



**M-Systems**  
Flash Disk Pioneers

# **TrueFFS/95**

# **User's Guide**

**For M-Systems, Intel and compatible**  
**Linear Flash Cards**

**Jun-96**

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# TrueFFS for Windows-95 User's Guide

## 1.1 Introduction

TrueFFS-95 is TrueFFS for Microsoft's Windows-95: A new version of M-Systems' TrueFFS Flash File System supporting the FTL standard data format.

In keeping with the spirit of Windows 95, TrueFFS breaks all ties with real-mode DOS, and is a true 32-bit protected mode VxD. TrueFFS-95 works in coordination with the protected-mode Card Services & Socket Services, with the plug-and-play configuration manager and with the Windows-95 I/O Supervisor.

To TrueFFS for Windows-95 are attached several utilities: TFORMAT to format Flash cards, SRFORMAT to format Static RAM cards, and TCHECK to verify and correct the TrueFFS format.

At installation time, these utilities are copied to your \WINDOWS\TFFS95 directory.

The utilities are console applications, which means that they have the general appearance of DOS commands, and will run in what appears to be a DOS box (although in fact they are Win-32 applications).

## 1.2 Requirements

A PCMCIA adapter that is supported by Windows-95 Card & Socket Services. To our knowledge these include adapters based on Intel 82365SL controllers or compatibles (Cirrus Logic, Vadem & others) and Databook drives. It is assumed that the PCMCIA adapter was properly configured and that Windows-95 Card Services is accessing PCMCIA cards on it.

TrueFFS-95 works with Intel Series-2, Maxtor & M-Systems MobileMax, Intel Series-2+ Flash cards and SRAM/ROM/EPR0M cards.

## 1.3 Installation

Follow these steps to install TrueFFS/95:

1. If you have not yet read the "Requirements" section above, please read them now.
2. Is your PCMCIA socket installed? If no, or you don't know, refer to details on PCMCIA Socket installation in this section below.
3. Insert the disk with TrueFFS installation files into a drive.
4. Remove any Flash memory cards from the PCMCIA slots.
5. From the Windows-95 display, open "My Computer" on your desktop or open the Windows Explorer.
6. Open the disk with TrueFFS installation files.
7. Click with the right mouse button on the file **Trueffs.inf**. You will see a menu.
8. In the menu choose "Install" and click on it.
  9. After Windows-95 finishes copying installation files you are ready to work with Flash Memory Cards.

## 1.4 Installing the PCMCIA Socket

To find out if your PCMCIA Socket is installed:

1. From the Windows-95 display, choose "Start", then "Settings", then "Control Panel".
2. Open "System".
3. Click on "Device Manager".
  4. Scan the list of devices class for "PCMCIA socket". If you find it, open it (click on +). It should contain at least one line. If you do not find it, or it contains no lines, your PCMCIA socket is not installed.

If your PCMCIA Socket is not installed, but the actual PCMCIA hardware exists on your system, proceed to install it:

1. From the Windows-95 display, choose "Start", then "Settings", then "Control Panel".
2. Open "Add New Hardware".
3. Click "Next".
4. If the "Add new hardware wizard" suggests that Windows look for your new hardware, click on the "No" button and then click "Next".
5. Choose "PCMCIA Socket" and click "Next".
  6. Choose from the list of known sockets, or click "Have Disk" as appropriate to the PCMCIA hardware installed.

## 1.5 Removing installed components

Follow these steps to uninstall TrueFFS/95:

1. From the Windows-95 display choose “Start”, then “Settings”, then “Control Panel”.
2. Open “Add/Remove Programs”. You will see the list of the software that can be automatically removed by Windows.
3. Select “M-Systems TrueFFS driver” from the list and click “Add/Remove”.
4. Windows-95 will remove all installed components.

## 1.6 TFORMAT - The TrueFFS Format Utility

Before TrueFFS can access a Flash medium, the medium must be formatted, just as a floppy disk must be formatted. Formatting initializes the medium and writes to it a new and empty DOS file system. When formatting is complete, the medium contains only a root directory.

The DOS FORMAT command cannot be used for formatting Flash media driven by TrueFFS.

The medium may be formatted more than once. However, all data on the medium is destroyed each time it is formatted. When reformatting, the boot-image is **retained** by default, although it may be deleted or reallocated by various TFORMAT options.

The syntax of the TFORMAT command is:

```
TFORMAT { drive-letter }  
  [ /S:boot-image-file-name ]  
  [ /S:drive-letter:]  
  [ /S:! ]  
  [ /S:* ]  
  [ /BOOTSIZ:boot-image-size ]  
  [ /USE:nnn ]  
  [ /LOWMEM:size ]  
  [ /LABEL:label ]  
  [ /DOSVER:dos-major-version ]  
  [ /SIZE:size ]  
  [ /SPARE:n ]  
  [ /Y ]
```

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**Note** An equal sign (=) may be used wherever a colon (:) is required.

Examples:

**TFORMAT E:**

**TFORMAT D: /SIZE=8M**

---

All sizes specified in TFORMAT options are in bytes if specified as simple numbers, in KBytes if specified with the suffix **K**, or in megabytes if specified with the suffix **M**.

The TFORMAT options are:

<b><i>drive-letter</i></b>	DOS drive letter of the TrueFFS drive.						
<b><i>/S:boot-image-file-name</i></b>	Create a boot-image partition with a boot-image copied from the file specified. The partition size will be the smallest that may contain the file contents, unless overridden by the /BOOTSIZ parameter described below.						
<b><i>/S:drive-letter:</i></b>	Create a boot-image partition, with a boot-image copied from a memory card residing on a different TrueFFS drive. The amount copied from the socket must be specified by the /BOOTSIZ parameter. The partition size will be the smallest that may contain the boot-image.  This variation of the /S parameter is useful to create boot-images which are clones of another memory card.						
<b><i>/S:!</i></b>	Do not create a boot-image partition. This option is necessary if, upon reformatting, an existing boot-image partition is to be deleted.						
<b><i>/S:*</i></b>	Retain the previous boot-image partition. This is the default action. If no boot-image existed previously, this option acts like the /S:0 parameter.						
<b><i>/BOOTSIZ:boot-image-size</i></b>	The size of the boot-image partition in bytes. This parameter must be specified when copying a boot-image from another socket. Otherwise it is defaulted as follows:  <table> <tr> <td><b><i>/S:file-name</i></b></td> <td>Number of bytes in the file</td> </tr> <tr> <td><b><i>/S:!</i></b></td> <td>0</td> </tr> <tr> <td><b><i>/S:*</i></b></td> <td>Old partition size</td> </tr> </table>	<b><i>/S:file-name</i></b>	Number of bytes in the file	<b><i>/S:!</i></b>	0	<b><i>/S:*</i></b>	Old partition size
<b><i>/S:file-name</i></b>	Number of bytes in the file						
<b><i>/S:!</i></b>	0						
<b><i>/S:*</i></b>	Old partition size						
<b><i>/USE:nnn</i></b>	Percentage of available space on the Flash medium to be used for file storage. <i>nnn</i> can be any number from 1 to 100. Default is 99 (99%).  The value of this option may affect the write performance of TrueFFS. For more details, see <i>Performance Considerations</i> , later in this manual.						
<b><i>/LOWMEM:size</i></b>	The low-memory part of the TrueFFS DOS medium may be handled using a faster access mechanism than the rest of the medium.  Since the FAT and root directory reside in low sector numbers, this may improve performance. However, this option has an overhead in TrueFFS memory requirements.  For more details, see <i>Performance Considerations</i> , later in this manual.  The default is 64 KBytes. In principle, it is possible to specify a size that will span the entire medium, if the memory required to handle this is available.						
<b><i>/SIZE:size</i></b>	The size of the Flash medium to be formatted (including the boot-image). By default the entire medium is formatted by TFORMAT. This option may be used to limit the formatted size to a smaller size.  This option is useful if the memory card will be transported to a machine that is physically able to address only a part of Flash memory.						
<b><i>/LABEL:label</i></b>	A string to be used as the DOS label of the formatted medium.						

**/DOSVER:dos-major-version** Format for a target system running the specified DOS version. The default is the current DOS version (the one on which TFORMAT is executed). E.g. **/DOSVER:3** formats for DOS 3.x. Valid values are 1 to 6.

**/SPARE:n** Leave *n* Flash erase units as spare units for garbage collection. The default is 1. At least one unit should be specified for the Flash medium to operate as a true read-write device.

More than one spare unit may be specified to format media that have bad Flash units. In such a case the number of spare units should exceed the number of bad units by at least 1. It is also possible to specify more than one spare unit in anticipation of Flash units becoming bad in the future.

A value of 0 spare units may be specified to create a **WORM** (Write-Once-Read-Many) disk. When formatting with this option, the Flash medium can be written **once only**, after which it will become a read-only medium. TrueFFS will report that the medium is write-protected when space for writing is exhausted. This option provides very limited functionality, and should not be used except in special cases. The option has the advantage of lowering the formatting overhead of TrueFFS, since a spare Flash erase zone is not needed for space reclamation.

**/Y** Do not pause for confirmation before beginning to format.

## 1.7 SRFORMAT - Static RAM Formatter

SRFORMAT formats Static RAM cards, writing on them a new and empty file-system.

Note that different vendors use different methods of writing DOS-FAT partitions on SRAM cards, usually differing in on which card offset the file-system partition begins. TrueFFS will support most of such formats. SRFORMAT writes a file-system partition beginning at offset 0 of the card.

The syntax of the SRFORMAT command is as follows:

```
SRFORMAT      { drive-letter }
               [ /LABEL:label ]
               [ /DOSVER:dos-major-version ]
               [ /Y ]
```

For example,

```
SRFORMAT D: /Y
```

The SRFORMAT options are:

**drive-letter** DOS drive letter of the TrueFFS drive.

**/LABEL:label** A string to be used as the DOS label of the formatted medium.

**/DOSVER:dos-major-version** Format for a target system running the specified DOS version. The default is the current DOS version (the one on which TFORMAT is executed). E.g. **/DOSVER:3** formats for DOS 3.x. Valid values are 1 to 6.

**/Y** Do not pause for confirmation before beginning to format.

## 1.8 TCHECK - Format Verification Utility

The TCHECK utility is used to verify the underlying TrueFFS format and, optionally, to correct formatting inconsistencies. TCHECK is comparable to the SCANDISK program or the Norton Disk Doctor, which do the same for the DOS FAT format.

You may run SCANDISK or a Disk Doctor on a TrueFFS drive, just as you may for any other standard DOS drive. These utilities, however, will diagnose and fix **DOS** errors. The TrueFFS format is transparent to them, as it is to you.

The syntax of the TCHECK command is as follows:

```
TCHECK { drive-letter } [ /F ]
```

For example,

```
TCHECK D:
```

The TCHECK options are:

<i><b>drive-letter</b></i>	DOS drive letter of the TrueFFS drive.
<b>/F</b>	Attempt to fix inconsistencies when they are found. The default is not to fix, but only to report errors.

TCHECK performs the following consistency scans of the TrueFFS format:

- It checks that the spare transfer units are erasable. An error indicates that your system's power supply to the Flash medium is insufficient, or that the Flash unit involved is faulty.  
If there is no problem in power supply, and all transfer units are no longer erasable, the medium should be reformatted with a larger value of the /SPARE parameter. To do this without losing data, download all files on the TrueFFS medium to a backup medium, reformat with the new /SPARE value, and then reload all files from the backup medium.
- Logical-to-virtual scan of the format tables.  
Logical-to-virtual errors are usually not serious, and do not indicate damage to user data, unless they occur often and in large numbers. They are usually the result of occasional power failures or Flash hardware failure. Fixing them will usually result in regaining a sector that was inaccessible.
- Virtual-to-logical scan of the format tables.  
Virtual-to-logical errors will never occur unless there is a serious malfunction in TrueFFS operation, Socket Services operation, or hardware. Although such errors can be fixed by TCHECK, such fixes will often not prevent loss of user data.