Trans'Expert

Field SONET/SDH Analyzer

KEY FEATURES

- All in one
- Easy to use
- Fast to operate
- Quality conformance testing
- Asymmetric SONET/SDH testing
- Automatic protection switching (APS) testing

Industry Overview

In this new millennium, the communication industry is experiencing explosive growth in the demand for new services and transmitted traffic. The number of Internet users and the amount of bandwidth per user is continuously growing. The next generation of mobile networks will be able to carry even more data from almost any location. Consequently, the need for high-quality optical networks capable of managing multiple technologies (voice, video and data) will increase. At the same time, the telecommunications industry must adapt to the new commercial and financial demands.

The new challenge is to deploy more bandwidth, commission networks rapidly, maintain complex networks and provide high quality of service, while simultaneously improving efficiency, reducing operational expenses and managing skilled technician time to create a competitive operational environment.

Building and maintaining sophisticated networks requires a leading edge tester, the Trans'Expert.

Product Overview

The NetTest Trans'Expert field SONET/SDH analyzer is the most comprehensive, user-friendly and cost-efficient transport layer testing platform in the market today. With one of the most complete sets of electrical and optical interfaces available in any portable platform, Trans'Expert enables installation and maintenance professionals to rely on one compact and rugged tool for all transport layer testing needs, from DS1/E1 through OC-192/STM64.

SDH Specifications

Optical Outputs [1, 3]

Bit Rate	Wavelength	Specifications
9953.280 Mb/s (STM-64)	1527-1563 nm	• Transmitted power: -1dBm to +3 dBm
2488.320 Mb/s (STM-16)	1527-1563 nm	Extinction ratio: 10 dB minimum
622.080 Mb/s (STM-4)	1527-1563 nm	SMSR: 37 dB
155.520 Mb/s (STM-1)	1527-1563 nm	Templates: ITU-T G.957, G. 959
2488.320 Mb/s (STM-16)	1270-1330 nm	• Transmitted power: -6 dBm to -2 dBm
622.080 Mb/s (STM-4)	1270-1330 nm	Extinction ratio: 10 dB minimum
155.520 Mb/s (STM-1)	1270-1330 nm	Spectral width: 2.5 nm
		Templates: ITU-T G.957

Optical Inputs [1,3]

Bit Rate	Wavelength	Specifications
9953.280 Mb/s (STM-64)	1527-1570 nm	Sensitivity: -17 dBm (at 10^{-10} BER)
		Saturation: +2 dBm
2488.320 Mb/s (STM-16)	1270-1570 nm	Sensitivity: -30 dBm (at 10^{-10} BER)
		Saturation: -8 dBm
622.080 Mb/s (STM-4)	1270-1570 nm	Sensitivity: -33 dBm (at 10^{-10} BER)
		Saturation: -8 dBm
155.520 Mb/s (STM-1)	1270-1570 nm	Sensitivity: -33 dBm (at 10^{-10} BER)
		Saturation: -8 dBm

Electrical Interfaces

Bit Rate	Connectors	Templates
2.048 Mb/s (E1)	BNC (75 Ohms, unbalanced)	ITU-T G703 - line code: HDB3
34.368 Mb/s (E3)	BNC (75 Ohms, unbalanced)	ITU-T G703 - line code: HDB3
44.736 Mb/s (DS3)[2]	BNC (75 Ohms, unbalanced)	ANSI T1.102 - line code: B3ZS
139.264 Mb/s (E4)	BNC (75 Ohms, unbalanced)	ITU-T G703 - line code: CMI
155.520 Mb/s (STM-1)	BNC (75 Ohms, unbalanced)	ITU-T G703, G772 - line code: CMI

Clocks Synchronization

Type	Specifications
Clock Reference	• Internal stratum 3 clock generation
	• External 2.048 MHz reference clock: 75 Ohms BNC connector, 0.05 to 2 Vpp signal amplitude
	• Timed from SDH received signal
Clock Output	• 622.080 MHz frequency signal synchronous with transmitted SDH signal, 50 Ohms connector, AC coupled, 600 mV amplitude

Notes

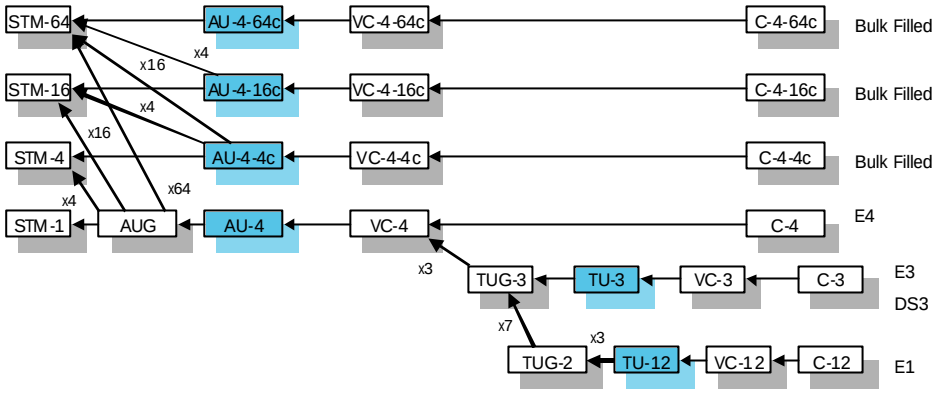
[1] Depends on product configuration

[2] Depends on selected options

[3] Connectors FC/PC

SDH Specifications

SDH Mappings



Frame Specification

SDH Format	SDH Frame (G707)
SOH Editor	All bytes of SOH (STM-1) are programmable except B1/B2 J0: (Trace identifier) programmable 15 bytes ASCII sequence, CRC (E.164) added
POH Editor	VC4 and VC3 POH: C2, G1, F2, H4, F3, K3, N1 J1: (Trace identifier) programmable 15 bytes ASCII sequence, CRC (E.164) added VC12 POH: V5, N2, K4 J2: (Trace identifier) programmable 15 bytes ASCII sequence, CRC (E.164) added
PRBS Patterns	PRBS: 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{29}-1, 2^{31}-1 inverted and non-inverted
Word Patterns	All “1” pattern, all “0” pattern, alternative “01” pattern, user-defined 2 bytes Word pattern
Mappings	C12 (2 Mbit/s in STM-N, AU4) C3 (34 Mbit/s in STM-N, AU4) C3 (45 Mbit/s in STM-N, AU4)[2] C4 (140 Mbit/s in STM-N, AU4)
Concatenation	Contiguous concatenation signal structure for STM-4c, STM-16c, STM-64c[2] Payload is Bulk PRBS or word pattern
PDH Formats	Unframed PRBS: 2, 34, 45, 140 Mbit/s Framed: 2 Mbit/s (G.704), 34 Mbit/s (G.751), 45 Mbit/s (G.704), 140 Mbit/s (G.751)
Drop & Insert	External drop & insert of PDH payloads (E1, E3, E4) via PDH electrical test ports

Network Emulation

Error Addition	B1, B2, MS-REI, B3, AU-REI, V5, TU-REI, PRBS, Word, Transmission errors FAW Timing: Programmable number and programmable rate
Alarms Addition	LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-TIM, HP-UNEQ, AU-RDI, TU-LOM, TU-AIS, TU-LOP, LP-SLM, LP-UNEQ, LP-TIM, TU-RDI, LSS, LPS, AIS Timing: Steady-state and programmable number of frames
Pointer Movement	AU4, TU3 and TU12 pointers • Pointer set to any value with or without NDF • Positive and negative movements • Pointer sequences (G-783)
Frequency Shift	Programmable frequency offset: -30 ppm to +30 ppm in 1 ppm steps for SDH -100 ppm to -100 ppm in 1 ppm steps for PDH
APS (K1/K2)	Automatic protection switch messages are user-programmable MSP (G783) and MSP-ring (G841) supported
SDH Through Mode	SOH overwrite K1, K2, S1, A1, A2, J0, M1 recalculated; error addition: B1, B2, MS-REI Transmission; alarm addition: LOF, MS-AIS, MS-RDI; APS simulation

Notes

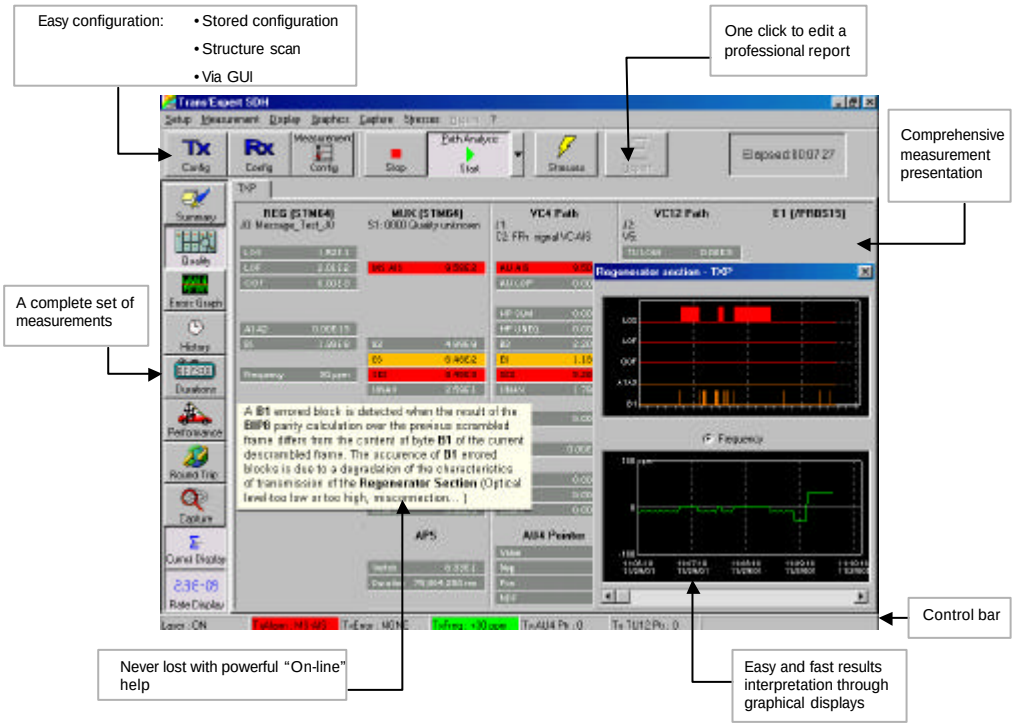
[2] Depends on selected options

SDH Specifications

SDH Analysis	
Error Analysis	B1, A1A2, B2, MS-REI, B3, AU-REI, LP-B3, TU-REI, PRBS, Word The results can be displayed as cumulative totals or as rates
Alarms Analysis	LOS, LOF, OOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-UNEQ, HP-TIM, AU-RDI, TU-LOM, TU-AIS, TU-LOP, LP-SLM, LP-UNEQ, LP-TIM, TU-RDI, LSS, LPS, AIS
Quality	Transmission quality is calculated each second in accordance with recommendations
Parameters	G.826, G828, M2100, M2101.1, M2101 for performance and G827, G827.1 for availability
The following performance events and parameters are displayed:	• Instantaneous and cumulative number of Errors • Instantaneous and cumulative number of Background Block Errors • Instantaneous and cumulative number of Errored Seconds • Instantaneous and cumulative number of Severely Errored Seconds • Instantaneous and cumulative number of Seconds Unavailability
SOH and POH Evaluation	The value of the following bytes is displayed in real time: J0, J1 and J2 messages: display of 15 bytes ASCII sequence S1: Interpretation of the received value (synchronization status) C2/V5: Interpretation of the received value (signal label)
Overhead Capture	Displays all SOH (STM-1) and POH bytes. The capture capacity is 64 frames
Pointer Movement	AU4, TU3 and TU12 pointer: • Pointer value • Number of positive and negative pointer movements • Number of pointer movement with NDF
Clock Frequency	The deviation of the input signal clock frequency from the nominal frequency is displayed in ppm
Optical Power	Range: -8 dBm to -33 dBm, 1 dB resolution (on STM-1, STM-4 & STM-16 optical inputs)
APS Measurement	Number of switch duration (with 125 µs resolution); K1/K2 capture
Round Trip Delay	Measures at each path level, resolution: 100ns, from 0 to 2 sec depending on path level

Benefits

- Easy to use
- Fast to operate



The graphical User Interface provides all the commands, measurements information and analyzer status on one large color screen.

SONET Specifications

Optical Outputs [1,2]

Bit Rate	Wavelength	Specifications
9953.280 Mb/s (OC-192)	1527-1563 nm	• Transmitted power: -1dBm to +3 dBm
2488.320 Mb/s (OC-48)	1527-1563 nm	Extinction ratio: 10 dB minimum
622.080 Mb/s (OC-12)	1527-1563 nm	SMSR: 37 dB
155.520 Mb/s (OC-3)	1527-1563 nm	Templates: GR-253, ANSI T1.105.06
2488.320 Mb/s (OC-48)	1270-1330 nm	• Transmitted power: -6 dBm to -2 dBm
622.080 Mb/s (OC-12)	1270-1330 nm	Extinction ratio: 10 dB minimum
155.520 Mb/s (OC-3)	1270-1330 nm	Templates: GR-253, ansi t1.105.06
		Spectral width: 2.5 nm

Optical Inputs [1, 2]

Bit Rate	Wavelength	Specifications
9953.280 Mb/s (OC-192)	1527-1570 nm	Sensitivity: -17 dBm (at 10^{-10} BER)
		Saturation: +2 dBm
2488.320 Mb/s (OC-48)	1270-1570 nm	Sensitivity: -30 dBm (at 10^{-10} BER)
		Saturation: -8 dBm
622.080 Mb/s (OC-12)	1270-1570 nm	Sensitivity: -33 dBm (at 10^{-10} BER)
		Saturation: -8 dBm
155.520 Mb/s (OC-3)	1270-1570 nm	Sensitivity: -33 dBm (at 10^{-10} BER)
		Saturation: -8 dBm

Electrical Interfaces

Bit Rate	Connectors	Templates
1.544 Mb/s (DS1)	Bantam Jack (100 Ohms, balanced)	ANSI T1.102 - line code: B8ZS
44.736 Mb/s (DS3)	BNC (75 Ohms, unbalanced)	ANSI T1.102 - line code: B3ZS
51.840 Mb/s (STS-1)	BNC (75 Ohms, unbalanced)	Telcordia GR-253 - line code: B3ZS
155.520 Mb/s (STS-3)	BNC (75 Ohms, unbalanced)	Telcordia GR-253 - line code: CMI

Clocks Synchronization

Type	Specifications
Clock Reference	• Internal stratum 3 clock generation
	• External 1.544 MHz reference clock: 75 Ohms BNC connector, 0.05 to 2 Vpp signal amplitude
	• Timed from SONET received signal
Clock Output	• 622.080 MHz frequency signal synchronous with transmitted SONET signal, 50 Ohms connector, AC coupled, 600 mV amplitude

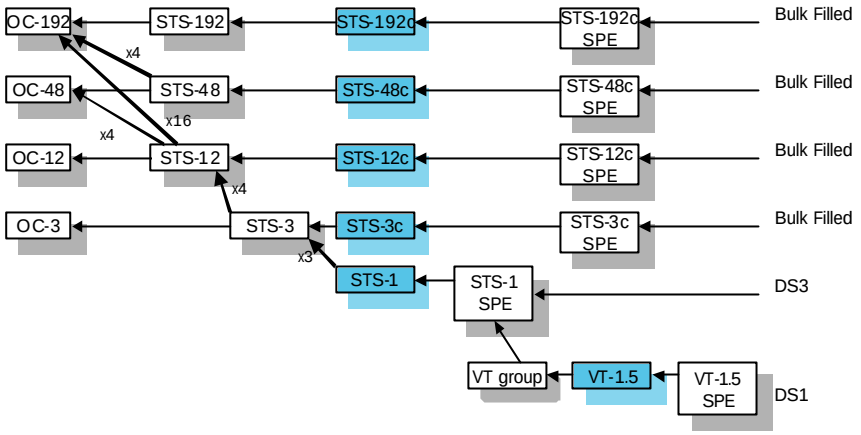
Notes

[1] Depends on product configuration

[2] Connectors FC/PC

SONET Specifications

SONET Mappings



Frame Specification

Sonet Format	Telcordia GR-253
TOH Editor	All bytes of TOH (STS-1/STS-3) are programmable except B1/B2 and Z0 J0: (Trace identifier) programmable 62 bytes ASCII sequence, CRLF added
POH Editor (STS)	C2, G1, F2, F3, K3, N1 J1: (Trace identifier) programmable 62 bytes ASCII sequence, CRLF added
POH Editor VT (POH)	V5, N2, K4 J2: (Trace identifier) programmable 62 bytes ASCII sequence, CRLF added
PRBS Patterns	PRBS: 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, QRSS 2^{20}-1, 2^{23}-1, 2^{29}-1, 2^{31}-1 inverted and non-inverted
Specific Patterns	All “1” pattern, all “0” pattern, alternative “01” pattern, user-defined 2 bytes Word pattern 1 in 8, 2 in 8, 3 in 24 patterns for DS1 signal
Mappings	Asynchronous mapping for DS1 Asynchronous mapping for DS3 Bulk PRBS or word pattern into STS-SPE
Concatenation	Contiguous concatenation signal structure for OC-12c, OC-48c, OC-192c [2], Payload is Bulk PRBS or word pattern
T-Carriers Formats	Unframed PRBS: 44 Mbit/s and 1.5 Mbit/s Framed: 44 Mbit/s DS3 ANSI T1.107, 1.5 Mbit/s DS1 ANSI T1.107
Drop & Insert	External drop & insert of DSn payloads via DS1 or DS3 electrical test ports

Network Emulation

Error Addition	B1, B2, REI-L, B3, REI-P, V5, REI-V, PRBS, Word, Transmission errors Timing: Programmable number and programmable rate
Alarms Addition	LOF, OOF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, SLM-P, UNEQ-P, RDI-P, H4-LOM, AIS-V, LOP-V, SLM-V, UNEQ-V, RDI-V, TIM-V, LSS, LPS, AIS Timing: Steady-state and programmable number of frames
Pointer Movement	STS pointers and VT pointer • Pointer set to any value with or without NDF • Positive and negative movements • Pointer sequences (GR-253)
Frequency Shift	Programmable frequency offset : -30 ppm to +30 ppm in 1 ppm steps for SONET -100 ppm to +100 ppm in 1 ppm steps for T-carriers
APS (K1/K2)	Automatic protection switch messages are user-programmable MSP (GR-253) and MSP-ring (GR-1230) supported
SONET Through Mode	TOH overwrite K1, K2, S1, A1, A2, J0, M1 recalculated; error addition: B1, B2, REI-L transmission, alarm addition: LOF, AIS-L, RDI-L; APS simulation

Notes

[2] Depends on selected options

SONET Analysis	
Error Analysis	B1, A1A2, B2, REI-L, B3, REI-P, V5, REI-V, PRBS, Word The results can be displayed as instantaneous/cumulative totals or as rates
Alarms Analysis	LOS, LOF, OOF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, SLM-P, UNEQ-P, TIM-P, RDI-P, H4-LOM, AIS-V, LOP-V, SLM-V, UNEQ-V, TIM-V, RDI-V, LSS, AIS, LPS
Quality Parameters	Transmission quality is calculated each second as per GR-253 For Line, STS-SPE and VT-SPE, the following quality parameters are displayed: • Instantaneous and cumulative number of Errors • Instantaneous and cumulative number of Background Block Errors • Instantaneous and cumulative number of Errored Seconds • Instantaneous and cumulative number of Severely Errored Seconds • Instantaneous and cumulative number of Seconds Unavailability
TOH and POH	The value of the following bytes is displayed in real time: J0, J1 and J2 messages: display of 62 bytes ASCII sequence S1: Interpretation of the received value (synchronization status) C2/V5: Interpretation of the received value (signal label)
Overhead Capture	Displays all SOH, LOH (STS-1/STS-3) and POH bytes. The capture capacity is 64 frames
Pointer Movement	STS pointer and VT pointer: • Pointer value • Number of positive and negative pointer movements • Number of pointer movements with NDF
Clock Frequency	The deviation of the input signal clock frequency from the nominal frequency is displayed in ppm
Optical Power	Range: -8 dBm to -33 dBm, 1 dB resolution (on OC-3, OC-12 & OC-48 optical inputs)
APS Measurement	Number of switches Switch duration (with 125 µs resolution) K1/K2 capture
Round Trip Delay	Measures at each path level, resolution: 100 ns, from 0 to 2 sec depending on path level

Trans'Expert: a Compact, Rugged and Evolutionary SDH/SONET Analyzer

The Trans'Expert is based on a portable platform designed for the harshness of a military environment.

Its magnesium alloy housing provides both a rugged and light weight design.

The Trans'Expert has the following characteristics:

General Platform Description	
• Intel Pentium II processor 500 MHz • 64 MB of RAM • 6 GB Hard Drive - 1 Type I-III PCMCIA slot • 1.44 MB Floppy Drive • 24x CD-ROM Rice • 12.1" SVGA Active LCD Display • AC power: 100 - 250 VAC • Environmental: - Operating temperature 5°C - 40°C - Storage temperature -10°C - 60°C - Humidity: 10% - 80% • Warranty: 1 year as standard • Calibration cycle: 2 years	• 1 ECP/EPP parallel port • 2 serial ports • 2 USB ports • External SVGA • External PS/2 type keyboard/mouse port • Weight: < 12 kg with test modules • Dimensions: - Width 38.00 cm (14.96 inches) - Depth 45.00 cm (17.72 inches) - Height 10.50 (4.13 inches) • Safety: - EN 61010-1 (Ed 98) - EN 60825-1 (Ed 00) • CEM: - EN 55022 (Ed 98) - EN 50082-1 (Ed 97) - FCC Part 15 (Ed 99)

Configuration Guide

Configuration Guide - SDH Version

Product Description

TXP-010020868	**Trans'Expert 10Gig** Portable platform with: • Optical interfaces at 1310 nm and 1550 nm for STM-1, STM-4, STM-16 • Optical interfaces at 1550 nm for STM-64 • Electrical interfaces for E1, E3, E4, STM-1
TXP-002520865	**Trans'Expert 2.5Gig** Portable platform with: • Optical interfaces at 1310 nm and 1550 nm for STM-1, STM-4, STM-16 • Electrical interfaces for E1, E3, E4, STM-1

Option Description

Opt 110	Add DS3 mapping to Trans'Expert
Opt 120	Add SONET functions to Trans'Expert
Opt 130	Concatenation 1xVC4-4c for Trans'Expert
Opt 140	Concatenation 1xVC4-16c for Trans'Expert
Opt 150	Concatenation 1xVC4-64c for Trans'Expert 10Gig (only on TXP 10Gig)
Opt 160	Factory upgrade Trans'Expert 2.5Gig to Trans'Expert 10Gig (only for TXP 2.5Gig)
Opt 170	One year extension guarantee for SDH Version
Opt 180	Calibration report

Notes

Power cord, user manuals and carrying bag are provided with each instrument

Configuration Guide - SONET Version

Product Description

TXP-010010867	**Trans'Expert 10Gig** Portable platform with: • Optical interfaces at 1310 nm and 1550 nm for OC-3, OC-12, OC-48 • Optical interfaces at 1550 nm for OC-192 • Electrical interfaces for DS1, DS3, STS1, STS3
TXP-002510864	**Trans'Expert 2.5Gig** Portable platform with: • Optical interfaces at 1310 nm and 1550 nm for OC-3, OC-12, OC-48 • Electrical interfaces for DS1, DS3, STS1, STS3

Option Description

Opt 220	Add SDH functions to Trans'Expert
Opt 230	Concatenation STS-12c for Trans'Expert
Opt 240	Concatenation STS-48c for Trans'Expert
Opt 250	Concatenation STS-192c for Trans'Expert 10Gig (only on TXP 10Gig)
Opt 260	Factory upgrade Trans'Expert 2.5Gig to Trans'Expert 10Gig (only for TXP 2.5Gig)
Opt 270	One year extension guarantee for SONET Version
Opt 280	Calibration report

Accessories

TXP-000072000	Ethernet 10BaseT PCMCIA interface for remote control
TXP-000073001	56KBps Modem PCMCIA interface for remote control
TXP-000074002	Hard travel case

NetTest A/S
Kirkebjerg Allé 90
2605 Brøndby
Denmark
Tel: +45 72 11 22 00
Fax: +45 72 11 22 10
E-mail: com@nettest.com
web: www.nettest.com

NetTest Sales Offices

Australia	+61 39 890 6677	Italy	+39 02 95 12 621
Brazil	+55 11 5505 6688	Mexico	+52 5557 8249
Canada	+905 479 8090	Singapore	+65 220 9575
China	+86 10 6467 9888	Spain	+34 91 372 92 27
Denmark	+45 72 11 22 00	Sweden	+46 8 555 410 65
France	+33 1 61 34 34 34	UK	+44 1883 349 110
Germany	+49 89 99 89 01 0	USA	+1 978 983 3800

NetTest is a leading worldwide provider of testing, monitoring and management systems across both the optical and network layers of communications networks. NetTest provides network operators, network equipment manufacturers, component manufacturers and enterprise service providers with the network testing solutions they need.