

Needle-500

Airborne Radio Modem



***“Long Jab” Technology for
FPV-One-Way & FPV-Reusable Attack Drones***

First Person View (FPV) Drone Pilot



Needle-500

Airborne Radio Modem

For today's military, situational awareness is a critical component to the success of their mission. Threat actors readily stand by to monitor, exploit or intercept communications for malicious intent. To mitigate this threat, RIMCO has provided enhanced transmission security capabilities within our firmware for Needle-500 Data Link System.

Needle-500 with AI-based Equalizer. The minimum operating signal-to-noise ratio (SNR) is -26 dB, and the Needle-500 system operates significantly below the noise floor, ensuring high secrecy. This is achieved by cascading spread spectrum with an error-correcting code, as well as wideband synchronization circuits that operate under noise.



Specifications*

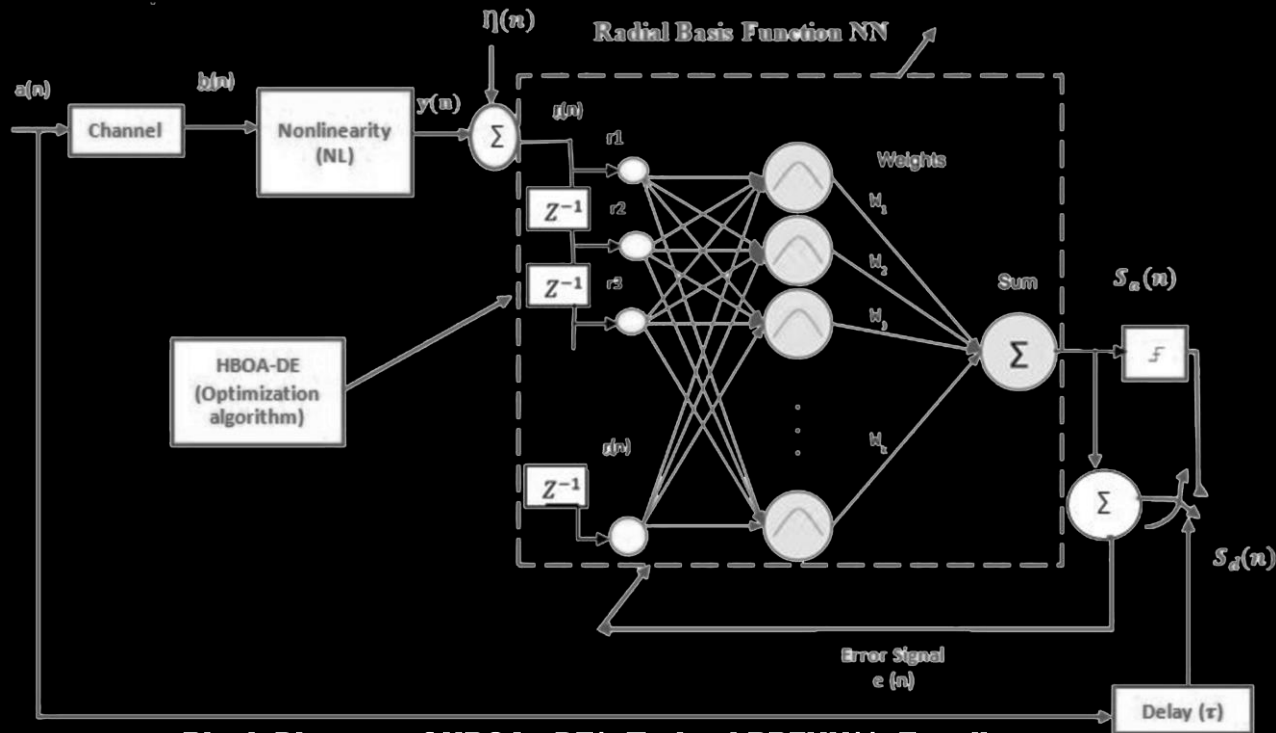
Frequency: 50 – 12000 MHz (user selection)
Spread Method: DSSS+FHSS
Modulation: SR-FQPSK
Duplex Mode: Time-Division Duplexing (TDD)
Link Rate: 10 Mbps or 45 Mbps
Data Link Range (visible):
500 km @ 10 Mbps
300 km @ 25 Mbps
200 km @ 45 Mbps
Sensitivity: - 171 dBm
Bandwidth: 80/40/20/10/5 MHz
Output Power: up to 0.1 - 5 W
Ethernet: 10/100/1000 Mbps (RJ45)
Network Protocols: MAVLink for UART/ Telnet/ SCPI
Operating Modes: Point-to-Point
Input Voltage: 12-14 VDC
Power Supply: 50 W
Environmental: -40°C to +50°C
Weight: Approx. 1400 g
Size: Approx. 189 x 78 x 50 mm
***Specifications subject to change**

RIMCO's Needle-500 Data Link System AI-driven anti-jamming. RIMCO's Needle-500 It can provide users with reliable and secure full IP clear voice, broadband data, high-definition video and visual command FPV drone and other multimedia integrated services under complex application scenarios such as fast movement and non-line-of-sight shielding.

The Needle-500 uses Low Probability of Detection (LPD) and Low Probability of Intercept (LPI) method, are techniques used in tactical communications to reduce the visibility and vulnerability of signals on the battlefield. In contested battlespace, stealth equals survivability and operational success.

Needle-500 with RBF Neural-Network (NN)-Based Equalizer

Wireless communications are susceptible to various signal distortions during transmission, including inter-symbol interference, adjacent channel interference, and co-channel interference. To make sure the signal is recovered with a minimum bit error rate, equalizers are needed at the front end of the receiver. As an optimization algorithm, a nature-inspired hybrid algorithm is applied, namely BOA/DE, which is a combination of the HBOA and DE. For Needle-500 proposes an algorithm for training RBFNNs that is applied to the problem of channel equalization.



Block Diagram of HBOA - DE* Trained RBFNN Equalizer**

LPD/LPI protects the signal itself, including its presence, direction, and vulnerability to tracking. Systems built with directional transmission, beamforming, signal power control, and frequency agility offer significant operational advantages.

Anti-jamming: As a premier anti-jamming drone payload, it utilizes frequency switching from 30 MHz to 12 GHz and high-speed hopping at over 2,000 hops per second to ensure stable links even in electronic warfare environments.

The performance of any radio communication system is affected by several factors such as: interference, and jamming caused by some other parallel networks for the purpose of decreasing the performance of a given system.

DSSS, FHSS and a hybrid approach of both techniques DS/FH are proposed to solve the problem.

Whereas DSSS generates a sequence of bit and sends them over a fixed data rate and spread the spectrum with a spreading sequence, FHSS send the data into different channels with variable data rates, and the hybrid DS/FH approach takes advantage of DSSS and uses it in multiple channels

*Hybrid Butterfly optimization algorithm (HBOA) and differential evolution (DE)

** Radial Basis Function Neural Networks (RBFNNs)

* Orthogonal frequency-division multiplexing (OFDM) / Frequency-Hopping Spread Spectrum (FHSS)

Direct Sequence Spread Spectrum (DSSS)

** UHF (300 MHz - 1 GHz) and L/S-bands (1 - 4 GHz) is a critical capability in modern communication systems

Contact: info@rimco.ru / www.rimco.ru

Needle-500

The Needle-500 is a high-performance Airborne Radio Modem manufactured by RIMCO, specifically designed for long-range, high-throughput wireless data transmission on aerial and unmanned platforms. It is engineered to maintain highly reliable communication links over exceptional operational distances, even in environments with severe signal degradation

*FPV-Reusable Attack Drones/
FPV-One-Way Attack Drones*

500 km @ 10 Mbps link rate

Air Avionic Repeater

300 km @ 25 Mbps link rate

First Person View (FPV) Drone Pilot

***“Long Jab” Technology for
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RIMCO's Needle-500/N Tactical Data Link Network for intelligence, surveillance and reconnaissance

The Needle-500/N uses Low Probability of Detection and Low Probability of Intercept method, are techniques used in tactical communications to reduce the visibility and vulnerability of signals on the battlefield. In contested battlespace, stealth equals survivability and operational success.

Needle-500/N structure:

- Needle-500/R Air repeater
- Needle-500 Airborne Radio Modem up to 25 UAV's

Shahpar-III UAV

Needle-500/R Air repeater
Frequency: UHF/L/S/Ku - Bands

Ground Control Center

300 Km @ 25 Mbps

500 km @ 10 Mbps

The total length of the land border between India and Pakistan is 2,912 kilometers

Needle-500

Remotely Piloted Aircraft System
with Night Visibility

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Remotely Piloted Aircraft System
with Night Visibility

Detection/Recognition/ Identification (Car)
Day Camera 15000 m / 8000 m / 1500 m
Thermal Camera 6000 m / 1500 m / 200 m

The logo for RIMCO.RU, featuring a stylized 'R' composed of a red square and a blue square, followed by the text 'RIMCO.RU' in red.

RIMCO.RU

Needle-500

Airborne Radio Modem

RIMCO JSC, delivers secure air-based voice, video and data applications with anytime and anywhere connectivity in the air, at sea and on land.

RIMCO advanced UAV solutions are used for critical ISR, airborne, maritime and communications to support force protection, logistics, situational awareness, disaster recovery and emergency response.

RIMCO's specialized technology includes transmission security, Communication Signal Interference Removal (CSIR™) anti-jam technology.

All Defense-grade products sold by RIMCO are designed, developed, assembled, programmed and verified within the Russia.