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# Motorola Surfboard 4100 + 4200 Series USB Cable Modem mini-HOWTO

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## Abstract

This document was written to assist the Linux user in setting up the Motorola Surfboard 4000 series of cable modems.

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## Introduction

This document was written to assist the Linux user in setting up the Motorola Surfboard 4100 and 4200 series cable modems, and includes information on configuring a DHCP client, enabling the device with or without USB support and troubleshooting.

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## New Versions

This is the initial release.

The latest version number of this document can be found here [<http://www.hshanemd.net/docs/HOW-TOS/SurfBoard/>].

## Credits

I would like to thank Brad Hards, the primary author of the Linux CDCEther kernel driver for graciously volunteering several useful bits of information.

Also, I would like to thank Marla, who has cheerily tolerated the time I've spent sifting through documentation and endless typing while completing this and other projects. Without you I'm lost.

## Feedback

Please send any additions or comments pertaining to this document to the following email address: <[hshane@Austin.RR.com](mailto:hshane@Austin.RR.com)>. If you have an earlier (e.g., 3000 series) or later (e.g. 5000) series Surfboard and have it working in linux, please contact me with any model-specific setup information so we can update this document!

## Conventions Used in this Document

The following conventions are used in this document and are outlined here for those who may not yet have a complete understanding of how to access and control the underlying operating system in Linux, which is almost always the bash shell.

First, filenames are referenced in a paragraph like so: `/path/file`

Commands in Linux are executed (or 'called') at the command prompt, otherwise known as the 'command line.' If you are in the non-graphical (text-based) environment you will usually be presented the bash shell prompt which is a dollar sign:

\$

...or the hash mark:

#

...if you have logged in as root or have acquired root, or 'superuser' privileges. You can also access the bash shell in the X window system, otherwise known as X or X11, with an xterm [<http://invisible-island.net/>

xterm/] or similar X-terminal-emulator. Commands to be performed at the bash prompt, but referenced in a paragraph of this document, usually look like this: **do this now**

Commands and/or the resulting output of commands may also be outlined with screen output in their own paragraph or heading:

```
$ date  
Sun Jul 27 22:37:11 CDT 2003
```

When a command is written in front of the bash prompt (e.g. **\$ date** above), it is assumed the [Return] or [Enter] key has been depressed after the command, possibly followed by the output on a new line (e.g., as in the date in the above example).

## Prerequisites

### Networking and Operating System Support

The Motorola Surfboard 4100 and 4200 Cable Modem series are common devices provided by cable Internet services. They are easily configurable for use under Linux. For more information about the device not related to Linux configuration, please see the manufacturer's website here. [<http://broadband.motorola.com/noflash/surfboard.html>]

There are two requirements for using a Motorola Surfboard 4100 and 4200 series USB cable modem (hereafter referred to as a 'Surfboard'). The first is the appropriate networking support for the device in your kernel; note that most base installs of Linux distributions come TCP/IP and ethernet enabled 'out of the box,' so there is probably very little most readers will need to do other than be sure their ethernet card is working. If you know that your ethernet card is supported and working you can move on to the section called "The Modem Device". For those who like to compile their own kernels (see the Kernel HOWTO [<http://www.tldp.org/HOWTO/Kernel-HOWTO.html>] for more information), the following options are required to get the cable modem to work:

Under 'Networking options':

- TCP/IP Networking

along with ONE of the following:

- Network Device Support: Ethernet (10 or 100Mbit) Support and your ethernet card driver
- USB Support + USB CDCether driver support

PPP support is not required per se, as the modem is itself a PPP link.

Note that there are two possible interfaces on the modem to connect your computer. One is through ethernet and is probably the default a cable provider will attempt to use when setting up the Surfboard. The other is to use the USB interface. The former of these is arguably easiest; the only requirements other than the above is that you have an ethernet card installed which is open, i.e. that you can connect to the modem ethernet jack using ordinary 10BaseT/100BaseT ethernet cable. If you are uncertain about anything in the last sentence I recommend you read the Ethernet HOWTO [<http://www.tldp.org/HOWTO/Ethernet-HOWTO.html>] for proper configuration of your ethernet card.

I have used my own 4100 model with each interface, and at least on my system there seems to be little difference in performance using an ethernet card or the USB port. The drawback of the ethernet method is that your network card will be tied up.

## The Modem Device

First, plug in and turn on the Surfboard. Connect your ethernet card to the Surfboard with 10BaseT/100BaseT cable into the non-USB interface, if this was not already done for you. Be sure the modem isn't on standby mode by checking the LEDs; you should see some dancing green lights to confirm this. The standby button is on the top of the device on most models. Your cable internet provider should be able to tell remotely whether your modem is connected and functioning properly, which is helpful for differentiating between hardware and configuration problems on your end. They will also need the MAC (Media Access Control) hardware address of your modem to allow the device access to their network. If at any time you substitute one modem for another you will need to inform them so the MAC address can be updated and your access to the cable network restored.

Once you connect for the first time, your modem will be assigned an IP address, which may remain the same or change periodically depending on the IP address turnover of your ISP's DHCP server, and how long you remain offline if you disconnect. Should the IP address provided to the modem by your ISP ever have to be released, for whatever reason, you can do this by resetting the device. This involves inserting the tip of a sharp pencil or a pin into the small orifice on the input face. The only time this may be necessary is if you are having trouble with your connection and you are instructed to try this maneuver by your ISP's technical support staff. Only do this if you know what you're doing or are directed to do so by your ISP, as it's generally not a good idea to go around sticking metal objects into the various openings of electrical devices.

## The DHCP Client

### Installation on a Debian System

The Surfboard works fine out of the box under Debian once you have installed and started the DHCP client package. As of this writing there are two user-space programs for this. In Woody (stable), there is the `dhcp-client` package, automatically installed as a part of the base packages as `/sbin/dhclient`. For Sarge (testing) and up, this has been replaced by the `dhcpcd` package. The latter has its configuration files under `/etc/dhcpcd`, but nothing really needs to be modified if you are setting up only one ethernet card for the cable internet service. The `dhcpcd` daemon is easily installed for those using testing branch as root, with `apt-get install dhcpcd`.

### Installing on .rpm- or .tgz-Based Systems

For .rpm- or .tgz-based distributions, I offer the following link that walks you through the setup of a DHCP client, in the DHCP mini-HOWTO [<http://www.tldp.org/HOWTO/mini/DHCP/x74.html>].

Just run `/sbin/dhclient` or whichever client you use to get a dynamic IP address.

### Checking your Configuration

Once you are plugged into the system you are provided your own IP address, which doesn't change unless you drop the lease (i.e. go offline) for a while. To confirm that the DHCP client is working and you have a new IP address, execute (as root) `ifconfig` without any other arguments, and you should see the following:

```
eth0 Link encap:Ethernet HWaddr 00:D0:09:DE:D4:6F
  inet addr:66.190.XXX.XXX Bcast:255.255.255.255 Mask:255.255.255.0
  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
  RX packets:2591777 errors:0 dropped:0 overruns:0 frame:0
  TX packets:5589 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:100
```

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```
RX bytes:168673636 (160.8 MiB) TX bytes:1752872 (1.6 MiB)
Interrupt:12 Base address:0xc400
```

```
lo Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:5168 errors:0 dropped:0 overruns:0 frame:0
TX packets:5168 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:1695104 (1.6 MiB) TX bytes:1695104 (1.6 MiB)
```

...which shows the system loopback device, `/dev/lo`, and also `/dev/eth0`, your ethernet card and the Surfboard, having successfully acquired an IP address (or 'inet addr') provided by the cable internet service provider.

## Using the USB interface instead of an ethernet card

### USB CDCEther

If you wish to use the USB interface to accept data you will need USB subsystem support in your kernel, whether USB-ohci, USB-ehci, or whichever USB host controller driver type your system prefers. For a more in-depth discussion of this, I direct you to the Linux-USB project site [<http://www.linux-usb.org/>].

Assuming you have USB subsystem support, to find out if your kernel supports the CDCEther (Communications Device Class Ethernet) driver as a module, in a shell, issue the command **lsmod** as root.

You should see output similar to the following, though a number of entries have been edited, and you shouldn't worry too much if you don't see the exact entries displayed here:

```
CDCEther          11040    0  (unused)
usb-ohci          17888    0  (unused)
usbcore           56768    1  [scanner CDCEther usb-ohci]
```

If you don't see CDCEther listed among the modules try loading the module directly:

```
# modprobe CDCEther
```

If all goes well you should see the following message in your system log files, or with **dmesg**:

```
Mar  2 11:00:52 K7 kernel: CDCEther.c: 0.98.6 7 Jan 2002 Brad Hards and another
Mar  2 11:00:52 K7 kernel: usb.c: registered new driver CDCEther
```

If you don't have it compiled as a module, check the output of **dmesg** (you may need to pipe it through 'less' or 'more' like so: **dmesg | less**); if the driver loads as a module you will see a message similar to the above at boot-up. If not, and you want to use the USB conduit of this device, you will need to recompile your kernel to support it. You will need the 2.4.3 kernel or later. For detailed instructions on recompiling your kernel, I direct you to the Kernel-HOWTO [<http://www.tldp.org/HOWTO/Kernel-HOWTO.html>]. The options shown next will need to be selected. As an aside, you should be aware that compiling things as modules, rather than statically within the kernel, gives you a greater degree of control and greatly simplifies troubleshooting.

## Kernel Requirements

In addition to the 'TCP/IP networking' listed in the section called "Prerequisites", the following should be compiled in your kernel in the 'USB support' menu (assuming you are using **menuconfig**):

- USB support
- USB Communication Class Ethernet device support

## Grabbing the Correct Interface

Now we have to select the correct ethernet interface (/dev/ethX) to be the recipient of the DHCP service. If you run **ifconfig** as root you get a list of open devices:

```
eth0 Link encap:Ethernet HWaddr 00:D0:09:DE:D4:6F
  inet addr:192.168.1.1
  Bcast:192.168.1.255 Mask:255.255.255.0
  BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
  RX packets:0 errors:0 dropped:0 overruns:0 frame:0
  TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:100
  RX bytes:0 (0.0 b) TX bytes:0 (0.0 b) Interrupt:12 Base address:0xc400

lo Link encap:Local Loopback
  inet addr:127.0.0.1 Mask:255.0.0.0
  UP LOOPBACK RUNNING MTU:16436 Metric:1
  RX packets:5168 errors:0 dropped:0 overruns:0 frame:0
  TX packets:5168 errors:0 dropped:0 overruns:0 carrier:0
  collisions:0 txqueuelen:0
  RX bytes:1695104 (1.6 MiB) TX bytes:1695104 (1.6 MiB)
```

...where eth0 is a standard NIC, pre-configured to the IP address 192.168.1.1.

Note the HWaddr field, or hardware address, on the first line. This is the same as the MAC, or Media Access Control address, and is how we will specify the interface for each action. If you are running a Debian system, you can alter the /etc/network/interfaces file to look like this:

```
# /etc/network/interfaces -- configuration file for ifup(8), ifdown(8)
# The loopback interface
auto lo
iface lo inet loopback
auto eth0
  iface eth0 inet static
  address 192.168.1.1
  netmask 255.255.255.0
  network 192.168.1.0
  hwaddress ether 00:D0:09:DE:D4:6F

auto eth1
  iface eth1 inet dhcp
  hwaddress ether 00:04:BD:DE:42:0B
```

The **auto eth0** and **auto eth1** are required to have the interfaces configured at bootup. Note that some versions of dhcp clients by default always grab eth0 for the dhcpc interface. So even after doing all the

above, unless you specifically run `/sbin/dhccpd-bin eth1` it won't work. The easy way to do this at boot-up is to make an init script to load the dhcp address to the correct interface. For most distributions, such a script is in `/etc/rc.d` or a similar location. If you have an `rc.local` script, as in Slackware, you can simply add `/sbin/dhclient` to the end of the file. If you have a model `rc.d` script (such as `/etc/init.d/skeleton` in Debian) you can convert that to such a purpose. Whatever the case (either at the command line manually or appended to an init script), the command to run is as follows:

```
# ifconfig ethX hw ether 00:D0:09:DE:D4:6F up
```

You can confirm it worked by calling `ifconfig` without options after your next reboot.

## Troubleshooting

Q: I get kicked offline about once every 4 days, for no apparent reason, and get the following error, or something similar, in the kernel log:

```
Feb 20 10:05:12 K7 kernel: CDCEther.c: rx status -110
Feb 20 10:05:12 K7 kernel: CDCEther.c: no repsonse in BULK IN
Feb 20 10:05:12 K7 kernel: CDCEther.c: rx status -110
Feb 20 10:05:12 K7 kernel: CDCEther.c: no repsonse in BULK IN
Feb 20 10:05:12 K7 kernel: CDCEther.c: rx status -110
Feb 20 10:05:12 K7 kernel: CDCEther.c: no repsonse in BULK IN
Feb 20 10:05:12 K7 kernel: CDCEther.c: rx status -110
```

A: There are a number of reasons this may be happening, and future updates to the CDCEther driver may solve some of them. A user on the Linux-USB-user mailing list noticed that on at least one occasion data sent to the modem from upstream by the cable provider has triggered it. Also, the modem itself is very sensitive to power interruptions and can lose the connection if this occurs. The fix is to run `ifdown ethX`, where `ethX` is the ethernet interface (`eth0`, `eth1` etc.) to clear out any remaining settings that are hung, then remove the module with `rmmmod CDCEther`, reinsert the CDCEther module and then `ifup ethX`. A reboot may be necessary if this doesn't fix the problem. If none of these work you probably have a real service interruption.

Q: I get the following messages on boot-up; are they errors?

```
Can't use SetEthernetMulticastFilters request
Mar  2 11:00:52 K7 kernel: CDCEther.c: Ethernet information found at
device configuration. Trying to use it anyway.
Mar  2 11:00:52 K7 kernel: CDCEther.c: Imperfect filtering support -
need sw hashing
```

A: No. The multicast message is pertaining to Multicast support in the kernel, which is optional and not necessary for the proper functioning of this modem. The message about 'Ethernet Information' is a design bug in the modem and can be ignored. As for the 'Imperfect filtering support,' to quote Brad Hards:

“ This is a bit difficult to explain - I assume that you know what multicasting is - when you join a multicast group, this can be handled by the networking device so that other multicast traffic doesn't cause interrupts. That is called 'perfect filtering.' However sometimes the number of multicast addresses exceeds the number of filters that you have. This leads to 'imperfect filtering,' which can cut down the number of interrupts, but you still need to do some work in the networking stack. Then you get to the typical cable modem implementation, and there is not filtering at all. Every multicast packet goes to the host to be filtered. This doesn't normally matter though, because the cable modem is a point to point link. ”

Q: I'm still having problems, or I'm unusually curious...is there a way that I can get more information about what the device is up to?

A: Yes, there is. The manufacturer hard-wired an http server for status and configuration purposes into the modem itself. It seems to have been designed for troubleshooting by cable technician staff, but you can access the 4100 and 4200 models by directing your web browser to <http://192.168.100.1>. [<http://192.168.100.1>] You will need to kill your firewall if you have one running prior to doing this. You can see statistics, logs and some other miscellaneous info at this address.

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