

# MINI-LINK™ TN RELEASE 4, ANSI

ERICSSON'S MARKET LEADING MICROWAVE TRANSMISSION NODE



Ericsson has over 40 years of microwave experience with more than 2.2 million radio units delivered to over 150 countries. MINI-LINK TN is produced in the world's largest microwave production facility and has market leading reliability. Ericsson is the market leader in microwave transmission.



# THE WORLD'S MOST WIDELY DEPLOYED MULTISERVICE MICROWAVE SYSTEM

MINI-LINK TN is a unique microwave transmission node, handling single hops and access sites, as well as advanced hub sites for large networks, optimized for traffic aggregation and capacity savings.

Our customers use MINI-LINK TN in a number of different scenarios:

- **New roll-out of mobile backhaul networks;** MINI-LINK TN fully supports all-IP RAN over Ethernet Backhaul preferred in new mobile networks, with the necessary Ethernet quality of service.
- **Evolution of mobile backhaul networks;** With the current increase of data traffic in the mobile network, MINI-LINK TN is a perfect fit. It supports Native Ethernet as well as Native TDM or a mix of them. This enables our customers to start with TDM traffic, add Ethernet when data traffic increases, and move to all Ethernet when required.
- **Fixed Broadband over Microwave** utilizes the integrated solutions for both Carrier and best effort Ethernet. Backhaul of broadband access over microwave, close to the end user, is a proven cost efficient solution.
- **Our Enterprise, Broadcasting and National security customers** successfully deploy both single hops, and complete backhaul networks.

MINI-LINK TN is accepted for use on telecommunications systems of USDA Rural Development (RUS) borrowers.

**MINI-LINK TN is a high performance radio link** with high capacities and high availability. Our best-in-class radio output power provides longer hops with smaller antennas. MINI-LINK TN is able to send twice the capacity in one frequency channel using XPIC. With the Gigabit Ethernet link, MINI-LINK TN is ready for the all-IP over Ethernet network.

MINI-LINK TN is a Hybrid Node, perfect for all-IP and your network evolution.

## Complete solution for all-IP networks

Native Ethernet enables maximized Ethernet throughput and with up to 1 Gbps Ethernet over the air, MINI-LINK supports the necessary high capacities for all-IP. Optimized capacity use is achieved by traffic aggregation, Hitless Adaptive Modulation and Protected 2+0.

MINI-LINK TN fully supports Carrier Grade Networks with Carrier Grade QoS for Ethernet, IP and MPLS, as well as Sync distribution in packet networks.

## Complete solution for your network evolution

The Hybrid Radio Link transports both Native Ethernet and Native PDH simultaneously over the same hop, which is perfect for a cost-effective TDM to packet migration. Start with all DS1's or a mix with Ethernet. Add more Ethernet as data traffic increases and complete the migration by moving to all Ethernet.

MINI-LINK TN fully supports Carrier Grade Networks with Layer 1 sync distribution to your existing network and no extra delay or delay variation.

**Hitless adaptive modulation** is a perfect way to supply additional best effort traffic under normal weather conditions. With Ericsson's solution you will get no bit errors during the modulation change and the constant delay is crucial for network sync. The

MINI-LINK Adaptive Modulation handles not only Rain fading but also complex Selective/Multipath fading; it is designed for Carrier Grade networks.

**Protected 2+0** enables our customers with priority and best effort traffic to add up to 3 times more capacity on a hop. By changing a 1+1 hop into a protected 2+0 for both PDH and Ethernet, you add best effort traffic and keep your priority traffic protected.

## MINI-LINK TN is a Network Cost Saver

The integrated traffic routing enables remote reconfiguration of the traffic. When the network grows and the capacity needs increases, the capacity is easily upgraded remotely. The integrated Ethernet switch enables aggregation of the Ethernet traffic with substantial capacity and cost savings.

**MINI-LINK TN's market leading reliability** includes a field proven MTBF of typically over 70 years. The integrated cross connect and switching function minimizes cabling and reduces the site complexity. MINI-LINK TN has the extensive protection necessary for carrier grade equipment.



### Ethernet Switching

Integrated non-blocking Gigabit Ethernet switch and Provider Bridge (IEEE 802.1D, 802.1Q, 802.1ad compliant). Switching capacity up to 24Gbit/s full duplex. QoS with 8 priority queues using SPQ and WFQ. MSTP and RSTP functionality. Policing according to MEF. LAG (IEEE 802.1AX). WRED. Link OAM (IEEE 802.3ah). LLF (Link Loss Forwarding) for error detection. Jumbo frames.

### Network Synchronization

The Network Synchronization provides selection of clock source for the node and squelches on the outgoing interfaces when network synchronization is enabled. Sync output via TDM traffic or a dedicated 2 MHz sync port.

### Radio Link

Native Ethernet and Native PDH are supported over the microwave radio link. The maximum air interface rate over one radio is 340 Mbit/s per radio, line interface rate 342-420 Mbit/s depending on compression and frame size. Using XPIC will double the capacity. With radio link bonding 1 Gbit/s line interface capacity can be achieved.

### XPIC

The Radio Link can offer XPIC support for SONET traffic, Native PDH and Native Ethernet traffic in combination.

### Adaptive Modulation

The Radio Link supports hitless adaptive modulation for 4-512 QAM over 10-50 MHz channels.

### Backplane Traffic Routing

Up to 800 Mbit/s for PDH traffic on shared bus, non-blocking, switching, 2 Gbit/s Ethernet (full duplex) traffic on High Speed Buses per board position.

### Integrated SONET terminal Multiplexer

Terminal Multiplexer with 84xDS1 capacity.

### Extensive protection for carrier class equipment

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



## TECHNICAL SPECIFICATIONS

### ANTENNAS

- 9 in. and 1/2/4/6 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
- 1/2/4/6/8/10/12 ft. dual polarized antennas for separate installation
- 1.2/1.8/2.4/3.0/3.7 m dual polarized antennas for separate installation

### INTEGRATED POWER SPLITTERS

Available in symmetrical and asymmetrical versions

### PROTECTION

1+1 Radio equipment and propagation protection, APS 1+1 Equipment protection, ELP Protection, EEP Protection, SNCP Network protection

### POWER SUPPLY

-48 V DC and +24 V DC

### POWER CONSUMPTION

Radio Terminal: 30-110 W (Depending on configuration)

Basic Node: AMM2p/6p/20p 11W<sup>1</sup> / 27W<sup>1</sup> / 37 W<sup>1</sup>

<sup>1</sup> including node processor, power filtering and fan (AMM 6p)

### WEIGHTS AND DIMENSIONS (HxWxD)

Radio Unit: 8.8 lbs (4 kg), 12-1/2 x 10-1/4 x 3-3/4 inch (321x260x97 mm)

Basic Node: AMM 2p/6p/20p

5.3 lbs<sup>1</sup> (2.4 kg<sup>1</sup>), 1-3/4 x 17-3/4 x 9-1/4 in.

(44x4483x2404 mm) / 13.7 lbs<sup>1</sup> (6.4 kg<sup>1</sup>), 5-1/4 x 17-3/4 x

9-1/4 in. (133x4383x2404 mm) / 25.5 lbs<sup>1</sup> (7 kg<sup>1</sup>), 122 x

17-3/4 x 9-1/4 in. (3002x4483x2404 mm)

Plug-in units: 0.7-2.4 lbs (0.3-1.1 kg), 10-1/2 x 10 x 2 in.

(265x225x20 mm)

<sup>1</sup> Not including node processor, power filtering and fan.

<sup>2</sup> 444 mm with fan unit and cable tray.

<sup>3</sup> 483 mm with mounting brackets.

<sup>4</sup> 280 mm with mounting brackets and connectors.

### TRAFFIC INTERFACES

DS-1, STS-3 Electrical T1.102

OC-3 Optical S-1.1 T1 105

10/100/1000 BASE-T IEEE802.3

Optical GbitE via 1000 BASE-LX/ZX IEEE802.3

### MAINTENANCE INTERFACE

USB

### DIAGNOSTIC FUNCTIONS

Line, local, and connection loops. Built-in Bit Error Rate Test on all circuits or boards

### STANDARDS AND RECOMMENDATIONS

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

### OPERATIONAL TEMPERATURE

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

-4°F (-20°C) to +131°F (+55°C) (indoor, full functionality)

### 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-bound transport over OC-3 and Microwave

## TECHNICAL DATA (FOR MINI-LINK TN RELEASE 4.4 FP)

Frequency (GHz)	6L 6U	7 8	10	11	13 15	18	23	24	28	38
<b>Max RF output power (dBm)</b>										
512 QAM	+25 +25*	+25 +25*	+23	+24	+20 +24*	+17 +22*	+17 +21*	+19	+18	+16
256 QAM	+25 +27*	+25 +27*	+24	+24	+20 +24*	+17 +22*	+17 +21*	+19	+18	+16
128 QAM	+26 +30*	+26 +30*	+25	+25	+21 +25*	+18 +23*	+18 +22*	+20	+19	+17
64 QAM	+26 +30*	+26 +30*	+25	+25	+21 +25*	+18 +23*	+18 +22*	+20	+19	+17
16 QAM	+27 +30*	+27 +30*	+26	+26	+23 +26*	+20 +24*	+20 +23*	+21	+20	+18
4 QAM	+29 +30*	+29 +30*	+27*	+28	+24 +28*	+21 +26*	+21 +25*	+23	+22	+20
C-QPSK	-	-	-	+29	+25 +29*	+24 +27*	+24 +26*	+24	+23	+21

\* RAU X HP

### Min. RF output power (dBm)

All modulation schemes	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10
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### Receiver threshold BER 10<sup>-6</sup> (dBm)

Frequency (GHz)	6L 6U	7 8	10	11	13 15	18	23	24	28	38
<b>Net Throughput</b>										
<b>Ethernet [Mbps] TDM</b>										
<b>Air (Line Interface**) Net Throughput</b>										
6.2 (5.89 – 7.42)	4xDS-1	16QAM/2.5 MHz	-90	-90	-89	-90	-	-	-	-
12.4 (11.8 – 14.8)	8xDS-1	32QAM/3.75 MHz	-85	-85	-84	-85	-	-	-	-
6.2 (5.89 – 7.42)	4xDS-1	C-QPSK/5 MHz	-	-	-	-	-89	-88	-88	-88
12.4 (11.8 – 14.8)	8xDS-1	16QAM/5 MHz	-88	-88	-87	-88	-88	-87	-87	-87
24.8 (23.6 – 29.7)	16xDS-1	128QAM/5 MHz	-73	-73	-72	-73	-	-	-	-
12.4 (11.8 – 14.8)	8xDS-1	C-QPSK/10 MHz	-	-	-	-	-86	-85	-85	-85
14.0 (13.2 – 17.3)	9xDS-1	4QAM/10 MHz	-90	-90	-89	-90	-90	-89	-89	-89
24.8 (23.6 – 29.7)	16xDS-1	16QAM/10 MHz	-	-	-	-	-82	-82	-82	-82
30 (30.3 – 37.1)	19xDS-1	16QAM/10 MHz	-83	-83	-82	-83	-83	-82	-82	-82
29 (29.3 – 35.8)	18xDS-1	16QAM/10 MHz	-84	-84	-83	-84	-84	-83	-83	-83
43 (43.5 – 53.1)	28xDS-1	64QAM/10M Hz	-77	-77	-76	-77	-77	-76	-76	-76
49.5 (47.1 – 59.4)	32xDS-1	128QAM/10 MHz	-71	-71	-70	-71	-	-	-	-
50 (50.5 – 61.8)	32xDS-1	128QAM/10 MHz	-74	-74	-73	-74	-74	-73	-73	-73
24.8 (23.6 – 29.7)	16xDS-1	C-QPSK/20 MHz	-	-	-	-	-83	-82	-82	-82
33 (33.4 – 40.8)	21xDS-1	4QAM/20 MHz	-86	-86	-	-86	-86	-85	-85	-85
49.5 (47.1 – 59.4)	32xDS-1	16QAM/20 MHz	-	-	-	-	-79	-79	-79	-79
65 (65.7 – 80.3)	42xDS-1	16QAM/20 MHz	-80	-80	-	-80	-80	-79	-79	-79
64 (64.7 – 79.1)	40xDS-1	16QAM/20 MHz	-81	-81	-	-81	-81	-80	-80	-80
93 (94.0 – 115)	60xDS-1	64QAM/20 MHz	-74	-74	-	-74	-74	-73	-73	-73
107 (108 – 132)	69xDS-1	128QAM/20 MHz	-71	-71	-	-71	-71	-70	-70	-70
120 (121 – 148)	77xDS-1	256QAM/20 MHz	-67	-67	-	-67	-67	-66	-66	-66
50 (50.5 – 61.8)	32xDS-1	4QAM/30 MHz	-85	-85	-	-85	-85	-84	-84	-84
101 (102 – 125)	65xDS-1	16QAM/30 MHz	-78	-78	-	-78	-78	-77	-77	-77
97 (98.0 – 120)	62xDS-1	16QAM/30 MHz	-79	-79	-	-79	-79	-78	-78	-78
147 (149 – 182)	80xDS-1	64QAM/30 MHz	-72	-72	-	-72	-72	-71	-71	-71
143 (145 – 177)	80xDS-1	64QAM/30 MHz	-73	-73	-	-73	-73	-72	-72	-72
155 (152 – 176)	OC-3	128QAM/30 MHz	-70	-70	-	-70	-70	-69	-69	-69
166 (168 – 205)	80xDS-1	128QAM/30 MHz	-70	-70	-	-70	-70	-69	-69	-69
182 (184 – 225)	80xDS-1	256QAM/30 MHz	-66	-66	-	-66	-66	-65	-65	-65
204 (207 – 252)	80xDS-1	512QAM/30 MHz	-63	-63	-	-63	-63	-62	-62	-62
67 (67.7 – 82.8)	43xDS-1	4QAM/40 MHz	-84	-84	-	-84	-84	-83	-83	-83
135 (136 – 167)	80xDS-1	16QAM/40 MHz	-	-	-	-77	-77	-76	-76	-76
131 (132 – 162)	80xDS-1	16QAM/40 MHz	-78	-78	-	-78	-78	-77	-77	-77
155 (152 – 176)	OC-3	64QAM/40	-	-	-	-74	-73	-73	-73	-73

200 (202 – 247)	80xDS-1	MHz 64QAM/40	-71	-71	-	-71	-71	-70	-70	-70	-69	-68
194 (196 – 240)	80xDS-1	MHz 64QAM/40	-71	-71	-	-71	-71	-70	-70	-70	-69	-68
227 (229 – 280)	80xDS-1	MHz 128QAM/40	-69	-69	-	-69	-69	-68	-68	-68	-67	-66
225 (227 – 278)	80xDS-1	MHz 128QAM/40	-68	-68	-	-68	-68	-67	-67	-67	-66	-65
248 (251 - 306)	80xDS-1	MHz 256QAM/40	-65	-65	-	-65	-65	-64	-64	-64	-63	-62
279 (282 – 344)	80xDS-1	MHz 512QAM/40	-62	-62	-	-62	-62	-61	-61	-61	-60	-59
82 (83 – 101)	52xDS-1	MHz 4QAM/50	-83	-83	-	-83	-83	-82	-82	-82	-81	-80
155 (152 – 176)	OC-3	MHz 16QAM/50	-	-	-	-	-79	-78	-78	-78	-77	-76
169 (171 - 209)	80xDS-1	MHz 16QAM/50	-76	-76	-	-76	-76	-75	-75	-75	-74	-73
165 (167 – 204)	80xDS-1	MHz 16QAM/50	-77	-77	-	-77	-77	-76	-76	-76	-75	-74
256 (259- 316)	80xDS-1	MHz 64QAM/50	-70	-70	-	-70	-70	-69	-69	-69	-68	-67
248 (251 - 306)	80xDS-1	MHz 64QAM/50	-71	-71	-	-71	-71	-70	-70	-70	-69	-68
293 (296 – 362)	80xDS-1	MHz 128QAM/50	-	-	-	-	-67	-66	-66	-66	-65	-64
285 (288 – 352)	80xDS-1	MHz 128QAM/50	-67	-67	-	-67	-67	-66	-66	-66	-65	-64
315 (318 – 389)	80xDS-1	MHz 256QAM/50	-64	-64	-	-64	-64	-63	-63	-63	-62	-61
354 (357 – 437)	80xDS-1	MHz 512QAM/50	-61	-61	-	-61	-61	-60	-60	-60	-59	-58
**Dependent on packet size												
ATPC	Available in all frequencies											
Frequency stability	± 10 ppm											

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EN/LZT 110 5205 R1 ANSI  
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