Proteus AMT
Digital Microwave Radios

Operating Frequencies
15, 18, 23, & 38 GHz
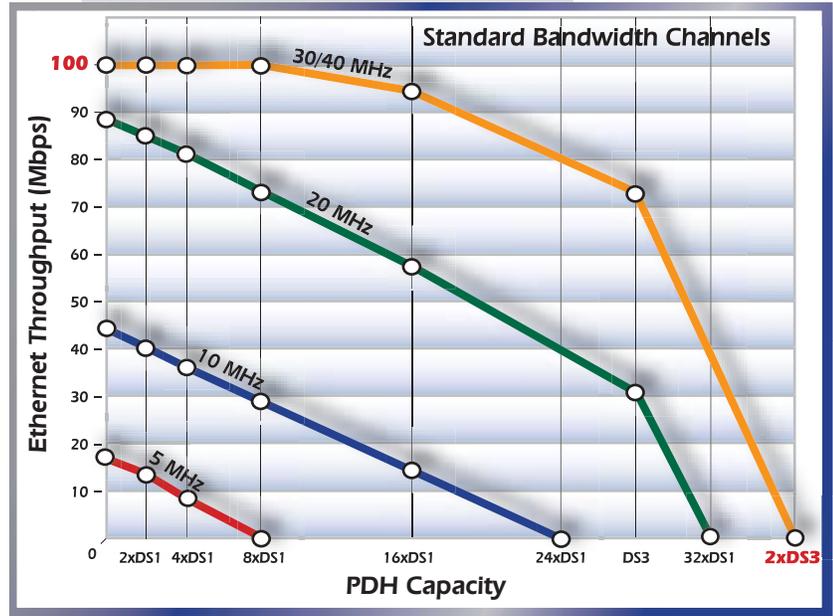**With Capacities from 3 to 122 Mbps**
2xDS1 to 32xDS1 • 2xDS3 • 10/100BaseT

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.

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 to optimize performance, channel utilization, and affordability. Proteus' selectable modulation and configurable plug-in slots enable you to mix and match virtually any combination of DS1 and Ethernet IP up to 122 Mbps. This translates to either greater system gain (longer path length) or maximum link data throughput.
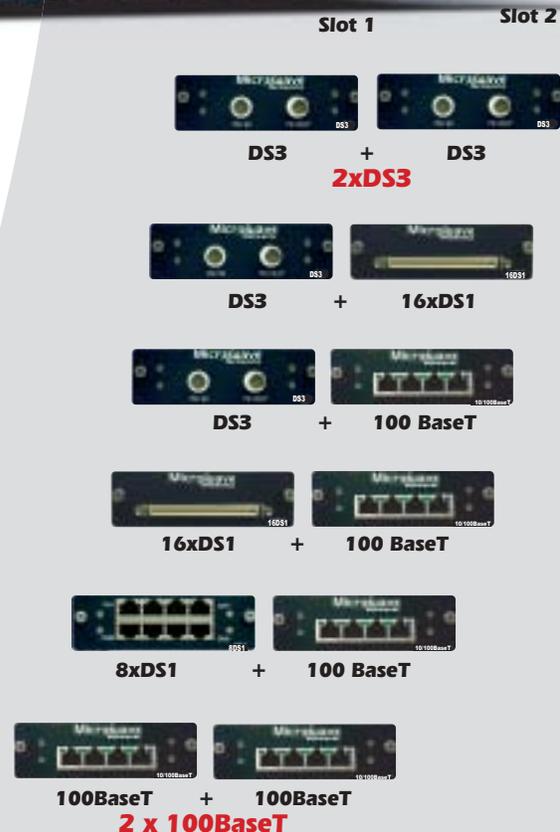
Standard Bandwidth Channels

Chart: Ethernet Throughput (Mbps) vs PDH Capacity

Y-axis: Ethernet Throughput (Mbps) — 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

X-axis: PDH Capacity — 2xDS1, 4xDS1, 8xDS1, 16xDS1, 24xDS1, DS3, 32xDS1, 2xDS3

Curves: 30/40 MHz, 20 MHz, 10 MHz, 5 MHz

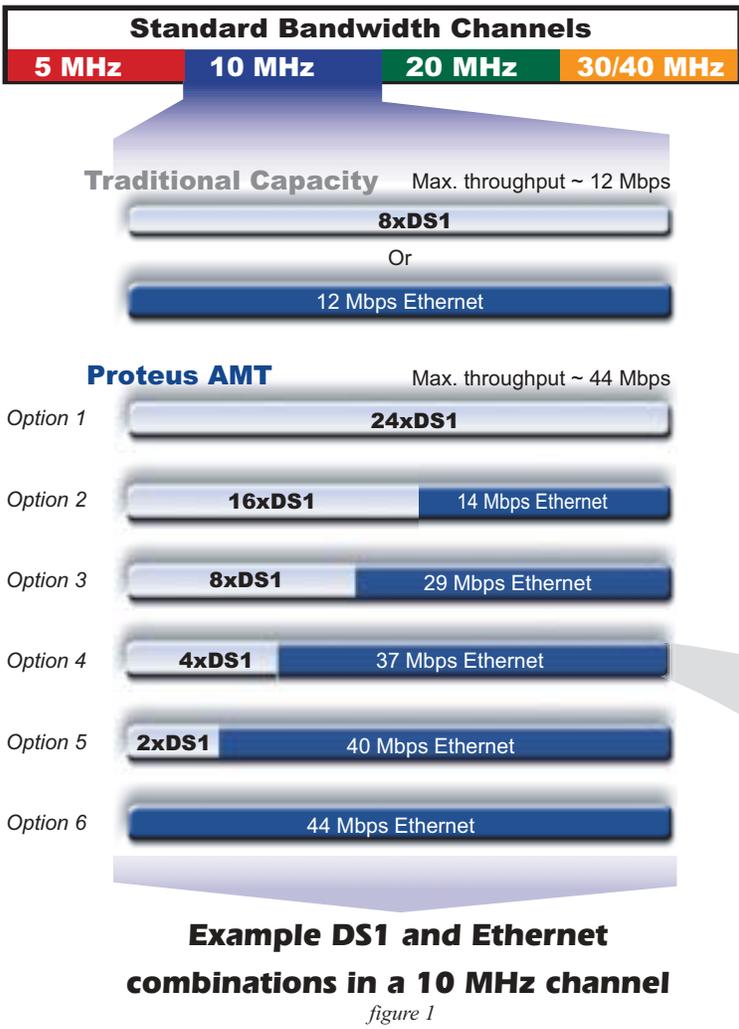**Mix and match virtually any combination of DS1s and Ethernet up to 122 Mbps**

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

Configure up to 2xDS3s 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 1xDS3. With Proteus, simply add another module and select a different modulation for up to 2xDS3s 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.

Slot 1   Slot 2

DS3   +   DS3
2xDS3

DS3   +   16xDS1

DS3   +   100 BaseT

16xDS1   +   100 BaseT

8xDS1   +   100 BaseT

100BaseT   +   100BaseT
2 x 100BaseT

Standard Bandwidth Channels

5 MHz	10 MHz	20 MHz	30/40 MHz

Traditional Capacity — Max. throughput ~ 12 Mbps

8xDS1

Or

12 Mbps Ethernet

Proteus AMT — Max. throughput ~ 44 Mbps

Option 1

24xDS1

Option 2

16xDS1	14 Mbps Ethernet

Option 3

8xDS1	29 Mbps Ethernet

Option 4

4xDS1	37 Mbps Ethernet

Option 5

2xDS1	40 Mbps Ethernet

Option 6

44 Mbps Ethernet

Example DS1 and Ethernet combinations in a 10 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 10 MHz channel can be partitioned with several configurations from all narrowband Ethernet, N x DS1 plus Ethernet, to all N x DS1 applications. At the highest modulation rate, Proteus AMT is capable of transporting data at 44 Mbps in a 10 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 10 MHz channel (configured for 4xDS1 + Ethernet) can be optimized by selecting QPSK, 8PSK, 16QAM, or 32QAM. These options are available in 5, 10, 20, 25, & 30 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.

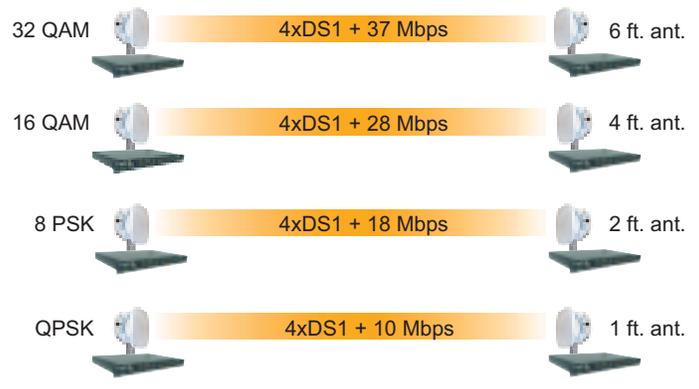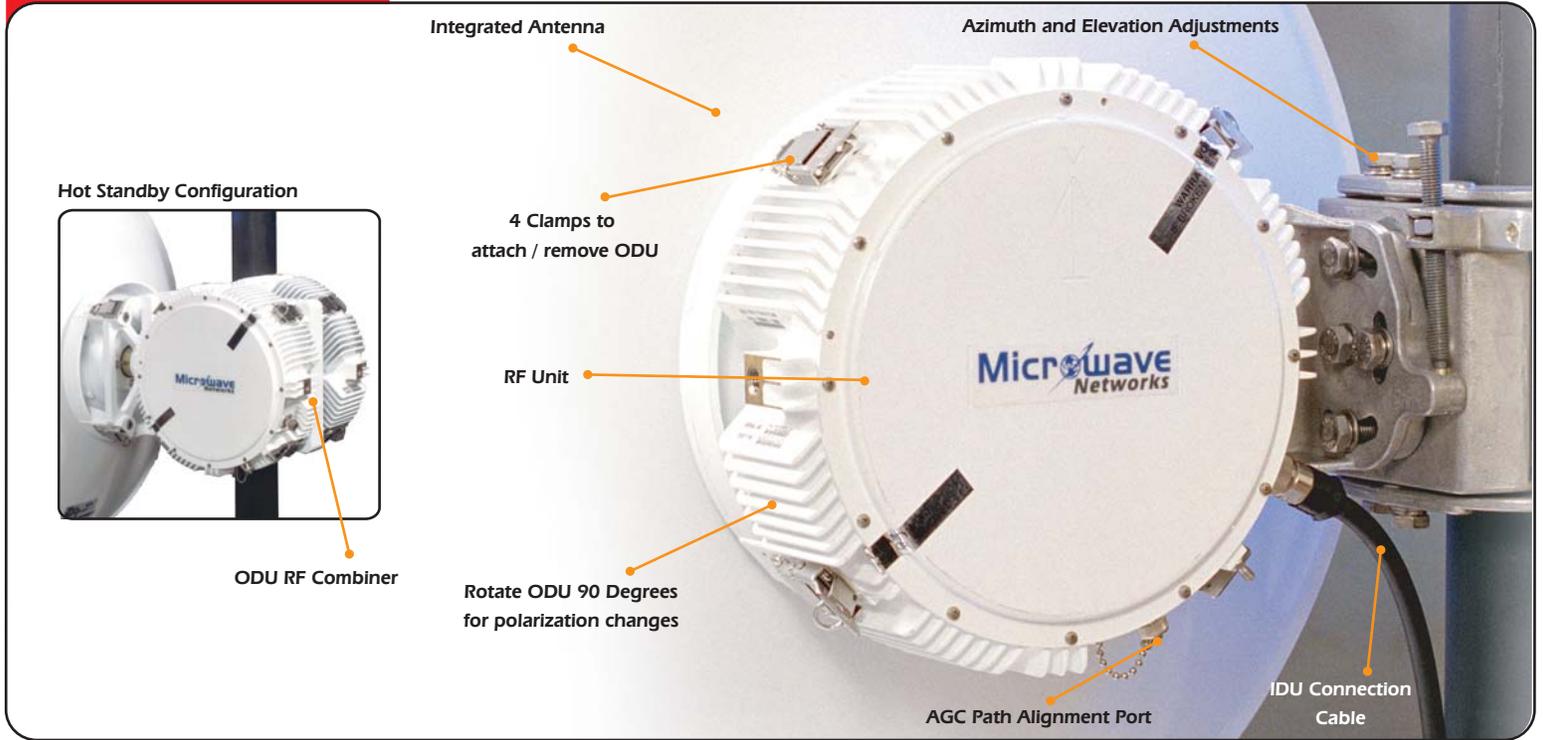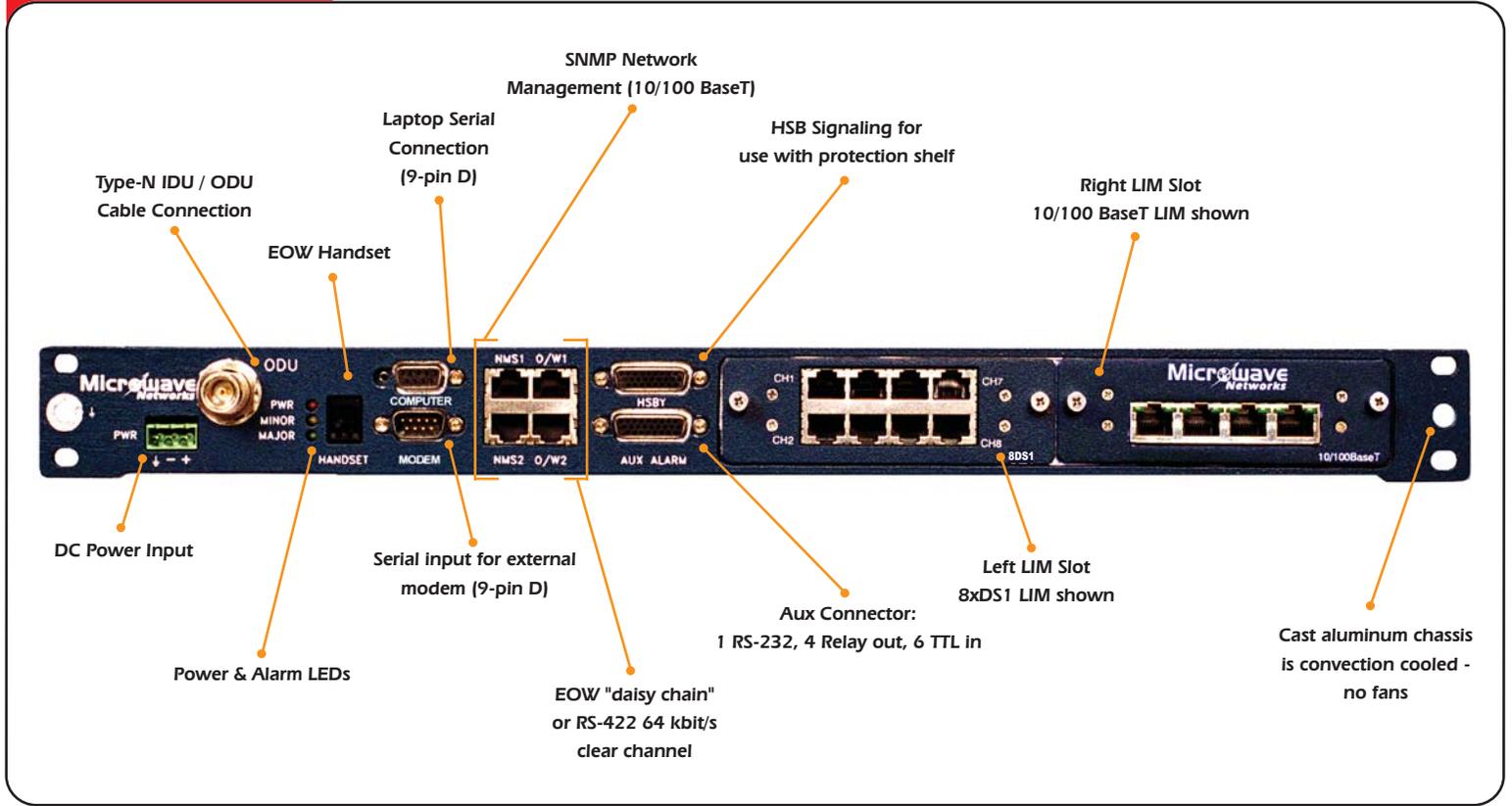### Sample 10 MHz Channel

4xDS1	Ethernet

32 QAM	4xDS1 + 37 Mbps	6 ft. ant.
16 QAM	4xDS1 + 28 Mbps	4 ft. ant.
8 PSK	4xDS1 + 18 Mbps	2 ft. ant.
QPSK	4xDS1 + 10 Mbps	1 ft. ant.

figure 2

Outdoor Unit

Integrated Antenna

Azimuth and Elevation Adjustments

Hot Standby Configuration

4 Clamps to
attach / remove ODU

RF Unit

ODU RF Combiner

Rotate ODU 90 Degrees
for polarization changes

AGC Path Alignment Port

IDU Connection
Cable

Indoor Unit

SNMP Network
Management (10/100 BaseT)

Laptop Serial
Connection
(9-pin D)

HSB Signaling for
use with protection shelf

Right LIM Slot
10/100 BaseT LIM shown

Type-N IDU / ODU
Cable Connection

EOW Handset

DC Power Input

Serial input for external
modem (9-pin D)

Power & Alarm LEDs

EOW "daisy chain"
or RS-422 64 kbit/s
clear channel

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

Left LIM Slot
8xDS1 LIM shown

Cast aluminum chassis
is convection cooled -
no fans

System Specifications

General

Operating Frequencies	14.40 - 15.35 GHz @ 420, 475, 490 MHz T/R spacing
	17.70 - 19.70 GHz @ 340, 1010, 1560 MHz T/R spacing
	21.20 - 23.60 GHZ @ 1200, 1232 MHz T/R spacing
	37.00 - 40.00 GHz @ 700, 1260 MHz T/R spacing
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

Proteus AMT
Digital Microwave Radio

15, 18, 23, & 38 GHz
With Capacities from 3 Mbps to 122 Mbps
2xDS1 to 32xDS1 • 2xDS3 • 10/100BaseT

Indoor Unit (IDU)

Mechanical & Environmental

Dimensions (H x W x D)	1.75" x 19" x 13" (4.5 cm x 48.2 cm x 34.0 cm)
Weight	9.7 lbs (4.4 kg)
Temperature	23°F to 122°F (-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 +30 volts DC
Power Consumption	80 watts non-protected; 165 watts protected

ODU and Antenna

Mechanical & Environmental

Dimensions	10.24" (26 cm) diameter; 6" (15 cm) deep
Weight	10.8 lbs (4.9 kg)
Temperature	
Full Performance	27°F to 131°F (-33°C to +55°C)
Operational	-58°F to 131°F (-50°C to +55°C)
Humidity	up to 100%
Altitude	14,750 feet (4,500 meters)

Antenna

Type	Parabolic Reflector; Integrated
Diameter	1 ft (30 cm); 1.5 ft(45 cm); 2 ft (60 cm);
	3 ft (90 cm); 4 ft (120 cm); 6 ft (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

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	1000 feet (300 meter)

Management

Connections and Access

Connections	
SNMP1 and SNMP2	2 x RJ-45 bridged connectors; 10 BaseT
Computer	RS-232 serial DB9
Modem	RS-232 serial DB9
Integral SNMP Agent	Internal 64 kbps channel used for
	radio management, control and IP packet routing.
Management IP Routing	Standard IP routing over radio network
	using RIP2 and static routing
SNMP Element Manager (EM)	Software typically runs on a laptop PC;
	Allows full control of radios in a graphical environment.
User Access	SNMP1 and SNMP 2 connectors;
	"Computer" port; direct serial access
	"Modem" port; dial-up access

Craft Terminal (VT100 or emulator)	Used to access Command Line Interface for
	full control in text environment.
User Access	TELNET access through SNMP1 or SNMP2 port;
	"Computer" port; direct serial access
	"Modem" port; dial-up access
SNMP Network Manager	3rd party software used to remotely control radios
NMS Compatibility	OpenView™, NetView™, SNMPc™,
	or other SNMP-based NMS
User Access	SNMP1 and SNMP 2 connectors
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

DSx Specifications

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

Bandwidth	5 MHz		10 MHz				20 MHz				25 MHz					30/40 MHz				
Data Rate	4xDS1	8xDS1	8xDS1	12xDS1	16xDS1	24xDS1	16xDS1	24xDS1	28xDS1/DS3	32xDS1	24xDS1	28xDS1/DS3	32xDS1	DS3+16xDS1	2xDS3	24xDS1	28xDS1/DS3	32xDS1	DS3+16DS1	2xDS3
Modulation	QPSK	16 QAM	QPSK	16 QAM	16 QAM	32 QAM	QPSK	16 QAM	16 QAM	16 QAM	QPSK	8 PSK	16 QAM	16 QAM	32 QAM	QPSK	8 PSK	8 PSK	16 QAM	32 QAM
Receiver Threshold (10^{-6}) (dBm)																				
7, 13, 38 GHz	-89.5	-82.0	-86.5	-82.0	-79.0	-75.0	-84.0	-79.0	-78.0	-76.5	-81.5	-78.5	-78.0	-75.0	-71.5	-82.0	-78.0	-78.0	-75.0	-71.5
15, 18, 23, 26 GHz	-90.5	-83.0	-87.5	-83.0	-80.0	-76.0	-85.0	-80.0	-79.0	-77.5	-82.5	-79.5	-79.0	-76.0	-72.5	-83.0	-79.0	-79.0	-76.0	-72.5
Transmit Power (dBm)																				
7 GHz	25.0	21.0	25.0	21.0	21.0	21.0	25.0	21.0	21.0	21.0	25.0	21.0	21.0	21.0	21.0	25.0	21.0	21.0	21.0	21.0
13, 15 & 18 GHz	24.0	20.0	24.0	20.0	20.0	20.0	24.0	20.0	20.0	20.0	24.0	20.0	20.0	20.0	20.0	24.0	20.0	20.0	20.0	20.0
23 GHz	22.0	18.0	22.0	18.0	18.0	18.0	22.0	18.0	180	18.0	22.0	18.0	18.0	18.0	18.0	22.0	18.0	18.0	18.0	18.0
26 GHz	22.0	18.0	22.0	18.0	18.0	18.0	22.0	18.0	18.0	18.0	22.0	18.0	18.0	18.0	18.0	22.0	18.0	18.0	18.0	18.0
38 GHz	20.0	16.0	20.0	16.0	16.0	16.0	20.0	16.0	16.0	16.0	20.0	16.0	16.0	16.0	16.0	20.0	16.0	16.0	16.0	16.0
Emission Designator	5M0D7W		10M0D7W				20M0D7W				25M0D7W					27M0D7W				

Ethernet + DSx 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 us for more details.

Bandwidth	5 MHz		10 MHz		20 MHz		25 MHz		30/40 MHz	
	High Gain	High Throughput	High Gain	High Throughput	High Gain	High Throughput	High Gain	High Throughput	High Gain	High Throughput
Ethernet Throughput (Mbit/s)										
100 BaseT	7 - 8	14 - 17	14 - 17	37 - 43	29 - 35	74 - 89	37 - 45	94 - 100	41 - 50	100
100 BaseT + 2DS1	4	11 - 13	11 - 13	33 - 39	26 - 31	71 - 85	34 - 41	90 - 100	38 - 46	100
100 BaseT + 4DS1	4	8 - 9	8 - 10	30 - 37	22 - 27	67 - 81	30 - 37	86 - 100	35 - 42	97 - 100
100 BaseT + 8DS1	-	1 - 2	2	24 - 29	16 - 20	60 - 73	24 - 29	80 - 97	28 - 35	91 - 100
100 BaseT + 16DS1	-	-	4 - 5	11 - 14	3 - 4	48 - 58	11 - 14	67 - 81	16 - 19	78 - 94
100 BaseT + DS3	-	-	-	-	-	26 - 31	-	48 - 58	-	59 - 72
Receiver Threshold (10^{-6}) (dBm)										
7, 13, 38 GHz	-89.0	-81.5	-86.0	-75.5	-83.0	-72.5	-82.0	-71.5	-81.5	-71.0
15, 18, 23 & 26 GHz	-90.0	-82.5	-87.0	-76.5	-84.0	-73.5	-83.0	-72.5	-82.5	-72.0
Transmit Power (dBm)										
7 GHz	25.0	21.0	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	24.0	20.0
23 & 26 GHz	22.0	18.0	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	20.0	16.0
Emission Designator	5M0D7W		10M0D7W		20M0D7W		25M0D7W		27M0D7W	

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 with HSB configurations.

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

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

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