



WIR VERSTEHEN DIE ZEICHEN DER ZEIT  
KEEPING PACE WITH THE SIGNAL OF TIME

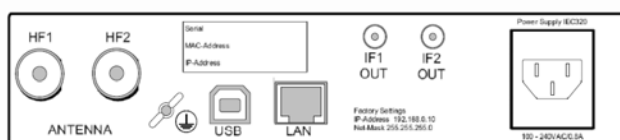
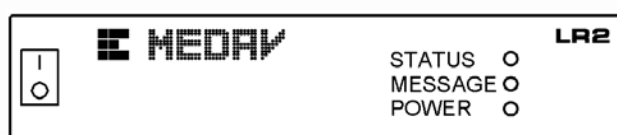


# LANReceiver Tuner LR2 + Software

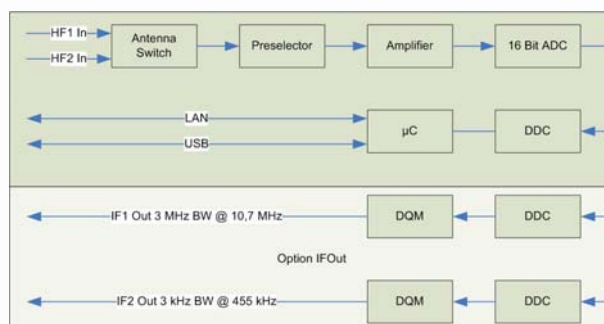
HF Digital Tuner with  
Integrated Wideband ADC  
and Digital IF Output to LAN and USB  
Operating Software

## Overview

- Software Defined Radio (SDR)
- Frequency range:  
LR2-D2: 100 kHz - 30 MHz
- IF bandwidth: 8 kHz - 500 kHz
- Low noise figure typical 9 dB
- High Spurious Free Dynamic Range (SFDR) > 85 dB
- High input sensitivity
- High in-band dynamic range
- Direct RF sampling of HF signals
- Output of digital complex baseband data (CBB) up to 500 kHz bandwidth
- Integrated Digital Down Converter
- Broadband power measurement before A/D conversion allows exact AGC control



- Deliverable as half 19" table housing
- Two single tuners can be combined to a standard 19" 1 U size housing using the optional rack mount kit
- Robust design
- Embedded 16 bit ADC and high speed signal processing core
- Preselector filters to suppress out-band signals
- Low power consumption less than 25W
- Analogue IF output options:  
IF1: BW = 3 MHz at 10.7 MHz  
IF2: BW = 30 kHz at 455 kHz



Simplified LR2-D2 Block Diagram

# LR2 Technical Specifications

## GENERAL

<b>Analog to Digital Converter</b>		
Sampling Rate		66.66 MS/sec
<b>Digital Post Processing</b>		
Digital Down Converter		
Bandwidth over LAN		Selectable: 8, 15, 30, 60, 120, 150, 250, 500 kHz
Bandwidth over USB		Selectable: 8, 15, 30, 60, 120, 150 kHz
<b>Digital Output via LAN</b>		
Complex Baseband	Maximum Data Rate	16 bit signed integer, I and Q samples approx. 2.5 MByte / sec
<b>Digital Output via USB</b>		
Complex Baseband	Maximum Data Rate	16 bit signed integer, I and Q samples approx. 750 kByte / sec
<b>Operating Temperature</b>		0°C to 50°C
<b>Storage Temperature</b>		-40°C to 70°C
<b>Humidity</b>		Max. 85%, non-condensing
<b>Power Consumption</b>		85-264 Volt AC, 50-60 Hz, 25 Watt
<b>Mechanical Table Housing</b>		
Width		215 mm
Height		1 RU (Rack Units)
Depth		320 mm
Weight		1.6 kg
<b>Mechanical 2 Tuners combined with option LR2-RMK</b>		
Width		19 inch
Height		1 RU (Rack Units)
Depth		322 mm
Weight		3.2 kg
<b>Interface</b>		
RF Inputs		HF1 and HF2, N, Female, 50 Ohm
IF1 and IF2 Output (optional)		SMA, Female
LAN		RJ45, (100 Base-T)
USB		USB Socket
Power Supply		IEC 320
<b>Standards</b>		
MTBF		> 10.000 hrs (MIL-HDBK)
Compliant to		EN 61010-1:2002 / EN 61000-6-2:2002 / EN 61000-6-3:2002
<b>Frequency Range</b>		100 kHz - 30 MHz
<b>Tuning Resolution</b>		1 Hz
<b>Bandwidth</b>		8 kHz to 500 kHz
<b>Tuning Accuracy</b>		1 Hz
<b>RF Gain</b>		20 dB min.
<b>Max. Attenuation</b>		30 dB
<b>Attenuator Stepsize</b>		10 dB
<b>Gain Control</b>		AGC, MGC

<b>Input Sensitivity</b>	
AM, 6 kHz BW, Mi=0.5, Fm=1.0 kHz for 10 dB /SNR	-108 dBm
SSB, 2.7 kHz BW, for 10 dB /SNR	-116 dBm
FM, 15 kHz BW, 5 kHz Deviation, Fm=0.4 kHz for 20 dB /SNR	-103 dBm
<b>Oscillator Phase Noise</b>	
HF @ 1 kHz offset	-120 dBc/Hz typ. -110 dBc/Hz max
HF @ 10 kHz offset	-130 dBc/Hz typ. -110 dBc/Hz max
<b>Maximum Input Power</b>	+14 dBm with input attenuator active
<b>Input IP3</b>	> 35 dBm (0.3 MHz - 30 MHz) 40 dBm typ.
<b>Input IP2</b>	> 75 dBm 85 dBm typ.
<b>Noise Figure</b>	9 dB typ.
<b>Image Frequency Rejection</b>	Due to digital complex mixer not applicable
<b>IF Rejection</b>	Due to direct HF sampling technique not applicable
<b>Preselector</b>	11-Band
<b>SFDR (referred to full scale of A/D converter)</b>	> 85 dB
<b>Oscillator Reradiation at antenna input</b>	< -110 dBm
<b>Spurious Response</b>	< -110 dBm (1 – 30 MHz)

### HF - 11 Band Preselector

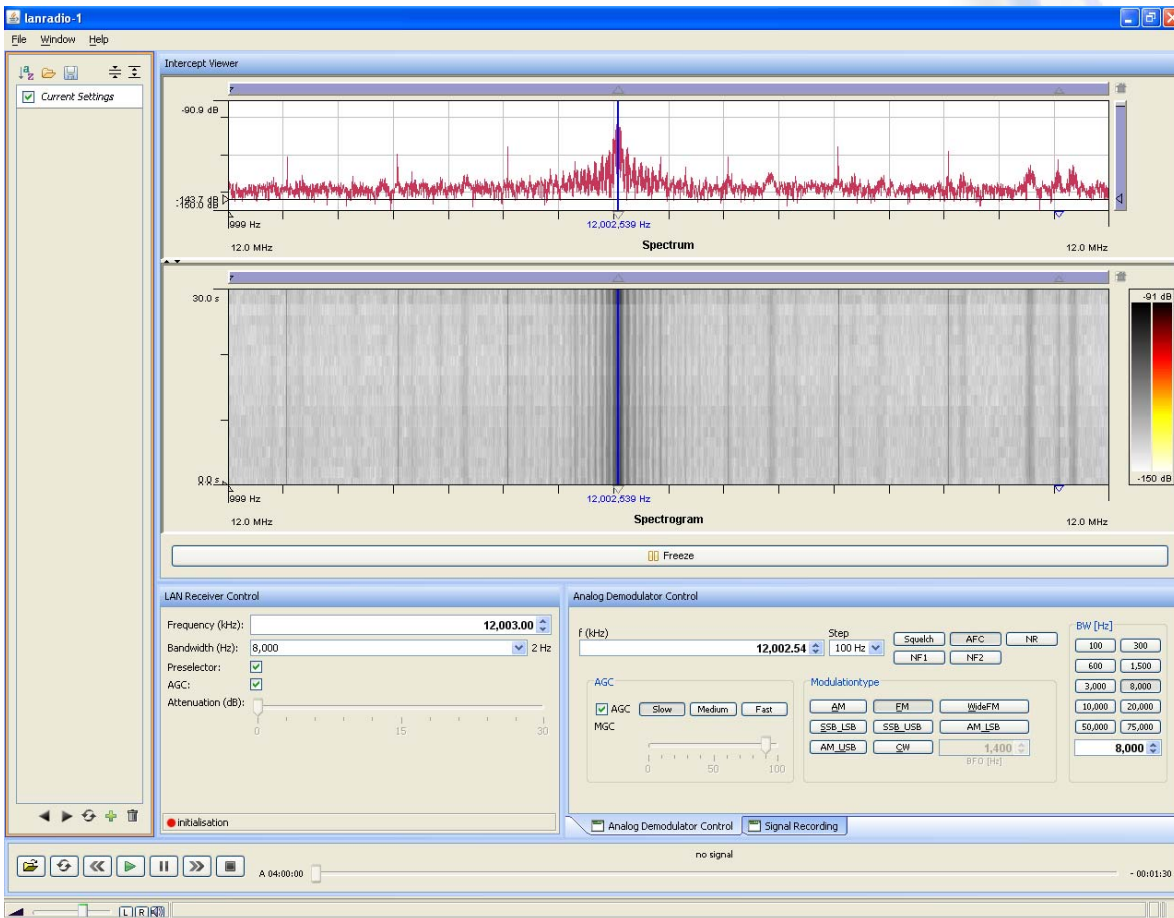
Band 0	Preselector bypass	
Band 1	0.1 MHz	0.5 MHz
Band 2	0.1 MHz	1.5 MHz
Band 3	1.5 MHz	2.0 MHz
Band 4	2.0 MHz	3.0 MHz
Band 5	3.0 MHz	5.0 MHz
Band 6	5.0 MHz	7.0 MHz
Band 7	7.0 MHz	10.0 MHz
Band 8	10.0 MHz	13.0 MHz
Band 9	13.0 MHz	17.0 MHz
Band 10	17.0 MHz	22.0 MHz
Band 11	22.0 MHz	30.0 MHz

### Hardware Options

<b>LR2-IFOut</b>	IF1 and IF2 Output
<b>LR2-RMK</b>	Rack Mount Kit, combines two LR2 Tuners into an standard 19 inch 1 U housing

# Control Software

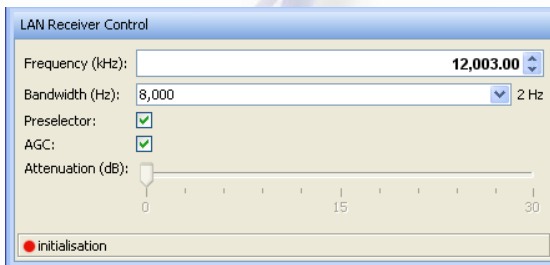
The software is used to control the tuner.



Core features of the software are:

- Controlling the tuner
- Navigating within the signals
- Controlling the analog demodulator
- Managing different tuner and program setups
- Controlling AGC and MGC (automatic and manual gain control)
- Narrowband recording
- Wideband recording and replaying
- Using preselectors
- Visualising signals (spectrum, spectrogram)

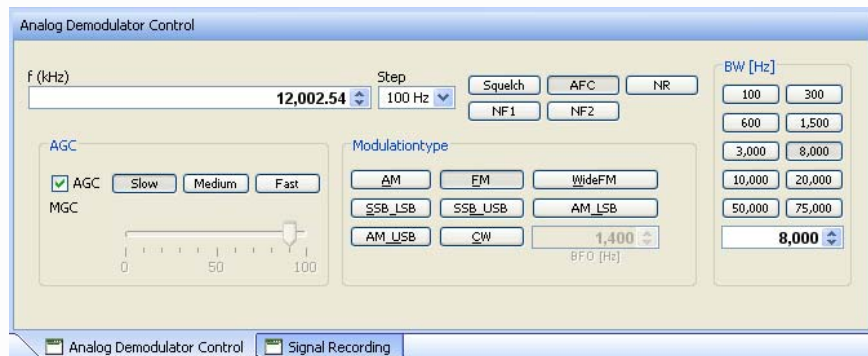
## Controlling the tuner



The software is used to control the tuner. The tuner outputs an IF signal. After the connection to the tuner is set up, the software allows to set the tuner frequency and bandwidth, and to set the gain manually or automatically.

## Controlling the analog demodulator

The analog demodulator demodulates analogue signals contained in the IF signal from the tuner. To do this, demodulator frequency and bandwidth, different modulation types, and filters can be applied.



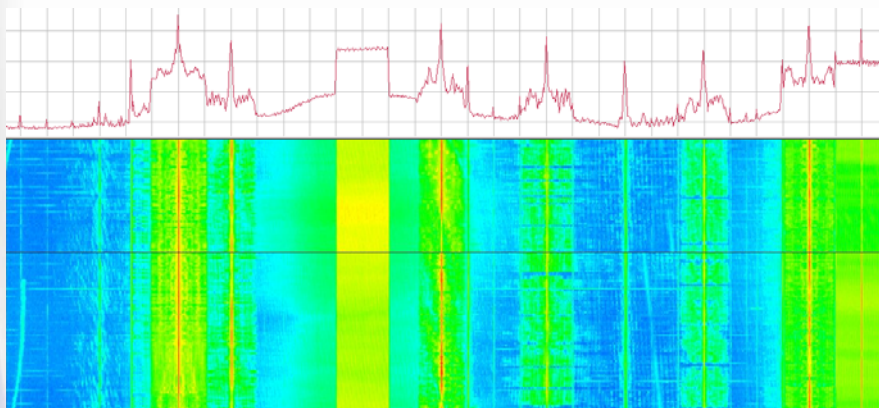
The AF output of the analog demodulator is audible over the PC speakers and/or headset.

## Using preselectors

Usage of the LR2 preselectors can be enabled and disabled. The preselectors are used to suppress outband signals.

## Visualising and navigating within the signals

The program shows the wideband signal graphically as spectrum and spectrogram.



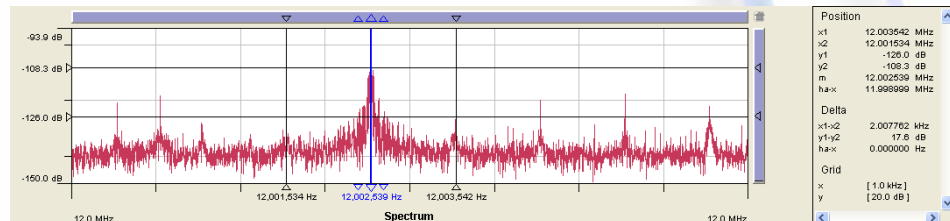
The instruments to navigate in the graphics, as known from common graphic processing applications (moving, zooming in and out, etc.) can be applied easily.

The program allows for navigation in both time direction and frequency direction, and there are several tools as buttons and scroll bars for zooming and step wise scanning the signal (step mode).

Additionally, the software allows to set the demodulator center frequency by a special cursor that can be moved through the spectra.

## Measuring

The software allows for measurements within in the signals.



Different types of measurement cursors can be moved over signal segments, which can be zoomed in and out. It is easy to find the difference between peaks and channels or the time distance of bursts or hops.

## Managing different tuner and program setups

If the tuner is once set up to receive and demodulate a certain signal, it may be of interest, to document the settings or to transfer these settings to another computer or to store them for later reuse.

For these cases, the software provides easy-to-use means to save and restore program settings as set-up in files.

## Recording

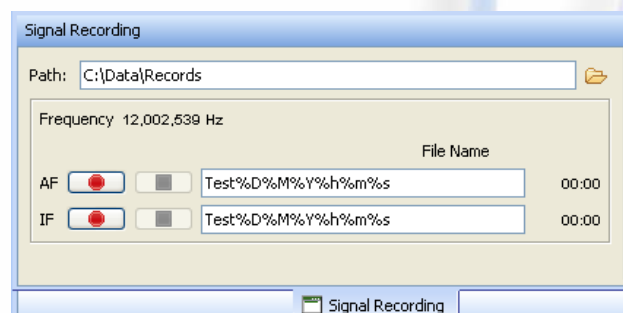
The software allows to record wideband and narrowband signals.

### Wideband recording and replaying

While it is received, the wideband signal can be recorded for further processing and analysis. The stored signal can be reloaded for visualisation and navigating and demodulation of contained narrowband signals.

### Narrowband recording

The demodulated signal can be recorded while it is received. The resulting AF file can be played by the WAVE-file player of the operating system and/or post processed by other audio processing software.





## **Our Goals**



### **Technology**

... in the development and in the company management is state-of-the-art and represents a high level.



### **Quality**

... in all divisions of our company is considered as the pre-requisite for a risk-free and successful cooperation with our customers and business partners.



### **Position in the market**

... is affected by the experience made in the signal and information processing. We are ready to face up to the competition



### **Service Offering**

... is comprehensive, complete and tailored to suit the needs. As a systems vendor, we offer standard devices, systems and services



### **Employees**

... form the roots of the company and render the services necessary for maintaining and expanding the technical basis and a trustful cooperation



### **Growth**

... on a stable technical and economical basis within the country and outside is our aim



### **Trust**

... vis-à-vis our business partners and within the own company is the basis of our business

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