

**Burroughs**

**ELECTRONIC  
KEYBOARD  
TRAINING**



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Detroit, Michigan 48232

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The Burroughs Electronic Keyboard contains alpha and numeric keys and several dedicated keyboard function keys; such as Shift, Shift Lock, and Repeat. The keyboard keys are mostly single stroke keys with some keys having repeat capability.

The keyboard assembly contains keyboard switches, diode chips and a keyboard LSIC. A diagram labeled "Keyboard Block Diagram" can be found in the back of this handout. The ROM portion of the LSIC contains 132 character locations and is divided into two sections, shifted (upper case characters) and unshifted (lower case characters). The two sections are clocked at the same time and are in step with one another. As the ROM is sequenced, the shift key determines whether the indexed character key code is read from the upper or lower case section of the ROM. Depressing the shift key will select the upper case section of the ROM.

The shift lock key when depressed, will electrically lock the keyboard in the upper case mode by preventing the lower case section of the ROM from being selected. The shift lock can be reset by the depression of the shift key. When the depression of the shift lock key selects the upper case section of the ROM, the shift lock light located to the left of the shift lock key, is turned "ON". The shift lock light is a light emitting diode. The number of keys which can be repeated on the alphanumeric keyboard is determined by specific style of electronic keyboard. When a repeatable character key and the repeat key are held depressed, the character will repeat at a rate of 10 characters per second (every 8th keyboard scan). Keys which repeat unshifted (lower case) will also repeat shifted (upper case). If more than one repeatable key is depressed simultaneously along with the repeat key, all keys depressed may print one time. However, only the first key in order of scan (sequence of ROM addressing) will be repeated.

The standard keyboard utilizes a single LSIC MOS package. The LSIC electronics provide for up to 132 keys with an "N" key rollover feature. Any number of keys may be designated to generate the same code by parallel wiring.

The ROM provides for up to 132 character locations. Each ROM location contains an eight bit (hex-dec) character code. This eight bit code consists of a standard seven (7) bit ASCII code and a bit which indicates whether the character is an alpha or numeric keyboard character.

Code variations from the standard output can be accomplished by the addition of a ROM code Conversion Chip which is located external to the LSIC chip. This ROM chip can be encoded to convert the eight output bits plus the two shift levels to any desired output code.

The LSI Chip provides for ROM addressing, keyboard scan, input signal processing, output signal generation, and output code generation.

ROM addressing keyboard scan is accomplished through two unequal shift registers. The unequal shift registers generate the signals KAO through KA11 and KB0 through KB10 which continuously cycles through the ROM addresses and the 11 x 12 keyboard matrix. Each KA signal has a repetition rate of 1.2MS while each KB signal has a repetition rate of 1.1MS. The KA and KB signals are gated so that each ROM location is addressed for 100 us and in a specific sequence. The sequence keyboard scan and addressing of every ROM location is repeated every 13.2MS (132 char. locations X 100 us). Although the character code is available on the ROM output data lines as the ROM locations are addressed, a strobe signal does not occur unless a key has been depressed.

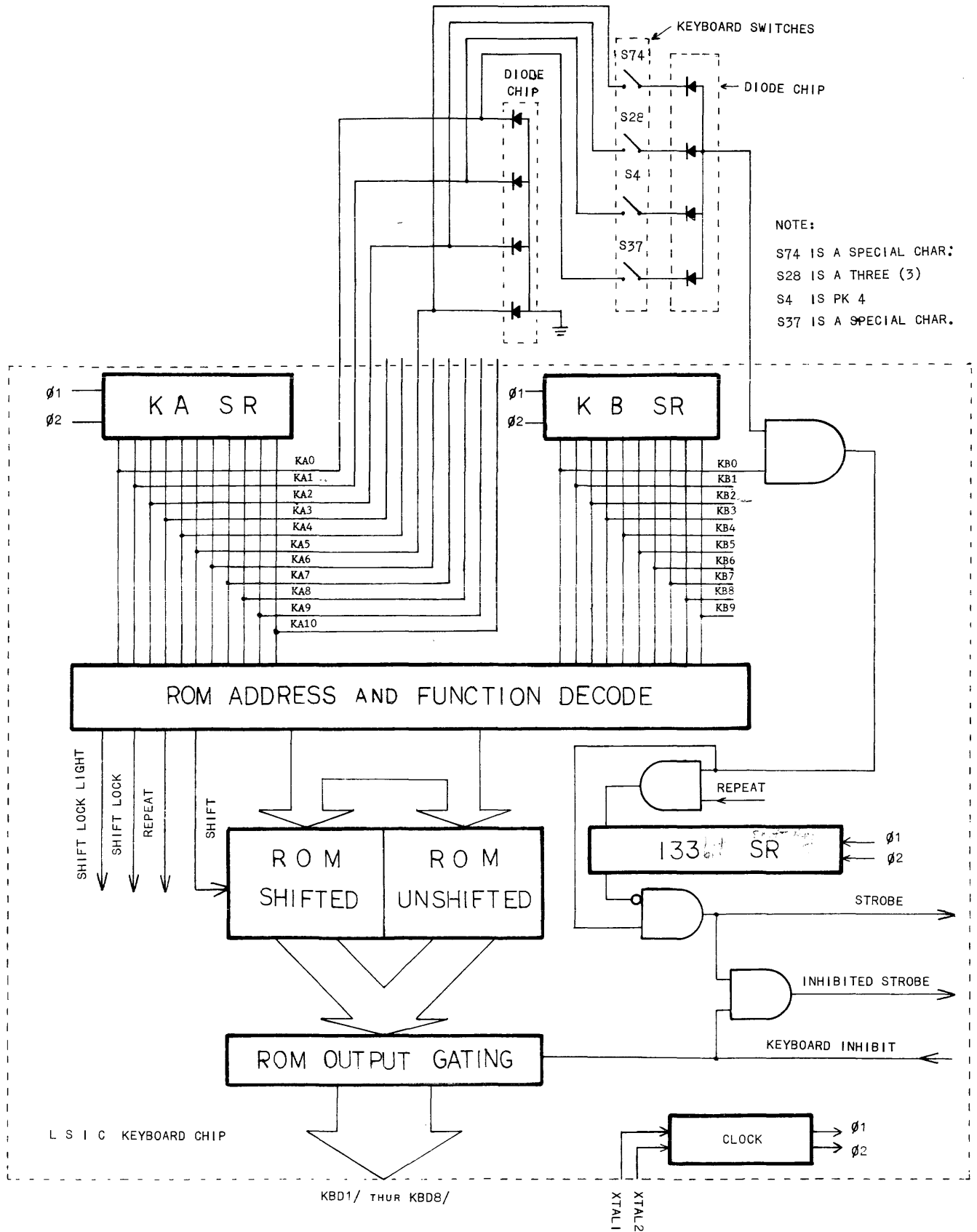
The output signals KBD1/through KBD8/ are in ASCII code with the KBD8/line indicating the numeric keyboard is in use. The varying output signals KBD1/ - KBD8/ are continually being generated but will only be used when a key depression and a ROM address combine to form a path through the scan matrix to generate a strobe signal.

When a key is depressed and the switch closed, a 60 us STROBE signal (EKBST/) is generated at the time the ROM location for the key depressed is addressed by the KA and KB signals. EKBST/ will occur only once per key depression although the keyboard scan (ROM addressing sequence) can be repeated many times while the key is depressed. More than one strobe signal is prevented by a 133 bit shift register.

The 133 bit shift register is shifted in step with the ROM addressing sequence. When the ROM location for the depressed key is addressed, a STROBE signal is generated and a bit is inserted in that location in the shift register. If the key is still depressed on the next keyboard scan, the bit in that location of the shift register will inhibit the strobe (EKBST/) signal. The bit in the shift register is reset if the key depressed had been released.

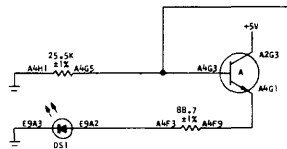
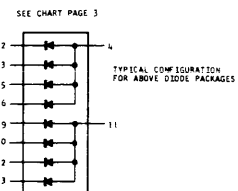
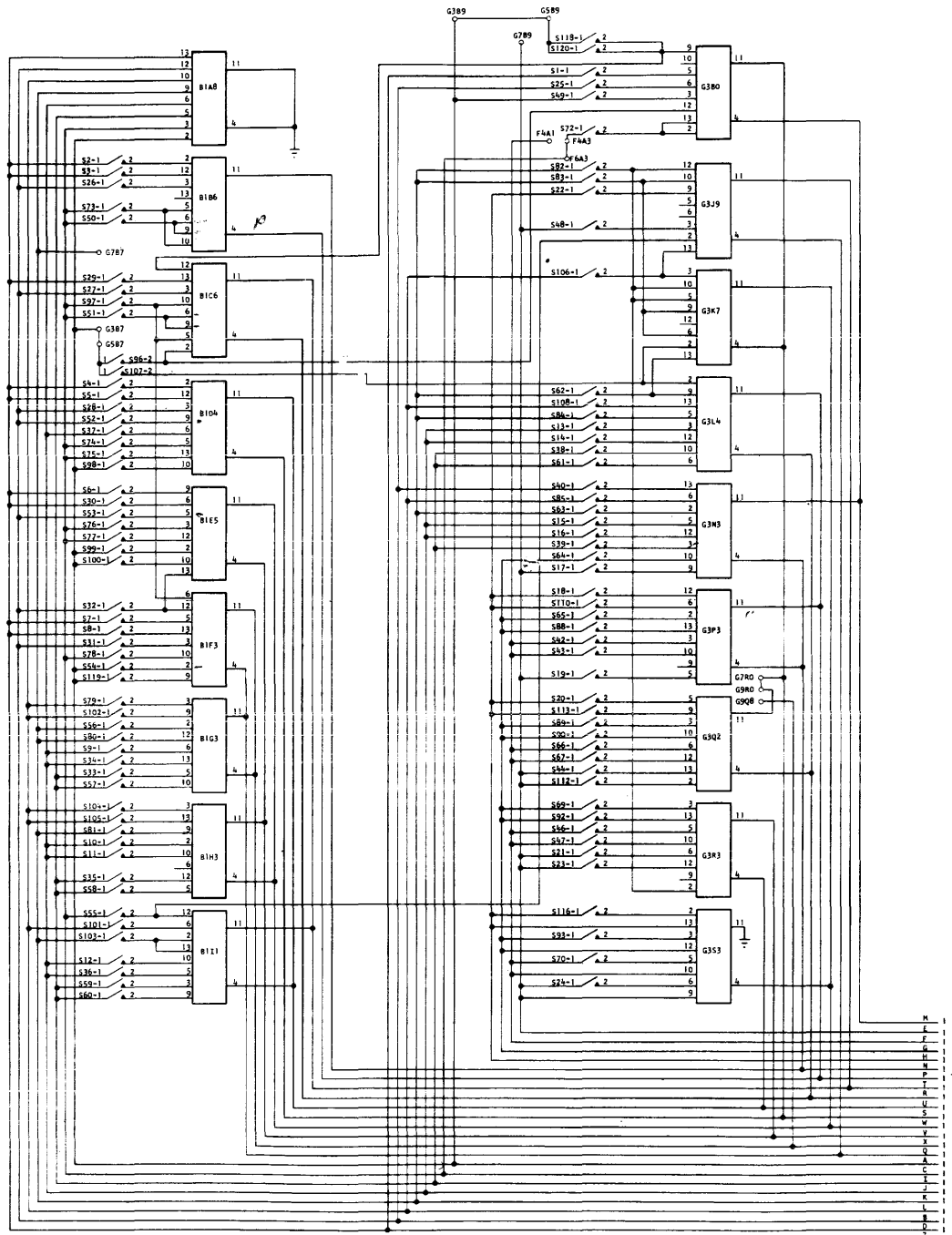
Normally, because of the frequency at which the keyboard SCAN (ROM addressing sequence) occurs, the character codes are transferred to the keyboard buffer in the same order as indexed on the keyboard. However, if keys are depressed simultaneously, the character codes will be transferred to the keyboard buffer in the order of the keyboard scan (ROM addressing sequence). The KA's are used as an output and drive to approximately - 9 volts, while the KB's are used as an input. When a key is depressed the KB levels will drop to approximately -1 or -2 volts. The KB level drop is used to generate a strobe signal at the same time. In step with these two shift registers is a third register, a 133 bit shift register. This register is used to indicate whether or not the data for this key has already been strobed.

The signal inhibit will inhibit the outputs KBD1/ through KBD8/. If the operator depresses a key while the keyboard is inhibited the strobe signal (non inhibited strobe) is still generated and logic is thus able to indicate to the operator that the key is being ignored.



ELECTRONIC KEYBOARD BLOCK DIAGRAM







SW NO.	PIN NO.	KB	KA	DIODE PACK LOC.	SEE NOTES	LSI PART NO. 2475 399	
						NEW-DEC CODE	LC UC
1	5	10	2	G380		18/0	12/0
2	8	8	2	B186		18/1	12/1
3	2	0	2	B102		18/2	12/2
4	2	0	2	B102		18/2	12/2
5	12	1	7	B106		18/5	12/5
6	3	3	2	B1E5		18/5	12/5
7	12	5	2	B1F3		18/7	12/7
8	6	4	5	B1G3		18/8	12/8
9	3	2	5	B1H3		18/9	12/9
10	10	2	5	B1H3		18/10	12/10
11	10	2	5	B1H3		18/10	12/10
12	10	2	5	B1H3		18/10	12/10
13	10	2	5	B1H3		18/10	12/10
14	12	8	5	B1L4		18/11	12/11
15	12	8	5	B1L4		18/11	12/11
16	12	8	5	B1L4		18/11	12/11
17	12	8	5	B1L4		18/11	12/11
18	12	10	5	B1M3		18/15	12/15
19	12	10	5	B1M3		18/15	12/15
20	5	7	10	G392		18/20	12/20
21	5	7	10	G392		18/20	12/20
22	5	7	10	G392		18/20	12/20
23	18	2	8	G381		18/21	12/21
24	6	3	8	G383		18/22	12/22
25	5	10	1	G380		18/23	12/23
26	5	8	1	B186		18/24	12/24
27	13	6	2	B1E5		18/25	12/25
28	6	2	2	B1E5		18/25	12/25
29	12	4	1	B1F3		18/26	12/26
30	6	2	2	B1E5		18/25	12/25
31	1	5	1	B1E5	A,B,C,D,E	18/27	12/27
32	12	4	1	B1F3		18/26	12/26
33	12	4	1	B1F3		18/26	12/26
34	12	4	1	B1F3		18/26	12/26
35	12	4	1	B1F3		18/26	12/26
36	5	1	5	B1X1		18/28	12/28
37	10	0	5	B1D4		18/29	12/29
38	10	0	5	B1D4		18/29	12/29
39	10	0	5	B1D4		18/29	12/29
40	13	10	1	G385		18/30	12/30
41	1	3	5	G393		11/2	9/2
42	1	3	5	G393		11/2	9/2
43	13	0	8	G392		11/2	9/2
44	5	1	9	G383		10/11	8/11
45	10	2	8	G383		11/12	9/12
46	1	5	8	G392		11/12	9/12
47	3	10	4	G380		10/9	8/9
48	3	9	0	B186		7/1	5/1
49	6	0	0	B186	A,C,D,E	6/1	4/1
50	5	7	0	B1E5	B,C	7/2	5/2
51	5	9	0	B1E5	A,D,E	7/10	5/10
52	9	1	1	B1D4		6/5	4/5
53	2	2	1	B1E5		7/2	5/2
54	2	2	1	B1E5		7/2	5/2
55	2	2	1	B1E5		7/2	5/2
56	12	6	0	B1L1	A,B,C,E	7/10	5/10
57	10	3	6	B1H3		6/5	4/5
58	3	1	6	B1H3		7/0	5/0
59	3	1	6	B1H3		7/0	5/0
60	3	1	6	B1H3		7/0	5/0
61	6	7	6	G3L4		3/11	2/11
62	13	8	7	G3K7	A,B,C,D,E	5/15	3/15
63	13	8	7	G3K7		5/15	3/15

SW NO.	PIN NO.	KB	KA	DIODE PACK LOC.	SEE NOTES	LSI PART NO. 2475 399	
						NEW-DEC CODE	LC UC
64	2	9	7	G3H3		10/8	8/8
65	10	10	11	G3J3		11/12	9/12
66	6	7	9	G3K7		11/2	9/2
67	12	15	8	G3L4		11/12	9/12
68	3	1	11	G3K3		10/0	8/0
69	3	1	9	G3K3		10/0	8/0
70	2	10	0	G380		SHIFT	LOCK
71	5	8	0	B186	B	6/1	4/1
72	10	9	0	B186	A,C,D,E	7/1	5/1
73	5	0	0	B1D4		7/2	5/2
74	13	1	0	B1D4		6/2	4/2
75	6	2	0	B1E5		6/2	4/2
76	12	3	0	B1E5		6/2	4/2
77	10	4	0	B1F3		6/2	4/2
78	10	4	0	B1F3		6/2	4/2
79	1	4	3	B1G3		6/10	4/10
80	12	5	3	B1G3		6/11	4/11
81	12	6	3	B1H3		6/12	4/12
82	2	1	2	G3K3	A,C,D,E	6/13	4/13
83	6	0	2	G3K7	A,B,C,D	7/11	5/11
84	6	0	2	G3K7		7/11	5/11
85	10	6	2	G3J3	A,B,C,D	7/12	5/12
86	6	7	2	G3L4		3/10	2/10
87	6	5	3	G3K3		10/4	8/4
88	12	8	11	G3J3		11/1	9/1
89	1	7	11	G3J3		11/2	9/2
90	10	0	11	G3J3		11/3	9/3
91	13	2	11	G3K3		10/1	8/1
92	3	2	11	G3K3		10/2	8/2
93	2	7	4	B1E5		SHIFT	
94	10	6	0	B1E5	B,C,D	7/10	5/10
95	5	7	0	B1E5	A,D,E	7/7	5/7
96	6	5	0	B1E5	A,B,C,E	7/8	5/8
97	10	1	4	B1D4		7/8	5/8
98	10	1	4	B1D4		7/8	5/8
99	10	1	4	B1D4		7/8	5/8
100	10	3	4	B1E5		6/2	4/2
101	6	1	3	B1L1		6/12	4/12
102	9	5	5	B1G3		6/13	4/13
103	2	1	7	B1L1	B	6/13	4/13
104	13	6	7	B1L1	A,C,D,E	7/12	5/12
105	13	6	7	B1L1		7/12	5/12
106	13	2	3	B1H3		2/11	3/11
107	13	2	3	G3J3	S	2/15	3/15
108	1	0	3	G3K7	A,B,C,D,E	3/15	3/15
109	2	7	4	G3L4		SHIFT	
110	13	8	3	G3L4		10/2	8/2
110	6	5	10	G3K3		11/0	9/0
112	2	7	8	G3J3		11/10	9/10
113	9	0	10	G3J3		11/11	9/11
116	2	3	10	G3K3		10/3	8/3
118	12	6	4	B1E5	REPEAT		
119	9	4	4	B1F3	SPACE BAR	2/0	2/0
120	12	6	4	B1E5	REPEAT		

- NOTES:
- A. FOR DOMESTIC KEYBOARDS (CODE MAP 1) LEFT DIODE PIN NO. DESIGNATED.
  - B. FOR "CODE MAP 2" KEYBOARDS LEFT DIODE PIN NO. DESIGNATED.
  - C. FOR "CODE MAP 3" KEYBOARDS LEFT DIODE PIN NO. DESIGNATED.
  - D. FOR "CODE MAP 4" KEYBOARDS LEFT DIODE PIN NO. DESIGNATED.
  - E. FOR "CODE MAP 5" KEYBOARDS LEFT DIODE PIN NO. DESIGNATED.
  - F. TO GET 7 PIP CODE+ B1F3-12 DIODE MUST BE LIFTED AND B1E5-13 DIODE INSERTED.
  - G. TO GET 7 PIP CODE+ G3J9-13 DIODE MUST BE LIFTED AND G3K7-3 DIODE INSERTED.
  - H. TO GET KATAKANA OR KATAKANA ROMASI CODE IN PLACE OF DOUBLE UNDERSCORE, G3L4-9 DIODE MUST BE LIFTED AND G3K7-13 DIODE INSERTED.

DIODES TO BE LIFTED TO ACCOMMODATE THE FOLLOWING CODE MAPS.

CODE MAP 1	CODE MAP 2	CODE MAP 3	CODE MAP 4	CODE MAP 5
B1E5-13	B1E5-13	B1E5-13	B1E5-13	B1E5-13
B1E6-6	B1E6-6	B1E6-6	B1E6-6	B1E6-6
B1E9-9	B1E9-9	B1E9-9	B1E9-9	B1E9-9
B1I1-12	B1I1-12	B1I1-12	B1I1-12	B1I1-12
G3K7-13	G3K7-13	G3K7-13	G3K7-13	G3K7-13
B1M6-10	B1M6-10	B1M6-10	B1M6-10	B1M6-10
G3K7-5	G3K7-5	G3K7-5	G3K7-5	G3K7-5
G3K3-2	G3K3-2	G3K3-2	G3K3-2	G3K3-2
G3J9-10	G3J9-10	G3J9-10	G3J9-10	G3J9-10
B1E5-2	B1E5-10	B1E5-10	B1E5-10	B1E5-6
B1F3-6	B1F3-6	B1F3-6	B1F3-6	B1F3-6
B1I1-13	B1I1-2	B1I1-13	B1I1-13	B1I1-13
G3K7-3	G3K7-3	G3K7-3	G3K7-3	G3K7-3
G3M0-9	G3M0-9	G3M0-9	G3M0-9	G3M0-9
G3M0-12	G3M0-12	G3M0-12	G3M0-12	G3M0-12
G3M0-13	G3M0-13	G3M0-13	G3M0-13	G3M0-13
G3K7-2	G3K7-2	G3K7-2	G3K7-2	G3K7-2
G3K7-9	G3K7-9	G3K7-9	G3K7-9	G3K7-9
G3K7-10	G3K7-10	G3K7-10	G3K7-10	G3K7-10

- I. UNLESS OTHERWISE NOTIFIED VENDOR TO LEFT DIODES PER CODE MAP 1.
- J. KEYBOARD MUST BE CAPABLE OF PASSING THE TEST SPECIFIED IN 2477 2543.

