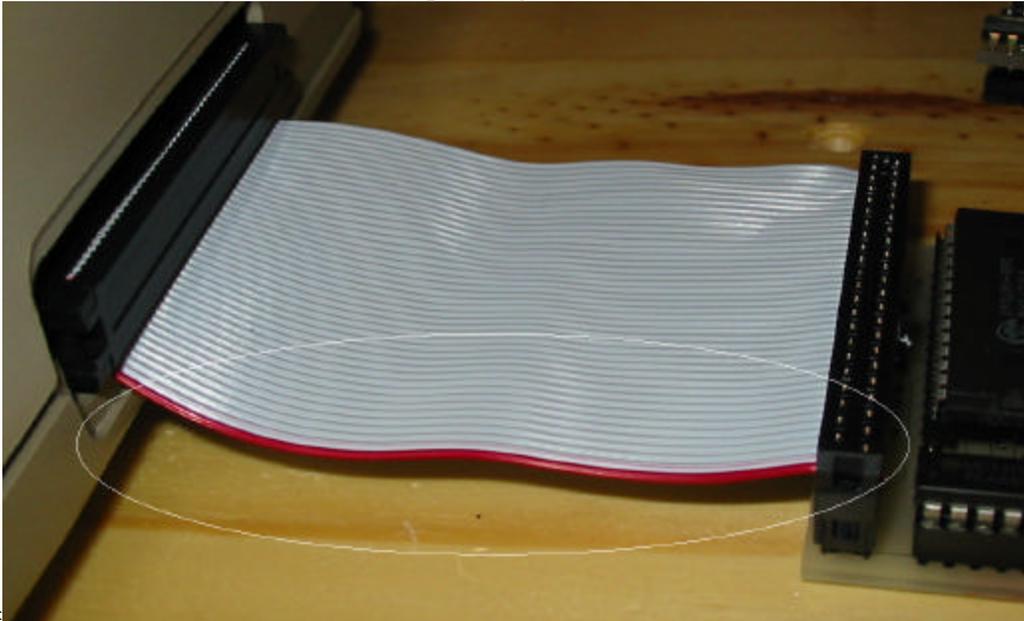


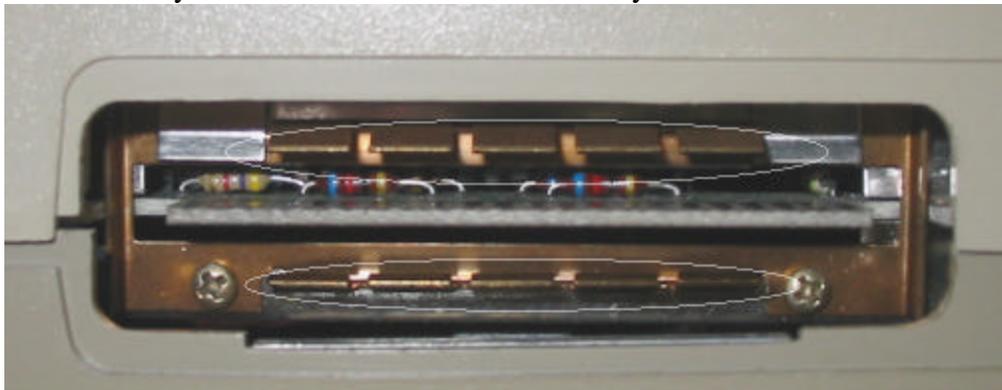
Compact Flash Drive For the TI-99/4a Computer

Installation Instructions

1. Position the Compact Flash Drive (called drive for the remainder of this document) to the right of the TI-99/4a computer (called console for the remainder of this document).
2. Turn the console's power off on
3. Position the drive's card edge connector toward the console. Be sure the red (or blue) wire on the ribbon cable is pointing towards the front of the console.



4. Insert the connector into the console's expansion port. There are two copper bushings in the port that may get in the way of the connector. Gently bend them out of the way until the drive's connector is firmly seated.



5. Place a compact flash into the drive. Never insert or remove a compact flash while the power is on.
6. Turn on the console. Drive 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 stay in contact with a heavy metal item such as metal file cabinet or obtain a grounding wrist strap (such the one Radio Shack offers).

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.

Some IDE disk drives will work (a Maxtor hard disk drive has been tested, but it requires its own power supply). The drive must be capable of LBA addressing. However, not much testing has been done on hard drives and some drives may not work.

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”.

Compact flashes are usually formatted using FAT, a PC floppy disk standard. The ROM will overwrite this with its own 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, a 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 sets 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 keep performance up and stay as compatible as possible with the original TI Disk Drive system.

- This device supports the old TI Disk system, not Window FAT or NTFS.
- Microdrives have not been tested. They consume a lot of power and will not work.
- Only half of the 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.
- The ROM simulates three disk drives. Only three volumes can be accessed at one time. Volumes 1-3 are automatically mounted when the console powers up.
- Mounting of volumes is active only while in Basic. The Disk Manager cannot access volumes 4 and up. The CALL FORMAT Basic command remedies the limitation somewhat.

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.

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 exist. 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 wipe out you're your data.

Windows 98

Windows 98 uses drive letters 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 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 has been found. Selection is made by press “Y”.

```
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 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 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"
```

Port Assignments

Description	Address
Data (read)	>9000
Data (write)	>9400
Error code (read)	>9002
Feature (write)	>9402
Number of sectors (read)	>9004
Number of sectors (write)	>9404
LBA – bits 7..0 (read) or sector	>9006
LBA – bits 7..0 (write) or sector	>9406
LBA – bits 15..8 (read) or cylinder low	>9008
LBA – bits 15..8 (write) or cylinder low	>9408
LBA – bits 23..16 (read) or cylinder high	>900A
LBA – bits 23..16 (write) or cylinder high	>940A
LBA – bits 27-24 (read) or head	>900C
LBA – bits 27-24 (write) or head	>940C
Status (read)	>900E
Command (write)	>940E
Control (write)	>941C

Support

E-mail any questions or problems to cfdisksupport@cox.net Please note that there are three p's in the word support.