ND SAT COM

INSTALLING RELIABILITY

ACM
TDMA
TDM/TDMA
P2P (SCPC)

DVB S2

www.ndsatcom.com

SKYWAN 5G OUTDOOR

In varied situations – from rough environments to when deployable antenna systems or a tower installation are needed – the SKYWAN 5G Outdoor is the modem of choice. It incorporates the full feature set of the indoor rack 1U SKYWAN 5G VSAT satellite router and 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 (Virtual Routing and Forwarding) capabilities, is managed by an NMS (Network Management System). The SKYWAN 5G Outdoor supports cascading or N+M redundancy and an internal encryption board with AES-256 if required.

APPLICATIONS

- Air Traffic Control Networks
- Broadcast/Satcom-on-the-Move
- Disaster Recovery & Emergency Response
- Private Enterprise Networks
- Governmental & Administration Networks
- Defence
- Cellular Backhaul/Mesh Interconnection of Cells
- Energy Sector, Oil & Gas

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

KEY FEATURES

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

TECHNICAL SPECIFICATIONS
SKYWAN 5G OUTDOOR (SINCE V2.0.161)

VSAT NETWORK

Network Topology	P2P/Star/Hybrid/True Full Mesh, Multi-Master: fully-redundant network control function with seamless switchover/DVB-S2 star overlay/Multiple DVB-S2 Gateways per network/Dynamic DVB-S2 Receiver assignment over MF-TDMA control link	
Supported Satellites/ Transponders	Geostationary, transparent bent-pipes, cross-strapped transponders, HTS spot beams, meshed over HTS spot beams	
Type & Number of Modems	1x MF-TDMA or P2P modulator, 1x TDMA or P2P demodulator, 1x DVB-S2 receiver (ETSI)	
Access Type TDMA	MF-TDMA with fast frequency hopping in Tx (16 channel) and fixed Rx home channel, pure data channels, Beam Switching, Communication-On-The-Move (COTM) with Doppler shift compensation. Bandwidth-on-Demand DAMA/real-time/non-real-time/guaranteed throughput/ QoS classes, TDMA Adaptive Coding and Modulation1 (ACM) for QPSK up to 16APSK, cascading of units to one node with up to 4 TDMA demodulators, up to 4+4 redundancy option	
Access Type TDM/DVB-S2	DVB-S2 receiver with Adaptive Coding and Modulation (ACM)/MPE and ULE	
Access Type P2P	Point-to-point connection with exclusive bandwidth assignment (SCPC), link aggregation option follows stacking concept, 1+1 or 2+1 redundancy option	
Modulation & FEC Code Rates	**P2P (Turbo-ϕ)** QPSK: 1/3, 2/5, 4/9, 1/2, 2/3, 3/4, 4/5, 5/6, 6/7 8PSK: 2/3, 3/4, 4/5, 5/6, 6/7 16APSK: 2/3, 3/4, 4/5, 5/6, 6/7 **MF-TDMA (Turbo-ϕ)** BPSK: 1/3, 2/5, 4/9, 1/2, 2/3 QPSK: 1/3, 2/5, 4/9, 1/2, 2/3, 3/4, 4/5, 5/6, 6/7 8PSK: 2/3, 3/4, 4/5, 5/6, 6/7 16APSK: 2/3, 3/4, 4/5, 5/6, 6/7	**TDM – DVB-S2(X)** QPSK: 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 9/10 32APSK: 3/4, 4/5
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	0.1, 0.2, 0.4	0.05, 0.10, 0.15, 0.20, 0.25, 0.35
Modem Symbol Rate	200 ksps – 12 Msps, variable in 1 ksps increments	Up to 45 Msps, variable in 1 sps increments
User Data Rate	**P2P:** Up to 20 Mbps per direction, up to 40 Mbps per direction with link aggregation **MF-TDMA:** Up to 20 Mbps per Tx or Rx unit, carrier user data rate starting at ~64 kbps, slot assigned traffic starting at ~4 kbps	**TDM – DVB-S2(X):** Up to 80 Mbps unicast/ 60 Mbps multicast user data rate on LAN port, starting at 3 kbps **MF-TDMA + DVB-S2 Receiver:** Tx 20 Mbps/ Rx up to 120 Mbps per stack **Peak Packet Rate:** in total up to 65,000 pps

BASEBAND INTERFACES

LAN Interface	Four GbE RJ-45 ports, VLAN/VRF/GRE/Jumbo Frames (max 1,600 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[2]) and VLAN/GRE/Multicast Forwarding/IGMPv2/IGMPv3/DiffServ/Class Selector/ DSCP/OpenAMIP[3]/DHCP Server/DNS Service
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), high priority real-time service supporting “red phone” application 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

[1] 6dB range, 18 dB range with HW revision ≥A5

[2] Patent EP 2871895 A1

[3] facilitating data exchange with compliant antenna control units (ACUs)

TECHNICAL SPECIFICATIONS
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BASEBAND INTERFACES

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

RF INTERFACES

Tx Modulator Port	N-connector (50 Ohm female) L-Band 950 – 2150 MHz max power: 0 … -6 dBm, typical -3 dBm min power: -40 ... -46 dBm, typical -43 dBm
Rx Demodulator Port	N-connector (50 Ohm female) L-Band 950 – 2150 MHz/0 ... -70 dBm common used Rx port for DVB-S2 and TDMA receiver
10 MHz reference signal	Configurable by software on Tx and Rx port
Frequency Step Size	Tx and Rx center frequency configurable in 100 Hz steps
LNB Support on Rx Port	Software configurable 0/13/18 V DC support, 22 kHz signal – internal/external PLL, 10 MHz reference signal
BUC Support on Tx Port	Software enabled internal 24 V DC support, up to 85 W on IDU N-connector (typical 6 – 8 W Ku), 10 MHz reference signal
Note for System Performance	LNB and BUC must operate with either SKYWAN 5G provided reference clock or from an alternative source with minimum performance according to 10 MHz Reference Signal Specification.
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.

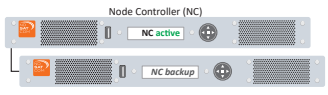
10 MHZ REFERENCE SIGNAL SPECIFICATION

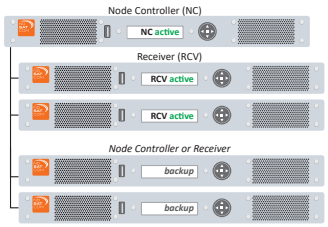
Nominal Frequency	10 MHz; frequency tolerance ≤±2 x 10^{-7} (60 minutes after power on)		
Power Level	Tx: typ. +4 dBm (+3 dBm ... +7 dBm, <-40 dBm when switched off) Rx: typ. -1 dBm (-3 dBm ... +1 dBm, <-46 dBm when switched off)		
Frequency Stability	temperature range 0 °C ... +70 °C: versus supply voltage changes Vs ±5 %: versus load changes 50 Ω ±10 %:		±25 x 10^{-9} ±5 x 10^{-9} ±5 x 10^{-9}
Aging	±1 x 10^{-9} 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 Hz: -115 dBc 10 kHz: -155 dBc	100 Hz: -140 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).

REDUNDANCY

Type	1+1 node redundancy, hot standby	N+M node redundancy, hot standby





Interconnection	LAN Ethernet connection with external switch
External Switch Requirement	VLAN (802.1Q) capable switch with high MTBF and redundant power supply

TECHNICAL SPECIFICATIONS
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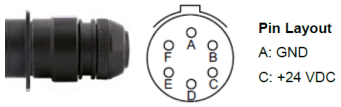
REDUNDANCY

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 or a Transceiver in P2P mode. 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

NETWORK MANAGEMENT

NMS Agent	One per node, controls cascaded and redundant modules for MF-TDMA and P2P, controls attached DVB-Gateway(s)
Security Architecture	Secure logins (https), role based views/LDAP support, all management interfaces via ssh only
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 (RS 232), NETCONF (RFC 6241)
Architecture	Web based local GUI for station surveillance, look and feel identical on NMS and IDU, central NMS for planning & configuration (NETCONF RFC 6241) and monitoring (SNMP), network runs without NMS always on or connected NMS, TDMA and P2P links can be defined in one NMS network, any IDU can become either a TDMA node or a P2P node
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.

MECHANICAL/ENVIRONMENTAL

Unit	SKYWAN 5G Outdoor 	SKYWAN 5G Outdoor Enclosure 
Dimensions (H x W x D)	80 mm x 440 mm x 250 mm	450 mm x 486 mm x 100 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, Connector	24 V DC, 40 VA nominal (without BUC/LNB), Souriau 85136RG106S54 (MIL-DTL-26482) 	
External Power Supply	Mean Well HEP-150-24 A: Input 100 – 260 V AC, 1.7 A, 50/60 Hz, Output 24 V DC, 6.3 A	
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 5,000 m above sea level	
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	

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