

# GNU/Linux Installation & Troubleshooting Guide

SPACE

(<http://www.space-kerala.org>)

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## 1 Setting up BIOS

BIOS, in computing, stands for Basic Input/Output System. The BIOS runs off the onboard flash memory when the computer is powered on and it initializes the chipset and the memory subsystem. Subsequently, it uncompresses itself from flash memory into the system main memory and starts executing from there. PC BIOS code also contains diagnostics to assure critical hardware components, such as keyboard, disk drive, IØports etc., are operational, and properly initialized. Nearly all BIOS implementations can optionally execute a setup program interfacing the nonvolatile BIOS memory (CMOS). This memory holds user-customizable configuration data (time, date, hard drive details, etc.) accessed by BIOS code.

### 1.1 Boot Sequence setting

In computing, booting is a process that starts operating systems when the user turns on a computer system. Many BIOS set-up menus allow you to select the devices from which Operating System for computer can be selected. In order to install GNU/Linux set first device to look for operating system as CD-ROM (as CD-Rom is most commonly used media for GNU/Linux distribution, floppies are also used some times).

If you have a newer SCSI controller and you have a CD-ROM device attached to it, you are usually able to boot from the CD-ROM. All you have to do is enable booting from a CD-ROM in the SCSI-BIOS of your controller.

Other popular option is to boot from a USB storage (also called USB memory stick or USB key). Some BIOSes can boot USB storage directly, and some cannot. You may need to configure your BIOS to boot from a Removable drive or even a USB-ZIP to get it to boot from the USB device.

Here are some details about how to set the boot order. Remember to reset the boot order after GNU/Linux is installed, so that you restart your machine from the hard drive.

### 1.2 Changing the Boot Order in PCs

1. As your computer starts, press the keys to enter the BIOS utility. Often, it is the Delete key. However, consult the hardware documentation for the exact keystrokes.

2. Find the boot sequence in the setup utility. Its location depends on your BIOS, but you are looking for a field that lists drives. Common entries on IDE machines are C, A, cdrom or A, C, cdrom. C is the hard drive, and A is the floppy drive.
3. Change the boot sequence setting so that the CD-ROM or the floppy is first. Usually, the Page Up or Page Down keys cycle through the possible choices.
4. Save your changes. Instructions on the screen tell you how to save the changes on your computer.

### 1.3 Setting shared Video Memory

Display controller in computers will need memory for its own operations. In high end display controllers and older controllers special ram comes with controller. Recent days display controller comes with mother board of computer. In these kind of computers part of the main system memory is shared with display controller. BIOS will allow user to decide how much memory is to be given to display controller. This setting is very important for GNU/Linux distributions. Display resolution and colour depends on size of memory given to display controller. 16 MB minimum memory is recommended for most of machines we find these days. If shared memory is less than this GNU/Linux will run in lesser resolution like 640x480.

### 1.4 BIOS Anti Virus disabling

During the installation procedure GNU/Linux installer will modify boot sector of hardisk. BIOS antivirus softwares some time consider this as virus attack and disable modification of boot sector. This will make installed version of GNU/Linux inaccessible. Disabling BIOS anti virus applications will prevent this from happening.

## 2 SATA Controller and GNU/Linux installer

Serial ATA (also known as S-ATA or SATA) chipsets are rapidly replacing legacy "parallel ATA" (PATA, i.e., regular ATA/133) chipsets but many GNU/Linux installers don't yet support many Serial ATA chipsets. If yours isn't supported, you have an installation obstacle.

There are three workaround options:

1. Switch the motherboard BIOS back to "legacy ATA mode" (parallel ATA = PATA). Complete a Linux installation. Fetch or build a kernel with support for your chipset. Switch the BIOS setting back.
2. Rebuild your installer using kernel 2.4.27 or later, which includes libata, desirable since it adds many new chipsets and gives a (potential, subject to physical read limits, etc.) 10M/s speed boost to some others compared to the quite slow 2.4.x drivers/ide set.

- Temporarily add a regular PATA drive to your system. Install Linux onto that. Fetch or build a kernel with support for your chipset. Migrate your system to the SATA drives.

For more information visit the following URL:- <http://linuxmafia.com/faq/Hardware/sata.html>

## 3 Introduction to Partitioning

### 3.1 Device naming in GNU/Linux

GNU/Linux disks and partition names may be different from other operating systems. You need to know the names that Linux uses when you create and mount partitions. Here's the basic naming scheme:

fd0	First Floppy Drive
fd1	Second Floppy Drive
hda	IDE Hard disk / CD-ROM on the first IDE port (Master)
hdb	IDE Hard disk / CD-ROM on the first IDE port (Slave)
hdc	IDE Hard disk / CD-ROM on the second IDE port (Master)
hdd	IDE Hard disk / CD-ROM on the second IDE port (Slave)
hda1	First partition of the first IDE hard disk
hdd15	Fifteenth partition of the fourth IDE hard disk
sda	SCSI Hard disk with lowest SCSI ID (e.g. 0)
sdb	SCSI Hard disk with next higher SCSI ID (e.g. 1)
sdc	SCSI Hard disk with next higher SCSI ID (e.g. 2)
sda1	First partition of the first SCSI hard disk
sdd10	Tenth partition of the fourth SCSI hard disk
sr0	SCSI CD-ROM with the lowest SCSI ID
sr1	SCSI CD-ROM with the next higher SCSI ID

### 3.2 Primary and logical partitions

Partitioning is a means to divide a single hard drive into many logical drives. A partition is a contiguous set of blocks on a drive that are treated as an independent disk.

“Primary” partitions are the original partitioning scheme for PC disks. However, there can only be four of them. To get past this limitation, “extended” and “logical” partitions were invented. By setting one of your primary partitions as an extended partition, you can subdivide all the space allocated to that partition into logical partitions. You can create up to 60 logical partitions per extended partition; however, you can only have one extended partition per drive.

GNU/Linux represents the primary partitions as the drive name, plus the numbers 1 through 4. For example, the first primary partition on the first IDE drive is `/dev/hda1`. The logical partitions are numbered starting at 5, so the first logical partition on that same drive is `/dev/hda5`. Remember that the extended partition, that is, the primary partition holding the logical partitions, is not usable by itself. This applies to SCSI disks as well as IDE disks.

At a bare minimum, GNU/Linux needs one partition for itself. You can have a single partition containing the entire operating system, applications, and your

personal files. You also need a separate swap partition. *Swap* is scratch space for an operating system, which allows the system to use disk storage as *virtual memory*. By putting swap on a separate partition, GNU/Linux can make much more efficient use of it. It is possible to force Linux to use a regular file as swap, but it is not recommended.

### 3.3 GNU/Linux and Windows Partition Analogy

While Microsoft Windows partition the Hard disk using the C, D, E naming convention for the first 3 primary partitions, and F for the 4th primary partition, GNU/Linux uses /dev/hda1 for the first primary partition, /dev/hda2 for the second primary partition, /dev/hda3 for the third primary partition, /dev/hda5, /dev/hda6 etc for the logical drives inside the /dev/hda4 primary partition. Microsoft Windows partitions are accessible as different drive names like C, D, E etc. Windows partition tool will allow user to make 2 primary partitions. One of them is an Extended partition in which logical partitions are created. First primary partition is given the name 'C' (corresponding to /dev/hda1 in GNU/Linux). Next primary partition is Extended partition which is not accessible directly. Logical partitions in this extended partition will be given name 'D', 'E' etc (corresponding to /dev/hda5, hda6 etc in GNU/Linux).

## 4 Boot Loader

During the installation procedure system will ask several question relating to time setting, packages to install, device configuration etc. At the end of the procedure it will ask for installation of Boot Loader. Boot Loaders are specialized softwares which will load operating system. Boot loaders are particularly useful when there are more than one Operating System in computer. GRUB and LiLo are two boot loaders coming with GNU/Linux. Boot Loader should be installed in Master Boot Record.

### 4.1 The fdisk /mbr Command

fdisk command in Windows OS comes handy when you are try to install GNU/Linux along with Windows in same disk and some how GNU/Linux installation failed. In such situation system may be left with no Operating System.

fdisk program comes with Windows system disk. The fdisk /mbr command re-writes the MBR on the system drive using BIOS calls. This will remove Boot Loader installed by GNU/Linux installer. Usually operating sysem which was available before GNU/Linux installation will be activated.

### 4.2 Re-installing grub

If you reinstall windows after installing GNU/Linux, it will overwrite the grub boot loader and you cannot boot into your GNU/Linux system. To recover the boot loader (GRUB) you need a grub boot floppy/CD. It is safe to make a grub floppy using the command #grub-floppy /dev/fd0 as root user.

To recover grub:

- boot the system with grub floppy

- In the grub prompt `grub>enter root (hdX,Y)` where X is the number of your harddisk starting from 0 and Y is the partation where you installed GNU/Linux. The numbering starts from 0, ie if you installed GNU/Linux on 5th partation of your first harddisk you will enter `root (hd0,4)`. You can use TAB key to see all the disks/partitions you have. If you select the correct partitions you will see the type of partition which is ext2/3 for a gnu/linux system.
- enter `setup (hd0)`
- reboot the computer after removing the floppy from the drive.

## 5 Device Configurations

### 5.1 Keyboard

Keyboard is usually autodetected by installer. Settings for Keyboards are 1. Number of Keys (101/104 etc) 2. Language (us)

In India we are using us as keyboard language (see the dollar sign available in Key with numeral 4). Earlier keyboards had 101 keys. Now days we have keyboard with 3 extra keys with 'Window' sign. Such keyboards are called 104 keyboards.

### 5.2 Mouse

Mouse configuration requires following settings:

1. Interface Type (connector used to connect device with computer)
2. Protocol of the Mouse

Interfaces are usually 3 types. They are serial, PS/2, usb. This can be identified with connectors at the end of mouse cable. There will be a device entry in GNU/Linux file system corresponding to each of these devices. `/dev/ttyS0` is used for mouse connected to first serial port, `/dev/ttyS1` for mouse in second serial port and `/dev/psaux` for PS/2 mouse. Newer versions of GNU/Linux comes with a special device entry called `/dev/input/mice`, very common for USB mouses and in some case for PS/2 mouses also.

Protocol depends on owner of mouse. Usual choice for this is *Auto* where system will try to determine protocol on its own. If that fails we will have to set protocol manually. Usual choices are as below.

#### 5.2.1 PS/2 mouse

The "PS/2" protocol should always be tried first for the PS/2 mouse regardless of the brand of the mouse. Any PS/2 mouse should work with this protocol type, although wheels and other additional features are unavailable

After verifying the mouse works with this protocol, you may choose to specify one of "xxxPS/2" protocols so that extra features are made available.

### 5.2.2 Serial mouse

You need to manually specify a protocol type for your mouse. Choose one from the following list:

- IntelliMouse
- Logitech
- Microsoft
- GlidePoint
- MMHittab
- MMSeries
- MouseMan
- MouseSystems
- ThinkingMouse

When you choose, keep in mind the following rule of thumb:

1. “Logitech” protocol is for old serial mouse models from Logitech. Modern Logitech mice use either “MouseMan” or “Microsoft” protocol.
2. Most 2-button serial mice support the “Microsoft” protocol.
3. 3-button serial mice may work with the “Mousesystems” protocol. If it doesn’t, it may work instead with the “Microsoft” protocol although the third (middle) button won’t function. 3-button serial mice may also work with the “Mouseman” protocol under which the third button may function as expected.
4. 3-button serial mice may have a small switch at the bottom of the mouse to choose between “MS” and “PC”, or “2” and “3”. “MS” or “2” usually mean the “Microsoft” protocol. “PC” or “3” will choose the “MouseSystems” protocol.
5. If the serial mouse has a roller or a wheel, it may be compatible with the “IntelliMouse” protocol.
6. If the serial mouse has a roller or a wheel and it doesn’t work with the “IntelliMouse” protocol, you have to use it as a regular 2- or 3-button serial mouse.

### 5.2.3 USB mouse

If your mouse is connected to the USB port, it can either be supported by the “Auto” protocol, or by an OS-specific protocol (see below), or as a generic Human Interface Device by the “usb” protocol.

## 5.3 Display Controller(Adaptor)

Drivers for Display controllers comes with X-Window system (frame work for GUI applications in Unix like systems). There are two variants of X-Window systems being used in GNU/Linux. They are Xfree86 and X-Org. X-Org is the latest system with some advanced features. Drivers come as modules in X-Window. Most intel graphics chips like 810, 845 etc. uses the driver i810. For newer chipsets like 915 choose vesa. VESA is a driver which can support

almost all video cards. If driver module is not available for your specific Display controller try “vesa”.

Configuration tools for X-Window will help in selecting driver for controller and setting up monitor. Generally we use the command line utilities `xfree86config` for `xfree86` and `xorgconfig` for `xorg`. For a graphical configuration we use the `xfree86cfg` for `xfree86` and `xorgcfg` for `xorg`.

In debian systems for `xfree86` versions use `dpkg-reconfigure xserver-xfree86` for Xorg versions use `dpkg-reconfigure xserver-xorg`

There is an advanced configuration option recommended only for experts the command is `X -configure`. Copy the file thus generated to the file `/etc/x11/xfree86.conf` and `/etc/x11/xorg.conf`

## 5.4 Sound Card

Sound cards are usually detected by GNU/Linux installer. If that is not happening use the `lspci` command to list all PCI all devices connected. Identify the sound module for your system. Then use tools like `modconf` to load driver manually. In case driver for card is not available Kernel may have to be updated. This happens usually for devices which came to market recently.

`alsaconf` can be used to automatically detect and configure sound cards. for that the package `alsa-base` should be installed

## 5.5 Scanner

Scanners can be configured using a tool named `xsane`. A hardware compatibility list found at <http://sane-project.org> Any Scanner not found in the sane hardware compatibility list is presently unsupported by GNU/Linux.

## 5.6 Webcam

See the link for webcams supported in GNU/Linux <http://linuxtv.org/v4lwiki/index.php/Webcams>

## 5.7 Digital Video Camera

Digital Video Cameras can be configured by visiting the Hardware Compatibility List URL at [www.linux1394.org/hcl.php](http://www.linux1394.org/hcl.php)

## 5.8 Digital Camera

USB storage digital cameras are supported by default in GNU/Linux. Also visit the URL <http://www.gphoto.org/proj/libgphoto2/support.php> for the hardware compatibility list

## 5.9 TV/Tuner Card

The TV tuner card Hardware compatibility list is found in the [http://linuxtv.org/v4lwiki/index.php/List\\_survey\\_of\\_cards\\_in\\_use\\_now](http://linuxtv.org/v4lwiki/index.php/List_survey_of_cards_in_use_now) [http://linuxtv.org/v4lwiki/index.php/Main\\_Page](http://linuxtv.org/v4lwiki/index.php/Main_Page)

## 5.10 Wi-Fi

Wi-Fi devices in GNU/Linux requires the acx100 module that can be found at <http://acx100.sf.net>. Additional support is also found at <http://www.linux-wlan.org/> and <https://wiki.ubuntu.com/HardwareSupport> Presently cards without the acx 100 module are unsupported in GNU/Linux. Wi-fi devices can be configured using the iwconfig command.

# 6 Internet Connection Settings

## 6.1 Modem

All external modems are supported by GNU/Linux. Most of the internal modems are not supported. Modems in CDMA/WLL phones are also recognised in GNU/Linux. Special initialisation strings are required in case of CDMA phones. Settings are available on internet.

## 6.2 Asianet

- case 1 DHCP Ethernet In the above screen shot set the Configuration as DHCP instead of the Static IP address.
- Case 2 Download and Time Limited Connections Asianet provides a script for this scheme. Run the script after setting the network configuration as DHCP.

## 6.3 BSNL Dataone

for configuring bsnl dataone connection use the command `pppoeconf`

# 7 Device Drivers

Microsoft Windows device drivers are mostly installed using a driver cd provided by the hardware vendors. In GNU/Linux the drivers are in the `/lib/modules` folder. For example the cdrom device driver for the system which runs a kernel version of 2.6.10-5-386 is located in the location `/lib/modules/2.6.10-5-386/kernel/drivers/cdrom/cdrom.ko`

The driver files are usually found with a `.ko` extension as in the above example. The `dmesg` command program helps users to print out their bootup messages. The `lsmod` program to show the status of modules currently in the GNU/linux kernel. The `Modprobe` program to add modules to the Linux Kernel. syntax:- `modprobe module name` The `rmmod` command can be used to remove modules from the Kernel. Syntax:- `rmmod (module name)` The `uname` command prints system information. The `uname -a` gives the following output: Linux Debian 2.6.10-5-386 #1 Fri Jun 24 16:53:01 UTC 2005 i686 GNU/Linux on a debian gnu/linux system with 2.6.10 kernel.

## 7.1 Hardware Detection

`lspci` is a utility for displaying information about all PCI buses in the system and all devices connected to them.

`lsusb` is a utility for displaying information about USB buses in the system and the devices connected to them.

## 8 AMD 64

A separate version on GNU/Linux for the AMD 64 bit processor is available for distributions like Debian GNU/Linux.

## 9 Managing Printing using CUPS

Printing can be done using the GNOME-Cups tool, which can be invoked with `gnome-cups-manager` command as root user. Click on New printer, you have the option of setting up the printer as a local or network printer. You will also have to choose the make and type of the printer.

Two useful commands for printing are `lpq` and `lprm`

`lpq`:- the command shows the printer queue status. A sample `lpq` command output is as follows

```
root@debian:~# lpq
LaserJet-1010 is ready and printing
Rank   Owner   Job      File(s)                Total Size
active gnu     32      training-update.sxw    1952768 bytes
lprm:- The command cancels print jobs.
Syntax:- lprm queue number
```

## 10 Network sharing

### 10.1 NAT

In computer networking, network address translation (NAT, also known as network masquerading or IP-masquerading) is a technique in which the source and/or destination addresses of IP packets are rewritten as they pass through a router or firewall. It is most commonly used to enable multiple hosts on a private network to access the Internet using a single public IP address.

```
echo '1' > /proc/sys/net/ipv4/ip_forward
iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
```

### 10.2 SQUID

Squid is a high-performance proxy caching server for web clients, supporting FTP, gopher, and HTTP data objects. Unlike traditional caching software, Squid handles all requests in a single, non-blocking, I/O-driven process. Squid keeps meta data and especially hot objects cached in RAM, caches DNS lookups,

supports non-blocking DNS lookups, and implements negative caching of failed requests.

Squid supports SSL, extensive access controls, and full request logging. By using the lightweight Internet Cache Protocol, Squid caches can be arranged in a hierarchy or mesh for additional bandwidth savings. Squid consists of a main server program squid, a Domain Name System lookup program dnsserver, some optional programs for rewriting requests and performing authentication, and some management and client tools. When squid starts up, it spawns a configurable number of dnsserver processes, each of which can perform a single, blocking Domain Name System (DNS) lookup. This reduces the amount of time the cache waits for DNS

## 11 Some usefull links

- [www.gnu.org](http://www.gnu.org)
- [www.gnu.org.in](http://www.gnu.org.in)
- [www.debian.org](http://www.debian.org)
- [www.tldp.org](http://www.tldp.org)
- <http://librenix.com>
- <http://howtoforge.org>
- [www.space-kerala.org](http://www.space-kerala.org)