The BTTV Mini−HOWTO

Table of Contents

The BTTV Mini−HOWTO

By Eric Sandeen, `eric_sandeen@bigfoot.com`

v0.3, February 2000

This document describes the hardware, software, and procedures needed to use a bt8x8 chipset based frame grabber or TV tuner card under Linux.

---

1. Introduction

The ability to capture and view video sources is one of the more interesting multimedia features of Linux. Many different types of video devices are supported via the video4linux API (http://roadrunner.swansea.uk.linux.org/v4l.shtml), including several TV tuner cards based on the Conexant bt848 and bt878 chipsets. This document explains how to use these cards on a Linux system.

1.1 Copyright of this document

1.2 Where to get this document

The most recent official version of this document can be obtained from the Linux Documentation Project http://metalab.unc.edu/LDP/.

1.3 Acknowledgments

Thanks to Ralph Metzler and Marcus Metzler for writing the original bttv driver. Also, Alan Cox for creating the Video4Linux API, Gerd Knorr for his work on the radio cards, subsequent bttv releases, and xawtv. And everyone else who contributed to Linux support for these cards. Thanks to William Burrow, who also wrote a BTTV Howto (which I learned about *after* I wrote this document...) I have improved this guide, thanks to his work.

In writing this HOWTO I have drawn heavily on the bttv and xawtv documentation.

1.4 Disclaimer

Use the information in this document at your own risk. I disavow any potential liability for the contents of this document. Use of the concepts, examples, and/or other content of this document is entirely at your own risk.

All copyrights are owned by their owners, unless specifically noted otherwise. Use of a term in this document should not be regarded as affecting the validity of any trademark or service mark.

Naming of particular products or brands should not be seen as endorsements. You are strongly recommended to take a backup of your system before major installation and backups at regular intervals.

2. Hardware Requirements

From the bttv `README`:

Bttv is a device driver for frame grabber cards using the Conexant (http://www.conexant.com) Bt848 family of video decoder chips. Among those are the Bt848, Bt848A, Bt849, Bt878 and Bt879. The only major differences between the cards by different manufacturers are the types of tuners and extra components on the boards. E.g., some cards by Hauppauge have an additional Videotext decoder and/or sound decoder chip. Only some of these additional components are supported by bttv. Also, type (Composite or S−Video) and number of inputs differ.

The following cards should work:

- **AverMedia TV98**
    - http://www.aver.com/products.html
- **AVerMedia TV−Phone**
    - http://www.aver.com/lite/products/avertvphone.html
- **Diamond DTV2000**
    - http://www.diamondmm.com/products/current/dtv−2000.cfm
- **Hauppauge Win/TV pci** (and other Hauppauge cards)
    - http://www.hauppauge.com/
- **IDS Imaging FALCON**
    - http://www.ids−imaging.de/
- **Lifeview Flyvideo II**
    - http://www.lifeview.de/lifeview/html/produkte.htm#karte
- **Matrix Vision MV−Delta**
    - http://www.matrix−vision.de/
- **miroVIDEO PCTV**
    - http://www.pinnaclesys.com/
- **Osprey−100**
    - http://www.mmac.com/products/osprey/osprey100.html
- **STB TV PCI**
    - http://www.stb.com/products/multimedia/tvpci/tvpci.html
- **Terratec TERRA TV+**
    - http://www.terratec.de/produkte/terratv/terratv_info.htm
- **Videologic Captivator PCI**
    - http://www.videologic.com/Productinfo/capt_pci.htm

If you know of other cards which work, please email me and I'll add them in the next revision of this document.

---

3. Software Requirements

To use these TV tuner cards under Linux, you will need the appropriate kernel drivers. The bttv drivers have been a part of the kernel distribution since version 2.2.0.

Alternately, you can get the latest version of tbe driver package and use it with 2.0.35 or newer kernels. However, it's not guaranteed to work with the older 2.0.x series kernels. The updated bttv package is available from http://www.thp.uni−koeln.de/~rjkm/linux/bttv.html, and an even more updated version is available from Gerd Knorr at http://www.in−berlin.de/User/kraxel/xawtv.html These packages add support for more audio chips, including the TEA6300, TDA8425, and DPL3518.

If you're new to the world of the bttv driver, I would suggest starting with the version included with the latest kernel. If you find that you have trouble with it, or that it does not support your card, then venture out to the updated 0.6 series drivers at the locations shown above. If you're feeling really adventurous, you can try Gerd Knorr's 0.7 series drivers, due to be incorporated in the 2.4 kernel. The 0.7 series drivers are also available at http://www.in−berlin.de/User/kraxel/xawtv.html.

This document is based primarily on the 2.2.14 kernel drivers, with some mention of the features available in the updated 0.6 series driver packages. The 0.7 series is currently not covered, as it is in heavy development at the time of this writing.

---

4. System Configuration

4.1 Hardware Installation

(Thanks to William Burrow for this section.)

If you are afraid to open the case of your computer, be sure to read over this entire HOWTO first and make notes about the card, such as its tuner type, integrated circuit numbers, the frequencies of the crystal(s) and so on. Then get someone competent to install the card for you.

Otherwise, open the case and install the card in an available slot. Pick one that supports PCI bus transfers and PCI bus mastering, if your mainboard is picky about this (see your mainboard's manual). You will want this for overlay mode.

For sound, there are two different ways to connect your video grabber card and your sound card. One way is internal routing. Connect your CD−ROM audio cable to the video card sound input and the video card output to the sound card CD−ROM or Tuner audio input. Another way is to connect the external 1/8" audio jack on the video card to the audio card's 1/8" line audio in jack. You can also just plug amplified speakers into the grabber card audio out if you do not have an audio card or don't want to route through the sound card. (A few of the newer bt878 cards don't have any sound connector, because they send digital audio data across the PCI bus. There is no support for this at the time of this writing.)

A video source is also handy, especially for determining if the card is working or not. Many cards handle composite video in, S−Video in and, if equipped with a tuner, RF in. There is a separate connector for each of these inputs.

4.2 Kernel Configuration

Your kernel will need to be correctly configured to support your card. Most newer Linux distributions come with the necessary modules already compiled, so if you can find the `videodev.o`, `bttv.o`, and `tuner.o` under `/lib/modules/2.x.x/misc`, you should be ready to go.

If not, you'll need to recompile your kernel with

```
CONFIG_VIDEO_DEV
```

and

```
CONFIG_VIDEO_BT848
```

enabled, preferably as loadable modules. See the Linux Kernel HOWTO (http://www.linuxdoc.org/HOWTO/Kernel−HOWTO.html) for details on recompiling your kernel.

4.3 Using the updated 0.6.x packages

If you want to use the updated 0.6.x package, you should first retrieve the archive from one of the sites mentioned above. Extract it with

```
tar −xvzf bttv−0.6.x.tar.gz
```

and change to the newly created directory. `su` to root, and type

```
make
```

in the main directory to create the drivers. (You can safely ignore the information in the `INSTALL` file about editing makefiles, and the like, since we will pass this information to the driver as module parameters.) Then, type

```
make install
```

to install them. Finally, run

```
/sbin/depmod −a
```

to update your module dependency information.

4.4 Special files in `/dev`

Next, you may need to make the special character files in the `/dev` directory. Type `ls /dev/video*; ls /dev/radio*` to see if these devices already exist. If not, you'll need to create them. All of the files have major device number 81, and the minor device numbers depend on the specific device (video, radio, etc.) as well as multiple instances of these files. See the Video4Linux API (http://roadrunner.swansea.uk.linux.org/v4lapi.shtml) for the programming−related details.

There is a `MAKEDEV` script in the `driver` directory of the bttv driver package which will create four video devices for you. You can also do it yourself fairly easily if you only have one video capture card. As root, type:

```
mknod /dev/video0 c 81 0
```

```
chmod 666 /dev/video0
```

```
ln −s /dev/video0 /dev/video
```

```
mknod /dev/radio0 c 81 64
```

```
chmod 666 /dev/radio0
```

```
ln −s /dev/radio0 /dev/radio
```

There are also videotext and VBI devices which can be created if you have an application which needs them. (Currently, there are only a few.) Type:

```
mknod /dev/vtx0 c 81 192
```

```
chmod 666 /dev/vtx0
```

```
ln −s /dev/vtx0 /dev/vtx
```

```
mknod /dev/vbi0 c 81 224
```

```
chmod 666 /dev/vbi0
```

```
ln −s /dev/vbi0 /dev/vbi
```

4.5 Loading the Modules

The bttv driver provides many different modules, with many different options, as described in the appendix of this document. With so many modules and options, you may wish to do this by hand until you get everything working. On the off chance that this causes your box to crash, it wouldn't hurt to type

```
sync; sleep 1; sync
```

to flush any dirty disk buffers before proceeding. Then, using the `insmod` command as root, try loading up the modules. The first two are easy, because they don't usually need any options:

```
insmod videodev
```

```
insmod i2c
```

Now you're ready to load the bttv module itself:

```
modprobe bttv
```

By default, the `bttv` module attempts to autodetect your card type. Watch `/var/log/messages` to see what it finds. If it doesn't autodetect properly, you can add the `card=`*n* option to the end of the previous command to force a card type, with *n* chosen from the following list. (Types 0 through 19 are provided in the kernel series driver, bttv−0.6.4h contains support for types 20 through 27) You can also add the `radio=1` option if your card has FM tuner functionality.

```
card=n          card type
                0:  Auto-Detect
                1:  Miro
                2:  Hauppauge (old bt848 boards)
```

```
                3:  STB
                4:  Intel
                5:  Diamond
                6:  AVerMedia
                7:  MATRIX Vision MV−Delta
                8:  FlyVideo
                9:  TurboTV
                10: Hauppauge (new bt878 boards)
                11: MIRO PCTV pro
                12: Terratec/Vobis TV−Boostar
                13: Newer Hauppauge WinCam (bt878)
                14: MAXI TV Video PCI2
                15: Terratec TerraTV+
                16: Aimslab VHX
                17: PXC200
                18: AVermedia98
                19: FlyVideo98 (newer FlyVideo cards)
                20: Zoltrix TV−Max
                21: iProTV
                22: ADS Technologies Channel Surfer TV
                23: Pixelview PlayTV (bt878)
                24: Leadtek WinView 601
                25: AVEC Intercapture
                26: LifeView FlyKit w/o Tuner
                27: Intel Create and Share PCI
```

Next, load the tuner module, with

`modprobe tuner type=`*n*

You will probably need to dig into your case to see which tuner you have. Some cards (Miro and Hauppauge) allow the tuner to be automatically detected, but you may need to specify it. The tuner should be marked with the brand name, and you can look at the crystals (little aluminum cans) on the board to see if you have an NTSC or a PAL tuner. For PAL, the crystal is marked 28.xxxMHz (where xxx are three digits). For NTSC, the canister should say 35.xxxMHz. Once you have identified your tuner, select the value of *n* from the following list (types 8 and 9 are included only in bttv−0.6.4h):

```
type=n          type of the tuner chip. n as follows:
                0: Temic PAL tuner
                1: Philips PAL_I tuner
                2: Philips NTSC tuner
                3: Philips SECAM tuner
                4: no tuner
                5: Philips PAL tuner
                6: Temic NTSC tuner
                7: Temic PAL tuner
                8: Alps TSBH1 NTSC tuner
                9: Alps TSBE1 PAL tuner
```

Finally, insert any sound modules you may need. Again, you will probably need to take a very close look at the card to see what you've got. Note that drivers for TEA6300, TDA8425, TDA9855, and DPL3518 chips are only included in the 0.6.4h series driver, and are not included with the current (2.2.14) kernel drivers.

`modprobe msp3400` or `tea3600` or `tda8425` or `tda9855` or `dpl3518`(see the appendix for details and options)

Fire up your favorite video4linux program, and see if it works. If you can't change the channel, make sure you have inserted the correct tuner module. If you can't hear any sound, double check the sound module, and make sure that the channel is not muted, if you're running the audio through your sound card.

4.6 Automating the process

After you know which modules and options you need, you can automate the process by putting the information into `/etc/conf.modules`. Then, running an application which needs the driver will cause it to be loaded automatically. I use the following:

```
# TV
alias   char−major−81   bttv
pre−install bttv        modprobe −k tuner; modprobe −k msp3400
options bttv            radio=1 card=3
options tuner           type=2
```

Be sure change this to reflect the proper modules and options for your particular card. (Run an `/sbin/depmod −a` to make sure all your module dependency information is up to date, as well.)

5. Applications

Now that your kernel is configured, your devices have been configured, and your modules are inserted, you will also need an application to actually view or capture the images from your card. There are many available:

- **bttvgrab** − Provides high−quality grabbing suitable for video recording
    - http://moes.pmnet.uni−oldenburg.de/bttvgrab/
- **Gnome−o−Vision** − A viewer for the Gnome desktop environment (currently under development in the Gnome CVS)
    - http://cvs.gnome.org/lxr/source/gnomovision/
- **kwintv** − Qt−based TV viewer for the KDE environment
    - http://www.mathematik.uni−kl.de/~wenk/kwintv/
- **wmtune** − window maker radio tuner applet for bttv based TV/radio cards
    - http://home.pages.de/~fionn/archive/wmtune−1.0_bttv.tar.bz2
- **wmtv** − WindowMaker TV dock.app
    - http://www.student.uwa.edu.au/~wliang/
- **XawTV** − a TV application and a few utilities
    - http://www.in−berlin.de/User/kraxel/xawtv.html
- **XtTV** − Simple TV/Video program for Linux/X Windows
    - http://home.pages.de/~rasca/xttv/

There is also a driver available for the FlyVideo98 Remote control card at http://wolf.ifj.edu.pl/~jochym/FlyVideo98/

Be sure to read the documentation for any applications you plan to use. Many of them require detailed configuration files to be edited before the application will work properly! Due to the many different types of cards out there, you *must* take the time to read the documentation on most of these, as the application defaults will most likely *not* work for your card.

6. Appendix − Arguments for All Modules

Items preceded with a "*" are only available in the 0.6.4h series driver

```
videodev.o
        this is the basic video4linux module, all video
        drivers (incl. bttv) register themselves here.

i2c.o
        the generic i2c module. It does much of the i2c bus
        management, all other modules (except videodev.o)
        use this one

        insmod args:
                scan=1          scan the bus for i2c devices
                verbose=0       shut up i2c
                i2c_debug=1     for debugging, it sticks the
                                whole (software) i2c bus
                                traffic to the syslog

bttv.o
        the bt848 (grabber chip) driver

        insmod args:
                remap=adr       remap Bt848 memory to adr<<20
                vidmem=base     frame buffer address>>20 (of graphic card)
                triton1=0/1     for Triton1 compatibility
                                Triton1 is automatically recognized
                                but this might also help with other chipsets
                pll=0/1/2       pll settings
                                0: don't use PLL
                                1: 28 MHz crystal installed
                                2: 35 MHz crystal installed
                radio=0/1       card supports radio
                card=n          card type
                                0:  Auto-Detect
                                1:  Miro
                                2:  Hauppauge (old bt848 boards)
                                3:  STB
                                4:  Intel
                                5:  Diamond
                                6:  AVerMedia
                                7:  MATRIX Vision MV-Delta
                                8:  FlyVideo
                                9:  TurboTV
                                10: Hauppauge (new bt878 boards)
                                11: MIRO PCTV pro
                                12: Terratec/Vobis TV-Boostar
                                13: Newer Hauppauge WinCam (bt878)
                                14: MAXI TV Video PCI2
                                15: Terratec TerraTV+
```

```
                                16: Aimslab VHX
                                17: PXC200
                                18: AVermedia98
                                19: FlyVideo98 (newer FlyVideo cards)
                                *20: Zoltrix TV-Max
                                *21: iProTV
                                *22: ADS Technologies Channel Surfer TV
                                *23: Pixelview PlayTV (bt878)
                                *24: Leadtek WinView 601
                                *25: AVEC Intercapture
                                *26: LifeView FlyKit w/o Tuner
                                *27: Intel Create and Share PCI

        remap, card, radio and pll accept up to four comma-separted arguments
        (for multiple boards).  The CARD and PLL defines from the Makefile
        are used as defaults.

msp3400.o
        The driver for the msp34xx sound processor chips. If you have a
        stereo card, you probably want to insmod this one.

        insmod args:
                debug=1/2       print some debug info to the syslog,
                                2 is more verbose.

*tea6300.o
        The driver for the tea6300 fader chip.  If you have a stereo
        card and the msp3400.o doesn't work, you might want to try this
        one.  This chip is seen on most STB TV/FM cards (usually from
        Gateway OEM sold surplus on auction sites).

        insmod args:
                debug=1         print some debug info to the syslog.

*tda8425.o
        The driver for the tda8425 fader chip.  This driver used to be
        part of bttv.c, so if your sound used to work but does not
        anymore, try loading this module.

        insmod args:
                debug=1         print some debug info to the syslog.

*tda9855.o
        The driver for the tda9855 stereo decoder / audio processor chip.

        insmod args:
                debug=1         print some debug info to the syslog.

*dpl3518.o
        Driver for the dpl3518a Dolby Pro Logic Processor

        insmod args:
                debug=1         print some debug info to the syslog.

tuner.o
        The tuner driver.  You need this unless you want to use only
        with a camera or external tuner ...

        insmod args:
                debug=1         print some debug info to the syslog
                type=n          type of the tuner chip. n as follows:
                                0: Temic PAL tuner
```

```
                                1: Philips PAL_I tuner
                                2: Philips NTSC tuner
                                3: Philips SECAM tuner
                                4: no tuner
                                5: Philips PAL tuner
                                6: Temic NTSC tuner
                                7: Temic PAL tuner
                                *8: Alps TSBH1 NTSC tuner
                                *9: Alps TSBE1 PAL tuner

i2c_chardev.o
        provides a character device for i2c bus access.  Works for 2.1.x
        only, not compiled by default.
```