



User's Guide

TN-SFP-xxx

Small Form Factor Pluggable (SFP) Transceiver Modules

The Transition Networks TN-SFP-xxx series small form factor pluggable (SFP) transceiver modules are designed to install in any SFP port, connect multimode 1000Base-SX or single mode 1000Base-LX fiber-optic cable to the network through the SFP connector. The TN-SFP-xxx transceivers are designed for bi-directional serial-optical data communications such as Gigabit Ethernet or fiber channel at speeds up to 1.25 Gbps.

Part Number	Duplex Fiber-Optic Port
TN-SFP-SX	LC, 1000Base-SX, 850 nm multimode, 220 m (722 ft)* on 62.5/125 μm fiber, 550 m (1840 ft)* on 50/125 μm fiber
TN-SFP-SXD	LC, 1000Base-SX, 850 nm multimode with DMI management, 220 m (722 ft)* on 62.5/125 μm fiber, 550 m (1840 ft)* on 50/125 μm fiber
TN-SFP-ESX5	LC, 1000Base-SX, 1310 nm multimode extended with DMI management, 2 km (1.2 miles)* 50/125μm fiber
TN-SFP-ESX6	LC, 1000Base-SX, 1310 nm multimode extended with DMI management, 2 km (1.2 miles)* 62.5/125μm fiber
TN-SFP-ELX1	LC, 1000Base-LX, 1310 nm single mode 10 km (6.2 miles)*
TN-SFP-LX1	LC, 1000Base-LX, 1310 nm single mode with DMI management, 10 km (6.2 miles)*
TN-SFP-LX3	LC, 1000Base-LX, 1310 nm single mode with DMI management, 30 km (18.8 miles)*
TN-SFP-LX5	LC, 1000Base-LX, 1550 nm single mode with DMI management, 50 km (31.2 miles)*
TN-SFP-LX8	LC, 1000Base-LX, 1550 nm single mode with DMI management, 80 km (50.0 miles)*

*Unless otherwise indicated, the distances listed are the typical maximum cable distance. The actual maximum cable distances are dependent upon the physical characteristics of the network installation.

Installation	3
Operation	8
Diagnostic Monitoring Interface (DMI)	4
Cable Specifications	5
Technical Specifications	8
Contact Us	9
Declaration of Conformity	10
Compliance Information	11

TN-SFP-xxx

Part Number	Duplex Fiber-Optic Port
TN-SFP-LX12	LC, 1000Base-LX, 1550 nm single mode with DMI management, 120 km (74.6 miles)*
TN-SFP-LX16	LC, 1000Base-LX, 1550 nm single mode with DMI management, 160km (99.4 miles)*
TN-SFP-OC3M	LC, 100Base-FX/OC-3 1300 nm multimode 2km (1.2 miles)*
TN-SFP-OC3S	LC, 100Base-FX/OC-3 1310 nm single mode 20km (12.4 miles)*
TN-SFP-OC3S3	LC, 100Base-FX/OC-3 1310 nm single mode 30km (18.6 miles)*
TN-SFP-OC3S8	LC, 100Base-FX/OC-3 SFP 1550 nm single mode with DMI management, 80km (50 miles)*
TN-SFP-OC12M	LC, OC-12/STM-4 SFP 1300 nm multimode 1 km (0.6 miles)*
TN-SFP-OC12S	LC, OC-12/STM-4 SFP 1310 nm single mode 20 km (12.4 miles)*
TN-SFP-FC2XM	LC, FC 2x/1x/OC-48/STM-16/1000Base-SX, 850 nm multimode, with DMI management 150 m (492 ft)* on 62.5/125 μm fiber, 300 m (984ft)* on 50/125 μm fiber
TN-SFP-FC2XS2	LC, FC 2x/1x/OC-48/STM-16/1000Base-LX, 1310 nm single mode with DMI management 2 km (1.2 miles)*
TN-SFP-FC2XS15	LC, FC 2x/1x/OC-48/STM-16/1000Base-LX, 1310 nm single mode with DMI management 15 km (9.3 miles)*
TN-SFP-FC2XS40	LC, FC 2x/1x/OC-48/STM-16/1000Base-LX, 1310 nm single mode with DMI management 40 km (24.9 miles)*

Part Number	Simplex Fiber-Optic Port
TN-SFP-OC3SB21**	LC, 1000Base-FX, Single Fiber, 1310nm TX/1550nm RX, single mode with DMI management, 20 km (12.4 miles) .
TN-SFP-OC3SB22**	LC, 1000Base-FX, Single Fiber, 1550nm TX/1310nm RX, single mode with DMI management, 20 km (12.4 miles) .
TN-SFP-BXU**	LC, 1000Base-BX, Single Fiber, 1310nm TX/1490nm RX, single mode with DMI management, 10 km (6.2 miles) .
TNSFP-BXD**	LC, 1000Base-BX, Single Fiber, 1490nm TX/1310nm RX, single mode, 10 km (6.2 miles) with DMI management.
TN-SFP-BXU2**	LC, 1000Base-BX, Single Fiber, 1310nm TX/1490nm RX, single mode, 20 km (12.4 miles) with DMI management.
TN-SFP-BXD2**	LC, 1000Base-BX, Single Fiber, 1490nm TX/1310nm RX, single mode, 20 km (12.4miles) with DMI management.

Part Number	Simplex Fiber-Optic Port
TN-SFP-LXB11**	LC, 1000BASE-LX, 1310TX/1550RX Simplex, single mode, with DMI, 10km (6.2 miles)*
TN-SFP-LXB12**	LC, 1000BASE-LX, 1550TX/1310RX Simplex, single mode, with DMI management, 10km (6.2 miles)*
TN-SFP-LXB21**	LC, 1000BASE-LX, 1310TX/1550RX Simplex, single mode, with DMI management, 20km (12.4 miles)*
TN-SFP-LXB22**	LC, 1000BASE-LX, 1550TX/1310RX Simplex, single mode, with DMI management, 20km (12.4 miles)*
TN-SFP-LXB41**	LC, 1000BASE-LX, 1310TX/1550RX Simplex, single mode, with DMI management, 40km (24.9 miles)*
TN-SFP-LXB42**	LC, 1000BASE-LX, 1550TX/1310RX Simplex, single mode, with DMI management, 40km (24.9 miles)*

*Unless otherwise indicated, the distances listed are the typical maximum cable distance. The actual maximum cable distances are dependent upon the physical characteristics of the network installation.

**Install simplex or single-fiber models in pairs in the same network where one is the local SFP and the other is the remote SFP.

Installation

Important: In Cisco Systems' literature, Cisco switches with SFP slots do not accept SFP modules from other manufacturers. The Cisco switch identifies the manufacturer's ID along with the part number and blocks operations to the port for non-Cisco modules. Other major SFP switch manufacturers do not indicate in their literature that such restrictions are imposed.

Installing the SFP transceiver

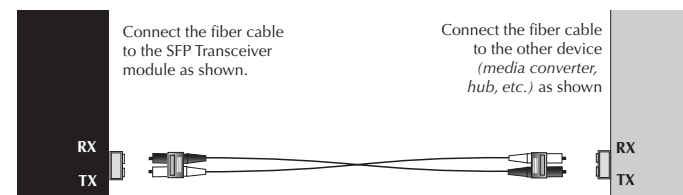
To install the SFP module into a media converter, do the following:

1. Position the module at the installation slot with the label faces up.
2. Slide the module into the slot fully to ensure proper connection.

Installing the fiber cable

To install the fiber cable, do the following:

1. Locate 1000Base-SX-compliant or 1000Base-LX-compliant fiber cable with male TX to RX connectors installed at both ends.
2. Install the fiber cable as shown below.



Diagnostic Monitoring Interface (DMI)

The following DMI port screen and explanation table contains brief definitions of the DMI support offered on Transition Networks SFP optical interfaces. For further information, please see the help option on the CPSMM-xxx SNMP agent or Focal Point, Transition Networks' GUI.

DMI RX Power 210 μ W -6.778 dBm	DMI RX Power Alarm <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Low Warn <input type="checkbox"/> High Warn <input type="checkbox"/> Low Alarm <input type="checkbox"/> High Alarm
DMI Temp 30.1 $^{\circ}$ C 86.2 $^{\circ}$ F	DMI Temp Alarm <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Low Warn <input type="checkbox"/> High Warn <input type="checkbox"/> Low Alarm <input type="checkbox"/> High Alarm
DMI Bias Current 20 μ A	DMI Bias Alarm <input type="checkbox"/> Normal <input checked="" type="checkbox"/> Low Warn <input type="checkbox"/> High Warn <input type="checkbox"/> Low Alarm <input type="checkbox"/> High Alarm
DMI TX Power 0 μ W 0.000 dBm	DMI TX Power Alarm <input type="checkbox"/> Normal <input type="checkbox"/> Low Warn <input type="checkbox"/> High Warn <input checked="" type="checkbox"/> Low Alarm <input type="checkbox"/> High Alarm
Rx Power Intrusion Threshold 1000 μ W 0.000 dBm	<input checked="" type="checkbox"/> Intrusion Detected

Variable Name	Description
DMI Rx Power	Measured Receive optical power in microwatts and in decibels relative to 1mW.
DMI Rx Power Alarm	Alarm status of measured receive optical power.
DMI Temp	Internally measured temperature of transceiver in degrees C and degrees F.
DMI Temp Alarm	Alarm status for internally measured temperature of the transceiver.
DMI Bias Current	Measured transmit bias current in microamperes.
DMI Bias Alarm	Alarm status for measured transmit bias current for the interface.
DMI Tx Power	Measured transmit power in microwatts and in decibels relative to 1mW.
DMI Tx Power Alarm	Alarm status of measured transmit power.
Rx Power Intrusion Threshold	Instructs the converter to stop passing traffic when the receive power drops below the new threshold. This feature is sometimes referred to as 'Intrusion Detection,' since tapping into a fiber to intercept traffic leads to a reduction in receive power. This value can be entered in microwatts or in decibels relative to 1mW. Note: This feature is not available on all devices.

Fiber Cable Specification

The physical characteristics must meet or exceed IEEE 802.3z™ specifications.

single mode fiber (<i>recommended</i>):	9 μ m	
Multimode fiber (<i>recommended</i>):	62.5/125 μ m	
Multimode fiber (<i>optional</i>):	100/140, 85/140, 50/125 μ m	
TN-SFP-SX	850 nm multimode	
Fiber Optic Transmitter Power:	min: -9.5 dBm	max: -4.0 dBm
Fiber Optic Receiver Sensitivity:	min: -17.0 dBm	max: -3.0 dBm
Link Budget:	7.5 dB	
TN-SFP-SXD	850 nm multimode	
Fiber Optic Transmitter Power:	min: -9.5 dBm	max: -4.0 dBm
Fiber Optic Receiver Sensitivity:	min: -17.0 dBm	max: -3.0 dBm
Link Budget:	7.5 dB	
TN-SFP-ESX-5	1310 nm multimode	
Fiber Optic Transmitter Power:	min: -10.0 dBm	max: -3.0 dBm
Fiber Optic Receiver Sensitivity:	min: -18.0 dBm	max: -3.0 dBm
Link Budget:	8.0dB	
TN-SFP-ESX-6	1310 nm multimode	
Fiber Optic Transmitter Power:	min: -10.0 dBm	max: 3.0 dBm
Fiber Optic Receiver Sensitivity:	min: -18.0 dBm	max: -3.0 dBm
Link Budget:	8.0 dB	
TN-SFP-LX1	1310 nm single mode	
TN-SFP-ELX1	1310 nm single mode	
Fiber Optic Transmitter Power:	min: -9.5 dBm	max: -3.0 dBm
Fiber Optic Receiver Sensitivity:	min: -21.0 dBm	max: -3.0 dBm
Link Budget:	11.5 dB	
TN-SFP-LX3	1310 nm single mode	
Fiber Optic Transmitter Power:	min: -5.0 dBm	max: 0.0 dBm
Fiber Optic Receiver Sensitivity:	min: -24.0 dBm	max: -3.0 dBm
Link Budget:	19.0 dB	
TN-SFP-LX5	1550 nm single mode	
Fiber Optic Transmitter Power:	min: -5.0 dBm	max: 0.0 dBm
Fiber Optic Receiver Sensitivity:	min: -24.0 dBm	max: -3.0 dBm
Link Budget:	19.0 dB	
TN-SFP-LX8	1550 nm single mode	
Fiber Optic Transmitter Power:	min: 0.0 dBm	max: +5.0 dBm
Fiber Optic Receiver Sensitivity:	min: -24.0 dBm	max: -3.0 dBm
Link Budget:	24.0 dB	
TN-SFP-LX12	1550 nm single mode	
Fiber Optic Transmitter Power:	min: 0.0 dBm	max: +5.0 dBm
Fiber Optic Receiver Sensitivity:	min: -32.0 dBm	max: -9.0 dBm
Link Budget:	32.0 dB	

Fiber Cable Specification -- Continued

TN-SFP-LX16	1550 nm single mode		
Fiber Optic Transmitter Power:	min: 1.0 dBm	max: +5.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -36.0 dBm	max: -10.0 dBm	
Link Budget:	37.0 dB		
TN-SFP-OC3M	1300 nm multimode		
Fiber Optic Transmitter Power:	min: -19 dBm	max: -12.0dBm	
Fiber Optic Receiver Sensitivity:	min: -30.0 dBm	max: -8.0 dBm	
Link Budget:	11.0 dB		
TN-SFP-OC3S	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -14.0 dBm	max: -8.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -31.0 dBm	max: -8.0 dBm	
Link Budget:	17.0 dB		
TN-SFP-OC3S8	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -5.0 dBm	max: -0.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -34.0 dBm	max: -8.0 dBm	
Link Budget:	29.0 dB		
TN-SFP-OC12M	1300 nm multimode		
Fiber Optic Transmitter Power:	min: -19 dBm	max: -12.0dBm	
Fiber Optic Receiver Sensitivity:	min: -26.0 dBm	max: -8.0 dBm	
Link Budget:	7.0 dB		
TN-SFP-OC12S	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -14.0 dBm	max: -8.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -28.0 dBm	max: -5.0 dBm	
Link Budget:	14.0 dB		
TN-SFP-FC2XM	850 nm multimode		
Fiber Optic Transmitter Power:	min: -9.5 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -15.0 dBm	max: 0.0 dBm	
Link Budget:	5.5 dB		
TN-SFP-FC2XS2	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -9.5 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -18.0 dBm	max: -3.0 dBm	
Link Budget:	8.5 dB		
TN-SFP-FC2XS15	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -5.0 dBm	max: 0.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -18.0 dBm	max: -0.0 dBm	
Link Budget:	13.0 dB		
TN-SFP-FC2XS40	1310 nm single mode		
Fiber Optic Transmitter Power:	min: -2.0 dBm	max: 3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -28.0 dBm	max: -9.0 dBm	
Link Budget:	26.0 dB		
TN-SFP-OC3SB21	1310TX/1550RX single mode		
TN-SFP-OC3SB22	1550TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -14.0 dBm	max: -8.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -33.0 dBm	max: -8.0 dBm	
Link Budget:	19.0 dB		

Fiber Cable Specification -- Continued

TN-SFP-BXU	1310TX/1490RX single mode		
TN-SFP-BXD	1490TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -9.0 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -20.0 dBm	max: -3.0 dBm	
Link Budget:	11.0 dB		
TN-SFP-BXU2	1310TX/1490RX single mode		
TN-SFP-BXD2	1490TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -8.0 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -22.0 dBm	max: -3.0 dBm	
Link Budget:	14.0 dB		
TN-SFP-LXB11	1310TX/1550RX single mode		
TN-SFP-LXB12	1550TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -9.0 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -20.0 dBm	max: -3.0 dBm	
Link Budget:	11.0 dB		
TN-SFP-LXB21	1310TX/1550RX single mode		
TN-SFP-LXB22	1550TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -8.0 dBm	max: -3.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -22.0 dBm	max: -3.0 dBm	
Link Budget:	14.0 dB		
TN-SFP-LXB41	1310TX/1550RX single mode		
TN-SFP-LXB42	1550TX/1310RX single mode		
Fiber Optic Transmitter Power:	min: -3.0 dBm	max: 2.0 dBm	
Fiber Optic Receiver Sensitivity:	min: -23.0 dBm	max: -3.0 dBm	
Link Budget:	20.0 dB		

For the most up-to-date information on the TN-SFP-xxx transceiver module, view the user's guide on-line at: www.transition.com.

WARNING: Visible and invisible laser radiation when open. Do not stare into beam or view directly with optical instruments. Failure to observe this warning could result damage to your eyes or blindness.

WARNING: Use of controls, adjustments or the performance of procedures other than those specified herein could result in hazardous radiation exposure.

The fiber optic transmitters on this device meet Class I Laser safety requirements per IEC-825/CDRH standards and comply with 21 CFR1040.10 and 21CFR1040.11.

Technical Specification

For use with Transition Networks Model TN-SFP-xxx or equivalent.

Standard:	IEEE 802.3 2003; ANSI X3.297-1997 <u>TN-SFP-SX or -LXx SFP or TN-SFP-BXx modules:</u> Compliant with IEEE 802.3z Gigabit Ethernet; FC-1X SM-LC-L FC-PI. <u>TN-SFP-OC3x SFP modules:</u> Compliant with 100BASE-FX; SONET OC-3 /SDH STM-1 (S-1.1) <u>TN-SFP-OC12x SFP modules:</u> Compliant with SONET OC-12 /SDH STM-4 (S-4.1) <u>TN-SFP-FC2Xx SFP modules:</u> Compliant with IEEE 802.3z Gigabit Ethernet; FC-1X/2X SM-LC-L FC-PI; SONET OC-48 /SDHSTM-16 (S-16.1)
Dimensions:	0.52 x 2.18 x 0.33" (<i>13.4 x 55.5 x 8.5 mm</i>)
Weight:	1 oz. (<i>28 g</i>) approximately
Power:	3.3V, power consumption = 0.66 W
Tmra:*	TN-SFP-SX /-ELX1/-LX1/-FC2XM/-FC2XS2: 10°C to 85°C (<i>140°F to 185°F</i>) TN-SFP-LX3/-LX5/-LX8/-LX12/-OCx/-FC2XS15/-FC2XS40/-BXx: 0°C to 70°C (<i>32°F to 158°F</i>)
Storage Temp:	-40°C to 85°C (<i>-40° to 185°F</i>)
Humidity:	5% to 95%, non-condensing
Altitude:	0 to 10,000 feet
Warranty:	Lifetime

*Manufacturer's ambient rated temperature.

Note: Transition Networks' SFP modules fully comply with Multi-Sourcing Agreement (MSA). This compliance allows our SFP modules to be used in other MSA compliant most other SFP platforms without any problems.

Contact Us

Technical support

Technical support is available 24 hours a day.
U.S.A. and Canada: 1-800-260-1312
International: 00-1-952-941-7600

Transition now

Chat live via the Web with Transition Networks Technical Support.
Log onto www.transition.com and click the Transition Now link.

Web-Based seminars

Transition Networks provides seminars via live web-based training.
Log onto www.transition.com and click the Learning Center link.


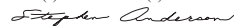
E-Mail

Ask a question anytime by sending an e-mail to our technical support staff.
techsupport@transition.com

Address

Transition Networks
10900 Red Circle Drive Minnetonka, MN 55343 U.S.A.
telephone: 952-941-7600
toll free: 800-526-9267
fax: 952-941-2322

Declaration of Conformity

	
Declaration of Conformity	
Name of Mfg:	Transition Networks 10900 Red Circle Drive, Minnetonka MN 55343 U.S.A.
Model:	TN-SFP-xxx Series Transceiver Modules
Part Number(s):	TN-SFP-SX, TN-SFP-SXD, TN-SFP-ESX5, TN-SFP-ESX6, TN-SFP-LX1, TN-SFP-ELX1 TN-SFP-LX3, TN-SFP-LX5, TN-SFP-LX8, TN-SFP-LX12, TN-SFP-LX16, TN-SFP-OC3M, TN-SFP-OC3S, TN-SFP-OC3S3, TN-SFP-OC3S8, TN-SFP-OC12M, TN-SFP-OC12S, N-SFP-FC2XM, TN-SFP-FC2XS2, TN-SFP-FC2XS15, TN-SFP-FC2XS40, TN-SFP-OC3SB21, TN-SFP-OC3SB22, TN-SFP-BXU, TN-SFP-BXD, TN-SFP-BXU2, TN-SFP-BXD2, TN-SFP-LXB11, TN-SFP-LXB12, TN-SFP-LXB21, TN-SFP-LXB22, TN-SFP-BX41, TN-SFP-BX42
Regulation:	EMC Directive 89/336/EEC
Purpose:	To declare that the TN-SFP-xxx to which this declaration refers is in conformity with the following standards:
IEC 60825-1; IEC60825-2; FC1X SM-LC-L FC-PI; FC1X/2X SM-LC-L FC-PI; SONET OC-3 /SDH STM-1 (S-1.1); SONET OC-12 /SDH STM-4 (S-4.1); ONET OC-48 /SDHSTM-16 (S-16.1); IEEE 802.3z 2003; ANSI X3.297 1997; Class A; FDA 21; CFR1040.10; CFR1040.11	
I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).	
 Stephen Anderson, Vice-President of Engineering	
November, 2008 Date	

Compliance Information

CE Mark: IEC-60825; FDA 21; CFR 1040.10 and 1040.11

FCC regulations

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense.

Canadian regulations

This digital apparatus does not exceed the Class A limits for radio noise for digital apparatus set out on the radio interference regulations of the Canadian Department of Communications. Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la Class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

European regulations

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Achtung !

Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten. In diesem Fall ist der Benutzer für Gegenmaßnahmen verantwortlich.

Attention !

Ceci est un produit de Classe A. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.



In accordance with European Union Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003, Transition Networks will accept post usage returns of this product for proper disposal. The contact information for this activity can be found in the 'Contact Us' portion of this document.



CAUTION: RJ connectors are NOT INTENDED FOR CONNECTION TO THE PUBLIC TELEPHONE NETWORK. Failure to observe this caution could result in damage to the public telephone network.

Der Anschluss dieses Gerätes an ein öffentliches Telekommunikationsnetz in den EG-Mitgliedstaaten verstößt gegen die jeweiligen einzelstaatlichen Gesetze zur Anwendung der Richtlinie 91/263/EWG zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Telekommunikationsendeinrichtungen einschliesslich der gegenseitigen Anerkennung ihrer Konformität.

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