In rough environments or with deployable antenna systems or when a tower installation is needed – the SKYWAN 5G Outdoor modem incorporates the full feature set of the indoor rack 1U SKYWAN 5G VSAT Satellite router but is encapsulated in a tough IP65 chassis.

The Outdoor version uses the identical software and is controlled the same way as the indoor units. The embedded MF-TDMA and DVB-S2 modem with its QoS enhanced IP Router with VRF capabilities is managed by a NMS system. It supports cascading or N+M redundancy and an internal Encryption Board with AES-256 if required.

**KEY FEATURES**
- Built for deployable terminals and cellular network installation
- IP65 chassis
- COTM support with Doppler Shift compensation and COTM antenna interface
- Display and joystick for local setup
- External AC power supply
- Options for external cooling and weather/sun protection

**YOUR 5G HIGHLIGHTS**
- Get all-in-one - the reliable ONE solution
- Gain flexible topology - star to mesh networks
- Gain space & portability - smallest unit available
- Gain powerful performance - with easy interface
- Generate savings - lower cost of ownership
TECHNICAL SPECIFICATIONS SKYWAN 5G OUTDOOR (since v1.5.113)

VSAT NETWORK

Network Topology
- Star / Hybrid / True Full Mesh, Multi-Master: fully redundant network control function with seamless switchover

Supported Satellites / Transponders
- Geostationary, transparent bent-pipes, cross-strapped transponders, HTS spot beams, meshed over HTS spot beams

Type & Number of Modem
- 1x MF-TDMA modulator, 1x TDMA demodulator, 1x DVBS2 receiver (ETSI)

Access Type TDMA
- MF-TDMA with fast frequency hopping in Tx (16 channel) and fixed Rx home channel, Beam Switching, Communication-On-The-Move (COTM) with Doppler shift compensation. Bandwidth-on-Demand DAMA / real-time / non-real-time / guaranteed throughput / QoS classes

Access Type TDM/DVBS2
- DVBS2 receiver with Adaptive Coding and Modulation (ACM) / MPE and ULE

Stacking
- Cascading of multiple units to one stack for up to 4 TDMA demodulators

Modulation & FEC Code Rates
- **TDMA (Turbo-ϕ)**
  - BPSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7
  - QPSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7
  - 8APSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7
  - 16APSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7
  - 32APSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7

- **TDMA - DVBS2(X)**
  - QPSK: 8/9, 1/2, 3/4, 2/3, 3/5, 2/5, 4/5, 3/4, 5/6, 4/5, 6/7

Eb/No (BER 10^-7, incl. 0.5 dB margin)
- QPSK 1/2: 2.4 dB
- 8PSK 2/3: 5.8 dB
- 16APSK 3/4: 8.2 dB

- QPSK 1/2: 1.2 dB
- 8PSK 9/10: 7.3 dB
- 16APSK 9/10: 8.4 dB
- 32APSK 4/5: 9.9 dB

Roll-off
- 0.4 , 0.2 , 0.1 , 0.35 , 0.25 , 0.20 , 0.15 , 0.10 , 0.05

Modem Symbolrate
- 200 ksps - 12 Msps, variable in 1 ksps increments
- Up to 45 Msps, variable in 1 sps increments

User Data Rate
- Up to 20 Mbps per Tx or Rx unit, carrier user data rate starting at ~64 kbps, slot assigned traffic starting at ~4 kbps
- Up to 80 Mbps unicast / 60 Mbps multicast user data rate on LAN port, starting at 3 kbps

VSAT Data Throughput
- Tx 20 Mbps / Rx up to 120 Mbps per stack / Switching packet rate in total up to 65,000 pps

INTERFACES

LAN Interface
- Four GbE RJ-45 ports, VLAN/VRF/GRE/Jumbo Frames (max 1600 Byte) configurable per port, local switching

IP Features
- IPv4 / IPv6 (tunnel) / Static Routing / OSPF / BGP / Multi VRF support (up to 8) including Virtual Channel Groups (VCGr*) and VLAN / GRE / Multicast Forwarding / IGMPv2 / IGMPv3 / DiffServ / Class Selector / DSCP / OpenAMIP** / DHCP Server

Traffic Processing
- Load Balancing / Header Compression / Traffic Filtering with real-time flow detection and Shaping for QoS based on configurable PHB rules (up to 14 classes per VRF) / Option: Encryption (AES-256) based on plugin board

Serial RS232/Console
- SUB DB-9S socket for management access via command line interface

Aux-Port
- 8 pin connector DIN 45326 – contains Rx lock signal (5 VDC) indicator and Tx inhibit with cable detect support

Display and 5-button switch
- Notification of status information (reception level, IP-address etc.)

USB-A 2.0 ports
- 1x front panel port for image updates and configuration uploads, 1x rear port

Tx Modulator Port
- N-connector (50 Ohm female) L-Band 950 – 2150 MHz / -3…-43 dBm

Rx Demodulator Port
- N-connector (50 Ohm female) L-Band 950 – 2150 MHz / 0…-70 dBm

ODU SUPPORT

10 MHz reference signal
- Configurable by software on Tx and Rx port

LNB
- Software configurable 0/13/18 VDC support, 22 kHz signal – internal/external PLL

BUC
- Software enabled internal 24 VDC support, up to 85 W on IDU N-connector (typical 6-8 W Ku)

Others
- Radios with L-Band interface – Ka, Ku, Ext Ku, C, X

Shared Amplifier
- Multiple SKYWAN 5G modulators can be operated in a multi-carrier setup utilizing the same RF-transmitter without requiring a back-off. Depending on the configured mode, traffic is routed through a single SKYWAN 5G unit or all transmitters are scheduled in sequence to prevent parallel transmission.

NETWORK MANAGEMENT

Security Architecture
- Secure logins (https), role based views / LDAP support, all management interfaces via ssh only

NMS Platform
- SKYWAN 5G NMS – virtual appliance optional: pre-installed on NMS server machine

NMS Architecture
- Web based application / identical GUI look and feel on NMS and IDU reduces training to a minimum / central NMS server, can be placed everywhere (only IP connectivity needed) mainly for planning & configuration, network runs without NMS always on or connected, NMS Redundancy, NETCONF (RFC 6241)

IDU Management Interfaces
- Remote access with in-band management (from central NMS station over satellite), additional SNMP access for monitoring, local access via WEB-GUI and CLI or integrated console port (RS232), NETCONF (RFC 6241)

Multi-Language Support
- Multi-Language WebUI for NMS and modem, all text can be translated and customized by the operator with the SKYWAN 5G Translation Editor.
### TECHNICAL SPECIFICATIONS SKYWAN 5G OUTDOOR (since v1.5.113)

#### REDUNDANCY

<table>
<thead>
<tr>
<th>Type</th>
<th>1+1 node redundancy, hot standby</th>
<th>N+M node redundancy, hot standby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Node Controller (NC)</td>
<td><img src="image1" alt="Node Controller (NC)" /></td>
<td><img src="image2" alt="Node Controller (NC)" /></td>
</tr>
<tr>
<td>Receiver (RCV)</td>
<td><img src="image3" alt="Receiver (RCV)" /></td>
<td><img src="image4" alt="Receiver (RCV)" /></td>
</tr>
</tbody>
</table>

- **Interconnection**: LAN Ethernet connection with external switch
- **External Switch Requirement**: VLAN (802.1Q) capable switch with high MTBF and redundant power supply
- **Switchover**: Automatic, no operator intervention required. Operational parameters are mirrored to backup unit for seamless switchover.
- **Failure Detection**: Active monitoring of keep alive signals
- **Stacking**: In a network node with stacked units, the backup unit is agnostic for the function it takes over, it can replace either a Node Controller or a Receiver. Up to 4 active units plus up to 4 backup units form the N+M redundant node.
- **Operator Support**: NMS integrated configuration and monitoring, status display in NMS and SKYWAN 5G front panel

#### 10 MHz Reference Signal Specification

<table>
<thead>
<tr>
<th>Nominal Frequency</th>
<th>10 MHz; frequency tolerance ≤ ±2 x 10⁻⁷ (60 minutes after power on)</th>
</tr>
</thead>
</table>
| Power Level | Tx: typ. +4 dBm (+3 dBm ... +7 dBm, <-40 dBm when switched off)  
Rx: typ. -1 dBm (-3 dBm ... +1 dBm, <-46 dBm when switched off) |
| Frequency Stability | temperature range 0 °C ... +70 °C:  
versus supply voltage changes Vₕ ±5%:  
versus load changes 50 Ω ±10%:  |
| Aging | ±1 x 10⁻⁶ per day  
±1 x 10⁻⁷ per year  
±6 x 10⁻⁷ per 10 years |
| Phase Noise | 1 Hz: -85 dBc  
1 kHz: -145 dBc  
10 kHz: -155 dBc  
100 kHz: -155 dBc |

Note: For an optimal and reliable system performance use the SKYWAN 5G reference signal to clock the outdoor equipment (BUC / LNB).

#### MECHANICAL/EVIRONMENTAL

**SKYWAN 5G Outdoor**

- **Dimensions (H x W x D)**: 80 mm x 440 mm x 250 mm
- **Weight**: 6.5 kg (including external power supply, DVB-S2 receiver card and optional encryption card)
- **Mounting Options**: indoor, outdoor, mast, in Outdoor Enclosure (additional protection for mechanical action, environmental impact, solar radiation, unauthorized access)
- **Input Power/Power Consumption**: 100 – 260 VAC, 1.7A, 50 / 60 Hz, 40 VA nominal (without BUC / LNB)  
24 VDC, 6.3 A
- **Attached External Power Supply**: Mean Well HEP-150-24A: Output 24VDC, 6.3A
- **Power Connector**: Binder M12-A Serien 713 Power (4 pins, waterproof, screw lock)
- **Operating Temperature/Humidity**: -20 °C to +55 °C, 5%-95% non-condensing  
-40 °C to +55 °C, 5%-95% non-condensing with Outdoor Enclosure and heater
- **Storage Temperature/Humidity**: -40 °C ... +70 °C, 5%-95% non-condensing
- **Altitude**: Up to 5000m above sealevel
- **International Protection Marking**: IP65 for base unit and power supply / IP55 for fans mounted at outside of base unit
- **Regulatory Approvals**: Fully CE compliant with RoHS and REACH, no export limitations for product

**SKYWAN 5G Outdoor Enclosure**

- **Dimensions (H x W x D)**: 450 mm x 486 mm x 100 mm

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**HEADQUARTERS**
ND SatCom GmbH  
Graf-von-Soden-Strasse  
88090 Immenstaad  
Germany  
PHONE: +49 7545 939 0  
FAX: +49 7545 939 8780  
E-Mail: info@ndsatcom.com

**CHINA**
ND SatCom (Beijing) Co. Ltd.  
PHONE: +86 10 6590 6869/6878

**MIDDLE EAST**
ND SatCom FZE  
PHONE: +971 4886 5012