

# TrafficTester Series



A hand-held measuring instrument for network installation testing. A single unit can test Ethernet networks at 10 Mbit/s, 100 Mbit/s, and 1 Gbit/s.



A traffic tester supporting multiple-port, full-wire speed testing. Equipped with BERT (Bit Error Rate Test) functions.

# AE5501 TrafficTesterMini

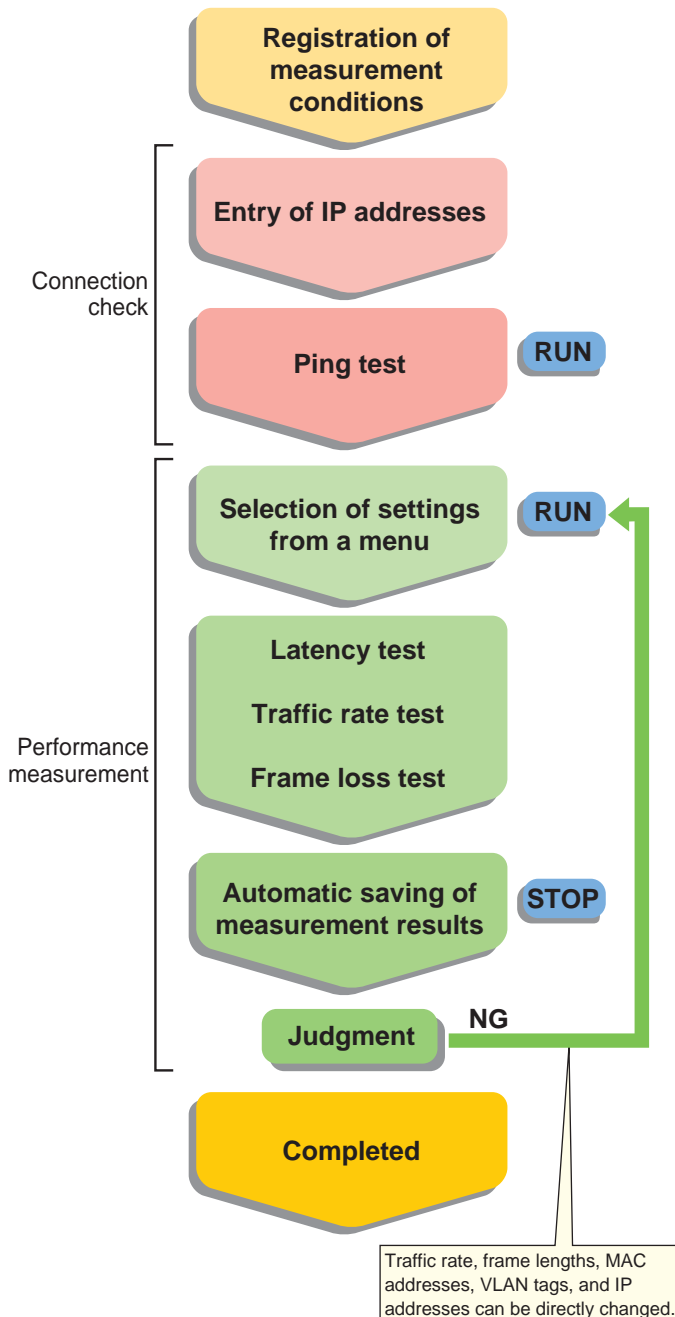


## Major features

- Performance testing at full-wire rates of 10 Mbit/s, 100 Mbit/s, and 1Gbit/s
- Setting errors can be minimized through preset measurement conditions, greatly improving operation efficiency.
- Telnet-based remote control
- Testing networks including routers (Layer 3 line compatible)
- Reducing operator workloads by creating macros containing measurement conditions
- Achieving high-quality Ethernet measurement

## Example of installation testing procedures

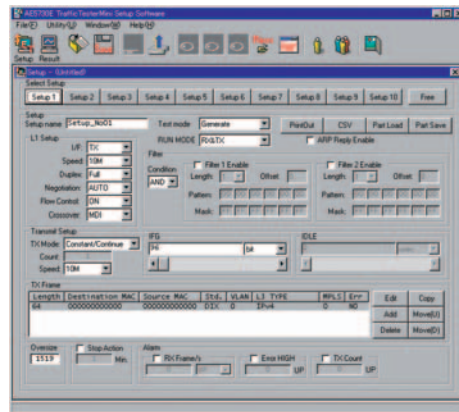
■ This hand-held instrument for Ethernet installation and maintenance can handle 10 Mbit/s, 100 Mbit/s, and 1 Gbit/s networks with a single unit, implementing quick and easy measurement.



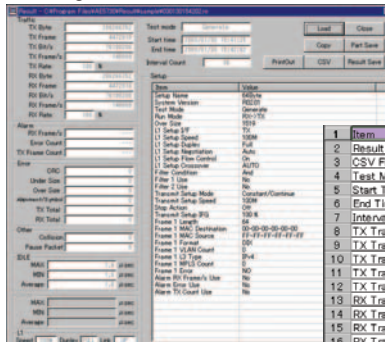
## Measurement condition setting and results output

### ■ AE5730 Setup Software

Easy setting of test conditions on a personal computer

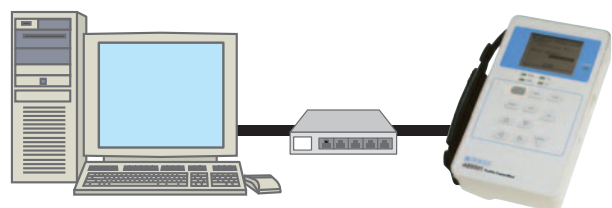


Viewing results files



Item	Value	Unit
1	Result File Name	030130154202.ms
2	CSV File Write DATE/TIN	2009/1/30 15:46
3	Test Mode	Generate
4	Start Time	2009/1/30 15:41
5	End Time	2009/1/30 15:42
6	Interval Count	36
7	TX Traffic Byte	286266752
8	TX Traffic Frame	4472818
9	TX Traffic Bit/s	78190208
10	TX Traffic Frame/s	148809
11	TX Traffic Rate	100%
12	RX Traffic Byte	286266752
13	RX Traffic Frame	4472818
14	RX Traffic Bit/s	78190208
15	RX Traffic Frame/s	148809
16	RX Traffic Rate	100%
17	Alarm RX Frame/s	---
18	Alarm Error Count	---
19	Alarm TX Frame Count	---
20	Error CRC	0
21	Error Under Size	0
22	Error Over Size	0
23	Error Alignment/Symbol	0
24		

Converting results files in CSV format with a single click

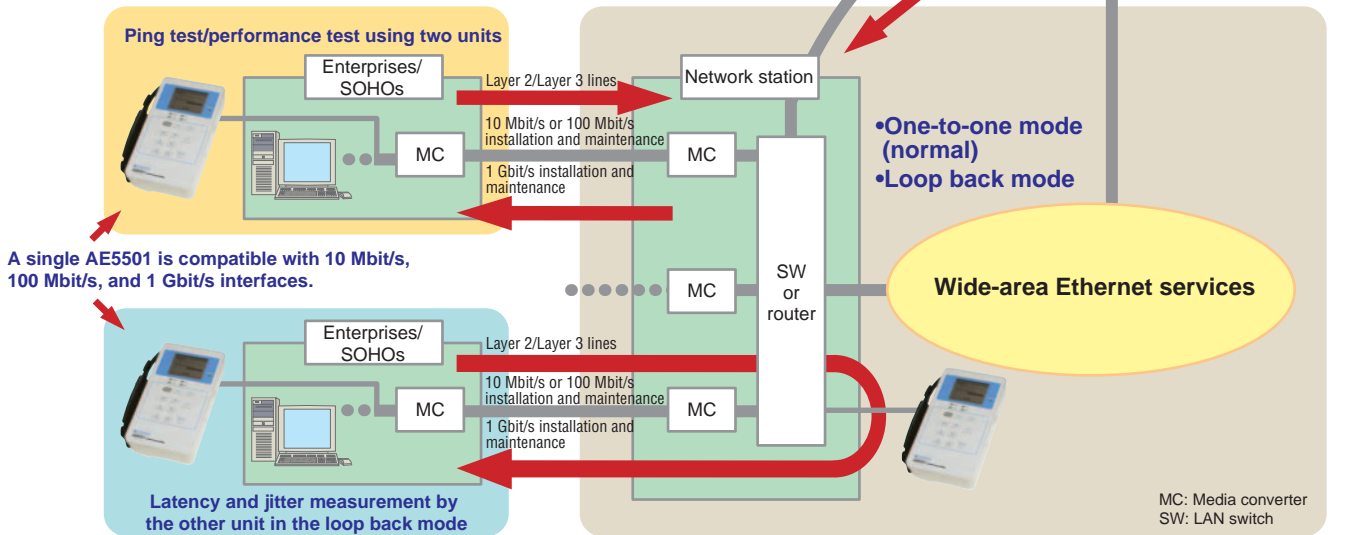


Up to 100 measurement results files can be automatically saved. These files can be transferred to a personal computer, so as to be easily managed and compiled as well as to be attached to e-mail for information exchange.

# AE5501 TrafficTesterMini

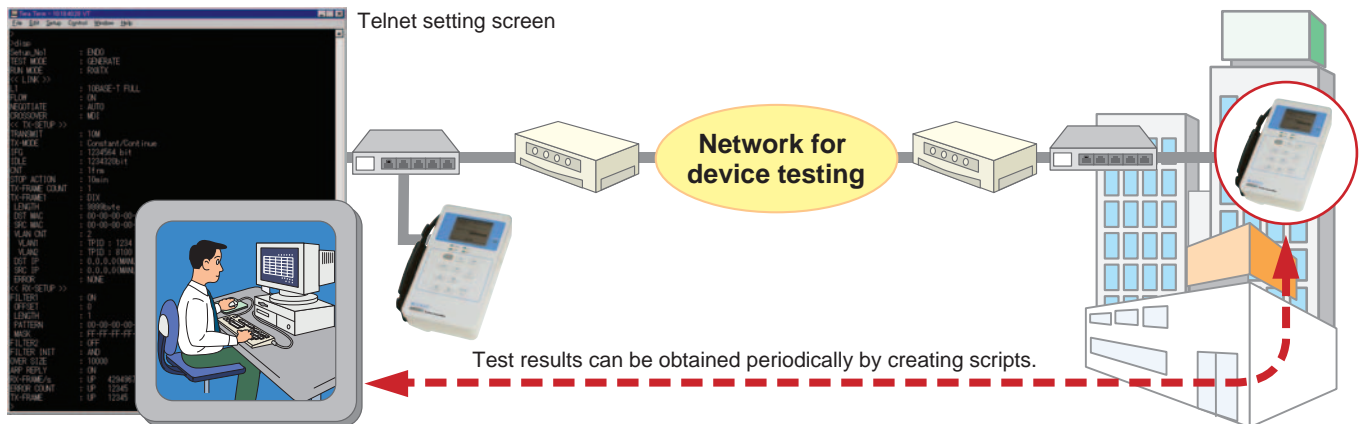
## Application 1

- Not only Layer 2 but also Layer 3 lines can be tested for connection and maintained. Tests that can be conducted include: Ping, traffic rate, latency, and frame loss tests.
- Line installation and maintenance between stations. Tests that can be conducted include: Ping, traffic rate, latency, and frame loss tests. As the AE5501 is a simple Ethernet traffic generator, it can be used in a variety of applications.
- Remote installation and maintenance facilitated through Telnet
- Network environments using dynamic IP addresses also supported, including DHCP function



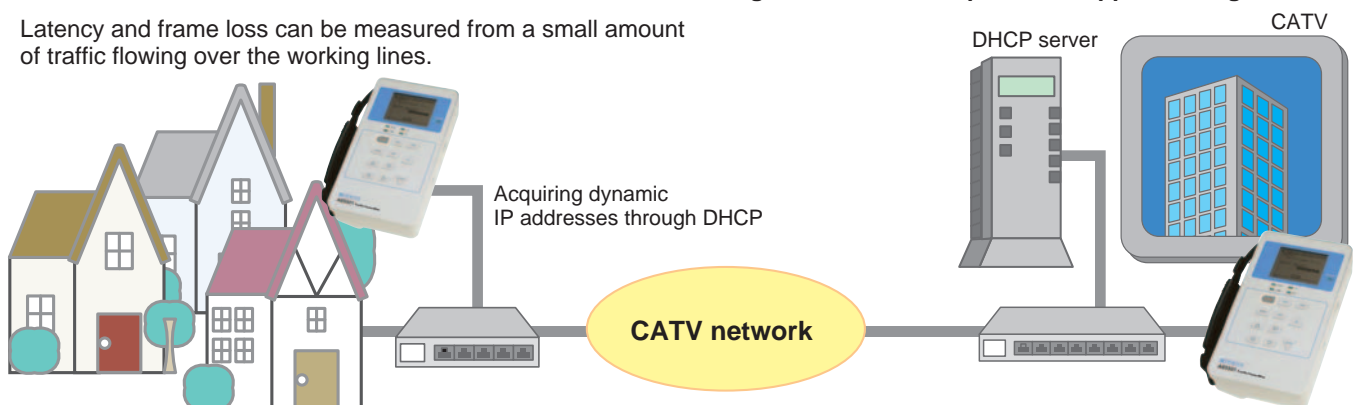
## Application 2

- Expediting testing work on the engineer side. More than one unit can be remotely controlled from a single personal computer through Telnet.



- CATV-based Internet access installation and maintenance through DHCP and ARP protocol support through Telnet.

Latency and frame loss can be measured from a small amount of traffic flowing over the working lines.



# AE5501 TrafficTesterMini

## Specifications

### ■ Main unit

Interface specifications		
Measurement port standards	10BASE-T, 100BASE-TX, 1000BASE-T (RJ45), and 1000BASE-SX/LX (through a GBIC module)	
Line speed	10 Mbit/s, 100 Mbit/s, and 1 Gbit/s	
Remote port	10BASE-T (for uploading test conditions from and downloading measurement results to a PC)	
Telnet connection	Changing of condition settings, starting/stopping of measurement, and checking of ongoing measurement statuses are possible using a remote port.	
Duplex modes	10 Mbit/s and 100 Mbit/s: full-duplex/half-duplex; 1 Gbit/s: half-duplex only	
Cable connection	MDI and MDIX ports, automatic detection	
Negotiation	Automatic/manual	
Flow control	On/off (valid in the traffic generation mode only)	
Condition settings		
Traffic generation mode/latency measurement mode	Number of settings	Up to 10 settings can be registered.
	Number of transmission frames	Up to 4 for each setting
Run setup	Timing of transmission and reception	Transmission and reception can start simultaneously, or can be individually timed with the RUN button.
Stop action	Measurement period timer	On/off, can be set in minutes.
Line performance measurement		
Traffic generation mode (Traffic Generate Mode)		
Transmission	Transmission method	Flat transmission, basic burst transmission (4 frames), and count transmission
	IFG (Inter-frame gaps) rate measurement	From less than 1% to 110%
Statistics functions	Transmitted patterns	Up to 4 frames can be set.
	Frame setting	Packet length (26 to 9999 bytes), MAC header, VLAN tag (up to 4 stacks), LLC header, SNAP header, MPLS header (up to 4 stacks of SHIM headers), IPv4 header, IPv4 multicast, IPv6 header, and payload (up to 256 bytes)
	Error frame setting	CRC, oversize, undersize, CRC and oversize, and CRC and undersize
	Traffic counter	Tx/Rx rate (%), Tx/Rx frames/s, Tx/Rx bit/s, Tx/Rx frame count, and Tx/Rx byte count
Receive functions	Error frame counter	CRC, oversize, undersize, and alignment
	Idle time measurement	Gaps between Rx frames with resolutions of 1 μs (10 Mbit/s) and 100 ns (100 Mbit/s and 1 Gbit/s)
	Others	Number of collisions (for half-duplex mode) and pause frames
	Filter	Two sets of 48 bit (6 byte) patterns with an offset (0 to 58)
	Oversize frame setting	From 65 to 10,000 bytes
Latency measurement mode (Latency Mode)	ARP reply	On/off
	Alarms	Thresholds for number of Rx frames/s, number of Tx frames, and total error count
	Latency	Maximum, minimum, and average; Resolution: 1 μs for 10 Mbit/s and 100 ns for 100 Mbit/s and 1 Gbit/s; Maximum error: 3 μs for 10 Mbit/s and 300 ns for 100 Mbit/s and 1 Gbit/s
Ping test and traffic loop back function		
Ping test mode		
Transmission	Source MAC address	Manual setting, global MAC address, and setting upon acquisition of a dynamic IP address (through DHCP)
	Source IP address	Manual setting and dynamic IP address
	Transmission frame	Programmable frame lengths (From 64 to 1518 bytes)
	Transmission intervals	1, 5, and 10 seconds
	Transmission modes	Normal transmission, and frame count transmission
	VLAN tags	Up to 4 stacks
Display (main unit's LCD only)	Displays destination's MAC address after resolving ARP requests.	
Ping reply mode (Reply Mode)		
Transmission	Source MAC address	Manual setting, global MAC address, and setting upon acquisition of a dynamic IP address (through DHCP)
	Source IP address	Manual setting and dynamic IP address (through DHCP)
	VLAN tags	The number of VLAN stacks for transmitted frames can be set. The maximum number is 4.
Loop back mode		
Function	Swaps received frame's destination address (DA) with its source address (SA), re-calculates the CRC value, then replies to the frame.	
MAC addresses only	Source MAC address	Manual setting, global MAC address, setting upon acquisition of a dynamic IP address (through DHCP), and all of the aforementioned
Both MAC and IP addresses	Source MAC address	Manual setting, global MAC address, setting upon acquisition of a dynamic IP address (through DHCP), and all of the aforementioned
	Source IP address	Manual setting and dynamic IP address (through DHCP)
	VLAN tags	The number of VLAN stacks for transmitted frames can be set. The maximum number is 4.
	ARP reply	On/off
Measurement results file viewer (File View)		
New files	Displays the latest measurement results.	
Results files for each setting	Up to 100 files can be selected and displayed.	
File deletion	Can delete individual files, or all files.	
Dynamic IP address acquisition and ARP resolution (through DHCP)		
Dynamic IP address acquisition	Source MAC address	Manual setting and global MAC address
	Source IP address	Dynamic IP address (automatic) and manual setting (used to set ARP setting when the DHCP server is not available.)
ARP resolution	Destination IP address	Manual setting
Macro creation for continuous testing		
Ten preset test settings (up to 50 command lines) can be successively put into effect.		
Remote setting		
Modes	Remote	Measurement condition setting and results file transfer (through DHCP or manual operation)
	Upgrade	Upgrades the AE5501 main unit (through DHCP or manual operation).
	Telnet	Remote control through Telnet. The command prompt and password can be set (through DHCP or manual operation).
Default settings (ALL DEFAULT)		
Initializes the AE5501 settings.		
Hardware specifications		
Display	Monitor	2.8-inch LCD (320 × 240 dots, dot-matrix display)
	Input interface	Adjustable contrast Original key pad
Power supply	AC supply	Adapter at 100 to 240 V and 50 to 60 Hz, with 18-VA output
	Battery	Rechargeable 6 NiMH batteries (Can operate over 1.5 to 2 hours depending on the interface.)
Dimensions and weight	Approximately 120 (W) × 60 (H) × 215 (D) mm and 1.2 kg (including battery)	
Accessories	Standard	CD-ROM (AE5730 Setup Software), AC adapter, power cable, and user's manuals
	Optional	Six rechargeable 1.2-V NiMH batteries, battery charger, soft carrying case, 1000BASE-LX GBIC module, and 1000BASE-SX GBIC module

# AE5511 TrafficTesterPro



## Major features

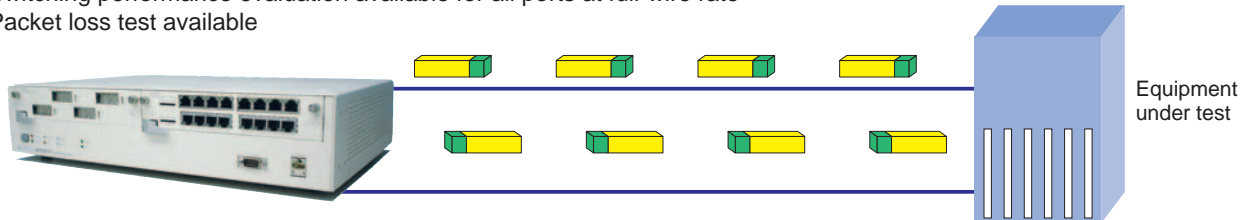
- Multiple-port, full-wire speed testing available  
16 ports/unit (10 Mbit/s and 100 Mbit/s Ethernet)  
4 ports/unit (1 Gbit/s Ethernet)
- BERT (Bit Error Rate Test) function
- Full-wire rate traffic generation and statistics monitoring
- Frame latency and inter-frame gap measurement
- Can be controlled through a Web browser.

## Main functions

■ With the AE5511, various network tests can be performed on a Web browser without using special software, namely pre-shipment and acceptance inspections of Ethernet-ready network equipment such as media converters, LAN switches, routers, and transmitters, as well as throughput measurement, latency measurement, and a BERT function. These are useful for evaluating network performance when configuring IP networks.

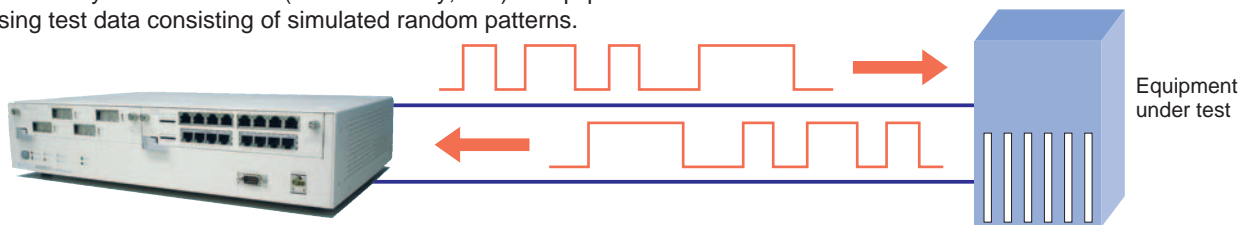
### ● Traffic generation and statistics display

- Switching performance evaluation available for all ports at full-wire rate
- Packet loss test available



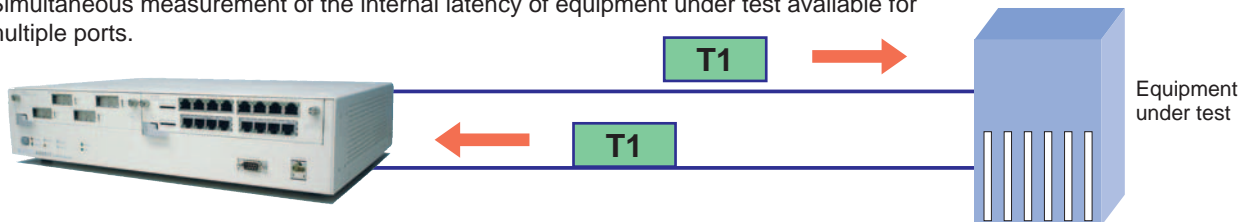
### ● BERT

- The validity of the hardware (cache memory, etc.) of equipment under test can be confirmed using test data consisting of simulated random patterns.



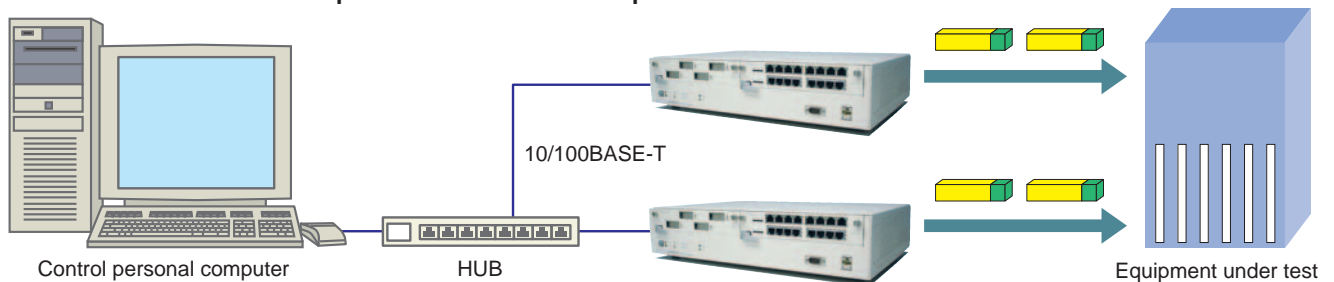
### ● Latency measurement

- Simultaneous measurement of the internal latency of equipment under test available for multiple ports.



## Applications

■ Two or more AE5511 units can be controlled from a single personal computer through a Web browser or Telnet. This facilitates the efficient evaluation of LAN switches equipped with multiple ports and repeatedly performed tests such as those conducted on production lines and acceptance tests.

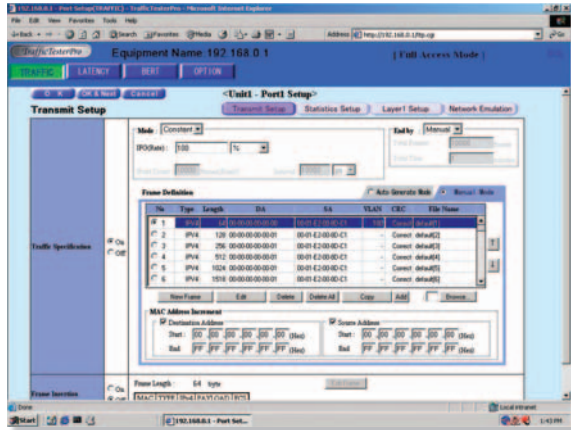


# AE5511 TrafficTesterPro

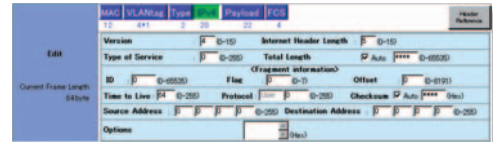
## Functions

### Transmitted frame creation

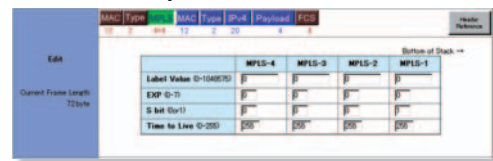
A variety of field parameters for transmitted frames can easily be compiled. These include MAC addresses and other parameters, such as IPv4, IPv6, VLAN tags, MPLS SHIM headers, TCP, UDP, IGMP, and ICMP. Up to 127 frames can be registered for each port, and frames from short 18-byte to large 9999-byte frames can be created. This frame creation function makes it possible to generate traffic that can closely simulate the actual environment, thereby enabling the efficient performance and functional evaluation of network equipment.



### IPv4 header compilation



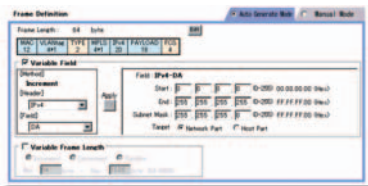
### EoMPLS-compatible MPLS Shim header compilation



### Variable transmitted frame fields

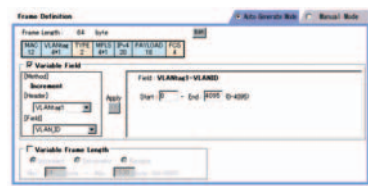
Frames can be transmitted in synchronization with the increment of MAC addresses, IP addresses, VLAN IDs, MPLS labels, TCP/UDP port numbers, and the like. It is also possible to simultaneously increment and transmit IP headers' TOS fields and VLAN tags' QoS parameter fields including "Priority." Moreover, frame lengths can be incremented or decremented within a specified range or in a random manner, and then be transmitted. These functions are useful for QoS performance and functional testing.

#### Setting variable IP addresses



IP address

#### Setting variable VLAN IDs



VLAN ID

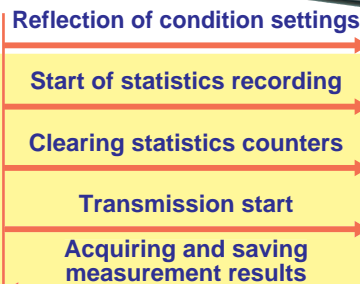
### Automatic measurement

The AE5511 can be controlled remotely through Telnet. By defining multiple test conditions in script files and executing them, measurement can be performed automatically, reducing the time required for interim evaluation in the development phase as well as in pre-shipment inspection.



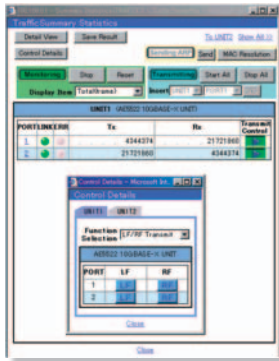
#### Example

```
#sample
Print *****
Print "*** Throughput START ***"
Print *****
Update /set_files/ttp_setup
Statistics Start
Statistics Clear
Transmit start unit 1 port 1,5,9,13
WaitTime 2
show counter unit 1 port 2,6,10,14 rx frame current >>
/result_files/rxframe_1
WaitTime 1
```



## ■ Statistics monitor

Statistics can be monitored in two modes: the summarized statistics mode which facilitates throughput and packet loss testing, and the detailed statistics mode for displaying error frame counts and IFG (Inter-frame gaps) measurements. Measurement results can be saved in both HTML and CSV files.



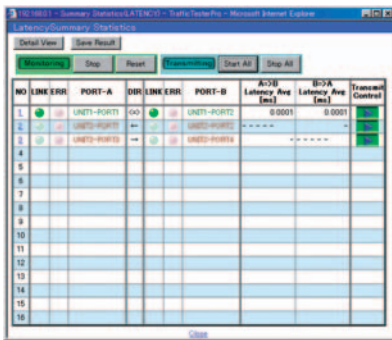
Summarized statistics



Detailed statistics

## ■ Latency measurement

The maximum, minimum, and average latency periods between specified ports can be measured and displayed. As frames can be arbitrarily assigned specifically for latency measurement, this function can be used for advance inspections before building IP networks.



## ■ BERT (Bit Error Rate Test) function

The BERT function detects bit errors by inserting simulated random patterns (PN15) into the payload sections for MAC, IPv4, TCP/IP, IPv6, etc. This is useful for checking the internal memory of network equipment and for evaluating transmission lines.



## Specifications

### ■ Main unit

Item	Specification
Control port	One 10/100BASE-T port (RJ-45 connector)
Console port	One RS-232C port (D-sub connector)
LEDs	POWER, STANDBY, HDD, REMOTE, STATUS, STATUS1, STATUS2, and LINK
Power supply	90 to 264 V AC at 48 to 63 Hz
Power consumption	200 VA or lower
Dimensions and weight	Dimensions
	Weight
Number of slots for mounting Ethernet units	2
Operating environment	Temperature: 5°C to 40°C; humidity: 35% to 85%
Standard accessories	User's manual (CD-ROM), start-up manual, power cable, 3p-to-2p conversion plug, control port connection cable (2-m long, cross over cable with RJ-45 connector), console port connection cable (2-m long, RS-232C cross over cable)

### ■ Ethernet unit

Item	Specification	
	Model AE5520 10/100BASE-T unit	Model AE5521 1000BASE-X unit
Control port	10BASE-T and 100BASE-TX	1000BASE-SX and 1000BASE-LX (GBIC module required*)
Number of ports	16	4
Connector type	RJ-45	SC
Line speed	10 Mbit/s and 100 Mbit/s	1 Gbit/s
Duplex mode	Half-duplex and full-duplex	Full-duplex
Automatic negotiation	Can be set to on/off.	Can be set to on/off (for flow control only).
Flow control	Can be set to on/off (IEEE 802.3x compliant).	Can be set to on/off (IEEE 802.3x compliant).

\* Note that only the GBIC modules from Yokogawa are guaranteed.

## AE5511 TrafficTesterPro Specifications

### ■ Functions

Traffic generation mode				
Transmission	Transmission mode	Rates	Fixed rates: %, $\mu$ s, ns, bits (10 Mbit/s and 100 Mbit/s: 48 bits min.; 1 Gbit/s: 32 bits min.), and frames/s * IFG settings: 10BASE-T: In units of 400 ns (from 4,800 to 999,979,200 ns); 100BASE-TX: In units of 40 ns (from 480 to 999,997,920 ns); 1000BASE-X: In units of 32 ns (from 32 to 999,999,808 ns) Burst transmission: Interval setting from 1 $\mu$ s to 1 sec.	
		Transmission modes	Continuous and single (transmitting the specified number of frames), Time	
	Transmitted data (fixed)	Number of frames that can be defined	A maximum of 128 frames/port * One dedicated frame is required for the frame insertion function.	
		Frame length	Fixed at from 18 to 9999 bytes	
		Defined frames	Tags: VLAN tags (up to 4 stacks), MPLS Shim headers (up to 4 stacks), and EoMPLS Layers 2 and 3: IPv4, IPv4+UDP, IPv4+TCP, IPv6, IPX, TCP, UDP, ICMP, ICMPv6, IGMP, Pause, ARP, IPv4 multicast, IPv4 multicast+UDP, and customized frames with/without MAC addresses	
		Parameter increment	Can be set for MAC addresses	
	Transmitted data (variable)	Number of frames that can be defined	1 frame/port	
		Frame length	Setting range: from 64 to 9999 bytes (increments, decrements, and random length can be set.)	
		Defined frames	Tags: VLAN tags (up to 4 stacks), MPLS SHIM headers (up to 4 stacks), and EoMPLS Layers 2 and 3: MAC addresses, IPv4, IPv6, IPX, TCP, UDP, ICMP, ICMPv6, IGMP, Pause, ARP, and payloads	
		Parameter increment	MAC addresses (lower 4 bytes), VLAN tags (VLAN ID, Priority), MPLS Shim headers (label values, EXP), IPv4 headers (IP addresses, ToS fields, ID fields), IPv6 headers (IP addresses in units of 4 bytes, traffic classes, flow labels, TCP/UDP port numbers, and payloads (offsets and a maximum size of 32 bits can be specified.)	
Receive	Filters	MAC filter	Destination and source MAC addresses. Can be set so that only unicast messages are received.	
		VLAN filter	VLAN IDs, TP IDs, and Priority can be used as filters.	
		Pattern filter	A 6-byte comparison pattern, a mask pattern, and 2 offsets can be set. Two filters can be combined using the AND/OR logics. Operations to skip or remove filters can also be executed.	
	Summarized statistics display	Statistics items	Total frame count, total byte count, rate (frames/s), rate (%), rate (bit/s), and maximum IFG (ms)	
		Duplex mode	Full-duplex and half-duplex modes can be indicated.	
	Detailed statistics display	Errors	Error status is indicated in red.	
		Statistics items	Frame count, byte count, rate (%), rate (bit/s), reply, collision, and pause	
		IFGs	CRC, undersize, oversize, alignment, and symbol	
	<b>Bit error mode</b>			
	Transmission	Transmission mode	Rates	Fixed rates: %, $\mu$ s, ns, bits (32 bits min.), and frames/s * 10BASE-T: In units of 400 ns (from 4,800 to 999,979,200 ns); 100BASE-TX: In units of 40 ns (from 480 to 999,997,920 ns); 1000BASE-X: In units of 32 ns (from 32 to 999,999,808 ns)
Transmission modes			Continuous and single (transmitting the specified number of frames)	
Transmitted data (fixed)		Number of frames that can be defined	1 frame/port (from 64 to 9999 bytes)	
		Frame length	From 64 to 9999 bytes (fixed frame lengths, increments, decrements, and random length can be set.)	
		Defined frames	Tags: VLAN tags (up to 4 stacks), MPLS Shim headers (up to 4 stacks), and EoMPLS Layers 2 and 3: IPv4, IPv4+UDP, IPv4+TCP, ICMP, IPv6, IPX, IPv4 multicast, IPv4 multicast+UDP, and customized frames with/without MAC addresses	
		Test pattern (payload)	PN15	
Reception	Filter	MAC filter	Destination and source MAC addresses. Can be set so that only unicast messages are received.	
		VLAN filter	VLAN IDs, TP IDs, and Priority can be used as filters.	
		Pattern filter	A 6-byte comparison pattern, a mask pattern, and 2 offsets can be set. Two filters can be combined using the AND/OR logics. Operations to skip or remove filters can also be executed.	
	Summarized statistics display	Statistics items	Total frame count and synchronized byte count	
		Duplex mode	Full-duplex and half-duplex modes can be indicated.	
	Detailed statistics display	Errors	Error status and "out-of-synchronization" are indicated in red.	
Statistics items		Synchronously received byte count, frame count, byte count, rate (%), rate (bit/s), reply, collision, and pause		
<b>Latency measurement mode</b>				
Transmission	Transmission mode	Rates	Fixed rates: %, $\mu$ s, ns, bits (10 Mbit/s and 100 Mbit/s: 48 bits min.; 1 Gbit/s: 32 bits min.), and frames/s * 10BASE-T: In units of 400 ns (from 4,800 to 999,979,200 ns); 100BASE-TX: In units of 40 ns (from 480 to 999,997,920 ns); 1000BASE-X: In units of 32 ns (from 32 to 999,999,808 ns)	
		Transmission modes	Continuous and single (transmitting the specified number of frames)	
	Transmitted data (fixed)	Number of frames that can be defined	1 frame/port (from 64 to 9999 bytes)	
		Frame length	Fixed at from 64 to 9999 bytes	
		Defined frames	Tags: VLAN tags (up to 4 stacks), MPLS Shim headers (up to 4 stacks), and EoMPLS Layers 2 and 3: IPv4, IPv4+UDP, IPv4+TCP, ICMP, IPv6, IPX, IPv4 multicast, IPv4 multicast+UDP, and customized frames with/without MAC addresses	
Reception	Filter	Payload setting	Available within a range of 00 to FFh. The size of payloads can be selected from bytes, words, and longwords.	
		MAC filter	Destination and source MAC addresses. Can be set so that only unicast messages are received.	
		VLAN filter	VLAN IDs, TP IDs, and Priority can be used as filters.	
	Summarized statistics display	Pattern filter	A 6-byte comparison pattern, a mask pattern, and 2 offsets can be set. Two filters can be combined using the AND/OR logics. Operations to skip or remove filters can also be executed.	
		Statistics items	A-to-B average latency (ms) and B-to-A average latency (ms) 10 Mbit/s: 100-ns resolution and (3 $\mu$ s $\pm$ 1 digit) accuracy; 100 Mbit/s and 1 Gbit/s: 100-ns resolution and (1 $\mu$ s $\pm$ 1 digit) accuracy	
Detailed statistics display	Duplex mode	Full-duplex and half-duplex modes can be indicated.		
	Errors	Error status is indicated in red.		
	Statistics items	Frame count, rate (%), rate (bit/s), reply, pause, and error		
<b>Common functions</b>				
Settings storage		Condition settings can be saved for each Ethernet unit. Test results can be saved in HTML and CSV files.		
Emulation		ARP reply and ping reply		
Automatic MDI/MDIX detection		Can detect straight-through and cross-over types.		
Automatic MAC address acquisition (for traffic generation mode only)		Can acquire and display target IP addresses' MAC addresses. The MAC address acquisition can be turned on/off on a port basis.		
Automatic measurement		Can be controlled remotely through Telnet. Automatic measurement is possible using script files.		
Operating environment for control PC and Web browser		Operating system: Windows 2000/XP; CPU: Pentium III at 1 GHz or faster; memory: at least 256 Mbytes; display resolution: 1024 x 768 dots or higher; Web browser: Internet Explorer 5.5 SP2 or later		

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[Ed : 01/b]

Printed in Japan, 406(KP)