

Alan-1 Regulator/Audio II++ Installation and User Guide

The Alan-1 Regulator/Audio II++ is a drop-in replacement for all variants of the Atari Regulator/Audio II, -01 through -06, with built-in voltmeters and a headphone/line out jack. *It doesn't matter which version your game originally had: ours replaces all of them.* Here is the list of compatible games:

Battlezone	Kangaroo	Red Baron
Black Widow	Liberator	Return of the Jedi
Centipede	Major Havoc	Space Duel
Cloak and Dagger	Millipede	Star Wars
Crystal Castles	Missile Command	Tempest
Dig Dug	Monte Carlo	Warlords
Fast Freddie	Pole Position I*	Xevious
Food Fight	Pole Position II*	
Gravitar	Quantum	* = requires two

How To Install the Regulator/Audio II++

1. Uninstall the original Atari Regulator/Audio II.

- Power off your game and unplug it from wall power.
- Unplug all the Molex connectors. Hold onto the PCB-side connector as you unplug each one, so you don't bend the PCB or break traces on it.
 - You might want to label the two 6-pin connectors, J6 and J9, first. Plugging one into the other can damage the PCB and your classic game.
- Unscrew the screws holding on the original PCB, and slide it out from the wooden rails.
- Store the original PCB in a safe place, so that you can restore your game to original condition.

2. Install the Alan-1 Regulator/Audio II.

- Slide the new PCB into the wooden rails.
- Screw the screws back into their original locations.
- Plug all the Molex connectors back into the PCB. Hold onto the PCB-side connector as you plug in each one, so you don't bend the PCB or break traces on it.

3. Power up your game. The Alan-1 logo should light up and the lights spin in reverse for 1 second. Soon after, the digital displays should start showing voltages. (If not, make sure the coin and rear door power interlocks are on, and that you've hooked all the connectors back up.)

4. Adjust the voltage to the game PCB. *Do this first, before you play your game or do anything else!* The directions begin on the next page, "How To Check and Adjust Voltages."

How To Check and Adjust Voltages

The Alan-1 Regulator/Audio II++ has built-in voltmeters, so you don't need anything but a small screwdriver to keep your game running optimally. The RA2++ will never run away and burn your PCB fingers, your edge connectors, R29/R30, or your game PCB. Even better, the voltmeters tell you when it's time to clean your edge connectors or replace Big Blue!

How to Check and Adjust +5V and +SENSE

- *Find the adjustment pot VR1.* It's located just to the right of the lower big heatsink.
- By default, the voltmeters alternate between showing "+5V" (top) and "+SENSE" (bottom), and "DC IN" and "RIPPLE".
- To make adjustment easy, you can tap the HOLD/SWITCH button below the displays until it shows +5V and SENSE, then hold it down for about a second. Now it will stay on those values until you tap the button again. (UI options are explained on the next page.)
- **What you want is +SENSE = 5.0 volts.** This is the voltage coming back from the game PCB. (+5V is the voltage produced by the Regulator/Audio II++.)
- If it's lower, turn VR1 clockwise, and count to ten while the voltage stabilizes. You'll see both +5V and +SENSE slowly rise.
- If it's higher, turn VR1 counter-clockwise, and count to ten while the voltage stabilizes. You'll see both +5V and +SENSE slowly fall.
- You'll see an extra period . after the voltage while it's still settling down. Wait until the . goes away before making another adjustment.
- We recommend a maximum of 1/8 turn at a time.
- *Repeat your adjustments until +SENSE is exactly 5.0 volts. This means your game PCB is receiving exactly 5V.*
- **IMPORTANT! If "+5V" reads 5.4 volts or more when +SENSE reads 5.0 volts, your PCB fingers, and/or the edge connectors on your wiring harness, are dirty and need to be cleaned.**
- Periodically check the +5V and +SENSE readouts to make sure +SENSE is still at 5.0 volts, and +5V is 5.3 volts or less. With many games, the Regulator/Audio II++ is mounted so that you can see the voltmeters through the coin door. (Apologies to Centipede owners.)

How to Check +DC IN and RIPPLE

- +DC IN shows the unregulated voltage coming in from the transformer block.
 - Atari calls it "10.3VDC UNR", but in reality it'll usually be 12-12.5 volts.
 - If this value is anywhere between 10.3 volts and 13 volts, everything is OK.
- RIPPLE shows the ripple voltage on +DC IN.
 - "Big Blue" is the giant cylindrical capacitor on the transformer block. The originals were all blue – hence the name – but if yours has been replaced, it might be black, or (rarely) red.
 - **If Big Blue is in good condition, RIPPLE will be a very small number:** usually 0.02 – 0.03 volts, and definitely less than 0.05 volts.
 - If Big Blue needs replacing, RIPPLE will creep upward. If it's $\geq 0.1V$, it's likely time to replace Big Blue.

How To Change Display and Lighting Modes

How to Change the Display Mode

- By default, the voltmeters display +5V and +SENSE for a couple seconds, then +DC IN and RIPPLE for a couple seconds. You can change this with the HOLD/SWITCH button below the displays, as follows:
 - To show the other set of values, tap the HOLD/SWITCH button briefly. The display will switch to the other side, and hold that set of values for about 10 seconds. Then it will resume switching back and forth.
 - To hold a set of values on the display, hold the HOLD/SWITCH button for about a second, until the LEDs flash. Those values will be held on the display until you tap the button again.

How to Change the Lighting Mode

- The Alan-1 Regulator/Audio II++ has three built-in lighting modes.
- To change between them, hold the HOLD/SWITCH button for about three seconds, until the LEDs flash a second time.
- The three lighting modes are:
 - Default: Chaser lights rotate clockwise around the Alan-1 logo. The lit “ALAN-1” reacts to game audio, when present.
 - Always On: The chaser lights and Alan-1 logo are always on.
 - Dark: The chaser lights and Alan-1 logo are always off.

How To Use the Headphone/Line Out Jack

You can connect headphones, a Bluetooth audio transmitter, a stereo amplifier, or anything that takes line-level input signals to the 3.5mm Headphone/Line Out jack at J2.

- The volume control is to the left of the jack.
- **Volume at the output jack is independent of the game speaker volume.**
- Set switch S1 and S2 according to whether your game is mono or stereo.
 - *Almost all Atari games compatible with the Regulator/Audio II++ are monophonic. In this case, set both S1 and S2 to UP.*
 - A few games, like the Pole Position cockpit, have stereo sound. In this case, set S1 to UP and S2 to DOWN.
 - Technical explanation: S1 and S2 assign the left and right channels of the headphone/line out jack to the left and right channels of the game audio. Most Atari games are monophonic – but they use both amplifier channels in a “bridged” configuration in order to double the output power. This means one audio channel is 180 degrees out of phase with the other, and you will get strange cancellation artifacts if you play both channels through different stereo speakers. Assigning both L and R stereo outputs to only one of the input channels, by setting S1 and S2 to UP, solves this problem. But we don’t want to disable stereo output for the few games that have it, so we leave the stereo outputs in place.

Troubleshooting

Problem: The Regulator/Audio II++ does not light up and perform its powerup animation.

- This means that the board is not getting “10.3V unregulated” power (actually 12-12.5V in reality) from the transformer block.
- Check that the power interlocks for any open doors, like the rear door and the coin door, are pulled out, or the game cannot power on.
- Check the fuses in the transformer block. Sometimes fuses that look good, or even show continuity on a multimeter, won’t carry power.
- Check that all the connectors and fuses to and from the transformer block are firmly seated.
- If a loud humming noise comes from the speakers when you turn the game volume up, Big Blue has likely failed. (This is rare, but it can happen.) Replace it and try again.

Problem: The light show is distracting and I want to stop it, or turn it off.

Solution: See the section “How to Change the Lighting Mode” above. You can make the logo lights stay on continually, or shut them off completely.

Problem: I want to adjust the voltages, but the display keeps blinking back and forth.

Solution: See the section “How to Change the Display Mode” above.

Problem: I can’t get +SENSE up to 5.0V no matter how high I set +5V.

Solution: **Power your game down immediately!** *This is dangerous and you WILL damage your game in short order.* Any situation where +5V is higher than +SENSE by 0.4V or more can cause damage.

- Remove the edge connector to the main PCB.
- Clean the PCB fingers with contact cleaner. Use a rag or a Q-tip. Don’t spray it directly on the contacts, or you’ll get it all over the game PCB.
- Clean all of the contacts inside the edge connector with contact cleaner. Use a Q-tip or a rag wrapped around an awl. Again, don’t spray contact cleaner all over your classic game.
- *It is normal to have to do this anywhere from every few months to every few years.* That’s why we added voltmeters to the Regulator/Audio II++...so you know when it’s time, without having to pull your game off the wall and sit on the floor with a voltmeter.

Notes

- *All parts in the power supply and the audio power amplifier are through-hole, Everything required to keep your classic game running can be repaired or replaced with a soldering iron and no special equipment.*
- *If the digital section or headphone amplifier malfunctions or fails, the Regulator/Audio II++ will still power your game and amplify the game speakers.*
- *Please keep your original Atari Regulator/Audio II PCB in a safe place, so that you can restore your game to original condition.*