AFEDRI SDR-Net – short user manual.

1. AFEDRI SDR-Net, main information.

The image of AFEDRI SDR-Net receiver, it contains also the external connectors and indication LEDs that are marked on the picture (see **Figure 1.)**. There is short description of marked connectors and indication LEDs.
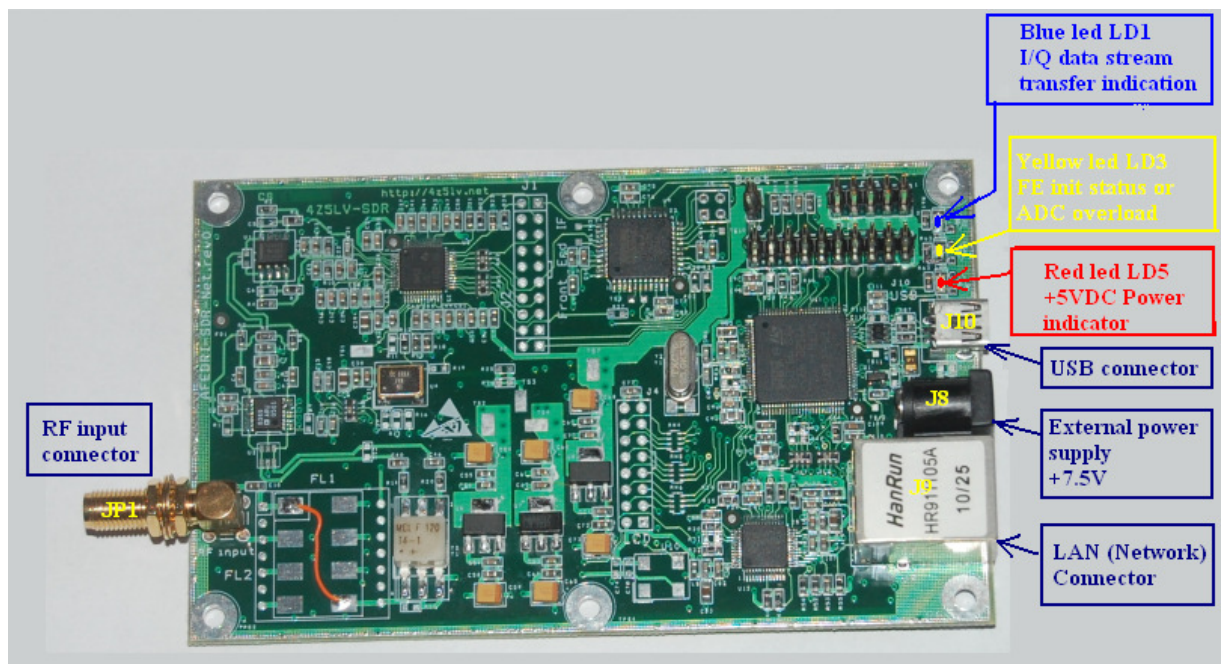

Figure 1 AFEDRI SDR-Net receiver

1.1 JP1 connector (RF Input connector) – This SMA type connector, it is used to connect external antenna or any other RF signal source (maximum limit is 13dbm).
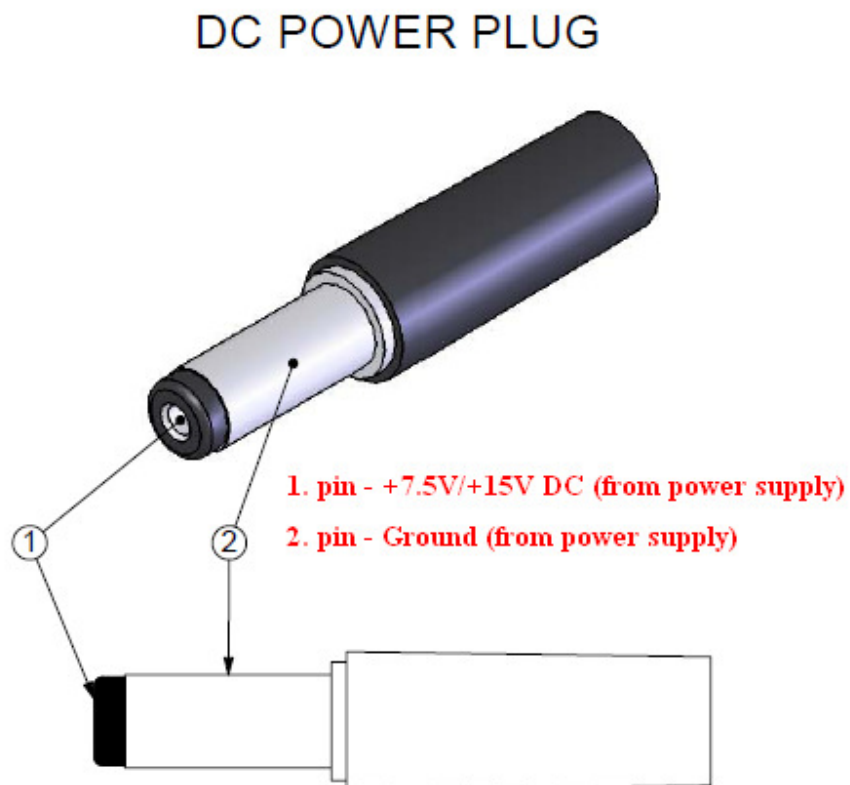
1.2 J10 connector (USB connector) – it is used to connect USB cable (mini-B USB type) between SDR and PC. When AFEDRI SDR-Net is configured for USB connection mode, this connector provides +5VDC power supply for SDR, and control/data transfer, when receiver is configured for Network mode, USB cable can be used for +5V power supply only. Mini-B USB connector pin-out you can see on **Figure.2**

Table 6-2. USB Series "mini-B" Connector Termination Assignment

Contact Number	Signal Name	Typical Wiring Assignment
1	VBUS	Red
2	D-	White
3	D+	Green
4	ID	not connected
5	GND	Black
Shell	Shield	Drain Wire

Figure 2 Mini-B USB connector pinout

1.3 J8 connector (External Power Supply +7.5V) – it can be used to connect SDR to external power supply. External power supply required DC voltage from +7V up to +15V for the AFEDRI SDR-Net rev.2.1 and down, and for the AFEDRI SDR-Net rev.2.2 and up DC voltage from +7V up to +10V is required. The 2.5mmX5.5mm DC power Plug is needed for external power supply cable assembly. The external power supply can be used when AFEDRI SDR-Net receiver is used in Network mode. The pin-out for external power supply cable is shown on **Figure.3**

Figure 3 DC power plug pin-out

Attention!!! AFEDRI SDR-Net 2.1 and down have switched DC/DC converter to connect to external power supply (this was done to decrease power dissipation). Because there is switched DC/DC converter that is working on 930kHz frequency, so there interference is possible on this frequency or its harmonics. **Beginning AFEDRI SDR-Net rev.2.2 it has linear power supply it does not have interference from embedded power supply.**

If you prefer to use Lower Noise Power Supply you can connect AFEDRI SDR-Net to external stabilized power supply that gives +5V voltage using USB connector – J10. In

this case you need supply +5V to J10 pin.1 and "ground" or zero signal to J10 pin.5 (see **Figure.2)**

1.4 J9 connector – standard J45 Ethernet Network connector, it is used to connect receiver to Local Area Network (100Mb/s).

Next network cable should be used for AFEDRI SDR-Net:

- On most modern PC You can use Straight network cable for both connection types, for connection to hub of for direct connection to PC (see **Figure.4)**

- On some old PCs if you connect SDR to PC directly, you should use Crossover cable (see **Figure.4)**

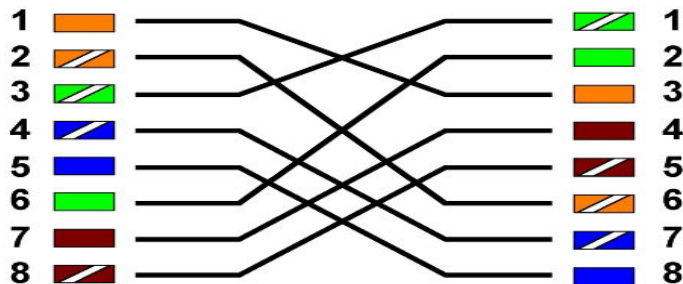- If you connect SDR to network router, hub or switch you should use Straight cable (see **Figure.4).**

Figure 4 Network cables diagrams (Crossover and Straight)

If you are planning to use USB connection only – no network cable connection is needed.

1.5 LD1 LED (blue or green) – is indicating that AFEDRI SDR-Net front-end IC is functioning properly, including all electronics, that is servicing data stream transfer path (CPLD, CPU). If there is not problem in data stream transfer, so LD1 LED has to be blinking (switching On and OFF) consequently. If LD1 is not blinking, i.e. LED is constantly lighting or switched OFF, so there is problem in hardware functioning or in software. In the case of problem you need to "reset" AFEDRI SDR-Net, switching OFF and ON of external power supply or disconnecting USB cable.

There is no blinking of LD1 LED during number of seconds right after AFEDRI SDR-Net was connected to power (or USB line) – this delay it is normal initialization process. After SDR's firmware detects that receiver functioning OK, the LD1 will begin blinking after several seconds delay (it take longer time when network cable is not connected to SDR).

Attention!!! You should not start any software that is using AFEDRI SDR-Net (Linrad, SDR-Radio, Winrad, HDSDR, WRPlus), till SDR's firmware will finish start-up initialization, so you need to wait till LD1 (blue or green LED) is beginning to blink!!!

1.6 LD3 LED (yellow) – is used for indication of proper finishing of Front-end IC initialization and in same time it is used as input ADC overload. During normal operation the LD3 will be lighting constantly If front-end was initialized successfully and input RF signal has level smaller than ADC overload limit. If DHCP client function is enabled in SDR during the time when SDR acquiring IP address from router, LD3 is blinking twice and after that has longer pause when LED is Off, this cycle repeats again till initial network configuration will be finished.

Overload conditions: LD3 will be blinking On/Off whith equal intervals if input signal level is higher than ADC overload limit, in the case of ADC overload you should decrease RF Gain or/and FE gain. For more information about Gain control please see "SDR network Control Box short Software description".

1.7 LD5 LED (red) – this LED is connected to +5V voltage, that coming from USB line or switched DC/DC converter that receive voltage from external power supply (J8 connector).

2 Some hint for usage of AFEDRI SDR-Net with different software

2.1 AFEDRI SDR-Net connected trough network interface and used with Linrad and/or SDR-Radio v1.5 software

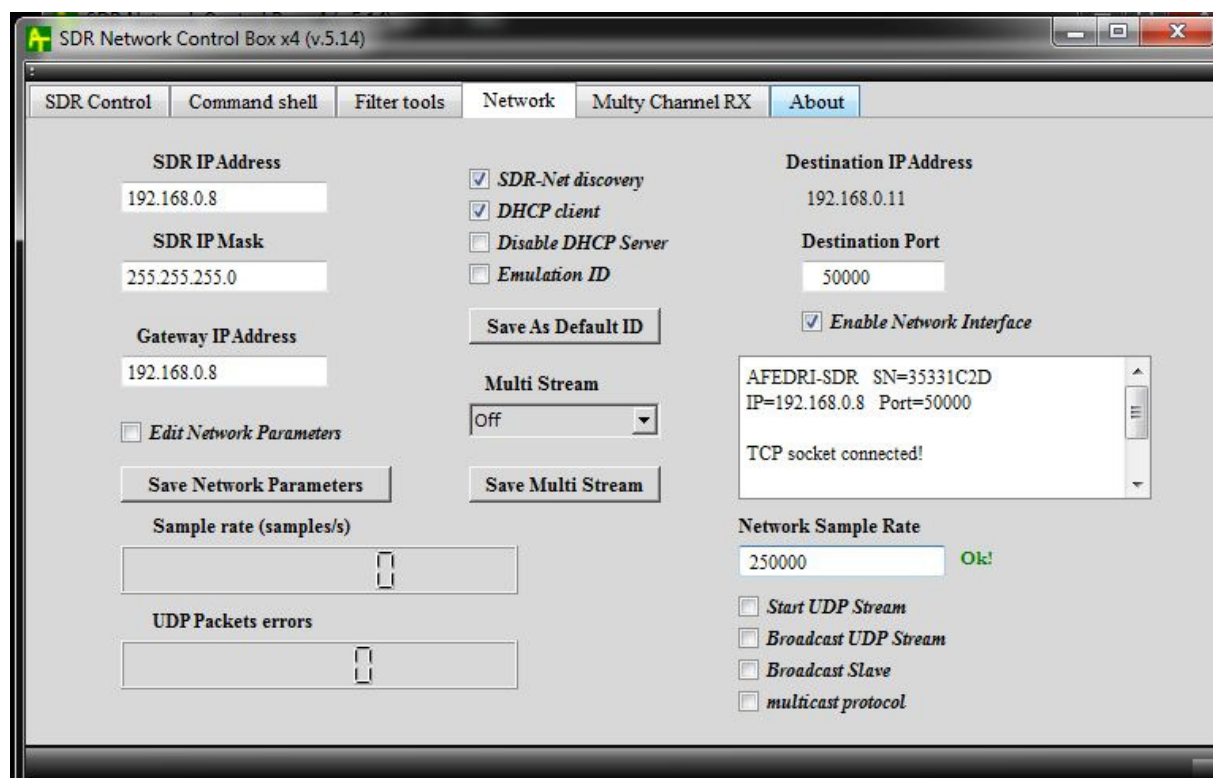By default AFEDRI SDR-net has network parameters, that is shown on **Figure.5**

Figure 5 Default network configuration of AFEDRI SDR-Net.

You can change and save new network parameters according to configuration of local network.

There is no need to use any additional software to use AFEDRI SDR-Net with Linrad and SDR-Radio v2.2 software. You need only to configure your software (Linrad or SDR-radio) to use AFEDRI SDR-Net receiver as signal input device, and provide to software IP address of AFEDRI SDR-Net.

Software Linrad and SDR-Radio can set gain of SDR-IP receiver only by 4 steps (0db, -10db, -20dB, -30db), but AFEDRI SDR-Net has 16 steps gain regulation from -10db up to 35db with minimal step 3db, so there is used next table to translate attenuation values to AFEDRI SDR-Net scale, please see next table for reference:

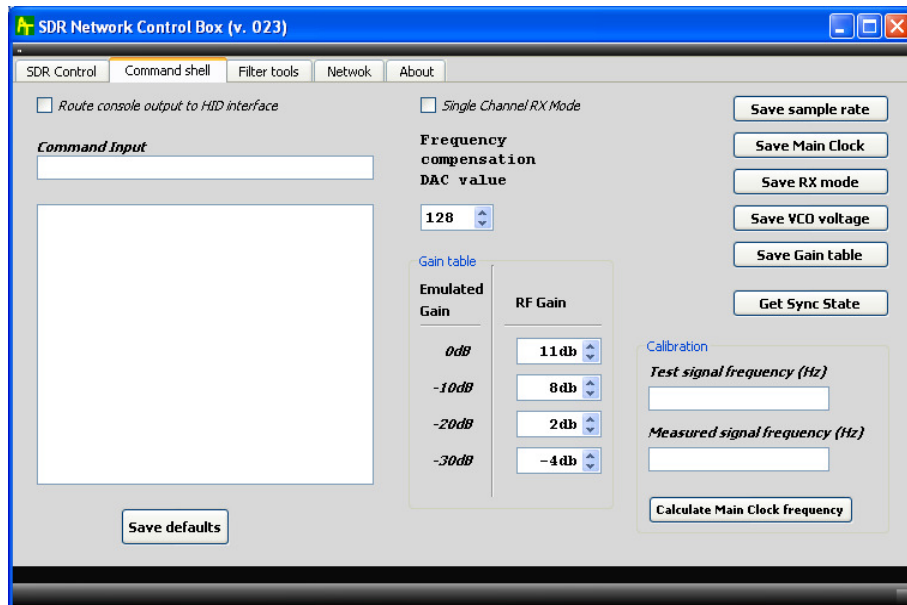| SDR-Radio, Linrad Attenuation, dB	AFEDRI SDR-Net RF gain, db
0	29
-10	14

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-20	-1
-30	-10

Figure 6 The "Gain Table" with default parameters

Since firmware version 128 it is possible to change gain translation table and save in the internal SDR's EEPROM, according user's preference. After power up the AFEDRI SDR-Net will use this, preliminary saved, custom table (see **Figure 6**).

3 AFEDRI SDR-Net firmware upgrade

3.1 Firmware upgrade of AFEDRI SDR-Net receiver can be done using TFTP network protocol. There is utility tftpd32.exe that can be used for firmware upgrade, it can be downloaded using next link:

http://tftpd32.jounin.net/tftpd32_download.html

   May be there is lot of other software that implements tftp protocol client, that could be used for firmware upgrade, below described process for tftpd32.exe only.

   You need to do next sequence for AFEDRI SDR-Net firmware upgrade:

3.1.1. Set jumper between pins 5 and 6 of JTAG connector P1 (see Figure.7). If you put only this jumper, SDR will have default IP address - 192.168.0.8.

If you want to use same address that is used for SDR regular connection, you need in to set additional jumper between pins 7 and 8 on same (P1) connector.

Attention!!! You can use user defined IP address only if it was saved in ADEDRI SDR-Net EEPROM. IP address can be configured by SDR Network Control Box software when it connected to PC using USB interface!!!
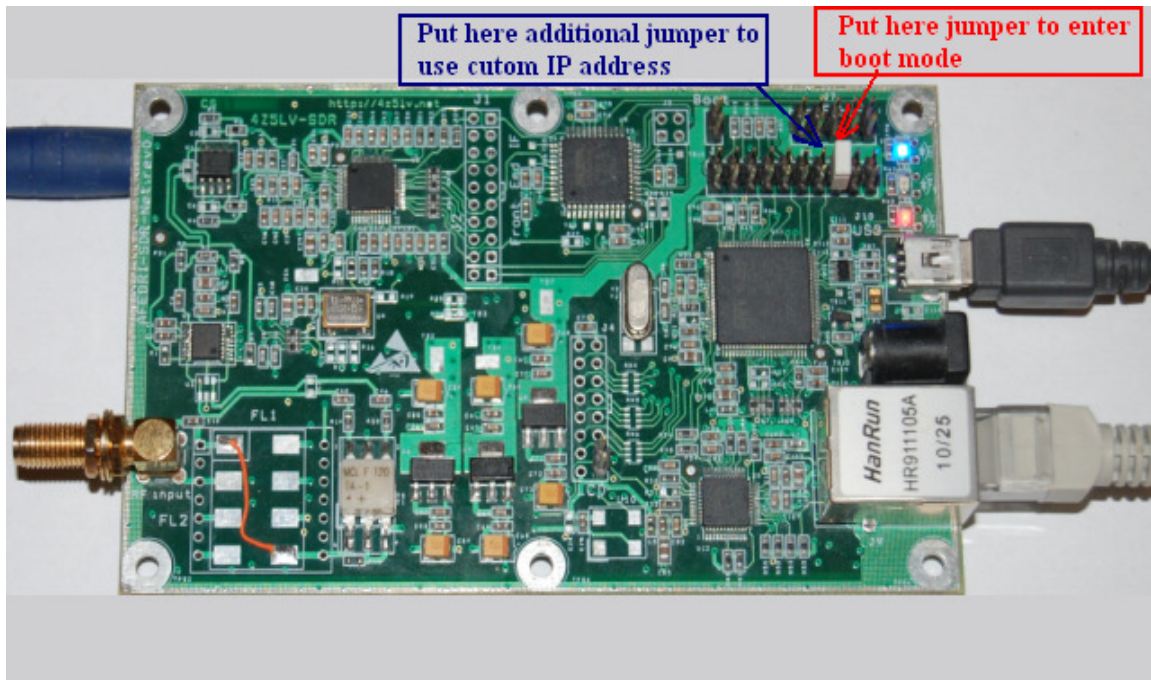

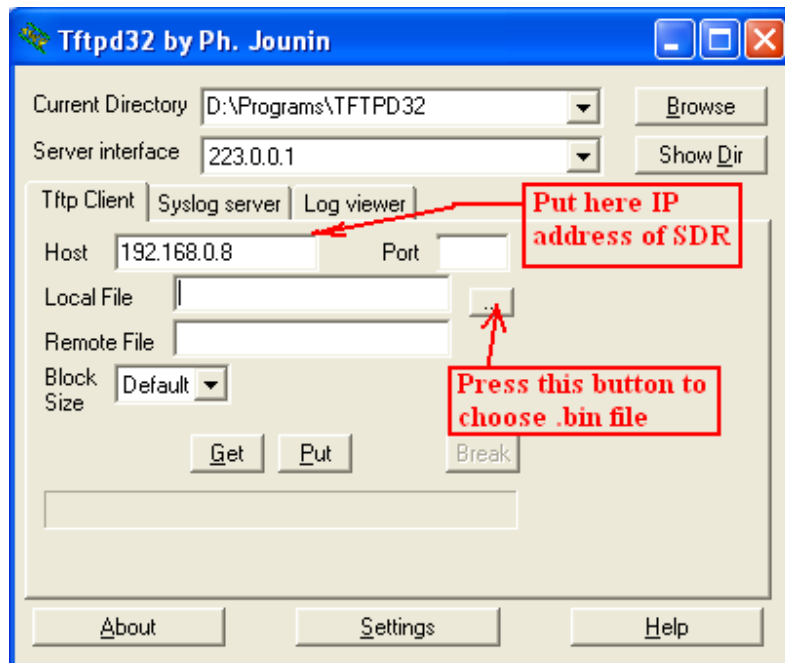**Figure 7 AFEDRI SDR-Net boot-mode jumper position on JTAG (P1) connector, for firmware upgrade mode**

3.1.2. There is new feature exists in AFEDRI SDR-Net beginning boot-loader v2, firmware v204 and "SDR Network Control Box" v.23. User can enter AFEDRI SDR-Net to firmware upgrade mode without any jumper, but using command that sent from "SDR Network Control Box" application. User need to press the button "Firmware Upgrade", that is located on the "About" tab (see Figure 7.1). This procedure allows

user to do firmware upgrade without any box opening. Attention all network parameter in this case will be same as AFEDRi SDR-Net as configured for regular work (i.e. network parameters that was saved in the internal Flash memory of SDR). Further firmware upgrade procedure is same as described below for "jumper" mode.

Figure 7.1 3 «About» tab, «Firmware Upgrade» button

3.1.3. Connect SDR to PC (or network router, hub) by network cable. After network cable was connected, you can switch on receiver AFEDRI SDR-Net, voltage can be supplied from external power supply or USB line.

3.1.4. Now you need to wait till SDR enter to firmware update mode (boot loader), if SDR successfully enter to boot loader it indicate this constantly lighting two LEDs red and blue (green), yellow LED have to be constantly switched off .

3.1.5. You need to start tftpd32.exe utility, screen-shot of this utility is shown on **Figure.8**

Figure 8 Tftpd32 utility (red color writings shows author's comments)

After first start of this utility you can (but not must) configure it to run only in tftp client mode, to do this you need to press "Settings" button (see **Figure.8**). In "Tftp Client" tab you need to enter IP address of AFEDRI SDR-Net receiver.
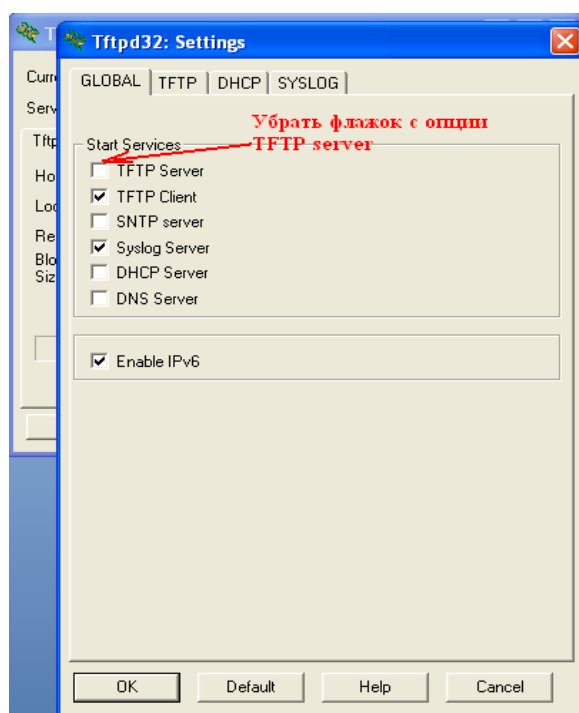
Figure 9 Tftpd32 utility, "Settings" tab

3.1.6. To choose firmware file (it has .bin extension), press button "Local File" and find firmware file in "Select file" dialog that is appearing after the button was pressed. (see **Figure.10)**
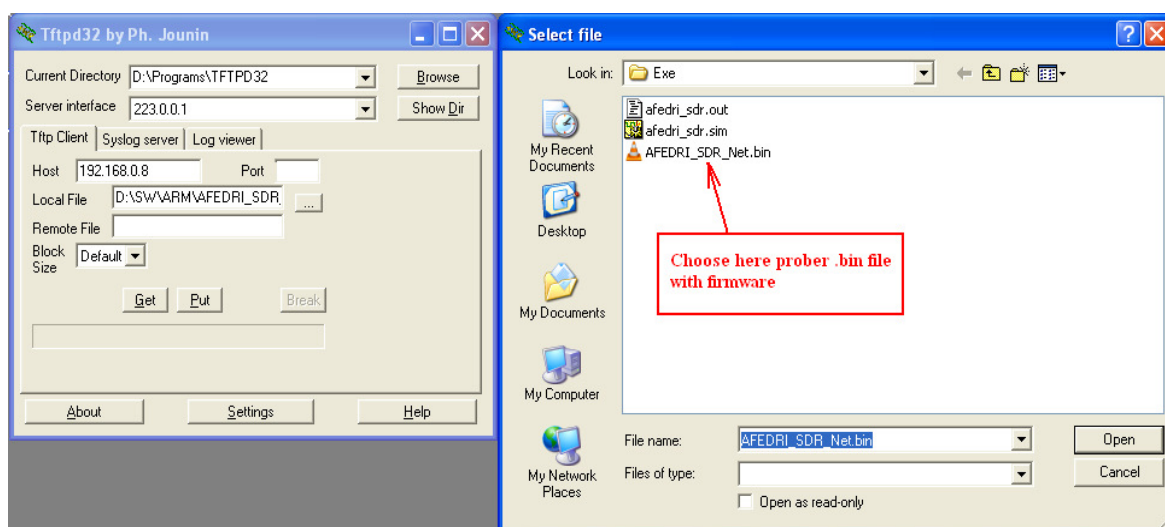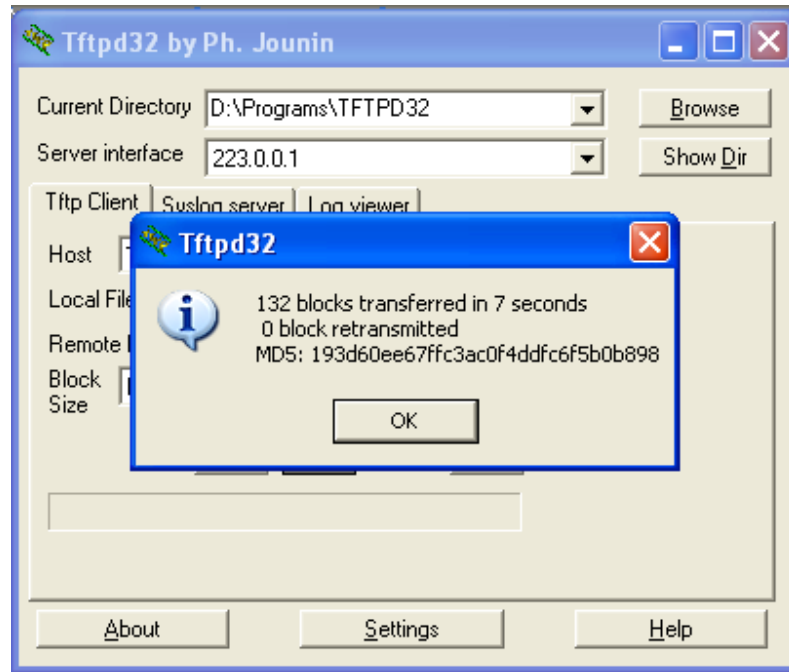

Figure 10 Tftpd32 utility, "Select File" dialog

3.1.7. After firmware file has been found, press "Put" button, it begin firmware upgrade process. If all sequence, that is described above, has been done successfully, after number of second delay you will see that yellow LED is blinking – this indicate that firmware upgrade process is running. After firmware process is finishing, yellow LED is switched off and data transfer finish message window is appearing (see **Figure.11**)
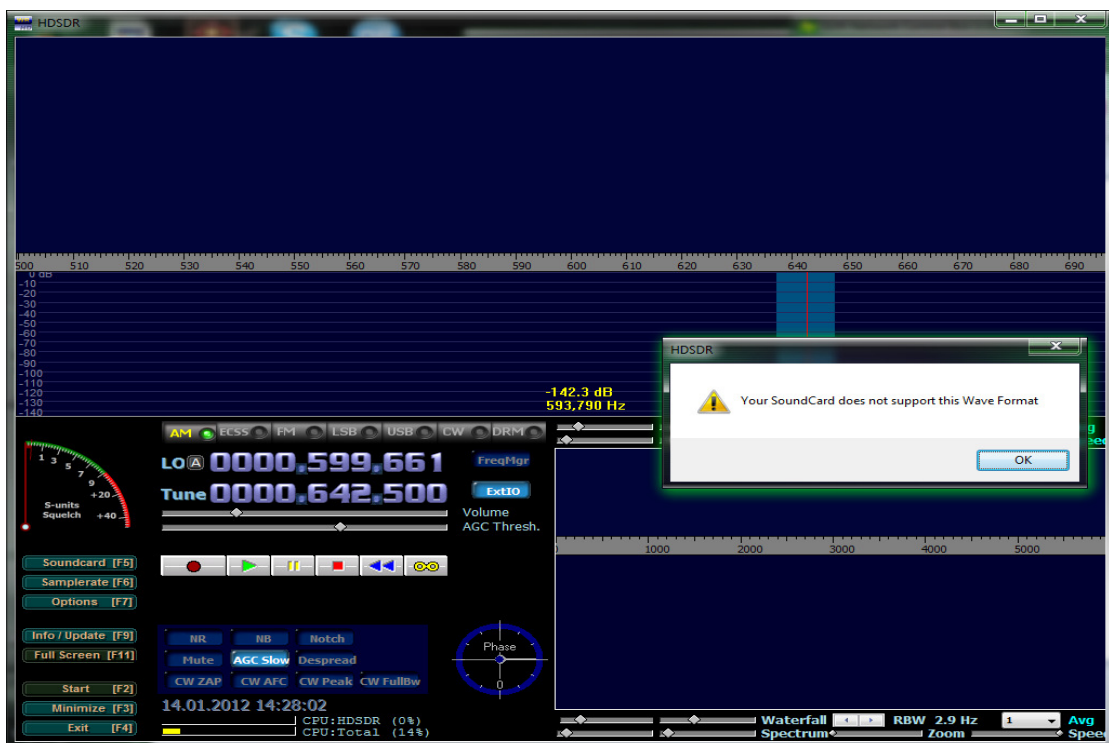

Figure 11 Tftpd32 utility, firmware transfer finish message window

3.1.8. After successful firmware upgrade, you should remove all jumpers that was set for firmware upgrade and reboot AFEDRI SDR-Net

3.1.9. You can check firmware version of SDR, using SDR Network Control Box application, it is shown on "About" tab.

4 Recommendations for AFEDRI SDR-Net used with USB connection and Windows 7

If you has changed sample rate of AFEDRI SDR-Net, when it connected by USB line to PC with Windows 7 installed, you can see error massage, that shown on **Figure 12**. This message can appears when user is pressing "Start" button of Winrad (HDSDR, WRPlus etc.)**.**
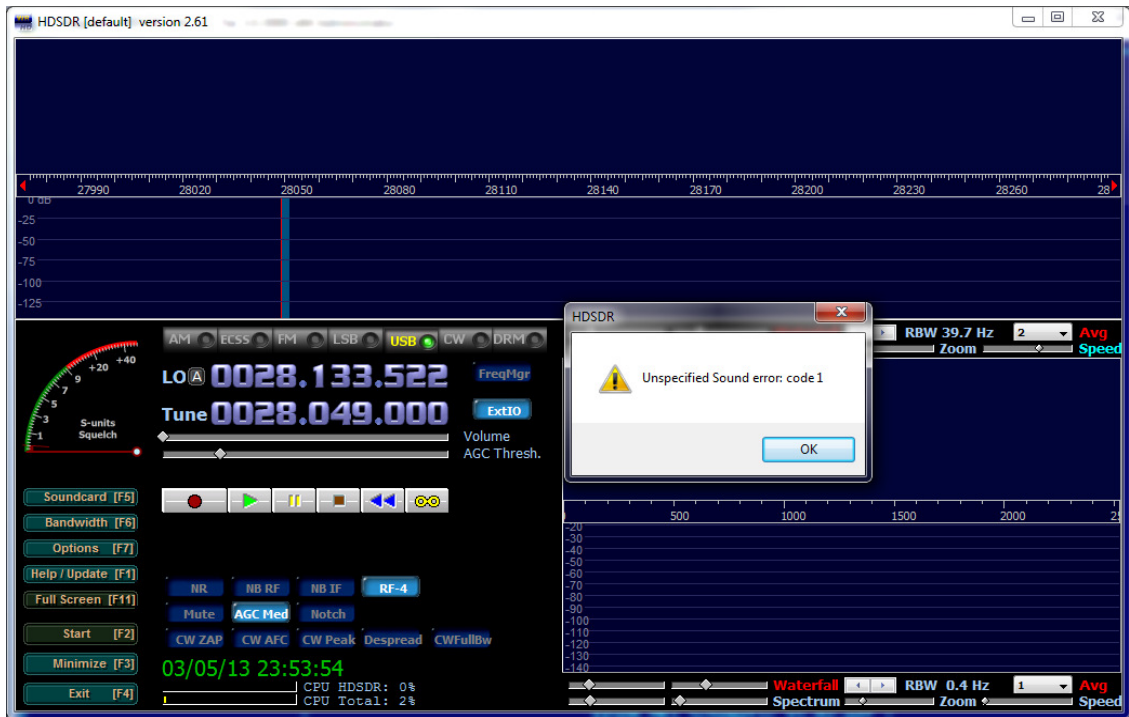

Figure 12 USB Audio Device Wave Format error message on Windows 7.

With latest AFEDRI SDR-Net firmware versions this massage shows that you did not install the SDR_Control box dll as plugin for HDSDR!!! To install SDR_Control box as HDSDR plug-in you should:

- Exit HDSDR

- copy all files from SDR_Network_Control_Box directory to folder where HDSDR installed (for example to C:\Program Files\HDSDR).

- Restart HDSDR application.

When SDR_Control is installed as plug-in it should be started automatically when users starts HDSDR application, you should not start is manually!

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If you see System error message "Unspecified Sound error code 1", when pressing "Start" button, this error appearing when USB port where you connect the SDR is not able provide the sample rate that SDR configured (250kHz by default). (See. **Figure 13.**)

Figure 13 "Control Panel" -> "Hardware and Sound" window

This problem can be solved using one of two ways:

- Try to connect SDR to alternative USB port

- Try to decrease AFEDRI SDR-net USB sample rate to lower value (you can try 192000 Hz or 125000 Hz).

The USB sample rate value can be changed using next sequence (See. **Figure 14.**):

- Run SDR_Control utility

- Switch to "Command shell" tab

- Input the new sample rate value in "Command Input" edit box.

- Press "Save sample rate" button

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- To make the new value actual for OS, restart SDR, pressing "Reset SDR" button that located on "About" tab or disconnect USB cable from PC and connect it again.
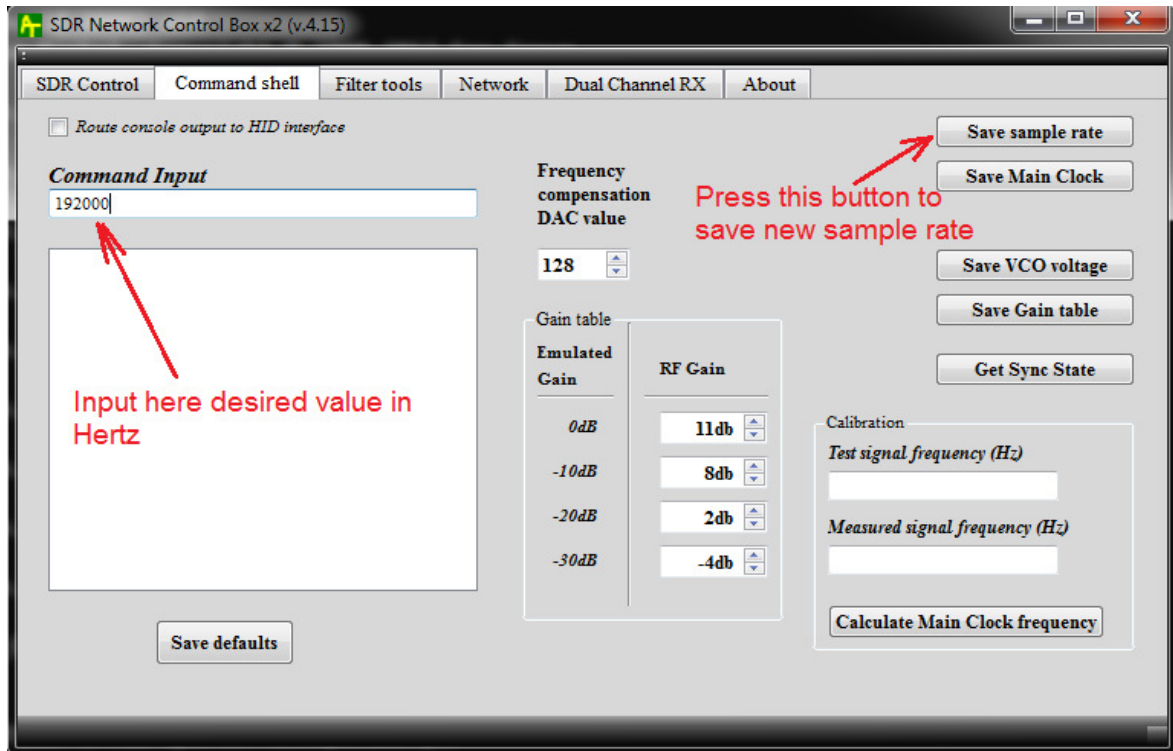

Figure 13