



# Proteus AMT

## Digital Microwave Radios

**7, 8, 10, 11, 13, 15, 18, 23, 26, & 38 GHz**  
**With Capacities from 4 Mbps to 100 Mbps**  
**2E1 to 32E1 • 10/100BaseT**

Representing the next generation of highly configurable point-to-point millimeter wave transmission media, the Proteus AMT features include in-field capacity upgrades from 4 Mbit/s to 100 Mbit/s, multiple modulation schemes from 4PSK to 32QAM, two plug-in interface modules, and dynamically variable transmitter power. The Proteus AMT is the perfect choice for growing, changing, and expanding networks. It is a single platform to fill all of your short-haul transmission needs; expandable in the field from 2E1s to 32E1s, or a combination of PDH and Ethernet protocols.

Designed specifically for maximum flexibility, the Proteus AMT's digital processing allows the choice of multiple modulation schemes for easy data rate upgrades within the same occupied bandwidth. The use of two plug-in line interface modules provides amazing flexibility for configurations, upgrades and sparing. The Proteus AMT terminal consists of an Indoor unit (IDU), an outdoor unit (ODU) with an integrated antenna, and one or two plug-in Line Interface Modules (LIM). The IDU to ODU connection uses a single RG-8A/U coaxial cable with commonly available N-type connectors.

### Competitive Advantages

- **Double system capacity for a given bandwidth or use half the bandwidth for the same capacity**
- **Combine Ethernet and PDH rates over same radio link for maximum link flexibility**
- Up to 100 Mbps aggregate throughput
- High system gain with FEC and Trellis Coding
- Commonality throughout reduces spares

### Easy to Use

- Intuitive Element Manager (EM) software for configuration and control
- Command Line Interface as alternative to the EM
- Automatically configures for selected LIM(s)
- Hot-swappable LIM(s)
- Common ODU for all data rate configurations
- ODU can be replaced without affecting antenna alignment

**Customer Satisfaction**

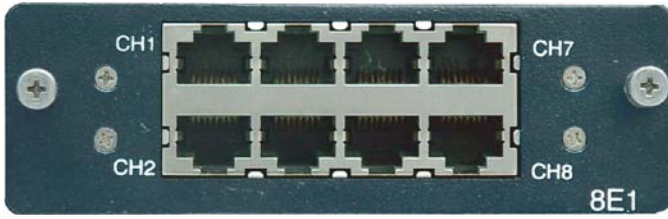
### Reliable Operation

- Maintenance free operation
- Digital system design
- Reed Solomon FEC and Trellis Coding
- High System Gain
- SNMP Network Management
- Convection cooling, no fans

### Flexible Interfaces

- One IDU for all frequencies and interface applications
- Two front loading plug-in Line Interface Modules (LIMs)
- LIMs can be used in any combination
- Automatically configures modulation based on data rate & bandwidth
- LIMs can be configured for sub-rates
- Two to thirty-two E1s plus 100BaseT Ethernet in a single platform

# Proteus AMT Line Interface Modules (LIM)



## 8E1 LIM

Digital Capacity  
Digital Interface  
Digital I/O Connector  
Digital Line Code

2E1, 4E1, 8E1  
E1 per ITU-T Rec. G.703  
8 x RJ-48 (shielded), 120Ω balanced  
HDB3



## E3 LIM

Digital Capacity  
Digital Interface  
Digital I/O Connector  
Digital Line Code

1E3  
E3 per ITU- T Rec. G.703  
2 x BNC, 75Ω unbalanced  
HDB3

### Hot-Standby Protection

The Proteus AMT is available in either non-protected or 1 + 1 hot-standby protected configurations. To maintain the highest system gain in the 1 + 1 configuration two ODUs are connected through a waveguide coupler with an unequal split between the primary and standby radios.

### Hot-Standby Branching Loss

	Primary	Standby
Transmitter	1 dB	7 dB
Receiver	1 dB	7 dB

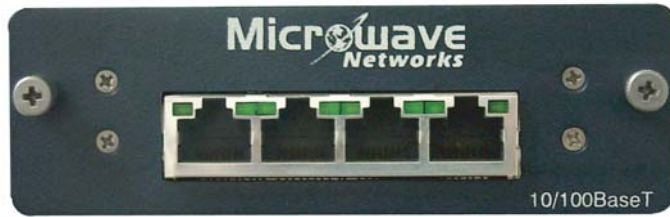
Bandwidth (MHz)	3.5 MHz			7 MHz						
	2E1	4E1	100BaseT	4E1	100BaseT	8E1	100BaseT	12E1	8E1	100BaseT
Data Rate										
Modulation	QPSK	16 QAM	8 PSK	QPSK	8 PSK	16 QAM	16 QAM	32 QAM	QPSK	QPSK
Bandwidth (MHz)	3.5	3.5	3.5	7	7	7	7	7	14	14
100BaseT Throughput*			8 Mbit/s*		15 Mbit/s*		20 Mbit/s*			20 Mbit/s*
Receiver Threshold (10 <sup>-6</sup> )										
7, 8, 10, 11, 13 GHz	-93.5	-87.0	-89.5	-90.5	-86.5	-84.0	-82.5	-80.0	-87.5	-86.0
15, 18, 23, 26 GHz	-94.0	-87.5	-90.0	-91.0	-87.0	-84.5	-83.0	-80.5	-88.0	-86.5
38 GHz	-93.0	-86.5	-89.0	-90.0	-86.0	-83.5	-82.0	-79.5	-87.0	-85.5
Transmit Power										
7, 8 GHz	21.0	19.0	20.0	21.0	20.0	19.0	19.0	18.5	21.0	21.0
10, 11, 13 GHz	20.0	18.0	19.0	20.0	19.0	18.0	18.0	17.5	20.0	20.0
15, 18 GHz	21.0	19.0	20.0	21.0	20.0	19.0	19.0	18.5	21.0	21.0
23 GHz	19.0	17.0	18.0	19.0	18.0	17.0	17.0	16.5	19.0	19.0
26 GHz	20.0	18.0	19.0	20.0	19.0	18.0	18.0	17.5	20.0	20.0
38 GHz	20.5	18.5	19.5	20.5	19.5	18.5	18.5	18.0	20.5	20.5

\*Worst Case - 100BaseT throughput is based on 1518 Byte packets. Smaller packets result in higher throughput. Combining 100BaseT with E1's will reduce the 100BaseT through



### Hot Standby LIM (16E1)

Digital Capacity	2E1, 4E1, 8E1, 12E1, 16E1
Digital Interface	E1 per ITU-T Rec. G.703
Digital I/O Connector	100-pin SCSI connector, 120Ω balanced
Digital Line Code	HDB3



### 10/100BaseT LIM

Digital Capacity	Up to 100 Mbit/s throughput
Digital Interface	IEEE 802.3, IEEE 802.3u, auto-negotiating
Digital I/O Connector	4 x RJ-45 (shielded) 100Ω balanced
LED Indicators	Port enabled, port activity
Port Configurations	4-port hub or bridged or 4 x VPN

### 100BaseT - Ethernet

For Enterprise applications the Proteus AMT is the most flexible licensed microwave radio available. It offers an auto-negotiating 10/100BaseT interface with throughput from 8 Mbit/s in 3.5 MHz of RF bandwidth, to a full 100Mbit/s in 28 MHz of RF bandwidth. The 10/100BaseT LIM can be used alone or it can be combined with any of the Proteus AMT PDH LIMs providing 100BaseT plus 2 to 16E1s. The Proteus AMT's multiple-modulation capability makes it possible to select between higher system gain or higher IP throughput at each bandwidth. The 100BaseT LIM has four RJ-45 connectors that can be configured as 4 bridged ports on a single WAN or can be configured as four separate Virtual LANs.

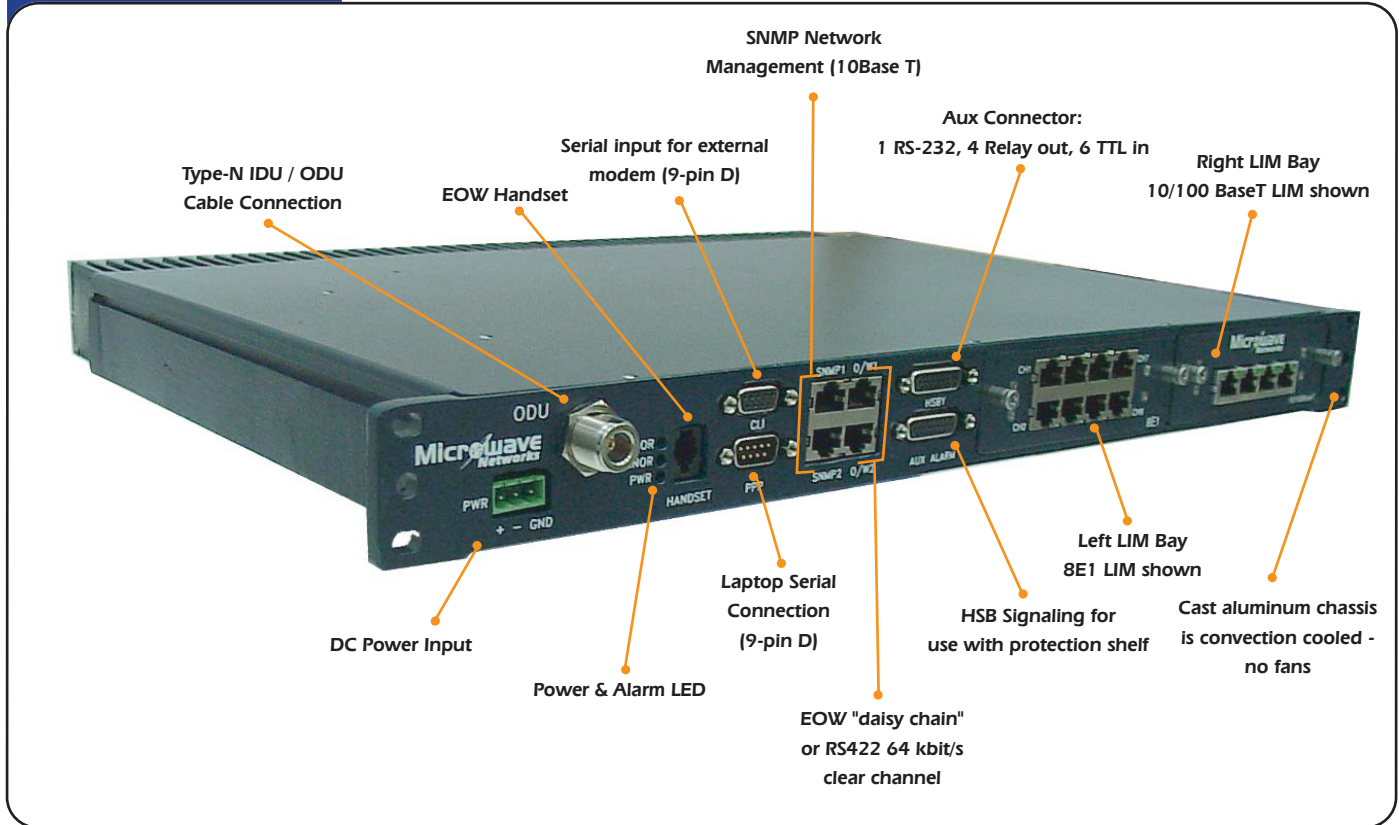
14 MHz					28 MHz					
12E1	16E1/E3	20E1	24E1	100BaseT	16E1/E3	20E1	24E1	100BaseT	32E1	100Base
16 QAM	16 QAM	16 QAM	32 QAM	16 QAM	QPSK	QPSK	8 PSK	8 PSK	16 QAM	32 QAM
14	14	14	14	14	28	28	28	28	28	28
				41 Mbit/s*				62Mbit/s*		100Mbit/s*
-83.5	-81.0	-80.0	-77.0	-80.0	-84.5	-83.5	-79.5	-80.0	-78.0	-73.0
-84.0	-81.5	-80.5	-77.5	-80.5	-85.0	-84.0	-80.0	-80.5	-78.5	-73.5
-83.0	-80.5	-79.5	-76.5	-79.5	-84.0	-83.0	-79.0	-79.5	-77.5	-72.5
19.0	19.0	19.0	18.5	17.5	21.0	21.0	20.0	19.5	19.0	18.5
18.0	18.0	18.0	17.5	16.5	20.0	20.0	19.0	18.5	18.0	17.5
19.0	19.0	19.0	18.5	17.5	21.0	21.0	20.0	19.5	19.0	18.5
17.0	17.0	17.0	16.5	15.5	19.0	19.0	19.0	17.5	17.0	16.5
18.0	18.0	18.0	17.5	16.5	20.0	20.0	20.0	18.5	18.0	17.5
18.5	18.5	18.5	18.0	17.0	20.5	20.5	20.5	19.5	18.5	18.0

\*Output by the equivalent PDH data rate.

## Outdoor Unit



## Indoor Unit



# Technical Specifications<sup>1</sup>

## System Parameters

Operating Frequencies	7.125 - 8.5 GHz 10.0 - 10.68 GHz 10.7 - 11.7 GHz 12.75 - 13.25 GHz 14.40 - 15.35 GHz 17.70 - 19.70 GHz 21.20 - 23.60 GHz 24.25 - 26.5 GHz 37.00 - 40.0 GHz
Residual BER	< 10 <sup>-11</sup>

## Transmitter

Power Output	See Table Inside
Modulation Type	4PSK to 32 QAM, See Table Inside
Frequency Stability	+/- 10 ppm
Output Power Control	Manual or Automatic 0-27 dB

## Receiver

Threshold	See Table Inside
Frequency Stability	+/- 10 ppm
Coding	Reed Solomon FEC & Trellis

## Auxiliary Interfaces

Engineering Orderwire	Optional DTMF handset, RJ-11 jack + two RJ-45 jacks for daisy chain
Auxiliary Data Channels	1 x RS-232, up to 19.2 kbps 1 x RS-422 64 kbps (not available if EOW installed)
Relay Alarm Outputs	4 Form C relay, NO & NC contacts, software mapped
External Inputs	6 TTL floating inputs
Remote Management	SNMP, 10BaseT, 2 x RJ-45, bridged
Local Control	
Element Manager (EM) Software	Accessed at 10/100BaseT through the SNMP Interface (RJ-45) or PPP through RS-232 serial interface on a 9-pin D connector
Craft Terminal Interface	RS-232 serial for VT100 Terminal, 9-pin D
External Modem	RS-232 on a 9-pin D connector for dial-up access to Element Manager or Command Line Interface

## IDU to ODU Interface

Connector Type	Coaxial, N-type Female
Recommended Cable	Times Microwave LMR - 400 or equivalent RG-8A/U
Max IDU to ODU distance	300 meters (1000 feet)

## Standards

Safety	EN 60950
EMI/EMC	EN 301 489, EN 300 385
Environmental	
IDU	ETS 300 019-1-3 Class 3.1E
ODU	Exceeds ETS 300 019-1-4 Class 4.1E

## Mechanical

IDU	
Dimensions (H x W x D)	45 mm x 482 mm x 340 mm (1.75 in x 19 in x 13.4 in)
Weight	4.4 kg
ODU	
Dimensions	26 cm diameter 15 cm deep
Weight	4.4 kg

## Environmental

ODU Temperature	
Full Performance	-33°C to + 55°C
Operational	-50°C to + 55°C
ODU Humidity	up to 100%
IDU Temperature	-5°C to +45°C
IDU Humidity	up to 95% non-condensing
Altitude	4500 Meters

## Network Management

Type:	Integral SNMP agent, Craft Terminal Interface (CTI), SNMP Element Manager (EM)
User Interface:	SNMP, CTI via Telnet, CTI via direct serial interface, SNMP EM
Security:	3-level password protection CHAP security for PPP
Remote Software Updates:	Flash download via TFTP
NMS Compatibility <sup>2</sup> :	OpenView™, NetView™, or any SNMP-based NMS
NM IP Routing:	Standard IP routing over radio network using RIP2 and Static Routing

## Antenna

Type:	Parabolic reflector; integrated or external
Diameter:	1' (30 cm), 1.5' (45 cm), 2' (60 cm), 3' (90 cm), 4' (120 cm), 6' (180 cm)
Wind Loading:	Operational: 100 mph (160 km/h) Survival: 125 mph (220 km/h)
Polarization:	Linear (vertical or horizontal)
Adjustment Angle:	±35° elevation, ±15° azimuth

## Power

Standard Voltage	-36 VDC to -60 VDC
Optional Voltage	+19 to + 28 VDC
Power Consumption:	80 watts (non-protected); 165 watts (protected)

**Footnotes:** 1.) All specifications are subject to change without notice.  
2.) Openview and Netview are registered trademarks of Hewlett Packard  
Corporation & IBM Corporation

# Microwave Networks Incorporated

HOUSTON H.Q.

4000 GREENBRIAR, STAFFORD, TX USA 77477 TEL 1.281.263.6500 FAX 1.281.263.6400

LONDON

Unit 7, Cordwallis Park, Maidenhead, Berkshire, SL67BU Tel 44.1628.788383 Fax 44.1628.788424

www.microwavenetworks.com