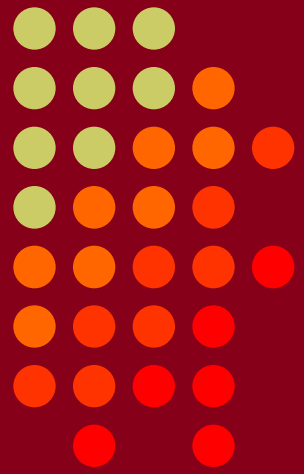
How to Record an Entire Contest and Learn From Your Mistakes

Presented by N6TV

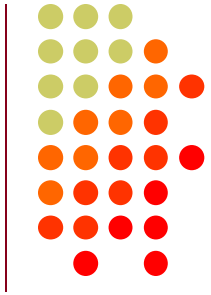
n6tv@arrl.net



• CTU •
CONTEST
UNIVERSITY

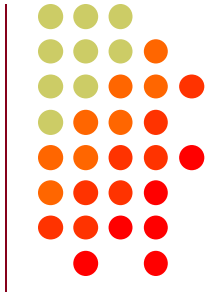
ICOM

Presentation Overview



- Why record a contest?
- How to record an entire contest
- How to record analog audio on a PC sound card
- How to record digital audio from a radio's sound card
- How to record two radios (SO2R) at once
- How to record with Logging Software
- How to learn from your mistakes (and mine)
- Q & A

Why record the entire contest?

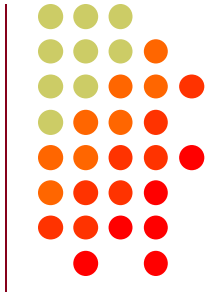


- You can learn a lot
  - Review highlights (and lowlights) with your contest Elmer
  - Send audio excerpts to friends
  - Review Log Check Report, improve skill & accuracy
- You can help others
  - Publish web page where people can listen to their QSOs with you
  - Bad audio? Bad keying? Send them a clip
- Got intermittent noise?
  - Analyze audio spectrum, send clip to RFI experts
- For top competitors, a recording may be required

CQ WW Rule XII.C – Audio Recordings

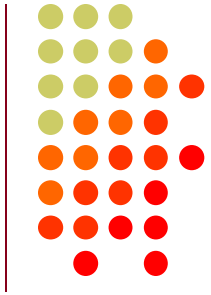
- “Any single operator entrant competing for a top three finish at the (a) World, (b) Continent, or (c) USA levels, must record the transmitted and received audio as heard by the operator for the duration of the contest operation.
- “The recording must be in a common format (e.g., mp3) and should include the audio to each ear as a separate channel
- “The recording may be requested by the Committee within 90 days after the log deadline to help adjudicate the log
- “The recording files must be provided by the entrant within 5 days of the request.
- “If no recording is made available, the Committee may reclassify or disqualify the entry.”

Can I use a recording to fix my log?



- CQ WW Rule IX.9:
  "Correction of logged call signs and exchanges after the contest by using any database, recordings, email or other methods of confirming QSOs is not allowed."
- So, do *not* use a recording make corrections

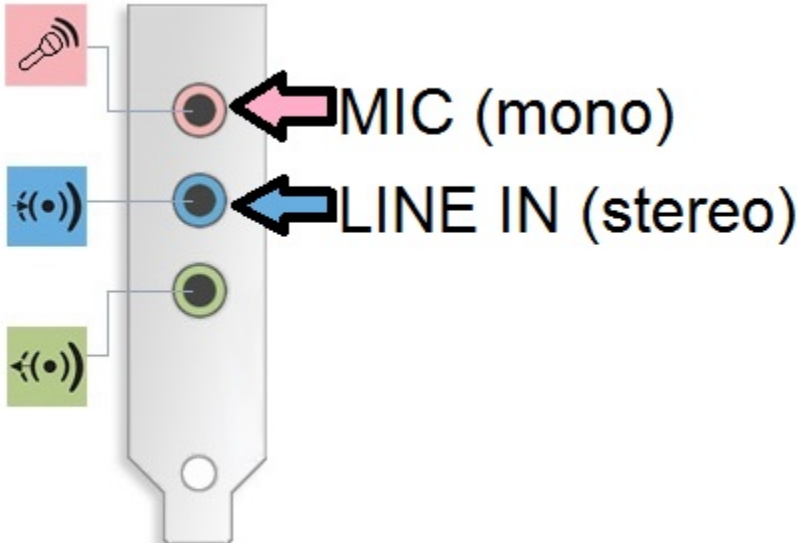
How do I make a recording?



- Connect headphone output to PC
- Before the contest starts, start recording
- Simple enough, right?
- Nope
  - Headphone level much too high for MIC or LINE inputs
  - Any recorded audio will be severely distorted
  - Interface circuit required

First challenge

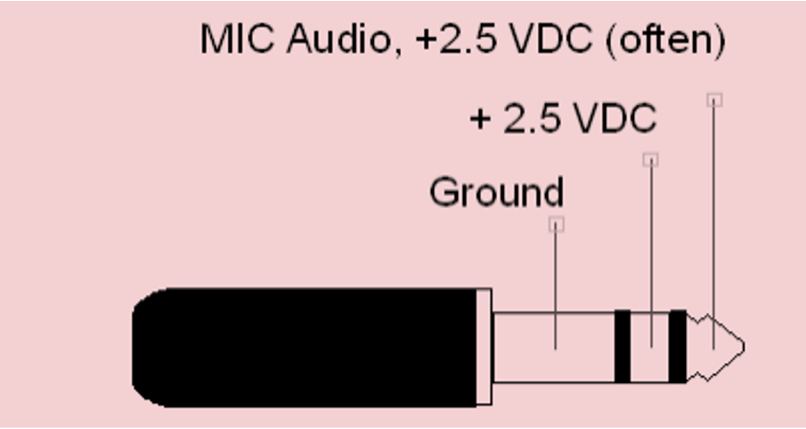
- Headphone audio is stereo, PC MIC input is MONO (even though it uses a stereo plug)



- Most notebook PC do not have a LINE IN

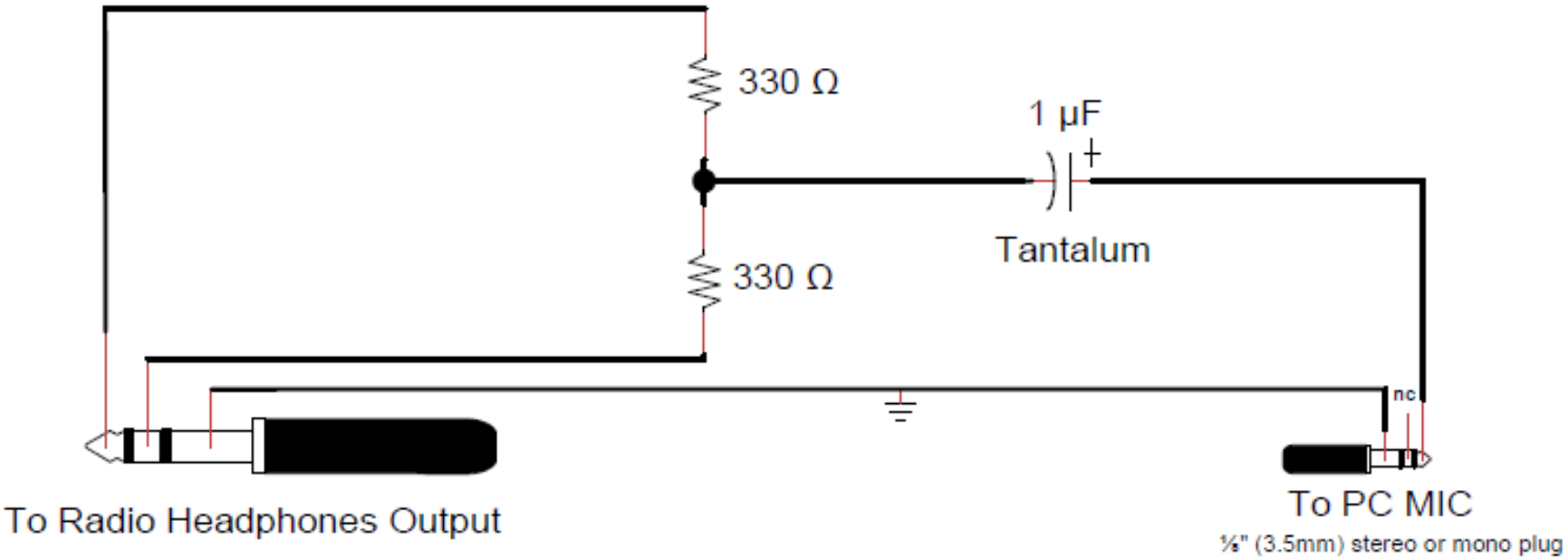
Second challenge

- "Stereo" PC MIC jack provides DC power to small condenser mics:



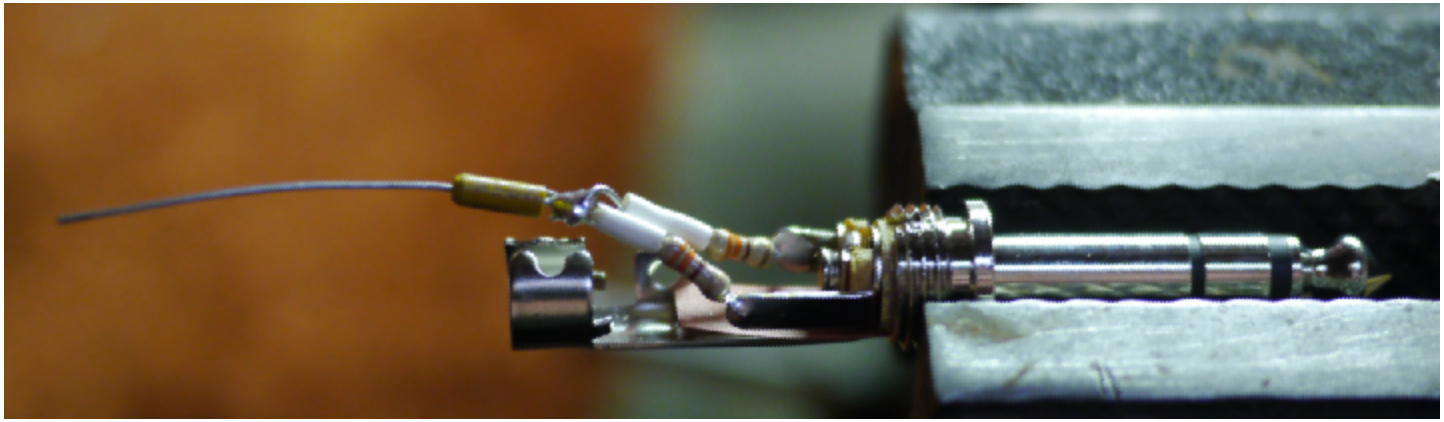
- Must block this DC voltage
  - Using mono plug grounds RING, but does *not* block DC on TIP
- Must attenuate headphone audio to mic. level

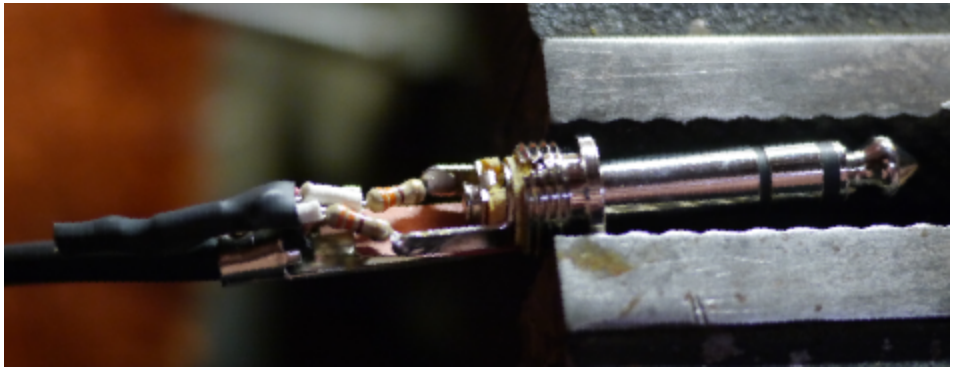
Solution – mix audio, block DC



(Mono recording not good enough for “Top 3” CQ WW competitors, but OK for everyone else)

Fit inside ¼” stereo headphone plug

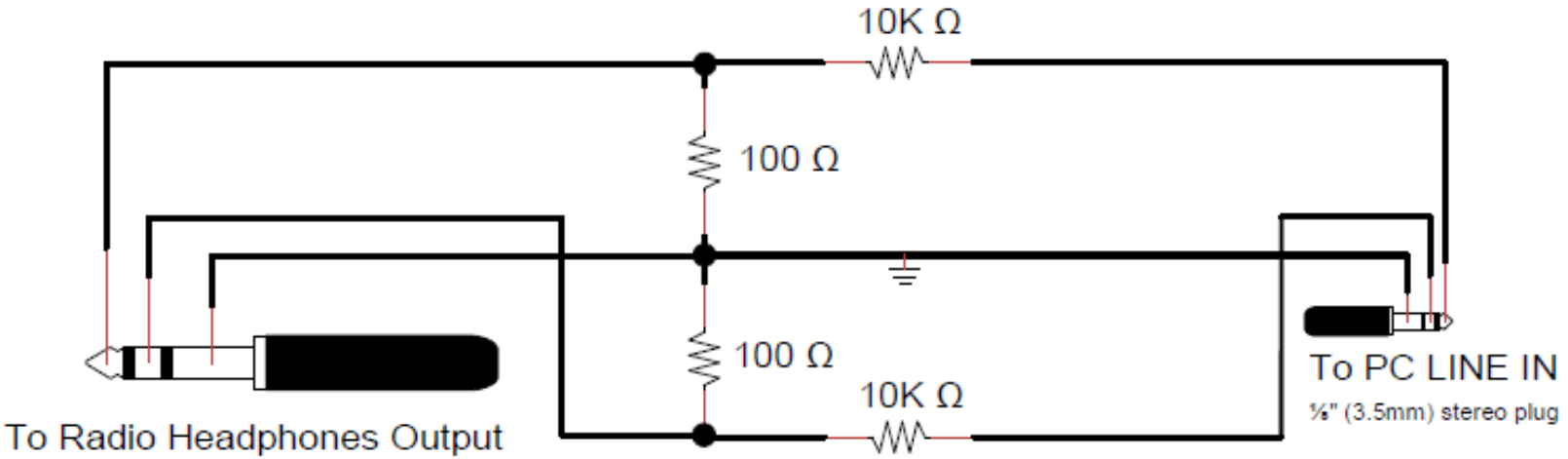




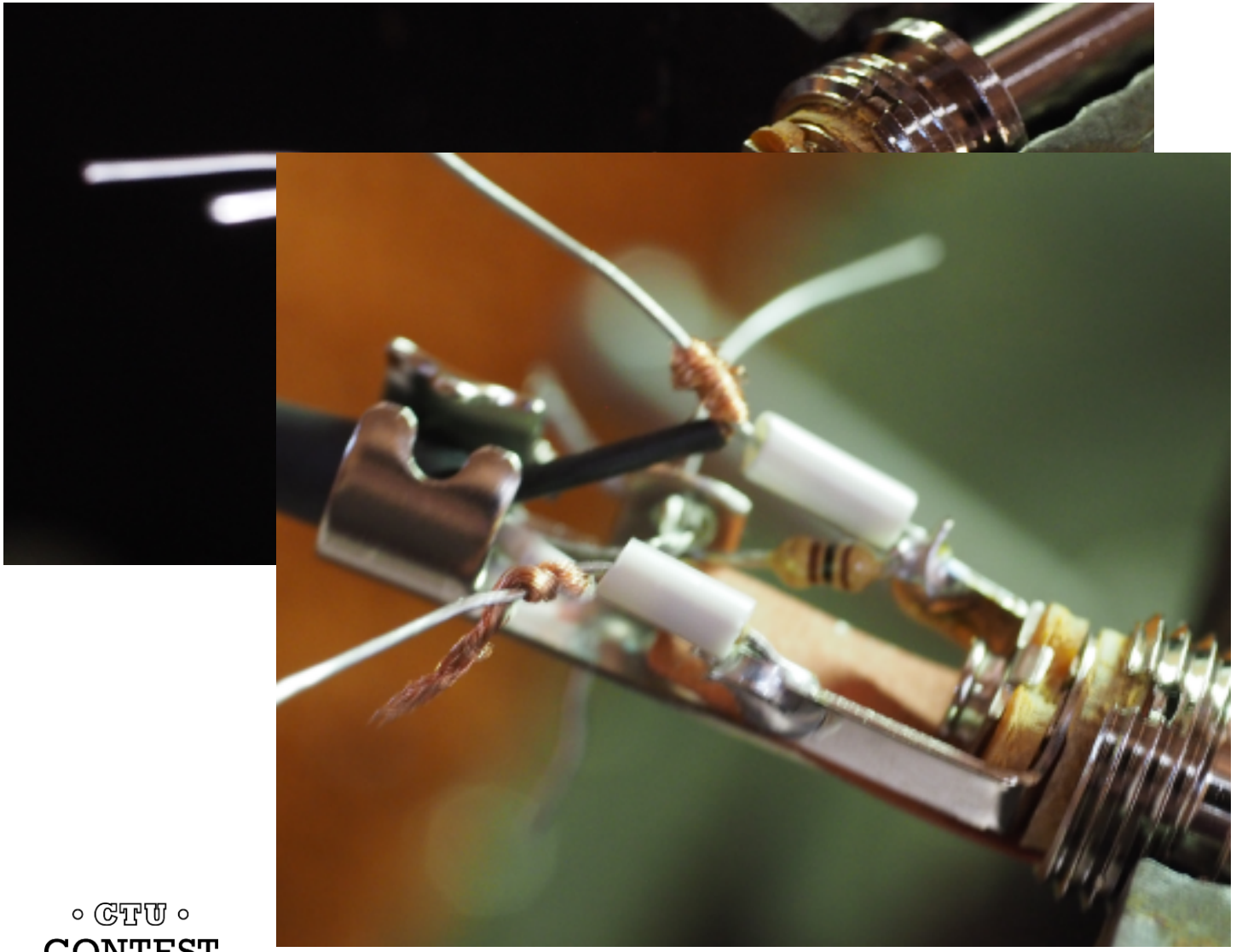
For 1/8” plugs, use a project box

For recording stereo via LINE IN

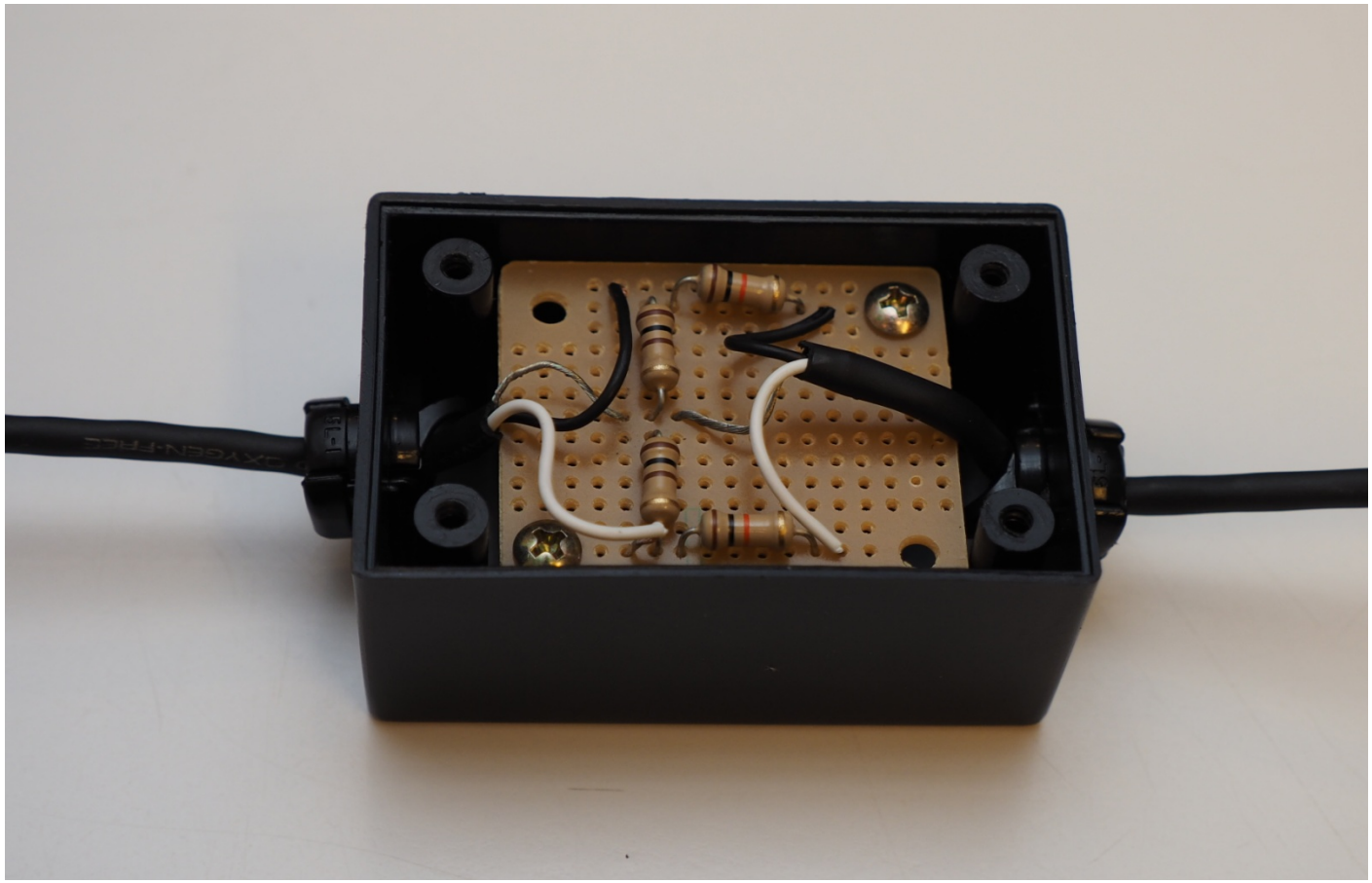
- DC blocking cap. not needed
- Use impedance pad to attenuate to line level



LINE IN circuit inside ¼” stereo headphones plug



LINE IN circuit in a project box



You may also buy rather than build

Olympus KA-333 Compaticord, Connects Earphone or Headphone Jack Output to Mic Input Jack

by Olympus

13 customer reviews | 8 answered questions

“Can’t I just connect LINE OUT to LINE IN?”

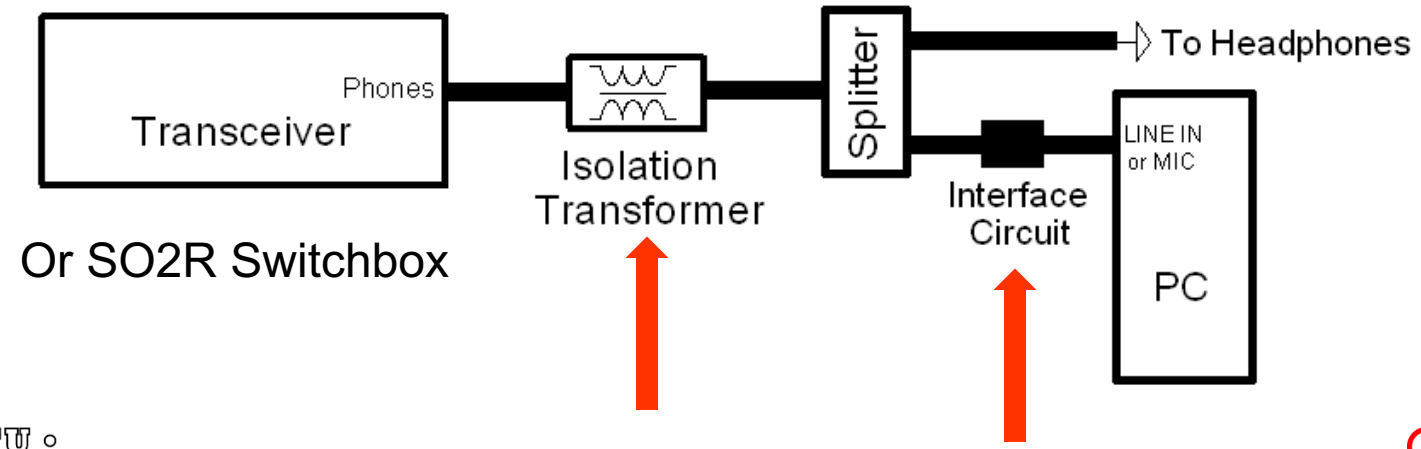
- Yes, but that’s not what you heard in your headphones
- Many radios do *not* forward audio monitor to LINE OUT
  - Transmissions will not be recorded
- Elecraft K3 works OK, has nice isolated stereo LINE OUT jack
  - Simple stereo patch cable from LINE OUT to PC LINE IN or MIC
  - LINE IN will record stereo
  - MIC will record MONO
- But …
  - LEFT channel will be VFO A (Main) only
  - RIGHT channel will be VFO B (SubRx), but *only* when SUB activated, otherwise *nothing!*
  - Transmitted audio is forwarded to *both* channels
- Recording will not match your contest experience

For radios with two headphone jacks

- Connect headphones to first jack
- Connect PC interface circuit to second
- If no change in headphone audio, you're good to go

For radios with one headphone jack

- Using a simple stereo “T” or Y-adapter (splitter)
  - Will probably cause unacceptable noise from PC
  - Ground loops
- Solution: Use **line isolation transformer** between radio and splitter



Radio Shack® “Ground Loop Isolator”

- Works quite well (though not shielded)
- Requires phono adapters
- May be hard to find
- Cat. No. 270-054

Ebtech Hum Eliminator

- Two isolated LINE IN / OUT pairs, shielded
- Four ¼” MONO phono connectors
- Requires phono to stereo adapters

Avoiding the Analog Problems

- Some radios have a S/PDIF (digital optical) audio output
- Requires sound card with S/PDIF input:

S/PDIF IN (Analog Stereo Line IN)

HDE 6 Channel 5.1 Surround Sound USB 2.0 External Optical Audio Sound Card Adapter for PC Laptop

by HDE

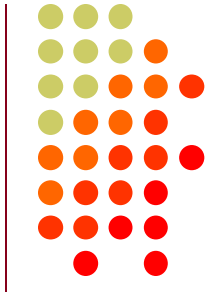
77 customer reviews | 20 answered questions

List Price: $39.99

Price: $12.95 + $2.99 shipping

You Save: $27.04 (68%)

Newest HF transceivers look like external USB sound cards



- Radio treated as external sound card named **USB AUDIO CODEC**
- USB Sound Card Radios:
  - Elecraft K3S
  - Icom IC-7300, IC-7851
  - Kenwood TS-590S, TS-990S
  - Yaesu FT-991
  - FlexRadio 6700
- No need for isolation transformer, splitter, or level conversion circuit
- Use USB Audio CODEC as recording source

However …

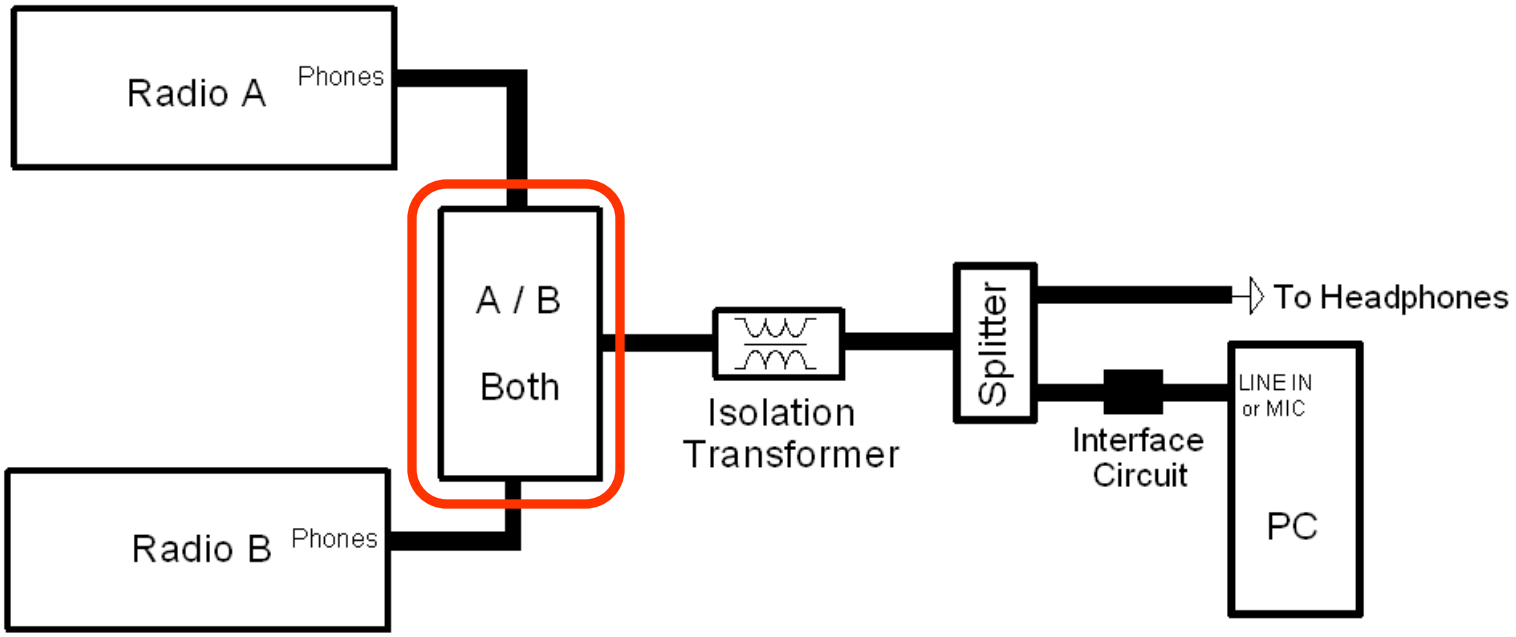
- Transmitted audio may *not* be recorded
  - IC-7851 records transmitted SSB OK
  - IC-7851 does *not* record transmitted CW at all (yet)
- It *may* be possible to use radio USB sound card as *both* voice keyer and contest recorder at same time (works OK in IC-7851)
- TS-590S? Elecraft K3S? FT-991?

Recording SO2R (now it gets complicated)

- Easiest (but most expensive) solution: microHAM MK2R+ (does it all)

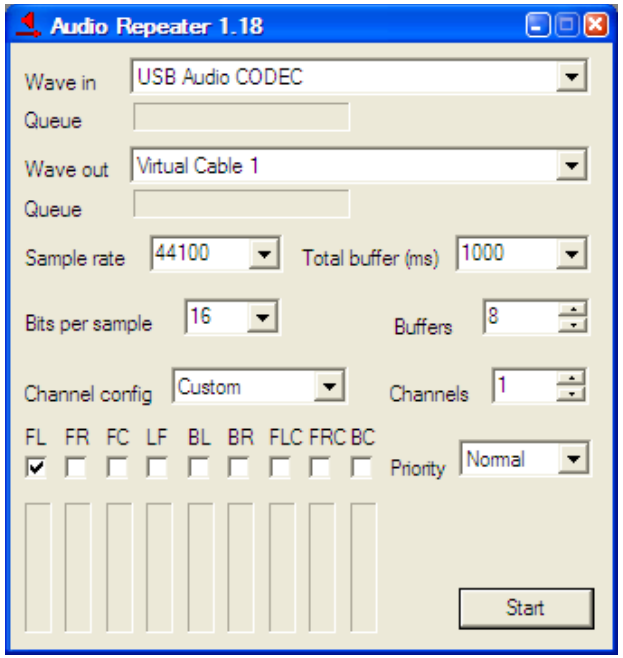
- Includes two USB Sound Cards (DVK + Stereo Recording)
- Will record “What You Hear” in headphones
- Set recording source to microHAM **USB Audio CODEC**

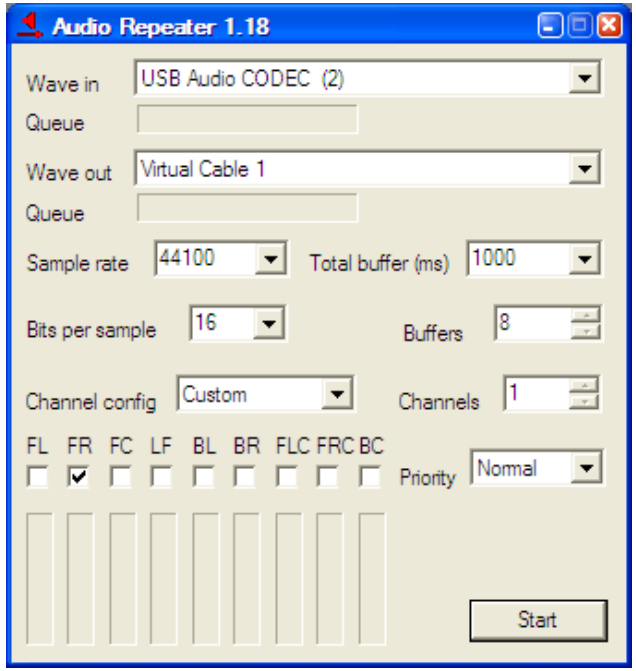
For SO2R, record output of headphone switch



SO2R Digital Recording

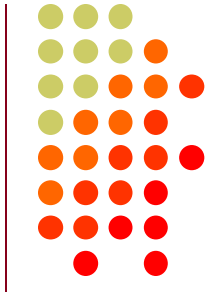
- Can use Virtual Audio Cable (VAC) “Repeaters” to mix digital stereo inputs together





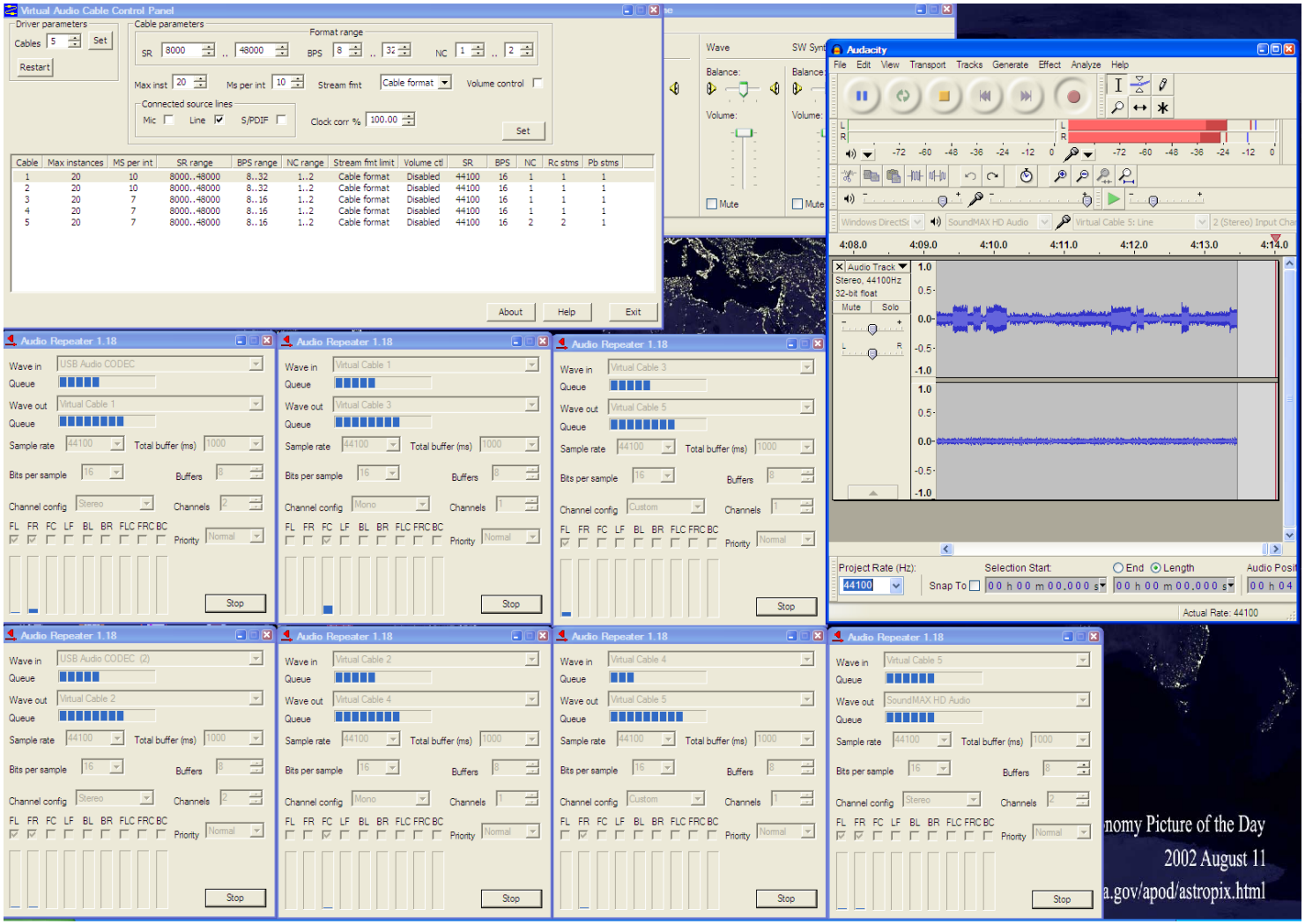
- But … radio USB sound card may not record transmitted audio

A Test – Mix *four* audio sources

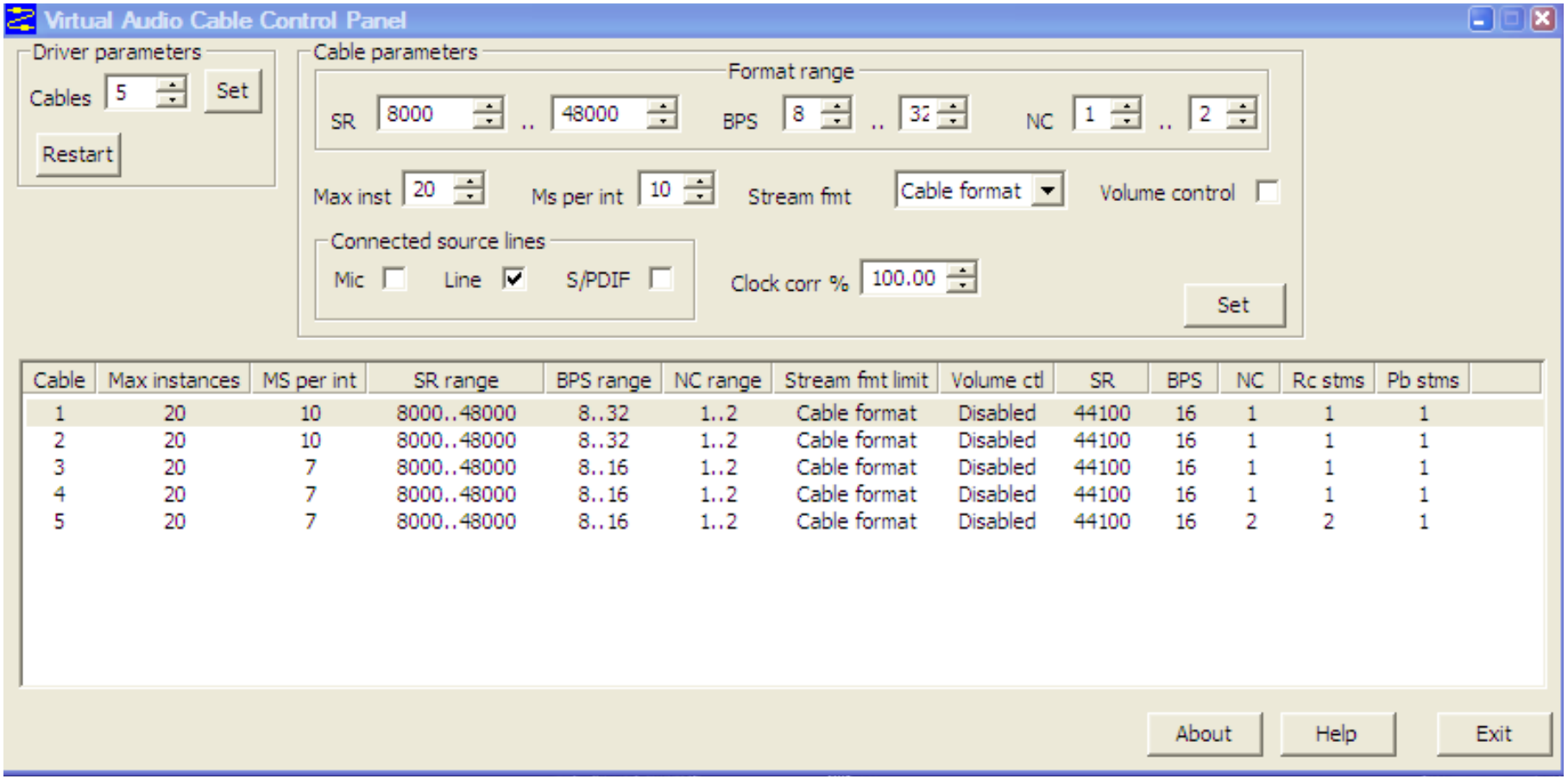


- Four audio channels mixed into a single Virtual Cable for recording in stereo
  - Left Channel: Rig A Main + SubRx (stereo-to-mono mix)
  - Right Channel: Rig B Main + SubRx (stereo-to-mono mix)
- Had to define of five (5) VACs
- Had to start six (6) VAC Audio Repeaters

Here's what it looked like

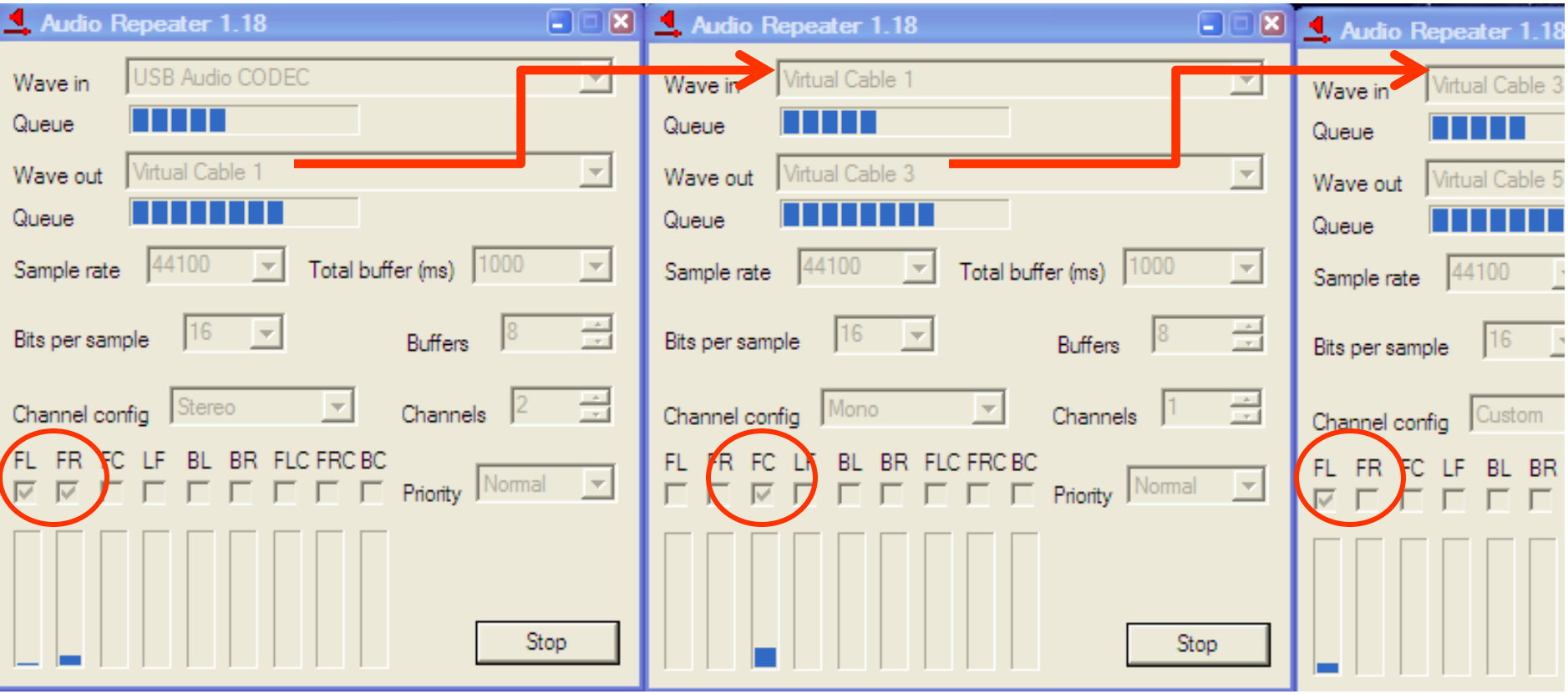


Defining Five VACs



Cable	Max instances	MS per int	SR range	BPS range	NC range	Stream fmt limit	Volume ctl	SR	BPS	NC	Rc stms	Pb stms
1	20	10	8000..48000	8..32	1..2	Cable format	Disabled	44100	16	1	1	1
2	20	10	8000..48000	8..32	1..2	Cable format	Disabled	44100	16	1	1	1
3	20	7	8000..48000	8..16	1..2	Cable format	Disabled	44100	16	1	1	1
4	20	7	8000..48000	8..16	1..2	Cable format	Disabled	44100	16	1	1	1
5	20	7	8000..48000	8..16	1..2	Cable format	Disabled	44100	16	2	2	1

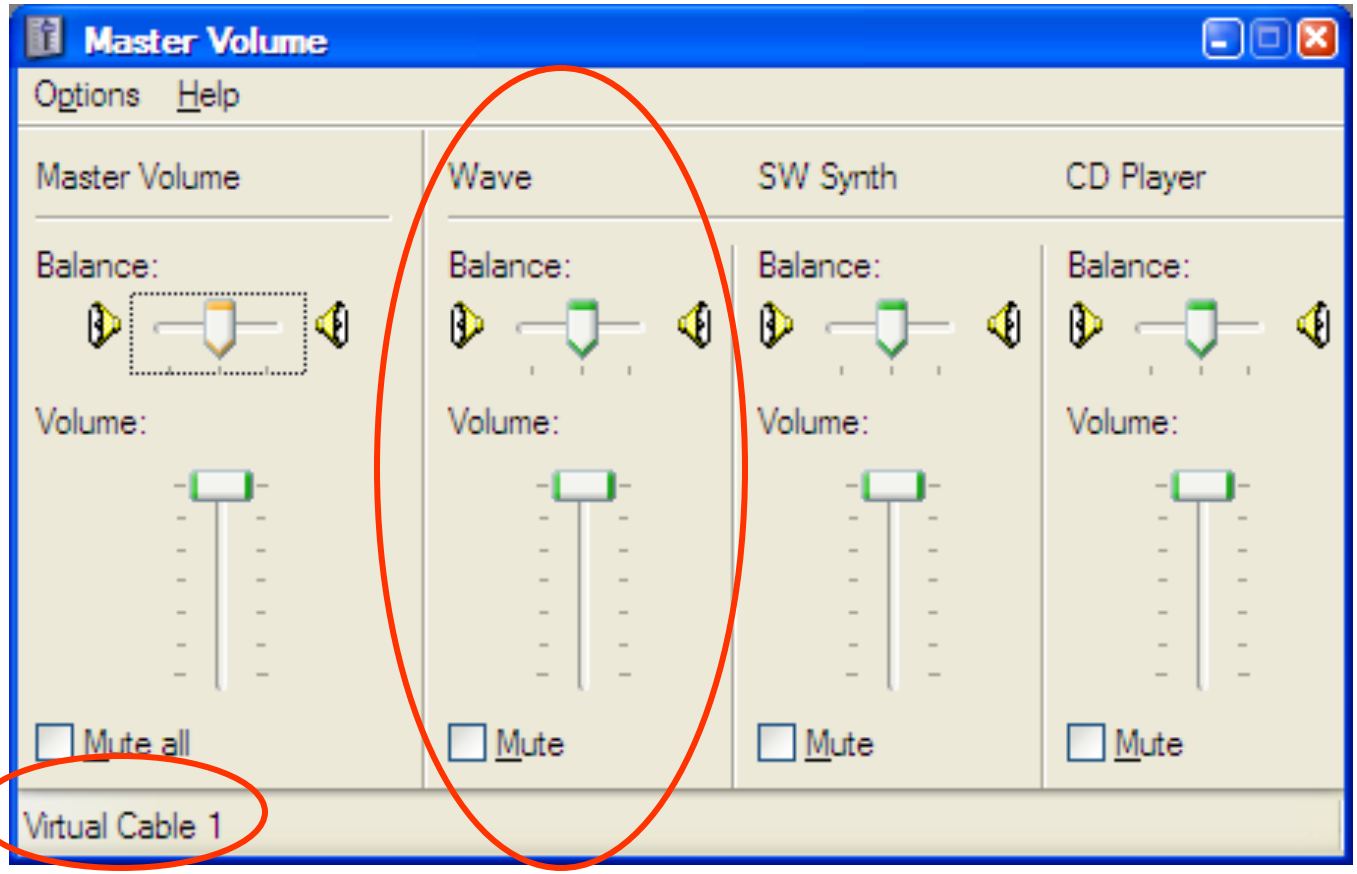
Chaining VAC repeaters to mix Stereo to Mono to Left Channel



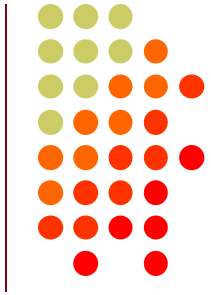
How to Autostart Audio Repeaters

- Can use Windows shortcut, but batch file can automate startup:
  - Left Channel:
    "C:\Program Files\Virtual Audio Cable\audiorepeater.exe" /Input:"USB Audio CODEC " /Output:"Virtual Cable 1" /Channels:1 /ChanCfg:custom=1 /SamplingRate:44100 /BitsPerSample:16 /AutoStart
  - Right Channel:
    "C:\Program Files\Virtual Audio Cable\audiorepeater.exe" /Input:"USB Audio CODEC (2)" /Output:"Virtual Cable 1" /Channels:1 /ChanCfg:custom=2 /SamplingRate:44100 /BitsPerSample:16 /AutoStart
- Had to use extra blanks in CODEC names!
- Arguments are *case-sensitive*

Rec. volume set by VAC WAV *Output*



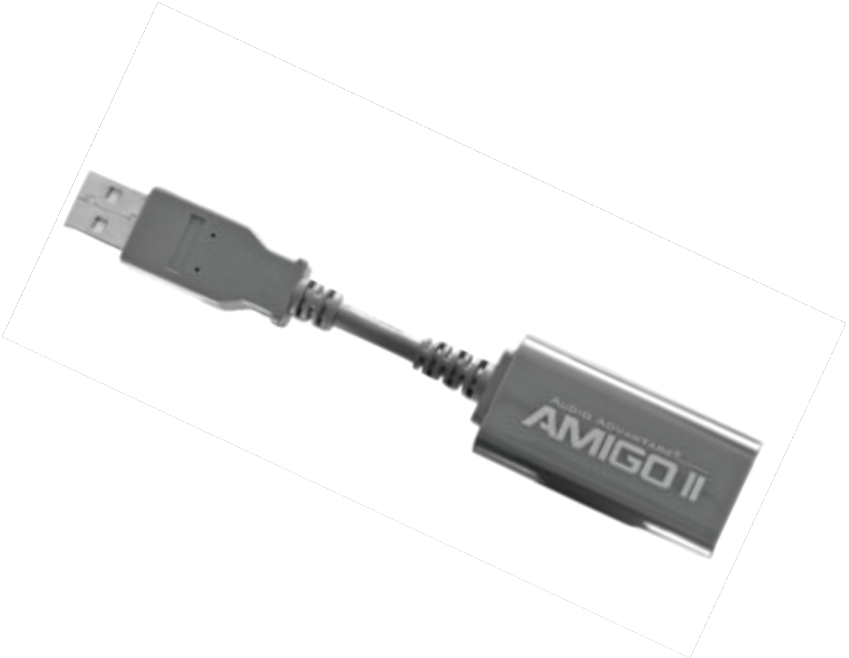
What if two computers are used for SO2R?



- You need two sound cards in one PC
- Use Virtual Audio Cable to mix them
  - USB Audio CODEC (From Rig A, local, digital)
  - USB Audio CODEC 2 (USB Sound Card)
    LINE IN/MIC (From Rig B, remote, analog)
    -or-
    S/PDIF IN (digital)
- Supports single combined stereo recording of two radios on single PC
- Recording analog headphone output is simpler, but that requires interface circuits

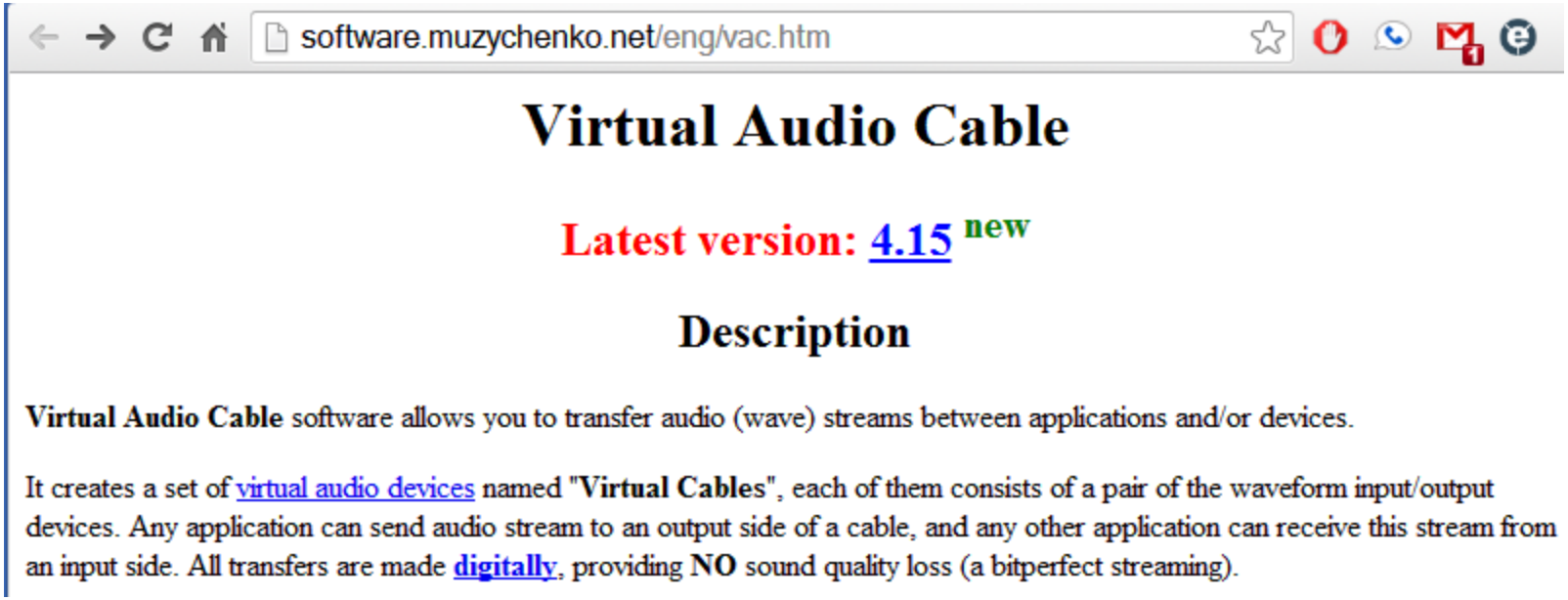
How to add a second sound card?

- Try external USB (HDE 6 shown previously)
- Turtle Beach Audio Advantage Amigo II

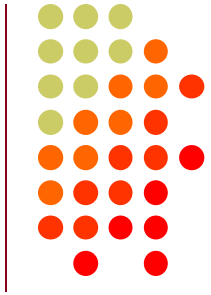


Downloading and Buying Virtual Audio Cable

- http://software.muzychenko.net/eng/vac.htm
  - ~$25 (self-support), $35 (basic support), $50 (extended support)



Using Logging Software to Record

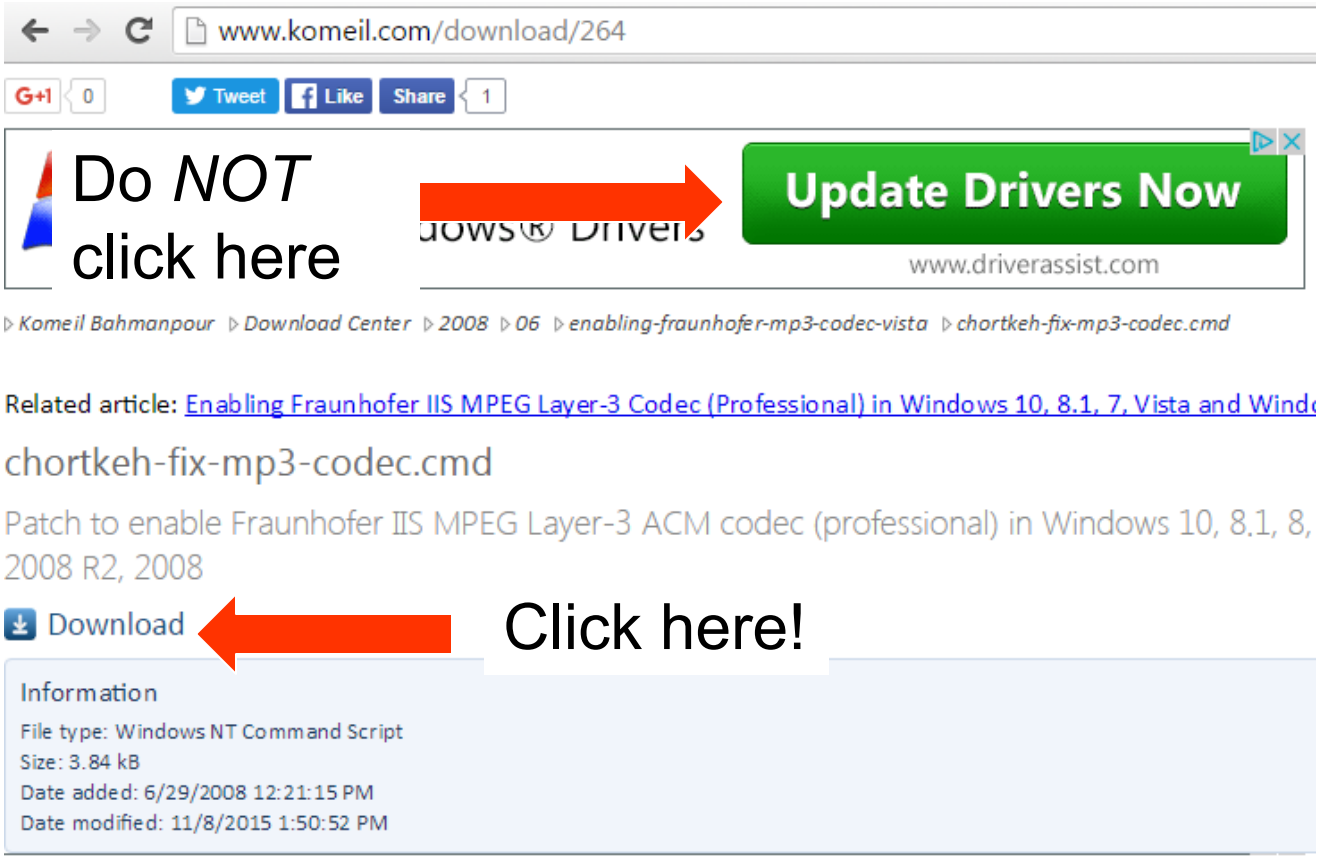


- Example is from Win-Test (others briefly)
- Recording to MP3 using the Fraunhofer CODEC (built-in to Windows, but hidden)
- Compressed audio files < 1.4 GB / 48 hours
- Play back any QSO using logging window
- Just move cursor to QSO and click **Play** button

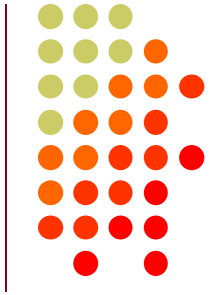
First, we need Fraunhofer MP3 CODEC

- Windows XP has it already
- For Windows Vista to Win10, enable CODEC by running batch file:
  The Chortkeh fix (updates the Windows registry)
- Download from
  http://www.komeil.com/download/264

Getting the Chortkeh Fix



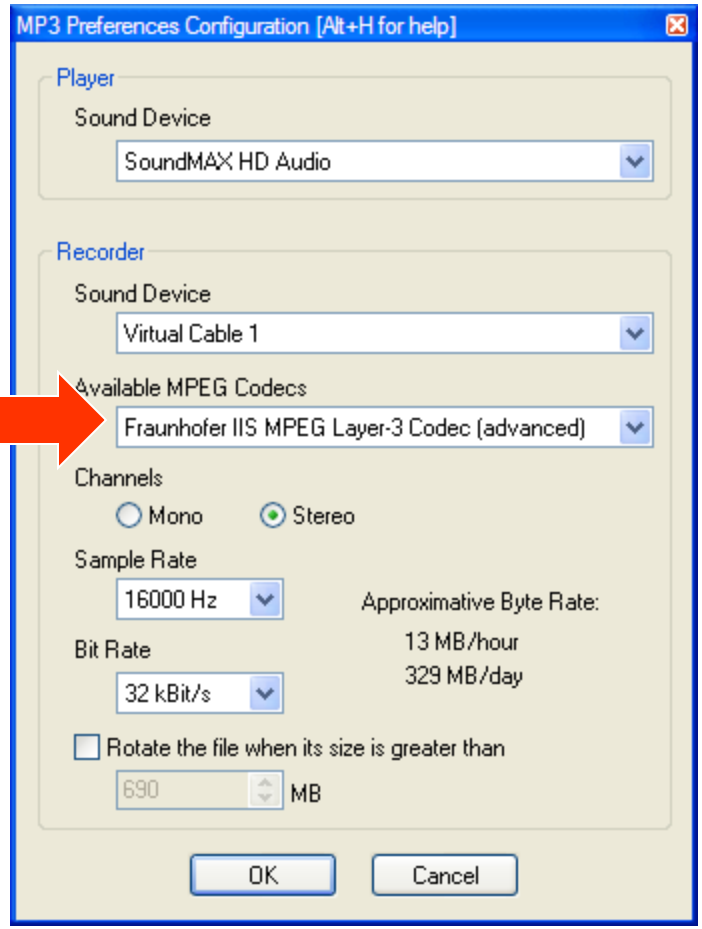
Running the Chortkeh fix batch file (.cmd)



- Download the .cmd file
- Right click on the .cmd file and select **Run as an Administrator**
- No reboot required, just restart Win-Test

Set Recording Parameters (Win-Test)

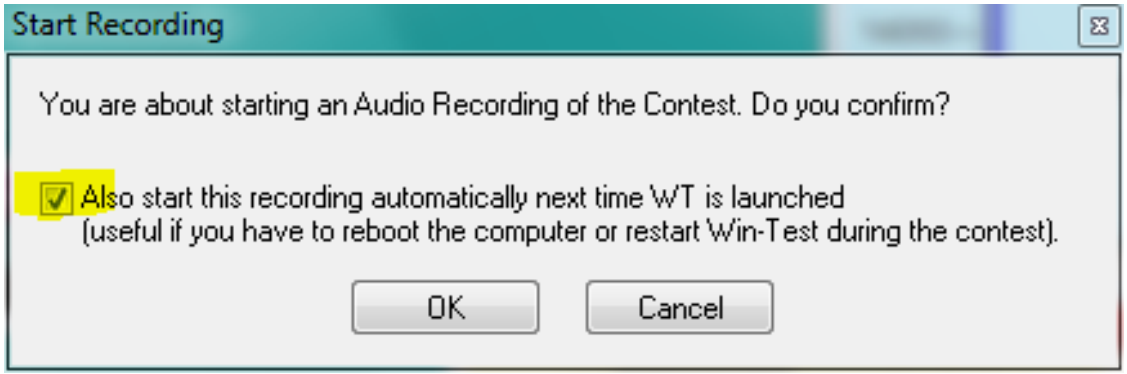
- From the menu, select **Options | MP3 Configuration…** or type **MP3SETUP** [Enter] in the logging window



Before the contest starts, start recording

- From the menu, select **Windows | Contest Recorder**

- Click the record button
- Check **start recording automatically**, click **OK**

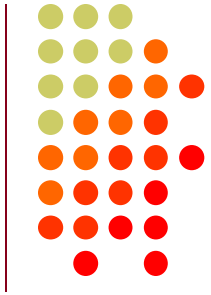


Recorder starts recording

- Recording normally:

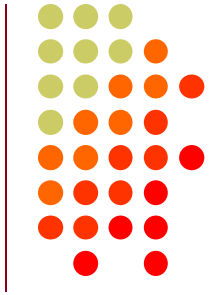
- Record level too high!

Setting record levels



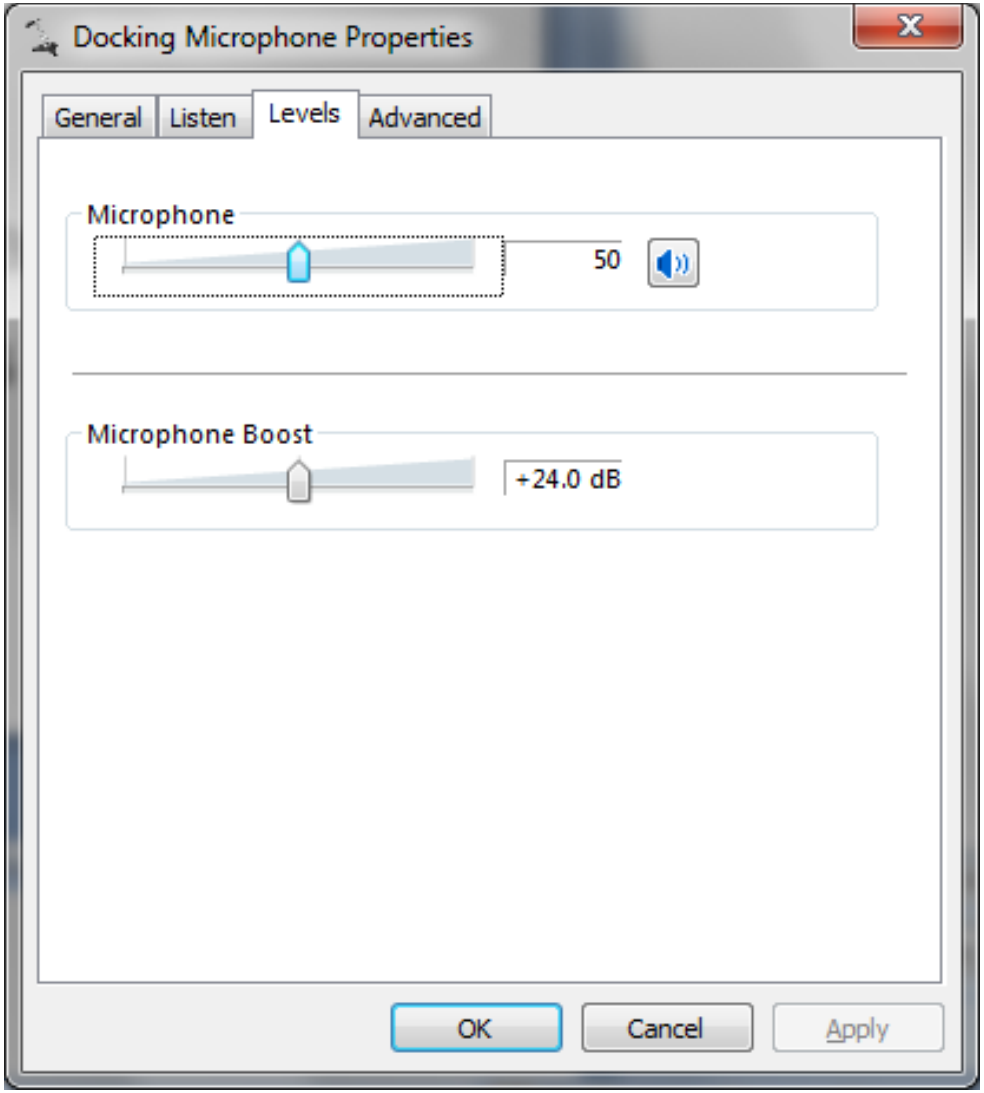
- Better to **record low** than too high (amplify later)
- Don't let audio peaks get into red zone
- Adjustment varies by **recording source**:
  - Headphone jack –
    Radio volume control + PC Sound Card MIC or LINE IN slider
    Recording Devices > Properties > Levels
  - LINE OUT jack – Fixed level, a radio setting
    K3 CONFIG:LIN OUT
  - USB Audio CODEC (radio sound card) – Icom Menu
    USB MOD LEVEL
  - USB Audio CODEC (microHAM MK2R+) –
    Turn level **knobs** on SO2R box, top right corner
  - Virtual Cable 1 –
    WAV OUT slider

Setting sound card record level



- Right click on speaker icon in Windows task bar, select **Recording Devices**
- (Or Control Panel, Search: **Manage Audio Devices > Recording** tab)
- Select recording device (MIC, LINE, S/PDIF, etc)
- Click **Properties** button
- Click **Levels** tab

Windows 7 Recording Levels



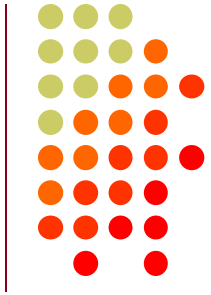
Publish contest audio on the web

- Win-Test QSO Player
  http://download.win-test.com/utils/wtQsoPlayer.zip
- Generates Web Page, e.g. http://bit.ly/R39Maudio

Listen to your QSO with R39M during the 2010 World Radiosport Team Championship (WRTC) contest!

Enter your callsign : Search

Recording with N1MM Logger



n1mm.hamdocs.com/tiki-index.php?page=Third+Party+Software#QSOrder_by_Vasily_K3IT_

9. QSOrder (by Vasily, K3IT)

QSOrder is a QSO recording program written by Vasily, K3IT, to enable N1MM Logger users to record contest QSOs on the fly and replay them. QSOs are stored individually in folders labelled with the contest name.

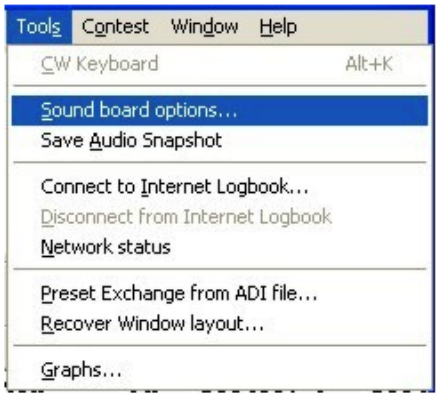
Download QSOrder as a zip file from the QSOrder project area at Sourceforge.net. Create a folder in which you will store the contest recording folders (e.g. a Contest Recordings folder within your N1MM Logger program folder) and unzip the contents of the zip file into that folder.

QSOrder uses N1MM Logger's UDP broadcasts. Follow the instructions in the downloaded readme.txt file to modify your N1MM Logger.ini file to include broadcasts of contact information from N1MM Logger to QSOrder. Note that the default port in the instructions is 12060. If you use other plugins that rely on UDP broadcasts from N1MM Logger, you may need to change the port number used by QSOrder in order to avoid conflicts. If you wish to use a different port number, change the port number used for contact broadcasts in the N1MM Logger.ini file and use QSOrder's PORT command-line flag to tell it to use the port number you have chosen (e.g. -P 12061).

To use QSOrder for a particular contest, start the QSOrder program and run it at the same time as N1MM Logger. Each time a QSO is logged in the Logger, a UDP broadcast will trigger QSOrder to save a recording of that QSO. Recordings are saved in a sub-folder named by contest-name and year, and each QSO is saved in a file whose name includes the callsign of the station worked, the name of the contest, the date, time and band. The length of each recording is determined by the buffer length option, and the recordings are set to run until a specified delay time after the contact is logged; both of these time parameters are configurable using command-line flags. To use one of these command-line flags, insert it into the Target: line in the desktop shortcut you use to start QSOrder with, e.g. Target: "C:\Users\User\Documents\N1MM Logger+\QSOrecording\QSOrder.exe" "-P 12061" (the program name and each command-line flag should be enclosed in a separate set of quotation marks).

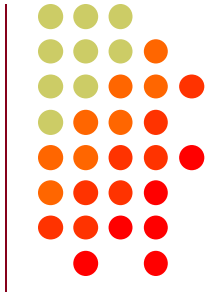
Recording with WriteLog

k9jy.com/blog/contest-setup/tools/



Clicking on the selection produces the following dialog box:

Reviewing your Log Check Report



- http://www.arrl.org/contest-log-checking-reports
  Sign in to see your LCRs
- http://www.cqww.com/lcr/
  http://www.cqwpx.com/lcr/

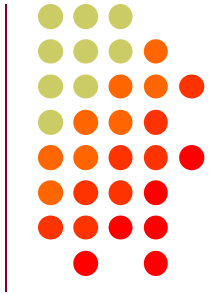
  “An email with the link to your private log checking report is sent to the email account you used to submit the log.”

What you'll see in the LCR

- CROSS CHECK RESULTS

  QSO #151: Received QSO# 59 should be 69 N0IJ
  QSO #220: QSO not found in log of WA1S
  QSO #533: Received QSO# 5 should be 56 KS7T
  QSO #546: QSO not found in log of VE3MM
  QSO #638: Received QSO# 281 should be 28 VE4DXR
- Go back and listen to these QSOs and figure out what happened
- Cross check results not perfect, but usually *very* good
- Best way to learn is from your mistakes, so *listen* to them

To Review



- Recording mono to a sound card is easy
- Recording stereo is harder
- Recording two stereo radios (SO2R) is even harder
- Recording what you hear in the headphones – **best choice for SO2R**
- Use real cables / isolators
- USB Sound Card digital mixing can work too; use virtual cables
- It really works – try it!

Questions?

- http://www.k6jrf.com/FT_HUM.html
  K6JRF Technical Review of Audio Isolators
- http://www.qrz.com/db/N6TV
  Links to this and other presentations
- http://www.audiosystemsgroup.com/publish.htm
  K9YC on “Hum, Buzz, RF Interference”