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CompatiCard

User's Guide

CompatiCard IV

User's Guide

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Table of Contents

1.0 Introduction 1–1
1.1 Conventions Used in This Manual 1–1
1.2 Features 1–2
1.3 System Requirements 1–2

2.0 Overview 2–1
2.1 Primary and Secondary Controller Addresses 2–1
2.2 The BIOS ROM 2–2
2.3 Device Driver Software 2–2
2.4 DMA Channels 2–2
2.5 Interrupts 2–3

3.0 Quick Installation 3–1

4.0 Detailed Installation 4–1
4.1 Card Installation 4–1
4.1.1 Card Address (J1) 4–1
4.1.2 BIOS Address (SW1-1, 2, 3) 4–2
4.1.3 DMA Channel Selection (J2) 4–3
4.1.4 Interrupts (J2) 4–5
4.1.5 Dual Speed Drives (SW1-7) 4–6
4.1.6 Auto Boot (SW1-8) 4–7
4.1.7 External Power Jumpers (J3, J4, J5, J6) 4–8
4.1.8 Drive Types (SW2) 4–10
4.1.9 Drive Cable Connections (P2, P3, P4) 4–12
4.1.10 Inserting the Card 4–14
4.2 Software Installation 4–16
4.2.1 Copying the Master Diskette 4–16
4.2.2 Updating CONFIG.SYS 4–17
4.2.3 The NOROM Option 4–18

5.0 Using CompatiCard IV 5–1
5.1 Drive Letters (CCDRIVES) 5–2
5.2 Formatting Disks 5–3
5.2.1 CCFORMAT 5–3
5.2.2 BACKFMT 5–5
5.3 Disk Formats Supported 5–7
5.4 Auto Boot 5–9
5.5 720KB and 1.4MB Diskettes 5–10

6.0 Advanced Software Options 6–1
6.1 CC4DRV.SYS Device Driver 6–1
6.1.1 Determining the ADDRESS 6–2
6.1.2 Selecting the Drive TYPE 6–3
6.1.3 Specifying the STEP Rate 6–3

6.1.4 Altering the Disk CHANGE Flag 6–4
6.2 Overriding Default Parameters 6–5
6.3 Using the DOS FORMAT Command with CompatiCard IV 6–8
6.3.1 Using FORMAT with CC4DRV.SYS Installed 6–9
6.3.2 Using FORMAT without CC4DRV.SYS 6–9
6.3.3 DOS FORMAT Command Option Summary 6–10
6.4 Retaining Drive A after Auto Boot 6–11

Appendix A Performance Tips A–1
A.1 Disk Change Signal A–1
A.2 Using Pin 2 Density Select on 3.5 Inch Drives A–1
A.3 Single Speed versus Dual Speed 1.2MB Drives A–2
A.4 8 Inch Drive STEP Rates A–2

Appendix B Troubleshooting B–1
B.1 Symptoms B–1
B.2 Warning Message Summary B–5

Appendix C Technical Details C–1
C.1 Summary of Switch Settings C–1
C.2 I/O Ports C–2
C.3 Interrupt 13h Software Support C–3

Appendix D Cable Wiring D–1
D.1 Connector Pin Assignments D–1
D.2 DC Power for External Drives D–3
D.3 8 Inch Drive Cable Wiring D–4

Appendix E Update Policy E–1

Appendix F Technical Support F–1

Appendix G Hardware Warranty G–1

Appendix H Software License Agreement H–1

List of Tables

3–1 Drive Position Numbers and Drive Type Switch Settings 3–3
4–1 BIOS Address Switch Settings 4–3
4–2 DMA Channel Switch and Jumper Settings 4–4
4–3 Interrupt Level Jumper Settings 4–5
4–4 1.2MB Drive Spindle Speed Switch Settings 4–6
4–5 Auto Boot Feature Switch Settings 4–7
4–6 External Drive Power Jumper Settings 4–9
4–7 Drive Position Numbers and Drive Type Switch Settings 4–10
4–8 Connector Designations 4–12
5–1 Types of Drives and Formats Supported 5–8
6–1 Drive Position Numbers 6–2
6–2 Drive Type Numbers and Default Values 6–3
6–3 DOS Format Commands 6–10
6–4 DRIVER.SYS Commands to Retain Drive A after Auto Boot 6–12
C–1 SW1 Switch Settings C–1
C–2 SW2 Switch Settings C–2
C–3 I/O Ports Used C–2
D–1 Connector Pin Assignments D–2
D–2 External Drive Power Jumper Settings D–3
D–3 8 Inch Drive Wiring D–4

1.0 Introduction

Congratulations on your decision to purchase **Compati**Card IV, the most advanced floppy disk controller available for IBM PCs, XTs, ATs, and compatibles. With **Compati**Card IV, you can add any type of floppy drive to any computer that uses the PC/AT bus.

As personal computers have evolved there have been many changes in the type of diskettes used for storage—from 8 inch media to 3.5 inch media, with storage densities anywhere from 100KB per diskette to over 2MB per diskette. The original IBM PC sported single sided 160KB 5.25 inch drives, followed shortly by the popular 360KB drives. The IBM AT introduced us to the 1.2MB drive. The introduction of laptop computers and the IBM PS/2 series ushered in the use of 3.5 inch diskettes. While each drive has its advantages, each new type of diskette posed a problem for the existing base of computers. **Compati**Card IV solves these problems by letting any computer use any type of 3.5 inch, 5.25 inch, and even an 8 inch drive. Best of all, **Compati**Card IV supports all available formats regardless of whether you have a PC, XT, or AT.

Before you start installing **Compati**Card IV, take just a moment to read about its features, the conventions used in this manual, and the system requirements.

1.1 Conventions Used in This Manual

To make reading this guide a little easier, we have clarified certain conventions and phrases:

- "↵" means that you should press the RETURN or ENTER key.
- When you are to give a command to the computer, your inputs will appear in **boldface**.
- PCDOS and MSDOS are functionally the same operating system. If the system comes with an IBM computer, it's called PCDOS; if it comes with a compatible model, it's called MSDOS. We will refer to them both as DOS.
- Your computer needs to have a special type of disk to load the DOS operating system after the power is turned on. We will refer to this type of disk as a "DOS system disk." It must contain at least the DOS operating system, and it probably has one or two more utility programs on it. If your computer loads DOS from a hard disk, the hard disk drive is considered your DOS system disk.

- The process of loading DOS from your DOS system disk is sometimes referred to as "booting" the computer. The term is derived from "bootstrapping," wherein the computer uses a relatively simple built-in program to load in the rather sophisticated DOS operating system—picking itself up by its own bootstraps so to speak.

- This manual contains many examples which may be helpful in understanding the material under discussion. Examples are marked with a box around them and may be treated as optional reading.

1.2 Features

- Allows the installation of an IBM PS/2 compatible 3.5 inch drive (720KB, 1.4MB, or 2.8MB) in any PC, XT, or AT.
- Allows the installation of a 5.25 inch drive (360KB, 800KB, or 1.2MB) in any PC, XT, or AT.
- Works as a replacement for, or in addition to, existing controllers in PCs, XTs, and ATs.
- On-board ROM can boot from any attached drive.
- 250Kbps, 300Kbps, 500Kbps, and 1Mbps data transfer rates support all types of drives.
- Supports four drives, up to two external.
- Single and double density formats are supported on all drive types.

1.3 System Requirements

Check the system requirements listed here to make sure that you have everything needed for proper operation of **Compati**Card IV:

- IBM PC, XT, AT, or 100% compatible computer with:
  - 128K memory
  - DOS version 2 or above
  - One half-size expansion slot

2.0 Overview

Because of the wide variety of drive types and computers supported by **Compati**Card IV, several options must be selected before the card can be installed. A quick discussion of some of the important aspects of operation follows. It should help when you are selecting the installation options.

2.1 Primary and Secondary Controller Addresses

Every PC, XT, AT, or compatible is originally sold with a floppy controller in it. It may be on a separate plug-in card, it may share a card with some other portion of the computer, or it may be on the main board of the computer. We call that controller the Primary Floppy Controller. The computer has built-in software to make use of the Primary Controller when it is reading and writing to diskettes. There are usually limitations to using the Primary Controller that comes with the computer. It usually supports only two floppy drives, or only internally mounted drives, and the type of drive is usually limited to the type that comes with the computer. The Primary Controller has an electronic "address" that is used to communicate with the computer.

One way to add more drives or different types of drives to your computer is to add another floppy controller, without removing the Primary Controller. This new controller can be called a Secondary Controller. Software must be provided with the Secondary Controller in order to enable the computer to make use of it. The Secondary Controller also has an electronic address used to communicate with the computer.

The Secondary Controller must use a different electronic address than that of the Primary Controller. If it doesn't, there will be a conflict and neither controller will work properly. **Compati**Card IV provides for four addresses: the primary address and three different secondary addresses.

CompatiCard IV may be installed as a Primary controller in computers that have no other controller. **Compati**Card IV can be installed as a Secondary Controller in computers that already have a Primary Controller. Whether you address it as a Primary Controller or a Secondary Controller, **Compati**Card IV will support a total of four drives connected to it.

2.2 The BIOS ROM

The BIOS ROM (read-only memory) chip located at position U4 on **Compati**Card IV contains the software necessary for your computer to use the additional capabilities of **Compati**Card IV. The BIOS chip has its own electronic address, which is set independently from the rest of the card. The BIOS address can be selected by switches on switch bank SW1 so as not to interfere with other BIOS chips on other cards. Seven address options are provided to ensure compatibility.

2.3 Device Driver Software

Device driver software is the mechanism DOS uses to allow more than two floppy disk drives to be supported. The CC4DRV.SYS software has been provided with **Compati**Card IV for this purpose. The device driver works in conjunction with the BIOS ROM software to enable your computer to take advantage of the additional capabilities of **Compati**Card IV.

Device driver software is required in addition to the BIOS ROM whenever **Compati**Card IV is addressed as a Secondary Controller or for any drives attached to connectors P3 and P4 of **Compati**Card IV when **Compati**Card IV is the Primary Controller. To state it another way, device driver software is not required if **Compati**Card IV is the Primary Controller supporting only two drives on connector P2.

2.4 DMA Channels

The DMA (direct memory access) controller in your computer is used to move information between your floppy drive and memory. It has three "channels" that can be used for moving information. Channel 2 is normally used for floppy disk operations. It is possible for both the Primary and Secondary Controller to use the same DMA channel. In fact, this is usually the case, since the IBM PC was designed to make the channel shareable. On some computers, channel 2 is not shareable. In such a case, a different DMA channel must be selected for the Secondary Controller.

CompatiCard IV provides three DMA channel options. To change the channel, both corresponding jumpers on header J2 must be moved to the new position. Switches 5 and 6 on switch bank SW1 must also be set to correspond to the new DMA channel.

2.5 Interrupts

Interrupts are used when the floppy controller needs to communicate with the computer. The Primary Controller uses interrupt 6. In most cases the Secondary Controller will use the same interrupt because the IBM PC was designed to make it shareable. On some computers, interrupt 6 is not shareable. In such a case, a different interrupt must be selected for the Secondary Controller.

CompatiCard IV provides 6 interrupt options. To change the interrupt, move the jumper on header J2. The BIOS software will automatically determine which interrupt you have selected.

3.0 Quick Installation

The instructions that follow will help you install **Compati**Card IV. These abbreviated instructions contain the switch and jumper settings used for the majority of **Compati**Card IV installations. For more information on individual options, or if the quick installation doesn't work for you, Read section 4.0 (Detailed Installation).

Please make backup copies of your DOS system disk before you perform the installation. Improper installation can cause the accidental erasure or loss of data on your disks. Do not connect **Compati**Card IV to your hard disk, because loss of hard disk data may result.

Installation is a two part process. It consists of preparing and installing the card and cables and then installing the device driver software. Familiarity with the DOS operating system and with floppy disk drives is required to complete the installation. If you don't feel comfortable doing the installation yourself, have your local computer dealer or service shop do it for you.

To install **Compati**Card IV perform the following steps:

1) Set the BIOS ROM address switches (positions 1, 2, and 3 on switch bank SW1) as follows: SW1-1 OFF, SW1-2 ON, SW1-3 OFF.

2) Select DMA channel 2 by positioning both DMA jumper blocks to the channel 2 position on header connector J2 on the card and by setting switches SW1-5 ON and SW1-6 OFF.

3) Place the jumper block on the interrupt position marked 6 on header connector J2 of the card. This selects interrupt 6.

4) If you will be attaching a 1.2MB drive, you must set switch SW1-7 to correspond to the type of 1.2MB drive you are using. The factory setting is SW1-7 OFF, which corresponds to a single speed drive. Set SW1-7 ON if your 1.2MB drive is set for dual speed operation.

5) If you want **Compati**Card IV to load DOS from any drive attached to it that has a disk in it, switch SW1-8 must be set ON. If you don't want to use this feature, set SW1-8 OFF.

6) Set the external power jumpers J3, J4, J5, and J6 to the A position. If you have an external drive that requires DC power from **Compati**Card IV read section 4.1.7 for further information.

7) Set jumper J1 to one of the four positions (A through D) to select the card "address" for **Compati**Card IV.

Position A selects the Primary Controller address. If you are using **Compati**Card IV as the Primary Floppy Controller and have it connected to drive A, set J1 to position A.

Positions B, C, and D are Secondary Controller addresses. Use any one of these settings if you are not using **Compati**Card IV as a Primary Controller. Position C is known to work in most brands of computers.

Place the jumper block on the pins corresponding to the address you wish to use. Write down the setting you choose. You may need to refer to it during software installation.

If your computer has no floppy controller, you will want to set **Compati**Card IV as the Primary Controller. Every computer must have one and only one Primary Controller. Set J1 to position A.

Your computer may already have a Primary Controller. This controller may be on a plug-in card or it may be on the main board of the computer. In either case, **Compati**Card IV must be installed as a Secondary Controller. J1 can be set to positions B, C, or D. They are all Secondary Controller positions. If you choose B, you will set J1 to B.

Suppose you have installed **Compati**Card IV as a Secondary Controller but it does not work. After reading the section on troubleshooting, you conclude that the problem may be from another card in the computer trying to use the same electronic "address". Set J1 to a different secondary address (B, C, or D) and try again.

8) Set the switches on switch bank SW2 corresponding to the drives attached to **Compati**Card IV. For each of the four possible drives there are two switches to set.

CompatiCard IV follows IBM's conventions for disk drive cable wiring and addressing. All drives attached should have their drive select jumper set to the second drive position (e.g., DS1 if the sequence is DS0, DS1, DS2, DS3; and DS2 if the sequence is DS1, DS2, DS3, DS4). Each drive connector is capable of handling two floppy drives. The low-order/high-order addressing of the drives is determined by the type of cable used for the connection. A cable connector that has wires 10 through 16 twisted over connects to the low-order drive; a cable connector in which wires 10 through 16 run straight through connects to the high order drive. Many internal drive cables have both the low- order and high-order connector on them.

CompatiCard IV supports up to four drives. Use the following table to determine the drive position number for each of the drives you will be connecting. Write down the drive position number; you'll need it later for software setup.

Drive cable connected to	Cable type used	Drive position #	Switches used to set drive type	
P2	Twisted	0	SW2-1	SW2-2
	Straight	1	SW2-3	SW2-4
P3 or P4	Twisted	2	SW2-5	SW2-6
	Straight	3	SW2-7	SW2-8

Type of drive attached	Switch settings	
360KB or 1.2MB	OFF	ON
1.4MB	ON	OFF
2.8MB	ON	ON
No drive or other type installed	OFF	OFF

Table 3–1 Drive Position Numbers and Drive Type Switch Settings

The setting for both 360KB and 1.2MB 5.25 inch drives is the same. **Compati**Card IV will automatically determine which type of 5.25 inch drive you are using. If you are using a 3.5 inch 1.4MB or 2.8MB drive, set the switches accordingly. For all other drive types (e.g., 720KB and 8 inch) or when no drive is in use, set both switches OFF.

If you connect a 1.2MB 5.25 inch drive to connector P2 of **Compati**Card IV using a twisted cable, you will use the preceding tables to find that the drive position number is 0. Using this information you find that you should set switches 1 and 2 on SW2. Since you have a 5.25 inch drive, set SW2-1 OFF and SW2-2 ON. All other SW2 switches should be OFF.

Perhaps you have connected a 360KB 5.25 inch drive to connector P2 of **Compati**Card IV using a straight cable and you have connected a 1.4MB 3.5 inch drive to connector P2 using a twisted cable. Using the preceding table you find that the drive position number for the 5.25 inch drive is 1. The drive position number for the 3.5 inch drive is 0. You then find that you should set SW2-1 ON, SW2-2 OFF, SW2-3 OFF, and SW2-4 ON. All other SW2 switches should be OFF.

Suppose you have connected a 1.4MB 3.5 inch drive to connector P3 of **Compati**Card IV using a straight cable and have connected an 8 inch drive to connector P4 using a twisted cable. You will use the preceding tables to find that the drive position number for the 3.5 inch drive is 3 and the drive position number for the 8 inch drive is 2. You then will find that you should set SW2-7 ON, SW2-8 OFF, SW2-5 OFF, and SW2-6 OFF. All other SW2 switches should be OFF.

Perhaps you have installed a 2.8MB 3.5 inch drive connected to P2 with a twisted cable. The drive position number for this drive will be 0. Using the tables, you will find that you should set SW2-1 ON and SW2-2 ON. All other SW2 switches should be OFF.

9) Connect the drives to the card using connectors P2 through P4. P2 is for drives with position numbers 0 or 1. Both P3 and P4 can be used for drives with position numbers 2 or 3.

10) Proceed to section 4.1.10 and complete the installation of the card and software.

4.0 Detailed Installation

The step-by-step instructions that follow will help you install **Compati**Card IV. Please make backup copies of your DOS system disk before you perform the installation. Improper installation can cause the accidental erasure or loss of data on your disks. Do not connect **Compati**Card IV to your hard disk, because loss of hard disk data may result.

Installation is a two part process. It consists of preparing and installing the card and cables and then installing the device driver software. Familiarity with the DOS operating system and with floppy disk drives is required to complete the installation. If you don't feel comfortable doing the installation yourself, have your local computer dealer or service shop do it for you.

4.1 Card Installation

Before **Compati**Card IV is installed, you must prepare it by setting the various switches and jumpers for the appropriate options. Please read each section here to see if it applies to your installation and to see what options you should select.

4.1.1 Card Address (J1)

You must set jumper J1 to one of the four positions (A through D) that sets the electronic "address" that the computer uses to communicate with **Compati**Card IV.

Position A selects the Primary Controller address. If you are using **Compati**Card IV as the Primary Floppy Controller in the computer and have it connected to drive A, set J1 to position A.

Positions B, C, and D select Secondary Controller addresses. Use any one of these settings if you are not using **Compati**Card IV as a Primary Controller. Three choices are provided to avoid interference with other add-on cards. You may use any of the three that works in your computer. Position C is known to work in most brands of computers. Appendix C lists the I/O port addresses used for each J1 setting.

Place the jumper block on the pins corresponding to the address you wish to use. Write down the setting you choose. You may need to refer to it during software installation.

If your computer has no floppy controller, you will want to set **Compati**Card IV as the Primary Controller. Every computer must have one and only one Primary Controller. Set J1 to position A.

Your computer may already have a Primary Controller. This controller may be on a plug-in card or it may be on the main board of the computer. In either case, **Compati**Card IV must be installed as a Secondary Controller. J1 can be set to positions B, C, or D. They are all Secondary Controller positions. If you choose B, you will set J1 to B.

Suppose you have installed **Compati**Card IV as a Secondary Controller but it does not work. After reading the section on troubleshooting, you conclude that the problem may be from another card in the computer trying to use the same electronic "address". Set J1 to a different secondary address (B, C, or D) and try again.

4.1.2 BIOS Address (SW1-1, 2, 3)

You must set the address the computer will use to read the BIOS ROM. This is done by setting switches 1, 2, and 3 on switch bank SW1 to correspond to the desired address.

Choose an address location from the following table and set the switches accordingly. The factory setting has been found to work well in many computers. Depending on what other cards are installed in your computer, you may have to select another option. The symptoms of a BIOS address conflict will be that **Compati**Card IV does not access the floppy drives properly, the computer does not load DOS, or one of your other cards will not function when this BIOS address is selected. In any of these cases, try another switch setting. Always turn the power off before you make a switch change, otherwise the computer will lock up.

If you are unable to find a BIOS address that works for you, you will have to use the NOROM option. Set the switches according to the table and use the NOROM option (see section 4.2.3) when installing the device driver software. When the NOROM option is used, the auto boot feature will no longer work, You will also lose the ability to boot from certain types of drives.

BIOS Address	SW1-1	SW1-2	SW1-3	Notes
NOROM	OFF	OFF	OFF	Turns off ROM BIOS
CC00:0000h	OFF	OFF	ON	
CE00:0000h	OFF	ON	OFF	Factory Setting
D000:0000h	OFF	ON	ON	
D800:0000h	ON	OFF	OFF	
DE00:0000h	ON	OFF	ON	
E800:0000h	ON	ON	OFF	
EE00:0000h	ON	ON	ON	

Table 4–1 BIOS Address Switch Settings

To perform a normal first-time installation of **Compati**Card IV you would use the factory setting of the BIOS address. Make sure that SW1 positions 1, 2, and 3 are set to OFF, ON, OFF respectively.

Suppose you have already performed the installation and your computer exhibits the symptoms of a BIOS address conflict (won't boot or locks up). Try another BIOS address setting. Turn off the power to your computer and set SW1 switches 1, 2, and 3 to one of the other six address choices.

You may have tried all of the BIOS address options with no success. Either the problem is not with the BIOS address or else your computer has no BIOS space available. Try using the NOROM option. Set switches SW1 1, 2, and 3 to the OFF position. Install the NOROM software option as explained in section 4.2.3 of this manual. If NOROM doesn't solve your problem, it is not a BIOS address problem.

4.1.3 DMA Channel Selection (J2)

You must select the DMA channel to be used. This is accomplished by positioning both jumper blocks to the corresponding DMA channel position on header connector J2 on the card and by appropriately setting switches 5 and 6 on switch bank SW1.

Choose the appropriate DMA channel number (1, 2, or 3) from table 4–2 and move both DMA jumper blocks to the correct numbered position on header J2. Set switches SW1-5 and SW1-6 to the position corresponding to the selected DMA channel. This indicates to the BIOS software which channel is in use. For all Primary Controller applications and most Secondary Controller applications the correct DMA channel will be 2.

DMA Channel	J2 DMA Setting	SW1-5	SW1-6	Notes
1	1	OFF	ON	Optional in PC, XT, or AT
2	2	ON	OFF	Factory setting
3	3	ON	ON	Optional in PC, AT only—not XT
2	2	OFF	OFF	Must also jumper for Interrupt 6

Table 4–2 DMA Channel Switch and Jumper Settings

SW1-5 off and SW1-6 off is a special case that should be used only as a last resort. When both switches are off, the DMA channel must be jumpered for channel 2 and the interrupt must be jumpered for 6 on header J2 of the card. This option defeats the automatic sensing of which interrupt is being used. It has been provided for use when interrupt sensing does not work. It should not be necessary in most cases.

DMA channel 2 will not work with Secondary Controllers on a few types of computers. If it doesn't work, the computer will appear to function normally but operations involving disk access using **Compati**Card IV will fail. If your computer shows this symptom, try one of the optional DMA channels.

> You are performing a normal first-time installation of **Compati**Card IV. Channel 2 is the DMA channel normally used for floppy disk controllers. Set both DMA jumpers on J2 to the channel 2 position. Set SW1-5 ON and SW1-6 OFF.

> Suppose you have installed **Compati**Card IV using DMA channel 2 and your computer will not access the drives properly. After reading the section on troubleshooting you decide it may be a problem with the DMA channel. **You have an IBM AT.** From the DMA Channel Selection table you see that you may select either DMA channel 1 or DMA channel 3. Do so and try again. Set the J2 DMA jumpers to the new channel setting and set SW1-5 and SW1-6 accordingly.

> Suppose you have installed **Compati**Card IV using DMA channel 2 and your computer will not access the drives properly. After reading the section on troubleshooting you decide it may be a problem with the DMA channel. **You have an IBM XT.** From the DMA Channel Selection table you see that you may select DMA channel 1 as an alternate. Set the J2 DMA jumpers to the channel 1 setting and set SW1-5 OFF and SW1-6 ON.

Suppose you have installed **Compati**Card IV using DMA channel 2 and your computer will not access the drives properly. After reading the section on troubleshooting you decide it may be a problem with the DMA channel. **You have an XT compatible.** You may select either DMA channel 1 or DMA channel 3 and try again. Set the J2 DMA jumpers to the new channel setting and set SW1-5 and SW1-6 accordingly.

Suppose you have installed **Compati**Card IV as a Primary Controller using DMA channel 3 and your computer will not access the drives properly. After reading the section on Troubleshooting you decide it may be a problem with the DMA channel. **Primary Controllers must use DMA channel 2.** Set the J2 DMA jumpers to the channel 2 setting and set SW1-5 ON and SW1-6 OFF.

4.1.4 Interrupts (J2)

You must select the interrupt number to be used when the floppy controller communicates with the computer. This is done by placing a jumper block on the position corresponding to the desired interrupt on header connector J2 of the card.

For almost all computers, the correct setting will be 6. This is the correct setting for all Primary Controllers and works for most Secondary Controller applications because this interrupt was designed to be shareable on the IBM PC. If interrupt 6 does not work in your PC, move the jumper to one of the other five optional positions until you find one that does.

If the selected interrupt does not function with **Compati**Card IV in your computer, a message will print on the screen telling you that there is an interrupt conflict.

The interrupt number in use is automatically sensed by the BIOS software when the power is turned on. If you are unable to make any combination of DMA channel and interrupt work in your computer, try using DMA 2 and interrupt 6 with SW1-5 off and SW1-6 off. This unique setting defeats the automatic sensing of interrupts.

J2 Interrupt Setting	Notes
2	Optional in PC, XT only—not AT
3	Optional in PC, XT, or AT
4	Optional in PC, XT, or AT
5	Optional in PC, AT only—not XT
6	Factory Setting
7	Optional in PC, XT, or AT

Table 4–3 Interrupt Level Jumper Settings

For a normal first-time installation of **Compati**Card IV, set the J2 interrupt jumper to position 6.

> After you install **Compati**Card IV, if a message appears on your screen indicating an interrupt conflict, you must change J2 to another interrupt position. Move J2 to a different interrupt position and try again.

> If you have tried all of the interrupt positions but still get the message about an interrupt conflict, it is possible that the automatic sensing of interrupts doesn't work on your computer. Try using interrupt 6 and DMA channel 2 with SW1-5 OFF and SW1-6 OFF. This special setting defeats the automatic sensing of interrupts.

> Suppose you have installed **Compati**Card IV as a Primary Controller and have selected interrupt 3 for use. You find that the computer will not boot from drive A and will not access drives A or B. You must use interrupt 6 for a Primary Controller. Move the J2 interrupt jumper to position 6.

4.1.5 Dual Speed Drives (SW1-7)

You must set switch SW1-7 to correspond to the type of 1.2MB drive you are using. There are two popular types of 1.2MB drives available. The original type used in the AT has only one spindle speed of 360 RPM; 360KB density and 1.2MB density are achieved by using data transfer rates of 300Kbps and 500Kbps respectively. Almost all aftermarket drives have two spindle speeds available, 300 RPM and 360 RPM. With a dual speed drive the data transfer rates to achieve 360KB and 1.2MB densities would be 250Kbps and 500Kbps. **Compati**Card IV can handle both types of drives properly but needs to be told which type has been installed. Refer to section A.3 for information on jumpering drives for dual speed operation. Set switch SW1-7 according to the following table.

1.2MB Drive Type	SW1-7	Notes
Single speed	OFF	Factory Setting
Dual speed	ON	Optional

Table 4–4 1.2MB Drive Spindle Speed Switch Settings

Most 1.2MB drives being sold today can operate in either single speed or dual speed mode. The mode of operation is controlled by a jumper block or switch on the drive

electronics board. It is common for these boards to be shipped jumpered for single speed operation. This is a good guess to start with if you don't know which kind you have.

The symptoms of having SW1-7 set improperly will be that you can read 1.2MB disks but not 360KB disks. You must restart your computer after changing switch SW1-7.

If you have a choice, use your 1.2MB drives in single speed mode. You will acheive faster data transfer on 360KB disks.

> Let's assume you are installing **Compati**Card IV and one of the drives attached to it will be a single speed 1.2MB drive. In this case you will set switch SW1-7 to the OFF position.

> Perhaps you are installing **Compati**Card IV in a computer with a dual speed 1.2MB drive, a 360KB drive, and a 720KB 3.5 inch drive. In this case, because the 1.2MB drive is a dual speed drive, you will set switch SW1-7 to the ON position. It does not matter which other types of drives are connected.

> As another example, assume you have installed **Compati**Card IV in a computer with what you believe is a dual speed 1.2MB drive and you have set switch SW1-7 to the ON position. You find that you are able to read 1.2MB diskettes but cannot access 360KB diskettes. This will occur if the drive itself has been jumpered for single speed operation. Try setting switch SW1-7 to the OFF position.

4.1.6 Auto Boot (SW1-8)

You must decide if you want **Compati**Card IV to load DOS from any drive attached to it that has a disk in it. Switch SW1-8 must be set appropriately.

CompatiCard IV has the unique ability to be able to boot from more than one floppy drive. In fact, it will try to boot from the first drive it checks that contains a diskette. This feature is useful for people who usually boot from one type of disk but wish to boot from another type on occasion (e.g. who normally boot from 360KB 5.25 inch diskettes but sometimes boot from 720KB 3.5 inch diskettes). Use the following switch settings to control the Auto Boot feature.

Auto Boot	SW1-8
YES	ON
NO	OFF

Table 4–5 Auto Boot Feature Switch Settings

When Auto Boot is enabled, **Compati**Card IV will check each drive for about 1 second, looking for a DOS system disk. If none is found, your computer will proceed to boot in its normal fashion. If a DOS system disk is found, **Compati**Card IV will boot from that drive. The drive that **Compati**Card IV boots from will become drive A for the duration of that computing session. This is desirable since most diskettes that contain DOS have been configured to run as drive A. The drive that is normally drive A will be unavailable for the duration of the session. (You can get around this by using some software options documented in section 6.4—Retaining Drive A after Auto Boot.)

> Let's assume that your computer has a 360KB 5.25 inch drive as drive A. You want the 360KB drive to be drive A except when you occasionally boot from a 3.5 inch system disk. You have installed a 1.4MB 3.5 inch drive connected to **Compati**Card IV. In this case you should set switch SW1-8 to the ON position. **Compati**Card IV will check the 3.5 inch drive for the presence of a diskette each time you boot your computer. If a DOS system disk is present, your computer will boot from the 3.5 inch diskette and the 3.5 inch drive will become drive A until the next time DOS is loaded.

> If, in your installation, you have several drives attached to **Compati**Card IV and you have set switch SW1-8 to the ON position, **Compati**Card IV will check each drive sequentially, looking for a DOS system disk. If none is found, your computer will boot as it normally would. Drives are checked in drive position number order, from lowest to highest.

> Let's assume that you have installed **Compati**Card IV with several drives attached. You don't want **Compati**Card IV to boot from drives other than your normal drive A. Set switch SW1-8 to the OFF position. This will disable the Auto Boot feature.

4.1.7 External Power Jumpers (J3, J4, J5, J6)

You must set the jumper blocks J3, J4, J5, and J6 to the appropriate positions in order to enable or disable DC power on the external DB-37 connector P4.

For most external drive applications, DC power should not be present on P4 because it is provided by a power supply in the external drive cabinet. In this case the jumpers should be set to disable DC power.

In some applications, the external cabinet does not contain a power supply and DC power must be provided by the computer through the drive cable. This type of application requires a specially fabricated cable. Megamate and Overdrive by Micro Solutions may be used in this fashion and include the appropriate cable. For the required DC power to be provided, the jumpers must be set to enable DC power.

Note that there are two wiring conventions supported for DC power on the DB-37. Appendix D gives a more thorough description of the pinouts and wiring conventions to help you decide which DC power arrangement, if any, is appropriate for you.

Select the power configuration appropriate for your installation and set the jumper blocks at J3, J4, J5, and J6 to the appropriate positions using table 4–6.

	DC Power Pins (P4)			Jumper Settings				
Power Convention	+5v	+12v	Gnd	J3	J4	J5	J6	Notes
No Power	None	None		A	A	A	A	Factory Setting
Micro Solutions	2	1	20-37	A	A	B	B	
Alternate	4	1	2-3	B	B	A	B	

Table 4–6 External Drive Power Jumper Settings

For an installation where there are no external drives connected to **Compati**Card IV, set J3, J4, J5, and J6 to position A. This disconnects DC power from the external connector.

For an installation where an external drive is used and the drive has its own power supply, set J3, J4, J5, and J6 to position A.

If you are installing an external floppy that requires 5v (volts) on pin 2 and 12v on pin 1 of the DB-37 external floppy connector, set J3 and J4 to position A. Set J5 and J6 to position B.

If you are installing a Megamate or an Overdrive by Micro Solutions as the external drive on **Compati**Card IV, set J3 and J4 to position A. Set J5 and J6 to position B.

If you are installing an external floppy that requires 5v on pin 4 and 12v on pin 1 of the DB-37 external floppy connector, set J3 and J4 to position B. Set J5 to position A and J6 to position B. This external drive power arrangement has been used by IBM and some other vendors.

4.1.8 Drive Types (SW2)

You must set the switches on switch bank SW2 that correspond to each of the drives attached to **Compati**Card IV. For each of the four possible drives there are two switches to set.

CompatiCard IV follows IBM's conventions for disk drive cable wiring and addressing. All drives attached should have their drive select jumper set to the second drive position (e.g., DS1 if the sequence is DS0, DS1, DS2, DS3; and DS2 if the sequence is DS1, DS2, DS3, DS4). Each drive connector is capable of handling two floppy drives. The low-order/high-order addressing of the drives is determined by the type of cable used for the connection. A cable connector that has wires 10 through 16 twisted over connects to the low-order drive; a cable connector in which wires 10 through 16 run straight through connects to the high order drive. Many internal drive cables have both the low- order and high-order connector on them.

CompatiCard IV supports up to four drives. Use table 4–7 to determine the drive position number for each of the drives you will be connecting. Write down the drive position number; you'll need it later for software setup.

Drive cable connected to	Cable type used	Drive position #	Switches used to set drive type	
P2	Twisted	0	SW2-1	SW2-2
	Straight	1	SW2-3	SW2-4
P3 or P4	Twisted	2	SW2-5	SW2-6
	Straight	3	SW2-7	SW2-8

Type of drive attached	Switch settings	
360KB or 1.2MB	OFF	ON
1.4MB	ON	OFF
2.8MB	ON	ON
No drive or other type installed	OFF	OFF

Table 4–7 Drive Position Numbers and Drive Type Switch Settings

The setting for both 360KB and 1.2MB 5.25 inch drives is the same. **Compati**Card IV will automatically determine which type of 5.25 inch drive you are using. If you are using a 3.5 inch 1.4MB or 2.8MB drive, set the switches accordingly. For all

other drive types (e.g., 720KB and 8 inch) or when no drive is in use, set both switches OFF.

If you connect a 1.2MB 5.25 inch drive to connector P2 of **Compati**Card IV using a twisted cable, you will use the preceding tables to find that the drive position number is 0. Using this information you find that you should set switches 1 and 2 on SW2. Since you have a 5.25 inch drive, set SW2-1 OFF and SW2-2 ON. All other SW2 switches should be OFF.

Perhaps you have connected a 360KB 5.25 inch drive to connector P2 of **Compati**Card IV using a straight cable and you have connected a 1.4MB 3.5 inch drive to connector P2 using a twisted cable. Using the preceding table you find that the drive position number for the 5.25 inch drive is 1. The drive position number for the 3.5 inch drive is 0. You then find that you should set SW2-1 ON, SW2-2 OFF, SW2-3 OFF, and SW2-4 ON. All other SW2 switches should be OFF.

Suppose you have connected a 1.4MB 3.5 inch drive to connector P3 of **Compati**Card IV using a straight cable and have connected an 8 inch drive to connector P4 using a twisted cable. You will use the preceding tables to find that the drive position number for the 3.5 inch drive is 3 and the drive position number for the 8 inch drive is 2. You then will find that you should set SW2-7 ON, SW2-8 OFF, SW2-5 OFF, and SW2-6 OFF. All other SW2 switches should be OFF.

Perhaps you have installed a 2.8MB 3.5 inch drive connected to P2 with a twisted cable. The drive position number for this drive will be 0. Using the tables, you will find that you should set SW2-1 ON and SW2-2 ON. All other SW2 switches should be OFF.

4.1.9 Drive Cable Connections (P2, P3, P4)

CompatiCard IV has three disk drive connectors to accommodate a variety of cable configurations. Two of the connectors are for internally mounted drives. The third is for externally mounted drives. Each connector has a name associated with it (P2 to P4). The name is printed on the card near its associated connector. Table 4–8 describes each connector and the drive positions associated with it.

Connector Designation	Drive Positions	Drive Location	Connector Type
P2	0 & 1	Internal	34 Pin Header
P3	2 & 3	Internal	34 Pin Header
P4	2 & 3	External	DB-37 (female)

Table 4–8 Connector Designations

When you are installing cables for internally mounted drives, make sure the pin 1 side of the cable (usually marked with a colored stripe) is connected to the side of the connector that is marked "1." On all **Compati**Card IV internal disk drive connectors (P2 and P3), pin 1 is toward the top of the card.

Connector P2 may be used for drives in drive position 0 or 1. Connectors P3 and P4 may be used interchangeably for drives in drive position 2 or 3. If you are installing **Compati**Card IV as your Primary Controller, your normal 5.25 inch drives will use connector P2.

> If you are installing **Compati**Card IV as a Primary Controller with a 360KB A drive, a 1.2MB B drive, and an internally mounted 1.4MB 3.5 inch C drive, you will proceed as follows. The 360KB drive and the 1.2MB drive must be connected to P2 because they must be the drives with position numbers 0 and 1 in a Primary Controller. You can make this connection by using a cable that has two drive connectors, one twisted and one straight. The 360KB drive must be connected to the twisted connector to be assigned position number 0. The 1.2MB drive connected to the straight connector will receive position number 1. The 1.4MB 3.5 inch drive will be connected to P3 using either a straight or a twisted connector. If you use a twisted connector, it will receive position number 2; a straight connector will result in position number 3. Either way, the drive letters A, B, and C (D if you have a hard disk) will be assigned in drive position order, starting with position 0. Drive letters are not assigned for unused position numbers.

If you are installing **Compati**Card IV as a Secondary Controller with a 1.4MB 3.5 inch drive, you may use any of the three drive connectors. The drive letter assigned by DOS will be the same regardless of the drive position number on **Compati**Card IV because it is the only drive attached to **Compati**Card IV.

Suppose you are installing **Compati**Card IV as a Secondary Controller with an external 1.2MB 5.25 inch drive and an internal 2.8MB 3.5 inch drive, and you want the drive letter of the 1.2MB drive to precede that of the 2.8MB drive. For this to occur, the 1.2MB drive must have a lower drive position number than the 2.8MB drive. The external 1.2MB drive must connect to P4 and must use a twisted cable in order to receive the lower order drive position number (2). The 2.8MB drive must connect to P3 and must use a straight cable to receive drive position number 3. In this way a drive letter will be assigned to the 1.2MB drive before the 2.8MB drive.

Suppose you have installed a 1.4MB drive on P3 with a twisted cable and a 1.2MB drive on P4 with a twisted cable. In this case, neither drive will work, since you have connected two drives to the same drive position number (remember, P3 and P4 are electronically equivalent). You must connect one of the two using a straight cable so that they receive different drive position numbers.

4.1.10 Inserting the Card

Installing **Compati**Card IV is a straightforward process. It consists of plugging the card into one of the computer's existing expansion slots and making the proper cable connections from the card to your disk drives. The instructions in this section will guide you step by step through the installation procedure. If you don't feel comfortable doing the installation yourself, have your local computer dealer or service shop do it for you

It's possible that if the **Compati**Card IV is installed improperly your computer will erase your diskettes when you try to use them. Do not connect **Compati**Card IV to your hard disk because loss of hard disk data may occur. Make a backup copy of your DOS system diskette now. Use the copy to test the installation.

The installation procedure described here is used to replace an existing floppy disk controller in an IBM PC or compatible with a **Compati**Card IV. If you are installing **Compati**Card IV in addition to an existing disk controller, skip the step concerning the removal of the existing controller and repeat the step concerning connection of the disk drive cables for each of your additional drives.

1) With the power off and the computer unplugged, remove any screws necessary to allow you to get access to the expansion slots in your computer.
2) Study the orientation of the floppy drive cable to determine which side is pin 1. The pin 1 side can usually be located by one of the following indicators: a color stripe on one side of the flat cable, an index mark molded into the cable socket toward one side, a number (1 or 2) molded into the cable socket toward one side, or a number (1 or 2) printed on the existing disk controller connector where the cable is attached.

   Once you have determined which ends of the connectors orient toward pin 1, you can proceed. If you can't make the determination, let someone else perform the installation. If you proceed and do things improperly, your computer will erase your diskettes when you try to use them.
3) Remove the existing controller and disconnect your floppy disk drive's cable from it. Connect the cable to P2 on **Compati**Card IV. Make sure you orient the pin 1 side of the cable to the pin 1 side of P2.
4) Remove the retaining screw holding the existing disk controller to the back of the cabinet. Save the screw. Remove the existing controller by gently rocking the card lengthwise while pulling it upward.
5) Install **Compati**Card IV in the same slot by lining the card up with the connector and gently pushing down. Seat **Compati**Card IV squarely and firmly in the slot in such a way that its mounting bracket lines up with the mounting hole in the cabinet. Using the screw removed previously,

mount the bracket securely to the cabinet. If you are installing **Compati**Card IV in an IBM XT, be sure it is not plugged into the slot closest to the power supply (slot 8).

6) Put the cabinet back together and replace any screws that were removed. Connect the power cable and anything else you might have disconnected.

7) With no diskettes in the floppy disk drives, power up the computer. If the activity light on your floppy drive comes on as soon as you turn on the power and stays on continuously, do not proceed any further. Your diskettes will be erased if you try to use them. Carefully go through the installation steps again. Refer to Appendix B (Troubleshooting) to try to isolate the cause of the problem. If you can't find the cause, remove **Compati**Card IV and let someone else perform the installation.

8) Put in the DOS system diskette which you created at the start of this installation process and load DOS (or load it from the hard disk if your computer has one). If your computer will not load DOS from the floppy diskette, carefully go through the installation steps again. Don't try your other DOS diskettes until you locate and correct the problem or the computer may erase them when it tries to load DOS.

   Refer to Appendix B (Troubleshooting) to try to isolate the cause of the problem. If you can't find the cause, remove **Compati**Card IV and let someone else perform the installation.

9) Install the **Compati**Card IV software according to Section 4.2 and use the CCFORMAT utility to initialize a blank diskette in each drive attached to **Compati**Card IV. If it formats properly, your **Compati**Card IV is installed correctly.

If you have completed the installation successfully, your computer should work exactly as it did before.

4.2 Software Installation

The **Compati**Card IV software diskette contains the CC4DRV.SYS device driver as well as some utility programs and a file containing up-to-date information on **Compati**Card IV. The following instructions will step you through the process of copying the **Compati**Card IV software and configuring it on your DOS system disk. You may skip the software installation if you are using **Compati**Card IV as the Primary Controller and have two or fewer drives connected to P2.

4.2.1 Copying the Master Diskette

The following instructions assume that your DOS system disk is drive A. If you have a hard disk, substitute the letter for your system drive in place of the "A>" or "a:" in these instructions.

1) Turn on the computer and insert your DOS system disk. Make sure that you have the DOS system prompt "A" before you proceed to the next step.
2) Place your **Compati**Card IV master diskette into an available disk drive.
3) Now copy the **Compati**Card IV files to the DOS system disk. For our example, we will assume that you put the **Compati**Card IV master diskette into drive B. If you inserted it into a drive other than B, substitute the correct drive letter in place of the "b" in the following command:

   ```
   A>copy b:*.* a:↵
   ```

   If you receive an "insufficient disk space" error message while you are copying the **Compati**Card IV files, it means that the disk you are copying to is full. In this case you must either erase some files from your DOS system disk, using the DEL command, or try using another disk and repeating the steps until you are successful.
4) A file called PRINT.ME, containing up-to-date information on **Compati**Card IV, has been copied to your DOS system disk. Use the following command to list this file to your printer. (Be sure you have a printer connected.)

   ```
   A>copy print.me prn:↵
   ```

You have now finished copying the software. Remove the **Compati**Card IV master diskette and put it in a safe place.

4.2.2 Updating CONFIG.SYS

The final step in installing **Compati**Card IV is to configure the software for your installation. Read section 6 (Advanced Software Options) to see what configuration options are available. Use the DOS COPY command to make a duplicate of your current CONFIG.SYS file on a floppy diskette before you start. The following simplified configuration will work for most applications.

1) Using a suitable text editor or word processor, bring up the CONFIG.SYS file from your DOS system disk for editing. If the file doesn't exist, create it, using a text editor or word processor.

2) Add the following line to the end of the CONFIG.SYS file:

```
device=cc4drv.sys
```

3) Save the modified CONFIG.SYS file on your DOS system disk. Make sure the CONFIG.SYS and CC4DRV.SYS files are both in the root directory so DOS can find them when the computer starts up.

4) Restart the computer by pressing CTL–ALT–DEL. The computer should now start up and include the **Compati**Card IV software driver. A message will be printed on the screen indicating what types of drives are connected to **Compati**Card IV and what letters will access them. To utilize a **Compati**Card IV drive, use the corresponding drive letter and access the drive as you would any other DOS drive, with normal DOS commands and software.

4.2.3 The NOROM Option

Your computer uses the CC4DRV device driver to access the **Compati**Card IV drives. The CC4DRV device driver uses the ROM BIOS software on **Compati**Card IV to do its work. Some computers have so many ROMS in them already that there is no address space for the BIOS on **Compati**Card IV. The NOROM software option solves this problem. When you use NOROM, a temporary copy of the BIOS software is written to your program memory each time you turn on the power to your computer. CC4DRV uses the memory resident copy of the BIOS to do its work. The ROM BIOS on the card must be turned off (SW1-1,2,3 all OFF).

The NOROM option is utilized when you add a line to your CONFIG.SYS file causing the CC4BIOS.SYS device driver to be executed each time the computer boots up. Perform the following steps to install the CC4BIOS.SYS device driver.

1) Using a suitable text editor or word processor, bring up the CONFIG.SYS file from your DOS system disk for editing.

2) Substitute the J1 card address setting (A-D) for the "*x*" in the line below. Add the following line to the CONFIG.SYS file, making sure that it precedes the line referencing CC4DRV.SYS:

   device=cc4bios.sys /*x*

3) Save the modified CONFIG.SYS file on your DOS system disk. Make sure the CONFIG.SYS, CC4DRV.SYS, and CC4BIOS.SYS files are all in the root directory so that DOS can find them when the computer starts up.

   At this point your CONFIG.SYS file should contain at least the following two lines in the order shown:

   device=cc4bios.sys /*x*
   device=cc4drv.sys

4) Restart the computer by pressing CTL-ALT-DEL.

5.0 Using CompatiCard IV

Disk drive usage with **Compati**Card IV is no different from normal disk drive usage. Once you know the drive letter associated with a given drive, you can use all of your normal DOS utilities and programs to access that drive. A few programs have been included with **Compati**Card IV to assist you in using the attached drives and further enhance the capabilities of **Compati**Card IV. Following is a list of the utilities.

CCDRIVES.COM	A status utility that displays the types of drives attached to **Compati**Card IV and indicates which drive letters to use to access the drives.
CCFORMAT.COM	A diskette-initializing utility almost identical in use to the DOS FORMAT utility. CCFORMAT supports all of the DOS formats possible on your drives.
BACKFMT.COM	A diskette-initializing utility that runs in the background and can be invoked while other programs are running by means of a "hot key."

The following sections explain the use of **Compati**Card IV in detail.

5.1 Drive Letters (CCDRIVES)

Just as your primary floppy drive is referred to by the letter A, each **Compati**Card IV drive also has a drive letter associated with it. The actual letter to be used is assigned by DOS and is determined by which letters are already in use on your system.

The CCDRIVES program tells you which types of drives are connected to **Compati**Card IV and what drive letters are associated with them. It is used as follows.

Syntax

CCDRIVES

Purpose

CCDRIVES is used to display the types of drives currently in use with **Compati**Card IV and the drive letters you use to access them.

Description

When you issue the CCDRIVES command, status information about the disk drives currently attached to **Compati**Card IV will be displayed on the screen.

```
A>ccdrives↵
```

would produce a display similar to the following, depending on what types of drives you are using:

```
CCDRIVES Version 2.00

 The following CompatiCard IV drives are available:
  Drive E: - 3.5 inch High Capacity 1.4MB
  Drive F: - 5.25 inch 1.2MB 300/360 RPM
  Drive G: - 8 inch

A>
```

The types of drives listed and the order of assignment of drive letters are determined by the settings of SW2 and drive position number resulting from the method of connection to **Compati**Card IV. It is possible to rearrange the order in which the drive letters are assigned. If you wish to do so, read section 6 (Advanced Software Options).

5.2 Formatting Diskettes

Brand new diskettes are blank and must be initialized to a format before they can be used. Diskettes that have already been used can be reinitialized as a way of completely erasing them.

High density 3.5 inch diskettes are actually a different type of diskette than the standard double density variety. Diskettes should be initialized only to the format for which they were intended. Initializing double density diskettes to the 1.4MB format will result in unreliable operation, as will initializing high density diskettes to the 720KB format. The same is true of 5.25 inch high density and double density diskettes.

Two programs are included for initializing diskettes with CompatiCard: CCFORMAT and BACKFMT. CCFORMAT is a command line driven disk initialization utility, similar in usage to the DOS FORMAT command. BACKFMT is a "pop-up" disk initializer that can be used in the background while you continue working on another application.

5.2.1 CCFORMAT

Syntax

CCFORMAT drive letter *options*

Purpose

CCFORMAT is a diskette initialization utility for use only with disk drives connected to **Compati**Card IV. Similar in use to the DOS FORMAT utility, CCFORMAT allows you to initialize blank diskettes into all DOS formats supported by each particular style of drive.

Options

/N disables verification of diskette while formatting

/V prompts for a volume label after the diskette is initialized

/S copies the operating system files to the diskette after initialization

Description

The drive letter, followed by a colon(:), determines which **Compati**Card IV drive to use. The format option determines which format will be used. It consists of a forward slash (/) followed by three characters. Table 5–1 lists the supported formats and options for each type of drive. If you enter the

CCFORMAT command without specifying a format option, the highest capacity format supported for that drive will be used. This conforms to the precedent set with the DOS FORMAT command.

Make sure you have high capacity diskettes if you are trying to use a high capacity format, or else initialization errors and data loss will probably occur. You may initialize a blank diskette or reinitialize an existing diskette, but remember that initialization will erase any existing data on the diskette.

For this example, assume that drive G is a 3.5 inch high capacity (720KB/1.4MB) drive:

```
A>ccformat g:/720↵
```

would initialize the diskette in drive G to the 720KB format.

```
A>ccformat g:/1.4 /s↵
```

would initialize the diskette in drive G to the 1.4MB high capacity format used by the IBM PS/2 computers and place a copy of DOS on the disk, making it a DOS system disk.

```
A>ccformat g:↵
```

would also initialize the diskette in drive G to the 1.4MB high capacity format used by the IBM PS/2 computers. Since no capacity is specified, the highest capacity supported for the type of drive is used.

For the next example, assume that drive E is a 1.2MB single speed high capacity (360KB/1.2MB) drive:

```
A>ccformat e:/360↵
```

would initialize the diskette in drive E to the 360KB format used by most IBM PCs and XTs.

5.2.2 BACKFMT

Initializes diskettes while other programs are running.

Syntax

BACKFMT *options*

Purpose

BACKFMT is a background diskette formatting program that allows you to initialize diskettes while you continue running other programs.

Options

/C reconfigures some BACKFMT options after the initial installation

/D disables BACKFMT and removes it from memory

Description

Background formatting is initiated when you press a user-definable "access key," which displays a menu from which you can select the drive and capacity of the diskette to initialize. After you select the drive and capacity, BACKFMT will start initializing the diskette while returning you to your original program. You can continue working while BACKFMT performs the initialization.

To make the background formatter available, you have to run the BACKFMT program. Enter the following command at the DOS prompt:

```
A>backfmt↵
```

Configuration

The first time the BACKFMT program is run, it will display a message indicating that it has not been configured yet. Configuration consists of answering a few simple questions. Each question has a default answer (in square brackets) that can be used for the first-time installation. Listed here are some points you will be asked about:

- Would you like to change the background formatter access key? This allows you to change the access key to a different combination of keys. The access key is initially set to Ctrl-Alt-F.
- What would you like BACKFMT to do when it completes the initialization of a diskette? You can select how to be informed when BACKFMT finishes initializing a diskette.

- Would you like the diskette to be verified after formatting? You should always have the diskette verified for normal operation. If you tell BACKFMT not to verify, it will always verify the first cylinder, where the directory is placed. If that area is good, it will continue without verifying the rest of the diskette. Turning verification off allows diskettes to be initialized about 20-30% faster.
- Are you using a color monitor? You should answer Yes to this question only if you are really using a color monitor. If you have a monochrome (white, green, or amber) monitor, answer No. Menu readability will be improved by a correct response.

Once you answer the configuration questions, the BACKFMT.COM file will be updated with the new information. From that point on, when BACKFMT is run, it will not ask for configuration information. If you want to change the configuration, you should specify the /C option when you are running the BACKFMT program, as follows:

```
A>backfmt /c↵
```

If BACKFMT is reconfigured with the /C option, all the changes will be made to the BACKFMT.COM file. The changes will take effect immediately.

The currently defined access key will be displayed near the end of the BACKFMT signon message. It will look similar to this:

```
While holding Ctrl & Alt, press F
```

When the DOS prompt returns, BACKFMT is ready for use. If you need to remove BACKFMT from memory, use the following command from the DOS prompt:

```
A>backfmt /d↵
```

Using BACKFMT

To initialize a diskette with BACKFMT, use the following procedure:

1) Press the BACKFMT key sequence. The default is Ctrl-Alt-F unless you changed it during configuration. A window displaying the available drives and formats should appear near the top of your screen.
2) Using the cursor keys, select the drive and format capacity that you would like to use.
3) When you have selected the desired drive and format capacity, press ENTER to get the program to accept your choices.

4) Another window will appear, displaying your selection and giving you one last chance before the initialization starts. Pressing ENTER will start the diskette initialization, and you will be returned to the program you were originally running.

If you press the BACKFMT access key while a diskette is being initialized, a status window will appear. The current cylinder and head being initialized will be displayed in this window. Press any key to remove the status window.

Depending on how you configured BACKFMT, a window may appear when the initialization is finished or if an error exists. This display will be self-explanatory. If you configured BACKFMT so it won't display a window, the result will be displayed when you press the access key again.

Notes

BACKFMT will work only with disk drives controlled by CC4DRV.

If you attempt to access a diskette that is currently being background formatted, you will get a "Drive not ready" error message. The drive will be accessible as soon as the initialization is complete.

You may notice the drive light going off on a drive being background formatted when you access another diskette drive. This is normal because only one diskette drive can be used at a time. BACKFMT will give priority to another program if it is accessing a diskette drive. When the program seems to be done with the diskette drive, BACKFMT will continue.

The BACKFMT menu is not available while your screen is displaying graphic images. If you try to access the BACKFMT menu while your display is in a graphic mode, you will hear a beep.

Don't remove BACKFMT from memory with any memory management program. While in memory, BACKFMT is closely linked to CC4DRV; and if it is improperly removed, it will cause system failure. Remove BACKFMT from memory only with the /D option.

5.3 Disk Formats Supported

Table 5–1 lists the DOS formats supported for each type of disk drive you may use. It also lists the option you would enter with the CCFORMAT command to initialize a diskette to that format. The last column indicates which version of DOS introduced the format. If no DOS version number appears next to a format, it means the format is unique to CC4DRV and will not be readable with other software

packages. These formats were included for people who wish to use the full capacity of their drive.

Drive Description	Drive Type	Format Capacity	Sides	CCFORMAT Option	DOS Version
5.25 inch 48 TPI (360KB)	0	360KB	2	/360	2.00
		320KB	2	/320	1.10
		180KB	1	/180	2.00
		160KB	1	/160	1.00
5.25 inch 96 TPI (800KB)	1	800KB	2	/800	
		360KB	2	/360	2.00
		320KB	2	/320	1.10
		180KB	1	/180	2.00
		160KB	1	/160	1.00
5.25 inch 96 TPI high capacity single speed (1.2MB)	2	1.2MB	2	/1.2	3.00
		800KB	2	/800	
		360KB	2	/360	2.00
		320KB	2	/320	1.10
		180KB	1	/180	2.00
		160KB	1	/160	1.00
5.25 inch 96 TPI high capacity dual speed (1.2MB)	3	1.2MB	2	/1.2	3.00
		800KB	2	/800	
		360KB	2	/360	2.00
		320KB	2	/320	1.10
		180KB	1	/180	2.00
		160KB	1	/160	1.00
8 inch double sided	4	1.2MB	2	/1.2	
		250KB	1	/250	1.00
3.5 inch (720KB)	5	720KB	2	/720	3.20
3.5 inch 600 RPM	6	720KB	2	/720	3.20
3.5 inch high capacity (1.4MB)	7	1.4MB	2	/1.4	3.30
		720KB	2	/720	3.20
3.5 inch high capacity (2.8MB)	8	2.8MB	2	/2.8	
		1.4MB	2	/1.4	3.30
		720KB	2	/720	3.20

Table 5–1 Types of Drives and Formats Supported

5.4 Auto Boot

Most computers are limited to being able to boot from only one floppy drive. **Compati**Card IV has the unique ability to be able to boot from any floppy drive attached to it. This feature is useful for people who usually boot from one type of disk but wish to boot from another type on occasion (e.g., for those who normally boot from a 360KB 5.25 inch diskette but who would like to boot from a 720KB 3.5 inch diskette on occasion). The Auto Boot feature will work if it was enabled during the card installation process. Switch SW1-8 controls this feature.

When Auto Boot is enabled, each time you start or restart your computer, **Compati**Card IV will check each drive for about 1 second looking for a DOS system disk. Your computer will try to boot from the first drive it checks that contains a diskette. If none is found, the computer will proceed to boot in its normal fashion. If a DOS system disk is found, **Compati**Card IV will boot from that drive. The drive that **Compati**Card IV boots from will become drive A for the duration of that computing session. This is desirable since most diskettes that contain DOS have been configured to run as drive A.

CompatiCard IV uses the drive position number from the card installation to determine the order in which to check for boot disks. Drives are searched from lowest number to highest number. Be sure to open the drive doors or eject the disks from any drive you don't wish to boot from.

When you use Auto Boot, the drive you boot from is assigned drive letter A. The drive that would normally be drive A does not have a drive letter and thus is not usable. Section 6.4 (Retaining Drive A during Auto Boot) explains how you can recover the use of this drive should your application require it.

> Let's assume that your computer has a 360KB 5.25 inch drive as drive A. You want the 360KB drive to be drive A except when you occasionally boot from a 3.5 inch system disk. You have installed a 1.4MB 3.5 inch drive connected to **Compati**Card IV. If Auto Boot has been enabled, **Compati**Card IV will check the 3.5 inch drive for the presence of a diskette each time you boot your computer. If a DOS system disk is present, your computer will boot from the 3.5 inch diskette and the 3.5 inch drive will become drive A until the next time DOS is loaded.

> If you have several drives attached to **Compati**Card IV and in your installation you have enabled Auto Boot, **Compati**Card IV will check each drive sequentially, looking for a DOS system disk. If none is found, your computer will boot as it normally would. Drives are checked in drive position number order, from lowest to highest.

Let's assume that you have installed **Compati**Card IV with several drives attached. You don't want **Compati**Card IV to boot from drives other than your normal drive A. Disable the Auto Boot feature by setting switch SW1-8 OFF

5.5 720KB and 1.4MB Diskettes

There are two popular 3.5 inch disk formats for IBM computers. One is the 720KB format which is used by the IBM laptop computer and several other laptops. The other is the 1.4MB high density format introduced on the PS/2 model 50 and higher level models. The PS/2 models that support the 1.4MB format are also capable of using the 720KB diskettes.

CompatiCard IV will automatically sense the format of the disk being used, whether it is 720KB or 1.4MB, and will adjust itself accordingly. The only time you have to select a format is when you are initializing a new blank disk to either the 720KB or the 1.4MB format.

High density diskettes can be easily distinguished from double density diskettes because they have an extra hole molded into the case. If you hold a 3.5 inch diskette in your hand with the spindle hole facing down and the access door facing away from you, the write protect hole will be in the left hand corner nearest you. If the diskette has a similar hole in the right hand corner nearest you, it is a high density diskette.

6.0 Advanced Software Options

The software installation performed in section 4.2 is a simplified installation that works well for most computers. There are also options that you can take advantage of when installing the software to enhance your installation. For example, you can rearrange the order of drive letter assignments or change the step rate for an individual drive. In many cases, you can make the DOS FORMAT command support your new drives. The following sections describe in detail how to implement these options.

6.1 CC4DRV.SYS Device Driver

The CC4DRV.SYS device driver uses the information from the switches on SW2 to determine what types of drives are available. Certain assumptions are made regarding these drives. You can override the default assumptions for any drive by including a parameter block for that drive in the CONFIG.SYS file where CC4DRV.SYS is referenced.

The syntax of the CC4DRV.SYS line in CONFIG.SYS is as follows:

device=cc4drv.sys /$addr_1$,$type_1$,$step_1$,$change_1$ /$addr_2$,$type_2$,$step_2$,$change_2$ ...

where:

ADDR	is the "drive address." The drive address is made up of the J1 jumper setting (A through D) followed by a drive position number (0 through 3) indicating where the drive is connected to the card.
TYPE	is a number (0 through 8) representing the type of disk drive attached.
STEP	is the drive step rate in milliseconds (1 through 32). This is the time that it takes to step from one track to the next adjacent track.
CHANGE	(Yes or No) indicates whether a drive provides a "diskette changed" signal when a drive door is opened.

By determining the appropriate values for ADDRESS, TYPE, STEP, and CHANGE, you can enhance the performance of your drive installation and overcome special problems. Sections 6.1.1 through 6.1.4 describe how to determine the proper values for ADDRESS, TYPE, STEP, and CHANGE. Section 6.2 will discuss how to use those values in more advanced installations.

6.1.1 Determining the ADDRESS

The first portion of the ADDRESS is determined by jumper J1 on **Compati**Card IV. Use the letter that matches the setting of J1 (A through D).

The second portion of the ADDRESS is the drive position number. The drive position number is assigned according to table 6–1:

Drive cable connected to	Cable type used	Drive position #
P2	Twisted	0
	Straight	1
P3 or P4	Twisted	2
	Straight	3

Table 6–1 Drive Position Numbers

(A "twisted" cable is one that reverses wires 10 through 16 between **Compati**Card IV and the drive. Note that many flat wire cables contain one "twisted" connector and one "straight" one.)

If **Compati**Card IV has J1 set in the "A" position and you have connected a drive to P3 using a straight cable, the ADDRESS for the drive will be A3.

If **Compati**Card IV has J1 set in the "C" position and you have connected a drive to P3 using a straight cable, the ADDRESS for the drive will be C3.

If **Compati**Card IV has J1 set in the "C" position and you have connected a drive to P2 using a straight cable, the ADDRESS for the drive will be C1.

If **Compati**Card IV has J1 set in the "C" position and you have connected a drive to P2 using a twisted cable, the ADDRESS for the drive will be C0.

If **Compati**Card IV has J1 set in the "B" position and you have connected a drive to P3 using a twisted cable, the ADDRESS for the drive will be B2.

6.1.2 Selecting the Drive TYPE

Determine the TYPE number by locating the description of the drive in the following table and using the associated TYPE number (0 through 8).

Drive Type	Drive Description	Default Values	
		Step Rate	Change Flag
0	5.25 inch 360KB	6	N
1	5.25 inch 800KB	6	N
2	5.25 inch 1.2MB	3	Y
3	5.25 inch 1.2MB dual speed	3	Y
4	8 inch	10	N
5	3.5 inch 720KB	6	N
6	3.5 inch 720KB 600 RPM	12	N
7	3.5 inch 1.4MB	3	Y
8	3.5 inch 2.8MB	3	Y

Table 6–2 Drive Type Numbers and Default Values

6.1.3 Specifying the STEP Rate

You may specify any STEP rate you wish between 1 ms (millisecond) and 32 ms for your drives. The STEP rate is the time allowed for the drive to reposition its read/write head from any track to any adjacent track. It is best to choose the lowest step time that the drive was designed to accommodate. This will result in the fastest drive access.

If you choose a STEP rate that is too fast (too low a STEP number), your drive will get errors while trying to read and write diskettes. If you choose a STEP rate slower than necessary (too high a STEP number), your drive will make an excessive amount of noise as it moves from track to track because it is moving in a jerky fashion rather than in a smooth sweep. With some brands of drives, too slow a step rate will also cause errors.

Table 6–2 lists the default STEP rates associated with the nine different drive TYPEs. These are the values that are used if you don't specify something different. You may wish to try smaller or larger numbers to try to improve the performance or reliability of your drive installation.

If you are specifying the parameter block for a TYPE 7 drive (3.5 inch 1.4MB) and you don't specify the STEP rate, 3 will be the STEP rate used (3 ms from track to track).

Perhaps you have a TYPE 0 drive designed to STEP at a 4 ms rate. When you are specifying the parameter block for the drive, if you specify that the STEP rate is 4, a 4 ms STEP rate will be used (4 ms from track to track).

Perhaps you have a TYPE 3 drive that will not STEP at the 3 ms rate. If you specify that the STEP rate is 6 in the parameter block for this drive, a 6 ms STEP rate will be used.

6.1.4 Altering the Disk CHANGE Flag

CHANGE is an option "flag" that tells the **Compati**Card IV device driver software whether or not your drive provides a "diskette changed" signal when the drive door is opened. CHANGE can be set to either Y or N, depending upon whether or not your disk drive has the capability.

The default setting of CHANGE is determined by the type of drive installed. Generally speaking, you will need to specify CHANGE only if the default setting causes your drive to malfunction.

You should use the CHANGE feature if your drive provides the "diskette changed" signal. It will decrease the amount of time necessary to do a disk access because the computer will not have to reread the directory of the diskette with each access.

Don't use the CHANGE feature if your drive is not equipped for it. Doing so will cause the computer to ignore the files stored on the diskette and possibly write over them. It could cause the loss of files on the diskette.

Some drives that have the CHANGE feature allow it to be disabled through the removal or repositioning of a jumper block on the drive electronics card. If you suspect this has been done to your drive, because it exhibits the symptoms of not providing a "diskette changed" signal, you must either rejumper the drive or use CHANGE to specify that your drive does not have the "diskette changed" feature.

If you specify that "diskette changed" is present when, in fact, the drive does not provide it, the drive select light will not go on when you do a directory of the diskette, even after you remove the diskette and replace it again. When in doubt, set CHANGE to N.

If you specify that "diskette changed" is absent when, in fact, the drive does provide it, the drive select light will go on each time you do a directory of the diskette, whether or not you have removed the diskette and replaced it. This will not cause any errors in operation; it will just cause an increase in overall drive access time.

Refer to Table 6–2 for the default values of CHANGE for the various drive types.

> Assume that you have installed a 360KB 5.25 inch drive. It does not provide the "diskette changed" signal. From the preceding table we can see that the default value of CHANGE for this drive type is N; therefore you don't have to specify CHANGE. The default is correct. If you do specify CHANGE, it must be with a value of N.

> Assume that you have installed a 1.2MB dual speed drive. Most 1.2MB drives provide the "diskette changed" signal. From the table above we can see that the default value of CHANGE for this drive type is Y, therefore you don't have to specify CHANGE. The default is correct.

> Assume that you have installed a 1.2MB dual speed drive and have used the default value of CHANGE (Y). When using the drive you notice the symptoms of an improper CHANGE specification. (The drive select light doesn't go on when you read the directory after a diskette change.) You should set the value of CHANGE to N for this drive.

6.2 Overriding Default Parameters

As mentioned in section 6.1, you can include drive parameter blocks in the CONFIG.SYS file to give CC4DRV.SYS specific information about the individual drives connected to **Compati**Card IV. By doing this you can modify certain aspects of the drives' performance, such as the step rate or the order in which drive letters are assigned. The following examples will help illustrate how the drive parameter blocks can be used to accomplish this.

When no parameters are specified for a drive, the default parameters for that type of drive will be used. The drive type is determined by the setting of switch SW2 on **Compati**Card IV. Parameters that you specify will take precedence over the default values. With each drive, you may specify some parameters and use default values for others.

When used with no parameters, CC4DRV.SYS will assign drive letters according to the switch settings of SW2. Drive letters will be assigned in ascending order starting with the drive with the lowest physical drive address (see section 6.1.1.)

In the following examples, assume that your computer already has drives A, B, and C before you add **Compati**Card IV. Assume that you add **Compati**Card IV and you have drives installed as follows:

Drive C0: 3.5 inch 1.4MB drive
Twisted cable connected to P2 on **Compati**Card IV

Drive C1: 5.25 inch 1.2MB dual speed drive
Straight cable connected to P2 on **Compati**Card IV

Drive C2: 5.25 inch 360KB drive
Twisted cable connected to P4 on **Compati**Card IV

Drive C3: 3.5 inch 2.8MB drive
Straight cable connected to P3 on **Compati**Card IV

For using the default disk drive parameters, the syntax is

device = cc4drv.sys

When used with no parameters, CC4DRV.SYS will use the default drive parameters and drive letters. Drive types will be determined from the settings of switch SW2.

For specifying the drive parameters completely, the syntax is

device = cc4drv.sys /c0,7,3,y /c1,3,3,y /c2,0,6,n /c3,8,3,y

This example contains four parameter blocks, one for each of the drives connected to **Compati**Card IV. The card address jumper J1 is assumed to be set to position C. Each block specifies all of the parameters for one of the drives. The values used are the default values for each drive. This example is equivalent to the previous example, in which no parameters were specified.

For partially specifying the drive parameters, the syntax is

device = cc4drv.sys /c0,,3,y /c1,,,y /c2 /c3,,3

You may specify some parameters in each block and leave out others. Use commas to fix the position when a parameter is not specified previous to one that is. It is not necessary to use commas after the last parameter to be specified in each block. This example is equivalent to the two previous examples.

For changing the order of drive letter assignment, the syntax is

device = cc4drv.sys /c1,3,3,y /c2,0,6,n /c0,7,3,y /c3,8,3,y

When drive parameter blocks are present, their sequence in the CONFIG.SYS file determines the sequence in which drive letters will be assigned to the drives. In this example the card address jumper J1 is assumed to be set to position C. The drive letters assigned will be "D" to the 1.2MB drive at C1, then "E" to the 360KB drive at C2, then "F" to the 1.4MB drive at C0, and finally "G" to the 2.8MB drive at C3.

device = cc4drv.sys /c1 /c2 /c0 /c3

Drive letter assignment control takes place whether a complete or a partial parameter block is present. This example has the same order of drive letter assignment as the previous example. If drive letter sequence is all you wish to change, you need only specify the ADDRESS for each drive.

device = cc4drv.sys /c2,0,3,n

Drive letters will be assigned first to the drives with a parameter block, then to the others in order of ADDRESS. In this example the STEP has been changed to 3 ms on the 360KB drive. It will be assigned drive letter "D," then "E" for the 1.4MB drive at C0, then "F" for the 1.2MB drive at C1, and finally "G" for the 2.8MB drive at C3.

device = cc4drv.sys /c0 /c1 /c2,0,3,n

In this example the STEP for the 360KB drive at C2 has been changed to 3 ms. The original order for drive letter assignment has been retained by specification of a partial parameter block for the drives with ADDRESS C0 and C1.

For assigning multiple drive letters to one drive, the syntax is

device = cc4drv.sys /c0 /c0 /c1,,6 /c1,,6

In some installations it is advantageous to have two drive letters for the same drive. This can be useful for performing single drive diskette copying. In this example the 1.4MB drive at C0 is assigned letters "D" and "E." The 1.2MB drive at C1 is assigned letters "F" and "G." The 360KB drive becomes "H," and the 2.8MB drive becomes "I." The STEP for the 1.2MB drive is changed to 6 ms.

For changing the drive TYPE, the syntax is

device = cc4drv.sys /c0 /c1 /c2,4,12,n /c3

You may specify a new drive TYPE in a parameter block , and it will take precedence over the setting of the switches on SW2. In this example the drive installed at C2 is an 8 inch drive with a 12 ms STEP and no "diskette changed" signal. This drive will be assigned drive letter "F." TYPE reassignment should be done only for drives whose TYPE is not supported on switch SW2. It is suggested you set the corresponding SW2 switches to the OFF OFF position (no drive installed) if you are going to reassign the TYPE.

For specifying the STEP rate, the syntax is

device = cc4drv.sys /c0,,6 /c1,,6,n

You may change the value of STEP if you want to make your drive step from track to track faster or slower. The value of STEP is the number of milliseconds that the drive will wait before stepping from any track to an adjacent track. In this example we have set STEP to 6 ms for both the 1.4MB drive at C0 and the 1.2MB drive at C1.

For specifying a value for CHANGE, the syntax is

device = cc4drv.sys /c0 /c1,,,n

You may specify a different value for CHANGE if you know that the default value is not correct for your drive. In this example we have specified that the 1.2MB drive does not have the "diskette changed" function. In some cases this will be necessary for proper operation. If you are unsure whether your drive supports "diskette changed," it is better to set CHANGE to N. The partial parameter block for the drive at C0 is present to retain the original order of drive letter assignment.

6.3 Using the DOS FORMAT Command with CompatiCard IV

It is possible to use the DOS FORMAT command with your new **Compati**Card IV drives in some cases. DOS versions 3.2 and above are the only ones with FORMAT commands capable of supporting new types of drives. It is easier, however, to use CCFORMAT or BACKFMT (the background formatter) than it is to use the DOS FORMAT command. Section 5.2 of this guide explains how to use CCFORMAT and BACKFMT. This section explains the use and limitations of the DOS FORMAT command with your new **Compati**Card IV drives.

6.3.1 Using FORMAT with CC4DRV.SYS Installed

To get the most out of the FORMAT command, you must install the CC4DRV.SYS device driver when you install **Compati**Card IV. If you do, you'll be able to use FORMAT to initialize diskettes in all of the supported DOS formats on all of the supported drive types (with DOS version 3.2 or higher). Be sure you have included the following line in your CONFIG.SYS file:

```
device=cc4drv.sys
```

Make sure the CONFIG.SYS and CC4DRV.SYS files are both in the root directory so DOS can find them when the computer starts up.

6.3.2 Using FORMAT without CC4DRV.SYS

When the FORMAT command is used without CC4DRV.SYS installed, it is limited to use on drives A and B. FORMAT is also limited to certain drive types and disk formats, depending on the DOS version being used. Following is a summary of the drive types and formats supported by the various DOS versions when used without CC4DRV.SYS:

DOS versions 3.3 and higher

Support 360KB 5.25 inch, 1.2MB 5.25 inch, 720KB 3.5 inch, and 1.4MB 3.5 inch drives and their associated disk formats.

DOS version 3.2

Supports 360KB 5.25 inch, 1.2MB 5.25 inch, and 720KB 3.5 inch drives and their associated disk formats.

DOS versions 3.1 and 3.0

Support 360KB 5.25 inch and 1.2MB 5.25 inch drives and their associated disk formats.

DOS versions lower than 3.0

Support 360KB 5.25 inch drives and their associated disk formats.

6.3.3 DOS FORMAT Command Option Summary

Use the following table to determine the options used with the DOS FORMAT command to create the desired type of disks. Keep in mind the FORMAT limitations that are dependent on your installation and DOS version. (The following examples assume drive A is being used.)

Drive Type	Diskette Capacity	FORMAT Command
5.25 inch 360KB	360KB	format a:
	320KB	format a: /8
	180KB	format a: /1
	160KB	format a: /8 /1
5.25 inch 800KB	800KB	format a:
	360KB	format a: /n:9 /t:40
	320KB	format a: /n:8 /t:40
	180KB	format a: /n:9 /t:40 /1
	160KB	format a: /n:8 /t:40 /1
5.25 inch 1.2MB	1.2MB	format a:
	360KB	format a: /4
	320KB	format a: /4 /8
	180KB	format a: /4 /1
	160KB	format a: /4 /8 /1
3.5 inch 720KB	720KB	format a:
3.5 inch 1.4MB	1.4MB	format a:
	720KB	format a: /n:9 /t:80
3.5 inch 2.8MB	2.8MB	format a:
	1.4MB	format a: /n:18 /t:80
	720KB	format a: /n:9 /t:80
8 inch	1.2MB	format a:

Table 6–3 DOS Format Commands

Assume you have **Compati**Card IV installed as a Primary Controller with a 1.2MB 5.25 inch drive A, a 360KB 5.25 inch drive B, a hard drive C, and a 1.4MB 3.5 inch drive D, and you have installed CC4DRV.SYS. Assume also that you have DOS version 3.2. To initialize a 720KB diskette in drive D you would issue the following command at the DOS prompt:

```
format d: /n:9 /t:80↵
```

Assume you have **Compati**Card IV installed as a Secondary Controller with a 360KB 5.25 inch drive A, a 360KB 5.25 inch drive B, and a 1.4MB 3.5 inch drive C. Assume also that you have CC4DRV.SYS installed and that you are using DOS version 2.11. You cannot initialize a diskette in drive C with FORMAT because the DOS 2.11 FORMAT command can support only drives A and B. You should use CCFORMAT to initialize diskettes.

Assume you have **Compati**Card IV installed as a Primary Controller with a 1.2MB 5.25 inch drive A, a 1.4MB 3.5 inch drive B, and a 360KB 5.25 inch drive C. Assume also that you have CC4DRV.SYS installed and that you are using DOS version 3.3. To initialize a 360KB diskette in drive A you would issue the following command at the DOS prompt:

```
format a: /4↵
```

6.4 Retaining Drive A after Auto Boot

If the Auto Boot switch (SW1-8) is ON, **Compati**Card IV will attempt to boot from any drives that are defined on switch SW2. The drive used to boot will be assigned drive letter A and drive number 0. The drive that is normally letter A and number 0 will be assigned drive number 16. For this drive to be accessed, the DOS DRIVER.SYS file (DOS Version 3.2 and above) must be invoked at boot time to assign drive 16 a letter.

If your application is such that you need to access what is normally the A drive after using the Auto Boot feature, perform the following steps:

1) Copy the DOS DRIVER.SYS file to the diskette you will boot from. Make sure it is the same version as the DOS you will be booting.

2) Add a line to the CONFIG.SYS file on the diskette you will boot from to include a reference to DRIVER.SYS. (Create the CONFIG.SYS file if it doesn't already exist.) Select the appropriate line from table 6–4, depending on which type of drive is normally your A drive:

Drive Type	Add to CONFIG.SYS
5.25 inch 360KB	device=driver.sys /d:16 /f:0 /t:40 /s:9 /h:2
5.25 inch 1.2MB	device=driver.sys /d:16 /f:1 /t:80 /s:15 /h:2
3.5 inch 720KB	device=driver.sys /d:16 /f:2 /t:80 /s:9 /h:2
3.5 inch 1.4MB	device=driver.sys /d:16 /f:7 /t:80 /s:18 /h:2

Table 6–4 DRIVER.SYS Commands to Retain Drive A after Auto Boot

Assume your computer has one 360KB drive and you use **Compati**Card IV to add a 1.4MB 3.5 inch drive. At some point you wish to boot from a 3.5 inch diskette but you want to retain the use of the 360KB drive. To do so, you will need to copy DRIVER.SYS to the 3.5 inch diskette. Then you will need to add the following to the CONFIG.SYS file on the 3.5 inch diskette:

device=driver.sys /d:16 /f:0 /t:40 /s:9 /h:2

When you boot from the 3.5 inch diskette, your 360KB drive will be accessible as drive C (or the next available letter on your system).

Appendix A Performance Tips

The sections that follow contain tips that will enhance the performance of your disk drives. Although they are not essential they can make disk access a little quicker and more pleasant.

A.1 Disk Change Signal

Some types of disk drives provide a signal whenever a diskette is removed from the drive. This signal is called "disk change." If, while installing the **Compati**Card IV software, you specify which drives provide Disk Change, it will speed up your disk access. The computer will not have to check the directory of the disk as often during disk operations. Read section 6.1.4 (Setting the Change Option Flag) for information on using the CHANGE option.

A.2 Using Pin 2 Density Select on 3.5 Inch Drives

Most 3.5 inch 1.4MB drives being sold today have the capability of using a media sensor or using Pin 2 of the interface to control the operating density. Most drives are shipped from the factory set for media sensor control because most controllers don't have Pin 2 control capability.

CompatiCard IV has Pin 2 control capability, and you should use it with 3.5 inch drives. By jumpering your drive for Pin 2 control, you'll be able to read and write to "cross formatted" diskettes (e.g., 720KB media formatted to 1.4MB density or vice versa). Micro Solutions does not condone cross formatting, but IBM PS/2 owners can do it and the chances are relatively good that someone is going to hand you a cross formatted diskette some day. If you are jumpered for media sensor control you will get a disk error and will not be able to access the disk. If you are jumpered for Pin 2 control, CCDRIVER will figure out how the disk is formatted and you'll be able to use it. Only **Compati**Cards have this capability. Be sure to use it!

A.3 Single Speed versus Dual Speed 1.2MB

There are two popular types of 1.2MB drives available. The original type, used in the AT, has only one spindle speed of 360 RPM. 360KB density and 1.2MB density are achieved by the use of data transfer rates of 300Kbps and 500Kbps respectively. Almost all aftermarket drives have two spindle speeds available, 300 RPM and 360 RPM. With a dual speed drive the data transfer rates to achieve 360KB and 1.2MB densities would be 250Kbps and 500Kbps respectively.

Most 1.2MB drives sold today can operate in either single speed or dual speed mode. The mode of operation is controlled by a jumper block or switch on the drive electronics board. It is common for these boards to be shipped jumpered for single speed operation. If you have a choice, use your 1.2MB drives in single speed mode; it will result in faster data transfer on 360KB disks. Refer to section 4.1.5 of this manual for further information.

Following is a list of drives which are known to support both single and dual speed operation. Also listed are the jumper changes needed to operate the drive in dual speed mode.

Chinon FZ-506	J1 positions 1, 3, 6, 8, 10, 13 shorted
Fujitsu M2554	Jumper 1SP open, 2SP shorted
Mitsubishi MF-504	Jumper SB open, SS shorted
NEC 1157C	Jumper HDE to position 2
Panasonic JU-475-2	Jumper CX open, BX shorted
Panasonic JU-475-3	Jumper BX shorted
TEAC FD-55GFR	Jumper I shorted, II (if present) open
Toshiba 08DEG	Jumper DE/X shorted

A.4 8 Inch Drive STEP Rates

Most of the early model 8 inch drives (pre 1980) cannot STEP at a rate faster than 10 ms. The default rate used if you install an 8 inch drive on **Compati**Card IV is 10 ms. Many later model 8 inch drives, including those by Siemens, are designed to STEP at a 6 ms rate and may actually perform more reliably at the 6 ms STEP rate than at 10 ms. Refer to section 6.1.3 for information on how to specify a 6 ms STEP rate.

Appendix B Troubleshooting

If you experience trouble with your computer after installing **Compati**Card IV, it could be for one of several reasons. Read the following problem descriptions to see if any match those you are experiencing. If you can't resolve the problem, call Micro Solutions and ask for **Compati**Card IV technical assistance.

B.1 Symptoms

When you try to access a diskette, an "Invalid drive specification" message appears on the screen.

This can occur if you are not using the correct drive letter to access the drive. Be sure the letter you use is the correct one. Use the CCDRIVES utility to show which drive letters are in use with **Compati**Card IV. Review section 5.1 for information on CCDRIVES.

This can also occur if you have not installed the CC4DRV.SYS software or if you have not restarted the computer after installing the software. Review section 4.2 for information on software installation.

The activity light on one of the drives never goes on. When you try to access that drive, nothing happens. Eventually a "drive not ready" or other failure message appears.

This can occur if the drive address specified in the CONFIG.SYS file does not match the way the drives are connected to **Compati**Card IV. Read section 6.1.1 of this guide and review the contents of your CONFIG.SYS file.

The activity lights on one or more drives do not go on. When you try to access the drives, nothing happens. The computer locks up and must be rebooted.

This problem may occur if another card in your computer uses some of the same I/O addresses that **Compati**Card IV is trying to use. Normally, setting J1 to position C will prevent this if you are using **Compati**Card IV as a Secondary Controller. If this problem occurs when you are trying to use **Compati**Card IV as the Primary Controller, it's an indication that something else in the computer is interfering with **Compati**Card IV. Make sure you don't have another primary or Secondary Controller in the computer that could be causing the interference. You may need to try

jumpering J1 for a different address range. Review section 4.1.1 and try installing **Compati**Card IV with a different card address.

This problem may also occur if the J1 address jumper has been set to the wrong address or has been removed from the card. Be sure that jumper J1 is present at one of the four address positions (A through D). Be sure it's at the correct position.

When you are using CompatiCard IV as a Primary Controller, the computer will not boot from a floppy disk. The computer either locks up or gives a boot failure error message.

This problem may occur if another card in your computer uses some of the same I/O addresses that **Compati**Card IV is trying to use. It's an indication that something else in the computer is interfering with **Compati**Card IV. Make sure you don't have another Primary Controller located on the mainboard of the computer that could be causing interference.

When you try to access a drive, the activity light goes on but nothing else happens. Eventually a "drive not ready," a "seek error," or another failure message appears.

This problem may occur if another card in your computer uses the same I/O addresses that **Compati**Card IV is trying to use. Normally, setting J1 to position C will prevent this if you are using **Compati**Card IV as a Secondary Controller. If this problem occurs when you are trying to use **Compati**Card IV as the Primary Controller, it's an indication that something else in the computer is interfering with **Compati**Card IV. Make sure you don't have another Primary or Secondary Controller in the computer that could be causing the interference. You may need to try jumpering J1 for a different address range. Review section 4.1.1 and try installing **Compati**Card IV with a different card address.

This problem can also occur because of a DMA channel conflict. Try selecting an alternate DMA channel for **Compati**Card IV. Review section 4.1.3 for information about DMA channels.

When you try to access a diskette, the activity lights for two drives go on at the same time. Eventually a "drive not ready" or other failure message appears.

This probably indicates that another controller card in your computer is using the same I/O addresses that **Compati**Card IV is trying to use. It will be necessary to jumper J1 for a different address range. Read section 4.1.1 for more information on the card address.

This problem can also occur if your drive cables are not connected properly. If you have two drives on the same cable, be sure that one of them uses twisted wiring and one does not. Review section 4.1.9.

When you try to access a drive, the activity lights for two drives go on at once. At least one of the lights blinks on and off.

This is most likely to occur when two floppy disk device driver software packages are trying to control the same physical drive. Make sure you have not defined the same drive to more than one driver.

The activity light on the drive goes on. When you try to access the drive, the disk rotates. Eventually a failure message appears.

This probably indicates that another controller card in your computer is using the same I/O addresses that **Compati**Card IV is trying to use. It will be necessary to jumper J1 for a different address range. Read section 4.1.1 for more information on the card address.

This problem can also occur because of a DMA channel conflict. Try selecting an alternate DMA channel for **Compati**Card IV. Review section 4.1.3 for information about DMA channels.

This problem could also occur if you have a disk drive alignment problem. Either the drive that created the diskette or the drive you are trying to use may be out of alignment. Try initializing a new diskette on the drive using CCFORMAT and then try to access it. If this works, one of the drives is probably misaligned. Try reading your diskettes on a different PC to pinpoint the problem. Your local service center should be able to perform a drive alignment for you.

The activity light on the drive goes on. You are able to initialize a diskette with CCFORMAT, but when you try to use the diskette you get a "Non DOS disk" error.

This can occur if there is a DMA channel conflict between **Compati**Card IV and something else in your computer. Try setting **Compati**Card IV for a different DMA channel.

The "CompatiCard IV BIOS Version X.XX" message does not appear before your computer boots, even though you have enabled the BIOS ROM. The computer boots normally.

This will occur if another BIOS ROM in the computer is trying to use the same address as the one on **Compati**Card IV. Try using another BIOS address for **Compati**Card IV. Refer to section 4.1.2 for more information on BIOS address selection.

The computer locks up before booting. It doesn't try to access any hard drives or floppy drives.

This can occur if another BIOS ROM in the computer is trying to use the same address as the one on **Compati**Card IV. Try using another BIOS address for **Compati**Card IV. Refer to section 4.1.2 for more information on BIOS address selection.

After the installation of CompatiCard IV, one of your existing cards, devices, or programs doesn't work properly.

This problem may occur if another card in your computer uses the I/O addresses that **Compati**Card IV is using. Remove the **Compati**Card IV card and the CC4DRV.SYS software to see if the problem goes away. If it does, there appears to be an I/O address conflict. If it doesn't, **Compati**Card IV is not the source of the problem. Read section 4.1.1 and try another jumper option if necessary.

With CompatiCard IV installed on an AT&T PC 6300, the activity light goes on when you try to access the drive, but CompatiCard IV doesn't function properly. Errors in reading or writing occur.

Replace the AMD 9517 DMA controller with an equivalent DMA controller of another brand. The NEC 8237-5 is known to be a good substitute. The 9517 is located on the mainboard of the computer and will require a computer service technician to replace it.

The CCFORMAT and CCDRIVES commands don't work. Invoking them results in a "Bad command or file name" message.

The CCFORMAT.COM and CCDRIVES.COM files are not located on the disk you are trying to access them from. For you to be able to use either command, the files must be located on the disk you are invoking them from. During software installation the files were copied to your DOS system diskette or to your DOS system hard disk. You may copy them to another diskette or to the utilities subdirectory of your hard disk by using the DOS "COPY" command. You may wish to experiment with the DOS "PATH" utility to make your computer find them automatically.

The CCFORMAT and CCDRIVES commands don't work. Invoking them results in the following message: "The CompatiCard IV device driver 'CC4DRV.SYS' is not installed."

The **Compati**Card IV controlling software was not included in DOS as your computer powered up. The CONFIG.SYS file on your DOS system disk may have been modified or deleted, eliminating the reference to CC4DRV.SYS. The CC4DRV.SYS file on your DOS system disk may have been deleted. If either of the above is true, you must perform the

software installation procedure again. Refer to section 4.2 for instructions.

The same message will occur if you loaded DOS from a DOS system disk other than the one CC4DRV.SYS was installed on. For example, you may have loaded DOS from a diskette after installing the software on your hard disk, or from a DOS diskette other than the one CC4DRV.SYS was installed on. In this case, restart your computer using the proper DOS system disk, or install CC4DRV.SYS on the new diskette.

B.2 Warning Message Summary

Following are the warning messages that may be produced by **Compati**Card IV and suggestions for dealing with them.

CC4: I/O address conflict.

During its self-test, **Compati**Card IV has determined that some of the input/output ports used to communicate with the processor are being interfered with. If you are using **Compati**Card IV as a Primary Controller, either remove or disable the other Primary Controller which is causing the interference. If you are using **Compati**Card IV as a Secondary Controller, try using a different secondary address.

CC4: Primary controller must use DMA 2 and IRQ 6.

During its self-test, **Compati**Card IV has determined that it cannot access both DMA channel 2 and interrupt 6. Primary Controllers must use DMA 2 and interrupt 6. Either the card is not set for the proper DMA and interrupt, or else another card is interfering with the I/O addresses. Check the DMA and interrupt jumpers for proper position. If that's not the problem, look for another controller trying to use the same address range as **Compati**Card IV.

CC4: Interrupt conflict or not jumpered.

CompatiCard IV cannot use the interrupt that has been selected on J2. Something else in the computer is interfering with it. Move the J2 interrupt jumper to another setting (2 through 7) and try again. This problem could also occur if no interrupt was jumpered. You must select one and only one interrupt. Refer to section 4.1.4 for further information.

CC4: You have a bad or upside-down cable.

During its self-test, **Compati**Card IV determined that a drive cable is either shorted or plugged in backwards. Check your cables carefully.

The same message will occur if a drive that is properly connected to **Compati**Card IV, does not have DC power connected to it. Check your DC power connections.

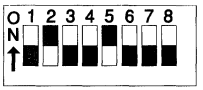
This error could also occur if an I/O conflict exists with another card in your system. If you still get this error with no cables connected to **Compati**Card IV, try using a different card address. If you are using **Compati**Card IV as the primary controller, make sure you have either removed or completely disabled your original controller.

Appendix C Technical Details

This section will address some of the more technical aspects of **Compati**Card IV along with providing a sumary of the switch and jumper settings. When summarizing switch or jumper settings, specific section numbers from this manual where detailed information is available will be included.

C.1 Summary of Switch Settings

This section is meant to be a quick reference for the switch settings of **Compati**Card IV. For further information on any of the settings, refer to the appropriate sections in this manual.



Auto Boot Enable—Section 4.1.6
- ↓ Disabled
- ↑ Enabled

1.2MB Spindle Speed—Section 4.1.5
- ↓ Single Speed
- ↑ Dual Speed

DMA Channel—Section 4.1.3
- ↓↓ DMA 2, IRQ 6 Fixed
- ↓↑ DMA 1
- ↑↓ DMA 2
- ↑↑ DMA 3

Reserved

ROM BIOS Address—Section 4.1.2
- ↓↓↓ ROM BIOS Disabled
- ↓↓↑ CC00:0000h
- ↓↑↓ CE00:0000h
- ↓↑↑ D000:0000h
- ↑↓↓ D800:0000h
- ↑↓↑ DE00:0000h
- ↑↑↓ E800:0000h
- ↑↑↑ EE00:0000h

Table C–1 SW1 Switch Settings

Drive Types—Section 4.1.8
Drive Position 3
↓↑ 360KB or 1.2MB
↑↓ 1.4MB
↑↑ 2.8MB
↓↓ No drive or other type installed
Drive Position 2
↓↑ 360KB or 1.2MB
↑↓ 1.4MB
↑↑ 2.8MB
↓↓ No drive or other type installed
Drive Position 1
↓↑ 360KB or 1.2MB
↑↓ 1.4MB
↑↑ 2.8MB
↓↓ No drive or other type installed
Drive Position 0
↓↑ 360KB or 1.2MB
↑↓ 1.4MB
↑↑ 2.8MB
↓↓ No drive or other type installed

Table C–2 SW2 Switch Settings

C.2 I/O Ports

Jumper J1 is used to select the I/O port locations that **Compati**Card IV will occupy. Use Table C–3 to determine the I/O address range according to the position of jumper J1.

Jumper J1	I/O Ports
A	3F0h-3F7h
B	370h-377h
C	360h-367h
D	3E0h-3E7h

Table C–3 I/O Ports Used

C.3 Interrupt 13h Software Support

The **Compati**Card IV BIOS provides a convenient way for programmers to access disk data directly from their own programs. This eliminates the need to directly interface with the **Compati**Card IV hardware. To access diskettes using Interrupt 13h, the **Compati**Card IV BIOS must be enabled either by using the on-board ROM or by including the CC4BIOS.SYS in the CONFIG.SYS file.

Information for using Interrupt 13h can be found in the INT13.DOC file on the **Compati**Card IV software diskette. This information is provided with no technical support for use by qualified programmers.

Appendix D Cable Wiring

CompatiCard IV follows IBM's conventions for disk drive cable wiring and addressing. Each drive attached should have its drive select jumper set to the second drive position (e.g., DS1 if the sequence is DS0, DS1, DS2, DS3, and DS2 if the sequence is DS1, DS2, DS3, DS4). Each drive connector is capable of handling two floppy drives. The low-order/high-order addressing of the drives is determined by the type of cable used to connect them. The drive that has wires 10 through 16 of the cable twisted relative to the controller will be the low-order drive, a cable connector that runs straight through connects to the high-order drive. Many internal drive cables have both the low-order and high-order connector on them.

All cable connections to **Compati**Card IV are made with 34 conductor cable. In the event that the disk drive to be attached does not have a 34 conductor connector, an adapter cable will have to be fabricated for the proper connections to be made.

D.1 Connector Pin Assignments

CompatiCard IV provides three connectors to which drives can be attached. Connector P2 is a header connector for internal drives. Connectors P3 and P4 are electronically the same and may be used interchangeably. P3 is a header connector for internal drives. P4 is a DB-37S for external drives. Table D–1 describes the signals that are available from the connectors.

P2 Pin	Signal Name
2	Mode 1
6	Mode 2
8	Index
10	Motor Enable 0
12	Drive Select 1
14	Drive Select 0
16	Motor Enable 1
18	Step Direction
20	Step Pulse
22	Write Data
24	Write Enable
26	Track 0
28	Write Protect
30	Read Data
32	Select Head 1
34	Disk Change
Odd Pins	Ground

P3 Pin	P4 Pin	Signal Name
2	3	Mode 1
6	5	Mode 2
8	6	Index
10	7	Motor Enable 2
12	8	Drive Select 3
14	9	Drive Select 2
16	10	Motor Enable 3
18	11	Step Direction
20	12	Step Pulse
22	13	Write Data
24	14	Write Enable
26	15	Track 0
28	16	Write Protect
30	17	Read Data
32	18	Select Head 1
34	19	Disk Change
Odd Pins	20-37	Ground

Table D–1 Connector Pin Assignments

All of the signals listed in the table, except Mode 2, are standard disk drive control signals. The Mode 2 signal is controlled by the **Compati**Card IV BIOS ROM and is used by 2.8MB 3.5 inch drives.

D.2 DC Power for External Drives

The jumper blocks at positions J3 through J6 on **Compati**Card IV are used to configure the presence of DC power on P4 for use by external disk drives.

For most external drive applications, DC power should not be present on P4 because it is provided by a power supply in the external drive cabinet. In a case such as this the jumpers should be set to disable DC power.

In some applications, the external cabinet does not contain a power supply and the DC power must be provided by the computer through the drive cable. This type of application requires a specially fabricated cable. The disk drive end of the cable must contain both a 34 conductor drive connector and the drive power connector. Megamate and Overdrive by Micro Solutions may be used in this fashion and include the appropriate cable. To provide the required DC power, the jumpers must be set to enable DC power.

There are two wiring conventions supported for DC power on the DB-37. The Micro Solutions convention puts DC power on Pins 1 and 2 of the DB-37. These pins are normally not used by the drive and thus the potential for wiring conflicts is minimized. The alternate convention puts DC power on Pins 1, 2, 3, and 4. This convention has been used by IBM and Western Digital in the past, so it is supported here.

Select the power configuration that is appropriate for your installation and set the jumper blocks at J3, J4, J5, and J6 to the appropriate positions using Table D–2:

	DC Power Pins (P4)			Jumper Settings				
Power Convention	+5v	+12v	Gnd	J3	J4	J5	J6	Notes
No Power	None	None		A	A	A	A	Factory Setting
Micro Solutions	2	1	20-37	A	A	B	B	
Alternate	4	1	2-3	B	B	A	B	

Table D–2 External Drive Power Jumper Settings

Fuses are built onto **Compati**Card IV near the bottom of connector P4. F1 is for the 12v (volt) power and F2 is for the 5v power. Both 5v and 12v power consumption should be limited to 1.5 amps or less. Please make sure that the computers power supply is not being overtaxed in supplying your external drive. Overtaxing will result in a burned out supply.

D.3 8 Inch Drive Cable Wiring

Eight inch drives can be attached to **Compati**Card IV if a wiring adapter is used to convert the 34 wire cable that **Compati**Card IV uses to the 50 wire connector on the 8 inch drive. An adapter specifically designed for this conversion can be purchased from Micro Solutions or can be assembled from the information in Table D–3.

CompatiCard IV				8 Inch Drive	
Signal Name	34 Pin	37 Pin	Signal Direction	50 Pin	Signal Name
Programmable	2	3	→	2	Low Current
Index	8	6	←	20	Index
Drive Select 1/3	12	8	→	28	Head Load
Motor Enable 1/3	16	10	→	18	Drive Select 2
Step Direction	18	11	→	34	Direction Select
Step Pulse	20	12	→	36	Step
Write Data	22	13	→	38	Write Data
Write Enable	24	14	→	40	Write Gate
Track 0	26	15	←	42	Track 0
Write Protect	28	16	←	44	Write Protect
Read Data	30	17	←	46	Read Data
Select Head 1	32	18	→	14	Side Select

Table D–3 8 Inch Drive Wiring

If you are connecting the 8 inch drive to **Compati**Card IV through one of the 34 pin connectors (P2 or P3), use the 34 pin column of Table D–3. Connect the odd numbered pins (1/33) from **Compati**Card IV to all the odd pins on the 50 pin connector for the 8 inch drive.

If you are connecting the 8 inch drive to the DB–37 connector P4, use the 37 pin column of Table D–3. Connect pins 21/37 of the DB–37 to all the odd pins on the 50 pin connector for the 8 inch drive.

When an 8 inch drive is being installed, the physical drive address on its electronics board must be jumpered to the second drive out of the four possible drives.

Appendix E Update Policy

Since the **Compati**Card IV software may be updated with new features, registered users can send in their master diskettes for updating to the latest version. Please note the following policy for updating **Compati**Card IV master diskettes:

- There is a nominal charge for updating **Compati**Card IV master diskettes. Contact Micro Solutions for the current update charge before sending in your master diskette. Payment for the update must be included with the diskette.
- In order to obtain an update, you must send in your original master **Compati**Card IV diskette. Copies will not be accepted.
- A registration card for your **Compati**Card IV must be on file with us before your diskette will be updated. If you did not receive one with your package or if you lost it, contact us and we'll send one to you. You can then return the completed card along with your diskette for updating.

Appendix F Hardware Warranty

1 Year Limited Warranty

Micro Solutions, Inc. (MSI) warrants **Compati**Card IV to be free from defects in workmanship or material under normal use for a period of (1) year from the date of purchase by the original consumer purchaser. During this warranty period, MSI at its option, will repair or replace any component parts which in its opinion prove to be defective. This warranty does not extend and shall not apply to products which have been subject to misuse, neglect, accident, or improper installation.

Products to be repaired under the term of this limited warranty must be returned, shipping and insurance prepaid, by the original purchaser to the address noted below. A Return Material Authorization (RMA) number must be obtained from MSI prior to return of defective material. Telephone 815-756-3411, Technical Support Department for an RMA number. MSI is not responsible for material returned without the RMA number clearly printed on the outside of the shipping container.

Micro Solutions Computer Products
132 West Lincoln Hwy.
DeKalb, IL 60115
Attn: RMA#_____

THIS LIMITED WARRANTY AND REMEDY ARE EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MICRO SOLUTIONS, INC. BE LIABLE FOR LOST PROFITS, LOSS OF GOOD WILL, OR ANY OTHER SPECIAL OR CONSEQUENTIAL DAMAGES. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Appendix G Software License Agreement

Terms and Conditions

Micro Solutions, Inc. licenses the **Compati**Card IV software for your personal use. You assume all responsibility for the operation and results. Micro Solutions, Inc. may from time to time, revise the performance of this program and in doing shall incur no obligation to furnish such revisions to you. Further, Micro Solutions, Inc. may elect to charge an update fee for such revisions.

Software Warranty Information

Micro Solutions, Inc. warrants that the diskette containing the **Compati**Card IV software is free from defects and will replace a defective diskette within thirty (30) days from the date of purchase by the original consumer.

Micro Solutions, Inc. makes no warranties, either express or implied, with respect to this software, its quality, performance, merchantability, or fitness for any particular purpose. The entire risk as to the performance of this program is with you.

IN NO EVENT WILL MICRO SOLUTIONS, INC. BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS PROGRAM.

This agreement shall be interpreted in accordance with the laws of the State of Illinois.

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