

PERSEUS SOFTWARE V2.1h RELEASE NOTES

(c) 2007-2009 Microtelecom s.r.l. - Pavia di Udine, Italy
8 December 2009

Things to remember prior to install the V2.1h Software Version

Install the new WinUSB drivers.

The WinUSB drivers installation is required only if the Perseus software is used in conjunction with a Perseus receiver. If you are using the Perseus software in demonstration mode please skip this section. The Perseus software version 2.1h includes a new control DLL named *perseususb.dll* which is backward compatible with previous software versions but accesses the Perseus hardware through the USB drivers provided by the Microsoft WinUSB library instead of through the old *CyUsb.sys* driver.

Please read the documents WinUSB_xxx_R1.pdf provided with this distribution for information on how to install the new drivers on your system.

If this is not the first Perseus software version you have installed on your system

If this is your first Perseus software installation you may skip this section.

Once the new WinUsb drivers are installed, the Perseus receiver will be no more visible to the system through its old *CyUsb.sys* drivers and by the software versions which make use of the old *perseususb.dll*.

In the case you wish to continue to use also older versions of the Perseus software, you may either reinstall the older *CyUsb.sys* driver on your system (not suggested) or overwrite the *perseususb.dll* file provided with the old software versions with the *perseususb.dll* file provided in this v2.1h software version (preferred option).

Please make a backup of your older software versions prior to overwrite any file provided with it.

Even if Windows XP automatically creates a System Restore Point during the drivers update, it is suggested to execute a manual System Restore Point on your system prior to install the new drivers. Give the manual Restore Point the name "Prior to WinUsb drivers installation" so that it will be easy to find it, restore your system to its original status and retry the drivers installation in the case something should go wrong.

Backup your Memory Banks Files.

Memory banks are stored in files named *membankx.dat* (where x=1,2,...,6) in the same directory where the software is executed.

The Perseus software generates blank (empty) user's memory files if they do not exist in the folder where the software is executing.

Please make a backup of the memory banks files *membankx.dat* created by the previous software versions and copy them in the folder where you are going to install the new software version.

This operation will allow the new Perseus software to use the memory banks you may have stored with older versions.

2.1H VERSION FEATURES

- **Fully featured demonstration version**
- **WinUSB drivers and control DLL. Windows Vista and Windows 7 support.**
- **Multiple receivers attached to a single PC.**
- **New FPGA cores with 48, 96, 192 kHz output sample rates. Direct CW Skimmer support.**
- **Support for external frequency down-converters**
- **Spectrum Display Max Hold/Clear/ Pause Functions**
- **Waterfall Automatic Gain Control**
- **New Waterfall Processing Mode**
- **Waterfall Time Ticks**
- **Markers Log**
- **S-Meter and Marker Units**
- **Waterfall color palettes**
- **Bugs Fixed**
- **Bugs Added**

Fully featured demonstration version

The Perseus software runs in a fully featured file playback mode for those who would like to evaluate its features before buying the Perseus receiver.

The Perseus software can be freely evaluated for a 60 days trial period.

A permanent license for those who would like to use the Perseus software beyond the trial period will be available upon request.

The Perseus software is permanently enabled to owners of the Perseus receiver.

WinUSB drivers and control DLL. Windows Vista and Windows 7 support.

The Perseus control DLL *perseususb.dll* now supports also the Microsoft operating systems Windows XP/Vista/Windows 7, in both their 32 and 64 bit versions and interface directly to the Windows WinUSB library, which is native in Vista and 7 OSs.

The software drivers folder provided in this version include the WinUSB library software required by Windows XP (in which the library is not native and should be installed on the system).

Multiple receivers attached to a single PC.

The Perseus software now accepts multiple Perseus receivers attached to a single PC.

Multiple instances of the software can be run in real-time and up to the number of the receivers connected to the system.

Once a new Perseus application instance is run, the software automatically checks for unused Perseus receivers attached to the system and connects to the first of them. If no more unused receivers are available on the system, further Perseus software instances will run in playback mode.

Please note that multiple runs of the Perseus software require a huge amount of digital signal processing, especially when the highest DDC sample rates are selected, which can easily surpass the processing capability of the system CPU. As a rule of thumb each software instance should be run at a DDC sample rate so that summing all of the rates the total does not exceed the sample rate that a single instance can process (2000 kS/s).

When using multiple software instances always monitor the CPU load with the task manager.

Reduce the receiver's DDC sample rate if the load on any of the cores of the CPU of your system approaches a 100 % utilization.

New FPGA cores with 48, 96, 192 kHz output sample rates. Direct CW Skimmer support.

New FPGA digital down converter cores have been made available to provide a direct support to software applications which require the hardware to produce a data stream at sample rates commonly used by audio peripheral devices, 48 kHz, 96 kHz and 192 kHz, like i.e. in the popular *CW Skimmer* designed by Alex VE3NEA.

This distribution includes three new FPGA cores which provide the required sample rates, as indicated in the following list:

perseus48k24v31.sbs – Nominal Sample Rate: 48 kHz.

perseus96k24v31.sbs – Nominal Sample Rate: 96 kHz.

perseus192k24v31.sbs – Nominal Sample Rate: 192 kHz.

The sample rates provided by these cores are only approximate to about 0.16% of the nominal rate. The true output sample rate provided by these three core is obtained dividing the receiver ADC clock (80 MHz) respectively by 416, 832 and 1664.

These three files, along with the new Perseus control DLL *perseususb.dll*, should be copied in the folder where CW Skimmer has been installed, as explained in the CW Skimmer help.

Support for external frequency down-converters

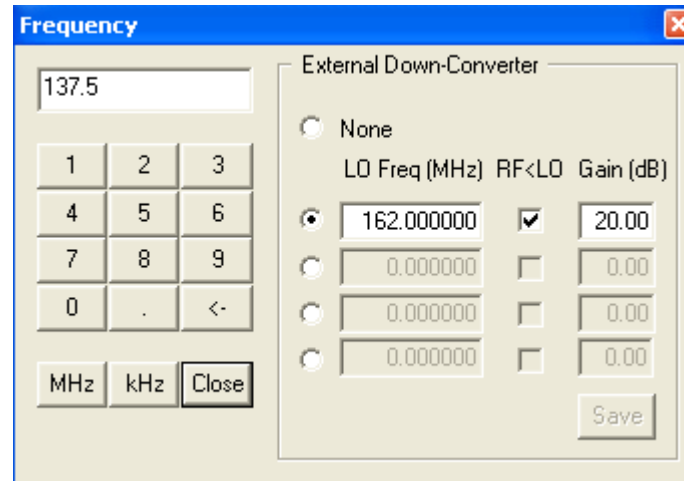
A full support for external frequency down converters has been added.

Up to four external down converter configurations can be stored and accessed from the tuning frequency dialog.

Once an optional external down converter is connected to the receiver input, the Perseus software will display the true tuning frequency and signal amplitudes provided that the frequency of the down-converter local oscillator frequency and the down converter gain are entered in one of the available entries of the tuning frequency dialog.

Since the Perseus is an HF receiver with a frequency coverage from 10 kHz to 30 MHz, only down converters with an IF output in this frequency range are supported.

Both inverting (RF frequency < LO frequency) and non inverting ((RF frequency > LO frequency) converters are supported. For inverting down converter the button RF<LO should be checked as shown in the following picture:



The Perseus software will not place any limit in the tuning frequency beyond the limits dictated by the fact that the IF signals at the receiver input must fall within the range [0..40 MHz].

With the setting shown in the above picture the software will accept a tuning frequency from 122 MHz to 162 MHz.

In general, for inverting down-converters the software will accept a tuning frequency in the range $[F_{LO}-40 \text{ MHz} .. F_{LO}]$. For non inverting down-converters the tuning frequency must be in the range $[F_{LO} .. F_{LO} + 40 \text{ MHz}]$.

Once the LO frequency, the inverting flag and the gain of the down-converter are entered click the button “Save” to store them (the “enter” key will simply close the dialog without saving).

The maximum LO frequency accepted by the software is 960 MHz. For operations above 1 GHz, please omit the GHz digits when tuning the receiver and when entering them in the external down converter dialog (i.e. for a 2.120 GHz LO, only the value 120 MHz should be entered).

Once one of the four external down converters radio button is selected, the software assumes that the receiver will operate above the HF frequency range and set the S-Meter S scale so that S9 corresponds to – 93 dBm (5 uV rms). When the external down converter option is set to “None”, the S-Meter scale is reverted to the HF convention ($S9 = -73 \text{ dBm}$ or 50 uV rms into a 50 Ohm load).

The external down converter dialog is disabled during file playback and recording to prevent inconsistent frequency reading or receiver control.

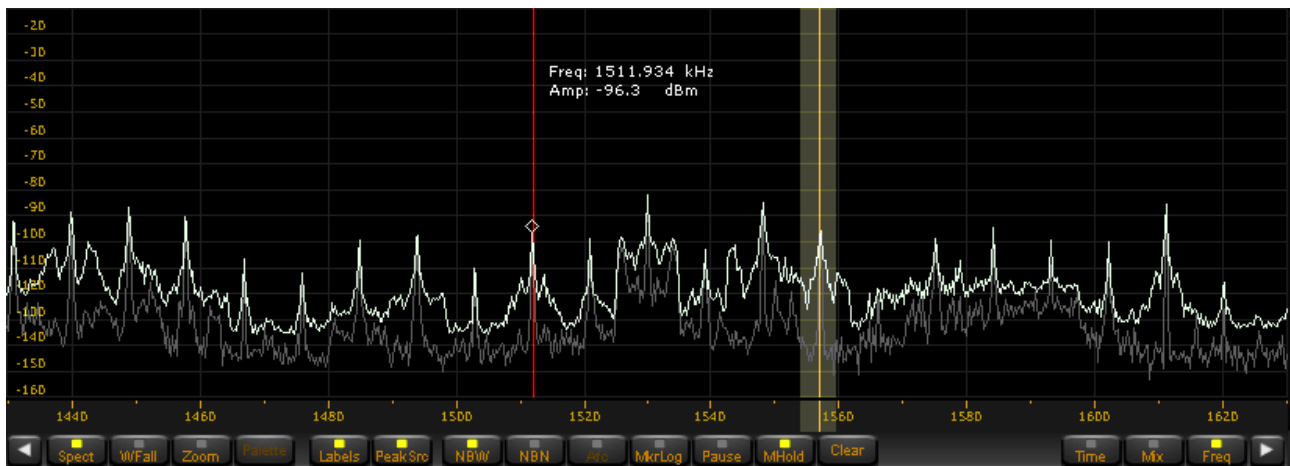
IMPORTANT NOTICE: The support for external down converters is offered for a limited evaluation time. A permanent software license for this option will be offered for free to owners of original Microtelecom s.r.l. frequency converter products once they will be available.

Spectrum Display Max Hold/Clear/ Pause Functions

A spectrum Max Hold function (MHold button in the main menu control bar right below the spectrum display) has been added.

The Max Hold function can be activated only in Spectrum mode and is disabled when the Waterfall mode is selected.

When the Max hold function is activated two traces will be visible in the main spectrum display as indicated in the following picture:



The Pause button suspends only the spectrum update (not the audio signal or the playback of a file). The Clear button reset the Max trace for a new Max Hold calculation.

Waterfall Automatic Gain Control

Three waterfall automatic gain control modes are now available: OFF, Auto1, Auto2.

The mode Auto1 is the automatic gain control provided in all the software versions prior to this version and effectively mitigates sudden noise level variations.

The mode Auto 2 is the default mode in this software version. It offers an improved waterfall visualization in the cases when the wide band signals are analyzed or the band is crowded by many narrow band signals, but is less effective in controlling the background brightness of the waterfall in presence of sudden noise level variations.

The automatic gain control can be excluded selecting the option OFF in the software settings dialog (see Waterfall AGC entry). This option is effective when it is preferable to have a waterfall background brightness which is proportional to the background noise level. When the automatic gain control is excluded the background brightness of the waterfall has to be adjusted manually each time the frequency span of the waterfall display is changed.

New Waterfall Mode

A new “v2.1h” waterfall processing mode has been added to improve the quality of the waterfall display when the main spectrum average function is used.

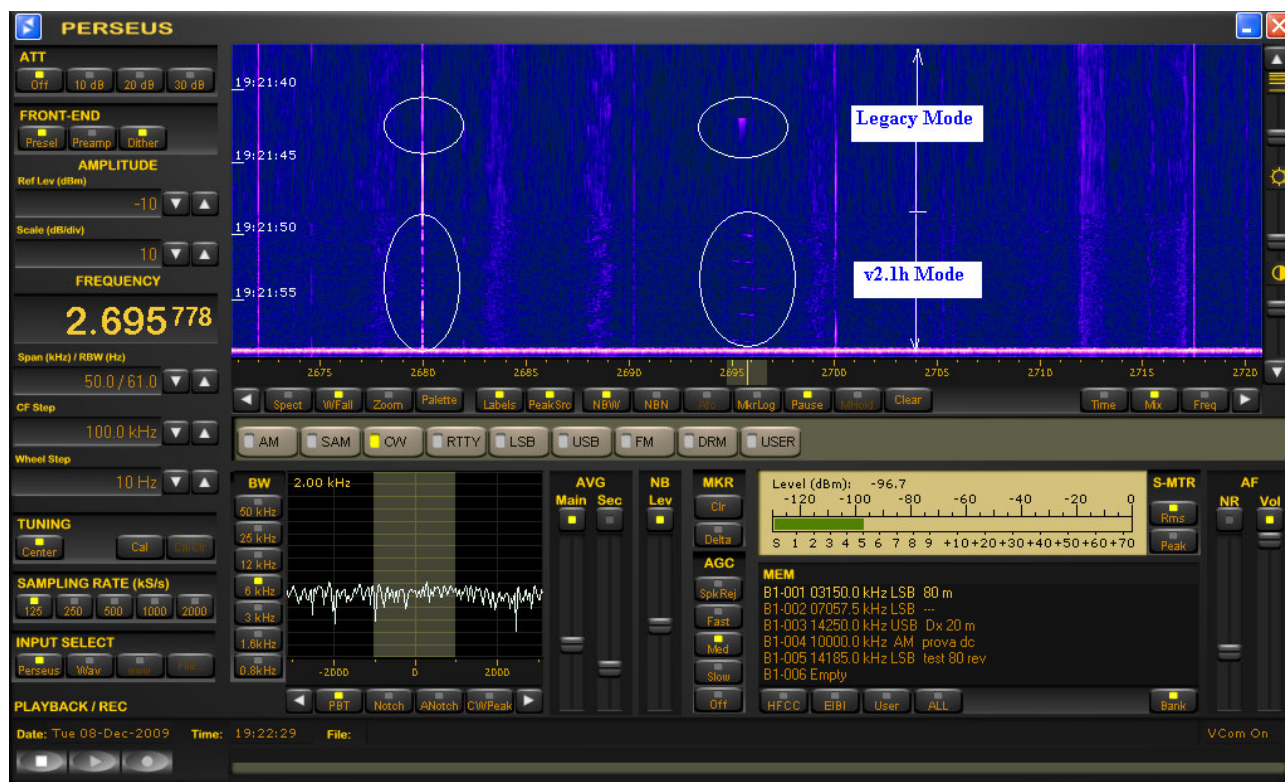
With this new mode the spectral data is computed at a fixed and much higher speed than in the previous versions, disregarding the waterfall speed control slider which now controls how much fast this data output is sampled and shown on the screen.

This has the main advantage that the lines output to the waterfall display are much less correlated even if the spectral data is being averaged.

The old “Legacy” processing mode has been maintained and can be selected in the software settings dialog (see the WF Mode entry).

The difference between the “v2.1h” and the “Legacy” mode can be appreciated setting the waterfall speed control to a moderate to low speed and increasing the Main Average slider up to when the waterfall lines begin to show a correlation effect. Switching to the Legacy mode with the same speed and average settings will produce a much more blurred waterfall, as shown in the following picture.

As the new mode allows to increase the average constant without producing as much blurring as the Legacy one, it effectively improves the waterfall sensitivity to weak signals.



Please note that the v2.1h mode is more processing intensive than the Legacy mode and should not be used on low end systems unless the CPU load is at an acceptable level.

Waterfall Time Ticks

Time ticks at regular intervals (1, 2, 5, 10, 30, 60, 120, 600 s) have been added to the waterfall display. The ticks time interval is computed automatically by the software. The time ticks can be enabled/disabled with the “Labels” button in the main spectrum display control bar.

Markers Log

This software version handles up to eight markers which can be set right-clicking the main spectrum display as in the previous software releases.

The markers can be logged to a text file named *markers.log* for further data processing. The marker log function is activated/deactivated clicking the MkrLog button in the main display menu bar. The markers log interval can be set to 0.1, 0.2, 0.5, 1, 2, 5 s from the software settings dialog (see Mkr Log Interval).

Markers are saved to the markers.log file accordingly to the selected unit as shown in the following sample file and can be imported by external software (i.e. Matlab) for further processing.

```
# PERSEUS RECEIVER - MARKERS LOG FILE
#
# Creation date : 07-11-2009 19:01:59 UTC
# Log interval : 1.0 s
# Frequency units: kHz
# Amplitude units: dBm
# Data format : ElapsedTime MkrId Frequency Amplitude
1.000 0 900.000 -69.9
1.000 1 909.033 -75.5
1.000 2 918.066 -87.7
1.000 3 926.978 -82.6
1.000 4 936.011 -75.4
2.000 0 900.000 -70.8
2.000 1 909.033 -72.7
2.000 2 918.066 -86.9
2.000 3 926.978 -82.3
2.000 4 936.011 -77.6
3.000 0 900.000 -72.8
3.000 1 909.033 -74.7
3.000 2 918.066 -89.5
3.000 3 926.978 -80.4
3.000 4 936.011 -77.1
4.000 0 900.000 -71.7
4.000 1 909.033 -73.7
4.000 2 918.066 -90.2
4.000 3 926.978 -81.7
4.000 4 936.011 -74.5
5.000 0 900.000 -71.1
5.000 1 909.033 -76.1
5.000 2 918.066 -96.2
```

S-Meter and Marker Units

The units used by the S-Meter, the markers and the labels in the main spectrum display can be set to dBm or dBuV accessing the software settings dialog (see SMTR/Mkr Units).

When an external down converter is selected in the tuning frequency dialog the scale of the S-Meter is calibrated so that S9 corresponds to a -93 dBm (5uV rms on a 50 Ohm load) input instead of the value used for operation in the HF's (S9 = -73 dBm or 50 uV rms).

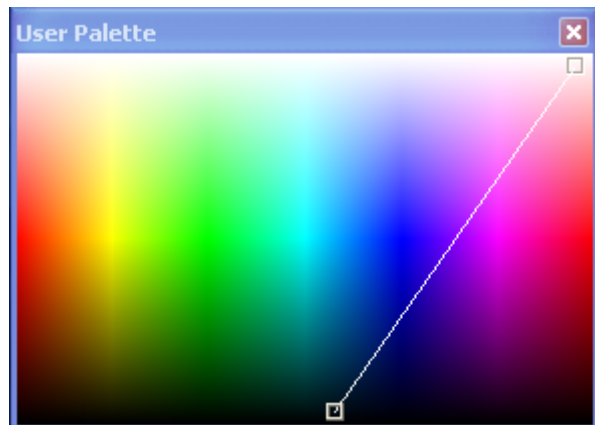
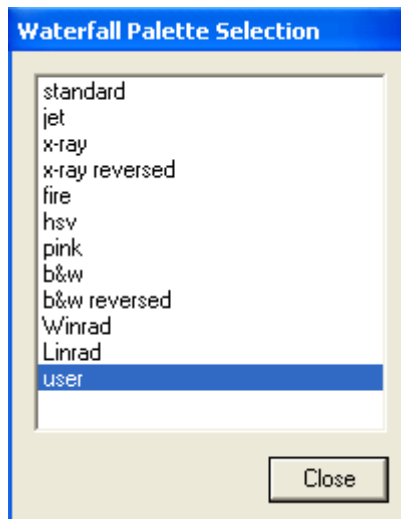
Waterfall color palettes

Three new color palette have been added, the Winrad palette (thanks to Winrad author Alberto di Bene, I2PHD), the Linrad palette (thanks to Linrad author Leif Asbrink, SM5BSZ) and a user configurable palette.

When the “user” palette is selected, the colors of the waterfall palette can be chosen by the user dragging the terminal points of the line shown in the “User Palette” color dialog.

The default configuration indicated in the following picture will produce a waterfall with a deep blue background and signals appearing from purple to white.

The brightness and contrast sliders affect the way the signal amplitude is mapped to the colors lying on the selected line of the User Palette dialog, as much as done with the other, non configurable, color palettes provided by the software.



Bugs Fixed

- Squelch/Mute and Noise Reduction overflows.
- Frequency dialog issues dependent on monitor DPI settings.
- Memory window doesn't display correctly the stations list when the tuning frequency is changed.
- CI-V protocol issues as pointed out by third party software developers.

Bugs Added

Great care has been taken to check this software version against new bugs and correct the most evident of them.

Those which were introduced with this version and not evident after tenths of hours of debug activity are TBD (to be discovered).

Enjoy this new version,
Nico Palermo – IV3NWV
Microtelecom s.r.l.