



# FireWire Mass Storage Enabler for DOS

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FireWire Mass Storage Enabler for DOS

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APSOFT.  
Siemensstrasse 1b  
84405 Dorfen  
Germany

Tel: +49 (0) 8081 955 89 0  
Fax: +49 (0) 8081 955 89 11  
Internet: <http://www.tssc.de>

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## Introduction

This manual provides an overview of the FireWire Mass Storage Enabler for DOS. All released versions are collectively named “FireWire Mass Storage Enabler” or simple “Enabler” throughout this manual

Enabler is a small, but powerful driver for quickly enable PCI FireWire (IEEE 1394) Adapter such as Adaptec AFW-4300 FireConnect Adapter, Orange Micro Inc. OrangeLink FireWire PCI Board, etc.

Due to the small memory footprint of the resident part the enabler is an ideal solution for use in various disk-cloning schemes. Both, Symantec Norton Ghost and Power Quest Disk Copy, are supported.

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## Features and Limitations

Enabler supports both, original DOS (e.g. MS-DOS 6.22) as well as DOS included with Windows 95/98. Resident part of FireWire Mass Storage Enabler occupies approximately 1 kB of memory or larger, depend from used features.

Enabler can be loaded via CONFIG.SYS, AUTOEXEC.BAT, or simply started from DOS command prompt.

Enabler can be unloaded, except if it is loaded from CONFIG.SYS. Besides Enabler prevents second load of itself.

Enabler may provide support of FireWire devices without load additional driver for your device (e.g. ASPICD.SYS for CD-ROM device).

Enabler does not provide support of audio CD disks for FireWire CD-ROM devices without load additional driver for your device.

Enabler may provide full LBA support for disks of any size. Large disks are supported.

Enabler may provide full INT 13h support, including extension. Most utilities (FORMAT.COM, FDISK.EXE, Norton Utilities, etc.) are supported.

User may freely assign drive letters to partitions, except if Enabler is loaded from CONFIG.SYS. Number of supported partitions is limited only by number of available drive letters.

Enabler does not provide hot-swap support. All FireWire devices should be connected to the computer before Enabler is started.

Enabler cannot be loaded in the Windows DOS session.

Enabler provides a set of flexible configuration options via command line or external .INI file.

In case a CardBus adapter is not properly initialized by BIOS, Enabler is able to update the CardBus adapter configuration. Most of the required initialization can be done automatically without user intervention. However, if required, user will be able to control most settings, either via command line parameters or, in complicate cases, via external .INI file

## Installation

The Enabler may be installed either in CONFIG.SYS, AUTOEXEC.BAT or started from DOS command line. It's possible to relocate enabler into upper memory using DEVICEHIGH or INSTALLHIGH statements in CONFIG.SYS.

The Enabler provides several command line switches allowing fine-tuning of the driver. In more complicate cases you may create an initialization file with very detailed configuration instructions.

It is recommended that you fine-tune CardBus Enabler switches starting CardBus Enabler from the command line. After switches are set, you can place call of CardBus Enabler either to CONFIG.SYS or to AUTOEXEC.BAT.

---

## Deployment

In order to use FireWire devices (such as Hard disk or CD-ROM) you typically will need to load FireWire Mass Storage Enabler and driver for your device. E.g. usage of CD-ROM requires ASPICD.SYS; usage of FireWire Disk – ASPIDISK.SYS, etc. Required drivers could be found in the Adaptec EZ-SCSI package.

However FireWire Mass Storage Enabler may provide support of FireWire devices without load any additional drivers.

For use CD-ROM you will also need to load MSCDEX.EXE in your AUTOEXEC.BAT.

Enabler may allocate the required memory (see “Resource Management” chapter for details).

To be available inside of 1<sup>st</sup> MB (not required) memory should not be shadowed by BIOS and should be excluded from memory management by EMM386.EXE.

FireWire Mass Storage Enabler may use memory located anywhere in 4GB address space.

---

**Example of  
config.sys**

You can invoke FireWire Mass Storage Enabler in the any point. For example:

```
SWITCHES = /F
BUFFERS  = 10,0
FILES     = 99
BREAK    = ON
FCBS     = 16,8
LASTDRIVE = Z
STACKS   = 9,512
DEVICE   = \dos\himem.sys /testmem:off
DEVICE   = \dos\emm386.exe noems
DOS      = HIGH,UMB
DEVICE   = \FWMASS.EXE
```

---

**Fine-tuning**

If your BIOS configure CardBus Adapter properly, no command line parameters are necessary. Otherwise fine-tuning could be required.

The fine-tuning could be performed either in standard installation mode via command line options, or in advanced installation mode via an external INI file.

Following chapters describe both modes in detail.

In both modes several optional parameters require a numeric value. Any numeric value could be entered as decimal (default form) or hexadecimal (with 0x prefix) number. For example: /PI:10 and /PI:0x0A both specify IRQ 10.

In both modes several optional parameters require <use> values. Use values may typically be specified as ON, OFF or AUTO in upper or lower case.

## Resource management.

During the loading Enabler collects information about resources (IRQ, I/O and memory) used by PCI, PnP and Option ROMs. Enabler considers such resources as non-free and excludes them from hardware configuration procedure.

In non-PnP computer Enabler may be not able detect all used resources (e.g. resources used by Legacy ISA devices). In such case you can adjust resource filters manually by adding such resources into [Resource] section of the external .INI file. The list of all detected resources is displayed if Enabler is started with /V+ switch.

Algorithm of resource management is as follow:

1. Collect PCI, PnP and Option ROM resource information.
2. Result is combined with resource information in [Resources] section of .INI file (if file and section exist).
3. Resulting resources collection is used as resource filter.
4. Resource assignment via external .INI file (e.g. bridge filter settings or ExCA address register) overrides assigned resources unconditionally, even if specified resource is unavailable. If resource is unavailable and Enabler is started in verbose mode (with /V switch) - a warning is issued.
5. If specific resource is assigned by BIOS, Enabler keeps such resource (unless otherwise is directed by .INI file).
6. If specific resource is not assigned by BIOS and there is no .INI file settings, Enabler will allocate required resource automatically:
  - a) Command line settings specify preferable resources to be used if available.
  - b) If preferable resources are not available or if no preferable resources specified via command line, any available (according to filters set during the loading) resource will be used.

Note: For I/O and memory pools Enabler use preferable resource from bottom up (in other words, minimal possible address is used first).

Intel 16-bit PCIC compatible (non-CardBus) PC Card adapters are limited by using memory inside of 1st MB. PCI and CardBus adapters may use memory anywhere in 4GB address space.

## Command Line Options.

Command line options can be specified in any order, either in upper case or in lower case. Typical parameters start with slash (/) or dash (-) followed by one or two letters (e.g. /H or /VR).

Some command line options require an additional value. In this case parameters should be followed by colon (:) or equal (=) then value (e.g. /M:0xEC000).

Command line options are separated by spaces.

---

### Common Command Line Options

Following options are common for all versions of FireWire Mass Storage Enabler.

- /H | ?    Print online help
- /E        Silent mode: No display output.

---

### Resource Management

- /PI:n    PCI Interrupt level            (Default: 0x0B)
- /M:n    Start address of memory pool    (Default: 0xD0000)
- /IO:n    Start address of I/O pool        (Default: 0x340)

---

## Diagnostics and Fine-tuning

- `/F=filename` Specifies the initialization file pathname.
- By default the initialization file has the same name as the Enabler, but with extension `.INI` (i.e., `FWMASS.INI`). Enabler will be looking for the `.INI` file in the same subdirectory where enabler itself is located.
- Using `/F` parameter user may override path and name of the default initialization file. (E.g., `/F:E:\Settings\fwmass.ini`)
- `/V[:<file>]` Verbose mode: Configuration steps will be outlined on console or to file (if file pathname is specified).
- `/FL` Flush log file to disk immediately after each update (may be useful in case of system hang).
- `/ID` Displays identified drive information.
- `/In:Letter` Specifies the drive letter assigned to partition 'n', where n could be in range of 0 to 9 (E.g. `/L0:M /L1:K /L2:Z`)
- Drive letters selected by the user can only be taken into account if the Enabler is loaded in TSR mode (e.g., from `AUTOEXEC.BAT` or command line), and will be ignored if the device driver is loaded from `CONFIG.SYS`.
- User may assign more than 10 drive letters using the `.INI` file.
- `/DOSONLY` By default, Enabler assigns drive letters to all found drive partitions regardless the file system. This mode allows e.g. reformat unrecognized file system to one supported by DOS.
- If `/DOSONLY` switch is added to the command line, the drive letters will be assigned only to partitions with file system recognized by DOS (FAT12 & FAT16 under DOS 6.x and FAT12, FAT16 & FAT32 under DOS).
- Use this mode if you plan to install third-party file system driver for non-DOS partitions. For example, Symantec Norton Ghost 8.x contains a built-in NTFS driver allowing backup/restore operation to/from NTFS drive under DOS.
- `/IB:B:D:F` Ignore PCI-2-PCI bridge. This switch may be used if PCI-2-PCI bridge pass all memory and I/O requests behind. B - bus (0-255), D - device (0-31), F - function (0-7). Alternative way to ignore bridge is via `.INI` file.

- `/FI` Force updating of PCI IRQ routing table for socket (even if selected IRQ is already in table).
- `/BS` Performs PCI bus scan and termination. Information will be displayed on console
- `/TC:n` Maximal time in sec waiting for device connect signal after bus reset (Value 1 - 60, Default 10 sec)

---

## ASPI Management

- `/NU` Do not move part of resident code to upper memory.
- `/I` Ignore (do not install) INT 13 interface support for ASPI hard disk devices. Also no drive letter will be created.  
  
In this case driver for your device is required.
- `/IC` Ignore (do not install) support for ASPI CD-ROM disk devices.  
  
In this case driver for your device is required.
- `/D:devname` Specifies device name of CD-ROM driver (Default: ASPICD01)  
  
Can be used by MSCDEX.EXE to support ASPI CD-ROM disk devices.

---

## Unloading

- `/UL` Unload resident part (not supported, if driver is loaded via config.sys)

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## Initialization File

The initialization file is a text file that contains special settings. These settings allow you to configure computer hardware components so your CardBus adapters and/or FireWire CardBus card become functional.

Any text in the .INI file starting after the semicolon (;) to end of the line, is interpreted as a comment.

Using the INI file you may set PCI-2-PCI Bridges and FireWire card parameters in any combination.

---

### PCI Sections

PCI Section describes PCI Device. Enabler supports any number of PCI Sections in the .INI file.

All section names are relative to original PCI subsystem configuration. You can see that configuration if you switch program to verbose mode. (/V key) or use the /BS switch.

In order to specify the required configuration of the PCI device, you need to know the location of the device. This location is specified in Bus:Device:Function form. Location 0:A:1 describes the first function of PCI device number 10 ("A" in hexadecimal format) located on PCI bus 0. Initialization file section used for the configuration of such a device should have the name [0:A:1].

Value names depend on device type.

For CardBus adapters, following values are defined: 'IoFilter0', 'IoFilter1', 'MemFilter0', 'MemFilter1', 'ExCABase', 'LegacyBase', 'IRQ', 'ISAEnable', 'VGAEnable', 'VGAEnable', 'SkipSocket'.

For PCI-to-PCI bridges, following values are defined: 'IoFilter', 'MemFilter', 'PreFilter', and 'IRQ', 'ISAEnable', 'VGAEnable', 'IgnoreBridge'.

For FireWire adapter, following values are defined: 'IRQ', 'BARMask', 'BAR0', 'BAR1', 'BAR2', 'BAR3', 'BAR4', 'BAR5', 'BAR6', 'SkipAdapter'.

---

**MemFilter,  
PreFilter,  
MemFilter0,  
MemFilter1**

These parameters define the CardBus or PCI-to-PCI bridge memory filter base and limit (or size) both memory filters (prefetchable and non-prefetchable).

The CardBus base and size values should have 4K alignments according to Yenta specification and limit (maximum address) should be aligned to 4K minus one.

Following formats could be used to specify bridge memory filter ranges:

BaseAddress:Limit. This means that we define the first and exactly the last integer number in a range (e.g., 0xA0000000:0xA0000FFF specifies 4K ranges). If you wish to disable positive decoding of PCI-to-PCI bridge's filter range, please specify something like: 200000:1ffff.

If you prefer to specify filter size rather than filter max address you should use BaseAddress,Size format, where Size by default is a literal decimal number. In this case you also could use 'M' or 'K' postfixes (e.g., 0xA0000000,1M specifies 1M memory filter starting at 0xA0000000 address).

Attention! All values are treated as hexadecimal even if there is no "0x" prefix.

Examples:

MemFilter0=A0000000h:A0000fffh	4K memory range
MemFilter0=A0000000h,4K	4K memory range
MemFilter0=A1000000h:A1001ffff,Pre	8K pref. memory
MemFilter0=A1000000h,8K,Pre	8K pref. memory

---

**IoFilter,  
IoFilter0,  
IoFilter1**

This is the bridge I/O range base and limit (or size). For CardBus base and size values must have double-word alignment.

Examples:

IoFilter = 0xD000:0xD00F	16-bytes I/O range
--------------------------	--------------------

---

**IRQ**

CardBus interrupt line settings. According to PC/AT architecture this value must not exceed 15.

IRQ = 10	10th interrupt
----------	----------------

IRQ = 10	10th interrupt
----------	----------------

---

**ISAEnable**

Control setting of ISA Enable bit in Bridge Control Register. Valid values are 0 and 1.

Example:

ISAEnable = 1	Set ISA Enable bit
---------------	--------------------

---

**VGAEnable**

Control setting of VGA Enable bit in Bridge Control Register. Valid values are 0 and 1.

Example:

```
VGAEnable = 0                                Reset VGAEnable bit
```

---

**ExCABase**

This option is used to mount CardBus socket register/ExCA registers base address register. Available values: any 32-bit hexadecimal number aligned to 4K boundaries.

Example:

```
ExCABase = D8000000h
```

---

**LegacyBase**

This is PC Card 16-Bit IF legacy mode base address. Available values: any 16-bit hexadecimal number aligned to double-word boundary.

Example:

```
LegacyBase = 3e0h
```

---

**PrimaryBus,  
SecondaryBus,  
SubordinateBus**

These options control bus number assignments for PCI-to-PCI and CardBus bridges. Available values: any decimal number not greater than 255.

Example:

```
[0:A:0]                                TI PCI1131 socket
PrimaryBus      = 0
SecondaryBus    = 1                Set sec. bus to 1
SubordinateBus  = 3                Set sub. bus to 3
```

```
; Now socket 0 of TI PCI1131 CardBus adapter accepts
; I/O requests to buses from 1 to 3 inclusive
```

```
[0:A:1]                                TI PCI1131 socket
PrimaryBus      = 0
SecondaryBus    = 4                Set sec. bus to 4
SubordinateBus  = 3                Set sub. bus to 3
```

---

**SkipSocket**

Allows skip (ignore) particular CardBus socket. Valid values are 0 and 1

Example:

```
SkipSocket = 1                                Skip socket
```

---

**IgnoreBridge**

Allows ignore PCI-2-PCI bridge. This option may be used for subtractive-decode PCI-2-PCI bridges (bridges which pass all memory and I/O requests behind). Valid values are ON, OFF and AUTO. 'ON' means that bridge is ignored (i.e. bridge is subtractive). 'OFF' means that bridge is not ignored (even

if physically subtractive). 'AUTO' means that bridge's decoding mode should be read out of bridge.

Example:

```
IgnoreBridge = ON                Ignore bridge
```

---

### **BARMask**

This option allows specifying mask of BARs that will be initialized by enabler. If bit in the mask is set, the Enabler will initialize corresponding BAR. If bit is reset, Enabler will ignore corresponding BAR.

Example:

```
BARMask          = 3                Set BAR0 and BAR1
```

---

### **BAR0 - BAR6**

These options allow specifying values for card base address registers (BARs).

If Enabler configures BARs by itself then it automatically adjust parent CardBus bridge filters (if required). However if these options are used then Enabler assumes that parent CardBus bridge filters were already set to proper values.

Example:

```
BAR0              = 0xFFFEFE000    Set BAR0  
BAR1              = 0xFD00         Set BAR1
```

---

### **SkipAdapter**

Allows to skip (ignore) particular FireWire adapter . Valid values are 0 and 1

Example:

```
SkipAdapter = 1                Skip Adapter
```

---

## **Resources Section**

The Enabler INI file offers user an extended control over resource allocation. Using [Resources] section of the Enabler INI file user can include or exclude specific resources for use by Enabler.

During the loading Enabler collects information about resources (IRQ, I/O and memory) used by PCI, PNP and Option ROMs. Enabler considers such resources as non-free and excludes them from hardware configuration procedure. In non-PnP computer Enabler may be not able detect all used resources (e.g. resources used by Legacy ISA devices). Such undetected resources may cause resource conflict. In such case you can adjust resource

filters manually by adding resources into this [Resources] section for the Enabler's INI file.

Only one [Resources] section can be defined in INI file.

To add resource you should define its description in separate line.

Any resource may be either excluded or included to hardware configuration procedure. To exclude resource its description should start from 'XMEM' (for memory), 'XIO' (for I/O) or 'XIRQ' (for IRQ). To include resource its description should start from 'MEM' (for memory), 'IO' (for I/O) or 'IRQ' (for IRQ).

For memory and I/O you also specify base address and size of resource range separated by commas. For IRQ you specify only IRQ number separated by comma.

Finally for any resource you may specify sharable attribute separated by comma. There are next possible attributes:

- E - Resource is available for exclusive (non-shared) use.
- D - Resource is available for dynamic-shared use.
- T - Resource is available for time-shared use.

You may specify sharable attribute for any resource, either excluded or included. However for excluded resource it makes no sense (since excluded resource is unavailable for any using) and will be ignored.

If no shared attribute specified, resource is assumed as an exclusive use resource.

Example:

```
[Resources]
XMEM = 0xD0000, 0x400           ; Exclude memory
                                ; [0xD0000-0xD03FF]
XIO = 0, 0x100                 ; Exclude I/O [0-0xFF]
IRQ = 5, D                      ; Include IRQ 5 with dynamic
                                ; share
XIRQ = 6                        ; Exclude IRQ 6
XMEM = 0x100000, 0x7FF0000     ; Exclude memory
                                ; [1MB - 2GB]

; Exclude memory [0xE0000-0xE7FFF] except [0xE1000-0xE2FFF]

XMEM = 0xE0000, 0x8000, E      ; Exclude [0xE0000-0xE7FFF]
MEM = 0xE1000, 0x2000, E      ; Include [0xE1000-0xE2FFF]
```

```
[Resources]
XMEM = 0xD0000, 0x400           ; Exclude memory
                                ; [0xD0000-0xD03FF]
XIO = 0, 0x100                 ; Exclude I/O [0-0xFF]
IRQ = 5, D                     ; Include IRQ 5 with dynamic
                                ; share
XIRQ = 6                       ; Exclude IRQ 6
XMEM = 0x100000, 0x7FF0000     ; Exclude memory
                                ; [1MB - 2GB]

; Exclude memory [0xE0000-0xE7FFF] except [0xE1000-0xE2FFF]

XMEM = 0xE0000, 0x8000, E      ; Exclude [0xE0000-0xE7FFF]
MEM = 0xE1000, 0x2000, E      ; Include [0xE1000-0xE2FFF]
```

## Additional information

---

### How to get Technical Support for FireWire Mass Storage Enabler

*Please send an E-mail in English (we can't process technical support questions in any other language) to [technical support](mailto:support@tssc.de) ([support@tssc.de](mailto:support@tssc.de)).*

In your request please specify:

1. Description of your problem.
2. The card name **exactly** as it appears on the card.

Please attach to your e-mail following files:

1. Please run FireWire Mass Storage Enabler with /V+[:<file>] switch (plus all parameters you normally use), capture the output to the file and attach it to your e-mail. E.g.  
C:\>FWMASS /V+:LOG.TXT  
or  
DEVICE = FWMASS.EXE /V+:LOG.TXT
2. CONFIG.SYS
3. AUTOEXEC.BAT
4. Enabler initialization file if one exists.

---

## Example of INI file

Following sample shows an example of FWMASS initialization file for the system with one CardBus and one PCIC compatible adapter

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;;          FWMASS Enabler. Sample of Initialization file
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

; PCI-2-PCI Bridge between bus 0 and bus2
[0:1E:0]
PreFilter=0x60000000:0x60FFFFFF

; CardBus socket 0
[2:B:0]
ExCABase      = 0xFF000000
PrimaryBus    = 2
SecondaryBus  = 0x81
SubordinateBus = 0x81
MemFilter0    = 0xFFE000,4K
MemFilter1    = 0xFAC00000:0xFEBFFFFFF
IOFilter0     = 0xFD00:0xFDFE
IOFilter1     = 0xFC00:0xFCFE
LegacyBase    = 0
IRQ           = 11
ISAEnable     = 0
VGAEnable     = 0

; FireWire Card
[81:0:0]
BARMask      = 1
BAR0         = 0xFD00
IRQ          = 11
```

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