

# RELAY DRIVER BOARD

## ASSEMBLY MANUAL

ELECTROVOCE [www.electrovoec.com](http://www.electrovoec.com)

### 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** where you see the jumper wire length designation (----**4**----). There is only 1 jumper on this circuit board. Mount the component body flush to the board surface. Solder the leads and trim off the excess.
2. Install **00096** in positions **R2**, **R4**, **R6**, and **R8**. Solder and trim the leads.
3. Install **00095** in positions **R1**, **R3**, **R5**, and **R7**. Solder and trim the leads.

#### B. Diodes



1. Install **00046** in positions **D1**, **D2**, **D3**, and **D4**. 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 shown in the layout diagram, all 4 diodes should have their stripe towards the right of the circuit board. Solder and trim the leads.

#### C. Transistors



1. Install **00122** in positions **Q1**, **Q2**, **Q3**, and **Q4**. The flat face of the transistor must point to the top of the circuit board as in the layout diagram. Solder and trim the leads.

#### D. Relays

1. Install **00074** in positions **K1**, **K2**, **K3**, and **K4**. The relays will only fit in the circuit board one way. Solder and trim all 5 leads.

#### E. IC Socket



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

#### F. Connectors

1. Install **00061** in positions **J1**, **J2**, **J3**, and **J4** so that the open end sticks out from the top edge of the circuit board. The connectors should be flush with the circuit board. Solder the terminals.

#### G. Ribbon Cable

1. Install either end of **00083** flush to the circuit board in the position marked “**EXPANSION**” (**J5**). 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.

#### H. Integrated Circuits



1. Install **00055** in the socket for **U1**. 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!**

#### I. Mounting Hardware and Rear Cover

1. Set the mounting hardware ( **00111** washers, **00113** spacers, **00109** nuts, and **00106** screws) aside for now. During the final assembly , you will use these to mount this circuit board in your enclosure -- see the Final Assembly Manual.
2. Set the rear cover (**00054**) and its mounting screws (**00105**) aside as well. If you are going to assemble your computer in PAVO's rackmount enclosure, you will mount this cover to the back of the enclosure during the final assembly steps.

### 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!*

# EXPANSION CONNECTOR

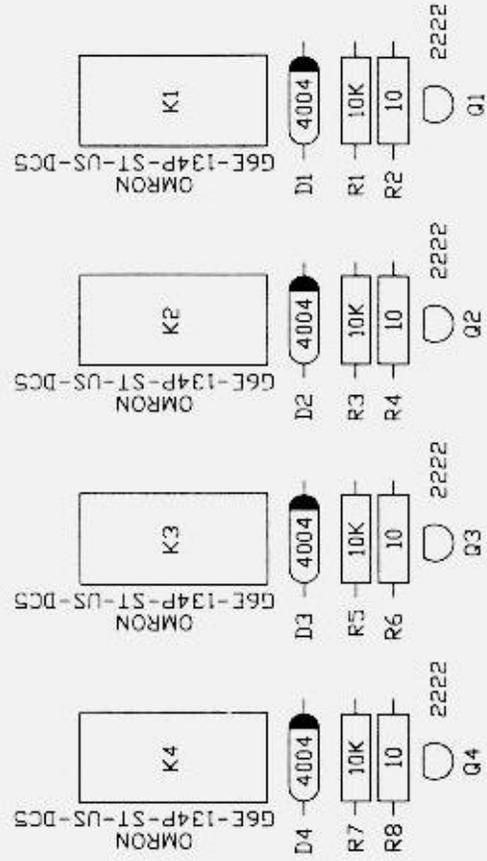
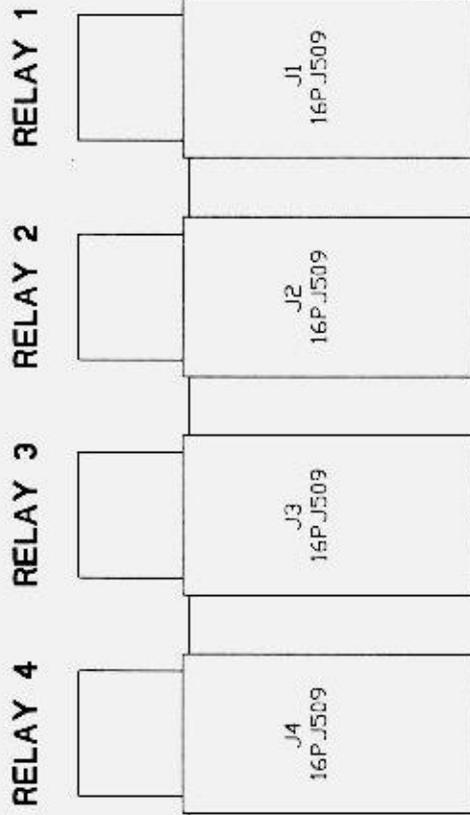
16 PIN RIBBON

J5

-.4-

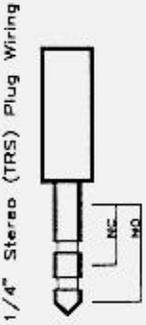
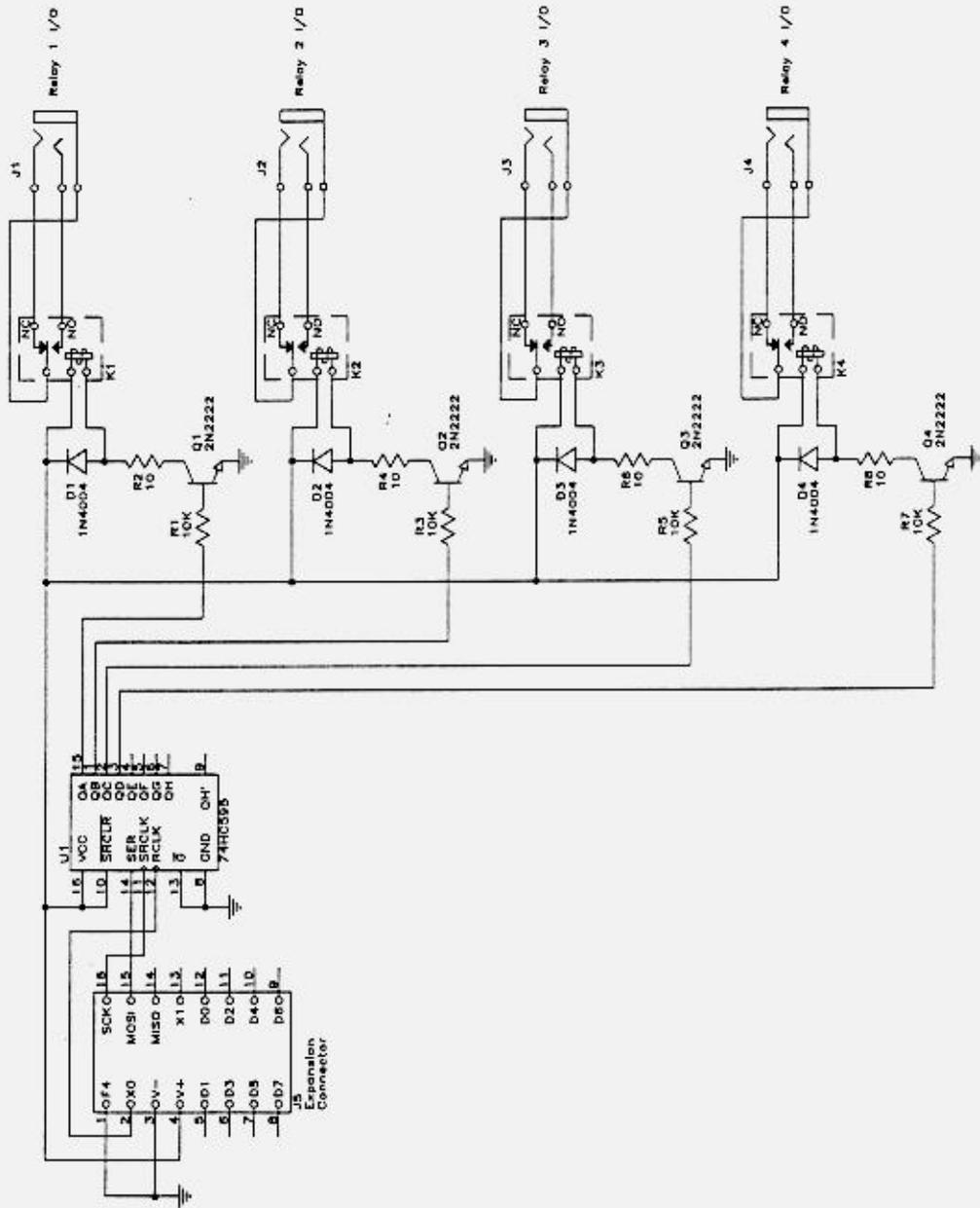


U1



# RELAY BOARD

**MIDtools**  
**RELAY BOARD**  
 Rev: 1.0  
 05/01/94



Item 00036		Rev A		RELAY DRIVER BOARD KIT		Reference
Line *	Qty	Item Number	Item Class	Item Shape	Item Details	Designator(s)
1	1	00083	CABLE	DIP16	RIBBON, W/2 TIN CONNECTORS, 18"	J5
2	4	00061	CONNECTOR	1/4"	1/4" STEREO JACK, PCB MOUNT	J1-4
3	1	00070	CONNECTOR	DIP16	SOCKET, IC, TIN	
4	4	00046	DIODE	DO41	1N4004 RECTIFIER	D1-4
5	1	00054	ENCLOSURE	1.1"x7.75"	RELAY DRIVER REAR COVER	
6	4	00111	HARDWARE	#06	LOCK WASHER, INTERNAL TOOTH	
7	4	00113	HARDWARE	#06	SPACER, CLEAR, ALUM, 1/4"	
8	4	00100	HARDWARE	06-32	HEX NUT	
9	4	00106	HARDWARE	06-32	MACHINE SCREW, PANHEAD, PHILLIPS, 1/2"	
10	2	00105	HARDWARE	06-32	MACHINE SCREW, PANHEAD, PHILLIPS, 1/4"	
11	1	00055	IC	DIP16	74HC595 SHIFT REGISTER	U1
12	1	00126	MANUAL	8.5"x11"	ASSEMBLY, RELAY BOARD	
13	1	00037	PCB	3.4"x6.7"	RELAY DRIVER	
14	4	00074	RELAY	RECT	+5V, SPDT, PCB MOUNT	K1-4
15	1	00093	RES	1/4W	0 OHM, JUMPER	
16	4	00096	RES	1/4W	10 OHM, 5%	R2,4,6,8
17	4	00095	RES	1/4W	10K OHM, 5%	R1,3,5,7
18	4	00122	TRANSISTOR	TO92	2N2222A, NPN	Q1-4