
CF7+
Compact Flash Drive and Printer Port
For the TI-99/4a Computer

Document Rev. 3.0

Familiarization

Figure – 1 shows the location of the major components of CF7+. They are:

- LEDs – (right to left) parallel port, compact flash, power
- Parallel Port
- Power
- Switch
- Cable to Console
- Compact Flash

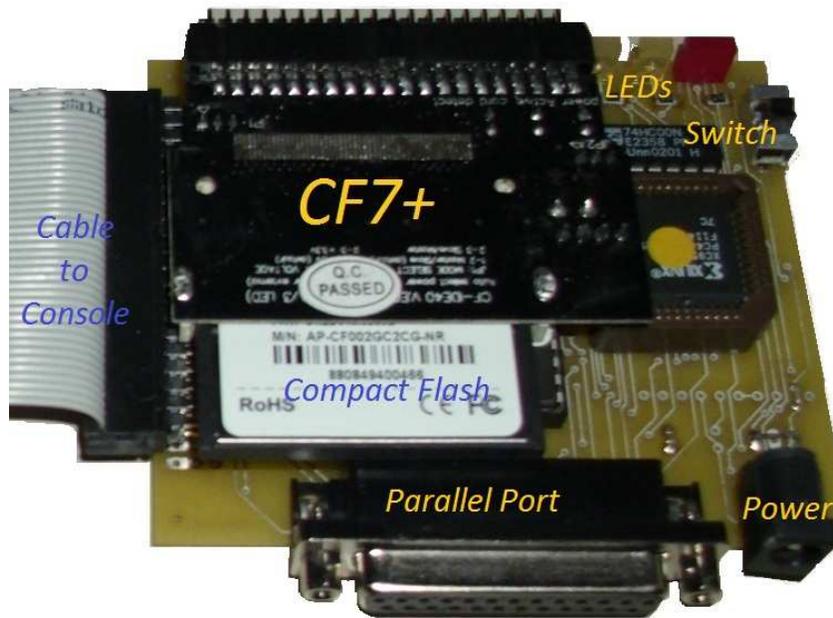


Figure 1- Component Location

CF7+ is designed to plug into the console's expansion port. A +5v, external power supply is required.

Installation Instructions

- Turn the console power off.
- Plug the Controller card cable into the console's expansion port as shown in figure 1.
- Plug a +5v power source into the power connector.
- Plug in printer into parallel port (optional).
- Turn power on CF7+ using the on-board switch (always do this first!)



Figure 2 - CF7+ Installed

- Turn on the console. CF7+ is now ready for use.

NOTE: Beware of static discharge! Static can damage the drive, the console or both. One way to protect against static discharge is to ground your self on a heavy metal item such as metal file cabinet. Alternatively, a grounding wrist strap can be worn.

Operation

Power LED

The red LED (light emitting diode) is the power LED. CF7+ has power when lit.

DSR Activity LEDs

The two yellow LEDs on the controller indicate DSR activity. The printer activity LED is next to the compact flash connector. The Compactflash activity LED is next to the power LED.

Printer Port

The printer port is designed for parallel printers. It is nearly identical to TI's original PIO port. For example, to print a Basic program listings use the command LIST "PIO".

How it works

The drive is actually a simple IDE interface. The compact flash plugs into a compact-flash-to-IDE adapter. The adapter then plugs into a controller. The controller has a ROM that contains a device driver that allows Basic and the Disk Manager to operate on the compact flash. However, due to TI-99/4a's bus timing, most hard disks and some compact flash cards are not compatible.

The ROM implements the original TI file system. It simulates three disk drives and multiple 1600-sector "virtual floppies" called volumes. Each volume's content is similar to a TI diskette. Each volume is enumerated and is fixed in size. Volumes are "mounted" into a simulated drive (still called DSK1, DSK2 and DSK3) after they have been "formatted". Volume settings are saved on the Compact Flash and are restored each time the console is restarted.

Compact flashes are formatted using a PC floppy disk standard. The ROM will overwrite this with TI-99/4a format.

Basic Commands

There are three enhancements to Basic to make the drive workable. Please note that all of the commands can accept only constants, but can be included in a program.

- **CALL FORMAT (<volume number>)** – performs a quick format of a volume. A volume must be formatted before it can be used. The number of volumes a compact flash can contain is derived by dividing the size of the compact flash by 819,200. Thus, an 8mb compact flash can contain 10 volumes. Note: the actual capacity of compact flashes may differ from its published value. The best way to check is to format the highest number volume the compact flash should handle, and then mount it and attempt to save a file to it. If an error occurs or if the console hangs, then the compact flash may have less capacity than it specifies.
- **CALL MOUNT(<drive number>,<volume number>)** – mounts a volume in a drive. This is the same as inserting a floppy into a disk drive. Drive number must be between 1 and 3.
- **CALL UNMOUNT(<drive number>)** – un-mounts the disk drive and set the volume to the matching drive number. In other words, DSK3 will have VOL3 re-mounted.

Command Examples

Valid calls:

```
CALL FORMAT(15)
CALL MOUNT(2,5)
CALL UNMOUNT(2)
```

Invalid calls:

```
CALL FORMAT(A)      - A is not a constant
CALL MOUNT(5,5)     - drive 5 does not exist
CALL UNMOUNT(D$)    - D$ is not a constant
```

Some Limitations

Some compromises were made to for performance and compatibility with the original TI Disk Drive system.

- This device supports the old TI Disk file system, not Windows FAT or NTFS.
- Microdrives, large capacity compact flash cards and most hard disks are not compatible.
- Only half of the compact flash's 512-byte sector is used. The original disk system used a 256-byte sector. Using this technique kept the circuit simple and memory usage nearly identical to the original diskette drivers but results in only half of the compact flashes capacity being available.
- The ROM simulates three disk drives. Only three volumes can be accessed at one time. Initially, volumes 1-3 are automatically mounted when the console powers up. The Mount command saves volume settings on the primary drive so that when the console is restarted or powered up, the settings will be restored.

TI-99/4A Software

CATALOG

Catalog is a Basic program that displays the files on disks 1, 2 or 3. If you wish to view the contents of volumes 4 and up, you must mount it using the CALL MOUNT command and then re-run CATALOG.

CFINFO

CFINFO is a TI-99/4A assembler program that display information about the currently mounted compact flash. The following is an example of the screen:

COMPACT FLASH INFO	
CYLS:	745
HEADS:	15
SECTS:	56
SERIAL#	STI 0E301205200309
FIRMWARE:	Rev 1.01
MODEL#	Hitachi CVM1.1.1
MAX VOLS:	391

Where:

- *CYLS*: is the number of cylinders
- *HEADS*: is the number of heads
- *SECTS*: is the number of 512 byte sectors (disk size = CYLS*HEADS*SECTS)
- *SERIAL#* is the serial number of the compact flash
- *FIRMWARE*: is the revision number of the compact flash's microcontroller software
- *MAX VOLS*: is an estimate of the maximum of volumes a compact flash can hold. In the example, there are 391 maximum number volumes a 320mb compact flash can hold.

Run Instructions

CFINFO is designed to run in a mini-memory cartridge. The steps to load and run are:

- Insert Mini-memory cartridge
- Press option 3) Re-Initialize. If you have data or programs already loaded you may want to save them to cassette tape first.
- Press the PROCEED function key to confirm re-initialization.
- Press option 1) Load and Run. Type DSK1.CFINFO/O at the FILE NAME? prompt and press ENTER.
- Press ENTER again. At the PROGRAM NAME? prompt type CFINFO and press ENTER.
- The compact flash information will display on the screen.

Please note that during testing, LEXAR compact flashes were not compatible with this program.

Windows Software

cf2dsk.exe – Version 1.0

cf2dsk.exe is a DOS program that transfers files from a Compact Flash to a PC. It is located on the enclosed CD-ROM or sent via e-mail. Install it into onto your disk drive and start it at a Command Prompt (found in Accessories). The following describes the command:

```
cf2dsk Version 1.0

Usage:    cf2dsk <volume#> <DSK file>
Example:  cf2dsk 5 c:\ti_dsk\dm5.dsk
```

where -

- **5** - is the volume number (virtual floppy). The Compact Flash drive emulates 3 disk drives with multiple floppies. You mount the floppy you want to use just like you would physically insert a floppy into a floppy disk drive. (The Compact Flash Drive instructions describe how to do this.)
- **c:\ti_dsk\dm5.dsk** - is a TI diskette image

Windows XP

Windows XP uses the term “\\.\PHYSICALDRIVE_N” to annotate physical drives such as a Compact Flash. In the example below, *cf2disk.exe* will display a list if two or more potential compact flash drives exists. The size of the disk is also displayed. Selection is by number.

```
Microsoft Windows XP Workstation 5.1 Service Pack 2 (Build 2600)
List of All Possible Flash Drives
-----

1) \\.\PHYSICALDRIVE2 24mb
2) \\.\PHYSICALDRIVE4 123mb

Select drive (1-2) or press ENTER to exit:
```

In the example below, only one drive has been found. Selection is made by press “Y”.

```
Microsoft Windows XP Workstation 5.1 Service Pack 2 (Build 2600)
List of All Possible Flash Drives
-----

1) \\.\PHYSICALDRIVE4 123mb

Use this drive? (Y/N):
```

In the example below, no drives could be found. If this should occur, check cabling connections and make sure compact flash is securely inserted.

```
Microsoft Windows XP Workstation 5.1 Service Pack 2 (Build 2600)
List of All Possible Flash Drives
```

```
-----
** None **
```

Warning: be very careful which drive you select. It will complete wipe out all data on the drive.

Windows 98

Windows 98 uses drive letters to annotate physical drives such as the Compact Flash. In the example below, there are two or more potential compact flash drives. *cf2disk.exe* will display a list consisting of drive letter and size. Selection is by drive letter.

```
Microsoft Windows 98
List of All Possible Flash Drives
-----

D: 124mb
E: 31mb

Select drive letter or press ENTER to exit:
```

In the example below, only one drive exists. Pressing “Y” makes selection.

```
Microsoft Windows 98
List of All Possible Flash Drives
-----

E: 31mb

Use this drive? (Y/N):
```

In the example below, no drives could be found. If this should occur, check cabling connections and make sure the Compact Flash is securely inserted. Also, be sure the device driver for the compact flash has been installed and is functioning.

```
Microsoft Windows 98
List of All Possible Flash Drives
-----

** None **
```

dsk2cf.exe – Version 1.0

dsk2cf.exe is a DOS program that transfers files from a PC to a Compact Flash. It is located on the enclosed CD-ROM or sent via e-mail. Install it into onto your disk drive and start it at a Command Prompt (found in Accessories). The following describes the command:

```
dsk2cf Version 1.0  
  
Usage:    dsk2cf <DSK file> <volume#>  
Example:  dsk2cf c:\ti_dsk\dm5.dsk 5
```

where -

- **5** - is the volume number (virtual floppy). The Compact Flash drive emulates 3 disk drives with multiple floppies. You mount the floppy you want to use just like you would physically insert a floppy into a floppy disk drive. (The Compact Flash Drive instructions describe how to do this.)
- **c:\ti_dsk\dm5.dsk** - is a TI diskette image

This utility is virtually identical to *cf2dsk.exe* and uses the same disk select prompts.

Example

You can practice with downloading the "Wheel of Fortune" Extended Basic game from this web site:

<http://ti994a.thebbs.org/Catalog.asp>

Use the following command to copy the disk image to compact flash volume 1. It assumes compact flash shows up as H: drive.

Note that double-quotes are necessary if the Windows path has an embedded space.

```
dsk2cf "f:\ti stuff\wheelfor.dsk" 1
```

Alternatively, you can copy a volume from the compact flash to a disk file.

```
cf2dsk 1 "f:\ti stuff\wheelfor.bkp.dsk"
```

Troubleshooting

Issue

The console makes a “howling sound” or there is no screen image:

Solutions

- Unplugged the CF7+ cable from the console and plug back in.
- Verify that the CF7+ power supply is providing power

Issue

Some downloaded disk images don't work.

Solutions

- Some disk images include track information. This is a physical image of the original diskette. It needs to be converted to the logical image which is sector only data.
- Some disk images have the TIFILE header. This header defines the content of the file and is intended for the Windows file systems. The header must be removed to convert the disk image to sectors only.

Issue

Can't insert CF7+ cable into the console

Solution

There are two copper bushings in the port that may get in the way of the Controller Card's connector as shown in figure 3. They may be gently bent out of the way so that the Controller Card can be firmly seated.



Figure 3 - Copper Bushings

Support

E-mail any questions or problems to malilonj@gmail.com