User's Manual

Model 731011
AE5524 1000BASE-X Unit

YOKOGAWA
Yokogawa Electric Corporation

IM 731011-01E
1st Edition

Thank you for purchasing the AE5524 1000BASE-X Unit.
The AE5524 is a measurement unit for the AE5511 TrafficTesterPro.
This user's manual contains useful information about the instrument's functions and operating procedures and lists the handling precautions of the AE5524. To ensure correct use, please read this manual thoroughly before beginning operation.
After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.
In addition to this manual, the following three additional manuals are available for the AE5511 in which the AE5524 is installed. Please read all of them.

Manual Title	Manual No.	Description
AE5511 TrafficTesterPro User's manual (Windows Version)	IM417322900-01E	Explains all functions and procedures of the AE5511 excluding the communication functions.
AE5511 TrafficTesterPro Startup Manual	IM417322900-02E	Explains the procedures for setting up the AE5511 so that it can be accessed.
AE5511 TrafficTesterPro Remote Command Manual	IM417322900-17E	Explains automatic measurement using the communication function (remote control function) of the AE5511 and commands.

Note

- The WEB application (former system software) that was used with the AE5520-AE5522 cannot be used on the AE5524.
- If you do not have the Windows version of the program (TTPro Control WindowE), you must download it from the Web page located at the URL below and install it in the AE5511 and the controller PC.
  http://www.yokogawa.com/tm/AE5511/
- If you do not have the AE5511 manual for the Windows version, download it also from the Web page located at the URL above.

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.

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Revisions

- 1st Edition: July, 2005

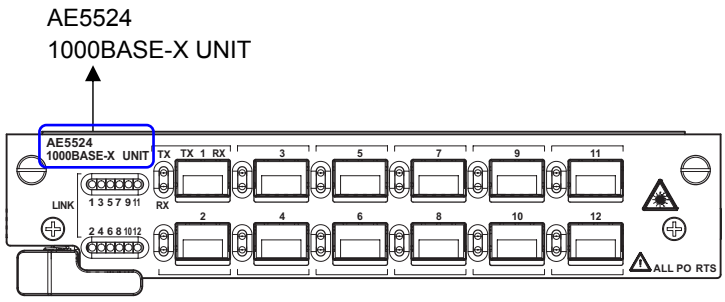
1st Edition : July 2005 (YK)

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

AE5524 1000BASE-X Unit

Check that the MODEL indicated on the front panel is what you ordered.



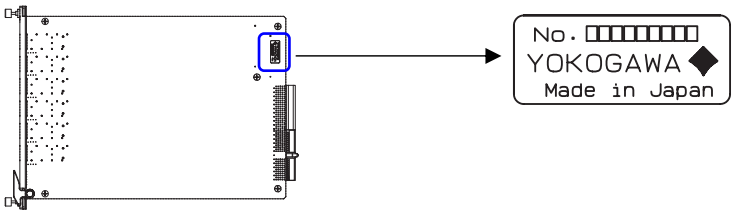
- MODEL

Model	Suffix Code	Description
731011	-	AE5524 1000BASE-X Unit

- No. (Instrument No.)

  The instrument number is inscribed on the name plate at the bottom of the AE5524 unit.

  When contacting the dealer from which you purchased the instrument, please give them the instrument number.



Standard Accessories

The standard accessories below are supplied with the instrument.

Name	Manual No.	Qty.	Notes
AE5524 1000BASE-X Unit User's Manual	IM731011-01E	1	This manual

Options (Sold Separately)

The interface modules below are available for purchase separately.

Name	Model	Manufacturer	Notes
1000BASE-SX SFP Module	TRF2816ANLB	OPNEXT	LC connector, 0.85 µm, for MMF
	FTRJ8519P1BNL	Finisar	
1000BASE-LX SFP Module	TRF5836ANLB	OPNEXT	LC connector, 1.3 µm, for SMF
	FTRJ1319P1BTL	Finisar	

Note

Warranty applies only to interface modules that you purchase from YOKOGAWA.

Safety Precautions

The general safety precautions described herein must be observed during all phases of operation. If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. Yokogawa Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.

Warning: handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

Hazard, radiation of laser apparatus

Make sure to comply with the precautions below. Not complying might result in injury or death.

WARNING

- **Do Not Operate in an Explosive Atmosphere**
  Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such an environment constitutes a safety hazard.
- **Do Not Touch Parts**
  Do not touch parts on the unit board. It may cause damage to the unit due to shorting of the electric circuit or static electricity.

Conventions Used in This Manual

Markings

The following markings are used in this manual.

Improper handling or use can lead to injury to the user or damage to the instrument.
This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word “WARNING” or “CAUTION.”

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user’s data, and precautions that can be taken to prevent such occurrences.

Note Calls attention to information that is important for proper operation of the instrument.

Contents

1.1 Functional Overview

The AE5524 is a unit for the AE5511 TrafficTesterPro that supports Gigabit Ethernet. The functions of the AE5524 are listed below.

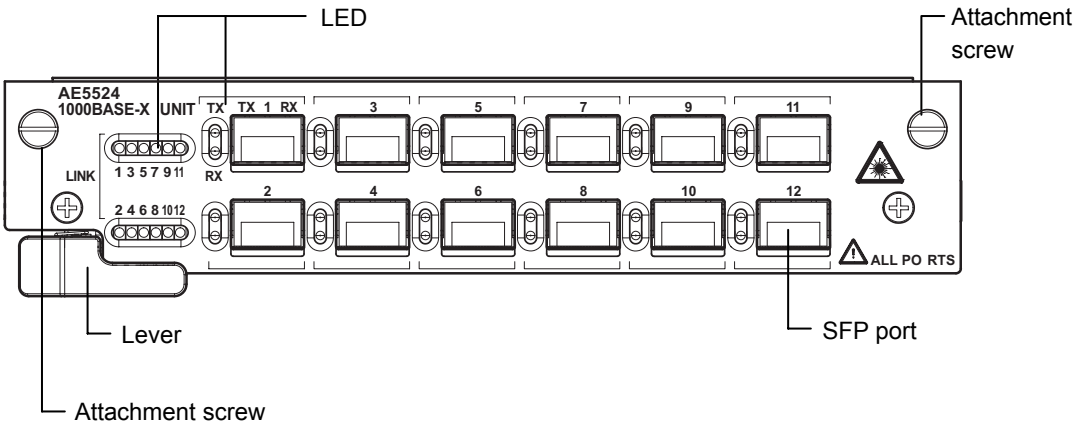
- Evaluation and test functions for IP network equipment
  - Statistics function for each QoS (supports up to 8 flows)
  - Sequence check function (lost packets, reordered packets, and duplicate packets)
  - IPv6 emulation function (NDP and Ping6 auto response)

- Basic measurement functions
  - Traffic generation function
  - Latency measurement function
  - Bit error rate measurement function
  - Multi user function (up to 8 users can connect simultaneously)
  - Capture function (equipped with 1-MB capture memory for each port)

CAUTION

This instrument has functions allowing it to transmit frames at high loads from its measurement ports. Incorrect operation can result in breakdown or deterioration of network media or related devices. Sufficient care must be taken when performing tests while connected to networks. Yokogawa does not assume any responsibility for damages resulting from incorrect operation.

1.2 Front Panel



Name	Description
LED	LINK: Illuminates during line link up status. TX: Illuminates when transmitting data. RX: Illuminates when receiving data. Blinks during a self test.
SFP port	A port for installing various SFP modules (need to be purchased separately).
Attachment screw	Used to fix the unit in place after inserting it in the AE5511.
Lever	Used to remove the unit from the AE5511.

Note

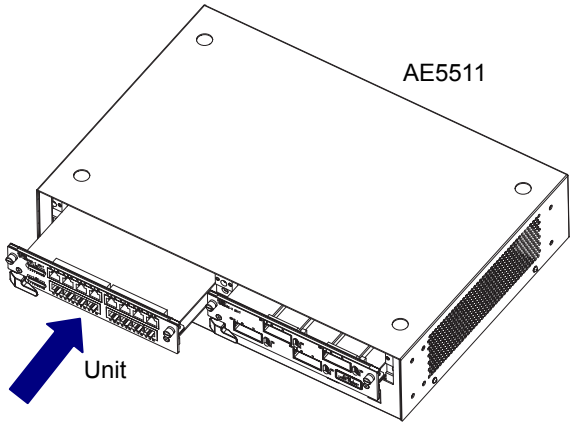
The SFP port TX/RX indication and TX/RX LED indication are available only for port 1. Refer to the port 1 indications when using ports 2 to 12.

2.1 Installing the Unit

Installing the Unit

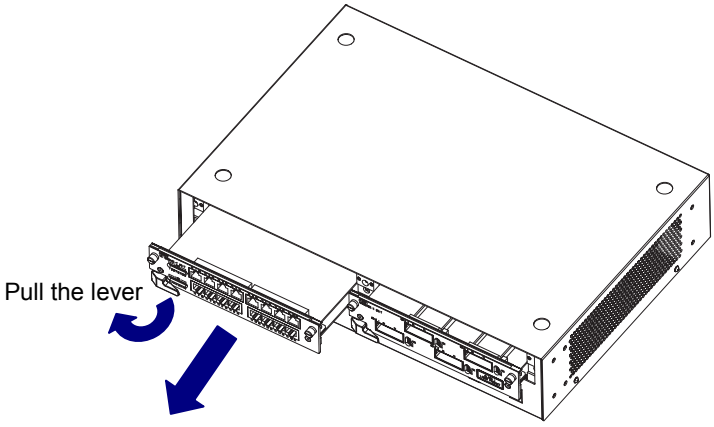
CAUTION

- Install or remove the unit with the main power of the AE5511 turned OFF (STANDBY LED: OFF and POWER LED: OFF). Otherwise, malfunction may result.
- Attach blank panels to unused AE5511 slots to prevent accidents.



1. Check that the main power of the AE5511 is turned OFF.
2. Align the unit with the slot guide of the AE5511 and insert it slowly toward the back of the AE5511.
3. Press the panel section of the unit with your thumbs until the connectors on the unit and AE5511 engage.
4. Fasten the two attachment screws of the unit to fix the unit in place.

Removing the Unit



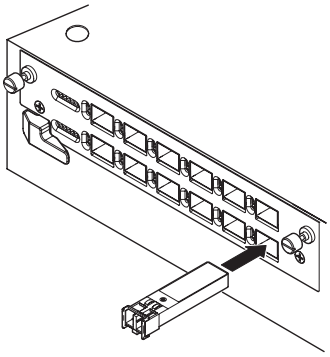
1. Check that the main power of the AE5511 is turned OFF.
2. Loosen the two attachment screws of the unit.
3. Pull the unit lever slowly toward you. The connectors disengage, and the unit comes out from the AE5511.
4. Hold the attachment screw with each hand, and pull the unit slowly out from the AE5511.

2.2 Installing the Interface Module

Installing the SFP Module

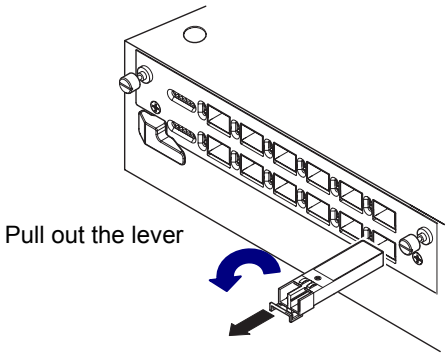
CAUTION

- Be careful of static electricity when installing or removing the SFP module. If you install or remove the module when static electricity is built up, it can cause damage.
- Do not install or remove the module with the cable connected. Doing so may cause malfunction.



Align the SFP module with the SFP module guide of the unit and insert the module slowly into the unit. Press the module in firmly until the connectors engage.

Removing the SFP Module



Pull out the lever at the front, top section of SFP module and pull the lever toward you. The connectors disengage, and the SFP module comes out from the unit.

Note

The SFP module can be installed or removed with the power turned ON.

3.1 Interface

Item	Specifications		
SFP port *1	Standard	1000BASE-SX	(Complies with IEEE802.3z)
		1000BASE-LX	(Complies with IEEE802.3z)
	Number of ports	12 port	
	Link speed	1000 Mbps	
	Duplex	Fixed to full duplex	
	Auto negotiation	ON/OFF setting (flow control negotiation only)	
	Flow control	ON/OFF selectable (complies with IEEE802.3x)	
	LED	TX (green)	Illuminates during data transmission operation. Blinks during a self-test.
		RX (green)	Illuminates during data reception operation. Blinks during a self-test.
		LINK (green)	Illuminates during line link up status. Blinks during a self-test.

*1 An SFP module option, sold separately, is required. See page ii for the SFP module option.

3.2 Functions

Traffic Generation Function

Item	Specifications		
Transmit	Transmission mode	Rate	Constant rate: %, µs, ns, bit (48 bits minimum), frame/s, or bps
			Burst (interval setting: 1 µs to 1 s)
		Transmission mode	Continuous, single shot (specify the number of transmission frames), time designation (in unit of s)
	Transmitted data (fixed)	Defined no. Of frames	128 frames/port max. (one frame is used for the insert frame)
		Frame length	48 to 9999 bytes (fixed frame length)
		Defined frames	IPv4, IPv6, IPX, UDP, TCP, IGMP, ICMP, ICMPv6, ARP, PAUSE custom (with MAC), custom (without MAC) tag (VLAN tag, MPLS, EoMPLS)
		Increment	MAC address increment can be set
		Payload setting	Set in the range of 00 to FFh. Set the size to Byte, Word, or LongWord.
		Errors	CRC error, symbol error, IP header checksum error, TCP checksum error, UDP checksum error, ICMP checksum error, ICMPv6 checksum error, and IGMP checksum error
	Transmitted data (variable)	No. of variable fields	Up to 4 fields can be varied simultaneously
		Variable size	128 bit width (can be divided in to 4 fields in unit of 32 bits)
		Variable field offset	0 to 9990 bytes
		Variable method	Increment, random, or table reference (max. no. of ref. tables: 1024)
		Frame length	Range: 64 to 9999 bytes (set increment, decrement, or random)
	Insert frame function	Manual	One frame can be sent manually.
		Periodic	Sends insert frames periodically. Period setting: 1 ms to 600 s (1 ms resolution)
	Link up/down control function	Manual	Generate link up or link down through manual operation
		Periodic	Repetitively generate link up and link down Min. period: 10 s. Max. period: 3600 s. Step: 1 s
Receive	Filter	MAC filter	Receive frames only from a specified destination MAC address, source MAC address, or unicast frames
		VLAN filter	VLANID, TPID, and Priority can be set
		Pattern filter	Two filters each consisting of 6-byte comparison and mask patterns and offset can be set. AND or OR logic, pass, or reject on the two filters can be set.
	Transmit statistics display	Normal	No. of frames, no. of bytes, rate (%), rate (frame/s), rate (byte/s), rate (bps), no. of insert frames, and no. of reply frames
		Error	No. of error frames, no. of CRC error frames, no. of undersize frames, no. of oversize frames, and no. of symbol error frames
			Error frame (frame/s), CRC error (frame/s), undersize error (frame/s), oversize error (frame/s), and symbol error (frame/s)
	Receive statistics display	Normal	No. of frames, no. of byte, rate (%), rate (frame/s), rate (byte/s), rate (bps), and no. of pause frames
		Error	No. of error frames, no. of CRC error frames, no. of undersize frames, no. of oversize frames, and no. of symbol error frames
			Error frame (frame/s), CRC error (frame/s), undersize error (frame/s), oversize error (frame/s), and symbol error (frame/s)
	QoS statistics display	Statistics mode	For each flow (frame pattern comparison) and for each frame length
		Statistics channel	8 channels
		Statistical items	Total (frame), total (byte), rate (frame/s), rate (%), and rate (bps)
		QoS statistical filter	Two filters each consisting of 32-bit comparison and mask patterns and offset can be set. Frame length can be specified.

Latency Measurement Function

Item	Specifications	
Measurement item	IFG	Measures the max., min., and average IFG (Inter Frame Gap) (unit: µs)
	Packet latency	Measures the max., min., and average packet delay (unit: µs)
	Packet delay for each QoS	Measures the packet delay for each flow (8 channels)

Bit Error Rate Measurement Function

Item	Specifications		
Transmit	Transmission mode	Rate	Constant rate: %, µs, ns, bit (48 bits minimum), frame/s, or bps
			Burst (interval setting: 1 µs to 1 s)
		Transmission mode	Continuous, single shot (specify the number of transmission frames), time designation (in unit of s)
	Transmitted data (fixed)	Defined no. Of frames	1 frame/port (64 to 9999 bytes)
		Frame length	64–9999 bytes (fixed frame length)
		Test pattern (payload)	PN15
	Variable frame length	Variable method	Increment, decrement, and random
		Frame length	64 to 9999 bytes
Receive	Displayed statistical items		Bit error rate, bit error frame, bit error count, sync loss, checked byte, bit error (bps), bit error frame (frame/s), sync loss/s, checked byte/s, bit error insert, and bit error insert frame

Capture Function

Item	Specifications	
Capture function	Capture size	1 MB per port
	Frame slice function	Select from four types: 64, 256, 2048, or 9999 bytes
	Filter function	• Pattern filter Comparison pattern: 6 bytes × 2, mask pattern: 6 bytes × 2 Offset: 0 to 58 bytes • Capture only normal frames, error frames, layer 1 state change, or insert frames
	Trigger function	• Normal frame pattern Comparison pattern: 6 bytes × 2, mask pattern: 6 bytes × 2 Offset: 0 to 58 bytes • Completion of the Insert frame transmission • Error frames CRC error, undersize, oversize, symbol error, sequence error, bit error, all error frame, link up, and link down
		Trigger position (select from three types) Top, center, or end
	Displayed items	Frame No., time stamp, frame status, frame length, destination MAC address, source MAC address, payload data (hexadecimal display)
	File type	AE5511 format, Etherreal (tcpdump) format, and CSV format

Other Functions

Item	Specifications	
Sequence check function	Types of errors detected	Packet loss, max. burst packet loss, reordered packets, and duplicate packets
Emulation function	IPv4	ARP reply, Ping reply, and MAC address auto learn
	IPv6	NDP address resolution function, PING6 reply function, auto address generation function
Alarm log function	Alarm items	Packet error, reception rate error, packet delay error, IFG error, and layer 1 state change
	No. of recorded logs	Up to 1000 events (log recorded at 1-s intervals min.)
Transmit clock variable function		Range: ±100 ppm. Resolution: 1 ppm. Accuracy: 5 ppm ± 1 digits

3.3 General Specifications

Item	Specifications	
Power supply	Voltage	5 VDC or 3.3 VDC
	Power consumption	47 W or less
Dimensions and weight	Dimensions	H40 × W200 × D260 [mm] (projections excluded)
	Weight	Approx. 1 kg
Operating environment	Temperature	5 to 40°C
	Humidity	35 to 85%

3.4 External Dimensions

Unit: mm
Tolerance: ±3%