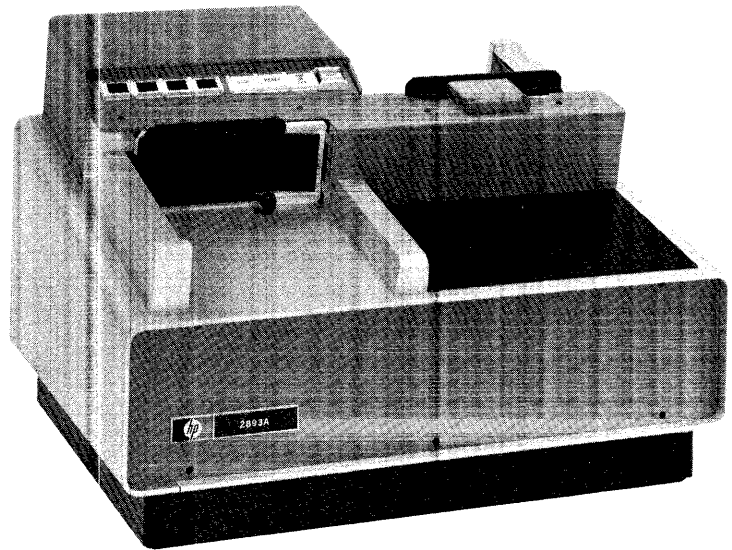


OPERATING AND SERVICE MANUAL

2892A AND 2893A CARD READERS



HEWLETT  PACKARD

CERTIFICATION

The Hewlett-Packard Company certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from the factory. The Hewlett-Packard Company further certifies that its calibration measurements are traceable to the U.S. National Bureau of Standards to the extent allowed by the Bureau's calibration facility.

HEWLETT  PACKARD

OPERATING AND SERVICE MANUAL

**2892A AND 2893A
CARD READERS**

SERIAL NUMBERS PREFIXED:

Model 2892A; 1208, 1236

Model 2893A; 1235

FOREWORD

This manual contains operating and service information for the Hewlett-Packard Models HP 2892A and HP 2893A Card Readers. Model numbers HP 2892A and HP 2893A are the Hewlett-Packard designation for the Model M 600L Card Reader manufactured by Documation Incorporated.

Except as noted, the information contained in this manual applies to both the HP 2892A and HP 2893A. This manual also applies to HP option 015, which is the 230-volt, 50-hertz version of both card readers.

The content of this manual was prepared by Documation Incorporated.

APPLICABILITY

This manual applies directly to HP 2892A Card Readers having serial numbers prefixed 1236 and HP 2893A Card Readers having serial numbers prefixed 1235. To make this manual applicable to HP 2892A Card Readers having serial numbers prefixed 1208, replace pages 3-3, 3-4, 4-7, 4-8, 10-1, 10-5, and 10-6 with like numbered pages located in the backdating supplement at the back of this manual.

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SECTION 1 INTRODUCTION

1.1 GENERAL

This technical manual contains operation, maintenance and repair information for Hewlett-Packard field specialists to support either the HP-2892A or the 2893A card readers. The HP-2892A Card Reader is interfaced to the HP-2100 computers using a HP-12924A interface kit. The HP-2893A Card Reader is interfaced to the HP-3000 series computers, using an HP-30206A interface kit and is referenced to as the HP-30106A Card Reader subsystem. The 2892A uses TTL interface circuits and the 2893A uses differential interface circuits. This manual provides the assembly and schematic diagrams for both interfaces.

Both readers are modified Documation Incorporated M600L Card Readers. The two card readers are identical mechanically and very similar in logic.

The M600L Card Reader shown in figures 1-1 and 1-2 is designed to read standard 12-row, 80 column punched cards. The hopper capacity is adequate to hold approximately 1000 cards of .007" thickness. These are separated from the stack sequentially and moved past a phototransistor read station where the data is recognized in a serial, column-by-column manner. The cards are then stacked into the output hopper in the same order as they were originally put into the reader. The reading cycle is externally controlled for single card selection or continuous run. In the continuous mode, the reader will read 600 cards per minute.

The M600L card readers are specifically designed for continuous duty operation in adverse operational environments. The chassis is of heavy duty construction and all components have been chosen to provide for rugged, reliable performance. The vacuum-type picker has a remarkable tolerance to mutilated, warped, and edge-damaged cards. The short card track and gentle acceleration forces of the card handling mechanism yield insignificant wear so that card decks routinely last in excess of 1000 passes.

1.2 SPECIFICATIONS

READING SPEED:	600 cards per minute maximum in continuous run. Single Card Cycle: 100 milliseconds.
CARD TYPE:	Standard 80 column cards.
CONTROL:	Demand feed, one card-at-a-time under external program control. Reader will continuous run as long as the Pick Command remains TRUE.
HOPPER SIZE:	7.25 inches (approximately 1000 cards of 7 mil thickness).
STACKER SIZE:	7.25 inches (approximately 1000 cards of 7 mil thickness).

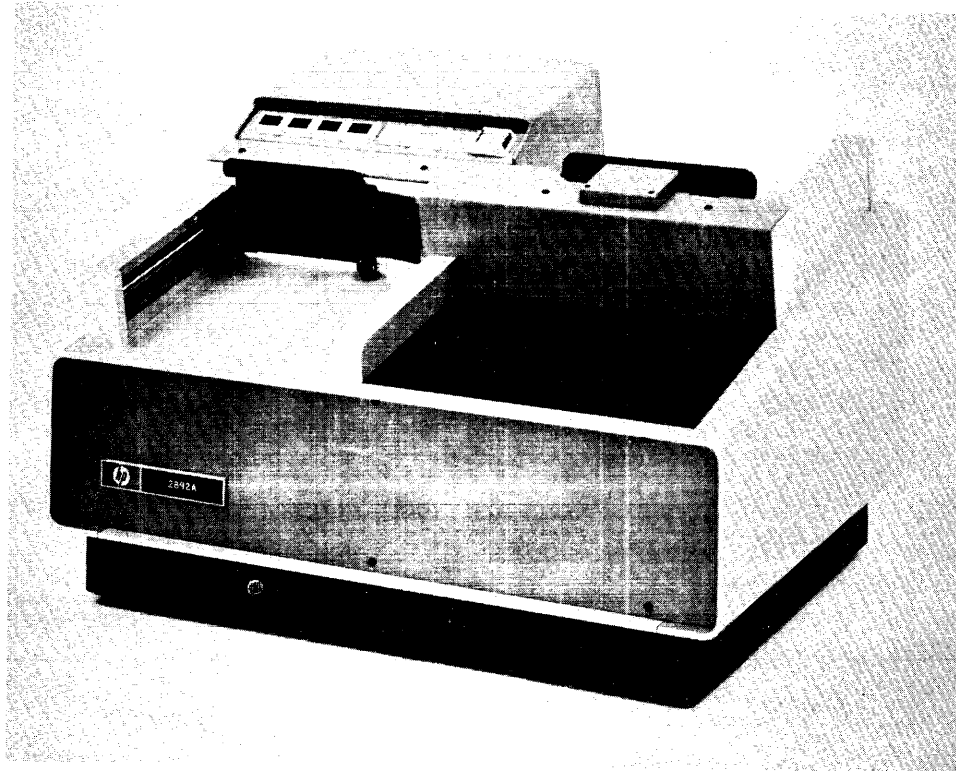


Figure 1-1 - Model HP-2892A and HP-2893A Card Reader,
Three-Quarter Front View

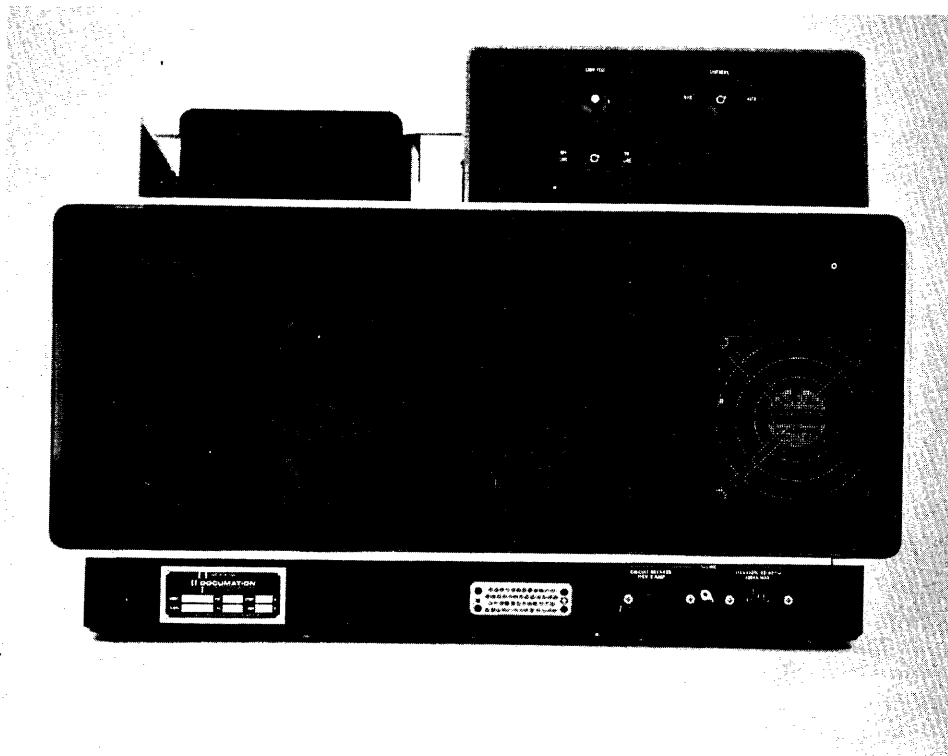


Figure 1-2 - Model HP-2892A and HP-2893A Card Reader,
Rear View

POWER REQUIREMENTS:

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

Power: 1350 VA starting load for 3 sec
450 VA running load

SIZE:

Height: 16-1/4 inches 41.2 cm

Width: 23-1/16 inches 58.6 cm

Depth: 18 inches 45.7 cm

WEIGHT: 77 pounds 34.4 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 sturdy triple container 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 Documation 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 reinstalled.

2.2 INITIAL CHECKOUT

Use the following instructions to test reader readiness.

- a. Make sure input voltage and frequency are correct. Plug in the AC power cord.
- b. Place the circuit breaker (rear base panel) to ON.
- c. Set the MODE switch (rear panel) in OFF LINE.
- d. Set the SHUTDOWN switch (rear panel) in AUTO.
- e. Depress the POWER switch to energize the reader (blower will not come on at this time).
- f. Depress the LAMP TEST switch (rear panel) and observe that all front panel indicators illuminate, except END OF FILE indicator.
- g. Pull the hopper follower back with one hand and load approximately 3 inches of unpunched cards into the hopper area.
- h. Depress the RESET switch. The blower should come on and, after a short delay (approximately three seconds), the cards should be picked and stacked. The blower will then turn off.
- i. Depress END OF FILE switch and observe that the indicator illuminates.

- j. Press the POWER switch turning reader off.
- k. Pull the stacker plate toward the front of the reader and remove the cards.
- l. This completes the initial off-line operational test.

SECTION 3 OPERATION

3.1 LOADING THE INPUT HOPPER

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

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

CAUTION

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

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

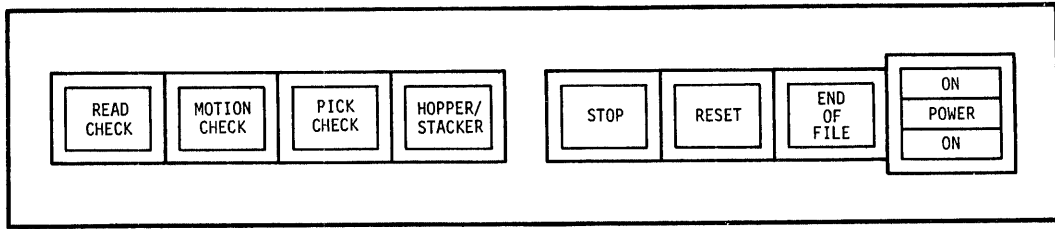
3.2 UNLOADING STACKER

To unload the stacker, perform the following steps:

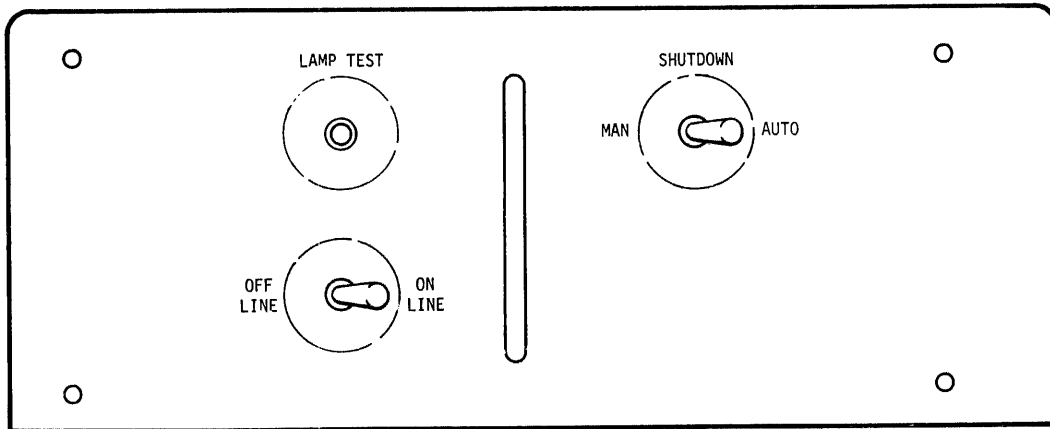
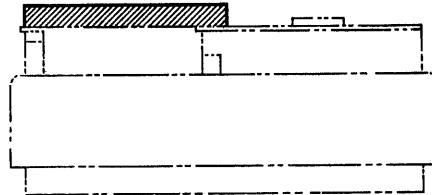
- a. Pull stacker follower back with one hand and remove the front or rear portion of the card deck from the stacker area, being careful that deck order is maintained.
- b. To unload stacker during operation, pull stacker back and remove portion of deck taking care to allow stacker plate to return to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

3.3 CONTROL AND INDICATOR DESCRIPTION

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



FRONT CONTROL PANEL



REAR PANEL

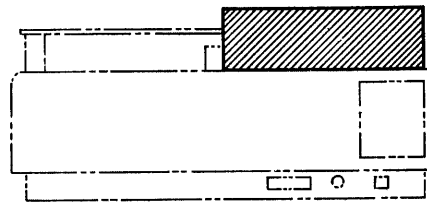


Figure 3-1 - Switch and Indicator Location

3.3.1 FRONT PANEL CONTROLS AND INDICATORS

Located on the front panel are four pushbutton type switches.

- POWER
- END OF FILE
- RESET
- STOP

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

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

READ CHECK
MOTION CHECK
PICK CHECK
HOPPER/STACKER

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 - ON LINE/OFF LINE

3.4 OPERATIONAL PROCEDURES

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

- a. Place the AC power circuit breaker in the ON position to allow power ON/OFF control from the front panel.
- b. Select the mode of operation, MANUAL or AUTO. When the MANUAL mode is selected, the vacuum/blower will run continuously when AC power is applied. When the AUTO mode of operation is selected, the vacuum/blower will turn off after the last card is read.
- c. The second mode switch is used to select either ON-LINE or OFF-LINE operation. When OFF-LINE 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 ON-LINE positions.
- d. With the OFF-LINE mode of operation established, depress the POWER switch on the front panel to apply primary power to the reader. Applying AC power turns on the drive motor and the cooling fan. The vacuum/blower motor will not come on at this time due to the input hopper being empty and AUTO shutdown selection.
- e. Depress the LAMP TEST switch and check that all front panel indicators are lighted (except END OF FILE indicator).

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

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- d. With the OFF-LINE mode of operation established, depress the POWER switch on the front panel to apply primary power to the reader. Applying AC power turns on the drive motor and the cooling fan. The vacuum/blower motor will not come on at this time due to the input hopper being empty and AUTO shut-down selection.
- e. Depress the LAMP TEST switch and check that all front panel indicators are lighted (except END OF FILE indicator).

- f. Load the input hopper and depress the RESET switch. the RESET switch is a momentary action pushbutton indicator used to clear any error conditions and establish the card reader "ready" condition. When the "ready" condition is established, the RESET switch indicator will light green. The vacuum/blower motor will start and riffling of the first half inch of cards begins.
- g. 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.
- h. 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.
- i. The MOTION 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.
- j. The END-OF-FILE switch is used to develop a status signal to the external control logic. This status indicates that the cards remaining in the input hopper are the last cards in the input file. The END-OF-FILE switch indicator will light green when the END-OF-FILE switch is pressed. The END-OF-FILE switch indicator can be turned off by again pressing the END-OF-FILE switch or pressing the RESET switch.
- k. The HOPPER/STACKER indicator will light when the input hopper is empty or when the output stacker is full. This is normal operation.
- l. The STOP switch is a momentary action pushbutton switch indicator 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.

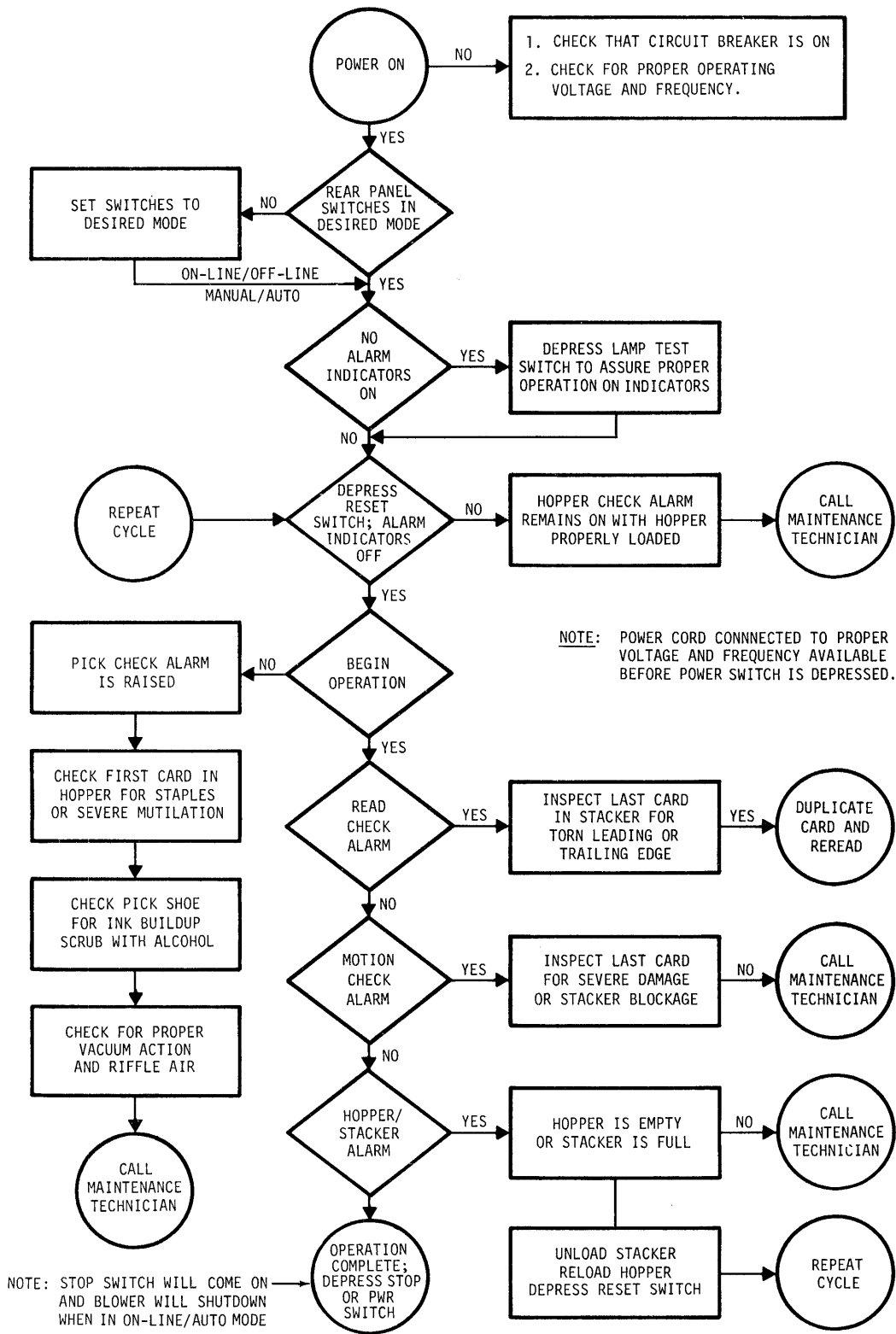


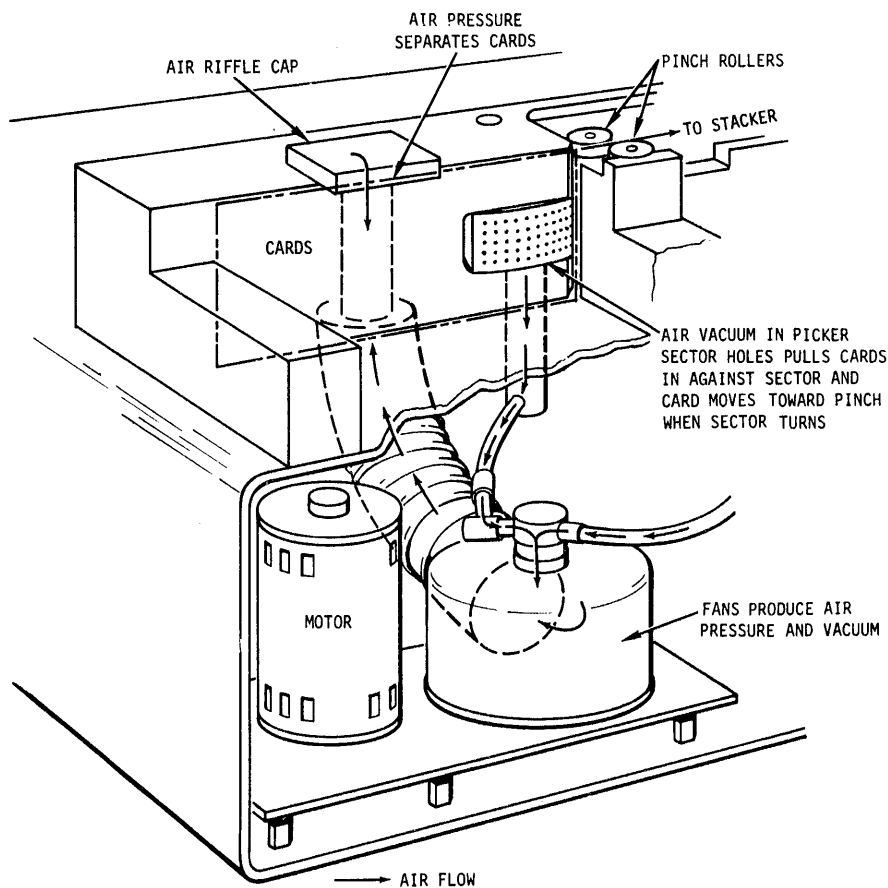
Figure 3-2 - Operational Flow Chart

SECTION 4 THEORY OF OPERATION

4.1 CARD FEEDING MECHANISM

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

Once in the card track, the drive rollers on either side of the read station drive the card through the read station and into the stacker at a velocity equal to 100 inches per second. (.001 inches equals 10 usec.)



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 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

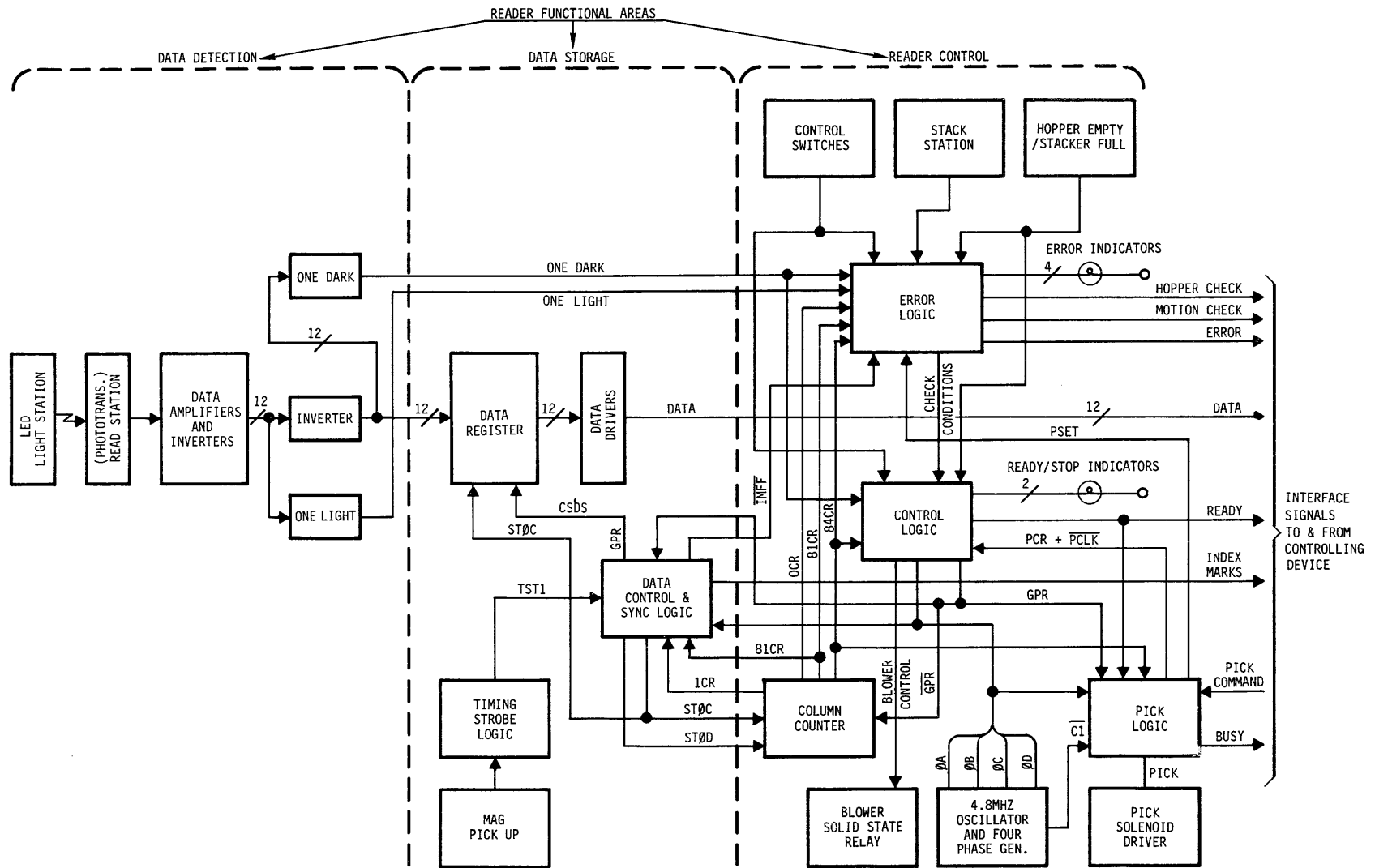


Figure 4-2. Block Diagram, M Series Card Reader

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.

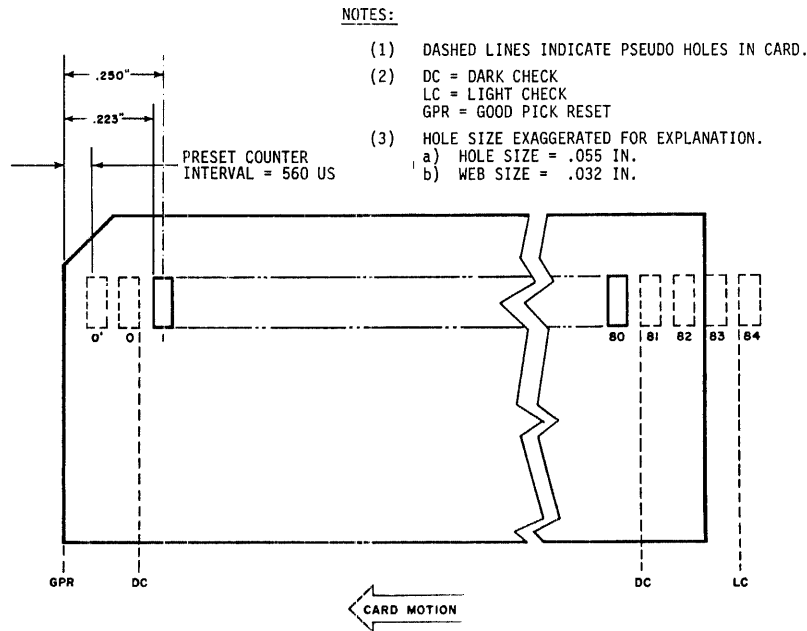


Figure 4-3 - Timing Relationship for Standard Punched Card

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

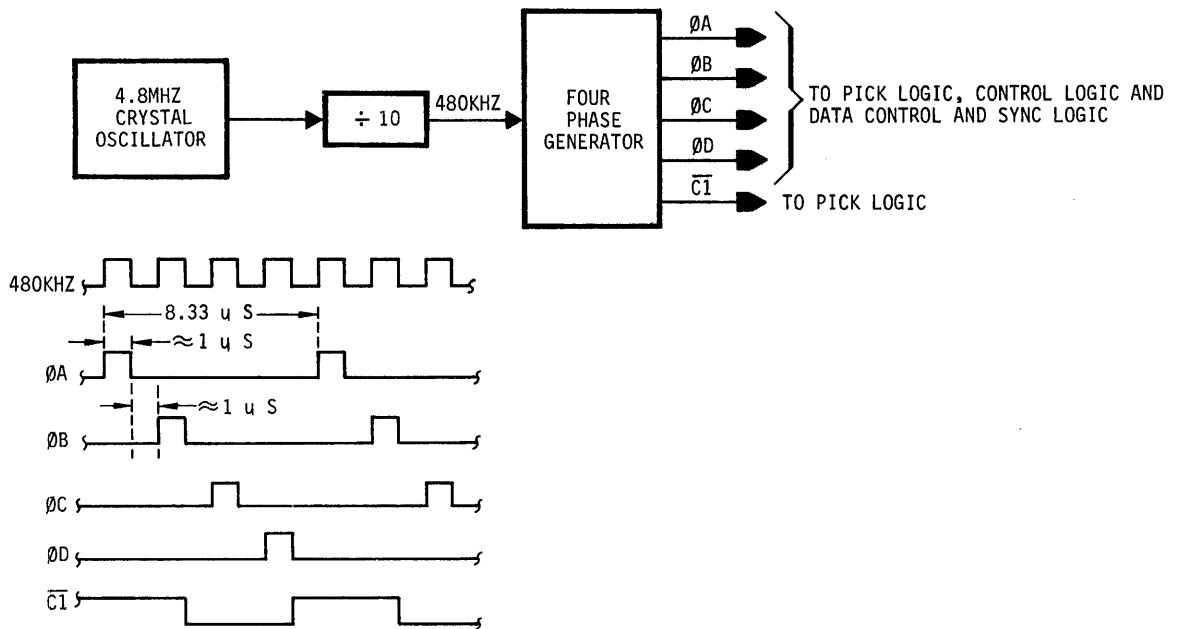


Figure 4-4 - Block and Timing Diagram, 4.8 MHz Oscillator and Four-Phase Generator

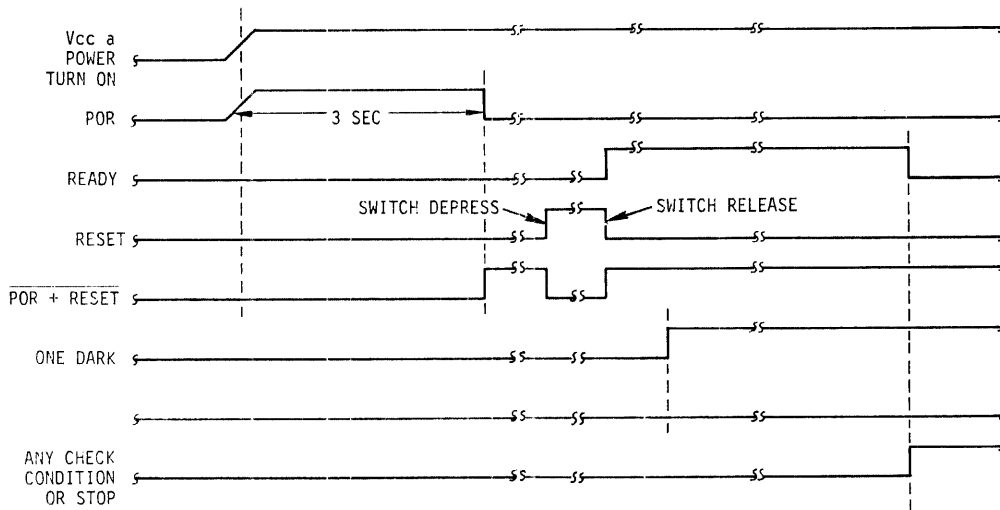
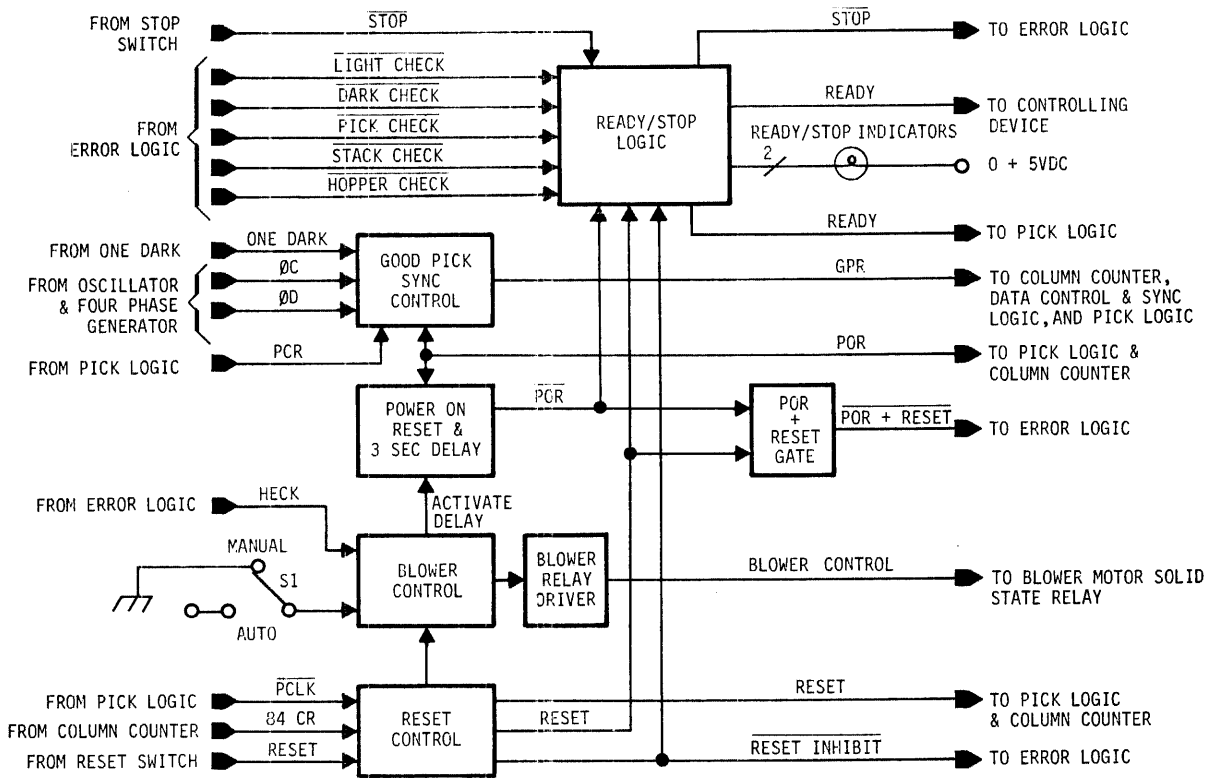


Figure 4-5 - Block and Timing Diagram, Control Logic

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 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. 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:

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

The Blower Control provides signals to control AC power to the reader's blower motor. The blower motor automatically shuts 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 three-second POR. When the SHUTDOWN switch is in the MAN position, the blower remains 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

operation. POR is also used to initialize the Pick Logic and Column Counter. $\overline{\text{POR}}$ OR'ed with $\overline{\text{RESET}}$ to form $\overline{\text{POR} + \text{RESET}}$ 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 $\overline{\text{RESET}}$ activates the $\overline{\text{POR} + \text{RESET}}$ signal to the Error Logic. The Reset Control is designed to ignore all RESET switch signals while a read cycle is in progress. Signals $\overline{\text{PCLK}}$ and $\overline{84\text{CR}}$ 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 $\overline{\text{POR}}$ or $\overline{\text{RESET}}$.) 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 $\overline{\text{RESET INHIBIT}}$ is not present. The Ready/Stop Logic gates the STOP signal with $\overline{\text{RESET INHIBIT}}$, preventing READY from being reset due to STOP during a card read cycle. RESET INHIBIT, generated by the Reset Control, is set by $\overline{\text{PCLK}}$ and reset by $\overline{84\text{CR}}$. 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 $\overline{\text{OC}}$ and $\overline{\text{OD}}$ to produce Good Pick Reset (GPR). GPR is used to:

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

The Blower Control provides signals to control AC power to the reader's blower motor. The blower motor automatically shuts 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 three-second POR. When the SHUTDOWN switch is in the MAN position, the blower remains 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 $\overline{\text{PCLK}}$
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 ($\overline{\text{PSET}}$).

The Pick Control generates $\overline{\text{PCLK}}$ (Figure 4-6 timing) until a GPR is received or READY goes false due to the pick fail signal ($\overline{\text{PSET}}$). $\overline{\text{PCLK}}$ 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

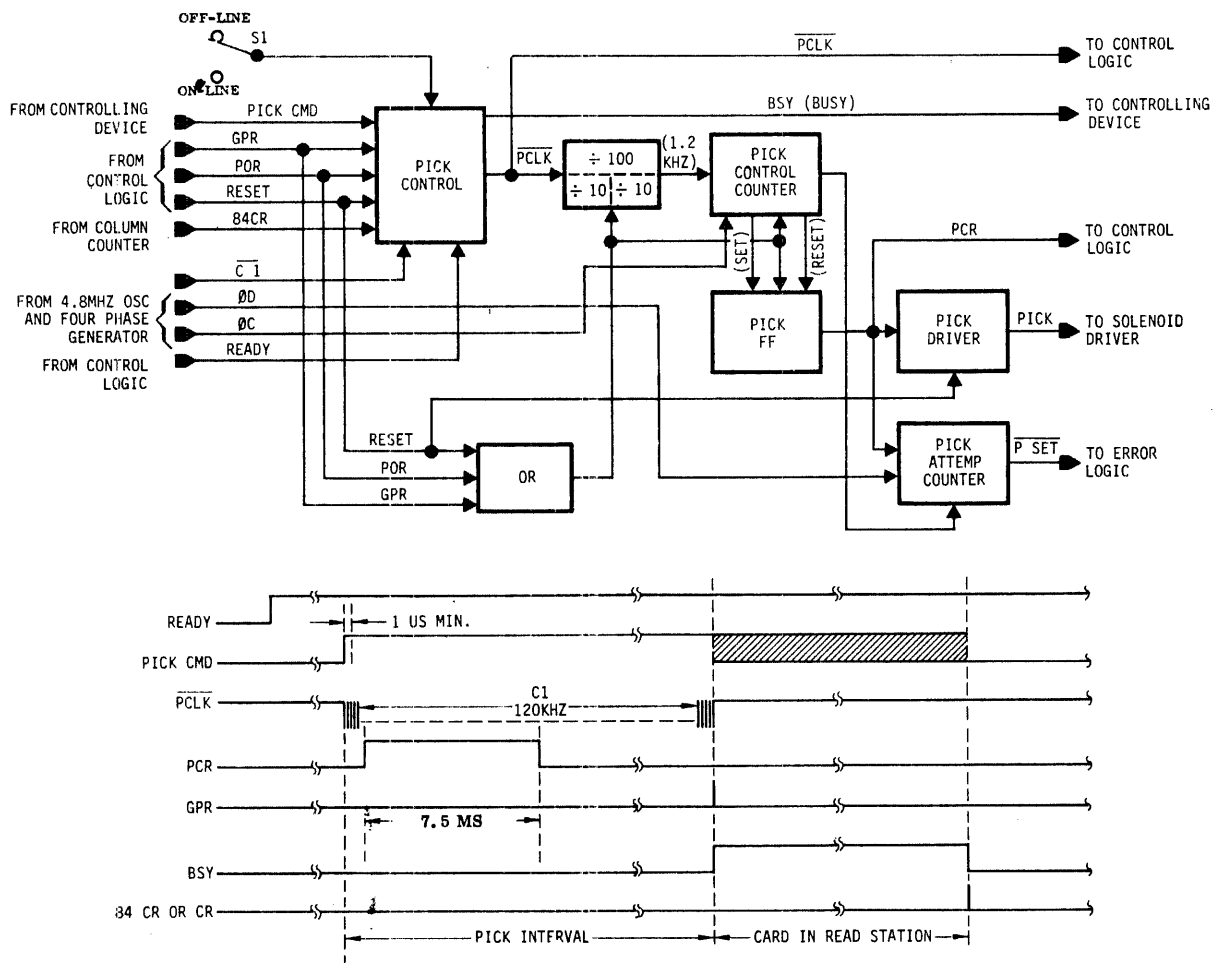


Figure 4-6 - Block and Timing Diagram, Pick Logic

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

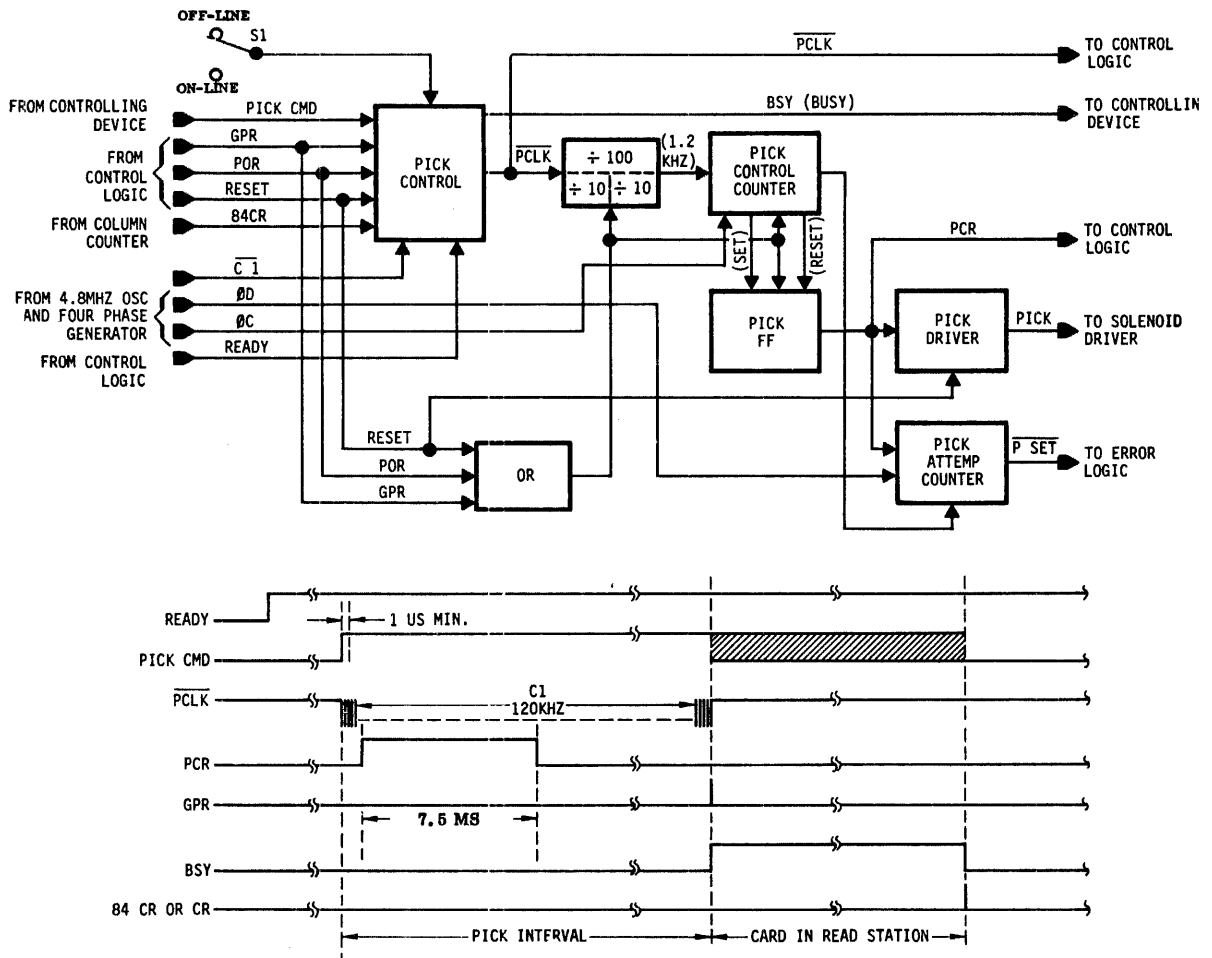


Figure 4-6 - Block and Timing Diagram, Pick Logic

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 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 have been counted and count 56 is reached $\overline{\text{PSET}}$ is generated. $\overline{\text{PSET}}$ will cause READY to go false terminating $\overline{\text{PCLK}}$.

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 OFF LINE, 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 ON LINE, 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 and 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
1CR	1. Data Control and Sync Logic to set the Index Mark Control Flip Flop (IMFF).

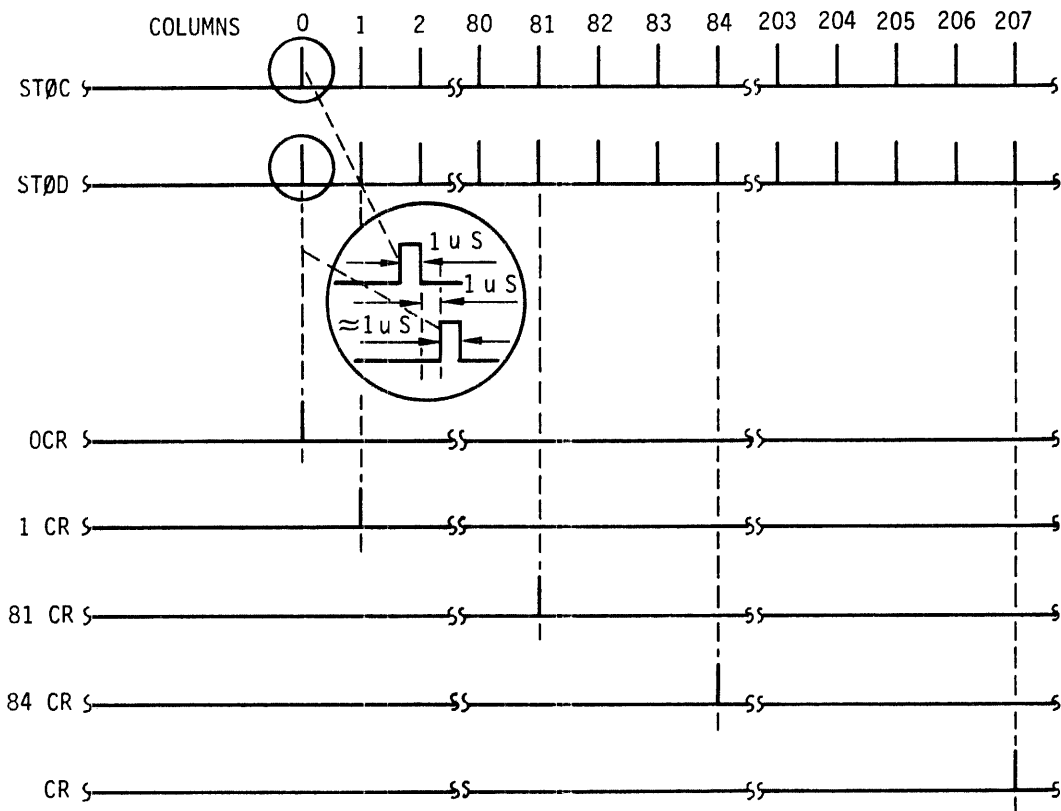
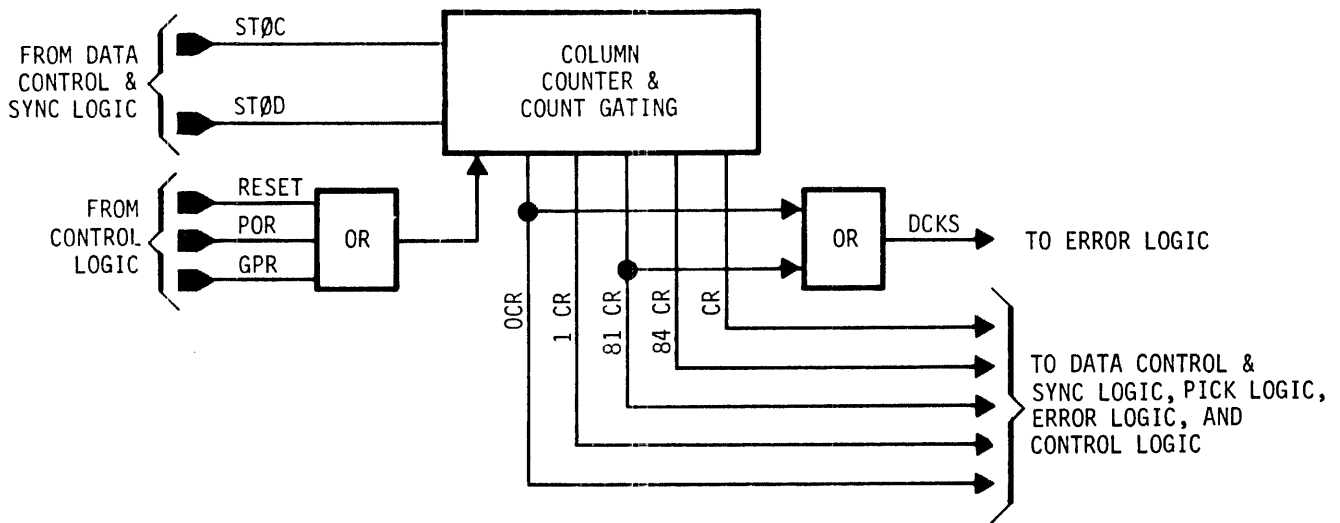


Figure 4-7 - Block and Timing Diagram, Column Counter

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.

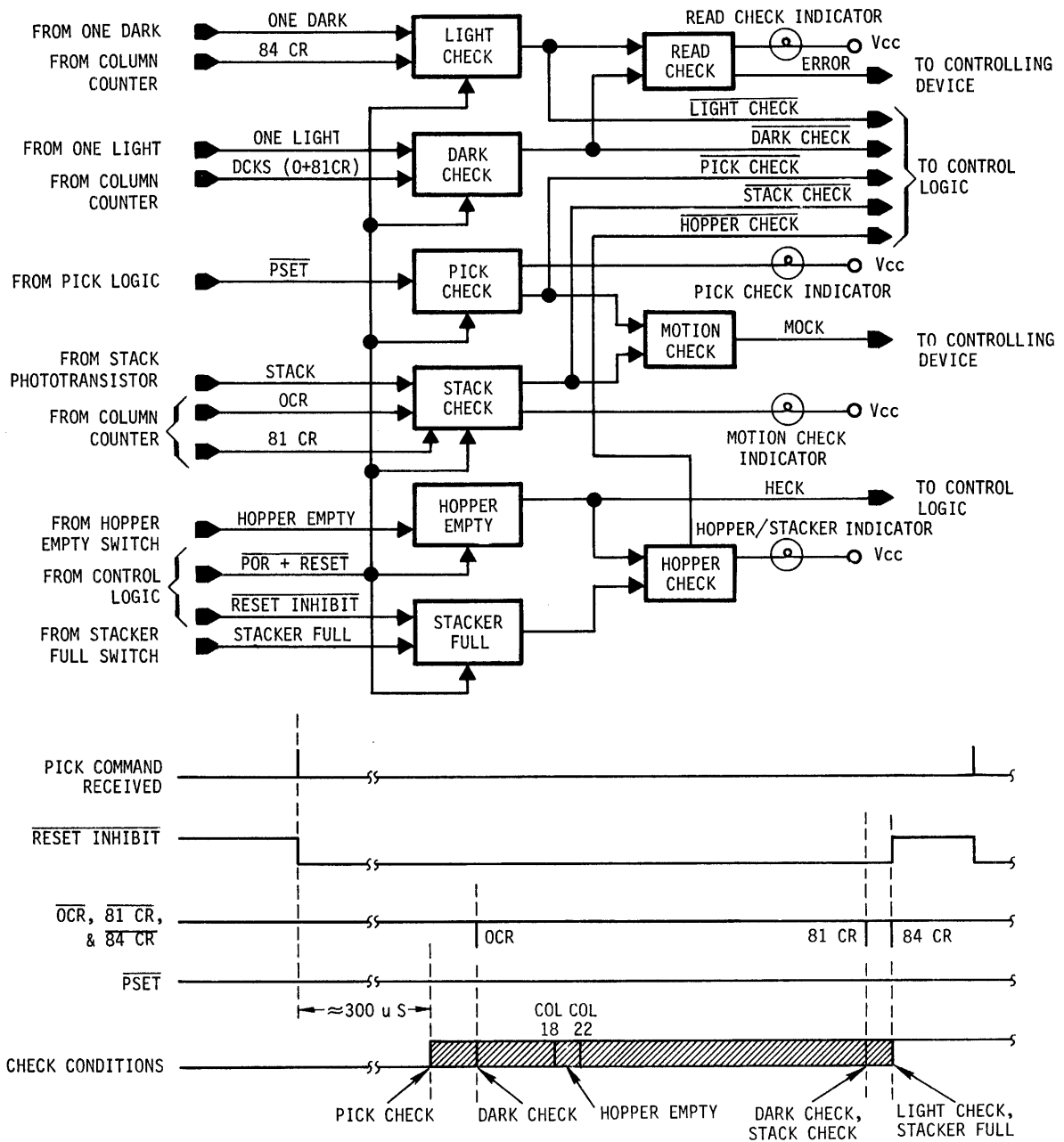


Figure 4-8. Block and Timing Diagram, Error Logic

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 MOCK Motion Check 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 signaled to the controlling device and READY is reset. Hopper Empty is signalled to the operator by the HOPPER/STACKER 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 MOTION 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.

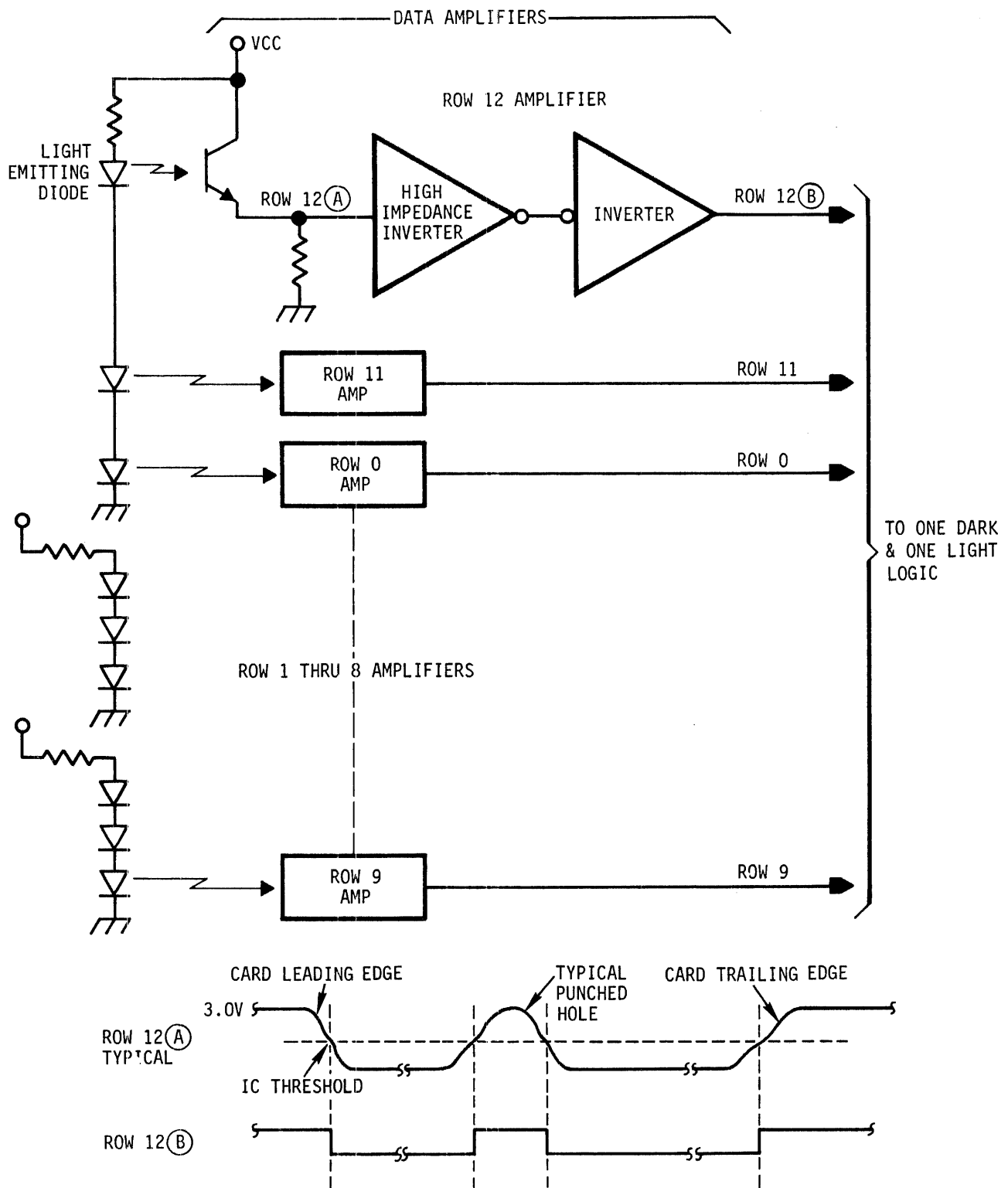


Figure 4-9. Block and Timing Diagram, Data Amplifiers and Inverters

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,

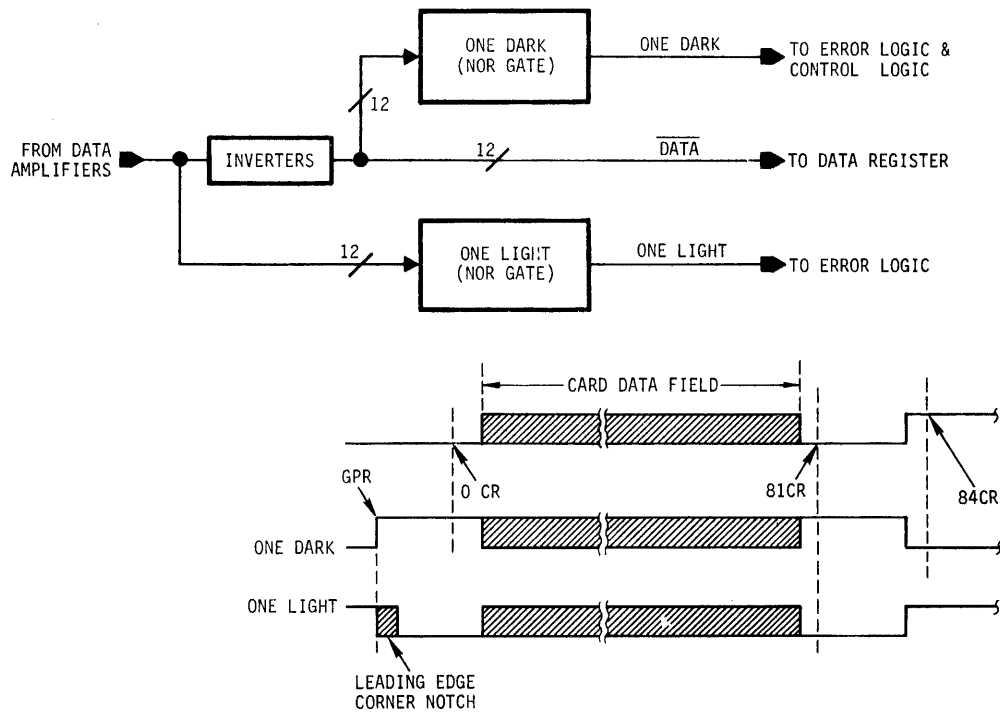


Figure 4-10. Block and Timing Diagram, One Dark and One Light

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 $\overline{\text{PRCLK}}$ (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 $\overline{\text{OSCLK}}$ (Offset Clock). $\overline{\text{OSCLK}}$ at 120 KHz drives the eight stage Offset Storage Counter, counting it upwards, while and until the Preset Counter reaches all ones. $\overline{\text{ZERO}}$ is now generated by the Preset Counter terminating both $\overline{\text{PRCLK}}$ and $\overline{\text{OSCLK}}$. 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 ($\overline{\text{OSUCLK}}$). $\overline{\text{OSUCLK}}$ 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 $\text{ST}\overline{\text{O}}\text{B}$ resets the Sync Control Logic, $\text{ST}\overline{\text{O}}\text{C}$ resets the Data Register and $\text{ST}\overline{\text{O}}\text{C}$ and $\text{ST}\overline{\text{O}}\text{D}$ 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, $\text{ST}\overline{\text{O}}\text{B}$, $\text{ST}\overline{\text{O}}\text{C}$ and $\text{ST}\overline{\text{O}}\text{D}$ each time.

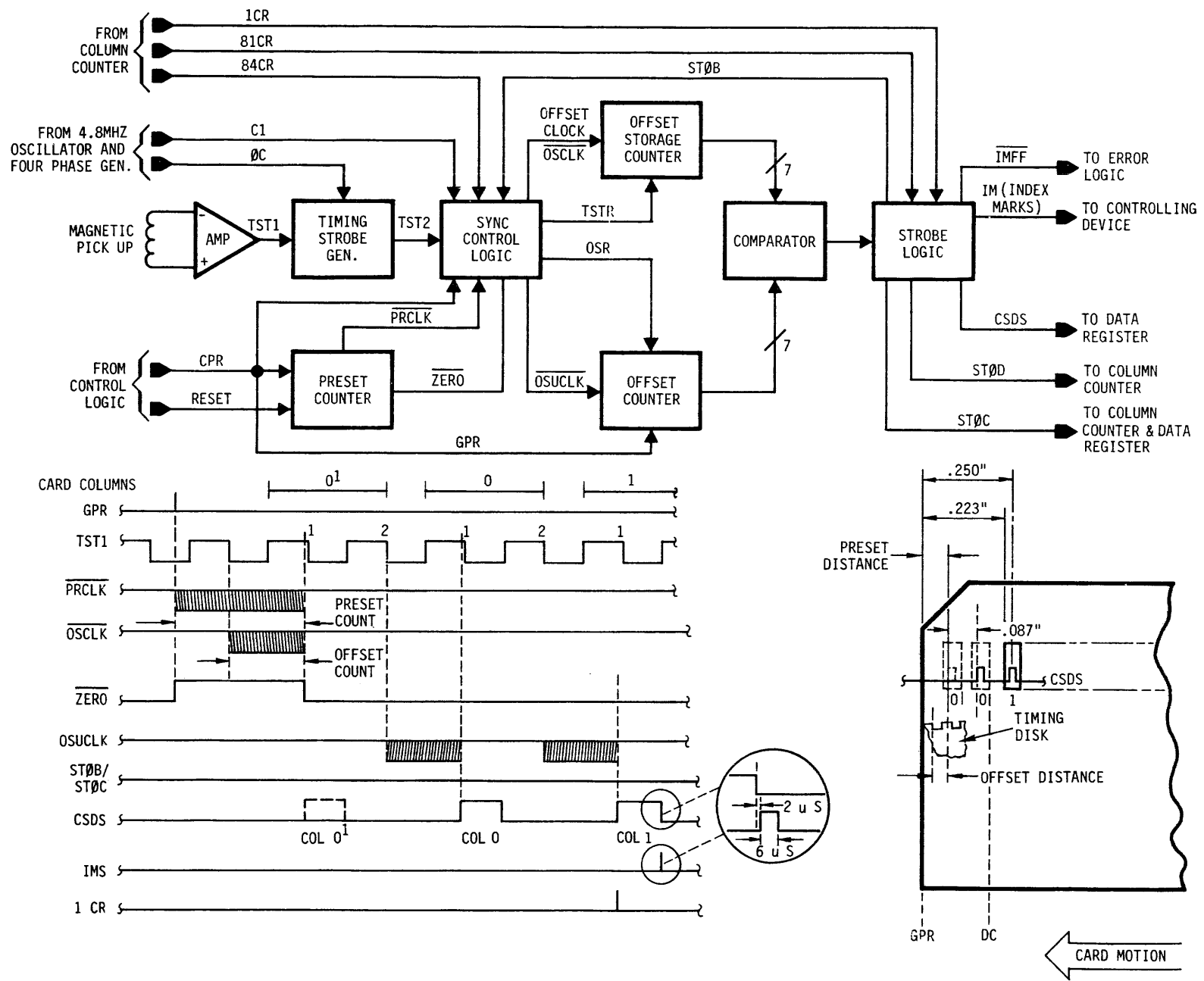


Figure 4-11. Block and Timing Diagram, Data Control and Sync Logic Drivers

1CR from the Column Counter sets the Index Mark Control Flip Flop (IMFF) in the Strobe Logic. The Strobe Logic generate $6\mu\text{s}$ 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.

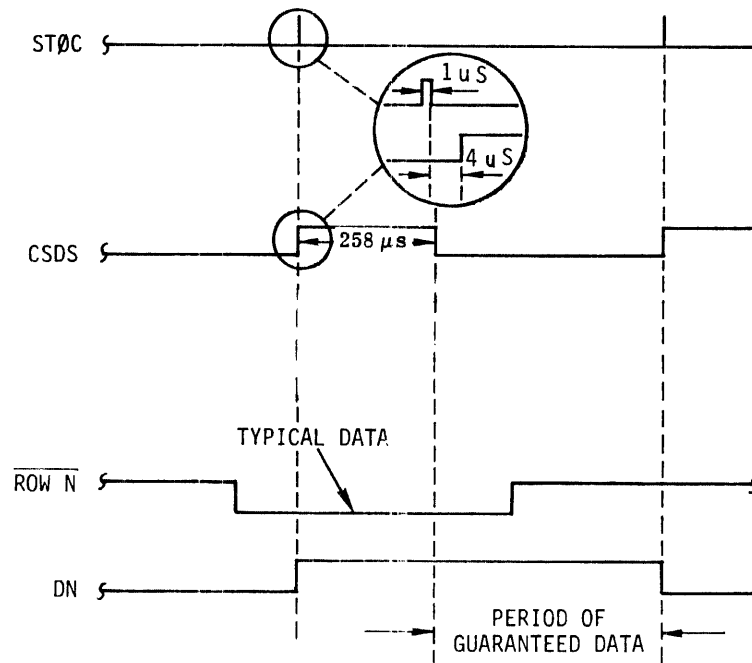
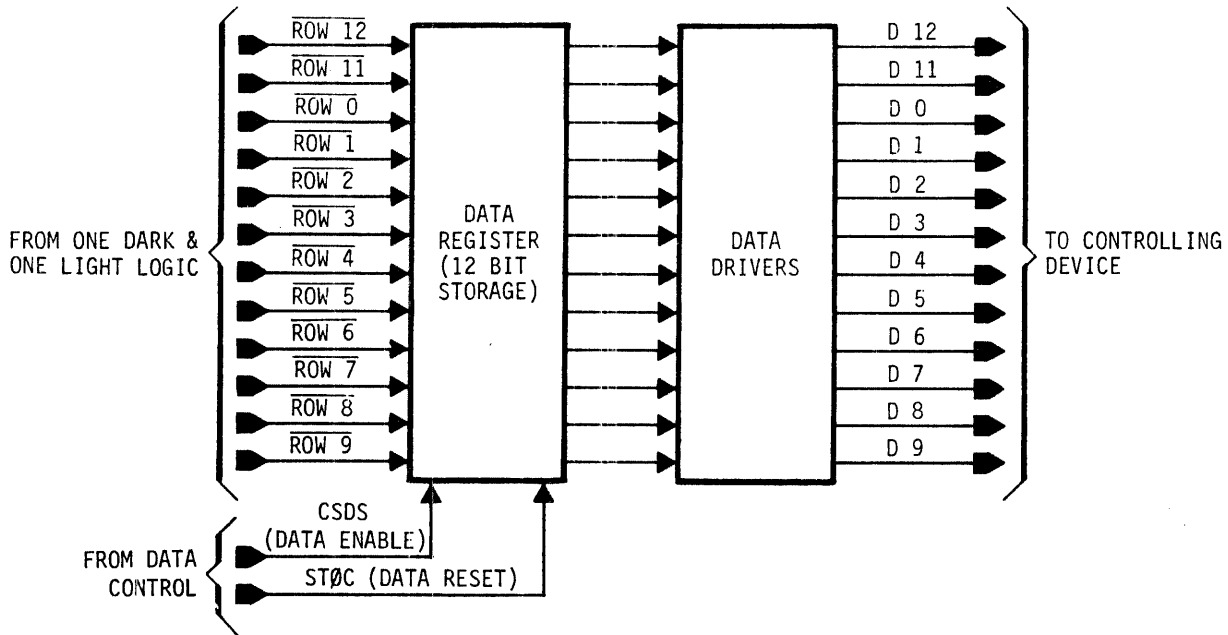


Figure 4-12. Block and Timing Diagram, Data Register and Data Drivers

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 Amplifiers and Inverters

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 us $ST\bar{O}C$ is followed in approximately 4 us 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 M600L punched card readers and the equipment into which it transfers data.

5.2 INTERFACE CARDS

All interface signals are processed by and/or routed through the Interface Cards as shown in Figure 5-1. The Interface Cards are supplied in two configurations. In Configuration 1, the Driver Card and Receiver Card contain Differential Line Drivers and Receivers. The Differential Line Drivers and Receivers transmit differential outputs and receive differential inputs providing rejection of large common mode signals while responding to small differential signals. In Configuration 2, the Driver Jumper Card and Receiver Jumper Card replace the Driver and Receiver Cards. In this configuration, Jumpers are

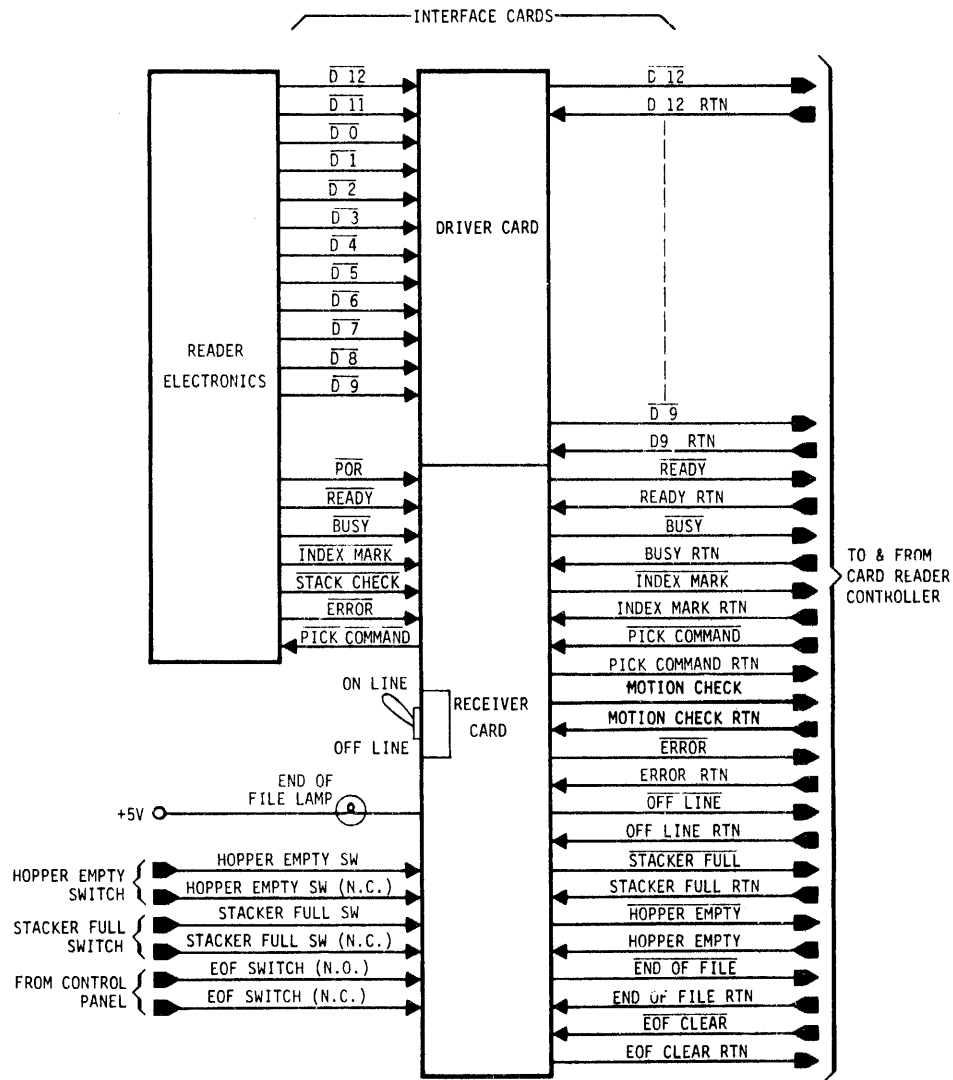


Figure 5-1. Block Diagram, Interface Cards

used to route signals through the Interface Card, thus, interfacing the Card Reader Controller directly to the Reader Electronics.

Figure 5-1 is a block diagram showing the interconnections between the Interface Cards, Reader Electronics, Reader Control Panel and Card Reader Controller. The following is a description of each of those interconnections and their functions.

Signal	Description
D12 through D9	D12 through D9 are converted to differential outputs by the Driver Card or jumpered from card input to output by the Driver Jumper Card.
POR	Power On Reset (POR) is used by the Receiver or Receiver Jumper Card to initialize the End of File logic.
READY BUSY INDEX MARK STACK CHECK ERROR PICK COMMAND	These signals are converted to differential outputs Receiver Card or jumpered from card input to output by the Receiver Jumper Card. The Receiver Card accepts a <u>differential input</u> signal and generates PICK COMMAND to the Reader Electronics. The Receiver Jumper Card routes PICK COMMAND from the Card Reader Controller to the Reader Electronics. Logic is provided on the Receiver Card and Receiver Jumper Card to generate a continuous PICK COMMAND to the Reader Electronics when in the OFF LINE mode of operation.
HOPPER EMPTY SW. HOPPER EMPTY SW. (N. C.) STACKER FULL SW. STACKER FULL SW. (N. C.)	The Receiver Card and Receiver Jumper Card contain debounce Flip Flops for the Hopper Empty and Stacker Full switches. The Flip Flops drive differential line drivers on the Receiver Card and TTL line drivers on the Receiver Jumper Card.
EOF SWITCH (N. O.) EOF SWITCH (N. C.)	Depressing the End-of-File Control Panel Switch will cause the Receiver Card to generate a differential END OF FILE signal to the Card Reader Controller.

The EOF SWITCH (N. O.) and (N. C.) inputs are used to set and reset a debounce Flip Flop on the Receiver Card. The output of this Flip Flop drives the clock input of the End of File Flip Flop. Each time the switch is depressed and released a clock edge is generated causing the End of File Flip Flop to toggle.

END OF FILE LAMP

The End of File Lamp is located in the EOF switch housing. Each time the End of File Flip Flop is set the lamp will light.

EOF CLEAR

The Receiver Card receives a differential EOF CLEAR signal and clears the End of File Flip Flop.

The Receiver Jumper Card receives the EOF CLEAR signal and clears the End of File Flip Flop.

5.3 TIMING

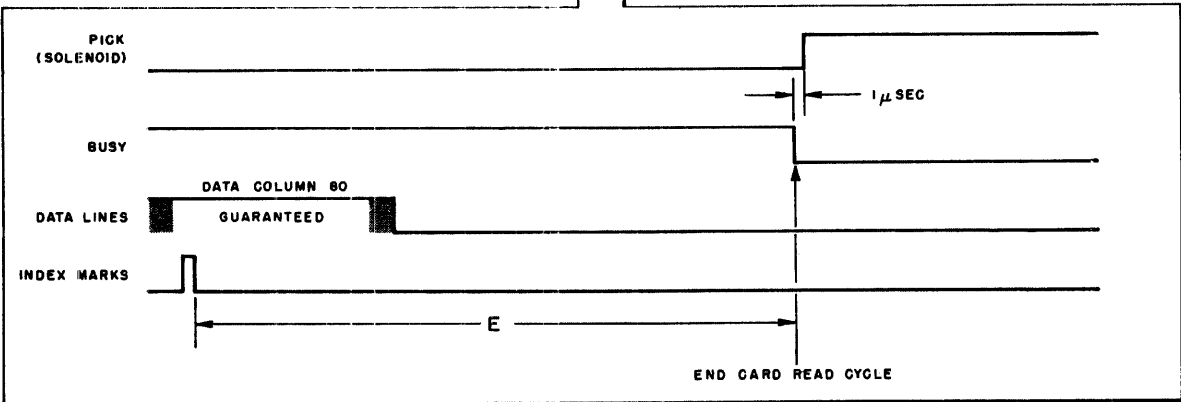
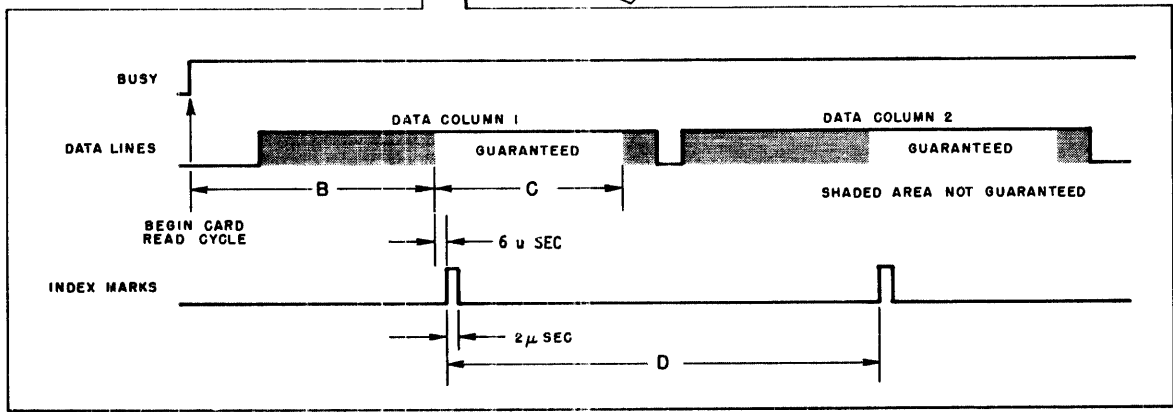
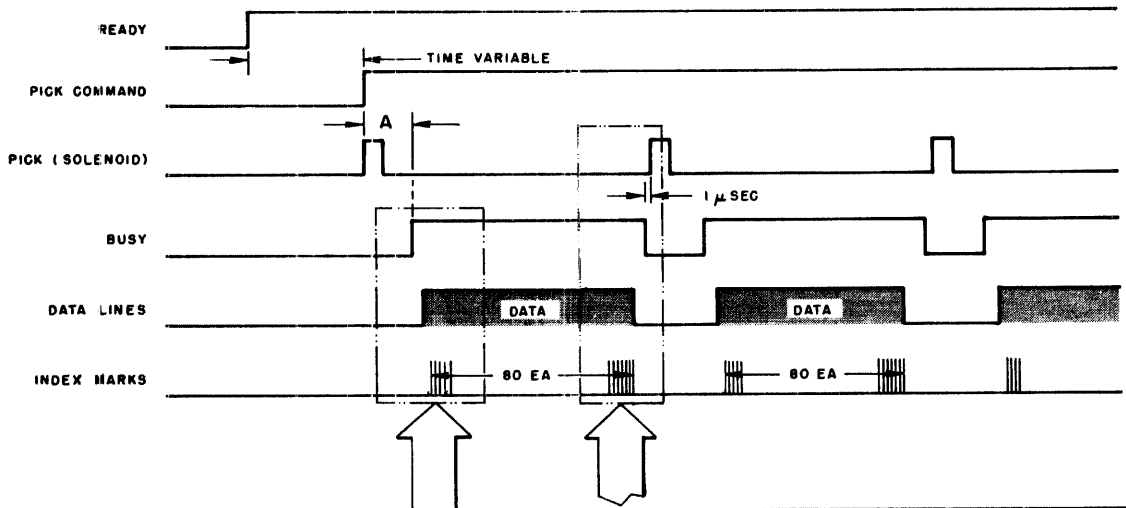
In interfacing the M600L card readers to an external system or card reader controller, the designer should appreciate that three separate categories of interface signals are being dealt with. The first are the signals which control and report the status of card processing, the second are the data signals themselves with their associated index marks, and the third are the various alarm signals provided. In the description following, the designer should refer to the timing diagram shown in figure 5-1.

5.3.1 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. ON LINE is selected by the ON LINE/OFF LINE MODE switch.
4. Depress and release of the RESET pushbutton.



NOTE:
WAVEFORMS NOT SHOWN TO SCALE.

MODEL	A (min)	B	C	D	E	CARD PICK CYCLE
M600	24	2600	435	870	3480	100
		M SEC	u SEC	u SEC	u SEC	M SEC

Figure 5-2. Interface Timing Diagram

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, 5-2), 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.

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.

5.3.2 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 5-2.

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 should have settled. Data levels are guaranteed to remain on the output lines available for transfer to the external equipment for interval C. The data lines may actually remain TRUE longer than the guaranteed period; however, the absolute duration of the data signal is not controlled as it will vary slightly due to variations in the track speed of the card reader.

5.3.3 ALARMS

A description of the standard alarm signals provided in the M600L reader follows:

5.3.3.1 Hopper Empty

The HOPPER EMPTY signal goes TRUE when the last card has been fed from the input hopper. When the hopper goes empty and the AUTO/MANUAL switch is on the AUTO position, the blower is automatically switched off. When the input hopper is reloaded and RESET depressed, the blower will turn on.

5.3.3.2 Stacker Full

The STACKER FULL signal goes TRUE when the stacker reaches its card capacity. The STACKER FULL condition can only be reset after sufficient cards are removed to eliminate the full-to-capacity condition.

5.3.3.3 End of File

The END OF FILE signal goes TRUE whenever the END OF FILE (EOF) switch is depressed. The EOF condition is indicated by the switch lighting green. EOF can be reset by again depressing the EOF switch.

5.3.3.4 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.

5.3.3.5 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 MOTION 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.

5.4 CONNECTOR

A 50 pin Winchester connector P/N MRAL-50-S-J-602, provides access for all control, data and alarm lines.

The connector pin assignment configuration is listed as follows:

J2 I/O SIGNAL CONNECTOR PIN LIST

<u>PIN</u>	<u>SIGNAL</u>	<u>DESCRIPTION</u>	<u>PIN</u>	<u>SIGNAL</u>	<u>DESCRIPTION</u>
A	D12	Row 12 Data	<u>e</u>	HOPPER EMPTY	Hopper Empty
E	D12 RTN	Row 12 Data Return	<u>k</u>	HOPPER EMPTY RTN	Hopper Empty Rtn
B	D11	Row 11 Data	<u>p</u>	MOTION CHECK	Motion Check
F	D11 RTN	Row 11 Data Return	<u>u</u>	MOTION CHECK RTN	Motion Check Rtn
C	DO	Row 0 Data	<u>f</u>	PC	Pick Command
H	DO RTN	Row 0 Data Return	<u>m</u>	PC RTN	Pick Command Rtn
D	D1	Row 1 Data	<u>n</u>	BUSY	Busy
J	D1 RTN	Row 1 Data Return	<u>t</u>	BUSY RTN	Busy Return
K	D2	Row 2 Data	<u>r</u>	IM	Index Mark
P	D2 RTN	Row 2 Data Return	<u>v</u>	IM RTN	Signal Ground
L	D3	Row 3 Data	<u>y</u>	STACKER FULL	Stacker Full
R	D3 RTN	Row 3 Data Return	<u>cc</u>	STACKER FULL RTN	Stacker Full Rtn
M	D4	Row 4 Data	<u>w</u>	EOF CLEAR	End of File Clear
S	D4 RTN	Row 4 Data Return	AA	EOF CLEAR RTN	End of File Clear Rtn
N	D5	Row 5 Data			
T	D5 RTN	Row 5 Data Return			
U	D6	Row 6 Data	<u>x</u>	EOF	End of File
Y	D6 RTN	Row 6 Data Return	BB	EOF RTN	End of File Rtn
V	D7	Row 7 Data	<u>z</u>	OFF LINE	Off Line
Z	D7 RTN	Row 7 Data Return	DD	OFF LINE RTN	Off Line Return
W	D8	Row 8 Data	HH	+5V	+5 Volts
<u>a</u>	D8 RTN	Row 8 Data Return	<u>s</u>	SPARE	
<u>d</u>	D9	Row 9 Data	FF	SPARE	
<u>i</u>	D9 RTN	Row 9 Data Return	EE	SPARE	
X	RDY	Ready			
<u>b</u>	RDY RTN	Ready Return			
<u>c</u>	ERROR	Error			
<u>h</u>	ERROR RTN	Error Return			

5.5 SIGNAL CHARACTERISTICS

When the Receiver Jumper Card and Driver Jumper Card are supplied, (HP-2892A) signal sense is a ground true. Circuit characteristics are shown in figure 5-3.

When the Receiver and Driver Cards are supplied, (HP-2893A) signal sense is a differential signal consisting of the signal line going to ground and the signal line's return going to Vcc. Circuit characteristics are shown in figure 5-4.

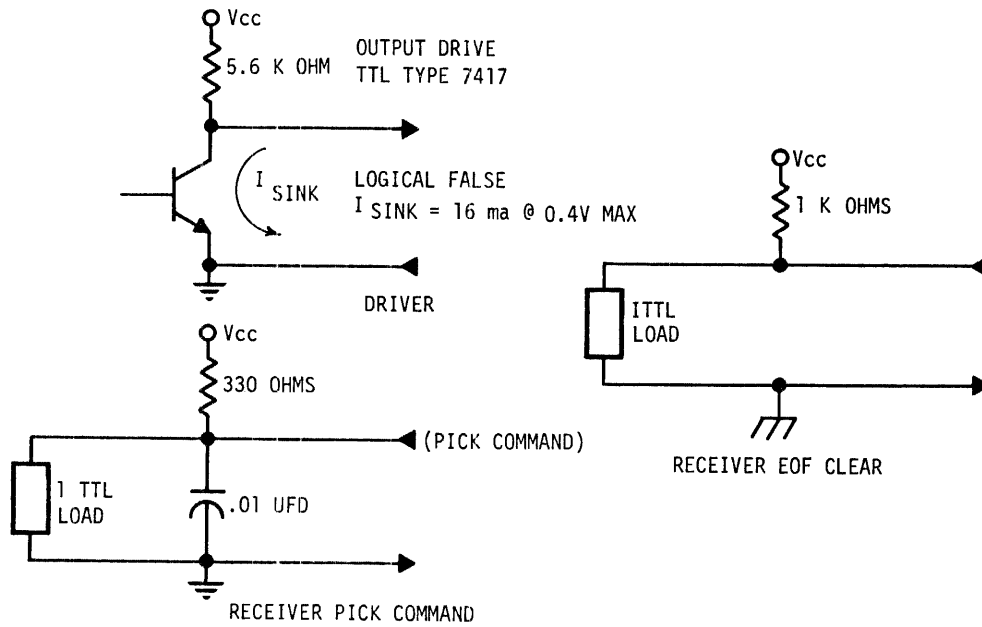


Figure 5-3. Receiver and Driver Jumper Card Interface, Circuit Characteristics

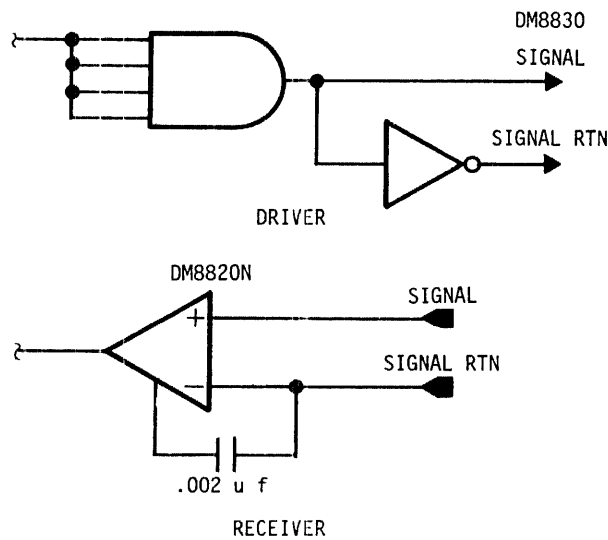


Figure 5-4. Receiver and Driver Card Interface, Circuit Characteristics

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 following adjustments it will be necessary to remove the front, top, and rear panels. Remove all three panels using a 5/64 Allen screwdriver.

- a. Remove the six screws 1 which secure the front panel to the mainframe. Refer to figure 6-1.
- b. With the front panel removed, remove the top cover. The top cover is secured with 4 screws 3 figure 6-1.
- c. With the front panel and top cover removed, remove the rear panel. The rear panel is also held in place by 6 screws 2 figure 6-2.
- d. After removing the 6 screws, move the rear panel out slightly and disconnect the fan, then remove the panel.

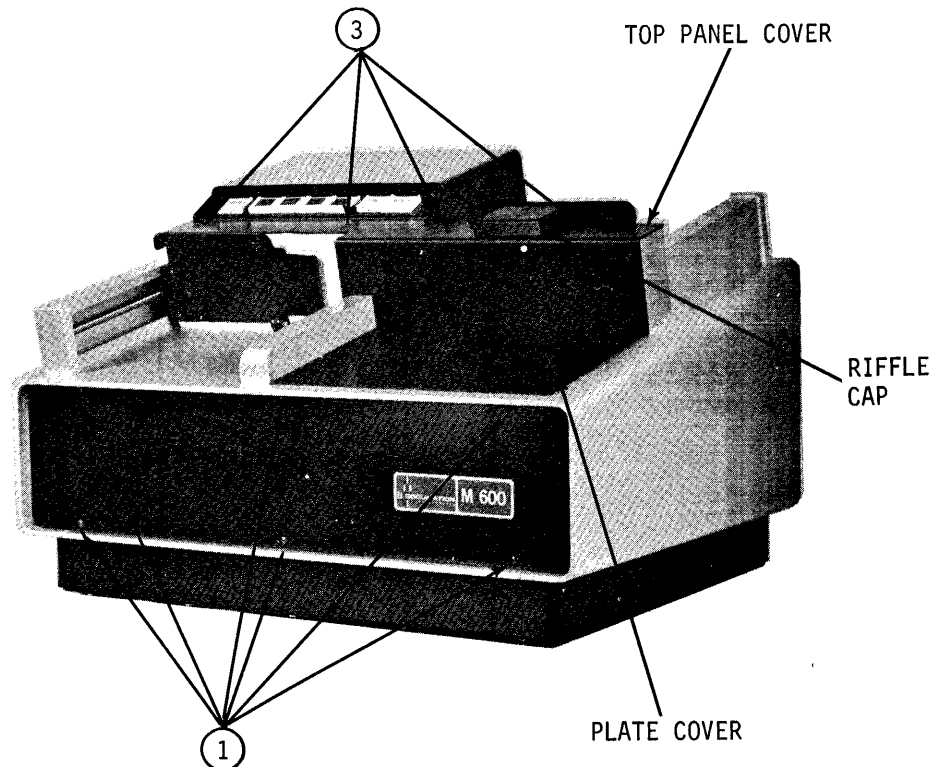


Figure 6-1. Front Panel and Top Cover Removal

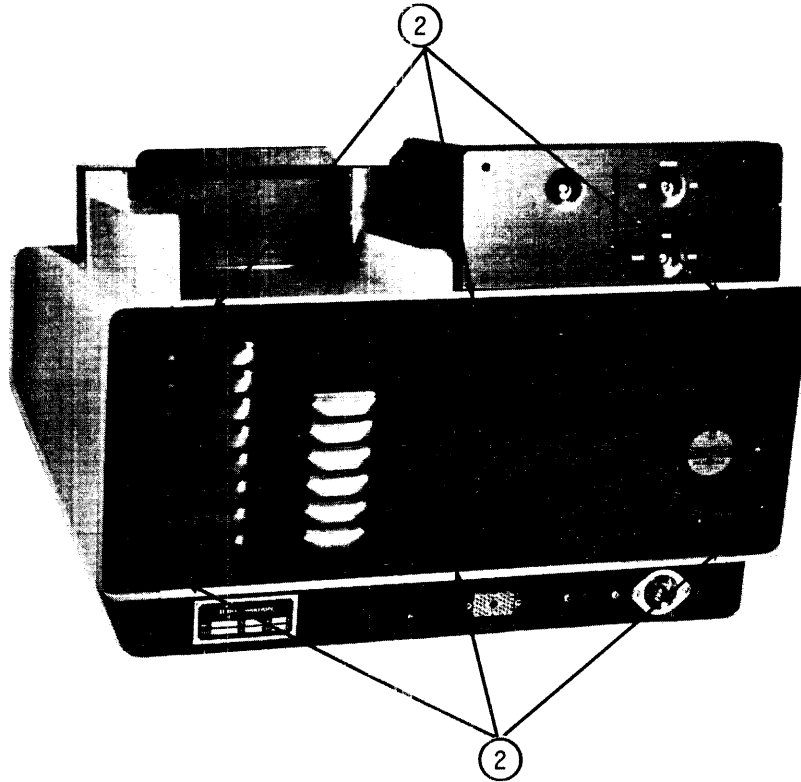


Figure 6-2. Rear Panel Removal

6.2 TENSION ON THE MAIN DRIVE MOTOR BELT

The drive motor belt tension is adjusted to insure constant card speed and timing.

- a. Using a 9/64 Allen ratchet wrench, loosen the 4 socket head motor mounting plate screws, figure 6-3.
- b. Move the motor mounting plate back and forth to be sure it slides freely. Grasp the motor from the front of the reader and apply sufficient pressure toward the rear to remove all slack from the belt. Tighten the motor plate mounting screws.
- c. Manually deflect the belt halfway between the motor pulley and the drive roller shaft pulley. Approximately 1/16" deflection of the belt should cause a very slight movement of the timing disc.

CAUTION

THE DRIVE MOTOR BELT
TENSION IS A CRITICAL
ADJUSTMENT.

A belt that is too tight can cause excessive wear of the drive roller bearing. It may also cause deflection of the drive roller shaft resulting in read checks. A belt that is too loose may jump a cog or create a non-constant track speed resulting in loss of timing, incorrect data or read checks.

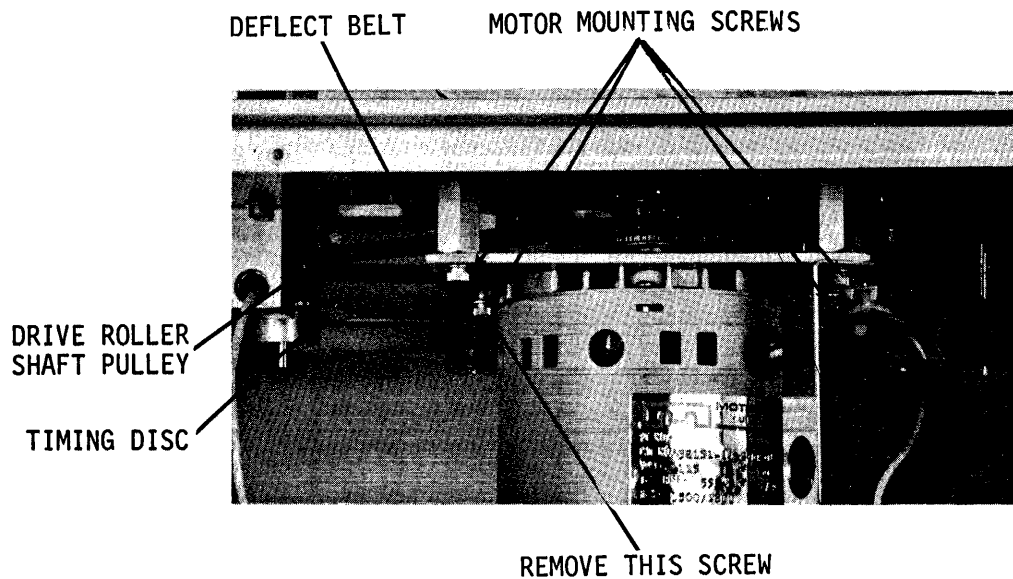


Figure 6-3. Drive Motor Belt Tension Adjustment

6.3 MAGNETIC PICKUP ADJUSTMENT

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

- a. Position the timing disc on the drive roller shaft so that it is in a horizontal plane with the center of the magnetic pickup tip. This is accomplished by using a 5/64 Allen screwdriver and loosening the set screw that is holding the timing disc on the drive roller shaft.

CAUTION

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

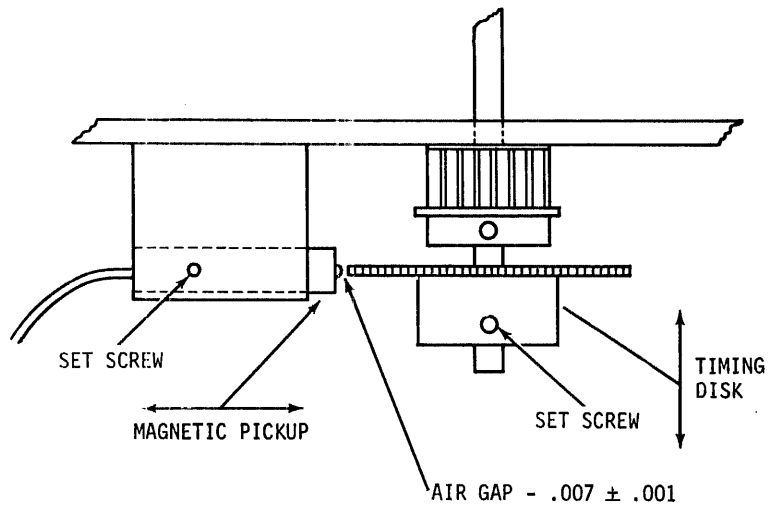


Figure 6-4. Magnetic Pickup Adjustment

- b. Align the disc in the correct position and tighten the set screw, making sure that the set screw is tightened on the flat side of the shaft.
- c. To adjust the air gap between the magnetic pickup and the timing disc, loosen the set screw holding the magnetic pickup in its mounting block and reposition the pickup. The air gap should be set to $.007'' \pm .001$.
- d. Rotate the timing disc and check two other positions to make sure that the air gap is maintained.

If either of these two adjustments of the magnetic pickup are not correct, card synchronization may be erratic resulting in read checks or incorrect data being read.

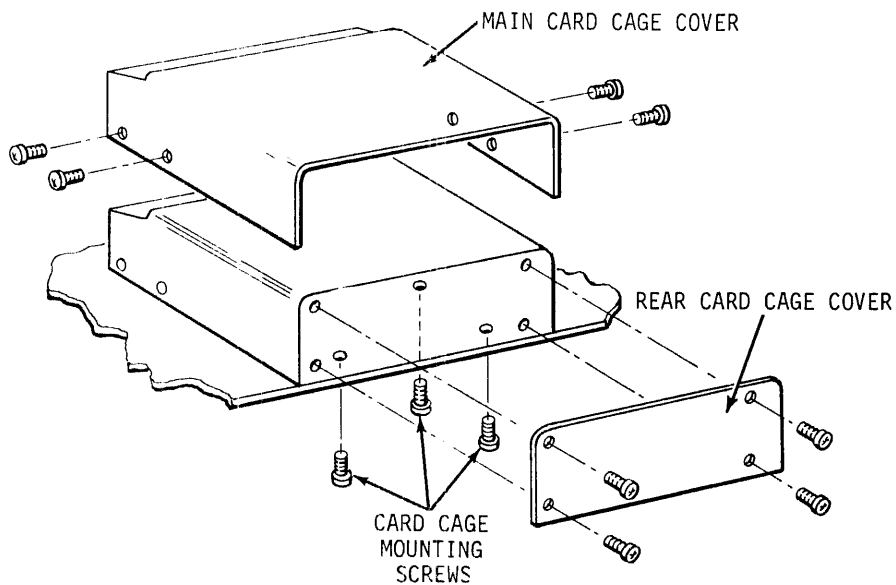


Figure 6-5. Card Cage Repositioning

6.4 ADJUSTMENT OF STACK PHOTOCELL

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

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

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

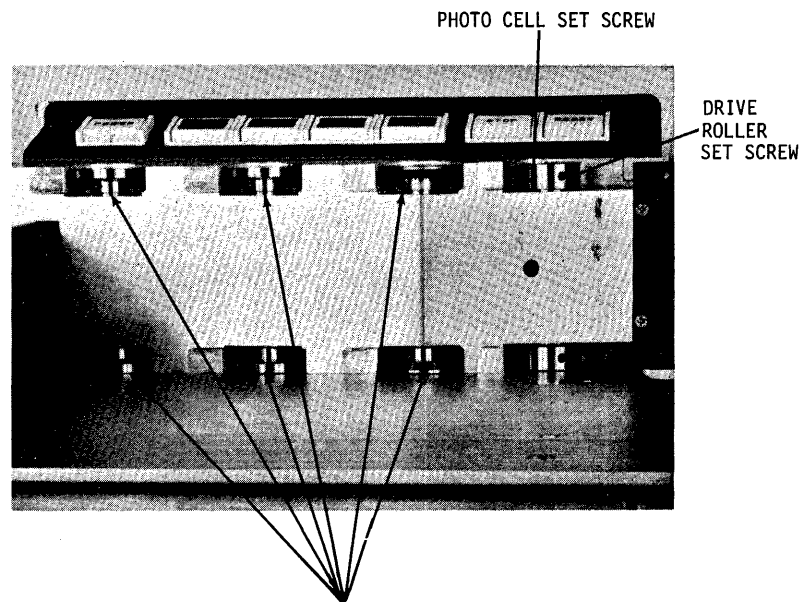
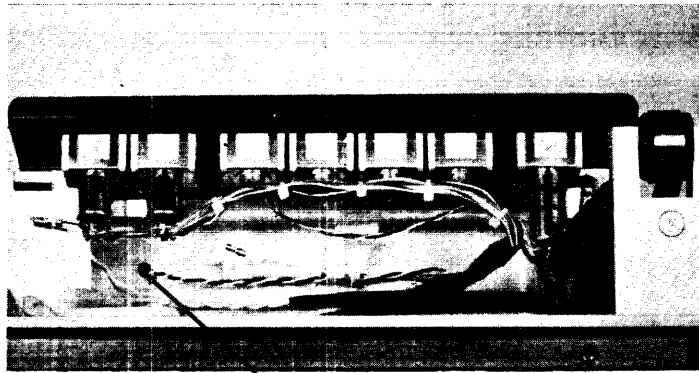


Figure 6-6. Location of Photo Cell Set Screw



STACKER PHOTO CELL

Figure 6-7. Stacker Photo Cell

- g. Remove the photocell from the rear of the stacker casting and inspect the lens of the cell for any damage, figure 6-7.
- h. Replace the stack photocell and align the lens of the photocell flush with the surface of the stacker casting.
- i. Tighten the photocell set screw.
- j. Reinstall the card cage in its normal mounting position.

NOTE

The following section will explain the installation procedure for replacing the drive roller removed in the previous adjustment.

6.5 STACKER ROLLER SHAFT BEARING PRELOAD

The preload of the bearings on the drive and stacker roller shafts is very important. This ensures that there is no detectable end play in the shafts. If there is any detectable end play, excessive wear of the support bearings will result.

- a. Preloading the bearings can be accomplished by rotating the roller of the shaft to be adjusted to conveniently expose the set screw. Using a 1/16" Allen screwdriver, loosen the set screw in the roller, figure 6-8.
- b. From the bottom side of the mainframe push the shaft upwards as far as possible.

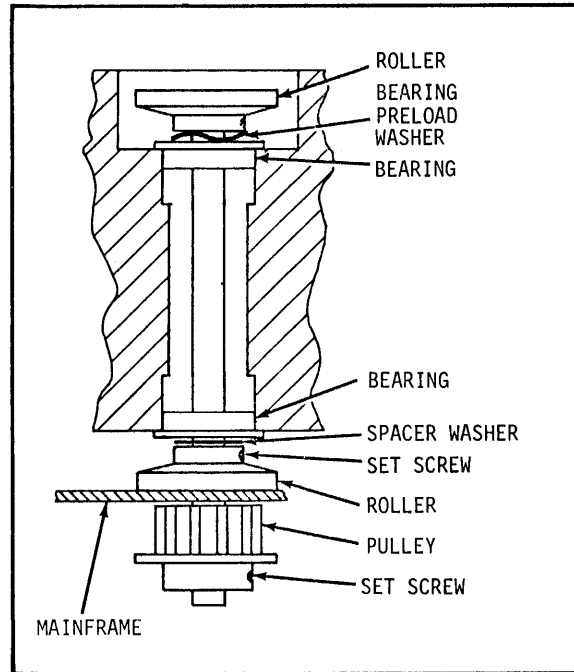


Figure 6-8. Roller Shaft Bearing Preload Adjustment

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

NOTE

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

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

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

6.6 HOPPER EMPTY SWITCH ADJUSTMENT

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

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

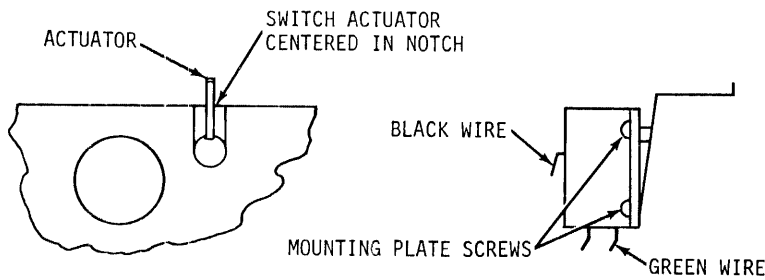


Figure 6-9. Hopper Empty Switch Adjustment

- c. Using a 1/16 Allen screwdriver, loosen the two screws holding the switch mounting plate, figure 6-9.
- d. Center the switch arm in the picker casting counterbore. Exert slight pressure on the switch arm, pressing arm into casting. Tighten switch mounting plate set screws.
- e. Replace riffle air cap.

If the hopper empty switch is faulty or misadjusted, an erroneous status condition will be developed.

6.7 STACKER FULL SWITCH ADJUSTMENT

The stacker full switch is adjusted to ensure that when the output stacker becomes full, the condition is detected.

- a. Place approximately one inch of cards in the hopper. Depress the POWER switch placing the machine in operation.

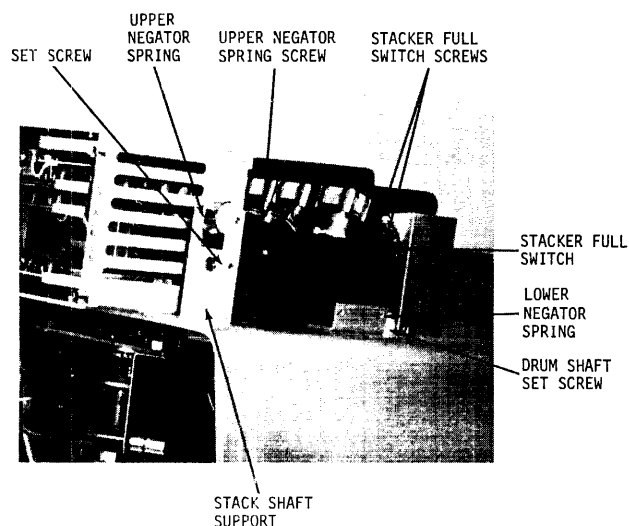


Figure 6-10. Stacker Full Switch Adjustment

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

6.8 PICKER SECTOR ADJUSTMENT

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

CAUTION

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

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

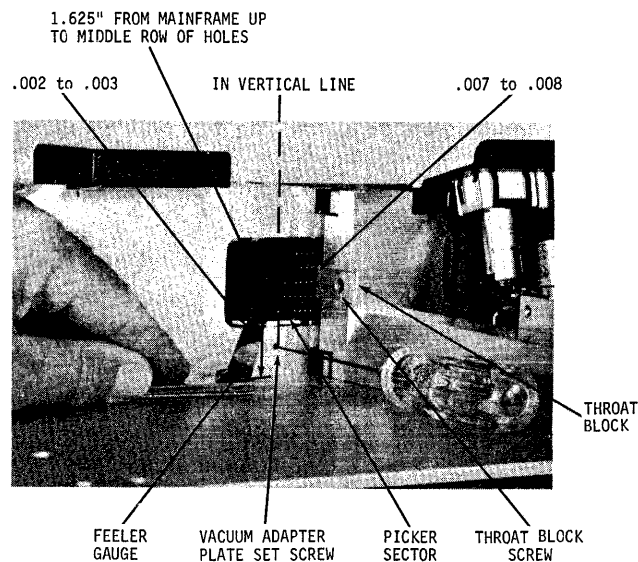


Figure 6-11. Picker Sector Adjustment, Rear View

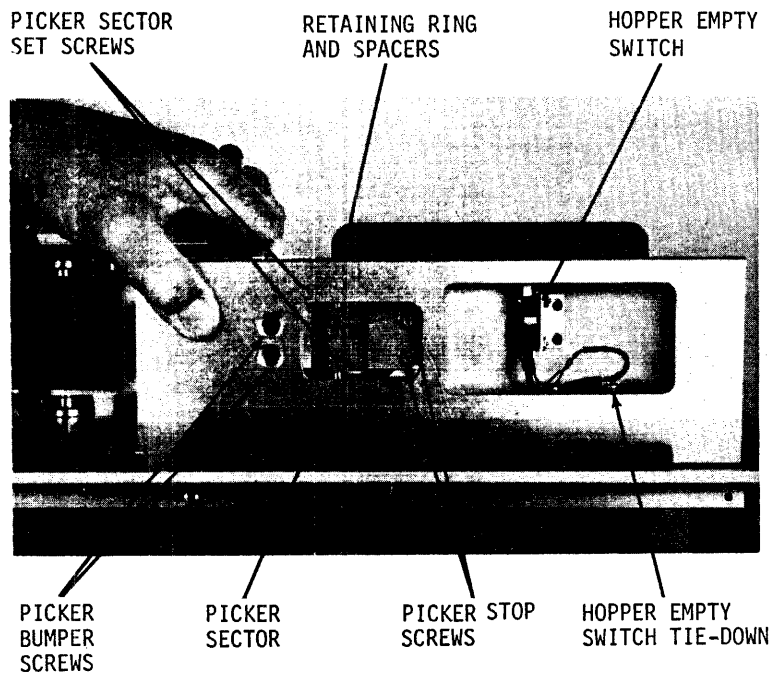


Figure 6-12. Picker Sector Adjustment, Front View

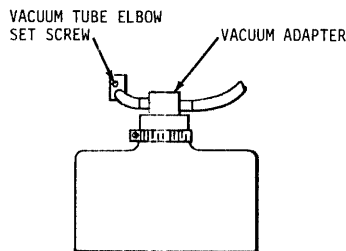


Figure 6-13. Removal of Vacuum Tube Adapter

- b. If the height of the picker sector requires adjustment, use a 5/64 Allen wrench and loosen the set screws in the back of the picker sector, figure 6-12.
- c. Adjust the picker sector until there is exactly 1-5/8" between the mainframe and the center of the middle rows of holes on the picker sector.
- d. Check the air gap adjustment between the picker sector and the vacuum adapter plate. The clearance between the sector and the plate is .002 to allow for maximum vacuum with free sector travel.
- e. Using a .050 Allen screwdriver, loosen the set screw in the vacuum tube adapter elbow located on the underside of the mainframe, figure 6-13. Remove the elbow from the sleeve. Prop open the hopper using about 1" of cards inserted at a right angle.

- f. Using a .050 Allen screwdriver, loosen the vacuum adapter plate set screw, figure 6-11.
- g. Insert a .002 feeler gauge between the picker sector and the vacuum adapter plate. From the bottom side of the mainframe push the vacuum adapter plate upward. Exert upward pressure and tighten the vacuum adapter plate set screw.
- h. Replace the vacuum tube adapter elbow.
- i. Check the picker sector rest position. The back edge of the last row of holes on the picker sector should line up with the middle of the vacuum adapter plate set screw hole, figure 6-11. The position is established by placement of the rest stop.
- j. Using a 5/64 Allen screwdriver, loosen the two rest stop socket head screws, figure 6-12.
- k. Using a 6" steel rule to gauge the picker sector rest position, and while holding the picker sector firmly in alignment push the rest stop against the picker sector and tighten the screws.
- l. Check the gap between the throat block and the 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 the screw holding the throat block, figure 6-11.
- n. Place an .008 feeler gauge between the throat block and the picker sector face.
- o. Exert slight pressure on the rear of the throat block and tighten the mounting screw.
- p. Check the solenoid coupling adjustment. The solenoid coupling is used to transfer the rotational solenoid motion to the picker sector.
- q. Using a 1/16 Allen screwdriver, loosen the two set screws in the top of the solenoid coupling, figure 6-14.
- r. Preload the solenoid coupling by depressing the top of the solenoid coupling. Sufficient pressure should be exerted to result in .010 clearance between the wafers of the coupling. This may be checked using a feeler gauge.
- s. While maintaining the proper pressure on the coupling, tighten the two set screws ensuring the set screws are on the flats of the shaft. 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 the rest position. If the picker sector does not return to the rest position, the coupling has been compressed too far. Test for this latter condition by operating the picker sector manually while power is applied, vacuum is applied, and cards are in the input hopper.

- t. Check the adjustment of the picker sector bumper. This bumper is used to limit the picker sector over-travel to .020 inches beyond the point where the card is delivered to the pinch rollers.
- u. The adjustment must be made with the machine operating. Place about 2" of cards in the input hopper. Depress the POWER switch. With the reader in "off-line", depress the RESET switch and run a few cards into the stacker. Depress the STOP switch.
- v. Manually operate the picker sector. Note the point at which the card reaches the pinch rollers. After the card is picked, there should be approximately .020" of over-travel of the sector before it reaches the bumper.
- w. Using a 9/64 Allen screwdriver, loosen the two picker bumper socket head screws, figure 6-12.
- x. Adjust the picker bumper to the proper position and tighten the screws.

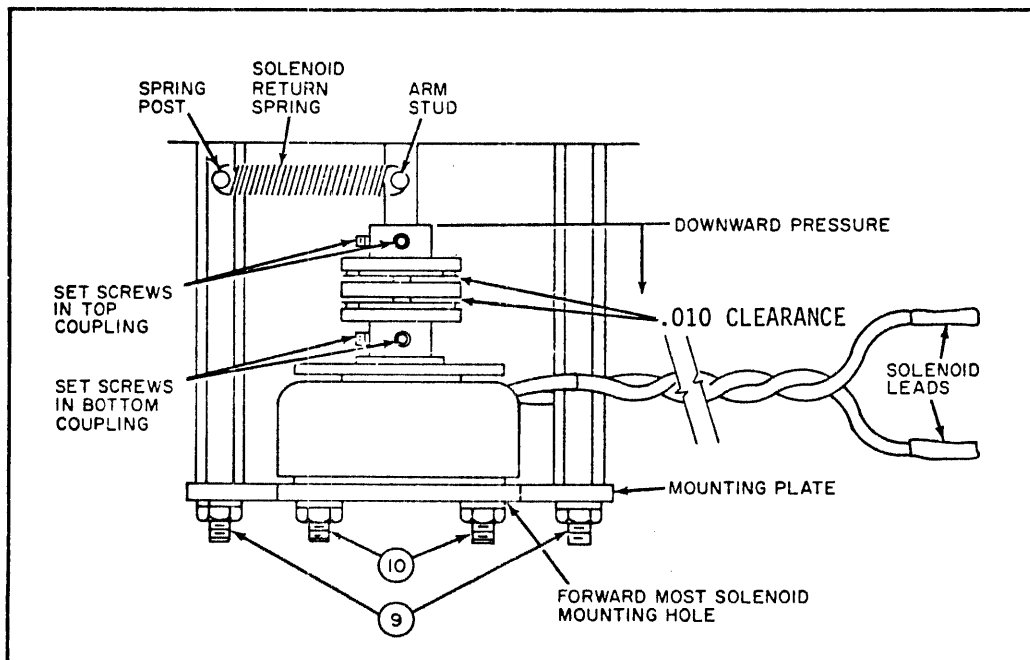


Figure 6-14. Solenoid Preload Adjustment

6.9 VACUUM PUMP BELT TENSION ADJUSTMENT

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

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

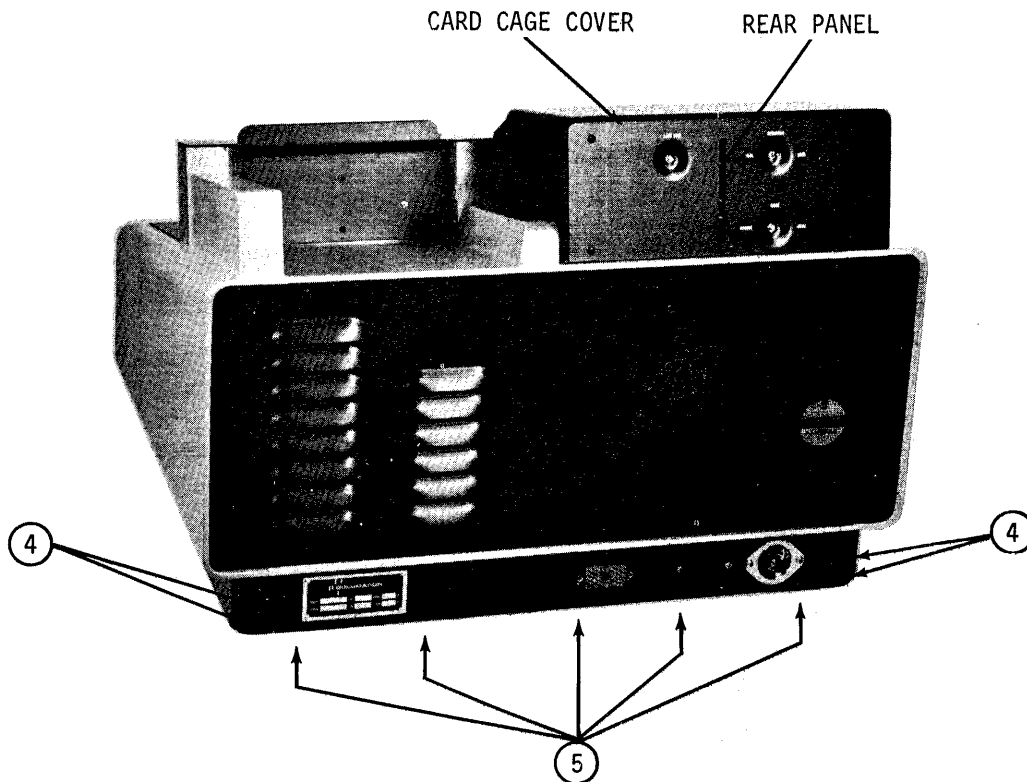


Figure 6-15. Removal of Rear Subframe Panel

NOTE

Be sure to tag the wires to be removed in the following step to insure they are replaced on the proper terminals.

- d. Remove the rubber hood from the motor run capacitor and disconnect the red and blue clip leads, figure 6-16.
- e. Remove the yellow clip lead from the solid state relay, figure 6-16.
- f. Loosen the blower hose clamp on the side of the pump and remove the hose from the pump, figure 6-16.

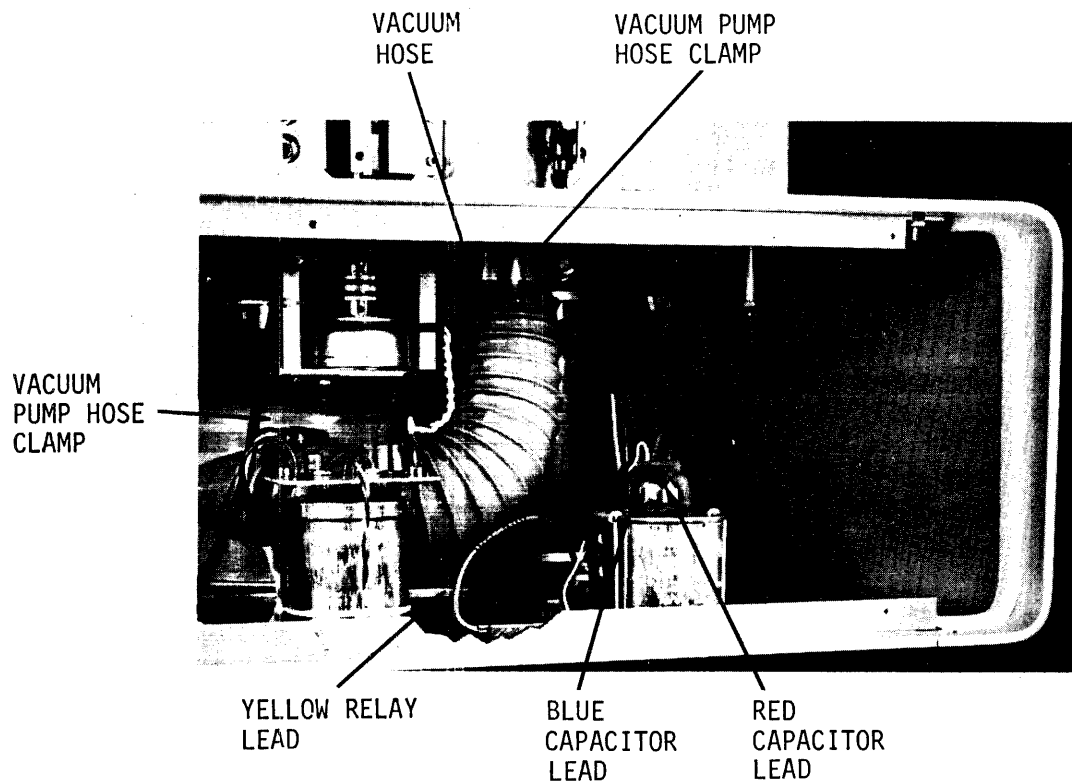


Figure 6-16. Disconnecting Vacuum Blower Motor Assembly

- g. Loosen the vacuum adapter clamp on the top of the pump and remove from the pump, figure 6-17.
- h. Using a Phillips screwdriver, remove the ground strap from the pump mounting plate, figure 6-17.
- i. Using a 1/2" open-end wrench to hold the mounting post, remove the four Phillips head screws located on the bottom of the baseplate, figure 6-17.

CAUTION

BE SURE TO USE THE OPEN-END WRENCH TO AVOID TWISTING OFF THE PUMP PLATE RUBBER SHOCK MOUNTS.

- j. The pump assembly can now be removed from the reader and the belt tension adjusted.

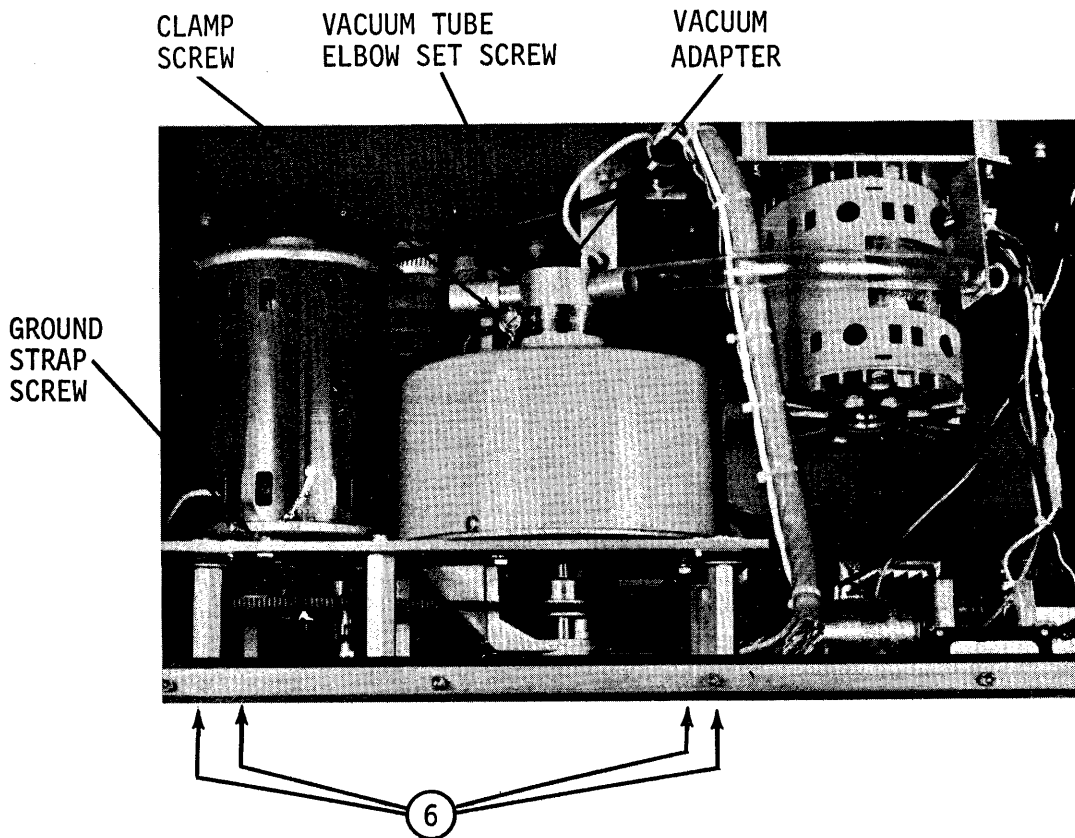


Figure 6-17. Removal of Vacuum Blower Motor Assembly

- k. Using a 7/16" open-end wrench, loosen the three hex bolts holding the pump assembly in place, figure 6-18.
- l. Using a spring scale, adjust for approximately 4 to 6 ounces of tension to the belt. This should cause the belt to deflect 3/64 inch when properly adjusted.
- m. Check the pulleys to make sure they are in the same plane. Also check the motor pulley set screw to make sure it is secure, figure 6-18.
- n. Install the pump in the reverse order of disassembly and check the reader for proper operation.

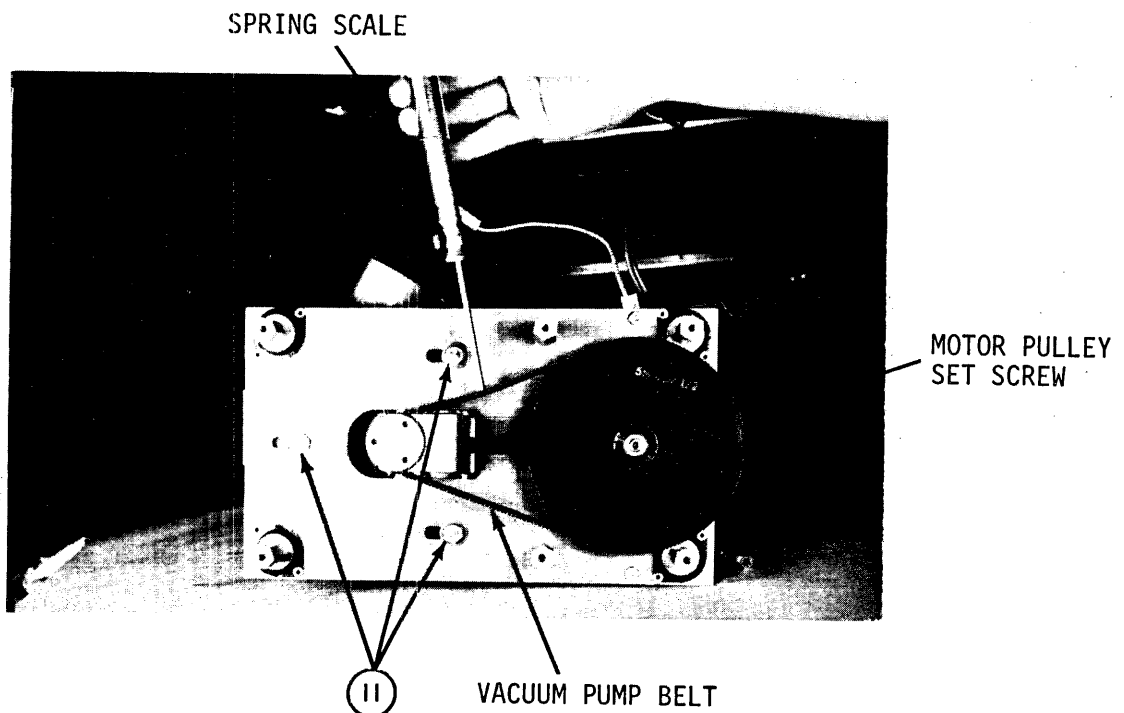


Figure 6-18. Adjustment of Vacuum Blower Motor Belt Tension

SECTION 7

PREVENTIVE MAINTENANCE

7.1 GENERAL

The following paragraphs provide information for preventive maintenance and general care of the M600L card readers. The card readers are of rugged construction and are designed to provide many hours of failsafe, reliable operation; as such, preventive maintenance consists primarily of routine cleaning.

7.2 CLEANING

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

7.2.1 PICKER SECTOR

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

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

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

7.2.2 CASTING ASSEMBLIES

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

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 grease, HP #6040-0222, to each of the three roller grease points (Figure 7-1).

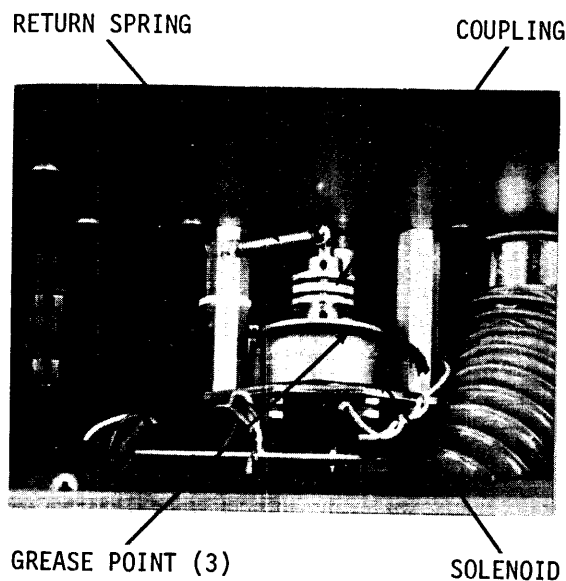


Figure 7-1. Solenoid Lubrication

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 ON 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 ON and END OF FILE 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 ON and END OF FILE 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/STACKER 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/STACKER indicator does not light when hopper goes empty and MOTION 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/STACKER 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.
MOTION 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 Data 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 MOTION 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 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 "84" 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 Sync Card.
Sharp, metallic noise from picker sector while reading cards.	Picker sector maladjusted.	Adjust picker sector per procedure in paragraph 6. 8.

SECTION 9 REPAIR PROCEDURES

9.1 GENERAL

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

9.2 REQUIRED TOOLS

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

Description	Manufacturer and Part Number of Special Tools
1/16" Allen Screwdriver	
3/32" Allen Wrench (long arm)	
5/64" Allen Wrench (long arm)	
7/64" Allen Wrench (long arm)	
1/8" Allen Wrench (long arm)	
9/64" Allen Wrench (long arm)	
.050" Allen Wrench (short arm)	
1/16" Allen Wrench (short arm)	
AMP Extraction Tool	AMP 91022-1
"AMP Leaf Contact" Extraction Tool	AMP 465195-2 or 465275-1
"AMP Modified Fork" Contact Extraction Tool	AMP 91037-2
"AMP Mod IV" Contact Extraction Tool	AMP 91029-1A
Deutsch Insertion/Extraction Tool (mounted on base plate)	M15570-16
Elco Extraction Tool	Elco 061877-02
Elco Insertion Tool	Elco 061742-04
Feeler Gauge Set 0.0015" thru 0.025"	
Long Nose Pliers	
Knife Blade - 2-1/2" blade	
Medium Flat Blade Screwdriver 3" long	
Medium Flat Blade Screwdriver 6" long	
6" Metal Scale, decimal/fraction per inch	
1/4" - Open End or Socket Wrench	
1/2" - Open End Wrench	
11/32" - Open End or Socket Wrench	
7/16" - Open End or Socket Wrench	
#1 Phillips Screwdriver 6" long	
#2 Phillips Screwdriver 6" long	
Printed Circuit Card Extender	Documation P/N 103099501
#2 Retaining Ring Remover	
Side Cutter	
Solder Removal Tool	
60-Watt Soldering Iron	
32-oz. Spring Scale	

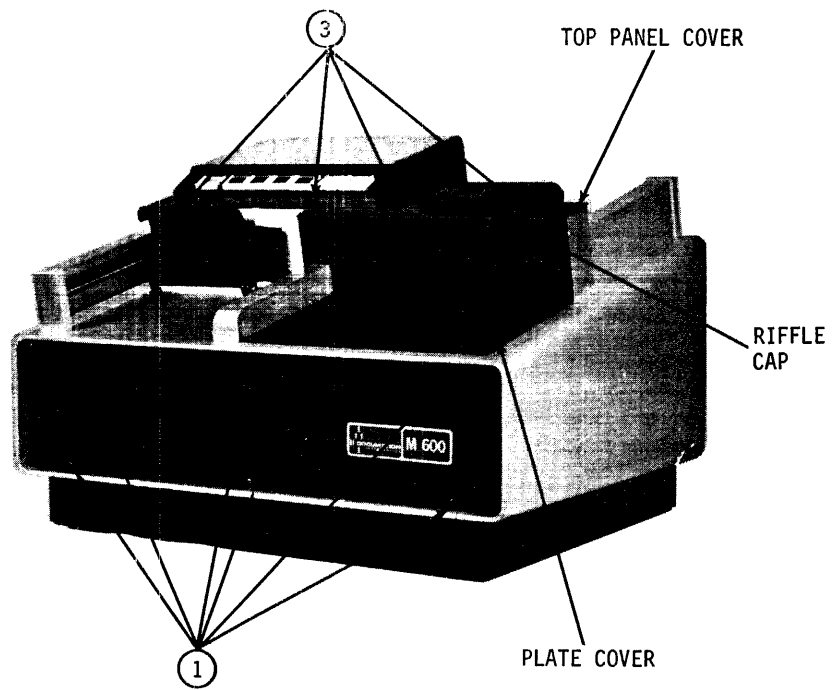


Figure 9-1. Front Panel and Top Cover Removal

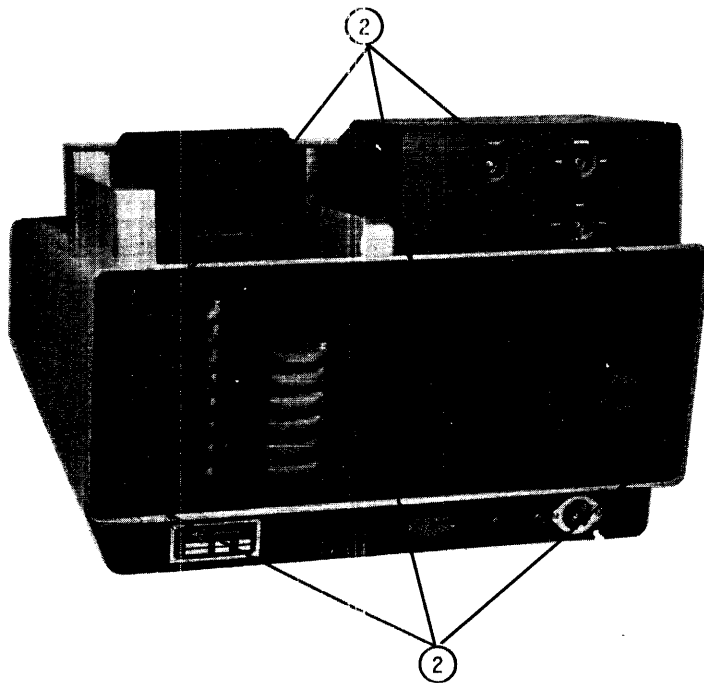


Figure 9-2. Rear Panel Removal

9.3 MAIN DRIVE MOTOR BELT

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

CAUTION

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

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

CAUTION

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

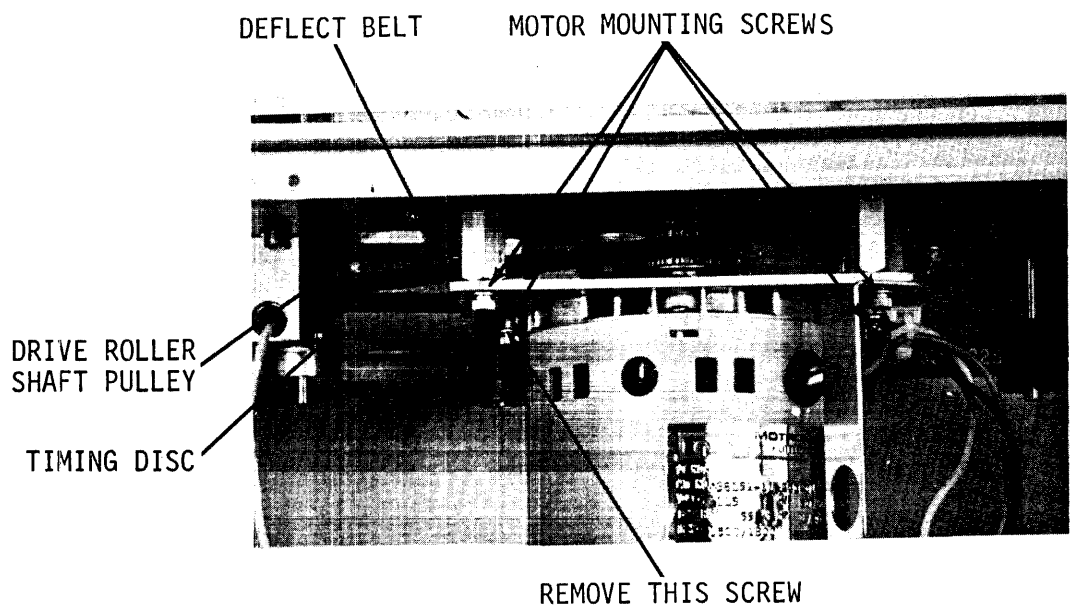


Figure 9-3. Main Drive Motor Mounting

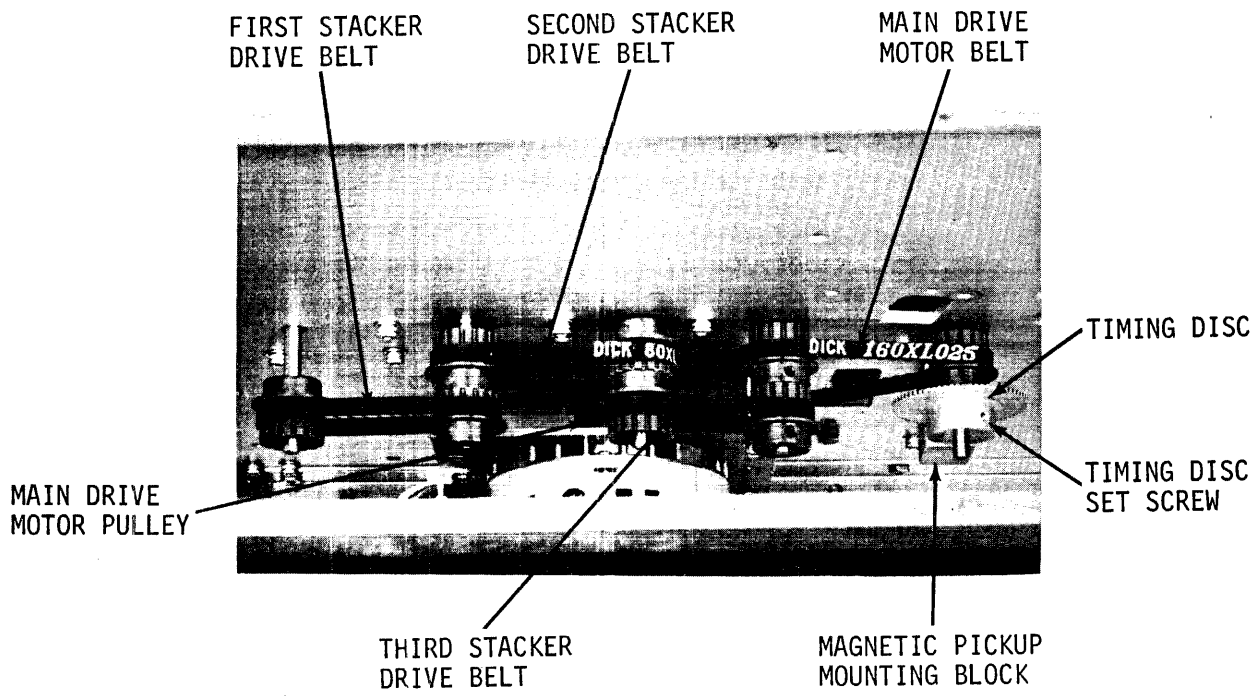


Figure 9-4. Stacker Drive Train Belt Arrangement

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

CAUTION

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

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

9.4 THIRD STACKER ROLLER DRIVE BELT

- a. Using steps a. and b. of Paragraph 9.3, remove front and rear panels, figures 9-1 and 9-2.
- b. Using a 3/32 Allen wrench, LOOSEN set screws in bottom third and fourth stacker roller pulleys, figure 9-5.
- c. Rotate third and fourth stacker roller pulleys and belt pulling downward; remove third and fourth stacker roller pulleys and third stacker drive belt, figures 9-4 and 9-5.

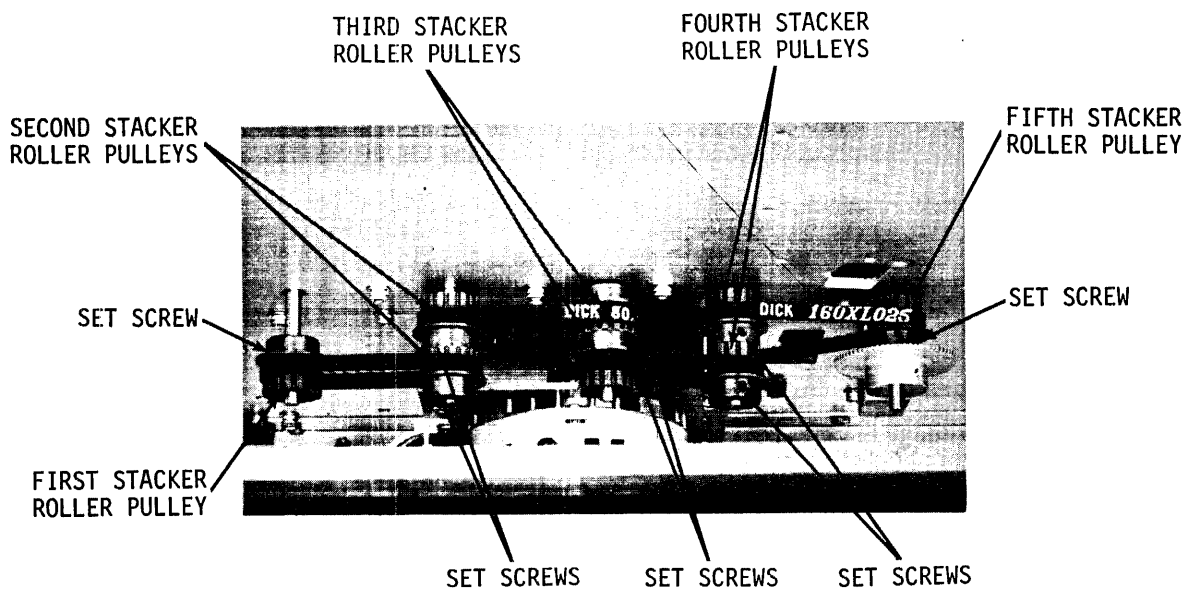


Figure 9-5. Stacker Drive Train Pulley Arrangement

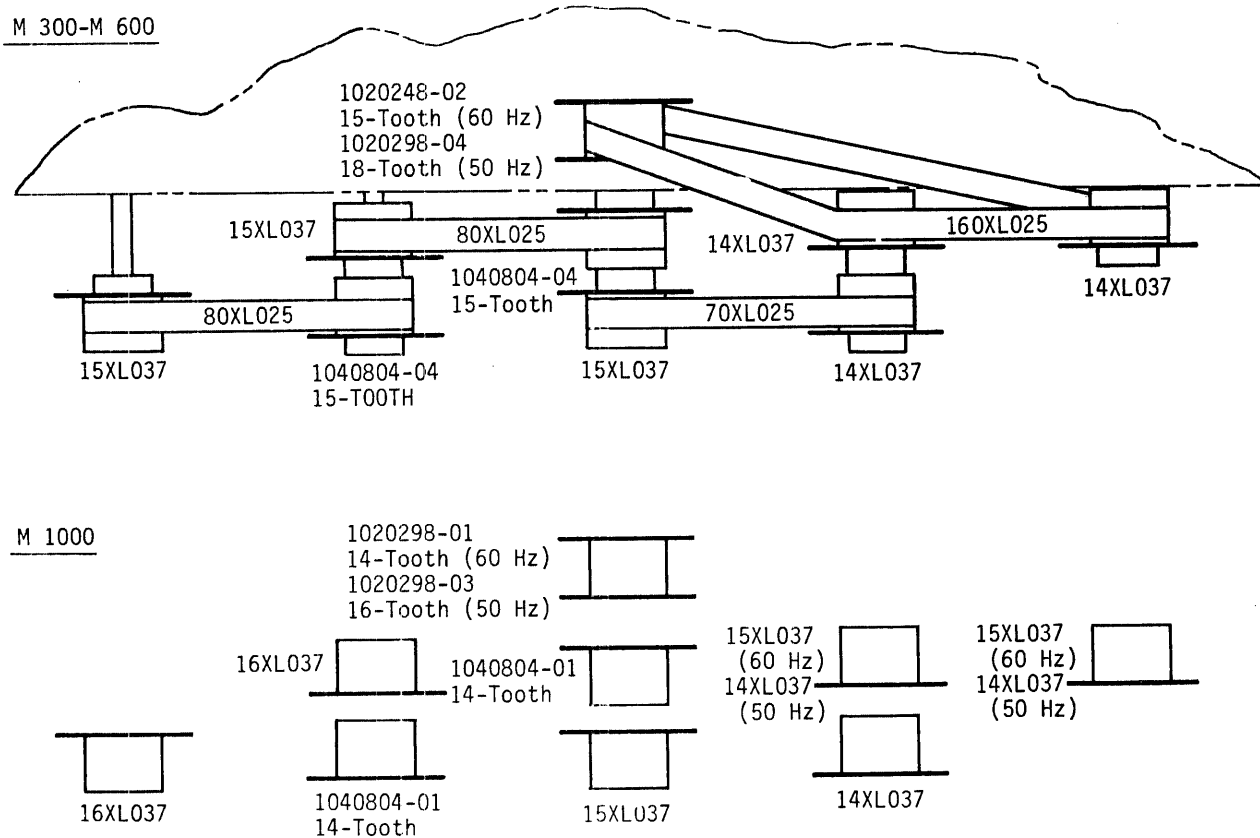


Figure 9-6. Pulley and Belt Configuration

- d. Replace third drive belt between two loose pulleys; work pulleys with belt onto third and fourth stacker roller shafts until pulleys are against top pulleys.
- e. Position third and fourth stacker roller pulleys so that set screws are on the flat side of the shafts.

CAUTION

USING MODERATE TORQUE, TIGHTEN PULLEY SET SCREWS. DO NOT OVERTORQUE OR DAMAGE WILL RESULT TO PULLEY.

9.5 FIRST AND SECOND STACKER ROLLER DRIVE BELTS

- a. To replace the second stacker roller drive belt, LOOSEN the set screw in the first stacker roller pulley, and the set screws in the bottom second, third, and fourth stacker roller pulleys.
- b. Work the first and second stacker roller pulleys downward and remove from shafts.
- c. Work the third and fourth stacker roller pulleys downward and remove from shafts.
- d. LOOSEN the set screws in the top second and third stacker roller pulleys.
- e. Work the top second and third stacker roller pulleys downward and remove from shafts.
- f. Replace second stacker roller drive belt around pulleys and reinstall on respective shafts.

NOTE

Observe the position of the upper pulleys with respect to the mainframe, figure 9-5. Note that pulleys three, four and five are installed close to the mainframe with a slight clearance. Pulley number two should be lowered sufficiently to allow the belt to line up with pulley number three.

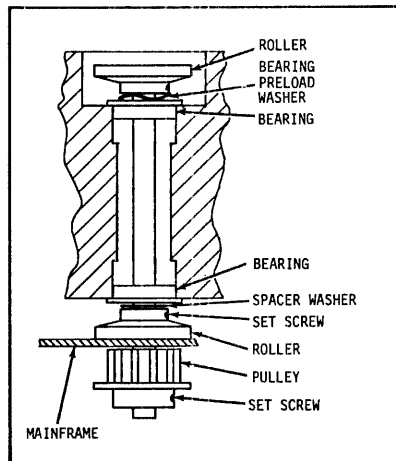
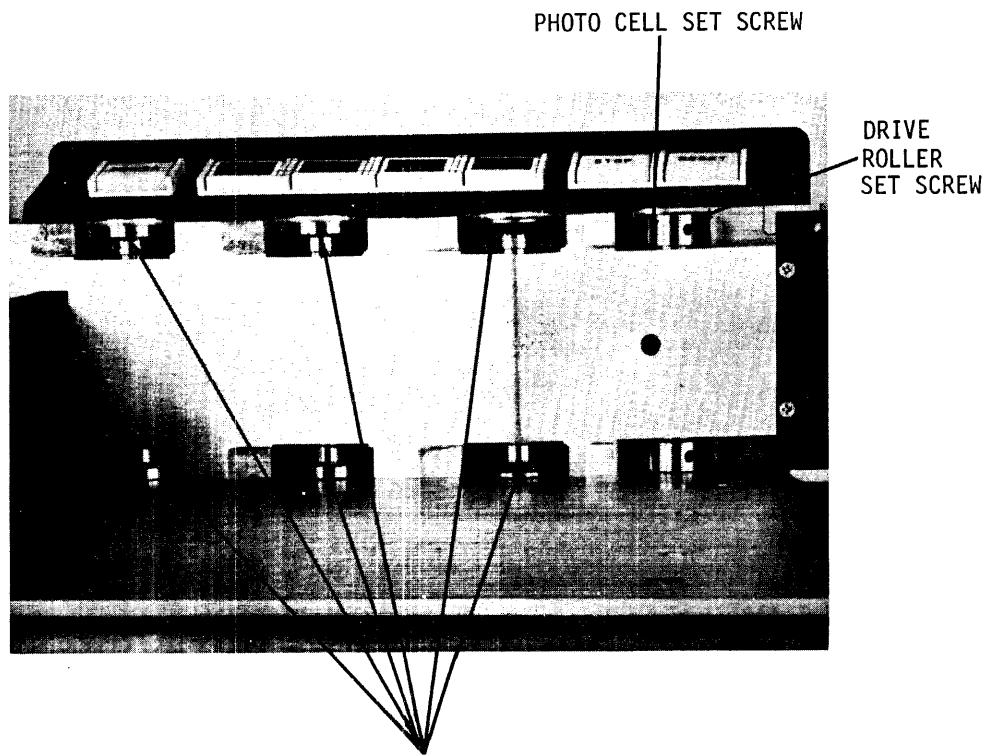


Figure 9-7. Pictorial, Stacker Roller Bearing Assembly

- g. Reinstall the remainder of the pulleys and belts on their respective shafts making sure the configuration is correct.

CAUTION

ALWAYS POSITION PULLEY SO THAT SET SCREW IS ON THE FLAT OF THE SHAFT AND USE MODERATE TORQUE TO TIGHTEN SET SCREW.

- h. The first stacker roller drive belt may be replaced by removing the bottom second stacker roller pulley and slipping the belt down the teeth of the first stacker pulley.

9.6 FIRST, SECOND, AND THIRD STACKER ROLLER BEARINGS

- a. Using a 5/64 Allen wrench, remove four button head screws (3), figure 9-1, holding top panel cover.
- b. Using a 5/64 Allen wrench, remove six 6 x 32 button head screws (1), figure 9-1, retaining front panel and remove front panel.
- c. Tape together 1/2" thickness of cards and use to prop stacker tray in extended position.
- d. Using procedures in paragraphs 9.4 and 9.5, remove the first, second, and third stacker roller drive belts and their respective pulleys. Also remove the bottom fourth stacker roller pulley.
- e. Using a 1/16 Allen wrench, LOOSEN set screw in the bottom stacker roller of assembly to be removed, figure 9-7.
- f. Lift stacker shaft straight up out of stacker casting. Note there is a bearing preload washer between the top roller and bearing seat, figure 9-7.
- g. Slide out the bottom roller. Note there is a spacer washer on top of the roller.
- h. Using a knife blade, pry out top or bottom bearing to be replaced and insert new bearing.

The bearings are a loose pressfit into the casting. If the bearings appear difficult to remove, use a slender tool such as a small Allen screwdriver and tap the edge of the bearing from the inside of the stacker shaft hole.

- i. Reinstall stacker shaft and bottom roller, making sure spacer washer and preload washer are reinstalled between top and bottom rollers and bearing seats.
- j. Select a feeler gauge that will fit tightly between mainframe and bottom stacker roller.
- k. Apply firm finger pressure on the top stacker roller and tighten set screw in the bottom stacker roller.
- l. Refer to paragraph 6.5 for roller shaft bearing preload adjustment.
- m. Reassemble stack drive train in reverse order of disassembly.

9.7 SOLENOID

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

NOTE

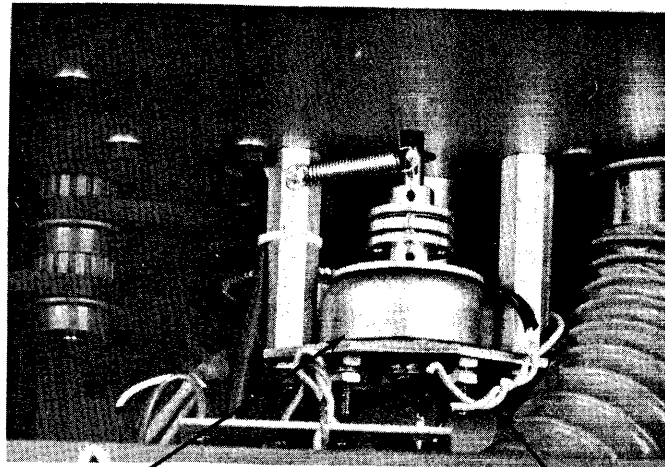
Hold the lugs on the board with a long nose pliers while unsoldering the leads in the following step. This will prevent the lugs from being disconnected from the land on the bottom side of the board.

- b. Unsolder the two white leads from the solenoid driver circuit board, figure 9-8.
- c. Remove solenoid return spring from spring post and arm stud, figure 9-8.
- d. Using a 1/16 Allen wrench, LOOSEN two set screws in the top solenoid coupling, figure 9-8.
- e. Using a 9/64 Allen wrench, remove two 8 x 32 socket head screws (9) holding solenoid mounting plate, figure 9-8.
- f. Remove solenoid downward.

NOTE

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

- g. Using an 11/32 wrench, remove two 8 x 32 mounting nuts (10) , figure 9-8.
- h. Using a 1/16 Allen wrench, LOOSEN two set screws retaining the coupling on the solenoid shaft. Remove coupling, figure 9-8.



SOLENOID ASSEMBLY

SOLENOID LEADS

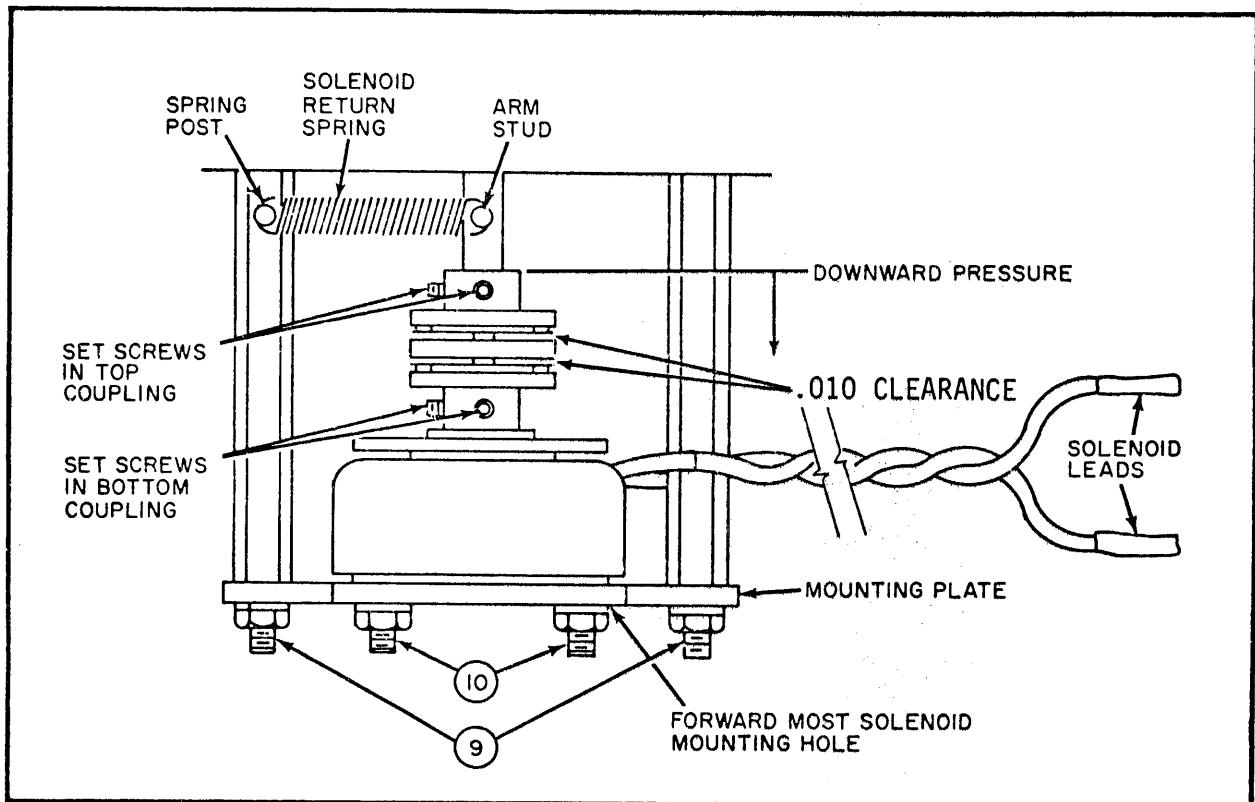


Figure 9-8. Pictorial, Solenoid Assembly

- i. Install new solenoid.

NOTE

Remove the set screws from the coupling and replace using LOCKTITE GRADE C. All operational and mounting type hardware, with the exception of panel screws, should be replaced using LOCKTITE GRADE C.

- j. Replace the coupling locating the bottom coupling set screws on the two flat sides of the shaft.
- k. Tighten the bottom coupling set screws and replace the solenoid on the mounting plate making sure holes are in the proper position, with wires extending from the right side, figure 9-8.
- l. Replace solenoid on mounting posts.
- m. Replace the solenoid return spring between the spring post and the arm stud, figure 9-8.
- n. Resolder the solenoid leads to the output terminals on the solenoid driver

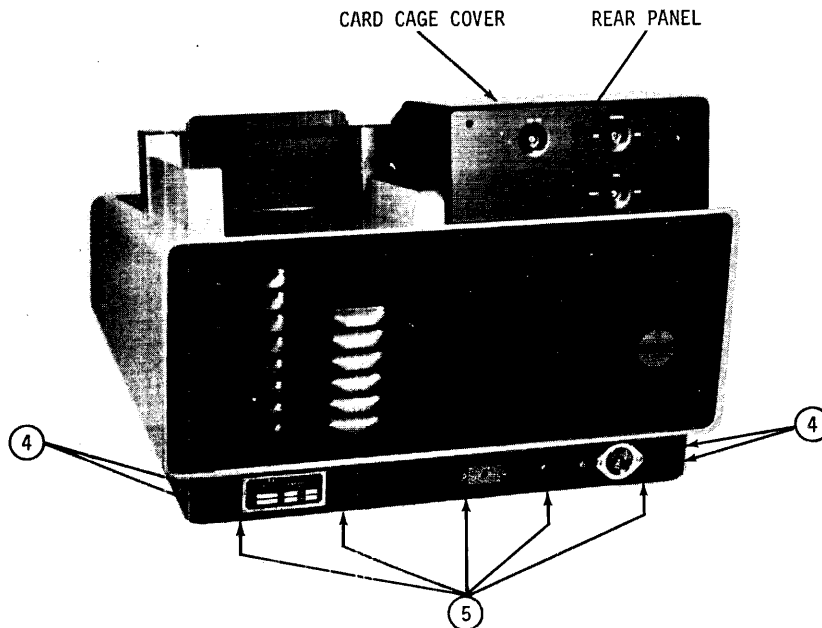


Figure 9-9. Removal of Rear Subframe Panel, Main Card Cage Cover and Panel

circuit board, figure 9-8.

- o. Refer to paragraph 6.8, steps p, q, r and s, for preloading the solenoid coupling.

NOTE

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

9.8 VACUUM PUMP MOTOR ASSEMBLY BELT

- a. Remove front and rear panels. Refer to steps a. and b. of paragraph 9-3, figures 9-1 and 9-2.
- b. Remove four Phillips head screws (4) at rear of subframe panel, figure 9-9.
- c. Remove five Phillips head screws (5) on bottom, rear edge of card reader, holding subframe panel, figure 9-9.

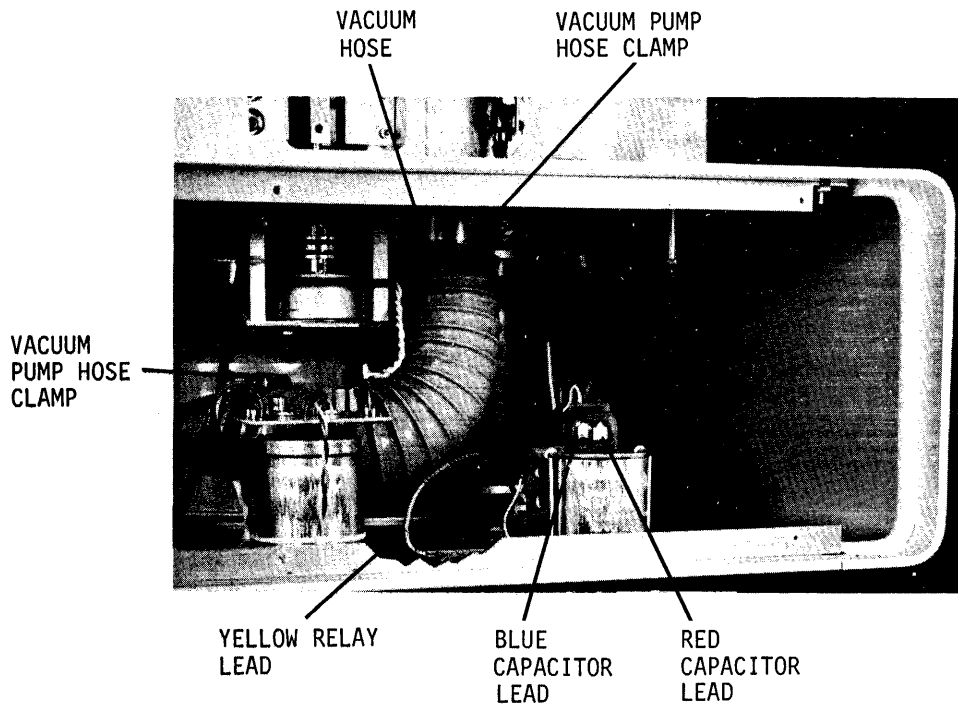


Figure 9-10. Vacuum Motor Pump Assembly Connections

NOTE

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

- d. Remove two connectors from capacitor and one connector from relay disconnecting vacuum pump motor, figure 9-10.
- e. Loosen vacuum hose clamp on vacuum pump and remove hose from pump, figure 9-10.
- f. Using a .050 Allen wrench, LOOSEN #440 set screw in vacuum tube elbow and pull elbow downward, figure 9-11.
- g. LOOSEN vacuum adapter clamp screw at top of vacuum pump assembly and remove this assembly from card reader, figure 9-11. The adapter will lift out with a slight upward pressure.
- h. Remove screw holding ground strap to subframe, figure 9-11.

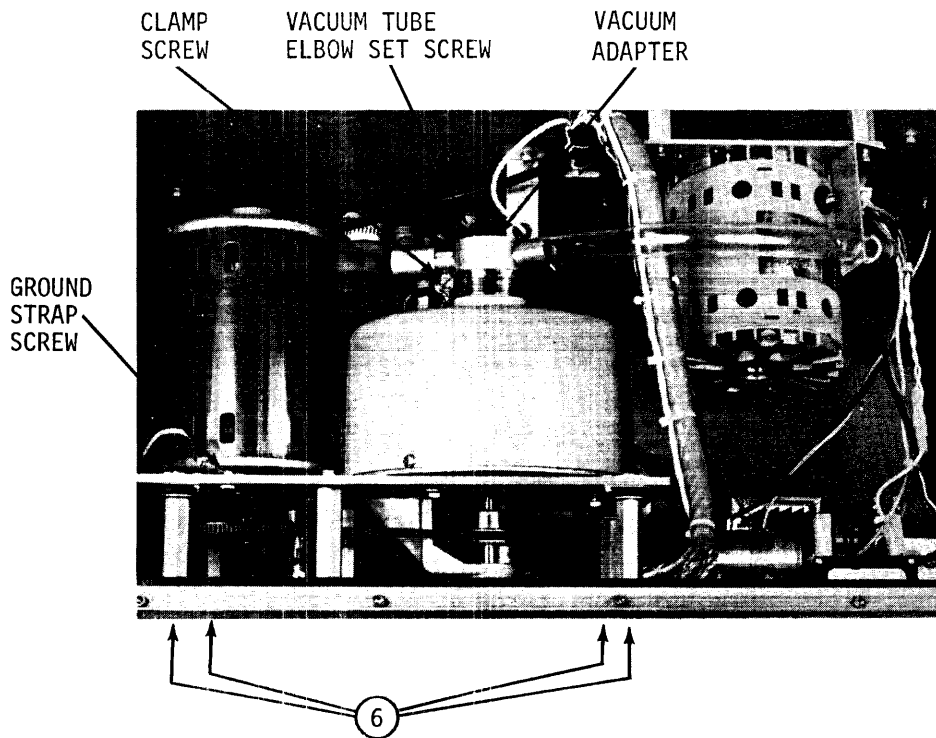


Figure 9-11. Removal of Vacuum Pump Motor Assembly

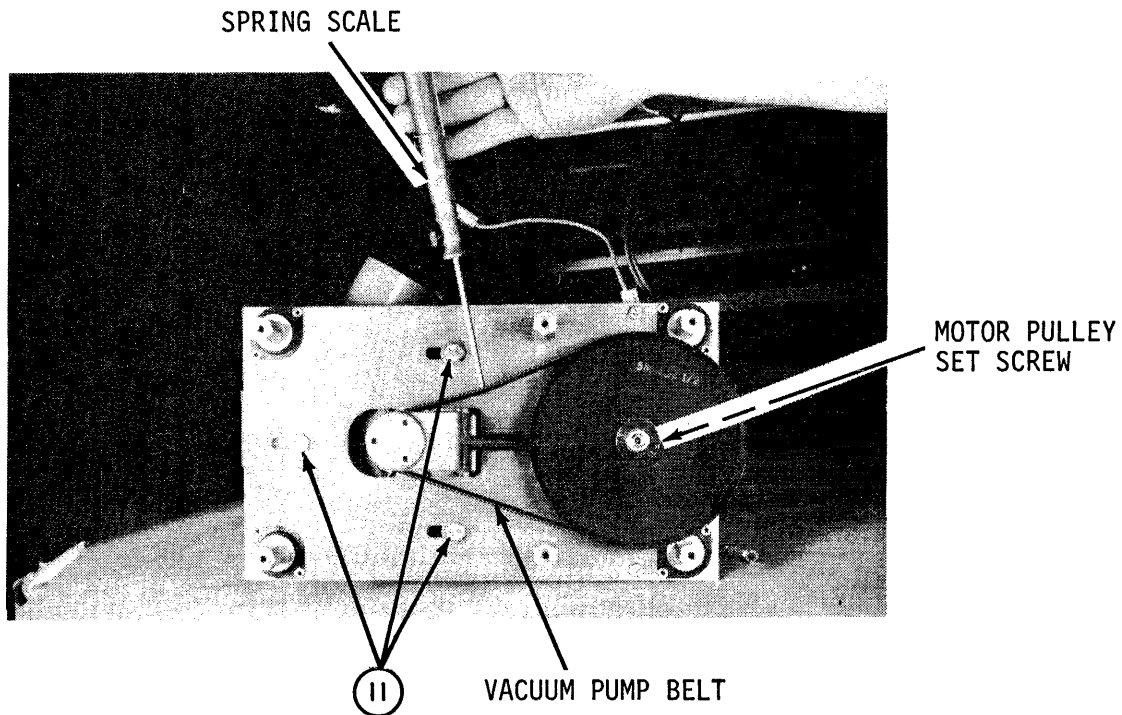


Figure 9-12. Vacuum Pump Belt Replacement

- i. Using a 1/2" open end wrench to hold the mounting posts, remove four Phillips head screws (6) located on bottom of card reader chassis (holding vacuum pump motor assembly), figure 9-11. Use the 1/2" open end wrench to prevent damage to the vibration isolators.
- j. The vacuum pump assembly may now be removed from the card reader.
- k. LOOSEN the three hex bolts (11) holding the vacuum pump in place, figure 9-12.
- l. Replace vacuum pump belt, figure 9-12.
- m. Using a spring scale, adjust vacuum pump for a belt tension of 4-6 ounces. This is about 3/64" belt deflection, figure 9-12.
- n. With the appropriate belt tension applied, tighten the three hex vacuum pump mounting bolts, figure 9-12.
- o. Check the pulleys to make sure they are in the same plane. Also check the pulley set screw to make sure it is secure.
- p. Reinstall the vacuum pump assembly into the card reader in reverse order of disassembly.

9.9 MAGNETIC PICKUP

- a. Using a 5/64 Allen wrench, remove six 6 x 32 button head screws holding rear panel, move rear panel out slightly, disconnect blower motor connector and remove rear panel, figures 9-2 and 9-14.
- b. Using a 1/16 Allen wrench, LOOSEN set screw in magnetic pickup mounting block, figure 9-13.
- c. Remove magnetic pickup from mounting block, figure 9-13.
- d. Remove two button head screws on each side of the card cage cover, slide backward, and lift off, figure 9-9.
- e. Remove four button head screws holding rear panel of card cage and remove rear panel, figure 9-9.
- f. Using a 9/64 Allen wrench, remove three socket head screws (8) holding card cage in place. Move card cage to rear and remount using two rear screws, figures 9-14 and 9-15.

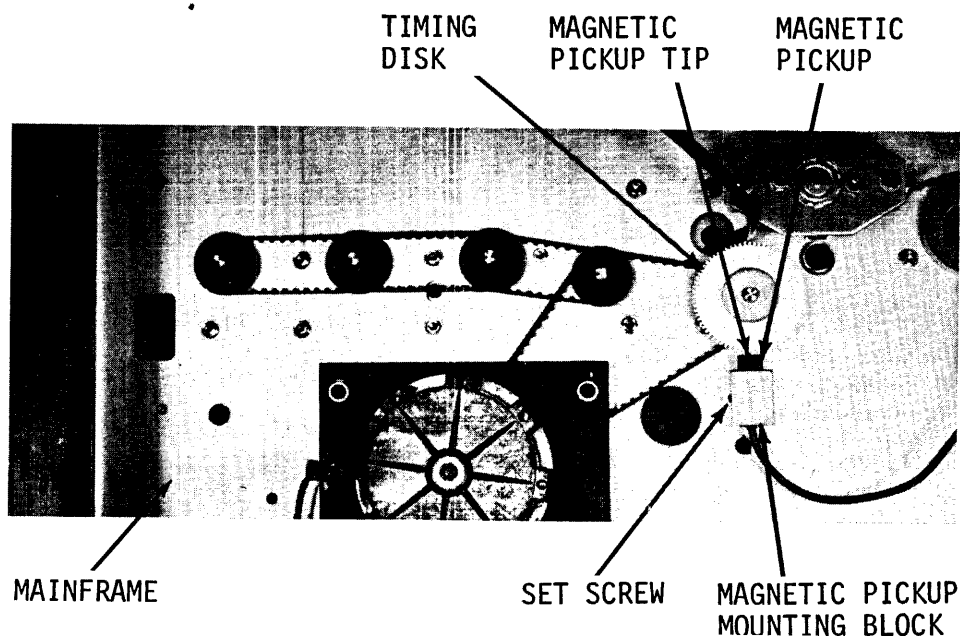


Figure 9-13. Magnetic Pickup Replacement

- g. Remove all cards from card cage using card extractor levers, figure 9-15.

NOTE

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

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

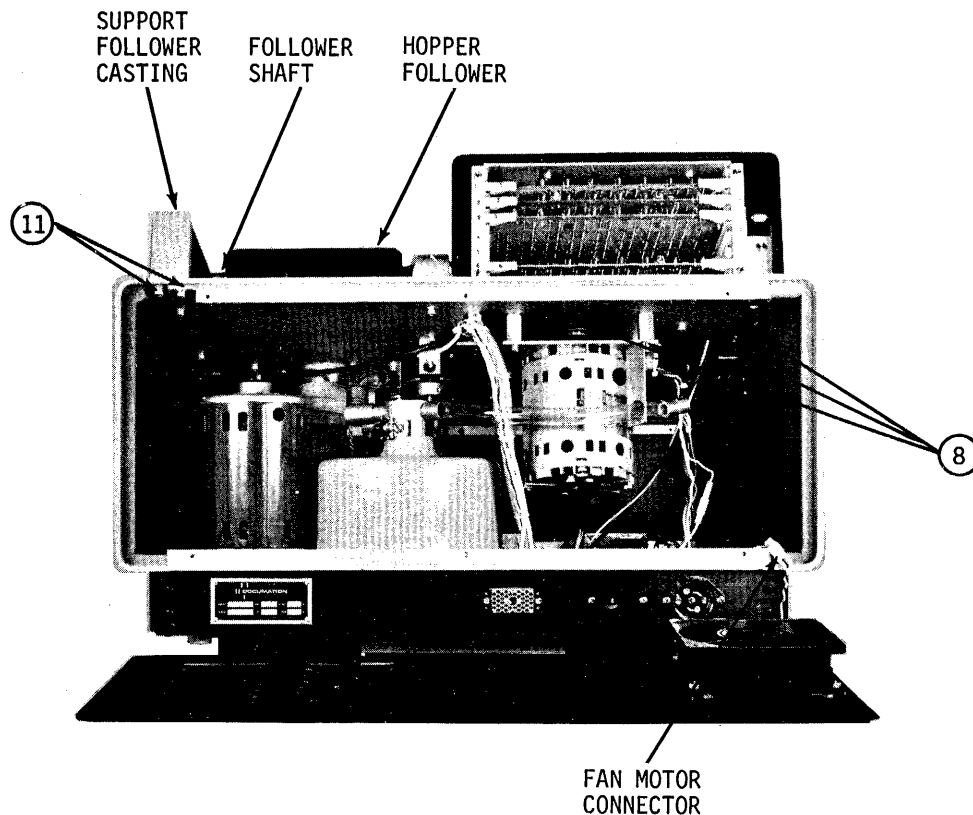


Figure 9-14. Card Cage Repositioning

9.10 READ HEAD, LIGHT STATION, FOURTH AND FIFTH STACKER ROLLER BEARINGS, OR FIRST AND SECOND PICKER ROLLER BEARINGS

NOTE

Use the following procedures to remove the picker casting. The picker casting must be removed to accomplish any of the above four repairs.

- a. Remove front and rear panels. Refer to steps a. and b. of paragraph 9.3, and figures 9-1 and 9-2.
- b. Using a 5/64 Allen wrench, remove four button head screws (3), holding top panel cover, figure 9-1.
- c. Using a 9/64 Allen wrench, remove two socket head screws (12) holding stacker follower casting, figure 9-16, front of reader.
- d. Using a 9/64 Allen wrench, remove two socket head screws holding hopper support follower casting, figure 9-17.
- e. Remove hopper follower shaft, figure 9-17.
- f. Pull hopper support follower beyond rear of mainframe sufficiently to expose negator spring screw.
- g. Using a Phillips screwdriver, remove negator spring screw and allow spring to slowly return to its roller. Remove hopper follower.
- h. Using a .050 Allen wrench, LOOSEN vacuum tube elbow set screw, figure 9-11. Slide elbow off vacuum tube and move to left.
- i. LOOSEN adapter clamp screw at top of vacuum pump assembly and remove this assembly from card reader, figure 9-11. The adapter will lift out with a slight upward pressure.
- j. LOOSEN screw on two large hose clamps, remove blower hose, figure 9-10.
- k. Remove solenoid return spring, figure 9-8.
- l. Using a 1/16 Allen wrench, LOOSEN two top solenoid coupling set screws, figure 9-8.
- m. Using a 9/64 Allen wrench, remove two socket head screws (9) holding solenoid assembly, figure 9-8. Lay solenoid assembly on baseplate.

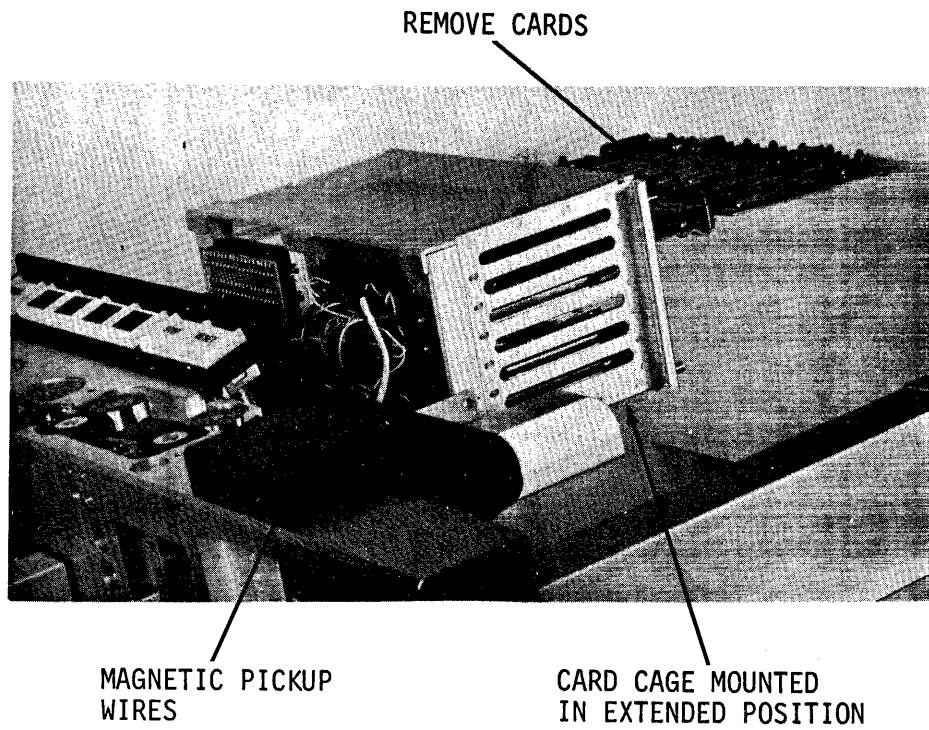


Figure 9-15. Card Cage in Extended Position

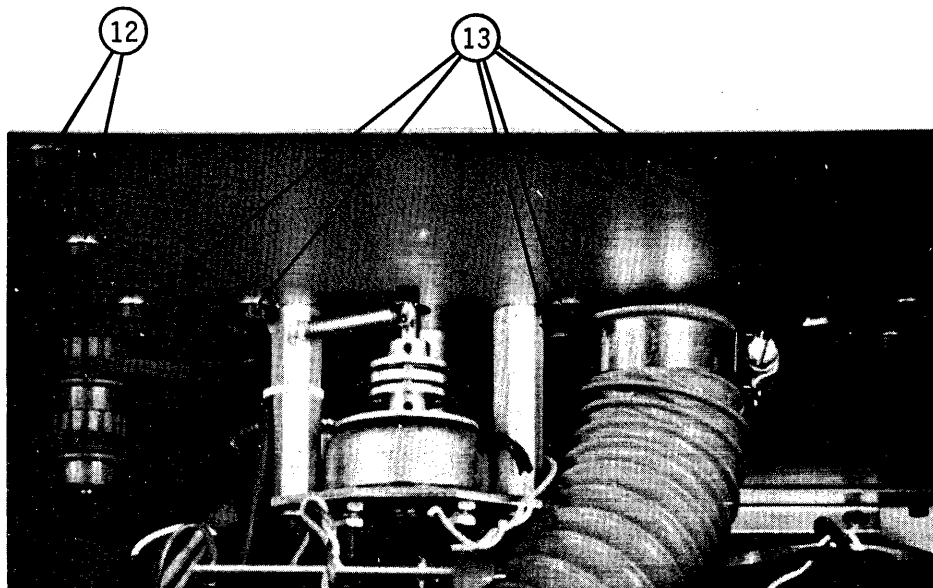


Figure 9-16. Picker Casting Removal

- n. Using a 9/64 Allen wrench, remove six socket head screws (13) holding picker casting, figure 9-16.
- o. Remove nylon tie-down holding light station cable on solenoid mounting post, figure 9-16.
- p. Remove nylon tie-down holding hopper empty switch cable, figure 9-19.
- q. Lift picker casting straight up and lay on chassis, figure 9-18.

9.11 READ HEAD

- a. Remove two button head screws each side of card cage cover and remove main card cage cover sliding back slightly and lifting upward, figure 9-9.
- b. Remove four button head screws and remove rear card cage panel, figure 9-9.
- c. Using a 9/64 Allen wrench, remove three socket head screws (8) holding card cage in place. Move card cage to rear and remount using two rear screws, figures 9-14 and 9-15.

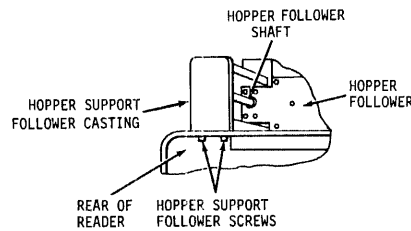
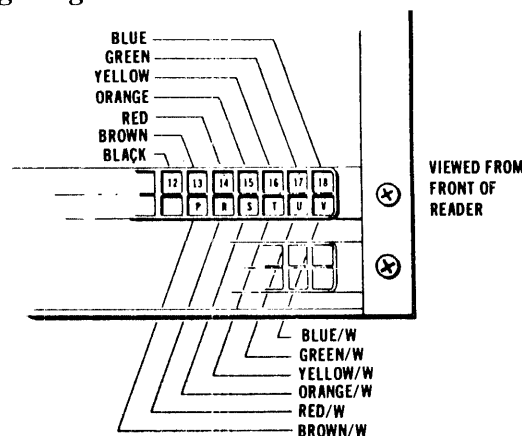


Figure 9-17. Hopper Follower Assembly Removal

- d. Remove all cards from card cage using extractor levers, figure 9-15.
- e. Using AMP tool 465195-2, remove read head wires from connector per the following diagram.



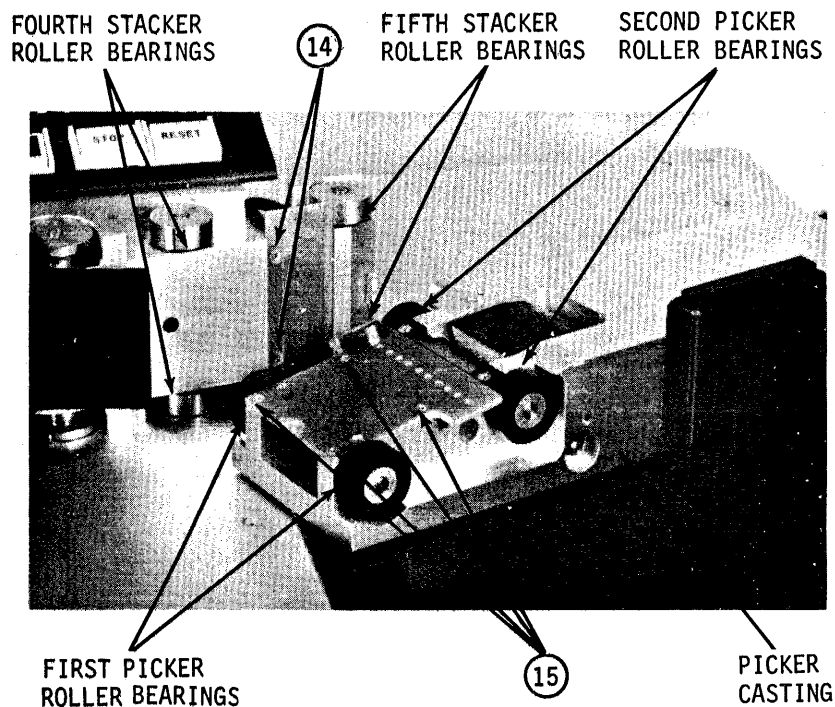


Figure 9-18. Picker Casting Removed From Reader

- f. Remove two 440 x 1/4 flat head Phillips screws (14) to remove read head, figure 9-18.
- g. Replace read head and connectors in card cage making sure wires are installed in proper color coded positions.

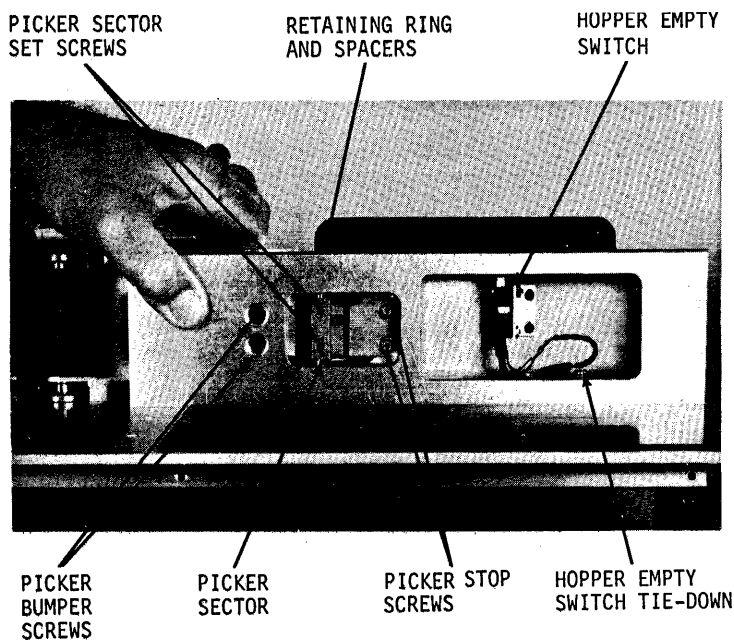


Figure 9-19. Replacement of Picker Casting And Picker Sector, Front View

9.12 LIGHT STATION

- a. Remove four 256 x 1/4 flat head Phillips screws 15 to remove light station, figure 9-18.
- b. Slide off nylon tie-down holding light station cable connector on power supply.
- c. Remove light station connector from power supply.
- d. Replace light station, plug connector into power supply, and replace tie-downs.

9.13 FOURTH AND FIFTH STACKER ROLLER BEARINGS

- a. Perform steps b. and c. of paragraph 9.4.
- b. Release the tension on the main driver motor belt by LOOSENING the motor mounting plate screws, figure 9-3. Use a 9/64 Allen wrench.
- c. Using a 5/64 Allen wrench, remove the timing disc. Refer to figure 9-4.

CAUTION

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

- d. LOOSEN the set screw in the upper fourth stacker roller pulley and the fifth stacker roller pulley and remove pulleys from shafts. Use a 3/32 Allen wrench.
- e. Using a 1/16 Allen wrench, LOOSEN the set screw in the bottom stacker roller assembly to be serviced.
- f. Lift the stacker roller assembly straight up out of the casting.
- g. Using a flat blade knife, pry out the bearing to be replaced and replace the bearing, figure 9-7.
- h. Use steps i., j. and k. of paragraph 9.6 to reinstall the stacker roller assembly.
- i. Refer to paragraph 6.5 for roller shaft bearing preload adjustment.
- j. Reassemble the track drive assembly in reverse order of disassembly. Replace the timing disc.

- k. Refer to paragraph 6.2 for main drive motor belt tension adjustment.

9.14 FIRST AND SECOND PICKER ROLLER BEARINGS

- a. To replace the first picker roller bearings, LOOSEN the set screw in the bottom roller. Remove picker roller, figure 9-18.
 - b. To replace the second picker roller bearings, LOOSEN the set screw in the top or bottom roller. The shaft of either may then be removed from the center of the casting.
- q

NOTE

After replacing the bearing and the shaft assembly, always apply firm finger pressure when tightening the roller set screw. This is to remove all vertical end play in the shaft.

9.15 PICKER CASTING REPLACEMENT

- a. Set picker casting in place, figure 9-19.
- b. Using LOCKTITE GRADE C, set all six socket head screws (13), figure 9-16, BUT DO NOT TIGHTEN.
- c. With hand pressure applied between picker casting and stacker casting as in figure 9-19, tighten six picker casting mounting screws.
- d. The remainder of the reader may now be assembled in reverse order of disassembly.
- e. Readjust the magnetic pickup per paragraph 6.3.
- f. Readjust the picker sector per paragraph 6.8.

9.16 PICKER SECTOR

- a. Using a 5/64 Allen wrench, remove four button head screws (3) holding top panel cover, figure 9-1.
- b. Perform steps a. and c. through f. of paragraph 9.7. Prop open input hopper follower by taping together 3/4 inch of cards and placing in hopper at right angles.
- c. Using a #2 retaining ring remover tool, remove the retaining ring from the top of the picker shaft, figure 9-19.

- d. Remove spacers located under the retaining ring, figure 9-19.

CAUTION

ALL OF THE SPACERS MUST BE REPLACED
IN REASSEMBLY.

- e. Using a 5/64 Allen wrench, LOOSEN two set screws holding picker sector, figure 9-19.
- f. Remove picker shaft from bottom of chassis.
- g. Using a Phillips screwdriver, remove throat block, figure 9-20.
- h. Remove picker sector from rear side of picker casting, figure 9-20.
- i. Replace picker sector, shaft, spacers, and retaining ring.
- j. Adjust shaft to place sector set screws on flat side of shaft.
- k. Using a 6" metal ruler, measure 1.625" from the mainframe up to the center of the row of holes on the picker sector, figure 9-20.

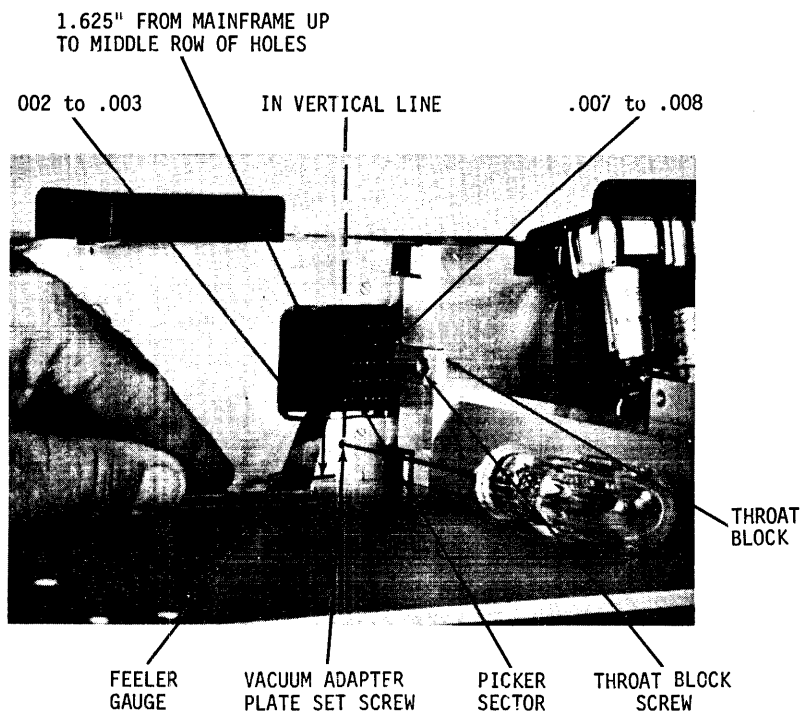
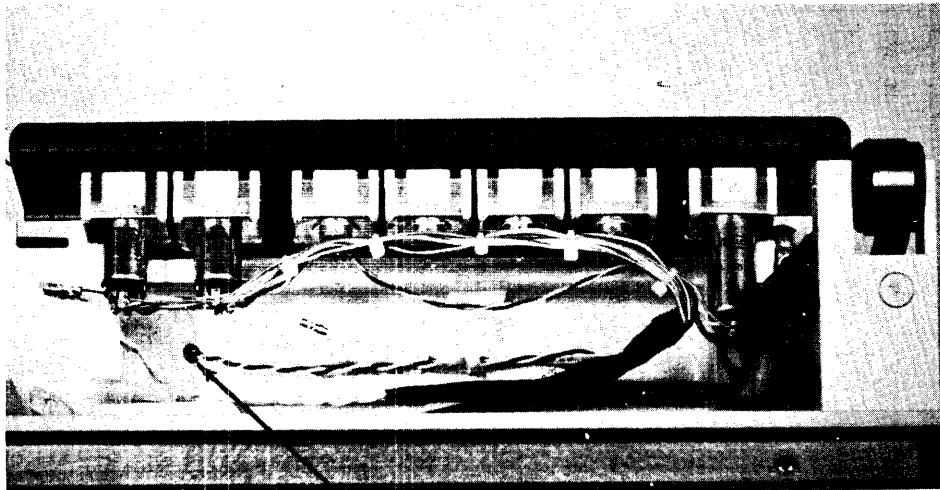


Figure 9-20. Picker Sector, Rear View

- l. Retaining this measurement, tighten the two picker sector set screws, figure 9-19.
- m. Reassemble the reader in the reverse order of disassembly.
- n. Refer to paragraph 6.8 for adjustment of the picker sector.

9.17 STACKER PHOTOCELL

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



STACKER PHOTO CELL

Figure 9-21. Location of Stacker Photocell

CAUTION

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

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

9.18 HOPPER NEGATOR SPRING

- a. Use steps d., e., and f., of paragraph 9.10 to gain access to the negator spring retaining screw.
- b. Hold the spring and remove the spring screw.
- c. Pull the spring from the roller and roll a new spring onto the roller.
- d. Replace the spring screw and reassemble the input hopper follower assembly, figure 9-17.

9.19 LOWER STACKER NEGATOR SPRING

- a. Using a 5/64 Allen wrench, remove six button head screws retaining front panel and remove front panel, figure 9-1.
- b. Remove two button head screws each side of main card cage cover, slide cover back slightly and lift off, figure 9-9.
- c. Using a 9/64 Allen wrench, remove two socket head screws (15) holding front stacker shaft support, figure 9-22.
- d. LOOSEN set screw in rear stacker shaft support, figure 9-23.
- e. Remove stacker shaft, figure 9-22.
- f. Move stacker follower sufficiently beyond front edge of chassis to reveal negator spring screw.

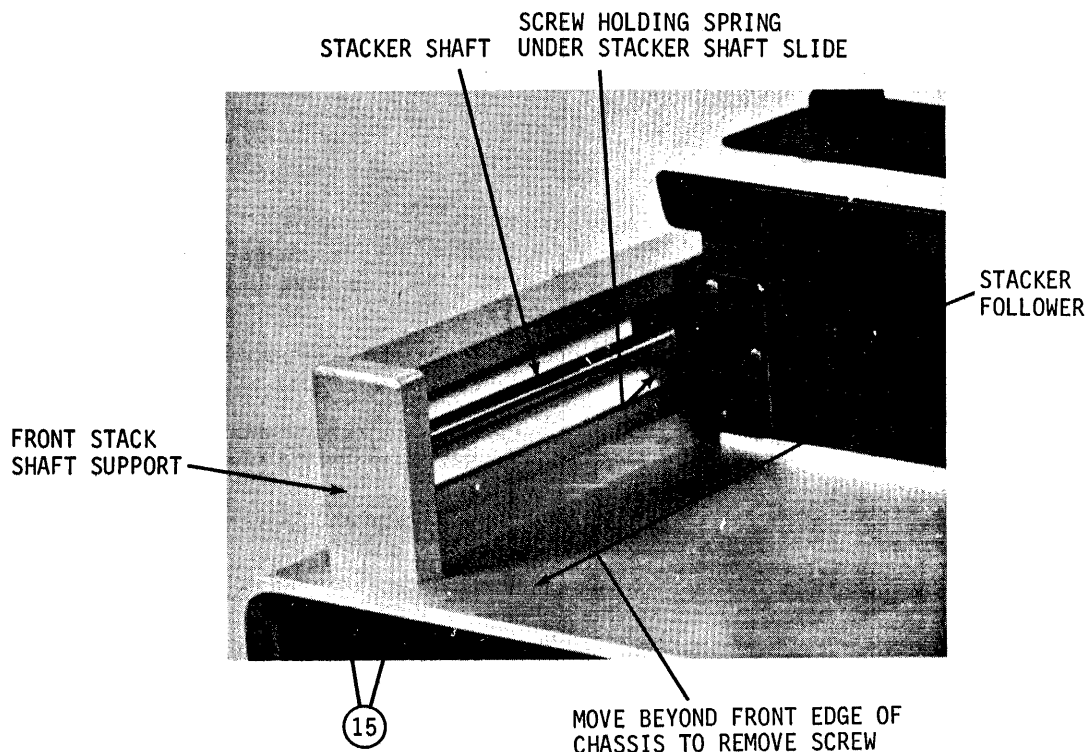


Figure 9-22. Stacker Negator Spring Replacement

- g. Hold spring, remove screw, and pull spring from roller.
- h. Reroll new spring onto roller and replace spring screw.
- i. Reassemble stacker follower assembly.

NOTE

Do not replace card cage cover if UPPER STACKER NEGATOR spring is to be replaced.

9.20 UPPER STACKER NEGATOR SPRING

- a. Remove upper stacker negator spring screw, figure 9-23.
- b. Pull spring from roller and roll new spring onto roller.
- c. Replace spring screw and reassemble reader.

9.21 HOPPER EMPTY SWITCH

- a. Using a 5/64 Allen wrench, remove four button head screws 3 , figure 9-1, holding top panel cover.
- b. Using a 3/32 Allen wrench, remove two socket head screws holding riffle cap, figure 9-1.
- c. Remove two connectors from hopper empty switch, figure 9-19.
- d. Using a 1/16 Allen wrench, remove two button head screws holding switch, figure 9-19.
- e. Replace switch and adjust using paragraph 6. 6.
- f. Reassemble in reverse order of disassembly.

9.22 STACKER FULL SWITCH

- a. Remove two button head screws on each side of card cage cover, slide backward about 2" and lift off, figure 9-9.
- b. Remove two Phillips head screws holding stacker full switch, figure 9-23.

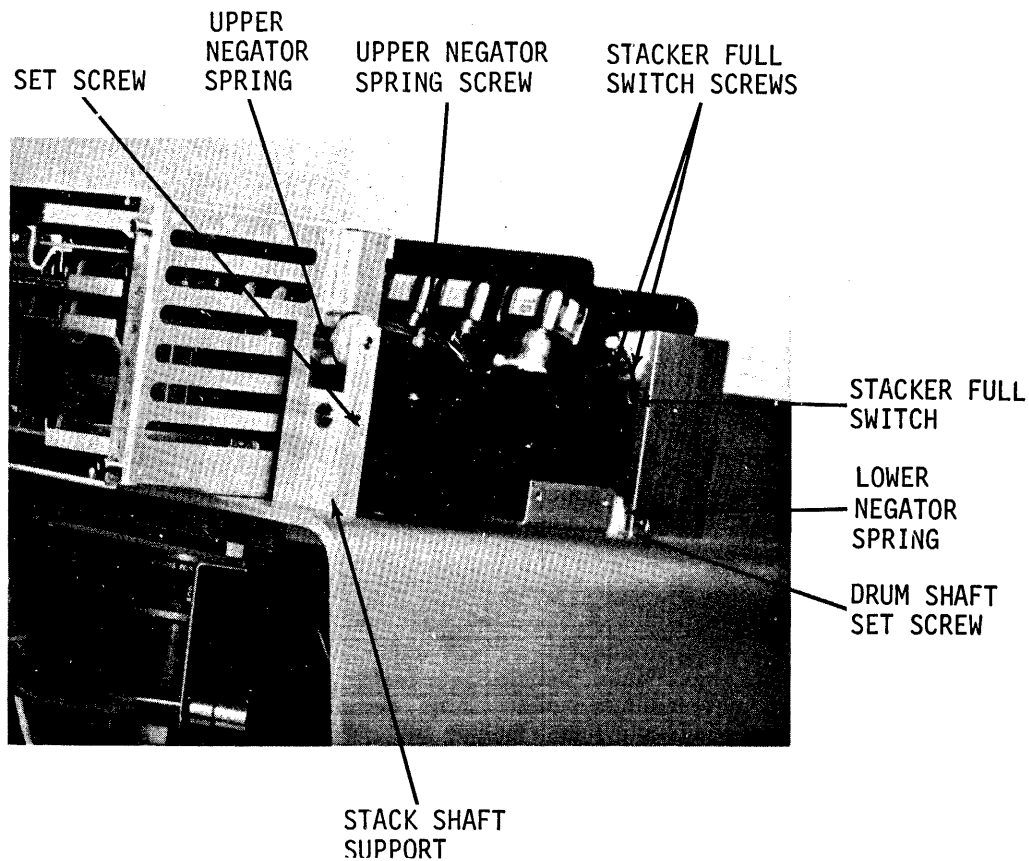


Figure 9-23. Stacker Full Switch Replacement

- c. Unsolder leads from switch, and replace.
- d. Remount switch and adjust using paragraph 6.7.
- e. Replace card cage cover.

9.23 INDICATOR LAMPS

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

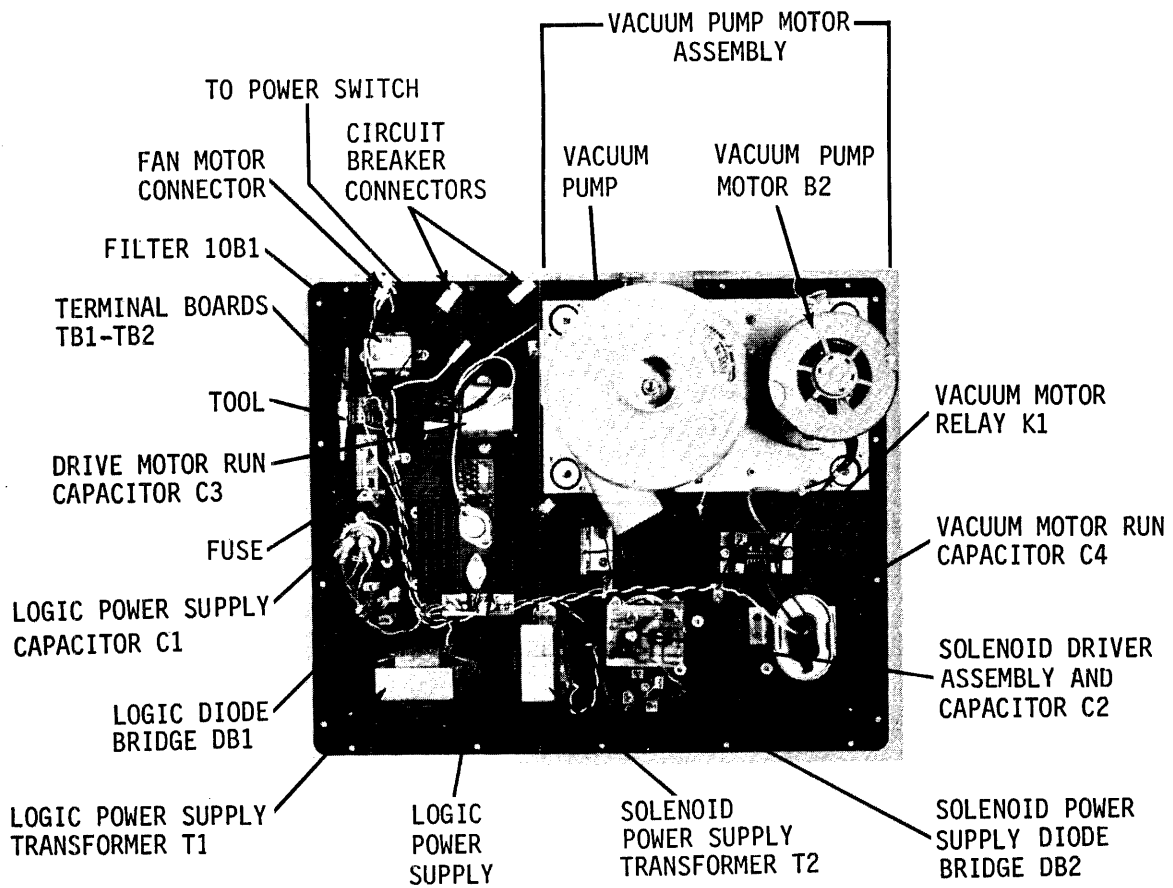


Figure 9-24. Bottom Plate, Component Location

**SECTION 10
DIAGRAMS**

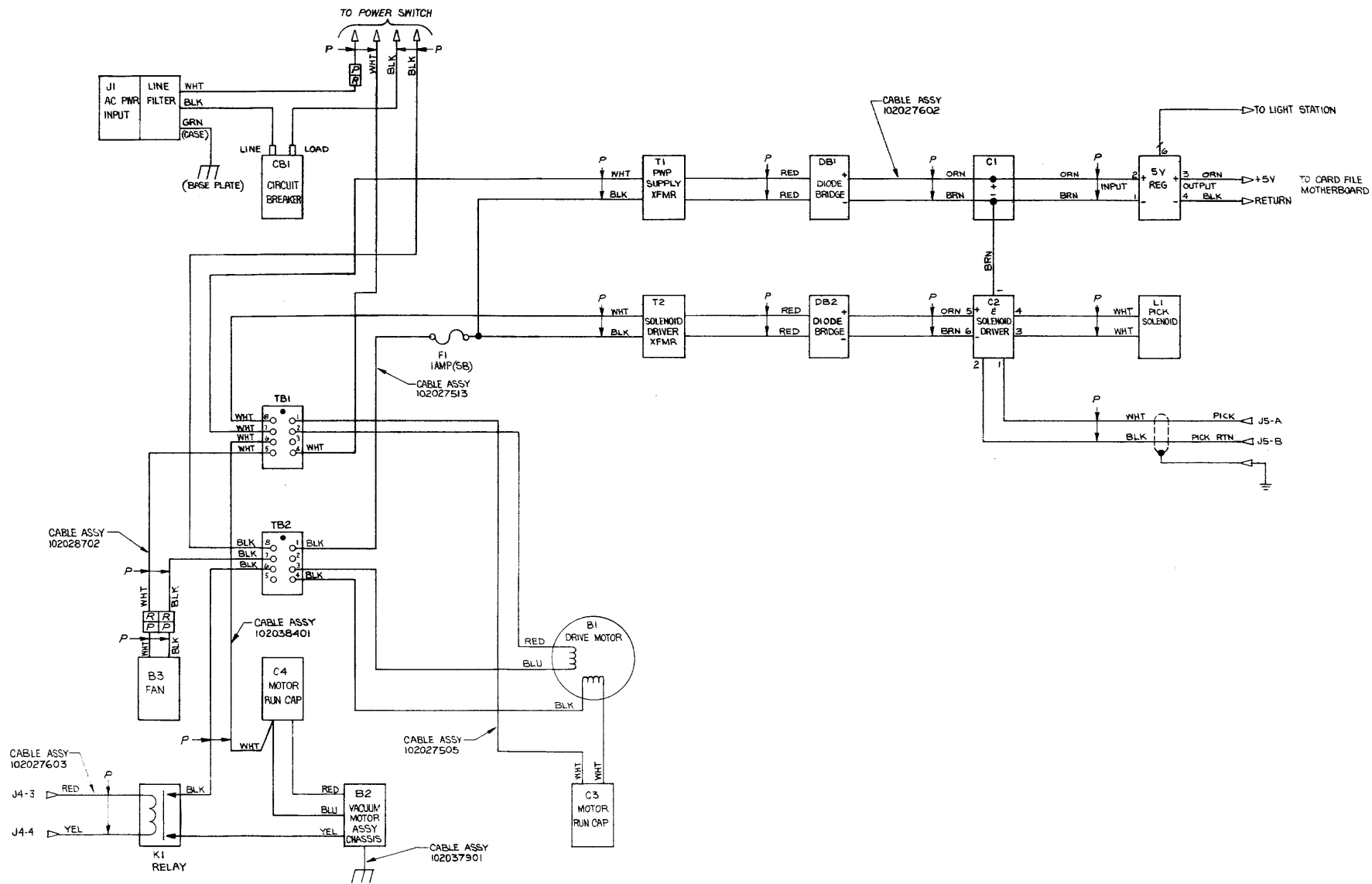


Figure 10-1. Wiring Diagram, AC Power Distribution

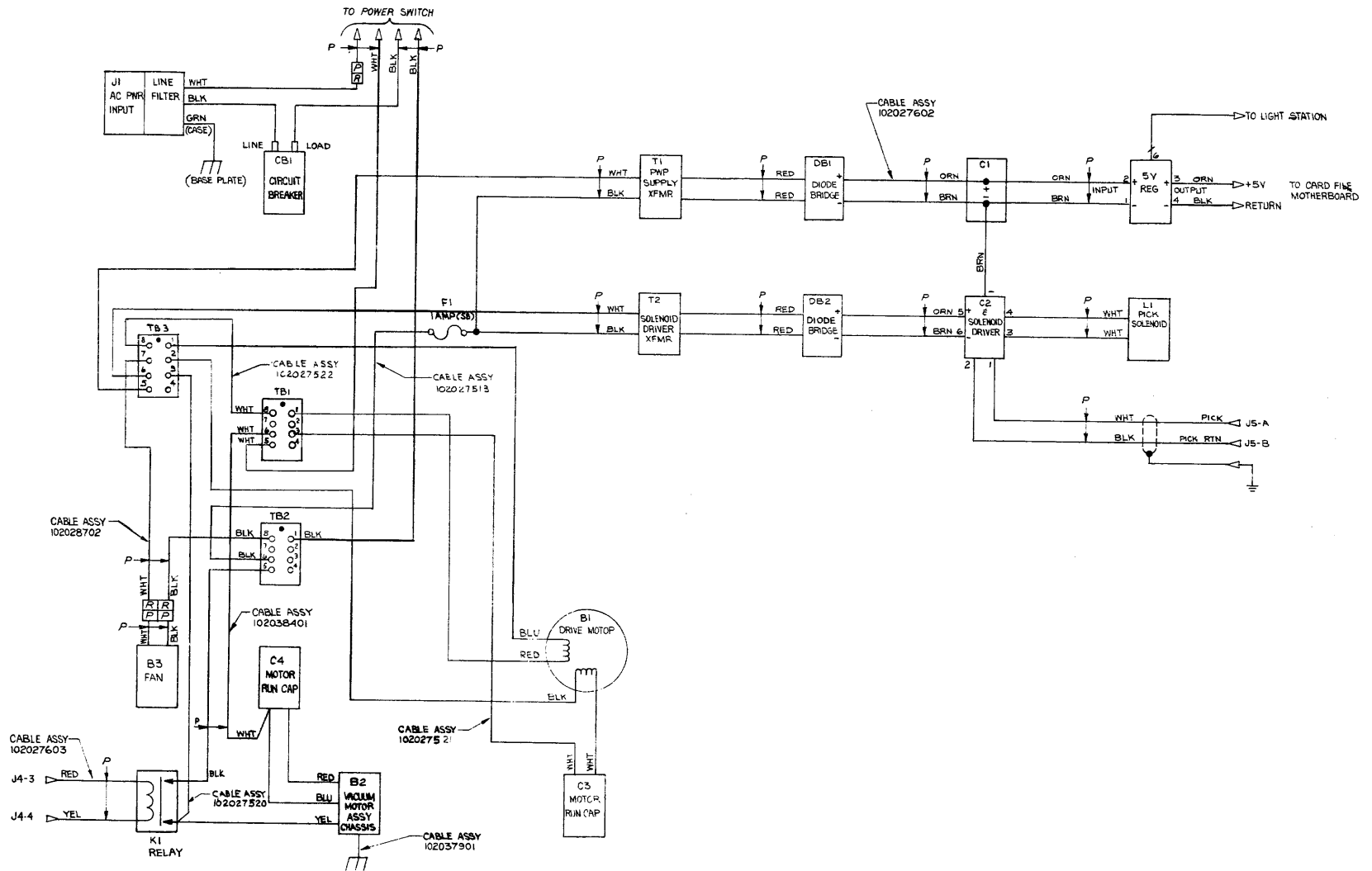


Figure 10-1. Wiring Diagram, AC Power Distribution, 115 VAC, 60 Hz.

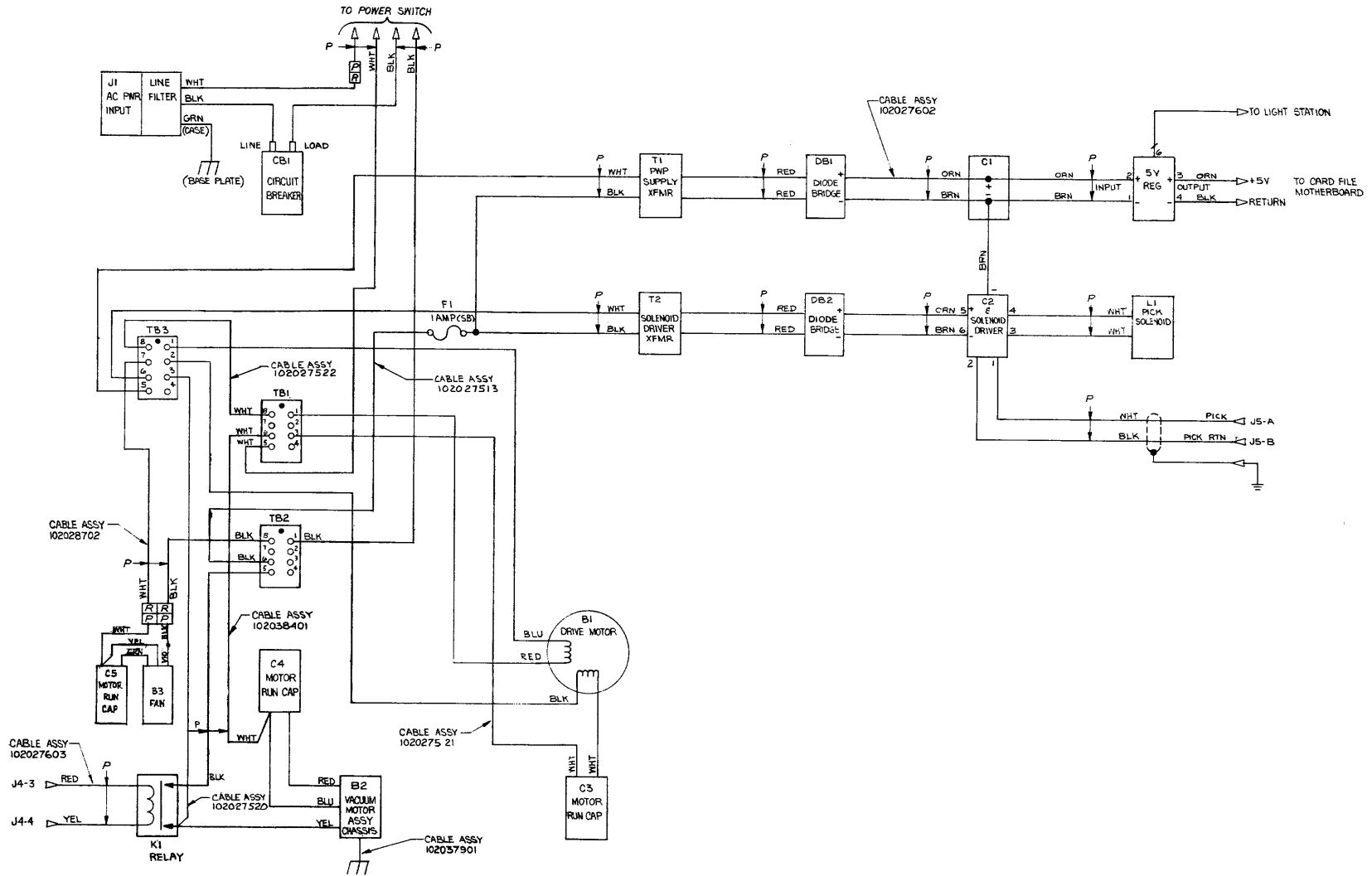


Figure 10-1A. Wiring Diagram, AC Power Distribution, 230 VAC, 50 Hz.

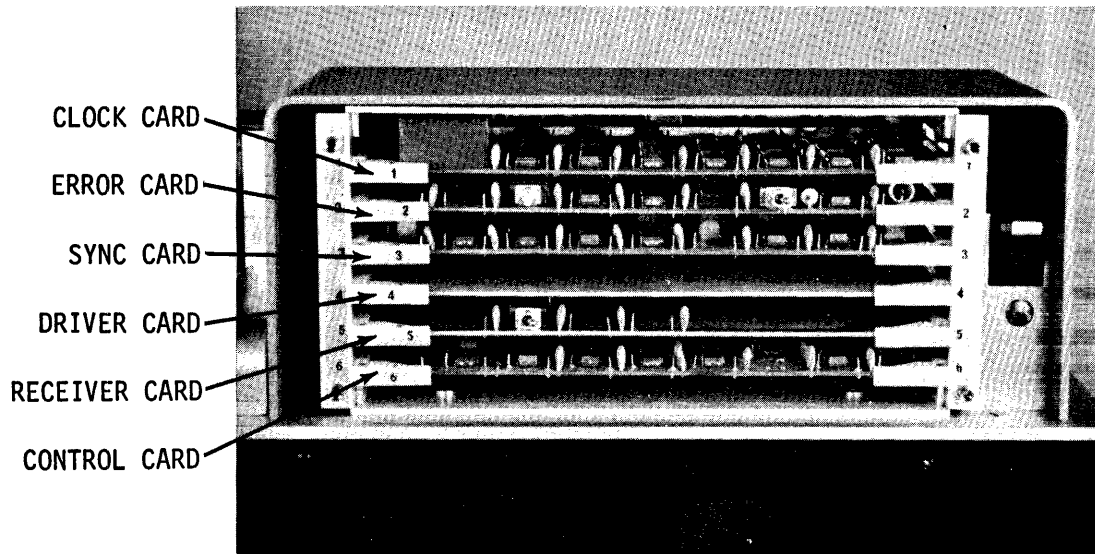


Figure 10-2. Card Cage, P. C. Card Location

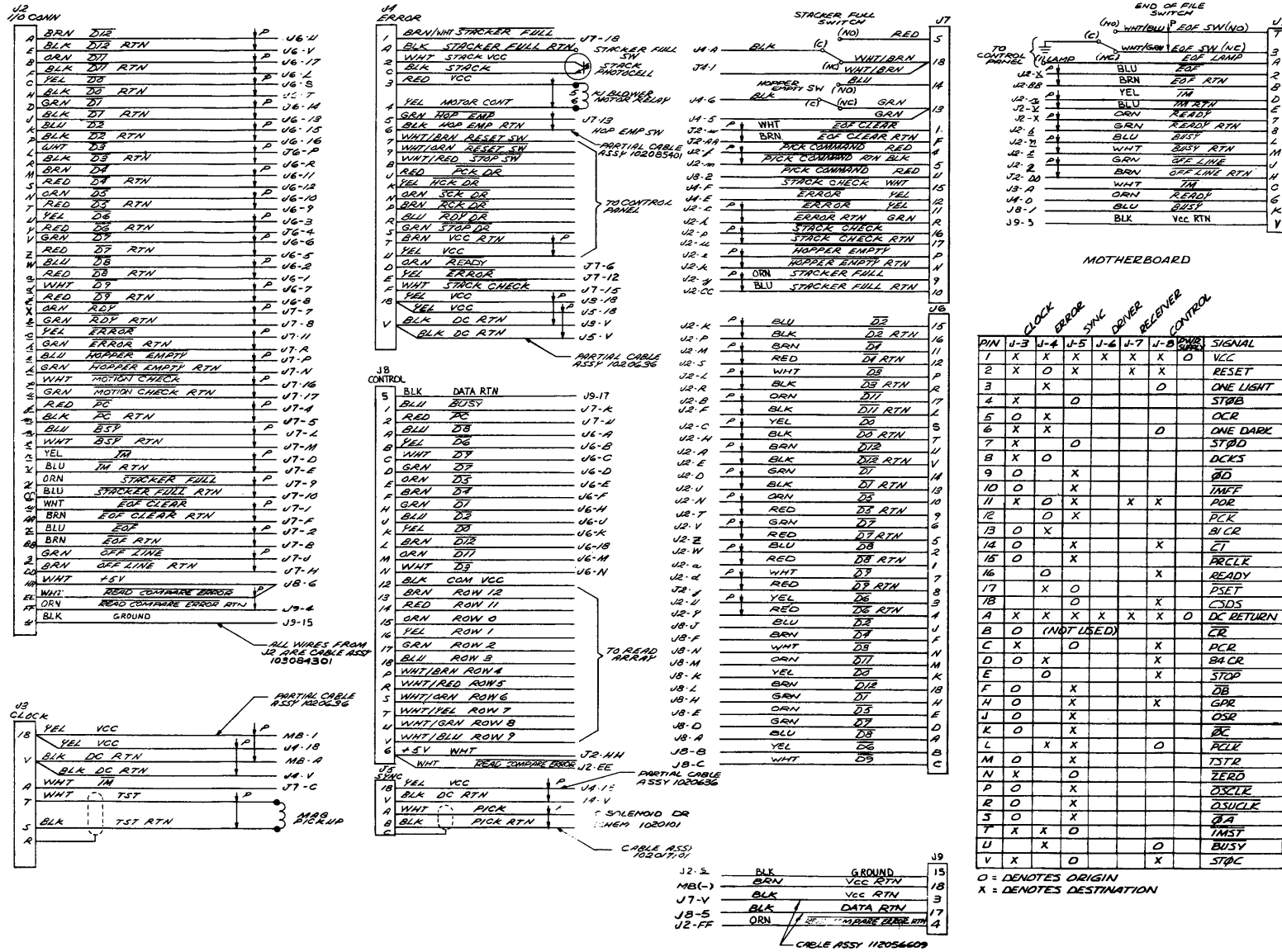
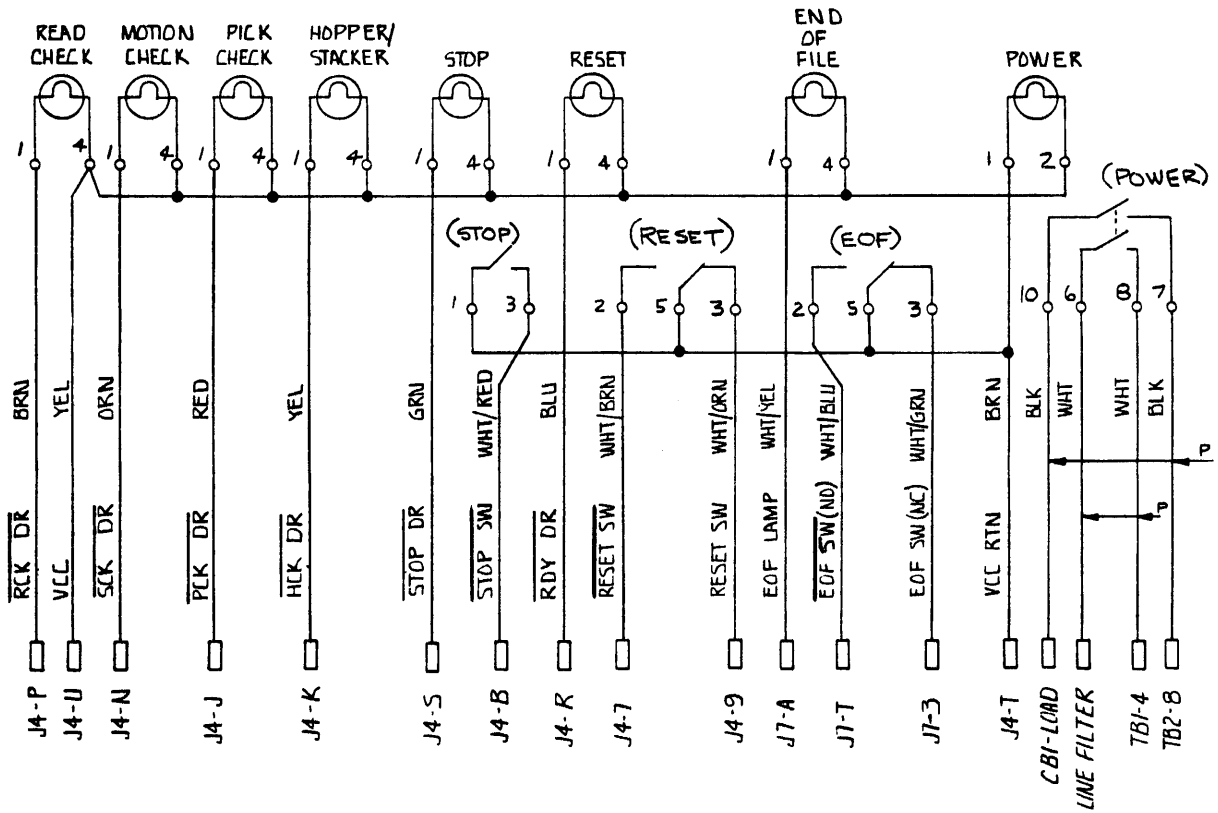
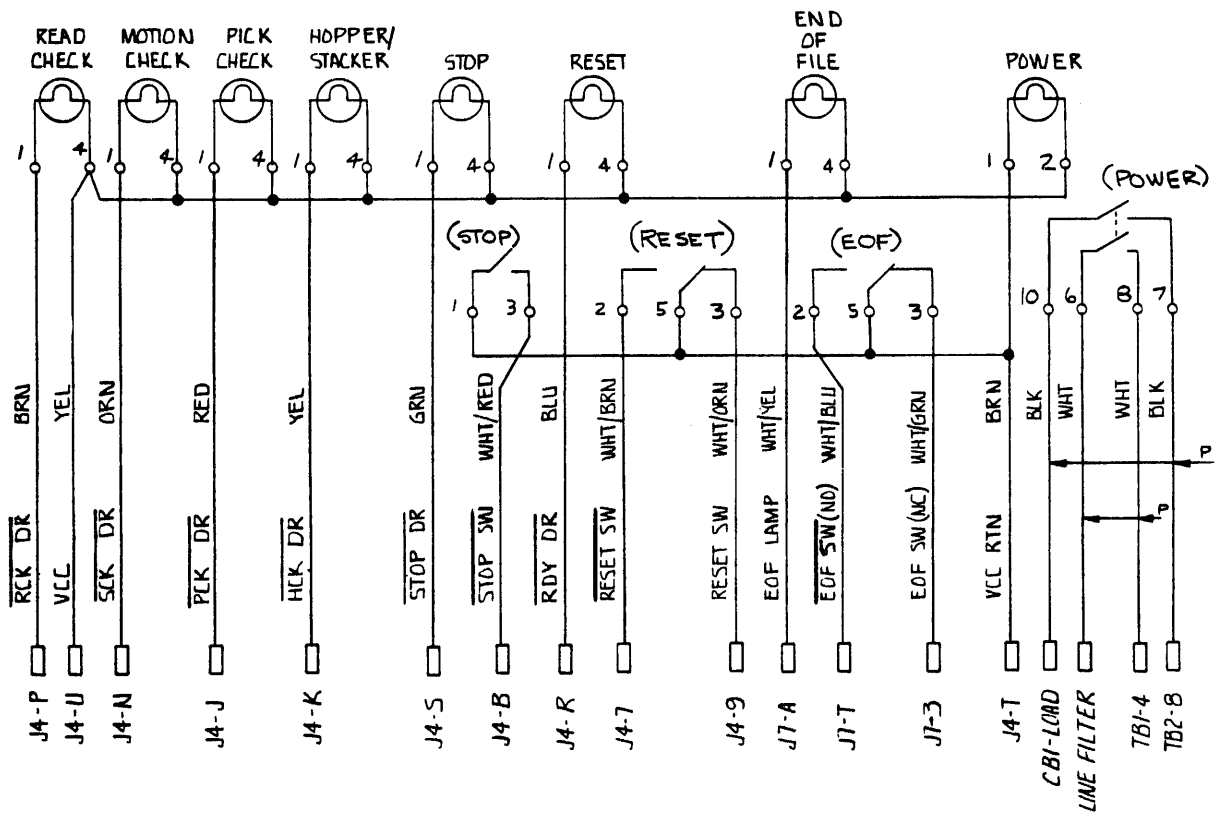


Figure 10-3. Wiring Diagram, Card Cage



NOTE:
 THIS SCHEMATIC USED WITH H.P. CONTROL
 PANEL. (DWG NO. 103083 B)

Figure 10-4. Wiring Diagram, Control Panel



NOTE:
 THIS SCHEMATIC USED WITH H.P. CONTROL
 PANEL. (DWG NO. 103083 B)

Figure 10-4. Wiring Diagram, Control Panel

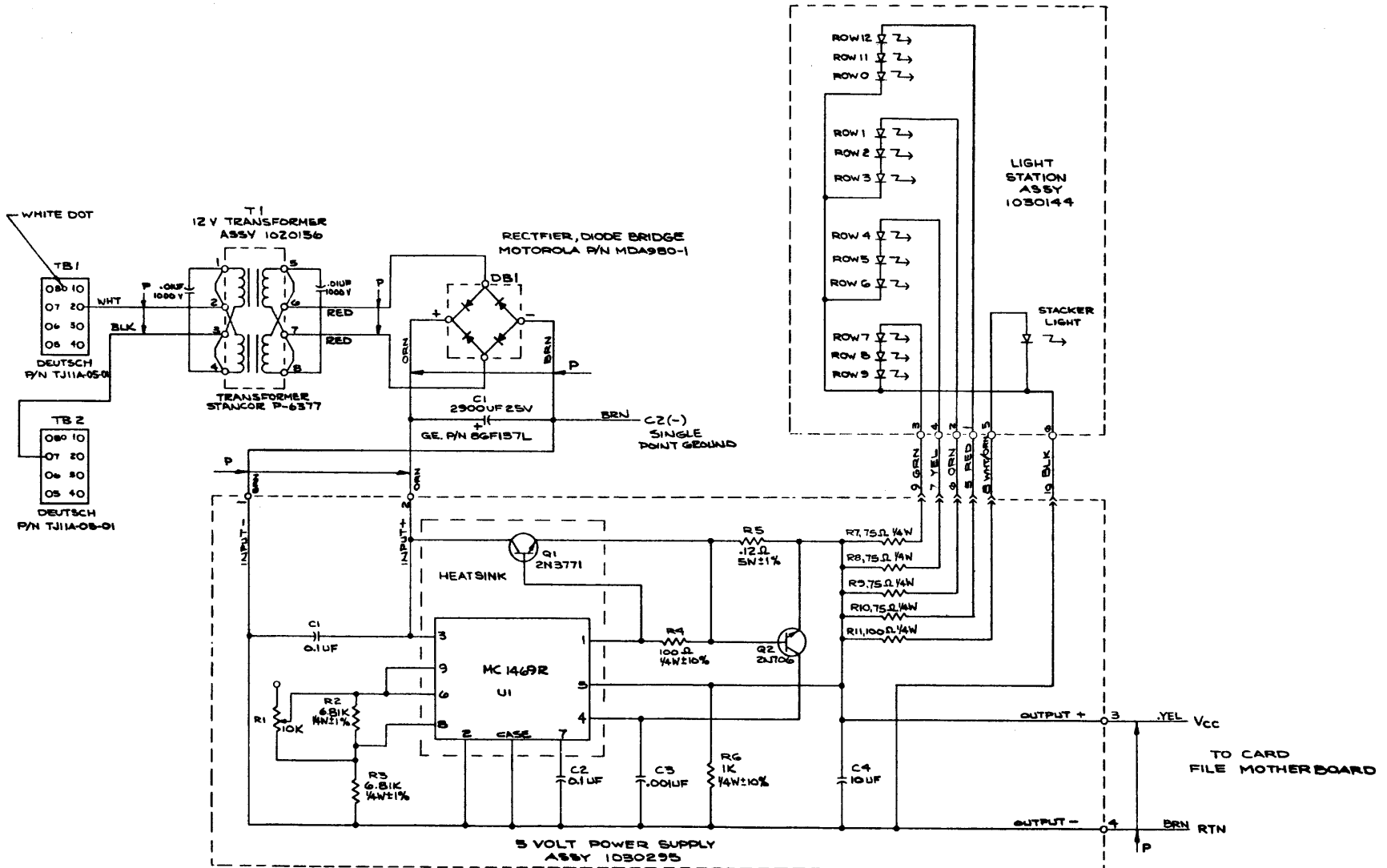


Figure 10-5. Schematic Diagram, 5V Power Supply

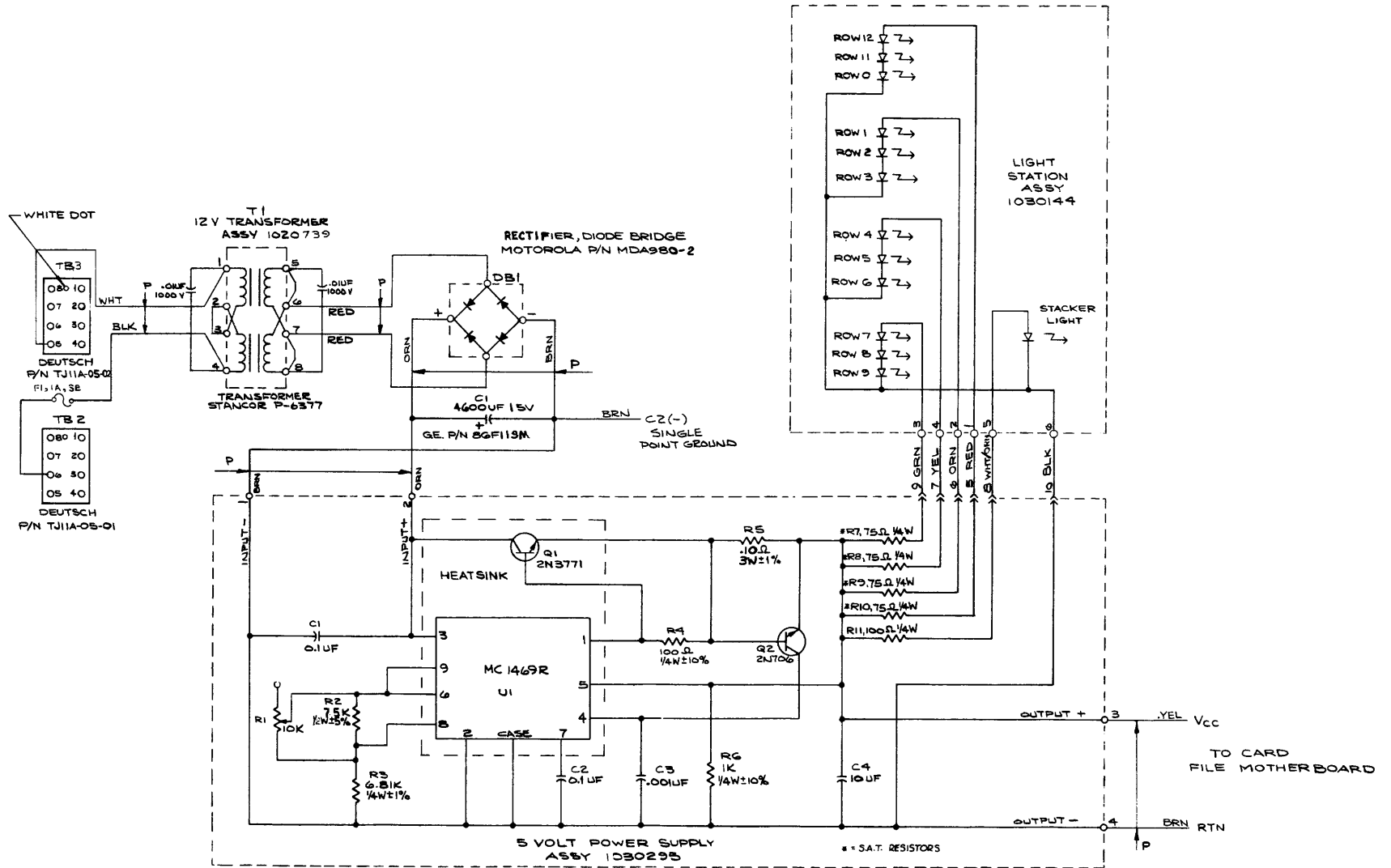


Figure 10-5A. Schematic Diagram, 5V Power Supply, 230 VAC, 50 Hz.

10-6

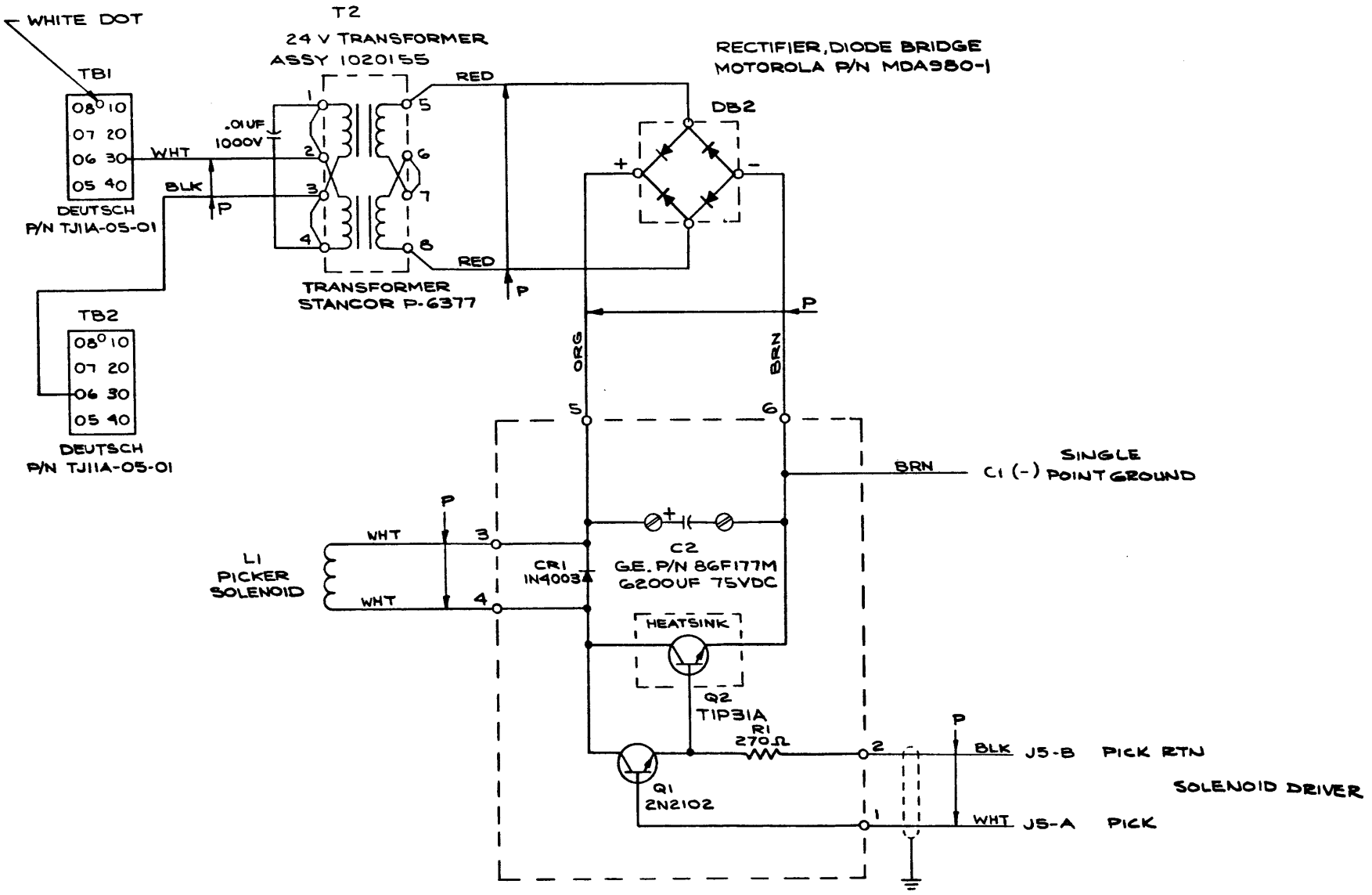


Figure 10-6. Schematic Diagram, Solenoid Driver

Change 3

10-6A

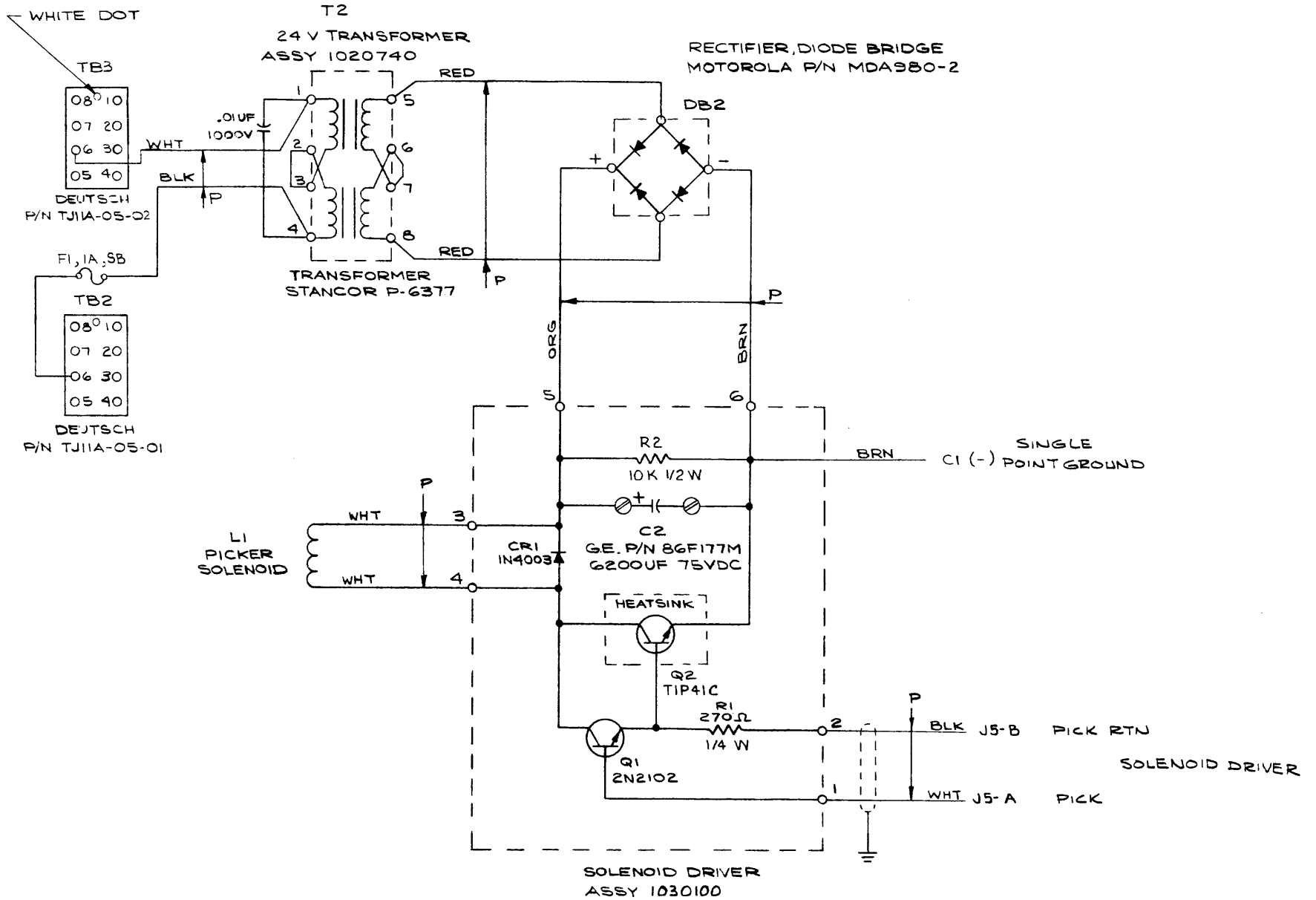


Figure 10-6A. Schematic Diagram, Solenoid Driver, 230 VAC, 50 Hz.

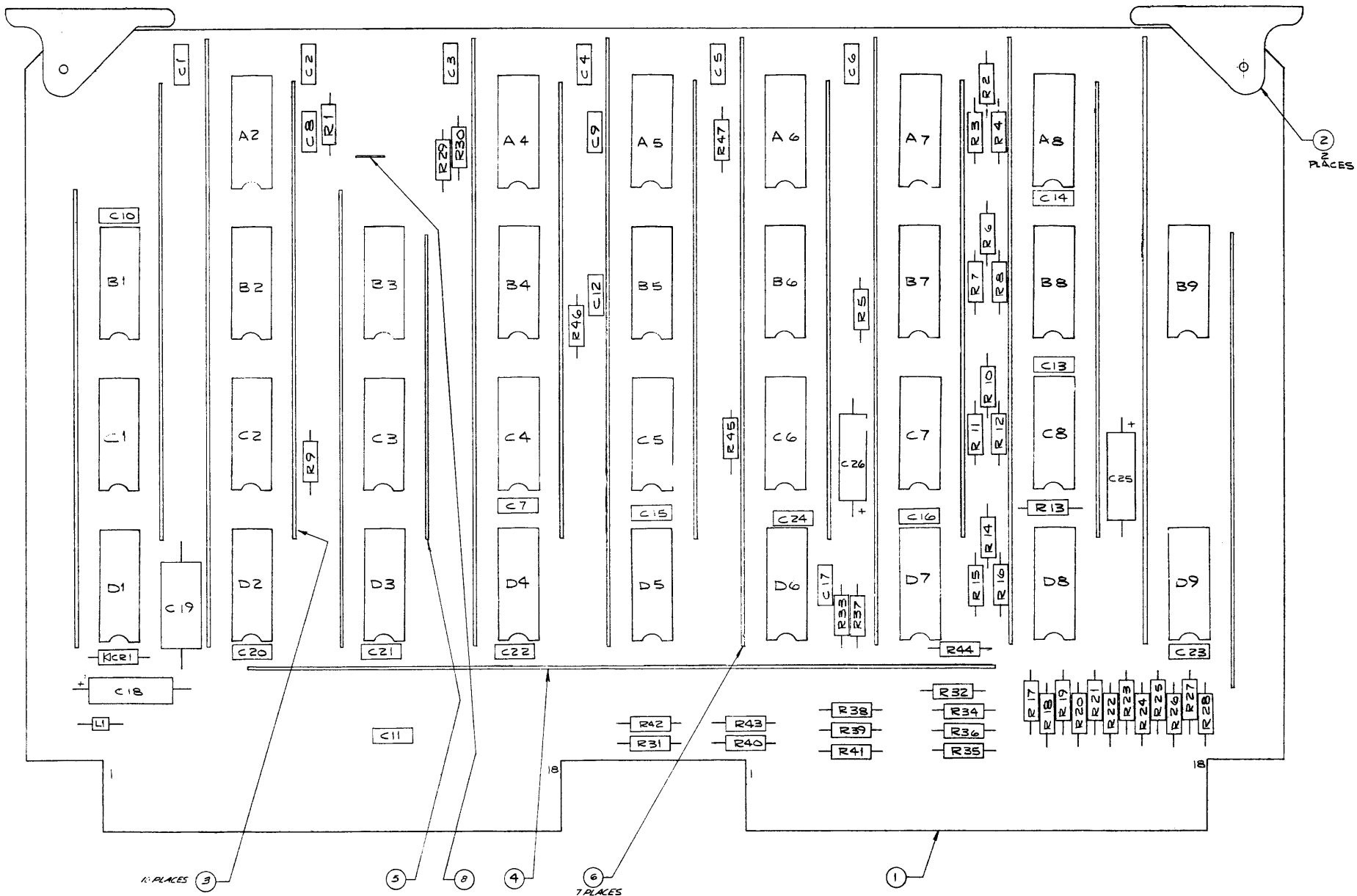


Figure 10-7. Assembly Diagram, Control Card

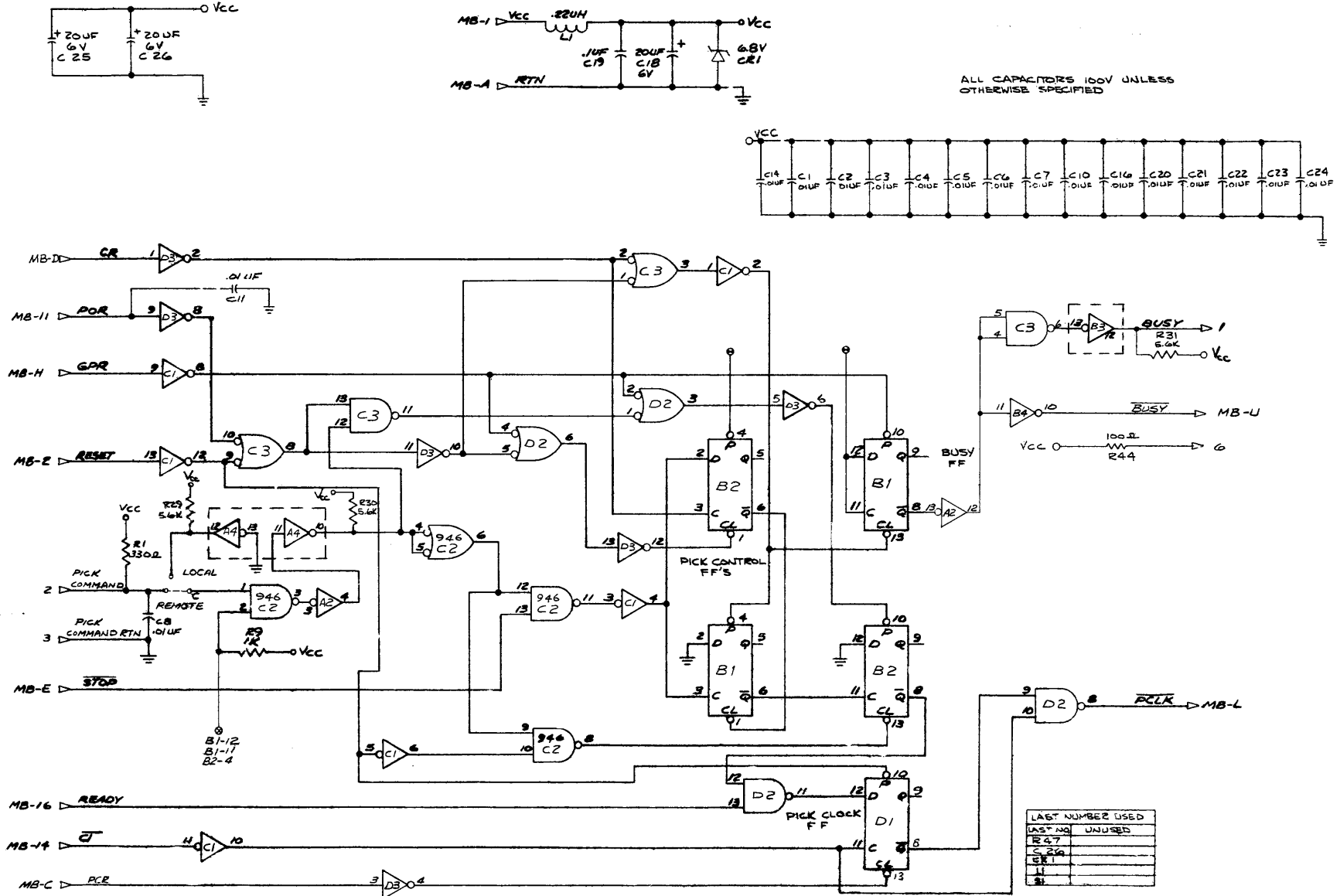


Figure 10-8. Schematic Diagram, Control Card (sheet 1 of 2)

10-9

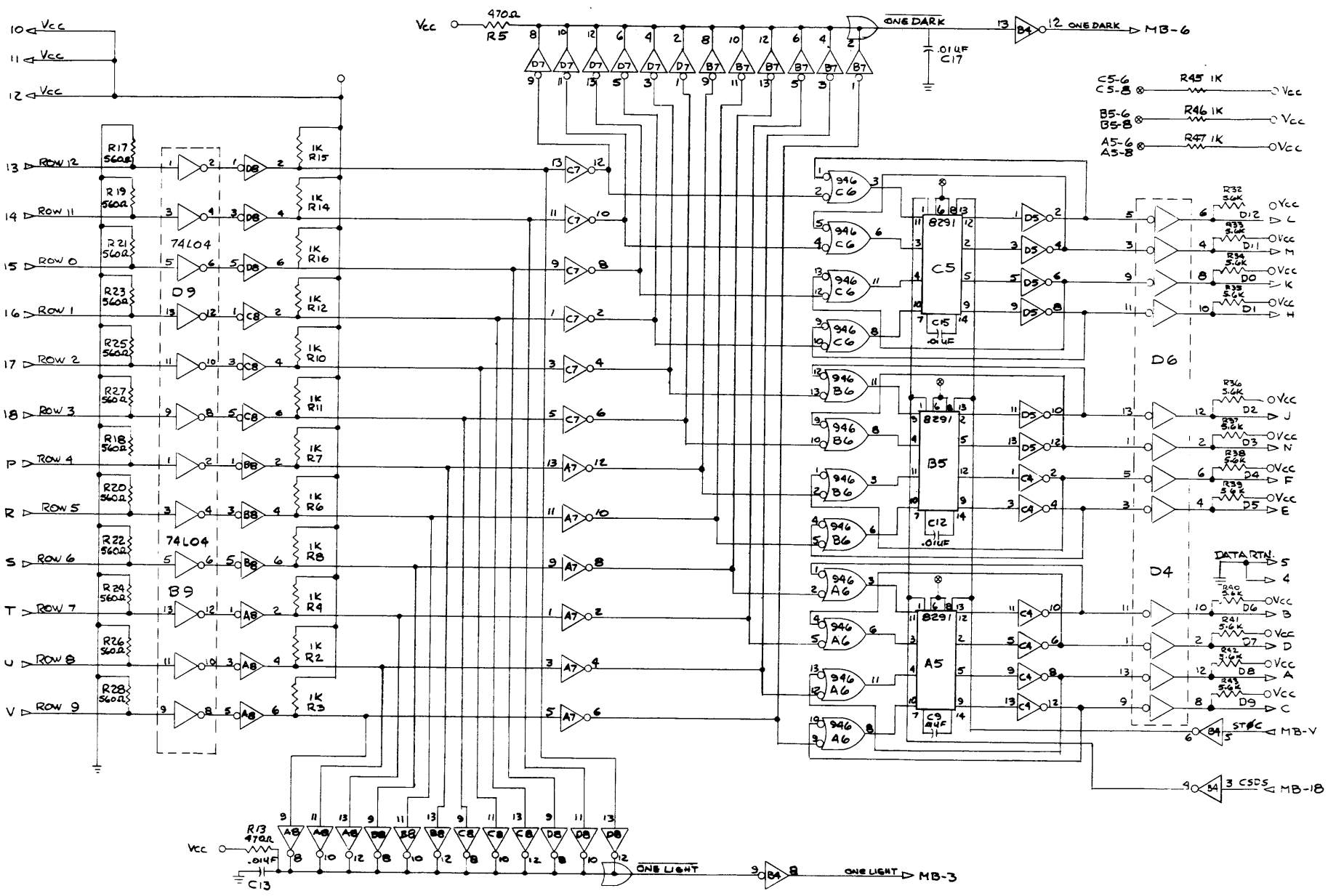


Figure 10-9. Schematic Diagram, Control Card (sheet 2 of 2)

10-10

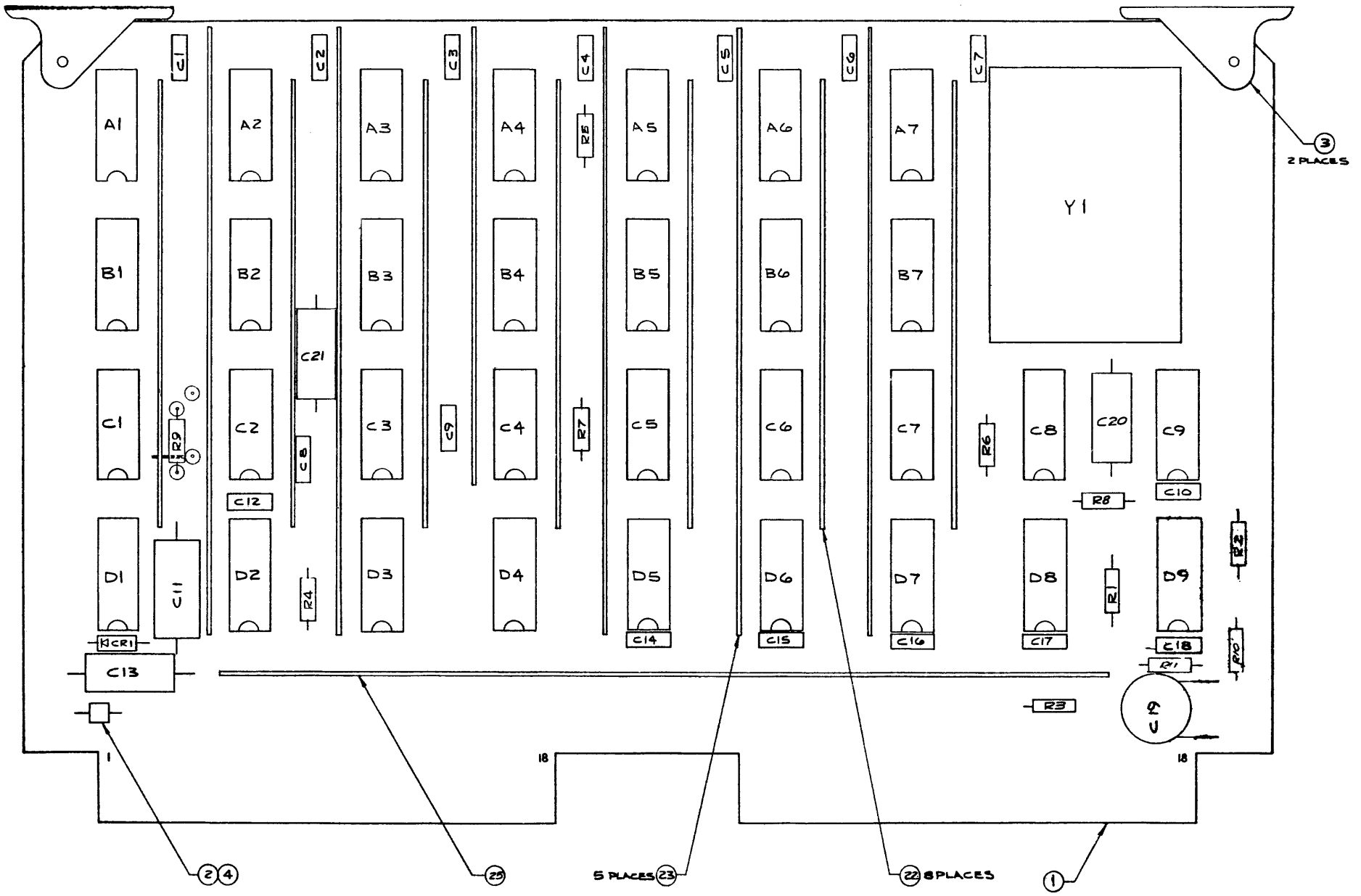


Figure 10-10. Assembly Diagram, Clock Card

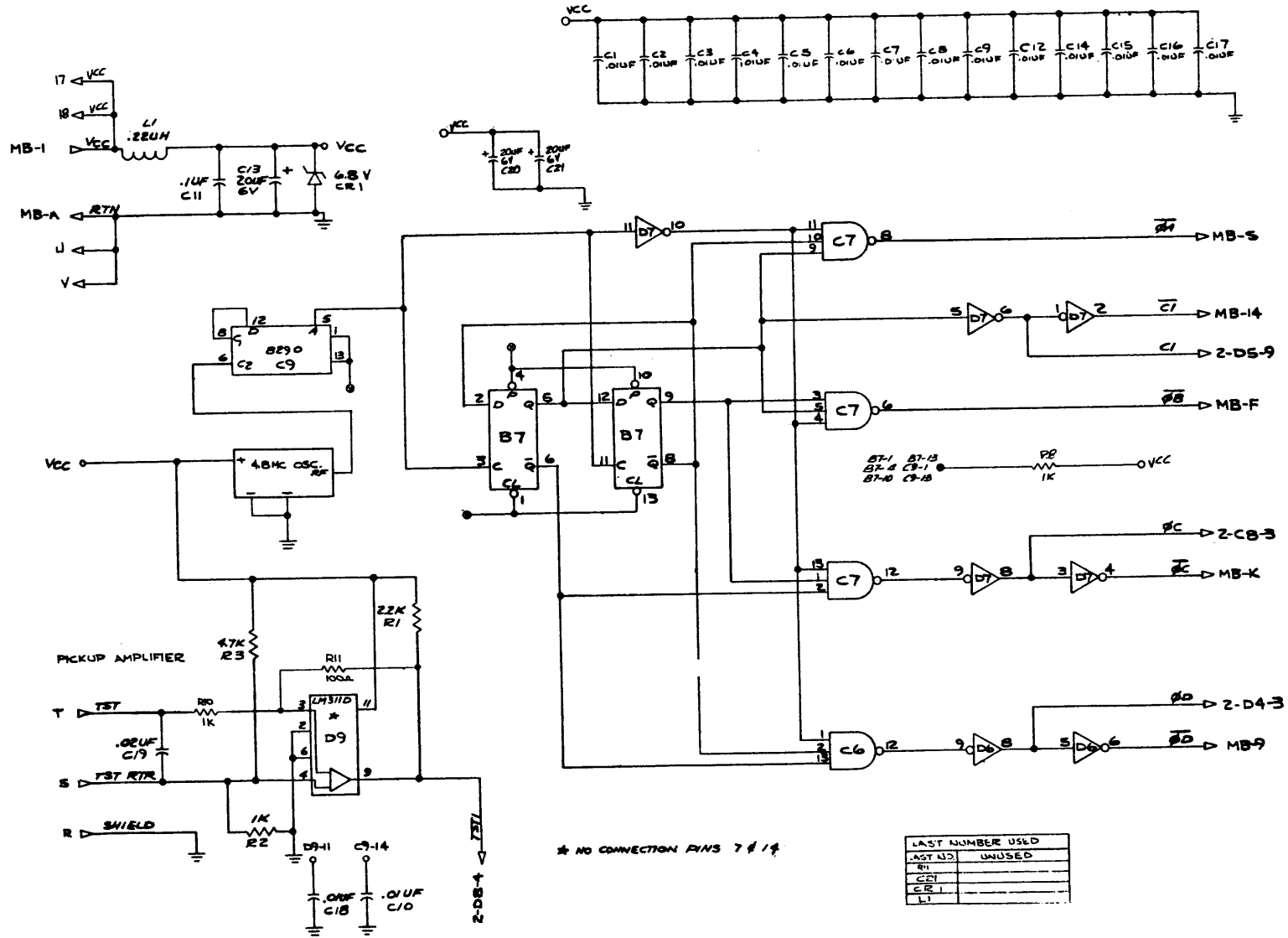


Figure 10-11. Schematic Diagram, Clock Card
(Sheet 1 of 3)

10-12

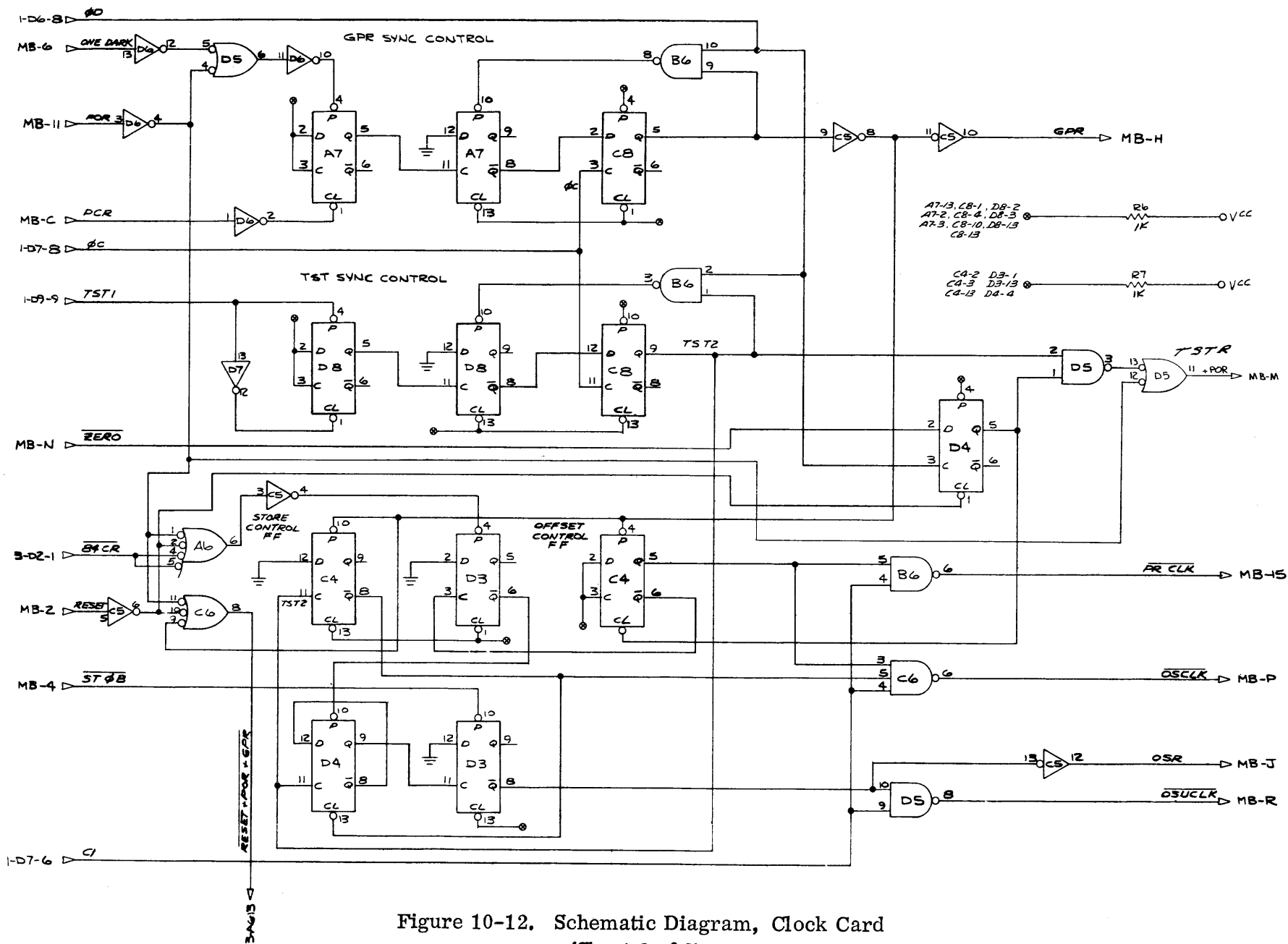


Figure 10-12. Schematic Diagram, Clock Card
(Sheet 2 of 3)

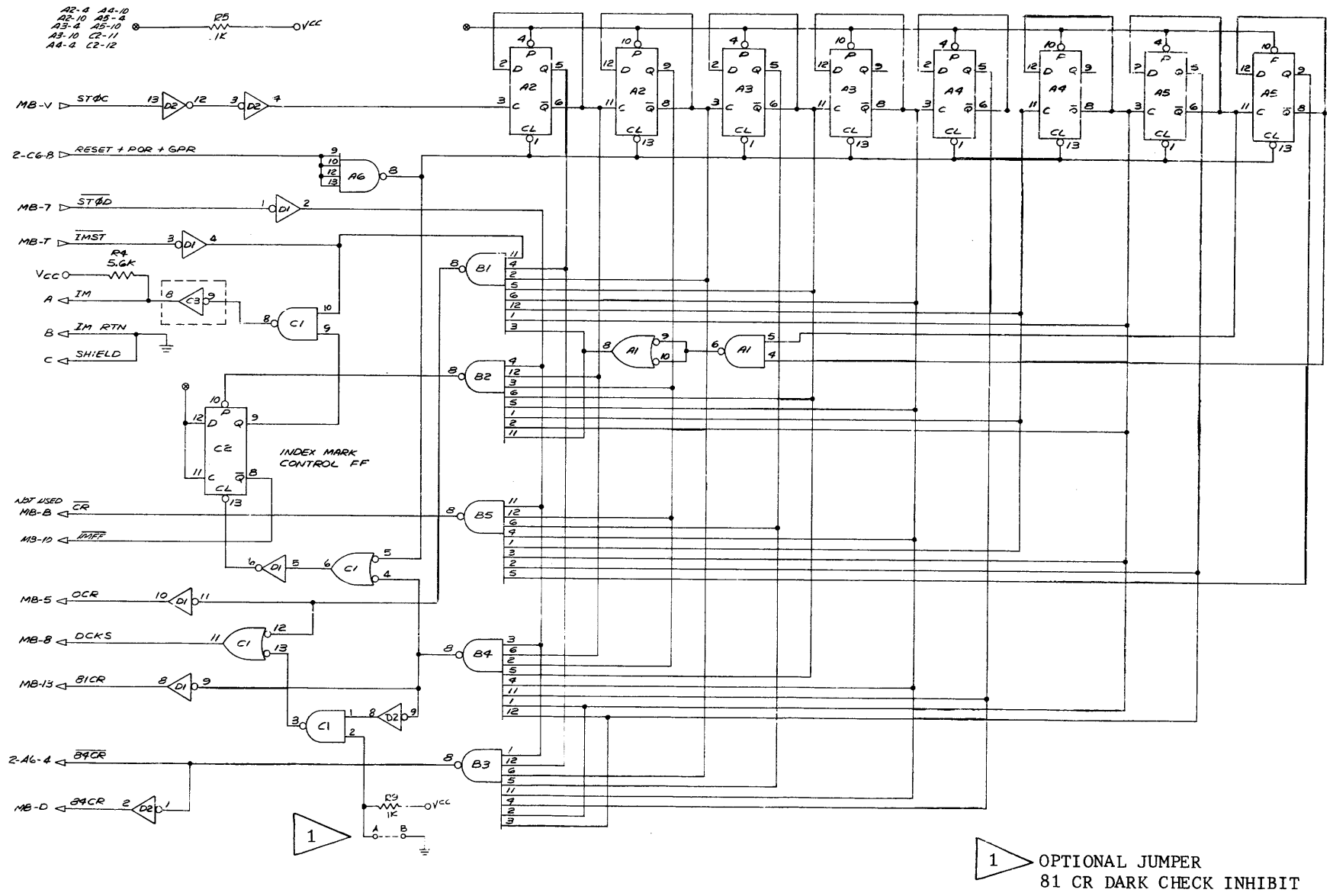


Figure 10-13. Schematic Diagram, Clock Card (Sheet 3 of 3)

1 OPTIONAL JUMPER
81 CR DARK CHECK INHIBIT

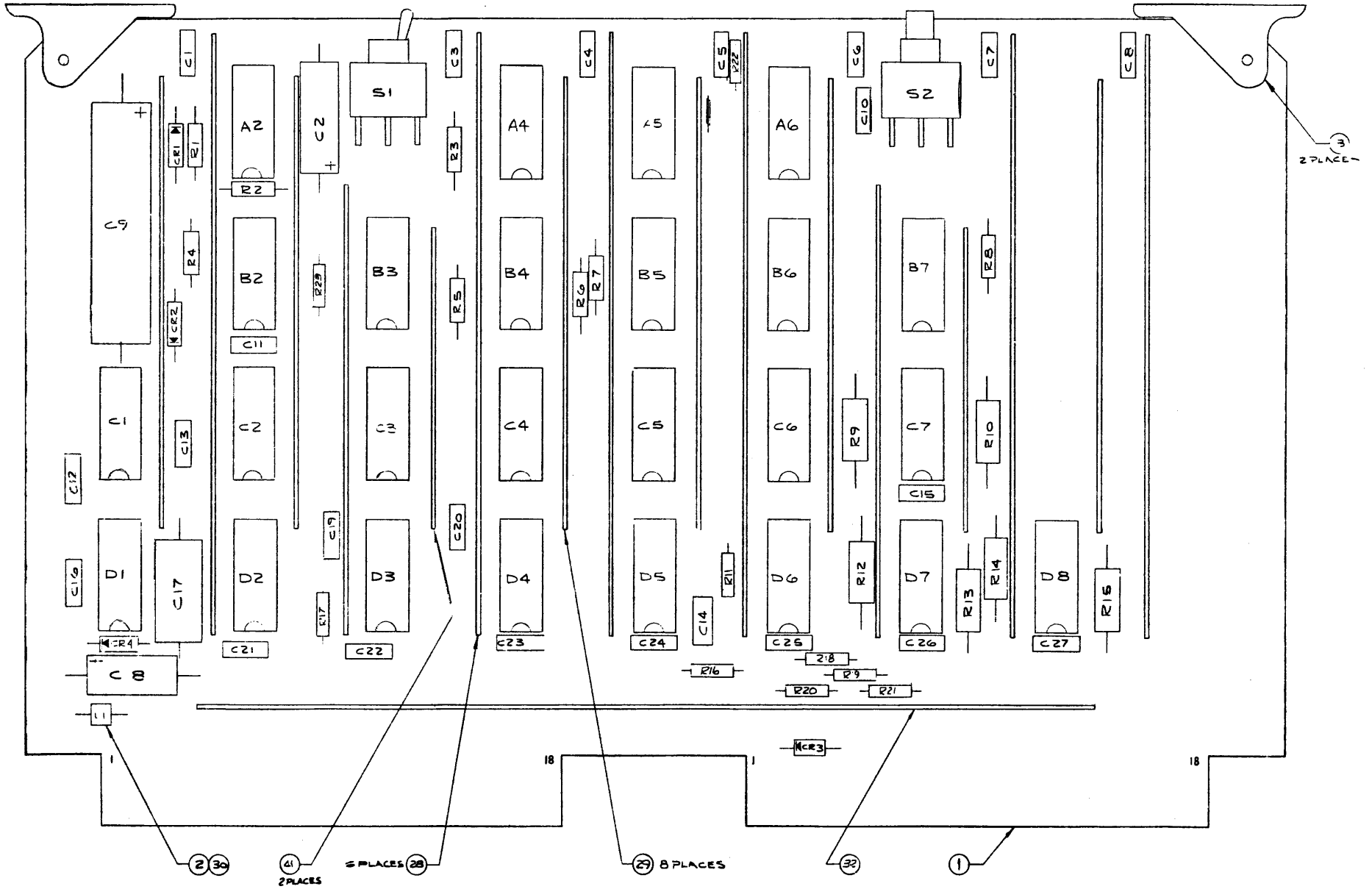


Figure 10-14. Assembly Diagram, Error Card

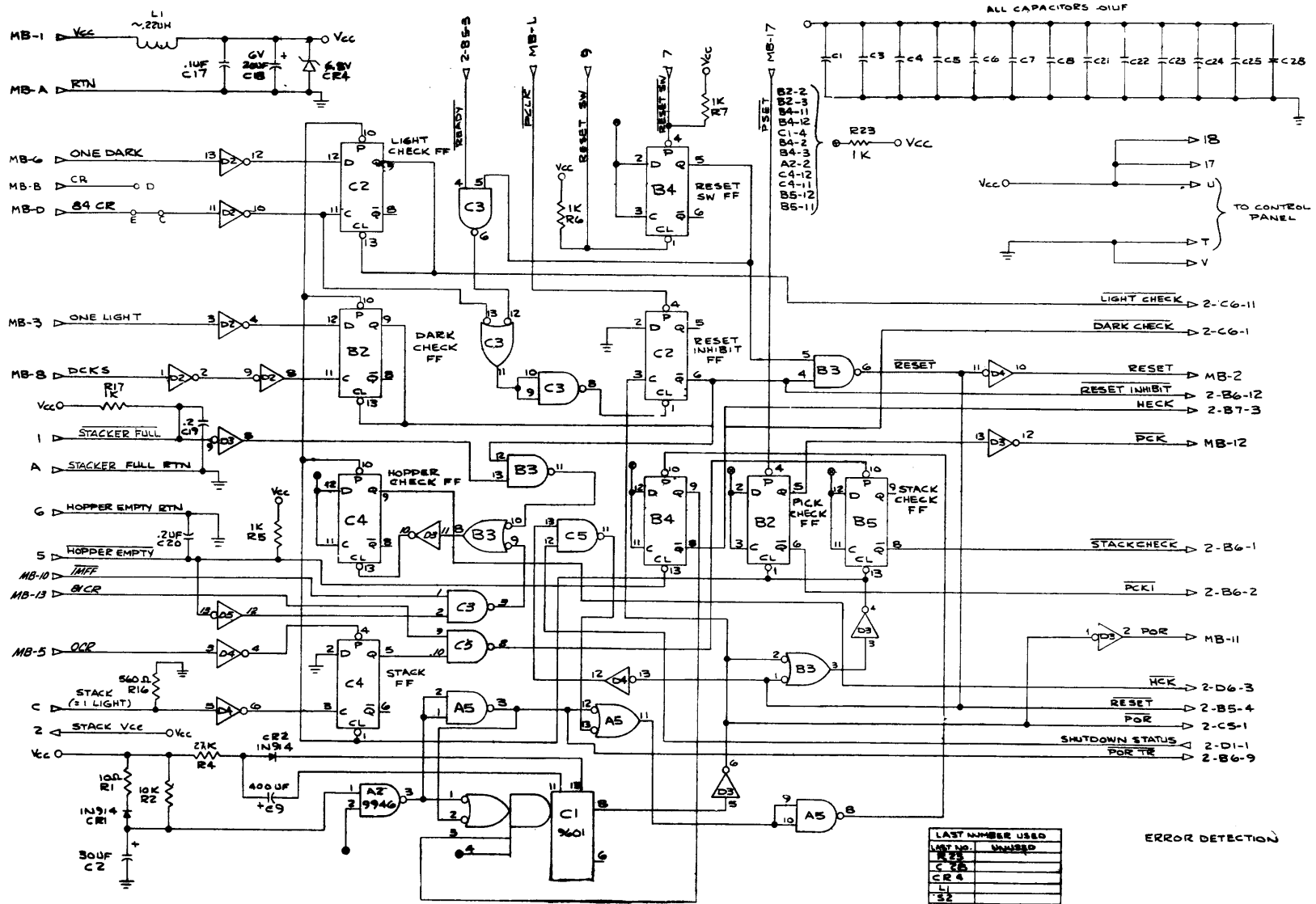
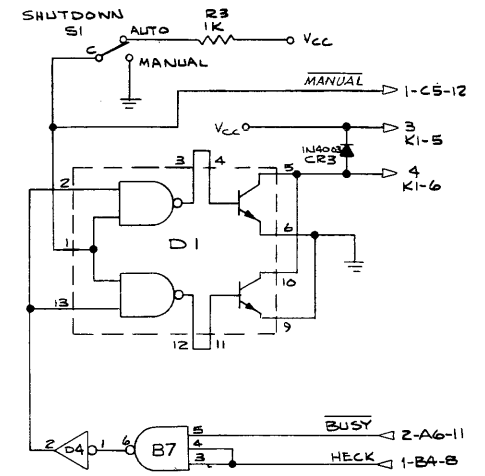
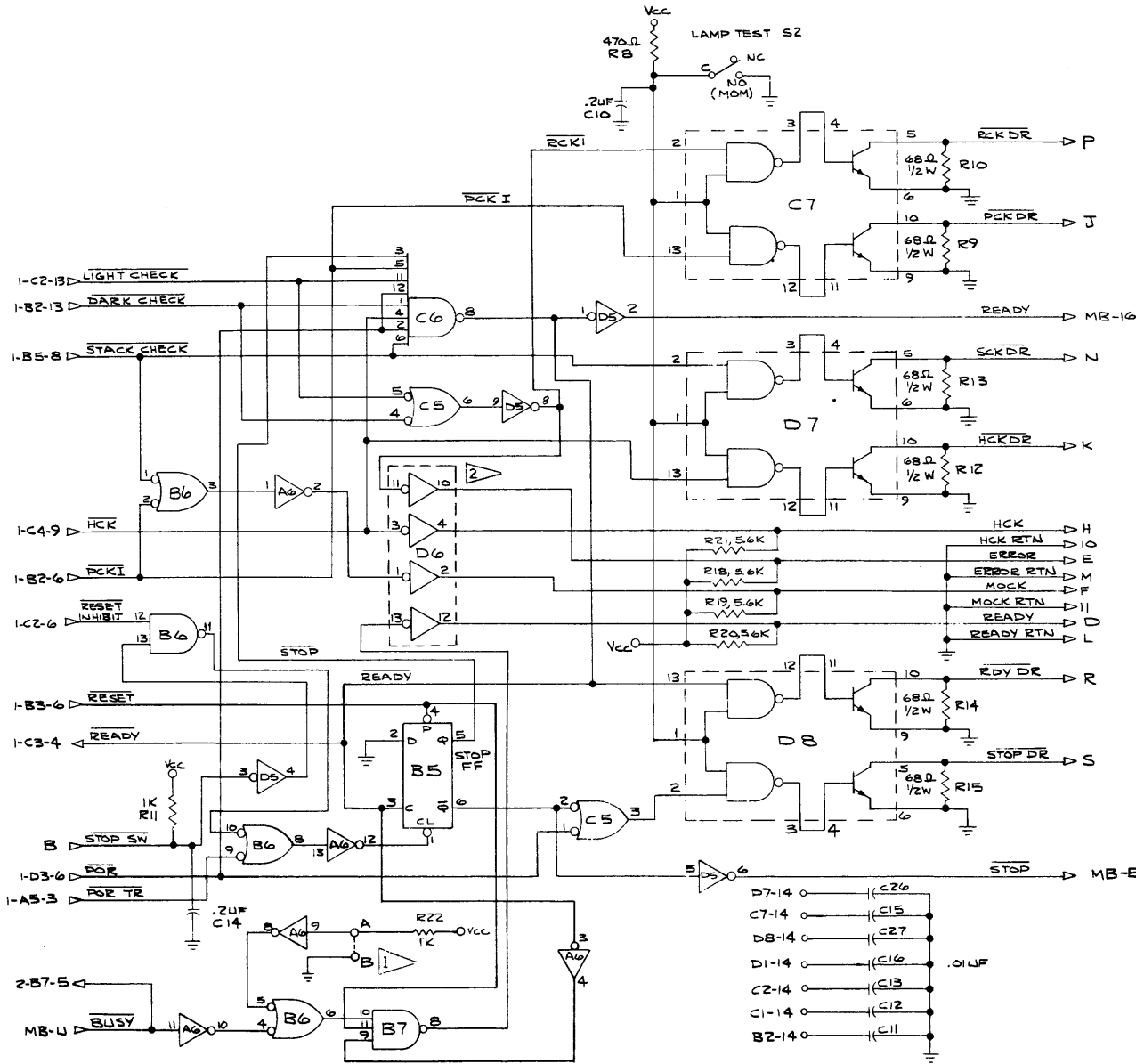


Figure 10-15. Schematic Diagram, Error Card
(Sheet 1 of 2)



1 OPTIONAL JUMPER
BUSY INHIBITS READY

2 OPTIONAL DRIVERS
TO MATCH GROUND TRUE
LOGIC INTERFACE

Figure 10-16. Schematic Diagram, Error Card
(Sheet 2 of 2)

10-17

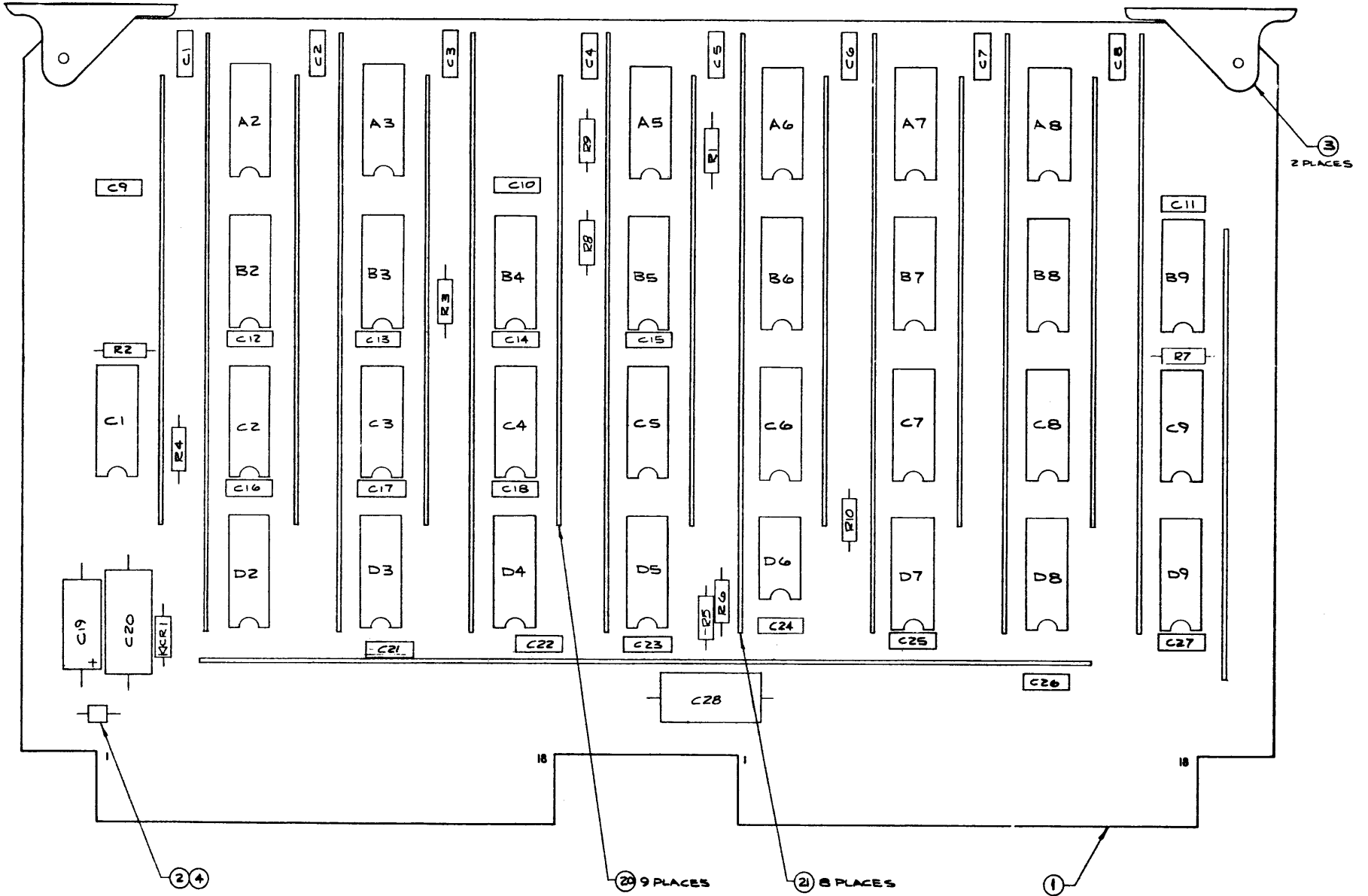


Figure 10-17. Assembly Diagram, Sync Card

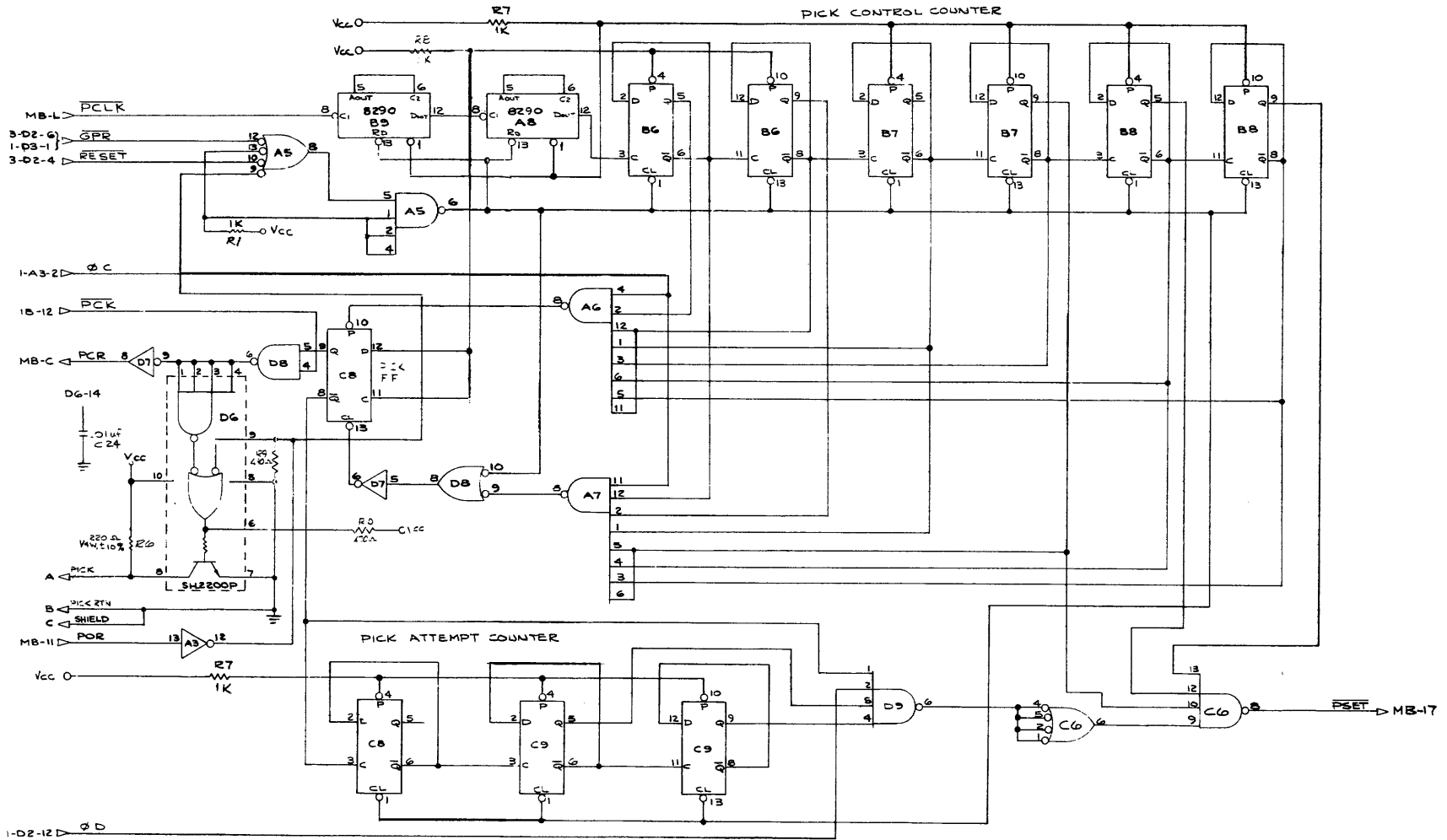


Figure 10-19. Schematic Diagram, Sync Card (Sheet 2 of 3)

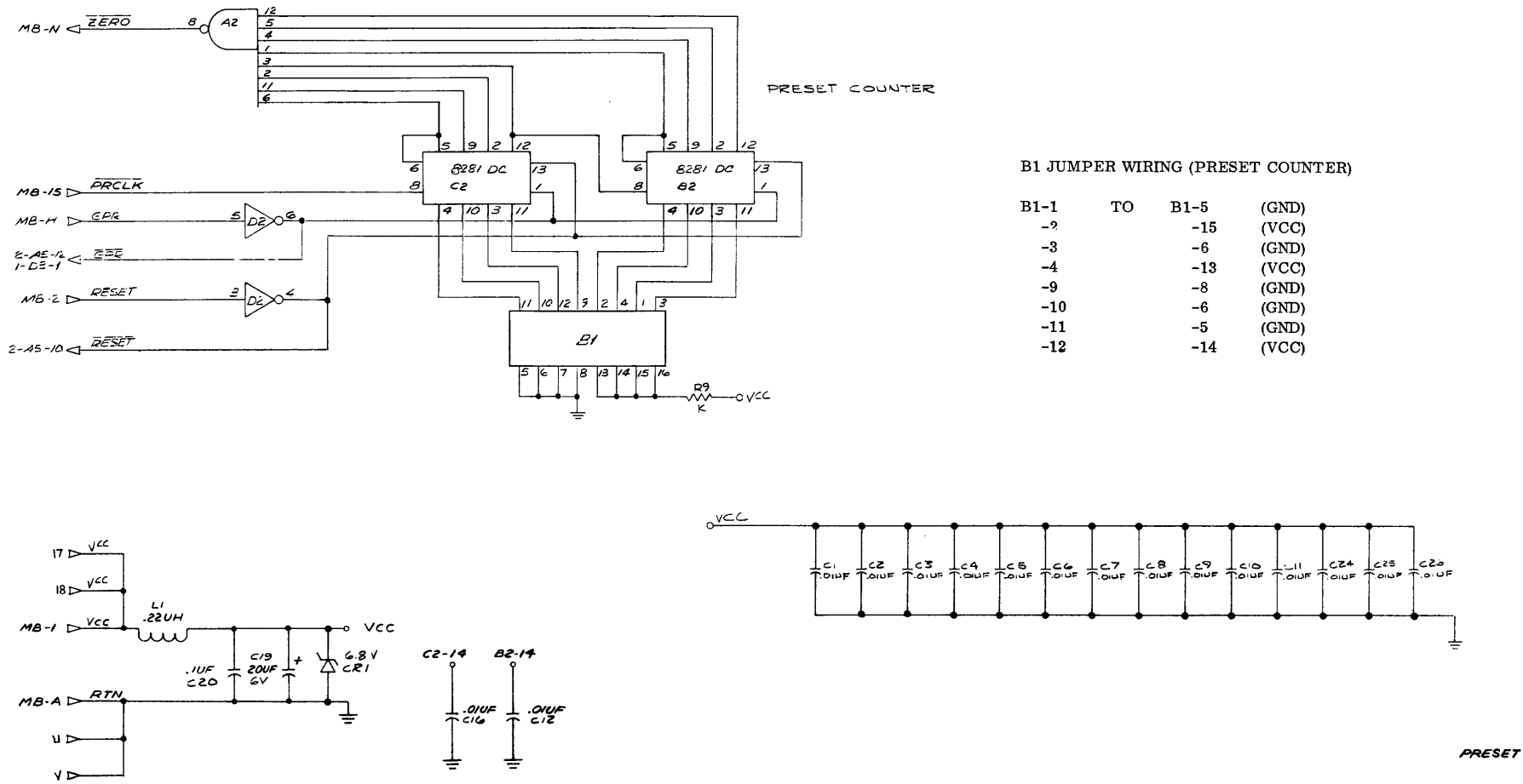


Figure 10-20. Schematic Diagram, Sync Card
(Sheet 3 of 3)

10-21

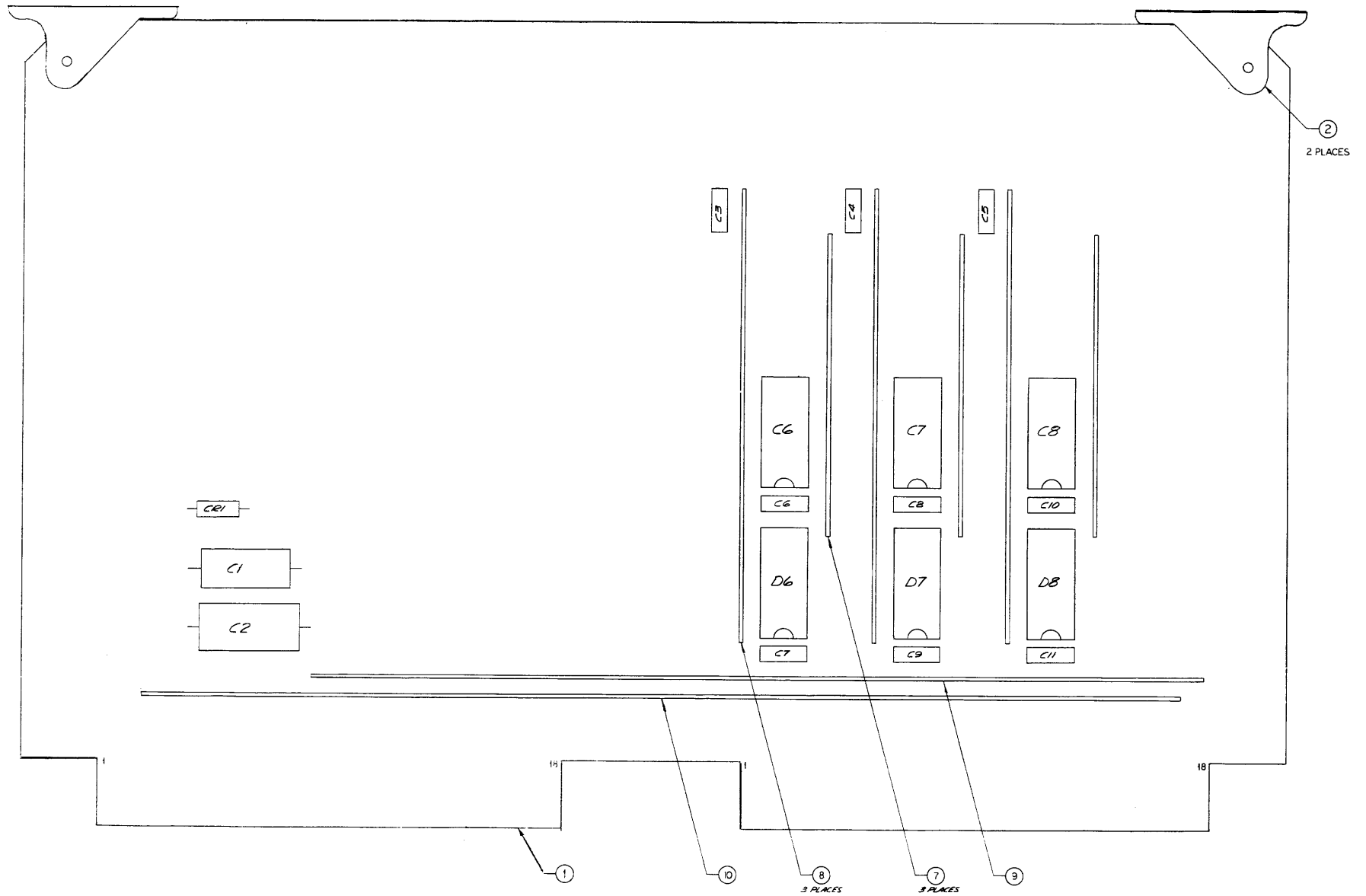


Figure 10-21. Assembly Diagram, Driver Card (Model 2893A)

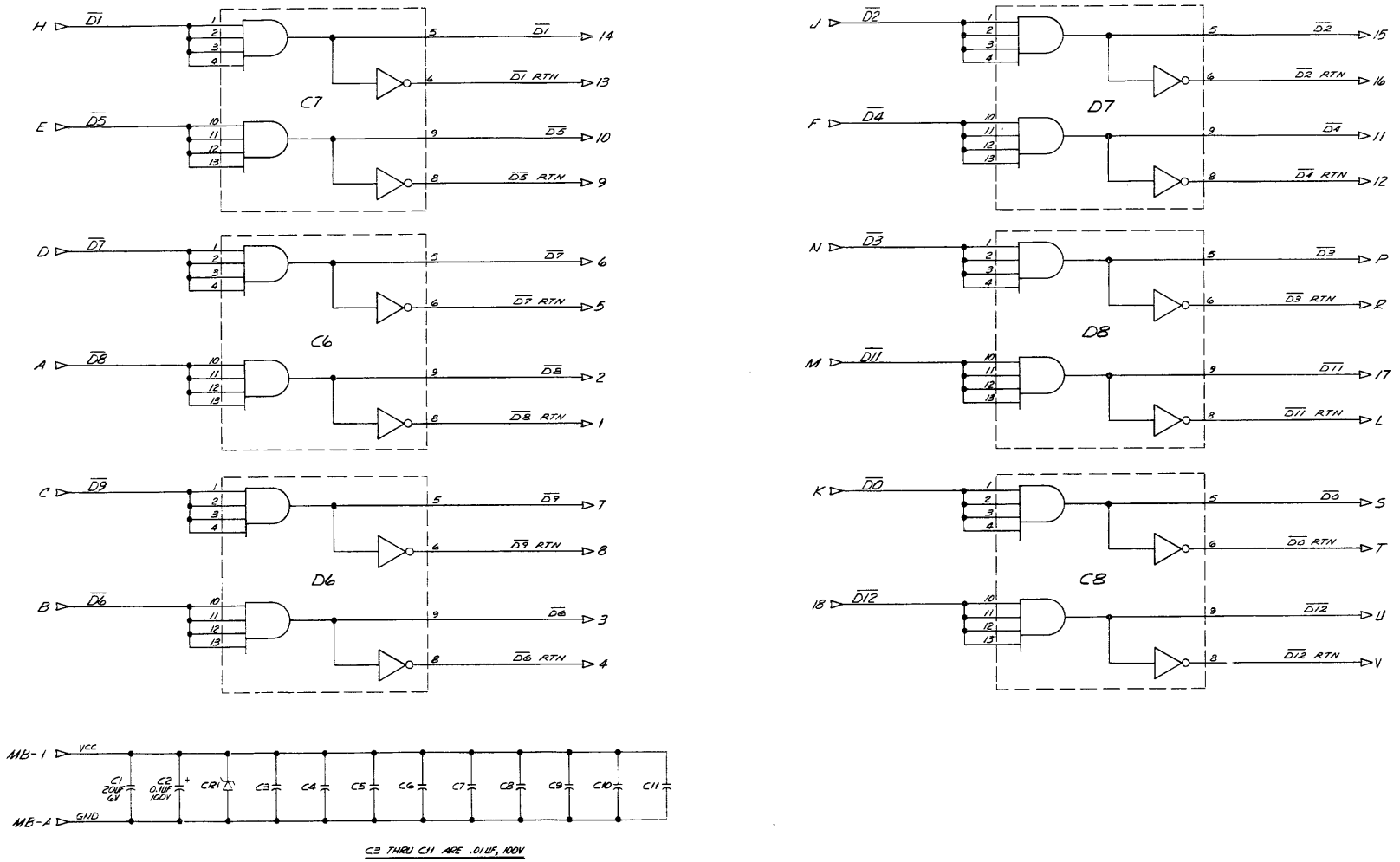


Figure 10-22. Schematic Diagram, Driver Card (Model 2893A)

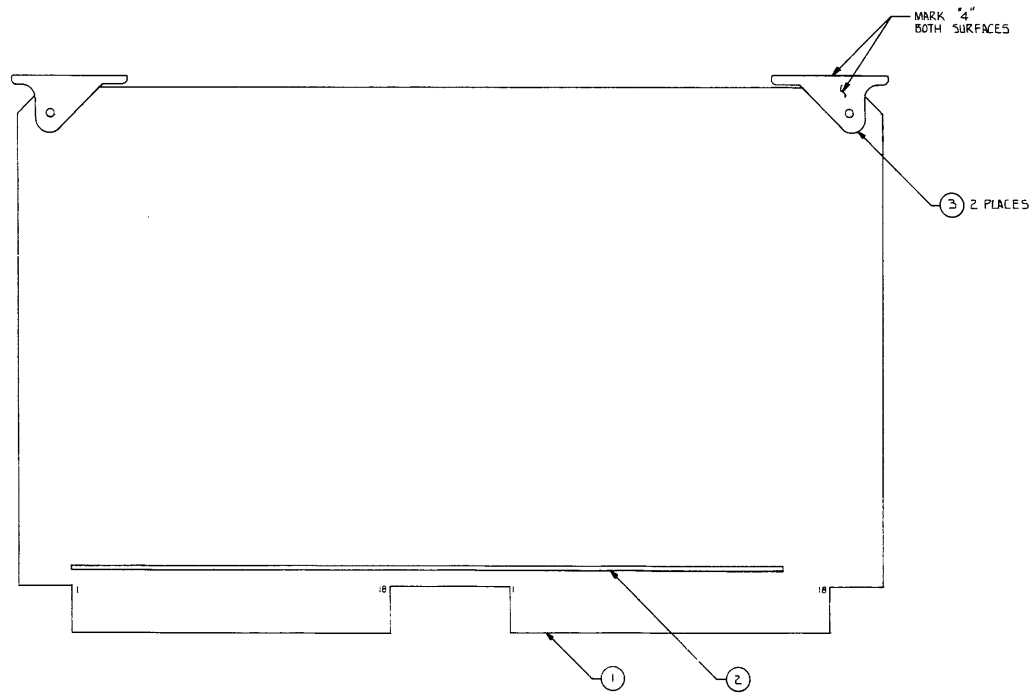
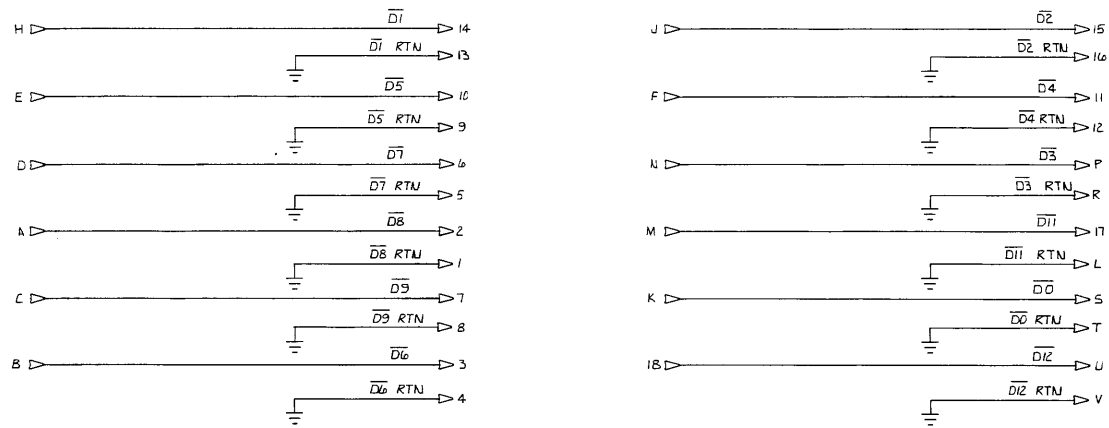


Figure 10-23. Assembly and Schematic Diagram, Driver Card (2892A)

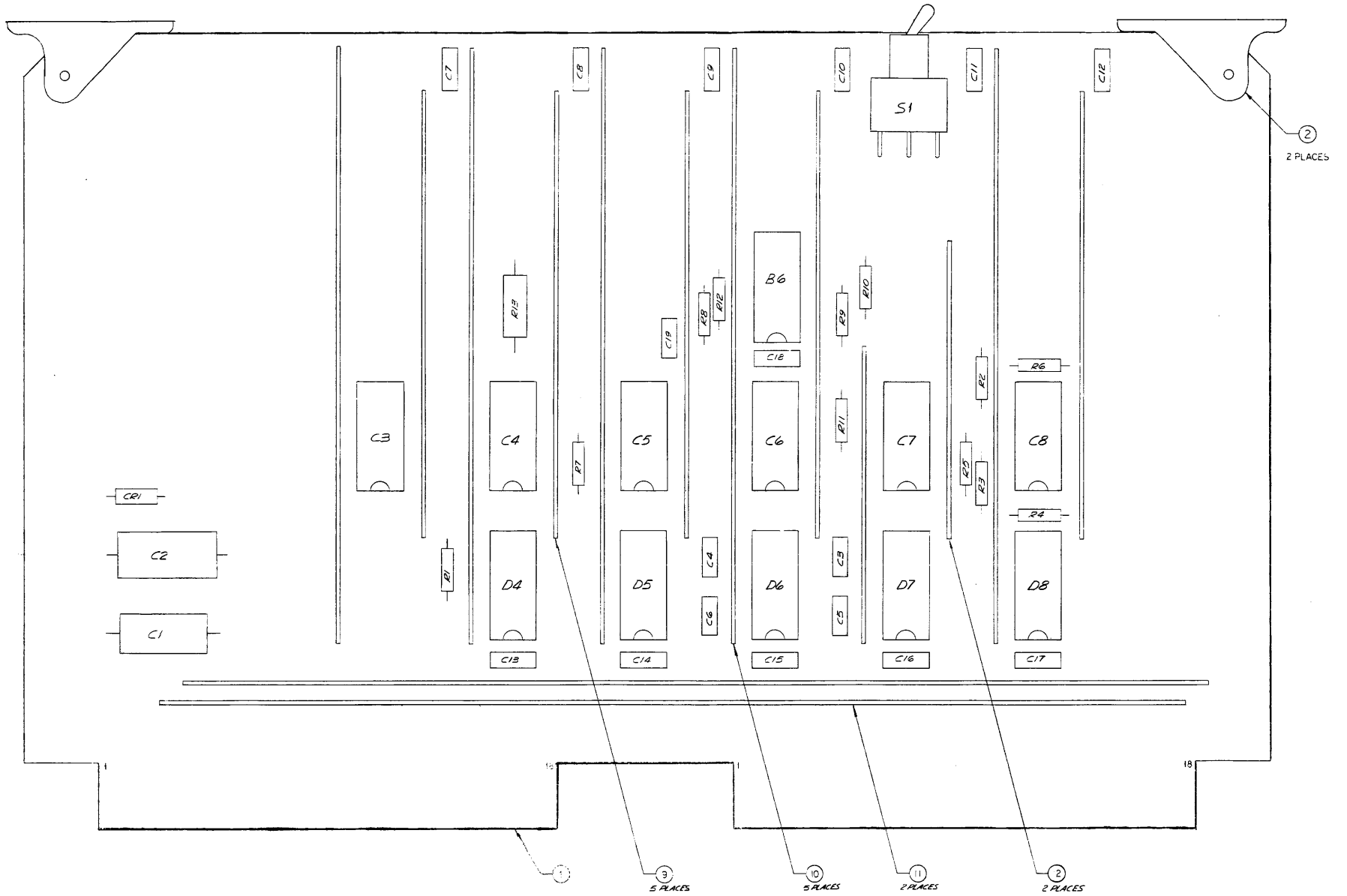


Figure 10-24. Assembly Diagram, Receiver Card (Model 2893A)

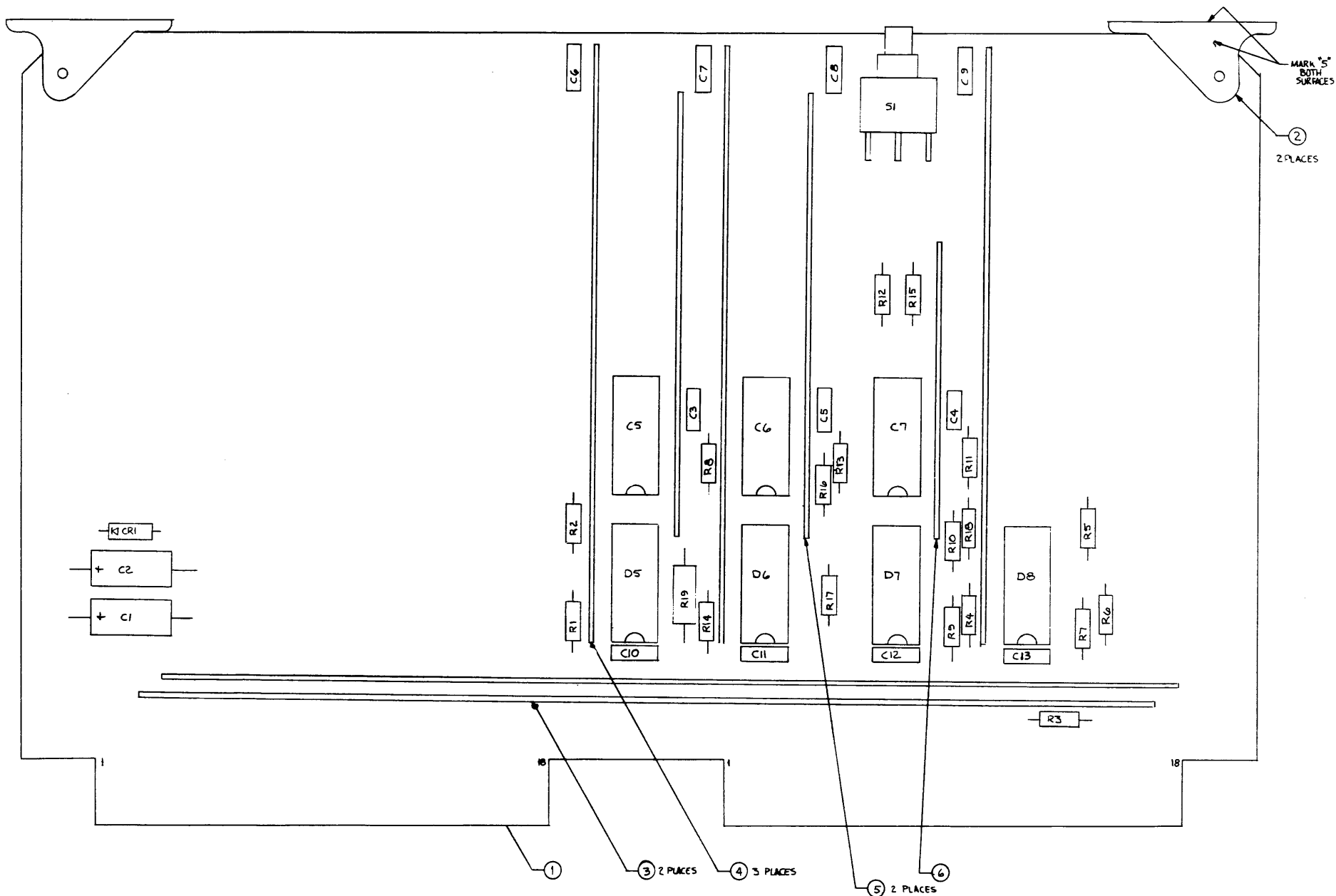


Figure 10-26. Assembly Diagram, Receiver Card (Model 2892A)

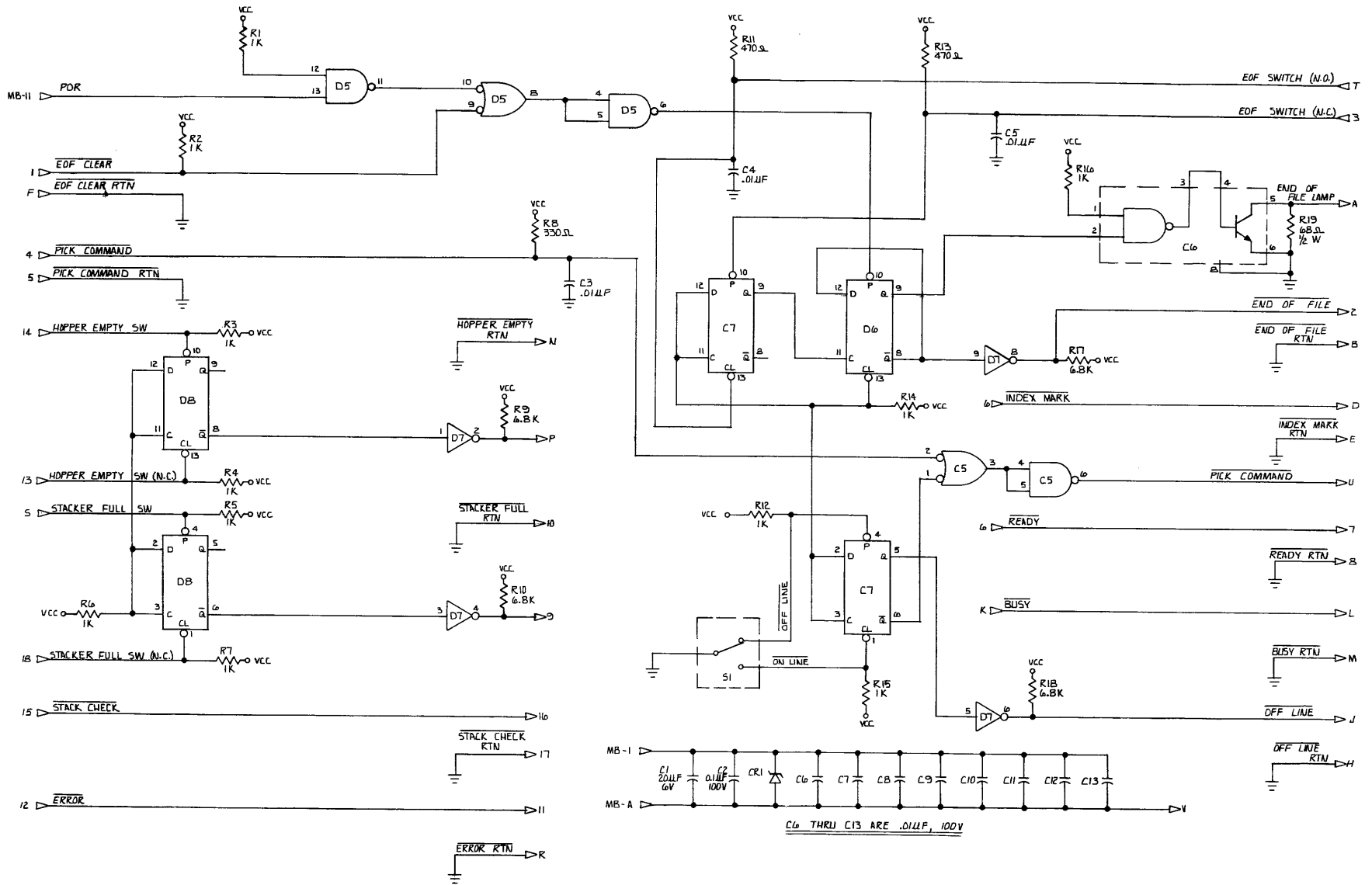


Figure 10-27. Schematic Diagram, Receiver Card (Model 2892A)

SECTION 11

SIGNAL MNEMONICS AND ABBREVIATIONS

MNEMONIC	DESCRIPTION	LOCATION	ORIGINATING SOURCE
Vcc	+5 volts	MB-1	5 volt power supply (Mother Board)
RTN	+5 volt return	MB-A	5 volt power supply (Mother Board)
ØA	Clock Phase A	MB-S	Clock Card
ØB	Clock Phase B	MB-F	Clock Card
ØC	Clock Phase C	MB-K	Clock Card
ØD	Clock Phase D	MB-9	Clock Card
81CR	81st Column Reset	MB-13	Clock Card
84CR	84th Column Reset	MB-D	Clock Card
BUSY	Busy Output	J8-1	Control Card
BUSY	Busy Signal	MB-U	Control Card
C1	Basic Clock	MB-14	Clock Card
CR	Column Reset	MB-B	Clock Card
CSDS	Column Storage Data Strobe	MB-18	Sync Card
D0	Data Row 0 Output	J8-K	Control Card
D1	Data Row 1 Output	J8-H	Control Card
D2	Data Row 2 Output	J8-J	Control Card
D3	Data Row 3 Output	J8-N	Control Card
D4	Data Row 4 Output	J8-F	Control Card
D5	Data Row 5 Output	J8-E	Control Card
D6	Data Row 6 Output	J8-B	Control Card
D7	Data Row 7 Output	J8-D	Control Card
D8	Data Row 8 Output	J8-A	Control Card
D9	Data Row 9 Output	J8-C	Control Card
D11	Data Row 11 Output	J8-M	Control Card
D12	Data Row 12 Output	J8-L	Control Card
DCKS	Dark Check Strobes	MB-8	Clock Card
DARK CHECK	Dark Check	B2-9	Error Card
EOF CLEAR	End of File Clear	J7-1	Receiver Card
EOF SWITCH (N. O.)	End of File Switch (Normally Open)	J7-T	Receiver Card
ERROR	Error Output	J4-E	Error Card
ERROR RTN	Error Output Return	J4-M	Error Card
GPR	Good Pick Reset	MB-H	Clock Card
HCK	Hopper Check Output	J4-H	Error Card
HCK	Input or Output Hopper Check	C4-9	Error Card
HCK DR	Hopper Check Lamp Driver	J4-K	Error Card
HCK RTN	Hopper Check Output Return	J4-10	Error Card
HECK	Hopper Empty Check	B4-8	Error Card

MNEMONIC	DESCRIPTION	LOCATION	ORIGINATING SOURCE
HOPPER EMPTY	Hopper Empty Switch	J4-5	Error Card
HOPPER EMPTY RTN	Hopper Empty Switch Return	J4-6	Error Card
STACKER FULL	Stacker Full Switch	J4-1	Error Card
STACKER FULL RTN	Stacker Full Switch Return	J4-A	Error Card
IM	Index Marks	J3-A	Clock Card
IM RTN	Return for Index Marks	J3-B	Clock Card
IMST	Index Mark Strobes	MB-T	Sync Card
LIGHT CHECK	Light Check	C2-9	Error Card
MOCK	Motion Check Output	J4-F	Error Card
MOCK RTN	Motion Check Output Return	J4-11	Error Card
OCR	Zero Column Reset	MB-5	Clock Card
ONE DARK	Read Station Any Dark	MB-6	Control Card
ONE LIGHT	Read Station Any Light	MB-3	Control Card
OSCLK	Offset Clock	MB-P	Clock Card
OSR	Offset Reset	MB-J	Clock Card
OSUCLK	Offset Up-Clock	MB-R	Clock Card
PCK	Pick Check	B2-5	Error Card
PCK DR	Pick Check Lamp Driver	J4-P	Error Card
PCKI	Pick Check Indicator	B2-2	Error Card
PCLK	Pick Clock	MB-L	Control Card
PCR	Pick Control Reset	MB-C	Sync Card
PICK	Pick Driver Output	J5-A	Sync Card
PICK RTN	Pick Driver Output Return	J5-B	Sync Card
PICK COMMAND	Pick Command Input	J8-2	Control Card
PICK COMMAND RTN	Pick Command Input Return	J8-3	Control Card
POR	Power On Reset	MB-11	Error Card
POR TR	Power On Reset Trigger	A5-12	Error Card
PRCLK	Preset Clock	MB-15	Clock Card
PSET	Pick Check Set	MB-17	Sync Card
RCK DR	Read Check Lamp Driver	J4-P	Error Card
RDY DR	Ready Lamp Driver	J4-R	Error Card
READY	Ready	MB-16	Error Card
READY	Ready Output	J4-D	Error Card
READY RTN	Ready Output Return	J4-L	Error Card
RESET	Gated Reset Switch	MB-2	Sync Card
RESET SW	Reset Switch Normally Open	J4-9	Error Card
RESET SW	Reset Switch Normally Closed	J4-7	Error 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

MNEMONIC	DESCRIPTION	LOCATION	ORIGINATING SOURCE
Row 6	Read Sensor Input Row 6	J8-S	Control Card
Row 7	Read Sensor Input Row 7	J8-T	Control Card
Row 8	Read Sensor Input Row 8	J8-U	Control Card
Row 9	Read Sensor Input Row 9	J8-V	Control Card
Row 11	Read Sensor Input Row 11	J8-14	Control Card
Row 12	Read Sensor Input Row 12	J8-13	Control Card
RTN	Data Drivers Return	J8-5	Control Card
SCK DR	Stack Check Lamp Driver	J4-N	Error Card
SHIELD	Shield for Index Marks	J3-C	Clock Card
SHIELD	Shield for PICK	J5-C	Sync Card
SHIELD	Shield for Timing Strobe	J3-R	Reluctance Pickup
SHUTDOWN STATUS	Mode Switch Input	S1-C	Error Card
STACK	Stack Sensor Input	J4-C	Error Card
STACK CHECK	Output Stacker Check	B5-8	Error Card
STACK Vcc	Stack Sensor +5 volts	J4-2	Error Card
ST ϕ B	Column Strobe Phase B	MB-4	Sync Card
ST ϕ C	Column Strobe Phase C	MB-V	Sync Card
ST ϕ D	Column Strobe Phase D	MB-7	Sync Card
STOP	Stop	MB-E	Error Card
STOP DR	Stop Lamp Driver	J4-S	Error Card
STOP SW	Stop Switch Input	J4-B	Error Card
TST	Timing Strobe	J3-T	Reluctance Pickup
TST RTN	Timing Strobe Return	J3-S	Reluctance Pickup
TST1	Timing Strobe One	D9-9	Clock Card
TST2	Timing Strobe Two	C8-9	Clock Card
TSTR	Timing Strobe Reset	MB-N	Clock Card
Vcc	+5V to Read Sensor Array	J8-12	Control Card
ZERO	Preset Decode	MB-N	Sync 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 BASE PLATE ASSEMBLY breakdown, for example, (Figure 12-9), under index #19, two capacitors are listed for the same index number.

19 00000202 . . CAPACITOR 17 μ f, 370 VAC (60 Hz Models)
 00000206 . . CAPACITOR 10 μ f, 365 VAC (50 Hz Models)

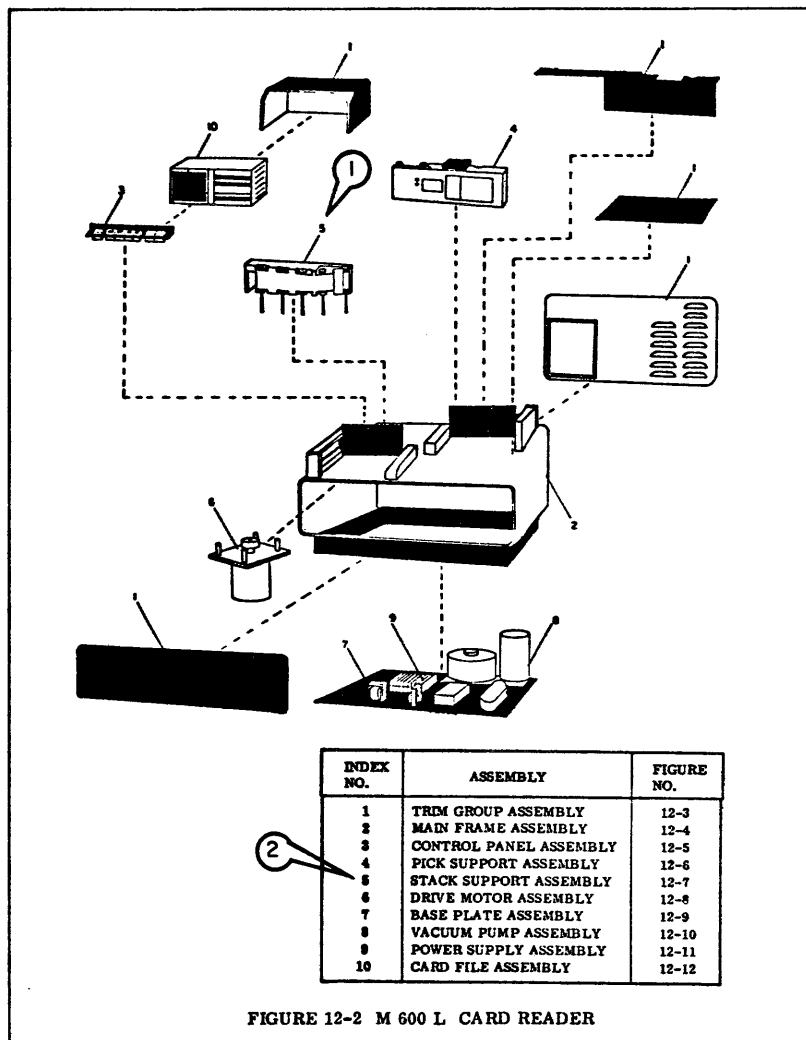
The Quick Reference List (Table 12-1) list the major assemblies and subassemblies and associated components of the card reader with the figure number in which they are listed and illustrated. In the parts list, Documentation parts or assemblies are identified by an eight-digit number. Parts or assemblies that Documentation purchases from suppliers and used "as is" are identified by manufacturer part number. The manufacturers' are identified by manufactureres codes in the description column of the parts list. Table 12-2 list the names and address 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 lists the individual components or parts.
- c. To simplify the updating of Section 12 of this manual, only ODD numbered pages are used.



- 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 accompanying parts list, use index number of part to find part number, description, and quantity per unit.

FIGURE 12-7 STACK SUPPORT ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY							VENDOR PART NO.	
			1	2	3	4	5	6	7		
	40021205	STACK SUPPORT ASSEMBLY								1	
-1	40048801	SUPPORT, Stack								1	
-8	30050301	READ ARRAY ASSEMBLY (Attaching Parts)								1	
-8	80060353	SCREW, Flat Head 4 - 40 x 1/4								8	
-4	10003002	FIRST STACK DRIVE ASSEMBLY SHAFT, Stack Drive								1	

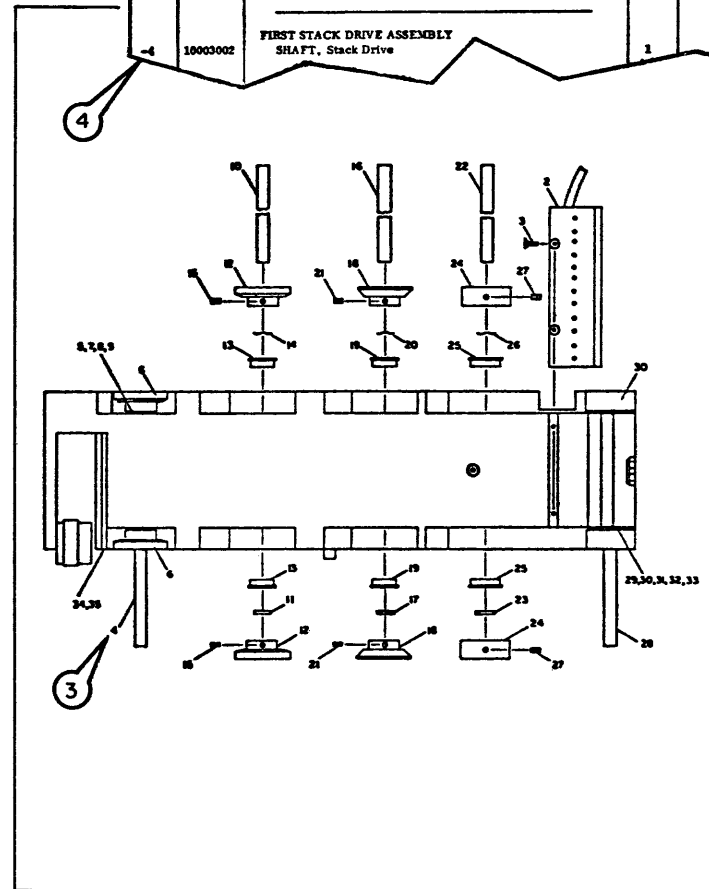


FIGURE 12-1 HOW TO USE PARTS BREAKDOWN WHEN PART NUMBER IS NOT KNOWN

TABLE 12-1 QUICK REFERENCE LIST

FIGURE	ASSEMBLY	PAGE
12-3	TRIM GROUP ASSEMBLY Fan Capacitor Cord, Power	12-11 12-11 a 12-11 b 12-11 b
12-4	MAIN FRAME ASSEMBLY Yoke, Stack Shaft Spring, Negator Drum, Spring Shaft, Spring Drum Shaft, Pick Follower Solenoid Assembly Timing Disc Assembly Pulleys, Stack Drive Assemblies Belts, Stack Drive Assemblies Magnetic Pickup Assembly Pick Follower Assembly Stack Bumper Plate Assembly Circuit Breakers Filter	12-13 12-13 d 12-13 d 12-13 d 12-13 d 12-13 d 12-13 d 12-13 d 12-13 e 12-13 e 12-13 e 12-13 e 12-13 f 12-13 f 12-13 g
12-5	CONTROL PANEL ASSEMBLY Bulbs	12-15 a 12-15 a
12-6	PICK SUPPORT ASSEMBLY Light Station Assembly Switch Assembly, Hopper Empty Sector Assembly Cap, Riffle Air Drive Roller, 2nd Pick Drive Assembly Stack Drive, 1st Pick Drive Assembly Drum, Spring Spring, Negator Shaft, Spring Drum Tube, Pick Vacuum	12-17 b 12-17 b 12-17 b 12-17 b 12-17 b 12-17 b 12-17 c 12-17 c 12-17 c 12-17 c 12-17 c 12-17 c

QUICK REFERENCE LIST (CONT'D)

FIGURE	ASSEMBLY	PAGE
12-7	STACK SUPPORT ASSEMBLY Read Array Assembly 1st, 2nd, 3rd, Stack Drive Assemblies 4th Stack Drive Assembly 5th Stack Drive Assembly Stack Photocell Assembly Drum, Spring Spring, Negator Shaft, Spring Drum Throat, Pick Switch Assembly, Stacker Full	12-19 b 12-19 b 12-19 b 12-19 b 12-19 c 12-19 c 12-19 c 12-19 c 12-19 c 12-19 c 12-19 c
12-8	DRIVE MOTOR ASSEMBLY Motor Sprocket, Timing Belt Connector	12-21 a 12-21 a 12-21 a 12-21 a
12-9	BASE PLATE ASSEMBLY Driver Assembly, Solenoid Capacitor, Vacuum Pump Motor Run Relay, Vacuum Pump and Drive Motor Capacitor, Logic Power Supply Transformer Assembly, Solenoid Driver Transformer Assembly, Logic Power Supply Rectifier, Diode Bridge Capacitor, Driver Motor Run Fuse, 1 amp Slo-Blo Junction, Terminal	12-23 a 12-23 a 12-23 a 12-23 a 12-23 b 12-23 b 12-23 b 12-23 b 12-23 b 12-23 b 12-23 c 12-23 c
12-10	VACUUM PUMP ASSEMBLY Motor (50 and 60 Hz) Blower Belt Pulley Adapter Assembly	12-25 a 12-25 a 12-25 a 12-25 a 12-25 a 12-25 a

QUICK REFERENCE LIST (CONT'D)

FIGURE	ASSEMBLY	PAGE
12-11	POWER SUPPLY ASSEMBLY PC Board Assembly	12-27 a 12-27 a
12-12	CARD FILE ASSEMBLY Connectors PC Card (Mother Board)	12-29 a 12-29 a 12-29 a
12-13	PC ASSEMBLY - CONTROL CARD	12-31 a
12-14	PC ASSEMBLY - SYNC CARD	12-33 a
12-15	PC ASSEMBLY - CLOCK CARD	12-35 a
12-16	PC ASSEMBLY - ERROR CARD	12-37 a
12-17	PC ASSEMBLY - DRIVER CARD (Model 2893A)	12-39 a
12-18	PC ASSEMBLY - RECEIVER CARD (Model 2893A)	12-41 a
12-19	PC ASSEMBLY - DRIVER CARD (Model 2892A)	12-43 a
12-20	PC ASSEMBLY - RECEIVER CARD (Model 2892A)	12-45 a

TABLE 12-2 LIST OF MANUFACTURERS

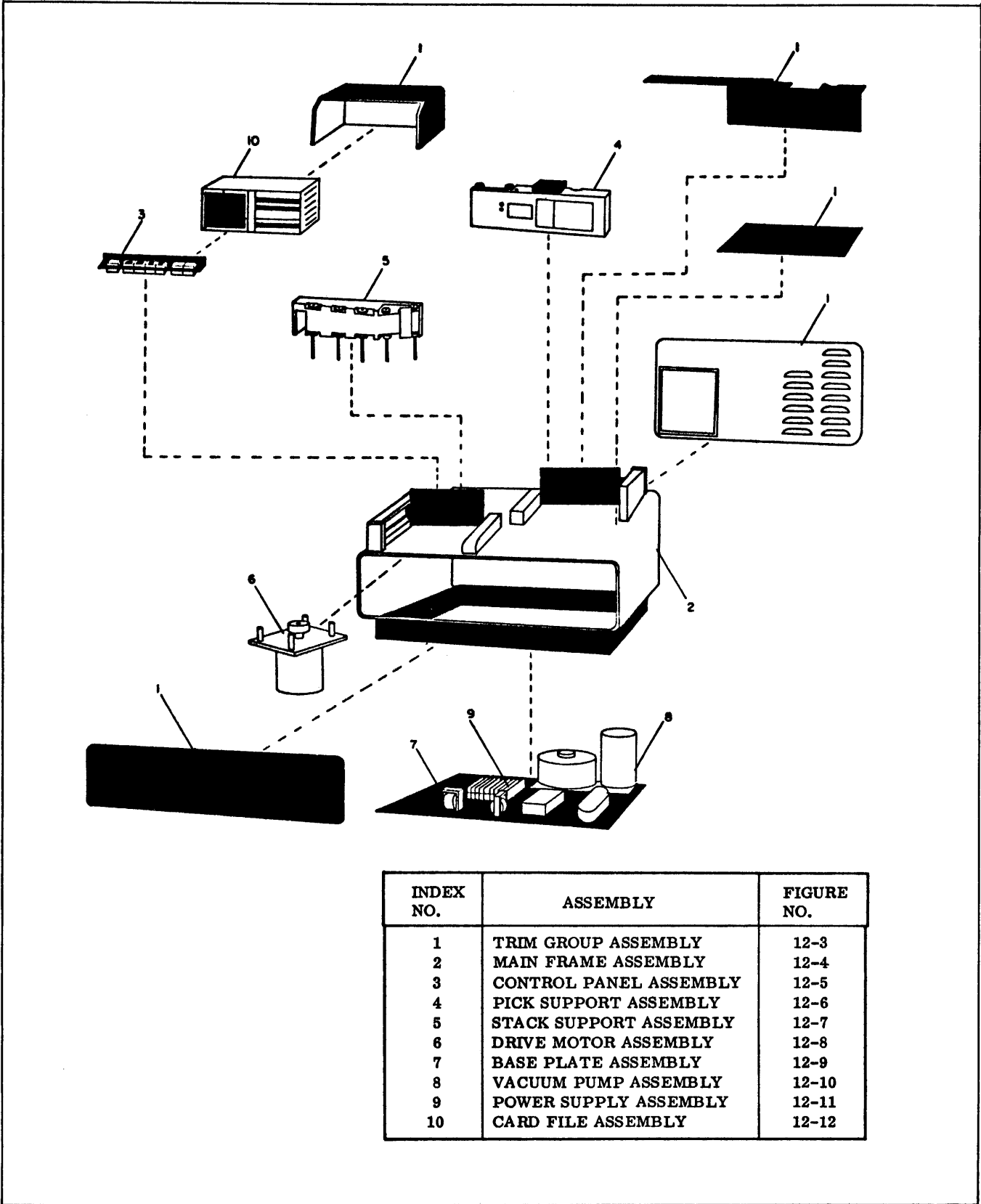
CODE	MANUFACTURER	CODE	MANUFACTURER
00779	Amp Inc. P. O. Box 3608 Harrisburg, Pa. 17105	07355	Airpax Electronics, Inc. Central Engineering Division 6601 N. W. 19th Street Ft. Lauderdale, Florida 33310
01121	Allen Bradley Company 1201 S. 2nd Street Milwaukee, Wisconsin 53204	07886	National Radio Co., Inc. Commercial Products Division 37 Washington Street Melrose, Mass. 02176
01295	Texas Instruments, Inc. Semiconductor Components Div. 13500 North Central Expressway Dallas, Texas 75231	08524	Deutch Fastener Corp. Municipal Airport Banning, Calif. 92220
01963	Cherry Electrical Products Corp. 3600 Sunset Avenue P. O. Box 718 Waukegan, Illinois 60085	08806	General Electric Company Miniature Lamp Department Nela Park Cleveland, Ohio 44112
02735	RCA Corporation Solid State Division Fostoria Road Findlay, Ohio 45840	09023	Cornell - Dubilier, Div. Fed. Pac. Elec. Co. 2562 Dalrymple Sanford, N. C. 27330
03597	General Electric Company Turbine Division of Apparatus Group Schenectady, N. Y.	09353	C & K Components, Inc. 103 Morse Street Watertown, Mass. 02172
04713	Motorola Semiconductor Products, Inc. 5005 East McDowell Road Phoenix, Arizona 85008	09922	Burndy Corporation Richards Avenue Norwalk, Conn. 06852
05245	Components Corporation 2855-57 North Halsted Street Chicago, Illinois 60657	10108	Hurst Manufacturing Corp. P. O. Box 326 Princeton, Indiana 47570
06229	Electrovert Inc. 86 Hartford Avenue Mt. Vernon, N. J.	12617	Hamlin Inc. Lake and Grove Streets Lake Mills, Wisconsin 53551
06383	Panduit Corporation 17301 Ridgeland Tinley Part, Illinois 60477	13103	Thermalloy Company 8717 Diplomacy Row Dallas, Texas 75247
07108	R. & J. Dick Co., Inc. 912 E. 5th Street Muscatine, Iowa 52761	14927	Kubar, Inc. 21 Erie Cambridge, Mass 02139
07263	Fairchild Semiconductor A division of Fairchild Camera and Instrument Corporation 464 Ellis Street Mountain View, Calif. 94040	18324	Signetics Corp. 811 East Arques Avenue Sunnyvale, Calif. 94086

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

CODE	MANUFACTURER	CODE	MANUFACTURER
18677	Scanbe Manufacturing Corp. 1161 Monterey Pass Road Monterey Park, Calif. 91754	71590	Centralab Elect. 5757 N. Greenbay Avenue Milwaukee, Wisc. 53201
19070	Eastern Air Devices 385 Central Avenue Dover, New Hampshire 03820	71984	Dow Corning Corp. South Saginaw Road Midland, Mich. 48641
19701	Electra/Midland Corp. P. O. Box 760 Mineral Wells, Texas 76067	72619	Dialight Corp. 60 Stewart Avenue Brooklyn, N. Y. 11237
20772	Spectronics Inc. 541 Sterling Drive Richardson, Texas 75080	74364	Eastman Chem. Prod, Inc. Eastman Road Kingsport, Tenn. 37662
23936	Pamotor Inc. 770 Airport Boulevard Burlingame, Calif. 94010	74545	Hubbell Harvey, Inc. State Street and Bostwick Avenue Bridgeport, Conn. 06602
24161	Gates Rubber 2301 N. Dale Mabry P. O. Box 15454 Tampa, Florida 33614	75511	Lamb Electric/Ametek Kent, Ohio 44240
24202	Computer Products 1400 N. W. 70th Street P. O. Box 23849 Ft. Lauderdale, Florida 33307	75915	Littlefuse, Inc. 800 E. Northwest Highway Des Plaines, Illinois 60016
29440	Winfred Berg 499 Ocean Avenue East Rockaway, L. I., N. Y. 11518	76005	Lord Manufacturing Company Eric, Pennsylvania 16512
33062	Ferronics Inc. 66 North Main Street Fairport, N. Y. 14450	76599	The Murray Corporation Industrial Park Cockeysville, Maryland 21030
46384	PEM (Penn Eng. Mfg. Co.) P. O. Box 311 Doylestown, Pa. 18901	79136	Waldes Kohinoor, Inc. 47 - 16 Austel Place Long Island City, N. Y. 11101
56289	Sprague Electric Company North Adams, Mass. 01247	80103	Lambda Electronics Corp. 515 Broad Hollow Road Huntington, N. Y. 11749
70276	Allen Mfg. Co. P. O. Box 570 Hartford, Conn. 06101	80183	Sprague Products Company North Adams, Mass.
70854	Barden/NMB P. O. Box 231 Danbury, Conn. 06810	80294	Bourns, Inc. 1200 Columbia Avenue Riverside, Calif. 92507
		80382	Airco, Inc. 150 E. 42nd Street New York, N. Y. 10017

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

CODE	MANUFACTURER	CODE	MANUFACTURER
80545	Ametek Hunter Spring 1 Spring Avenue Hatfield, Pa. 19440		Belden Corporation 415 S. Kilpatrick Avenue Chicago, Illinois
81541	Airpax Electronics, Inc. Woods Road Cambridge, Md. 21613		Electro Space Fabricators, Inc. 101 - 125 Centre Avenue Topton, Penn. 19562
83014	The Hartwell Corporation 9035 Venice Blvd. Los Angeles, Calif. 90034		Herco - Hecht Rubber Company 482 - 484 Riverside Avenue Jacksonville, Florida 32202
83259	Parker - Seal Co. 10567 Jefferson Blvd. Culver City, Calif. 90231		IMC Magnetics Corp. 6058 Walker Avenue Maywood, Calif. 90270
83330	Smith Herman H., Inc. 812 Snediker Avenue Brooklyn, N. Y. 11207		Motronics Corp. Riverside Industrial Park Little Falls, N. Y. 13365
87034	Marco - Oak Industries 2231 N. State Road 7 Lauderhill, Fla. 33311		Stancor - Essex Int'l./Stancor Division 3501 West Addison Street Chicago, Ill. 60618
88132	Goodyear Rubber Company 25 Hamlin Middletown, Conn. 06457		Thompson Industries, Inc. Manhasset, N. Y. 11030
91637	Dale Electronics, Inc. P. O. Box 609 Columbus, Neb. 68601		
91662	Elco Corporation Maryland Road and Computer Avenue Willow Grove, Pa. 19090		
92194	Alpha Wire Corporation 711 Lidgerwood Avenue Elizabeth, N. J. 07207		
94144	Raytheon Company Components Div. Industrial Components Operation Quincy, Mass.		
95987	Weckesser 4444 West Irving Park Road Chicago, Illinois 60641		
	Electro - Space Fabricators, Inc. Centre Avenue Topton, Pa. 19562		



INDEX NO.	ASSEMBLY	FIGURE 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	STACK SUPPORT ASSEMBLY	12-7
6	DRIVE MOTOR ASSEMBLY	12-8
7	BASE PLATE ASSEMBLY	12-9
8	VACUUM PUMP ASSEMBLY	12-10
9	POWER SUPPLY ASSEMBLY	12-11
10	CARD FILE ASSEMBLY	12-12

FIGURE 12-2 M 600 L CARD READER

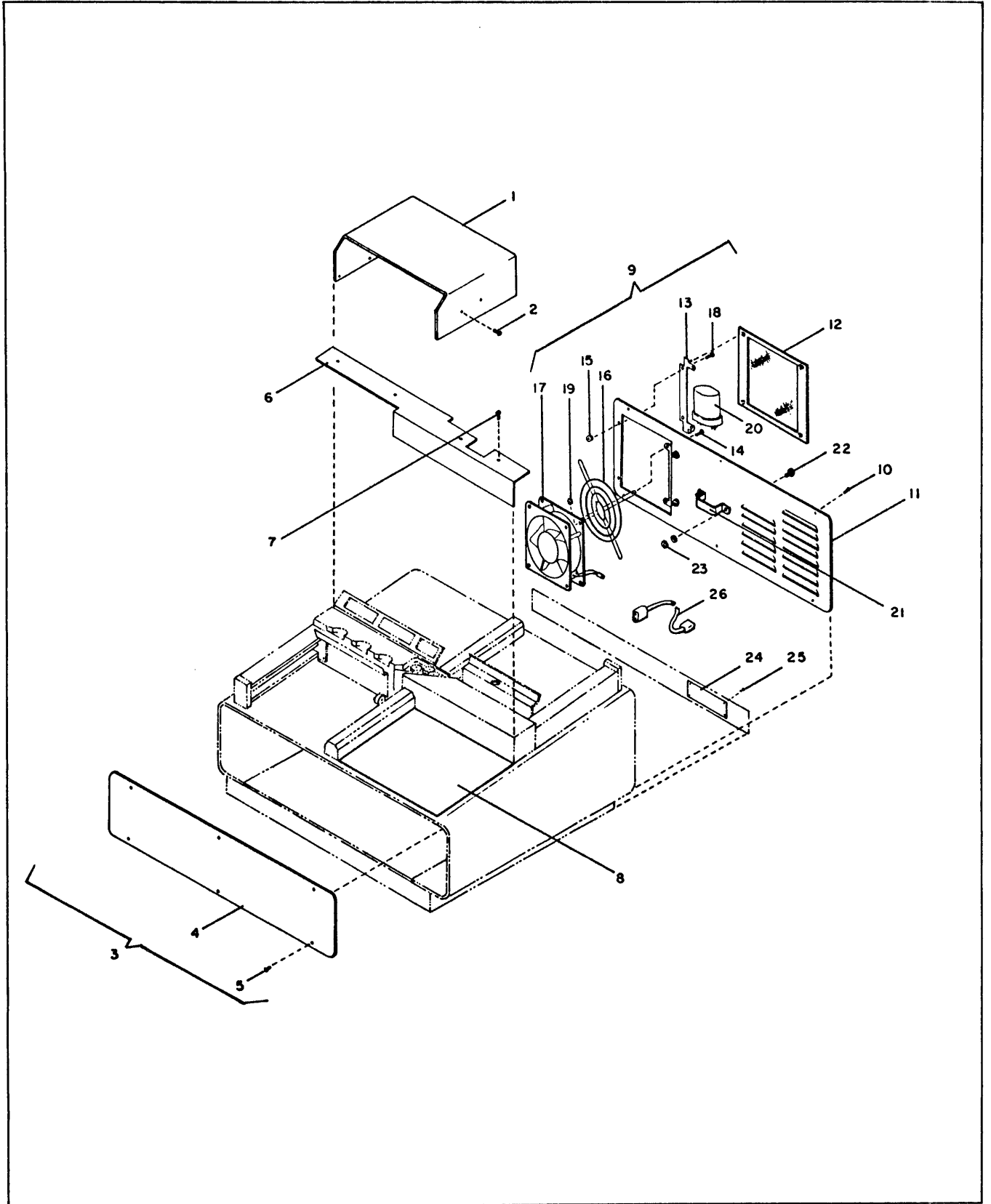


FIGURE 12-3 TRIM GROUP ASSEMBLY

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
-1	40049402	TRIM GROUP ASSEMBLY - 115 VAC, 60 Hertz Model	1			
	40049405	TRIM GROUP ASSEMBLY - 230 VAC, 50 Hertz Model				
	30031602	. HOOD, Control Panel (Attaching Parts)				
-2	00000343	. . SCREW, Machine, Button Head 6 - 32 x 3/8	4			
-3	40045502	. COVER ASSEMBLY, Front (Modified)	1			
-4	40045591	. . COVER, Front (Attaching Parts)	1			
-5	00000343	. . . SCREW, Machine, Button Head 6 - 32 x 3/8	6			
-6	40031501	. COVER, Track (Attaching Parts)	1			
-7	00000343	. . SCREW, Machine, Button Head 6 - 32 x 3/8	4			
-8	30005801	. PLATE, Cover, Top	1			
-9	40048601	. COVER ASSEMBLY, Rear - 115 VAC, 60 Hertz Model	1			
	40048602	. COVER ASSEMBLY, Rear - 230 VAC, 50 Hertz Model (Attaching Parts)				
-10	00000343	. . SCREW, Machine, Button Head 6 - 32 x 3/8	6			
-11	40045701	. . PANEL, Rear - 115 VAC, 50/60 Hertz	1			
	40045702	. . PANEL, Rear - 230 VAC, 60 Hertz	1			
-12	00000323	. . SCREEN, Fan (23936)	1	5503		
-13	00000324	. . MOUNTING BRACKETS, Fan (Pair) (23936) (Attaching Parts)	1	5501		
-14	00000375	. . . SCREW, Pan Head 6 - 32 x 1/4	4			
-15	00000301	. . . NUT, Hex 6 - 32	4			
-16	00000473	. . GUARD, Finger, Metal, Fan (IMC)	1	65-175		
-17	00000325	. . FAN - 115 VAC, 50/60 Hertz (23936) W/INTEGRAL COMPONENTS	1	4600		
	00000035	CONTACT, Pin (00779)	2	60618-1		
	00000449	HOUSING, Pin (00779)	1	1-480319-0		
	00000127	TUBING, Heatshrink 1/8 DIA. x 1/2 (92194)	2	FIT-105		
	00000164	WIRE, Elec. AWG 20 TWPR BLK-WHT 3"	1	1854/19		
	00000059	MOUNT, Cable Tie (06383)	1	TAIS8		
	00000058	TIE, Cable (06383)	1	SSTIM		
	20098301	. . FAN ASSEMBLY - 230 VAC, 50 Hertz W/INTEGRAL COMPONENTS	1			
	00000035	CONTACT, Pin (00779)	2	60618-1		
	00000449	HOUSING, Pin (00779)	1	1-480319-0		
	00000087	TUBING, Heatshrink 3/32 x 1" (92194)	1	FIT-105		
	00000530	RECEPTACLE, Faston (250) (00779)	3	61370-1		
	00000452	HOUSING, Receptacle (00779)	3	480416-0		
	00000114	SCREW, Button Head 6 - 32 x 1/4	6			
	00000301	NUT, Hex 6 - 32	8			
	00000302	SCREW, Pan Head 6 - 32 x 1/2	4			

TRIM GROUP ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	00000295								4	
	00000059								1	TAIS8
	00000058								1	SSTIM
	00000156								1	1858/19
	00000155									(Attaching Parts)
-18	00000302	.	.	.					4	SCREW, Pan Head 6 - 32 x 1/2
-19	00000301	.	.	.					4	NUT, Hex 6 - 32
<hr/>										
-20	00000511	.	.						1	CAPACITOR, 2.0 μ f 270 VAC Nom. (230 VAC, 50 Hz) (03597)
-21	00000289	.	.						1	BRACKET, Cap. Mtg. (03597) (Attaching Parts)
-22	00000375	.	.	.					2	SCREW, Pan Head 6 - 32 x 1/4
-23	00000301	.	.	.					2	NUT, Hex 6 - 32
<hr/>										
-24	20028101	.							1	TAG, Information - 115 VAC, 60 Hertz
	20028102	.							1	TAG, Information - 230 VAC, 50 Hertz (Attaching Parts)
-25	00000488	.	.						4	PIN, Drive
<hr/>										
-26	00000456	.							1	CORD, Power (Belden)
-27	00000555	.							A/R	ADHESIVE, Pliobond

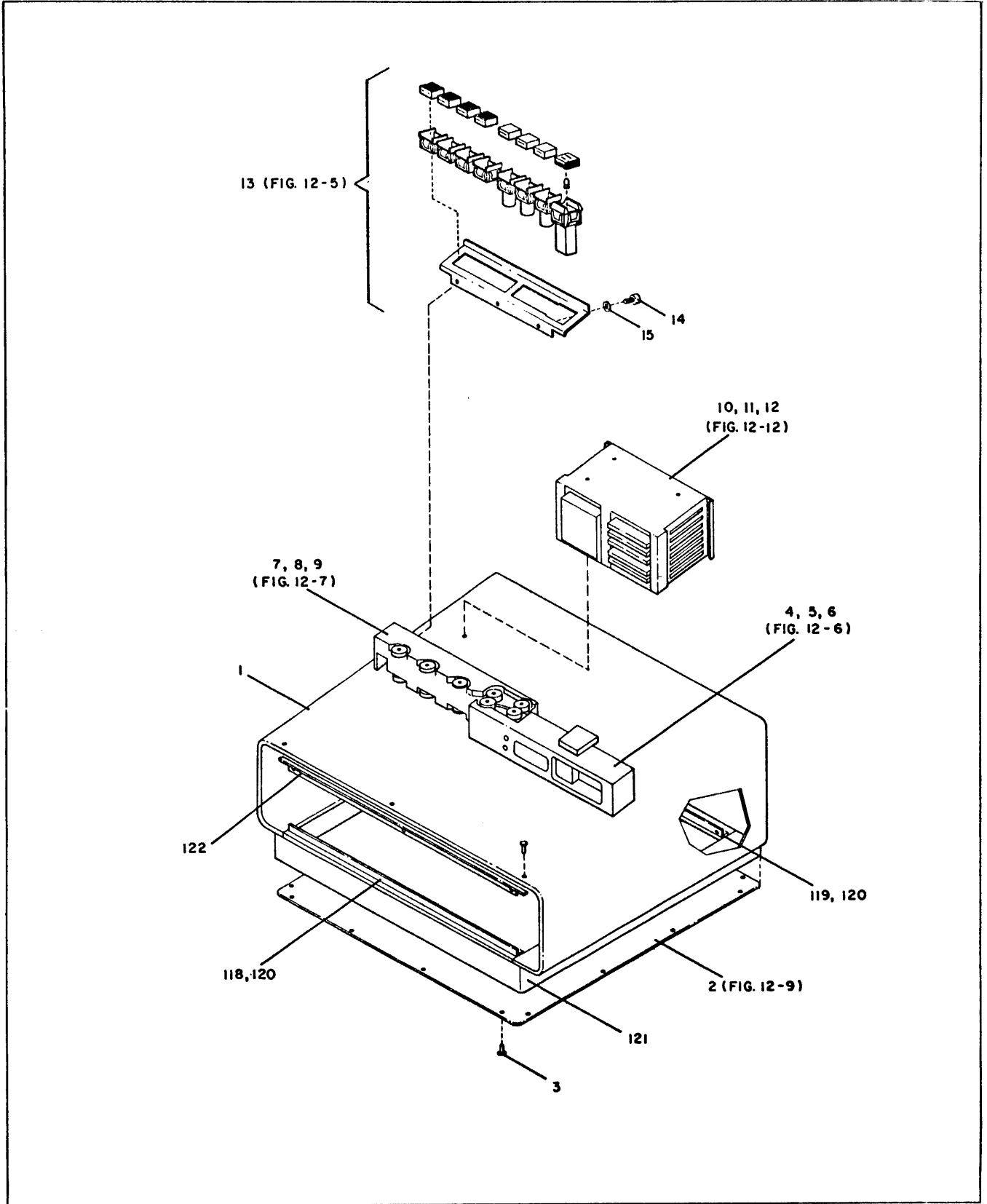


FIGURE 12-4 MAIN FRAME ASSEMBLY (sheet 1 of 3)

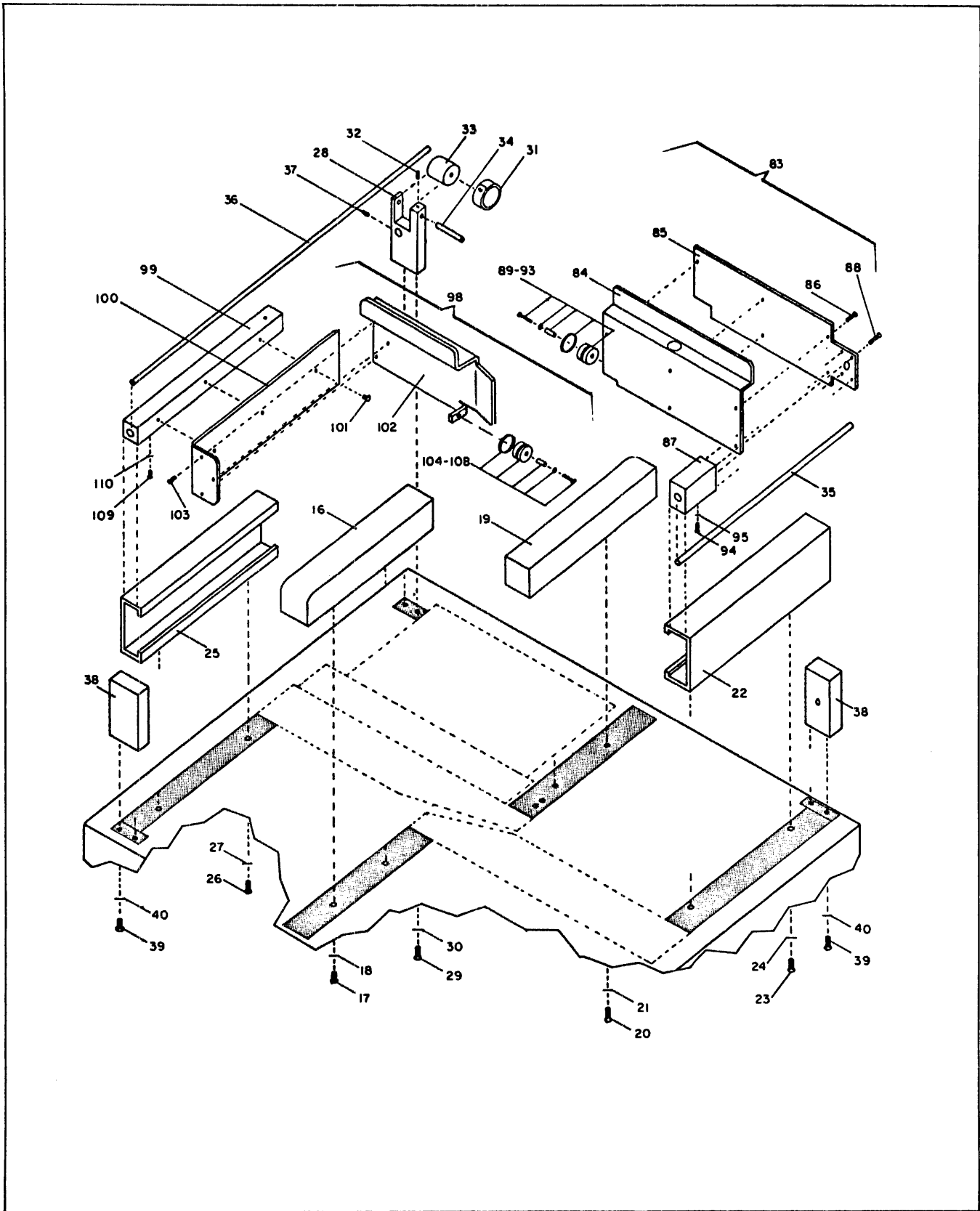


FIGURE 12-4 MAIN FRAME ASSEMBLY (sheet 2 of 3)

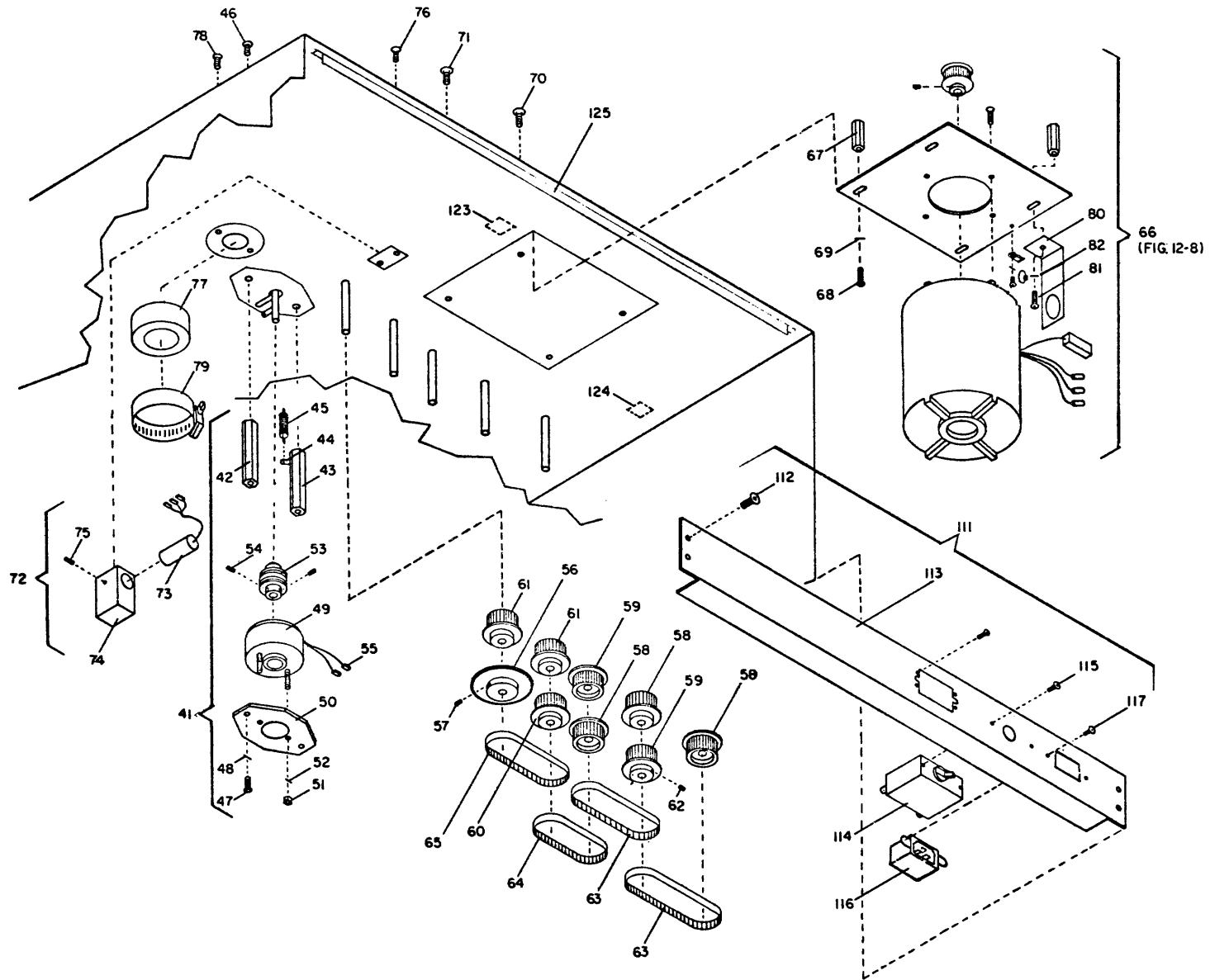


FIGURE 12-4 MAIN FRAME ASSEMBLY (sheet 3 of 3)

FIGURE 12-4 MAIN FRAME ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40048903	MAIN FRAME ASSEMBLY - 60 Hertz Models, 115 VAC								
	40048905	MAIN FRAME ASSEMBLY - 50 Hertz Models, 230 VAC								
-1	40045001	. MAIN FRAME							1	
-2	40075101	. BASE PLATE ASSEMBLY - 60 Hertz Models (Fig. 12-9)							1	
	40075113	. BASE PLATE ASSEMBLY - 50 Hertz Models, 115 VAC (Figure 12-9)							1	
	40075103	. BASE PLATE ASSEMBLY - 50 Hertz Models, 230 VAC (Figure 12-9) (Attaching Parts)								
-3	00000382	. . SCREW, Machine, Pan Head 8 - 32 x 3/8							18	
<hr/>										
-4	40048201	. PICK SUPPORT ASSEMBLY (Fig. 12-6) (Attaching Parts)							1	
-5	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							6	
-6	00000294	. . WASHER, Flat No. 8							6	
<hr/>										
-7	40021205	. STACK SUPPORT ASSEMBLY (Fig. 12-7) (Attaching Parts)							1	
-8	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							8	
-9	00000294	. . WASHER, Flat No. 8							8	
<hr/>										
-10	40061216	. CARD FILE ASSEMBLY (Fig. 12-12) (Attaching Parts)							1	
-11	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 3/8							3	
-12	00000294	. . WASHER, Flat No. 8							3	
<hr/>										
-13	30038301	. CONTROL PANEL ASSEMBLY (Fig. 12-5) (Attaching Parts)							1	
-14	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 3/8							3	
-15	00000294	. . WASHER, Flat No. 8							3	
<hr/>										
-16	20000101	. GUIDE, Card Edge, Stack (Attaching Parts)							1	
-17	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							2	
-18	00000294	. . WASHER, Flat No. 8							2	
-19	20000102	. GUIDE, Card Edge, Pick (Attaching Parts)							1	
-20	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							2	
-21	00000294	. . WASHER, Flat No. 8							2	
-22	30046502	. COVER, Pick Slide (Attaching Parts)							1	
-23	00000395	. . SCREW, Machine, Socket Head 8 - 32 x 3/8							2	
-24	00000294	. . WASHER, Flat No. 8							2	
<hr/>										
-25	30049201	. COVER, Stack Slide (Attaching Parts)							1	
-26	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							2	

MAIN FRAME ASSEMBLY (CONT'D)

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-27	00000294	. . WASHER, Flat No. 8							2	
-28	20122801	. YOKE, Stack Shaft (Attaching Parts)							1	
-29	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							2	
-30	00000294	. . WASHER, Flat No. 8							2	
-31	00000306	. SPRING, Negator (80545)							1	SL6F24
-32	00000297	. . SETSCREW, 8 - 32 x 3/16							1	
-33	20012703	. DRUM, Spring							1	
-34	20047601	. SHAFT, Spring Drum							1	
-35	20000503	. SHAFT, Pick Follower							1	
-36	20000502	. SHAFT, Stack Follower (Attaching Parts)							1	
-37	00000297	. . SETSCREW, 8 - 32 x 3/16							1	
-38	20000201	. SUPPORT, Follower Shaft (Attaching Parts)							2	
-39	00000396	. . SCREW, Machine, Socket Head 8 - 32 x 5/8							2	
-40	00000294	. . WASHER, Flat No. 8							2	
-41	20022501	. SOLENOID ASSEMBLY (Attaching Parts)							1	
-42	10002002	. . STANDOFF, Plain							1	
-43	10002003	. . STANDOFF, With Arm Stud Hole							1	
-44	00000439	. . PIN GROOVED TYPE							1	
-45	00000285	. . SPRING, Solenoid (84830) (Attaching Parts)							1	LE026C2MW
-46	00000358	. . . SCREW, Machine, Flat Head 8 - 32 x 3/8							2	
-47	00000396	. . . SCREW, Machine, Flat Head 8 - 32 x 5/8							2	
-48	00000294	. . . WASHER, Flat No. 8							2	
-49	20010601	. . SOLENOID							1	
-50	20001201	. . MOUNTING PLATE (Attaching Parts)							1	
-51	00000299	. . . NUT, Plain, Hex 8 - 32							2	
-52	00000269	. . . WASHER, Lock, int. tooth No. 8							2	
-53	10010501	. . COUPLING (Attaching Parts)							1	
-54	00000566	. . . SETSCREW, Knurled Cup Point 4 - 40 x 3/16							4	
-55	00000270	. . CONNECTOR, Pin (00779)							2	60598-5
-56	20022301	. TIMING DISC ASSEMBLY (Attaching Parts)							1	
-57	00000297	. . SETSCREW, 8/32 x 3/16							1	

MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR
				PART NO.
-58	00000274	. PULLEY, First, Second (Top), and Third (Bottom) Stack Drive Assemblies (07108)	3	15XL037
-59	20080404	. PULLEY, Second (Bottom), and Third (Top) Stack Drive Assemblies (07108)	2	
-60	00000273	. PULLEY, Fourth (Bottom) Stack Drive Assemblies (07108)	1	14XL037
-61	20127003	. PULLEY, Timing (Fourth (Top) and Fifth Stack Drive Assemblies (07108) (Attaching Parts)	2	
-62		. . SETSCREW, 10 - 24 x 1/4	8	
-63	00000281	. BELT, First and Second Stack Drive (07108)	2	80XL025
-64	00000280	. BELT, Third Stack Drive (07108)	1	70XL025
-65	00000283	. BELT, Fourth Stack Drive (07108)	1	160XL025
-66	30016201	. DRIVE MOTOR ASSEMBLY - 60 Hertz Models - 115 VAC	1	
	30016203	. DRIVE MOTOR ASSEMBLY - 50 Hertz Models - 230 VAC	1	
	30016204	. DRIVE MOTOR ASSEMBLY - 50 Hertz Models - 115 VAC (Attaching Parts)	1	
-67	10002001	. . STANDOFF	4	
-68	00000293	. . SCREW, Machine, Socket Head 8 - 32 x 1/2	4	
-69	00000294	. . WASHER, Flat No. 8	4	
-70	00000298	. . SCREW, Machine, Flat Head 8 - 32 x 1/2	2	
-71	00000379	. . SCREW, Machine, Pan Head 8 - 32 x 1/2	2	
-72	20016101	. MAGNETIC PICKUP ASSEMBLY	1	
-73	00000447	. . PICKUP, Magnetic (07355)	1	1-0194/086-2110019
-74	20010401	. . HOLDER, Pickup (Attaching Parts)	1	
-75	00000292	. . . SETSCREW, Flat 6 - 32 x 3/16	1	
-76	00000304	. . . SCREW, Machine, Flat Head 6 - 32 x 1/2	2	
-77	20031901	. FITTING, Air Outlet (Attaching Parts)	1	
-78	00000358	. . SCREW, Machine, Flat Head 8 - 32 x 3/8	2	
-79	00000407	. CLAMP, Hose (76599)	1	H - 24
-80	20059901	. BRACKET, Vacuum Pump Hose Support (Attaching Parts)	1	
-81	00000293	. . SCREW, Machine, Socket Head 8 - 32 x 1/2	1	
-82	00000294	. . WASHER, Flat No. 8	1	
-83	30104401	. PICK FOLLOWER ASSEMBLY		
-84	30101002	. . FOLLOWER, Card	1	
-85	30047701	. . BRACKET, Card Follower (Attaching Parts)	1	
-86	00000271	. . . SCREW, Machine, Button Head, 4 - 40 x 3/16	5	

MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
-87	20000301	. . BEARING, Follower Support (Attaching Parts)	1			
-88	00000096	. . . SCREW, Machine, Button Head, 4 - 40 x 1/4	4			
-89	10011801	. . ROLLER, Card Follower	1			
-90	10011901	. . SHAFT	1			
-91	00000518	. . "O" RING (Attaching Parts)	1	5 - 23D		
-92	00000272	. . . SCREW, Cap, Socket Head, 4 - 40 x 5/8	1			
-93	00000065	. . . WASHER, Flat No. 4	1			
REF	20000301	. . BEARING, Follower Support (Attaching Parts)	1			
-94	00000397	. . . SCREW, Cap Socket Head, 4 - 40 x 1/4	1			
-95	00000065	. . . WASHER, Flat No. 4	1			
-96	00000409	. . BUSHINGS, Ball	2	A61014		
-97	00000495	. . RUBBER, Neoprene 1/8 x 1/4 x 5/8	2			
	00000573	. . EASTMAN 910	A/R			
	00000557	. . LOCKTITE RETAINING COMPOUND 75	A/R			
<hr/>						
-98	40104301	. STACK BUMPER PLATE ASSEMBLY				
-99	20012501	. . CARRIER, Card Follower	1			
-100	30012401	. . BUMPER, Card (Attaching Parts)	1			
-101	00000346	. . . SCREW, Machine, Flat Head 4 - 40 x 1/4	3			
-102	30078801	. . FOLLOWER, Card (Attaching Parts)	1			
-103	00000271	. . . SCREW, Machine, Button Head 4 - 40 x 3/16	3			
-104	10011801	. . ROLLER CARD FOLLOWER	1			
-105	10011901	. . SHAFT	1			
-106	00000518	. . "O" RING (83259) (Attaching Parts)	1	5 - 23D		
-107	00000272	. . . SCREW, Cap, Socket Head 4 - 40 x 5/8	1			
-108	00000065	. . . WASHER, Flat No. 4	1			
<hr/>						
REF	40104301	. STACK BUMPER PLATE (Attaching Parts)				
-109	00000397	. . SCREW, Cap, Socket Head 4 - 40 x 1/4	2			
-110	00000065	. . WASHER, Flat #4	2			
REF	00000409	. . BUSHING, Ball	2	B61014		
REF	00000495	. . SPONGE, Neoprene Closed Cell	1			
REF	00000495	. . RUBBER, Neoprene	1			
<hr/>						
-111	30079301	. PANEL ASSEMBLY, Subframe (Attaching Parts)	1			
-112	00000382	. . SCREW, Pan Head, 8 - 32 x 3/8	4			
-113	30073001	. . PANEL, Subframe - 115 VAC, 60 Hertz	1			
	30073002	. . PANEL, Subframe - 230 VAC, 50 Hertz	1			
-114	00000188	. . CIRCUIT BREAKER, 8A - 115 VAC, 60 Hertz	1	UPG1162802		
	00000186	. . CIRCUIT BREAKER, 5A - 230 VAC, 50 Hertz (Attaching Parts)	1	UPG1162502		
-115	00000375	. . . SCREW, Machine, Pan Head, 6 - 32 x 1/4	2			

MAIN FRAME ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.						
				1	2	3	4	5	6	7
-116	00000470	. . FILTER RFI, Connector 50 - 400 Hz 6A (05245) (Attaching Parts)	1	6EF1						
-117	00000375	. . . SCREW, Machine, Pan Head 6 - 32 x 1/4	2							
-118	30006301	. PLATE, Front Edge Frame	1							
-119	30008301	. PLATE, Rear Edge Trim	1							
-120	30006901	. ANGLE ASSEMBLY, Panel Mount Bottom	2							
-121	40006401	. SUBFRAME	1							
-122	30046001	. ANGLE ASSEMBLY, Panel Mount Top	1							
-123	20065501	. MOUNTING BRACKET, Hood	1							
-124	20057101	. MOUNTING BRACKET, Hood	1							
-125	30046201	. ANGLE ASSEMBLY, Panel Mount	1							
-126	00000302	. SCREW, Machine Pan Head, 6 - 32 x 1/2 Output Connector Mounting	4							
-127	20085401	. CABLE ASSEMBLY, Hopper Empty Switch								
-128	20027502	. CABLE ASSEMBLY, Circuit Breaker								
-129	20027603	. CABLE ASSEMBLY, Relay								
-130	40076401	. WIRING DIAGRAM (230 VAC, 50 Hertz)								
-131	40075401	. WIRING DIAGRAM (115 VAC, 60 Hertz)								
-132	00000059	. MOUNT, Cable Tie (06383)	1	TA158C						
-133	00000058	. TIE, Cable (06383)	1	SSTIM						
-134	30084301	. CABLE ASSEMBLY, Output								
-135	20017101	. CABLE ASSEMBLY, Solenoid DR								
-136	00000657	. RUBBER, Foam	A/R							

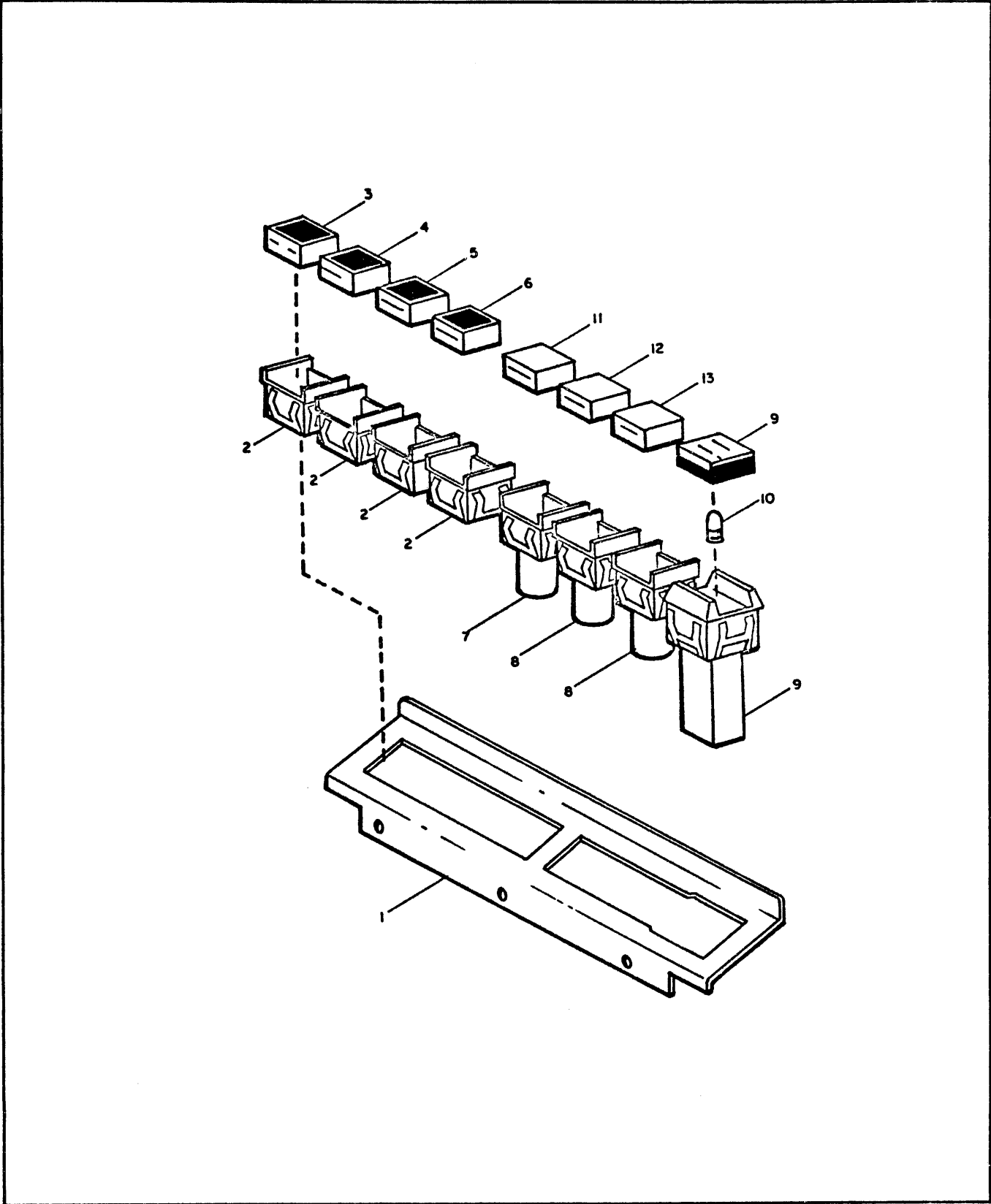


FIGURE 12-5 CONTROL PANEL ASSEMBLY

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		
	30083802	CONTROL PANEL ASSEMBLY								
-1	30083401	. PANEL, Control							1	
-2	00000106	. INDICATOR, White Barrier (72619)							4	533-1004
-3	00000097	. CAP "READ CHECK", White Barrier (72619)							1	534-0404-339
-4	00000093	. CAP "MOTION CHECK", White Barrier (72619)							1	534-0404-339
-5	00000094	. CAP "PICK CHECK", White Barrier (72619)							1	534-0404-339
-6	00000092	. CAP "STACKER/HOPPER", White Barrier (72619)							1	534-0704-339
-7	00000321	. SWITCH N.O. SPST, White Barrier (72619)							1	513-0110-004
-8	00000320	. SWITCH N.O. SNAP ACTION, White Barrier (72619)							2	513-1610-004
-9	00000316	. SWITCH, Presslight, w/green "on" insert (87034)							1	53-77200-121
-10	00000318	. BULB, Incandescent 6V @ .2A (08806)							8	381
-11	00000102	. CAP, "STOP" (72619)							1	303-6361
-12	00000103	. CAP, "RESET" (72619)							1	303-6362
-13	00000104	. CAP, "END OF FILE" (72619)							1	303-6362
-14	00000510	. CONTACT, Junction (08524)							2	1841-1-5616
-15	00000036	. CONTACT, Conn Amp Leaf (00779)							12	42702-4LP
-16	00000034	. CONTACT, Amp Leaf (00779)							2	42717-4LP
-17	00000035	. CONTACT, Pin (00779)							2	60618-1
-18	00000451	. HOUSING, Pin (00779)							2	1480350-0
-19	00000058	. TIE, Cable (06383)							3	STIM-M
-20	00000085	. TUBING, Heatshrink, 1/4 x 31" (92194)							1	FIT-105
-21	00000018	. WIRE, Elec. #18 AWG TWPR BLK/BLK 66" (92194)							1	1857/19-2
-22	00000085	. TUBING, Heatshrink, 1/4 x 12" (92194)							1	FIT-105
-23	00000160	. WIRE, Elec., #18 AWG TWPR WHT/WHT 66"							1	1857/19-1
-24	00000157	. WIRE, Elec., #18 AWG BRN 44"							1	1857/19-7
-25	00000161	. WIRE, Elec., #18 AWG YEL 44"							1	1857/19-5
-26	00000002	. WIRE, Elec., #24 AWG RED/WHT 44"							1	1854/19-12
-27	00000006	. WIRE, Elec., #24 AWG BRN/WHT 44"							1	1854/19-16
-28	00000010	. WIRE, Elec., #24 AWG GRN - 44"							1	1854/19-4
-29	00000013	. WIRE, Elec., #24 AWG BRN - 44"							1	1854/19-7
-30	00000011	. WIRE, Elec., #24 AWG YEL - 44"							1	1854/19-5
-31	00000012	. WIRE, Elec., #24 AWG BLUE - 44"							1	1854/19-6
-32	00000009	. WIRE, Elec., #24 AWG RED - 44"							1	1854/19-3
-33	00000014	. WIRE, Elec., #24 AWG ORG - 44"							1	1854/19-8
-34	00000004	. WIRE, Elec., #24 AWG YEL/WHT - 44"							1	1854/19-14
-35	00000005	. WIRE, Elec., #24 AWG BLU/WHT - 44"							1	1854/19-15
-36	00000003	. WIRE, Elec., #24 AWG GRN/WHT - 44"							1	1854/19-13
-37	00000007	. WIRE, Elec., #24 AWG ORG/WHT - 44"							1	1854/19-17

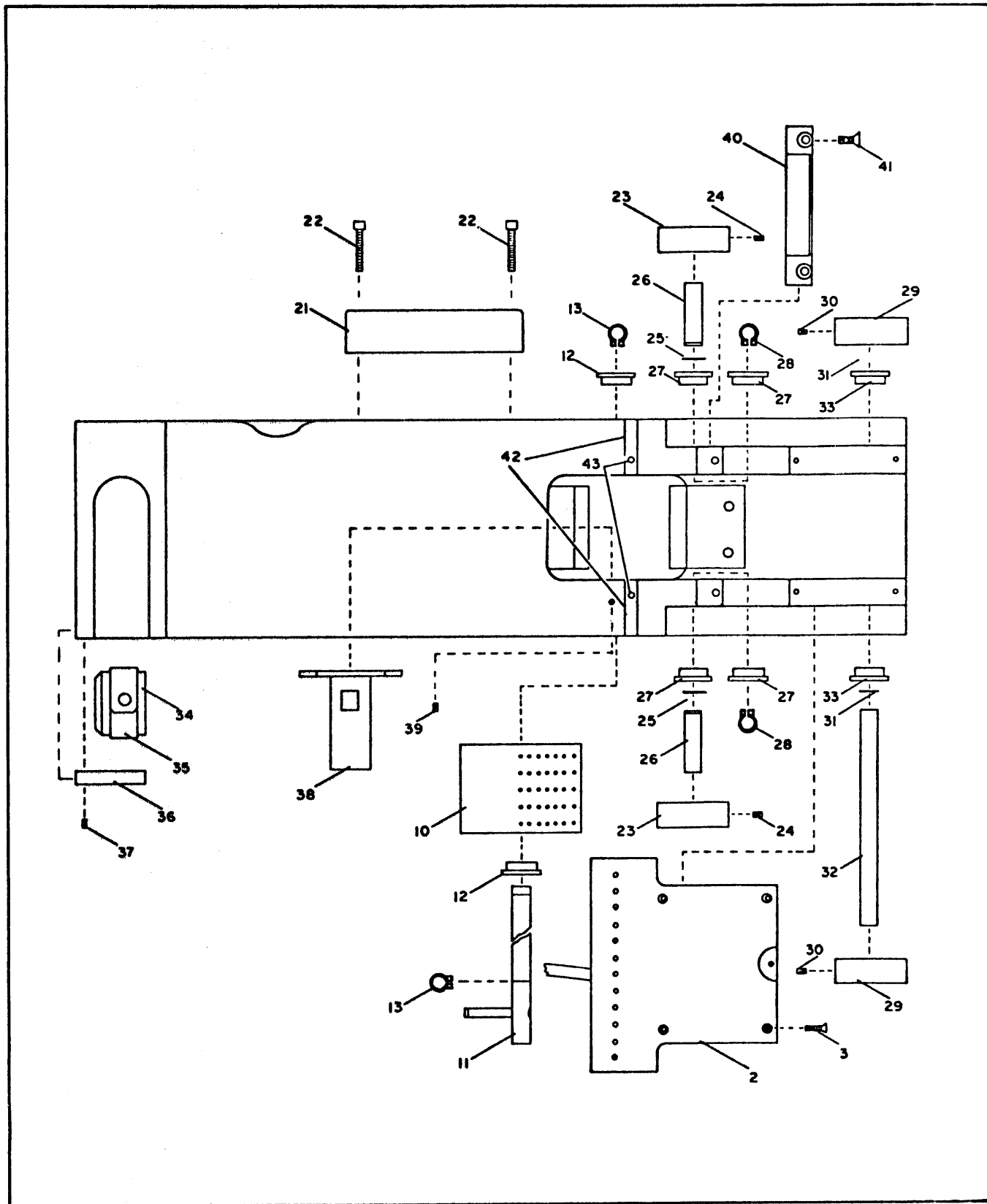


FIGURE 12-6 PICK SUPPORT ASSEMBLY (sheet 1 of 2)

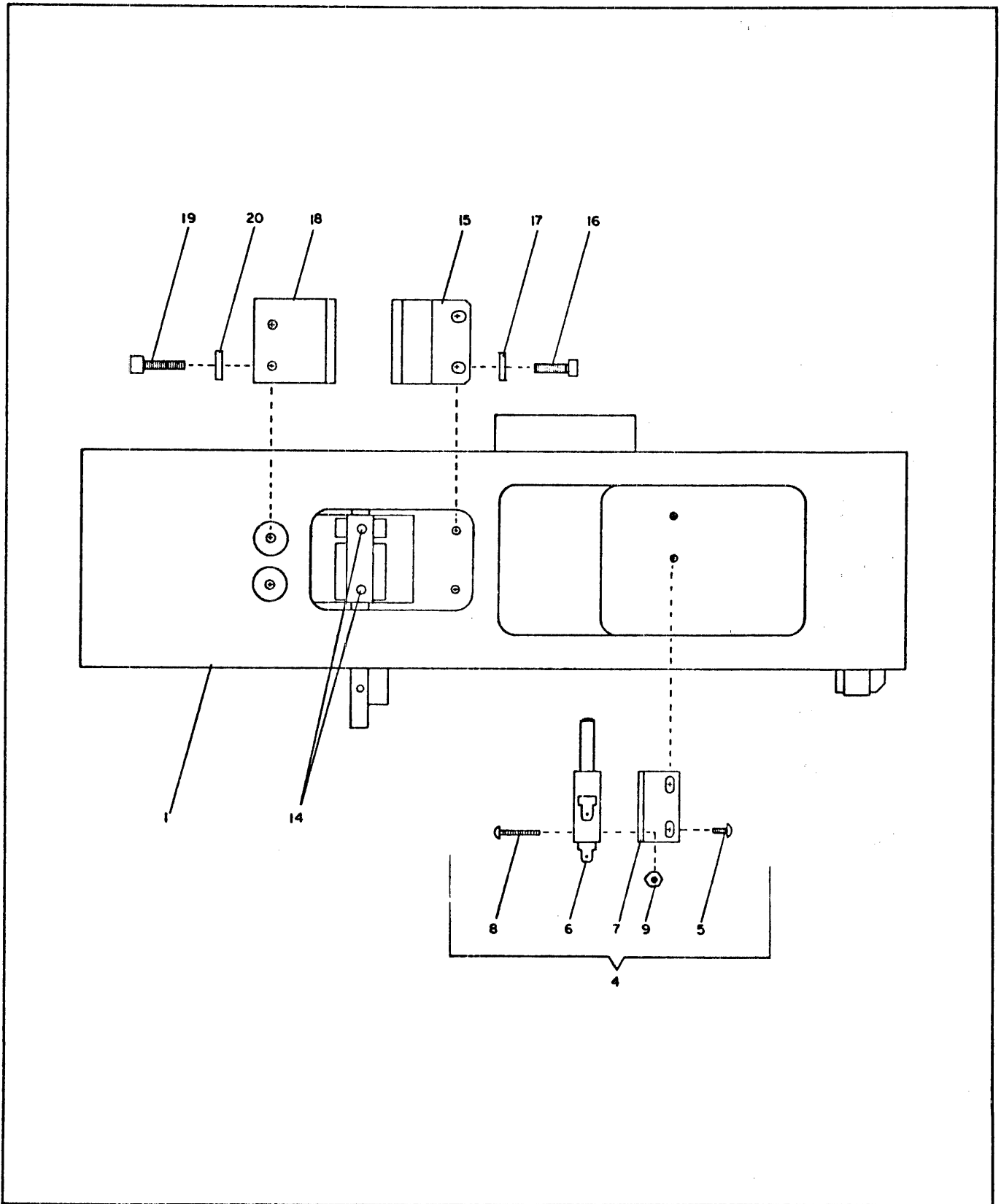


FIGURE 12-6 PICK SUPPORT ASSEMBLY (sheet 2 of 2)

FIGURE 12-6 PICK SUPPORT ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.		
					1	2	3	4	5	6	7
	40048201	PICK SUPPORT ASSEMBLY				
-1	40001601	. PICK SUPPORT	1			
-2	30014401	. LIGHT STATION ASSEMBLY (Attaching Parts)	1			
-3	00000344	. . SCREW, Machine, Flat Head, 2 - 56 x 1/4	4			
-4	20027701	. SWITCH ASSEMBLY, Hopper Empty (Attaching Parts)	1			
-5	00000096	. . . SCREW, Machine, Button Head, 4 - 40 x 1/4	2			
-6	10023501	. . SWITCH (01963)	1	E21-85HX		
-7	20023401	. . BRACKET, Switch (Attaching Parts)	1			
-8	00000272	. . . SCREW, Machine, Pan Head, 4 - 40 x 5/8	2			
-9	00000062	. . . NUT, Plain, Hex 4 - 40	2			
-10	30003701	. SECTOR ASSEMBLY (Attaching Parts)	1			
-11	20101401	. , SHAFT, Pick Assembly	1			
-12	00000429	. . BEARING (14927)	2	SFR188TTK25LG1		
-13	00000467	. . RING, Snap (79136)	2	5100-25		
-14	00000297	. . SET SCREW, 8 - 32 x 3/16	2			
-15	10004101	. STOP, Pick (Attaching Parts)	1			
-16	00000398	. . SCREW, Socket Head, 6 - 32 x 5/8	2			
-17	00000295	. . WASHER, Flat #6	2			
-18	10004701	. BUMPER, Pick (Attaching Parts)	1			
-19	00000293	. . SCREW, Socket Head, 8 - 32 x 1/2	2			
-20	00000294	. . WASHER, Flat #8	2			
-21	30023303	. CAP, Rifle Air (Attaching Parts)	1			
-22	00000391	. . SCREW, Socket Head, 4 - 40 x 3/4	2			
-23	20005901	DRIVE ROLLER, 2nd PICK DRIVE ASSEMBLY . CAPSTAN (Attaching Parts)	2			
-24	00000292	. . SETSCREW, Knurled Cup, 6 - 32 x 3/16	2			
-25	00000432	. SPACER, Bearing	2	SS2-28		
-26	10002201	. SHAFT	2			
-27	00000429	. BEARING (14927)	4	SFR118TTK25LG1		

PICK SUPPORT ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-28	00000467	.							2	5100-25
<hr/>										
		STACK DRIVE, 1st PICK DRIVE ASSEMBLY								
-29	20005901	.							2	
		(Attaching Parts)								
-30	00000292	.	.						2	
		. . SETSCREW, Knurled Cup, 6 - 32 x 3/16								
-31	00000432	.							2	SS2-28
		. SPACER, Bearing								
-32	10003003	.							1	
		. SHAFT								
-33	00000429	.							2	SFR188TTK25LG1
		. BEARING (14927)								
<hr/>										
-34	20012703	.							1	
		. DRUM, Spring								
-35	00000306	.							1	SLGF24
		. SPRING, Negator (80545)								
-36	10000701	.							1	
		. SHAFT, Spring Drum								
		(Attaching Parts)								
-37	00000564	.	.						1	
		. . SET SCREW, 4 - 40 x 3/32								
<hr/>										
-38	20004801	.							1	
		. TUBE, Pick Vacuum								
		(Attaching Parts)								
-39	00000564	.	.						1	
		. . SET SCREW, 4 - 40 x 3/32								
<hr/>										
-40	20008101	.							1	
		. GUIDE, Card								
		(Attaching Parts)								
-41	00000346	.	.						2	
		. . SCREW, Machine, Flat Head, 4 - 40 x 1/4								
<hr/>										
-42	20072801	.							2	
		. INSERT, Pick Support								
		(Attaching Parts)								
-43	00000565	.	.						2	
		. . SCREW, Machine, under cut Flat Head, 2 - 56 x 3/16								

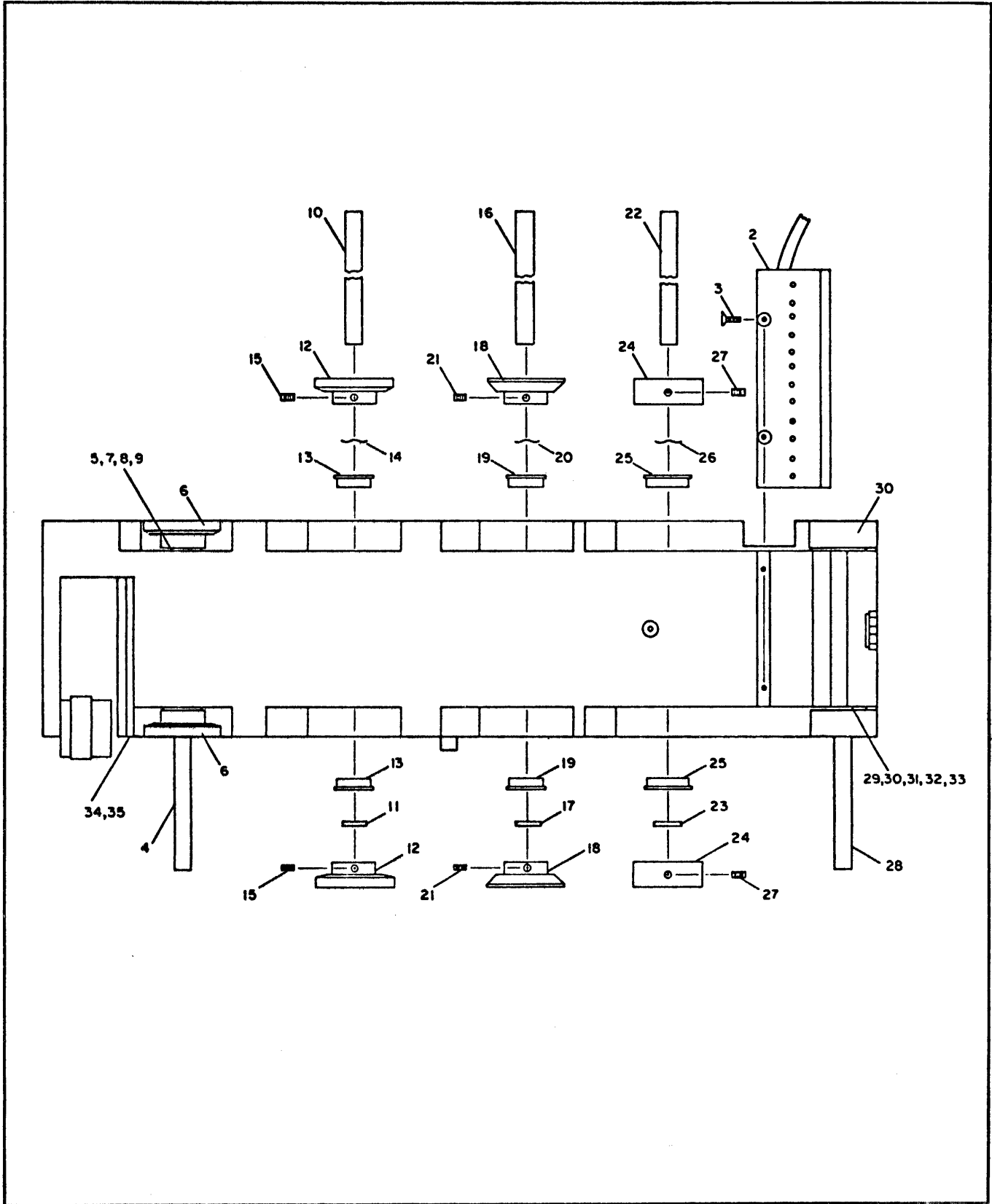


FIGURE 12-7 STACK SUPPORT ASSEMBLY (sheet 1 of 2)

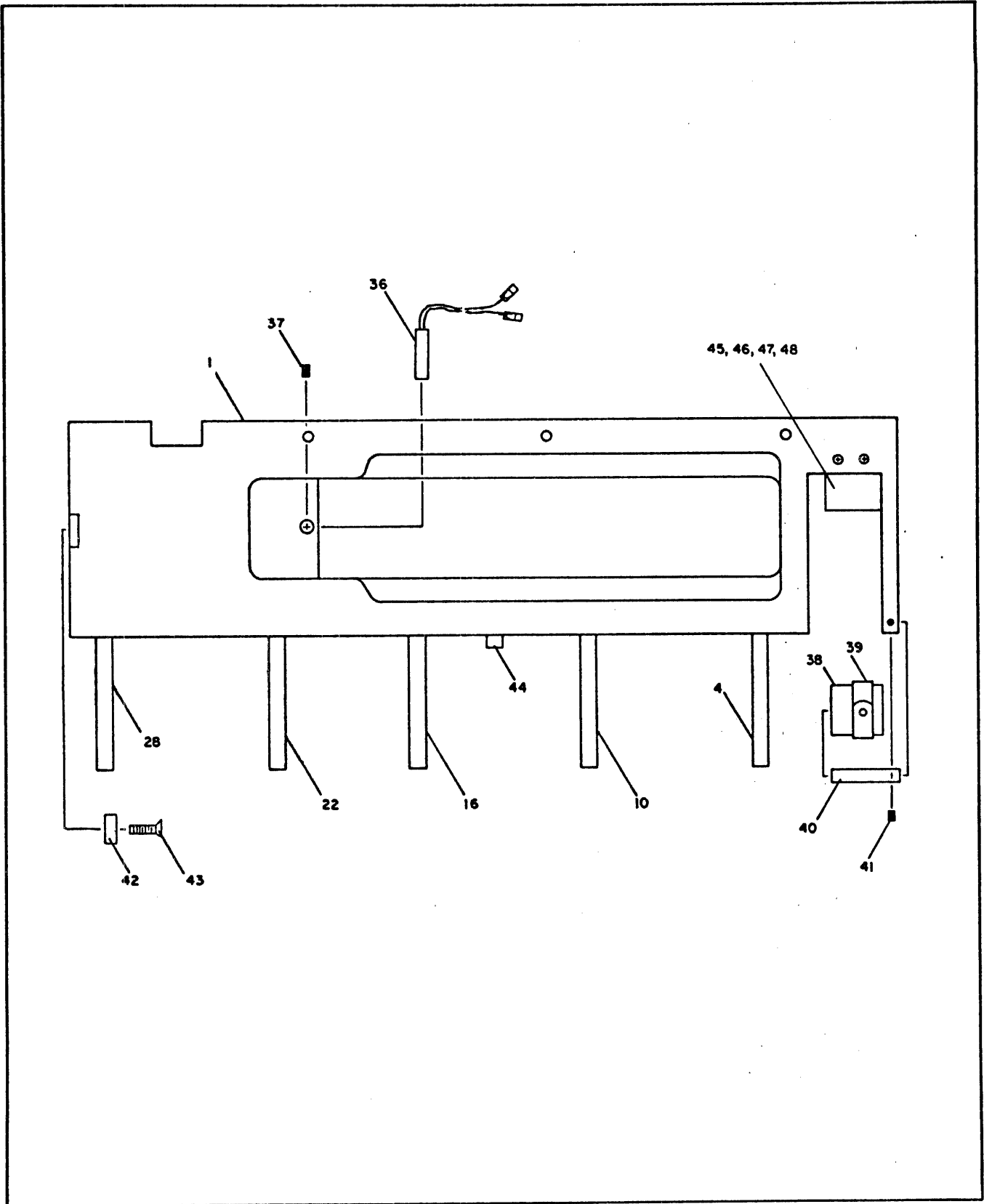


FIGURE 12-7 STACK SUPPORT ASSEMBLY (sheet 2 of 2)

FIGURE 12-7 STACK SUPPORT ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY							VENDOR PART NO.
			1	2	3	4	5	6	7	
	40021205	STACK SUPPORT ASSEMBLY							1	
-1	40048801	. SUPPORT, Stack							1	
-2	20050301	. READ ARRAY ASSEMBLY (Attaching Parts)							1	
-3	00000353	. . SCREW, Flat Head 4 - 40 x 1/4							2	
		FIRST STACK DRIVE ASSEMBLY								
-4	10003002	. SHAFT, Stack Drive							1	
-5	00000431	. SPACER, Bearing (29440)							A/R	SS2-27
	00000432	. SPACER, Bearing (29440)							A/R	SS2-28
	00000433	. SPACER, Bearing (29440)							A/R	SS2-30
-6	20001504	. ROLLER, Stack Drive							2	
-7	00000429	. BEARING (14927)							2	SFR188TT (3)
-8	00000435	. SPRING, Bearing Pre-load (29440) (Attaching Parts)							1	SV - 1
-9	00000292	. . SCREW, Set Knurled Cup PT, 6 - 32 x 3/16							2	
		SECOND STACK DRIVE ASSEMBLY								
-10	10003002	. SHAFT, Stack Drive							1	
-11	00000431	. SPACER, Bearing (29440)							A/R	SS2-27
	00000432	. SPACER, Bearing (29440)							A/R	SS2-28
	00000433	. SPACER, Bearing (29440)							A/R	SS2-30
-12	20001504	. ROLLER, Stack Drive							2	
-13	00000429	. BEARING (142927)							2	SFR118TT (3)
-14	00000435	. SPRING, Bearing Pre-load (29440) (Attaching Parts)							1	SV - 1
-15	00000292	. . SCREW, Set Knurled Cup PT, 6 - 32 x 3/16							2	
		THIRD STACK DRIVE ASSEMBLY								
-16	10003002	. SHAFT, Stack Drive							1	
-17	00000431	. SPACER, Bearing (29440)							A/R	SS2-27
	00000432	. SPACER, Bearing (29440)							A/R	SS2-28
	00000433	. SPACER, Bearing (29440)							A/R	SS2-30
-18	20001506	. ROLLER, Stack Drive							2	
-19	00000429	. BEARING (14927)							2	SFR1181TT (3)
-20	00000435	. SPRING, Bearing Pre-load (29440) (Attaching Parts)							1	SV - 1
-21	00000292	. . SCREW, Set Knurled Cup PT, 6 - 32 x 3/16							2	
		FOURTH STACK DRIVE ASSEMBLY								
-22	10003002	. SHAFT, Stack Drive							1	
-23	00000431	. SPACER, Bearing (29440)							A/R	SS2-27
	00000432	. SPACER, Bearing (29440)							A/R	SS2-28
	00000433	. SPACER, Bearing (29440)							A/R	SS2-30
-24	20002101	. ROLLER, Stack Drive							2	

STACK SUPPORT ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-25	00000430	.							2	SFR4TT (3)
-26	00000435	.							1	SV - 1
-27	00000292	.	.						2	
<hr/>										
FIFTH STACK DRIVE ASSEMBLY										
-28	10003002	.							1	
-29	00000431	.							A/R	SS2-27
	00000432	.							A/R	SS2-28
	00000433	.							A/R	SS2-30
-30	20002101	.							2	
-31	00000430	.							2	SFR4TT (3)
-32	00000435	.							1	SV - 1
-33	00000292	.	.						2	
-34	20065101	.							1	
-35	00000379	.	.						2	
<hr/>										
-36	20038202	.							1	
-37	00000292	.	.						1	
<hr/>										
-38	20012702	.							1	
-39	00000306	.							1	SL5E17
-40	10000701	.							1	
-41	00000292	.	.						1	
<hr/>										
-42	10075801	.							1	
-43	00000305	.	.						1	
<hr/>										
-44	00000492	.							1	PINDOW1-4X1-2
<hr/>										
-45	20084201	.							1	
-46	00000305	.	.						1	
-47	00000059	.	.						1	
-48	00000064	.	.						1	

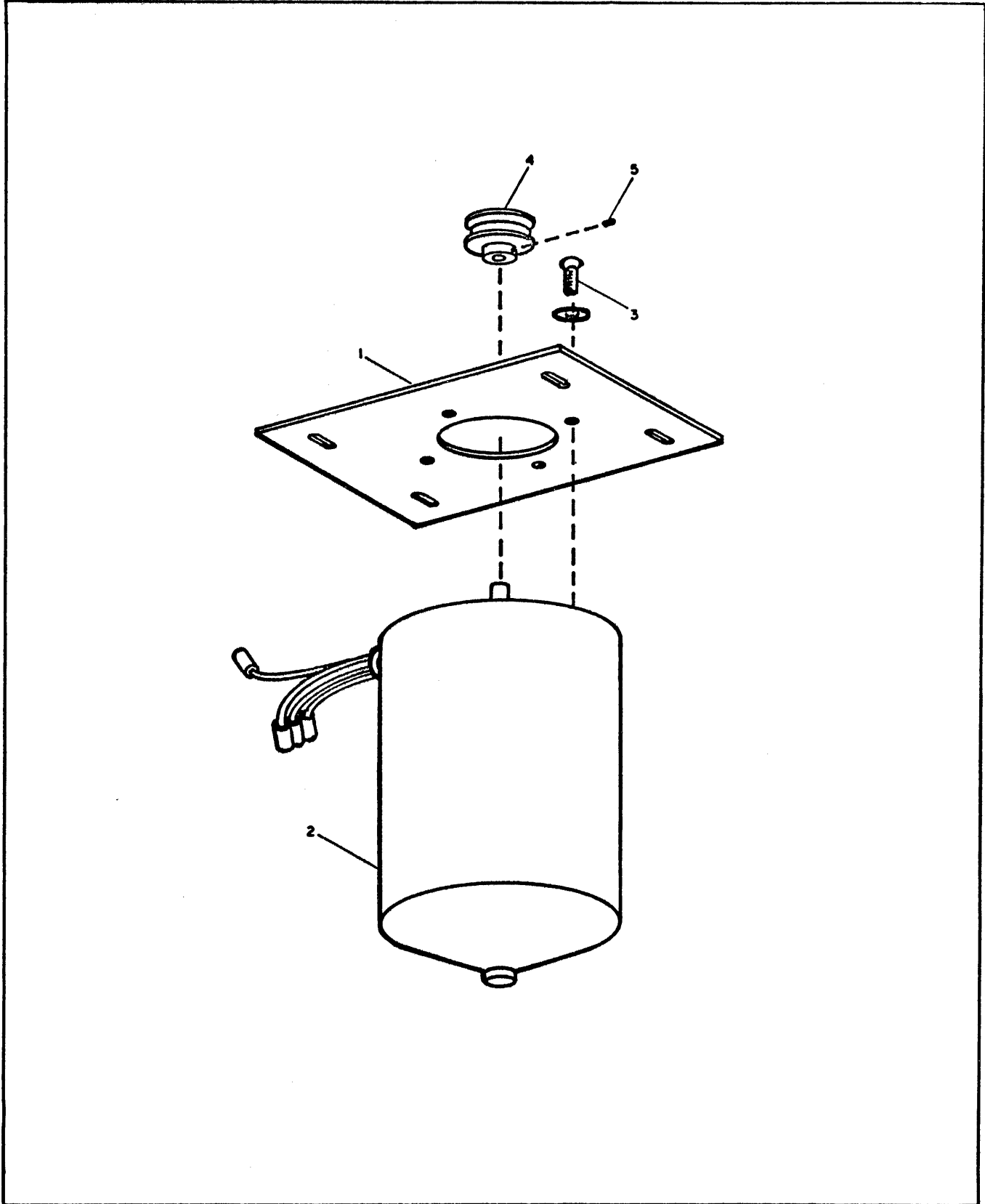


FIGURE 12-8 DRIVE MOTOR ASSEMBLY

FIGURE 12-8 DRIVE MOTOR ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	VENDOR PART NO.
-1	30016205	DRIVE MOTOR ASSEMBLY, 115 VAC, 60 Hertz		
	30016206	DRIVE MOTOR ASSEMBLY, 230 VAC, 50 Hertz		
	20001901	. PLATE, Motor Mounting - 115 VAC, 60 Hertz	1	
	20001902	. PLATE, Motor Mounting - 230 VAC, 50 Hertz	1	
-2	00000774	. MOTOR, (19070) (Attaching Parts)	1	H34BBP-8
-3	00000368	. . SCREW, Machine Pan Head, 10 - 32 x 3/8	4	
-4	20127008	. SPROCKET, Timing Belt (15) - (115 VAC, 60 Hertz)	1	
	20127006	. SPROCKET, Timing Belt (18) - (230 VAC, 50 Hertz) (Attaching Parts)	1	
-5	20127008	. . SCREW, Set (Supplied with item 4)	1	
-6	00000295	. CONNECTOR, Housing 6 Pos SKT (00779)	1	
-7	00000610	. CONTACT, Connector SKT Crimp (00779)	6	
-8	00000526	. TIE, Cable (06383)	2	SSTIM
-9	00000058	. MOUNT, Cable Tie (06383) (Attaching Parts)	1	TAI58C
-10	00000059	. . SCREW, Machine Pan Head 6 - 32 x 1/4	1	
-11	00000375	. . WASHER, Flat No. 6	1	

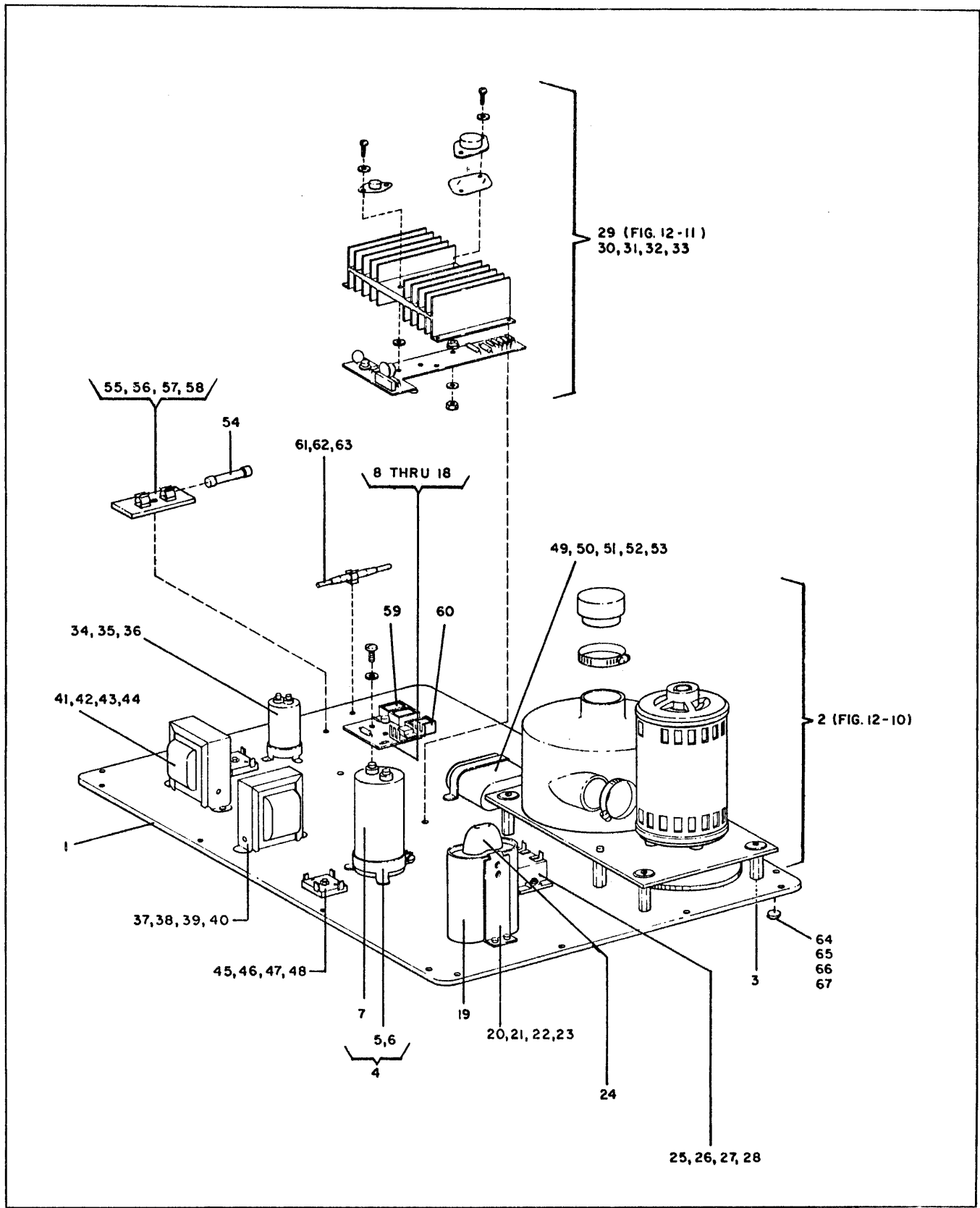


FIGURE 12-9 BASE PLATE ASSEMBLY

FIGURE 12-9 BASE PLATE ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION						UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6			7
	40075115 40075116	BASE PLATE ASSEMBLY - 115 VAC, 60 Hertz BASE PLATE ASSEMBLY - 230 VAC, 50 Hertz							
-1	40008001 40077401	. PLATE, Bottom - 115 VAC, 60 Hertz . PLATE, Bottom - 230 VAC, 50 Hertz						1 1	
-2	40033304 40033307	. VACUUM PUMP ASSEMBLY - 115 VAC, 60 Hz (Fig. 12-10) . VACUUM PUMP ASSEMBLY - 230 VAC, 50 Hz (Fig. 12-10) (Attaching Parts)						1 1	
-3	00000379	. . SCREW, Machine, Pan Head #8 - 32 x 1/2						4	
-4	30010001	. DRIVER ASSEMBLY, Solenoid						1	
-5	00000199	. . CAPACITOR, 6200 mf, 75 VDC (08806)						1	86F177M
-6	00000498	. . . RIVET, (Pop)						3	SD44BS
-7	00000548	. . BRACKET, Capacitor, Mounting (08806)						1	94A734AB3
-8	20010201	. . P. C. BOARD						1	
-9	00000040	. . . DIODE (01295)						1	1N403
-10	00000139	. . . TRANSISTOR, NPN (94144)						1	2N2102
-11	00000247	. . . RESISTOR, 270 ohms, ± 10%, 1/4W						1	RCO7GF271K
-12	00000141	. . . TRANSISTOR, NPN, Power (01295)						1	T1P41C
-13	00000108	. . . COMPOUND, Heatsink (13103) (Attaching Parts)						1	6107B-14
-14	00000064	. . . . SCREW, Machine, Pan Head 4 - 40 x 3/8						1	
-15	00000062	. . . . NUT, Hex 4 - 40						1	
-16	00000065	. . . . WASHER, Flat No. 4 (Attaching Parts)						1	
-17	00000368	. . . SCREW, Pan-Head, 10 - 32 x 3/8						2	
-18	00000444	. . . WASHER, Lock, Internal tooth No. 10						4	
-19	00000202	. CAPACITOR, Vacuum Pump Motor Run, 17.5 µf 370 VAC (115 VAC, 60 Hertz) (08806)						1	45F279
	00000206	. CAPACITOR, Vacuum Pump Motor Run, 10 µf 200-365 VAC (230 VAC, 50 Hertz) (08806)						1	45F170
-20	00000290	. CLAMP, Capacitor (Pair) (08806) (Attaching Parts)						1	302C920126
-21	00000302	. . SCREW, Machine, Pan Head #6 - 32 x 1/2						4	
-22	00000301	. . NUT, Hex, #6 - 32						4	
-23	00000295	. . WASHER, Flat #6						4	
-24	00000472	. BOOT						1	614A625P21
-25	00000109	. RELAY, Vacuum Pump and Drive Motor 20A (115 VAC, 60 Hertz) (12617)						1	724-11-159
	00000474	. RELAY, Vacuum Pump and Drive Motor 6A (230 VAC, 50 Hertz) (12617) (Attaching Parts)						1	733-12-150
-26	00000379	. . SCREW, Machine, Pan Head, 8 - 32 x 1/2						2	
-27	00000299	. . NUT, Hex #8 - 32						2	
-28	00000556	. . COMPOUND, Heatsink						A/R	

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

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.
-29	30029505	. POWER SUPPLY ASSEMBLY (Fig. 12-11) (Attaching Parts)		
-30	10015401	. . STANDOFF	4	
-31	00000392	. . SCREW, Socket Head, #6 - 32 x 1/2	4	
-32	00000295	. . WASHER, Flat #6	4	
-33	00000302	. . SCREW, Machine, Pan Head, #6 - 32 x 1/2		
-34	00000200	. CAPACITOR, Logic Power Supply, 4600 mf 25 VDC (08806)	1	86F119M
-35	00000479	. CLAMP, Capacitor (08806) (Attaching Parts)	1	942A734AA1
-36	00000498	. . RIVET, (Pop)	3	SD44B5
-37	20015501	. TRANSFORMER ASSEMBLY, Solenoid Driver, 24V (115 VAC, 50/60 Hertz)	1	
	20074001	. TRANSFORMER ASSEMBLY, Solenoid Driver, 24V (230 VAC, 50 Hertz)	1	
	00000134	. . TRANSFORMER (Stancor)	1	P6377
	00000194	. . CAPACITOR, .01 mf, 1000 VDC (Attaching Parts)	2	5HK510
-38	00000296	. . SCREW, Machine, Pan Head, 6 - 32 x 3/8	2	
-39	00000295	. . WASHER, Flat #6	2	
-40	00000301	. . NUT, Hex #6 - 32	2	
-41	20015601	. TRANSFORMER ASSEMBLY, Logic Power Supply 12V (115 VAC, 50/60 Hertz)	1	
	20073901	. TRANSFORMER ASSEMBLY, Logic Power Supply 12V (230 VAC, 50 Hertz)	1	
	00000134	. . TRANSFORMER (Stancor)	1	P6377
	00000194	. . CAPACITOR, .01 mf, 1000 VDC (Attaching Parts)	2	5HK510
-42	00000296	. . SCREW, Machine, Pan Head, 6 - 32 x 3/8	2	
-43	00000295	. . WASHER, Flat #6	2	
-44	00000301	. . NUT, Hex #6 - 32	2	
-45	00000143	. RECTIFIER, Diode Bridge, 100 VDC (04713) (Attaching Parts)	2	MDA980-2
-46	00000272	. . SCREW, Machine, Pan Head, 4 - 40 x 5/8	2	
-47	00000065	. . WASHER, Flat #4	2	
-48	00000062	. . NUT, Hex #4 - 40	2	
-49	00000205	. CAPACITOR, Drive Motor Run, 3 μ f, 370V (115 VAC, 60 Hz) (08806)	1	45F271
	00000201	. CAPACITOR, Drive Motor Run, 1 μ f, 660V (230 VAC, 50 Hz) (08806)	1	45F601
-50	00000289	. BRACKET, Capacitor (08806) (Attaching Parts)	1	K987065P21
-51	00000296	. . SCREW, Machine, Pan Head, 6 - 32 x 3/8	2	

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

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.
-52	00000295	. . WASHER, Flat #6	2	
-53	00000301	. . NUT, Hex, 6 - 32	2	
-54	00000147	. FUSE, 1 amp Slo - Blo (75915)	1	313001
-55	00000133	. MOUNT, Fuse (75915) (Attaching Parts)	1	356001
-56	00000302	. . SCREW, Machine, Pan Head, 6 - 32 x 1/2	1	
-57	00000295	. . WASHER, Flat #6	1	
-58	00000301	. . NUT, Hex 6 - 32	1	
-59	00000503	. JUNCTION, Terminal (08524)	2	TJ11A-0501
-60	00000504	. JUNCTION, Terminal (08524)	1	TJ11A-0502
-61	00000487	. TOOL, Insertion/Extraction (08524)	1	M15570-16
-62	00000132	. CLIP (79515) (Attaching Parts)	1	101002
-63	00000498	. . RIVET, (Pop)	1	SD44BS
-64	00000428	. BUMPER, Rubber (83330) (Attaching Parts)	4	SC405
-65	00000296	. . SCREW, Pan Head, #6 - 32 x 3/8	4	
-66	00000295	. . WASHER, Flat #6	4	
-67	00000301	. . NUT, Hex #6 - 32	4	
-68	00000498	. RIVET, Blnd, Aluminum, 1/8 inch	2	SD44BS
-69	00000059	. MOUNT, Cable Tie (06383)	5	TA158C
-70	00000058	. TIE, Cable (06383)	11	SSTIM
-71	00000531	. LOCTITE, Grade C	A/R	60414-1
-72	00000555	. ADHESIVE, Pliobond	A/R	
-73	00000556	. COMPOUND, Heatsink (13103)	A/R	
-74	20027513	. CABLE ASSEMBLY, Fuse	1	
-75	20027505	. CABLE ASSEMBLY	1	
-76	20091301	. CABLE ASSEMBLY, Relay (230 VAC, 50 Hertz)	1	
-77	20027502	. CABLE ASSEMBLY	1	
-78	40075401	. WIRING DIAGRAM (115 VAC, 60 Hertz)		
	40076401	. WIRING DIAGRAM (230 VAC, 50 Hertz)		

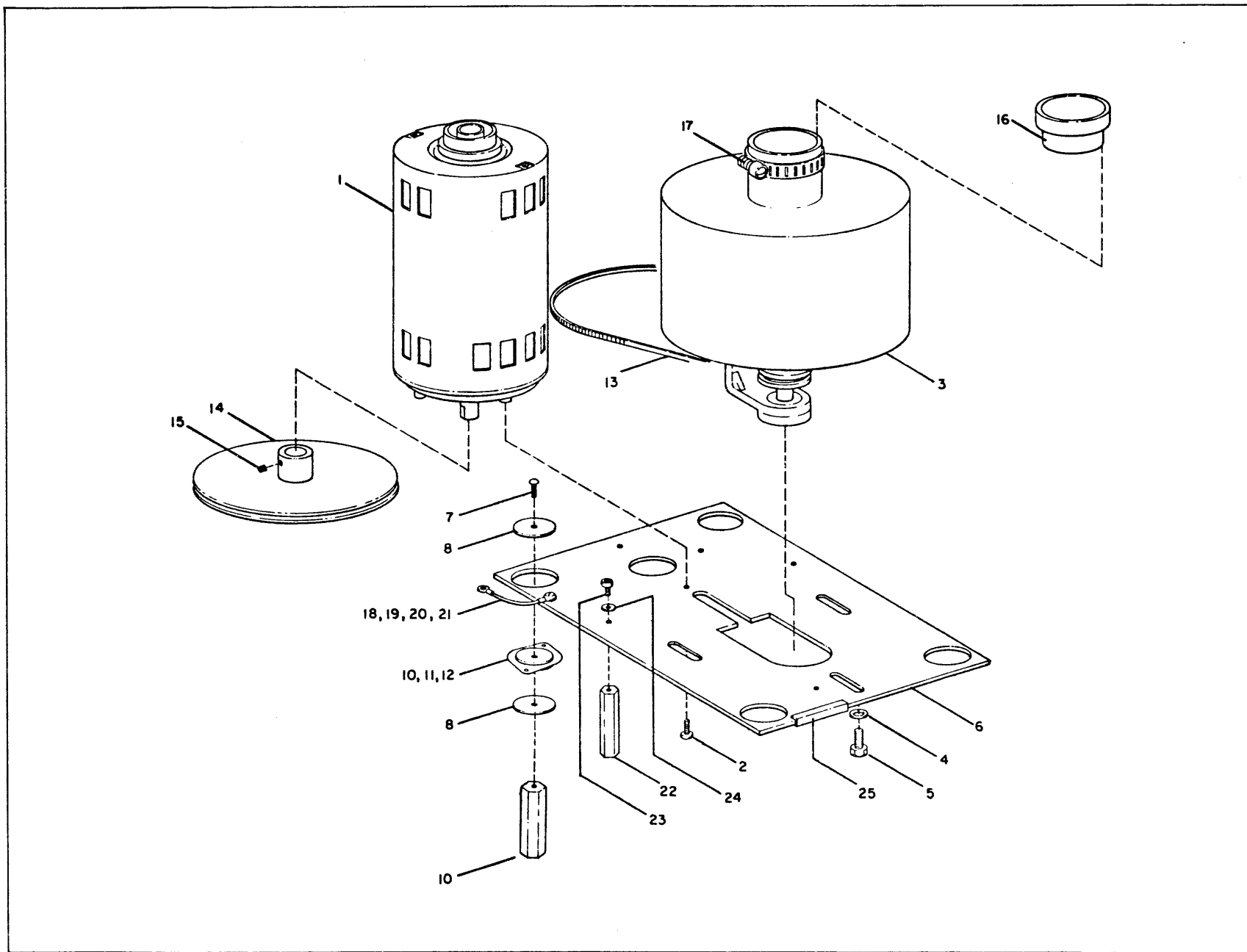


FIGURE 12-10 VACUUM PUMP ASSEMBLY

FIGURE 12-10 VACUUM PUMP ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	VENDOR PART NO.	
				1	2
-1	40033304	VACUUM PUMP ASSEMBLY, 115 VAC, 60 Hertz	1		
	40033307	VACUUM PUMP ASSEMBLY, 230 VAC, 50 Hertz	1		
	00000539	. MOTOR, 60 Hz, 3350 rpm, 115 VAC, 60 Hertz (03597)	1	KCPMPG-190A	
	00000540	. MOTOR, 50 Hz, 230 VAC, (03597) (Attaching Parts)	1	5KCP19PG0222	
-2	00000379	. . SCREW, Machine, Pan Head, 8 - 32 x 1/2	4		
-3	00000541	. BLOWER (75511) (Attaching Parts)	1	60-115626	
-4	00000441	. . WASHER, Flat #1/4	3		
-5	00000855	. . SCREW, Cap, Hex Head, 1/4 - 20 x 5/8	3		
-6	30031801	. PLATE, Blower - 115 VAC, 60 Hertz	1		
	30076701	. PLATE, Blower - 230 VAC, 50 Hertz (Attaching Parts)	1		
-7	00000381	. . SCREW, Machine, Pan Head, 8 - 32 x 3/4	4		
-8	00000294	. . WASHER, Flat, No. 8 7/8 OD	8		
-9	00000505	. . MOUNT, Rubber (76005)	2	100PD2	
	00000291	. . MOUNT, Rubber (76005)	2	100PD4	
-10	10002004	. . STANDOFF	4		
-11	00000064	. . SCREW, Machine, Pan Head 4 - 40 x 3/8	8		
-12	00000062	. . NUT, Plain, Hex, No. 4 - 40	8		
-13	00000519	. BELT - 115 VAC, 60 Hertz (24161)	1	5 M 545	
	00000520	. BELT - 230 VAC, 50 Hertz (24161)	1	5 M 580	
-14	20076101	. PULLEY - 115 VAC, 60 Hertz	1		
	20076102	. PULLEY - 230 VAC, 50 Hertz (Attaching Parts)	1		
-15	00000591	. . SCREW, Set, Nyloc Cup Point STLN BLK, 1/4 - 20 x 3/8 (83014)	1		
-16	20064701	. ADAPTER ASSEMBLY, Vacuum, 115 VAC, 60 Hertz	1		
	20064702	. ADAPTER ASSEMBLY, Vacuum, 230 VAC, 60 Hertz (Attaching Parts)	1		
-17	00000407	. . CLAMP (76599)	1	H - 24	
-18	20037901	. GROUND STRAP ASSEMBLY (Attaching Parts)	1		
-19	00000296	. . SCREW, Pan Head, 6 - 32 x 3/8	1		
-20	00000445	. . WASHER, Lock, int. tooth, #6	1		
-21	00000301	. . NUT, Hex, 6 - 32	1		
-22	10002005	. STANDOFF (Attaching Parts)	2		
-23	00000293	. . SCREW, Cap, Socket Head, 8 - 32 x 1/2	2		
-24	00000294	. . WASHER, Flat #8	2		

VACUUM PUMP ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-25	00000482	.	STRIP, Grommet (06229)						1	G55
-26	00000058	.	TIE, Cable (06383)						2	SSTIM
-27	00000059	.	CABLE TIE, Mount (06383)						1	TAIS8
-28	00000525	.	RECEPTACLE, Faston (2.50) (00779)						3	60414-1
-29	00000531	.	LOCTITE, Grade C						A/R	
-30	00000085	.	TUBING HEAD SHRINK, 1/4 x 1 1/4 (92194)						3	FIT - 105
-31	00000555	.	ADHESIVE, Pliobond						A/R	

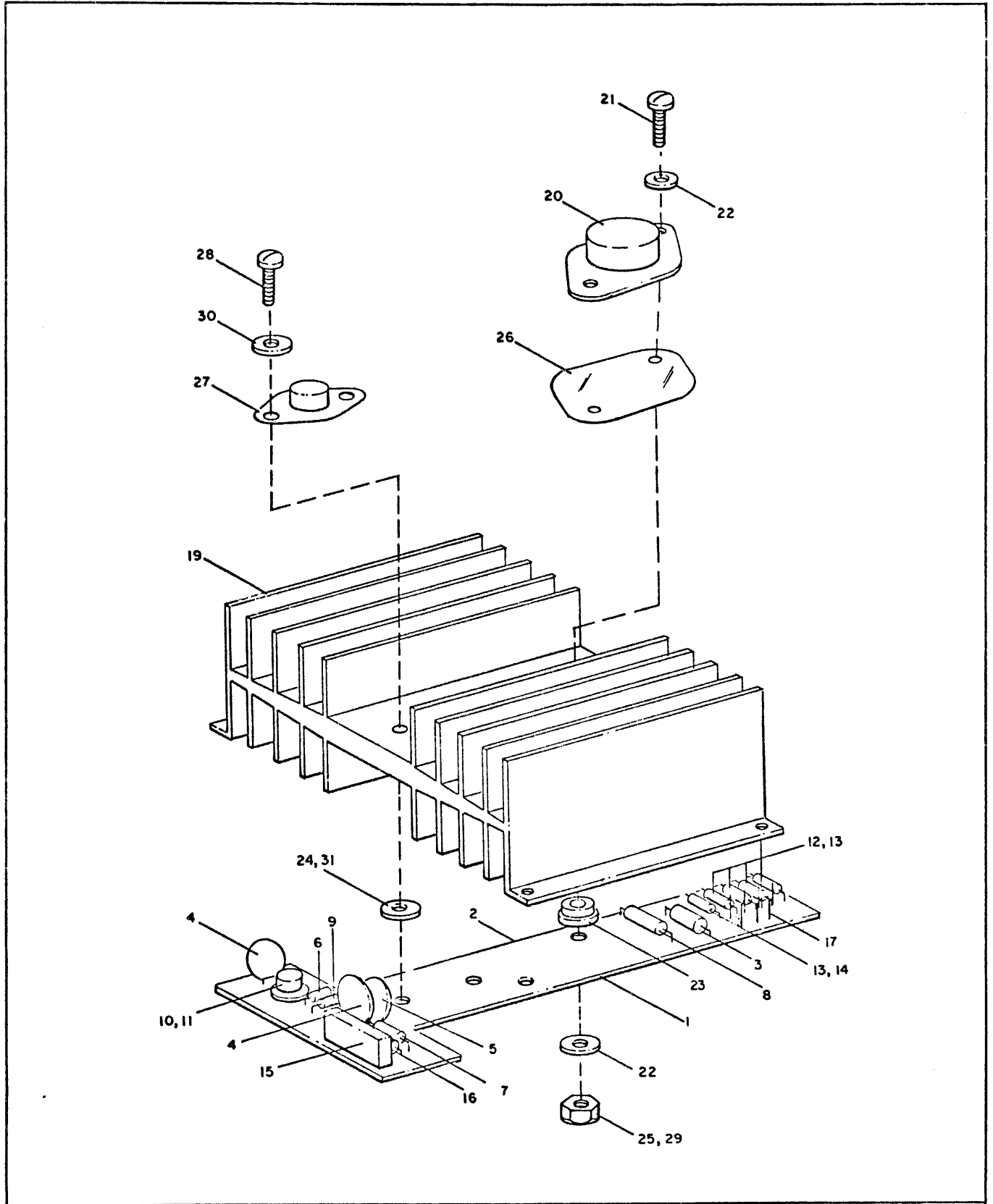


FIGURE 12-11 POWER SUPPLY ASSEMBLY

FIGURE 12-11 POWER SUPPLY ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNITS	VENDOR
			PER ASSY	PART NO.
	30029505	POWER SUPPLY ASSEMBLY		

-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	RN60D6811F
-7	00000069	. . . RESISTOR, 100 ohm \pm 10% 1/4W	1	RCO7GF101K
-8	00000207	. . . RESISTOR, 10 ohm \pm 1% 2W	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	32949
-19	20029101	. . . HEAT SINK	1	
-20	00000137	. . . TRANSISTOR, NPN, Power (04713) (Attaching Parts)	1	2N3771
-21	00000568	. . . SCREW, Machine, Phillips Head 6 - 32 x 5/8 Nickle 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, Nickle Brass Plate	2	
-26	00000567	. . . . WASHER, Insulating (13103)	1	43-03-04

-27	00000115	. . . INTEGRATED CIRCUIT, Regulator (Attaching Parts)	1	MC 1469R
-28	00000568	. . . . SCREW, Machine, Phillips Head, 6 - 32 x 5/8 Nickle Brass Plate	2	
-29	00000569	. . . . NUT, Plain, Hex 6 - 32, Nickle Brass Plate	2	
-30	00000445	. . . . WASHER, Lock internal tooth #6	4	
-31	00000491	. . . . WASHER, Nylon (95987)	2	NW-6-3124NA

-32	00000108	. COMPOUND, Heatsink, (13103)	A/R	

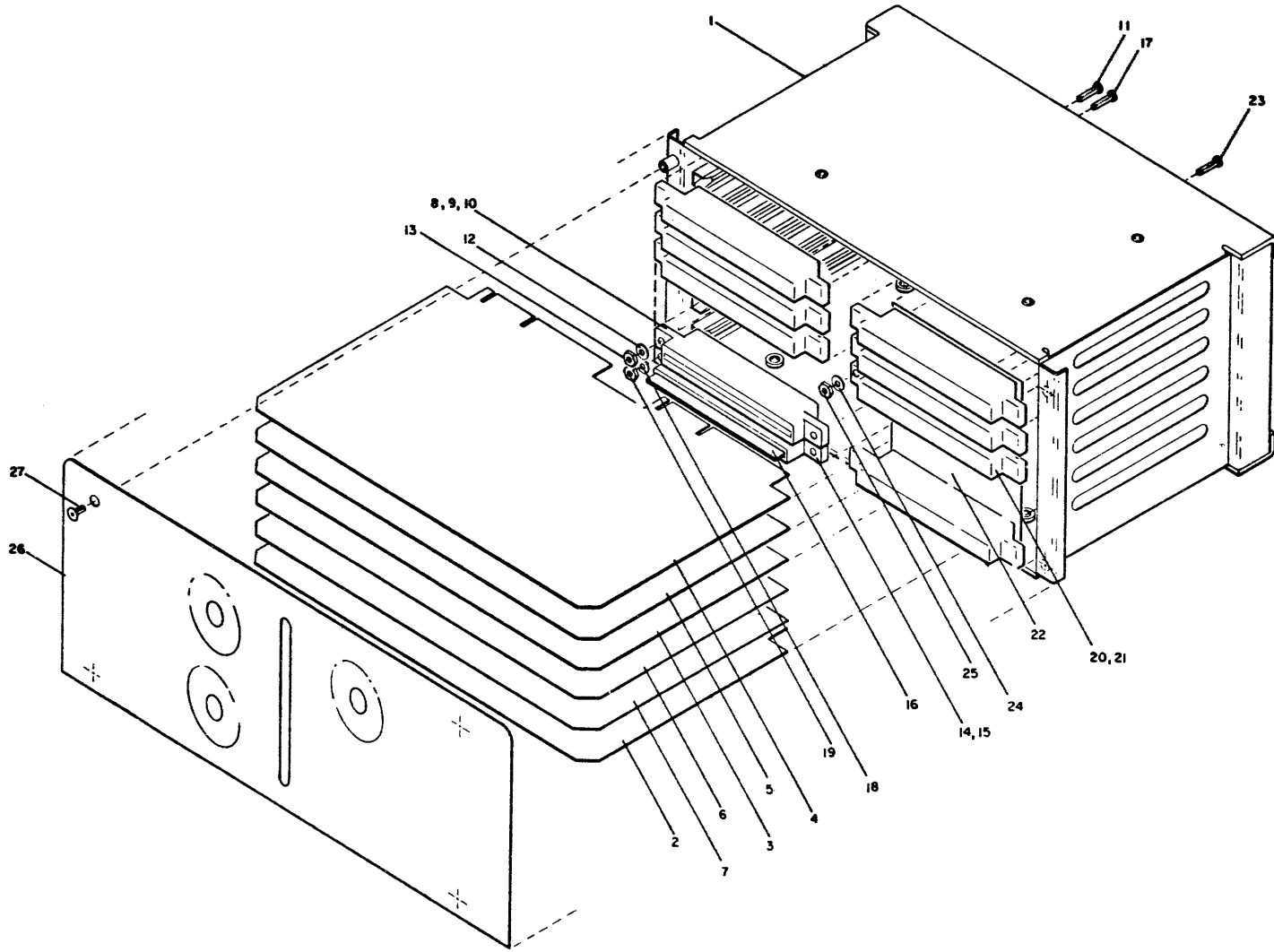


FIGURE 12-12 CARD FILE ASSEMBLY

FIGURE 12-12 CARD FILE ASSEMBLY

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY							VENDOR PART NO.	
			1	2	3	4	5	6	7		
	40083601	CARD FILE ASSEMBLY									
-1	30029401	. CARD CAGE W/GUIDES								1	
-2	40083301	. P. C. CARD ASSEMBLY, Control								1	
-3	40035302	. P. C. CARD ASSEMBLY, Sync								1	
-4	40076503	. P. C. CARD ASSEMBLY, Clock								1	
-5	40061007	. P. C. CARD ASSEMBLY, Error								1	
-6	40078601	. P. C. CARD ASSEMBLY, Driver								1	
	40087501	. P. C. CARD ASSEMBLY, Driver								1	
-7	40079101	. P. C. CARD ASSEMBLY, Receiver								1	
	40087601	. P. C. CARD ASSEMBLY, Receiver								1	
-8	00000029	. CONN HOUSING, Crimp, Snap-In (00779)								6	1-582191-5
-9	00000030	. PLUG, Keying (00779)								24	582501-1
-10	00000061	. SPRING, Retaining (00779) (Attaching Parts)								11	42973-2
-11	00000064	. . SCREW, Machine, Pan Head, SSL, 4 - 40 x 3/8								12	
-12	00000066	. . WASHER, Lock, internal tooth, #4								12	
-13	00000062	. . NUT, Plain, Hex, 4 - 40								12	
-14	00000032	. CONNECTOR, Single Row (00779)								1	583302-1
-15	00000702	. CONTACT, Connector (00779)								37	583259-2
-16	20036201	. BUS BAR, Connector (Attaching Parts)								1	
-17	00000064	. . SCREW, Machine, Pan Head, SSL 4 - 40 - 3/8								2	
-18	00000066	. . WASHER, Lock, Internal tooth #4								2	
-19	00000062	. . NUT, Plain, Hex 4 - 40								2	
-20	00000032	. CONNECTOR, Solder, TAB, Loaded (00779)								6	583334-1
-21	00000030	. PLUG, Keying (00779)								36	582501-1
-22	40032401	. P. C. CARD, Mother Board (Attaching Parts)								1	
-23	00000063	. . SCREW, Machine, Pan Head SSL 4 - 40 x 1/2								12	
-24	00000066	. . WASHER, Lock, internal tooth #4								12	
-25	00000062	. . NUT, Plain, Hex, 4 - 40								12	
-26	30083701	. COVER PLATE (Attaching Parts)								1	
-27	00000114	. . SCREW, Machine Button Head, BLK, 6 - 32 x 1/4								4	
-28	20063601	. CABLE ASSEMBLY, D. C. Power								1	
-29	00000017	. WIRE, Elec., #20 AWG, BRN, 8"								1	
-30	00000166	. WIRE, Elec., #24 AWG, WHT, 2.25" (92194)								2	1854/19-1
-31	00000014	. WIRE, Elec., #24 AWG, ORN, 2.25" (92194)								2	1854/19-8
-32	00000013	. WIRE, Elec., #24 AWG, BRN, 3.00" (92194)								1	1854/19-7
-33	00000011	. WIRE, Elec., #24 AWG, YEL, 2.25" (92194)								2	1854/19-5
-34	00000012	. WIRE, Elec., #24 AWG, BLU, 2.25" (92194)								3	1843/19-6
-35	00000010	. WIRE, Elec., #24 AWG, GRN, 2.25" (92194)								2	1854/19-4
-36	00000013	. WIRE, Elec., #24 AWG, BRN, 2.25" (92194)								1	1854/19-7
-37	00000009	. WIRE, Elec., #24 AWG, RED, 4.00" (92194)								1	1854/19-3
-38	00000166	. WIRE, Elec., #24 AWG, WHT, 3.00" (92194)								1	1854/19-1

CARD FILE ASSEMBLY (CONT'D)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
-39	00000011	.	WIRE, Elec., #24 AWG, YEL, 2.75"	(92194)					1	1854/19-5
-40	00000014	.	WIRE, Elec., #24 AWG, ORN, 2.75"	(92194)					1	1854/19-8
-41	00000166	.	WIRE, Elec., #24 AWG, WHT, 3.25"	(92194)					1	1854/19-1

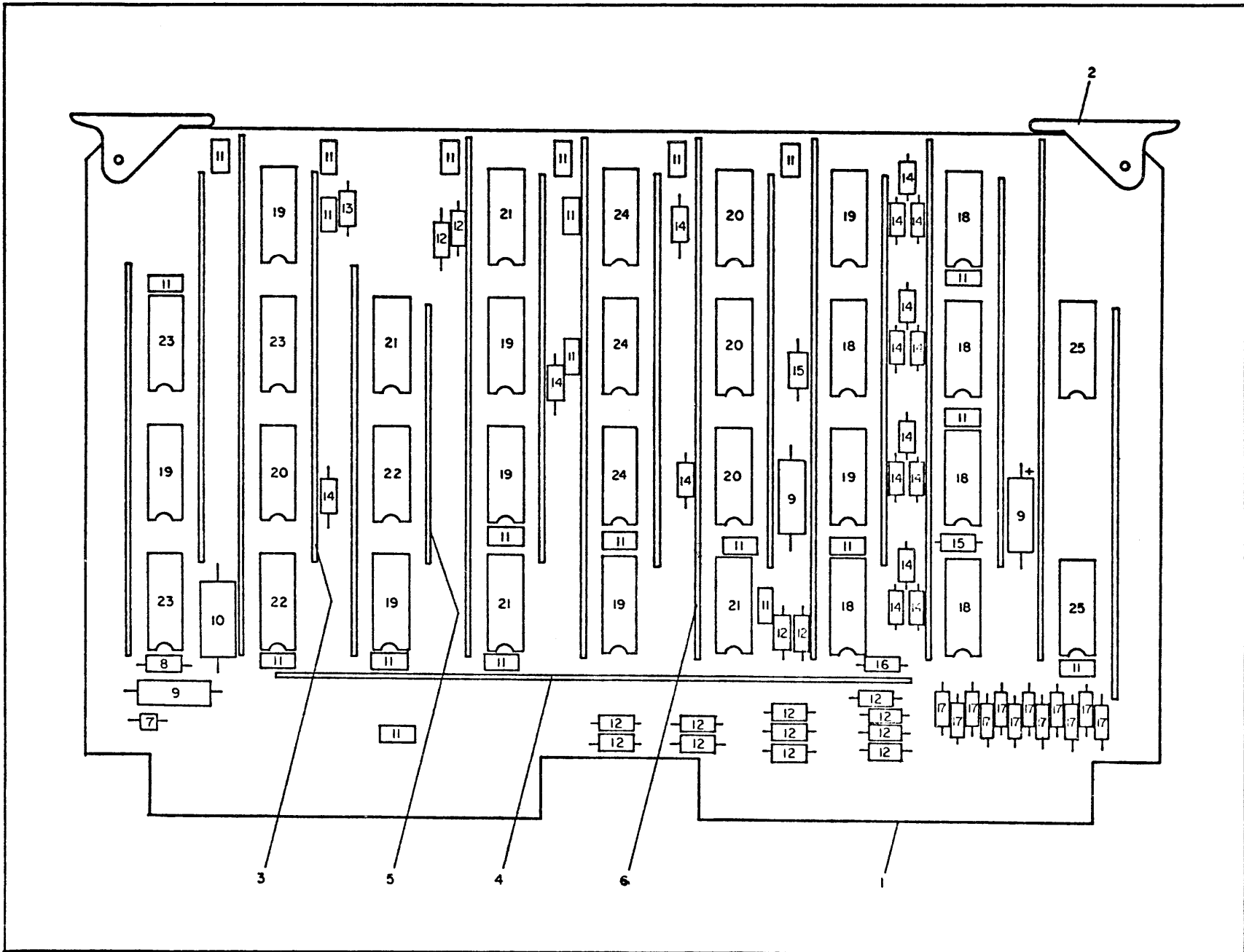


FIGURE 12-13 PC ASSEMBLY - CONTROL CARD

FIGURE 12-13 PC ASSEMBLY - CONTROL CARD

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY							VENDOR PART NO.
			1	2	3	4	5	6	7	
	40083301	PC ASSEMBLY, Control Card								
-1	40064901	. PRINTED CIRCUIT BOARD							1	
-2	00000060	. HANDLE, Extractor with roll pin (18617)							2	S-203
-3	20031104	. BUS BAR, 4 pin							10	
-4	20031106	. BUS BAR, 6 pin							1	
-5	20031103	. BUS BAR, 3 pin							1	
-6	20031105	. BUS BAR, 5 pin							7	
-7	00000088	. BEAD, Ferrite (33062)							1	21-030-F
-8	00000039	. DIODE, Zener 6.8V (04713)							1	IN5235
-9	00000025	. CAPACITOR, Elcc., 20 UF, 6V (03597)							3	76F02CC200
-10	00000024	. CAPACITOR, Mylar, 0.1 UF, 100V (03597)							1	BA12A1043
-11	00000023	. CAPACITOR, 0.01 UF, 100V (80813)							22	T6-S10
-12	00000080	. RESISTOR, 5.6K, $\pm 10\%$, 1/4 W							15	RC07GF562K
-13	00000075	. RESISTOR, 330 ohm, $\pm 10\%$, 1/4 W							1	RC07GF331K
-14	00000070	. RESISTOR, 1K, $\pm 10\%$, 1/4 W							16	RC07GF102K
-15	00000076	. RESISTOR, 470 ohm, $\pm 10\%$, 1/4 W							2	RC07GF471K
-16	00000069	. RESISTOR, 100 ohm, $\pm 10\%$, 1/4 W							1	RC07GF101K
-17	00000079	. RESISTOR, 560 ohm, $\pm 10\%$, 1/4 W							12	RC07GF561K
-18	00000049	. INTEGRATED CIRCUIT, Hex Inverter (18324)							6	N7405A
-19	00000050	. INTEGRATED CIRCUIT, Hex Inverter (18324)							8	N7404A
-20	00000043	. INTEGRATED CIRCUIT, 2 input DTL gate (07263)							4	UGA994659X
-21	00000124	. INTEGRATED CIRCUIT, Hex - Buffer, non, inv. (18324)							4	SN7417N
-22	00000046	. INTEGRATED CIRCUIT, Quad 2 input (18324)							2	N7400A
-23	00000044	. INTEGRATED CIRCUIT, Dual D flip flop (18324)							3	N7474A
-24	00000053	. INTEGRATED CIRCUIT, 4 bit counter (07263)							3	UGA937659
-25	00000057	. INTEGRATED CIRCUIT, Low power Hex inverter (07263)							2	UGA9L0459X
-26	00000020	. WIRE, Bus 18 AWG 7/16"							1	
-27	00000020	. WIRE, Bus 18 AWG 11/16"							1	
-28	40083501	. SCHEMATIC (See Figure 10-8)								

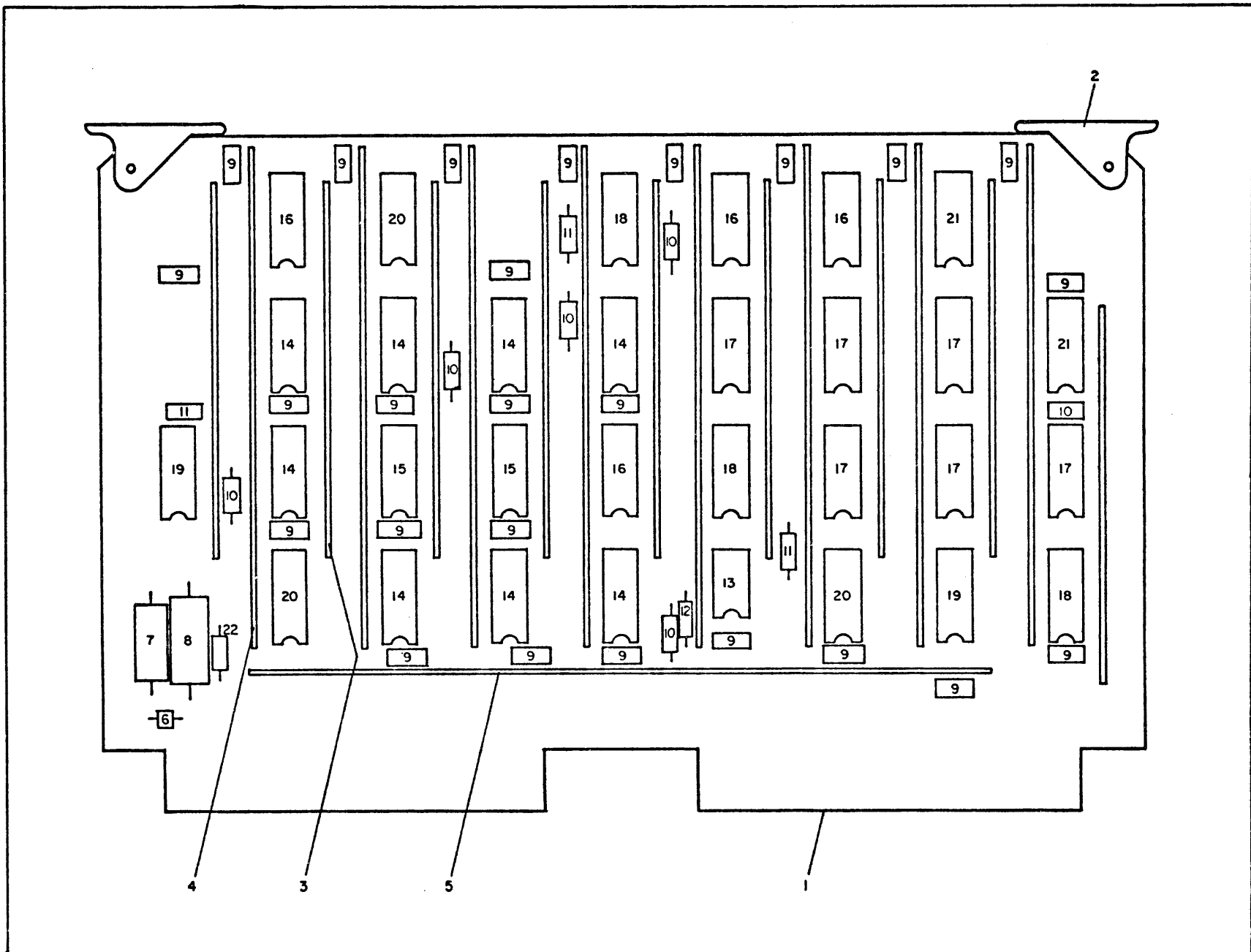


FIGURE 12-14 PC ASSEMBLY - SYNC CARD

FIGURE 12-14 PC ASSEMBLY - SYNC CARD

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40035301	PC ASSEMBLY, Sync Card								
-1	40060101	. BOARD, Printed circuit							1	
-2	00000060	. HANDLE, Extractor with roll pin (18677)							2	S-20-3
-3	20031105	. BUS BAR, 5 pin							8	
-4	20031104	. BUS BAR, 4 pin							9	
-5	20031107	. BUS BAR, 7 pin							1	
-6	00000088	. BEAD, Ferrite (33062)							1	21-030F
-7	00000025	. CAPACITOR, Electrolytic, 20 UF, 6V (03597)							1	76F02CC200
-8	00000024	. CAPACITOR, Mylar, .1 UF, 100V (03597)							1	BA12A104B
-9	00000023	. CAPACITOR, .01 UF, 50V (80183)							25	TG-S10
-10	00000070	. RESISTOR, 1K OHM, $\pm 10\%$, 1/4 W							6	RCO7GF102K
-11	00000076	. RESISTOR, 470 ohm, $\pm 10\%$, 1/4 W							3	RCO7GF471K
-12	00000072	. RESISTOR, 220 ohm, $\pm 10\%$, 1/4 W							1	RCO7GF221K
-13	00000042	. INTEGRATED CIRCUIT, Hybrid driver (07883)							1	NH0017CN
-14	00000054	. INTEGRATED CIRCUIT, Counter register							8	N8281ADC
-15	00000055	. INTEGRATED CIRCUIT, 4 bit comparator, O. C. (18324)							2	N8242A
-16	00000047	. INTEGRATED CIRCUIT, Single 8 input gate (18324)							4	N7430A
-17	00000044	. INTEGRATED CIRCUIT, Dual D flip flop (18324)							6	N7474A
-18	00000045	. INTEGRATED CIRCUIT, Dual 4 input buff (18324)							3	N7440A
-19	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)							2	N7400A
-20	00000050	. INTEGRATED CIRCUIT, Hex inverter (18324)							3	N7404A
-21	00000053	. INTEGRATED CIRCUIT, Counter register (18324)							2	N8280ADC
-22	00000039	. DIODE 6.8V, Zener (04713)							1	IN5235
-23	00000020	. WIRE, Bus, #18 GA, 11/16							1	
-24	40060401	. SCHEMATIC (See Figure 10-18)								

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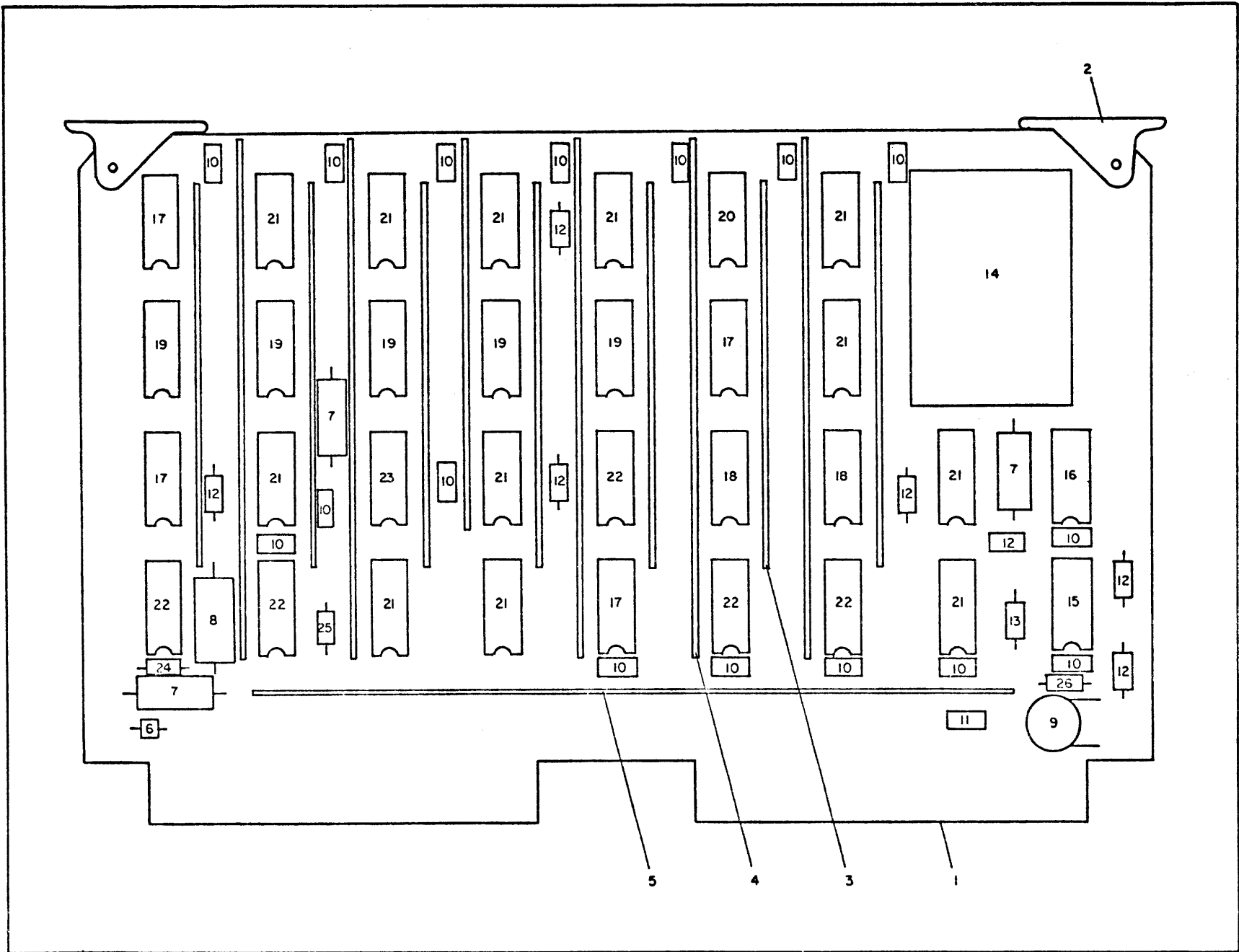


FIGURE 12-15 PC ASSEMBLY - CLOCK CARD

FIGURE 12-15 PC ASSEMBLY - CLOCK CARD

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40076503	PC ASSEMBLY, Clock Card								
-1	40079901	. BOARD, Printed circuit							1	
-2	00000060	. HANDLE, Extractor with roll pins (18677)							2	S-203
-3	20031104	. BUS BAR, 4 pin							8	
-4	20031105	. BUS BAR, 5 pin							5	
-5	20031107	. BUS BAR, 7 pin							1	
-6	00000088	. BEAD, Ferrite (33062)							1	21-030-F
-7	00000025	. CAPACITOR, Electrolytic, 20 UF, 6V (03597)							3	76F02CC200
-8	00000024	. CAPACITOR, Mylar, .1 UF, 100V (03597)							1	BA12A104A
-9	00000022	. CAPACITOR, .02 UF, 100V (80183)							1	TG-S20
-10	00000023	. CAPACITOR, .01 UF, 100V (80183)							16	TG-S10
-11	00000077	. RESISTOR, 4.7K, $\pm 10\%$, 1/4 W							1	RCO7GF472K
-12	00000070	. RESISTOR, 1K $\pm 10\%$, 1/4 W							7	RCO7GF102K
-13	00000073	. RESISTOR, 2.2K $\pm 10\%$, 1/4 W							1	RCO7GF222K
-14	00000067	. OSCILLATOR, Crystal, 4.8 MHz (04713)							1	K1035A00710
-15	00000056	. INTEGRATED CIRCUIT, Comparator (07886)							1	LM311D
-16	00000053	. INTEGRATED CIRCUIT, Counter Register (18324)							1	N3280ADC
-17	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)							4	N7400A
-18	00000048	. INTEGRATED CIRCUIT, 3 input gate (18324)							2	N7410A
-19	00000047	. INTEGRATED CIRCUIT, 8 input gate (18324)							5	N7430A
-20	00000045	. INTEGRATED CIRCUIT DUAL, 4 input gate (18324)							1	N7440A
-21	00000044	. INTEGRATED CIRCUIT, Dual D flip flop (18324)							12	N7474A
-22	00000050	. INTEGRATED CIRCUIT, Hex inverter (18324)							5	N7404A
-23	00000124	. INTEGRATED CIRCUIT, Hex buff, Non inv. O. C. (18324)							1	N7417A
-24	00000039	. DIODE, Zener, 6.8V (04713)							1	IN5235
-25	00000080	. RESISTOR, 5.6K, $\pm 10\%$, 1/4 W							1	RCO7GF562K
-26	00000225	. RESISTOR, 100K, $\pm 10\%$, 1/4 W							1	RCO7GF104K
-27	00000020	. WIRE, Bus, #18 AWG, 11/16							1	
-28	40080003	. SCHEMATIC (See Figure 10-11)								

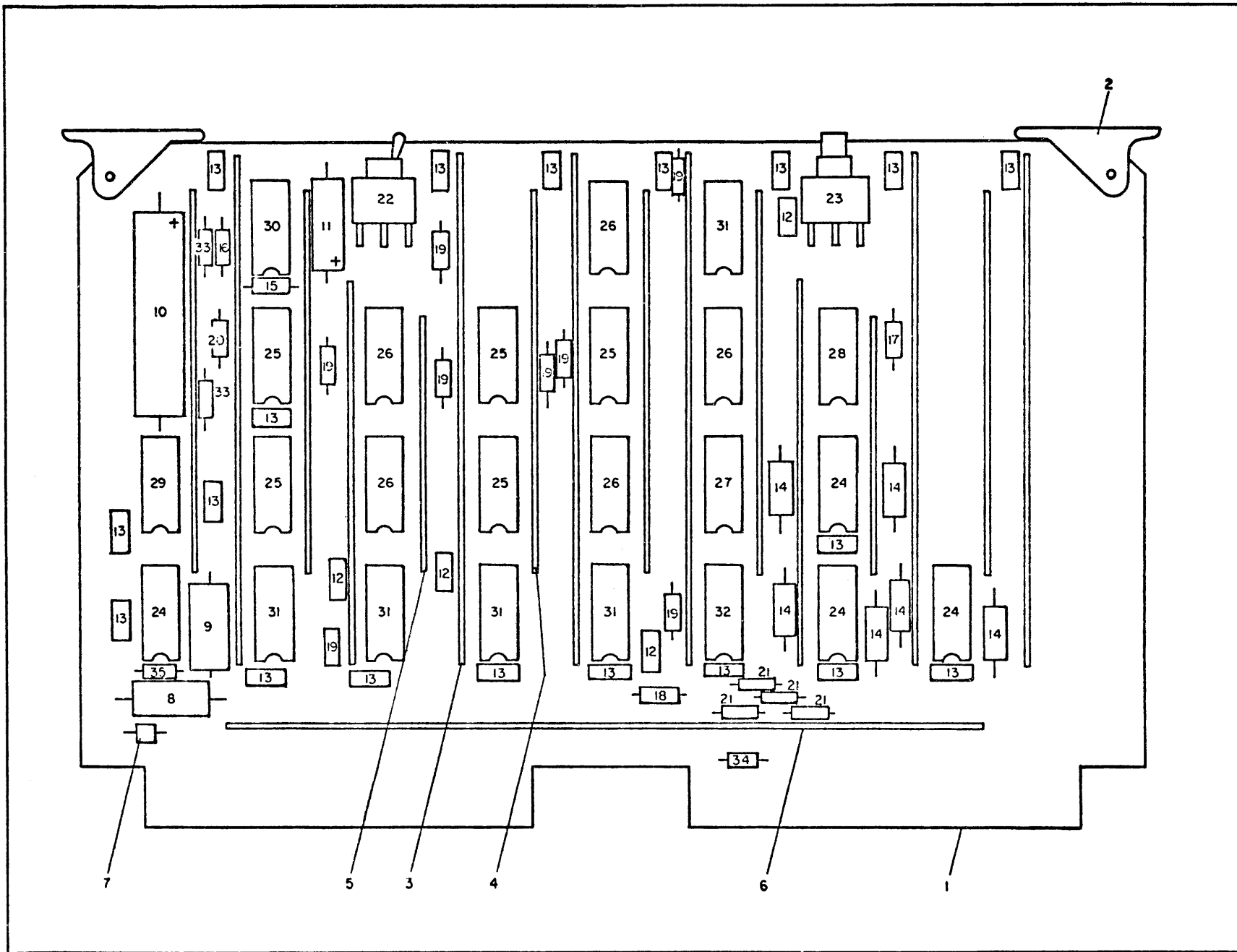


FIGURE 12-16 PC ASSEMBLY - ERROR CARD

FIGURE 12-16 PC ASSEMBLY - ERROR CARD

FIG. INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY							VENDOR PART NO.	
			1	2	3	4	5	6	7		
	40061007	PC ASSEMBLY, Error Card									
-1	40060901	. BOARD, Printed circuit								1	
-2	00000060	. HANDLE, Extractor with roll pins (18677)								2	S-203
-3	20031105	. BUS BAR, 5 pin								6	
-4	20031104	. BUS BAR, 4 pin								8	
-5	20031103	. BUS BAR, 3 pin								2	
-6	20031107	. BUS BAR, 7 pin								1	
-7	00000088	. BEAD, Ferrite (33062)								1	21-030-F
-8	00000025	. CAPACITOR, 20 UF, 6V (03597)								1	76F02CC200
-9	00000024	. CAPACITOR, 0.1 UF, 100V (03597)								1	BA12A104B
-10	00000026	. CAPACITOR, 400 UF, 6V (03597)								1	76F02CM401
-11	00000027	. CAPACITOR, 30 UF, 12V (03597)								1	76F02ED300
-12	00000021	. CAPACITOR, .22 UD, 25V (80183)								4	2C023224X0250A3
-13	00000023	. CAPACITOR, 0.01 UF, 100V (80183)								19	TG-S10
-14	00000081	. RESISTOR, 68 ohm, $\pm 10\%$, 1/2 W								6	RC20GF68OK
-15	00000071	. RESISTOR, 10K OHM, $\pm 10\%$, 1/4 W								1	RCO7GF103K
-16	00000068	. RESISTOR, 10 ohm, $\pm 10\%$, 1/4 W								1	RCO7GF100K
-17	00000076	. RESISTOR, 470 ohm, $\pm 10\%$, 1/4 W								1	RCO7GF471K
-18	00000079	. RESISTOR, 560 ohm, $\pm 5\%$, 1/4 W								1	RCO7GF561K
-19	00000070	. RESISTOR, 1K OHM								8	RCO7GF102K
-20	00000841	. RESISTOR, 33K OHM, $\pm 10\%$, 1/4 W								1	RCO7
-21	00000080	. RESISTOR, 5.6K OHM, $\pm 10\%$, 1/4 W								4	RCO7GF562K
-22	00000083	. SWITCH, SPDT, PC mount (09353)								1	7101A
-23	00000082	. SWITCH, SPDT, Push, P. C. mount (09353)								1	P8121R
-24	00000051	. INTEGRATED CIRCUIT, Driver (01295)								4	SN75450N
-25	00000044	. INTEGRATED CIRCUIT, Dual D type F. F. (18324)								5	N7474A
-26	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)								5	N7400A
-27	00000047	. INTEGRATED CIRCUIT, Single 8 input gate (18324)								1	N7430A
-28	00000048	. INTEGRATED CIRCUIT, Triple 3 input gate (18324)								1	N7410A
-29	00000052	. INTEGRATED CIRCUIT, Delay Element (07263)								1	UGA960159X
-30	00000043	. INTEGRATED CIRCUIT, Quad 2 input DTL gate (07263)								1	UGA994659X
-31	00000050	. INTEGRATED CIRCUIT, Hex inv. (15324)								5	N7404A
-32	00000124	. INTEGRATED CIRCUIT, Hex Buff, Non inv., D. C. (18324)								1	N7417A
-33	00000041	. DIODE, Signal								2	IN914
-34	00000040	. DIODE								1	IN4003
-35	00000039	. DIODE, Zener, 6.8V (04713)								1	IN5235
-36	00000020	. WIRE, Bus, AWG 18, solid 11/16								1	
-37	40060801	. SCHEMATIC (See Figure 10-15)									

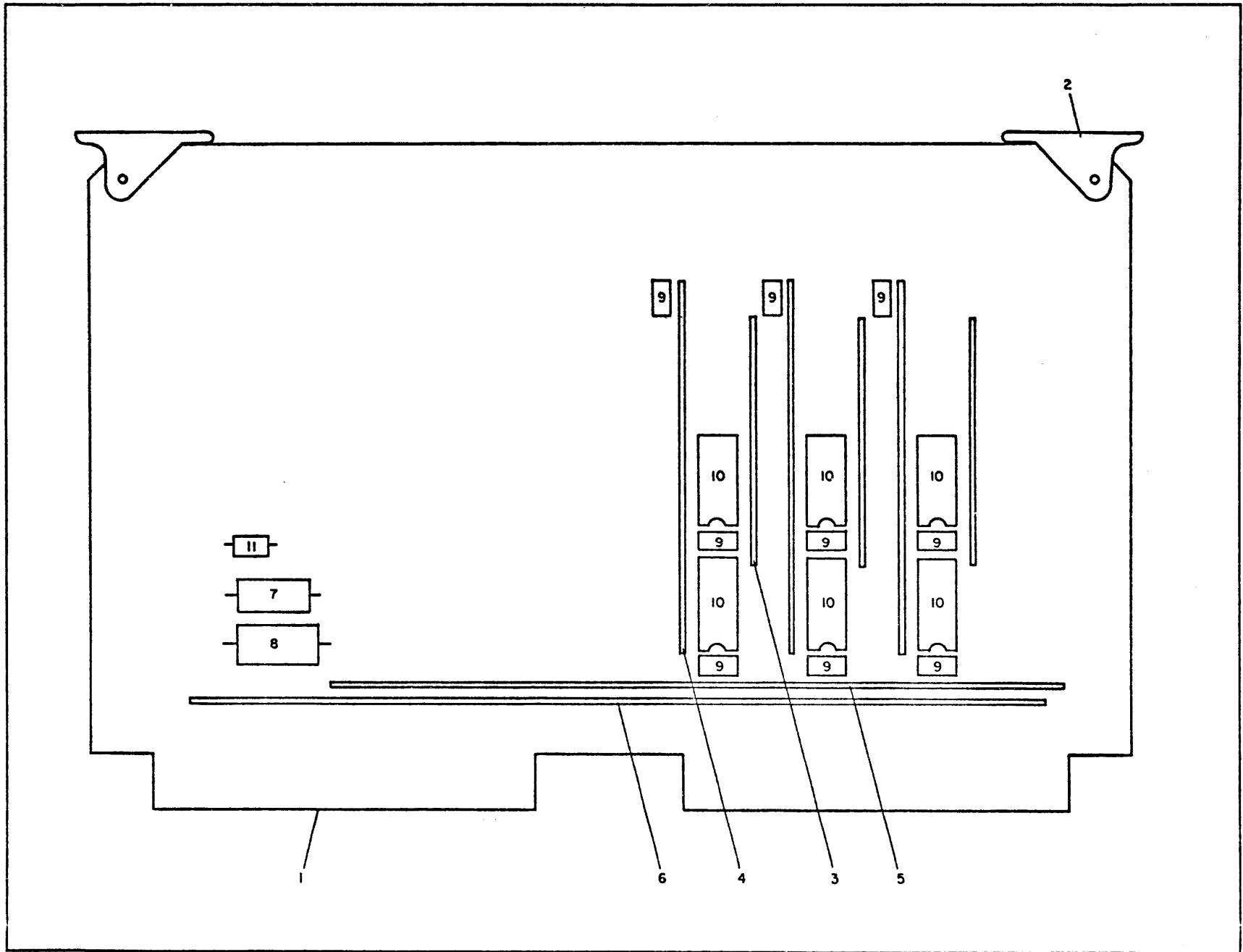


FIGURE 12-17 P.C. ASSEMBLY, DRIVER CARD (Model 2893A)

FIGURE 12-17 P. C. ASSEMBLY, DRIVER CARD (Model 2893A)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40078601	PC ASSEMBLY, Driver								
-1	40078501	. BOARD, Printed circuit							1	
-2	00000060	. HANDLE, Extractor with roll pins (18677)							2	S-203
-3	20031103	. BUS BAR, 3 pin							3	
-4	20031104	. BUS BAR, 4 pin							3	
-5	20031107	. BUS BAR, 7 pin							1	
-6	20031103	. BUS BAR, 8 pin							1	
-7	00000025	. CAPACITOR, 20 UF, 6V (03597)							1	76F02CC200
-8	00000024	. CAPACITOR, .10 UF, 100V (03597)							1	BA12A104B
-9	00000023	. CAPACITOR, .01 UF, 100V (80183)							9	TG-S10
-10	00000116	. INTEGRATED CIRCUIT, Dual Diff, Line Driver (07886)							6	DM8930AN
-11	00000039	. DIODE, Zener, 6.8V							1	DN5235
-12	40078701	. SCHEMATIC (See Figure 10-22)								

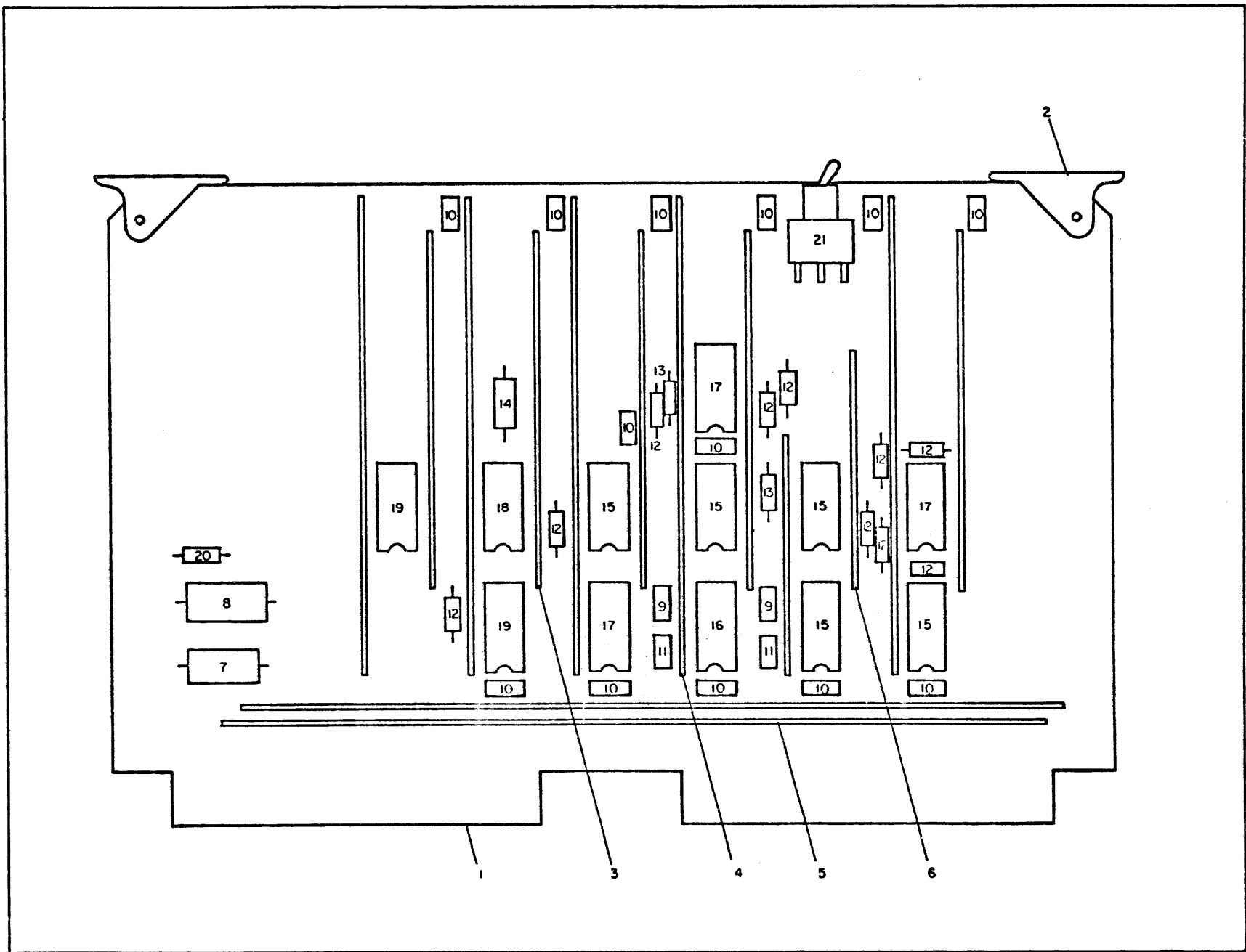


FIGURE 12-18 P. C. ASSEMBLY, RECEIVER CARD (Model 2893A)

FIGURE 12-18 P. C. ASSEMBLY, RECEIVER CARD (Model 2893A)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40079101	PC ASSEMBLY, Receiver								
-1	40079001	. BOARD, Printed circuit							1	
-2	00000060	. HANDLE, Extractor with roll pins (18677)							2	S-203
-3	20031104	. BUS BAR, 4 pin							5	
-4	20031105	. BUS BAR, 5 pin							5	
-5	20031108	. BUS BAR, 8 pin							2	
-6	20031103	. BUS BAR, 3 pin							2	
-7	00000025	. CAPACITOR, 20 UF, 6V (03597)							1	76F02CC200
-8	00000024	. CAPACITOR, 0.1 UF, 100V (03597)							1	BA12A104B
-9	00000193	. CAPACITOR, 100 PF (Centralab)							2	DD101
-10	00000023	. CAPACITOR, .01 UF, 100V (80183)							13	TG-S10
-11	00000192	. CAPACITOR, .002 UF (Centralab)							2	DD202
-12	00000070	. RESISTOR, 1K, $\pm 10\%$ 1/4 W							10	RCO7GF102K
-13	00000076	. RESISTOR, 470 ohm, $\pm 10\%$, 1/4 W							2	RCO7GF471K
-14	00000081	. RESISTOR, 68 ohm, $\pm 10\%$, 1/2 W							1	RN20GF680K
-15	00000116	. INTEGRATED CIRCUIT, Dual Diff Line Driver (07886)							5	DM8830AN
-16	00000117	. INTEGRATED CIRCUIT, Dual Line Receiver (07886)							1	DM8820AN
-17	00000044	. INTEGRATED CIRCUIT, Dual D Type FF (18324)							3	N4747A
-18	00000051	. INTEGRATED CIRCUIT, Driver (01295)							1	SN75450N
-19	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (19324)							2	N7400A
-20	00000039	. DIODE, Zener, 6.8V							1	IN5235
-21	00000083	. SWITCH, SPST, P. C. mount (C & K)							1	7101A
-22	00000198	. JUMPER, (Speer)							1	
-23	40079201	. SCHEMATIC (See Figure 10-24)								

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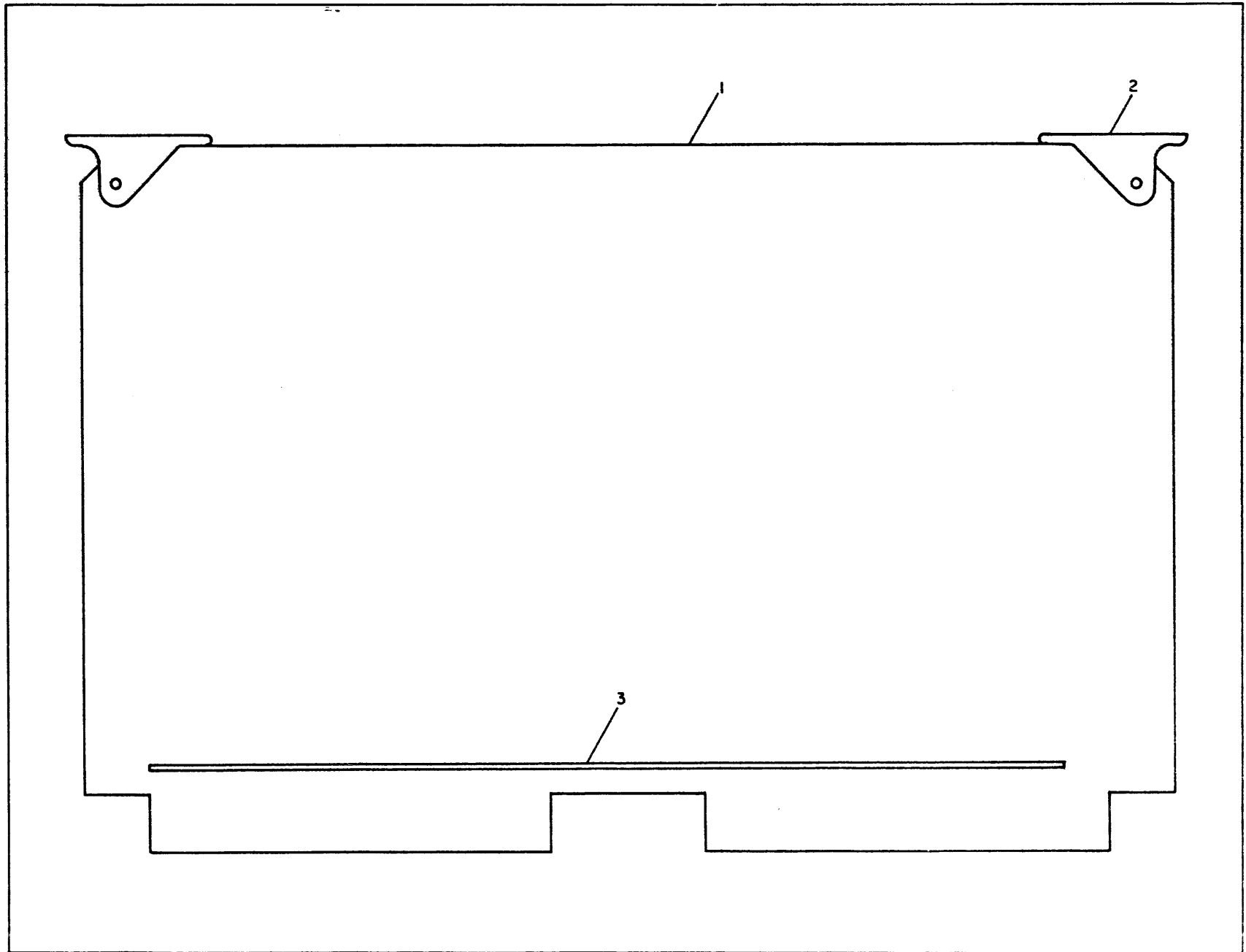


FIGURE 12-19 P. C. ASSEMBLY, DRIVER CARD (Model 2892A)

FIGURE 12-19 P. C. ASSEMBLY, DRIVER CARD (Model 2892A)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40087501	P. C. ASSEMBLY, Driver, Jumper								
-1	40090201	. PRINTED CIRCUIT BOARD							1	
-2	00000060	. HANDLE, Extractor with Roll Pins (18617)							2	S - 203
-3	20031108	. BUS BAR, 8 Pins							1	
-4	40087501	. SCHEMATIC (See Fig. 10-23)								

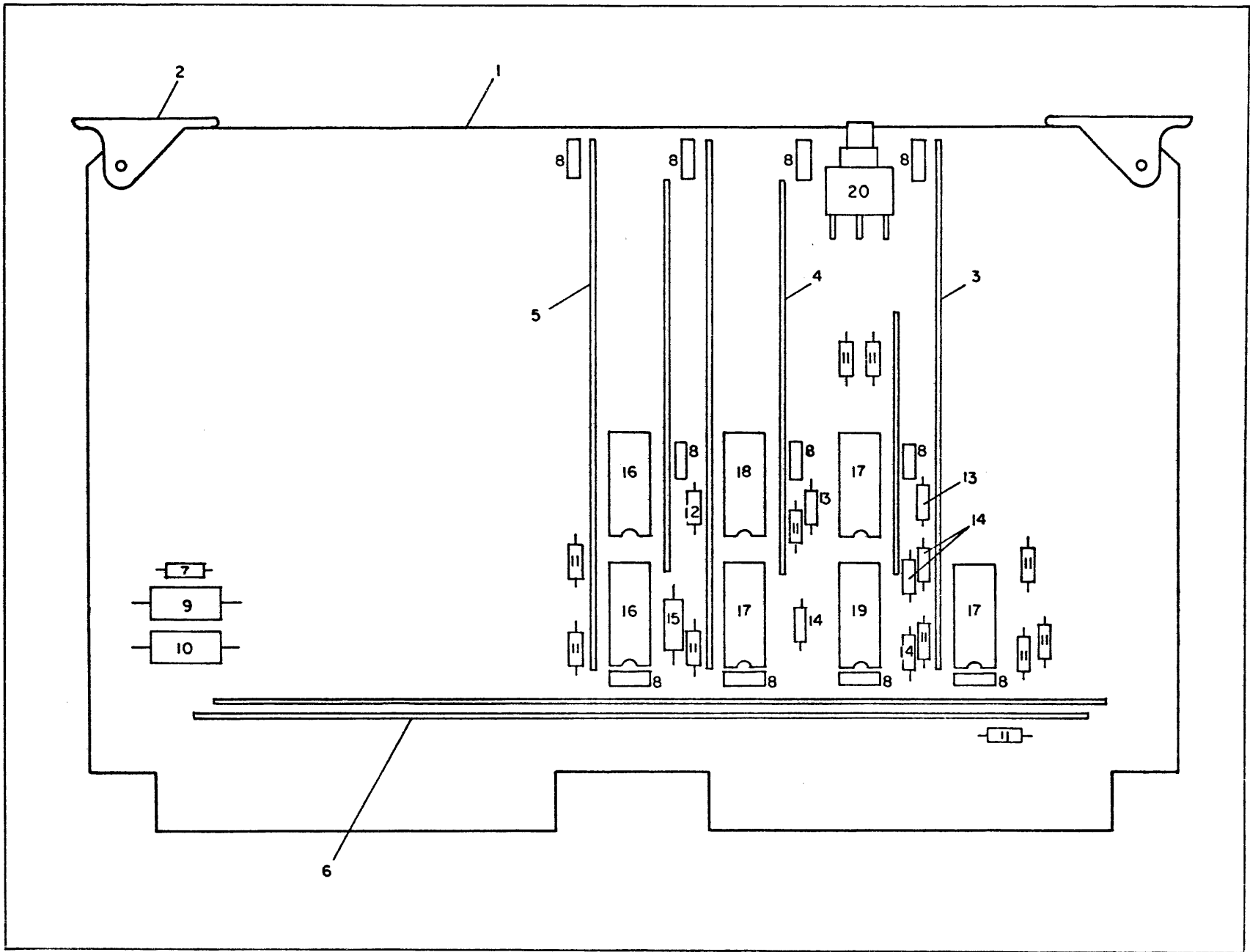


FIGURE 12-20 P. C. ASSEMBLY, RECEIVER CARD (Model 2892A)

FIGURE 12-20 P. C. ASSEMBLY, RECEIVER CARD (Model 2892A)

FIG. INDEX NO.	PART NUMBER	DESCRIPTION							UNITS PER ASSY	VENDOR PART NO.
		1	2	3	4	5	6	7		
	40087601	P. C. ASSEMBLY, Receiver								
-1	40089801	. PRINTED CIRCUIT BOARD							1	
-2	00000060	. HANDLE, Extractor with Roll Pins (18617)							2	S - 203
-3	20031103	. BUS BAR, 3 pin							1	
-4	20031104	. BUS BAR, 4 pin							2	
-5	20031105	. BUS BAR, 5 pin							3	
-6	20031108	. BUS BAR, 8 pin							2	
-7	00000039	. DIODE, Zener 6.8V (04713)							1	
-8	00000023	. CAPACITOR, .01 μ f, 100V (80813)							11	TG - S10
-9	00000024	. CAPACITOR, .1 μ f, 100V (03597)							1	BA12A1043
-10	00000025	. CAPACITOR, 20 μ f, 6V (03597)							1	76F02CC200
-11	00000070	. RESISTOR, 1K, \pm 10%, 1/4W							11	RCO7GF102K
-12	00000075	. RESISTOR, 330 ohm, \pm 10%, 1/4W							1	RCO7GF331K
-13	00000076	. RESISTOR, 470 ohm, \pm 10%, 1/4W							2	RCO7GF471K
-14	00000240	. RESISTOR, 6.8K, \pm 10%, 1/4W							4	RCO76GF682K
-15	00000081	. RESISTOR, 68 ohm, \pm 10%, 1/2W							1	RCO20GF680K
-16	00000046	. INTEGRATED CIRCUIT, Quad 2 input gate (18324)							2	N7400A
-17	00000044	. INTEGRATED CIRCUIT, Dual D type Flip Flop (18324)							3	N7474A
-18	00000051	. INTEGRATED CIRCUIT, Driver (01295)							1	SN75450N
-19	00000123	. INTEGRATED CIRCUIT, Hex Inverter (01295)							1	SN7416N
-20	00000083	. SWITCH, SPDT, P. C. Mount (09353)							1	7101A
-21	40090001	. SCHEMATIC (See Figure 10-26)								

BACKDATING SUPPLEMENT

To make this manual applicable to HP 2892A Card Readers having serial numbers prefixed 1208, replace pages 3-3, 3-4, 4-7, 4-8, 10-1, 10-5, and 10-6 in the basic manual with like numbered pages located in this backdating supplement.

2892A / 2893A Card Reader

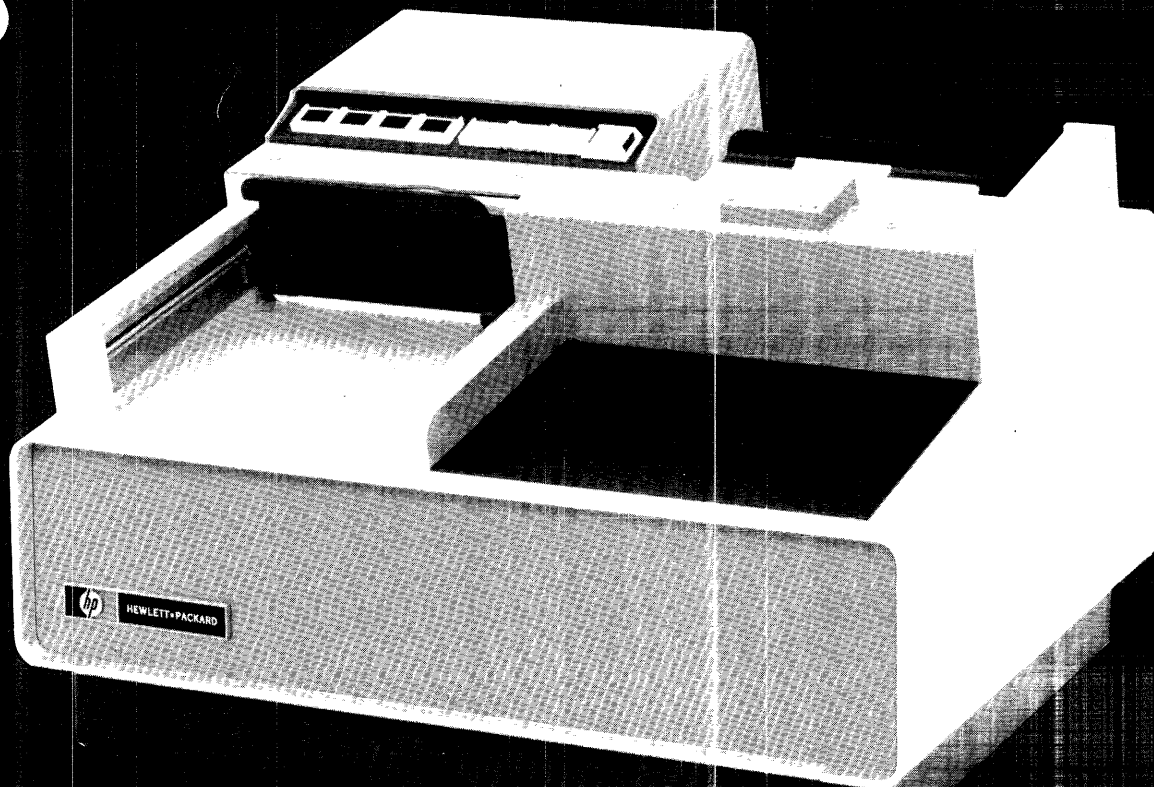
Features

- Reads punched cards 600 cards per minute
- Vacuum card picking
- Slant-top design for smooth card flow
- Straight-through card-track for long card life
- Jam-proof operation
- 1000 card hopper/stacker

The HP 2892A and 2893A Card Readers provide medium-speed, dependable card reading capability for Hewlett-Packard computer systems. A vacuum pick mechanism is used in conjunction with riffle air for ease of card picking and minimum card wear. This technique also permits extremely high tolerance to damaged or worn cards. The card track is very short so that at no time is more than one card in motion. Card life is in excess of 1000 passes for virtually unlimited card life.

The many checking features of the 2892A and 2893A insure safe, dependable operation. These include light/dark check, motion check, pick-check for stapled cards, and hopper checks.

The 2892A is used with HP 2100-based computer systems and the 2893A with the HP System/3000. Both units are identical functionally, the only differences being in the type of interfacing each employs. Either the 2892A or 2893A is easily included with your HP computer system. All interface and software requirements for card reader operation with the appropriate computer system are supplied with the unit.



HEWLETT  PACKARD

Specifications

2100-BASED SYSTEMS

Software allows operation with HP Assembly Language, FORTRAN and ALGOL programs. SIO (non-interrupt), BCS (interrupt), Disc Operating System and Real-Time Executive Drivers are available.

HP SYSTEM/3000

Software provided with the Multiprogramming Executive (MPE/3000) allows for operation from any programming language available with HP System/3000.



Specifications

CARD RATE

600 cards/minute

CARD TYPE

Standard 80-column EIA card

HOPPER/STACKER

1000 card capacity

CARD LIFE

Excess of 1000 passes

LIGHT SOURCE

Infrared light emitting diodes

HEWLETT *hp* **PACKARD**

For more information, call your local HP Sales Office or East (201) 265-5000, Midwest (312) 677-0400, South (404) 436-6181, West (213) 877-1282.

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READ STATION

Photo transistor, 12 bits simultaneously

INTERNAL CLOCK

Crystal Oscillator

CONTROLS

Stop Switch

Reset Switch

End of File Switch

Power Switch

INDICATORS

Read Check Indicator

Motion Check Indicator

Pick Check Indicator

Hopper/Stacker Indicator

DATA FORMATTING

System/3000 interface controller provides Hollerith to ASCII conversion with packing; packed binary formatting (packs four columns into six bytes); and column binary conversion (each column plus four leading zeros packed into two bytes). Data formatting is provided by software subroutine in 2100-based systems.

POWER REQUIREMENTS

Load:

1000 VA Starting Load,

450 VA Running Load

Voltage:

115V $\pm 10\%$, 60Hz $\pm 2\%$

230V $\pm 10\%$, 50Hz $\pm 2\%$

115V $\pm 10\%$, 50Hz $\pm 2\%$

PHYSICAL

Height: 16-1/4 inches (413 mm)

Width: 23-1/16 inches (586 mm)

Depth: 18 inches (457 mm)

Weight: 75 lbs (34 kg)

Shipping Weight: 100 lbs (45.4 kg)

ORDERING INFORMATION

2100-Based Systems

A. 2892A Card Reader, 115V: 60Hz operation

B. 2892A-015 Card Reader, 230V, 50Hz operation

C. 2892A-020 Card Reader, 115V, 50Hz operation

D. 12924A Interface Kit: Includes interface card, inter-connecting cable and all necessary software for operation with HP 2100-Based Computer Systems.

Interface Power Requirements for 2100-Series Computers
0.43A (-2V); 0.97A (+4.5V)

HP System/3000

A. 30106A Input/Output Subsystem: Includes the 2893A Card Reader and interface for use with HP 3000 computer systems

B. 30106A-015: Same as A except 230V, 50Hz operation

