

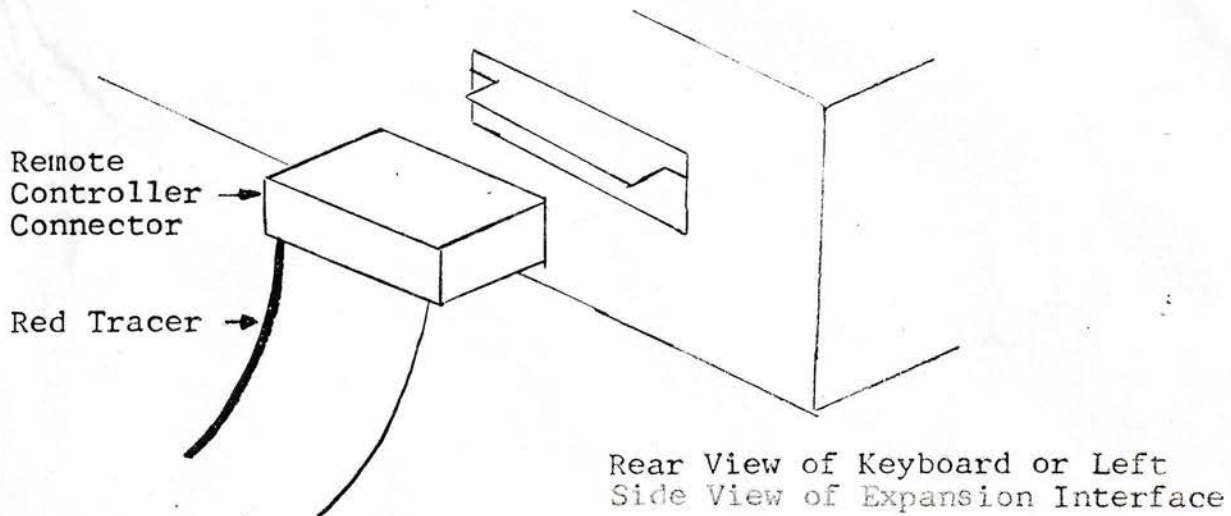
The SciTronics Remote Controller

S-100 users:

- 1/ Plug the board into an unused socket in your system.
- 2/ Plug the power chord into a 120 VAC outlet.
- 3/ Go and read section II where the software is explained.

TRS-80I users:

- 1/ Plug the AC adaptor into the back of the case and then plug the adaptor into a 120 VAC outlet.
- 2/ Plug the connector, on the end of the ribbon cable, into the Expansion Port at the rear of the Keyboard or into port J3 of the Expansion Interface.



- 3/ Plug the power chord into a 120 VAC outlet.
- 4/ Go and read section II where the software is explained.

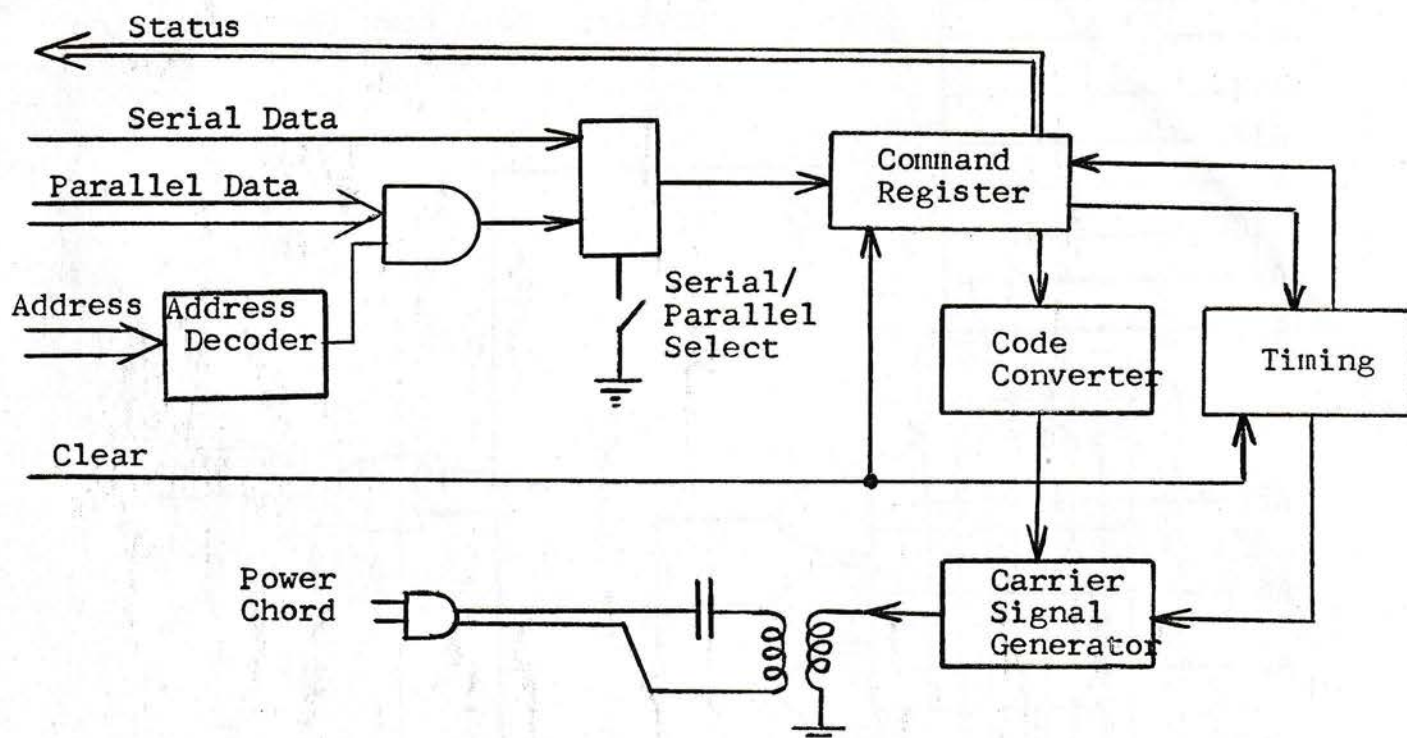
Apple II users:

- 1/ Plug the edge card into a slot on your system.
- 2/ Plug the AC adaptor into the back of the RC case and then plug the adaptor into a 120 VAC outlet.
- 3/ Plug the power chord into a 120 VAC outlet.
- 4/ Go and read section II where the software is explained.

Other users:

Read Section I to determine how you wish to configure your system, and then go to Section II. With orders for other specific systems one receives special wiring information. Follow these special instructions.

I-A System Operation



The Remote Controller operates in the following manner.

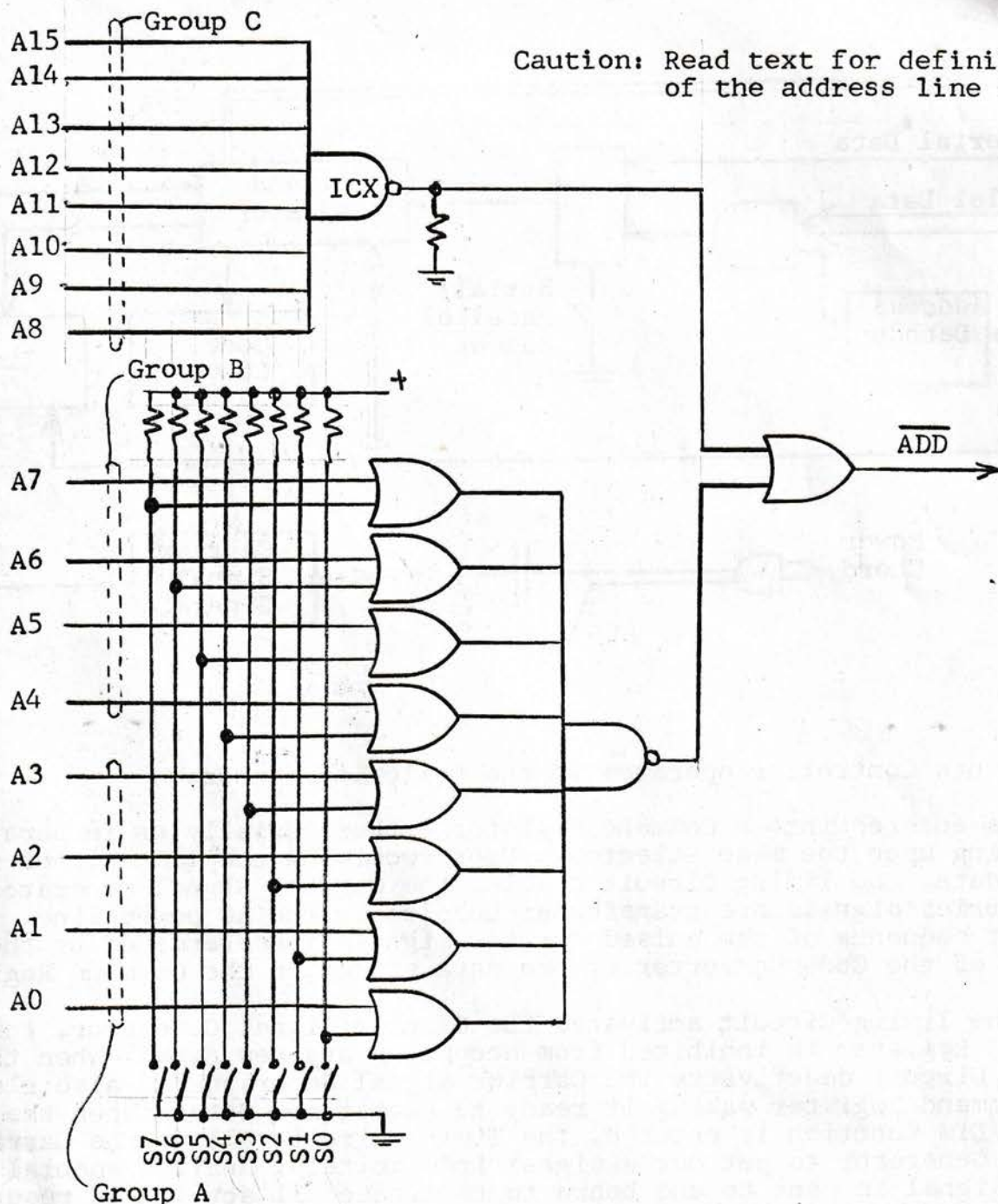
Data is entered into a Command Register either serially or in parallel, depending upon the mode selected. Upon receiving the last bit of required data, the Timing Circuit enables the Carrier Signal Generator. The carrier signals are transformer coupled to the AC power line. The correct sequence of the pulsed carrier signals is determined by the action of the Code Converter on the data stored in the Command Register.

When the Timing Circuit activates the Carrier Signal Generator, the Command Register is inhibited from accepting any new data. When the Timing Circuit deactivates the Carrier Signal Generator it also clears the Command Register making it ready to accept new data. When the Bright/Dim function is entered, the Timing Circuit allows the Carrier Signal Generator to put out a signal indefinitely, until a special clear signal is sent to the board to terminate all action and reset the Command Register.

The contents of part of the Command Register are available as Status Signals whenever the board is read. If the Command Register is empty the board is "Ready". If the Timing Circuit is busy putting out a normal signal the board is "Busy", whereas if the Timing circuit is busy putting out a Bright/Dim signal the board is "Bright/Dim".

If the AC power plug should accidentally become unplugged, preventing the carrier signals from getting onto the power line, the board will not clear itself and will remain in a "Busy" mode.

I-B Address Decoder



When used in a port addressed or memory mapped mode the address decoder is employed. The 16 possible input lines are divided into three groups (A, B, and C). In a port addressed system, part ICX is absent from its socket and the low byte of the address bus feeds groups A and B. This allows switches S0 thru S7 to establish the board address anywhere from 0 to 255 (Decimal).

In a memory mapped system the middle 8 bits of the 16 bit address bus are fed to part ICX via group C. Group A then handles the lowest 4 bits and group B the highest 4 bits of the address. This allows the address to be set at any location XXXX11111111XXXX (Binary).

I-C Control Logic

Board Clear- An active low on $\overline{\text{RST}}$ will immediately terminate any present activity and completely clear the board. In addition, the board has its own power on reset (POR) which lasts for $\frac{1}{2}$ ms.

When operating in the serial mode of data entry, $\overline{\text{RST}}$ is the only way of quickly clearing the board. When in this mode, writing a burst of 12 consecutive ones will also clear the board.

In the parallel mode of data entry clearing is best achieved by writing the data word "00" to the board.

Control C1- C1 is the clock pulse in which:

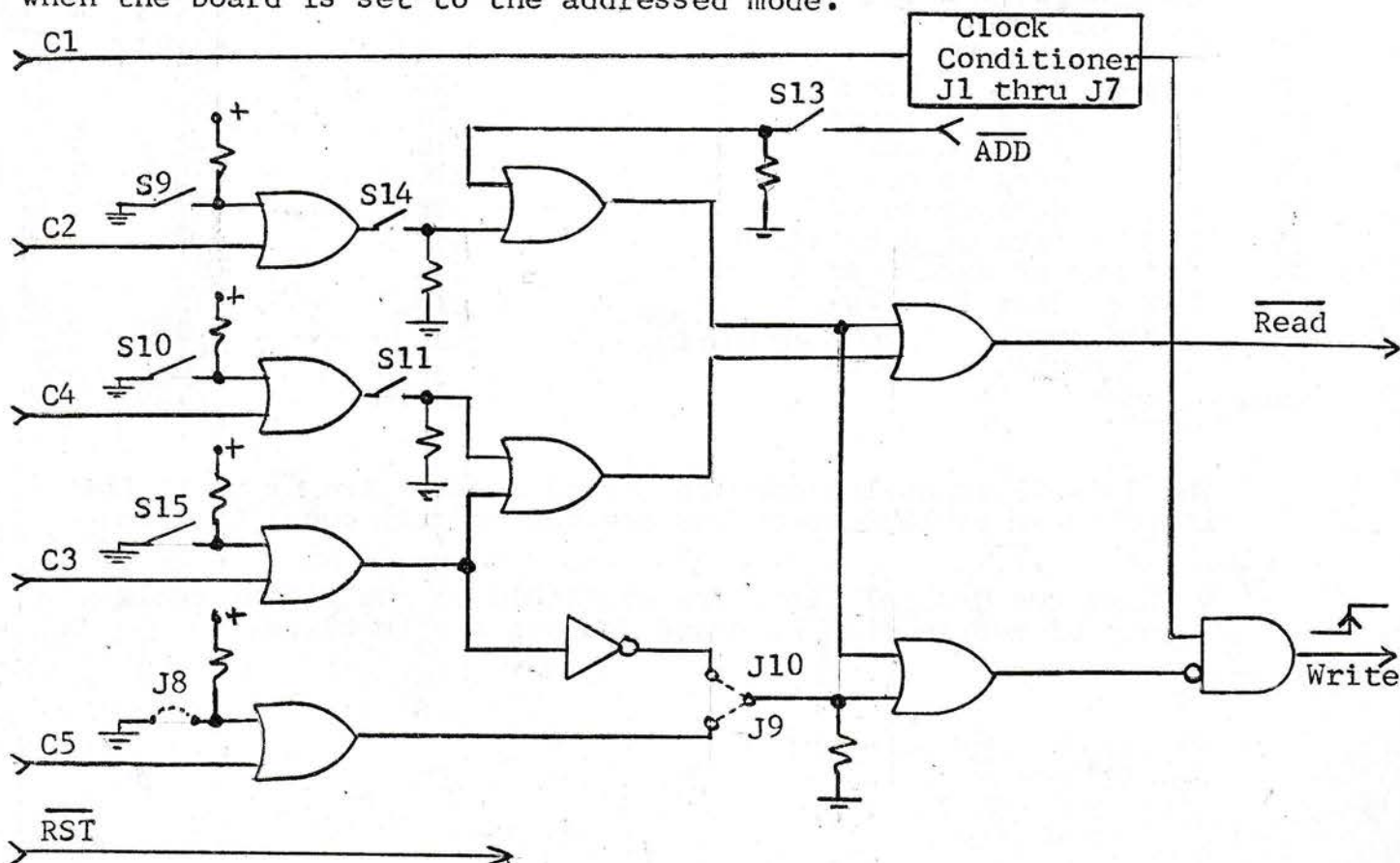
- i/ either transition of either polarity can be used (Jumper selectable) to clock in data which is presented to the board either in a parallel or serial format, and
- ii/ the active level is used to strobe in the clear data word "00".

Control C2- C2 is used to enable the read-write process when the board is set to the addressed mode. C2 can be used as a board disable.

Control C3- C3 is used to enter a Read/Write select (Jumper J10 present), or a Read Strobe (Jumper J3 absent), when the board is set to the addressed mode.

Control C4- C4 is used to gate a Read signal (Switch 11 on) when the board is set to the addressed mode.

Control C5- C5 is used to gate a Write signal (Jumper J9 present), when the board is set to the addressed mode.



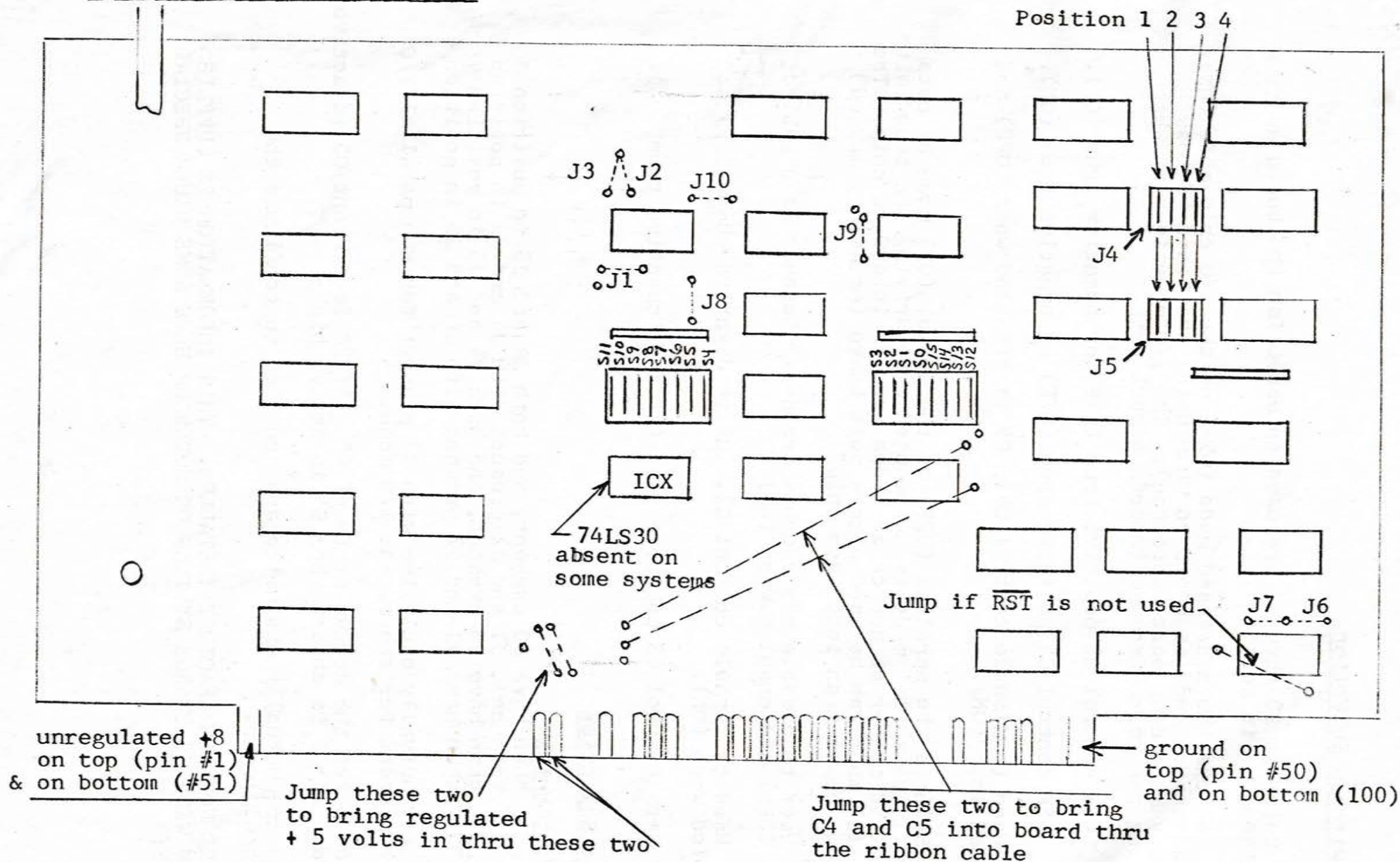
I-D The Physical Location Of The Signal Lines

RC Line	Description	Pin Number on RC-100 edge card	Conductor No. of ribbon Cable (#1 at red) or pin number of edge card connector on cable
A0	LSB of address	79	26
A1	2nd LSB of address	80	28
A2	3rd LSB of address	81	39
A3	4th LSB of address	31	33
A4	4th MSB of address	30	32
A5	3rd MSB of address	29	36
A6	2nd MSB of address	82	37
A7	MSB of address(8th bit on port address, 16th bit on full memory map)	83	35
A8	these are the middle 8 bits of the memory mapped address	84	12
A9		34	18
A10		37	3
A11		87	10
A12		33	6
A13		85	5
A14		86	9
A15		32	8
C1	Control 1 <u>WRITE</u>	77 NO	11
C2	Control 2 <u>ADDRESS DISABLE</u>	22 NO	24
C3	Control 3 <u>DATA BUS IN</u>	78 NO	20
C4	Control 4 <u>SWP</u>	46	(1)*
C5	Control 5 <u>SOOT</u>	45	(3)*
D0	LSB of data to board	36	29
D1	data to board	35	21
D2	data to board	88	31
D3	data to board	89	25
D4	data to board	38	17
D5	MSB of data <u>used by</u> board	39	27
D6	2nd MSB of data from board	93	23
D7	MSB of data from board	43	19
RST	board reset <u>POWER ON CLEAR</u>	99	1
+8	unregulated +8 volts	1, 51	NA
gnd.	ground	50, 100	7, 30

The TRS-80I expansion port edge card numbers are close to the above given cable numbers but are not exactly equal to them.

* These two Control lines are available on the ribbon cable only if two special PC board jumpers are in place.

I-E Jumper and Switch Layout



To expose the board on encased models remove the two screws on the top rear of the lid and slide the top panel towards the back. (CAUTION - DO NOT OPEN THE LID WITHOUT FIRST UNPLUGGING THE POWER CHORD AND AC ADAPTOR)

I-F DIP Switches Selection

S0-S7 Switches S0 thru S7 are used to establish the board address as discussed in section I-B.

- OFF S8 Selects the addressed mode (OFF) or the I/O chip mode (ON). The addressed mode is employed when using the board address (memory mapped or port addressed). The I/O mode is used when driving the board from an interface port chip
- S9 Sets control C2 positive true (OFF) or negative true (ON).
- S10 Sets control C4 positive true (OFF) or negative true (ON).
- S11 Used to disable control C4. C4 is disabled when (OFF) and enabled when (ON).
- S12 Selects the parallel (OFF) or the serial (ON) mode of data entry. The serial mode is to be used when driving the board with a limited number of dedicated lines from an interface chip. The parallel mode can be used with a port based (or memory mapped) system or with an interface chip.
- S13 Used to disable the address decoder. Decoder is disabled when (OFF) and enabled when (ON).
- S14 Used to disable control C2. C2 is disabled when (OFF) and enabled when (ON).
- S15 Sets control C3 positive true (OFF) or negative true (ON).

I-G Jumper Selection

Clock Conditioning

- If C1 is  then have J3 present, and both J4 and J5 in position 3
- If C1 is  then have J1 and J2 present with J4 and J5 in position 3
- If C1 is  then have J3 present, and both J4 and J5 in position 4
- If C1 is  then have J1 and J2 present with J4 and J5 in position 4

J6 and J7 are mutually exclusive with J6 present for the parallel I/O mode or J7 present for the serial I/O mode.

J8 is used to set the active state of C5. If J8 is present C5 is active low, whereas if J8 is absent then C5 is active high.

J9 and J10 are mutually exclusive and are used to configure the input control logic.

JUMPERS ARE NORMALLY FACTORY INSTALLED. THIS INFORMATION IS SUPPLIED SHOULD YOU WISH TO CHANGE SYSTEMS OR MODES OR HAVE SOME OTHER SPECIAL REQUIREMENTS.

II. Software Considerations

The board must first be in a ready state, and then be sent 12 bits of data, before it can transmit a valid line carrier signal. The sensing of the boards state and the entering of the required 12 bits of data is best presented with specific examples.

Board Set To Addressed Mode

The board is ready to accept new data if reading it yields 0XXXXXXX. By examining the MSB of the result one can see if it will accept new data. As an example, if the result of logical anding of the boards output word with the number 128 (Decimal), or 80 (Hex) yields zero, then the board is busy, otherwise it is ready.

To activate the board, write to the board address the House Code, the Unit Code, and then the Function Code (See accompanying table of code words). If desired, the Unit Code may be written before the House Code, but as soon as the board receives the Function Code it starts putting out carrier signal.

If nonvalid code words are written to the board, the board might go "BUSY" and put out a nonfunctional carrier signal, and might not terminate such action on its own. If such occurs, writing the "STOP" command to the board will clear it.

The board uses the last House Code and the last Unit Code it has received before the activating Function Code arrives. Since the completion of carrier transmission resets the Command Register one must reenter a House and Unit Code before each Function Code.

When data is written to the board, only the 6 low order bits of the data word are used. The board decodes the 6 bits as being either a House Code, a Unit Code, a Function, or a STOP Code (STOP is a special type Function Code). Then 4 bits are extracted from each word and entered into the Command Register.

If the board has been sent a Bright/Dim command it will continuously output a carrier signal until the "STOP" is written to the board. One can sense this state by noting that a board so read will yield 00XXXXXX. Thus an active low second MSB indicates that a Bright/ Dim signal is being sent.

Board Set To Parallel I/O Mode

Board data output lines D7 and D6 are always enabled. An active low on D7 signifies a busy board, while an active low on D6 shows that Bright/Dim transmission is taking place.

If C1 is jumper selected to clock on a positive going transition, the output port driving C1 should start out low. To parallel load the data, establish the desired House Code on lines D0 thru D5 via six dedicated output port lines. For example, to set up House Code A have D0=D2=D5=1 and D1=D3=D4=0, since A is 25 Hex. Next bring C1 high to clock in the House Code. Then bring C1 down at the

same time that D0 thru D5 are receiving the Unit Code. Bringing C1 high will then write in the unit code. Bring C1 low once more while setting up the Function Code on D0 thru D5. Finally bringing C1 high completes the process by clocking in the Function Code.

The board can be cleared, or a Bright/Dim transmission terminated anytime by bringing C1 high while $D0 \cdot D1 = \text{low}$.

If $\overline{\text{RST}}$ is not employed it must be tied high, see figure I-E.

Board Set To Serial I/O Mode

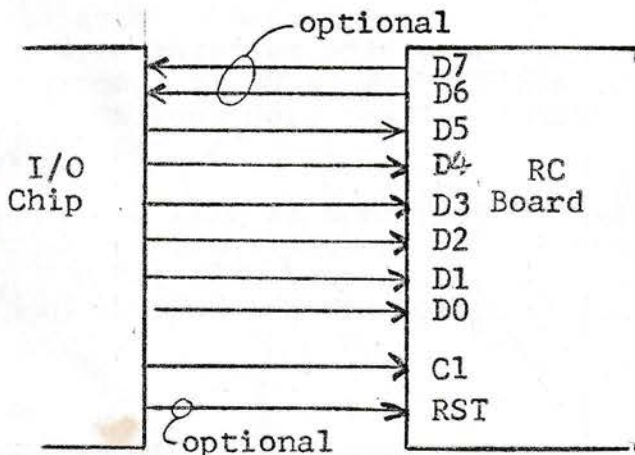
Board output lines D7 and D6 are always enabled. A low D7 indicates a busy board. A low D6 indicates a Bright/Dim mode in action.

Suppose that C1 was jumper selected to clock on a positive going transition; then to serial load the data first clear the board by bringing $\overline{\text{RST}}$ low and then back up. If $\overline{\text{RST}}$ is not employed, hold D0 high and bring C1 from low to high twelve times in succession.

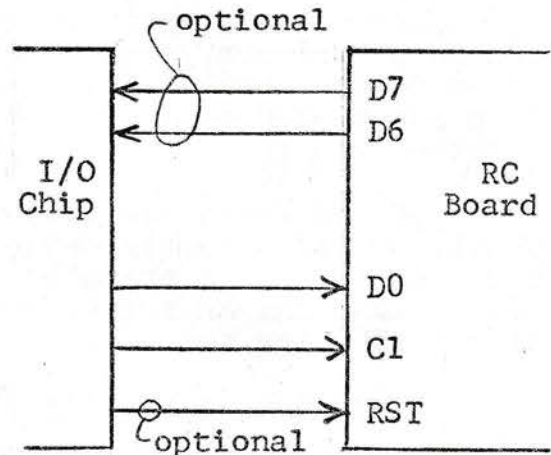
The 12 bits of data presented to D0 must be in the following form. The data must be clocked in (via low to high transitions on C1) starting with the 0 and proceeding to the right in the form 0, F1, F2, F3, U1, U2, U3, U4, H1, H2, H3, H4, where the F's, U's, and H's are as given in the Code Table.

To terminate a Bright/Dim mode let $\overline{\text{RST}}$ go low, or hold D0 high and bring C1 from low to high 12 times in succession.

If $\overline{\text{RST}}$ is not employed it must be tied high, see figure .



Parallel I/O



Serial I/O

S8 on, S12 off, J6 present.

S8 on, S12 on, J7 present

To clock both of these cases on C1 $\nearrow$ have J3 present and J4 & J5 in position 3.

All other jumpers should be absent and all other switches can be set anywhere.

HOUSE CODES

<u>House Code</u>	<u>Decimal</u>	<u>Hex</u>	<u>DEC</u>	<u>HEX</u>	<u>H1</u>	<u>H2</u>	<u>H3</u>	<u>H4</u>
A	37	25	218	DA	1	0	0	1
B	33	21	222	DE	0	0	0	1
C	45	2D	210	D2	1	1	0	1
D	41	29	214	D6	0	1	0	1
E	29	1D	226	E2	1	1	1	0
F	25	19	230	E6	0	1	1	0
G	21	15	234	EA	1	0	1	0
H	17	11	238	EE	0	0	1	0
I	5	05	250	FA	1	0	0	0
J	1	01	254	FE	0	0	0	0
K	13	0D	242	F2	1	1	0	0
L	9	09	246	F6	0	1	0	0
M	61	3D	194	C2	1	1	1	1
N	57	39	198	C6	0	1	1	1
O	53	35	202	CA	1	0	1	1
P	49	31	206	CE	0	0	1	1

UNIT CODES

<u>Unit Code</u>	<u>Decimal</u>	<u>Hex</u>	<u>DEC</u>	<u>HEX</u>	<u>U1</u>	<u>U2</u>	<u>U3</u>	<u>U4</u>
1	27	1B	228	E4	0	1	1	0
2	31	1F	224	E0	1	1	1	0
3	19	13	236	EC	0	0	1	0
4	23	17	232	E8	1	0	1	0
5	35	23	220	DC	0	0	0	1
6	39	27	216	D8	1	0	0	1
7	43	2B	212	D4	0	1	0	1
8	47	2F	208	D0	1	1	0	1
9	59	3B	196	C4	0	1	1	1
10	63	3F	192	C0	1	1	1	1
11	51	33	204	CC	0	0	1	1
12	55	37	200	C8	1	0	1	1
13	3	03	252	FC	0	0	0	0
14	7	07	248	F8	1	0	0	0
15	11	0B	244	F4	0	1	0	0
16	15	0F	240	F0	1	1	0	0

FUNCTION CODES

	<u>Function</u>	<u>Decimal</u>	<u>Hex</u>	<u>DEC</u>	<u>HEX</u>	<u>F1</u>	<u>F2</u>	<u>F3</u>
	ON	18	12	237	ED	0	1	0
	OFF	50	32	205	CD	0	1	1
ALL*	LIGHTS ON	34	22	221	DD	0	0	1
	ALL* OFF	2	02	253	FD	0	0	0
	BRIGHT	42	2A	213	D5	1	0	1
	DIM	10	0A	245	F5	1	0	0
	AND	26	1A	229	E5	1	1	1
	STOP	0	00	255	FF	SEE SERIAL I/O SECTION		

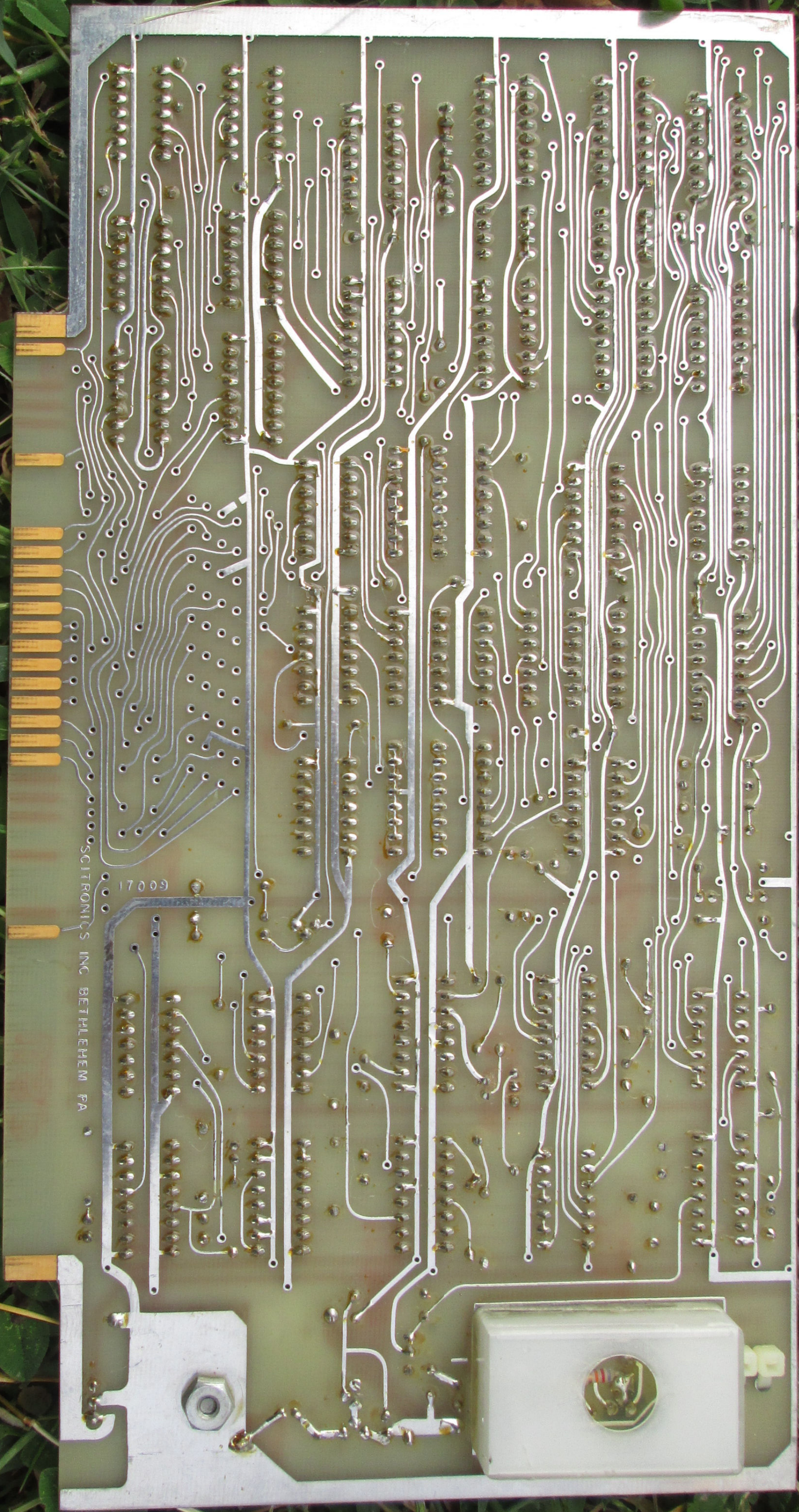
- * "ALL" refers to ALL on same HOUSE CODE.
- A "STOP" clears the board and terminates a bright/dim glide.
- "AND" is used to string units (on the same HOUSE CODE) together so that they all simultaneously respond to the same command. See example in Software Section

Remote Controller Board Address

For S-100 and TRS-80I users who need to change the board address to something other than the factory set value of 240 Decimal (F0 Hex), but who are unfamiliar with hardware, here are some suggested alternatives:

<u>Switch Numbers*</u>								<u>Address</u>	
<u>S7</u>	<u>S6</u>	<u>S5</u>	<u>S4</u>	<u>S3</u>	<u>S2</u>	<u>S1</u>	<u>S0</u>	<u>Dec.</u>	<u>Hex</u>
off	off	off	off	on	on	on	on	15	0F
off	on	off	on	off	on	off	on	85	55
on	off	on	off	on	off	on	off	170	AA
on	on	off	off	on	on	off	off	204	CC
off	off	on	on	off	off	on	on	51	33
on	on	on	off	off	off	off	off	224	E0
off	off	off	on	on	on	on	on	31	1F
on	on	on	on	on	off	off	off	248	F8
off	off	off	off	off	on	on	on	7	07

* see I-E for switch locations



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