

## SageTV Firewire Settop Box Tuner Setup

The Following instructions are a very comprehensive look at exactly what is needed for a firewire equipped STB to be used as a tuner from within SageTV. These instructions also detail how to set up more than one STB via firewire.

These instructions are courtesy of my personal experiences and all of the work put forth by people from the SageTV forums that have been doing this before I came around. Many thanks to them. Thanks also go out to the author of SGraphRecorder as this is not doable without his software.

And for all of the Firewire users out there, we all must say thanks to Timm Moore for his work on the FireSTB package that this and many other firewire setups critically rely on.

If you have any comments or would like me to change or add anything, please e-mail me at [jokerofdeath@gmail.com](mailto:jokerofdeath@gmail.com) .

SageTV Firewire Settop Box Tuner Setup .....	1
Assumptions.....	3
Required Software .....	3
Graphedit.....	3
Connecting the Set Top Box - FireSTB .....	4
Testing with the VideoLan Media Player .....	4
Channel Change via Firewire.....	5
SgraphRecorder.....	6
SGraphRecorder Configuration .....	8
SageTV .....	10
The Final Steps .....	12
Last Points and Recommendations. ....	13
Appendix.....	14
HD Playback Requirements .....	14
5C – What is the Deal? .....	14
Video Decoders.....	15

## Assumptions

- You are planning on doing this on Windows.
- You are installing a set top box (STB) with a connection via firewire to use as a SageTV tuner.
- Your tuner has an active firewire port, and your cable company is not setting 5C=1 or 5C=2. For instructions on how to check this, see the appendix.
- Your system has enough CPU horsepower and a good enough graphics card to record and play back HD content. See appendix for HD requirements that are well proven minimums.
- If you are configuring this remotely, your bandwidth is sufficient. 100mbps Ethernet is as slow as you can go. Wireless N is the slowest wireless for playback of prerecorded content only.

## Required Software

Graphedit  
FireSTB.msi or one of the zip files  
SGraphRecorder  
Proppage.dll

## Graphedit

<http://www.digital-digest.com/dvd/downloads/graphedit.html>

[http://www.apecity.com/tivo/graphedit\\_dx9.zip](http://www.apecity.com/tivo/graphedit_dx9.zip)

From the first link above, download graphedit or Google search for graphedit and download from your own chosen source. You will also need proppage.dll, which is not included in the first link. Find that file as well or It can be found in the zip in the second link above.

For installation, I simply created a folder **C:\GRAPHEDIT** and put everything there.

If you used the first link, which comes with several filters, open a command, unzip it into a directory you can easily get to through a command prompt. Go there and execute **register.bat**. This will register all the filters. Now put proppage.dll in the same directory and execute **regsvr32 proppage.dll** from the same folder. You should see a successful registry of the file.

Open graphedit and see if it works. If it opens, close it and continue.

## Connecting the Set Top Box - FireSTB

<http://home.comcast.net/~timmmoore/firewire/readme.htm>

If you have not already connected your STB to your PC, please see the above link for the FireSTB download and the instructions on how to install it. Within the instructions there is an explanation on how to install the package for use with other applications than MCE / Vista MCE. This is what we are interested in. I know that there are those out there that are suggesting to download a file called firewire.zip or firestb.zip but the caution that I must state is that these files are not as new as the FireSTB.msi file from Timm's site. This includes newer versions of the channel.exe and channelw.exe files and as channel changes are VERY important, it is more often best to use the newer files.

The short instructions are:

1. Download the file
2. Install (For Non WXP MCE, use **msiexec /i firestb.msi IDENT="1"** as your command.
3. Reboot
4. Once Windows is started back up, connect the STB (or STBs if you have more than one) via firewire

When Windows starts asking for drivers, allow it to automatically choose but do not allow it to search the internet as it will find nothing.

As this is needed for further configuration steps, the path to the software is:  
**C:\Program Files\Timm Moore\MCE 2005 STB Controller**

## Testing with the VideoLan Media Player

Now we take a moment to test that you have a solid and dependable firewire connection to the STB.

Download the VLC media player as it is capable of communicating with any variety of connections and files. If you are like most, you like opening media files in certain programs. When you install VLC, it can sometimes hijack certain types of media files. If it gives you an option to associate file types, clear them. We just want the player to test with.

VLC can be found here: <http://www.videolan.org/vlc/>

Install it. Open the vlc player. Choose File – open capture device. Next to video device name, click refresh. Your tuner should now be in the list. Select it. Hit play. With your remote (or if you have skipped ahead and read the firewire channel change section, use channelw.exe or channel.exe) change the channels on your set top box and see if you are getting video. If nothing is playing on any channel, you likely have a problem that is unfixable by the average user or your cable company is setting 5C to higher than 0 on all the content (See appendix for info). If you are getting video, excellent. You can capture this and use it in Sage.

Note that you will want to perform this test for each STB that you have connected.

## Channel Change via Firewire

Now we need to set up the channel changing. There are alternate ways to do this but the best overall method is via firewire. For information on other methods, please see Spaceghost's post at:

<http://forums.freytechnologies.com/forums/showthread.php?p=91976&postcount=355>

Get yourself to a DOS prompt and get to the installation directory for FireSTB. From here, you can execute the channel.exe application and it will allow you to change channels.

The very first command you really need to run is: **channel.exe -v** This will list off all of your tuner devices that channel.exe can see.

You will see output that looks something like this:

```
Firewire STB channel changer V1.0.9, by timmmoore
Device 1 Channel 1 Timeout 0 Dec 0
1 "FireBus MPEG2TS Tuner Subunit Device"
'Motorola AV/C Tuner Device'
"@device:pnp:\\?\avc#motorola&dct-6200&typ_5&id_0#376ed3feff5c0e00#{65e8773d-8f56-11d0-a3b9-00a0c9223196}\global" 0
2 "FireBus MPEG2TS Tuner Subunit Device"
'Motorola AV/C Tuner Device'
"@device:pnp:\\?\avc#motorola&dct-6200&typ_5&id_0#84fea2feff9f0f00#{65e8773d-8f56-11d0-a3b9-00a0c9223196}\global" 0
3 "Motorola AV/C Panel Device"
'Motorola AVC Panel Device'

UniqueID '376ed3feff5c0e00'
VendorID 'e5c'
ModelID '620a'
VendorText 'MOTOROLA'
ModelText 'DCT-6200'
"@device:pnp:\\?\avc#motorola&dct-6200&typ_9&id_0#376ed3feff5c0e00#{65e8773d-8f56-11d0-a3b9-00a0c9223196}\global" 1
```

#### 4 "Motorola AV/C Panel Device" 'Motorola AVC Panel Device'

**UniqueID '84fea2feff9f0f00'**

VendorID 'f9f'

ModelID '620a'

VendorText 'MOTOROLA'

ModelText 'DCT-6200'

"@device:pnf:\\?\avc#motorola&dct-6200&typ\_9&id\_0#84fea2feff9f0f00#{65e8773d-8f56-11d0-a3b9-00a0c9223196}\global" 1

The information that you are looking for is highlighted in bold. This is the device number that you need to specify to change channels on a specific STB. You will also note that it shows the actual MAC address for each of the devices. Due to all kinds of smart reasons, the manufacturers of nearly every device that has MAC addresses assigned to it also has the MAC on a sticker on the STB. You can search the back, bottom or the system menu of your device to locate it. If you are only installing one STB, this is unnecessary. If you are adding more, it is supremely important. Take great care to associate the tuner # and AVC panel # that is associated with a MAC as this is needed when setting up SGraphRecorder.

Back to the command prompt, you can now use channel.exe or channelw.exe to change the channel. The command for the above examples would read:  
**channel.exe -v T CCC** where **T** is the AVC panel and **CCC** is the channel that you want to change to.

There are many other settings and switches in channel.exe but these are described at length in the readme that comes with the FireSTB package and the readme can be found in the install path of FireSTB.

Some have used the channel.exe, with VLC running and playing, to figure out which channels are not set above 5C=0. There is no real science to the setting of 5C and in some cases, only certain shows on certain channels are set to higher than 5C=0. If you choose to do this, make note of the channels that work as this will ease your setup once in SageTV.

Fortunately, I live in an area that has all channels and all shows set to 5C=0.

### SgraphRecorder

<http://www.nolberger.se/Sage/GraphRecorder/>

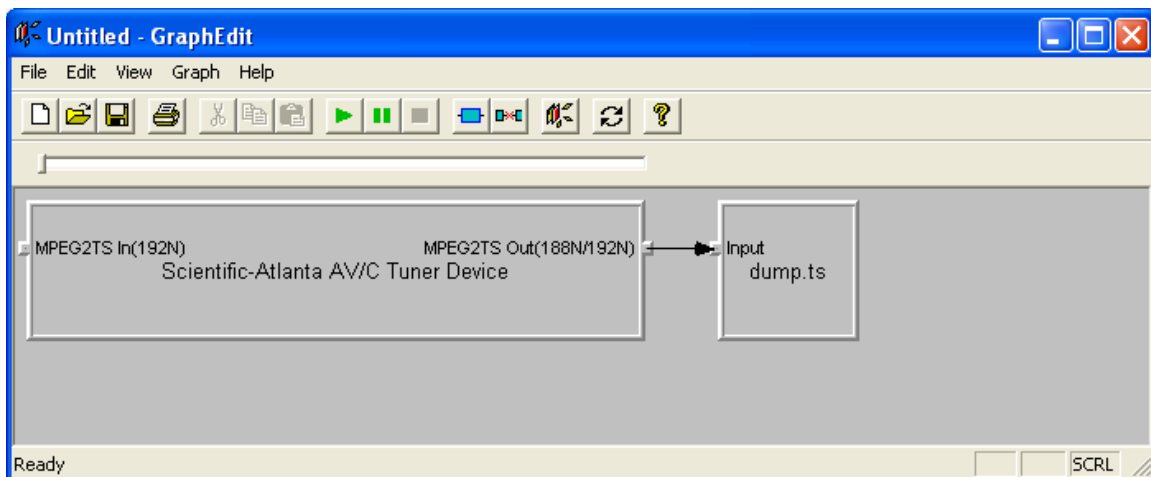
Go to the link above and download SgraphRecorder. Create a directory under the FireSTB install folder called SGR1 (Create one called SGR2 and so on for every additional STB you will hook up). Unzip the contents into the directories you created. Go there and execute regdumpfilter. Or execute regsvr32 dump.ax.

Note that you could put the SGR folders anywhere but I chose to keep them with the FireSTB install.

Now we must use Graphedit to create a template file for SGraphRecorder to use.

Open Graphedit. We are going to create a simple graph that captures the video stream coming from the firewire and dump that to a file. In Graphedit, the screen should be clear. Choose **Graph – Insert Filters**. Expand **Video Capture Sources** and choose your **TUNER** device. (not the AVC panel). It will place that filter into your graph. This is the point at which a multiple STB setup requires the MAC addresses. If you expand the TUNER element before adding it, you will see that Graphedit shows you the MAC. You are now able to identify which STB you are communicating with.

Now choose graph, insert filter again. Expand Directshow Filters, and choose **SBDARecorderDump**. It will ask for a file. For now – choose any file location. Such as c:\dump.ts (The file extension is arbitrary and you can use avi if you desire). Now connect the two filters by clicking on the output from the capture device and dragging the line to the input of the dump file. It should look like this:



Now push play. In another window, open up explorer and browse your directory. Keep hitting F5 to refresh and you should see your dump.ts growing. Of course you need to be on a channel where you are getting SD or HD video (see last testing section). Once you have captured some, hit stop. Open that file in Windows Media Player and see if it plays. If it does, great job. If it does not play, or does not play well, it might be a video decoder issue (See the appendix for details on video decoders).

**Now this is important.** Right mouse click on the dump.ts filter in graphedit – and edit the file location. Change this location to the directory (and drive letter) of

your SageTV recording directory. Name the file anything, such as dump.ts, or null.ts. Now in graphedit, choose **File, save as graph**, and save the graph as **C:\LOCATION-OF-YOUR-SGR-DIRECTORY\sgrx.grf** where the x in sgrx.grf is the same as the sgr folder you are saving to. This task is needed to be completed for each STB that you plan on installing.

**A note regarding setting up your firewire STBs on a different PC.** If you are configuring this on a remote system – (on a separate system than your Sage server, then your drive letters must match. For instance, if you have a dedicated local G: drive with a path of **g:\recordings** and Sage uses this to store recordings, you must share the root of this drive and map that share on the remote systems as **G:**. This is necessary if you plan on using SGR tuners on a separate PC from the actual SageTV server.

The dump file you created will never really get used by sgraphrecorder. It will instead grab the graph and send the data through to SageTV and create a normally named file like all the rest of the files in the recordings directory. It does need to be in the same directory though.

Now that you have saved that graph in your working directory. Lets configure SGraphRecorder to use that graph and to change the channel via firewire. Make sure graphedit is now closed.

## **SGraphRecorder Configuration**

Open your working directory (where sgr was unzipped). You will see an sgraphrecorder.ini file. Here is how it is constructed:

### **[System]**

**Port=6969**

### **[Graph]**

**FileName="C:\Program Files\Timmmoore\MCE 2005 STB  
Controller\sgr1\sgr1.grf"**

**TuningDelay=0**

**UnloadGraphOnStop=1**

**UnloadGraphOnSwitch=0**

### **[Girder]**

**UseGirder=0**

**GirderHost=127.0.0.1**

**GirderPort=1024**

**GirderPassword=**

**GirderPrefix=Channel**

**GirderIndividualNumbers=1**



**GirderInterNumberTimeSpacing=10**

**[ExeTuner]**

**UseExeTuner=1**

**ExeTunerPath=C:\Program Files\Timm Moore\MCE 2005 STB  
Controller\channelw.exe -v 2**

The above is an example of my Tuner #1 config.

In the **System** section, the port number can be left as is for a single STB setup. If you are setting up more than one, you need to choose a different port for each STB. I simply chose to increment by 1 for each STB, so my second STB is set for a port of 6970.

In the **Graph** section, you specify the path to the grf file that is for the STB in question. So if this is your first tuner, then set it to **your path\sgr1.grf**. The tuning delay setting is a delay of how long to start using the graph to record after the channel has been changed. As you can see, I left it as 0. You can play with this as you see fit.

The **Girder** section is for users of girder. Where I do not use Girder nor have any experience, I will not be covering the settings in these instructions. Do note that the author of SGR has ample information comments in the INI file.

The **ExeTuner** section is what we are interested in as this is where we set the channelw.exe application to be fired off from. This is another section that is important for a multiple STB setup so be sure that when you add the -v and the number, that you are putting in the right one. Otherwise, you will change channels on the wrong STB. Note also that **UseExeTuner** is set to 1. If you are not going to use this form of channel change, set this to 0.

## SageTV

You need to close Sage TV. And I mean CLOSE IT. If it is running as a service, stop the service. Now open your sage properties file. That would be **sage.properties** in your sagetv directory. In this file, you will see **mmc/encoders** lines for each tuner you have defined, each designated by a unique number.

If you are adding multiple STBs, you need to change the unique # on each line from 12346 to say 12347 (and so on for more than 2 tuners). To make these changes quickly, you can paste the text into a new notepad file and then use the find and replace tool.

Go to the last line of your mmc/encoders lines, and insert the following (And any other modified sets of lines) under it:

```
mmc/encoders/12346/1/0/available_channels=  
mmc/encoders/12346/1/0/brightness=-1  
mmc/encoders/12346/1/0/contrast=-1  
mmc/encoders/12346/1/0/device_name=  
mmc/encoders/12346/1/0/hue=-1  
mmc/encoders/12346/1/0/last_channel=8  
mmc/encoders/12346/1/0/provider_id=0  
mmc/encoders/12346/1/0/saturation=-1  
mmc/encoders/12346/1/0/sharpness=-1  
mmc/encoders/12346/1/0/tuning_mode=Cable  
mmc/encoders/12346/1/0/tuning_plugin=  
mmc/encoders/12346/1/0/tuning_plugin_port=0  
mmc/encoders/12346/1/0/video_crossbar_index=0  
mmc/encoders/12346/1/0/video_crossbar_type=10  
mmc/encoders/12346/2/0/available_channels=  
mmc/encoders/12346/2/0/brightness=-1  
mmc/encoders/12346/2/0/contrast=-1  
mmc/encoders/12346/2/0/device_name=  
mmc/encoders/12346/2/0/hue=-1  
mmc/encoders/12346/2/0/last_channel=  
mmc/encoders/12346/2/0/provider_id=0  
mmc/encoders/12346/2/0/saturation=-1  
mmc/encoders/12346/2/0/sharpness=-1  
mmc/encoders/12346/2/0/tuning_mode=Cable  
mmc/encoders/12346/2/0/tuning_plugin=  
mmc/encoders/12346/2/0/tuning_plugin_port=0  
mmc/encoders/12346/2/0/video_crossbar_index=0  
mmc/encoders/12346/2/0/video_crossbar_type=2  
mmc/encoders/12346/2/1/available_channels=
```

mmc/encoders/12346/2/1/brightness=-1  
mmc/encoders/12346/2/1/contrast=-1  
mmc/encoders/12346/2/1/device\_name=  
mmc/encoders/12346/2/1/hue=-1  
mmc/encoders/12346/2/1/last\_channel=  
mmc/encoders/12346/2/1/provider\_id=0  
mmc/encoders/12346/2/1/saturation=-1  
mmc/encoders/12346/2/1/sharpness=-1  
mmc/encoders/12346/2/1/tuning\_mode=Cable  
mmc/encoders/12346/2/1/tuning\_plugin=  
mmc/encoders/12346/2/1/tuning\_plugin\_port=0  
mmc/encoders/12346/2/1/video\_crossbar\_index=1  
mmc/encoders/12346/2/1/video\_crossbar\_type=2  
mmc/encoders/12346/3/0/available\_channels=  
mmc/encoders/12346/3/0/brightness=-1  
mmc/encoders/12346/3/0/contrast=-1  
mmc/encoders/12346/3/0/device\_name=  
mmc/encoders/12346/3/0/hue=-1  
mmc/encoders/12346/3/0/last\_channel=  
mmc/encoders/12346/3/0/provider\_id=0  
mmc/encoders/12346/3/0/saturation=-1  
mmc/encoders/12346/3/0/sharpness=-1  
mmc/encoders/12346/3/0/tuning\_mode=Cable  
mmc/encoders/12346/3/0/tuning\_plugin=  
mmc/encoders/12346/3/0/tuning\_plugin\_port=0  
mmc/encoders/12346/3/0/video\_crossbar\_index=0  
mmc/encoders/12346/3/0/video\_crossbar\_type=3  
mmc/encoders/12346/audio\_capture\_device\_name=  
mmc/encoders/12346/audio\_capture\_device\_num=0  
mmc/encoders/12346/capture\_config=2058  
mmc/encoders/12346/default\_device\_quality=  
mmc/encoders/12346/encoder\_merit=0  
mmc/encoders/12346/encoding\_host=127.0.0.1\6969  
mmc/encoders/12346/encoding\_host\_login\_md5=  
mmc/encoders/12346/last\_cross\_index=0  
mmc/encoders/12346/last\_cross\_type=1  
mmc/encoders/12346/live\_audio\_input=  
mmc/encoders/12346/never\_stop\_encoding=false  
mmc/encoders/12346/video\_capture\_device\_name=SGraphRecorder  
mmc/encoders/12346/video\_capture\_device\_num=0  
mmc/encoders/12346/video\_compressor=  
mmc/encoders/12346/video\_encoding\_params=Best

In the line

**mmc/encoders/12346/video\_capture\_device\_name=SGraphRecorder** you can and must for a multiple STB setup, change this to say something unique, as in **Firewire Tuner #1** (And 2 and so on as you add more STB tuners)

In the line **mmc/encoders/12346/encoding\_host=127.0.0.1:6969** you can change the port to match up to the appropriate SGR session for however many STBs you set up. You can also change the IP address if you are hosting the STB on another PC (SGR would also be running from there)

Save your properties file.

## The Final Steps

Start up SGraphRecorder. Start SageTV. Under **setup, video sources**, choose to add new source. You should see SGR1 and/or whatever you called it and however many you have. Select each and get to configuring. Obviously you should use the 1394 port. As for zip/postal code, put in what applies. Once in the channel lineup, you can disable all the channels that you don't want or can't get.

Other than this, the last thing you need to do is create a startup batch file and disable SageTV from starting up when Windows starts and to also NOT use it as a service. This is due to the fact that SGR **MUST** be started before SageTV starts.

Where you create the batch file is irrelevant, however, due to the fact that you likely want SageTV to start when Windows starts, create the batch file in the **C:\Documents and Settings\All Users\Start Menu\Programs\Startup** directory. Call it whatever you want but this is what needs to be in it:

```
@echo off
"Path to SGR session"\sgraphrecorder.exe
SLEEP 5
"Path to second SGR session"\sgraphrecorder.exe
SLEEP 5
C:\Program Files\SageTV\SageTV\sagetv.exe
```

The sleep command may not be available on all Windows installs but is easy to get. It should still be a free download from Microsoft. It is called sleep.exe. The importance of the sleep command is to make sure that each SGR session has started before SageTV starts.

## **Last Points and Recommendations.**

You should never try to run multiple STBs on a SageTV server that is not running a good 7200 RPM hard drive and it should also be formatted with 64k blocks.

The High Definition TV that is sent from your provider is never going to exceed 19 mbps or about 8 GB per hour of TV. This is less than half of what 1080p TrueHD runs at so you can skimp a little on hardware playback horsepower.

Because you are recording the actual bit stream from the cable or sat company, non-HD channels will record at a MUCH more compact rate than through a tuner card via analog connectors. For comparison, the average file size for a firewire recorded non-HD show is about 1.5 GB per hour. If you did the same thing via s-video into a Hauppauge card, you would always have a 3.2 GB per hour result.

Because you are recording the actual bit stream from the cable or sat company, you are also recording the Dolby Prologic PCM or Dolby Digital 5.1 that is part of the show. If you are going to be playing the video back and want the Dolby Digital 5.1 to be handled by your home theater receiver, it is strongly recommended to get the AC3 codec.

## ***Appendix***

### **HD Playback Requirements**

There are serious demands made of an HTPC that is asked to play back 720p or 1080i HD content. Although not as intense as the demands of TrueHD 1080p, they are still far higher than SD or DVD quality content.

I have spent the last 2 years very laboriously testing a broad range of CPU, RAM and video card combinations and what performance to expect from them when playing HD content. Here is my recommendation for the least hardware that should be used with the HD content from a STB:

#### **Minimum**

Athlon XP 2500+ or Pentium 4 2.4 GHz w/HT  
1 GB DDR  
ATI X1300 Pro or NVidia GeForce 6600GT

#### **Minimum Recommended**

Athlon XP 3200+ or Pentium 4 3.0 GHz w/HT  
1 GB DDR  
ATI X1600 Pro or NVidia GeForce 7600GT or GS

#### **Recommended**

Any Dual Core CPU at no less than 2 GHz  
2 GB DDR2  
ATI HD2600 or NVidia GeForce 8600GT

As always, there is room for debate and there is always the fact that you may be alright with how your system performs. I simply wanted people to see what a great many hours of testing has revealed to me.

### **5C – What is the Deal?**

5C is one of the most misunderstood and misrepresented aspects of any firewire discussion. 5C is NOT encryption. It IS a copy prevention technology. 5C is actually a reference to the five companies that created the standard. Its proper name is **Digital Transmission Content Protection**.

Every firewire equipped STB and DVHS device is also set to comply with the 5C standard. This standard is comprised of 3 settings:

5C=0 – Copy

5C=1 – Copy Once  
5C=2 – Copy Never

So long as the setting is 0, any firewire device can record from the output. Once set to 1, it is necessary to have a 5C certificate. This is where the DVHS unit comes in. It has a 5C certificate so that will allow it to record a 5C=1 show/channel.

Where we are all out in the cold is that unless Sage, Snapstream and/or Microsoft pursue using STBs directly and natively, no private citizen will ever be able to get a 5C certificate for its drivers. For instance, there is no way that Timm Moore himself, will be able to get FireSTB upgraded to have a 5C certificate.

## **Video Decoders**

Well, here is a fun subject. As is discussed on many forums, the first key is to only install the NEEDED codecs. NEVER install a codec pack.

Beyond this, the three codecs to try to use for the HD playback are: The Sage codec, NVidia's PureVideo and the Cyberlink PowerDVD 7.3 package. The biggest determining factor as to which one to use is the power of the CPU/GPU combination.

The NVidia and PowerDVD codecs are hardware accelerated so are less dependant on the speed of the main CPU. The PowerDVD codec is the recommended codec from both ATI and NVidia and fully supports the hardware acceleration of both manufacturers.

I have not had a lot of luck with the Sage codec for HD so I don't even bother with it. I do not believe it uses hardware accelerations that are in the ATI and NVidia chips.