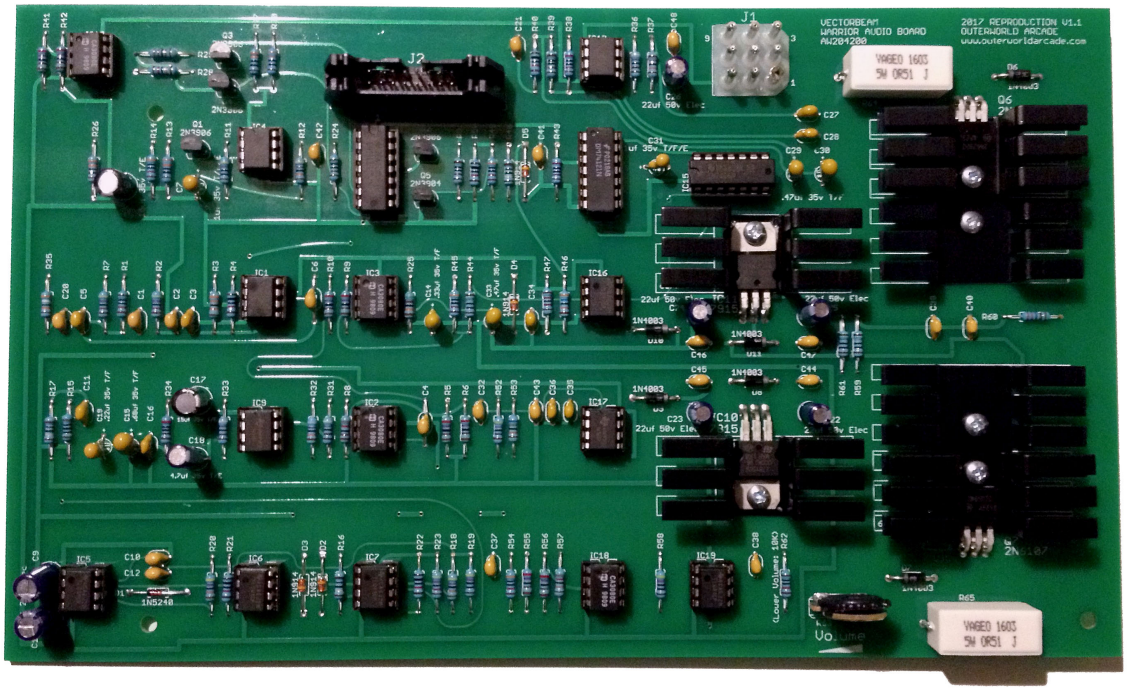
Vectorbeam Warrior Reproduction Audio PCB v1.1



Pricing

Warrior Audio PCB: $250.00
Optional Audio Harness Converter: $15.00
USA Shipping (Priority Mail with Insurance): $13.50

Overview

The Vectorbeam Warrior Reproduction Audio PCB is a drop-in replacement for the original Warrior Audio PCB with most traces and components in the same locations as in the original board. The reproduction has the following upgrades over the original PCBs:

1. Upgraded Resistors. All resistors are 1% tolerance (metal) rather than the 5% tolerance (carbon) used in the original boards, providing greater accuracy in the sound circuits.

2. Socketed ICs. Sockets have been installed for all ICs for easier maintenance and troubleshooting.

3. Amplifier Transistors replaced. The reproduction board replaces the 2N5878 and 2N5876 transistors used on the original Warrior audio boards with the same 2N6107 and 2N6292 transistors used in all other Cinematronics and Vectorbeam audio PCBs.

4. Added circuit protection for Amplifier. An additional .51 Ohm 5% 5W resistor and 1N4003 diode were added to each half of the Power Amp circuit in the audio boards of later games such as Armor Attack. This protection has been also added to the reproduction Warrior Audio board.

5. Upgraded Voltage Regulation Circuits. The original Warrior voltage regulation circuits used tantalum capacitors, which were prone to failure. This circuit was upgraded by Cinematronics beginning with the Rip Off audio board, replacing each of the 3.3uf tantalum capacitors with 22uf electrolytic capacitors and a .1uf ceramic disc capacitor. The circuit was further refined in boards such as Star Castle and Armor Attack, adding four 1N4003 diodes to the circuit. The Warrior Reproduction Audio PCB v1.1 uses this final revision of the circuit.

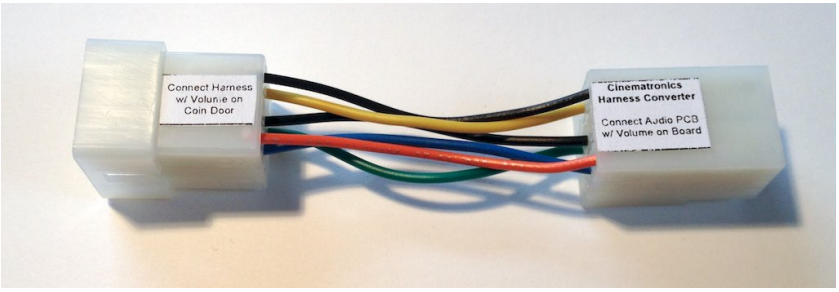
6. Improved Volume Control. The original Warrior Audio boards are PAINFULLY loud, even at their lowest setting. R62 sets the minimum volume setting, with the potentiometer R63 increasing the volume from this minimum level. R62 was specified in the Warrior schematics to be a 47K Ohm resistor and R63 increases this by 0-100K Ohms (Range of 47K – 147K). By reducing the value of this resistor, the minimum volume setting is reduced, giving the operator the ability to set the volume lower. Sundance uses a 10K Ohm resistor for this purpose and is the value I'm currently installing (range of 10K – 110K). This change makes the lowest volume setting much quieter (but still nowhere near silent).

7. Component Labels. The reproduction board includes component values that were not labeled on the original boards.

8. Upgraded Capacitors. The original Warrior boards used a number of tantalum capacitors in the sound circuits. By 1980, Cinematronics had phased out the use of tantalum capacitors in its audio boards replacing them with film or electrolytic capacitors.

In the reproduction board, tantalum capacitors 1uf and above are replaced with electrolytic capacitors. In my initial experiments replacing capacitors between .1uf and 1uf with film capacitors, I found subtle changes in the sounds produced. For now, I am continuing to use tantalum parts for these capacitors.

Ceramic disc capacitors have been replaced with multi-layer ceramic capacitors (MLCC), which have much smaller tolerances than standard disc capacitors.



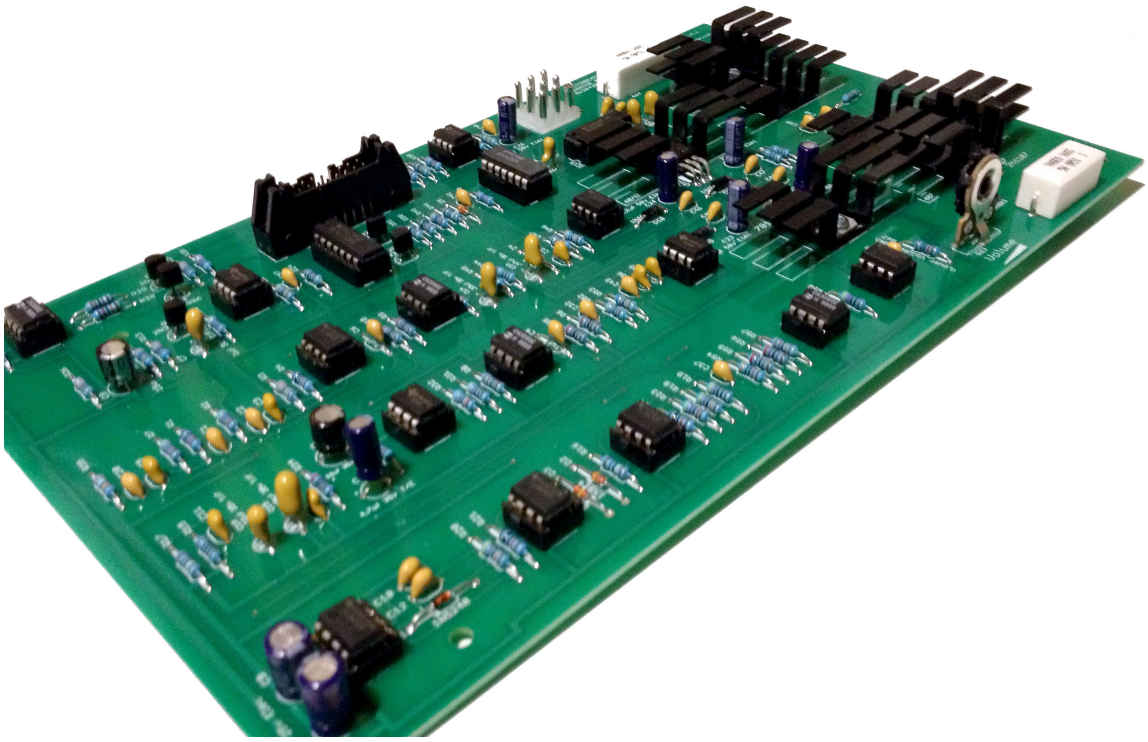
9. Audio Harness Converter. With the optional harness converter, audio PCBs with volume control on-board (Space Wars, Starhawk, Warrior, Sundance) can be plugged into cabinets with the volume control located in the door (Rip Off, Star Castle, Armor Attack). When installed, the volume is controlled by the potentiometer on the Sound PCB and the coin door volume control has no effect.

Installation Overview

The Reproduction Warrior Audio PCB is a drop-in replacement for the original Warrior Audio PCB. To install, just power off the machine and swap in the reproduction board. If installing into a cabinet with the volume control located on the coin door, install the harness converter between the board (J1) and the game's wiring harness. This connector is keyed and should only connect in the proper orientation. The ribbon cable to the Cinematronics CPU (J2) is not keyed and it is possible to insert it backwards.

Ordering Information

Due to the time it takes to hand-assemble a board, the Reproduction Warrior Audio PCB is available in small quantities and limited availability. Pricing is subject to change. Please email arcade@outerworldmedia.com to find out about current pricing, availability and to purchase a board.



Revision History

1.0: 2015 Initial Release

1.1: March 2017

Upgrades to the Voltage Regulation Circuits:

Changed C22,C23,C24,C25,C26 to “22uf 50v Elec” and changed part for a better fit for the caps.

Added C44,C45,C46,C47,C48: .1uf ceramic disc caps.

Added D8,D9,D10,D11: 1N4003 Diodes.

Other Changes:

Changed volume control potentiometer to match original Bourns potentiometer and added Volume label. Added triangle icon showing direction to increase or decrease volume. Added note to R62 about value for lower volume.

Renamed labels for tantalum capacitors to:
T/F: Tantalum or Film Capacitor
T/E: Tantalum or Electrolytic Capacitor
T/F/E: Tantalum, Film or Electrolytic Capacitor

Adjusted names and locations of capacitor labels to accommodate film cap size.

Corrected Errors in Component Values On Board. Vertical labels are read from the right side of the board rather than the left. This is because the board was submitted to the manufacturer vertical (1.0) rather than horizontal (1.1).

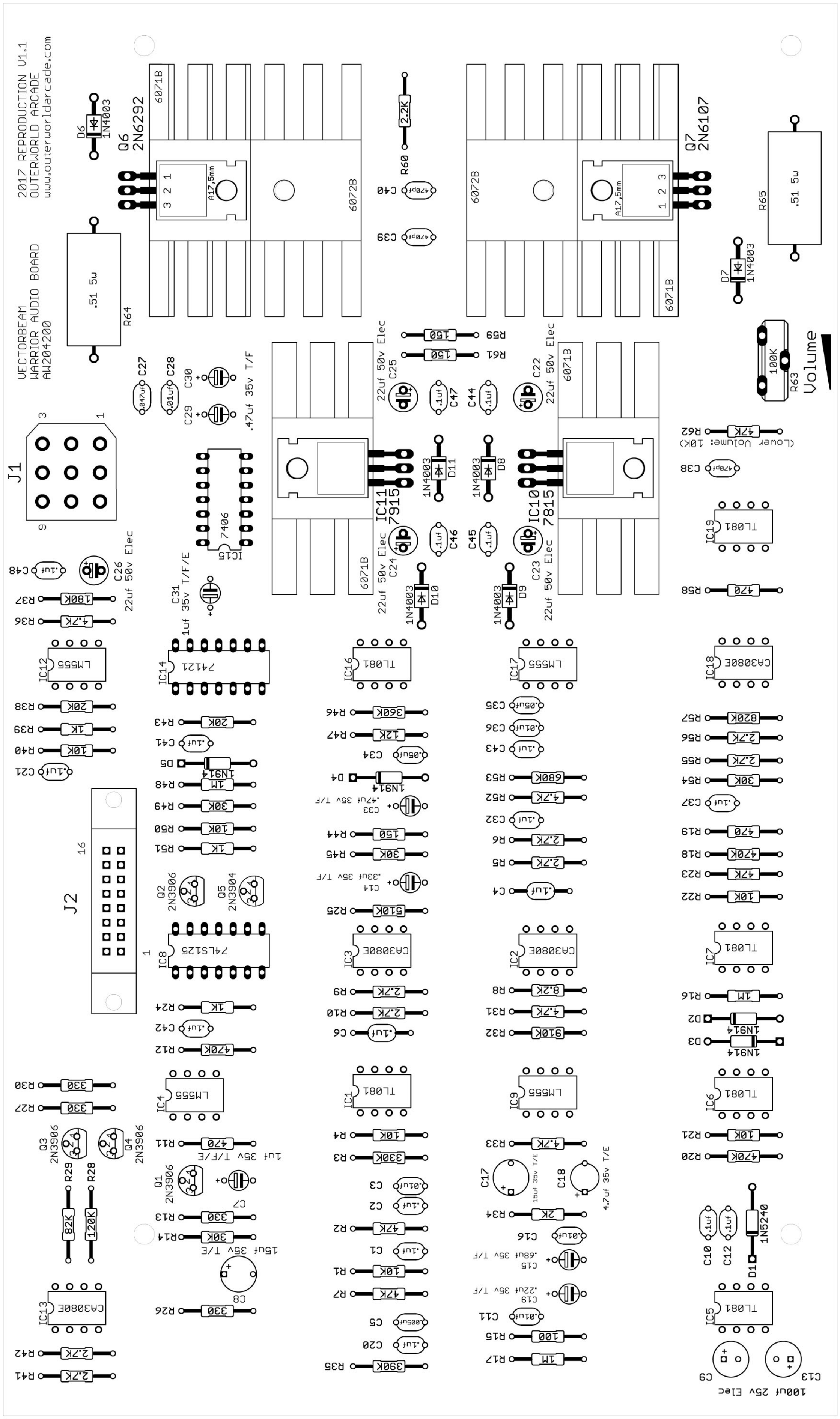
Trace to pin 2 of Q7 (2N6107) routed from top to bottom of board to prevent any short circuits between heatsink and trace. R65 moved down and to the left to allow more space between it and Q7.

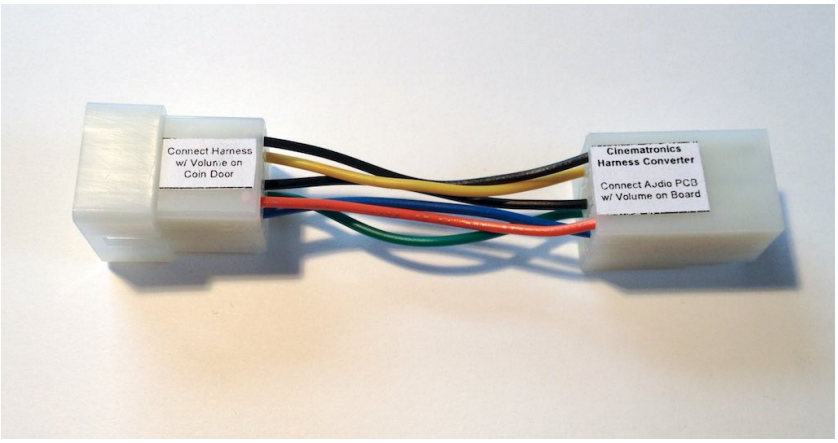
J1 Moved to the right to allow a bit more finger space for plugging and unplugging and to save on wear and tear on components close to the connector. Made diameter of pad around each hole larger.

Numerous minor adjustments were made to board traces and part labels.

Adjusted spacing of mounting holes.

Adjusted lead spacing of ceramic caps to 5mm where possible to ease in board manufacture.


2017 REPRODUCTION V1.1
OUTERWORLD ARCADE
www.outerworldarcade.com
VECTORBEAM
WARRIOR AUDIO BOARD
AW204200



Building an Audio Harness Converter

The Audio Harness Converter allows the use of audio PCBs with volume control on-board in cabinets with the volume control located in the door. When installed, the volume is controlled by the potentiometer on the Sound PCB and the coin door volume control has no effect. Without this converter, -25v on pin 8 is connected through the volume control in the coin door to the game's speaker.

Below is the pinout for the Audio Harness Converter if you have the tools and wish to build one yourself. The converter changes shaded rows.

Parts:

Plug	Molex 03-09-2092	Quantity: 1
Receptacle	Molex 03-09-1093	Quantity: 1
Male Terminal	Molex 02-09-1119	Quantity: 7
Female Terminal	Molex 02-09-2118	Quantity: 6

22 AWG Stranded Wire

To Harness Volume off-board (coin door)				To Audio PCB Volume on-board		
Pin #	Pin Gender	Connection	Wire Color	Pin #	Pin Gender	Connection
1	-	Volume GND	N/C	1	Male	
2	Male	Speaker	Green	2	Female	Speaker
3	-	Volume		3	-	
4	Male	+25v	Yellow	4	Female	+25v
5	Male	Speaker GND	Black	5	Female	Speaker GND
6	Male	-25v	Blue	6	Female	-25v
7	Male	GND	Black	7	Female	GND
8	-	Volume		8	-	-25v
9	Male	+5v	Orange	9	Female	+5v