



HP 13255

SIMPLIFIED KEYBOARD MODULE

Manual Part No. 13255-91069

PRINTED

MAY-23-78

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NOTE: This document is part of the 264XX DATA TERMINAL product series Technical Information Package (HP 13255).

1.0 INTRODUCTION.

The Simplified Keyboard Module substitutes the Simplified Keyboard Assembly (02640-60068) and the Simplified Keyboard PCA (02640-60069) for the General Purpose Keyboard Assembly and the Keyboard PCA. Parts lists and detailed description for the Keyboard Interface PCA are contained in the keyboard interface module section.

2.0 OPERATING PARAMETERS.

A summary of operating parameters for the Simplified Keyboard Module is contained in tables 1.0 through 5.3.

Table 1.0 Physical Parameters

Part Number	Nomenclature	Size (L x W x D) +/-0.100 Inches	Weight (Pounds)
02640-60069	Simplified Keyboard PCA	16.8 x 7.1 x 2.1	2.75

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Table 2.0 Reliability and Environmental Information

Environmental: (X) HP Class B () Other:
Restrictions: Type tested at product level
Failure Rate: 1.542 (percent per 1000 hours)

Table 3.0 Power Supply and Clock Requirements - Measured
(At +/-5% Unless Otherwise Specified)

+5 Volt Supply @ 400 mA	+12 Volt Supply @ 100 mA	-12 Volt Supply @ 80 mA	-42 Volt Supply @ mA
			NOT APPLICABLE
115 volts ac @ A		220 volts ac @ A	
NOT APPLICABLE		NOT APPLICABLE	
Clock Frequency:		MHz	
NOT APPLICABLE			

Table 4.0 Connector Information

Connector and Pin No.	Signal Name	Signal Description
J3, Pin 1	GND	} Ground
- 2	GND	
- 3	BADDR3	Positive True, Column Address Bit 3
- 4	<u>BBUS4</u>	Negative True, Buffered Data Bus Bit 4
- 5	<u>BBUS5</u>	Negative True, Buffered Data Bus Bit 5
- 6	<u>BBUS7</u>	Negative True, Buffered Data Bus Bit 7
- 7	<u>BBUS6</u>	Negative True, Buffered Data Bus Bit 6
- 8	<u>READ . COL15</u>	Negative True, Enables Reading the Column 0-13. Not asserted for Columns 14 & 15
- 9		Not Used
-10	LED EN	Strobes Data into LED Latches
-11	BEEP	Triggers Beeper Circuit
-12	+12V	+12 Volt Power Supply
-13	+5V	+5 Volt Power Supply
-14	-12V	-12 Volt Power Supply
-15	CHASSIS GND	Grounds the Switchplate

Table 4.1 Connector Information

Connector and Pin No.	Signal Name	Signal Description
J4, Pin 1	PON	Resets the Terminal
- 2	+5V	+5 Volt Power Supply
- 3	COL OUT EN	Strobes Data into Column's Previous State in Input Register
- 4	BBUS3	Negative True, Buffered Data Bus Bit 3
- 5	BBUS0	Negative True, Buffered Data Bus Bit 0
- 6	BBUS2	Negative True, Buffered Data Bus Bit 2
- 7	BBUS1	Negative True, Buffered Data Bus Bit 1
- 8	BADDR2	Positive True, Column Address Bit 2
- 9	BADDR1	Positive True, Column Address Bit 1
-10	BADDR0	Positive True, Column Address Bit 0

Table 5.0 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Output a column's previous state into Simplified Keyboard PCA's input register	X	ADDR 15
Poll Bit: Not Applicable	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (0011)	X	ADDR 12
	0	ADDR 11
	0	ADDR 10
	1	ADDR 9
Function Specifier: ADDR 5 = 1	X	ADDR 8
	0	ADDR 7
	X	ADDR 6
	1	ADDR 5
	1	ADDR 4
	X	ADDR 3
	X	ADDR 2
Data Bus Bit Interpretation: Each data bit is associated with a switch in a column. If the bit is set to 1, it indicates that the switch was previously depressed. The column to which the value is applied is specified by a subsequent switch read as indicated in table 5.1.	X	ADDR 1
	X	ADDR 0
	B7	BUS 7
	B6	BUS 6
	B5	BUS 5
	B4	BUS 4
	B3	BUS 3
	B2	BUS 2
	B1	BUS 1
	B0	BUS 0
		1=Logical 1=Bus Low
		0=Logical 0=Bus High
		X=Don't Care

Table 5.1 Module Bus Pin Assignments

Function Performed:	Value	Bus Signal
Read switches in column "n" as determined by A3, A2, A1, and A0	X	ADDR 15
Poll Bit: Not Applicable	X	ADDR 14
	X	ADDR 13
Module Address: (ADDR 11,10,9,4) = (0011)	X	ADDR 12
	0	ADDR 11
	0	ADDR 10
	1	ADDR 9
Function Specifier: ADDR 0,1,2,3, are used to specify which keyboard column is to be read. The column number specified must be less than 14 (decimal)	X	ADDR 8
	0	ADDR 7
	X	ADDR 6
	X	ADDR 5
	1	ADDR 4
	A3	ADDR 3
	A2	ADDR 2
Data Bus Bit Interpretation: Each data bit is associated with a switch in a column. If the switch is depressed, the data bit is 1. (Refer to figure 1 for a cross-reference of key numbers to the physical switches on the keyboard.)	A1	ADDR 1
	A0	ADDR 0
	B7	BUS 7
	B6	BUS 6
	B5	BUS 5
	B4	BUS 4
	B3	BUS 3
	B2	BUS 2
	B1	BUS 1
	B0	BUS 0
	1=Logical 1=Bus Low	
	0=Logical 0=Bus High	
	X=Don't Care	

Column	Address	DATA BUS BIT											
A3	A2	A1	A0	B7	B6	B5	B4	B3	B2	B1	B0		
0	0	0	0	007	006	005	004	003	002	001	000		
0	0	0	1	017	016	015	014	013	012	011	010		
0	0	1	0	027	026	025	024	023	022	021	020		
0	0	1	1	037	036	-	034	033	032	031	030		
0	1	0	0	047	046	-	044	043	042	041	040		
0	1	0	1	057	-	-	054	053	052	051	050		
0	1	1	0	-	-	-	064	063	062	061	-		
0	1	1	1	-	-	075	074	073	072	071	070		
1	0	0	0	-	-	105	104	103	102	101	100		
1	0	0	1	-	116	115	114	113	112	111	110		
1	0	1	0	127	126	125	124	123	122	121	120		
1	0	1	1	137	136	-	134	133	132	131	130		
1	1	0	0	147	-	-	144	-	142	141	140		
1	1	0	1	157	-	-	154	-	152	151	150		

Table 5.2 Module Bus Pin Assignments

Function Performed:	Read data comm switches on Simplified Keyboard PCA. (Refer to figure 1 for physical location of data comm switches and their positions.)	Value	bus Signal
		X	ADDR 15
		X	ADDR 14
Poll Bit:	Not Applicable	X	ADDR 13
		X	ADDR 12
Module Address:	(ADDR 11,10,9,4) = (0011)	0	ADDR 11
		0	ADDR 10
		1	ADDR 9
Function Specifier:	ADDR 0,1,2,3 = (1111)	X	ADDR 8
		0	ADDR 7
		X	ADDR 6
		X	ADDR 5
Data Bus Bit Interpretation:		1	ADDR 4
		1	ADDR 3
		1	ADDR 2
		1	ADDR 1
		1	ADDR 0
		B7	BUS 7
		B6	BUS 6
		B5	BUS 5
B6	Not assigned, always 0	B4	BUS 4
		B3	BUS 3
		B2	BUS 2
		B1	BUS 1
		B0	BUS 0
			1=Logical 1=Bus Low
			0=Logical 0=Bus High
			X=Don't Care

Switch 1	
Position	0 1
B7	1 0

Switch 2			
Position	0	1	2
B5	0	0	1
B4	0	1	0

Switch 3								
Position	0	1	2	3	4	5	6	7
B3	0	0	0	0	1	1	1	1
B2	0	0	1	1	0	0	1	1
B1	0	1	0	1	0	1	0	1

B0	Not assigned, always 0
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Table 5.3 Module Bus Pin Assignments

Function Performed:	Write LED latch and trigger alarm generator (Beep)	Value	Bus Signal
Poll Bit:	Not Applicable	X	ADDR 15
Module Address:	(ADDR 11,10,9,4) = (0011)	X	ADDR 14
		X	ADDR 13
		X	ADDR 12
		0	ADDR 11
		0	ADDR 10
		1	ADDR 9
Function Specifier:	ADDR 5 = 0	X	ADDR 8
		0	ADDR 7
		X	ADDR 6
		0	ADDR 5
		1	ADDR 4
		X	ADDR 3
		X	ADDR 2
Data Bus Bit Interpretation:		X	ADDR 1
		X	ADDR 0
B7	When Set, Beeper is triggered	B7	BUS 7
		B6	BUS 6
		B5	BUS 5
B6	When Set, LED #7 is turned on	B4	BUS 4
		B3	BUS 3
		B2	BUS 2
		B1	BUS 1
B5	When Set, LED #6 is turned on	B0	BUS 0
		===== 1=Logical 1=Bus Low 0=Logical 0=Bus High X=Don't Care =====	
B4	When Set, LED #5 is turned on		
B3	When Set, LED #4 is turned on		
B2	When Set, LED #3 is turned on		
B1	Not Used		
B0	When Set, LED #1 is turned on		

3.0 FUNCTIONAL DESCRIPTION. Refer to the switch location diagram (figure 1), block diagram (figure 2), schematic diagram (figure 3), timing diagram (figure 4), component location diagram (figure 5), and parts lists (02640-60069) located in the appendix.

The Simplified Keyboard PCA consists of a column decoder, an 8 by 14 key matrix, ramp generator, differential comparator circuits, an output register (data taken by processor), an input register (receives previous state of the key switches from processor), data comm logic, and a LED register.

3.1 COLUMN DECODER. The column decoder selects one column in the key matrix when binary address ADDR0 through ADDR3 is applied.

3.2 KEY MATRIX.

3.2.1 The key switches are arranged in a matrix of 8 rows and 14 columns. The matrix is scanned column by column, so that eight switches at a time are read.

3.2.2 The key switch used is a LICON type consisting of a ferrite core, a drive wire, a sense wire, and two magnets. When the switch is in the undepressed state, the two magnets are in close proximity to the core, thus saturating the core and inhibiting the coupling of a signal from the drive wire to the sense wire. When the switch is depressed, two magnets are moved away from the core and a signal is coupled from the drive wire to the sense wire. All switches in one column are connected serially by drive lines and switches in one row are connected serially by sense lines. One side of the drive lines is connected to the column decoder (U5 and U7), and the other side to the ramp generator (to collector of Q2). Eight sense lines are connected to differential comparators on one side and are grounded on the other end. After the column decoder selects a column and the ramp generator is enabled, then drive current (80 milliamperes) flows through the selected column. Depressed keys in the selected column couple the drive signal to the sense line which is then applied to the differential comparator.

3.3 RAMP GENERATOR.

3.3.1 When a RD . COL15 signal is applied to the ramp generator, the current is enabled into the selected column. The current rises linearly from 0 to 80 milliamperes in 80 nanoseconds.

3.3.2 The ramp generator is a combination of a Miller integrator (transistor Q1, resistor R35, and capacitor C5) and a current mirror (transistors Q3 and Q2). When the RD . COL15 signal is applied to the input, the collector of transistor Q1 falls to ground according to the transit time determined by R35 and C5. The collector current of Q1 rises linearly and is determined by resistors R39 and R36. Since the same base emitter voltage is applied to Q2 and Q3, the emitter current of Q2 "reflects" the current of Q3. This current flows through the selected column of the matrix. Nominally, the current rises from 0 to 80 milliamperes in 80 nanoseconds. The function of R37 (10 kilohms) is to bias the drive lines to ground when Q2 is off and no column is selected.

3.4 DIFFERENTIAL COMPARATORS.

3.4.1 The eight sense lines out of the key matrix are fed into the eight differential comparators. Each depressed switch generates a pulse on the corresponding row when its column is scanned. Differential comparators translate this pulse into the required TTL level.

3.4.2 Differential comparators are MC1414 or equivalent. Sense lines are fed into the minus input and are terminated by a 200-ohm resistor. Threshold is determined by resistor network (47K, 47K, 1.2K) and the previous state held in the input register. When the previous state is "0", the threshold is set to 200 millivolts and when "1", it is 100 millivolts. The differential comparator timing is shown in figure 4. When the processor wants to read one column, it puts the binary address of the column on the terminal data bus and the column decoder selects the corresponding drive line for the column. Approximately 200 nanoseconds

after the column has been selected, the RD . COL15 signal comes true and turns on the ramp generator. This current is transformed into sense lines only on those switches that are depressed. The sense pulse is approximately 400 millivolts in amplitude and 80 nanoseconds wide at the base. Differential comparators set the corresponding bits in the output register.

- 3.5 OUTPUT REGISTER. Outputs of the differential comparators set the corresponding bits in an 8-bit output register. Signals RD . COL15 and DATA OUT EN (on the Keyboard Interface PCA) enable the result of the selected column on the terminal data bus.
- 3.6 INPUT REGISTER. Before a column is read, the previous state of that column is sent from the processor to the input register. Outputs of this register determine the threshold of the differential comparators. If the previous state of a switch was "0", the threshold is 200 millivolts; if it was "1", then the threshold is 100 millivolts. This causes hysteresis in the key travel since the sense pulse amplitude is proportional to the key depression.
- 3.7 DATA COMM LOGIC. The data communications logic contains a baud rate encoder and the keyboard data communications switches. Eight positions of the rotary BAUD RATE switch (Switch 3) are encoded into three binary bits. The 3-position PARITY switch (Switch 2), is encoded into two bits. The 2-position DUPLEX switch (Switch 1) uses one bit for detection. When column 15 is addressed, the RD . COL15 (U8, Pin 10) signal is decoded and the data comm byte is released to the terminal data bus. (Refer to table 5.2 for more details.)
- 3.8 LED REGISTER. The LED register is loaded with six data bits when a LED EN signal is decoded. Outputs of this latch drive six LED indicators.

ITCH IS NOT
MATRIX

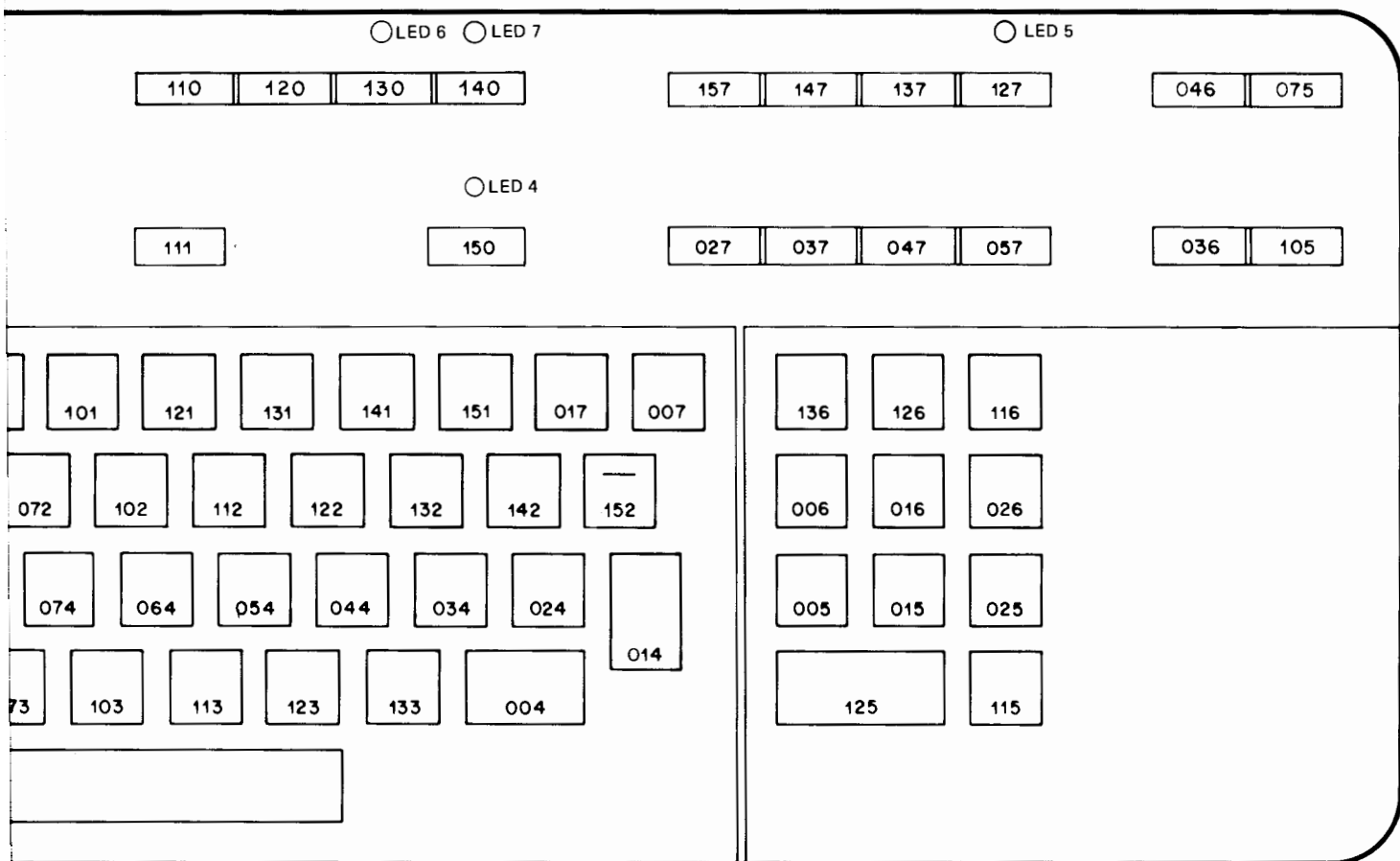
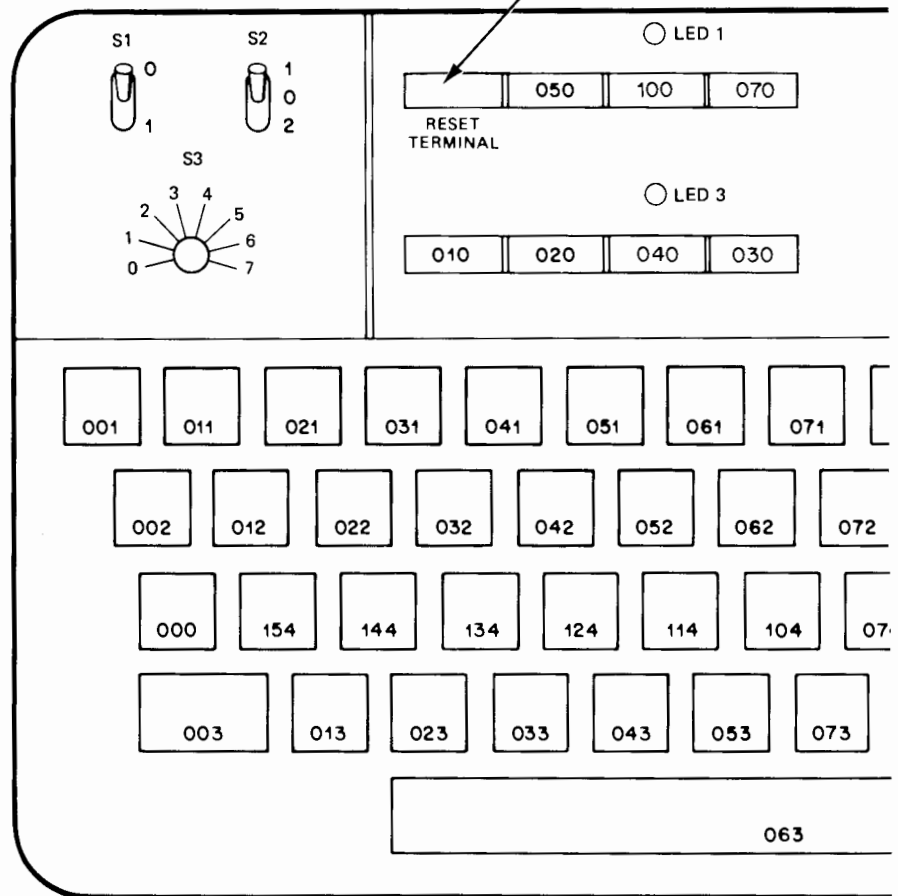


Figure 1
Simplified Keyboard Switch Location Diagram
MAY-23-78 13255-91069

RESET TERMINAL SWITCH IS PART OF THE KEY MATRIX



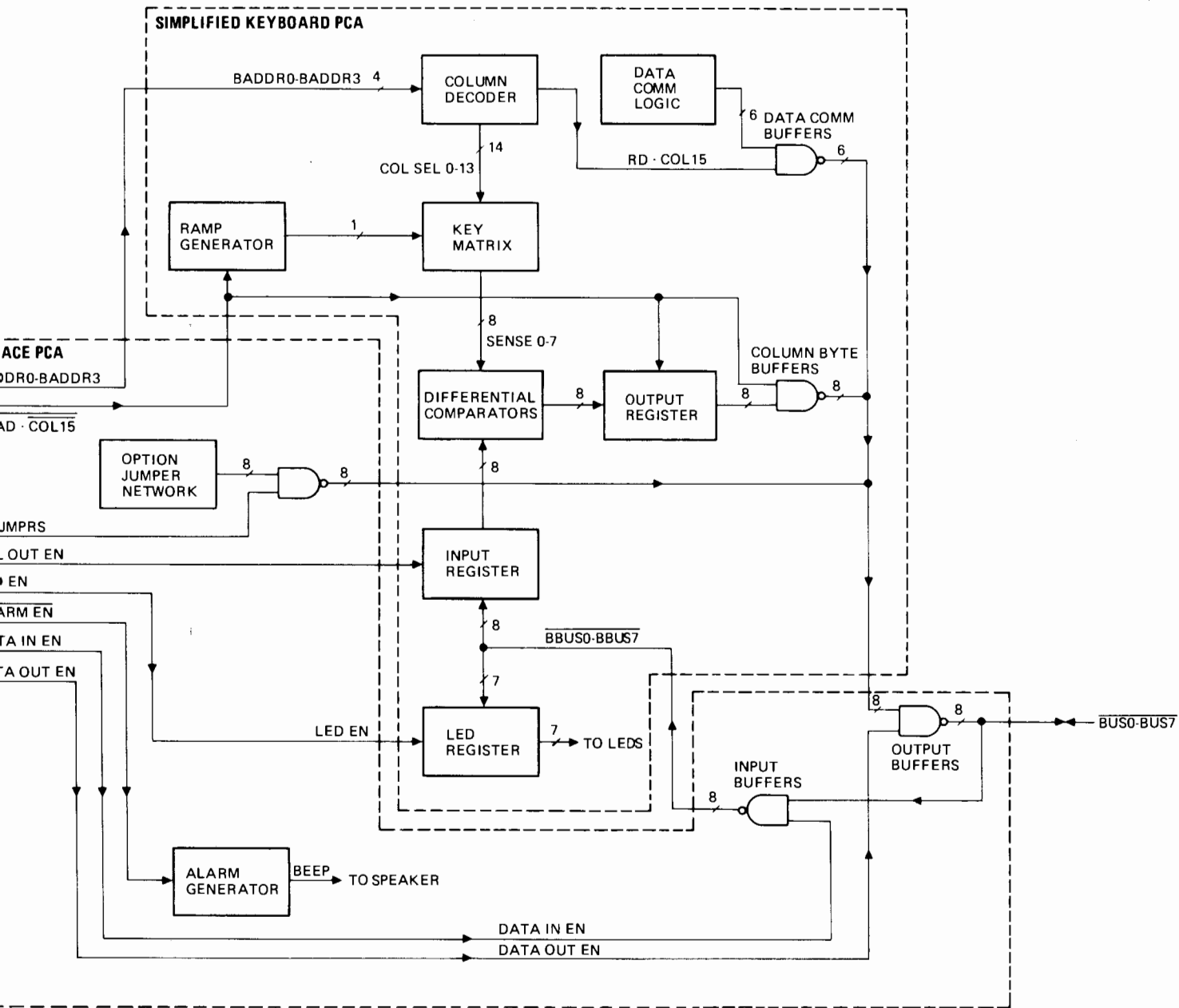
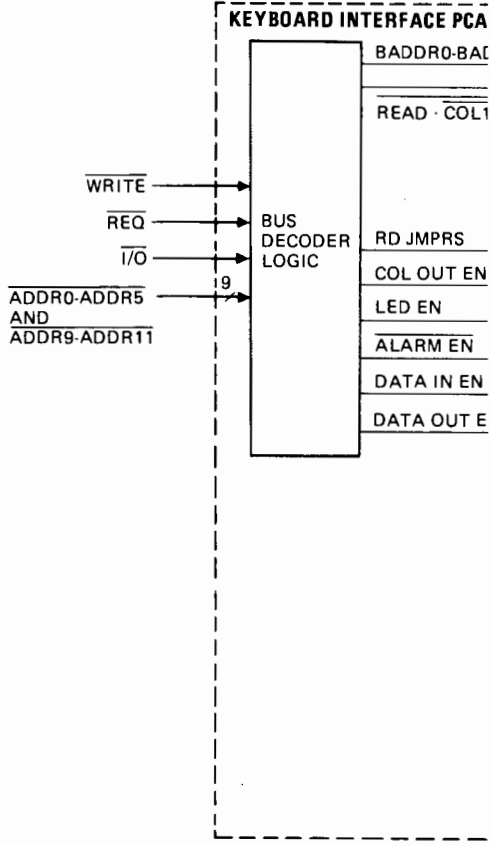
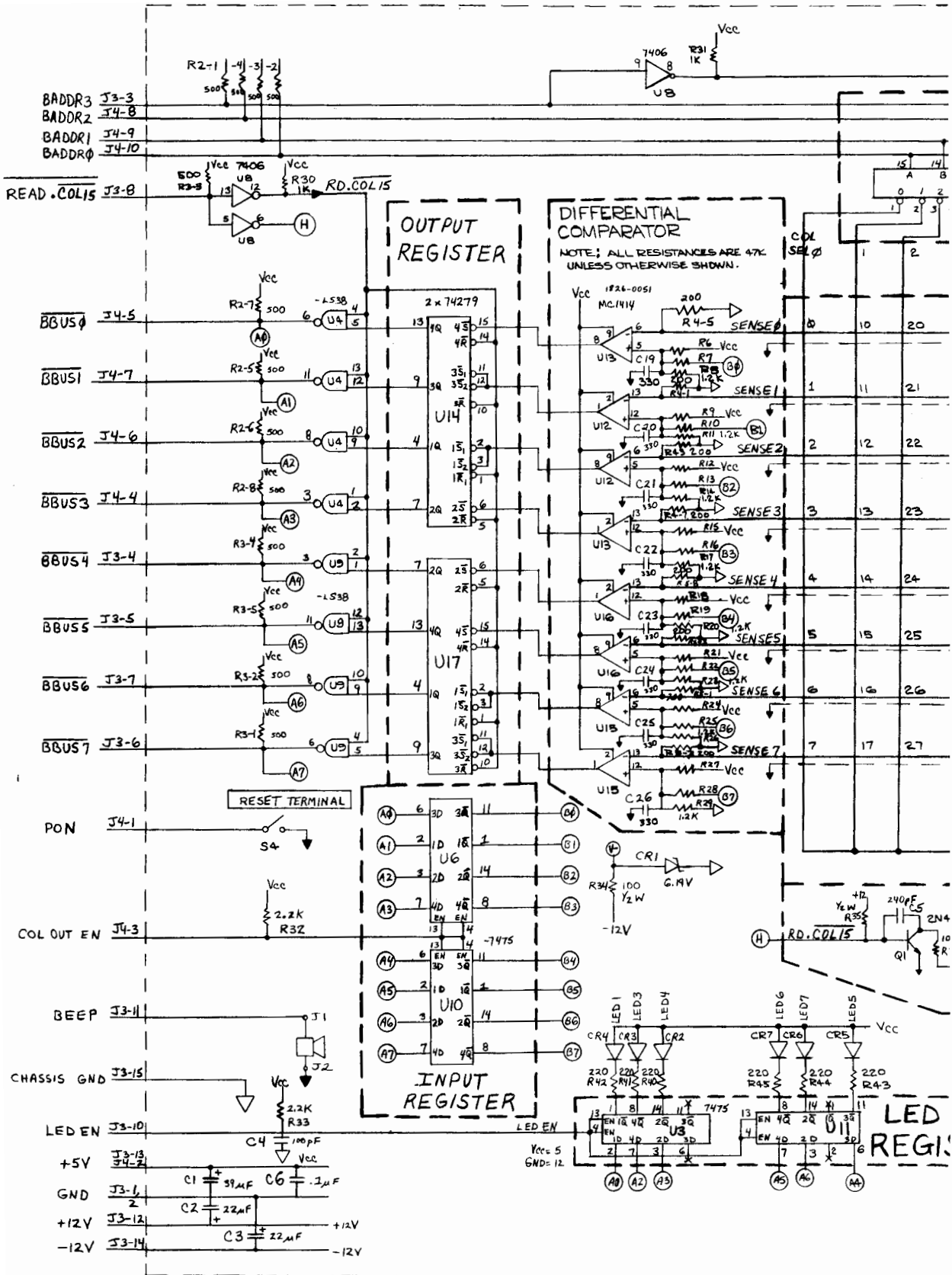


Figure 2
Simplified Keyboard Block Diagram
MAY-23-78 13255-91069





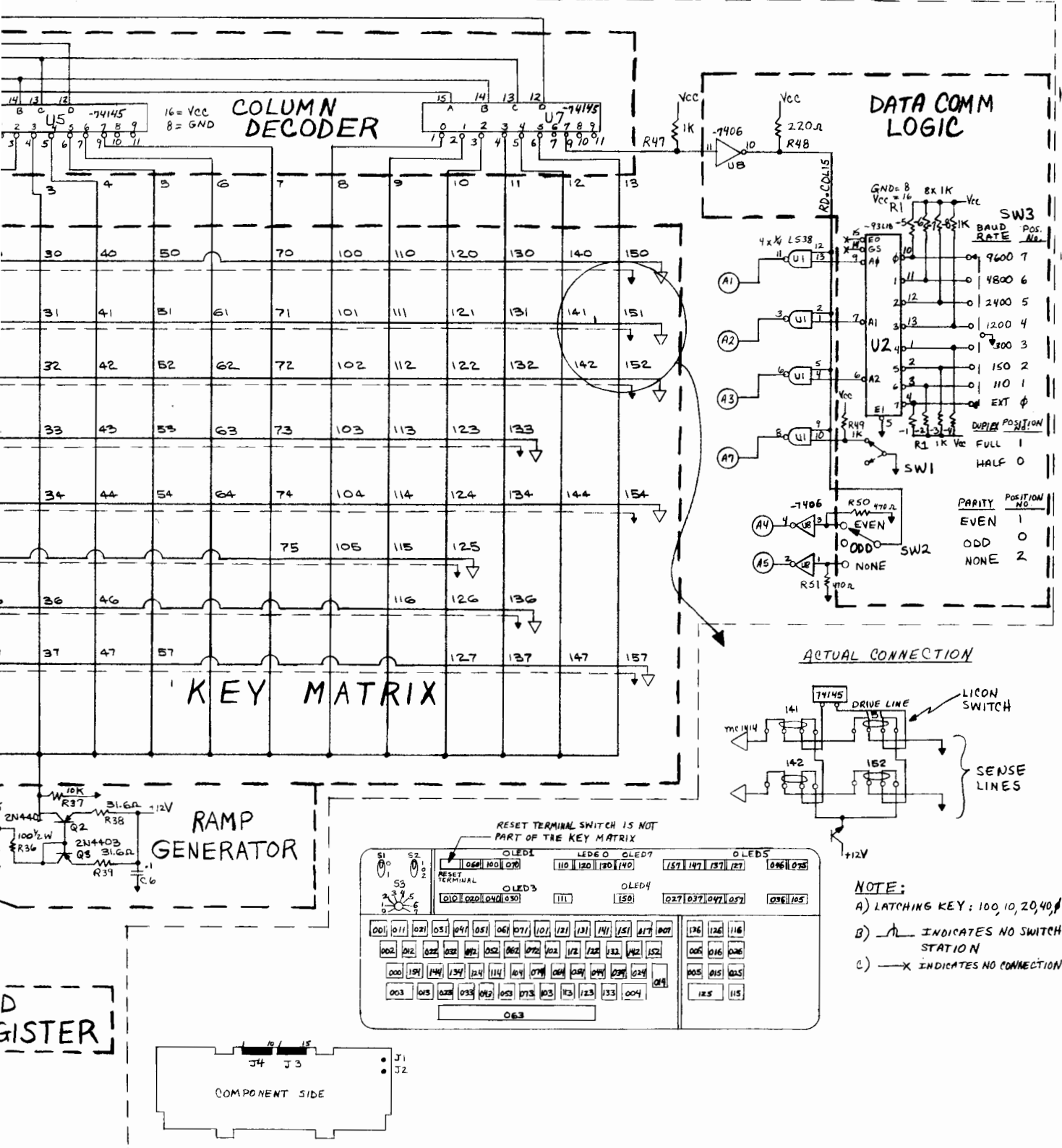
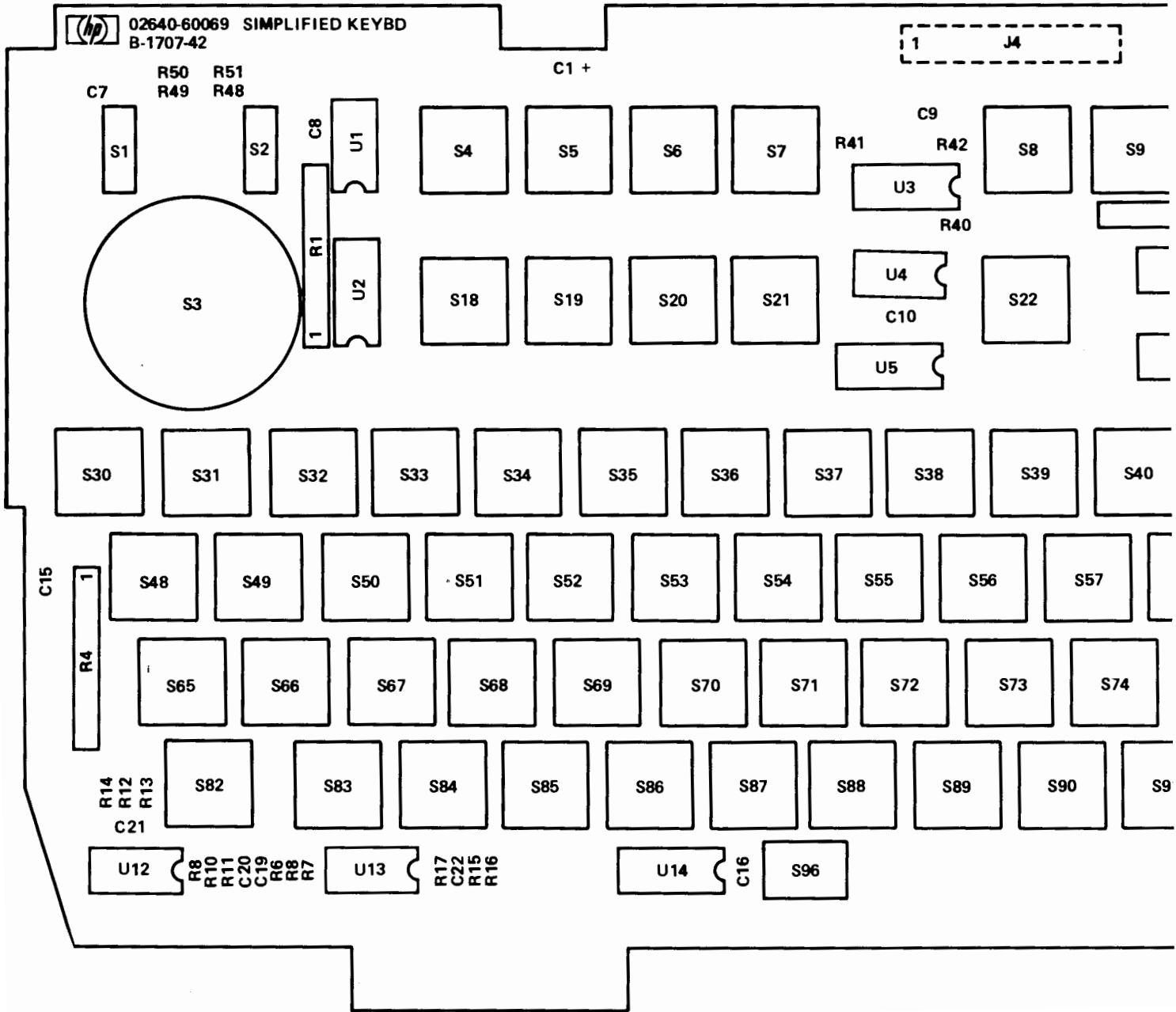


Figure 4
Differential Comparator Timing Diagram
MAY-23-78
13255-91069



02640-60069 SIMPLIFIED KEYBD
B-1707-42

1 J4





Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	02640-60069	1	1	SIMPLIFIED KEYBOARD ASSEMBLY DATE CODE: B=1707=42	28480	02640-60069
C1	0180-0393	6	1	CAPACITOR-FXD 39UF+10% 10VDC TA	56289	150D396X901082
C2	0180-0228	6	2	CAPACITOR-FXD 22UF+10% 15VDC TA	56289	150D226X901582
C3	0180-0228	6		CAPACITOR-FXD 22UF+10% 15VDC TA	56289	150D226X901582
C4	0160-2204	0	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
C5	0140-0199	6	1	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300V1CM
C6	0150-0121	5	1	CAPACITOR-FXD .01UF +80-20% 50VDC CER	28480	0150-0121
C7	0160-2055	9	12	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C8	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C9	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C10	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C11	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C12	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C13	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C14	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C15	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C16	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C17	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C18	0160-2055	9		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
C19	0160-3572	7	8	CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C20	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C21	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C22	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C23	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C24	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C25	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
C26	0160-3572	7		CAPACITOR-FXD 330PF +-10% 500VDC CER	28480	0160-3572
CR1	1902-0049	2	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	28480	1902-0049
CR2	1990-0486	6	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	5082-4664
E1	0360-0124	3	5	CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
E2	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
E3	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
E4	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
E5	0360-0124	3		CONNECTOR-SGL CONT PIN .04-IN-BSC-SZ RND	28480	0360-0124
J3	1251-3198	7	1	CONNECTOR 15-PIN M POST TYPE	28480	1251-3198
J4	1251-3475	3	1	CONNECTOR 10-PIN M POST TYPE	28480	1251-3475
Q1	1854-0467	5	1	TRANSISTOR NPN 2N4401 SI TO-92 PD=310MW	04713	2N4401
Q2	1853-0271	7	2	TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
Q3	1853-0271	7		TRANSISTOR PNP 2N4403 SI TO-92 PD=310MW	04713	2N4403
R1	1810-0121	6	1	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	91637	C8P09C07-102J
R2	1810-0132	9	2	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	91637	C8P09C-07-501J
R3	1810-0132	9		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	91637	C8P09C-07-501J
R4	1810-0163	6	2	NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	91637	C8P09C07-201J
R5	1810-0163	6		NETWORK-RES 9-PIN-SIP .15-PIN-SPCG	91637	C8P09C07-201J
R6	0683-4735	4	16	RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R7	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R8	0683-1225	1	8	RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R9	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R10	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R11	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R12	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R13	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R14	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R15	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R16	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R17	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R18	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R19	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R20	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R21	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R22	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R23	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R24	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R25	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R26	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R27	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R28	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	C84735
R29	0683-1225	1		RESISTOR 1.2K 5% .25W FC TC=-400/+700	01121	C81225
R30	0683-1025	9	4	RESISTOR 1K 5% .25W FC TC=-400/+800	01121	C81025

Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
R31	0683-1025	9		RESISTOR 1K 5% .25W FC TC=400/+600	01121	CB1025
R32	0683-2225	3	2	RESISTOR 2.2K 5% .25W FC TC=400/+700	01121	CB2225
R33	0683-2225	3		RESISTOR 2.2K 5% .25W FC TC=400/+700	01121	CB2225
R34	0686-1015	3	1	RESISTOR 100 5% .5W CC TC=0+529	01121	EB1015
R35	0698-3402	1	1	RESISTOR 316 1% .5W F TC=0+100	28480	0698-3402
R36	0757-0198	2	1	RESISTOR 100 1% .5W F TC=0+100	28480	0757-0198
R37	0683-1035	1	1	RESISTOR 10K 5% .25W FC TC=400/+700	01121	CB1035
R38	0757-0180	2	2	RESISTOR 31.6 1% .125W F TC=0+100	28480	0757-0180
R39	0757-0180	2		RESISTOR 31.6 1% .125W F TC=0+100	28480	0757-0180
R40	0683-2215	1	7	RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R41	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R42	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R43	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R44	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R45	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R47	0683-1025	9		RESISTOR 1K 5% .25W FC TC=400/+600	01121	CB1025
R48	0683-2215	1		RESISTOR 220 5% .25W FC TC=400/+600	01121	CB2215
R49	0683-1025	9		RESISTOR 1K 5% .25W FC TC=400/+600	01121	CB1025
R50	0683-4715	0	2	RESISTOR 470 5% .25W FC TC=400/+600	01121	CB4715
R51	0683-4715	0		RESISTOR 470 5% .25W FC TC=400/+600	01121	CB4715
SW1	3101-1858	7	1	SWITCH-TGL SUBMIN SPDT .02A 20VAC/DC PC	28480	3101-1858
SW2	3101-1859	8	1	SWITCH-TGL SUBMIN SPDT .02A 20VAC/DC PC	28480	3101-1859
SW3	3100-3313	1	1	SWITCH-ROTARY 0.812 STKUT CTR SPCG; 6	28480	3100-3313
SW4	3101-1745	1	1	SWITCH-PB SPST-NO MOM .12A 28VAC	28480	3101-1745
SW5	3101-2137	7	85	SWITCH-PB SPST-NO MOM	28480	3101-2137
SW6	3101-2136	6	5	SWITCH-PB SPST-NO ALTNW	28480	3101-2136
SW7	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW8	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW9	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW10	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW11	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW12	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW13	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW14	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW15	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW16	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW17	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW18	3101-2136	6		SWITCH-PB SPST-NO ALTNW	28480	3101-2136
SW19	3101-2136	6		SWITCH-PB SPST-NO ALTNW	28480	3101-2136
SW20	3101-2136	6		SWITCH-PB SPST-NO ALTNW	28480	3101-2136
SW21- SW64	3101-2137	7		SWITCH-PB SPST-NO MOM	28480	3101-2137
SW65- SW66- SW96	3101-2136	6		SWITCH-PB SPST-NO ALTNW	28480	3101-2136
U1	1820-1209	4	3	IC BFR TTL LS NAND QUAD 2-INP	01295	SN74LS38N
U2	1820-0987	3	1	IC ENCDR TTL L 8-INP	07263	93L18PC
U3	1820-0301	5	4	IC LCH TTL D-TYPE 4-BIT	01295	SN7475N
U4	1820-1209	4		IC BFR TTL LS NAND QUAD 2-INP	01295	SN74LS38N
U5	1820-0491	4	2	IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN74145N
U6	1820-0301	5		IC LCH TTL D-TYPE 4-BIT	01295	SN7475N
U7	1820-0491	4		IC DCDR TTL BCD-TO-DEC 4-TO-10-LINE	01295	SN74145N
U8	1820-0471	0	1	IC INV TTL HEX 1-INP	01295	SN7406N
U9	1820-1209	4		IC BFR TTL LS NAND QUAD 2-INP	01295	SN74LS38N
U10	1820-0301	5		IC LCH TTL D-TYPE 4-BIT	01295	SN7475N
U11	1820-0301	5		IC LCH TTL D-TYPE 4-BIT	01295	SN7475N
U12	1826-0051	4	4	COMPARATOR GP DUAL 14-DIP-P	01295	TL514CN
U13	1826-0051	4		COMPARATOR GP DUAL 14-DIP-P	01295	TL514CN
U14	1820-1089	8	2	IC LCH TTL QUAD	01295	SN74279N
U15	1826-0051	4		COMPARATOR GP DUAL 14-DIP-P	01295	TL514CN
U16	1826-0051	4		COMPARATOR GP DUAL 14-DIP-P	01295	TL514CN
U17	1820-1089	8		IC LCH TTL QUAD	01295	SN74279N
MISCELLANEOUS PARTS						
	0371-0213	4	1	SPACE BAR	28480	0371-0213
	0380-0371	4	6	SPACER-RND .375-IN-LG .14-IN-ID	28480	0380-0371
	0380-0585	2	4	STANDOFF-RVT-ON .531-IN-LG 6-32THD	00000	ORDER BY DESCRIPTION
	0470-0231	6	3	ADHESIVE LOCTITE 242 POLYESTER 1P BLE	05972	242
	1450-0528	3	6	LAMP SOCKET 8IPIN-SKT 8IPIN-TERM PC	28480	1450-0528
	1460-1562	8	1	SPRING-TRSN MUW BLK OXD	28480	1460-1562
	1530-1983	6	2		28480	1530-1983
	2190-0027	6	2	WASHER-LK INTL T 1/4 IN .256-IN-ID	28480	2190-0027
	2360-0117	6	1	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2360-0197	2	4	SCREW-MACH 6-32 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION

Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	2950-0052	9	2	NUT=HEX=DBL=CHAM 1/4-40-TMD .062-IN-TMK	00000	ORDER BY DESCRIPTION
	2950-0121	3	1	NUT=HEX=DBL=CHAM 1/4-32-TMD .062-IN-TMK	00000	ORDER BY DESCRIPTION
	3050-0099	7	2	WASHER=FL MTLC NO. 12 .25-IN-ID .5-IN-OD	28480	3050-0099
	5001-2815	8	1	BUSHING, SPACEBAR	28480	5001-2815
	5001-2816	9	2	PLUNGER	28480	5001-2816
	5001-2817	0	1	GROUNDING PLATE	28480	5001-2817
	02640-00003	7	1	PLATE, SWITCH MOUNTING	28480	02640-00003

