

MINI-LINK™ TN RELEASE 4.1

Hybrid microwave system with advanced multiservice capabilities



Ericsson MINI-LINK TN (Traffic Node) is a scalable and cost-effective microwave radio platform for applications that demand high reliability and flexibility. MINI-LINK TN is the world's most widely deployed multiservice microwave system, and it is optimized for use in carrier-grade transport networks such as mobile backhaul and multiservice access networks.

MINI-LINK TN: a Hybrid Node

MINI-LINK TN was designed to support traditional operator services such as low speed TDM (DS-1, DS-3), high speed TDM (SONET), and Ethernet with both efficiency and a high degree of reliability. Utilizing Hybrid Node technology, the MINI-LINK TN transports Ethernet frames in their native format, as well as TDM frames over the same radio link. Hybrid Node technology allows MINI-LINK TN to leverage the benefits of the statistical gain derived from Ethernet switching to ensure the maximum possible throughput over the radio link.

Key benefits

- Common radio platform for TDM, SONET, and Ethernet transport
- Highly efficient mixture of native Ethernet and native TDM over a single radio link supports zero to 80 DS1s and up to 270 Mbps of Ethernet traffic
- Very reliable microwave system with measured mean time between failures of over 70 years

System overview

From a functional and configuration point of view, MINI-LINK TN is divided into the following parts:

- Basic node — includes the indoor chassis, power, cooling, and the node processor, which provides traffic and system control. The basic node performs traffic forwarding and multiplexing, system protection, and management functions. It also provides traffic interfaces (Ethernet, DS-1, DS-3, and SONET) for connection to network equipment.
- Radio terminal — consists of modem units in the chassis, as well as outdoor radios and antennas. Outdoor units are interconnected by a coaxial cable carrying traffic and the DC supply. Radio terminals may be configured as unprotected (1+0) or protected (1+1) inside the basic node.

TDM for reliable timing

The radio link can be configured to operate as all-TDM microwave transport, all-Ethernet microwave, or in a configurable combination of both TDM and Ethernet in increments of 1.5 Mbps. This level of flexibility enables operators to utilize highly efficient Ethernet transport to meet the unique demands of each cell site, while ensuring that existing TDM services will always have the radio link bandwidth they need for highly reliable transport of key customer traffic. Additionally, maintaining TDM traffic within a TDM frame ensures that cell site synchronization is maintained without complex, alternative synchronization techniques for packet-based timing.

Efficiency and flexibility

Switching traffic from multiple 10/100 and/or Gigabit Ethernet ports at a single site — or switching traffic with Ethernet streams from other MINI-LINK TN sites — ensures a highly efficient use of the radio link. The added benefit of a scalable chassis design (with multiple interface options such as pliesochronous digital hierarchy [PDH] and SONET) offers operators a unique blend of scalability, efficiency, and throughput.

MINI-LINK TN provides operators with a microwave system that can start life by transporting a mixture of TDM and Ethernet traffic and convert to an all-Ethernet platform as market and customer traffic dictate. This efficiency and flexibility makes MINI-LINK TN a future-proof platform that adjusts to the market, user behaviors, and service mixes unique to every operator's business.

Key features

- Hybrid Node technology supports native Ethernet packets and TDM frames over a single radio link
- Agile radios with soft key support for increased throughput
- Ethernet switching with 802.1p and 802.1Q support
- Three chassis support a common set of plug-in cards
- Proven, successful platform: over 1.7 million MINI-LINKs sold globally

Scales to fit where it is needed

Wherever MINI-LINK TN is deployed, its compact, scalable nodes and unique features allow operators a much higher degree of flexibility in their network designs, leading to faster implementations at lower costs. MINI-LINK TN scales from:

- Small end sites with single or redundant microwave links;
- To hub sites of microwave links using up to five modems to a common uplink;
- To a large aggregation site supporting as many as 19 modems

Both the intermediate site and the central hub site leverage the statistical gain of Ethernet switching and the reliability of TDM frames to ensure the maximum utilization of the radio uplink.

Investment protection

MINI-LINK TN owners realize valuable cost savings because all of the chassis in the MINI-LINK family use a common set of plug-in units. This reduces sparing costs and simplifies inventory issues. Using common plug-in units means that a site which may

have begun as a small end site can be transformed into an aggregation site while retaining the use of the plug-in units already on that site.

A common radio unit provides the entire MINI-LINK point-to-point portfolio with all of the frequency and bandwidth options necessary to succeed in any leased-spectrum microwave deployment. The compact microwave radio utilizes cutting edge technology to ensure high reliability microwave communications to MINI-LINK TN users. Ericsson's agile radio handles all of the required capacities and modulations with a complete range of antennas to meet the requirements of the most demanding designs.

Software upgrades increase performance

With the use of Soft Key upgrades and plug-in modems, MINI-LINK TN supports network evolution in terms of increased capacity, new functionality, and restructuring of topology. In view of the demand for cost-efficient migration from voice to data, MINI-LINK TN handles both TDM and packet traffic in an efficient and flexible way. MINI-LINK TN provides the Quality of Service necessary for Ethernet in a mobile network.

Reliability

Market leading reliability maximizes air time, reduces the need for redundant links, requires fewer spare parts, and reduces overall support costs. An efficient management system with advanced fault management is another key to reducing operational cost.

Integrated Ethernet

Ethernet in mobile networks provides one interface for all capacities, enabling the ability to remotely upgrade capacity both in Ericsson's base stations and in MINI-LINK TN. Aggregation of traffic through the integrated Ethernet switch means substantial capacity savings. The capability to simultaneously transmit both Ethernet and TDM traffic permits easy migration to Ethernet.



AMM 20p, 2p and 6p — Scalable microwave nodes designed for networks.

MINI-LINK TN provides all of the Ethernet protection and Quality of Service capabilities needed for mobile backhaul, multiservice government networks, or fiber relief opportunities that any operator may need.

Extensive protection for carrier class equipment

Network, line, equipment, and propagation protection are all supported by the MINI-LINK TN equipment.

XPIC and dual polarization antenna

Cross polarization interference cancellation (XPIC), together with dual polarized antennas, allow for

twice the capacity within one frequency channel. Integrated dual polarized antenna installation reduces waveguide losses compared to the separate installation. This allows for using a smaller antenna or a longer hop.

Cost-efficient, all-outdoor solutions

The compact MPH for MINI-LINK TN is an all-outdoor solution for end and repeater sites with 1 or 2 radio units. TMR 9302 is an all-outdoor solution for medium aggregation sites with the possibility to use up to 5 radio units. Both solutions may be mounted on a single pole or on a wall.

Technical data

Weights and dimensions (HxWxD)

Radio unit 6L/6U GHz	15.4 lbs (7 kg); 16-1/4 in. (411 mm); x 12-3/4 in. (326 mm) x 5-3/4 in. (144 mm)
Radio unit 7/8/10/11/15/18/23/24/28/38 GHz	8.8 lbs (4 kg); 12-1/2 in. (321 mm); x 10-1/4 in. (260 mm) x 3-3/4 in. (97 mm)
Basic Node: AMM 2p	5.3 lbs ¹ (2.4 kg ¹); 1-3/4 in. (44 mm) x 17-3/4 in. ³ (448 mm ³) x 9-1/2 in. ⁴ (240 mm ⁴)
Basic Node: AMM 6p	13.7 lbs ¹ (6.4 kg ¹); 5-1/2 in. (133 mm) x 17-3/4 in. ³ (448 mm ³) x 9-1/2 in. ⁴ (240 mm ⁴)
Basic Node: AMM 20p	15.4 lbs ¹ (7 kg ¹); 12 in. ² (300 mm ²) x 17-3/4 in. ³ (448 mm ³) x 9.5 in. ⁴ (240 mm ⁴)
Plug-in unit	0-1.7 lbs (0.25-0.8 kg); 10-1/2 in. (265 mm) x 10 in. (225 mm) x 2 in. (20 mm)

¹ Not including node processor, power filtering and fan.

² 17-1/2 in. (444 mm) with fan unit and cable tray.

³ 19 in. (483 mm) with mounting brackets.

⁴ 11 in. (280 mm) with mounting brackets and connectors.

Power supply -48 V DC and +24 V DC

Power consumption

Radio Terminal	30-110 W (depending on configuration)
Basic Node: AMM 2p/6p/20p	10W ¹ / 32W ¹ / 53W ¹

¹ including node processor, power filtering and fan (AMM 6p)

Integrated power splitters Available in symmetrical and asymmetrical versions

Antennas 9 in. and 1/2/3/4/6 ft single polarized antennas for integrated and separate installation
8/10/12 ft single polarized antennas for separate installation
1/2 ft. dual polarized antennas for integrated and separate installation
4/6/8/10/12 ft dual polarized antennas for separate installation

Protection 1+1 radio equipment and propagation protection, APS 1+1 equipment protection, ELP protection, EEP protection, SNCP network protection

Traffic interfaces

DS-1, DS-3 Electrical T1.102, STS Electrical T1.102, OC-3 Optical S-1.1, T1 105, 10/100/1000 BASE-T, IEEE802.3, Optical GBitE via 1000 BASE-LX or 1000 BASE ZX IEEE802.3

Standards and recommendations

ITU, IEC, FCC, ANSI, UL, CAN/CSA, SRSP IEEE, IETF, IETF, CEN/CENELEC

Data Communication Network

IP DCN and site LAN service provided by built-in IP router.
DCN interfaces via 10/100 BASE-T and USB.
In-band transport over OC-3 and microwave.

Maintenance interface

USB

Diagnostic functions

Line, local, and connection loops.
Built-in Bit Error Rate Testers on all circuit boards.

Backplane traffic routing

Up to 800 Mbps for PDH traffic on shared bus, non-blocking switching. Up to 2 Gbps Ethernet (full duplex) traffic on high speed bus.

Integrated SONET terminal multiplexer

Terminal multiplexer with 84x DS-1 capacity.

Ethernet switching

Integrated non-blocking Gigabit Ethernet switch (IEEE 802.1D, 801.2Q compliant) QoS aware with 8 priority queues. RSTP functionality.

Network synchronization

Provides selection of clock source for the node and SSM propagation on outgoing interfaces (not PDH) when network synchronization is enabled.

Operational temperature

-58°F (-50°C) to + 140°F (+60°C) — outdoor, full functionality

-13°F (-25°C) to + 140°F (+60°C) — indoor, full functionality

Technical data *continued*

Frequency (GHz)	6L* 6U*	7 8	10	11	15	18 23	24*	28*	38*	
Max. RF output power (dBm)										
128 QAM	+24	+26	+19	+23	+21	+18 +23**	+14	+15	+12	
64 QAM	+24	+26	+19	+23	+21	+18 +23**	+14	+15	+12	
16 QAM	+26	+27	+21	+24	+23	+20 +24**	+15	+17	+14	
4 QAM	-	-	-	-	+24	+21 +26**	+17	+17	+16	
C-QPSK	-	-	-	-	+25	+24 +26**	+21	+17	+17	
* RAU N										
** RAU X HP										
Min. RF output power (dBm)										
All modulation schemes	+8	-5	-10	-8	-10	-10	-5	-3	-5	
Receiver threshold BER 10⁻⁶ (dBm)										
Net Throughput										
Ethernet (Mbps)										
Air (Line Interface**) TDM										
5.6*** (5.7-7.4)	4xDS-1	16 QAM/2.5 MHz	-89	-89	-88	-89	-	-	-	-
11*** (11-15)	8xDS-1	32 QAM/3.75 MHz	-84	-84	-83	-84	-	-	-	-
5.6*** (5.7-7.4)	4xDS-1	C-QPSK/5 MHz	-	-	-	-	-87	-87	-87	-86
11*** (11-15)	8xDS-1	16 QAM/5 MHz	-87	-87	-86	-87	-85	-85	-85	-84
23*** (23-29)	16xDS-1	128 QAM/5 MHz	-74	-74	-73	-74	-	-	-	-
11*** (11-15)	8xDS-1	C-QPSK/10 MHz	-	-	-	-	-84	-84	-84	-83
23*** (23-29)	16xDS-1	16 QAM/10 MHz	-	-	-	-	-82	-82	-82	-81
30 (30-39)	20xDS-1	16 QAM/10 MHz	-83	-82	-83	-82	-82	-82	-82	-81
45*** (46-59)	32xDS-1	128 QAM/10 MHz	-72	-72	-71	-72	-	-	-	-
23*** (23-29)	16xDS-1	C-QPSK/20 MHz	-	-	-	-	-81	-81	-81	-80
45*** (46-59)	32xDS-1	16 QAM/20 MHz	-	-	-	-	-79	-79	-79	-78
64 (64-84)	42xDS-1	16 QAM/20 MHz	-86	-85	-86	-85	-85	-85	-85	-84
100 (101-131)	69xDS-1	128 QAM/20 MHz	-70	-70	-	-70	-69	-69	-69	-68
118*/*** (120-155)	OC-3	128 QAM/30 MHz	-70	-70	-	-70	-69	-69	-69	-67
160 (162-210)	80xDS-1	128 QAM/30 MHz	-69	-69	-	-69	-68	-68	-68	-67
135 (136-177)	80xDS-1	16 QAM/40 MHz	-	-	-	-76	-75	-75	-75	-74
118*** (120-155)	OC-3	64 QAM/40 MHz	-	-	-	-74	-73	-73	-73	-71
118*** (120-155)	OC-3	16 QAM/50 MHz	-	-	-	-	-77	-77	-77	-76
270 (273-354)	80xDS-1	128 QAM/50 MHz	-	-	-	-	-	-66	-	-64
*X-PIC support for SONET (MMU2 F 155)										
** Dependent on packet size										
*** Ethernet over TDM										
ATPC	Available in all frequencies									
Frequency stability	± 10 ppm									

28701-AE/LZT 1105196, ANSI

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