

ROM X ***Apple II, II+***

Installation Guide

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Dean Claxton, Jeff Mazur



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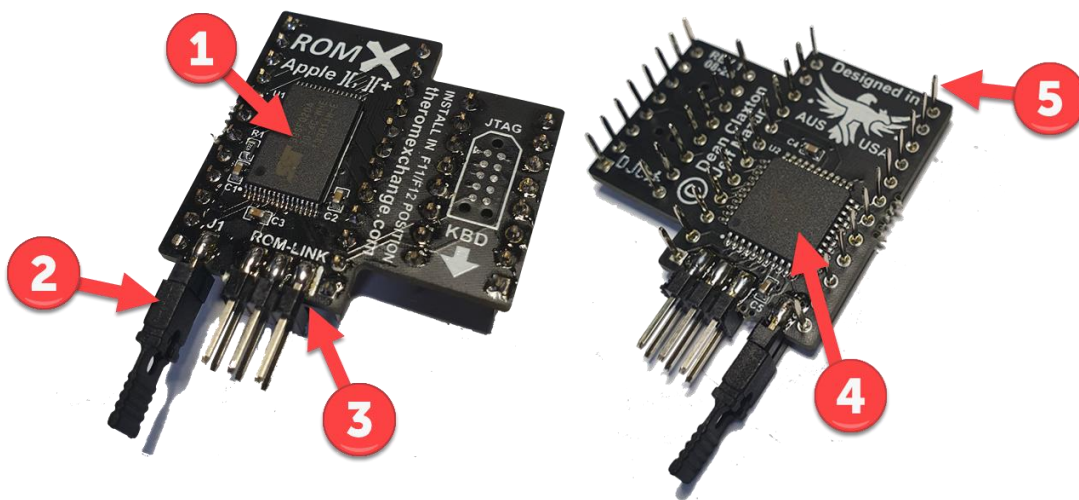
ROMX Hardware

Thank you for purchasing ROMX! We hope that you enjoy experimenting with many different ROM's for your Apple][system.

We will be sharing tools, ROM images, and related documentation at www.theromexchange.com – be sure to check the site regularly for updates.

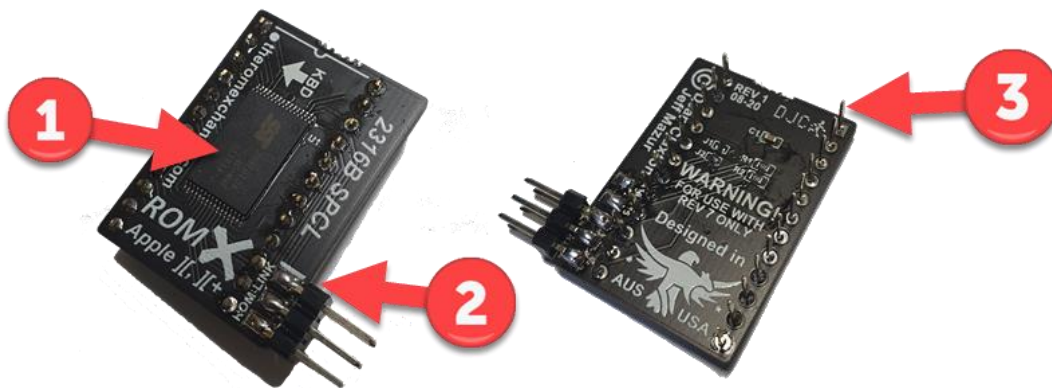
Before removing your ROMX modules from the ESD compliant packaging, please study the ESD section of this installation guide. Use the following images to familiarise yourself with the ROMX hardware before installation.

ROMX



1. 2Mbit Flash Memory
2. Recovery Jumper (normally installed – remove for recovery mode – see the User Guide)
3. ROM-Link header linking the optional ROMX Text ROM – Pin 1 end (white bar on PCB)
4. CPLD (Complex Programmable Logic Device)
5. Pin headers (legs)

ROMX 2316B SPCL Text ROM for Rev 7 Motherboards



1. 1Mbit Flash Memory
2. ROM-Link Header – Pin 1 end (white bar on PCB)
3. Pin headers (legs)

ROMX 2513 Text ROM for pre-Rev 7 Motherboards

1. 2513 board with 1Mbit Flash Memory
2. U-Board



As shown above, the 2513 Text ROM is a two board set that has been designed to upgrade the text capabilities of a pre-rev 7 motherboard to that of a rev 7 without requiring any hardware modification. It is a plug in upgrade consisting of the main 2513 PCB which plugs into the 2513 socket, and a U-Board that spans the B9 and B11 sockets.

The 2513 board has a ROM-Link header that is used to connect it to the ROMX board, as well as a U-Link header to connect the U-Board and supports the same 16 fonts as the ROMX 2316B SPCL.

ESD Prevention

Whenever you open an Apple II or other electrical device, you are exposing its internal components to potential damage from the static electricity that builds up in your body through normal activity. Electrostatic discharge (ESD) occurs when static electricity is discharged from one conductor (such as your finger) to another conductor (such as an integrated circuit) of a different voltage potential. Exposing an integrated circuit (IC) to as little as 10 volts of static electricity can damage the IC irreparably—and you wouldn't even know it had happened, because humans can't perceive static electricity less than 1500 volts.

Ideally, installation should be carried out on a static safe surface such as a grounded anti-static mat, while wearing an anti-static wristband. If you have these available to you, then by all means use them.

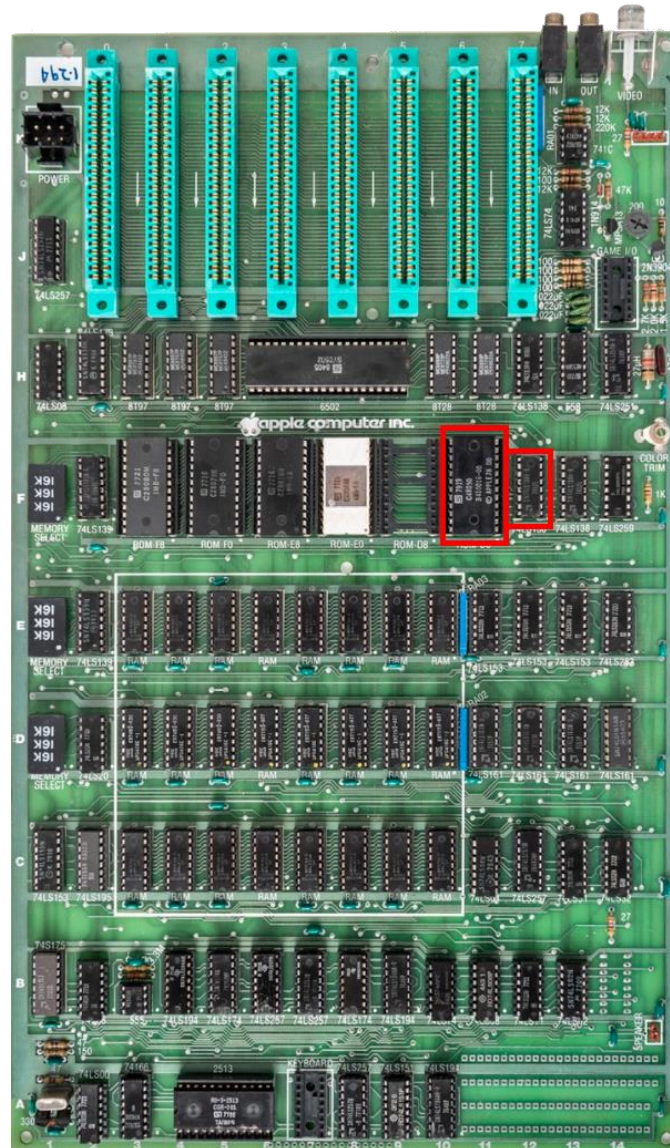
Following the guidelines below will reduce the risk of ESD damage when installing the ROMX module(s):

- Leave the ROMX module(s) in the ESD-compliant packaging until you are ready to plug them in.
- Ensure that the computer is turned off but leave the power cord connected to a grounded outlet. Even with the power turned off, the power cord acts as a ground for the computer system, protecting it from static electricity.
- Before removing the module(s) from the ESD-compliant packaging, touch the metal case of the Apple II power supply to discharge static electricity that may have accumulated on your body.
- Handle ROMX modules by the edges of the PCB, not by the pins. Avoid touching the ROM-Link connector, the pins, or exposed components.

ROMX Installation

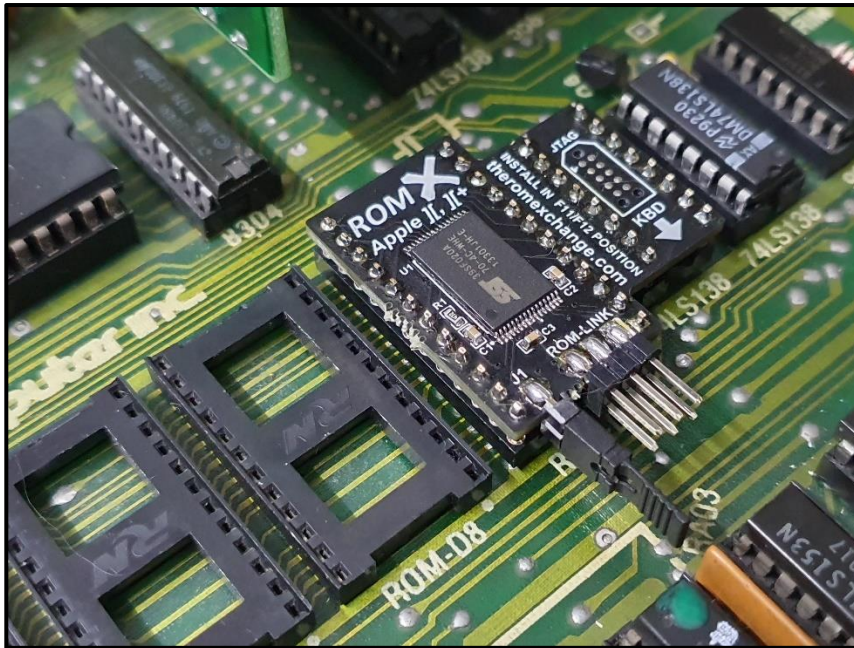
The ROMX module spans motherboard locations F11 and F12, replacing the D0 ROM and 74LS138 IC's.

1. Switch off the computer and remove the top cover.
2. Touch the case of the power supply to discharge any static electricity that may have accumulated on your body.
3. Visually locate the D0 ROM at position F11, and 74LS138 IC at position F12 on the motherboard (highlighted below in red). Remove any peripheral cards which will hinder access to these IC's sockets such as the Disk][Interface commonly installed in Slot 6.



4. Remove the D0 ROM at position F11, and 74LS138 IC at position F12 from their sockets. This is easily accomplished using a small flat-bladed screwdriver. Starting at one end of the IC, carefully insert the screwdriver between the top of the IC socket, and the bottom of the IC. Gently lever the IC up just a little, then move to the other end of the IC and repeat the process. Continue levering the IC up a little at a time, alternating end to end until the chip is free of its socket. Do not try to lever it out in one go – doing so will likely bend the pins.

5. Remove the ROMX module from the ESD-compliant packaging and visually inspect the pins to ensure that none have been bent. Carefully line up the pins above the sockets, then gently press the ROMX module down until it is fully seated. A small gap between the underside of the ROMX printed circuit board, and the top of the socket is normal.



6. Do not throw out the packaging! You can press the original IC's into the conductive foam (use both sides if you choose to remove your other ROMs as well) and place them into the antistatic bag and box for storage.
7. With ROMX installed, the remaining ROMs F8, F0, E8, E0, and D8 are disabled. To save power/heat generation, these may optionally be removed from the system and stored away.
8. If you have purchased a ROMX text ROM, refer to the relevant section for installation (ROMX 2316B SPCL or ROMX 2513). If you have an Apple Language card refer to the Apple Language Card Compatibility section else skip ahead to the Testing section.

ROMX 2316B SPCL Text ROM Installation (for Rev 7 Motherboards)

The socket for the 2316B SPCL text ROM is located underneath the keyboard and requires you to separate the top of the case from the chassis to access it.

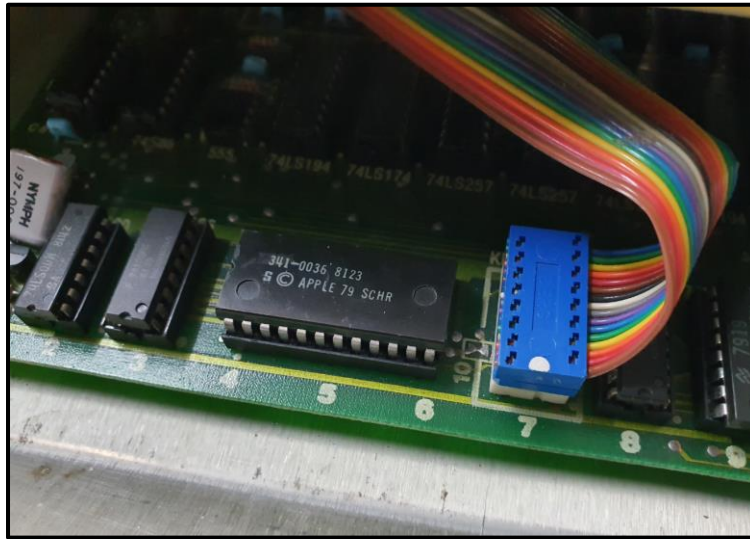
1. Switch off the computer and remove the top cover.
2. Gently turn the computer case upside down and remove the 10 screws from the bottom of the case as shown below. **Do not** attempt to lift the chassis baseplate from the case, as there is a keyboard ribbon cable joining the two:



3. Holding the case and chassis base plate together, carefully turn the computer back onto its feet.
4. Gently raise the front of the case from the chassis baseplate and inspect the keyboard ribbon cable. Without removing the keyboard connector, you should be able to carefully move the top of the case backward far enough to access the 2316B SPCL ROM at position A5:



5. Working around the keyboard connector, remove the 2316B SPCL ROM at position A5 from its socket.



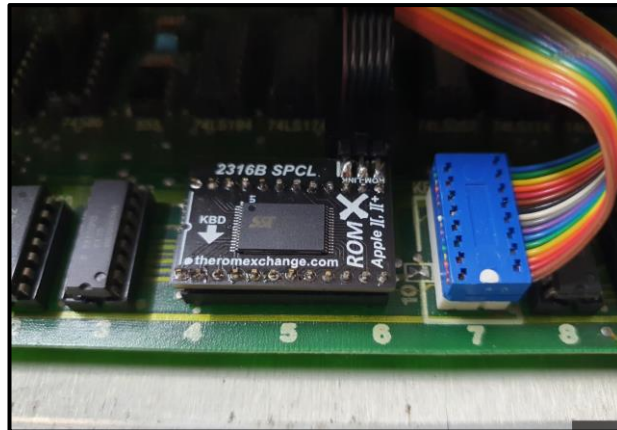
This is easily accomplished using a small flat-bladed screwdriver. Starting at one end of the IC, carefully insert the screwdriver between the top of the IC socket, and the bottom of the IC. Gently lever the IC up just a little, then move to the other end of the IC and repeat the process. Continue levering the IC up a little at a time, alternating end to end until the chip is free of its socket. Do not try to lever it out in one go – doing so will likely bend the pins.

NOTE: In order to reduce the risk of damage to the keyboard connector, we are going to leave it in place while installing the ROMX 2316B module. Removing the connector from its socket does allow you to separate the two case halves however, giving full access to the motherboard and the opportunity to give everything a good clean.

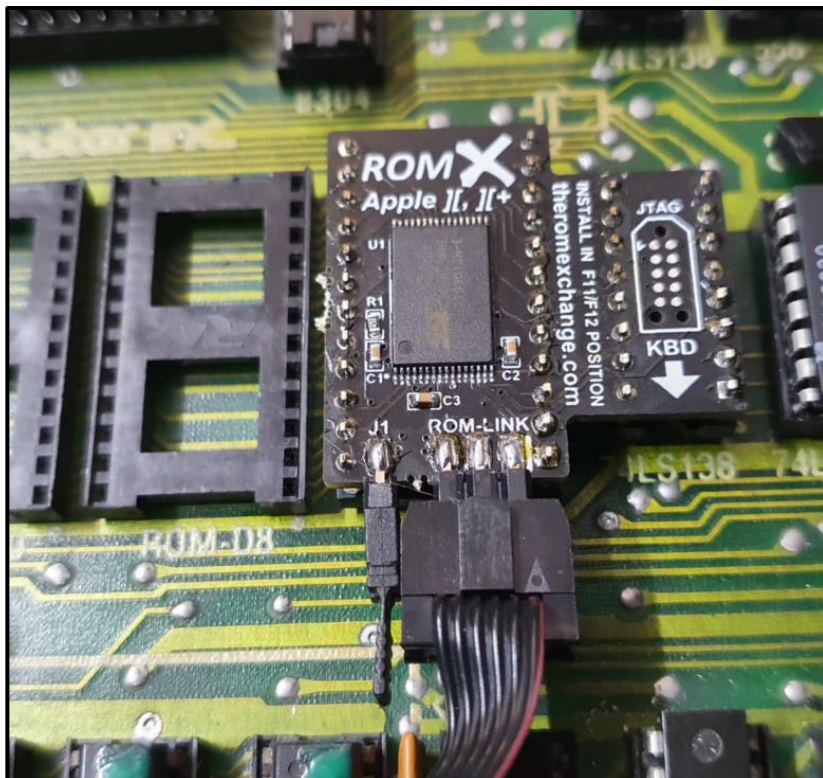
6. Remove the ROMX 2316B SPCL text ROM from its ESD-compliant packaging and visually inspect the pins to ensure none are bent. Attach the ROM-Link cable to the header - the Red stripe on the cable (pin 1) should be located at the end of the ROM-Link header marked by the white bar on the PCB:



7. Thread the ROM-Link cable underneath the keyboard then carefully line up the pins of the 2316B SPCL module above the socket, and gently press the module down until it is fully seated. A small gap between the underside of the printed circuit board, and the top of the socket is normal.



8. Re-use the ROMX packaging - press the original 2316B SPCL IC into the conductive foam and place it into the antistatic bag and box for storage.
9. Ensure that the keyboard connector is still fully seated, then carefully move the top of the case back into position.
10. Working through the top of the case, connect the ROM-Link cable to the ROMX module. The Red stripe (pin 1) should be located at the end of the ROM-Link header marked by the white bar on the PCB (right side when viewed from the front):



11. If you have an Apple Language Card, proceed to the Apple Language Card Compatibility section, else proceed to the Testing section before reassembling the case.

ROMX 2513 Text ROM Installation (for pre-Rev 7 Motherboards)

The installation positions for the ROMX 2513/U-Board set are located underneath the keyboard. It is easiest to remove the top of the case to access them.

1. Switch off the computer and remove the top cover.
2. Gently turn the computer case upside down and remove the 10 screws from the bottom of the case as shown below. **Do not** attempt to lift the chassis baseplate from the case, as there is a keyboard ribbon cable joining the two:



3. Holding the case and chassis base plate together, carefully turn the computer back onto its feet.
4. Gently raise the front of the case from the chassis baseplate to access the keyboard ribbon cable.

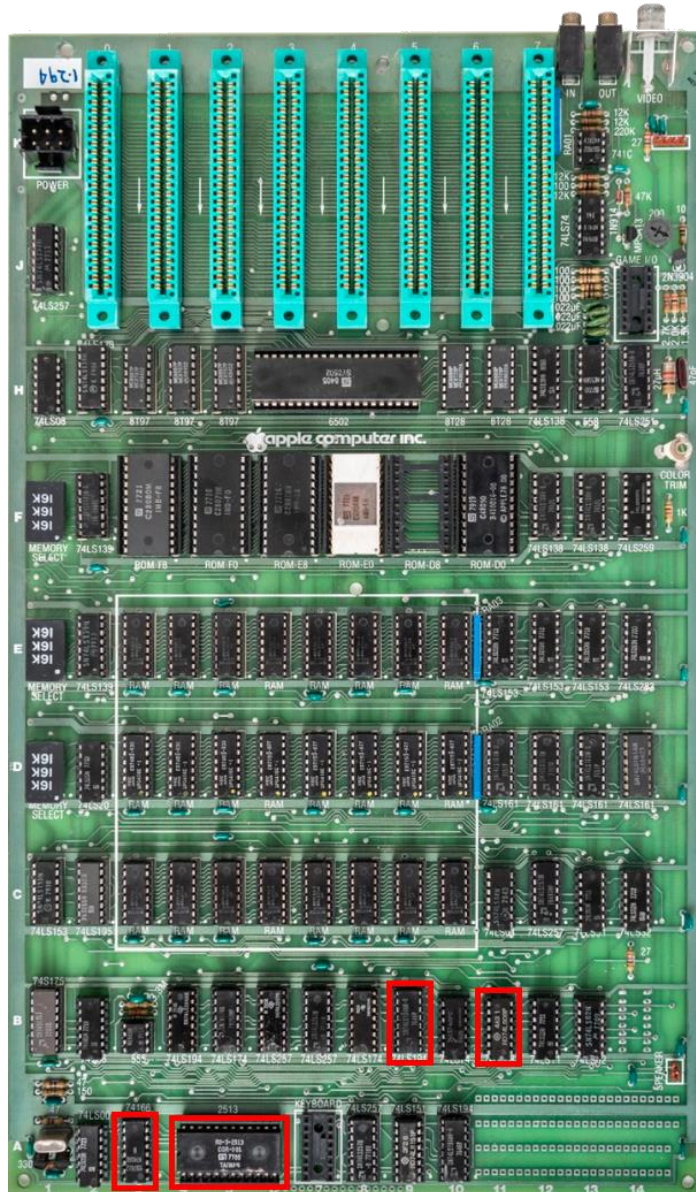


5. Unplug the keyboard connector from the motherboard. This is easily accomplished using a small flat-bladed screwdriver but must be performed carefully to ensure that the connector does not get damaged in the process.

Starting at one end of the keyboard connector, carefully insert the screwdriver between the top of the IC socket, and the bottom of the connector. Gently lever the connector up just a little, then move to the other end of the connector and repeat the process. Continue levering the connector up a little at a time, alternating end to end until it is free of its socket. Do not try to lever it out in one go – doing so will likely bend the pins and they can be quite fragile should you have to straighten them.

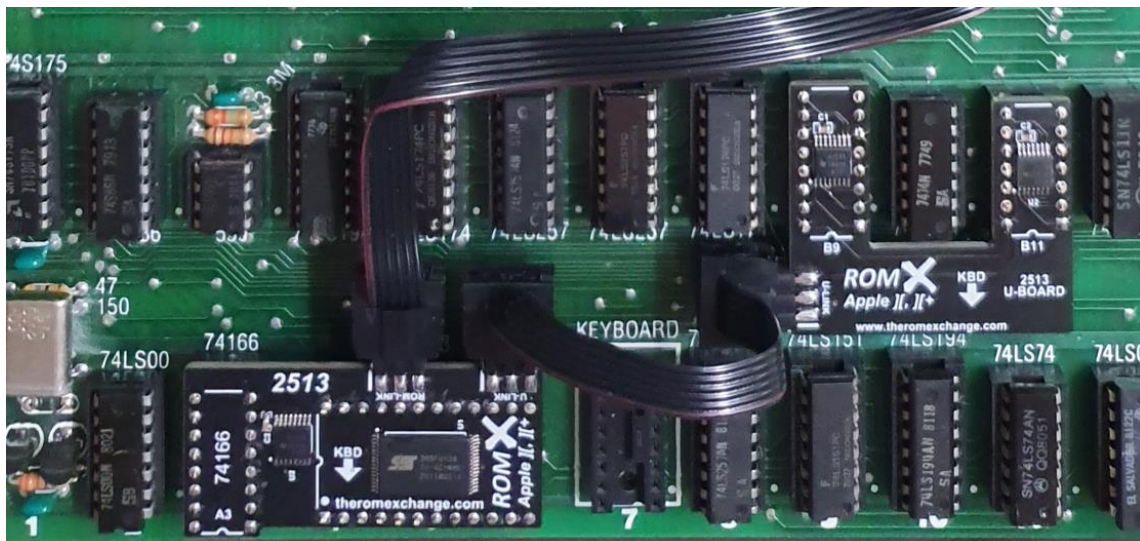
Once the connector has been unplugged from the motherboard you can lift the top of the case away from the baseplate and will have full access to the motherboard.

6. We can now remove the IC's that we will be replacing with ROMX parts, highlighted below in red :

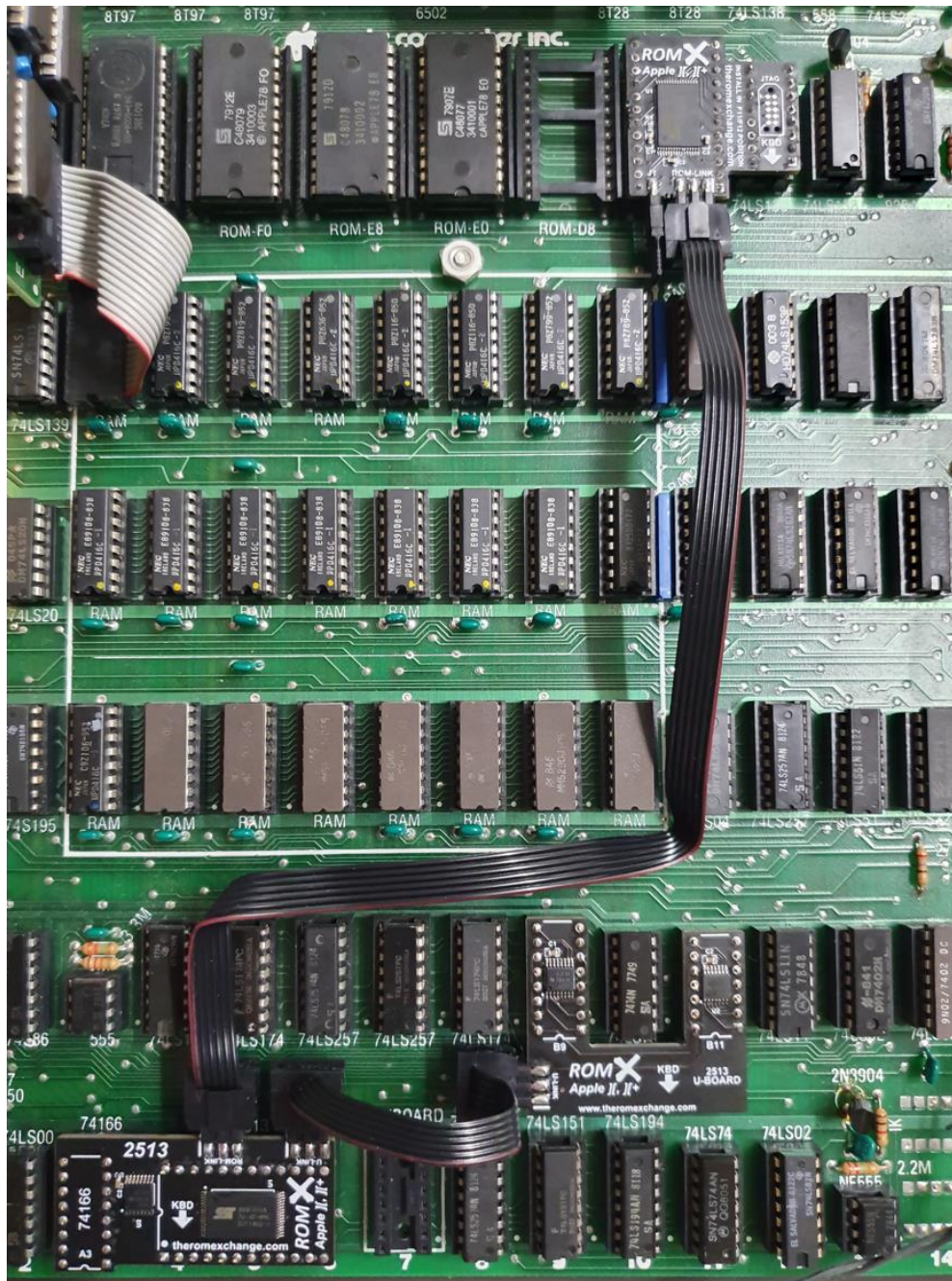


These are the 74LS166 at position A3, 2513 character generator at position A5, 74LS194 at position B9, and 74LS08 at position B11. Remove these following the same procedure as the keyboard connector - levering the IC up a little at a time, alternating end to end until it is free of its socket.

7. Remove the ROMX 2513 text ROM board set from its ESD-compliant packaging and visually inspect the pins to ensure none are bent. Attach the ROM-Link cable (the longer one) to the ROM-Link header on the 2513 PCB - the Red stripe on the cable (pin 1) should be located at the end of the ROM-Link header marked by the white bar on the PCB.
8. Attach the U-Link cable between the U-Link header on the 2513 PCB, and the U-Link header on the U-Board. Again the red stripe on the cable should be located at the end of the mating header that is marked with a white bar on the PCB.
9. Carefully line up the pins of the 2513 module above the A3 and A5 sockets, and gently press the module down until it is fully seated. A small gap between the underside of the printed circuit board, and the top of the socket is normal. Repeat this process for the U-board – with it lined up above the B9 and B11 sockets:



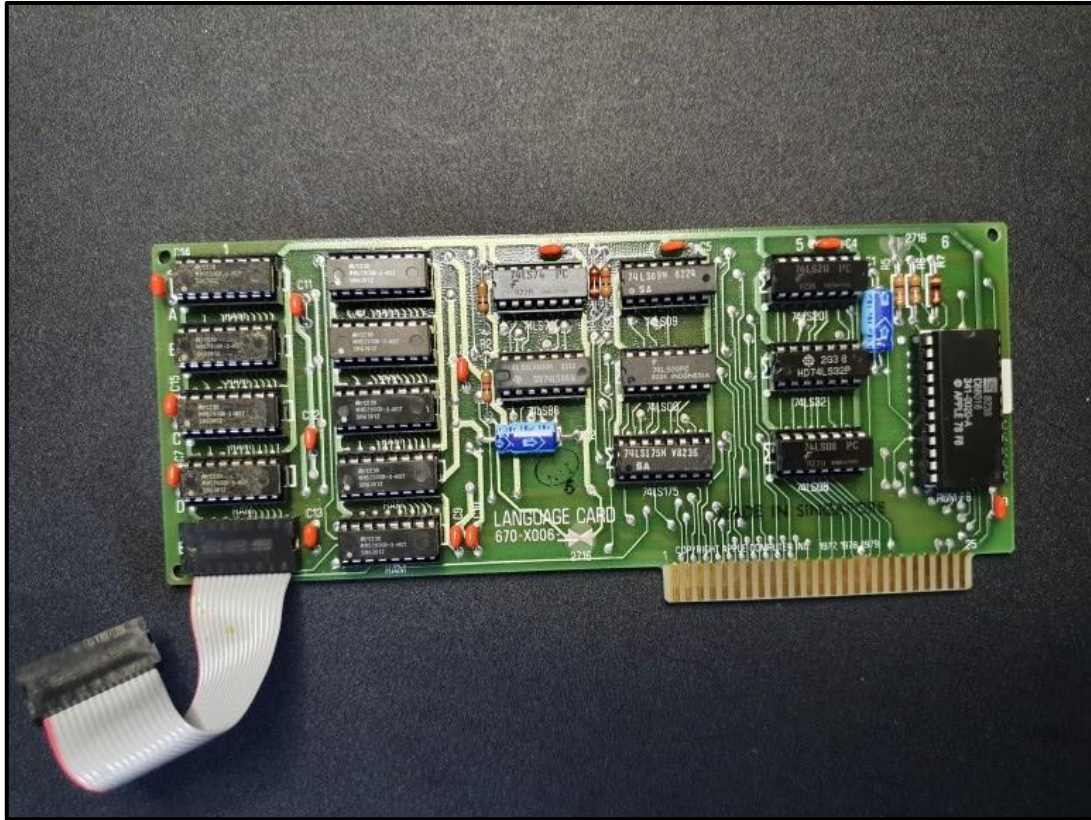
10. Connect the free end of the ROM-Link cable to the ROM-Link header on the ROMX module – again the Red stripe on the cable (pin 1) should be located at the end of the ROM-Link header marked by the white bar on the PCB:



11. Re-use the ROMX packaging - press the original IC's into the conductive foam and place it into the antistatic bag and box for storage.
12. Position the top of the case over the bottom plate, and carefully reconnect the keyboard connector.
13. If you have an Apple Language card, see the following section for required modifications, else proceed to the Testing section before reassembling the case.

Apple Language Card Compatibility

Whilst slot 0 RAM cards (Microsoft, Saturn, etc) will work fine with ROMX, the Apple Language Card (or clone) requires a reversible modification to ensure that its onboard F8 ROM does not override ROMX.



Background

When the Apple Language Card was released in 1979 with the Apple Pascal Language system, it served two purposes:

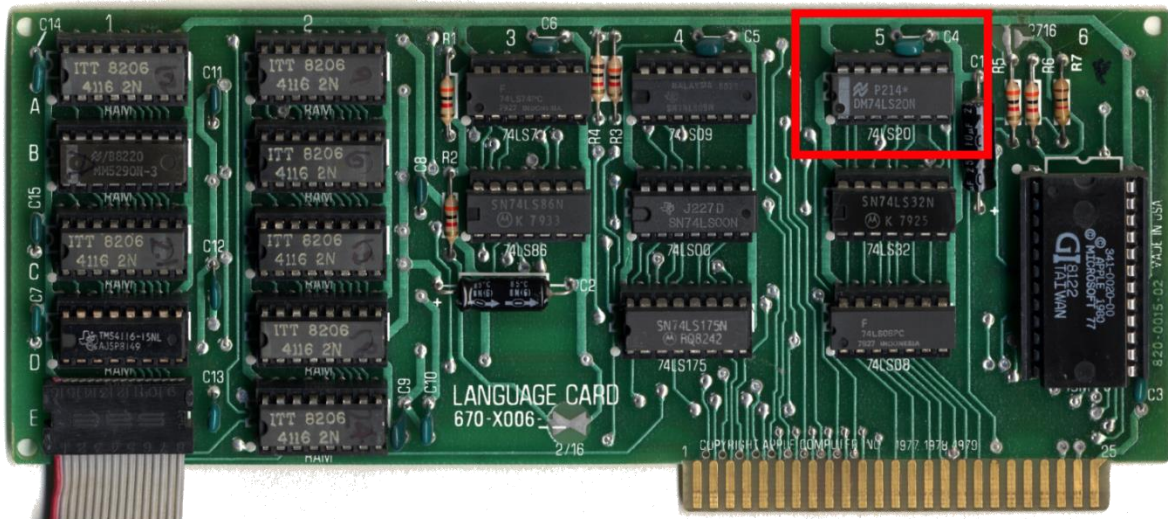
1. Provide an Autostart F8 ROM, allowing an Apple II to boot from a floppy disk drive.
2. Provide an extra 16KB of RAM to a fully expanded 48K Apple, bringing the total memory available to 64KB.

The Autostart F8 ROM was later shipped as standard, and when Microsoft released their 16K RAM card in 1980, the Language Card was no longer required.

Modification

We need to disable the Language Card F8 ROM, and also ensure that the slot inhibit signal is not asserted by the Language Card with access to the \$F800 address space (inhibit must still be allowed to function normally for Language Card RAM access).

Fortunately, both needs can be met with a minor modification centred around pin 6 of the IC at position A5 (74LS20), which is the output of a quad NAND gate.

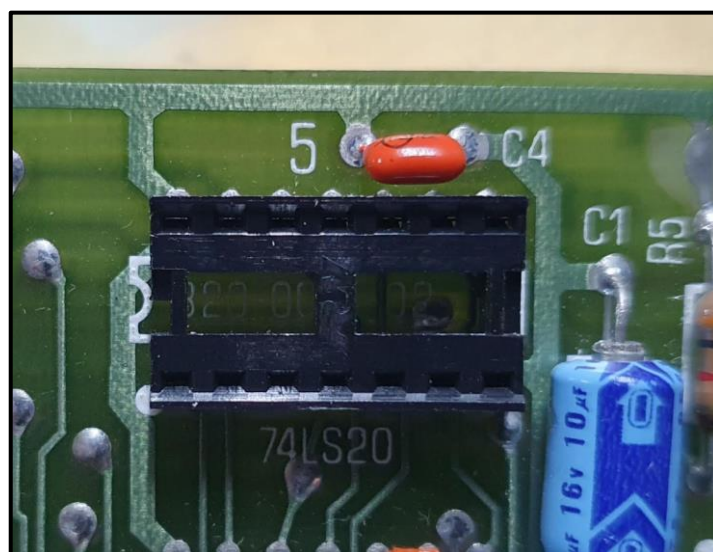


Pin 6 drives the chip select for the F8 ROM, and further logic that controls the inhibit signal.

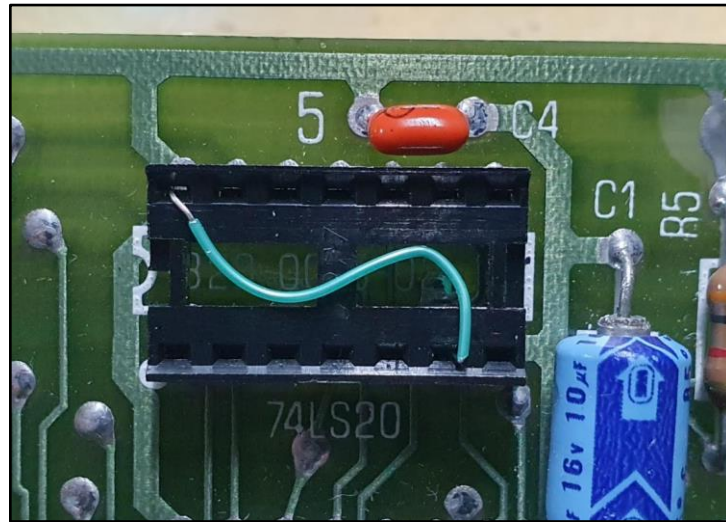
We need to isolate the output of this gate from the PCB to ensure that it has no control over these signals, and then we need to pull the pin 6 trace on the PCB high (+5V), disabling both the F8 ROM chip select and inhibit line for ROM access.

This is an easy 100% reversible mod that require no soldering.

1. Remove the 74LS20 at location A5 from the socket on the Language Card.

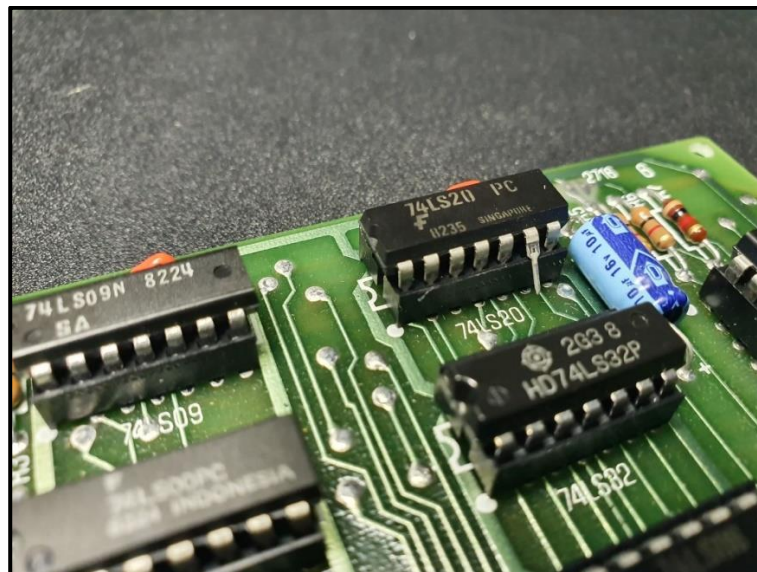


- Strip approx. 4mm off each end of a short length of thin solid core wire (such as Kynar wire – even a twist tie has been used for this!) and insert one end into pin 14 of the A5 socket, and the other into pin 6. Position the wire so that it will not prevent you from reinserting the IC over the top:



If you have a multi-meter you can test continuity on the rear of the socket to ensure that pin 6 is now connected to pin 14.

- Using your favourite pliers, carefully bend pin 6 of the 74LS20 IC outward, then replace the chip in the socket ensuring that pin 14 slides in over the top of the wire you have fitted. You could also purchase another chip just for this purpose, and snip/break off pin 6 :



Done! The 16KB RAM on the Language Card is now useable by the system, with ROMX handling all the ROMs you could ever need.

Proceed to the Testing section to ensure everything is working correctly.

