



Optelecom 9000 Series Installation and Operation Manual

Model 9771 Model 9771Y

Four-Port 100 Mbps Ethernet
Switch/Fiber Optic Transmission Cards

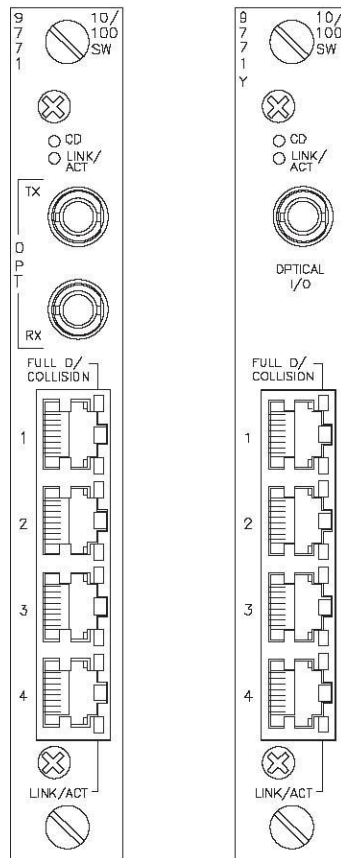


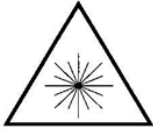
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Safety Instructions

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The safety information contained in this section, and on other pages of this manual, must be observed whenever this unit is operated, serviced, or repaired. Failure to comply with any precaution, warning, or instruction noted in the manual is in violation of the standards of design, manufacture, and intended use of the unit. TKH Security Solutions USA assumes no liability for the customer's failure to comply with any of these safety requirements.



LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (MAGNIFIERS)
CLASS 1M LASER PRODUCT

CAUTION:
DISCONNECTED OPTICAL CONNECTORS MAY EMIT OPTICAL ENERGY.
DO NOT VIEW BEAM WITH OPTICAL INSTRUMENTS (MAGNIFIERS)

This product contains Class 1M lasers or LEDs.

- Class 1M laser product according to IEC60825-1:1993+A1+A2

- **CAUTION: Use of controls or adjustments or procedures other than those specified herein may result in hazardous radiation exposure.**

- Precautions should be taken to prevent exposure to optical radiation when the unit is removed from its enclosure or when fiber is disconnected from the unit.

- Laser radiation may be present on a fiber connection to this unit even when the power has been removed from the unit.

- This unit is intended for installation in locations where only trained service personnel have access to the fiber connections.

- The locations of all optical connections are listed in the Connection Locations and Function section of this manual.

- Optical outputs and wavelengths are listed in the Specifications section of this manual.

The optical devices used in this equipment are Hazard Level 1M. As required by IEC60825-1, the installer is responsible for insuring that the label depicted below is present in the restricted locations where this equipment is installed.

Hazard Level 1M

The border shall be black and the background shall be yellow



This assembly contains parts sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting parts or assemblies.

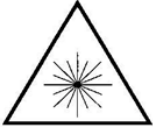


The chassis into which this unit is installed must be housed in a properly rated NEMA enclosure.



When this unit is operated in extremely elevated temperature conditions, it is possible for internal and external metal surfaces to become extremely hot. Care should be taken to insure this unit is installed in a restricted area where only properly trained service personnel have access to the unit.

Debe observarse la información de seguridad contenida en esta sección, y en otras páginas de este manual siempre que se opere, dé servicio o repare esta unidad. Si no se cumple con alguna precaución, advertencia o instrucción indicada en este manual se infringen los estándares de diseño, fabricación y el uso destinado a la unidad. TKH Security Solutions USA no asume ninguna responsabilidad si el cliente no cumple con alguno de estos requisitos de seguridad.



RADIACIÓN LÁSER
NO VER DIRECTAMENTE CON INSTRUMENTOS ÓPTICOS (DE AUMENTO)
PRODUCTO LÁSER CLASE 1M

PRECAUCIÓN:
LOS CONECTORES ÓPTICOS DESCONECTADOS PUEDEN AMITIR ENERGÍA ÓPTICA
NO VER EL HAZ CON INSTRUMENTOS ÓPTICOS (DE AUMENTO)

Este producto contiene rayos láser o diodos emisores de luz Clase 1M.

- Producto láser Clase 1M conforme a la norma IEC60825-1: 1993+A1+A2
- **PRECAUCIÓN:** El uso de los controles, ajustes o procedimientos, aparte de los aquí especificados, pueden ocasionar exposición peligrosa a la radiación.
- Deben tomarse precauciones para evitar la exposición a la radiación óptica cuando se saque la unidad de su alojamiento, o cuando se desconecte la fibra de la unidad
- Puede haber radiación laser en una conexión de fibra a esta unidad aun cuando se haya eliminado la corriente de la unidad.
- Este equipo está destinado a instalarse en lugares donde sólo el personal de servicio debidamente entrenado tenga acceso a las conexiones de fibra.
- La ubicación de todas las conexiones ópticas se enumeran en la sección Ubicación de los conectores y funciones de este manual.
- Las salidas ópticas y longitudes de onda aparecen en la sección Especificaciones de este manual.

Los dispositivos ópticos usados en este equipo son de Nivel de Riesgo 1M. Según lo exige la norma IEC60825-1, el instalador es responsable de asegurar que la etiqueta descrita a continuación esté presente en las áreas restringidas donde se instale este equipo.



El borde debe ser negro y el fondo debe ser amarillo



Este ensamblaje contiene piezas sensibles al daño por descargas electrostáticas (ESD, por sus siglas en inglés). Use procedimientos para prevenir las descargas electrostáticas al tocar, desmontar o insertar piezas o ensamblajes.

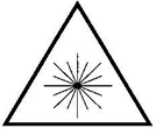


El chasis en el cual está instalada esta unidad debe estar dentro de un alojamiento debidamente calificado por NEMA.



Cuando se opera esta unidad en condiciones de temperatura sumamente elevada, es posible que las superficies internas y externas de metal se pongan extremadamente calientes. Debe tenerse cuidado para asegurar que esta unidad se instale en un área restringida donde sólo tenga acceso a la unidad el personal de servicio debidamente capacitado.

Die in diesem Abschnitt und auf anderen Seiten dieses Handbuchs enthaltenen Sicherheitsinformationen müssen befolgt werden, wenn diese Einheit betrieben, gewartet oder repariert wird. Falls Vorsichtsmassnahmen, Warnungen oder Anweisungen in diesem Handbuch nicht befolgt werden, verstösst dies gegen die Konstruktions, und Herstellungsstandards und erfolgt im gegensatz zum vorgesehenen Verwendungszweck dieser Einheit. TKH Security Solutions USA übernimmt keine Haftung für das Verabsäumen des Kunden, diese Sicherheitsanforderungen einzuhalten.



LASER-STRAHLUNG
NICHT DIREKT MIT OPTISCHEN INSTRUMENTEN (LUPEN) ANSEHEN
LASER-PRODUKT DER KLASSE 1M

VORSICHT:
ABGEKLEMMTE OPTISCHE STECKVERBINDER KÖNNEN OPTISCHE ENERGIE FREI SETZEN
NICHT MIT OPTISCHEN INSTRUMENTEN (LUPEN) IN DEN STRAHL BLICKEN.

Dieses Produkt enthält Laser oder LEDs der Klasse 1M.

- Laserprodukt der Klasse 1M gemäß IEC60825-1:1993+a1+A2
- **VORSICHT: Wenn die Bedienungselemente anders als hier beschrieben bzw. andere Einstellungen verwendet werden, kann es zu schädlicher Strahlenaussetzung kommen.**
- Es müssen Vorsichtsmaßnahmen getroffen werden, um Aussetzung an optischer Strahlung zu vermeiden, wenn die Einheit aus dem Gehäuse genommen oder die Faseroptik von der Einheit getrennt wird.
- In einer Faseroptik-Verbindung dieser Einheit kan auch dann Laserstrahlung vorhanden sein, wenn die Stromversorgung zur Einheit abgeschaltet wurde.
- Diese Einheit ist zum Einbau an Orten vorgesehen, an denen nur geschultes Personal Zugang zu den Faseroptik-Verbindungen hat.
- Die Lage aller optischen Verbindungen ist im Abschnitt über die Lage von Anschlüssen und Funktionsweise dieses Handbuchs zu finden.
- Optische Ausgänge und Wellenlängen sind im Abschnitt mit den technischen Daten dieses Handbuchs zu finden.

Die optischen Vorrichtungen in diesem Gerät haben Gefahrenstufe 1M. Wie vorgeschrieben durch IEC60825-1 ist der Installateur dafür verantwortlich, sicherzustellen, dass die unten abgebildeten Schilder an den Orten mit eingeschränktem Zugang, an denen dieses Gerät aufgestellt ist, vorhanden sind.



Schwarzer Rand und
gelber Hintergrund



Diese Baugruppe enthält Teile, die durch elektrostatische Entladungen (ESD) beschädigt werden können. Vorsichtsmaßnahmen zum Schutz vor elektrostatischer Entladung treffen, wenn Teile oder Baugruppen berührt, ausgebaut oder eingefügt werden.



Das Gestell, in dem diese Einheit eingebaut ist, muss in einem entsprechend klassifizierten NEMA-Schutzgehäuse untergebracht sein.

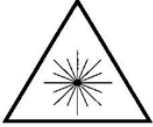


Wenn diese Einheit bei besonders hohen Temperaturen betrieben wird, können interne und externe Metallflächen extrem heiß werden. Es muss darauf geachtet werden, dass diese Einheit in einem Bereich mit eingeschränktem Zugang aufgestellt wird, damit nur geschultes Wartungspersonal Zugang zur Einheit hat.

Consignes de Sécurité

RM-1

Les consignes de sécurité contenues dans cette section et dans le reste de ce manuel doivent être respectées à chaque fois que cet appareil est utilisé ou fait l'objet d'une maintenance ou d'une réparation. Le non-respect d'une précaution, d'un avertissement ou d'une instruction figurant dans ce manuel est une violation des normes de conception, fabrication et indication d'usage de l'appareil. TKH Security Solutions USA n'est pas responsable du non-respect de ces consignes de sécurité par le client.



RAYONNEMENT LASER
NE PAS REGARDER DIRECTEMENT AVEC DES INSTRUMENTS OPTIQUES (LOUPES)
PRODUIT LASER DE CLASSE 1M

ATTENTION:
LES CONNECTEURS OPTIQUES DEBRANCHES PEUVENT EMETTRE UNE ENERGIE OPTIQUE.
NE PAS REGARDER LE FAISCEAU AVEC DES INSTRUMENTS OPTIQUES (LOUPES)

Ce produit contient des lasers ou diodes électroluminescentes de classe 1M.

- Produit laser de classe 1M conformément à IEC60825-1:1993+A1+A2
- **ATTENTION: L' utilisation de commandes ou réglages, ou de procédures différentes de celles indiquées ici risque de provoquer une exposition dangereuse au rayonnement.**
- Prendre des précautions pour empêcher une exposition au rayonnement optique lorsque l' appareil est retiré de son boîtier ou lorsque la câble optique fibre est débranché de l' appareil.
- Un rayonnement laser pourra être présent dans un câble optique branché sur cet appareil, même une fois l'alimentation coupée.
- Cet appareil est prévu pour une installation à des endroits où seul un personnel de maintenance formé accès aux câbles optiques.
- Les points de branchement de tous les câbles optiques sont indiqués à la section Points de branchement et fonction de ce manuel.
- Les sorties et longueurs d' onde optiques figurant à la section Caractéristiques techniques de ce manuel.

Les appareils optiques utilisés dans cet équipement correspondent à un niveau de danger 1M. Comme exigé par la norme IEC60825-1, il incombe à

l'installateur de s'assurer que l'étiquette ci-dessous est présente aux endroits d'accès limité où cet équipement est installé.

Niveau de danger 1M

La bordure doit être noire et le fond jaune



Cet ensemble contient des pièces sensibles aux décharges électrostatiques (ESD). Prendre les précautions relatives aux ESD avant de toucher, retirer ou insérer des pièces ou des ensembles.



Le châssis dans lequel est installé cet appareil doit être placé dans une enceinte NEMA conforme aux spécifications nominales.



Lorsque cet appareil fonctionne à une température ambiante extrêmement élevée, il est possible que les surfaces métalliques internes et externes deviennent extrêmement chaudes. S'assurer que cet appareil est installé dans une zone dont l'accès est limité à un personnel de maintenance correctement formé.

Fiber Information

This unit was manufactured with attention to fiber cleanliness by TKH Security Solutions USA. Beyond the optical safety information contained in this manual, the following guidelines should be observed when working with optical fibers.

The biggest problem is **dirt!**

It takes very little contamination to cause problems with optical fiber connections; cleanliness is extremely important to proper operation of optical equipment.

1. Protect optical connectors by leaving the connector covers in place on unused fiber connections and on the fiber tips themselves.
2. Personnel who remove and replace fibers should be equipped with a fiber cleaning kit. These are inexpensive and can be obtained from any fiber equipment supply house. If you choose to, you can use propanol and lint-free tissue to clean fibers.
 - a. Do not use isopropanol alcohol (typically called rubbing alcohol) mixed with water. This can cause additional spots. (**Caution: Pure isopropanol is very flammable!**)
 - b. Use lintless tissues to clean fibers.
 - c. Clean the fiber with a folded tissue moistened with the propanol, pulling the connector tip across the tissue, then turn the connector 90 degrees and repeat in a different spot on the tissue.
 - d. Don't pull the fiber across and then push it back. This will put the dirt that was cleaned off back on again.
 - e. Repeat the process on a dry, folded tissue.
3. When removing fibers, **always** clean them when replacing them no matter how long you had them off.
4. When connecting fibers, pay attention to the bend radius of the fibers. A general rule is to have a 3-inch (8 cm) bend radius. A bend radius less than 3 inches is an attenuator and can cause optical signal loss.
5. Installers of fiber equipment should be equipped with the equipment manuals and an optical power meter to measure the optical inputs and outputs in a system. An optical power meter is an inexpensive tool that can save much time and effort in getting optical communications links up and running. Properly equipped and trained installers can quickly determine the source of any problems that occur.

External Wiring Information

Cable assemblies with lengths external to the unit not exceeding 3.05 meters, coiled or uncoiled, may be constructed of jacketed appliance wiring material suitable for the maximum voltage current and temperature, rated VW-1 or FT-1 or better. Cable assemblies with lengths external to the unit not exceeding 3.05 meters, coiled or uncoiled, and supplied by a limited power source or NEC Class 2 source of supply as defined in the National Electric Code, ANSI/NFPA 70, may be constructed of materials rated VW-1 or FT-1 or better with no additional requirements.

Functional Description

A pair of 9771 or 9771Y cards provide optical transmission for a 100 mbs fast Ethernet link and include a built-in unmanaged four-port Ethernet switch. The 9771 is available in two versions, the 9771 dual fiber version and the 9771Y single fiber version. Each of the four RJ45 Ethernet ports are 10/100, Auto Negotiate, Full or Half Duplex, and Auto MIDX.

The 9771-L-ST or 9771-L-SC version of the product is also FX (Optical Ethernet Standard) compliant and will communicate over fiber with other FX compliant optical Ethernet transmission equipment.

The 9771 also offers a version that operates as part of a *SpectraStream 128* CWDM system, supporting the addition of 100 mbs fast Ethernet on the same fiber with the uncompressed video, audio, and low speed data already available in the system.

The 9771 is optically compatible with the 9772 Eight-Port Drop and Repeat Ethernet Switch Transmission card.

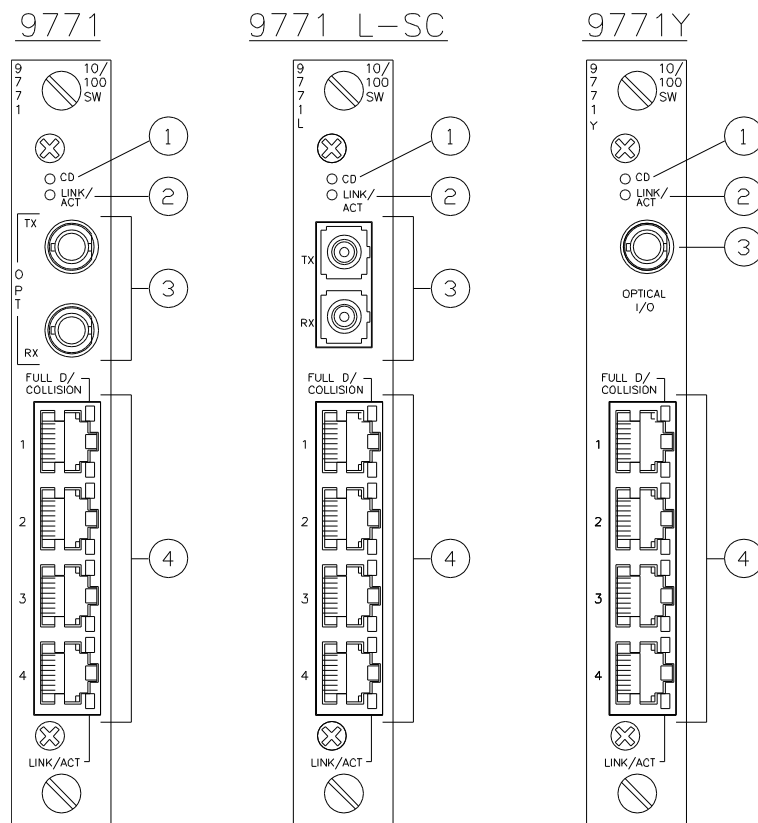
The 9771 and 9771Y are rack-mount cards designed to operate in any of the TKH Security USA Series 9002 or 9003 chassis. The cards operate on 6VDC as supplied by the chassis into which they are installed.

The optical ports always operate at 100 Mbps full duplex, that is 100 Mbps simultaneously in both directions. This means that distance is limited only by the optical performance of the particular 9771 and not by restrictions imposed by Half Duplex Ethernet. Also for most applications there is plenty of bandwidth.

Each of the eight RJ45 copper Ethernet ports is Auto Negotiate, 10/100 Mbps, Full/Half Duplex and Auto MIDX. This means that the 9771 copper ports can be connected to most any other Ethernet device using a regular Cat5 cable. Speed, duplex, and direction are automatically negotiated. Previous generation switches and hubs required a crossover cable or an "uplink" port to connect to another switch or hub.

9771 and 9771Y Indicator and Connector Locations and Functions

FIGURE 1



1. CARRIER DETECT (CD) INDICATOR

This **green** LED illuminates when a valid *optical* link has been established on the fiber port.

2. LINK/ACTIVITY INDICATOR

This **green** LED is illuminated when the fiber port has established an Ethernet link with the far end unit. It blinks when there is data activity on the link.

3. OPTICAL FIBER CONNECTOR(S)

- The optical fiber(s) connect to these fiber connector(s).
- The 9771 versions have two optical connectors, an Input (RX) and an output (Tx).
- The 9771Y versions have one input/output optical connector.

4. ETHERNET SWITCH PORTS (PORTS 1 THROUGH 4)

- Each of the four RJ45 Ethernet switch ports is 10/100 Ethernet, Auto Negotiate, and Auto MIDX.
- Each port has a **yellow** Full Duplex/Collision LED. This LED is illuminated when the port is operating in Full Duplex mode and will blink when there are collisions on the port.
- Each port also has a **green** Link/Activity LED that illuminates when the port has established a link and will blink when there is data activity on the port.

Set Up and Operation of the 9771 and 9771Y

Operation of the 9771 and 9771Y cards consists of installing the card into the chassis, making the fiber connection(s), and connecting the Ethernet cables as required. The optical ports always operate at 100 Mbps full duplex, which is 100 Mbps simultaneously in both directions. This means that distance is limited only by the optical performance of the particular 9771 and not by restrictions imposed by Half Duplex Ethernet. Also for most applications there is plenty of bandwidth.

The 9771 is an Ethernet switch, which means that unicast packets (most common type) only appear on the ports where they are needed. In other words, bandwidth is not used unnecessarily. Multicast packets (sometimes used for MPEG video) will, however, appear on every port of a 9771.

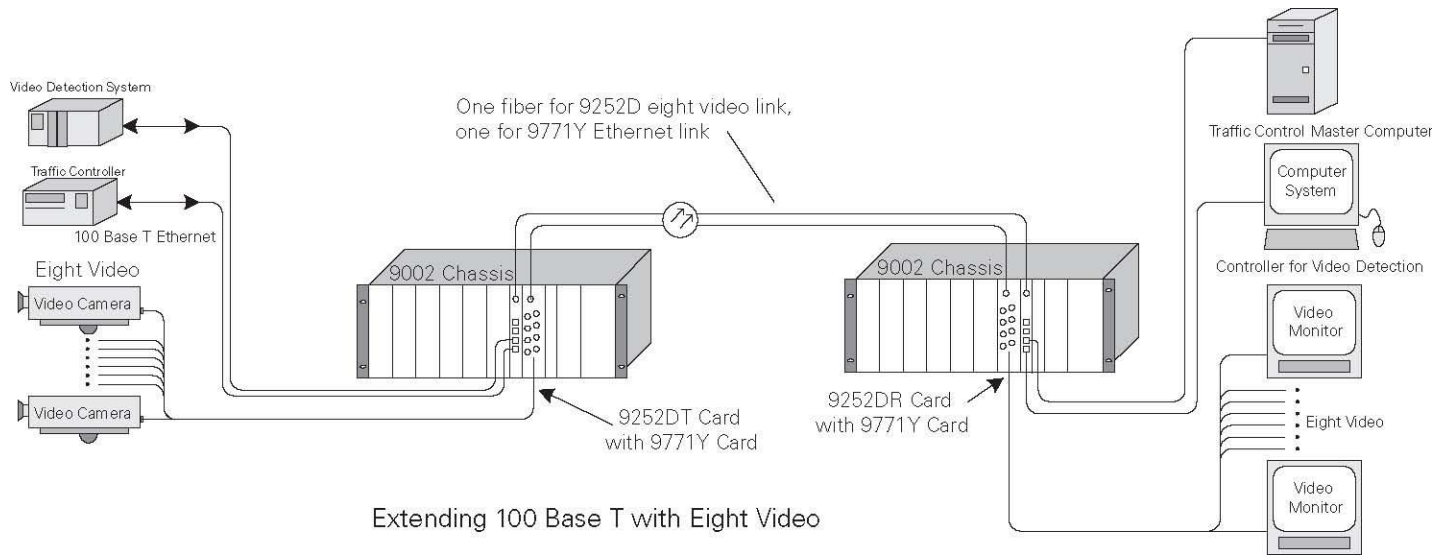
Each of the four RJ45 copper Ethernet ports is Auto Negotiate, 10/100 Mbps, Full/Half Duplex and Auto MIDX. This means that the 9771 copper ports can be connected to most any other Ethernet device using a regular Cat5 cable. Speed, duplex, and direction are automatically negotiated. Previous generation switches and hubs required a crossover cable or an "uplink" port to connect to another switch or hub.

Things to take into consideration for copper ports are:

- 100 Mbps copper connections (100BASE-T) are limited to 100 meters of Cat5 (or better) cable.
- Restrictions apply when connecting several Half Duplex devices together. Consult the manuals of such devices for details.
- A port on a device that is 10 Mbps full duplex (TKH Security USA 9971), or has been set to 10 Mbps Full Duplex, does not reliably participate in the auto negotiate process and may well result in an invalid connection.

Typical Applications for the 9771 and 9771Y

FIGURE 2



Operation of the 9771 and 9771Y with the Network Management System

Operation of the 9771 and 9771Y with the Network Management System consists of the following parameters:

1. Card Location
2. Card Size (Number of Slots)
3. Card Name (Mode Number)
4. Serial Number
5. Revision Number
6. Chronometer Value (Cumulative Hours of Operation)
7. Reset Cycles (Cumulative Number of Power Cycles)
8. Firmware Revision
9. Optical Carrier Detect (CD) Status and Alarm
10. Optical Port Link Status/Alarm
11. Link Status/Alarm for each of the four Ethernet ports
12. Full Duplex Status/Alarm for each of the four Ethernet ports

Specifications

OPTICAL SPECIFICATIONS 9771 (DUAL FIBER VERSION)

Transmitter/Receiver Versions	Fiber Size	LDS	L	LD	LD3	LD3X ¹
Wavelength (nm)		850	1310	1310	1550	1470-1610
Optical Output Power (dB) minimum	50/125	-11	-22	N/A	N/A	N/A
	62.5/125	-7	-18	N/A	N/A	N/A
	09/125	N/A	N/A	-7	0	0
Minimum Optical Input Power (dB) for proper operation	50/125	-28	-34	N/A	N/A	N/A
	62.5/125	-28	-34	N/A	N/A	N/A
	09/125	N/A	N/A	-34	-34	-34
Link Budget	50/125	17	12	N/A	N/A	N/A
	62.5/125	21	16	N/A	N/A	N/A
	09/125	N/A	N/A	27	34	34
Estimated Range (km) ^{2, 3, 4}	50/125	4	2 ⁴	N/A	N/A	N/A
	62.5/125	4	2 ⁴	N/A	N/A	N/A
	09/125	N/A	N/A	68	124	68-124 ⁵

¹ Replace X with A to W to represent CWDM wavelengths per CWDM Wavelength Table below.

² Range based on losses of 3.0 dB/km @ 850 nm or 1.0 dB/km @ 1310 nm for 62.5/125 multimode fiber, 0.35 dB/km @ 1310 nm or 0.25 dB/km @ 1550 nm for singlemode fiber, and includes a 3 dB safety factor.

³ Range limited by fiber bandwidth on multimode fiber versions; estimates based on 300 MHz/km fiber specification.

⁴ FX Ethernet specifications limit the distance for the FX compatible version (L) to 2 Km.

⁵ Distance on CWDM systems varies with the wavelengths and insertion losses of the CWDM components used.

CWDM WAVELENGTH TABLE (nm)

A = 1470	D = 1530	G = 1590	N = 1290	R = 1350	U = 1410
B = 1490	E = 1550	H = 1610	P = 1310	S = 1370	V = 1430
C = 1510	F = 1570	M = 1270	Q = 1330	T = 1390	W = 1450

OPTICAL SPECIFICATIONS 9771Y (SINGLE FIBER VERSION)

Fiber Type	Model Pair	Parameter	Specifications
MM 62.5/125	9971Y/MM-08T-XX 9971Y/MM-13T-XX	Optical Output Power (dB) min. (Tx/Rx)	-7/-17
		Wavelength (nm) (TX/RX)	850/1310 ¹
		Receiver Sensitivity (dBm) (TX/RX)	-32/-24
		Optical Budget (dB) [(RX Out Pwr – TX Sens)/(TX Out Pwr – RX Sens)]	17/15
		Estimated Range (Km) ^{2, 3}	4
SM 09/125	9971Y/SM-13T-XX 9971Y/SM-15T-XX	Optical Output Power (dB) min. (TX/RX)	-7/-7
		Wavelength (nm) (TX/RX)	1310/1550
		Receiver Sensitivity (dBm) (TX/RX)	-28/-28
		Optical Budget (dB) [(RX Out Pwr – TX Sens)/(TX Out Pwr – RX Sens)]	21/21
		Estimated Range (Km) ³	51

¹ Range based on losses of 3.0 dB/km @ 850 nm or 1.0 dB/km @ 1310 nm for 62.5/125 multimode fiber, 0.35 dB/km @ 1310 nm or 0.25 dB/km @ 1550 nm for singlemode fiber, and includes a 3 dB safety factor.

² Range may be limited by chromatic dispersion and by fiber quality.

³ Range may be dependent on Ethernet distance limitations.

ELECTRICAL SPECIFICATIONS

POWER

Requirements

9771

6VDC @ 550 mA

9771Y

6VDC @ 550 mA

Source

Chassis backplane

ETHERNET

Connector Type

RJ45

10/100 Base T, Full or Half Duplex, Auto Negotiate, Auto MIDX

PHYSICAL

Dimensions (in inches)

6.1 H x 0.8 W x 8.6 D

Weight (in pounds)

0.8

ENVIRONMENTAL

Operating Temperature

-40° C to +74° C

Storage Temperature

-55° C to +85° C

Relative Humidity

0 to 95% noncondensing

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