ROMX+

Apple][,][+

Installation Guide

JD MICRO

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Contents

Thank You!

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 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 Prevention section of this installation guide. Use the following sections to familiarise yourself with the ROMX hardware before installation.

ROMX+ Hardware

ROMX for Apple II/II+ was the first product developed by JD Micro. Later products such as ROMXc, ROMXc+ and ROMXe were all built upon its success, adding features such as the real-time clock, and a larger flash memory to support 32KB ROM images. With ROMX+ we've been able to circle back to the Apple II/II+ platform and bring the original ROMX up to the same specification. In fact we went a step further, and added a header for I2C (Inter-Integrated Circuit) devices such as a small LCD display that can be used to display the ROM selection.
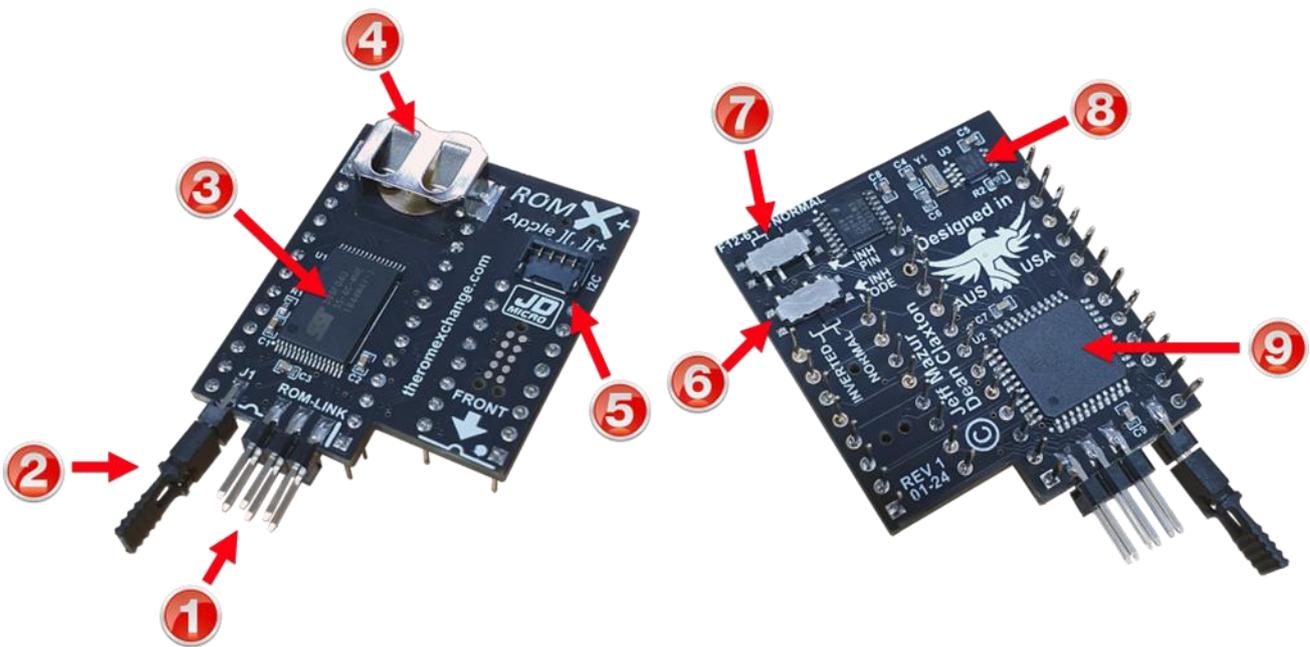
1. ROM-Link header – Pin 1 end (white bar on PCB).
2. Recovery Jumper
3. 4Mbit flash memory chip.
4. Battery holder for CR1220 RTC backup battery.
5. I2C Header (see APPENDIX 2 : I2C Header).
6. ROM Inhibit polarity inversion switch.
7. ROM Inbibit pin selection switch.
8. RTC (Real-Time Clock).
9. CPLD (Complex Programmable Logic Device).

For a genuine Apple II/II+ computer, both ROM Inhibit switches should be set to the NORMAL position and this is the factory setting. See APPENDIX 1 : ROM Inhibit Switches for more information about the ROM Inhibit switch settings.

ROMX 2316B SPCL Text ROM for Rev 7 Motherboards

The ROMX 2513B SPCL text ROM supports Rev 7 Apple II+ motherboards which would be originally fitted with 2316 SPCL ROM. It contains 16 different fonts – many include upper and lower case.

See the ROMXce+ User Guide for a list of included Fonts.
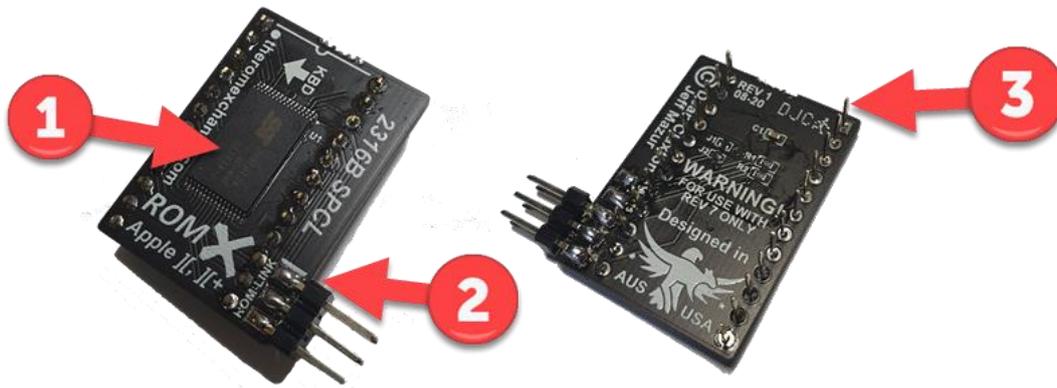
1. 1Mbit Flash Memory
2. ROM-Link Header – Pin 1 end (white bar on PCB)
3. Pin headers (legs)

ROMX 2513 Text ROM for pre-Rev 7 Motherboards

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 A3 and 2513 sockets, and a U-Board that spans the B9 and B11 sockets. The two boards are connected via a U-Link cable that connects to a U-Link header on each board.
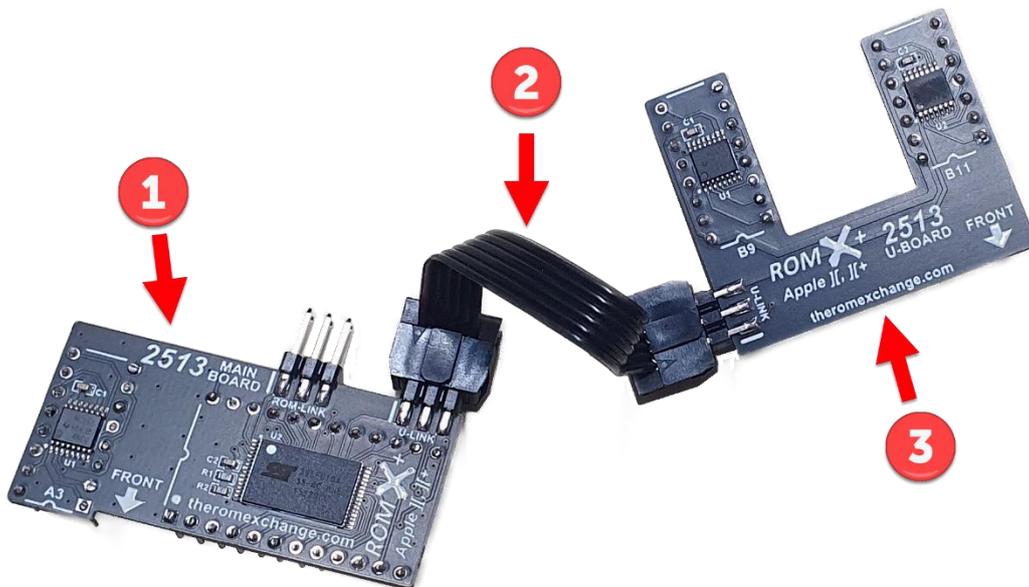
1. 2513 Main Board with 1Mbit Flash Memory
2. U-Link Cable
3. U-Board

The 2513 Main Board also has a ROM-Link header that is used to connect it to the ROMX+ board via the ROM-Link cable.

The same 16 fonts as the ROMX 2316B SPCL are supported (the 1Mbit flash chip contains the very same image), with many including lower case text. See the ROMXce+ User Guide for a list of included fonts.

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).

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, be sure to 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.
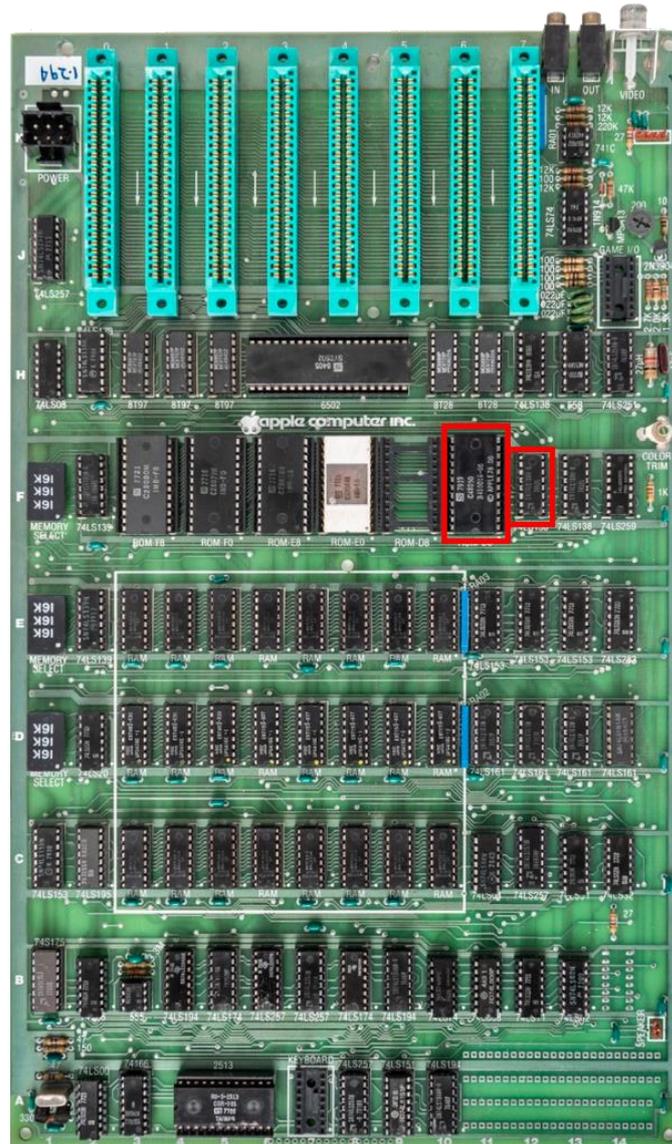
4. Remove the D0 ROM at position F11, and 74LS138 IC at position F12 from their sockets. This is easily accomplished using a small flat-bladed screwdriver. Starting at one end of the IC, carefully insert the screwdriver between the top of the IC socket, and the bottom of the IC. Gently lever the IC up 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. Following ESD precautions, remove the ROMX+ module from the ESD-compliant packaging and visually inspect the pins to ensure that none have been bent. To maintain time-keeping with the ROMX real-time clock, a CR1220 coin cell battery must be installed. Remove the battery from the packaging. The Top side of the battery is marked with a + sign as below.

Install the battery into the ROMX+ battery holder with the + side to the top of the battery holder.

6. Ensure that the switches on the underside of the board are in the correct positions for your motherboard. For a genuine Apple computer, set them both to the NORMAL position (this is the default shipping position). Some clone motherboards invert the Inhibit signal in which case the Inhibit polarity switch should be set to INVERTED (see APPENDIX 1 : ROM Inhibit Switches).

7. Carefully line up the ROMX+ 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.
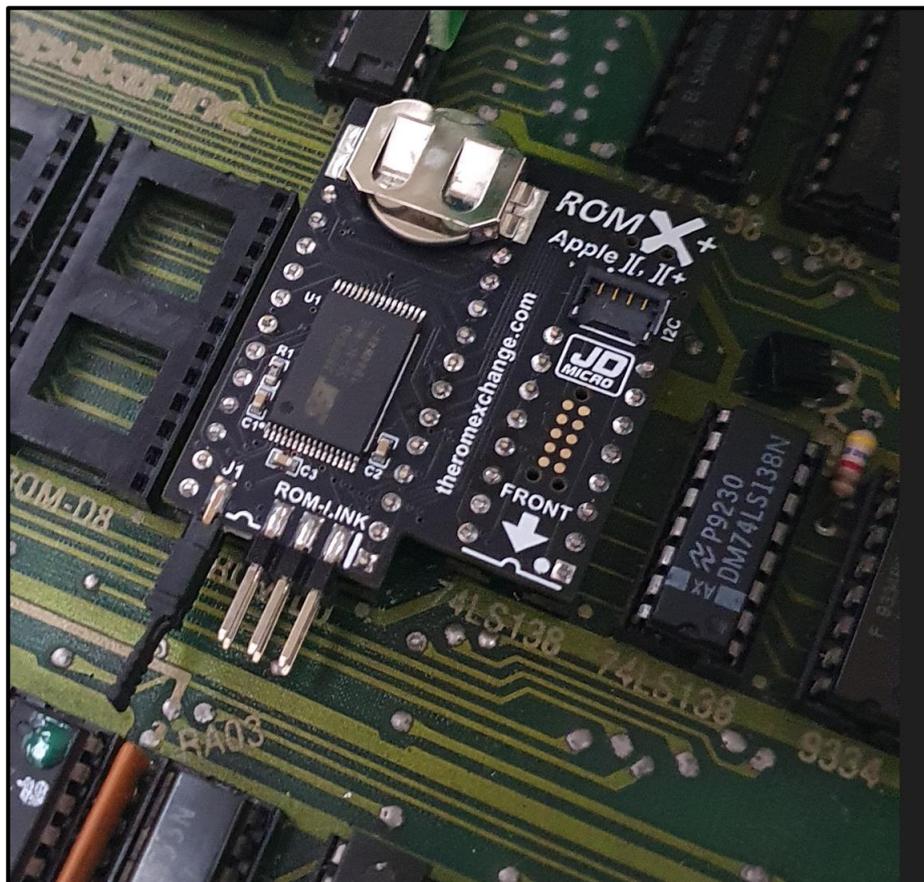
Do not throw out the packaging! You can press the original IC's into the conductive foam (use both sides if you choose to remove your other ROMs as well) and place them into the antistatic bag and box for storage.

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.

If you have purchased a ROMX text ROM, refer to the relevant section for installation (ROMX 2316B SPCL Text ROM Installation (for Rev 7 Motherboards) or ROMX 2513 Text ROM Installation (for pre-Rev 7 Motherboards)) .

If you have an Apple Language card refer to APPENDIX 3 : Apple Language Card Compatibility for required modifications, 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.
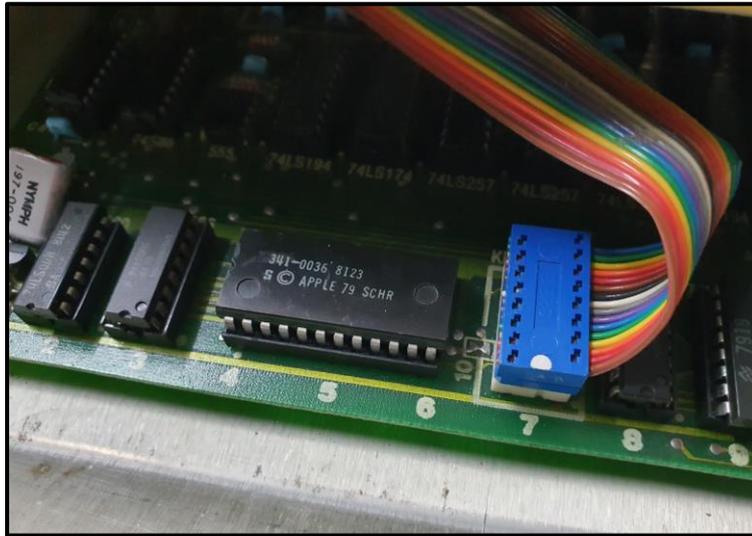
This is easily accomplished using a small flat-bladed screwdriver. Starting at one end of the IC, carefully insert the screwdriver between the top of the IC socket, and the bottom of the IC. Gently lever the IC up just a little, then move to the other end of the IC and repeat the process. Continue levering 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.
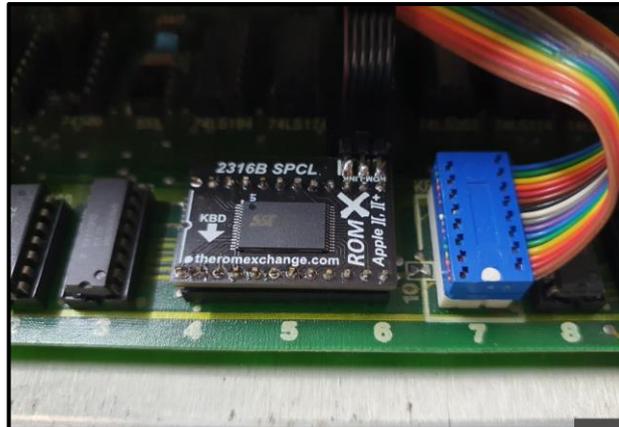
8. Re-use the ROMX packaging - press the original 2316B SPCL IC into the conductive foam and place it into the antistatic bag and box for storage.
9. Ensure that the keyboard connector is still fully seated, then carefully move the top of the case back into position.
10. Working through the top of the 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):
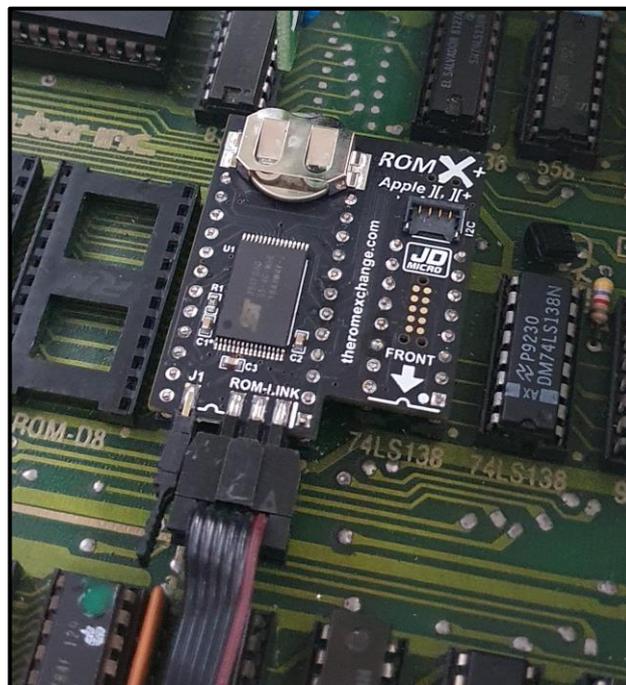
11. If you have an Apple Language Card, see APPENDIX 3 : Apple Language Card Compatibility for required modifications , else proceed to the Testing section before reassembling the case.

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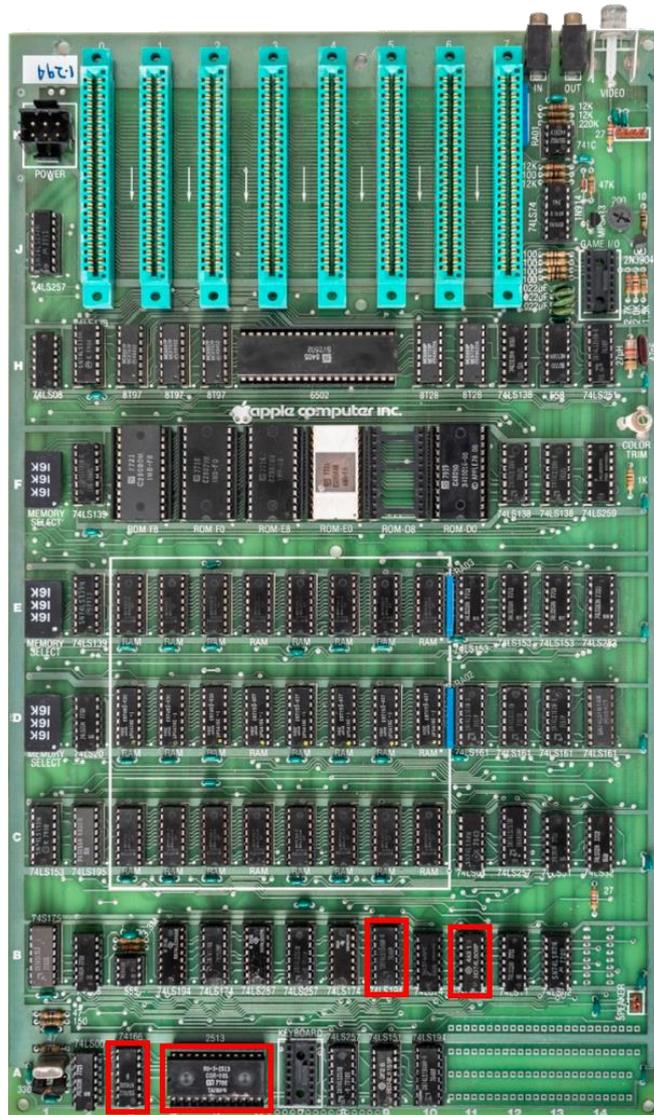
    These are the 74LS166 at position A3, 2513 character generator at position A5, 74LS194 at position B9, and 74LS08 at position B11. Remove these following the same procedure as the keyboard connector - levering the IC up a little at a time, alternating end to end until it is free of its socket.

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 APPENDIX 3 : Apple Language Card Compatibility for
required modifications, else proceed to the Testing section before reassembling the case.

Testing

We can now perform a quick test to verify that the ROMX modules are correctly installed.

1. Make sure your display is turned on and warmed up (if necessary), then power on your computer. You should be presented with the following menu – press the ESC key to stop the countdown timer. If your computer does not display the menu, check your monitor connection before checking that the ROMX+ module is correctly installed.

2. Press 1 to boot using the regular Applesoft Basic ROM. If you have the optional ROMX text ROM, try pressing the 2 key to boot using the lowercase modified Applesoft ROMs whilst simultaneously switching to font 2. All going well you should see the APPLE][Boot logo displayed in lower case as below :

3. If you removed the case screws to install the text ROM module, after a successful test you can reassemble the case. Holding the case and chassis base plate together, carefully turn the computer upside down and reinstall the 10 screws that fix the top of the case to the base plate.
4. Refer to the ROMXce+ User Guide for further information on how to use ROMX+.

APPENDIX 1 : ROM Inhibit Switches

In order to better support the various Apple II clone computers, two switches were included on the underside of the ROMX+ module.

These switches are used to select :

1. The polarity of the motherboards ROM Inhibit signal (active low = NORMAL, active high = INVERTED).
2. The pin used for the ROM Inhibit signal (D0 ROM pin 18 = NORMAL, 74LS138 pin 5 = F12-6*).

ROM INHibit Pin Selection

ROM INHibit Polarity Selection
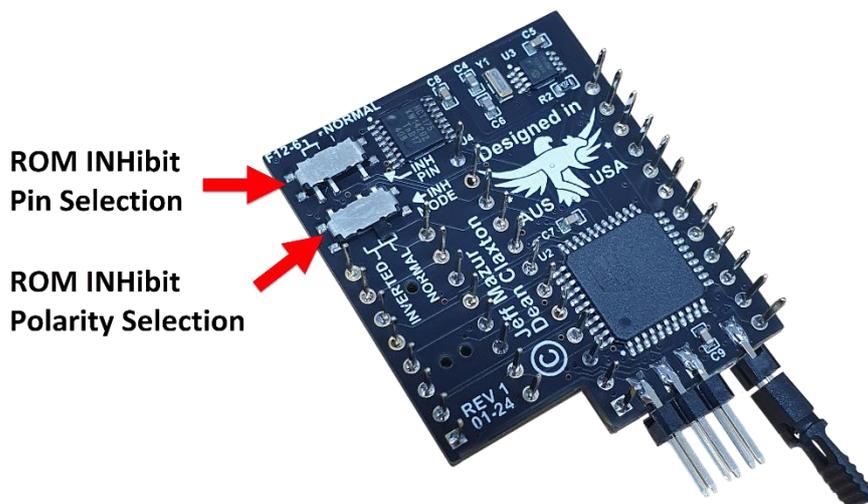
*Note that there is an error on the PCB silkscreen – this should read F12-5.

For a genuine Apple II/II+ motherboard, both switches should be set to the NORMAL position and this is the factory setting.

Switch settings for Apple II clone computers will be published on our website as information becomes available.

If no switch settings are published for your clone computer, then it is safe to experiment. If the ROMX menu is not displayed on powerup with the factory switch settings, then firstly try setting the polarity to INVERTED.

Work through the various switch options and share your findings with support@jdmicro.com.

APPENDIX 2 : I2C Header

ROMX+ includes a 4 pin header to allow you to connect devices (such as an LCD display) to the I2C (Inter-Integrated Circuit) bus. Custom interfacing software can be written to access the device via ROMX API calls. See the ROMXce+ API Reference for example code.

A MOLEX Pico-EZmate cable will be required to connect a device to the ROMX+ board. Pico-EZmate cables are available in multiple lengths – some examples are shown in the table below.

Length	Molex Part Number	Digikey Part Number
450mm	0369200405	WM26613-ND
600mm	0369200406	WM26614-ND

The above cables are pre-terminated – simply cut the connector off one end of the cable and wire in your device.

The ROMX+ I2C pinout is shown below. The I2C SDA and SCL lines are pulled up on the ROMX module – you will not require pullup resistors on your device.
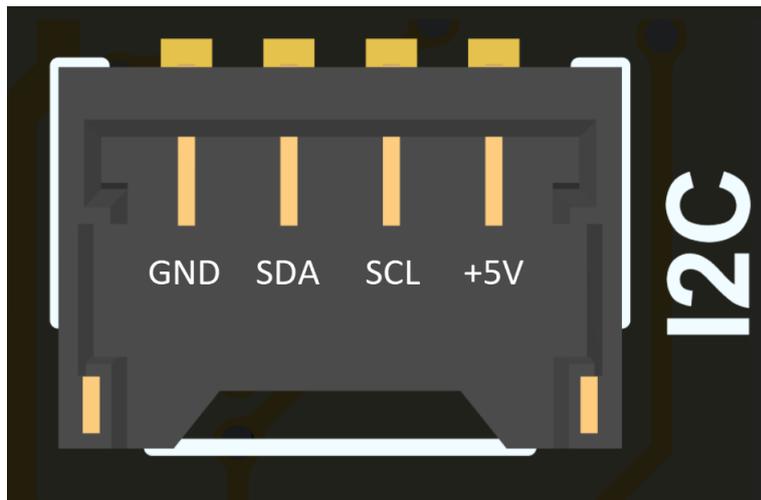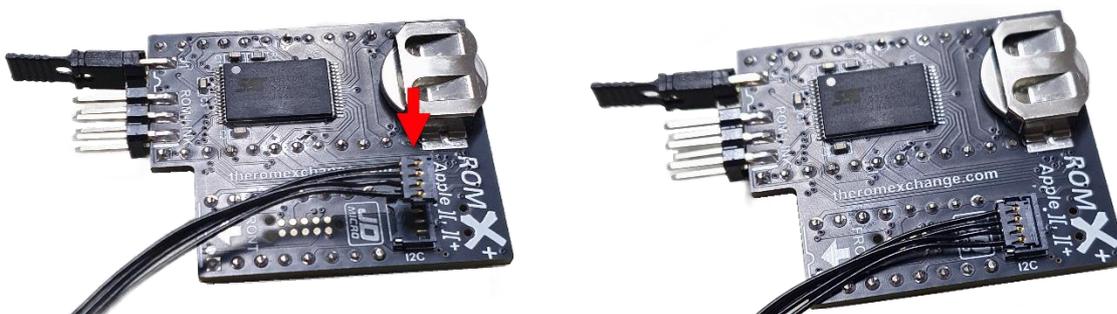
Connecting and Disconnecting a Cable

To connect the Pico-EZmate cable to the ROMX+ board, first identify the top side of the connector (this will face upward and is visible once the connectors are mated):

TOP

BOTTOM
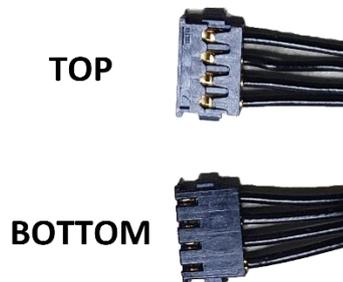
Then line the connector up directly above the socket, and apply light pressure to seat it. It should click into position :
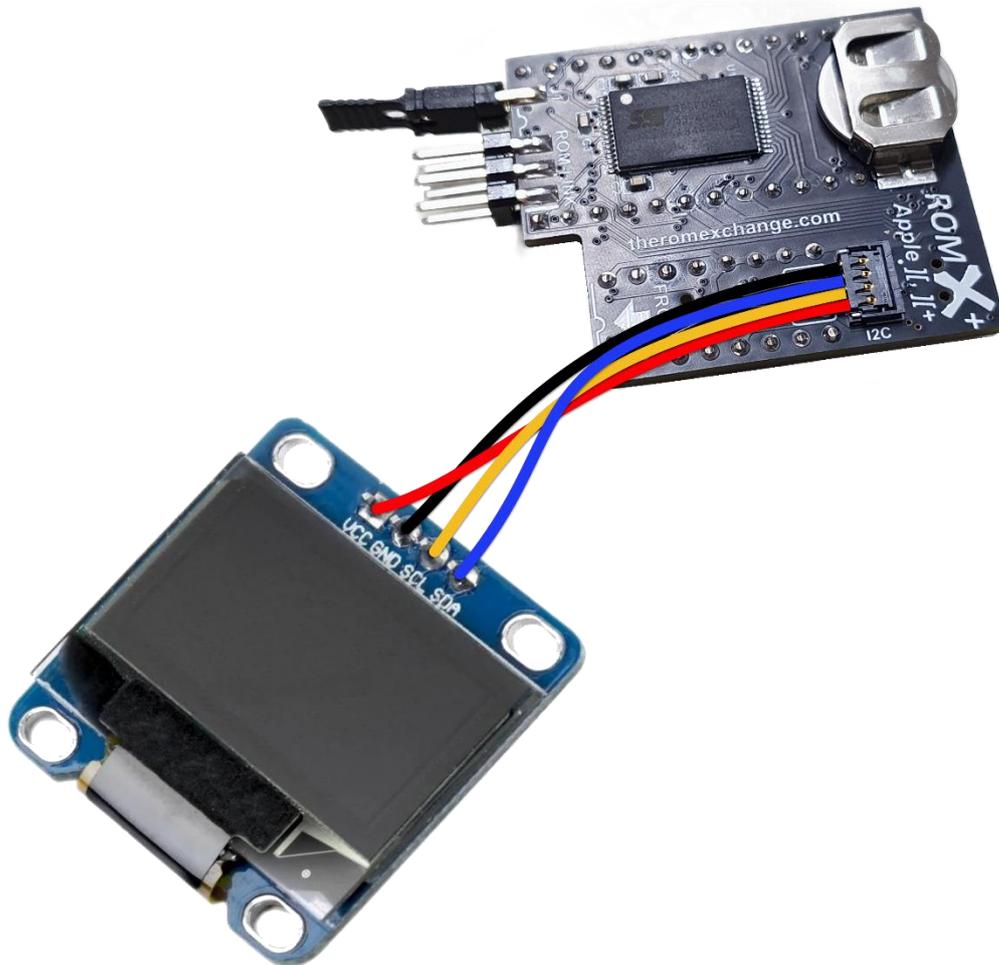
To disconnect the I2C cable, grip the wires and gently pull the cable directly upward :
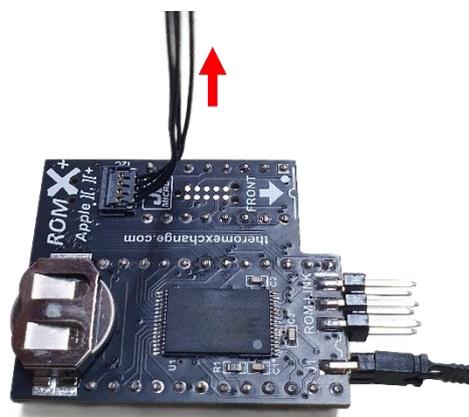
I2C LCD Example

Below is the wiring for a typical OLED I2C LCD display :

APPENDIX 3 : 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.
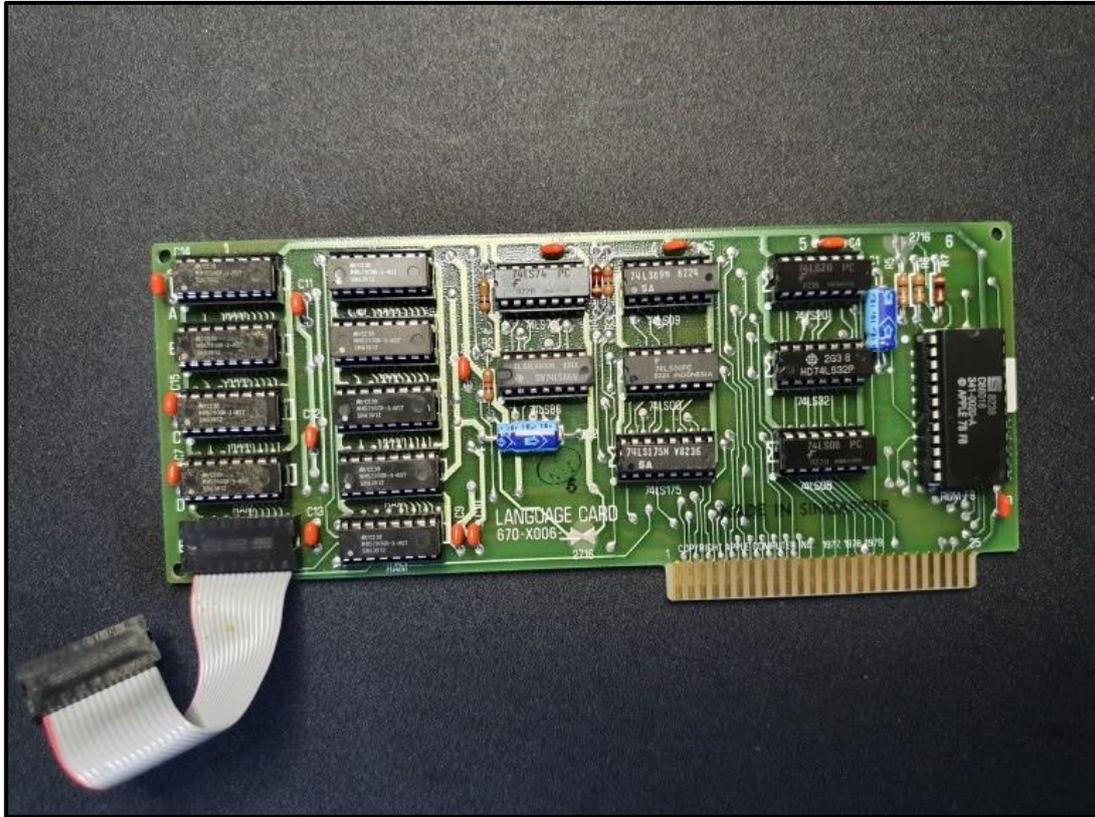
Background

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.
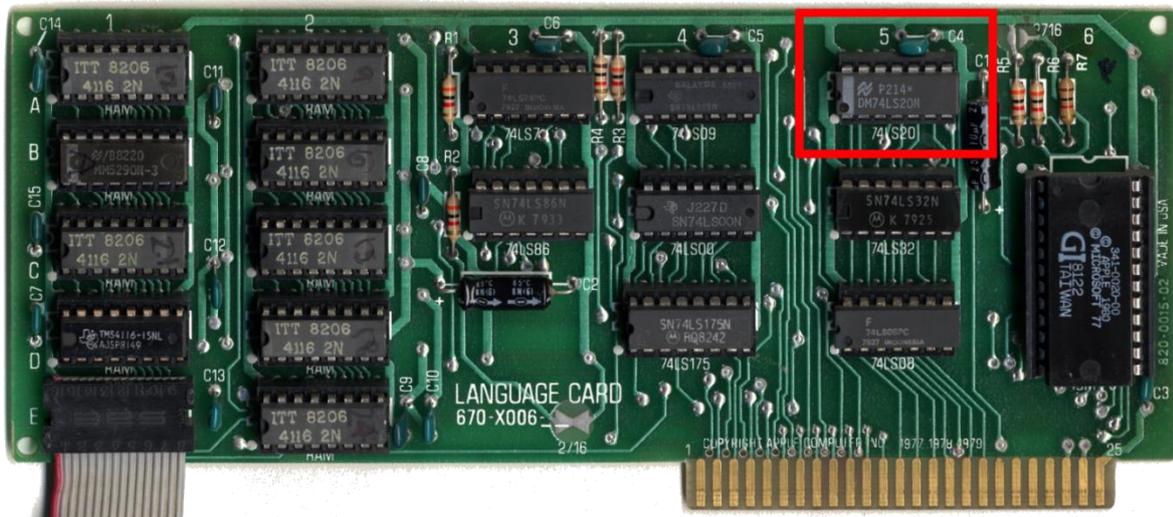

Pin 6 drives the chip select for the F8 ROM, and further logic that controls the inhibit signal.

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.
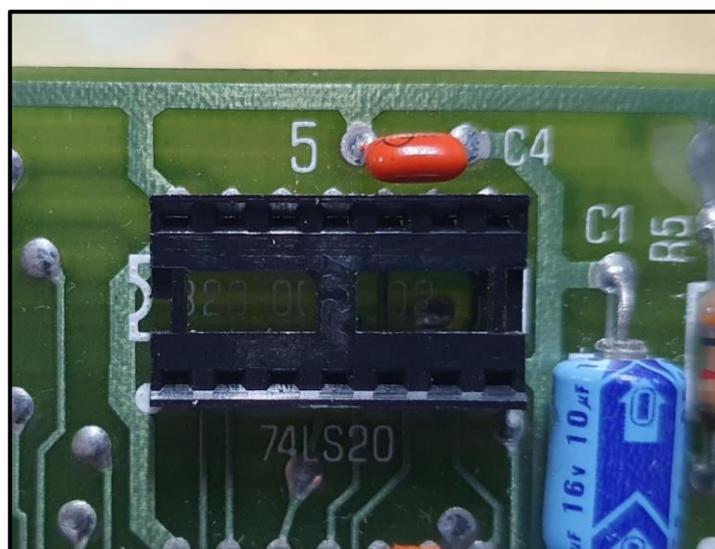
2. Strip approx. 4mm off each end of a short length of thin solid core wire (such as Kynar wire – even a twist tie has been used for this!) and insert one end into pin 14 of the A5 socket, and the other into pin 6. Position the wire so that it will not prevent you from reinserting the IC over the top:
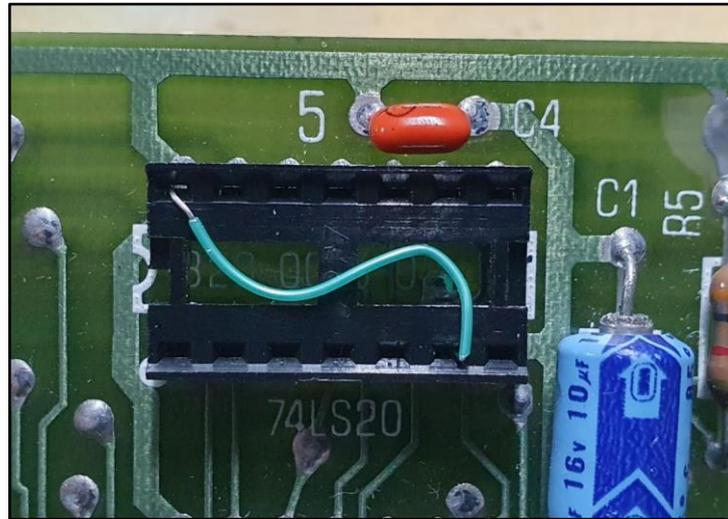
If you have a multi-meter you can test continuity on the rear of the socket to ensure that pin 6 is now connected to pin 14.

3. 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 :
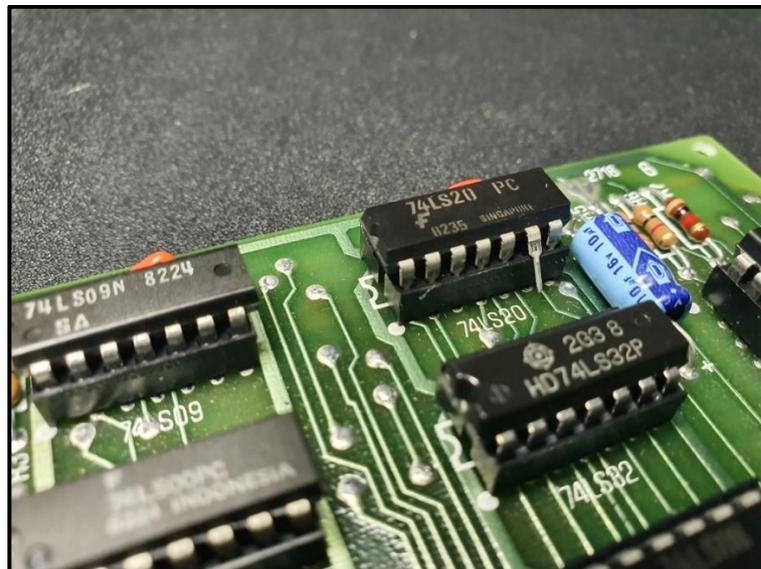
Done! The 16KB RAM on the Language Card is now useable by the system, with ROMX+ handling all the ROMs you could ever need.

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