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

Document Rev. 1.1

Familiarization

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

- Controller card
- Printer Port (shown with a printer cable plugged in; cable is not included)
- Adapter (note position relative to console)
- Compact Flash


Figure 1 - Component Location

CF7+ is designed to plug into the console's expansion port. It draws power from the console so no external power supply is needed.

However, upon request some versions are modified for external power. This is so the Speech Synthesizer can be used. You will need to provide a regulated +5v power source (such a wall transformer). The connector is a female "berg" connector. This connector may be replaced with any more suitable one.

Installation Instructions

1. Turn the console power off.
2. Plug the Controller card into the console's expansion port as shown in figure 1.
3. 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.
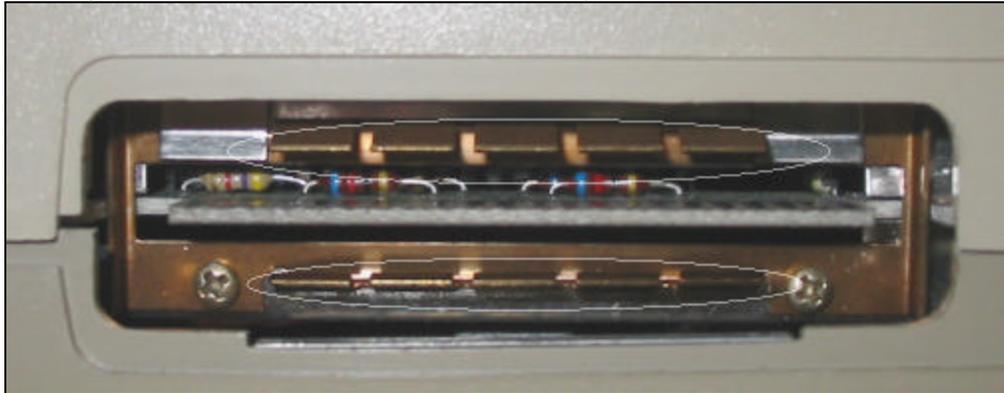
Figure 2 - Copper Bushings

4. Place a compact flash into the Adapter as show in figure 4. CF7+ is shipped with the compact flash installed. Never insert or remove a Compact Flash while the power is on. Doing so may damage the Compact Flash.
5. Turn on the console. Compact Flash 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 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 LED (light emitting diode) next to the printer port is the power LED. The Controller has power when lit.

DSR Activity LEDs

There are two side-by-side LEDs on the back of the controller that indicate DSR activity. One LED is printer activity and the other is Compact Flash activity.

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 listing 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, hard disks 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 it 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 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 comprises 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 Windows FAT or NTFS.

- Microdrives have not been tested. They consume a lot of power and possibly will not work unless an external power supply is provided.

- 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 diskette drivers.

- 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.

- The Controller gets its power from the console. Unfortunately, some side-car expansion devices (such as the Speech Synthesizer) blocks the power. CF7+ will not work unless external power is provided.

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"

Support

E-mail any questions or problems to cfdisksuppport@cox.net (*note that there are three p's in e-mail address*).