

TRINITY BAPTIST CHURCH  SOUND

Sound Training

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1.0 Purpose of the TBC Sound System

Why do we have a sound system?

1. Voice amplification
2. Instrument amplification
3. Adjust the levels of various inputs (mixing)
4. Capture (record) the audio (sermons online, archive purposes)
5. Playback recorded audio
6. Assisted listening for the hard of hearing (audio and video)
7. To enhance special productions (drama etc).
8. Play audio from video stream



2.0 Simplified Sound System

A simple sound system consists of 3 primary components. A sound source supplies electrical audio signals. The audio amplifier receives the audio source signals (which have a small amount of energy) and increases this signal in order to drive the speakers. In the system below the microphone converts differences in sound pressure to electrical signals. These signals are then sent to the amplifier which increases the signal controlled by the volume or gain rotary dial. The speaker changes the electrical signals back into sound waves.

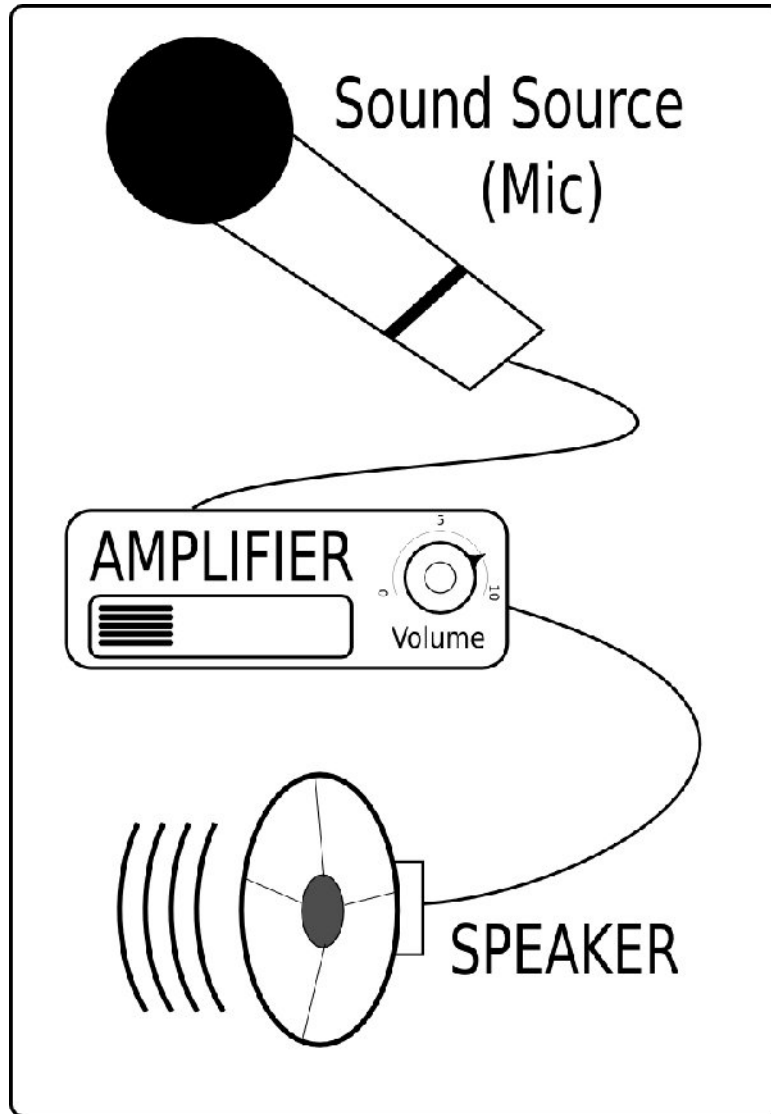


Figure 1. Simplified Sound System

3.0 TBC Sound Components

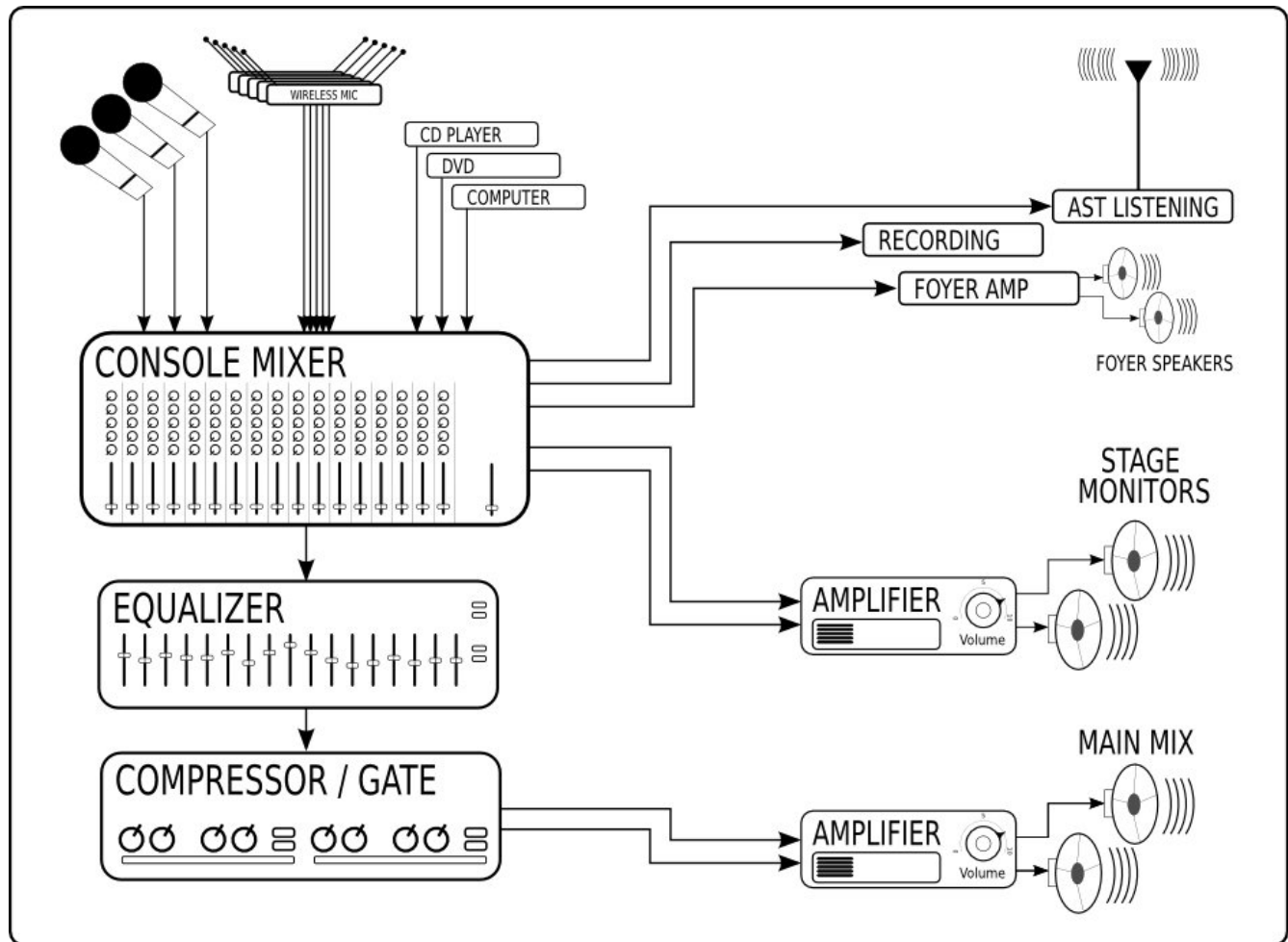


Figure 2. Signal Flow Block Diagram

Input Sources

Input sources consist of anything that produces or supplies sound to the system. Examples include microphones, CD player, computer.

Console Mixer

This device houses the main audio controls. It is what allows the sound technician to adjust the mixture of various input channels. It controls the audio levels from input to output.

Equalizer

Allows the adjustment of sound frequencies that are sent to the main house speakers. The equalizer can boost or cut a range of sounds from very low bass to high treble. In our configuration the equalizer is used for feedback control.

Compressor with Gate

The compressor reduces the signal strength of very large (loud) signals that would otherwise be clipped (making the audio distorted), to a level that the speakers can use. The gate will stop audio output if the audio level drops below a set threshold. The gate is useful because it will keep things like scuffing feet from being amplified and sent to the house speakers.

Power Amplifier (Amp)

The power amplifier increases the signal strength to a level that can drive speakers. There are 3 amps in our system for the 3 speaker systems that are in use (house speakers, stage monitors, and foyer speakers).

Aux Sends

The auxiliary sends are used to create special purpose mixes (in addition to the main mix). These mixes are sent to devices such as the assisted listening system, the sermon recorder / audio to text converter, and the foyer amp.

Stage Monitors

The stage monitors are used by the worship team so that the singers can hear themselves as well as the music during the worship time. Since the stage monitors are independent of the house speakers the audio produced here can be a completely separate mix than what the rest of the auditorium hears.

Main Mix

These are the main speakers that those sitting in the audience will hear.



4.0 General Tasks

This section describes a few simple tasks that you may want to perform with the sound system. Understanding the *Signal Flow Block Diagram* in section 3.0 will help you understand how to run specific tasks. Each component in the signal flow path must have power and be configured to pass the audio electrical signal on to the next component. If you don't hear any audio revisit the flow diagram and check each component.

4.1 Turning the Sound Equipment On / Off

The TBC sound system should be turned on and off in a specific order to reduce the risk of damaging components such as the speakers. Follow the steps below for turning the sound system on and off.

Turning The Sound System On

1. Insure all channels are muted on the mixing console.
2. Power on the **green power switch** (this will apply power to the mixing console, equalizer, compressor/gate as well as several other peripheral devices such as the assisted listening system).
3. Power on any additional devices (cordless microphones ... etc)
4. Power on the amplifiers (bottom 2 switches of rack)

Turning The Sound System Off

1. Mute all channels on the mixing console
2. Power off the amplifiers (bottom 2 switches of rack)
3. Power off any additional devices (cordless microphones ... etc)
1. Power off the **green power switch** (this will remove power to the mixing console, equalizer, compressor/gate as well as several other peripheral devices such as the assisted listening system).

***Reminder:** Turn the amplifies **on last** and **off first**. Powering on or off the mixing console will cause a spike in energy that can damage speakers if the power amplifiers are on.



4.2 Single Channel Amplification

There are times when only a single audio source needs to be amplified through the sound system. This might be the case when there is only one speaker using a microphone or a CD is being played alone. Turn on the sound system as described in section 4.1. Once the system is on, interaction with the sound system is almost strictly done through the mixing console.

Mixing can be viewed as turning on valves of a plumbing system. Rotary knobs and sliders adjust the amount of water (electrical signal) that is allowed to pass through the pipes. Switches completely shut the water off or on. A single channel described conceptually in plumbing is shown in *Figure 3* below.

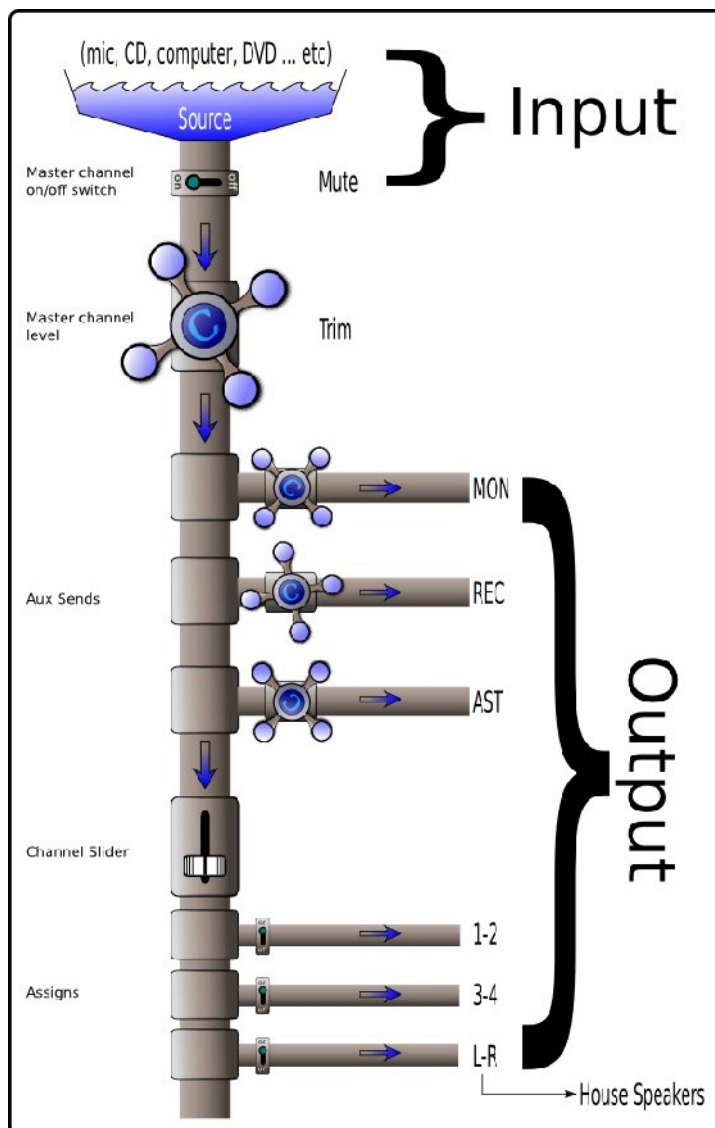


Figure 3. Single Mixer Channel

Mute Turns the channel completely on or off. When the mute is engaged no signal flows from that channel (you may still listen to the channel through the headphones)

Trim This is the master valve that controls how much signal is sent to the rest of the mixer. This should be set first before adjustments are made to the Aux Sends or Channel Fader.

Aux Sends Controls how much signal is sent to each of the auxiliary output mixes. These mixes are used for stage monitors, assisted listening, and recording purposes.

Channel Slider or Fader During a live performance these are most commonly adjusted controls. The slider adjusts how much of the mix is sent to the assigns.

Assigns Each channel should have one assign engaged. Assigns 1-2 and 3-4 are subgroups (voice / instruments). L-R sends the signal directly to the main mix.

Main Mix Slider (not shown) This master control adjusts the overall volume coming from the main speakers (but not the monitors!)

4.3 Mixing Two or More Channels

When multiple channels of audio are available these channels can now be mixed together to form output channel mixes. Mixing generally should follow these steps. See section 5.0 for more detailed information.

1. **Set the Trim.** Use the solo function (headphones) to insure the audio peaks are near 0 .
2. Adjust the **channel fader down**
3. **UnMute** the channel
4. Adjust the **Aux send** rotary knobs if desired
5. Adjust the **Channel Slider** to the desired level. The slider should be some where between -20 and 0 or U (unity) when the channel is adjusted properly.

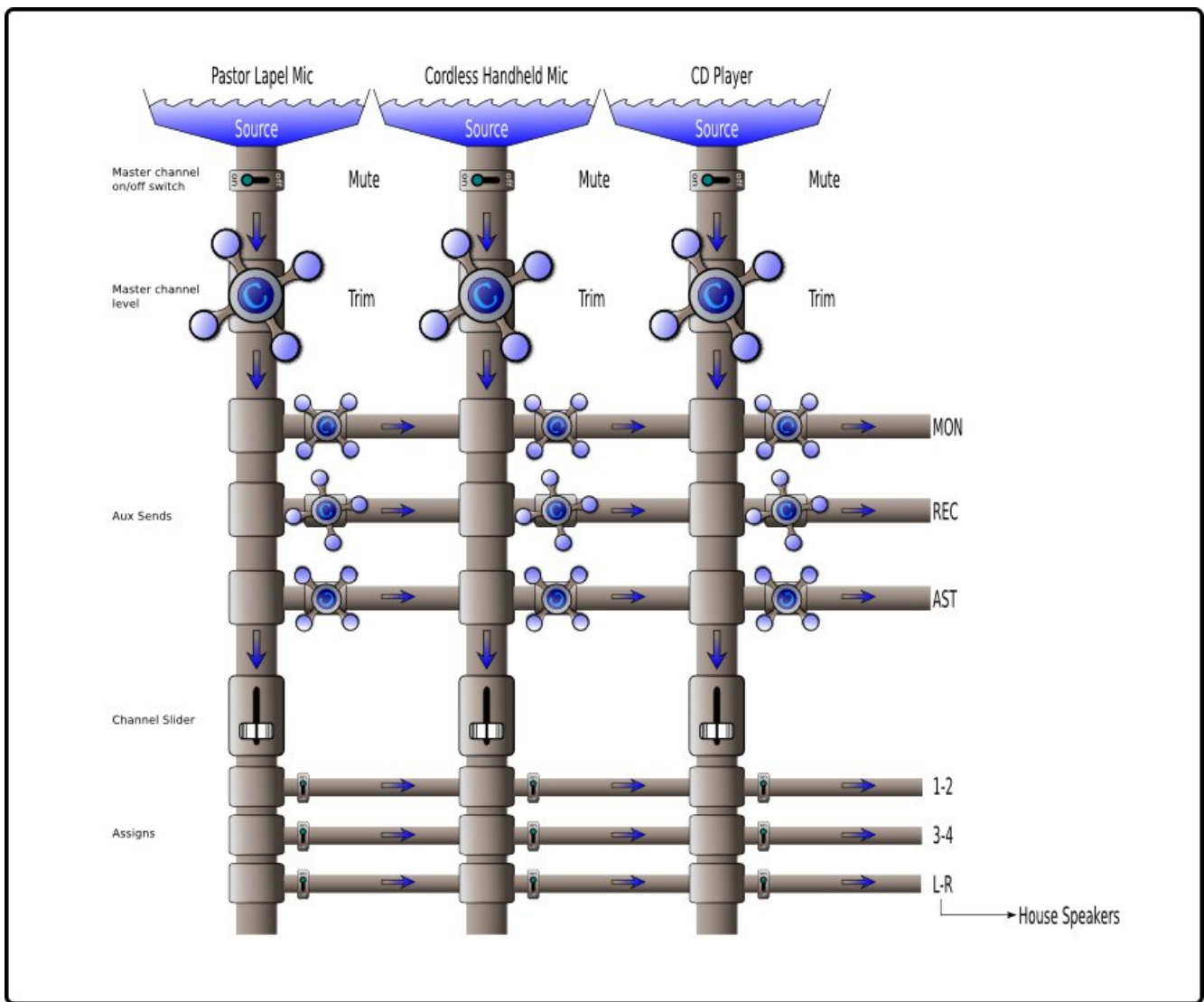


Figure 4. Multiple Channel Mixer

5.0 Mixing

Achieving a great mix is vital to the perceived quality of the sound system. The mix should not be so loud people cannot hear themselves sing, but it can't be too soft either. During the worship time the lead singer should be strong, but not overpowering. The mix of voices and instruments must blend together well. No single voice or instrument should be overpowering, but each should complement the others.

5.1 Setting the Trim

The audio input signal can be monitored through the use of the **SOLO** switch associated with each channel. Switch the solo switch on (ensure the solo mode is set to **PRE FADER**). Adjust the trim while watching the left/right level in the upper right of the mixing console. The loudest parts of the signal should peak at 0 . If the levels are going higher adjust the trim down. If they are too low adjust the trim up.

5.2 Equalization

The 3 band channel equalizer can aid in the achieving a great mix. Engage the solo switch for the channel that needs adjusting. Listen to the audio on the headphones and adjust the equalizer bands slowly one at a time.

5.3 Low Cut Switch

This switch engages a filter that will cut out the lowest (deep bass) audio signals. This will keep the sound of microphone handling on the stage out of the mix. Engage this switch on all microphones (except ones that are meant to pick up low bass such a kick drum microphone). Do not engage this on computer or CD inputs.

5.4 Channel Slider

Adjust the Channel Slider to the desired level. The slider should be some where between -20 and 0 or U (unity) when the channel is adjusted properly.

5.5 Subgroups (Vocals and Instruments)

In our system subgroups 1-2 are used for vocals and 3-4 are used for instruments. Each vocal channel should have the 1-2 assign switch set and each instrument channel should have the 3-4 assign switch set. Channels used for things other than vocals and instruments should be assigned to L-R. When individual channels are assigned to subgroups then the whole subgroup volume can be adjusted using the subgroup faders (next to the main mix fader). Also subgroups are usefully for monitoring the subgroup mix. Select solo on subgroup 1-2 (two solo switches) to listen to only the vocals- this is useful in determining if any single person sounds too loud or too soft.



5.6 Aux Sends

Monitor the Aux Sends from time to time by selecting the solo next to the aux send master rotary knobs. Use this to monitor what is being sent to the recording or assisted listening system.

5.7 Spicing up the Mix

Mixing is not just adjusting the relative sound gain from individual channels. A fuller mix can be achieved by using the PAN, and EQ knobs.



6.0 Signal Processing

Signal processing refers to modifying the signal before it is send out to the speakers. The mixing console has several signal processing features built in, such as the 3 band equalizer and the low cut filter. There are also many types of devices that are meant to clean an audio signal or tweak it.

6.1 Master EQ

The master equalizer in our system is used for feedback control. Feedback is often caused by specific resonating frequencies. These frequencies can be cut back using the equalizer in order to reduce the possibility of feedback. Adjusting the equalizer should be done one frequency band at a time and not during a live service.

6.2 Compressor with Gate

The compressor and gate work on opposite sides of the gain spectrum. The gate cuts off any audio signal if it gets below a configured threshold. This is useful for cutting out small sound from the main mix (such as someone breathing into the microphone, or knocking it around on stage). The compressor works when the audio levels become too high. If the audio levels are too high, the sound from the main speakers will become distorted. The compressor takes the high peaks of the signal and gradually reduces or compresses them so that the speakers can handle the signal. The compressor and gate settings rarely need adjustment.

6.3 Effects

We have an effect box that can add additional effect to the mix. Effects such as reverb can be used for dramatic effect. Other effects can make the mix sound like it is coming from a cathedral or hall. Currently we do not actively use our effect box (partly because it adds noise to the mix as well).



7.0 Recording and Speech to Text

A dedicated computer is assigned the task of recording the sermon as well as converting the sermon audio into text real-time. The speech to text computer has no monitor, keyboard or mouse. Instead it is controlled using either the A/V computer or a CC client with the administrator password. The operator will use VNC to connect to the speech to text computer, start Audacity to record the sermon, and then start Dragon Speak and open up a text window for the software to put the processed text. The CC clients will watch the speech to text conversion using a view only window of the speech to text computer.

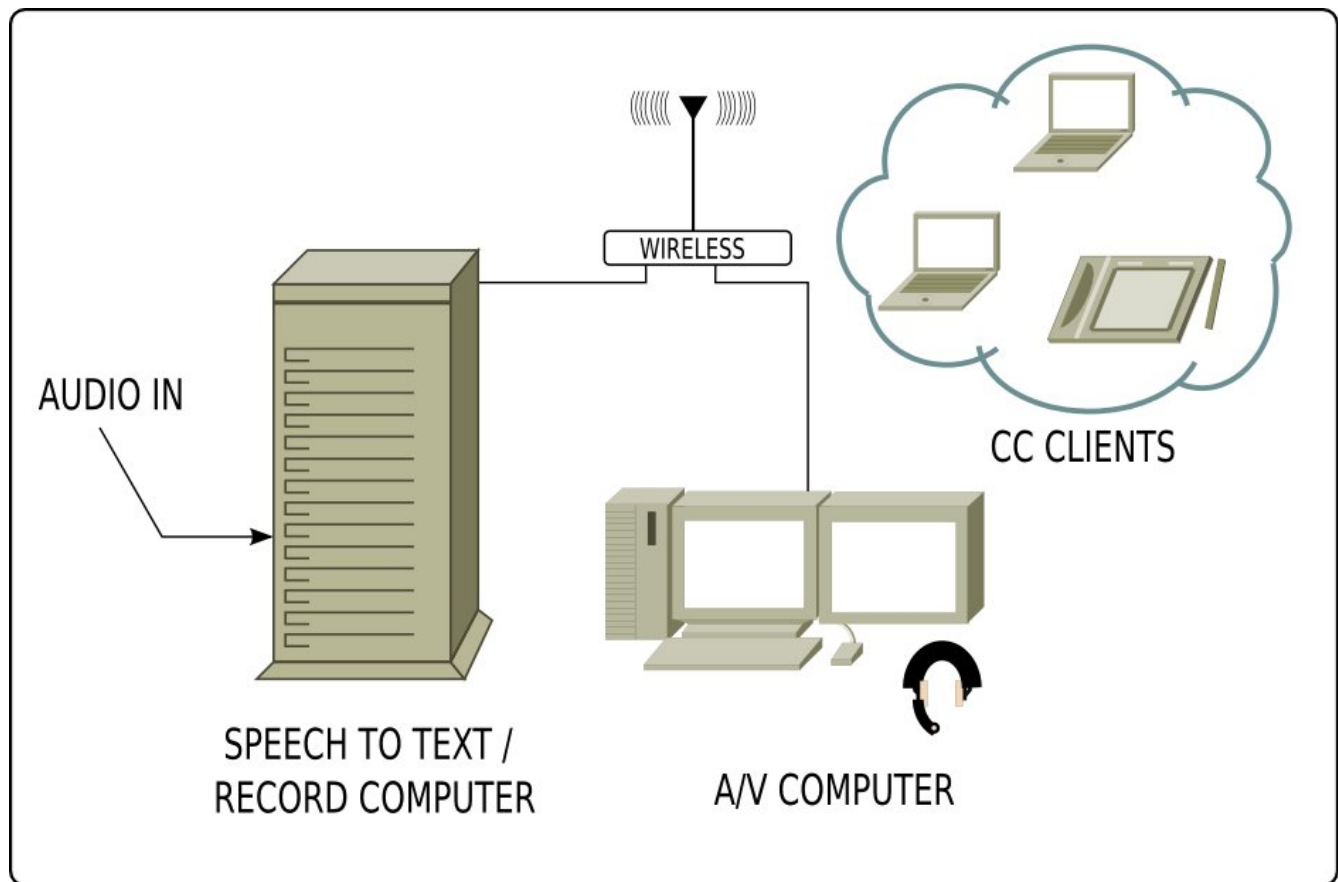


Figure 5. Speech to Text System

8.0 Assisted Listening

The audio system also has an assisted listening system attached for the hard of hearing. The assisted listening system automatically is powered on with the mixing console. The audio send to the assisted listening system can be monitored visually on the assisted listening transmitter as well as audibly via the solo control on the aux sends. Receivers are located in the charging station and headphones are located in the sound room cabinets.

9.0 Common Mistakes

1. **The trim is set incorrectly**, therefore the channel fader is much higher or much lower than what it should be.
2. **General channels sending to the stage monitors.** This most commonly happens with the hand held microphone which is used for singing as well as announcements/prayer. During prayer when the church is fairly quiet the gate cuts the main mix when the speaker stops talking, but the rustling of the microphone and any low sounding umms come through the monitors as they are not controlled by the gate.
3. **Gate threshold is set too high.** When the gate threshold is too high low audio signals get cut completely off until they reach a volume above the threshold. This sounds bad during an offertory when CD music is fading in. The result is blips of audio and silence until the music reaches a volume that is consistently above the gate threshold.
4. **(Un)Muting a music Channel without fading.** It is almost always better to slowly fade in or out a music channel rather than abruptly muting / unmuting it. Fade the channel using the channel fader before engaging / disengaging the mute.
5. **Equalization is set incorrectly.** When the master equalizer is set incorrectly the overall house mix can be distorted.
6. **Microphones are too far away from the speaker's mouth.** Microphones work best when they are close to the mouth of the speaker. This allows for more gain and therefore the trim doesn't have to be set as high- reducing the risk of feedback. Lapel mics should be 2 inches below the chin of the speaker (when the chin is held to the chest). Hand held mics should be pointed toward the speakers lips but below the lips. The audience should be able to see the speakers lips. The mic should never be tilted outward and away from the speaker.

