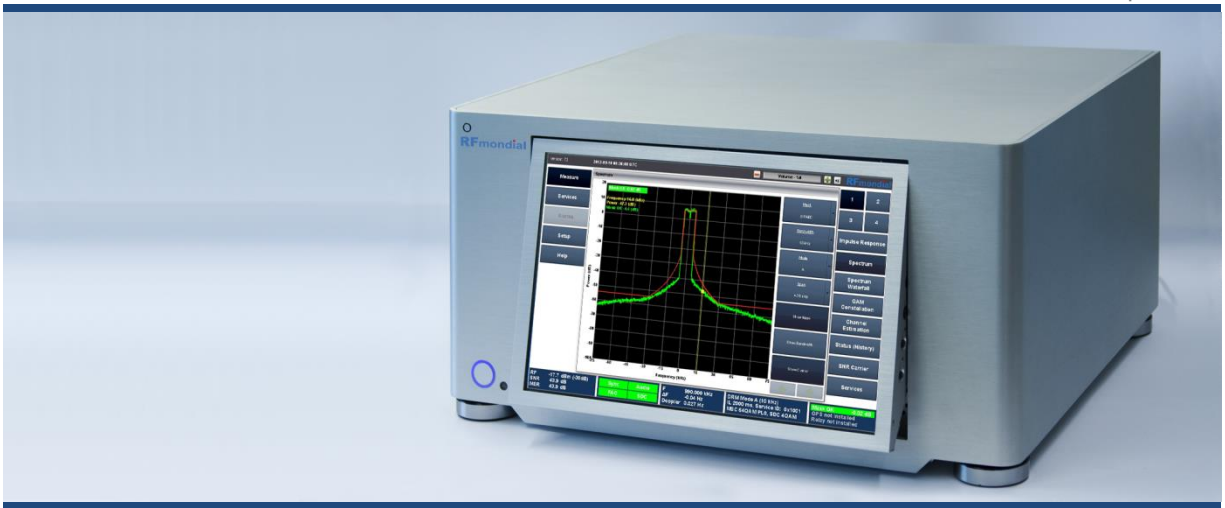
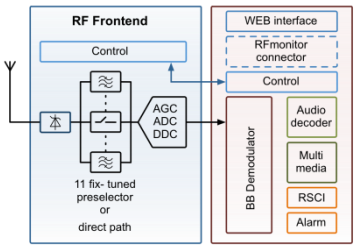


Product Line DRM Monitoring Receiver RF-SE

Overview

RF-SE is a professional digital radio monitoring and measurement receiver, which is available in different models.

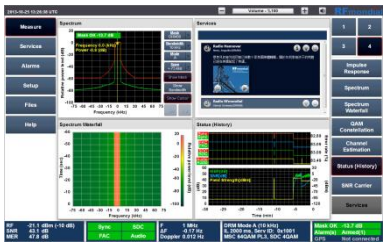
The outstanding reception characteristics are based on a high-performance frontend with preselector filter banks and digital direct-down conversion system approach. The field-proven digital baseband demodulator provides access to all needed measurement and monitoring parameter. Furthermore, various modular blocks like RSCI capability, audio and data decoder, alarm feature, browser based GUI, RFmonitor connector are available to suite the specific needs of the desired application.



Specification

Basic Features

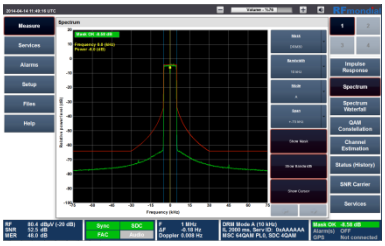
- Stand-alone monitoring receiver for reception analysis and content verification
- High-end fully digital tuner with high accuracy reference oscillator
- Field-proven demodulator for DRM (DRM30 or DRM+), AM, SSB
- Fully compliant to DRM standard (ETSI ES 201 980)
- Integrated audio and data decoder incl. HE-AACv2/xHE-AAC and all DRM data services
- Advanced GUI to evaluate receiver characteristics in real-time
- Browser based configuration and services decoding. No installation of software necessary.
- RSCI compatible to ETSI TS 102 349
- Integrated alarm system with email notification and two independent relay outputs (depending on model)
- Proven long term stability
- Firmware update via DVD or USB
- Possible integration into RFmonitor network



Advanced GUI

The RF-SE user interface is designed to provide the full experience of a modern and professional measurement device:

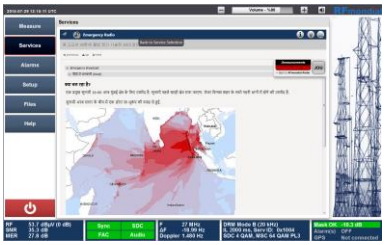
- Same browser based advanced GUI remotely and locally (if available)
- Touchscreen and mouse capability
- Proportional scaling to adapt to different screen sizes
- Either four window view or full screen display of diagrams



Application Decoder

Integrated audio and data decoding, licensed by Fraunhofer IIS:

- Browser-based selection and decoding of audio and data services
- Audio decoding: HE-AACv2, xHE-AAC, with SBR, PS, MPEG Surround Optional: HVXC, CELP
- Display of audio related information, e.g. audio rate, sampling rate, mode
- Streaming and downloading of selected audio service to remote PC
- Service and signalling decoding, e.g. service description, emergency warning feature (EWF)
- Decoding of all DRM data services and signalling, e.g. TextMessages, Journaline, SlideShow.
- Statistical information of each service



Measurements

High quality measurements on various stages of the reception and decoding chain:

- Field strength (antenna factor can be specified)
- Frequency offset
- Signal to noise ratio (SNR >45dB)
- Modulation error ratio (MER >45dB)
- Delay spread
- Doppler spread
- Error rate of synchronization, FAC CRC, SDC CRC, audio frames, PRBS

Monitoring

The following items can be displayed and monitored:

- Channel impulse response
- Power spectrum and spectrum mask compliance
- Spectrum waterfall
- QAM constellation
- Channel estimation
- History of reception status (sync, FAC CRC, SDC CRC, audio, PRBS) as well as SNR, MER, field strength
- SNR carrier spectrum
- Location of an external USB NMEA-compliant GPS receiver

RSCI Capability

The ETSI standardized RSCI (Receiver Status and Control Interface) protocol

covers the transport of receiver's status information in addition to the DRM multiplex as well as commands to control the receiver's behavior:

- Display and recording to file
- Live DCP/UDP output of RSCI
- Integration of external GPS information into rgps tag
- Control via DCP/UDP

Alarm System

Flexible, built-in alarm system with the following features:

- Two independent alarm rules using a configurable combination of spectrum mask violation, RF and SNR level, audio drop-out and level, MDI errors, wrong service ID, frequency offset
- Alarm triggering via email and/or relay outputs (depending on model)

DRM Demodulation

DRM30: below 30MHz, including the SW, MW and LW broadcasting bands

- Robustness modes A, B, C, D
- Spectrum occupancy 4.5, 5, 9, 10, 18, 20kHz
- MSC modes 16 QAM, 64 QAM, and hierarchical (HM-mix, HMsym)
- SDC modes 4 QAM and 16 QAM
- Interleaver depth 0.4s and 2s
- EEP and UEP with all protection ratios / code rates

DRM+: above 30 MHz, incl. the VHF broadcast bands I, II (FM) and III

- Robustness mode E
- Spectrum occupancy 96kHz
- MSC modes 4 and 16 QAM
- SDC mode 4 QAM, code rates 0.5 & 0.25
- Interleaver depth 0.6s
- EEP and UEP with all protection ratios / code rates

Configuration / Remote Control

- Full remote control via LAN
- Browser-based user interface
- Touch TFT display or LCD (depending on model)
- Receivers can be remotely scheduled, controlled and automatically tuned via RSCI
- Optional: CSV-based scheduler

Option DRM+ Diversity

- Second reception channel
- Advanced diversity algorithms, optimized for DRM+

Applications

- Transmitter, spectrum and coverage monitoring
- Modulation quality and parameter measurements
- RSCI (long-term) logging and analysis
- Reference device for receiver development
- High accuracy field strength measurements
- Content verification and logging
- QoS (Quality of Service) monitoring
- Mobile field trials and measurements

RF-Frontend

RF-Frontend DRM+

Parameter	Value
Input frequency range	Band I: 47-74MHz Band II: 86-108MHz Optional: Band III: 174-230MHz
Input level	-105 dBm to +20 dBm
Oscillator accuracy	<0.01 ppm Usage of external 10 MHz reference possible
Level measurement accuracy	±1 dB
RF mask-monitoring	Up to ±75 kHz

RF-Frontend DRM30

Parameter	Value
Input frequency range	100 kHz to 30 MHz
Input filtering	Fixed-tuned 11-band pre-selection filter bank as well as bypass
Input level	-110 dBm to +20 dBm
Oscillator accuracy	<0.01 ppm Usage of external 10 MHz reference possible
Phase noise at ± 20Hz	<-120 dBc/Hz
Phase noise at ± 20kHz	<-150 dBc/Hz
Level measurement accuracy	±1 dB
RF data bandwidth	40 kHz, ripple 0.2 dB
RF mask-monitoring	Up to ±75 kHz
In-channel IP3	+15 dBm (noise figure 15 dB)
Out of band IP3	+30 dBm (noise figure 15 dB)

Receiver IP Core

All components of the RF-SE product line are available as IP cores for integration into the customer's products:

- Field-proven DRM baseband decoder
- PCB reference design of RF-frontend and two-channel digital down converter
- OEM branding possible

Options

Several options can be added to the standard version of the RF-SE. All options are integrated into the RF-SE user interface, i.e. no external software installation is necessary. The options are activated via a license update.

RSCI to CSV Format Converter

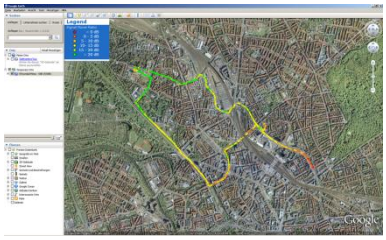
As RSCI is a binary format and it needs ETSI standard experience to be able to interpret the measurement results, an RSCI to CSV (comma separated values) format converter can be integrated into the RF-SE. The main features are as follows:

- Parsing of RSCI tags from file compatible to ETSI TS 102 349
- Writing RSCI tags in human readable format to CSV format

RSCI to KML Format Converter

As RSCI is a binary format and it needs ETSI standard experience to be able to interpret the measurement results, an RSCI to KML-file converter can be integrated into the RF-SE. The main features are as follows:

- Parsing of RSCI tags from file compatible to ETSI TS 102 349
- Writing of selected tags (e.g. audio frame error, SNR, MER, field strength) in Open Geospatial Consortium KML/KMZ format
- Classification of tag values in meaningful level ranges including legend generation
- Import to Google Earth possible



Long-term Logging and Analysis

For long-term analysis of transmitter performance, varying transmission characteristics like Ionosphere, weather, sun activity, day/night, seasons or proof of coverage, a long-term logging capability can be integrated into the RF-SE:

- All RF measurements and content information can be logged for up to 120 days
- Display of parameter over time
- Export of all measurements and content information
- Playback of audio and data services at selected time point
- Integrated into the RF-SE user interface, accessible via a web browser, no software installation necessary

Scheduler

Next to the built-in remote control interface via RSCI, a scheduler can be used for monitoring various broadcasting situations:

- CSV-based schedule list containing time slots with date/time/frequency information
- Once activated the schedule is automatically followed and – if desired – corresponding files (e.g. RSCI) are recorded

Model RF-SE12

- Full feature monitoring receiver
- DRM30/AM or DRM+ version
- Industrial chassis with touchscreen and built-in stereo loudspeakers
- Advanced user interface for local and remote usage
- Integrated audio and data decoder
- Alarm system functionality with 2 relay outputs and email notification
- Integrated RSCI logging and analysis

Mechanical

- All aluminium chassis (5RU)
- 435 x 390 x 220 mm
- 12.1“ TFT touch screen display, 1280x800 resolution
- Weight: 12 kg
- 19” rack mounting kit available
- Operating temperature: 0 - 40°C
- Humidity: 20 - 80% non-condensing

Front Panel Interfaces

Interface	Value	Comments
RF input	N-type, female, 50 Ohm	Max. input power +25 dBm
DVD	DVD/CD-ROM	
USB	USB 2.0	
Phones	3.5 mm TRS plug	Stereo audio

Back Panel Interfaces

Interface	Value	Comments
Power	Voltage range: 100-240 V, 50-60 Hz AC	Input current consumption 230 V, max. 2.5 A; 115 V, max. 5 A
USB	USB 2.0	E.g. for external GPS, keyboard, mouse
ETH	RJ45 1000Base-T Ethernet	Auto-sensing
Line OUT	3.5 mm TRS jack	Stereo audio
VGA	VGA output	Connect the provided VGA cable between these interfaces
VGA	VGA input	
RS232	UART	
Speakers	6.35 mm TRS jack	Left and right speaker output
Relays	6.35 mm TRS jack	A and B
10 MHz ref. input	3 - 4.5 V TTL	BNC
Loud-speakers	4 W, 4 Ohm, 80 Hz-20 kHz	2 built-in stereo 4” loudspeakers

Model RF-SE19

- Compact measurement receiver
- DRM30/AM or DRM+ version
- Industrial, 1RU chassis
- Advanced user interface for remote usage
- Integrated audio and data decoder
- Alarm system functionality with email notification
- Integrated RSCI logging and analysis

Mechanical

- All aluminium chassis
- Industrial 19“ 1RU, rack mountable
- 420 (483) x 220 x 44mm
- Weight: 2kg
- Operating temperature: 0 - 40°C
- Humidity: 20 - 80% non-condensing

Front Panel Interfaces

- LED status (red, orange, green)
- LCD display with status information and IP address

Back Panel Interfaces

Interface	Value	Comments
Power	Voltage range: 100-240 V, 50-60 Hz AC Optional: 12V DC	Typ. 15W, max 20W
USB	USB 2.0	E.g. for external GPS
ETH	RJ45 1000Base-T Ethernet	Auto-sensing
RF input	BNC, 50 Ohm	Max. input power +25 dBm
10 MHz ref. input	3 - 4.5 V TTL	BNC

Ordering Information

RF-SE12DRM30: Touchscreen model for DRM30/AM monitoring

RF-SE12DRMplus: Touchscreen model for DRM+ monitoring

RF-SE19DRM30: 1RU model for DRM30/AM monitoring

RF-SE19DRMplus: 1RU model for DRM+ monitoring

Option MDI: Receiving and decoding input DCP/MDI stream

Option CSV: Built-in RSCI to CSV format converter

Option KML: Built-in RSCI to KML format converter

Option IQF: Logging to IQ file (192kHz/32bit)

Option DIV: Receiver diversity (DRM+ only)

Option LOG: Long-term logging and analysis

Option SCH: Usage of a CSV-based scheduler

Option HVC: Decoding of AAC, CELP, HVXC instead of xHE/AAC

Option GPS: USB GNSS receiver with magnetic bottom

Option CAS: Transport case for all models

Option RAC: 19” rack mounting kit for RF-SE12

Option 12V: 12VDC instead of 100-240VAC for RF-SE19