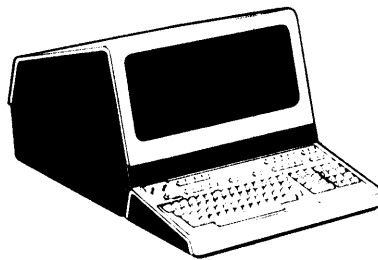HP 13220

EXTENDED KEYBOARD MODULE

Manual Part No. 13220-91061

REVISED

AUG-19-81

DATA TERMINAL
TECHNICAL INFORMATION

HEWLETT **hp** *PACKARD*

1.0   INTRODUCTION.

The Extended Keyboard Module is the part of the terminal that provides
for user input. It provides the keyswitch contacts and an addressing
and detection scheme for those contacts. It depends heavily on the
specific terminal processor it is connected to. In addition, the
Extended Keyboard Module provides for the connection of a speaker
(pass-through connection).

2.0   OPERATING PARAMETERS.

A summary of operating parameters for the Extended Keyboard Module is
contained in in tables 1.0 through 4.0.

Table 1.0 Physical Parameters

PART NUMBER	NOMENCLATURE	Size (L x W x D) +/-5 mm	Weight (Kg)
02620-60061	Extended Keyboard Module	410 x 165 x 50	1.1

HP 13220

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NOTE: This document is part of the 262XX DATA TERMINAL product
       series Technical Information Package (HP 13220).

1.0 INTRODUCTION.

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PART NUMBER	NOMENCLATURE	Size (L x W x D) +/-5 mm	Weight (Kg)
02620-60061	Extended Keyboard Module	410 x 165 x 50	1.1

Table 2.0 Reliability and Environmental Information

```
===============================================================================
|                                                                             |
|                                                                             |
|   Environmental:        ( X ) HP Class B        (   ) Other:                |
|                                                                             |
|   Restrictions:    Type tested at product level                            |
|                                                                             |
|                                                                             |
|                                                                             |
|=============================================================================|
|                                                                             |
|               Failure Rate:     2.     (percent per 1000 hours)             |
|                                                                             |
|=============================================================================|
```

Table 3.0 Power Supply Requirements

```
===============================================================================
|                                                                             |
|   The Extended Keyboard Module requires less than 10 ma of +5 volts.        |
|   The Bell Speaker's current is not controlled by the Extended Keyboard     |
|   Assembly.  Instead, it is controlled by the processor board the           |
|   keyboard is connected to.                                                 |
|                                                                             |
|                                                                             |
===============================================================================
```

Table 4.0 Connector Information (Extended Keyboard Module)

CONNECTOR AND PIN NO.	SIGNAL NAME	SIGNAL DESCRIPTION
J1-1	A0	Key address 0 (least significant)
J1-2	A1	Key address 1 Note: A0-A2 form
J1-3	A2	Key address 2 the column address
J1-4	A3	Key address 3 Note: A3-A6 form
J1-5	A4	Key address 4 the row address
J1-6	Unused	
J1-7	A5	Key address 5
J1-8	A6	Key address 6
J1-9	KEY	Low true, indicates key down
J1-10	Ground	Ground return
J1-11	BELL	Connection for speaker
J1-12	+5	+5 volts
J2-1	Speaker	Connected to BELL (J1-11)
J2-2	Speaker	Connected to +5 (J1-12)
J3	Spade Lug	Shield

3.0   The Extended Keyboard Module is responsible for interfacing the keyswitch contacts to the terminal processor.   To do this it contains the COLUMN SELECT, SWITCH-DIODE ARRAY, ROW SELECT and OUTPUT blocks. In addition, the keyboard is capable of indicating its presence and type.   To do this it contains the ID DIODE block.   The keyboard also provides for audio feedback with the BELL block. See figures 1, 2 and 3.

3.1   Addressing, input protection, CMOS level shifting.

3.1.1   The keyboard is addressed by seven address lines.   The inputs are TTL compatible.

3.1.2   The address lines are named A0 to A6 with A0 being the least significant.   The column address is formed from A6 to A3.   The row address is formed from A2 to A0.   Each address line is filtered with an R-C low pass filter to reduce the sensitivity to noise.   Pull-up resistors are provided on each line so the CMOS inputs on the keyboard can be driven by TTL from the processor board.

3.2   Column select.

3.2.1   The keyboard contains column selection logic to drive the switch array.

3.2.2   The combination if Q1, U1 and U2 provide for selection of one column of the switch array.   Q1 is a simple inverter.   Notice that not all possible columns are used.

3.3   Switch-diode array. ID diode.

3.3.1   The keyboard uses mechanical switches isolated by diodes.

3.3.2   The mechanical switches of the keyboard are isolated by diodes to fully implement N-key rollover.   The resistors terminating each row provide for some small current flow even in an unselected row.   The identification diode looks like a keyswitch which is permanently pressed.

3.4   Row select.

3.4.1   Only one row is selected at a time.

3.4.2   The analog switch, U3, selects one keyboard row. At the same time,
           one column has been selected. If the key is pressed at this
           intersection current will from from U1 or U2, through the switch and
           diode and through the analog switch.

3.5   Output.

3.5.1   The keyboard output circuit drives the keyboard cable.

3.5.2   The output of the analog switch is converted by Q2 and Q3 to drive the
           long keyboard cable. Because Q2 is simply an open-collector output,
           it can drive almost anything.

3.6   Bell.

3.6.1   A bell speaker is provided.

3.6.2   A speaker is connect to the keyboard PCA. It can be driven by almost
           any signal. The specific signal driving the speaker is left up to the
           terminal the keyboard is connected to. Don't forget the fact that the
           current required by the speaker is a factor when doing power
           calculations!

4.0   Compatibility issues.

4.1   The extended keyboard is compatible with the standard keyboard used on
           the 2621A/P. Identical keys have identical keycodes. Different keys
           have different (non-overlapping) keycodes. This makes it possible to
           use either keyboard on the same product if the product understands
           either. The presence of an ID diode allows the product the freedom of
           discovering that the extended keyboard is connected.   See figures 2
           and 4.

4.2   There are several unused, extra keys which have keycodes assigned and
           are usable given the attempt.   The two keys on the sides of the space
           bar and the key under the return key are these keys.   Note that this
           would require changes to the plastic parts of the keyboard.   See
           figure 2.

4.3   The keyboard can run on +5 volts or +12 volts. The CMOS inside really
           wouldn't care.

4.4   The single transistor inverter (Q1) is extremely slow. To save cost,
           there is no speedup capacitor in its base.   This means that stored
           charge must be removed exclusively through the 47K resistor.   This
           makes it really slow.   The preferred scanning scheme is a "debounce-
           in-place".   That is, apply an address, wait about 50 us, look, wait
           about 50us more, and look again for similarity.   Hold on that key
           until two consecutive reads separated by about 50us get the same
           result.   The 50us number is ballpark and is for the first look.   It
           should not be slower than about 30us. It can be as long as you want.

A6-A3⊢ ——————4————→ COLUMN   SELECT

BELL⊢ → SPEAKER

⟋15

A2-A0⊢ ——3——→ ROW SELECT

KEY ← OUTPUT ← ——8——→ SWITCH — DIODE ARRAY

I.D.

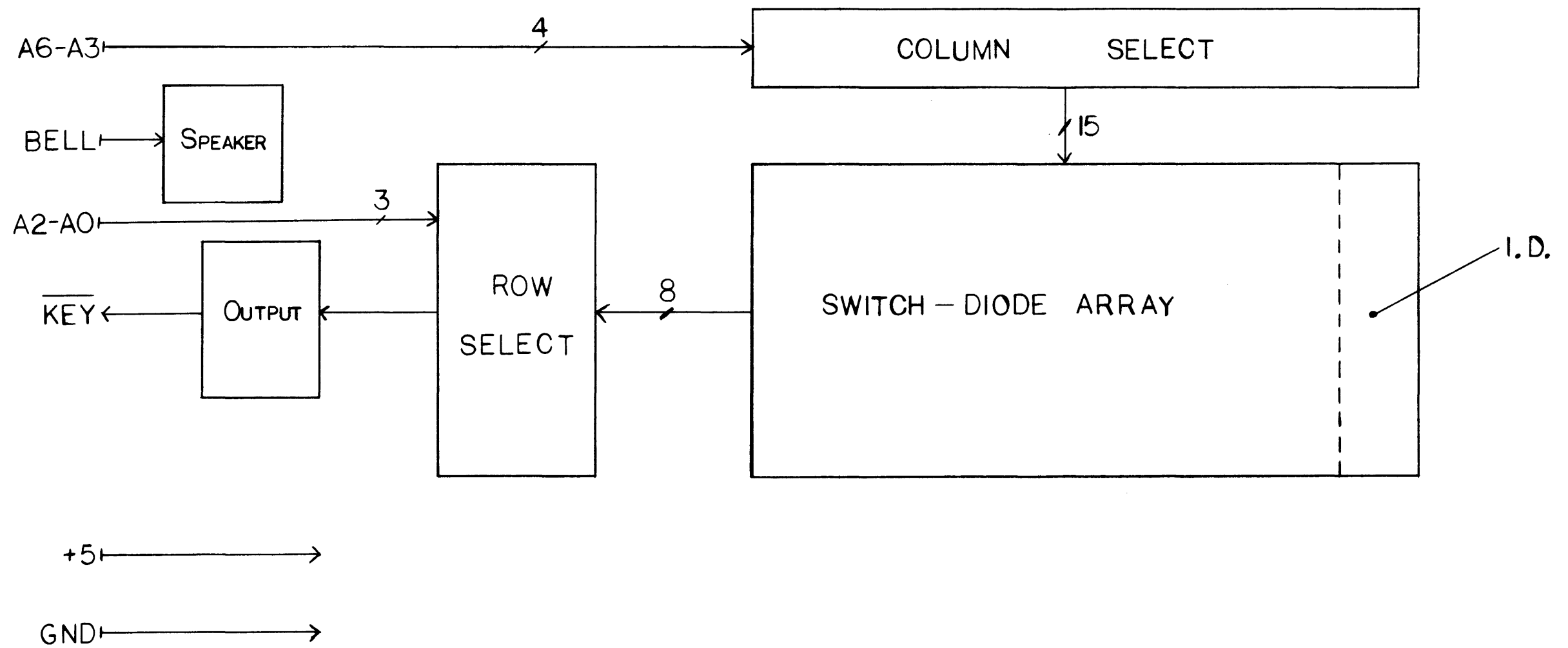+5⊢ ——————→

GND⊢ ——————→

Figure 1
Extended Keyboard Module Block Diagram
APR-20-81   13220-91061
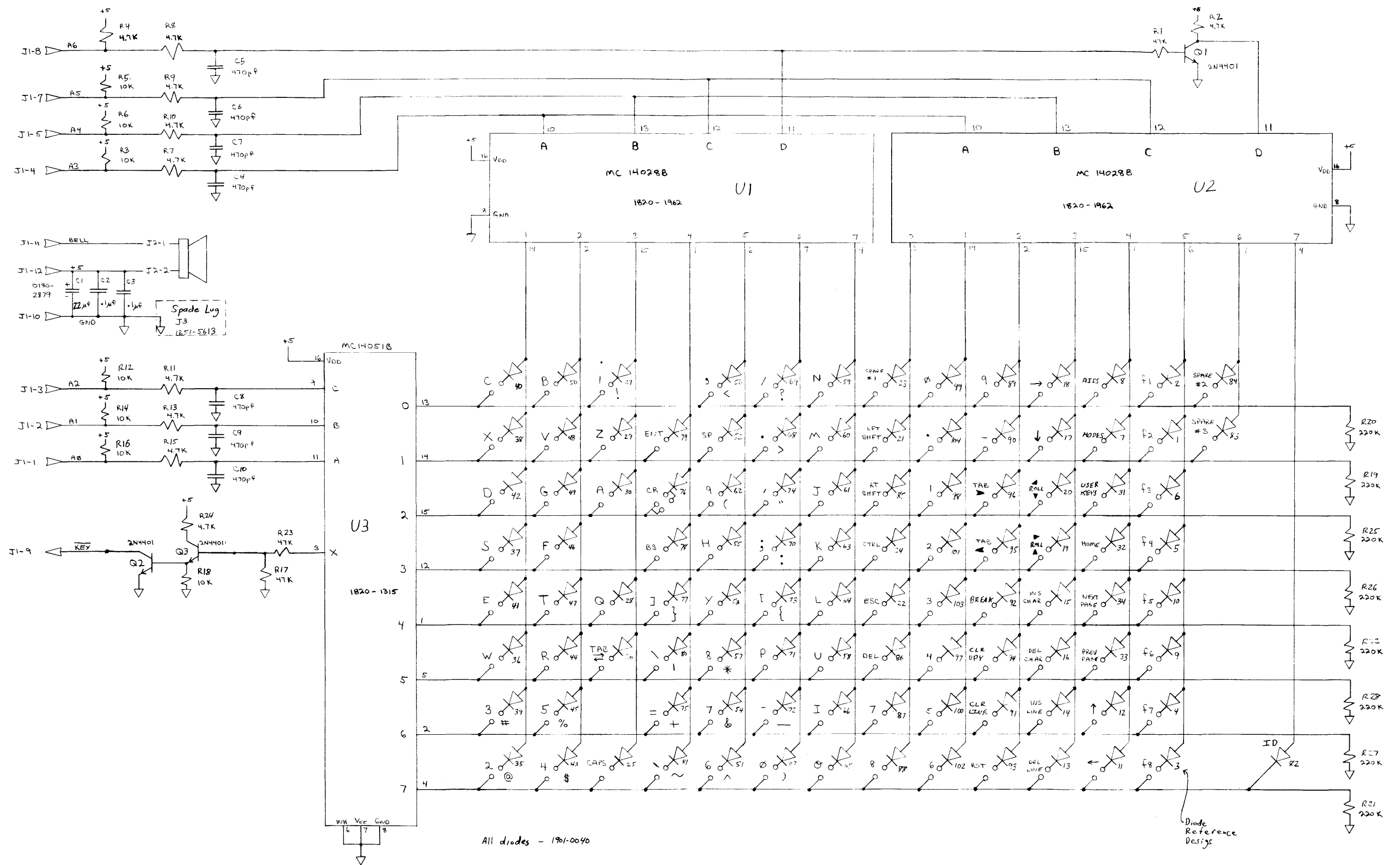
Figure 2
Extended Keyboard PCA Schematic Diagram
FEB-12-81   13220-91061

DIRECTION THRU WAVE SOLDER

SWITCH ARRAY 10 KEY
3101-0464

SWITCH ARRAY 10 KEY
3101-0464

SWITCH ARRAY 8 KEY
3101-0465

SWITCH ARRAY 60 KEY
⚠3101-2554

SWITCH ARRAY 14 KEY
3101-0466

20 PLACES
INSTALL FARSIDE

TYP INSTALL
CR1 THRU CR104
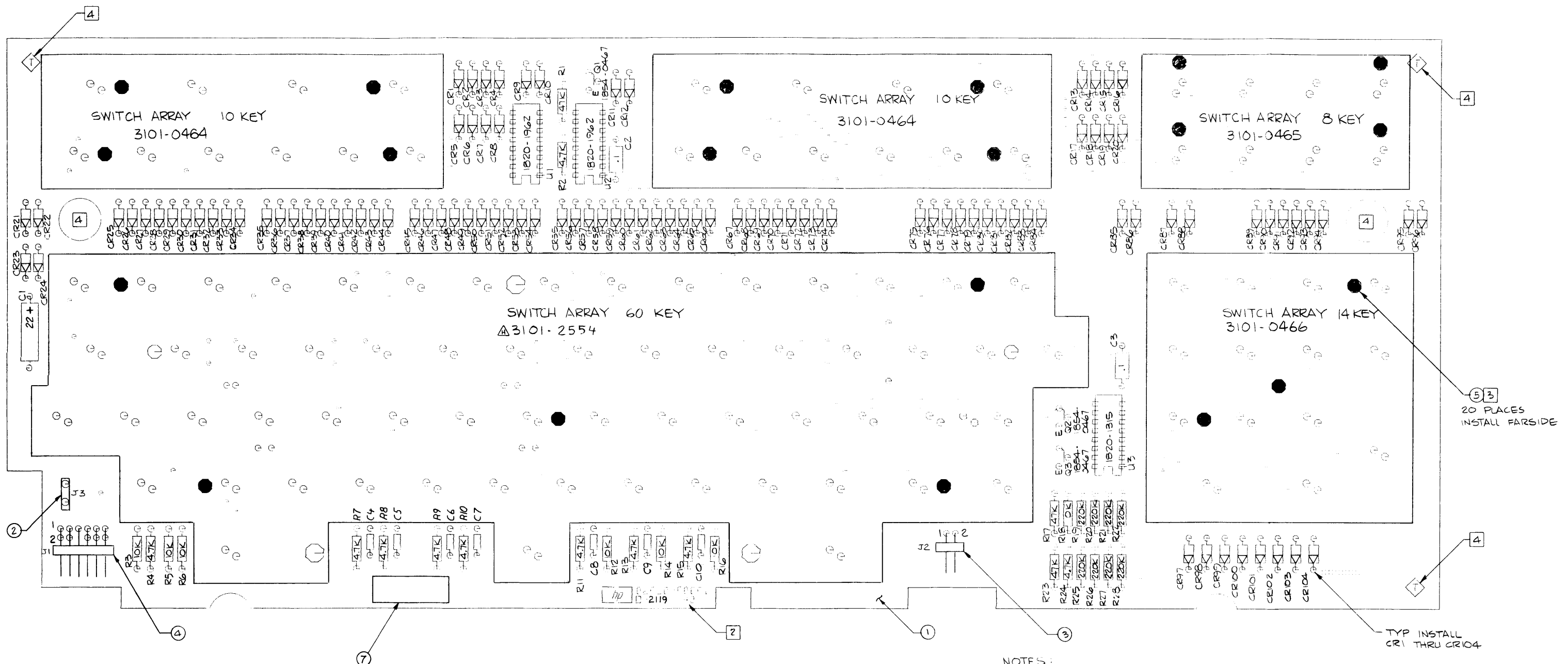
PRODUCT	ASSY NO	LABEL TEXT
2622A,26A,24A, 29C,29D,29E	02620-60061	NO LABEL
2622A,26A,24A, 29C,29D,29E OPT 001-006	02620-60058	20-60058
⚠ 2623A/2629G	02620-60098	20-60098
⚠ 2623A/2629G OPT 001-006	02620-60108	20-60108
⚠		
⚠		

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE VALUES ARE IN OHMS ±5%, 1/4W.
   ALL DIODES ARE 1901-0040,
   ALL CAPACITANCE VALUES ARE IN MICROFARADS.
   ALL CAPACITORS ARE 470 PF ±5%.
2. MARK DATE CODE
3. INSTALL ITEM ⑤ IN LOADING
4. MASK AS INDICATED PRIOR TO WAVE SOLDER
5. SCHEMATIC D-02620-90061-51
6. 3060 FIXTURE ET-14533
7. ITEM ⑦ TO BE PRINTED AND APPLIED AS
   PER THE FOLLOWING TABLE:

Figure 3
Extended Keyboard PCA Component Locations
MAY-19-81   13220-91061
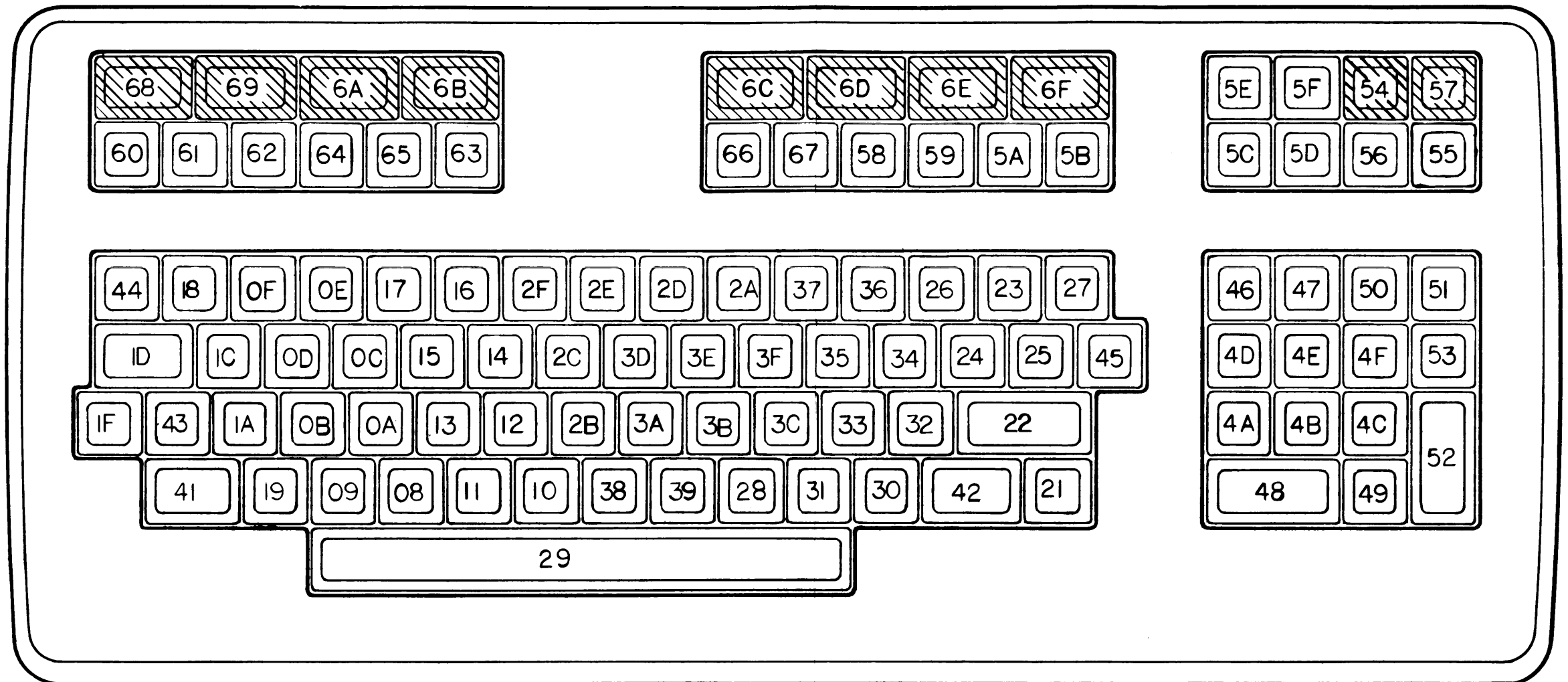
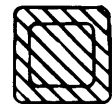NOTES:

1. KEYCAP COLORS:

BODY COLOR - COCOA BROWN ACCENT
LEGEND COLOR - PEARL GRAY CABINET

BODY COLOR - ADOBE BROWN KEY
LEGEND COLOR - PEARL GRAY CABINET

2. ALL KEYCODES IN HEXADECIMAL, A6 IS MSB.

Figure 4
Extended Keyboard Module Keycode Diagram
MAY-20-81   13220-91061

Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	02620-60061	9	1	EXTENDED KEYBOARD, PCA	28480	02620-60061
C1	0180-2879	7	1	CAPACITOR-FXD 22UF+50-10% 25VDC AL	28480	0180-2879
C2	0160-4557	0	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC04X7R104M050A
C3	0160-4557	0		CAPACITOR-FXD .1UF +-20% 50VDC CER	16299	CAC04X7R104M050A
C4	0160-3335	0	7	CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C5	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C6	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C7	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C8	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C9	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
C10	0160-3335	0		CAPACITOR-FXD 470PF +-10% 100VDC CER	28480	0160-3335
CR1-CR104	1901-0040	1	104	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
J1	1251-5551	0	1	CONNECTOR 11-PIN M POST TYPE	28480	1251-5551
J2	1251-5545	2	1	CONNECTOR 2-PIN M POST TYPE	28480	1251-5545
J3	1251-5613	5	1	CONNECTOR-SGL CONT QDISC-M TAB	28480	1251-5613
Q1	1854-0832	8	3	TRANSISTOR NPN PD=350MW FT=250MHZ	28480	1854-0832
Q2	1854-0832	8		TRANSISTOR NPN PD=350MW FT=250MHZ	28480	1854-0832
Q3	1854-0832	8		TRANSISTOR NPN PD=350MW FT=250MHZ	28480	1854-0832
R1	0683-4735	4	3	RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
R2	0683-4725	2	10	RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R3	0683-1035	1	7	RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R4	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R5	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R6	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R7	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R8	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R9	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R10	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R11	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R12	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R13	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R14	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R15	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R16	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R17	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
R18	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
R19	0683-2245	7	8	RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R20	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R21	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R22	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R23	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
R24	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
R25	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R26	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R27	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
R28	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
S1	3101-0464	9	2	SWITCH ARRAY-10 KEYS	28480	3101-0464
S2	3101-0465	0	1	SWITCH ARRAY-8 KEYS	28480	3101-0465
S3	3101-0466	1	1	SWITCH ARRAY-14 KEYS	28480	3101-0466
S4	3101-2554	2	1	KEYSWITCH SUB-ASSEMBLY	28480	3101-2554
U1	1820-1962	6	2	IC DCDR CMOS BCD-TO-DEC	3L585	CD4028BE
U2	1820-1962	6		IC DCDR CMOS BCD-TO-DEC	3L585	CD4028BE
U3	1820-1315	3	1	IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	3L585	CD4051BE
	0371-1219	2	1	KEYCAP "A" COCOA BROWN	28480	0371-1219
	0371-1220	5	1	KEYCAP "B" COCOA BROWN	28480	0371-1220
	0371-1221	6	1	KEYCAP "C" COCOA BROWN	28480	0371-1221
	0371-1222	7	1	KEYCAP "D" COCOA BROWN	28480	0371-1222
	0371-1223	8	1	KEYCAP "E" COCOA BROWN	28480	0371-1223
	0371-1224	9	1	KEYCAP "F" COCOA BROWN	28480	0371-1224
	0371-1225	0	1	KEYCAP "G" COCOA BROWN	28480	0371-1225
	0371-1226	1	1	KEYCAP "H" COCOA BROWN	28480	0371-1226
	0371-1232	9	1	KEYCAP "N" COCOA BROWN	28480	0371-1232
	0371-1234	1	1	KEYCAP "P" COCOA BROWN	28480	0371-1234
	0371-1235	2	1	KEYCAP "Q" COCOA BROWN	28480	0371-1235
	0371-1236	3	1	KEYCAP "R" COCOA BROWN	28480	0371-1236
	0371-1237	4	1	KEYCAP "S" COCOA BROWN	28480	0371-1237
	0371-1238	5	1	KEYCAP "T" COCOA BROWN	28480	0371-1238
	0371-1240	9	1	KEYCAP "V" COCOA BROWN	28480	0371-1240
	0371-1241	0	1	KEYCAP "W" COCOA BROWN	28480	0371-1241
	0371-1242	1	1	KEYCAP "X" COCOA BROWN	28480	0371-1242
	0371-1243	2	1	KEYCAP "Y" COCOA BROWN	28480	0371-1243
	0371-1244	3	1	KEYCAP "Z" COCOA BROWN	28480	0371-1244
	0371-1245	4	1	KEYCAP "1!" COCOA BROWN	28480	0371-1245

Replaceable Parts

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
	0371-1246	5	1	KEYCAP "2@" COCOA BROWN	28480	0371-1246
	0371-1247	6	1	KEYCAP "3#" COCOA BROWN	28480	0371-1247
	0371-1248	7	1	KEYCAP "4$" COCOA BROWN	28480	0371-1248
	0371-1249	8	1	KEYCAP "5%" COCOA BROWN	28480	0371-1249
	0371-1250	1	1	KEYCAP "6CAROT" COCOA BROWN	28480	0371-1250
	0371-1251	2	1	KEYCAP "7&" COCOA BROWN	28480	0371-1251
	0371-1252	3	1	KEYCAP "8*" COCOA BROWN	28480	0371-1252
	0371-1253	4	1	KEYCAP "9(" COCOA BROWN	28480	0371-1253
	0371-1254	5	1	KEYCAP "0)" COCOA BROWN	28480	0371-1254
	0371-1255	6	1	KEYCAP "UDLINE"COCOA BROWN	28480	0371-1255
	0371-1256	7	1	KEYCAP "=+" COCOA BROWN	28480	0371-1256
	0371-1257	8	1	KEYCAP "TILDE-GRV" COCOA BROWN	28480	0371-1257
	0371-1258	9	1	KEYCAP "LT BKTPAR" COCOA BROWN	28480	0371-1258
	0371-1259	0	1	KEYCAP "RT BKTPAR" COCOA BROWN	28480	0371-1259
	0371-1260	3	1	KEYCAP "BKSLH BAR" COCOA BROWN	28480	0371-1260
	0371-1261	4	1	KEYCAP ";:" COCOA BROWN	28480	0371-1261
	0371-1262	5	1	KEYCAP " " COCOA BROWN	28480	0371-1262
	0371-1263	6	1	KEYCAP ",<" COCOA BROWN	28480	0371-1263
	0371-1264	7	1	KEYCAP ".>" COCOA BROWN	28480	0371-1264
	0371-1265	8	1	KEYCAP "/?" COCOA BROWN	28480	0371-1265
	0371-1267	0	1	KEYCAP "BACKSPACE" COCOA BROWN	28480	0371-1267
	0371-1268	1	1	KEYCAP "CAPS" COCOA BROWN	28480	0371-1268
	0371-1269	2	1	KEYCAP "CTRL" COCOA BROWN	28480	0371-1269
	0371-1270	5	1	KEYCAP "ENTER" COCOA BROWN	28480	0371-1270
	0371-1273	8	1	KEYCAP "TAB/BKTB" COCOA BROWN	28480	0371-1273
	0371-1274	9	1	KEYCAP "SHIFT" COCOA BROWN	28480	0371-1274
	0371-1970	2	4	KEYCAP "CURSOR"	28480	0371-1970
	0371-1971	3	1	KEYCAP "CURS HOM UP"	28480	0371-1971
	0371-1973	5	1	KEYCAP "F1"	28480	0371-1973
	0371-1974	6	1	KEYCAP "F2"	28480	0371-1974
	0371-1975	7	1	KEYCAP "F3"	28480	0371-1975
	0371-1976	8	1	KEYCAP "F4"	28480	0371-1976
	0371-1977	9	1	KEYCAP "F5"	28480	0371-1977
	0371-1978	0	1	KEYCAP "F6"	28480	0371-1978
	0371-1979	1	1	KEYCAP "F7"	28480	0371-1979
	0371-1980	4	1	KEYCAP "F8"	28480	0371-1980
	0371-1981	5	1	KEYCAP "ESC"	28480	0371-1981
	0371-1982	6	1	KEYCAP "DEL"	28480	0371-1982
	0371-1983	7	1	KEYCAP "TAB LEFT"	28480	0371-1983
	0371-1984	8	1	KEYCAP "TAB RIGHT"	28480	0371-1984
	0371-1985	9	1	KEYCAP "9"	28480	0371-1985
	0371-1986	0	1	KEYCAP "NEXT PAGE"	28480	0371-1986
	0371-1987	1	1	KEYCAP "PREV PAGE"	28480	0371-1987
	0371-1990	6	1	KEYCAP "INS LINE"	28480	0371-1990
	0371-1991	7	1	KEYCAP "DEL LINE"	28480	0371-1991
	0371-1992	8	1	KEYCAP "INS CHAR"	28480	0371-1992
	0371-1993	9	1	KEYCAP "DEL CHAR"	28480	0371-1993
	0371-1994	0	1	KEYCAP "CLEAR DSPLY"	28480	0371-1994
	0371-1995	1	1	KEYCAP "BREAK"	28480	0371-1995
	0371-1996	2	1	KEYCAP "RESET"	28480	0371-1996
	0371-1997	3	1	KEYCAP "1"	28480	0371-1997
	0371-1998	4	1	KEYCAP "2"	28480	0371-1998
	0371-1999	5	1	KEYCAP "3"	28480	0371-1999
	0371-2000	1	1	KEYCAP "4"	28480	0371-2000
	0371-2001	2	1	KEYCAP "5"	28480	0371-2001
	0371-2003	4	1	KEYCAP "7"	28480	0371-2003
	0371-2004	5	1	KEYCAP "8"	28480	0371-2004
	0371-2006	7	1	KEYCAP "-(MINUS)"	28480	0371-2006
	0371-2007	8	1	KEYCAP ".(PERIOD)"	28480	0371-2007
	0371-2013	6	1	KEYCAP "AIDS STR"	28480	0371-2013
	0371-2015	8	1	KEYCAP "CLEAR LINE"	28480	0371-2015
	0371-2016	9	1	KEYCAP "I TLT"	28480	0371-2016
	0371-2017	0	1	KEYCAP "J TLT"	28480	0371-2017
	0371-2018	1	1	KEYCAP "K TLT"	28480	0371-2018
	0371-2019	2	1	KEYCAP "L TLT"	28480	0371-2019
	0371-2020	5	1	KEYCAP "M TLT"	28480	0371-2020
	0371-2021	6	1	KEYCAP "O TLT"	28480	0371-2021
	0371-2022	7	1	KEYCAP "U TLT"	28480	0371-2022
	0371-2029	4	1	KEYCAP "MODES"	28480	0371-2029
	0371-2030	7	1	KEYCAP "USER KEYS"	28480	0371-2030
	0371-2081	8	2	KEYCAP "6 AND 9"	28480	0371-2081
	0371-2367	3	1	KEYCAP "RETURN"	28480	0371-2367
	0624-0324	5	20	SCREW-TPG 4-20 .312-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
S0545	NIPPON ELECTRIC CO	TOKYO	JP	
00000	ANY SATISFACTORY SUPPLIER			
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
03508	GE CO SEMICONDUCTOR PROD DEPT	AUBURN	NY	13201
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85008
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW	CA	94042
11961	SEMICON INC	BURLINGTON	MA	01803
16299	CORNING GLASS WKS COMPONENT DIV	RALEIGH	NC	27604
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
34371	HARRIS SEMICON DIV HARRIS-INTERTYPE	MELBOURNE	FL	32901
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247