



ATE8104/ATE8108

Optical Transceiver Tester

Version 1.7





1. Product Description

The ATE (Automatic Test Equipment) integrated testing system combines various test cases for transceiver and integrates the sub-functional modules according to the functional requirements ratio. Users can flexibly configure the system according to their actual testing needs, improving the utilization of transceiver test instruments and effectively reducing testing costs. The system's integrated software encapsulates various parameters in transceiver testing, allowing users to quickly build the test system like building blocks and accelerate the mass production introduction of new products.

The entire system adopts multi-channel parallel testing, combining software and hardware to fully utilize the functions of instruments and software, significantly improving the testing efficiency of each unit product.

2. Key Features

- Some optical instruments are packaged as plug-in modules, supporting flexible optimization of hardware configuration.
- The PC is controlled and managed by a PCI bus interface card to control the test host.
- The optical instrument chassis is equipped with 17 slots, supporting different hardware modules.
- High integration of hardware improves device stability and ease of connection.
- The software is highly encapsulated, and various sub-functional modules can be called and combined as needed.
- Multi-channel parallel testing increases the number of channels, greatly improving testing



efficiency.

- Integrated TEC (Thermoelectric Cooler) temperature control system supports module temperature cycling testing from -10 to 85 °C (TEC temperature range: -10 to 85 °C, reported module temperature: -5 to 85 °C).

3.Applications

The ATE integrated testing system is applied for transceiver performance testing. The ATE automated testing system comes with dedicated software that is user-friendly, straightforward, and easy to use. It can be customized and expanded according to the specific testing requirements of the customers, allowing for the addition of testing functions.

The system is primarily designed for the performance testing of commercial-grade temperature transceiver used in data centers. It supports the testing of various packaging types, such as 400G, 200G, and 100G transceiver. With this system, accurate evaluation of key performance parameters, including transmission rate, bit error rate, and optical power, can be conducted. Moreover, the system can simulate the actual operating environment of data centers, enabling comprehensive testing and validation of the transceiver's performance under high-temperature conditions.

In summary, the ATE integrated testing system is a powerful and user-friendly tool specifically designed for the performance testing of commercial-grade temperature transceiver used in data centers. It provides accurate and reliable testing results, assisting users in evaluating the performance of transceiver in real-world application scenarios.



4. System Architecture



Fig. 1 ATE system

The integrated testing system includes all the necessary equipment for transceiver testing, including optical sampling oscilloscopes, bit error rate testers, multi-channel parallel testing fixtures, TEC temperature control systems, clock recovery units, optical attenuators, optical power meters, optical switches, and PCs.



4.1.PC

To improve testing efficiency, the computer configuration for the integrated testing system should meet the following minimum requirements:

- 2.9GHz 8-core CPU
- Dedicated graphics card with a minimum of 4GB VRAM
- 16GB RAM
- 1TB hard drive
- Color display with a resolution of 1024 x 768 or higher
- 1 or more PCI slots (for inserting system bus interface cards)
- Windows 10 64-bit operating system

4.2.UPS

In order to prevent data loss and abnormal test termination caused by an unexpected power outage, a 2400W rack UPS is optional-configured.

- Protection against power outages
- Protection against voltage sags
- Protection against lightning surges
- Protection against undervoltage and overvoltage transients
- Protection against harmonic distortion and electronic interference
- 2U form factor for easy integration into a rack-mounted setup
- Provides power backup for at least 1 hour



4.3. Mainframe of the optical instrument

The optical instrument mainframe supports various optical components including single-mode and multi-mode optical attenuators, optical switches, power meters, and Mux/Demux devices. It is equipped with built-in power supply and communication interfaces (LAN/USB). The components can be combined according to the testing requirements. Here are the specifications of the mainframe:

- 4U Full Rack form factor
- Supports 17 slots for component installation
- Each slot has a width of approximately 20 mm, while the overall width of the chassis is approximately 448 mm
- Supports plug-in optical switches
- Supports plug-in power meters
- Supports plug-in optical attenuators
- The power consumption of the mainframe is designed to be 100 W



Fig. 2 Mainframe of the optical instrument



4.4. Water Chiller

The water chiller is an optional accessory for TEC-assisted cooling, and it is recommended to be selected. Here are the features and specifications of the water chiller:

- Supports adjustable coolant temperature ranging from 5 to 40 °C.
- TEC heat sink temperature ranges from -10 to 85 °C.
- Supports remote command set, allowing real-time monitoring of the water tank status and alarm information.
- Provides overcurrent protection to prevent damage caused by excessive current.
- Includes water shortage protection to avoid operating without sufficient water.
- Equipped with compressor overheat protection to prevent device failure due to overheating.
- Offers high and low temperature protection to safeguard the equipment under extreme temperature conditions.

Choosing the water chiller as a TEC-assisted cooling device can provide better temperature control and stability, ensuring accurate and reliable performance testing of transceiver.

5. Pluggable Optical Instrument Modules

5.1. Multi-mode optical attenuator



Fig. 3 MM VOA card module

Technical Specifications:

Technical Specifications	Operating wavelength	850nm
	Connectivity	FC/PC
	Insertion loss	<2.5dB
	Return loss	>30dB
	Attenuation range	0~40dB
	Channels	4
	Resolution	0.1 dB
	Accuracy	±0.15dB
	Max. input power	500mW
	Power monitoring mode	Input/Output
	Power monitoring range	+10~-50 dBm



	Power accuracy	$\leq \pm 0.2\text{dB}$ (0 ~35dB) $\leq \pm 0.5\text{dB}$ (35 ~50dB)
	Operating temperature	0°C to 50°C
	Storage temperature	-20°C to +70°C

5.2.Single-module optical attenuator



Fig. 4 SM VOA card module

Technical Specifications:

Technical Specifications	Operating wavelength	1270/1290/1310/1330/1295/1300/1305 /1490/1550/1625nm
	Attenuation range	0 ~40dB
	Resolution	0.01dB
	Power monitoring range	+20 ~ -50dBm
	Power accuracy	$\leq \pm 0.2\text{dB}$ (0 ~20dB)



		$\leq \pm 0.4\text{dB}$ (20 ~40dB)
	Max. input power	500mW
	Insertion loss	$\leq 2.5\text{dB}$
	Return loss	$\geq 45\text{dB}$
	Connectivity	FC/PC
	Operating temperature	-5°C to + 60°C

5.3. Single-mode 1x4 optical switch plug-in module

Main functions

- Standard plug-in module supports 1x4 single module optical switches
- Each plug-in module occupies two slots



Fig. 5 SM 1x4 optical switch module

Technical Specifications:

Technical	Operating wavelength	1310/1550nm
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Specifications	Connectivity	FC/PC
	Insertion loss	$\leq 1.0\text{dB}$
	Repeatability	$< 0.03\text{ dB}$
	Return loss	$\geq 50\text{dB}$
	Crosstalk	$\leq -70\text{dB}$
	Switch time	$< 12\text{ ms}$
	Lifetime	$> 3 \times 10^7\text{ cycles}$
	Operating temperature	-20°C to $+70^{\circ}\text{C}$
	Storage temperature	-40°C to $+85^{\circ}\text{C}$

5.4. Multi-mode 1x4 optical switch plug-in module

Main functions

- Standard plug-in module supports 1x4 single module optical switch
- Each plug-in module occupies two slots



Fig. 6 Multi-mode 1x4 optical switch

Technical Specifications:

Technical Specifications	Operating wavelength	850nm
	Connectivity	FC/PC
	Insertion loss	$\leq 1.0\text{dB}$
	Repeatability	$\leq 0.03\text{dB}$
	Return loss	$\geq 30\text{ dB}$
	Crosstalk	$\leq -70\text{dB}$
	Switch time	$\leq 12\text{ ms}$

5.5. Optical power meter

Functional features

- Utilizes $\phi 2\text{mm}$ InGaAs detectors.
- Each subcard occupies one slot in the system.



Fig. 7 Optical power meter module

Technical Specifications:

Technical Specifications	Sensor element	InGaAs
	Size	Diameter 2mm
	Power range	Type A: -70~+10 dBm, Type B: -50~+26 dBm
	Operating wavelength	850/1270/1290/1310/1330/1350/1370/1390/ 1410/1430/1450/1470/1490/1510/1530/1550/ 1570/1590/1610/1625/1650nm
	Accuracy	0.1dB
	Linearity	0.1dB
	Polarization loss	0.3dB
	Sample Rate	470 Hz
	Operating temperature	-10°C to +50°C
	Storage temperature	-20°C to +70°C

5.6.CWDM Demux



Main functions:

- 4-channel coarse wavelength division multiplexing (CWDM) functionality.
- Occupies 1 slot in the system.
- Supports CWDM wavelengths.



Fig.8 4 CH CWDM

Technical Specifications:

Technical Specifications	Wavelength range	1260~1620 nm
	Center wavelength	1271nm/1291/1311nm/1331nm
	Channel Spacing	20 nm
	Bandwidth	± 6.5 nm
	Transmission channel insertion loss	≤ 1.2 dB
	Reflection channel insertion loss	≤ 0.5 dB
	Transmission channel isolation	30 dB



	Reflection channel isolation	40 dB
	Insertion loss temperature sensitivity	$\leq 0.005\text{nm}/^{\circ}\text{C}$
	Wavelength temperature shifting	$\leq 0.002\text{nm}/^{\circ}\text{C}$
	Polarization dependent loss	$\leq 0.2\text{ dB}$
	Polarization mode dispersion	$\leq 0.2\text{ dB}$
	Ripple	$\leq 0.5\text{ dB}$
	Directivity	$\geq 50\text{ dB}$
	Return loss	$\geq 45\text{ dB}$
	Max. input power	300mW
	Operating Temperature	-5°C to +70°C
	Storage Temperature	-40°C to +85°C
	Connectivity	FC/PC

5.7.LWDM Demux

Main functions:

- Ethernet channel wavelength division multiplexing occupies two slots
- Support LWDM wavelength



Fig.9 LWDM Demux module

Technical Specifications:

Technical Specifications	Channels	8
	Channel Wavelength	CH1/2 1273.54nm/1277.89nm
		CH3/4 1282.26nm/1286.66nm
		CH5/6 1295.56nm/1300.05nm
		CH7/8 1304.58nm/1309.14nm
	Insertion loss	≤ 2 dB
	Adjacent Isolation	≥ 25 dB
	Non-adjacent Isolation	≥ 35 dB
	Channel ripple	≤ 0.5 dB
	Temperature dependent loss	≤ 0.5 dB
	Polarization dependent loss	≤ 0.5 dB
	Polarization mode dispersion	≤ 0.2 ps
	Uniformity	≤ 1.0 dB
	Return loss	≥ 45 dB
Directivity	≥ 50 dB	
Max. input power	≤ 500 mW	
Operating temperature	-10°C to +70°C	



	Storage temperature	-40°C to +85°C
	Connectivity	FC/APC

5.8. Single-mode optical splitter

Technical Specifications:

Parameter		Grade	P	A
		Operating wavelength		1290 or 1550 nm
Operating bandwidth		±15 nm		
Typical excess loss		0.07 dB		0.1 dB
Technical Specifications	Insertion loss	50/50	≤ 3.6 dB	≤ 3.6 dB
		40/60	≤ 4.4/2.6 dB	≤ 4.7/2.8 dB
		30/70	≤ 5.7/1.9 dB	≤ 6.0/2.0 dB
		20/80	≤ 7.6/1.2 dB	≤ 8.0/1.3 dB
		10/90	≤ 11.5/0.7 dB	≤ 12/0.8 dB
		5/95	≤ 14.2/0.4 dB	≤ 14.8/0.5 dB
		2/98	≤ 18.5/0.25 dB	≤ 19.0/0.35 dB
		1/99	≤ 21.5/0.2 dB	≤ 22.0/0.3 dB
	Polarization dependent loss		≤ 0.1 dB	
Directivity		≥ 55 dB		
Operating temperature		-40°C to +85 °C		



5.9. Multi-mode optical splitter

Technical Specifications:

Parameter	Grade	P	A
	Operating wavelength	850nm	
Bandwidth	±40 nm		
Typical excess loss	0.4 dB		0.7 dB
Insertion loss	50/50	≤ 3.7/3.7 dB	≤ 4.0/4.0 dB
	40/60	≤ 4.7/2.7 dB	≤ 5.0/3.0 dB
	30/70	≤ 6.0/2.1 dB	≤ 6.3/2.4 dB
	20/80	≤ 7.8/1.4 dB	≤ 8.1/1.7 dB
	10/90	≤ 11.2/0.9 dB	≤ 11.6/1.2 dB
	5/95	≤ 14.5/0.7 dB	≤ 15.0/1.0 dB
	2/98	≤ 18.6/0.6 dB	≤ 19.4/0.9 dB
	1/99	≤ 22.0/0.5 dB	≤ 22.8/0.8 dB
Uniformity (50/50)	≤ 0.5 dB		≤ 0.8 dB
Directivity	≥ 40 dB		
Operating temperature	-40°C to +85°C		



6. Software function

Main features:

- Supports commonly used equipment drivers for transceiver testing.
- Modular software architecture.
- Automated software code generation.
- Test report generation.
- Supports testing of 100G/200G/400G/800G transceivers.
- Common functionalities encapsulated for transceiver testing, such as LOS testing, error rate testing, eye diagram testing, RX power calibration, VCC calibration, temperature calibration, etc.
- Database support (including SQL Server/MySQL and other database options).
- Data reporting (including test reports, yield analysis, failure analysis).
- MES system integration.
- Automatically generates testing applications based on selected options.
- Supports customer's secondary development.

These main features highlight the capabilities of the ATE system for transceiver testing. It includes support for commonly used equipment drivers, modular software design, automated code generation, and various testing functionalities. It also integrates with databases and provides data reporting and MES system integration. Additionally, it offers flexibility for customization and secondary development by the customers.



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*This information is subject to change without notice.