# Computer Club

*The 710 Lecture Series presents…*

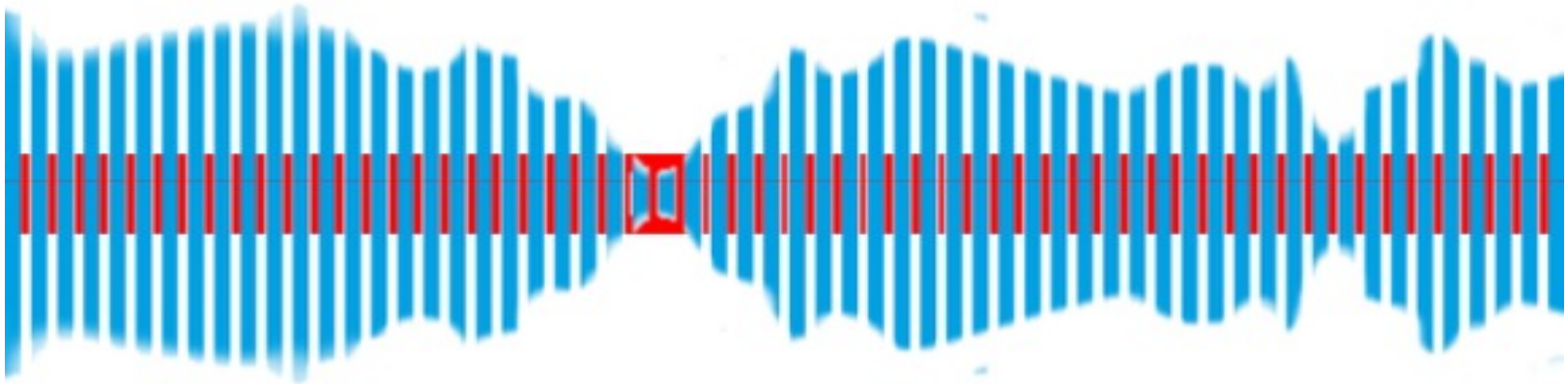
## An Audiophile's Experiences at Maris Grove

## The pros and cons of using

- Radio
- Vinyl -78s, 45s, 33s
- Tapes - Reel to Reel, Cassette
- Digital - CDs, MP3s, etc.
- Streaming including Subscription

**Thursday, Dec. 5th, 10:00 AM to about 11:15**
**Redwood Commons Theater**

**The Amplitude Modulated (AM radio) carrier frequencies are in the frequency range 535-1605 kHz.**

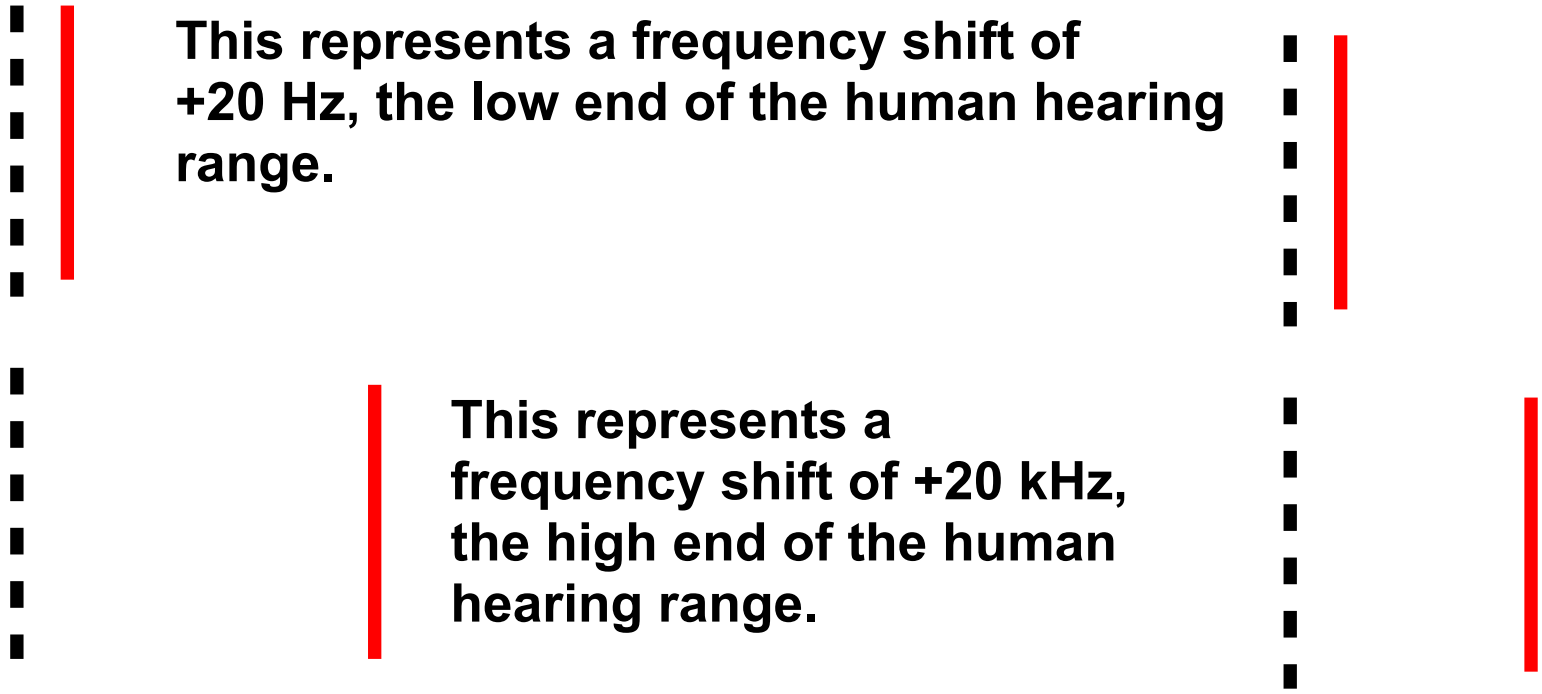


**The carrier frequency is modulated, and for at a receiver relatively near the transmitter, the signal overpowers the background noise.**

**As the distance between transmitter and receiver is increased, the modulated signal strength falls off and the background noise overpowers the signal.**

**The FM radio band is from 88 to 108 MHz between VHF television Channels 6 and 7. The assigned FM frequencies have offsets of .1, .3, .5, .7 and .9 - i.e. they are separated by .2 MHz. This space allows for modulation of as much as .1 MHz without interfering with an adjacent station's frequency.**

# Suppose the dotted line represents a pulse at the assigned frequency of 96.3 MHz.



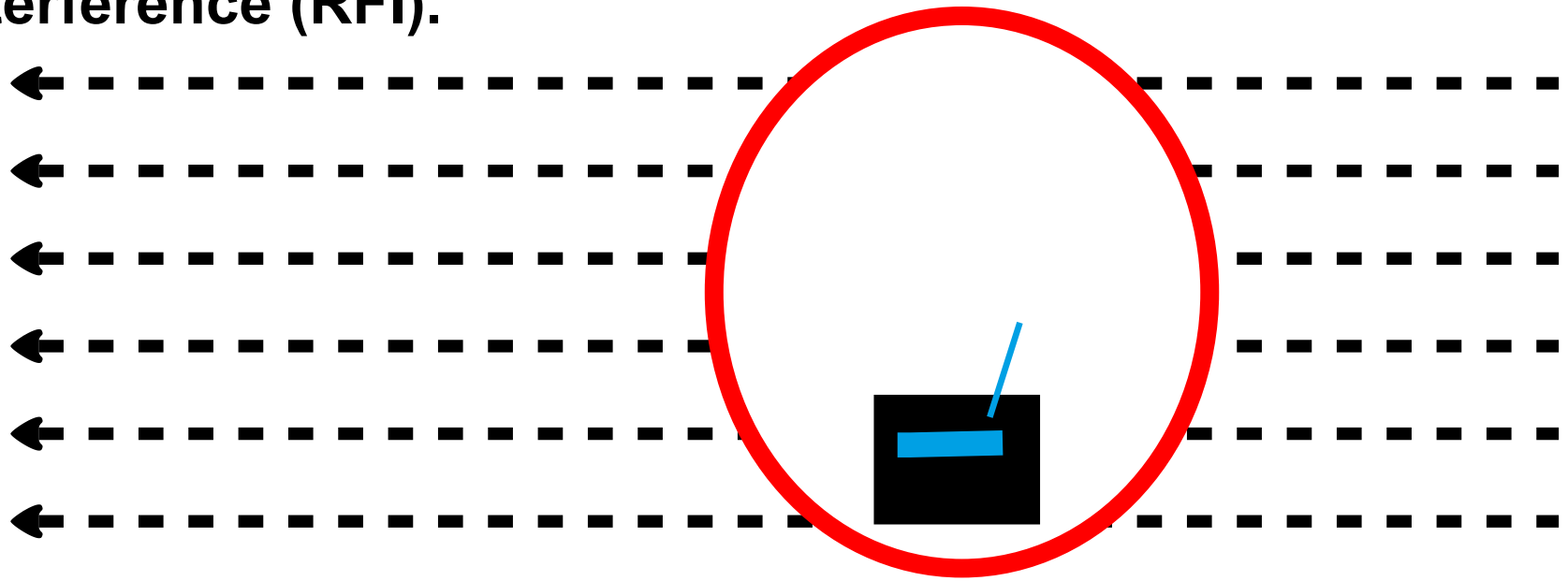

**The maximum + or - shift only makes use of about 2% of the allowable frequency deviation. Since the full power is always radiated, background noise is overpowered.** ***Note: I do not know how the loudness of the output is controlled.***

# Question:

***"I can pick up many radio stations with my car radio in the parking lot, yet I can't I get my table-top radio, clock radio, TV, etc. get a broadcast signal in my apartment here at Maris Grove?"***

A Faraday cage or Faraday shield is an enclosure made from material that conducts electricity. It is used to block electric fields. The Faraday cage is named after the English scientist Michael Faraday, who invented it in 1836.

An electrical field outside the cage causes electric charges in the cage's conducting material to move around and cancel the field's effect inside the cage. It protects sensitive electronic equipment from external radio frequency interference (RFI).



**The steel and reinforced concrete construction of the Maris Grove buildings act as a Faraday cage, blocking broadcast radio and TV transmissions. For that reason basic cable service is provided for TV. Thus regular AM and FM radio reception just isn't available here. There is an alternative which will be coved when I get to streaming.**

# Vinyl - 78s, 45s, 33s

**Phonograph records have a single spiral grove, the walls of which have ripples. A 'needle' or stylus rides within the groove as the 'platter' is rotated at a fixed speed such as 33-1/3 RPM for a standare "LP". The movement of the stylus generates a small electric voltage which is amplified by a 'pre-amp', adjusted for volume, and perhaps bass, treble and balance. It is then passed to a power amplifier which drives the speaker(s).**

**To an audiophile phonograph records present several problems:**

- **Bulky**
- **Mechanical interface between platter and stylus is prone to damage or contamination.**
  - **Scratches**
  - **Dust**
- **Capacity Limitations**

# TAPE - Reel to Reel, Cassette

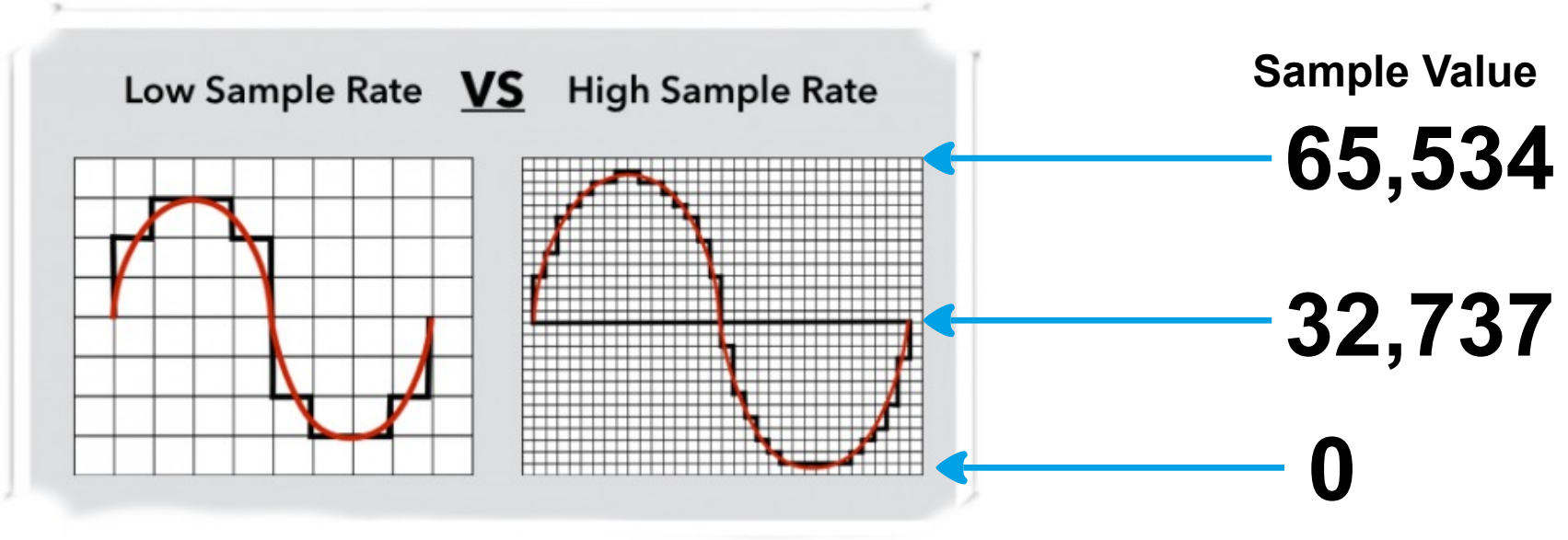
**I had a very good TEAC reel-to-reel tape recorder that I used to make “mix” tapes. They were typically three hours per side. That’s the good news. The bad news is that to created them required playing at listening speed, and the result was serial - you could not easily skip to a specific ‘cut’. But if I wanted familiar, commercial-free background music it was wonderful.**

# What's not to like about tape media?

- Limitations in regards to Dynamic Range
  - If recording level is too low, then you get background tape hiss.
  - If recording level is too high then you get clipping distortion.
  - Source (such as LPs) dynamic range is all over the place, thus each 'cut' must be handled individually when making a 'mix' tape.
- Serial playback
- Fragility of tape
- "Print-through"
  - Pre-echo, post-echo

# Digital Media - CDs, MP3s

**Digital audio as found on CDs and in MP3 files can represent frequencies up to 22.05 kHz, the range accurately detectable by the Nyquist process's 44.1 kHz sample rate. The selection of the sample rate was based primarily on the need to reproduce the audible frequency range of 20–20,000 Hz (20 kHz).**




**For CD audio the electrical signal from the source (such as a microphone or mixer) is sampled 44,100 times per second and converted to an unsigned integer number in the range of 0 to 65,534.**

- **65,534 represents maximum positive voltage**
- **32,747 represents 0 voltage**
- **0 represents maximum negative voltage.**

**For stereophonic recordings, two tracks are sampled, each at the 44.1 kHz rate, and written to disk. These are loss-less files which on a Windows machine is of type .WAV. When written to a CD the format is the same, but the 'type' is CDA for CD Audio.**

**A standard Compact Disk (CD) is 120 mm in diameter. It is capable of holding a maximum of 74 minutes of music if in .WAV/.CDA format.**

**The information is written twice, at a physical distance from each other. Each block includes a CRC (Cyclic Redundancy Check) value to be used for error detection. If the CD is later damaged by scratches, contamination of the surface, etc., it can be detected as part of the reading process. The player calculates the CRC, and compares with the block's CRC value. If they don't match the alternate block is read, tested and if the CRC matches - that block's content is used. If nothing matches the player will indicate a damaged disk.**

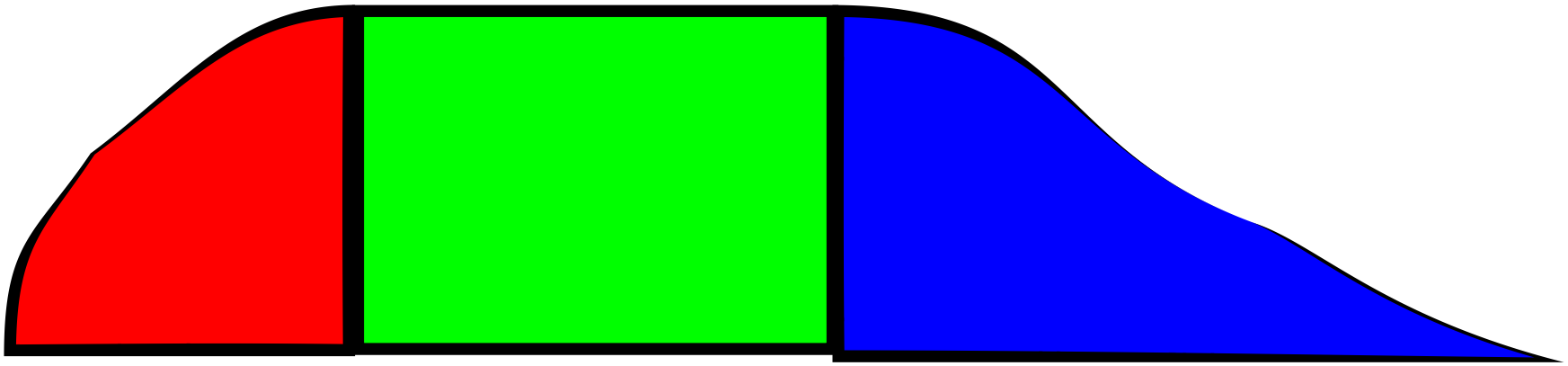
# What does Loss-Less mean?

**Loss-less means that the file contains every sampled value. This can result in a rather large file.**

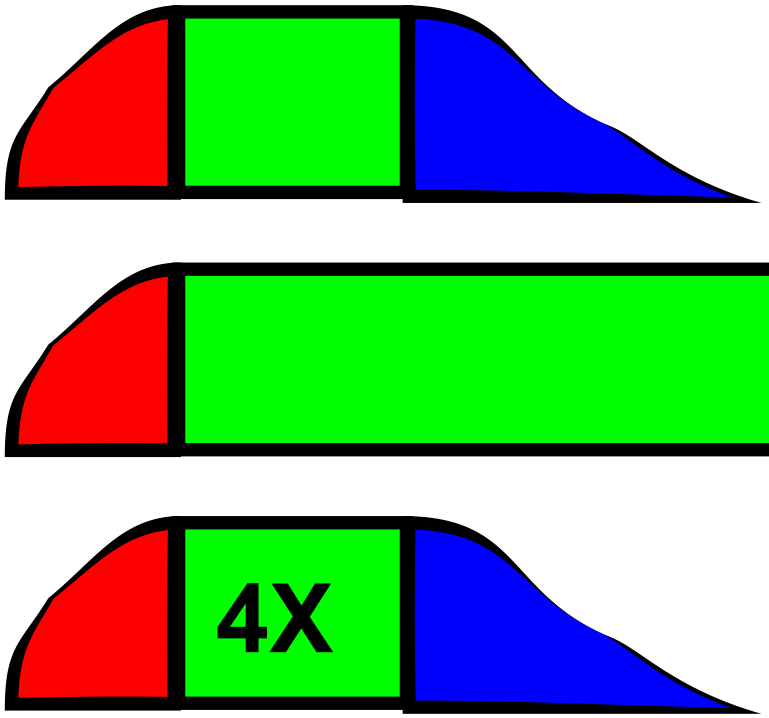
**The opposite of Loss-less is a Compressed file which uses any of several techniques to reduce the size of the file yet maintain a high quality representation of the original sound. The MP3 compression is the most popular. The details are too complex to describe, but here is a gross simplification of audio compression.**

# Consider playing a single note on an instrument, such as a piano. When digitized the wave form may be broken into three components:

- The ATTACK - represented by RED
- The SUSTAIN - represented by GREEN
- The DECAY - represented by BLUE



Think of the above as envelopes containing thousands of waves at the sound's frequency.




A quarter note

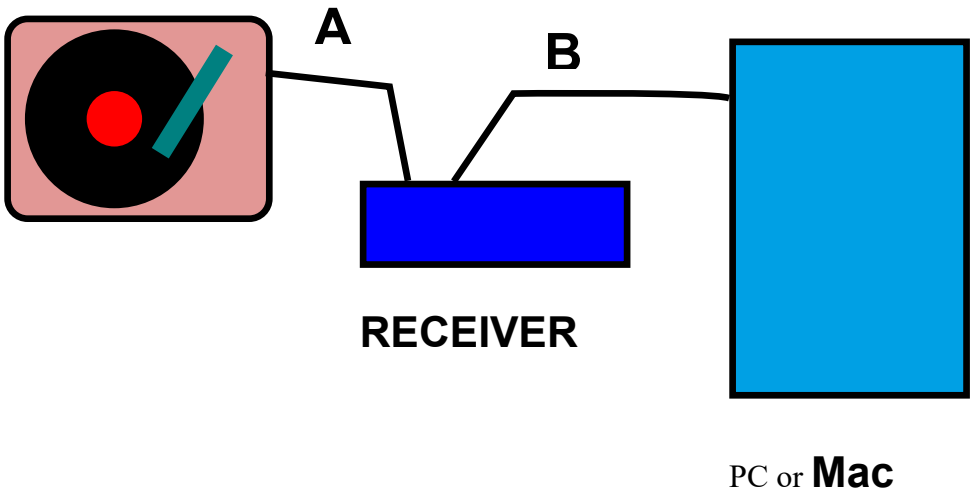
A whole note

A compressed whole note

Yes, this is over-simplified.

A compression algorithm doesn't know about quarter notes, whole notes, etc. But it does detect repetitions within wave forms such that it may indicate that a repeat multiplier may be used to cause a small snippet of the wave form to be repeated.

# RIPPING - Source to MP3




**Cable “A” - phono output ( 2 RCA plugs ) to Receiver.**

- **RED goes to PHONO-IN “R”**
- **WHITE goes to PHONO-IN “L”**

**Cable “B” - Receiver to Computer**

**Y Cable - 2 RCA plugs for Receiver’s LINE-OUT or TAPE- OUT jacks.**

**Computer end - 3.5 mm MALE Stereo plug connected to either PC’s LINE-IN or MICROPHONE-IN.**

**Alternate “B” - 3.5 mm MALE at each end. Connect to Receiver’s headphone out and PC’s Microphone-IN.**

**I use an open-source, cross-platform program named AUDACITY. It is powerful, flexible, well documented. There are many YouTube videos that demonstrate its use.**

**It captures wave forms to your hard disk, or read pre-existing digital format media. It then lets you edit using several dozen tools for such 'plug-Ins' for noise reduction, click and pop, amplification, copying, etc. You may then export to several formats, such as MP3.**

# RIPPING PROCESS

- Launch AUDACITY
- Start the turntable, queue the stylus, in Audacity key R or click the red ‘Record” button.
- If you want individual ‘cuts’ press Ctrl-B between cuts, and type the cut name n the created label field.
- When done, click the STOP icon.
- Save the project.
- Apply clean-up if desired.
- FILE → EXPORT MULTIPLE
- Answer the prompts for meta-data.
- When done, MP3s will be created.

# Why I Rarely RIP my own LPs anymore.

- It is time-consuming.
- It is frustrating - old home had hot water baseboard heating. Maris Grove has forced air system which circulates microscopic dust like crazy. I can no longer get the disks clean, they attract dust as soon as they come out of the jacket and sleeve.
- It is easier to just capture or stream the selected recording ‘on demand’.

# Streaming and Subscriptions

**There are many streaming sources - Amazon Music Unlimited, YouTube RED, Apple Music etc. I used to budget about $15/month for purchasing CDs - typically two 'economy' brands, or one 'premium' brand. As an Amazon Prime subscriber, the additional cost of Prime Music Unlimited is less than my previous expenditure, and I don't have boxes of CDs or LPs on the shelves. I can find something quickly, even by voice command to Alexa if I want. The quality is better than what I was able to get by ripping LPs, and equal if not better to that I get from ripping CDs that I have purchased to MP3s on my server.**

## Radio replacement

**There are several ‘apps’ available for computers, tablets, and phones. I have been using SIMPLE RADIO for several years (IOS) and Tune-In RADIO (IOS, Android, Kindle) also. Amazon’s Echo ‘smartspeaker’ uses both Tune-In and I (heart) Radio as source, Alexa can find things in response to spoken requests. I presume that Google’s and Apple’s smart speakers have similar capabilities.**

**Before we came to Maris Grove we lived in a home situated in the center of a heavily wooded lot. We could not see any of our neighbors. If I wanted to 'rattle the windows' with high sound levels I could (but usually only when my wife was away.)**

**Once we decided that we were coming to Maris Grove we know things would be more like when we each had condos - neighbors on the other side of a firewall, floor or ceiling. I knew that we would have less space, and have sound-level restrictions. I started selling off or donating my equipment and recordings.**

**When the 2016 holidays came around, my wife gave me a Bose Wave SoundTouch System IV. This is much like the standard Bose Wave Radio, but it includes Wi-Fi capabilities. Thus it can link to:**

- **Wireless speakers in other rooms**
- **My server music libraries, including iTunes and private MP3s**
- **Internet-based Subscriptions services (such as Amazon Prime Music Unlimited, YouTube, etc.**
- **Streaming radio (world wide)**
- **Other streaming services (non-broadcast)**

**It is controlled via PC, iOS or Android 'app'**

**Lastly there are times when it is unavoidable that the household is noisy. For example:**

- **My wife is watching television.**
- **My wife is weaving with CD playing, or iPad streaming audio.**
- **Someone's vacuum cleaner running (including nearby apartment.)**
- **Dishwasher running.**
- **Washer running.**
- **Dryer running.**
- **HVAC is running.**
- **Someone's on the phone.**
- **Someone wants to sleep, or read, etc.**

**At these times I am apt to put on noise-canceling headphones. These *actively* cancel ambient noise so that I can listen to music, an audio book, podcasts, news reports, streamed TV, etc. and not be aware of any external sounds or distractions, or cause disturbances. Unlike 'ear buds' which usually wedge into the ear canal like a cork in a bottle, these do not irritate the ear after extended use.**

**I happen to like the Bose QuietComfort 35 II. They are lightweight and highly efficient. For example, I don't hear the phone ring - even though it is a foot from my elbow. One negative is I often don't hear "Dinner's ready!"**

# Let me wrap up with various demonstrations.