

# **“A Church's Guide to Video & Audio Recording, Production, and Distribution”**

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Recent developments in technology have opened up new possibilities for congregations considering ways to spread the Gospel to new ears, as well as supporting their current members that are unable to attend worship services. Purchasing audio/visual equipment can be a worthwhile investment in this endeavor. However, the abundance of choices as well as the steep learning curve can make the shopping experience rather daunting. The aim of this paper is to assist congregations in deciding what should be recorded, how it could be recorded, and how it could be distributed. It is in no way comprehensive. Wherever possible, concepts will be explained as simply as possible. Nevertheless, if you are a person that has never burned a CD, never hooked up a stereo component like a DVD player, or don't know what an mp3 is, you should not expect that you will be able to implement all of this advice on your own. This information will be best understood by your congregation's “gadget guru” that has had at least some experience fiddling with audio components and computer software. That is not to say though that the “tech challenged” will not find anything useful in these pages.

## **What to Record**

It is important that congregations don't quickly gloss over this topic without first considering their audience. At first glance, recording the entire worship service with a camcorder and posting it on the internet may seem like the best choice for the sake of everyone's convenience. Congregations would perhaps do better to poll their members at a distance first as to what would serve them best. Some may prefer to watch the service on their TV rather than via a compressed format on their computer. Some may prefer to be able to download the service in a compressed format, but only want the audio, and perhaps just the sermon. A congregation may not want to invest in Videocassette recording and duplication equipment if only one member would prefer that. Members overseas may prefer being able to stream the entire service audio/visually over the internet. So, it is good to see what is desired before deciding what technology to implement. Beyond that, a congregation may or may not decide to make additional offerings to the world on the internet beyond what their own members prefer.

## **How it Could be Recorded**

This will be the largest section to consider, due to the number of variables involved. We will be considering analog vs. digital, audio vs. audio/visual, and the presence or absence of a Public Address (P.A.) system.

Analog examples: audio cassette tape, VHS tape / *VHS, 8mm and Hi-8 camcorders*

Digital examples: CD, mp3, wma, DVD / *MiniDV, Digital-8 and DVD camcorders*

Analog +s: generally dependable recording, high compatibility of media, good for backup if live digital recording fails, fast transfer of recorded video to a VHS tape copy (no computer rendering time required)

Analog -s: becoming more obsolete, lower quality and more noise than digital alternatives, quality degradation exists in copies of master

Digital +s: cheaper to ship, cheaper media, faster to duplicate several CD's or DVD's (once video rendering is complete), takes up less room to store, digital copies are perfect copies (no degradation)

Digital -s: compatibility of media (CD/DVD's) in players, may be a few people who don't have DVD players. Live capture of audio or video *on a computer* is not always the most reliable.

### Understanding Level Matching

Let's stop here for a moment. There's some really neat things you can do to improve the sound of your recorded audio, namely using dedicated microphones for the pastor and congregation. However, if you wish to use any microphones that are not built into your recording equipment, it is important to understand how to hook them up to your gear. It is not enough to just attach the proper adapter so that things can be plugged together, but to actually understand what can properly be hooked together without getting distortion or a signal that is too quiet to be usable. Let's consider 3 major examples you are likely to encounter:

Microphone Level: the lowest or quietest level. These are often 1/8" inputs on sound cards next to a picture of a microphone, or labeled "mic" on a camcorder or recording device next to an 1/8" input. Professional microphones and mixers generally have a 3-pin XLR connector.



In this picture above we see from left to right: XLR, 1/4", and 1/8" on the side

Line Level: RCA connections usually carry line level signals. These are common on the backs of stereo components like CD/DVD players, VCR's and tape players. They are usually stereo, with red and white jacks. Mixers generally have line level outputs on 1/4" or perhaps even XLR jacks. These outputs may be labeled "line out", "main out", "tape out" or similar. These outputs are intended to be fed into an amplifier or another component like a recording device. A headphone output is similar in level (volume) to line level.



*Here are some RCA connections for video (yellow) and line level audio (red and white)*

Speaker Level: the highest/loudest level. Watch out! This amount of level is enough to drive speakers, perhaps enough power to fill a building with sound. You do not want to plug this output into a microphone level or line level input. Whereas incorrectly interfacing microphone or line levels together may only cause distorted or quiet sound, incorrect use of speaker level outputs could cause damage to equipment. Speaker outputs generally have 1/4" or some type of receptacles that accept bare wire, and may be labeled "Speakers" or may have a number like 4 or 8 in front of the Greek Omega symbol, signifying the ohm rating of the speakers that should be connected. The output may also say something like "2 x 180 watts", signifying the power of the output.

*There are subdivisions among each category, like one microphone may be too quiet for a particular microphone input, but for now it is enough to understand the major differences between the above three.*

### **Using External Microphones**

Before we took our little detour into matching levels, we were considering the possibility of using external microphones for our recordings, whether they are for audio only, or audio/video. If you already have a sound system, you probably already have the pastor's microphone taken care of. That microphone level is being translated up via the amplifier to speaker level outputs. However, before that takes place, the microphone level is actually being "pre-amplified" to line level. Check your mixer/amplifier. Are there additional line level outputs? Perhaps they are already being used with a tape recorder. Or, if the pastor is using a wireless lapel microphone, the wireless receiver often times has more than one type of output, like XLR and 1/4". These are usually both line level outputs, one of which could go to the amplified church system, the other to your recording gear. If you are only recording the sermon, that is all you will need. However, if you want to include a congregational microphone, you will need to purchase an additional mixer that can take the input of the pastor's microphone as well as a new congregational microphone. As the name implies, the mixer will mix the

two signals together, (you determine the relative volumes), and output it to line level outputs. You would want a mixer with at least one microphone preamplifier, to amplify it to line level.

Below is a picture of a mixer made by Behringer: the Xenyx 802. The first two channels have “preamps” on XLR and 1/4” inputs. There are RCA line level inputs, as well as line level outputs on RCA and 1/4” jacks. There is also a headphone jack for monitoring. I highly recommend these mixers by Behringer that are high quality and affordable. They have gone through the MX and UB product line (all still excellent) and are currently selling the Xenyx line. Different model numbers relate to varying numbers of inputs.



So let's say we have now installed a congregational microphone, and mixed it with the pastor's microphone, perhaps with a mixer like the one above. The outputs can simply be routed to the audio inputs of a line level input like the RCA inputs on a tape recorder. We're faced with a new challenge however when we want to use a digital camcorder and also our line level audio from the mixer. That's because if a consumer digital camcorder has an audio input, it's going to be in the form of a microphone input. This is at “microphone level.” As you may remember, this is a much lower level, and no, you can't just turn the volume way down on the mixer's output. It would still sound distorted. So, we need some type of transformer to step the level down to microphone level. Furthermore, many camcorders like Sony's provide a small amount of voltage at that input to power an external microphone that would be plugged in. That voltage must be blocked or else it can cause noise in the audio.

Although pricey, there is a workaround for all of this, and you wouldn't even have to purchase a mixer. The XLR Pro that is available at [www.signvideo.com](http://www.signvideo.com) has 2 XLR microphone inputs, a volume adjustment for each, and the output is a stereo mini-plug that gets inserted into the microphone input of the camcorder. There is even a switch that changes the input from microphone level to line level, should you still need to use the mixer. There are also 1/8” inputs on the device, so if your mixer had 1/4” outputs, you'd need a cable with 1/4” on one side and 1/8” on the other. You could also attach an adapter. The 2 input model is \$169 shipped, and the single input model is \$119 shipped. A single input model may be all that is needed if a mixer is used, or if only one microphone is being used to record from. This device also blocks the voltage mentioned before that could cause noise. Available here:

[http://www.signvideo.com/xlr-pro\\_xlr\\_adapter-audio-mixer.htm#xlr\\_front](http://www.signvideo.com/xlr-pro_xlr_adapter-audio-mixer.htm#xlr_front)



*XLR Pro (XLR inputs not visible from this angle)*

The 2 input model will give a choice of mono or stereo on a switchable toggle. Use mono mode to ensure both inputs will be heard on even a mono TV.

### **Cables and Adapters**

If you don't want to solder up your own custom cords or can't find them at Radio Shack, head over to [www.zzounds.com](http://www.zzounds.com) where you will find several types of adapters and cables made by Hosa. If you are for example looking for an 1/8" stereo cable that terminates in two 1/4" mono ends, just type "1/8" 1/4" " in their search box.

### **Purchasing Microphones**

Microphones are a large topic all by themselves, but let's hit some of the highlights. The three most common types of microphones you're likely to run into are dynamic, condenser, and electret. Dynamic are the familiar hand-held type that have a ball screen on the end. Condensers can look similar, but are higher quality, usually used to make accurate recordings. They usually require a voltage supplied by the mixer called "phantom power." They come in a variety of shapes and sizes. The electret microphones are the types used in clip-on lapel microphones, the small thin desk microphones used with computers, and are also the type built into camcorders and other portable recording devices. The microphone capsules themselves are about the size of a pea. They also require a special voltage that is much less than that intended for condenser microphones. This "phantom power" is usually supplied by mini-jack microphone inputs.

I have found "Nady" brand microphones to be an exceptional value for high quality and low cost. If you're looking to get the pastor a lapel microphone for your church P.A. and/or recording system, consider the UHF lapel models by Nady. The VHF band is becoming overcrowded by TV and other wireless signals, so it is best to avoid these. Condenser microphones for recording are usually quite expensive, commonly hundreds or thousands of dollars. The Nady SPC-10 Condenser costs about \$50 from [Musiciansfriend.com](http://Musiciansfriend.com) and will require phantom power from a mixer like the Behringer models mentioned previously. If budget doesn't permit, or you need to go directly from the microphone into something like the XLR Pro camcorder adapter that doesn't provide phantom power, a dynamic microphone like the Nady SP1 is an exceptional value at \$10 from [Musician's Friend](http://Musician's Friend). They also offer a tripod stand, 20' cable and microphone bundle for \$20, which is an unheard of deal.



*Nady SPC10 Condenser*

If you're simply using the electret microphone that is built into your recording gear, you can still make great recordings as long as you are not a great distance from what you are recording. A recording location in the balcony or back of a long church may not produce the most clear recording, especially if there is no P.A. system amplifying the pastor. However, if your church is not very big, or your recording device is closer to the source, electret microphones do an exceptional job of clearly recording sound in all directions. Camcorders also generally have an auto gain control that bumps the recording volume up during quiet speaking and curbs the recording volume when congregational singing gets louder, thereby avoiding distorted sound

## ***In Use...***

*Now that we have taken care of some of the more complicated issues of interfacing a/v gear together, let's see some real world examples that your congregation may want to consider.*

## **No Church Sound System-Video**

Analog: Record with a VHS camcorder and its built in microphone. To duplicate tapes, use the camcorder's included accessory cable, attaching it to the camcorder as well as a second VCR. Either record from the camcorder to another VCR or vice versa. Two VCR decks could be attached in a similar manner w/ a 3 conductor RCA cable (video/audio left/audio right) for dubbing.

Digital: Record with a digital camcorder and its built in microphone. After the service, plug your camcorder into your computer (usually requires Firewire connection) and use the software that came with your DVD burner to capture, edit, and create your DVD. DVD burners often come with some version of Nero Vision Express. That should be sufficient for most congregation's purposes, though you may find it rather cumbersome to accurately trim the beginning and end of a video's clip, *if* you need to do that. For more advanced DVD editing and creation, I recommend Sony Vegas Movie Studio. Pinnacle software is also very advanced and easy to use, but has suffered with stability issues over the years while the Sony Vegas products have not. Sony Vegas Movie Studio is now at version 8 and is available new on ebay for under \$70. Be aware that creating a DVD from start to finish can take many hours. While most of that work is done by the computer and you can be off doing something else, keeping the video computer at the church while the operator lives more than a few minutes away may not be a very convenient solution unless he/she makes frequent trips to the church throughout the week.

## Yes, Church Sound System- Video

Analog: Record with a VHS camcorder. However, instead of recording to a tape in the camcorder, attach the camcorder's included 3 conductor RCA cable to both the camcorder and a VCR. More specifically, only attach the yellow RCA plug to the video input of the VCR, and not the audio leads. Attach the output of the church's audio mixer to the RCA audio inputs of the VCR. In this way you are capturing the video from the camcorder, the audio from the church's mixer, and recording the service tape on the VCR. You will probably select something like "L1" (usually back RCA inputs) on the VCR input selector instead of a channel number. Otherwise you will just be recording fuzz. Attach a TV monitor to the output of the VCR to see and/or hear if you have everything hooked up and recording properly.

Digital: This is where we need to step the line level down to microphone level so that it can be input into the camcorder. As mentioned before, the "XLR Pro" from Sign Video works well for this. If purchasing a new camcorder, it is advantageous to get one with a headphone jack so that you can adjust the output level from the mixer or XLR Pro to get a sufficiently loud enough signal without distortion. It is OK if your camcorder doesn't have this, but you will have to use trial and error, that is, recording at different volume settings and playing back the video, to determine the appropriate volume setting. Levels should be set conservatively enough so that a congregation's loudest hymn or a pastor's loudest speaking doesn't cause distortion. Next, follow the capture instructions listed under "No Church Sound System- Video" under the "digital" section.

Digital Video with Analog Video backup: Record as above in the digital section, but also have the digital camcorder's analog cable attached to the camcorder. Feed only the video output into the VCR's video input. If you are using a mixer before the audio input of the digital camcorder, also run audio output from the mixer into the input of the VCR. Hopefully your mixer will have sufficient audio outputs to do this. Otherwise you will have to get a Y-cable that splits the signal. This is safe to do, but be aware that it will output half of the volume to each, so appropriate volume adjustment on the mixer's end would need to be made.

## No Church Sound System-Audio Only

Analog: Use a cassette recorder that has a built in microphone to record. Use a second cassette deck or a dual cassette stereo that has dubbing capability. The stereos that have high speed dubbing can duplicate faster than "real time."

Digital: Purchase a "digital voice recorder." The models by Olympus are popular. Look for the amount of space it has so you know how long it can record. Olympus models also usually have different record quality settings, which is handy when you create a small enough file that can be posted on the internet. Record at the lowest quality setting that you are satisfied with. These compressed .wma files can be listened to by anyone that has Windows Media Player. A huge number of worship services could be archived by burning a Data CD of all the .wma files, and about 74 minutes of audio can be burned to an Audio CD. If you have Nero burning software that is before version 6.3 you may have to download the .wma plugin, which is available freely from their site here:

## Yes, Church Sound System- Audio Only

Analog: Use the line level output of the mixer into the line level input of a cassette recorder. The mixer may have plugged into it the pastor's microphone, the congregation's microphone, or both. Adjust levels to taste.

Digital: 1. Digital Voice Recorders like those made by Olympus generally don't have a "line input" to route our church mixer into. Even if they have a microphone input, we're still faced with the level matching problem of converting line level to microphone level. There are a lot of \$300 options out there for portable recorders with line input capabilities, but if that's beyond your budget, pick up an mp3 player that has line input capabilities. Just be aware that most limit you to one or a few recording modes. The sole default compression ratio may still be too big for convenient internet posting. You may want to check out the Truly MP310. At the time of this writing it was \$25 at TigerDirect.com and can create mp3's in three formats: 32Kbps, 128Kbps, and 192Kbps. 32Kbps is lower than you'd find on most mp3 players as a recording option, so this is a plus when it comes to consideration for file size. After recording, simply plug it into your computer where it will be treated as a removable drive. Be aware that *some* of these portable devices don't allow you to audition your recording level with headphones, so some trial and error ahead of time may be needed to find the proper volume level to send to the device.

2. Greater features and flexibility come with a larger investment. The \$199 "Zoom H2" records to an SD card, has high quality microphones built in, or can also take a line input via 1/8" stereo. It can record to uncompressed .wav or .mp3 format, and uploads the audio file to computer via USB. It is a high end recording device designed for recording concerts, services, Sunday school classes, interviews, etc.



*Zoom H2*

3. Another option would either be to record directly to the line input of a computer's sound card, or probably better yet for dependability's sake, record to tape in church, then re-record the tape through the sound card at a later time. This gives you tape quality, and must be transferred in real time, but it does give you the advantage of compressing the .wav file into your choice of .wma or .mp3, and your choice of compression quality. There are a variety of ever-changing free programs out there to do this. You can then burn to cd and/or distribute via the internet.

4. Do the same as above, but record to a minidisc deck and then transfer to computer. This would produce digital quality by avoiding the cassette tape step.



## Extracting Audio from Video

Analog: You can use the VHS tape that was made during the service to make an audio tape, by connecting the RCA audio outputs of a VCR to the RCA inputs of a tape deck. Rewind both tapes and hit play/record.

Digital: You can make a digital audio file from your recorded digital video by using a program like Sony Vegas Movie Studio. After you have captured your video and it is displayed in the video software, go to “render as” in the program and select an audio format. Use .wav if burning to a CD. Use .wma if you're planning on posting to the internet. There are also file converter programs available for free or for purchase that can convert the .avi video files into audio formats. I will not list any names because usually they are offered for free for awhile and then change in price as awareness increases. Windows Media Player could also be used to convert full resolution .wav audio files to .wma, or full resolution .avi video files to .wmv (Windows Media for Video).

## Duplication

Analog: If you'd like to duplicate more than one cassette or video tape at a time, multiple player/recorders need to be purchased. One VCR, for example, serves as the master player. To connect the other VCR's for recording, you will need a distribution amplifier, which is a device that multiplies and amplifies the signal of the master player. Radio Shack carries these for about \$50, and can interface with one master and 4 cassette or VCR recorders via RCA jacks.



*Distribution Amplifier by Radio Shack*

Digital: If you are creating several DVD's and burning them all from your computer, you may want to consider creating an “image” of the file, whenever possible. This is done at the point you would normally select your DVD drive as the “burn to” drive. In other words, this appears on the burning (disc creation) page. That image file can later be opened up and the desired number of copies can be made without having to re-encode (render) the video file, which takes several hours. The image file will be less than or equal to the size of a DVD (4.7 GB), and does not reference the original uncompressed avi files. Avi files should only be deleted though after you're happy with the disc or image you've created.



*Standalone CD/DVD Duplicator*

If you're creating a large number of CD's or DVD's, you may want to look into getting a stand-alone duplicator. Be sure to get one that creates both CD's and DVD's. The more expensive models have a hard drive that can store “images” of the discs you've created, but burning from disc to disc on a low speed can also be quite dependable. It is never advised to use two drives in a computer to duplicate discs. Even on a low speed, this is not a dependable solution. CD and DVD duplicators are created specifically to duplicate reliably. Significant savings can be found by purchasing a new duplicator on ebay from a reputable seller. If you want a duplicator that can create 5 discs at a time, do a search for “5 target CD DVD duplicator.” A good quality duplicator with one “Asus” brand master drive and 5 “Sony” recording drives can be purchased for around \$380, shipped. I recommend getting a black model, as white cases will yellow over time.

### **Compatibility and Brands of Digital Media**

If you have a problem where a disc is not playing in someone's CD or DVD player, or a disc is not burning in your burner, there are three factors to keep in mind. First of all, DVD's come in 2 “write once” formats: DVD-R and DVD+R. Neither is superior or more common, there are just two formats. Most players play both, but you may encounter older models that do not. The second and third things to keep in mind are that compatibility can be caused by incompatible brands of media as well as improper burn speeds when the DVD was made with that particular brand. In general, it is best to burn at the lowest speed possible, but I have also had cases where the lowest speed caused playback difficulties. To obtain a high rate of compatibility, I recommend not using DVD's that you can purchase at the store, but to go online and purchase Ritek Ridata DVD-R. They are about 25 cents each, shipped. This is a highly recommended disc among professionals, and in my experience I have had the most success with burning these at 8x, regardless of whether there is a lower speed available. For compatibility's sake, I also recommend using Taiyo Yuden brand CD-R discs, and burning them at 8x or lower speed. These are about half the cost of the top of the line CD-R brand Mitsui, but are still highly regarded as far as compatibility goes. You would need to purchase these online as well.

### **Labeling your CD and DVD Discs**

Do not, I repeat, do not use paper labels on your finished discs. This can make your discs significantly less playable in players that would otherwise play them fine. The weight and size difference may seem insignificant, but the difference is significant. A new technology called LightScribe is more promising, but the downfall is that it requires special burners and media to be purchased, it can take about 30 minutes to inscribe a disc, the media is more expensive, and the discs are not yet available in the highly compatible brands mentioned above. The fastest and most convenient option is still using a Sharpie permanent marker. Do not use a pen! I am not a fan of the inkjet printable discs due to printing costs and smearing when some of these types get wet. If you want professional and affordable disc printing, check out the UPrint Thermal Printer for \$99. This is a USB

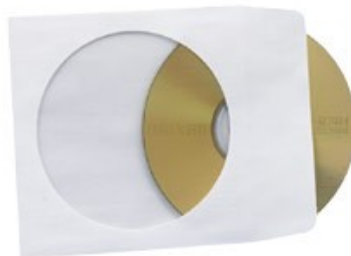
printer that prints directly on the disc, and comes with software so that any font on your computer can be used to create labeling that does not smear. Non-complex images can also be printed. The printer does include one ribbon, and the replacements, which are available in a variety of colors, cost under \$20. These ribbons can print over 110 discs when using two lines of text in one section of the disc. Just be sure when ordering DVD's like the Ritek Ridata to get "Ritek Ridata Thermal Printable." These are available in standard silver or white. This printer should also work on your standard lacquer silver finish CD's or DVD's that you are accustomed to seeing if there is not a brand label on the disc. The cost per DVD, including a thermal disc and single section of thermal ribbon, is within 50 cents, and the printing process is very fast.



*UPrint Thermal Printer*

### **Packaging and Mailing your Discs**

Discs can scratch easily even with normal handling, so it is important, at a minimum, to distribute them in a "Paper CD Sleeve." In most cases it would even be suitable to mail them in a manila envelope if the media is sleeved, as it is very hard to break a disc. However, for extra insurance this could be sandwiched between cardboard or a minimally padded envelope. Alternatively, a sleeved disc could be simply packaged in a cardboard envelope, like those available from the postal service. CD sleeves of stiffer cardboard material are also available. Priority mailers are available freely via the postal service's website, but if you provide your own envelope, you can send your discs and cassettes at their discounted media mail rate.



*Paper sleeve with clear plastic window*