Proteus AMT

Digital Microwave Radios*

Operating Frequencies
7, 8, 10, 11, 13, 15, 18, 23, 26, & 38 GHz
With Capacities from 4 to 122 Mbps
2E1 to 32E1 • 10/100BaseT

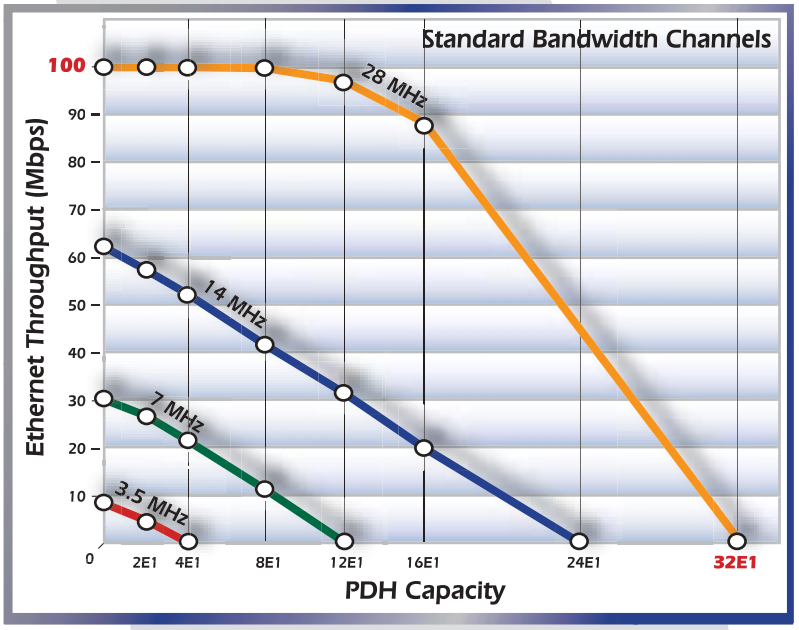
Representing the next generation of highly configurable point-to-point microwave transmission media, the Proteus AMT features adaptive modulation transport (AMT), in-field capacity upgrades, two plug-in interface modules, and dynamically variable transmitter power. The Proteus AMT is the perfect choice for growing, changing, and emerging networks.

*also marketed as Proteus 3G

Path Design Choices

Double your capacity... or use half the bandwidth

Every network design has its own challenges. This is especially true with today's systems that are evolving from simple voice traffic towards complex integration of voice, data, and Ethernet IP. Proteus breaks through all the traditional limitations by offering multiple configuration choices that optimize performance, channel utilization, and affordability. Proteus' selectable modulation and configurable plug-in slots enable you to mix and match virtually any combination of E1 and Ethernet IP up to 122 Mbps. This translates to either greater system gain (longer path length) or maximum link data throughput.



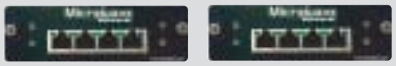
Mix and match virtually any combination of E1s and Ethernet up to 122 Mbps

One chassis ... Two plug-ins ... Many possibilities

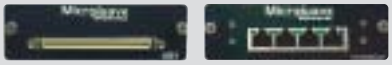
Configure up to 32E1s or 100 Mbps Ethernet

In a dramatic departure Proteus AMT provides network designers many different configuration options. Two plug-in slots can be provisioned with four separate module types. This provides great flexibility during the initial installation, and makes upgrades as easy as adding another module. This value is most evident when other radios run out of capacity at 16E1. With Proteus, simply add another module and select a different modulation for up to 32E1s in the same channel. Or, if there is a need to convert from a PDH to an Ethernet IP network in the future, simply plug in a 100BaseT module for a smooth transition. All of these upgrades are possible with no changes to the outdoor RF unit.

16E1 + 16E1
32E1



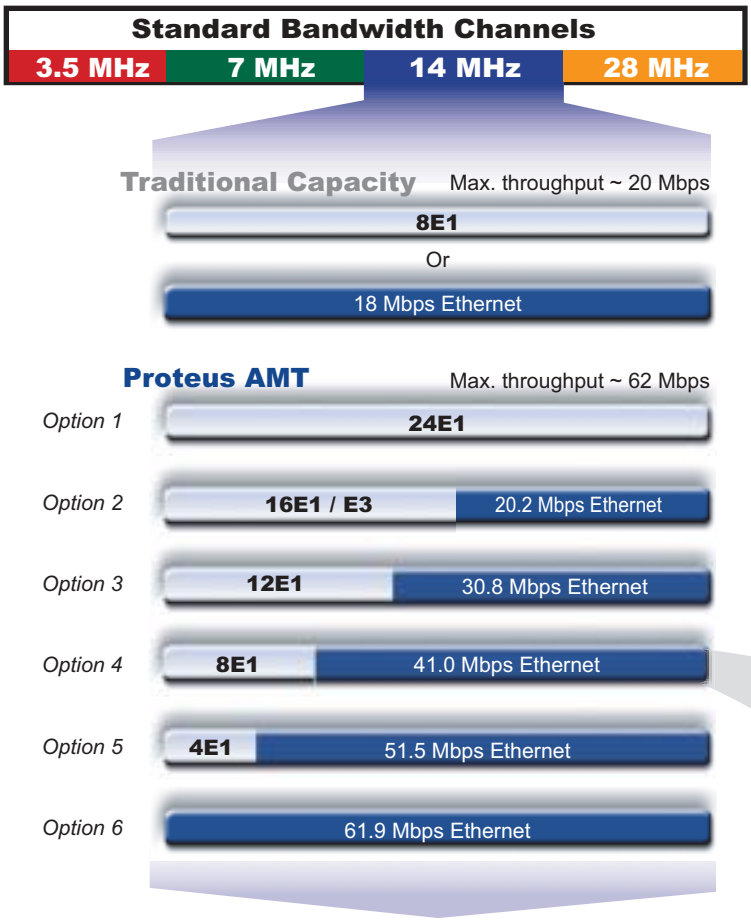
100 BaseT + 100 BaseT
2 x 100BaseT



16E1 + 100 BaseT

E3 + 100 BaseT

8E1 + 100 BaseT



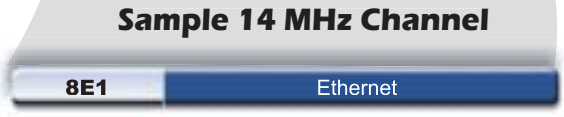
Example E1 and Ethernet combinations in a 14 MHz channel

figure 1

Select a Combination of PDH and Ethernet

Simplify migration to emerging networks

Proteus offers a wide array of choices for data transmission. Figure 1 shows an example of how a 14 MHz channel can be partitioned with several configurations from all narrowband Ethernet, N x E1 plus Ethernet, to all N x E1 applications. At the highest modulation rate, Proteus is capable of transporting data at 62 Mbps in a 14 MHz channel ... Three times the traditional throughput. This unique capability makes it possible to initially install a low capacity link, and then upgrade in the future as demand requires… all without changing the outdoor unit or re-licensing to a wider channel. Simply change the software driven configuration setup and/or install new plug-in modules and you're done.



Choose System Gain or Throughput

Optimize your path length

For an additional layer of control and flexibility, Proteus provides the facility to trade excess Ethernet capacity for an increase in system gain. This results in reduced cost through smaller antennas or longer paths. Figure 2 further illustrates how the sample 14 MHz channel (configured for 8E1) can be optimized by selecting QPSK, 8PSK, 16QAM, or 32QAM. These options are also available at 3.5, 7, 14, & 28 MHz standard bandwidth channels. This flexibility is unmatched in the industry and provides network designers with many tools and options to maximize the return on investment while keeping pace with growing demand.

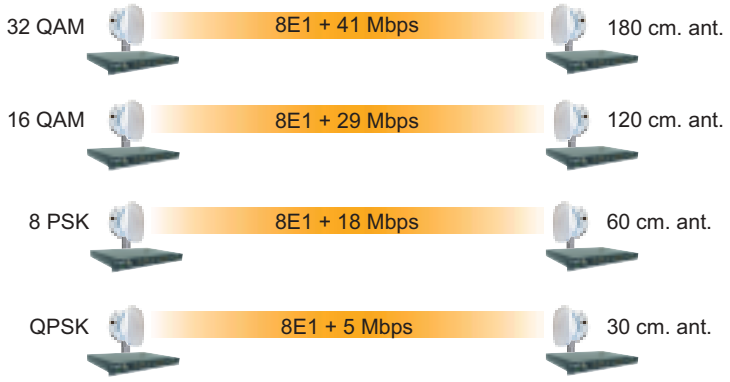


figure 2

Outdoor Unit

Hot Standby Configuration

ODU RF Combiner

Integrated Antenna

4 Clamps to attach / remove ODU

RF Unit

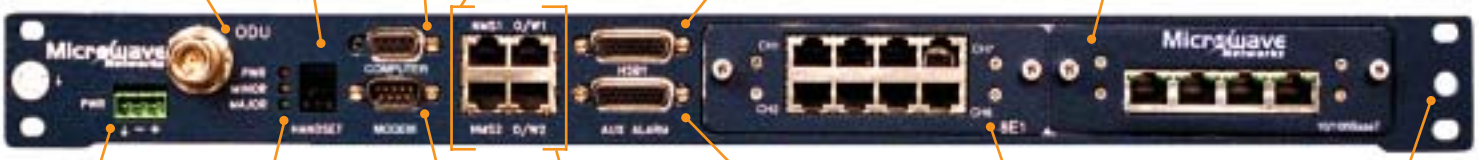
Rotate ODU 90 Degrees for polarization changes

Azimuth and Elevation Adjustments

AGC Path Alignment Port

IDU Connection Cable

Indoor Unit



SNMP Network Management (10Base T)

Laptop Serial Connection (9-pin D)

HSB Signaling for use with protection shelf

Type-N IDU / ODU Cable Connection

EOW Handset

Right LIM Slot 10/100 BaseT LIM shown

DC Power Input

Power & Alarm LEDs

Serial input for external modem (9-pin D)

EOW "daisy chain" or RS422 64 kbit/s clear channel

Aux Connector: 1 RS-232, 4 Relay out, 6 TTL in

Left LIM Slot 8E1 LIM shown

Cast aluminum chassis is convection cooled - no fans

Proteus AMT

Digital Microwave Radio

7, 8, 10, 11, 13, 15, 18, 23, 26, & 38 GHz
With Capacities from 4 Mbps to 122 Mbps
2E1 to 32E1 • 10/100BaseT

System Specifications

General		
Operating Frequencies	7.125 - 8.50 GHz	17.70 - 19.70 GHz
	10.00 - 10.68 GHz	21.20 - 23.60 GHz
	10.70 - 11.70 GHz	24.25 - 26.50 GHz
	12.75 - 13.25 GHz	37.00 - 40.00 GHz
	14.40 - 15.35 GHz	
Coding	Reed Solomon FEC	
Residual BER	< 10^{-11}	
Standards		
Safety	EN 60950	
EMI / EMC	EN 301 489; EN 300 385	
IDU - Environmental	ETS 300 019-1-3 Class3.1E	
ODU - Environmental	Exceeds ETS 300 019-1-4 Class 4.1E	

Indoor Unit (IDU)

Mechanical & Environmental	
Dimensions (H x W x D)	4.5 cm x 48.2 cm x 34.0 cm
Weight	4.4 kg
Temperature	-5°C to +50°C
Humidity	up to 95% non-condensing
Auxiliary Interfaces	
Engineering Orderwire	1 x RJ-11 jack;
	2 x RJ-45 jacks for daisy chain
Auxiliary Data Channels	2 x RS-232 up to 19.2 kbps;
	1 x RS-422 at 64 kbps (not available if EOW installed)
Relay Alarm Outputs	4 x Form-C relays, NO & NC contacts, software mapped
External Inputs	6 x TTL floating inputs
Input Power	
Standard Voltage	-36 to -60 volts DC
Optional Voltage	+19 to +28 volts DC
Power Consumption	80 watts non-protected; 165 watts protected

ODU and Antenna

Mechanical & Environmental	
Dimensions	26 cm diameter; 15 cm deep
Weight	4.9 kg
Temperature	
Full Performance	-33°C to +55°C
Operational	-50°C to +55°C
Humidity	up to 100%
Altitude	4,500 meters (14,750 feet)
Antenna	
Type	Parabolic Reflector; Integrated
Diameter	30 cm (1 ft); 45 cm (1.5 ft); 60 cm (2 ft);
	90 cm (3 ft); 120 cm (4 ft); 180 cm (6 ft)
Wind Loading	
Operational	160 km/h (100 mph)
Survival	220 km/h (125 mph)
Polarization	Linear (Vertical or Horizontal)
Adjustment Angle	+/- 35° elevation; +/- 15° azimuth

Transmitter and Receiver

General	
Power Output	See Table on Reverse Side
Threshold	See Table on Reverse Side
Modulation Type	QPSK to 32 QAM - See Table on Reverse Side
Frequency Stability	+/- 10 ppm
Output Power Control	Manual or Automatic, 0-27 dB

IDU to ODU Interface

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

Management

Connections and Access			
Connections		**Craft Terminal (VT100 or emulator)**	Used to access Command Line Interface for full control in text environment.
SNMP1 and SNMP2	2 x RJ-45 bridged connectors; 10 BaseT	User Access	TELNET access through SNMP1 or SNMP2 port;
Computer	RS-232 serial DB9		"Computer" port; direct serial access
Modem	RS-232 serial DB9		"Modem" port; dial-up access
Integral SNMP Agent	Internal 64 kbps channel used for radio management, control, and IP packet routing.	**SNMP Network Manager**	3rd party software used to remotely control radios
Management IP Routing	Standard IP routing over radio network using RIP2 and static routing	NMS Compatibility	OpenView™, NetView™, SNMPc™, or other SNMP-based NMS
SNMP Element Manager (EM)	Software provided by MNI typically run on a laptop PC; Allows full control of radios in a graphical environment.	User Access	SNMP1 and SNMP 2 connectors
User Access	SNMP1 and SNMP 2 connectors; "Computer" port; direct serial access "Modem" port; dial-up access	Security	3-level password protection; CHAP security for PPP (computer/modem connections)
		Remote Software Updates	Flash upload via TFTP
		External Modem Connection	Attach to "Modem" port for dial-up access

PDH Specifications

The chart below indicates the Transmitter and Receiver specifications for radios configured with only PDH data capacities.

Bandwidth	3.5 MHz		7 MHz			14 MHz				28 MHz			
Data Rate	2E1	4E1	4E1	8E1	12E1	8E1	16E1/E3	20E1	24E1	16E1/E3	20E1	24E1	32E1
Modulation	QPSK	16 QAM	QPSK	16 QAM	32 QAM	QPSK	16 QAM	16 QAM	32 QAM	QPSK	QPSK	8 PSK	16 QAM
Receiver Threshold (10^{-6}) (dBm)													
7 & 13 GHz	-91.0	-83.0	-88.5	-81.5	-77.0	-85.5	-78.5	-76.5	-74.0	-82.5	-81.0	-78.0	-75.0
15, 18 23 & 26 GHz	-92.0	-84.0	-89.5	-82.5	-78.0	-86.5	-79.5	-77.5	-75.0	-83.5	-82.0	-79.0	-76.0
38 GHz	-91.0	-83.0	-88.5	-81.5	-77.0	-85.5	-78.5	-76.5	-74.0	-82.5	-81.0	-78.0	-75.0
Transmit Power (dBm)													
7 GHz	25.0	21.0	25.0	21.0	21.0	25.0	21.0	21.0	21.0	25.0	25.0	21.0	21.0
13, 15 & 18 GHz	24.0	20.0	24.0	20.0	20.0	24.0	20.0	20.0	20.0	24.0	24.0	20.0	20.0
23 & 26 GHz	22.0	18.0	22.0	18.0	18.0	22.0	18.0	18.0	18.0	22.0	22.0	18.0	18.0
38 GHz	20.0	16.0	20.0	16.0	16.0	20.0	16.0	16.0	16.0	20.0	20.0	16.0	16.0
Emission Designator	3M50D7W		7M00D7W			13M7D7W				27M5D7W			

Ethernet + PDH Specifications

The Proteus AMT uses QPSK, 8PSK, 16 QAM and 32 QAM to achieve a tradeoff between system gain and throughput.

Ethernet throughput varies based on packet size. Maximum throughput occurs when the packet size is 64 bytes while minimum throughput occurs for 1518 byte packets.

Additional configurations are available; contact MNI for more details.

Bandwidth	3.5 MHz		7 MHz		14 MHz		28 MHz	
	High Gain	High Throughput	High Gain	High Throughput	High Gain	High Throughput	High Gain	High Throughput
Ethernet Throughput (Mbit/s)								
100 BaseT	5 - 6	10 - 12	10 - 12	25 - 30	20 - 25	50 - 61	41 - 50	100
100 BaseT + 2E1	0.9 - 1	3 - 4	6 - 7	21 - 25	16 - 20	46 - 56	37 - 45	100
100 BaseT + 4E1	-	-	1 - 2	16 - 20	12 - 15	42 -51	33 - 40	99 - 100
100 BaseT + 8E1	-	-	-	8 - 10	3 - 4	33 - 40	25 - 30	91 - 100
100 BaseT + 12E1	-	-	-	1	6 - 7	25 - 30	16 - 20	80 - 97
100 BaseT + 16E1/E3	-	-	-	-	-	16 - 19	8 - 9	73 - 89
Receiver Threshold (10^{-6}) (dBm)								
7, 13 GHz	-90.5	-85.0	-87.5	-79.0	-84.5	-74.0	-81.5	-70.5
15, 18, 23 & 26 GHz	-91.5	-86.0	-88.5	-80.0	-85.5	-75.0	-82.5	-71.5
38 GHz	-90.5	-85.0	-87.5	-79.0	-84.5	-74.0	-81.5	-70.5
Transmit Power (dBm)								
7 GHz	25.0	21.0	25.0	21.0	25.0	21.0	25.0	21.0
13, 15 & 18 GHz	24.0	20.0	24.0	20.0	24.0	20.0	24.0	20.0
23 & 26 GHz	22.0	18.0	22.0	18.0	22.0	18.0	22.0	18.0
38 GHz	20.0	16.0	20.0	16.0	20.0	16.0	20.0	16.0
Emission Designator	3M50D7W		7M00D7W		13M7D7W		27M5D7W	

* All specifications on this datasheet are for non-protected systems and are subject to change without notice

Hot Standby Configuration

Proteus AMT can be configured as Hot Standby using an unequal-split waveguide coupler assembly. The following losses should be included when operating as HSB.

Branching Loss	Primary	Standby
Transmitter	1 dB	7 dB
Receiver	1 dB	7 dB