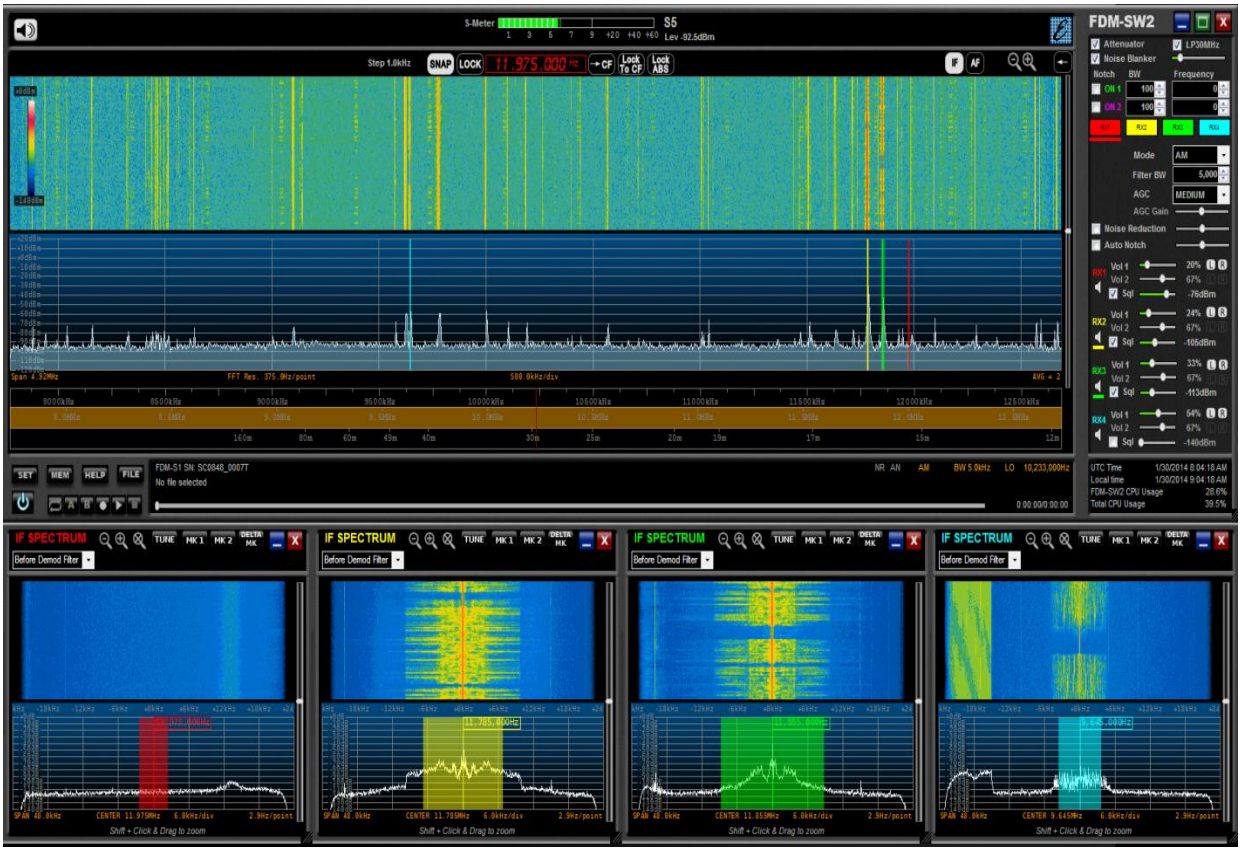
Communication

ELAD

ELAD FDM-SW2



USER MANUAL

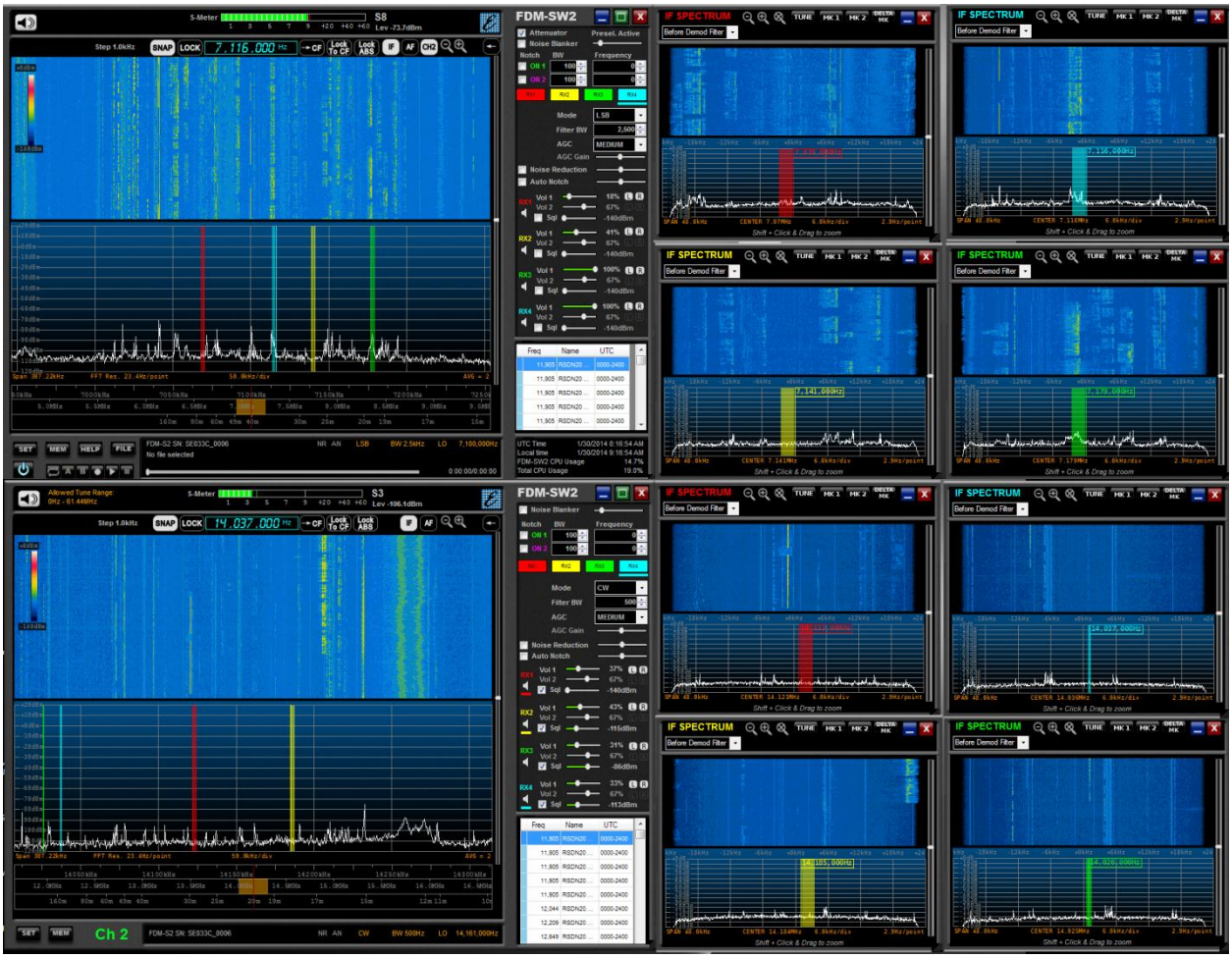
Contents

Revision History

Revision	Date	Description
Rev 1.3	02/2018	• Added this table. • Various corrections. • Added information related to the latest software versions. • Added cross-references to titles, e.g. **Overview**. • Updated FDM-DUO section. FDM-DUO(r) means both FDM-DUO and FDM-DUOr. Added an example of using preselectors. • Revised annexes.

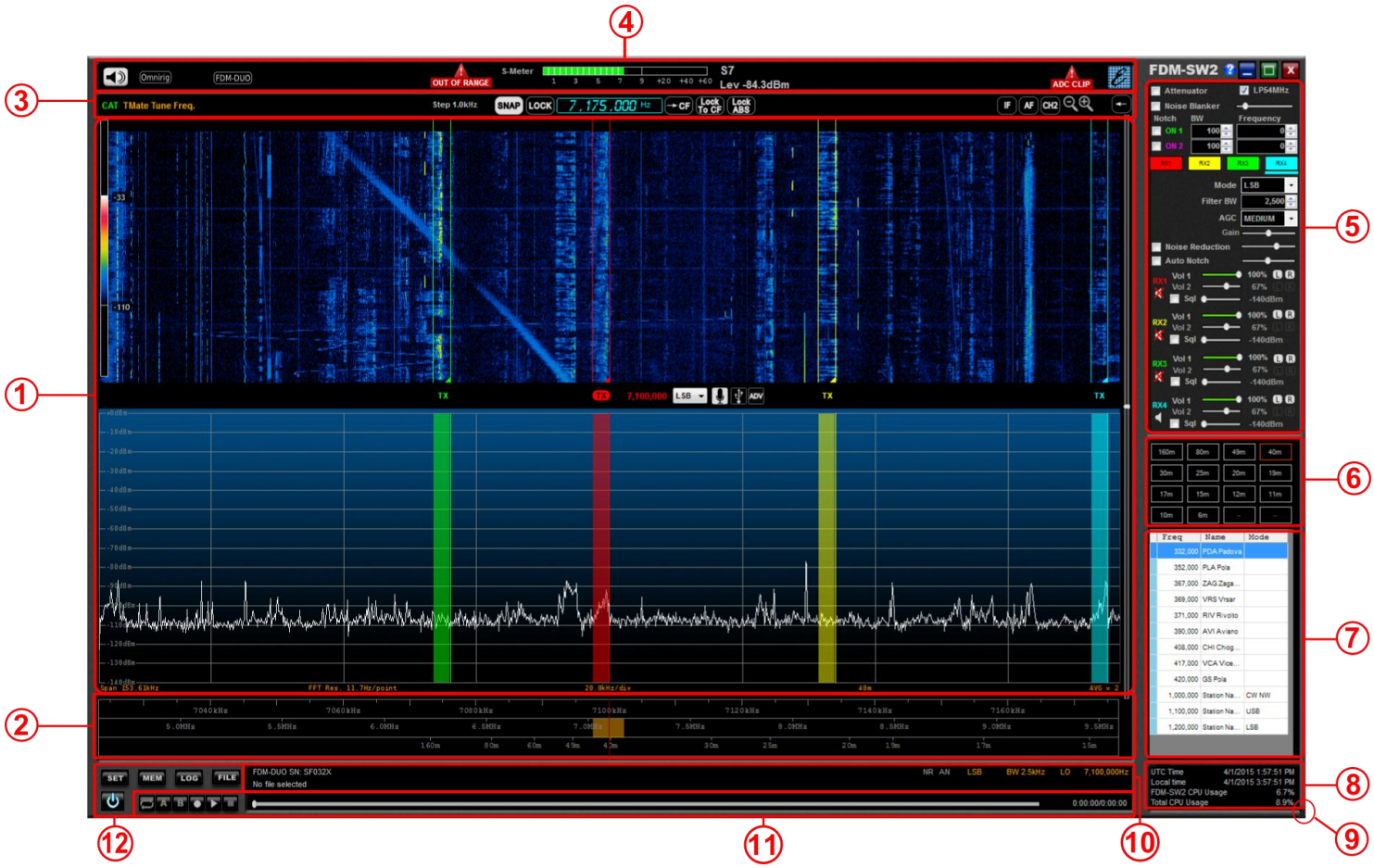
1 Overview

FDM-SW2 is a SDR software (Software Defined Radio) that is intended to be used with the FDM-Sx receivers family, the FDM-DUOr receiver and the FDM-DUO transceiver. It manages up to two different acquisition channels, on each one four virtual receivers can be activated. In this way, the user can analyze more than one signal together.



2 User Interface

The picture below shows the different parts of the user interface.

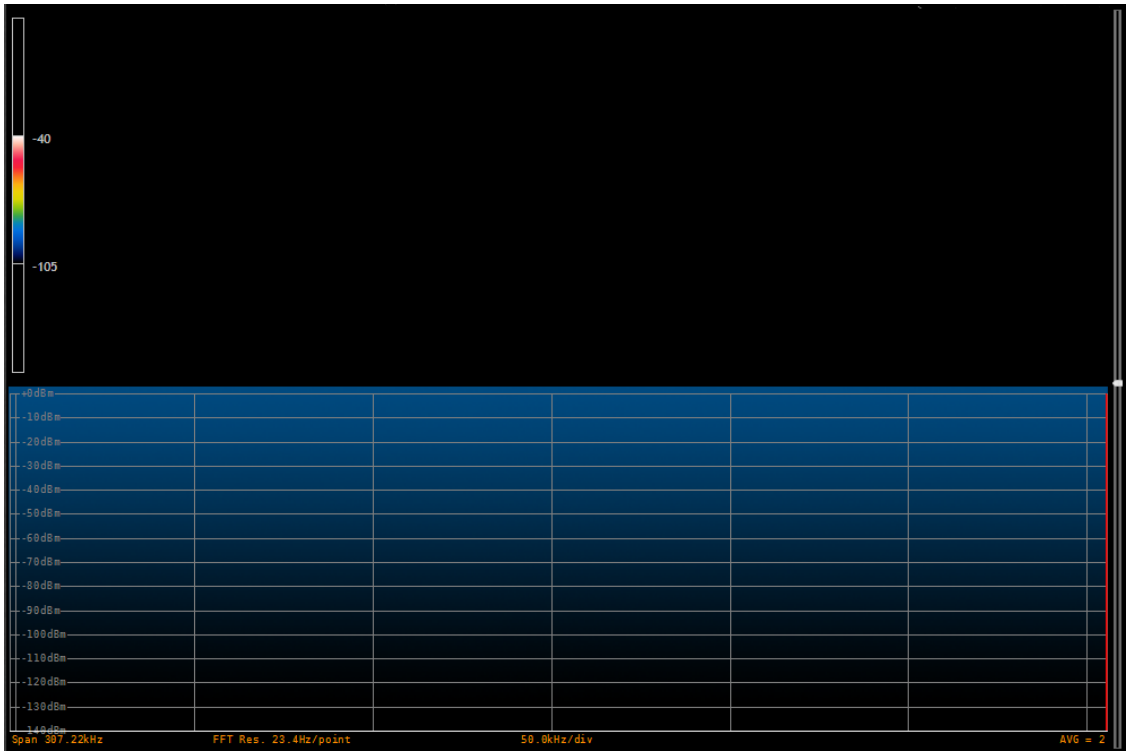


The different parts of the user interface are :

1. the **Main Window**,
2. the **Tuning Bars**,
3. the **Tuning Commands Panel**,
4. the **Signal Control Panel**,
5. the **Receiver Commands Panel**,
6. the **Preset Buttons Panel**,
7. the **Station Memory Panel**,
8. the **System Information Panel**,
9. the **Resize Corner**,
10. the **Status Bar**,
11. the **Recorder/Player Panel**,
12. the **Buttons Panel**.

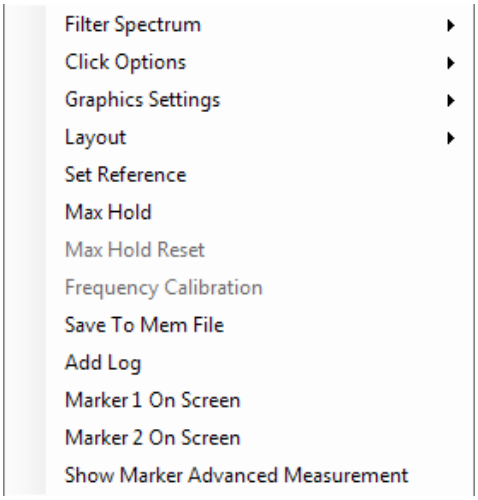
2.1 Main Window

The Main Window displays the spectrum and the waterfall of the input signal.



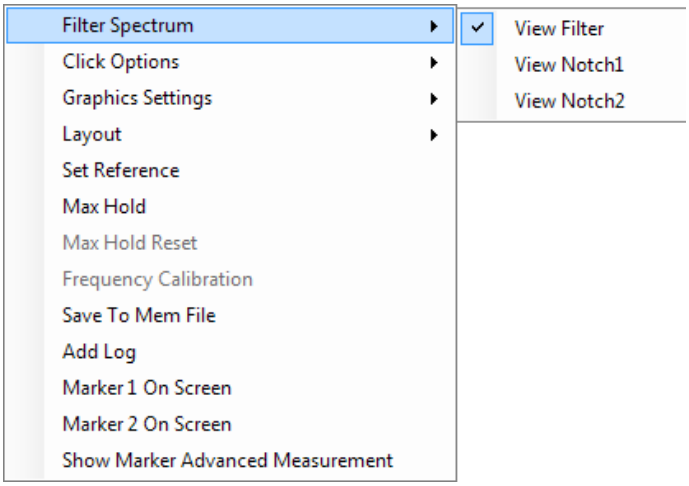
The sliding bar on the right side allows the user to change the area portions assigned to the two types of graphics. The waterfall palette control on the left side allows the user to adjust the minimum and the maximum value displayed on the waterfall. On the lower part, information about the current setting of "Span", "FFT Res", "kHz/div" and "AVG" is displayed.

When right-click is performed on the Main Window the software displays a pop-up menu that contains advanced options.



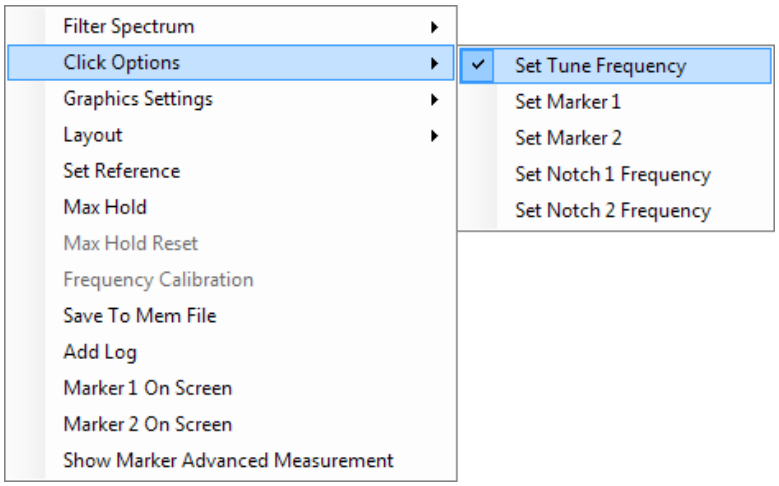
2.1.1 Advanced options - Filter Spectrum

Allows the user to select which information is displayed on the spectrum area.



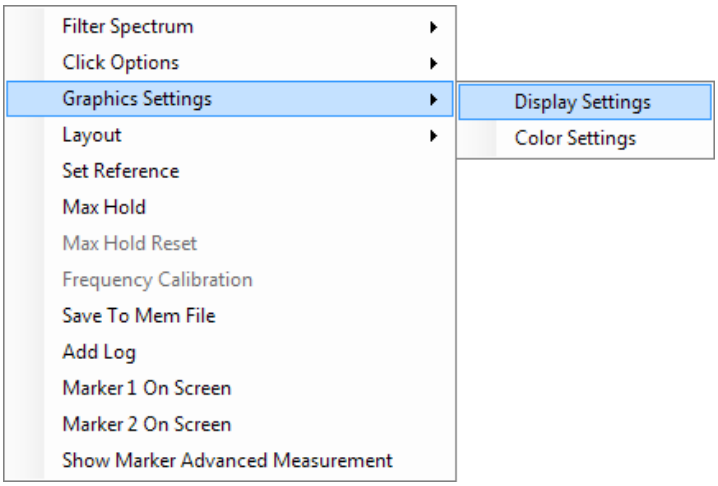
2.1.2 Advanced options - Click Options

Allows the user to select which kind of operation can be done when left-click is performed on the Spectrum area.



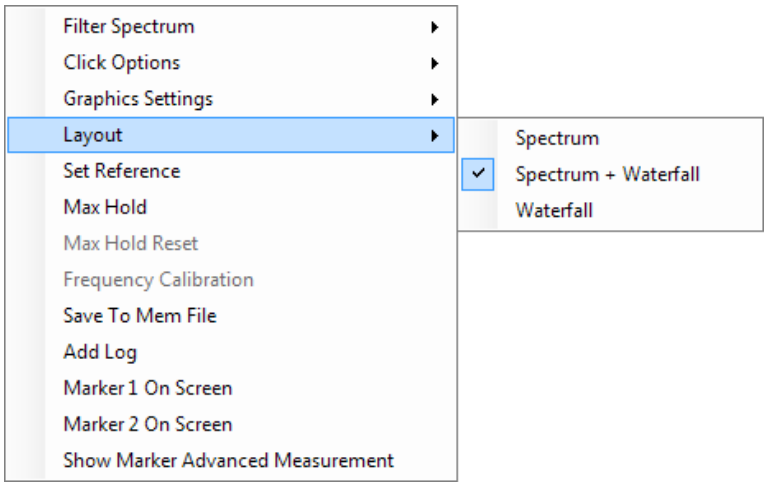
2.1.3 Advanced options - Graphics Settings

Allow the user to open the Display Settings to configure the parameters of the Spectrum/Waterfall graphics displayed in the Main Window. Moreover the Color Settings option allows to change the colors used in the Main Window.



2.1.4 Advanced options - Layout

Allows the user to select the Main Window visualization mode.



2.1.5 Advanced options - Set/Reset Reference

When “Set Reference” is clicked, the software displays as a reference trace the input spectrum available at the moment of the click. “Reset Reference” disables the visualization of the reference trace.

2.1.6 Advanced options - Max Hold

When “Max Hold” is selected, the software displays the “max hold” of the input spectrum together with the real-time input spectrum trace. Click “Max Hold Reset” to reset the max hold trace. Unselect “Max Hold” to remove the “Max Hold” visualization.

2.1.7 Advanced options - Frequency Calibration

This option allows the user to modify the factory frequency offset of the FDM receivers. Normally this operation is not needed.

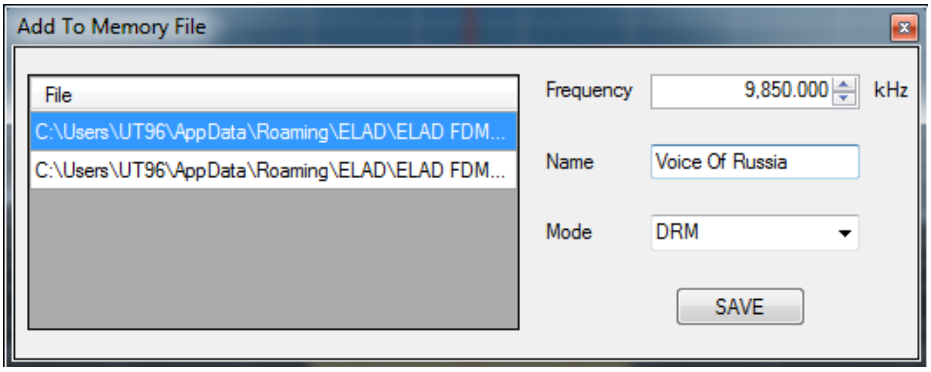
As described in the picture above, a reference signal has to be provided at the antenna input of the receiver to perform the frequency calibration. Once done, place the marker on the peak value of the reference signal, press Set Offset and then EXIT .

Clicking on Reset Offset , the software resets the sampling frequency offset to zero.

NOTE:
This operation will cause the loss of the factory calibration. Perform this operation only if you are sure to accomplish the operation in the right way and to use a precise frequency reference.

2.1.8 Advanced options - Save to Mem File

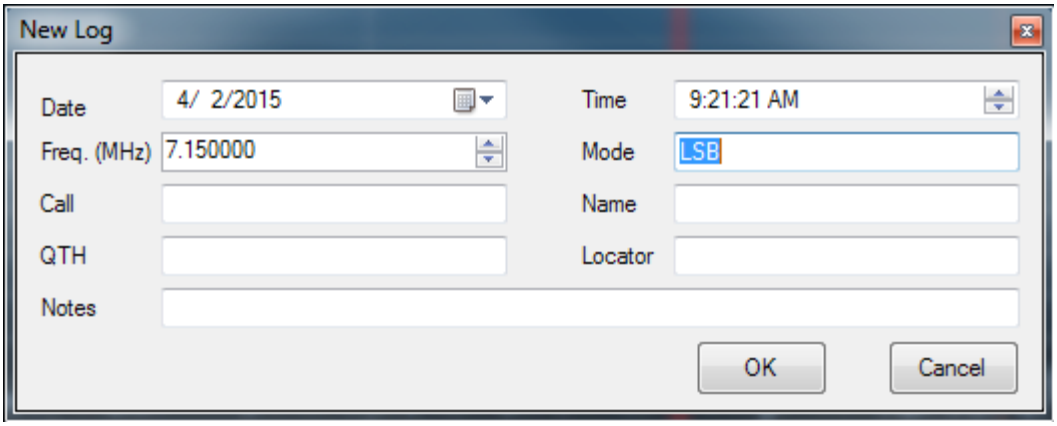
When “Save To Mem File” is clicked, the “Add to Memory File” window is displayed.



This window allows to add a new station in memory file (see the dedicated section further on in this manual). The user can select the memory file and save the frequency, name and a default demodulation mode for the station.

2.1.9 Advanced options - Add Log

When “Add Log” is clicked the “New Log” window is displayed.



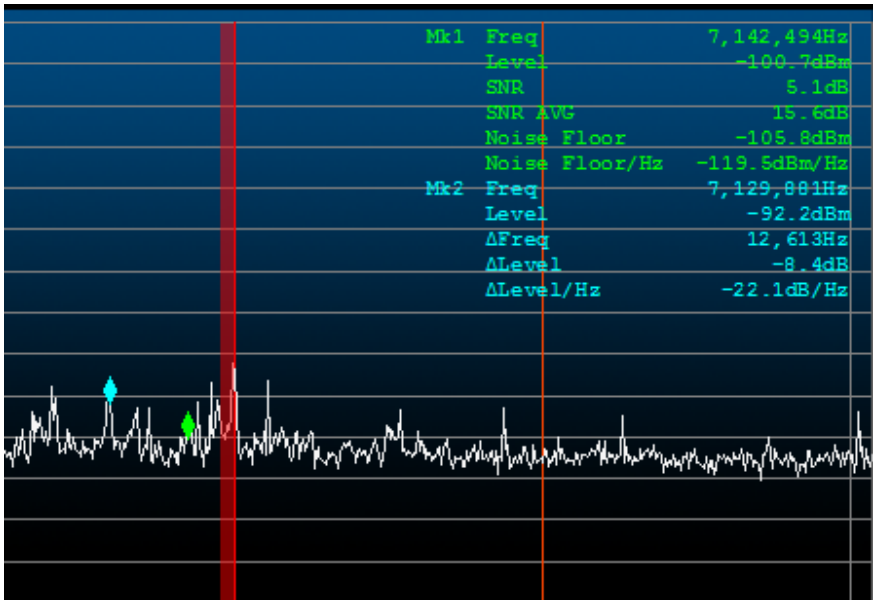
This window allow the user to add a new contact in the current logbook.

2.1.10 Advanced options - Marker 1 on Screen / Marker 2 on Screen

This option enables the visualization of the markers on the spectrum. The frequency and amplitude value (in dBm) of the Marker 1 is displayed on top-right corner of the Main Window. The Marker 2 includes the “Marker Delta” feature to display the frequency and the amplitude difference between the markers.

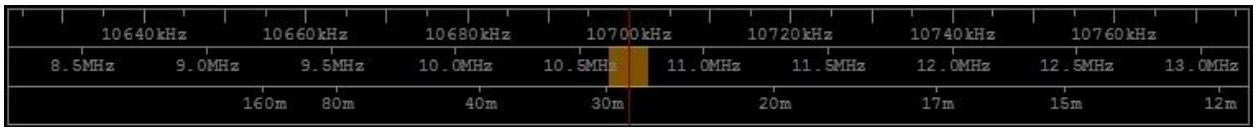
2.1.11 Advanced options - Show Marker Advanced Measurement

If this option is selected, signal to noise ratio (SNR) measurement are performed and displayed.



2.2 Tuning Bars

These innovative tuning bars (Patent Pending) allow the user to perform fast tuning over the whole receiver bandwidth. Each bar is characterized by different frequency spans. By performing drag-and-drop or scrolling with the mouse wheel over the different bars, the user can easily select the desired frequency using the lower bar to select the frequency band, the middle bar to make a coarse tuning and the higher bar to do fine positioning.



The span of the higher bar corresponds to the frequency range of the spectrum, and can be modified using the zoom buttons in the **Tuning Commands Panel**. The frequency step of the higher bar (displayed in the Tuning Commands Panel) can be changed using the ↑ ↓ arrows on the PC keyboard, while ← → keys decrease or increase the tuning frequency by one step respectively (see **Tuning Tab** section for keyboard shortcut configuration). The yellow segment on the middle bar represents the portion of the spectrum displayed by the software in the **Main Window**.

2.3 Tuning Commands Panel

The main function of this panel is to display the tuning frequency.

Double click on the frequency viewing  or press space bar to open the "Advanced Tuning" panel.

In the "Digit by digit" section it is possible to modify the tuning frequency or the local oscillator frequency by moving the mouse over each digit and then scroll with the mouse wheel to increase or decrease the digit value. Alternatively the user can click on the small arrow button over and below each digit. In the "Manual input" section it is possible to modify the tuning frequency or the local oscillator frequency inserting manually the desired value using the PC keyboard (Note: "+" key allow to insert "000").

If the Lock To CF button is selected the tuning frequency corresponds to the center frequency of the Spectrum (that is the L.O. frequency). Otherwise it's possible to select different demodulation frequencies by clicking on the desired point on the Spectrum/Waterfall. Use the mouse scroll wheel over the Spectrum/Waterfall area to move the tuning frequency.

If the Lock ABS button is selected the tuning frequency remains constant even if the local oscillator frequency is changed (until the tuning frequency falls within the selected frequency span; otherwise the tuning frequency will be set according to the frequency span limits).

If the LOCK button is selected, all the settings except the volume controls are disabled.

Clicking on button →CF the software forces the L.O. frequency to be equal to the current demodulation frequency.

Use the SNAP button to enable/disable the rounding of the tuning frequency at multiples of the frequency step.

Use the IF button to open the **IF Spectrum Window**. Left click on this button to open/close the IF window. If the IF window is open, right click on this button to move to foreground the IF window.

Use the AF button to open the **Audio Spectrum Window**. Left click on this button to open/close the AF window. If the AF window is open, right click on this button to move to foreground the AF window.

Use the CH2 button to open the **Channel 2 Spectrum Window**. Left click on this button to open/close the Channel 2 Spectrum Window. If the Channel 2 Spectrum Window is open, right click on this button to move to foreground the Channel 2 Spectrum Window. Note: this feature is available only if the connected FDM supports "2 channels" mode in the "Device Configuration" menu of the **Advanced Tab** in the **Setup Window**. FDM-S2 and FDM-DUO(r) support the "2 channels" mode.

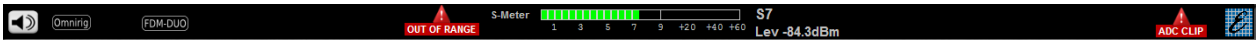
Buttons  implement "zoom in", "zoom out" and "zoom reset" respectively. Use the arrows that appear on the **Main Window** ( ) when zoom function is active to move left/right the visualization.

The button ← hide the receiver setup.

Moreover, the **Tuning Commands Panel** shows the TMate label when a TMate is connected and the CAT label when the CAT protocol is enabled.

2.4 Signal Control Panel

In this area, the FDM-SW2 software displays the level of the input signal.



appears when the local oscillator is tuned in a frequency range not implemented in the pre-selection filters (FDM-S2 only).

notifies an ADC saturation.

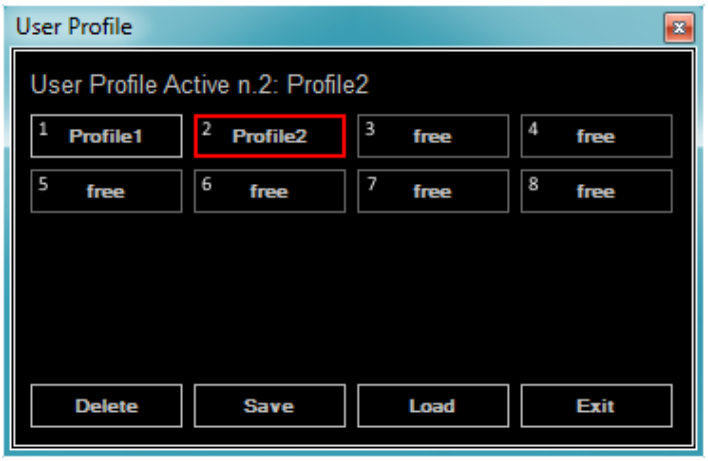
allows to activate or deactivate the Mute function.

presents if Omnirig is active, click on it to open the Omnirig control panel.

if the device connected is a FDM-DUO(r), click on this button to open the FDM-DUO(r) **Control Panel**.

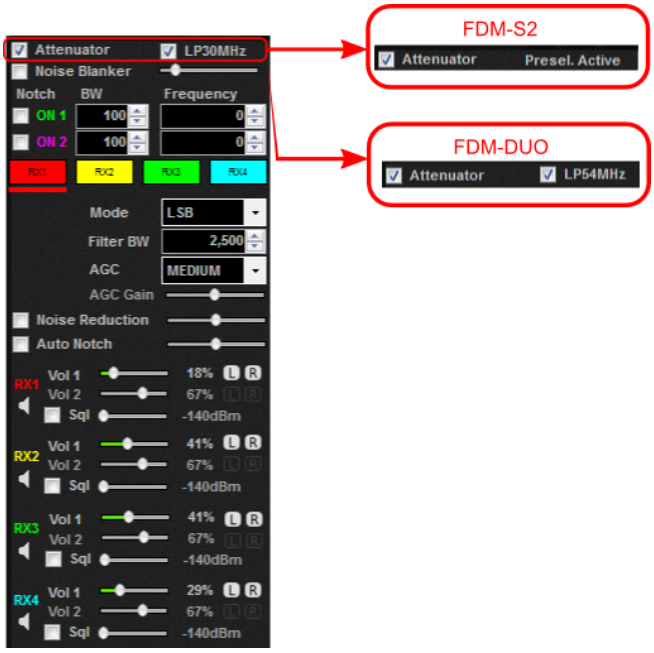
allows to manage user profiles.

Clicking on the user profile icon opens the profiles management window which allows to create, delete, load and save user profiles. The picture bellow shows this window.



2.5 Receiver Commands Panel

The receiver commands panel allows the user to control the FDM receiver and the virtual receivers.



Controls allow to :

- switch On/Off the anti-aliasing filter, only for FDM-S1 (30 MHz Low Pass) and FDM-DUO (54 MHz Low Pass);
- switch On/Off the 20 dB attenuator (12 dB for FDM-S2 and FDM-DUO);
- switch On/Off the noise blanker and modify its level;
- switch On/Off the two notch filters (at IF stage) and set their parameters (frequency and bandwidth);
- turn On/Off and select (RX1) the four virtual receiver (RX1 ... RX4) available for each channel;
- select the demodulation mode for the selected RX (CW, CW SH+, CW SH-, USB, LSB, DSB, AM, SAM, FM, WB FM Stereo, DRM is available only for RX1 of Channel 1);
- set the bandwidth of the demodulation filter for the selected VRX (virtual receiver);
- set the AGC type for the selected VRX; if “AGC OFF” is selected, the user could adjust the AGC Gain manually and the software displays a warning (CLIP) when audio clipping is detected;
- switch On/Off the “Noise Reducer” and modify its speed for the selected RX;
- switch On/Off the “Auto Notch” reducer and modify its speed for the selected RX.

For each virtual receiver it is possible to :

- set the volume of the main audio output (Vol 1 18%) ;
- set the volume of the auxiliary audio output (Vol 2 67%) ;
- switch On/Off the squelch and set its level (Sql -140dBm) ;
- mute the VRX with (only for main audio output);
- send the audio, with the L R buttons, to the left/right or both channels of main or auxiliary audio output.

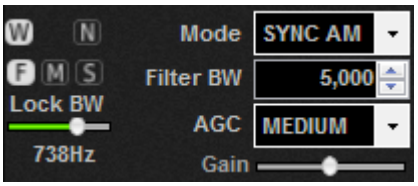
2.5.1 CW / CW SH+ / CW SH- / CW NW Settings

If a CW demodulation mode is selected it is possible to activate a digital resonator filter.

The filter is activated/disabled with the D-RES button, with the slide bar under the button it is possible to adjust the filter bandwidth.

2.5.2 SYNC AM Settings

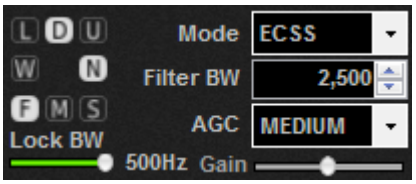
If the SYNC AM mode is selected it is possible to set some parameters to improve the signal locking.



- If the W button is clicked the initial locking filter bandwidth is set to the “Filter BW” value, when a signal is locked, the locking filter bandwidth is set to the “Lock BW “ value.
- If the N button is clicked the locking filter bandwidth is set to the “Lock BW” value.
- With the F M S buttons it is possible to set a Fast/Medium/Slow locking speed.
- With the “Lock BW” slide it is possible to adjust the locking filter bandwidth.

2.5.3 ECSS Settings

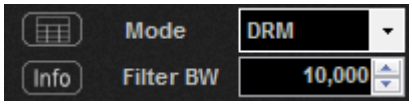
If the ECSS mode is selected it is possible to select the upper side / lower side band and to set some parameters to improve the signal locking.



- If the W button is clicked the initial locking filter bandwidth is set to the “Filter BW” value, when a signal is locked, the locking filter bandwidth is set to the “Lock BW “ value.
- If the N button is clicked the locking filter bandwidth is set to the “Lock BW value”.
- With the F M S buttons it possible to set a Fast/Medium/Slow locking speed.
- With the “Lock BW” slide it is possible to adjust the locking filter bandwidth.

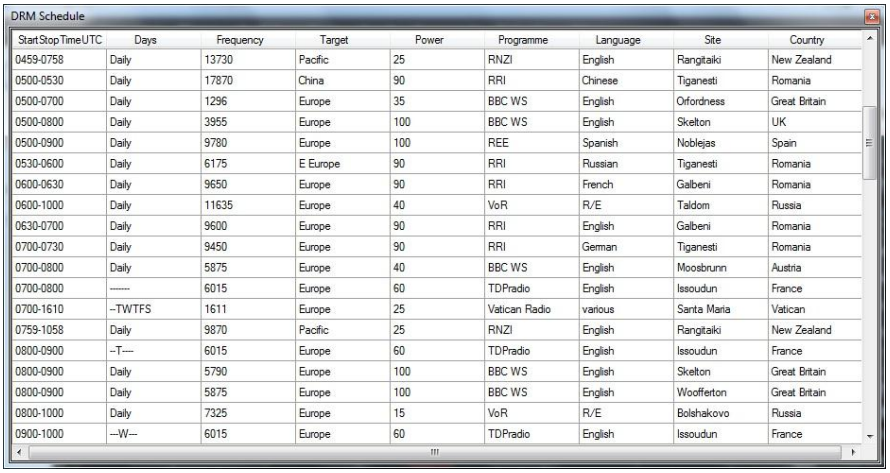
2.5.4 DRM Info Window and DRM Schedule

If the DRM mode is selected two buttons allows to show the DRM info window and the DRM schedule window.



Clicking on  the DRM info window is displayed.

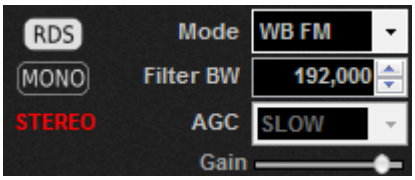
Clicking on  button, if an internet connection is available, causes the software to automatically downloads and displays the last DRM schedule from ftp://216.92.35.131.



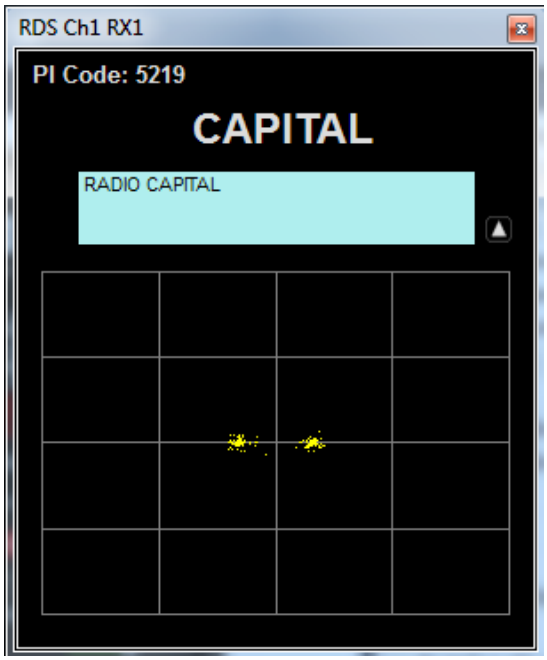
Start Stop Time UTC	Days	Frequency	Target	Power	Programme	Language	Site	Country
0459-0758	Daily	13730	Pacific	25	RNZI	English	Rangitaiki	New Zealand
0500-0530	Daily	17870	China	90	RRI	Chinese	Tiganesti	Romania
0500-0700	Daily	1296	Europe	35	BBC WS	English	Orfordness	Great Britain
0500-0800	Daily	3955	Europe	100	BBC WS	English	Skelton	UK
0500-0900	Daily	9780	Europe	100	REE	Spanish	Noblejas	Spain
0530-0600	Daily	6175	E Europe	90	RRI	Russian	Tiganesti	Romania
0600-0630	Daily	9650	Europe	90	RRI	French	Galbeni	Romania
0600-1000	Daily	11635	Europe	40	VoR	R/E	Taldom	Russia
0630-0700	Daily	9600	Europe	90	RRI	English	Galbeni	Romania
0700-0730	Daily	9450	Europe	90	RRI	German	Tiganesti	Romania
0700-0800	Daily	5875	Europe	40	BBC WS	English	Moosbrunn	Austria
0700-0800	------	6015	Europe	60	TDPradio	English	Issoudun	France
0700-1610	--TWTFS	1611	Europe	25	Vatican Radio	various	Santa Maria	Vatican
0759-1058	Daily	9870	Pacific	25	RNZI	English	Rangitaiki	New Zealand
0800-0900	--T---	6015	Europe	60	TDPradio	English	Issoudun	France
0800-0900	Daily	5790	Europe	100	BBC WS	English	Skelton	Great Britain
0800-0900	Daily	5875	Europe	100	BBC WS	English	Woofferton	Great Britain
0800-1000	Daily	7325	Europe	15	VoR	R/E	Bolshakovo	Russia
0900-1000	---W---	6015	Europe	60	TDPradio	English	Issoudun	France

2.5.5 WBFM Settings

If the WB FM mode is selected it is possible to display some RDS decoding information and, by using the MONO button, force a mono decoding mode.



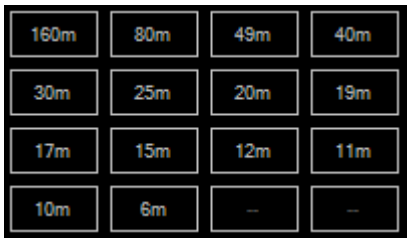
Click on RDS button to open the RDS Window.



Use the button to Show/Hide the RDS constellation graphic.

2.6 Preset Buttons Panel

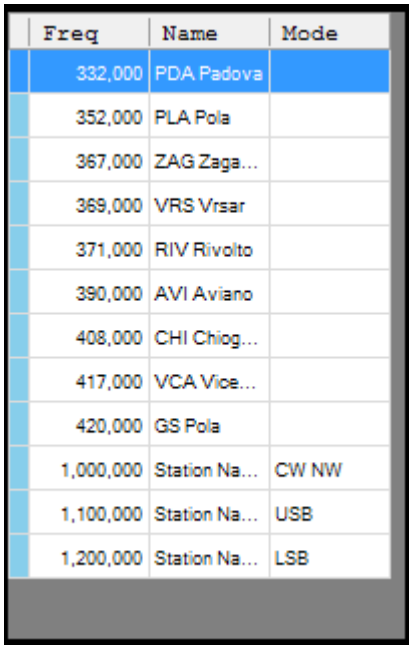
Use this buttons to quickly recall a preset containing the local oscillator frequency, RX1 tuning frequency, mode and bandwidth. By default, the commons radio amateur and broadcast bands are assigned to this buttons. However the user can modify every settings in the **Tuning Tab** of the **Setup Window**.



Note: if the **User Interface** size is set to the default size, this panel is not visible. Use the **Resize Corner** to increase the window height and make visible the Preset Buttons Panel.

2.7 Station Memory Panel

In this panel, each station memory, frequency, name and mode are displayed. Clicking on a line of the table implies that the receiver is tuned at the selected frequency and the mode is set at the value saved in the file.

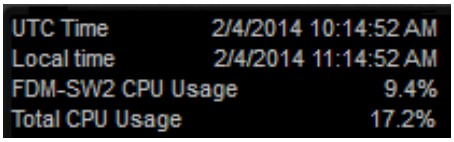


Freq	Name	Mode
332,000	PDA Padova	
352,000	PLA Pola	
367,000	ZAG Zaga...	
369,000	VRS Vrsar	
371,000	RIV Rivolto	
390,000	AVI Aviano	
408,000	CHI Chiog...	
417,000	VCA Vice...	
420,000	GS Pola	
1,000,000	Station Na...	CW NW
1,100,000	Station Na...	USB
1,200,000	Station Na...	LSB

Note: if the **User Interface** size is set to the default size, this panel is not visible. Use the resize corner to increase the window height and make visible the preset buttons panel.

2.8 System Information Panel

This panel displays the system time (UTC and local) and the CPU usage.



2.9 Resize Corner

Drag-and-drop the bottom-right corner to resize the **User Interface**.

2.10 Status Bar

The picture bellow shows the Status Bar.

The Status Bar displays the following information:

- the serial number of the connected FDM receiver;
- the selected demodulation mode and filter bandwidth;
- the status of Noise Reducer and Auto Notch (On or Off);
- the status of the Panadapter Mode (see “Advanced Tab” section):
  - if Panadapter Mode is activated, the PAN label is showed;
  - if AOR AR8600 Control is activated the AR8600 label is showed;
  - if Swap I/Q option is selected, the I/Q Swap label is showed;
- the status of the Downconverter Mode (see “Advanced Tab” section):
  - if Downconverter Mode is activated, the DW CONV label is showed;
  - if Swap I/Q option is selected, the I/Q Swap label is showed;
- the Local Oscillator frequency.

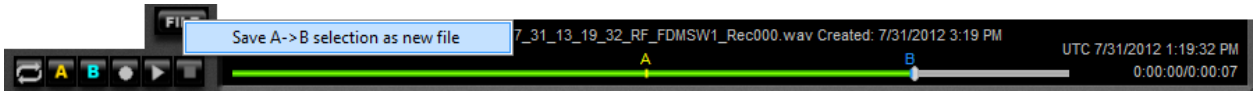
2.11 Recorder/Player Panel

The FDM-SW2 software embeds an advanced player/recorder.

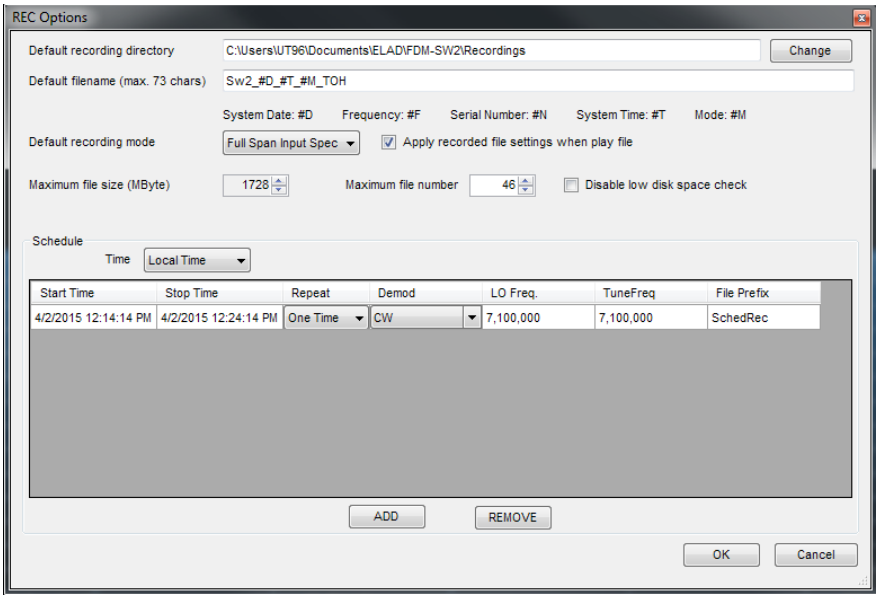
When the recorder is activated, the RF input signal or the audio output signal is stored in a .wav file (see **Recording Tab** section for details). Some information regarding the settings used during the recording (file creation date, L.O. frequency, demodulation frequency, demodulation mode, filter bandwidth, etc...) is stored in the file header.
When the file is played, the stored information is loaded by the software. When the playback is finished, last demodulation settings (demodulation frequency, demodulation mode and filter bandwidth) are stored again in the .wav header.

Six button function are available  (Loop, A, B, Rec, Play/Pause, Stop).

After placing "A" and "B" (when the reproduction is stopped), user can create a new file with the samples included between the two markers by right-clicking the  button and then clicking on this label 



When a right-click is performed on the Rec button, the "REC Options" window is displayed.



This window allows the user to set the recording options and schedule the recording of the input spectrum or the audio output signal.
The user can set the start and stop time of recording (UTC Time or Local Time), the repetition mode (one time or daily), the demodulation mode, the local oscillator frequency, the tuning frequency and the file name prefix.

2.12 Buttons Panel

 switches on/off the demodulation.

 opens the **Setup Window**.

 opens the Station List window.

 opens the Logbook management window.

 opens the Windows dialog box to allows the user to select the file to play.

3 Setup Window

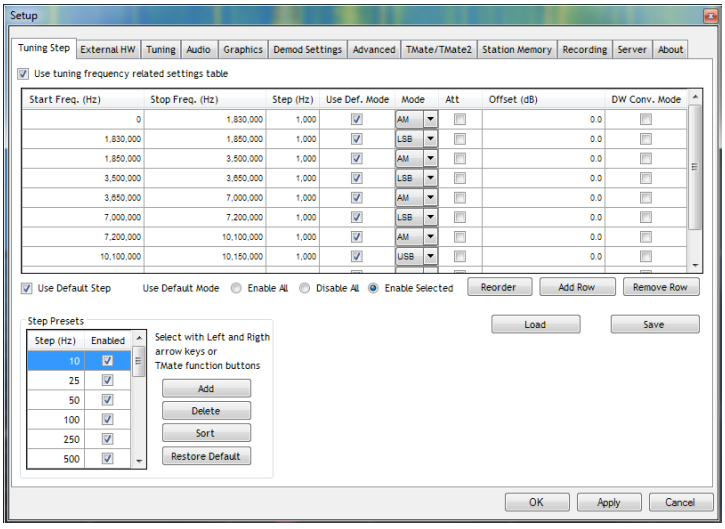
When the SET button is clicked, the FDM-SW2 software displays the Setup window. This window contains several settings that control the behavior of the software.

The Setup window consists of 13 tabs:

1. the **Tuning Step Tab**,
2. the **External HW Tab**,
3. the **Tuning Tab**,
4. the **Audio Tab**,
5. the **Graphics Tab**,
6. the **Demod Settings Tab**,
7. the **Remote Ctrl Tab**,
8. the **Advanced Tab**,
9. the **TMate/TMate2 Tab**,
10. the **Station Memory Tab**,
11. the **Recording Tab**,
12. the **Server Tab**,
13. the **About Tab**.

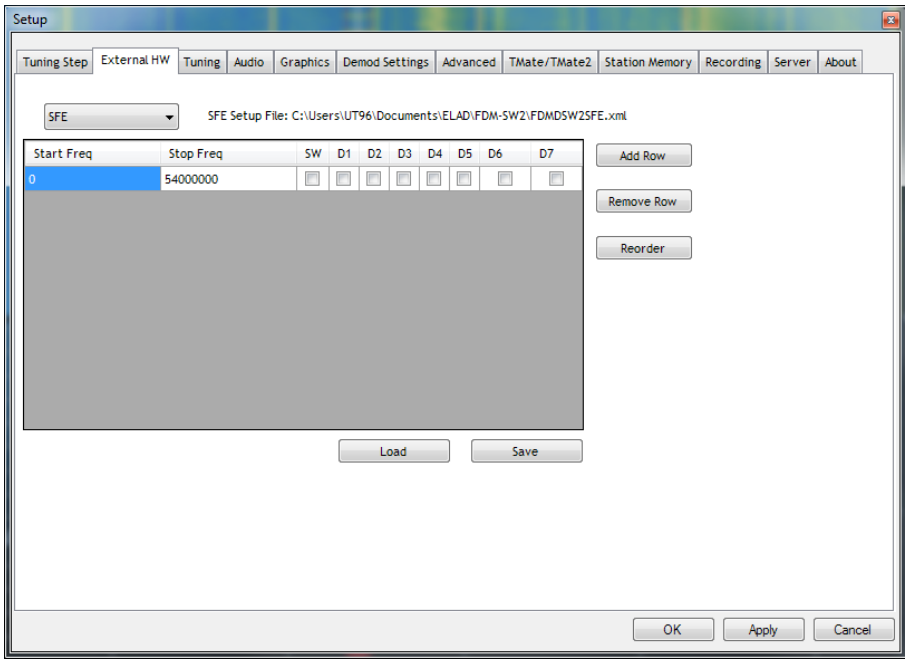
3.1 Tuning Step Tab

In the Tuning Step tab the user can configure the frequency steps that the software sets when the arrows on the PC keyboard are pressed; these frequency steps are configurable under “Step Presets” area. Moreover, the user can compile a table containing custom settings (frequency step, demodulation mode, attenuator, low pass filter (FDM-S1 only), down converter mode) that the software automatically applies if the tuning frequency falls within the user-defined frequency ranges: to make this, check “Use tuning frequency related settings table” on the top of the tab.

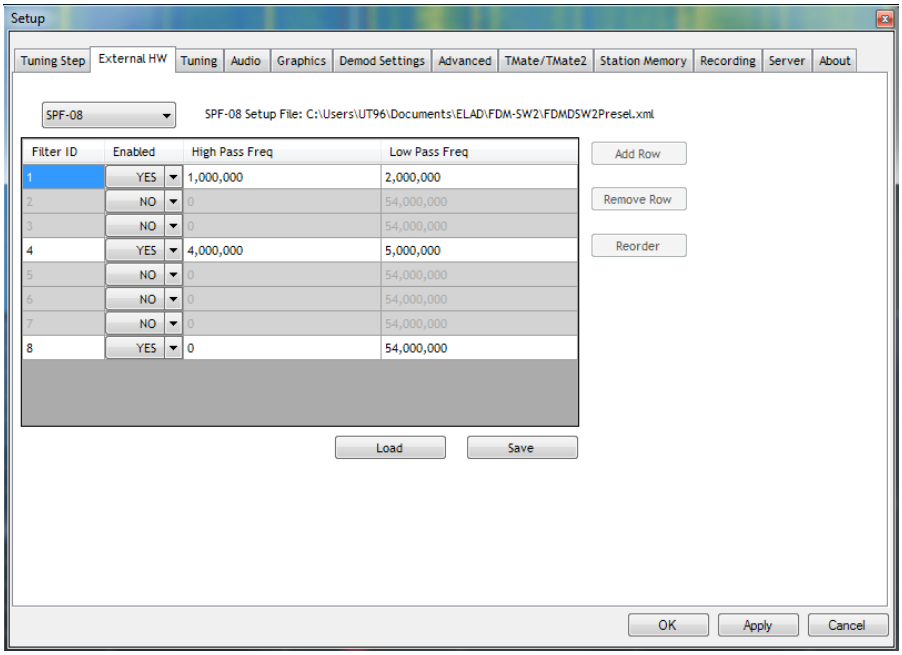


3.2 External HW Tab

This tab allows the user to set frequency related settings for the ELAD SFE expansion board and the ELAD SPF-08 pre-selector filter board.
If the SFE model is selected, the user can compile a table containing the Ext/IO settings that the software automatically applies if the tuning frequency falls within the user-defined frequency ranges.



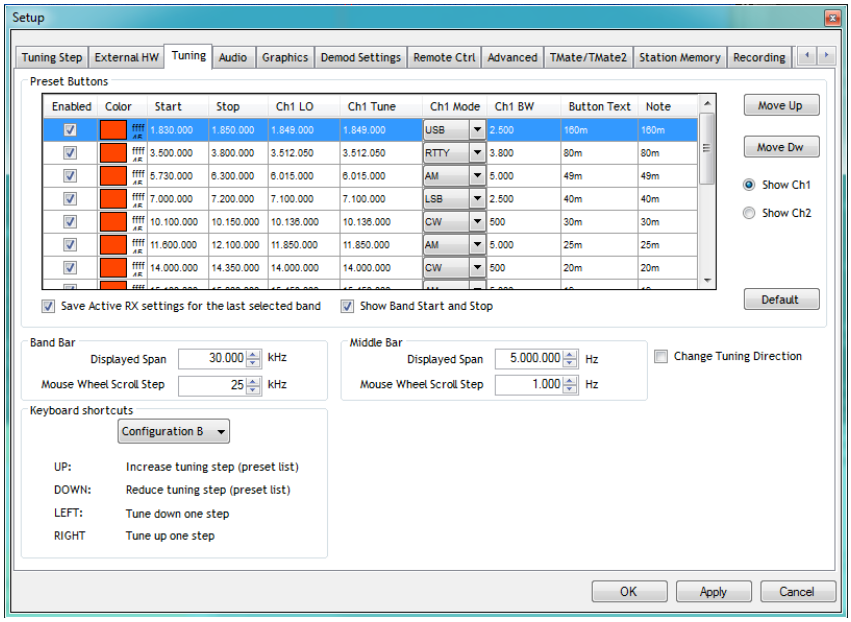
If the SPF-08 board is selected, the user can enable/disable each pre-selector and set pre-selector high pass and low pass frequency.



Note: High Pass Freq refers to the lower frequency and Low Pass Freq to the higher one.

3.3 Tuning Tab

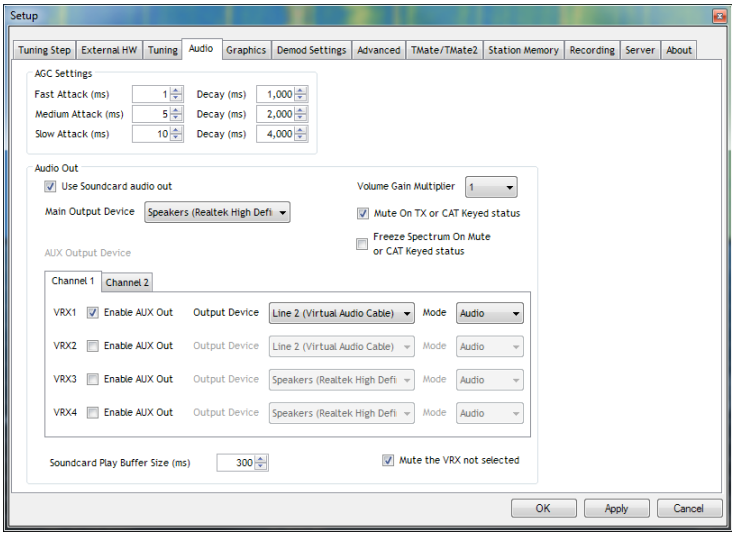
The Tuning tab allows the user to customize the **Preset Buttons Panel**. Each button defines a frequency range highlighted with to vertical lines in the spectrum graphic (if the “Show Band Start and Stop” option is checked). When a preset button is clicked, the stored local oscillator value, the RX1 tuning frequency, mode and bandwidth are applied.



The Tuning tab allows also the user to customize the frequency span and step of the “Band” and “Middle” tuning bars, change the mouse wheel tuning direction (with the “Change Tuning Direction” checkbox) and the keyboard shortcuts configuration.

3.4 Audio Tab

The Audio tab allows the user to set the AGC and audio output settings.



On the “Audio Out” section the user can select the main audio output device and an auxiliary output device (for example a virtual audio cable) for each of the virtual receivers. When the “AUX Out” is enabled, the user can select the data type that will be reproduced on this device:

- Audio (48 kHz),
- IF (192 kHz),
- IF (48 kHz),
- WBFM MUX.

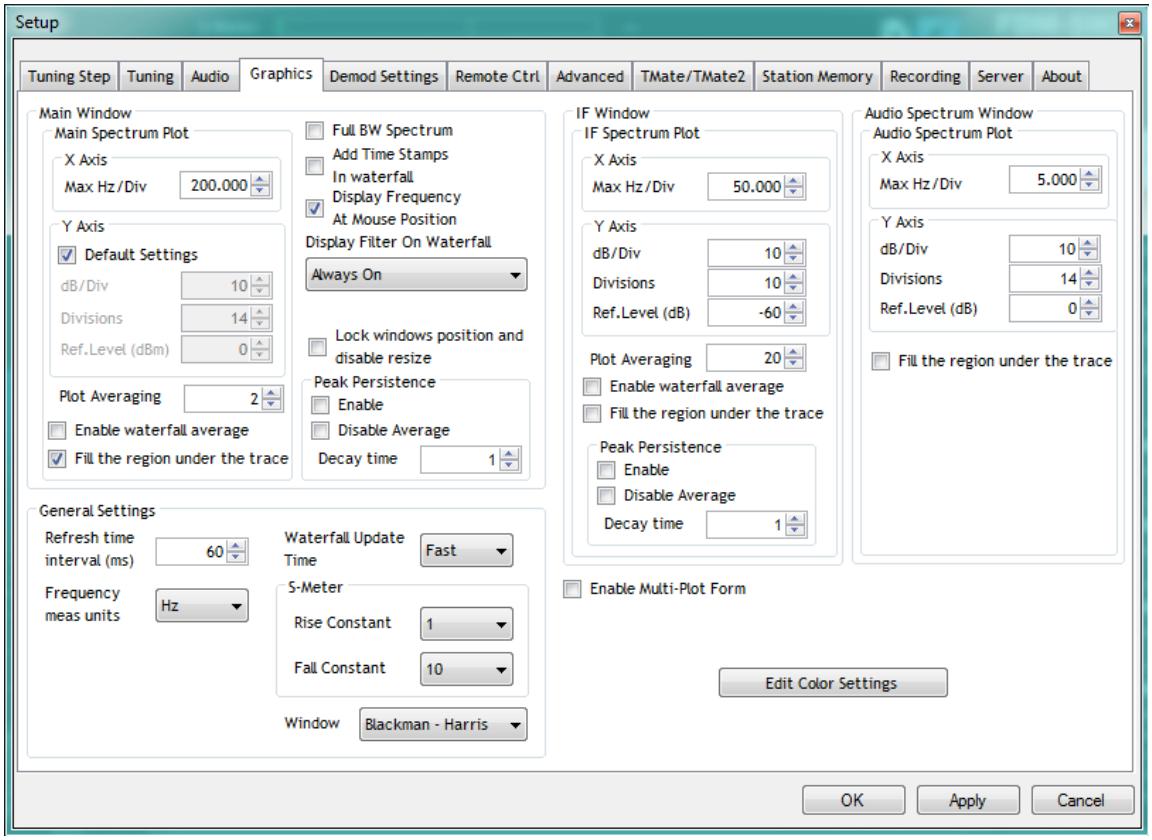
“Soundcard Play Buffer Size” allows the user to set the soundcard buffer time used when a recorded file is reproduced.

Other settings allow the user to :

- mute the virtual receiver not selected,
- mute during TX/Keyed status,
- freeze the main window during TX/Keyed status.

3.5 Graphics Tab

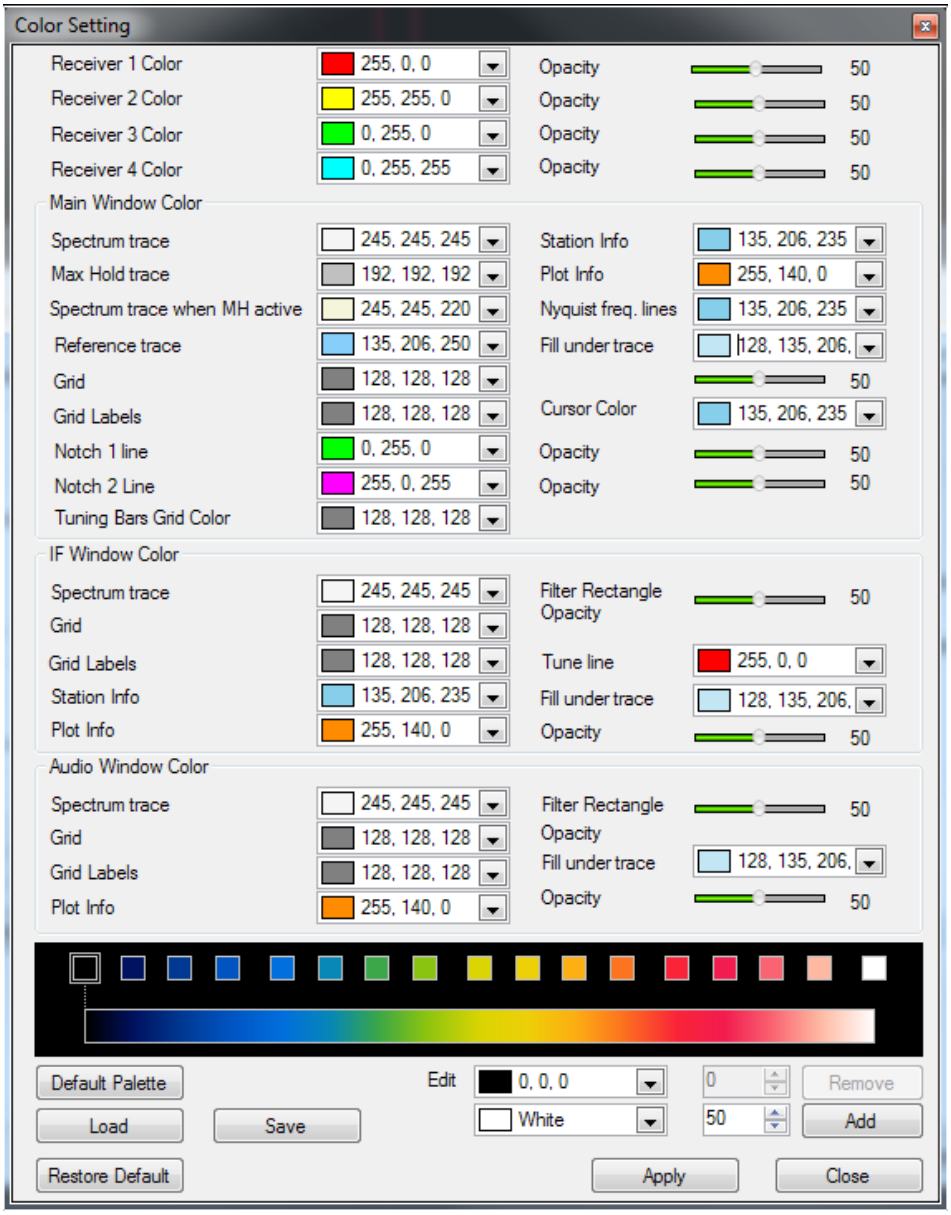
The Graphics tab allows the user to customize several parameters related to the **Main Window** visualization.



Moreover, in this tab the user can also customize the visualization of the **IF Spectrum Window** and the **Audio Spectrum Window**.

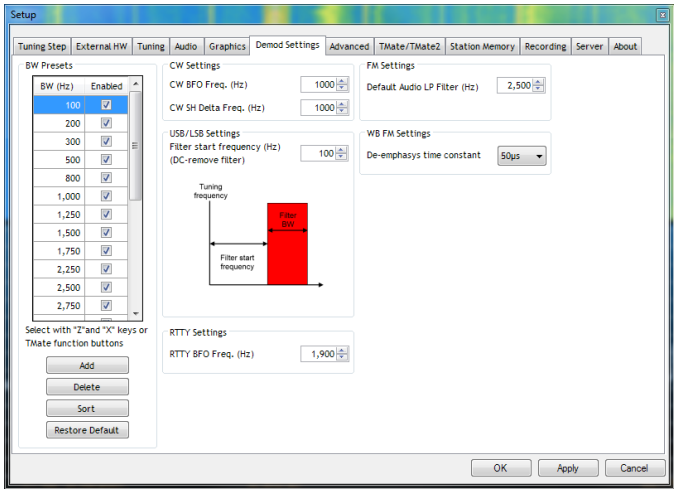
General Settings section allows to change, obviously, some general settings of the **User Interface** related to refresh times and visualization methods.

If the “Edit Color Settings” button is clicked, the color settings window is opened. This window allows the user to change the colors used in the graphical user interface and the waterfall color palette.



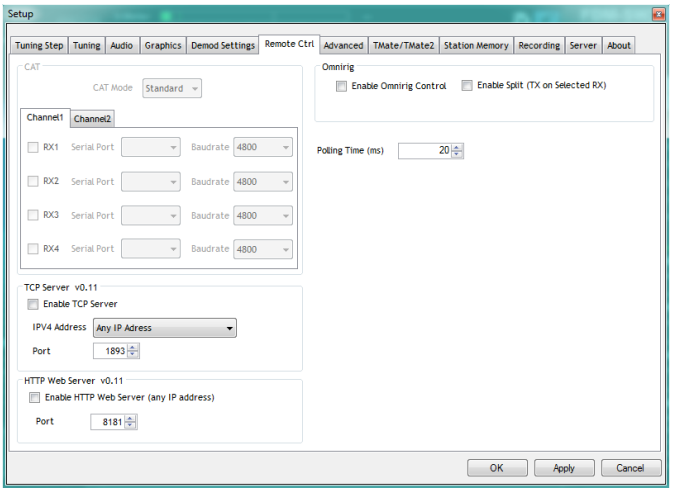
3.6 Demod Settings Tab

The Demod Settings tab allows the user to customize several parameters related to the demodulation algorithms.



3.7 Remote Ctrl Tab

The Remote Ctrl tab allows the user to set some of the remote control functionalities of the FDM-SW2 software.



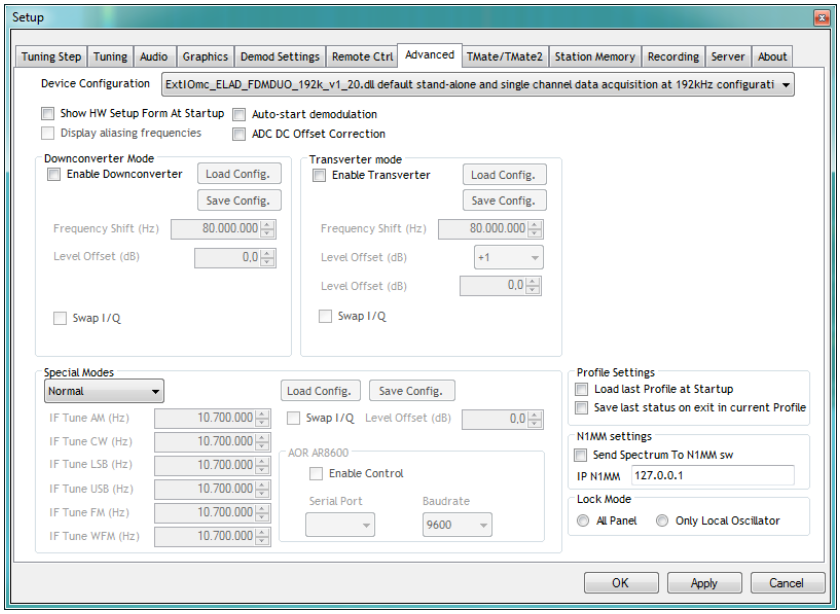
In the CAT section the user can configure the serial communication settings. When the CAT control is active, the Tuning Commands Panel displays the CAT label. The FDM-SW2 software implements the commands set of the Yaesu FT-897 transceiver.

When Enable Omnirig Control checked, the FDM-SW2 software can control two transceivers using the Omni-Rig technology. Please go to website http://dxatlas.com/OmniRig/ for more information about Omni-Rig. Note that Omnirig must be installed on your PC.

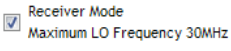
In this tab you can also activate the TCP and Web servers to remotely control the FDM-SW2 software.

3.8 Advanced Tab

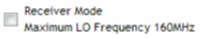
In this tab the user can select the advanced options of the software.



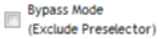
The combo box “Device Configuration” allows to change the device sampling frequency and if the connected device allow it, it is possible to select a two-channel configuration.

If the connected device is a FDM-S1 , if the 

checkbox is selected, the software operates in “Receiver Mode” and limits the maximum tunable frequency at the Nyquist frequency (half of the ADC sampling rate). If the checkbox is deselected, the software operates in “Sampler Mode” and unlocks the limitation.

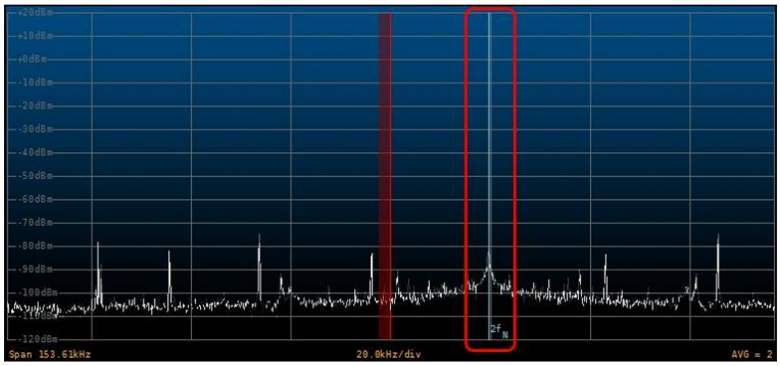
If the connected device is a FDM-S2, if the 

checkbox is selected, the software limits the maximum tunable frequency at 160MHz. If the checkbox is deselected, the software operates in “Sampler Mode” and unlocks the limitation.

If the 

checkbox is selected, the pre-selection filters are excluded. This option is disabled by default.

If the “Sampler Mode” is activated, the user can force the software to highlight the multiples of the Nyquist frequency on the Spectrum by checking the Display aliasing frequencies checkbox.



Checking the Show HW Setup Form At Startup checkbox, the **Hardware Setup Window** is loaded at software startup.

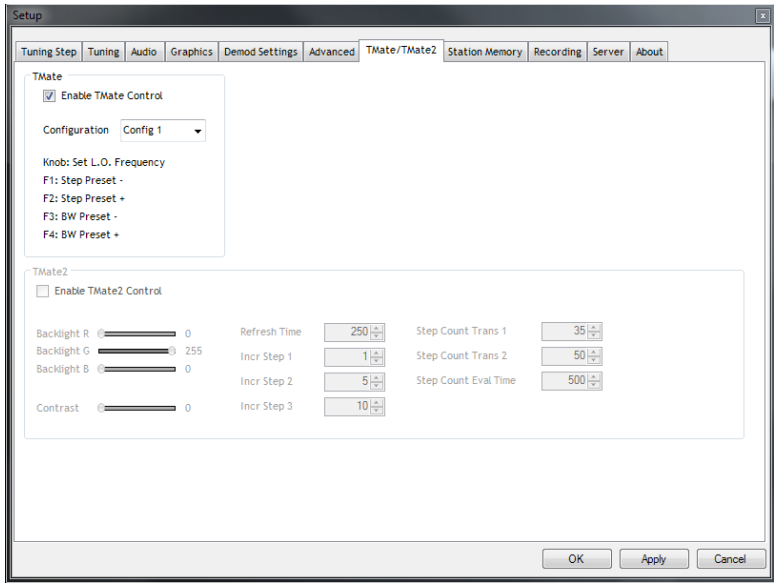
To enable the DC offset correction feature of the ADC, check the ADC DC Offset Correction checkbox. This option removes ADC offset at 0 Hz.

Activating the “Panadapter Mode” in the “Special Modes” section (the Status Bar displays the PAN label), the user can configure the IF frequency for the different demodulation modes and the amplitude offset that allows the right visualization. Moreover, the spectrum flip around L.O. frequency can be enabled by check “Swap I/Q” option (the Status Bar displays the I/Q Swap label). This configuration parameters can be saved/loaded using the buttons Save Config. and Load Config. respectively.
Enabling the AOR AR8600 Control (the Status Bar displays the AR8600 label), the software can directly control this radio through serial communication.

If “Downconverter Mode” or “Transverter Mode” is activated (the Status Bar displays the relative label), the user can configure the IF frequency shift and the amplitude offset that allows the right visualization. Moreover, the spectrum flip around L.O. frequency can be enabled by check “Swap I/Q” option (the Status Bar displays the I/Q Swap label).

3.9 TMate/TMate2 Tab

If a TMate is connected, the “TMate” panel is activated.



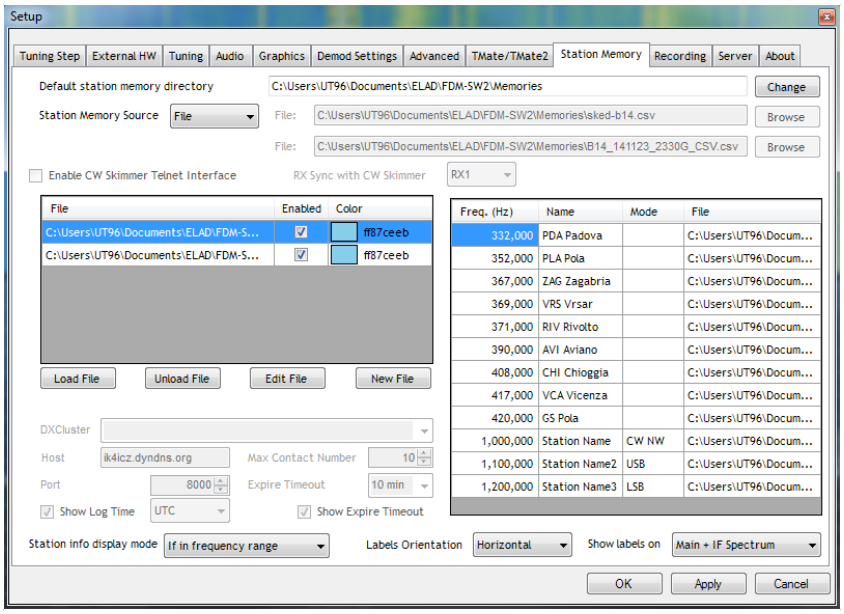
In this panel, the user can choose among the proposed configurations of TMate button functions. When the TMate control is active, the Tuning Commands Panel displays the following labels :

- TMate: Set LO if Lock To CF button is selected,
- TMate: Set Tune if Lock To CF button is unselected.

If a TMate2 is connected, the TMate2 panel is activated. In this panel, the user can set the display backlight color, the refresh time, the increment steps of the tree knobs and others timing parameters.

3.10 Station Memory Tab

Here below a picture of the Station Memory tab.



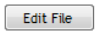
In the FDM-SW2, four types of memory source are available :

- Xml memory file;
- DX Cluster Connection;
- EIBI Database;
- SWSkeds.

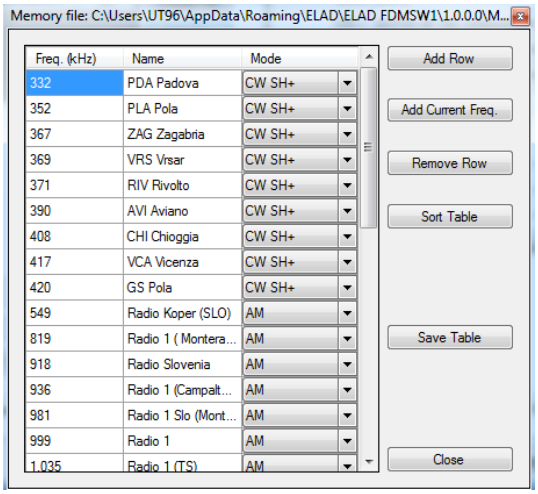
3.10.1 Xml memory file

Select “File” as Station Memory Source.

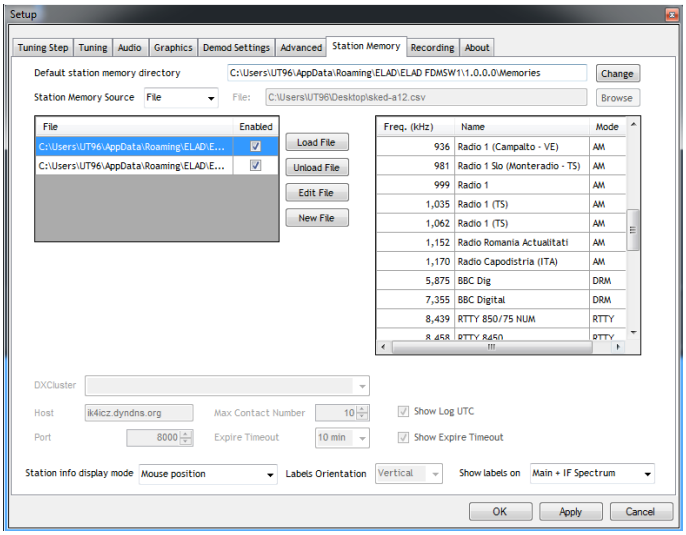
Press the 

button to create a new memory file.
When a new file is created or when 

button is pressed, FDM-SW2 visualizes an “Edit” window (represented in the figure below). User can add or delete stations from the editor to create or change a memory file.



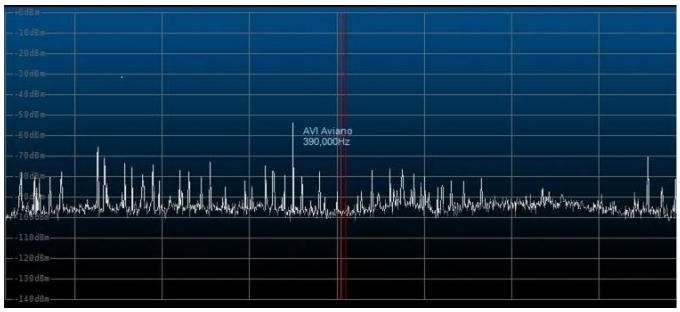
Press Load File or Unload File to load or unload a memory file respectively (more than one memory file can be loaded at the same time).



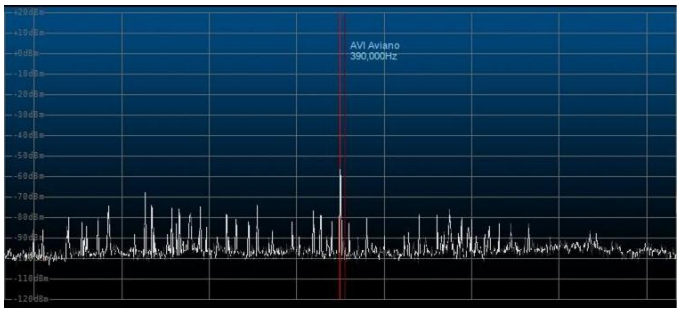
The table on the right side of the tab displays all the stations that are stored in the selected memory files.

The “Station info display mode” combo-box allows the user to choose 4 types of memories visualization on the Spectrum graphic:

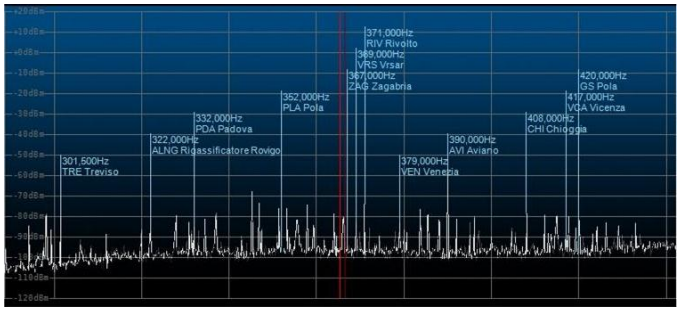
- “None”;
- “Mouse position”: a label containing the station info is displayed when the mouse is positioned over a frequency included in the selected memory files;



- “L.O. Frequency”: a label containing the station info is displayed when the L.O. frequency corresponds to a frequency included in the selected memory files;



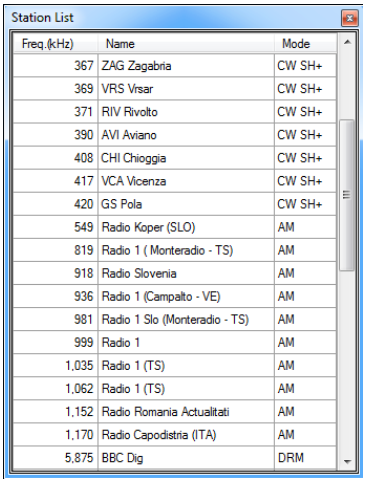
- "If in frequency range": a label containing the station info is displayed for each frequency included in the selected memory files that falls within the spectrum frequency range.



If the option "If in frequency range" is selected, the "Labels orientation" combo-box, allow the user to select three types of visualization : Horizontal, Oblique or Vertical.

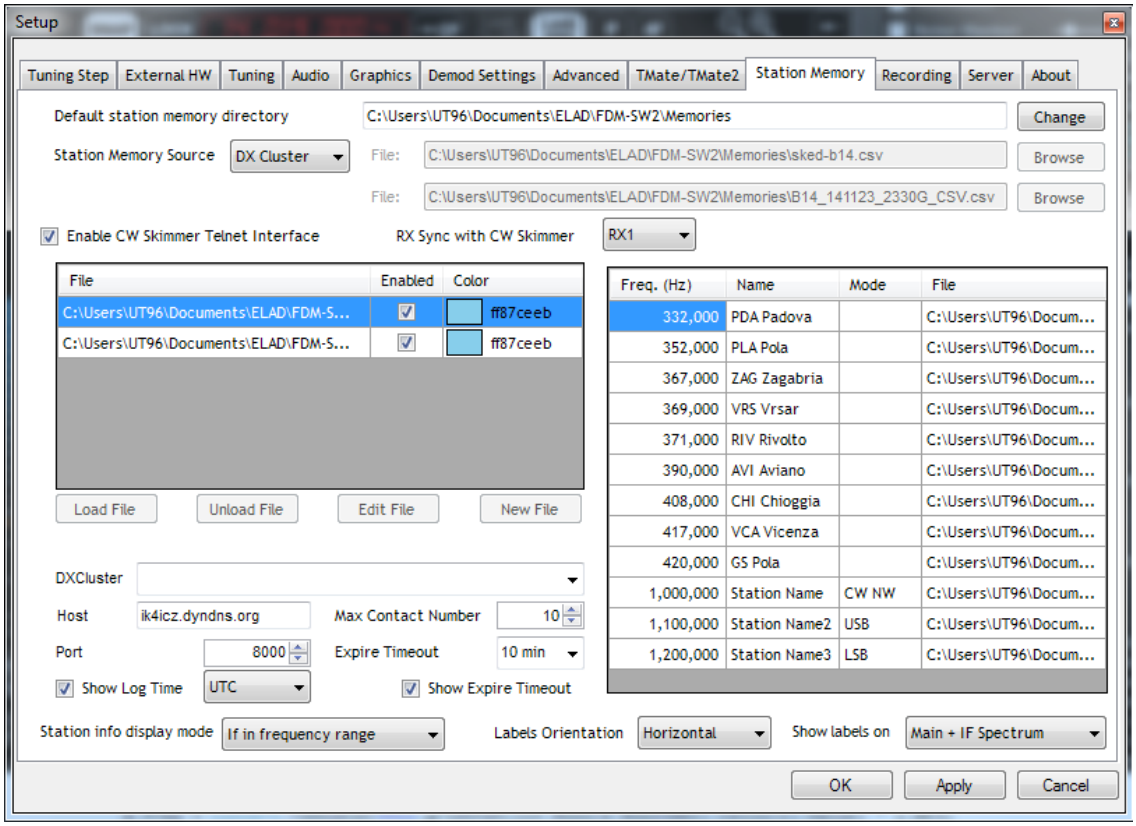
Finally, the combo-box "Show labels on", allows the user to enable the station memory label display on the **Main Window** spectrum, on the **IF Spectrum Window** or on both the windows.

When the MEM button is clicked, FDM-SW2 displays the "Station List" form. Clicking on a line of the table implies that the receiver is tuned at the selected frequency and the mode is set at the value saved in the file.

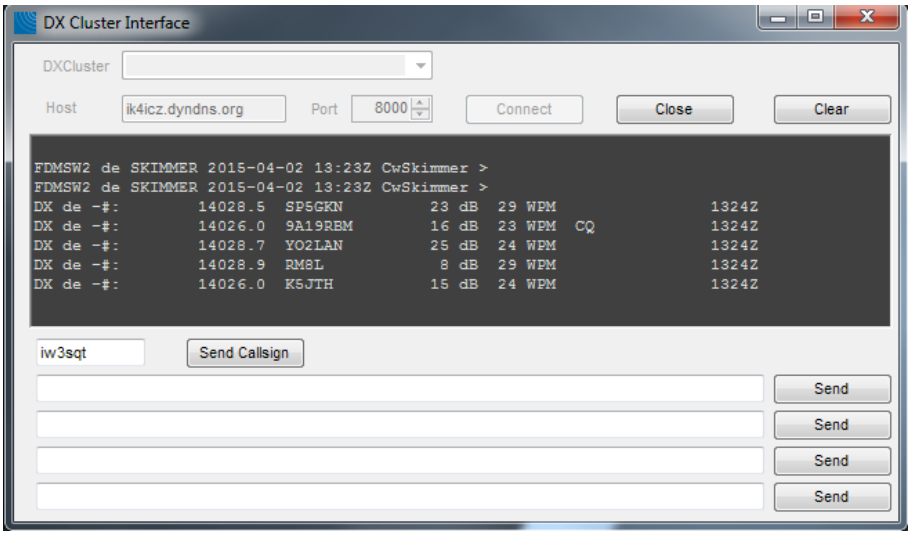


3.10.2 DX Cluster connection

Select “DX Cluster” as Station Memory Source: all options for “DXCluster” source are available on the bottom area of the tab. Select a cluster from the “DXCluster” combo-box or insert manually the cluster settings. The “Station info display mode” combo-box displays the same options described in the previous paragraph.



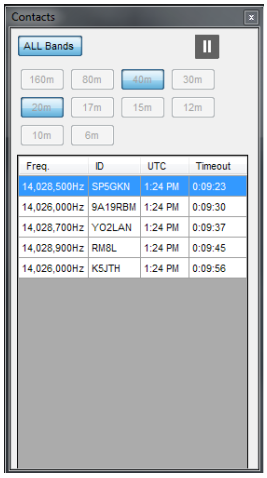
When the MEM button is clicked, FDM-SW2 displays the “DX Cluster Interface” window and the “Contacts” form.



Press Connect or Close button of the “DX Cluster Interface” window to open or close the link with the Cluster, and use Send to send the string entered in the “Send” area.

If the Enable CW Skimmer Telnet Interface option is selected, when the Connect button is clicked, the software automatically opens a link with the telnet interface generated by the CW Skimmer software.

The “Contacts” window displays the users connected to the cluster. Double-clicking on a line of the table implies that the L.O. is tuned at the selected frequency. Use the “Show Log UTC” and “Show Expire Timeout” checkboxes to enable or disable the visualization of this information in the “Contacts” form.

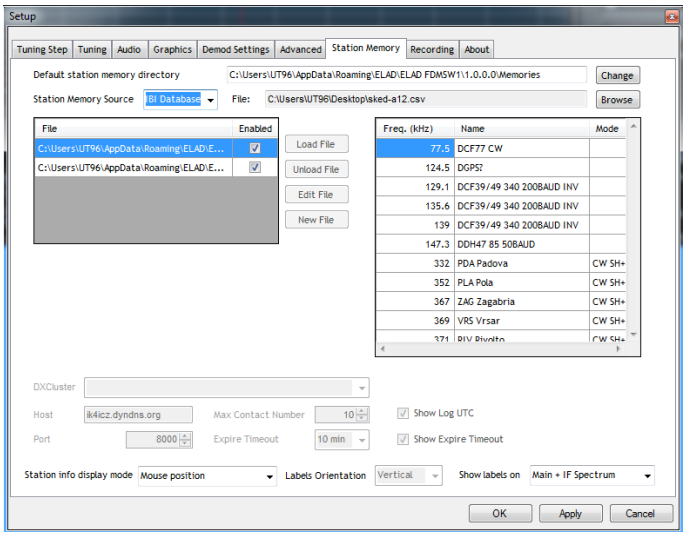


Use the button to pause/resume the contact list update process.

Press ALL Bands to display all the contacts from the cluster or press a band button to display only the contacts from the selected radio-amateur band(s).

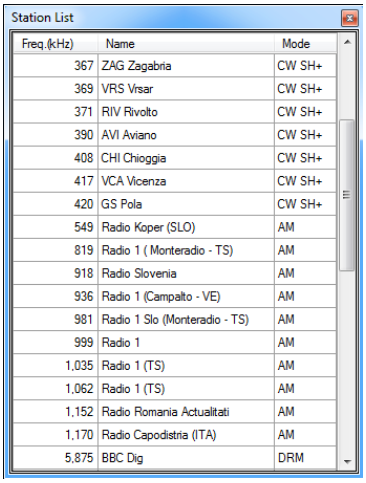
3.10.3 EIBI Database

Select “EIBI Database” as Station Memory Source. The “Station info display mode” combo box displays the same options described in the previous paragraphs.



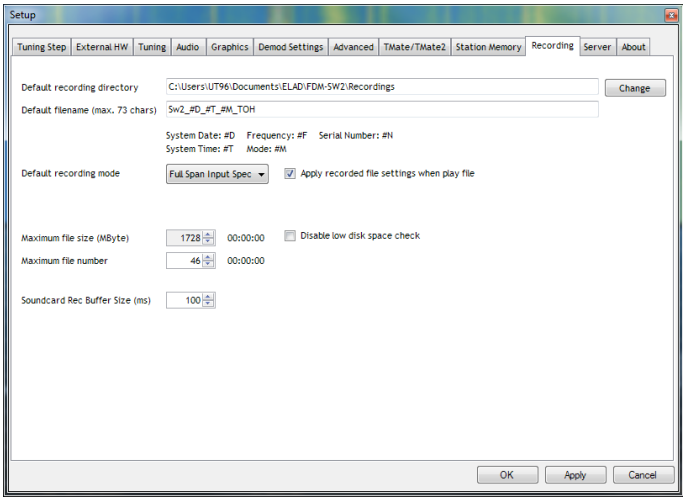
Download the CSV database file from www.eibispace.de. Click the Browse button and select the downloaded .csv file.

When the MEM button is clicked, FDM-SW2 displays the “Station List” form. Clicking on a line of the table implies that the receiver is tuned at the selected frequency and the mode is set at the value saved in the file.



3.11 Recording Tab

Here below a picture of the Recording tab.

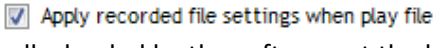


The Recording Tab allows the user to configure :

- the default directory for the recorded .wav files;
- the default filename format, use the following codes to customize the file name :
  - #D to insert the system date,
  - #IF to insert the tuning frequency,
  - #N to insert the receiver serial number,
  - #T to insert the system time,
  - #M to insert the demodulation mode.

  The software automatically appends to the filename a prefix containing the data type (RF for "Full Span Input Spectrum" or AF for "Audio Frequency") and a numeric suffix that represents the incremental index within a recording section;
- the default recording mode :
  - Full Span Input Spectrum (the sampling rate of the RF I/Q datastream depends on the HW configuration Dll loaded, see Hardware Setup section),
  - Audio Frequency;
- the maximum allowed size for each recorded .wav files;
- the maximum allowed number of .wav file for each recording session,
- the "Soundcard Rec Buffer Size" that allows the user to set the soundcard buffer time used when a file is recorded.

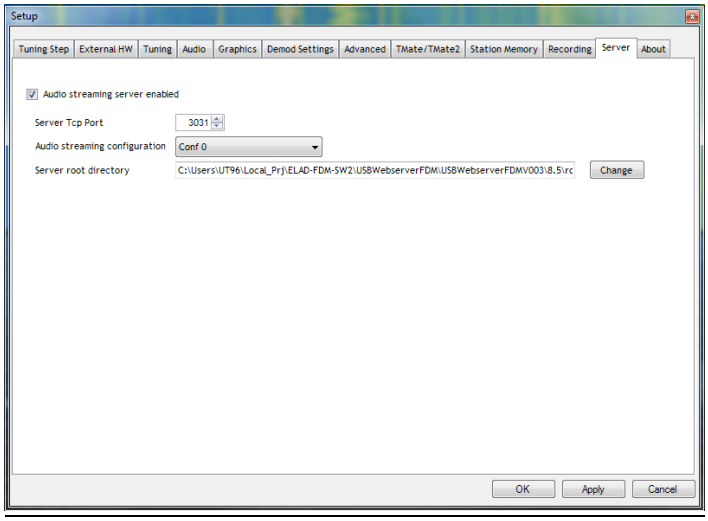
As explained in Recorder/Player Panel section, some information regarding the settings used during the recording and the playback of a .wav file (demodulation frequency, demodulation mode and filter bandwidth) is stored in its header.

If the 

checkbox is checked, the stored information is automatically loaded by the software at the beginning of the playback of every file even though the files belong to the same recording session. This may cause an unwanted change of configuration in the transition between a file and the subsequent. If the checkbox is unchecked, the software loads the information stored in the header of the first file of the recording session and keeps this configuration unchanged until the end of the reproduction of the whole session.

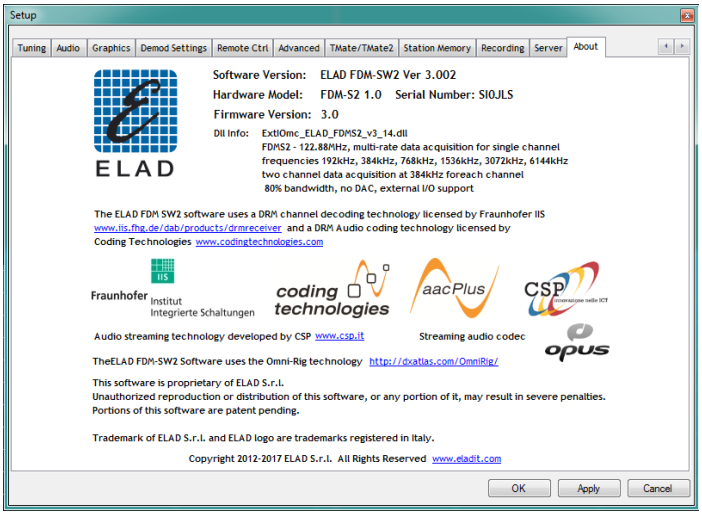
3.12 Server Tab

In this tab it is possible to activate the Audio Streaming & Web Control functionality. Please see the Annex B for details.



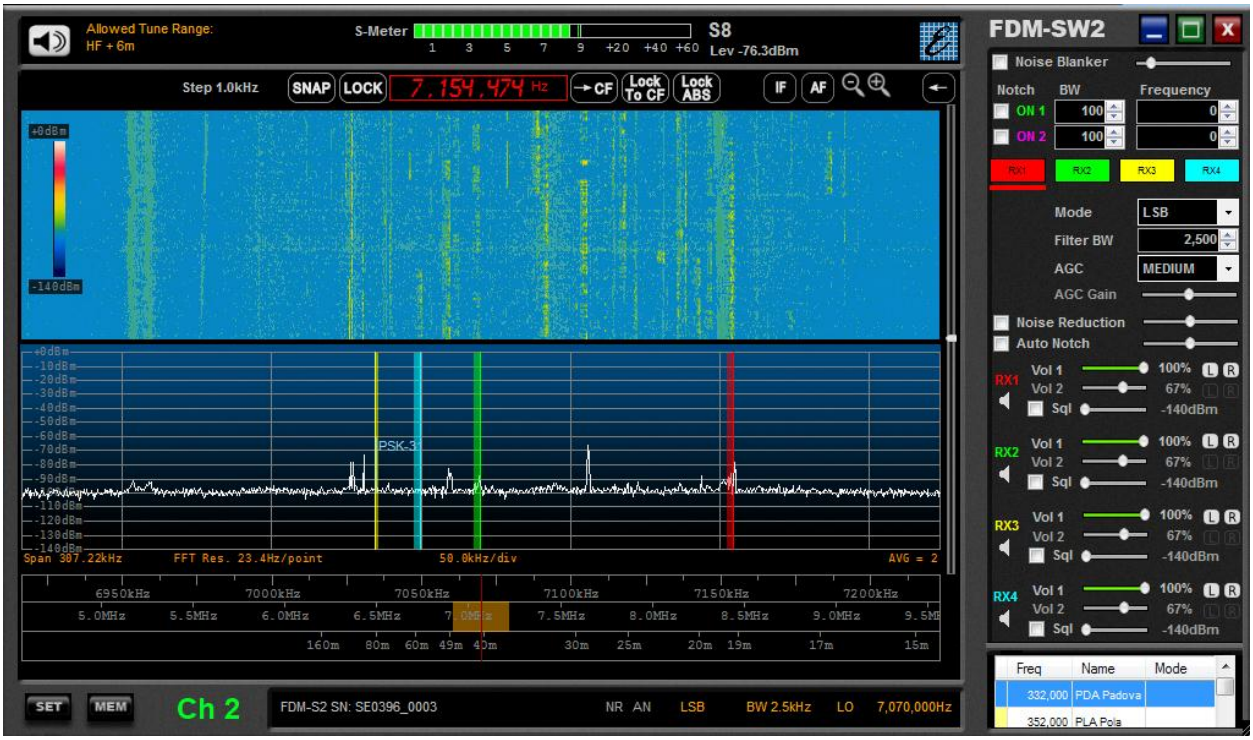
3.13 About Tab

The About tab displays useful information about Software and Hardware.



4 Channel 2 Spectrum Window

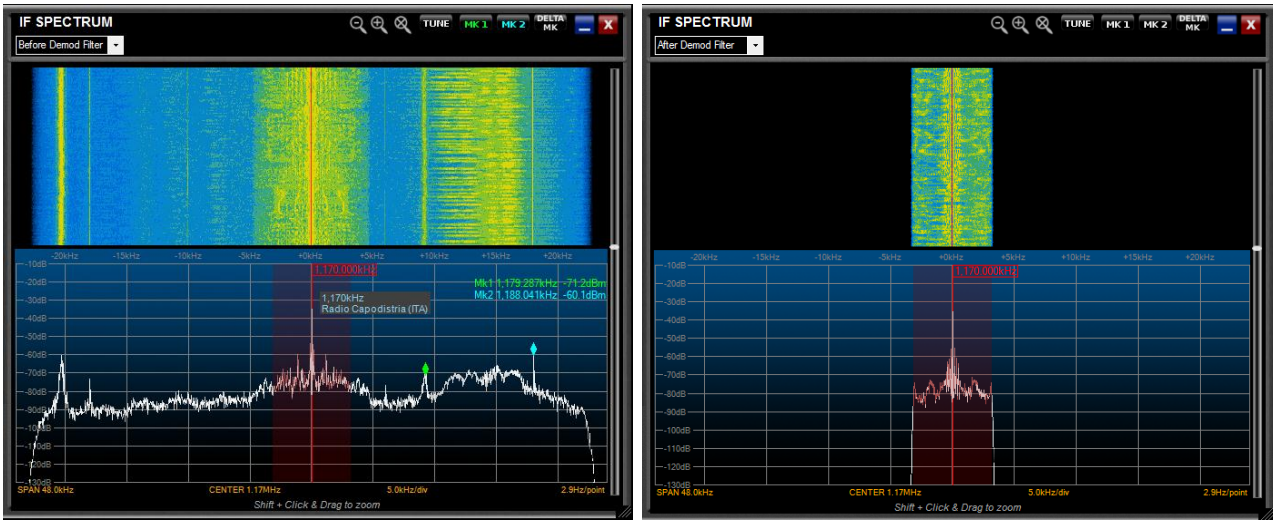
If the connected FDM supports “2 Channels” configuration, click on CH2 button to open the Channel 2 spectrum window.



Note: if the option Bypass Mode (Exclude Preselector) in the **Advanced Tab** of the **Setup Window** is not selected, the local oscillator of the second channel can be tuned only in the “Allowed Tune Range” displayed in the upper left corner of the window. This range depends on the frequency of the local oscillator in the **Main Window**.

5 IF Spectrum Window

This window displays the Spectrum/Waterfall of the IF frequency of the software. The frequency span is set to 192 kHz when the “WB FM” demodulation mode is selected, 48 kHz for the other modes. The user can select to visualize the Spectrum/Waterfall of the IF signal “Before Demod Filter ” or “After Demod Filter”.



To zoom in or out the area of the tuning frequency, click on button or on button.

To zoom a desired area, press the “Shift” button of the keyboard while operating the drag-and-drop action over the Spectrum.

Use the arrows when zoom function is active to move left/right the visualization and click the button to reset the zoom.

User can perform three types of click function :

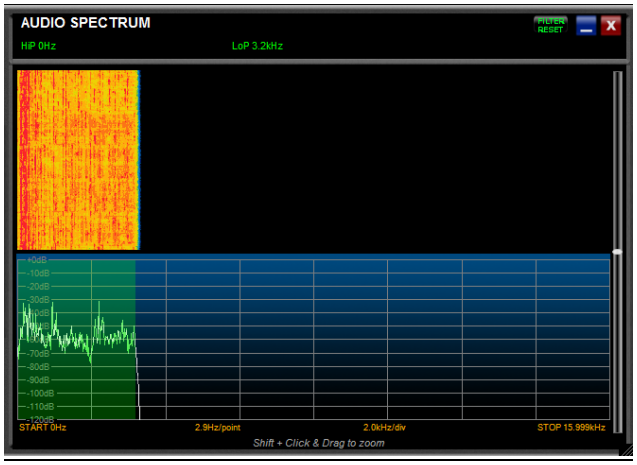
- set tuning to the selected frequency if TUNE is selected;
- set “Marker 1” if MK 1 is selected. Note that the label is green when the marker is enabled and when the click function is active the label is green and underlined;
- set “Marker 2” if MK 2 is selected. Note that the label is cyan when the marker is enabled and when the click function is active the label is cyan and underlined;

If both markers are enabled, user can activate the DELTA MK function that displays the frequency and amplitude difference between the markers.

Drag-and-drop the bottom-right corner to resize the “IF Spectrum” form.

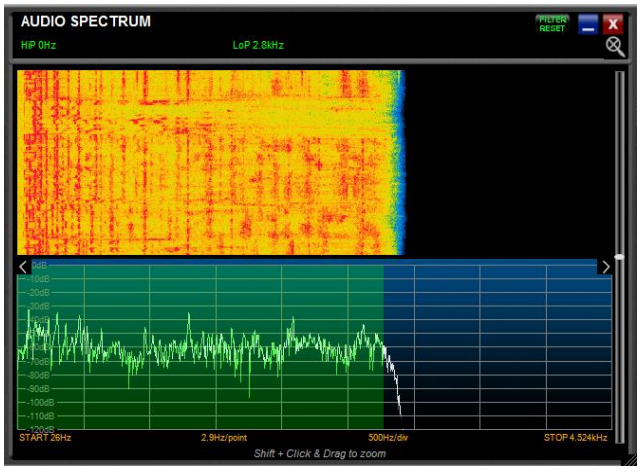
6 Audio Spectrum Window

This window is loaded by default when the player is active and the data type of the reproduced .wav file is "Audio Frequency" (see **Recording Tab**). The frequency span is set to 16 KHz for all demodulation modes.



To zoom a desired area, press the "Shift" button of the keyboard while operating the drag-and-drop action over the Spectrum. Use the arrows when zoom function is active to move left/right the visualization and click the button to reset the zoom.

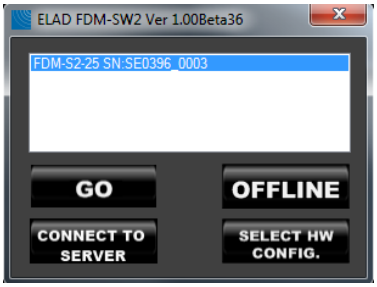
In CW, CW SH+, CW SH-, USB, LSB, AM, FM, SYNC AM and DSB mode an audio filter is inserted at the end of the demodulation chain (audio filter is omitted in WB FM and DRM demodulation). This filter is represented by the green area drawn over the audio Spectrum. User can modify the bandwidth of the audio filter by drag-and-drop the borders of this area. Note that the higher frequency of the audio filter is limited to the bandwidth of the demodulation filter.



Drag-and-drop the bottom-right corner to resize the "Audio Spectrum" form.

7 Hardware Setup Window

If the option Show HW Setup Form At Startup of the **Advanced Tab** is selected, the FDM-SW2 Hardware Setup Window is loaded at software startup.



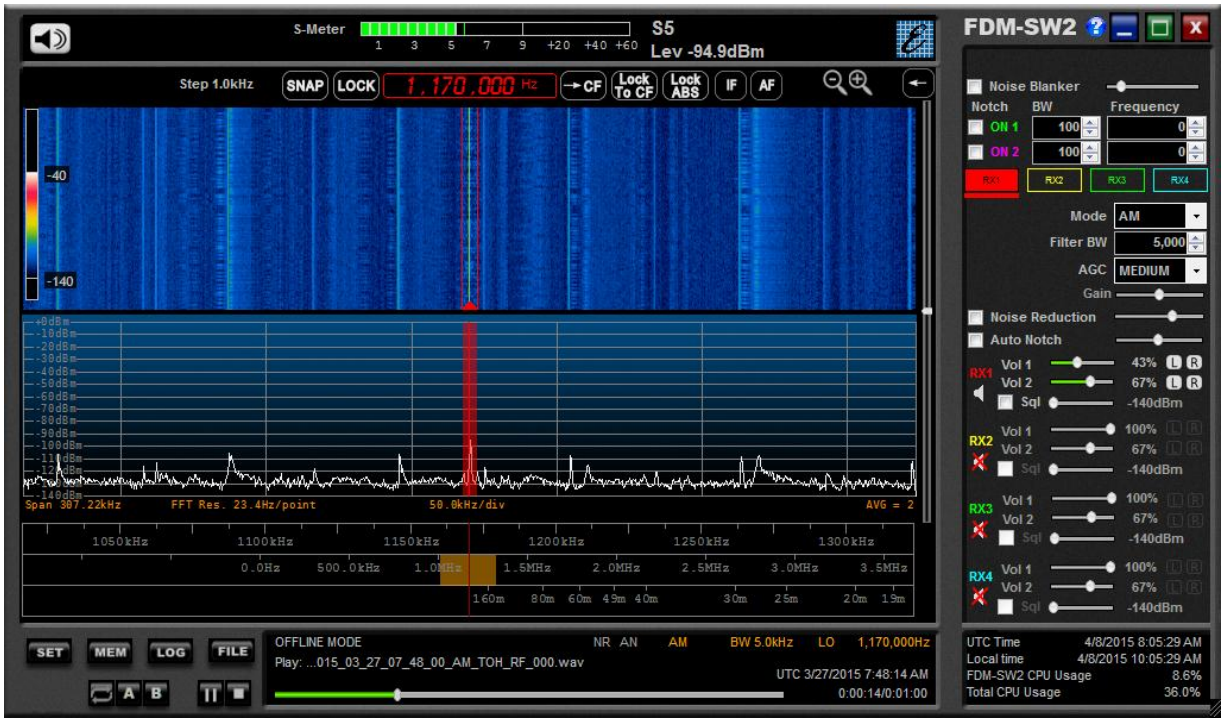
Press GO button to start the FDM-SW2 software.

Press OFFLINE button to start the FDM-SW2 software in **Offline Mode**.

Press SELECT HW CONFIG. button to open a Windows dialog box that allows to manually choose the hardware configuration file (named ExtIOmc_ELAD_FDMSx_yyy.dll for FDM-Sx receivers). Use this functionality only if you understand it.

8 Offline Mode

If the OFFLINE button of the **Hardware Setup Window** is pressed, FDM-SW2 starts in OFFLINE MODE. In this case, no connection with the hardware is established and only the playback of recorded files is available.



As shown in the picture above, the button is not available in OFFLINE MODE.

9 Connect to Server

Press the CONNECT TO SERVER button of the **Hardware Setup Window** to connect the software to a remote FDM device through a server software. Note : at the moment the server software is under development.

10 Using the FDM-DUO(r)

10.1 Control Panel

Click on the FDM-DUO button on the **Signal Control Panel** to open the FDM-DUO Control Panel. The picture below shows the Control Panel for the FDM-DUO (on the left) and for the FDM-DUOr (on the right). Some features are not available for the FDM-DUOr, primarily those related to the transmission.

The Control Panel allows to set some parameters of the FDM-DUO(r) without do it directly with its buttons and encoders. Features are :

- Mode : allows to synchronize the RX mode of the FDM-DUO(r) with FDM-SW2 software,
- Antenna (only for FDM-DUO) : allows to switch between one antenna mode (RTX) and two antennas mode (RX/TX),

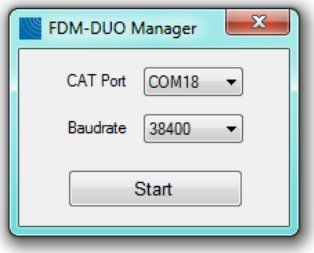
- Volume : these two sliders allow to control the main volume (FDM-DUO(r) internal speaker) and the auxiliary volume (AUX OUT connector of the FDM-DUO(r) front panel),
- Tx Power (only for FDM-DUO) : this menu allows to set the output power of the FDM-DUO. Reminder that the FDM-DUO has two output power settings, this one (Tx Power) and another one dedicated to the tune function. Please, refer to the FDM-DUO user manual for details.
- AGC & AGC Gain: choosing OFF you can set manually the Gain with the slider bellow. Choosing SLOW, MEDIUM or FAST activates the Automatic Gain Control.
- MACRO : macros allow the user to associate a list of CAT commands to a button press. They are managed with a simple text file. Click on the button to open the Options window, then clicking on the Browse button you can eventually change the MACRO folder.

  To modify the macros :
  - open the Options window and locate the MACRO Folder,
  - go to the MACRO Folder using Windows Explorer and locate the "FdmDuoMacro.txt" file,
  - do a copy of it to avoid non-recoverable issue,
  - open it and analyze its structure (E.g. **VFO B - 6m;FR1;FB00050000000;MD3;**) :
    - the row 1 corresponds to the first button, the row 2 to the second button and so on,
    - ';' acts as delimiter character,
    - the first part of the row is the button text (E.g. **VFO B - 6m**),
    - the other parts are CAT commands (E.g. **FR1;FB00050000000;MD3;**),
  - modify the text file as wanted, save it and close it. Restart the FDM-SW2 software for the changes to take effect. Refer to the FDM-DUO(r) user manual for a complete list of the CAT commands.
- TUNE (only for FDM-DUO) : allows to put the FDM-DUO in TUNE MODE. See FDM-DUO user manual for details.

10.2 Manager

The Manager allows to set some stand-alone mode parameters like Memories, CW Messages, LCD Backlight and Preselectors. From the FDM-DUO(r) **Control Panel** it is possible to access to the FDM-DUO(r) Manager clicking on the FDM-DUO MANAGER button. This operation needs to connect the computer to the FDM-DUO(r) through the CAT USB connector situated on the rear panel of the FDM-DUO(r).

When the window shown below appears, choose the COM port and the current baud rate of the FDM-DUO(r). Go to the Windows Device Manager to find the correct COM port number. Use the menu 70 "CAT BAUD" on the FDM-DUO(r) to find the current baud rate. Clicking on "Start" the loading process begins.



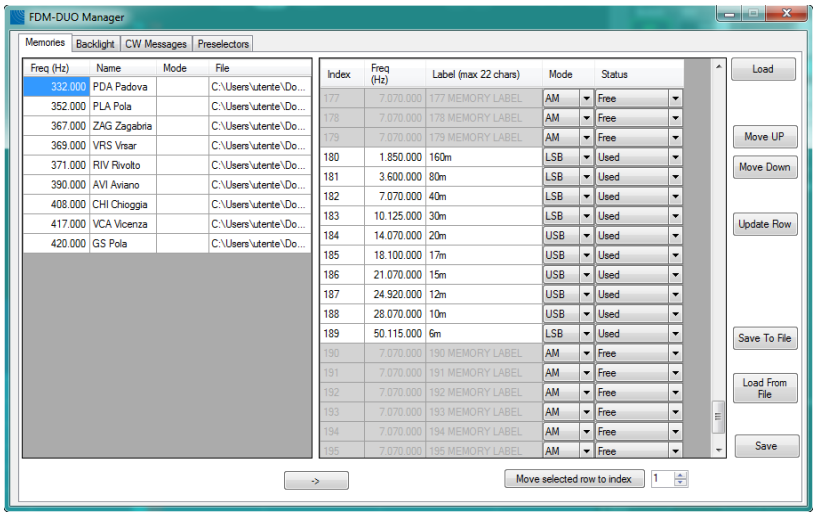
Like for the **Control Panel** some parameters are not available for the FDM-DUOr. In anyway, parameters are :

- Memories,
- Backlight,
- CW Messages (only for the FDM-DUO),
- Preselectors.

10.2.1 Memories

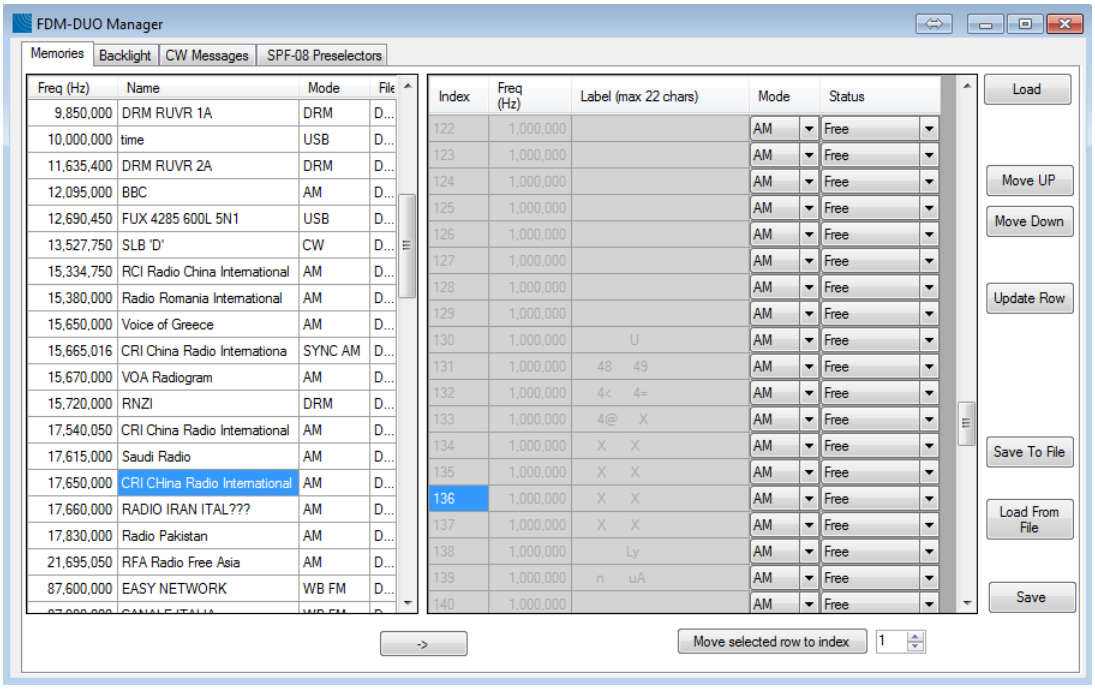
The Memories tab shows and allows to manage the 200 memories of the FDM-DUO(r). User can :

- load the memories from the FDM-DUO(r) using the "Load" button,
- sort the memories with "Move UP" and "Move Down" buttons,
- edit the labels, set the mode, change the frequency,
- save the memories to the FDM-DUO(r) using the "Save" button.

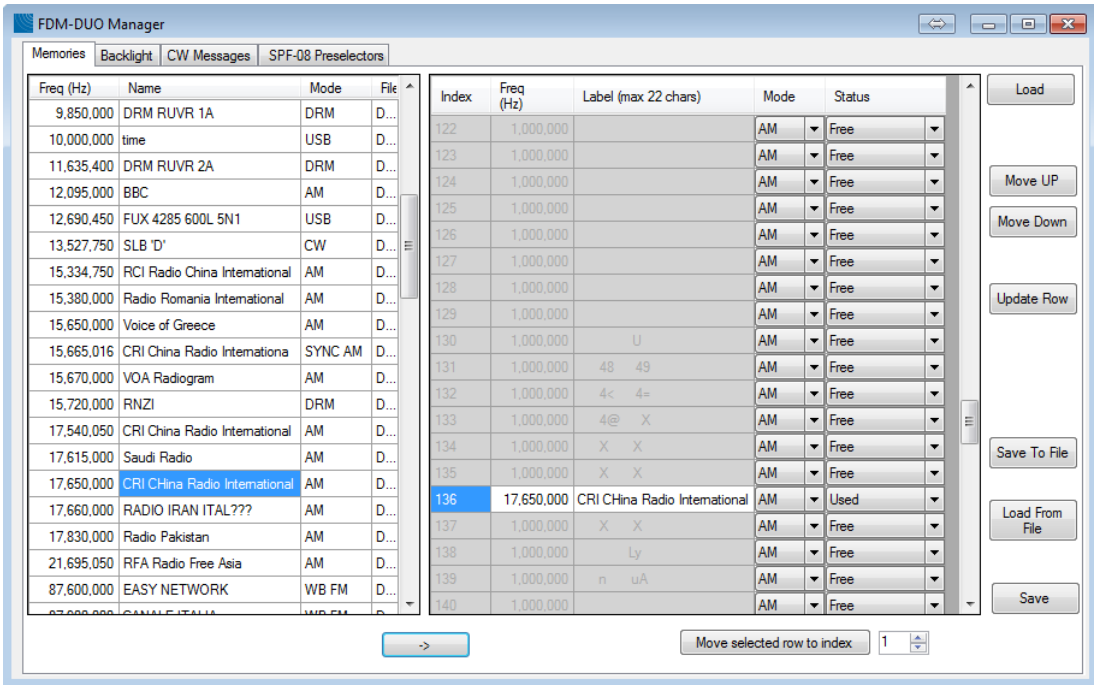


It is also possible to save the FDM-DUO(r) memories to an Xml file and load them from an Xml file.

On the left part of the Memories tab appears the stations memorized on FDM-SW2. It is possible to copy the content of an FDM-SW2 memory (left side) to an FDM-DUO memory (right side) simply selecting the memories positions and clicking on the -> button, see the pictures below.

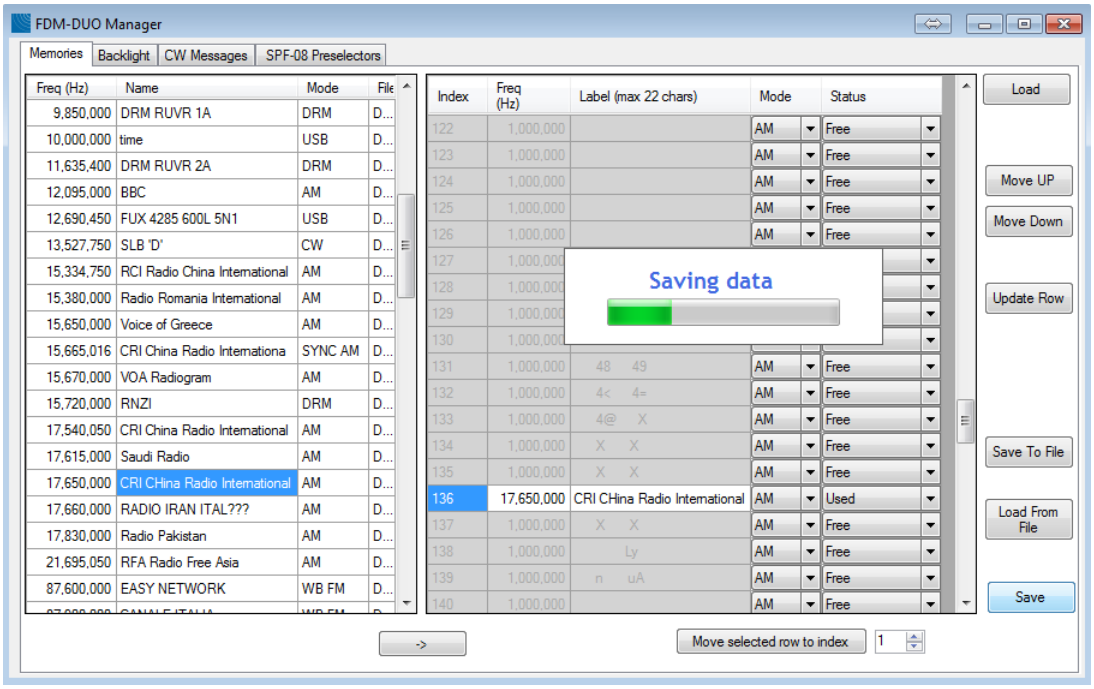


Memories selection



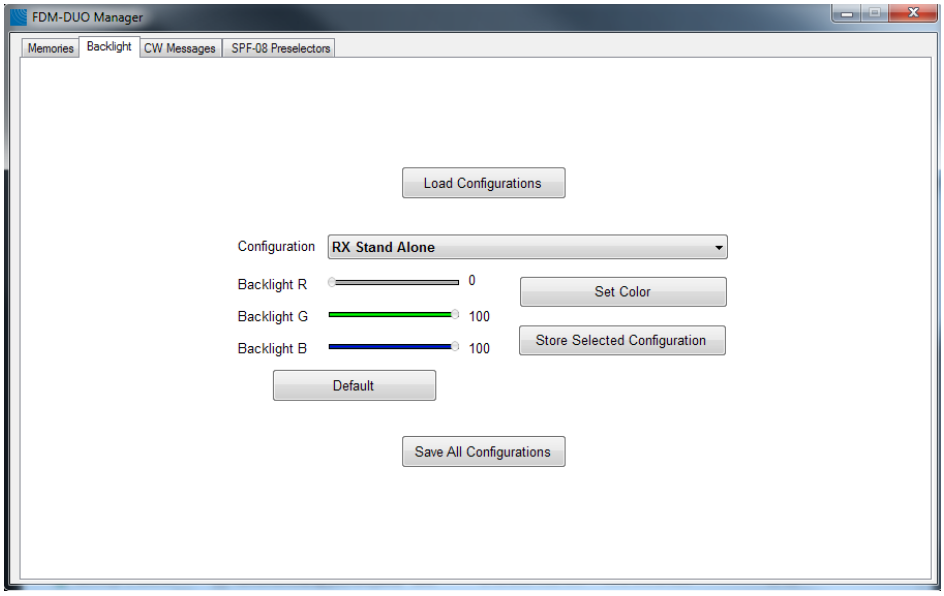
Memory copy

As mentioned before, press the “Save” button to store the memories of the right side of the tab inside the FDM-DUO(r).



10.2.2 Backlight

In this tab the user can configure the backlight color for each modality of the FDM-DUO(r).



The “Load Configurations” button allows to read the current backlight settings from the FDM-DUO(r).

The “Configuration” menu allows to select the modality to manage :

- RX Stand Alone : this is the modality that is running when you power up the FDM-DUO(r),
- RX Remote : the FDM-DUO(r) run this modality when you choose another “Device Configuration” than the default one in the **Advanced Tab** of the **Setup Window**,
- TX AM/SSB MIC : this modality is activated when going in transmission (not in CW mode) with the microphone as audio input source,
- TX AM/SSB PC Data : this modality is activated when going in transmission (not in CW mode) with the USB TX connector as input source,
- TX CW : this modality is activated when going in transmission in CW mode.

The FDM-DUOr manages only the first two modalities.

The sliders “Backlight R”, “Backlight G” and “Backlight B” allow to adjust the red, green and blue components of the color for the selected configuration/modality.

The “Set Color” button allows to try the slide bars settings. The backlight color is applied to the FDM-DUO(r) but not save inside its memory.

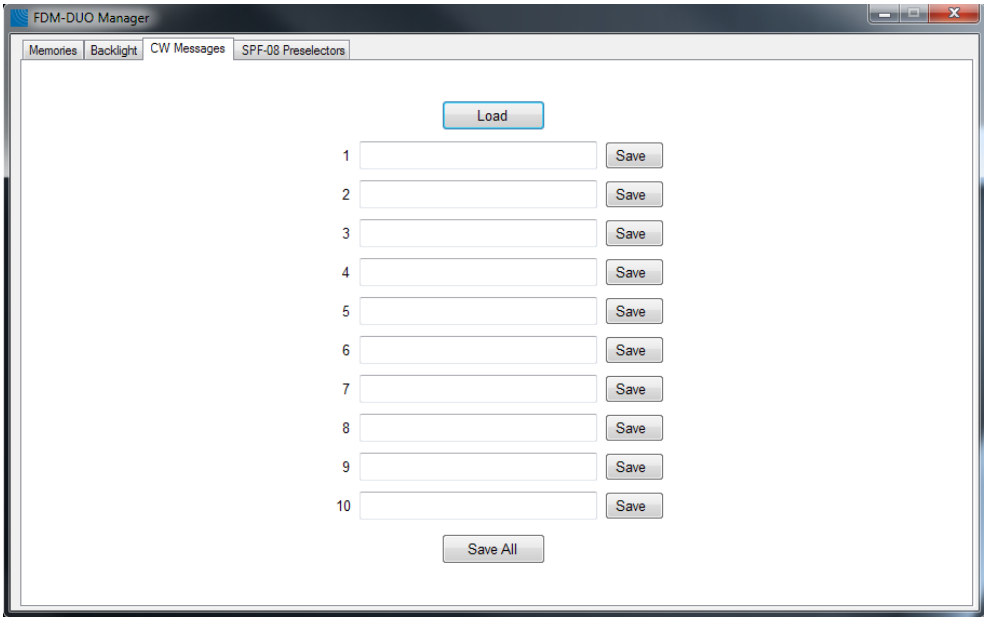
The “Store Selected Configuration” button allows to save the settings of the selected configuration/modality inside the memory of the FDM-DUO(r).

The “Default” button allows to set all configurations/modalities to the default values. Using this button the default settings will be saved inside the memory of the FDM-DUO(r).

The “Save All Configurations” button allows to save the settings of all the configurations/modalities inside the memory of the FDM-DUO(r).

10.2.3 CW Messages

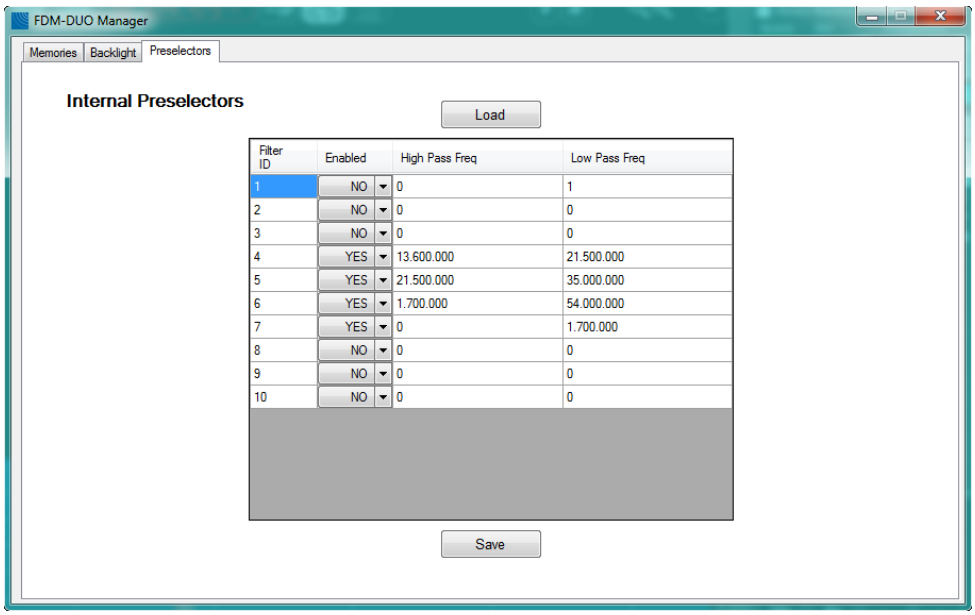
This tab allows to manage the FDM-DUO CW messages. You can load the current messages saved inside the FDM-DUO with the “Load” button; modify the messages; save them one by one with the “Save” buttons or all together with the “Save All” button.



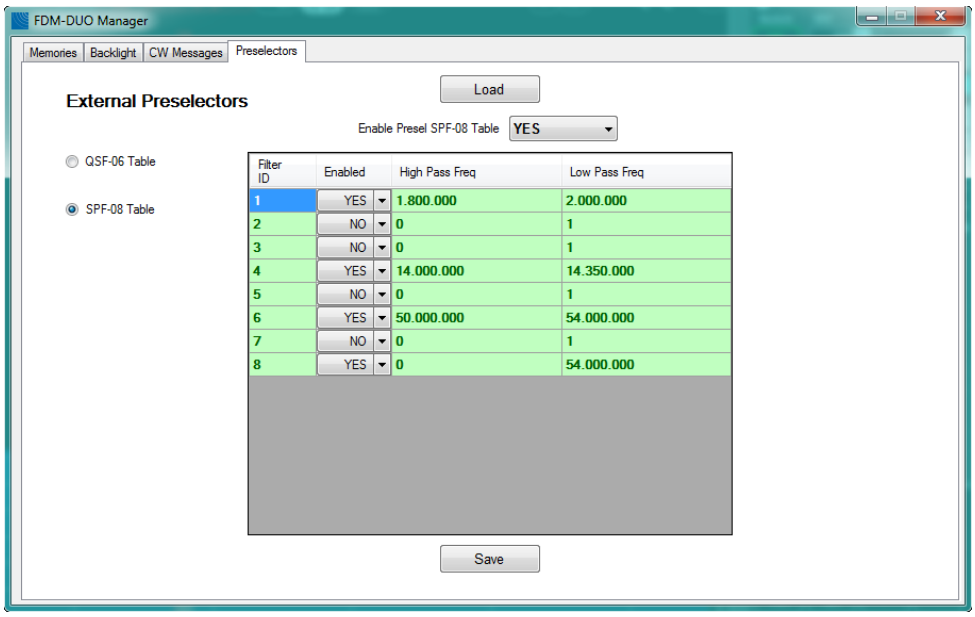
10.2.4 Preselectors

Preselectors tab differs from the FDM-DUOr to the FDM-DUO.

When managing an FDM-DUOr this tab allows to set the FDM-DUOr internal preselector filters. The user can enable and disable each preselector slot and set preselector high pass and low pass frequencies. The “Load” button allows to read the configuration stored inside the FDM-DUOr. The “Save” button allows to save the configuration inside the FDM-DUOr.

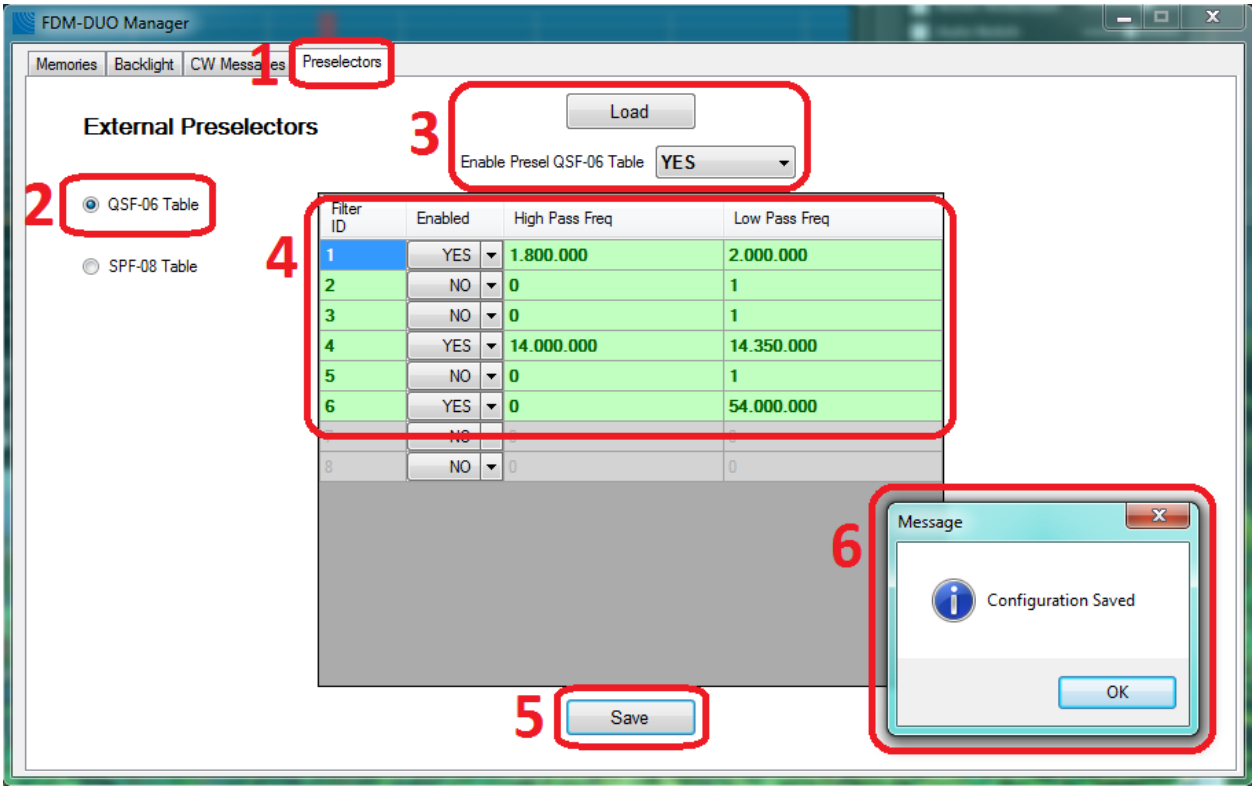


When managing an FDM-DUO this tab allows to set the preselector filters of two accessories : the SPF-08 and the QSF-06. The user can enable the preselectors management, enable and disable each preselector slot and set preselector high pass and low pass frequencies. The “Load” button allows to read the configuration stored inside the FDM-DUO. The “Save” button allows to save the configuration inside the FDM-DUO.



10.2.4.1 Example of using the Preselectors tab

This example is an extract of the QSF-06 user manual. It explains how to use the **Preselectors** tab of the FDM-DUO **Manager** when using a QSF-06 preselector. However, it can be used as a guideline also when using SPF-08 with FDM-DUO and the FDM-DUOr internal preselectors.



Follow these steps to configure the QSF-06 preselector.

1. Select the “Preselectors” tab.
2. Choose the “QSF-06” option.
3. Enable the QSF-06 management if not already done.
   The “Load” button allows you to retrieve from the FDM-DUO the current configuration.
4. Set a filter. The settings table is formed by 6 rows, one for each filter slot of the QSF-06 board.
   Each row contains 4 fields :
   - the filter ID / slot number : from 1 to 6,
   - the state of the filter/slot : enabled or not,
   - the beginning frequency of the filter use, otherwise called “high pass frequency”,
   - the end frequency of the filter use, otherwise called “low pass frequency”.

   For each row choose the “Enable” state and if enabled, enter the desired High Pass and Low Pass frequencies which specify the activation band of the filter.
5. Press the “Save” button to store the configuration in the FDM-DUO internal memory.
6. A message box appears to confirm the operation or indicate a negative outcome.

Some rules to keep in mind :

- the frequency to enter is in Hertz,
- the High Pass frequency must be strictly slower than the Low Pass frequency,
- in the same way the Low Pass frequency must be strictly higher than the High Pass frequency,
- in case of use of the FBPY bypass module, insert it to the last slot (number 6).

Filter ID	Enabled	High Pass Freq	Low Pass Freq
1	YES	1.800.000	2.000.000
2	NO	0	1
3	NO	0	1
4	YES	14.000.000	14.350.000
5	NO	0	1
6	YES	0	54.000.000
7	NO	0	0
8	NO	0	0

For example, considering the configuration of the screenshot above, you can insert this filters :

- filter ID/slot 1 : band pass 160 m, FBP160-1 filter module,
- filter ID/slot 2 : none,
- filter ID/slot 3 : none,
- filter ID/slot 4 : band pass 20 m, FBP20-1 filter module,
- filter ID/slot 5 : none,
- filter ID/slot 6 : bypass, FBPY module.

To select the right filter the FDM-DUO analyses the configuration following the ascending order of the slots. If the current tuning frequency is inside the frequency range the filter is selected, if not it passes to the next slot. It is recommended to place the bypass module in the last slot and to enable it in the frequency range which is not covered by the others filter modules.

Some cases with the above screenshot :

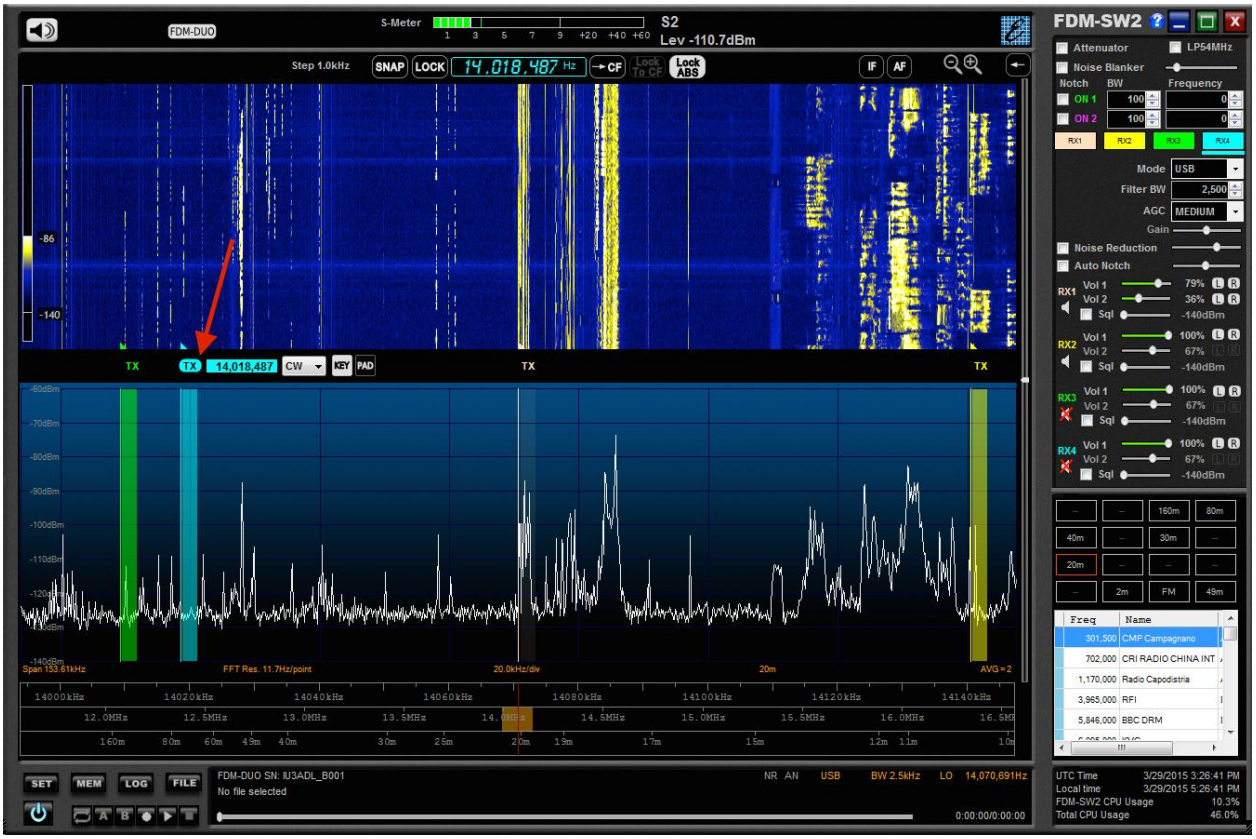
- tuning frequency set to 1MHz : the filter on the sixth slot is selected,
- tuning frequency set to 1.9MHz : the filter on the first slot is selected,
- tuning frequency set to 14.070MHz : the filter on the fourth slot is selected,
- tuning frequency set to 30MHz : the filter on the sixth slot is selected,
- tuning frequency set to 50MHz : the filter on the sixth slot is selected.

10.3 Transmitting

The RX and TX parts of the FDM-DUO are separated, so the FDM-SW2 software take advantage of this to implement the SPLIT mode. The SPLIT mode is used by the FDM-SW2 software to manage the transmission with the FDM-DUO. In SPLIT mode, the VFO A is used for receiving while the VFO B is used for transmitting. Take care, the FDM-DUO has two SPLIT modes :

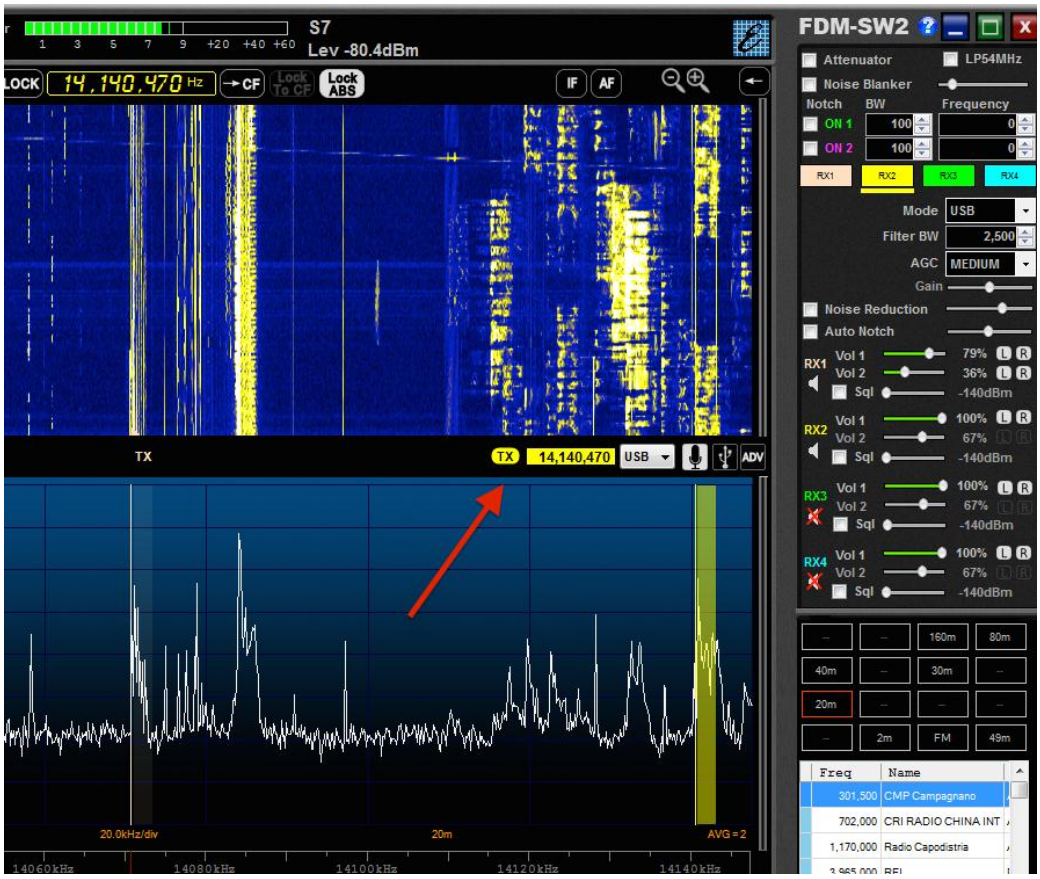
- the Stand-Alone SPLIT : activated by the FDM-DUO itself,
- the Remote SPLIT : activated by the FDM-SW2 software.

To activate the Remote SPLIT mode, click on the “TX” label of a virtual receiver as shown on the picture bellow. Note that the FDM-DUO displays the “SP” label when a SPLIT mode is activated.



In the picture above the virtual receiver 4 is used. The center frequency is 14.070.691Hz and the FDM-DUO VFO A frequency is set to the same value. The frequency of the virtual receiver 4 is set to 14.018.487Hz and the FDM-DUO VFO B frequency is the to the same value.

Clicking on the “TX” button of another virtual receiver change the virtual receiver selected to manage the Remote SPLIT mode. In the picture bellow, the virtual receiver 2 is now selected and its frequency is set to 14.140.470Hz, the frequency of the FDM-DUO VFO B is also set to this value.



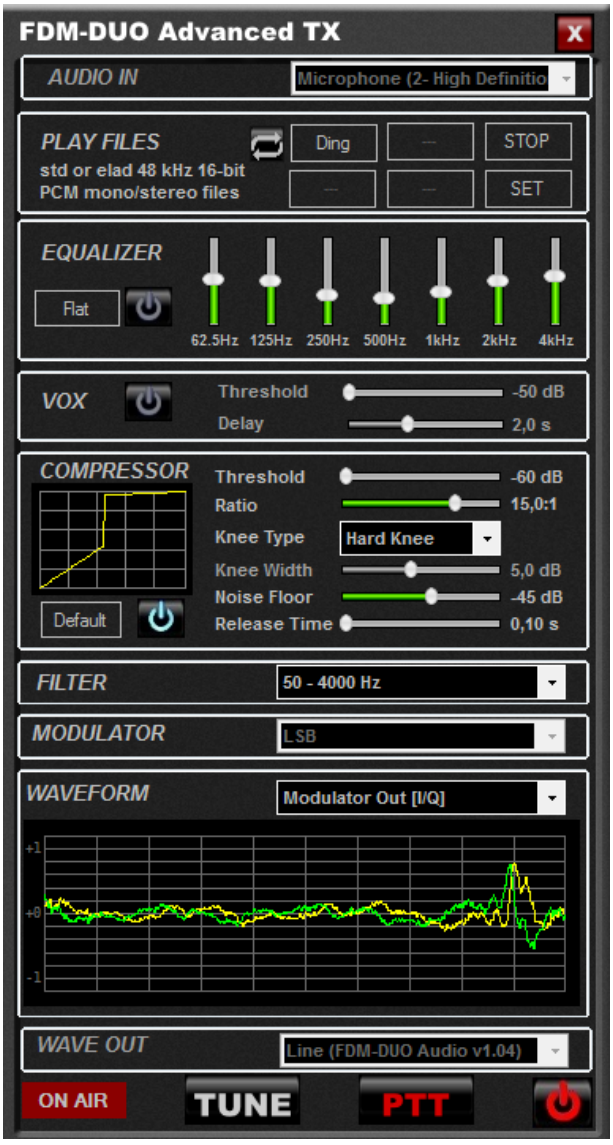
You can change the mode used for transmitting choosing another mode with the related combo-box. If the mode selected is CW 

, you can choose between key and paddle as input source. Try to change the setting and see the result on the FDM-DUO display. If the mode selected is USB, LSB, AM or FM 

, you can choose between these input sources : microphone
, USB soundcard
and the FDM-DUO Advanced TX panel 

. Try to change the setting and see the result on the FDM-DUO display.

The FDM-DUO Advanced TX panel allows you to add digital processing to the transmission source. Choose the audio input (AUDIO IN menu), it can be a microphone connected to the computer or an internal or external soundcard. If displayed, do not choose "FDM-DUO Audio" as input source as the "Line (FDM-DUO Audio)" device corresponds to the auxiliary audio output (the AUX OUT connector of the front panel of the FDM-DUO) and the "Microphone (FDM-DUO Audio)" device doesn't correspond to the microphone connected to the FDM-DUO trough the MIC/PTT connector of the rear panel. Instead, for the WAVE OUT menu, choose the "Line (FDM-DUO Audio)" device to send the processed signal to the TX USB connector situated on the rear panel of the FDM-DUO. It is also possible to send the processed signal to another audio device.



Features of the FDM-DUO Advanced TX panel are : files playing, equalization, vox feature, compression, setting of filter and mode, tune feature. It is also possible to choose the signal displayed in the waveform graphic. Press the button to start the digital processing and the PTT button to start the transmission.

Annex A - FDM-SW2 CAT Protocol

Protocol Description

The FMD-SW2 software implements a subset of the CAT commands of the Yaesu FT-897 transceiver. The parameters of the serial port are listed in the following table.

Baud rate	38400
Data Size	8
Parity	None
Start Bits	1
Stop Bits	2

The command sent to FDM-SW2 consists of 5 bytes and is structured as follows:

Data 1	Data 2	Data 3	Data 4	Command

FDM-SW2 software implements the following commands derived from the command set of FT-897:

Command Description	**Data 1**	**Data 2**	**Data 3**	**Data 4**	**Command**	**Remarks** (see following command descriptions)
Set LO Frequency	100/10MHz	1MHz/100kHz	10/1kHz	100/10Hz	0x01	This command sets the current frequency
Set operating mode	Mode Byte	X	X	X	0x07	-
Read Receiver Status	X	X	X	X	0xE7	This command returns one byte containing receiver status
Read Frequency and mode	X	X	X	X	0x03	This command returns five bytes
Read EEprom Data	Address MSB	Address LSB	X	X	0xBB	This command causes ***two*** bytes of EEPROM data to be returned, beginning with the address in data bytes 1 and 2. (Approximately 6.25k of EEPROM data may be accessed)
Read TX Metering	X	X	X	X	0xBD	This command returns one byte (00) when in receive. When in transmit, this command returns **two** bytes (in BCD format) indicating Forward power, VSWR, ALC, and Modulation.
Read Transmitter status	X	X	X	X	0xF7	This command returns one byte containing transmitter status
Set PTT ON	X	X	X	X	0x08	This "keys" the FT-817. In CW, this sets the radio to transmit mode, but does key the transmitter. Keying and unkeying the PTT line will cancel the transmit mode (i.e. put it back into receive.) This command returns 00 if the '817 was unkeyed, and F0 if already keyed.
Set PTT Off	X	X	X	X	0x88	This command puts the FT-817 into receive mode. This command returns 00 if the '817 was keyed, and F0 if already unkeyed.

Command Descriptions

Command 0x01 - set local oscillator frequency: the local oscillator frequency is set by the transmission of 4 Binary Coded Decimal (BCD) bytes. For example, to set the frequency at 435.12345 MHz the bytes to be sent are: **[43][51][23][45]** followed by the byte command **[01]**.
The command returns 1 byte set to **[00]**.

Command 0x03 - read local oscillator frequency and mode: this command returns 5 bytes. The first four bytes contain the local oscillator frequency in the same format of the command **0x01** (4 BCD bytes), while the last byte contains the operating mode encoded as follows:

Mode	Value
LSB	0x00
USB	0x01
CW, CW SH+, CW SH-	0x02
AM, SYNC AM	0x04
FM, WB FM	0x06
DRM	0x07

Command 0x07 - set operation mode: the first byte contains the operating mode that is encoded as follows:

Mode	Value
LSB	0x00
USB	0x01
CW	0x02
AM	0x04
WB FM	0x08
FM	0x88

The command returns 1 byte set to **[00]**.

Command 0xBB - read EEPROM data: this command returns 2 bytes. To simulate the behavior of the FT-897, the software replies to “EEprom read” request as follows:

Address	Data 1	Data 2
0x006A	0xC4	0x20
0x00A9	0x00	0x05
0x006B	0x20	0x59
0x008C	0x00	0x00
0x00A8	0x00	0x18
0x008E	0x40	0x00

For example, if the software receive the command **[00] [6A] [00] [00] [BB]** the answer must be **[C4] [20]**.

Command 0xBD - read TX metering: this command returns 1 byte set to **[00]** when receive mode is enabled, while it returns 2 byte set to **[00] [00]** when transmit mode is enabled.

Command 0xE7 - read receiver status: this command returns 1 byte. The 4 least significant bits indicate the current reading of S-METER. Some examples are reported in the following table:

Retuned Byte	S-METER
0x00	S0
0x04	S4
0x09	S9
0x0A	S9+10
0x0B	S9+20
0x0F	S9+60

Command 0xF7 - read transmitter status: this command returns 1 byte. If *"keyed"* the byte is set to **[7f]** otherwise **[ff].**

Specific Command Descriptions

In addition to the controls derived from the command set of FT-897, the CAT protocol include specific commands for the FDM-SW2:

Command Description	Data 1	Data 2	Data 3	Data 4	Command	Remarks (see following command descriptions)
Set FDM- SW2 operating mode	Mode Byte	X	X	X	0xC7	-
Read Tuning Frequency and mode	X	X	X	X	0xC8	This command returns five bytes
Set Tuning Frequency	100/10MHz	1MHz/100kHz	10/1kHz	100/10Hz	0xC9	This commands sets the current frequency
Read Locked Mode	X	X	X	X	0xCA	-
Set Locked Mode	Locked Mode Byte	X	X	X	0xCB	-
Read FDM-SW2 Status	X	X	X	X	0xCF	This command returns 10 bytes containing the FDM-SW2 status.

Command 0xC7 - set FDM-SW2 operating mode: the first byte contains the operating mode that is encoded as follows:

Mode	Value
CW	0x00
CW SH+	0x01
CW SH-	0x02
USB	0x03
LSB	0x04
AM	0x05
FM	0x06
DRM	0x07
WBFM	0x08
SYNC AM	0x09
DSB	0x0A

The command returns 1 byte set to **[00]**.

Command 0xC8 - read tuning frequency and mode: this command returns 5 bytes. The first four bytes contain the tuning frequency in the same format of the command **0x01** (4 BCD bytes), while the last byte contains the operating mode encoded as in command **0xC7**.

Command 0xC9 - set tuning frequency: the tuning frequency is set by the transmission of 4 Binary Coded Decimal (BCD) bytes For example, to set the frequency at 435.12345 MHz the bytes to be sent are: **[43][51][23][45]** followed by the byte command **[C9]**.
The command returns 1 byte set to **[00]**.

Command 0xCA - read locked mode: this command returns 1 byte containing the receiver locked status:

Mode	Value
Unlocked	0x00
Locked to CF	0x01
Locked ABS	0x02
LOCK	0x03

Command 0xCB - set locked mode: this command returns 1 byte.

Mode	Value
Unlocked	0x00
Locked to CF	0x01
Locked ABS	0x02

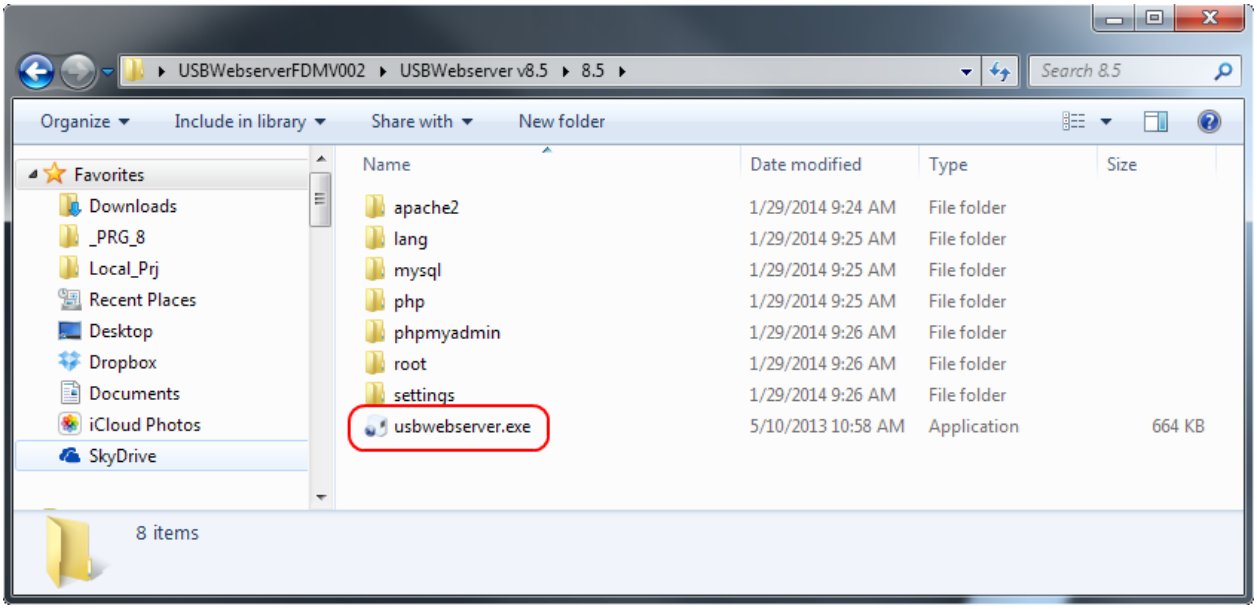
Command 0xCF - read FDM-SW2 global status: this command returns 10 bytes containing the status of the FDM-SW2 :

- byte 0 : locked mode (encoded as in command 0xCA),
- byte 1-4 : LO frequency (4 BCD),
- byte 5-8 : tuning frequency (4BCD),
- byte 9 : operating mode (encoded as in command 0xC7).

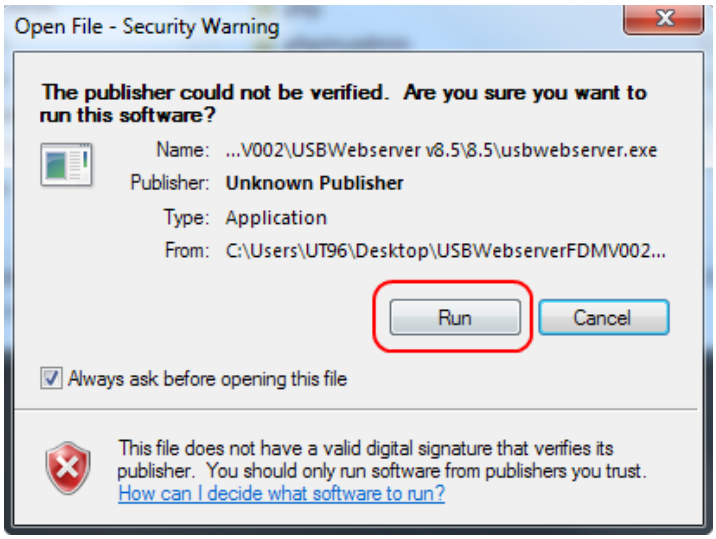
Annex B - Audio Streaming & Web Control

Starting USB Web Server

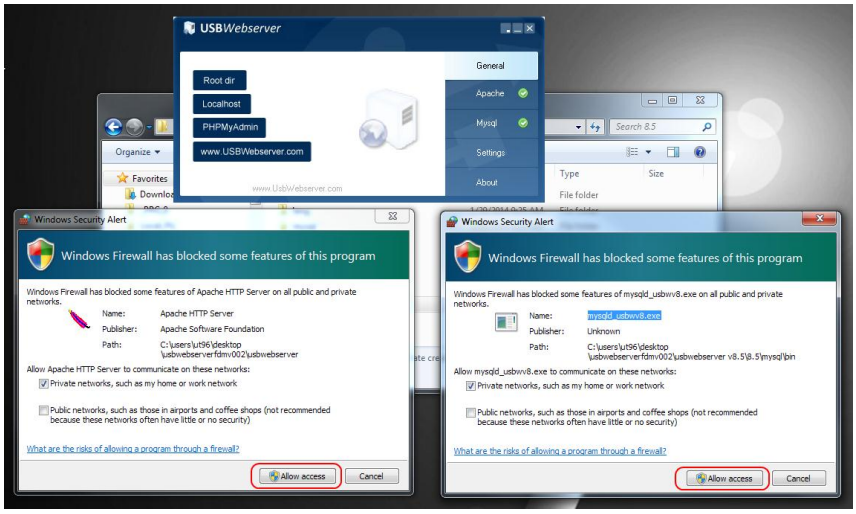
Go to sdr.eladit.com/FDM-sw2 Software/ and download the web server. Open the folder "USBWebserverFDMVxxx\USBWebserver v8.5\8.5" and launch the file usbwebserver.exe.



If a security warning appears, click on "Run".

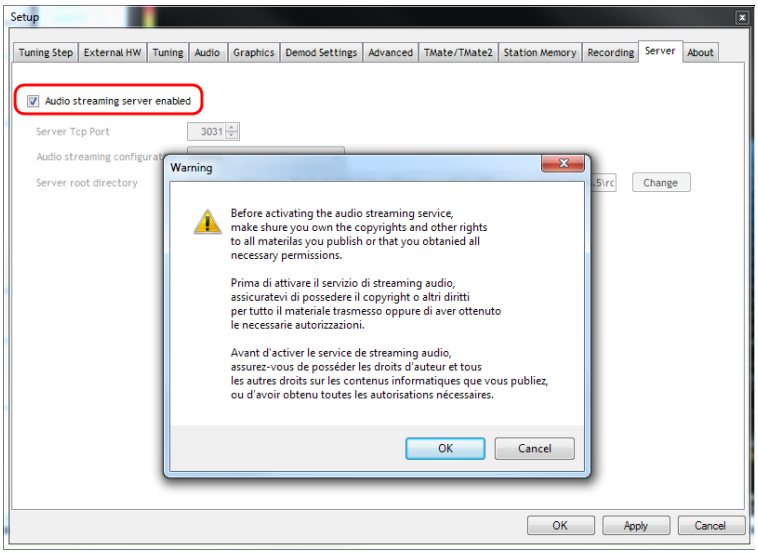


When the web server starts for the first time, two Windows security warning appears, click “Allow access” in both windows.



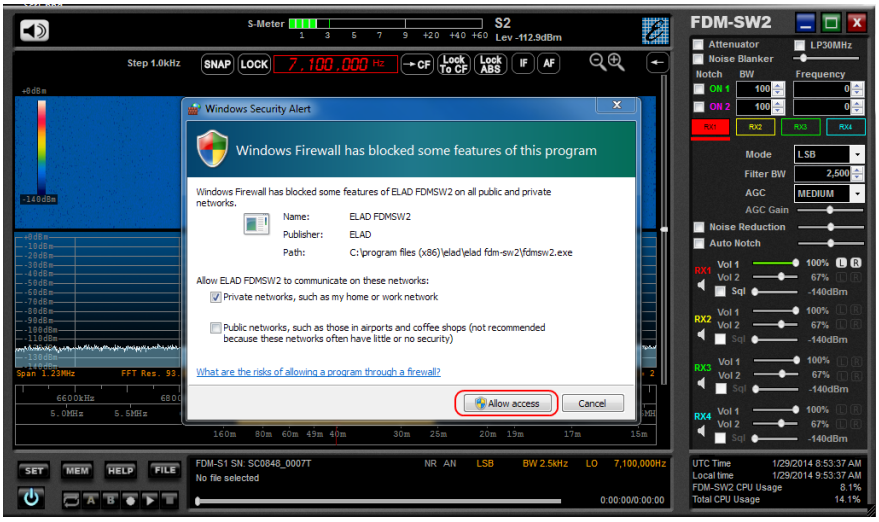
FDM-SW2 Settings

In the FDM-SW2 software, open the setup window by clicking on “SET” button and select the “Server” tab. Enable the check box “Audio streaming server enabled”. Read carefully the warning and then click “OK”.



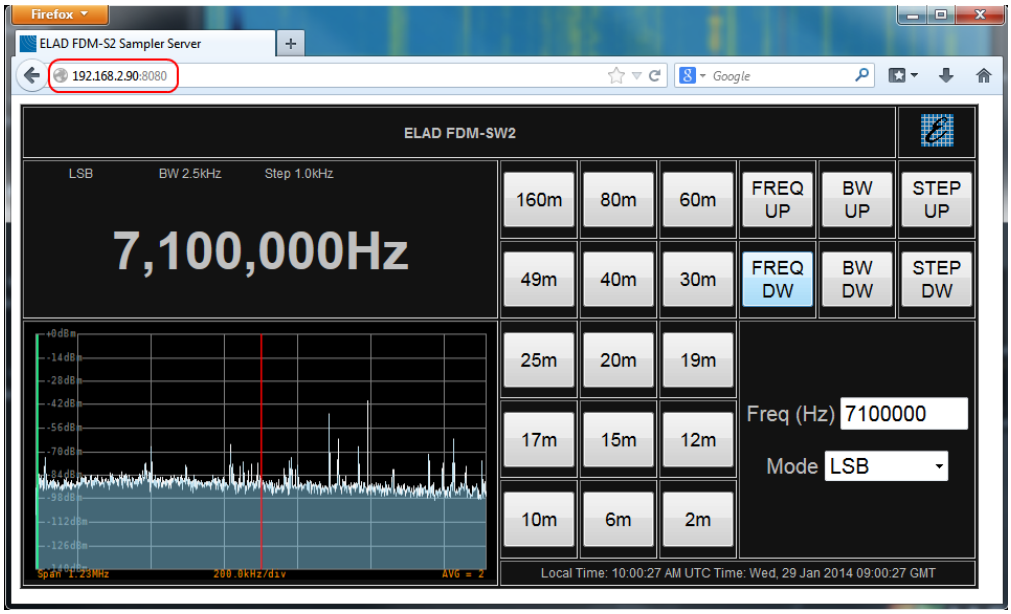
Select the same “Server Tcp Port” used by USBWebServer. Click on “Change” to select the USBWebserver root directory. Select the folder : USBWebserverFDMVxxx\USBWebserver v8.5\8.5\root
In the “Audio streaming configuration combo box” select “Conf 0”.

Once the setup is saved, when the FDM device start the acquisition, a Windows security warning appears, click “Allow access”.



Use with Browser

The Audio Streaming & Web control feature works only with Firefox web browser. Open Firefox and type in the address bar : *“ip address of the PC where FDM-SW2 is running”*:8080.



If you are interested to only hear the audio stream, type in the address bar : *“ip address of the PC where FDM-SW2 is running”*:1412.

Audio Streaming Configuration Description

- Conf 0 :
  - Codec : OPUS
  - Input Bitrate : 48kHz
  - Bitrate : 32kHz
  - Audio encoding frame size : 2.5ms
  - Maximum band-pass : 20kHz

- Conf 1 :
  - Codec : OPUS
  - Input Bitrate : 48kHz
  - Bitrate : 6kHz
  - Audio encoding frame size : 10ms
  - Maximum band-pass : 4kHz

- Conf 2 :
  - Codec : PCM
  - Bitrate : 48kHz

- Conf 3 :
  - Codec : PCM
  - Bitrate : 8kHz

Annex C - Configuration Files

Filenames

The FDM-SW2 software configuration is stored in some files located in *"local drive"*\Users\"your user name"\Documents\ELAD\FDM-SW2, common files are :

- **FDMSW2SwSetup.xml** : contains FDM-SW2 general settings like main windows position and size, graphics settings, default directory for save the recordings, …
- **FDMSW2SwSetup_*XXXXX* :** specific settings for the connected FDM device (where *XXXXX* is the FDM serial number, Offline for the offline mode),
- **FDMS2RxSetup_*XXXXX*** : specific settings for the virtual receiver,
- **FDMDS1Config.xml** : frequency related settings.

Restore to Factory Default

If the files are corrupted or contain invalid data, the software can stop working correctly. However it is possible to restore the FDM-SW2 software in a stable state doing the following procedure :

- close the FDM-SW2 software,
- open the FDM-SW2 configuration files directory : *"local drive"*\Users\"your user name"\Documents\ELAD\FDM-SW2,
- move the following files to another directory, by moving these files, you will lost all the user settings such as the last tuning frequency, demodulation mode, frequency related settings,
- restart the FDM-SW2 software.

FDM-DUO(r) Maximum Frequency

The factory default maximum frequency of the FDM-DUO is 54MHz. However, for experimental purposes, user can extend the frequency range up to 165MHz setting the FDM-DUO as follows : menu 2 "RX LP" on OFF and menu 33 "TX OUT" on 0dBm. But if the FDM-SW2 software is connected to the FDM-DUO it blocks the frequency at 55MHz. For experimental purposes, this limitation can be unlocked : close the FDM-SW2 software, go to the configuration files directory (*"local drive"*\Users\"your user name"\Documents\ELAD\FDM-SW2), open the **FDMSW2SwSetup.xml** file, search for the **UnlockDUOt** label and set it to '1'. Save and close the file, restart the FDM-SW2 software. If you are using profiles (see **Signal Control Panel**), there is a copy of the FDMSW2SwSetup.xml file in each "ProfileX" directory. If you created profiles before editing the main FDMSW2SwSetup.xml file, it will have the UnlockDUOt label set to '0'. If necessary edit the UnlockDUOt labels in these files too.

The maximum frequency of the FDM-DUOr depends on the maximum frequency set into the **Preselectors** tab of the **Manager** window. However, like for the FDM-DUO there is a limitation from the FDM-SW2 software at 55MHz. To unlock this limitation proceed in the same way as for the FDM-DUO with the difference that the label to edit is **UnlockDUOr**.