

**TRITON™**  
NETWORK SYSTEMS, INC.

# INVISIBLE FIBER™ UNIT TECHNICAL DATA SHEET

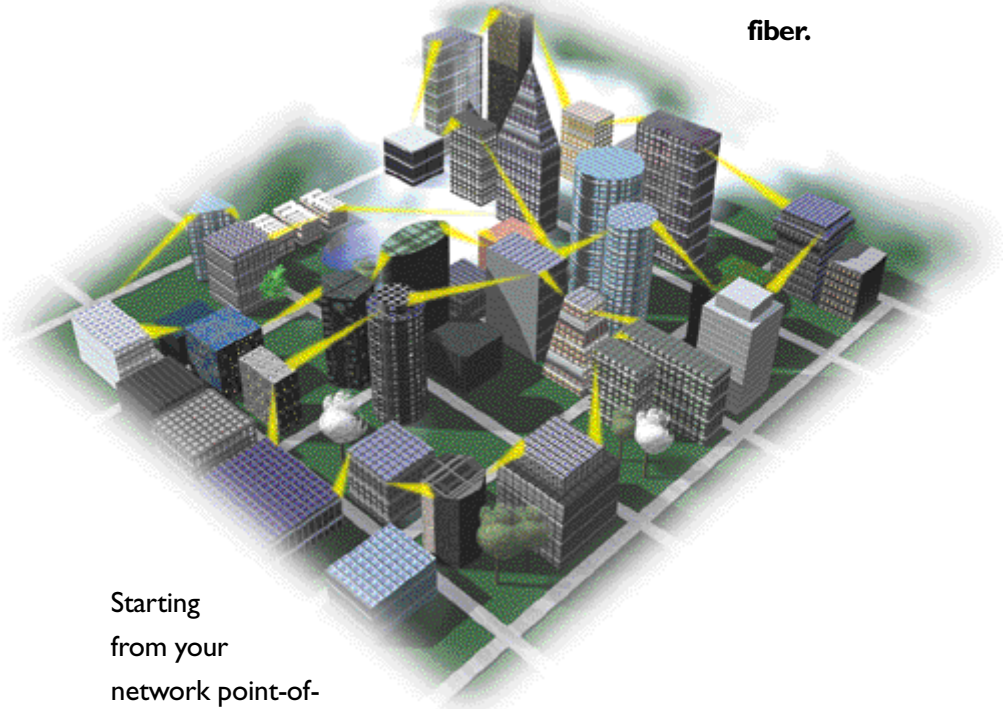
100 MBPS INTERNET



**NOW**

## Creating Consecutive Point Networks with Invisible Fiber™ Units

Invisible Fiber™ products enable the deployment of **consecutive point networks** – the definitive architecture for achieving highly survivable, expansive and cost-effective broadband fixed wireless networks. Based on the proven ring architecture of fiber-based networks, consecutive point allows a service provider to offer high bandwidth telephony, data and Internet services. The unique features of Invisible Fiber products – fiber-optic quality, aesthetically pleasing design, network management and more – combine with the consecutive point architecture to deliver **all the advantages of wireless, all the benefits of fiber.**



Starting from your network point-of-presence, Triton Network Systems Invisible

Fiber units are placed in a ring configuration. Invisible Fiber links are deployed between sites, and at each site, two Invisible Fiber units are connected back-to-back. This “link/back-to-back/link” pattern is repeated until the routing comes full circle, back to the original switch site or network access point. This architecture can cover an expansive area allowing you to connect broadly dispersed customers as well as those in dense service areas. At every site fiber cables provide direct connectivity between two Triton Network Systems Invisible Fiber units and standard network equipment.

# Invisible INTERNET Fiber

## Application:

Designed to be deployed in consecutive point networks, Triton Network Systems Invisible Fiber™ broadband fixed wireless products meet fiber optic specifications. Now 38 GHz, LMDS and LMCS license-holders can implement fiber quality, standards-based broadband wireless networks.

The Triton Network Systems 100 Mbps Invisible Fiber Internet product offers network operators the ability to provide affordable Internet service that delivers one-hundred times the speed – the next tremendous step in the evolution of the Internet. The Invisible Fiber Internet unit offers features unique to broadband fixed wireless products. Outstanding product advantages, 100 Mbps speed and consecutive point architecture combine to enable e-commerce, portals, software-on-demand applications and more.

## Key features include:

- Single outdoor only, building-complementing package
- Dual polarized integrated antenna
- 2 Watt linear RF power
- 50 dB range adaptive transmit power control (0.5 dB step size)
- 99.999% link availability at  $10^{-12}$  Bit Error Rate (BER) faded
- Adaptive channel equalization
- Operations Administration Maintenance & Provisioning (OAM&P) in-channel, separate from user payload
- Payload delivered via direct fiber interface
- Quick connect outdoor cabling – including fiber
- Full OAM&P functionality and performance monitoring
- No scheduled maintenance required

## Standards Compatibility:

IEEE 802.3, IEEE 802.2, IEEE 802.1d (MAC Bridging), IEEE 802.1q (VLAN), NEMA 250, NEBS Requirements, GR-2834



	28 GHz 100 Mbps Internet	29 GHz 100 Mbps Internet
<b>Invisible Fiber™ RF Links:</b>		
Frequency	Band A1: 27.500 to 28.350 GHz (850 MHz)	Band A2: 29.100 to 29.250 GHz (150 MHz)
	LMCS: 27.350 to 28.350 GHz (1,000 MHz)	Band A3: 31.075 to 31.225 GHz (150 MHz)
Frequency Accuracy	+/- 1ppm	+/- 1ppm
Full Duplex Channels	8/7 (programmable) LMCS: 10 (programmable)	3 (programmable)
Rx/Tx Offset	450 MHz/200-800 MHz (programmable) LMCS: 500 MHz (programmable)	1.975 MHz (programmable)
Channel Bandwidth	50 MHz	50 MHz
Modulation	8 PSK	8 PSK
Forward Error Correction	Reed Solomon and Trellis Code Modulation	Reed Solomon and Trellis Code Modulation
System Gain (H Pol)	171 dB (with antennas)	171 dB (with antennas)
Noise Figure	< 5 dB typical, < 7 dB maximum	< 5 dB typical, < 7 dB maximum
BER (faded)	1 x 10 <sup>-12</sup> or better	1 x 10 <sup>-12</sup> or better
Adaptive Tx Power Control	50 dB available range (0.5 dB step size)	50 dB available range (0.5 dB step size)
Antenna Beamwidth	2.5°	2.5° / 2.3°
<b>Interfaces</b>		
User Payload	100 Mbps, two full duplex switched Fast Ethernet ports	100 Mbps, two full duplex switched Fast Ethernet ports
User Interconnect	100BaseFX fiber – 1310 nm multimode	100BaseFX fiber – 1310 nm multimode
OAM&P	10BaseT, 10BaseFL – 850 nm multimode	10BaseT, 10BaseFL – 850 nm multimode
<b>Power</b>		
Electrical Requirement	-28 to -56 VDC, 175 Watt maximum	-28 to -56 VDC, 175 Watt maximum
<b>Physical</b>		
Dimensions	16" H x 16" W x 14.5" D (40 cm H x 40 cm W x 36 cm D)	16" H x 16" W x 14.5" D (40 cm H x 40 cm W x 36 cm D)
Packaging	Weatherproof outdoor housing, paintable exterior	Weatherproof outdoor housing, paintable exterior
Mounting Bracket	Direct wall mount or pole mount with integral alignment	Direct wall mount or pole mount with integral alignment
Alignment	Azimuth: ± 90°, Elevation: ± 30°	Azimuth: ± 90°, Elevation: ± 30°
Wind Loading	Operational: 90 mph (145 kph), Survival: 125 mph (200 kph)	Operational: 90 mph (145 kph), Survival: 125 mph (200 kph)
<b>Environmental</b>		
Operating Conditions :	Temp -27°F to +131°F (-33°C to +55°C) ambient	-27°F to +131°F (-33°C to +55°C) ambient
	Humidity 100% condensing	100% condensing
	Altitude -450 ft. to 15,000 ft. (-135 m to 4,550 m)	-450 ft. to 15,000 ft. (-135 m to 4,550 m)
Storage:	Temp -40°F to +158°F (-40°C to +70°C)	-40°F to +158°F (-40°C to +70°C)
	Humidity 95% non-condensing	95% non-condensing
<b>OAM&amp;P</b>		
NMS Interface	SNMP (2 – 10BaseFL remote, 1 – 10BaseT local, 1 – RS-232 local)	SNMP (2 – 10BaseFL remote, 1 – 10BaseT local, 1 – RS-232 local)
Relay	Optically isolated (2 inputs)	Optically isolated (2 inputs)
Tx "On" Indicator	High lumen outdoor LED	High lumen outdoor LED
Fault Detection	Auto-diagnostics, alarms	Auto-diagnostics, alarms
<b>Regulatory</b>		
FCC/IC	Parts 15, 101 / RSS-191	Parts 15, 101
UL/CSA	50, 1950 / C22.2 # 94-M91, C22.2 # 950-93	50, 1950

	31 GHz 100 Mbps Internet	38 GHz 100 Mbps Internet	
<b>Invisible Fiber™ RF Links:</b>			
Frequency	Band B1: 31.000 to 31.075 GHz (75 MHz)	Band A: 38.6 to 39.3 GHz (700 MHz)	
	Band B2: 31.225 to 31.300 GHz (75 MHz)	Band B: 39.3 to 40.0 GHz (700 MHz)	
Frequency Accuracy	+/- 1ppm	+/- 1ppm	
Full Duplex Channels	1 (programmable)	14 (programmable)	
Rx/Tx Offset	200-250 MHz (programmable)	700 MHz	
Channel Bandwidth	50 MHz	50 MHz	
Modulation	8 PSK	8 PSK	
Forward Error Correction	Reed Solomon and Trellis Code Modulation	Reed Solomon and Trellis Code Modulation	
System Gain (H Pol)	≥ 171 dB (with antennas)	≥ 177 dB (with Class A antennas)	
Noise Figure	< 5 dB typical, < 7 dB maximum	< 5 dB typical, < 7 dB maximum	
BER (faded)	1 x 10 <sup>-12</sup> or better	1 x 10 <sup>-12</sup> or better	
Adaptive Tx Power Control	50 dB available range (0.5 dB step size)	50 dB available range (0.5 dB step size)	
Antenna Beamwidth	2.3°	1.7°	
<b>Interfaces</b>			
User Payload	100 Mbps, two full duplex switched Fast Ethernet ports	100 Mbps, two full duplex switched Fast Ethernet ports	
User Interconnect	100BaseFX fiber – 1310 nm multimode	100BaseFX fiber – 1310 nm multimode	
OAM&P	10BaseT, 10BaseFL – 850 nm multimode	10BaseT, 10BaseFL – 850 nm multimode	
<b>Power</b>			
Electrical Requirement	-28 to -56 VDC, 175 Watt maximum	-28 to -56 VDC, 175 Watt maximum	
<b>Physical</b>			
Dimensions	16" H x 16" W x 14.5" D (40 cm H x 40 cm W x 36 cm D)	16" H x 16" W x 14.5" D (40 cm H x 40 cm W x 36 cm D)	
Packaging	Weatherproof outdoor housing, paintable exterior	Weatherproof outdoor housing, paintable exterior	
Mounting Bracket	Direct wall mount or pole mount with integral alignment	Direct wall mount or pole mount with integral alignment	
Alignment	Azimuth: ± 90°, Elevation: ± 30°	Azimuth: ± 90°, Elevation: ± 30°	
Wind Loading	Operational: 90 mph (145 kph), Survival: 125 mph (200 kph)	Operational: 90 mph (145 kph), Survival: 125 mph (200 kph)	
<b>Environmental</b>			
Operating Conditions :	Temp	-27°F to +131°F (-33°C to +55°C) ambient	-27°F to +131°F (-33°C to +55°C) ambient
	Humidity	100% condensing	100% condensing
	Altitude	-450 ft. to 15,000 ft. (-135 m to 4,550 m)	-450 ft. to 15,000 ft. (-135 m to 4,550 m)
Storage:	Temp	-40°F to +158°F (-40°C to +70°C)	-40°F to +158°F (-40°C to +70°C)
	Humidity	95% non-condensing	95% non-condensing
<b>OAM&amp;P</b>			
NMS Interface	SNMP (2 – 10BaseFL remote, 1 – 10BaseT local, 1 – RS-232 local)	SNMP (2 – 10BaseFL remote, 1 – 10BaseT local, 1 – RS-232 local)	
Relay	Optically isolated (2 inputs)	Optically isolated (2 inputs)	
Tx "On" Indicator	High lumen outdoor LED	High lumen outdoor LED	
Fault Detection	Auto-diagnostics, alarms	Auto-diagnostics, alarms	
<b>Regulatory</b>			
FCC/IC	Parts 15, 101	Parts 15, 101 / RSS-191	
UL/CSA	50, 1950	50, 1950 / C22.2 # 94-M91, C22.2 # 950-93	

## OAM&P

Integral Simple Network Management Protocol (SNMP) compatible management agent for integration with existing operator systems such as HP OpenView™.

## Element Manager

IFU Link Manager, a JAVA™ based GUI, connects locally/remotely through out of band 10BaseT/10BaseFL interfaces. Provides security, configuration, fault and performance management.

# Ordering Information

<b>28 GHz 100 Mbps Internet</b>	TNS-28-ETP-FE-100 paired with TNS-28-ETP-FE-300 (27.50 to 27.70 GHz and 27.95 to 28.15 GHz)
	TNS-28-ETP-FE-200 paired with TNS-28-ETP-FE-400 (27.70 to 27.90 GHz and 28.15 to 28.35 GHz)
	TNS-28-ETP-FE-500 paired with TNS-28-ETP-FE-600 (27.50 to 27.85 GHz and 28.00 to 28.35 GHz)
<b>LMCS 100 Mbps Internet</b>	TNS-28-ETP-FE-10I paired with TNS-28-ETP-FE-30I (27.35 to 27.60 GHz and 27.85 to 28.10 GHz)
	TNS-28-ETP-FE-20I paired with TNS-28-ETP-FE-40I (27.60 to 27.85 GHz and 28.10 to 28.35 GHz)
<b>29 GHz 100 Mbps Internet</b>	TNS-29-ETP-FE-100 paired with TNS-29-ETP-FE-200 (29.100 to 29.250 GHz and 31.075 to 31.225 GHz)
<b>31 GHz 100 Mbps Internet</b>	TNS-31-ETP-FE-100 paired with TNS-31-ETP-FE-200 (31.000 to 31.075 GHz and 31.225 to 31.300 GHz)
<b>38 GHz 100 Mbps Internet</b>	TNS-38-ETP-FE-100 paired with TNS-38-ETP-FE-300 (38.60 to 38.95 GHz and 39.30 to 39.65 GHz)
	TNS-38-ETP-FE-200 paired with TNS-38-ETP-FE-400 (38.95 to 39.30 GHz and 39.65 to 40.00 GHz)

### Notes:

1. HP OpenView™ and JAVA™, are registered trademarks of Hewlett Packard and Sun Microsystems respectively.
2. All specifications subject to change without notice.
3. Revision 1.4

