

Linux Drivers

The IEEE 1394 drivers for Linux are still labeled "experimental", and they change frequently. On this page, we give the latest information about working with the different kernel versions.

Installing IEEE/1394 Capability on LINUX

Kernel 2.6.x has built-in IEEE 1394 support, and these versions are currently recommended. If you are using a MEGA-DCS, MEGA-D, DCAM, or Dual-DCAM (STH-DCAM/-VAR), you should be able to use this version without any kernel recompilation.

Earlier version of the kernel are also usable. There have been some reports of instability problems with 2.4.21, so we recommend using 2.4.22 if you go to a later kernel. On the 2.4.21/22 kernels, the Root node is found correctly, and the "attempt_root" parameter to the ohci1394 module is no longer necessary or permitted (see below under Installation).

Check Memory and Multiprocessors

There are known problems with using the IEEE 1394 drivers with larger memory sizes >> 900 MB and with SMP. The memory problem appears to have been solved with the RH 9.0 distribution (2.4.20). The SMP problem is still present in the low-level Linux IEEE 1394 drivers, but it may be solved in some later 2.6 kernels.

If you have a machine with more than 900 MB of memory, you can limit the amount of memory used by specifying a parameter on boot-up.

Check Version of GCC

With the latest versions of RedHat and some other Linux distributions, GCC has moved from version 2.95/2.96 to version 3.x. Source code compiled under these different versions are incompatible.

To check which version you have, execute:

```
gcc -v
```

This will tell you which version you have. Make sure you download the correct SVS or DCAM software distribution for your GCC version.

GCC 2.95/2.96 support has been discontinued. Please try to upgrade to GCC 3.3 or later.

Installation

To complete Linux installation for SVS, follow these instructions.

- A. Get and install the libraw1394 libraries
- B. Install hardware, check /sbin/lspci to see that it's there

C. Insert IEEE/1394 drivers with modprobe

A. Get and install the libraw1394 libraries

In most distributions, these libraries are already present. You can check by using the command

```
which testlibraw
```

which looks for the libraw test program.

SVS 4.4x uses libraw1394.so.8 (libraw1394-1.2.0). You can download and install it from source at Sourceforge libraw1394 files, or use your favorite package manager.

B. Install hardware, check /sbin/lspci to see that it's there

Plug in the IEEE 1394 board, and restart the computer. Most 1394 boards install just fine. You can check using

```
/sbin/lspci -vvx
```

which gives verbose info about the PCI bus. You should see the 1394 board, and make sure it is both a bus master and has 2 memory segments active. If it doesn't, the problem is most likely a buggy BIOS. On my stupid laptop, the BIOS doesn't configure the 1394 port properly, I have to do it by hand later.

On some systems it appears that the /dev/video1394 and /dev/raw1394 devices are not created. You can check by doing:

```
ls -l /dev/video1394
ls -l /dev/raw1394
```

which should give you a listing - check to make sure permissions are set correctly. If the device is not there, create the device as root using:

```
mknod -m 666 /dev/video1394/0 c 171 16 [kernel 2.6 and above]
mknod -m 666 /dev/video1394 c 171 16 [kernel 2.4.19 and above]
mknod -m 666 /dev/video1394 c 172 0 [kernel 2.4.18 and below]
mknod -m 666 /dev/raw1394 c 171 0
```

Note that 2.6 kernels, and some later 2.4 kernels, have /dev/video1394 as a directory, and 0,1,2,3 as devices for separate cards. Device 0 takes 16 as its minor number, device 1 is 17, and so on. This allows more than one ohci1394 card to be used. If you have more than one card, you must use a later kernel, with the 0,1,2,3 numbering. For these kernels, your /dev/video1394 listing should look like this (for one or two cards):

```
crw-rw-rw- 1 root root 171, 16 Jun 14 2004 0
crw-rw-rw- 1 root root 171, 17 Jun 14 2004 1
```

In RH 8.0/9.0, the /dev/video1394 device is configured as (172,0), which is wrong. You should change it by first deleting the old node (rm /dev/video1394), and then using

the mknod 171,16 statement above.

It appears that security paranoia in RH 8.0/9.0 automatically turns off user permissions on /dev/video1394 whenever a user logs in - it is confused with /dev/videoN, the V4L driver. To turn off this behavior, edit the /etc/console.perms file (as root). Change the following line:

```
<v4l>=>/dev/video* /dev/radio* /dev/winradio* /dev/vtx* /dev/vbi* /dev/video/*  
to  
<v4l>=>/dev/video[0-9] /dev/radio* /dev/winradio* /dev/vtx* /dev/vbi* /dev/video/*
```

Then, change the permissions of the /dev/video1394 device:

```
chmod a+rw /dev/video1394  
chmod a+rw /dev/video1394/0 -- if you have 0,1,2,3 devices in video1394
```

Note: if you have a later kernel with video1394/0,1,2,3 devices, then you have to set permissions on both the video1394 directory, and the individual devices.

The permissions on /dev/raw1394 may also be set to deny user access. Change them so that all users have r/w access. Unlike the /dev/video1394 permissions, these settings are not reset by the system, so no further action is necessary.

C. Insert IEEE/1394 drivers

The IEEE 1394 Linux drivers are usually configured as loadable modules. In RH 8.0/9.0, the ieee1394 and ohci1394 drivers are installed automatically if there is an IEEE 1394 OHCI card present, or one is inserted into a PC card slot. To add the video1394 and raw1394 modules, use the following additions to /etc/modules.conf:

```
above ohci1394 raw1394 video1394  
options ohci1394 attempt_root=1 [NOTE: ONLY FOR EARLY KERNELS]  
If you have a later kernel with /etc/modprobe.conf, use the following additions:  
install ohci1394 { /sbin/modprobe --ignore-install ohci1394; } ; /sbin/modprobe  
raw1394 video1394
```

If you want to install the modules on your own, or you have an older version of the kernel, here's a sample shell for installing the drivers:

```
echo "Adding modules..."  
/sbin/modprobe ieee1394  
/sbin/modprobe raw1394  
/sbin/modprobe ohci1394 attempt_root=1 [NOTE: FOR LATER KERNEL,  
REMOVE THE PARAMETER ATTEMPT_ROOT]  
/sbin/modprobe video1394  
/sbin/lsmmod
```

In a desktop system, you can install a script with these commands at the end of /etc/rc.d/rc.local.

You can check that the host controller is root by looking at the output from:

```
cat /proc/bus/ieee1394/devices | grep Root
```

which should produce the output:

```
Root    : yes
```

If the IEEE 1394 system ever gets hung, you have to unhang it by removing all the modules, and re-installing them.

Notes on Installing PCMCIA Cards

PCMCIA card support for IEEE 1394 is stabilizing, but still has some idiosyncracies. When the PC card is plugged in, ieee1394 and ohci1394 modules are loaded on RH 8.0/9.0. If you follow the directions above for modifying the modules.conf file, the correct options for ohci1394 will be present, and the raw1394 and video1394 modules will be pulled in.

To test your setup, insert the PCMCIA card. You should get two high beeps, to indicate the card driver was found by the PCMCIA subsystem. Check (with /sbin/lsmmod) to see that the ohci1394 driver was loaded. If not, load it by hand (modprobe ohci1394 attempt_root=1). Finally, check that raw1394 and video1394 modules were pulled in. If not, load them by hand.

To take out the card, you must remove video1394 and ohci1394, in that order (rmmod). Then eject the card. If you fail to remove ohci1394, you'll get a kernel oops.

Special Notes for MEGA-D Devices

MEGA-D devices had some problems with later kernel versions, especially 2.4.20. These problems have been fixed in the latest version of the SVS software (3.0e). MEGA-D devices will work correctly with 2.4.19 and 2.4.20 kernels. MEGA-D devices do not work with the IEEE 1394 drivers in kernels >= 2.4.21, and there is no workaround using the SVS software. If you wish to use 2.4.21+ kernels or the latest CVS version of the IEEE 1394 drivers, you must patch the IEEE 1394 kernel drivers, and recompile the kernel. The patch can be found [here](#) for 2.4 kernels and [here](#) for 2.6.x (x < 20) kernels and [here](#) for 2.6.x (x >= 20) kernels. Apply the patch in the drivers/ieee1394 directory as follows:

```
patch nodemgr.c nodemgr-patchXXX.txt
```

and then re-make and re-install the modules. Since there are some stability issues with 2.4.21 kernels, we recommend going to 2.4.22. Note that the "attempt_root" parameter is no longer necessary or permitted with the ohci1394 module for these kernels.

Debugging

There are many places where the IEEE 1394 installation can go awry. These are some of the common problems.

1. Make sure libraw access is working. Run the program `/usr/bin/testlibraw` that comes with the libraw distribution, and check that there are no errors in the output. Another good program to run is `gscanbus`, which will show devices on the bus.
2. Check that all required modules are loaded: `ieee1394`, `raw1394`, `ohci1394`, and `video1394`. `video1394` won't load if `ohci1394` isn't loaded, or there are no OHCI cards present.
3. If there is a "no image, timed out" message in the `smallv` application when `Continuous` is invoked, then there may be a problem with the `ohci1394` module. Use the command:

```
cat /proc/bus/ieee1394/devices | grep Root
```

If `Root` is "no", then there is no IEEE 1394 root node, and interrupts will not be delivered. Try installing the `ohci1394` with `attempt_root=1`.

4. If there is an error from `smallv` in accessing `/dev/video1394`, check that this device has been created and has the right permissions. Make sure to look at the node creation information above. Your console output, on opening the device, will look like this:

Imager ready.

Camera ISO speed set to 400 Mb/sec

Camera ISO parameters: 2000000

Failed to open video1394 device, errno XX

Opening Stereo Device Failed

Make sure you have the right node number for `/dev/video1394`. For 2.4.18 kernels and below, use (172 0). For 2.4.19 and above, use (171 16).

Here are the common sources of errors for failing to open `video1394`:

error 20: `/dev/video1394/0` does not have "rw" permission for all users

error 19: `video1394` driver is not installed - use "`modprobe video1394`", and check the `/dev/video1394` has the correct node listing - usually it should be 171,16.

error 13: `/dev/video1394` does not have "rw" permission for all users

error 2: `/dev/video1394` is not created

error 6: `/dev/video1394` has the wrong device number (172,0 or 171,16)

Using libdc1394

All MDCS and DCSG cameras are IIDC v 1.30 compliant, so you can use `libdc1394` to control them and capture images. Here are some notes on using the library.

1. For older devices ONLY, with FW version < 2.5 (March 2005), there is a problem with controlling the parameters of the cameras. The firmware expects a bit to be set to indicate that the parameter was changed. Just modify the function `SetFeatureValue` in `dc1394_control.c` of the library in the following way:

```
retval= SetCameraControlRegister(handle, node, offset,
                                (curval & 0xFFFFF000UL) |
                                (value & 0xFFFUL));
```

should be:

```
retval= SetCameraControlRegister(handle, node, offset,
                                (curval & 0xFFFFF000UL) | 0x20000000UL |
                                (value & 0xFFFUL));
```

This will enable control of the camera video parameters like exposure.

2. Use DMA mode for capturing images. The buffer-copy mode is too slow.

3. STH-MDCS devices send their image data as 2-byte pixels, with the left image in the upper byte (YUV 422 format). Single MDCS devices send their image data as 1-byte pixels (Mono format). If the device is a color device, then the image data is a Bayer pattern.

4. Some devices have extra parameters that are not present in the IIDC specification. There are two local IEEE 1394 addresses used by devices:

- 0x FFFF F0FF 0800 - holds uploaded calibration parameters

- 0x FFFF F0FF F000 - holds device-dependent parameters

It is recommended that these local parameters be accessed implicitly through the appropriate SVS functions. However, we recognize that some users may want to program the registers directly through the Linux libraw1394 interface. Please consult the device manual for relevant local parameters and their effect.