



TRITON™
NETWORK SYSTEMS, INC.

INVISIBLE FIBER™ UNIT
TECHNICAL DATA SHEET

SONET OC-3
SDH STM-1

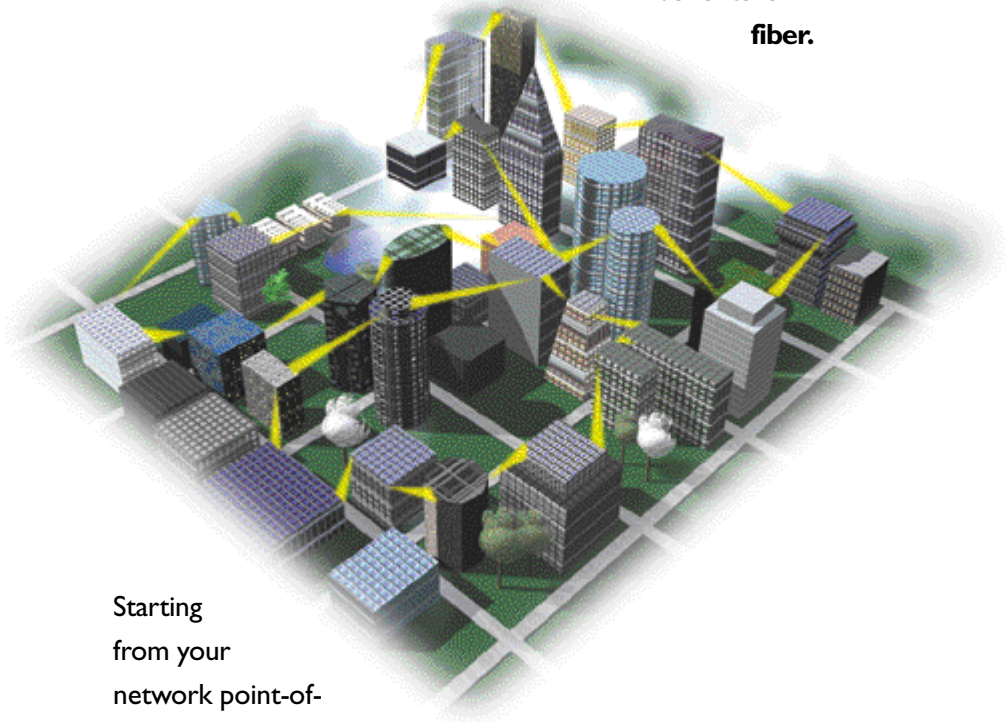


ACCESS...

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 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 155 Mbps Invisible Fiber SONET OC-3/SDH STM-I product affords network operators the ability to deliver telephony and data services to not just the last mile, but the 20-40 square mile area of most metropolitan cities. Invisible Fiber SONET OC-3/SDH STM-I units, when deployed in consecutive point rings, provide for non-blocking, self-healing, fault-tolerant network service. Invisible Fiber SONET OC-3/SDH STM-I offers features unique to broadband fixed wireless products. Outstanding product advantages, 155 Mbps non-blocking service and consecutive point architecture combine to deliver services that truly compete with the incumbent carrier.

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:

GR-253-CORE, TR-NWT-000917, IEEE 802.3, IEEE 802.2, IEEE 802.1d (MAC Bridging), NEMA 250, NEBS Requirements, GR-2834



	28 GHz SONET OC-3/SDH STM-1	29 GHz SONET OC-3/SDH STM-1
Invisible Fiber™ RF Links:		
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	32 QAM	32 QAM
Forward Error Correction	Reed Solomon and Trellis Code Modulation	Reed Solomon and Trellis Code Modulation
System Gain (H Pol)	162 dB (with antennas)	162 dB (with antennas)
Noise Figure	< 5 dB typical, < 7 dB maximum	< 5 dB typical, < 7 dB maximum
BER (faded)	1 x 10 ⁻¹² or better	1 x 10 ⁻¹² 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°
Interfaces		
User Payload	155 Mbps, full duplex	155 Mbps, full duplex
User Interconnect	OC-3/STM-1 fiber – 1310 nm single mode	OC-3/STM-1 – 1310 nm single mode
OAM&P	10BaseT, 10BaseFL – 850 nm multimode	10BaseT, 10BaseFL – 850 nm multimode
Power		
Electrical Requirement	-28 to -56 VDC, 175 Watt maximum	-28 to -56 VDC, 175 Watt maximum
Physical		
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)
Environmental		
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
OAM&P		
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
Regulatory		
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 SONET OC-3/SDH STM-1	38 GHz SONET OC-3/SDH STM-1
Invisible Fiber™ RF Links:		
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	32 QAM	32 QAM
Forward Error Correction	Reed Solomon and Trellis Code Modulation	Reed Solomon and Trellis Code Modulation
System Gain (H Pol)	≥ 162 dB (with antennas)	≥ 168 dB (with Class A antennas)
Noise Figure	< 5 dB typical, < 7 dB maximum	< 5 dB typical, < 7 dB maximum
BER (faded)	1 x 10 ⁻¹² or better	1 x 10 ⁻¹² 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°
Interfaces		
User Payload	155 Mbps, full duplex	155 Mbps, full duplex
User Interconnect	OC-3/STM-1 – 1310 nm single mode	OC-3/STM-1 – 1310 nm single mode
OAM&P	10BaseT, 10BaseFL – 850 nm multimode	10BaseT, 10BaseFL – 850 nm multimode
Power		
Electrical Requirement	-28 to -56 VDC, 175 Watt maximum	-28 to -56 VDC, 175 Watt maximum
Physical		
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)
Environmental		
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
OAM&P		
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
Regulatory		
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

28 GHz SONET OC-3	TNS-28-SNP-03-100 paired with TNS-28-SNP-03-300 (27.50 to 27.70 GHz and 27.95 to 28.15 GHz)
	TNS-28-SNP-03-200 paired with TNS-28-SNP-03-400 (27.70 to 27.90 GHz and 28.15 to 28.35 GHz)
	TNS-28-SNP-03-500 paired with TNS-28-SNP-03-600 (27.50 to 27.85 GHz and 28.00 to 28.35 GHz)
28 GHz SDH STM-1	TNS-28-SDP-01-100 paired with TNS-28-SDP-01-300 (27.50 to 27.70 GHz and 27.95 to 28.15 GHz)
	TNS-28-SDP-01-200 paired with TNS-28-SDP-01-400 (27.70 to 27.90 GHz and 28.15 to 28.35 GHz)
	TNS-28-SDP-01-500 paired with TNS-28-SDP-01-600 (27.50 to 27.85 GHz and 28.00 to 28.35 GHz)
LMCS SONET OC-3	TNS-28-SNP-03-101 paired with TNS-28-SNP-03-301 (27.35 to 27.60 GHz and 27.85 to 28.10 GHz)
	TNS-28-SNP-03-201 paired with TNS-28-SNP-03-401 (27.60 to 27.85 GHz and 28.10 to 28.35 GHz)
29 GHz SONET OC-3	TNS-29-SNP-03-100 paired with TNS-29-SNP-03-200 (29.100 to 29.250 GHz and 31.075 to 31.225 GHz)
31 GHz SONET OC-3	TNS-31-SNP-03-100 paired with TNS-31-SNP-03-200 (31.000 to 31.075 GHz and 31.225 to 31.300 GHz)
31 GHz SDH STM-1	TNS-31-SDP-01-100 paired with TNS-31-SDP-01-200 (31.000 to 31.075 GHz and 31.225 to 31.300 GHz)
38 GHz SONET OC-3	TNS-38-SNP-03-100 paired with TNS-38-SNP-03-300 (38.60 to 38.95 GHz and 39.30 to 39.65 GHz)
	TNS-38-SNP-03-200 paired with TNS-38-SNP-03-400 (38.95 to 39.30 GHz and 39.65 to 40.00 GHz)
38 GHz SDH STM-1	TNS-38-SDP-01-100 paired with TNS-38-SDP-01-300 (38.60 to 38.95 GHz and 39.30 to 39.65 GHz)
	TNS-38-SDP-01-200 paired with TNS-38-SDP-01-400 (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

