HANDHELD HUMAN INTERFACE 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 (non-corrosive 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 4 jumpers on this circuit board. Mount the component bodies flush to the board surface. Solder the leads and trim off the excess.

2. Install **00097** in positions **R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15** and **R16**. Solder and trim the leads.

3. Install **00092** in position **RP1**. Make certain that the stripe on the component body lines up with the pin 1 orientation marking dot shown on the circuit board and layout diagram. Solder and trim the leads.

B. Diodes

1. Install **00075** in positions **D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15** and **D16**. The longer lead of the LED is the anode (+). The shorter lead is the cathode (-). The short lead should be inserted in the circuit board hole corresponding to the schematic symbol cathode shown on the circuit board and layout diagram. In other words, the long lead goes in the bottom hole and the short lead goes in the top.

The LEDs must be soldered in place perpendicular to the circuit board surface so that they fit into the holes cut into the top panel of your enclosure. Also, they must stick through the holes uniformly. You can probably rig up a fixture to accomplish this. If you are using a PAVO enclosure, simply insert all LEDs in the circuit board, connect the circuit board to the top metal piece using the screws and spacers specified in the Final Assembly Manual, lay the top face down flat on your work surface, and solder and trim the leads. The top of the LEDs will be flush with the top face of your computer.

C. IC Sockets

1. Install **00070** flush to the circuit board in positions **U1 and U2.** The notch on the socket body (used to indicate pin 1 of the ICs) should point towards the right of the circuit board. Solder all 16 socket pins.

D. Pushbutton Switches

1. Install **00066** flush to the circuit board in positions **S0, S1, S2, S3, S4, S5, S6** and **S7.** Make sure that the switches are perpendicular and flush to the circuit

board surface. The switches have standoffs on them to aid in positioning. Solder both pins of each switch.

E. Ribbon Cable

1. Install either end of **00082** flush to the circuit board in the position marked **"STANDARD I/O CONNECTOR"**. The red wire indicates pin 1 of the ribbon cable. This wire must be aligned with the pin 1 marking dot shown on the circuit board and layout diagram. Solder all 16 connector pins.

F. Integrated Circuits

1. Install **00055** in the sockets for **U1** and **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!

G. Potentiometer Assembly

NOTE: The potentiometer assembly can be soldered to either the CPU Board Assembly or this circuit board. In this step, you will only put the potentiometer assembly together. During the final assembly (see the Final Assembly Manual), you will solder the three potentiometer wires to the circuit board of your choice.

1. Strip off 0.5" of the insulation off of both ends of the three 12" wires (**00101, 00102** and **00103**). Solder one end of the black wire (**00101**) to the counter clockwise (CCW) terminal of the potentiometer (**00059**). If you look at the end of the pot shaft with the terminals at the bottom, the black wire should be soldered to the left terminal. Next, solder the yellow wire (**00103**) to the center terminal. Finally, solder the red wire (**00102**) to the remaining terminal.

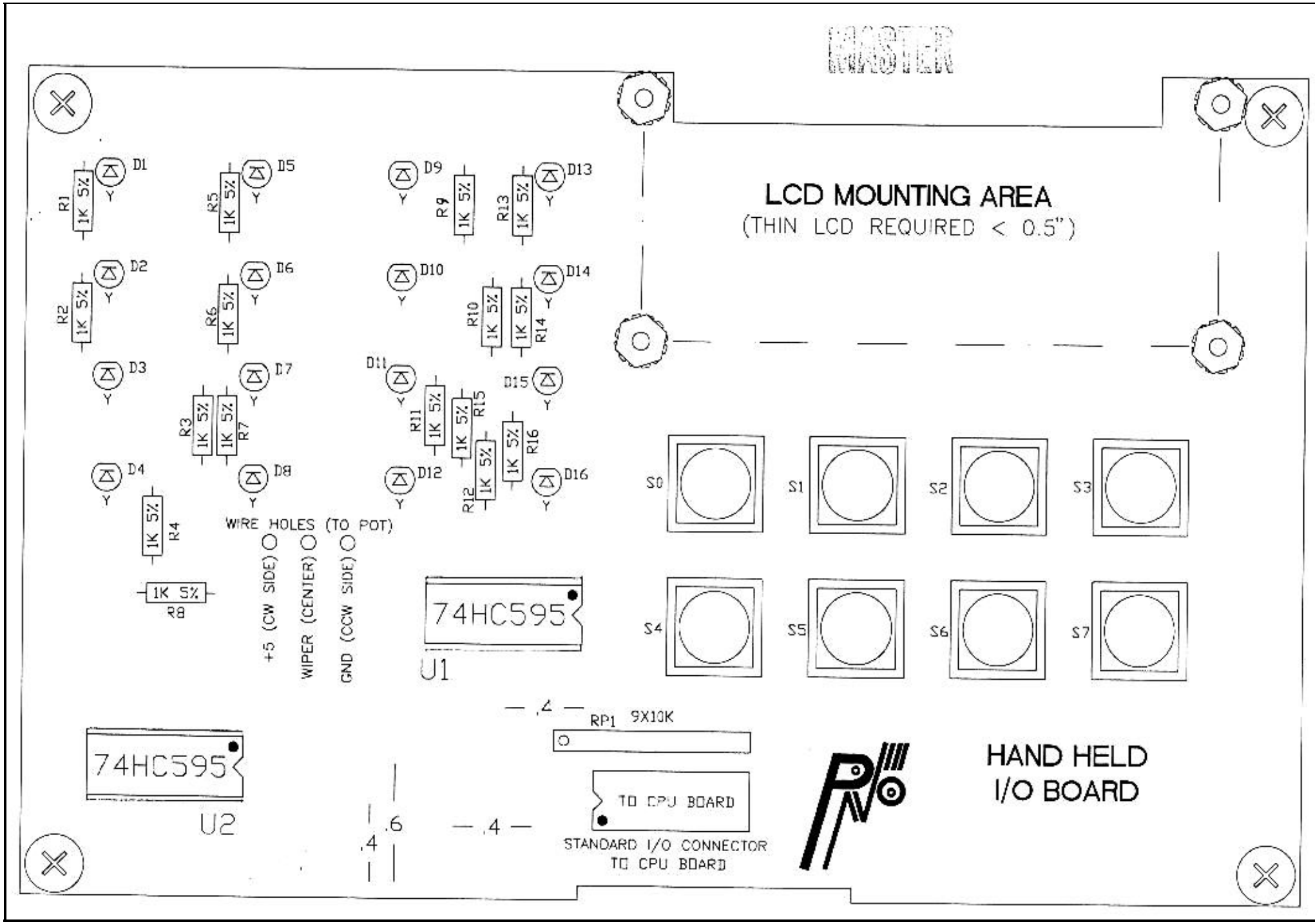
2. For safekeeping, attach the knob (**00057**) to the pot shaft by loosening the set screw, sliding the knob on the shaft, and tightening the screw.

IV. INSPECT YOUR WORK

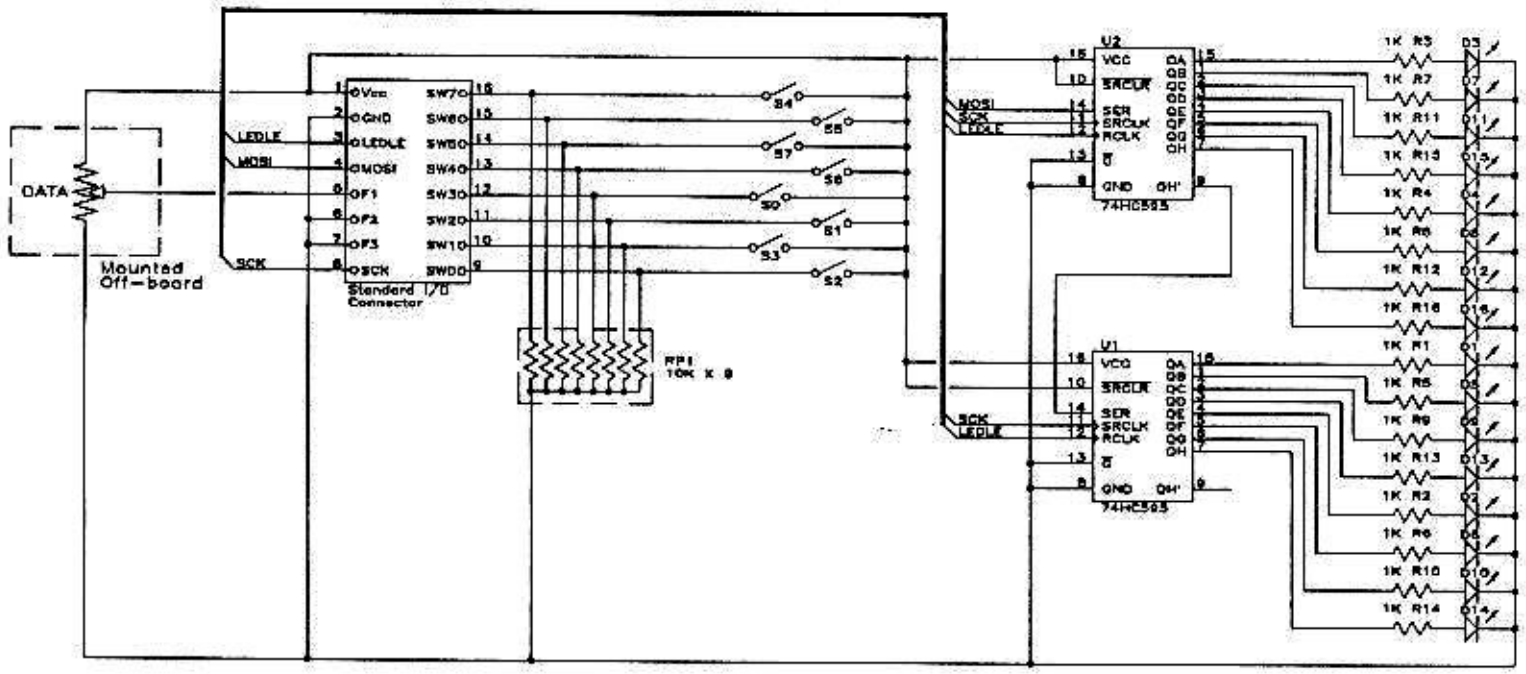
Before proceeding, take some time to inspect your workmanship. Look for and correct the following potential problems:

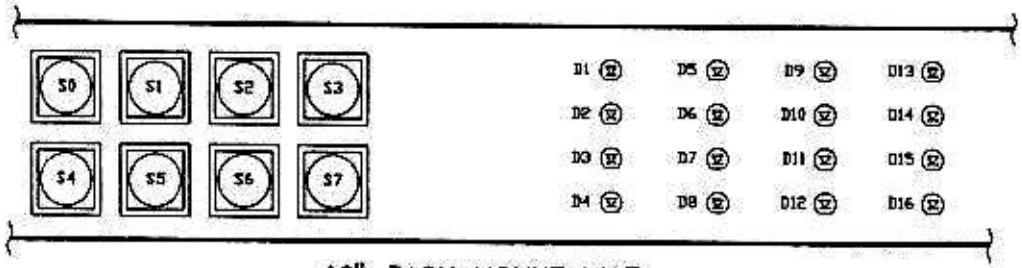
- solder that bridges two or more traces
- missed solder joints
- untrimmed leads
- incorrect component orientation
- forgotten parts (did you have any leftover components?)
- ICs not inserted in sockets properly
- ICs not oriented properly
- are all the jumpers installed?

If things look the way they should, you are ready to move on!

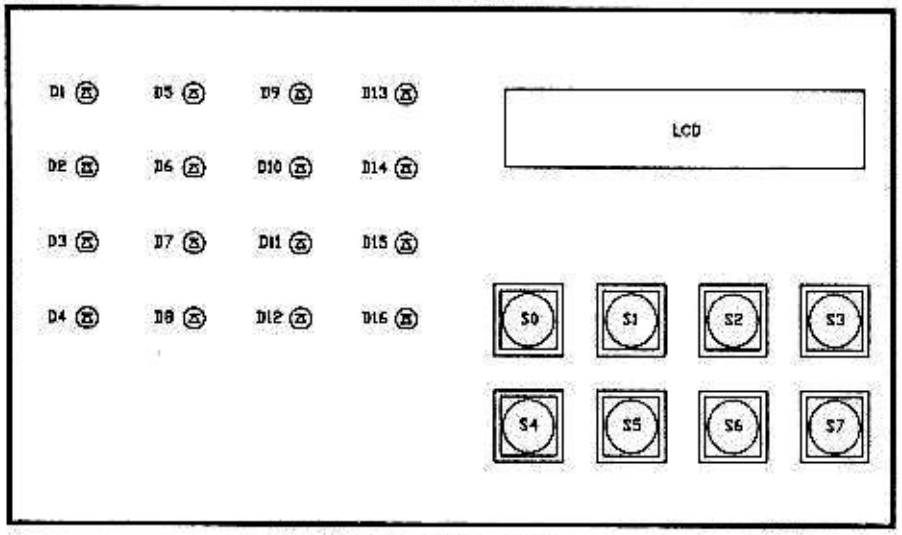

MASTER
LCD MOUNTING AREA
(THIN LCD REQUIRED < 0.5")
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
R1 1K 5%
R2 1K 5%
R3 1K 5%
R4 1K 5%
R5 1K 5%
R6 1K 5%
R7 1K 5%
R8 1K 5%
R9 1K 5%
R10 1K 5%
R11 1K 5%
R12 1K 5%
R13 1K 5%
R14 1K 5%
R15 1K 5%
R16 1K 5%
WIRE HOLES (TO POT)
+5 (CW SIDE)
WIPER (CENTER)
GND (CCW SIDE)
74HC595
U1
74HC595
U2
S0
S1
S2
S3
S4
S5
S6
S7
RP1 9X10K
TO CPU BOARD
STANDARD I/O CONNECTOR
TO CPU BOARD
.4
.6
.4
.4
HAND HELD
I/O BOARD

MIDItools
STANDARD I/O Board
Rev: 1.0
05/01/94





19" RACK MOUNT UNIT



HAND HELD UNIT

Notes:

(1) This schematic for both the 19" rack mount I/O board and the hand held I/O board

HANDHELD HUMAN INTERFACE BOARD KIT

Line	*	Qty	Item Number	Item Class	Item Shape	Item Details	Reference Designator(s)
1		0.0015	00101	CABLE	AWG24	7X32 STRANDED WIRE, BLACK, 1000'	
2		0.0015	00102	CABLE	AWG24	7X32 STRANDED WIRE, RED, 1000'	
3		0.0015	00103	CABLE	AWG24	7X32 STRANDED WIRE, YELLOW, 1000'	
4		1	00082	CABLE	DIP16	RIBBON, W/2 TIN CONNECTORS, 6"	
5		2	00070	CONNECTOR	DIP16	SOCKET, IC, TIN	
6		16	00075	DIODE	T1	LED, GREEN, DIFFUSED LENS	D1-16
7		1	00057	HARDWARE	WEDGE	KNOB FOR POTENTIOMETER	
8		2	00055	IC	DIP16	74HC595 SHIFT REGISTER	U1,2
9		1	00120	MANUAL	8.5"x11"	ASSEMBLY, HAND H/I BOARD	
10		1	00031	PCB	4.2"x6.5"	HANDHELD HUMAN INTERFACE	
11		1	00059	RES	0.25"	10K LINEAR TAPER POT, PANEL MOUNT	
12		4	00093	RES	1/4W	0 OHM, JUMPER	
13		16	00097	RES	1/4W	1K OHM, 5%	R1-16
14		1	00092	RES	SIP10	9x10K NETWORK	RP1
15		8	00066	SWITCH	SQUARE	MOM SPST-NO PUSHBUTTON, PCB MOUNT	S0-7