Assured Positioning in GNSS-Denied Environments

NJORD

The Novator Solutions NJORD MSK Modulator with Ranging Mode provides resilient, shore-based positioning corrections for maritime users operating in GNSS-denied or degraded environments. Integrating seamlessly with existing or newly established beacon infrastructure, it delivers robust navigation support using terrestrial medium-frequency transmissions, ensuring safe and continuous positioning in critical maritime regions worldwide.

Highlights

- Fully integrated rack for MSK modulation with R-Mode
- Compatible with existing and new MF (medium frequency) beacon infrastructure
- Includes high-stability clock and MSK (minimum shift keying) modulation module, GNSS and GPS antennas
- Remote network configuration and monitoring
- Designed for continuous 24/7 maritime operation

Assured Positioning Beyond GNSS

Developed for the next generation of resilient navigation systems, NJORD delivers a terrestrial alternative to satellite positioning. Based on Ranging Mode (R-Mode) technology developed under initiatives such as Interreg Baltic Sea Region's ORMOBASS project, it enhances maritime safety by providing continuous, reliable signals where GNSS reception may be unreliable or intentionally disrupted.

Flexible Deployment with Proven Performance

Designed for flexible deployment, NJORD can be installed at existing MF or DGPS beacon sites or as part of new dedicated installations. It builds upon Novator Solutions' proven MSK and R-Mode deployments, minimising integration costs while meeting modern navigation requirements. The system integrates GNSS and GPS antennas, a precision clock and MSK (minimum shift keying) and CW (continuous wave) modulators within a compact, rack-mounted unit.

Flexible Deployment at Beacon Sites

Remote operation via secure network protocols enables centralised monitoring, configuration and performance management across multiple sites. NJORD provides positioning accuracies in the range of 10 to 100 metres, depending on the availability, distance and geometry of the R-Mode transmitting stations. In the daytime, typical positioning accuracies of 10 to 20 metres are achieved. In the night, the skywave creates a second propagation path, causing fading and hence a reduction in positioning accuracy, especially at longer distances from the transmitting station.

Built for harsh coastal environments, it meets stringent maritime requirements for reliability, signal integrity and continuous operation.

NOVATOR
SOLUTIONS

Technical Specifications NJORD

MSK Modulator with Ranging Mode	
Parameter	**Specification**
Transmission Type	MF R-Mode (MSK-modulated)
Frequency Range	283.5 – 325 kHz
Frequency Resolution (MSK)	500 Hz
Frequency Resolution (CW)	1 Hz
Frequency Accuracy	< 1 μHz
Antenna Interface	50 Ω terminated, 1 V peak-to-peak
Output Power	Configurable up to site limits
Reference Clock	10 MHz and PPS (pulse-per-second)
Control Interface	Ethernet (remote network operation)
RTCM Interface	TCP / IP / RS 232
Rack Format	19" rack
Power Supply	230 V AC, 50 Hz
Operating Environment	Maritime shore station conditions
Compliance	R-Mode standards

Novator Solutions AB, part of Defensor Group, is at the forefront of RF, SIGINT and electronic warfare (EW) technology. Our highly skilled R&D team combines deep expertise in high-speed data processing and software-defined radio (SDR) technology to deliver advanced monitoring receivers and RF signal systems.

With a strong legacy in MSK (minimum shift keying) modulator technology used in previous generations of maritime positioning and communication systems, Novator Solutions brings proven experience to the development and support of R-Mode transmitters and resilient positioning systems.

Our proficiency in modular hardware and flexible software design enables us to provide customised, future-ready solutions that meet the evolving needs of the maritime domain and beyond.

Part of the DEFENSOR GROUP

Mail: info@novatorsolutions.se
Call: +46 8-622 63 50
Visit: novatorsolutions.com

NOVATOR SOLUTIONS