Apple //e Diagnostics Card Rev. B Assembly Guide
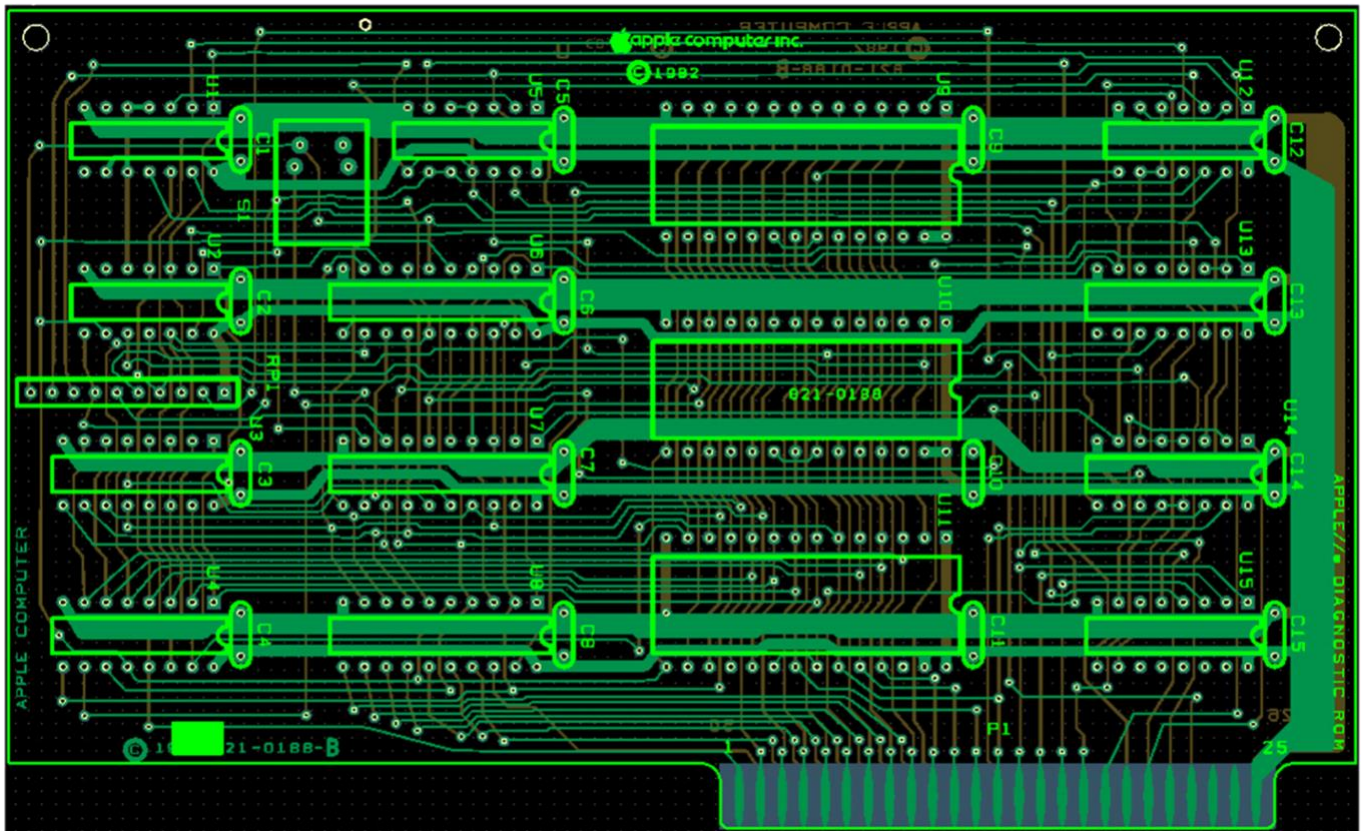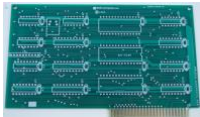
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Kit Contents

Your Apple //e Diagnostic Card Kit includes the following parts:

Printed Circuit Board (board)	74LS05 (1) (printed on top of chip)	74LS09 (1) (printed on top of chip)	74LS11 (1) (printed on top of chip)	74LS32 (1) (printed on top of chip)
74LS138 (1) (printed on top of chip)	74LS139 (1) (printed on top of chip)	74LS244 (1) (printed on top of chip)	74LS245 (1) (printed on top of chip)	74LS253 (1) (printed on top of chip)
74LS273 (1) (printed on top of chip)	52112A-4 RAM Chip (2) (printed on top of chip)	28-pin EPROM Sockets (3)	0.1uF Disk Capacitors (15)	10-pin Resistor Network (1)
DPST Paddle Switch (1)	28C64 EPROMs Rev. B (2) (labeled 0018 and 0019 on top of chip)	Magic Rub Eraser (1)	Operations Manual (1)	

Before You Begin

These instructions assume a basic knowledge of soldering and electronics. For those interested in a review of soldering basics and safety tips, the links below offer excellent tutorials:

https://youtu.be/IpkkfK937mU

https://learn.sparkfun.com/tutorials/how-to-solder-through-hole-soldering

Basic Electronics

The 7400 series chips are known as Transistor Transistor Logic (TTL) chips and are the most commonly used Integrated Circuit (IC) logic chips.   While grounding yourself before handling is always recommended, TTL is not as sensitive as the CMOS counterparts and therefore less sensitive to static discharge.

The 7400 series chips being used in this kit are designated as "LS" (Low Power Schottky). This means that the chips all have Schottky diode clamps at the inputs to prevent charge storage and to improve speed.

Installation Steps

Remove all parts from the kit and separate them for easy accessibility.

STEP 1 – Use the Magic Rub eraser contained in the kit to clean all pads on the bottom of the board. This will ensure that the pads will more easily accept the soldering.

STEP 2 – Begin to place each of the chips onto the board according to the map below in Figure 1. The placement of the chips in the exact location indicated on the map is important.   It is also important to ensure that the notch on the chips are aligned with the notch markings on the board.

Figure 1 Component layout (top of board)
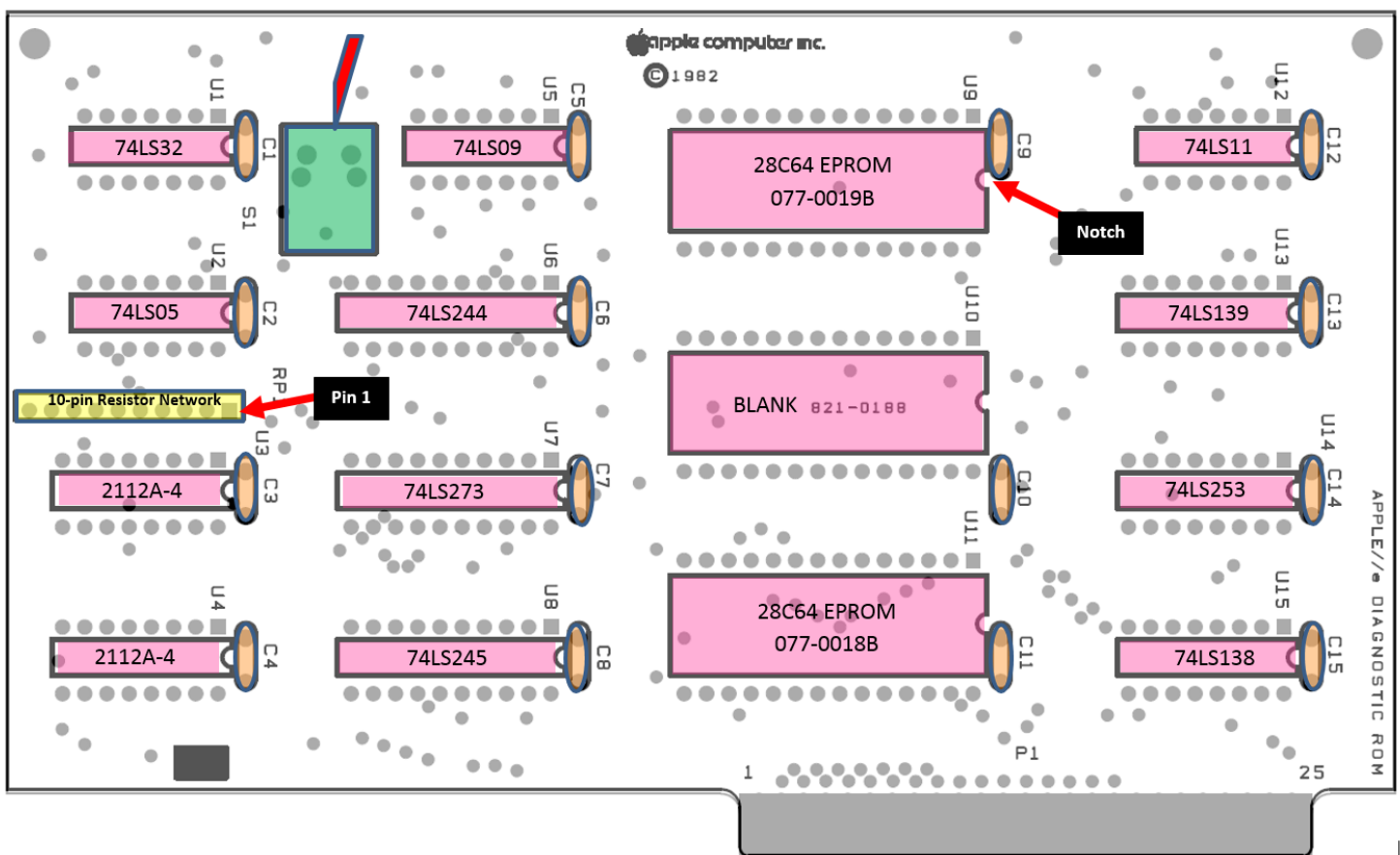
Once you have verified that the chips are in their proper locations, use a small piece of scotch tape to secure each chip in place before turning it over to begin soldering.

Solder one pin at the opposite end of each chip to secure it in place. This will allow you to perform a final review before completing the soldering of all pins. (At this point, if you find that you've made a mistake, it is fairly easy to desolder the two pins and start over.)

Solder all pins in place.

STEP 3 – Install the three 28-pin EPROM sockets in their designated locations on the board (U9, U10, U11). These sockets also have notches that need to be properly aligned. (While there are three EPROM sockets, there are only two EPROM chips. The U10 socket will be empty but has been provided to allow for future expansion.)

Use a small piece of scotch tape to secure each socket in place before turning it over to begin soldering.

STEP 4 – Install the 0.1uF disk capacitors in their respective locations, C1 – C15. These can be installed in either direction, however installing them with the printed side facing in the same direction makes the job look more professional. Once you have verified that the capacitors are in their proper locations, use a small piece of scotch tape to secure each capacitor before you turn the board over to begin soldering.

STEP 5 – Install the 10-pin Resistor Network component. Direction matters when installing this component. There is a small white dot on above pin 1. This pin must align with pin 1 (the square solder pad) on the board as indicated in Figure 1.

Figure 2 – Resistor Network
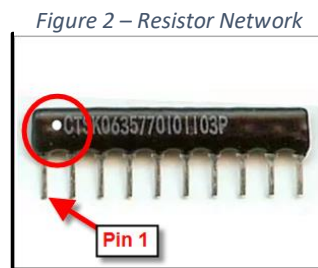
STEP 6 – Solder the DPST Paddle Switch in place. This Switch fits only one way. To prevent damage, be careful not to overheat the switch when soldering.

STEP 7 – Install EPROM 0019 in location U9 and install EPROM 0018 in location U11. Be sure that the notch on the EPROM aligns with the notch markings on the board. Carefully align the EPROM in the socket. Apply even pressure on the top of the EPROM to seat it. Failure to do so, could result in bent pins.

Assembly Complete!

Before inserting the card in your Apple //e, do a final check of the following:

- All chips are in installed in the proper sockets and aligned properly
- Solder is in place for each pin with no 'cold solder joints' (A cold solder joint, as described in the tutorial videos referenced above, will prevent the pin from making a solid electrical connection.)
- EPROM pins are straight and properly aligned

For a quick test of the card, insert it into an empty slot on the Apple //e and move the red paddle switch toward the back of the unit. The card is now in diagnostics mode and the diagnostic test screen should appear on the monitor.

The Operation Instructions, included with this kit, describes how to run the diagnostic tests.

Thanks and Credits

A Special Thanks to the Following for Their Help in Making This Project a Reality

Robin Graham - For the past 30 years she has supported my Apple obsession including, but not limited to, relinquishing half of the basement to house more than 100 Apple computers, traveling across most of PA and Ohio to rescue Apple computers and peripherals, listening to endless Apple 'facts', and graciously considering a trip to Kansas Fest a 'vacation'.

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