APPLE IIc
MEMORY EXPANSION CARD

DEALER INSTALLATION INSTRUCTIONS

INTRODUCTION

The Apple IIc Memory Expansion Card can be used with any Apple IIc which has a logic board containing the memory expansion connector. This card supports the addition of RAM memory in increments of 256K, to a maximum of 1,024K (1 Megabyte) with 256K of memory as the minimum configuration available. (For further information on the features of the Memory Expansion Card, refer to the *Apple IIc Memory Expansion Card Owner's Manual* which accompanies the card.)

THINGS TO REMEMBER

1. The Memory Expansion Card has ICs which are **HIGHLY SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE.** Ground yourself by touching the internal power supply case before picking up the Memory Expansion Card or installing it into any system. To further prevent any damage from electrostatic discharge, place the board in an anti-static bag before carrying it anywhere.

2. The Memory Expansion Card exchange module is shipped configured with 256K of RAM. Any additional RAM is considered a replaceable part. 256K RAM chips are **SUSCEPTIBLE TO DAMAGE FROM ELECTROSTATIC DISCHARGE.** Touch the internal power supply case before handling or installing the RAM chips. **Remember to remove any additional RAM from the board you are sending to Apple. Additional or defective RAM should not be sent in on the card.**

INSTALLATION

NOTES:

Apple IIc computers with model number A2S4100 contain the connector and circuitry necessary to install a Memory Expansion Card.

Apple IIc computers with model number A2S4000 will require a Logic Board Upgrade **BEFORE** installing a Memory Expansion Card.

If an upgrade is required, refer to the **Apple Service Technical Procedures Binder, Volume 1** under the tab "Apple IIc" for take-apart instructions.

Determine Logic Board Compatibility

1. Turn off the power to the IIc and disconnect the power cord and any attached peripherals.

2. Remove the logic board from the computer.

3. Compare the logic board with Figures 1 and 2. If the logic board looks like the one shown in Figure 2, then a logic board upgrade is required. Perform a **Logic Board Upgrade** (instructions are included in the **Apple IIc Logic Board Upgrade Kit**) before proceeding to "Install Logic Board Stand-Offs". If the logic board looks like the one shown in Figure 1, continue.
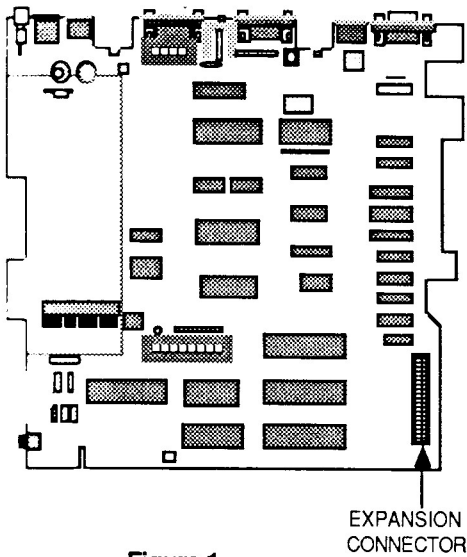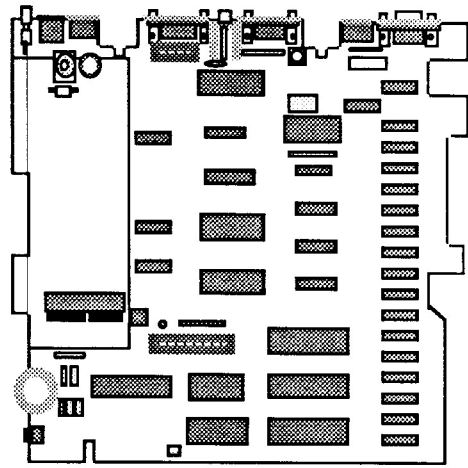
Figure 1

**LOGIC BOARD
WITH
EXPANSION CONNECTOR**

Figure 2

**LOGIC BOARD
WITHOUT
EXPANSION CONNECTOR**

Install Memory Expansion Card Stand-Offs

1. Insert the flared-end of each stand-off, from the component
    (top) side, through the four holes in the logic board and
    press until you hear a "click". Refer to Figure 3, #1 for
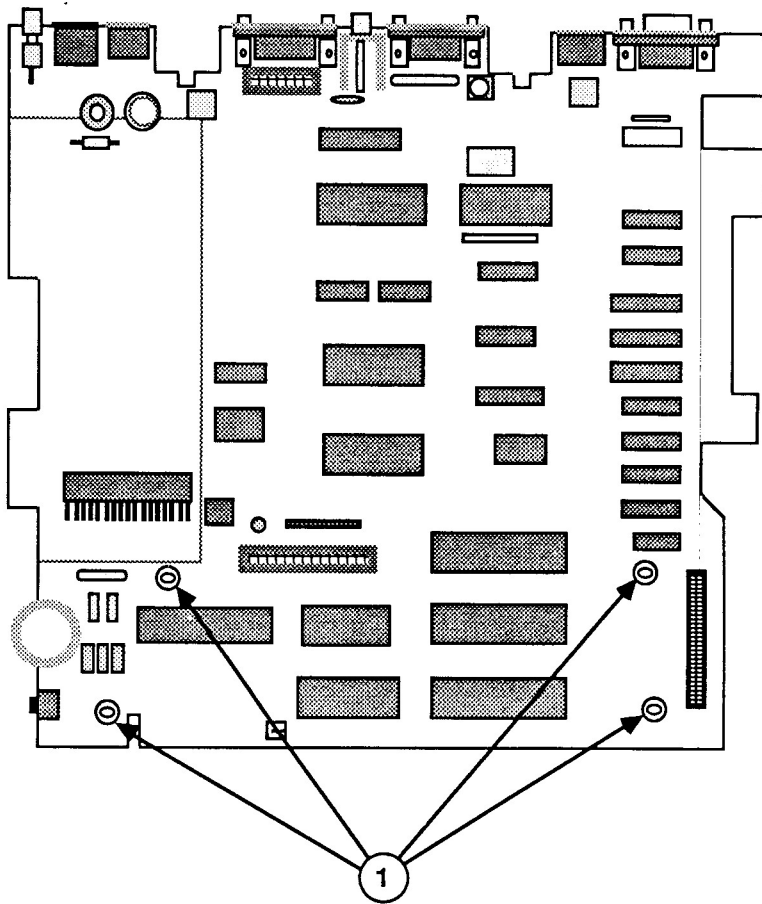   stand-off locations.

Figure 3

LOGIC BOARD
STAND-OFF LOCATIONS

2. Re-install the logic board, internal power supply, and disk drive.

3. Connect the keyboard cable to the logic board and place the keyboard upside down on top of the disk drive.

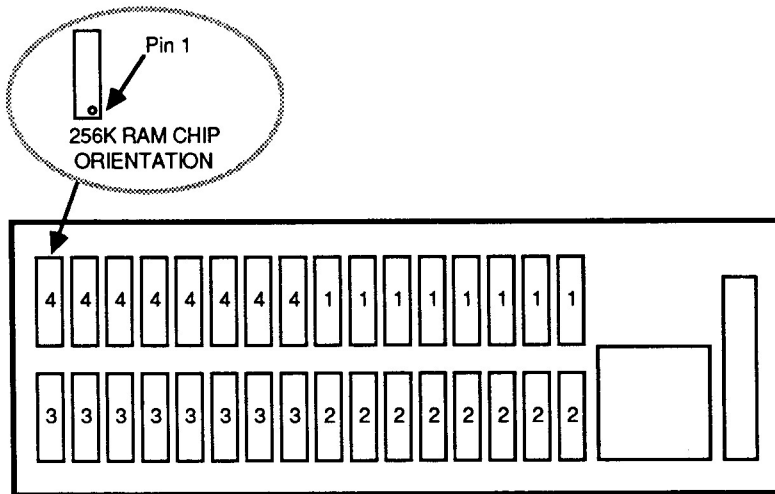**Configure the Memory Expansion Card**

The Memory Expansion Card is shipped from Apple configured with 256K of RAM. To increase to 512K, 768K or 1,024K, an appropriate number of Apple II 256K Memory Expansion Kits must be purchased and installed.

Memory Size	Number of Expansion RAM Kits
512K	1
768K	2
1,024K	3

The RAM must be inserted in the correct sockets for the desired configuration. Remember to place the dot or indentation on the chip in the correct direction for pin 1.

Only Apple RAM chips should be used. (Apple RAM has the letter A near pin 1.)

To install the RAM chips at their appropriate locations on the Memory Expansion Card, refer to the Memory Configuration Chart (see Figure 4).

CARD SIZE	FILL BLOCK
256K	1
512K	1,2
768K	1,2,3
1024K	1,2,3,4

Figure 4

MEMORY CONFIGURATION CHART

Install and Test the Memory Expansion Card

1. Peel off the protective paper from one of the rubber feet supplied with the kit. Place the foot on the solder (bottom) side of the keyboard, one-half inch from the side of the space bar. Repeat for the other side of the space bar.

2. Place the Memory Expansion Card on the four nylon stand-offs, component side down and with the connector on the right side. GENTLY press down on the board starting at the connector side and then at each stand-off on the left side.

3. Re-install the keyboard.

4. Run the built-in Memory Expansion Card diagnostic to verify the correct operation of the card. Refer to "Diagnostics and Troubleshooting" on the following page.

5. Re-install the top cover.

6. Affix the appropriate memory ID sticker (see Table 1) to the IIc case between the <OPEN APPLE> and Accent mark keys.

Memory Expansion Card Size	Memory ID Sticker
256K	384K
512K	640K
768K	896K
1024K	1.15MB

Table 1
Memory ID Sticker

7. Return the IIc to the customer. Also, include the *Apple IIc Memory Expansion Card Instruction Manual,* Tell Apple and Warranty Cards, *Apple II Utilities Guide,* and ProDOS System Utilities. **Do not give the Dealer's Installation Instructions or Packing List to the customer.**

DIAGNOSTICS AND TROUBLESHOOTING

1. Connect a video display to the IIc.

2. Plug the power cord into the power socket and turn on the computer.

    The words **Apple //c** will be displayed at the top of the screen.

3. Simultaneously press the <CONTROL> and <RESET> keys.

4. Enter CALL -151 and press <RETURN>.

    The machine language monitor prompt (*) will appear.

5. Enter C40AG and press <RETURN>.

6. The following display will appear. Verify that the card size which appears is the actual size for the card installed (in our example, a 256K Memory Expansion Card is installed). The dots appear on the screen as the card is tested. The test will repeat until either the <ESC> key is pressed or an error is encountered.

    MEMORY CARD TEST
    ESC TO EXIT
    TEST WILL TAKE 45 SECONDS
    CARD SIZE = 256K

    PASSES = 0001

    ....
    ....
    ....
    ....
    ....
    ....

    CARD OK

NOTE: A complete card failure is indicated if the internal diagnostics will not run. In that case, remove the customer's RAM, install them on an exchange module, and retest.

Error Code Interpretation

If an error is found during the internal diagnostic it will be displayed in one of the following formats:

DATA ERROR XXYYYY - ZZ   (indicates a RAM or card failure)

ADDRESS ERROR XXYYYY - ZZ   (usually indicates a card failure)

Data Errors

Data errors usually indicate a RAM chip failure. The **XX** in the error code specifies which 256K block contains the error. The **ZZ** in the error code specifies which RAM chip within a section (see Figure 5, "**Memory Expansion Error Code Chart**", on the following page) is defective. See "**Using the Error Code Chart**", below, to find and replace the appropriate RAM chip.
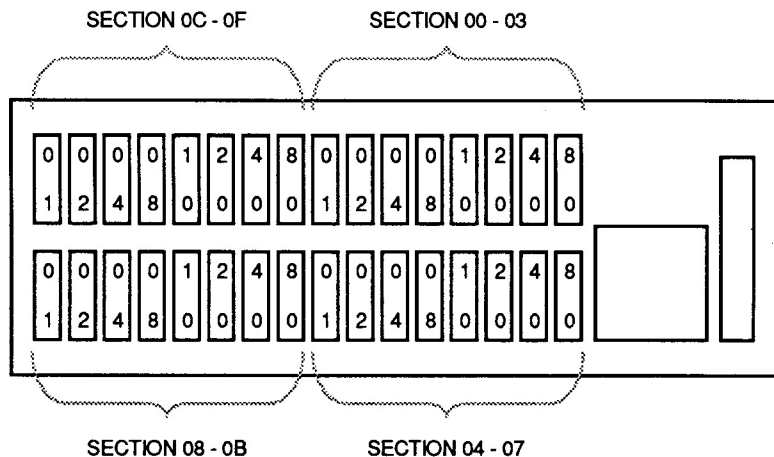

Figure 5

MEMORY EXPANSION ERROR CODE CHART

Address Error

An address error usually indicates a card failure. Remove all the customer's RAM chips, install them on an exchange module and run the test again. If the test passes, return the defective Memory Expansion Card to Apple for exchange. If the test fails, remove all but one bank of memory and re-test the card in increments of 256K.

Using the Error Code Chart

The Error Code Chart on the opposite page shows the locations of ICs on the card. Above each group of eight ICs is a section number corresponding to the **XX** in the error code. The numbers printed on each IC correspond to the RAM locator code (**ZZ**) in the error code. (The numbers are in hexadecimal notation.) To locate DATA ERROR 080000 - 40 using the chart:

1. Locate section 08 (IC locations U17 - U24)

2. Locate the IC shown in section 08 that contains the RAM locator code for 40. In this case, U18.

3. Replace the RAM chip.

Card Size Error

If the actual card size does not correspond to the card size displayed by the built-in diagnostic, you will need to exchange eight RAMs. For example, if the card size indicated by the internal diagnostic is 768K, and the actual RAM on the card is one megabyte, remove the RAM at locations U25 through U32. Install known good RAM chips at these locations and run the diagnostics.

1. If the card size is now correct, there may be one or more bad ICs among the RAM chips removed. Replace the removed RAM one at a time, testing after each installation, until the bad RAM is located.

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2. If the card size is still incorrect, this will indicate a **CARD FAILURE**. Remove all the customer's RAM chips and install them on an exchange module.

This procedure can be used for any card size problem. If you need assistance on memory configuration refer to **"Configure the Memory Expansion Card"**, described earlier in this procedure.