



EXPANSION CHASSIS
OPERATING MANUAL

Expansion Chassistm
Operating Manual

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Warranty

Introduction

If you own many peripherals for your Apple II computer*, you have probably run into the problem of too few slots for too many peripherals. The frequent "card swapping" you must do to cope with this problem is inconvenient and can be damaging to your peripheral cards. The Expansion Chassis offers a solution to this problem by providing you with an abundance of peripheral slots.

The Expansion Chassis is compatible with Pascal, as well as Integer BASIC, Applesoft BASIC and the Monitor. It can be controlled with software, hardware or a combination. In addition, each Expansion Chassis has its own power supply and provides 30 watts of continuous power.

Each Expansion Chassis has eight peripheral I/O slots, and you can use from one to four Expansion Chassis in one Apple. Since each Expansion Chassis requires only one Apple slot for its interface card, you are effectively allowed up to 36 peripheral I/O slots for one Apple!

The Expansion Chassis is easy to use. It can be selected and deselected either through software or by pressing a button on its faceplate. A special light indicates whether the Expansion Chassis is selected or deselected at any given time.

Because the Expansion Chassis's slots are numbered from 0 to 7, just like the Apple's, you must choose between the Apple's bank of peripheral slots and the Chassis'. If you have more than one Expansion Chassis, you must also choose between Chassis. The Expansion Chassis is equipped with a special "jumper" to let you select each Chassis with a unique command.

*Apple II is a trademark of Apple Computer Inc. of Cupertino, CA.

Chapter 1

Installation

The Expansion Chassis is easy to install, but take care to install it correctly. The directions for installing your Expansion Chassis appear in this chapter as step by step instructions. If you follow all the directions in this chapter carefully, you should have no trouble installing the Chassis.

If you are familiar with the installation procedure, you may want to refer to the brief installation summary in Appendix C instead of rereading this entire chapter. However, if this is your first time installing an Expansion Chassis, read this chapter thoroughly and carefully, following all the instructions as you read.

What You Need

To use your Expansion Chassis you need only an Apple II or II Plus. All Mountain Computer peripherals and many other well designed peripheral cards will work in the Expansion Chassis. For information on installation considerations and limitations for the Expansion Chassis, see Appendix A in this manual.

An optional item you may find useful is an IC puller, a small tweezer-like device used to remove IC's. You can probably get one at your local computer or electronics store. You'll find that installing the Expansion Chassis is a little easier if you have an IC puller, but you don't have to have one.

Unpacking

The Expansion Chassis was packed in a specially designed carton to insure its safety during shipping. The smaller box in which you found this manual contains items necessary for installation of the Expansion Chassis. The Expansion Chassis itself was packed beneath the smaller box and suspended between styrofoam supports. As you unpack the Expansion Chassis notice how it was packed, and save the packing materials. At some time you may need to repack your Expansion Chassis, for example, if you wish to ship it for servicing.

Packing List

As you unpack your Expansion Chassis, check that the following items are included:

- an Expansion Chassis
- a smaller box containing the following:
 - a manual
 - a Warranty
 - a power transformer
 - an Expansion Chassis Interface Card
 - a large ribbon cable with a 50 pin connector on each end
 - a small ribbon cable with a 16 pin header on each end

If any of these items are missing from your package, see your dealer.

NOTE: As you are unpacking, be careful not to drop the Expansion Chassis or bump it against a hard surface. A sharp impact can damage the components inside the Expansion Chassis.

Before Plugging In

Before you begin installing the Expansion Chassis, lay all the necessary items within easy reach. This will help make the installation procedure go smoothly and quickly. In addition, make sure the Apple's power is turned OFF. This is important! If you neglect to turn the power off, you may damage the Apple and/or the Expansion Chassis.

It's a good idea to familiarize yourself with the various parts of the Expansion Chassis before you actually begin installation. Let's take a look at these parts now.

The Box

The Expansion Chassis itself is housed in a buff-colored metal box. The front side of the box is black and is called the face plate. On the back of the Expansion Chassis you will find some narrow notches. These notches will allow peripheral card cables to extend from the Chassis. Notice that one of the notches is separated from the others and is fitted with an adjustable metal strain relief.

As you face the front of the Expansion Chassis you will see on the right edge of the face plate two LED lights, one green and one red, and a square shaped black button. The green light indicates whether the Expansion Chassis is powered up, and the red light indicates whether the Expansion Chassis is selected. The button is used to select and deselect the Expansion Chassis.

Now remove the top cover of the Expansion Chassis. The Expansion Chassis' cover is removed in much the same way as the Apple's. Lift the back edge of the cover at the corners until the two fasteners pop apart. Then slide the cover backward until it comes free.

CAUTION: Make sure you are not wearing or holding any metal, such as a ring or a paper clip, on your hands during the installation procedure! If the metal touches parts of the power supply you could get a shock.

The Mother Board

Because the Expansion Chassis is now empty, you have a perfect opportunity to examine the mother board in detail. Following is a labelled diagram of the Expansion Chassis mother board.

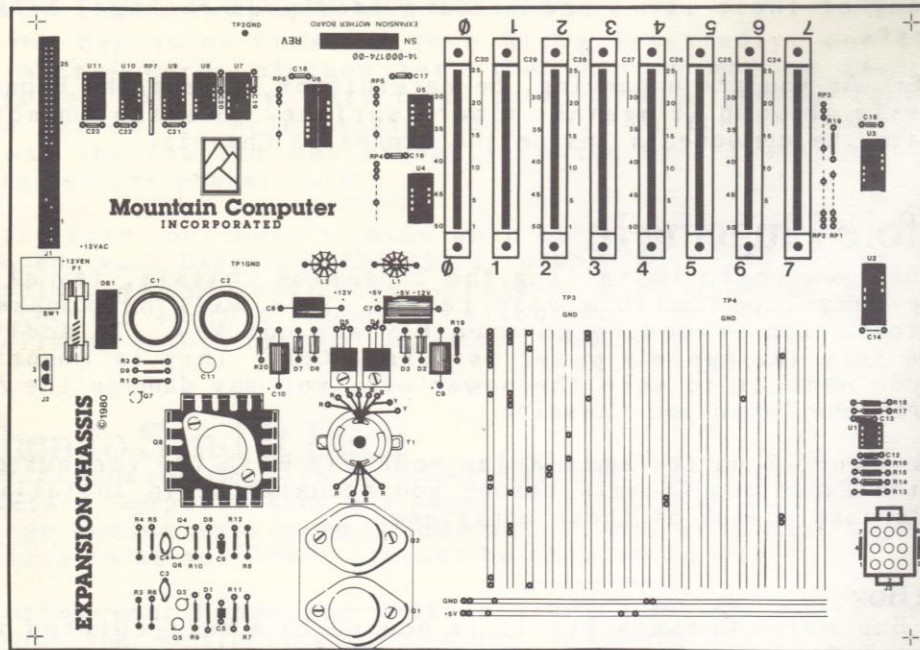


Figure 1--The Mother Board

Notice the twin cylinders near the left edge of the Chassis. These are capacitors. Directly to the left of the cylinders is a clear glass fuse. In front and to the right of the cylinders is a short, round, black transformer with wires extending from it to the mother board. The components in this area of the mother board comprise the power supply. Do not touch anything in this area (unless you are replacing the fuse) even when the power is off, or you may get an electrical shock.

NOTE: If the Expansion Chassis power supply is overloaded, the fuse will blow. Replace it with a BUSS MDX 1-1/2 amp. fuse, which you can get at an electronics, hardware or autoparts store. Detailed instructions on identifying and replacing a blown fuse can be found in Appendix B -- Trouble Shooting.

Along the back edge of the Expansion Chassis are eight peripheral card slots, numbered from 0 to 7. These slots behave almost exactly like peripheral slots in the Apple.

In the left rear corner of the mother board is a 50 pin "male" connector labelled "J1". Notice the white "1" at the lower right edge of the connector and the "25" at its upper right edge. This is where the 50 pin ribbon cable will be attached.

The Interface Card

The Expansion Chassis Interface Card that will plug into the Apple has white labels that indicate its various components. Following is a labelled diagram of the Expansion Chassis Interface Card.

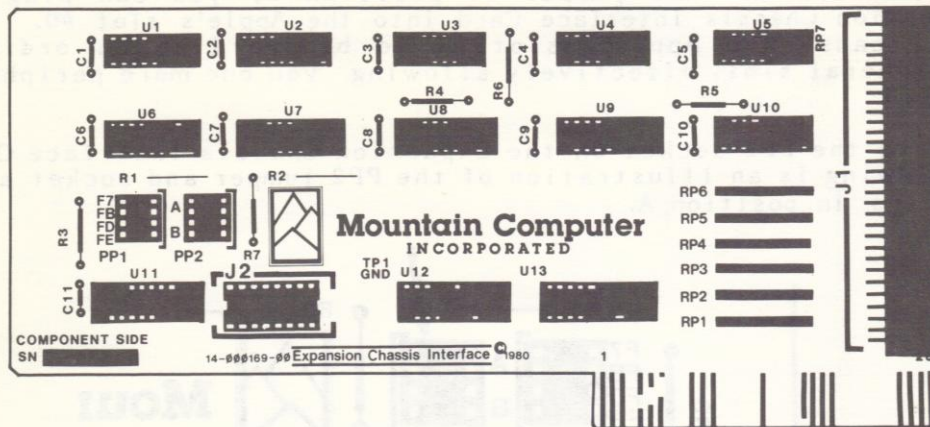


Figure 2--The Interface Card

The Expansion Chassis Interface Card is a little different from most peripheral cards. Notice that it has a 50 pin connector on one edge. There are also two "jumpers" near the left edge of the Expansion Chassis Interface Card. The jumpers have two pins each and are plugged into the sockets labelled "PP1" and "PP2".

The setting of the PP1 jumper is important if you will be using more than one Expansion Chassis in a single system. See the section called "Multiple Expansion Chassis" for more information on setting this jumper.

The setting of the PP2 jumper determines how the Apple's slot #0 will be used. See the following section called "The PP2 Jumper" for directions on setting this jumper.

The PP2 Jumper

There are two PP2 jumper settings, A and B. When the jumper is in position A, slot #0 in the Apple is always active regardless of whether the Expansion Chassis is selected or deselected. If the PP2 jumper is in position B, slot #0 in the Apple is active if the Chassis is deselected, but slot #0 in the Expansion Chassis is active if the Chassis is selected.

The PP2 jumper is factory set at position A. If you are using a language ROM card you will probably want to plug the card into the Apple's slot #0 and leave the PP2 jumper in position A. This will insure that your language ROM card will not be deactivated when the Expansion Chassis is selected.

If you set the PP2 jumper at position B, you can plug the Expansion Chassis Interface Card into the Apple's slot #0. This will cause the Apple's slot #0 to behave like an ordinary peripheral slot, effectively allowing you one more peripheral slot.

Locate the PP2 socket on the Expansion Chassis Interface Card. Following is an illustration of the PP2 jumper and socket as it appears in position A.

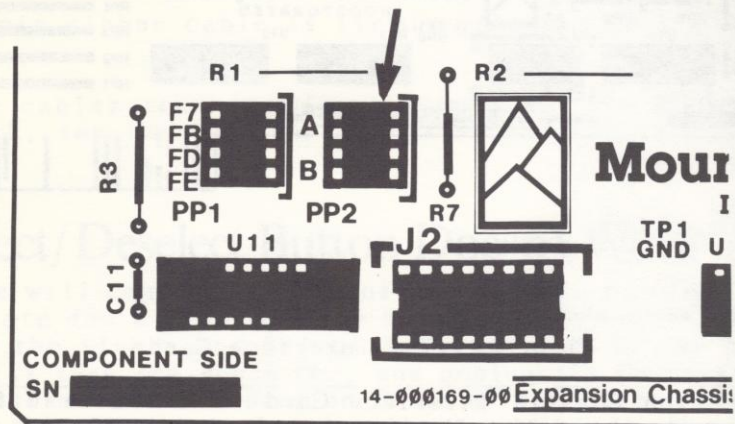


Figure 3--PP2 Jumper

There are two PP2 jumper settings, but there are four possible positions for the 2 pin jumper. The top position is for setting A, and the bottom position is for setting B. The two middle positions are not used.

To change the jumper setting, remove the jumper from its present position at setting A by pulling it straight out of the socket. Take care not to bend the pins. Then carefully plug the jumper into the B position. Again, make sure you do not bend the pins.

Putting It All Together

Now that you know what you are getting into, it's time to actually put the pieces together. This section will help you do just that.

The 50 Pin Ribbon Cable

The large 50 pin ribbon cable that came with your Expansion Chassis is for attaching the Chassis to the Expansion Chassis Interface Card. This cable has two 50 pin "female" connectors, one on each end, which will plug into the 50 pin connectors in the Expansion Chassis and on the Expansion Chassis Interface Card.

It doesn't matter which end of the 50 pin ribbon cable is plugged into the Expansion Chassis and which into the Expansion Chassis Interface Card. However, the connectors on the cable must be oriented in a particular way. Each pin and socket in each connector is assigned a number from 1 to 50. It is important to plug the connectors in so that pin number 1 is plugged into socket number 1. If the connectors are plugged in the wrong way, neither your Apple or the Expansion Chassis will be damaged, but the Expansion Chassis will not work.

The connectors on the ribbon cable each have a white triangle in one corner, which points to socket 1. The colored stripe along one edge of the cable is on the same edge as socket number 1. These markings will help you orient the cable correctly.

As indicated earlier, labels indicating pins 1 and 25 are located next to the 50 pin connector inside the Expansion Chassis. The 50 pin connector on the back edge of the Expansion Chassis Interface Card has no such labels, but pin 1 is in the bottom corner (next to the gold plated peripheral slot connectors.)

First plug the ribbon cable into the Expansion Chassis Interface Card so that socket 1 on the cable corresponds to pin 1 on the Expansion Chassis Interface Card. The red stripe and the white triangle should be at the bottom edge of the card.

Now plug the other end of the ribbon cable to the connector inside the Expansion Chassis so that pin 1 in the Chassis is plugged into socket 1 on the cable. The white triangle should be lined up with the pin 1 label next to the connector. Check that the red stripe is toward you as you face the front of the Chassis.

Check the connections on both the Expansion Chassis Interface Card and the Expansion Chassis to make sure the connectors are firmly attached. The following illustration shows the correct arrangement of the Expansion Chassis, 50 pin ribbon cable, and Expansion Chassis Interface Card.

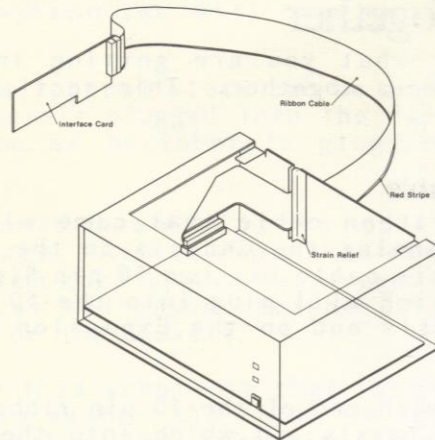


Figure 4--50 Pin Ribbon Cable Installed

The Small 16 Pin Ribbon Cable

One end of the 16 pin ribbon cable will plug into the IC socket labelled "J2" on the Expansion Chassis Interface Card, and the other end of the cable will plug into an IC socket in the Apple's mother board. As with the 50 pin ribbon cable, it is important that pin 1 on the cable correspond to pin 1 on the IC socket.

The connectors on each end of the 16 pin ribbon cable are marked at pin 1 to make installation easier. The particular mark on the connectors will vary, depending on the cable you have. Connectors will be marked with either a dot, arrow, or a small notch.

To locate pin 1 on the J2 socket, lay the Interface Card so that the component side is facing up and the Mountain Computer label is right side up. When the Interface Card is oriented this way, pin 1 on the J2 socket is in the lower left corner.

Now plug the 16 pin connector into the J2 socket so that the mark indicating pin 1 corresponds to pin 1 on the J2 socket. Check that the connector is firmly seated in the socket and that none of the pins are bent. The next section will tell you how to plug the 16 pin connector into the Apple.

Installing the Interface Card

The Expansion Chassis Interface Card can be plugged into any Apple slot including slot #0 if you are not using the Apple Language System. If you are using the Apple Language System, the Language Card must be plugged into the Apple's slot #0, and the Expansion Chassis Interface Card plugged into another Apple slot.

Because Pascal is a slot-dependant language there are limitations on its use in conjunction with the Expansion Chassis. For now, use slot #7 for your Expansion Chassis Interface Card if you are using Pascal. (The Pascal slot issue will be discussed in detail in the section called "If You Are Using Pascal ..." later in this chapter.) If you are not using Pascal, any Apple peripheral slot, including slot #0, will work equally well.

Plugging Into the Apple

It is easier to install the Expansion Chassis Interface Card if you temporarily remove all other peripheral cards from the Apple.

NOTE: Make sure your Apple is turned **OFF** before you remove or insert anything!

Plug the Expansion Chassis Interface Card into the slot you have chosen. Arrange the large 50-pin ribbon cable so that it passes through the opening with the built-in strain relief on the rear of the Apple's case. Make sure the card is seated firmly and is plugged all the way in the slot. **If the card is not properly plugged in, your Apple may be damaged when you turn the power on.**

To complete installation of the Expansion Chassis Interface Card you must remove an IC from the Apple's mother board and plug the Expansion Chassis Interface Card's small ribbon cable into the empty socket. The IC you must remove is the third one from the right in row F, immediately to the right of the large IC labelled "ROM D0". (Look along the left edge of the Apple's mother board for the letter labels for each row.) This IC is number F12. The following photographs show the IC's position in the Apple.

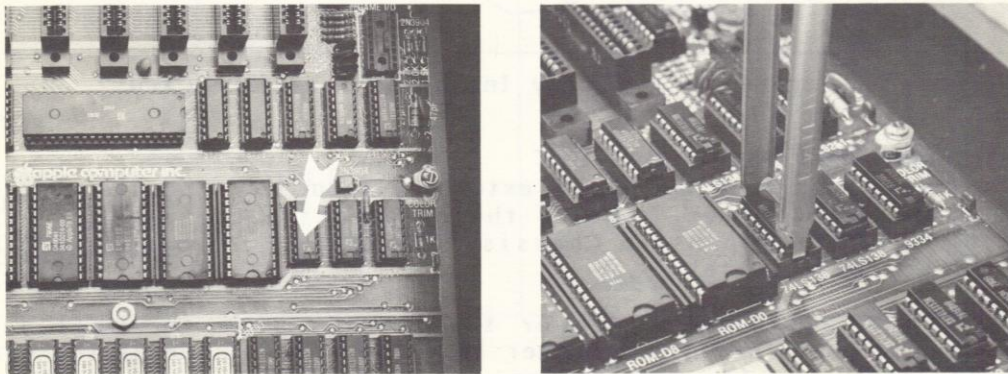


Figure 5--IC Being Removed

Notice the small notch on the edge of the IC that is closest to the keyboard. If you ever wish to replace this IC, you must plug it in so that the notch is toward the keyboard.

Gently remove the IC by sliding the edges of the IC puller (or your fingernails) under it, as shown in the photograph above, and slowly pulling straight up. Be careful not to bend the pins on the IC. When the IC has been removed, label it, and store it away in a safe place. If you ever wish reconfigure your system without the Expansion Chassis, you will need to replace this IC.

One edge of the 16 pin connector on the free end of the small ribbon cable is marked with a notch or a dot. Carefully plug the connector into the vacant socket so that, as you face the Apple keyboard, the marked edge is toward the front. If there are other peripheral cards plugged into your Apple, thread the ribbon cable under them.

When the cable has been plugged in, inspect the socket to make sure no pins are sticking out. (That's what happens if you try to force bent pins!) If pins are sticking out, remove the connector, carefully straighten the pins, and repeat the plugging in procedure. Following is an illustration of a correctly installed Expansion Chassis Interface Card.

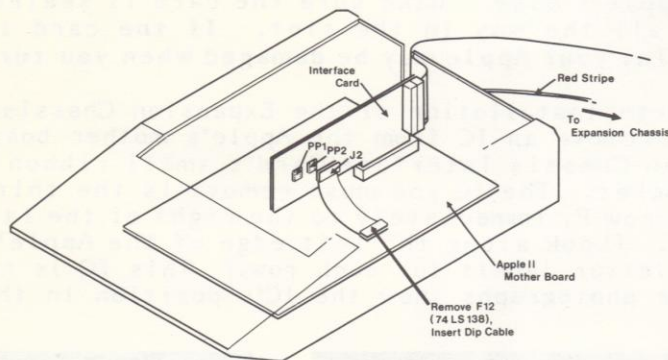


Figure 6--Correctly Installed Interface Card

Attaching the Power Transformer

The black box with two cords extending from its opposite ends is a power transformer. One of the cords has a socket that will plug into the Expansion Chassis. The other cord plugs into an ordinary wall outlet.

NOTE: DO NOT plug the power transformer into the wall yet! Plugging the power transformer into the wall is one of the very last steps, and for good reason.

On the back edge of the Expansion Chassis is a plug that the power transformer socket will attach to. Plug the power transformer connector cord into the Expansion Chassis. If you have trouble plugging it in, it may be backwards. If so, turn it around and try again.

Installing Other Peripheral Cards

Now you are ready to install your other peripheral cards. With 15 slots available, you can configure your system in a variety of ways. You will find that you have the same slot freedom in the Expansion Chassis that you have with the Apple. That is, you can plug peripheral cards into any slot you wish except slot #0, which has limitations. Slot #0 in the Expansion Chassis has the same limitations as Apple's slot #0.

If You Are Using Pascal

Pascal, as implemented on the Apple II, is a slot-dependant language. This means that Pascal expects certain peripheral slots to contain only certain types of peripherals. For example, with the Pascal System slot #1 can only contain a printer or other similar output device.

When you are using the Expansion Chassis, only one bank of peripheral slots will be addressed by Pascal's slot assignment scheme. All the Pascal peripherals (excluding the Language Card itself) must be plugged into that bank of slots. For example, if your disk controller cards, are plugged into the Expansion Chassis, your external terminal, printer, and all other Pascal addressed peripherals must also be plugged into the Expansion Chassis. Your Apple must contain the Language Card. Auxillary peripherals, such as a second printer or the Apple Clock can also be plugged into the Apple.

The Last Steps

If you have followed all the directions in this chapter so far, you are now ready to complete the last installation steps. These steps are the same no matter what system configuration you are using.

Replace the Expansion Chassis top cover. Slide the cover into place and press on the rear corners until the fasteners snap together. The remaining step is to plug the Expansion Chassis power transformer into a grounded electrical outlet. If you are using more than one Expansion Chassis make sure each power transformer is plugged in.

Multiple Expansion Chassis

Each Expansion Chassis must be connected to an Expansion Chassis Interface Card, which must be plugged into an Apple. You can't use one Expansion Chassis Interface Card for more than one Expansion Chassis. Neither can you plug an Expansion Chassis Interface Card into an Expansion Chassis, or the Chassis will not work.

If you are using more than one Expansion Chassis with one Apple, you will need to reset the PPI jumpers on the Expansion Chassis Interface Cards for every additional Chassis you install. By setting the PPI jumpers you can determine exactly which data bit will select which Chassis.

The PPI Jumper

If you examine the PPI jumper socket closely, you will see that it is divided into four possible jumper positions. Each position represents a different setting, and each setting is labelled with a silk screened hexadecimal number at the left edge of the socket. On the next page is an illustration of the PPI jumper.

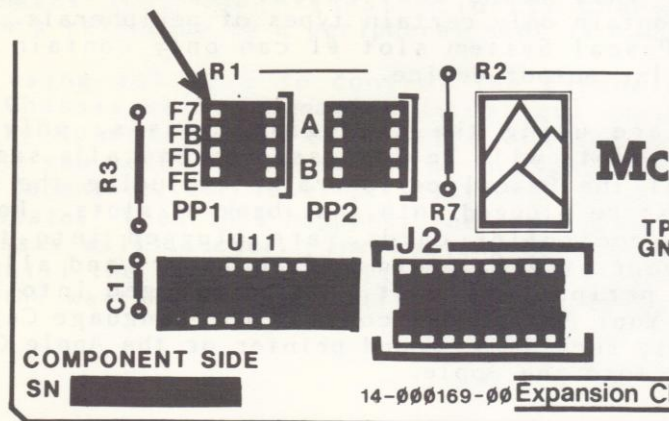


Figure 7--PPI Jumper

You must change the PPI jumper settings so that each Expansion Chassis uses a different one. We recommend that you use the following settings for your Chassis.

- first Chassis -- FE
- second Chassis -- FD
- third Chassis -- FB
- fourth Chassis -- F7

The PPI jumpers are all set at position FE at the factory. One Expansion Chassis can be left at this setting, but the others must be changed.

To change the PP1 jumper setting, you must move the 2 pin jumper to a different position. Carefully remove the jumper by pulling it straight out of the connector. Then, being careful not to bend the pins, plug it into the position you have chosen. Change the PP1 jumper settings for each additional Expansion Chassis, using a different setting each time.

The PP2 Jumper With Multiple Chassis

The section earlier in this chapter called "The PP2 Jumper" discusses the PP2 jumper in detail. Multiple Expansion Chassis systems use the PP2 jumper as described in that section except for one consideration. All Expansion Chassis in a multiple Chassis system must have the same PP2 jumper setting. If all Expansion Chassis have their PP2 jumpers set at A, the Apple's slot #0 will be used when slot #0 is indicated, as you would expect. If they are set at B, slot #0 in the Chassis which is currently selected will be used.

Multiple Interface Cards

Now you are ready to plug the Expansion Chassis Interface Cards into the Apple. One Expansion Chassis Interface Card should be installed exactly as described in the section that appears earlier in this chapter, called "Plugging In". The other Expansion Chassis Interface Cards are a little simpler to install.

Additional Expansion Chassis Interface Cards don't require the 16 pin ribbon cable. (When installing them, omit the steps in which you attach the ribbon cable to the Expansion Chassis Interface Card and plug the ribbon cable into the Apple's mother board.) Simply plug these Interface Cards into the peripheral slot you have chosen.

The Expansion Chassis Interface Cards can be plugged into any available Apple peripheral slot. However, there is a priority scheme. To get the most out of the priority scheme, plug the first Chassis into the lowest numbered slot (the highest priority), the second Chassis into the next lowest numbered slot, etc. The priority scheme will be discussed in more detail in the following chapter, which discusses operation of the Expansion Chassis.

Chapter 2

Operating the Expansion Chassis

Your Expansion Chassis should now be fully installed and ready to use. To turn on your Expansion Chassis, turn on the Apple. The Expansion Chassis power supply turns on or off when it senses that the Apple has been turned on or off. The Expansion Chassis will not receive any power unless the Apple is turned on.

There are no software requirements for the Expansion Chassis. Software that works with the Apple II, including Pascal programs, should work with the Expansion Chassis. However, you may wish to enhance the Expansion Chassis' usefulness by customizing your software to make the most of the additional peripheral slots.

Select and Deselect

The Expansion Chassis can be in either select mode or deselect mode. Switching back and forth between these conditions allows you to alternate between the peripheral slots in the Apple and those in the Chassis.

When the Expansion Chassis is deselected, the Apple's peripheral slots are selected. That is, if you refer to slot #4, the peripheral card in the Apple's slot #4 will respond. When the Expansion Chassis is selected and you refer to slot #4, the peripheral card in the Chassis' slot #4 will respond.

The current mode of the Expansion Chassis is indicated by the two lights on the Chassis faceplate. The green light indicates that the power is on (i.e. the Chassis is properly installed and the Apple is turned on). The red light indicates that the Expansion Chassis is selected. When the Expansion Chassis is first turned on, only the green light should go on, indicating that the power is on but the Chassis is deselected.

There are two ways to change the Expansion Chassis' mode. The simplest method is to press the black button on the face plate below the green and red lights. When you do this, the red light comes on, indicating that the Expansion Chassis is selected. Pressing the button again causes the red light to go off, indicating that the Chassis is deselected. You can switch modes with this button at any time.

NOTE: Pressing the button while software is being executed may cause your software to behave unpredictably.

It is often more convenient to switch the Expansion Chassis' modes through software. The exact method for switching modes through software depends on the computer language you are using. The following sections present the software commands for selecting and deselecting the Expansion Chassis.

NOTE: The Expansion Chassis select/deselect uses the cassette port address. However, under normal conditions the Expansion Chassis does not interfere with the operation of a cassette player, nor does the cassette player interfere with the operation of the Expansion Chassis. The Expansion Chassis and cassette recorder will hinder each other only if the cassette player is recording or playing while the Expansion Chassis is switching modes.

Switching Modes From BASIC or the Monitor

If you are using Integer BASIC, Applesoft BASIC, or the Monitor, switching the Expansion Chassis from mode to mode is simply a matter of inserting a value into a memory location. This can easily be done either in immediate execution mode or from a program.

Integer BASIC

To select the Expansion Chassis from Integer BASIC, simply type the command

```
POKE -16352,254
```

The red light on the Expansion Chassis' face plate will then come on to indicate that the Chassis is selected.

This command only selects an Expansion Chassis with a PPI jumper setting of FE. If you are using more than one Expansion Chassis, you can select the Chassis with other PPI settings by replacing the 254 in this command with one of four other values. See the Software Commands Table later in this chapter for a list of the values you must use.

To deselect the Expansion Chassis from Integer BASIC, type

```
POKE -16352,255
```

and the red light will go off, indicating that the Chassis is deselected. If you are using more than one Expansion Chassis, this command will deselect all of them. To deselect just one Chassis of several, use the above command to deselect all of them. Then reselect only the Chassis you want.

Applesoft BASIC

Controlling the Expansion Chassis from Applesoft is almost exactly like the Integer BASIC procedures. To select the Expansion Chassis from Applesoft, type

```
POKE 49184,254
```

As with Integer BASIC, you can select Chassis with other PPI settings by replacing the 254 with another value. See the Software Commands Table for a list of these values.

To deselect the Expansion Chassis from Applesoft, type

```
POKE 49184,255
```

This command will deselect all the Chassis plugged into your Apple. To deselect one of several Expansion Chassis, first use this command to deselect them all, and then reselect the one you want.

The Monitor

To select the Expansion Chassis from the Monitor, type

```
C020:FE
```

As with both versions of BASIC, the hexadecimal value FE in this statement will have to be replaced if you are using Expansion Chassis with different PPI settings. You will find the appropriate values with which to replace the FE in the Software Commands Table.

To deselect the Expansion Chassis from the Monitor, type

```
C020:FF
```

If there are more than one Expansion Chassis installed in your Apple, this command will deselect them all. To deselect one of several Expansion Chassis, first deselect them all with the command above, and then reselect the one you want.

Switching Modes From Pascal

Selecting or deselecting the Expansion Chassis from Pascal is a little different from doing the same thing from BASIC or the Monitor. There is no single command to access a particular memory location. However, embedding two short Pascal procedures in your program will allow you to select or deselect your Chassis from Pascal.

The two Pascal procedures are given below. The first procedure, when called in a program, selects the Expansion Chassis. The second procedure deselected it. Neither of these procedures require parameters.

Here's the Select procedure:

```
PROCEDURE EXCHON;  
  
CONST  EXPANCH=-16352;  
        SELECT=254;  
  
TYPE   MEMORY=PACKED ARRAY[0..0] OF 0..255;  
  
VAR    ADDR: INTEGER;  
        P:^MEMORY;  
  
BEGIN  
    ADDR:=EXPANCH;  
    MOVELEFT(ADDR,P,2);  
    P^[0] :=SELECT  
END;
```

This procedure will only select an Expansion Chassis with a PPI jumper setting of FE. If you are using more than one Expansion Chassis, you can modify this procedure slightly to select your other Chassis by replacing the value in the third line of the procedure, SELECT=254;, with a different value. The values you must use are given in the Software Commands Table.

Here's the Deselect procedure:

```
PROCEDURE EXCHOFF;  
  
CONST  EXPANCH=-16352;  
        DESELECT=255;  
  
TYPE   MEMORY=PACKED ARRAY[0..0] OF 0..255;  
  
VAR    ADDR: INTEGER;  
        P:^MEMORY;  
  
BEGIN  
    ADDR:=EXPANCH;  
    MOVELEFT(ADDR,P,2);  
    P^[0] :=DESELECT  
END;
```

If you are using more than one Expansion Chassis, this procedure will deselect all of them. To deselect one of several Expansion Chassis, first deselect all of them with the above procedure, and then reselect the one you want with the Select procedure.

NOTE: These procedures will not work by themselves. As with all Pascal procedures, they must be incorporated in a program and compiled.

The Priority Scheme

If you are using more than one Expansion Chassis, you should be aware of the built-in Expansion Chassis priority scheme. The priority scheme insures that only one Expansion Chassis operates at a time.

In general the Expansion Chassis with the highest priority is the one in lowest numbered peripheral slot. For example, an Expansion Chassis plugged into the Apple's slot #2 is of a higher priority than another Expansion Chassis that is plugged into slot #4. This means that the highest priority Chassis will be selected when a reference to a peripheral slot is made.

If you are using software to control the Expansion Chassis, selecting a Chassis will automatically deselect any others that are currently selected. However, if a Chassis is currently selected, and you select another one by pressing the button on the Chassis' faceplate, the lower priority Chassis will be put in a "waiting" state. When this happens, the red light on the lower priority Chassis will flicker. The waiting Chassis will stay in this state until the higher priority Chassis is deselected, at which point the waiting Chassis will automatically be selected.

The Software Commands Table

The following table shows all the commands discussed in this chapter. This table assumes that, if you are using more than one Chassis, you arranged their PPI jumpers as suggested in this manual.

	SELECT	DESELECT
Integer BASIC Chassis 1 Chassis 2 Chassis 3 Chassis 4 All Chassis	POKE -16352,254 POKE -16352,253 POKE -16352,251 POKE -16352,247 POKE -16352,0	POKE -16352,255
Applesoft BASIC Chassis 1 Chassis 2 Chassis 3 Chassis 4 All Chassis	POKE 49184,254 POKE 49184,253 POKE 49184,251 POKE 49184,247 POKE 49184,0	POKE 49184,255
The Monitor Chassis 1 Chassis 2 Chassis 3 Chassis 4 All Chassis	C020:FE C020:FD C020:FB C020:F7 C020:00	C020:FF
Pascal Chassis 1 Chassis 2 Chassis 3 Chassis 4 All Chassis	SELECT=254 SELECT=253 SELECT=251 SELECT=247 SELECT=0	DESELECT=255

Figure 8--Software Commands Table

Some Helpful Tips

As you use your Expansion Chassis, you will find that it is good for more than just adding peripheral slots. There are some things you can do with an Expansion Chassis that you just couldn't do with an Apple, no matter how many peripheral slots it had.

For example, if you have a hard-copy print routine that insists your printer be in slot #1, you can switch between two different printers without modifying your software. If you have, say both a dot matrix and a letter quality printer, you can plug one into slot #1 in the Apple and the other into slot #1 in the Expansion Chassis and switch between the two by deselecting or selecting the Expansion Chassis at strategic points in the program's operation.

Here's another idea. If you have an Auto Start ROM you can autoboot disk drives plugged into the Expansion Chassis by simply holding in the Select/Deselect button on the Chassis face plate while you turn the Apple on. Another way to autoboot disk drives in the Expansion Chassis is to press the RESET key.

If you discover some clever ways to use the Expansion Chassis, we at Mountain Computer would love to hear about them in writing.

Appendix A

Installation Considerations

Your Expansion Chassis is a useful and versatile enhancement to your Apple II computer system. Every computer product designed to be used with the Apple has limitations simply because there are so many products available for the Apple, and thus many possible system configurations. This section on limitations of the Expansion Chassis' use has been included in the manual so that you can get the most from your Chassis.

Processors Verses Peripherals

Some peripheral cards are also microprocessor cards. For this reason, processor cards, such as the Microsoft Z80 cardtm, will not work in the Expansion Chassis. However, you can use processor cards in conjunction with your Expansion Chassis by always plugging them into the Apple.

Video Cards

Peripheral cards that change the Apple's video display take extensive control of parts of the Apple, and thus often interfere with peripheral devices. These video cards can cause problems when used in conjunction with the Expansion Chassis.

If a video card is active in your Apple and you select the Expansion Chassis your system may "hang", and you may have to power down the Apple to recover. To avoid this problem, make sure any video cards in your Apple are not in an active state while the Expansion Chassis is selected. Video cards will work normally if the Expansion Chassis is deselected.

Jumpers to the Mother Board

Any peripheral card with a jumper that plugs into the Apple's mother board should be plugged into the Apple, not the Expansion Chassis. In most cases the cable connecting the peripheral card to the Apple's mother board is not long enough to reach from the Expansion Chassis to the Apple. Even if the cable is long enough, it is inconvenient to have unnecessary cables and wires stretched between the Apple and the Chassis.

Selectable Slot Banks

The Expansion Chassis doesn't just augment your Apple's peripheral capacity with eight additional peripheral slots. Instead you get another bank of slots. For example, with a single Chassis system you will have two banks of peripheral slots.

No two bank of peripheral slots can be active at the same time. Therefore, peripherals plugged into the Apple can't be operating at the same time as peripherals plugged into the Expansion Chassis.

NOTE: An exception to this rule is the Apple Language System with the Pascal language. As was explained earlier in this manual, the Language System card should be plugged into the Apple's slot #0, and the Pascal addressed peripherals can be plugged into either the Apple or the Chassis.

One advantage to this scheme is that slot designations in your software apply to either the Apple or the Expansion Chassis, depending on whether the Expansion Chassis is selected or deselected. This lets you switch back and forth between two similar peripherals (such as two disk drives) by simply selecting and deselecting the Expansion Chassis.

Some Ideal Chassis Peripherals

Following is a list of peripherals that are especially convenient to use from the Expansion Chassis. This list is just a small sample to give you a general idea of the types of peripherals that work well in the Expansion Chassis. As you use your Expansion Chassis you will find that many other peripherals work equally as well as those mentioned.

Mountain Computer Products

Apple Clocktm

SuperTalkertm

MusicSystemtm

ROMPLUStm

A/D + D/Atm

Introl X-10tm

ROMWRITERtm

Other Products

Micromodem IItm *

Speechlinktm **

In General

serial or parallel cards

disk drives

NOTE: Because of their design some types of peripheral cards don't work as well when installed in the Expansion Chassis. If you find that one of your peripherals doesn't seem to work well when plugged into the Expansion Chassis, try installing it in the Apple.

* Micromodem II is a trademark of Hayes Microcomputer Products Inc.

** Speechlink is a trademark of Hueristics Inc.

Appendix B

Trouble Shooting

Even though your Expansion Chassis was carefully designed and built with quality materials, you may have a problem with it at some point. You can solve some of these problems yourself. Other problems need the attention of experts. The purpose of this section of the manual is help you determine which kind of problem you have, and if possible, help you solve it yourself.

It Doesn't Work At All

If the lights on Expansion Chassis' faceplate do not come on and the Chassis doesn't respond to commands, one or more critical cables may have come loose. Turn the Apple OFF and unplug the Chassis. Then check that

- the power transformer is properly attached to the Chassis.
- the 50 pin ribbon cable is firmly attached to the Chassis.
- the 50 pin ribbon cable is firmly attached to the Interface Card.

If all the cables seem firmly attached, but the Chassis still doesn't work, see the section in this Appendix called "Replacing the Fuse".

The Select/Deselect Button Doesn't Work

If software will control the Expansion Chassis, but the lights on the faceplate don't go on and the button doesn't work, the block that holds the lights and Select/Deselect button may have come loose. First turn the Apple OFF, and unplug the Chassis from the wall. Then remove the Expansion Chassis' top cover. Inside the Chassis in the right front corner is a small block that holds the lights and button on the Chassis faceplate. Check that the wires connecting this block to the Chassis' mother board are secure.

Replacing the Fuse

Perhaps the most likely problem to occur is a blown fuse. If you are careful, you should never have to replace the fuse. However, replacing the fuse is not difficult or complicated.

The fuse in the Expansion Chassis acts as a safety device. If something goes wrong and the electrical current in the Chassis is greatly disturbed, the fuse will blow out, breaking the electrical circuit and thus saving the Expansion Chassis' power supply from severe damage.

Here are some reasons that the fuse might blow out:

- A peripheral card is not properly plugged into the Chassis.
- A defective peripheral card is plugged into the Chassis.
- Metal, such as a paper clip or ring, comes in contact with the power supply.
- Liquid is spilled inside the Chassis.

You can reduce the likelihood of a blown fuse by avoiding the situations listed above.

Identifying a Blown Fuse

The most obvious indication that you may have a blown fuse is if the Expansion Chassis will not work. If the fuse is blown, the green and red lights on the Chassis faceplate will not work and the Chassis will not respond to any commands.

NOTE: Before you run out to buy a new fuse, make sure that the Apple in which the Expansion Chassis is plugged is on and the Expansion Chassis itself is plugged in to the wall. This may sound silly, but check anyway. It might save you time and money.

If the Expansion Chassis seems to be hooked up correctly and it still doesn't work, you should check the fuse. Before you remove the Chassis' top, unplug it from the wall. This is important! If you touch parts of the power supply while the Chassis is plugged in, you may get a shock, and the fuse will probably blow out if it hasn't already.

Remove the Chassis' top cover and examine the fuse. (If you don't remember where it is, see the drawing of the mother board in Chapter 1 of this manual.) A healthy fuse of this type is completely clear. If the fuse is blown it may be slightly discolored. If the fuse is not discolored that doesn't necessarily mean it is not blown, however. To check for certain, hold the fuse gently between your thumb and forefinger, and pull it out. Then look for the thin wire that runs through its length. If this wire is broken, the fuse is definitely blown.

The Right Fuse for the Job

If you have determined that your Expansion Chassis does need a new fuse, go to your local electronics, hardware, or autoparts store and buy a BUSS MDX 1-1/2 amp. fuse.

Installing the New Fuse

The new fuse is easy to install. Just push it gently into the metal holders the old fuse was in, making sure the metal ends of the fuse come into contact with the metal holders. Don't worry about installing it backwards. This fuse doesn't have a backwards.

If the Fuse Repeatedly Blows

If the Expansion Chassis' fuse blows repeatedly, one of the peripheral cards plugged into the Chassis may be faulty or installed improperly. Try removing all the peripheral cards and then selecting the Expansion Chassis. If the fuse no longer blows, the problem was probably caused by a faulty or poorly installed peripheral card.

If the fuse continues to blow when all the peripheral cards are removed, your Expansion Chassis is probably not working properly. In this case, you will have to return it to us for service. See the section in this appendix called "When to Send It Back" for details on returning your Expansion Chassis for service.

When to Send It Back

Your Expansion Chassis is under warranty for 1 year, and we at Mountain Computer Inc. are happy to service it for you free of charge during this time. However, if you want your Expansion Chassis to be serviced, it must be shipped to us.

Shipping your Expansion Chassis takes time and money, not to mention the possibility that it may be damaged if it is not very carefully packed. To avoid these inconveniences when possible, as well as to speed up the time it takes to service your Chassis, we recommend that you try to isolate any problems you are having before you send your Expansion Chassis to us.

If your Expansion Chassis is not working properly, first check that the problem isn't one that you can take care of with the information in this appendix. If it isn't mentioned here, you will probably have to send your Expansion Chassis to us for service.

NOTE: Before returning your Expansion Chassis to us for repair, contact our Customer Service department for an authorization number. Your Expansion Chassis must be sent prepaid. See the warranty in the back of this manual for more information.

Appendix C

Installation Summary

If you have never installed an Expansion Chassis before, carefully read Chapter 1, Installation, following the instructions as you read. If you already know how to install an Expansion Chassis, you can skip Chapter 1, as this short summary probably has all the information you need.

Following is a list of installation steps. For more details, refer to Chapter 1.

- 1) Unpack the Expansion Chassis and lay all parts out within easy reach.
- 2) Attach the 50 pin ribbon cable to the Chassis and to the Interface Card. Make sure that socket 1 corresponds to pin 1 at each end. Plug the cable in so that the colored stripe is toward the front of the Chassis and toward the bottom edge of the Interface Card.
- 3) If you want to change the PP1 and PP2 jumpers, do so now. (For multiple Chassis systems, change the PP1 jumper. To use slot #0 for the Expansion Chassis Interface Card, change the PP2 jumper.)
- 4) Attach the smaller 16 pin ribbon cable to the Interface Card. Make sure pin 1 on the cable corresponds to pin 1 on the IC socket. Pin 1 on the ribbon cable connector is marked.
- 5) Remove the IC at location F12 on the Apple mother board (row F, third IC from the right).
- 6) Plug the Interface Card into the Apple. Then plug the free end of the smaller 16 pin ribbon cable into the socket on the Apple mother board that is now empty.
- 7) Plug the transformer into the connector on the rear of the Expansion Chassis.
- 8) Replace the Expansion Chassis' top cover, and plug the power transformer into an electrical outlet.

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WARRANTY

Your factory-built Mountain Computer Inc. product is warranted against defects in materials and workmanship for a certain year from the date of delivery. We will repair or replace products that prove to be defective during the warranty period provided they are returned to Mountain Computer Inc. No warranty is extended on products that have been subjected to repair and product that, in our opinion, has been subjected to abnormal electrical or mechanical stresses. Products less than a year out of warranty will be repaired at a nominal fee. Before sending your Mountain Computer Inc. unit in for repair, contact our Customer Service Representative for a Return Authorization Number.

Mountain Computer Inc.
1000 Mountain View Drive
Mountain View, CA 94035

Warranty

Limited Warranty for Mountain Computer Inc. Hardware

Your factory-built Mountain Computer Inc. product is warranted against defects in materials and workmanship for a period of one year from the date of delivery. We will repair or replace products that prove to be defective during the warranty period, provided they are returned to Mountain Computer Inc. No other warranty is expressed or implied. We reserve the right to refuse to repair any product that, in our opinion, has been subjected to abnormal electrical or mechanical abuse. Products less than two years out of warranty will be repaired for a nominal flat fee. Before sending your Mountain Computer Inc. unit in for repair, contact our Customer Service Representative for a Return Authorization Number.



Mountain Computer INCORPORATED

Located in the Santa Cruz Mountains of Northern California. Mountain Computer, Inc. is a computer peripheral manufacturer dedicated to the production of use-oriented high technology products for the microcomputer. On-going research and development projects are geared to the continual supply of unique, innovative products that are easy to use and highly complementary in a broad variety of applications.