Jaz−Drive−HOWTO

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Jaz−drive HOWTO

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This HOWTO covers the configuration and use of the 1Gb and 2Gb Iomega Jaz drives under Linux.

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1.Introduction

The Iomega Jaz drive is a removable−media disk drive whose disks have a capacity of 1 or 2 Gigabytes. Unlike the Zip drive, the Jaz is only available as a SCSI device (internal or external), so a SCSI interface card and driver are required to use these drives.

1.1 History

Much of this HOWTO evolved from what was created by the previous author, Bob Willmot, (who can now be reached at bob@willmot.com), who maintained the HOWTO through version 1.6, with contributions and information from the following people:

- Grant Gunther, grant@torque.net
- Tom Poindexter, tpoindex@nyx.net
- Todd Woods, woods@cs.uiowa.edu
- Richard B. Melrose, rbm@math.mit.edu
- Phil Howard, phil@charon.milepost.com
- Rick Niess, rniess@ocean.st.usm.edu

1.2 Latest Version

The latest version of this document can be found on my homepage http://www.ultranet.com/~hsd/HOWTO/ where you will find the HTML version, suitable for browsing, a PostScript version, suitable for printing, and the SGML source. Other versions may be found in different formats at the LDP homepage http://www.linuxdoc.org/.

Version History

v1.8, 12 January 2000

- Fixed an incorrect HTTP link
- Added clarification to jaztool code for 2Gb drives

v1.7, 18 November 1999

- Converted to SGML
- Added info for 2Gb drives
- Added fstab entry examples
- General freshening up

If you have any comments/suggestions/corrections please send them to: Herb DaSilva at Home or (if you *must* have fast response) at Work.

1.3 Copyrights and Trademarks

1.4 Acknowledgements and Thanks

Thanks to Stephan Burlot, stephan.burlot@edicom.ch, for pointing out the error (or lack of clarity) in the 2Gb patch to jaztool that was fixed in version 1.8.

My thanks go out to Mark F. Komarinski for his "HOWTO−HOWTO" − This LDP author was helped Mark, you did your job. ;−)

2.Jaz Hardware

2.1 The Jaz Drives

Jaz drives are SCSI devices and are available as an external drive with a 50−pin SCSI−2 self−terminating interface or an internal 3−1/2 format drive with a 50−pin header interface.

Both the internal and external devices are available in either 1 or 2 Gigabyte capacity, so there are four different Jaz drives available.

2.2 The Jaz "Disks"

Jaz disks are a cartridge−style removable media containing a stack of three 3.5" platters. From here out, I'll be using the terms "cartridge" and "disk" interchangeably to mean the Jaz media.

The 1Gb and 2Gb cartridges appear similar, but there is actually a subtle difference in their shape which prevents a 2Gb cartridge from being fully inserted into a 1Gb drive. Obviously, this means that you can't use a 2Gb cartridge in a 1Gb drive.

The 2−Gb capacity Jaz drives can read, write, and format both 2−Gb and 1−Gb Jaz cartridges.

2.3 The Jaz Jet Host Adapter

Iomega markets a SCSI host adapter under the name Jaz Jet. However, there are at least two different SCSI chipsets that are used. For this reason, the Jaz Jet isn't necessarily the best SCSI adapter to buy if you need one for your Jaz drive. You're better off getting a card that you *know* your Linux distribution will support (see the next section).

One of the Jaz Jet cards is based on the Adaptec 7800 family of adapters. Linux 2.0 supports this adapter with the aic7xxx driver. This driver is built into most of the standard 2.x SCSI−capable kernels supplied with most Linux distributions.

The other adapter is based on the Advanced Systems chipset. At boot time the board gives a message like:

```
Jaz Jet PCI SCSI adapter Copyright Advanced Systems 1996
```

Depending on your Linux distribution, you may need to build a custom kernel (with the CONFIG_SCSI_ADVANSYS variable set) to use this adapter.

Personally, I don't like surprises, so if I were going to buy an adapter card, I would get a name−brand card with a 50−pin connector, so that I knew that what I was getting was supported.

2.4 Other SCSI Host Adapters

If you're using an Ultra−Wide SCSI card with a 68−pin connector, you'll need to get an adapter or another cable. The adapters do indeed work just fine with the Jaz drive, but can be rather pricey, so if you're buying a SCSI card primarily for the purpose of connecting the Jaz drive, you're better off picking up a card with a 50pin connector on it.

If you're looking for a suggestion, I like the Adaptec AHA−2930U − it's cheap, it's fast, and the Jaz drive just plugs right in using the supplied cable with no adapter hassles. Unfortunately, support for this card is fairly new, so unless you have a fairly new Linux distribution (2.2.x kernel), it probably isn't supported. There are patches to the aic7xxx driver for 2.0.36 kernels that support this card, however. The AHA−2940U is an excellent choice as well, and it has been supported for a lot longer, it's just more expensive.

2.5 Kernel Driver Issues

As always, be sure that your Linux distribution supports a particular card EXPLICITLY before making a purchase. Many manufacturers, like Adaptec, have cards with numbers and letters *similar* to each other that are actually *completely different chipsets*, and therefore use *completely different drivers*.

Configuring the Linux kernel for a SCSI card is the subject of a complete document in itself, so I won't go into that here.

Info on rebuilding the kernel should be found in /usr/src/linux/README, or in /usr/src/linux/Documentation/ directory for the 2.x kernels. If these files don't exist, make sure that you have installed the kernel package source for your distribution.

You can also check out

3.Identifying the Jaz Drive

3.1 During Power−On Test

With a SCSI controller installed, when the machine is powered up or reset the SCSI controller will scan the SCSI bus looking for attached devices before booting the operating system.

If your SCSI card is correctly installed, and your Jaz drive is attached and powered on, you should see the drive listed as something like "Iomega Jaz 1GB" or "Iomega Jaz 2GB" during this time.

If the drive doesn't show up, there's no sense booting Linux. Power down the PC and Jaz drive, and check everything again. In particular, unplug the cables and make sure none of the the pins are bent, then replug them and ensure they are completely seated against the connector. If you have multiple SCSI devices, make sure they all have different ID numbers, and that the last device in the SCSI chain is terminated.

When the drive shows up in the power−on test, you're half way home.

3.2 During Boot

When Linux boots the SCSI driver should display information about your SCSI adapter and what devices are attached to the SCSI bus.

Boot messages will vary depending on your driver and adapter, and are logged to the /var/log/messages (or

/var/adm/messages) file as well as appearing on the screen during boot. You can also 'replay' the messages since your last boot from the command prompt with the `dmesg` command.

Here's the kernel booting output from a 2.0.36 kernel with an Adaptec 2940 controller (using the aic7xxx driver):

```
(scsi0) <Adaptec AHA-2940A Ultra SCSI host adapter> found at PCI 14/0
(scsi0) Narrow Channel, SCSI ID=7, 3/255 SCBs
(scsi0) Warning - detected auto-termination
(scsi0) Please verify driver detected settings are correct.
(scsi0) If not, then please properly set the device termination
(scsi0) in the Adaptec SCSI BIOS by hitting CTRL-A when prompted
(scsi0) during machine bootup.
(scsi0) Cables present (Int-50 NO, Ext-50 YES)
(scsi0) Downloading sequencer code... 419 instructions downloaded
scsi0 : Adaptec AHA274x/284x/294x (EISA/VLB/PCI-Fast SCSI) 5.1.2/3.2.4
       <Adaptec AHA-2940A Ultra SCSI host adapter>
scsi : 1 host.
  Vendor: iomega    Model: jaz 2GB           Rev: E.17
  Type:   Direct-Access                      ANSI SCSI revision: 02
Detected scsi removable disk sda at scsi0, channel 0, id 4, lun 0
scsi : detected 1 SCSI disks total.
(scsi0:0:4:0) Synchronous at 10.0 Mbyte/sec, offset 15.
sda : READ CAPACITY failed.
sda : status = 1, message = 00, host = 0, driver = 28
sda : extended sense code = 2
sda : block size assumed to be 512 bytes, disk size 1GB.
```

If something resembling these lines doesn't appear, then your kernel is probably not configured correctly (or you picked the wrong pre−built kernel).

If the "scsi0 :" line does not appear, then you have not configured your driver correctly. Some drivers will give you a hint about what is wrong. If a drive name is not assigned, you probably forgot to include SCSI disk support when you built the kernel.

Note the `READ CAPACITY failed`. Most SCSI drivers (like this one) will detect that the drive is a removable media type, and not get all flustered when it can't read the partition table. However, some SCSI cards aren't as graceful. If your PC hangs during boot, try booting with a cartridge in the drive.

Check the README files in /usr/src/linux/drivers/scsi and the Kernel HOWTO for other debugging hints.

3.3 Device Name

In the log output in the previous section note the raw SCSI device name, which in this case is "sda", the full name being /dev/sda. If the Jaz drive is the only SCSI disk on your system, it will typically be /dev/sda. If your primary hard drive is SCSI, or you have a SCSI CD−ROM drive, it could be sdb, sdc, etc.

Whatever the drive name is, you will need this name to access the drive, as explained in later sections.

4.Using a Jaz Disk

4.1 DOS Formatted Disks

Jaz disks come pre−formatted from Iomega with a single partition using the DOS FAT16 file system. The single partition is usually the 4th disk partition (for Mac compatibility − the Mac requires data to be on the 4th partition, but the PC doesn't care which partition data is on).

Linux is perfectly happy reading and writing a FAT16 file system, so you can use the disk as is. In order to use the disk, you need to mount it, so the first thing you need to do is create a mount point. For this document, we'll mount all our DOS Jaz drives under `/dos_jaz`, so let's create that mount point (you'll need to be root for most of this stuff). You'll only need to do this once:

```
mkdir /dos_jaz
```

In a previous section, I mentioned you'd need to remember the Jaz drive's raw SCSI device name. You need that now. If your drive is `/dev/sda` then all these examples will work for you. If not, you'll need to replace "sda" with the device ID of your Jaz drive. Since you need to issue these commands as root, you'll want to be sure you have the correct names.

If you have a 2.0 kernel, or have added VFAT support, you can mount the Jaz disk this way, and have long filenames under FAT16:

```
mount −t vfat /dev/sda4 /dos_jaz
```

Note that although VFAT allows you to use long filenames, those filenames are still case *in*−sensitive, and although 'ls' lists permissions, you can't actually change permissions on any of the files.

If the "vfat" format is not recognized by the mount command, then you'll use this command to mount the Jaz disk:

```
mount −t msdos /dev/sda4 /dos_jaz
```

Once you have issued either of the mount commands, files from the disk will appear under the `/dos_jaz` directory. While the disk is mounted, you will not be able to eject it.

When you are done with the disk, you can unmount it with the command:

```
umount /dos_jaz
```

Once unmounted, you can press the button on the front of the drive to eject the cartridge.

4.2 Repartitioned DOS Jaz Disks

Since a Jaz disk is simply a disk, it can be repartitioned and reformatted like a fixed disk. If this is done, you need to know which partition numbers were used during repartitioning to be able to mount the disk.

For instance, if the partition table was wiped, and a single new partition was created as the first partition, the two mount commands from the previous section would be:

```
mount −t vfat /dev/sda1 /dos_jaz
```

and

```
mount −t msdos /dev/sda1 /dos_jaz
```

4.3 Linux−Native Jaz Disks

Linux−Native Jaz disks allow files to be stored with standard Unix permissions and case−sensitive filenames. The only drawback to Linux−Native disks is that they can no longer be used on DOS/Windows machines.

A Jaz disk looks the same as a hard drive to Linux, so for those of you familiar with the Linux disk management tools, none of the following will be a surprise.

If you want to erase a Jaz disk and make a Linux native file system on it, you use fdisk on the entire disk. Please be very careful using fdisk, especially if you have a SCSI hard drive − we wouldn't want to have any "accidents". :−) In particular, make sure you are operating on the correct device before making changes. In most cases, you'll use:

```
fdisk /dev/sda
```

and delete the existing partitions (with the d command). Then create a new partition with the n command, make it primary partition number 1 (using all the cylinders), use w to write the partition table to disk, and quit with q.

Once the partition has been created, format it with:

```
mke2fs /dev/sda1
```

(The 1 is the number that you gave this partition in fdisk). I prefer to create a separate mount point for Linux native Jaz disks, and you'll see why a little later when we talk about the `fstab`. So let's create that mount point now, and then mount the disk:

```
mkdir /jaz
```

```
mount −t ext2 /dev/sda1 /jaz
```

As usual, when the Jaz disk is mounted, it cannot be ejected. When you're done using the Jaz disk, you unmount it with:

```
umount /jaz
```

Once unmounted, you can press the button on the front of the drive to eject the cartridge.

4.4 Checking Linux−Native Jaz Disks

Like your other disk drives, once a Linux Jaz disk has been mounted and unmounted a certain number of times, the system will mark the disk as "dirty". When this happens, you'll get a message like:

```
Mounting unchecked filesystem, /dev/sda1. Recommend running e2fsck.
```

Once you see this message, it's a good idea to go ahead and check the disk. The disk must be *unmounted* in order to check it. Unfortunately, you only get the "dirty" message when you mount it, so you can either check the disk when you're done using it, or unmount it, check it, then re−mount it. Use the following command to check the disk (assuming the partition to be checked is the first one):

```
e2fsck /dev/sda1
```

4.5 Using the fstab to Make Things Easier

Up to now, we've had to be root to mount and unmount the Jaz disks, and we've had to type quite a bit to mount the Jaz disks. By adding a couple of entries to the file `/etc/fstab`, we can make using the Jaz drive *much* easier.

DOS Format Disks

If you've got preformatted DOS disks, and you've created the `/dos_jaz` mount point, you can add this line to the file `/etc/fstab`:

```
/dev/sda4 /dos_jaz vfat defaults,user,nosuid,noauto 0 0
```

With this line in the fstab, *any user* can mount and unmount a DOS−format Jaz cartridge with the following commands:

```
mount /dos_jaz
```

```
umount /dos_jaz
```

This is because we have told Linux what the Jaz device ID and media type are in the `fstab`, plus we have given the `user` option to allow any user to mount and unmount the disk. Naturally, if your Jaz drive is other than `sda`, you'll need to change that, and this won't work for DOS cartridges that have been repartitioned without another entry in the fstab that uses a *separate* mount point (e.g. /dos_jaz2).

Linux Format Disks

If you've got Linux formatted disks, and you've created the `/jaz` mount point, you can add this line to the `fstab`:

```
/dev/sda1 /jaz ext2 defaults,user,exec,nosuid,noauto 0 0
```

With this line in the fstab, *any user* can mount and unmount a Linux−format Jaz cartridge with the following commands:

```
mount /jaz
```

```
umount /jaz
```

Once again, we have told Linux what the Jaz device ID and media type are in the `fstab`, plus we have given the `user` option to allow any user to mount and unmount the disk. Some system administrators may not wish to have the `exec` option present, as there are some security risks with letting any user run an executable of unknown origin from the drive, but with the `nosuid` option present, these risks are minimal.

Automatic Mount at Boot Time

Both of the `fstab` examples above have the option `noauto` in them to prevent the disk from being automatically mounted at boot time. In general, this is a good idea because if there is no disk in the drive when the computer boots, or the drive is powered off, it can cause varying amounts of trouble, depending on which SCSI driver you are using.

If you're *sure* you want to mount the jaz drive at boot time, simply remove the `noauto` option, and make sure the drive is on, and a cartridge is inserted before booting. Note that you can only have one fstab entry for jaz drive that will auto−mount, or you may encounter the same problems as if there was no cartridge in the drive.

4.6 The Jaz "tools" Disk

With some Jaz drives, the software to run the drive is supplied on a Jaz cartridge instead of on CD−ROM. The "problem" with these disks is that software−controlled write protection is enabled on the disk, so that the user can't wipe the disk until after the tools are installed at least once.

There are several ways you can reclaim the Jaz tools disk:

- Install the tools on a DOS/Windows computer.
- Use a DOS/Windows computer with the Jaz tools already installed to remove the password protection.
- Use one of the Linux Utilities mentioned in a later section to remove the password protection.

If you have access to one of the password protection removal programs, all you need is the password that Iomega uses, and it is:

```
APlaceForYourStuff
```

Note that capitalization is important.

5.Linux Utilities for Jaz Drives

5.1 jaztool

jaztool is a Linux utility written by Bob Willmot to support some of the Jaz drive's features (including software controlled ejection and write protection). I like jaztool because its commands can be embedded in alias commands and scripts. It's also easy to compile and install.

The original source code for jaztool can be found at http://www.willmot.com/jaztool/ and is also mirrored at my site at http://www.ultranet.com/~hsd/HOWTO/index.shtml#jaztool

Note that to use jaztool with a 2Gb Jaz drive, you must change ONE line of code. Change line 188 from this:

```
return(!strncasecmp(id,"IOMEGA JAZ 1GB",15));
```

to this:

```
return(!strncasecmp(id,"IOMEGA JAZ",11));
```

NOTE: There are **two spaces** between IOMEGA and JAZ in the previous two lines of code. SGML (or maybe just HTML) apparently removes the extra whitespace.

After building jaztool and installing it, it must be suid root, or run as root, or it won't work.

I use jaztool regularly, so if you have a question about it, I would be happy to try and answer it.

Ejecting a Cartridge

Use the following command to eject a cartridge:

```
jaztool /dev/sda eject
```

This might seem like a lot to type, but it's easy to make a slick alias like this:

```
alias jazej 'umount /jaz; jaztool /dev/sda eject'
```

Password Protection

There are two password protection modes on a Jaz, and both are controlled through software. One is Write Protected and the other is Read/Write Protected. jaztool will allow you to unlock a Write Protected disk, but under Linux, a device that cannot be read cannot be mounted, so Read/Write Protected is not supported.

If the cartridge is Write Protected (such as a Jaz Tools disk), use the following command to unlock it (the disk must not be mounted):

```
jaztool /dev/sda rw
```

jaztool prompts for a password, and if the password is correct, the disk is unlocked and ejected. This must be done to cause the SCSI driver to pick up the new mode when the cartridge is re−inserted.

To make the disk Write Protected again, use the following command:

```
jaztool /dev/sda ro
```

jaztool again prompts for a password, and the disk is locked and ejected.

Note that jaztool doesn't support the "Unprotect until Eject" feature found in the Windows world. If you remove the password protection, it is removed until you put it back on.

5.2 jaZip

If you'd prefer a nice, slick, graphical user interface to control your Jaz (and Zip!) drive, there's the jaZip tool. Check it out at: http://www.scripps.edu/~jsmith/jazip/

I haven't used jaZip myself, so please contact the author directly with questions on jaZip. Contact information is on the website listed above.

6.Booting from a Jaz Cartridge

6.1 BIOS Issues

If the Jaz drive co−exists with other SCSI harddrives, most BIOSes will want to boot the disk that has the lowest SCSI Id. The Jaz drive can be set to SCSI Ids 0−6, and typically come out of the box set to SCSI Id 5. Some BIOSes detect and skip removable devices like the Jaz. If your BIOS will boot from a Jaz, you can set your main SCSI harddrive to SCSI Id 1, then you can change the Jaz from SCSI Id 5 to 0 when you want to boot from the Jaz.

More typically, the Jaz drive co−exists with an IDE harddrive. Nearly every BIOS will want to boot the first IDE harddrive. Some BIOSes will allow you change a setting in the BIOS setup to boot from a SCSI device first. Others may require you to disable the IDE drives in the BIOS setup. Still others may require detaching the IDE drives physically or disabling the IDE interface.

6.2 Installing Linux on a Jaz Cartridge

Although running Linux from a Jaz cartridge is *much* slower than running from a harddrive, the Jaz drive makes an excellent ERD (Emergency Repair Disk). It's also fun to be able to just pop in some new Linux system or to try Linux on someone else's Jaz−equipped machine.

By far the easiest way to install Linux on the Jaz cartridge is simply to follow the install procedure for your favorite distribution with the Jaz drive being the only drive on the system. I've done this with RedHat 5.2, and it works perfectly. If you're not completely comfortable with doing weird, wild stuff with LILO, it's the only way to go.

If you want to do an "install" from your running system, you can often succeed in "building" a bootable system on a Jaz cartridge.

- Partition the drive and make the filesystems. You probably need to have a swap partition, too, but if you have lots of RAM then maybe not. Mount the new root as /jaz and any additional partitions within that directory as appropriate.
- Copy all the files into place. Be sure all the `/dev` files are copied. Be sure all permissions, ownership and group ids are retained.
- Modify the files on the Jaz cartridge to suit the circumstances of booting from it. In particular be sure to change `/jaz/etc/fstab` to mount the Jaz cartridge partition(s) as appropriate. Also change `/jaz/etc/lilo.conf` to match as well.
- There are two alternatives for installing the LILO boot loader:
    - Make a kernel image floppy and use `rdev` to make it mount the Jaz cartridge as root. Boot from the floppy when ready the first time then run LILO to make the Jaz MBR bootable.
    - You can run LILO from your non−Jaz root running system to install the bootable MBR on the Jaz cartridge. For more information on this option, check out Alessandro Rubini's LILO mini−HOWTO
