

# Installing Debian GNU/Linux on a Dell Inspiron 5100 Laptop

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Last updated April 11, 2005

Installing Debian on my new Dell Inspiron 5100 turned out to be one of the most frustrating things I've done in a while. It was quite difficult to get things going with no network to look up trouble spots and no way to get data off the laptop. However, I have (almost) everything operating now, and after a couple of months of use I'm quite happy with the machine. Hopefully this chronicle will be useful to other users of these hardwares.

If you have one of these machines or might in the future, and the subset of things you figure out is different from mine, I'd like to hear about it<sup>1</sup>.

In the section headings below I've indicated which pieces gave me problems and very briefly what I did to solve them.

This document lives at <http://web.utk.edu/~rmahurin/inspiron5100/>, where it was originally posted on 10 September 2003. As of 25 September 2003, printable versions are available online as well: the  $\text{\LaTeX}$  source, and PostScript and PDF versions.

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# 1 Hardware List

Here's what I discuss in this document:

- Built-in PS/2 Keyboard
- Built-in PS/2 Trackpad
- ATI Technologies Inc Radeon Mobility M6 LW (as identified by `lspci`)
- Internal Disk. Don't know the make. `dmesg` calls it an IC25N040ATCS05-0 ATA DISK drive.
- Matsushita CD-RW/DVD-ROM UJDA740, ATAPI CD/DVD-ROM drive
- TEAC FD-05PUB external USB floppy drive
- Broadcom 4401 internal NIC. *Updated 24 September 2003.*
- Broadcom 4320 internal wireless NIC (a.k.a. Dell Truemobile 1300)
- Proxim Orinoco Silver model 8421-WD wireless PCMCIA NIC
- Conexant D480 56K Modem
- Built-in SigmaTel C-Major Audio
- USB
- PCMCIA/CardBus
- FireWire
- ACPI Power Management. *Updated 25 September 2003.*

## 2 Human interface devices

### 2.1 Keyboard (updated 24 September 2003)

The keyboard worked without trouble. I had the impression that it was connected internally via USB and would give me problems, but I was wrong and it's a PS/2 keyboard. There wasn't any harm in including USB keyboard modules.

The blue "function keys" on the laptop worked after I included "Dell laptop support" in the kernel (by setting `CONFIG_I8K`). I could also have included the module `i8k`, had I known about it. All of the function keys that map to keys on a vanilla PC keyboard (SysRq, Pause, NumLock and the numeric keypad) seem to produce the correct keycodes. The CD-eject key (Fn-F10) ejects the CD-ROM tray, and the screen brightness keys (Fn-up and Fn-down) adjust the screen brightness. Sometimes I have to press the CD-eject more than once, and sometimes changing the screen brightness ejects the CDROM. How strange.

I have just noticed (24 September 2003) that the “magic SysRq” shortcuts in the kernel are useless because the numeric keypad is accessed with the Fn key: since the Fn key is down to get SysRq, the Unmount, kill, saK, showMem commands just change the loglevel. What a pain.

The only keys that don’t work are the software volume controls, the suspend key, and the “home page button” above the keyboard. These pass keycodes to the operating system which you can see with showkey(1). Presumably you could program them if you were so inclined. This might be a good idea if you hit them accidentally and passing unconfigured keycodes does strange things to your system. Someone has documented how to do this but I have lost it.

Actually I’m not sure what the CRT/LCD key (Fn-F8) does. Connecting a CRT monitor to the port on the back sends simultaneous signals to the CRT and the LCD, irrespective of the status of that key. It doesn’t produce a keycode, so the kernel is recognizing it, but I don’t know what it does.

### **2.1.1 Keyboard: update 19 July 2004**

I have learned that the Fn-key combinations are really read in by the BIOS. After upgrading to BIOS A30, as described in Section 6, the SysRq problem is solved by Fn-F10 no longer opens the CD Drive. Go figure.

## **2.2 Trackpad**

The trackpad worked out of the box. It thinks it is a PS/2 mouse with two buttons. I am running gpm on the console and letting X watch the mouse via `/dev/gpmdata`. For some reason, gpm is on the second Debian CD, which meant I had to work extra hard to install it. I think it should be on the first so that one-disc installs can have mouse support on the console, but I don’t make the CDs.

I have read that there is a driver by Symantec, who manufactures the pad, but I didn’t need it.

## **2.3 Video Card: Needed More Recent Driver**

This was the most difficult thing to get going. The video card is an ATI Radeon Mobility, but of recent enough vintage that the X server on the Debian 3.0 CD doesn’t support it. I grabbed the `xserver-xfree86` package from testing, which required me to also use the testing versions of `libc6`, `libc6-dev`, `libdb1-compat`, and `locales`. The X server now works using the “radeon” driver.

I used an apt “Package Pin” in `/etc/apt/preferences` to (hopefully) keep my testing packages up to date without running a full testing system that would require frequent updating. The pin is

```
Package: xserver-xfree86 libc6* libdb1-compat locales
Pin: release a=testing
Pin-Priority: 996
```

giving these packages a higher priority than the stable version at 995. I'm not sure if this will work automagically. We'll see.

For completeness, I'm running xserver-xfree86 version 4.2.1-6.

## 3 Mass Storage

### 3.1 Disk

The disk is 40 GB and was shipped from the factory with two partitions: a 40 MB partition with "diagnostic tools" on it (looks like a bootable DOS system with a few programs and information about the hardware) and the rest of the disk a huge NTFS partition containing Windows XP. Since I don't have Partition Magic and fips is afraid of NTFS, I had to wipe my WinXP installation to repartition the disk. Since I did this the day I got the computer there was no harm in erasing everything.

If you're contemplating not doing so, *save the diagnostic partition!* See the section about my hardware problems, Section6.

Interestingly the disks are in reverse order: the CDROM is connected as `/dev/hda` and the hard disk and `/dev/hdc`. The installer caught this for me.

Filesystem	Size	Used	Avail	Use%	Mounted On
<code>/dev/hdc5</code>	91M	41M	45M	47%	/
<code>/dev/hdc6</code>	91M	4.1M	82M	5%	<code>/tmp</code>
<code>/dev/hdc7</code>	2.8G	276M	2.3G	11%	<code>/var</code>
<code>/dev/hdc8</code>	4.6G	1.3G	3.0G	30%	<code>/usr</code>
<code>/dev/hdc9</code>	9.0G	3.6G	4.9G	42%	<code>/home</code>
<code>/dev/hdc2</code>	19G	9.5G	9.0G	52%	<code>/winxp</code>
<code>/dev/hdc1</code>	39M	5.7M	33M	15%	<code>/mnt/tmp</code>

Table 1: My disk partitioning scheme. `/dev/hdc10` is a 2 GB swap partition.

### 3.2 CD Writer

I can write CDs, so the CD writer works as well as the reader. I haven't tried to read a DVD yet but I can't imagine that it would cause problems. The drive is identified as a MATSHITA CD-RW/DVD-ROM UJDA740.

To write CDs requires the modules `ide-scsi` and `scsi_mod` to be loaded. If you are using `ide-scsi` remember that your CD drive is no longer accessible as `/dev/hda`; you probably want `/dev/sr0`. Just change your `/dev/cdrom` symlink and forget about it.

### 3.3 External USB Floppy Drive

The external floppy (by TEAC) worked as soon as USB did. As soon as I plug it into the machine it appears in `/proc/bus/usb/devices` and tries to see if there's a disk in the drive. It uses the `usb-storage` driver to access the SCSI layer; the disk mounts from `/dev/sda`.

## 4 Networking: Nothing But Trouble

I finally have wired, wireless, and modem networking. But it was a pain in the ass.

From reading around about these machines it seems that Dell switches hardware vendors fairly frequently, especially for the networking components; I didn't have a choice of wireless cards or modems when I bought the machine, but other people with Inspiron 5100s have different hardware that works. So don't despair. Besides, probably all the hardware will be officially supported before long.

### 4.1 Built-in Network Interface Card: Driver Available

The integrated ethernet card is a Broadcom 4401. It is supported, but not in the kernel; you have to find and build the driver yourself. The driver's name is `bcm4400`. Version 1.0.1 of the driver is a package in Debian unstable (though it's just source, you still have to build it); I am running version 2.0.0 and more recent versions may exist. Once I knew the name of the driver Google found it without much trouble.

The driver is able to tell when a network cable is plugged in (it says things like "NIC is up! NIC is down. Darn.") but I can't figure out how to make plugging in the cable trigger running `dhclient` (for DHCP) or otherwise configuring the network. There is a package called `laptop-net` that is supposed to make this easy but I haven't learned to use it yet. I'll post instructions when I do.

To build the driver you have to install the kernel source, and it has to have a copy of `modversions.h`. This file didn't appear in my tree until after I had configured and made the kernel. But of course you want a custom kernel anyway. They boot faster.

#### 4.1.1 Built-in NIC Update 19 July 2004: in-kernel driver exists.

The Broadcom driver has been integrated into the main kernel source as of version 2.4.22. The in-kernel driver is called `b44`. To get DHCP to work correctly I had to name this module in `/etc/default/laptop-net`.

### 4.2 Built-in Wireless Network Card: Unsupported

This is a Broadcom 4320 and is apparently unsupported in linux, much to the dismay of many. I read a report that the `bcm4400` driver can somehow

be convinced to operate the network card. I also read a report that Venus is populated by bat people who vote Republican. You have to be careful about what you read.

I have heard that there is now (July 2004) a driver available but I've decided I prefer the PCMCIA card.

### 4.3 Orinoco Silver Wireless Network Card: Driver Available

I bought an Orinoco Silver card by Proxim and am using it to post this message. I picked this because I had heard it was well-supported; however Proxim has changed the chipset to something called Hermes-2, which the kernels' `hermes.o` driver can't handle yet.

The card is

```
prompt> /sbin/cardctl ident
Socket 0:
  product info: "Agere Systems", "Wireless PC Card Model 0110", "", ""
  manfid: 0x0156, 0x0003
  function: 6 (network)
```

and I found the driver at <http://greenblaze.com>. I'll post a copy soon or when prodded.

### 4.4 Built-in Modem: Driver Available

The modem is a Conexant D480: `lspci` says

```
00:1f.6 Modem: Intel Corp.: Unknown device 24c6 (rev 02) (prog-if 00 [Generic])
  Subsystem: Conexant: Unknown device 5422
```

Go to <http://linuxant.com/drivers>, get the HSF (softmodem) driver, and follow the instructions.

### 4.5 Networking Drivers

These are the networking drivers that I had to find on the web. Of course, you are finding them on the Web, too. But this should make searching easier.

Or it would if it weren't incomplete. If you can't find one of these anywhere else and I haven't gotten around to posting them send a frustrated message to [rob@utk.edu](mailto:rob@utk.edu).

- Broadcom driver `bcm4400`
- Conexant driver <http://linuxant.com/drivers> get the HSF (softmodem) driver
- Agere Systems' driver for Hermes-2 chipsets: <http://greenblaze.com> my driver is `wlags49_h2_cs`

## 5 Miscellany

### 5.1 Sound

Sound works. The owner’s manual calls the sound card a “Sigmatel C-Major Audio”; it uses the driver `i810_audio`. I’d like the keyboard volume controls to work, just because I prefer hardware to software controls, but that feels like one of those things that I’ll never get around to doing. Somewhere I saw instructions how to do that.

### 5.2 USB

USB was tricky for the wrong reason. The machine has a USB 2.0 controller, and the USB 2.0 driver (`ehci-hcd`) is “experimental code” and didn’t show up in my kernel config until I asked to see experimental options. Now the magic works. I also seem to need the drivers `usb-uhci` and `usb-storage`, though I haven’t tried running without them.

### 5.3 PCMCIA

This worked right off, though I had trouble finding the right driver for my card.  
4.3

### 5.4 Firewire

The firewire module (`ieee1394`) loads successfully. I don’t have any hardware to test it with.

### 5.5 Power Management

This sort of works. The power button works, anyway. ACPI is another “experimental” bit of code in the kernel.

I can’t find how to send the thing to sleep. Echoing numbers to `/proc/acpi/sleep` seems to either hang or crash the machine; pressing the power button undoes the hang, then shuts the machine off, darn it.

I found a program called `swsusp` which claims to suspend to disk, like the Windows command “hibernate.” I couldn’t get it to work. This is probably the feature I would use most; I hear it will be included in the 2.6 kernel.

What I can’t do is learn about the charge on the battery or the temperature of the CPU. The second I don’t mind so much, but the first is sort of a pain: if I use the machine unplugged I have no clue short of the idiot light on the front as to how much battery I have. It seems to last for a while, but I haven’t really pushed it.

I’ve read that it works.

### 5.5.1 Update 19 July 2004: Software Suspend (“Hibernation”)

I have suspend-to-disk working in kernel 2.4.26 using the swsusp 2.0 patches from <http://softwaresuspend.berlios.de/>. The process was pretty easy. There are two patches to apply to the kernel: a kernel-specific patch which must match your running kernel, and a “core patch” which is applied after that. Reconfigure the kernel and say “yes” to Software Suspend and the Swap Writer under “General Setup.” Install this kernel as the default (under LILO or GRUB or your bootloader) with `append="resume2=swap:/dev/hdc10"` in order to enable recovery from hibernation. Then use the hibernate script from the swsusp distribution (follow the links from the homepage to the “berlios download page”) and you can suspend with `sudo hibernate`.

I’m using swsusp 2.0 and suspend-script-0.94.

By default the hibernate script doesn’t do very much before it takes the machine down. Some of the modules (especially the modem driver) didn’t handle this well, and USB acted funny after hibernation, and `gpm` lost control of the touchpad. However the hibernate script is easy to modify. I have it unload all the modules, unmount any removable drives (`/floppy` etc.) and stop hotplug before suspending. After resuming it reloads from `/etc/modules` (like at boot), restarts `gpm`, and starts hotplug. Pretty flawless.

### 5.5.2 ACPI Update 13 September 2003: Battery support in 2.4.22 kernel

ACPI is fully functional with kernel 2.4.22, with the dsdt patch for the Dell Inspiron 5100 from <http://acpi.sourceforge.net>. You have to patch the kernel to use the new dsdt, but you don’t have to apply an ACPI patch. Follow Matt Perry’s instructions.

None of the GNOME battery monitors seem to work; that may be a Debian stable-vs-testing issue. I’ll play with that soon.

Apparently the behavior I observed with the machine hanging reversibly is actually the operation of the ACPI driver; the thing looks frozen because it doesn’t blank the screen before it stops. This isn’t quite what I wanted. I’ll hold out for swsusp in the 2.6 kernel. (Update: This works now, see Section 5.5.1.)

Interestingly, while the battery monitor (`acpi -V`) does a good job of estimating the remaining lifetime of the battery, it does a lousy job of guessing charging time. The file `/proc/acpi/battery/BAT1/state` reports typical charging rates of 62000 mA, which would trip a working circuit breaker. But that is a small problem.

### 5.5.3 ACPI Update 23 September 2003: LCD Backlight on/off with lid

Thanks to ThanhVu Nguyen, I have taught `acpid` to turn off the LCD backlight when I close the lid. Here’s how:

1. I downloaded radeontool<sup>2</sup> and put it in /usr/local/bin.
2. I put the following text in a file called /etc/acpi/events/lid:

```
# turn the backlight on and off to correspond with the state of the lid
# based on /etc/acpi/events/powerbtn
```

```
event=button[ /]lid
action=/etc/acpi/lid.sh
```

and the following in /etc/acpi/lid.sh:

```
#!/bin/sh

# lid.sh
# Copyright 2003 Rob Mahurin <rob@utk.edu>
# Available for use under the General Public License
# No warranty etc.

XSC=/usr/bin/xscreensaver-command
XSET=/usr/bin/X11/xset
# XSET=/bin/false # uncomment this or something similar to not use DPMS

die() {
    echo "Unable to determine state of lid."
    exit 1
}

lockall() {
    for i in /tmp/.X11-unix/X* ; do
        num=$(basename $i | cut -b2-)
        export DISPLAY=${num}.0
        echo "Locking display " $DISPLAY
        $XSC -lock
    done
}

RADEONTOOL=/usr/local/bin/radeontool
[ -x $RADEONTOOL ] || exit 0

STATEFILE=/proc/acpi/button/lid/LID/state
[ -f $STATEFILE ] || die;
STATE=$(awk '{ print $2 }' < $STATEFILE)

case "$STATE" in
    "closed")
        echo "Lid is closed. "
        echo "Turning off backlight." && $RADEONTOOL light off
```

---

<sup>2</sup><http://fdd.com/software/radeon/>

```

        lockall
[ -x $XSET ] && echo DPMS off && $XSET dpms force off
        ;;
        "open")
        echo "Lid is open.  Activating backlight."
[ -x $XSET ] && echo DPMS on && $XSET dpms force on
        $RADEONTOOL light on
        ;;
        *)
        $RADEONTOOL light on
        die
        ;;
esac

```

- Restart `acpid`. If you say `sudo /etc/init.d/acpid restart` from an environment where `sudo xterm` would work, `acpid` will have permission to lock your `xscreensaver`. If you just let `acpid` start when the machine boots, the `lockall` function in `lid.sh` will fail harmlessly. This is nice for me, since I occasionally work in a security-paranoid place and being able to lock the screen and save the battery simultaneously is a Good Thing.

Update 11 April 2005: Ulrich Dangel writes to tell me that he has changed `lid.sh` so that it locks the display without having to use the `sudo` trick. You can get his script from him at <http://spamt.net/acpi/lid.sh>.

### 5.5.4 ACPI Update 25 September 2003: LCD Backlight with DPMS

Run a script like this one to have `radeonool`<sup>3</sup> work with `xscreensaver`'s DPMS (power management) setting. Notice the person running the script needs to have permission to use `radeonool`.

I like this better than `lightwatch.pl` because it's independent of `xscreensaver` and permits me to use screen locking – `lightwatch.pl` presents the `xscreensaver` password box without turning the LCD back on.

```

#!/bin/bash

#####
# dpmswatch.sh
# Copyright 2003 Rob Mahurin <rob@utk.edu>
# Available for use under the General Public License
# No warranty etc.
##
# This is based on lightwatch.pl, but instead of using
# xscreensaver-command -watch, it uses xset to query the DPMS state
# of the LCD.  If the desired DPMS state is off, blank the LCD
# backlight using radeonool.
##

```

---

<sup>3</sup><http://fdd.com/software/radeon/>

```

# If your system gives a different output to this command :
# $ for i in standby suspend off on ; do
#     xset dpms force $i ;
#     xset q ;
# done | grep Monitor | awk '{print $3 $4 }'
#   inStandby
#   inSuspend
#   Off
#   On
# then you may have to modify this script.
##
# It's written in shell instead of Perl because that's what I know.
#####

# commands to use. Correct on Debian woody.
XSET=/usr/bin/X11/xset
# radeontool is broken on Debian testing.
#RADEONTOOL=/usr/local/bin/radeontool
RADEONTOOL=/bin/true

# also look at the state of the lid. Don't change anything if it is
# closed.
STATEFILE=/proc/acpi/button/lid/LID/state

# The polling intervals, for feeding to sleep(1). Is there way to
# make this event-driven, rather than poll all the time? Does it
# matter?
#
# Notice that we don't want to watch the xscreensaver, since that
# would bring up the password box without turning on the LCD. Very
# confusing.
inStandby_INTERVAL=5s
inSuspend_INTERVAL=5s
Off_INTERVAL=1s
On_INTERVAL=5s
INTERVAL=0s;

# check to make sure we have all the commands we need
for i in $XSET $RADEONTOOL
do    [ -x $i ] || { echo $i not found >&2 || exit 0 ; }
done

while : ; do
    # what is the state of the monitor?
    STATE=$(XSET q | grep Monitor | awk '{print $3 $4}')

    # what is the state of the lid
    OLDLIDSTATE=$LIDSTATE
    [ -f $STATEFILE ] &&
    LIDSTATE=$(awk '{ print $2 }' < $STATEFILE) ||

```

```

LIDSTATE=open

# if the monitor is closed, set DPMS off (so the screensaver
# doesn't run). If it has just opened, turn DPMS back on.
[ "closed" = "$LIDSTATE" ] &&
xset dpms force off && INTERVAL=$Off_INTERVAL
[ "open" = "$LIDSTATE" ] && [ "closed" = "$OLDLIDSTATE" ] &&
xset dpms force on && STATE="On"

# if the monitor is in standby or suspend, change the polling
# interval but turn the light on or off. If the monitor is Off,
# turn off the LCD backlight. If the monitor is On, turn on the
# backlight. Then sleep until it's time to check again.

[ "open" = "$LIDSTATE" ] && case $STATE in
    inStandby)
        INTERVAL=$inStandby_INTERVAL
        ;;
    inSuspend)
        INTERVAL=$inSuspend_INTERVAL
        ;;
    Off)
        INTERVAL=$Off_INTERVAL
        $RADEONTOOL light off
        ;;
    On)
        INTERVAL=$On_INTERVAL
        $RADEONTOOL light on
        ;;
    # if something strange happens, turn the light on and fail.
    *)
        $RADEONTOOL light on
        exit 1
        ;;
esac
sleep $INTERVAL
done &

```

### 5.5.5 ACPI Update 19 July 2004: New system board, BIOS A30

After my hardware problems (see section 6), Dell gave me a new motherboard. This had an updated version of the BIOS software, version A30, and ACPI no longer worked under kernel 2.4.22. Under kernel 2.4.26, it works enough for me, but I don't get events, which means that I can't use the power button to execute a shutdown and I can't do software things when the lid closes. That's kind of a downer.

From the ACPI section of the kernel config, I have selected

```
[*] ACPI Support
```

```
<*> AC Adapter
<*> Battery
<*> Button
<*> Fan
<*> Processor
<*> Thermal Zone
< > ASUS Laptop Extras
< > Toshiba Laptop Extras
[ ] Debug Statements
[*] Relaxed AML Checking
```

The ac adapter, battery, and thermal zone sections all seem to work. The lid, power, and sleep “buttons” are all recognized, though without events they don’t do much. The processor is recognized; I’m able to e.g. slow it down by 87% by typing `echo -n 7 > /proc/acpi/processor/CPU0/throttling.` `/proc/acpi/fan` is an empty directory. Changing the “relaxed AML checking” doesn’t seem to have any effect.

I should note that this is with a stock 2.4.26 kernel. If I follow Matt Perry’s instructions, I get the same broken behavior (ACPI unaware of battery). Probably I am done messing with this.

## 6 Update 19 July 2004: Tech Support and the failed motherboard

So after using this laptop for a year I have been quite pleased with it. However, about a month ago I began to get intermittent, causeless crashes of several types. Some were linux kernel panics: the machine would freeze and the CapsLock and ScrollLock LEDs would blink together. (Yes! Blinking LEDs on a crashed system are in fact due to kernel panics; the code that makes it happen is `panic_blink()` in `drivers/char/pc_keyb.c`) But some were not linux crashes: the machine would suddenly shut off, or instantly reboot (going to the startup Dell logo in less than a second). And sometimes the machine would fail to come back on: either the fan would blow for about three seconds and the power light would turn back off, or it would hang during its power-on-self-test. Sometimes the POST failures were accompanied by LED signals as well. The failures seemed less frequent if the machine had been off for a long time.

I booted into the Diagnostics partition, which is actually a Win95 system with some tools in it. The machine passed all its tests but the system crashed. So I called tech support. For the record, the day I called support was a year and a day after the date on my order invoice; I suppose it is lucky that I got the three-year support contract. The first time I called, my intermittent problem never appeared: the system was stable for about three hours and passed all its tests. The tech I spoke to seemed eager to think that it was a Linux software problem (which of course would be unsupported); she didn’t seem to believe me that the machine was failing its POST.

Of course, after I got off the phone with this person, the machine began to crash again. This was pretty late in the day. So the next day I made sure it was crashing before I called. Having it crash on the phone, while running Dell's Diagnostic tools, which ought to be stable, made the appropriate impression. I was also told that the LED status codes I had seen indicated problems with the memory and the motherboard. Finally Dell agreed to send me a box — I was to send the machine back to them to have the main board replaced. I was impressed that they asked me to send it without the drive, which meant I didn't even have to reinstall when I got it back.

Since the repair, the machine has worked flawlessly. My only complaint is that the new BIOS broke ACPI and I had to upgrade my kernel. But that turned out for the better, anyway, because I finally got hibernation (Section 5.5.1) to work.

## 7 Other Reports

Here is a list of reports relevant to this set of hardware. You might also find them useful.

- Matt Perry<sup>4</sup> has gotten ACPI and 3D acceleration to work.
- Michael Davis<sup>5</sup> was quite helpful.
- ThanhVu Nguyen<sup>6</sup> wrote to me the day I posted this to tell me he had solved most of the issues I was struggling with to work. He used Matt Perry's instructions for fixing ACPI. He has also kept me apprised of his progress.
- I learned a lot from the other pages listed on <http://tuxmobil.org>.

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<sup>4</sup><http://somewhere.fscked.org/laptop/>

<sup>5</sup><http://www.linuxvirgins.com/inspiron5100.html>

<sup>6</sup><http://halong.dyndns.org/thanhvu/linux/i5100/index>