

Recording Dances Using a Smart-phone

by Keith Rubow

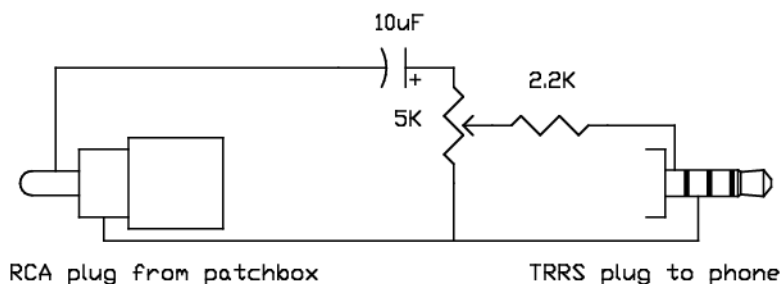
I have been recording square dances digitally since 1999. I started using an IBM Thinkpad 755 CD laptop, which was a far cry from today's thin and lightweight laptops. Over the years I used quite a few different laptops to record MP3 files. Eventually I collected a whole pile of small laptops which I have used to record multiple halls at various square dance conventions. Lugging around six laptops (plus one or two extras just in case something goes wrong) is quite a chore. You should see the looks I get from TSA agents at airport security checkpoints when I take out 8 laptops! So from time to time I have considered alternatives to laptops.

I considered the small MP3 recorders (often called voice recorders) that I have seen some people use to record dances. But for a high quality unit with the features I needed (external mic input, adjustable recording quality, etc.) the prices were well over \$100. Also, many of those units run on AA or AAA batteries which need to be changed well before they are dead to avoid the possibility of dying in the middle of a dance session.

What I needed was a very small lightweight computer with a rechargeable battery and good audio support. Then I looked at my smart-phone and a light went on! Audio recording apps are readily available for smart-phones, and phones have a combined headphone/microphone audio jack. Well, except for the newer iPhones, but they are way too expensive anyway. Could I really record dances using a smart-phone? I was about to find out. There was a lot to learn, and here is my story.

I knew that the combined headphone/microphone jack used a funny four conductor jack. I also knew that you could just plug in standard stereo headphones and they would work. But you can't just plug in a standard microphone using an 1/8" plug. But there are adapters (splitters) that plug into a smart-phone's audio jack and convert it into separate headphone and microphone jacks. That was a good place to

start, so I bought one. I used the splitter to connect the microphone I use for calling. No luck, the phone refused to recognize that an external microphone was connected. Google to the rescue. I soon learned that an external microphone must have an impedance of at least 1500 ohms to work with a smart-phone. My microphone was a standard 600 ohm model. I didn't really want to use that microphone anyway, it was just for testing. I really needed a cable to connect the phone to a patchbox to record the signal right out of the caller's amplifier. I knew I would have to get the signal level right so it wasn't too high (clipping is bad) or too low (signal is buried in the noise). So I built a cable using a four conductor plug (so I didn't need the splitter), a “pot” to adjust the signal level, a DC blocking capacitor (it's technical) and a 2200 ohm resistor to keep the impedance above 1500 ohms. A few tests with my wife's phone and with an Android tablet proved the concept. I actually made some test recordings at a dance. The diagram below shows how I built my cable.



Let's face it, a smart-phone can be quite expensive, and six (or more) of them seems unreasonable! But I had learned long ago that I didn't need the newest or fastest laptops to record MP3 files. What kind of smart-phone would I really need, and how much would it cost? I found out I could get by with a pretty old phone with a pretty old version of Android. Plenty of recording apps were available that would run on Android version 5.0 (Lollipop) or 4.4 (KitKat). There are so many older Android phones still in use that many apps support older phones. I searched Ebay for used smart-phones and found the Samsung Galaxy S4 (first released in 2013) was readily available for \$30-\$35, well within my price range. I bought one.

Next came the software. I needed a recording app that could record directly to MP3 files. There are lots of free recording apps in the Google Play Store. Many are free “introductory” versions of paid apps with limitations, restrictions, advertisements, and other undesirable stuff. Plus I didn't really want to have a Google account on every one of my recording phones just so I could access the Google Play Store. It turns out that Android phones can get apps from other app stores as well. There is an app store called “F-Droid” that has nothing but free open-source apps. I Googled F-Droid and found their website (f-droid.org) where I could download the F-Droid app (phone warns about installing from an unknown source, just check the box to allow Unknown sources). The F-Droid app let me search their collection of free apps. I installed a recording app called “Audio Recorder” (what a unique name) that has all the features I need.

Now things get a little tricky, but with the right settings things work very well. Android phones let you select different sources for audio input. “Microphone” sounds like the logical choice, but it is wrong. The microphone input does some filtering for voice frequencies, which reduces the high and low frequencies found in music. This is fine for a phone call, but bad for recording music. In Audio Recorder settings, select “Unprocessed” as the Recording Source. Set Sample Rate to 22 Khz (or 44.1KHz for higher quality, but I can hardly tell the difference), Encoding to MP3, Mode to Mono, and turn on Encoding on Fly. Using my special cable I connected the phone to the patchbox. I found that the “Low” output from the patchbox was too low, but the “High” output worked great if I turned the level adjust pot on my cable down to about 10-15% of full level. Tapping the red Record button on Audio Recorder starts the recording. The recording must be started and stopped manually, since there is no sound-activated recording. That's OK because it is easy to split the recording into individual tips later.

I did learn a few more things. I found that plugging the phone into the charger while I was recording caused a loud buzzing noise in the recordings that made them useless. I had to record using battery power. But how long would the battery last? At first it would barely last

through a three hour session. But I found ways to make the battery last longer. Many things use power on a phone, and I didn't need most of them. The screen uses lots of power, so I turned the brightness all the way down while recording. I also turned off WiFi, Location (or GPS), Bluetooth, S Beam and NFC. I also put the phone into airplane mode to turn off the cell phone radio. This extended the battery life considerably. I had no trouble recording 3 hour dance sessions.

Even though the battery lasted long enough, I wanted it to last even longer so I wouldn't have to remember to charge it between sessions. Then I discovered that Audio Recorder has an amazing feature to allow recording to continue in the background with the phone in standby. To use this feature, turn on Lockscreen Controls in the Audio Recorder settings. It took me a while to figure out how this works. Audio Recorder displays a notification on the lock screen (the screen that pops up when you wake up the phone by pushing the power button). On this notification is a red record button. Pressing the red button starts the recording. The Audio Recorder screen appears indicating recording in progress. The level indicator will show if the recording level is decent. Then pressing the power button puts the phone in standby, but the recording continues in the background with the screen off, and it uses very little power. To return to the Audio Recorder screen to stop the recording and save the file, press the power button and tap the Audio Recorder notification (do not tap the pause button where the record button was). The Audio Recorder screen appears where you can tap the red checkmark to stop recording and save the file, or the red X to discard the file. Recording in this mode makes the battery last MUCH longer. How much longer? I found I could record for over 24 hours on a single charge!

Transferring the MP3 files to a computer is easy with an Android phone. Just connect the phone to a computer with a USB cable. The phone appears in Windows File Explorer just like an external USB flash drive (it works on my Linux computer too). The MP3 files from Audio Recorder are in a folder called Audio Recorder.

It turns out that a \$35 used smart-phone makes an excellent MP3

recorder. And if you only need one recording device you can just use the smart-phone you already have. I'm sure any Android phone would work just fine. Can you use an iPhone to record? I'm sure you can, but don't ask me what app to use, or how to transfer the files. I've not gone down that road. And if your iPhone doesn't have a headphone jack you will need a USB-C to headphone/microphone adapter.

I find that recording with an Android phone is very convenient. It is much easier to carry around than a laptop computer, and I don't need to wait for it to boot up or shut down. I don't even need to carry a charger because the battery lasts so long, and the sound quality has been excellent.