CPU BOARD ASSEMBLY MANUAL

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I. IMPORTANT NOTES BEFORE BEGINNING

A. Failure to take ESD precautions could permanently damage the components. ESD damage is permanent and invisible to the naked eye. (Zapped parts are terribly difficult to find once they are assembled into your MIDItools Computer.)

Although it is best to always wear your ESD ground strap while assembling your kit, all assembly steps that require ESD protection are marked with this symbol in the margin.

B. Many components are *polarized.* This means that they must be installed only in the orientation shown on the layout diagram.

All assembly steps that pertain to polarized, or directional, components are marked with
this symbol in the margin. Incorrect orientation can damage components.

C. This manual may make reference to the TOP, BOTTOM, LEFT, or RIGHT sides of the circuit board. These directions correspond to the circuit board held as shown in the layout diagram. In other words, holding the circuit board with the white text markings right side up.

D. The components bodies are installed on the white text side of the circuit board (inside the component outlines). The component leads go through the holes in the circuit board and are soldered on the opposite side.

E. *Integrated circuits (ICs) are not soldered to the circuit board.* Instead, IC sockets are soldered in their place. When solder assembly is finished, ICs are pressed in into the appropriate socket.

II. SET UP YOUR WORK AREA

A. Your work surface should be well lit and well ventilated.

B. Gather your tools: ESD grounding strap; soldering iron; solder (noncorrosive electronics solder); wire cutters; screwdrivers (phillips and pan head); pliers; wire strippers; etc.

C. Prepare ESD grounding protection. A typical ESD ground strap is adequate. Put the strap around your wrist and clip the other end to the head of a slightly-loosened screw of a working, grounded AC outlet plate. The strap will should have an internal 10M ohm (or equivalent) resistor in series to ground. This will safely dissipate any static charge that might otherwise damage your components during assembly and test.

D. Lay out the circuit board and components. Do not remove components from their bags yet. Familiarize yourself with the parts list, layout diagram, and part numbers. Notice that the

component bags are marked with the item number found on the parts list. Also, note that the reference designators can be found on the schematic, parts list, and layout diagram.

III. INSTALL THE COMPONENTS

A. Resistors and Jumpers

1. Install **00093** everywhere you see the jumper wire length designation (**----.4----** or **----.6----)**. There are 28 jumpers on this circuit board. Mount the component bodies flush to the board surface. Solder the leads and trim off the excess.

2. Install **00094** in position **R19**. Solder and trim the leads.

3. Install **00098** in positions **R3**, **R4**, **R5**, **R6** and **R7**. Solder and trim the leads.

4. Install **00099** in positions **R12** and **R18**. Solder and trim the leads.

5. Install **00100** in position **R2**. Solder and trim the leads.

6. Install **00095** in positions **R1** and **R8**. Solder and trim the leads.

B. Diodes

1. Install **00046** in positions **D2, D3, D4 and D5**. The stripe on the diode body must be on the same side as the shaded end of the diode outline shown on the circuit board. As in the layout diagram, **D2** and **D3** should have their stripe towards the bottom of the circuit board; **D4** and **D5** towards the top. Solder and trim the leads.

2. Install **00045** in position **D1**. It should have its stripe at the left of the circuit board. Solder and trim the leads.

C. IC and Ribbon Cable Sockets

1. Install **00068** flush to the circuit board in positions **U2 and U3**. The notch on the socket body is used to indicate pin 1 of the IC. As shown in the layout diagram, the notch should point towards the bottom of the circuit board. Solder all 8 socket pins.

2. Install **00069** flush to the circuit board in positions **U4 and U5**. The notch should point towards the bottom of the circuit board. Solder all 14 socket pins.

3. Install **00070** flush to the circuit board in positions **J5, J6 and J7**. The notch on the socket body is used to indicate pin 1 of the ribbon cable. The notch should point towards the bottom of the circuit board. Solder all 16 socket pins.

4. Install **00067** flush to the circuit board in position **U1**. The lever arm on the ZIF socket body is used to indicate pin 1 of the microcontroller. The arm should be at the bottom of the circuit board. Solder all 40 socket pins. Be patient!

D. Voltage Regulator and Heatsink Assembly

1. Insert screw (**00105**) through the hole in the regulator (**00081**) from the printed side of the regulator. Thread the heatsink (**00072**) on the screw and push it up flush against the regulator. The heatsink fins should wrap fully around the regulator body. Tighten the heatsink to the regulator using the lock washer (**00111**) and hex nut (**00109**).

2. Install the entire regulator assembly in position **Q1** with the heatsink back towards the top of the circuit board. Push the assembly through the mounting holes as far as it will go. Solder and trim the leads.

E. Crystal

1. Install **00073** in position **Y1**. Solder and trim the leads.

F. Capacitors

1. Install **00088** in positions **C2** and **C3**. Solder and trim the leads.

2. Install **00089** in positions **C4, C5, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16** and **C17** (13 places). Solder and trim the leads.

3. Install **00091** in position **C1**. Electrolytic capacitors are polarized. The negative (-) lead is indicated by a stripe and minus sign marked on the capacitor body. The circuit board has markings for the positive (+) lead. Put the positive lead in the hole marked “+” on the circuit board; put the negative lead in the other hole. Solder and trim the leads.

4. Install **00090** in position **C6**. Put the positive lead in the hole marked “+” on the circuit board; put the negative lead in the other hole. If your CPU Board Assembly is going in a Handheld Enclosure, bend the body of this capacitor to rest on the circuit board. (This is necessary due to the low profile of the Handheld Computer. Solder and trim the leads.

F. LCD Contrast Trimpot

1. Install **00060** in position **R9** so the edge of the dial hangs over the edge of the circuit board. Solder all 4 leads.

G. Connectors

1. Install **00085** in positions **J1, J2** and **J3**. Make certain that the connectors are flush with the surface of the circuit board. Solder all 7 terminals.

2. Install **00084** in position **J4** so that the open end sticks out from the edge of the circuit board. Make certain that the connector is flush with the surface of the circuit board. Solder the terminals.

H. Power Switch

1. Push the cap (**00087**) on the end of the pushbutton switch (**00086**). Install this switch in position **S1**. The cap should stick out from the edge of the circuit board. Press the switch flush with the board until the plastic standoffs (on the underside of the switch body) touch the circuit board. Solder all 6 terminals.

I. Integrated Circuits

1. Install **00062** in the socket for **U5**. Align the notch on the IC with the notch on the socket. Place the IC in the socket carefully so as not to damage any leads. Be certain that all IC leads end up in the socket. Push evenly until the IC body rests on the top of the socket. DO NOT SOLDER!

2. Install **00076** in the socket for **U2**. Align the notch on the IC with the notch on the socket. Place the IC in the socket carefully so as not to damage any leads. Be certain that all IC leads end up in the socket. Push evenly until the IC body rests on the top of the socket. DO NOT SOLDER!

3. Install **00077** in the socket for **U4**. Align the notch on the IC with the notch on the socket. Place the IC in the socket carefully so as not to damage any leads. Be certain that all IC leads end up in the socket. Push evenly until the IC body rests on the top of the socket. DO NOT SOLDER!

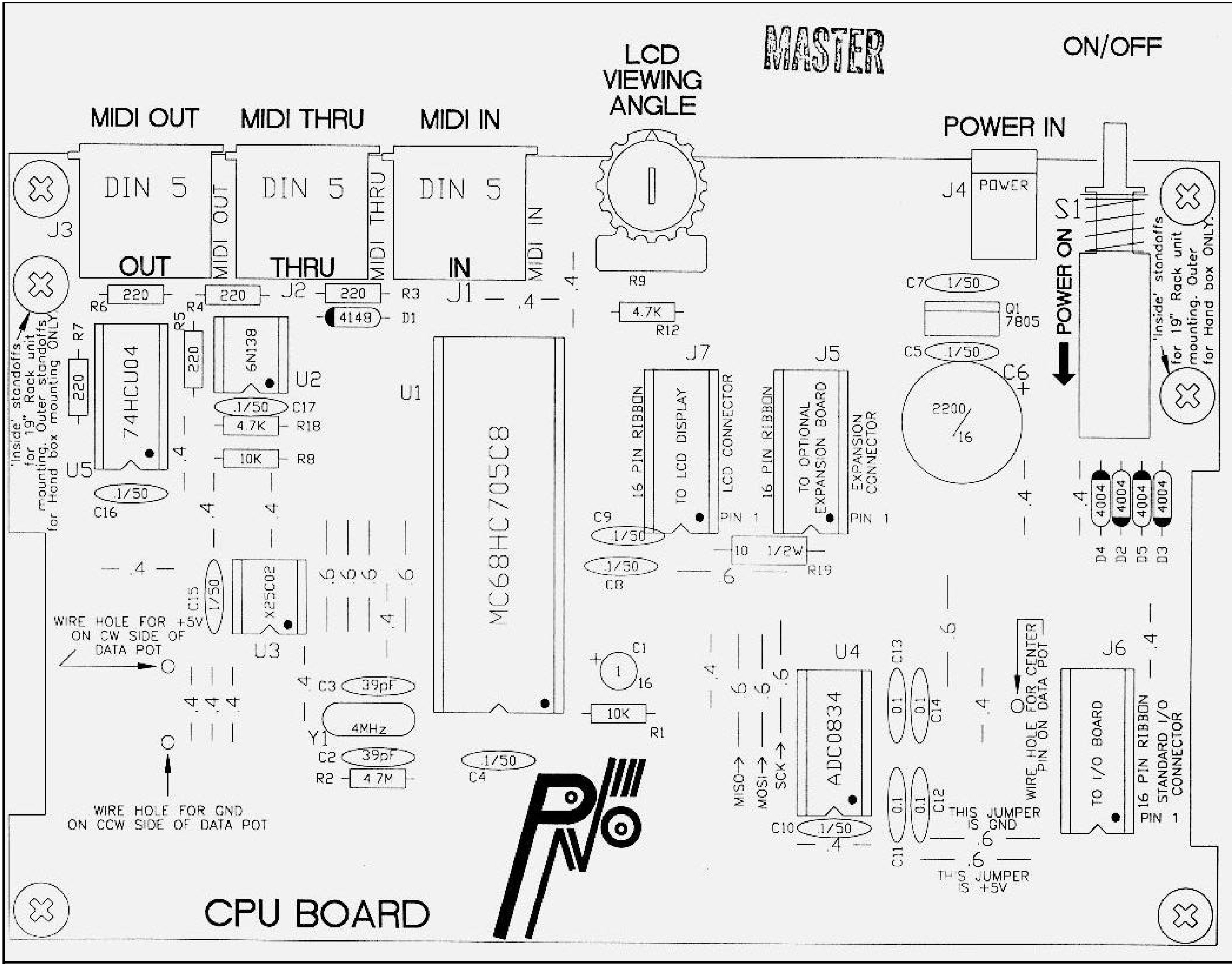
NOTE: IC U3 is not on the parts list. This integrated circuit comes with the System Exclusive Folder PROMpack only. The socket is provided so you can add this device to your arsenal at a later date.

IV. INSPECT YOUR WORK

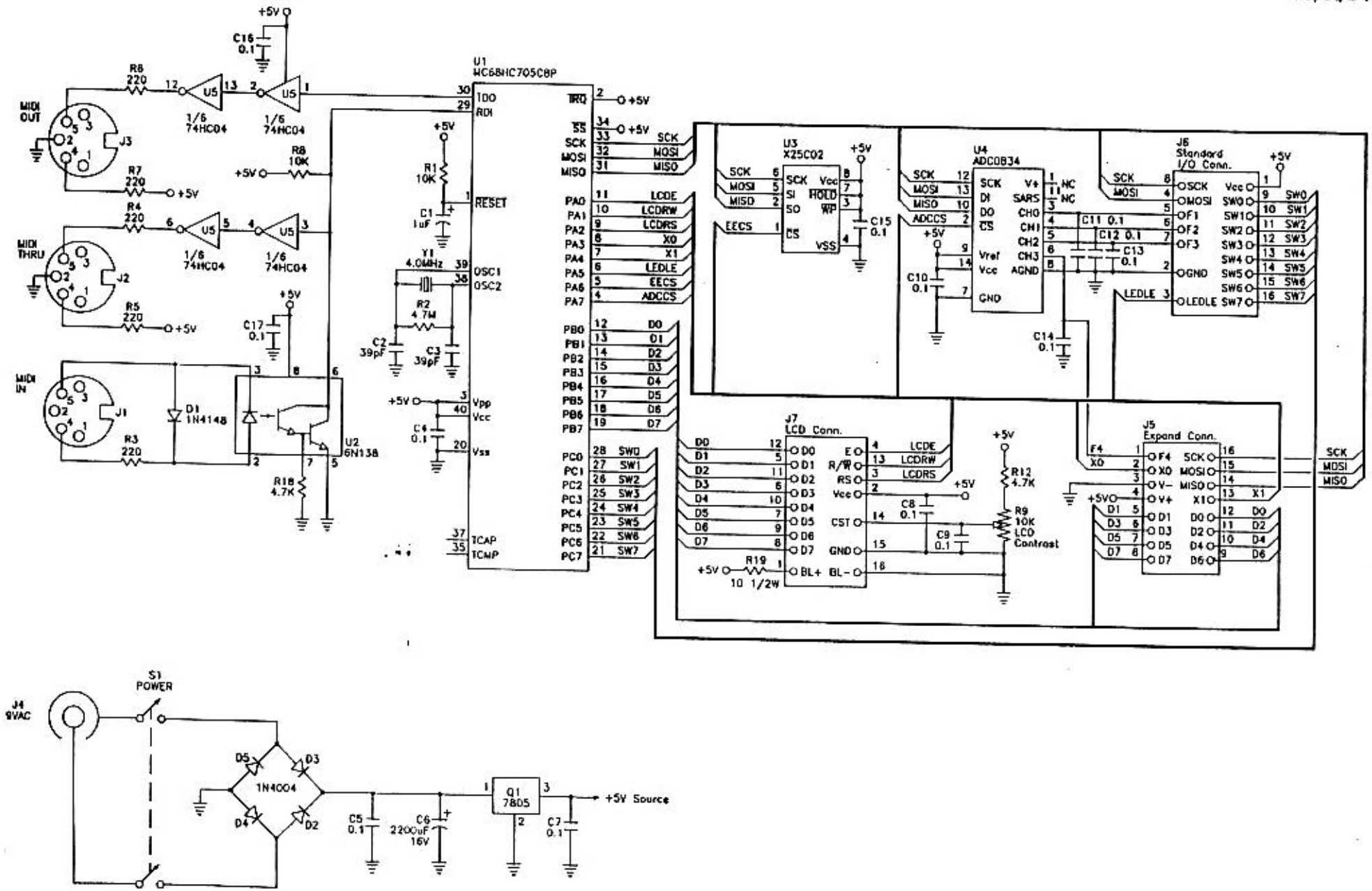
Before proceeding, take some time to inspect your workmanship. Look for and correct the following potential problems:

- solder that bridges two or more traces
- missed solder joints
- untrimmed leads
- incorrect component orientation
- forgotten parts (did you have any leftover components?)
- ICs not inserted in sockets properly
- ICs not oriented properly
- are all the jumpers installed?

*If things look the way they should, make sure that the pushbutton switch (**S1**) is in the off (OUT) position and you are ready to move on!*


MASTER
ON/OFF
LCD VIEWING ANGLE
MIDI OUT
MIDI THRU
MIDI IN
POWER IN
DIN 5
OUT
THRU
IN
J1
J2
J3
J4
POWER
S1
POWER ON
'Inside' standoffs for 19" Rack unit mounting. Outer standoffs for Hand box mounting ONLY.
R9
4.7K
R12
Q1 7805
C6
2200/16
J7
16 PIN RIBBON
TO LCD DISPLAY
LCD CONNECTOR
PIN 1
J5
TO OPTIONAL EXPANSION BOARD
EXPANSION CONNECTOR
10 1/2W
R19
74HCU04
U5
6N138
U2
U1
MC68HC705C8
X25C02
U3
4MHz
Y1
39pF
4.7M
WIRE HOLE FOR +5V ON CW SIDE OF DATA POT
WIRE HOLE FOR GND ON CCW SIDE OF DATA POT
10K
R1
ADC0834
U4
MISO
MOSI
SCK
THIS JUMPER IS GND
THIS JUMPER IS +5V
WIRE HOLE FOR CENTER PIN ON DATA POT
J6
TO I/O BOARD
16 PIN RIBBON STANDARD I/O CONNECTOR
4004
CPU BOARD

MIDItools
CPU Board
Rev: 1.0
05/01/94



Item 00028 *Rev* A

CPU BOARD KIT

Line	*	Qty	Item Number	Item Class	Item Shape	Item Details	Reference Designator(s)
1		13	00089	CAP	DISC	0.1UF, 50V, CERAMIC	C4,5,7-17
2		2	00088	CAP	DISC	39PF, 100V, CERAMIC	C2,3
3		1	00091	CAP	RADIAL	1UF, 50V, ELECTROLYTIC	C1
4		1	00090	CAP	RADIAL	2200UF, 16V, ELECTROLYTIC	C6
5		1	00084	CONNECTOR	2.4MM	POWER, MALE, PCB MOUNT	J4
6		3	00085	CONNECTOR	DIN5	MIDI, FEMALE, PCB MOUNT	J1-3
7		2	00068	CONNECTOR	DIP08	SOCKET, IC, TIN	
8		2	00069	CONNECTOR	DIP14	SOCKET, IC, TIN	
9		3	00070	CONNECTOR	DIP16	SOCKET, IC, TIN	J5-7
10		1	00067	CONNECTOR	DIP40	SOCKET, IC, ZERO INSERTION FORCE, TIN	
11		1	00073	CRYSTAL	RECT	4 MHZ, PARALLEL, 20PF, PCB MOUNT	Y1
12		4	00046	DIODE	DO41	1N4004 RECTIFIER	D2-5
13		1	00045	DIODE	DO41	1N4148 SIGNAL	D1
14		1	00111	HARDWARE	#06	LOCK WASHER, INTERNAL TOOTH	
15		1	00109	HARDWARE	06-32	HEX NUT	
16		1	00105	HARDWARE	06-32	MACHINE SCREW, PANHEAD, PHILLIPS, 1/4"	
17		1	00087	HARDWARE	BULLET	CAP FOR PUSHBUTTON SWITCH	
18		1	00072	HARDWARE	TO220	HEATSINK, SCREW-ON	
19		1	00076	IC	DIP08	6N138 OPTOISOLATOR	U2
20		1	00062	IC	DIP14	74HCU04 HEX INVERTER	U5
21		1	00077	IC	DIP14	ADC0834 8-BIT QUAD A/D CONVERTER	U4
22		1	00081	IC	TO220	7805 REGULATOR, +5V, 1A	Q1
23		1	00117	MANUAL	8.5"x11"	ASSEMBLY, CPU BOARD	
24		1	00029	PCB	4.2"x6.5"	CPU	
25		1	00094	RES	1/2W	10 OHM, 5%	R19
26		28	00093	RES	1/4W	0 OHM, JUMPER	
27		2	00095	RES	1/4W	10K OHM, 5%	R1,8
28		5	00098	RES	1/4W	220 OHM, 5%	R3-7
29		2	00099	RES	1/4W	4.7K OHM, 5%	R12,18
30		1	00100	RES	1/4W	4.7M OHM, 5%	R2
31		1	00060	RES	DISK	10K LINEAR TAPER TRIM POT, PCB MOUNT	R9
32		1	00078	SUPPLY	2.5MM	9VAC, 1A, AC ADAPTER,WALL MOUNT	
33		1	00086	SWITCH	RECT	DPDT, PUSH-PUSH, PCB MOUNT	S1