RHO Elektronik GmbH THETA



MULTICHANNEL RADIO DIRECTION FINDER RT-2000

The professional standard for air traffic control, airspace surveillance and search and rescue: the RHOTHETA RT-2000 Multichannel Radio Direction Finder enables the precise location of radio transmissions – automatically, in real time, and across multiple frequency bands. Scalable and modular. Seamlessly integrated. Built to operate around the clock.



AIR TRAFFIC CONTROL UNDER PRESSURE

Air traffic is growing. Airspace is becoming more complex – and air traffic controller workload is reaching new levels. Conventional surveillance systems can track aircraft but they cannot identify who is transmitting. The RT-2000 closes this gap.

The limits of conventional surveillance

Radar and transponder-based systems provide detailed flight information. But they have a fundamental blind spot: they do not identify which aircraft is transmitting on a given radio frequency. Controllers must rely on auditory call sign recognition to associate a voice with a radar target – a process that becomes increasingly error-prone as traffic density rises.

> For the 2018-2022 period, airlines reported more than 800 instances of call sign confusion. In the same period, ANSPs provided more than 4,000 call sign similarity/confusion reports. {...} Air-ground communication generally records a higher rate of occurrences than other contributors. In 2022, air-ground communication accounted for 37% of the top seven contributors to ATM occurrences identified in the EVAIR database.
>
> From: EUROCONTROL EVAIR Bulletin No. 25, 2024

Similar call signs, poor audio quality, and readback errors add to the pressure. When an aircraft is lost or disoriented, or unable to transmit its position due to GPS failure or transponder malfunction, conventional systems reach their limits. The threat of interference adds another layer of risk. Malfunctioning equipment, accidentally activated ELT beacons, and unauthorized transmissions can disrupt communication and navigation at any time – and often go undetected until the damage is done.

RT-2000 closes the gap: It doesn‘t just hear the signal. It finds it.

WHERE RT-2000 MAKES THE DIFFERENCE



Increase situational awareness

The RT-2000 automatically displays the bearing and geographic location of the transmitting aircraft on the radar screen – making call sign identification faster, more reliable, and less demanding for controllers under high traffic loads.



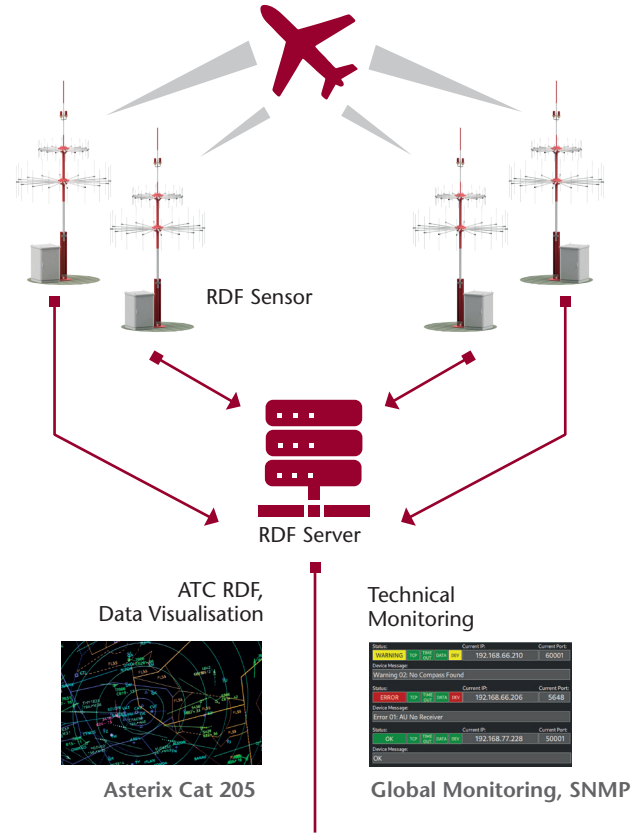
Reduce call sign confusion

Similar call signs, poor audio quality, and readback errors are a persistent source of risk. By instantly localising the source of a transmission, the RT-2000 eliminates ambiguity and helps resolve misunderstandings before they escalate.



Assist in navigation

When an aircraft is lost or disoriented, the RT-2000 determines its location from radio transmissions alone – without GPS, transponder, or any other position data. Particularly valuable for smaller airports without radar coverage, it provides reliable QDM guidance and cost-effective navigation support.



- With its modular and scalable architecture, RT-2000 is adaptable for both local ATC centers and nationwide RDF networks.

HOW THE RT-2000 WORKS

The RT-2000 uses the Doppler principle to determine the direction of any radio transmission within its frequency range. Bearing data from one or more RDF sensors is fed to a central RDF server in real time. One sensor delivers a bearing line. Multiple RDF sensors triangulate an exact position.

1. **Receive & Decode:** The system simultaneously monitors up to 92 channels across the full frequency range, capturing radio transmissions with a minimum signal duration of just 50 ms.
2. **Calculate & Locate:** For each transmission, the RT-2000 calculates a precise bearing. Where multiple RDF sensors are deployed, cross-bearings determine the geographic location of the transmitting aircraft.
3. **Display & Integrate:** Results appear as bearing lines and precise locations on the radar screen or are transmitted via ASTERIX CAT 205 or JSON API to existing ATM systems.
4. **Monitor & Manage:** The DF Commander MK2 software gives operators full remote control of all connected RHOTHETA RDF sensors from a single interface. SNMP-based real-time monitoring captures the network topology, infrastructure components, and system status, enabling the assessment of system availability as well as immediate fault detection and resolution in plain text.

The RT-2000 RDF System is designed for **high availability and reliability**. It supports comprehensive and individually configurable redundancy concepts at the system and network levels, thereby ensuring uninterrupted operation even in the event of component or connection failures. This makes the system suitable for continuous operational use within an ANSP environment.

High-precision direction finding with 1° RMS bearing accuracy

Scalable architecture from single airport to nationwide RDF network

Seamless integration into existing ATC and surveillance systems

Provide a backup in emergencies

GPS failures, transponder malfunctions, and situations where an aircraft cannot report its position are precisely the moments when the RT-2000 proves its value. It enables controllers to locate and guide aircraft through critical situations using radio signals alone.

Detect and locate interference

Malfunctioning equipment, accidentally activated ELT beacons or unauthorized transmissions can disrupt operations at any time. The RT-2000 continuously monitors all transmissions and can pinpoint interference sources immediately – enabling swift corrective action.

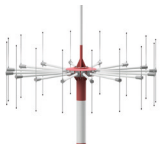
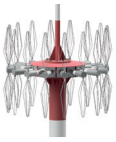
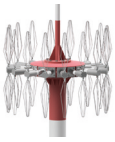
Save lives in SAR operations

The RT-2000 monitors radio transmissions, including those from aircraft invisible to conventional surveillance. The ability to precisely locate ELT signals is vital for search and rescue – providing critical support when every second counts.

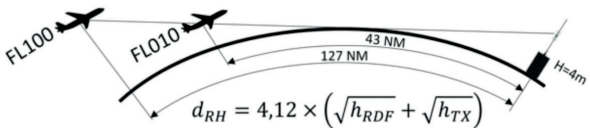
System Characteristics*

PARAMETER	CONDITION	DATA
DF Method		Doppler
Number of DF Channels	Simultaneous operation	Up to 92
Frequency Range	Full DF range	117.975 – 470.000 MHz
	Air band VHF	117.975 – 137.000 MHz
	Air band UHF	225.000 – 400.000 MHz
	COSPAS-SARSAT	406.000 – 406.100 MHz
Channel Spacing		5 kHz / 8.33 kHz / 12.5 kHz / 25 kHz
Bearing Sensitivity	for ± 2° fluctuation	≤ 5 µV/m / 3 µV/m typ.
Bearing Accuracy	Antenna depending, Measured in undisturbed wave field, with unmodulated signal, with sufficient signal strength	≤ 1 ° RMS
Bearing Resolution		0.1°
Minimal Signal Duration		50 ms
Operating Temperature Range	Bearing Channel	-40°C ... +55°C
	RDF Antenna	-50°C ... +80°C
Service life		15 years

Antenna Options*

ANTENNA TYPE	VHF WIDE APERTURE	UHF MEDIUM APERTURE	WIDEBAND MEDIUM APERTURE	VHF SMALL APERTURE	WIDEBAND SMALL APERTURE
Antenna view Channels					
Frequency range	117 – 174 MHz	225 – 470 MHz	117 – 470 MHz	117 – 137 MHz	117 – 410 MHz
Number of elements	16	16	16	4	4
Diameter	270 cm	100 cm	100 cm	25 cm	25 cm
Weight	67 kg	62 kg	62 kg	10,4 kg	11 kg
Immunity to reflections	high	high	medium	standard	standard
Accuracy Resolution	typ. 0.5° RMS	typ. 1° RMS	typ. 1° RMS	typ. 1° RMS	typ. 1° RMS
Max. Wind Speed	275 km/h	275 km/h	275 km/h	275 km/h	275 km/h

RDF Coverage range at flight levels:



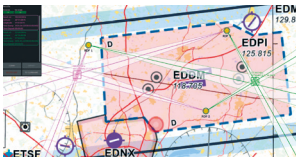
* The information contained in this brochure is for reference only. The manufacturer reserves the right to modify specifications without prior notice.

RT-2000 – Perfect when paired with:

► Local Homing Display

Fits even in small workspaces (on a 10-inch monitor) – integrable in existing panels: The target acquisition display shows bearing information in real time and visualizes bearing direction, reference data, and signal quality in a display tailored to the air traffic controller.



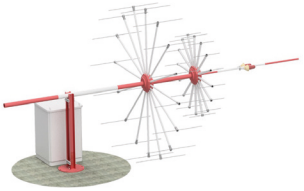


► DF Commander MK2

Software for the remote control, monitoring and integration of radio direction finder systems into ATC network architectures.

► DF Antenna Mast

The mast design enables easy access to the antenna, allowing for convenient maintenance and servicing operations.



This brochure contains AI-generated images.



RHOTHETA RT-2000: BUILT FOR SAFETY

Rev 2.00

LOCATE WHAT RADAR CANNOT LOCATE.

- Determines the bearing and position of radio transmitters fully automatically
- Delivers precise location even when GPS and transponder data are malfunctional or not existing (e.g. Microleight Aircrafts)
- Supports lost aircraft and emergency navigation
- Identifies sources of interference and unauthorized transmissions (Homing)

PRECISION DATA FOR SAFE DECISIONS.

Creates a reliable foundation for

- Faster call sign identification and reduced controller workload
- Targeted navigation assistance in critical situations
- Immediate interference detection
- Life-saving support in SAR and emergency operations

SCALABLE. INTEGRATABLE. CERTIFIABLE.

- Modular architecture for single airports and nationwide RDF networks
- High availability through modular redundancy options
- Seamless integration via ASTERIX CAT 205, JSON API and SNMP
- ED-153 certified and ICAO Annex 10 compliant
- Audio streaming, technical monitoring in real time
- Your reliable partner throughout the entire product life cycle

The Leader in Direction Finding

RHO Elektronik GmbH THETA

www.rhotheta.com

BUILT TO FIND

RHOTHETA: The Leader in Direction Finding

Comprehensive expertise, decades of specialization, and a focus on the needs and requirements of our customers: Building on this foundation, RHOTHETA Elektronik GmbH, based in Murnau, has been developing and manufacturing state-of-the-art, reliable radio direction-finding systems since 1989.

The innovative product portfolio is designed for professional applications where terrestrial radio direction finding – as a supplement to and independent of GPS – is essential for reliable, safe, and fail-safe positioning: **in maritime and airborne sector, in air traffic control (ATC), in vessel traffic services (VTS), and in search and rescue operations (SAR)** for professional maritime and air rescue.

However, we are not only a manufacturer of highly available systems, but also a reliable partner—throughout the entire product lifecycle: Our products save lives, and we take this responsibility seriously.







Talk on the air? We‘ve got the Where.

RHO THETA
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