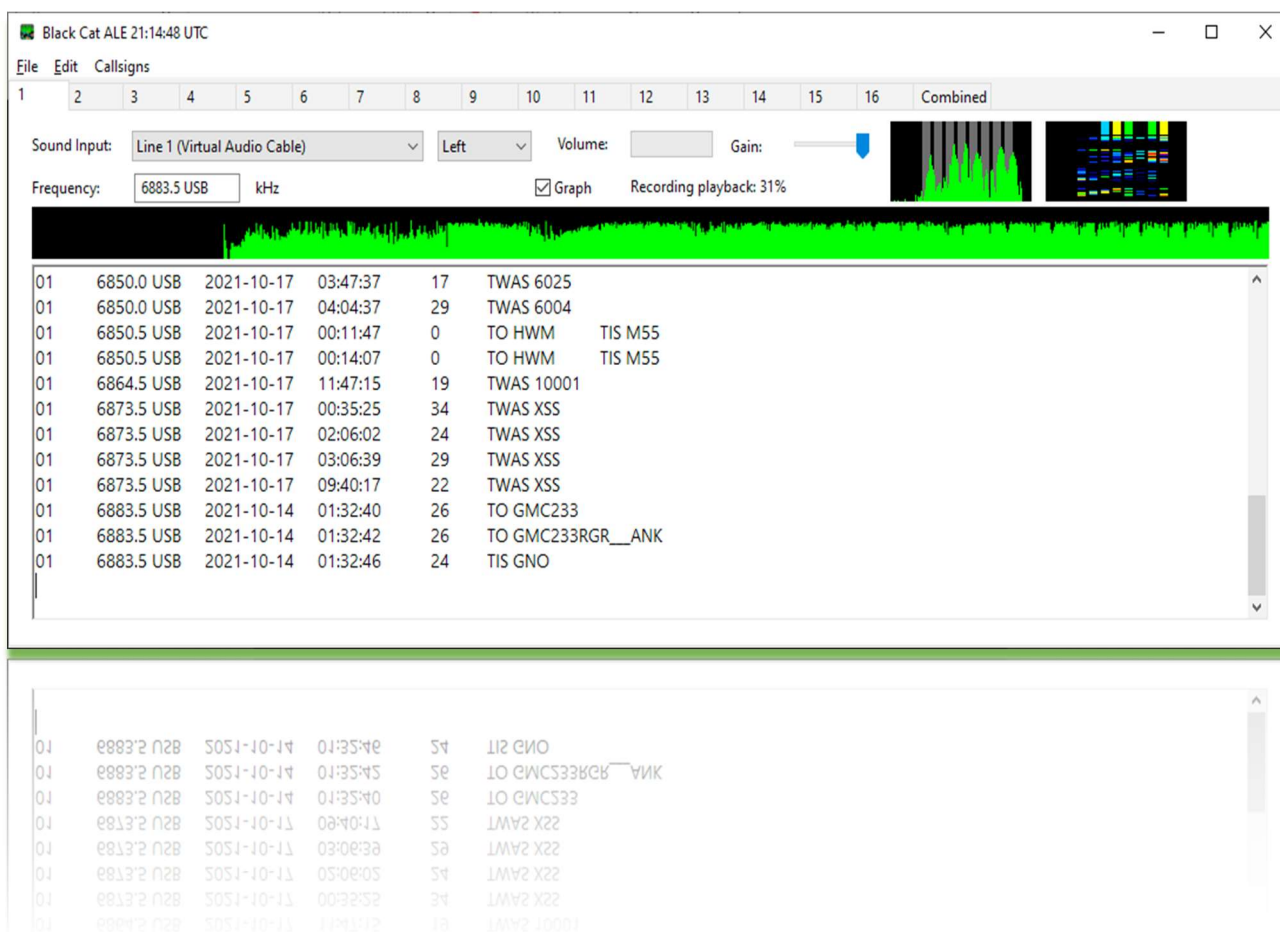# Black Cat ALE

## Multi-channel ALE Automatic Link Establishment decoder

## by Chris Smolinski W3HFU

### Guide v0.28 - aligned to release 0.3.1b1 (11 nov'21)

Photo: Paolo Romani IZ1MLL

Bronze sculpture: S.Borelli

| | | | | | | |
|---|---|---|---|---|---|---|
| 01 | 6850.0 USB | 2021-10-17 | 03:47:37 | 17 | TWAS 6025 | |
| 01 | 6850.0 USB | 2021-10-17 | 04:04:37 | 29 | TWAS 6004 | |
| 01 | 6850.5 USB | 2021-10-17 | 00:11:47 | 0 | TO HWM | TIS M55 |
| 01 | 6850.5 USB | 2021-10-17 | 00:14:07 | 0 | TO HWM | TIS M55 |
| 01 | 6864.5 USB | 2021-10-17 | 11:47:15 | 19 | TWAS 10001 | |
| 01 | 6873.5 USB | 2021-10-17 | 00:35:25 | 34 | TWAS XSS | |
| 01 | 6873.5 USB | 2021-10-17 | 02:06:02 | 24 | TWAS XSS | |
| 01 | 6873.5 USB | 2021-10-17 | 03:06:39 | 29 | TWAS XSS | |
| 01 | 6873.5 USB | 2021-10-17 | 09:40:17 | 22 | TWAS XSS | |
| 01 | 6883.5 USB | 2021-10-14 | 01:32:40 | 26 | TO GMC233 | |
| 01 | 6883.5 USB | 2021-10-14 | 01:32:42 | 26 | TO GMC233RGR__ANK | |
| 01 | 6883.5 USB | 2021-10-14 | 01:32:46 | 24 | TIS GNO | |

# Contents

# Introduction

Black Cat ALE is a first multi-channel ALE decoder with new concept compared to previous radioamateur decoders that will surely make people talk!

Up to 3 decoders can run at the same time in regular license and, up to 24 in high performance mode! Dedicated radio Input Source or WAV audio file, specific management of Logs (different formats of reporting, among them one for filing UDXF logs) and Callsigns really one of a kind, etc, etc…

Each decoder can be connected to its own audio input source (a virtual audio device, from now on always referred to as VAD, or physical sound input device). Select Settings from the Edit menu to change the number of decoders.

Its working range is HF, and with any receiver, though preferably SDR, it is possible to see it at work with some real signals and with operational suggestions *collected and typographically highlighted in blue italics.*

**Requirements:** Windows 8/10 or Mac OS X 10.10 to Big Sur


**Automatic Link Establishment** - 2G ALE Official designation MIL-STD-188-141A and/or MIL-STD-188-141B (Appendix A) is the current standardized method of establishing connections between radio operators. Also known as: FED-STD 1045/1049 or STANAG 5066.

The system uses 8 tone MFSK *(clearly visible in the audio Spectrum display on the right of the decoder)* at 125 baud with 250 Hz shifts between tones for a total bandwidth of 2000 Hz.
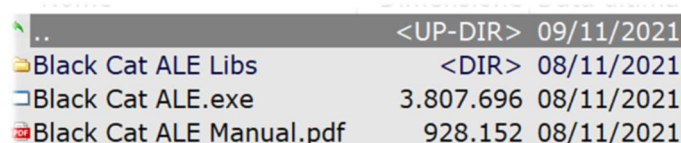
For more information about ALE system I suggest:

**https://en.wikipedia.org/wiki/Automatic_link_establishment**

# Windows installation

So let's see how to start using the software starting from the installation.

In fact, since there is NO real installation procedure on Windows, you only need to extract the zipped content into any directory (excluding ONLY the "Program Files"!!)

| | | |
|---|---|---|
| .. | <UP-DIR> | 09/11/2021 |
| Black Cat ALE Libs | <DIR> | 08/11/2021 |
| Black Cat ALE.exe | 3.807.696 | 08/11/2021 |
| Black Cat ALE Manual.pdf | 928.152 | 08/11/2021 |

*All you need are these few files and Libs directory (keep them together)…*

Same for the uninstallation... to delete the software it is sufficient to delete the directory. That's all!!

# Purchase and licensing

You can, and should, fully test this program prior to purchase. Other than some usage time restrictions, it is fully functional. If something "doesn't seem to work", or work the way you want it to, in trial mode, it's probably not going to work differently once you have paid. So be sure to address any issues prior to purchase, as refunds are not available.

Two Black Cat ALE license codes are available. The regular license code allows for up to 3 decoders running at the same time, the Pro up to 24. Updates from the former to the latter are also available. A license code will work with the current release version at the time of purchase as well as any updates released over the next year. Use of updates past then will require a renewal of your license code. Of course your license code will continue to work with the previous versions, should you not wish to renew.

Note that until you purchase a Pro license code for high performance mode, your usage of the program will be restricted in high performance mode to several hours at a time, requiring a restart of the program to continue. This provides ample opportunity to evaluate the program. Also note that in trial mode without any license code, your usage may also be limited (but again you can restart the program to continue using it).

Visit the Black Cat ALE program page to purchase your license code, when you are ready:

**http://blackcatsystems.com/software/black_cat_ale_decoder.html**

# First start-up

The first time Black Cat ALE decoder is started, check the following points for this basic operation:

- The program defaults run with one decoder. It's recommended to get some experience in single decoder mode first, before enabling additional decoders.
- Previous pre-installation and configuration of a VAD (Virtual Audio Device). *See dedicated section.*
- Size the program window (User interface) to your liking and save the environment with FILE / SAVE SETTINGS.
- Select your sound input device from the popup menu.
  *For example, if you are using an external analogue receiver it is advisable to use the "Microphone (Realtek High Definition)", whereas if you are using a newer SDR receiver then it is preferable setting a VAD on "Line1 Virtual Audio Cable". In most cases, you can ignore the "Left/Right channel" selection unless your sound input device supports different audio feeds on each channel.*
- Tune in a live ALE signal (99% of transmissions are all in USB) or perhaps at the beginning, in order not to wait too long on air for a real signal, it might be a good idea to use your own recorded audio sample or WAV file that you can find on the net, for example one of these:
  **https://www.sigidwiki.com/wiki/Automatic_Link_Establishment_(2G_ALE)**

  **https://dk8ok.org/2019/04/02/ale-which-is-the-best-decoder/**

- Try adjusting the Gain control.
  *The gain slider can be used in some cases to adjust the input level, but note that not all sound devices support this capability.*
- In the presence of an ALE signal, you should start to see activity in the spectrum and volume displays, once you start feeding audio from a radio into that audio channel will show sounds data. (See points 7 and 9 below).
  *If you don't see activity, troubleshoot your audio connection/settings.*
- Set the frequency in the appropriate field to get the correct logs
- At this point the software starts working and displays all decoded traffic.
- In the EDIT / SETTING... menu there are some important configurations to evaluate and try, then remember to save everything in FILE / SAVE DECODER CONFIGURATION...

In addition, at each startup, the presence of a new version of the program is checked, with the possibility of using your web browser to access the download site, skip this version or postpone the activity later.
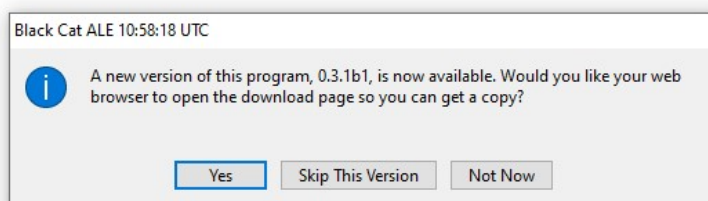
# Software integration

The SDRs or receivers can be different, each with its own specific characteristics but some are more performing than others for the number of receivers that can be added. But for all of them is essential the use of VAD or Virtual Audio Devices with which to bring the audio of the various receivers to the different channel decoders of the software.

VADs are programs that create virtual cables between the audio output of the computer and the audio input of the same: in this way you can perform any operation (record / playback / mixing) with the highest possible quality and especially without external cables and physical sound card on your computer!
*Their use is easy and the proposed automatic configurations should go well right away, however the first few times of use it is good to take some care to remember to select/deselect it when we are done as the default audio device.*

For this purpose there are different software with different names and features:

| WINDOWS | macOS |
|---|---|
| **VAC** – Virtual Audio Cable | BlackHole |
| **VAS** – Virtual Audio Streaming | Ground Control |
| **VB-Cable** | Soundflower |
| **VSC** – Virtual Sound Card | VB-Audio CABLE - They also offer other versions, for additional audio connections: VB-Audio CABLE A & B VB-Audio CABLE C & D |

One of the best known and popular in Windows is the VAC by Eugene Muzychenko and on this I will dwell with some indications, but before using the ALE decoder it is necessary to install with the default options...
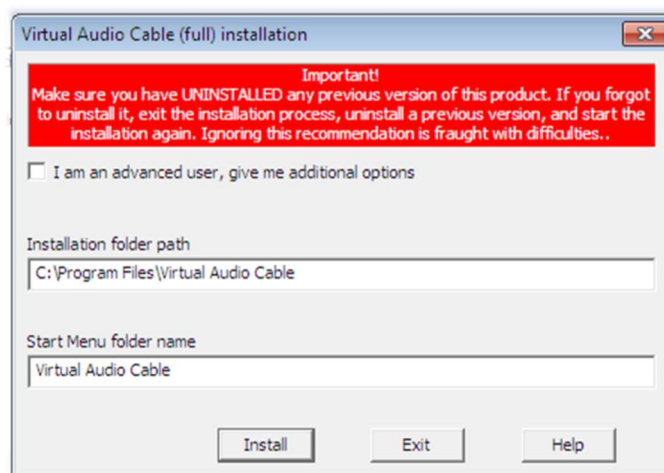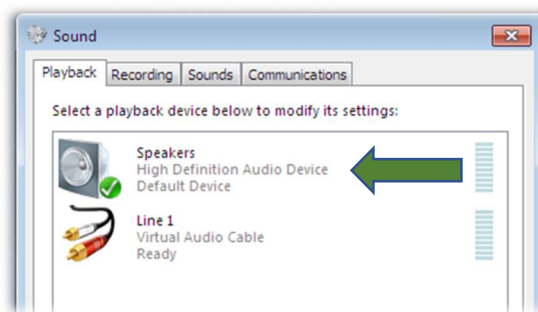
As indicated, a new pair of audio devices is created in Windows with the name "Mic 1 Virtual Audio Cable" and "Line 1 Virtual Audio Cable", which should be set in Device Default as in the example…
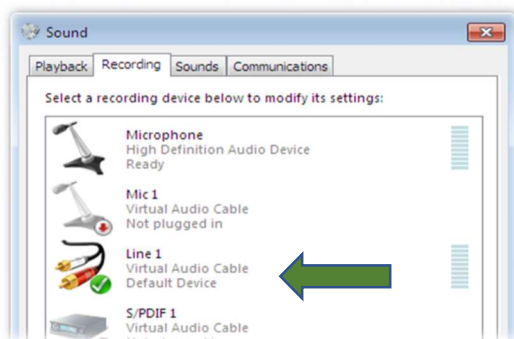
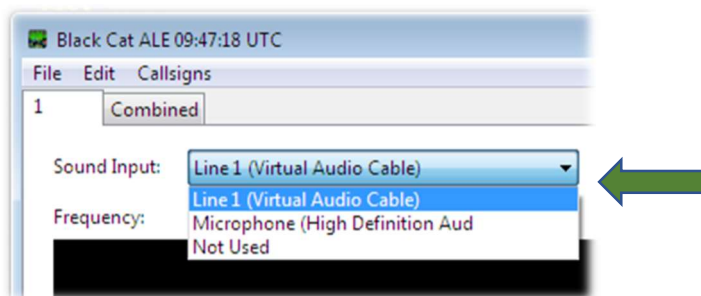| **RECORDING panel** | **PLAYBACK panel** |
|---|---|



Now starting the Black Cat ALE we will have the new device available in "Sound Input".
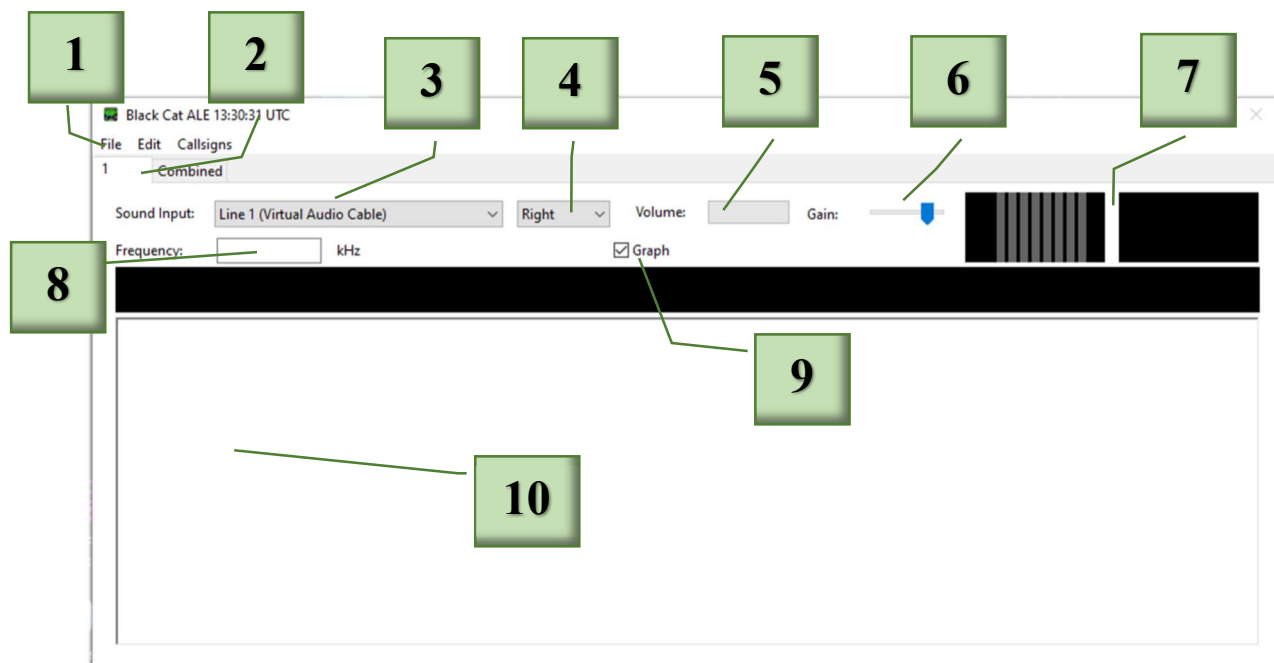


Everything is ready!

*However, we must remember that now the audio transits internally and if you want to listen to the HF audio in speaker you must use the internal additional tool (in the directory of VAC) named **audiorepeater.exe** and configure it as indicated…*
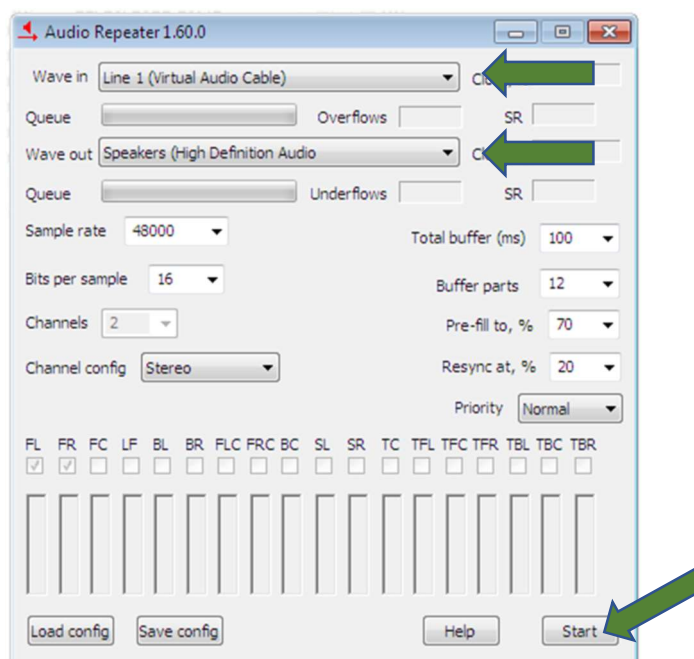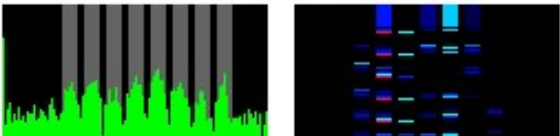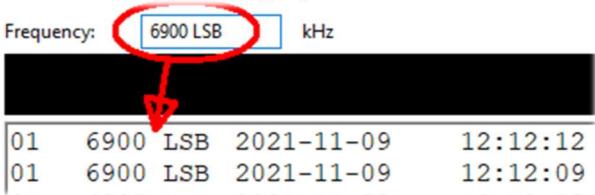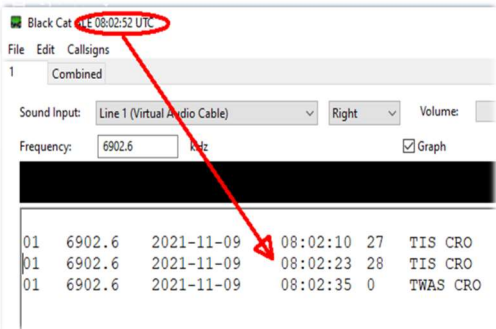
# ALE user interface overview



These are the main points in details:

1. **Main Menu: File / Edit / Callsigns**
2. **Tab decoder (1/24 or Combined)**
3. **Sound Input**
4. **Channel sound input**
5. **Volume (input audio level)**
6. **Gain (input audio gain)**
7. **Audio Spectrum displays**
8. **Frequency (in kHz)**
9. **Graph signal display**
10. **Windows received text**
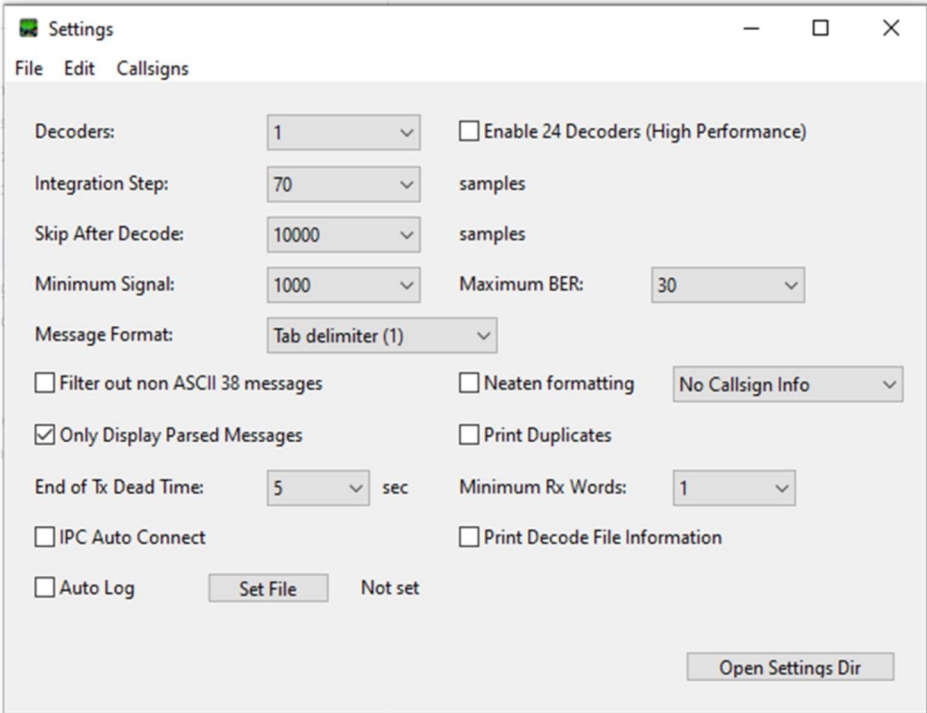
| Key | Action |
|---|---|
| *1. Main Menu* | File / Edit / Callsigns  *(see dedicated section)* |
| *2. Tab decoder* | Up to 24 decoders can run at the same time. Each decoder can be connected to its own audio input source (a Virtual Audio Device or physical sound input device). The program defaults to one decoder. Select Settings from the Edit menu to change the number of decoders. Each decoder appears in its own tab in the main window. There is also a tab named "Combined" on the far right, this displays the text from all decoders in one easy to read display. |
| *3. Sound Input* | Select your sound input device (physical or VAD) from the popup menu. |

| | |
|---|---|
| **4. Channel sound input** | The device (physical or VAD) to use, along with which sound channel (left or right) to use. The latter can sometimes be used to double the effective number of VADs on your system, if your SDR or other software can feed audio to just a single channel vs stereo. *In most cases, you can ignore the Left / Right channel selection unless your sound input device supports different audio feeds on each channel.* |
| **5. Volume** | The volume bar from audio input. |
| **6. Gain** | The gain setting for the audio input. *Not all devices support changing the gain, so it may do nothing on your setup.* |
| **7. Audio Spectrum Displays** | Two audio spectrum displays for diagnostic and tuning purposes. |
| **8. Frequency** | This is a text field for your own personal use. When ALE messages are displayed, the receiver frequency is included, this is useful when looking at the combined display, or logging files, so you know what you're looking at. *The decoder makes no additional use of this value.*<br>The receiver frequency can be entered optionally with the mode (USB or LSB). This information will be added to displayed ALE decoded. |
| **9. Graph** | Enables/disables the graphical audio signal display. *You can turn this off to use a little less CPU time, as well as gain a little more decode text space.* |
| **10. Windows received text** | Each line of a fully parsed message contains the following informations:<br>• Decoder number<br>• Frequency (with mode if you have entered it)<br>• Date & Time (UTC). *A very useful clock in the top left corner allows you to automatically create listening logs with the exact UTC time...*<br>• Worst BER for any ALE word in the message<br>• ALE message, optionally with callsign information *(See the dedicated section "Callsigns").*<br><br>*With right click in the decoded text area to Select all the text, Copy text, or Clear the text…* |

# Menu File

| Key | Action |
|---|---|
| Decode Audio File… | Interesting possibility to use one's own previous recordings or audio samples found on the net. It is also possible to load several files simultaneously for subsequent sequential decoding. *Depending on the power of your PC, audio files are decoded in a fraction of the original time. See also the specific section "Decoding from audio file".* |
| Abort Decoding File / All File | Stops the decoding of one or all audio files. |
| Start Logging… | Enables logging to file by asking for name and directory. |
| Stop Logging | Stop recording the Log. |
| Load Decoder Configuration… | Load the logs customisations carried out *(See dedicated section "Logging")* |
| Save Decoder Configuration… | Save the logs customisations provided in a file of your choice. *(See dedicated section "Logging")* |
| Save Settings | Saves your customizations, *example after the window resizing of the User interface.* |
| Exit | Closes and exit the programme. *At the moment the X button (top right) is still not working…* |

# Menu Edit

| Key | Action |
|---|---|
| Settings… |  |

**Decoders:** From 1 to 3: each decoder appears in its own tab in the main window. There is also a tab "Combined" on the far right, this displays the text from all decoders in one easy to read display.

**Enable 24 Decoders (High Perfomance)**: to increase up to 24 decoders: requires a specific Pro license.

**Integration Step:** How closely Black Cat ALE looks for signals. The smaller the number, the more closely, but also the more processing time required. Experimentation has shown that a value of 30 is generally quite adequate, and even 70 or 100 works well for most cases.

**Skip After Decode:** After a valid message is found, how many sound samples skipped (ignored) until decoding starts again.

**Minimum Signal:** The required minimum strength of the demodulated audio to trigger a decode.

**Maximum BER:** Maximum allowed Bit Error Rate. Compares the number of bit errors between three successive ALE words. 48 would ignore all bit errors, 0 means the word must be received with no bit errors.

**Message Format:** Controls the format of a displayed message with the following five preset types:
*Space Delimiter*
```
[01 6907 USB 2021-10-13 22:20:55 24] TO EWD | KA=1 MP=7
SINAD=31 BER=31  | TIS 4BUAAR
```
*Tab Delimiter (1)*
```
01   6907 USB      2021-10-13   22:20:55 24   TO EWD |
KA=1 MP=7 SINAD=31 BER=31   | TIS 4BUAAR
```
*Tab Delimiter (2)*
```
01   6907 USB      2021-10-13   22:20:55 24   TO EWD   KA=1
MP=7 SINAD=31 BER=31 TIS 4BUAAR
```
*Tab Delimiter (3)*
```
01    6973.0 USB  2021-10-17   08:43:51 0    TO   ZEN TIS
     CM2
```
*UDXF, formatted for posting logs to this mailing list*
```
 06950.0 69PMSANMIGUEL: TWAS ALE/USB (14OCT21 0536) (MD)
```

Another interesting example of displaying the same message in different formats:

```
Space Delimiter:
[01 5905.5 USB 2021-11-05 09:08:37 17] TO J10 | TIS LNT

Tab Delimiter (1):
01 → 5905.5 USB → 2021-11-05 → 09:10:46 ——→ 0 ——→ TO J10 | TIS LNT

Tab Delimiter (2):
01 → 5905.5 USB → 2021-11-05 → 09:12:03 ——→ 23 → TO J10 → TIS LNT

Tab Delimiter (3):
01 → 5905.5 USB → 2021-11-05 → 09:13:05 ——→ 19 → TO → J10 TIS LNT

UDXF:
05905.5 LNT: TO J10 TIS ALE/USB (05NOV21 0915) (W3HFU)

UDXF, Neaten formatting, Print Details Also:
05905.5 LNT: TO J10 DHS COTHEN/USCG MH-60J #6010 USA USCG Chesapeake [on COTHEN] Chesapeake USA TIS ALE/USB (05NOV21 0919) (W3HFU)
```

**Filter out non ASCII 38 messages:** Don't display messages with characters outside of the ALE specified ASCII 38 character set.

| | |
|---|---|
| | **Neaten formatting:** always prints frequencies with tenth kHz, and pads spaces in front of the kHz, for a uniform width.<br><br>**Only Display Parsed Messages:** Don't display the raw ALE words. Most users will want to select this.<br><br>**Print Duplicates:** When displaying raw ALE words, duplicate words (same word and timestamp) will be displayed. Duplicate parsed messages will also be dropped. These two settings result in four possible ways of controlling what is displayed:<br>• Only Display Parsed Messages ON, Print Duplicates OFF: The least output, only fully formed messages will be displayed, no duplicates.<br>• Only Display Parsed Messages ON, Print Duplicates ON: Only fully formed messages will be displayed, with duplicates.<br>• Only Display Parsed Messages OFF, Print Duplicates OFF: Fully formed messages will be displayed, along with raw ALE words.<br>• Only Display Parsed Messages OFF, Print Duplicates ON: Fully formed messages will be displayed, along with raw ALE words, with duplicates of each. Will produce a lot of output. But this can be useful if you are decoding very weak signals, when not all of the ALE words may be received, resulting in only partial display of messages, or none at all in some cases.<br><br>**End of Tx Dead Time**: Used to decide when an ALE transmission has ended, and display any remaining buffered message.<br> *I suggest 3 seconds for now as a value, but you can experiment.*<br><br>**Minimum RX Words:** Sets the minimum number of ALE words that must be received for a parsed message to be displayed. This can help filter out extraneous random decodes from noise, caused by the high sensitivity of the decoder. It does not stop the printing of raw ALE words.<br>*A value of 2 or 3 will probably be sufficient, but the user can experiment.*<br><br>**IPC Auto Connect:** For future use.<br><br>**Print file decode information:** Adds the name of the WAV file to the decoded text.<br><br>**Auto log:** allows you to choose your own text file for automatic logging. When this is done, and the checkbox is ticked, this log file will be automatically opened and written to each time the program is launched, saving you from doing this manually.<br>*Note that you must not have this log file you will be writing to open in any other program, or it will not be written to, and Black Cat ALE could misbehave/crash.* |
| Enter Registration Code | After the trial period it is necessary to register the software.<br>*Prior to registration, a reminder of the trial version will appear when the programme is started.* |

| | |
|---|---|
| | **Please Buy Your Copy of Black Cat ALE**<br><br>Thank you for trying Black Cat ALE, it looks like you have been using it for some time. My goal was to write a sensitive ALE app, able to decode even extremely weak signals.<br><br>If you use Black Cat ALE, you should pay the registration fee. It's affordable, easy to use, and a great value. Just click the Buy Now button below, and you'll be taken to our online site.<br><br>Registration will make this window go away, as well as allow me to develop new and better versions of Black Cat ALE. Your code will be good for all updates released within one year of your purchase date.<br><br>32 seconds until you can use Black Cat ALE<br><br>Reg Name: [                    ]     [ Clear ]<br>Reg Code: [                    ]<br><br>[ Enter Code ]   [ Buy Now ]   [ Not Yet ] |
| Cut / Copy / Paste / Delete | Allows you to perform the indicated operations on the decoded text windows. |
| Clear Decodes | Cleans the current decoded screen (but not the Combined). |
| Clear All Decodes | Cleans all decoders |
| Clear DSP Internals | This is used to "reset" the decoding machine in the software.<br>*Think of it somewhat like quitting and restarting the program…* |
| Select All | Selects all decoded text for processing with Cut / Copy / Paste / Delete |
| Set Text Size, Font, Color… | Change text size, font type and colour. |
| Set Text Background Color… | Change the background colour of decoder windows. |
| Set Graph Color… | Change the colour of the Graph waveform. |
| Set Graph Background Color… | Change the background colour of Graph. |
| About | Displays the software release and allows to visit the website to check for updates. |
| IPC Listen | This allows another program to "control" Black Cat ALE, for example to tell it to decode from a particular WAV file.<br>*It's for future use, perhaps as a way to automate processing of lots of WAV files from SDR programs, etc.* |

# Menu Callsigns

| Key | Action |
|---|---|
| Rescan Files | Rescans the callsigns files in the dedicated directory.<br>*(See dedicated section "Callsigns")* |
| Load All | Uploads all callsigns files present in C:\USERS\xxx\DOCUMENTS\callsigns.<br>*(See dedicated section "Callsigns")* |
| *Files.txt* | Uploads only the specific optional callsigns file present in:<br>C:\USERS\xxx\DOCUMENTS\callsigns. *(See dedicated section "Callsigns")* |

# Decoding from audio file

One of the special features of the decoder is that it can decode directly from a WAV audio file *(Remember: not MP3 or other format, although these can be read by external software and decoded via VAD)*.
Simply go to one of the decoders and select from the menu FILE / DECODE AUDIO FILE.
Multiple files can be selected, they will decode one after another. Don't change the decoder tab while files are decoding.
Decoding of WAV files is much faster than real time decoding, limited by the speed of your computer, often 10x real time processing.

*During playback WAV audio file, you will see active the Audio Spectrum Displays (top right), the Graph bar (if activated) and the Recording playback percentage…*
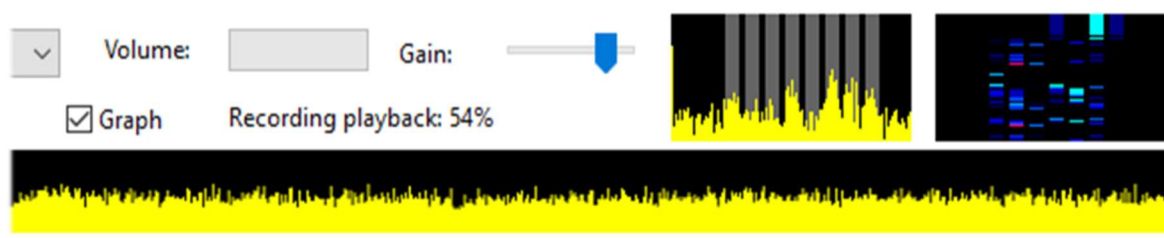


Internally, sound is processed at a 44.1 kHz rate, monophonic, 16 bits.
If the sound file is different from this, it will be converted internally to this format. As this takes some time, the fastest processing will occur if the sound file is already in this format.

The file name is parsed for the frequency and time/date/mode information.
If it is found, it will be used when decoding messages, so they get timestamp corresponding to their actual time. Otherwise the current time/date is used.

As of now, two formats are supported:
1. That when you download an audio file from a KiwiSDR receiver in your web browser:
   **sdr.hfunderground.com_2021-10-19T18_09_09Z_10242.00_usb.wav**

2. Files from my SDR playback program mySdrPlayback:
   **Frequency (kHz) [space] Mode (LSB/USB) [space] day-Month-Year [space] hour.minute.second.wav**
   For example: **6950.0 USB 14-Oct-2021 05.36.27.wav**
   Any deviation from this format will cause it to not be parsed.

# Callsigns

Black Cat ALE can use one or more text files to provide very useful additional informations about all the callsigns!

You need to create a directory called "ale_callsigns" in the Documents directory for your user account and put one or more plain TEXT files, the program will look for them at opening.
These files should be a tab delimited list of callsigns, along with two or more descriptive fields (one for the organization and one for more details), with another tab between each, in this way:

<div align="center">

**CALLSIGN [tab] ORGANIZATION [tab] DETAILS [return]**

</div>

Any deviation from this format will cause it to not be parsed.

When a **CALLSIGN** matches an entry in the list, the **ORGANIZATION** and/or **DETAILS** will be displayed after it, in curly braces { xxx }. This functionality is controlled in the Settings.



If there are two or more callsigns with the same name, then information will not be printed for that callsign, instead "Ambiguous - multiple entries" will be printed.
You can select which file to use from the Callsigns menu in the program. You can select "Load All" to load all of the callsign files.

As each file is loaded, a line of text will be displaying indicating the number of callsigns in the file, the name of the file, and the total number of unique callsigns so far loaded into the program.

# Logging

Start and Stop Logging can be used to route all decoded messages to a text file.
*Note that when you start logging, any existing file will not actually be erased, but will be appended to.*

Loads and saves the current setup (in menu FILE / LOAD/SAVE DECODER CONFIGURATION…) for all defined decoders.
Handy if you want to have banks of decoder setups for FEMA, COTHEN, FAA, etc.

There is an option in Setup to specify an "Auto Log" file.
When this is done, and the checkbox is ticked, this log file will be automatically opened and written to each time the program is launched, saving you from doing this manually.

Note that you must not have the log file you will be writing to open in any other program, or it will not be written to, and Black Cat ALE could misbehave/crash.

# Some examples…

## SDR Console - what you need to do:

* Start by creating an appropriate text file in which we will arrange alternately the frequency and the emission mode and on the next line the VAC line in this way:

>    6500 USB

>    (Line 1 - Virtual Audio Cable)

>    ...

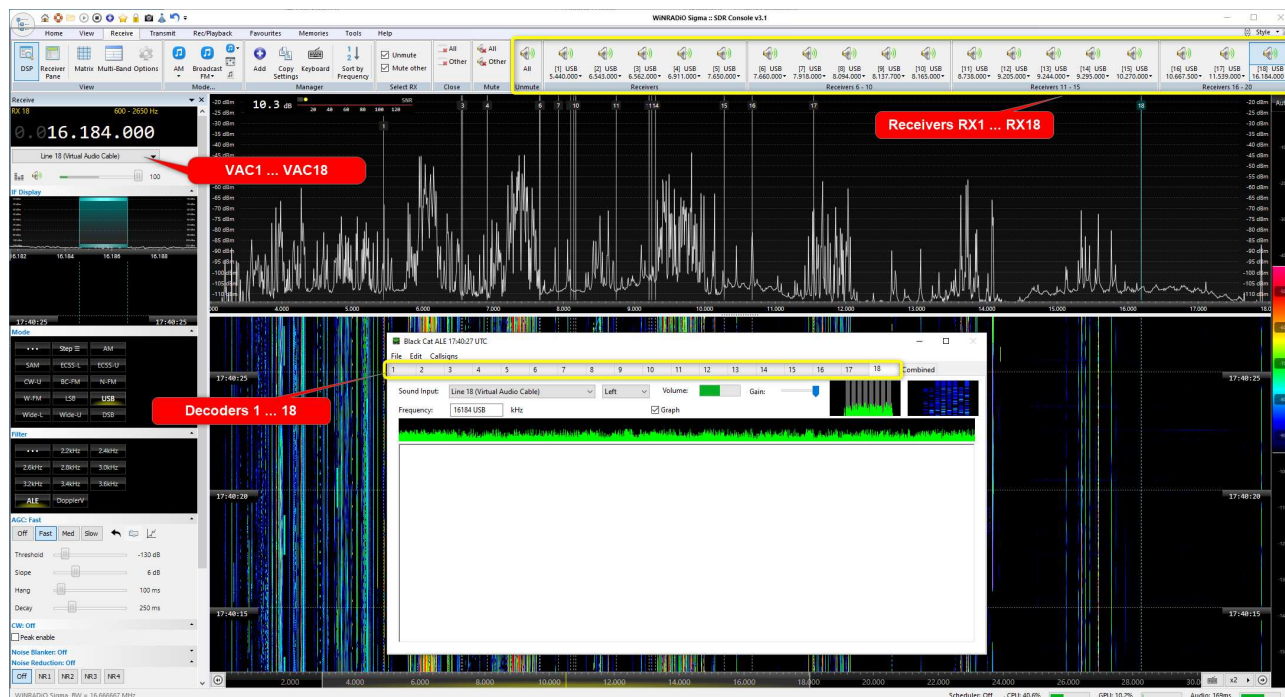>    6600 USB

>    (Line 18 - Virtual Audio Cable)

* RX1 ... RX18 (Receive --> Add)

* Tune each RX1 ... RX18 to the correct frequency
* Make sure that each RX1 ... RX18 is set to the correct sideband (mostly USB) and the correct bandwidth to cover the whole ALE signal
* Output for RX1 = Line 1 - Virtual Audio Cable ... RX18 = Line 18 - Virtual Audio Cable
* Activate ALL receivers RX1 ... RX18 (Receive --> ALL)

# Things to know…

- Depending on the number of decoders enabled and the decoding settings, the program can be extremely CPU intensive! To the point of effectively making your computer non functional. Start with one decoder with a selected sound input device when changing the other settings, especially the integration step, then enable additional decoders one by one, by selecting a sound input device, while watching the CPU usage in the Task Manager (Windows) or Activity Monitor (macOS).

- Sound issues. If you don't see any sound devices, quit and run again.

- Due to the sensitivity of the detector, random noise can be mis-interpreted as a valid ALE signal. If you get the right noise, it looks like an ALE decode.

```
01        2021-11-02      09:55:21   35    TO |Z!
01        2021-11-02      09:58:32   29    TWAS  D
01        2021-11-02      10:03:55   41    TWAS ⌷⌷#
01        2021-11-02      10:04:31   38    TWAS f~⌷
01        2021-11-02      10:05:44   39    TWAS BN^
01        2021-11-02      10:08:15   38    TIS 12
01        2021-11-02      10:09:27   41    TWAS <⌷_
01        2021-11-02      10:14:28   38    TIS Q/D
01        2021-11-02      10:15:25   42    TIS sGX
01        2021-11-02      10:17:45   38    TWAS ;I7
01        2021-11-02      10:18:02   37    TO 1L4
01        2021-11-02      10:19:49   37    TO O.o
```

The solution is to require at least a certain minimum number of decodes before deciding a decode is real. Currently this can be done manually, but this could also be built into the software. I'll have to think about how to best do it. But that will essentially eliminate the problem.

- Nils Schiffhauer DK8OK wrote specific documents which provides some very useful usage tips, and is well worth reading:
  **https://dk8ok.org/2021/10/31/black-cat-ale-decoding-24-ale-channels-in-parallel/**

  **https://dk8ok.org/2021/11/12/multi-channel-ale-decoder-listing-and-logging/**

- Email your comments and questions to **info@blackcatsystems.com**

*WARNING! RECEIVING AND SPREAD RADIO COMMUNICATION SYSTEMS IT COULD BE ILLEGAL IN YOUR COUNTRIES! Check carefully and thoroughly the regulations in force in your country. Some of this radio system was specifically designed for use by government, emergency services, for public safety networks, etc etc. who all share spectrum allocated.*