OPERATING AND SERVICE MANUAL

13012A/13014A

READ/WRITE PARITY ACCESSORY KITS

(FOR THE 7970 SERIES DIGITAL MAGNETIC TAPE UNIT)

Card Assemblies:

07970-60952, Series 1120
07970-60951, Series 1126
07970-60953, Series 1120
07970-60950, Series 1120

Note

This manual should be retained with the 7970 Series Digital Magnetic Tape Unit Operating and Service Manual.
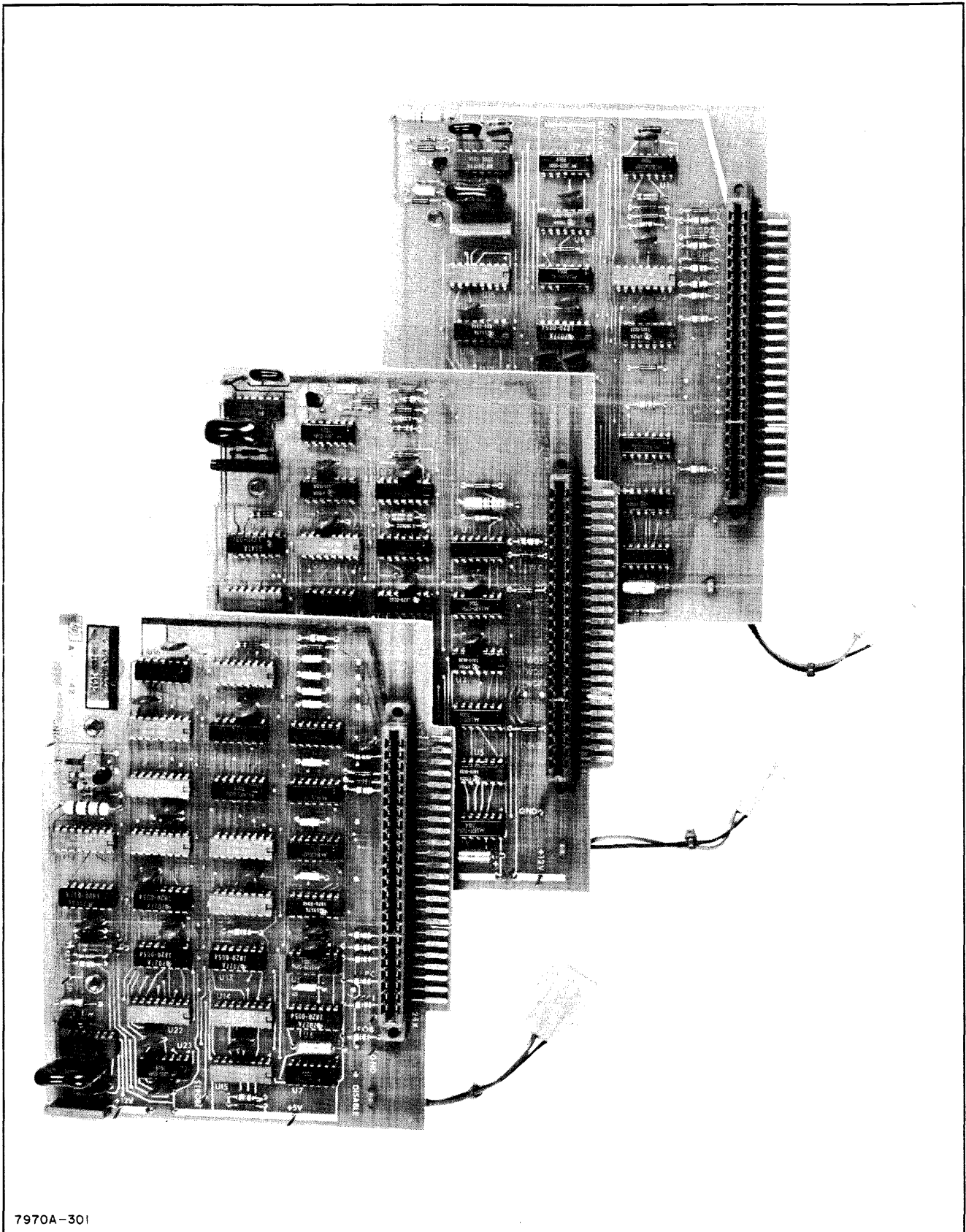
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7970A-301

Figure 1-1. Read/Write Parity Accessory Kits

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION.

1-2.   This operating and service manual is concerned with the HP 13012A/13014A Read/Write Parity Accessory Kits. The manual contains general information, installation information, theory of operation, maintenance data, and replaceable parts information. This manual is supplemental to the HP 7970 Series Digital Magnetic Tape Unit Operating and Service Manual.

1-3. GENERAL DESCRIPTION.

1-4.   The four cards with which this manual is concerned are a seven-track write card, a nine-track write card, a seven-track read card, and a nine-track read card. The only physical difference between the seven- and nine-track read cards is in the strapping arrangement on the cards. Table 1-1 lists the cards and associated part numbers. (See figure 1-1.)

Table 1-1. Tape Unit Parity Cards

CARD FUNCTION	PART NUMBER
Seven-Track Write Parity	07970-60952
Nine-Track Write Parity	07970-60951
Seven-Track Read Parity	07970-60953
Nine-Track Read Parity	07970-60950

1-5.   The circuitry for each card is mounted on a 5-1/2 inch by 7 inch card which plugs into the multiple-unit connectors of the tape unit mother-boards (data interconnect assemblies). Power to each card is provided by the tape unit power supply. The printed-circuit pins of the parity card connector tongues are paralleled to a second connector, which is mounted at a 90-degree angle to the tongue to provide for parallel connection (daisy-chaining) to other tape units. Each card can provide parity for a maximum of four tape units, and only two cards are required since all four units must be operating in either the seven or the nine-track mode.

1-6. SEVEN-TRACK WRITE CARD.

1-7.   The seven-track write card generates the vertical parity bit and the longitudinal redundancy check character (LRCC) as well as processing six data inputs and a Write Clock input. The card circuitry also switches a Write Tape Mark (WTM) to the tape together with the associated LRCC.

1-8. NINE-TRACK WRITE CARD.

1-9.   This card generates the vertical parity bit, the LRCC, processes eight data inputs and a Write Clock input. And, like the seven-track card, switches a WTM to the tape. However, unlike the seven-track card, the nine-track card generates a cycle redundancy check character (CRCC), which not only provides an additional data check, but makes possible a correction of certain errors.

1-10. SEVEN- AND NINE-TRACK READ CARDS.

1-11.   These cards perform the read-parity function for seven- and nine-track configurations. The cards are identical except for the strapping arrangements on the cards. The read-parity card provides end-of-block (EOB) and tape mark (TM) detection circuitry. Longitudinal parity detection circuits check the LRCC, while EOB circuitry provides a True output, indicating end of data block, two character periods after the LRCC.

1-12. IDENTIFICATION.

1-13.   Printed circuit card revisions are identified by a letter, a series code, and a division code marked beneath the part number on the card. The letter identifies the etched trace pattern on the unloaded card. The four-digit series code references the electrical characteristics of the loaded card. The two-digit division code identifies the division of Hewlett-Packard that manufactured the card. If the series code number does not correspond exactly with the code number on the title page of this manual, the card differs from those described in this manual. These differences are covered in manual supplements available at the nearest HP Sales and Service Office

1-14. SPECIFICATIONS.

1-15.   Specifications for the parity accessory kits are listed in table 1-2.

1-16. OPTIONS.

1-17.   When the parity cards are installed in the tape unit at the factory, the cards are ordered by specifying the option numbers in table 1-3. When ordering the cards for installation in the field, the cards are ordered by specifying the appropriate accessory kit number(s) as follows:

   a. HP 13012A Nine-Track Read Parity Accessory Kit.

   b. HP 13012A-001 Seven-Track Read Parity Accessory Kit.

   c. HP 13014A Nine-Track Write Parity Accessory Kit.

   d. HP 13014A-001 Seven-Track Write Parity Accessory Kit.

Table 1-3. Parity Accessory Kit Option Numbers

CARD FUNCTION	OPTION NUMBER
Seven-Track Write Parity	7970A-015
Nine-Track Write Parity	7970A-014
Seven-Track Read Parity	} 7970A-013*
Nine-Track Read Parity	
*Specify seven- or nine-track read parity when ordering this option.	

Table 1-2. Parity Accessory Kit Specifications

GENERAL		Minimum Block Length Versus Synchronous Speed:	
Board Width: 5-1/2 inches		Block Length	Speed (ips)
		13	10
Board Length: 7 inches		13	12.5
Temperature parameters: 0° to +55°C (32° to 132°F)		12	15
		9	20
SEVEN- AND NINE-TRACK READ CARD		7	25
		4	37.5
Input Voltage: +5 Vdc, +12 Vdc		4	45
SEVEN-TRACK WRITE CARD		NINE-TRACK WRITE CARD	
Input Voltage: +5 Vdc, +12 Vdc		Input Voltage: +5 Vdc, +12 Vdc	

SECTION II

INSTALLATION

2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, and installation of the tape unit parity cards.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the cards are unpacked. Inspect the cards for damage (scratches, dents, broken parts, etc.). If the cards are damaged and fail to meet specifications, notify the carrier and the nearest HP Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping container and the packing material for the carrier's inspection. Hewlett-Packard will arrange for repair or replacement of the damaged cards without waiting for any claims against the carrier to be settled.

2-5. INSTALLATION.

2-6. CONNECTOR PIN FUNCTIONS.

2-7. Connector pin functions for the read parity card (seven- and nine-track) are listed in table 2-1. Pin functions for the write parity card (seven- and nine-track) are listed in table 2-2.

2-8. PARITY CARD INSERTION.

2-9. To insert the read card and/or the write card into the mother board receptacle:

a. Determine that both cards are for the same configuration (i.e., seven-track or nine-track) by checking the part numbers on the cards.

b. Turn off computer and tape unit power.

c. Insert cards and power plugs in appropriate connectors (figure 2-1).

d. Restore power to computer and tape unit.

e. Perform adjustment procedures listed in paragraph 4-5.

f. To verify proper operation of the tape unit parity cards, run the diagnostic for the tape unit, tape unit controller, and parity cards.

2-10. PARALLELING UNITS (DAISY-CHAINING).

2-11. Each parity card can provide the parity function for a maximum of four tape units. To connect additional units, perform the following steps:

a. Determine that units to be daisy-chained units are in the same track configuration as the host unit (i.e., seven- or nine-track).

b. Turn off computer and tape unit power.

c. Insert daisy-chain interconnect cabling (HP 13190A or 13190B Multi-Unit Cable Accessory Kit.) in appropriate connector of host parity card (figure 2-2).

d. Restore power to computer and tape units.

e. Perform adjustment procedures listed in paragraph 4-5.

f. To verify proper operation of the tape unit parity cards, run the diagnostic for the tape unit, tape unit controller, and parity cards.

2-12. SHIPPING INSTRUCTIONS.

2-13. If the cards are to be shipped to Hewlett-Packard for service or repair, attach a tag to the cards identifying the owner and indicating the service or repair to be accomplished. Include the part numbers of the cards.

2-14. Place the cards in the original container if available. If the original container is not available, a suitable container and packing material can be purchased from a local Hewlett-Packard Sales and Service Office.

2-15. If the original container is not used, wrap the cards in heavy paper and place in an inner container. Place adequate packing material around all sides of the cards. Place the cards and inner container in a heavy carton. Mark the shipping container "FRAGILE."

Note

In any correspondence, identify the cards by part number. Refer any questions to the nearest Hewlett-Packard Sales and Service Office.

Table 2-1. Read Parity Card Pin Functions

SIGNAL MNEMONIC	MOTHER BOARD TONGUE RJ10		DAISY CHAIN CONNECTOR RJ13 (ON PARITY CARD)	
	ACTIVE PIN	GND PIN	ACTIVE PIN	GND PIN
PSL	1X	1	PSL	1
Reserved	2X	2	Reserved	2
SD2	3X	3	SD2	3
SD5	4X	4	SD5	4
Spare	5X	5	Spare	5
Spare	6X	6	Spare	6
Spare	7X	7	Spare	7
RC	8X	8	RC	8
RDP	9X	9	RDP	9
RD0	10X	10	RD0	10
RD1	11X	11	RD1	11
RD2	12X	12	RD2	12
RD3	13X	13	RD3	13
RD4	14X	14	RD4	14
RD5	15X	15	RD5	15
RD6	16X	16	RD6	16
RD7	17X	17	RD7	17
Disable	18X	18	Disable	18
VP	19X	19	VP	19
VPC	20X	20	VPC	20
TM	21X	21	TM	21
LPC	22X	22	LPC	22
CCI	23X	23	CCI	23
EOB	24X	24	EOB	24

Table 2-2. Write Parity Card Pin Functions

| SIGNAL MNEMONIC	WRITE MOTHER BOARD TONGUE		DAISY CHAIN CONNECTOR ON PARITY BOARD		PARITY BOARD CONNECTION	
	ACTIVE PIN	GND PIN	ACTIVE PIN	GND PIN	NINE-TRACK	SEVEN-TRACK
PSL	1X	1	1X	1	NC	3
Reserved	2X	2	2X	2	NC	NC
SD2	3X	3	3X	3	NC	3
SD5	4X	4	4X	4	NC	3
WTM	5X	5	5X	5	3	3
SW	6X	6	6X	6	NC	NC
WRS	7X	7	7X	7	2	2
WC	8X	8	8X	8	1	1
WDP	9X	9	9X	9	2	2
WD0	10X	10	10X	10	1	NC
WD1	11X	11	11X	11	1	NC
WD2	12X	12	12X	12	1	1
WD3	13X	13	13X	13	1	1
WD4	14X	14	14X	14	1	1
WD5	15X	15	15X	15	1	1
WD6	16X	16	16X	16	1	1
WD7	17X	17	17X	17	1	1
Disable	18X	18	18X	18	Spare	Spare
Spare	19X	19	19X	19	Spare	Spare
Spare	20X	20	20X	20	Spare	Spare
Spare	21X	21	21X	21	Spare	Spare
Spare	22X	22	22X	22	Spare	Spare
INH	23X	23	23X	23	2	2
Spare	24X	24	24X	24	NC	NC
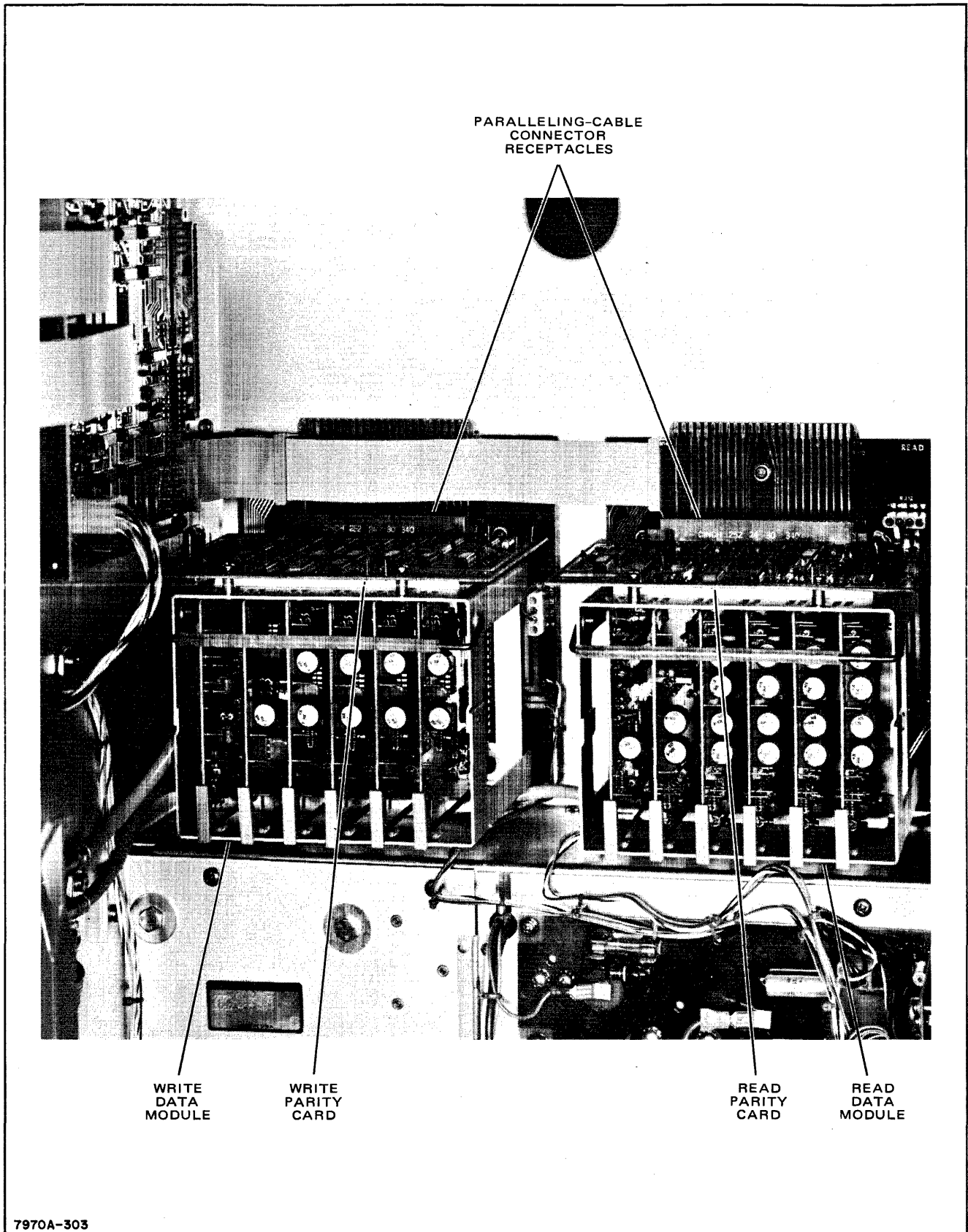
Figure 2-1. Read/Write Card Locations
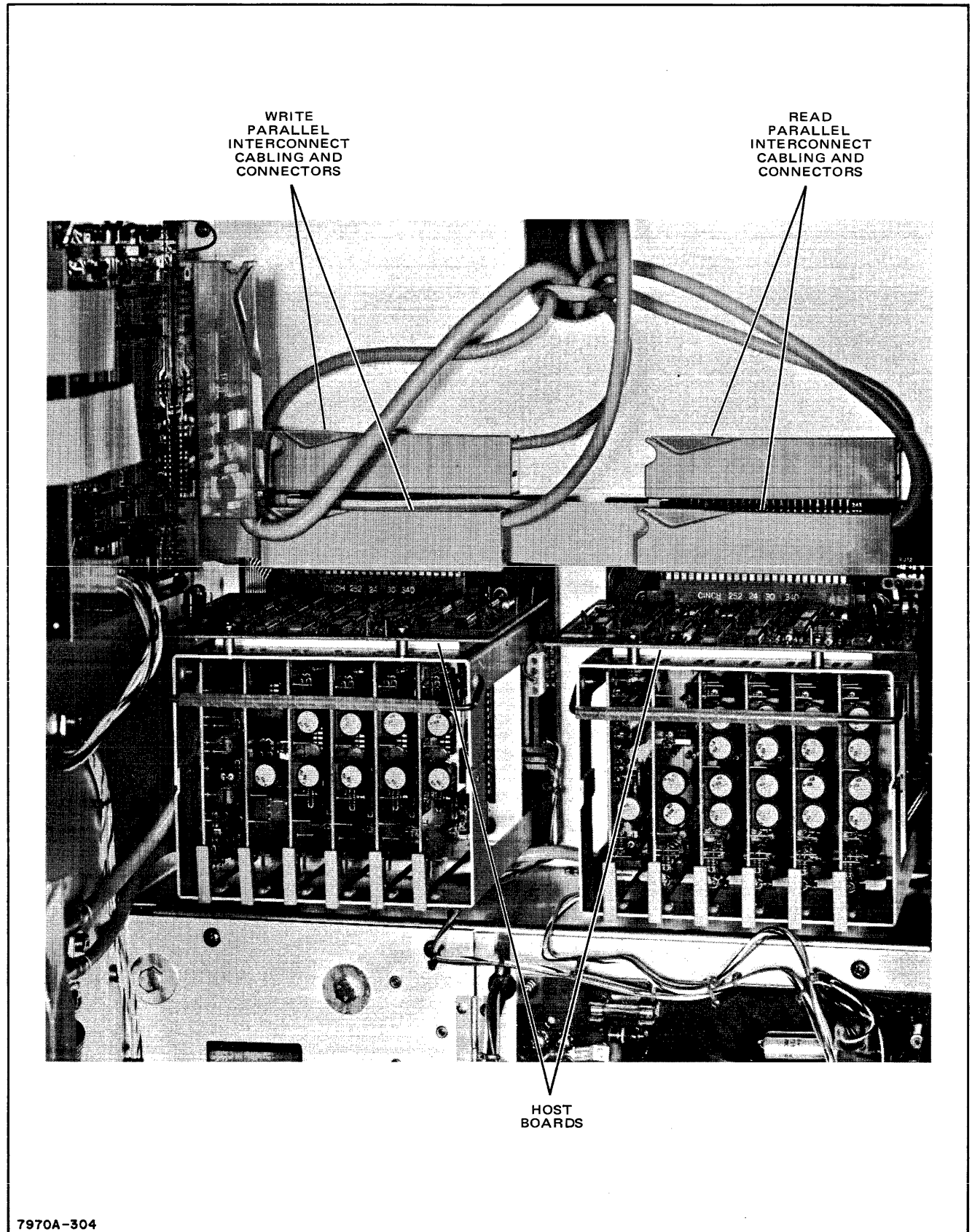
Figure 2-2. Paralleling-Cable Connectors Installed

SECTION III
THEORY OF OPERATION

3-1.   INTRODUCTION.

3-2.   This section covers the parity card functions on two levels. The first level (the least complex) is the overall functional description, which discusses parity in general, the read and write parity function of the cards, and the relationship of the cards to the system in which they operate. The second level provides a detailed circuit description related to block diagrams and to the appropriate schematics in section IV.

3-3.   OVERALL FUNCTIONAL DESCRIPTION.

3-4.   PARITY.

3-5.   Parity refers to the technique in which a single bit is added (or subtracted) to an incoming word to make the number of bits in the word odd or even. When the data word is read, the number of bits in the word is checked and, if the number of bits is different than it was originally, loss or addition of data bits is suspected. It is possible, of course, that enough false bits may have been added (or valid bits knocked out) to keep to the predetermined odd or even count. However, the parity check technique increases the possibility of detection of bad data where accurate data storage or transmission is required.

3-6.   The HP 13012A/13014A Read/Write Parity Accessory Kits are concerned with vertical parity, longitudinal parity, and the longitudinal redundancy check character (LRCC). A fourth form called the cyclic redundancy check character (CRCC) is available in the nine-track configuration.

3-7.   Vertical parity is a technique by which the number of bits in a character are checked, then adjusted to be either odd of even (as desired). Longitudinal parity is a technique which checks the number of "1" bits along the length of each track to assure that all are present. The LRCC checks longitudinal against vertical parity by checking the random combination of bits in an entire record, then writing the check character four spaces after the last character in the record.

3-8.   PARITY CARDS.

3-9.   Four separate cards make up the complement of parity cards for the tape unit. These are the seven-track write card, the nine-track write card, the seven-track read card, and the nine-track read card. In operation the write parity card and the read parity card perform separate and distinct functions (figure 3-1). The write parity function is accomplished by adding any required parity bits while the tape unit is writing. In the read mode, the number of bits are

counted (checked) for the correct number (parity) and an error signal generated if the count is incorrect.

3-10.   CIRCUIT DESCRIPTION.

3-11.   SEVEN-TRACK WRITE CARD.

3-12.   This card provides circuitry which processes six data inputs and a Write Clock input. The circuitry also generates a vertical parity track bit and an LRCC. The card will accept a Write Tape Mark command (WTM) and transfer the tape mark code to the tape along with the associated LRCC.

3-13.   The LRCC is internally generated four bit-periods after the last data character. Receipt of a WTM command causes a "1" bit to be written on tracks 1, 2, 3, and 4 (IBM) channels 1, 2, 4, and 8 followed by an LRCC four bit-periods later. The card has triple density (200, 556, 800 bpi) and even or odd parity capability, which is remotely selectable.

3-14.   Analysis of the seven-track write card is related to figure 3-2. Figure 4-1 includes a schematic diagram for the card. Table 3-1 lists and defines associated mnemonics.

3-15.   CONTROL LOGIC. The control logic centers around one-shot U14, which provides Inhibit Control, Write Reset (WRS) control, and Clock output signals. Inputs to the control logic include a Write Clock (WC) signal and internally generated Strobe and Density Select Control signals (SD2 and SD5). The Density Select Control signals are computer-generated.

3-16.   PARITY GENERATION LOGIC. Parity generation circuitry (U13 and associated gating) checks the state of each of the six Write Data signal lines and, when the Write Clock signal is received, writes the odd or even parity bit on the WDP output line. Determination of whether the bit is odd or even is computer-selected by the setting of U3C through the Parity Select (PSL) input line. Four input data lines (WD4 through WD7) are paralleled from the output of the tape mark logic, which operates when the command is received on the Write Tape Mark (WTM) input line through U3E and U10D.

3-17.   NINE-TRACK WRITE CARD.

3-18.   This card provides circuitry which processes eight data inputs and a Write Clock input. The card generates a vertical parity bit, a CRCC and an LRCC. The CRCC is automatically generated and recorded four bit-periods after the last data character. The LRCC is internally generated four bit-periods after CRCC. Receipt of a WTM command causes

WRITE
PARITY CARDS

9-TRACK
7-TRACK

HP 7970   DMTU

READ
PARITY CARD

9-TRACK
7-TRACK

WRITE
HEAD

WRITE
MODE

NOTE:
    HEAVY LINES INDICATE
    ACTIVE CIRCUITRY.

WRITE
PARITY CARD

9-TRACK
7-TRACK

HP 7970   DMTU

READ
PARITY CARD

9-TRACK
7-TRACK

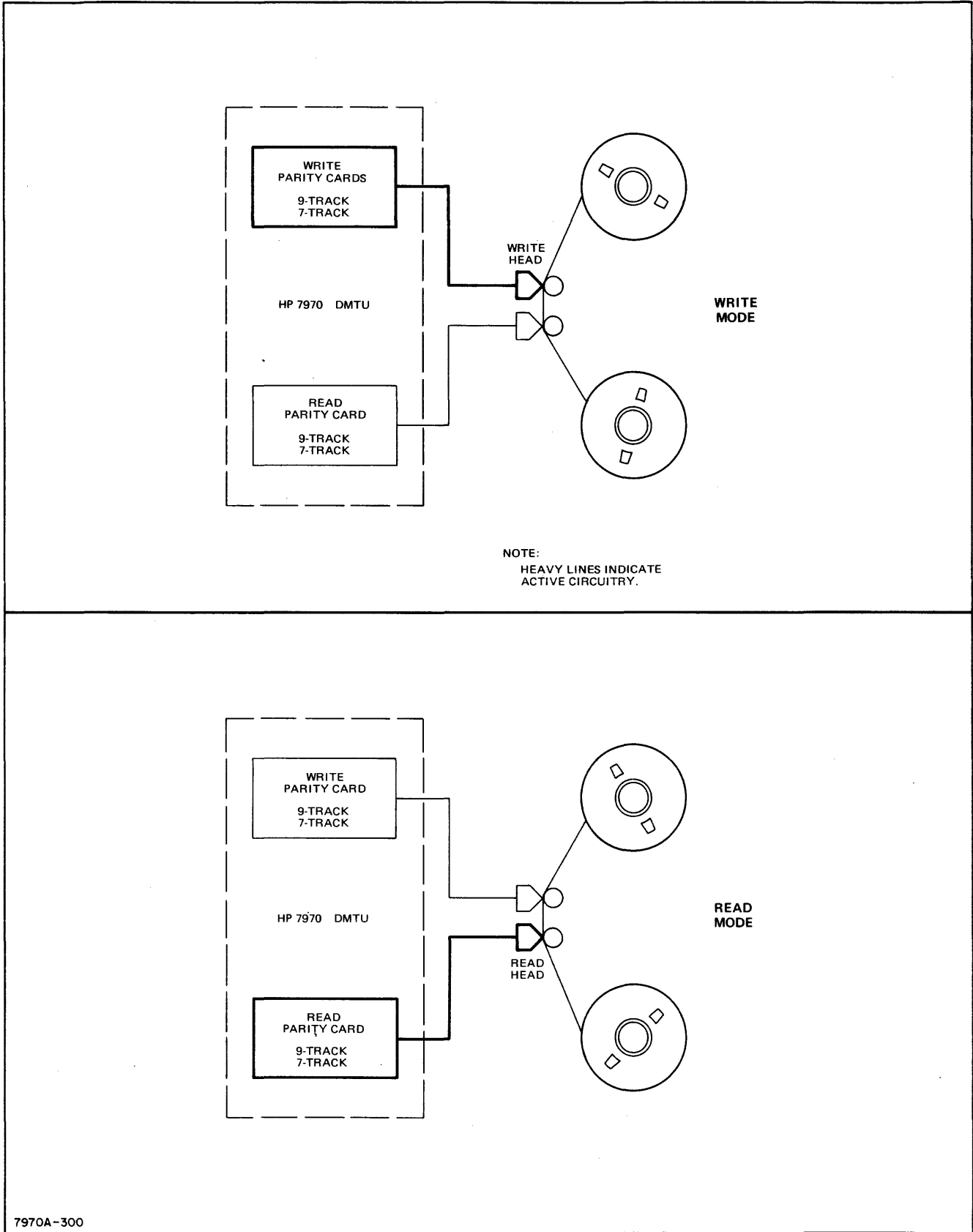READ
HEAD

READ
MODE

7970A-300
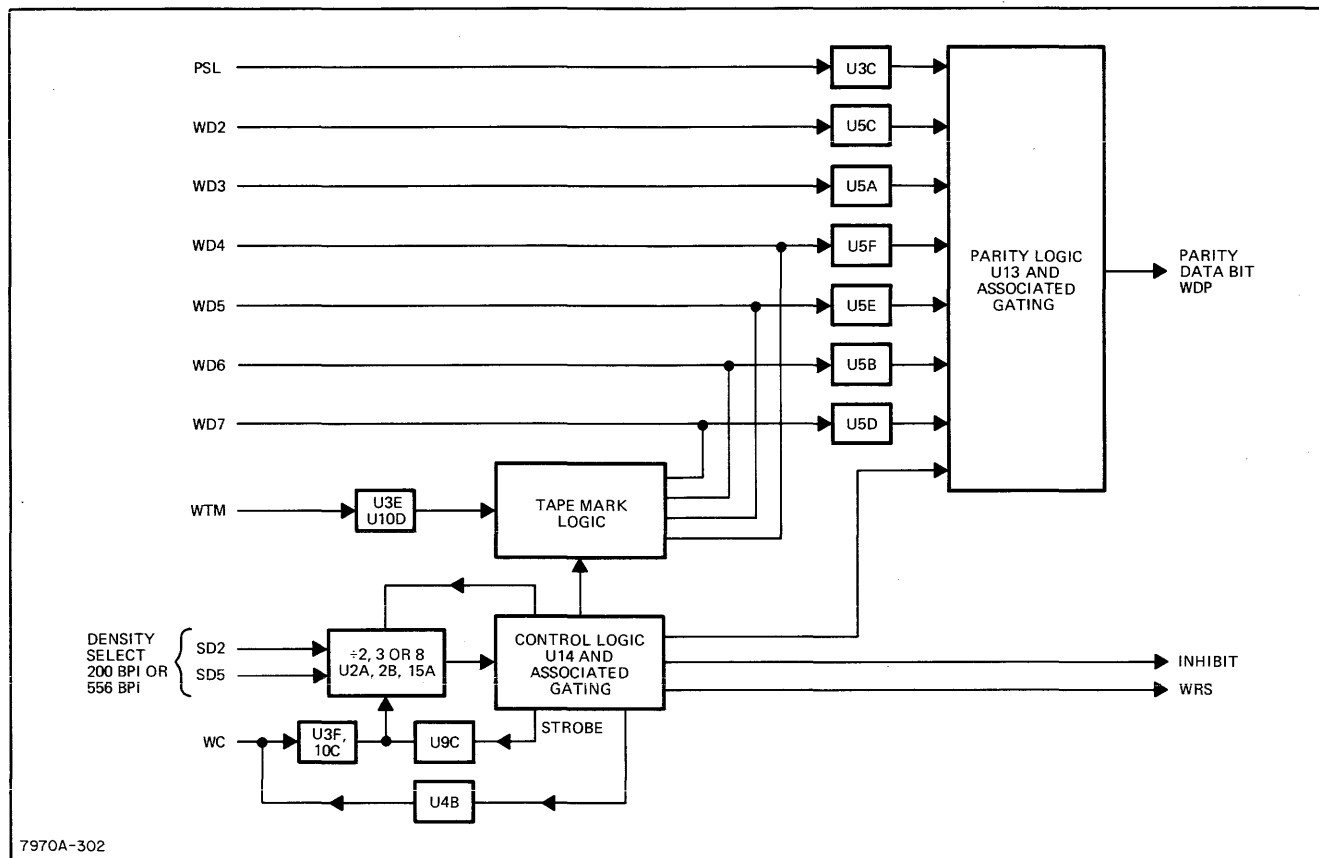
Figure 3-1. Parity Card Functions

Figure 3-2. Seven-Track Write Parity, Simplified Block Diagram

a "1" bit to be written on tracks 3, 6, and 7 (IBM channels 3, 1, and 0) followed by an LRCC eight bit-periods later. The card has single density (800 bpi) and odd-parity capability.

3-19.   Analysis of the nine-track write card is related to figure 3-3. Figure 4-2 includes a schematic diagram for the card. Table 3-2 lists and defines nine-track write mnemonics.

3-20.   CONTROL LOGIC. The control logic for the nine-track write card centers around one-shot U22 and associated logic circuitry. This circuitry, like the seven-track card, receives external control signals WC, WTM, and an internally generated strobe control signal. However, unlike the seven track card, the nine-track card provides no density select circuitry.

3-21.   Output from the control logic includes a Write Clock pulse, a reset signal to the Write Tape Mark (WTM) logic, an Inhibit signal, and a CRCC signal to the CRCC circuitry. Control logic also generates Inhibit and WRS signals for external use.

3-22.   CRCC LOGIC. Cyclic Redundancy Check Character signal generation is available only in the nine-track write card. CRCC is generated from the paralleled output of WD lines WD0 through WD7, with the count updated with each Write Clock signal. When WC stops, one additional clock is applied to the clock input of each CRCC flip-flop, causing one more shift. The output state of the flip-flops after the last shift is the CRC character. The CRCC signal is input to each data line through gating, which was enabled by the Control Logic.

3-23.   TAPE MARK. Input data lines are paralleled from the output of the tape mark logic, which operates upon command from the WTM input line through U17A.

3-24.   PARITY GENERATION. Parity generation circuitry (U13 and associated gating) checks the state of each of the eight Write Data lines and determines whether the total is odd or even. If the total is even, the parity generator adds one bit to make the total an odd number of bits. Unlike the seven-track write cards, the nine-track write cards have no parity select circuitry. If required, the bit is added to the word through the WDP output line.

Table 3-1. Seven-Track Write Mnemonics

SIGNAL MNEMONIC	SIGNAL DESCRIPTION
WD2 thru WD7 (input and output)	Write Data Lines.
WC	Write Clock.
WTM	Write Tape Mark. Assertion to be maintained for 2 μs minimum, 6-bit times maximum.
DISABLE	Optional.
PSL	Parity Select. Assertion causes even parity generation.
SD2*	200 BPI Density Select. Assertion causes LRC and TM timing for 200 bpi.
SD5*	556 CPI Density Select. Assertion causes LRC and TM timing for 556 cpi.
WDP	Parity Data Bit. If PSL false, WDP is true if an even number of data lines (WD2 thru WD7) are asserted. If PSL true, WDP is true if an odd number of data lines are asserted.
WC (input and output)	Write Clock.
WRS	Write Reset.
INH	Inhibit.
*If neither SD2 or SD5 is asserted, timing is for 800 bpi.	

3-25. SEVEN- AND NINE-TRACK READ CARDS.

3-26.   The seven- and nine-track read cards are identical except for the strapping arrangements. The read card circuitry monitors the interface lines Read Clock (RC), RDP through RD7 (Read Data) and generates the following outputs: End Of Block (EOB); Vertical Parity Check (VPC); Longitudinal Parity Check (LPC); Tape Mark (TM); Check Character Inhibit (CCI); and Vertical Parity Error (VP).

3-27.   Analysis of the read card is related to figure 3-4. Figure 4-5 includes a schematic diagram of the read card. Table 3-3 lists and defines the read card mnemonics.

3-28.   CONTROL LOGIC. The control logic centers around one-shot U26, which provides Density Select signals (seven-track configuration), End Of Block pulses, Check Character Inhibit gating, and clock signals to other circuits

of the card. Inputs to control logic are Density Select signals (seven-track configuration), Read Clock timing, and Inhibit signals.

3-29.   VERTICAL PARITY. In the nine-track configuration, in which only odd parity is available, strapping connects Read Data lines RD0 and RD1 to VP detector U9 and disconnects the Parity Select input. In the seven-track configuration, strapping connects the PSL input and disconnects RD0 and RD1. In both seven- and nine-track the remainder of the Read Data lines (RD2 through RD7) connect to U9.

3-30.   As each data line is clocked into U9, the state is checked and at the end of a sequence a summation is made. If parity is set to the odd mode, a 1-bit at the output of U9 will signify a parity error. If parity is set to the even mode (seven-track only) a "1" bit at the output will signify parity error. A signal from the inhibit input will disable the VPC output gating.
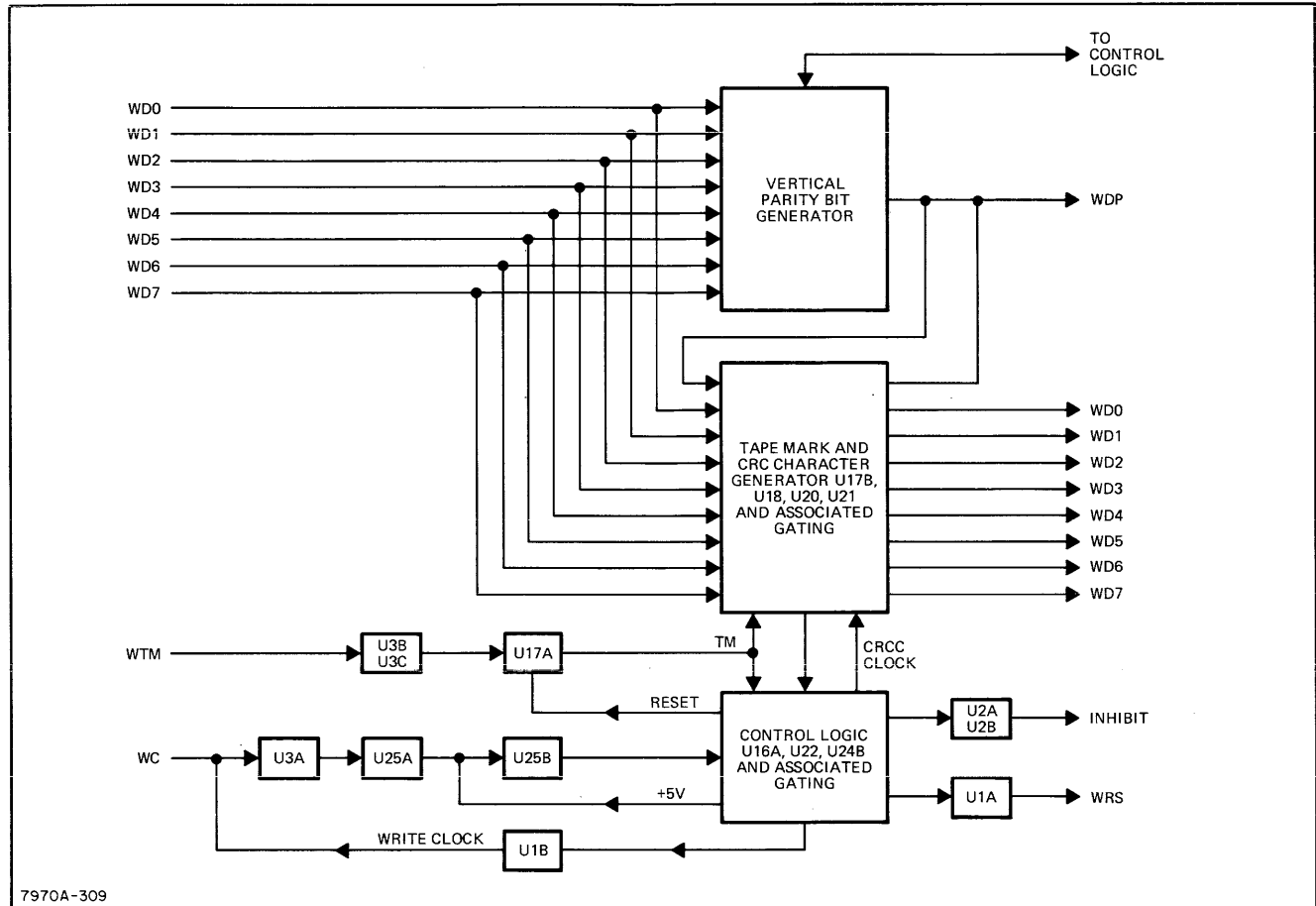
Figure 3-3. Nine-Track Write Parity, Simplified Block Diagram

3-31. Like the vertical parity function, seven- or nine-track operation of the Longitudinal Parity Error detector is determined by strapping, which provides either RD2 through RD7 data line input (seven-track), or RD0 through RD7 data input (nine-track). In either case LRC parity is even. Clock input is from the control logic, paralleled with a line to VP error detector circuitry.

3-32. TAPE MARK DETECTOR. In the nine-track configuration inputs to the tape mark detector are RDP, RD0 through RD7, and Clock. In the seven-track configuration

the inputs are RDP, RD2 through RD7, and the Clock signal. In both seven- and nine-track configurations, PSL is disabled.

3-33. For the detection of tape marks in the nine-track version, the tape mark is a "1" bit in channels 3, 6, and 7, and a "0" bit in all other channels; in the seven-track version, the tape mark is a "1" bit in channels 4, 5, 6, and 7. Strapping automatically provides for the correct inputs to gate U10.

3-34. The presence of a TM signal on output line 21X is signified by a "0" bit.

Table 3-2. Nine-Track Write Mnemonics

SIGNAL MNEMONIC	SIGNAL DESCRIPTION
WD0 thru WD7 (input and output)	Write Data Lines.
WC	Write Clock.
WTM	Write Tape Mark.
DISABLE	Optional. Assertion causes all output transmitters to be false.
WDP	Parity Data Bit (odd parity). True if an even number of data lines (WD0 thru WD7) are asserted; otherwise false. Output transition occurs within 100 μs (maximum) of any input transition.
WC	Write Clock.
WRS	Write Reset. Causes tape unit to write the LRC character.
INH	Assertion indicates that all other transmitters on the Write Data and Write Clock lines must be false within 3 μs (maximum) to avoid interfering with parity board transmitters.
CRCC	Cyclic Redundancy Check Character. Provides high level parity check derived from both vertical and longitudinal parity checks.
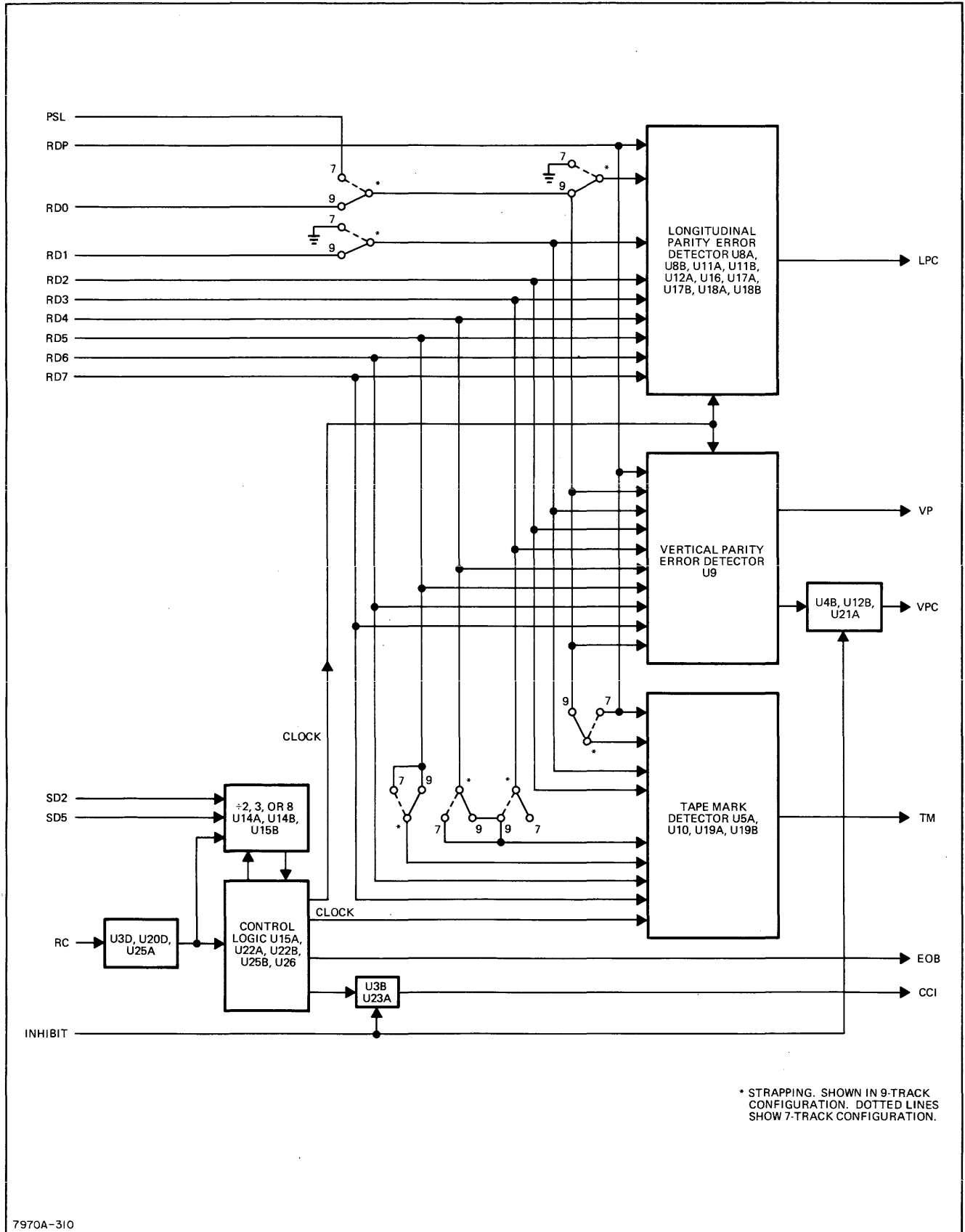
Figure 3-4. Seven- and Nine-Track Read Parity, Simplified Block Diagrams

Table 3-3. Read Mnemonics

SIGNAL MNEMONIC	SIGNAL DESCRIPTION
EOB	End of Block. EOB is a 10 μs pulse signaling the end of a data block. The leading edge of the pulse nominally occurs 6-bit times after the last character in the record in forward and reverse normal speed modes.
VPC	Vertical Parity Check. VPC is a signal that is true at EOB time if the transmitted record contained in data character having an improper (odd or even) number of "1" bits. In the nine-track version, the parity check is for an odd number of "1's"; in the seven-track version, the parity check is remotely programmed (odd or even) via the PSL control line. The VPC line is inhibited (false) during reverse of high-speed operation.
LPC	Longitudinal Parity. LPC is a signal that is true at EOB time if any data line within the transmitted record contains an odd number of "1" bits (the LRC character assures an even sum in both seven- and nine-track formats). If the record is valid, LPC will be false at EOB time. The LPC check is made in both forward and reverse normal-speed modes.
TM	Tape Mark. TM is a signal that is true at EOB time if the transmitted record was a tape mark; if not, TM will be false at EOB time. TM may be true or false before the last character in the record occurs.
CCI	Check Character Inhibit. CCI is a line that becomes true (in normal-speed forward mode) two bit-times after the last data character in the block occurs. CCI remains true until the leading edge of EOB arrives.
VP	Vertical Parity Error. VP is an instantaneous mod 2 sum of the read data inputs RDP thru RD7. In nine-track, VP is true if the sum is even. In seven-track, odd parity selected, VP is true if the sum is even; with even parity selected, VP is true if the sum is odd.

SECTION IV

MAINTENANCE

4-1.   INTRODUCTION.

4-2.   This section contains information concerning maintenance, trouble analysis, and repair of the parity cards.

4-3.   PREVENTIVE MAINTENANCE.

4-4.   No separate preventive maintenance procedures are required for the parity cards. Preventive maintenance procedures for the tape unit are listed in the Operating and Service Manual for the unit.

4-5.   ADJUSTMENT PROCEDURES.

4-6.   A one-time frequency-speed adjustment is required to set the parity card frequency to be compatible with tape transport tape speed. The adjustment of variable resistors and timing requirements is identified in the figures listed below.

   a. Seven-Track Write Parity: R19, figures 4-1 and 4-2.

   b. Nine-Track Write Parity: R13, figures 4-3 and 4-4.

   c. Seven- or Nine-Track Read Parity: R18, figures 4-5, 4-6, and 4-7.

4-7.   TEST EQUIPMENT.

4-8.   The following test equipment and test tools are required:

   a. HP 5245L Electronic Counter (or equivalent).

   b. Trimmer Adjusting Tool.

4-9.   NINE-TRACK READ AND NINE-TRACK WRITE CARDS.

4-10.   Perform the nine-track read and the nine-track write card adjustment procedure as follows:

   a. Install parity card.

   b. Connect jumper wire across TP and GND.

   c. Connect counter to STROBE test point.

   d. Set tape unit power switch to ON.

   e. Adjust variable resistor (tape speed set at 800 bpi) to obtain the timing frequency required for the tape transport tape speed. The frequency required is indicated in table 4-1. The frequency (F) is based on the formula: $F(kHz) = (0.2)$ (Tape Speed).

   f. Set tape unit power switch to OFF.

   g. Remove jumper wire.

   h. Disconnect test equipment

Table 4-1. Parity Speed Frequency Relationship
(Nine-Track)

SPEED (ips)	FREQUENCY (kHz)
10	2.000
12.5	2.500
20	4.000
25	5.000
30	6.000
37.5	7.500
45	9.000

4-11.   SEVEN-TRACK READ AND SEVEN-TRACK WRITE CARDS.

4-12.   Perform the seven-track read and the seven-track write adjustment procedure as follows:

   a. Install parity card.

   b. Connect jumper wire across TP and GND.

   c. Connect counter to STROBE test point.

   d. Set power switch to ON.

   e. Adjust variable resistor (tape speed set at 800 bpi) to obtain the timing frequency required for the tape transport tape speed. Required frequency response is indicated in table 4-2. The frequency (F) is based on the formula: $F(kHz) = (0.204)$ X (Tape Speed).

   f. Set tape unit power switch to OFF.

   g. Remove jumper wire.

   h. Disconnect test equipment.

Table 4-2. Parity Speed Frequency Relationship
(Seven-Track)

SPEED (ips)	FREQUENCY (kHz)
10	2.040
12.5	2.550
20	4.080
25	5.100
30	6.120
37.5	7.650
45	9.180

4-13. TROUBLE ANALYSIS.

4-14.   If a parity card becomes defective, visually check for broken connections, defective receptacles, components, or other obvious faults. If no obvious fault is found, perform trouble analysis procedures using appropriate test equipment, and the schematic and timing diagrams of figures 4-1 through 4-7.
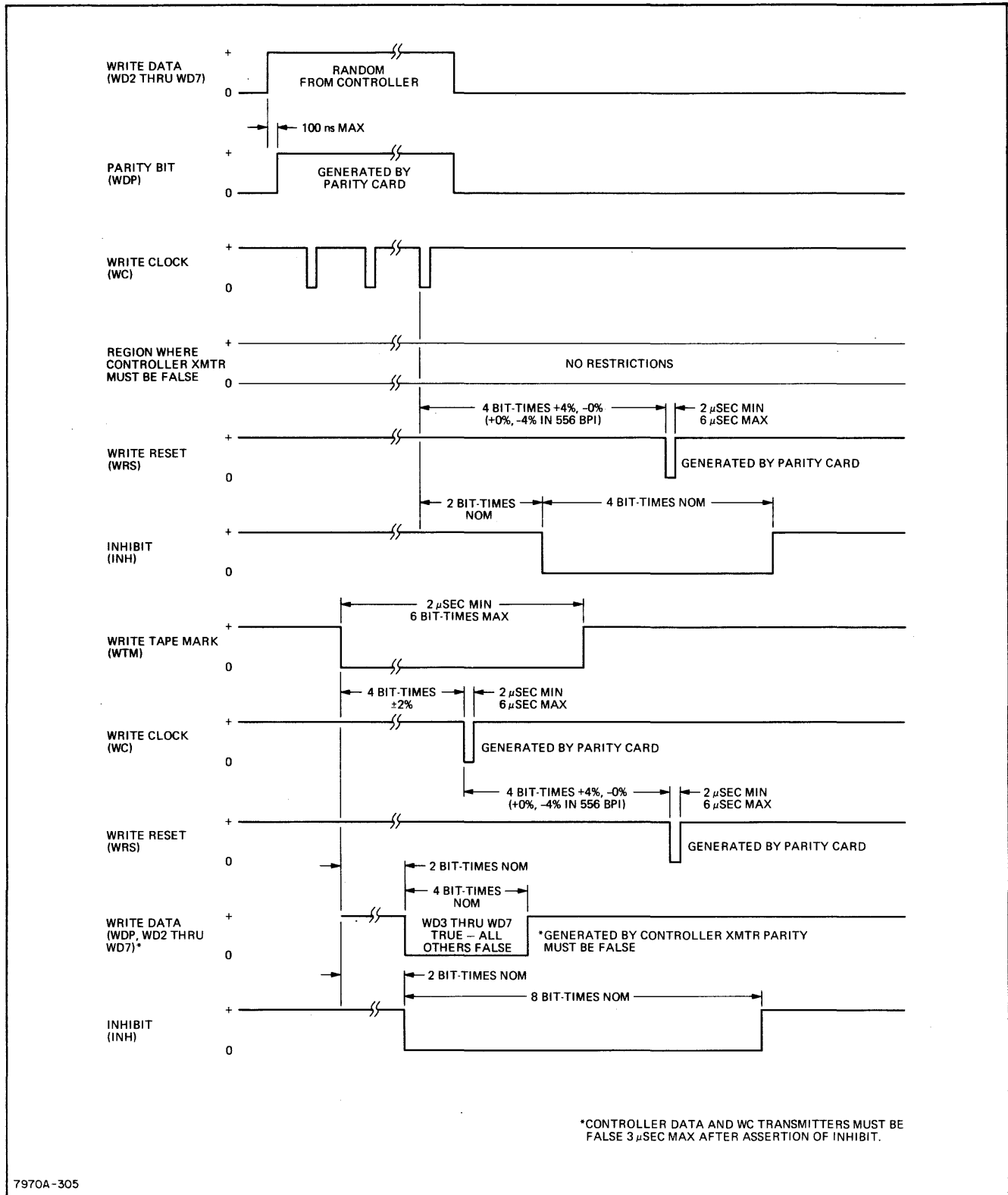
Figure 4-1. Seven-Track Write Parity Timing Diagram
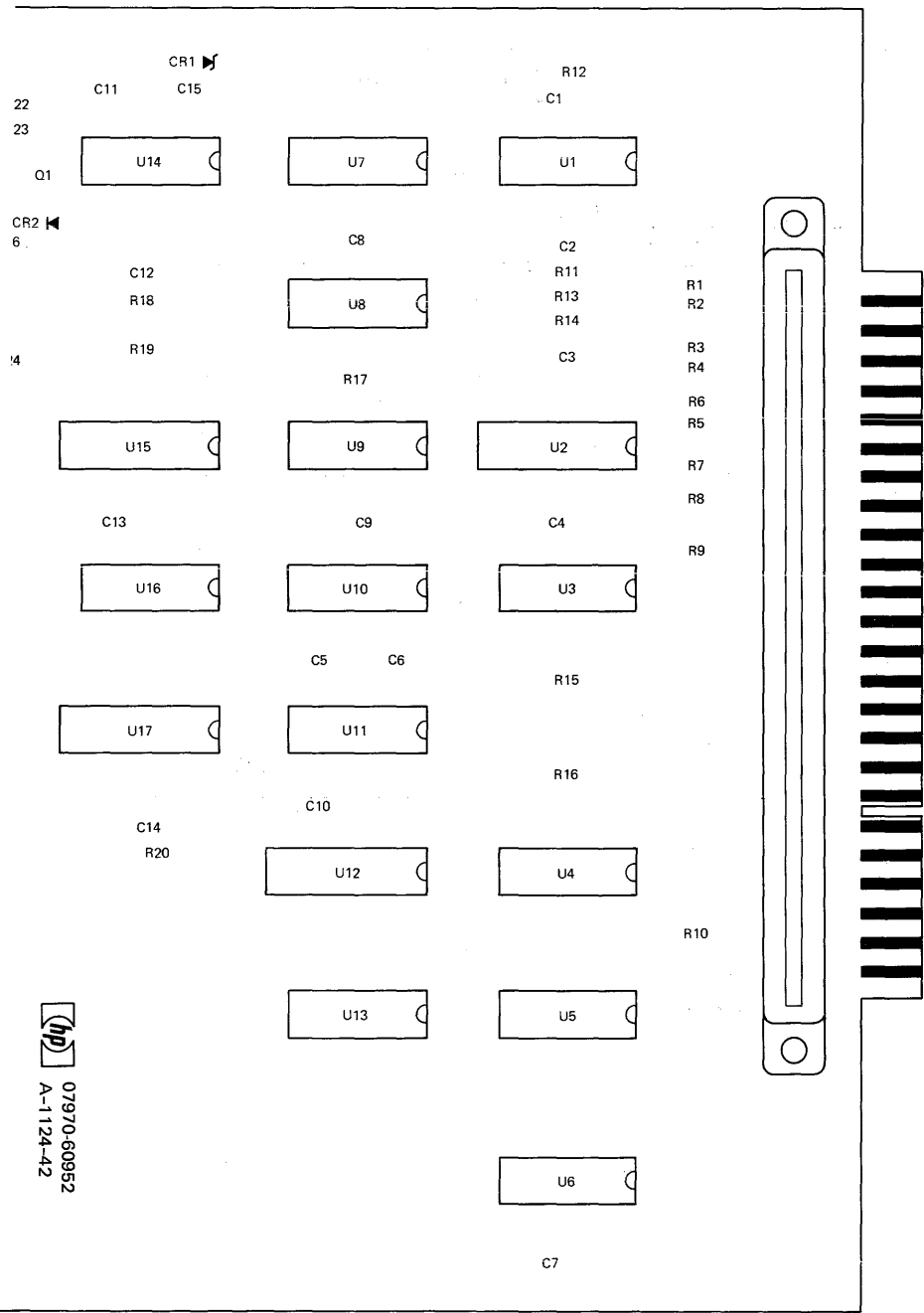
SEVEN-TRACK WRITE PARITY PCA (07970-60952; SERIES 1120)
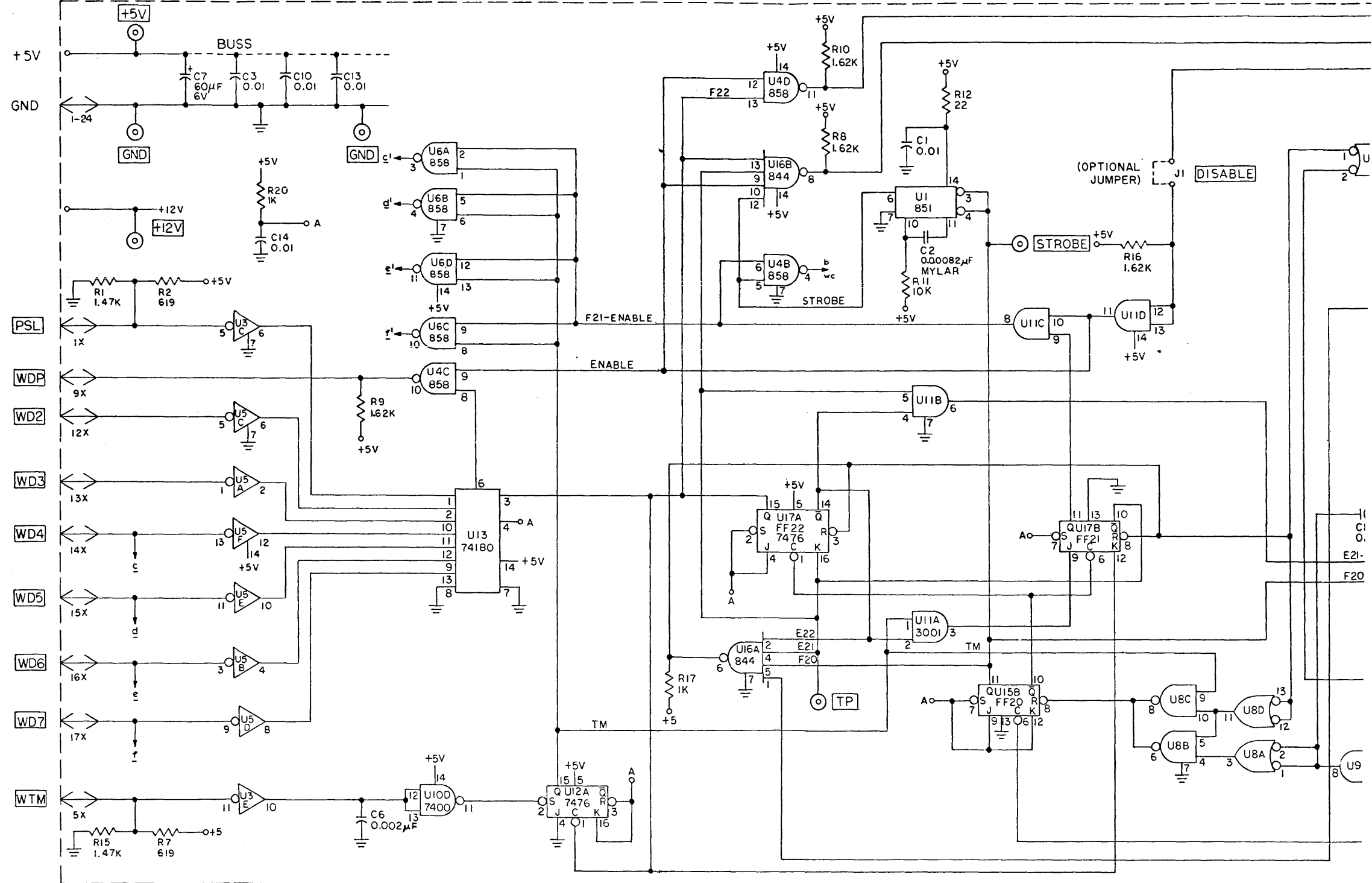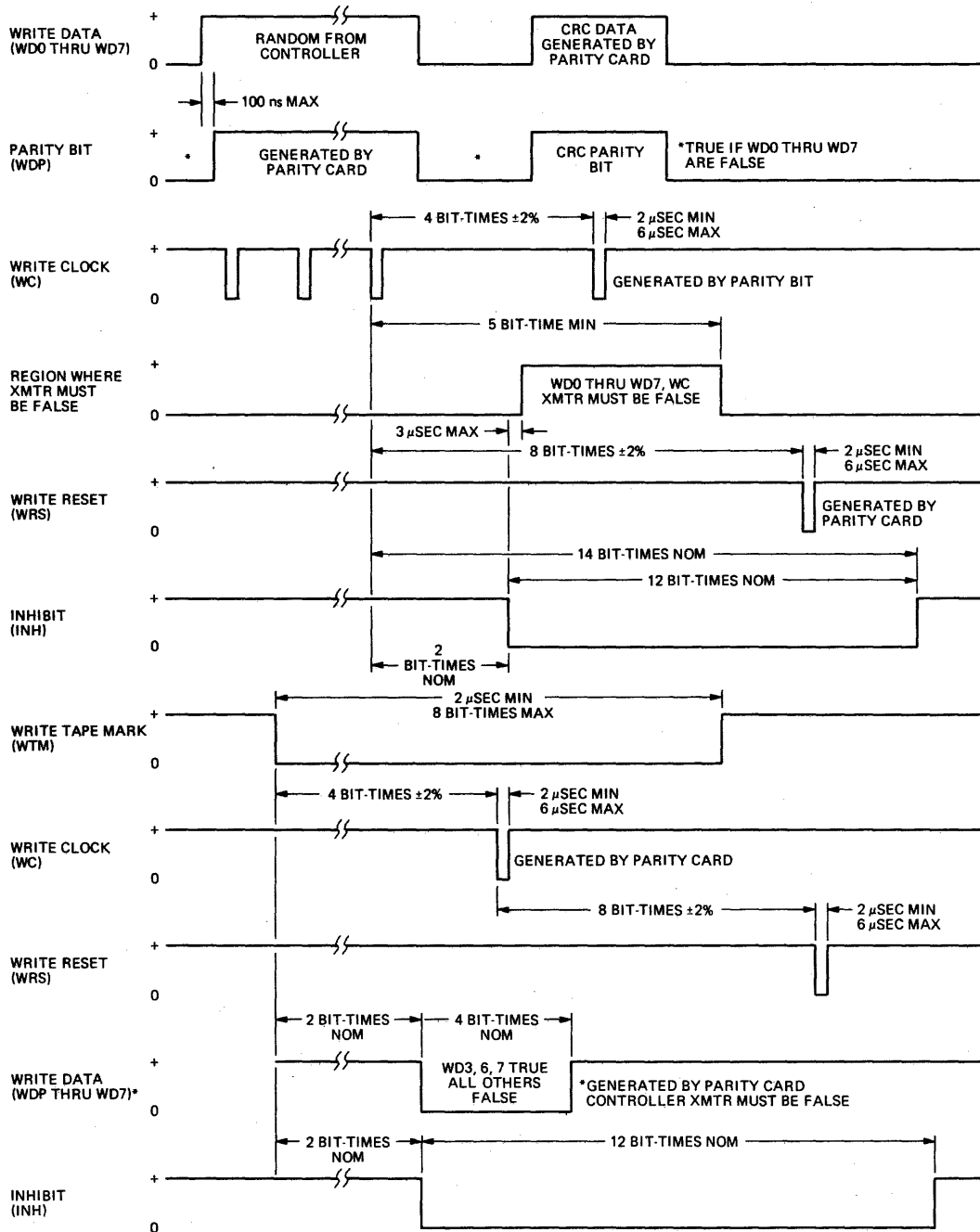
7970-321B

Figure 4-2. Seven-Track Write Parity Schematic and Parts Location Diagrams

UI	MC-851P	1820-0088
U2,I2,I5,I7	SN-7476N	1820-0076
U3,5	MC-837P	1820-0128
U4,6	MC-858P	1820-0256
U7	MC-849P	1820-0349
U8	MC-846P	1820-0094
U9,11	MC-3001P	1820-0141
U10	SN-7400N	1820-0054
UI3	SN-74180N	1820-0435
UI4	9601	1820-0207
UI6	MC-844P	1820-0348

CONTROL STATES

| STATE	F22	F21	F20	NEXT STATE
WTM FALSE				
A	0	0	I	B
B	0	0	0	C
C	I	0	I	D
D	I	0	0	A
WTM TRUE				
A	0	0	I	B
B	0	0	0	C
C	I	I	I	D
D	I	I	0	E
E	I	0	I	F
F	I	0	0	A

Figure 4-3. Nine-Track Write Parity Timing Diagram

13012A/13014A
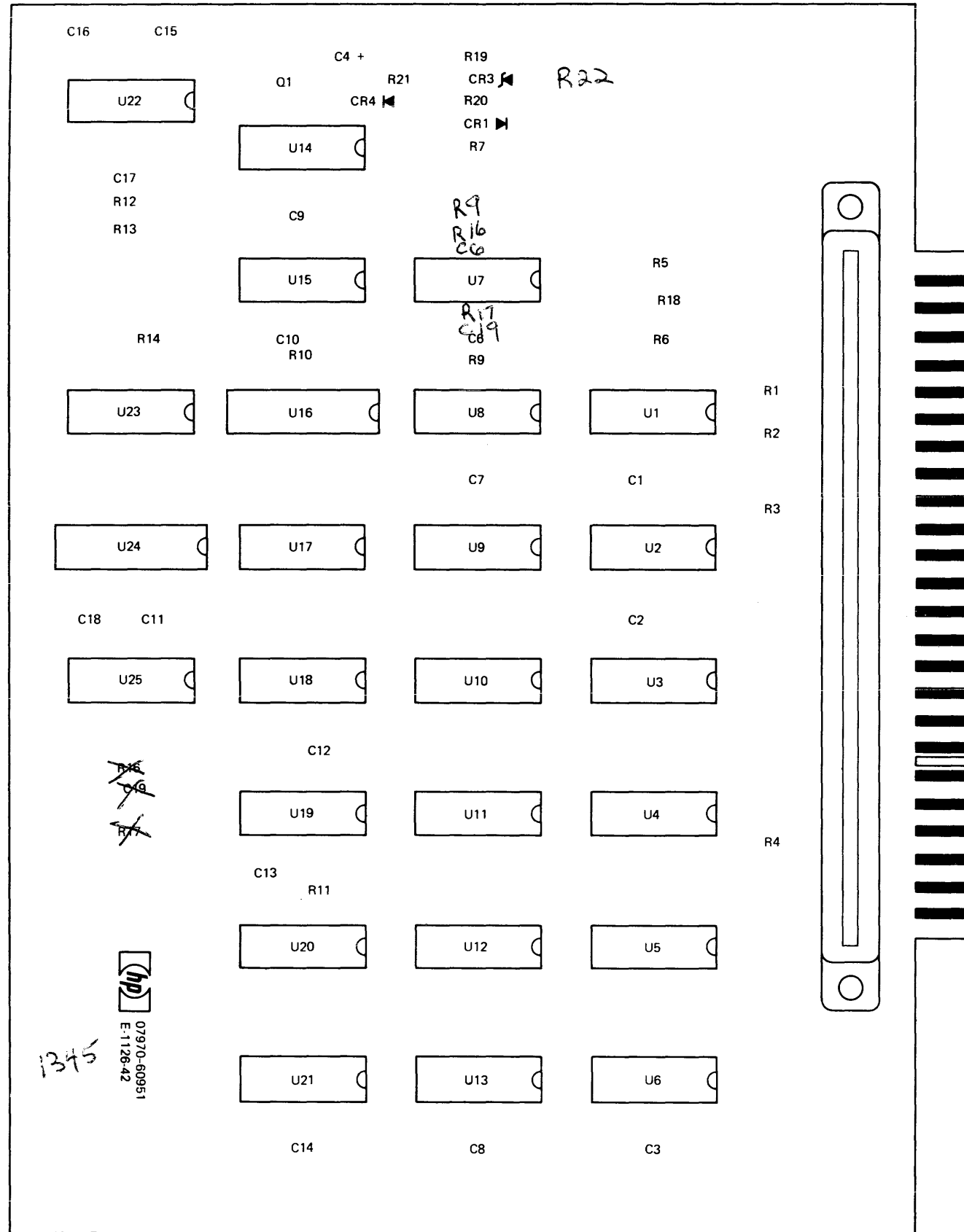
NINE-TRACK WRITE PARITY PCA (07970-60951; SERIES 1126) 13-45

NINE-TRACK WRITE PARITY PCA (07970-60951; SERIES 1126) 1345
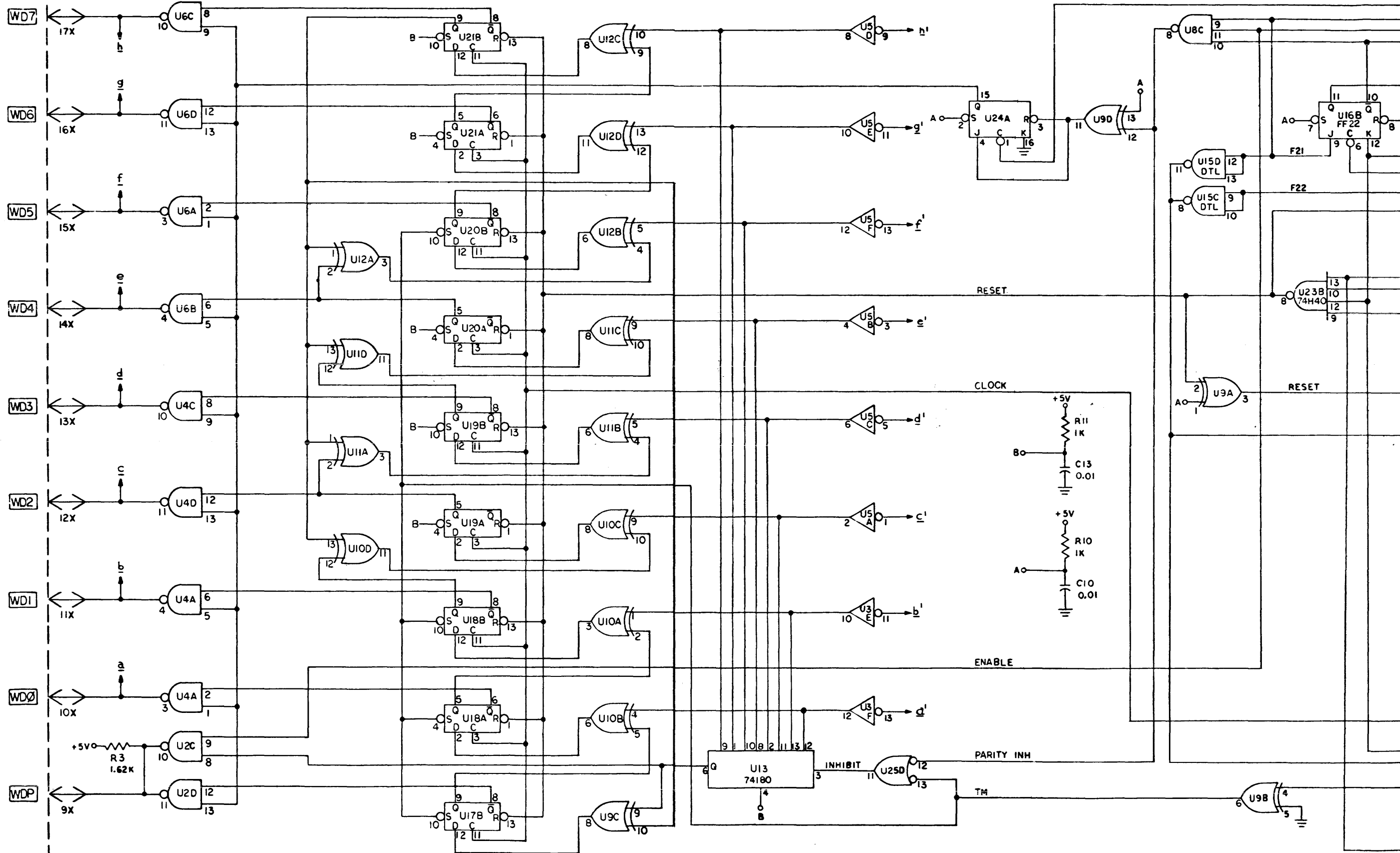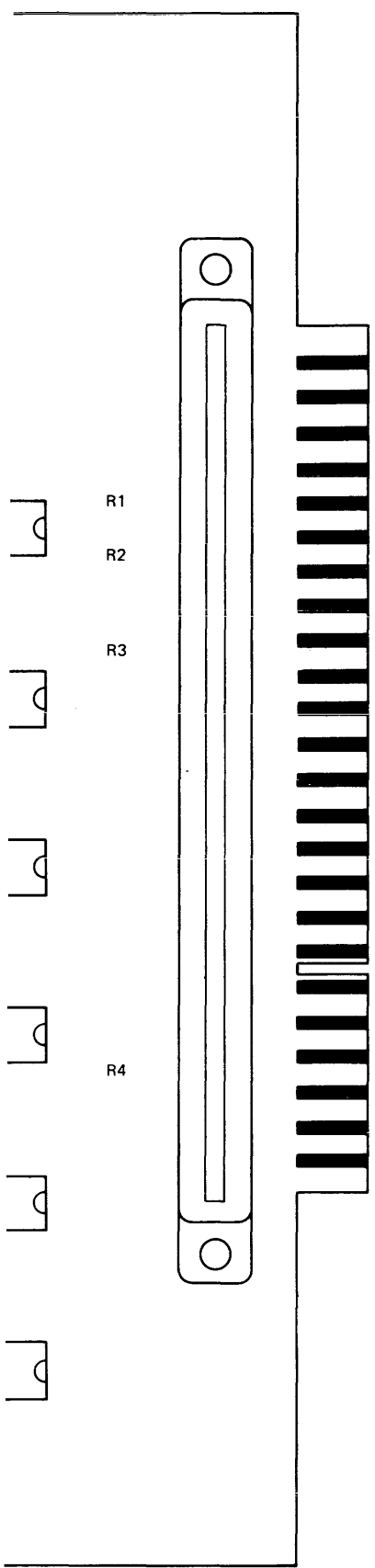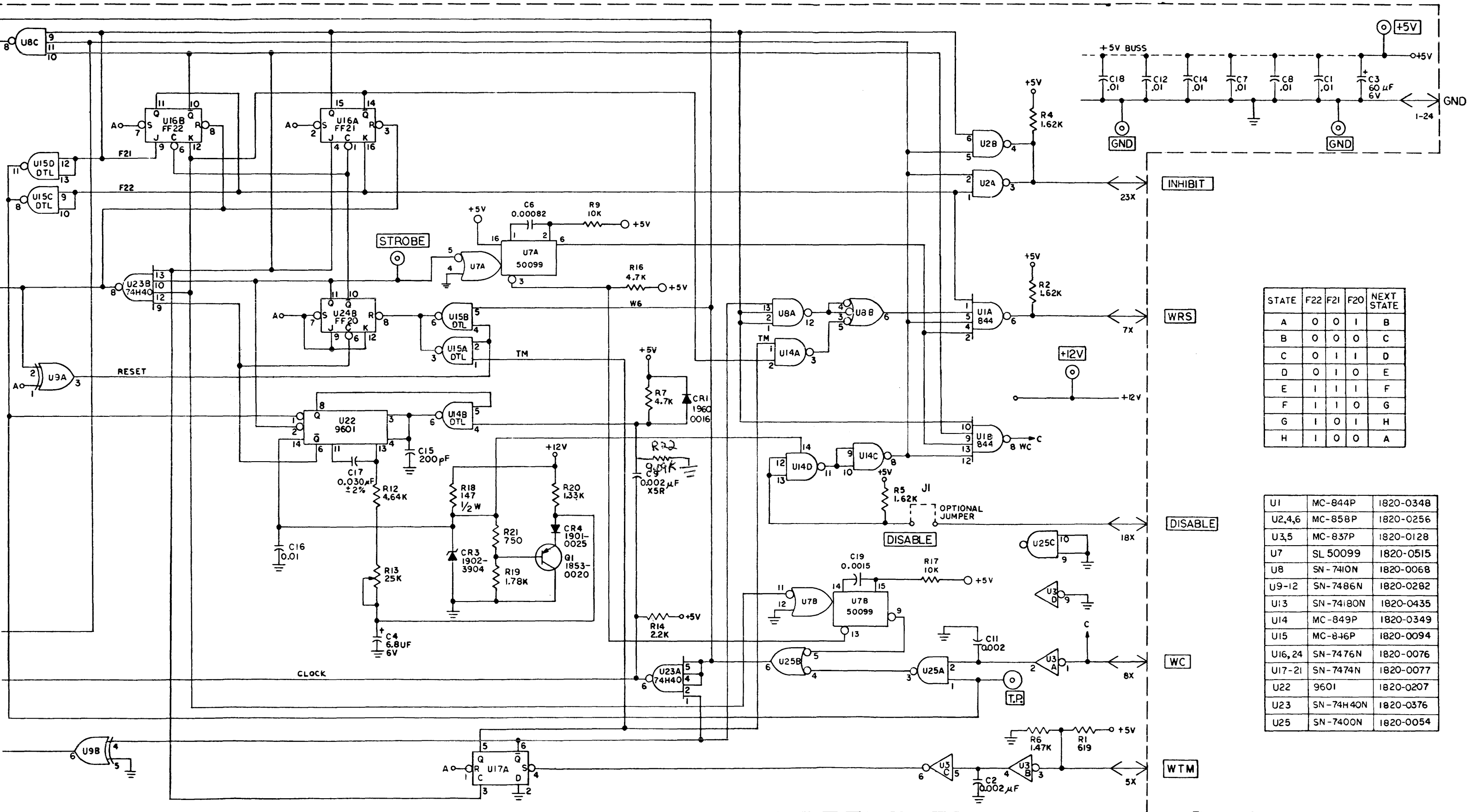
7970-319C

Figure 4-4. Nine-Track Write Parity Schematic and Parts Location Diagrams

STATE	F22	F21	F20	NEXT STATE
A	0	0	1	B
B	0	0	0	C
C	0	1	1	D
D	0	1	0	E
E	1	1	1	F
F	1	1	0	G
G	1	0	1	H
H	1	0	0	A

U1	MC-844P	1820-0348
U2,4,6	MC-858P	1820-0256
U3,5	MC-837P	1820-0128
U7	SL 50099	1820-0515
U8	SN-7410N	1820-0068
U9-12	SN-7486N	1820-0282
U13	SN-74180N	1820-0435
U14	MC-849P	1820-0349
U15	MC-846P	1820-0094
U16,24	SN-7476N	1820-0076
U17-21	SN-7474N	1820-0077
U22	9601	1820-0207
U23	SN-74H40N	1820-0376
U25	SN-7400N	1820-0054

4-5/4-6
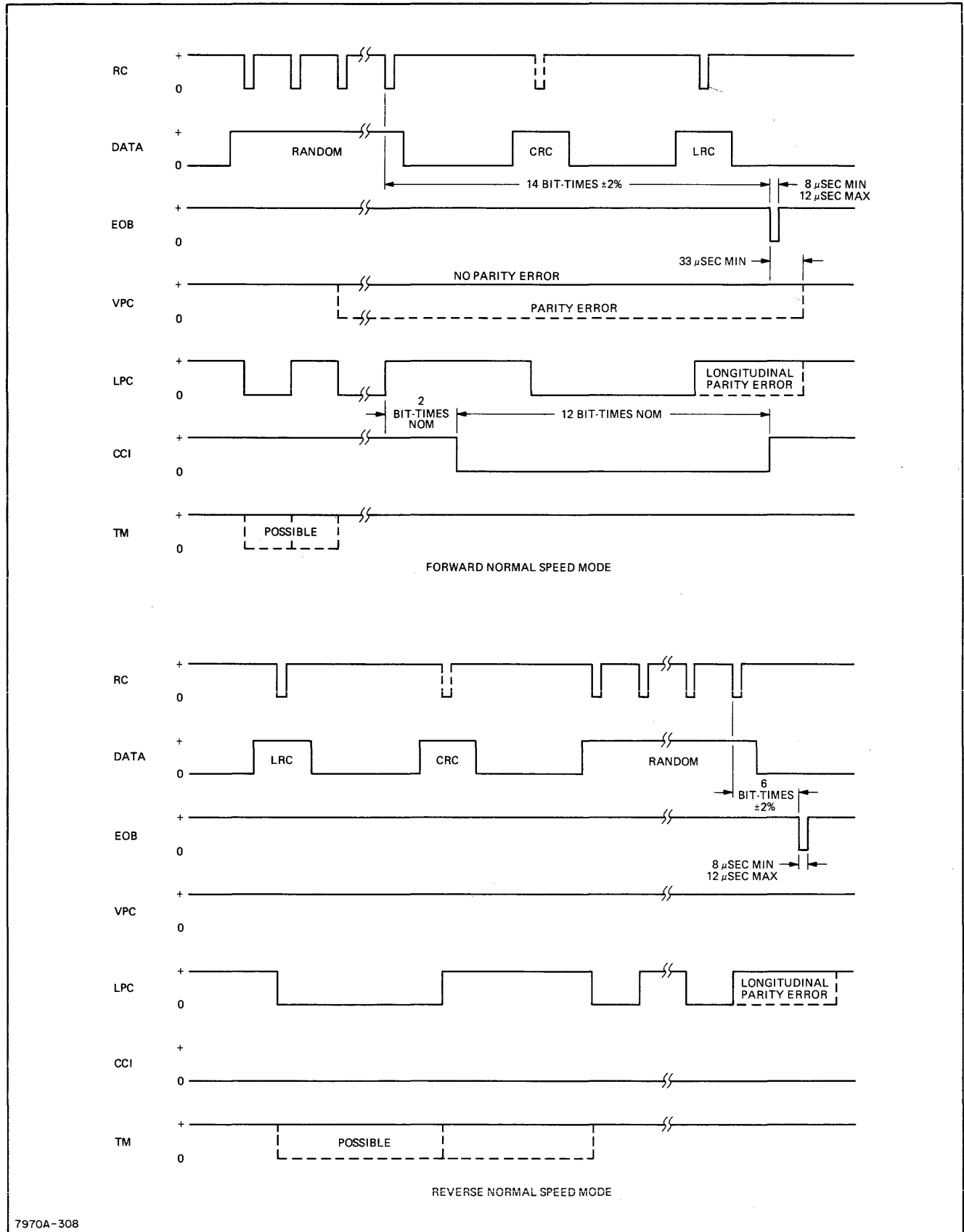
Figure 4-5. Nine-Track Read Timing Diagram (Normal Mode, Forward and Reverse)
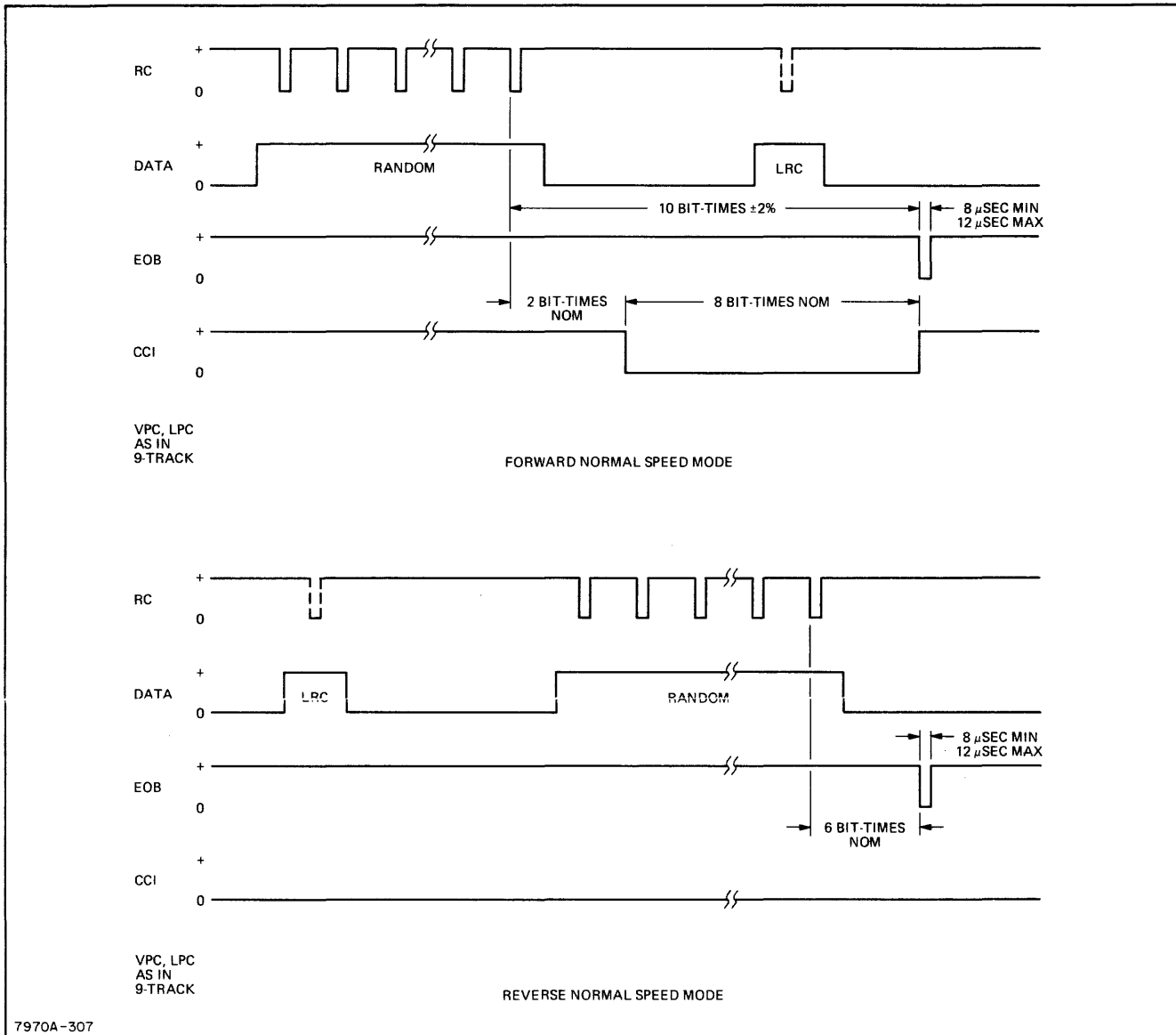
Figure 4-6. Seven-Track Read Timing Diagram (Normal Mode,
Forward and Reverse)

13012A/13014A

SEVEN- AND NINE-TRACK READ PARITY PCA (07970-60953, 07970-60950; SERIES 1120)

NOTE:
BOARD STRAPPED FOR
NINE-TRACK CONFIGURATION
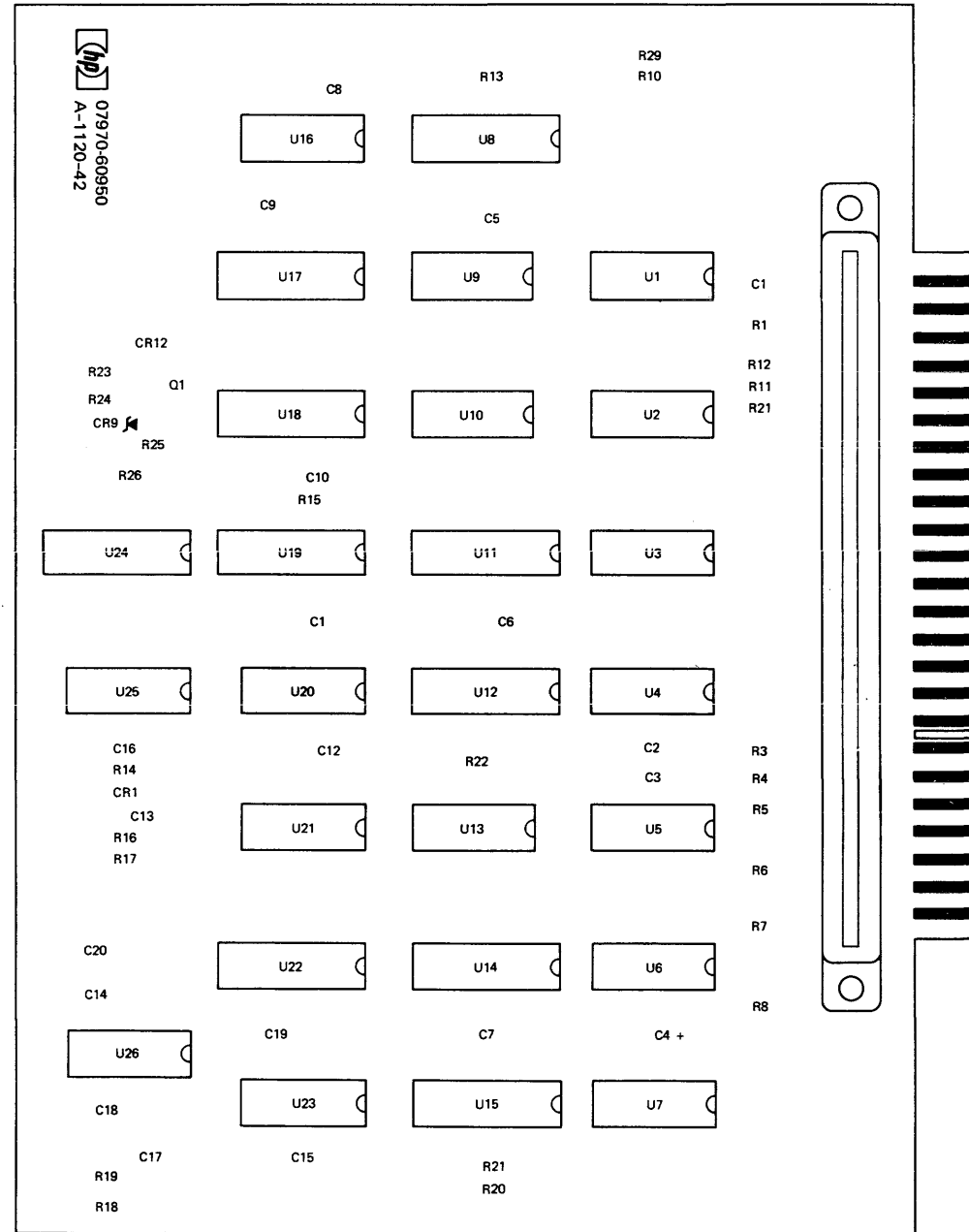
7970-317A
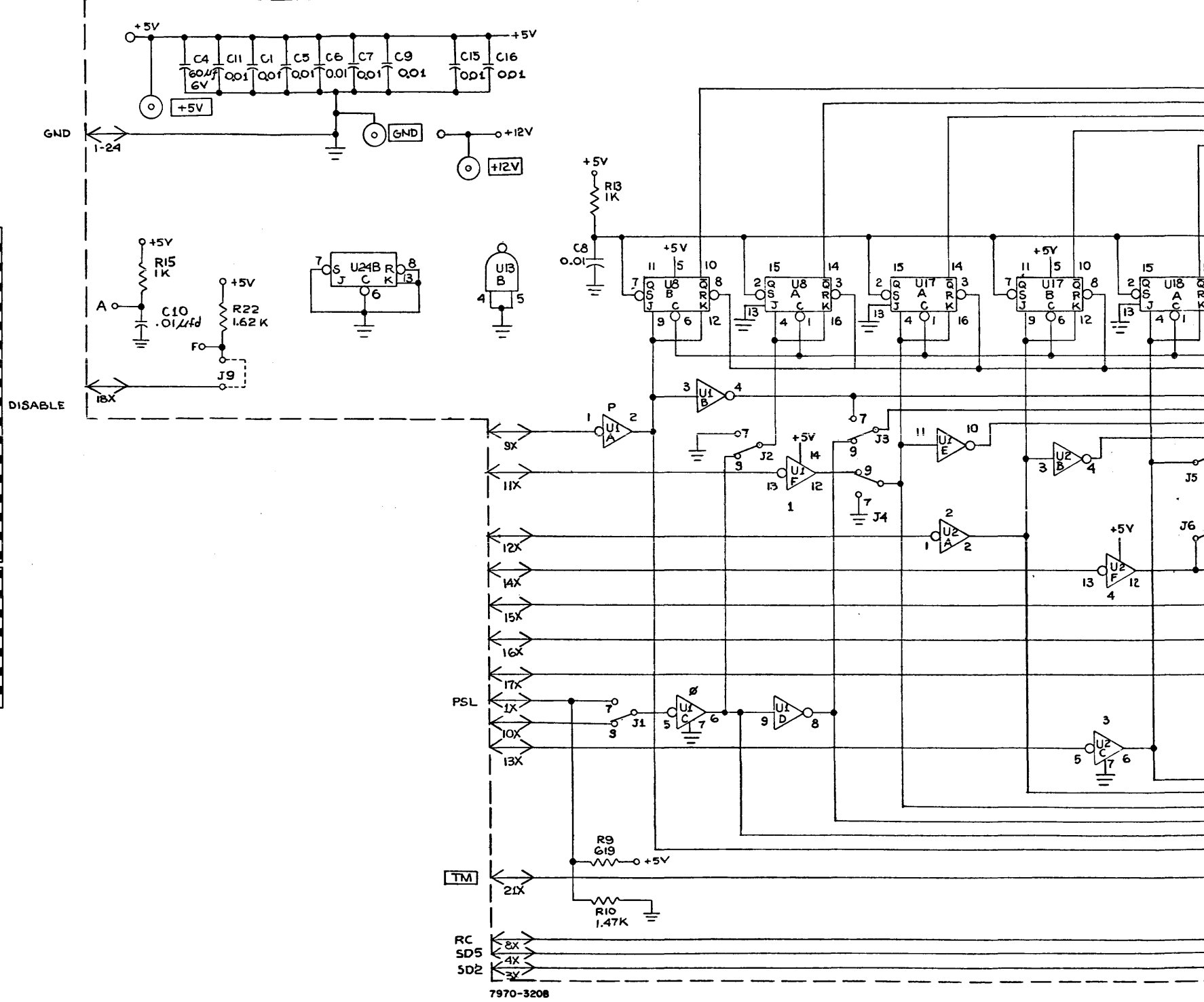
7970-3208

SEVEN- AND NINE-TRACK READ PARITY PCA (07970-60953, 07970-60950; SERIES 1120)

7970-3208
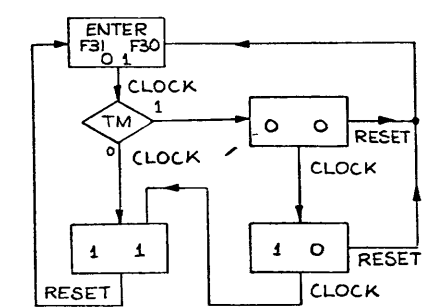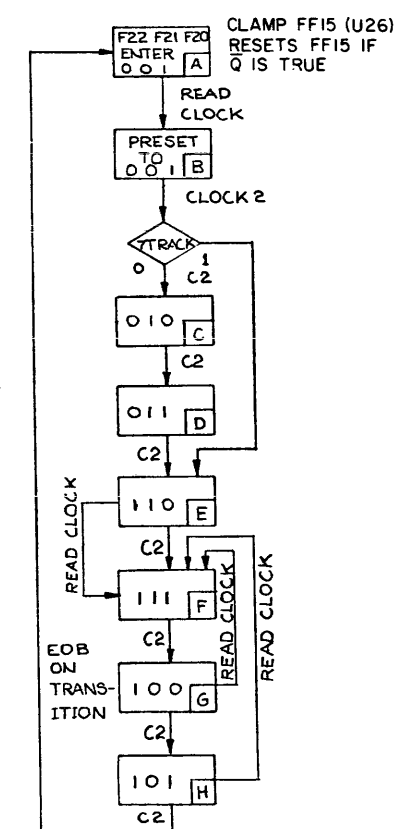
Figure 4-7. Read Parity Schematic and Parts Location Diagram

4-9/4-10

SECTION V

REPLACEABLE PARTS

5-1. INTRODUCTION.

5-2.   This section contains information for ordering replacement parts for the tape unit parity cards. Tables 5-1 through 5-3 list the parts in numerical order by HP part number for the seven-track write card, the nine-track write card, and the seven- and nine-track read cards, respectively. The tables list the following information for each part:

a. Hewlett-Packard part number.

b. Description of the part, including the reference designation(s). (Refer to table 5-4 for an explanation of abbreviations and reference designations used in the DESCRIPTION column.)

c. Total quantity of each part used on the respective card.

5-3.   Parts location diagrams for the cards are located in section IV of this manual.

5-4. ORDERING INFORMATION.

5-5.   To order replacement parts, address the order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to the list at the end of this manual for addresses.) Specify the following information for each part ordered:

a. Tape unit model and serial number.

b. Hewlett-Packard part number for each part.

c. Description of each part.

d. Circuit reference designation.

5-6.   Table 5-4 lists reference designations and abbreviations.

Table 5-1. Seven-Track Write Card Replaceable Parts

HP PART NUMBER	DESCRIPTION 1 2 3 4 5	UNITS PER ASSY
07970-60952	PRINTED CIRCUIT BOARD, 7-Track Write Parity	Ref
0698-3400	. RESISTOR, Fixed, 147 ohm, Film, 1%, 1/2W (R21)	1
0140-0198	. CAPACITOR, Fixed, 200 pF, Mica, 5%, 300 WVDC (C15)	1
1908-3094	. DIODE, Silicon, 5.11V, 2%, 40 mW (CR1)	1
0160-2055	. CAPACITOR, Fixed, 0.01 mF, Ceramic 100 WVDC (C9, C1, C4, ... C3, C10, C13, C11, C14)	8
0160-3449	. CAPACITOR, Fixed, 2000 pF, 10%, Ceramic, 250 WVDC (C8, ... C6, C5)	3
0683-1025	. RESISTOR, Fixed, 1k, Comp, 5%, 1/4W (R20, R17)	2
0683-2205	. RESISTOR, Fixed, 22 ohm, Comp, 5%, 1/4W (R12)	1
~~0160-2444~~ 0160-3534	. CAPACITOR, Fixed, 820 pF, Mylar, 10%, 200 WVDC (C2)	1
0757-0442	. RESISTOR, Fixed, 10k, Film, 1%, 1/8W (R11).	1
0698-3150	. RESISTOR, Fixed, 2.37k, Film, 1%, 1/8W (R13)	1
0698-0085	. RESISTOR, Fixed, 2.61k, Film, 1%, 1/8W (R14)	1
0757-1094	. RESISTOR, Fixed, 1.47k, Film, 1%, 1/8W (R15, R1, R3, R6)	4
0757-0418	. RESISTOR, Fixed, 619 ohm, Film, 1%, 1/8W (R2, R4, R5, R7)	4
0757-0428	. RESISTOR, Fixed, 1.62k, Film, 1%, 1/8W (R8, R16, R9, R10)	4
0180-0106	. CAPACITOR, 60 mF, Tantalum, 20%, 6 WVDC (C7).	1
2100-3138	. RESISTOR, Variable, 25k, 10%, 1W, Trimmer (R19)	1
0698-3155	. RESISTOR, Fixed, 4.64k, Film, 1%, 1/8W (R18)	1
0160-2277	. CAPACITOR, Fixed, 0.015 mF, Mica, 2%, 300 WVDC (C12)	1
0757-0317	. RESISTOR, Fixed, 1.33k, 1%, 1/8W (R24)	1
0180-1701	. CAPACITOR, Fixed, 6.8 mF, Tantalum, 20%, 6 WVDC (C16)	1
1901-0025	. DIODE, Silicon (CR2)	1
1853-0020	. TRANSISTOR, PNP, Silicon (Q1)	1
0757-0278	. RESISTOR, Fixed, 1.78k, Film, 1%, 1/8W (R23)	1
0757-0420	. RESISTOR, Fixed, 750 ohm, Film, 1%, 1/8W (R22)	1
1820-0207	. IC, TTL, Monostable Multivibrator, Type 9601 (U14)	1
1820-0349	. IC, DTL, 2-Input NAND gate, Type 849P (U7)	1
1820-0094	. IC, Type 846P (U8)	1
1820-0088	. IC, Type 851P (U1)	1
1820-0141	. IC, TTL, Quad 2-Input NAND Gate, Type 3001P (U9, U11)	2
1820-0076	. IC, Type 7476N (U2, U12, U15, U17).	4
1251-2025	. CONNECTOR, PC, 48 Cont	1
1820-0054	. IC, Quad 2-Input NAND Gate, Type 7400N (U10).	1
1820-0128	. IC, Inverter, Type 837P (U3, U5)	2
1820-0256	. IC, Quad 2-Input Nand Power Gate, Type 858P (U4, U6)	2
1251-2512	. BODY, R&P Connector	1
1251-2097	. CONTACT, Male	1
1251-2418	. CONTACT, Female	1
1820-0435	. IC, DGTL, Type 74180N (U13)	1
1820-0348	. IC, Type 844P (U16)	1

Table 5-2. Nine-Track Write Card Replaceable Parts

HP PART NUMBER	DESCRIPTION 1 2 3 4 5	UNITS PER ASSY
07970-60951	PRINTED CIRCUIT BOARD, 9-Track Write Parity	Ref
0160-2055	. CAPACITOR, Fixed, 0.01 mF, Ceramic (C16, C18, C12, ... C14, C7, C8, C1, C13, C10)	9
0140-0198	. CAPACITOR, Fixed, 200 pF, Mica (C15).	1
1853-0020	. TRANSISTOR, PNP, Silicon (Q1)	1
0180-1701	. CAPACITOR, Fixed, 6.8 mF, Tantalum, 6 WVDC (C4)	1
1901-0025	. DIODE, Silicon (CR4)	1
0757-0420	. RESISTOR, Fixed, 750 ohm, Film, 1%, 1/8W (R21)	1
0757-0278	. RESISTOR, Fixed, 1.78k, Film, 1%, 1/8W (R19)	1
~~1902-3904~~	. DIODE, Zener (CR3) .*9.102-3094*.	1
0757-0317	. RESISTOR, Fixed, 1.33k, Film, 1%, 1/8W (R20)	1
1910-0016	. DIODE, Germanium (CR1)	1
0683-4725	. RESISTOR, Fixed, 4.7k, Comp, 5%, 1/4W (R7, R16)	2
0160-2444	. CAPACITOR, Fixed, 820 pF, Mylar, 10%, 200 WVDC (C6)	1
0757-0428	. RESISTOR, Fixed, 1.62k, Film, 1%, 1/8W (R5,R2,R3,R4)	4
0698-3400	. RESISTOR, Fixed, 147 ohm, Metal Film, 1%, 1/2W (R18)	1
0757-1094	. RESISTOR, Fixed, 1.47k, Film, 1%, 1/8W (R6)	1
0757-0418	. RESISTOR, Fixed, 619 ohm, Film, 1%, 1/8W (R1)	1
0160-3449	. CAPACITOR, Fixed, 2000 pF, Ceramic, 10%, 250 WVDC (C2,C9,C11)	3
0180-0106	. CAPACITOR, Fixed, 60 mF, Tantalum, 20%, 6 WVDC (C3)	1
0683-1025	. RESISTOR, fixed, 1k, Comp, 5%, 1/4W (R10, R11)	2
0757-0442	. RESISTOR, Fixed, 10k, Film, 1%, 1/8W (R9, R17)	2
~~0160-0298~~	. CAPACITOR, Fixed, 1500 pF, Mylar, 10%, 250 WVDC (C19)*0160-2202*	1
0683-2225	. RESISTOR, Fixed, 2.2k, Comp, 5%, 1/4W (R14)	1
2100-3138	. RESISTOR, Variable, 25k, 10%, 1W, Trimmer (R13)	1
0698-3155 *0757-0288*	. RESISTOR, Fixed, 4.64k, Film, 1%, 1/8W (R12) *RESISTOR FIXED 20.5K FILM 1% 1/8 W R12*	1
0160-0943	. CAPACITOR, Fixed, 0.030 µF, Mica, 1%, 100 WVDC (C17)	1
1820-0207	. IC, TTL, Monostable Multivibrator, Type 9601 (U22)	1
1920-0349	. IC, DTL, 2-Input Nand Gate, Type 849P (U14)	1
1820-0515	. IC, Type SL50099 (U7)	1
1820-0068	. IC, Type 7410N (U8)	1
1820-0348	. IC, Type 844P (U1)	1
1251-2025	. CONNECTOR, PC, 48 Cont	1
1820-0282	. IC, DGTL, Quad, 1-Input Exclusive OR Gate, Type 7486N (U9 . . . U10, U11, U12)	4
1820-0256	. IC, Digital, Quad, 2-Input Nand Pwr Gate, Type 858P (U2, U4, U6) .	3
1820-0128	. IC, DTL, Hex Inverter, Type 837P (U3, U5)	2
1251-2512	. BODY, R&P Connector	1
1251-2097	. CONTACT, Male	1
1251-2418	. CONTACT, Female	1

Table 5-2. Nine-Track Write Card Replaceable Parts (Continued)

HP PART NUMBER	DESCRIPTION 1 2 3 4 5	UNITS PER ASSY
1820-0435	. IC, DGTL, 8 Bit Odd/Even Parity, Gen Check, Type 74180N (U13) . . .	1
1820-0077	. IC, Type 7474N (U17, U18, U19, U20, U21)	5
1820-0054	. IC, Quad 2-Input Nand Gate, Type 7400N (U25)	1
1820-0076	. IC, Type 7476N (U16, U24)	2
1820-0376	. IC, Dual 4-Input Nand Power Gate, Type SN74H40N (U23)	1
1820-0094	. IC, Type 846P (U15)	1

Table 5-3. Seven- and Nine-Track Read Card Replaceable Parts

HP PART NUMBER	DESCRIPTION 1 2 3 4 5	UNITS PER ASSY
07970-60950	PRINTED CIRCUIT BOARD, 9-Track Read Parity.	Ref
07970-60953	PRINTED CIRCUIT BOARD, 7-Track Read Parity.	Ref
0160-2055	. CAPACITOR, Fixed, Ceramic, 0.01 mF, 100 WVDC (C11, C1, C5, . . . C6, C7, C9, C15, C16, C17, C8, C2, C10, C3)	13
0683-1025	. RESISTOR, Fixed, 1k, Comp, 5%, 1/4W (R13, R15)	2
0757-0418	. RESISTOR, Fixed, 619 ohm, Film, 1%, 1/8W (R1, R2, R9).	3
0757-1094	. RESISTOR, Fixed, 1.47k, Metal Film, 1%, 1/2W (R10, R12, ... U11)	3
8159-0005	. STRAPPING LEAD, Electrical, 0.090 dia 1/4 long, 2 axial Leads	8
0757-0428	. RESISTOR, Fixed, 1.62k, Film, 1%, 1/8W (R22, R3, R4, R5, ... R6, R7, R8)	7
0180-0106	. CAPACITOR, Fixed, 60 μF, Tantalum, 20%, 6 WVDC (C4).	1
0698-0085	. RESISTOR, Fixed, 2.61k, Film, 1%, 1/8W (R21)	1
0698-3150	. RESISTOR, Fixed, 2.37k, Film, 1%, 1/8W (R20)	1
2100-3138	. RESISTOR, Variable, 25k, 10%, 1W, Trimmer (R18)	1
0698-3155	. RESISTOR, Fixed, 4.64k, Film, 1%, 1/8W (R9, R17).	2
0160-2277	. CAPACITOR, Fixed, 0.015 μF, Mica, 2%, 300 WVDC (C18)	1
0160-3449	. CAPACITOR, Fixed, 2000 pF, Ceramic, 10%, 250 WVDC . . . . . . (C19, C12)	2
0140-0198	. CAPACITOR, Fixed, 200 pF, Mica, 5%, 300 WVDC (C14)	1
0180-1701	. CAPACITOR, Fixed, 6.8 mF, Tantalum, 20%, 6 WVDC (C20)	1
0757-0279	. RESISTOR, Fixed, 3.16k, Film, 1%, 1/8W (R16)	1
0160-0161	. CAPACITOR, Fixed, 0.01 mF, Mylar (C13)	1
1901-0040	. DIODE, Silicon (CR1)	1
0683-1035	. RESISTOR, Fixed, 10k, 5%, 1/4W (R14)	1
0698-3400	. RESISTOR, Fixed, 147 ohm, Film, 1%, 1/2W (R26)	1
0757-0317	. RESISTOR, Fixed, 1.33k, Film, 1%, 1/8W (R25)	1
1901-0025	. DIODE, Silicon (CR2)	1
0757-0420	. RESISTOR, Fixed, 750 ohm, Film, 1%, 1/8W (R24)	1
0757-0278	. RESISTOR, Fixed, 1.78k, Film, 1%, 1/8W (R12)	1

Table 5-3. Seven- and Nine-Track Read Card Replaceable Parts (Continued)

HP PART NUMBER	DESCRIPTION 1 2 3 4 5	UNITS PER ASSY
1853-0020	. TRANSISTOR, PNP, Silicon (Q1)	1
1902-3904	. DIODE (CR3)	1
1820-0454	. IC, DGTL, 10-IN NAND, DTL, Type 1805P (U16, U10)	2
1820-0076	. IC, Type 7476, JK, FF (U8, U17, U18, U24, U19, U11, U12, ... U22, U14, U15)	10
1820-0435	. IC, DGTL, Type SN74180N (U9)	1
1820-0128	. IC, DTL, Hex Inverter, Type 837P (U1, U3, U2)	3
1820-0348	. IC, Type 844P (U4)	1
1820-0054	. IC, Type 7400N (U13, U21, U20, U6)	4
1820-0256	. IC, Digital, Quad, 2-Input Nand, Type 858P (U5)	1
1251-2025	. CONNECTOR, PC, 48 pin, Ribbon Type	1
1251-2512	. BODY, R & P Connector	1
1251-2097	. CONTACT, Male	1
1251-2418	. CONTACT, Female	1
1820-0141	. IC, TTL, Quad, 2-Input and Gate, Type 3001P (U7)	1
1820-0349	. IC, DTL, 2-Input Nand Gate, Type 849P (U23)	1
1820-0207	. IC, TTL, Monostable Multivibrator, Type 9601 (U26)	1
1820-0376	. IC, TTL, Type 74H40 (U25)	1

Table 5-4. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A	= assembly	K	= relay	TB	= terminal board
B	= motor, synchro	L	= inductor	TP	= test point
BT	= battery	M	= meter	U	= integrated circuit, non-repairable assembly
C	= capacitor	P	= plug connector		
CB	= circuit breaker	Q	= semiconductor device other than diode or microcircuit	V	= vacuum tube, photocell, etc.
CR	= diode				
DL	= delay line			VR	= voltage regulator
DS	= indicator	R	= resistor	W	= cable, jumper
E	= Misc electrical parts	RT	= thermistor	X	= socket
F	= fuse	S	= switch	Y	= crystal
FL	= filter	T	= transformer	Z	= tuned cavity, network
J	= receptacle connector				

ABBREVIATIONS

A	= amperes	gra	= gray	PCA	= printed-circuit assembly
ac	= alternating current	grn	= green	PWB	= printed-wiring board
ad	= anode			ph	= Phillips head
Al	= aluminum	H	= henries	pk	= peak
AR	= as required	Hg	= mercury	p-p	= peak-to-peak
adj	= adjust	hr	= hour(s)	pt	= point
assy	= assembly	Hz	= hertz	PIV	= peak inverse voltage
		hdw	= hardware	PNP	= positive-negative-positive
B	= base	hex	= hexagon, hexagonal	PWV	= peak working voltage
bp	= bandpass			porc	= porcelain
bpi	= bits per inch	ID	= inside diameter	posn	= position(s)
blk	= black	IF	= intermediate frequency	pozi	= pozidrive
blu	= blue	in.	= inch, inches		
brn	= brown	I/O	= input/output	rf	= radio frequency
brs	= brass	int	= internal	rdh	= round head
Btu	= British thermal unit	incl	= include(s)	rmo	= rack mount only
Be Cu	= beryllium copper	insul	= insulation, insulated	rms	= root-mean-square
		impgrg	= impregnated	RWV	= reverse working voltage
C	= collector	incand	= incandescent	rect	= rectifier
cw	= clockwise	ips	= inches per second	r/min	= revolutions per minute
ccw	= counterclockwise			RTL	= resistor-transistor logic
cer	= ceramic	k	= kilo (10^3), kilohm		
cmo	= cabinet mount only			s	= second
com	= common	lp	= low pass	SB, TT	= slow blow
crt	= cathode-ray tube			Se	= selenium
CTL	= complementary-transistor logic	m	= milli (10^{-3})	Si	= silicon
		M	= mega (10^6), megohm	scr	= silicon controlled rectifier
cath	= cathode	My	= Mylar	sil	= silver
cd pl	= cadmium plate	mfr	= manufacturer	sst	= stainless steel
comp	= composition	mom	= momentary	stl	= steel
conn	= connector	mtg	= mounting	spcl	= special
compl	= complete	misc	= miscellaneous	spdt	= single-pole, double-throw
		Met Ox	= metal oxide	spst	= single-pole, single-throw
dc	= direct current	mintr	= miniature	semicond	= semiconductor
dr	= drive				
DTL	= diode-transistor logic	n	= nano (10^{-9})	Ta	= tantalum
depc	= deposited carbon	n.c.	= normally closed or no connection	td	= time delay
dpdt	= double-pole, double-throw			Ti	= titanium
dpst	= double-pole, single-throw	Ne	= neon	tgl	= toggle
		no.	= number	thd	= thread
E	= emitter	n.o.	= normally open	tol	= tolerance
ECL	= emitter-coupled logic	np.	= nickel plated	TTL	= transistor transistor logic
ext	= external	NPN	= negative-positive-negative		
encap	= encapsulated	NPO	= negative-positive zero (zero temperature coefficient)		
elctlt	= electrolytic			U(μ)	= micro (10^{-6})
		NSR	= not separately replaceable		
F	= farads	NRFR	= not recommended for field replacement	V	= volt(s)
FF	= flip-flop			var	= variable
flh	= flat head			vio	= violet
Flm	= film	OD	= outside diameter	VDCW	= direct current working volts
Fxd	= fixed	OBD	= order by description		
filh	= fillister head	orn	= orange	W	= watts
		ovh	= oval head	ww	= wirewound
G	= giga (10^9)	oxd	= oxide	wht	= white
Ge	= germanium			WIV	= working inverse voltage
gl	= glass	p	= pico (10^{-12})		
gnd	= ground(ed)	PC	= printed circuit	yel	= yellow

APPENDIX A
BACKDATING INFORMATION

This backdating appendix provides information for making this manual applicable to earlier versions of the HP 13012A/ 13014A Read/Write Parity Accessory Kits. Series numbers of earlier kit versions and corresponding changes to adapt this manual to those versions are listed in the table below.

Description	HP Part No.	Rev	Changes
Seven-Track Write Parity	07970-60952	1035	1,2
Nine-Track Write Parity	07970-60951	1035	2,3,5,6
Seven-Track Read Parity	07970-60953	1035	2,4
Nine-Track Read Parity	07970-60950	1035	2,4
Nine-Track Write Parity	07970-60951	1124	5,6

CHANGE   DESCRIPTION

1   Page 4-3, figure 4-2; page 5-2, table 5-1.

                      a. Change capacitor C12 from 0.015 μF, part no. 0160-2277 to 0.017 μF, part no. 0140-0166.

                      b. Change resistor R19 from 25k, part no. 2100-3138 to 20k, part no. 2100-1972.

2   Page 4-1, tables 4-1 and 4-2. Delete entries for 45 ips operation.

3   Page 4-5, figure 4-4; page 5-3, table 5-2.

                      a. Change capacitor C17 from 0.030 μF, 19%, part no. 0160-0943 to 0.034 μF, 2%, part no. 0160-2278.

                      b. Change capacitor C19 from 0.001 μF, part no. 0160-3456 to 0.005 μF, part no. 0160-3458.

                      c. Change resistor R13 from 25k, part no. 2100-3138 to 20k, part no. 2100-1972.

4   Page 4-9, figure 4-7; page 5-4, table 5-3.

                      a. Change capacitor C18 from 0.015 μF, part no. 0160-2277 to 0.017 μF, part no. 0140-0166.

                      b. Change resistor R18 from 25k, part no. 2100-3138 to 20k, part no. 2100-1972.

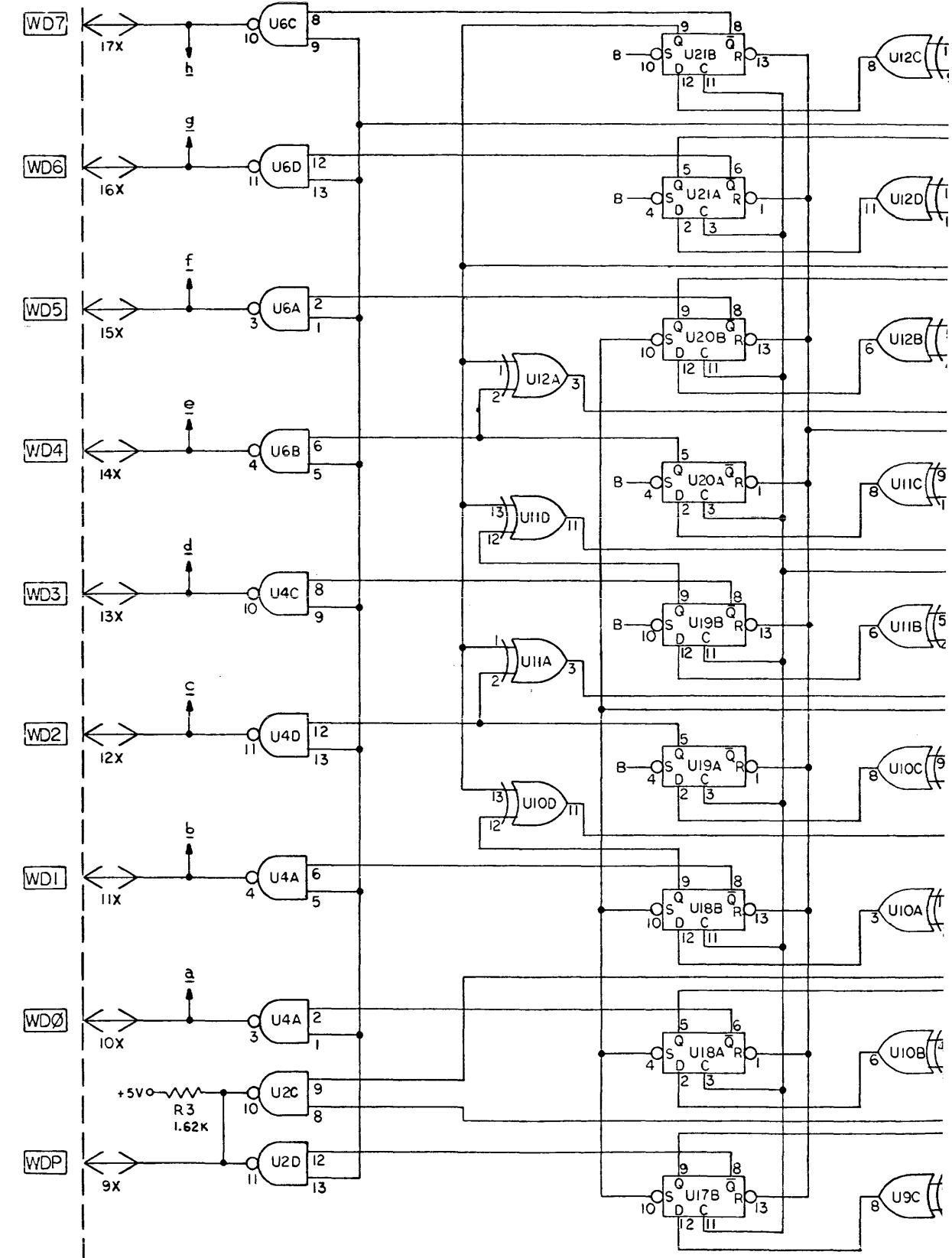5   Page 4-5, figure 4-4. Delete figure 4-4 and replace with figure A-1.

6   Page 5-3, table 5-2.

                      a. Add "C5" to description of part no. 0160-2055 and change units per assy from 9 to 10.

                      b. Delete capacitor C19, part no. 0160-0298.

                      c. Delete IC U7, part no. 1920-0515.

                      d. Delete "R9" from description of part no. 0757-0442 and change units per assy from 2 to 1.

                      e. Add the following:

HP PART NUMBER	DESCRIPTION	UNITS PER ASSY
0683-2205	. RESISTOR, Fixed, 22 ohm, Comp, 5%, 1/4W (R8)	1
0683-1035	. RESISTOR, Fixed, 10k, Comp, 5%, 1/4W (R9)	1
1901-0040	. DIODE, Silicon (CR2)	1
0160-0298	. CAPACITOR, Fixed, 1500 pF, Mylar, 10%, 250 WVDC (C19) .	1
0683-1835	. RESISTOR, Fixed, 18k, Comp, 5%, 1/4W (R15)	1
1820-0515	. IC, Type SL50099 (U7)	1
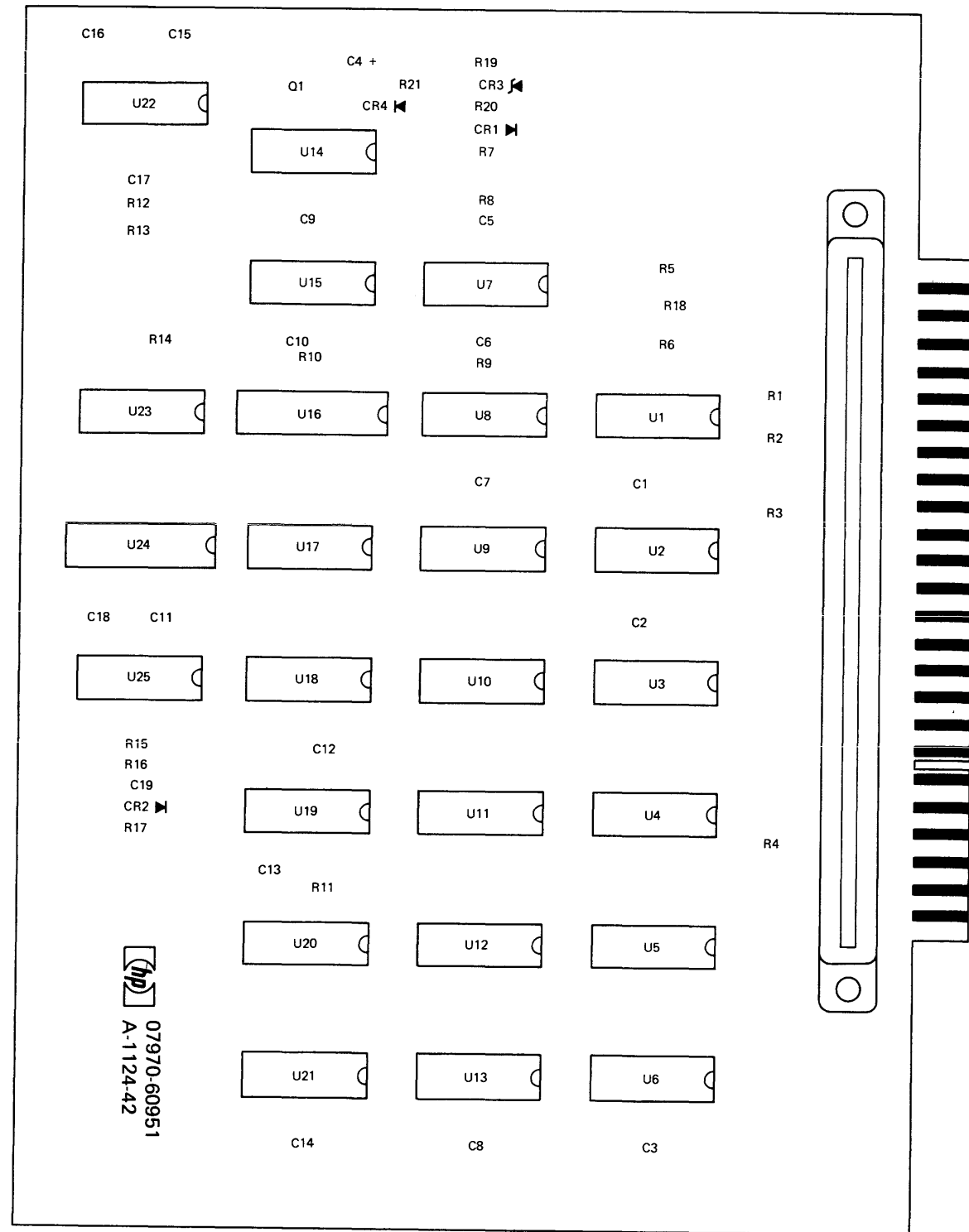
7970-318A

NINE-TRACK WRITE PARITY PCA (07970-60951; SERIES 1124)
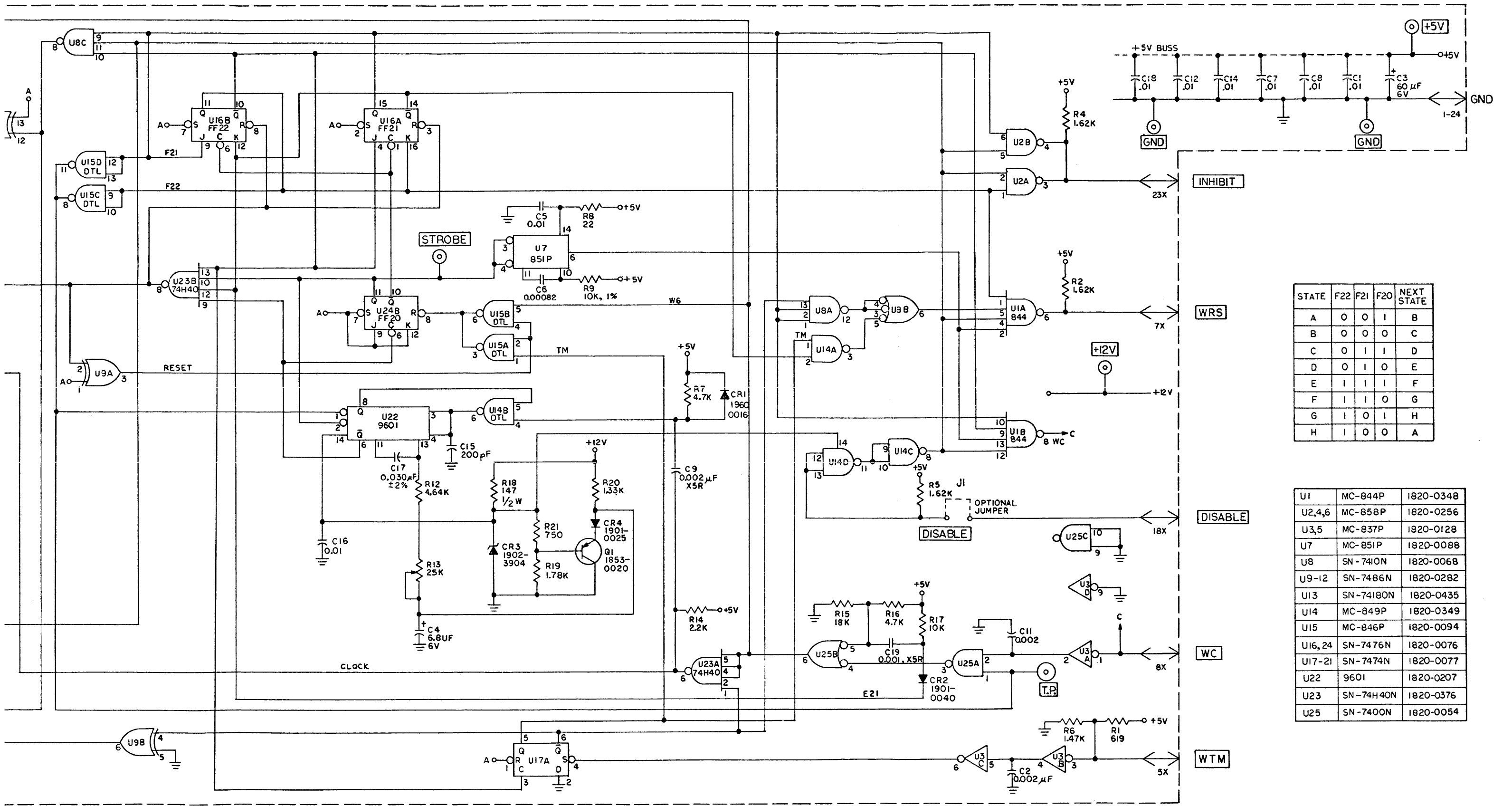
7970-319B

NINE-TRACK WRITE PARITY PCA (07970-60951; SERIES 1124)

7970-319B

STATE	F22	F21	F20	NEXT STATE
A	0	0	1	B
B	0	0	0	C
C	0	1	1	D
D	0	1	0	E
E	1	1	1	F
F	1	1	0	G
G	1	0	1	H
H	1	0	0	A

U1	MC-844P	1820-0348
U2,4,6	MC-858P	1820-0256
U3,5	MC-837P	1820-0128
U7	MC-851P	1820-0088
U8	SN-7410N	1820-0068
U9-12	SN-7486N	1820-0282
U13	SN-74180N	1820-0435
U14	MC-849P	1820-0349
U15	MC-846P	1820-0094
U16,24	SN-7476N	1820-0076
U17-21	SN-7474N	1820-0077
U22	9601	1820-0207
U23	SN-74H40N	1820-0376
U25	SN-7400N	1820-0054

Figure A-1. Nine-Track Write Parity Schematic and Parts Location Diagrams

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