

SoDiRa – Software-Radio

Specification

Version of this document and SoDiRa software: 0.100 preview

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Common Informations

Program name:	SoDiRa
Program Version:	0.100 Preview
Development Tools:	Delphi 5.0, Visual Studio 6.0 for c++ library abstractions
External Libraries used for main program:	nothing used, 99.99% selfmade coded
other used External Libraries:	libfaad, libcelt for Audiodecoding

Supported receiver

Internal direct supported receiver:

Sound card as real data based VLF receiver	tested
Sound card as real or IQ data based IF stage receiver	tested
Sound card with Elektor DRM 03/2004	(not tested since version 0.099)
Sound card with DRT1	(not tested since version 0.099)
Sound card with DRB30/DRB32	(not tested since version 0.099)
Sound card with Elektor USB IQ 05/2007	(not tested since version 0.099)
Sound card with HCJB Pappradio Version 1	(not tested since version 0.099)

ExtIO supported receiver:

SDRPLAY RSP1	tested with ExtIO_SDRplay_RSP1.dll low border 100 kHz and high border 2000 kHz should be used to prevent dll messages no correct feedback of tuned frequency value
SDRPLAY RSP2	(not tested)
RTLSDR USB Stick	tested
Perseus SDR	tested with ExtIO_perseus2v4a release
FUNcube Dongle	tested
FUNcube Dongle Pro+	(not tested)
Airspy mini	tested with extio_airspy_cmake_mgw-v1.0.5.dll no correct feedback of tuned frequency value
Airspy R2	(not tested)
HackRF	(not tested)

If you can use SoDiRa with your receiver, please send me a message.

Tuning

Tuning accuracy and resolution <ul style="list-style-type: none">• exactly to 1 Hz• only be possible if receiver support correct feedback of tuned frequency• receiver tuning offset will be automatically corrected by an software tuning offset• some ExtIO receiver will give incorrect feedback
Tuning range <ul style="list-style-type: none">• 0 Hz to 999,999,999,999 Hz (1 Thz minus 1 Hz) plus an offset caused by the ADC bandwith• The tuning range is depend on used receiver hardware
Manuell mode <ul style="list-style-type: none">• frequency is choosed by user action
Auto IF tuning <ul style="list-style-type: none">• frequency is chossed by an automatic spectrum peak detection• tuning speed depends on receiver
Receiver tuning <ul style="list-style-type: none">• receiver frequency will be changed
Software tuning <ul style="list-style-type: none">• software frequency offset will be changed within the RF/IF1/ADC stage tuning range• 10 steps per second speed
Shift tuning <ul style="list-style-type: none">• Receiver and software frequency will be changed together, the sum of booth is constant• Tuning station will be halted but some interferences will be shift out
Search tuning <ul style="list-style-type: none">• Receiver frequency will be decreased or increased by a choosing step until a new station will be found• stop point is detected by a spectrum band power detection
Direct enter tuning <ul style="list-style-type: none">• frequency can be direct entered by keyboard buttons
Digit tuning <ul style="list-style-type: none">• single frequency digit can be increased or decreased

Frequency manager tuning

- Frequency changing by choosing an item of the frequency manager

Signal processing working principle

Signal processing is divided into 3 stages:

1. ADC input signal is named to the RF / IF1 / ADC stage
 2. Demodulator input signal is named to the IF2 or Demodulator stage
 3. Audio signal stage
- the ADC input signal will be decimated / resampled to the Demodulator input signal samplerate
 - the demodulator output signal will be decimated / resampled to the audio signal samplerate

Within this 3 stages will be done the processing described below.

RF / IF1 / ADC stage processing

useable sample rates

- min 44100 Hz
- max sample rate is depend on host CPU power
- 5 MHz sample rate at 2 Ghz Intel CPU is tested
- all samplerate values between min and max are allowed

processing modules

- decimation and sample rate conversion to IF2 / demod stage sample rate
- frequency shifting
- impulse noise supression
- IQ balance controlling
- DC filtering
- spectrum calculation for graphical viewing

IF2 stage processing

sample rates

- 48k, 96k, 192k, 384k
- manually chooseable or automatically chosen by demodulation bandwidth and lowest CPU consumption

processing modules

- bandpass filtering / lowpass filtering
- demodulation / decoding
- level calculation
- spectrum calculation

demodulation modules

- Simple: high abstraction radio
- Universal: high configurable radio
- FM + RDS: RDS decoder and broadcast FM Radio
- DRM: DRM decoder for DRM30 and DRM+
- DCF77: Decoder for the DCF77 time signal
- RFSensors: Decoder for the 433 MHz and 868 MHz RF sensors

Audio stage processing

Samplerates	48k, fixed
Processing modules	low pass filtering high pass filtering DC filtering white noise suppression impulse noise suppression automatic gain control (AGC) manually gain control

Simple Receiver Module

AM

Demodulator bandwidth: 10 kHz

Demodulator type: envelope demodulator

Audio bandwidth: 5 kHz

DC filter: on

AGC: RMS mode, medium speed

Version history:

0.100 Completely new internaly and GUI designed version