



CMA4000i

Optical Test System



research
& design



manufacturing



installation
& maintenance



network
monitoring



optical
components

Solutions



Reduce the Cost of Optimizing Optical Networks

Applications and Benefits

The all-in-one system for network:

- Commissioning
- Fault Location / Restoration
- Maintenance
- DWDM Spectrum Analysis

Benefits

- Highest Dynamic Range in the Industry - 50 dB
- OTDR, Loss Test Set and VFL in a Single Module
- Optical Spectrum Analyzer Module with 10 GHz Channel Resolution
- One-Button Testing

The insatiable consumer desire for real-time interaction with multimedia applications over the Internet has continued to fuel the demand for more bandwidth. To satisfy this need and to provide additional revenue generating services, telecommunication providers either install more optical fiber, increase the number of channels on existing fiber or speed up the data rate for additional bandwidth.

With efforts to not only increase revenue potential through bandwidth optimization, industry professionals are also looking for ways to reduce their measurement costs during the installation, commissioning and maintenance of optical networks. As a result, they require flexible, economical equipment that will enable them to accurately measure the performance of current and converging optical networks in less time.

The CMA4000i Optical Test System is an all-in-one test and measurement solution for network commissioning, fault location/restoration, maintenance and DWDM spectral analysis. Combining best in class OTDR and OSA performance, modular flexibility and ease-of-use, the CMA4000i is the ultimate time saving system for increasing network performance while reducing the cost of measurement.

The All-In-One System

The CMA4000i can be configured as an OTDR with a Visual Fault Locator, Optical Power Meter and Light Source, or as a high resolution

Optical Spectrum Analyzer (OSA) for DWDM systems. With its variety of functions, the CMA4000i clearly offers the best value for optical network installation, commissioning and maintenance applications.

Reduce Test Time

Save test time by quickly characterizing optical fiber and DWDM systems with the industry's best performance specifications, such as the highest OTDR dynamic range and the highest optical spectral resolution.

- 50 dB dynamic range provides improved data quality, the ability to test longer lengths, less averaging and shorter test time
- Operating from 1520-1620 nm (C- and L-band), the OSA module automatically identifies over 400 DWDM channels spaced less than 12.5 GHz apart

Increase User Efficiency

The CMA4000i user interface and test applications provide ease-of-use for increased operator efficiency and decreased training time.

- Multiple test modes simplify and automate tests for several applications from fiber reel validation measurements to Metropolitan and Backbone network maintenance
- Panel of dedicated keys for easy access to functions needed most

The Industry Leader in Optical Performance

High performance networks demand even higher performance test and measurement equipment - and there's no better solution than NetTest's award winning CMA4000i. With the recent release of the CMA4000i, NetTest continues the tradition of being the worldwide leader in optical performance.

With 50 dB of dynamic range and deadzones as small as 3.0 m, the CMA4000i is the ideal solution for testing long-haul backbone networks, Metropolitan Optical Networks (MONs) or Passive Optical Networks (PONs). For complete system characterization, the CMA4000i can be easily equipped with a light source and power meter for complete end-to-end loss testing. In addition, the Visual Fault

Locator (VFL) option for the CMA4000i enables you to locate breaks within the OTDR's deadzone or identify specific optical fibers within a cable.

For commissioning or maintaining networks that employ DWDM technology, the 4792 OSA module for the CMA4000i is the ideal solution. It allows the testing of DWDM networks deployed both today and in the future. Operating from 1520-1620 nm (C- and L-band), the 4792 OSA module for the CMA4000i Optical Test System can automatically identify over 400 DWDM channels spaced 10 GHz apart - perfect for testing high capacity DWDM systems.

Benefits

- Tri- and Quad-wavelength OTDR modules simplifies S-, C- and L-band fiber characterization
- Industry leading OSA performance
- Long-haul, Metro or PON network applications

FROST & SULLIVAN

Market Engineering Award Recipient

Market Penetration

2001



Benefits

Fault Locate Mode

- Quickly identify faults
- One-button operation

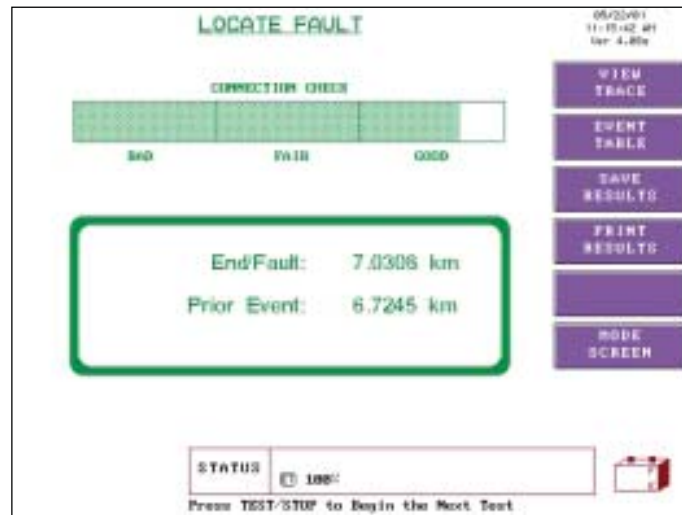
Expert OTDR Mode

- Traditional OTDR measurements
- Unsurpassed flexibility for OTDR parameter optimization

Fault Locate Mode

With a one-button auto test option, the CMA4000i brings ease-of-use to a new level. Simply attach the fiber to the instrument, press Fault Locate and your entire fiber optic

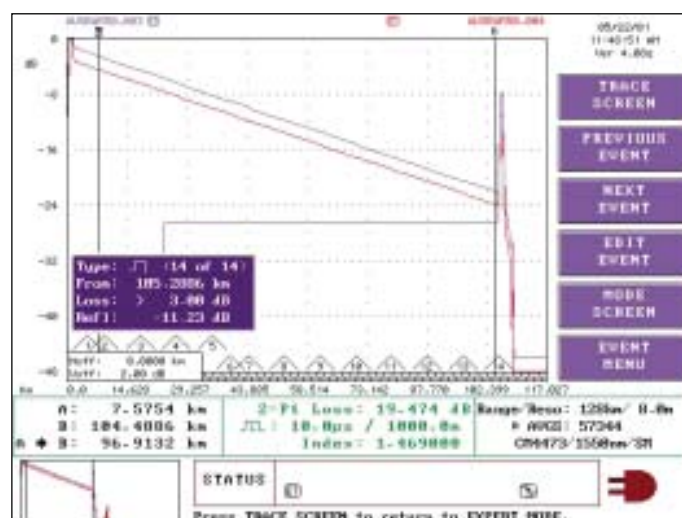
cable is completely characterized for length attenuation, splice loss, and reflectance.



Expert OTDR Mode

Expert OTDR allows the user to perform traditional OTDR functions with dedicated hard keys tied to frequently used OTDR parameters such as pulse width, range/resolution, and wavelength. This mode provides unsurpassed user flexibility for optimization of OTDR parameters without stopping the test in progress. Key features of the Expert mode include:

- Real-time Testing
- Splice Optimization
- Loss Mode Setup
- Dual-Wavelength Testing
- Trace Compare Mode
- Trace Shift Capability
- Trace Analysis
- Event Table Editing



Construct OTDR Mode

Construct Mode simplifies and automates the tests and documentation most frequently performed during fiber installation. Construct Mode is designed for testing multiple fibers and is ideal for cable installation and commissioning.

Construct Mode eliminates the time consuming setups common to the repetitive practices of testing, storing, analyzing, and documenting high fiber count cables. From the setup screen, the operator can quickly select one or all wavelengths to test, determine the file naming

structure and specific fiber count for a given cable. Once set up, the OTDR acts as a “task master” to perform the following functions:

- Select the wavelengths
- Test the fiber at all selected wavelengths
- Analyze the trace data
- Store the trace and analysis data to either floppy or hard drive
- Alert the technician to move to the next fiber to be tested and increment the filename to the next sequential number

Benefits

Construct OTDR Mode

- Automates most frequently performed tasks
- Simplifies testing of high fiber count cables

CONSTRUCTION MODE

12/11/00 02:44:03 PM Ver 4.870

FIBER STORAGE INFORMATION

Standard Construction Form

Store To:

Test Site (A):

Far Site (B):

Direction:

☒ A -> B ☒ 1550 NM

☐ B -> A ☒ 1310 NM

☒ Autorange Once

☒ Enable Overlay

☒ Rapid Save Mode

☒ Default Header

Port A:

No. of Fibers:

Start No.:

Base Filename:

CONTINUE

SELECT WAVELENGTH

QUICK SETUP

MODE SCREEN

Press TEST/STOP to Begin the Next Test

CONSTRUCTION MODE

12/11/00 02:40:22 PM Ver 4.870

CONNECT FIBER 2

AAABBB15.002

AAABBB13.002

CONTINUE

CHANGE FIBER #

CANCEL TEST

CANCEL ALL TESTS

MODE SCREEN

Press CONTINUE or TEST/STOP to Start Test



DWDM System Qualifications

Benefits

Optical Spectrum Analyzer

- Solid-state design for portability and field use
- OSA testing in both the C- and L-bands

Characterizing complex DWDM systems is simple with the CMA4000i. One-button operation ensures that even the novice user is capable of characterizing a complex DWDM system for channel center wavelength, power, and Optical-Signal-to-Noise-Ratio (OSNR). Simply power on the unit with the OSA module installed and one of the following views will be displayed.

Table View

Table View is ideal for quickly characterizing a DWDM system's essential features and performance. The number of channels, channel spacing, and relative power between channels is immediately visible. The table also shows each channel's wavelength/ frequency, power, OSNR, delta wavelength, and delta power.

PEAK	WAVELENGTH nm	POWER dBm	SN (dB)	DELTA WAVELENGTH	DELTA POWER
1	1536.233	-18.500	26.31	0.000	0.000
2	1550.762	-18.400	26.43	1.529	0.100
3	1543.894	-18.711	27.36	4.132	-1.689
4	1544.655	-15.581	28.33	0.761	-1.130
5	1545.416	-16.617	27.39	0.764	-1.036
6	1546.180	-18.503	26.31	0.761	-1.886
7	1546.944	-17.632	26.52	0.764	0.871
8	1547.708	-17.067	26.99	0.764	-0.565
9	1548.471	-18.500	26.31	0.763	-1.435
10	1549.235	-18.400	26.43	0.764	0.100
11	1549.997	-16.711	27.36	0.762	1.689
12	1550.761	-15.581	28.33	0.764	1.130
13	1551.523	-16.617	27.39	0.762	-1.036
14	1552.287	-18.503	26.31	0.764	-1.886
15	1553.047	-17.632	26.52	0.760	0.871
16	1553.807	-17.067	26.99	0.760	-0.565
17	1554.569	-18.503	26.31	0.762	-1.436
18	1555.333	-17.632	26.52	0.764	0.871

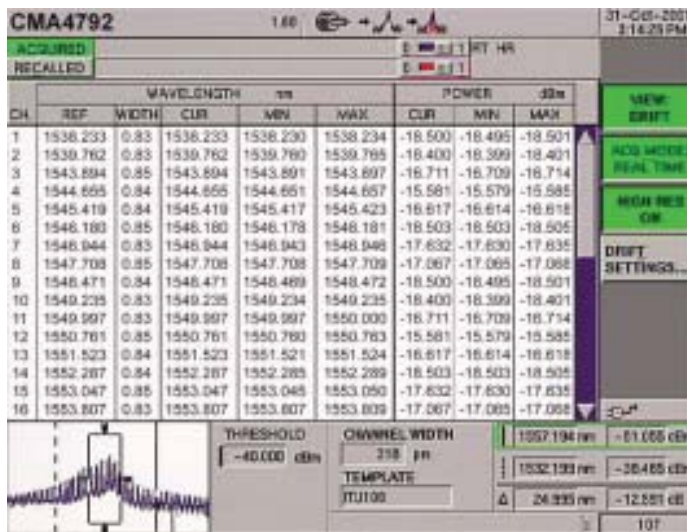
Additional parameters shown at the bottom of the screen:

- THRESHOLD: -40.000 dBm
- GAIN TILT: 28.832 dB
- GAIN SLOPE: 66 mdB/nm
- 1537.194 nm: -21.625 dBm
- 1532.193 nm: -28.465 dBm
- 24.935 nm: -12.581 dB
- 107

Table View

Drift View

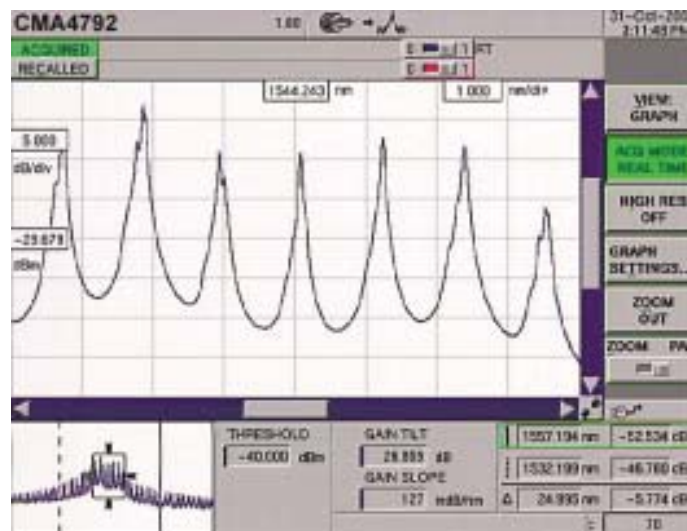
Drift View is used in conjunction with the drift acquisition mode and is ideal for evaluating long-term power and wavelength stability of DWDM channels. This view displays channel number, reference wavelength, reference channel width, current wavelength, current power, minimum/maximum detected wavelength and detected power. It can also be used to compare the received channel frequencies to the ITU standard DWDM grid or a user-defined template - making field procedures simpler than ever.



Drift View

Graph View

Graph View displays full spectrum data and allows full manipulation of the waveform. Since this view displays the entire spectrum at all times, the user can zoom in while still maintaining a full spectrum view. In addition, it allows acquired and recalled data to be displayed together; this is especially useful for comparing spectra, analyzing channel power flatness, and viewing channel spacing.

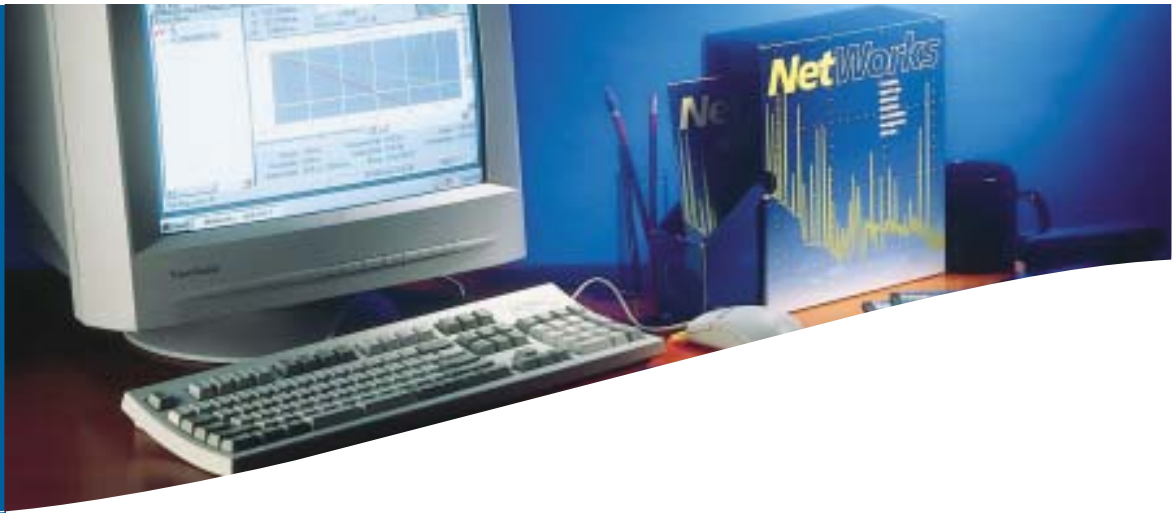


Graph View

Benefits

Optical Spectrum Analyzer

- Only instrument in its class providing 10 GHz (0.08 nm) DWDM system measurements
- Automatic measurements - up to 400 DWDM channels simultaneously



NetWorks OTDR/OSA Emulation Software

Benefits

NetWorks OTDR/OSA

- Two applications in one - NetWorks/OTDR and NetWorks/OSA
- The complete solution for loss reporting and fiber acceptance
- Familiar Windows® environment promotes ease of use

Because obtaining and analyzing test data can prove to be a daunting task, particularly in high fiber count networks, NetTest offers comprehensive data emulation software and economical trace analysis services that will make you and your equipment more productive.

NetWorks - The Software Emulation Tool that Simplifies Data Analysis

NetWorks data emulation software contains powerful tools for analyzing, reporting, and printing OTDR and OSA data from the NetTest Model 7500 and CMA family of OTDRs. The software allows you to save test data in the field and perform analysis on your desktop, which means that the equipment can remain in the field performing more tests instead of being tied up in the office.

Whether you're viewing OTDR trace results or analyzing spectral data, NetWorks will save valuable time in the office, as well as in the field. Its familiar Windows® environment makes operating the software a simple task, even for those unfamiliar with OTDR or OSA operations. Analysis can be performed with a few clicks of the mouse - integrated help screens are available whenever they're needed. The software supports other manufacturer's OTDR data formats and can easily convert between legacy and current file formats and the Bellcore GR-196 standard.

With compliments

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NetWorks/OTDR key features

- Automated analysis tools for locating splice-points and building splice loss measurement templates
- Batch processing to update and reformat multiple trace files simultaneously
- Current View, Batch, Frame and Bi-directional printing with color option
- Trace Summary, Exception, Fiber Acceptance, Uni-directional and Bi-directional splice loss reports
- Dial-a-language with English, Spanish, French, Russian, German and Traditional Chinese available to the user

NetWorks/OSA key features

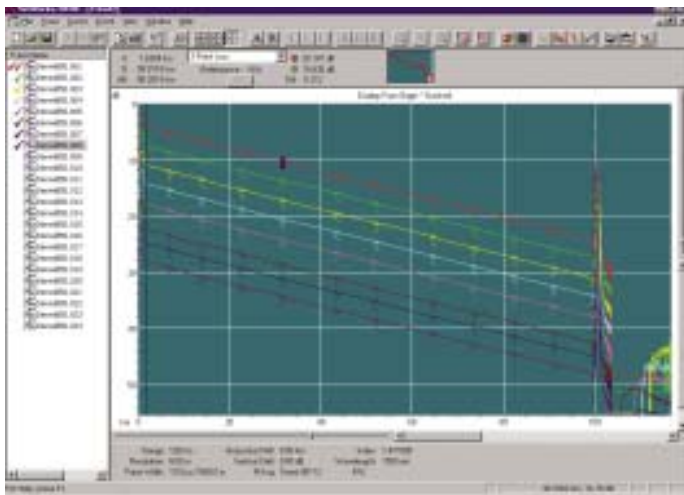
- Multiple spectrum viewing and power measurements
- Integrated peak and drift tables
- Optional gain tilt and slope lines
- Flexible batch and frame printing formats
- Ability to display in nanometers (nm) or terahertz (THz)

With OTDR and OSA trace analysis capability, and unsurpassed reporting capability, NetWorks is the one product needed for all your fiber optic system analysis.

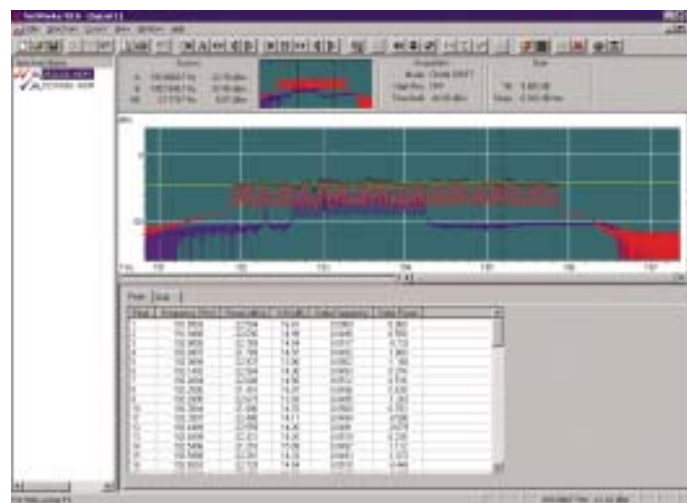
Benefits

NetWorks OTDR/OSA

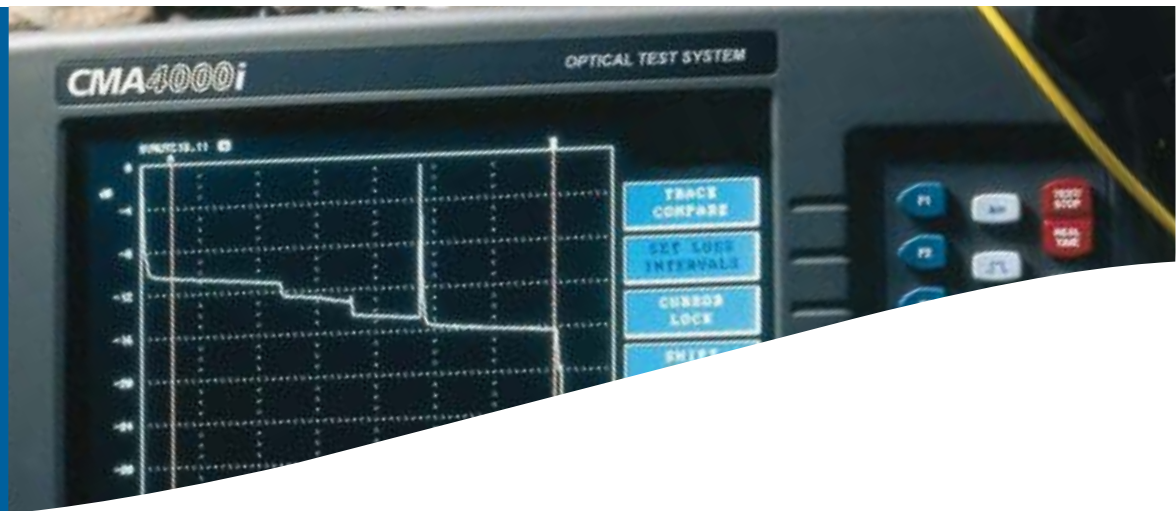
- Automated analysis for locating splice-points
- Batch processing for multiple file analysis



NetWorks OTDR



NetWorks OSA



NetTest Training

Benefits

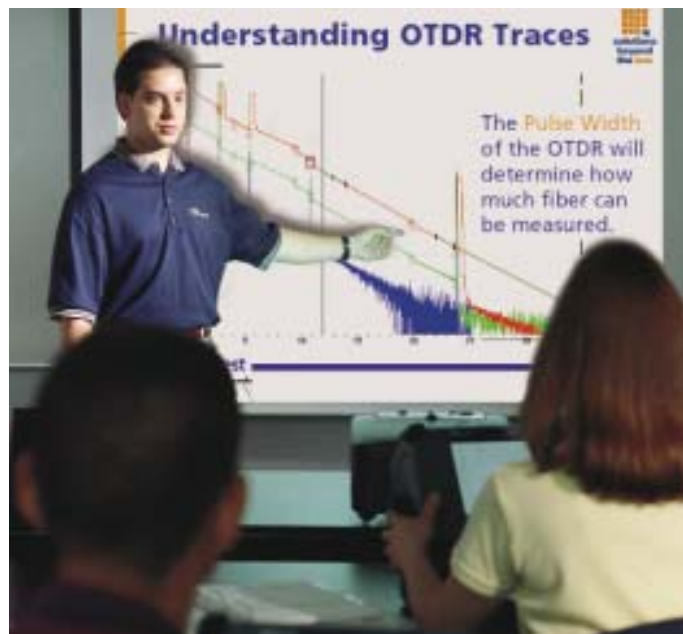
Training Service

- Cutting edge training from the industry leader
- Classes tailored for specific needs
- "Train the Trainer" classes educate in-house training departments

As the industry leader in the field of fiber optic installation, commissioning and installation products, NetTest understands the importance of education. The fiber optic industry is rapidly progressing, and staying abreast of the latest technology is a must for retaining your competitive advantage.

NetTest, your fiber optic testing partner, offers a variety of comprehensive and economical training courses held either at a NetTest

training facility or at your own location. Standard training courses include Introduction to Fiber Optics, Introduction to Dispersion, OTDR User Training, Advanced OTDR Training (Train-the-Trainer), and NetWorks Software Training. In addition to standard training, NetTest offers customized courses designed specifically for your training and educational needs.

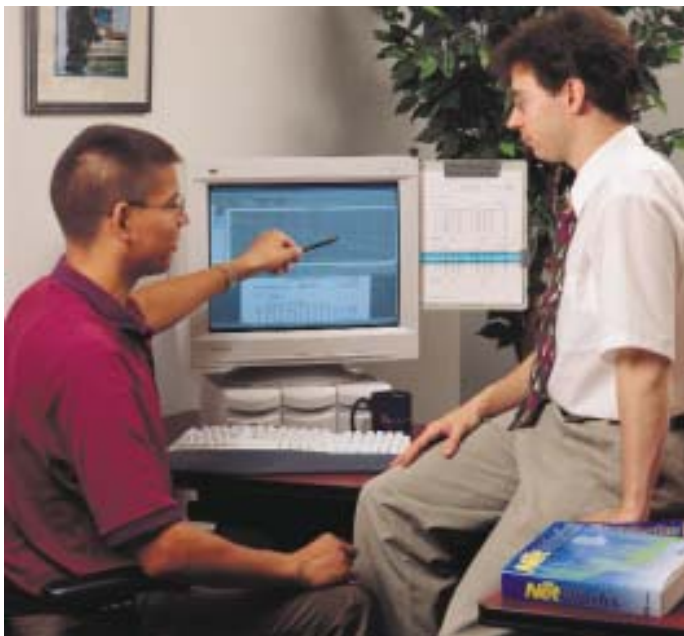


NetTest Trace Analysis Service



Commissioning a large fiber optic cable, or even a small one, can prove to be a daunting task. Often, dual wavelength, bi-directional testing of fiber optic cables results in hundreds or thousands of OTDR trace signatures. It is imperative that this myriad of information is analyzed accurately and quickly so end-users of

network services feel confident that their networks will operate at their optimal level. NetTest's unique trace analysis service will analyze your OTDR traces and quickly prepare clear, concise reports detailing all necessary OTDR trace data to properly commission your fiber optic cables.



Benefits

Trace Analysis Service

- Comprehensive analysis from the industry leader
- Standard and custom reports
- Minimizes costs by outsourcing data analysis

CMA4000i

Optical Test System

The CMA4000i Optical Test System is an all-in-one test and measurement solution for network commissioning, fault location/restoration, maintenance, and DWDM spectral analysis. Combining best in class OTDR and OSA performance, modular flexibility and ease-of-use, the CMA4000i is the ultimate time saving system for increasing network performance while reducing the cost of measurement.

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Mainframe Specifications

Display	VGA LCD Display (21.3 cm (8.4 inch) color or 20.8 cm (8.2 inch) monochrome)
Floppy Drive	3.5 inch/1.44 MB floppy disk (up to 180 OTDR traces for a standard disk)
Keyboard	Integral alpha-numeric, external keyboard (optional)
I/O Ports	Standard: (2) RS-232 Serial, (1) Parallel, VGA, Mouse, and (1) PS/2 External Keyboard Port
Internal Storage	Up to 125 OTDR traces internal 2 Gigabytes minimum (Over 65,000 traces with hard drive option)
Dimensions (H x W x D)	24.1 x 34.3 x 9.5 cm (9.5 x 13.5 x 3.75 inches)
Weight	4.9 kg (11.0 lbs.) Includes mainframe, battery and module
Power Supply	Autoswitching 100-132 VAC, 47-63 Hz, 184-250 VAC, 47-63 Hz, 10-15 VDC
Battery	(2) Sealed lead acid battery pack
Battery Life	6 hours typical, depending on operating mode Recharge Time 1.5 - 2 hours
AC Power Temperature	0° C to 45° C (32° F to 122° F)
AC Power Humidity	95% RH max., non-condensing
AC Power Maximum Altitude	15,240 meters (50,000 feet)
Battery Temperature	0° C to 40° C (32° F to 104° F)
Battery Humidity	95% RH max., non-condensing
Battery Maximum Altitude	15,240 meters (50,000 feet)
Storage Temperature	-25° C to 60° C (-13° F to 140° F)
Storage Humidity	95% RH max., non-condensing
Storage Maximum Altitude	15,240 meters (50,000 feet)



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Specifications

OTDR Specifications			
Module	4415	4425	4436
Emitter Type ¹	Laser Diode	Laser Diode	Laser Diode
Center Wavelength	1310 nm ±20 nm 1550 nm ±20 nm	1310 nm ±20 nm 1550 nm ±20 nm	1310 nm ±20 nm 1550 nm ±20 nm
Fiber Type	Single-mode	Single-mode	Single-mode
Spectral Width (RMS)	1310 nm: ≤10 nm 1550 nm: ≤10 nm	1310 nm: ≤10 nm 1550 nm: ≤10 nm	1310 nm: ≤10 nm 1550 nm: ≤10 nm
Dynamic Range ²	1310 nm: 30 dB 1550 nm: 28 dB	1310 nm: 36 dB 1550 nm: 34 dB	1310 nm: 40 dB 1550 nm: 40 dB
Initial Reflective Deadzone ³	1310 nm: 3.0 meters 1550 nm: 3.0 meters	1310 nm: 3.0 meters 1550 nm: 3.0 meters	1310 nm: 3.5 meters 1550 nm: 3.5 meters
Initial Non-Reflective Deadzone ⁴	1310 nm: 10 meters 1550 nm: 12 meters	1310 nm: 10 meters 1550 nm: 12 meters	1310 nm: 6.0 meters 1550 nm: 6.0 meters
Linearity	.04 dB/dB	.04 dB/dB	.04 dB/dB
Pulsewidth	10 ns to 20 µs	10 ns to 20 µs	10 ns to 20 µs
Distance Resolution	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi
Loss Resolution	0.001 dB	0.001 dB	0.001 dB
Distance Sampling (range dependent) ⁵	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters
Distance Range Setting	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/ 64/128/256 km
Distance Accuracy	0.0025% of distance measurement + distance resolution + index uncertainty		
Loss Modes	ORL, 2-point, 2-point LSA, dB/KM, dB/KM LSA, splice, dual splice loss, reflectance		
Trace Compare Modes	4 Trace Overlay, Delta Trace Compare, Align, Stack		
Data Acquisition	Real Time, Fast Scan, Medium Scan, Slow Scan, Timed Average (user selectable)		
Vertical Scale Settings	0.125/0.25/0.5/1/2/4/8 dB (module dependent)		
Horizontal Scale Settings	0.001 km/div. to 0.448 km/div. @ 2 km; 0.001 km/div. to 57.304 km/div. @ 256 km (IOR = 1.5)		
Language Capability	Dial-a-language (English, Chinese, Spanish, Portuguese, French, Russian, German, Italian, Swedish, Korean, Hungarian)		

Notes

¹ Meets CDRH Class 1 Requirements (Eye Safe) 21 CFR

² SNR=1 with up to 256k averages (Typical, subtract approximately 1.7 dB of range for 98% peak noise. Bellcore TR-TSY-000196 Issue 2)

³ Using Bellcore TR-TSY-000196 Issue (typical)

⁴ Deadzones measured on -45 dB reflections (typical)

⁵ Stored Data Points 16,000

OTDR Specifications			
Module	4439	4442	4453
Emitter Type ¹	Laser Diode	Laser Diode	Laser Diode
Center Wavelength	1310 nm ±20 nm 1550 nm ±20 nm	850 nm ±20 nm 1300 nm ±20 nm	1310 nm ±20 nm 1550 nm ±20 nm 1625 nm ±10 nm
Fiber Type	Single-mode	Multimode	Single-mode
Spectral Width (RMS)	1310 nm: ≤10 nm 1550 nm: ≤10 nm	850 nm: ≤10 nm 1550 nm: ≤15 nm	1310 nm: ≤12 nm 1550 nm: ≤12 nm 1625 nm: ≤12 nm
Dynamic Range ²	1310 nm: 43 dB 1550 nm: 46 dB	850 nm: 23 dB 1300 nm: 26 dB	1310 nm: 40 dB 1550 nm: 40 dB 1625 nm: 40 dB
Initial Reflective Deadzone ³	1310 nm: 3.0 meters 1550 nm: 3.5 meters	850 nm: 3.5 meters 1300 nm: 3.0 meters	1310 nm: 3.5 meters 1550 nm: 3.5 meters 1625 nm: 3.5 meters
Initial Non-Reflective Deadzone ⁴	1310 nm: 10 meters 1550 nm: 10 meters	850 nm: 6.5 meters 1300 nm: 7.0 meters	1310 nm: 7.0 meters 1550 nm: 7.0 meters 1625 nm: 7.0 meters
Linearity	.04 dB/dB	.04 dB/dB	.04 dB/dB
Pulsewidth	10 ns to 30 µs	4 ns to 1 µs	10 ns to 20 µs
Distance Resolution	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi
Loss Resolution	0.001 dB	0.001 dB	0.001 dB
Distance Sampling (range dependent) ⁵	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters
Distance Range Setting	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/64 km	2/4/8/16/32/ 64/128/256 km
Distance Accuracy	0.0025% of distance measurement + distance resolution + index uncertainty		
Loss Modes	ORL, 2-point, 2-point LSA, dB/KM, dB/KM LSA, splice, dual splice loss, reflectance		
Trace Compare Modes	4 Trace Overlay, Delta Trace Compare, Align, Stack		
Data Acquisition	Real Time, Fast Scan, Medium Scan, Slow Scan, Timed Average (user selectable)		
Vertical Scale Settings	0.125/0.25/0.5/1/2/4/8 dB (module dependent)		
Horizontal Scale Settings	0.001 km/div. to 0.448 km/div. @ 2 km; 0.001 km/div. to 57.304 km/div. @ 256 km (IOR = 1.5)		
Language Capability	Dial-a-language (English, Chinese, Spanish, Portuguese, French, Russian, German, Italian, Swedish, Korean, Hungarian)		

Notes

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² SNR=1 with up to 256k averages (Typical, subtract approximately 1.7 dB of range for 98% peak noise. Bellcore TR-TSY-000196 Issue 2)

³ Using Bellcore TR-TSY-000196 Issue (typical)

⁴ Deadzones measured on -45 dB reflections (typical)

⁵ Stored Data Points 16,000

OTDR Specifications			
Module	4454	4456	4457
Emitter Type ¹	Laser Diode	Laser Diode	Laser Diode
Center Wavelength	1310 nm ±20 nm 1410 nm ±10 nm 1550 nm ±20 nm 1625 nm ±10 nm	850 nm ±20 nm 1300 nm ±20 nm 1310 nm ±20 nm 1550 nm ±20 nm	850 nm ±20 nm 1300 nm ±20 nm 1310 nm ±20 nm 1550 nm ±20 nm
Fiber Type	Single-mode	Multimode and Single-mode	Multimode and Single-mode
Spectral Width (RMS)	1310 nm: ≤12 nm 1410 nm: ≤12 nm 1550 nm: ≤12 nm 1625 nm: ≤12 nm	850 nm: ≤10 nm 1300 nm: ≤10 nm 1310 nm: ≤10 nm 1550 nm: ≤10 nm	850 nm: ≤10 nm 1300 nm: ≤10 nm 1310 nm: ≤10 nm 1550 nm: ≤10 nm
Dynamic Range ²	1310 nm: 36 dB 1410 nm: 36 dB 1550 nm: 36 dB 1625 nm: 36 dB	850 nm: 23 dB 1300 nm: 25 dB 1310 nm: 22 dB 1550 nm: 21 dB	850 nm: 22 dB 1300 nm: 24 dB 1310 nm: 33 dB 1550 nm: 31 dB
Initial Reflective Deadzone ³	1310 nm: 3.5 meters 1410 nm: 3.5 meters 1550 nm: 3.5 meters 1625 nm: 3.5 meters	850 nm: 3.5 meters 1300 nm: 3.0 meters 1310 nm: 3.0 meters 1550 nm: 3.0 meters	850 nm: 4.5 meters 1300 nm: 4.5 meters 1310 nm: 4.0 meters 1550 nm: 3.5 meters
Initial Non-Reflective Deadzone ⁴	1310 nm: 7.0 meters 1410 nm: 7.0 meters 1550 nm: 7.0 meters 1625 nm: 7.0 meters	850 nm: 6.5 meters 1300 nm: 7.0 meters 1310 nm: 10 meters 1550 nm: 12 meters	850 nm: 8.0 meters 1300 nm: 9.0 meters 1310 nm: 11 meters 1550 nm: 12 meters
Linearity	.04 dB/dB	.04 dB/dB	.04 dB/dB
Pulsewidth	10 ns to 20 μs	4 ns to 10 μs ⁵	4 ns to 20 μs ⁵
Distance Resolution	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi
Loss Resolution	0.001 dB	0.001 dB	0.001 dB
Distance Sampling (range dependent) ⁶	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters ⁵	0.25, 0.5, 1, 2, 4, 8, 16 meters ⁵
Distance Range Setting	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/ 64/128/256 km ⁵	2/4/8/16/32/ 64/128/256 km ⁵
Distance Accuracy	0.0025% of distance measurement + distance resolution + index uncertainty		
Loss Modes	ORL, 2-point, 2-point LSA, dB/KM, dB/KM LSA, splice, dual splice loss, reflectance		
Trace Compare Modes	4 Trace Overlay, Delta Trace Compare, Align, Stack		
Data Acquisition	Real Time, Fast Scan, Medium Scan, Slow Scan, Timed Average (user selectable)		
Vertical Scale Settings	0.125/0.25/0.5/1/2/4/8 dB (module dependent)		
Horizontal Scale Settings	0.001 km/div. to 0.448 km/div. @ 2 km; 0.001 km/div. to 57.304 km/div. @ 256 km (IOR = 1.5)		
Language Capability	Dial-a-language (English, Chinese, Spanish, Portuguese, French, Russian, German, Italian, Swedish, Korean, Hungarian)		

Notes

¹ Meets CDRH Class 1 Requirements (Eye Safe) 21 CFR

² SNR=1 with up to 256k averages (Typical, subtract approximately 1.7 dB of range for 98% peak noise. Bellcore TR-TSY-000196 Issue 2)

³ Using Bellcore TR-TSY-000196 Issue (typical)

⁴ Deadzones measured on -45 dB reflections (typical)

⁵ Wavelength dependent

⁶ Stored Data Points 16,000

OTDR Specifications			
Module	4473	4476	4498
Emitter Type ¹	Laser Diode	Laser Diode	Laser Diode
Center Wavelength	1550 nm ±20 nm 1625 nm ±10 nm	1550 nm ±20 nm 1625 nm ±10 nm	1550 nm ±20 nm
Fiber Type	Single-mode	Single-mode	Single-mode
Spectral Width (RMS)	1550 nm: ≤10 nm 1625 nm: ≤10 nm	1550 nm: ≤10 nm 1625 nm: ≤10 nm	1550 nm: ≤15 nm
Dynamic Range ²	1550 nm: 34 dB 1625 nm: 36 dB	1550 nm: 40 dB 1625 nm: 40 dB	1550 nm: 50 dB
Initial Reflective Deadzone ³	1550 nm: 4.0 meters 1625 nm: 4.0 meters	1550 nm: 4.0 meters 1625 nm: 4.0 meters	1550 nm: 4.5 meters
Initial Non-Reflective Deadzone ⁴	1550 nm: 11 meters 1625 nm: 7.0 meters	1550 nm: 11 meters 1625 nm: 7.0 meters	1550 nm: 12 meters
Linearity	.04 dB/dB	.04 dB/dB	.04 dB/dB
Pulsewidth	10 ns to 20 µs	10 ns to 20 µs	10 ns to 30 µs
Distance Resolution	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi
Loss Resolution	0.001 dB	0.001 dB	0.001 dB
Distance Sampling (range dependent) ⁵	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters	0.25, 0.5, 1, 2, 4, 8, 16 meters
Distance Range Setting	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/ 64/128/256 km	2/4/8/16/32/ 64/128/256 km
Distance Accuracy	0.0025% of distance measurement + distance resolution + index uncertainty		
Loss Modes	ORL, 2-point, 2-point LSA, dB/KM, dB/KM LSA, splice, dual splice loss, reflectance		
Trace Compare Modes	4 Trace Overlay, Delta Trace Compare, Align, Stack		
Data Acquisition	Real Time, Fast Scan, Medium Scan, Slow Scan, Timed Average (user selectable)		
Vertical Scale Settings	0.125/0.25/0.5/1/2/4/8 dB (module dependent)		
Horizontal Scale Settings	0.001 km/div. to 0.448 km/div. @ 2 km; 0.001 km/div. to 57.304 km/div. @ 256 km (IOR = 1.5)		
Language Capability	Dial-a-language (English, Chinese, Spanish, Portuguese, French, Russian, German, Italian, Swedish, Korean, Hungarian)		

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⁵ Stored Data Points 16,000

Power Meter Connector Options

Select one when ordering
a power meter

AM-430-15	D4
AM-430-20	SMA 906
AM-430-25	Diamond GFS-3
AM-430-45	FC
AM-430-50	ST
AM-430-75	VFO/PFO
AM-430-85	DIN
AM-430-90A	SC
AM-430-95	E2000
AM-430-100	FDDI

VFL Connector Options

FC, SC, ST - fixed connector

OTDR Connector Options

Adapters for Ultra Polish

UC-130-15	DIN 47256
UC-130-20	D4
UC-130-25T	FC
UC-130-30T	ST
UC-130-55A	SC
UC-130-35	SMA 905/906
UC-130-40	Diamond HP
	HMS-10
UC-130-45	Diamond
	HMS-0
UC-130-50	Diamond
	HMS-10/A

Adapters for Angle Polish

UC-130-60	FC NTT
UC-130-60A	FC Seiko Giken
UC-130-65	SC
UC-130-70	DIN/HRL-10
UC-130-75	ST
UC-130-80	Diamond
	E-2000

Ordering Information

Mainframe Selection (required)

TD-14XXE

Select Display Option

1 = Monochrome Display

(Available for use with OTDR modules)

2 = Color Display

(Color display required for use with OSA modules)

Select Hard Drive Option

1 = No hard drive (OTDR only)

3 = Hard drive option

4 = Hard drive & DOS 6.22 option

5 = Hard drive & Windows 95 option

AC Power Cord Options

TD-11685	US/Japan AC power cord	TD-30360	Swiss AC power cord
TD-30358	European AC power cord	TD-30362	Australian AC power cord
TD-30359	UK AC power cord	TD-30361	Italian AC power cord

OTDR Module Ordering Information

Part Number TD-14MXX XX-X

Enter Last Two Digits Of Module Number

Select Power Meter

(For OTDR modules 4415, 4425, 4436, 4439, 4442, and 4456)

0 = No power meter

1 = 10 dBm power meter

2 = 20 dBm power meter

Select Power Meter

(for OTDR modules 4453, 4454, 4473, and 4476)

0 = No Power Meter

3 = 10 dBm InGaAs power meter

4 = 20 dBm InGaAs power meter

Note: No power meter options for module 4498

Select Light Source Option

0 = No light source

1 = Dual wavelength with only dual optical module

2 = Single wavelength with only single optical module

Note: No light source option for 4498 or multimode wavelength modules

Select Connector Polish For Modules

2 = Ultra PC single-mode

3 = Angled PC single-mode

4 = 62.5 μ m PC multimode (444X modules only)

6 = 62.5 μ m PC MM / Ultra PC SM

(4456 and 4457 modules only)

7 = 62.5 μ m PC MM/ angled PC SM

(4456 and 4457 modules only)

VFL Module Available

VFL-XX (FC, SC, ST - fixed connectors)

Notes

¹ Model 4791 only

² Available with 1625 nm light source only

³ Available with 1410 nm light source only

⁴ Specification applies to +10 dBm meter.

Optical Spectrum Analyzer (OSA) Specifications		
Module	4791 NI	4792
Wavelength Range	1520 - 1570 nm	1520 - 1620 nm
Wavelength Accuracy	±20 pm (typical)	±20 pm (typical)
Resolution Bandwidth	<0.05 nm	<0.05 nm
Power Range	+10 to -70 dBm per channel +20 to -60 dBm per channel ¹	+10 to -70 dBm per channel
Polarization Dependence	<±0.25 dB	<±0.25 dB
Channel Table	Automatically generated, up to 400 channels	Automatically generated, up to 400 channels
Return Loss	<35 dB	<35 dB
Cyclic Time	4 seconds maximum	4 seconds maximum
Stability	±0.2 dB per hour	±0.2 dB per hour
Power Accuracy	±0.5 dB (23° C)	±0.5 dB (23° C)
Modes of Operation	Graph, table and drift modes	
Acquisitions	Real time, average, peak hold and channel drift	
Language Capability	English	
Single-mode Light Source Specifications		
Wavelengths	Same as OTDR	
Output	-8 dBm (minimum)	
Transmission Mode	CW, 2 KHz	
Output Fiber	9/125 µm SM fiber	
Optical Connector	Same as OTDR	
Stability	±0.2 dB (8 hours)	
Spectral Width	Same as OTDR	
Power Meter Specifications		
Detector Type	2 mm Ge PIN photodiode or InGaAs photodiode ²	
Range	+10 to -55 dBm or +20 to -45 dBm with AM460 filter	
Calibrated Wavelengths	850, 1310, 1410 ³ , 1550, 1625 nm ²	
Universal Connector	Yes (use AM-430-xx adapter caps)	
Resolution	0.01 dB, 0.01% Watts	
Store Reference Mode	Yes	
Accuracy ⁴	±4% (±0.18 dB) @ +5 dBm to -50 dBm, ±8% (±0.36 dB) @ + 10 dBm to +5 dBm and @ -50 dBm to -55 dBm	
Linearity	±0.04 dB, +5 dBm to -50 dBm	
Visual Fault Locator Specifications		
Wavelength	650 ±10 nm	
Output	0 dBm	
Transmission Mode	CW or 2 Hz	
Output Fiber	9/125 µm, SM fiber	
Safety	IEC 825 Class 2, FDA (21 CFR 1040. 10 Class 2)	

The CMA 4000i Optical Test System provides the most complete test and measurement solution for the All-Optical Network. With its modular design, the instrument can be configured to meet the most demanding requirements for a variety of applications from fault location to testing Dense Wavelength Division Multiplexing (DWDM) systems. The CMA 4000i can be configured as an OTDR with a Visual Fault Locator, Optical Power Meter, and Light Source; or as a high resolution Optical Spectrum Analyzer (OSA) for DWDM systems. With its variety of functions, the CMA 4000i offers the best value for optical network commissioning, troubleshooting, restoration, and maintenance applications.

Applications

CMA 4000i is the all-in-one test system for qualifying optical networks:

- Commissioning
- Fault Location / Restoration
- Maintenance
- DWDM System Turn-up

The Industry Leader in Optical Performance

High performance networks demand even higher performance test and measurement equipment -- and there's no better solution than Anritsu's award winning test and measurement solutions. The CMA 4000i continues the Anritsu tradition of worldwide leadership in optical test and measurement.

With 50 dB of dynamic range and deadzones as small as 3.0 m, the CMA 4000i is ideal for testing long haul backbone networks, metro networks, or Passive Optical Networks (PONs). For complete system characterization, the CMA 4000i can easily be equipped with a light source and power meter for complete end-to-end loss testing. In addition, its Visual Fault Locator (VFL) option enables you to locate breaks within the OTDR's deadzone or identify specific optical fibers within a cable. The 4000i offers a variety of operating modes for varying OTDR applications.

DWDM System Qualification

For commissioning or maintaining networks that employ DWDM technology, the model 4792 OSA module for the CMA 4000i is the ideal instrument. It allows testing both current and future DWDM networks. Operating from 1520-1620 nm (C- and L-bands), the model 4792 OSA module can automatically identify over 400 DWDM channels spaced less than 12.5 GHz apart -- perfect for testing high capacity DWDM systems.

Characterizing complex DWDM systems is simple with the CMA 4000i. One-button operation ensures that even the novice user is capable of characterizing a complex DWDM system for channel center wavelength, power, and OSNR. Simply power on the unit with the OSA module installed to see one of the following views: Table View, Drift View, or Graph View.

Features

- Highest Dynamic Range in the industry: 50 dB
- OTDR, Loss Test Set, and VFL in a single module
- Optical Spectrum Analyzer module with 10 GHz channel resolution
- One-button testing

Operating Modes

Fault Locate Mode With its one-button auto test option, the CMA 4000i brings ease of use to a new level. Simply attach the fiber to the instrument, press Fault Locate, and your entire fiber optic cable is completely characterized for attenuation, splice loss, and reflectance. For users needing more measurement flexibility, the CMA 4000i offers the following modes to bring OTDR testing to a higher level:

Construction OTDR Mode Construction Mode simplifies and automates the tests and documentation most frequently performed during fiber installation. Construction Mode is designed for testing multiple fibers, and is ideal for cable installation and commissioning. It

eliminates the time consuming setups common to the repetitive practices of testing, storing, analyzing, and documenting high fiber count cables.

From the setup screen, the operator can quickly select one or all wavelengths to test, specify the file naming structure, and enter the fiber count for a given cable. Once set up, the OTDR acts as a “task master” to perform the following functions:

- Select the wavelengths
- Test the fiber at all selected wavelengths
- Analyze the trace data
- Store the trace and analysis data to either floppy or hard drive
- Alert the technician to move to the next fiber to be tested and increment the filename to the next sequential number

Expert OTDR Mode Expert OTDR allows the user to perform traditional OTDR functions with dedicated hard keys tied to frequently used OTDR parameters such as pulse width, range/resolution, and wavelength. This mode provides unsurpassed user flexibility for optimization of OTDR parameters without stopping the test in progress. Key features of the Expert Mode include:

- Real-time Testing
- Splice Optimization
- Loss Mode Setup
- Dual Wavelength Testing
- Trace Compare Mode
- Trace Shift Capability

Views

Table View Table view is ideal for quickly characterizing a DWDM system’s essential features and performance. The number of channels, channel spacing, and relative power between channels is immediately visible. The table also shows each channel’s wavelength/frequency, power, optical signal-to-noise ratio (OSNR), delta wavelength, and delta power.

Graph View Graph view displays full spectrum data and allows full manipulation of the waveform. Since this view displays the entire spectrum at all times, the user can zoom in while still maintaining a full spectrum view. In addition, it allows acquired and recalled data to be displayed together; this is especially useful for comparing spectra, analyzing channel power flatness, and viewing channel spacing.

Drift View Drift view is used in conjunction with the drift acquisition mode and is ideal for evaluating long-term power and wavelength stability of DWDM channels. This view displays channel number, reference wavelength, reference channel width, current wavelength, current power, minimum/maximum detected wavelength, and detected power. It can also be used to compare the received channel frequencies to the ITU standard DWDM grid or to a user-defined template, making field procedures simpler than ever.

Mainframe

Specifications

Display	VGA LCD Display (21.3 cm (8.4 inch) color or 20.8 cm (8.2 inch) monochrome)
Floppy Drive	3.5 inch/1.44 MB floppy disk (up to 180 OTDR traces for a standard disk)
Keyboard	Integral alpha-numeric, external keyboard (optional)

I/O Ports	Standard: (2) RS-232 Serial, (1) Parallel, VGA, Mouse, and (1) PS/2 External Keyboard Port
Internal Storage	Up to 125 OTDR traces internal 2 Gigabytes minimum (Over 65,000 traces with hard drive option)
Dimensions (H x W x D)	24.1 x 34.3 x 9.5 cm (9.5 x 13.5 x 3.75 inches)
Weight	4.9 kg (11.0 lbs.) Includes mainframe, battery and module
Power Supply	Autoswitching 100-132 VAC, 47-63 Hz, 184-250 VAC, 47-63 Hz, 10-15 VDC
Battery	(2) Sealed lead acid battery pack
Battery Life	6 hours typical, depending on operating mode Recharge Time 1.5 - 2 hours
AC Power Temperature	0° C to 45° C (32° F to 122° F)
AC Power Humidity	95% RH max., non-condensing
AC Power Maximum Altitude	15,240 meters (50,000 feet)
Battery Temperature	0° C to 40° C (32° F to 104° F)
Battery Humidity	95% RH max., non-condensing
Battery Maximum Altitude	15,240 meters (50,000 feet)
Storage Temperature	-25° C to 60° C (-13° F to 140° F)
Storage Humidity	95% RH max., non-condensing
Storage Maximum Altitude	15,240 meters (50,000 feet)

NETTEST CMA4425 Specs:

Center Wavelength	1310 nm ± 20 nm 1550 nm ± 20 nm
Fiber Type	Singlemode 9/125μ
Spectral Width (RMS)	1310 nm: = 10 nm 1550 nm: = 10 nm

Dynamic Range	1310 nm: 36 dB
(SNR = 1)	1550 nm: 34 dB
Initial Reflective Deadzone	1310 nm: 3 meters (typical)
	1550 nm: 3 meters (typical)
Initial Non-Reflective Deadzone	1310 nm: 10 meters (typical)
	1550 nm: 12 meters (typical)
Pulsewidth	10 ns to 10 μ s
Distance Resolution	0.0001 km; 0.1 meters; 0.001 kft, 1 ft, 0.0001 mi
Distance Sampling	0.25, 0.5, 1, 2, 4, 8, 16 meters (range dependent)
Distance Accuracy	0.0025% of distance measurement \pm distance resolution \pm index uncertainty
Distance Range Setting	2/4/8/16/32/64/128/256 km
Loss Resolution	0.001 dB
Laser Safety	Meets CDRH Class 1 Requirements (Eye Safe) 21 CFR