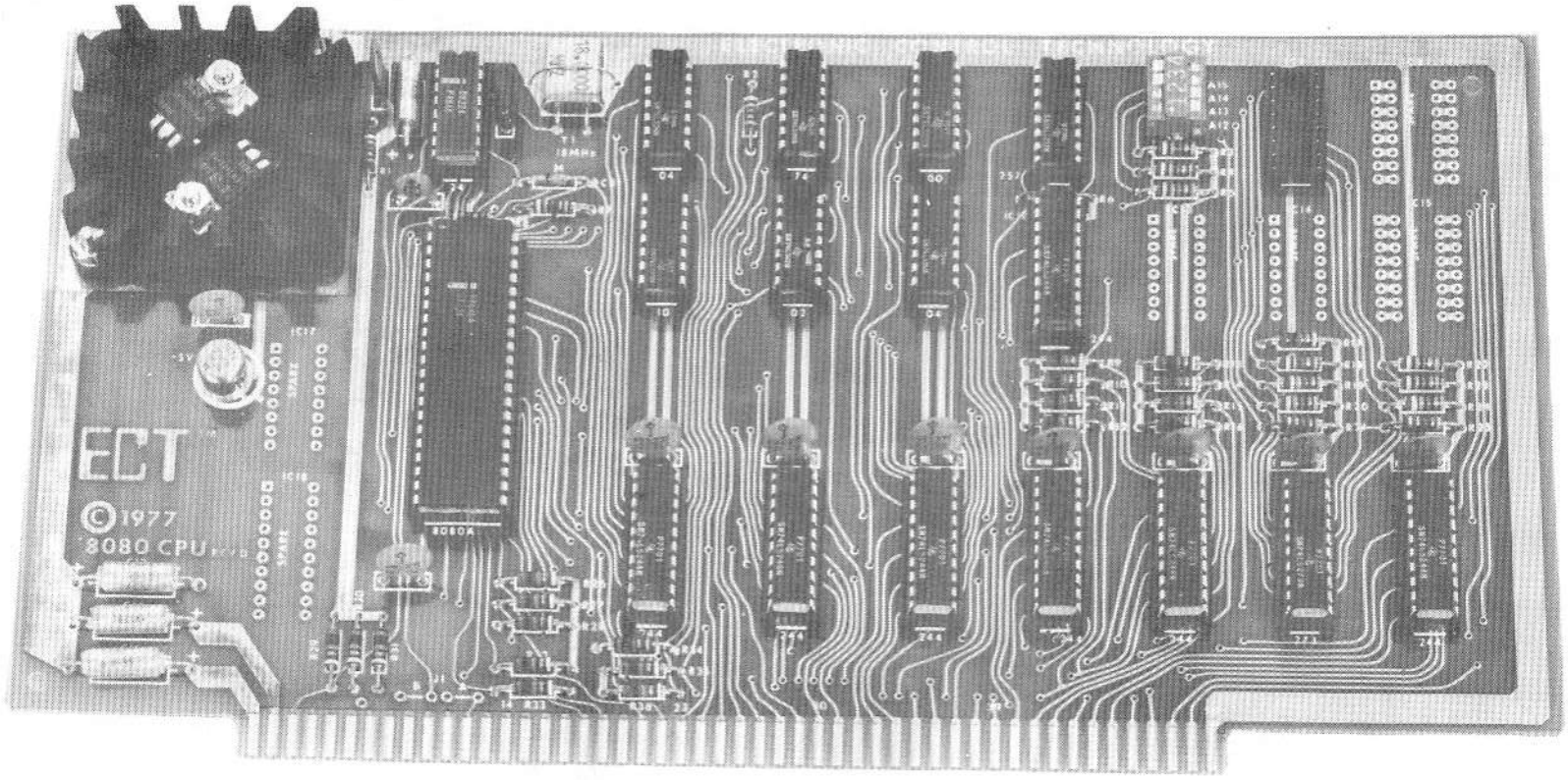
8080 CPU CARD



Electronic Control Technology

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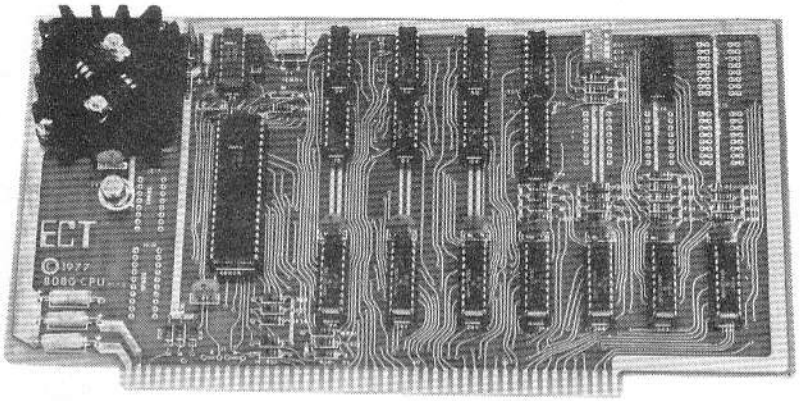
8080 CPU BOARD



* 8080A IC
* S-100 BUS
* JUMP ON RESET
* NEEDS NO FRONT PANEL

ELECTRONIC CONTROL TECHNOLOGY's 8080 CPU is an S-100 bus 8-bit processor board based on the 8080A microprocessor IC. The clock is crystal controlled and digitally generated for optimum system performance. 74LS244 bus drivers are utilized to provide low power with high drive capability. M WRITE is generated on the board and a switch selectable 'JUMP' on Reset circuit is provided for use in systems without a front panel. Low profile sockets are provided for all IC's.

SPECIFICATIONS

MICROPROCESSOR TYPE: 8080A
CLOCK: Crystal controlled digitally generated 2 MHz
NUMBER OF MACHINE INSTRUCTIONS: 78 (244 with variants)
CPU REGISTERS: Accumulator, 6 general purpose, and stack pointer
DIRECT ADDRESSING CAPABILITY: 65,536 bytes of memory
256 input ports
256 output ports
'JUMP' ON RESET: Switch selectable on 4K boundaries
INTERRUPTS: One direct (eight level priority vectored with additional hardware)
BUS DRIVERS: 74LS244 Sink 24 mA Source 15 mA
POWER REQUIREMENTS (TYPICAL): +8 Volts to +10 Volts @ 500 mA
+16 Volts to +20 Volts @ 50 mA
-16 Volts to -20 Volts @ 5 mA
Regulated on board to +5 V, +12 V, & -5 V
SIZE: 5.3" x 10" x 1/16"
PC MATERIAL: G10 or FR4 double sided 2 oz. copper with plated through holes
EDGE CONTACTS: 50 per side on 0.125" spacing, gold over nickel plated
FINISH: Solder mask both sides with silk screened legend
SOCKETS: Low profile sockets for all IC's

Specifications subject to change without notice. 8/77

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8080 CPU

The 8080 CPU is an S-100 Bus CPU Card which utilizes the 8080A Microprocessor IC. It has been designed to be similar in function to other S-100 Bus CPU Cards such as the MITS 8800 CPU Board and the IMSAI MPU-A Board with the addition of the M WRITE signal being derived on the CPU Card and a "'JUMP TO' on 'RESET' circuit" so that a system can operate without a front panel.

A 4 pole DIP switch is provided to select one of the sixteen possible starting addresses on 4K boundaries 0000, 1000, 2000,... F000 in Hex. A switch closure ('ON') produces a logic zero. With all four switches in the 'ON' position execution starts at location 0000 Hex. Switches A15 & A14 being 'OFF' with A13 & A12 'ON' execution starts at C000 Hex. Use of a ROM Monitor such as the one on the National Multiplex 2SIO(R) board located at C000 Hex allows control of the Microcomputer from a terminal (CRT or TTY).

The 8080 CPU Card uses the 8224 Clock Driver IC and an 18 MHz crystal to generate a stable 2 MHz 2 phase non-overlapping clock to drive the system. SN74LS244N tristate bus drivers are used to drive all CPU output bus signals: Address, Data Out, Status & Command/Control. All CPU input bus signals are buffered. The 8080 CPU requires unregulated +8V, +16V and -16V.

The instruction set and timing is that of the standard 8080A Microprocessor IC and is described in detail in the INTEL 8080 Microcomputer System Uses's Manual.

Spare spaces are provided for user optional circuitry to make the board more flexible to the user's special requirements.

8080 CPU

PARTS LIST

SEMICONDUCTORS

1	74LS00	1	74LS273
1	74LS02	1	8224
2	74LS04	1	1N914
1	74LS10	1	340T-5 / 7805
1	74LS74	1	340T-12 / 7812
7	74LS244	1	79L05
1	74LS257	1	8080A

IC SOCKETS

6	14 pins	8	20 pins
3	16 pins	1	40 pins

CAPACITORS

1	22 pF	3	6.8 MF 35V TANTALUM
1	.01 MF 25V DISC	1	33 MF 10V
10	.1 MF 10V		

RESISTORS

1	100 Ohms 1/4 W	16	4.7K 1/4 W
20	1K 1/4 W		

MISCELLANEOUS

1	PC Board 8080 CPU	1	Crystal 18 MHz
1	DIP Switch	1	Heat Sink
4	Screws 4-40 x 1/2"	1	Instruction Manual
4	Nuts 4-40		wire
4	Lockwashers #4		solder

8080 CPU Rev 1
May 1977

CAUTION

FAILURE TO OBSERVE THESE IMPORTANT PRECAUTIONS WILL VOID WARRANTY

1. Read all material before beginning assembly.
2. Use only electronic quality 60-40 rosin-core solder.
3. Use only a low-wattage soldering iron - 25 watts.
4. Use extreme care with MOS IC's to prevent static discharge damage.
5. Do not plug or unplug boards while power is applied.
6. Do not plug boards in backwards.
7. Do not install IC's before all voltages are verified.
8. Do not attempt repairs beyond your level of skill. Some repairs can damage the PC board or other components.
9. Do not solder on a board while power is applied.
10. Do not plug or unplug an IC from a socket while power is applied.

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8080 CPU

ASSEMBLY INSTRUCTIONS

CAUTION

This device uses a MOS integrated circuit which can be damaged by static electricity. Avoid unnecessary handling of the MOS IC. Keep all IC's in their protective container until instructed to do otherwise (part of the test procedure) and wear cotton clothing rather than synthetic when handling the MOS IC. Read the instructions entirely before starting assembly.

( ) Check all parts against the parts list.

( ) Visually inspect the PC board for shorts, especially in the area of lands between IC pads. It is easier to repair, if necessary, before the components are mounted.

( ) Orientation: The component side has the fingers of the 100 pin edge connector marked with 1 and 50. The heat sink area will be located in the upper left hand corner of the board when the 100 pin edge connector is on the lower edge of the board. All DIP IC's will then be oriented with pin #1 in the upper left. (Do not install IC's yet).

NOTE: Assembly will probably be easier if the board is assembled in order of component height. This allows installation of a group of components of the same height, then turning the board over, soldering all of those components while the weight of the board is holding the components in place, flush against the board.

NOTE: Holes for the discrete components are larger than holes for feed-throughs or IC's.

( ) Install the diode CR1. Observe polarity. The end of the diode with the band, goes in the hole closer to the heat sink.

( ) Install the 1/4 W resistors; see the component placement diagram. Use a lead bending tool to form the leads; all resistors are on 1/2" spacing. R34 is 100 Ohms; R1-8, 18-25, 37 & 38 are all 4.7K; all the rest are 1K. Push the resistors flush against the board and then bend the leads out slightly. Turn the board over and place on a flat surface so that all of the resistors are held flush against the board while soldering. Trim the leads.

( ) Install the tantalum capacitors C2, C13, C14, & C15 in a similar manner. Observe polarity.

( ) Install all of the IC sockets, except for the spare locations and IC-6, the switch location. A piece of cardboard will hold the sockets in place while turning the board over. The sockets have an identification notch or chamfer for pin #1. Locate as follows: 14 pin - IC's 2-4 & 9-11; 16 pin - IC's 1, 5, & 7; 20 pin - IC's 12 & 19-25; 40 pin - IC-16.

( ) Install the crystal (Y1) next. Mount it flat against the board with leads at a right angle and identifying markings up. Secure it with a jumper wire across the crystal in the two holes in the ground plane area on each side of the crystal to prevent it from vibrating.

( ) Install the DIP switch in IC-6 position. Orient the switch such that the contacts are open when the switch is depressed adjacent to the address identification (on an SAE DIP switch the plus sign is at pin #4). Solder and trim the leads.

( ) Next install the disc capacitors. All of the remaining capacitors are .1MF except C3 & C4.

( ) Install VR3 (79L05), which is the -5V regulator in the TO-5 package. Do not mount it flush to the board, leave at least 1/8" clearance so that the case does not short to the pads and also for air flow.

( ) Orient the heat sink with its flat side to the board over the square foil area in the upper left corner of the board with three holes visible in each of the triangular cut-outs. Mount the heat sink with two sets of screws, nuts and lockwashers. The screw should be inserted from the back of the board with the nut and lockwasher on the top of the heat sink. Make sure that the heat sink is not touching any of the pads for the voltage regulators.

( ) Install VR1 and VR2 in their respective locations on the heat sink by bending the leads down at a right angle and fastening with a screw inserted from the back of the board. Solder and trim the leads.

TEST PROCEDURE

( ) Inspect the board for solder bridges, poor solder joints or flaws and repair, if any.

( ) The only semiconductors on the board at this time should be the voltage regulators. Plug the board into the computer. Turn the power on and measure the power supply voltages at the IC sockets. On IC-16 +5V is on pin 20, +12V is on pin 28 and -5V is on pin 11. If these voltages are not correct on these pins, find out why and correct the problem before proceeding. Turn off the power and remove the board from the computer.

DO NOT PROCEED UNTIL ALL PREVIOUS STEPS HAVE BEEN COMPLETED AND ARE CORRECT

( ) Refer to the component placement diagram. Install the TTL IC's (All IC's except the 8080A CPU, IC-16). Note the proper location of pin 1, upper left corner.

( ) Install the 8080A CPU (IC-16) observing all MOS precautions. Note location of pin 1.

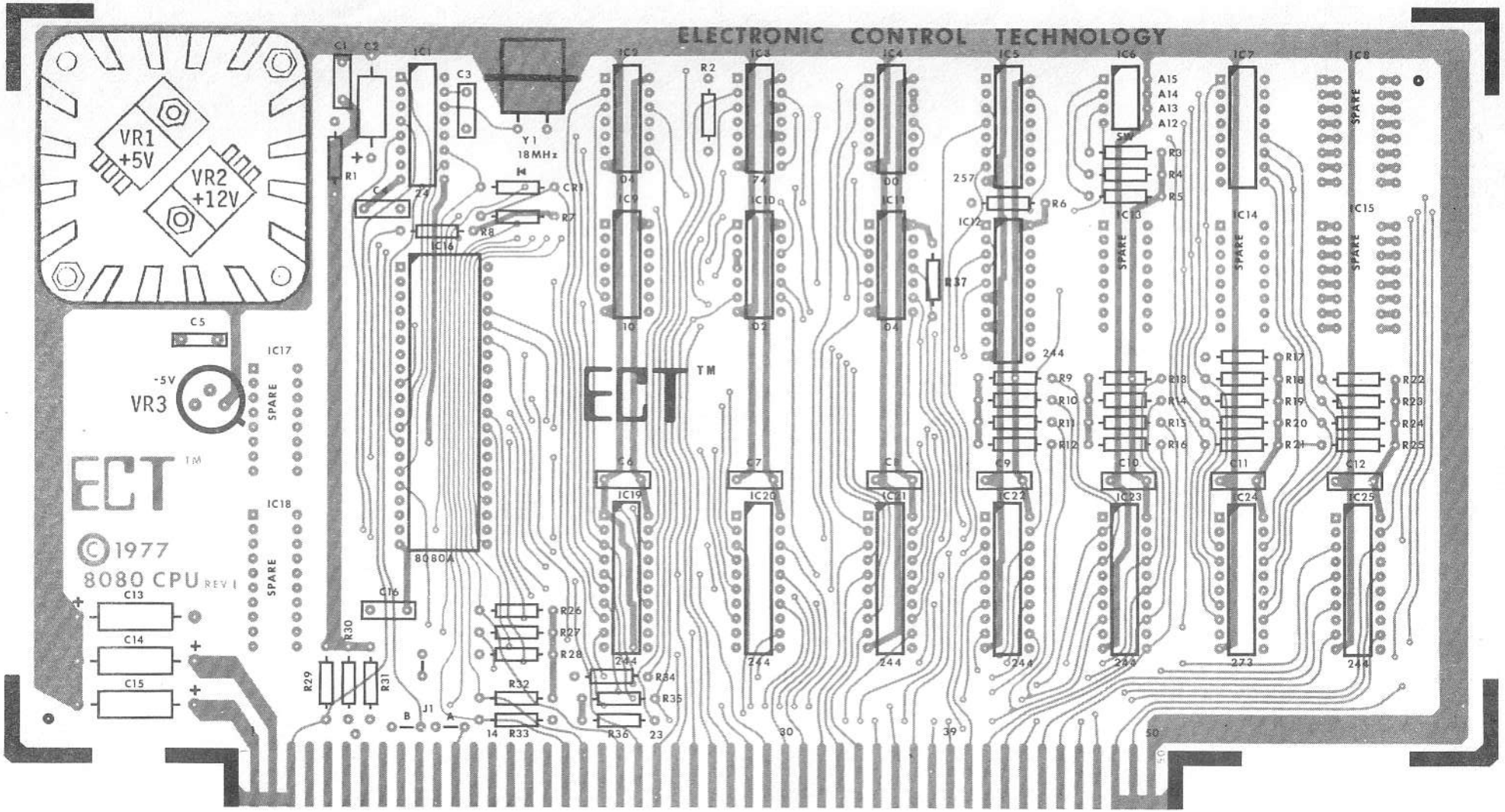
( ) Set the DIP switch, IC-6, for the address of your ROM monitor. The switch being open produces a logic one for the associated address.

Your 8080 CPU is now ready to be used. Plug it into your system and power up. The power-on reset circuit should activate the "Jump to" circuit which should start you running in your monitor with control from the terminal. A normally open pushbutton on the reset line #75 will also activate the "Jump-to" circuit and return you to the control of your monitor.

If it should not appear to work and you are not experienced with microprocessor IC's, seek help from the store where you bought the kit (they should be experienced) or if you purchased it direct, return it for repair.

NOTE: When using this CPU in an ALTAIR or IMSAI with a front panel, the M WRITE circuit pin #68 on the CPU board must be disconnected (cut the exposed land on the solder side of the board between the two pads which are located below IC-16 and above J-1) in order to deposit from the front panel.

IC-7 is just a socket for test points or front panel use.



IC 1	8224	CR 1	1N914
IC 2 & 11	74LS04	VR 1	340T-5/7805
IC 3	74LS74	VR 2	340T-12/7812
IC 4	74LS00	VR 3	79L05
IC 5	74LS257	C 1, 5-12 & 16	.1MFD 10V
IC 9	74LS10	C 2	33MFD 10V
IC 10	74LS02	C 3	24pF
IC 12, 19-23 & 25	74LS244	C 4	.01MFD 25V
IC 24	74LS273	C 13-15	6.8MFD 35V
IC 6	Switch	R 1-8, 18-25	4.7K 1/4 W
IC 7	IC Socket	R 9-17, 26-33 & 35-37	1K 1/4 W
Y 1	18 MHz	R 34	100 Ohms 1/4 W

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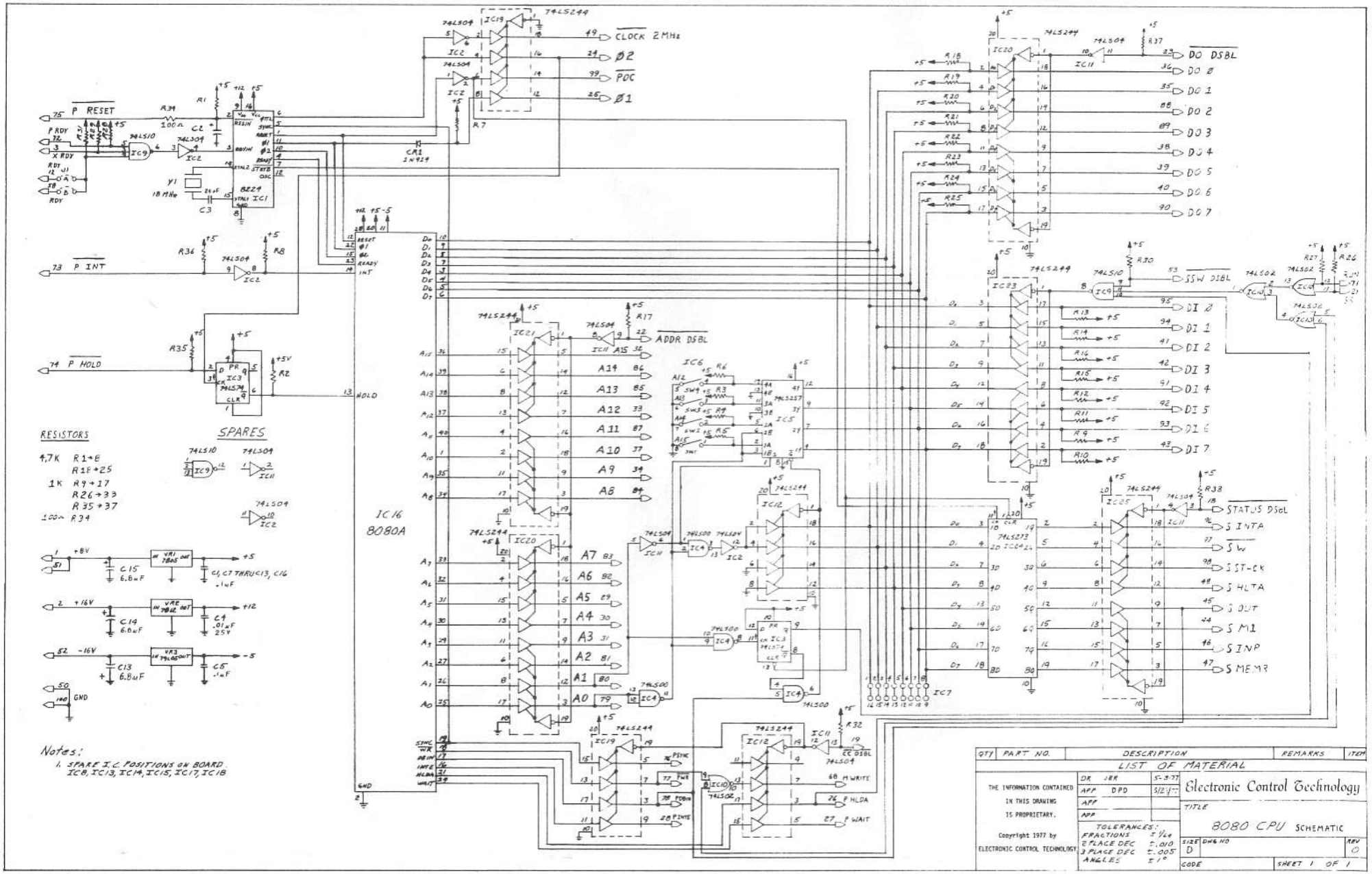

Notes:
1. SPARE I.C. POSITIONS ON BOARD IC8, IC13, IC14, IC15, IC17, IC18

QTY	PART NO.	DESCRIPTION	REMARKS	ITEM
		LIST OF MATERIAL		

THE INFORMATION CONTAINED IN THIS DRAWING IS PROPRIETARY.

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DR	JBR	5-3-77
APP	DPD	5/23/77
APP		
APP		

TOLERANCES:
FRACTIONS ±1/64
2 PLACE DEC ±.010
3 PLACE DEC ±.005
ANGLES ±1°

Electronic Control Technology

TITLE: 8080 CPU SCHEMATIC

SIZE D | DWG NO | REV 0

CODE | SHEET 1 OF 1

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WARRANTY

ELECTRONIC CONTROL TECHNOLOGY, hereinafter referred to as ECT, in an effort to assure its customers that it is providing them with quality products, components and workmanship, hereby warrants its products as follows:

All products both in kit form and assembled units and all components sold by ECT are purchased through factory distribution and any part which fails because of defects in workmanship or material will be replaced at no charge for a period of three (3) months following the date of purchase. The defective part must be returned postpaid to ECT within the warranty period.

Any fully assembled kit, which fails to perform satisfactorily, may be returned to ECT within the warranty period, and if in the judgement of ECT it has been assembled with care and has not been subjected to electrical or mechanical abuse, it will be restored to proper operating condition and returned, regardless of the cause of malfunction, with a minimal charge to cover shipping and handling.

Any unit purchased as a kit and returned to ECT and which in the judgement of ECT is not covered by this warranty will be repaired and returned at a cost commensurate with the work required. In no case will this charge exceed twenty dollars ($20.00) without prior notification to and approval by the owner.

Any product purchased as an assembled unit is guaranteed against defects in materials and workmanship and is further guaranteed for a period of three (3) months to meet the specifications in effect at the time of manufacture. All warranted factory assembled units returned to ECT postpaid will be repaired and returned without charge.

This warranty is made in lieu of all other warranties expressed or implied and is limited in any case to repair or replacement of the ECT product involved.

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