SE ROM-inator

Assembly Instructions

ROM disk kit for the Macintosh SE · ROM V1.2



© Kero's Mac Mods, Infinity Products Co., Ltd.
www.kerosmm.com · en.infinityproducts.co.jp/shop-1

Before you start

This is a solder kit. Most of it is easy through-hole work, but PCB B gets soldered straight onto the legs of the 68000 on your logic board, and that part has no undo. Read the whole thing once before you heat up the iron.

> **Safety**
> Take the logic board out of the Mac first. The CRT and analog board in a compact Mac can hold a dangerous charge even after it's been unplugged for a while. If you've never had one apart, read up on it or get someone who has to help you.

> **This is a kit**
> We can't be held responsible for injury, fire or death while building it, damage to other equipment or fire caused by using it, or anything that follows from those. You're the one holding the iron, so take your time.

What you'll need

Soldering iron with a fine tip, solder, flux, IPA or flux remover, flush cutters, a small wire brush or fine sandpaper for the CPU legs, and some double-sided tape.
Optional: three LEDs and three resistors if you want the status lights (see Chapter 2).

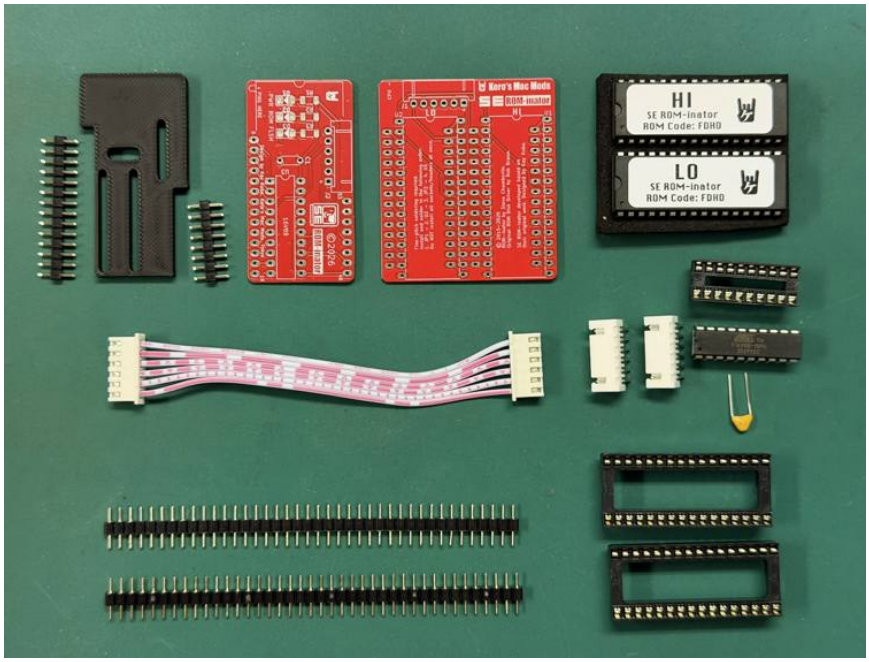
One habit for the whole build

Every socket and header: solder the two end pins only, then check. Is it flat? Is it straight? With just two pins tacked it's easy to reheat and push it into place. Once all the pins are done, it isn't.

What's in the kit

Check that everything below is in the bag before you start. We're a long way from you, so every kit is double-checked before it ships, but it's better to find a missing part now than halfway through.

Qty	Part
1	SE ROM-inator PCB A (ROM board)
1	Signal Generation PCB B (piggybacks onto the 68000 CPU)
2	ROM chips, HI and LO, pre-programmed ROM code: ☐ FDHD ☐ Early SE
1	16V8B, pre-programmed (signal generator)
1	20-pin DIP socket (for the 16V8)
2	32-pin DIP sockets (for the HI/LO ROMs)
1	0.1 µF ceramic capacitor (marked “104”)
2	6-pin connectors (J1 and J2)
1	6-pin cable with connectors on both ends
2	40-pin machined pin headers (PCB A to the logic board, cut into four 14-pin strips)
1	14-pin short pin header (for the CPU pins)
1	8-pin short pin header (for the CPU pins)
1	3D-printed CPU mount spacer

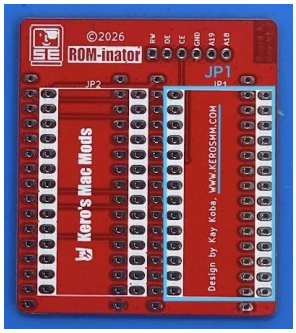


1. Building PCB A (ROM board)

PCB A takes the place of the original HI and LO ROMs. The order matters here: **JP1, U2, JP2, U1**, then J1. Do them out of order and some pins end up where the iron tip can't reach. Ask me how I know.

1-1 JP1 (pin header)

The headers go in from the side that says "Design by Kay Koba, WWW.KEROSMM.COM" and get soldered on the other side, where the U1/U2 outlines are.
Tack the two end pins, check that the header is straight, then solder the rest. A bent header is easy to fix at this point and a real pain later.

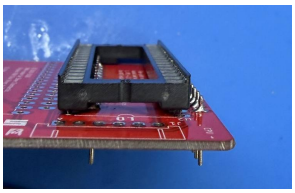




1-2 U2 (32-pin socket)

Line the notch up with the silkscreen. Tack the ends, then look at it edge-on like in the second photo. The socket should sit flat against the board with no gap. If it's fine, do every other pin.





1-3 JP2 (pin header)

Same as JP1: ends first, check it's straight, then the rest.
Now test-fit PCB A into the ROM sockets on the logic board. Even a slight bend in either header can stop it from going in, so check before you go further.

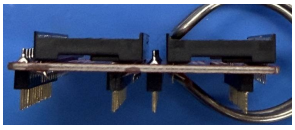




1-4 U1 (32-pin socket)

Last socket. Notch to the silkscreen, ends first, check it's flat, then all pins.



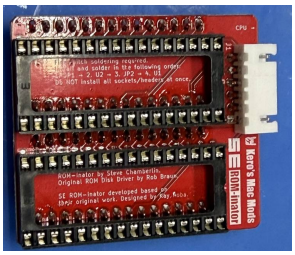


A clothespin holds the socket down nicely while you tack the first pins.

1-5 J1 (link cable connector)

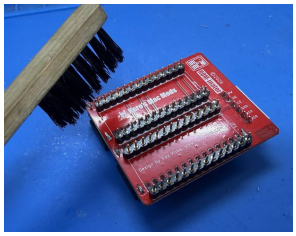
The 6-pin connector for the link cable goes on the top side, the same side as the ROM sockets, with its open side facing the edge of the board (second photo).
Solder it from the underside. The clothespin trick works here too.

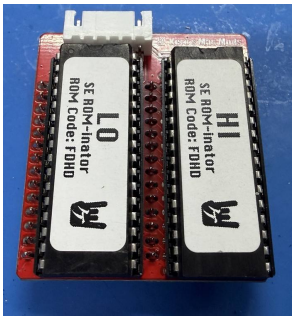




1-6 Clean up and fit the ROMs

Scrub the flux off both sides with a brush and some IPA.
Then fit the ROMs. HI goes in U1, LO goes in U2 (it's marked on the board too). Don't mix them up. The notch on each chip goes to the notch end of the socket, which is the J1 end.





> **Don't plug PCB A into the logic board yet**
> It'll be in the way when you solder PCB B onto the CPU. Leave it out until Chapter 3.
> Also worth knowing: the ROM sockets on the logic board are around 40 years old. They may have been fine with the original chips but still give a flaky contact with these machined pins. If PCB A doesn't make good contact, plan on replacing both sockets (28-pin wide).

2. Building PCB B and fitting it to the CPU

PCB B sits on top of the 68000 and holds the 16V8, which generates the ROM select and write signals that let you reflash the ROMs in the machine.

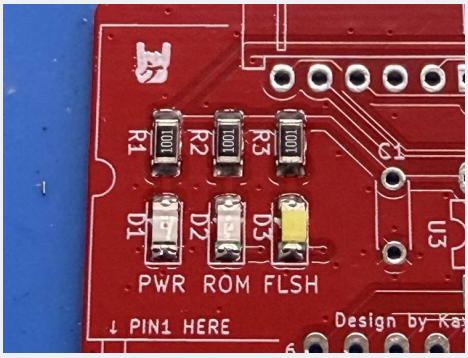
About the LEDs (optional)

PCB B has footprints for three LEDs and three resistors. They aren't included, because once the Mac is closed up you can't see them anyway. Fit them if you like, skip them if you don't. The board works the same either way.

They're surface-mount parts, like in the photo. R1, R2, R3 are 1kΩ (marked 1001). Use 330Ω if the LEDs are too dim for you. The silkscreen has a triangle for each LED. Most SMD LEDs have a matching triangle on the underside. Line the two up. The point of the triangle is the cathode.

I like red for PWR, blue for ROM (ROM disk access) and white for FLSH (flashing), but pick whatever you want.

If you're fitting them, do it first, before C1 and the socket. Small SMD parts are much easier with nothing tall around them.

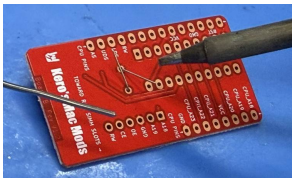


2-1 C1 (0.1 µF capacitor)

The capacitor marked “104” goes in at C1 from the top side, the side with the LED and 16V8 markings. It isn't polarized.

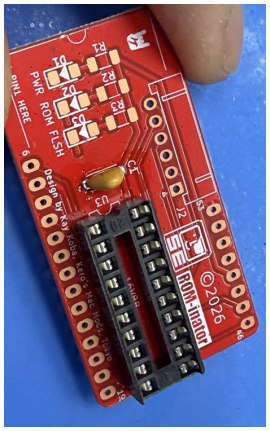
Solder it on the underside, where the CPU pin names are printed, and trim the leads.





2-2 U3 (20-pin socket)

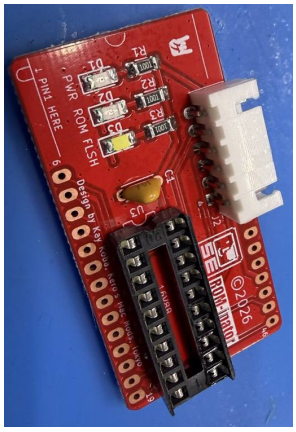
The socket goes on the top side with its notch toward C1, matching the silkscreen. Solder it on the underside. Ends first, check it sits flat, then the rest.

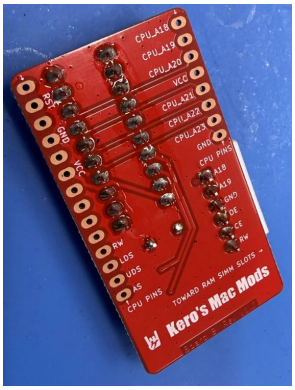




2-3 J2 (link cable connector)

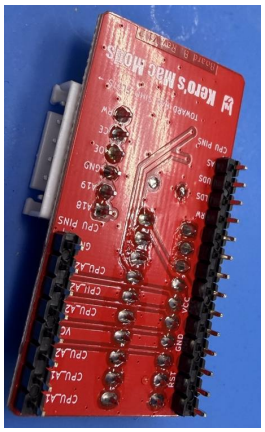
The second 6-pin connector goes on the top side, next to U3, with its open side facing the edge of the board. Solder it on the underside.

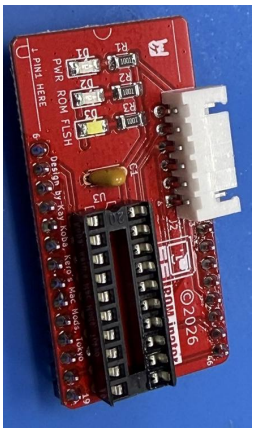




2-4 CPU pin headers (8-pin and 14-pin)

These connect PCB B to the CPU legs, so they need to be straight. The short pins go in from the underside and get soldered on the top side: 14 pins on the 6–19 row, 8 pins on the 46–53 row.
The first photo shows them from the underside. Tack the end pins, check for tilt, correct it, then solder the rest on the top side (second photo).

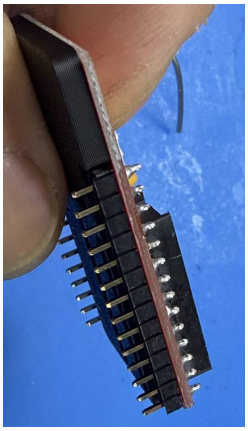




2-5 CPU mount spacer

The 3D-printed spacer goes on the underside, between the two CPU pin headers. It fits around the solder joints, so it sits flat (first photo).
Hold it in place with a bit of double-sided tape. From the side it should look like the second photo.



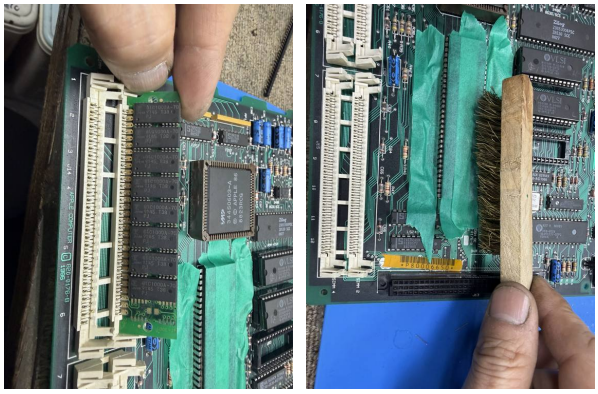


2-6 Prep the CPU and line up PCB B

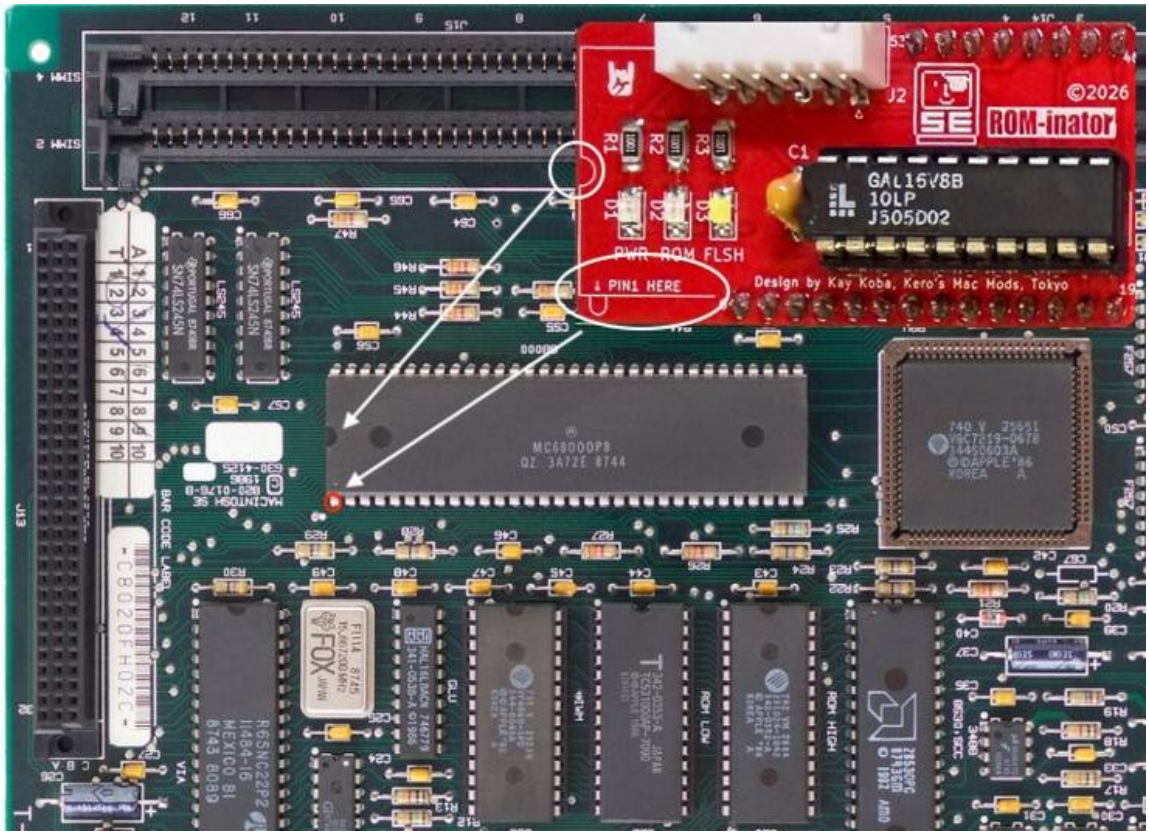
Pull the RAM SIMMs out before you start (first photo).

The solder on the CPU is 40 years old and the legs will be oxidized. Mask off the board around the CPU with tape so the brush debris doesn't go everywhere, then scrub the legs with a brass wire brush until they're bright (second photo). Pre-tin them if you can. Fresh solder won't flow onto dirty legs.

Find the notch on one end of the 68000. Pin 1 is at that end. PCB B has a matching notch outline and a pin 1 mark on the silkscreen. Line them up with the CPU, and check the “TOWARD RAM SIMM SLOTS” arrow on the back points the right way. Tape it down so it can't move while you solder. The picture below shows how it lines up.



Take the SIMMs out first, just to be safe.



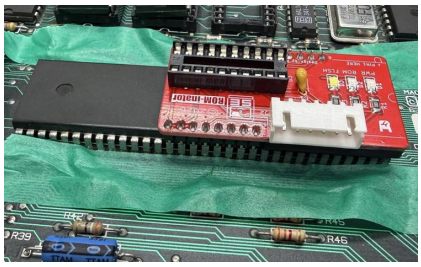
Lining up PCB B. The half-circle notch outline on PCB B goes over the notch end of the 68000, and the “PIN1 HERE” arrow points at pin 1 of the CPU (red dot). Check the notch on the end of the CPU itself too, so you know for sure which end is pin 1.

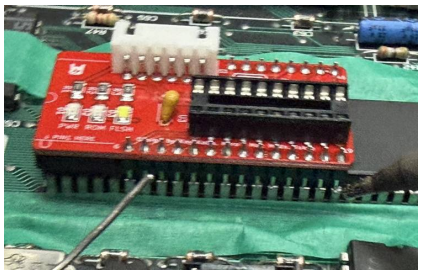
2-7 Solder to the CPU

Solder every pin. Look closely at each one afterwards for cold joints and bridges. A magnifier helps a lot here.

The header pins are only just long enough to reach the CPU legs. That's on purpose. If you ever need to take PCB B off for troubleshooting, it comes away easily. So don't expect a deep joint here. Put the iron on, feed a little solder, and let surface tension pull it between the pin and the leg. A small, smooth fillet joining the two is all you need.

If you've done piggyback boards before, this part is easy. If it's your first time, it can feel a bit fiddly. One thing that helps: the CPU legs heat up fast, but the header pins on PCB B are slower. Put the tip mostly on the header pin and let the heat reach the leg. Do it that way and the solder goes where you want it.







2-8 Clean up and fit the 16V8

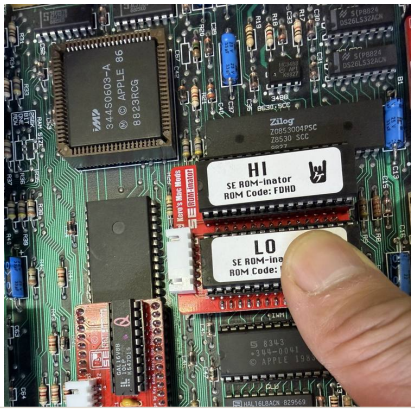
Clean off the excess flux, then plug the pre-programmed 16V8 into U3. Its notch goes toward C1, the same way as the socket and the CPU.



3. Final assembly

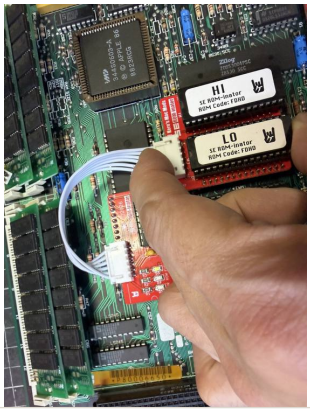
3-1 Fit PCB A

Now plug PCB A into the original ROM sockets on the logic board, with J1 toward the CPU (there's a “CPU →” arrow on the board). Press down evenly and check no pins have folded under.



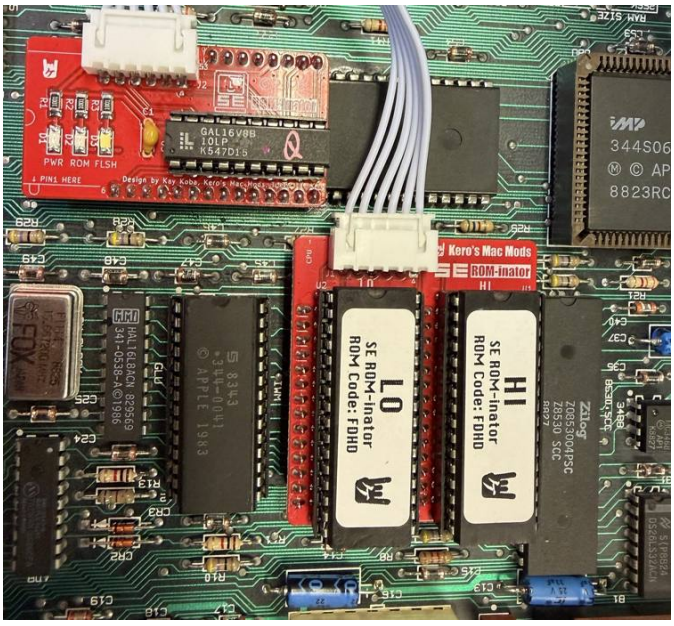
3-2 Connect the link cable

Run the 6-pin cable between J1 on PCB A and J2 on PCB B. The plugs only go in one way.



3-3 Check everything once more

Chip orientation, HI/LO in the right sockets, no solder bridges on the CPU. Peel off the masking tape and put the RAM SIMMs back in.
It should look like this. Then put the logic board back in the Mac.



4. Usage

Boot Manager. Hold Option at startup. If there's a bootable floppy in the drive, eject it first. The SE always boots from floppy first, so with a disk in, Option won't bring up the Boot Manager.

Booting the ROM disk. Hold R as soon as the mouse pointer shows up.

Resetting PRAM. Under System 7, Command-Option-P-R at startup works as usual. System 6 never had that shortcut (the old way was Command-Option-Shift while opening the Control Panel). Either way, Zap PRAM in the Boot Manager works with any system.

Startup sound. It always plays at full volume, whatever the volume setting.

With an accelerator. I can't promise the SE ROM-inator will work alongside every accelerator. I've had it running with a MicroMac Performer, but I haven't tested all the details. Physically, the Performer touches the ROM chips sitting in their sockets on PCB A. If you leave out the U1/U2 sockets and solder the ROMs straight to PCB A, the stack gets lower and the Performer fits fine. The catch is you can only reflash them in the Mac with Flash Tool after that, not in an external programmer. One more thing: with a 68030 accelerator installed, using Zap PRAM or Exit in the Boot Manager restarts the Mac, but Option won't get you back into the Boot Manager after that. Use Restart from the Finder while holding Option, or switch the Mac off and on and hold Option.

Reflashing. Use SE ROM Flash Tool. Take the accelerator out before you flash.

Thanks to Steve Chamberlin (Big Mess o' Wires) and bbraun, whose work the ROM-inator is built on. Steve also helped me a lot with the Flash Tool program. SE ROM Flash Tool wouldn't exist without his code and advice.

Steve Chamberlin, Mac ROM-inator: www.bigmessowires.com/mac-rom
bbraun, 68k Mac ROM boot disk: synack.net/~bbraun/macromboot.html

Questions or problems: www.kerosmm.com