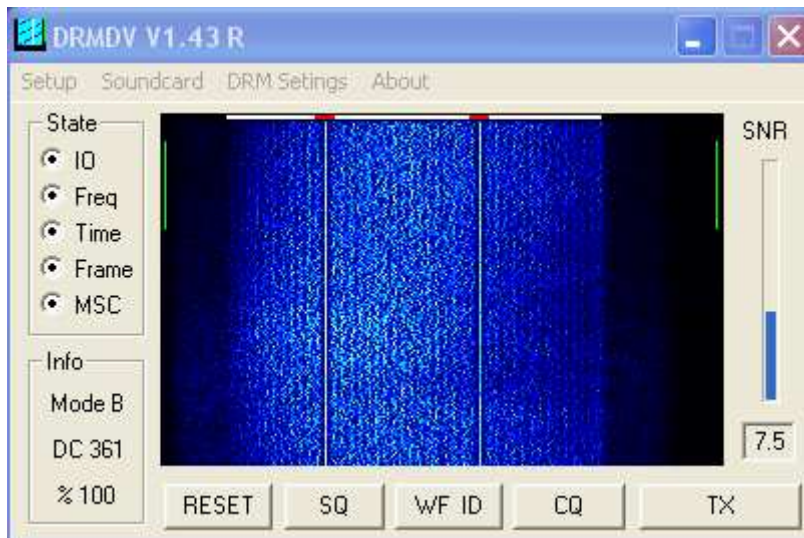


DRMDV

Digital Radio Mondiale – Digital Voice

A new and robust digital voice mode for HF ...



Decoding Digital Voice

N1FFX running 5 watts average power decoded by KØPFX on 14.236

Experiments with Digital Voice over HF continue! This latest work from Cesco, HB9TLK named DRMDV has a simple DV-only GUI for easy operation and improved weak signal decoding down to <6 dB SNR. Only a small degradation in voice quality is noted over its predecessor, WinDRM. In an effort to meet the challenges of DV over HF, changes in the coding scheme for DRM/OFDM had to be made. As a result, DRMDV is not compatible with WinDRM. However, the configuration for sound cards, PTT control and TX/RX requirements remain the same. Two sound cards are required and eliminate any cable swapping for RX and TX.

Two CODECs, MELP and LPC are used. MELP provides better voice quality. However, it does require the user to perform steps as outlined in a DIY (Do it yourself) kit document to create this slower bit rate MELP (1400 BPS) DLL file.

PC Requirement:

Minimum 1GHz CPU with Win2000 or XP. Two sound cards, one may be a USB audio adapter such as the (geeks.com HE-280B) or USB headset (Logitech 250/350). These perform well for the second sound card and may be configured for the voice input and Speaker or headset audio.

Transceiver:

Any modern SSB transceiver with good frequency stability. DRMDV may be used on VHF/UHF with SSB or FM transceivers.

PC-Rig Interface:

RIGblaster or equivalent. Isolation transformers are recommended to avoid common mode noise pick up on signal lines between PC and transceiver. PTT recommended for TX/RX rig control but VOX may be used in absence of a serial port or for preliminary testing.

Software:

DRMDV software found at www.n1su.com

drmdv.exe (Version 1.43r or later)

melp_1400.dll (use MELP DIY (Do It Yourself) to create this dll)

For the DIY, follow instructions here: <http://n1su.com/drmdv/melpcreate/>

Optional files:

cq.wav (use Windows sound recorder to create, 8kHz sample rate)

audioconv.exe (converts CODEC files to wave files)

id.wave (a waterfall call sign graphic created by the user) See <http://www.kiva.net/~djones/> "Create a waterfall ID for WinDRM" by Dave, KB4YZ

Files created by DRMDV:

CarMapTable.txt (an artifact from DRMDV's development showing the DRM configuration robustness mode, number of OFDM carriers, guard size and symbol size).

Settings.txt (contains the com port, sound cards and DRM mode used). Call sign input is not an option.

mixer.bin (sound card binary file)

Set up steps:

- 1- Make a DRMDV folder on the desktop (maybe moved later).
- 2- Download DRMDV143r.zip and audioconv.zip and save in the folder.
- 3- Create melp_1400.dll and save in the DRMDV folder.
- 4- Create id.wav, and cq.wav and save in the folder (optional, will run w/o these)
- 5- Run drmdv.exe
- 6- Click on Setup, set PTT com port (or none for VOX)
- 7- Under DRM Settings, check MELP 1400 BPS
- 8- Go to Setup>Display and verify moving waterfall is selected (best for receiving).
- 9- Go to Setup>Soundcard and choose how each card will be connected using the following info:



Typical set up of soundcard devices

Note:

Devices checked are the only ones in Use(and needed) for DRMDV

RX Input = Mixer Recording Line-In (connect to receiver's speaker)

TX Output = Mixer Playback Master Volume (connect to transmitter's mic input)

Voice input = Mixer Recording Mic-In (connect PC microphone to soundcard)

Voice output = Mixer Playback Master Volume (connect to PC spkrs or headset)

10. Under Soundcard go to Open Mixer and adjust "sliders" to set the audio levels.

Note: Steps 11-14 are making adjustments on two different mixers since two sound cards are utilized. Do not use any sound card EQ. Enable only the inputs/outputs used by DRMDV. All others should **not** be selected.

Open Mixer with DRMDV may not always select the correct device. Open up the Mixer found in the Windows tray or go to Control Panel's "Sounds and Audio Devices" and use the mixers there.

11. **Rx Input** slider adjusts the digital audio coming from the receiver to the line input. First, adjust the receiver for normal listening level and then adjust Recording Line In for a dark blue waterfall display. Signals and noise will be

white. Turn off all noise blankers, and tone controls or any DSP EQ that alters the audio. *Note: If a Line Input is not available, MIC input can be used but be careful not to overdrive this input. Mic inputs for RX input can be more susceptible to common mode noise and RFI.*

12. **Tx Output** slider adjusts the digital audio from the sound card to the transmitter's microphone input. First, adjust the transmitter's mic gain and RF Power out for full output on SSB. Turn off any EQ or compression. The audio must be flat and is 350Hz to 2850Hz in spectrum bandwidth. Ensure the transceiver's TX/RX band pass is set to pass this entire multi-carrier signal without attenuation. Next, click on TX and adjust the Playback Speaker and Wave sliders to for approximately 15-20 watts average power with no ALC action (assuming a typical 100 watt transceiver). If a typical 1.5KW linear is used, keep output down to approximately 250 watts.

Voice Input slider adjusts the PC microphone level connected to the soundcard. Adjust this level while transmitting so the display shows between 60-80% deflection of the waveform. Generally, the CODECs work best when the mic slider is kept low (less than 1/2 of the way) up while speaking in a full voice across the microphone element. Voice peaks too high will be displayed in red. A slight delay for processing will be noted between the voice input and output on the TX display.

Voice Output slider adjusts the drive level for the PC speakers (or headset). First, adjust the amplified PC speakers to a normal listening level. Then adjust the Mixer's Playback Speaker and Wave sliders while decoding digital voice.

13. **Using DRMDV:**

Receiving DV

Find a frequency where DV is being used, typically 14.236. While a station is sending DV, watch the waterfall and carefully tune the signal until the 2 vertical carriers (pilots) are centered under the red blocks at the top of the display. Once on frequency with SNR reading around 6dB, DRMDV will begin the sync process followed by decoding of the MSC (Main Service Channel) voice data. The "Info" box will show the percentage of voice packets decoded and the DC Offset frequency. The SNR is continuously calculated and displayed. Approximately 4-6 dB is required to decode voice without dropouts. Higher SNRs ensure no dropouts when multi-path and/or QRN/QRM is encountered. A typical S9 signal should provide approximately 15-18dB SNR or higher. Many factors can affect SNR at the RX station. Under poor band conditions, try the SQ (squell) option. SQ allows packets to be decoded with errors as long as the percent encoded without errors does not exceed 60%. Although artifacts of speech at the end of a transmission may be heard with SQ enabled, some dropouts may be avoided. Garbled speech may be heard due to this loss of packets, but the speech may still be understandable

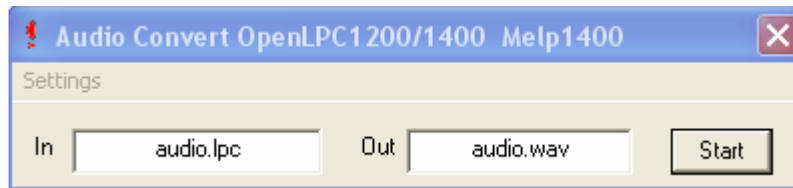
Transmitting DV

For TX voice, simply click on TX and speak into the PC microphone and watch the display for best voice level. Once the TX button is in focus, the space bar may be used to control the PTT line. Typical watt meters including peak reading

types can not accurately measure the high peak power of DRMDV's 44 OFDM carriers. To avoid distortion, do not run more than 25 watts for a TX rated at 100 PEP or 250 watts for a 1500w PEP amplifier. Checking WF ID will toggle PTT line and play a wave file of the call sign in the waterfall. This is a rather robust signal allowing the receiving station to quickly identify the transmitter. DRMDV includes a voice-playback feature primarily for calling "CQ". Record a ~15 second CQ call using the Windows Recorder (16bit, 8kHz, PCM format). Save this file as cq.wav in the DRMDV directory. To transmit the CQ, press the CQ button. When Auto CQ 2m is checked under DRM settings, DRMDV will call CQ every two minutes. Keep the cq.wav file less than 500k in size.

Audio Recording

Click "Save audio" under DRM settings to save the received DV audio in a file where later it may be converted to a wave file. Both LPC and MELP files may be saved.



Audio Converter

The audio recorder works the same as WinDRM's. See the docs for Audio Convert at N1SU's web site. Easy to use, just enter the name of the recorded and converted audio files (defaults shown).

Note: The audio.lpc file suffix "lpc" is assigned for both MELP and LPC file recordings. If a MELP file is recorded, it will have a .lpc suffix also.

For more information on DRMDV and DRM, see the WinDRM. Ver 1.2 document. DRMDV and WinDRM are not compatible with AOR 9000/9800 DV or LW/MW/SW DRM (Digital Radio Mondiale).