



LINUX UDO DRIVER
USER GUIDE



Plasmon

Preliminaries

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Changes

The material in this User Guide is for information only and is subject to change without notice.

Plasmon PLC reserves the right to make changes in the product design and installation software without reservation and without notification to its users.

Additional information may be obtained from your supplier, or from the addresses on page vi.

Safety agency standards

European notice



This product is in conformity with the following directives:

- EN 55022/CISPR 22, Class B
- EN 55024
- EN 61000-3-2
- EN 61000-3-3
- EMC directive
- Low-voltage directive.

FCC notice



The equipment to which this manual pertains has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this User Guide, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into a circuit different from that to which the receiver is connected
- Consult an experienced radio/TV technician for help.

Industry Canadian notice per ICES-003

English: This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled Digital Apparatus, CES-003 of the Industry Canada.

French: Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel brouilleur: Appareils Numériques, NMB-003 édictée par l'Industrie Canada.

Australia/New Zealand

This equipment has been tested and complies with AS/NZS 3548.

Product safety standards

The Plasmon UDO drive complies with the following domestic and international product safety standards:



- UL Standard 60950-1, 1st Edition: 2003 Safety of Information Technology Equipment
- CSA Standard C22.2 No. 60950-1-03, Safety of Information Technology Equipment
- IEC 60950-1, 1st Edition: 2001.

Laser safety notice

Warning: Use of controls, adjustments or performance of procedures other than those specified herein, may result in hazardous radiation exposure.

The drive complies with 21 CFR 1010.10, 1040.11 and IEC 60285-1:1993+A1:1997+A2:2001 as a Class 1 Laser product.

CDRH Regulations

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Warning: Use of controls, adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

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Minimum system requirements

USB or SCSI attached drive

- Fedora Core 6 (or later)
- Red Hat Enterprise Linux Release 5 (or later)

Note: FUSE must be installed prior to installing the UDO Driver.

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Chapter 1

Installing the software

Overview

This chapter describes how to install and operate UDO Driver on Linux operating systems.

This package supports only the Plasmon UDO drive, with Rewriteable or Write Once media and the UDF, Archive, and SSMDf file systems. Other drives or file systems are not supported.

This package supports the following Linux distributions:

- USB or SCSI attached drive
 - Fedora Core 6 (or later)
 - Red Hat Enterprise Linux 5 (or later)

Note: FUSE must be installed prior to installing the UDO Driver.

It is recommended that the system have at least 1GB of physical RAM and a swap partition of at least 1GB.

Note: Swap partition size should always be at least double the installed RAM. If RAM is upgraded, the swap partition should be resized accordingly.

Technical Details

The UDO drive cannot be used directly as a normal block device because it has a hardware sector size of 8 KB that is not natively supported by Linux.

This functionality is supported by a background process (daemon) which controls the UDO drive through the USB or SCSI device and provides an AFS, UDF or SSMDf filesystem through FUSE (Filesystem in Userspace).

The set of UDO-UDF packages is a collection of tools and utilities for the GNU/Linux operating system to create, access and check UDF filesystems on Plasmon's UDO drives. It is dependent upon the FUSE (Filesystem in Userspace) package, which must be present on the system prior to installation of the udofs package.

Udofs package contains the module that provides access to UDF filesystems on UDO media. It also encompasses a set of tools to support the creation, labelling and checking of UDO-UDF filesystems.

Installation

UDOFS

Before installing make sure that there are no previous versions of the package installed. To unintsall the older package run the following command as root:

```
# rpm -e udofs
```

The Linux UDO driver software is available in the Linux/Fedora folder of the Resources CD.

To install the package run the following command:

```
# rpm -ivh udofs-2.0-14.i386.rpm
```

To verify the installation use the following command:

```
# rpm -q fuse udofs
```

On a successful installation, this command returns:

```
fuse-2.6.5  
udofs-2.0-10
```

Note: If this is not correct, uninstall both packages and reinstall.

Note: If reinstallation fails, please contact Plasmon Technical Support for assistance.



Chapter 2

Connecting the UDO drive

Overview

This chapter describes:

- Unpacking the UDO drive on page 7
- Connecting the UDO drive on page 8.

Unpacking the UDO drive

When you unpack the UDO drive, check that you have the following equipment:

- UDO drive
- UDO Driver Software Installation CD
- UDO Driver for Linux User Guide (this document)
- Power supply and cable
- SCSI (plus SCSI Active terminator) or USB cable.

Note: For SCSI connected UDO drives, you will require an Adaptec 29160, or equivalent, SCSI card (not included).

Connecting the UDO drive

The UDO drive can be connected to your PC in one of two ways:

- *via USB* - see below
- *via SCSI* - see page 9.

via USB

Once the UDO Driver for Linux software has been installed, the UDO drive can be attached, via an available USB port, at any time.

To connect the UDO drive:

- 1 Connect the USB cable to the USB port on the rear of the UDO drive.



- 2 Connect the UDO drive to a power supply and switch the UDO drive on.
- 3 Connect the USB cable to an available USB port on your PC.

The UDO drive is now ready for use.

via SCSI

Once the UDO Driver for Linux software has been installed, the UDO drive can be attached, via your PC's SCSI card, at any time.

To connect the UDO drive:

- 1 Connect the SCSI cable to either of the SCSI connectors on the rear of the UDO drive.
- 2 Connect the SCSI active terminator to the other SCSI connector on the rear of the UDO drive.
- 3 Connect the SCSI cable to the SCSI connector on your PC's SCSI card.

Note: One SCSI card is required per UDO drive and the UDO drive must be the only device attached to that SCSI card.

- 4 Connect the UDO drive to a power supply and switch the UDO drive on.

The UDO drive is now ready for use.



Chapter 3

Operation

UDO media

The UDO drive exclusively uses UDO media, which is currently available in two 30 Gigabyte and two 60 Gigabyte forms:

- **Rewritable (RW)** - Rewritable UDO media is typically used in archive applications where the stability and longevity of optical media are important, but records change frequently and there is a need to delete and rewrite information. UDO Rewritable media is ideal for small office and departmental applications or in larger unstructured archives that are not subject to specific regulatory or corporate standards
- **Write Once (WORM)** - True Write Once media offers the highest level of physical record authenticity and is ideal for document classes with very long or indefinite record retention periods. Common uses of True Write Once media include medical, financial, industrial and cultural applications that require documents be retained for years or decades and must be held to a very high standard of legal admissibility.



Media and Drive cleaning

Media cleaning

Over a period of time dust may accumulate of the surface of the media, leading to possible read and write failures. The media should be periodically cleaned.

A media cleaning kit is available from Plasmon.

After cleaning, Plasmon recommends performing a low-level format.

UDO Drive Cleaning Cartridge

A special Plasmon UDO30GB Drive Cleaning Cartridge is shipped with all UDO1 products. This cartridge should be used only as recommended by a Plasmon support technician.

It provides a dry, contact cleaning method.

Caution: No liquid or cleaning solution of any kind should be used with this cartridge.

Caution: The Plasmon UDO30GB Drive Cleaning Cartridge must not be used on UDO2 drives.

After each use, a check box must be marked on the appropriate side of the cartridge. When all check boxes are marked, the cartridge must be retired.

Filesystem descriptions

The UDO drive can operate using one of two different filesystems. Each piece of media can have either filesystem assigned to it when the media is formatted.

UDF 2.01

UDF is a domain of ISO-13346 and is described in the UDF standard document, which can be downloaded from <http://www.osta.org>. UDF has been developed specifically to allow data to be exchanged between applications. UDF can be used to write to RW and WORM media. Use UDF if you need to create disks that can be read in other desktop UDO drives.

Note: For optimum performance on RW media, Plasmon recommend UDF format.

Note: File access date / time stamps are not updated on UDF.

Archive File System

Archive File System (AFS) is a WORM-style filesystem developed by Plasmon. It has been optimized for handling write operations. Use this format if data interchange is not an issue. AFS has a number of unique features, including:

- **Performance** – the filesystem is designed simply to append data to the disk during the write process, and requires very few seek operations
- **Resilience** – the filesystem has a number of schemes to cope with drive/media failures both during write operations and in case of subsequent media damage or degradation
- **Powerfail Recovery** – the filesystem has automatic powerfail recovery, so disks cannot be corrupted by power loss during writing. For archive filesystems, the repair function is embedded within the filesystem so that repair operations are performed automatically during the filesystem mount process.

AFS provides equivalent behaviour on both WORM and RW media. So on RW media, file modifications and deletions do not reclaim space, but instead provide a full audit trail.

Note: For optimum performance on WORM media, Plasmon recommend AFS format.

SSMDF

Storage Space Manager Data Format (SSMDF) is a filesystem developed by Plasmon.

SSMDF is the filesystem used by the Plasmon UDO Archive Appliance and can be used to access UDO Archive Appliance media on a standalone drive attached to a Linux PC.

Because SSMDF-formatted media come from an Archive Appliance, it is possible that some data spans more than one media side, whether on the same media or another.

Some files and folders may be displayed in without time or date information. While the data itself is intact, the metadata information is stored on another media side, and thus unavailable.

SSMDF is a read-only filesystem.

Files split across media sides have the available byte range appended to the file name, e.g. "Hello.txt.[0-65536]". If both halves of a file are available they can be combined to form the original file using the command line COPY command as follows:

```
cat source1 source2 > target
```

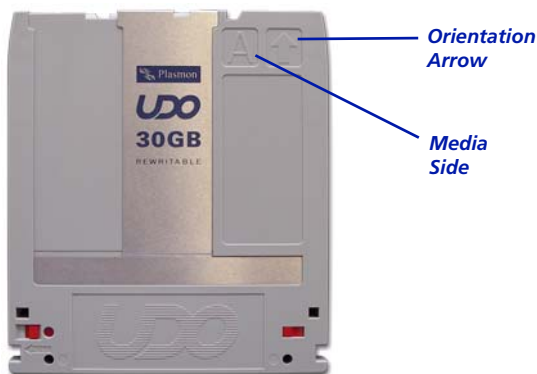
Files which are wholly metadata have [METADATA-ONLY] appended to the file name. Files which have been deleted have [DELETED] appended to the file name.

Inserting media

To insert a piece of UDO media:

UDO1 (30GB) drives

- 1 Hold the media at the rear of the cartridge and insert in the direction of the arrow (shown below):



UDO2 (60GB) drives

UDO2 drives are equipped with a drive door to prevent the ingress of dust, which must be opened prior to inserting media.

- 1 Press the Eject button.



- 2 Hold the media at the rear of the cartridge and insert in the direction of the arrow.

Basic usage

The package contains the following command line utilities to manage the UDO drive with UDF or AFS filesystem:

- **udomkfs -t udf** - Creates an UDF filesystem on UDO media
- **udomkfs -t afs** - Creates an AFS filesystem on UDO media
- **udolabel** - Changes or displays the label of an UDF/AFS formatted UDO medium
- **udomount** - Mounts the UDO drive with an UDF or AFS filesystems
- **udorepair** - Repair a corrupt Rewriteable UDF disk side
- **udochekc** - Reports the number of bad sectors and percentage of used spare sectors on the media
- **udocmd -s** - Flushes all internal caches onto the media
- **udofirmware** - Upgrades a UDO Drive with new firmware

In addition there are two more supporting binaries:

- **udofuse** - This is the background process (daemon) that controls the UDO drive and provides support for the filesystems in user space using FUSE (Filesystem in USErspace)
- **mount.udo** - mount.udo provides the ability to use the system mount command with the `-t udo` option instead of the `udomount` command. It also provides support for `/etc/fstab` configured mount points with the `udo` type.

The device name which all of these commands require can be one of the following:

- SCSI generic: `/dev/sg[0-99]`
- SCSI disk: `/dev/sd[a-z]`
- SCSI address: `Host:Bus:Target:Lun`

Examples

The following examples assume that a UDO device is connected to `/dev/sdX` and that there is an empty directory at `/mnt/udo` available for mounting.

Format a disk side with the UDF file system:

```
# udomkfs -t udf /dev/sdX
```

Mount with default options:

```
# udomount /dev/sdX /mnt/udo
```

Unmount:

```
# umount /mnt/udo
```

See command reference on page 20 or man pages for details for each of these commands.

Drive and media interoperability

Formatting

30 GB (UDO1) media cannot be formatted on a UDO2 drive. Similarly, 60 GB (UDO2) media cannot be formatted on a UDO1 drive.

30GB (UDO1) and 60GB (UDO2) drive and media interoperability

	UDO1 Drive	UDO2 Drive
30 GB Media (UDO1)	✓	read-only
60 GB Media (UDO2)	✗	✓

Limitations

The following are not supported by UDO or udofs:

- Non-root mounting (only the root user can run the `udomount` command).
- Various mount options: `dev`, `denyuser`, `dirsync`, `noatime`, `nodiratime`, `noexec`, `nosuid`, `remount`, `sync`, `user`, `users`.
- Reformatting of Write Once Media.
- Device nodes within mounted UDO volumes.
- Hard links within mounted UDO volumes.

Known issues:

- For a list of known issues, see the product's Release Notes.

udocmd

Command

udocmd is used to send required command to the udfuse (daemon) process running in the background and handling all the user operations on the filesystem.

Format

```
udocmd [-suhV?] mountpoint
```

Options

- `-h, -?`
Display help and exit
- `-V`
Display version and exit
- `-s`
Sync. Flush all the cache to the disk. Even if `-cache` option was used during mounting, this command will lead to flushing of all caches to the disk
- `-u`
Unmount. Unmount the filesystem
- `mountpoint`
The directory at which the filesystem is attached/mounted.

Exit Status

The following exit values will be returned:

- 0
Successful completion
- -1
Failed due to socket or memory issue
- 13 `EACCES`
Permission denied
- 22 `EINVAL`
Invalid argument.

Examples

Note: *The following examples assume that an UDO drive is mounted to /mnt/udo directory.*

```
# udocmd -s /mnt/udo
```

```
# udocmd -u /mnt/udo
```


udocheck

Command

A UDO media check utility which reports the number of bad sectors or the percentage of spare sectors already used, from the media.

Every piece of UDO media has a fixed number of spare sectors which are used to relocate the bad sectors. If all the spare sectors are used then drive will not be able to relocate the data when it encounters a bad sector and write operation will fail.

The performance of writing and reading data from the media decreases when large numbers of sectors are relocated. To ensure that the write operation always succeed without affecting the rate at which data is read or written on the UDO media, user should clean the UDO media and low level format it when the percentage of spare sectors used goes above 50% for a UDO RW media.

UDO1 (30 GB) RW media contains 36643 numbers of spare sectors.

Format

```
udocheck [-h?Vvnp] device
```

Options

- `-h, -?`
Display help and exit.
- `-V`
Display version and exit.
- `-v`
Be more verbose (use multiple to increase verbosity)
- `-n`
Display number of bad sectors on UDO1 media.
- `-p`
Display percentage of used spare sectors on UDO1 media.
- `device`
The device file name (`/dev/sg[0-99]`).

Exit Status

The following exit values will be returned:

- 0
Successful completion
- 1 `EPERM`
Operation not permitted
- 6 `ENXIO`
No such device or address
- 12 `ENOMEM`
Out of memory
- 13 `EACCES`
Permission denied
- 16 `EBUSY`
Device or resource busy
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument
- 124 `EMEDIUMTYPE`
Wrong media type.

Examples

Note: The following examples assume that an UDO device is connected to `/dev/sg0`

To check number of bad sectors on UDO1 media:

```
# udocheck -n /dev/sg0  
Number of bad sectors: 29314
```

To check percentage of used spare sectors on UDO1 media:

```
# udocheck -p /dev/sg0  
Percentage of used spare sectors:80%
```

udofirmware

Command

udofirmware is a tool to update/upgrade the firmware of the Plasmon UDO device. UDO device needs to be unmounted before running this command.

Options

- `-h, -?`
Display help and exit.
- `-V`
Display version and exit.
- `-d device`
SCSI device. Need to specify as "host:bus:target:lun" or "bus:target:lun" or device name (eg. /dev/sg0).
- `-n`
Don't change anything - just do a version check and display current status; will also check file type if `-f` is specified simultaneously.
- `-F`
Force the firmware upload, even if it's for the wrong device type.
- `-f filename`
Installs the firmware image specified by the file, filename, on Plasmon UDO device.

Note: After installing firmware on Plasmon UDO device, if UDO device is connected via USB cable, pull the USB cable from the system and put it back. This will make the operating system detect the Plasmon UDO device again.

Run the given below command and verify the version of firmware installed.

```
# udoFirmware -nd /dev/sg0
```

Exit Status

The following exit values will be returned:

- 0
Successful completion
- -1
Failed due to socket or memory issue.
- 2 `ENOENT`
No such file or directory
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument

Examples

Note: *The following examples assume that an UDO device is connected to SCSI /dev/sg0*

To upload "U05" version of firmware on to device, use following command.

```
# udofirmware -d /dev/sg0 -f ./U05.001
```

To check the current version of the firmware, use following command.

```
# udofirmware -nd /dev/sg0
```

udomkfs

Command

udomkfs is used to build a UDF or AFS filesystem on a piece of UDO media. Device is one of the SCSI disk devices (e.g. `/dev/sdX`). Label is an optional string for labelling the medium, if it is not provided the medium is labelled with an empty string.

Format

```
udomkfs [-h?Vvx] -t TYPE [-F] device [label]
```

Options

- `-h, -?`
Display help and exit
- `-V`
Display version and exit
- `-v`
Be more verbose (use multiple times to increase verbosity)
- `-t TYPE`
Select filesystem type. `TYPE` can either be `udf` or `afs`
This argument is mandatory
- `-x`
Extended options (used to pass internal and unsupported options)
- `-F`
Perform a low level device format
- `device`
The device file name (`/dev/sd[a-z]`)
- `label`
Optional medium label.

Exit Status

The following exit values will be returned:

- 0
Successful completion
- 1 `EPERM`
Operation not permitted
- 6 `ENXIO`
No such device or address
- 12 `ENOMEM`
Out of memory
- 13 `EACCES`
Permission denied
- 16 `EBUSY`
Device or resource busy
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument
- 30 `EROFS`
Read-only Filesystem
- 105 `ENOBUFS`
No buffer space available.

Examples

Note: *The following examples assume that an UDO device is connected to `/dev/sg0`*

- Quick format:

```
# udomkfs -t udf /dev/sg0
```
- Quick format with custom label:

```
# udomkfs -t afs /dev/sg0 Medium_20031112
```
- Low level format, then UDF format:

```
# udomkfs -F -t udf /dev/sg0
```

udolabel

Command

Changes or displays the label of a piece of UDF or AFS formatted UDO media.

Format

```
udolabel [-h?Vvx] device [label]
```

Options

- `-h, -?`
Display help and exit
- `-V`
Display version and exit
- `-v`
Be more verbose (use multiple times to increase verbosity)
- `-x`
Extended options (used to pass internal and unsupported options)
- `device`
The device file name (`/dev/sd[a-z]`)
- `label`
The new medium label.

Exit Status

The following exit values will be returned:

- 0
Successful completion
- 1 `EPERM`
Operation not permitted
- 6 `ENXIO`
No such device or address
- 12 `ENOMEM`
Out of memory

- 13 `EACCES`
Permission denied
- 16 `EBUSY`
Device or resource busy
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument.

Examples

Note: The following examples assume that an UDO device is connected to `/dev/sg0`

To label a medium:

```
# udolabel /dev/sg0 Medium_20031112
```

To display the current label of a medium:

```
# udolabel /dev/sg0
```

udomount

Command

Mounts the UDO drive with either UDF or AFS filesystems.

Note: *To unmount an udoludf filesystem use the system `umount` command.*

udofuse is the background process (daemon) that controls the UDO drive and provides support for the UDF and AFS filesystems in user space using FUSE (Filesystem in USErspace).

mount.udo provides the ability to use the system mount command with the `-t udo` option instead of the `udomount` command. It also provides support for `/etc/fstab` configured mount points with the "udo" type.

Format

```
udomount [-h?Vvx] [-o options] device mountpoint
```

Options

- `-h, -?`
Display help and exit
- `-V`
Display version and exit
- `-v`
Be more verbose (use multiple times to increase verbosity)
- `-x`
Extended options (used to pass internal and unsupported options)
- `-o`
Pass additional options to the filesystem:
 - `ro`
Mount media in read-only mode. If a medium is write-protected this option must be used.
 - `allowuser`
Allow access to normal users.
This is the default

- `denyuser`
Deny access to the filesystem for normal users.
- `nonempty`
Forces mounting to a non-empty directory mount point.
- `drivecache=enable|disable|readonly`
Controls the cache of the UDO drive.
The default is `enable`
- `device`
The device file name (`/dev/sd[a-z]`)
- `mountpoint`
The directory at which the filesystem will be attached.

Files

- `/etc/udofs.conf`

Configuration file where any of the above command line options except device and mountpoint can be specified.

Note: Configuration file where any of the above command line options except device and mountpoint can be specified.

Note: Lines starting with a # are ignored.

Note: Options specified in the command line will take precedence over the configuration file, so this is the appropriate place where defaults can be specified.

Exit Status

The following exit values will be returned:

- 0
Successful completion
- 1 `EPERM`
Operation not permitted
- 6 `ENXIO`
No such device or address
- 12 `ENOMEM`
Out of memory
- 13 `EACCES`
Permission denied
- 16 `EBUSY`
Device or resource busy
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument
- 30 `EROFS`
Read-only Filesystem
- 105 `ENOBUFS`
No buffer space available
- 125
Corrupt file system, run `udorepair` to repair the filesystem.

Examples

Note: *The following examples assume that an UDO device is connected to `/dev/sg0` and that there is a directory `/mnt/udo` available for mounting.*

- Mount with default options:

```
# udomount /dev/sg0 /mnt/udo
```
- Mount with the system mount command:

```
# mount -t udo /dev/sg0 /mnt/udo
```
- Unmount with the system umount command:

```
# umount /mnt/udo
```
- Entry in `/etc/fstab`:

```
/dev/sg0 /mnt/udo udo defaults 0 0
```
- Entry in `/etc/fstab`, with disabled automatic mount on boot:

```
/dev/sg0 /mnt/udo udo noauto 0 0
```

udorepair

Command

This utility will repair broken UDF file system and recover files & directories that exist on an UDF formatted UDO (RW) medium but are not visible. The corruption of the directory structure makes the files and directories in that directory invisible. This utility will scan through the UDO medium and recover lost and deleted files into "Lost+Found" directory. The file system should be unmounted to run the command.

File attributes, like creation time & ownership, are part of the file structure and are recovered, but the file names are part of the parent directory structure and are not recoverable due to the corruption of the directory structure. The recovered files and directories will have new names:

- Files will be renamed to:

```
file<unique index>
```

e.g. file00001

- Directories will be renamed to:

```
dir<unique index>
```

e.g. dir00001

For each corrupted file or directory, which can not be recovered, corresponding file or directory will be created in the "Lost+Found" directory with "_corrupted" appended to their name. This is to make user aware of the files & directories which are corrupt and are lost.

This tool can also be used to recover a deleted/removed files & directories. As long as the UDO medium is not formatted, the deleted files & directories are recoverable.

Format

```
udorepair [-h?Vv] device
```

Options

- `-h, -?`
Display help and exit.
- `-V`
Display version and exit.
- `-v`
Be more verbose (use multiple to increase verbosity)
- `device`
The device file name (`/dev/sd[a-z]`)

Exit Status

The following exit values will be returned:

- 0
Successful completion
- 1 `EPERM`
Operation not permitted
- 12 `ENOMEM`
Out of memory
- 13 `EACCESS`
Permission denied
- 16 `EBUSY`
Device or resource busy
- 19 `ENODEV`
No such device
- 22 `EINVAL`
Invalid argument
- 22 `EROFS`
Read only file system.

Examples

Note: The following examples assume that an UDO device is connected to /dev/sg0

To repair/recover the file system:

```
# udorepair /dev/sg0
```


Installing FUSE

Some distributions support FUSE out of the box or as part of the updates for the distribution. In this case the distribution's version of FUSE should be used. For distributions that do not include FUSE, it must be downloaded and installed separately prior to installing the UDO Driver.

The below procedures are included for customers with local policies which prevent altering the repository list or use of automatic RPM updates.

Fedora Core 6 (and higher)

FUSE kernel support is included with the default kernel.

Red Hat Enterprise Linux Release 5

Although it is possible to obtain and install FUSE via the Red Hat Package Manager, it is recommended that installation be performed via the **Add / Remove Programs** tool or the command line to ensure a smooth process.

If a version of FUSE prior to 2.6.5 is installed, or if a previous FUSE installation has failed, it may be necessary to remove the old version first.

Installing FUSE using Add / Remove Programs

The **Add / Remove Programs** tool requires superuser privileges. Search for `fuse` from the available list, and follow the on-screen instructions.

If there are any dependencies for installing FUSE, **Add / Remove Programs** will notify the user. Accept installation of any dependencies.

Note: Reboot the server after installing FUSE.

Installing FUSE via ATrpms

Visit <http://atrpms.net/dist/el5/fuse/> and obtain the `fuse-kmdl` RPM which matches the kernel release and machine that the UDO Driver is to be installed on. If in doubt, use `uname -rm` to obtain this information. Obtain the corresponding `fuse` and `fuse-libs` RPMs from the same location.

For example:

```
# uname -rm
2.6.18-92.1.6.EL i686
#
```

requires the following RPMs:

```
fuse-2.7.4-8_10.el5.i386.rpm
fuse-libs-2.7.4-8_10.el5.i386.rpm
fuse-kmdl-2.6.18-92.1.6.el5xen-2.7.4-
8_10.el5.i686.rpm
```

Before installing all three RPMs, import the ATrpms signing key using the following command:

```
# rpm --import http://atrpms.net/RPM-GPG-
KEY.atrpms
```

Warning: *Should either the kernel or FUSE versions be changed at a later date (e.g. due to upgrade) this process must be repeated.*

Note: *Reboot the server after installing FUSE.*

Removing FUSE

Warning: Only remove FUSE if no other packages are using it, or if an upgrade has failed.

Remove any existing UDOFS and FUSE RPMs using the Red Hat Package Manager. If there are problems, use:

```
rpm -e --noscripts
```

Unload any running FUSE module:

```
lsmod | fgrep fuse - check if FUSE is loaded.
```

```
modprobe -r fuse - unload FUSE.
```

```
lsmod | fgrep fuse - confirm that FUSE no longer running.
```

Check for any remaining FUSE kernel modules and remove them:

```
find /lib/modules -name 'fuse.ko' - locate FUSE modules.
```

Ensure that no other software is using the FUSE modules:

```
rpm -q -f <path/filename>
```

Remove using `rm`.

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