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CFFA 3.0.0.0

COMPACT FLASH FOR APPLE II

THE COMPLETE MANUAL

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Contents page...

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Introduction

Congratulations...

On your purchase of the CFFA 3ØØØ Expansion Card from ReActiveMicro, the world leader in Apple II related hardware.

This manual is designed to assist you in every phase of integrating the CFFA 3ØØØ Expansion Card into your Apple II Personal Computer System.

The manual covers everything from the hardware installation, software configuration, and much more. The hardware is the most sensitive part; an improperly-performed hardware installation could damage the CFFA 3ØØØ and/or your Apple II Personal Computer.

Everything is included to get you up and running right out of the box.

No matter what your level of experience, do not attempt to install CFFA 3ØØØ until you have read the manual and understand all of the steps completely.

Static Precaution

Avoid any and all electrostatic discharges to the CFFA 3ØØØ Expansion Board. Like all electronics devices, a static discharge can destroy or shorten the life span of the delicate components on the Expansion Card.

This risk is highest in areas where there is carpet, and especially during dry weather.

You can momentarily discharge any buildup by coming into contact with a grounded piece of metal, the most convenient method is touching the metal case of the Apple II's internal power supply, the computer must be plugged in for this procedure to work, the power cable has the grounded connection.

The CFFA 3000 Expansion Card

The Compact Flash for Apple (CFFA) 3ØØØ is an Apple II expansion card that takes advantage of USB and CompactFlash (CF) storage media devices and makes it accessible to the Apple II Family of Personal Computers. This eliminates the need for a physical hard drive with spinning platters and or flimsy floppy disks, giving your Apple II Personal Computer a modern day solid state storage solution.

USB hubs are currently not supported by the CFFA 3000.

Basic Concepts

Compact Flash Overview

What is a CF Storage Card?

The CompactFlash Storage Card contains a single chip controller and flash memory module(s) in a matchbook-sized package with a 5Ø-pin connector consisting of two rows of 25 female contacts each on 5Ø ml (1.27 mm) centers.

The controller interfaces with a host system allowing data to be written to and read from the flash memory module(*s*) as seen in Figure 1.

The CompactFlash Storage Cards on-card intelligent controller manages interface protocols, data storage and retrieval as well as Error Correcting Code (ECC), defect handling and diagnostics, power management and clock control.

CF Card Internal Diagram

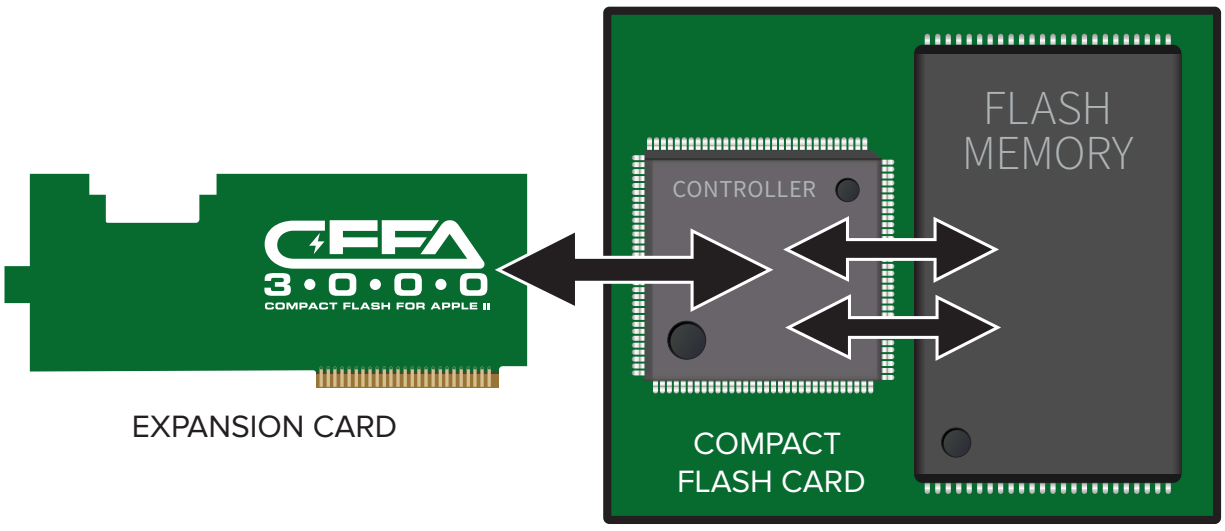


Figure 1: CompactFlash Storage Card Block Diagram.

For more information on this compact flash storage visit:

`http://www.compactflash.org/`

File Systems

All file systems consist of structures necessary for storing and managing data. These structures typically include an operating system boot record, directories, and files. A file system also performs three main functions:

1. Tracking allocated and free space.

2. Maintaining directories and file names.

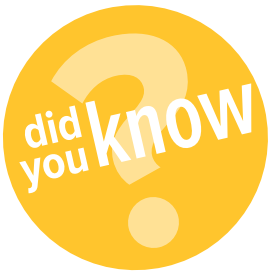
3. Tracking where each file is physically stored on the flash card or usb storage media.

Different file systems are used by different computer operating systems. Some OSs can recognize only one file system, while other OSs can recognize several.

Some of the most common file systems are the following:

- File Allocation Table (FAT)
- File Allocation Table 16 (FAT16)
- File Allocation Table 32 (FAT32)
- New Technology File System (NTFS)
- High Performance File System (HPFS)
- exFAT (Extensible File Allocation Table)
- Linux Ext2 and Linux Swap

The CFFA 3ØØØ currently utilizes only the FAT16 and FAT32 file systems.



File Allocation Table (FAT) is a file system developed for personal computers originally developed in 1977 for use on floppy disks, it was adapted for use on hard disks and other devices.

It is often supported for compatibility reasons by current operating systems for personal computers and many mobile devices and embedded systems, allowing interchange of data between disparate systems. The increase in disk drives capacity required three major variants: FAT12, FAT16 and FAT32. The FAT standard has also been expanded in other ways while generally preserving backward compatibility with existing software.

FAT file systems are still commonly found on floppy disks, flash and other solid-state memory cards and modules (including USB flash drives), as well as many portable and embedded devices. FAT is the standard file system for digital cameras per the DCF specification.

exFAT is a file system introduced by Microsoft in 2ØØ6 and optimized for flash memory such as USB flash drives and SD cards. exFAT was proprietary until 28 August 2Ø19, when Microsoft published its specification. Microsoft owns patents on several elements of its design. exFAT has been adopted by the SD Association as the default file system for SDXC cards larger than 32 GB.

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Installation

Apple II
Apple II Plus

Installation Scenarios

Possible System Configurations

a. Acting as a Disk II Drive:

Floppy disk images that you create yourself or find on the Internet can be used on the CFFA 3000, just the same way you might use them on an emulator — except you'll be running them on a real Apple II. Configure the CFFA 3000 to host a virtual Disk II adapter in whatever slot is convenient (slot 6 is of course typical for a Disk II).

b. Making Backup Copies of Disks:

You can use your normal Disk II expansion card in slot 6, and configure the CFFA 3000 to act as a second Disk II controller in slot 7. You can then use any Disk II copying software to copy from slot 6 to slot 7. The resulting disk image files on the CFFA 3000 will be backups of the physical disks.

Many Apple II-based tools (*i.e. COPYA, Copy II Plus, etc.*) that can successfully copy a disk in the real world will be able to copy to a disk image hosted on the CFFA 3000. The CFFA also has the ability to "**capture**" an image of any ProDOS drive (*including physical Disk II drives*) existing in the system.

Speeding up Disk Access

By default, an RWTS "**patch**" is active (*signified by a quick double-beep during startup*) that speeds up Disk II operations significantly under the DOS operating system.

Card Configuration

1. Discharge yourself of excess static charge and remove the CFFA 3ØØØ expansion card from the shielded anti-static bag.

2. Set DIP switches 4 and 7 as shown in Table 1. All switches are set to the **OFF** position by default. The **ON** position is down toward the board.

Model	Switch 4	Switch 7
Apple II, II *plus*	OFF	OFF

Table 1: Model-specific Switch Settings

System Installation

1. Turn off your Apple II computer. Insert your CFFA 3ØØØ in the slot you have chosen, a popular choice is expansion slot 7.

2. Insert a Compact Flash card and/or a USB thumb drive loaded with disk images you are interested in mounting. You may also use a USB extension cable. The CF and USB media may be hot plugged. Please refrain from removing the storage media while disk access is occurring.

3. Turn on computer and enter PR# <slot> – Example: PR#7. Then press the M key to enter the CFFA 3ØØØ menus. To boot automatically, go to `Other Settings` menu and change `Autoboot Older Apples` to `Yes`.

4. If you are planning to use Disk II emulation, select a Disk II Slot number (make sure it is empty).

5. Mount a disk image. The way you use them in a CFFA 3ØØØ is as follows:

   a. If the disk image you want to mount needs to be treated as if it were inserted in a virtual Disk II drive, then select `Disk II Assignments` from the main menu as seen in Figure 2.

Demonstrating how the Disk II works:

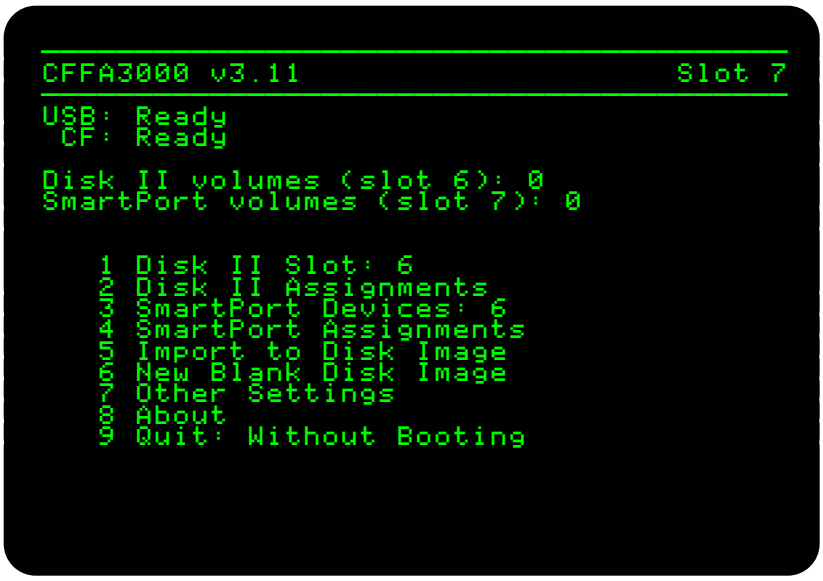

Figure 2: Selecting “Disk II Assignments” from the menu.

b. When assigning Disk II images, press the [1] key will assign the highlighted image to drive 1. Press the [2] key will assign the highlighted image to drive 2: as seen in Figure 3.

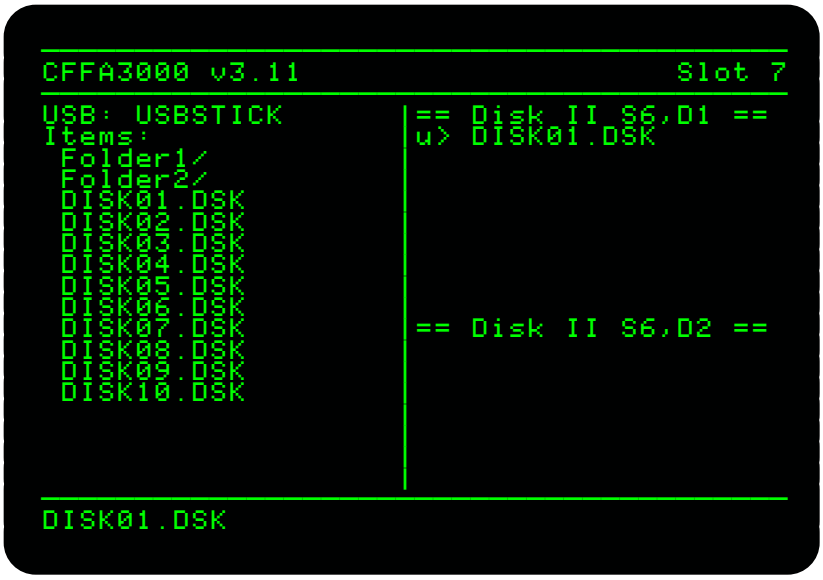

Figure 3: Select “1” to assign a disk image to Disk II drive 1.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will alternate the left-hand column between CF and USB file listings.
- ☛ To move the highlight-bar around the screen use Control I (not number 1).
- ☛ The greater-than sign ▶ indicates the currently mounted disk in the drive in the right-hand column. You can select multiple disks for the drive, and rotate through them with the optional remote pushbutton attachment.
- ☛ The current disk mounted in the Disk II drive (as noted with the greater-than sign ▶ may also be selected by highlighting the desired image in the right-hand column and press the Return key.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will switch the left-hand column to alternately display CF and USB file listings.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

6. To boot the Apple II using the disk images you have selected, press Control B from within the disk selection menu or select the Boot (Reboot) menu item at the bottom of the main menu.

CFFA 3000 Menu System

Navigating the Menus

The Menu System may be accessed in several ways:

a. Press the M key immediately after turning on your Apple II.

> You can only access the CFFA 3000 menu if you are booting either its physical slot or its virtual Disk II slot. The CFFA defaults its virtual Disk II slot to OFF.

b. The menus may be accessed by using the appropriate slot specific entry point, as shown in Table 2.

CFFA 3000 Slot	At the BASIC prompt:	At the MONITOR prompt:
1	CALL -16Ø8Ø	C13ØG
2	CALL -15824	C23ØG
3	CALL -15568	C33ØG
4	CALL -15312	C43ØG
5	CALL -15Ø56	C53ØG
6	CALL -148ØØ	C63ØG
7	CALL -14544	C73ØG

Table 2: Menu invocation based on slot number

Moving among menu items or files:

1. Use A / Z or Control K / Control J to move among items.
2. Use the numbers 1-9, or the first letter of an item, to select the next item starting with that character.
3. To navigate into a folder, highlight it and press the Return key. Use the ← left arrow or minus - to navigate back up one level.

Some menu items cycle through a list of options. These menu items show left or right arrows on the right side of the screen indicating other selections are possible. Press the ← and → arrow keys change these settings.

Any changes to a setting will be automatically saved when you move off that menu item.

Use Control I (not the number 1) to move among columns/panes in the disk assignment screens.

Use the minus - key, or Control D to remove a disk image from the mounted list on the right-hand of the disk assignment screens.

Use Control B to boot the Apple II when in any of the drive assignment menus. After making drive assignments, you can easily reboot with Control B.

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Installation

Apple IIe Unenhanced

Installation Scenarios

Possible System Configurations

a. Acting as a Disk II Drive:

Floppy disk images that you create yourself or find on the Internet can be used on the CFFA 3000, just the same way you might use them on an emulator — except you'll be running them on a real Apple II. Configure the CFFA 3000 to host a virtual Disk II adapter in whatever slot is convenient (slot 6 is of course typical for a Disk II).

b. Making Backup Copies of Disks:

You can use your normal Disk II expansion card in slot 6, and configure the CFFA 3000 to act as a second Disk II controller in slot 7. You can then use any Disk II copying software to copy from slot 6 to slot 7. The resulting disk image files on the CFFA 3000 will be backups of the physical disks.

Many Apple II-based tools (*i.e. COPYA, Copy II+, etc.*) that can successfully copy a disk in the real world will be able to copy to a disk image hosted on the CFFA 3000. The CFFA also has the ability to "**capture**" an image of any ProDOS drive (including physical Disk II drives) existing in the system.

Speeding up Disk Access

By default, an RWTS "**patch**" is active (signified by a quick double-beep during startup) that speeds up Disk II operations significantly under the DOS operating system.

Card Configuration

1. Discharge yourself of excess static charge and remove the CFFA 3ØØØ expansion card from the shielded anti-static bag.

2. Set DIP switches 4 and 7 as shown in Table 3. All switches are set to the **OFF** position by default. The **ON** position is down toward the board.

Model	Switch 4	Switch 7
Apple //e Unenhanced	OFF	OFF

Table 3: Model-specific Switch Settings

System Installation

1. Turn off your Apple II computer. Insert your CFFA 3ØØØ in the slot you have chosen, a popular choice is expansion slot 7.

2. Insert a Compact Flash card and/or a USB thumb drive loaded with disk images you are interested in mounting. You may also use a USB extension cable. The CF and USB media may be hot plugged. Please refrain from removing the storage media while disk access is occurring.

3. Turn on computer and enter PR# <slot> – Example: PR#7. Then press the M key to enter the CFFA 3ØØØ menus. To boot automatically, go to `Other Settings` menu and change `Autoboot Older Apples` to `Yes`.

4. Mount a disk image. The way you use them in a CFFA 3ØØØ is as follows:

   a. If the disk image you want to mount needs to be treated as if it were inserted in a virtual Disk II drive, then select `Disk II Assignments` from the main menu as seen in Figure 4.

Demonstrating how the Disk II works:

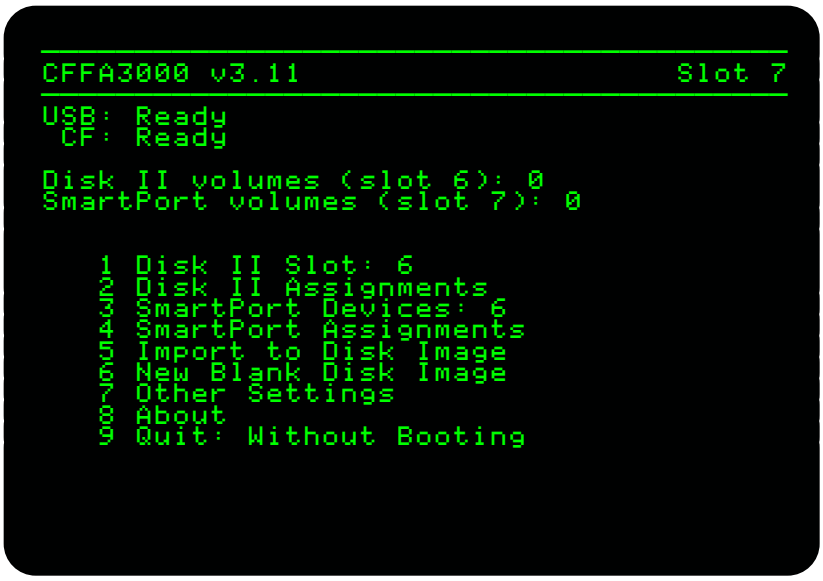

Figure 4: Selecting “Disk II Assignments” from the menu.

b. When assigning Disk II images, press the [1] key will assign the highlighted image to drive 1. Press the [2] key will assign the highlighted image to drive 2: as seen in Figure 5.

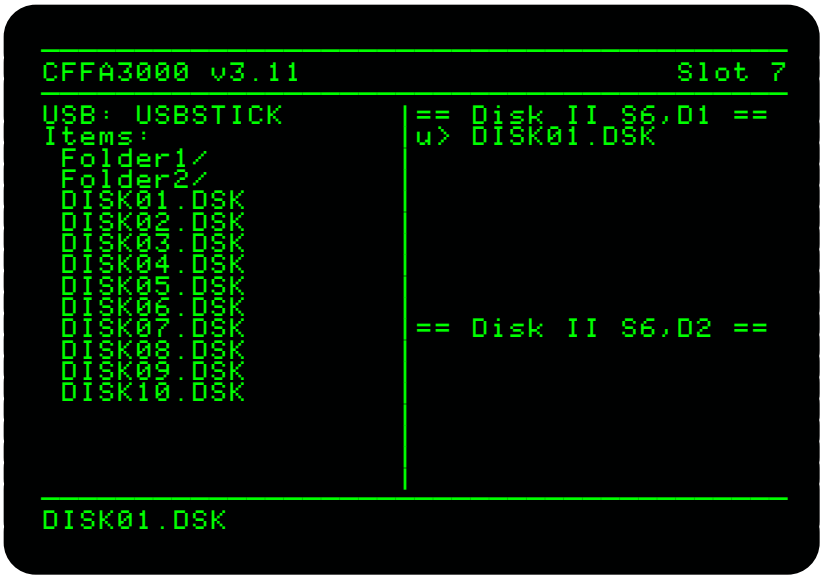

Figure 5: Select “1” to assign a disk image to Disk II drive 1.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will alternate the left-hand column between CF and USB file listings.
- ☛ The TAB key will move the highlight-bar around the screen.
- ☛ The greater-than sign ▶ indicates the currently mounted disk in the drive in the right-hand column. You can select multiple disks for the drive, and rotate through them with the optional remote pushbutton attachment.
- ☛ The current disk mounted in the Disk II drive (as noted with the greater-than sign ▶ may also be selected by highlighting the desired image in the right-hand column and press the RETURN key.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will switch the left-hand column to alternately display CF and USB file listings.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

5. To boot the Apple II using the disk images you have selected, press CONTROL B from within the disk selection menu or select the Boot (Reboot) menu item at the bottom of the main menu.

CFFA 3000 Menu System

This section describes how to navigate the menus and file assignment screens.

Navigating the Menus

The Menu System may be accessed in several ways:

a. Press the M key immediately after turning on your Apple II.

> You can only access the CFFA 3000 menu if you are booting either its physical slot or its virtual Disk II slot. The CFFA defaults its virtual Disk II slot to OFF.

b. The menus may be accessed by using the appropriate slot specific entry point, as shown in Table 4.

CFFA 3000 Slot	At the BASIC prompt:	At the MONITOR prompt:
1	CALL -16080	C130G
2	CALL -15824	C230G
3	CALL -15568	C330G
4	CALL -15312	C430G
5	CALL -15056	C530G
6	CALL -14800	C630G
7	CALL -14544	C730G

Table 4: Menu invocation based on slot number

Moving among menu items or files:

1. Use the CONTROL ↓ arrow keys to move among items.
2. Use the numbers 1-9, or the first letter of an item, to select the next item starting with that character.

3. To navigate into a folder, highlight it and press the RETURN key. Use the ← left arrow or minus - to navigate back up one level.

Some menu items cycle through a list of options. These menu items show left or right arrows on the right side of the screen indicating other selections are possible. Press the ← and → arrow keys change these settings.

Any changes to a setting will be automatically saved when you move off that menu item.

Use the TAB key to move among columns/panes in the disk assignment screens.

Use the DELETE key or the minus - key to remove a disk image from the mounted list on the right-hand of the disk assignment screens.

Use CONTROL B or CONTROL RESET to boot the Apple II when in any of the drive assignment menus. After making drive assignments, you can easily reboot with CONTROL B.

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Installation

Apple IIGS
Apple IIe Enhanced

Installation Scenarios

The CFFA 3ØØØ physically occupies one slot, however when configured to offer both SmartPort devices and Disk II devices, the CFFA 3ØØØ appears to the Apple II to be inserted in two separate slots: the physical slot it actually occupies, and the virtual Disk II slot you choose (typically slot 6). The slot you choose as a virtual Disk II card should not contain a real card.

Possible System Configurations

a. Acting as a Hard Disk Drive:

ProDOS has the ability to use one or more hard drives up to 32 megabytes in size. Configuring the CFFA 3000 with a hard drive image in the SmartPort will allow you to format it and copy files to it just like a real hard drive. Copying the files named PRODOS and BASIC.SYSTEM from any ProDOS system disk will make the CFFA 3000 bootable in that slot.

b. Acting as a Disk II Drive:

Floppy disk images that you create yourself or find on the Internet can be used on the CFFA 3000, just the same way you might use them on an emulator — except you'll be running them on a real Apple II. Configure the CFFA 3000 to host a virtual Disk II adapter in whatever slot is convenient (slot 6 is of course typical for a Disk II).

The virtual Disk II adapter slot you choose can either be the same lot as the CFFA 3000 is inserted into, which would disable the SmartPort capability - or it can be any other unoccupied slot in your Apple so you retain the SmartPort capability.

c. Making Backup Copies of Disks:

You can use your normal Disk II expansion card in slot 6, and configure the CFFA 3000 to act as a second Disk II controller in slot 7. You can then use any Disk II copying software to copy from slot 6 to slot 7. The resulting disk image files on the CFFA 3000 will be backups of the physical disks.

Many Apple II-based tools (i.e. COPYA, Copy II+, etc.) that can successfully copy a disk in the real world will be able to copy to a disk image hosted on the CFFA 3000. The CFFA also has the ability to "**capture**" an image of any ProDOS or SmartPort drive (including physical Disk II drives) existing in the system.

Speeding up Disk Access

Disk operations can be increased by two methods:

a. By default, an RWTS "**patch**" is active (signified by a quick double-beep during startup) that speeds up Disk II operations significantly under the DOS operating system.

b. Another speedup can be realized by assigning what would normally be used as a Disk II image as a SmartPort device, also realizing a significant speedup – this is especially useful for ProDOS disk images.

Apple IIGS Specifics

In order to have the CFFA 3ØØØ act as a virtual Disk II, be sure to set the Disk II slot to **YOUR CARD** in the IIGS control panel. The physical CFFA 3ØØØ expansion card will also need to be in a slot that has that setting. Slot 7 is set to **YOUR CARD** by default; the rest are not.

There is a CDA for convenient access to the CFFA 3ØØØ menus. Use CONTROL + ⌘ + ESC and choose CFFA 3ØØØ (Slot N) from the list of CDAs. The CDA gets installed automatically when you boot from the CFFA 3ØØØ, or when you boot from another slot and then access CFFA 3ØØØ block device (GS/OS and ProDOS 8 v1.9 and later does this at boot time).

When you boot GS/OS, there is a time early in the boot process when the CDA is not available (GS/OS empties the CDA list, and CFFA 3ØØØ re-installs the CDA later in the boot sequence).

There is no need or use for a GS/OS loaded driver for the CFFA 3ØØØ.

- The standard Disk II driver discovers the virtual Disk II and uses it.
- The standard "generated driver" discovers the CFFA 3ØØØ's block devices and uses Extended SmartPort calls to read and write blocks.

APPLE IIGS SLOT LIMITATIONS

The virtual Disk II slot must be set to 4, 5, 6, 7, or None. The same restriction applies to a real Disk II card, because a GS monitors the Disk II motor-on soft switches only for those slots, and it automatically throttles to 1 MHz when a motor is on. The CFFA 3ØØØ expansion card can occupy slot 1 or 2 without trouble.

Card Configuration

1. Discharge yourself of excess static charge and remove the CFFA 3ØØØ expansion card from the shielded anti-static bag.

2. Set DIP switches 4 and 7 according to your Apple model as shown in Table 5. All switches are set to the **OFF** position by default. The **ON** position is down toward the board.

Model	Switch 4	Switch 7
Apple //e Enhanced	OFF	OFF
Apple IIGS	OFF	ON

Table 5: Model-specific Switch Settings

3. Decide what CFFA functionality you would like to use. If you will be using only the CFFA hard drive (SmartPort) function or only the Disk II floppy emulation function, then you only need one empty slot in your Apple II for the CFFA 3ØØØ.

   If you plan to use both the hard drive (SmartPort) and Disk II emulation you will need two empty slots in your Apple II for the CFFA 3ØØØ. One slot for the CFFA 3ØØØ itself, and one empty slot for the Disk II emulated hardware.

System Installation

1. Turn off your Apple II computer. Insert your CFFA 3ØØØ in the slot you have chosen. A popular choice is to use slot 7. Keep in mind if you are using both floppy emulation and hard drive features, hard drive features will always appear in the physical slot the CFFA is plugged into. The floppy emulation will always be in another slot. If you set the floppy emulation slot to be the same as the physical slot, you will disable the hard drive (SmartPort) feature.

2. Insert a Compact Flash card and/or a USB thumb drive loaded with disk images you are interested in mounting. You may also use a USB extension cable. The CF and USB media may be hot plugged. Please refrain from removing the storage media while disk access is occurring.

3. Turn on your Apple II and quickly press the M key to enter the CFFA 3ØØØ menus.

4. If you are planning to use Disk II emulation, select a Disk II Slot number (*make sure it is empty*). Remember if you plan to NOT use the SmartPort hard drive feature then select the slot number that your CFFA is physically located in. If you want hard drive support for ProDOS or GS/OS, then select a different slot number than the CFFA is physically located in.

5. Mount a disk image. The way you use them in a CFFA 3ØØØ is as follows:

   a. If the disk image you want to mount needs to be treated as if it were inserted in a virtual Disk II drive, then select **Disk II Assignments** from the main menu as seen in Figure 6. If it can be treated as a SmartPort drive, then select Smartport assignments.

Demonstrating how the Disk II works:

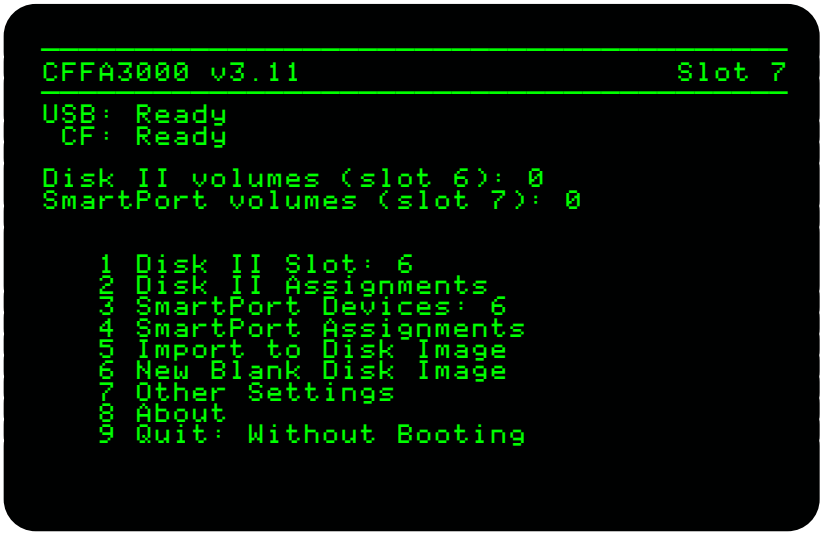


Figure 6: Selecting “Disk II Assignments” from the menu.

b. When assigning Disk II images, press the [1] key will assign the highlighted image to drive 1. Press the [2] key will assign the highlighted image to drive 2: as seen in Figure 7.

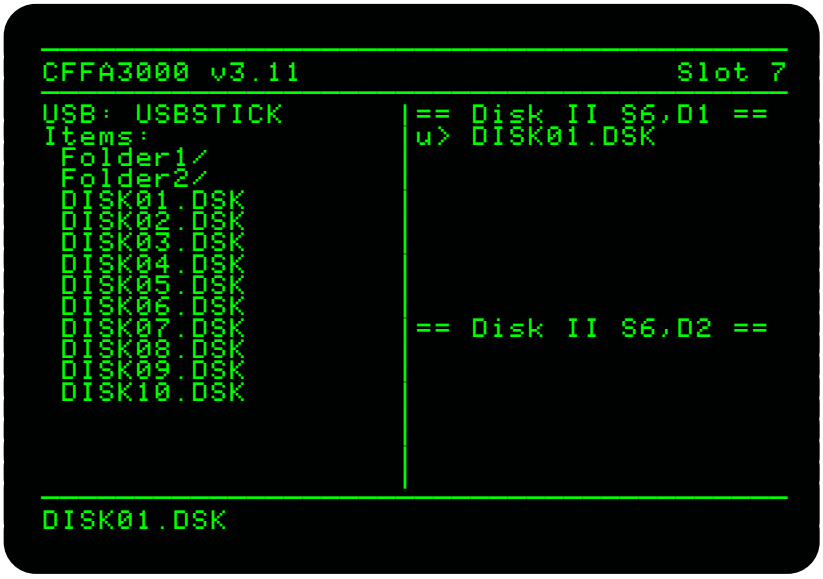


Figure 7: Select “1” to assign a disk image to Disk II drive 1.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will alternate the left-hand column between CF and USB file listings.
- ☛ The [TAB] key will move the highlight-bar around the screen.
- ☛ The greater-than sign ▮>▮ indicates the currently mounted disk in the drive in the right-hand column. You can select multiple disks for the drive, and rotate through them with the optional remote pushbutton attachment.
- ☛ The current disk mounted in the Disk II drive (as noted with the greater-than sign ▮>▮ may also be selected by highlighting the desired image in the right-hand column and press the [RETURN] key.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter [U] or [C] to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

6. When assigning an image to the SmartPort, press the [RETURN] key on the highlighted image will mount it as seen in Figure 8.

Figure 8: Press Return to assign a disk image to the SmartPort.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will switch the left-hand column to alternately display CF and USB file listings.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

7. To boot the Apple II using the disk images you have selected, press CONTROL B from within the disk selection menu or select the Boot (Reboot) menu item at the bottom of the main menu.

CFFA 3000 Menu System

Navigating the Menus

The Menu System may be accessed in several ways:

a. Press the M key immediately after turning on your Apple II.

> You can only access the CFFA 3000 menu if you are booting either its physical slot or its virtual Disk II slot. The CFFA defaults its virtual Disk II slot to OFF.

b. On an Apple IIGS, use the Classic Desk Accessory (CDA) menu by press the Apple CONTROL ESC key sequence almost any time.

c. The menus may be accessed by using the appropriate slot specific entry point, as shown in Table 6.

CFFA 3000 Slot	At the BASIC prompt:	At the MONITOR prompt:
1	CALL -16080	C130G
2	CALL -15824	C230G
3	CALL -15568	C330G
4	CALL -15312	C430G
5	CALL -15056	C530G
6	CALL -14800	C630G
7	CALL -14544	C730G

Table 6: Menu invocation based on slot number

Moving among menu items or files:

1. Use the CONTROL ↓ keys to move among items.
2. Use the numbers 1-9, or the first letter of an item, to select the next item starting with that character.

3. To navigate into a folder, highlight it and press the RETURN key. Use the ← left arrow or minus - to navigate back up one level.

☛ Some menu items cycle through a list of options. These menu items show left or right arrows on the right side of the screen indicating other selections are possible. Press the ← and → arrow keys change these settings.

Any changes to a setting will be automatically saved when you move off that menu item.

☛ Use the TAB key to move among columns/panes in the disk assignment screens.

☛ Use the DELETE key or the minus - key to remove a disk image from the mounted list on the right-hand of the disk assignment screens.

☛ Use CONTROL B or CONTROL RESET to boot the Apple II when in any of the drive assignment menus. After making drive assignments, you can easily reboot with CONTROL B.

CFFA
3.0.0.0
COMPACT FLASH FOR APPLE II

Installation

Apple ///

Installation Scenarios

Possible System Configurations

d. Acting as a Disk II Drive:

Floppy disk images that you create yourself or find on the Internet can be used on the CFFA 3000, just the same way you might use them on an emulator — except you'll be running them on a real Apple II. Configure the CFFA 3000 to host a virtual Disk II adapter in whatever slot is convenient (slot 6 is of course typical for a Disk II).

e. Making Backup Copies of Disks:

You can use your normal Disk II expansion card in slot 6, and configure the CFFA 3000 to act as a second Disk II controller in slot 7. You can then use any Disk II copying software to copy from slot 6 to slot 7. The resulting disk image files on the CFFA 3000 will be backups of the physical disks.

Many Apple II-based tools (i.e. COPYA, Copy II+, etc.) that can successfully copy a disk in the real world will be able to copy to a disk image hosted on the CFFA 3000. The CFFA also has the ability to "**capture**" an image of any ProDOS drive (including physical Disk II drives) existing in the system.

Speeding up Disk Access

Disk operations can be increased by two methods:

a. By default, an RWTS "**patch**" is active (*signified by a quick double-beep during startup*) that speeds up Disk II operations significantly under the DOS operating system.

b. Another speedup can be realized by assigning what would normally be used as a Disk II image as a SmartPort device, also realizing a significant speedup – this is especially useful for ProDOS disk images.

Card Configuration

1. Discharge yourself of excess static charge and remove the CFFA 3ØØØ expansion card from the shielded anti-static bag.

2. Set DIP switches 4 and 7 as shown in Table 7. All switches are set to the **OFF** position by default. The **ON** position is down toward the board.

Model	Switch 4	Switch 7
Apple ///	ON	ON

Table 7: Model-specific Switch Settings

System Installation

1. Turn off your Apple II computer. Insert your CFFA 3ØØØ in the slot you have chosen, a popular choice is expansion slot 7.

2. Insert a Compact Flash card and/or a USB thumb drive loaded with disk images you are interested in mounting. You may also use a USB extension cable. The CF and USB media may be hot plugged. Please refrain from removing the storage media while disk access is occurring.

3. Turn on computer and enter PR# <slot> – Example: PR#7. Then press the M key to enter the CFFA 3ØØØ menus. To boot automatically, go to `Other Settings` menu and change `Autoboot Older Apples` to `Yes`.

4. If you are planning to use Disk II emulation, select a Disk II Slot number (make sure it is empty).

5. Mount a disk image. The way you use them in a CFFA 3ØØØ is as follows:

   a. If the disk image you want to mount needs to be treated as if it were inserted in a virtual Disk II drive, then select `Disk II Assignments` from the main menu as seen in Figure 9.

Demonstrating how the Disk II works:

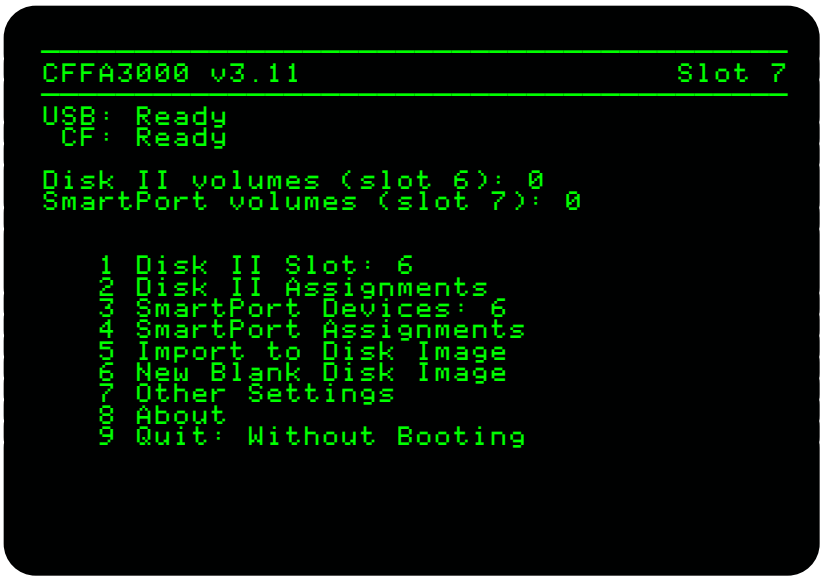


Figure 9: Selecting “Disk II Assignments” from the menu.

b. When assigning Disk II images, press the [1] key will assign the highlighted image to drive 1. Press the [2] key will assign the highlighted image to drive 2: as seen in Figure 1Ø.

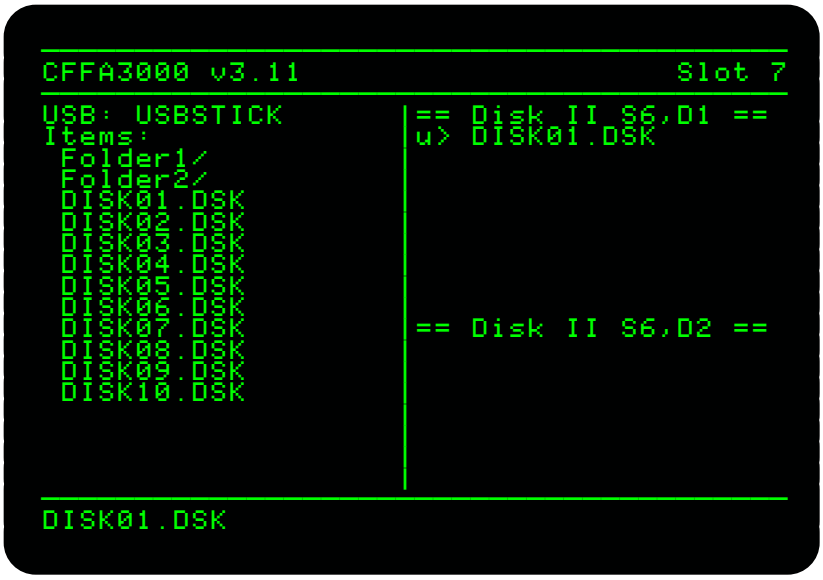


Figure 2: Select “1” to assign a disk image to Disk II drive 1.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will alternate the left-hand column between CF and USB file listings.
- ☛ To move the highlight-bar around the screen use Control I (not number 1).
- ☛ The greater-than sign ▶ indicates the currently mounted disk in the drive in the right-hand column. You can select multiple disks for the drive, and rotate through them with the optional remote pushbutton attachment.
- ☛ The current disk mounted in the Disk II drive (as noted with the greater-than sign ▶ may also be selected by highlighting the desired image in the right-hand column and press the Return key.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

DETAILED NOTES:

- ☛ If you have both a CF card and a USB drive inserted, press the space bar will switch the left-hand column to alternately display CF and USB file listings.
- ☛ Depending on whether the disk images came from the USB or CF drive, there will be a letter U or C to signify the location of the image file.
- ☛ You cannot assign the same image to more than one drive at once.

6. To boot the Apple II using the disk images you have selected, press Control B from within the disk selection menu or select the Boot (Reboot) menu item at the bottom of the main menu.

CFFA 3000 Menu System

Navigating the Menus

The Menu System may be accessed in several ways:

a. Press the [M] key immediately after turning on your Apple II.

> You can only access the CFFA 3000 menu if you are booting either its physical slot or its virtual Disk II slot. The CFFA defaults its virtual Disk II slot to OFF.

b. The menus may be accessed by using the appropriate slot specific entry point, as shown in Table 8.

CFFA 3000 Slot	At the BASIC prompt:	At the MONITOR prompt:
1	CALL -16Ø8Ø	C13ØG
2	CALL -15824	C23ØG
3	CALL -15568	C33ØG
4	CALL -15312	C43ØG
5	CALL -15Ø56	C53ØG
6	CALL -148ØØ	C63ØG
7	CALL -14544	C73ØG

Table 8: Menu invocation based on slot number

Moving among menu items or files:

1. Use [A] / [Z] or [Control] [K] / [Control] [J] to move among items.
2. Use the numbers [1]-[9], or the first letter of an item, to select the next item starting with that character.
3. To navigate into a folder, highlight it and press the [Return] key. Use the [←] left arrow or minus [-] to navigate back up one level.

Some menu items cycle through a list of options. These menu items show left or right arrows on the right side of the screen indicating other selections are possible. Press the ← and → arrow keys change these settings.

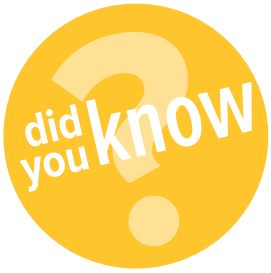
Any changes to a setting will be automatically saved when you move off that menu item.

Use Control I (not the number 1) to move among columns/panes in the disk assignment screens.

Use the minus - key, or Control D to remove a disk image from the mounted list on the right-hand of the disk assignment screens.

Use Control B to boot the Apple II when in any of the drive assignment menus. After making drive assignments, you can easily reboot with Control B.

In Popular Culture...



At the start of the Walt Disney Pictures film TRON, lead character Kevin Flynn (*played by Jeff Bridges*) is seen hacking into the ENCOM mainframe using an Apple III Personal Computer System.

For more information visit:

Q www.cedmagic.com/history/tron-apple3.html

Native SOS Apple /// Driver

The CFFA 3000 driver for the Apple /// computer takes many of the virtual resources of the CFFA 3000 expansion card and makes them available to SOS and the many languages and environments that **SOS** supports. The driver has the capacity for up to eight virtual drives hosted by the CFFA 3000 expansion card as SmartPort devices.

Disk II emulation (including the optional remote switch module) is not available under SOS and should not be enabled.

Unlike ProDOS, most of the environments under SOS are unable to use or correctly recognize more than 32,767 blocks of data on any given block device (approximately 16 megabytes). This is not a limitation of the CFFA 3000 expansion card; this is a limitation of SOS environments like Pascal, BASIC, and the Apple /// System Utilities. When creating virtual disks for the Apple ///, remember to make them of 32,767 blocks or fewer in size.

Configuration

Using the System Configuration Program (SCP), part of the SOS System Utilities disk, you can copy the CFFA 3000 expansion card driver to any boot disk you choose just like any other Apple /// driver. The only configurable parameter the slot the expansion card is in: 1-4. Ensure the slot parameter number matches which slot the expansion card is actually plugged into.

The driver is distributed on a copy of the SOS System Utilities disk both integrated into the SOS.DRIVER file as well as in a stand-alone `CFFA3000.DRIVER` file. The eight supported device names are `CFFA3000.01` through `CFFA3000.08`.

Compatibility with Earlier CFFA CF Cards

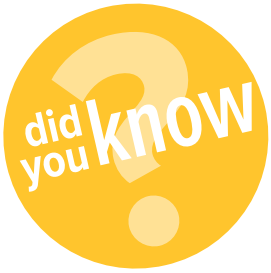
The CFFA 3000 driver will recognize native partitions (i.e. original CFFA Compact Flash cards), however, they generally won't be suitable for the Apple /// since they will be 32 megabytes in size, which will not be represented correctly by most SOS-based environments. They will be usable, but block sizes will be inaccurately reported. Pascal and the SOS Utilities Disk in particular will be unable to display the catalog of partitions greater than 32,767 blocks in size (16 megabytes).

Partitions as created by Dale Jackson's Apple /// driver for the original CFFA 3000 expansion card are not compatible with this new driver since they could be variably sized.

In order to use the information in those partitions with the CFFA 3000, plug the CF card into a card reader and use the CiderPress utility on Windows to extract ProDOS-order disk images of the native SOS partitions. Then, simply copy those disk image files to

a new CompactFlash card for use in the CFFA 3ØØØ. After configuring the CFFA 3ØØØ to host the images as SmartPort drives, they will be available to SOS just as they were before.

Q `http://ciderpress.sourceforge.net/`



Apple ProDOS uses the same file system as SOS...

The ProDOS loader includes code that can execute on an Apple III, and which will chainload the SOS loader from block one, so SOS and ProDOS can co-exist on the same volume. Some software, such as ADTPro, makes use of this to store Apple II and Apple III versions of a program on the same disk, which is then bootable on both systems.

Firmware Configuration

When a CFFA 3ØØØ expansion card is running in an Apple II, it is simple to call upon the firmware to manage disk images. However, the user interface - the configuration system - can't run natively on an Apple ///. There are at least two ways to accomplish the same goal:

1. Plug the CFFA 3ØØØ into any Apple II and bring up the firmware menu system on it, saving whatever configuration of drives you wish on a CompactFlash card (or on a USB stick if it is extremely small - there is very limited space for a USB adapter in the /// case).

2. Boot the Apple /// with the Apple II emulation diskette, press the RETURN key to boot an Apple II floppy, press the RESET button, then invoke the firmware menus from the Apple II emulation according to Table 9.

CFFA 3000 Apple /// Slot	BASIC Invocation	Monitor (i.e. CALL-151) invocation
1	CALL -16080	C130G
2	CALL -15824	C230G
3	CALL -15568	C330G
4	CALL -15312	C430G

Table 9: Menu invocation in Apple /// slots

Once a memory device has disk images configured on it, they can be left alone and used in the CFFA 3000 in the Apple /// without further intervention from the menus.

Memory devices can also be swapped, and as long as they have SmartPort configuration information saved on them (the CFFA.CFG file written by the firmware menus) they will be recognized and used by SOS.

Hot-Plugging Memory Devices

The Apple /// driver supports hot-plugging USB or CompactFlash memory devices. As long as each device has been pre-configured with drive selections, they will be made available to the operating system. Different operating environments behave differently when disks are swapped. In most cases, asking for a catalog based on the device name will be enough to make the system aware of a new drive, and subsequent access via the volume name will be possible.

From within Business BASIC, for example, after inserting a new CompactFlash card, issuing the `CATALOG` command and specifying the device name: `CATALOG .CFFA 3000U1` will re-attach the virtual drive to the system, and then the volume name (as opposed to the device name) can be used to interact with the drive contents.

ADTPro's Volume screen generally needs to be refreshed once or twice with the R key in order to re-scan the new set of available devices.

USB Memory Devices

Both USB and CompactFlash memory devices will work fine with the Apple /// driver. However, due to the proximity of the USB port to the physical wall of the Apple ///'s case, it may be difficult to insert a USB memory stick or a USB extension cord. Only the smallest or most flexible of USB solutions will likely fit. The vast majority will not.

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Storage Devices

COMPACT FLASH & USB

Hot Swappable

USB drives and Compact Flash cards store the data that your Apple II will see as virtual disks. You can insert and remove them any time, without turning anything off, and without rebooting the Apple II Computer. Choices of which disk image files to use are stored in a file named **CFFA.CFG** in the root folder on the USB or CompactFlash media, but you don‘t have edit this file manually.

Formatting Media

When formatting a Compact Flash or USB device, ensure that you format it with either FAT16 or FAT32 containing a Master Boot Record (MBR).

Apple Mac

Memory storage devices generally come this way when new. The Mac Disk Utility may not put a **MBR** on your device by default if you format it yourself; so you need to click on options and choose it. See Figure 11 for an example.

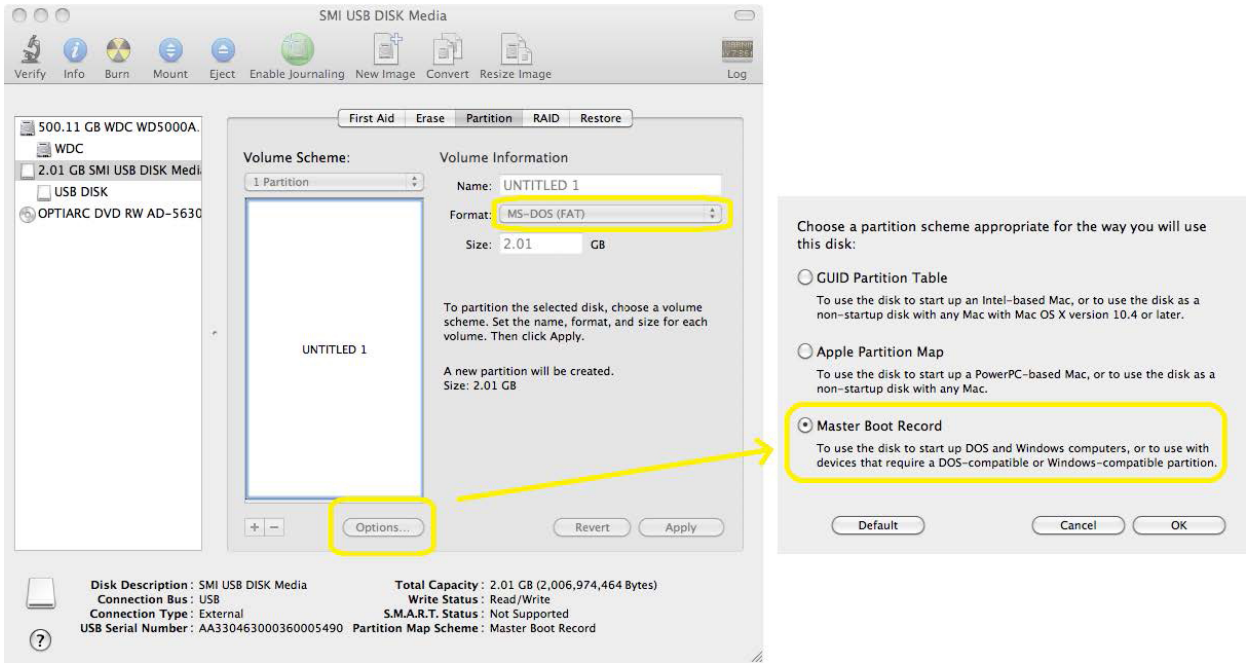


Figure 11: Partitioning and formatting with FAT16 or FAT32 and MBR required.

Microsoft Windows 10

This section explains the Microsoft Diskpart utility. Diskpart can permanently erase and or destroy all data on a selected drive. As an extra safety precaution remove all additional drives from your computer system excluding the drive you are booting from and the drive you want to restore the MBR to before proceeding with the following instructions.

From the Windows 10 Desktop:

- ☛ From the start menu search box search for **`command prompt`**. **`Right click`** on the command prompt app that comes up and then select **`Run as administrator`**.
- ☛ Type **`diskpart`** then press enter.

```
Microsoft Windows [Version 10.0.16299.1087]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>diskpart

Microsoft DiskPart version 10.0.16299.15

Copyright (C) Microsoft Corporation.
On computer:

DISKPART>
```

- ☛ Type **`list disk`** then press enter - this will show a list of drives in the system, starting with Drive Ø. Carefully check for the actual disk number that is to be cleaned - if the wrong disk is selected here, all data will be lost on that disk.

```
DISKPART> list disk

  Disk ###  Status         Size     Free     Dyn  Gpt
  --------  -------------  -------  -------  ---  ---
  Disk 0    Online          931 GB      0 B        *
  Disk 1    Online           14 GB    14 GB
  Disk 2    Online            0  B      0 B

DISKPART>
```

- ☛ Type **`select disk`** followed by the number of the drive that is to be cleaned, and then press enter - example: **`select disk 1`**. There will be a confirmation message stating what is now the selected disk. Double check if this is the drive to be cleaned.

```
  Disk ###  Status         Size     Free     Dyn  Gpt
  --------  -------------  -------  -------  ---  ---
  Disk 0    Online          931 GB      0 B        *
  Disk 1    Online           14 GB    14 GB
  Disk 2    Online            0  B      0 B

DISKPART> select disk 1

Disk 1 is now the selected disk.

DISKPART>
```

☛ Type **clean** then press enter. This will completely remove any data or formatting on the drive.

```
DISKPART> clean

Diskpart succeeded in cleaning the disk.

DISKPART>
```

☛ Type **convert mbr**.

```
DISKPART> convert mbr
xxxxx

DISKPART>
```

☛ Type **create partition primary** then press enter. This will add a partition to the drive and make it accessible.

```
DISKPART> create partition primary
xxxxx

DISKPART>
```

☛ Type **`select part 1`** then press enter.

```
DISKPART> create partition primary
xxxxx

DISKPART>
```

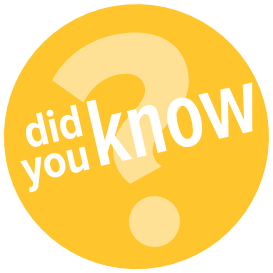
☛ Format the drive by typing **`format fs=FAT32`**.

```
DISKPART> format fs=FAT32
xxxxx

DISKPART>
```

☛ Type **`exit`**.

```
DISKPART> exit
```



The Master Boot Record

A (MBR) is a special type of boot sector at the very beginning of partitioned storage devices like fixed hard disk drives or removable media such as a CF card. The MBR holds the information on how the logical partitions, containing file systems, are organized on that medium. The MBR also contains executable code to function as a loader for the installed operating system.

Partitioning Media

If a Compact Flash or USB device is formatted with more than one partition, only the first partition will be visible / available to the CFFA 3ØØØ. All others will be untouched.

Compact Flash Cards

For CFFA hard-coded drive partitions - the Compact Flash Card will need to be zeroed out, or reformatted so that it doesn't have a Master Boot Record (**MBR**) present. You can use tools like Disk Utility (**Mac**) or the CFFA 3ØØØ firmware to perform this procedure, see Figure 12 for an example.

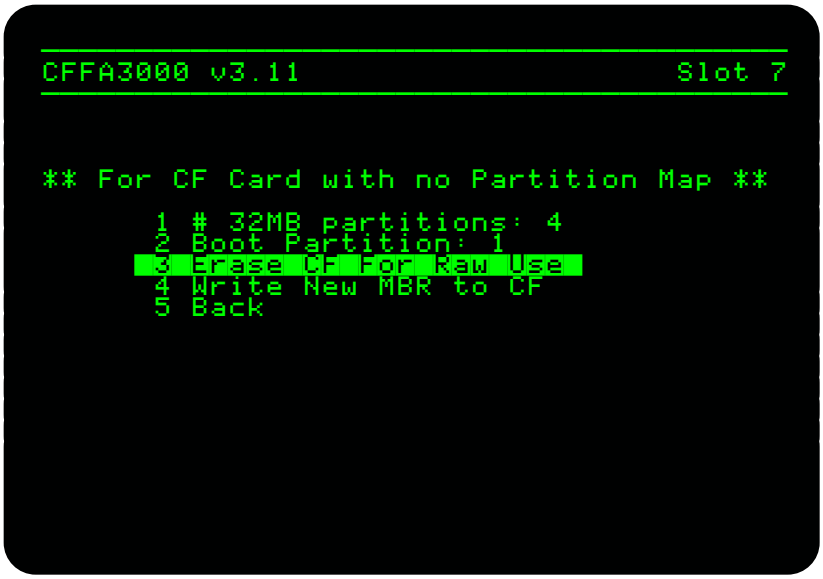


Figure 12: CFFA 3ØØØ Menu, "Other Settings" > "Raw CF Card Settings"

Old-style partitions can represent only block devices, not Disk II images. The only reason to use Compact Flash cards this way is for backwards compatibility with the original CFFA expansion card - it is much more flexible to use the new disk image support.

USB Memory

USB drives should be formatted with the **FAT16** or **FAT32** file system with a Master Boot Record. Most come this way ready to use right out of the box. If you have any trouble with them, use your operating system's native disk formatting capabilities to clean them off and start fresh.

SanDisk drives which come with "**U3 Smart Drive**" technology should be reformatted and the U3 software, which appears on a read-only partition, removed.

`http://u3.sandisk.com/launchpadremoval.htm`

Capabilities and Details

Block Devices

Block devices use the ProDOS or SmartPort firmware interfaces. The maximum number of devices to be presented to the operating system is configurable via the menu. Devices without any disk image file associated with them will be "offline" from the perspective of ProDOS.

Disk II Emulation

The Disk II emulation built into the CFFA 3ØØØ is compatible with DOS 3.3 and many other Apple II operating systems. The emulation happens at the "nibble" level, even if the disk image is not stored as nibbles. The emulation is good enough for many purposes, but it does not attempt to simulate the real-time spinning of the floppy disk.

Whenever Apple II software writes a nibble, the virtual disk advances by 1/6,656 of a rotation. Whenever Apple II software reads a nibble, it sees an alternating pattern of "no nibble yet" and a valid nibble from disk, and when it sees a valid nibble, the disk advances by 1/6,656 of a rotation. This means it is possible to read nibbles somewhat faster than from a real Disk II (where a valid nibble is ready every 32µs).

Generally when the Apple II does not read or write any nibbles, the virtual disk does not spin. The CFFA 3ØØØ virtual Disk II will not work with software that depends on:

- The disk spinning while nibbles are not being read and written.
- The relative positions of data when seeking to another track.
- Seeking to half-track or quarter-track positions.

The Disk II emulation keeps one track at a time in RAM on the CFFA 3ØØØ expansion card. When seeking to another track, it writes the old track to the disk image if there have been any changes, and then it reads the new track. If necessary, it automatically converts the track between sectors and nibbles.

The CFFA 3ØØØ uses its own slot-ROM code when booting, and it implements the **$Cn5C** and related entry points for compatibility with the boot sequences of various operating systems.

Formatting of Virtual Floppy Disks

Some aspects of the CFFA 3ØØØ Disk II support make it such that "formatting" of disks may not be successful, depending on several factors:

- Speed of the destination memory device
- Operating system of the software doing the formatting
- The formatting program itself

Several formatting scenarios have been tested with the CFFA 3ØØØ, and the ones that have been shown to work well are:

- DOS 3.3's INIT command.
- Whole-disk copies as performed by COPYA (on the DOS 3.3 System Master diskette), which performs a format operation before copying.
- Whole-disk copies as performed by CopyII+, which performs a format operation before copying.
- Disk format operations performed by ADTPro

Formatting scenarios that are known "not" to work are:

- Formatting performed by the ProDOS system utilities.
- Formatting performed by the Apple Pascal Operating System.

In general, all of these issues may be worked around by simply using a disk image that has been created elsewhere with programs like **CiderPress** or **AppleCommander**.

`http://adtpro.sourceforge.net/`

`http://ciderpress.sourceforge.net/`

`http://applecommander.sourceforge.net/`

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Disk Images

APPLE II

Image Formats Supported

The CFFA 3ØØØ currently supports the following Apple II Image formats:

- *.DSK, *.DO, *.PO 14ØK images (35 tracks x 4,Ø96 bytes per track), can be used either as Disk II or Block devices. *.PO is assumed to be in ProDOS sector order, *.DO is assumed to be in DOS sector order, and *.DSK sector ordering is auto-detected. If a *.DSK fails to boot as you are expecting, renaming it to the correct sector ordering explicitly may help.
- *.NIB nibble image files (35 tracks x 6,656 nibbles per track) can be used as a Disk II device only.
- *.2MG can contain a nibble image or a block image (same rules as above); when a 14ØK block image is used as a Disk II device, the volume number is respected.
- Any file at least 256K and an exact multiple of 512 bytes in size can be used as a Block device only.

Future Considerations

On January 15th, 2Ø17 John Morris released the "**AppleSauce**" file specifications for the new Apple II Disk Image format called *.WOZ.

Unlike all other Apple II Disk Images, "**WOZ**" disk images have the big benefit of being able to successfully run copy protected software.

`http://evolutioninteractive.com/applesauce/woz_reference.pdf`

Importing Disk Images

The CFFA 3000 has the ability to import virtual disk images directly from the physical disks and drives existing in the Apple II system. This makes it easy to digitize a stack of floppy disks or simply to back up an aging hard drive. From the main menu, select `Import to Disk Image` as shown in Figure 13.

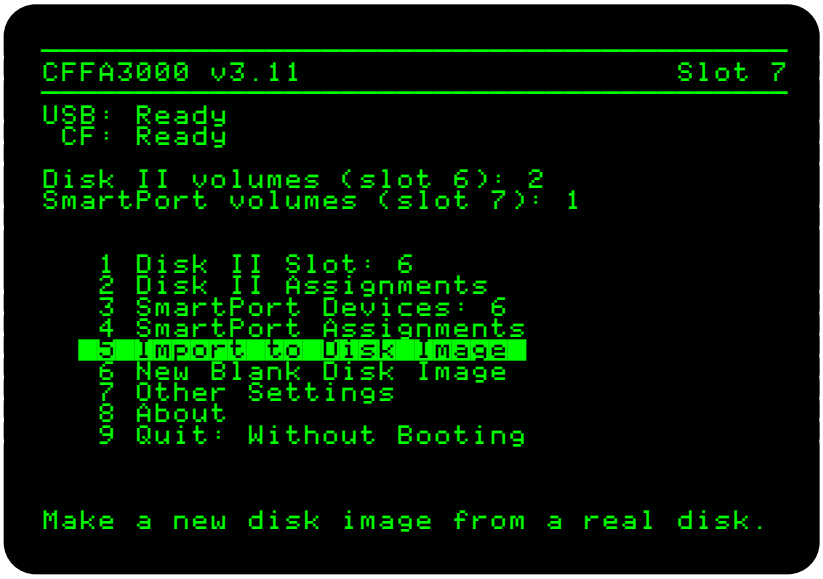

Figure 13: Importing Disk Images from Main Menu

In the next panel, any slot and drive that is recognized by the CFFA 3000 as a viable import candidate may be selected for importing. The ← → arrow keys will scroll through the candidates as seen in Figure 14.

Figure 14: Selecting slot and drive numbers for import

Once the drive and slot have been chosen, the file name that will be created is presented, and it can be modified to suit as seen in Figure 15.

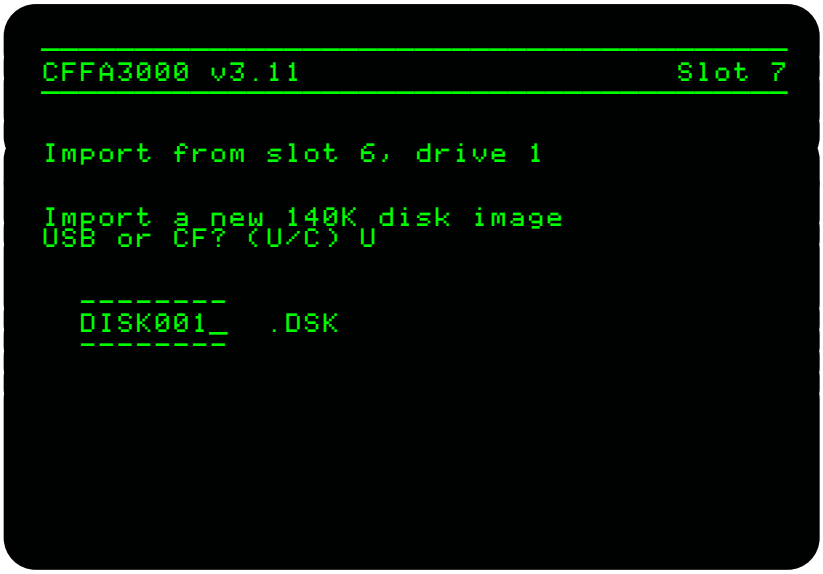

Figure 15: Modifying the imported file name

As the disk images are produced, they will be added to the root folder of the specified memory device. When importing multiple images, the numeric suffix will be incremented as each disk is imported. Next, if both USB and Compact Flash memory devices inserted, there will be a prompt to specify which device to write the new image to.

During the import operation, a progress bar will be displayed, along with any other status messages that are relevant to the import operation, as seen in Figure 16.

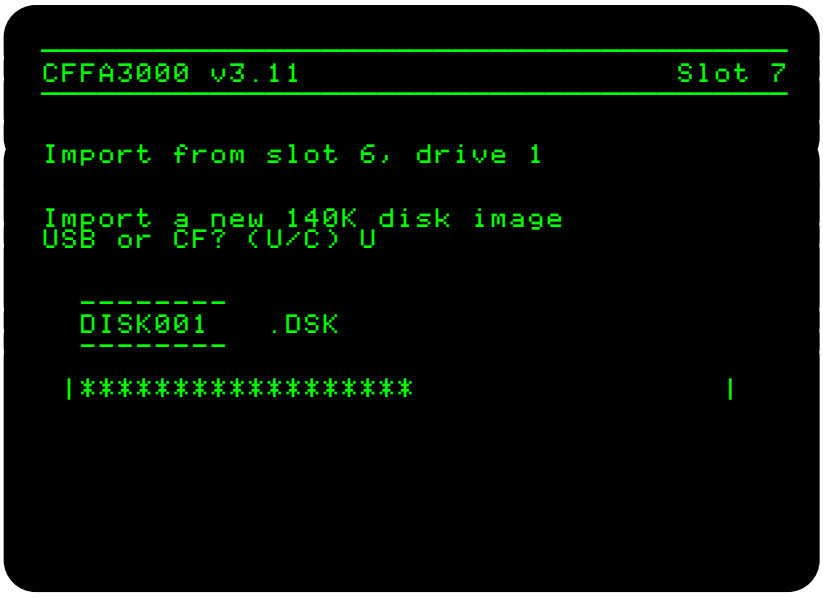

Figure 16: Progress while importing a physical disk

Once the import operation is complete, there will be a prompt to import another disk, using the same parameters as before. This would be especially useful for importing a stack of floppy disks as seen in Figure 17.

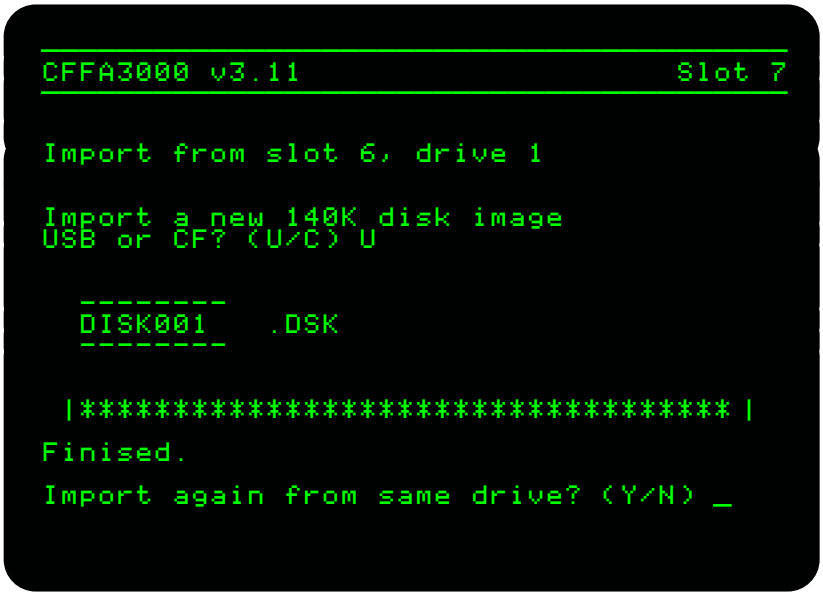

Figure 17: Opportunity to import again with the same parameters

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CFFA 3000

HARDWARE

External Remote

The CFFA 3ØØØ remote offers a way to change the currently mounted virtual diskette image in either of the virtual Disk II drives. Each push of a button mounts the next disk in the associated Disk II drive if more than one disk had been chosen on the Disk II assignment screen.

The remote cable as seen in Figure 18 is to be connected between the CFFA 3ØØØ expansion card and the external remote. The proper orientation is shown in Figure 19 and Figure 2Ø. Inproper connection between the remote control and the expansion board may result in damage to the CFFA 3ØØØ, double check before powering on the Apple II personal computer system.

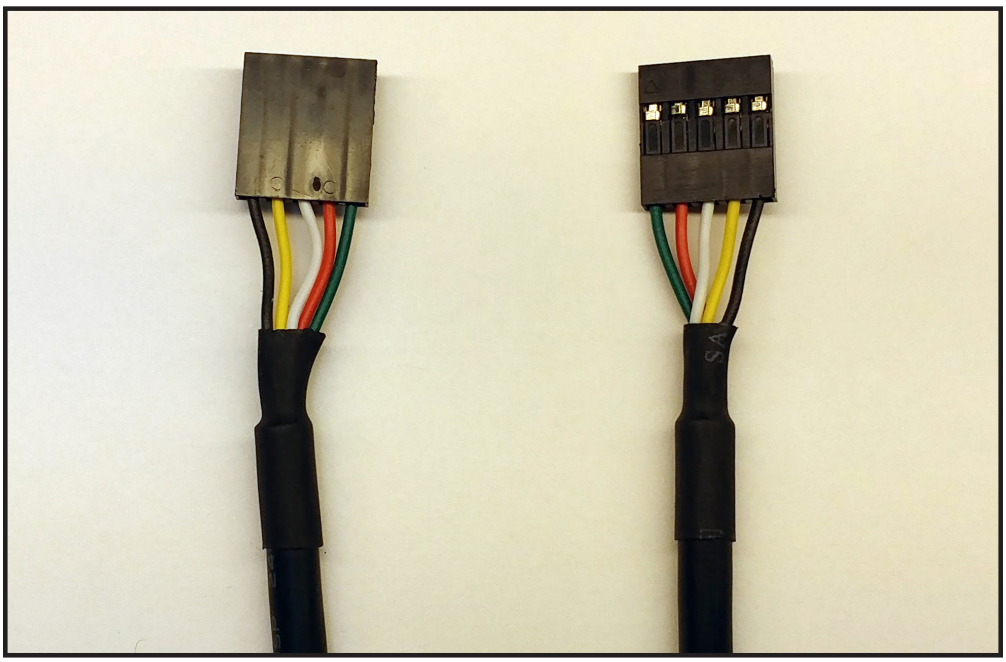

Figure 18: Remote Cable End Connectors

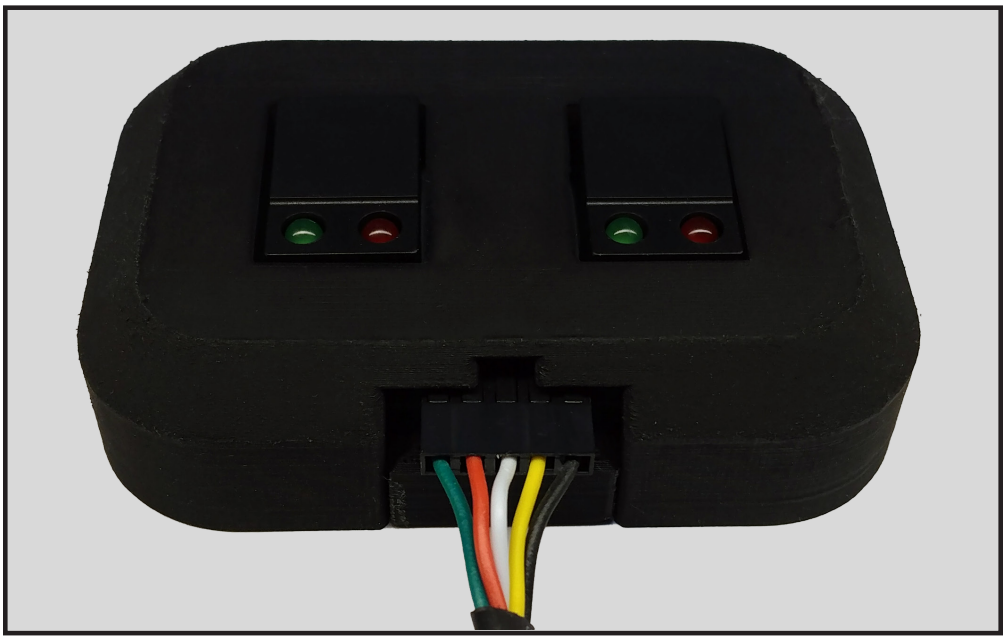

Figure 19: Remote Cable to External Remote

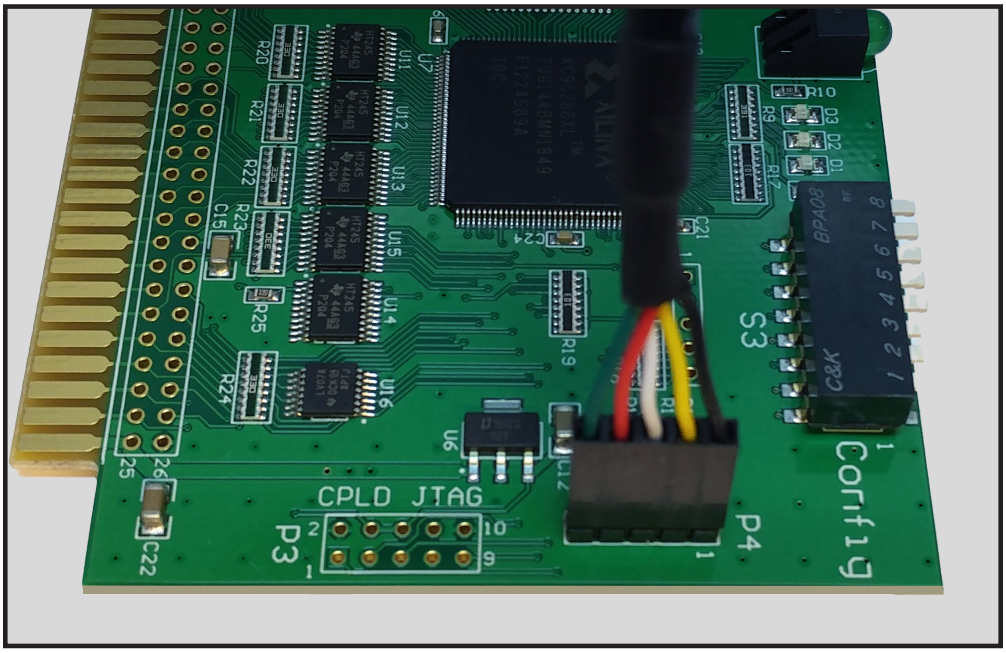

Figure 20: Remote Cable to CFFA 3000 P4 Connector

DIP Switches

All DIP switches are set to OFF (UP) by default

Switch 1 ON (DOWN)

- On an Apple II/II *plus*, use lowercase letters in CFFA 3000 menus. Turn this switch on only if your Apple II or II *plus* has a lowercase chip installed.

Switch 2 ON (DOWN)

- Disable the use of MouseText characters in CFFA 3000 menus even on machines where they are available.

Switch 3 ON (DOWN)

- Detailed debug logging.

Switch 4 ON (DOWN)

- Host machine is an Apple ///. Since the Apple /// also requires switch 7 to be on/down, switch 4 on/down tells the CFFA 3000 to use the 6502 firmware instead of the 65816 firmware.

Switch 6 ON (DOWN)

- Power-on self tests: Blink the LEDs in sequence, test 128K SRAM and 8K DPRAM. Then it either blinks an error code on the red LED, or it lights a green LED and waits for you to turn the switch off before proceeding.

Switch 7 ON (DOWN)

- Host machine is a Apple IIGS or an Apple ///; OFF/UP is not

Switch 8 ON (DOWN)

- At power on initiates firmware upgrade (looks for CFFA.bin and/or CFFA.xsv file on FAT-formatted/MBR CF card only).

On-board Status LEDs

Four Small Green LEDs

D3	D2	D1	D0
			
Blinks when reading or writing the (CF) Compact Flash Card.	Blinks when reading or writing the USB flash device.	Blinks when writing to a FAT formatted device.	Blinks when reading or writing virtual Disk II controller. LED also blinks while the virtual motor is on.

Animated LED Patterns

There are also patterns that you will see on these Green LEDs that have special meaning:

- Even/Odd animation at power-up,
- longer dance if the AVR restarts for some other reason, like after a firmware upgrade.
- In/Out animation while the Apple II is being in Reset.
- Repeated left-to-right animation while waiting for a USB device to be ready.

Big Green Access LED

LED	LOCATION	EVENT
	D4	On when reading or writing data to either a USB media or a (CF) Compact Flash Card.

Small Red LED

The onboard red led can be located near the expansion card's port connector labelled D5, it is small and very bright and blinks at power-up. It also communicates important information, usually by blinking a 2-number code. Many of the codes can repeat in an endles loop.

The (2, x) codes are from the bootloader, which always runs at power-on and provides the opportunity to replace the main firmware (DIP Switch 8 on), even if there is no firmware present and/or the CPLD is not in a good state:

LED	CODES	DESCRIPTION
	2, 4	Please insert CF card containing CFFA.BIN.
	2, 5	The CF card is not formatted as MBR + FAT16 / FAT32.
	2, 6	The file CFFA.bin was not found.
	2, 7	Firmware upgrade has successfully completed
	2, 8	The CFFA.bin file is too large (greater than 12ØK).
	2, 9	Failed to read from CFFA.bin file.
	2, 1Ø	No main AVR firmware is present: must install a CFFA.bin.

The (3, x) blink codes come from the main firmware, when it tries to program the **CPLD** from a CFFA.xsv file on the CF card.

This can be done "**blindly**" by powering up with DIP Switch 8 turned on:

LED	CODES	DESCRIPTION
	3, 4	Upgrade CPLD failed (power off and try again).
	3, 7	Upgrade CPLD complete (must power off and back on now).

Remote Pushbutton LEDs

As per Figure 21 the left button and LEDs apply to Disk II drive 1, and the right button and **LEDs** apply to Disk II drive 2. Press a button once to advance to the next disk in the list. Press and hold a button to have it blink a number of times corresponding to the index number of the disk in the drive.

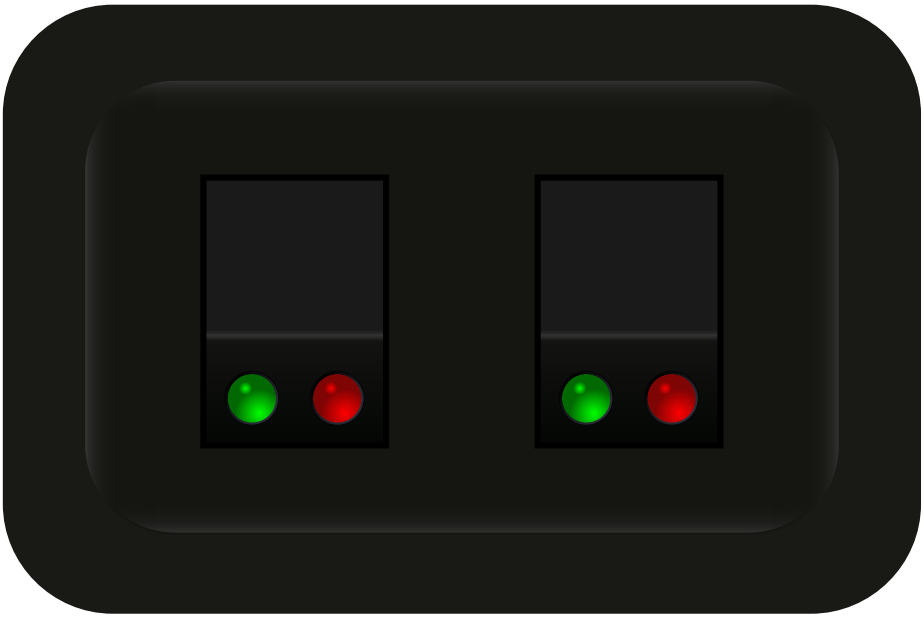

Figure 21: CFFA 3000 Remote Buttons

LED	EVENT	DESCRIPTION
	ON	The virtual Disk II motor is on.
	ON	Data is currently being written to the virtual Disk II image.
	FAST BLINK	Disk switch was not allowed, or there is no disk in the virtual drive.
	SLOW BLINK	Blinks once for disk image 1, twice for disk image 2, and so on. Disk images are assigned in the “Disk II Assignments” menu.

CFFA
3.0.0.0
COMPACT FLASH FOR APPLE II

Firmware

USER UPGRADES

Upgrading the CFFA 3000

Programmable Files

There are two user programmable chips on the CFFA 3ØØØ. These two firmware upgrades can be downloaded from the support web site.

AVR microcontroller firmware - **CFFA.bin**

Logic for the CPLD chip - **CFFA.xsv**

When upgrading either of these chips, these files must be placed on a (CF) Compact Flash memory card, not a USB memory device.

When CARD IS Working Normally

Update Main Firmware

1. Enter the CFFA's main menu on the Apple II.
2. Put the CFFA.bin file onto the CF card, and insert the CF card into the CFFA 3ØØØ.
3. The CFFA 3ØØØ automatically asks if you would like to install the update, if the version of CFFA.bin is different than the currently running version.
   Press **Y** for Yes to update.
4. The CFFA 3ØØØ will go through several sequences of flashing LEDs; when it is complete, the main menu will re-appear with an updated version number visible. The expected red LED blink code is 2, 7. See Diagnostic LED section for details on other blink codes.

Update the CPLD

1. Put the CFFA.xsv file onto the CF card, and insert the CF card into the CFFA 3ØØØ.
2. The CFFA 3ØØØ automatically asks if you would like to install the update, if the version of CFFA.xsv is different than the currently running version.
   Press **Y** for Yes to update.
3. Wait about 3Ø seconds for the expected red LED blink code of 3, 7. You will need to power the Apple II Computer off and then back on once the process is complete.

When CARD IS NOT Working Normally

To perform an update (even if the CFFA 3ØØØ is not working normally because of incorrect or incomplete firmware):

1. Power off the Apple II Computer.
2. Using your Personal Computer (Windows/Mac) copy one or both of CFFA.bin and CFFA.xsv files onto a CF card, and insert the CF card into the CFFA 3ØØØ.
3. Set DIP Switch #8 to ON and power on the Apple II Computer.
4. Watch the blinking LED on the CFFA 3ØØØ. After a minute or two it will settle down.

    ☛ If only a CFFA.bin is installed, the CFFA 3ØØØ will start operating normally (after the 4 green LEDs D3-DØ blink in an alternating pattern).

    ☛ If a CFFA.xsv installed, the final blink pattern will be (3, 7).

5. Turn DIP Switch 8 back off, to avoid potentially trying to apply automatic updates every time you turn on the Apple II Computer. If the switch is still on, the main menu will remind you to turn it off.
6. The CFFA.bin and/or CFFA.xsv files can be deleted from the CF card.

APPENDIX A

Copyright Notices

APPENDIX B

Acknowledgements

ReActiveMicro and R&D Automation, LLC would like to extend their gratitude to the following people who helped make the originally released CFFA 3000 possible:

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- Brian Wiser (Contributing Editor) brian@callapple.org

APPENDIX C

Warranty

The CFFA 3ØØØ expansion card from ReActiveMicro comes with a one year replacement warranty to the original purchaser only.

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