



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



CRS-8000

Compact Radio Monitoring System

Off-the-Shelf Solutions for
Diverse Platforms and Applications

CRS-8000 Key Features

- Wide band technology for DF and monitoring from 100 kHz to 3 GHz (6 GHz and 18 GHz on demand)
- Correlative high accuracy five channel interferometer direction finding
- Outstanding sensitivity and dynamic range
- Recording of wideband (IF) and narrowband (IF and AF) signals
- Automated signal acquisition and processing
- Comprehensive online and offline analysis
- Modular, scalable and flexible system design
- Automatic identification of emissions
- Different antennas for different operational and environmental conditions available
- Ruggedized processor hardware available on request
- User friendly man machine interface
- Multi console operation for parallel working on different tasks possible.



The solution is based on the **SDIA** concept which reduces cost significantly. Different solutions (mechanics, integration, robustness etc.) are available. The following pictures give an impression of the different possibilities and options for antennas, mechanical integration and consoles.



CRS-8000 in a Few Words

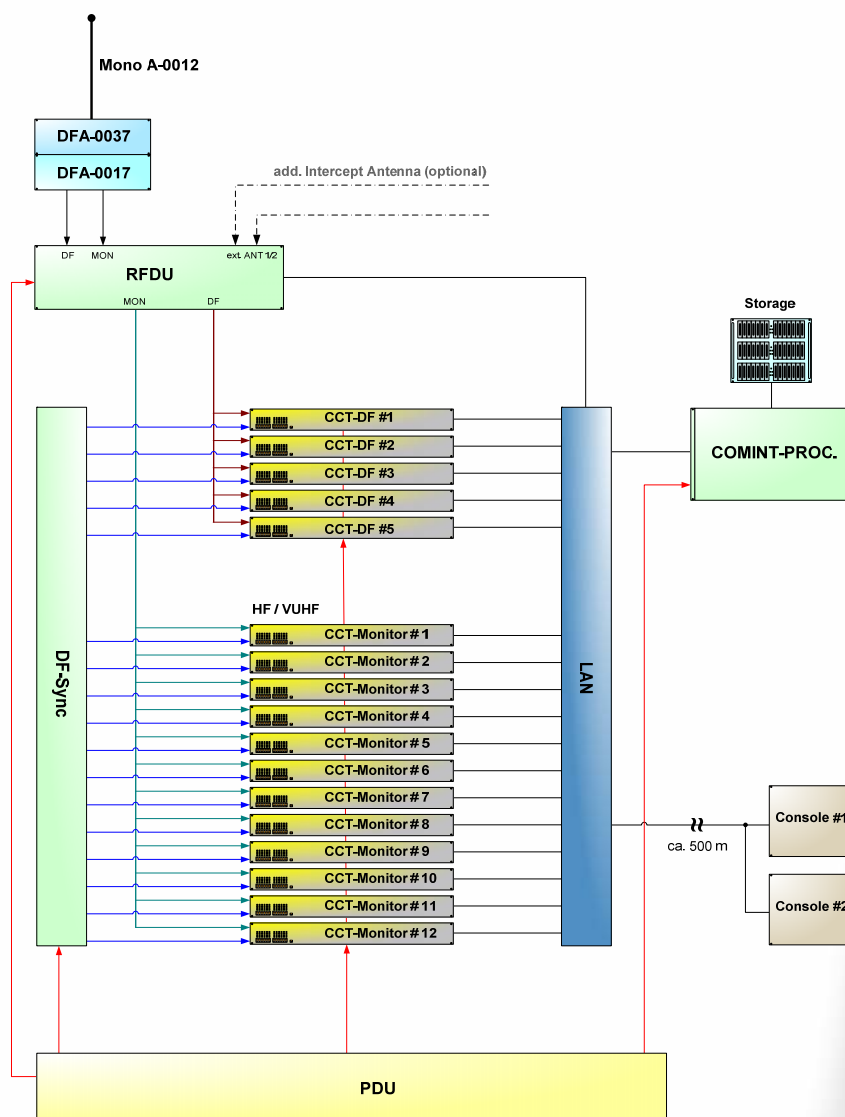
CRS-8000 (Compact Radio Monitoring System) – here “**compact**” means that CRS-8000 integrates acquisition and direction finding, HF as well as V/UHF, online and offline processing in one system including an integrated interception and DF antenna. Acquisition is realized with a configurable set of wide band drop receivers.

The system detects, collects, measures, characterises and identifies signals, while offering very **good bearing accuracy** over the full azimuth and a wide elevation.

The system includes the **DF** and **receiver** subsystems. Both subsystems use banks of identical wideband tuners digitizing and pre-processing the RF signals. These signals are fed into a high performance CRS processor via a LAN connection. The processor runs software modules for DF, segmentation, classification and recording. Demodulation and decoding is optionally available.

The system is controlled by user friendly and comprehensive **operating software** including complete analysis functionality.

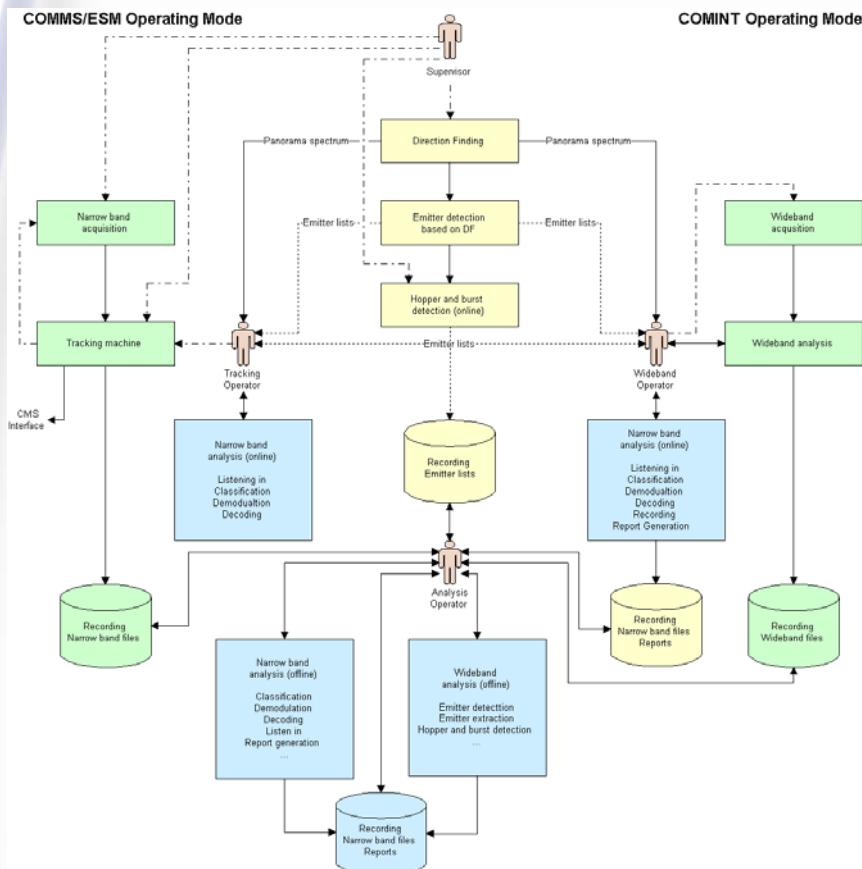
The following block diagram show the structure of the system in a configuration including 12 wide band drop receivers.



Roles and Workflow

Software controls the role-based workflow from the acquisition of the signal, processing, post-processing and storage and result management. One role can be assigned to one or more operators; one operator can perform one or more roles.

The figure shows the workflow, the roles and their tasks in an overview:



The different roles can be assigned to different workplaces. The roles and tasks are:

- **Supervisor:** sets up the missions and their parameters (frequency ranges, directions to monitor, setting operational parameters etc.)
- **Tracking Operator:** selects the emitters to be observed by the system.
- **Wideband Operator:** searches for emitters in the wideband spectrum
- **Post-processing Operator:** performs analyses on recorded signals to improve and complete results and system efficiency and reliability.

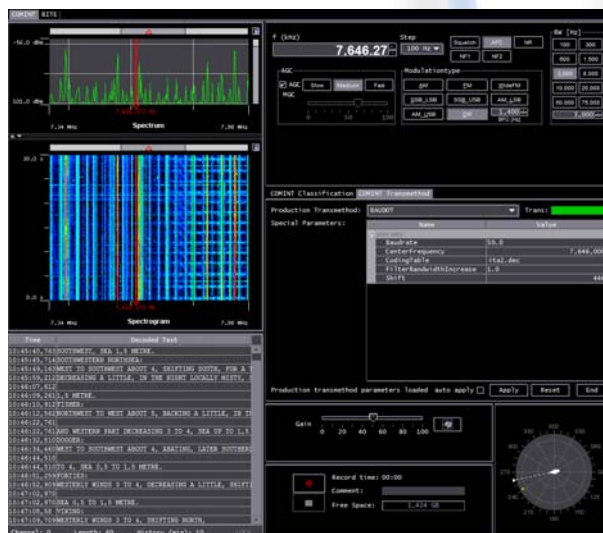
Depending on the mission, the system can be used for different tasks:

- **Search:** Search for frequencies of interest, detection and identification of emitters
- **Analysis:** Signal analysis to get detailed technical parameters of detected emitters
- **Monitoring** of radio traffic, production of message content
- **Reporting:** Condensing the results and reporting for decision.

Monitoring

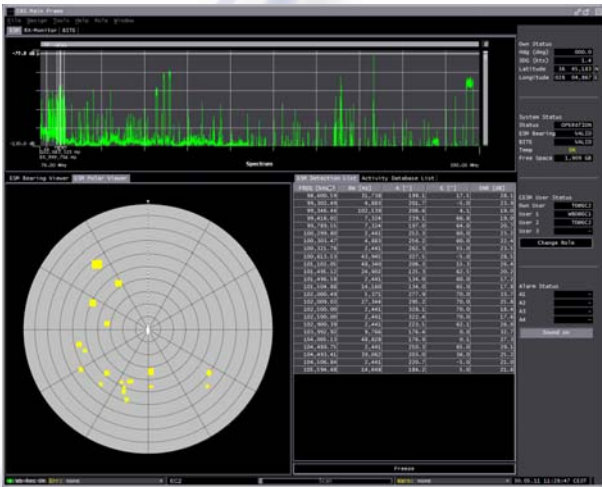
In the **monitoring mode**, the following functions are provided to the wideband operator.

- **Search** in a wideband spectrum display
- **Select** frequencies by easily clicking into the spectrogram
- **Listen-in** function to obtain an acoustic impression of the signal.
- **Positive and negative lists** allow excluding and focussing on a-priori known emitters within certain frequency ranges and other transmission parameters.
- **Automatic classification** gathers more detailed information on the signal, whereby operators can also measure out signal parameters by hand.
- **Selected channels** can be passed to “virtual hand-off receivers” for tracking, recording and further processing.
- The **monitoring displays** provide information, e.g. panorama, spectrum, spectrogram, recording, report generation, and audio control.
- **Recorded signals** can be analysed in additional displays, e.g. recording selection, time domain, phase constellation, eye pattern, database, and audio control.
- All automatically or manually achieved results are collected in **structured report messages** that can later be analysed in more detail. This is of interest especially, if the automatically generated results seem to be insufficient.
- The system allows the **retrieval and analysis of reports** using different search criteria. If a report is selected, its content is shown in forms. If information could not be gathered automatically, the operator can post process a signal recording and enter further results by hand.
- If automatic classification failed, the system automatically records a signal sample and attaches it to the report message. Offline analysis is possible.



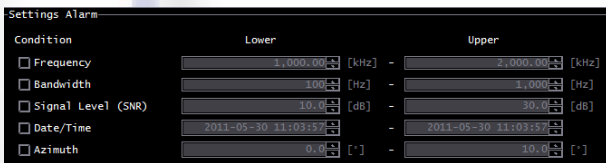
Surveillance

In the **surveillance mode**, information is displayed to the operator in graphical displays:



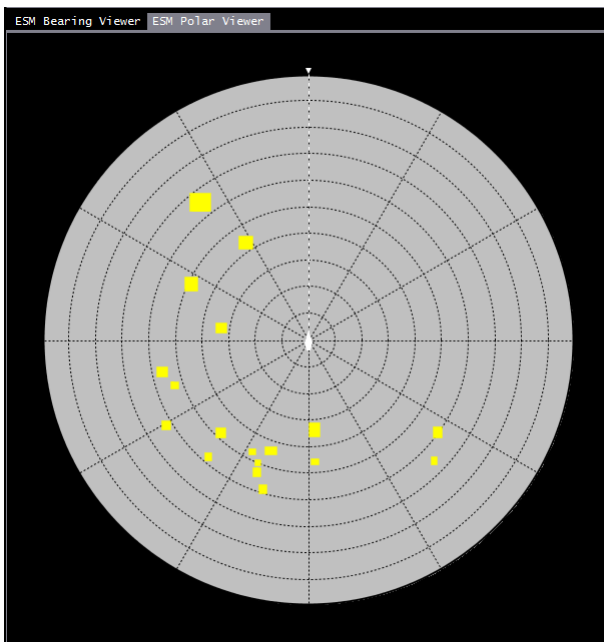
- The **polar display** shows the position of emitters at first sight. The emitters are symbolised according to their type. Priority can be colour coded.
- **Azimuth, elevation and DF quality** are visualised in spectral displays showing emissions and their direction characteristics over their frequencies. Additional measurement functions support the detailed analysis of results.

- **Automatically detected emitters** are listed in a table and symbolically displayed in the graphics. Different alarm conditions can be set, also in combination, to support the operator.
- **DF information** includes the LoB (line of bearing) of detected or selected emitters relative to true north or relative to the platform's main axis upon operator's selection.
- The system allows the **setting of alarm conditions**, e.g. frequencies, bandwidths, SNR, of emissions or emitters of special interest. If an emitter complies with the conditions, the system issues a visual and/or audible alarm.



- As many conditions as desired can be prepared, from which 4 can be monitored simultaneously.

Direction Finding

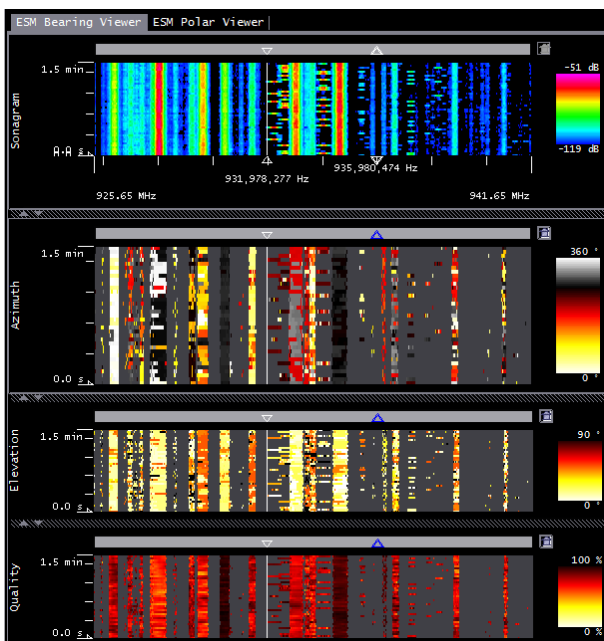


Direction finding (DF) is used to detect the direction (azimuth, elevation) from which a radio emission is received, but is not limited to this: it also improves the reliability of classification results, for example, identification of multifrequency emissions, for example hoppers.

In principle, unique direction finding is accomplished by using a minimum of three antennas arranged at different places but receiving the same radio emission from a transmitter. Specific DF antennas appear as one direction sensitive antenna only, however, internally they work in the same manner with three or more connected antennas.

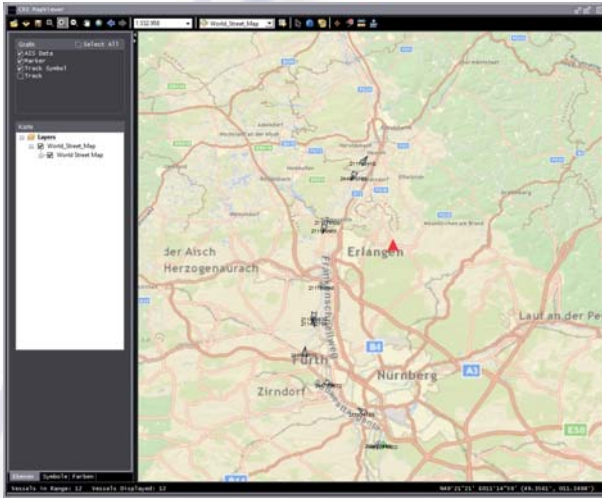
Due to the different distances of the emitter to the antennas, the radio emission needs different durations for the way from the emitter to the different antennas and thus arrives at them in different phases. From the phase differences, the direction beam (or more exactly: a curve on the earth surface) can be calculated showing the direction of the emission. Only the TDOA method (Time Difference of Arrival) uses the time difference between the signals rather than the phase difference.

The principle requires a set of synchronised tuners for DF to measure the phase differences between the single antenna elements.



For more details on direction finding, request the brochure:
"Direction Finding and Locating – MEDAV Digital Wideband DF Systems".

Map Viewer



The **map viewer** visualises direction and location finding results. The emitters found are directly placed at their location in the map. The users can assign certain symbols to them; different colours indicate a different priority. Motions of objects are indicated by a trace if the objects are tracked. The map viewer features the following.

- **Customising maps:** users can use own maps and map sets.
- **Navigation** in the maps: users can move the maps, zoom in and out, and also can directly specify different types of coordinates.
- **Multiple layers:** different types of objects are managed in different layers. Visibility of layers can be switched on and off to improve clearness and overview of the displayed information.
- **Tools for measuring:** users can read off distances between objects in the map and also the square measure between several objects in different types of coordinate systems (planar, geodesic, loxodrome, great elliptic).
- **Object management:** users can add different types of objects to the maps and place them into the map. To each object, users can add information about its category, state, add a description etc.

System Health Monitoring – BITE

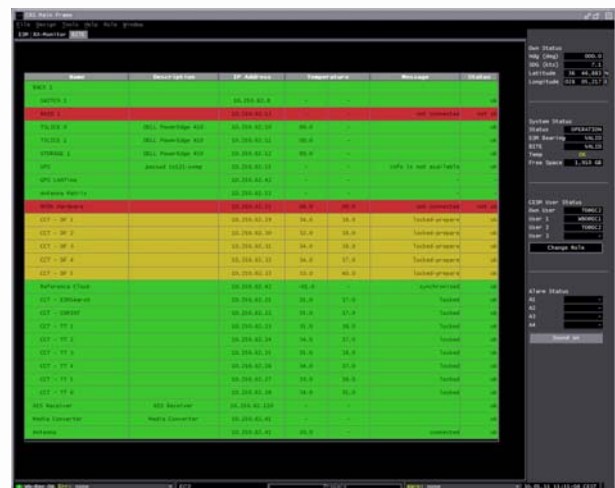
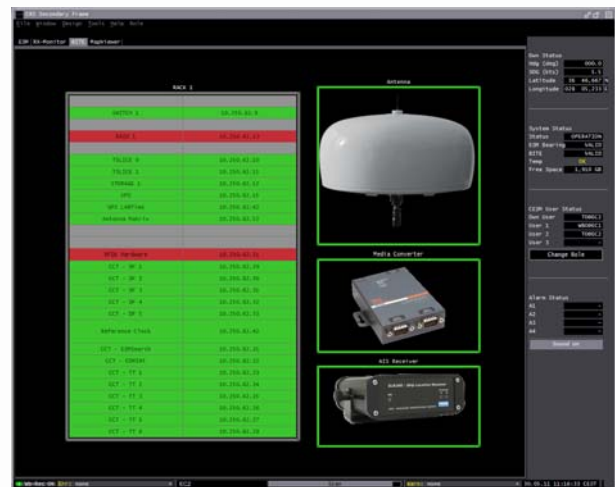
System health is a requirement for functionality and reliability of its results. Even in context of threat situations it is essential to monitor the system components and to see instantly, where problems might have occurred.

The system provides two overviews of the components and their status. The status is indicated by colour: green means the component is up and running, yellow and red indicate warnings and errors.

One of the displays shows all components in a structural view. This allows to recognize the origin of a failure and to see which components may be concerned by it subsequently.

Another display shows the components and their status location oriented, as they are arranged in the rack.

This allows to find a defective component or device immediately and to take measures to get it to work again, either by resetting, repairing or replacing.



Sensors

Corporate Policy

Technology

... in the products, development and in the company management is state-of-the-art and represents a top level.

Quality

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

Signals

Position in the market

... is affected by extensive experience gained from signal and information processing. We are prepared best to face competition.

Classification

Product and engineering spectrum

... are comprehensive, complete and tailored to meet all requirements. As a single source supplier of solutions, we offer standard devices, systems and services.

Content

Employees

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

Information

Growth

... on a stable technical and economical basis at home and abroad is our declared long-term goal.

Trust and fairness

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

Intelligence

Compliance

... with excessive sensibility and compliance with German and international export regulations we act on a worldwide basis.