

# Midway Sea Raider - Submarine Shooter

 [web.archive.org/web/20170707142909/http://rainfall.com/pinball1/machines/Midway-Sea-Raider/Midway-Sea-Raider.html](http://web.archive.org/web/20170707142909/http://rainfall.com/pinball1/machines/Midway-Sea-Raider/Midway-Sea-Raider.html)



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This is a great old periscope game. Ships pass by in the dark and your job is to hunt them down. When I plugged it in I heard a loud 60hz hum from the audio circuit. The game started but couldn't aim properly and ships would not explode when hit. Also it looks like someone painted black trim around the edges.

The machine looks clean on the inside - no rust on the relays and everything's labeled. Where to start...

I looked at the aiming mechanism. A small relay attached to the periscope pushes on levers that let the machine know where the periscope was when you pressed the fire button. It's like a drop target bank on a pinball machine. Non of the levers would operate smoothly and the entire assembly required cleaning and degreasing.

The shot tracing bar had numerous loose lamp sockets. I resoldered all of these sockets.

The ship unit was dirty and had some broken contacts which explains why no ships were getting hit. I soldered new contacts to the old assemblies as



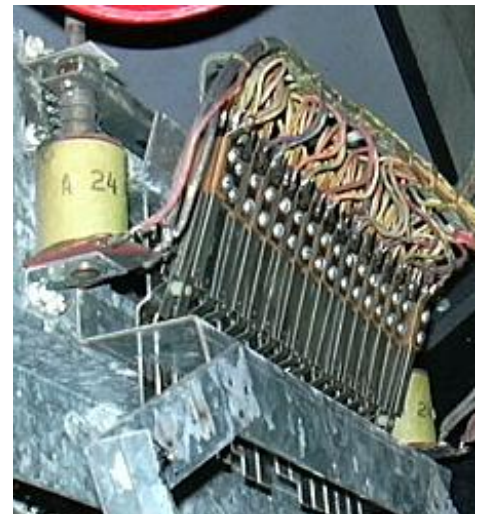
getting parts would not be easy.

Removing the main playfield for cleaning is quite the project. I laid the cabinet on it's face and was able to pull the entire playfield out easily through the bottom of the cabinet. The playfield appears very faded from age. Either that or it's coated with something. I clean a ton of dirt from it with Windex. The playfield is very brittle and cracks easily. The staples used to attach it all were loose so I carefully drilled tiny holes and tacked it back down.

*\* Updated: It has been confirmed by another Sea Raider owner that the periscope **mirror is supposed to have some black paint** on it. It's assumed the reason has to do with some effect. This explains why the periscope assembly is slightly offset. Unfortunately the sighting indicator will be off with the paint removed although you will get greater visibility. I opted to not re-install the site indicator.*

The periscope is also a project to remove. Removing the fire button and take out the front top glass and remove the four screws surrounding the upper shroud and the entire unit drops out. Whoever painted the cabinet must **have over sprayed onto the mirror**. This is easy to scraped with a razor blade and clean. The orange targeting indicator was cracked and missing some pieces. I'll rebuild one at a later time as it's easy to replace. After some derusting and decreasing the periscope cleaned up well.

**Audio:**



The audio circuit consists of 100% discrete components - no ics. There's an fx board for the two sounds ( torpedo and explosion ) and an amplifier board. I shunted the amp inputs and disconnected the fx board to determine the source of the hum. The power supply is 18v derived from the 12v ac and a single diode and capacitor. Adding capacitance reduced the hum but did not eliminate it. All transistors are good. It's just that 1/2 wave regulation that's not very good. As far as I can remember these games always had some hum. Do I just put in a new IC amp or continue with the hum perhaps beefing up the cap?



The fx board, on the other hand, has other issues. The torpedo sound is fine - a nice filtered white noise. The explosion sounds like pure a pure 60 cycle BUZZ. - That's not right. I got the radar ping sound to work - a transistor was breaking down in the circuit which tested fine with my meter. Hate when this happens. The last thing I'm having issues with is the 'ship hit' sound which, currently, is just a 60 cycle buzz. Also, there's an odd little relay off to the lower left of the sound board which has a 3 inch arm on it. It looks like something is missing. This relay closes when the 'ship hit' sound occurs. If anyone has one of these please let me know.











Ok - 3 days later and now it makes sense... **Something IS missing.** I drew a schematic of the audio circuit of the board to help make this more clear. ( audio-pcb-schematic.jpg ) The circuit looks more like an amplifier than an oscillator. Also, looking at the solenoid with the 3 inch arm, and the position of the coil about 8 inches above it - this looks like a reverb tank from an old Fender amp.... That's it - a spring is missing. The solenoid whacks the spring and the reverberation is the explosion sound - remember smacking your old Fender Twin Reverb? Same idea... Now to find a spring...



It turns out there's a couple problems. First the spring need a magnetic device to make the explosion loudest. As the attachment hole is small I ran a steel guitar string through it attached to a spring - not loud enough. I added a small magnet near the coil. Voila!. Ok, next - the sound only lasts about 1/10th of a second. This explains the 500uf capacitor which had leaked and had one purpose - to provide power to the explosion relay. This cap would simply hold the relay for about 2 seconds to prolong the explosion... Now we're cookin'!

Remaining is the translucent plastic targeting rod, locks, clean cabinet...