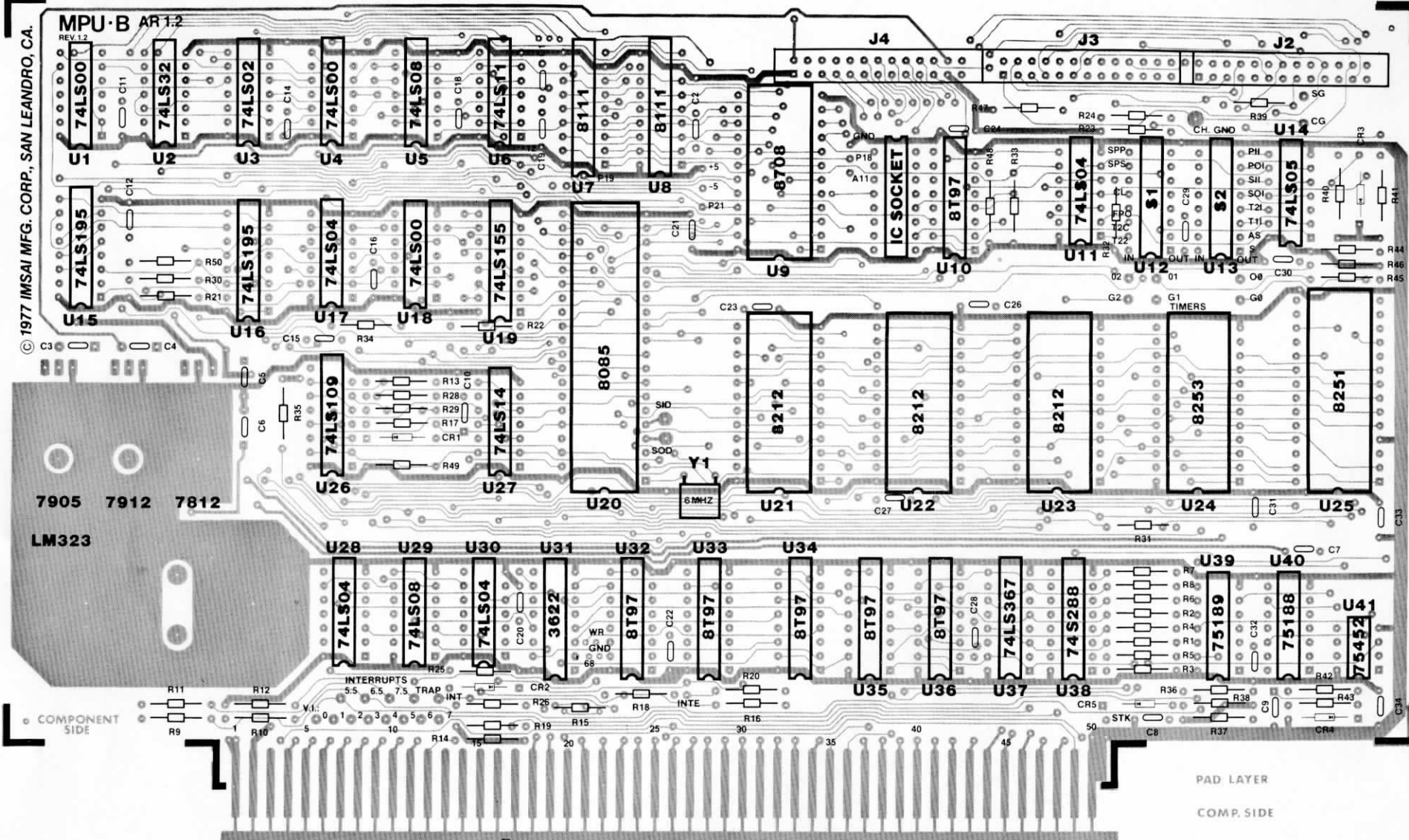


C. MPU-B ASSEMBLY



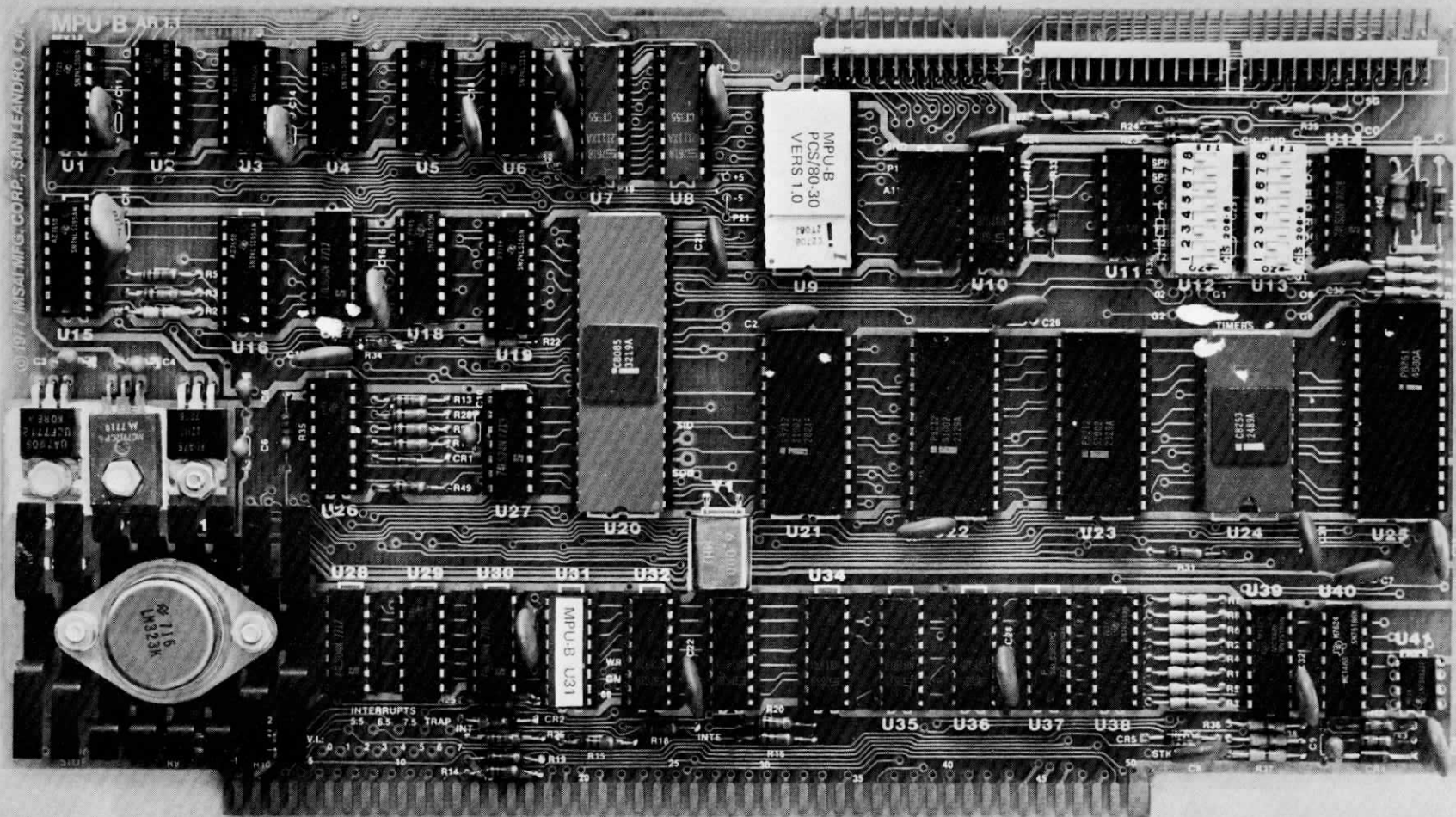
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PAC 6-27-77

MPU-B

IMSAI

MPU-B (PCS-80/30)



MPU-B PARTS LIST

<u>ITEM</u>	<u>IMSAI PART #</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
Solder	15-0000001	5'	
Heat Sink	16-0100008	1	TO-3, Thermalloy 6060 B
Screw	20-3402001	3	6-32x3/8" Phillips Pan Head
Screw	20-3701003	2	6-32x3/8" Round Head Nylon
Nut	21-3120001	5	6-32 Hex
Washer	21-3300001	2	#6 Mica, Pre-greased
Lockwasher	21-3350001	5	#6 Internal Star Lockwashers
Header	23-0400022	3	26 Pin Right Angle
Socket	23-0800001	1	16 Pin Solder Tail DIP Socket
Socket	23-0800002	2	24 Pin Solder Tail DIP Socket
Socket	23-0800003	1	28 Pin Solder Tail DIP Socket
Socket	23-0800004	1	40 Pin Solder Tail DIP Socket
Socket	23-0900007	1	Cambion Pin Socket
Switch	26-1200002	2	8 Position DIP Switch
Foam Tape	28-0600003	1	1/2x1/2x1/16 Double Side Sticky, 3M 2592
Resistor	30-3150362	2	150 Ohm, 1/4 Watt 5% (brown, green, brown)
Resistor	30-3620462	1	620 Ohm, 1/4 Watt 5% (blue, red, brown)
Resistor	30-3750462	1	750 Ohm, 1/4 Watt 5% (violet, green, brown)
Resistor	30-4100362	18	1K Ohm, 1/4 Watt, 5% (brown, black, red)
Resistor	30-4470362	18	4.7K Ohm, 1/4 Watt, 5% (yellow, violet, red)
Resistor	30-5100362	9	10K Ohm, 1/4 Watt, 5% (brown, black, orange)

<u>ITEM</u>	<u>IMSAI PART #</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
Capacitor	32-0220020	2	20pF Disk Ceramic
Capacitor	32-2010010	20	.1uf Disk Ceramic
Capacitor	32-2122070	6	2.2uF 25V Tantalum
Diode	35-1000007	2	1N4002
Diode	35-1000012	1	1N4148
Diode	35-1000013	2	1N270, Germanium
Crystal	35-5000005	1	6MHz, Series Resonant, .02%, HC-18 Case
LM323K	36-0032301	1	L7 8H05KC Regulator
8T97	36-0089701	6	IC, Hex 3-State Driver
74LS00	36-0740002	3	IC, Quad 2 Input NAND (Low Power Sch ^{ky})
74LS02	36-0740202	1	Quad 2 Input NOR (LPS)
74LS04	36-0740402	4	Hex Inverter (LPS)
74LS05	36-0740502	1	Hex Inverter, Open Collector (LPS)
74LS08	36-0740802	2	Quad 2 Input AND (LPS)
74LS11	36-0741102	1	Triple 3 Input AND (LPS)
74LS32	36-0743202	1	Quad 2 Input OR (LPS)
74LS74	36-0747402	1	Dual D Flip Flop (LPS)
7812	36-0781201	1	+12 V Regulator
7905	36-0790501	1	-5V Regulator
7912	36-0791201	1	-12V Regulator
8085	36-0808501	1	Microprocessor Chip
8111A-4	36-0811101	2	256x4 RAM
8212	36-0821201	3	8 Bit Latch
8251A	36-0825101	1	USART (Sub: 8251)

<u>ITEM</u>	<u>IMSAI PART #</u>	<u>QUANTITY</u>	<u>DESCRITION</u>
8253-2	36-0825301	1	Timer Chip (Alt: 8253)
74LS109	36-7410902	1	Dual JK Flip Flop (LPS)
74LS155	36-7415502	1	Dual 2 to 4 Decoder (LPS)
74LS195	36-7419502	2	4 Bit Shift Register (LPS)
74LS367	36-7436702	1	Hex 3-State Buffer (LPS)
75188	36-7518801	1	Quad RS232 Driver (LM1488)
75189	36-7518901	1	Quad RS232 Receiver (LM1489)
75452	36-7545201	1	Dual Open Collector Driver
PROM	88-0000042	1	74S288 IC
PROM	88-0000045	1	2708 HTP IC, System Monitor
PC Board	92-0000057	1	MPU-B Rev. 1

C. MPU-B ASSEMBLY

- () 1. Carefully unpack your board and check all parts against the parts list shown at the beginning of this instruction set. Do not discard any of the packing materials until all of the parts are accounted for. In case of any discrepancies, contact IMSAI Customer Service.
- () 2. The MPU-B circuit board has a gold-plated edge connector to insure good contact with the motherboard. Carefully inspect this edge connector (on both sides of the board) for any signs of tarnishing or contamination. If you notice any tarnishing, carefully polish the edge connector using a normal pencil eraser.

CAUTION: NEVER polish the gold-plated connector with anything other than an eraser, as it is very susceptible to damage. The gold is critical to reliable system operation — never cover it with solder or scratch it.

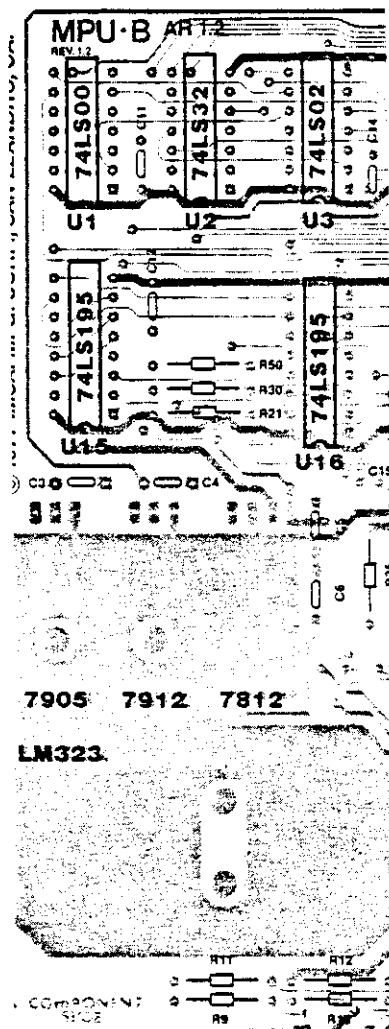
- () 3. Position the MPU-B circuit board on your work surface with the side labeled "component side" facing up. The gold-plated edge connector should be facing towards you.

NOTE: Refer to the photographs at the end of Section II in order to identify components with which you may be unfamiliar.

CAPACITOR AND RESISTOR INSTALLATION

In the following steps you will be instructed to "install" a particular part. In this context, to install means to "insert the part into the circuit board and bend the leads back". You will be instructed when to solder the components.

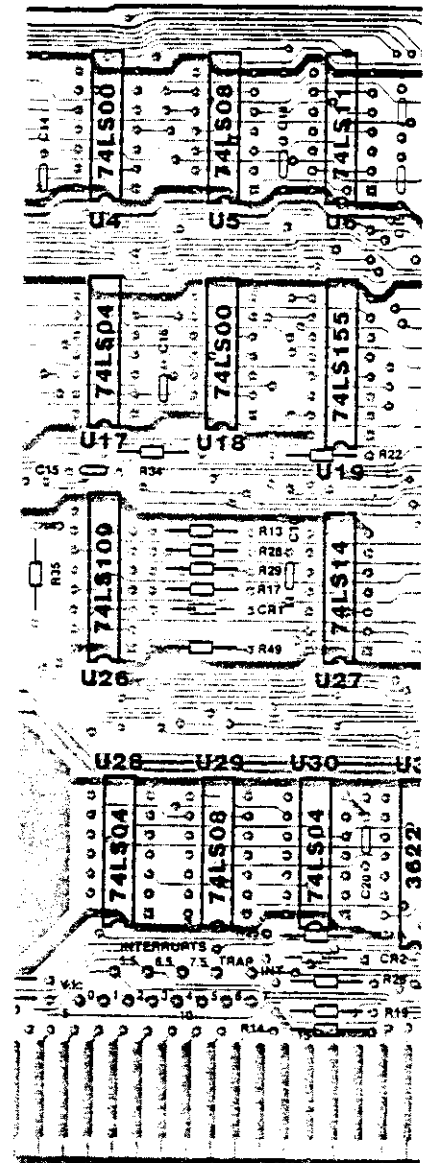
- () 4. Install a .1 uf ceramic capacitor at C14.
- () 5. Install a .1 uf ceramic capacitor at C11.
- () 6. Install a .1 uf ceramic capacitor at C12.
- () 7. Install a 1K ohm 1/4 watt resistor (brown-black-red) at R50.
- () 8. Install a 10K ohm 1/4 watt resistor (brown-black-orange) at R30.
- () 9. Solder all components to the board and cut off excess lead lengths.
- () 10. Install a 4700 ohm, 1/4 watt resistor (yellow-violet-red) at R21.
- () 11. Install a 2.2 uf 25V tantalum capacitor at C4.
- () 12. Install a 2.2 uf 25V tantalum capacitor at C3.
- () 13. Install a 2.2 uf tantalum capacitor at C5.
- () 14. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R35.
- () 15. Solder all components and cut off excess leads.
- () 16. Install a 2.2 uf tantalum capacitor at C6.
- () 17. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R12.
- () 18. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R11.
- () 19. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R9.
- () 20. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R10.
- () 21. Solder all leads and cut off excess lengths.



- () 22. Install a .1 uf ceramic capacitor at C18.
- () 23. Install a .1 uf ceramic capacitor at C16.
- () 24. Install a .1 uf ceramic capacitor at C15.
- () 25. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R34.
- () 26. Install a 4700 ohm, 1/4 watt resistor (yellow-violet-red) at R22.
- () 27. Solder all leads and cut off excess lengths.
- () 28. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R13.
- () 29. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R28.
- () 30. Install a 2.2 uf 25V tantalum capacitor at C10.
- () 31. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R29.
- () 32. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R17.
- () 33. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R49.
- () 34. Solder all leads and cut off excess lengths.
- () 35. Install a .1 uf ceramic capacitor at C20.
- () 36. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R25.
- () 37. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R26.

Note: Diode CR2 will be installed later; take care not to install a resistor in its position.

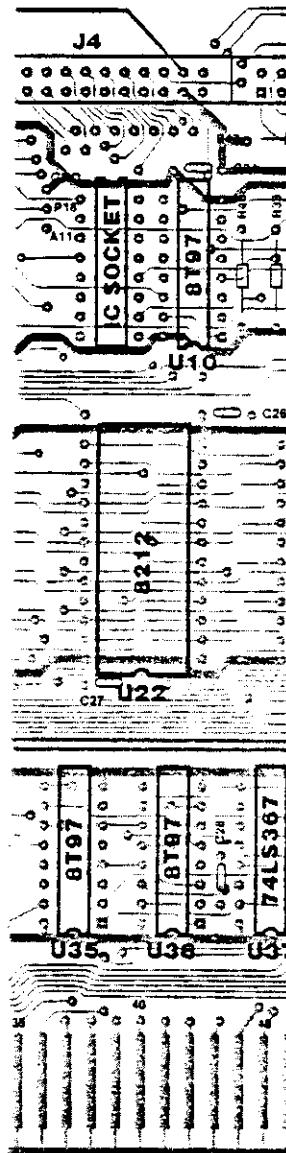
- () 38. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R19.
- () 39. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R14.



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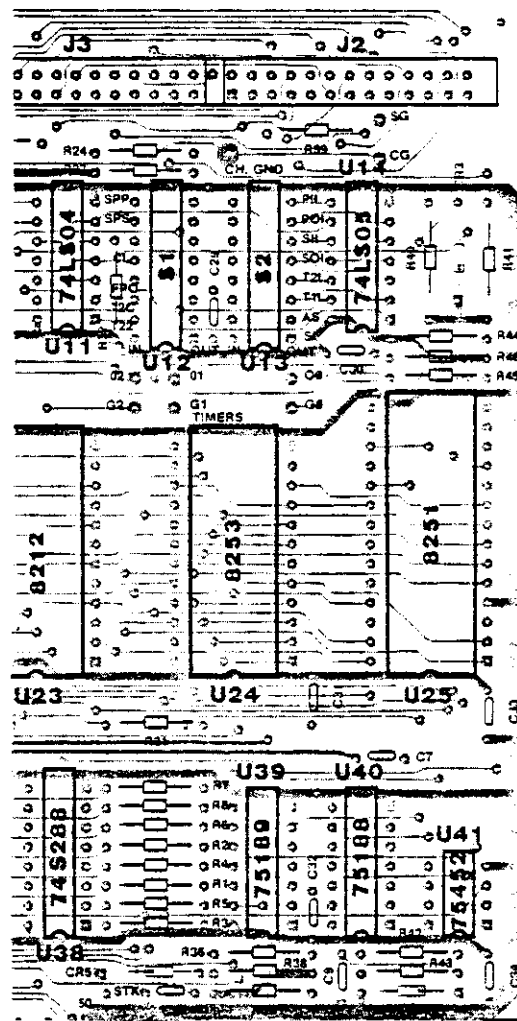


- () 49. Install a 4700 ohm, 1/4 watt resistor (yellow-violet-red) at R47.
- () 50. Install a .1 uf ceramic capacitor at C24.
- () 51. Install a 1K ohm, 1/4 watt resistor (brown-black-red) at R33.
- () 52. Install a 4700 ohm, 1/4 watt resistor (yellow-violet-red) at R48.
- () 53. Install a .1 uf ceramic capacitor at C26.
- () 54. Install a .1 uf ceramic capacitor at C27.
- () 55. Install a .1 uf ceramic capacitor at C28.



- () 56. Install a 620 ohm, 1/2 watt resistor (blue-red-brown) at R41.
- () 57. Install a 750 ohm, 1/2 watt resistor (violet-green-brown) at R40.
- () 58. Install a 4700 ohm, 1/4 watt resistor (yellow-violet-red) at R39.
- () 59. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R24.
- () 60. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R23.
- () 61. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R32.
- () 62. Install a .1 uf ceramic capacitor at C30.
- () 63. Solder all components and cut off excess lead lengths.
- () 64. Locate three (3) 4700 ohm, 1/4 watt resistors (yellow-violet-red) and install them at the following locations:

- () R44
- () R46
- () R45



- () 65. Install a 10K ohm, 1/4 watt resistor (brown-black-orange) at R31.
- () 66. Install a .1 uf ceramic capacitor at C31.
- () 67. Solder all components and cut off excess lead lengths.
- () 68. Locate eight (8) 4700 ohm, 1/4 watt resistors (yellow-violet-red) and install them at the following locations:

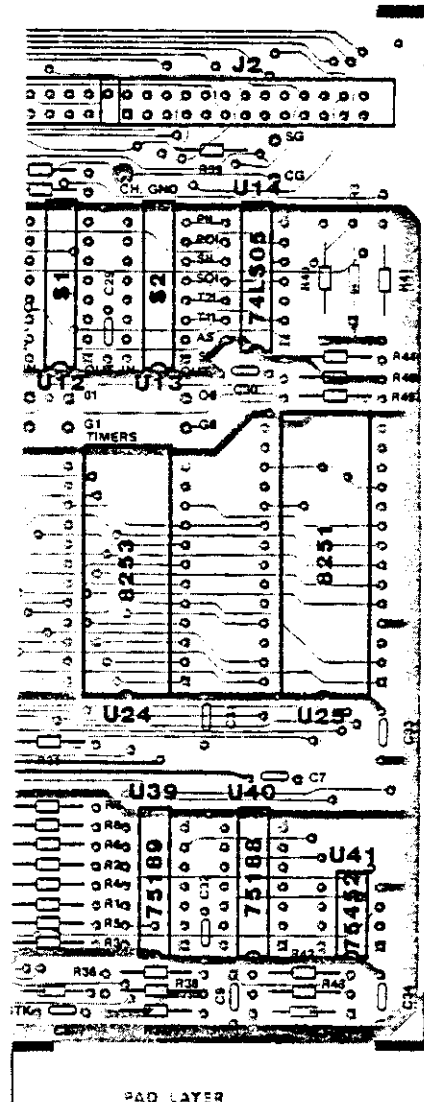
() R7	() R8
() R6	() R2
() R4	() R1
() R5	() R3

- () 69. Solder all components and cut off excess lead lengths.
- () 70. Install a .1 uf ceramic capacitor at C32.
- () 71. Install a .1 uf ceramic capacitor at C8.
- () 72. Locate three (3) 4700 ohm, 1/4 watt resistors (yellow-violet-red) and install them at the following locations:

() R36	() R38
() R37	

- () 73. Install a 2.2 uf 25V tantalum capacitor at C9.
- () 74. Install a 150 ohm, 1/4 watt resistor (brown-green-brown) at R42.
- () 75. Install a 150 ohm, 1/4 watt resistor (brown-green-brown) at R43.
- () 76. Install a .1 uf ceramic capacitor at C34.
- () 77. Solder all components and cut off excess lead lengths.

This completes the installation of the resistors and capacitors on the MPU-B board. We recommend that you go back and check your work carefully. Inspect all solder joints and check for any solder splashes and solder bridges. When you are satisfied that there are no errors, proceed with regulator installation.



INSTALLATION OF REGULATORS, DIODES AND CONNECTORS

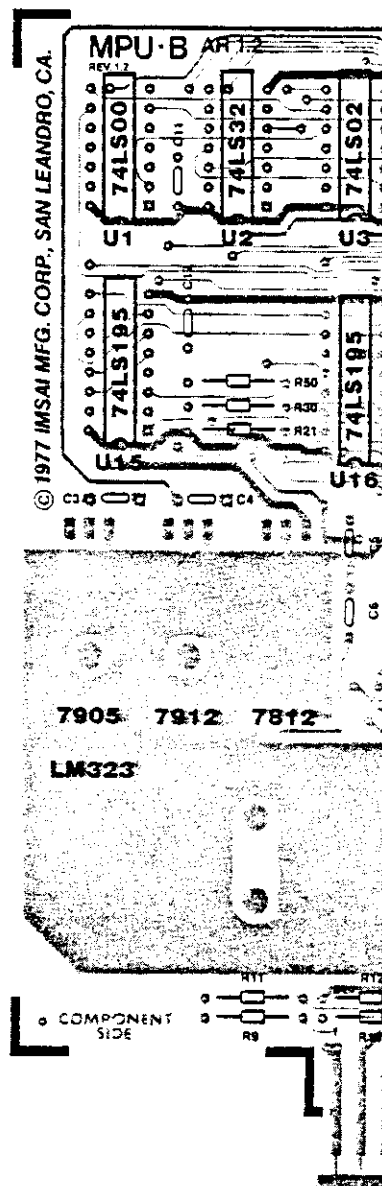
REGULATORS

- () 78. Locate the 7905 regulator. Make a 90 degree bend on all three leads 1/8 inch from the regulator body. See Section II, Figure II-3 for detail.

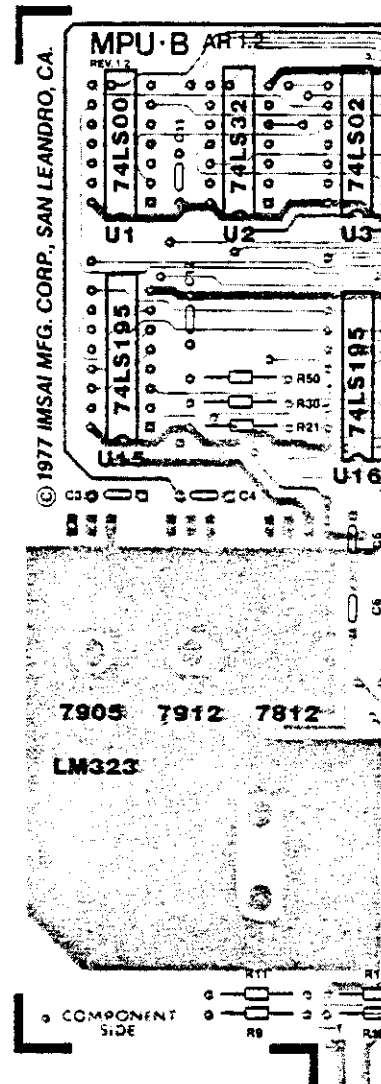
- () 79. Mount the 7905 regulator to the PC board using a 6x32 NYLON screw, a mica insulator, 6x32 lockwasher and nut. Place the mica insulator between the PC board and the regulator. Insert the nylon screw from the back of the board, through the board, through the mica insulator, then through the regulator body. Secure with a #6 lockwasher and 6-32 nut. Tighten the screw snugly, taking care not to overtighten.

CAUTION: This regulator must be insulated from the PC board or severe damage may result. Be sure to install the mica insulator correctly.

- () 80. Locate the 7912 regulator and bend the leads as described in Step 78.
- () 81. Mount the 7912 regulator on the PC board as described in Step 79. Again, we caution you to install the insulator correctly.



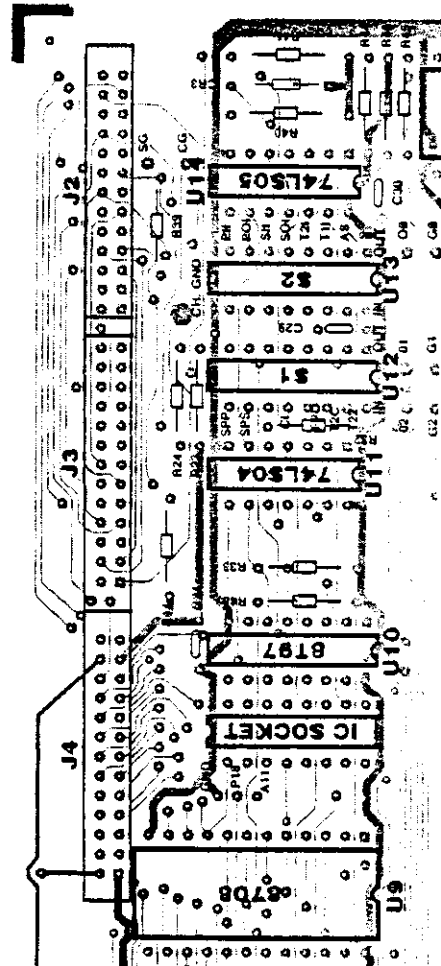
- () 82. Locate the 7812 regulator and bend the leads as as described in Step 78.
- () 83. Install the 7812 regulator on the board using a 6x32 machine screw, lockwasher and nut. Note that this regulator is not insulated from the board.
- () 84. Locate the heatsink and position it on the PC board over the area denoted as "LM323". Position the heatsink such that the side with the two holes is facing towards the RIGHT (that is, towards U28). The holes in the heatsink should line up with the holes in the PC board underneath. If the holes do not align, position the heat sink until they do.
- () 85. Locate the LM323 regulator. Note that this regulator does not resemble the three regulators installed above.
- () 86. Install the LM323 onto the heatsink using two 6x32 3/8 screws. Insert the screws from the bottom of the PC board and secure each of them with one lockwasher and 6-32 nut. Tighten these nuts securely (to maximize the efficiency of the heat sink), taking care not to overtighten.



- () 87. Locate the three (3) 26 pin connectors. Note that there is a right- angle bend on one side of the white plastic. Orient the side without the bend towards the top of the board (away from the edge connector) when inserting the connector into the PC board.
- () 88. Insert one of the 26 pin connectors into J4. Press the connector tightly against the board and solder one pin at each end. This will hold the connector in place.
- () 89. Install another 26 pin connector at J3 as described in Step 88.
- () 90. Install the third 26 pin connector at J2.
- () 91. Carefully check all three connectors to ensure that they are seated properly on the PC board, and that the pins are parallel to the board. When you are satisfied that they are installed correctly, solder all of the pins (72) to the board. Solder carefully: the pins are close together and a solder bridge can form easily.

DIODES

- () 92. Locate and install a 1N4002 diode at CR3. Be sure to observe correct diode polarity.
- () 93. Install a 1N270 diode at CR5, once again observing correct polarity.
- () 94. Install a 1N4002 diode at CR4. Observe the correct polarity.



INSTALLATION OF INTEGRATED CIRCUITS

The MPU-B contains many expensive IC's and great care must be taken in their installation. If you have not already done so, please read the "General Assembly Instructions" regarding IC's, and, in addition, observe the following precautions:

REMOVAL OF IC'S

If you install an IC in the wrong position, be extremely careful about removing it. Cut all of the leads near the body of the IC; the plastic body should fall off leaving the pins soldered in the holes. Carefully remove each pin with a soldering iron and a solder-removing device ("solder sucker"). Should you need to remove an IC during construction, we recommend that the PC board be returned to IMSAI Customer Service for IC removal.

SOCKETS

Included in your kit are sockets for the 8085, 8708, 8253, 8251 and the front panel connector. You may order sockets for all of the other IC's on the board. Socket use simplifies IC maintenance and replacement but may decrease system reliability in a harsh environment.

If you use sockets, install a socket at the specified location when an instruction calls for IC installation. Take care to use the correct socket for a particular IC. Do not use a 16 pin IC socket for a 14 pin IC, or vice versa. The number of pins on a particular IC will be specified in the assembly instruction step (for instance, an 18-pin IC is called out as P18).

IC INSTALLATION

In the following steps you will be directed to "install" an integrated circuit at a specified location. In this context, "install" means:

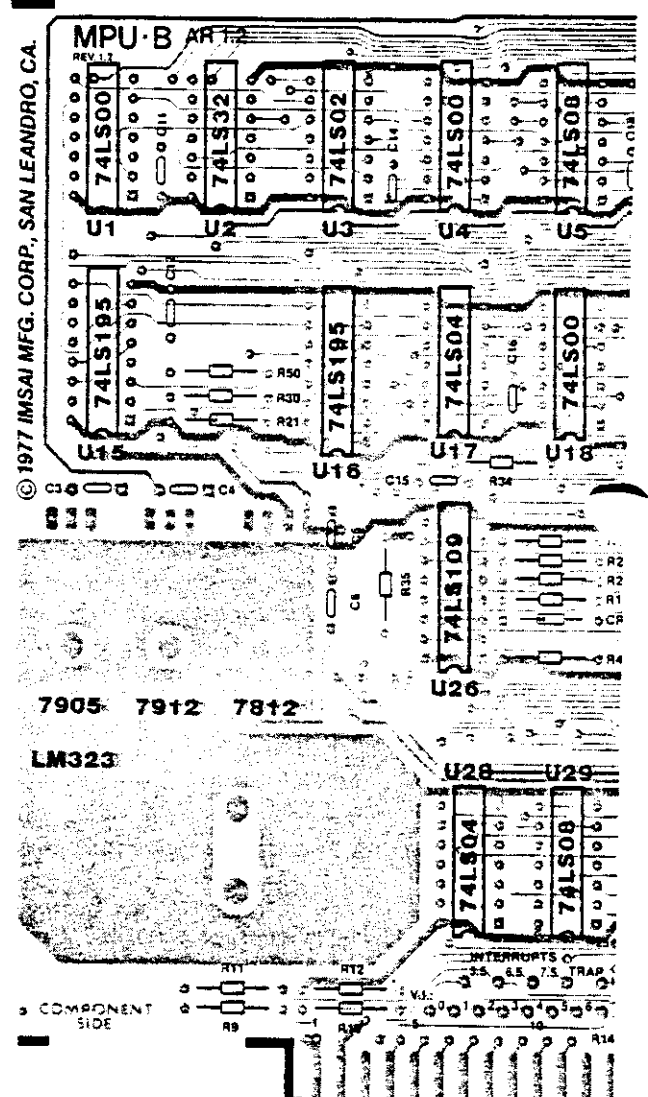
- 1) Insert the IC into the PC board. Ensure that pin 1 on the IC is oriented towards the gold-plated edge connector.
- 2) Be sure that all pins are seated in the appropriate holes.
- 3) Solder pin 1 and the pin at the farthest corner from pin 1. This procedure is followed in order to hold the IC onto the board until the remaining pins are soldered.

You will be instructed when to solder the remaining pins.

IMSAI PCS-80/30
SECTION III-C
MPU-B ASSEMBLY

() 95. Install the specified IC's at the following locations:

- () 74LS00 at U1 (P14)
- () 74LS32 at U2 (P14)
- () 74LS02 at U3 (P14)
- () 74LS00 at U4 (P14)
- () 74LS08 at U5 (P14)
- () 74LS195 at U15 (P16)
- () 74LS195 at U16 (P16)



() 96. Install the specified IC's at the locations indicated:

() 74LS04 at U17 (P14)

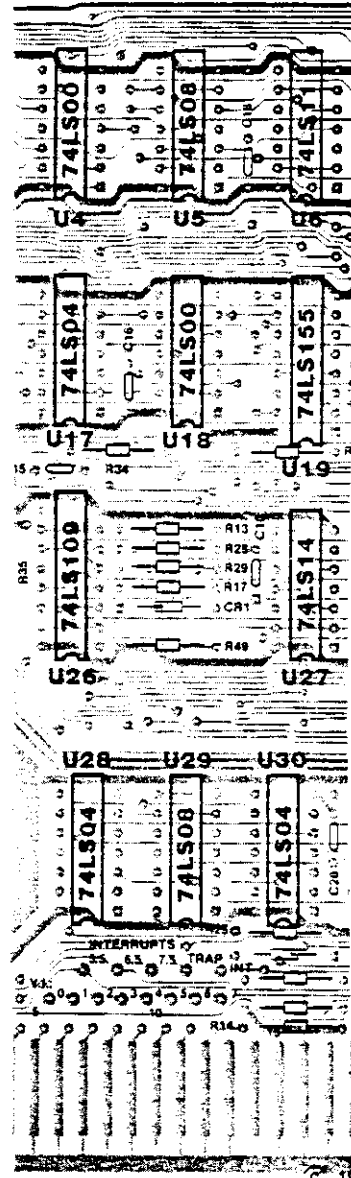
() 74LS00 at U18 (P14)

() 74LS109 at U26 (P16)

() 74LS04 at U28 (P14)

() 74LS08 at U29 (P14)

See that you have installed the IC's correctly, but
DO NOT SOLDER all of the pins at this time.



() 97. Locate the two (2) 8111 memory chips; note that these are 18 pin IC's.

() 98. Install one 8111 at U8 (P18).

() 99. Install the other 8111 at U7 (P18).

() 100. Install the specified IC's at the locations indicated:

() 74LS11 at U6 (P14)

() 74LS155 at U19 (P16)

() 74LS14 at U27 (P14)

() 101. Locate the 40 pin IC socket and install at U20. Ensure that all of the pins are seated in the appropriate holes. Note that the 8085 chip will be installed later.

() 102. Install a 74LS04 at U30 (P14).

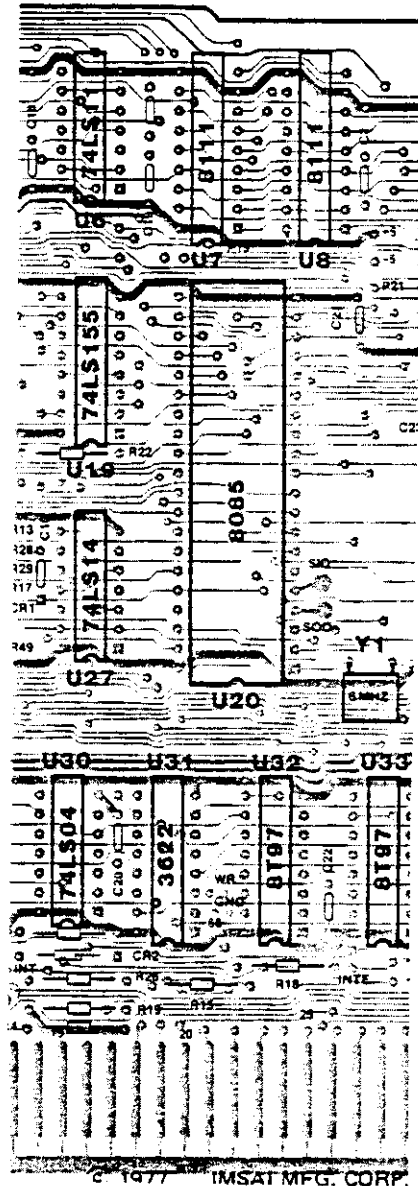
() 103. Install a 3622 at U31 (P16).

() 104. Install a 8T97 at U32 (P16).

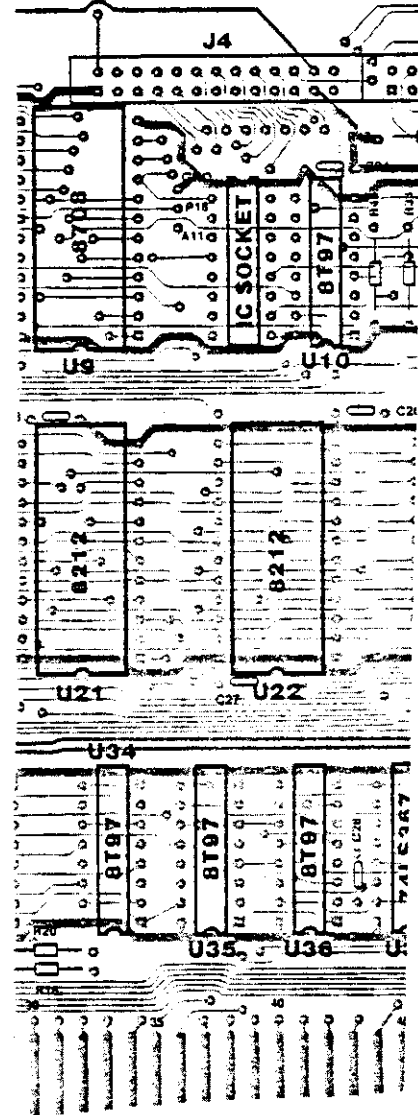
Note: The 8097 and 8T97 are interchangeable.

() 105. Install a 8T97 at U33 (P16).

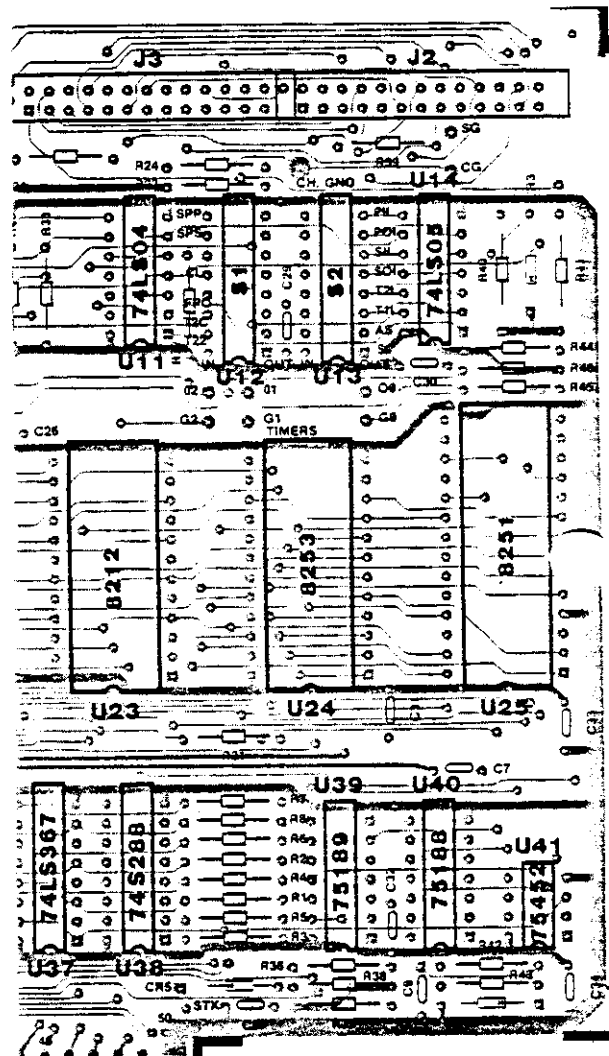
() 106. Inspect your work, checking to see that all IC's are installed in the proper locations.



- () 107. Install a 24 pin IC socket at U9. (The 8708 or 2716 will be installed later).
- () 108. Install a 16 pin IC socket between U9 and U10.
- () 109. Install an 8T97 at U10 (P16).
- () 110. Install an 8212 at U21 (P24).
- () 111. Install an 8212 at U22 (P24).
- () 112. Install an 8T97 (P16) at the locations indicated:
 - () U34
 - () U35
 - () U36
- () 113. Check to see that all IC's have been installed properly. Do NOT solder all of the pins at this time.



- () 114. Install a 74LS05 at U14 (P14).
- () 115. Locate the two (2) eight-position DIP switches. The switches are numbered 1 through 8. Position switch 1 towards the gold-plated edge connector.
- () 116. Install an eight-position dip switch at S1.
- () 117. Install an eight-position dip switch at S2.
- () 118. Install a 74LS04 at U11 (P14).
- () 119. Install a 28 pin IC socket at U25. Do NOT insert an IC into the socket.
- () 120. Install a 24 pin IC socket at U24.
- () 121. Install an 8212 at U23 (P24).
- () 122. Install a 74LS367 at U37 (P16).
- () 123. Install a 74LS288 at U38 (P16).
- () 124. Install a 75189 at U39 (P14).
- () 125. Install a 75188 at U40 (P14).
- () 126. Install a 75452 at U41. Note that this is an eight (8) pin IC.



- () 127. Installation of the IC's is now complete. Check the board against the assembly diagram to ensure that each IC is installed in the correct location.
- () 128. When you are satisfied that all IC's are positioned correctly, solder ALL of the remaining pins.
- () 129. Attach the piece of foam tape to one side of the crystal.
- () 130. Bend the leads on the crystal 90 degrees to the crystal body, towards the tape.
- () 131. Remove the backing from the other side of the foam tape, and insert the crystal leads into the holes on the MPU-B circuit board at Y1. Gently press the crystal against the board. The tape should hold the crystal in place. Solder the crystal leads onto the board.
- () 132. THIS COMPLETES THE ASSEMBLY OF THE MPU-B. You should have the following IC's left unmounted: 8085, 8251, 8253, 8708 (or 2716).

Before continuing, carefully inspect BOTH sides of the MPU-B for solder splashes and bridges.

