sat-nms Antenna Step Track System

The *sat-nms* ACU adaptive step-track system is an antenna manufacturer independent tracking system that can be easily connected to any satellite ground station antenna. The two core modules are:

- *sat-nms* ACU-ODM Tracking System
- *sat-nms* LBRX Beacon Receiver

The modular architecture and standard interfaces simplify a new or a retrofit integration. The *sat-nms* ACU Antenna Control System is an economic alternative to the systems provided by other antenna manufacturers. SatService GmbH provides upgrade kits for all antenna types found on the market and can also perform on-site system integration.

The *sat-nms* ACU-ODM Outdoor Module is the core module of a complete antenna step-track system, which tracks precisely

any antenna size on the satellite. The software does not only implement the standard step tracking mode but SatService has also implemented an improved adaptive tracking algorithm. The *sat-nms* ACU records the tracked positions over several days and calculates based on this data a mathematical model that is used to predict the antenna position. This reduces the step-track failure and provides continuous operation in case of a beacon receive failure.

In the Program Tracking Mode, the antenna follows a path defined by a file containing time stamped azimuth, elevation and polarization values. They have usually have been calculated by an external software.

The DIN Rail Module provides all necessary interfaces to any antenna. Therefore, the *sat-nms* ACU-ODM can be very

flexible adapted to any type of antenna as the motor controllers can be selected independently.

- Three motor controllers, like DC servos (for smaller antennas or frequency inverters, commonly used in larger antennas
- Limit switches, Interlock and Motor-Off Switches
- Angular detectors measuring azimuth, elevation and polarization angle, three different daughter boards are available covering most of the different angle detectors used in satellite ground stations:
  - o Analog resolver, covering the existing antennas
  - o Digital angle detectors with SSI interface
  - o A/D interface to measure the voltage across a precision potentiometer

The DIN Rail Module is normally integrated in the *sat-nms* ACU-ODU cabinet at the antenna mount, together with the *sat-nms* LBRX Beacon Receiver (also available as DIN Rail Module).
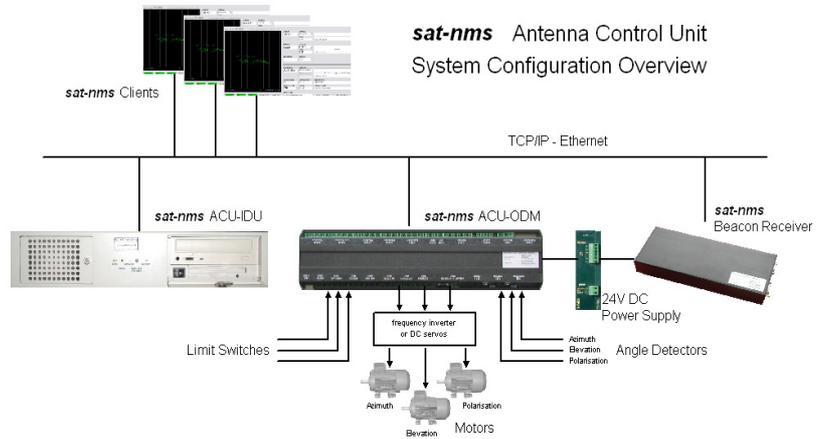
Key Features

- Adaptive Step-Tracking with self-learning Orbit Model Tracking Algorithm
- Together with *sat-nms* LBRX a complete step- track System in Cabinet at the Antenna
- Web-based, user-friendly Operator Interface
- HTTP Protocol for external MNC Interface
- High sophisticated *sat-nms* ACU-IDU Indoor Unit

Contact Information

SatService
Gesellschaft für Kommunikationssysteme mbH

Hardstrasse 9, D-78256 Steisslingen, Germany
Phone   +49 7738 99791 10,
Fax   +49 7738 99791 99
E-Mail   sales@satservicegmbh.de

www.satnms.com, www.satservicegmbh.de

The **sat-nms** ACU-ODM Module includes an integrated web server and provides its operator interface via web browser. The Ethernet is the main interface and the **sat-nms** ACU-ODM Processor includes http, ftp and telnet services for remote diagnosis and support. The system is easy to maintain and all support can be performed remotely. Furthermore, the interface to high-level Monitoring and Control Systems or a **sat-nms** ACU-IDU is provided via Ethernet and TCP/IP.

Technical Specification

Positioning / Tracking

Position Encoding	Resolver, Digital SSI and Potentiometer, scalable per Axis
Quantization Error	Resolver 16bit: 0.0055°
	SSI: 13bit: 0.044°, 16bit: 0.0055°, 17bit: 0.0028°, 19bit: 0.0007°
Display Position Resolution	0.001°
Maximum travel rate of each antenna axis	1°/sec
Interfaces to Beacon Receivers	**sat-nms** LBRX or analog Voltage Input for other Vendors Equipment
Analog Voltage Input	0 to 10V
Option Tracking Accuracy	Encoder Coupling and Alignment Error should not exceed 0.003° to achieve specified Tracking Accuracy. The Influence of Antenna Structure Thermal Error is not considered.
In step-track Mode	Better than 10% of Receive 3dB Beamwidth (RMS).
In adaptive tracking Mode	Better than 5% of Receive 3dB Beamwidth (RMS).
Position Encoding	1 LSB of Resolver / Digital Conversion
Operational Modes	Manuel Mode, Step Track, Adaptive Tracking takes into account last Days History, Program Tracking based on time stamped File Data
Number of Presets	99 Storage of **sat-nms** ACU Configuration (including **sat-nms** LBRX Beacon Receiver Settings)

System Interfaces

sat-nms MNC Interface	10-Base-T, via HTTP GET Requests
Operator Access	With Web Browser
To **sat-nms** MNC and **sat-nms** ACU-IDU	Ethernet RJ45 or RS232
To 6 Limit Switches	Opto-Coupler Input for Azimuth, Elevation and Polarization
Interlock and Motors-off switches	Opto-Coupler Input
3 Angular Detectors	Resolver, SSI or A/D Input
Motor Driver Interface	Via Opto-Coupler In- and Outputs: Motor on/off and Direction, low and high Speed
(For Frequency Inverter, DC servos etc.)	Selection, Reset Driver, Driver Fault

Electrical and Mechanical Specification, Environmental Conditions

Supply Voltage	Any Type of 230V AC Mains Voltage Single or 3-phase
Temperature Range	5° to 50° C
Humidity	Up to 90% non-condensing
Outdoor Cabinet Size (with Rain Canopy)	610 x 795 x 235 mm (WxHxD)

ACU Indoor Unit

The **sat-nms** ACU-IDU is for customers who want to have a more classic antenna step-track system, which also provides an Indoor Unit. This **sat-nms** ACU System does provide even more functionality, like data archiving, adaptive tracking, tracking on the basis of Intelsat data, two-line Kepler elements, graphical presentation of the angular and beacon level variation via time and other sophisticated features. The **sat-nms** ACU-IDU is an industrial PC incorporating digital technology for accurate antenna tracking with high reliability, flexibility and a user-friendly operator interface. This system is ideally uited for all kind of satellite ground station antennas.