CONTROL DATA®

CARD READERS

CB104/105/106
CB202/203

INTRODUCTION
OPERATING INSTRUCTIONS
INSTALLATION & CHECKOUT
THEORY OF OPERATION
MAINTENANCE
DIAGRAMS
PARTS DATA

CONTROL DATA
CORPORATION

REFERENCE/HARDWARE MAINTENANCE MANUAL

RECORD of REVISIONS

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PREFACE

This manual contains information for understanding the theory and operation of the CONTROL DATA ® CB10X/20X Card Reader. Also included is information for installation, checkout, maintenance, and parts.

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SECTION I

INTRODUCTION

Section I - INTRODUCTION

1-1. GENERAL

The description consists of general and physical characteristics, as well as interface descriptions and available options.

1-2. GENERAL DESCRIPTION

The Reader (Figure 1-1) is an input peripheral device. It is a column-oriented device which reads data represented by punched holes, presented upon 80 column or 51 column tabulating cards. Excluded are black cards or cards with detectable, non-reflecting marks on the unprinted side of the card; i.e., cards should conform to ANSI STD X3.21 - 1967. Model configurations are available, providing for speed options ranging from 300 to 800 cpm, a card capacity of 1000 cards, and an input power capability of 50 or 60 Hz. One model is also available which may be used with either punched cards or marked cards. Marked cards have data represented by pencil marks rather than punched holes. The Reader contains an electromechanical card transport that includes a hopper and solenoid-operated feeder, reflective read station, card transport roller, stacker, associated drive components, and dc power supply.

When properly powered up and loaded, operation of the reader is automatically controlled by an associated controller. Data is read in response to commands issued by the controller. Cards are transported individually, column by column, past a fiber optic read station. The data is detected by the fiber optics and transferred to a bank of phototransistors mounted on the rear of the read station. These phototransistors convert the visual data to electrical signals. Self-contained data and control logic sends the 12-bit parallel data to the interface connector (data output pins) where it is available to the computer. Cards may be added to the input hopper, provided that 100 or more cards remain in the hopper. Cards may be removed from the output stacker at any time while cards are being processed. The Reader may be operated Off-Line for the purpose of maintenance through the use of maintenance switches located on the Control Board and Data Board. Table 1-1 describes the difference between the reader models.

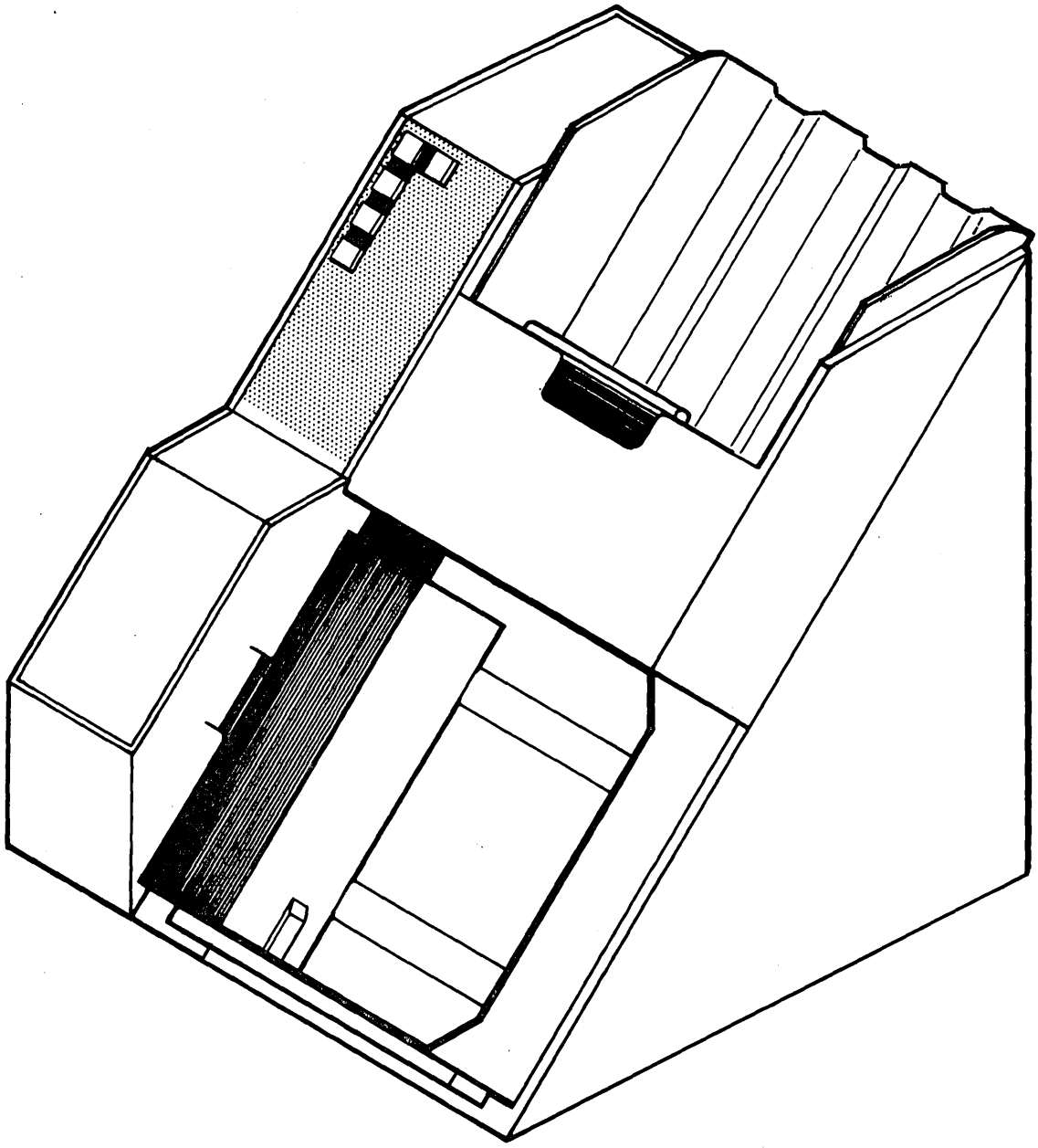


Figure 1-1. Card Reader (Optical Hole Reader Version)

Table 1-1. DIFFERENCE DATA

READER CHARACTERISTICS	CB104	CB105	CB106	CB202	CB203
SPEED (CPM)	300, 600	300, 400 600, and 800	300	300, 600	300, 400 600, and 800
HOPPER/STACKER CAPACITY	1000	1000	1000	1000	1000
INPUT DATA FORM	Punched	Punched	Punched	Punched or Marked	Punched or Marked

NOTE: Suffix notations; e.g., CB104C are used to designate primary frequency as: A, C, E = 60 Hz and B, D, F = 50 Hz.

1-3. PHYSICAL DESCRIPTION

The reader is a completely self-contained unit, provided with an input hopper, card feed mechanism, read station, output stacker, control logic, and data buffer electronics, as well as an integral power supply. An operator control panel (upper left of unit) provides the controls and indicators necessary to initialize or stop unit operation and to monitor the several status alarms (See Section II). The entire left side decorative panel is hinged and held secure by bayonet-type, snap-open disconnects to permit ready access to the read station and feed mechanism components.

Control logic and data buffer electronics are contained upon boards fixed to the inside of the rear panel. Two screw type fasteners are located along the upper edge of the hinged panel, permitting access during maintenance operations. Mounted directly behind the input hopper is an internal base plate on which is mounted the Data Amplifier Board, transport motor, and pulley components. All signal connections are made via ribbon-type cable and connectors.

Power and signal interface receptacles and three fuses are located at the rear of the unit along the lower main frame of the cabinet. The fuses are contained by bayonet, twist-lock receptacles (See Operator Maintenance, Section II). Table 1-2 describes the card reader specifications.

Table 1-2. CARD READER SPECIFICATIONS

CHARACTERISTICS	SPECIFICATIONS			
Dimensions and Weight	US Units	Metric Units		
Height	16.8 inches	43 centimeters		
Width	15.8 inches	40 centimeters		
Depth	19.5 inches	49.5 centimeters		
Weight	55 pounds	25 kilograms		
Environmental				
Temperature	50° F to 95° F with a maximum gradient of 0.2° F per minute (Operating) -30° F to 150° F with a maximum gradient of 20° F per hour (Non-Operating)			
Relative Humidity	20% to 80% without condensation (Operating) 5% to 95% without condensation (Non-Operating)			
Altitude	-1000 to 10,000 feet (Operating) -1000 to 15,000 feet (Non-Operating)			
Heat Dissipation	1100 BTU per hour (maximum)			
Electrical				
Input Power Requirements	Freq.	Voltage	Current	Limiting Values
	60 Hz	115V, 1ϕ	5 amp nominal	104-127 VAC 59.0-60.6 Hz
	50 Hz	230V, 1ϕ	3 amp nominal	207-246 VAC 49.0-50.5 Hz

NOTE

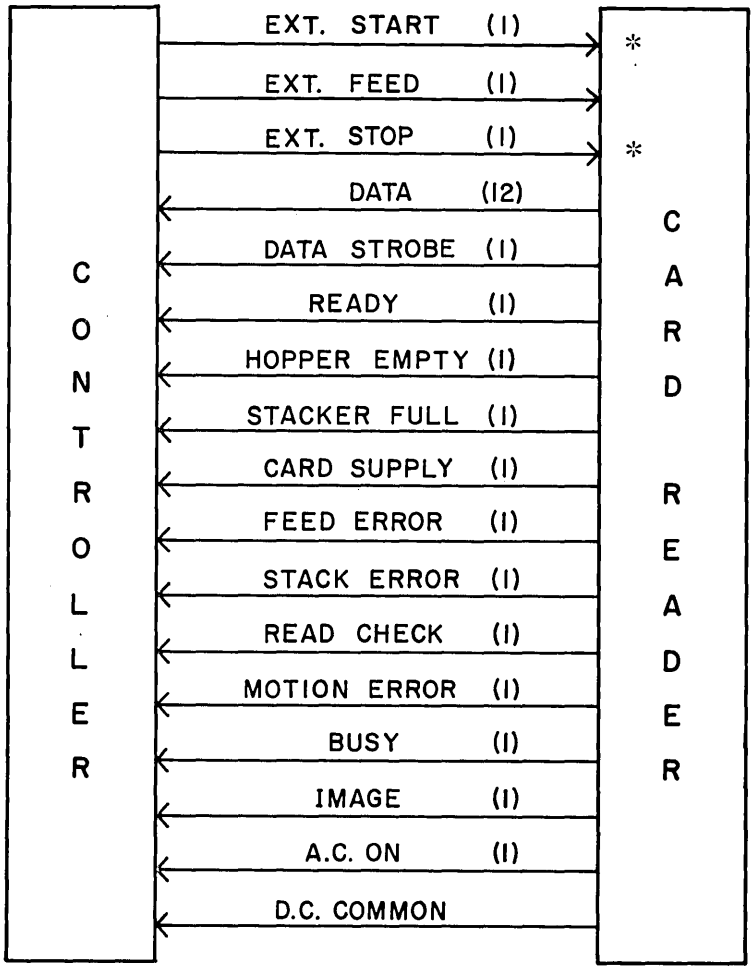
115VAC and 230 VAC are described as input power because they are most commonly used; however, by rewiring the power supply via terminal board jumpers, other input power may be obtained. These are 100VAC, 220VAC, 240VAC, and 250VAC. See Section VII - Diagrams for actual wiring connections.

Media Requirements	Before processing by the reader, cards must be stored for at least 40 hours under the following conditions: Temperature: 50° F to 95° F (10° C to 35° C) Humidity: As per ANSI STD X3.11-1969, a uniform relative humidity (between 30% to 65%) is recommended. Cards may become permanently warped if they have been exposed for an extended period of time outside recommended humidity range (30% to 65%) and cannot be easily corrected.

1-4. INTERFACE CHARACTERISTICS

The reader can use three different data boards. The variable polarity data board has been selected for description in this manual. The reader

utilizes integrated circuits from the 7400 TTL series. Signals that originate in the reader are defined as output signals. These lines are driven by 7416 drivers. Other drivers are available for special applications. Signals are received in the reader by 7414 Schmitt Triggers. The User's output drivers must be capable of sinking 5.8 milliamperes, plus any additional current from stray cable capacitance while maintaining a maximum of 0.8V. In the Hi level, the source must be capable of withstanding +5 VDC. The reader output drivers are capable of sinking 35 milliamperes in the Lo state and a 1K ohm resistor pulls the line to the +5 VDC level when in the Hi state. Figure 1-2 is a diagram, showing signals present at the card reader interface. Arrows associated with each lead indicate the direction of signal flow. Table 1-3 identifies each interface line.



NOTE

* External Start and External Stop depend on External Interface.

Figure 1-2. Interface Lines

Table 1-3. INTERFACE LINES DESCRIPTION

NAME	DESCRIPTION
Input Signals:	
External Start (ES)	An input command signal which, when true, initiates drive motor turn-on and conditions the reader ready logic to accept a feed command, provided no Error Condition exists.
External Feed (EF)	An input command signal which, when true, initiates a card feed and read cycle. Signal will only be accepted by the reader when the reader is Not Busy and Ready. A minimum pulse width of 2 microsecond will cause a single card to be fed and read. If the EF signal persists beyond the end of the card cycle, it will be interpreted as a continuous feed, causing an additional card to be fed and read. EF may be a dc level which will cause cards to process at the reader's maximum rate.
External Stop (EP)	An input command signal which, when true, stops the reader and makes the reader Not Ready. If a card cycle is in process, that cycle will be completed before the reader stops.
Output Signals:	
Data	Twelve buffered data lines correspond with data rows on punch cards. Signal is true for one full column (16 clock pulses).
Data Strobe (DS)	Indicates that data has stabilized on the data lines and is ready for acceptance.
Ready (R)	Indicates that no error conditions exist. If RESET switch is depressed or if HOPPER EMPTY, READ, or STACKER FULL errors occur, READY remains true until the card cycle is completed. SYNC ERROR or FEED ERROR will cause READY to go not true upon detection of the error.
Hopper Empty (HE)	Indicates that the input hopper is empty and the last card has been used.
Stacker Full (SF)	Indicates that the stacker is full and the last card fed has been read.
Card Supply (CS)	Indicates that the hopper empty or stacker full condition exists.

Table 1-3. INTERFACE LINES DESCRIPTION (Cont'd)

NAME	DESCRIPTION
Output Signals: (Cont'd)	
Feed Error (FE)	Indicates that the reader was not able to feed the bottom card from the deck after two feed attempts (initial feed and repick attempt), or the reader has detected a card feed with no Feed command.
Stacker Error (SE)	Indicates a jam in the card path from the read station to the stacker and double feed or timing error.
Read Check (RC)	Indicates a read station failure or possible data error or damaged card at the leading or trailing edge. (Refer to Section III - Theory of Operation)
Motion Error (ME)	Indicates a read station failure or possible data error. A composite of the following may cause this condition: 1. Feed Error 2. Stacker Error (jam) 3. Illegal Feed
Busy (B)	Indicates that a feed or read cycle is in process and the reader will not accept a feed command. Leading edge of BUSY indicates a feed command has been accepted.
Image (I)	Indicates that a card is in the read station. Signal encompasses the time frame of all eighty Data Strobes and all Timing Error Checks. No Data Strobes or Timing Error Checks will be generated, if IMAGE is not present.
AC On	Indicates power is ON and the +5 vdc supply is up. Line is open when power is OFF and must be terminated through a resistor to +5 vdc externally. Termination is to be compatible with 7416 driver specifications. Output will be low when +5 vdc supply is up.

1-4.1 SIGNAL INTERFACE

a. Connector and Cable

The card reader is supplied with a backpanel-mounted interface connector (AMP Part No. 201358-1) with pins (AMP 66106-1). Optional connectors are available. The following items are required to couple the unit to an associated controller:

1. Plug Connector (AMP Part No. 200277-2 and Socket No. 66108-1).

2. Cable - The card reader will operate with shielded twisted-pair signal lines of size 24 AWG copper wire, having a maximum length of 15 feet.

b. Interface Pin Assignment

The card reader may use any of three different Data Boards. Tables 1-4, 1-5, and 1-6 list the interface pin assignments for each of the Data Boards. A description of each of the three Data Boards is contained in Section III of this manual.

1-4.2 ELECTRICAL INTERFACE

Accepted commercial engineering practices are employed to prevent the introduction of large current transients into the input power lines and the dc logic power lines. To prevent power line current transients, triacs are used for motor control. To prevent dc logic line current transients, the following practices are employed:

a. The mechanical deck and motor frame are connected to the frame (ac) ground.

b. Power supply dc return lines and frame ground are strapped together at the power supply connector TB1, pins 3 and 4. The common and frame grounds may be isolated by removing this strap.

Table 1-4. INTERFACE PIN ASSIGNMENT

DATA BOARD A5 FIXED POLARITY A

SIGNAL TITLE	SIGNAL PIN	GROUND PIN
D12. FA/	r	v
D11. FA/	d	j
D0. FA/	f	m
D1. FA/	K	P
D2. FA/	N	T
D3. FA/	L	R
D4. FA/	W	a
D5. FA/	U	Y

Table 1-4. INTERFACE PIN ASSIGNMENT (Cont'd)

DATA BOARD A5 FIXED POLARITY A

SIGNAL TITLE	SIGNAL PIN	GROUND PIN
D6. FA/	X	b
D7. FA/	V	Z
D8. FA/	e	k
D9. FA/	c	h
HE. FA/	x	w
SF. FA/	y	w
AC ON. 2A	HH	-
IMAGE. FA/	M	S
ME. GA/	CC	DD
STKERR. FA/	BB	DD
CS. GA/	z	w
READY. GA/	n	t
BUSY. GA/	A	E
FE. FA/	AA	DD
RC. GA/	D	J
EXFD*/	C	H
EXSTP*/	p	u
EXSTRT*/	s	u
CHASSIS GROUND	FF	-

Table 1-5. INTERFACE PIN ASSIGNMENT

DATA BOARD A5 VARIABLE POLARITY

SIGNAL TITLE	SIGNAL PIN	GROUND PIN
DATA 12	r	v
DATA 11	d	j
DATA 0	f	m
DATA 1	K	P
DATA 2	N	T
DATA 3	L	R
DATA 4	W	a
DATA 5	U	Y
DATA 6	X	b
DATA 7	V	Z
DATA 8	e	k
DATA 9	c	h
DATA STROBE	B	F
EXT FEED	C	H
EXT STOP	p	u
EXT START	s	u
AC ON	HH	-
READY	n	t
HOPPER EMPTY	x	w
STACKER FULL	y	w
CARD SUPPLY	z	w

Table 1-5. INTERFACE PIN ASSIGNMENT (Cont'd)

DATA BOARD A5 VARIABLE POLARITY

SIGNAL TITLE	SIGNAL PIN	GROUND PIN
FEED ERROR	AA	DD
STACKER ERROR	BB	DD
READ CHECK	D	J
MOTION ERROR	CC	DD
BUSY	A	E
IMAGE	M	S
END OF FILE	Optional	-
CLEAR END OF FILE	Optional	-
CHASSIS GROUND	FF	-

1-5. FEATURES/OPTIONS

Enhancements to the basic card reader mechanism include the following options that may be retrofitted by kit under the listed part number, or incorporated in the initial manufacturing cycle:

FEATURE	DESCRIPTION	KIT PART NUMBER
51-Column	Enables reading of 51 column punched cards	77126601
OHMR	Enables reading optically marked cards	86878502
600/800 CPM	Enables reading at two card speeds	77110601
600 CPM	One card speed	77110501

The card reader power source is a 50/60 Hz power supply; therefore, when preparing the unit for 50 or 60 Hz input use the appropriate pulley.

Parts data on the above kits is included in Section VIII.

NOTE

The CB10X/20X card reader is checked for proper functional operation only in the operational mode requested by the customer. The individual card reader is not functionally checked with all the features/options that are available.

SECTION II

OPERATING INSTRUCTIONS

Section II - OPERATING INSTRUCTIONS

2-1. GENERAL

This section contains information on the Reader controls, indicators, and procedures necessary for properly operating the unit.

2-2. CONTROLS AND INDICATORS

The Reader can be operated in an Off-line or On-line mode by manipulation of Switch Panel, Data Board, and Control Board Switches. Processing cards in the Off-line mode is a feature associated with maintenance and is described in Section V - Maintenance.

In the On-line mode, the operation of the unit is controlled by the Reader logic and is synchronized with system demands by a controller. Surge and overload protection is provided by three fuses on the lower rear of the unit.

2-2.1 SWITCH PANEL ASSEMBLY (Figure 2-1)

A description of the Switch Panel Assembly is given in Table 2-1. Switch/Indicators and Indicators are both used on the panel. The signal, produced by the switch, is stored in the logic, as required for proper functional control.

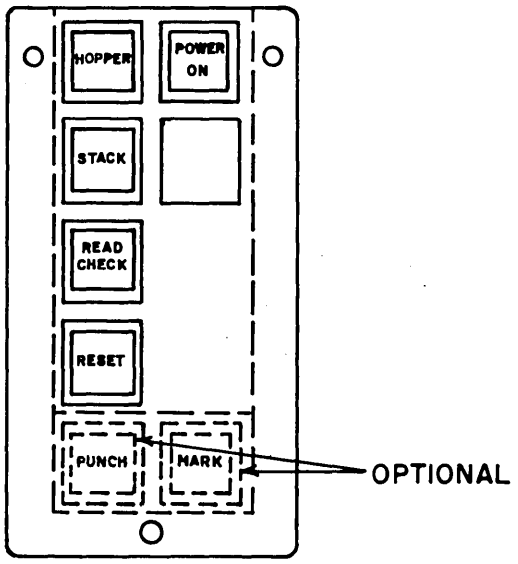


Figure 2-1. Switch Panel Assembly

Table 2-1. SWITCH PANEL
SWITCH/INDICATOR FUNCTIONS

NAME/TYPE	SWITCH FUNCTION	INDICATOR FUNCTION
POWER (Indicator Only)	Not applicable.	Green indicator illuminated indicates power is applied to Reader and backpanel toggle switch (S1) is on.
HOPPER (Indicator Only)	Not applicable.	Red indicator illuminated indicates empty input hopper, feed failure, or illegal feed.
STACK (Indicator Only)	Not applicable.	Red indicator illuminated indicates full output stacker.
READ CHECK L/T	When depressed, tests all front panel indicators if reader is not in READY condition.	Red indicator illuminated indicates read station failure, possible data error, or illegal feed.
RESET	When depressed, resets electronics and places Reader to a READY or NOT READY condition, depending upon previous condition.	White indicator illuminated indicates Reader is READY.
PUNCH (Only on units equipped with mark reading capability)	When depressed, places Reader in punch mode, resets mark mode, and automatically disables CARD CLK.	White indicator illuminated indicates Reader is in punch mode.
MARK (Only on units equipped with mark reading capability)	When depressed, places Reader in mark mode, resets punch mode, and automatically disables RESYNC on DATA.	White indicator illuminated indicates Reader is in mark mode. Reader will normally be set to mark mode when power is initially applied.

NOTE

If both STACK and READ CHECK L/T indicators are illuminated, this indicates either a double feed or a gross timing error.

2-3. OPERATING PROCEDURES

The following operating procedures are to be implemented only after Section IV - Installation and Checkout has been satisfactorily completed.

2-3.1 POWER ON

a. Place the power on toggle switch (S1) located on the lower rear panel of the Reader to the ON (up) position.

b. Check for proper indicator illumination by depressing READ CHECK L/T switch momentarily.

c. Place Reader in Punch or Mark mode.

d. Depress RESET switch to place Reader in READY status.

2-3.2 CARD LOADING

Before loading cards, remove all the markings from the back of the cards and fan the cards from both ends to break any bond between cards. Align cards by jogging, prior to placing them in the input hopper. Punched cards are to be loaded into the input hopper, face down, with the nine edge toward the rear. Marked cards are placed in the input hopper, face up, with the timing marks on the card toward the rear. Timing marks, used on marked cards, are placed on the nine edge of the card. A maximum of 1000 cards can be initially loaded into the input hopper. Cards may be added to the input hopper during machine operation; however, the card weight should not be removed when the card supply is less than 100 cards.

2-3.3 OFF-LINE OPERATION

The Reader may be operated in an Off-line mode. The only function the unit will perform is the manual feeding of cards. In Off-line mode, the unit is not under external control from the computer.

Maintenance routines may be run in the Off-line mode. Off-line maintenance techniques are described in paragraph 5-3.2, Section V - Maintenance.

2-3.4 ON-LINE OPERATION

The Reader, when in the On-line mode, will be able to accept commands from the computer system. The following steps are to be followed in order to place the unit in On-line mode:

a. I/O cables are properly connected. See Section IV - Installation and Checkout.

b. Apply power to machine by turning Power On switch (S1) to the ON position.

NOTE

Cards must be placed in the hopper at this time or the Reader will go NOT READY because of a hopper empty condition.

c. Depress RESET switch momentarily; RESET indicator should now be illuminated.

d. Unit is now in READY status and under control of computer system.

2-3.5 CARD UNLOADING

The cards enter the output stacker in the same order as they were loaded into the input hopper. A maximum of 1000 cards can be stacked in the output stacker. Card feeding is stopped automatically when the output stacker is full. Cards may be removed from the output stacker during operation.

2-4. OPERATOR MAINTENANCE

Operator maintenance consists of basic preventive maintenance; i.e., cleaning of the reader which must be done on a daily basis and minor emergency maintenance procedures (paragraphs 2-4.1 through 2-4.4).

2-4.1 CLEANING

After every 24 hours of operation, the operator is to perform the following maintenance (cleaning) with power turned off.

a. Open the left side decorative panel.

b. Using a paint brush or other similar soft brush, start at the input hopper and remove all card dust and other foreign matter from the entire card path. Clean read head area by unsnapping the clamp spring from the read support block and sliding the block back on its guide pins. The front of the read head will now be exposed and can be cleaned.

c. Moisten a Kimwipe with water and clean the surfaces of the card transport drum. To expose the entire surface of the feed drum, manually rotate the card transport drum in the direction of card feed. (See para. 5-2.3)

d. Perform lamp test, using READ CHECK L/T switch. Replace any indicators that do not illuminate. (Refer to para. 2-3.1)

2-4.2 FEED JAM ELIMINATION

Data card distortions or damage can cause a card jam condition which should result in immediate shutdown of the unit. If a card or portion of card remains in read station, reader will not start and no additional error indication will be provided. To clear a jam, proceed as follows:

a. Place backpanel power toggle switch in OFF (down) position.

b. Open left side decorative panel to better expose card path.

c. Remove clamp spring from read support block and slide block back along guide pins.

d. Remove jammed or torn card(s).

CAUTION

Cards must be removed in direction of normal travel only to avoid damage to select bands.

e. Slide support block back into place and replace clamp spring.

2-4.3 SWITCH LAMP REPLACEMENT

Failure of the unit to provide an appropriate alarm or switch lamp response may be due to a defective bulb element. Replacement is accomplished by grasping the recessed edges of the affected switch or lamp enclosure (thumb and forefinger) and pulling out with a sharp, deliberate movement. The type DL394 bulbs are removed by pulling free from the insert aperture. Following a bulb replacement, snap the entire enclosure into place. Observe nomenclature lettering to ensure correct insertion. Execute a lamp check; i.e., press the READ CHECK L/T switch lamp with the unit in the Not Ready condition and observe for lamp illumination. If failure persists, request qualified maintenance support.

2-4.4 FUSE REPLACEMENT

A failure of the unit to power up or a sudden shutdown, not immediately attributable to a feed or jam problem, could be caused by a blown fuse. Surge and overload protection is provided by three fuses: F1, F2, and F3, located on the lower rear power supply panel. Before checking

these fuses, remove power from the reader by either removing the power cord or by placing the power toggle switch (rear of unit) in the OFF (down) position. To inspect or replace these fuses, turn fuse holder counterclockwise 1/4 turn and withdraw from receptacle.

F1 - Primary 115 VAC - Use 5 amp, 3 AG (slow-blow), 60 Hz
or
- Primary 230 VAC - Use 3 amp, 3 AG (slow-blow), 50 Hz

F2 - 5 VDC - Use 8 amp, 3 AG
F3 - 17 VDC - Use 3 amp, 3 AG (slow-blow)

2-5. TRANSPORT DRIVE BELT

2-5.1 TRANSPORT DRIVE BELT REMOVAL

a. Loosen three motor mounting plate screws.

b. Slide motor so that transport drive belt slips off motor shaft pulley.

2-5.2 TRANSPORT DRIVE BELT REPLACEMENT

Follow steps in paragraph 2-5.1 in reverse.

2-5.3 SPEED SELECTION

a. Loosen three motor mounting plate screws.

b. Slip transport drive belt to adjacent pulley grooves.

c. Apply tension to drive belt and tighten three motor mounting plate screws.

SECTION III

THEORY OF OPERATION

Section III - THEORY OF OPERATION

3-1. GENERAL

Information, presented within this section, is intended to provide a comprehensive review of the principle of operation, as related to the card reader. Specific components (e.g., K029), referred to in this section, may be found in diagrams, Section VII.

3-2. FUNCTIONAL DESCRIPTION

The function of the card reader is to read either punched cards or marked cards. This is accomplished through the use of an electromechanical card transport and associated electronic circuitry. The card reader has six sub-areas of operation:

Card Transport
Read Station
Control Board
Data Board
Amplifier Board
Power Supply

Primary power single phase (60 or 50 Hz) is accepted by the card reader power supply and is converted to the dc levels required by the card transport system and electronics. Power distribution circuits provide the necessary voltages for transport motor, drive, and logic circuits in compliance with control and status levels.

Figure 3-1 is a block diagram, illustrating the electromechanical relationships that exist within the card reader. The reading of punched or marked cards is initiated in response to system demands through the function of an external controller unit. A start signal is issued by the controller and is recognized by the control logic circuits, provided that the reader is not "BUSY" (feeding or reading a card) and is READY (cards in hopper, stacker not full, and no error conditions exist). Recognition of the START command causes the control logic to issue a motor drive signal to the card transport motor. Upon reaching operational speed (a time delay function), the control logic circuits set the READY

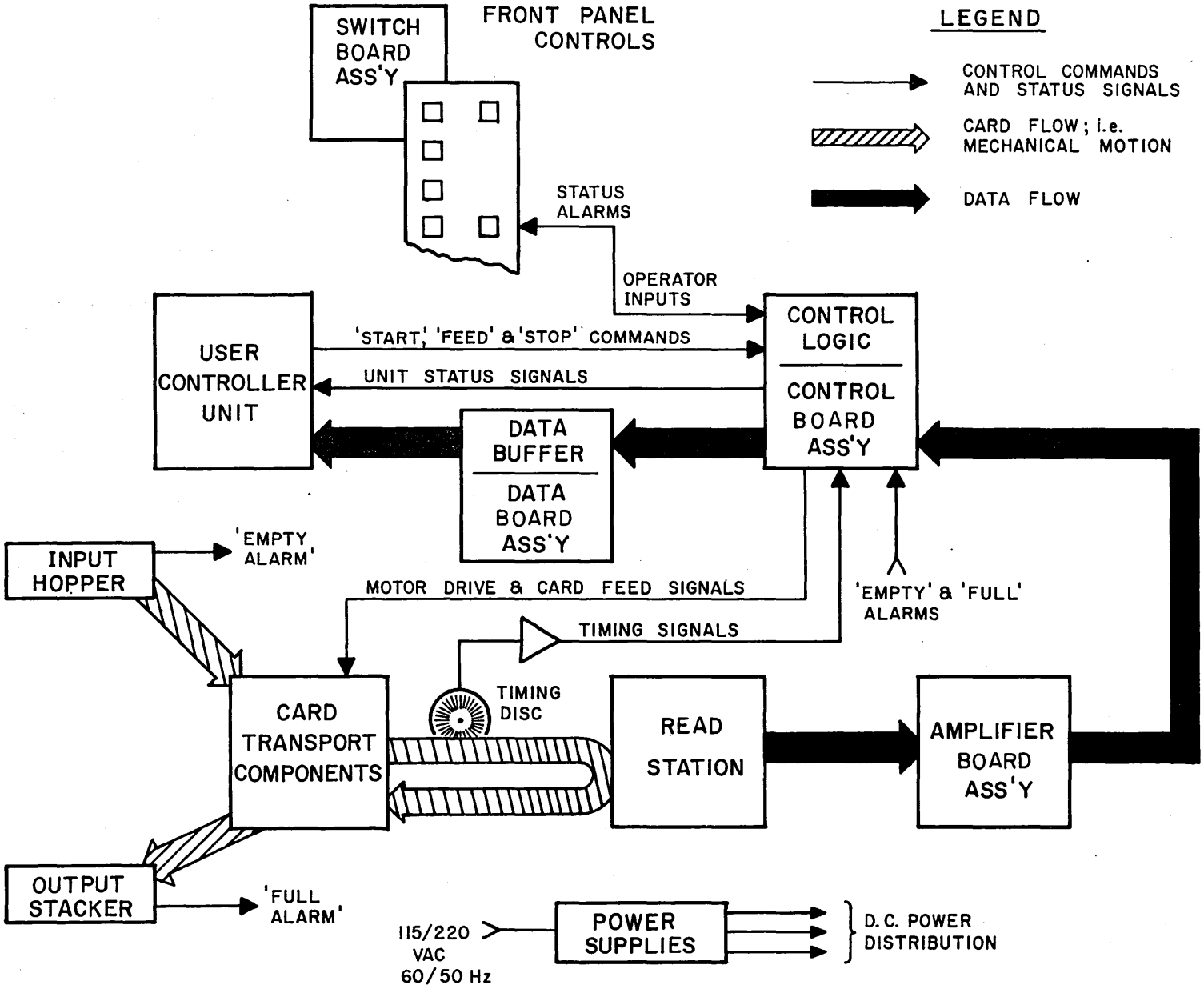


Figure 3-1. Block Diagram of Card Reader

signal on the correct status line to the controller which then responds with an external feed (EXT FEED) command.

NOTE

It is possible to program the reader via internal 'function' switches to respond to either sequentially received EXT FEED commands (single card processing) or to respond such that cards are automatically fed and read, as long as cards are inputted to the machine.

When the reader receives a signal from the controller that a feed and read cycle is to be initiated, the lead card in the input hopper is selected and drawn through the read station by the rotating transport drum. Attached to the drum is a timing disc that operates with a phototransistor pickup to generate timing pulses. The frequency of these timing pulses is such that 16 cycles represent 0.087 inch of card movement, which is the distance from the leading edge of one column to the leading edge of the next column.

The read station utilizes a system of fiber optic bundles, a light source, and an array of light sensitive phototransistors to detect the data that exists in each card column, as it passes through the read station. This light sensing system also provides a means of performing basic "error checks"; i.e., phototransistors correctly respond to the leading and trailing edges of a card and that column to column synchronization is maintained while reading. A data read or timing error stops the read process and the READ CHECK L/T indicator on the switch panel is illuminated.

The electrical impulses, developed by the read station phototransistors (for punched or marked cards), are received by the amplifier board where these impulses are amplified and shaped. These data signals are now shifted column by column through the control board and into the data buffer circuits where they are now available to the controller. This processing of data is accomplished by coordination of data and timing and strobe signals. The sequencing of cards by the reader will continue, as long as the controller furnishes the reader with FEED commands.

Operation is automatically discontinued; however, in response to error signals such as read errors, loss of timing, empty hopper, and stacker full.

In addition to the front panel operator controls and alarm indicators, the unit may be equipped with either of the two different data boards covered in the following paragraphs.

3-2.1 DATA BOARD, VARIABLE POLARITY, ASSY NO. 59540002

This board is provided with "POLARITY SELECT" switches in positions T4 and W4 that enables selection of positive or negative logic levels for all data, status, and interface signals. Setting the switch to the ON position selects the negative logic level.

3-2.2 DATA BOARD, FIXED POLARITY A, ASSY NO. 59535501

This board has negative output logic levels for all data, status, and interface signals.

3-3. FUNCTIONAL ANALYSIS

The following paragraphs explain the operation of the reader subsystems.

3-3.1 CARD TRANSPORT OPERATION

A single phase AC motor serves as the drive source for the card transport drum. A solenoid-activated feed plate (A, Figure 3-2) holds the card deck above the drum's surface until a FEED command is received. In response to the FEED command, this solenoid is energized, thus drawing the feed plate down and allowing the drum surface to contact the lead card in the input hopper. The elastomer surface of the drum thereby draws the card into the feed path through the read station and into the output stacker. The card is deposited in the output stacker by belt driven spiral rotating springs (Figure 3-3).

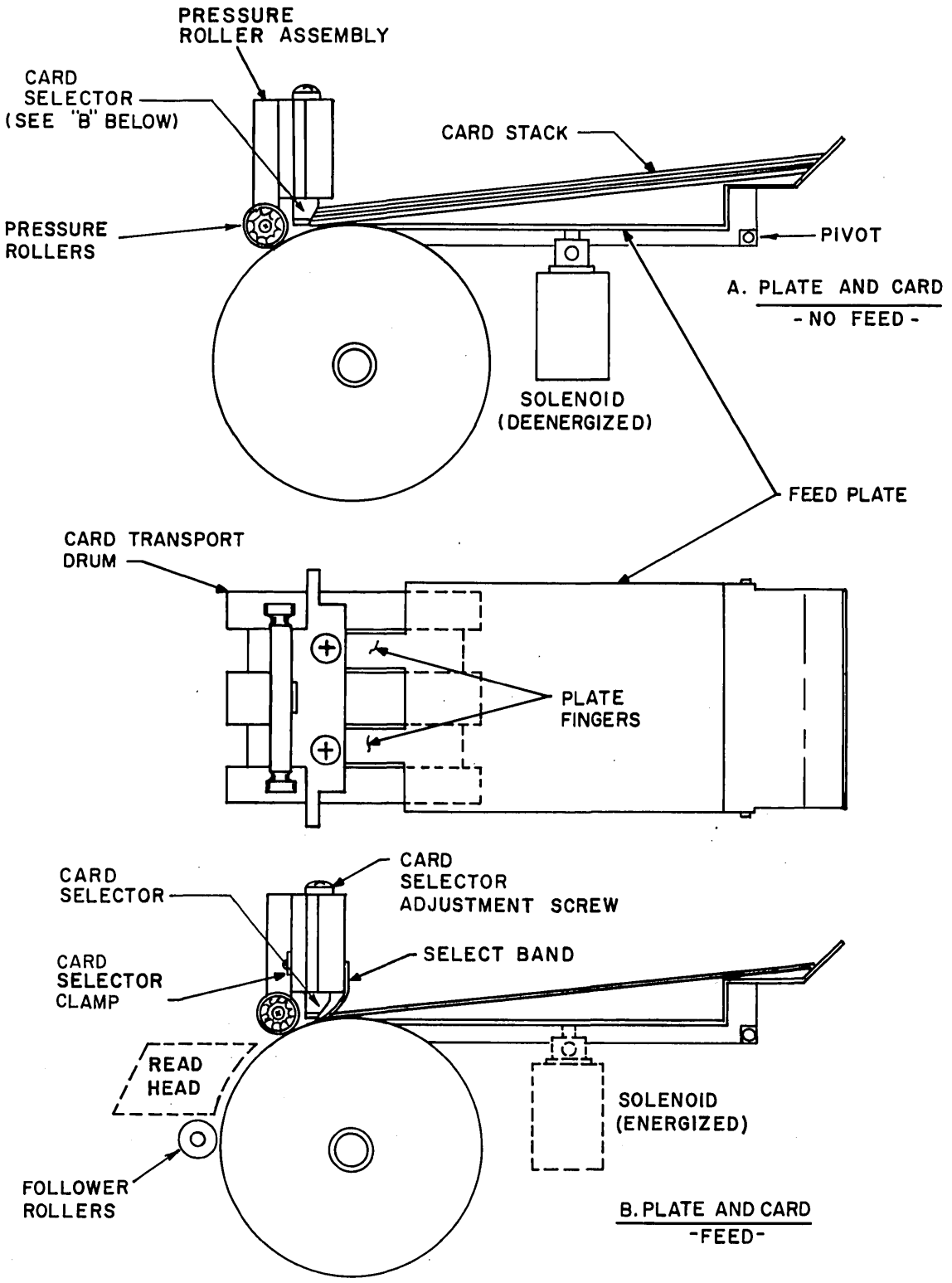


Figure 3-2. Feed Mechanism Components

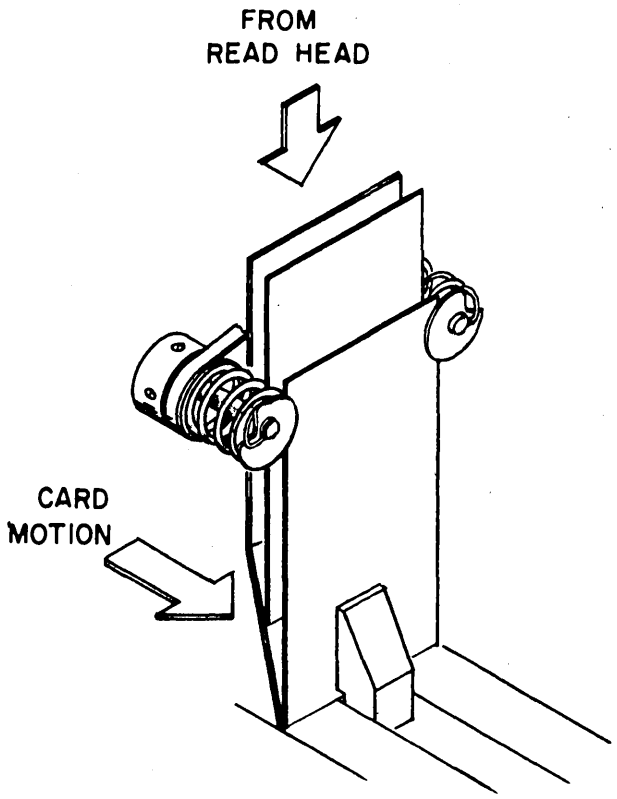


Figure 3-3. Stacker Belt Drive/Spring Arrangement

3-3.2 READ STATION FUNCTIONS

a. Read Head Operation

The read head consists of an array of fiber optic bundles, a light source, and a row of 12 phototransistor sensors (13 for mark option units). The light source provides its illumination through an array of fiber optic bundles that distribute light onto the card surface. Where a data hole is punched on a card's surface, the light is not reflected and results in a binary "one" (1) at the I/O interface. An unpunched surface at any data point on a card permits light to be reflected, thus transferred to the phototransistor sensor via the fiber optics. The resultant electrical impulse is representative of a binary "zero" (0). Important to internal timing is the detection of a card's leading edge, as it enters the read station, and its trailing edge, as it exits the station. Leading edge detection is accomplished when any one of four designated phototransistors (channel positions 0, 1, 6 or 7) respond to reflected light for the first time in a given card cycle.

Trailing edge detection is resolved when all twelve channel phototransistors respond to a dark condition after the card has passed the read head. The current, generated by a leading edge response, is furnished to the read amplifier circuits to condition the amplifiers for receipt of data impulses. Conversely, the dark sensing is used to reduce amplifier sensitivity when a card is not in the read station. (Also, see Read Amplifier Operation, paragraph 3-3.2b and ERROR DETECTION, paragraph 3-3.4.)

b. Read Amplifier Operation

Figure 3-4 provides a schematic interpretation of a single channel amplifier, operating in conjunction with the bias control circuit that is common to all channels.

As shown in Figure 3-4, the pickup elements (phototransistors) are TIL6203 types. Each phototransistor acts as a current source at point A of its respective amplifier. The current into point A divides evenly between section 1 and section 2 of each amplifier. Section 1 of an amplifier serves as the automatic gain control circuit.

Current from the phototransistor pickup flows into the positive node of amplifier section 1 and is amplified. The resultant voltage is detected by diode D1 and capacitor C1, producing an automatic gain bias for amplifier section 2, as seen at point B. This bias is fed back into the negative input of section 1 through resistor R1.

The foregoing action causes the voltage at point B to rise to a positive level. This rise continues until the current into the negative input of section 1 is equal to the current provided by the phototransistor; i.e., at the positive input of the amplifier section.

The bias voltage, set up at point B of the amplifier, is also fed back to the negative input of amplifier section 2 through resistor R3 and results in an effective subtraction from the current supplied to the positive input by the phototransistor.

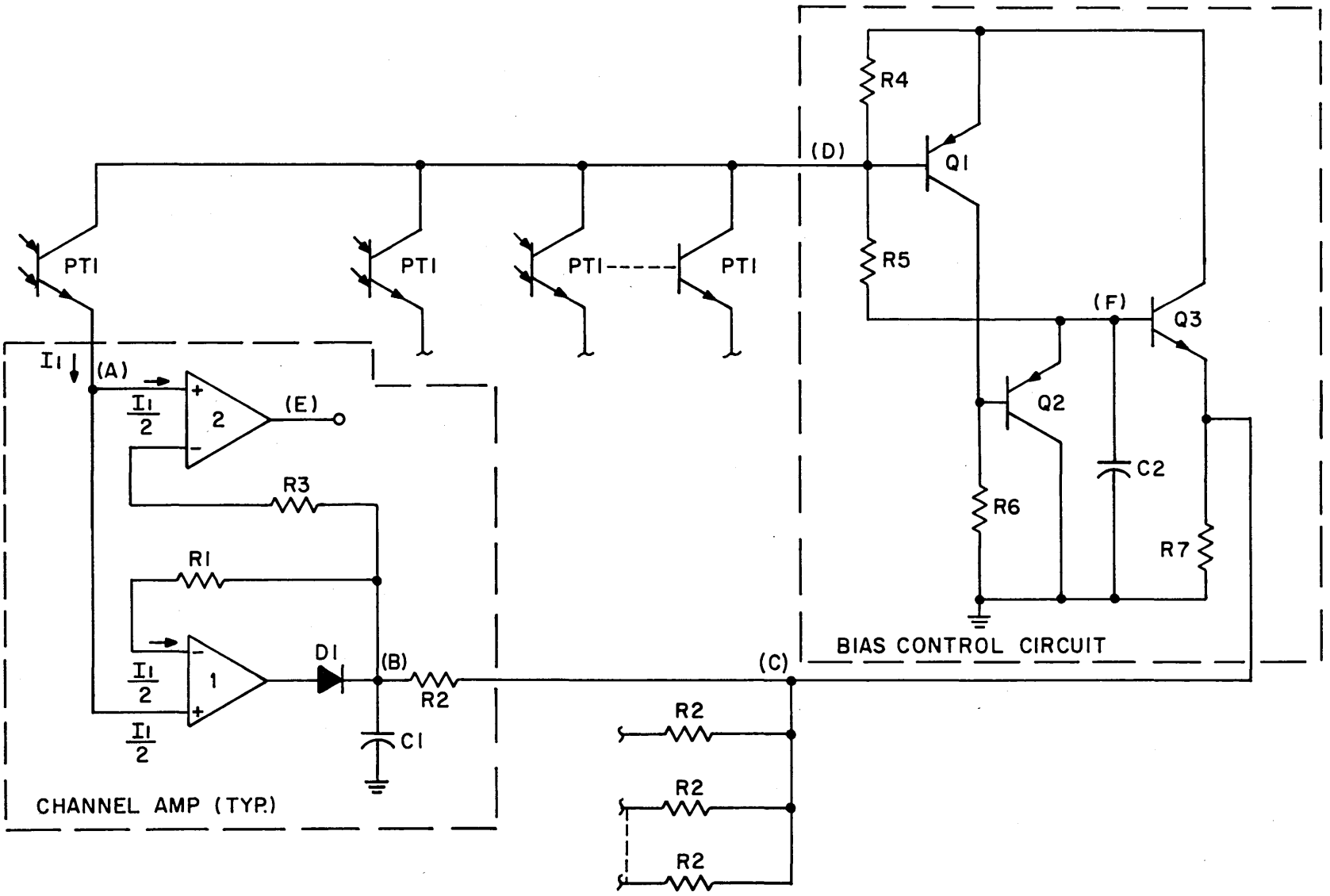


Figure 3-4. Read Amplifier Schematic

From the foregoing, it is seen that the current from the phototransistor at point A splits evenly into the positive inputs of amplifiers 1 and 2. Since the current into the negative input of amplifier 1 is also equal to the current into the positive input of amplifier 1, the acceptance level of amplifier section 2 can be set by establishing a specific ratio between resistors R1 and R3. The value of R3 is always larger than R1.

An appropriate expression for the voltage at point B is $\frac{I1}{2}$ (R1). The current fed into the negative node of amplifier 2 is defined as $\frac{VB}{R3} = \frac{I1 \cdot R1}{2R3}$. Since $\frac{I1}{2}$ represents the current flowing into the positive input of amplifier 2, the acceptable level of this amplifier is determined by the value $\frac{R1}{R3}$ and must always be less than one.

The automatic bias circuit consists of circuit elements R4, R5, R6, R7, C2, Q1, Q2, and Q3. The purpose of this circuit is to determine the average dark current carried by all twelve phototransistors and to inject a stabilizing bias current at point B of each amplifier section.

By reference to Figure 3-4, it is seen that the twelve phototransistor collectors (thirteen, if clock channel is used) are tied to point D. All twelve R2's (thirteen, if clock channel is used) are tied to point C and the opposite end of each of these resistors (R2) is connected to point B of its respective amplifier.

The foregoing arrangement senses the average current through all of the phototransistors during a sense "black" condition. The current at point D, as provided by the phototransistors, thus flows through R4 and produces a voltage drop across this resistor. During the "dark" sense period, a very small current flows to point D and transistor Q1 is held close to an "off" condition. With Q1 conduction minimal (or off), the impedance across Q1 is large and the voltage drop across R6 is very small. This voltage drop, plus the emitter drop at Q2, is thus seen as the effective voltage at point F; i.e., since Q2 is an emitter follower. The voltage at point F, plus the base emitter drop of Q3, therefore represents the "sense" dark

bias control voltage observed at point C. The voltage level is used to draw current through resistor R2 (as provided by peak detector, point B), resulting in a turn-down bias, as felt by each section 2 amplifier. The bias is used to ensure that the outputs of each amplifier are held low when there is no card in the read station.

When a card is in the read station, the photocells sense a white (reflective) level and additional current is drawn through resistor R4. The voltage drop across R4 is sufficient to turn Q1 on, causing a larger voltage drop across R6 and turning Q2 off. The bias voltage, established while looking at a white level (point F), is sustained during the card by the charge developed at capacitor C2.

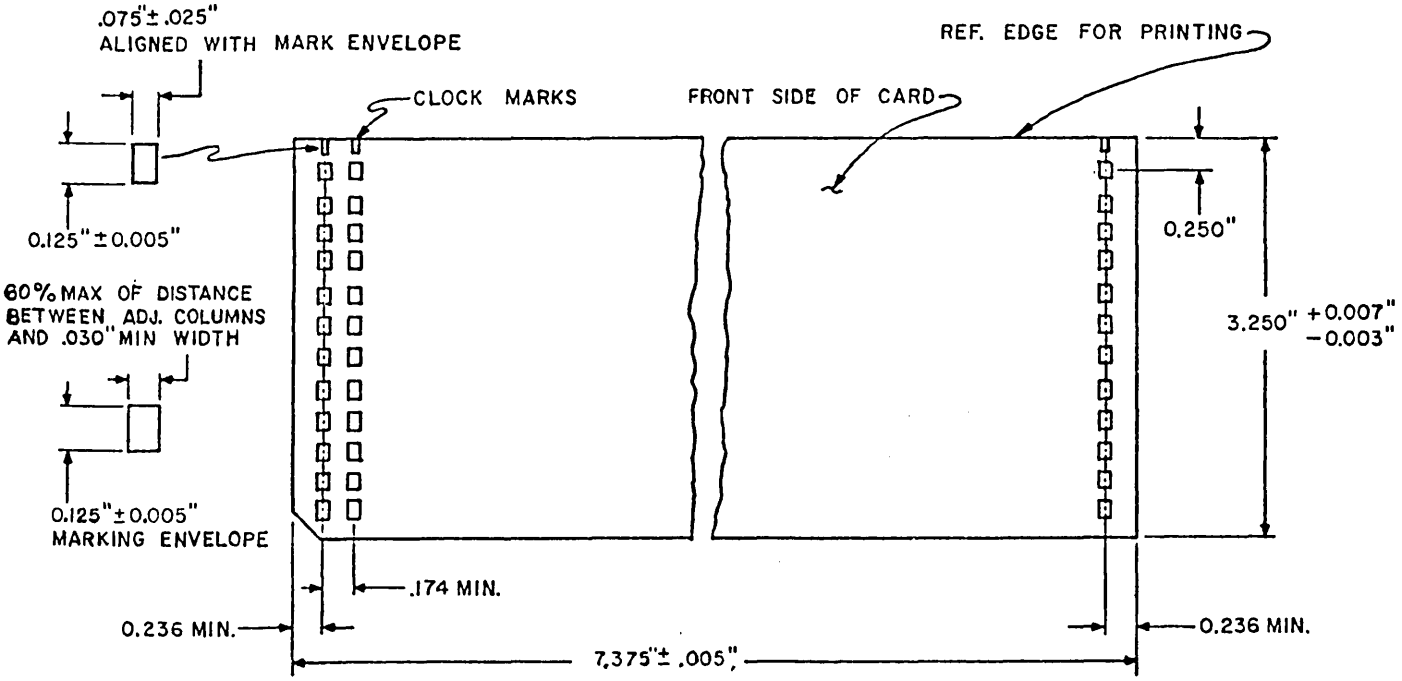
3-3.3 TIMING/SYNCHRONIZATION

Correct timing of the read function and synchronization of the several error checks is accomplished by circuits associated with all three major circuit boards; i.e., Control Board A4, Data Board A5, and Amplifier Board A2. These circuits obtain their columnar timing reference from one of two possible sources, depending upon the model options incorporated by the unit and/or specific operating mode selections. In all units, a timing disc is employed for basic timing. Punch/mark units can receive data column timing from either a binary counter driven by the disc or from timing marks inscribed upon the card (Figure 3-5). Counter operation is consistent with standard (Hollerith) card format while timing marks provide a variable output format. Of the three data boards available, data board Variable Polarity will be referenced to in this discussion.

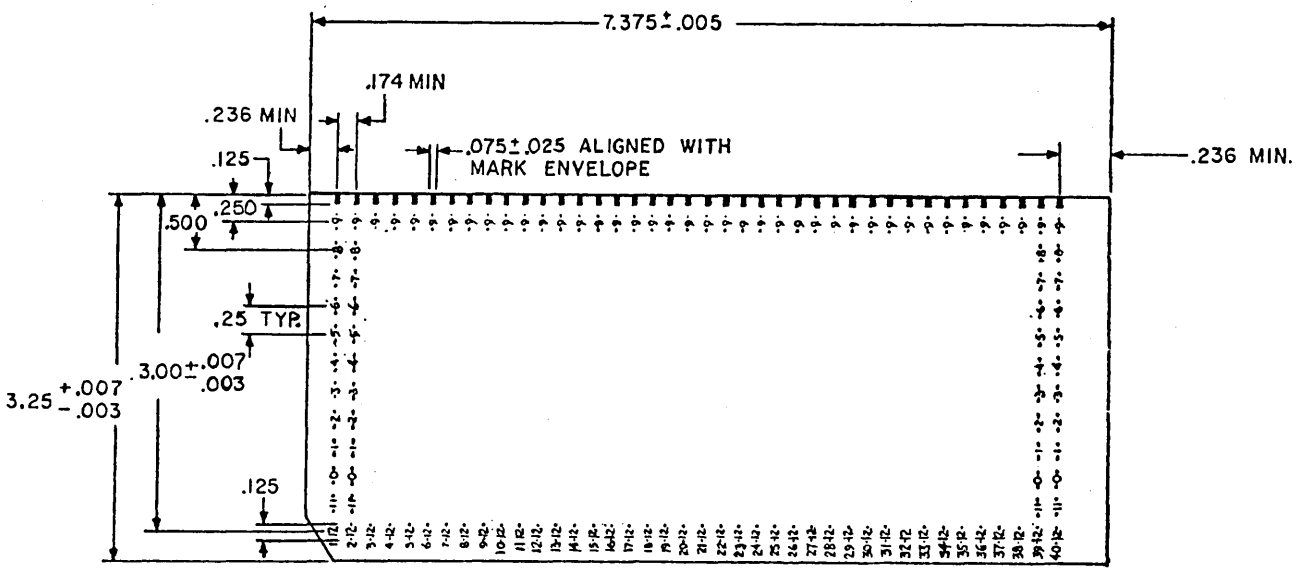
Since the operation of the counter and steering logic circuits is essentially similar for both modes of operation, the punch mode is selected for the basic discussion with operational differences of mark timing discussed under a separate heading.

a. Punch Mode Timing

Column to column movement of a card through the read station is sensed and tracked through the function of a timing disc, associated



A. Optical Read Marking Areas



FRONT SIDE OF CARD

B. Optical Read Marking Envelope

Figure 3-5. Card Format Information

pickup, and binary counting circuits. The timing disc (Figure 3-6) is rigidly mounted to the transport drum and carries 2304 timing marks about its circumference. A mask (section of the disc) and phototransistor pickup (mounted behind the disc) provide timing pulses, as the disc rotates with the transport drum. The frequency of these timing pulses is such that 16 pulses represent 0.087 inch of card movement. This amount of travel is consistent with the distance from the leading edge of a data hole to the leading edge of the next data hole.

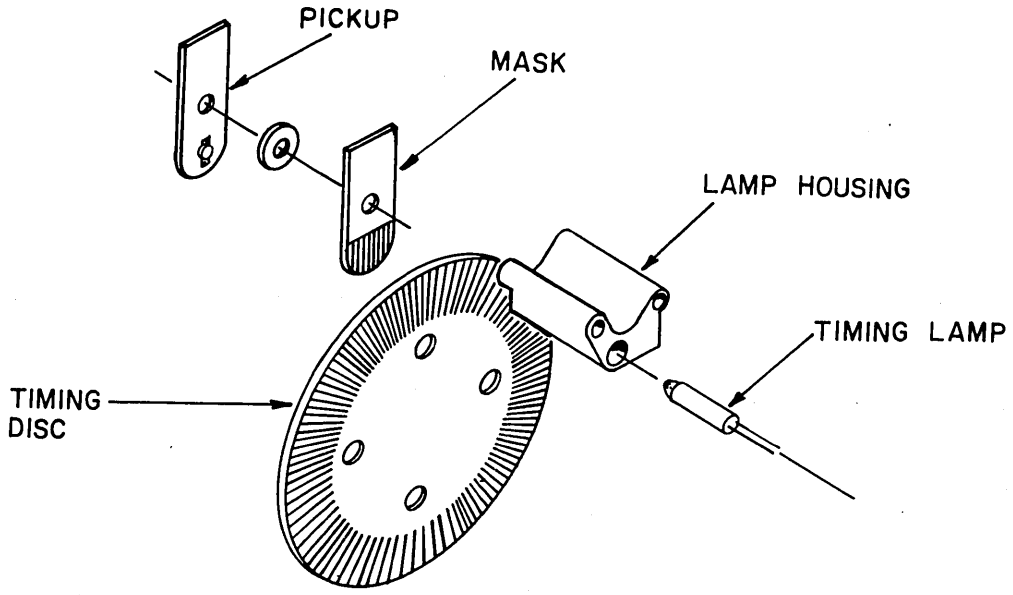


Figure 3-6. Timing Disc and Pickup Arrangement

The disc pulse train, previously discussed, is employed to "sync" a free-running oscillator (Amplifier Board A2) which, in turn, provides a clean, amplified clock train that agrees with the selected card speed of the unit. This clock train (80 CLK) is combined with a 500 KHz standard that is introduced at flip-flop K029 on Control Board A4. This slight modification of the basic clock is used to ensure consistent leading edge transitions throughout the steering logic. The clock output is thereafter used to control the stepping of counter circuits that provide the column timing, data gating, and strobe signals necessary for synchronous operation.

Column-to-column timing is established by the subcounter circuit, C000 on Data Board A5. This 16 count circuit is triggered by the CLOCK input and divides each column into 16 discrete counts (Figure 3-7). The first significant count is 11, at which time through associated decoder and gating logic, the INGATE signal is initiated, MUX-M000 on Data Board A5.

This signal enables the first buffer chain (K00-K010) and data is transferred and locked into the buffer prior to the 15th count, at which time INGATE is terminated.

At the count of 15.5, data is transferred to the second stage buffers (R000 and R001) by the INSTRB signal appearing at pin 9 of MUX circuit M000. The first stage buffers are cleared upon reaching the zero count. Output lines from the second stage buffers go through exclusive OR circuits(I030-I042) and driver/inverters (L000-L012) to the data interface connector. Data transfer is effected upon reaching the count of 0 on the next subcounter sequence. At this time, OUTSTROBE appears at the interface connector; i.e., from pin 12 of MUX M000 through an exclusive OR and an inverter driver stage. This status signal enables controller logic to sense the output lines thus concluding a first column data transfer.

Concurrent with completion of the first 16 count by the subcounter, the $\overline{\text{CARRY}}$ output, pin 12, C000 Data Board A5 is fed as a clock to increment the first of two column counters, C003 which then increments C004. These cascaded counters are, thereafter, incremented once for each column interval. This results in a possible total count of 255 that divides the card (leading to trailing edge) into approximately 85 column widths or 80 data columns, plus leading and trailing edge setback. Timing compensation for leading edge to first column setback is accomplished (at IMAGE set) by presetting the subcounter to 11 and the column counter to 254. All counters are initially cleared upon receipt of a FEED command.

Functionally, the column counters are employed to establish the timing sequence for various checks, status sensings, and logic decisions required to sustain synchronous operation of the reader.

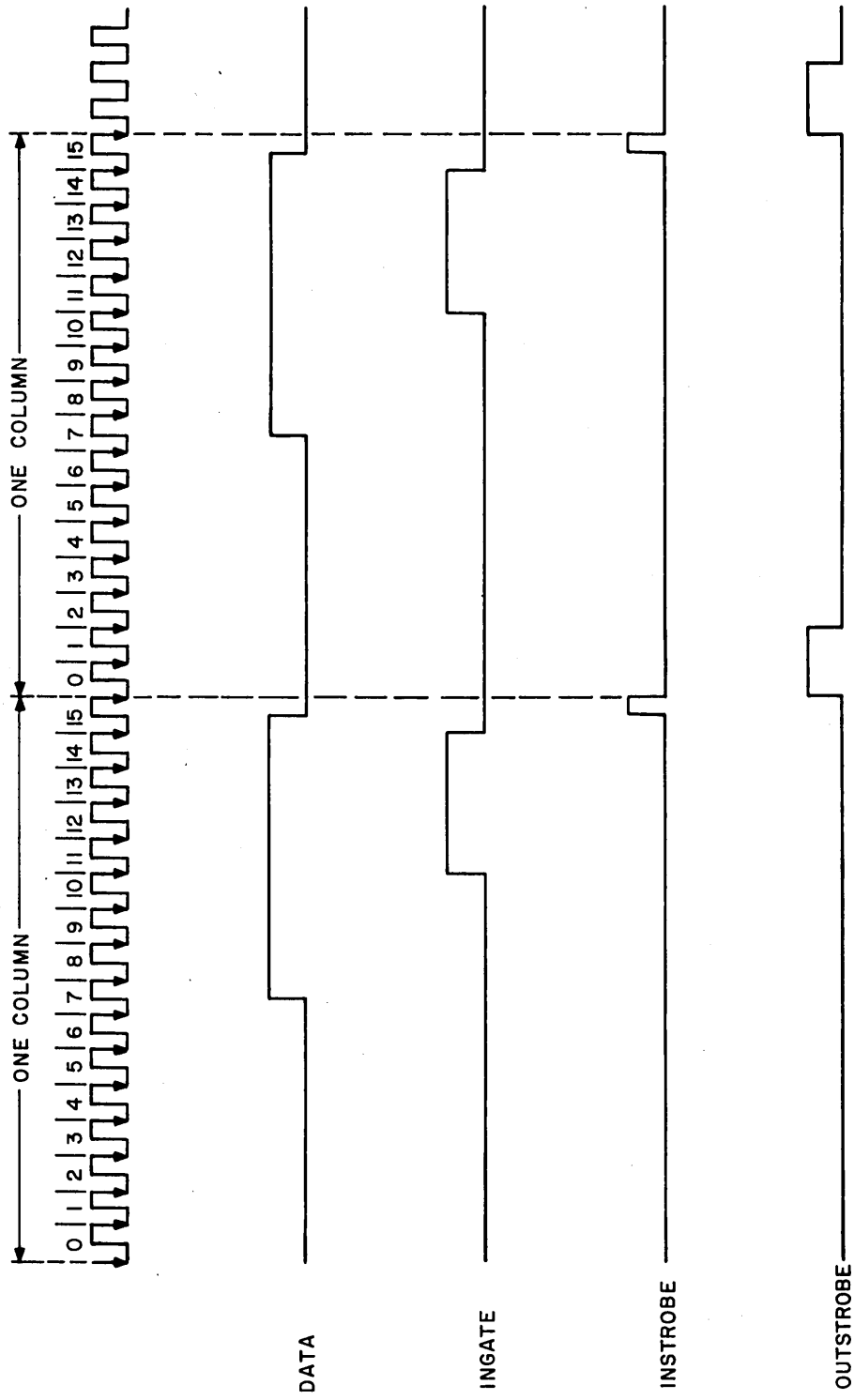


Figure 3-7. Subcount Timing

b. Mark Only Timing

Punch/Mark units (CB202/203) are equipped with a front panel selector switch that programs the unit for operation with either standard punched cards or cards upon which data is entered by optically sensed 'marks'. Punched cards operate from internal disc timing as previously described. Mark timing can be accomplished via the internal mode or by sensing timing marks located along the nine edge of the card, and when present are sensed by a thirteenth channel of the read head. The mark timing option is selected by closing an internal control switch (CARDCLK) on Control Board A4. When set to the 'true' (low) state, the CARDCLK input to MUX circuit M000 switches from the clock source previously used for derivation of INGATE, INSTRB, and OUTSTROBE signals; i.e., from the disc stepped subcounter to the timing mark clock. Data will be accepted only when a clock mark is present and output strobes will be generated only after a clock mark is read. The sub-counter and column counters continue to sequence all non-data events.

NOTE

Marks must be entered with a blunt No. 2 soft black lead pencil. Mark mode is generally selected in order to achieve a variable format. Column spacing is thus usually dictated by application. However, when keypunching, the columns must be spaced on 0.087 inch centers or multiples thereof. See Figure 3-5 for data box and clock (timing) mark positioning dimensions.

3-3.4 ERROR DETECTION

During a read operation, several dynamic checks are performed to determine:

a. Leading edge entrance at the read head.

b. Dynamic response of all channel sensors to reflected light; i.e., "Light Test".

c. That the card is still present just prior to the end of card time; i.e., "Early Dark Test".

d. Trailing edge exit from the read head; i.e., "Late Dark Test".

If errors are present, the LED error indicators mounted on the outer edge of the control board will be lit; these are FEED, LIGHT, ILLEGAL FEED, EARLY DARK, LATE DARK, STACK, and SYNC errors. Additional error indicators are on the switch panel (Table 2-1.) which are HOPPER, STACK, and READ CHECK.

a. Leading Edge Detection

This check is performed via data channels 0, 1, 6 and 7 since the associated light pickups are located over the grooves of the transport drum and hence are not susceptible to false reflections from particles such as card dust on the drum surface. This results in setting one or more of the input lines to counter C000 (Control Board A4) to the 'false' state, wherein, the LE output (pin 12) is brought to a high level indicative of not all dark. The LE signal is introduced at pin 1, I049, Control Board to initiate logic operation required to clear and preset the subcounter and counter circuits. LE is also fed to the enable gate, G1 of counter circuit C001 as a precondition of the next sequential tests.

b. Light Test

This test is a dynamic check for proper operation of all photosensor circuits and associated amplifier channels that is performed after LE time but prior to reading data from data column one. With all 12 data sense lines in a 'false' state ("a see light" condition), the associated cascaded counters C000, C001, and C002, Control Board A4 will produce a false LITE/ level at pin 13 (borrow output) of stage C002. Any single channel failure results in a lack of 'reset' of K000 which will cause READ CHECK L/T (error) lamp to turn on at the beginning of column one time. An error in this check causes termination of reader operation at the end of the card cycle (Figure 3-8).

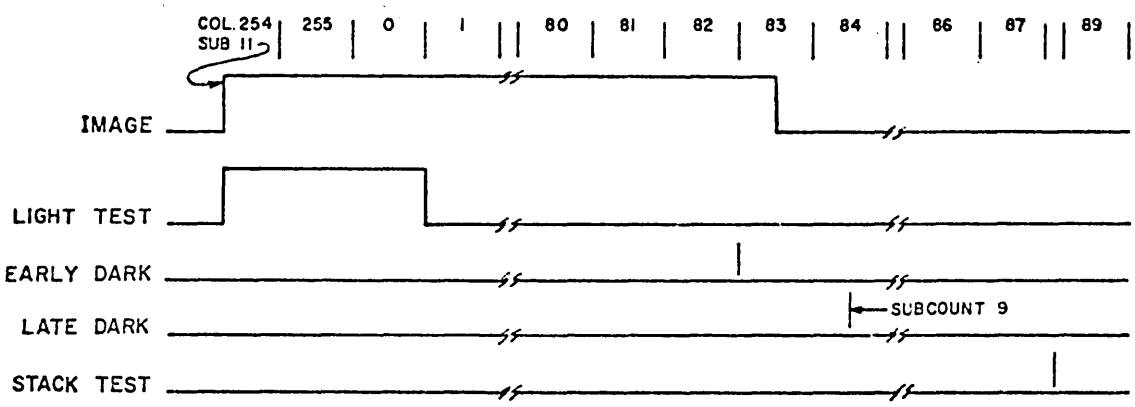


Figure 3-8. Error Detection Timing

c. Early Dark Test

Logic circuits associated with the column counters are employed to time this test, such that the data channels are sampled just prior to the appearance of the final data column beneath the sensors; i.e., effectively column 82 in reference to total card travel. The upper section of the I108 gate, Control Board A4, is conditioned for 80 column card applications and receives the AND result of IMAGE and the 82 column count via I107. With IMAGE still present at this time, the clock drive input to the early dark flip-flop (K026) is disabled and the alarm to the READ CHECK L/T lamp remains 'off'. However, a dark sense (no image) results in a high state of K026, pin 9, and a resultant 'error lamp' indication.

d. Late Dark Test

The late dark test samples the 12 channel sensors at subcount 9 of column 84 to ensure that an all dark response to the trailing edge has occurred. Logic actions are similar to those described for early dark above (See FF K027) except that IMAGE must be false to prevent a READ/CHECK lamp indication.

3-3.4 (Cont'd)

e. Miscellaneous Error Checks

The reader also stops operation if the input hopper is empty, the output stacker is full, feeder cannot feed a card after two attempts (FEED ERR), a card jams in the track (STACK ERR), or there is a loss of timing (SYNC ERR).

A feed and read cycle is completed before motor cut-off on all errors except for a card jam, timing loss, or feed error conditions. These errors cause immediate shutdown of the reader. If a card or portion of a card remains in the read station, the reader will not start and stack light and READ CHECK light will be on. Last card read will be valid, after a motor stop, only if no READ CHECK error condition exists.

3-4. POWER SUPPLY

Operating voltage for the reader is provided by a pass-regulated type of power supply accessible through the rear door of the reader. The supply converts 50/60 Hz AC power to a primary regulated output of +5 VDC for the logic circuits and secondary outputs of +17 VDC for the feed solenoid and indicator lamps, controlled 115 VAC lines for drive and stacker motors, and a sense output used to control power down sequencing.

Selected input power (Section VI, Diagrams) is applied through fuse F1 and switch S1 to transformers T1 and T2. Unregulated AC is rectified and filtered and applied to the integrated circuit voltage regulator. This component provides a precise voltage reference and includes an operational amplifier capable of continuously adjusting the power supply output voltage to +5 VDC $\pm$ 2.5% at 4 amps. The IC control drives intermediate power stages to three series pass transistors. During normal operation, a feedback loop across the output feeds into the IC to adjust power delivered and maintain the output voltage.

Solid state relay K1 responds to a motor start signal to switch 115 VAC to the motors at an approximate "zero" phase angle (zero-cross) of the

3-4. (Cont'd)

input waveform. +17 VDC is also controlled by the circuitry comprised of CR8, Q4, and Q5 which is switched to activate the feed solenoid. An unregulated "sense" voltage is also cabled to the Data Board through the Control Board.

Protection of the supply is provided by foldback current limiting and overvoltage circuitry. Foldback current limiting reduces output voltage as an overcurrent condition is approached. The overvoltage protection is triggered at +6.5 VDC by an SCR, shunting across the supply and causing its output to collapse to zero. Primary power must be turned off and then on again to reset the circuit.

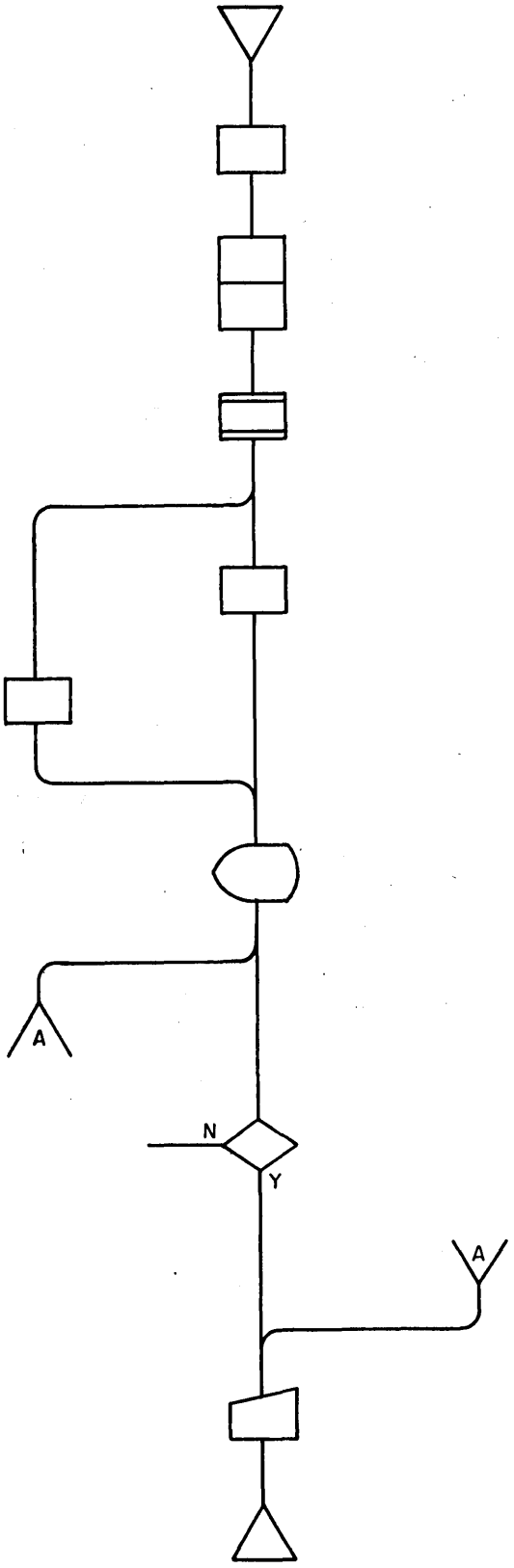
3-5. CABINET COOLING

The reader is cooled by a muffin fan mounted over a cutout on the floor of the reader cabinet.

3-6. LOGIC FUNCTIONS

The logic functions of the Card Reader are described in flow charts. SYMBOL TERMINOLOGY - Figure 3-9 describes the function of each symbol used in the flow chart and Figures 3-10 thru 3-13 depicts the card reader operation by use of flow charts.

The flow charts are keyed to the logic diagrams in Section VI - Diagrams.



Beginning of flowchart.

Happening of a normal event.

Happening of simultaneous event. It does not indicate that one event caused the other.

Happening of a special event.

The operation of both parallel branches, not precded by a decision block, must be completed in order to continue operation.

Indicator event-machine to operator (indicator lamp, mechanical motion etc).

Exit to another flowchart or a point on the same flowchart.

Decision block-check for condition, usually in the form of a question. Y=Yes N=No

Entry from another flowchart or from the same flowchart.

Manual input (switch keyboard etc.).

Termination of flowchart.

Figure 3-9. Symbol Terminology

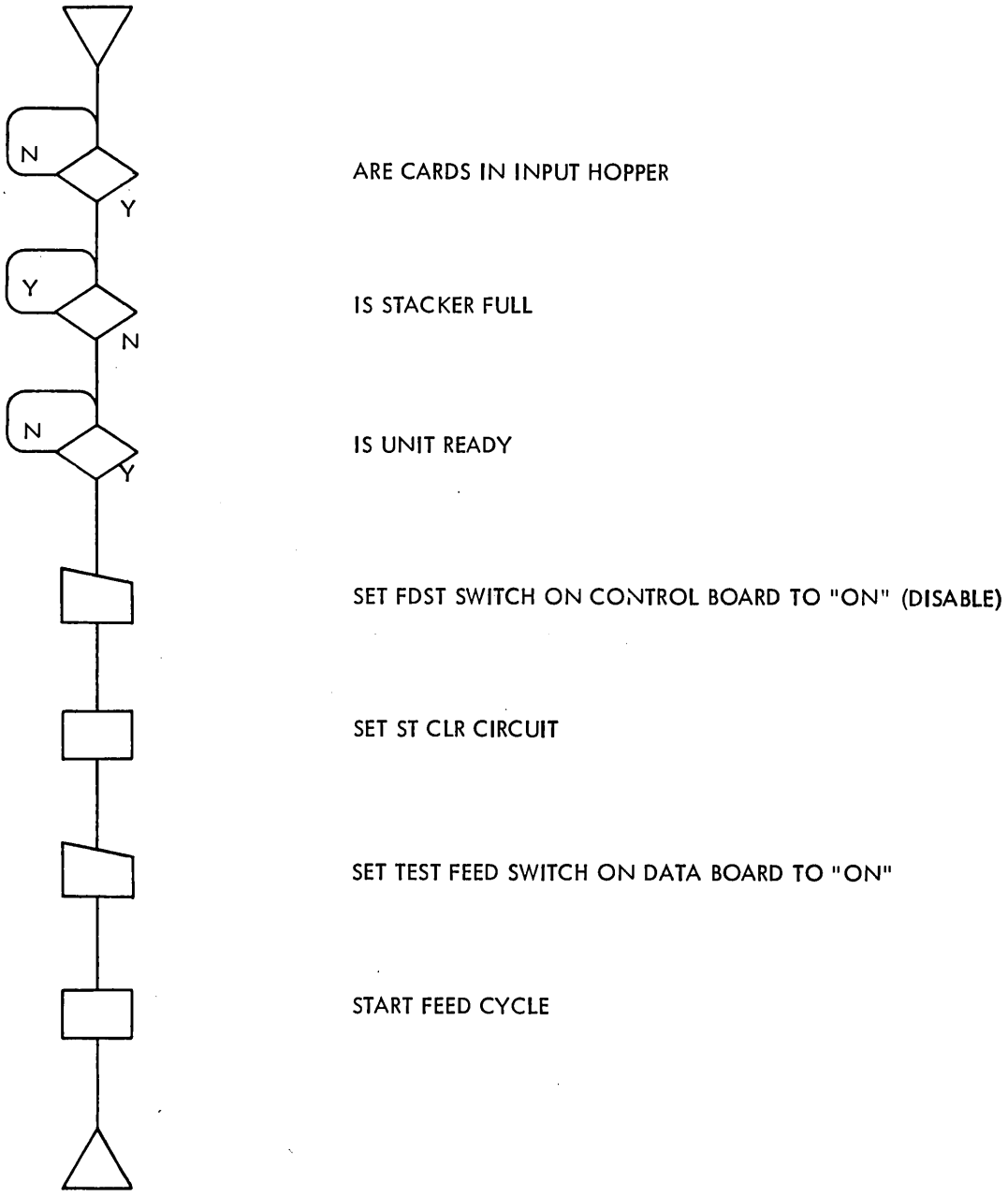


Figure 3-10. Flow Chart, Off-Line Mode, Fixed Pol. A

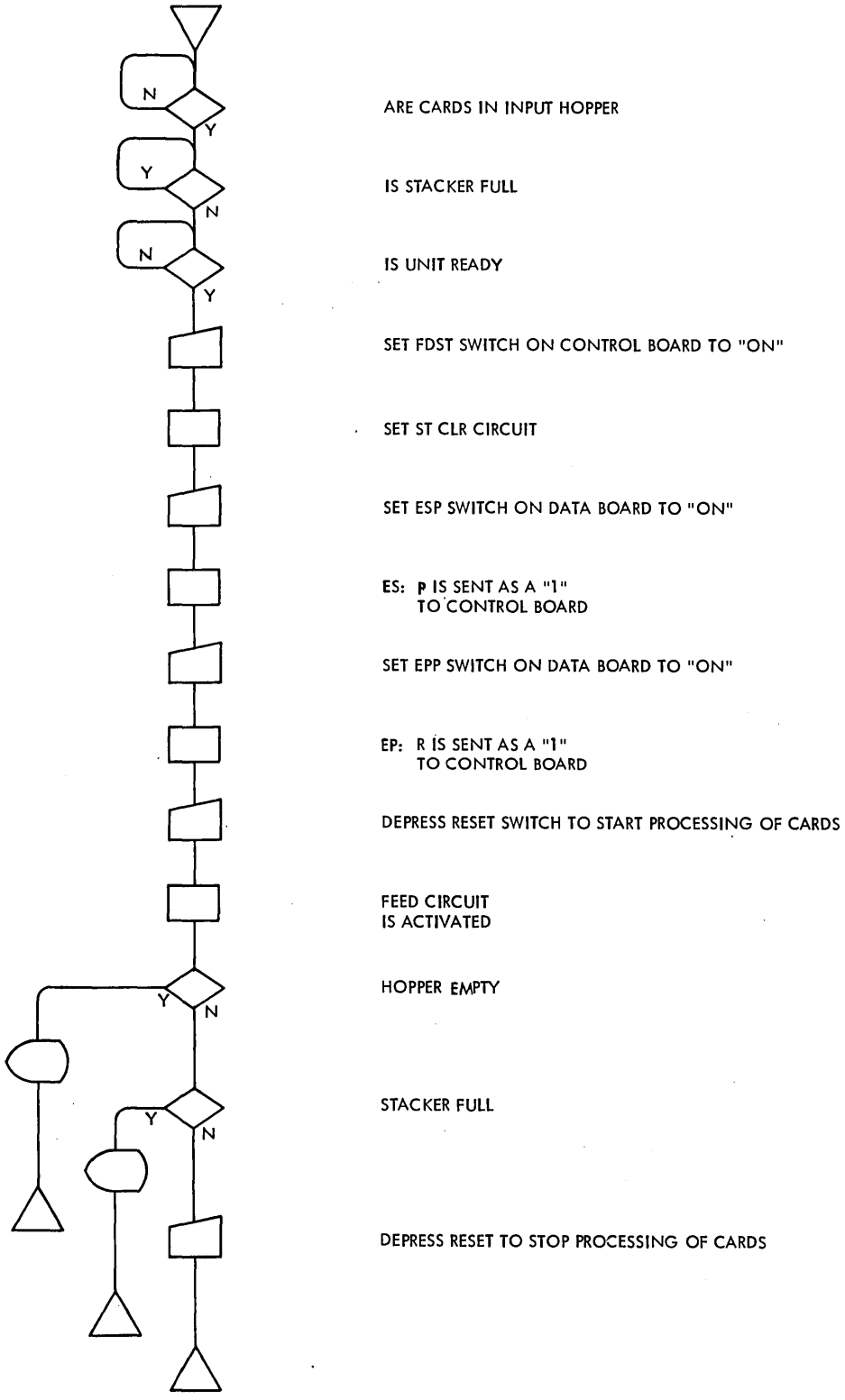


Figure 3-11. Flow Chart, Off-Line Mode, Var. Pol.

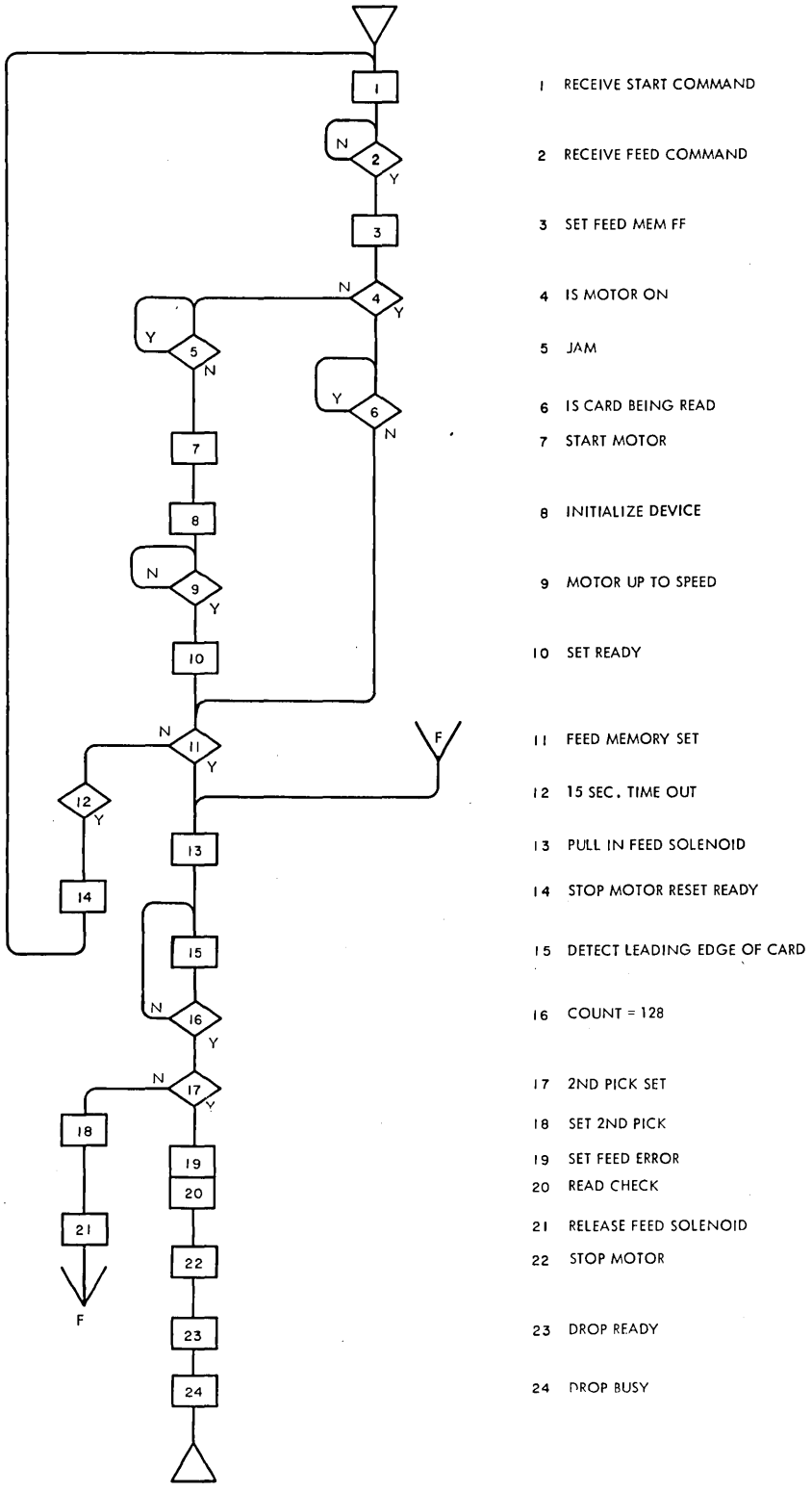
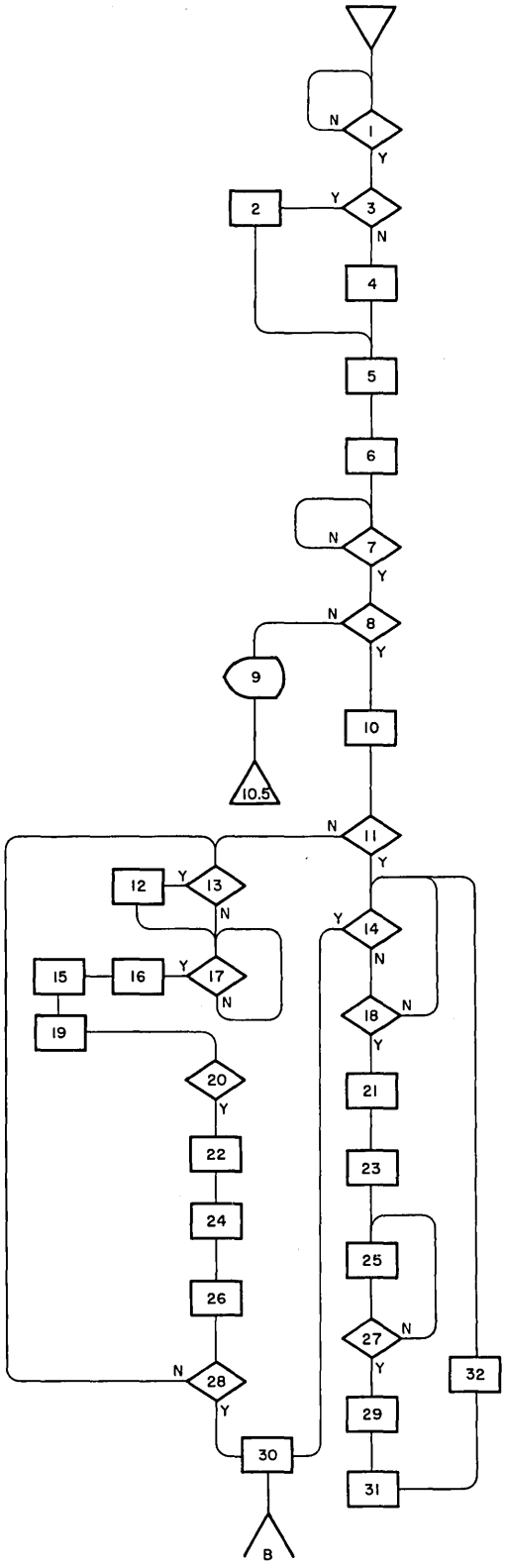


Figure 3-12. Flow Chart, Feed Cycle



1. DETECT LEADING EDGE OF CARD
2. PRESET SUB COUNT TO 15
3. MARK MODE
4. PRESET SUB COUNT TO 11
5. SET COLUMN COUNT TO 254
6. SET IMAGE FLIP FLOP
7. COLUMN COUNTER = 1
8. HAVE ALL CHANNELS SEEN LIGHT
9. SET READ CHECKLITE
10. SET DATA GATE

10.5 LIGHT ERROR, READER WILL STOP AT END OF CARD CYCLE

11. MARK MODE
12. SET SUB COUNTER TO 7
13. LEADING EDGE OF DATA RECEIVED
14. COLUMN COUNTER = 81
15. SET INGATE
16. CLEAR DATA REGISTER
17. SUBCOUNTER = 11
18. DI3 LEADING EDGE RECEIVED
19. TRANSFER DATA TO DATA REG.
20. SUBCOUNTER = 15.5
21. CLEAR DATA REGISTER
22. STOP INGATE
23. SET INGATE
24. COUNT COLUMN COUNTER
25. TRANSFER DATA TO DATA REGISTER
26. GENERATE OUTPUT STROBE
27. DI3 TRAILING EDGE RECEIVED
28. COLUMN COUNT = 81
29. STOP INGATE
30. RESET DATA GATE
31. GENERATE OUT STROBE
32. COUNT COLUMN COUNTER, COLUMN COUNTER RUNS INDEPENDENTLY OF DATA WHEN IN MARK MODE.

Figure 3-13. Flow Chart, Read Cycle, (Sheet 1)

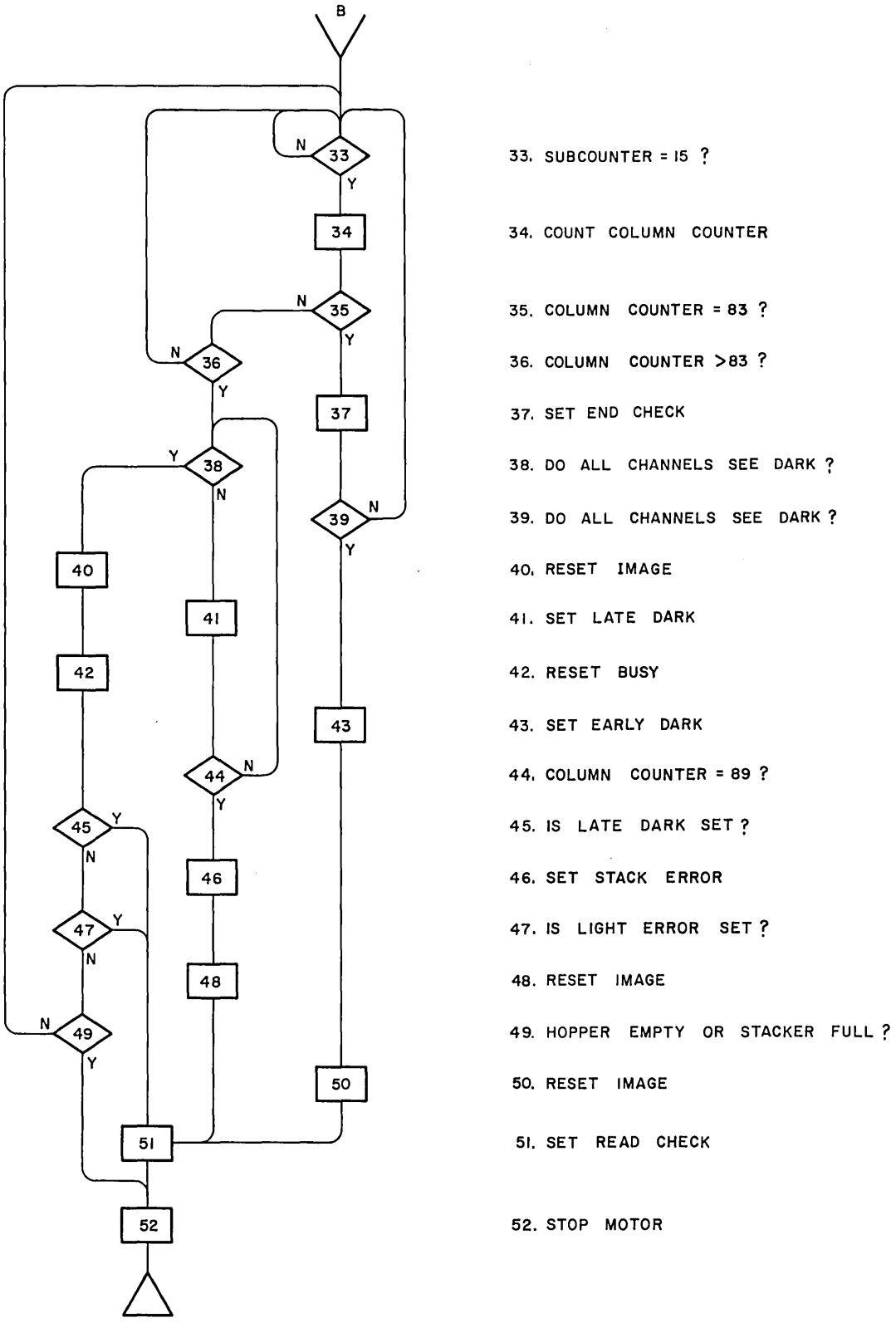


Figure 3-13. Flow Chart, Read Cycle (Sheet 2)

SECTION IV

INSTALLATION AND CHECKOUT

Section IV - INSTALLATION AND CHECKOUT

4-1. GENERAL

The card reader is highly compact and portable and is compatible with any reasonable data processing environment. This section lists applicable site requirements and provides information pertinent to uncrating, initial inspection and preliminary set-up.

4-2. SITE REQUIREMENTS

With the exceptions of meeting the environmental limitations of Table 1-2, Section 1, the only additional site requirements are those related to power and signal interface provisions.

4-2.1 POWER

Reader units bearing model suffixes C and E; e.g., CB202C, CB203E, etc., require access to a primary power source of a nominal 115 VAC, 60 Hz. Suffix D and F designated units operate with a nominal 230 VAC/50 Hz primary input. Tolerance values are listed below:

Freq.	Voltage	Current	Limiting Values
60 Hz	115V	5 amp (nominal)	104-127 VAC 59-60.6 Hz
50 Hz	230V	3 amp (nominal)	207-253 VAC 49-50.5 Hz

NOTE

Other input power is available by rewiring the power supply (Table 1-2)

The reader power cable is color coded as follows:

Black: V AC (115 or 230 Volts)
White: AC N (Neutral)
Green: Chassis (earth ground)

4-2.2 TEMPERATURE AND HUMIDITY

The operating temperature, limited by the media, is 50°F to 95°F. The non-operating temperature is minus 30° F to 150° F with a maximum gradient of 20° F per hour. The operating humidity, limited by the media, is 30% to 65%; non-operating humidity is 5% to 95%.

4-2.3 ALTITUDE

The maximum altitude is 10,000 feet operating, and 15,000 feet non-operating.

4-2.4 GROUNDING

Frame ground within the reader is connected to the cabinet, mechanical deck and drive motor housing. Frame ground conducts only leakage currents and short circuit currents for the protection of personnel against shock and fire hazards. The frame ground is connected to the service ground center terminal of the main power receptacle with #16 wire.

4-2.5 AREA AND MAINTENANCE ACCESS

With the decorative cover, rear panel and the hinged front panel all extended for maintenance access the reader will occupy approximately 4.5 square feet of installation space. See Figure 4-1.

4-2.6 FLOOR LOADING

Distributed floor loading is approximately 50 pounds per square foot. Maximum load imposed upon each of the six support bumpers is 17 pounds.

4-2.7 SIGNAL INTERFACE

The unit provides 12-bit word length, parallel output data to an interface receptacle (rear of unit) through which associated controller commands and unit status signals are also routed. Interface characteristics and signal definitions pertinent to controller/unit compatibility are provided by Section II of this manual.

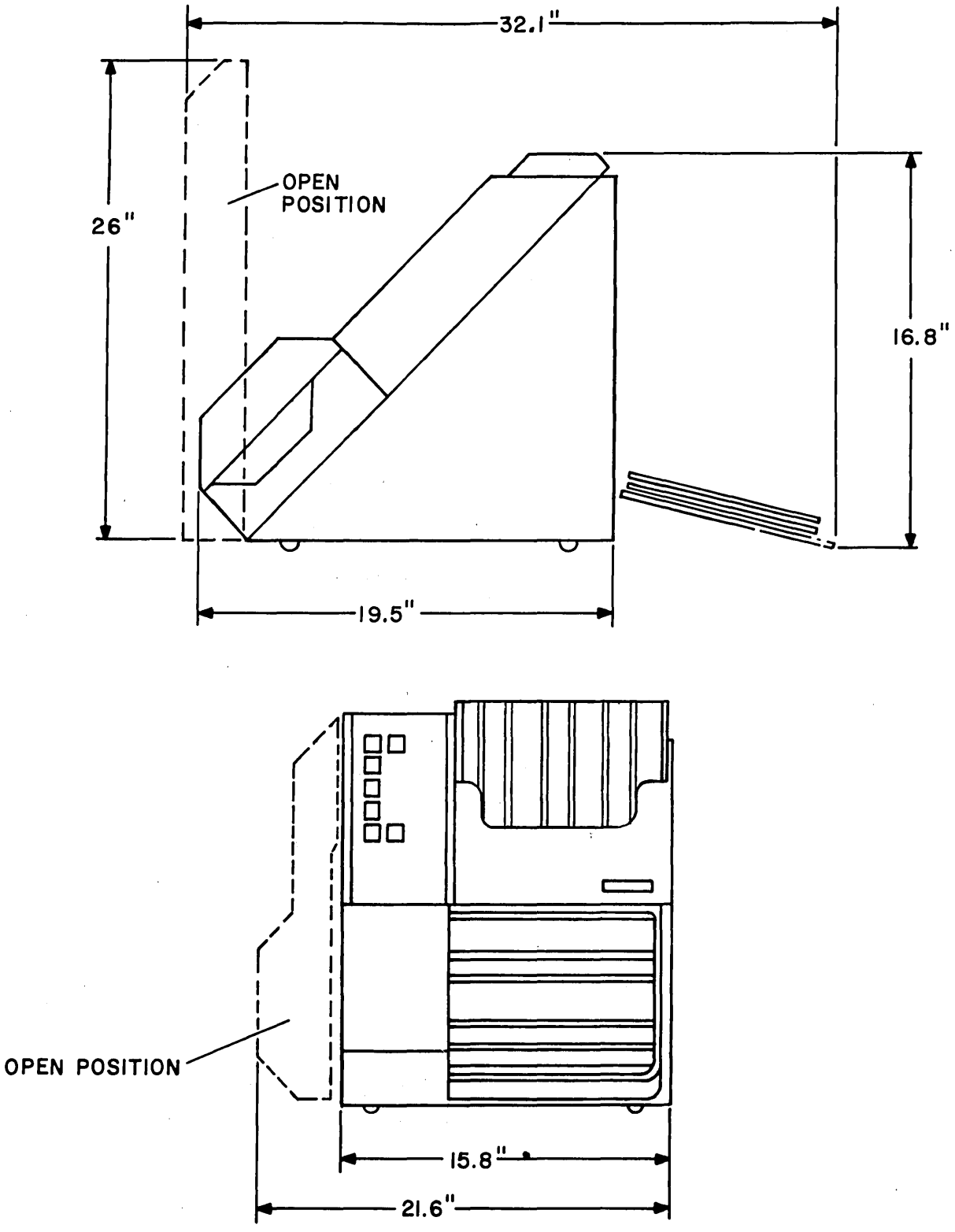


Figure 4-1. Card Reader Working Area

4-3. INSTALLATION

4-3.1 UNCRATING AND INSPECTION

The reader unit is shipped in a heavy duty cardboard carton and is buffered from shock and/or impact damage by industrial filler. Appropriate documentation; i.e., packing slip and service manual is enclosed. No special instructions are required to remove the unit. The "Visual Inspection" Table 4-1 should be accomplished to determine the possibility of in-transit damage.

Table 4-1. VISUAL INSPECTION

ITEM	DESIRED CONDITION
Cabinet exterior and decorative panels	Painted surfaces unmarred, no structural damage, hinged panels open/close without binding.
Switch-Indicators	Plastic housing intact, marking legible, and assemblies properly seated in plug-in receptacles.
Cabling & Wiring	Check for viewable continuity, connector pins not broken or bent, insulation sleeving correctly positioned.
Circuit Boards	No visible evidence of component damage, ribbon connectors properly seated in receptacles.
Fuse Elements	Properly rated fuses are installed - See Operator Maintenance, Section II.

4-4. INITIAL SET-UP/CHECKOUT

Prior to placing the reader in on-line operation perform the following checks:

a. Compare unit nameplate data i.e., primary power rating to the of the available power source to ensure compability.

b. Confirm that the drive belt and pulley arrangement is correct for desired reader card speed (See appropriate Parts List).

NOTE

Upon completion of step b, reader should be ready for primary power and controller interface connections. It is recommended; however, that unit first be set up for off-line operation (See paragraph 5-3.2a, Section V - MAINTENANCE) and a short card deck processed in order to verify unit operation.

c. For on-line operation, set all the switches on Control Board A4 to "OFF". When Data Board FIXED POLARITY A is used, the test feed switch on these data boards should be set to "off". If the Variable Polarity Data Board is used, set the switches in accordance with system requirements of negative active or positive active logic.

4-5. REPACKING PROCEDURES

For repacking procedures, follow the reverse of UNCRATING and INSPECTION PROCEDURES, paragraph 4-3.1.

4-5.1 FIELD SHIPMENT

To ship unit back for refurbishment or between sites, and to order packing material, consult the Field Procedure Guide, Section 8:504:00.

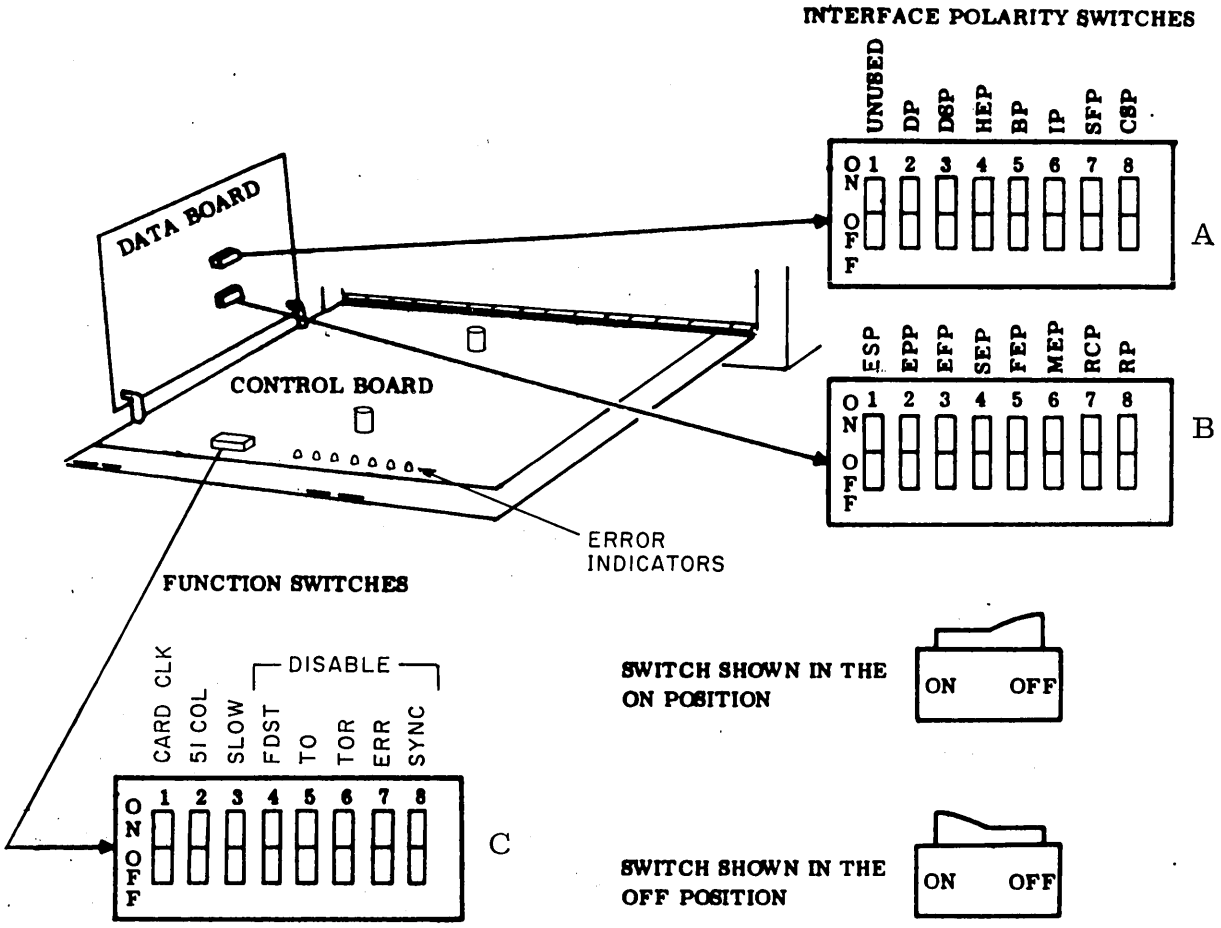


Figure 4-2. Card Reader Functions and Interface Polarity Switches

SWITCH A			SWITCH B			SWITCH C		
S1	Unused		S1	ESP	external start	S1	Card Clock	
S2	DP	12 data lines	S2	EPP	external stop	S2	51 Col	
S3	DSP	data strobe	S3	EFP	external feed	S3	Slow	
S4	HEP	hopper empty	S4	SEP	stacker error	S4	FDST	feed start
S5	BP	busy	S5	FEP	feed error	S5	TO	time out
S6	IP	image	S6	MEP	motion error	S6	TOR	time out-ready
S7	SFP	stacker full	S7	RCP	read check	S7	ERR	error run
S8	CSP	card supply	S8	RP	ready	S8	SYNC	resync bypass

NOTES

1. Switches A and B - refer to Tables 1-3, 1-4, 1-5 and 4- for additional information.
2. Switch C - Refer to Table 5-2 for additional information.

SECTION V

MAINTENANCE

Section V - MAINTENANCE

5-1. GENERAL

This section contains information pertinent to routine preventive maintenance services as required to preempt failures and reduce down-time, plus those exact troubleshooting, removal/replacement, and adjustment procedures required to return a defective unit to On-line status.

5-1.1 SPECIAL TOOLS AND TEST EQUIPMENT

Special tools and test equipment required for maintenance of the card reader are listed in Table 5-1.

Table 5-1. SPECIAL TOOLS AND TEST EQUIPMENT

ITEM	TOOL/EQUIPMENT
1	Set of Allen Wrenches
2	Oscilloscope - Hewlitt-Packward 180 or equivalent
3	Soldering Iron (low wattage)
4	Solder (resin core flux)
5	Assorted Screwdrivers
6	Feeler Gauge Set
7	Volt-Ohm-Meter (high impedance)
8	General Purpose Pliers
9	Needlenose Pliers
10	Gauge - Feed Plate (73715400)

5-1.2 FUNCTION SWITCHES

The reader can be programmed to operate in several modes via internal switch settings. These switch settings are also useful as an aid in trouble-shooting. A single DIP switch, located on Control Board A4, contains these switches. Table 5-2 lists and describes each of these 'function' switches.

Table 5-2. FUNCTION SWITCHES

NAME/LOCATION	DESCRIPTION	
Card Clock (CDCLK/), (S1) (OHMR Option) Refer to Para 1-5.	Disable (off):	Logic circuits are conditioned to accept column timing from either internal reader timing or timing marks on optical mark sense data cards.
	Enable (on):	Logic circuits derive column timing from timing marks on optical mark sense data cards. MARK switch must also be depressed on SWITCH PANEL.
51 Column (51 COL.T/), (S2)	Disable (off):	Logic circuits are conditioned for reading 80 column cards.
	Enable (on):	Logic circuits are conditioned for reading 51 column cards. 51 column card mechanical conversion kit must be installed when 51 column card mode is used.
Slow Card Rate (SLOW/), (S3) (Available on Dual Speed Models, Only)	Enable (off):	Reader will accept a feed command immediately upon detection of a card's trailing edge at read station.
	Disable (on):	Acceptance of feed command is delayed such that card per minute rate is one-half the rate with switch in enable position.
Feed Start (FDST.T/), (S4)	Enable (off):	Allows an external feed command to automatically start motor.
	Disable (on):	This is a maintenance position which enables off-line card processing in conjunction with Data Board Test Feed switch and Switch Panel "RESET" switch. (See paragraph 5-3.2a, Off-Line Mode)
Time Out Ready (TOR.T/), (S6)	Enable (off):	Off position is normal operating position. Ready signal remains active after motor turns off.

Table 5-2. FUNCTION SWITCHES (Cont'd)

NAME/LOCATION	DESCRIPTION	
Time Out Ready (TOR.T/), (S6)	Disable (on):	Ready signal will go inactive when reader Time Out signal occurs.
Time Out (TO.T/), (S5)	Enable (off):	Motor will automatically turn off 14 + 5 seconds after receipt of last feed command.
	Disable (on):	Motor stays on unless turned off by a NOT READY condition.
Error (ERR/), (S7)	Enable (off):	Reader will stop upon detection of all error conditions.
	Disable (on):	Maintenance position that permits reader to continue running while it is detecting all reader errors. Only STACK err will stop reader while in this condition.
Resync (SYNC/), (S8) NOTE In either position, DISABLE or ENABLE, Resync will occur upon detection of leading edge of card.	Enable (off):	Allows resync of electronics timing when leading edge of data is detected.
	Disable (on):	When Resync is disabled, the counters will not be preset to seven at the leading edge of data. Card slippage may be checked with the switch in this maintenance position. If a card is fed with only one column punched, the card slippage may be checked by looking at the INSTROBE test point with respect to the DATA test point. The relationship between them should remain constant throughout the card, within four clock periods.

NOTE

See Figure 4-2 for location of Function Switches.

5-1.3 ERROR INDICATORS

Seven LED type error (alarm) lamps provide maintenance personnel with indication as to the probable nature of a reader malfunction; i.e., the point in operational sequence where error occurred. These lamps are located along the bottom edge of Control Board A4 when this board is opened out for access. Table 5-3 lists and describes individual lamp functions.

Table 5-3. ERROR INDICATORS

LAMP	FUNCTIONAL INDICATION
FEED ERR	Lamp 'on' when two successive card feed attempts have failed to produce an image 'true' condition; i.e., leading edge detection.
LIGHT ERR	Lamp 'on' when read head sensors fail to detect 'all light' prior to column one immediately following leading edge detection.
ILLEGAL FEED ERR	Lamp 'on' denotes transport motor running and image 'true' prior to a valid FEED command; i.e., a card has been fed without command.
EARLY DARK ERR	Lamp 'on' indicates that all channels sense dark at the end of column 82 time.
LATE DARK ERR	Lamp 'on' when card is still under read head at subcount 9, column 84 time.
STACK ERR	Lamp 'on' when card presence is detected under read head at reference column 89 time.
SYNC ERR	Lamp 'on' indicates loss of basic timing pulses.

5-2. PREVENTIVE MAINTENANCE

5-2.1 ACTIVITIES AND OBJECTIVES

Preventive maintenance incorporates those inspections and/or procedures, scheduled on a continuing basis that are performed to eliminate undesirable conditions before operational degradation or total equipment failure can occur; e.g., dirt accumulation, excessive component wear or borderline adjustment/alignment tolerances. The P/M subsection is, therefore, a guide that establishes the manufacturer's recommended activity schedule and includes specific cleaning, adjustment checks and other procedures that are preventive in nature. Adherence to the P/M Schedule should prevent most marginal problems and materially reduce equipment 'down time'. Where a defective component or a misadjustment/alignment is exposed through a P/M activity, the appropriate remedial action is referenced to the "Corrective Maintenance" subsection.

5-2.2 PREVENTIVE MAINTENANCE INDEX

Table 5-4 lists and schedules the manufacturer's P/M activity recommendations. As a rule of interpretation, it is understood that "weekly" (50 hours) activities are automatically a prerequisite of "monthly" (200 hours) activities, etc.

The "Level" columns of Table 5-4 are designated, for scheduling purposes as:

Level 1 - - - - - - - - Prior to power-up after sustained shutdown
Level 2 - - - - - - - - 50 operating hours or weekly
Level 3 - - - - - - - - 200 operating hours or monthly
Level 4 - - - - - - - - 600 operating hours or quarterly

Table 5-4. PREVENTIVE MAINTENANCE INDEX

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	ACTIVITY/ACTION	REFERENCE	TIME REQ.
X				Visual Inspection	Table 4-1	3 min.
	X			Inspection/cleaning	Para. 5-2.3	15 min.
		X		Vacuum Interior of unit	None	10 min.
			X	Throat gap setting, check/adjust	Para. 5-3.3	
			X	Head skew, check/adjust	Para. 5-3.2	15 min.
			X	Drive belt-inspection and possible replacement	None	5 min.
			X	Timing disc-inspection, adjustment/replacement	Para. 5-4.19/20	45 min.

5-2.3 INSPECTION/CLEANING

Inspect the drum surface, stacker follower, card path and overall exterior of unit for buildup of dirt, dust, ink or other foreign material. Where a cleaning requirement is evident it should be accomplished using a soft, lint-free cloth such a kimwipe moistened with isopropyl alcohol with the exception of the card transport drum which is cleaned with water.

CAUTION

Manually rotate transport drum in direction of card feed only.

The area under feed plate accumulates card dust and should be dusted and vacuumed. (Failure to clean could result in premature failure of feed plate solenoid or intermittent feed fails.)

5-2.4 LUBRICATION

No lubrication requirements exist; i.e., motor drive components are sealed, permanently lubricated units.

5-3. CORRECTIVE MAINTENANCE

Corrective maintenance incorporates trouble isolation, component removal/replacement and mechanical/electrical adjustments and alignments.

5-3.1 TROUBLESHOOTING

Reader malfunctions lend themselves most readily to isolation with respect to the point-in-time that an 'error' is noted with respect to the overall card feed/read cycle. The 'error indicators', Table 5-3, facilitate rapid identification of the time point of a failure indication. Table 5-5, TROUBLESHOOTING GUIDE provides a rapid reference to problem areas associated with major symptoms and/or error lamp indications.

Table 5-5. TROUBLESHOOTING GUIDE

SYMPTOM OR ERROR LAMP	PROBABLE CAUSE	ACTION
Unit fails to power-up	Improper input power connection.	Check-correct
	Blown fuse.	Check-replace
	Defective power supply component (s).	See Section VII - DIAGRAMS.
Unit fails to power-off	Defective zero cross over detector in power supply.	Check-replace
Transport motor fails to start	Interface command level (ES) not set 'true'.	Table 1-3, Sec. I
	Motor start logic defective.	See Section VII - DIAGRAMS
Fails to feed (FEED ERR lamp - 'off')	Interface command level (EF), not set 'true'.	Table 1-3, Sec. I
Fails to feed (FEED ERR lamp - 'on')	Card contacting surface of drum is excessively dirty.	Inspect-clean para. 5-2.3
	Throat gap restrictively tight.	Inspect-adjust para. 5-3.3
	Hopper empty switch defective.	Inspect-replace paras. 5-4.24 and 5-4.25.

Table 5-5. TROUBLESHOOTING GUIDE (Cont'd)

Fails to feed (FEED ERR lamp - 'on') (Cont'd)	Feed plate mechanically bound.	Inspect-clear
	Feed plate solenoid defective.	Check-replace, para. 5-4.9/10.
	Control logic element defective.	See Section VII - DIAGRAMS
Invalid feed (ILLEGAL FEED ERR)	Logic element in feed control loop defective.	See Section VII - DIAGRAMS
	Solenoid spring weak or damaged.	Inspect-replace, para. 5-4.9/10.
	Feed plate damaged or alignment with drum surface incorrect	Inspect-replace plate, paras. 5-3.3 and 5-4.2.
Invalid feed; i.e., double feed (STACK ERR lamp - 'on')	Throat gap setting excessively open	Inspect-adjust, para. 5-3.3
	Timing invalid	See para. 5-3.2
	Feed plate up/down travel incorrect	Check per para. 5-3.3. Replace para. 5-4.3/4
READ CHECK L/T fault (LIGHT ERR lamp - 'on')	Bent or missing corner on card.	Check
	Read head lamp voltage low.	Check-adjust, para. 5-3.2
	Logic element LE/image loop	See Section VII - DIAGRAMS
	Read channel component defective.	Replace read head, para. 5-4.16.
READ CHECK L/T fault (EARLY DARK ERR lamp - 'on')	Timing lamp defective	Check para. 5-3.2, Replace 5-4.21
	Timing disc or mask damaged or incorrectly positioned.	Inspect-replace, para. 5-4.19/20
	Timing phototransistor pickup defective.	Replace, para. 5-4.22/23

Table 5-5. TROUBLESHOOTING GUIDE (Cont'd)

READ CHECK L/T fault (EARLY DARK ERR lamp-'on') (Cont'd)	Logic element in "Early Dark" test loop defective.	See Section VII - DIAGRAMS
READ CHECK L/T fault (LATE DARK ERR lamp-'on')	Throat gap setting excessively tight.	Check-adjust, para. 5-3.3
	Read head gap excessively tight.	Check-adjust, para. 5-3.3
	Feed plate fingers out of true (Fig. 3-2)	Check para. 5-3.3, para. 5-4.3/4
	Stacker springs damaged.	Check-replace, para. 5-4.7/8.
	Logic element in "Late Dark" test loop defective	See Section VII - DIAGRAMS
READ CHECK L/T fault (SYNC ERR lamp - 'on')	Timing lamp defective	Check-replace, para. 5-4.21
	Timing channel phototransistor defective.	Check-replace para. 5-4.22/23
	Timing amplifier channel defective	Check-replace, para. 5-3.2
	Logic element in "SYNC" test loop defective.	See Section VII - DIAGRAMS
Data Errors (all channels affected)	Read lamp intensity low	Check-adjust, Para. 5-3.2
	Data strobes missing or erratic	Check strobe generation logic (See Section VII - DIAGRAMS
	Read Head mechanical positioning incorrect; i.e., skew.	Check-align, Para. 5-3.2
Data Error (discrete channels only)	Channel sense and/or amplifier components defective.	Test - replace

Table 5-5. TROUBLESHOOTING GUIDE (Cont'd)

Card Damage (No other alarm/malfunctions present)	Stacker springs(s) defective	Inspect-replace, Para. 5-4.7/8.

5-3.2 ELECTRICAL ADJUSTMENTS/ALIGNMENTS

Electrical adjustment/alignment procedures that are prerequisite to proper reader operation are outlined by subordinate headings and are treated in the best order of performance. Instructions are prepared to the level of trained field maintenance personnel that are familiar with the operation of the reader unit and appropriate test equipment.

Prior to executing subsequent procedures the reader must be placed in Off-line operation; i.e., interface plug must be decoupled and all internal polarity select and function switches must be appropriately set. It is assumed that 80-column punched cards are used throughout the following procedures. An oscilloscope (Hewlitt-Packard 180 - or equivalent) and VOM (high impedance input) are required. See "Off Line operation", below.

a. Off-Line Operation

Decouple the interface connector and set internal polarity select and function switches as indicated:

1. Polarity select switches on Data Board A5: (Loc W4), ESP-'ON', EPP-'ON', EFP-'OFF'.
2. Function switches on Control Board A4: FDST switch - 'ON' - all other function switches to be initially 'OFF'.

Place cards in hopper, 9 edge in and face down. The operator panel RESET control is then used to start or stop card feeding i.e., alternate action sequencing.

NOTE

If FIXED POLARITY DATA BOARD A is used the Off-Line switch on the Data Board or the RESET control can be used to start or stop card processing.

NOTE

Refer to Tables 4-2 and 5-2 for additional information on polarity select switches and function switches.

b. Timing Pulse Check

1. Precondition:

   Unit powered up, motor off.

   Oscilloscope: Setup for single channel operation, internal trigger, and time base at approx. 10μsec/cm. Connect scope test probe at 80 CLOCK TP on Amplifier Board A2.

2. Observe that free running time of oscillator is 55 ± 10 μs (66 ± 10 μs*). If incorrect, try varying the lamp position. The lamp filament must be parallel to the timing disk segments. If changing the lamp position does not correct the time, perform Timing Lamp Adjustment, paragraph 5-3.2c.

3. Initiate motor start without feeding cards (EFP switch on A5 board 'ON'). Observe that clock cycle becomes shorter by at least 10%. Values for selectable read speeds are:

   800 cpm - 35 + 4 μsec
   600 cpm - 45 ∓ 5 μsec (37 ± 5 μsec*)

   * For the following units: CB104K and CB202K.

NOTE

If excessive jitter is observed or if 80 CLK output fails to achieve a stable sync with disc input, perform Timing Lamp Adjustment, paragraph 5-3.2 c.

NOTE

After repeating paragraphs 5-3.2 b and 5-3.2 c and jitter still exists, the timing lamp and/or phototransistor board may require replacement.

c. Timing Lamp Adjustment

1. Precondition: Same as para. 5-3.2 b above, except transport motor 'ON'. Set Function switch 'TO' to the ON position. (Refer to Figure 4-1)
2. Connect VOM to measure dc lamp voltage across variable resistor R9 on A2 board (or across lamp terminals).
3. Observe scope waveform while turning R9 clockwise (toward ground) until 80 CLK output begins to lose sync with disc timing pulses or end of pot is reached. Record VOM voltage reading.
4. Observe scope waveform while turning R9 counterclockwise until 80 CLK output begins to distort or lose sync or end of pot is reached. Record VOM voltage reading.
5. Set timing lamp voltage (R9) at midpoint of observed readings; i.e., $\frac{\text{V Step 3} + \text{V Step 4}}{2}$ = Pot Setting
6. Remove VOM connection and observe 80 CLK output for a clean stable pulse train. Jitter at middle or trailing edge of clock cycle should be minimal or preferably zero. Slight rotation of timing lamp within its holder may be necessary to reduce jitter effect. Lamp intensity is also affected by "in/out" movement. If lamp movement is accomplished, repeat this procedure to insure an appropriate final adjustment.

CAUTION

Overtightening of the set screw that holds the timing lamp in place may damage lamp, and result in the loss of +5V volts.

7. Reset adjusting screw on R9.

NOTE

If timing lamp phototransistor is removed, observe the following precautions upon replacement: (1) polarity markings of connecting leads and (2) mask is reinstalled with marked lines closest to timing disc.

d. Read Lamp Adjustment

1. Precondition: Input hopper loaded with high reflectance (Buff) cards, checkboard pattern (see Figure 5-2A).

   Oscilloscope: Setup for single channel operation, sync on "DATA" TP (A4 Board). Set voltage scale to 1V/DIV and time scale to 20 ms/DIV. Scope probe to "PEAK DETECT" output TP (Cathode CR3 of A2 board).

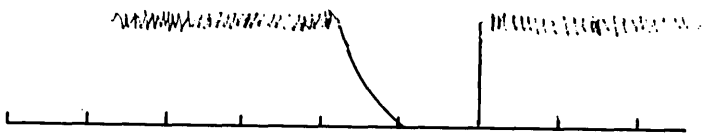
2. Initiate card feed. Adjust Read Lamp Control, variable resistor R10 (A2 Board) until one of the following occurs:

   (a) Peak detector output (Figure 5-1) approaches saturation as evidenced by a flattening of the waveform pedestal.

   (b) A READ CHECK alarm halts card processings.

NOTE

If step (b) occurs, back off R10 until cards can be run.

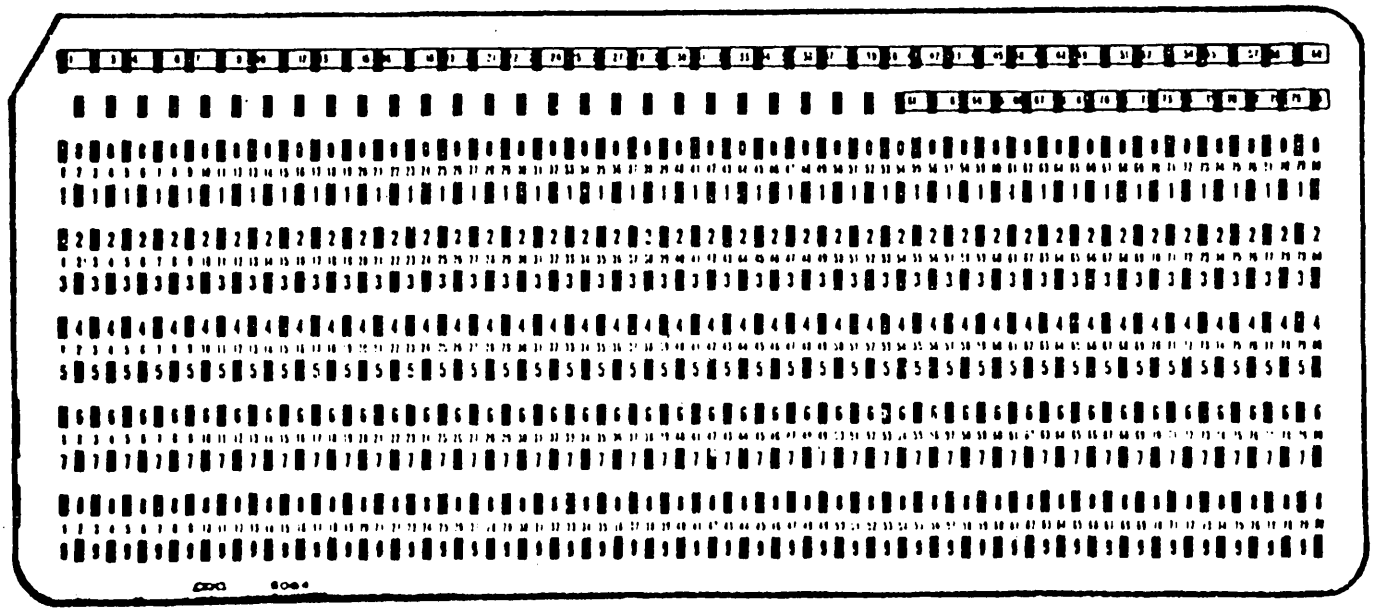


Unsaturated

Saturated

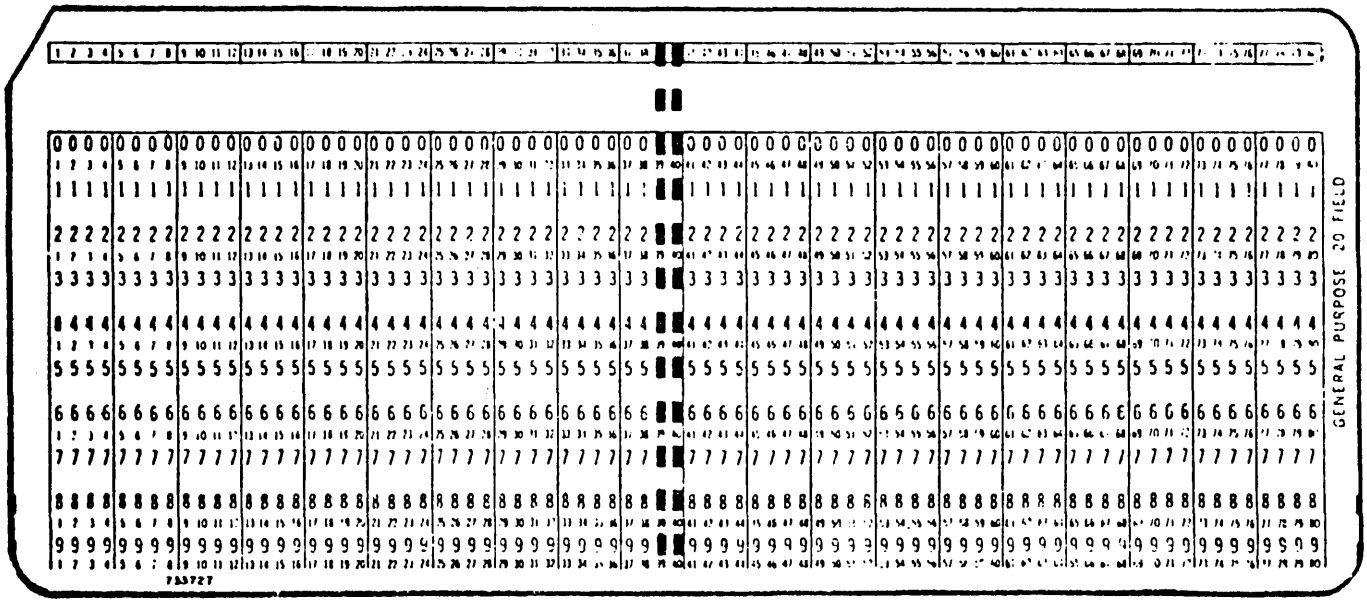
Figure 5-1. Peak Detector (while feeding heavily laced cards)

3. Measure (VOM) the read lamp voltage across read lamp terminals. Record value as V BUFF.



READ ADJUST CARD

Figure 5-2A



AMPLIFIER SETTING CARD

Figure 5-2B

4. Reload input hopper with low reflectance (Blue) cards punched in columns 39 and 40 (rows 12 thru 9). To determine low reflectance cards, observe "PEAK DETECT" TP on Amplifier card A2. Feed a deck of blue colored cards and record peak detect amplitude. If cards are of low reflectance, peak detect amplitude will be approximately 50% less than the value of the Buff cards as recorded in step 3 (see Figure 5-2B).

5. Place scope probe on "DATA" test point on Control Board (A4) Set scope to 2V/div and time base at 50 μsec/div. Initiate card feed. Observe scope waveform with uncalibrated time/cm control. Adjust trace until one period of data waveform occupies 10 cm on scope face.

6. Vary "Read Lamp Control" R10 until duty cycle of observed waveform is 20% greater than initial observation (see Figure 5-3) or bottom of potentiometer is reached .

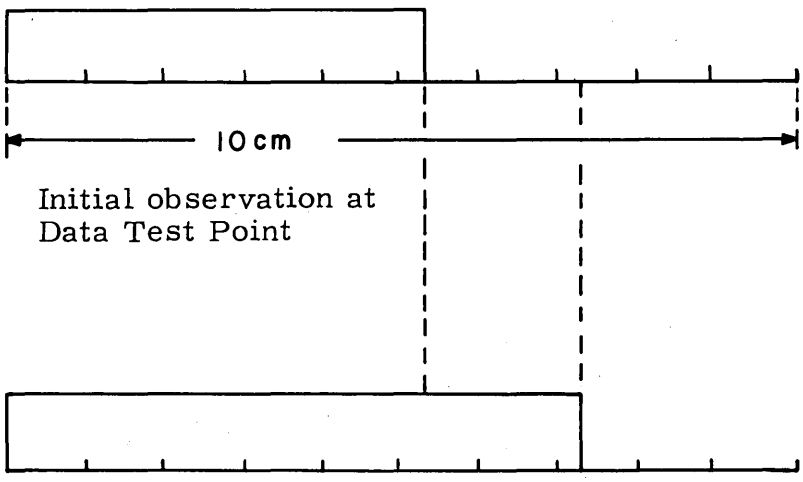


Figure 5-3. Read Lamp Adjustment

7. Measure and record the voltage across the read lamp (as in step 3). Record value as V BLUE.
8. Calculate final read lamp voltage (VL) setting as:

$$VL = \frac{V\ BUFF + V\ BLUE}{2}$$

9. Observe VOM as previously connected. Adjust R10 until voltage equals computed value of VL.
10. Using blue cards, check scope waveform duty cycle is not greater than 80% of period established in step 5 above. If greater than 80%, check amplifier or phototransistor board.
11. Reseal adjusting screw on R10.

e. Skew Adjustment

1. Precondition: Input hopper loaded with properly registered buff cards punched in rows 9 and 12 only. (See Figure 5-5) Oscilloscope: Set up for dual channel operation, algebraically add SYNC external on IMAGE TP on A4 board.
2. Connect CH-'A' probe at D9 TP (A2 board) and CH-'B' probe at D12 TP (A2 board).
3. Initiate card run. View data at center of card; i.e., expand or delay sweep.
4. Uncalibrate scope and expand one data bit over 10 scope divisions.
5. Loosen two read head adjustment link screws adjust position of assembly for minimum skew (Figure 5-4). Tighten adjustment link screws carefully to avoid disturbing adjustment.
6. Adjust sweep trace to observe data display at leading and trailing edge of card time. Skew should be less than 25% at either end. Skew measurements are to be made with respect to the data center points (not leading or trailing edges). Reference paragraph 5-3.3b.
7. Check read head gap.

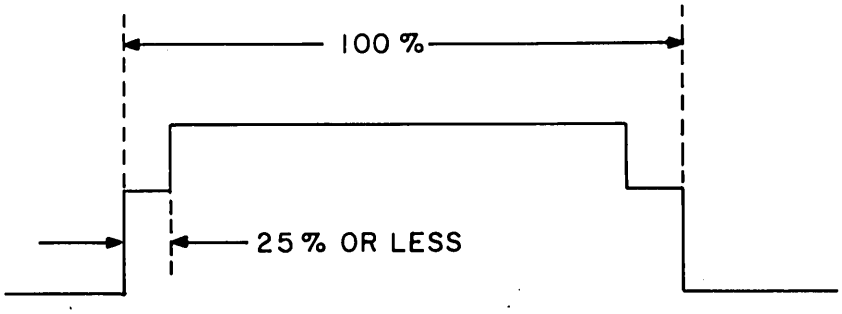
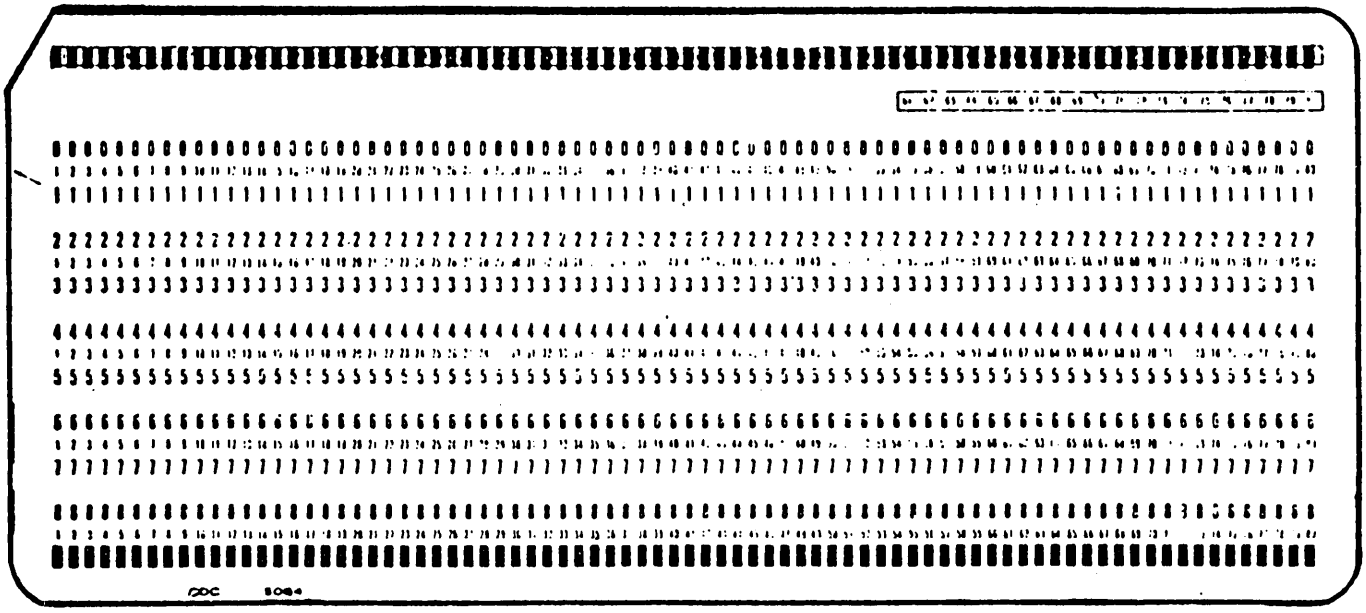


Figure 5-4. Minimum Skew Adjustment



SKEW ADJUST CARD

Figure 5-5.

NOTE

Alternate type skew pattern may be used also. Card punched with holes in rows 9 and 12 and columns 1 and 80.

5-3.3 MECHANICAL ADJUSTMENT

Mechanical adjustments, critical to the proper operation of the card reader, are outlined under appropriate subordinate headings of this subsection.

a. Throat Gap Adjustment

Prior to setting the throat gap, an attempt should be made to locate any low points along the card carrying surfaces of the drum; i.e., out of round points. This can be accomplished by slipping a 0.008-inch feeler gauge between each card stop (Figure 5-6) and the associated elastomer drum ring, and slowly rotating the drum, in the direction of card flow only, until such points are noted.

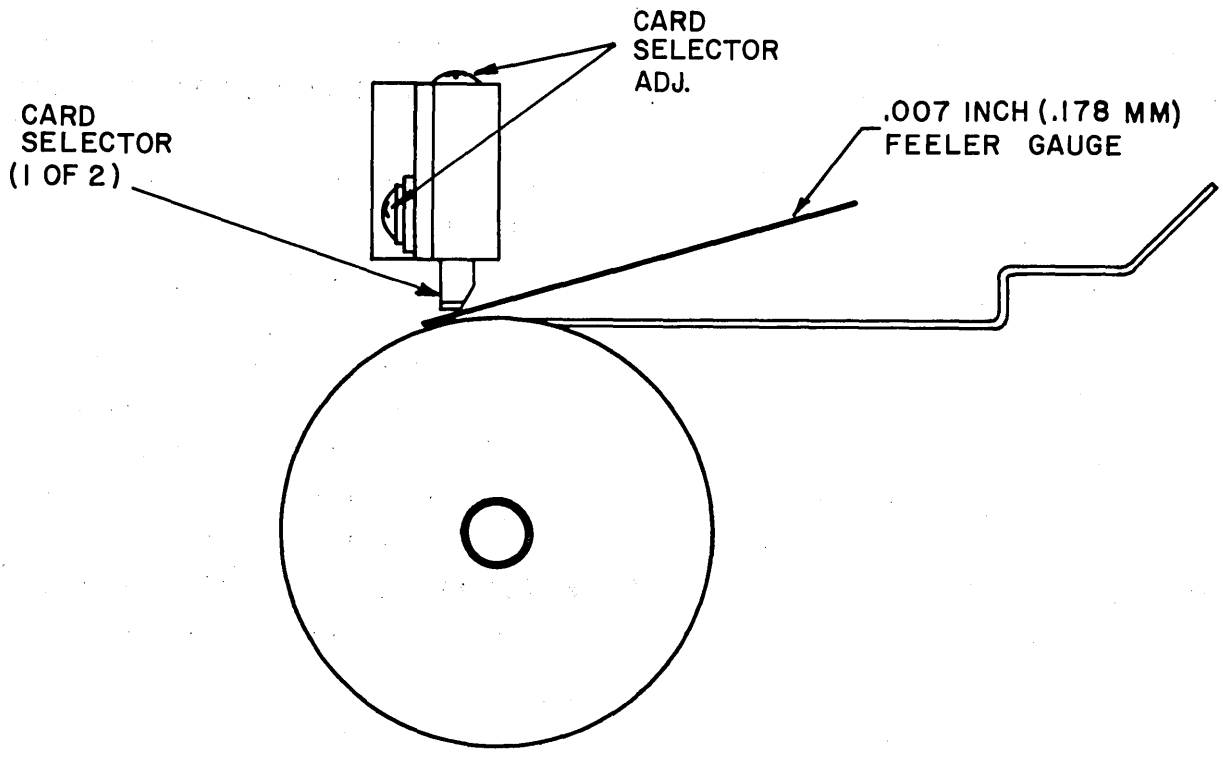


Figure 5-6. Feed Mechanism Components

Using the lowest point (widest gap) on an individual ring as a reference, insert an 0.008 inch feeler gauge between the drum and card stop at a position tangent to drum at the point of maximum gap between card stop and drum. Proper throat gap setting is such that linear movement of the 0.008 thickness gauge will cause positive rotation of drum in both directions, while corresponding movement of an 0.006 thickness gauge does not cause positive rotation. Both card stops should be adjusted individually.

Adjust gap by first loosening card stop set screws (Figure 5-6) and then adjusting spring loaded adjustment screws for correct gap. Lock adjustment by tightening set screws.

NOTE

The gap may be increased/decreased in event of failure to feed last card or double card feed when hopper is full. Check for card damage caused by card selectors when reducing gap.

b. Read Head Gap

The read head gap setting should be between 0.008 and 0.012 after all adjustments are completed. The gap is set initially to 0.007 - 0.010 by placing a 0.009 mylar gauge (or combination of a tab card and writing paper which will equal approximately 0.010 inch) between drum and read head with read head loose on rear head support. The head is pressed firmly toward drum and three allen head adjustment screws tightened uniformly, beginning with center screw. The final gap setting will be actually determined at skew adjustment, paragraph 5-3.2e, and should be checked to assure that it has not changed significantly. Scribe marks on the read head support and front and rear plates, to record the aligned position, can be made to simplify repositioning of read head and support assembly after removal. Otherwise, skew adjustment must be checked following any disturbance of read head positioning.

NOTE

As a preliminary skew setting, the top of Read Head Assembly should be parallel with the top drum.

5-3.3 (Cont'd)

c. Feed Plate to Drum - Symmetry and Throw

An undamaged (symmetrical) feed plate, operating with a properly installed and adjusted solenoid assembly, should exhibit the following conditions:

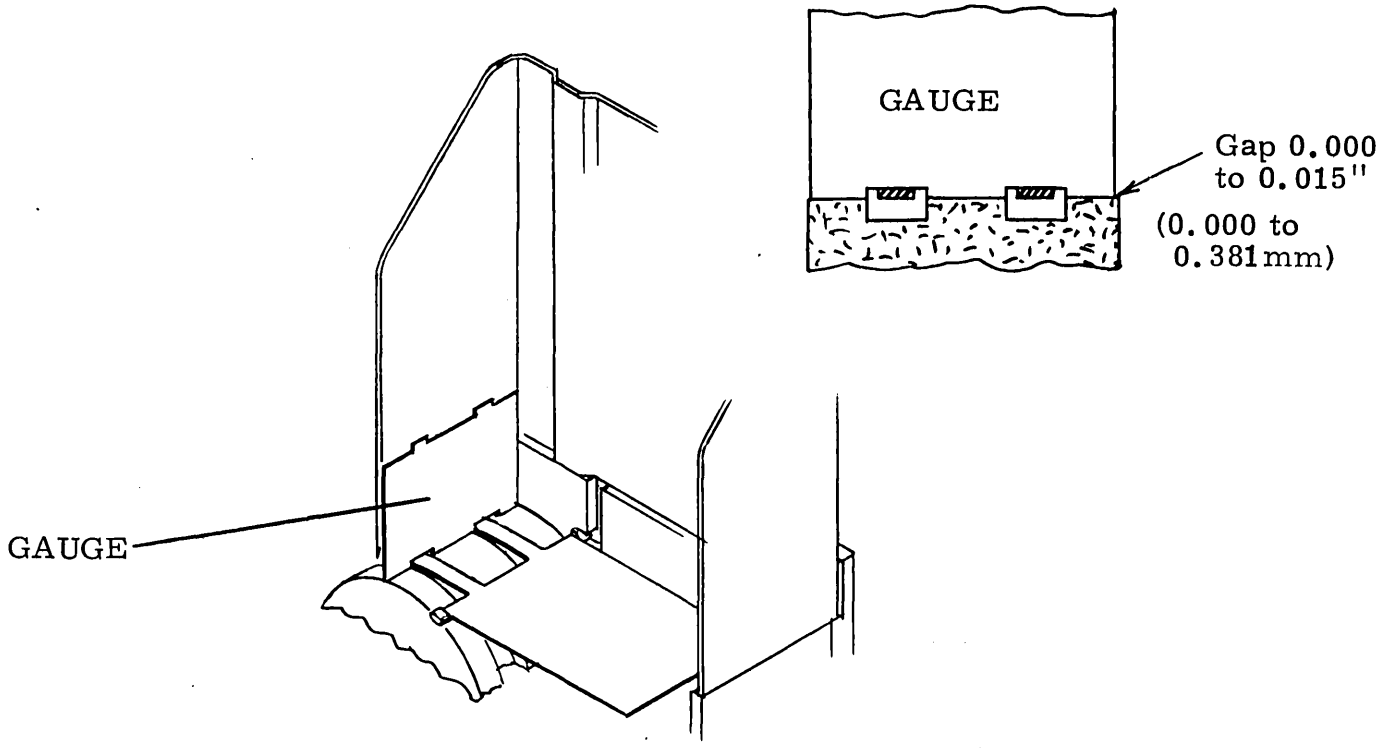
De-energized- Feed plate tangs should rise no more than 5/64-inch above elastomer rings on transport drum and no less than 3/64.

Energized - Feed plate tangs should deflect no less than 3/32-inch below elastomer rings on transport drum.

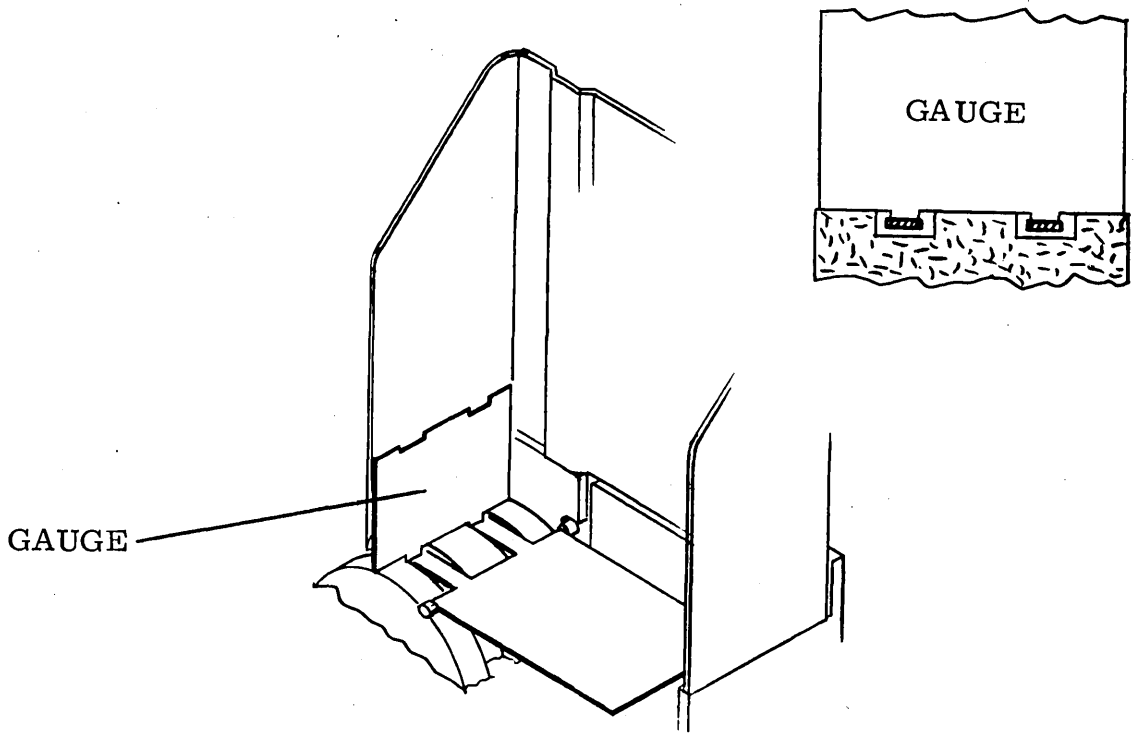
Obtain feed plate gauge (P/N 73715400). Refer to Figure 5-7 and check minimum/maximum deflections as follows:

1. Place gauge against left-hand side wall of input hopper with calibrated tang cutout notches down.
2. Allow gauge to rest across input throat; i.e., notches straddle feed plate tangs. Press gauge firmly against elastomer surface; the feed plate tangs should contact gauge.
3. Reverse position of gauge; i.e., calibrated extensions over feed plate tangs.
4. Press gauge down firmly; tangs should depress without undue resistance until shoulders of gauge are seated across elastomer rings of drum.

Failure to achieve proper deflections can be attributed to: (1) feed plate tangs bent or out-of-true, (2) a defective solenoid spring, or (3) solenoid assembly improperly installed.



A. De-energized Alignment



B. Energized Deflection

Figure 5-7. Feed Plate-To-Drum Mechanical Check

e. Follower Roller Adjustment

1. Remove Read Head Assembly (para. 5-4.16)
2. Loosen the two screws that contain the Follower Roller Assembly to the mounting bracket and adjust until the rollers lightly contact the drum; i.e., rotation of drum causes rotation of rollers but not vice versa. (During 360° rotation of drum, the rollers should be making contact.)

f. Wear Plate Damper Adjustment

Loosen the hex nut on the deck strap and turn the adjusting screw attached to the plunger cap until the plunger cap just contacts the deceleration plate (See Section VIII, Parts for illustration.) Adjust plunger cap until clearance between deceleration plate and stacker follower is zero to minus 0.050 inch (interference condition).

5-4. COMPONENT REMOVAL AND REPLACEMENT

The following procedures should be consulted prior to removal/replacement of reader components. Where replacement (reinstallation) of a component is accomplished by reversing the removal procedure, a separate replacement procedure is not provided.

The following instructions are supported by exploded view drawings contained in the Parts Section.

5-4.1 POWER SUPPLY REMOVAL

a. Disconnect power cord at terminal board connections.

b. Remove 6-32 screws from metal screen cover and remove cover.

c. Remove two screws that secure power supply fuse switch/plug panel to rear of reader cabinet.

d. Remove screw that secures power supply base to cabinet base.

e. Lift power supply through rear panel opening of cabinet.

5-4.2 FEED PLATE REMOVAL

Remove three screws in the top of the feed plate and remove plate by lifting upward, taking care not to damage hopper empty switch.

5-4.3 FEED PLATE CARRIER REMOVAL

a. Insert a phillips head screwdriver through the access slot in the front of the deck assembly and remove the 10-32 screw and washers securing the right side of the solenoid mounting plate.

b. Insert screwdriver through access slot and engage the remaining screw that secures the solenoid plate to the rear of the deck assembly. Remove screw while holding solenoid from underneath. Withdraw and remove solenoid. Slide the solenoid off of the plunger connector out of the plunger T-slot.

c. Remove screw and adjustment plate in front deck cutout.

d. Loosen screws which secure the front deck assembly to the rear deck assembly and pull back front deck until the feed plate carrier is free of the front deck.

e. Remove feed plate carrier from the hopper, being careful not to damage the hopper empty switch.

5-4.4 FEED PLATE CARRIER REPLACEMENT

a. Follow the reverse of the Feed Plate Carrier Removal, paragraph 5-4.3.

b. After the carrier has been replaced, check feed plate throw, paragraph 5-3.3.

5-4.5 STACKER DRIVE BELT REMOVAL

a. Loosen three screws that contain motor mounting plate via standoffs to rear plate. These screws should be loosened a sufficient amount to permit removal pulley belt between pulleys and rear plate, but still have retention of motor mounting plate to rear plate.

b. Slip motor drive belt off motor shaft pulley.

c. Remove stacker drive belt from inner pulley of motor shaft and remove belt from motor shaft area.

d. Remove outboard stacker spring mount and remove stacker drive belt from pulley drive system.

5-4.6 STACKER DRIVE BELT REPLACEMENT (Figure 5-6)

a. Slip new belt onto inner pulley of the motor shaft.

b. Place belt on outboard stacker pulley and snug down outboard pulley mount.

c. Rethread belt (refer to Figure 5-8).

d. Rotate motor and observe for correct pulley rotation (refer to Figure 5-6).

e. Replace drive belt on motor shaft pulley.

f. Tighten down outboard stacker mount screws and tighten down motor plate screws while maintaining tension on drive belt.

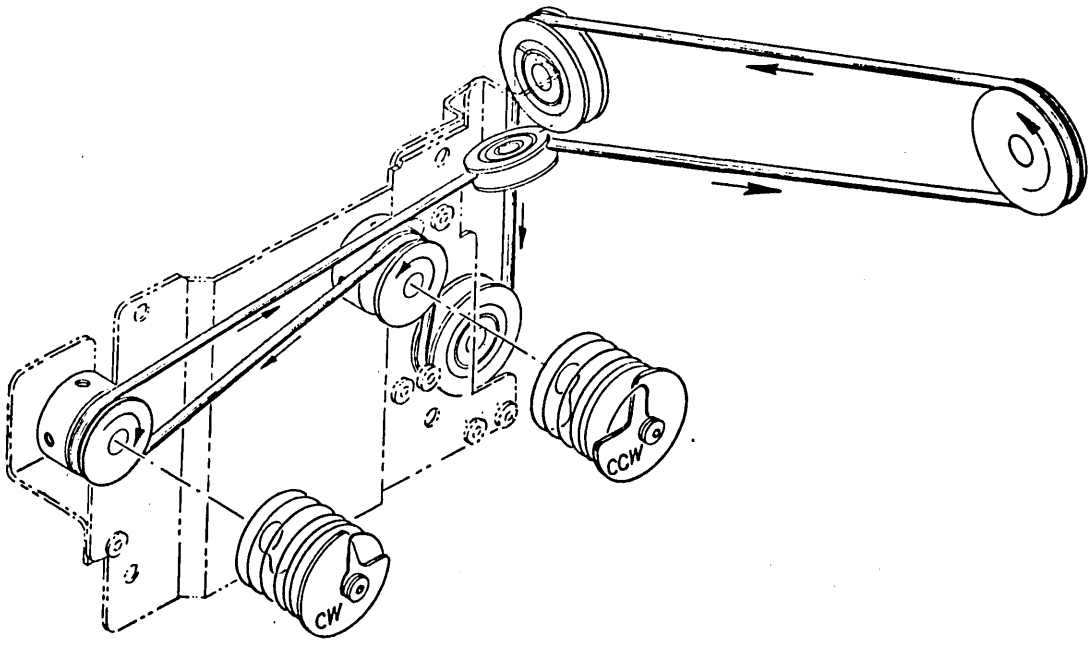


Figure 5-8. Stacker Belt Drive

5-4.7 STACKER SPRING/DISC REMOVAL

a. Remove pan head screw and washer that secure spring and disc to shaft; remove disc. Use needle-noise pliers to grasp spring.

b. It may be necessary to apply heat (clean-tipped soldering iron) to head of screw in order to dissipate previously applied "Loctite".

5-4.8 STACKER SPRING/DISC REPLACEMENT

a. Place one drop of "Loctite" into threaded end of shaft.

b. Select proper spring to conform with rotation; i.e., CW or CCW (See Figure 5-9).

c. Slide large end loop of spring over shaft until it snaps in groove of shaft.

d. Insert a 6-32 x 1/4 inch pan head screw and washer through spring wrap and hole in disc. Drop assembly over shaft and tighten just sufficiently to keep assembly on shaft.

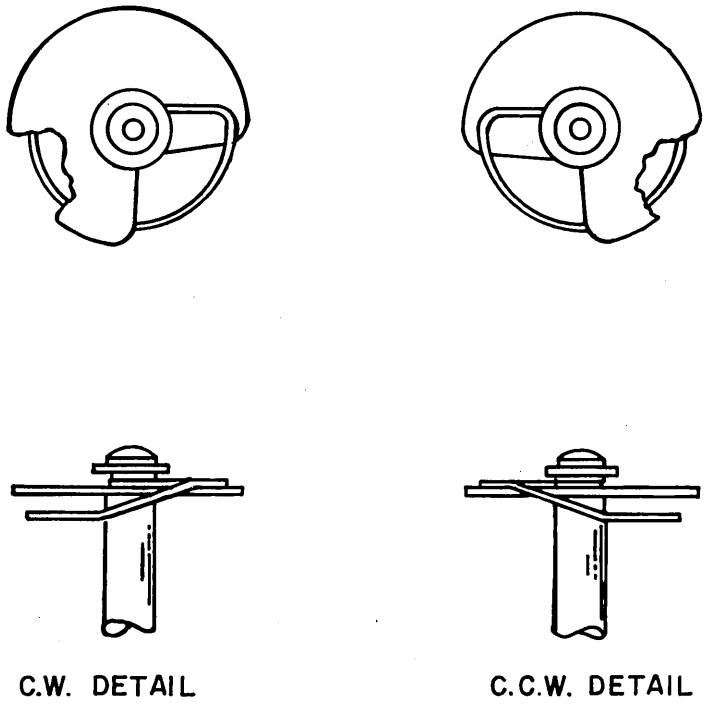


Figure 5-9. Stacker Spring and Disc

5-4.9 FEED SOLENOID REMOVAL

a. Remove power supply cover and disconnect solenoid leads from horizontal terminal board; i.e., terminals 3, 6, and 8. Open cable wrap to solenoid assembly.

b. Insert a screwdriver through access slot located in the front plate of mechanical deck assembly and remove 10-32 screw and flat and lockwashers.

c. Insert screwdriver through access slot and engage the remaining screw that secures the solenoid mounting plate to the rear of the deck assembly. Remove screw while holding solenoid from underneath. Withdraw solenoid and slide plunger off the connector "T", and also remove the shim behind the solenoid bracket.

5-4.10 FEED SOLENOID REPLACEMENT

NOTE

Mechanical deck should be in closed position prior to replacing solenoid.

a. Slide the solenoid shaft T-slot into feed plate connector. Slide spring over plunger and press solenoid upward until the right-hand mounting hole on solenoid mounting plate is aligned with tapped hole on the rear deck assembly.

b. Position shim behind solenoid and insert 10-32 screw (without washers) into tapped hole and tighten sufficiently to maintain solenoid assembly firmly, but not rigidly, cinched against rear deck plate.

c. Align hole in left side of solenoid mounting bracket with tapped hole in rear plate and securely tighten with 10-32 screw and lock and flat washers.

d. Reroute solenoid leads to power supply. Reconnect (step a, paragraph 5-4.9), replace power supply cover, and retie cable wraps.

e. Check feed plate throw, paragraph 5-3.3.

5-4.11 PRESSURE ROLLER ASSEMBLY REMOVAL

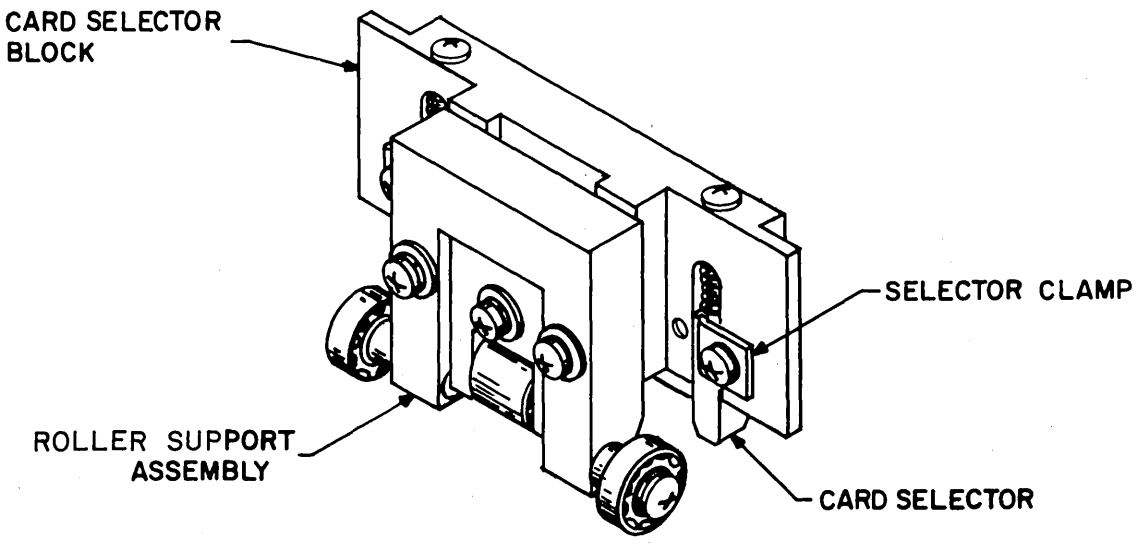
a. Remove four screws (two from the edge of front and back deck plates, respectively). See Figure 5-10.

b. Lift unit free of mechanical deck assembly.

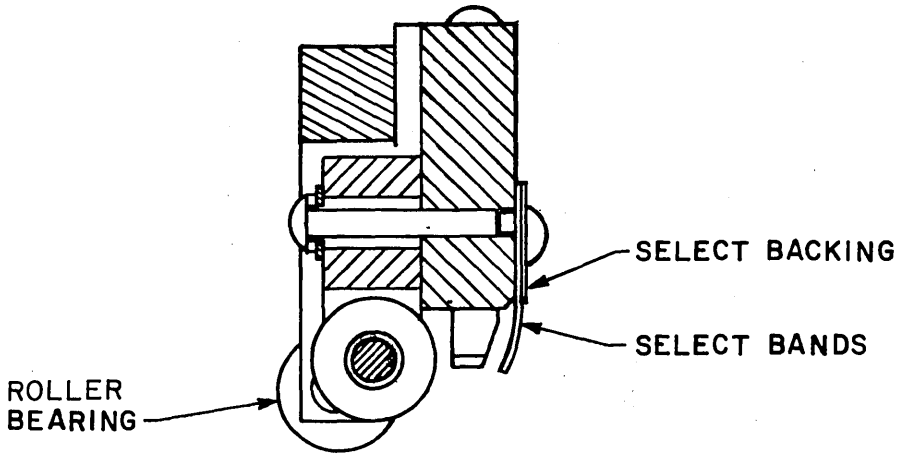
5-4.12 SELECT BANDS REMOVAL

a. Remove pressure roller assembly, paragraph 5-4.11.

b. Remove two 6-32 screws and remove backing strip and two select bands.



A. FRONT VIEW



B. SIDE VIEW

Figure 5-10 Pressure Roller Assembly

5-4.13 ROLLER BEARING REMOVAL

a. Remove 6-32 pan head screw in center of roller support assembly and remove roller bearing and block.

b. Tap the bearing pin from the block and remove bearing.

5-4.14 CARD SELECTOR(S) REMOVAL

a. Loosen 6-32 screw on top of the card selector block directly above the affected card selector.

b. Remove the selector clamp from the card selector block by removing the 6-32 screw which secures the selector clamp.

c. Remove card selector and compression spring.

NOTE

As selector clamp is removed, internal spring pressure will eject both selector and spring.

5-4.15 CARD SELECTOR(S) REPLACEMENT

a. Insert compression spring into appropriate aperture of pressure roller assembly.

b. Insert card selector against spring (Figure 5-8) and introduce 6-32 screw through top of assembly until threads engage compression spring.

c. Replace selector clamp and 6-32 screw.

d. Replace pressure roller assembly and perform Throat Gap Adjustment, paragraph 5-3.3.

5-4.16 READ HEAD ASSEMBLY REMOVAL

a. Remove two lead wires to read head lamp; i.e., bayonet type connection.

b. Disconnect ribbon interconnecting cable at top of Amplifier Board A2. Undo plastic cable strap at rear of deck assembly.

c. Remove three 6-32 screws that retain read head assembly to the support assembly.

d. Remove the clamp spring that locks the read head assembly in place by pulling back and up on the clamp spring.

e. Remove read head assembly.

5-4.17 READ HEAD ASSEMBLY REPLACEMENT

a. The clearance between the face of the read head assembly and the elastomer surface of card drum should be set from .012 to .016 inch.

b. Place read head assembly beneath the read head support and insert and loosely tighten the three 6-32 screws.

c. Insert a feeler gauge (.012 to .016) on each side of the read head assembly between the face of the read head and the surface of the card transport drum.

d. Press read head assembly forward until the assembly is snug against the feeler gauge and tighten the three 6-32 screws securely.

e. Draw feeler gauges through read head and remove at exit throat.

f. Insert and tighten read lamp in housing or reconnect bayonet lamp leads.

g. Connect ribbon cable from read head assembly to receptacle at upper right of Amplifier Board A2. Secure with cable clamp.

h. Perform Skew and Read Lamp Adjustment, paragraph 5-3.2.

NOTE

Two tabulating cards may be used in lieu of feeler gauges in setting clearance.

5-4.18 DRIVE MOTOR ASSEMBLY REMOVAL

a. Remove two 6-32 screws from top of motor bracket and disconnect cable clamps. Rethread screws for retention.

b. Unwrap power cable to power supply, remove power supply cover, and disconnect motor leads at terminals 1, 2, and 3 of TB2 in power supply.

c. Remove belts from motor pulley.

d. Loosen three 10-32 screws located at edge of motor mounting plate.

e. Remove upper right-hand screw and one lower mounting screw.

f. Cradle motor from beneath and remove remaining mounting screw. Lift motor assembly free of cabinet. Retain spacers on motor mounting plate.

5-4.19 TIMING DISC REMOVAL

a. Remove timing belt from pulley.

b. Remove two 6-32 x 1 inch pan head screws from lamp housing and remove housing.

c. Loosen two 8-32 set screws on hub and slide pulley and disc free of shaft.

d. Remove four 6-32 head screws and nuts securing disc to pulley surface.

5-4.20 TIMING DISC REPLACEMENT

a. Follow reverse procedure to that stipulated by paragraph 5-4.19 and adjust disc on shaft with a non-metal feeler gauge so that clearance between back of disc and deck assembly is 0.005 to 0.015 inch

at 1 o'clock position, with a minimum clearance of 0.005 inch at all other points around disc. Press assembly against non-metal feeler gauge(s) or two tabulating cards and tighten set screws; remove gauge. Be careful not to scratch disc scribe lines.

b. Perform Timing Lamp Adjustment, paragraph 5-3.2.

NOTE

Emulsion side of timing disc must face emulsion side of timing mask.

5-4.21 TIMING LAMP REMOVAL

a. Loosen set screw on side of lamp housing.

b. Withdraw timing lamp. Disconnect lamp leads.

NOTE

Perform Timing Lamp Adjustment, paragraph 5-3.2c, upon relacing a timing lamp.

5-4.22 TIMING MASK/PHOTOTRANSISTOR REMOVAL

a. Remove lamp housing, paragraph 5-4.21.

b. Remove color coded leads from pickup assembly.

c. Remove pulley/disc assembly, paragraph 5-4.19.

d. Remove 6-32 screw that secures mask/phototransistor pickup to rear deck and ease entire assembly out of cutout notch.

5-4.23 TIMING MASK/PHOTOTRANSISTOR REPLACEMENT

a. Place phototransistor on flat surface and reassemble with plastic spacer and timing mask (in that order).

CAUTION

Marked side of timing mask must face out.

b. Align screw holes on above components and insert 6-32 x 3/8 inch screw with lock and flat washers.

c. Lift entire assembly and position in cutout notch on rear plate of deck assembly. Tighten mounting screw.

d. Replace pulley/disc assembly and reconnect timing belt.

e. Replace timing lamp housing.

f. Reconnect phototransistor pickup wires to terminals. Observe color coding of wires to ensure correct polarity assignment.

g. Perform Timing Lamp Adjustment, paragraph 5-3.2c.

5-4.24 HOPPER EMPTY SWITCH REMOVAL

a. Remove front cover of reader from deck assembly by removing screw and pushing cover sideways.

b. Disconnect switch leads at quick disconnect receptacle.

c. Remove the two screws that attach switch bracket to front plate of deck assembly. Remove switch.

5-4.25 HOPPER EMPTY SWITCH REPLACEMENT

a. Perform steps b and c of paragraph 5-4.24 in reverse.

b. It may be necessary to adjust the switch after replacement; the front plate of the deck assembly has two 6-32 screws for adjustment.

5-4.26 OUTPUT STACKER SWITCH REMOVAL

a. Disconnect lead at quick disconnect receptacle.

b. Remove two 6-32 x 3/8 inch socket head screws that attach switch bracket to rear plate of deck assembly and remove assembly.

5-4.27 STACKER FOLLOWER ASSEMBLY REMOVAL

a. Remove one 6-32 inch screw that secures the spring support to the channel section of the stacker tray. Pull spring assembly and rod free of hole in right side of stacker to allow follower assembly to be removed free of rod.

b. Remove one 4-40 screw that fastens follower spring to the base of follower. Spring support and rod can then be removed from left side of stacker.

5-4.28 FOLLOWER (NEGATOR) SPRING REMOVAL

a. Perform steps a and b, paragraph 5-4.27.

b. Remove one 4-40 screw that fastens negator spring to follower.

c. Press out the pin from spring support and remove spring and sleeve bearing.

5-4.29 FOLLOWER ROLLER ASSEMBLY REMOVAL

a. Remove two pan-head screws and remove assembly.

5-3.30 FAN REMOVAL

a. Remove power from unit.

b. Disconnect fan leads at terminal 2 and 3 of TB2.

c. Remove four pan head screws that fasten fan to floor of reader cabinet.

SECTION VI

WIRE LIST

Section VI - WIRE LISTS

6-1. GENERAL

No wire lists as such are contained in this manual. Refer to Section VII, Diagrams, for the interconnections between the circuit boards and subassemblies.

SECTION VII

DIAGRAMS

Section VII - DIAGRAMS

7-1. GENERAL

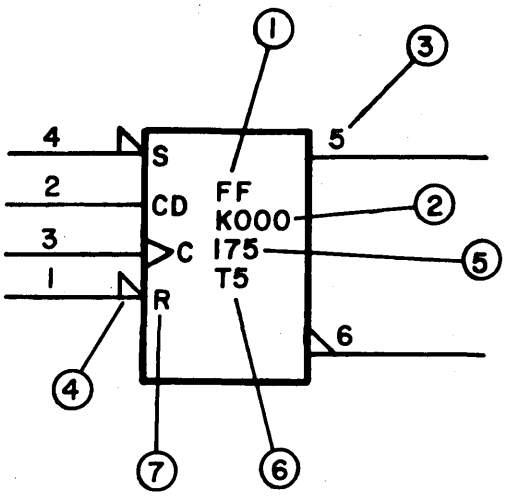
This section contains the diagrams and schematics necessary to maintain the reader in an operational status. Included are logic diagrams for the control, data, and amplifier boards. Discrete board schematics are also included, as well as a wiring diagram showing the interconnections between the circuit boards and subassemblies. While referencing the schematics, Figures 7-3 through 7-10, it may be noticed that these schematics begin with sheet two and not sheet one. Sheet one is the board assembly drawing and can be found in Section VIII, Parts. Figure 7-1 shows a typical logic symbol used on the diagrams and describes the nomenclature.

Data for the more complex components are listed in Table 7-1. The symbol for these components is also contained within the description. A cross-reference list of element numbers to commercial identification is shown at the beginning of the table.

Table 7-1. INTEGRATED CIRCUIT DATA

CROSS-REFERENCE LIST

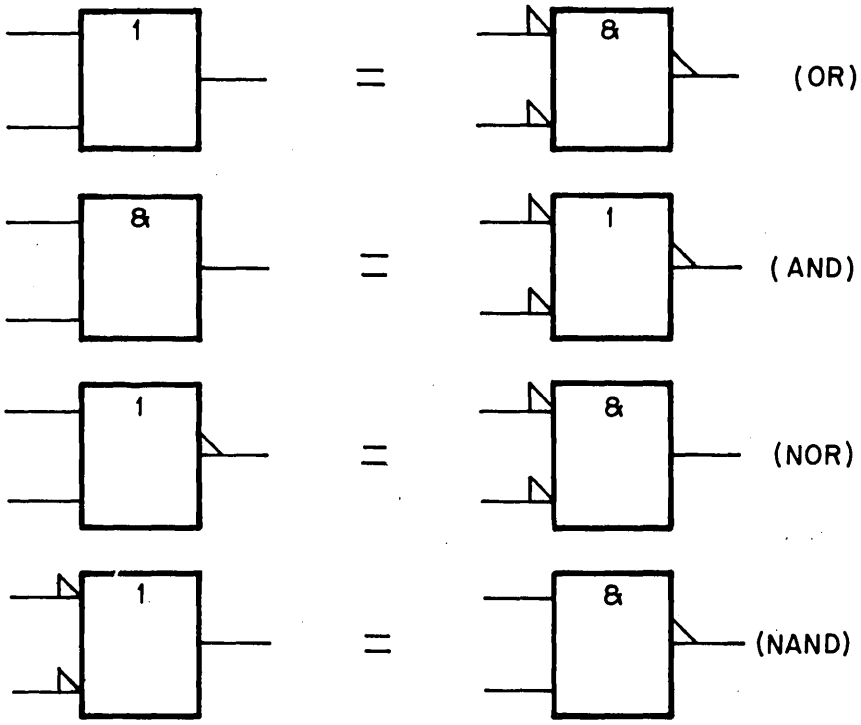
ELEMENT NUMBER	COMMERCIAL NUMBER
134	936
140	7400
141	7410
146	7404
148	7402
149	7486
156	74107
164S	74S113
175	7474
189	74157
193	74123
201	7408
203	7405
204	7438
208	7420
214L	74L73
223	7451
224	7427
500	74193
505	74151
507	7442
519	74174
905	75451
981	7416
	7414



FIND NO.	DESCRIPTION
1	FUNCTION - An abbreviation stating the function performed by the logic block. In the example, FF stands for flip-flop (bistable) multivibrator.
2	TERM - An alpha-numeric that uniquely identifies a particular logic symbol. It consists of a letter and several numbers and is used to locate and trace logic.
3	PIN NUMBER - The pin number of the IC associated with the logic symbol.
4	POLARITY INDICATOR - At input, indicates that input is active when low. At output, indicates that logical function has been performed when low.
5	TYPE - An element number that identifies the type of IC. It is used to look up the IC data found in Table 7-1. Data is arranged in type number sequence and supplied for the more complex IC's.
6	LOCATION - An alpha-numeric that locates an IC on the board in terms of co-ordinate designations inscribed along the edges.
7	PIN FUNCTION - An abbreviation that describes the signal or function associated with pin.

Figure 7-1. Logic Symbol Nomenclature

Table 7-1. INTEGRATED CIRCUIT DATA



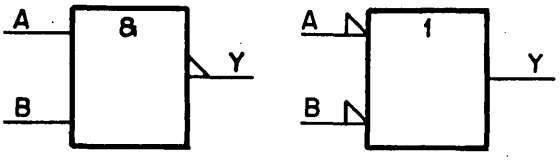
SYMBOLS USED FOR SAME TYPE IC DUE TO CIRCUIT FUNCTION.

SYMBOLS USED FOR SAME TYPE IC DUE TO CIRCUIT FUNCTION.

Table 7-1. INTEGRATED CIRCUIT DATA

DESCRIPTION

14 pin dual-in-line package which contains six DTL hex inverters.



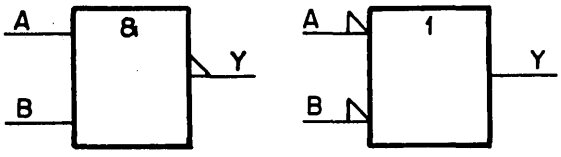
TRUTH TABLE

INPUTS		OUTPUT
A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

134 (936)

DESCRIPTION

14 pin dual-in-line package which contains four TTL 2-input positive NAND gates.



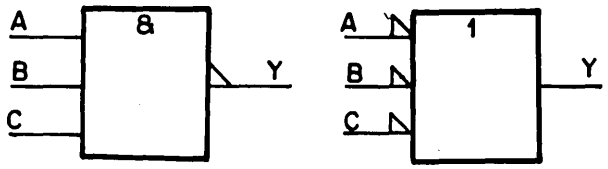
TRUTH TABLE

INPUTS		OUTPUT
A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

140 (7400)

DESCRIPTION

14 pin dual-in-line package containing three TTL 3-input positive NAND gates.



TRUTH TABLE

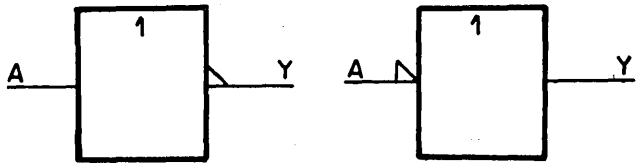
INPUTS			OUTPUT
A	B	C	Y
0	X	X	1
X	0	X	1
X	X	0	1
1	1	1	0

X = EITHER LOGIC 1 OR 0

141 (7410)

DESCRIPTION

14 pin dual-in-line package which contains six TTL inverter circuits.



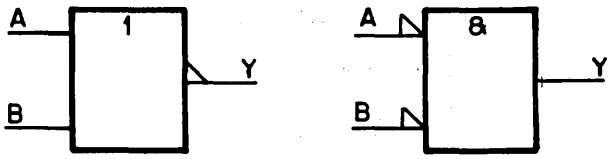
TRUTH TABLE

INPUT	OUTPUT
A	Y
0	1
1	0

146 (7404)

DESCRIPTION

14 pin dual-in-line package containing four TTL 2-input positive NOR gates.



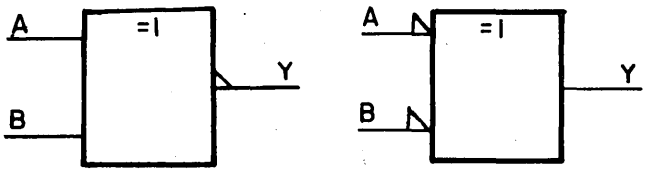
TRUTH TABLE

INPUTS		OUTPUT
A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

148 (7402)

DESCRIPTION

14 pin dual-in-line package containing four 2-input TTL Exclusive-OR gates.



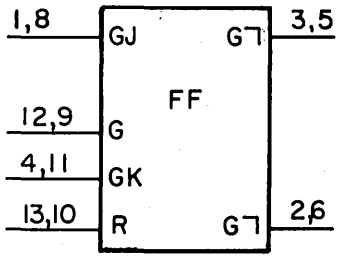
TRUTH TABLE

INPUTS		OUTPUT
A	B	Y
0	0	0
1	0	1
0	1	1
1	1	0

149 (7486)

DESCRIPTION

14 pin dual-in-line package containing two independent TTL J-K master-slave flip-flops. Each J-K master-slave flip-flop contains a master and a slave flip-flop. The master samples data at the GJ and GK inputs when the clock (G) waveform is at a logic 0. When the clock goes to a logic 1, the GJ and GK inputs are disabled. The data contained in the master is transferred to the slave outputs on the logic 1 to 0 transition of the clock waveform. A logic 0 input to the master reset (R) input sets Q (pins 3, 5) to a logic 0 and $\overline{Q}$ (pins 2, 6) to a logic 1 independently of all other inputs.



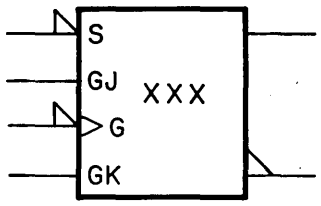
TRUTH TABLE

tn		tn+1
GJ	GK	G⁻
0	0	G⁻n
0	1	0
1	0	1
1	1	G⁻n

NOTES: 1. tn = BIT TIME BEFORE CLOCK PULSE
2. tn+1 = BIT TIME AFTER CLOCK PULSE.

DESCRIPTION

14 pin dual-in-line TTL package that contains dual J-K flip-flops that are designed so that when the clock goes high, the inputs are enabled and data will be accepted. The logic level of the J and K inputs may be allowed to change when the clock pulse is HIGH and the bistable will perform according to the truth table as long as minimum setup times are observed. Input data is transferred to the outputs on the negative-going edge of the clock pulse.



TRUTH TABLE

tn		tn+1
J	K	Q
L	L	Qn
L	H	L
H	L	H
H	H	$\overline{Qn}$

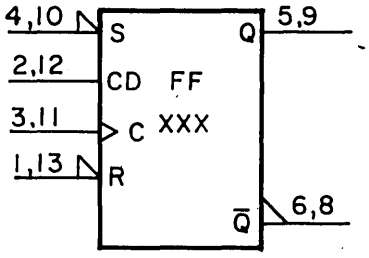
NOTE: tn = BIT TIME BEFORE CLOCK PULSE

tn+1 = BIT TIME AFTER CLOCK PULSE

164S (74S113)

DESCRIPTION

14 pin dual-in-line package containing two independent TTL D-type edge-triggered flip-flops. The data appearing on the D input is transferred to the complementary outputs on the logic 0 to 1 transition of the clock input. After the logic 0 to 1 transition of the clock input, the data input (CD) is locked out. A logic 0 input to the master set (S) inputs sets Q (pins 5, 9) the logic 1 independently of the clock input. Similarly a logic 0 input to the master reset (R) inputs sets Q to a logic 0. With S and R inputs at logic 0, both Q (pins 5, 9) and $\overline{Q}$ (pins 6, 8) outputs are at a logic 1.



TRUTH TABLE

t_n INPUTS			t_{n+1} OUTPUTS	
S	R	CD	(Q)	($\overline{Q}$)
0	1	X	1	0
1	0	X	0	1
0	0	X	1	1
1	1	↓	1	0
1	1	0	0	1

X = EITHER LOGIC 1 OR 0.

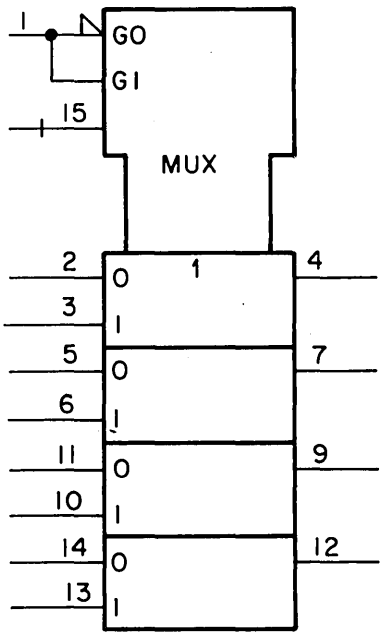
t_n = BIT TIME BEFORE LOGIC 0 TO 1 TRANSITION OF CLOCK PULSE.

t_{n+1} = BIT TIME AFTER CLOCK PULSE.

175 (7474)

DESCRIPTION

16 pin dual-in-line package consisting of data selectors/multiplexers that contain inverters and drivers for the four output gates. A separate strobe input is provided. A four bit word is selected from one of two sources and is routed to one of four outputs.



TRUTH TABLE

INPUTS				OUTPUT
ENABLE PIN 15	SELECT PIN 1	A PIN 25,11,14	B PIN 3,6,10,13	Y PIN 4,7,9,12
1	X	X	X	0
0	0	0	X	0
0	0	1	X	1
0	1	X	1	1

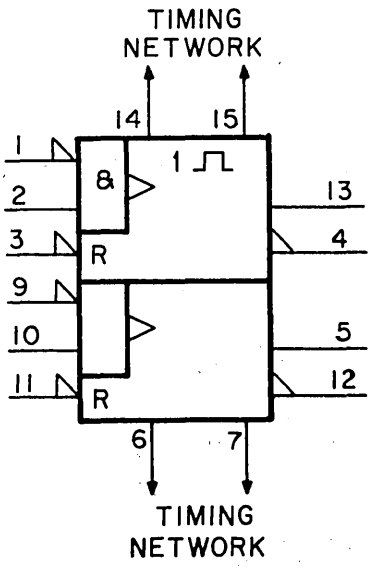
X = LOGIC 1 OR 0.

189 (74157)

DESCRIPTION

16 pin dual-in-line package containing two TTL retriggerable single shots having two trigger inputs, one active level 1 (pins 2, 10) and one active level 0 (pins 1, 9). The output pulse duration is a function of an external timing network. The overriding clear input (R) permits any output pulse to be terminated at any time independently of any other inputs.

If the trigger signals is applied to the active 1 input, triggering will occur on the rising edge of the waveforms. By applying the trigger input to the active 0 input, triggering will occur on the falling edge of the waveform. Each time the trigger conditions are met, the external timing capacitor is discharged and a new cycle is started. Successive trigger inputs with a period shorter than the output pulse delay time retrigger the single shot resulting in a continuous true output.



TRUTH TABLE

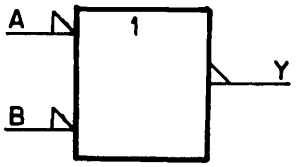
MODE	INPUTS			OUTPUTS[2]	
	PIN 1,9	PIN 2,10	R	PIN 13,5 (Q)	PIN 4,12 ($\overline{Q}$)
MASTER RESET	X	X	0	0	1
TRIGGERING	1	X	1	0	1
INHIBITED	X	0	1	0	1
POSITIVE EDGE TRIGGERING	0	0→1	1	POSITIVE PULSE OF WIDTH T	NEGATIVE PULSE OF WIDTH T
NEGATIVE EDGE TRIGGERING	1→0	1	1		

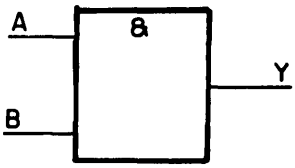
NOTES: 1. X = LOGIC 1 OR 0.
2. WIDTH "T" OF OUTPUT PULSE IS DETERMINED BY THE EXTERNAL TIMING NETWORK.

193 (74123)

DESCRIPTION

14 pin dual-in-line package containing four TTL 2-input positive AND gates.





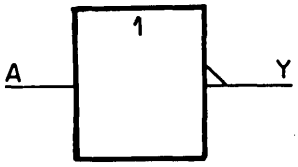
TRUTH TABLE

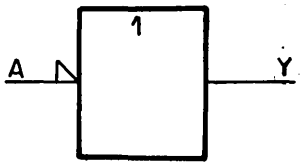
INPUTS		OUTPUT
A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

201 (7408)

DESCRIPTION

14 pin dual-in-line package that contains six TTL hex inverters with open collector output.





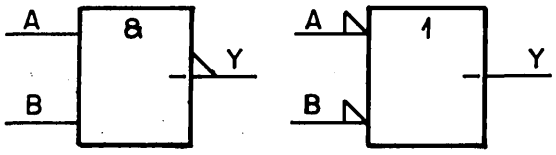
TRUTH TABLE

INPUT	OUTPUT
A	Y
0	1
1	0

203 (7405)

DESCRIPTION

14 pin dual-in-line package containing four TTL 2-input positive NAND gates with open collector output.



TRUTH TABLE

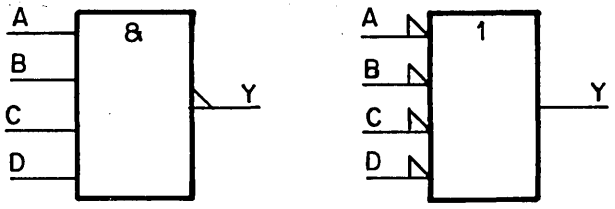
INPUTS		OUTPUT
A	B	Y
0	X	1
X	0	1
1	1	0

X = EITHER LOGIC 1 OR 0

204 (7438)

DESCRIPTION

14 pin dual-in-line package containing two 4-input TTL positive NAND gates.



TRUTH TABLE

INPUTS				OUTPUT
A	B	C	D	Y
0	X	X	X	1
X	0	X	X	1
X	X	0	X	1
X	X	X	0	1
1	1	1	1	0

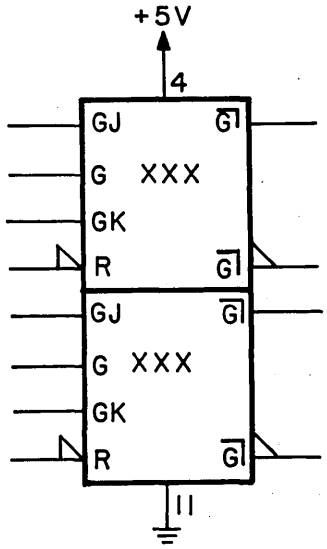
X = EITHER LOGIC 1 OR 0

208 (7420)

DESCRIPTION

14 pin dual-in-line package. This is a J-K flip-flop circuit based on the master-slave principle. The AND gate inputs for entry into the master section are controlled by the clock pulse. Sequence is as follows:

1. Isolate slave from master.
2. Enter information from AND gate inputs to master.
3. Disable AND gate inputs.
4. Transfer information from master to slave. Logical state of J and K inputs must be allowed to change when the clock pulse is in a high state.



TRUTH TABLE

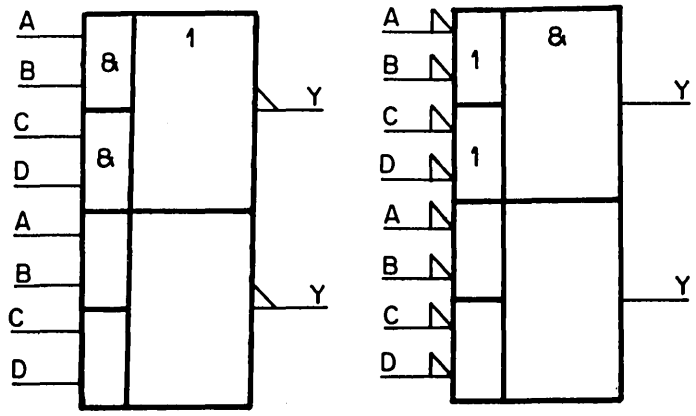
tn		tn+1
J	K	Q
0	0	Q_N
0	1	0
1	0	1
1	1	$\overline{Q_N}$

NOTES: 1. tn = BIT TIME BEFORE CLOCK PULSE
2. tn+1 = BIT TIME AFTER CLOCK PULSE.

214 L (74L73)

DESCRIPTION

14 pin dual-in-line package containing dual 2-wide 2-input AND-OR-invert gates.



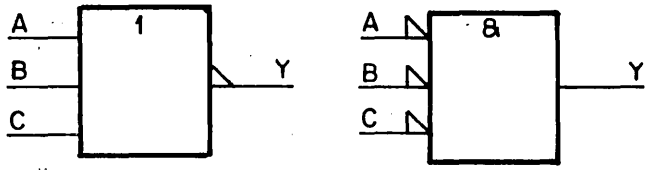
TRUTH TABLE

INPUTS				OUTPUT
A	B	C	D	Y
0	0	0	0	1
1	0	0	0	1
1	1	0	0	0
1	1	1	0	0
1	1	1	1	0
0	1	1	1	0
0	0	1	1	0
0	0	0	1	1

223 (7451)

DESCRIPTION

14 pin dual-in-line package containing three TTL 3-input positive-NOR gates.



TRUTH TABLE

INPUTS			OUTPUT
A	B	C	Y
1	X	X	0
X	1	X	0
X	X	1	0
0	1	1	X

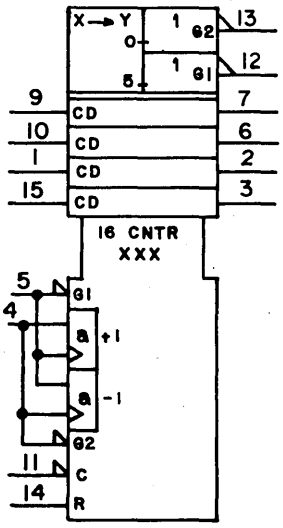
X = EITHER LOGIC 1 OR 0

224 (7427)

DESCRIPTION

16 pin dual-in-line package containing a 4-bit synchronous binary up/down counter. The outputs are triggered by a logic 0 to 1 transition of either count (clock) input. The direction of counting is determined by which count input is pulsing while the other count is high. The output may be reset to any state by entering the desired data at the data inputs while the load input pin 11 is logic 0. The output will change to agree with the data inputs independently of the count pulses. The master reset input forces all outputs to logic 0, independently of count and load inputs, when a logic 1 is applied.

Both borrow and carry outputs are available to cascade both the up-and-down counting functions. The borrow output (G2) produces a pulse equal in width to the count-down input when the counter overflows. Similarly, the carry output (G1) produces a pulse equal in width to the count-up input when an overflow condition exists. Cascading is accomplished by feeding the borrow and carry outputs to the count-down and count-up inputs respectively of the succeeding counter.



TRUTH TABLE

t_1									t_2					
INPUTS									OUTPUTS					
MODE	MASTER RESET	MODE SELECT	COUNT ENABLE		PARALLEL DATA									
		LOAD	UP	DOWN	PIN 15 (D0)	PIN 1 (D1)	PIN 10 (D2)	PIN 9 (D3)	PIN 3 (Q0)	PIN2 (Q1)	PIN 6 (Q2)	PIN 7 (Q3)	PIN13 (G2)	PIN12 (G1)
REGISTER CLEAR	1	X	X	X	X	X	X	X	0	0	0	0	0	0
PARALLEL LOAD	0	0	X	X	$D0_1$	$D0_2$	$D0_3$	$D0_4$	$D0_1$	$D0_2$	$D0_3$	$D0_4$	0	0
	0	0	X_1	X_1	1	1	1	1	1	1	1	1	X_1	X_1
	0	0	X_1	X_1	0	0	0	0	0	0	0	0	X_1	X_1
UP COUNTER	1	1	↑	1	X	X	X	X	$Q0_1$	$Q1_1$	$Q2_1$	$Q3_1$	1	1
	1	1	↑	1	X	X	X	X	1	0	0	0	0	0
	1	1	↑	1	X	X	X	X	0	1	0	0	0	0
	1	1	↑	1	X	X	X	X	1	1	0	0	0	0
	1	1	↑	1	X	X	X	X	0	1	1	1	0	0
	1	1	↑	1	X	X	X	X	1	1	1	1	0	1
	1	1	↑	1	X	X	X	X	0	0	0	0	0	0
DOWN COUNTER	1	1	1	↑	X	X	X	X	$Q0_1$	$Q1_1$	$Q2_1$	$Q3_1$	1	1
	1	1	1	↑	X	X	X	X	0	0	0	0	0	0
	1	1	1	↑	X	X	X	X	1	1	1	1	0	0
	1	1	1	↑	X	X	X	X	0	1	1	1	0	0
	1	1	1	↑	X	X	X	X	1	0	0	0	0	0
	1	1	1	↑	X	X	X	X	0	0	0	0	0	0

NOTES: 1. t_1 = BIT TIME BEFORE COUNT PULSE.
2. t_2 = BIT TIME AFTER COUNT PULSE.
3. XX_1 = INPUT OR OUTPUT STATE AT TIME t_1.
4. X_1 = DEPENDENT ON COUNT ENABLE STATE.
5. ↑ = COUNT ENABLE PULSE TRANSITION 0 TO 1.
6. X = EITHER LOGIC 1 OR 0.
7. G1 AND G2 PULSE WIDTH EQUAL TO COUNT ENABLE PULSE WIDTH.

500 (74193)

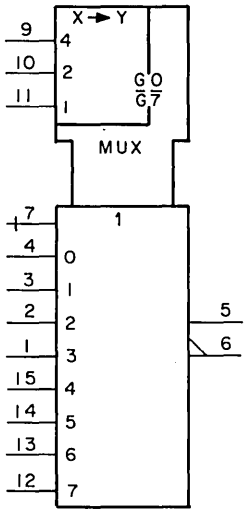
DESCRIPTION

16 pin dual-in-line package consisting of data selectors/multiplexers that contain inverters/drivers. The circuit is provided with a strobe-input which, when taken to a logic 0, enables the function of these multiplexers.

TRUTH TABLE

INPUTS												OUTPUT	
C PIN 9	B PIN 10	A PIN 11	STROBE PIN 7	D_0 PIN 4	D_1 PIN 3	D_2 PIN 2	D_3 PIN 1	D_4 PIN 15	D_5 PIN 14	D_6 PIN 13	D_7 PIN 12	Y PIN 5	W PIN 6
X	X	X	1	X	X	X	X	X	X	X	X	0	1
0	0	0	0	0	X	X	X	X	X	X	X	0	1
0	0	0	0	1	X	X	X	X	X	X	X	1	0
0	0	1	0	X	0	X	X	X	X	X	X	0	1
0	0	1	0	X	1	X	X	X	X	X	X	1	0
0	1	0	0	X	X	0	X	X	X	X	X	0	1
0	1	0	0	X	X	1	X	X	X	X	X	1	0
0	1	1	0	X	X	X	0	X	X	X	X	0	1
0	1	1	0	X	X	X	1	X	X	X	X	1	0
1	0	0	0	X	X	X	X	0	X	X	X	0	1
1	0	0	0	X	X	X	X	1	X	X	X	1	0
1	0	1	0	X	X	X	X	X	0	X	X	0	1
1	0	1	0	X	X	X	X	X	1	X	X	1	0
1	1	0	0	X	X	X	X	X	X	0	X	0	1
1	1	0	0	X	X	X	X	X	X	1	X	1	0
1	1	1	0	X	X	X	X	X	X	X	0	0	1
1	1	1	0	X	X	X	X	X	X	X	1	1	0

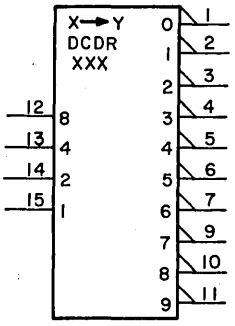
X = LOGIC 1 OR 0



505 (74151)

DESCRIPTION

16 pin dual-in-package containing a TTL BCD-TO-DECIMAL decoder. The decoder accepts a four input binary code and provides ten mutually exclusive active logic 0 inputs. All outputs are a logic 1 when binary codes greater than nine are applied to the inputs.



TRUTH TABLE

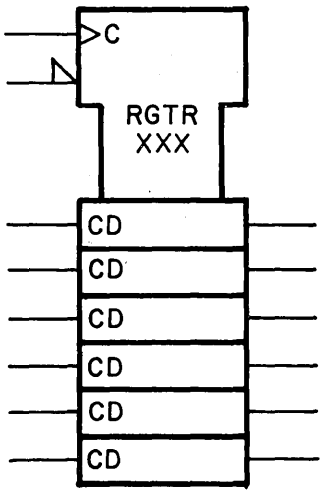
BINARY CODE	INPUTS				OUTPUTS									
	A1	A2	A4	A8	X0	X1	X2	X3	X4	X5	X6	X7	X8	X9
0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
1	1	0	0	0	1	0	1	1	1	1	1	1	1	1
2	0	1	0	0	1	1	0	1	1	1	1	1	1	1
3	1	1	0	0	1	1	1	0	1	1	1	1	1	1
4	0	0	1	0	1	1	1	1	0	1	1	1	1	1
5	1	0	1	0	1	1	1	1	1	0	1	1	1	1
6	0	1	1	0	1	1	1	1	1	1	0	1	1	1
7	1	1	1	0	1	1	1	1	1	1	1	0	1	1
8	0	0	0	1	1	1	1	1	1	1	1	1	0	1
9	1	0	0	1	1	1	1	1	1	1	1	1	1	0
10	0	1	0	1	1	1	1	1	1	1	1	1	1	1
11	1	1	0	1	1	1	1	1	1	1	1	1	1	1
12	0	0	1	1	1	1	1	1	1	1	1	1	1	1
13	1	0	1	1	1	1	1	1	1	1	1	1	1	1
14	0	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1

507 (7442)

507 (7442)

DESCRIPTION

16 pin dual-in-line package that contains six D-type flip-flops. Information at the input is transferred to the output on the positive-going edge of the clock pulse. When the clock input is either at the high or low level, the input signal has no effect at the output.



TRUTH TABLE

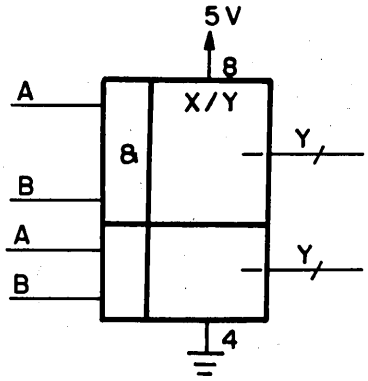
INPUTS			OUTPUTS	
CLEAR	CLOCK	D	Q	$\overline{Q_{\uparrow}}$
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Qo	$\overline{Qo}$

H = HIGH LEVEL
L = LOW LEVEL
X = IRRELEVANT
↑ = TRANSITION FROM LOW TO HIGH LEVEL
Qo = THE LEVEL OF Q BEFORE THE STEADY STATE CONDITIONS WERE ESTABLISHED.

519 (74174)

DESCRIPTION

8 pin dual-in-line package containing two independent peripheral drivers. It is used to drive transmission lines, lamps, relays and various memories. Each driver consists of a 2-input TTL NAND gate internally connected to an NPN transistor with an open-collector output.



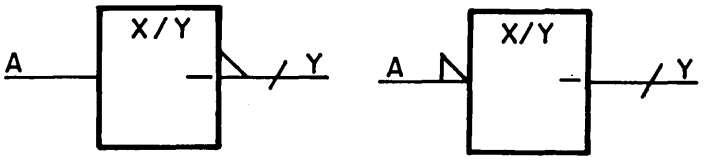
TRUTH TABLE

A	B	Y
0	0	0
1	0	0
0	1	0
1	1	*

905 (75451)

DESCRIPTION

14 pin dual-in-line package containing six drivers, hex inverter buffers, with open collector.



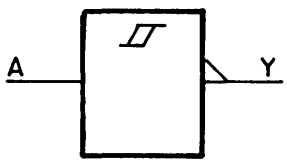
TRUTH TABLE

INPUT	OUTPUT
A	Y
0	1
1	0

981 (7416)

DESCRIPTION

14 pin dual-in-line package containing TTL Schmitt-Trigger positive - NAND gates and inverters with toem-pole outputs.



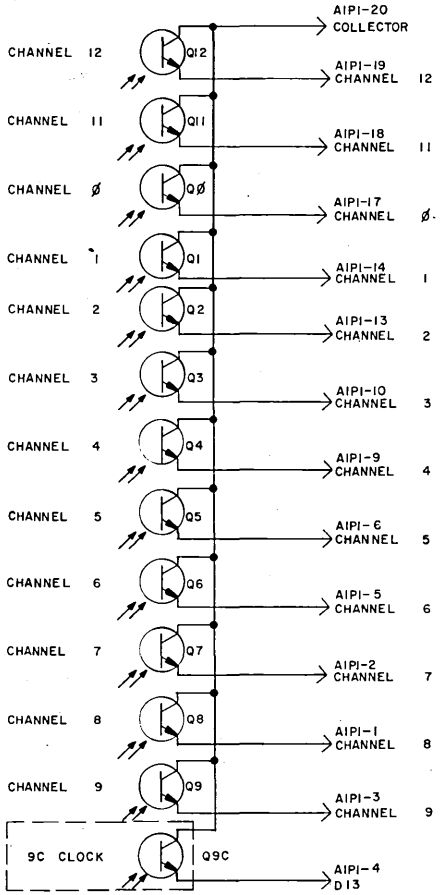
TRUTH TABLE

INPUT	OUTPUT
A	Y
0	1
1	0

7414

REVISION RECORD						
REV	CO	DESCRIPTION	DRFT	DATE	CHKD	APP

SEE SHEET 1 FOR REVISIONS



NOTES:
1. ALL PHOTO TRANSISTORS TIL6203 UNLESS OTHERWISE SPECIFIED.

Figure 7-2.

Computer Peripherals Inc. Video Image Division	LCR, CDC STD READ HEAD CARD SCHEMATIC	PART OF LOGIC SET 86914900 CODE IDENT 05875 / C	DWG NO 59534800 REV C SHEET 2

PB 33-2 Rev 5-15 70

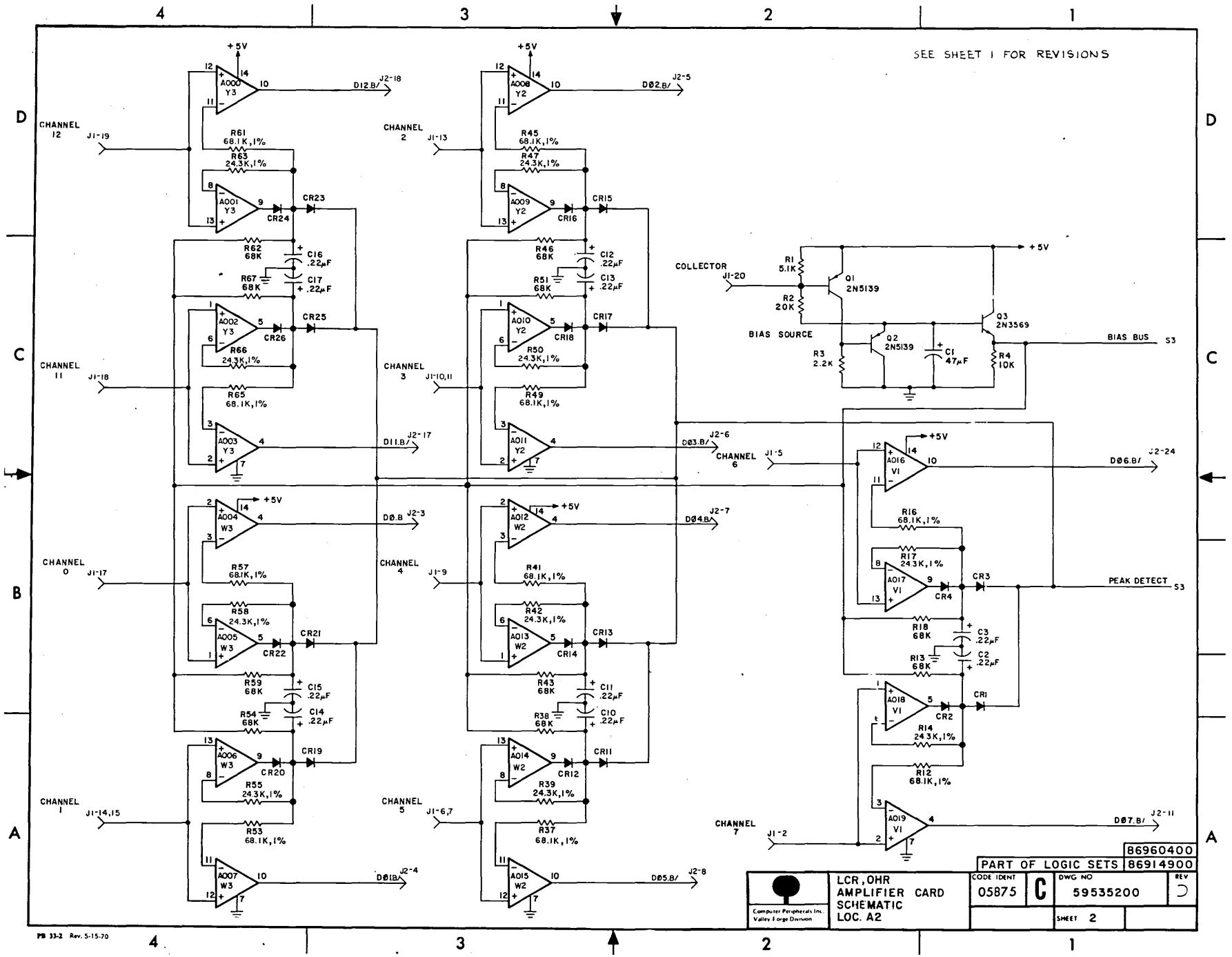

SEE SHEET 1 FOR REVISIONS
+5V
CHANNEL 12
J1-19
CHANNEL 11
J1-18
CHANNEL 0
J1-17
CHANNEL 1
J1-14,15
CHANNEL 2
J1-13
CHANNEL 3
J1-10,11
CHANNEL 4
J1-9
CHANNEL 5
J1-6,7
CHANNEL 6
J1-5
CHANNEL 7
J1-2
COLLECTOR
J1-20
BIAS SOURCE
BIAS BUS
S3
PEAK DETECT
S3
D12.B/
J2-18
D11.B/
J2-17
D10.B
J2-4
D09.B
J2-3
D02.B/
J2-5
D03.B/
J2-6
D04.B/
J2-7
D05.B/
J2-8
D06.B/
J2-24
D07.B/
J2-11
R61 68.1K,1%
R63 24.3K,1%
R62 68K
R67 68K
C16 .22µF
C17 .22µF
R66 24.3K,1%
R65 68.1K,1%
R57 68.1K,1%
R58 24.3K,1%
R59 68K
R54 68K
C15 .22µF
C14 .22µF
R55 24.3K,1%
R53 68.1K,1%
R45 68.1K,1%
R47 24.3K,1%
R46 68K
R51 68K
C12 .22µF
C13 .22µF
R50 24.3K,1%
R49 68.1K,1%
R41 68.1K,1%
R42 24.3K,1%
R43 68K
R38 68K
C11 .22µF
C10 .22µF
R39 24.3K,1%
R37 68.1K,1%
R1 5.1K
R2 20K
R3 2.2K
R4 10K
C1 47µF
Q1 2N5139
Q2 2N5139
Q3 2N3569
R16 68.1K,1%
R17 24.3K,1%
R18 68K
R13 68K
C3 .22µF
C2 .22µF
R14 24.3K,1%
R12 68.1K,1%
CR23
CR24
CR25
CR26
CR21
CR22
CR19
CR20
CR15
CR16
CR17
CR18
CR13
CR14
CR11
CR12
CR3
CR4
CR1
CR2
A001 Y3
A002 Y3
A003 Y3
A004 W3
A005 W3
A006 W3
A007 W3
A008 Y2
A009 Y2
A010 Y2
A011 Y2
A012 W2
A013 W2
A014 W2
A015 W2
A016 V1
A017 V1
A018 V1
A019 V1
86960400
PART OF LOGIC SETS 86914900
Computer Peripherals Inc. Valley Forge Division
LCR, OHR AMPLIFIER CARD SCHEMATIC LOC. A2
CODE IDENT 05875
C
DWG NO 59535200
REV D
SHEET 2
PB 33-2 Rev. 5-15-70

Figure 7-3.

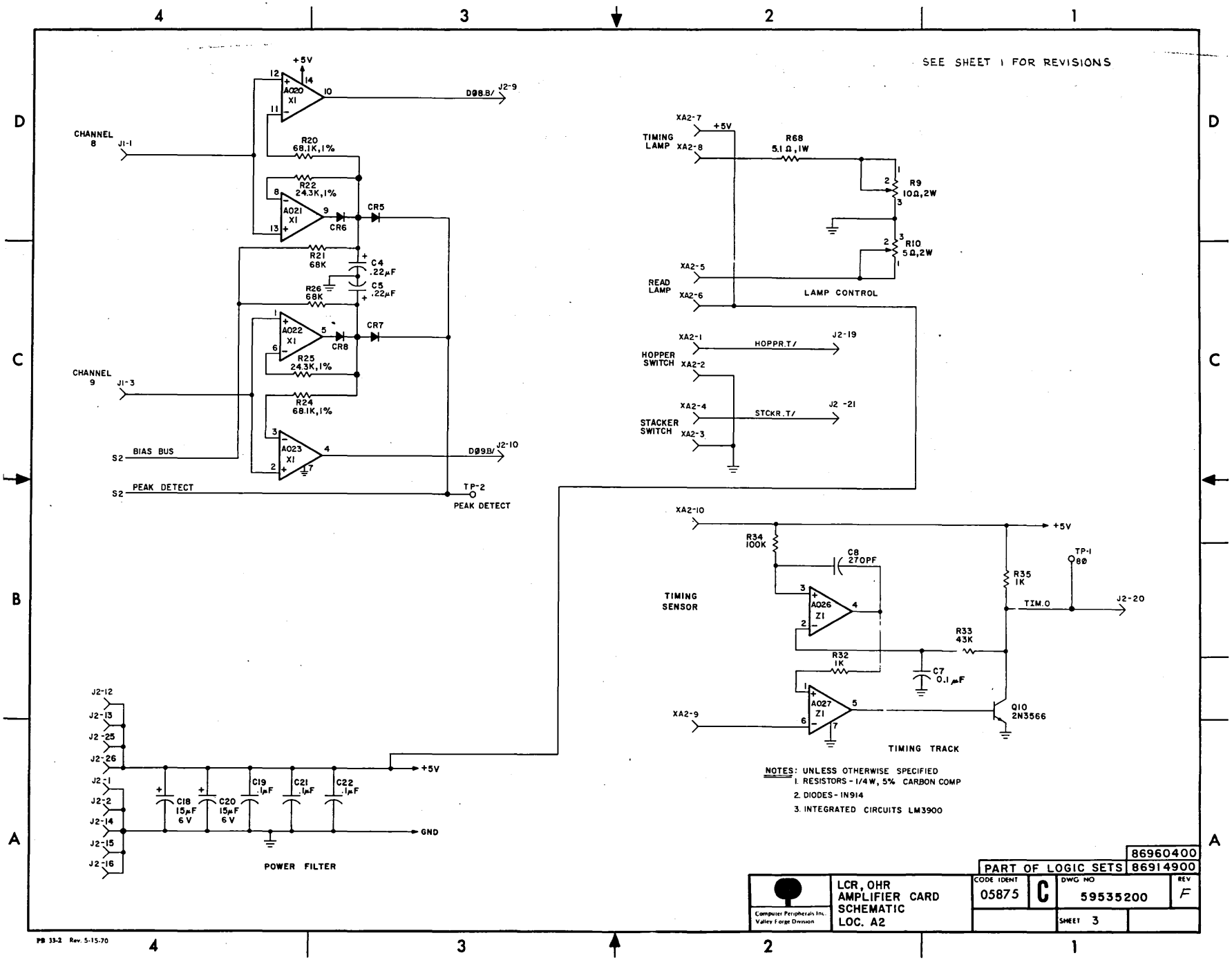

SEE SHEET 1 FOR REVISIONS
+5V
A020 X1
D08.8/
J2-9
CHANNEL 8
J1-1
R20 68.1K,1%
R22 24.3K,1%
A021 X1
CR5
CR6
R21 68K
C4 .22μF
C5 .22μF
R26 68K
A022 X1
CR7
CR8
R25 24.3K,1%
CHANNEL 9
J1-3
R24 68.1K,1%
A023 X1
S2 BIAS BUS
D09.8/
J2-10
S2 PEAK DETECT
TP-2
PEAK DETECT
XA2-7
+5V
TIMING LAMP
XA2-8
R68 5.1Ω,1W
R9 10Ω,2W
R10 5Ω,2W
XA2-5
READ LAMP
XA2-6
LAMP CONTROL
XA2-1
HOPPR.T/
J2-19
HOPPER SWITCH
XA2-2
XA2-4
STCKR.T/
J2 -21
STACKER SWITCH
XA2-3
XA2-10
+5V
R34 100K
C8 270PF
TP-1
80
R35 1K
TIMING SENSOR
A026 Z1
TIM.0
J2-20
R33 43K
R32 1K
C7 0.1μF
A027 Z1
XA2-9
Q10 2N3566
TIMING TRACK
J2-12
J2-13
J2-25
J2-26
J2-1
J2-2
J2-14
J2-15
J2-16
+5V
GND
C18 15μF 6V
C20 15μF 6V
C19 .1μF
C21 .1μF
C22 .1μF
POWER FILTER
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTORS - 1/4W, 5% CARBON COMP
2. DIODES - IN914
3. INTEGRATED CIRCUITS LM3900
86960400
PART OF LOGIC SETS 86914900
Computer Peripherals Inc. Valley Forge Division
LCR, OHR AMPLIFIER CARD SCHEMATIC LOC. A2
CODE IDENT 05875
C
DWG NO 59535200
REV F
SHEET 3
PB 33-2 Rev. 5-15-70

Figure 7-3.

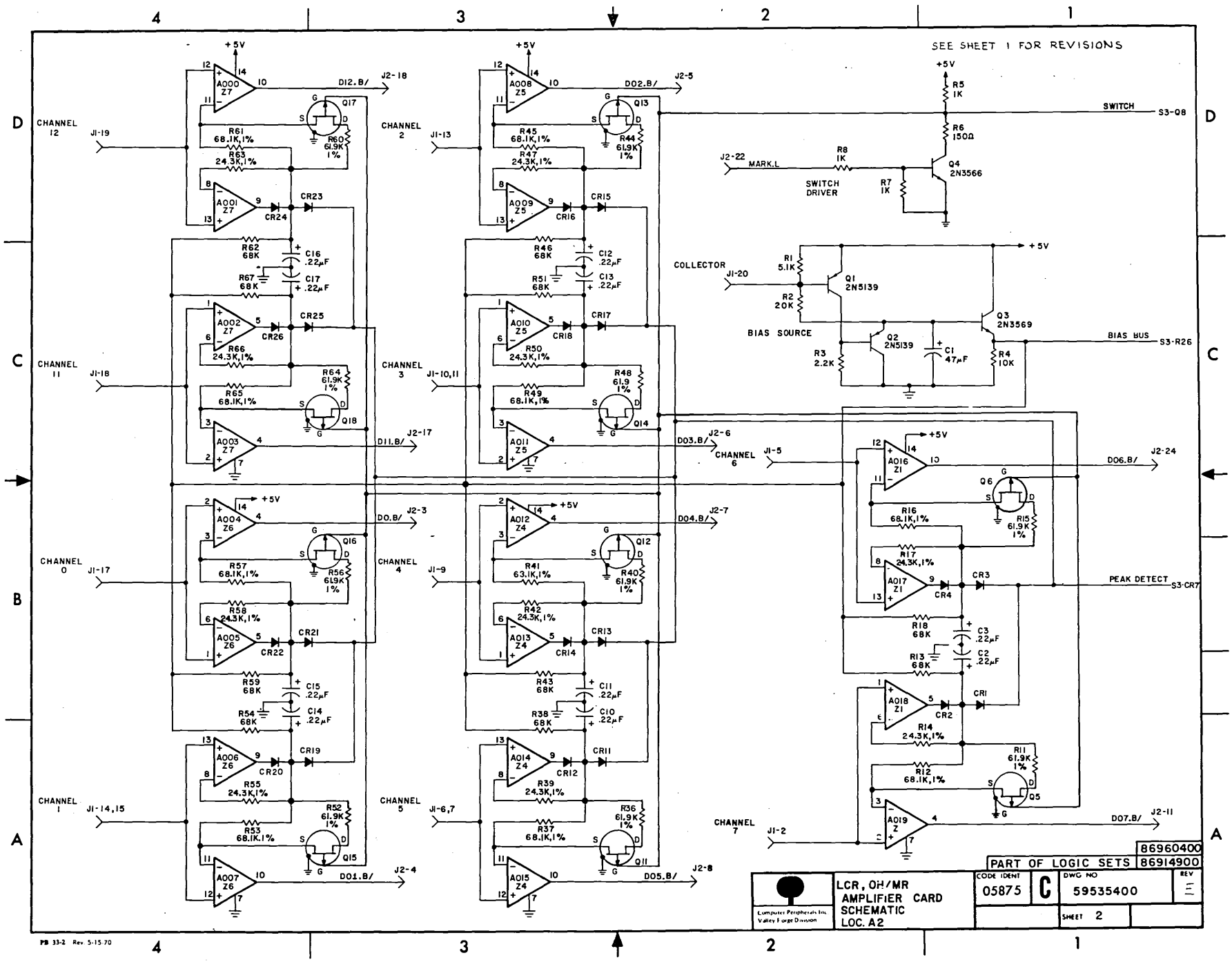

SEE SHEET 1 FOR REVISIONS
CHANNEL 12
CHANNEL 2
CHANNEL 11
CHANNEL 3
CHANNEL 0
CHANNEL 4
CHANNEL 1
CHANNEL 5
CHANNEL 6
CHANNEL 7
COLLECTOR
BIAS SOURCE
SWITCH DRIVER
MARK.L
SWITCH
BIAS BUS
PEAK DETECT
PART OF LOGIC SETS 86960400 86914900
LCR, OH/MR AMPLIFIER CARD SCHEMATIC LOC. A2
Computer Peripherals Inc. Valley Forge Division
CODE IDENT 05875
DWG NO 59535400
REV C
SHEET 2

Figure 7-4.

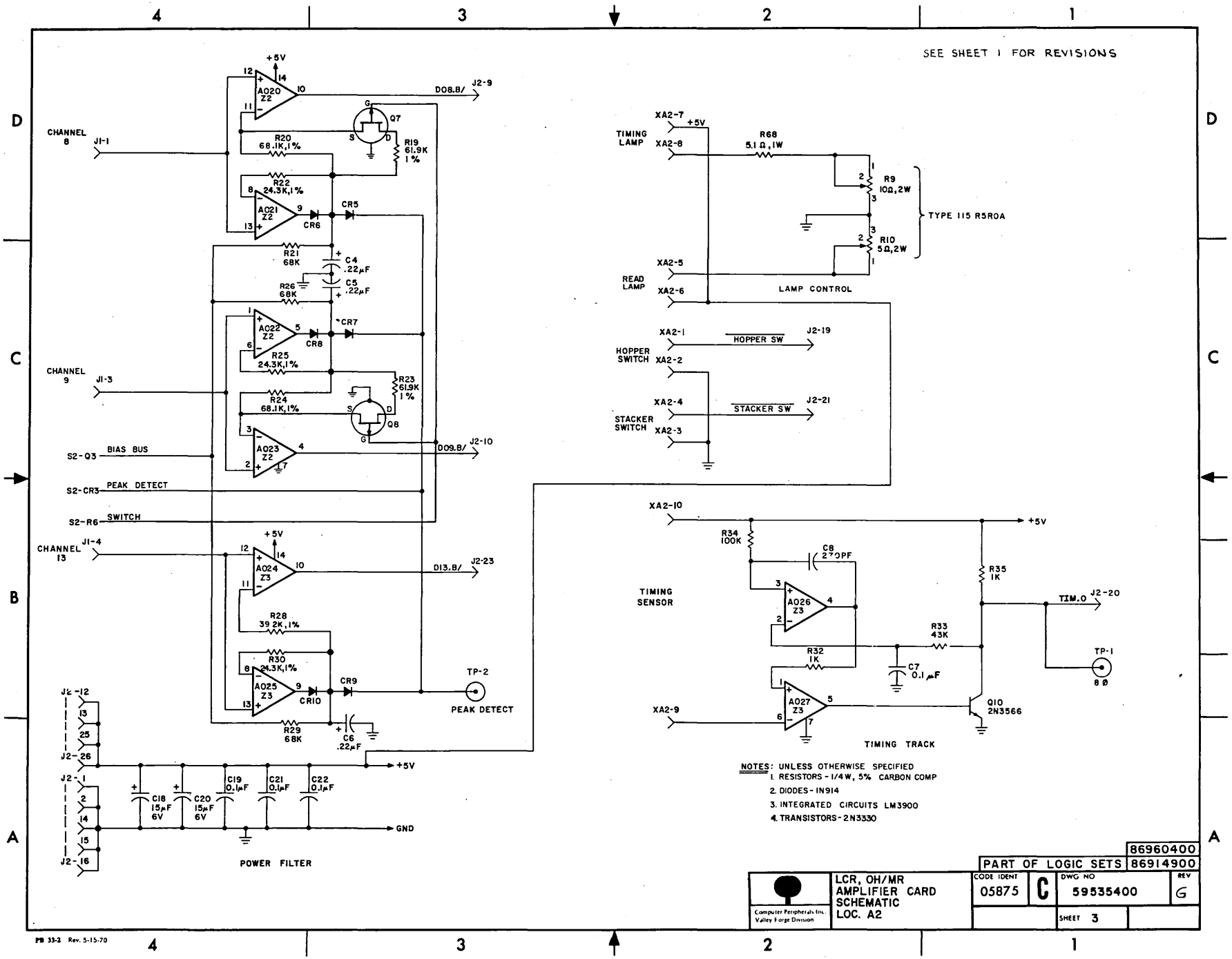
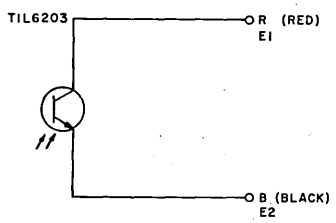

SEE SHEET 1 FOR REVISIONS
CHANNEL 8
J1-1
CHANNEL 9
J1-3
CHANNEL 13
J1-4
+5V
A020 Z2
A021 Z2
A022 Z2
A023 Z2
A024 Z3
A025 Z3
A026 Z3
A027 Z3
R20 68.1K,1%
R22 24.3K,1%
R19 61.9K 1%
R21 68K
R26 68K
R25 24.3K,1%
R24 68.1K,1%
R23 61.9K 1%
R28 39.2K,1%
R30 24.3K,1%
R29 68K
C4 .22μF
C5 .22μF
C6 .22μF
Q7
Q8
CR5
CR6
CR7
CR8
CR9
CR10
D08.B/ J2-9
D09.B/ J2-10
D13.B/ J2-23
S2-Q3 BIAS BUS
S2-CR3 PEAK DETECT
S2-R6 SWITCH
TP-2
PEAK DETECT
J2-12
J2-13
J2-25
J2-26
J2-1
J2-2
J2-14
J2-15
J2-16
C18 15μF 6V
C20 15μF 6V
C19 0.1μF
C21 0.1μF
C22 0.1μF
+5V
GND
POWER FILTER
XA2-7 +5V
TIMING LAMP
XA2-8
R68 5.1Ω,1W
R9 10Ω,2W
R10 5Ω,2W
TYPE 115 R5R0A
XA2-5
READ LAMP
XA2-6
LAMP CONTROL
XA2-1
HOPPER SW
J2-19
HOPPER SWITCH
XA2-2
XA2-4
STACKER SW
J2-21
STACKER SWITCH
XA2-3
XA2-10
R34 100K
C8 270PF
TIMING SENSOR
R35 1K
TIM.0 J2-20
R33 43K
R32 1K
C7 0.1μF
TP-1
8Ø
XA2-9
Q10 2N3566
TIMING TRACK
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTORS - 1/4W, 5% CARBON COMP
2. DIODES - IN914
3. INTEGRATED CIRCUITS LM3900
4. TRANSISTORS - 2N3330
86960400
PART OF LOGIC SETS 86914400
Computer Peripherals Inc. Valley Forge Division
LCR, OH/MR AMPLIFIER CARD SCHEMATIC LOC. A2
CODE IDENT 05875
C
DWG NO 59535400
REV G
SHEET 3
PB 33-2 Rev. 5-15-70

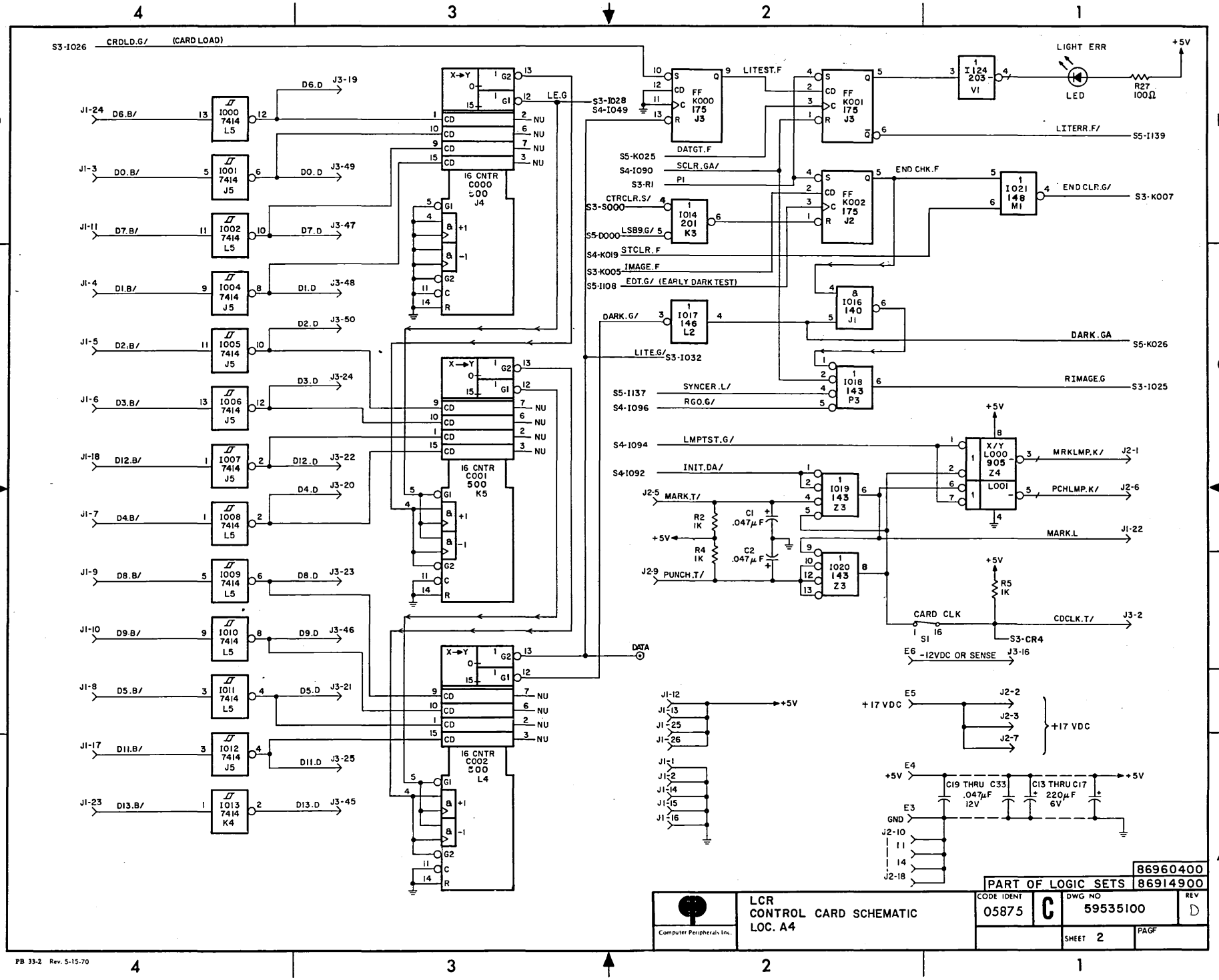
Figure 7-4.

FOR REVISIONS SEE SHT 1



					86960400
				PART OF LOGIC SETS	86914900
Computer Peripherals Inc. Valley Forge Division	LCR PHOTOTRANSISTOR CARD SCHEMATIC	CODE IDENT 05875	C	DWG NO 59534900	REV C
				SHEET 2	

Figure 7-5.



86960400

PART OF LOGIC SETS 86914900

Computer Peripherals Inc.	LCR CONTROL CARD SCHEMATIC LOC. A4	CODE IDENT 05875	C	DWG NO 59535100 REV D
				SHEET 2 PAGE

PB 33-2 Rev. 5-15-70

Figure 7-6.

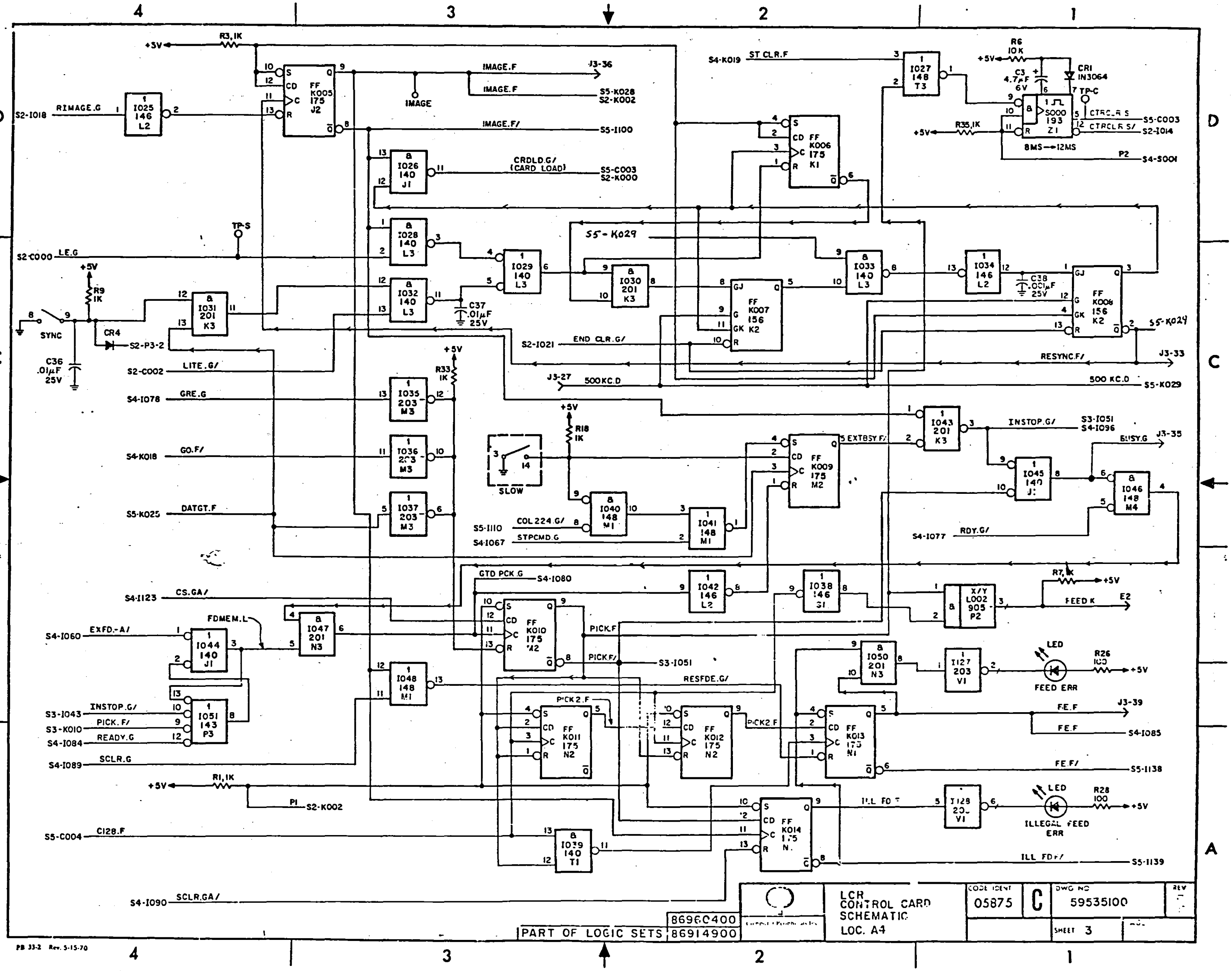
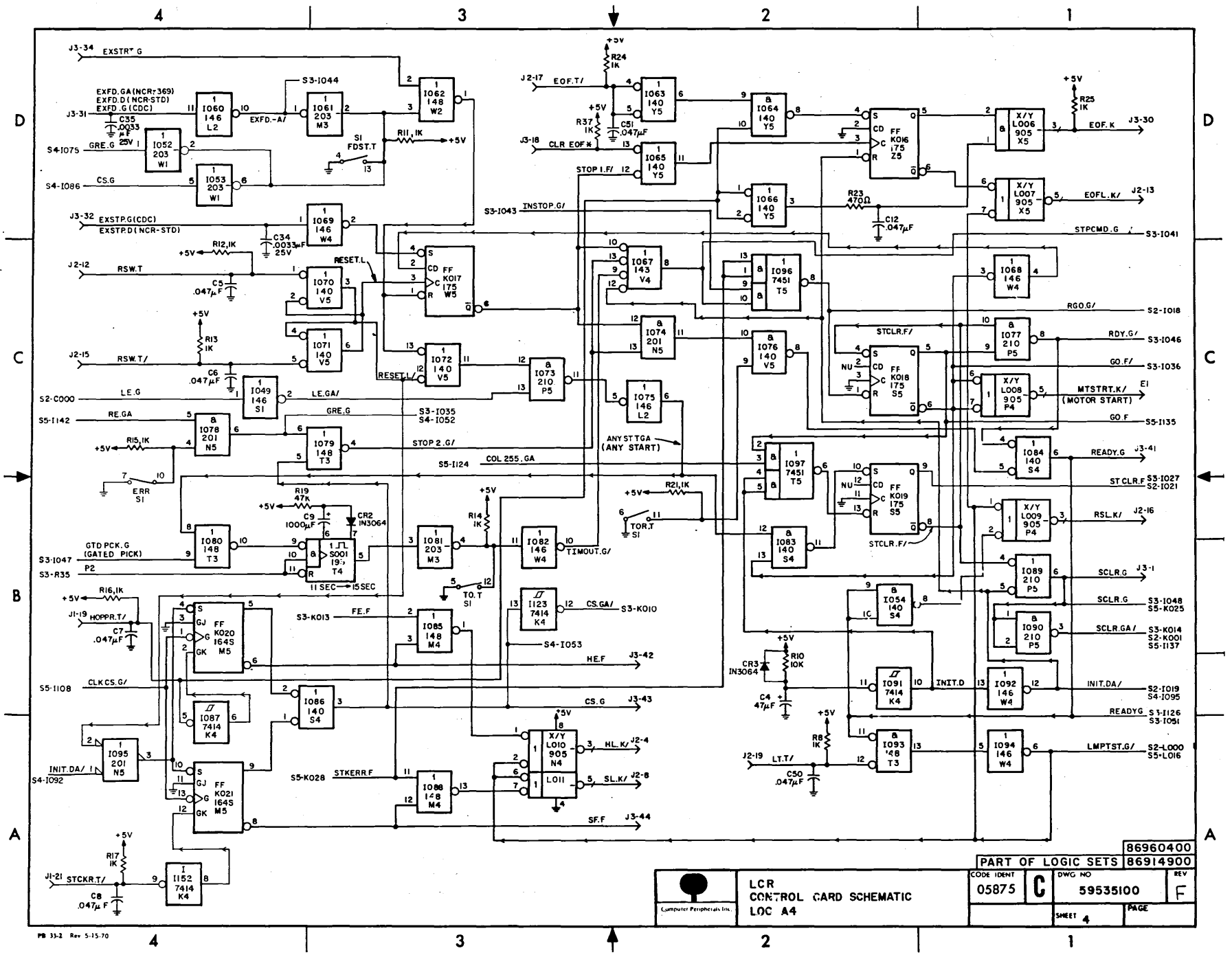

LCR
CONTROL CARD
SCHEMATIC
LOC. A4
CODE IDENT 05875
C
DWG NO 59535100
SHEET 3
PART OF LOGIC SETS 86960400 86914900
PB 33-2 Rev. 5-15-70

Figure 7-6.


LCR
CONTROL CARD SCHEMATIC
LOC A4
Computer Peripherals Inc.
CODE IDENT 05875
C
DWG NO 59535100
REV F
SHEET 4
PAGE
PART OF LOGIC SETS 86914900
86960400
PB 33-2 Rev 5-15-70
EXSTR'G
EXFD.GA(NCR-369)
EXFD.D(NCR-STD)
EXFD.G(CDC)
EXFD.-A/
S3-1044
SI FDST.T
GRE.G
CS.G
EXSTP.G(CDC)
EXSTP.D(NCR-STD)
RSW.T
RSW.T/
RESET.L
RESET.L/
LE.G
LE.GA/
RE.GA
GRE.G
S3-I035
S4-I052
ERR SI
STOP 2.G/
ANY ST TGA (ANY START)
COL 255.GA
S5-I124
GTD PCK.G (GATED PICK)
P2
11 SEC
15 SEC
TIMOUT.G/
TOT SI
TOR.T
HOPPR.T/
FE.F
CS.GA/
S3-K010
S4-I053
HE.F
CLKCS.G/
CS.G
INIT.DA/
STKERR.F
HL.K/
SL.K/
SF.F
STCKR.T/
EOF.T/
CLR EOF.K
STOP I.F/
EOF.K
INSTOP.G/
R23 470Ω
C12 .047μF
STPCMD.G
RGO.G/
STCLR.F/
RDY.G/
GO.F/
MTSTRT.K/ (MOTOR START)
GO.F
READY.G
ST.CLR.F
RSL.K/
SCLR.G
SCLR.GA/
INIT.D
READYG
LT.T/
LMPTST.G/
EOFL.K/
R24 1K
R25 1K
R37 1K
C51 .047μF
R11,1K
R12,1K
R13 1K
R14 1K
R15,1K
R16,1K
R17 1K
R19 47K
R21,1K
R10 10K
R8 1K
C4 47μF
C5 .047μF
C6 .047μF
C7 .047μF
C8 .047μF
C9 1000μF
C34 .0033μF 25V
C35 .0033 μF 25V
C50 .047μF
CR2 IN3064
CR3 IN3064

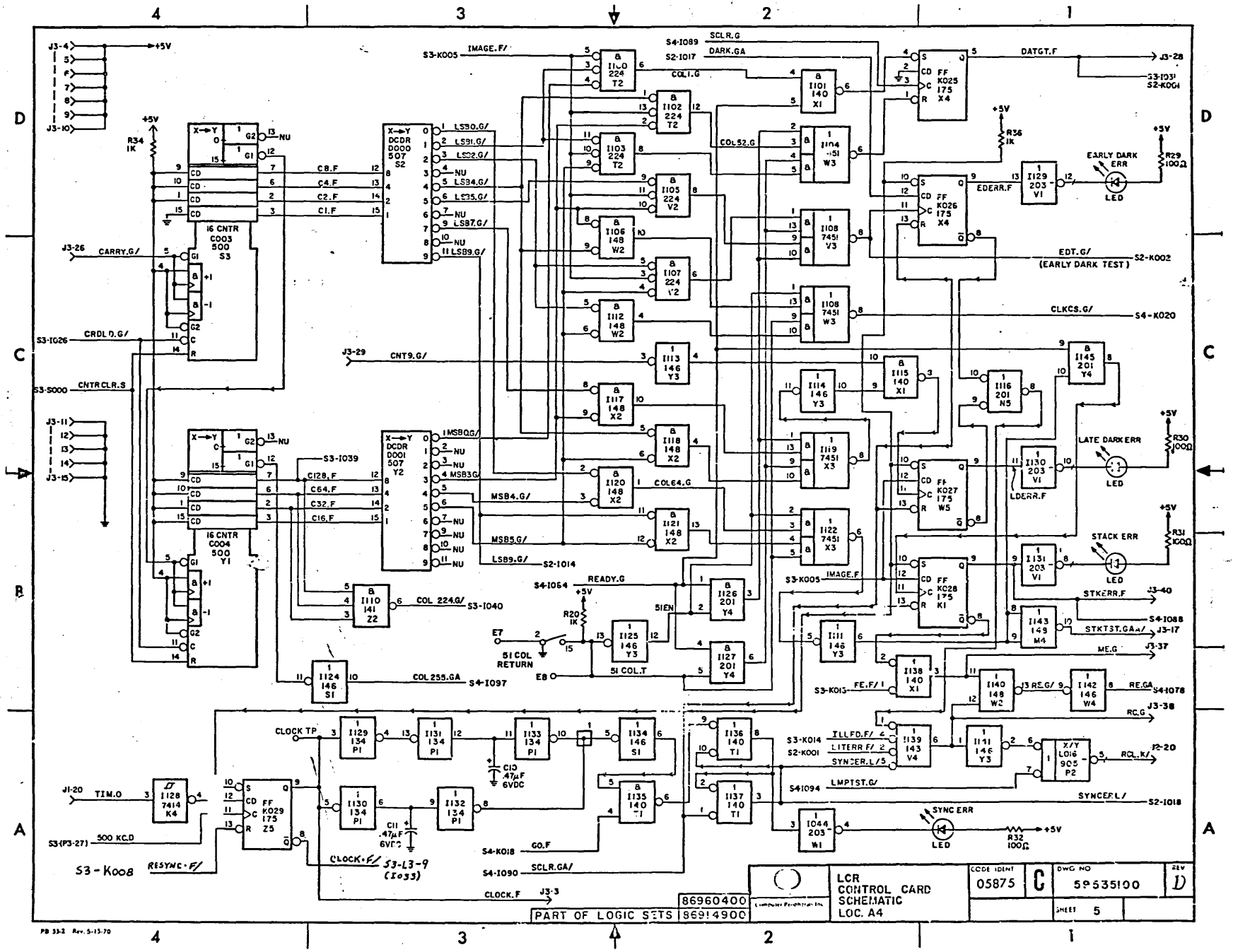

LCR
CONTROL CARD
SCHEMATIC
LOC. A4
CODE IDENT 05875
C
DWG NO 59535100
REV D
SHEET 5
PART OF LOGIC SETS 86914900
86960400
S3-K008 RESYNC·F/
CLOCK·F/ S3-L3-9 (1033)
CLOCK.F J3-3
S4-1090 SCLR.GA/
S4-K018 GO.F
S41094 LMPTST.G/
SYNCER.L/
S2-1018
SYNC ERR
LED
R32 100Ω
+5V
S3-(P3-27) 500 KC.D
J1-20 TIM.O
S3-K014 TLLFD.F/ 4
S2-K001 LITERR.F/ 2
SYNCER.L/5
RCL.K/
J2-20
RC.G
J3-38
S4-1078
RE.GA
J3-37
ME.G
S3-K013 FE.F/ 1
J3-40
STKERR.F
S4-1088
STKTST.GA/
J3-17
S3-K005 IMAGE.F
S4-1054 READY.G
S3-1040
COL 224.G/
S3-1039
S3-1014
LSB9.G/
MSB5.G/
MSB4.G/
MSB3.G/
COL64.G
COL52.G
COL.1.G
S4-1089 SCLR.G
S2-1017 DARK.GA
S3-K005 IMAGE.F/
J3-4 5 6 7 8 9 J3-10
J3-11 12 13 14 J3-15
J3-26 CARRY.G/
S3-1026 CRDL 0.G/
S3-S000 CNTRCLR.S
J3-29 CNT9.G/
S4-K020
CLKCS.G/
S2-K002
EDT.G/
(EARLY DARK TEST)
EARLY DARK ERR
LATE DARK ERR
STACK ERR
EDERR.F
LDERR.F
DATGT.F
J3-28
S3-1031
S2-K004
16 CNTR C003 500 S3
16 CNTR C004 500 Y1
DCDR D000 507 S2
DCDR D001 507 Y2
51 COL RETURN
51 COL.T
COL 255.GA S4-1097
CLOCK TP
R34 1K
R36 1K
R20 1K
R29 100Ω
R30 100Ω
R31 100Ω
C10 .47μF 6VDC
C11 .47μF 6VDC

Figure 7-6.

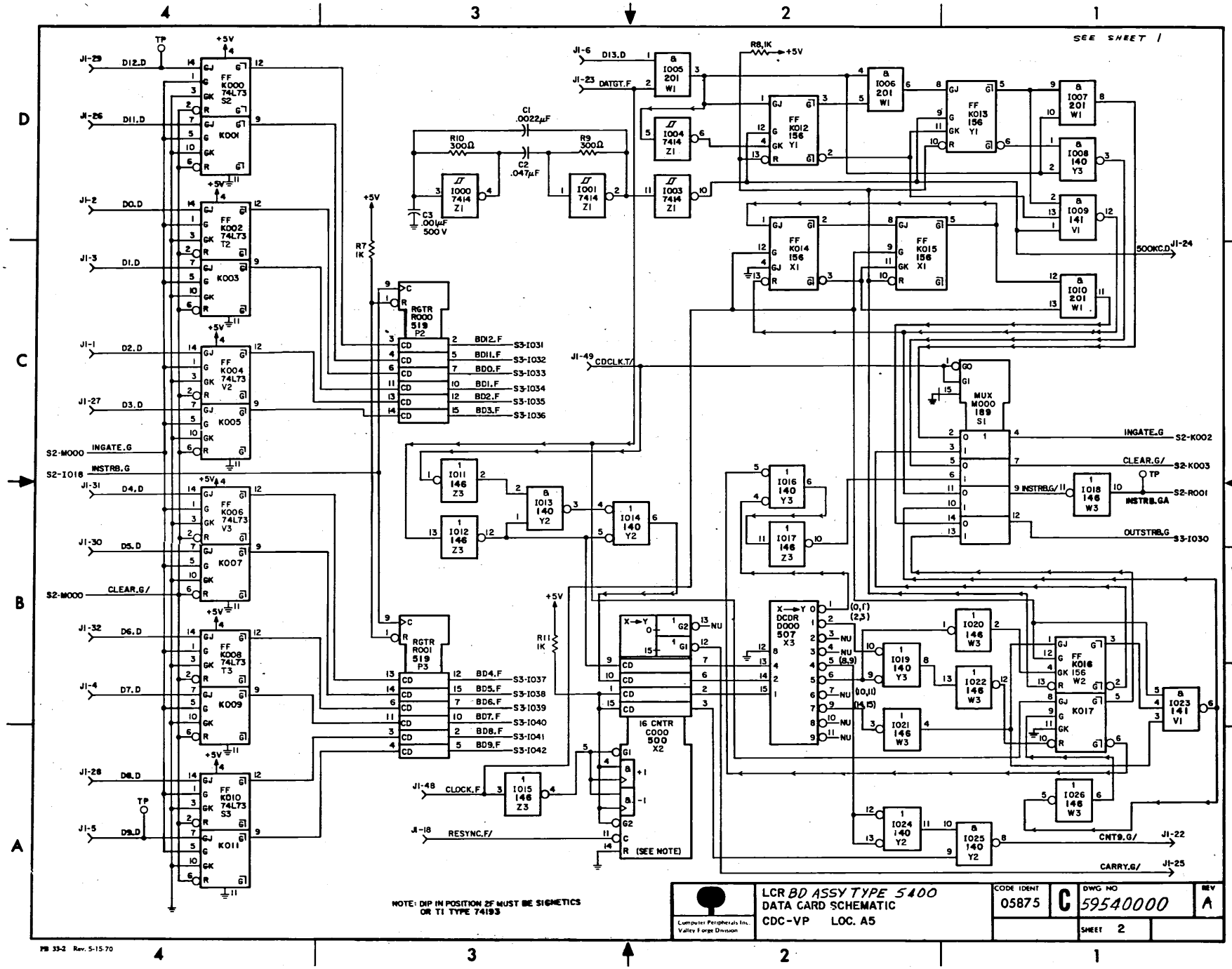
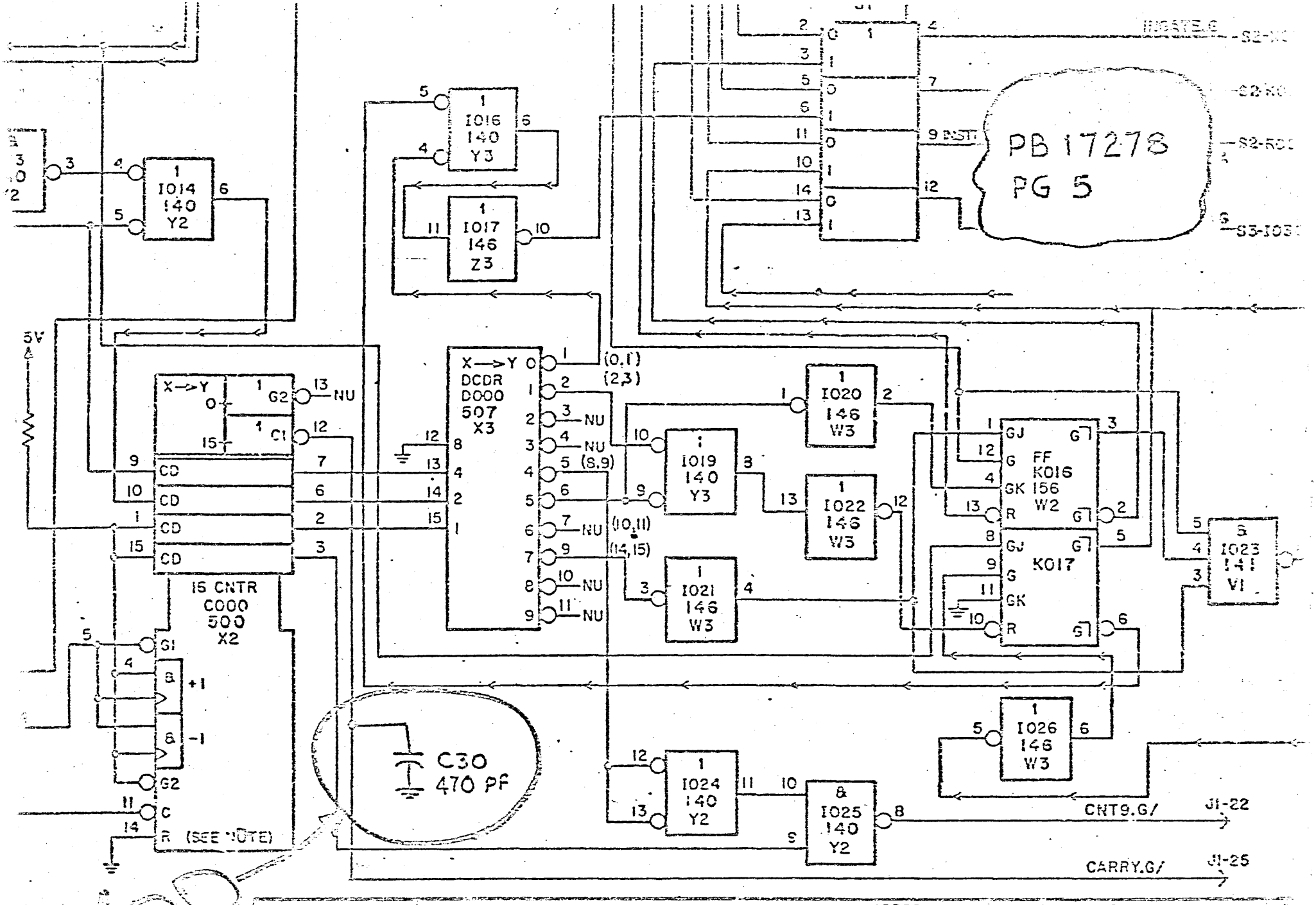
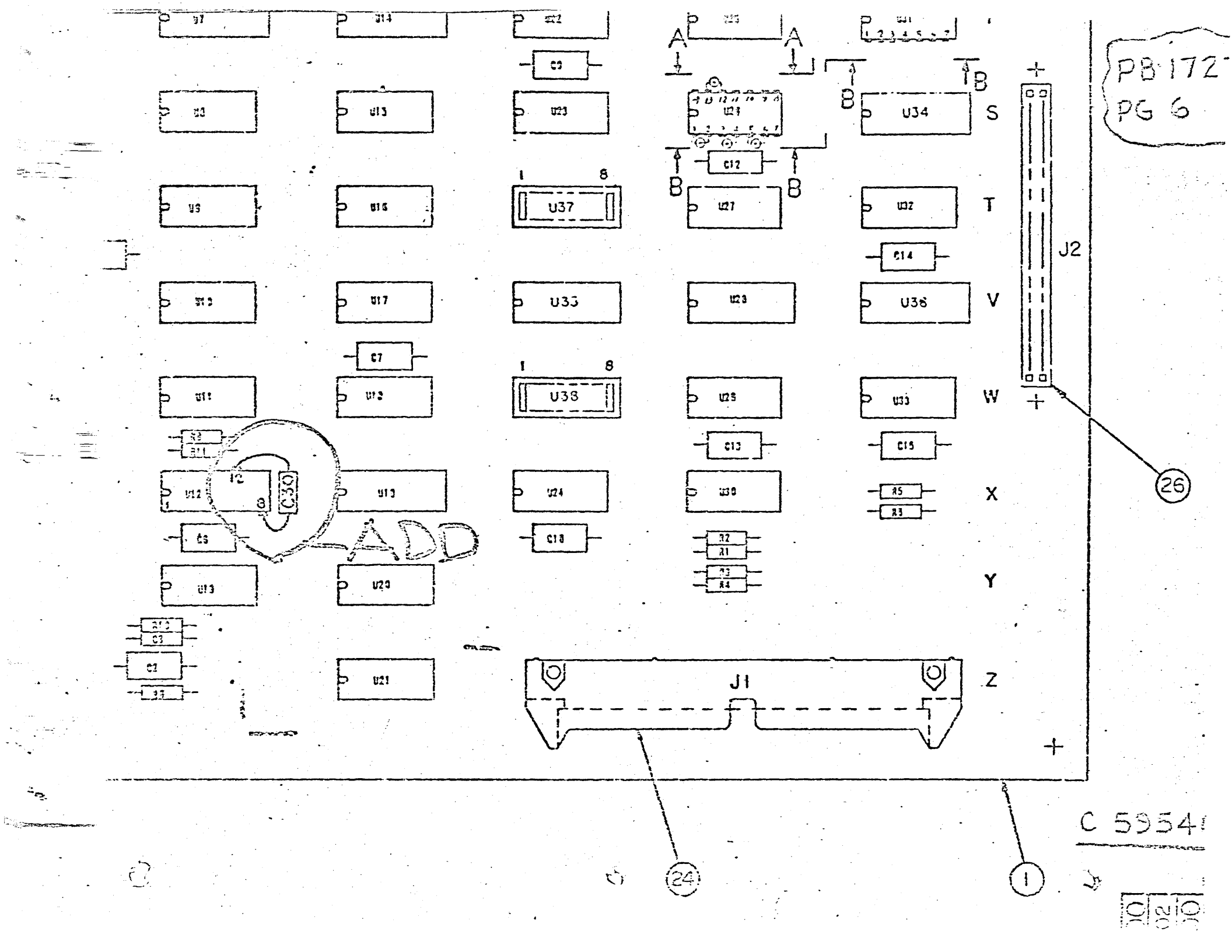

SEE SHEET 1
LCR BD ASSY TYPE 5400
DATA CARD SCHEMATIC
CDC-VP LOC. A5
CODE IDENT 05875
C
DWG NO 59540000
REV A
SHEET 2
Computer Peripherals Inc. Valley Forge Division
NOTE: DIP IN POSITION 2F MUST BE SIGNETICS OR TI TYPE 74193
59540000

Figure 7-7.


PB 17278
PG 5
I016 140 Y3
I017 146 Z3
I014 140 Y2
I019 140 Y3
I020 146 W3
I022 146 W3
I021 146 W3
I024 140 Y2
I025 140 Y2
I026 146 W3
I023 141 V1
X→Y DCDR D000 507 X3
15 CNTR C000 500 X2
K016 FF 156 W2
K017
C30 470 pF
CNT9.G/
CARRY.G/
J1-22
J1-25
(SEE NOTE)
Computer Peripherals Inc.
Valley Forge Division
LCR 8D ASSY TYPE 5400
DATA CARD SCHEMATIC.
CODE IDENT 05875
DWG NO 59540000
SHEET 2


PB 172
PG 6
U34
U37
U38
U36
U33
J2
J1
C12
C14
C13
C15
C7
C30
ADD
26
24
1
C 5954

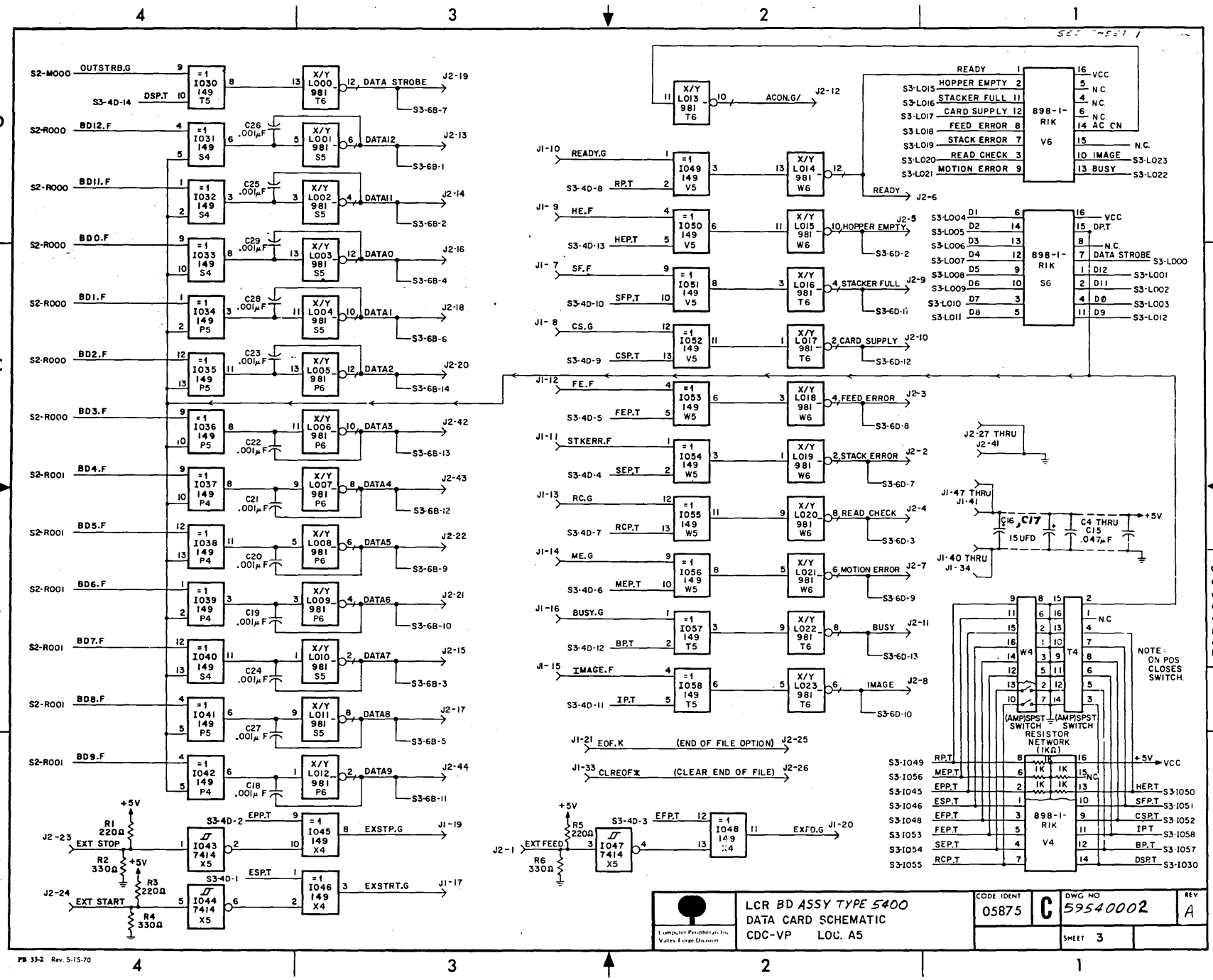
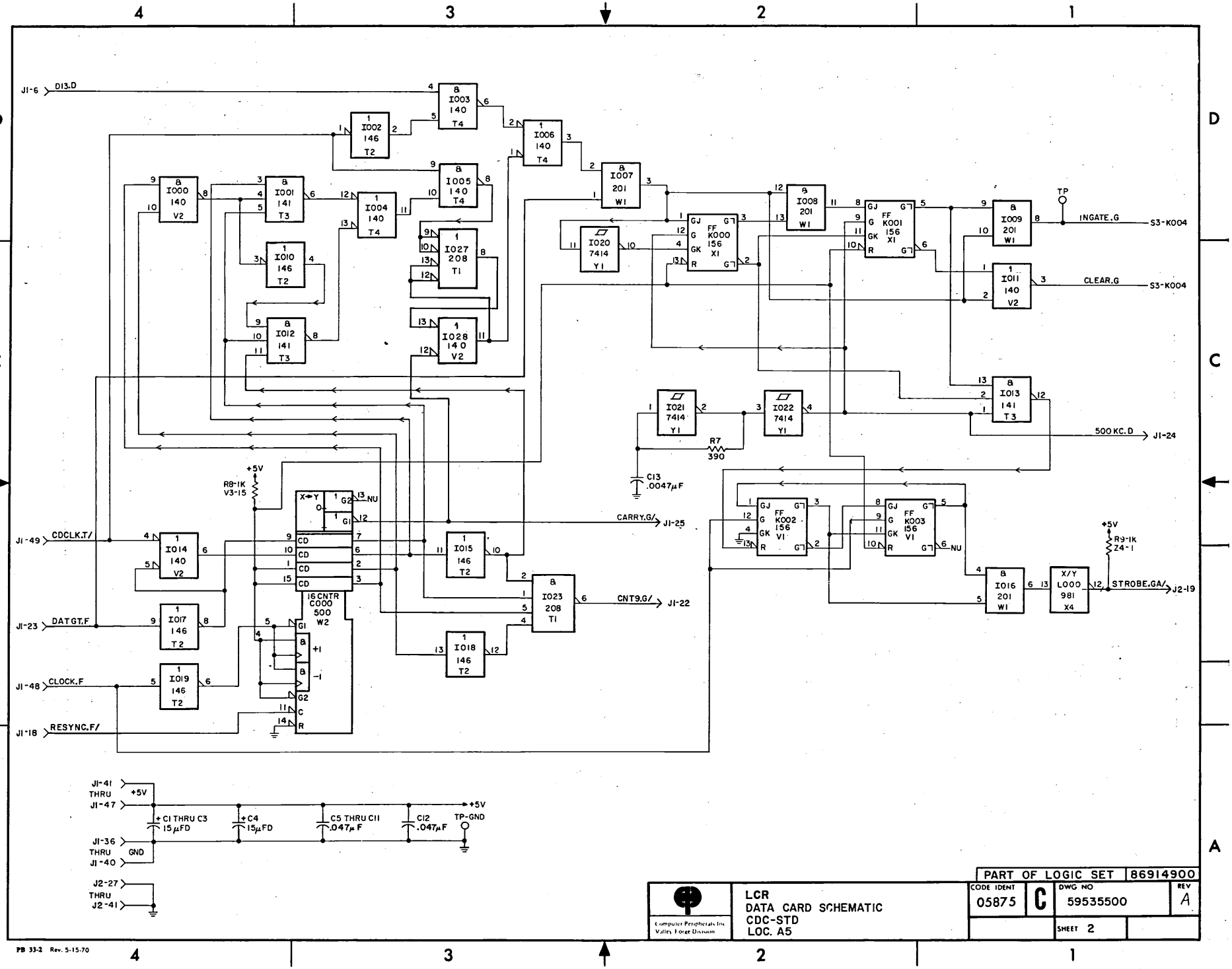

LCR BD ASSY TYPE 5400
DATA CARD SCHEMATIC
CDC-VP LOC. A5
CODE IDENT 05875
DWG NO 59540002
REV A
SHEET 3
59540000
NOTE: ON POS CLOSES SWITCH.
SEE SHEET 1
S2-M000 OUTSTRB.G
S3-4D-14 DSP.T
DATA STROBE
S2-R000 BDI2.F
DATAI2
S2-R000 BDII.F
DATAI1
S2-R000 BDI0.F
DATAI0
S2-R000 BDI1.F
DATAI1
S2-R000 BDI2.F
DATAI2
S2-R000 BDI3.F
DATAI3
S2-R001 BDI4.F
DATAI4
S2-R001 BDI5.F
DATAI5
S2-R001 BDI6.F
DATAI6
S2-R001 BDI7.F
DATAI7
S2-R001 BDI8.F
DATAI8
S2-R001 BDI9.F
DATAI9
J2-19
J2-13
J2-14
J2-16
J2-18
J2-20
J2-42
J2-43
J2-22
J2-21
J2-15
J2-17
J2-44
S3-6B-7
S3-6B-1
S3-6B-2
S3-6B-4
S3-6B-6
S3-6B-14
S3-6B-13
S3-6B-12
S3-6B-9
S3-6B-10
S3-6B-3
S3-6B-5
S3-6B-11
ACON.G/ J2-12
READY.G
RP.T
HE.F
HEP.T
SF.F
SFP.T
CS.G
CSP.T
FE.F
FEP.T
STKERR.F
SEP.T
RC.G
RCP.T
ME.G
MEP.T
BUSY.G
BP.T
IMAGE.F
IP.T
READY
HOPPER EMPTY
STACKER FULL
CARD SUPPLY
FEED ERROR
STACK ERROR
READ CHECK
MOTION ERROR
IMAGE
BUSY
898-1-RIK V6
898-1-RIK S6
898-1-RIK V4
J2-5 HOPPER EMPTY
J2-9 STACKER FULL
J2-10 CARD SUPPLY
J2-3 FEED ERROR
J2-2 STACK ERROR
J2-4 READ CHECK
J2-7 MOTION ERROR
J2-11 BUSY
J2-8 IMAGE
J2-27 THRU J2-41
J1-47 THRU J1-41
J1-40 THRU J1-34
C16, C17 15 UFD
C4 THRU C15 .047μF
+5V
VCC
N.C.
DP.T
DATA STROBE
(AMP)SPST SWITCH
(AMP)SPST SWITCH
RESISTOR NETWORK (1KΩ)
J1-21 EOF.K (END OF FILE OPTION) J2-25
J1-33 CLREOF/ (CLEAR END OF FILE) J2-26
J2-23 EXT STOP
J2-24 EXT START
J2-1 EXT FEED
R1 220Ω
R2 330Ω
R3 220Ω
R4 330Ω
R5 220Ω
R6 330Ω
EXSTP.G J1-19
EXSTRT.G J1-17
EXFD.G J1-20
Computer Peripherals Inc. Valley Forge Division
PB 33-2 Rev. 5-15-70

Figure 7-7.



PART OF LOGIC SET 86914900

Computer Peripherals Inc Valley Forge Division

LCR
DATA CARD SCHEMATIC
CDC-STD
LOC. A5

CODE IDENT		DWG NO	REV
05875	C	59535500	A
		SHEET 2	

PB 33-2 Rev. 5-15-70

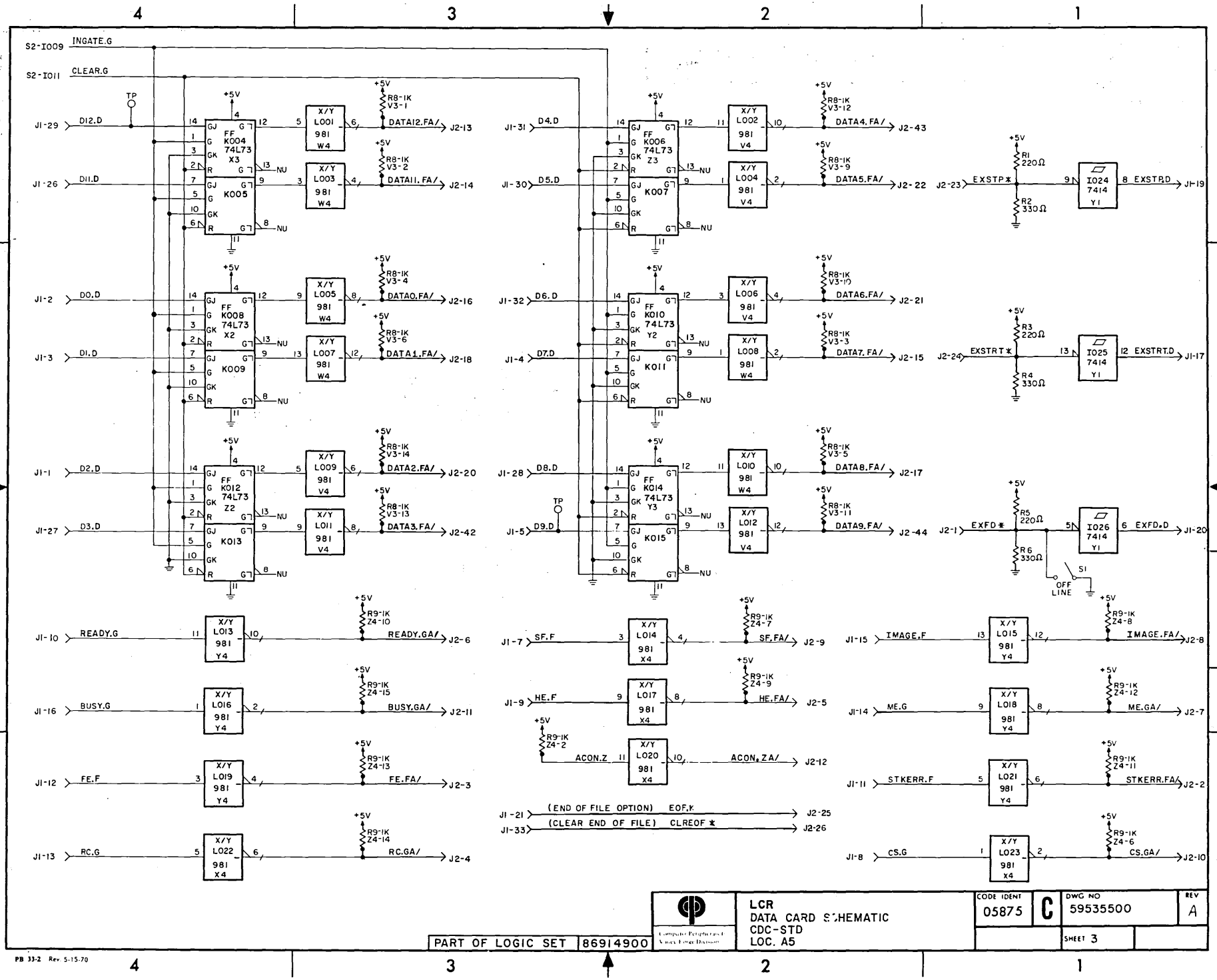
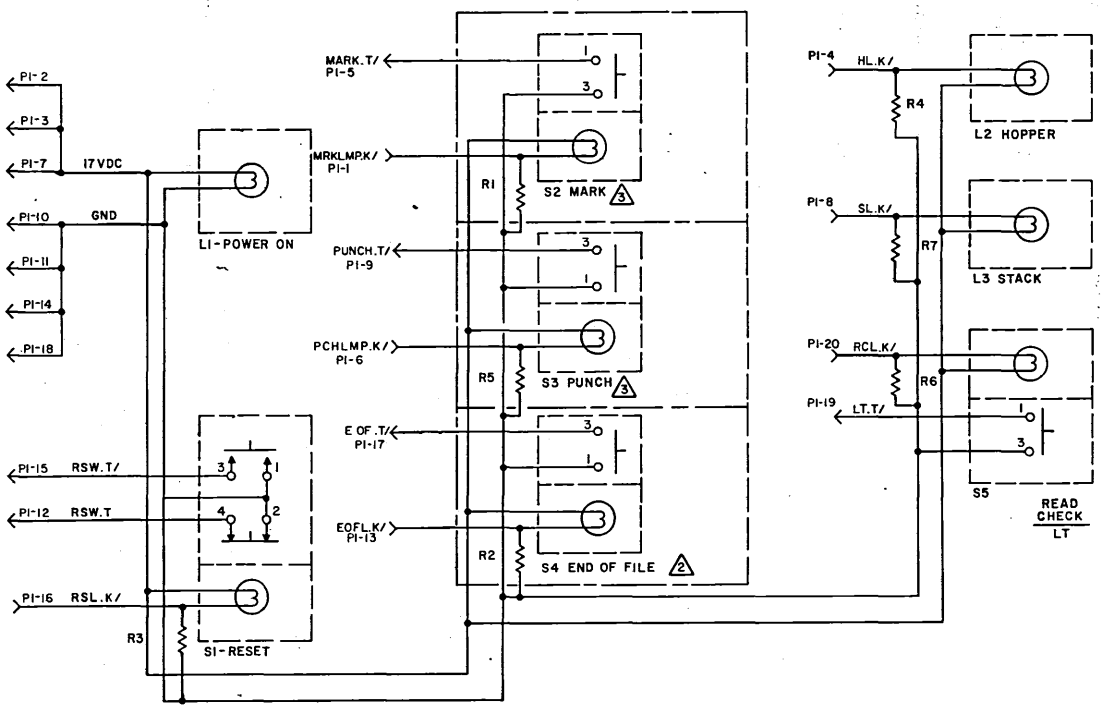

S2-I009 INGATE.G
S2-I011 CLEAR.G
J1-29 DI2.D
J1-26 DII.D
J1-2 DO.D
J1-3 DI.D
J1-1 D2.D
J1-27 D3.D
J1-31 D4.D
J1-30 D5.D
J1-32 D6.D
J1-4 D7.D
J1-28 D8.D
J1-5 D9.D
FF K004 74L73 X3
K005
FF K008 74L73 X2
K009
FF K012 74L73 Z2
K013
FF K006 74L73 Z3
K007
FF K010 74L73 Y2
K011
FF K014 74L73 Y3
K015
DATAI2.FA/ J2-13
DATAII.FA/ J2-14
DATAO.FA/ J2-16
DATA1.FA/ J2-18
DATA2.FA/ J2-20
DATA3.FA/ J2-42
DATA4.FA/ J2-43
DATA5.FA/ J2-22
DATA6.FA/ J2-21
DATA7.FA/ J2-15
DATA8.FA/ J2-17
DATA9.FA/ J2-44
J1-10 READY.G
J1-16 BUSY.G
J1-12 FE.F
J1-13 RC.G
READY.GA/ J2-6
BUSY.GA/ J2-11
FE.FA/ J2-3
RC.GA/ J2-4
J1-7 SF.F
J1-9 HE.F
ACON.Z
SF.FA/ J2-9
HE.FA/ J2-5
ACON.ZA/ J2-12
J1-21 (END OF FILE OPTION) EOF.K J2-25
J1-33 (CLEAR END OF FILE) CLREOF * J2-26
J2-23 EXSTP* J1-19
J2-24 EXSTRT* J1-17
J2-1 EXFD* J1-20
OFF LINE
J1-15 IMAGE.F
J1-14 ME.G
J1-11 STKERR.F
J1-8 CS.G
IMAGE.FA/ J2-8
ME.GA/ J2-7
STKERR.FA/ J2-2
CS.GA/ J2-10
PART OF LOGIC SET 86914900
LCR
DATA CARD SCHEMATIC
CDC-STD
LOC. A5
CODE IDENT 05875
C
DWG NO 59535500
REV A
SHEET 3
PB 33-2 Rev. 5-15-70

Figure 7-8.



NOTES :

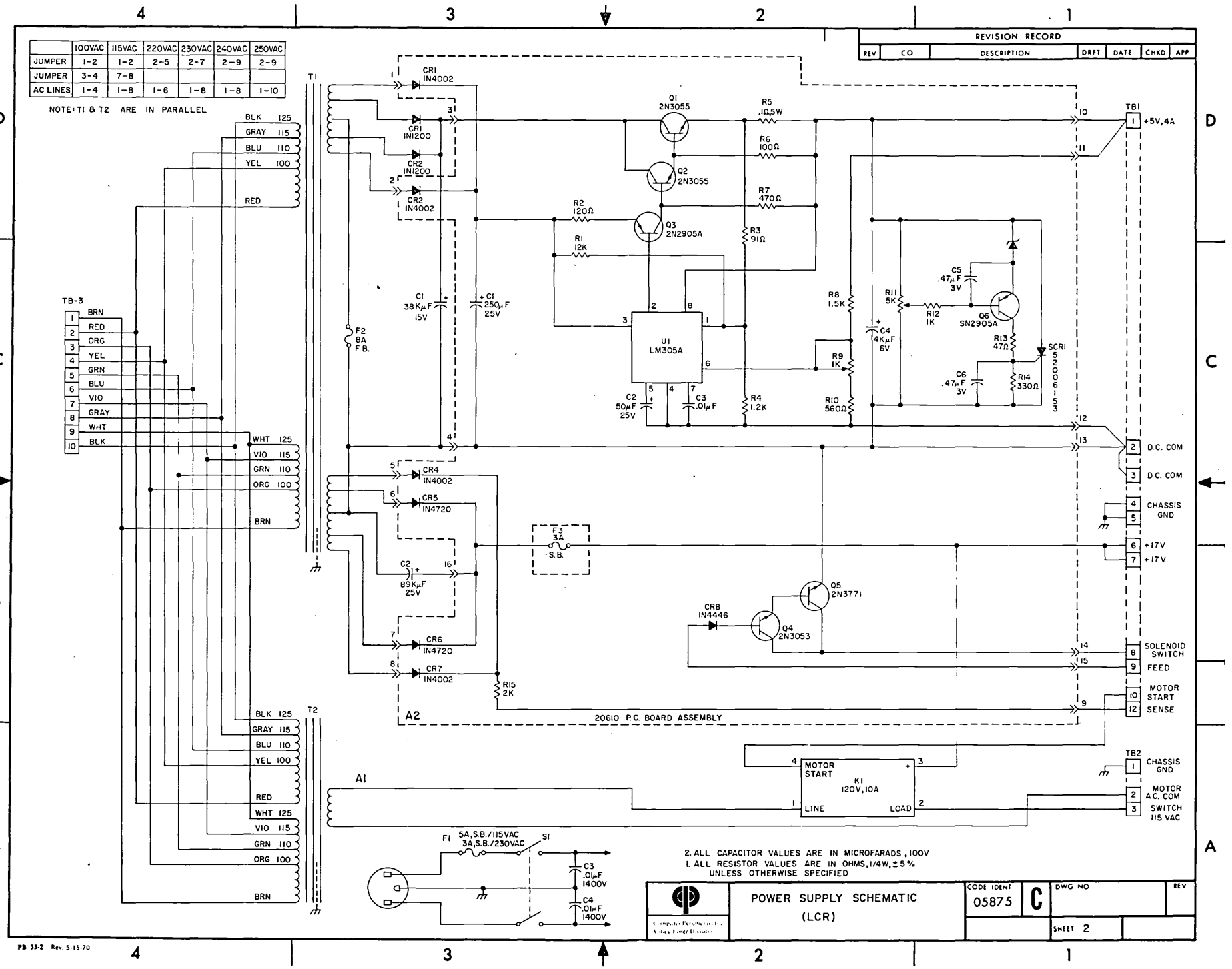
1. ALL RESISTORS 560Ω ,1/2W, 10%
2. E OF OPTION
3. "MARK/PUNCH" OPTION

Computer Peripherals Inc. Valley Forge Division	LCR SWITCH CARD SCHEMATIC LOC. A6	CODE IDENT 05875	C	DWG NO 59535300 REV A
				SHEET 2 PAGE

86960400
PART OF LOGIC SETS 86914900

PB 33-2 Rev. 5-15-70

Figure 7-9.



	100VAC	115VAC	220VAC	230VAC	240VAC	250VAC
JUMPER	1-2	1-2	2-5	2-7	2-9	2-9
JUMPER	3-4	7-8				
AC LINES	1-4	1-8	1-6	1-8	1-8	1-10

Figure 7-19.

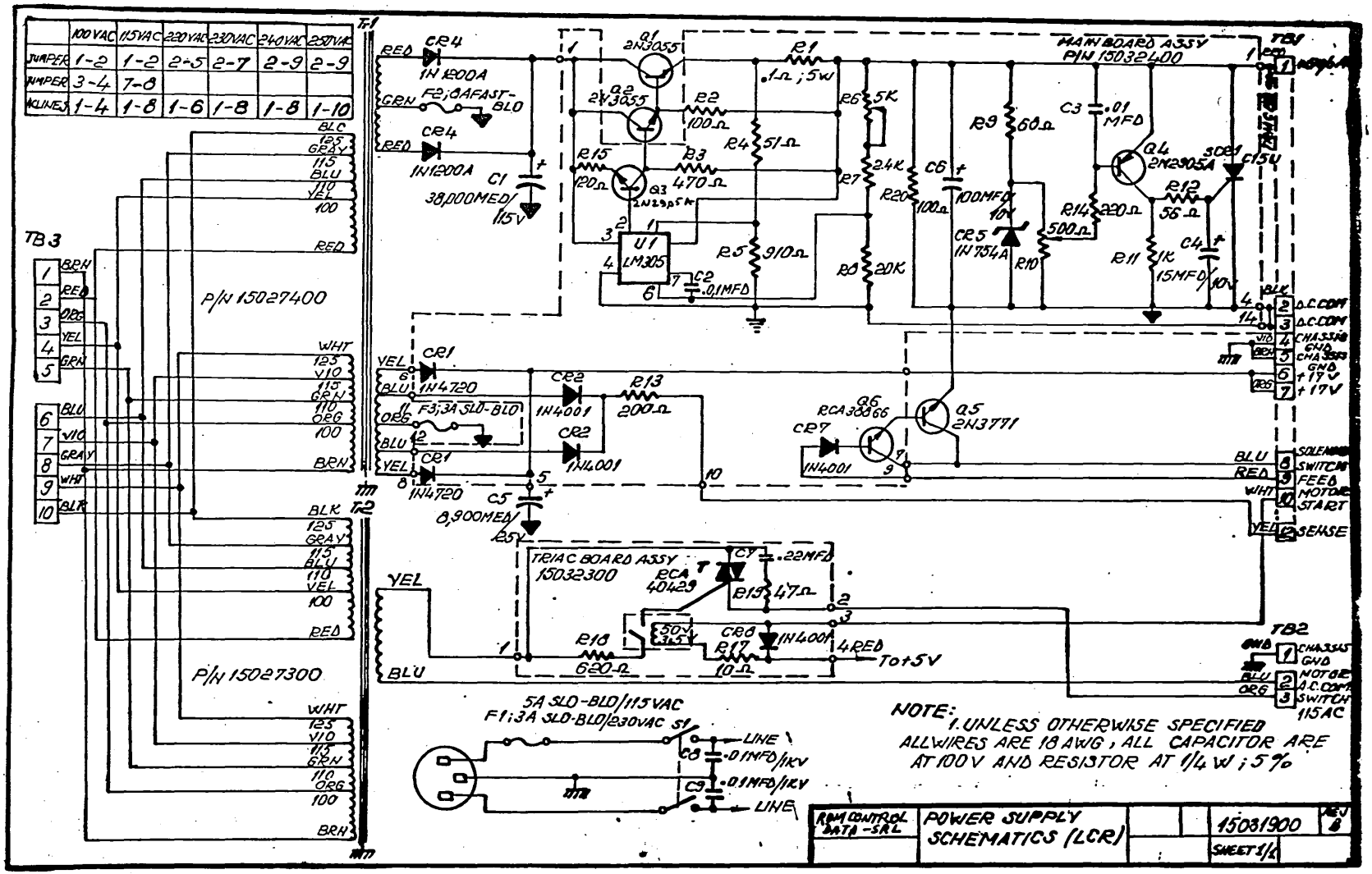
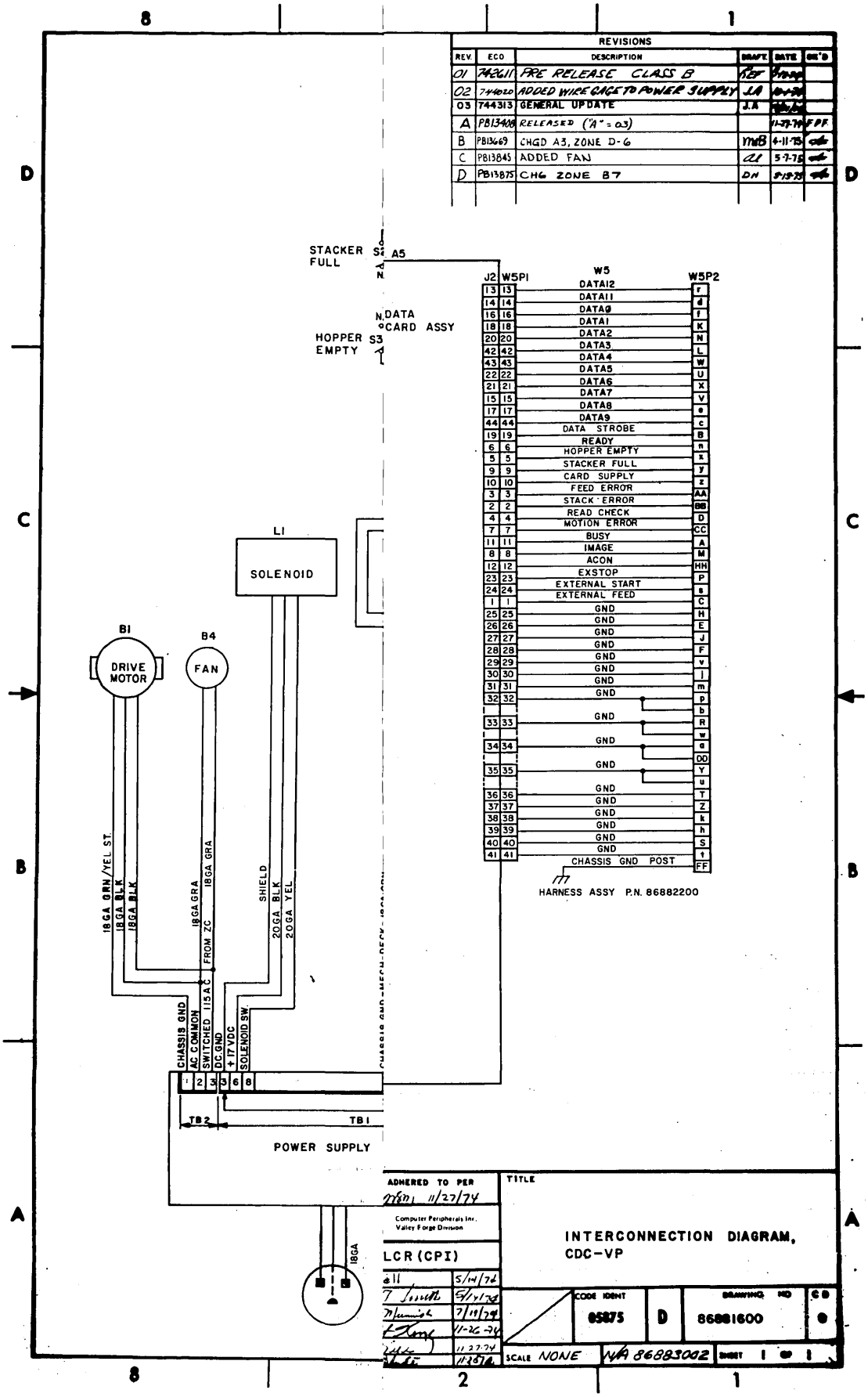
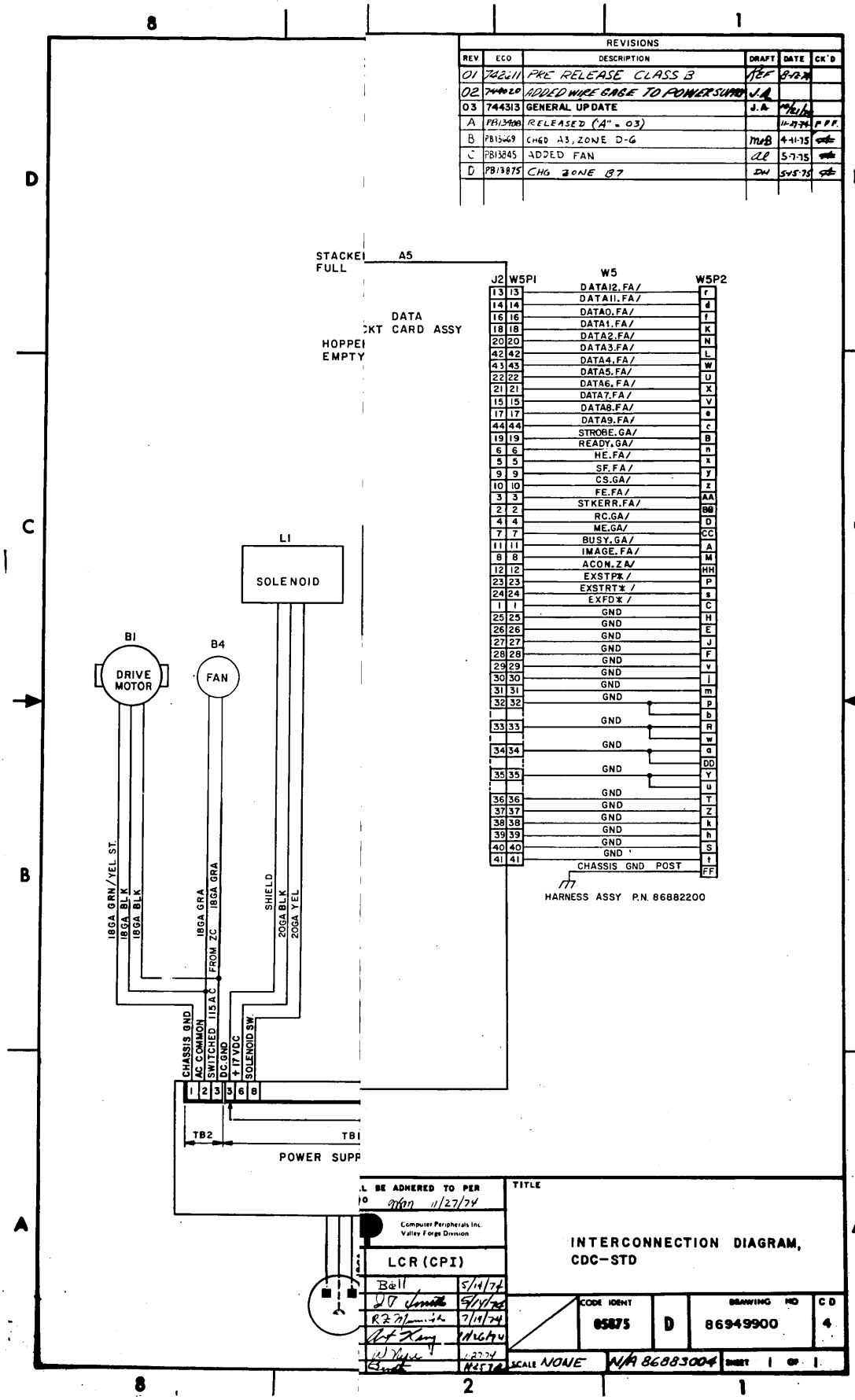

MAIN BOARD ASSY P/N 15032400
TRIAC BOARD ASSY 15032300
P/N 15027400
P/N 15027300
POWER SUPPLY SCHEMATICS (LCR)
15031900
NOTE: 1. UNLESS OTHERWISE SPECIFIED ALL WIRES ARE 18 AWG, ALL CAPACITOR ARE AT 100 V AND RESISTOR AT 1/4 W; 5%

Figure 7-10 A


REVISIONS
REV. ECO DESCRIPTION DRAFT. DATE CH'D
01 742611 PRE RELEASE CLASS B
02 744020 ADDED WIRE GAGE TO POWER SUPPLY
03 744313 GENERAL UPDATE
A PB13408 RELEASED ("A" = 03)
B PB13669 CHGD A3, ZONE D-6
C PB13845 ADDED FAN
D PB13875 CHG ZONE B7
STACKER FULL S2 A5
HOPPER EMPTY S3 A3
DATA CARD ASSY
J2 W5P1 W5 W5P2
DATA12
DATA11
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
DATA8
DATA9
DATA STROBE
READY
HOPPER EMPTY
STACKER FULL
CARD SUPPLY
FEED ERROR
STACK ERROR
READ CHECK
MOTION ERROR
BUSY
IMAGE
ACON
EXSTOP
EXTERNAL START
EXTERNAL FEED
GND
CHASSIS GND POST
HARNESS ASSY P.N. 86882200
L1
SOLENOID
B1
DRIVE MOTOR
B4
FAN
18GA GRN/YEL ST.
18GA BLK
18GA BLK
18GA GRA
18GA GRA
FROM ZC
SHIELD
20GA BLK
20GA YEL
CHASSIS GND
AC COMMON
SWITCHED 115 A.C.
DC GND
+17 VDC
SOLENOID SW.
1 2 3 3 6 8
TB2
TB1
POWER SUPPLY
18GA
ADHERED TO PER
11/27/74
Computer Peripherals Inc.
Valley Forge Division
LCR (CPI)
TITLE
INTERCONNECTION DIAGRAM, CDC-VP
CODE IDENT 05875
D
DRAWING NO 86881600
SCALE NONE
WA 86883002
SHEET 1 OF 1


REVISIONS
REV | ECO | DESCRIPTION | DRAFT | DATE | CK'D
01 | 742611 | PRE RELEASE CLASS B | JEF | 8-8-74
02 | 744020 | ADDED WIRE CABLE TO POWER SUPPLY | J.A. |
03 | 744313 | GENERAL UPDATE | J.A. | 11-27-74
A | PB13900 | RELEASED ("A" = 03) | | 11-27-74 | P.P.P.
B | PB13469 | CHGD A3, ZONE D-6 | MAB | 4-11-75
C | PB13845 | ADDED FAN | AL | 5-7-75
D | PB13875 | CHG ZONE B7 | DW | 5-15-75
STACKER FULL
A5
DATA CKT CARD ASSY
HOPPER EMPTY
J2 W5P1
W5
W5P2
DATA12.FA/
DATA11.FA/
DATA0.FA/
DATA1.FA/
DATA2.FA/
DATA3.FA/
DATA4.FA/
DATA5.FA/
DATA6.FA/
DATA7.FA/
DATA8.FA/
DATA9.FA/
STROBE.GA/
READY.GA/
HE.FA/
SF.FA/
CS.GA/
FE.FA/
STKERR.FA/
RC.GA/
ME.GA/
BUSY.GA/
IMAGE.FA/
ACON.ZA/
EXSTP*/
EXSTRT*/
EXFD*/
GND
CHASSIS GND POST
HARNESS ASSY P.N. 86882200
L1
SOLENOID
B1
DRIVE MOTOR
B4
FAN
18GA GRN/YEL ST.
18GA BLK
18GA BLK
18GA GRA
FROM ZC
18GA GRA
SHIELD
20GA BLK
20GA YEL
CHASSIS GND
AC COMMON
SWITCHED 115 AC
DC GND
+17 VDC
SOLENOID SW.
1 2 3 5 6 8
TB2
TB1
POWER SUPP
TITLE
INTERCONNECTION DIAGRAM, CDC-STD
Computer Peripherals Inc. Valley Forge Division
LCR (CPI)
Bell 5/14/74
CODE IDENT 05875
D
DRAWING NO 86949900
C D 4
SCALE NONE
W/A 86883004
SHEET 1 OF 1

SECTION VIII

PARTS

Section VIII - PARTS LIST

8-1. GENERAL

This section contains an indentured parts list for the reader. All parts listed reflect the latest configuration; as design changes are implemented on manufactured units, appropriate revisions will be made to the illustrations and lists.

8-2. FORMAT

Locators are provided to aid in the location of assemblies and the figure in which it is illustrated. Isometric illustrations are provided for every major assembly and subassembly of the card reader.

A card layout section shows the physical layout of all printed wiring board assemblies and gives a parts breakdown of each card.

8-3. EXPLANATION OF TERMS AS USED IN THE PARTS LIST (See Example)

1. The number before the hyphen is the figure to which it applies. The number after the hyphen is the callout number on the figure.

2. The eight digit number is the identifying number used in ordering replaceable parts.

3. The part code is as follows:

   SN - Parts marked with an SN may be ordered by a site or any higher support activity. No return, scrap.

   SC - Parts marked with an SC may be ordered by a site or any higher support activity. Return defective parts for repair.

   RO - Parts marked with an RO are shown for reference only. Parts will not be supplied to any activity outside manufacturing. If a malfunction is determined to be in part marked RO, use the next higher assembly. If the part marked RO is the highest assembly then use components of the assembly.

4. INDENTURES - This indicates the relationship of parts to the next higher assembly.

   EXAMPLE - The numerical display knob, Item -4, 2 dots, is part of the numerical display assembly, Item -3, one dot. The numerical display assembly is part of the operators control panel assembly, Item 1-, no dots.

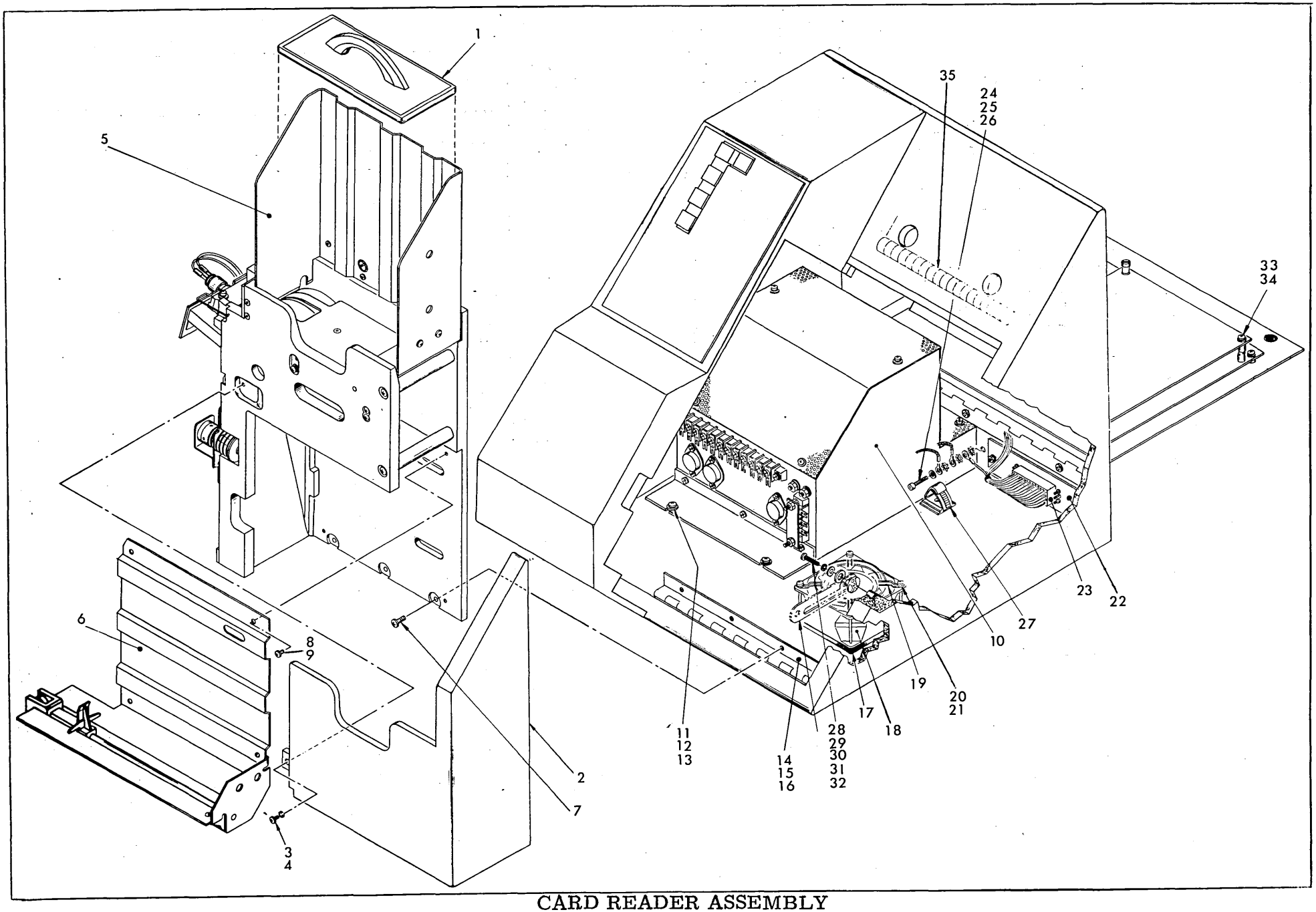
5. ATTACHING PARTS - The attaching parts for a particular part or assembly.

6. QUANTITY - Total number of units used in that assembly or subassembly.

7. The mod code column references the quantity of each item used in an assembly to a particular model. Mod A is 60 Hertz; Mod B is 50 Hertz.

(1) INDEX NO.	(2) PART NUMBER	(3) PART CODE	(4) (5) DESCRIPTION 1 2 3 4 5 6	(6) QTY	(7) MOD CODE
1-	49928400		OPERATORS CONTROL PANEL ASSEMBLY	1	
-1	49451003		. OPERATORS CONTROL PANEL	1	
			— attaching parts —		
-2			. SCREW	3	

-3	49894100		. NUMERICAL DISPLAY ASSEMBLY	1	
-4	94687100		. . KNOB, NUMERICAL DISPLAY	1	
-5	49894000		. . BEZEL, NUMERICAL DISPLAY	1	
-6	95088200		. . LENS, NUMERICAL DISPLAY	1	
-7	92629003		. . LAMP, INDICATOR	11	
-8	94826001		. . SOCKET LAMP	11	
-9	94690100		. . SWITCH, 12 POSITION	1	
			— attaching parts —		



CARD READER ASSEMBLY
(FRONT VIEW)
FIGURE 8-1

INDEX NO.	PART NUMBER	PART CODE	(Serial Number 151 & above) DESCRIPTION 1 2 3 4 5 6 (Sheet 1 of 2)	QTY	MOD CODE
1-	86883002		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		A
1-	86883003		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		B
1-	86883004		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		A
1-	86883005		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		B
1-	86883006		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		A
1-	86883007		CARD READER ASSEMBLY, 3/600 OHR (FRONT VIEW)		B
1-	86883010		CARD READER ASSEMBLY, 3/800 OHR		A
1-	86883011		CARD READER ASSEMBLY, 3/800 OHR		B
1-	86883012		CARD READER ASSEMBLY, 3/800 OHR		A
1-	86883013		CARD READER ASSEMBLY, 3/800 OHR		B
1-	86883016		CARD READER ASSEMBLY, 3/600 OH/MR		A
1-	86883017		CARD READER ASSEMBLY, 3/600 OH/MR		B
1-	86883018		CARD READER ASSEMBLY, 3/600 OH/MR		A
1-	86883019		CARD READER ASSEMBLY, 3/600 OH/MR		B
1-	86883020		CARD READER ASSEMBLY, 3/600 OH/MR		A
1-	86883021		CARD READER ASSEMBLY, 3/600 OH/MR		B
-1	86946601		. CARD WEIGHT ASSEMBLY-80 COLUMN	1	
-2	86911501		. SIDE PANEL ASSEMBLY	1	
-	86909505		. . SIDE PANEL, HARVEST GOLD	1	
-	86909507		. . SIDE PANEL, LIGHT GRAY	1	
-	86910600		. . KEEPER	1	
-	95655516		. . SCREW, PAN HEAD, TYPE B, 6-20 x 3/8	2	
			— attaching parts —		
-3	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	1	
-4	10125605		. WASHER, PLAIN, 6	1	
			-----*-----		
-5	77200702		. MECHANICAL DECK, 3/600 OHR (SEE FIGURES 8-2 AND 8-10)	1	A
-5	77200703		. MECHANICAL DECK, 3/600 OHR	1	B
-5	77200706		. MECHANICAL DECK, 3/800 OHR	1	A
-5	77200707		. MECHANICAL DECK, 3/800 OHR	1	B
-5	77200710		. MECHANICAL DECK, 3/600 OH/MR	1	A
-5	77200711		. MECHANICAL DECK, 3/600 OH/MR	1	B
-6	86897801		. . STACKER ASSEMBLY, 1000 CARDS	1	
			— attaching parts —		
-7	10127122		. SCREW, MACHINE, PAN HEAD, 8-32 x 3/8	3	
-8	10127111		. . SCREW, MACHINE, PAN HEAD, 6-32 x 1/4	4	
-9	10125605		. . WASHER, PLAIN, 6	4	
			-----*-----		
-10	86901001		. POWER SUPPLY, 115	1	A
-10	15031900		. ALTERNATE POWER SUPPLY, 115	1	A
-10	86901004		. POWER SUPPLY, 240	1	B
-10	15031901		. ALTERNATE POWER SUPPLY, 230	1	B
			— attaching parts —		
-11	10127122		. SCREW, MACHINE, PAN HEAD, 8-32 x 3/8	2	
-12	10125606		. WASHER, PLAIN, 8	2	
-13	10125804		. WASHER, LOCK, SPRING, 8	2	
			-----*-----		
-14	86899200		. HINGE-SHORT	1	
			— attaching parts —		
-15	10127122		. SCREW, MACHINE, PAN HEAD, 8-32 x 3/8	4	
-16	10125606		. WASHER, PLAIN, 8	4	
			-----*-----		
-17	86878300		. GRILL, SQUARE	1	
-18	77196201		. FAN ASSEMBLY	1	
-19	95877303		. GUARD	1	
			— attaching parts —		
-20	95655525		. SCREW, PAN HEAD, TYPE B, 6-32 x 2	4	
-21	10125605		. WASHER, PLAIN, 6	4	
			-----*-----		
-22	86911200		. PLATE-I/O CONNECTOR	1	
-23	86882201		. HARNESS ASSEMBLY, I/O	1	
-	93644003		. . CONTACT PIN, 26-24 AWG, SERIAL .062	44	
-	93644002		. . CONTACT PIN, 22-20 AWG, SERIAL .062	4	
-	94656800		. . MINIATURE RECTANGULAR BLOCK, 50 PLACE	1	
-	95813202		. . CONTACT-RECEPTACLE	44	
-	95884901		. . CONNECTOR-CABLE, .100 CENTER	1	
			-----*-----		
-24	10126228		. SCREW, CAP, CAP SOCKET	1	
-25	10125804		. WASHER, LOCK, SPRING, 8	1	
-26	10126402		. WASHER, LOCK, EXTERNAL TOOTH, 8	3	
-27	95892300		. CLAMP, CABLE	1	
			-----*-----		

INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (Sheet 2 of 2)	QTY	MOD CODE
-28	10127336		. SCREW, MACHINE, PAN HEAD, 6-32 x 5/8	1	
-29	10125803		. WASHER, LOCK, SPRING, 6	1	
-30	10125605		. WASHER, PLAIN, 6	1	
-31	10125600		. WASHER, PLAIN, 1/4	1	
-32	77145600		. SPACER, LATCH	1	
			-----*-----		
-33	10127111		. SCREW, PAN HEAD, 6-32 x 1/4	4	
-34	10125803		. WASHER, LOCK, SPRING, 6	4	
			-----*-----		
-35	95924100		. CONTACT FINGER	1	

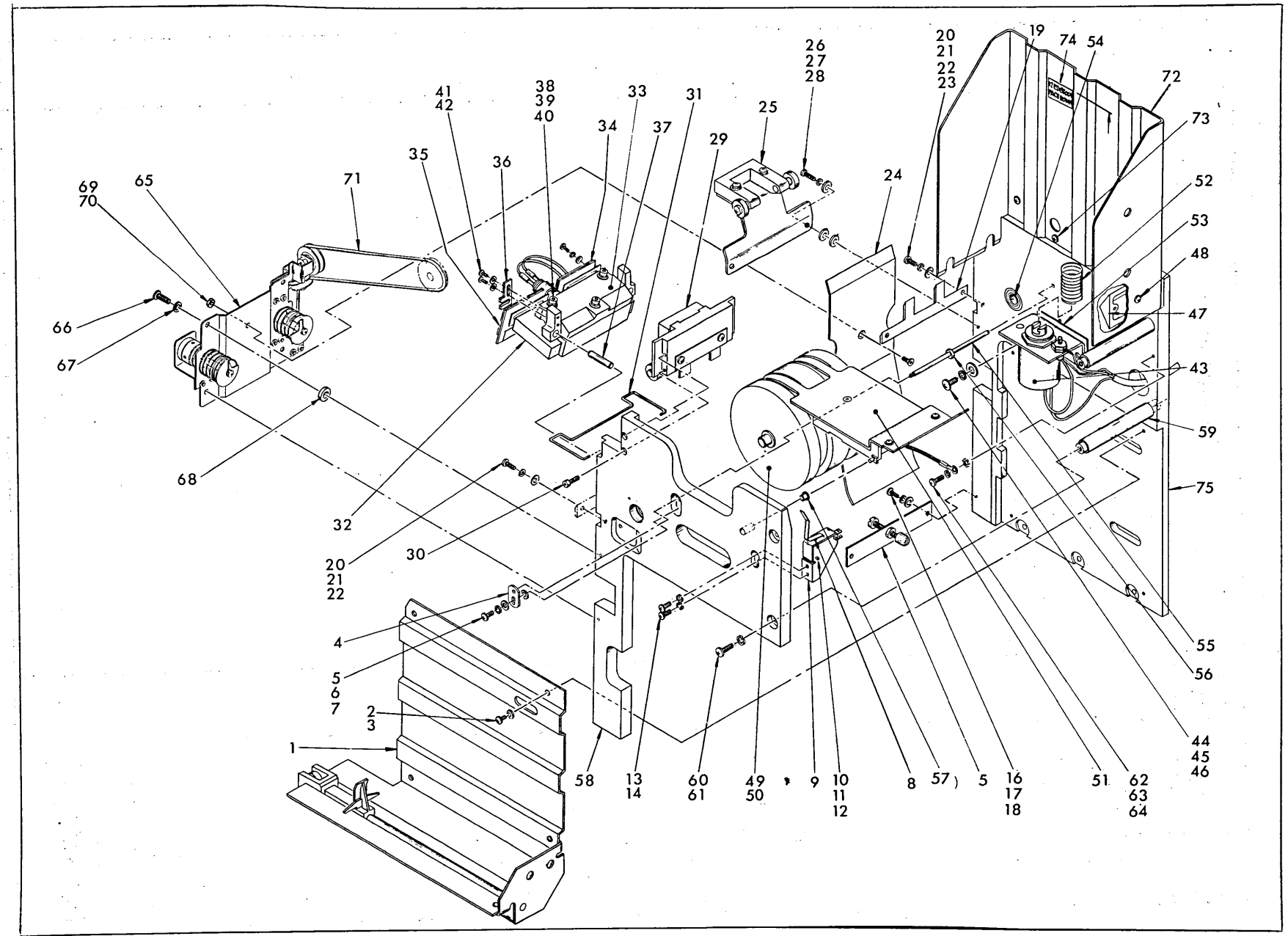
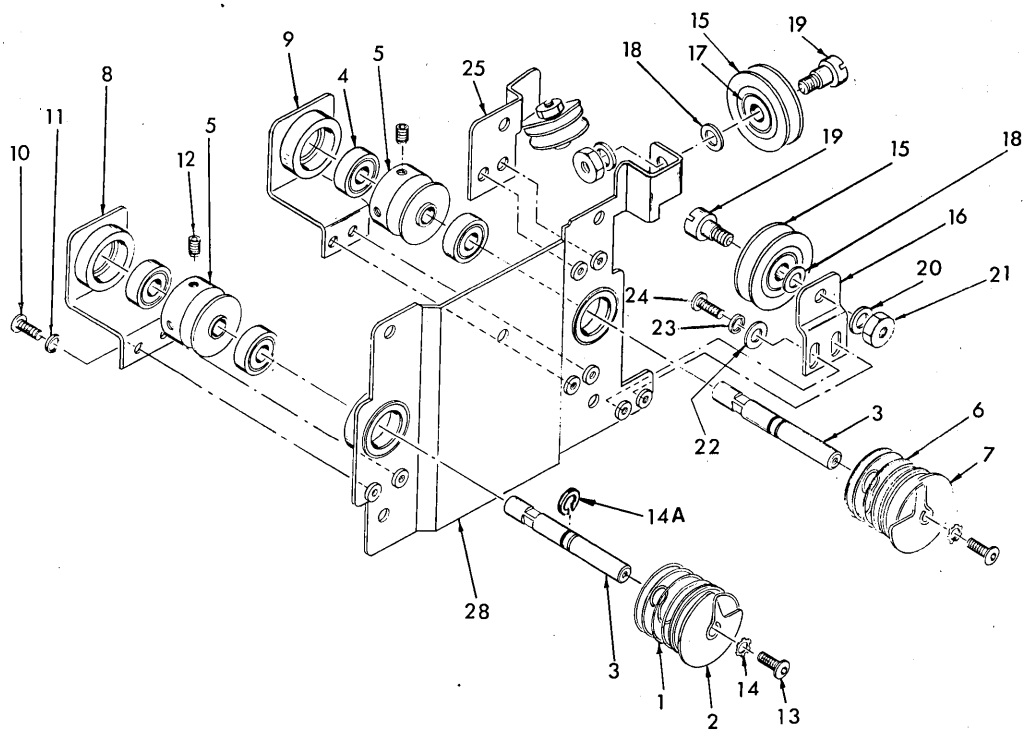


FIGURE 8-2

MECHANICAL DECK ASSEMBLY
(FRONT VIEW)

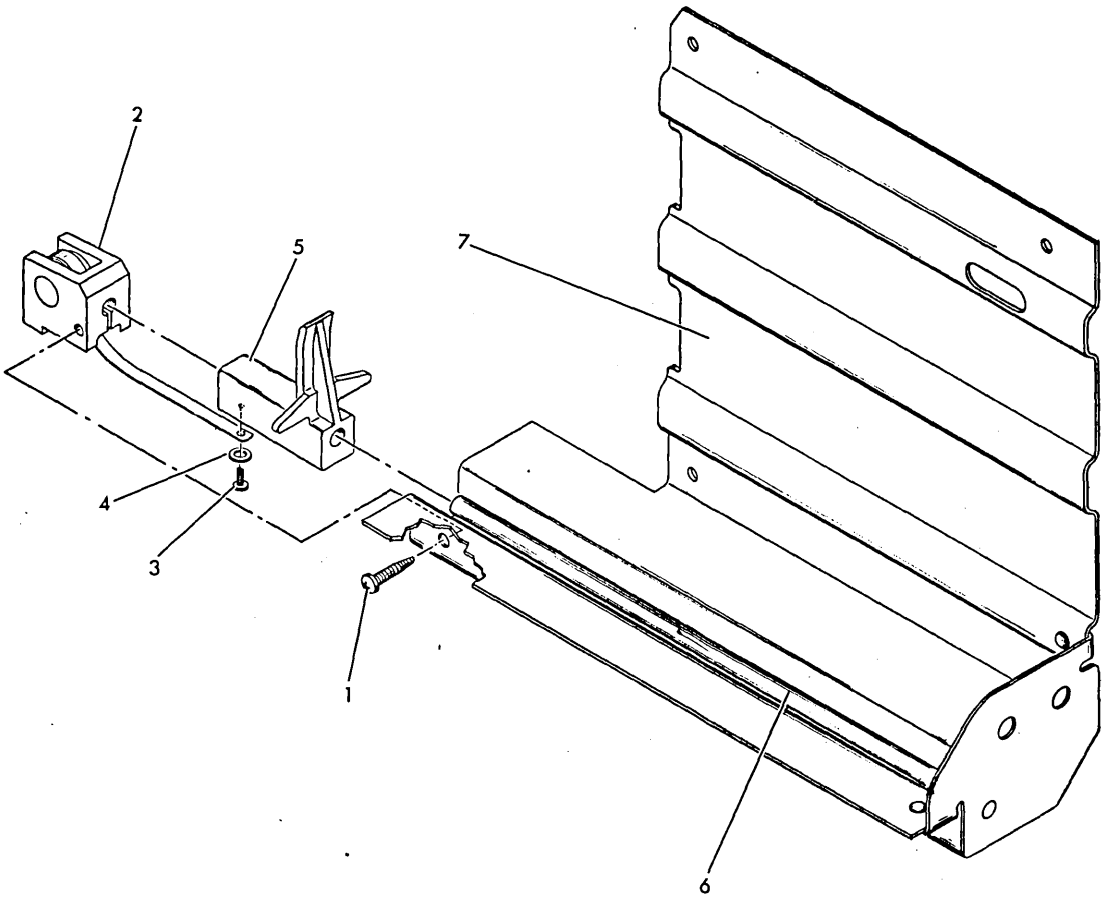
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (Sheet 1 of 2)	QTY	MOD CODE
2-	77200702		MECHANICAL DECK ASSEMBLY, 3/600 OHR		A
2-	77200703		MECHANICAL DECK ASSEMBLY, 3/600 OHR		B
2-	77200706		MECHANICAL DECK ASSEMBLY, 3/800 OHR		A
2-	77200707		MECHANICAL DECK ASSEMBLY, 3/800 OHR		B
2-	77200710		MECHANICAL DECK ASSEMBLY, 3/600 OH/MR		A
2-	77200711		MECHANICAL DECK ASSEMBLY, 3/600 OH/MR		B
-1	86897801		. STACKER ASSEMBLY, 1000 CARDS (SEE FIGURE 8-3)	1	
			— attaching parts —		
-2	10127111		. SCREW, PAN HEAD, 6-32 x 1/4	4	
-3	10125605		. WASHER, PLAIN, 6	4	
			-----*-----		
-4	86908401		. ADJ-FEED STROKE	1	
			— attaching parts —		
-5	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	1	
-6	10125605		. WASHER, PLAIN, 8	2	
-7	10125803		. WASHER, LOCK, SPRING, 6	1	
			-----*-----		
-8	95877502		. SWITCH, HOPPER, SNAP ACTION	1	
-9	86897300		. BRACKET, SWITCH	1	
			— attaching parts —		
-10	10127106		. SCREW, MACHINE, PAN HEAD, 4-40 x 5/8	2	
-11	10125603		. WASHER, PLAIN, 4	2	
-12	10125801		. WASHER, LOCK, SPRING, 4	2	
-13	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	2	
-14	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-15	86931201		. WEAR PLATE, DAMPER ASSEMBLY	1	
			— attaching parts —		
-16	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	2	
-17	10125605		. WASHER, PLAIN, 6	2	
-18	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-19	86946700		. STRIPPER, CARD	1	
			— attaching parts —		
-20	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	2	
-21	10125803		. WASHER, LOCK, SPRING, 6	2	
-22	10125605		. WASHER, PLAIN, 6	1	
-23	10126401		. WASHER, LOCK, EXTERNAL TOOTH, 6	1	
			-----*-----		
-24	86872700		. PLATE, WEAR, STOP	1	
-25	77145001		. FOLLOWER ROLLER ASSEMBLY (SEE FIGURE 8-7)	1	
			— attaching parts —		
-26	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	2	
-27	10125605		. WASHER, PLAIN, 6	4	
-28	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-29	86907101		. PRESSURE ROLLER ASSEMBLY (SEE FIGURE 8-8)	1	
			— attaching parts —		
-30	10126219		. SCREW, SOCKET HEAD, CAP	2	
-31	86899600		. CLAMP, SPRING	1	
			-----*-----		
-32	86893501		. READ HEAD ASSEMBLY (SEE FIGURE 8-9)	1	
-33	86893100		. SUPPORT-READ HEAD	1	
-34	86998100		. INSULATOR-READ HEAD	1	
-35	59534801		. BOARD ASSEMBLY, TYPE 5348, READ HEAD	1	
-36	86899400		. PLATE, ADJUSTMENT	1	
			— attaching parts —		
-37	86900700		. PIN	2	
-38	10126222		. SCREW, CAP, SOCKET HEAD	3	
-39	10125605		. WASHER, PLAIN, 6	3	
-40	10125803		. WASHER, LOCK, SPRING, 6	3	
-41	10127103		. SCREW, MACHINE, PAN HEAD, 4-40 x 5/16	4	
-42	10125603		. WASHER, PLAIN, 4	4	
			-----*-----		

INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (Sheet 2 of 2)	QTY	MOD CODE
-43	86876301		. SOLENOID ASSEMBLY	1	
			— attaching parts —		
-44	10127143		. SCREW, MACHINE, PHILLIPS HEAD, 10-32 x 1/2	2	
-45	10125607		. WASHER, PLAIN, 10	2	
-46	10125805		. WASHER, LOCK, SPRING, 10	2	
			-----*-----		
-47	86872100		. SPACER-HOPPER	1	
			— attaching parts —		
-48	95804833		. SCREW, PAN HEAD, THREAD FORMING, PHILLIPS	2	
			-----*-----		
-49	86897601		. DRUM ASSEMBLY	1	
-50	94555540		. SHIM	A/R	
-51	86905901		. FEED PLATE ASSEMBLY	1	
-	86905800		. . PLATE-FEED	1	
-	86905700		. . CARRIER-FEED PLATE	1	
-	86906000		. . CONNECTOR	1	
-	86906100		. . SHAFT-PIVOT	1	
-	92226009		. . PIN, DOWEL	1	
-	92720124		. . SCREW, BUTTON, SOCKET HEAD	4	
-	10126000		. . SCREW, FLAT, SOCKET HEAD	1	
-	10126400		. . WASHER, LOCK, EXTERNAL TOOTH, 4	2	
-	70037921		. . CABLE, GROUND, BRAIDED	1	
-52	95878104		. SPRING, COMPRESSION	1	
-53	86908500		. SPACER, SOLENOID	1	
-54	92054121		. BEARING, BALL	2	
-55	86908600		. ROD, STOP	1	
-56	92074139		. O-RING	1	
-57	95876400		. BUSHING	2	
-58	86874300		. PLATE-FRONT	1	
			— attaching parts —		
-59	86894300		. STUD	2	
-60	10127124		. SCREW, MACHINE, PAN HEAD, 8-32 x 5/8	2	
-61	10125804		. WASHER, LOCK, SPRING, 8	2	
-62	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	1	
-63	10125803		. WASHER, LOCK, SPRING, 6	1	
-64	10126401		. WASHER, LOCK, EXTERNAL TOOTH, 6	1	
			-----*-----		
-65	77178901		. STACKER DRIVE ASSEMBLY (SEE FIGURE 8-2A)	1	
			— attaching parts —		
-66	10127124		. SCREW, MACHINE, PAN HEAD, 8-32 x 5/8	4	
-67	10125606		. WASHER, PLAIN, 8	4	
-68	94335002		. WASHER, RUBBER, NEOPRENE	4	
-69	10125713		. SCREW, MACHINE, FLAT HEAD, 6-32 x 5/16	1	
-70	10125105		. NUT, HEXAGON, 6-32	1	
-71	95927200		. BELT, DRIVE	1	
			-----*-----		
-72	86873701		. HOPPER, 1000 CARDS	1	
			— attaching parts —		
-73	10127111		. SCREW, PAN HEAD, 6-32 x 1/4	4	
			-----*-----		
-74	95900800		. CARD PLACEMENT LABEL	1	
-75	86876900		. PLATE-REAR	1	



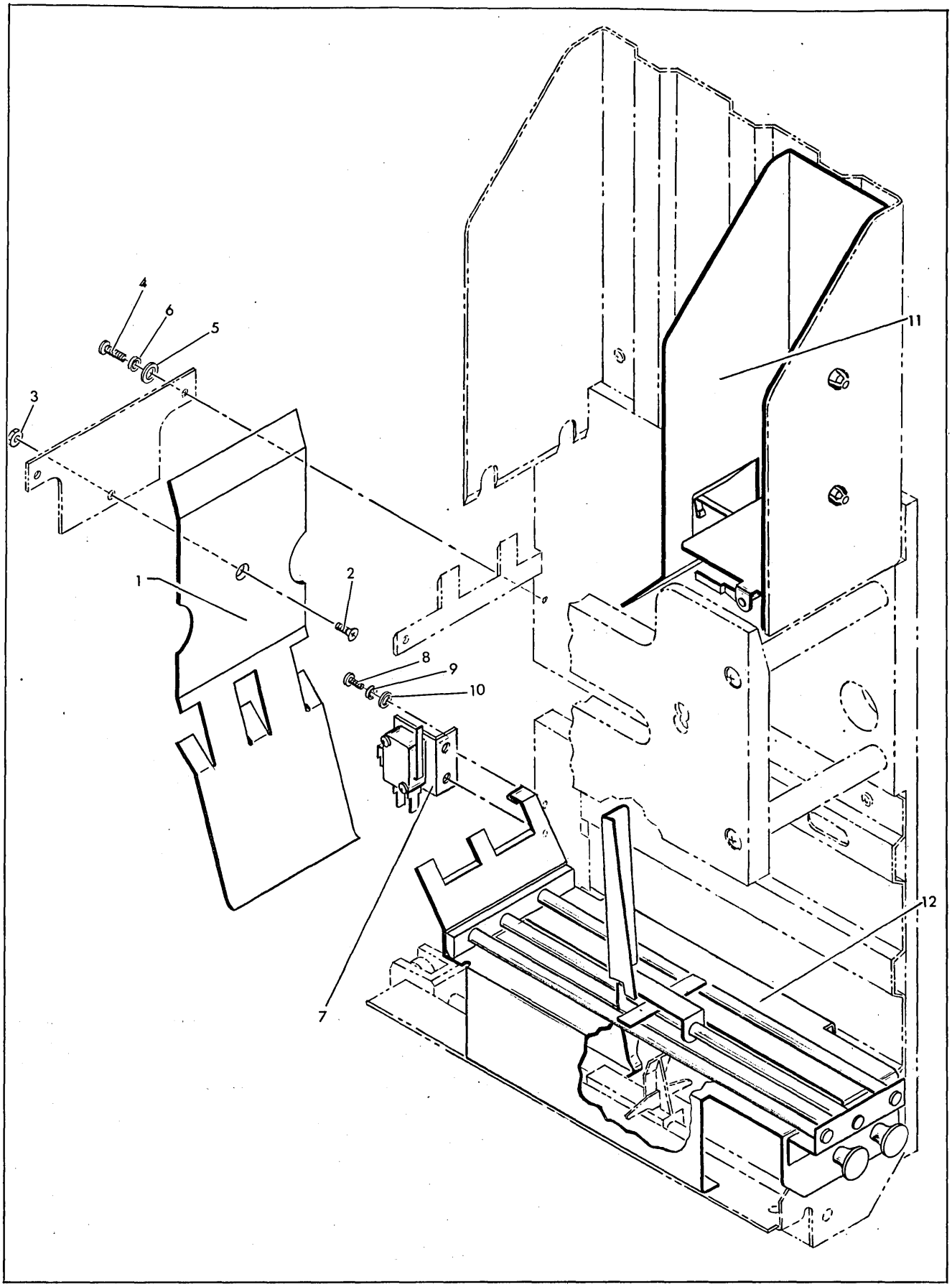
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
2A-	77178901		STACKER DRIVE ASSEMBLY		
- 1	86950401		. SPRING-STACKER, CW 7.5	1	
- 2	86893800		. DISC- CW STACKER	1	
- 3	77220900		. SHAFT-SPRING	2	
- 4	92054071		. BEARING, BALL	4	
- 5	77176900		. PULLEY, STACKER	2	
- 6	86950501		. SPRING-STACKER, CCW 7.5	1	
- 7	86893801		. DISC-CCW STACKER	1	
- 8	77179701		. FRONT BRACKET ASSEMBLY	1	
- 9	77179801		. REAR BRACKET ASSEMBLY	1	
			— attaching parts —		
-10	10127112		. SCREW, MACHINE, PAN HEAD, 6-32 x 5/16	4	
-11	10125803		. WASHER, LOCK, SPRING, C	4	
-12	93071286		. SCREW, SET, SOCKET, HEXAGON, 8-32 x 1/4	4	
-13	92720200		. SCREW, BUTTON, SOCKET HEAD, 6-32 x 3/8	2	
-14	10126401		. WASHER, LOCK, EXTERNAL TOOTH, 6	2	
-14A	92033029		. RING, RETAINING	2	
			-----*-----		
-15	77176600		. PULLEY, IDLER	2	
-16	77180100		. BRACKET, ADJUSTMENT	1	
-17	92054003		. BEARING, BALL	2	
			— attaching parts —		
-18	77177000		. SPACER, WASHER	2	
-19	93709024		. SCREW, SHOULDER, 8-32 x	2	
-20	10125607		. WASHER, PLAIN, 10	2	
-21	10125108		. NUT, HEXAGON, 10-32	2	
-23	10125803		. WASHER, LOCK, SPRING, 6	2	
-24	10127112		. SCREW, MACHINE, PAN HEAD, 6-32 x 5/16	2	
			-----*-----		
-25	77177301		. IDLER ASSEMBLY	1	
-	77176700		. . PULLEY -SMALL IDLER	1	
-	77176800		. . . BEARING, BALL	1	
-	77179600		. . BRACKET, ANGLE	1	
-	10127124		. . SCREW, MACHINE, PAN HEAD, 8-32 x 5/8	1	
-	10125804		. . . WASHER, LOCK, SPRING, 8	1	
-	10125106		. . NUT, HEXAGON, 8-32	1	
			— attaching parts —		
-26	10127112		. SCREW, MACHINE, PAN HEAD, 6-32 x 5/16	2	
-27	10125803		. WASHER, LOCK, SPRING, 8	2	
			-----*-----		
-28	77179501		. BRACKET ASSEMBLY	1	

STACKER DRIVE ASSEMBLY



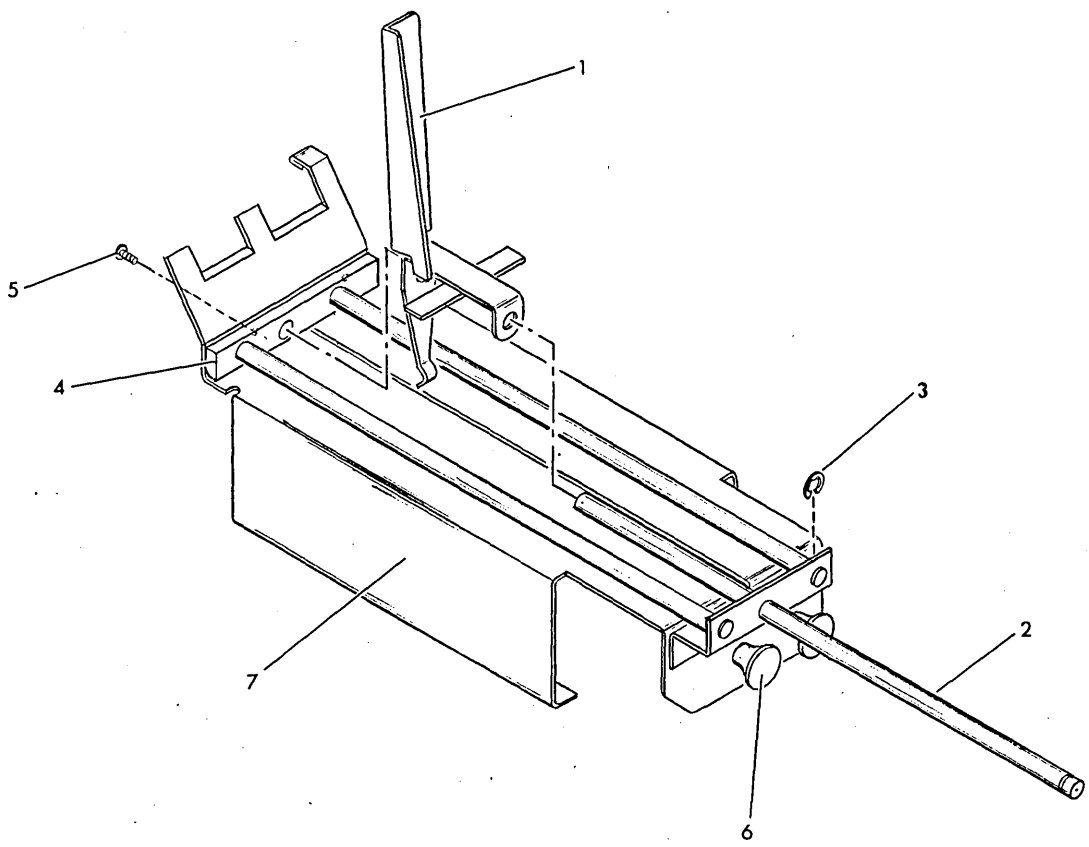
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
3-	86897801		STACKER ASSEMBLY, 1000 CARDS		
-1	95804841		. SCREW, THREAD FORMING, 6-19 x 13/16	1	
-2	86898001		. FOLLOWER SPRING ASSEMBLY	1	
-3	10127102		. SCREW, MACHINE, PAN HEAD, 4-40 x 1/4	1	
-4	10125603		. WASHER, PLAIN, 4	1	
-5	86899000		. FOLLOWER	1	
-6	86872001		. ROD-FOLLOWER, 1000 CARDS	1	
-7	86897901		. STACKER PLATE ASSEMBLY	1	

STACKER ASSEMBLY



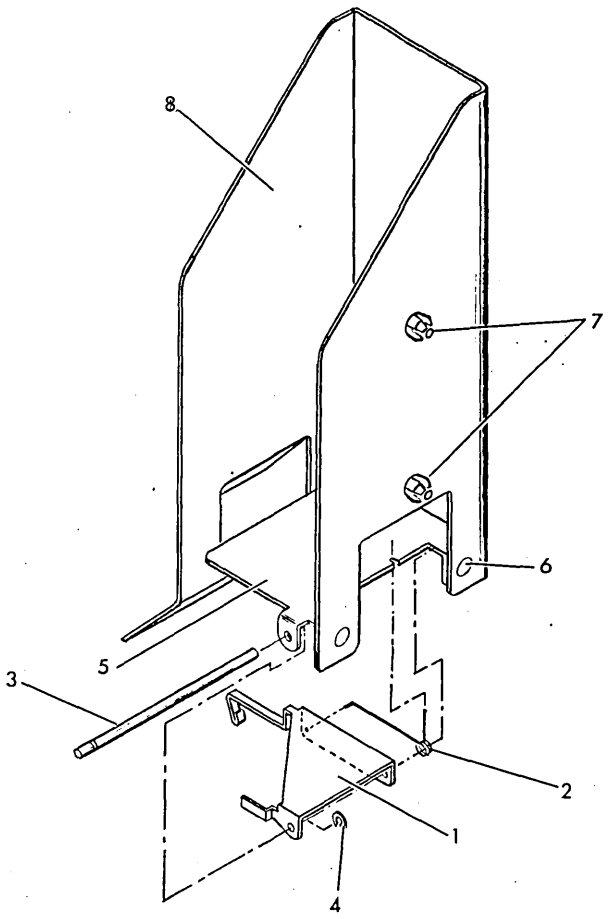
STANDARD OPTION - 51 COLUMN CARD KIT

INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
4-	77126600		STANDARD OPTION - 51 COLUMN CARD KIT		
-1	86931700		. CARD CHUTE	1	
			— attaching parts —		
-2*	10125713		. SCREW, FLAT, HEAD, 6-32 x 5/16	1	
-3*	10125105		. NUT, HEXAGON, 6-32	1	
-4*	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	2	
-5*	10125605		. WASHER, FLAT, 6	2	
-6*	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-7	77126201		. SWITCH ASSEMBLY	1	
-	86947000		. . BRACKET, SWITCH	1	
-	93786003		. . SWITCH, MINI ACTUATOR	1	
-	10127106		. . SCREW, MACHINE, PAN HEAD, 4-40 x 5/8	2	
-	10125103		. . NUT, HEXAGON, 4-40	2	
-	10125603		. . WASHER, FLAT, 4	2	
-	10125801		. . WASHER, LOCK, SPRING, 4	2	
			— attaching parts —		
-8	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	2	
-9	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-11	86945601		. HOPPER FILLER ASSEMBLY (SEE FIGURE 8-6)	1	
-12	86944701		. STACKER FILLER ASSEMBLY - 51 COLUMN (SEE FIGURE 8-5)	1	
			-----*-----		
-	86946602		. CARD WEIGHT ASSEMBLY - 51 COLUMN	1	
-	86705700		. EQUIPMENT IDENTIFICATION PLATE	1	
-	77126401		. HARNESS ASSEMBLY	1	
-	93747060		. . RECEPTACLE, SLIDE ON	4	
			*EXISTING PARTS		



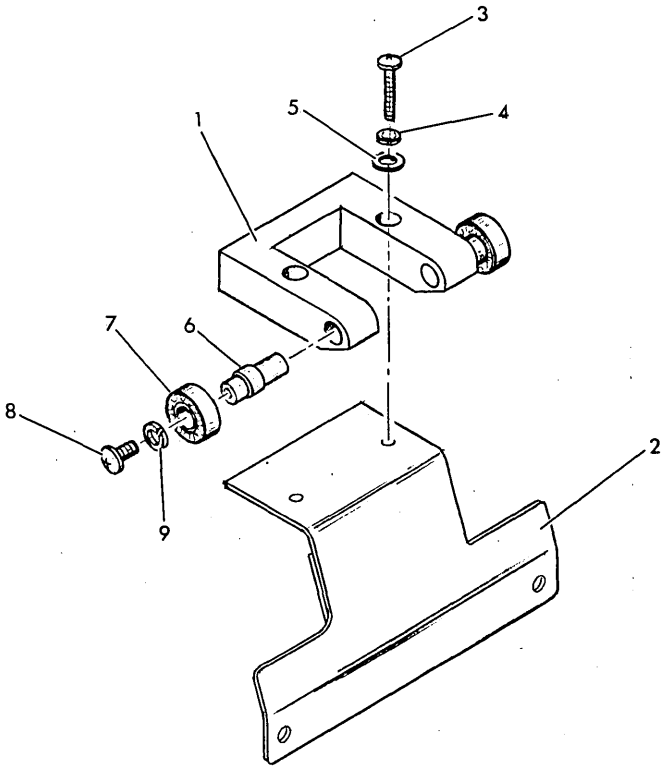
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
5-	86944701		STACKER FILLER ASSEMBLY		
-1	86944800		. FOLLOWER, 51 COLUMN CARD	1	
-2	86944600		. SHAFT	3	
			— attaching parts —		
-3	00843513		. RING, RETAINING	3	
			-----*-----		
-4	86940700		. STOP, CARD	1	
			— attaching parts —		
-5	95804817		. SCREW, THREAD FORMING, 4-20 x 1/4	2	
			-----*-----		
-6	93783103		. FASTENER, PUSH - PULL BLACK	2	
-7	86944901		. STACKER	1	

STACKER FILLER ASSEMBLY - 51 COLUMN



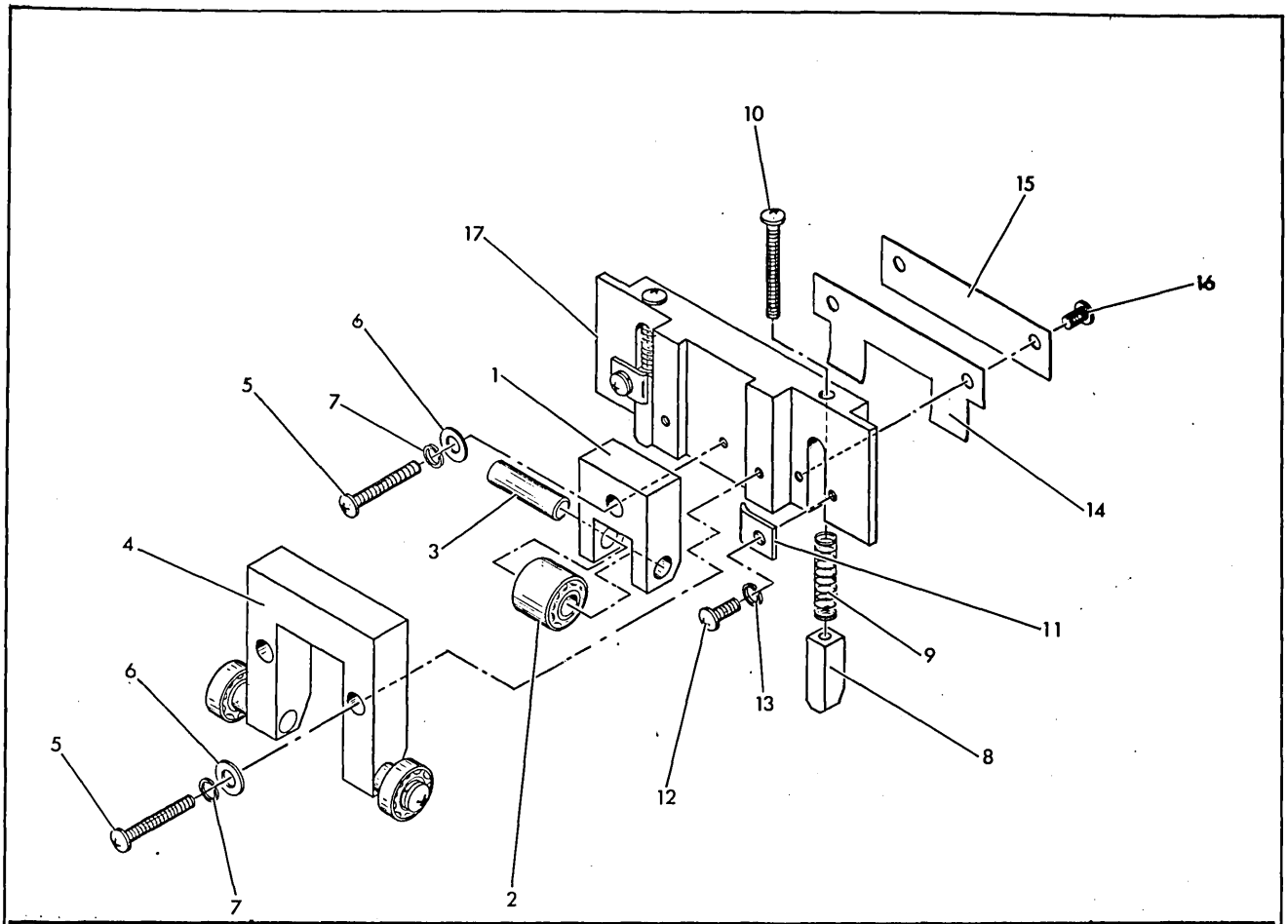
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
6-	86945601		HOPPER FILLER ASSEMBLY - 51 COLUMN		
-1	86945400		. LINK - SWITCH	1	
-2	86945200		. SPRING - TORSION	1	
			— attaching parts —		
-3	86945100		. PIN - PIVOT	1	
-4	00843506		. NUT, U TYPE	1	
			-----*-----		
-5	86945300		. SUPPORT - LINK	1	
			— attaching parts —		
-6	95869954		. RIVET, BOLD, ALUM, FLAT HEAD, 1/8 x 3/16	2	
			-----*-----		
-7	93783103		. FASTENER, PUSH - PULL BLACK	2	
-8	86945500		. FILLER - HOPPER	1	

HOPPER FILLER ASSEMBLY - 51 COLUMN



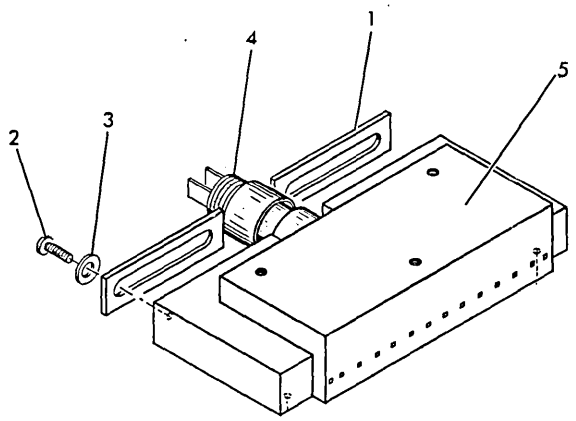
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
7-	77145001		FOLLOWER ROLLER ASSEMBLY		
-1	77144500		. BLOCK	1	
-2	77144600		. SUPPORT	1	
			— attaching parts —		
-3	10127117		. SCREW, MACHINE, PAN HEAD, 6-32 x 7/8	2	
-4	10125803		. WASHER, LOCK, SPRING, 6	2	
-5	10125605		. WASHER, PLAIN, 6	2	
			-----*-----		
-6	86912100		. STUD-DUAL ROLLER SUPPORT	2	
-7	92054249		. BEARING BALL	2	
			— attaching parts —		
-8	10127121		. SCREW, MACHINE, PAN HEAD, 8-32 x 5/16	2	
-9	10125804		. WASHER, LOCK, SPRING, 8	2	

FOLLOWER ROLLER ASSEMBLY



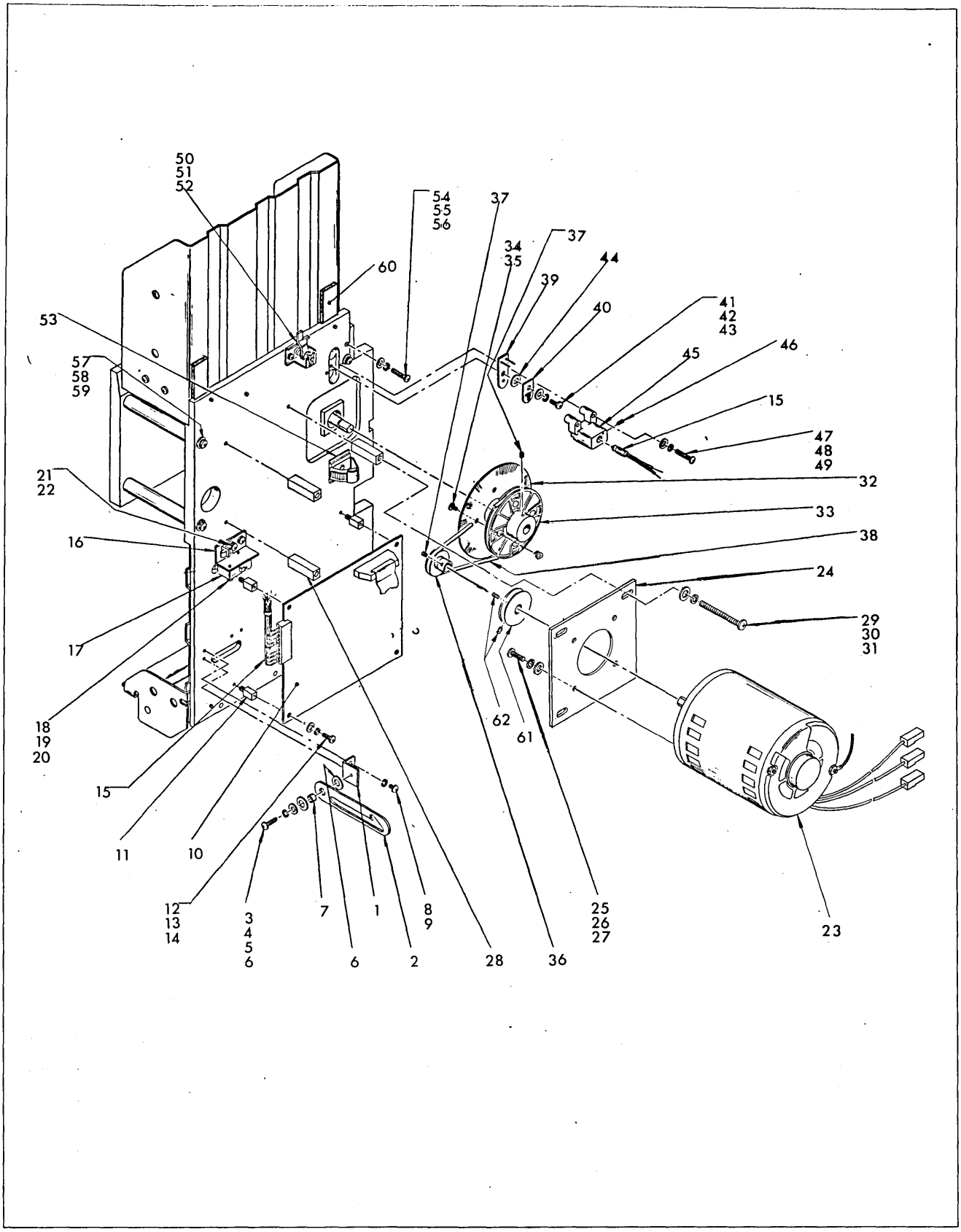
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
8-	86907101		PRESSURE ROLLER ASSEMBLY		
-1	86906600		. SUPPORT-CENTER ROLLER	1	
-2	95877200		. BEARING-TUMBLED	1	
-3	86906400		. PIN-ROLLER	1	
-4	86907001		. PIN & SUPPORT ASSEMBLY	1	
-	86906200		. . SUPPORT-DUAL ROLLER	1	
-	86912100		. . STUD-DUAL	2	
-	92054249		. . BEARING, BALL	2	
-	10127121		. . SCREW, MACHINE, PAN HEAD, 8-32 x 5/16	2	
-	10125804		. . WASHER, LOCK, SPRING, 8	2	
			— attaching parts —		
-5	10127118		. SCREW, MACHINE, PAN HEAD, 6-32 x 1	3	
-6	10125605		. WASHER, PLAIN, 6	3	
-7	10125803		. WASHER, LOCK, SPRING, 6	3	
			-----*-----		
-8	86906500		. SELECTOR-CARD	2	
-9	95878101		. SPRING, COMPRESSION	2	
			— attaching parts —		
-10	10127119		. SCREW, MACHINE, PAN HEAD, 6-32 x 1-1/4	2	
-11	86906700		. CLAMP	2	
-12	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	2	
-13	10125803		. WASHER, LOCK, SPRING. 6	2	
			-----*-----		
-14	86906900		. BAND-SELECT	1	
-15	86906800		. BACKING-SELECT	1	
			— attaching parts —		
-16	10127111		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/4	2	
			-----*-----		
-17	86906300		. BLOCK	1	

PRESSURE ROLLER ASSEMBLY



INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
9-	86893501		READ HEAD ASSEMBLY		
-1	86892700		. SPACER	2	
			— attaching parts —		
-2	10127103		. SCREW, MACHINE, PAN HEAD, 4-40 x 5/16	4	
-3	93564004		. WASHER, NYLON	4	
			-----*-----		
-4	94687500		. LAMP	1	
-5	86888700		. HOUSING	1	

READ HEAD ASSEMBLY

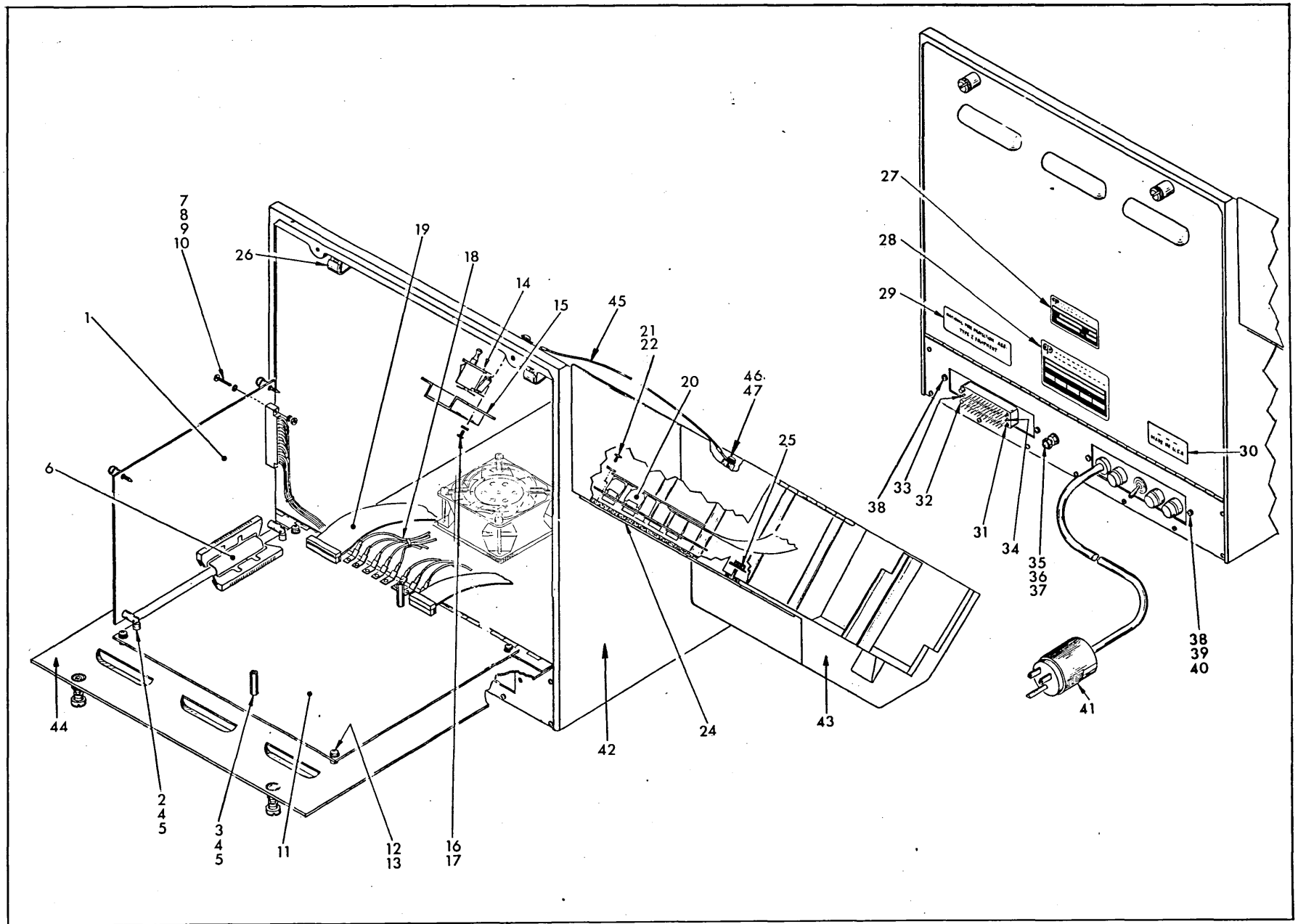


MECHANICAL DECK ASSEMBLY
(REAR VIEW)

FIGURE 8-10

INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (Sheet 1 of 2)	QTY	MOD CODE
10-	77200702		MECHANICAL DECK ASSEMBLY, 3/600 OHR		A
10-	77200703		MECHANICAL DECK ASSEMBLY, 3/600 OHR		B
10-	77200706		MECHANICAL DECK ASSEMBLY, 3/800 OHR		A
10-	77200707		MECHANICAL DECK ASSEMBLY, 3/800 OHR		B
10-	77200710		MECHANICAL DECK ASSEMBLY, 3/600 OH/MR		A
10-	77200711		MECHANICAL DECK ASSEMBLY, 3/600 OH/MR		B
-1	86871700		. BRACKET, LATCH	1	
-2	86872200		. LATCH	1	
			— attaching parts —		
-3	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	1	
-4	10125803		. WASHER, LOCK, SPRING, 6	1	
-5	10125605		. WASHER, PLAIN, 6	1	
-6	93564019		. WASHER, NYLON	2	
-7	93109309		. STANDOFF, SPACER ROUND	1	
-8	10127111		. SCREW, PAN HEAD, 6-32 x 1/4	2	
-9	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-10	59535201		. BOARD ASSEMBLY, TYPE 5352, AMP PUNCH (SEE FIG. 8-15)	1	
-10	59535401		. BOARD ASSEMBLY, TYPE 5354, AMP PUNCH MK (SEE FIG. 8-16)	1	
			— attaching parts —		
-11	95888401		. STANDOFF, HEXAGON	4	
-12	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	4	
-13	10125605		. WASHER, PLAIN, 6	4	
-14	10125803		. WASHER, LOCK, SPRING, 6	4	
			-----*-----		
-15	86877701		. HARNESS ASSEMBLY, LAMPS/SWITCH	1	
-	94659003		. . RECEPTACLE, SLIDE-ON	2	
-	93747060		. . RECEPTACLE, SLIDE-ON	4	
-	95804701		. . HOUSING INSULATION	4	
-	93943001		. . CONTACT, SOCKET	2	
-	95878900		. . LAMP-SUBMININIATURE, LENS END	1	
-	95876801		. . EDGE CONNECTOR P.C. BOARD	10	
			-----*-----		
-16	86872600		. BRACKET, SWITCH, STACKER	1	
-17	95877501		. SWITCH, STACKER	1	
			— attaching parts —		
-18	10127106		. SCREW, MACHINE, PAN HEAD, 4-40 x 5/8	2	
-19	10125603		. WASHER, PLAIN, 4	2	
-20	10125801		. WASHER, LOCK, SPRING, 4	2	
-21	10127111		. SCREW, PAN HEAD, 6-32 x 1/4	2	
-22	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-23	86973601		. MOTOR ASSEMBLY	1	
-	95910000		. . MOTOR DRIVE, 60/50 HZ, 115V	1	
-	95804701		. . HOUSING INSULATION	3	
-	93747017		. . RECEPTACLE-SLIDE ON, 20-16	3	
-24	86894100		. PLATE-MOTOR MOUNTING	1	
			— attaching parts —		
-25	10127124		. SCREW, MACHINE, PAN HEAD, 8-32 x 5/8	4	
-26	10125804		. WASHER, LOCK, SPRING, 8	4	
-27	10125606		. WASHER, PLAIN, 8	4	
-28	93110378		. STANDOFF, SPACER	3	
-29	10127151		. SCREW, MACHINE, PAN HEAD, 10-32 x 2	3	
-30	10125607		. WASHER, PLAIN, 10	3	
-31	10125805		. WASHER, LOCK, SPRING, 10	3	
			-----*-----		
-32	86875500		. DISC, TIMING	1	
-33	86874802		. PUL-T 600 CPM	1	A
-33	86874801		. PUL-T 600 CPM	1	B
-33	86874703		. PUL-T 6 & 800 CPM	1	A
-33	86874702		. PUL-T 6 & 800 CPM	1	B
-34	10127112		. SCREW, MACHINE, PAN HEAD, 6-32 x 5/16	4	
-34	10127114		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/2	4	
-35	10125105		. NUT, HEXAGON, 6-32	4	
-36	86874201		. PUL-DM 600 CPM	1	A
-36	86874202		. PUL-DM 600 CPM	1	B
-36	86874401		. PUL-DM 6 & 800 CPM	1	A
-36	86874402		. PUL-DM 6 & 800 CPM	1	B
-37	93071286		. SCREW, SET, SOCKET, HEXAGON, 8-32 x 1/4	2	
-38	95848809		. BELT-POLYFLEX	1	
			-----*-----		

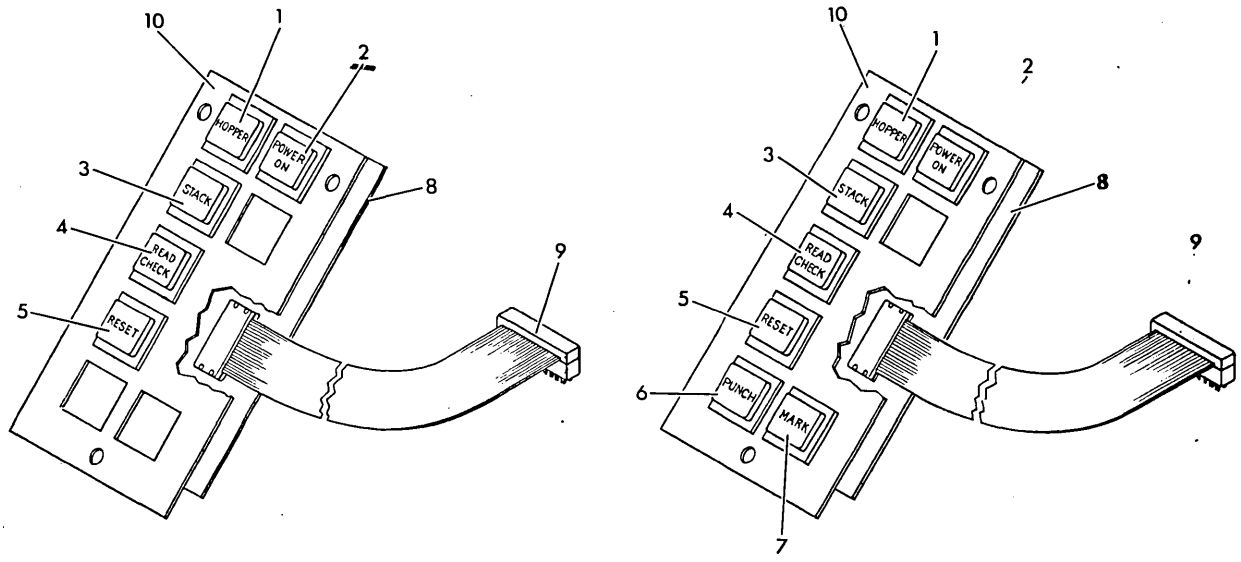
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (SHEET 2 of 2)	QTY	MOD CODE
-39	59534901		. BOARD ASSEMBLY-TYPE 5349	1	
-40	86875700		. SEGMENT, TIMING	1	
			— attaching parts —		
-41	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	1	
-42	10125803		. WASHER, LOCK, SPRING, 6	1	
-43	10125605		. WASHER, PLAIN, 6	1	
-44	93564039		. WASHER	1	
			-----*-----		
-45	86872400		. LIGHT HOLDER	1	
			— attaching parts —		
-46	93071286		. SCREW, SET, SOCKET, 8-32 x 1/4	1	
-47	10127117		. SCREW, MACHINE, PAN HEAD, 6-32 x 7/8	2	
-48	10125605		. WASHER, PLAIN, 6	2	
-49	10125803		. WASHER, LOCK, SPRING, 6	2	
			-----*-----		
-50	51824600		. FASTENER-PAWL-MIDGET	1	
			— attaching parts —		
-51	10127103		. SCREW, MACHINE, PAN HEAD, 4-40 x 5/16	2	
-52	10125801		. WASHER, LOCK, SPRING, 4	2	
			-----*-----		
-53	95892300		. CLAMP, CABLE	3	
-54	10127116		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/4	2	
-55	10125605		. WASHER, PLAIN, 6	2	
-56	10125803		. WASHER, LOCK, SPRING, 6	2	
-57	10127124		. SCREW, MACHINE, PAN HEAD, 8-32 x 5/8	2	
-58	10125804		. WASHER, LOCK, SPRING, 8	2	
-59	10125606		. WASHER, PLAIN, 8	2	
-60	49523900		. PAD	2	
			-----*-----		
-61	77176500		. PULLEY	1	
			— attaching parts —		
-62	93071286		. SCREW, SET, HEXAGON, SOCKET, 8-32 x 1/4	2	



CARD READER ASSEMBLY
(REAR VIEW)
FIGURE 8-11

INDEX NO.	PART NUMBER	PART CODE	(Serial Number 151 & above) DESCRIPTION 1 2 3 4 5 6 (Sheet 1 of 2)	QTY	MOD CODE
11-	86883002		CARD READER ASSEMBLY, 3/600 OHR (REAR VIEW)		A
11-	86883003		CARD READER ASSEMBLY, 3/600 OHR		B
11-	86883004		CARD READER ASSEMBLY, 3/600 OHR		A
11-	86883005		CARD READER ASSEMBLY, 3/600 OHR		B
11-	86883006		CARD READER ASSEMBLY, 3/600 OHR		A
11-	86883007		CARD READER ASSEMBLY, 3/600 OHR		B
11-	86883010		CARD READER ASSEMBLY, 3/800 OHR		A
11-	86883011		CARD READER ASSEMBLY, 3/800 OHR		B
11-	86883012		CARD READER ASSEMBLY, 3/800 OHR		A
11-	86883013		CARD READER ASSEMBLY, 3/800 OHR		B
11-	86883016		CARD READER ASSEMBLY, 3/600 OH/MR		A
11-	86883017		CARD READER ASSEMBLY, 3/600 OH/MR		B
11-	86883018		CARD READER ASSEMBLY, 3/600 OH/MR		A
11-	86883019		CARD READER ASSEMBLY, 3/600 OH/MR		B
11-	86883020		CARD READER ASSEMBLY, 3/600 OH/MR		A
11-	86883021		CARD READER ASSEMBLY, 3/600 OH/MR		B
-1	59540002		DATA BOARD ASSEMBLY, TYPE 5400 (VARIABLE POLARITY)	1	
-1	59535501		DATA BOARD ASSEMBLY, TYPE 5355 (FIXED POLARITY)	1	
			— attaching parts —		
-2	95880301		. STANDOFF, HINGED	2	
-3	93114218		. STANDOFF, TAPPED POST, HEXAGON	2	
-4	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	4	
-5	10125803		. WASHER, LOCK, SPRING, 6	4	
			-----*-----		
-6	86879004		. CABLE ASSEMBLY, FLAT	1	
-7	10127315		. SCREW, MACHINE, PAN HEAD	2	
-8	10125102		. NUT, HEXAGON	2	
-9	10125800		. WASHER, LOCK, SPRING, 2	2	
-10	10125602		. WASHER, PLAIN, 2	2	
			-----*-----		
-11	59535105		. CONTROL BOARD ASSEMBLY, TYPE 5351 (SEE FIGURE 8-14)	1	
			— attaching parts —		
-12	10127111		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/4	4	
-13	10125803		. WASHER, LOCK, SPRING, 6	4	
			-----*-----		
-14	62048203		. SWITCH - INTERLOCK	1	
-15	86923400		. BRACKET - INTERLOCK SWITCH	1	
			— attaching parts —		
-16	10127111		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/4	4	
-17	10125803		. WASHER, LOCK, SPRING, 6	4	
			-----*-----		
-18	86882401		. HARNESS ASSEMBLY (CONTROL BOARD ASSEMBLY)	1	
-	95867014		. . TERMINAL RING, 16-14	2	
-	93747017		. . RECEPTACLE - SLIDE ON, 20-16	2	
-	93747060		. . RECEPTACLE - SLIDE ON	14	
-	95804701		. . HOUSING INSULATION	16	
			-----*-----		
-19	86879003		. CABLE ASSEMBLY, AMPLIFIER CONTROL BOARD	1	
-	95880002		. . CONNECTOR - FLAT	1	
			-----*-----		
-20	86878501		. SWITCH PANEL ASSEMBLY, 5 POSITION (SEE FIGURE 8-12)	1	
-20	86878502		. SWITCH PANEL ASSEMBLY, 7 POSITION	1	
			— attaching parts —		
-21	10127111		. SCREW, MACHINE, PAN HEAD, 6-32 x 1/4	3	
-22	10126401		. WASHER, LOCK, EXTERNAL, 6	3	
-23	N/A				
			-----*-----		
-24	86911006		. TRIM PANEL, 5 POSITION - BLACK	1	
-24	86911008		. TRIM PANEL, 5 POSITION - IMPERIAL BLUE	1	
-24	86914506		. TRIM PANEL, 7 POSITION - BLACK	1	
-24	86914508		. TRIM PANEL, 7 POSITION - IMPERIAL BLUE	1	
			— attaching parts —		
-25	95936600		. NUT-SELF THREAD, WASHER	2	
			-----*-----		
-26	95892300		. CLAMP, CABLE	2	
-27	86705700		. EQUIPMENT IDENTIFICATION PLATE	1	
-28	86705900		. CABINET IDENTIFICATION PLATE	1	
-29	24547401		. PLATE, INFORMATION, NFPA TYPE 2	1	
-30	86895901		. LABEL - COUNTRY OF ORIGIN	1	
			-----*-----		

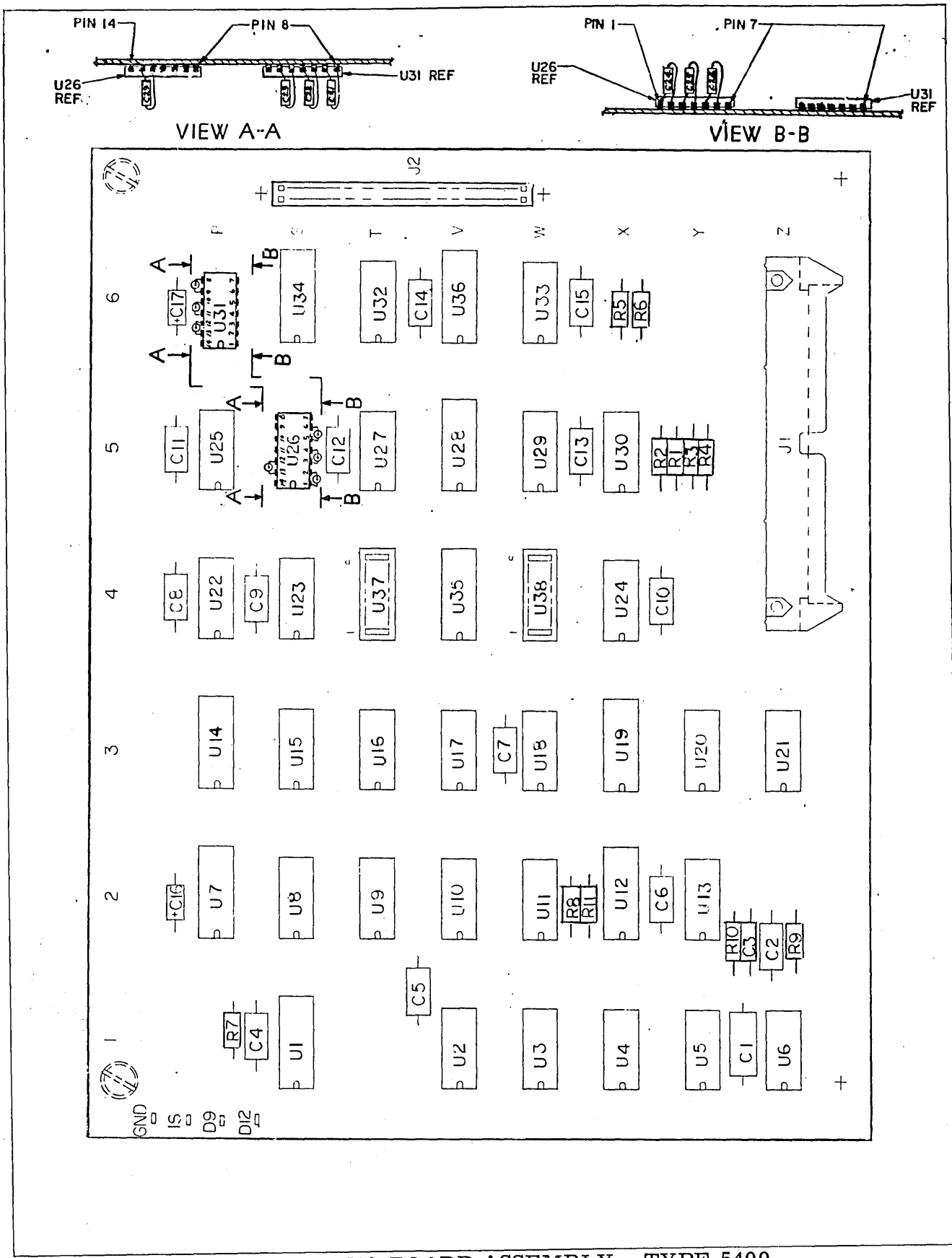
INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6 (Sheet 2 of 2)	QTY	MOD CODE
-31	94656900		. CORNER GUIDE PIN	2	
-32	94657000		. CORNER GUIDE SOCKET	2	
-33	94655800		. JACKSCREW - FIXED, MALE	1	
-34	94655900		. JACKSCREW - FIXED, FEMALE	1	
-35	10125606		. WASHER, PLAIN, 8	1	
-36	10125106		. NUT, HEXAGON, 8-32	1	
-37	92650002		. NUT, ACORN, 8-32	1	
-38	10127113		. SCREW, MACHINE, PAN HEAD, 6-32 x 3/8	4	
-39	10125803		. WASHER, LOCK, SPRING, 6	2	
-40	10125605		. WASHER, PLAIN, 6	2	
			-----*-----		
-41	24531601		. PLUG	1	A
-41	95899800		. PLUG, 250 VAC, STRAIGHT BLADE	1	B
			-----*-----		
-	86924601		. CABINET ASSEMBLY	1	
-42	86922105		. . CABINET (HARVEST GOLD)	1	
-42	86922107		. . CABINET (LIGHT GRAY)	1	
-43	86909305		. . COVER, SIDE (HARVEST GOLD)	1	
-43	86909307		. . COVER, SIDE (LIGHT GRAY)	1	
-44	86923905		. . REAR DOOR (HARVEST GOLD)	1	
-44	86923907		. . REAR DOOR (LIGHT GRAY)	1	
-45	94206908		. . CABLE, NYLON	1	
-46	10127142		. . SCREW, MACHINE, PAN HEAD, 10-32 x 3/8	2	
-47	10125607		. . WASHER, PLAIN, 10	2	



01 02

INDEX NO.	PART NUMBER	PART CODE	DESCRIPTION 1 2 3 4 5 6	QTY	MOD CODE
12-	86878501		SWITCH PANEL ASSEMBLY - 5 POSITION		
12-	86878502		SWITCH PANEL ASSEMBLY - 7 POSITION		
-1	95879001		. INDICATOR, ELECT, ILLUMINATED - "HOPPER"	1	
-2	95879003		. INDICATOR, ELECT, ILLUMINATED - "POWER ON"	1	
-3	95879002		. INDICATOR, ELECT, ILLUMINATED - "STACK"	1	
-4	95879102		. SWITCH, ILLUMINATED, PUSHBUTTON - "READ CHECK"	1	
-5	95879101		. SWITCH, ILLUMINATED, PUSHBUTTON - "RESET"	1	
-6*	95879104		. SWITCH, ILLUMINATED, PUSHBUTTON - "PUNCH"	1	
-7*	95879103		. SWITCH, ILLUMINATED, PUSHBUTTON - "MARK"	1	
-8	59535301		. BOARD ASSEMBLY, TYPE 5353 (SEE FIGURE 8-17)	1	
-9	86879001		. CABLE ASSEMBLY	1	
-10	86878200		. PLATE, SWITCH	1	
-	24512301		. LAMP	5/7	
			*TAB 02 ONLY		

SWITCH PANEL ASSEMBLY



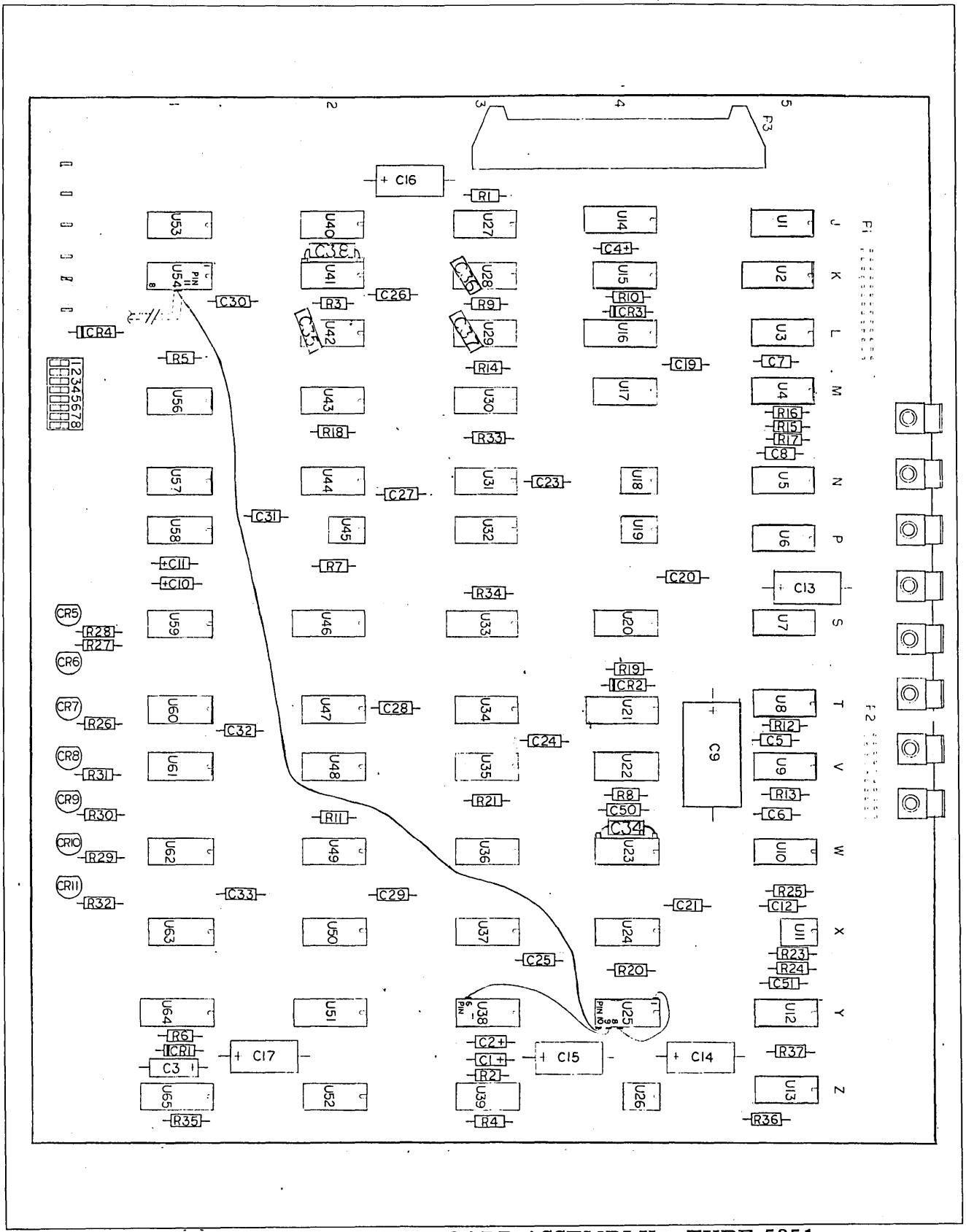
59540002 - DATA BOARD ASSEMBLY - TYPE 5400
SHEET 1 OF 2

FIGURE 8-13

INDEX NO.	PART NUMBER	DESCRIPTION
		INTEGRATED CIRCUITS
U1	95945500	INT CKT, 74S113N
U2	36187200	INT CKT, 7410
U3	94916119	INT CKT, TYPE 7408
U4	94916111	INT CKT, 74107
U5	94916111	INT CKT, 74107
U6	95880700	INT CKT, 7414
U7	95871000	INT CKT, SN 74174
U8	95883800	INT CKT, 74L73
U9	95883800	INT CKT, 74L73
U10	95883800	INT CKT, 74L73
U11	94916111	INT CKT, 74107
U12	94916120	INT CKT, 74193/9366
U13	94918809	INT CKT, 7400/9002
U14	95871000	INT CKT, SN 74174
U15	95883800	INT CKT, 74L73
U16	95883800	INT CKT, 74L73
U17	95883800	INT CKT, 74L73
U18	94918811	INT CKT, SN 7404/9016
U19	94916124	INT CKT, TYPE 7442/9352
U20	94918809	INT CKT, 7400/9002
U21	94918811	INT CKT, SN 7404/9016
U22	94916125	INT CKT, SN 7486
U23	94916125	INT CKT, SN 7486
U24	94916125	INT CKT, SN 7486
U25	94916125	INT CKT, SN 7486
U26	17183801	INT CKT, TYPE 7416-N
U27	94916125	INT CKT, SN 7486
U28	94916125	INT CKT, SN 7486
U29	94916125	INT CKT, SN 7486
U30	95880700	INT CKT, 7414
U31	17183801	INT CKT, TYPE 7416-N
U32	17183801	INT CKT, TYPE 7416-N
U33	17183801	INT CKT, TYPE 7416-N
U34	95903808	INT CKT, RES, MOD, 1.0K, 16 PINS
U35	95903808	INT CKT, RES, MOD, 1.0K, 16 PINS
U36	95903808	INT CKT, RES, MOD, 1.0K, 16 PINS
U37	95883501	INT CKT, SW, DUAL-IN-LINE PKG
U38	95883501	INT CKT, SW, DUAL-IN-LINE PKG
		RESISTORS
R1	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R2	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R3	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R4	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R5	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R6	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R7	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R8	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R9	24500050	RES, FXD, COMP, 300.0 OHMS, 5%, 1/4W
R10	24500050	RES, FXD, COMP, 300.0 OHMS, 5%, 1/4W
R11	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W

INDEX NO.	PART NUMBER	DESCRIPTION
		CAPACITORS
C1	36137104	CAP, VARI, .0022 UF, 100 WVDC
C2	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C3	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C4	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C5	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C6	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C7	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C8	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C9	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C10	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C11	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C12	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C13	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C14	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C15	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C16	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C17	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C21	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C22	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C23	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C24	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C25	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C26	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC
C29	94690303	CAP, FXD, CER, 0.001 UF, 100 WVDC

59540002 - DATA BOARD ASSEMBLY - TYPE 5400
SHEET 2 OF 2



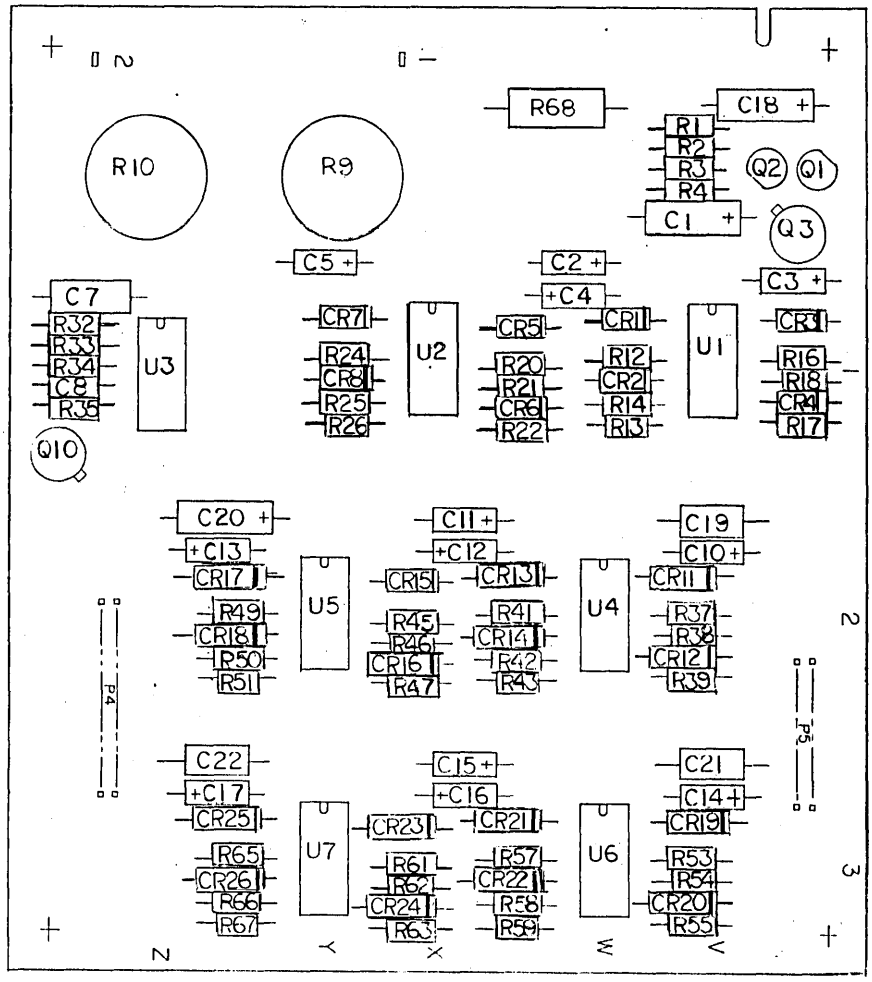
59535105 - CONTROL BOARD ASSEMBLY - TYPE 5351
SHEET 1 OF 2

FIGURE 8-14

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		INTEGRATED CIRCUITS
U1	95880700	INT CKT, 7414
U2	94916120	INT CKT, 74193
U3	95880700	INT CKT, 7414
U4	50255000	INT CKT, 74S113
U5	51801200	INT CKT, TYPE 7408
U6	15107000	INT CKT, 7437
U7	94916109	INT CKT, SN7474N
U8	94913100	INT CKT, TYPE 7451
U9	36186800	INT CKT, 7400
U10	94916109	INT CKT, SN7474N
U11	94931200	INT CKT, 75451
U12	36186800	INT CKT, 7400
U13	94916109	INT CKT, SN7474N
U14	94916120	INT CKT, 74193
U15	95880700	INT CKT, 7414
U16	94916120	INT CKT, 74193
U17	36187000	MICRO CKT, SN7402
U18	94931200	INT CKT, 75451
U19	94931200	INT CKT, 75451
U20	36186800	INT CKT, 7400
U21	95876100	INT CKT, 74123
U22	36187500	INT CKT, TYPE 7440
U23	36187100	INT CKT, SN7404
U24	94916109	INT CKT, SN7474N
U25	51801200	INT CKT, TYPE 7408
U26	94931200	INT CKT, 75451
U27	94916109	INT CKT, SN7474N
U28	51801200	INT CKT, TYPE 7408
U29	36186800	INT CKT, 7400
U30	94918812	INT CKT, SN7405N
U31	51801200	INT CKT, TYPE 7408
U32	36187500	INT CKT, TYPE 7440
U33	94916120	INT CKT, 74193
U34	36187000	MICRO CKT, SN7402
U35	94913100	INT CKT, TYPE 7451
U36	94913100	INT CKT, TYPE 7451
U37	94913100	INT CKT, TYPE 7451
U38	36187100	INT CKT, SN7404
U39	36187500	INT CKT, TYPE 7440
U40	94916109	INT CKT, SN7474N
U41	15105000	INT CKT, SN74107
U42	36187100	INT CKT, SN7404
U43	94916109	INT CKT, SN7474N
U44	94916109	INT CKT, SN7474N
U45	94931200	INT CKT, 75451
U46	36187600	INT CKT, TYPE 7442
U47	15106800	INT CKT, 7427N
U48	15106800	INT CKT, 7427N
U49	36187000	MICRO CKT, SN7402
U50	36187000	MICRO CKT, SN7402
U51	36187600	INT CKT, TYPE 7442
U52	36187200	INT CKT, 7410
U53	36186800	INT CKT, 7400
U54	94916109	INT CKT, SN7474N
U56	36187000	MICRO CKT, SN7402
U57	94916109	INT CKT, SN7474N
U58	94650600	INT CKT, 936
U59	36187100	INT CKT, SN7404
U60	36186800	INT CKT, 7400
U61	94918812	INT CKT, SN7405N
U62	94918812	INT CKT, SN7405N
U63	36186800	INT CKT, 7400
U64	94916120	INT CKT, 74193
U65	95876100	INT CKT, 74123
		DIODES
CR1	51001239	DIODE, SILICON, SWITCH, IN3064
CR2	51001239	DIODE, SILICON, SWITCH, IN3064
CR3	51001239	DIODE, SILICON, SWITCH, IN3064
CR4	11801200	DIODE, SPEC, GERMANIUM
CR5	95883200	DIODE, LIGHT EMITTING
CR6	95883200	DIODE, LIGHT EMITTING
CR7	95883200	DIODE, LIGHT EMITTING
CR8	95883200	DIODE, LIGHT EMITTING
CR9	95883200	DIODE, LIGHT EMITTING
CR10	95883200	DIODE, LIGHT EMITTING
CR11	95883200	DIODE, LIGHT EMITTING

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		RESISTORS
R1	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R2	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R3	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R4	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R5	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R6	24500087	RES, FXD, COMP, 10.0K OHMS, 5%, 1/4W
R7	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R8	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R9	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R10	24500087	RES, FXD, COMP, 10.0K OHMS, 5%, 1/4W
R11	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R12	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R13	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R14	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R15	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R16	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R17	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R18	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R19	92512167	RES, 47K OHMS, 1/4W
R20	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R21	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R23	24500055	RES, FXD, COMP, 470.0 OHMS, 5%, 1/4W
R24	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R25	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R26	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R27	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R28	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R29	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R30	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R31	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R32	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R33	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R34	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R35	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R36	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R37	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
		CAPACITORS
C1	24504313	CAP, SOLID, 0.047UF, 35WVDC
C2	24504313	CAP, SOLID, 0.047UF, 35WVDC
C3	24504310	CAP, SOLID, 4.7UF, 6WVDC
C4	24505269	CAP, SOLID, 47UF, 6WVDC
C5	24561316	CAP, FXD, CER, .047UF, 25WVDC
C6	24561316	CAP, FXD, CER, .047UF, 25WVDC
C7	24561316	CAP, FXD, CER, .047UF, 25WVDC
C8	24561316	CAP, FXD, CER, .047UF, 25WVDC
C9	95875500	CAP, ALUMINUM, 1000UF, 10WVDC
C10	24505225	CAP, SOLID, 0.47UF, 35WVDC
C11	24505225	CAP, SOLID, 0.47UF, 35WVDC
C12	24561316	CAP, FXD, CER, .047UF, 25WVDC
C13	94685384	CAP, ELECTL, 220UF
C14	94685384	CAP, ELECTL, 220UF
C15	94685384	CAP, ELECTL, 220UF
C16	94685384	CAP, ELECTL, 220UF
C17	94685384	CAP, ELECTL, 220UF
C19	24561316	CAP, FXD, CER, .047UF, 25WVDC
C20	24561316	CAP, FXD, CER, .047UF, 25WVDC
C21	24561316	CAP, FXD, CER, .047UF, 25WVDC
C23	24561316	CAP, FXD, CER, .047UF, 25WVDC
C24	24561316	CAP, FXD, CER, .047UF, 25WVDC
C25	24561316	CAP, FXD, CER, .047UF, 25WVDC
C26	24561316	CAP, FXD, CER, .047UF, 25WVDC
C27	24561316	CAP, FXD, CER, .047UF, 25WVDC
C28	24561316	CAP, FXD, CER, .047UF, 25WVDC
C29	24561316	CAP, FXD, CER, .047UF, 25WVDC
C30	24561316	CAP, FXD, CER, .047UF, 25WVDC
C31	24561316	CAP, FXD, CER, .047UF, 25WVDC
C32	24561316	CAP, FXD, CER, .047UF, 25WVDC
C33	24561316	CAP, FXD, CER, .047UF, 25WVDC
C34	10762421	CAP, FXD, CER, 3300PF, 50WVDC
C35	10752421	CAP, FXD, CER, 3300PF, 50WVDC
C36	10752403	CAP, FXD, CER, .01UF, 50WVDC
C37	10762403	CAP, FXD, CER, .01UF, 50WVDC
C38	10762410	CAP, FXD, CER, 1000PF, 50WVDC
C50	24561316	CAP, FXD, CER, .047UF, 25WVDC
C51	24561316	CAP, FXD, CER, .047UF, 25WVDC

59535105 - CONTROL BOARD ASSEMBLY - TYPE 5351
SHEET 2 OF 2



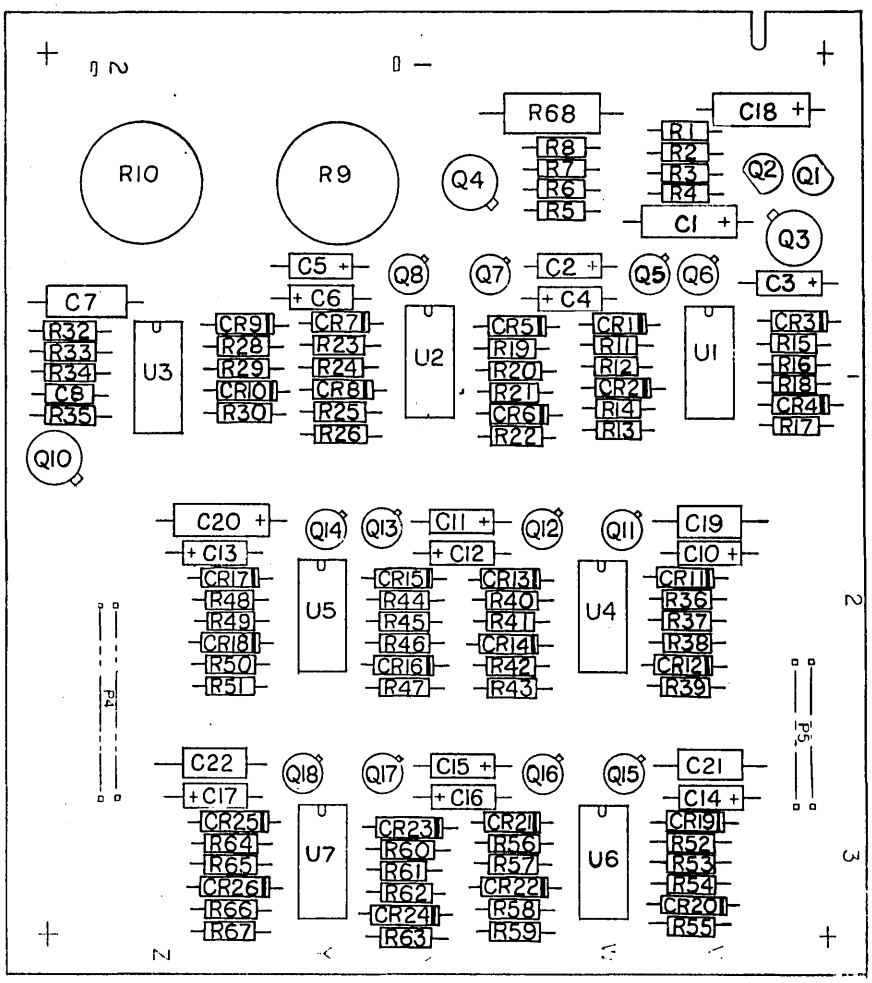
59535201 - AMPLIFIER PUNCH BOARD ASSEMBLY - TYPE 5352
SHEET 1 OF 2

FIGURE 8-15

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		RESISTORS
R1	24500080	RES, FXD, COMP, 5.1K OHMS, 5%, 1/4W
R2	24500094	RES, FXD, COMP, 20.0K OHMS, 5%, 1/4W
R3	24500071	RES, FXD, COMP, 2.2K OHMS, 5%, 1/4W
R4	24500087	RES, FXD, COMP, 10.0K OHMS, 5%, 1/4W
R9	95883401	RES, VAR, WW, 10 OHMS 2W
R10	95883400	RES, VAR, WW, 5 OHMS, 10%, 2W
R12	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R13	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R14	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R16	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R17	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R18	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R20	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R21	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R22	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R24	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R25	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R26	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R32	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R33	17705903	RES, FXD, COMP, 43.0K OHMS, 5%, 1/4W
R34	17705912	RES, FXD, COMP, 100.0K OHMS, 5%, 1/4W
R35	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R37	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R38	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R39	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R41	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R42	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R43	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R45	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R46	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R47	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R49	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R50	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R51	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R53	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R54	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R55	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R57	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R58	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R59	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R61	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R62	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R63	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R65	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R66	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R67	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R68	24507151	RES, FXD, COMP, 5.1 OHMS, 5%, 1W
		TRANSISTORS
Q1	95883000	TRANS, 2N5139
Q2	95883000	TRANS, 2N5139
Q3	50210801	TRANS, SILICON, 2N3569
Q10	51565800	TRANS, NPN, SILICON, 2N3566

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		INTEGRATED CIRCUITS
U1	95883700	INT.CKT, LM3900
U2	95883700	INT CKT, LM3900
U3	95883700	INT CKT, LM3900
U4	95883700	INT CKT, LM3900
U5	95883700	INT CKT, LM3900
U6	95883700	INT CKT, LM3900
U7	95883700	INT CKT, LM3900
		CAPACITORS
C1	24505269	CAP, SOLID, 47 UF, 6WVDC
C2	24504321	CAP, SOLID, .22UF, 35WVDC
C3	24504321	CAP, SOLID, .22UF, 35WVDC
C4	24504321	CAP, SOLID, .22UF, 35WVDC
C5	24504321	CAP, SOLID, .22UF, 35WVDC
C7	24561318	CAP, FXD, CER, .1UF, 25WVDC
C8	10762410	CAP, FXD, CER, .00027UF, 25WVDC
C10.	24504321	CAP, SOLID, .22UF, 35WVDC
C11	24504321	CAP, SOLID, .22UF, 35WVDC
C12	24504321	CAP, SOLID, .22UF, 35WVDC
C13	24504321	CAP, SOLID, .22UF, 35WVDC
C14	24504321	CAP, SOLID, .22UF, 35WVDC
C15	24504321	CAP, SOLID, .22UF, 35WVDC
C16	24504321	CAP, SOLID, .22UF, 35WVDC
C17	24504321	CAP, SOLID, .22UF, 35WVDC
C18	24504316	CAP, SOLID, 15UF, 6WVDC
C19	24561318	CAP, FXD, CER, .1UF, 25WVDC
C20	24504316	CAP, SOLID, 15UF, 6WVDC
C21	24561318	CAP, FXD, CER, .1UF, 25WVDC
C22	24561318	CAP, FXD, CER, .1UF, 25WVDC
		DIODES
CR1	25175800	DIODE, IN914
CR2	25175800	DIODE, IN914
CR3	25175800	DIODE, IN914
CR4	25175800	DIODE, IN914
CR5	25175800	DIODE, IN914
CR6	25175800	DIODE, IN914
CR7	25172800	DIODE, IN914
CR8	25172800	DIODE, IN914
CR11	25172800	DIODE, IN914
CR12	25172800	DIODE, IN914
CR13	25172800	DIODE, IN914
CR14	25172800	DIODE, IN914
CR15	25172800	DIODE, IN914
CR16	25172800	DIODE, IN914
CR17	25172800	DIODE, IN914
CR18	25172800	DIODE, IN914
CR19	25172800	DIODE, IN914
CR20	25172800	DIODE, IN914
CR21	25172800	DIODE, IN914
CR22	25172800	DIODE, IN914
CR23	25172800	DIODE, IN914
CR24	25172800	DIODE, IN914
CR25	25172800	DIODE, IN914
CR26	25175800	DIODE, IN914

59535201 - AMPLIFIER PUNCH BOARD ASSEMBLY - TYPE 5352
SHEET 2 OF 2

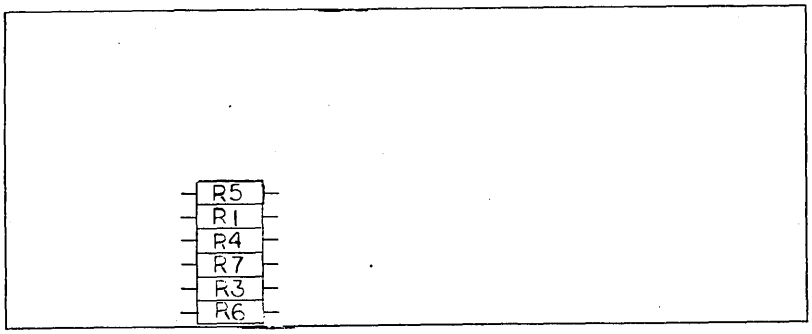


59535401 - AMPLIFIER PUNCH MARK BOARD ASSEMBLY - TYPE 5354
SHEET 1 OF 2

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		RESISTORS
R1	24500080	RES, FXD, COMP, 5.1K OHMS, 5%, 1/4W
R2	24500094	RES, FXD, COMP, 20.0K OHMS, 5%, 1/4W
R3	24500071	RES, FXD, COMP, 2.2K OHMS, 5%, 1/4W
R4	24500087	RES, FXD, COMP, 10.0K OHMS, 5%, 1/4W
R5	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R6	24500043	RES, FXD, COMP, 150.0 OHMS, 5%, 1/4W
R7	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R8	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R9	95883401	RES, VAR, WW, 10 OHMS, 2W
R10	95883400	RES, VAR, WW, 5 OHMS, 10%, 2W
R11	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R12	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R13	17705098	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R14	17705098	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R15	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R16	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R17	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R18	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R19	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R20	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R21	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R22	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R23	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R24	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R25	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R26	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R28	95856345	RES, FXD, FILM, 39.2K OHMS, 1%, 1/4W
R29	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R30	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R32	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R33	17705903	RES, FXD, COMP, 43.0K OHMS, 5%, 1/4W
R34	17705912	RES, FXD, COMP, 100.0K OHMS, 5%, 1/4W
R35	24500063	RES, FXD, COMP, 1.0K OHMS, 5%, 1/4W
R36	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R37	95856368	RES, FXD, FILM, 68.1KOHMS, 1%, 1/4W
R38	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R39	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R40	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R41	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R42	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R43	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R44	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R45	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R46	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R47	95856325	RES, FXD, FILM, 24.3KOHMS, 1%, 1/4W
R48	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R49	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R50	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R51	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R52	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R53	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R54	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R55	95856329	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R56	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R57	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R58	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R59	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R60	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R61	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R62	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R63	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R64	95856364	RES, FXD, FILM, 61.9K OHMS, 1%, 1/4W
R65	95856368	RES, FXD, FILM, 68.1K OHMS, 1%, 1/4W
R66	95856325	RES, FXD, FILM, 24.3K OHMS, 1%, 1/4W
R67	17705908	RES, FXD, COMP, 68.0K OHMS, 5%, 1/4W
R68	24507151	RES, FXD, COMP, 5.1 OHMS, 5%, 1W
		INTEGRATED CIRCUITS
U1	95883700	INT CKT, LM3900
U2	95883700	INT CKT, LM3900
U3	95883700	INT CKT, LM3900
U4	95883700	INT CKT, LM3900
U5	95883700	INT CKT, LM3900
U6	95883700	INT CKT, LM3900
U7	95883700	INT CKT, LM3900

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		DIODES
CR1	25175800	DIODE, IN914
CR2	25175800	DIODE, IN914
CR3	25175800	DIODE, IN914
CR4	25175800	DIODE, IN914
CR5	25175800	DIODE, IN914
CR6	26172800	DIODE, IN914
CR7	25175800	DIODE, IN914
CR8	25175800	DIODE, IN914
CR9	25172800	DIODE, IN914
CR10	25172800	DIODE, IN914
CR11	25172800	DIODE, IN914
CR12	25172800	DIODE, IN914
CR13	25172800	DIODE, IN914
CR14	25172800	DIODE, IN914
CR15	25172800	DIODE, IN914
CR16	25172800	DIODE, IN914
CR17	25172800	DIODE, IN914
CR18	25172800	DIODE, IN914
CR19	25172800	DIODE, IN914
CR20	25172800	DIODE, IN914
CR21	25172800	DIODE, IN914
CR20	25172800	DIODE, IN914
CR23	25172800	DIODE, IN914
CR24	25172800	DIODE, IN914
CR25	25172800	DIODE, IN914
CR26	25172800	DIODE, IN914
		TRANSISTORS
Q1	95883000	TRANS, 2N5139
Q2	95883000	TRANS, 2N5139
Q3	50210801	TRANS, NPN, SILICON, 2N3569
Q4	51565800	TRANS, NPN, SILICON, 2N3566
Q5	95883100	TRANS, 2N3330
Q6	95883100	TRANS, 2N3330
Q7	95883100	TRANS, 2N3330
Q8	95883100	TRANS, 2N3330
Q10	51565800	TRANS, NPN, SILICON, 2N3566
Q11	95883100	TRANS, 2N3330
Q12	95883100	TRANS, 2N3330
Q13	95883100	TRANS, 2N3330
Q14	95883100	TRANS, 2N3330
Q15	95883100	TRANS, 2N3330
Q16	95883100	TRANS, 2N3330
Q17	95883100	TRANS, 2N3330
Q18	95883100	TRANS, 2N3330
		CAPACITORS
C1	24505269	CAP, SOLID, 47UF, 6WVDC
C2	24504321	CAP, SOLID, .22UF, 35WVDC
C3	24504321	CAP, SOLID, .22UF, 35WVDC
C4	24504321	CAP, SOLID, .22UF, 35WVDC
C5	24504321	CAP, SOLID, .22UF, 35WVDC
C6	24504321	CAP, SOLID, .22UF, 35WVDC
C7	24561318	CAP, FXD, CER, .1UF, 25WVDC
C8	10762410	CAP, FXD, CER, .00027UF, 25WVDC
C10	24504321	CAP, SOLID, .22UF, 35WVDC
C11	24504321	CAP, SOLID, .22UF, 35WVDC
C12	24504321	CAP, SOLID, .22UF, 35WVDC
C13	24504321	CAP, SOLID, .22UF, 35WVDC
C14	24504321	CAP, SOLID, .22UF, 35WVDC
C15	24504321	CAP, SOLID, .22UF, 35WVDC
C16	24504321	CAP, SOLID, .22UF, 35WVDC
C17	24504321	CAP, SOLID, .22UF, 35WVDC
C18	24504316	CAP, SOLID, 15UF, 6WVDC
C19	24561318	CAP, FXD, CER, .1UF, 25WVDC
C20	24504316	CAP, SOLID, 15UF, 6WVDC
C21	24561318	CAP, FXD, CER, .1UF, 25WVDC
C22	24561318	CAP, FXD, CER, .1UF, 25WVDC

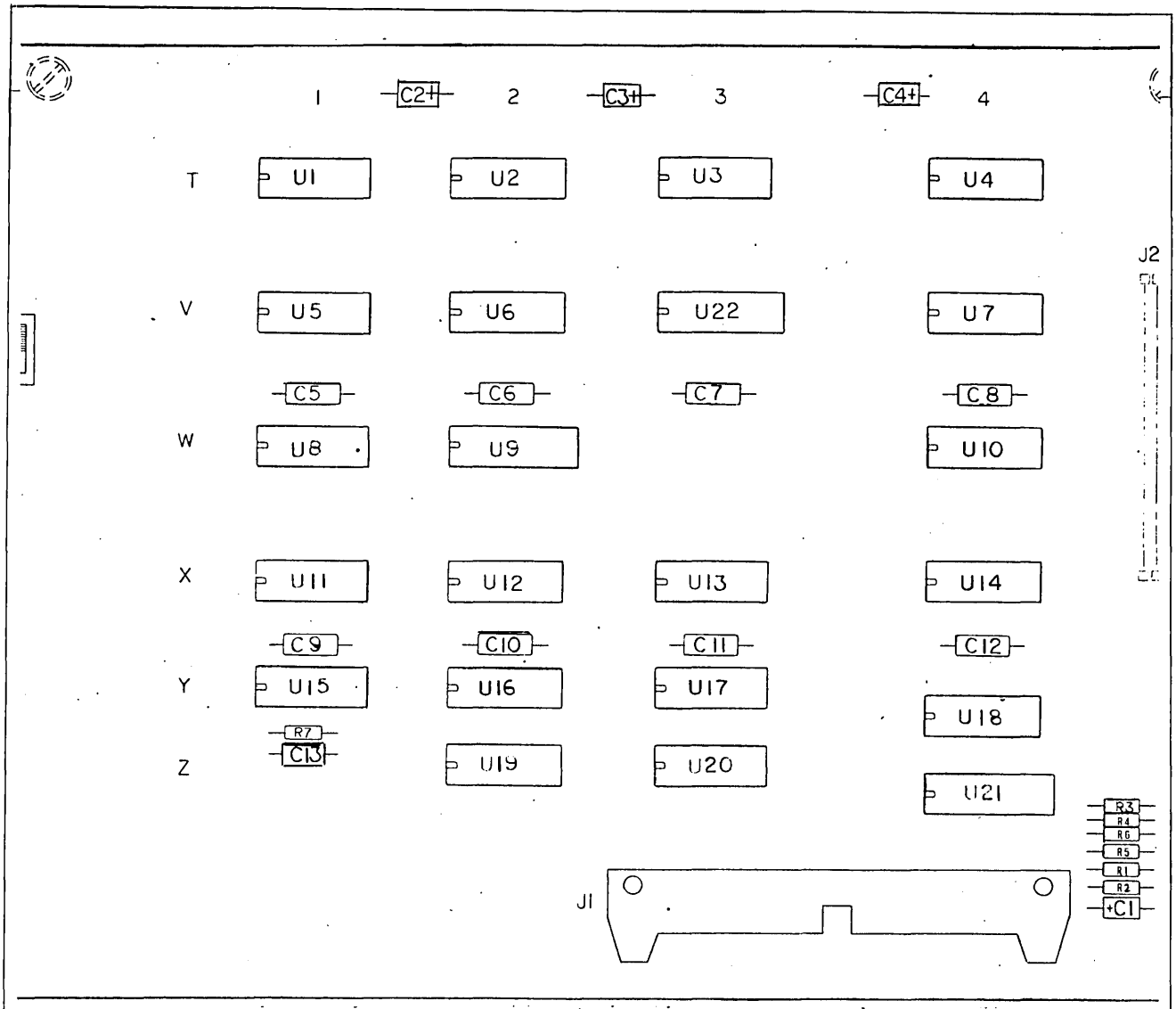
59535401 - AMPLIFIER PUNCH MARK BOARD ASSEMBLY - TYPE 5354
SHEET 2 OF 2



INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		RESISTORS
R1	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W
R2	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W
R3	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W
R4	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W
R5	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W
R6	24500329	RES, FXD, COMP, 560 OHMS, 10%, 1/4W

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION

59535301 - SWITCH PUNCH OR MARK BOARD ASSEMBLY - TYPE 5353



INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		INTEGRATED CIRCUITS
U1	94918813	INT CKT, SN 7420N
U2	36187100	INT CKT, SN 7404
U3	36187200	INT CKT, 7410
U4	36186800	INT CKT, 7400
U5	15105000	INT CKT, SN 74107
U6	36186800	INT CKT, 7400
U7	17183800	INT CKT, TYPE 7416
U8	51801200	INT CKT, TYPE 7408
U9	94916120	INT CKT, 74193
U10	17183800	INT CKT, TYPE 7416
U11	15105000	INT CKT, SN 74107
U12	95883800	INT CKT, 74L73
U13	95883800	INT CKT, 74L73
U14	17183800	INT CKT, TYPE 7416
U15	95880700	INT CKT, 7414
U16	95883800	INT CKT, 74L73
U17	95883800	INT CKT, 74L73
U18	17183800	INT CKT, TYPE 7416
U19	95883800	INT CKT, 74L73
U20	95883800	INT CKT, 74L73
U21	95903808	INT CKT, RES, MOD, 1.0K, 16 PINS
U22	95903808	INT CKT, RES, MOD, 1.0K, 16 PINS

INDEX NO.	EQUIPMENT PART NUMBER	ITEM DESCRIPTION
		CAPACITORS
C1	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C2	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C3	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C4	16431428	CAP, SOLID, 15.0 UF, 15 WVDC
C5	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C6	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C7	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C8	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C9	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C10	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C11	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C12	24561316	CAP, FXD, CER, .047 UF, 25 WVDC
C13	10762422	CAP, FXD, CER, 0.0047 UF, 25 WVDC
		RESISTORS
R1	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R2	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R3	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R4	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R5	24500047	RES, FXD, COMP, 220.0 OHMS, 5%, 1/4W
R6	24500051	RES, FXD, COMP, 330.0 OHMS, 5%, 1/4W
R7	24500053	RES, FXD, COMP, 390.0 OHMS, 5%, 1/4W

59535501 - DATA BOARD ASSEMBLY - TYPE 5355

COMMENT SHEET

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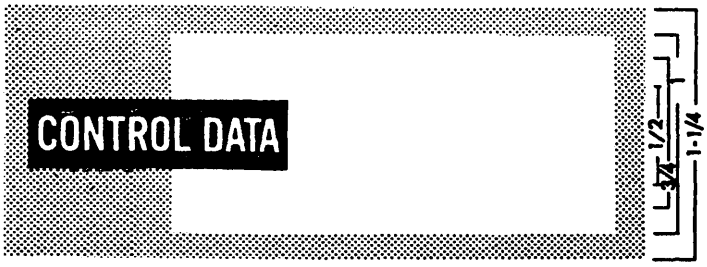

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