Compact Macintosh ROM-inator Kit Instructions

This kit can be assembled two ways: for the Macintosh Plus, or for the Mac 128K, 512K, and 512Ke.

1. **Gather Tools**
    To build the kit, you will need a few common tools for soldering and electronics work:
    - Soldering iron
    - Solder
    - Wire cutter/stripper
    - Flat blade screwdriver
    - Diagonal cutters (optional)
   - IC test clips (optional)
    - EPROM programmer (optional)

2. **Verify the Contents of the Kit**
    The kit contains:
    - ROM adapter circuit board
    - 2x 39SF040 preprogrammed Flash chips (32 pins)
    - 2x 32-pin 0.6-inch DIP sockets
    - 74HCT02 pre-soldered chip (14 pins)
    - 4-pin 0.1-inch spaced male square pin header
    - Length of wire
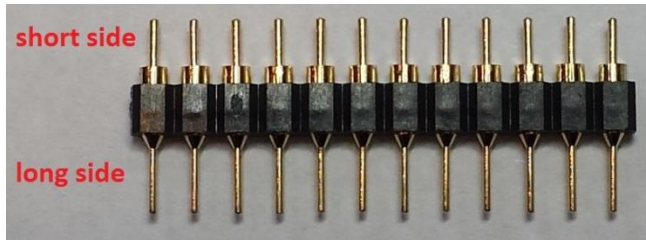   - 2x 40-pin 0.1-inch spaced male machined header strips

3. **Solder the 74HCT02 Chip**
    The 74HCT02 is already soldered to the circuit board.
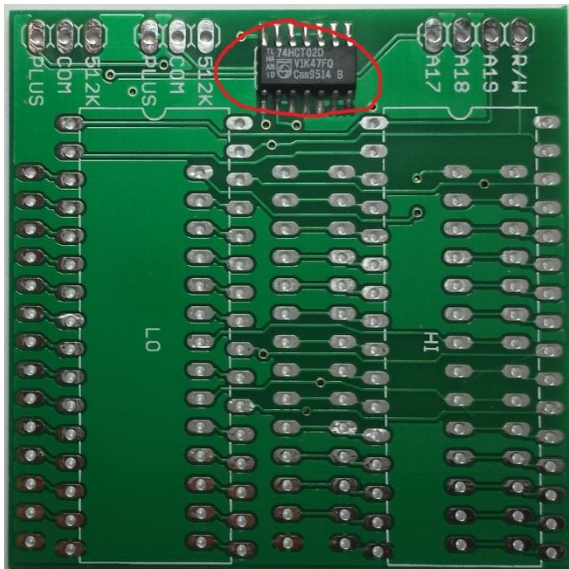
4. **Solder the Machined Pin Headers**

Break the machined header strips, to create four smaller 14-pin strips.


The pins are two-sided, with a short side and a long side. Insert the *short* side of each 14-pin strip into the labeled holes on the bottom of the circuit board. Put two strips into the two rows of holes labeled ALL, then:

Macintosh Plus: Put the other two strips into the two rows labeled PLUS.
Macintosh 128K, 512K, 512Ke: Put the other two strips into the two rows labeled 512K.

To help keep the strips aligned while soldering, insert the long sides of each pair of strips into a 32-pin DIP socket. You won't be soldering the sockets yet, they're just used to help keep everything lined up. On the top side of the circuit board, solder the strips. Then remove the DIP sockets and set them aside.
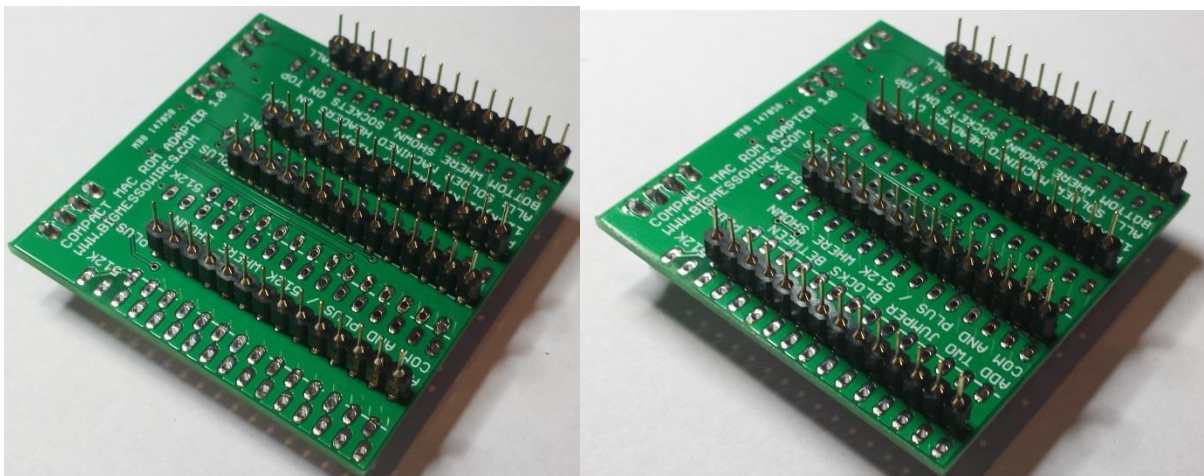
If the header strips are not straight and vertical, they may not fit in the ROM sockets on the Macintosh logic board.

5. **Solder the DIP Sockets**

Place the 32-pin DIP sockets into the spaces indicated on the top of the circuit board. The sockets may not lie completely flat, if the short side of the machined pin headers pokes through the circuit board far enough to interfere with the socket's plastic frame. If necessary, use cutters to trim the headers flush with the circuit board, or cut away a small piece of the socket's plastic frame.
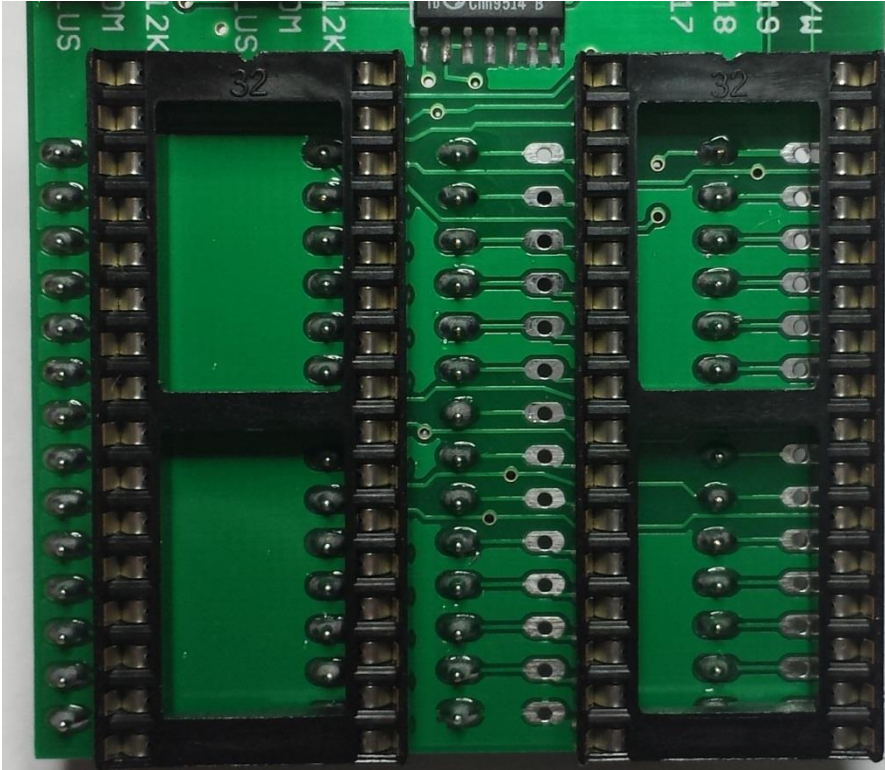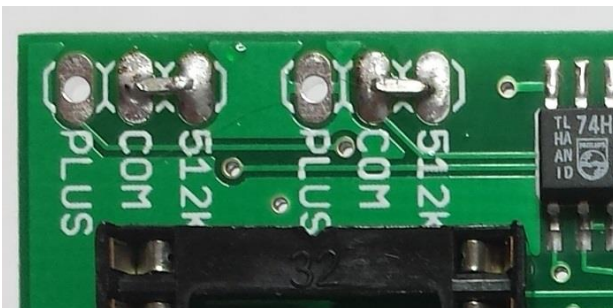

6. **Solder the Model Select Jumpers**
   Cut and strip two pieces of wire, each about 1cm long.

   Macintosh Plus: Solder wires between the holes labeled COM and PLUS.
   Macintosh 128K, 512K, 512Ke: Solder wires between the holes labeled COM and 512K.

7. **Solder the CPU Header (optional)**

If you plan to use IC test clips to attach the board to the CPU, solder the 4-pin male header to the row of holes labeled A17, A18, A19, R/W. If you plan to solder wires directly from the board to the CPU, skip this step.
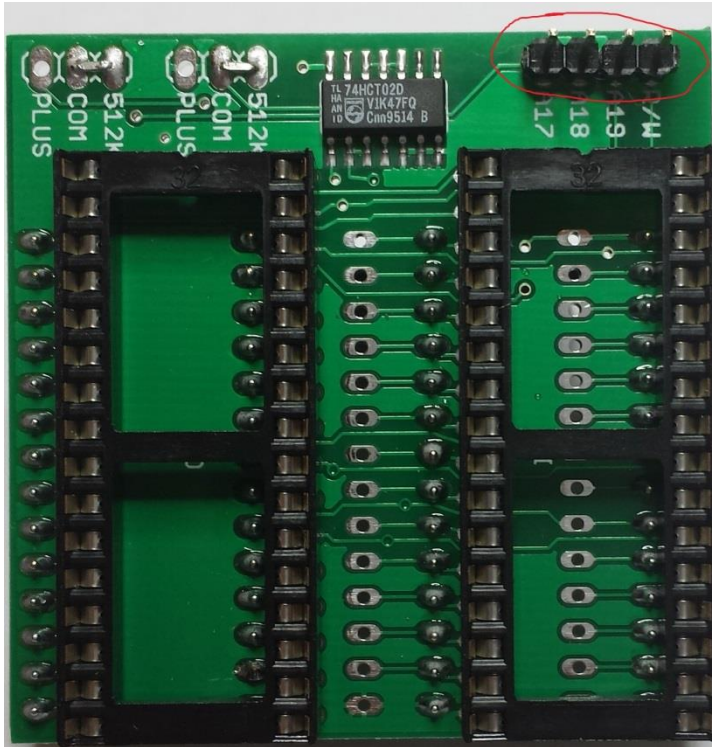
8. **Remove Old ROM Chips from Logic Board**
   Open the Macintosh case and take out the logic board. Carefully remove the two existing ROM chips from the logic board sockets. The ROM chips are often very tight and difficult to remove. Two flat blade screwdrivers can be used to lever a chip out of its socket, by inserting one under each end of the chip and gently wiggling until the chip comes loose. Set the old ROM chips aside for safekeeping.
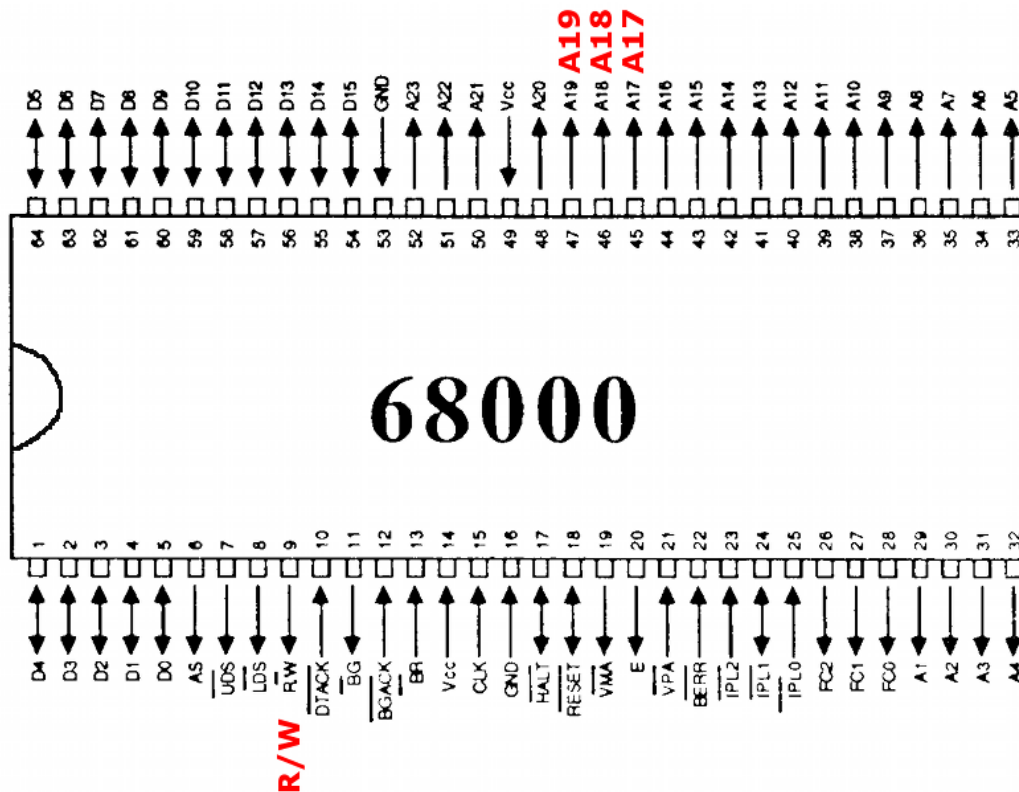
9. **Insert the ROM Adapter Board**
   Line up the machined pin header strips with the empty sockets on the Mac's logic board, and insert the adapter board. It should be oriented so the 74HCT02 chip is on the side closest to the 68000 CPU. Push down firmly to ensure that the machined header pins fit all the way into the logic board sockets.

10. **Make Wire Connections to the CPU**
    Depending on the Macintosh model used, three or four wires must be connected between the adapter board and the 68000 CPU on the Macintosh logic board. It's possible to use IC test clips (not included) at one or both ends of the wires, but the limited clearance between the logic board and the Macintosh chassis frame makes IC clips difficult to use. The clips often rip loose when the logic

board is reinserted into the case. For the most reliable results, solder wires directly to the CPU and the adapter board.


Attach wires between the CPU and the adapter board for the following signals:

Macintosh Plus: Connect A18, A19, and R/W. Leave A17 unconnected.
Macintosh 128K, 512K, 512Ke: Connect A17, A18, A19, and R/W.

11. **Insert the Flash Chips**
    Put the included flash ROM chips into the sockets on the ROM adapter board. Be sure to observe the LO and HI chip placement, and place the correct chip in each socket. Orient each flash chip so the notch at the end is facing towards the 74HCT02 chip.
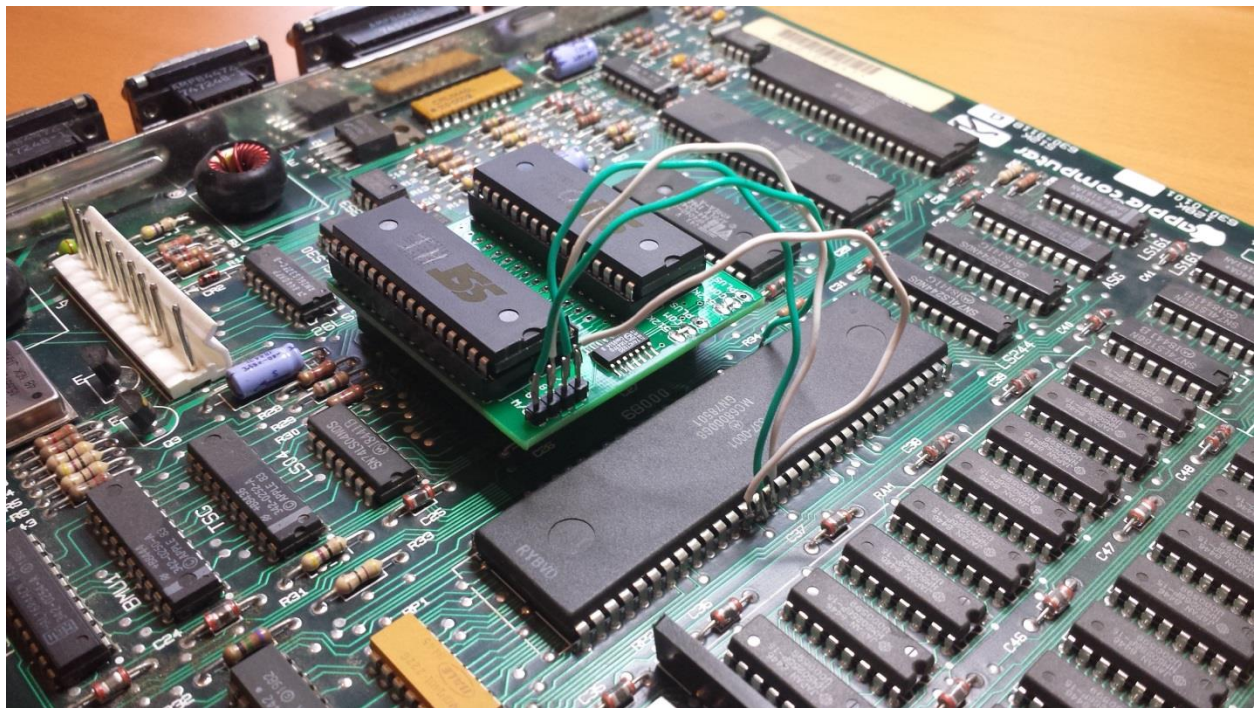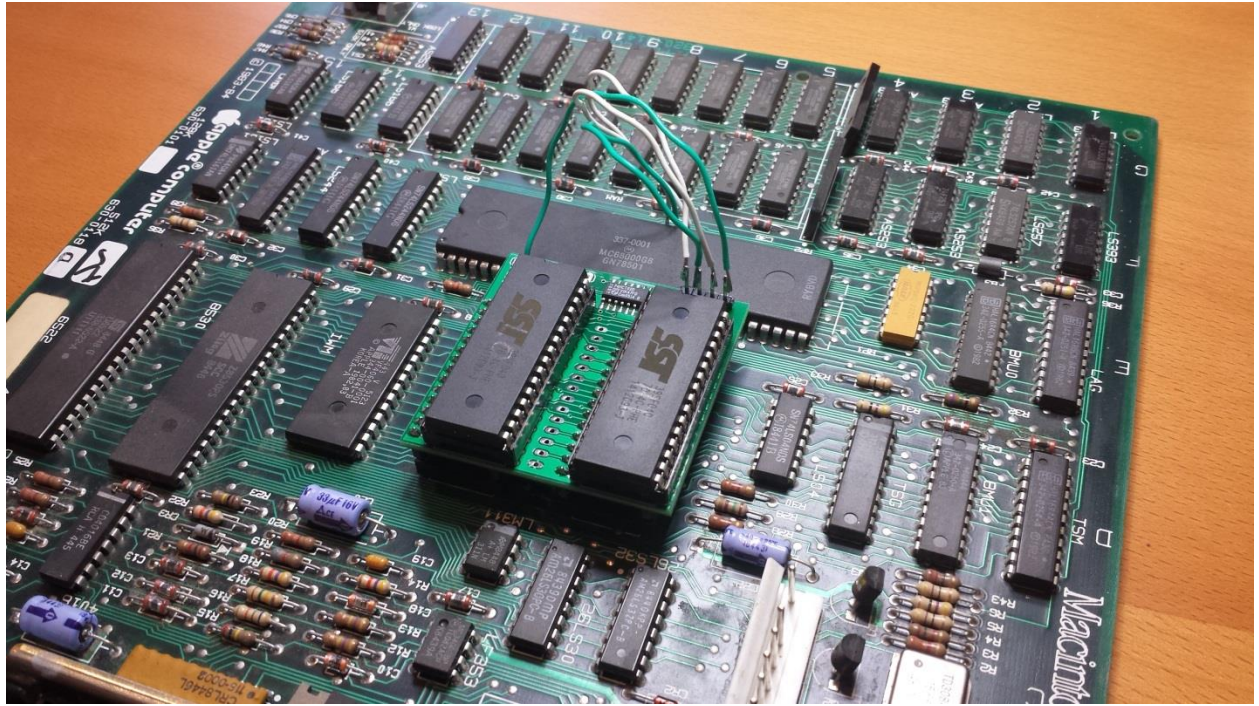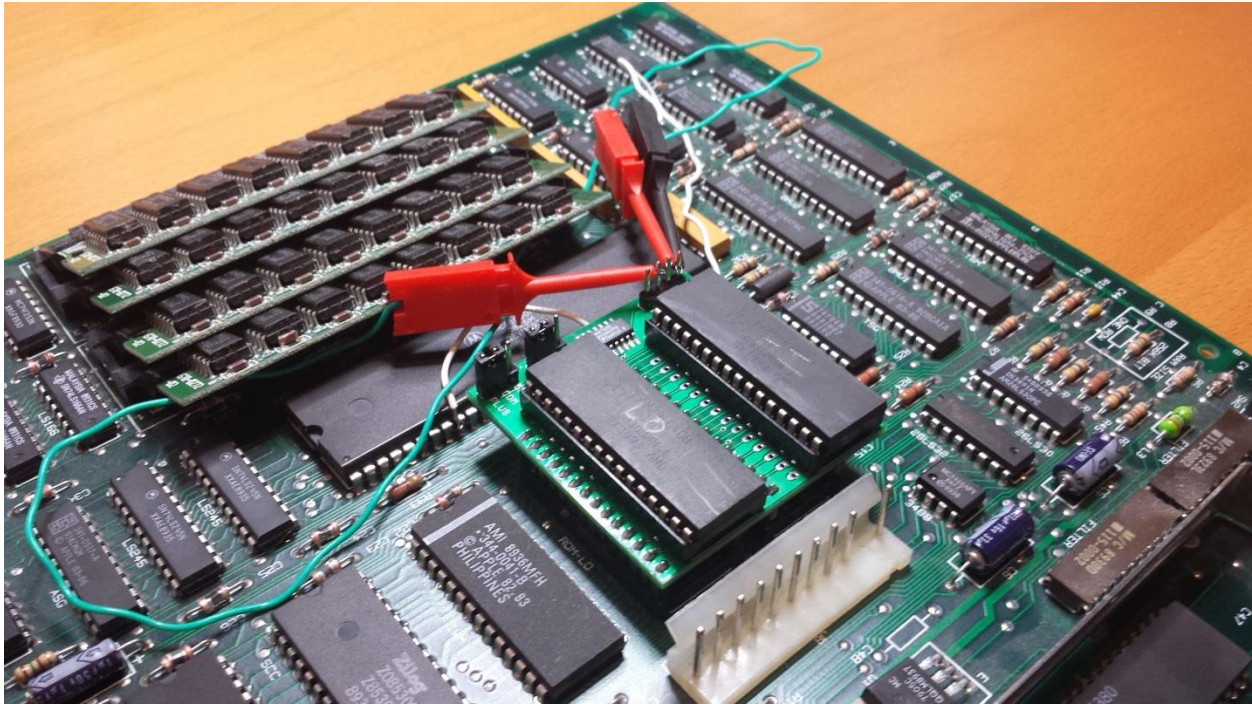
12. **Reinstall the Logic Board**

Carefully slide the logic board back inside the Macintosh case. You may need to bend the board or the guide rails slightly during installation of the logic board, to prevent the adapter from snagging on the chassis frame.

Don't forget to reconnect the logic board's power connector and floppy cable!

Usage

When first powered on, the Macintosh will play a customized startup sound, and display a "pirate Macintosh" icon. To boot from the internal ROM disk, press and hold the R key on the keyboard for a few seconds. If R is not pressed, the Macintosh will boot normally from an attached SCSI disk, or wait for a floppy disk to be inserted.

Press and hold r now
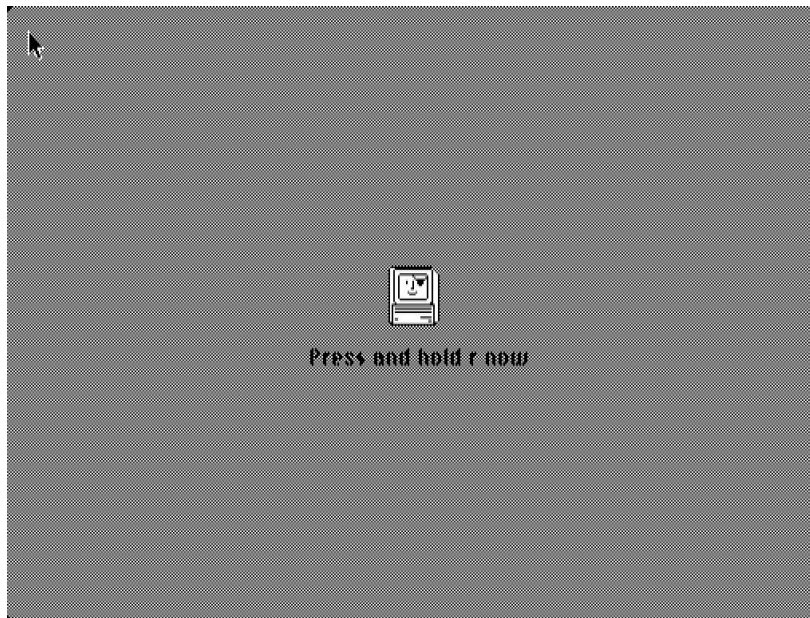
The adapter board increases the ROM size from the stock 64K or 128K to 1 MB. This includes 132K for ROM code, 28K for a custom startup sound, and up to 864K for a ROM disk image. The preprogrammed flash chips contain ROM code based upon the Mac Plus ROM. If used with a Macintosh 128K or 512K, it will turn them into a 128Ke or 512Ke.

Everything in flash ROM can be modified: the contents of the ROM disk, the startup sound, or even the Macintosh toolbox code. The utility program Flash Tool can update the flash ROM from within the running Mac. Alternatively, the flash chips can be removed from their sockets and reprogrammed using a standard EPROM programmer.
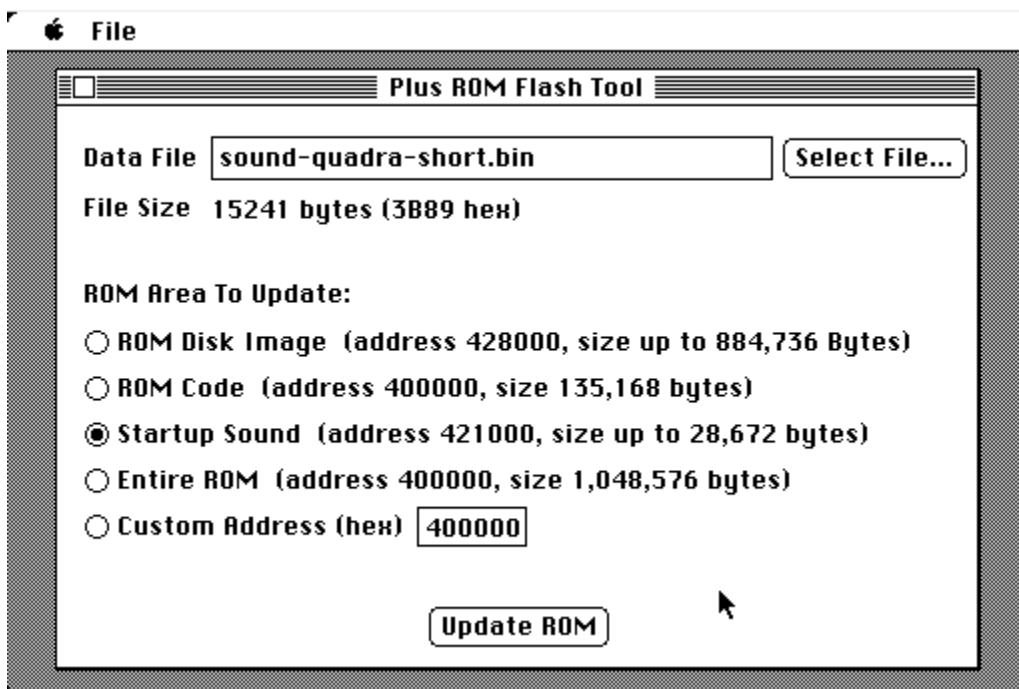
To use Flash Tool, just select the ROM area and the data file to use for the update. The program will verify that the data file is the correct size for the area to be updated. After about sixty seconds, it's done!

The 132K ROM code area contains 128K of code from the Macintosh Plus ROM, with a 4K ROM disk driver appended. The ROM disk image can be any standard disk image up to 864K in size, such as images used with Floppy Emu or Mini vMac.

The startup sound should be raw 22 kHz 8-bit unsigned format. The free audio tool Audacity can convert WAV or MP3 files to this format. The sound can be up to 28K in size (1.3 seconds), but by default only the first 0.66 seconds will play at startup. To change this behavior, edit the byte at address 0x0000EF in the ROM code area, and set it to the number of 1/60ths of a second that the sound should play. The default value is 0x28, or decimal 40, meaning a duration of 40/60ths or 2/3rds of a second.

Be careful when updating the ROM code area, or performing custom address updates. A mistake there can leave the Mac unable to boot, in which case the flash chips will need to be reprogrammed using an external EPROM programmer.

Mac 128K Owners: The Flash Tool program requires 192K of RAM, so it can't run on an unmodified Mac 128K. The ROM-inator hardware still works on the Mac 128K, but updating the flash ROM contents requires a second Macintosh or an external EPROM programmer.

Flash Tool crashes with a "bomb" error: This can happen when you've previously modified the ROM code area using the data from a stock 64K ROM (from the original Mac 128K or Mac 512K). The 64K ROM lacks some built-in System resources that Flash Tool needs in order to run. To resolve this, use Flash Tool version 1.6 or later, and boot your Mac from a disk containing System 3.2 and the HD20 INIT.

Troubleshooting

If the Macintosh won't boot when the adapter is installed, check for possible assembly and installation errors. Make sure:

- Adapter board is oriented correctly
- Adapter board is firmly seated in the logic board sockets
- LO and HI ROM chips are in the correct adapter board sockets
- Model select jumper wires are installed and correct for the Macintosh model used
- Three (Mac Plus) or four (Mac 128k, 512k) connection wires to the CPU are securely attached
- Connection wires are attached to the correct CPU pins
- All solder connections are clean and neat, with no bridges to adjacent pads or vias

More Info

For utility software, data files, and more information, see the Big Mess o' Wires web site at http://www.bigmessowires.com