Computer Access Card Assembly

Contents

Introduction

Before you begin the experiments in this training kit, you will assemble the special Computer Access Card. You will use this special circuit board to make connections to your computer. It will provide many useful circuits you will use in the experiments in the accompanying training kit.

All the small parts you will need to assemble the Computer Access Card are in a plastic bag marked 4A-9DC. This bag has four separate sections. The parts in each section are used in the four stages of assembly that follow. In addition to the parts in the plastic bag, you will need a soldering iron, a 1/4″ nut-driver, and a small screwdriver. The following parts are *not* in the plastic bag:

Part No.	Quan.	Description	Price Each
EC124	1	Computer Access Card	15.00
SO116	2	Breadboard sockets	12.00

Assembly Stages 1 Through 4

STAGE 1 ASSEMBLY

Refer to Fig.1 for the first assembly steps. You will need the following parts from bag 4A-9DC:

Part No.	Quan.	Description	Price Each
LP17	8	Red LEDs	.50
RE167	8	470 ohm, 1/4 watt resistors	.15
RE196	8	15k, 1/4 watt resistors	.15
TS43	8	2N4124 or equivalent transistors	.40

Follow the numbered steps in Fig.1 to install the parts. Make sure the bodies of the resistors are flush up against the circuit board before you solder the leads. Make certain the small flat portions of the LEDs are positioned exactly as shown on the circuit board when you install them. This is shown in Fig.1, Detail A. Use Detail B to identify the emitter (E), base (B), and collector (C) leads of the transistors.

When you have installed each group of eight parts, turn over the circuit board and solder the leads of the parts. Then clip off the excess lead length with your diagonal cutters.
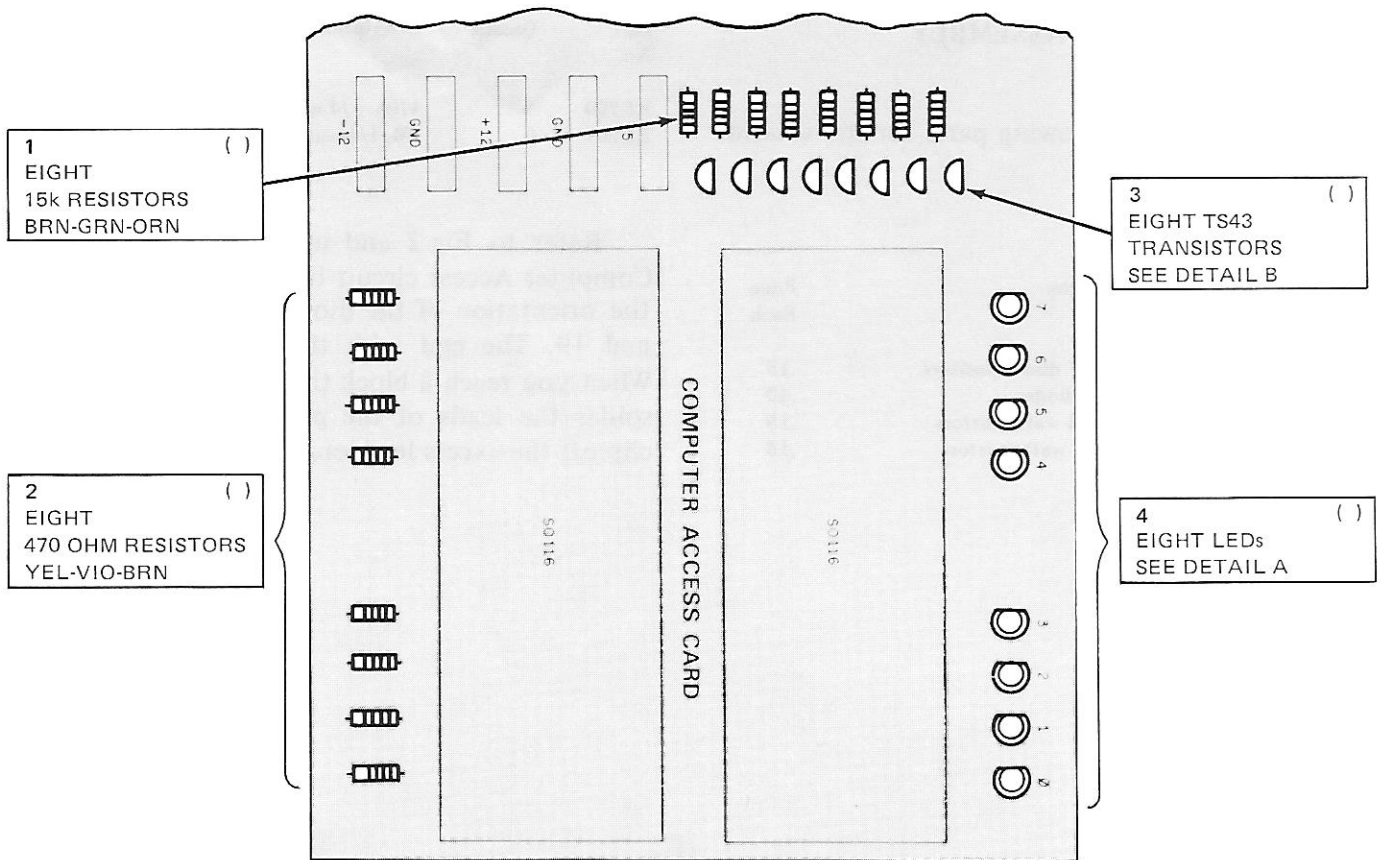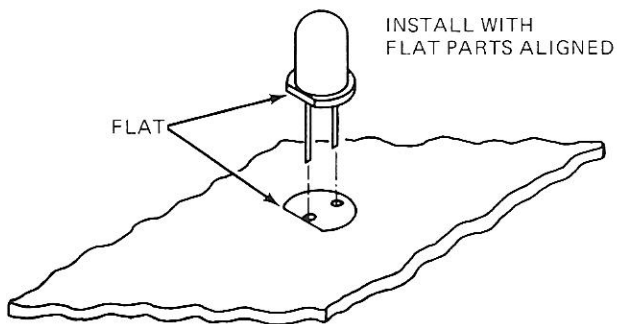
1 ( )
EIGHT
15k RESISTORS
BRN-GRN-ORN

2 ( )
EIGHT
470 OHM RESISTORS
YEL-VIO-BRN

3 ( )
EIGHT TS43
TRANSISTORS
SEE DETAIL B

4 ( )
EIGHT LEDs
SEE DETAIL A

COMPUTER ACCESS CARD

Figure 1. First assembly stage.

INSTALL WITH
FLAT PARTS ALIGNED

FLAT

Figure 1, Detail A.

FLAT

E B C
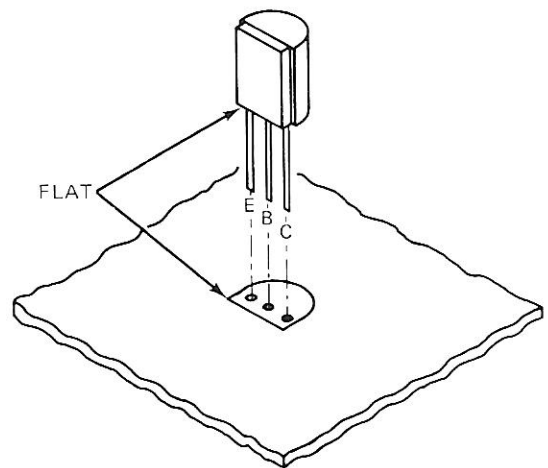
Figure 1, Detail B.

STAGE 2 ASSEMBLY

Now gather the following parts for the second assembly steps:

Part No.	Quan.	Description	Price Each
CN34	6	0.001 μF disc capacitors	.15
CR23	2	1 N914 diodes	.40
RE166	2	4.7k, 1/4 watt resistors	.15
RE197	8	22k, 1/4 watt resistors	.15

Part No.	Quan.	Description	Price Each
RE200	4	470k, 1/4 watt resistors	.15
RE201	6	1M, 1/4 watt resistors	.15

Refer to Fig.2 and install these parts on the Computer Access circuit board. Be sure to observe the orientation of the diodes installed in Steps 11 and 19. The end with the band is the *cathode*. When you reach a block that is shaded in, stop and solder the leads of the parts just installed. Then clip off the excess lead lengths.

| 1 ( )
470k
YEL-VIO-YEL | 10 ( )
0.001 μF | 11 ( )
1N914 DIODE
NOTE CATHODE | 12 ( )
470k
YEL-VIO-YEL |

| 2 ( )
1 MEGOHM
BRN-BLK-GRN | | | 13 ( )
1 MEGOHM
BRN-BLK-GRN |

| 3 ( )
0.001 μF | | | 14 ( )
1 MEGOHM*
BRN-BLK-GRN |

| 4 ( )
1 MEGOHM
BRN-BLK-GRN | | | 15 ( )
0.001 μF |

| 5 ( )
470k
YEL-VIO-YEL | | | 16 ( )
0.001 μF |

| 6 ( )
0.001 μF | | | 17 ( )
1 MEGOHM*
BRN-BLK-GRN |

| 7 ( )
0.001 μF | | | 18 ( )
470k
YEL-VIO-YEL |

| 8 ( )
EIGHT
22k RESISTORS
RED-RED-ORN | | | 19 ( )
1N914 DIODE
NOTE CATHODE |

| 9 ( )
TWO
4.7k RESISTORS
YEL-VIO-RED | | | 20 ( )
1 MEGOHM
BRN-BLK-GRN |

* Board may be marked 22k at locations shown in Steps 14 and 17. Install a 1 Megohm resistor instead of a 22k resistor.

Figure 2. Second assembly stage.

5

STAGE 3 ASSEMBLY

Now locate the following parts for the third assembly step:

Part No.	Quan.	Description	Price Each
SO84	5	14-pin IC sockets	.75
SO86	3	16-pin IC sockets	.75
SO102	5	Circuit board terminal blocks	.50
SO117	2	20-pin IC sockets	.75

Part No.	Quan.	Description	Price Each
SW99	2	Red pushbutton switches	.60
SW106	1	10-position DIP switch	3.40

The instructions for installing these parts are shown in Fig.3. Notice that each IC socket has a notch or other identifying feature at one end. This end of the socket should be positioned as shown in the figure. Solder all pins of each socket as you install them on the circuit board. Be sure the edge of the 10-position DIP switch marked "OPEN" is oriented as shown. Be sure the flat parts of the red pushbutton switches are in the position screened on the circuit board.

SOLDER THE SOLDER TAB TO THE FOIL. TOUCH IRON TO MELT PLASTIC TABS TO SECURE TERMINAL BLOCK.

PLASTIC TAB

PLASTIC TAB

SOLDER TAB

Figure 3, Detail A.

Figure 3. Third assembly stage.

1　( )
TWO
14-PIN SOCKETS

2　( )
TWO RED
PUSHBUTTON
SWITCHES
OBSERVE
FLAT POSITION

3　( )
20-PIN SOCKET

4　( )
10-POSITION
DIP SWITCH

5　( )
FIVE
TERMINAL BLOCKS
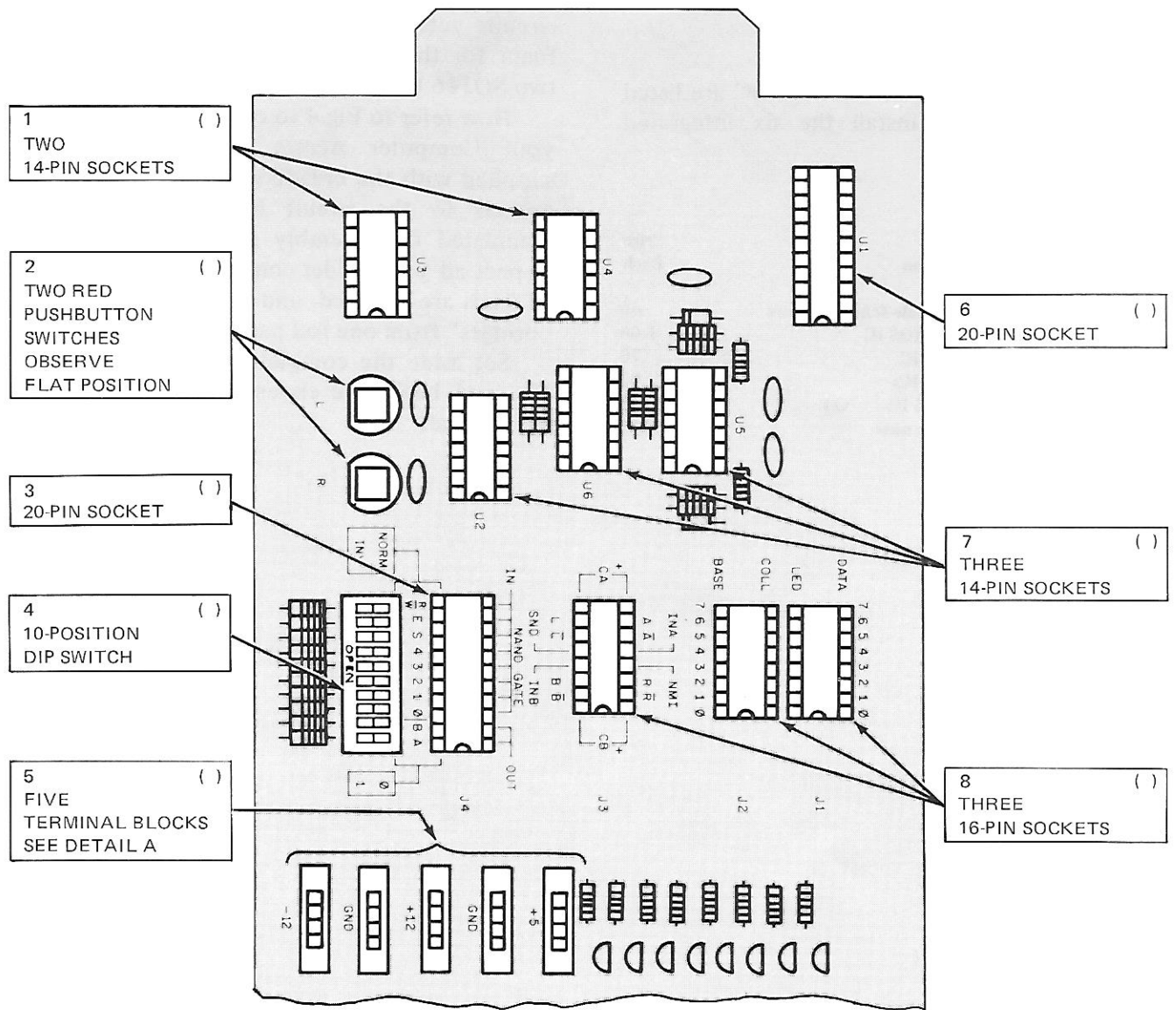SEE DETAIL A

6　( )
20-PIN SOCKET

7　( )
THREE
14-PIN SOCKETS

8　( )
THREE
16-PIN SOCKETS

STAGE 4 ASSEMBLY

The parts remaining in bag 4A-9DC are listed below. You will *not* install the six integrated circuits yet. Leave them in their protective black foam for the time being. You will also need the two SO116 breadboard sockets listed earlier.

Now refer to Fig.4 to complete the assembly of your Computer Access Card. Use the screws supplied with the breadboard sockets to secure the sockets to the circuit board. When you have completed the assembly steps in Fig.4, carefully inspect all your solder connections. Make sure that all leads are soldered, and that there are no solder "bridges" from one foil pad to another.

Set aside the completed circuit board and the ICs, and begin the experiments in your Training Kit manual.
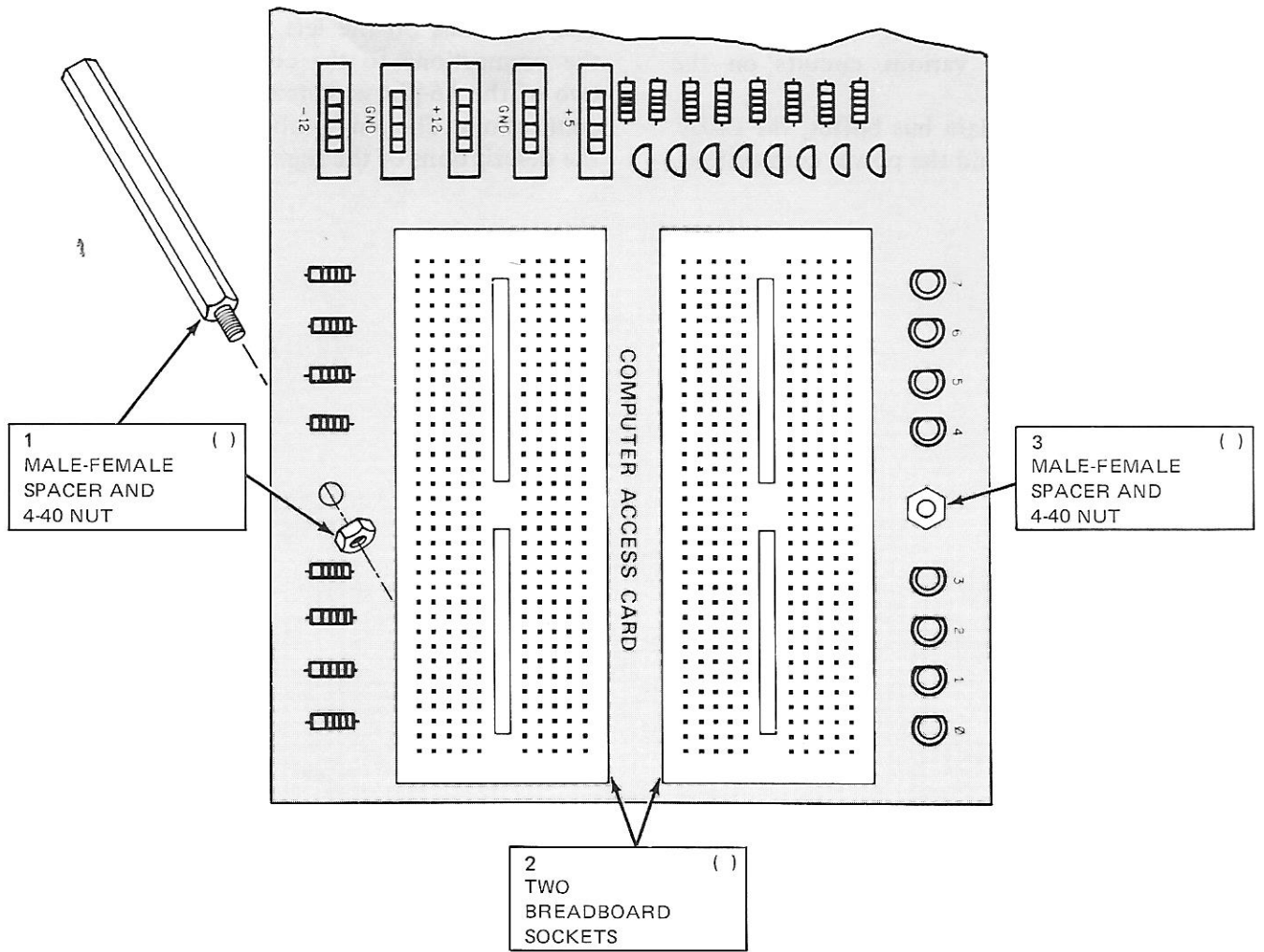
Part No.	Quan.	Description	Price Each
HA121	2	1-1/2″ male-female spacers	.60
IG48	2	4001 CMOS IC	1.00
IG103	1	74LS30 IC	.70
IG104	2	74LS86 ICs	.90
IG105	1	74LS245 IC U1	2.50
NU5	2	4-40 hex nuts	12/.15

Figure 4. Fourth assembly stage.

1   ( )
MALE-FEMALE
SPACER AND
4-40 NUT

2   ( )
TWO
BREADBOARD
SOCKETS

3   ( )
MALE-FEMALE
SPACER AND
4-40 NUT

COMPUTER ACCESS CARD

-12   GND   +12   GND   +5

There are three additional figures in this manual that show the various circuits on the Computer Access Card.

Figure 5 shows the data bus buffer, the LEDs, the transistor inverters, and the power connections.

The terminals on the left side of the diagram are the connections to the computer. J1 and J2 are two of the 16-pin sockets to which you can make connections. The pin numbers are shown, as well as the descriptions of the signals at each pin.

Figure 5. Data bus buffer, LEDs, transistor inverters, and power connections.
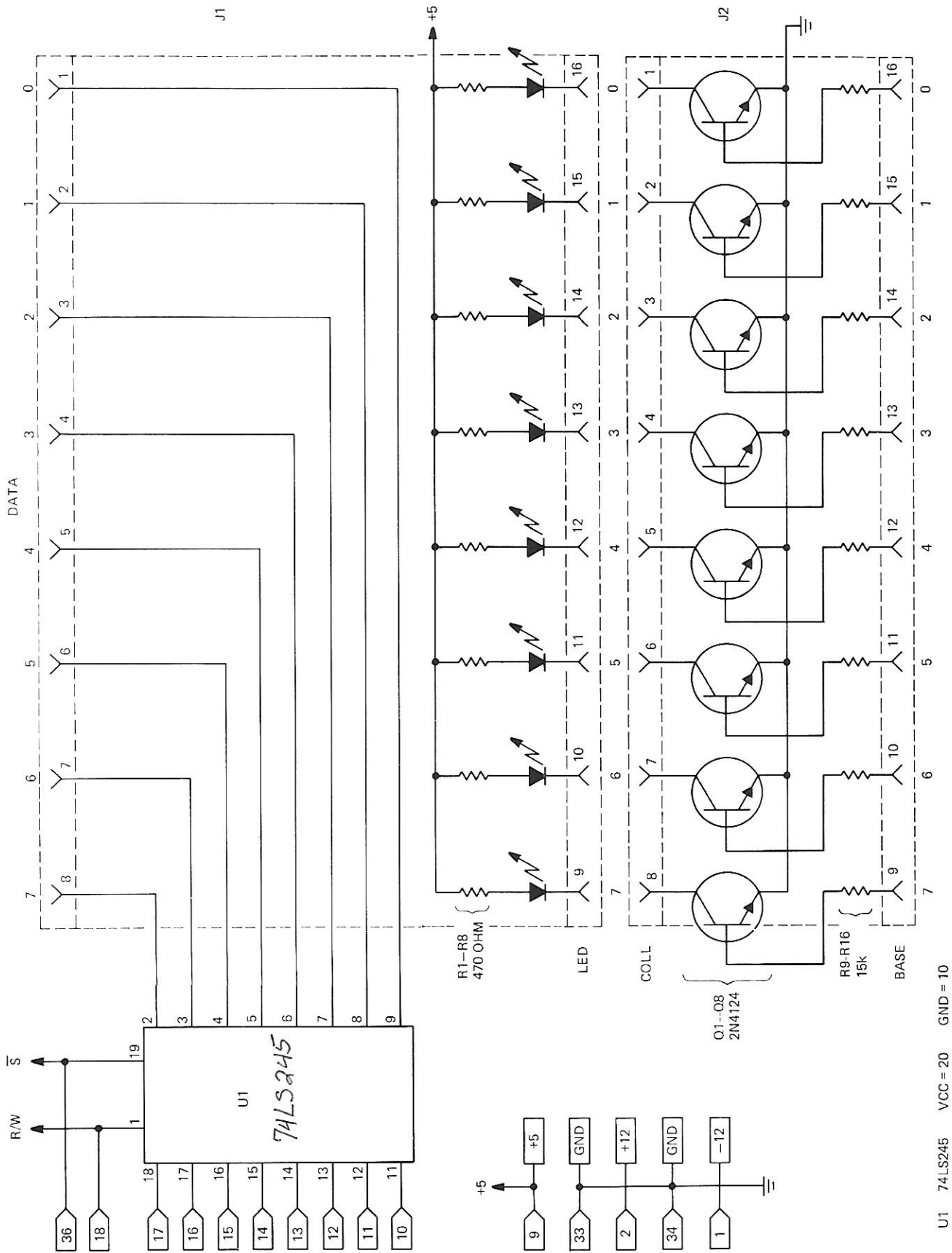
U1   74LS245   VCC = 20   GND = 10

Figure 6 shows the connections to the 20-pin socket, J4. It also shows the connections to the 10-position DIP switch. Again, the connections on the left side of the figure are the connections to the computer.

Figure 7 shows the circuits connected to the third 16-pin socket, J3. There are two buffers for the pushbutton switches, two monostable multivibrators (one-shots), as well as connections to the SND and NMI pins of the computer.

U2   74LS30   VCC = 14   GND = 7
U3, U4   74LS86   VCC = 14   GND = 7
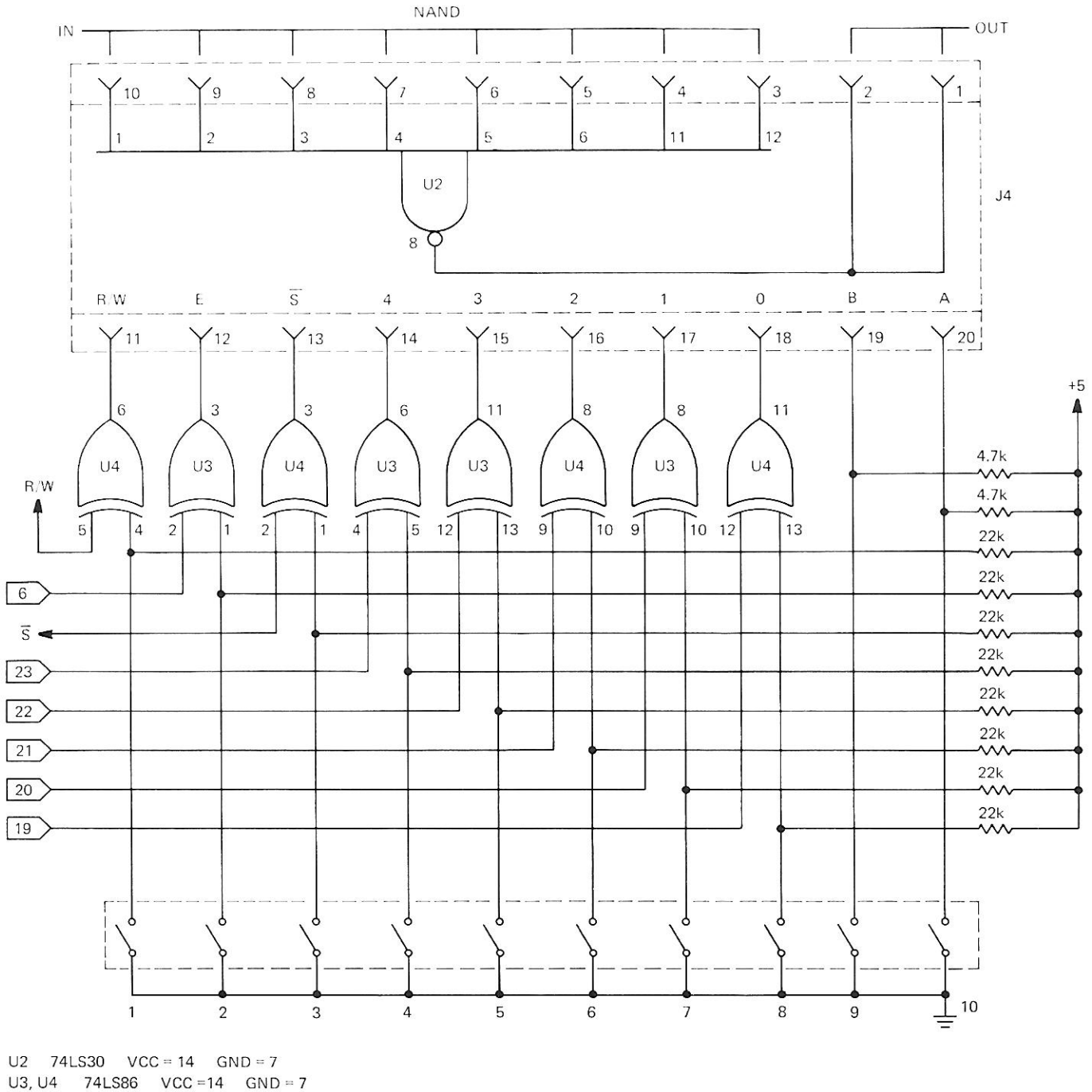
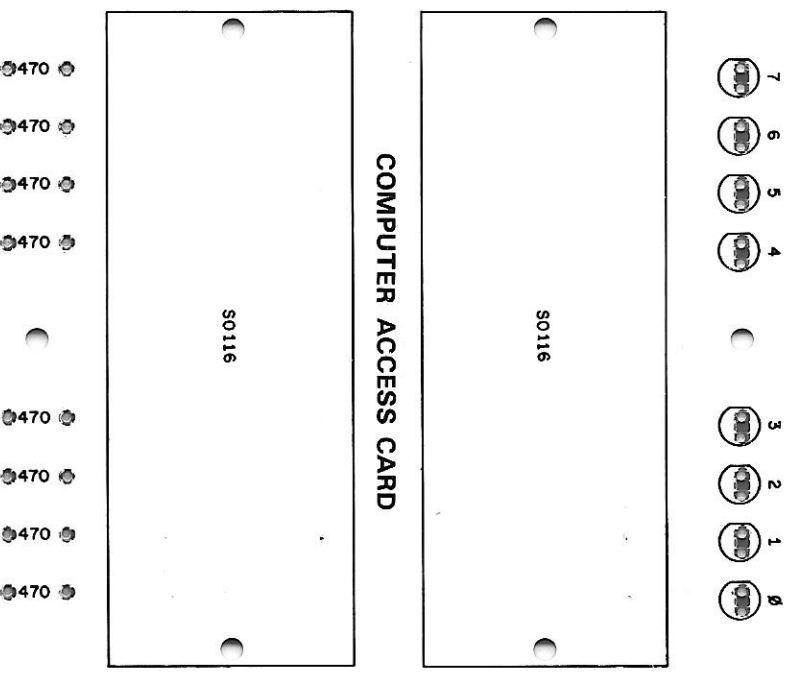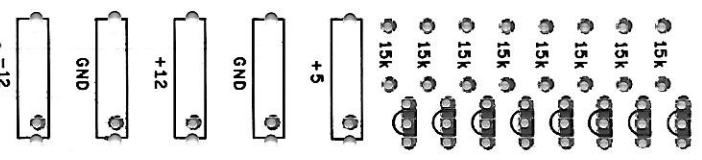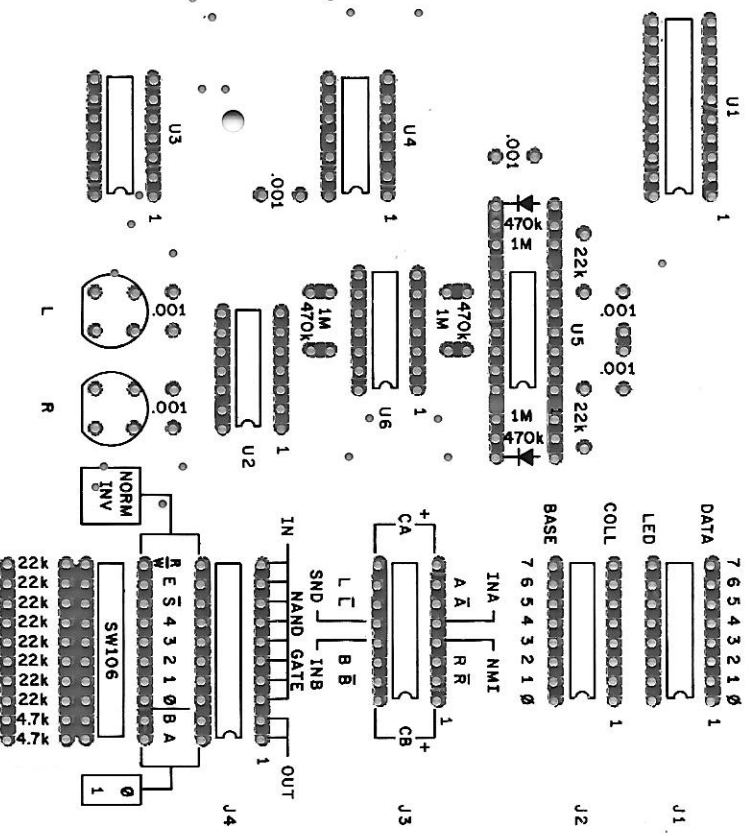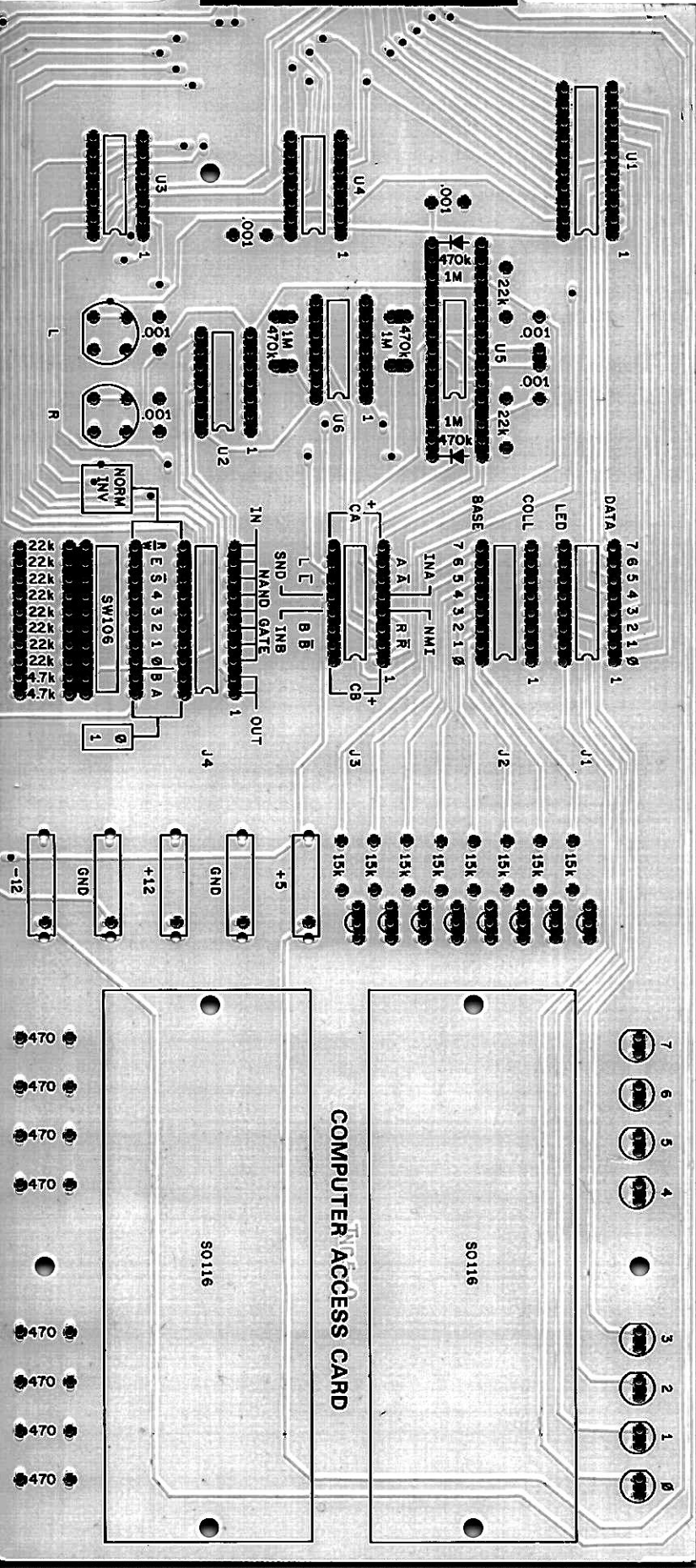Figure 6. Logic switches, address and control selects, and decoder.
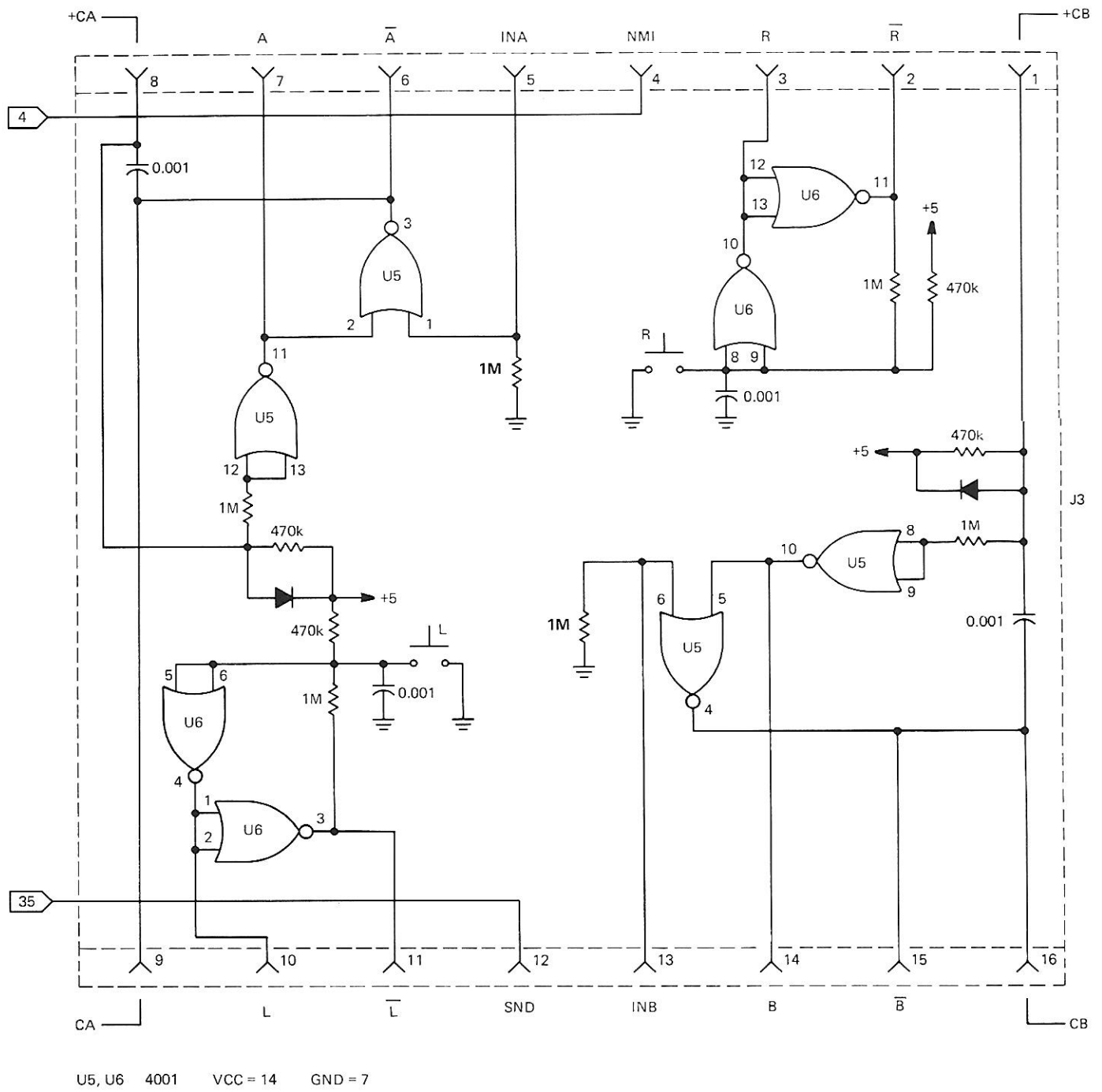
Figure 7. Left and right pushbutton switches, A and B monostable multivibrators, connections for NMI and SND.

U5, U6   4001   VCC = 14   GND = 7
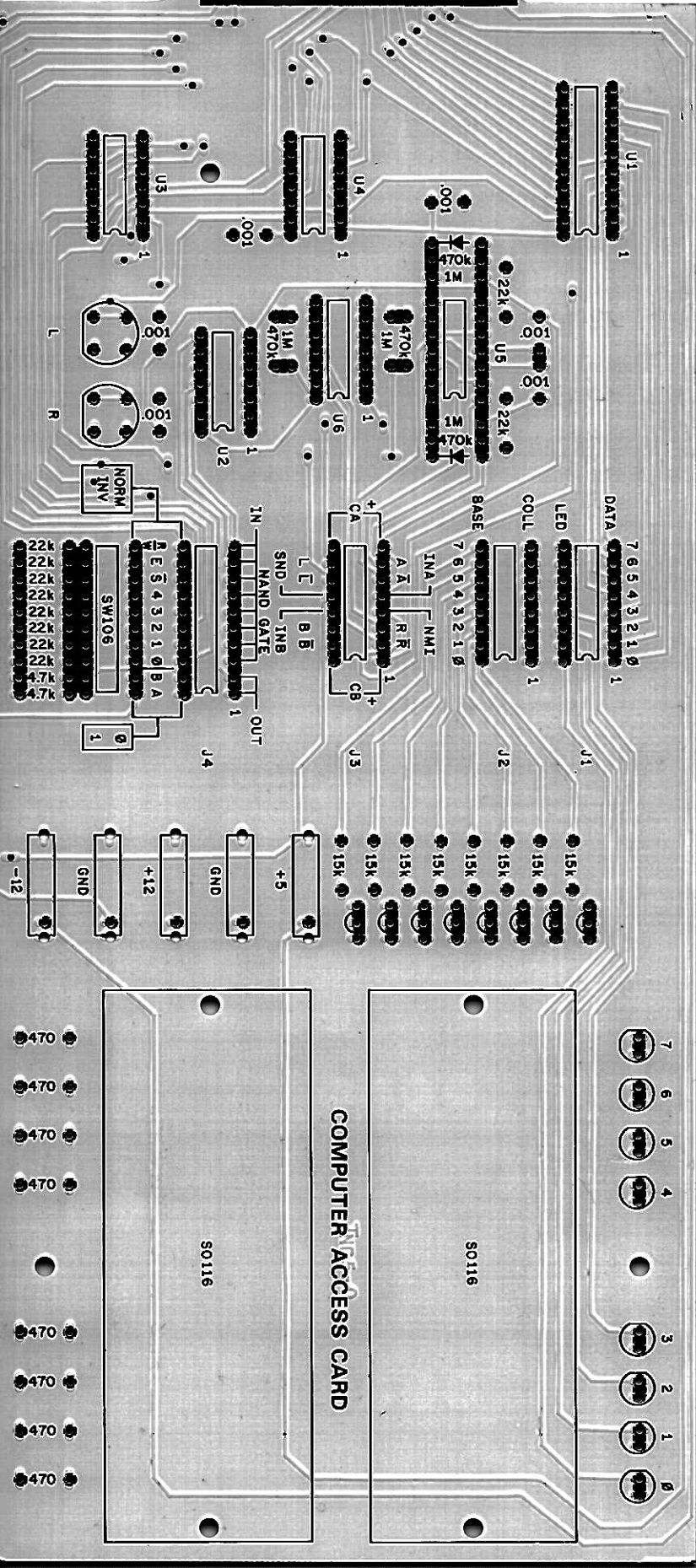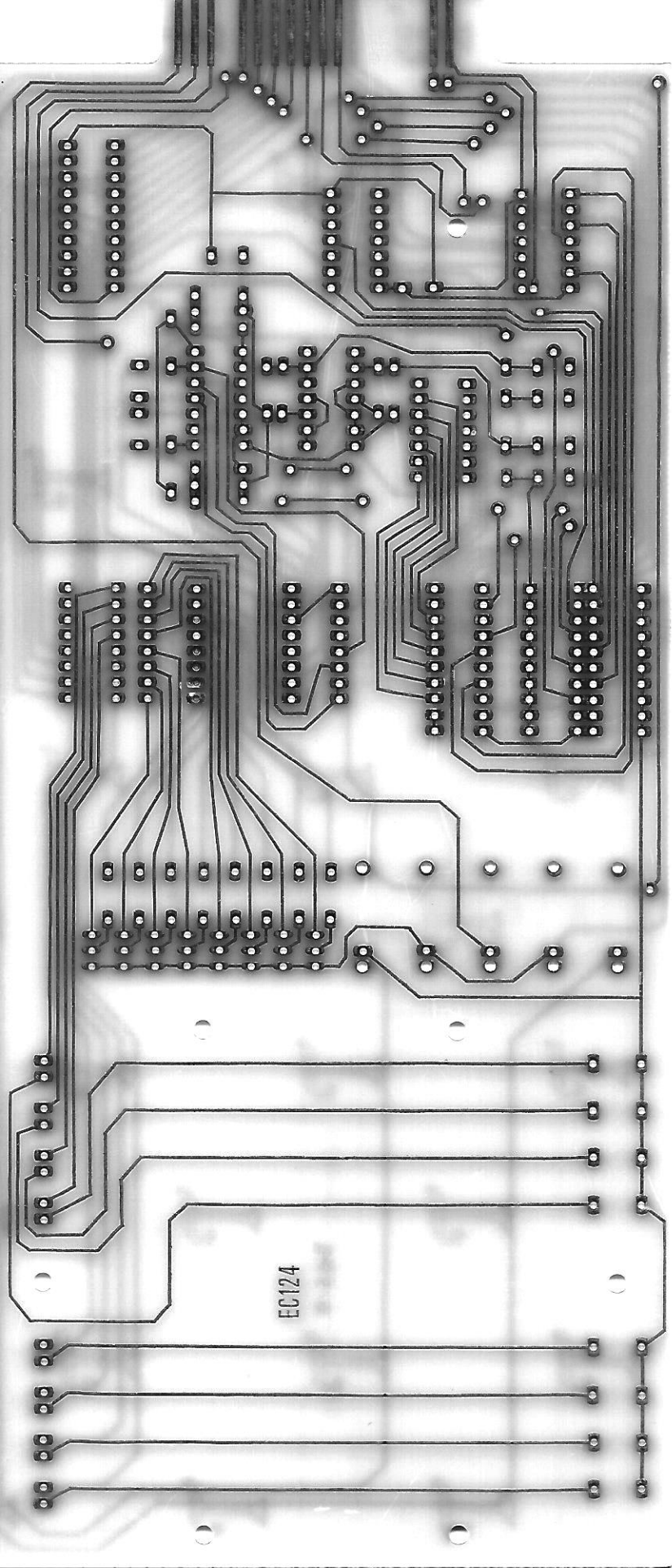
13

COMPUTER ACCESS CARD

U3 U4 U1

.001 .001

470k
1M

22k
U5

.001
.001

1M
470k
1M
470k
U6
U2

1M
470k
22k

NORM
INV

22k
22k
22k
22k
22k
22k
22k
22k
4.7k
4.7k

SW106
RES 5 4 3 2 1 0 B A

SND
NAND GATE
IN
OUT

1 0

CA
L C
INA
A Ā
B B̄
R R̄
NMI
CB

BASE
COLL
LED
DATA

7 6 5 4 3 2 1 0   7 6 5 4 3 2 1 0   1

J4   J3   J2   J1

-12   GND   +12   GND   +5

15k 15k 15k 15k 15k 15k 15k 15k

470
470
470
470

470
470
470
470

SO116   SO116

COMPUTER ACCESS CARD

7
6
5
4

3
2
1
0

U3 U4 U1

.001 .001

U5

470k
1M

22k

.001

.001

470k
1M 1M
470k

U6

U2

1M
470k

22k

NORM
INV

22k
22k
22k
22k
22k
22k
22k
22k
4.7k
4.7k

RES 4 3 2 1 0 B A

SW106

1 0

IN

SND
NAND GATE

CA
+
L
B B
C
CB
+

BASE

COLL

LED

DATA

INA
A Ā
R R̄
NMI
1

7 6 5 4 3 2 1 0

1

1

7 6 5 4 3 2 1 0

1

OUT
1

J4   J3   J2   J1

-12   GND   +12   GND   +5

15k 15k 15k 15k 15k 15k 15k 15k

470

470
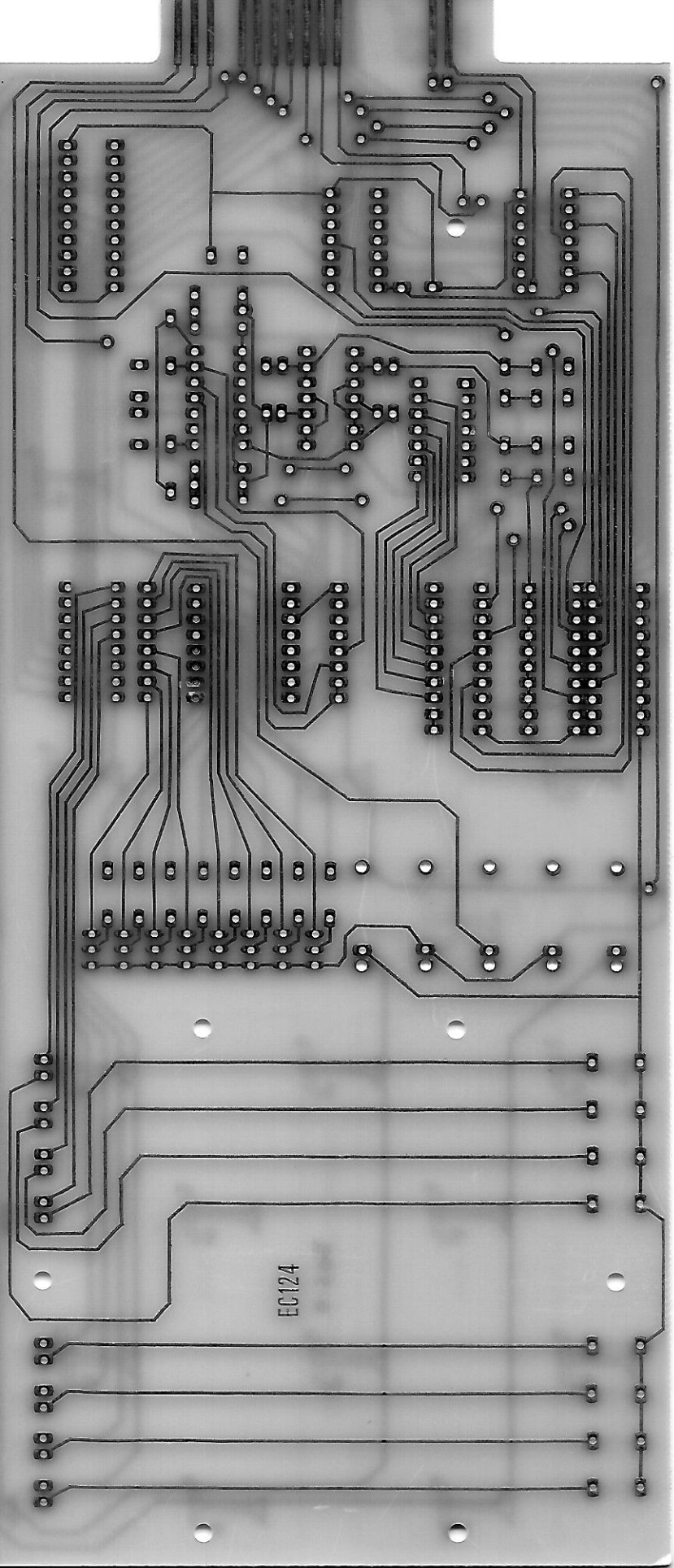
470

470

7

6

5

4

470

470

470

470

COMPUTER ACCESS CARD

SO116   SO116

3

2

1

0

EC124

EC124

EC124