MD1260A
40/100G Ethernet Analyzer
Operation Manual

10th Edition

For safety and warning information, please read this manual before attempting to use the equipment.
Keep this manual with the equipment.

ANRITSU CORPORATION

Document No.: M-W3395AE-10.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

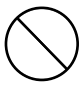
⚠ DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

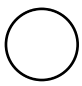
⚠ WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

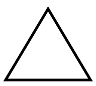
⚠ CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

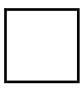
Safety Symbols Used on Equipment and in Manual

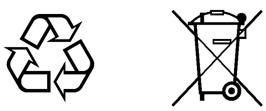
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.


This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.


This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.


This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.


This indicates a note. The contents are described in the box.


These indicate that the marked part should be recycled.

MD1260A
40/100G Ethernet Analyzer
Operation Manual

14 July 2010 (First Edition)
12 July 2013 (10th Edition)

For Safety

⚠ WARNING

- ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

- Overvoltage Category
  This equipment complies with overvoltage category II defined in IEC 61010. DO NOT connect this equipment to the power supply of overvoltage category III or IV.

- Laser radiation warning
  - NEVER look directly into the cable connector on the equipment nor into the end of a cable connected to the equipment. There is a risk of injury if laser radiation enters the eye.
  - The Laser Safety label is attached to the equipment for safety use as indicated in "Laser Safety" later in this section.

Electric Shock

- To ensure that the equipment is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components

For Safety

⚠ WARNING

Repair

WARNING ⚠

- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Calibration

- The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. Be careful not to break the seal by opening the equipment or unit covers. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed.

Falling Over

- This equipment should always be positioned in the correct manner. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
  Always set up the equipment in a position where the power switch can be reached without difficulty.

For Safety

⚠ WARNING

Replacing Battery

- When replacing the battery, use the specified battery and insert it with the correct polarity. If the wrong battery is used, or if the battery is inserted with reversed polarity, there is a risk of explosion causing severe injury or death.

Battery Fluid

- DO NOT short the battery terminals and never attempt to disassemble the battery or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak. This fluid is poisonous.
  DO NOT touch the battery fluid, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

Battery Disposal

- DO NOT expose batteries to heat or fire. Do not expose batteries to fire. This is dangerous and can result in explosions or fire. Heating batteries may cause them to leak or explode.

LCD

- This equipment uses a Liquid Crystal Display (LCD). DO NOT subject the equipment to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
  This liquid is very caustic and poisonous.
  DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly.

For Safety

⚠ CAUTION

Cleaning

- Always remove the main power cable from the power outlet before cleaning dust around the power supply and fan.
  - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
  - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

Check Terminal

- Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.

For Safety

Laser Safety

Class 1 and 1M indicate the danger degree of the laser radiation specified below according to IEC 60825-1:2007.

Class 1: Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Class 1M: Lasers emitting in the wavelength range from 302.5 to 4000 nm that are safe under reasonably foreseeable conditions of operation, but may be hazardous if the user employs optics within the beam. Two conditions apply:

a) for diverging beams, if the user views the laser output with certain optical instruments (for example, eye loupes, magnifiers and microscopes) within a distance of 100 mm; or

b) for collimated beams, if the user views the laser output with certain optical instruments (for example, telescopes and binoculars).

⚠ CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
The use of optical instruments with this product will increase eye hazard.

For Safety

⚠ WARNING

The laser in this equipment is classified as Class 1 and 1M according to the IEC 60825-1:2007 standard.

Never use optical instruments to directly view Class 1M aser products. Doing so may result in serious damage to the eyes.

Table 1 Laser Safety Classifications Based on IEC 60825-1:2007

Model Name	Class	Max. Optical Output Power (mW)*	Pulse Width (s)/ Repetition Rate	Emitted Wavelength (nm)	Beam Radiation Angle [deg.]	Laser Aperture	Built-in Laser
MD1260A	1M	6.5	CW	840 - 860	23.0	Figure 1-1	Table 2 c),d)
	1	11.3	CW	1260 - 1340	11.5	Figure 1-1	Table 2 a),b)

*: Indicates the possible optical output power when each and every reasonably foreseeable single-fault condition is included.

Table 2 Specifications of Laser Built into MD1260A

	Model Name	Max. Optical Output Power (mW)*	Pulse Width (s)/ Repetition Rate	Emitted Wavelength (nm)	Beam Radiation Angle [deg.]
a)	G0259A	11.3	CW	1290 - 1315	11.5
b)	G0279A	6.8	CW	1260 - 1340	11.5
c)	G0280A	6.5	CW	840 - 860	23.0
d)	G0281A	5.0	CW	840 - 860	23.0

*: Indicates the possible optical output power when each and every reasonably foreseeable single-fault condition is included.

Table 3 Labels on Product

	Type	Label	Affixed to:	Model Name
1	Explanation		Figure 1-2 A	MD1260A
2	Explanation		Figure 1-2 B	MD1260A
3	Certification		Figure 1-2 D	MD1260A
4	Identification		Figure 1-2 C	MD1260A

For Safety

Laser Radiation Markings

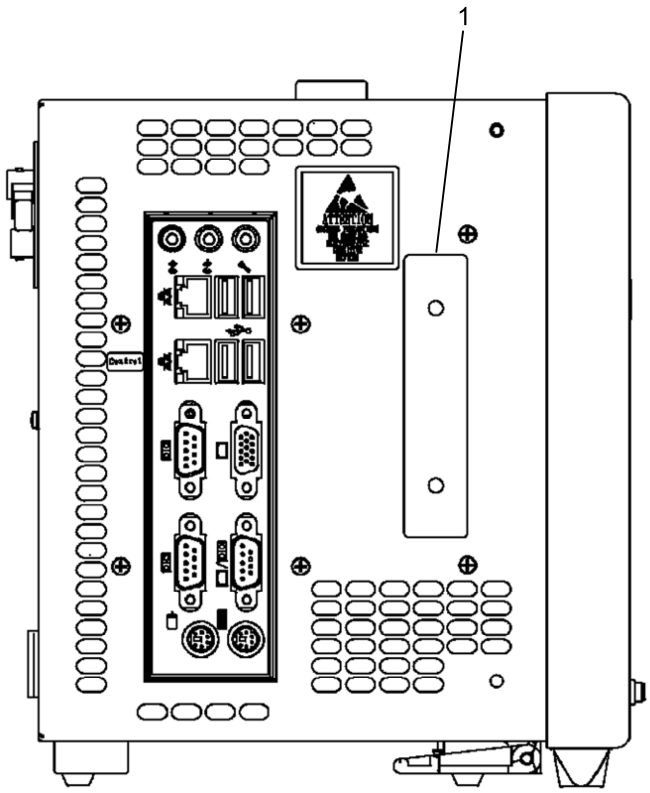


Figure 1-1   Locations of Laser Beam Apertures

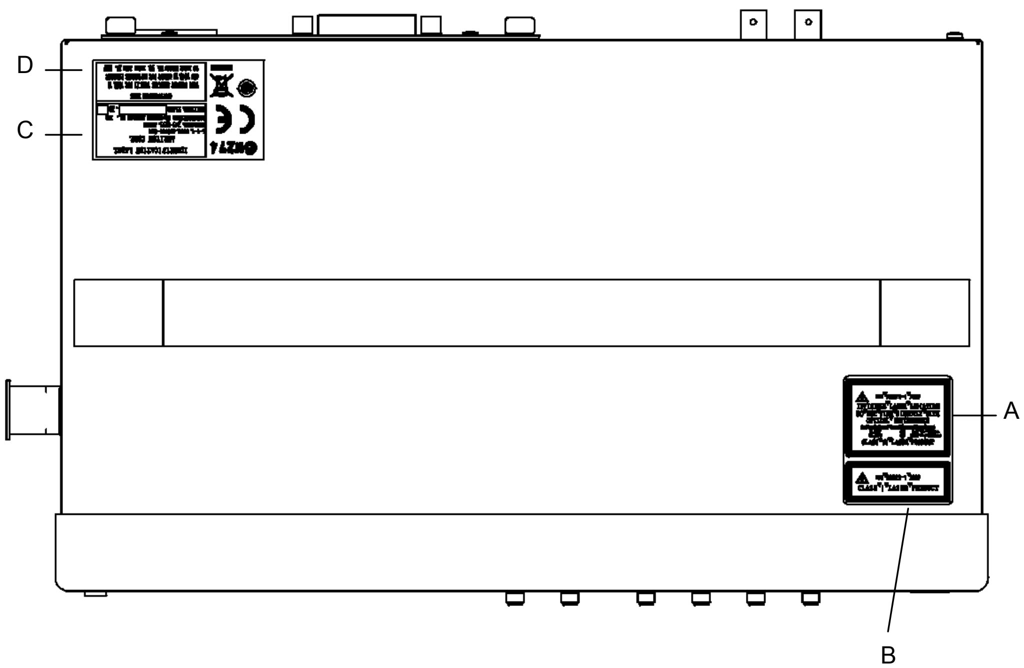


Figure 1-2   Locations of Affixed Labels

For Safety

⚠ CAUTION

Replacing Memory Back-up Battery

This equipment uses a Poly-carbomonofluoride lithium battery to backup the memory. This battery must be replaced by service personnel when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

Note: The battery used in this equipment has a maximum useful life of 4 years. It should be replaced before this period has elapsed.

External Storage Media

This equipment uses USB memory devices as external storage media for storing data and programs.

If this media is mishandled or becomes faulty, important data may be lost. To prevent this chance occurrence, all important data and programs should be backed-up.

Anritsu will not be held responsible for lost data.

Pay careful attention to the following points.

- Never remove the USB memory device from the instrument while it is being accessed.
- The USB memory device may be damaged by static electric charges.
- Anritsu has thoroughly tested all external storage media such as USB memory, Hard disk drive and DVD drive. Users should note that external storage media may not have been tested by Anritsu, thus Anritsu cannot guarantee the performance or suitability of such media.

For Safety

⚠ CAUTION

Hard disk

The equipment is equipped with an internal hard disk from which, as with any hard disk, data may be lost under certain conditions. To prevent this chance occurrence, all important data and programs should be backed-up.

<u>Anritsu will not be held responsible for lost data.</u>

Note: The writing limitation of disk drive is approximately one million per block. Under normal usage conditions, the life of this device is about 10 years. This instrument uses both a hard disk drive and flash memory.

To reduce the possibility of data loss, particular attention should be given to the following points.

- The instrument should only be used within the recommend temperature range, and should not be used in locations where the temperature may fluctuate suddenly.
- Always follow the guidelines to ensure that the instrument is set up in the specified manner.
- Always ensure that the fans at the rear and side of the instrument are not blocked or obstructed in any way.
- Exercise care not to bang or shake the instrument whilst the power is on.
- Never disconnect the mains power at the plug or cut the power at the breaker with the instrument turned on.

Use in a Residential Environment

This equipment is designed for an industrial environment.
In a residential environment, this equipment may cause radio interference in which case the user may be required to take adequate measures.

Use in Corrosive Atmospheres

Exposure to corrosive gases such as hydrogen sulfide, sulfurous acid, and hydrogen chloride will cause faults and failures.
Note that some organic solvents release corrosive gases.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault. However, software fixes will be made in accordance with the separate Software End-User License Agreement. Moreover, Anritsu Corporation will deem this warranty void when:

- The fault is outside the scope of the warranty conditions separately described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster, including fire, wind, flooding, earthquake, lightning strike, or volcanic ash, etc.
- The fault is due to damage caused by acts of destruction, including civil disturbance, riot, or war, etc.
- The fault is due to explosion, accident, or breakdown of any other machinery, facility, or plant, etc.
- The fault is due to use of non-specified peripheral or applied equipment or parts, or consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.
- The fault is due to use in unusual environments(Note).
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Note:
For the purpose of this Warranty, "unusual environment" means use:

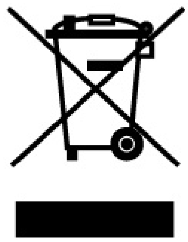
- In places of direct sunlight
- In dusty places
- Outdoors
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in places where chemically active gases (sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen chloride etc.) are present
- In places where high-intensity static electric charges or electromagnetic fields are present
- In places where abnormal power voltages (high or low) or instantaneous power failures occur
- In places where condensation occurs
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2002/96/EC (the “WEEE Directive”) in European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Lifetime of Parts

The life span of certain parts used in this instrument is determined by the operating time or the power-on time. Due consideration should be given to the life spans of these parts when performing continuous operation over an extended period. These parts must be replaced at the customer's expense even if within the guaranteed period described in Warranty at the beginning of this manual.

LCD:	50,000 hours
Compact Flash :	1 million counts (write cycle)
Flash Memory :	100 thousand counts (write cycle)
measurement port:	180 cycles maximum

Software End-User License Agreement (EULA)

Please read this Software End-User License Agreement (hereafter this EULA) carefully before using (includes executing, copying, registering, etc.) this software (includes programs, databases, scenarios, etc., used to operate, set, etc., Anritsu electronic equipment). By reading this EULA and using this software, you are agreeing to be bound by the terms of its contents and Anritsu Corporation (hereafter Anritsu) hereby grants you the right to use this Software with the Anritsu-specified equipment (hereafter Equipment) for the purposes set out in this EULA.

1. Grant of License and Limitations

1. Regardless of whether this Software was purchased from or provided free-of-charge by Anritsu, you agree not to rent, lease, lend, or otherwise distribute this Software to third parties and further agree not to disassemble, recompile, reverse engineer, modify, or create derivative works of this Software.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer this software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for personal injury, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, arising out of or related to your use or inability to use this Software.

3. Limitation of Liability

a. If a fault (bug) is discovered in this Software, preventing operation as described in the operation manual or specifications whether or not the customer uses this software as described in the manual, Anritsu shall at its own discretion, fix the bug, or exchange the software, or suggest a workaround, free-of-charge. However, notwithstanding the above, the following items shall be excluded from repair and warranty.
   - i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   - ii) If this Software is used in conjunction with other non-Anritsu-approved software.
   - iii) Recovery of lost or damaged data.
   - iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
   - v) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, etc.

b. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs by Anritsu engineers necessitated by the above faults shall be borne by you.

c. The warranty period for faults listed in article 3a above covered by this EULA shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair, whichever is longer.

4. **Export Restrictions**

You may not use or otherwise export or re-export directly or indirectly this Software except as authorized by Japanese and United States law. In particular, this software may not be exported or re-exported (a) into any Japanese or US embargoed countries or (b) to anyone on the Japanese or US Treasury Department's list of Specially Designated Nationals or the US Department of Commerce Denied Persons List or Entity List. By using this Software, you warrant that you are not located in any such country or on any such list. You also agree that you will not use this Software for any purposes prohibited by Japanese and US law, including, without limitation, the development, design and manufacture or production of missiles or nuclear, chemical or biological weapons of mass destruction.

5. **Termination**

Anritsu shall deem this EULA terminated if you violate any conditions described herein. This EULA shall also be terminated if the conditions herein cannot be continued for any good reason, such as violation of copyrights, patents, or other laws and ordinances.

6. **Reparations**

If Anritsu suffers any loss, financial or otherwise, due to your violation of the terms of this EULA, Anritsu shall have the right to seek proportional damages from you.

7. **Responsibility after Termination**

Upon termination of this EULA in accordance with item 5, you shall cease all use of this Software immediately and shall as directed by Anritsu either destroy or return this Software and any backup copies, full or partial, to Anritsu.

8. **Dispute Resolution**

If matters of dispute or items not covered by this EULA arise, they shall be resolved by negotiations in good faith between you and Anritsu.

9. **Court of Jurisdiction**

This EULA shall be interpreted in accordance with Japanese law and any disputes that cannot be resolved by negotiation described in Article 8 shall be settled by the Japanese courts.

Cautions against computer virus infection

- Copying files and data
  Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
  All other required files should be transferred by means of USB or CompactFlash media after undergoing a thorough virus check.
- Adding software
  Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
  Ensure that the network has sufficient anti-virus security protection in place.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model

Model: MD1260A 40/100G Ethernet Analyzer

2. Applied Directive

EMC: Directive 2004/108/EC

LVD: Directive 2006/95/EC

3. Applied Standards

- EMC: Emission: EN 61326-1: 2006 (Class A)

  Immunity: EN 61326-1: 2006 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-11 (V dip/short)	B, C

*: Performance Criteria

A: During testing, normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Harmonic current emissions:

EN 61000-3-2: 2006 +A1:2009 A2:2009

(Class A equipment)

: No limits apply for this equipment with an active input power under 75 W.

- LVD: EN 61010-1: 2010 (Pollution Degree 2)

4. Authorized representative

Name:	Murray Coleman Head of Customer Service EMEA ANRITSU EMEA Ltd.
Address, city:	200 Capability Green, Luton Bedfordshire, LU1 3LU
Country:	United Kingdom

C-Tick Conformity Marking

Anritsu affixes the C-Tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-Tick mark

N274

1. Product Model

Model: MD1260A 40/100G Ethernet Analyzer

2. Applied Standards

EMC: Emission: EN 61326-1: 2006 (Class A equipment)

About This Manual

The manuals of the MD1260A 40/100G Ethernet Analyzer are configured by the following two manuals.

MD1260A 40/100G Ethernet Analyzer
Operation Manual Operation (this manual)

This describes the usage precautions, product overview, installation method, panel operation, maintenance, specifications, and each function.

MD1260A 40/100G Ethernet Analyzer
Operation Manual Remote Control

This describes the remote command for controlling the MD1260A.

MD1260A 40/100G Ethernet Analyzer
Add-on Function Operation Manual

This describes how to use the Add-on function.

For how to use the remote control, refer to the MD1260A Remote Control Operation Manual (M-W3406AE).

For how to use the Add-on function, refer to the MD1260A Add-on Function Operation Manual (M-W3483AE).

This operation manual assumes the reader has the following basic knowledge of:

- Optical communications, handling of optical parts
- Windows file operations and the Windows Control Panel

Table of Contents

Chapter 1 Outline

This chapter explains the MD1260A functions and product configuration. For the product performance and specifications, refer to Appendix A Specifications.

1.1 Introduction of MD1260A

1.1.1 40/100G Ethernet Analyzer

The MD1260A 40/100G Ethernet Analyzer is a measuring instrument for R&D and manufacturing of 40/100 Gigabit Ethernet (40/100 GbE) and OTN (OTU3/OTU4)*1 equipment.
When the MD1260A is connected to the DUT*2 , test patterns can be sent and received and bit errors and latency can be measured.

*1 Optical Transport Network, Optical channel Transport Unit
*2 Device Under Test

Figure 1.1.1-1 Appearance of MD1260A

The MD1260A has the following features:

Editing Stream

The following items are changed according to the transmission stream.

- Frame header and data
- Frame gap
- Error insertion

Counter

The transmitted/received frames and number of errors are displayed as follows:

- Received total data
- Test frame number (Flow ID) per flow
- Ethernet PCS *3 lane, OTU3/OTU4 per logical lane

*3 Physical Coding Sublayer

Capture

The Ethernet XLGMII*4 or CGMII*5 data is captured. In these cases, both frames and inter-frame signals are captured.

The OTN header, OTU frame, and GMP*5 $C_m(t)$ and C_nD are captured and the analysis is displayed.

*4 40 Gigabit Media Independent Interface

*5 100 Gigabit Media Independent Interface

*6 General Mapping Procedure

Add-on function

The functions such as the automatic measurement can be added using the Ethernet measurement function. The currently prepared functions are as follows:

- Test defined by RFC2544
- CFP MDIO analysis (Option 031)
- 100GBASE-ER4/LR4 lambda grouping measurement
- Service disruption time measurement

1.1.2 Features

- Supports 40GbE, 100GbE, OTU3, or OTU4
  One unit supports 40GbE/100GbE/OTU3/OTU4, depending on the installed options.

- CFP for optical interface
  CFP conversion supports different transmission media.

- Easy operation, durable, compact, and light
  The 12.1-inch wide touch panel with intuitive GUI makes operation easy. A flash disk drive eliminates HDD crashes. The MD1260A is compact (221.5 (H) × 341(W) × 200 (D) mm) and lightweight (8 kg max.) for easy portability and a small benchtop footprint.

- Expandable by linking multiple MD1260A units
  Multiple MD1260A units can be linked to expand the number of measurement ports (Multiport function).
  Each Slave is controlled from the Master unit, making it easy to batch test multiple pieces of transmission equipment and to evaluate multiport switches and routers.
  In addition, the Multiport function supports simultaneous timestamping and sending of test frames from each MD1260A unit. As a result, delay can be measured using multiple MD1260A units to function as a background high-load generator.

- Functions for evaluating latest 40/100GbE technologies
  Equipment skew margins can be tested using the functions for generating/monitoring skew in all lanes and between lanes.
  Since the electrical I/F (CAUI/XLAUI) can be output to external equipment using application parts, the MD1260A supports both CFP standalone tests and troubleshooting problems between CFP and the transmission equipment.

- Remote control
  The MD1260A can be remotely controlled from a PC over Ethernet to configure both automatic and remotely controlled test systems.
  A GPIB remote control interface can be installed as an option.

1.2 Technical Terms

Alignment Marker

The Alignment Marker is a control block installed in the PCS lane for measuring skew between 40GbE/100GbE PCS lanes.
It is installed at every 16383 blocks.

Block

This specifies the 64-bit/66-bit converted 66-bit data for 40GbE/100GbE.

CFP

This is the abbreviation for 100G Form-factor Pluggable; it is an optical transceiver module with speeds of 40 or 100 Gbit/s.
The shape, connector pin arrangement, optical and electrical specifications, etc., are in accordance with world standards.

Frame BER*1 measurement

Frame BER measurement displays the bit errors for the Ethernet frame data fields.

☞ 4.5.2 Frame BER measurement

Loopback mode

In the Loopback Mode, data sent from the MD1260A is received after internal loopback in the analyzer. Although the signal is output to the CFP connector, the data is not received from the CFP connector. The Loopback Mode is used to check the single operation of the MD1260A mainly.

☞ 3.3.1 Loopback

Master/Slave

When connected over Ethernet, one MD1260A unit can control other MD1260A units; the controlling unit is the Master unit and the controlled units are the Slave units.

☞ 7.1 What is Multiport Function?

No Frame

No Frame indicates the status when there is no frame pattern. At No Frame BER*1 measurement, a PRBS*2 pattern is generated independently for lanes corresponding to transmission method and bit errors are measured as shown below figure.

*1 Bit Error Rate

*2 Pseudo Random Binary Sequence

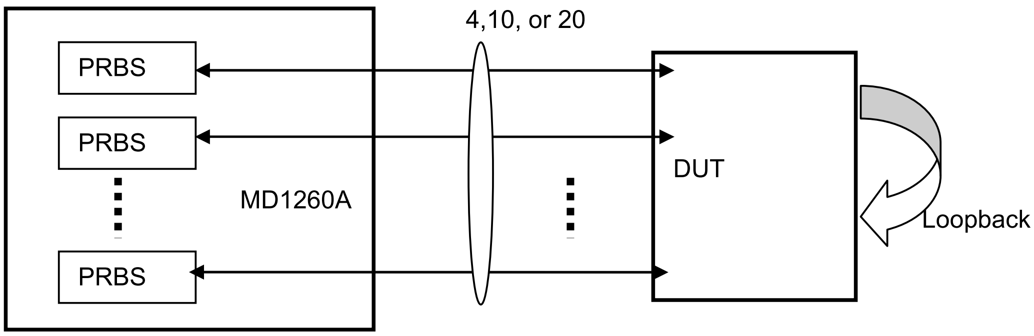


Figure 1.2-1 No Frame

☞ Chapter 6 No Frame Application

Skew

Skew is the time difference in signals transferred over the PCS or Logical lanes. Removal of skew at the Rx side is called Deskew.

Through mode

In the through mode, the data received by the MD1260A is output to the main port as is or after some of the data has been changed.
The mode is used for communications data monitoring, error insertion to the communications data, and overwriting the header.

☞ 5.3 Port Setting

1.3 Abbreviations

The abbreviations used in this manual are listed in Table 1.3-1.

Table 1.3-1 Abbreviation

Abbreviation	Formal Name
100GbE	100 Giga bit Ethernet
40GbE	40 Giga bit Ethernet
AIS	Alarm Indication Signal
APS/PCC	Automatic Protocol Switching and Protection Communication Channel
ARP	Address Resolution Protocol
BDI	Backward Defect Indication
BEI	Backward Error Indication
BER	Bit Error Rate
BIAE	Backward Incoming Alignment Error
BIP8	Bit Interleaved Parity-level 8
B-TAG	Backbone VLAN Tag
CAUI	100 Gigabit Attachment Unit Interface
CC	Country Code
CDR	Clock Data Recovery
CFP	100G Form-factor Pluggable
CGMII	100 Gigabit Media Independent Interface
CRC	Cyclic Redundancy Check
cHEC	core Header Error Check
CSF	Client Signal Fail
DA	Destination Address
DAPI	Destination Access Point Indicator
DEI	Drop Eligible Indication
ESP	Encapsulating Security Payload
EXI	Extension header Identifier
EXP	Experimental bit (MPLS)
EXP	Experimental overhead
FAS	Frame alignment signal
FCS	Frame Check Sequence
FEC	Forward Error Correction
FIF	Fault Indication Field
FTFL	Fault Type and Fault Location reporting communication channel
GARP	Gratuitous ARP
GbE	Gigabit Ethernet
GCC	General Communication Control
GFEC	General Forward Error Correction

Table 1.3-1 Abbreviation (Cont'd)

Abbreviation	Formal Name
GFP	General Framing Procedure
GFP-T	transparent General Framing Procedure
GMP	General Mapping Procedure
GPIB	General Purpose Interface Bus
IAE	Incoming Alignment Error
ICC	ITU Carrier Code
ICMP	Internet Control Message Protocol
IFG	Inter Frame Gap
IGMP	Internet Group Management Protocol
ILA	In Lane Alignment
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IS	International Segment
I-TAG	Service Interface Tag
JC	Justification Control
ITU	International Telecommunication Union
LCK	Locked defect
LF	Local Fault
LFS	Link Fault Signaling
LLD	Logical Lane Distribution
LOF	Loss of Frame
LOL	Loss of Lane Alignment
LOM	Loss of OTN Multiframe
LTC	Loss of Tandem Connection
MAC	Media Access Control
MDIO	Management Data Input/Output
MFAS	Multiframe Alignment Signal
MLD	Multi-Lane Distribution
MPLS	Multiple Protocol Labeling Switching
MPLS-TP	Transport Profile of MPLS
MSIM	Multiplex Structure Identifier Mismatch
NA	Neighbor Advertisement
NS	National Segment
NS	Neighbor Solicitaion
OCI	Open Connection Indication
OIF	Operator Indicator Field
ODU	Optical channel Data Unit
ODTU	Optical channel Data Tributary Unit
ODTUG	Optical channel Data Tributary Unit Group

Table 1.3-1 Abbreviation (Cont'd)

Abbreviation	Formal Name
OH	Overhead
OIF	Operator Indicator Field
OLA	Out of Lane Alignment
OOF	Out of Frame
OOM	Out of Multiframe
Opt	Optical Interface
OPU	Optical channel Payload Unit
OTN	Optical Transport Network
OTU	Optical channel Transport Unit
PBB	Provider Backbone Bridging
PCP	Priority Code Point
PCS	Physical Coding Sublayer
PFI	Payload Frame check sequence Identifier
PHY	Physical Layer
PLI	Payload Length Identifier
PLM	Payload Mismatch
PMA	Physical Medium Attachment sublayer
PM-BIP	Path monitoring bit interleaved parity
ppm	parts per million
PRBS	Pseudo Random Binary Sequence
PSI	Payload Structure Identifier
PT	Payload Type
PTI	Payload Type Identifier
RES	Reserved overhead
RF	Remote Fault
RFC	Request for Comments
Rx	Receiver
SA	Source Address
SAPI	Source Access Point Indicator
SID	Service Interface Identifier
SM-BIP	Section monitoring bit interleaved parity
SSF	Server Signal Fail
TCM	Tandem Connection Monitoring
TCP	Transmission Control Protocol
tHEC	type Header Error Check
TIM	Trail trace Indicator Mismatch
TOS	Type of Service
TP	Tributary Point
TPID	Tag Protocol Identifier
TS	Tributary Slot
TTI	Trail Trace Indicator
TTL	Time to Live
Tx	Transmitter

Table 1.3-1 Abbreviation (Cont'd)

Abbreviation	Formal Name
UAPC	Unique Access Point Code
UDP	User Datagram Protocol
UPI	User Payload Identifier
VID	VLAN Identifier
VLAN	Virtual Local Area Network
VOD	Voltage Output Differential
XLAUI	40 Gigabit Attachment Unit Interface
XLGMII	40 Gigabit Media Independent Interface

Chapter 2 Before Use

This chapter explains the following items:

- Procedures from unpacking through turning power-on
- Panel name and operation
- Control panel and peripheral devices settings

2.1 Unpacking

At unpacking, check that all items are included. See the attached file including the standard configuration table (see Table A.1-1 in Appendix A). Contact your Anritsu Service and Sales Office or agent if any parts are missing or damaged.

2.2 Installation

Install the MD1260A horizontally as shown in Figure 2.1.1-1.

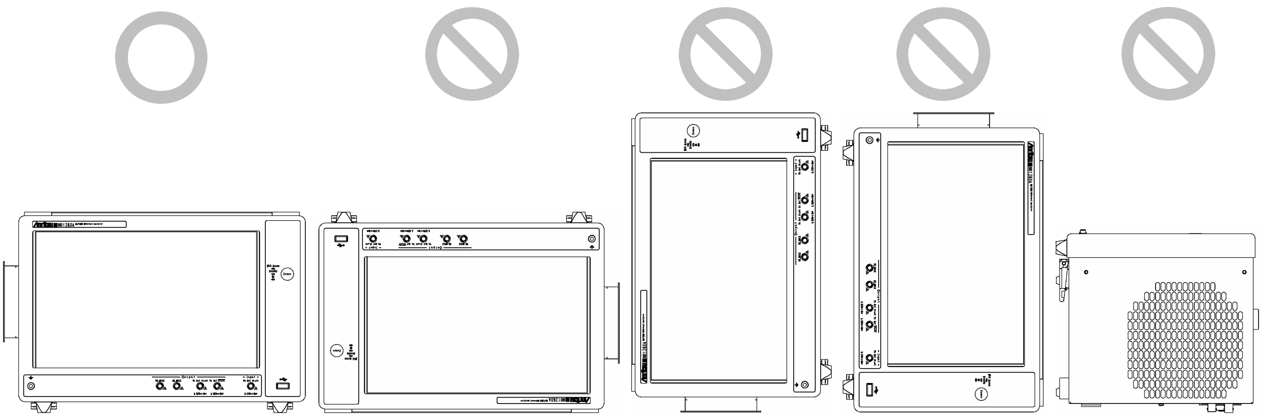


Figure 2.2-1 Installation Orientation

CAUTION

If the MD1260A is not installed in an “O” direction as above, a small shock may turn it over and harm the user.

A fan is installed in the MD1260A to prevent the internal temperature from rising. Install the MD1260A in a location with the vents at least 10 cm away from walls, peripherals or other obstructions so as not to block the fan perimeter.
There is also a vent on the bottom panel of the MD1260A. Ensure that it is not obstructed.

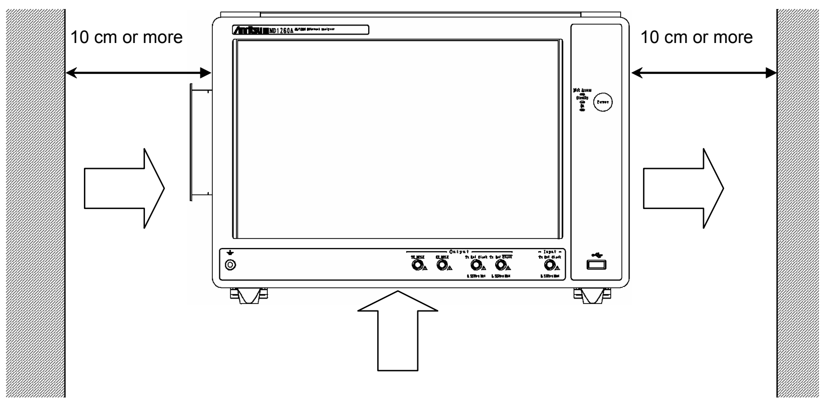


Figure 2.2-2 Vent Airflow System

In this instrument, cooling air is sucked in through the left side panel and bottom, and hot air is exhausted through the right side panel. When using two or more instruments side-by-side make sure that hot air exhausted from one unit is not sucked into the adjacent unit, otherwise overheating may occur.

⚠ CAUTION

Although the MD1260A operates at an ambient temperature of 5° to 40°C, avoid using it in locations, such as the following, since it may cause failure.

- **In direct sunlight for extended periods**
- **Outdoors**
- **In excessively dusty locations**
- **In liquids, such as water, oil, organic solvents, and medical fluids, or places where these liquids may adhere**
- **In salty air or where chemically active gases (sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen chloride etc.) are present**
- **Where toppling over may occur**
- **Where static electric charges or high electromagnetic fields are present**
- **Where abnormal power voltages (high or low) occur**
- **In the presence of lubricating oil mists**
- **Where condensation occurs**
- **In places at an altitude of more than 2,000 m**
- **In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes**

2.3 Part Names

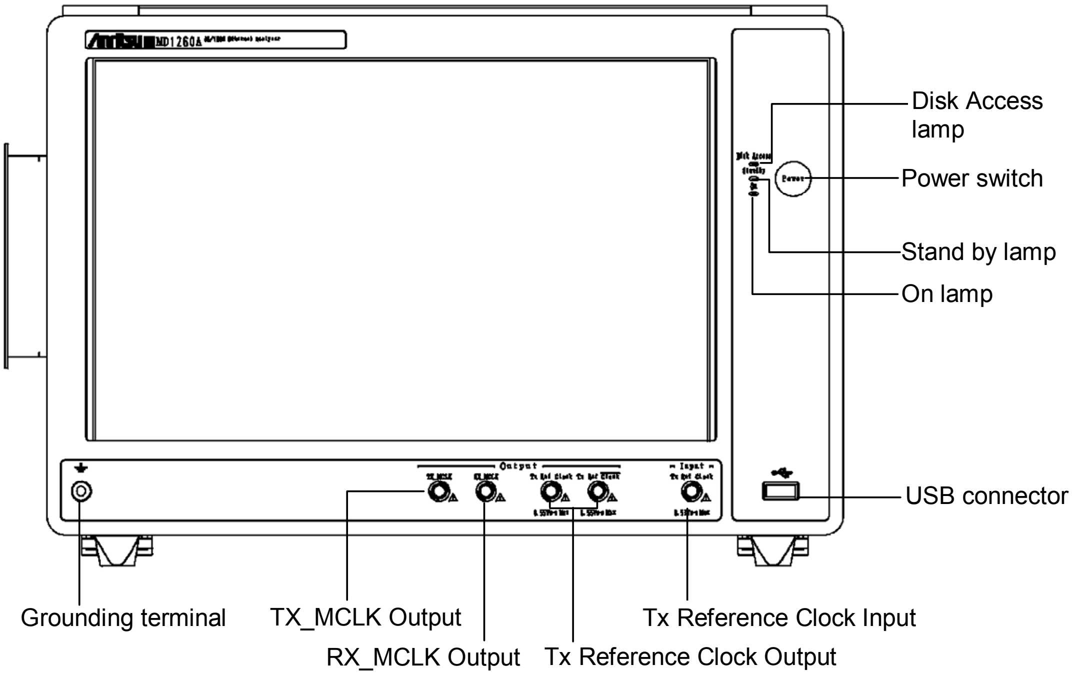


Figure 2.3-1 **MD1260A Front Panel**

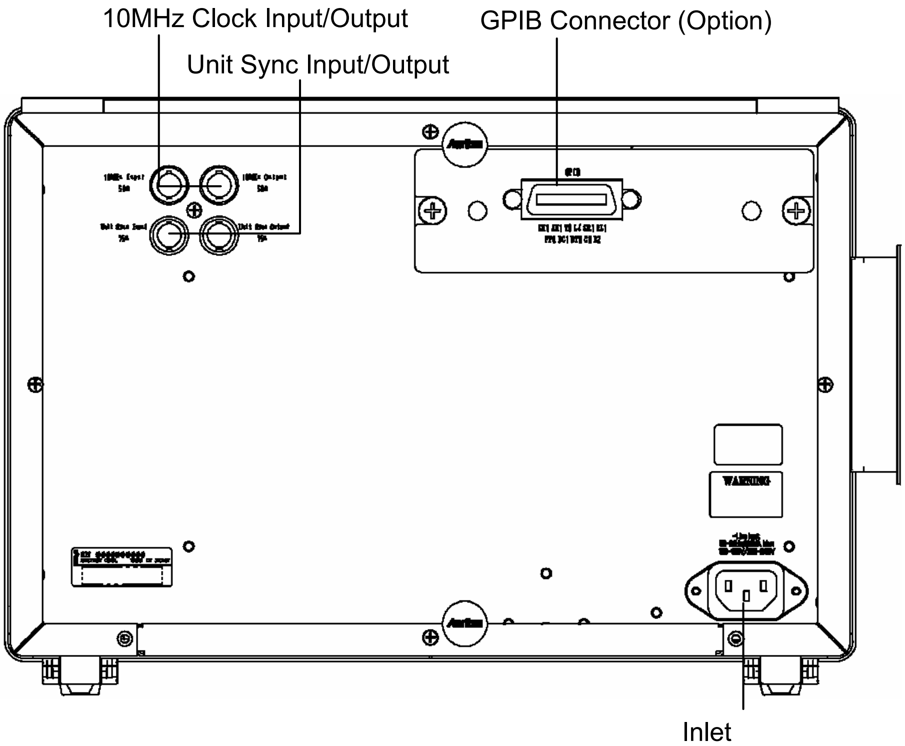


Figure 2.3-2 MD1260A Rear Panel

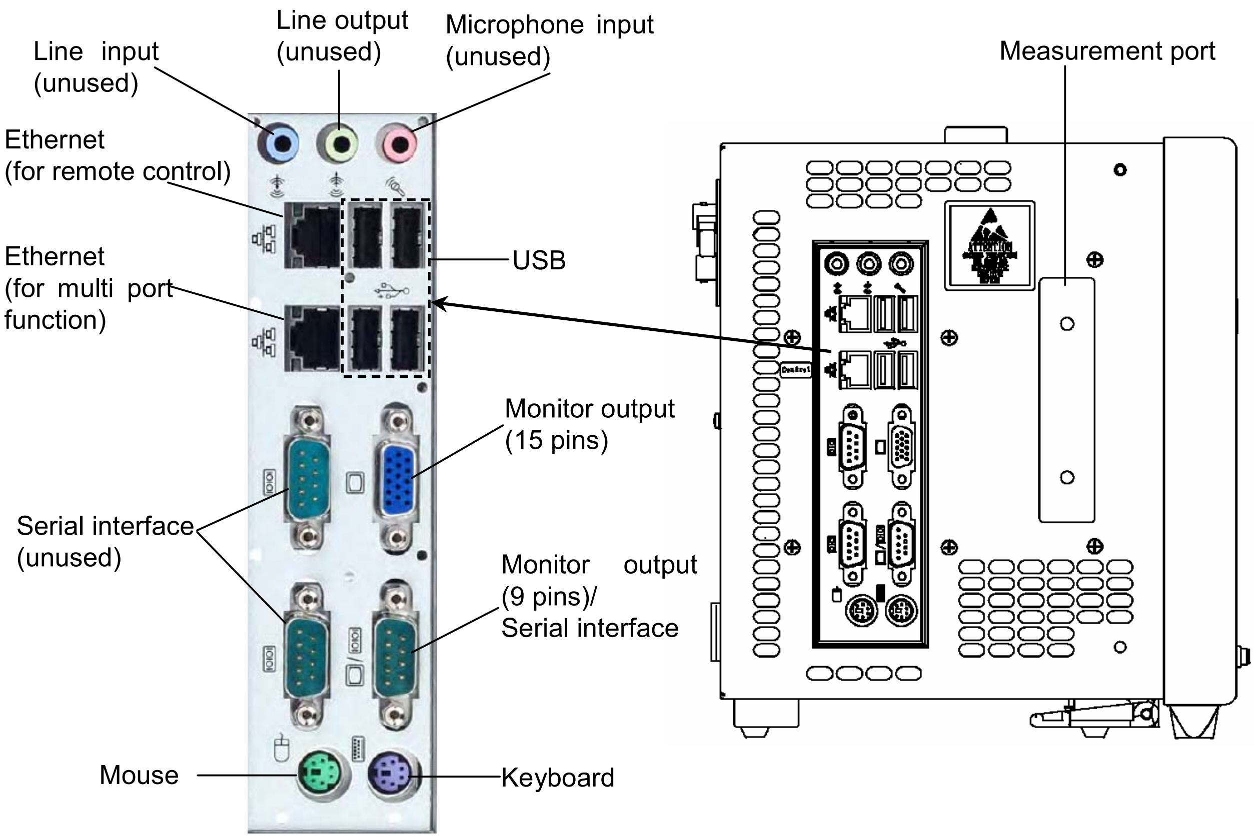


Figure 2.3-3 Left Side Panel

There are two Ethernet port; use the one marked $\boxed{\text{Control}}$ when using the Multiport function to connect several MD1260A units.

2.4 Power Connection

2.4.1 Power requirements

For normal operation of the MD1260A, observe the power voltage range described below.

Power source	Voltage range	Frequency
100 Vac system	100 to 120 V	50 to 60 Hz
200 Vac system	200 to 240 V	50 to 60 Hz

Switching between 100 and 200 V systems is automatic.

⚠ CAUTION

Supplying power exceeding the above range may result in electrical shock, fire, failure, or malfunction.

2.4.2 Connecting power cord

Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground pin.

⚠ WARNING

If the power cord is connected without grounding the instrument, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.
When connecting to the power supply, DO not connect to an outlet without an earth terminal. Also, avoid using electrical equipment such as an extension cord or a transformer.

Unless otherwise specified, the signal-connector ground terminal, like an external conductor of the coaxial connector, of the instrument is properly grounded when connecting the power cord to a grounded outlet. Connect the ground terminal of DUT to a ground having the same potential before connecting with the instrument. Failure to do so may result in an electric shock, fire, failure, or malfunction.

⚠ CAUTION

If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by disconnecting one or both ends of the power cord.

When installing the instrument, arrange the power inlet and outlet so that an operator may easily connect or disconnect the power cord. Moreover, DO NOT fix the power cord around the plug and the power inlet with a holding clamp or similar device.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

It should be noted that, the power switch on the front panel of the instrument is a standby switch, and cannot be used to cut the main power.

2.4.3 Power-on

1. Connect the power cord plug, referring to Section 2.4.2 “Connecting power cord”.
   Check that the MD1260A enters the standby state.
2. Press the power switch.
   The power lamp lights green and the Windows start-up screen is displayed.
3. After 30 seconds has passed, the selector screen is displayed.

Figure 2.4.3-1 Selector Screen

Note:

Do not press the power switch while the Windows start-up screen is displayed, otherwise the MD1260A Control software may not start normally.

2.4.4 Power-off

To turn off the main power, do one of the following:

Turning off the main power using panel keys

1. Press the power switch to close applications and start shutdown.
2. Select [OK] at the displayed dialog.
3. The On lamp goes off, the standby lamp lights orange, and the power is turned off.

WARNING

Do not press the power switch for 4 seconds or more. Doing so forcibly shuts down the system while the software is closing. In this case, the software might be damaged, preventing future normal start-up.

Turning off the main power from application

1. Select [Shut Down] at the Selector screen.
2. Select [OK] at the displayed dialog.
3. The On lamp goes off, the standby lamp lights orange, and the power is turned off.

Turning off the main power from the Windows start menu

1. Display the Windows desktop.

☞ 2.6.1 Displaying windows desktop

2. Open the [Start] menu on the Windows task bar.
3. Select [Turn off computer].
4. Select [Turn off].
5. The power on lamp goes off, the standby lamp lights orange, and the power is turned off.

Forced shutdown

Note:

1. Only use forced shutdown as an emergency operation when key, mouse, and keyboard operations fail. A fault may have occurred if the power cannot be turned off even by pressing the Power switch for 4 or more seconds. Unplug the power cord from the power outlet and contact your Anritsu Service and Sales Office or agent.

2. If the power plug is removed while the panel access lamp is lit, the data may not be saved correctly. Remove the power plug after cutting the power.

1. Press the Power switch for 4 seconds or more.
2. The power on lamp goes off, the Stand by lamp lights orange, and the power is turned off.

2.5 Preparations before Measurement

2.5.1 Precautions on connecting input/output signal

Carefully read the following precautions when connecting the input/output signal of the MD1260A or CFP.

⚠ CAUTION

1. **When signals are input to the MD1260A, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.**

2. **Never apply any current or input signals to outputs.**

3. **The impedance of front panel connectors is 50 Ω. Measurement may be incorrect if a coaxial cable with another impedance is used.**

4. **As a countermeasure to static electricity, ground other devices to be connected (including experimental circuits) with ground wires before connecting the I/O connector.**

5. **The output voltage of the Tx Ref Clock Output, TX_MCLK Output, and Rx_MCLK Output of the front panel is 0.1 to 0.55 Vp-p. Check that the output voltage does not exceed the DUT maximum input specifications. If it does, connect an attenuator to the connector.**

6. **The outer conductor and core of the coaxial cable may become charged as a capacitor. Use any metal to discharge the outer conductor and core before use.**

7. **When connecting the cables to the connector of the front panel and measurement port of the left side panel, the operator should wear an electrostatic discharge wrist strap. Otherwise, the internal circuit or CFP may be damaged.**

8. To protect the MD1260A from electrostatic discharge failure, an antistatic conductive mat should be placed on the workbench under the MD1260A, and the operator should wear an electrostatic discharge wrist strap. Connect the ground connection end of the wrist strap to the conductive mat or to the ground terminal of the main frame.

9. Never open the MD1260A. If you open it and MD1260A has failed or sufficient performance cannot be obtained, we may refuse to repair it.

10. Some devices installed in the MD1260A are vulnerable to static electricity. Do not open the MD1260A to touch such components.

2.5.2 Handling CFP

Handle the CFP (100G Form-factor Pluggable) module according to the following steps.

⚠ CAUTION

Operation is not assured if you use a CFP module not recommended by Anritsu (Table A.1-2 Applicable Parts). When using a CFP module, the MD1260A performance is affected by the CFP performance.

When the CFP module is installed in the MD1260A, make sure that dust is not attached to the card edge of the module. If the CFP module attached with dust is installed, the connector may be damaged or the measurement may not be executed correctly.

Be sure to cover the CFP slot and keep out the dust inside the slot, when connecting to CFP.

Installing the CFP module

1. Wear the ESD wrist strap, and connect it to the ground terminal on the front panel.
2. Remove the CFP slot cover.
3. Slowly press the front end of the CFP module along the railing into the port socket, until the CFP flange makes contact.
   Make sure not to damage the EMI gasket of the CFP module.

   There is a riding heat sink inside the measurement port for ventilation. Be careful of the friction between the CFP module and the riding heat sink when inserting the module.
4. Tighten the fixing screws clockwise (2 locations). Tighten the two screws clockwise.
5. Remove the protective cover from the CFP module.

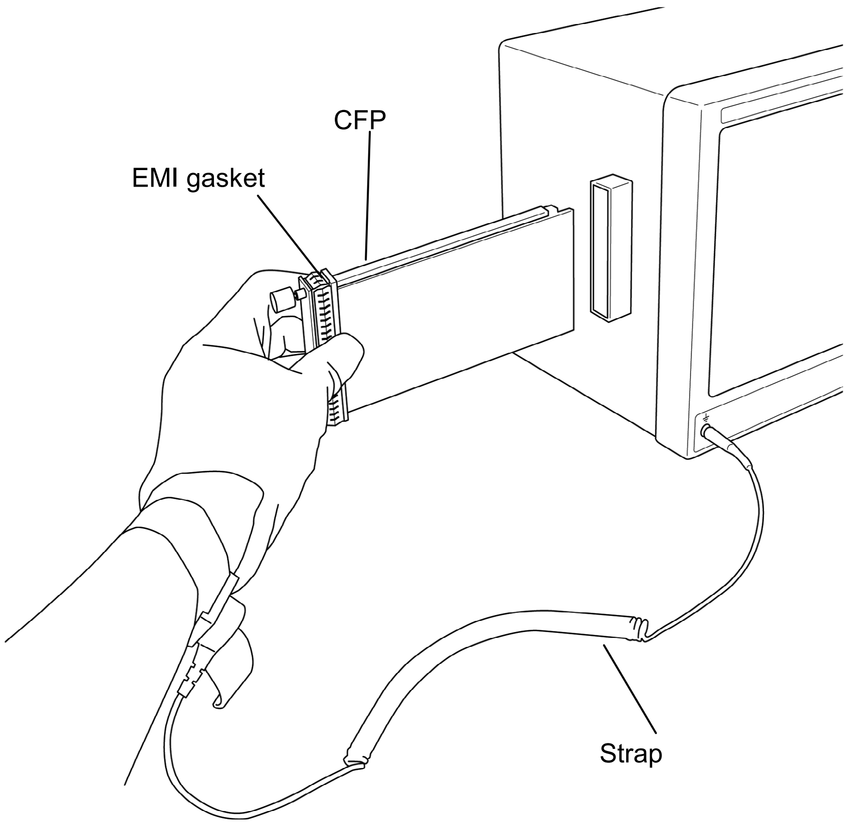


Figure 2.5.2-1 ESD Countermeasures of CFP

Removing the CFP module

⚠ CAUTION

CFP may become hot while operating. To prevent burns, wait for 10 minutes or longer after power-off to remove the CFP module.

1. Wear the ESD wrist strap, and connect it to the ground terminal on the front panel.
2. Remove the optical connector if it is already connected to the CFP connector.
3. Loosen the fixing screws counter-clockwise (2 locations).
4. Holding the two screws, slide the CFP module toward you.
5. When the CFP module is pulled out a little, hold the both ends of the front panel to pull the whole out.
6. Put the CFP slot cover.

2.5.3 Using touch panel

The MD1260A can be operated using the touch panel. In this manual, we say “touch” when explaining an operation by touching the touch panel with a finger.

Touch Panel Operation

Touch the required spot on the touch panel once. If two spots are touched simultaneously, the intermediate point will be detected.

Note:

The touch panel has the same hardness as a 3H lead pencil.
Touching the screen with anything sharp or hard will damage it.

Do not use an LCD panel protection sheet.
Such sheets can cause problems with touch panel operation.

Touch Panel Calibration

Refer to Section 8.5 “Calibrating Touch Panel Position”.

2.5.4 Connecting peripheral devices

This section explains the peripheral devices and how to connect the devices to the MD1260A.

Keyboard

The keyboard connector is the purple connector on the left side panel. USB keyboards are connected to the USB connector.

Mouse

The mouse connector is the light green connector on the left side panel. USB mouse is connected to the USB connector.

USB devices

USB devices such as mouse, keyboard, storage, etc., can be connected to the front-panel and left side panel USB connector.
No panel operations are required before removing USB devices from the MD1260A. USB devices can be removed at any time as long as no files are being written to or read from the USB devices.

External Monitor

Connect an external monitor to the connector of the left side panel monitor.
The supported monitor resolutions are 1280×768 dot or more.

Ethernet

Connect to the Ethernet connectors on the left side panel.
Either one of two connectors can be used.
When using the Ethernet cable, select a category-5 or better cable.

⚠ CAUTION

Do not connect a general-purpose network with IP addresses such as 192.168.1.0/24 (net mask 255.255.255.0) to the Ethernet connector on the left side panel. Otherwise, the MD1260A may not operate correctly.

For how to set GPIB and Ethernet, refer to Section 2.3 “Setting Interface” in the MD1260A 40/100G Ethernet Analyzer Remote Control Operation Manual.

2.6 Setting Control Panel

The MD1260A is set to the factory defaults for optimal measurement. Changing the Windows settings is outside the scope of operation warranty. In addition, the performance may drop or functions may not operate correctly if Windows settings are changed. Read the general notes in this section carefully when changes to Windows settings are required.

⚠ CAUTION

MD1260A operations are not guaranteed if the Windows default settings are changed.

Operation of the MD1260A is guaranteed at factory shipment status.

MD1260A operations are not guaranteed if programs calling Windows are installed or updated.

Changing registries may cause abnormal operations.

Set the IP address of the Ethernet connector on the right side of the MD1260A, referring to Section 2.3 "Setting Interface" in the MD1260A 40/100G Ethernet Analyzer Remote Control Operation Manual.
If the IP address is set from the control panel, the MD1260A may not operate correctly.

Note:

If a Windows setting is changed and the MD1260A does not operate normally and the Windows settings cannot be restored, contact your Anritsu Service and Sales office or agent.

2.6.1 Displaying windows desktop

Use a USB mouse and compatible USB keyboard.

When loading the application:

To display the Windows desktop while loading application, touch [Minimize] on the system menu.

To display the equipment application again, touch [MD1260A] on the Windows taskbar.

When the Selector screen is displayed:

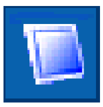
Touch the  button on the top right of the selector screen to display the Windows desktop when displaying the button Selector screen.

To display the Selector screen again, touch the icon of the [MD1260A] on the Windows taskbar twice or double-click it.

2.6.2 Setting control panel

The system time, external display settings and touch panel settings are set at the Windows Control Panel. Do not change any settings other than as listed in Table 2.6.2-1.

Table 2.6.2-1 Description of Control Panel

Icon	Description
	Date & Time • Change the date, time and time zone as necessary. • Internet Time is set to off at factory shipment. Operation may be affected if this setting is changed.
	Display Intel® GMA Driver for Mobile • This setting must be changed when connecting an external monitor to the MD1260A connector. For details, refer to Section 2.7 "Using External Monitor" for details. • Changing the screen resolution, refresh rate or power management, or enabling the screen saver may cause abnormal MD1260A operation. Figure 2.6.2-1 shows the initial Display Settings.
	Touch Panel • This calibrates the touch panel detection point. For details refer to Section 8.5 "Calibrating Touch Panel Position".

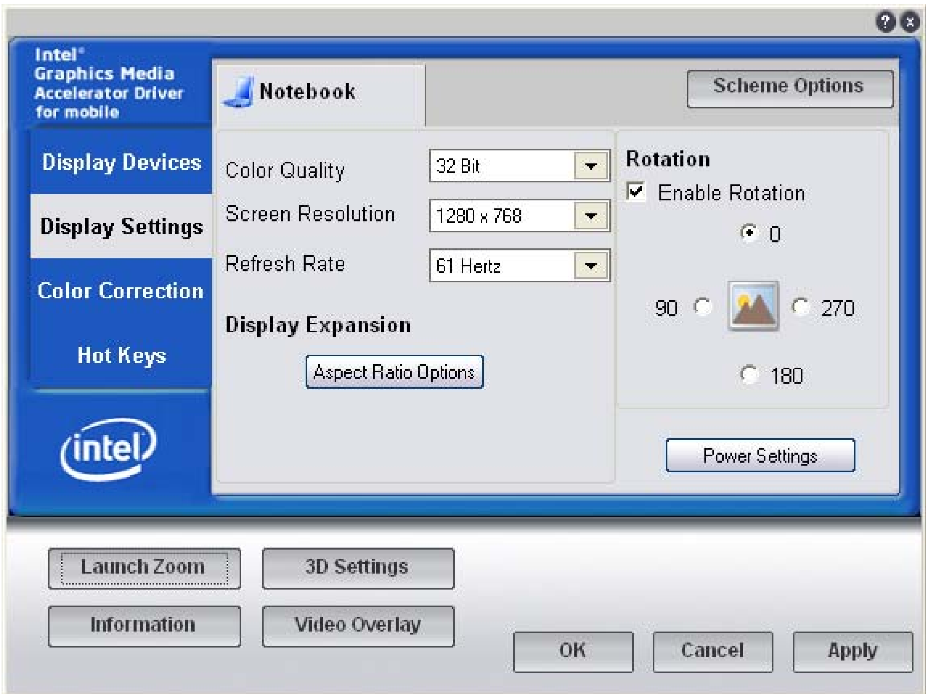
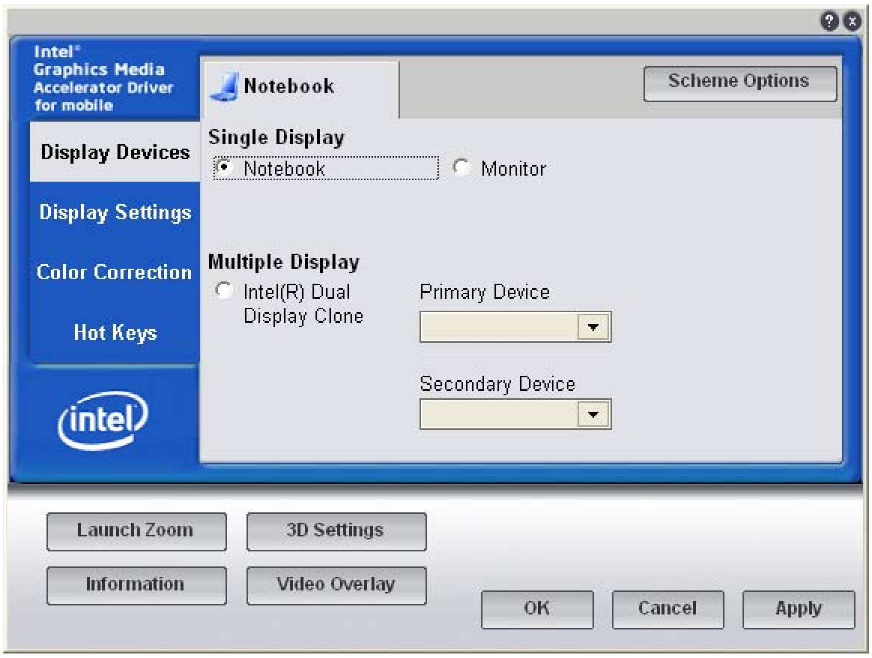


Figure 2.6.2-1 Initial Display Settings

2.7 Using External Monitor

This section explains how to display the MD1260A screen on the external monitor.

1. Connect the external monitor to the monitor connector on the left side panel of the main unit.
2. Set the main unit and monitor power to On.
3. Touch [Main Application] on the Selector screen.
4. Touch [System Menu].
5. Touch [Minimize].
6. Touch [Start] on the right bottom of the screen.
7. Touch [Control Panel].
8. Touch [Intel(R) GMA Driver for Module] twice (double-click) to display the following monitor setting screen.



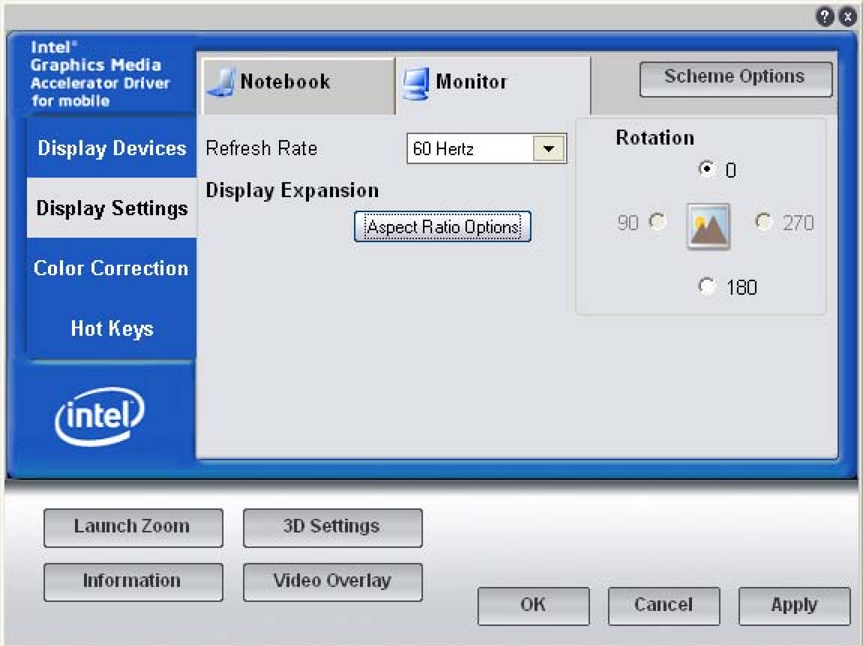
9. Touch [Multiple Display].
10. Touch [OK].
11. The dialog to confirm the changes on the desktop is displayed. Touch [OK].
12. Touch [MD1260A] of the task bar.

When the monitor is disconnected from the monitor output connector, the screen shown in step 8 returns to [Single Display].

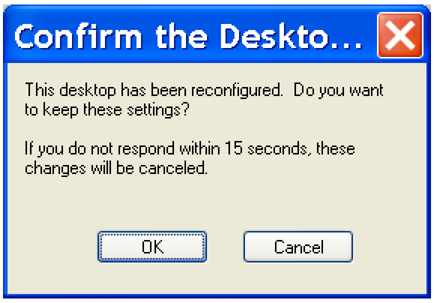
Execute the following procedures if the screen is too long vertically or is distorted.

When an external keyboard is connected, simultaneously press [Alt], [Ctrl], and [F1] on the keyboard to display the screen on the external monitor.
To return to the MD1260A panel display, press [Alt], [Ctrl], and [F3] on the keyboard simultaneously.

1. Touch [Control Panel].
2. Double-click or touch [Intel(R) GMA Driver for Module] twice.
3. Touch [Multiple Display].
4. Touch [Display Setting].
5. Touch the [Monitor] tab.



6. Touch [Aspect Ratio Options] to open a separate window.
7. Touch [Maintain Aspect Ratio].
8. Touch [OK] to close a separate window.
9. Touch [OK].
10. The dialog is displayed to confirm the changed settings on the desktop. Touch [OK].



11. Touch [MD1260A] on the task bar.

2.8 Initializing Transceiver Setting Values to Factory Defaults

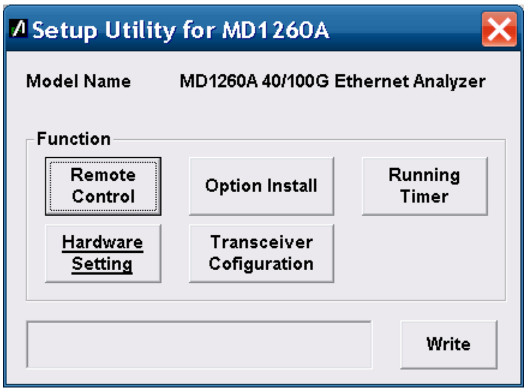
The transceiver settings of the measurement port are saved based on the following installation status.

- When installing 40GBASE-LR4 CFP
- When installing 40GBASE-SR4 CFP
- When installing 100GBASE-LR4 CFP
- When installing 100GBASE-SR10 CFP
- When not installing 40GbE CFP
- When not installing 100GbE CFP
- When measuring OTU4
- When measuring OTU3

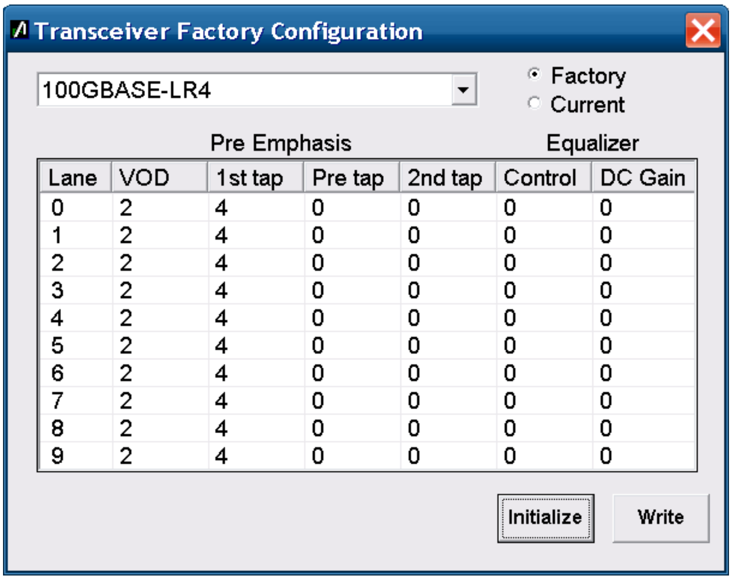
The initial values based on each CFP usage pattern are saved in the non-volatile memory for internal measurement.

The following explains how to initialize the transceiver settings to the factory defaults.

1. Touch the [System Menu] button.
2. Touch [Exit].
3. The message to confirm the measurement end is displayed. Touch the [Yes] button. When closing the application, the Selector screen is displayed.
4. Touch the [Utility] tab.
5. Touch the [Setup Utility] button to start [Security Utility for MD1260A].



6. Touch the [Transceiver Configuration] button to display the dialog box.



7. Touch [Factory] to display the factory defaults.
   To display the latest setting value on the screen operation, touch [Current].
8. Select the item to be initialized from the list box on the upper-left side of the screen.
9. Touch the [Initialize] button.
10. The confirmation message for the setting change is displayed. When touching the [OK] button, the transceiver settings are initialized.
11. Touch the [Write] button to close the dialog box.
12. Touch the [Write] button to close the [Security Utility for MD1260A] screen described at step 5.
    When closing the set-up utility, the setting values are written in the non-volatile memory for internal measurement.

2.9 Synchronizing Time of Multiple MD1260A Units

When latency is measured using several MD1260A units, connect the coaxial cables as follows.

1. Connect the Unit Sync Output connector of the MD1260A rear panel to the Unit Sync Input connector of another MD1260A using a 75-Ω coaxial cable.
2. When using multiple MD1260A units, connect the Unit Sync Output connector and the Unit Sync Input connector using a 75-Ω coaxial cable.
3. If the coaxial cable is connected to the Unit Sync Input connector of the MD1260A, Clock Source on the Clock screen is set to Sync Input after starting the application.

☞ 3.3.3 Clock

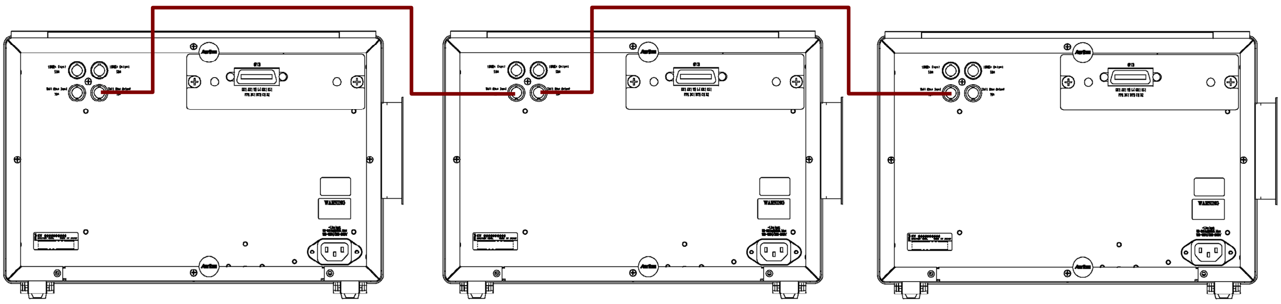


Figure 2.9-1 Connecting Coaxial Cables

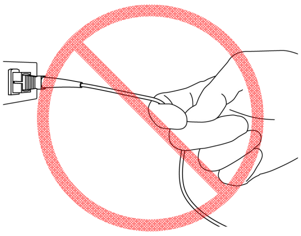
Note:

Latency measurement time is guaranteed when using up to three MD1260A units. Neither the Control Panel date nor time is synchronized.

2.10 Cautions on Handling Optical Fiber Cables

Optical fiber cables may suffer degraded performance or be damaged if handled incorrectly.

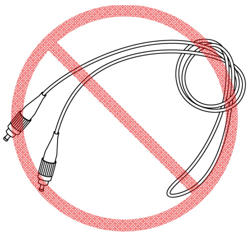
Note the following points when handling them.

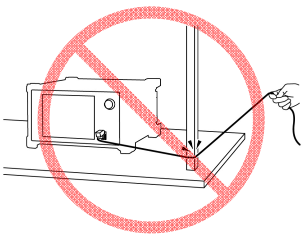


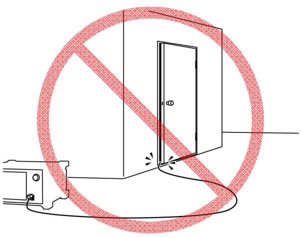
CAUTION

Do not pull the cable when removing the connector.

Doing so may break the optical fiber inside the cable, or remove the cable sheath from the optical connector.







CAUTION

Do not excessively bend, fold, or pinch an optical fiber cable.

Doing so may break the optical fiber inside the cable.
Keep the bend radius of an optical fiber cable at 30 mm or more. If the radius is less, the optical fiber cable loss will be increased.

⚠ CAUTION

Do not excessively pull on or twist an optical fiber cable.

Also, do not hang anything by using a cable. Doing so may break the optical fiber inside the cable.

Chapter 3 Explanation of Application Screen

This chapter explains common parts of each application in the MD1260A screens.

3.1 Loading/Unloading Application

3.1.1 Loading application

After turning on the MD1260A referring to Section 2.4.3 Power-on, the application selection screen (Selector screen) is displayed.

Figure 3.1.1-1 Selector Screen

Table 3.1.1-1 Items of Selector Screen

Name		Explanation
Ethernet Tab		
	40GbE	Analyzes 40GbE PCS layer and performs Ethernet frame TRx ☞ Chapter 4 40GbE/100GbE Application
	40GbE No Frame	Measures No Frame bit errors in 40GbE Physical lanes (4) ☞ Chapter 6 No Frame Application
	100GbE	Analyzes 100GbE PCS layer and performs Ethernet frame TRx ☞ Chapter 4 40GbE/100GbE Application
	100GbE No Frame	Measures No Frame bit errors in 100GbE Physical lanes (10) or PCS lanes (20) ☞ Chapter 6 No Frame Application

Table 3.1.1-1 Items of Selector Screen (Cont'd)

Name		Explanation
OTN tab		
	OTU4	Analyzes OTU4 layer and generates test pattern ☞ Chapter 5 OTU3/OTU4 Application
	OTU4 No Frame	Measures No Frame bit errors in OTU4 Physical lanes (10) and Logical lanes (20) ☞ Chapter 6 No Frame Application
	OTU3	Analyzes OTU3 layer and generates test pattern ☞ Chapter 5 OTU3/OTU4 Application
	OTU3 No Frame	Measures bit error of No frame for Physical lanes (4) of OTU3 ☞ Chapter 6 No Frame Application
Utility		
	Setup Utility	Runs setup utility ☞ 2.8 Initializing Transceiver Setting Values to Factory Defaults
	Self test	Runs self test ☞ 8.3 Self Test
Multi Port		Opens Multiport setting screen ☞ Chapter 7 Multiport Function
Shut down		Turns off MD1260A

When turning on the MD1260A or starting a different application, the start-up time for each application is about 30 seconds; on the other hand, when selecting the same application, the start-up time is about 10 seconds.

Note:

If the supported option is not installed, the button for the application will not be displayed. In this case, the application will not run.

Button Name	Required Option
Ethernet tab	
100GbE 100GbE No Frame	MD1260A-001
40GbE 40GbE No Frame	MD1260A-003
OTN tab	
OTU4 OTU4 No Frame	MD1260A-002
OTU4-100GbE *	MD1260A-005
OTU4-ODTU4.1-ODU0-GbE *	MD1260A-006
OTU4-ODTU4.8-ODU2e-10GbE *	MD1260A-007
OTU3 OTU3 No Frame	MD1260A-004 OTU3 option

*: Touching the OTU4 button allows the selection.

Note:

If the following dialog is displayed at the startup, the main unit set-up is not completed. Upgrade the software, referring to the manuals for upgrading the version.

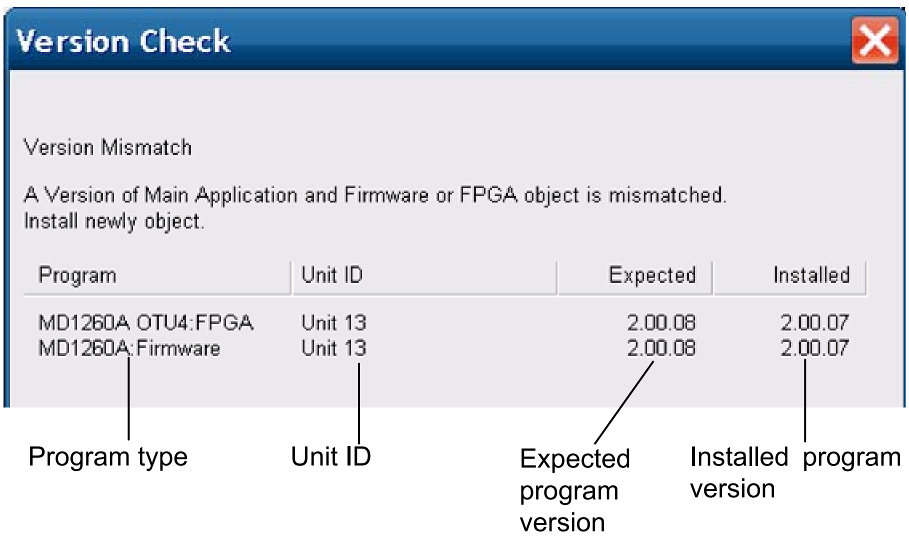


Figure 3.1.1-2 Dialog Indicating Setup Not Completed

3.1.2 Unloading application

1. Touch the [System Menu] button.
2. To unload the application, select [Exit] and touch the [Yes] button. The screen returns to the Selector screen.

3.2 How to Use Application Screen

3.2.1 Screen configuration

This section explains the screen configuration for the 100GbE application.

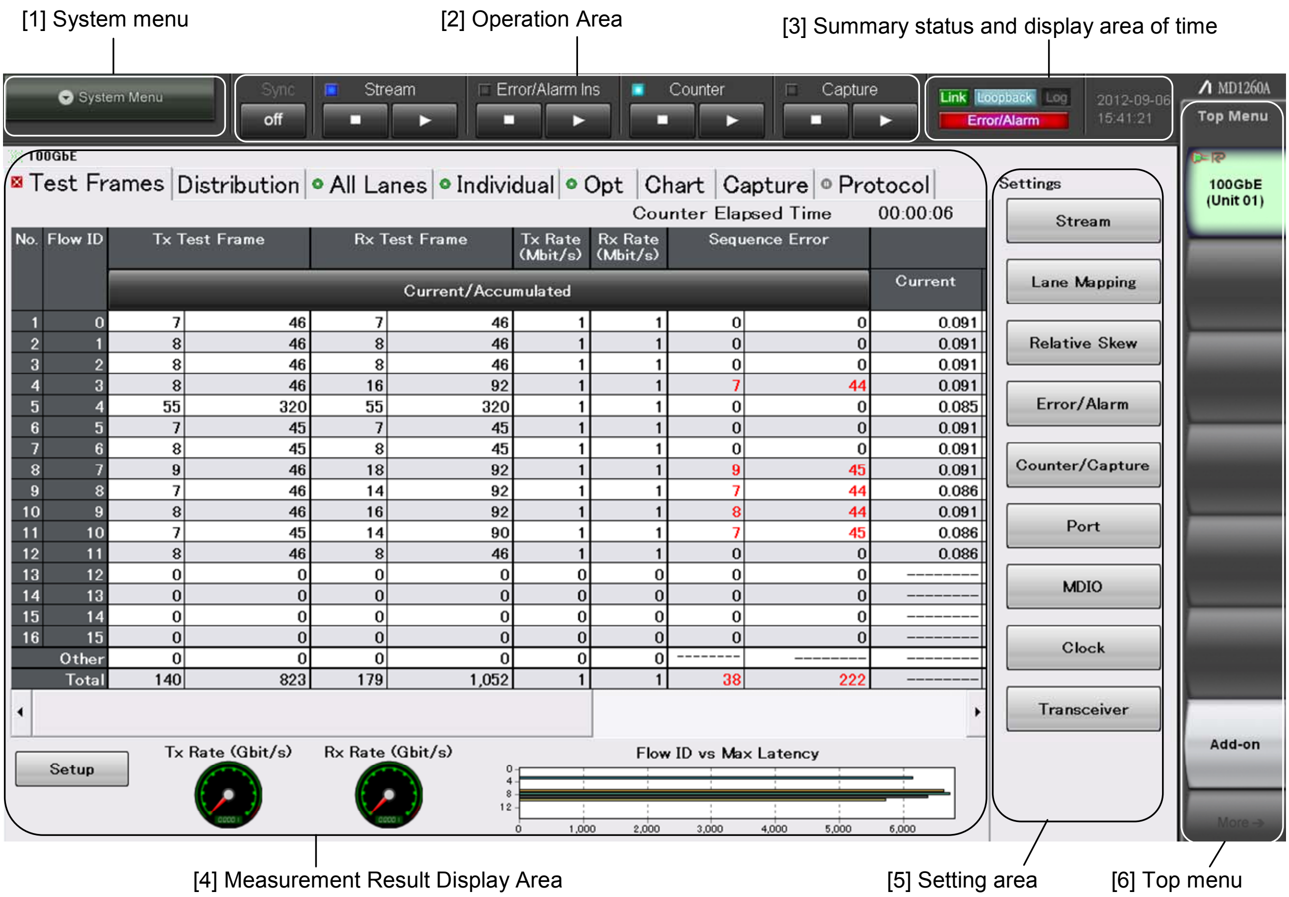


Figure 3.2.1-1 100GbE Application Screen

[1] System Menu
Sets non-measurement functions

3.2.2 System menu

[2] Operation Area
Starts and stops each measurement function

3.2.3 Operation area

[3] Summary status and time Display Area
Displays DUT connection status, operation status, and date/time

3.2.4 Summary status and time display area

[4] Measurement Result Display Area
Displays measurement result

3.2.6 Measurement result display area

[5] Setting Area
Sets operation and each measurement function

[6] Top Menu
Displays name of application

When a slave unit is connected, the controlled unit is selected.

☞ 3.2.7 Top menu

The details about each area are explained in the following sections.

Refer to Section 7.3 Multiport Function Screen Operation for the operation of each area of the multi port function.

3.2.2 System menu

The following items can be set and confirmed using the system menu.

- Saving measurement conditions and measurement results
- Reading measurement conditions
- Saving screen image
- Initializing device settings
- Starting and stopping to save log file of measurement results
- Setting log file
- Record of screen operation
- Setting panel lock
- Enabling panel lock and remote display
- Version display
- Minimizing screen display
- Unloading application

For the system menu operation when performing the multiport function, refer to Section 7.3.2 System menu.

To set the system menu, touch [System Menu] as shown in Figure 3.2.1-1.

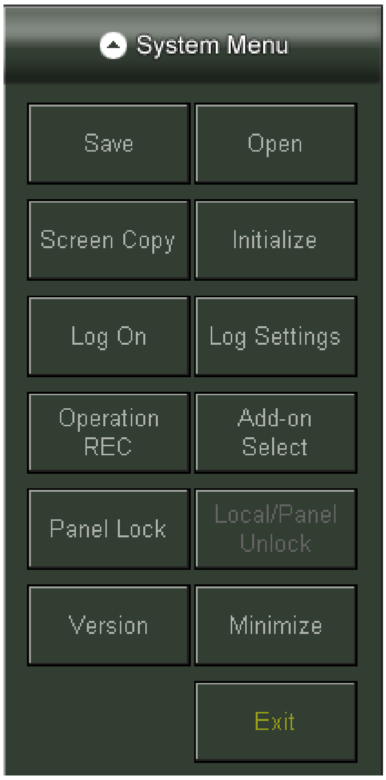
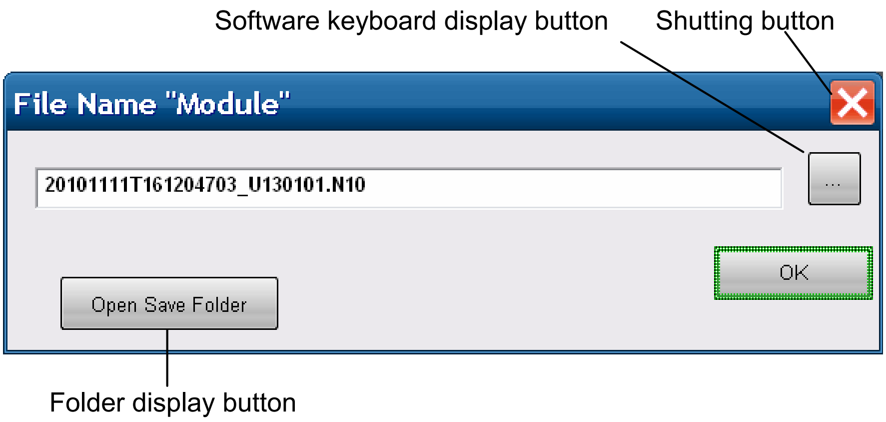


Figure 3.2.2-1 System Menu

Saving measurement conditions and results

1. Touch [Save]. The Save panel is displayed.
2. The data types are selected as follows.
   [Setting] : Measurement conditions
   [Result] : Measurement results
3. The file name is displayed.



4. When changing the displayed file name, touch the keyboard display button. Enter the file name using the software keyboard. Touch [OK] of the software keyboard.
5. When confirming the saving destination folder, touch [Open Save Folder]. The folder display is opened. When the screen is closed, touch the close button.
6. When saving the file name, touch [OK]. Also, when canceling the saving procedures, touch the close button.

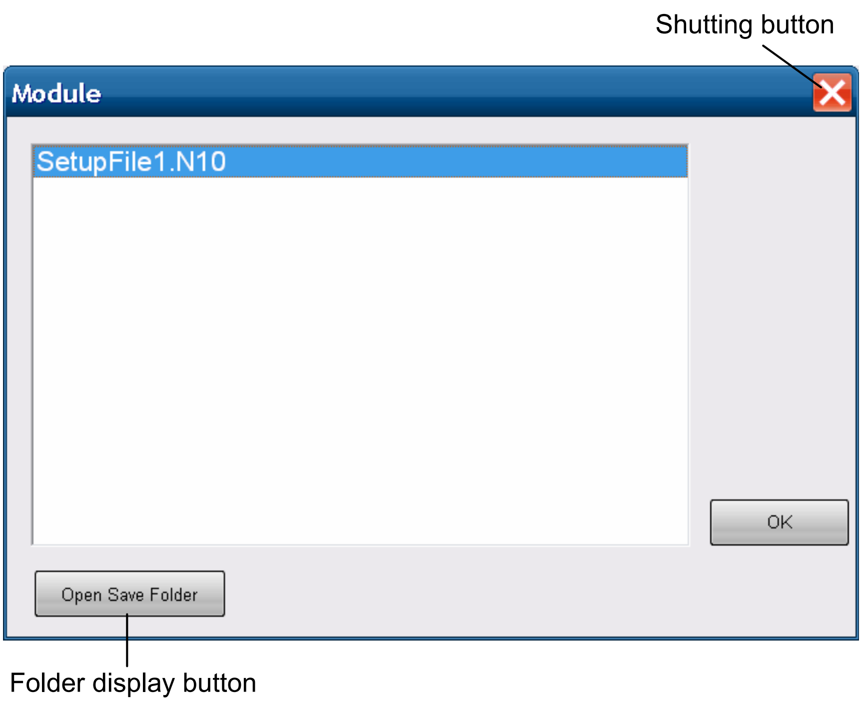
The measurement condition file is saved in the following folder.
C:\ Documents and Settings\Administrator\My Documents
\Anritsu\MD1260A\UserData\Setting

The measurement result file is saved in the following folder.
C:\ Documents and Settings\Administrator\My Documents
\Anritsu\MD1260A\UserData\Result

The measurement results are saved in the PDF and HTML formats.

Reading measurement conditions from the file

1. Touch [Open]. The Open panel is displayed.
2. The file selection screen is displayed.



3. Touch the file name to be read.
   When confirming the saving destination folder, touch [Open Save

Folder]. The folder display is opened. When the screen is closed, touch the close button.

4. When reading the file name, touch [OK]. When canceling reading of the file name, touch [Close].

Saving screen to image file

Touch [Screen Copy] to save the screen image as a file.
The screen file is saved to the following path.
C:\ Documents and Settings\Administrator\My Documents \Anritsu\MD1260A\UserData\Screen Copy

The file name is configured as the date and time.
For example, file 324 saved at 14:14:49 on 21 October 2010 will have the file name 20101021T141449324.png
20101021T141449324.png

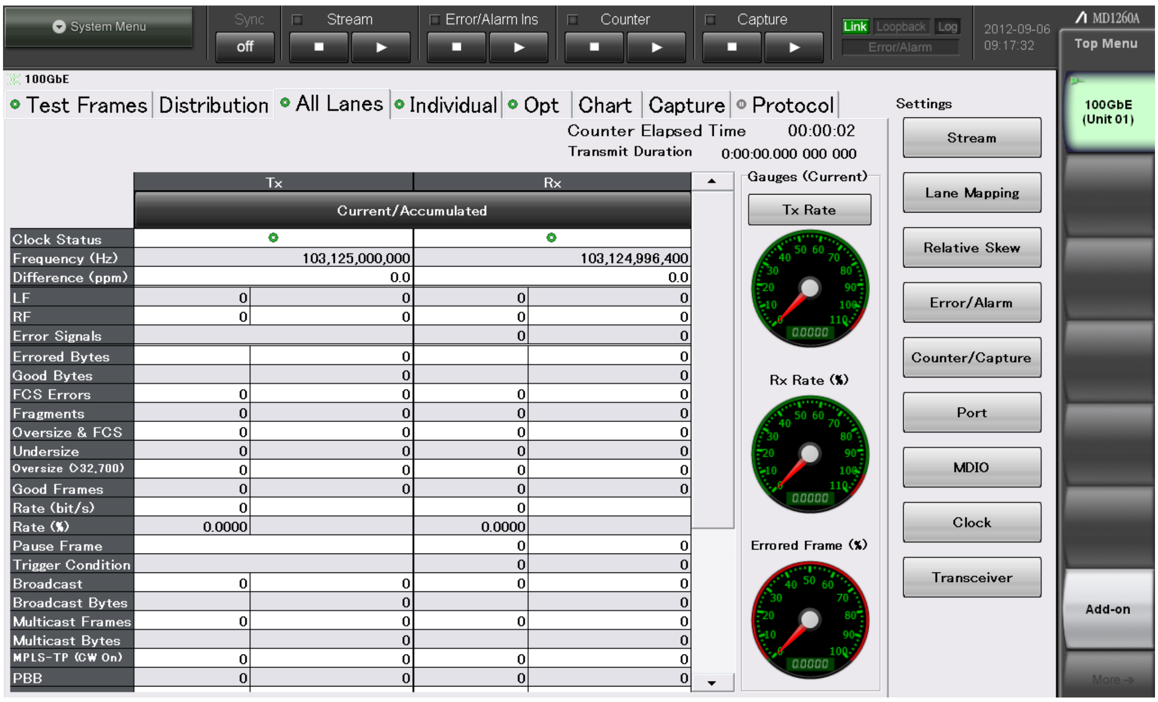


Figure 3.2.2-2 Screen Copy Example

Initializing measurement conditions

A setting in the setting area is backed up.
The setting value is saved even when unloading the application and turning off the main power of MD1260A.
A setting in the setting area can be initialized from the system menu.

1. Touch [Initialize]. Then, the dialog box indicating the initialization process is displayed.

2. Touch [OK] to initialize the measurement condition and touch [Cancel] to stop the initialization.

Refer to Appendix D Initial Setting Values for the value of the initial status.

Note:

Settings not in the setting area, such as [Log Settings] described later, are not initialized.

Saving measurement results to log file

1. To start the log saving function, touch [Log On]. The button display changes to Log Off and the Log lamp of the summary status lights.
2. To stop the log saving function, touch [Log Off].
   The button display changes into Log On and the Log lamp of summary status is turned off.

Displayed during save   Displayed when log not saved

Figure 3.2-3 Log Button Displays

About making new log file

A new log file is made in the following cases.

- When touching the [Log On] button and starting the Log operation
- When the number of lines of the Log file is 65,000 lines or more
- When changing the content of Log Settings while Log is operating

Setting Log Function

The MD1260A log function output details can be set.

1. Touch [Log Setting].
   The screen setting log function is displayed.
2. Touch the [Timing] button and set the timing to save the log.
   [Every 1s] Every 1 second
   [Every 10s] Every 10 seconds
   [Every 1min] Every 1 minute
   [Whenever an error occurs] When error occurs
3. When editing the characters attached to the log file name, touch the [File Prefix] of the text box. The keyboard is displayed. The initial value is Log. The log file name in this case is as follows.

   Log_20100917T095653_U010101_0.csv
4. When displaying the saving destination folder of the log file, touch [Open Folder]. The folder screen is displayed.
   The path to the default save destination folder for the log file is:.
   C:\ Documents and Settings\Administrator\My Documents
   \Anritsu\MD1260A\UserData\Log
5. Touch the button of the saving item. The displayed buttons change with the application. The selected button changes to dark gray.
6. To save the settings of the log file, touch [OK]. To cancel saving, touch [Cancel].

⚠ CAUTION

When the data cannot be output at interval specified by [Log Setting] → [Timing], [Log Drop] is output in the log file character string.

[Log Drop] may be output in the following conditions:

- **Execute the log operation by connecting to 5 or more units using the multi-port function.**
- **Burden the connecting network and screen operation while operating Log.**

Outputting data at error

Select [Whenever an error occurs] at [Timing].
At this time, when an error alarm is observed every second, and the event where the Error/Alarm LED of the summary status area lights occurs, the value of all measurement items is output to the log regardless of the output item setting.

Recording screen operation to file

To support development of programs for remote control, the MD1260A has a function for converting screen settings into remote commands saved as text files.

1. Touch [Operation REC].
   The Operation Record Panel is displayed.
2. To stop recording the screen operation, touch [Stop] in the Operation Record Panel.

Refer to Chapter 4 Operation Record Function in the MD1260A remote control manual for details of the recording file and the operation of the Operation Record Panel.

Setting application of Add-On function

The Add-on function displayed at the top menu is set.
For the explanation of the Add-on function, refer to MD1260A 40/100G Ethernet Analyzer Add-on Function Operation Manual.

1. Touch [Add-on Select].
   The Add-on List dialog is displayed.
2. Select the application and touch [OK].

Locking panel operation

Prohibiting screen operations other than at the System Menu is called [Panel Lock].
At Panel Lock, the screen is locked to prevent operation mistakes during measurements.

1. To lock the panel, touch [Panel Lock].
2. Screens other than the system menu, status display, and date/time display are grayed out.

Although the panel is locked, the system menu and power switch are enabled.
When the panel is locked, the [Local/Panel Unlock] button at the system menu can still be operated.
The panel is locked when the MD1260A measures via remote control.

Unlocking the panel

1. Touch [Local/Panel Unlock].

Minimizing the screen display

1. Touch [Minimize].
   The desk top is displayed and [MD1260A] is displayed on the task bar.
2. To display the screen, touch [MD1260A] on the taskbar.

Displaying the software version

1. Touch [Version]. The following items are displayed on the version screen.
   - Software version (Installer Version)
   - MD1260A serial number (Serial Number)
   - MD1260A running time (Running Timer)
2. To close the screen, touch [OK] on the version screen

Unloading application

1. Touch [Exit]. The dialog is displayed to confirm the application is unloaded.
2. To unload the applications, touch [Yes]. To cancel the unload procedure, touch [No].
3. The selector screen is displayed.

3.2.3 Operation area

Buttons for starting and stopping each measurement function are assigned in the operation area.

Figure 3.2.3-1 Operation Area

When each function is operating, the LED is green. Enabled buttons vary with application. Buttons for prohibited operations are grayed out.

Table 3.2.3-1 Items in Operation Area

Name	Explanation	Initial Status
Sync	The operation can be performed when executing the Multiport function. 7.3.3 Operation area	Off
Stream	Starts and stops sending of Ethernet frames Touching ▶ starts sending; touching the ■ button stops sending. Touch the ▶ button during transmission to restart sending. The contents of transmission frames are edited with the Test Pattern setting screen in the setting area for the 40/100GbE application, and with the Stream setting screen for the OTU4 application. OTU3 application has no setting of transmission frames.	Stop
Error/Alarm Ins	Inserts various error alarms Touching the ▶ button, starts insertion. Touching the ■ button, stops insertion. Also, touching the ▶ button while inserting error/alarms, starts insertion again. The error/alarm insertion item is set at the Error/Alarm setting screen in the setting area.	Stop

Table 3.2.3-1 Items in Operation Area (Cont'd)

Name	Explanation	Initial Status
Counter	The 40/100GbE application saves the received XLGMII data or CGMII data to the memory. The OTU4/3 application saves OH or Frame of the frame to the memory. When touching the button, the counter is started. When touching the button, the counter is stopped. When touching the button during the operation, the counter is started again. The counter operation is set on the Counter setting screen in a setting area.	Start
Capture	Saves received XLGMII data or CGMII data to memory This can be used with the 40/100GbE application. Touching the button, starts capture when the trigger occurs. Capture is stopped when the trigger occurs. Touching the button, stops capture.	Stop

3.2.4 Summary status and time display area

The connection status with DUT, the operation status of the MD1260A, and date/time are displayed.

Figure 3.2.4-1 Summary Status and Time Display Area

Table 3.2.4-1 Items of Summary Status and Time Display Area

Item	Explanation
Link	Lights green when connection status becomes Link Up The following are the conditions to link up: 100 GbE or 40 GbE: The LED of Alignment Status and High BER is displayed in green. 10 GbE: The LED of Sync Header Lock and High BER is displayed in green. GbE: When Auto-Negotiation is set to On: Auto-Negotiation completed, Comma sync completed, Available of data transmission When Auto-Negotiation is set to Off: Comma sync completed, Available of data transmission In the case of the No Frame, and OTU 4/OTU 3 application and mapping of PRBS, the light always turns off.
Loopback	Lights when Loopback mode set
Log	Lights while log function operating The log function is set at the System menu.

Table 3.2.4-1 Items of Summary Status and Time Display Area (Cont'd)

<table>
<tr><th>Item</th><th>Explanation</th></tr>
<tr><td>Error/Alarm</td><td>Lights to red or orange when the error occurs.
<table>
<tr><th>Color</th><th>Explanation</th></tr>
<tr><td>Red</td><td>Lights red (abnormal) for 1 s or more when Rx Error/Alarm count generated or abnormality displayed in CFP tab detected</td></tr>
<tr><td>Orange</td><td>Light orange when red light event occurs after Counter starts
Orange light (history status) goes off Counter button touched</td></tr>
</table>
</td></tr>
<tr><td>(Date/Time display)</td><td>Displays date/time setting at MD1260A
This date/time is output to the file name, etc., for the measurement results.
The date/time can be changed at [Date and Time Properties] of the Windows Control Panel.</td></tr>
</table>

3.2.5 Setting area

The buttons for setting operation and each measurement function are displayed in this setting area.

The buttons displayed in the setting area vary with the application.

Table 3.2.5-1 Button Displayed Setting Area

Button Name \ Application	40GbE	40GbE No Frame	100GbE	100GbE No Frame	OTU4	OTU4 No Frame	OTU3	OTU3 No Frame
Stream	✓	–	✓	–	✓ *1	–	–	–
Lane Mapping	✓	–	✓	–	✓	–	✓	–
Test Pattern	–	✓	–	✓	✓	✓	✓	✓
GFP-T *2	–	–	–	–	✓	–	–	–
TP/TS *3	–	–	–	–	✓	–	–	–
OH Preset	–	–	–	–	✓	–	✓	–
Relative Skew	✓	–	✓	–	✓	–	✓	–
Error/Alarm	✓	✓	✓	✓	✓	✓	✓	✓
Counter	–	✓	–	✓	✓	✓	✓	✓
Counter/Capture	✓	–	✓	–	–	–	–	–
Port	✓	✓	✓	✓	–	✓	–	✓
Port/Clock	–	–	–	–	✓	–	✓	–
MDIO	✓	✓	✓	✓	✓	✓	✓	✓
Clock	✓	✓	✓	✓	–	✓	–	✓
Transceiver	✓	✓	✓	✓	✓	✓	✓	✓

*1: MD1260A-005/006/007

*2: Only for MD1260A-006

*3: MD1260A-006/007

Table 3.2.5-2 Items in Setting Area

Name	Explanation
Stream	Edits the transmitted stream.
Lane Mapping	Sets the assignment of PCS lane, logical lane, or physical lane arbitrarily.
Test Pattern	Sets the details of sending/receiving test pattern
GFP-T	Sets the GFP-T header.
TP/TS	Sets the TP or TS for ODTU4.8/ODTU4.1.
OH Preset	Sets the contents of the OTU4/OTU3 transmission overhead.
Relative Skew	Sets skew per lane
Error/Alarm	Sets error/alarm insertion details
Counter	Sets counter operation
Counter/Capture	Sets counter operation and capture trigger condition
Port	Sets operating status for measurement ports
Port/Clock	Sets the operation status of measurement port, through mode, reference clock, frequency offset of transmission clock, and type of clock to be output to the panel.
MDIO	Sets reading/writing information about MDIO register for data
Clock	Sets reference clock, frequency offset of transmission clock, and clock type output to panel.
Transceiver	Sets following items of transceiver: VOD, Pre-Emphasis, Rx Equalizer

Note:

The screen that is displayed by touching the button in the setting area is hidden in the background when the Measurement Results Display area is touched. The screen hidden in the background can be displayed in the foreground by touching the setting area.

When the setting area screen is hidden, the other setting button is displayed in gray.

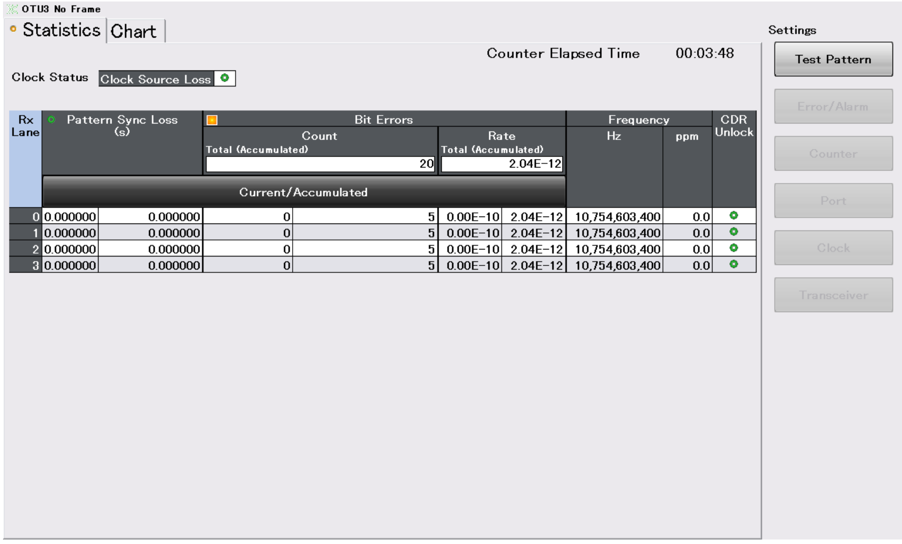


Figure 3.2.5-1 Displayed Example when Setting Area Screen Hidden

3.2.6 Measurement result display area

The measurement result is displayed in the measurement result display area. When there are many measurement items, change the display using the tab. The number and details of the displayed items vary with the application. The displayed items for each application are explained below.

Table 3.2.6-1 Tabs Displayed in Measurement Result Display Area

Tab Name \ Application	40GbE	40GbE No Frame	100GbE	100GbE No Frame	OTU4	OTU4 No Frame	OTU3	OTU3 No Frame
Test Frame	✓	–	✓	–	–	–	–	–
Distribution	✓	–	✓	–	–	–	–	–
All Lanes	✓	–	✓	–	–	–	–	–
Individual	✓	–	✓	–	–	–	–	–
Opt	✓	✓	✓	✓	✓	✓	✓	✓
Chart	✓	✓	✓	✓	✓	✓	✓	✓
Capture	✓	–	✓	–	✓	–	✓	–
Protocol	✓	–	✓	–	–	–	–	–
Summary	–	–	–	–	✓	–	✓	–
Statistics	–	✓	–	✓	✓	✓	✓	✓
Data Monitor	–	–	–	–	✓	–	✓	–
Delay	–	–	–	–	✓	–	✓	–
APS	–	–	–	–	✓	–	✓	–
GFP-T *	–	–	–	–	✓	–	–	–

*: Only for MD1260A-006

Table 3.2.6-2 Items Displayed in Measurement Result Area

<table>
<tr><th>Name</th><th>Explanation</th></tr>
<tr><td>Current</td><td>Displays latest count per second</td></tr>
<tr><td>Accumulated</td><td>Displays total count for period displayed at [Counter Elapsed Time] (elapsed time since Counter pressed)</td></tr>
<tr><td>Tx</td><td>Displays measurement results or status of transmitted frame</td></tr>
<tr><td>Rx</td><td>Displays measurement results or status of received frame</td></tr>
<tr><td>(LED)</td><td>Displays error occurrence status
<table>
<tr><th>Display</th><th>Meaning</th></tr>
<tr><td></td><td>No error occurred</td></tr>
<tr><td></td><td>Error occurred</td></tr>
<tr><td></td><td>Although error occurred, it not generated now</td></tr>
<tr><td></td><td>Measurement not performed</td></tr>
</table>
Red light held for 1 second or more
The orange light (History status) can be reset to off by pressing the Counterbutton.</td></tr>
<tr><td>(Measurement value)</td><td>“--------“ is displayed when the item is invalid.</td></tr>
</table>

The number and details of displayed setting items vary with the application. Each application setting item is explained below.

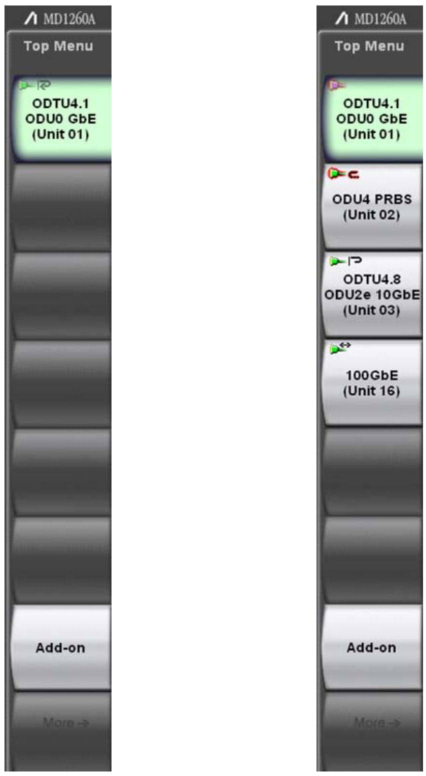
3.2.7 Top menu

The application name to be executed is displayed in the Top menu.

The application name of the Add-on function is displayed at the second-from-bottom of the button.
More buttons are displayed when another MD1260A is controlled using the Multiport function.

☞ 7.3.1 Top menu

MD1260A units connected over Ethernet can be controlled by touching Top Menu buttons.

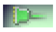


When not starting with Multiport function

When three MD1260A units connected with Multiport function

Figure 3.2.7-1 Example of Top Menu Display

The Top Menu buttons display the Link Up and error status of connected MD1260A units.

 Green: Ethernet application Link Up
Always green for OTN or No Frame applications

 Red background: Error/alarm occurred

 Red: Ethernet Link Down

The following icons are displayed depending on the port setting and whether the Ethernet stream has been transmitted.

Table 3.2.7-1 Display Example for Top Menu

Port Setting	Stream Tx	Stream Rx	Stream Tx/Rx	Stop stream Tx/Rx, Error frame Tx/Rx
Normal	→	←	↔	
Loopback				
Through				

3.3 Common Setting for Application

The common setting items for each application are as follows:

- Loopback On/Off
- Clock Offset frequency
- Clock signal source
- Clock signal source and division rate output at panel
- Transceiver Tx signal waveform
- Transceiver Rx setting

The following setting item is for 40GbE, 100GbE, 40GbE No Frame, and 100GbE No Frame:

- MDIO

3.3.1 Loopback

Loopback is set as follows:

1. Touch [Port] in the setting area.
2. To set the loopback, touch [Mode] and set the button display to [Loopback].
3. To release the loopback, touch [Mode] and set the button display to [Normal].
4. Touch [OK].

When Loopback is set, the Loopback summary status lights.

3.3.2 MDIO

MDIO register of CFP is set and confirmed as follows:

1. Touch [MDIO] in the setting area.
   The MDIO screen is displayed.
2. Touch the Address text box and set the value as a hexadecimal number.
3. To confirm the MDIO register data, touch [Read].
   Data is displayed as a hexadecimal number.
4. To set the MDIO register data, touch the Hex text box.
   Input data as a hexadecimal number.
   Touch [Write].

The CFP information is displayed on the MDIO screen.

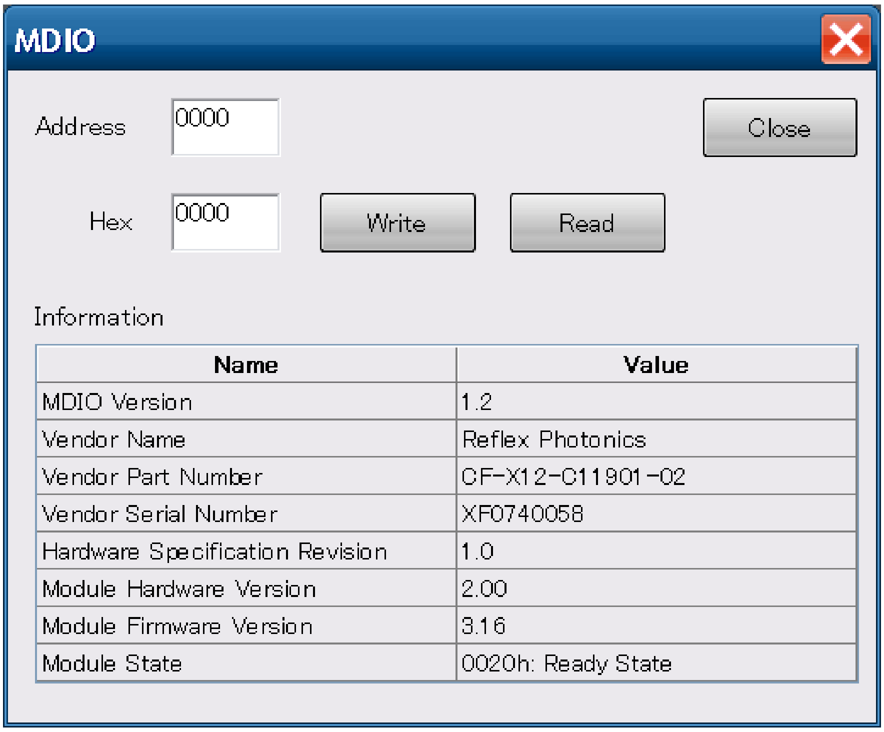


Figure 3.3.2-1 MDIO Screen

3.3.3 Clock

Set the Tx clock details as follows:

1. Touch [Clock] in the setting area.
2. When setting the frequency offset, touch the text box for Frequency Offset and set the value.
3. When changing the clock signal source, touch the button for Clock Source and select the signal source.
4. When changing the clock settings output at the Tx Ref Clock Output terminal, touch the button for Tx Reference Clock Output, and select the division rate.
5. When changing the clock signal source output to the 10 MHz Output terminal l, touch the button for 10 MHz Output and select the signal source.
6. Touch [OK].

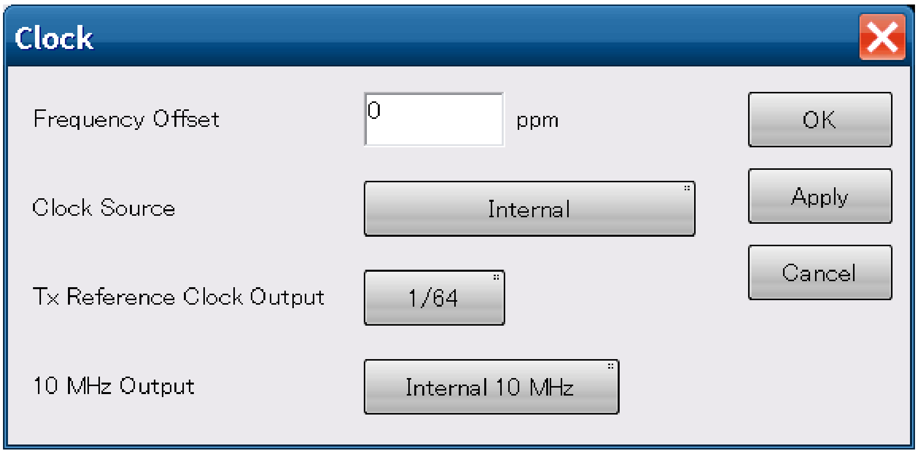


Figure 3.3.3-1 Clock Screen

Table 3.3.3-1 Clock Setting Items

<table>
<tr><th>Name</th><th>Explanation</th></tr>
<tr><td>Frequency Offset</td><td>Transmission clock frequency shift
The offset from the reference clock frequency is set as (–120 to +120 ppm).</td></tr>
<tr><td>Clock Source</td><td>Standard clock setting of transmission clock
The set standard clock varies with the application.
<table>
<tr><th>Application</th><th>40GbE, 100GbE</th><th>OTU3, OTU4</th><th>No Frame</th><th>Signal Source</th></tr>
<tr><td>Internal</td><td>✓</td><td>✓</td><td>✓</td><td>Oscillator in MD1260A</td></tr>
<tr><td>10 MHz Input</td><td>✓</td><td>✓</td><td>✓</td><td>10 MHz Input at rear panel</td></tr>
<tr><td>Tx Reference Clock Input</td><td>✓</td><td>✓</td><td>✓</td><td>Tx Reference Clock Input connector at front panel</td></tr>
<tr><td>Sync Input</td><td>✓</td><td>–</td><td>–</td><td>Unit Sync Input connector at rear panel</td></tr>
<tr><td>Received*</td><td>✓</td><td>✓</td><td>–</td><td>Rx recovery clock of Lane#3 (counting from 0 to 3)</td></tr>
</table></td></tr>
<tr><td>Tx Reference Clock Output</td><td>Rate of transmission clock output to Tx Ref Clock Output connector of front panel
1/16:16 division clock
1/64:64 division clock</td></tr>
<tr><td>10 MHz Output</td><td>Clock signal source output to 10 MHz Output connector of rear panel
[Internal 10 MHz]: 10 MHz clock of internal oscillator in MD1260A
[Locked 10 MHz]: 10 MHz Clock synchronized with measurement transmission signal</td></tr>
</table>

*: When the Loopback mode is selected, Received cannot be selected.

3.3.4 Transceiver

CAUTION

The value of the transceiver is set to the best value at factory shipment. Do not change it unnecessarily. If it is set wrongly, bit errors may occur and communication may fail.

When connecting DUT using MZ1223C 10 Lane Extender

If the transceiver value is changed by mistake, it can be returned to the factory default.

2.8 Initializing Transceiver Settings to Factory Defaults

The data communication speed between the MD1260A and CFP is 10 Gbit/s or more. The communication waveform between the two degrades as shown below.

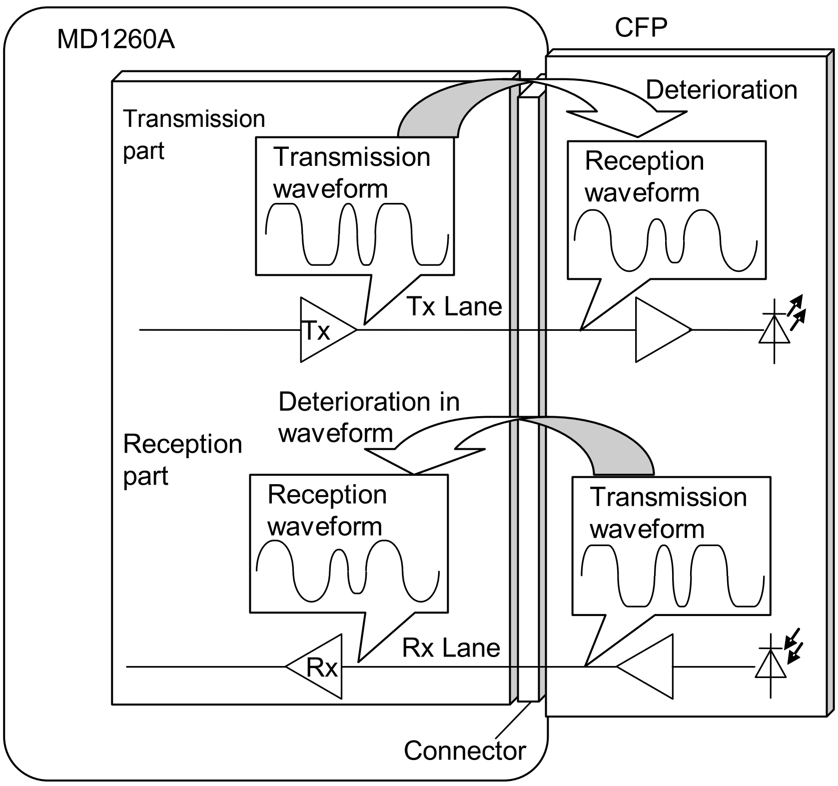


Figure 3.3.4-1 Degraded Waveform at Communication with CFP

It is impossible to measure correctly if the communication waveform is degraded and bit errors occur.

A degraded waveform can be corrected as follows:

- Increase amplitude of Tx signal.
- Increase amplitude at part degraded by communication path (pre-emphasis).
- Amplify frequency element where Rx signal degraded by communication path at Rx side (equalizer).
- Increase sensitivity at Rx side.

Setting transmission part

- Output voltage

  When the CFP module connector load resistance is 100 Ω, (VOD:Voltage Output Differential) can be set.

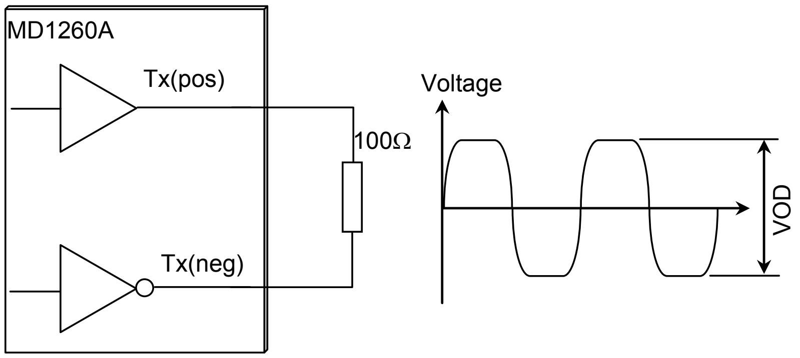


Figure 3.3.4-2 Definition of VOD

- Pre-emphasis

  Three kinds of pre-emphasis can be set.

  Pre-Emphasis First Post Tap
  : Emphasis is applied to the bit where data changes.

  Pre-Emphasis Pre Tap
  : Emphasis is applied to the bit immediately before where the data changes.

  Pre-Emphasis Second Post Tap
  : Emphasis is applied where the bits become consecutive after the data changes.

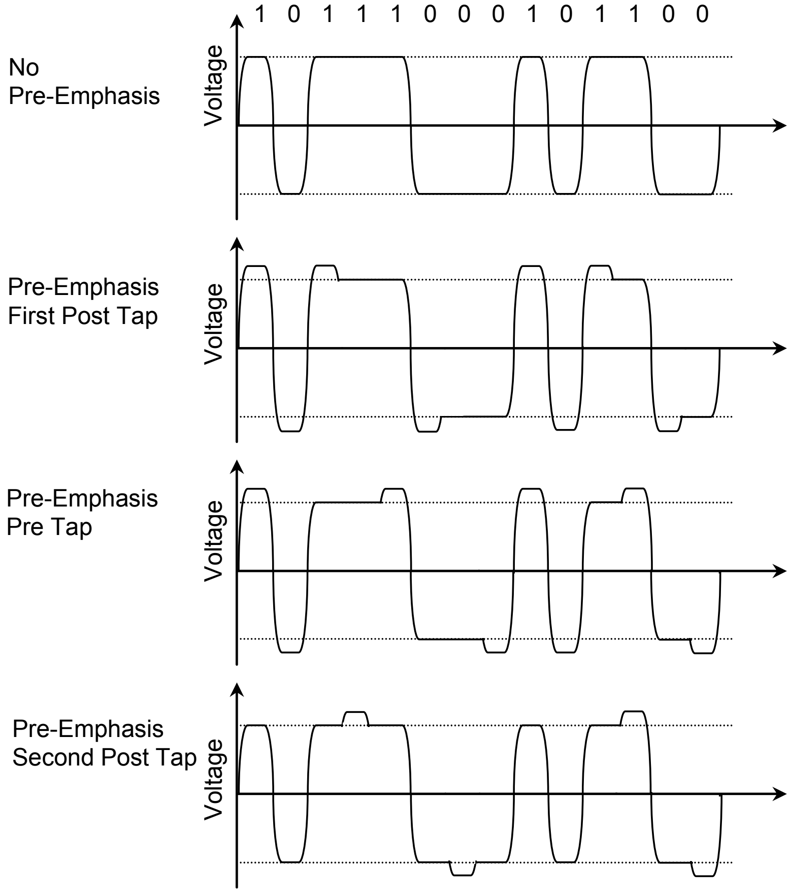


Figure 3.3.4-3 Pre-emphasis Waveform

Setting reception part

- Equalizer

  The gain of the high frequency band for the reception circuit is up to 16 dB (6.3 times).

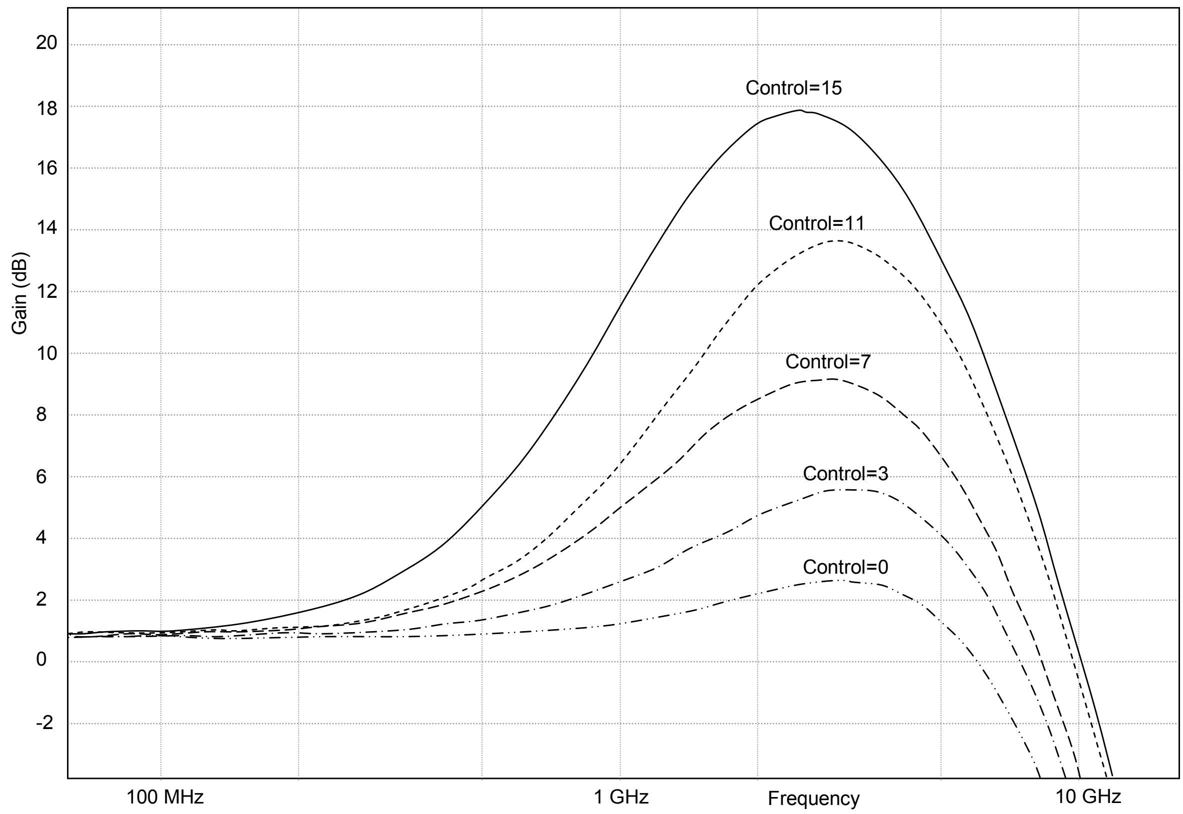


Figure 3.3.4-4 Frequency Response of Equalizer

- Gain

  The gain of the Rx circuit is up to 12 dB (4 times) in 3 dB steps.

The transceiver is set according to the following procedures.

1. Touch [Transceiver] of the setting area. The Transceiver screen is displayed. The count of displayed lanes varies with the application.
2. When setting same value at all lanes, touch the Tracking button for a setting item and set the button display to [On]. The value set at Lane 0 is applied to all lanes.
3. When setting a different value at each lane, touch the Tracking button for a setting item and set the button display to [Off]. Set the value by touching the text box for each lane.
4. Touch [OK].

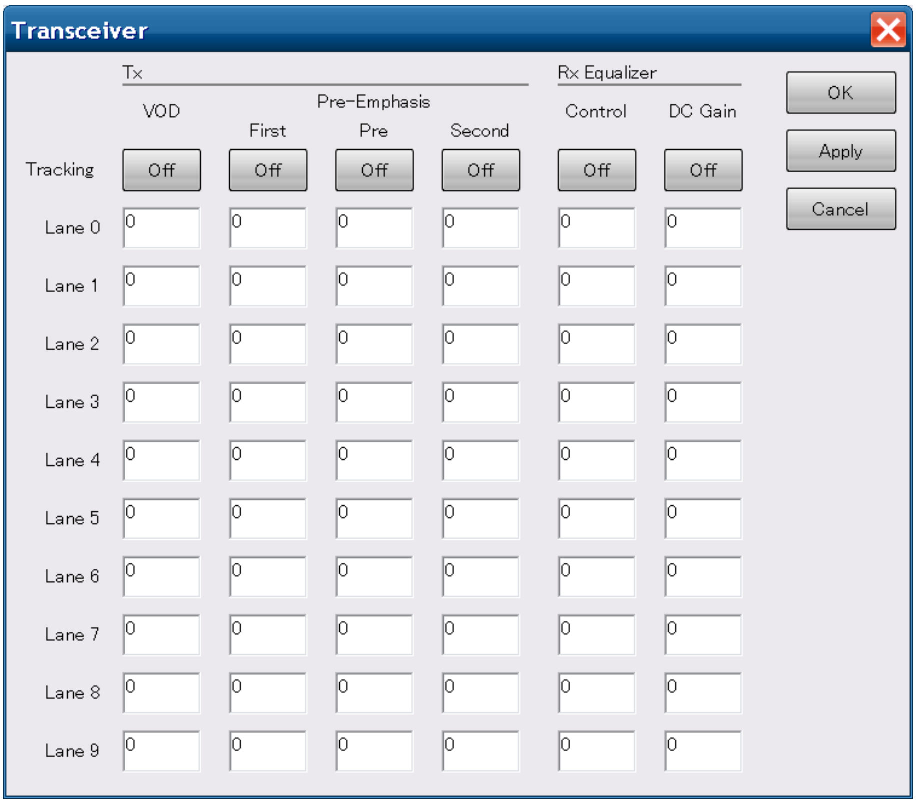


Figure 3.3.4-5　Transceiver Screen (For 100GbE)

The transceiver setting value is saved separately for each installed CFP and not-installed CFP.
The transceiver setting value is never initialized to factory defaults by system initialization or software version upgrades.
Moreover, the transceiver setting value cannot be saved or read using the System menu Save/Open settings.

The following table shows the transceiver settings.

Table 3.3.4-1 Transceiver Settings

Item		Explanation
Tx	VOD (Voltage Output Differential)	Sets VOD value to following (typical value at 100 Ω): 0: 200 mV ±20% 1: 400 mV ±20% 2: 600 mV ±20% 3: 700 mV ±20% 4: 800 mV ±20% 5: 900 mV ±20% 6: 1000 mV ±20%
	Pre-Emphasis First Post Tap	Applies emphasis to bit where data changes Specify a value of 0 to 31*1.
	Pre-Emphasis Pre Tap	Applies emphasis to bit immediately before data changes The value of –15 to +15 (% of VOD) is specified.
	Pre-Emphasis Second Post Tap	Applies emphasis to consecutive bits after data changes The value of –15% to +15 (% of VOD) is specified.
Rx	Equalizer Control	The setting step is 0 to 15*2.
	Equalizer DC Gain	The value of the DC Gain applied to the setting is as follows: 0: 0 dB 1: 3 dB 2: 6 dB 3: 9 dB 4: 12 dB

*1: The amount of the emphasis depends on Table. 3.3.4-2.

*2: For the gain characteristics of the equalizer, see Figure 3. 3. 4-4 "Frequency Response of Equalizer". For the signal of 10.3 to 11.8 GBit/s NRZ (Non Return Zero), the basic frequency is 5.15 to 5.9 GHz.For frequencies around this, the gain characteristics change 1 dB or less per step.Confirm the reception performance and adjust the setting if necessary.

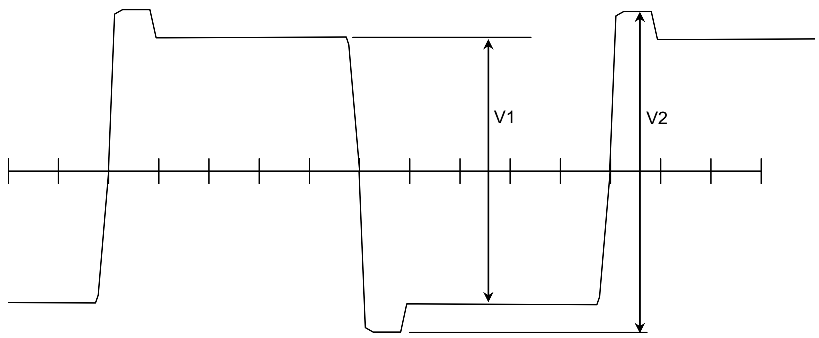
The effective range of pre-emphasis varies with the combination with VOD. Moreover, the effective range of Pre Tap and Second Post Tap varies with the value of Pre-Emphasis First Post Tap.

Table 3.3.4-2 Emphasis Level (dB)

Pre-Emphasis First Post Tap Setting Value	VOD Setting Value						
	0	1	2	3	4	5	6
0	0	0	0	0	0	0	0
1	N/A	0.7	0	0	0	0	0
2	N/A	1	0.3	0	0	0	0
3	N/A	1.5	0.6	0	0	0	0
4	N/A	2	0.7	0.3	0	0	0
5	N/A	2.7	1.2	0.5	0.3	0	0
6	N/A	3.1	1.3	0.8	0.5	0.2	0
7	N/A	3.7	1.8	1.1	0.7	0.4	0.2
8	N/A	4.2	2.1	1.3	0.9	0.6	0.3
9	N/A	4.9	2.4	1.6	1.2	0.8	0.5
10	N/A	5.4	2.8	1.9	1.4	1	0.7
11	N/A	6	3.2	2.2	1.7	1.2	0.9
12	N/A	6.8	3.5	2.6	1.9	1.4	1.1
13	N/A	7.5	3.8	2.8	2.1	1.6	1.2
14	N/A	8.1	4.2	3.1	2.3	1.7	1.3
15	N/A	88	4.5	3.4	2.6	1.9	1.5
16	N/A	N/A	4.9	3.7	2.9	2.2	1.7
17	N/A	N/A	5.3	4	3.1	2.4	1.8
18	N/A	N/A	5.7	4.4	3.4	2.6	2
19	N/A	N/A	6.1	4.7	3.6	2.8	2.2
20	N/A	N/A	6.6	5.1	4	3.1	2.4
21	N/A	N/A	7	5.4	4.3	3.3	2.7
22	N/A	N/A	8	6.1	4.6	3.8	3
23	N/A	N/A	9	6.8	5.4	4.3	3.4
24	N/A	N/A	10	7.6	6	4.8	3.9
25	N/A	N/A	11.4	8.4	6.8	5.4	4.4
26	N/A	N/A	12.6	9.4	7.4	5.9	4.9
27	N/A	N/A	N/A	10.3	8.1	6.4	5.3
28	N/A	N/A	N/A	11.3	8.8	7.1	5.8
29	N/A	N/A	N/A	12.5	9.6	7.7	6.3
30	N/A	N/A	N/A	N/A	11.4	9	7.4
31	N/A	N/A	N/A	N/A	12.9	10	8.2

The emphasis level is the typical value at the bit where the data is changed under the following conditions.

- Bit rate 6.25 Gbit/s
- Pattern with five bits of consecutive 1s and five bits of consecutive 0s



$$Emphasis\_level = 20\log\left(\frac{V2}{V1}\right)$$

For a different bit rate and the pattern, the emphasis level varies according to the values in Table 3.3.4-2.

Chapter 4 40 GbE/100 GbE Applications

This chapter explains the screen layout of the 40 GbE/100 GbE applications and operation method.

4.1 Outline of 40 GbE/100 GbE

This section outlines the 40 GbE/100 GbE processing.

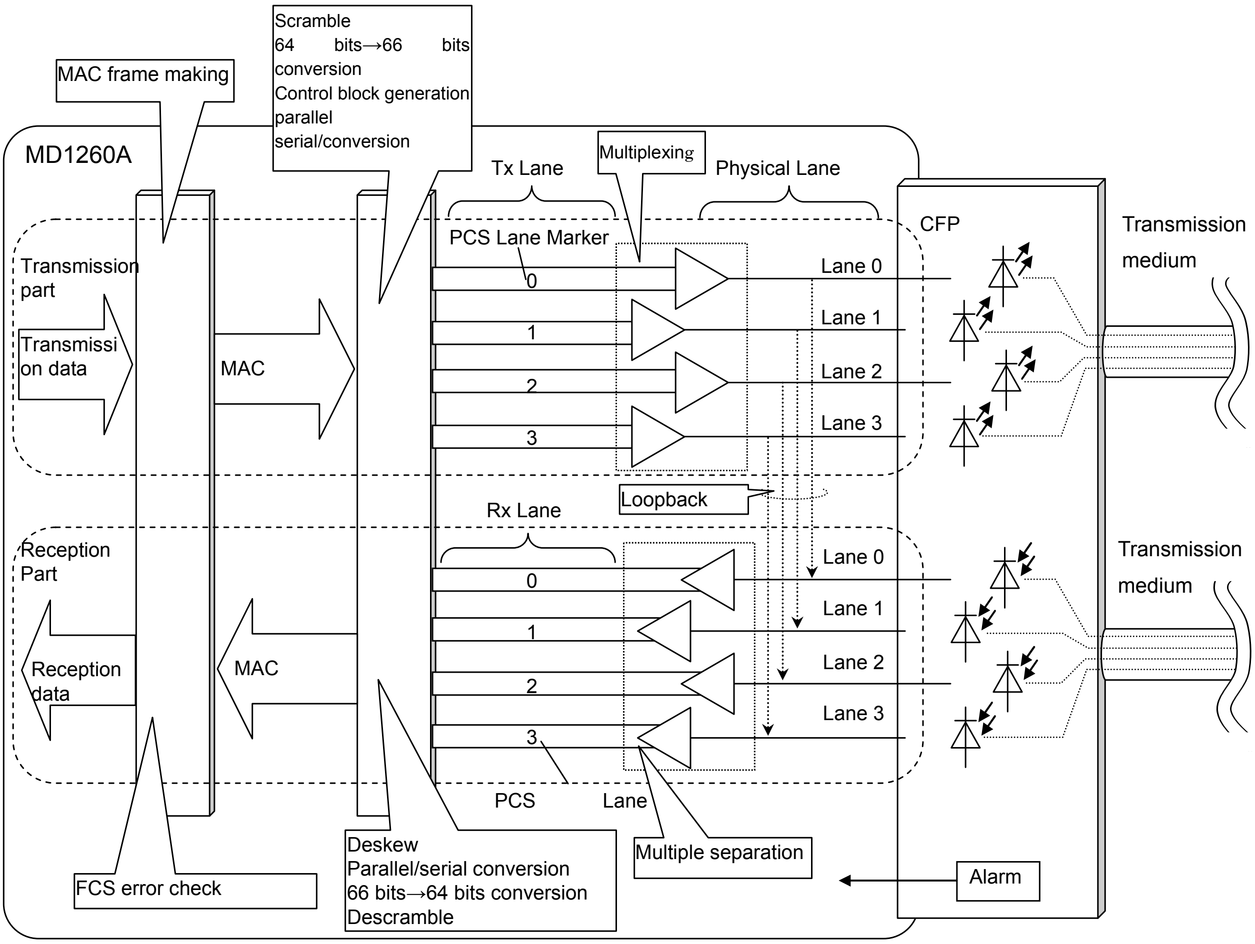


Figure 4.1-1 Flow of 40 GbE Signal

Data is processed in the following order at the transmission part.

1. The MAC header and frame check sequence (FCS) are added to the data to be sent with Ethernet to form the MAC frame.
2. The following operations are performed for the MAC frame.
   - Scramble bit string
   - 64B/66B encoding
   - Serial/parallel conversion (distribution to PCS lanes)
   - Insertion of alignment marker

   The 66-bit data after encoding 64B/66B is called a block.

   At PCS, the 66-bit converted block is split into to two or more communication paths called PCS lanes. There are 4 lanes for 40 GbE and 20 lanes for 100 GbE.

3. The multiplexed signal for the PCS lane is transmitted to the Tx lane for connecting to the CFP. There are 4 Tx lanes for 40 GbE and 10 Tx lanes for 100 GbE. When the transmission signal is loopbacked to the receive part, the transmission part is connected to the receive part with PMA.
4. The signal is sent to the CFP through the CFP connector.
5. The signal is sent from the CFP to the transmission medium.

The data is processed in the reception part in the reverse order of the transmission part.

1. The signal received by CFP from the transmission medium is input to PMA.
2. At PMA, the multiplexed signal is split per PCS lane.
3. At PCS, the following operation is performed.
   - Deskew (The time difference of the signal between lanes is removed and the signal timing is arranged)
   - Serial/parallel conversion
   - Removal of alignment markers
   - Descramble
   - 66B/64B multiplexed
4. At MAC, the FCS of the Ethernet frame is confirmed and the presence of errors is detected. The MAC header and FCS of the Ethernet frame with no errors is removed, and the received Ethernet data is output.

For Ethernet, the MDIO register manages hardware status. MDIO register is built into CFP.

The format of the Ethernet frame is shown below.

←Preamble Size→	←			Frame Size		→	← Gap Size →
55 55 55 55 55 55 55	D5 (SFD)	Destination MAC Address	Source MAC Address	Ethernet Type	Data Field	FCS	
7 byte	1 byte	6 byte	6 byte	2 byte		4 byte	

Figure 4.1-2 Format of Ethernet Frame

The format of the 66B block is shown below.

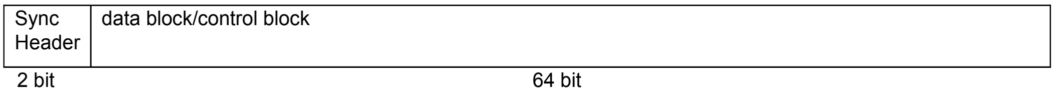


Figure 4.1-3 Format of Block

The block types are identified by the Sync Header.

Table 4.1-1 Block Types

Bit of Sync Header	Content of 64 bits	Remarks
00	—	Error block
01	Data block	
10	Control block	
11	—	Error block

4.2 Setting Transmission Data

The 40 GbE/100 GbE applications can edit the stream sent from the MD1260A and set the method for sending skew data, flow control, etc. The stream is a group of data meeting certain conditions, such as the interframe gap, MAC header, payload, etc.

4.2.1 Skew

Insert skew in each lane as follows:

1. Touch [Relative Skew] at the setting area.
2. Touch the Skew text box and set the amount of the skew in bits. The set skew is displayed.
3. For 100 GbE, touch the button for Lane and set the position where the skew is inserted.
4. Touch the button for the lane number where skew is inserted so the button becomes dark gray.

   Touching [All On] inserts skew in all lanes.
   Touching [All Off] does not insert skew.
5. Touch [OK].

Figure 4.2.1-1 Relative Skew Screen (100 GbE)

4.2.2 LFS Reply

Perform the following operations to set the LFS (Link Fault Signaling) Reply.

- When receiving local failure signal (LF)
  The remote failure signal (RF) is sent to notify other equipment of the problem occurrence.
- When receiving remote failure signal
  The IDLE pattern is sent.

Set the LFS Reply as follows:

1. Touch [Port] at the setting area.
2. Touch the button for LFS Reply to display it in dark gray.
3. Touch [OK].

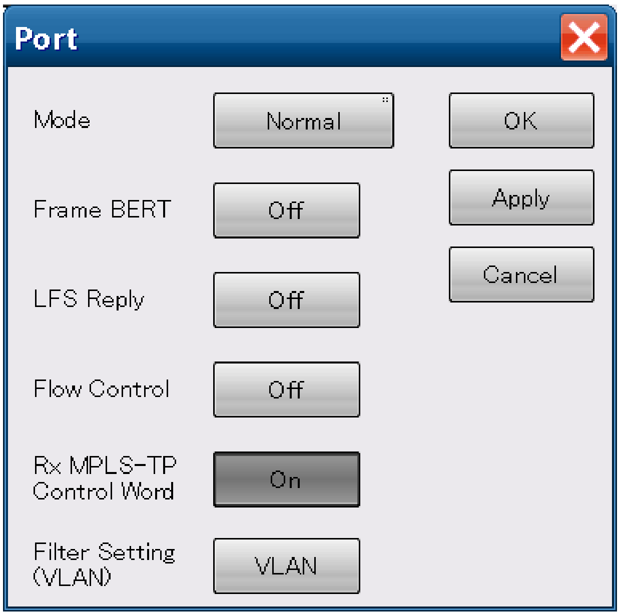


Figure 4.2.2-1 Port Screen

4.2.3 Flow Control

Set the Flow Control to control the data transmission after receiving the Pause Frame as follows:

1. Touch [Port] at the setting area.
2. Touch the button for Flow Control to display it in dark gray.
3. Touch [OK].

4.2.4 Editing two or more streams

The MD1260A can generate up to 16 streams.

The generation rate and test frame for each stream can be set when editing two or more streams.

To edit multiple streams, open the Stream screen as follows:

1. Touch [Port] at the setting area.
2. Touch the button for Frame BERT to set display to [Off].
3. Touch [OK].
4. Touch [Stream] at the setting area.

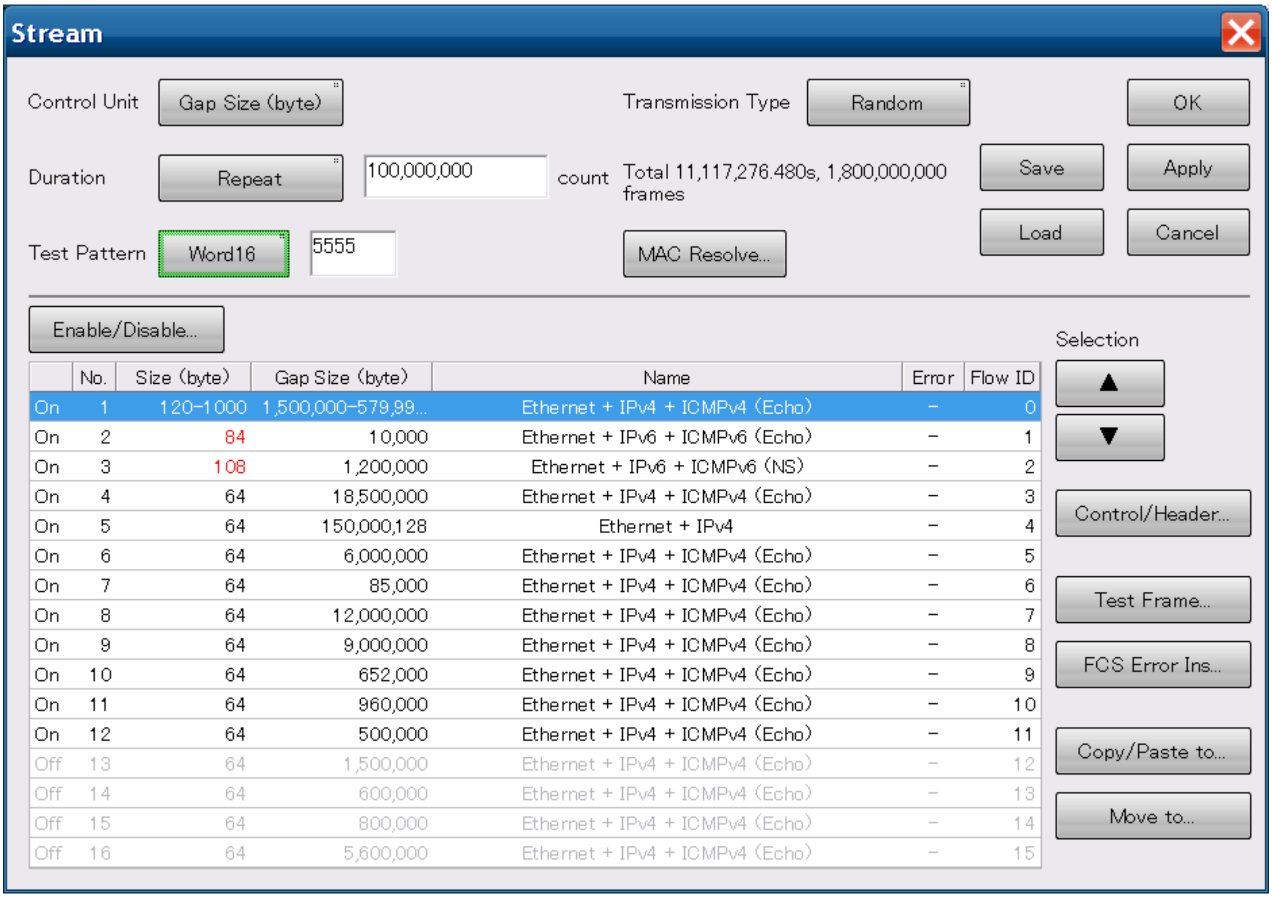


Figure 4.2.4-1 Stream Screen

Table 4.2.4-1 Stream Screen Setting Items

Name	Explanation
Control Unit	Selects stream unit as follows: [Gap Size (byte)], [Rate (%)], [Rate (fps)], [Rate (Gbit/s)], [Interval (s)] The total load for all streams is displayed as Rate (%), Rate (fps), and Rate (Gbit/s).
Duration	Specifies frame transmission time [Continuous]: Sends frames continuously [Time]: Stops after sending frame for set time period The sending time can be set from 1 to 600 seconds. The number of frames sent in the set time is displayed. [Repeat]: Stops after sending specified number of streams The frame count can be specified from 1 to 1,099,511,627,775. The sending time and number of streams are displayed.
Test Pattern	Sets pattern of frame data as follows: [All 0], [All 1], [Word16], [PRBS31] At Word16, the 16-bit pattern is set as a hexadecimal number. The pattern is this repetition of 16 bits.
Transmission Type	Sets stream transmission order [Sequence]: Sends stream repeatedly from smallest number over [Random]: Sends stream randomly
MAC Resolve	Specifies Destination IP Address or Gateway IP Address, and sets Destination MAC Address of the stream by ARP/NDP Protocol. It is displayed when one or more streams are On for transmission and include IPv4 or IPv6 in frame format.
Save	Saves the stream setting to the file.
Load	Reads out the stream setting from the file.
Enable/Disable	Sets transmission of 16 streams on/off.
Control/Header	Sets MAC header, frame size, and interframe gap of stream, etc. Refer to Table 4.2-2 and Table 4.2-3 for the settings.
Test Frame	Sets test frame Refer to Section 4.3.1 “Test frame”.
FCS Error Insertion	Sets FCS error inserted in stream.
Selection	Selects Control/Header of stream to edit
Control/Header	Sets MAC header, frame size, and interframe gap of stream, etc. Refer to Table 4.2-2 and Table 4.2-3 for the settings
Copy/Paste to	Copies currently selected stream setting contents to other streams
Move to	Replaces currently selected stream number with number of another stream

Table 4.2.4-1 Stream Screen Setting Items (Cont'd)

Name	Explanation
(Table of stream)	On/Off: Sets stream transmission The stream is transmitted when On is displayed. No.: Number of stream Size: Frame size of stream When the frame size is changed because the frame configuration has been edited in "Editing Frame Format" (Page 4-17), it is displayed in a red color. Gap Size (byte): Interframe gap size of stream * Rate (%), Rate (fps), Rate (Gbit/s) : Stream frame rate * When two or more streams are set to On and the total of rates exceeds 100%, it is displayed in a red color. Interval: Time interval between stream frames * Name: Stream name Set the stream name at the Stream Control/Header screen. Error: FCS error occurrence – is displayed when no error is inserted. Flow ID: Flow number for identifying the test frame

*: The same unit as Control Unit setting is displayed.

Setting Stream Generation Method

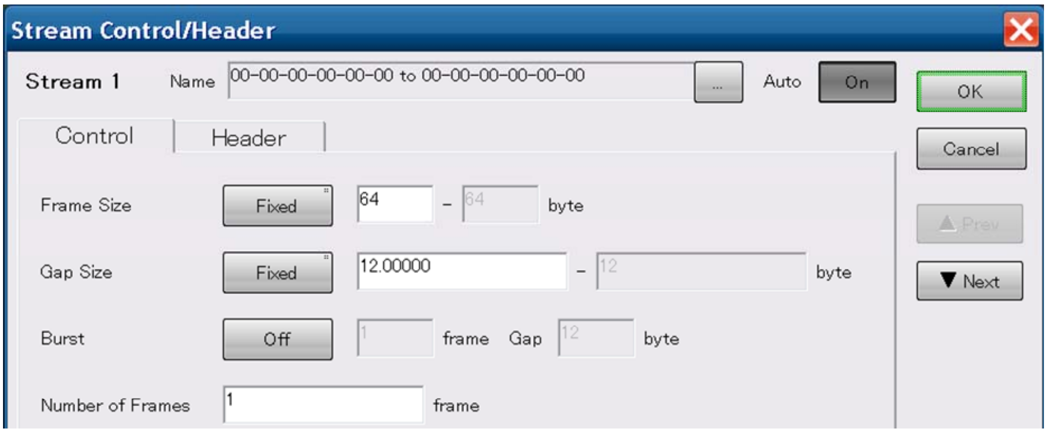


Figure 4.2.4-2　Control/Header Screen Control Tab (when Control Unit is Gap Size)

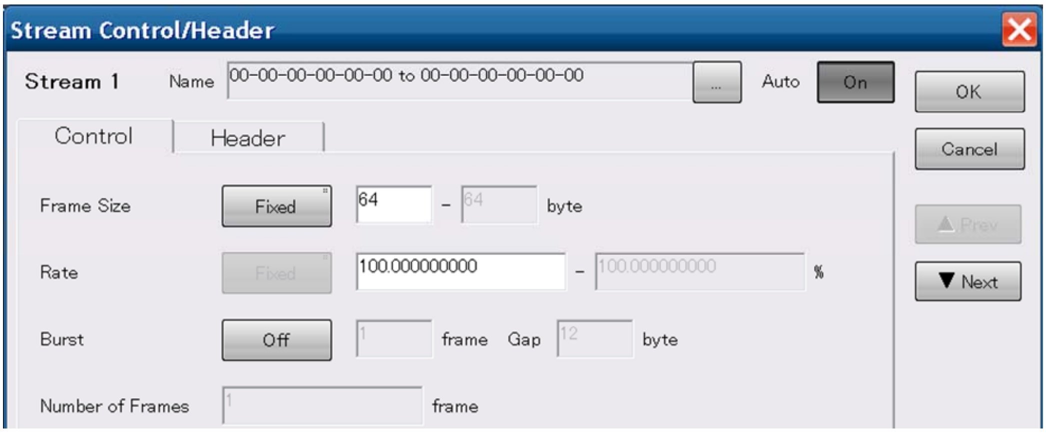


Figure 4.2.4-3　Control/Header Screen Control Tab (when Control Unit is Rate(%))

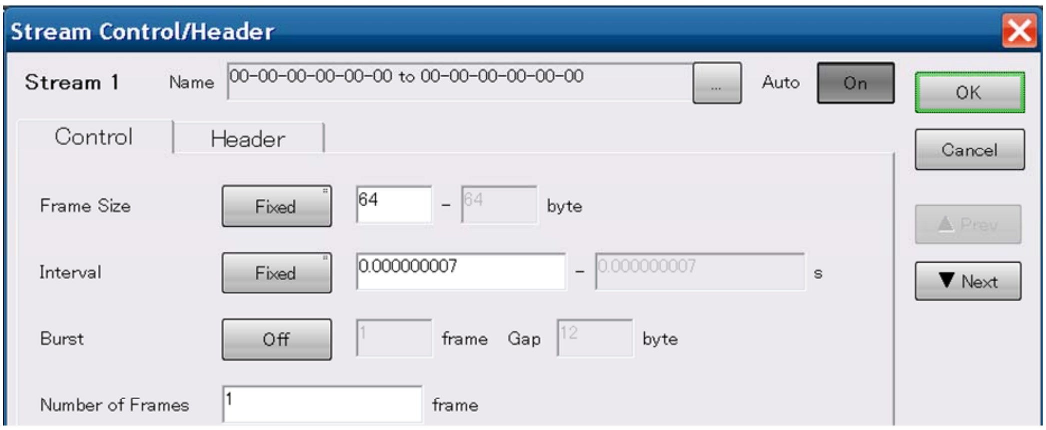
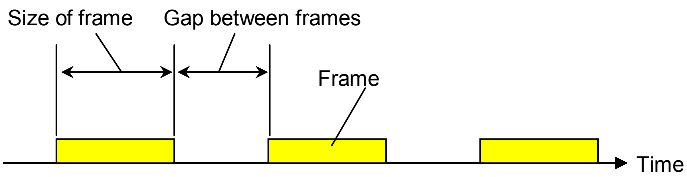


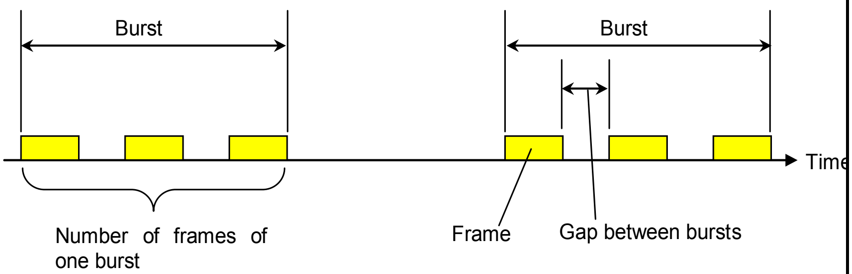
Figure 4.2.4-4　Control/Header Screen Control Tab (when Control Unit is Interval (s))

Table 4.2.4-2 Control Tab Setting Items

Name	Explanation
Name	Sets stream name When the Auto button is set to [On], the name is automatically set. When the frame configuration is [Custom Header] and [Ethernet], the source MAC address and destination MAC address are displayed. For other frame configurations, the combination of header names is displayed.
Frame Size	Sets size of sent frame (60 to 32,700 bytes) [Fixed]: Transmits set size [Random]: Transmits frame size within setting range at random As a result of the frame configuration edit in "Editing Frame Format" (Page 4-17), the required header size may exceed the value set here.In that case, the priority is placed on the header size, and this setting is ignored.Also the numbers in Size column in Figure 4.2.4-1 Stream Screen are displayed in a red color.
Gap Size	Displayed when the control panel of the stream screen is set to [Gap Size]. Sets interframe gap between sent frames in byte unit The minimum gap is 9 bytes*1. Moreover, a gap of about 120 seconds can be specified as the maximum. [Fixed]: Sets fixed gap size [Random]: Sets random gap size within specified range When a decimal is specified, the frame is sent to become the gap size specified by the average. For example, to set 16.5 bytes as a multiple of 8, a gap size of 16 and 24 bytes is transmitted at a ratio 15:1 to become an average gap size of 16.5 bytes. 

*1: When a value exceeding 16,000 bytes is specified for [Frame Size], the minimum value of [Gap Size] becomes 10 bytes.

Table 4.2.4-2　Control Tab Setting Items (Cont'd)

Name	Explanation
Rate	Displayed when the control unit of the stream screen is [Rate (%)], [Rate (fps)] or [Rate (Gbit/s)]. Sets interframe gap between sent frames in sending speed [Fixed] : Sets fixed gap size [Random] *2: Sets random gap size within specified range For 40 GbE: $Rate(\%) = 100 \times \frac{\text{Preamble} + \text{GapMin} + \text{Frame\_size}}{\text{Preamble} + \text{Gap\_size} + \text{Frame\_size}}$ Preamble=8 (Bytes), GapMin=12 (Bytes)
Interval	Displayed when the control unit of the stream screen is [Interval(s)]. Sets interframe gap between sent frames in time unit The time for the gap size in 1 byte is as follows. 40 GbE:0.2 ns, 100 GbE:0.08 ns [Fixed]: Sets fixed gap size [Random]: Sets random gap size within specified range
Burst	Sets condition when burst frame generated [On]: Generates burst frame The number of frames in the burst and the gap between gaps are set.  If the gap between bursts are increased, the upper value of rate to be set will be decreased. [Off]: Does not generate burst frame
Number of Frames	Displayed when Burst Off Sets number of frames in stream*3
Number of Burst	Displayed when Burst On Sets number of bursts in stream

*2:　In the following cases, [Random] cannot be selected.
The control unit is set to [Rate (%)], [Rate (fps)], or [Rate (Gbit/s)], and there are two or more streams set to Enable.

*3:　In the following cases, the value of Number of Frames cannot be entered.
The control unit is set to [Rate (%)], [Rate (fps)], or [Rate (Gbit/s)], and there are two or more streams set to Enable.

Touching [▲Prev.] or [▲Next] changes the stream to be edited.

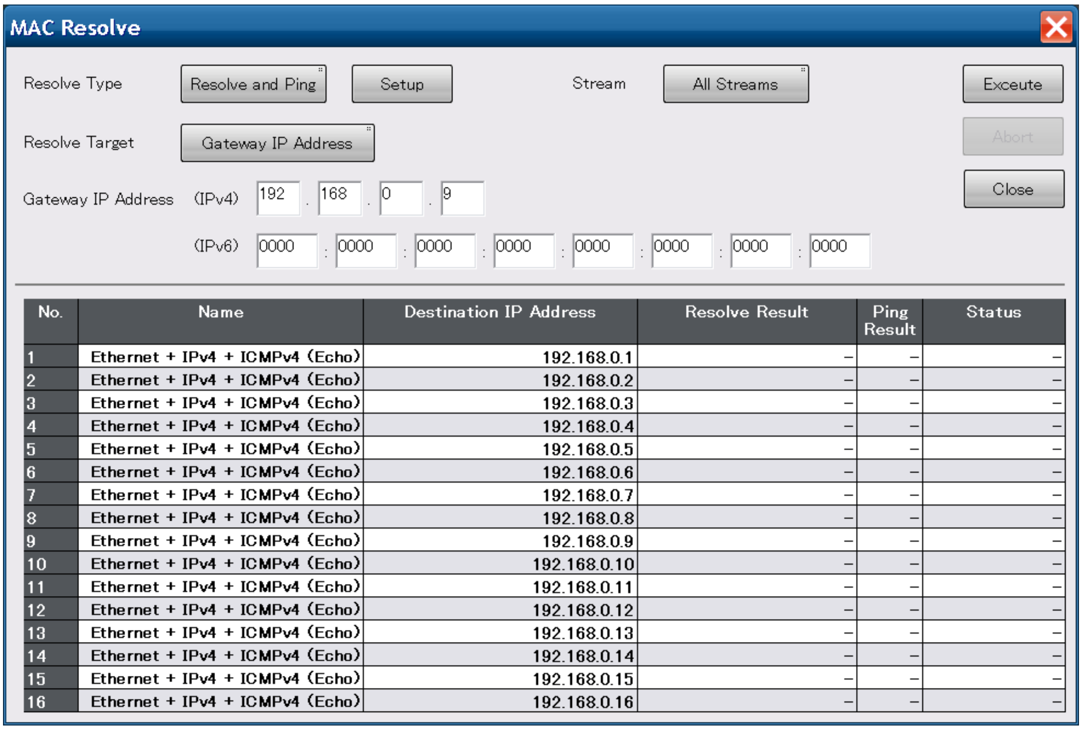
MAC Address Resolution

When the frame format meets all the conditions below, the MAC Address can be resolved from the IP Address.

- It does not include MPLS-TP, PBB, or MPLS-IP.
- It includes IPv4 or IPv6.

Touching [MAC Resolve] in Figure 4.2.4-1 Stream Screen displays MAC Resolve screen.

The protocols to resolve MAC address are ARP and NDP for the protocols in the frame format IPv4 and IPv6 respectively.



No.	Name	Destination IP Address	Resolve Result	Ping Result	Status
1	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.1	–	–	–
2	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.2	–	–	–
3	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.3	–	–	–
4	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.4	–	–	–
5	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.5	–	–	–
6	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.6	–	–	–
7	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.7	–	–	–
8	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.8	–	–	–
9	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.9	–	–	–
10	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.10	–	–	–
11	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.11	–	–	–
12	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.12	–	–	–
13	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.13	–	–	–
14	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.14	–	–	–
15	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.15	–	–	–
16	Ethernet + IPv4 + ICMPv4 (Echo)	192.168.0.16	–	–	–

Figure 4.2.4-5 MAC Resolve Screen

Table 4.2.4-3 MAC Resolve Screen Setting Items

Name	Explanation
Resolve Type	Selects the type of address resolutions. Resolve Only: Only MAC Address Resolution is executed. Resolve and Ping: Both MAC Address Resolution and Ping are executed. Ping Only: Only Ping is executed.
Setup	Displays Figure 4.2.4-6 "MAC Resolve Setup screen".
Stream	Displays MAC Resolve Stream screen. Stream 1 to Stream 16: Selects one or more streams as a target of address resolution. The streams below cannot be selected. The streams that are Off for transmission in Figure 4.2.4-1 Stream Screen. The streams that do not include IPv4 or IPv6 in frame format. All Streams: Selects all the selectable streams. IPv4 All Streams: Selects all the selectable streams with IPv4 as Destination IP Address. IPv6 All Streams: Selects all the selectable streams with IPv6 as Destination IP Address.
Resolve Target	Selects IP address to get MAC address. Destination IP Address: Destination IP address set for a stream. Gateway IP Address: IP address set for Gateway IP Address. The same Destination MAC Address is set to all the streams.
Gateway IP Address	Sets IP Address when Gateway IP Address is selected for Resolve Target.
Execute	Executes Address Resolution and/or Ping. The results are displayed in the field of Resolve Result and/or Ping Result.
Abort	Aborts Address Resolution or Ping. The results in the field of Resolve Result and/or Ping Result are deleted.
Close	Closes MAC Resolve screen. The resolved MAC Address is set as Destination MAC Address.
Name	Stream name.
Destination IP Address	IP address used for address resolution. The streams on which address resolution will not be executed are marked "—."
Resolve Result	Resolved MAC Address The streams on which address resolution will not be executed, or was executed but the addresses left unresolved, or has not been executed yet are all marked "—."
Ping Result	Number of Ping Reply times/Ping execution times

Table 4.2.4-3 MAC Resolve Screen Setting Items (Cont'd)

	Explanation
Status	Address resolution or Ping execution status is displayed. Unresolved: Address resolution not executed yet. Solving: Address resolution on progress. Done: Address resolution completed with success, or Ping Reply received. Resolve Failure: Address resolution failed. Aborted: Address resolution or Ping Reply aborted. Pinging: Ping on progress. Ping Failure: No Ping Reply received.

Destination MAC Address is not updated for the streams with unresolved addresses.
If touch [Abort] and then [Close], Destination MAC Address of the stream will not be updated.

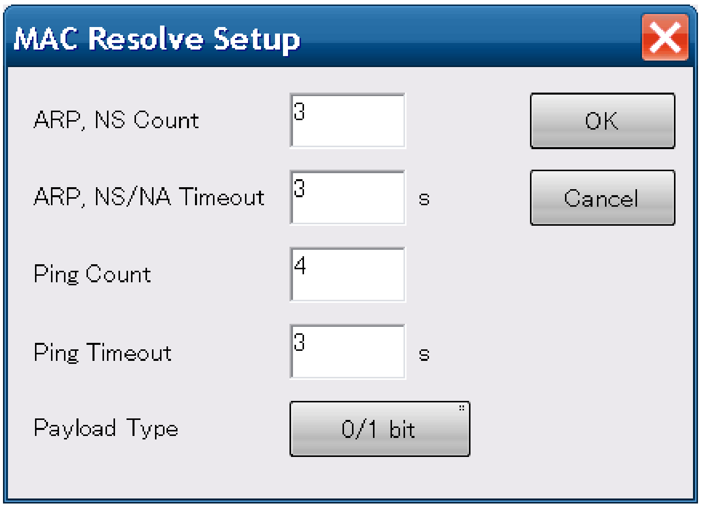


Figure 4.2.4-6 MAC Resolve Setup Screen

Table 4.2.4-4 MAC Resolve Setup Screen Setting Items

Name	Explanation
ARP,NS Count	The number of retries to send ARP or NS.
ARP,NS/NA Timeout	Timeout (second) of ARP or NS/NA.
Ping Count	The number of retries to send Ping.
Ping Timeout	Ping timeout (second).
Payload Type	Payload type of Ping packet. 0/1 bit:Repetitive pattern of bit0 and bit1. All0: All bits are 0s. All1: All bits are 1s.

Editing the Header

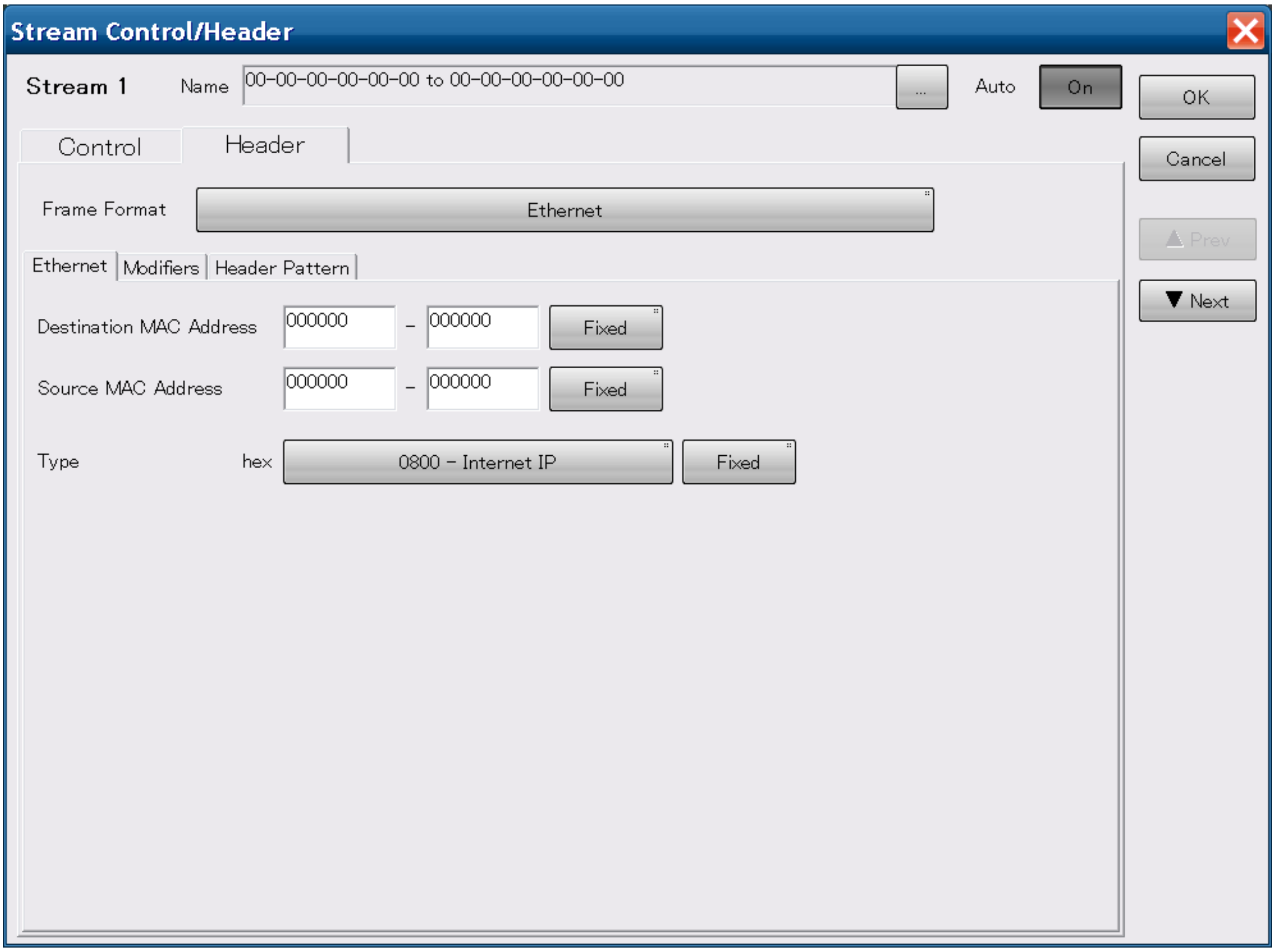


Figure 4.2.4-7　Stream Control/Header Screen Header Tab

Table 4.2.4-5　Setting Items of Header Tab

Name	Explanation
Frame Format	Opens the dialog to open the frame configuration screen.
Tab	Displays the tabs below depending on the frame configurations Ethernet, Header Pattern, IPv4, IPv6, Modifiers, MPLS, MPLS-TP, and PBB, ARP, ICMPv4, ICMPv6

Editing Frame Format

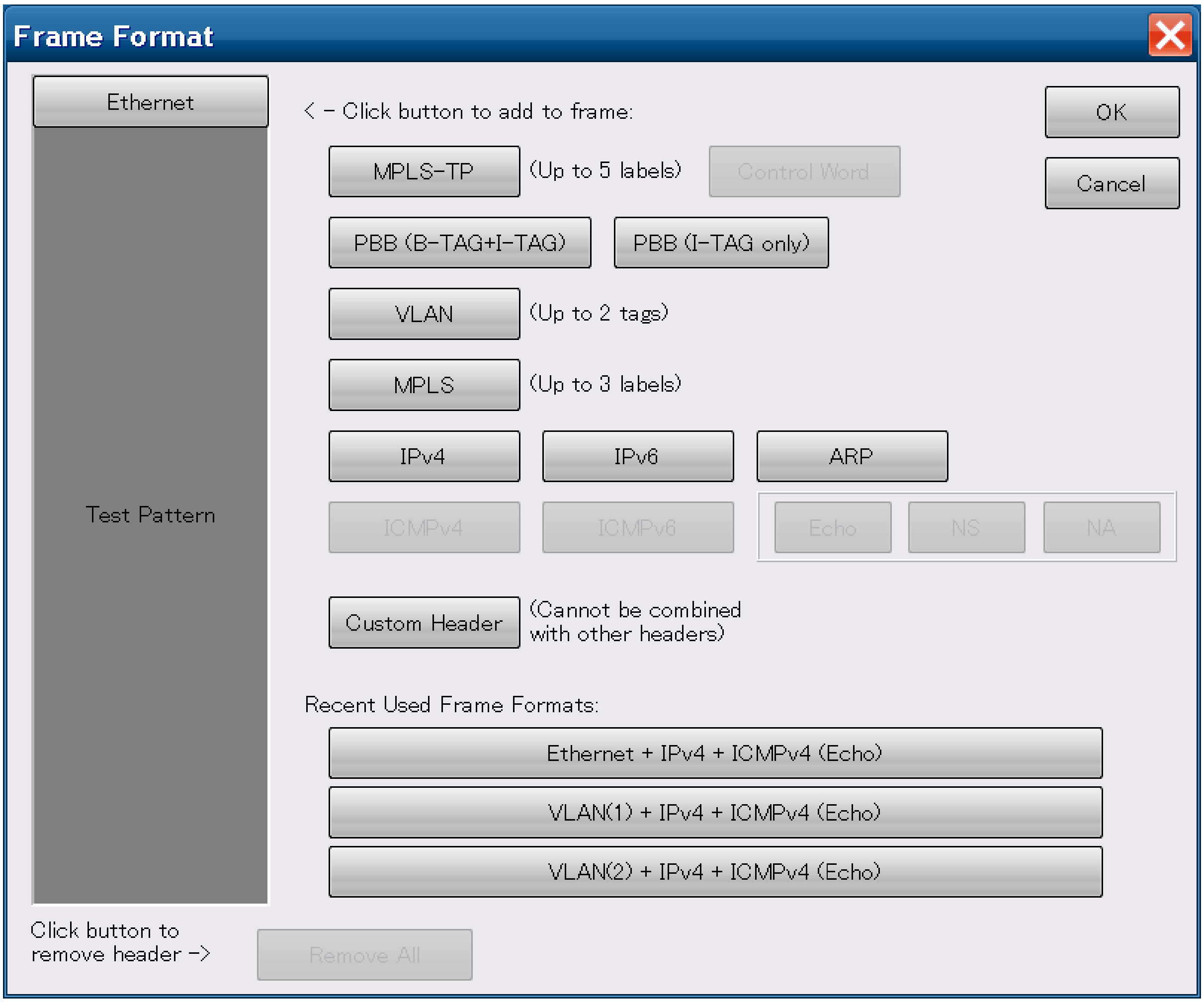


Figure 4.2.4-8 Frame Format Screen

Edit the stream frame as follows:

1. Touch Frame Format button of Header tab on Control/Header screen.
   The Frame Format screen is displayed.
2. Touch the button under [< - Click button to add to frame] to add the protocol header to the frame.
   However, touching [Custom Header] removes other headers from the frame.
3. Touching buttons on the left Test Pattern field removes their headers from the frame. Touching [Remove All] removes headers for patterns on Test Pattern field except [Ethernet].
4. Touching [OK] reflects the edited frame configuration.

When [ICMPv4] is added to the frame, [Echo] is selected as frame type.

When [ICMPv6] is added to the frame, [Echo], [NS], or [NA] can be selected as frame type.
Under [Recent Used Frame Formats:], up to three buttons of frame configurations set before are displayed.
Touching the button sets the corresponding frame format.

Editing Ethernet Header

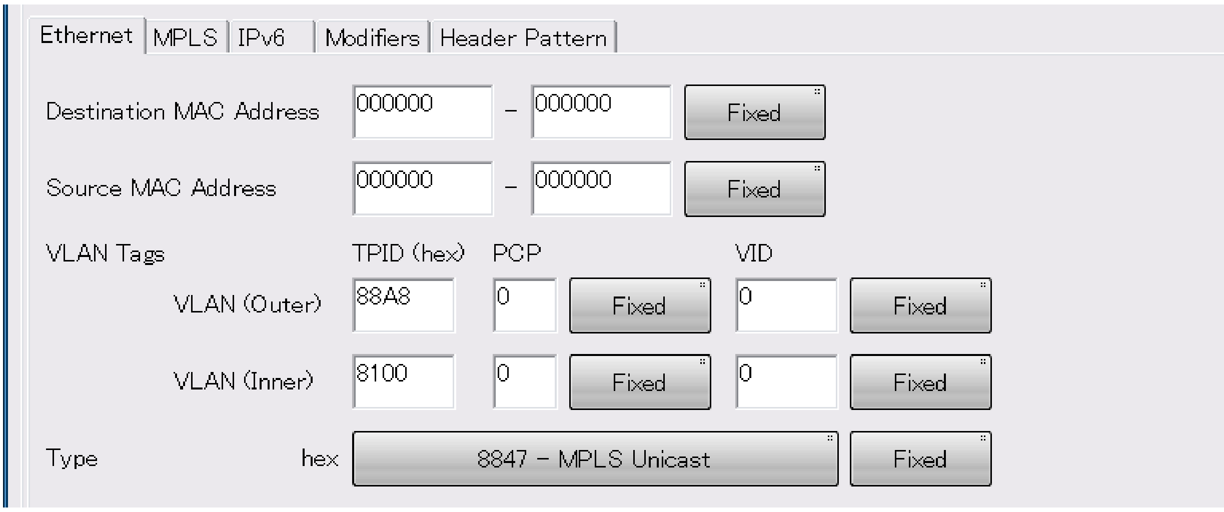


Figure 4.2.4-9 Ethernet Tab

Table 4.2.4-6 Setting Items of Ethernet Tab

Name	Explanation
Destination MAC Address	Sets value of destination MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
Source MAC Address	Sets value of source MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
VLAN Tags	Displayed when VLAN is added with the frame configuration
TPID	Sets the tag protocol ID value in 2-byte hexadecimal
PCP	Sets the priority value within 0 to 7
VID	Sets the VLAN ID value within 0 to 4095
Type	Sets the upper protocol in 2-byte hexadecimal When the upper protocol is set for the frame configuration, the protocol value is displayed

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing MPLS-TP Header

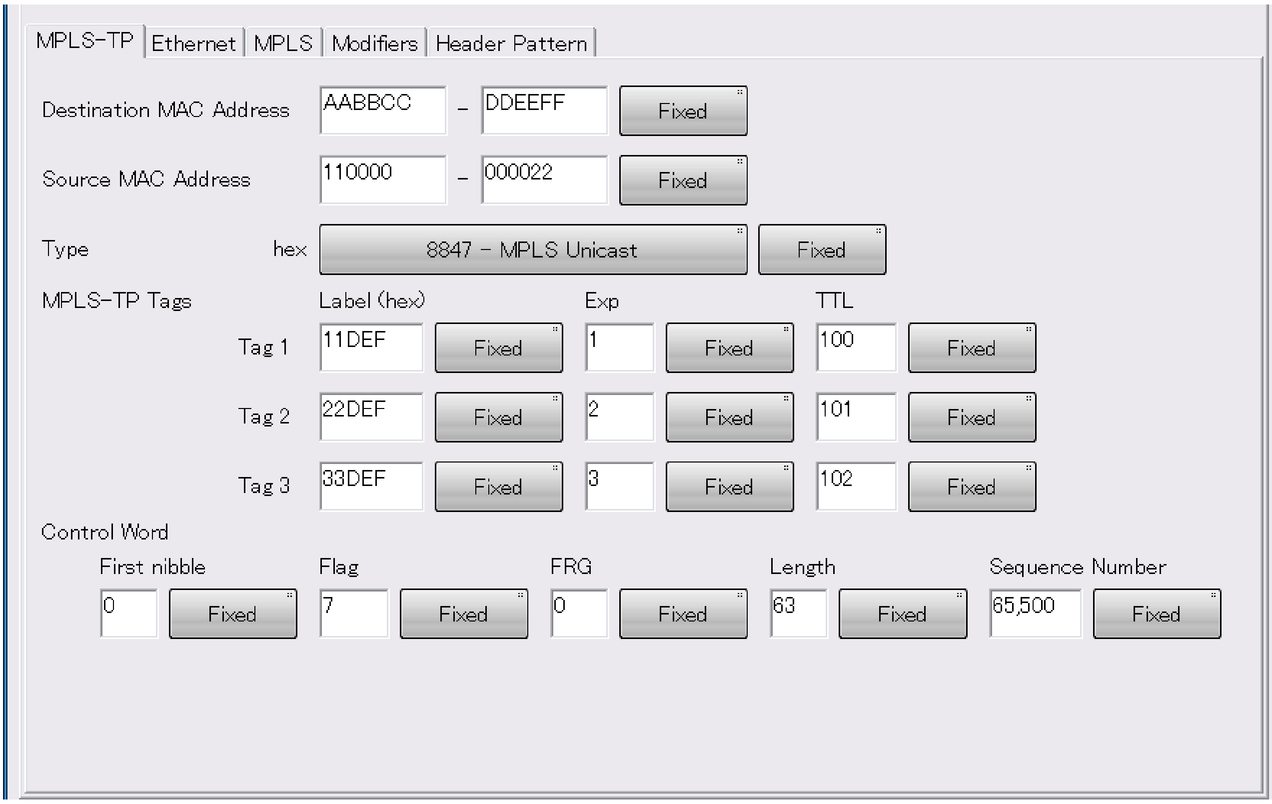


Figure 4.2.4-10 MPLS-TP Tab

Table 4.2.4-7　Setting Items of MPLS-TP Tab

Name	Explanation
Destination MAC Address	Sets value of destination MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
Source MAC Address	Sets value of source MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
Type	Sets the upper protocol in 2-byte hexadecimal When the upper protocol is set for the frame configuration, the protocol value is displayed
MPLS-TP Tags	Can set up to 5 MPLS-TP tags.
Label	Sets the label value in 20-bit hexadecimal
Exp	Sets the service quality information value within 0 to 7
TTL	Sets the Time to Live value within 0 to 255
Control Word	Displayed when Control Word is selected with "Editing Frame Format"
First nibble	Sets the Control Word beginning 4 bits value within 0 to 15
Flag	Sets the flag value within 0 to 15
FRG	Sets the value to be used for fragmentation within 0 to 3
Length	Sets the data padding length (byte) within 0 to 63
Sequence Number	Sets the sequence number within 0 to 65535

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing PBB Header

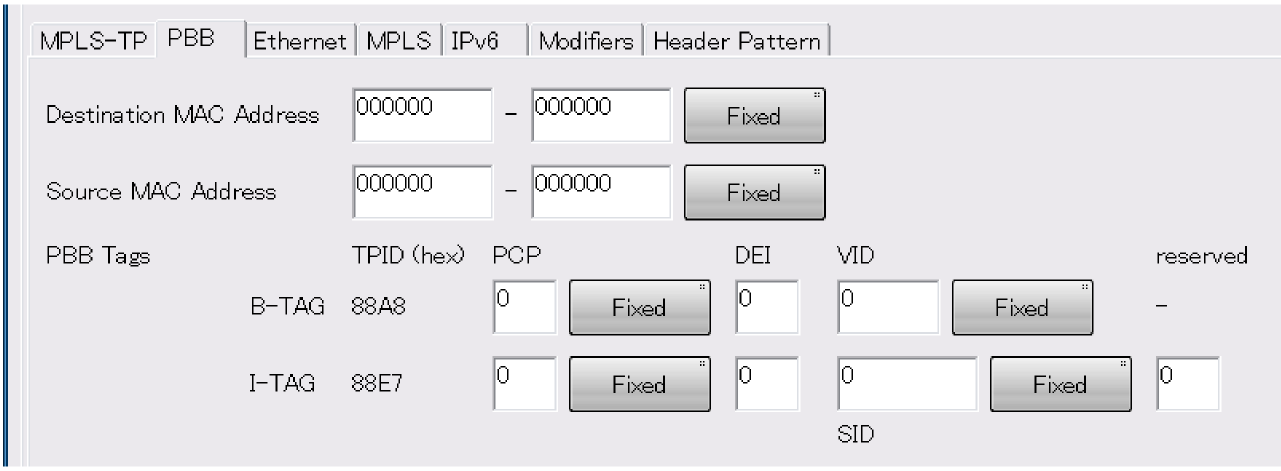


Figure 4.2.4-11 PBB Tab

Table 4.2.4-8 Setting Items of PBB Tab

Name	Explanation
Destination MAC Address	Sets the value of backbone destination MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
Source MAC Address	Sets the value of backbone source MAC address field (6 bytes) in hexadecimal The left text box is for upper 3 bytes and the right text box is for lower 3 bytes.
PBB Tags	Only I-TAG or both B-TAG and I-TAG is/are displayed depending on the frame configuration
PCP	Sets the priority value within 0 to 7
DEI	Sets the Drop Eligible Indication value within 0 to 1
VID	Sets the B-TAG backbone VLAN ID value within 0 to 4095
SID	Sets the I-TAG service instance ID (24 bits)
reserved	Sets the I-TAG-reserved 4-bit value

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing MPLS Header

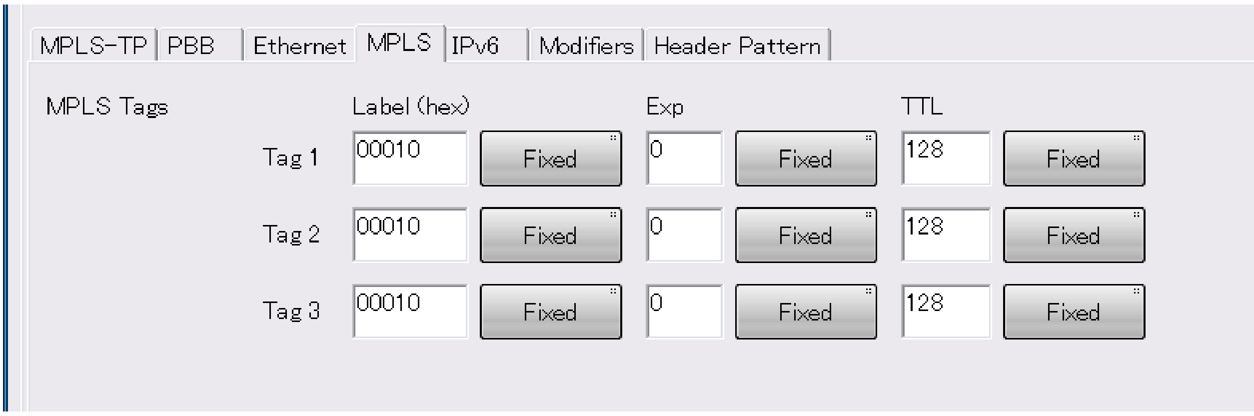


Figure 4.2.4-12　MPLS Tab

Table 4.2.4-9　Setting Items of MPLS Tab

Name	Explanation
MPLS Tags	Can set up to 3 MPLS tags
Label	Sets the label value in 20-bit hexadecimal
Exp	Sets the service quality information value within 0 to 7
TTL	Sets the Time to Live value within 0 to 255

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing IPv4 Header

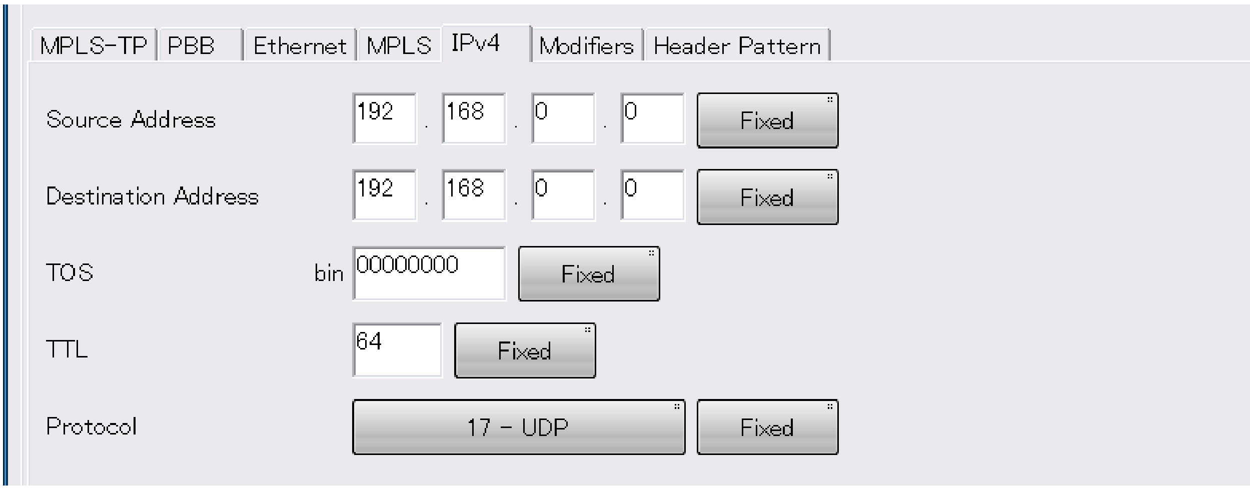


Figure 4.2.4-13 IPv4 Tab

Table 4.2.4-10 Setting Items of IPv4 Tab

Name	Explanation
Source Address	Sets the value of source IP address field (4 bytes) Input one byte value per text box.
Destination Address	Sets the value of destination IP address field (4 bytes) Input one byte value per text box.
TOS	Sets the service information value (8 bits)
TTL	Sets the Time to Live value within 0 to 255
Protocol	Sets the payload protocol number

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing IPv6 Header

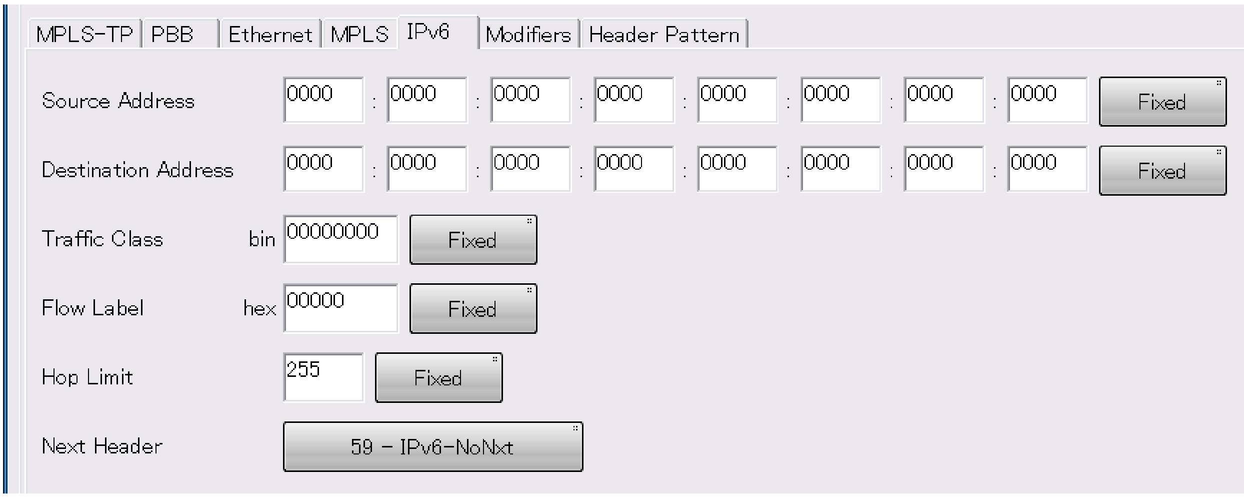


Figure 4.2.4-14 IPv6 Tab

Table 4.2.4-11 Setting Items of IPv6 Tab

Name	Explanation
Source Address	Sets the value of source IP address field (16 bytes) Input 2-byte value per text box.
Destination Address	Sets the value of destination IP address field (16 bytes) Input 2-byte value per text box.
Traffic Class	Sets the service information value (8 bits)
Flow Label	Sets the packet identification numeric value (20 bits)
Hop Limit	Sets the number of times for packet transfer (Hop Limit) within 0 to 255
Next Header	Sets the next header information number

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing ARP Header

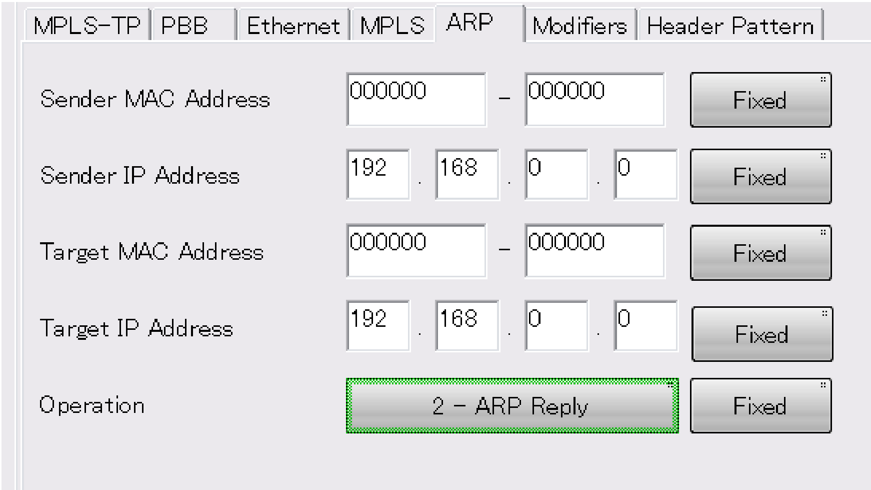


Figure 4.2.4-15 ARP Tab

Table 4.2.4-12 Setting Items of ARP Tab

Name	Explanation
Sender MAC Address	Sets the value of source MAC address field (6 bytes).
Sender IP Address	Sets the value of source IP address field (4 bytes).
Target MAC Address	Sets the value of target MAC address field (6 bytes).
Target IP Address	Sets the value of target IP address field (4 bytes).
Operation	Sets the value of operation field (2 bytes).

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing ICMPv4 Header

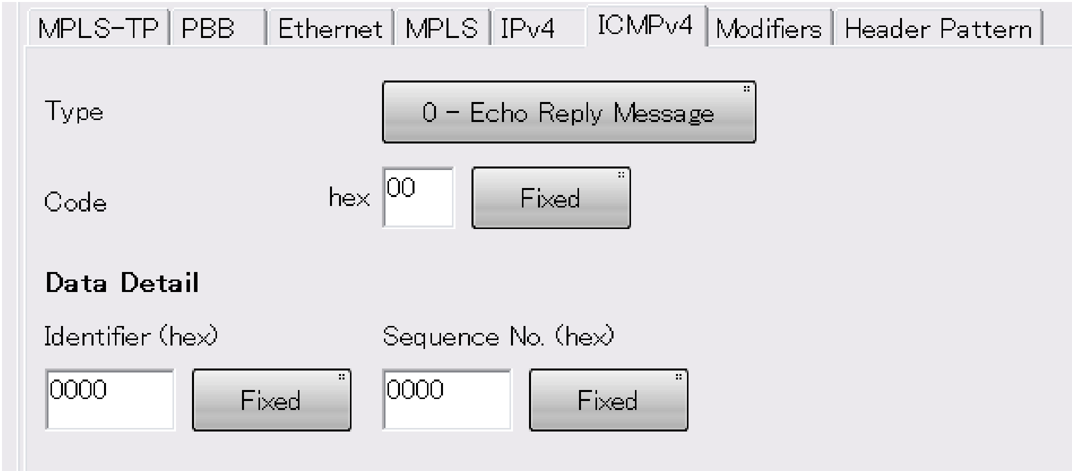


Figure 4.2.4-16 ICMPv4 Tab

Table 4.2.4-13 Setting Items of ICMPv4 Tab

Name	Explanation
Type	Selects a value for type field. 0 – Echo Reply Message 8 – Echo Message
Code	Code field (8 bit)
Identifier	Identifier field (16 bit)
Sequence No.	Sequence number field (16 bit)

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing ICMPv6 Header

The ICMPv6 tab display differs according to the ICMPv6 frame type set on Figure 4.2.4-8 Frame Format screen.

When [Echo] is selected

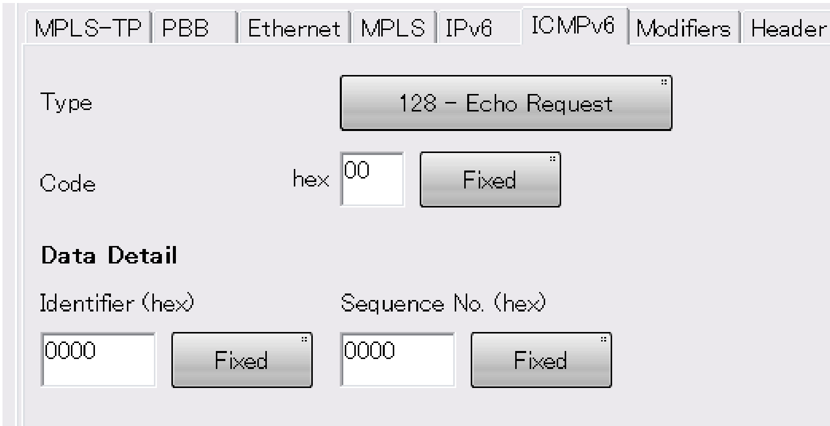


Figure 4.2.4-17 ICMPv6 Tab (Echo)

Table 4.2.4-14 Setting Items of ICMPv6 Tab (Echo)

Name	Explanation
Type	Selects [128 - Echo Request] or [129 - Echo Reply].
Code	Code field (8 bit)
Identifier	Identifier field (16 bit)
Sequence No.	Sequence number field (16 bit)

When [NS] is selected

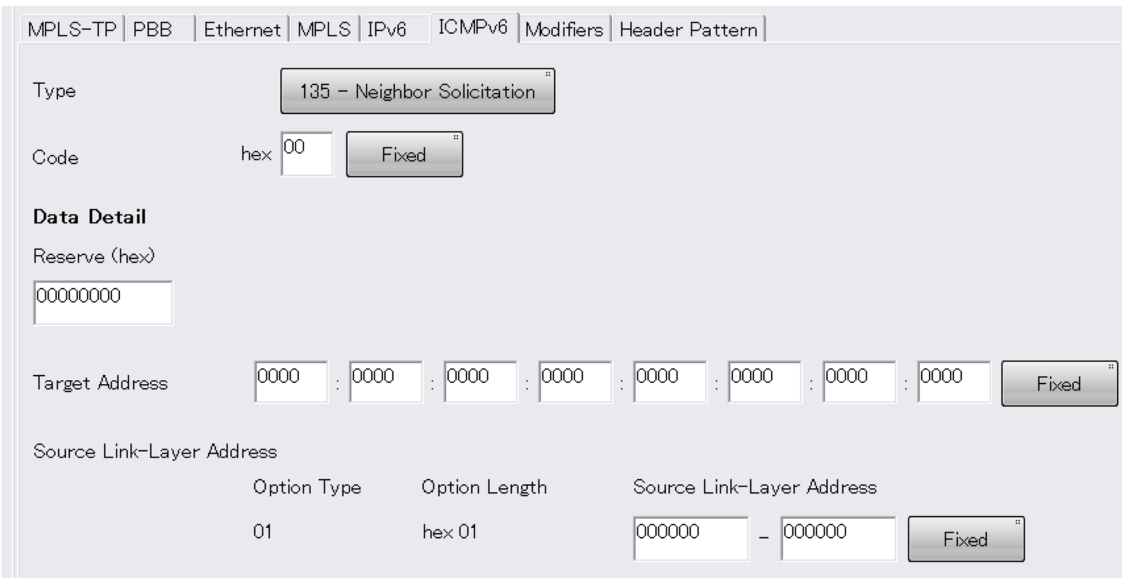


Figure 4.2.4-18 ICMPv6 Tab (NS)

Table 4.2.4-15 Setting Items of ICMPv6 Tab (NS)

Name	Explanation
Type	Fixed to 135 - Neighbor Solicitation
Code	Code field (8 bit)
Reserve	Reserve (32bit)
Target Address	Target address (128bit)
Option Type	Fixed to 0x01
Option Length	Fixed to 0x01
Source Link-Layer Address	Source Link-Layer Address (48bit)

When [NA] is selected

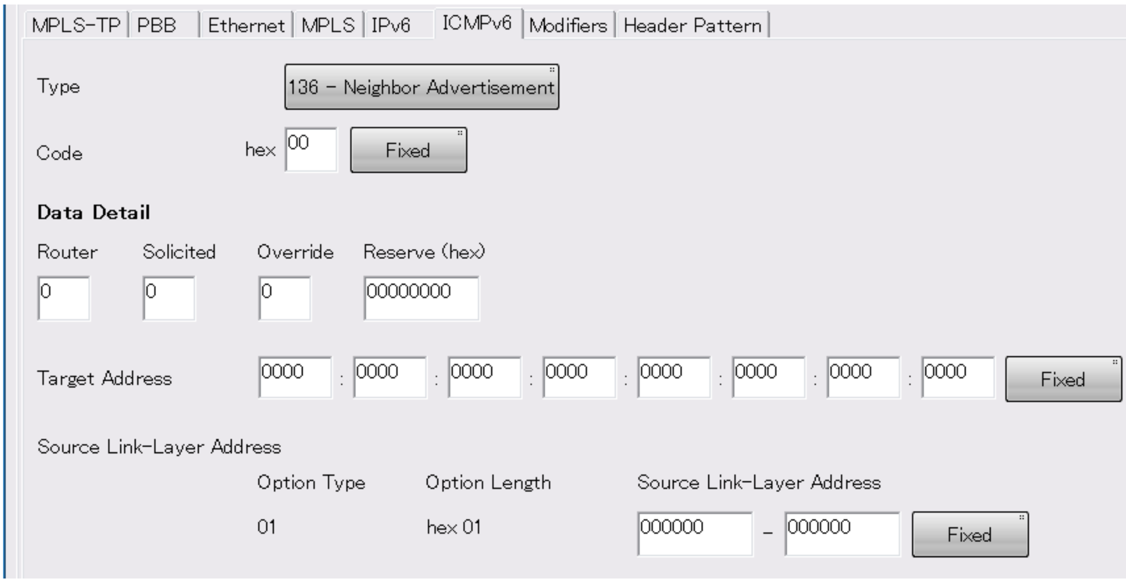


Figure 4.2.4-19 ICMPv6 Tab (NA)

Table 4.2.4-16 Setting Items of ICMPv6 Tab (NA)

Name	Explanation
Type	Fixed to 136- Neighbor Advertisement
Code	Code field (8 bit)
Router	Router (1bit)
Solicited	Solicited (1bit)
Override	Overrided(1bit)
Reserve	Reserve(29bit)
Target Address	Target Address(128bit)
Option Type	Fixed to 0x01
Option Length	Fixed to 0x01
Source Link-Layer Address	Source Link-Layer Address(48bit)

Refer to "Editing the Header Variable Range" in Page 4-29 for the setting method for [Fixed], [Increment], [Decrement], and [Random].

Editing the Header Variable Range

When the header value is to be variable such as increment by 1 for the individual frame to be transmitted, apply Modifier setting.

Modifier is a setting item that collects the following 4 types of attributes:

- Field to apply the header
- Variable method of field value (Increment, Decrement, and Random)
- Number of bits in the field to be variable
- Maximum value, minimum value, and step for variable values

Modifier can be set at two screens; each header setting screen such as Ethernet/IPv4 and Modifiers tab.The basic setting method for both screens is equivalent.

Setting with Modifiers tab

Five Modifiers are available as shown below. Up to five Modifiers per stream can be applied with selection from them.

The setting items in the following figure are same as ones in Table 4.2.4-18 "Setting Item of Modifier Screen".

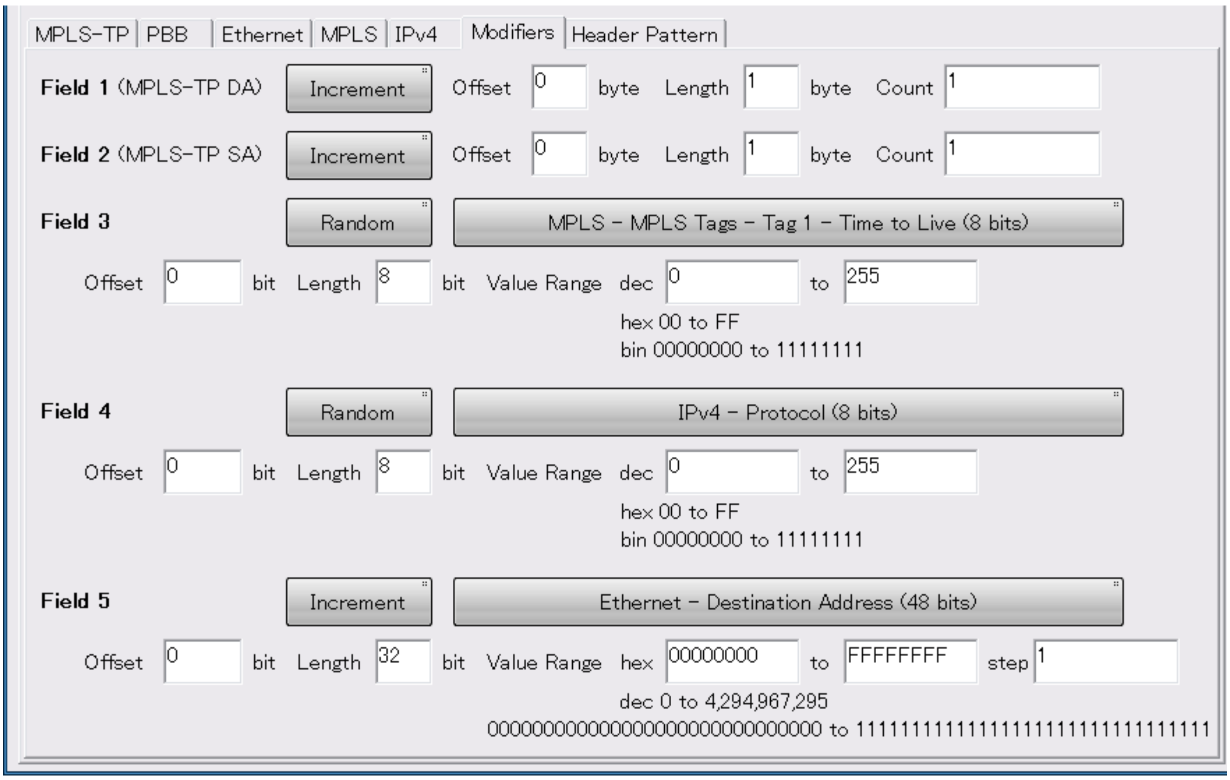


Figure 4.2.4-20 Modifiers Tab

Table 4.2.4-17　Setting Items of Modifiers Tab

Name	Explanation
Modifier #1 *	Destination MAC address field-dedicated ModifierUp to 48 bits can be specified.
Modifier #2 *	Source MAC address field-dedicated ModifierUp to 48 bits can be specified.
Modifier #3	Up to 32 bits Modifier that can be applied to arbitrary fields Multiple Modifiers cannot be applied to the same field.
Modifier #4	
Modifier #5	

*: MPLS-TP, PBB, or Ethernet MAC address is displayed depending on the frame configuration. For example, if Ethernet is encapsulated with MPLS-TP, the external MAC address is displayed.

If the buttons of Field 3 to 5 are set to [Decrement], [Increment], or [Random], the field selection buttons appear on the right.
Touch the field selection buttons to display Select Field screen.
The items on Select Field screen differ according to the frame format.

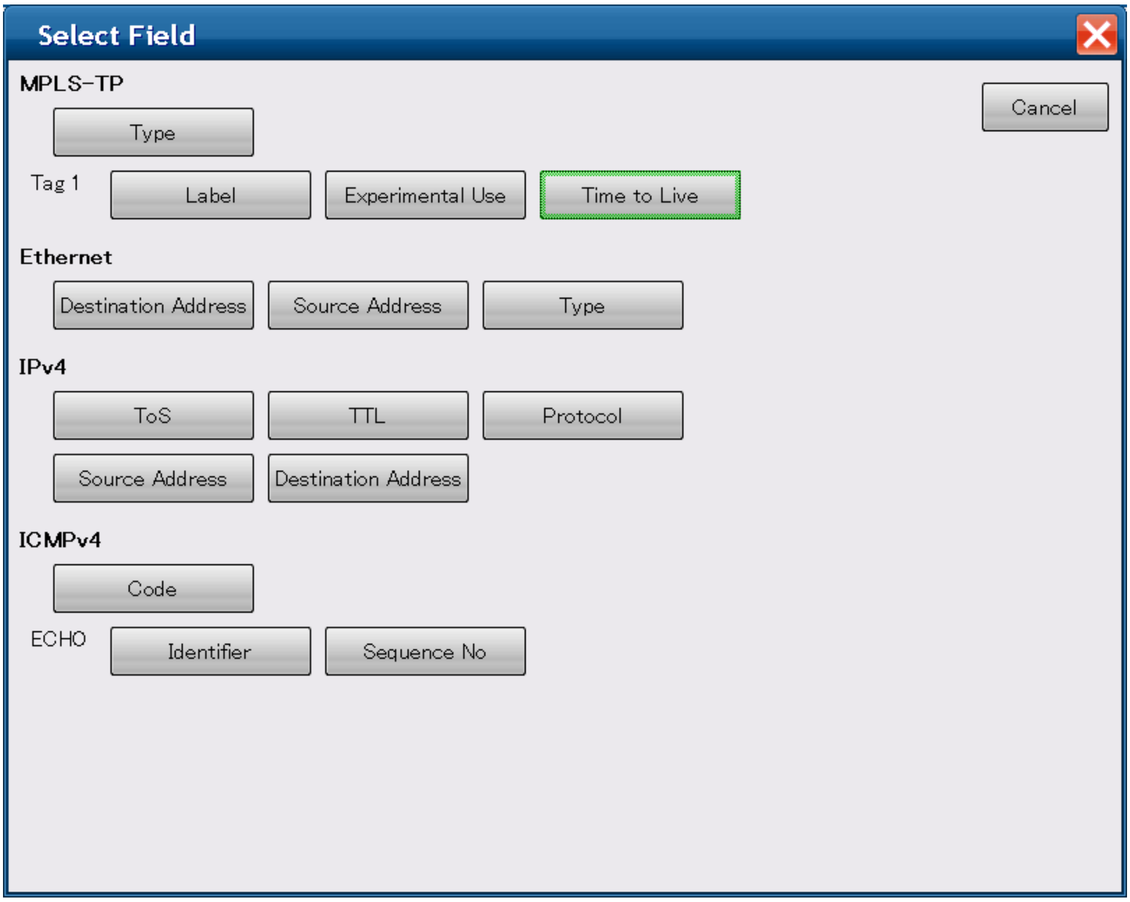


Figure 4.2.4-21　Select Field Screen

If select the field to change, the button on Modifiers tab is updated and the value range corresponding to the field appears.

When Modifier is to be applied at the header setting screen, touch the text box for header value input or the button on the right side of the button for value setting to display the Modifier screen.

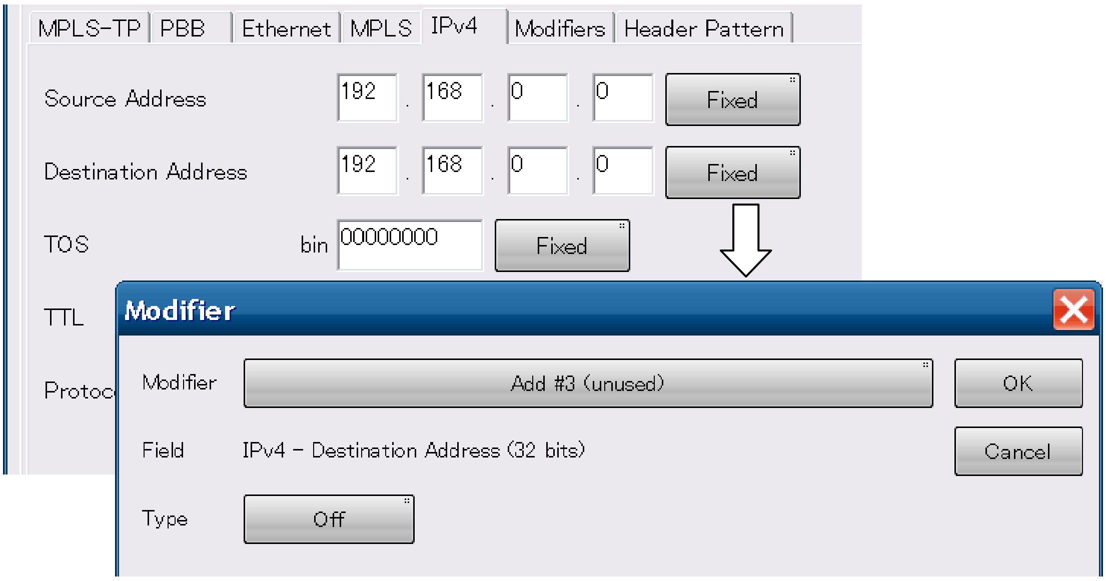


Figure 4.2.4-22 Modifier Screen (When Type Is Off)

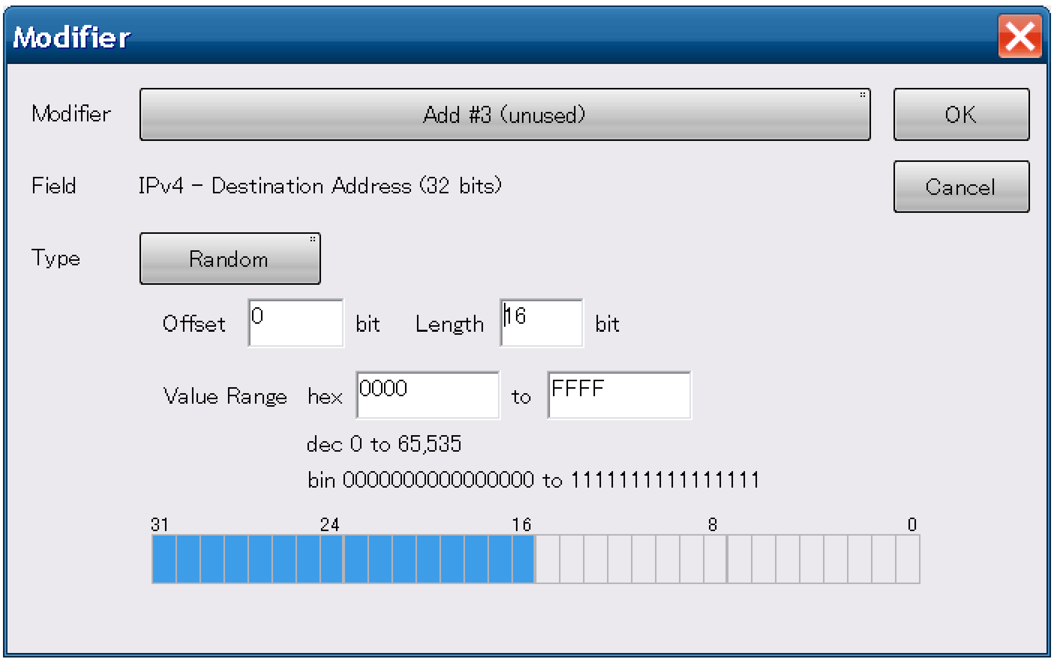


Figure 4.2.4-23 Modifier Screen (When Type Is Other Than Off)

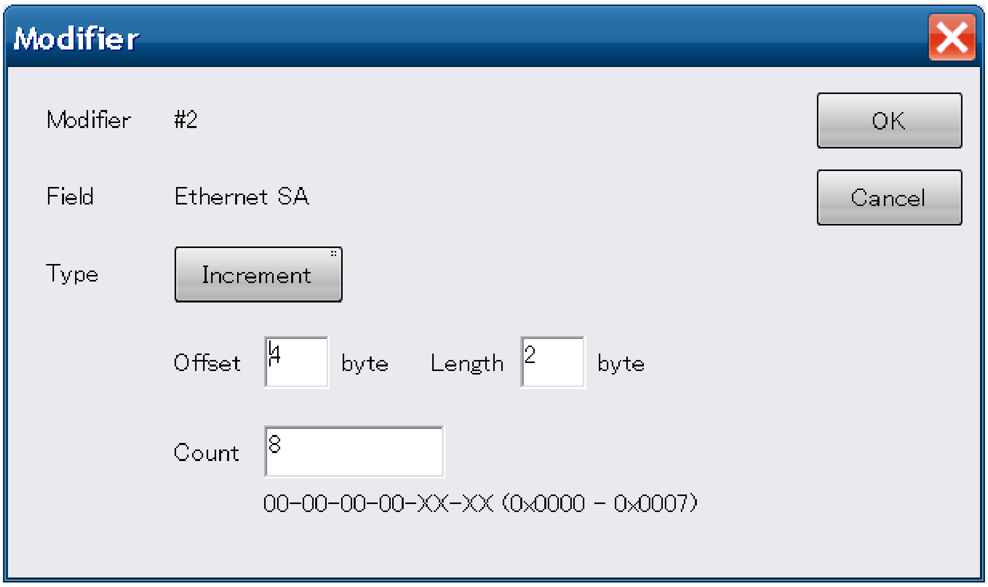


Figure 4.2.4-24 Modifier Screen (When Modifier Is #1 or #2)

Table 4.2.4-18 Setting Item of Modifier Screen

Name	Explanation
Modifier	Displays the button to select the number of Modifier#3 to #5 For Modifiers not applied to anywhere, (used) is displayed like [Add #3 (unused)]. For Modifiers already applied to other fields, Replaced is displayed like [Replaced #3 (IPv6 – Traffic Class)].If Modifiers like this are selected, they will be updated to fields which are being edited. When Modifier#1 or #2 is displayed, the button is not displayed because the field cannot be changed.
Field	Displays the header field name
Type	Off: Does not change the header value Increment: Increments the header value of each frame Decrement: Decrements the header value of each frame Random: Sets a random value to the header of each frame
Offset	Specifies the beginning location of the range for values to be changed
Length	Specifies the number of bytes of the range for values to be changed
Value Range *1	Minimum and maximum values of the range for values to be changed
Count *2	Number of values set to the range specified with Offset and Length

*1: Displayed when Modifier is #3 to #5

*2: Displayed when Modifier is #1 or #2

For the screen in Figure 4.2.4-24, the last 2-byte value of Source MAC Address is changed.
Under the text box, the following is displayed, and XXs indicate the locations specified with Offset and Length.In parentheses, the lower and upper values of set values are displayed in hexadecimal.

00-00-00-00-XX-XX (0x0000 – 0x003F)
For the screen in Figure 4.2.4-24, when Count on Modifier Screen is set to 8, the header value is changed according to the variable method.

Table 4.2.4-19 Header Value Variable Method

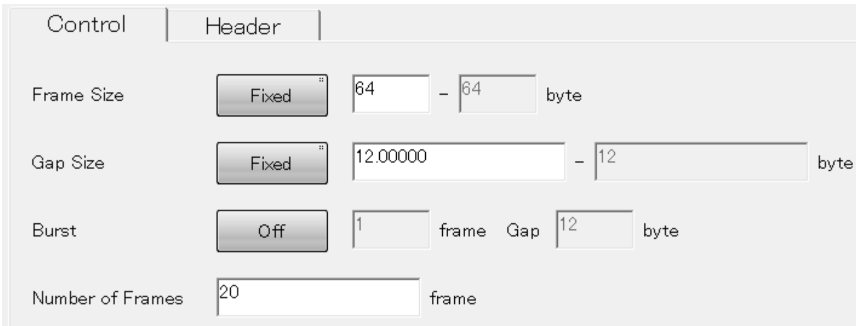
Transmission Count	Variable method			
	Off	Increment	Decrement	Random *
First	0	0	0	4
Second	0	1	7	3
Third	0	2	6	0
Fourth	0	3	5	6
Fifth	0	4	4	7
Sixth	0	5	3	2
Seventh	0	6	2	1
Eighth	0	7	1	5
Ninth	0	0	0	6
Tenth	0	1	7	2

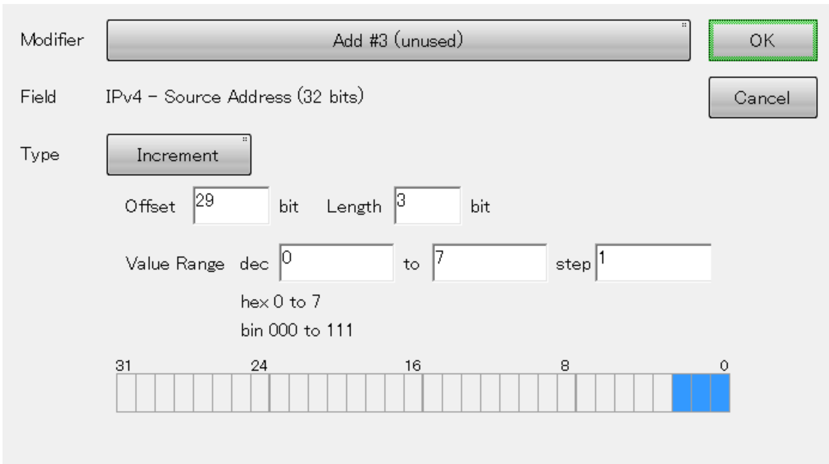
*: Values in Random are examples. The set value differs on each execution.

Setting stream generating method

In order to make the value of a header variable, the value of the number of frames of a Stream Control/Header Screen Control tab is set as the value more than the variable range.

Example 1





When setting Value Range of Modifiers to 0 through 7, Burst to [Off], and Number of frames to 20 on the Control tab respectively, the frame value will change as follows.

0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 4, 5, ….

Example 2

When setting Value Range of Modifiers to 0 through 7, Burst to [On], Burst Frame to 20, and Number of Bursts to 1 on the Control tab respectively, the frame value will change as follows.

0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 0, 1, 2, 3, 4, 5, 6, 7, 0, 1, 2, 3, 4, 5, ….

Example 3

Even if setting Value Range of Modifiers to 0 through 7, if Burst is set to [Off] and Number of frames is set to 2, the frame value will change as follows and Value Range is not changed to the maximum value.

0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, ….

Displaying/loading header pattern

On Header Patterntab, edited header patterns are displayed in hexadecimal.
Fields with Increment/Decrement/Random setting are displayed with XXs.

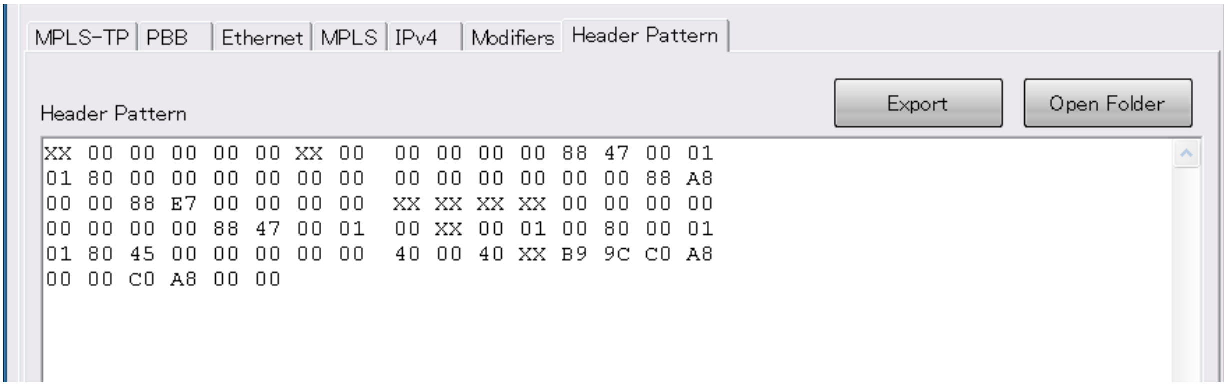


Figure 4.2.4-25 Header Pattern Tab

When the frame configuration is [Custom Header], [Import] button is displayed.

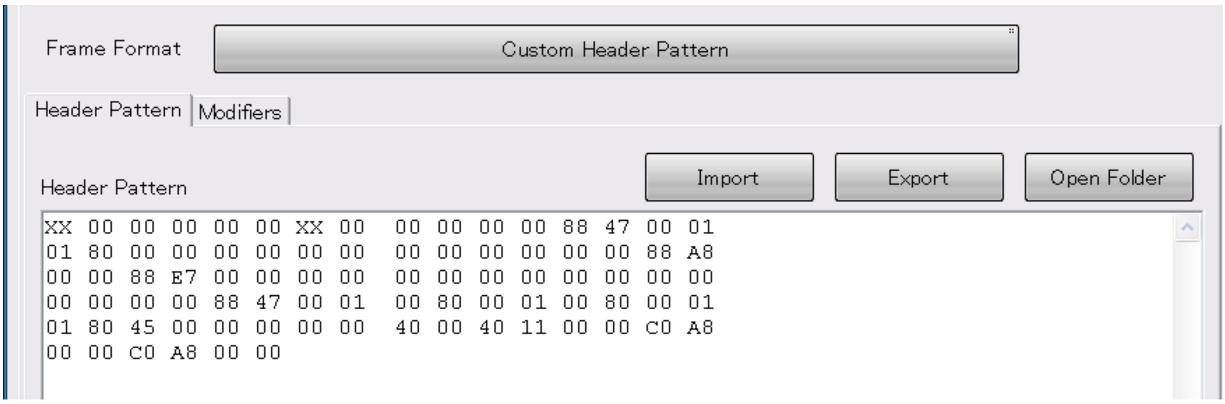


Figure 4.2.4-26 Header Pattern Tab When Frame Format is Custom Header

Table 4.2.4-20 Setting Items of Header Tab

Name	Explanation
Export	Saves value of header to file
Import	Reads value of header from file
Open Folder	Displays folder where file saved

The header file is saved to the following folder in the path:

C:\ Documents and Settings\Administrator\My Documents
\Anritsu\MD1260A\UserData\Stream

The header file is saved per stream number by the file name such as Stream001.txt to Stream016.txt

Edit and load the header pattern as follows:

1. Touch the [Frame Format] button.
2. Set the frame configuration that to be a form for the header pattern to be edited.
3. Touch [OK] to close Frame Format Screen.
4. Touch [Export] to save the header pattern in a file.
5. Touch [Open Folder].The folder is displayed.
6. Edit the file saved in Step 4 with a text editor.
   Save it with a name.
7. Touch the [Frame Format] button.
8. Touch [Customer Header].
9. Touch [OK] to close the Frame Format Screen.
10. Touch [Import].The file list is displayed.
11. Select the file saved in Step 6 and touch [OK].
12. The header pattern loaded from the file is displayed.

4.2.5 Editing stream for bit error measurement

The MD1260A can measure bit errors in Ethernet frame data.

☞ 4.6.2 Frame BER measurement

To edit the stream for the bit error measurement, open the Stream screen as follows:

1. Touch [Port] at the setting area.
2. Touch the button for Frame BERT to set the display to [On].
3. Touch [OK].
4. Touch [Stream] at the setting area.

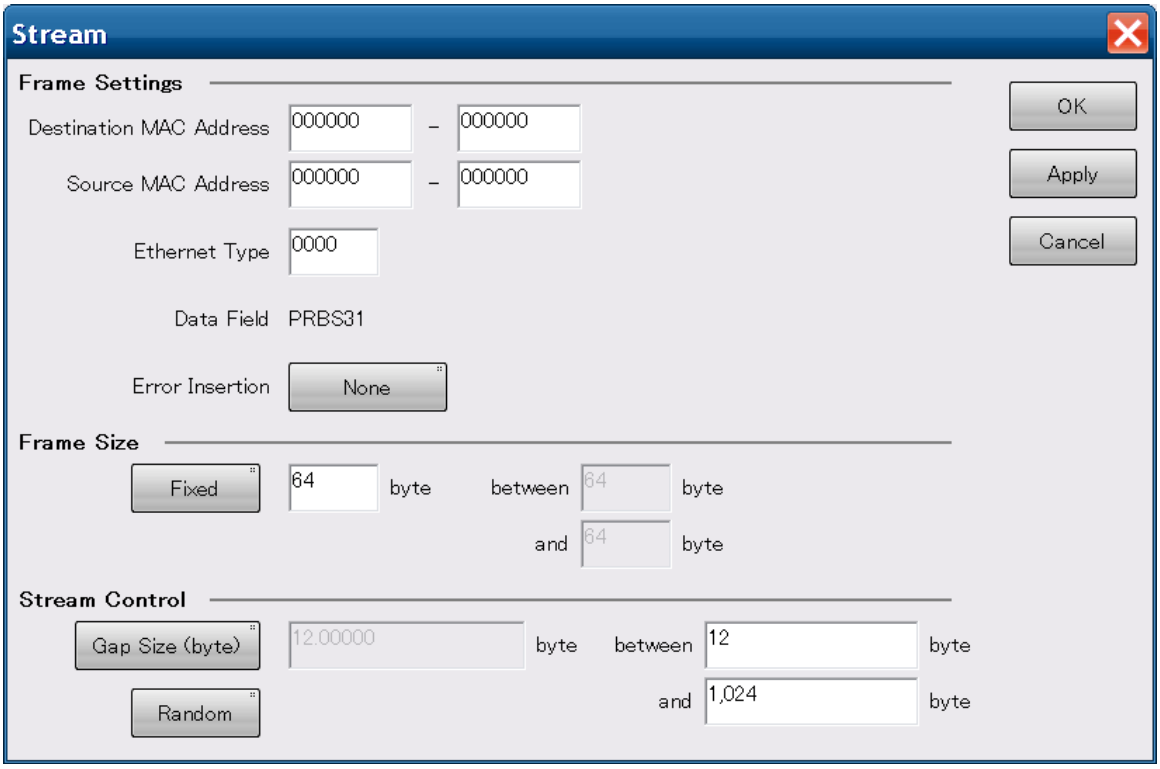


Figure 4.2.5-1 Stream Screen

Table 4.2.5-1 Setting Items of Stream Screen

Name	Explanation
Destination MAC Address	Sets destination MAC address field (6 bytes) as hexadecimal number
Source MAC Address	Sets source MAC address field (6 bytes) as hexadecimal number
Ethernet Type	Sets value of Ethernet Type field (2 bytes) as hexadecimal number
Data Field	Sets Ethernet frame to PRBS31
Error Insertion	[None]: Does not insert errors [FCS Error]: Inserts errors in FCS of all frames
Frame Size	Specifies size of sent frame (60 to 32,700bytes) [Fixed]: Sets fixed frame size [Random]: Changes size of each frame randomly The lower and upper bounds for the frame size can be set.
Stream Control	Specifies frame send interval or rate The total load for all streams is displayed as [Gap Size (byte)], [Rate (%)], [Rate (fps)], [Rate (Gbit/s)], [Intervals (s)] [Fixed]: Sets fixed frame size [Random]: Changes frame size randomly The lower and upper bounds of the frame size can be set. The minimum specified gap is 9 bytes*. Moreover, a maximum gap of about 120 seconds can be specified.

*: When a value exceeding 16,000 bytes is specified for [Frame Size], the minimum Gap Size becomes 10 bytes.

4.2.6 Setting errors/alarms

The MD1260A can insert the following errors.

- In Ethernet frame
- In PCS lane block
- In the LFS signal

To edit the inserted errors/alarms, open the Error/Alarm screen as follows:

1. Touch [Error/Alarm] at the setting area.
2. Touch the button for Mode and select the error type.
3. When [Ethernet Frame] is selected at step 2, set the Type and Timing.
4. When PCS Error is selected at step 2, set the Pattern and Timing. When the button for Lane is touched to insert the error, the button display becomes dark gray.
5. Touch [OK] at the setting area.

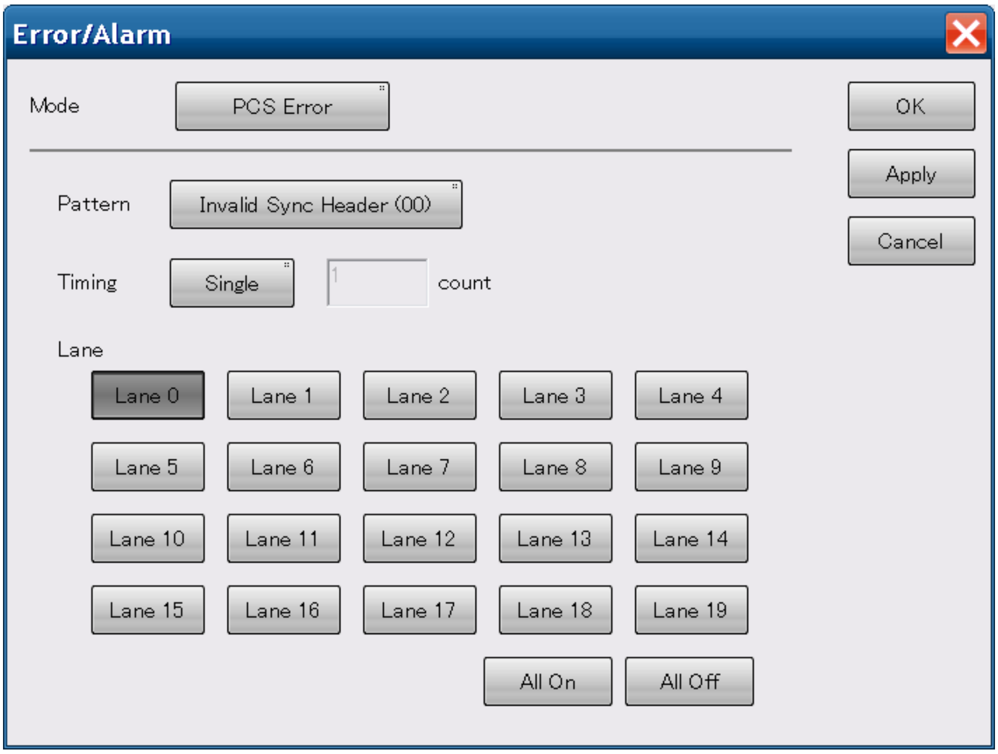


Figure 4.2.6-1 Error/Alarm Screen (100 GbE)

Table 4.2.6-1 Error/Alarm Screen Setting Items

Name	Explanation
Mode	Selects following error types: [Ethernet Frame], [PCS Error], [PCS Alarm]
Ethernet Frame	Inserts error in Ethernet frame[*1]
PRBS Bit Error[*2]	Inserts bit error when Ethernet frame is PRBS31 Sets error insertion method at Timing Single: Touching the[Error/Alarm Ins] button inserts the error once. Rate: Touching the[Error/Alarm Ins] button inserts the error at the specified rate. Touching the [Error/Alarm Ins] button stops error insertion.
LF	Sends local failure signal to CGMII or XLGMII
RF	Sends remote failure signal to CGMII or XLGMII
PCS Error	Inserts error block in PCS lane The error insertion method is set by Timing. Sets the error insertion method when button of [Error/Alarm Ins] is pressed at Timing setting. Single: Inserts an error block only once. Burst: Insert an error block in the specified number. Alternate: Insets an error in the specified pattern (Error/Normal). Rate: Insert an error block at the specified rate. All: Inserts an error block at the max rate.
Invalid Sync Header (00)	Sets two header bits to 00 and sends block[*3]
Invalid Sync Header (11)	Sets two header bits to 11 and sends block[*3]
Invalid Alignment Marker	Sets M_0 of Marker Alignment to 0x00 and sets M_4 to 0xFF [*3]
BIP Error	Bit inverts Marker Alignment BIP and sends[*3]
Invalid Block Type (0x00)	Sends control block with block type 0x00[*4]
Invalid Block Type (0x2d)	Sends control block with block type 0x2d[*4]
Invalid Block Type (0x33)	Sends control block with block type 0x33[*4]
Invalid Block Type (0x66)	Sends control block with block type 0x66[*4]
PCS Alarm	
High BER	Sends Invalid Sync Header for High BER generation value Touching the [Error/Alarm Ins] starts error insertion Touching the [Error/Alarm Ins] button stops error insertion

*1: To generate the FCS error for the Ethernet frame, set the FCS Error Insertion on the Stream screen. Refer to Table 4.2.4-1 “Stream Screen Setting Items.”

To generate the frame size error for the Ethernet frame, set the Frame Size to the undersize or oversize value on the Stream screen. Refer to Table 4.2.4-2 "Control Tab Setting Items" and 4.2.5-1 "Setting Items of Stream Screen."

*2: Available only when Frame BERT setting is On.

*3: The insertion PCS lane can be set.

*4: Only Single is settable as error insertion method.

4.2.7 Sending stream

Touch the Stream ▶ button at the operation area to start stream transmission. The lamp lights while the stream is being sent.
The elapsed time after starting stream transmission is displayed at Transmit Duration of the [All Lanes] tab.

Figure 4.2.7-1 Stream Button

Touch the Stream ■ button at the operation area to stop stream transmission.

4.2.8 Inserting errors/alarms

Touch the Error/Alarm Ins ▶ button at the operation area to insert errors/alarms.
The number of inserted errors depends on the Timing setting at the Error/Alarm screen.
The lamp lights while inserting errors/alarms.

Figure 4.2.8-1 Error/Alarm Ins Button

Touch the Error/Alarm Ins ■ button at the operation area to stop insertion of errors/alarms.

4.3 Measurement Screen

The following items can be measured using the 40 GbE/100 GbE applications.

- Sent/received number of test frames, rate of test frames, sequence error, and latency
- Distribution of Ethernet frame sent/received size
- Sent/received number of frames, bits, and errors for MAC layer, and error occurrence for all PCS lane
- Number of errors per PCS lane
- Status of CFP and received optical power per lane

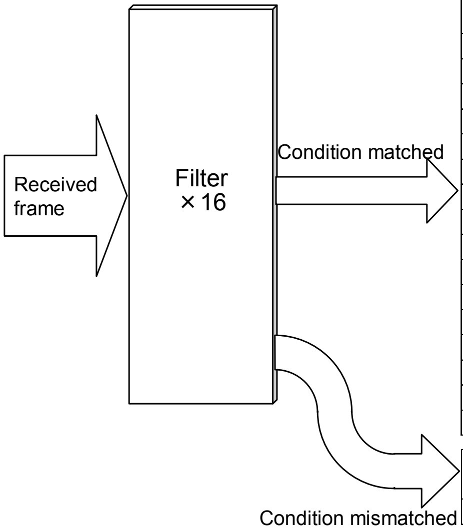
The elapsed time after touching the Counter button is displayed at Counter Elapsed Time of each measurement screen.

4.3.1 Test frame

The test frame is an Ethernet frame defined on Multiflow Screen.
There are three types of test frame definition methods.

- Specifying Flow ID
  Flow ID is an identification number described in the data part of the Ethernet frame. Values within 0 to 65535 can be set in Section 4.2.4 "Editing two or more streams".
- Specifying frame configuration and data value (User Defined)
  Specify the Ethernet frame configuration and data value in the frame.
- Specifying both the Flow ID and the frame configuration and header value
  The Ethernet frame that corresponds to both the Flow ID and the frame configuration and data value is identified.

Up to 16 test frames can be defined.When the Ethernet frame received by MD11260A is filtered and meets the condition, it is identified as a test frame.



Test Frame Counter

No.	Flow ID	Value	Tx Test Frame	Rx Test Frame
1	128	0		
2	128	1		
3	256	0		
4	256	1		
5	512	0		
6	1024	0		
7	2048	0		
8	4096	0		
9	4096	1		
10	4096	2		
11	4096	3		
12	4096	4		
13	4096	5		
14	4096	6		
15	4096	7		
16	1024	1		

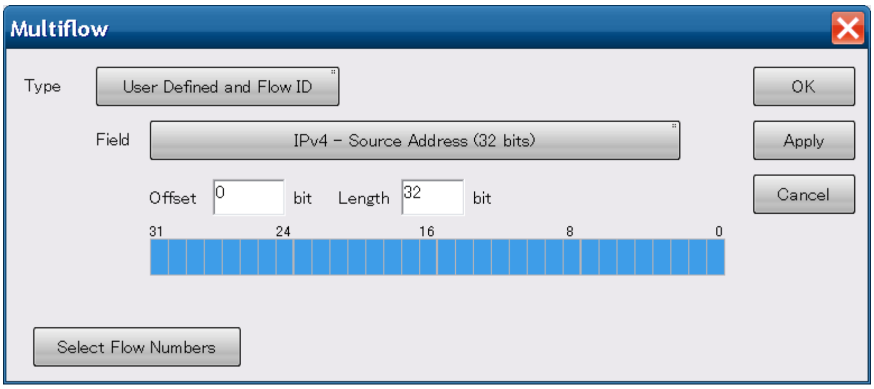
No.	Flow ID	Value	Tx Test Frame	Rx Test Frame
	Other			

Figure 4.3.1-1 Test Frame Processing

Setting test frame

Set the test frame identification method.

1. Touch [Port] at the setting area.
2. Touch the button for Frame BERT to set display to [Off].
3. Touch [OK].
4. Touch the [Test Frame] tab.
5. Touch [Setup] at the measurement result display area. The Multi Flow Screen is displayed.



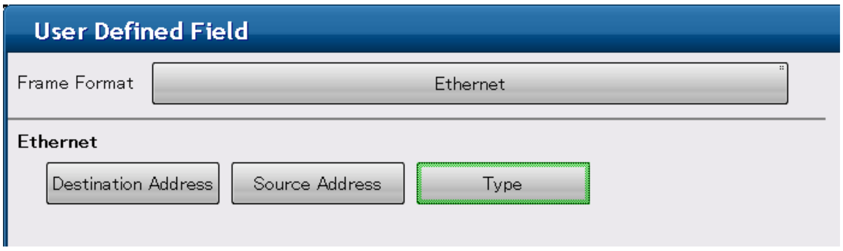
6. Touch the Type button to select the test frame identification method.

   Test Frame Flow ID: Identifies with Flow ID of Stream

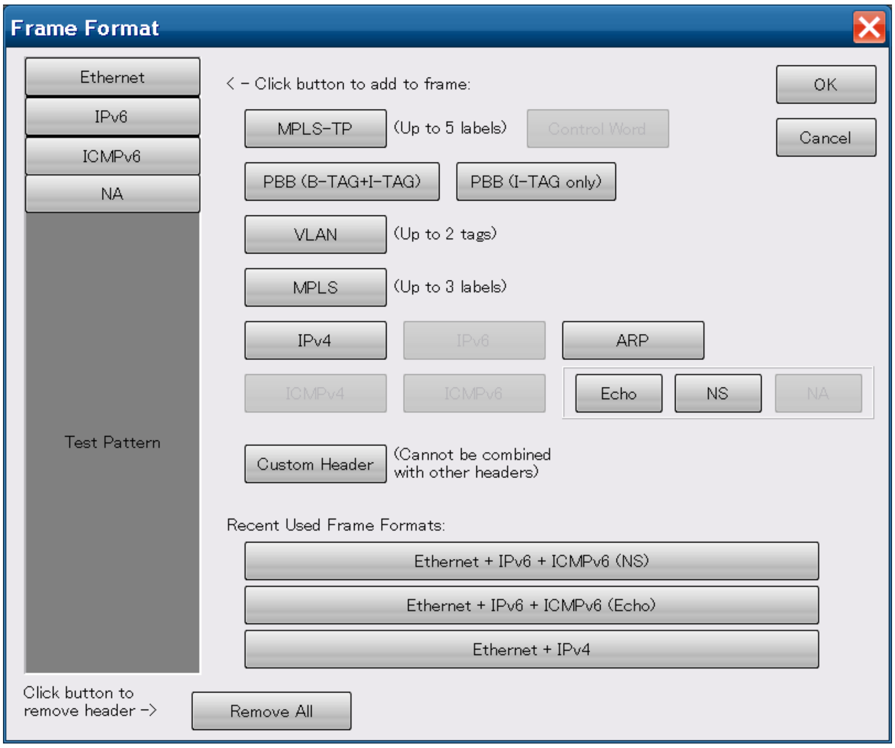
   User Defined: Identifies with the specified header field value

   User Defined and Flow ID: Identifies the Ethernet frame that corresponds to both the Stream Flow ID and specified header field value
7. Proceed to Step 10 when [Flow ID] is set in Step 2.

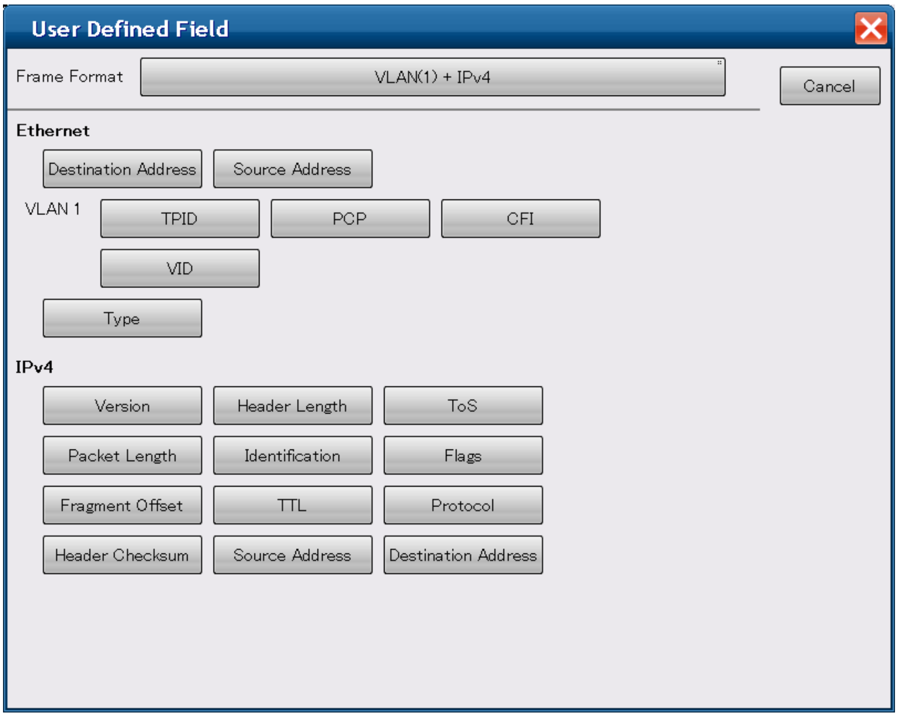
8. Touch the Field button when [User Defined] or [User Defined and Flow ID] is set in Step 2.The User Defined Field Screen is displayed.



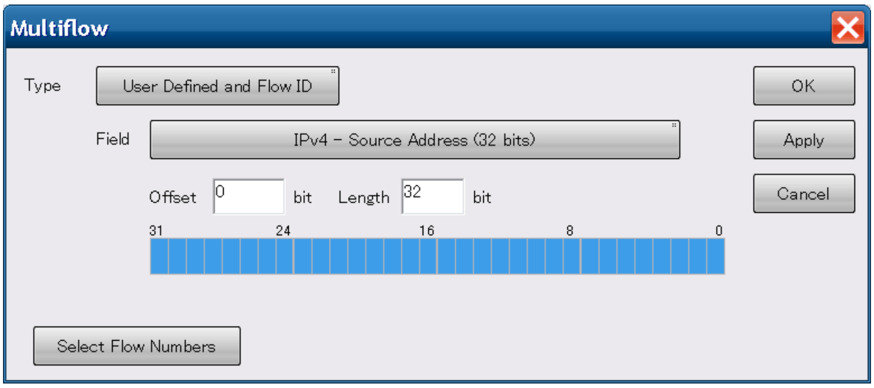
9. Touch the Frame Format button.The Frame Format Screen is displayed.



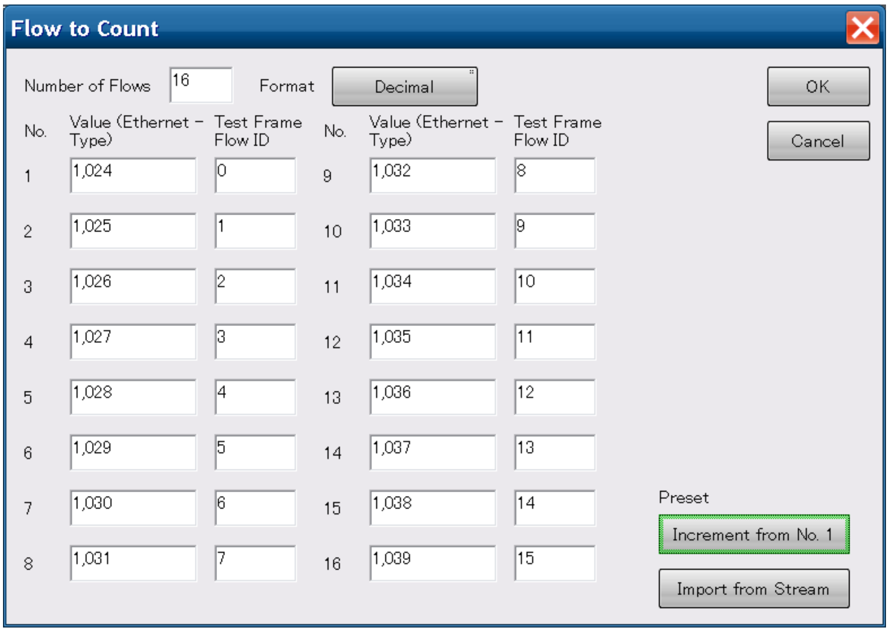
10. Touch the button of the header name to edit the Ethernet frame header configuration.
11. Touch [OK].The User Defined Field Screen is displayed.



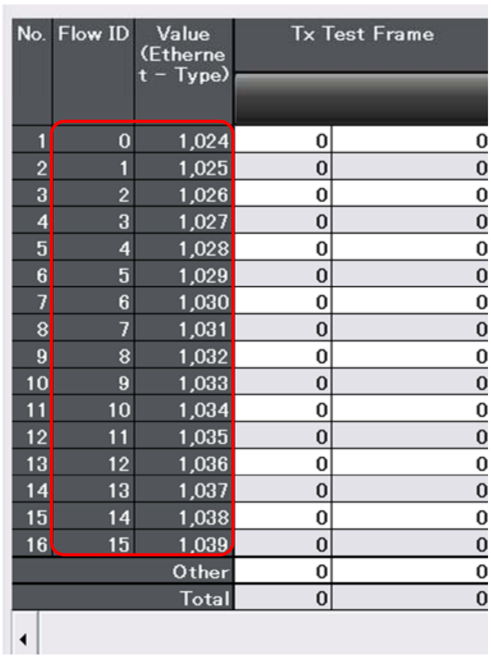
12. Touch the button of the header area for filter setting. The Multi Flow Screen is displayed.



13. Touch the Offset and Length text boxes and set the bit location for filter setting. Up to 32 bits can be set with Length.
14. Touch [Select Flow Numbers].The Flow to Count Screen is displayed.



15. Touch the text box to set the value for test frame specification.
16. Touch [OK] to close the Flow to Count Screen.
17. Touch [OK] to close the Multiflow Screen.
18. The value set on Flow to Count Screen is displayed on Test Frames tab.



Setting Flow ID

When Flow ID has been set to the test frame filter condition, set Flow ID to the stream transmitted by the MD1260A.

1. Touch [Stream] at the setting area.
2. Touch [Test Frame].
3. Touch the Test Frame button corresponding to the Stream number to set the test frame transmission. When the button display is set to On, Flow ID is added to the stream.
4. Touch the text box of the Flow ID corresponding to the Stream to set the Flow ID.

   Touching [Sequential] makes Flow ID values of Stream 2 to 16 to be Flow ID value of Stream 1 with the addition of 1 to 15 respectively.

   Touching [Same as Stream1] sets all Streams with the same Flow ID as Stream 1.
5. Touch [OK].

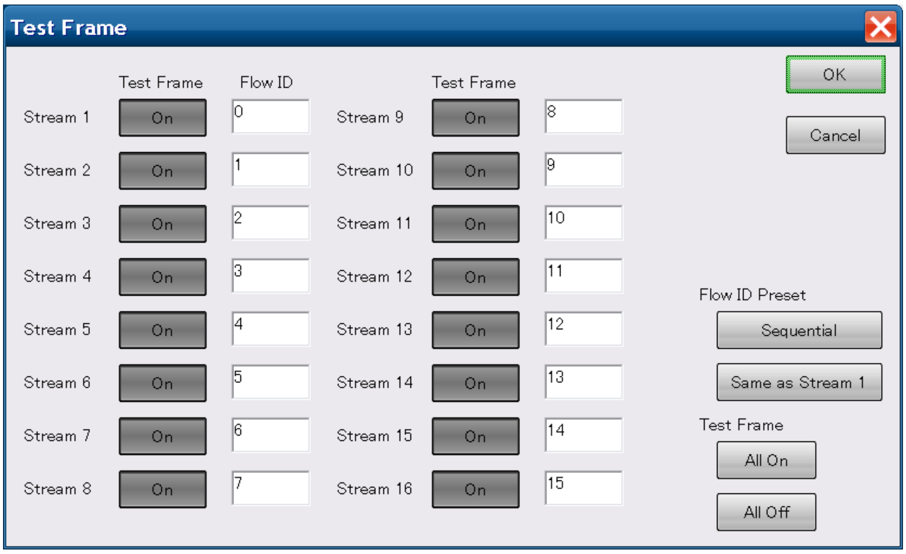


Figure 4.3.1-2 Test Frame Screen

A Sequence Error is counted when the received test frame order is different from the transmitted test frame order.

The Rx Test Frame measurement can be stopped when a Sequence Error is detected. To enable this function, perform the following:

1. Touch [Counter/Capture] at the setting area.
2. Touch the button for Stop Counting when Sequence Error Detected to set the button display to [On].
3. Touch [OK].

Stop Counting when Sequence Error Detected is counted when the button for Test Frame Sequence Error Detect is Off.
Refer to Section 4.2.4 “Editing two or more streams”, and to Section 4.2.7 “Sending Stream for editing and sending streams”.

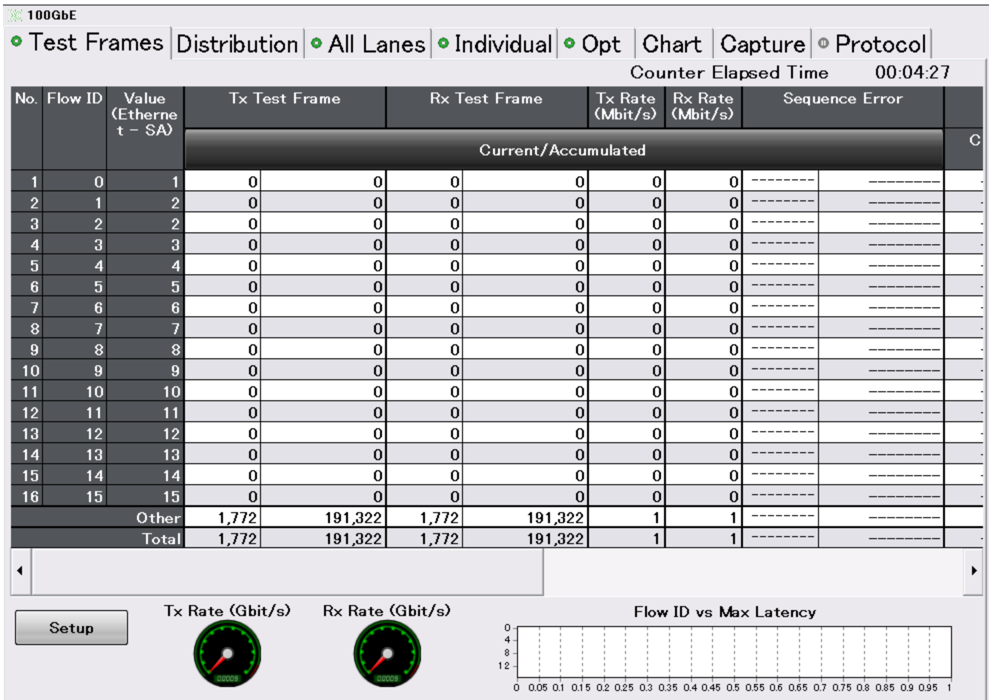


Figure 4.3.1-3　Test Frame Tab

Table 4.3.1-1 Test Frame Tab Display Items

Name	Explanation
Flow ID	Flow ID value to identify the test frame
Value *	User-defined field value to identify the test frame
Tx Test Frames	Number of sent test frames
Rx Test Frames	Number of received test frames
Tx Rate (Mbit/s)	Bit rate of sent test frames
Rx Rate (Mbit/s)	Bit rate of received test frames
Sequence Error	Number of test frames received out of sequence
Latency (us)	Time from start of sending of test frame to start of receiving test frame
Others	Measurement results of test frames that have not been identified by any of 16 flows
Total	Total value of the test frame 1 to 16 measurement results and the frame measurement results other than the test frames
Tx Rate (Gbit/s)	Meter display of the value displayed on the Total row in Tx Rate (Mbit/s)
Rx Rate (Gbit/s)	Meter display of the value displayed on the Total row in Rx Rate (Mbit/s)
Flow ID vs Max Latency	Graph display of the maximum latency The graph vertical axis is for the test frame numbers and the horizontal axis is for Latency (Maximum) values.

*: The user-defined field name is displayed.

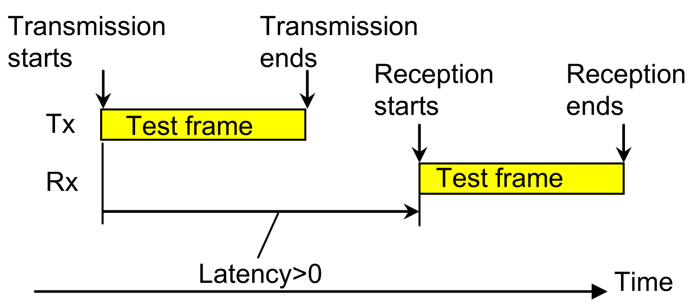


Figure 4.3.1-4 Latency Measurement

If the MD1260 time is not synchronized with the synchronous clock when measuring Latency using multiple MD1260A units, a test frame might appear to have been received before it was sent. In this case, the measured Latency is negative.

4

40 GbE/100 GbE Applications

Setting Test Frame tab display items

Items displayed on the screen can be edited.

1. Touch [Counter/Capture] at the setting area.
2. Touch [Test Frames Table…] in Counters to Display.
3. Touch the button of the item to be displayed on Test Frame tab to be displayed in dark gray.
4. Touch [OK] to close the Counter Item Screen.
5. Touch [OK] to close the Counter/Capture Screen.

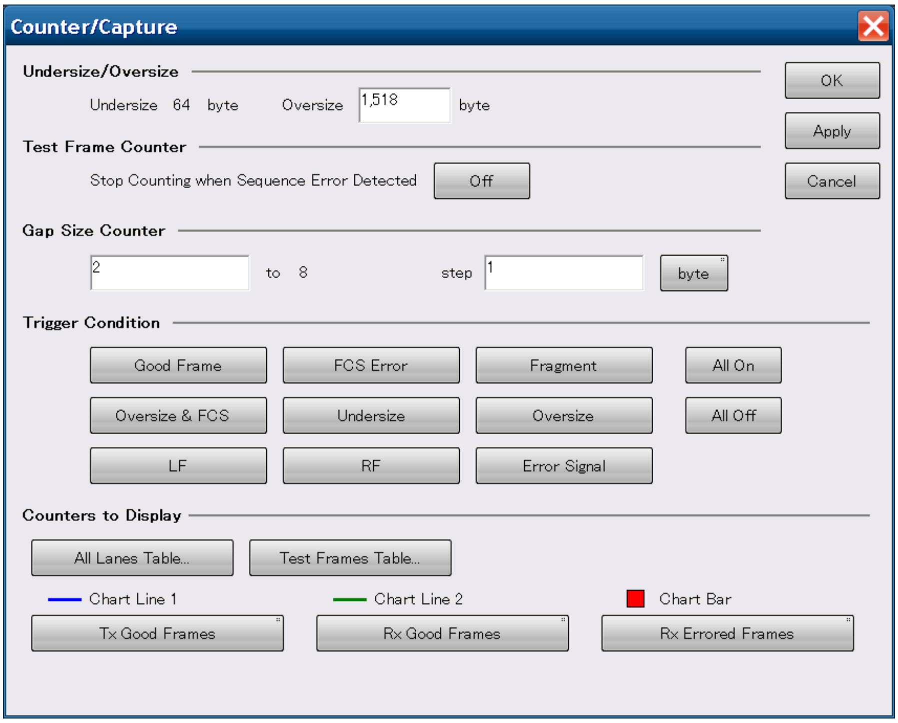


Figure 4.3.1-5 Counter/Capture Screen

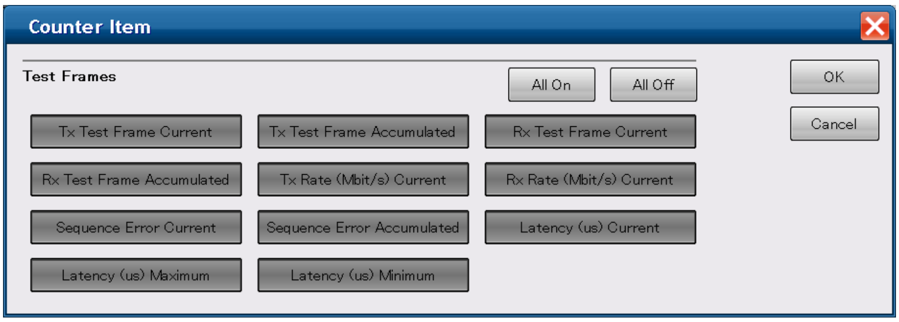
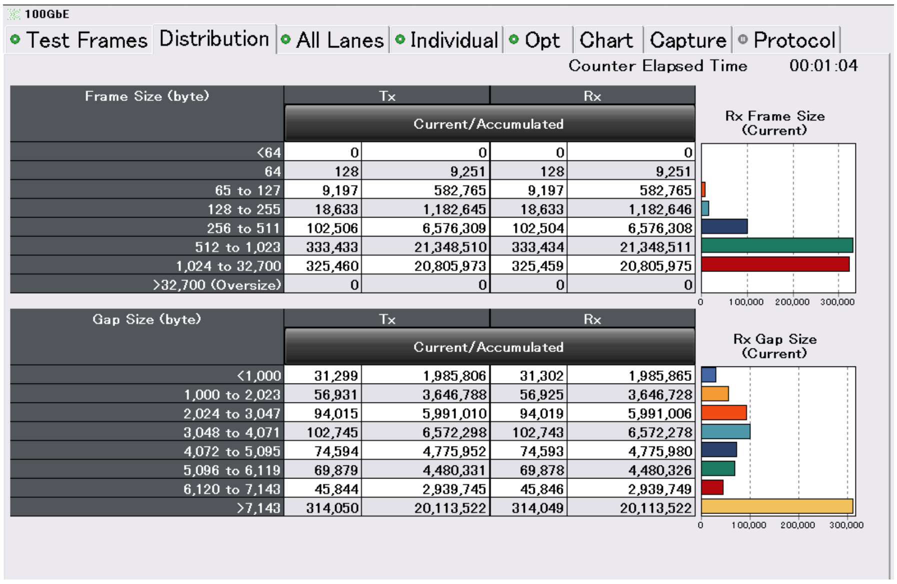


Figure 4.3.1-6 Counter Item Screen (Test Frames)

4.3.2 Frame size distribution

Touching the [Distribution] tab displays the transmitted/received and captured Ethernet frame size distribution.



Frame Size (byte)	Tx Current/Accumulated		Rx Current/Accumulated	
<64	0	0	0	0
64	128	9,251	128	9,251
65 to 127	9,197	582,765	9,197	582,765
128 to 255	18,633	1,182,645	18,633	1,182,646
256 to 511	102,506	6,576,309	102,504	6,576,308
512 to 1,023	333,433	21,348,510	333,434	21,348,511
1,024 to 32,700	325,460	20,805,973	325,459	20,805,975
>32,700 (Oversize)	0	0	0	0

Gap Size (byte)	Tx Current/Accumulated		Rx Current/Accumulated	
<1,000	31,299	1,985,806	31,302	1,985,865
1,000 to 2,023	56,931	3,646,788	56,925	3,646,728
2,024 to 3,047	94,015	5,991,010	94,019	5,991,006
3,048 to 4,071	102,745	6,572,298	102,743	6,572,278
4,072 to 5,095	74,594	4,775,952	74,593	4,775,980
5,096 to 6,119	69,879	4,480,331	69,878	4,480,326
6,120 to 7,143	45,844	2,939,745	45,846	2,939,749
>7,143	314,050	20,113,522	314,049	20,113,522

Figure 4.3.2-1 Distribution Tab

The byte size display range can be changed as follows:

1. Touch [Counter/Capture] at the setting area.
2. To change the upper bound of the frame size, touch the text box for Oversize and input a numerical value.
3. To change the lower bound of the gap size, touch the text box for Gap Size Counter and input a numerical value.
4. To change the display interval for the gap size, touch the text box for Gap Size Counter-step and input a numerical value.
5. Touch [OK].

See Figure 4.3.1-5 "Counter/Capture Screen".

4.3.3 Measuring Ethernet Frames and all PCS lanes

Touching the [All Lanes] tab displays the measurement results, such as number of sent/received Ethernet frames, local/remote failure counts, etc.

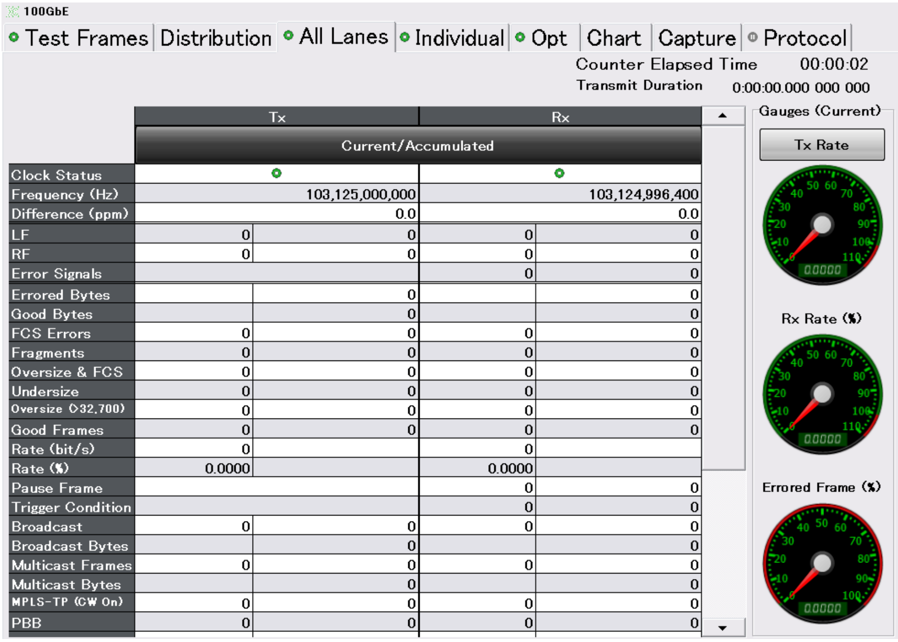


Figure 4.3.3-1 All Lanes Tab

Table 4.3.3-1 Displayed Items of All Lanes Tab (Counter)

<table>
<tr><th>Name</th><th>Explanation</th></tr>
<tr><td>Clock Status [*1]</td><td>Clock source and clock reception status selected at Section 3.3.3 Clock
<table>
<tr><th>Display</th><th>Tx</th><th>Rx</th></tr>
<tr><td>Green</td><td>Clock source signal detected</td><td>Clock received normally</td></tr>
<tr><td>Red</td><td>Clock source signal not detected (Clock Source Loss)</td><td>Clock not received normally CDR Unlock).</td></tr>
</table></td></tr>
<tr><td>Frequency (Hz) [*1]</td><td>Clock frequency (Hz)</td></tr>
<tr><td>Difference (ppm) [*1]</td><td>Clock frequency (Hz) and difference (ppm) from reference clock
When Clock Status (Tx) is red, the Tx value is not displayed.
When Clock Status (Rx) is red, the Rx value is not displayed.
Moreover, when an out-of-range clock is received, the display indicates it is out of range.</td></tr>
<tr><td>LF</td><td>Number of local failure signals</td></tr>
<tr><td>RF</td><td>Number of remote failure signals</td></tr>
</table>

*1: Measured even when Counter lamp in operation area off

Table 4.3.3-1 Displayed Items of All Lanes Tab (Counter) (Cont'd)

Name	Explanation
Error Signals	Number of total blocks becoming CGMII or XLGMII errors (RXC=1, RXD=0xFE)
Error Bytes	Total byte count of frames displayed in FCS Errors, Fragments, Oversize & FCS Errors, and Oversize
Good Bytes	Total byte count of normal frames measured as Good Frame
FCS Errors	Number of Ethernet frames with error FCS Errors, Fragments, and Oversize & FCS Errors indicate number of Ethernet frames with incorrect FCS field Fragments and Undersize indicate number of Ethernet frames in which frame size less than Undersize setting. Oversize indicates number of Ethernet frames in which frame size exceeds Oversize setting.
Fragments	
Oversize & FCS Errors	
Undersize	
Oversize*2	
Good Frames	Number of Ethernet frames meeting both following requirements • Frame size of 64 bytes or more and less than Oversize setting • No FCS error
Rate (bit/s)	Bit rate of Ethernet frame with no errors
Rate (%) *3	Ratio of measured frame rate to maximum frame rate in standard
Pause Frame	Number of paused frames
Trigger Condition	Number of generated trigger capture conditions
Broadcast	Number of Ethernet frames with broadcast destination address
Broadcast Byte	Total of byte count of Ethernet frames with broadcast destination address
Multicast Frames	Number of Ethernet frames with multicast destination address
Multicast Byte	Total of byte count of Ethernet frames with multicast destination address

*2: For the Oversize setting method, refer to Section 4.3.2 "Frame size distribution".

*3: Rate (%) indicates 100% when the Ethernet frame is transmitted and received at the specified minimum gap. The calculation formula is shown below.

$$<\%>=\frac{(\mathrm{Pr}\,eamble+GapMin)*<Good\_Frames>+<Good\_Bytes>}{(Speed/8)}\times 100$$

Preamble = 8 bytes (Specified preamble size)
GapMin = 12 bytes (Specified min gap size)
Speed = 100,000,000,000 bits (Media speed)

Table 4.3.3-1 Displayed Items of All Lanes Tab (Counter) (Cont'd)

Name	Explanation
MPLS-TP (CW On) MPLS-TP (CW Off)	Number of frames with MPLS-TP tag *5
PBB	Ethernet frame number with PBB header.
ARP Request	ARP request packet number
ARP Reply	ARP reply packet number
PINGv4 Request	Ping (IPv4) request packet number
PINGv4 Reply	Ping (IPv4) reply packet number
NDP (NS)	NDP (NS) packet number
NDP (NA)	NDP (NA) packet number
PINGv6 Request	Ping (IPv6) request packet number
PINGv6 Reply	Ping (IPv6) reply packet number
Bit Errors (count) *4	Number of bit errors in received test patterns
Bit Errors (Rate) *4	Ratio of number of bit errors to total number of bits in received test pattern
Pattern Sync Loss (s) *4	Number of seconds with pattern sync loss*6

*4: When Frame BERT is On at the Port setting, the measurement result is displayed.

*5: The item name display is switched according to the MPLS-TP reception condition setting. Refer to the following "MPLS-TP reception condition" for the setting method of MPLS-TP reception condition.

*6: Refer to Section 4.6.2 “Frame BER measurement” for the synchronous establishment and synchronous release conditions.

MPLS-TP reception condition

Control Word On/Off setting can be switched as the MPLS-TP reception condition.

Rx MPLS-TP Control Word setting	MPLS-TP counter detection condition
On	EtherType is 0x8847 or 0x8848. MPLS tag next beginning 4 bits are 0000b or 0001b.
Off	EtherType is 0x8847 or 0x8848. MPLS tag next beginning 4 bits are other than 0004b and 0006b.

Set it as follows:

1. Touch [Port] at the setting area.
2. Touch the button for Rx MPLS-TP Control Word.
3. Touch [OK].

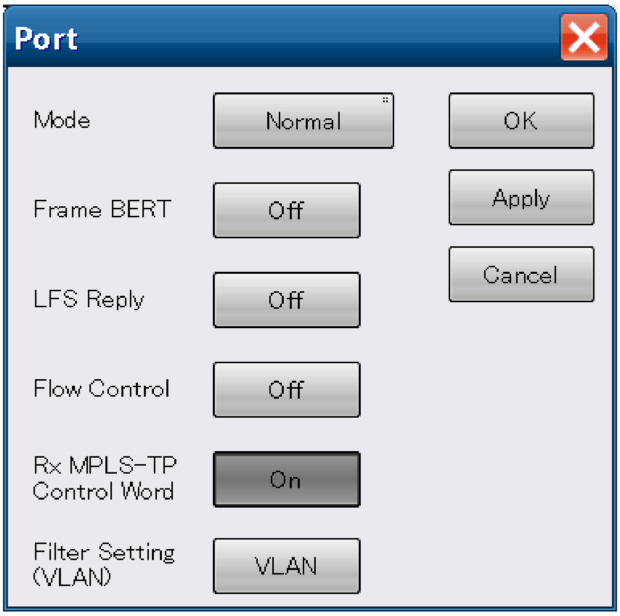


Figure 4.3.3-2 Port Screen

With the setting, the counter name displayed on All Lanes tab is switched to [MPLS-TP (CW On)] or [MPLS-TP (CW Off)].

Table 4.3.3-2 Displayed Items of All Lanes Tab (Gauges)

Name	Explanation
Tx Rate (%)	Table Tx rate (%)
Rx Rate (%)	Table Rx rate (%)
Error Frame(%)	Ratio of number* of frames with errors to received number of frames

*: Total number of frames displayed in FCS Errors, Fragments, Oversize & FCS Errors, and Oversize

Setting All Lanes tab display items

Items displayed on the screen can be edited.

1. Touch [Counter/Capture] at the setting area.
2. Touch [All Lanes Table…] in Counters to Display.
3. Touch the button of the item to be displayed on All Lanes tab to display in dark gray.
4. Touch [OK] to close the Counter Item Screen.

5. Touch [OK] to close the Counter/Capture Screen.

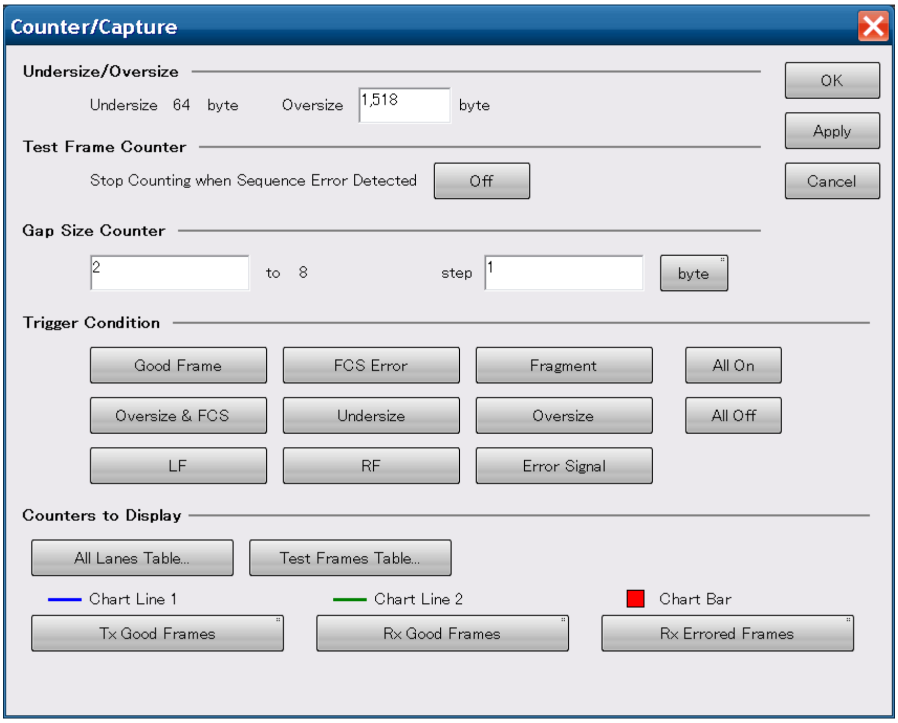


Figure 4.3.3-3 Counter/Capture Screen

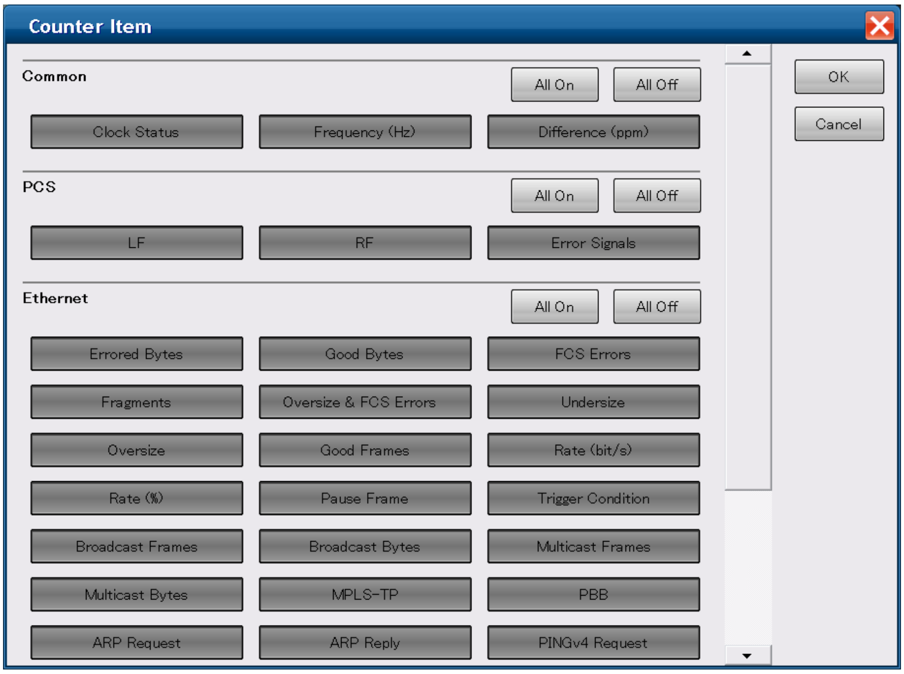


Figure 4.3.3-4 Counter Item Screen (All Lanes)

VLAN Filter Settings

A filter can be set to the counter next to All Lanes tab by VLAN filter.
ARP Request, ARP Reply, PINGv4 Request, PINGv4 Reply, NDP (NS), NDP (NA), PINGv6 Request, PINGv6 Reply

Set it as follows:

1. Touch [Port] at the setting area.
2. Touch [VLAN]. Filter Setting (VLAN) screen is displayed.
3. Touch [Number of Filter] text box to set VLAN filter number.
4. Touch [VLAN Stack] button to set VLAN number of the Ethernet frame to measure.
5. Set TPID in the number set in [VLAN Stack].
   Set VLAN1 TPID when [VLAN Stack] is 1, and VLAN1 TPID and VLAN TPID2 when [VLAN Stack] is 2.
6. Touch [OK]. Returns to the Port screen.
7. Touch OK on the Port screen.

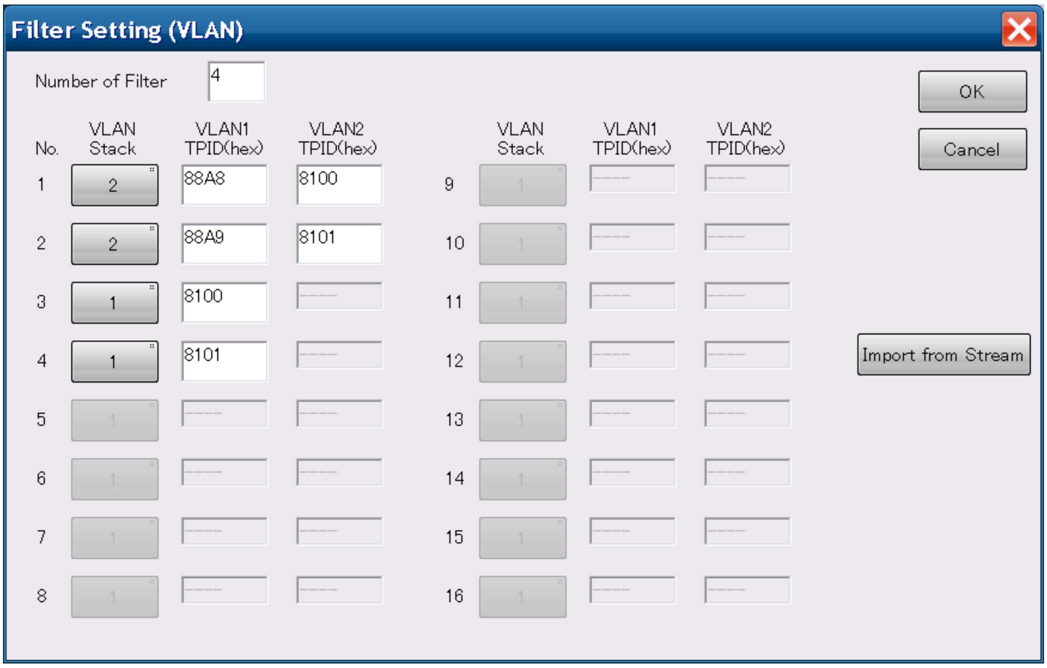


Figure 4.3.3-5 Filter Setting (VLAN) Screen

Table 4.3.3-3 Setting Items of Filter Setting (VLAN) Screen

Name	Explanation
Number of Filter	Sets the VLAN filter. If set to 3, three filters can be set and an Ethernet frame which meets one of them is received.
VLAN Stack	0: Ethernet frame with 0 VLAN (Ethernet frame without VLAN setting 1: Ethernet frame with 1 VLAN 2: Ethernet frame with 2 VLANs
VLAN1 TPID	VLAN1 TPID (16bit)
VLAN2 TPID	VLAN2 TPID (16bit)
Import from Stream	Set the VLAN values of the streams in Section 4.2.4 “Editing two or more streams” to the VLAN filter.

4.3.4 Measuring each PCS lane

Touching the [Individual] tab displays the measurement results, such as the synchronous status per PCS lane and error counts, etc.

The number of displayed lanes is 4 for 40 GbE, and 20 for 100 GbE.

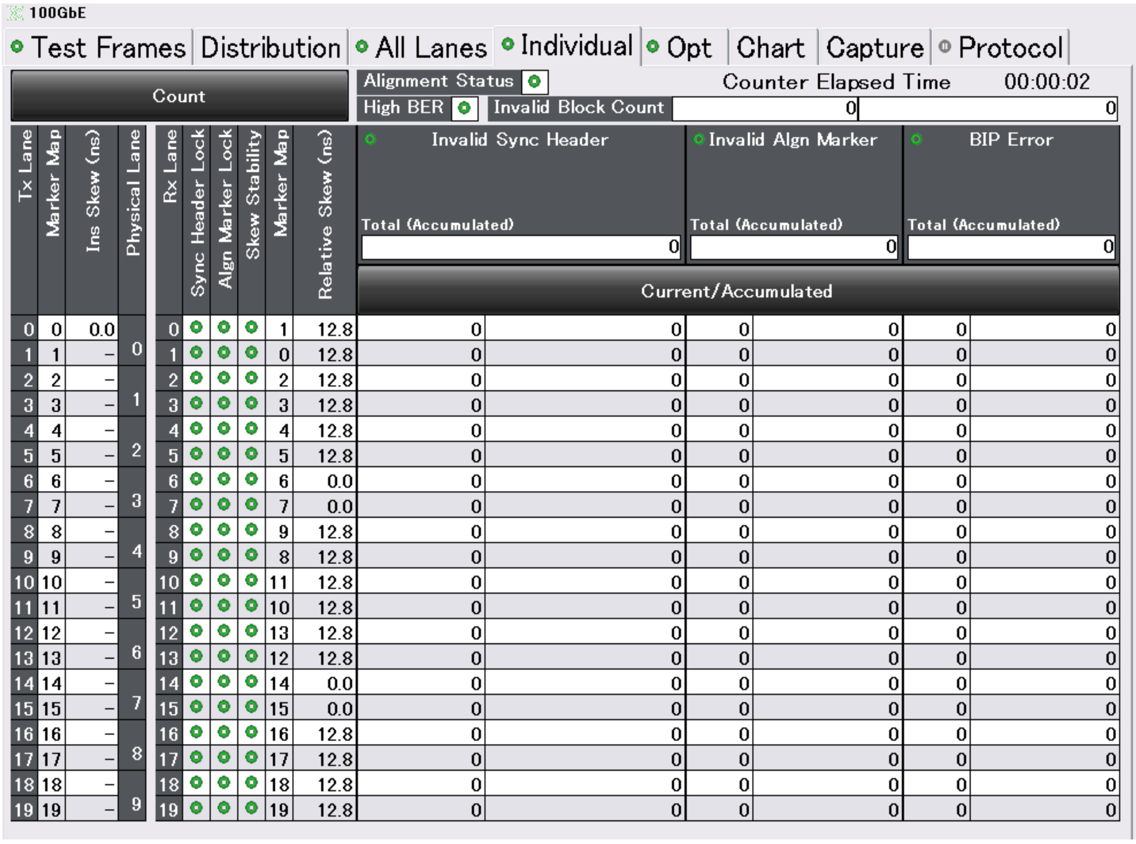


Figure 4.3.4-1 Individual Tab (100 GbE)

Table 4.3.4-1 Displayed Items of Individual Tab

Name	Explanation
Counter/Rate	Switches the display type of the following items. Invalid Sync Header Invalid Align Marker BIP Error When the button says Counter, displays the count number. When the button says Rate, displays the occurrence rate.

Table 4.3.4-2 Displayed Items of Individual Tab (All Lanes)

Name	Explanation
Alignment Status	Green: Indicates that following three conditions met • Alignment marker synchronization established • Value of alignment marker does not overlap in all lanes. • Deskew completed Red: Indicates that at least one of above three conditions not met
High BER	Green: 96 or less abnormal Sync. Headers monitored at window size Red: 97 or more abnormal Sync. Headers monitored at window size Window size: For 100GBASE-R 500 μs For 40GBASE-R, 1250 μs
Invalid Block	Following number of blocks explained as IEEE 802.3ba 82.2.3.5 Valid and invalid blocks a) Sync Field value is 00 or 11 b) Block Type Field includes reserved value c) Control character includes values not in Table 82-1 d) Combination of 8 characters of XLGMII/CGMII does not match format of IEEE 802.3ba Figure 82-5

Table 4.3.4-3 Displayed Items of Individual Tab (Tx)

Name	Explanation
Tx Lane	Send PCS lane number
Marker Map	Value of alignment marker sent at each PCS lane (0 to 3 at 40 GbE, 0 to 19 at 100 GbE) The layout can be changed using [Lane Mapping] at the setting area.
Ins Skew	Displays amount of skew between send PCS lanes The amount of the skew can be set using [Relative Skew] at the setting area.
Physical Lane *	Send physical lane number

*Not displayed by 40 GbE application

Table 4.3.4-4 Displayed Items of Individual Tab (Rx)

Name	Explanation
Rx Lane	Receive PCS lane number
Sync Header Lock	Green: Sync Header synchronization established When 64 continuous normal blocks (01 or 10) received Red: Sync Header synchronization not established 65 abnormal blocks (00 or 11) received in 1024 66-bit blocks
Alignment Marker Lock	Green: Two consecutive identical alignment markers every 16384 blocks Red: Four consecutive abnormal or dissimilar markers every 16384 blocks Normal indicates some value in IEEE802.3ba Table 82-2
Skew Stability	Green: No changes in Relative Skew value Red: Changes in Relative Skew value
Marker Map	Alignment marker value received at each PCS lane (0 to 3 at 40 GbE, 0 to 19 at 100 GbE) Can confirm whether or not send lane data received at which reception lane The display is the value sampled every second. When the block is out of sync, the last synchronized alignment marker value is displayed.
Relative Skew (ns)	Amount of skew between received PCS lanes The gap between alignment markers of each lane when the first received lane is 0 is displayed in 66 bits per block unit (6.4 ns at 40 GbE, 12.8 ns at 100 GbE). The display is the value sampled every second. The range to be measured is 0 to 819.2 ns. A value exceeding the set maximum value is displayed as >819.2.
Invalid Sync Header*	Number of blocks with abnormal Sync Header value (00 or 11)
Invalid Alignment Marker*	Number of alignment markers with abnormal values other than BIP field In concrete terms, this is the count of detected values that are different from the values in IEEE802.3ba Table 82-2 (100GBASE-R Alignment marker encoding).
BIP Error*	Number of error bits in BIP3 fields

*The total value of all lanes is displayed in Total (Accumulated).

When changing transmission lane assignment

Change Marker Map of Tx as follows:

1. Touch [Lane Mapping] at the setting area.
2. Touch the button for PCS Lane Maker and set the value of the PCS Lane assigned in the Tx Lane.
3. When assigning the same PCS Lane marker to multiple Tx Lanes, touch [Allow to Overlap] so the button display changes to dark gray.
4. Touch [OK].

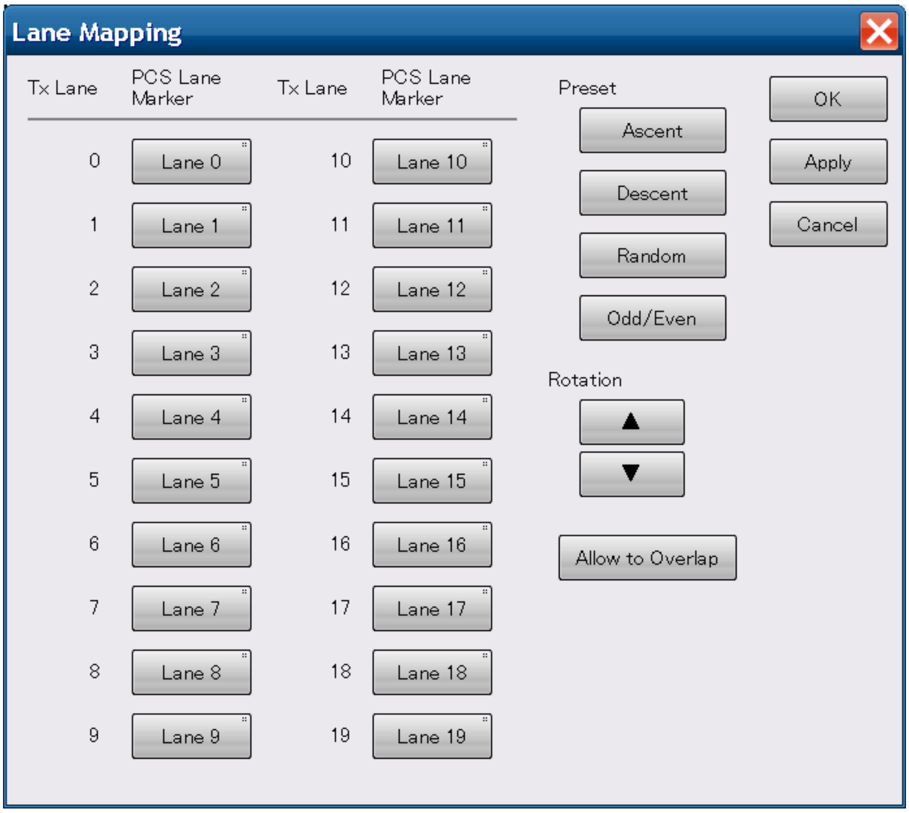


Figure 4.3.4-2　100 GbE Lane Mapping Screen

Touching [Random] allocates the PCS Lane Marker randomly.

Touching [Ascent], [Descent], and [Odd/Even] buttons allocates the PCS Lane Marker as shown in the following tables.

Table 4.3.4-5 For 40 GbE

	PCS Lane Marker		
Tx Lane	Ascent	Descent	Odd/Even
0	0	3	1
1	1	2	0
2	2	1	3
3	3	0	2

Table 4.3.4-6 For 100 GbE

	PCS Lane Marker		
Tx Lane	Ascent	Descent	Odd/Even
0	0	19	1
1	1	18	0
2	2	17	3
3	3	16	2
4	4	15	5
5	5	14	4
6	6	13	7
7	7	12	6
8	8	11	9
9	9	10	8
10	10	9	11
11	11	8	10
12	12	7	13
13	13	6	12
14	14	5	15
15	15	4	14
16	16	3	17
17	17	2	16
18	18	1	19
19	19	0	18

Touching [Rotation] allocates the PCS Lane Marker one-by-one.

4.3.5 Displaying CFP status

Touching the [Opt] tab displays the CFP status.

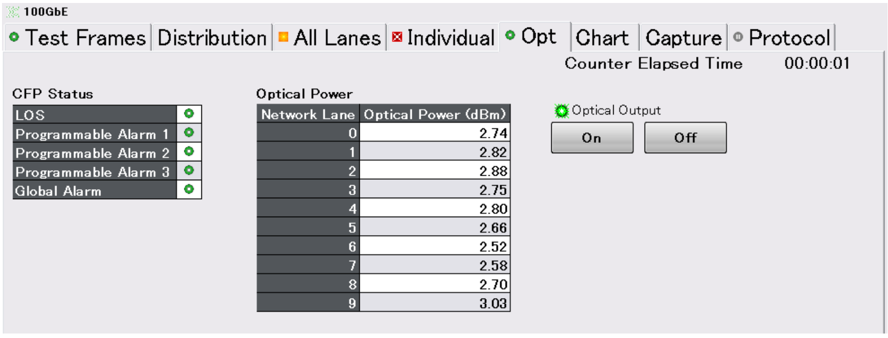


Figure 4.3.5-1 Opt Tab (100 GbE)

Table 4.3.5-1 Setting Items of Opt Tab

Name	Explanation
On	Turns On the CFP optical output
Off	Turns Off the CFP optical output

The default CFP setting for Global Alarm is disabled. Change the CFP setting at [MDIO] of the setting area to display the alarm.

Table 4.3.5-2 Display Items of Opt Tab

Name	Explanation
LOS	Green: Optical signal input to Rx reception part of CFP Red: Optical signal not input to Rx reception part of CFP
Programmable Alarm 1	Displays alarm because deems Programmable Alarm 1 assigned to default source recommended in CFP MSA standards Green: CFP power-up completion Red: CFP power-up not completed
Programmable Alarm 2	Displays alarm because deems Programmable Alarm 2 assigned to default source recommended in CFP MSA standards Green: Initialization completed Red: Initialization not completed
Programmable Alarm 3	Displays alarm because deems Programmable Alarm 3 assigned to default source recommended in CFP MSA standards Green: Initialization sequence terminated normally Red: Initialization sequence not terminated normally
Global Alarm	Green: No CFP Global Alarm Red: CFP Global Alarm
Optical Power	Optical reception level (dBm) ***Note:*** The value read from the CFP module is displayed. Refer to the CFP specifications for enable/disable of display value and measurement accuracy.
Optical Output	Green: CFP is outputting the optical signal. Gray: CFP is not outputting the optical signal.

4.3.6 Displaying graph

The change in up to 3 measurement results with elapsed time can be displayed as a graph.

Touch [Chart] tab, and touch another [Chart] tab on top left displays the graph screen.

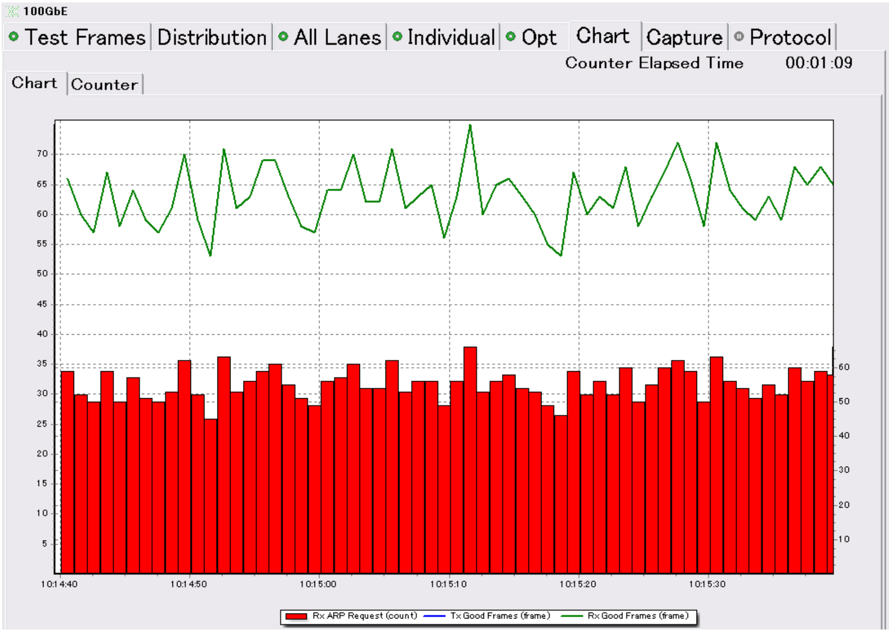


Figure 4.3.6-1 Chart Tab (Chart)

Set the displayed items as follows:

1. Touch [Counter/Capture] at the setting area.
2. Touch the button for the Chart Item. The screen for selecting measurement items is displayed.
3. Touch the button for the measurement items displayed on the graph. Touching [None] deletes the graph.
4. The button for setting the lane number is displayed in the following cases. Touch the button and set the lane number.
   - [Invalid Sync Header]
   - [Invalid Alignment Marker]
   - [BIP Error]

5. The button to set the number of bytes is displayed in the following cases.
   Touch the button and set the number of bytes.
   - [Tx Frame Size Distribution]
   - [Tx Gap Size Distribution]
   - [Rx Frame Size Distribution]
   - [Rx Gap Size Distribution]
6. The button to set the flow ID is displayed in the following cases.
   Touch the button and set the flow ID.
   - [Tx Test Frame]
   - [Rx Test Frame]
   - [Sequence Error]
   - [Current Latency]
   - [Maximum Latency]
   - [Minimum Latency]
7. Touch [OK] to display the graph in the Chart tab.
8. Touching [Counter] on top left displays enlarged measurement results.
   The item selected for Chart Line 1 is displayed on the top, and the item selected for Chart Line 2 on the bottom. The results in red letters show an error.
9. The display type can be switched by selecting [Current] or [Accumulated] on the screen.
   Current:　Count value in the last 1 second.
   Accumulated: Count value accumulated in the time shown in [Counter Elapsed Time].

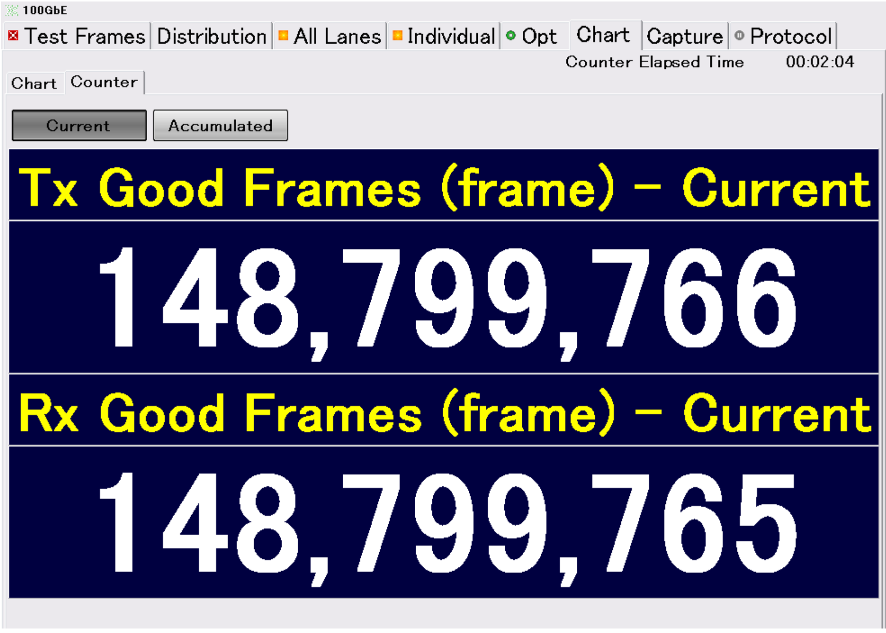


Figure 4.3.6-2 Chart Tab (Counter)

4.3.7 Starting/stopping measurements

To start the measurement, touch the Counter ▶ button at the operation area. The lamp lights during measurement. The elapsed time is displayed at Counter Elapsed Time of each tab.

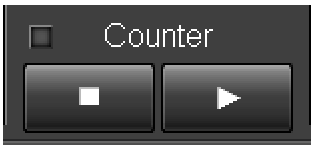


Figure 4.3.7-1 Counter Button

To stop measurement, touch the Counter ■ button at the operation area.

4.4 Capture

The MD1260A capture saves the received XLGMII data or CGMII data to memory.

4.4.1 Setting trigger

To set the trigger for starting capture, set the start conditions as follows:

1. Touch [Counter/Capture] in the setting area. The Counter/Capture dialog opens.
2. Touch the conditions buttons for triggering the capture start displayed at Trigger Condition. Selected trigger button are displayed in light gray.

   Touching [All Off] terminates capture at the point when the memory becomes full after capture starts.
3. Touch [OK] in the Counter/Capture dialog.

Before starting capture, confirm the trigger generation status as follows:

1. Touch the [All Lanes] tab.
2. Touch the ▶ button at the operation area.
3. The number of trigger generations is displayed in Trigger Condition. One or more Trigger Condition measurement results are confirmed. If there are no Trigger Condition measurement results, capture does not set at the set trigger.

4.4.2 Starting/stopping capture

To start capture, touch the Capture ▶ button at the operation area. After capture has been started, it stops when the set trigger event occurs.

The lamp is lit during capture. Capture is stopped when the lamp is off.

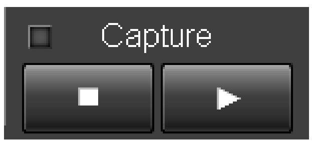


Figure 4.4.2-1 Capture Button

To stop capture, touch the Capture ■ button at the operation area.

4.4.3 Displaying capture results

Touching the [Capture] tab displays the capture result.

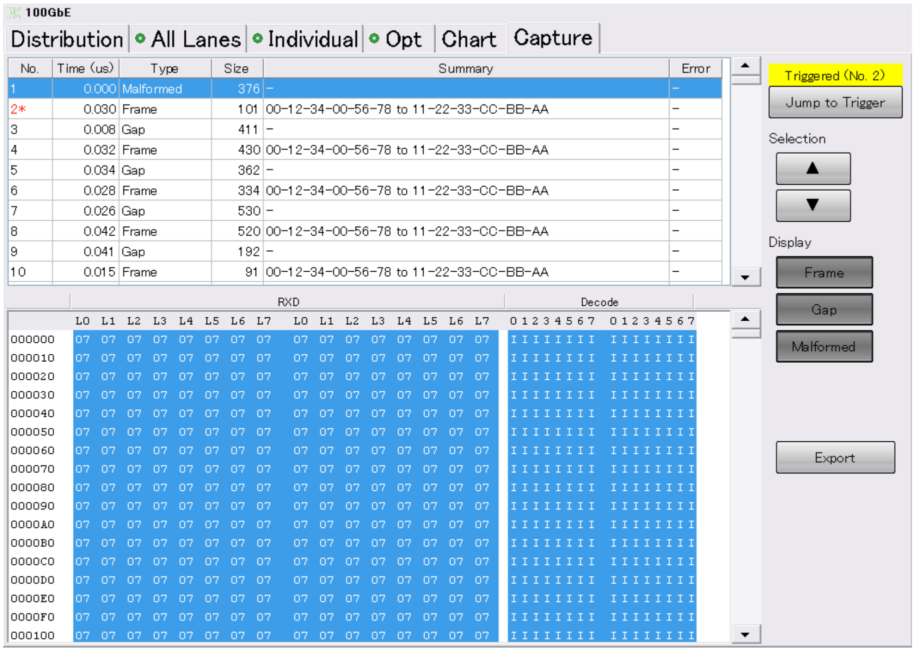


Figure 4.4.3-1 Capture Tab

Table 4.4.3-1 Display Item of Capture Tab

Name	Explanation
Summary data display*1	Displays following capture data No: Line number of data Time (μs):Time interval for preceding displayed line data Type: Frame type Frame: Frame Gap: Gap between frames Malformed: Neither frame nor gap between frames Size: 1 line data size (bytes) Summary: Source address and destination address when Type is Frame Error: Error type FCS: Frame check sequence error LF: Local failure MII: CGMII or XLGMII error data (RXC=1, RXD=0xFE) OVER: Oversize RF: Remote failure UNDER: Undersize
Detailed data display	Data for the line selected by the Type data display is displayed as a hexadecimal number. The Decode sign means the following. D: Data RXC=0 I: Idle RXC=1,RXD=07 S: Start RXC=1,RXD=FB T: Terminate RXC=1,RXD=FD Q: Sequence RXC=1,RXD=9C !: Error RXC=1,RXD=FE ?: Unknown or reserved Other
Triggered	Lit when trigger generated, and displays trigger line number Not displayed when no trigger
Jump to Trigger	Moves summary data cursor position to trigger position*3
Selection	Moves line number
Display	Selects displayed Type
Wireshark*2	Starts Wireshark when Wireshark installed
Export	Saves capture results to file

*1: When the summary display Type is [Frame], the displayed data includes the preamble, so note the following points.

- The data length displayed at the [Size] line is the size including the preamble. However, the Tx Stream setting and Frame Size set at the Frame Size counter does not including the preamble.
- The data reception time displayed at the [Time] line is the time when the preamble header was received. However, the timestamp displayed by Wireshark using the coordinated function is the time when the Ethernet header was received excluding the preamble.

*2: The user should install Wireshark. Refer to Appendix F "Introduction to Wireshark for the installation method".

*3: When the trigger condition is a frame sequence, the trigger position is the last byte of the frame square.

4.4.4 Saving capture results

1. Touch the [Capture] tab.
2. Touch [Export] to open the Capture Export window.
3. When saving the binary file for Wireshark, touch the button for Binary to display it in dark gray.
4. When saving a test file, touch the button for Text to display the item to save in dark gray.
5. Touch [Open Folder] to confirm the save destination folder.
6. Touch [OK] to save the capture results.

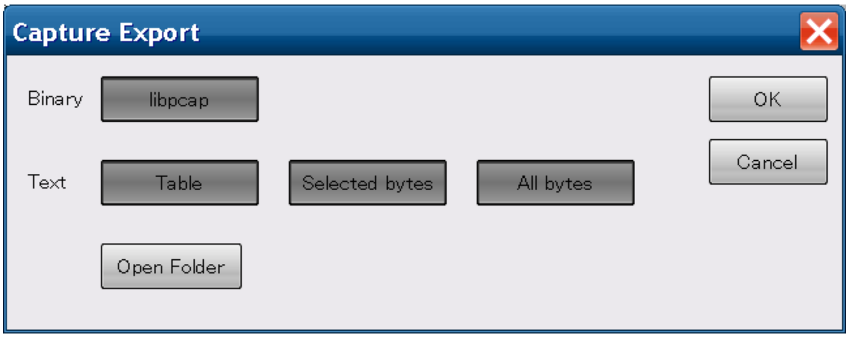


Figure 4.4.4-1 Capture Export Window

The capture file is saved to the following folder in the path:
C:\ Documents and Settings\Administrator\My Documents \Anritsu\MD1260A\UserData\Capture Data

```
=== Table
No.        Time (us)          Type     Size      Summary            Error
1          0.000      Malformed        8         -          -
2          0.000      Frame     88     16-17-18-19-1A-1B to 10-11-12-13-14-15      -
3          0.007      Gap       16     -         LF
4*         0.001      Frame     48     7E-7F-80-81-82-83 to 78-79-7A-7B-7C-7D      -
5          0.003      Gap       16     -         -
6          0.001      Malformed        16        -          -

=== Selected Bytes (No.1)
         ---------------------- RXD ---------------------- ---- Decode -----
         L0 L1 L2 L3 L4 L5 L6 L7   L0 L1 L2 L3 L4 L5 L6 L7   01234567 01234567
000000 07 07 07 07 07 07 07 FB                                IIIIIIIS

=== All Bytes
         ---------------------- RXD ---------------------- ---- Decode -----
         L0 L1 L2 L3 L4 L5 L6 L7   L0 L1 L2 L3 L4 L5 L6 L7   01234567 01234567
000000 07 07 07 07 07 07 07 FB   00 09 0A 0B 0C 0D 0E 0F   IIIIIIIS DDDDDDDD
000010 10 11 12 13 14 15 16 17   18 19 1A 1B 1C 1D 1E 1F   DDDDDDDD DDDDDDDD
000020 20 21 22 23 24 25 26 27   28 29 2A 2B 2C 2D 2E 2F   DDDDDDDD DDDDDDDD
000030 30 31 32 33 34 35 36 37   38 39 3A 3B 3C 3D 3E 3F   DDDDDDDD DDDDDDDD
000040 40 41 42 43 44 45 46 47   48 49 4A 4B 4C 4D 4E 4F   DDDDDDDD DDDDDDDD
000050 50 51 52 53 54 55 56 57   58 59 5A 5B 5C 5D 5E 5F   DDDDDDDD DDDDDDDD
000060 FD 07 07 07 07 07 07 07   9C 07 FD 07 07 07 07 FB   TIIIIIII QITIIIIS
```

Figure 4.4.4-2 Example of Test File

4.5 Protocol Test

Set Frame BERT to [Off] to display Protocol tab in the procedure below.

1. Touch [Port] at the setting area.
2. Touch the button for Frame BERT to set display to [Off].
3. Touch [OK].

4.5.1 Transmission of ARP/NS

When the stream frame formats edited in Section 4.2.4 “Editing two or more streams” include IPv4 or IPv6, the received ARP, NS, or Ping packet can be replied to the source IP address.
Additionally, sending ARP or NS packet with the same target address as the source address allows overlapping IP addresses to be detected and the measured object to memorize the IP address.
The protocol operation of the measured object can be tested by these functions.

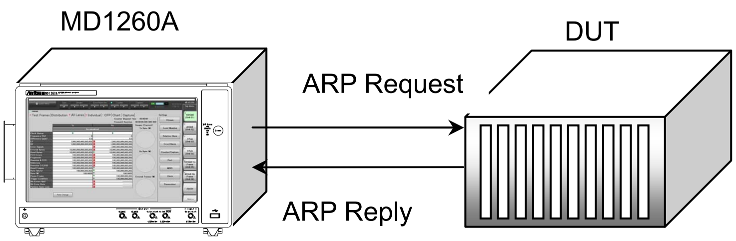


Figure 4.5.1-1 Checking Overlapping IP Addresses by Gratuitous ARP

Gratuitous ARP is a packet for which the source IP address and target IP address are the same. It is used to check if the same IP address as that of the ARP sending device exists.

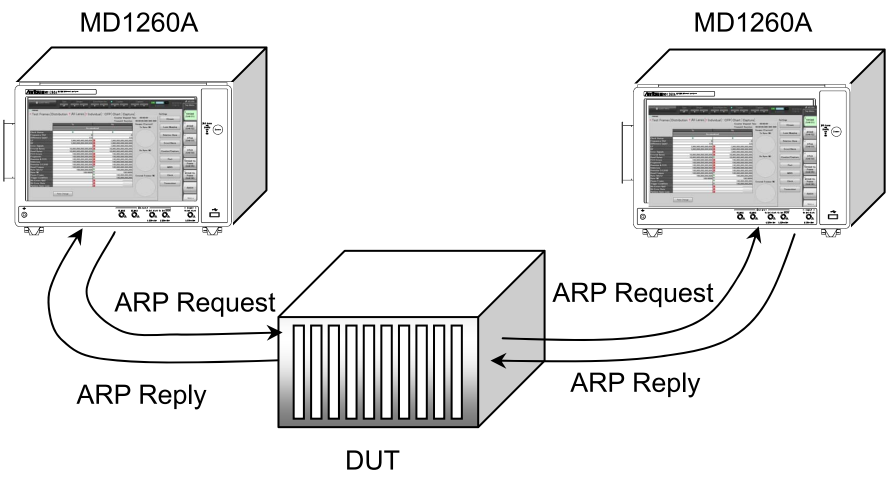


Figure 4.5.1-2 ARP Packet Communication Test Using Two MD1260As

Touch [Protocol] tab to set the transmission of ARP and NS packets. Touch [ARP/ICMP] tab to display the transmission settings of stream address, ARP packet, and ICMP packet.

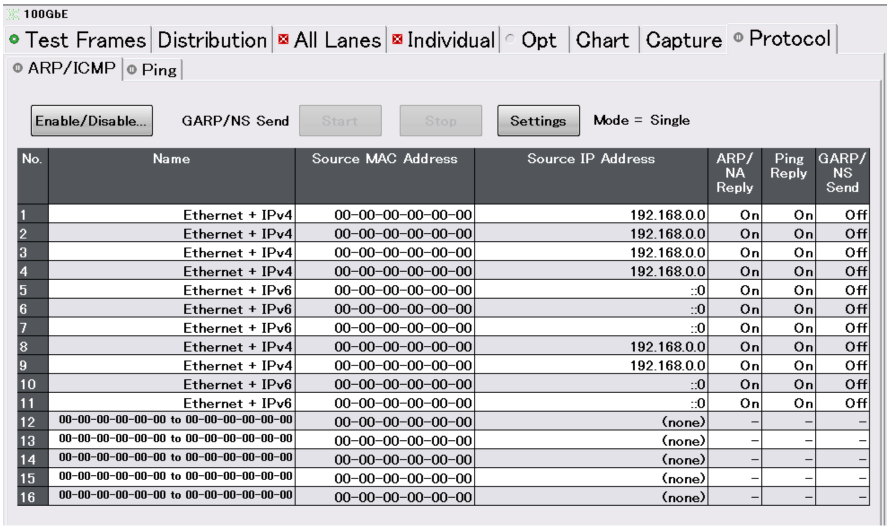


Figure 4.5.1-3 Protocol Tab (ARP/ICMP)

Table 4.5.1-1 Setting items of Protocol Tab (ARP/ICMP)

Name	Explanation
Enable/Disable	Displays ARP/ICMP Enable/Disable screen.
GARP/NS Send	Start: Starts sending Gratuitous ARP or NS.
	Stop: Stops sending Gratuitous ARP or NS.
	Settings: Displays GARP/NS Settings screen.

Table 4.5.1-2 Protocol tab (ARP/ICMP) display items

Name	Explanation
No.	Stream number
Name	Stream name.
Source MAC Address	Stream source MAC address
Source IP Address	Stream source IP address
ARP/NA Reply	When set to On, on receiving ARP Request or NS packet to inquire stream source IP address, sends ARP Reply or NA respectively.
Ping Reply	Ping Reply On/Off When set to On, sends Ping Reply on receiving Ping packet to inquire stream source IP address.
GARP/NS Send	Sending On/Off of Gratuitous ARP or NS. When set to On, sends ARP Request (Gratuitous ARP) or NS packet to inquire stream source IP address.

For the settings of Name, Source MAC Address, Source IP Address. refer to Section 4.2.4 “Editing two or more streams”

Figure 4.5.1-4　ARP/ICMP Enable/Disable Screen

ARP packet sending On/Off and PING packet sending On/Off can be set for each stream on ARP/ICMP Enable/Disable screen. For explanation of setting items, refer to Table 4.5.1-2 Protocol tab (ARP/ICMP) display items.

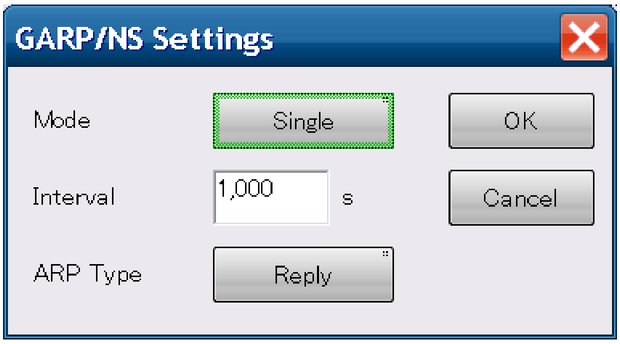


Figure 4.5.1-5　GARP/NS Settings Screen

Table 4.5.1-3　GARP/NS Settings Screen Items

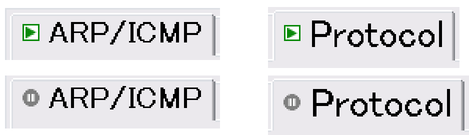
Name	Explanation
Mode	Sets the operation when [Start] is touched. Single: Sends ARP or NS packet once. Repeat: Sends ARP packet repeatedly at intervals set in the Interval field.
Interval	Sending time interval of ARP or NS packet.
ARP Type	Sets the type field of ARP packet.

ARP/NS is send in the following procedure. For editing streams, refer to Section 4.2.4 “Editing two or more streams.”

1. Touch the [Protocol] Tab.
2. Touch the [ARP/ICMP] Tab
3. Touch [Enable/Disable...]. ARP/ICMP Enable/Disable screen is displayed.
4. Sets the streams to send ARP/NS Reply, Ping Reply, and GARP/NS.
5. Touch [OK] to close ARP/ICMP Enable/Disable screen. Then the settings of ARP/NS Reply, Ping Reply, and GARP/NS Send are enabled.
6. Touch [Settings]. GARP/NS Settings screen is displayed.
7. Set Mode, Interval, and ARP Type and touch [OK].
8. Touch the Counter [▶] button.
9. Touch [Start] of GARP/NS Send to send GARP or NS. The icons on ARP/ICMP and Protocol tabs change.

ARP/ICMP Tab　　Protocol Tab

GARP sending



10. Touch the [All Lanes] Tab. The packet number sent/received are displayed in the following fields.

    IPv4: ARP Request, ARP Reply, PINGv4 Request, PINGv4 Reply

    IPv6: NDP (NS), NDP (NA), PINGv6 Request, PINGv6 Reply

4

40 GbE/100 GbE Applications

4.5.2 Ping Test

Transmit PING to an arbitrary IP address and check the connection. Touch [Protocol] tab and then [Ping] tab to set Ping test.

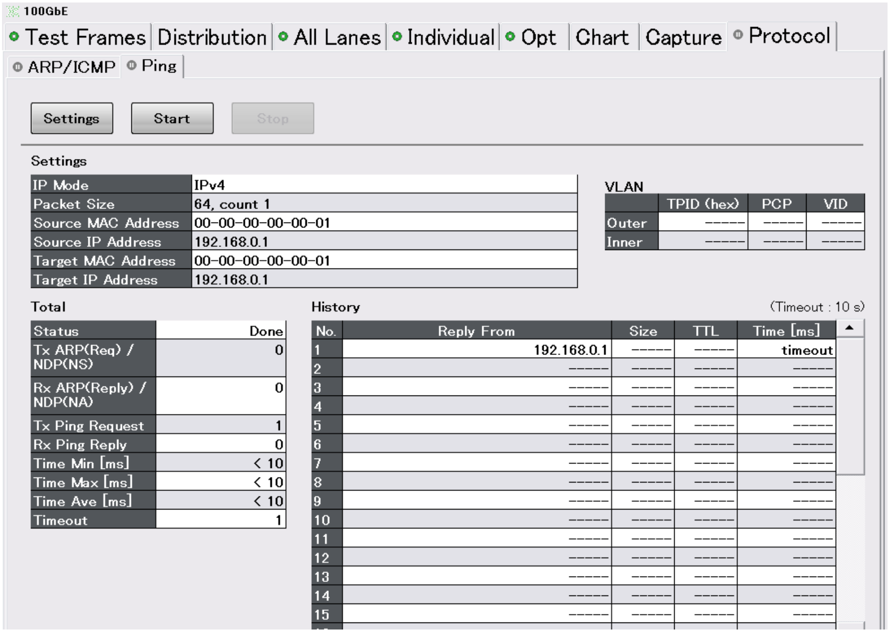


Figure 4.5.2-1 Protocol Tab (Ping)

Table 4.5.2-1 Setting items of Protocol Tab (Ping)

Name	Explanation
Setting	Displays Ping Settings screen.
Start	Starts the Ping test.
Stop	Stops the Ping test.

Table 4.5.2-2 Displayed Items of Protocol Tab (Ping)

Name	Explanation
Settings	IP version, packet size, MAC addresses, and IP addresses of Ping packet are displayed.
VLAN	When VLAN is set for Ping packet frame, the information is displayed.
Total	Ping test status and statistics values are displayed.
Status	– PING Test is not executed. Solving... MAC address resolution by ARP, NA/NS in progress. Resolve Timeout MAC address resolution by ARP, NA/NS has a timeout (in red). Ping... Ping test in progress. Done Ping test completed. Aborted Ping test aborted.
Tx ARP (Req) / NDP (NS)	Packet number of ARP Request or NDP (NS) sent
Rx ARP (Reply)/ NDP (NA)	Packet number of ARP Reply or NDP (NA) received
Tx Ping Request	Packet number of Ping Request sent
Rx Ping Reply	Packet number of Ping Reply received
Time Min[ms]	Minimum time of Ping Reply reception
Time Max[ms]	Maximum time of Ping Reply reception
Time Ave[ms]	Average time of Ping Reply reception
Timeout	Number of timed-out measurements
History	Displays the latest measurement results up to 32.
Reply From	Source IP address of Ping Reply packet
Size	Frame size of Ping Reply message
TTL	TTL value of Ping Reply message
Time[ms]	Time until Ping Reply reception Displays “timeout” when the measurement is timed out.

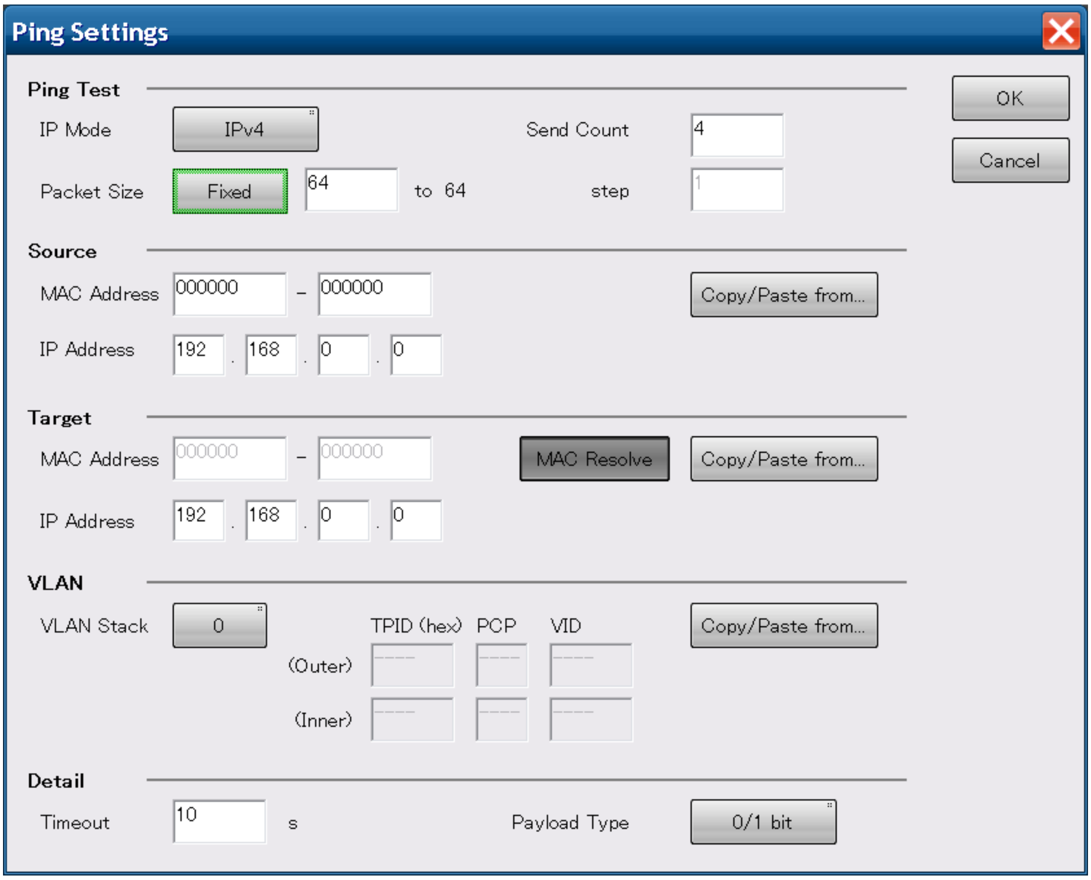


Figure 4.5.2-2　Ping Settings Screen

Table 4.5.2-3　Ping Settings Screen Items

Name	Explanation
Ping Test	
IP Mode	IP Version of Ping packet
Send Count	Number of transmitted Ping packets
Packet Size	Ping packet size (bytes) Press [Increment] to display in dark gray, and specify bytes in the step field to increase packet size at each transmission.
step	Change in packet size (bytes)
Source	
MAC Address	Source MAC Address
IP Address	Source IP Address
Copy/Paste from ...	Displays the stream selection screen.　Source MAC Address and Source IP Address of the selected stream are copied.

Table 4.5.2-3 Ping Settings Screen Items (Cont'd)

Name	Explanation
Target	
MAC Address	Target MAC Address Press [MAC Resolve] to display in dark gray to set MAC address by executing address resolution before Ping test.
IP Address	Target IP Address
Copy/Paste from ...	Displays the stream selection screen. Destination MAC Address and Destination IP Address of the selected stream are copied.
VLAN	
VLAN Stack	VLAN number of Ping packet The number of TPID, PCP, and VID change according to the VLAN number.
Copy/Paste from ...	Displays the stream selection screen. VLAN setting and Source IP Address of the selected stream are copied.
Detail	
Timeout	Ping test timeout (second)
Payload Type	Payload type of Ping packet All0: All bits are 0s. All1: All bits are 1s. 0/1 bit: Repetitive pattern of bit0 and bit1.

Execute Ping test as follows:

1. Touch the [Protocol] Tab.
2. Touch the [Ping] tab.
3. Touch [Settings].

Displays Ping Settings screen.

4. Set the items on Ping Settings screen and touch [OK].
5. Touch the Counter [▶] button.
6. Touch [Start] to start Ping test.

The icons on Ping and Protocol tabs change during the test.

	Ping Tab	Protocol Tab
Ping test in progress		
Ping test stopped		

7. The results are displayed in Total and History.

4.6 Measurement Procedures

4.6.1 Evaluating 40 GbE/100 GbE

Perform evaluation using the 40 GbE/100 GbE application as follows:

1. Connect the MD1260A and DUT.
2. Start the 40 GbE/100 GbE application.
3. Set Mode to [Normal] at the [Port] screen.
4. Confirm that Link in the summary status area is lit green, and Error/Alarm is not lit.
5. Set Frame BERT, LFS Reply, and Flow Control at the [Port] screen.
6. Set the PCS lane and physical lane assignment at the [Lane Mapping] screen.
7. Touch the Counter ▶ button in the operation area to start measurement.
8. Touch the Measurement Area tab and select the measurement results to be displayed.
   To reset the measurement (Counter), touch the Counter ▶ button.

At this time, the following items are evaluated at each operation area.

- Whether or not Link Up occurred and an Error/Alarm was generated can be confirmed at the summary data area.
- The PCS status can be confirmed at the [Individual] tab of the measurement results area.
  Touching the Counter ▶ button in the operation area starts the count.
- An error can be inserted into the PCS layer by touching the Error/Alarm Ins ▶ button in the operation area.
  The error insertion method is set at [Error/Alarm].
- Skew can be inserted in the PCS lane at[Relative Skew].
- The Tx clock frequency can be adjusted at [Clock].
- Touching the Stream ▶ button at the operation area, sends the Ethernet frame.
  The details of the sent frame are set at [Stream].
  The number of sent frames can be confirmed at the measurement result display area.
- Touching the Capture ▶ button at the operation area starts Ethernet capture.
  The capture stop condition can be set at [Counter/Capture].
  The number of sent frames can be confirmed at the measurement result display area.
- The CFP MDIO register value can be read and written at the [MDIO] screen.

Ethernet Frame Format

The format of the Ethernet frame sent from the MD1260A is shown below.

<--- Preamble Size	--->	<----- Frame Size				---->	<--- Gap Size --->
55 55 55 55 55 55 55	D5 (SFD)	Destination MAC Address	Source MAC Address	Ethernet Type	Data Field	FCS	
7 byte	1 byte	6 byte	6 byte	2 byte		4 byte	

Figure 4.6.1-1 Format of Ethernet Frame Sent from MD1260A

About Gap setting (byte)

The Gap Size (byte) setting indicates the average gap size. Under the following circumstances, sometimes the number of bytes in the sent gap may be different from the setting. As a result, the actually sent gap size may be in the range of the set gap size –7/+8 bytes.

According to IEEE 802.3, the total byte count of the gap size plus the preamble size plus the frame size must be set as a multiple of 8. Consequently, if the total of each setting is not a multiple of 8, the gap size is adjusted to make the total a multiple of 8.

For example, when the preamble is 8 bytes and the frame size is set to 64 bytes and the gap size is set to 12 bytes, the resultant total of 84 bytes is not a multiple of 8. As a result, the gap size is adjusted so the total becomes a multiple of 8 by sending gap sizes of 8 bytes and 16 bytes at a ratio of 1:1 so the average gap byte size becomes 12 bytes.

4.6.2 Frame BER measurement

The data field for the bit error measurement at Frame BER measurement is the area excluding the Ethernet header and FCS field as shown below.

MAC SA	MAC DA	Type	Data Field (PRBS31)	FCS

Figure 4.6.2-1 Frame Format for Bit Error Measurement

The bit error measurement is operated on the condition that only the frame for the bit error measurement is sent/received. If other frames are received, it is counted as error.

When 512 bits (64 bytes) in the received field data match to the PRBS pattern, the pattern synchronization is established and bit error measurement is started. On the other hand, when 4,000 bits (about 10%) in 39,936 bits are detected as errors, the pattern is not synchronized.

The Pattern Sync Loss count is counted while in sync loss. Moreover, the bit count not matching the PRBS pattern during the bit error measurement is counted by the Bit Errors count.

Perform measurement as follows:

1. Connect the MD1260A and DUT.
2. Start the 40 GbE/100 GbE application.
3. Set Mode to [Normal] at the [Port] screen.
4. Confirm that Link Up in the summary status area is lit green, and Error/Alarm is not lit.
5. Set Frame BERT to [On] at the [Port] screen.
6. Set the address and frame size of the Ethernet frame to be sent at the [Stream] screen.
7. Set the PCS lane and physical lane assignment at the [Lane Mapping] screen.
8. Touch the Counter button in the operation area to start measurement.
9. Touch the Stream button to send the stream.
10. Touch the [All Lanes] tab and select the measurement results to be displayed in the list of Bit Errors (bit), Bit Error Rate, and Pattern Sync Loss.
    To reset the measurement (Counter), touch the Counter button.

At this time, the bit error is inserted in the test pattern at the [Error/Alarm] setting and the frequency of the transmit clock can be adjusted at the [Clock] setting.

Also, the PCS layer is evaluated at the same time.

Chapter 5 OTU3/OTU4 Applications

This chapter explains the screen layout of the OTU3/OTU4 applications and operating method.

5.1 Outline of OTU3/OTU4

This section outlines the OTU3/OTU4 processing.

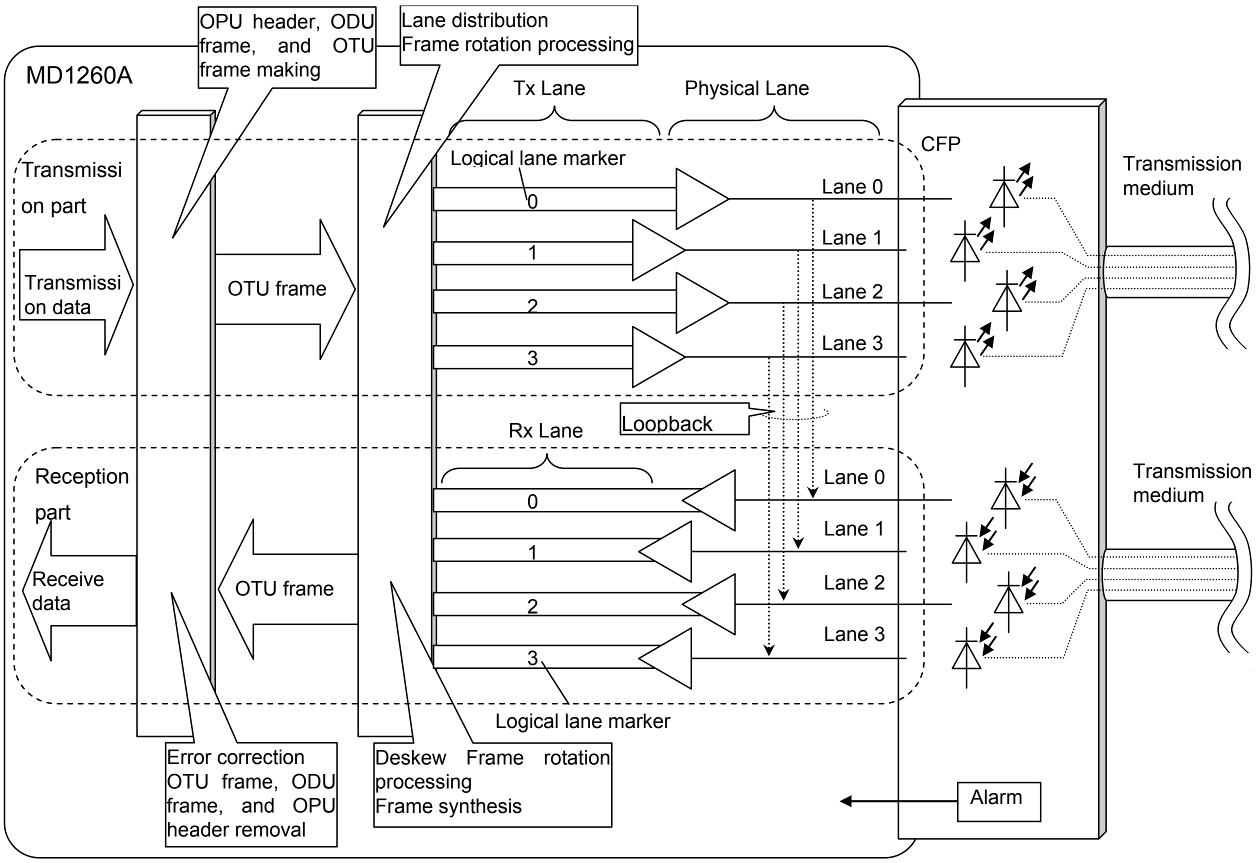


Figure 5.1-1 Flow of OTU3 Signal

Data is processed in the following order in the transmitter.

1. The OPU header, ODU header, and OTU header are added to the transmitted data to form the OTU frame. No error correction information (FEC) is added in the MD1260A.
2. The OTU frame is distributed to multiple communication lanes (called Logical lanes) every 16 bytes as each OTU frame rotates.

   OTU3 has 4 Logical lanes and OTU4 has 20.
3. OTU3 has 4 Physical lanes and OTU4 has 10. In the case of OTU4, two logical lane marker are assigned to one physical lane.
   When the sent signal is looped back at the receiver, the receiver and transmitter are connected by the Logical lanes.
4. The signal is sent to the CFP via the CFP connector.
5. The signal is transmitted from the CFP to the transmission medium.

*The data is processed in the receiver in the reverse order of the transmitter.

1. The signal received by the CFP from the transmission medium is input to the Physical lane.
2. In the case of OTU4, the multiplexed signal is split per Logical lane.
3. The following operation is performed for the data of the Logical lane.
   - Deskew (The time difference of the signal between lanes is removed and the signal timing is arranged)
   - The data in the lanes are combined to form the OTU frame.
4. The OTU header, ODU header, OPU header and FEC field are removed from the OTU frame. MD1260A can analyze the overhead and measure the bit error of OPU payload.

An error can be corrected by FEC when the mapping is other than ODU4-100GbE.

The OTU frame has 16320 bytes, and the frame is transmitted back-to-back without gaps.
Figure 5.1-2 shows the OTU frame format.

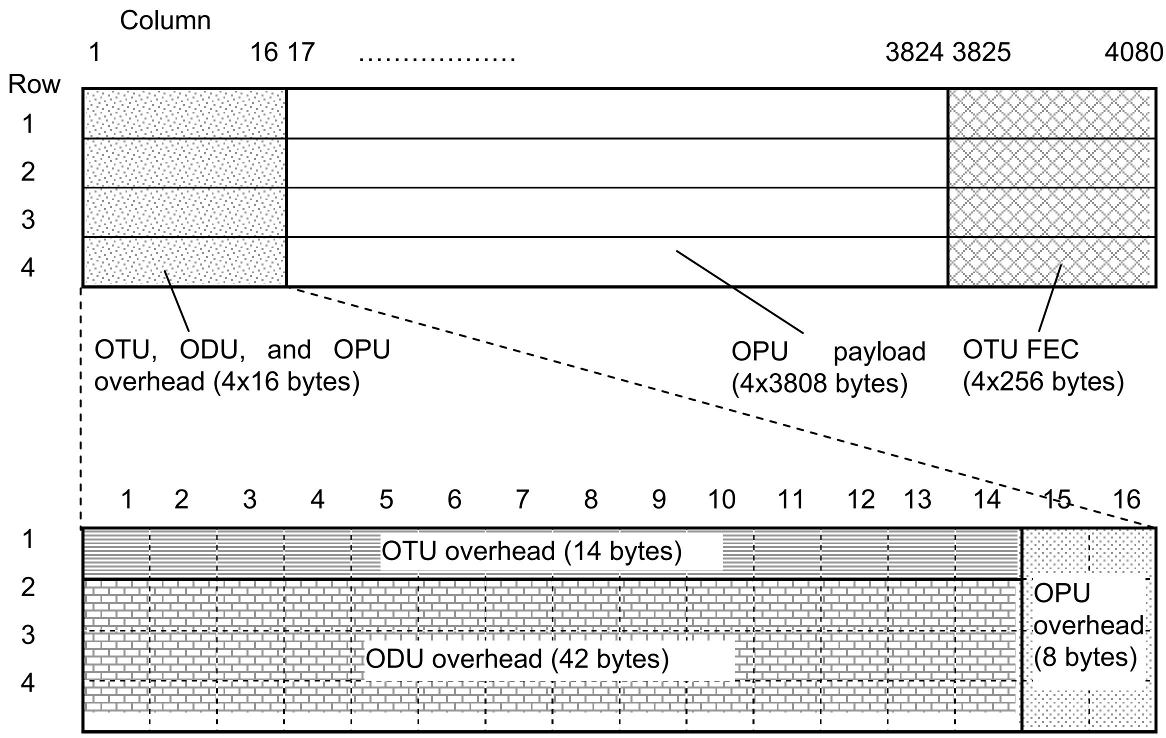


Figure 5.1-2 OTU Frame Format

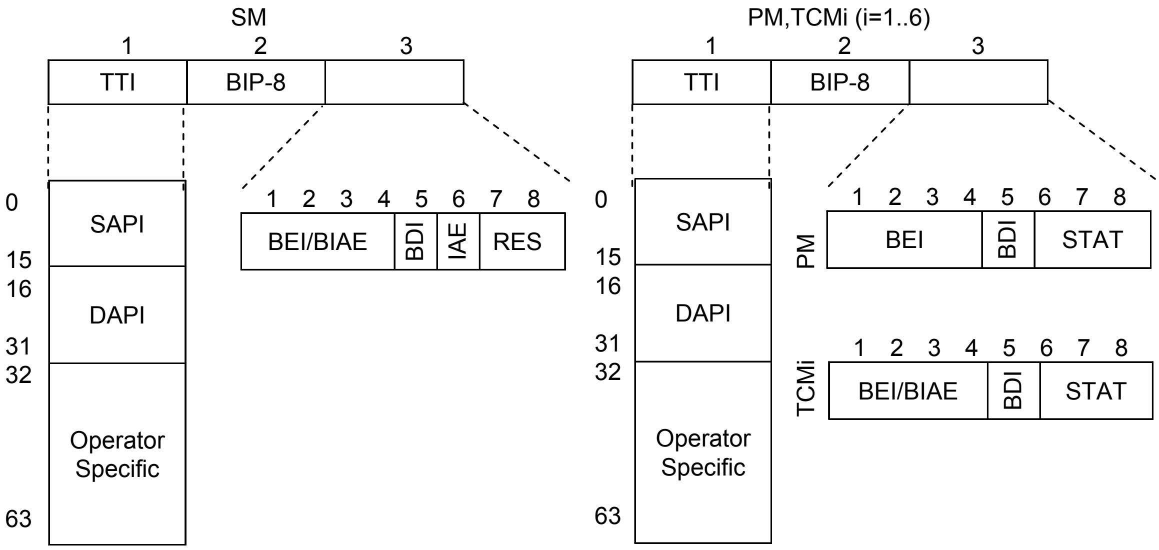
<table>
<tr><td>Row</td><td colspan="16">Column</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr>
<tr><td>1</td><td colspan="6">FAS</td><td>MFAS</td><td colspan="3">SM</td><td colspan="2">GCC0</td><td colspan="2">RES</td><td>RES</td><td>RES</td></tr>
<tr><td>2</td><td colspan="3">RES</td><td>TCM/ ACT</td><td colspan="3">TCM6</td><td colspan="3">TCM5</td><td colspan="3">TCM4</td><td>FTFL</td><td>RES</td><td>RES</td></tr>
<tr><td>3</td><td colspan="3">TCM3</td><td colspan="3">TCM2</td><td colspan="3">TCM1</td><td colspan="3">PM</td><td colspan="2">EXP</td><td>RES</td><td>RES</td></tr>
<tr><td>4</td><td colspan="2">GCC1</td><td colspan="2">GCC2</td><td colspan="4">APS/PCC</td><td colspan="6">RES</td><td>PSI</td><td>RES</td></tr>
</table>

ACT Activation/deactivation control channel
APS Automatic Protection Switching coordination channel
EXP Experimental
FAS Frame Alignment Signal
FTFL Fault Type & Fault Location reporting channel
GCC General Communication Channel
MFAS MultiFrame Alignment Signal
PCC Protection Communication Control channel
PM Path Monitoring
PM&TCM Path Monitoring & Tandem Connection Monitoring
PSI Payload Structure Identifier
RES Reserved for future international standardization
SM Section Monitoring
TCM Tandem Connection Monitoring

Figure 5.1-3 Format of OTU, ODU, and OPU Overhead

MFAS repeats the values from 0 to 255 at the frame number counter.

As for the first byte of SM, PM, and TCM, data is transmitted for around 64 frames.



BDI Backward Defect Indication
BEI Backward Error Indication
BIAE Backward Incoming Alignment Error
BIP8 Bit Interleaved Parity – level 8
DAPI Destination Access Point Identifier
IAE Incoming Alignment Error

PM: Path Monitoring
RES Reserved for future international standardization
SAPI Source Access Point Identifier
SM Section Monitoring
STAT: Status
TTI Trail Trace Identifier

Figure 5.1-4 SM, PM, and TCM Format

As for FTFL and PSI, the data is transmitted for around 256 frames.

5.2 Selecting Mapping

In OTU4 application, first select OPU payload mapping.

1. Touch [OTN] on the selector screen.
2. Touch [OTU4]. Then, the Mapping Select screen is displayed.
   The displayed mapping type varies with the selected option.
3. Touch the button on the right edge. The OTU4 application starts with the selected mapping. It takes 30 seconds for it to start.

When the Previous Setting is selected and [OTU4] is touched, the Mapping Select screen is not displayed.
The same mapping as when the OTU4 application was previously started is selected.

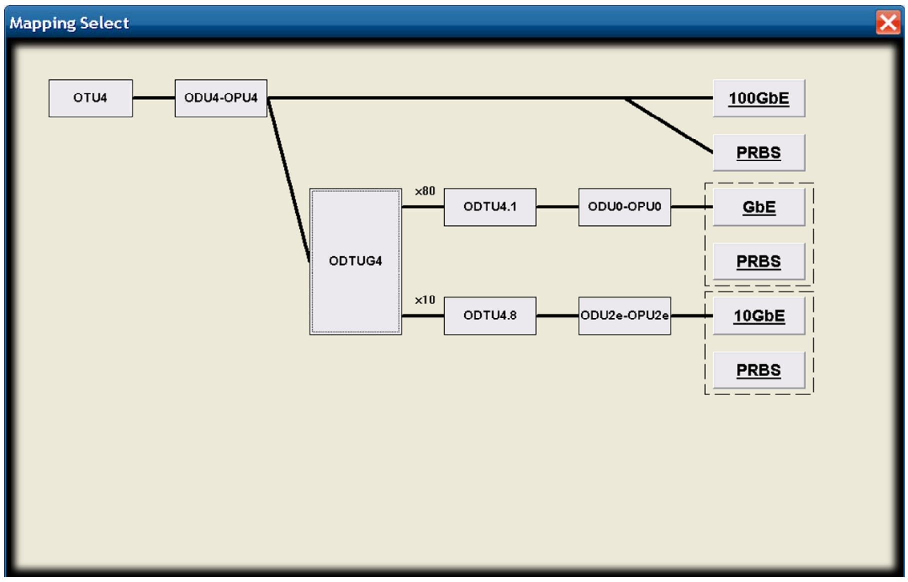


Figure 5.2-1 Mapping Select Screen

Option 002 is necessary for OTU4 application.
Moreover, the following options are available according to mappings.

Table 5.2-1 Required Option for Mapping

Mapping	Necessary Option	Mapping Option
ODU4-100GbE	MD1260A-002	MD1260A-005
ODU4-PRBS		
ODTU4.1-ODU0-GbE		MD1260A-006
ODTU4.1-ODU0-PRBS *1		MD1260A-006
ODTU4.8-ODU2e-10GbE		MD1260A-007
ODTU4.8-ODU2e-PRBS *2		MD1260A-007

*1: The PRBS mapping (m=8, n=8) via ODU0 low order ODU (payload type 0x07) GMP.

*2: The PRBS mapping via ODU2e low order ODU (payload type 0x03).

To change Mapping:

End the OTU4 application once, and select a mapping on the selector screen.

1. Touch [System Menu].
2. Touch [Exit].
3. Touch [OK].
4. Confirm that the Previous Setting is not selected on the selector screen and touch the [OTU4].

5.3 Setting Port

5.3.1 Through mode

For OTU4 application port, through mode can be selected besides normal mode and loopback mode.
With through mode, the received data is output to the transmission port as is, and it is operated as if the received data passes through this equipment. In addition, it is possible to partially overwrite the received data and transmit it.

As the following figure shows, by inserting a communication circuit into the equipment which is in through mode, monitoring of communication data and overwriting data are possible.

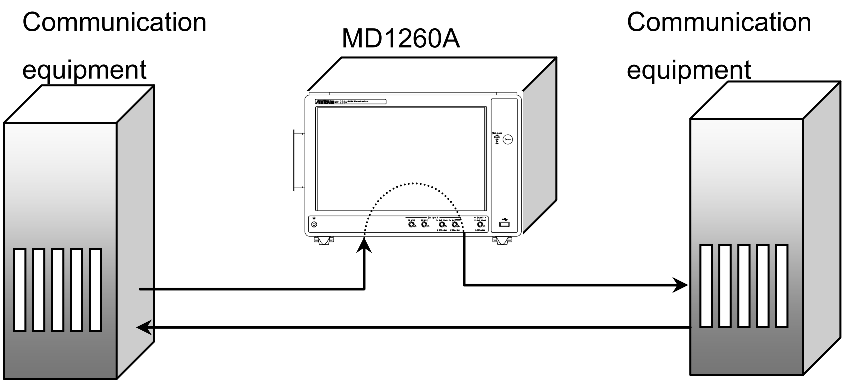


Figure 5.3.1-1 Usage Example of Through Mode

The data processing method of the through mode is as follows:

Transparent: Transmit the received data as is.
The received data can be measured.
Analyzed: Unlike the Transparent, it is possible to insert error, alarm or skew to the high order frame of the received data.
OH Overwrite: Overwrite the overhead of the received data. Other than that, it is the same as Analyzed.

For OH Overwrite, it is possible to select the portion to overwrite the data in this equipment from the following options.
All: Overwrite OTU, ODU and OPU header.
Overwrite OTU4/ODU4:OTU and ODU header.
OH 1Byte: Overwrite only one byte of the overhead.
OTU: Overwrite OTU header.
ODU: Overwrite ODU header.
OPU: Overwrite OPU header.

For how to overwrite the data, refer to Section 5.4.3 “Overhead”.

Note:

With OH Overwrite, only OTU4 or OTU3 overhead is overwritten. ODU2e and ODU0 overhead cannot be overwritten.

All is displayed when the mapping is ODU3-PRBS or ODU4-PRBS. With other mapping, OTU4/ODU4 is displayed.

To set through mode:

1. Touch [Port/Clock] at the setting area.
2. Touch the Mode button.
3. Touch [OTU-Through].
4. Touch the Through button to select [Transparent], [OH Overwrite], or [Analyzed].
   The signal flow inside the MD1260A is displayed in a figure.
5. When [OH Overwrite] is set to OTU-Through, a button to select a portion to overwrite is displayed.
   Select any of the [OTU4/ODU4], [OH 1byte], [OTU4], or [ODU4].
6. When setting to [Transparent] or [OH Overwrite], check the GFEC Encode button. When adding OTU frame error correction, set to [On]. If not, set to [Off].
7. Touch [OK].

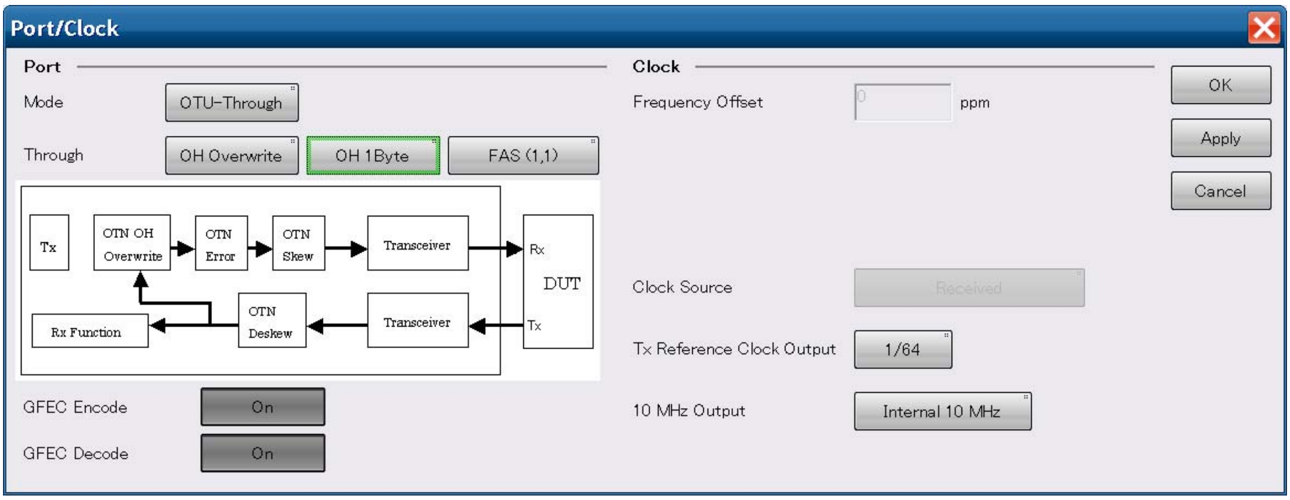


Figure 5.3.1-2 Port/Clock Screen (ODU4-PRBS)

5

OTU3/OTU4 Applications

To set the normal or loopback mode:

1. Touch [Port/Clock] at the setting area.
2. Touch the Mode button.
3. Touch [Normal] or [Loopback].

Note:

When setting to through mode, Clock Source of the clock setting is changed to [Received]. Even if the port setting Mode is changed to [Normal], the Clock Source remains as [Received].

When changing from through mode to normal mode, check the setting of the Clock Source.

5.3.2 FEC

OTU-FEC is settable for the modes with ✓ in the table below.

Note:

GFEC Decode button is not displayed when the mapping is ODU-100GbE.

Table 5.3.2-1 Mode and FEC Settings

Mode		Setting
Normal		✓
OTU-Through		
	Transparent	–
	OH Overwrite	✓
	Analyzed	✓
Loopbak		✓

1. Touch [Port/Clock] at the setting area.
2. Touch the GFEC Encode button.
   [On]: The error correction information is added to the OTU-FEC area.
   [Off]: All TU-FEC area becomes 0.
3. Touch GFEC Decode button to set the process for the received frame.
   [On] : Corrects the error.
   [Off] : Not corrects the error.

Does not correct the error.

4. Touch [OK].

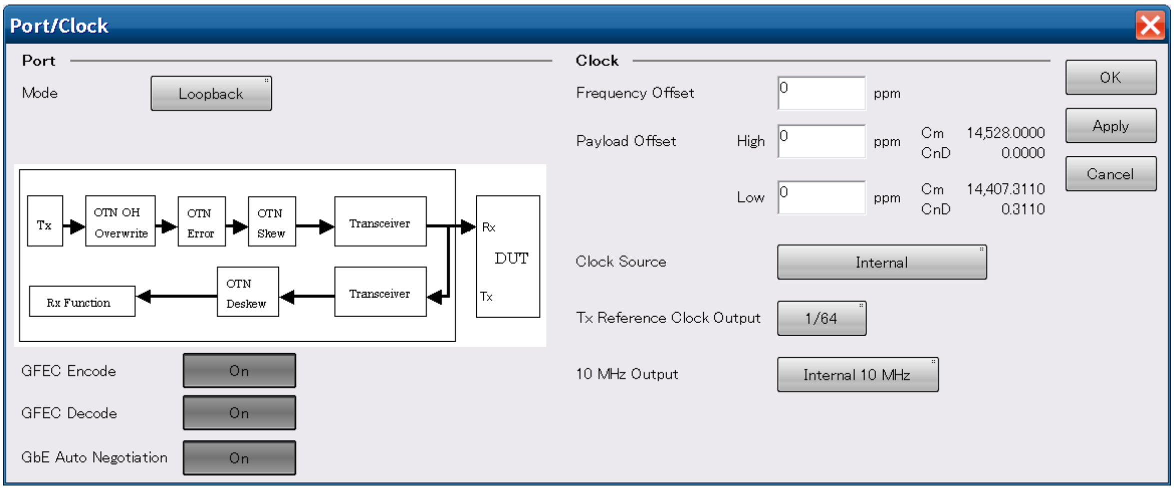


Figure 5.3.2-1 Port/Clock Screen (ODTU4.1-ODU0-GbE)

5.3.3 GbE Auto Negotiation

Set auto negotiation when the mapping is GbE and the mode is Normal mode or Loopback mode.

1. Touch [Port/Clock] at the setting area.
2. Touch the GbE Auto Negotiation button.
3. Touch [OK].

When GbE link is established, the Link lamp of the status area is lit.

5.4 Setting Transmission Data

In the OTU3 and OTU4 application, it is possible to set insertion of transmission lane, skew, overhead of transmission data, OPU payload data, pattern, and error/alarm.

5.4.1 Transmission Lane

Except for the case when [Transparent] is set at through mode, alignment marker is assigned to transmission lane with the following procedure.

1. Touch [Lane Mapping] at the setting area.
2. Touch the button of the Logical Lane Marker and set the value of the Logical Lane to assign to Tx Lane.
3. When assigning the same Logical Lane Marker to multiple Tx Lane, touch [Allow to Overlap] and change the button display to dark gray. When [Allow to Overlap] is off (light gray display), the value is changed to the specified value of Logical Lane.
   Example: At the initial setting, when Lane 1 is set to Tx Lane 0, Lane 0 is assigned to Tx Lane 1.
4. Touch [OK].

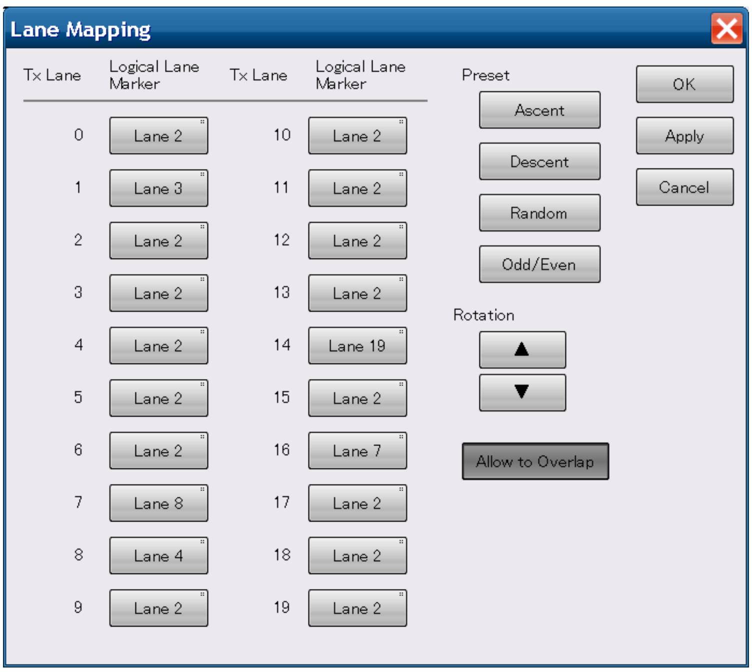


Figure 5.4.1-2 OTU4 Lane Mapping Screen

When the Rotation button is touched, the allocation of the Logical Lane Marker can be moved one by one.
When [Random] is touched, the Logical Lane Marker is allocated randomly.
When the [Ascent], [Descent], and [Odd/Even] buttons are touched, the Logical Lane Marker is allocated as follows:

Table 5.4.1-2 For OTU3

	Logical Lane Marker		
Tx Lane	**Ascent**	**Descent**	**Odd/Even**
0	0	3	1
1	1	2	0
2	2	1	3
3	3	0	2

Table 5.4.1-3 For OTU4

	Logical Lane Marker		
Tx Lane	**Ascent**	**Descent**	**Odd/Even**
0	0	19	1
1	1	18	0
2	2	17	3
3	3	16	2
4	4	15	5
5	5	14	4
6	6	13	7
7	7	12	6
8	8	11	9
9	9	10	8
10	10	9	11
11	11	8	10
12	12	7	13
13	13	6	12
14	14	5	15
15	15	4	14
16	16	3	17
17	17	2	16
18	18	1	19
19	19	0	18

5.4.2 Skew

Except for the case when [Transparent] is set, skew can be inserted per lane with the following procedure.

1. Touch [Relative Skew] at the setting area.
2. Touch the Skew text box and set the amount of the skew.
3. Touch the button of Lane and set the position in which the skew is inserted.
4. Touch the button for the lane number in which the skew is inserted to make a thick gray in the button display.
   When touching [All On], all buttons are set to [On].
   When touching [All Off], all buttons are set to [Off].
5. Touch [OK].

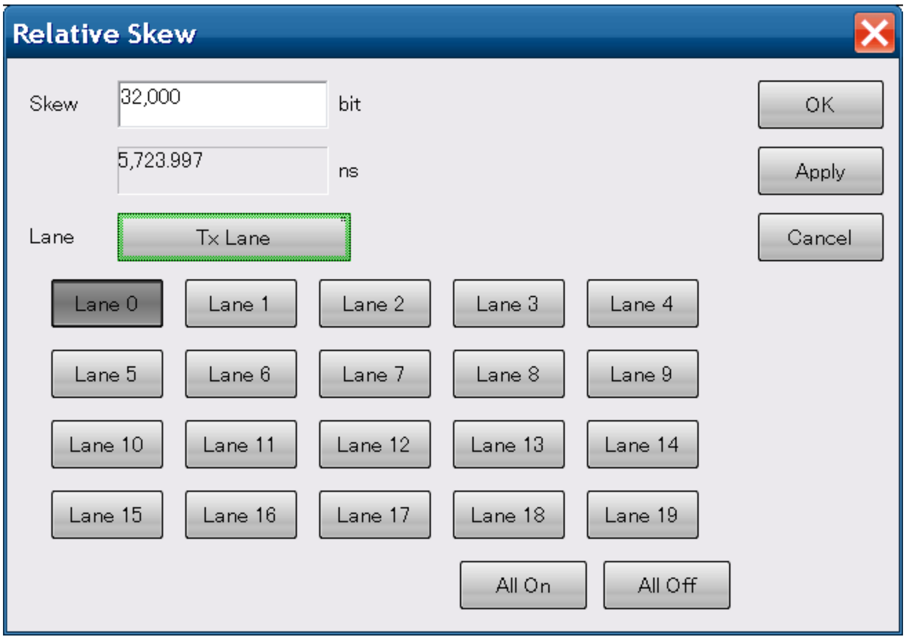


Figure 5.4.2-1 Relative Skew Screen (OTU4)

5.4.3 Overhead

Editing overhead

When [OH Overwrite] is selected at the normal mode, loopback mode, or through mode, it is possible to edit the overhead of the OTU frame, which is to be transmitted, with the following procedure.

1. Touch [OH Preset] at the setting area.
   Then, the OH Preset screen is displayed. The column name to be displayed and the editable column changes depending on the mapping.
2. When ODU2e or ODU0 is selected at mapping, a button of the layer to be edited is displayed. Touch [OTU4], [ODU2e], or [ODU0].
3. When editing the value of white-ground text box, touch the text box. Set a value from the numeric value entry window.
4. When editing the sequence pattern of multiframe, touch the button. Edit screen of the data is displayed.
   - SM (Only for OTU4)
   - TCM
   - FTFL
   - PM
   - PSI
5. Touch [OK].

Initializing overhead

1. Touch [OH Preset] at the setting area.
2. Touch [Default]. The confirmation message is displayed.
3. Touch [OK].

Figure 5.4.3-1 OH Preset Screen (ODU4-PRBS/ODU4-PRBS)

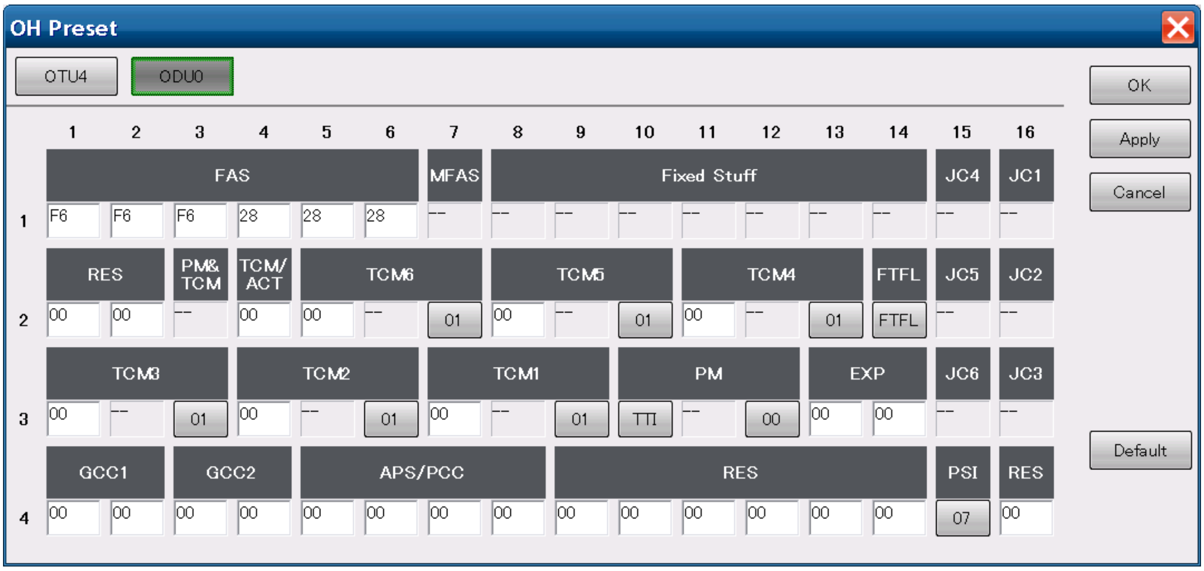


Figure 5.4.3-2 OH Preset Screen (ODTU4.1-ODU0-PRBS/GbE)

Editing TTI

1. When editing TTI (Trail Trace Identifier) of SM, PM, and TCMi (i=1 to 6) on the OH Preset screen, touch [TTI].
2. When setting up DAPI or SAPI country code (CC), touch [IS:CC]. Country code selection screen is displayed.
3. Touch the button of country code. Country code with three letters is displayed on the left side. ASCII code of country code character string is displayed in the table.
4. Touch [NS:ICC&UAPC] to set ITU carrier code (ICC) of DAPI or SAPI, and unique access point code (UAPC). A keyboard is displayed on the screen.
5. Enter ITU carrier code and unique access point code with up to 12 characters.
6. When [OK] on the keyboard is touched, the entered character string is displayed on the left side of the button. ASCII code of character string is displayed in the table.
7. Touch [OK].

When touching [Default], the TTI screen is set as follows.
CC:JPN, ICC&UAPC:MD1260A

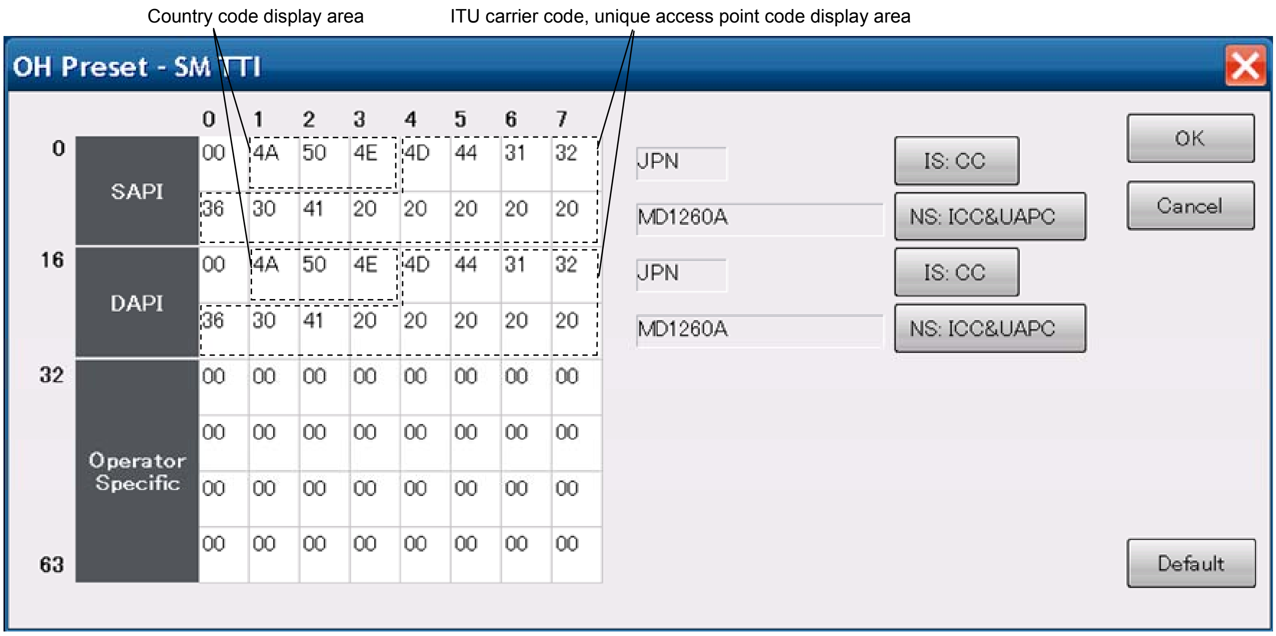


Figure 5.4.3-3 TTI Window

DAPI:Destination Access Point Identifier

SAPI:Source Access Point Identifier

IS:International Segment

CC:Country Code

NS:National Segment

ICC: ITU Carrier Code

UAPC:Unique Access Point Code

When changing Operator Specific, use the external key board. The Windows screen key board can be used as well.

1. Touch [TTI] on the OH Preset screen.
2. Touch the character in the table to be edited. The touched column is selected.
3. Press the arrow key of the keyboard to move the column.
4. Use the keyboard and enter two hexadecimal digits.
5. Touch [OK].

ASCII code of DAPI and SAPI can be edited in a similar fashion. The characters that correspond to the entered ASCII code are displayed on the right side of the table.

Windows screen keyboard can be started from the submenu of the start menu.

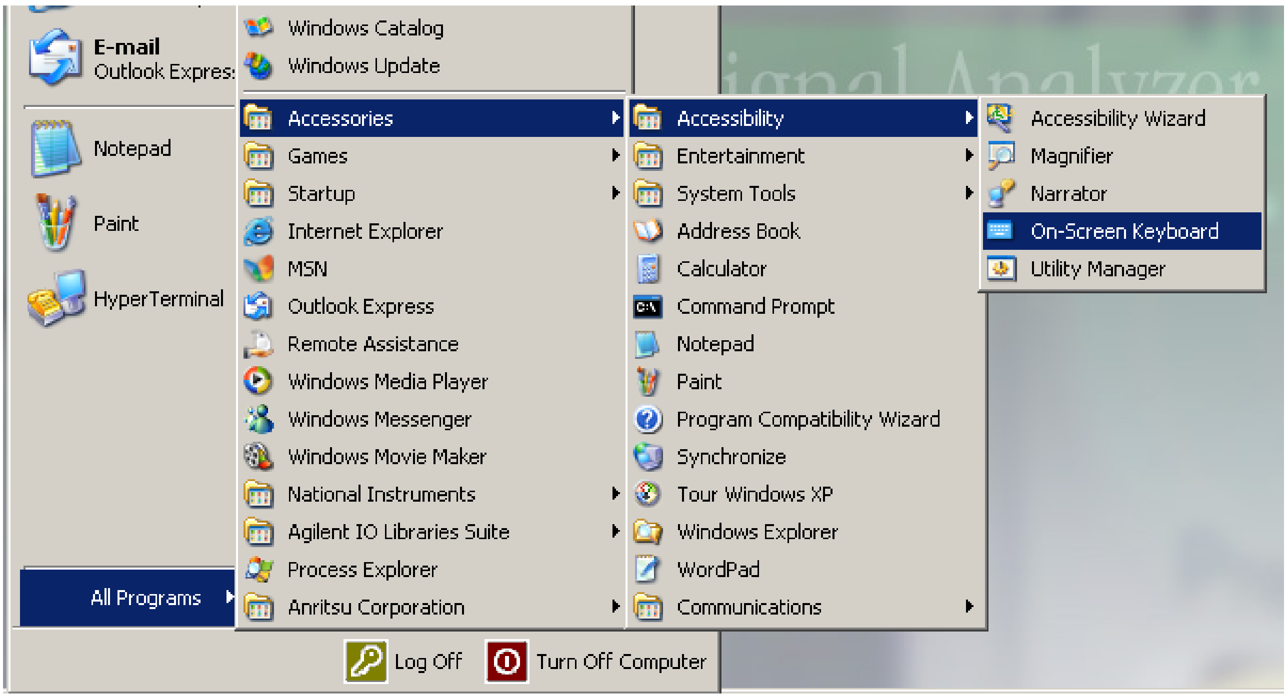


Figure 5.4.3-4 Starting Window Software Keyboard

Editing BEI/BIAE

1. When editing BEI (Backward Error Indication) /BIAE (Backward Incoming Alignment Error), touch the button where the value of SM, PM, or TCMi is displayed.
   Edit screen is displayed.
2. Touch the item button to be edited. The screen to set the parameters is displayed.
3. Touch the parameter button.
4. Touch [OK]. In the buttons of OH Preset screen, the values from bit 1 to bit 8 are displayed in hexadecimal numbers.

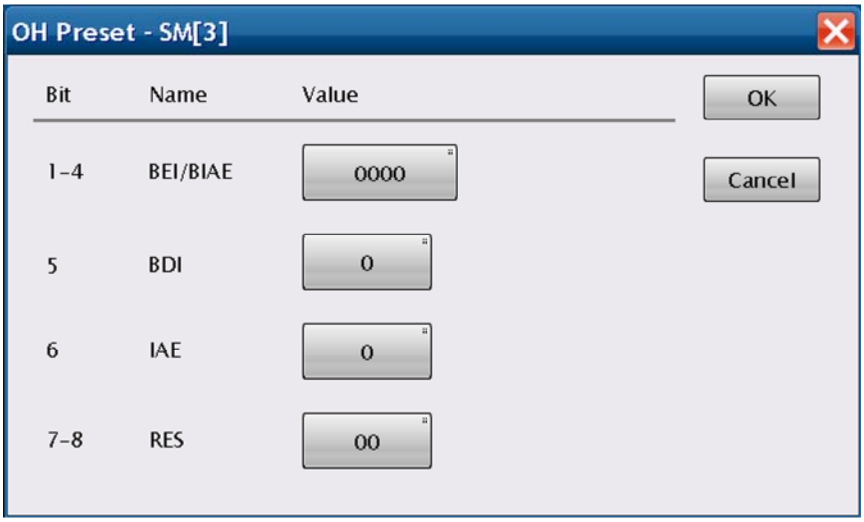


Figure 5.4.3-5 BEI/BIAE Screen (SM)

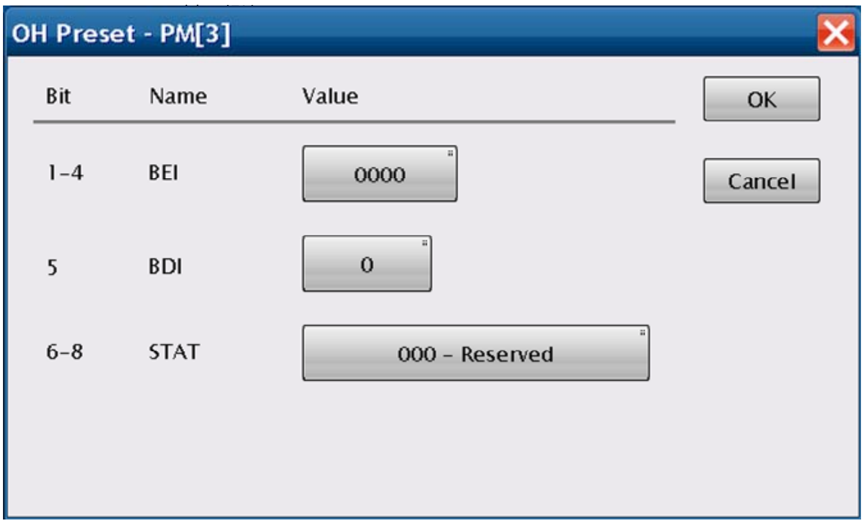


Figure 5.4.3-6 BEI Screen (PM)

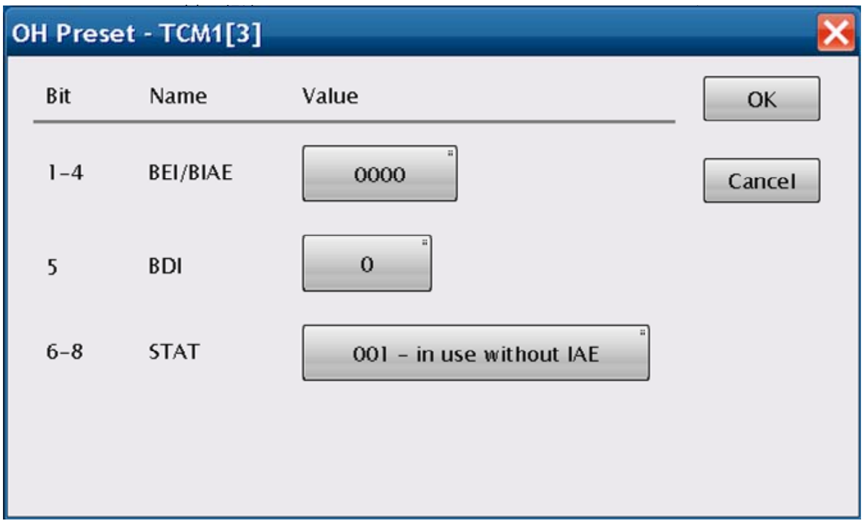


Figure 5.4.3-7 BEI/BIAE Screen (TCM)

Editing FTFL

1. When editing FTFL (Fault Type and Fault Location), touch the [FTFL] button on the OH Preset screen.
2. Touch [Forward] or [Backward] to select the area to be edited.
3. When touching [FIF], the code selector screen is displayed.
4. Touch [No Fault], [Signal Fail], or [Signal Degrade].
   The value that corresponds to the selected code name is displayed in the FIF column.
5. Touch [CC] or [NSC] to set OIF.
   The country code selector screen or keyboard is displayed.
6. Enter the country code or character strings.
   The character strings and ASCII code are displayed on the FTFL screen.
7. Touch [OK].

When touching [Default], the FTFL screen is set as follows.
FIF:No Fault, CC:JPN, NSC:MD1260

When changing Operator Specific, use the external key board. The Windows screen key board can be used as well. For the inputting method, refer to the explanation for Editing TTI.

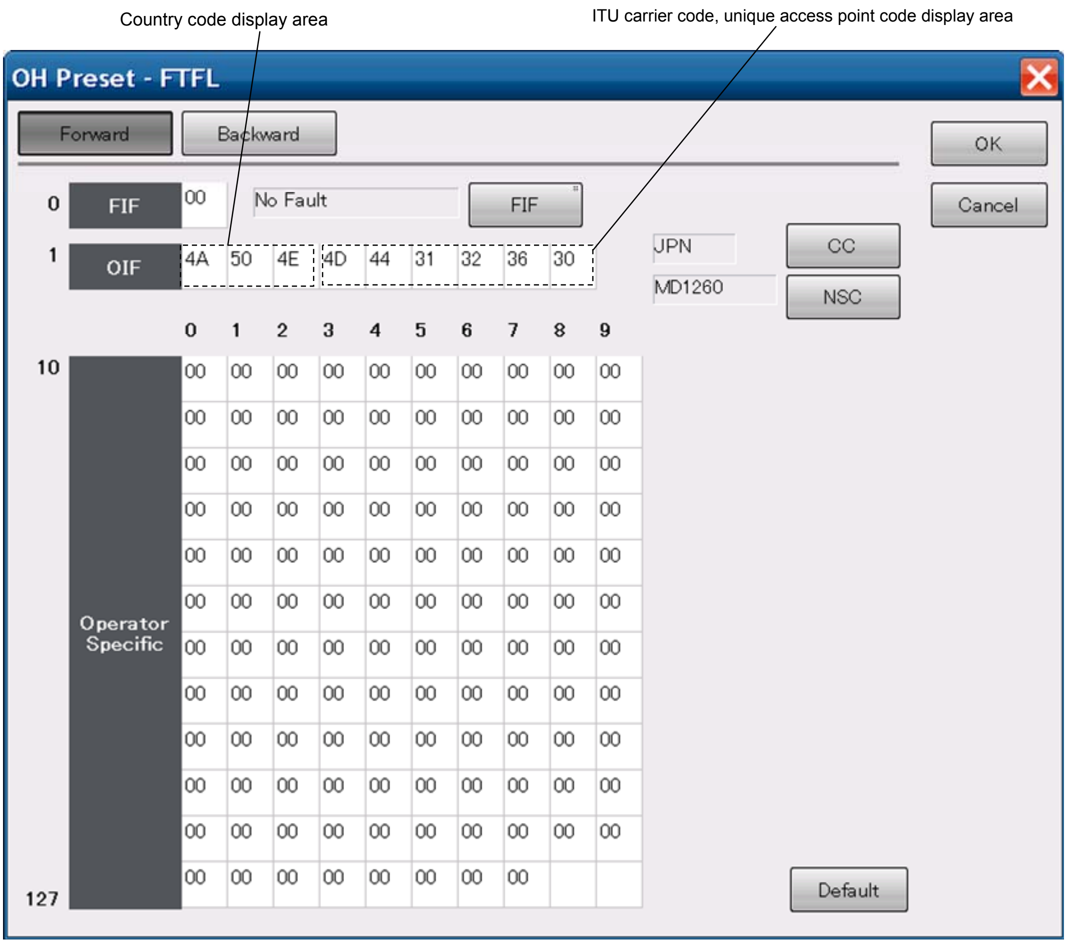


Figure 5.4.3-8 FTFL Screen

FIF: Fault Indication Field

OIF: Operator Identifier Field

NSC: National Segment Code

Editing PSI

1. When editing PSI (Payload Structure Identifier), touch the PSI column button on the OH Preset Screen.
2. Touch [PSI[0]]. The selector screen for the payload type is displayed.
3. Touch the payload button. When setting up a value that is not displayed in the button, touch the textbox and enter the value.
4. Touch [OK]. Payload type code is displayed in hexadecimal number in the payload type display area on the PSI screen.
5. Touch [OK].

When changing the values listed in the table, use the external key board. The Windows screen key board can be used as well. For the inputting method, refer to the explanation for Editing TTI.

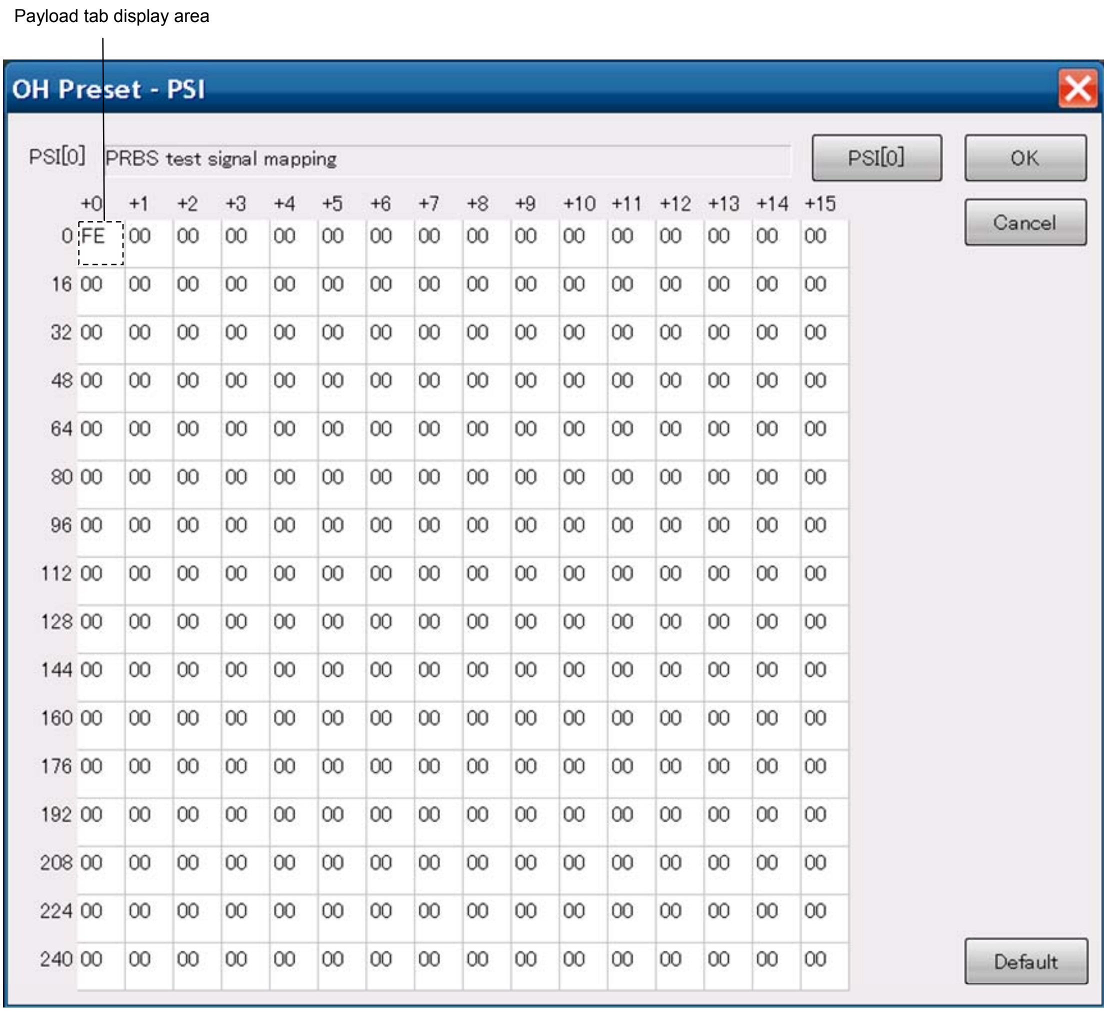


Figure 5.4.3-9 PSI Screen

5.4.4 Clock offset of client data

When [GMP] tab is displayed at Normal mode or Loopback mode , it is possible to set the clock offset of the OTU client data.

1. Touch [Port/Clock] at the setting area.
2. Touch the Payload Offset text box to set the offset.
   The Cm and CnD calculated by the offset value are displayed.
3. Touch [OK].

For ODTU4.1-OPU0, two clock offsets can be set.
Payload Offset-High: Clock offset of client data (high order)
Payload Offset-Low: Clock offset of client data (low order)

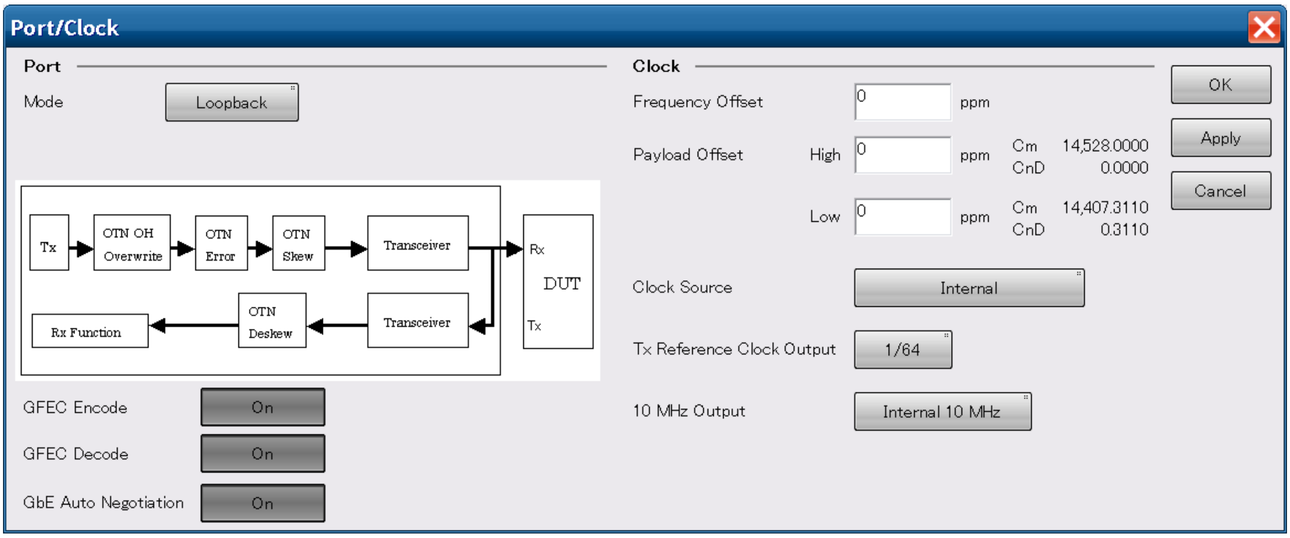


Figure 5.4.4-1 Port/Clock Screen (ODTU4.1-ODU0-GbE)

5.4.5 Pattern

Select PRBS at the mapping and when the mode is Normal or Loopback , set the test pattern for the bit error measurement with the following procedure.
When the mapping is 100GbE, 10GbE, or GbE, refer to Section 5.4.8 "Ethernet stream" for the pattern method.

1. Touch [Test Pattern] at the setting area.
2. Touch the Payload Data button.
3. Touch the pattern button.
4. When setting PRBS15, PRBS23, or PRBS31, touch the button for Invert so that On is displayed to invert the logic.
5. When setting Word16, touch the text box and set the 16-bit pattern.
6. Touch [OK].

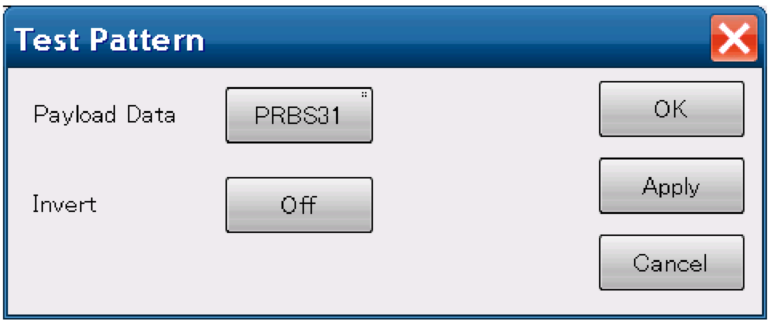


Figure 5.4.5-1 Test Pattern Screen

Table 5.4.5-1 Test Pattern Types

Pattern	Explanation
PRBS15 *	Pseudorandom bit string with length of 32767 bits
PRBS23 *	Pseudorandom bit string with length of 8388607 bits
PRBS31	Pseudorandom bit string with length of 2147483647 bits
Word16	Repetition pattern of 16 bits

*: When the mapping is ODU3-PRBS or ODU4-PRBS, the above setting is possible.

5.4.6 TP/TS

When ODU0 or ODU2e is selected at mapping, set TP (Tributary Port), and TS (Tributary Slot).
For through mode, only Rx can be set.

1. Touch [TP/TS] at the setting area.
2. When setting the same TP and TS for transmitted frame and received frame, touch the Combination button and turn the display [On].
3. When Combination is set to Off, touch the Mode button of RX.
   [Auto]: Automatically detects Main TP.
   Touch the Detect button and select the target for detection.
   [Manual]: Sets TS in the textbox.
4. The port number set in the table is displayed in light blue.
5. Touch the TS text box or button.
   For ODU0, set one slot number, and for ODU2e, set eight slot numbers.
6. Touch [OK].

When Combination display is [Off], the same setting as the transmitted side is possible for the received side with [Copy ->]. Similarly, the same setting as the received side is possible for the transmitted side with [<-Copy].

When touching [Random], the random value is set to TS.

Main TP is the channel where the data that is set at Section 5.4.5. "Pattern" or Section 5.4.8 "Ethernet stream" is transmitted. For other channels, Dummy TP is set.
Set the data to be transmitted to Dummy TP (Tributary Port) with the following procedure.

1. Touch the Dummy button.
   Send the same data as Main TP to the [Copy] Dummy TP.
   Send PRBS11 to [Dummy] Dummy TP
2. Touch [OK].

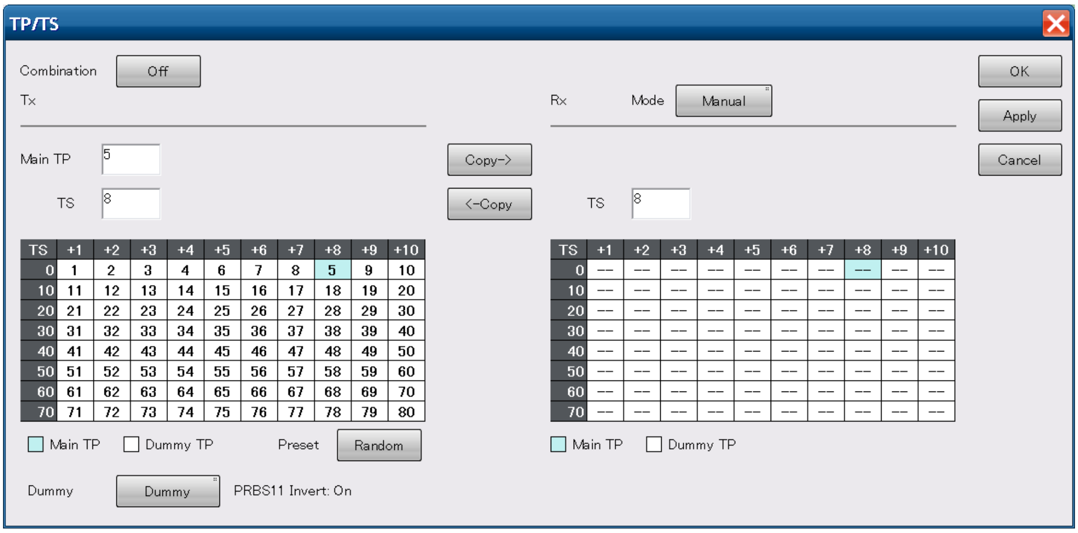


Figure 5.4.6-1 TP/TS Screen (ODTU4.1-ODU0)

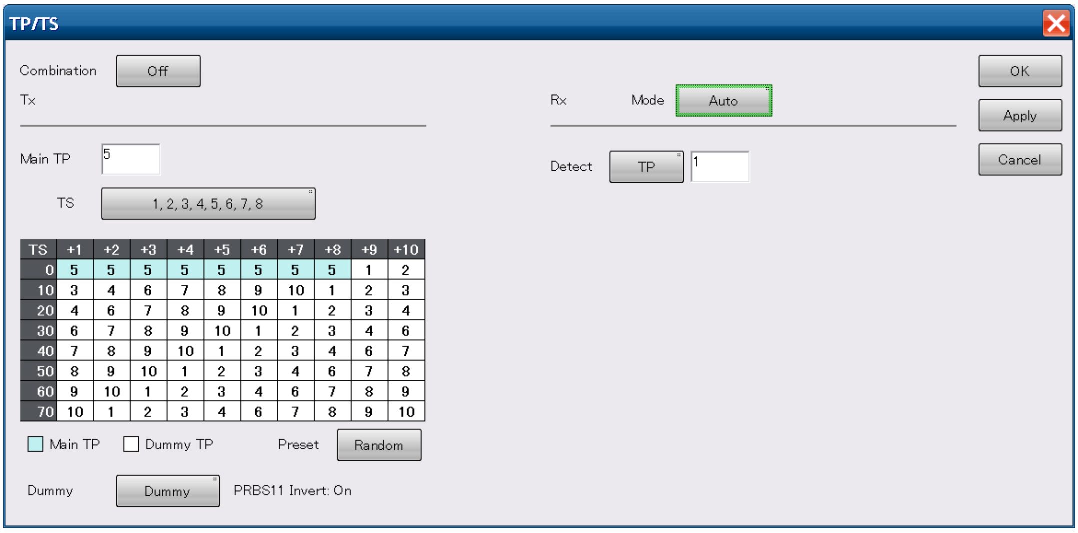


Figure 5.4.6-2 TP/TS Screen (ODTU4.8-ODU2e)

5.4.7 GFP-T

Select OPU0-GbE at the mapping. When it is in Normal or Loopback, set the payload header and the receiving method of the GFP-T (Transparent Generic Framing Procedure) by touching the [GFP-T] of the set area.

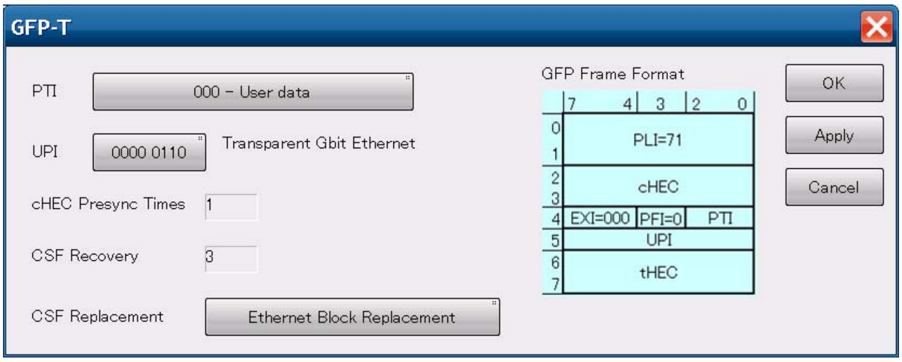


Figure 5.4.7-1 GFP-T Screen

Table 5.4.7-1 Setting Items for GFP-T Screen

Name	Explanation
PTI	[000-User data], [100-Client Management], [101-Management communications] Other values are Reserved. When setting PTI to [100-Client Management], all transmitting GFP-T frames is Client Management Frame.
UPI	When PTI is [000-User Data] or [101-Management communications], set the type of payload. When PTI is [100-Client Management], set the type of management signal.
cHEC Presync Times	The number of continuous receptions of normal cHEC (core Header error check) until HUNT status is transited to SYNC status.
CSF Recovery	The number of recoveries when CSF (Client signal fail) is detected.
CSF Replacement	Setting behavior of GFP-T when CSF occurs. [Ethernet Block Replacement] : Transmits 10B data to indicate the link error [GFP-T CSF Replacement] : Transmits CSF and IDLE frames CSF is transmitted with 500 ms interval.

5

OTU3/OTU4 Applications

5.4.8 Ethernet stream

When the following two conditions are met, touch the [Stream] of the set area and set the Ethernet stream.

- The mapping is 100GbE, 10GbE, or GbE
- Normal mode or Loopback Mode

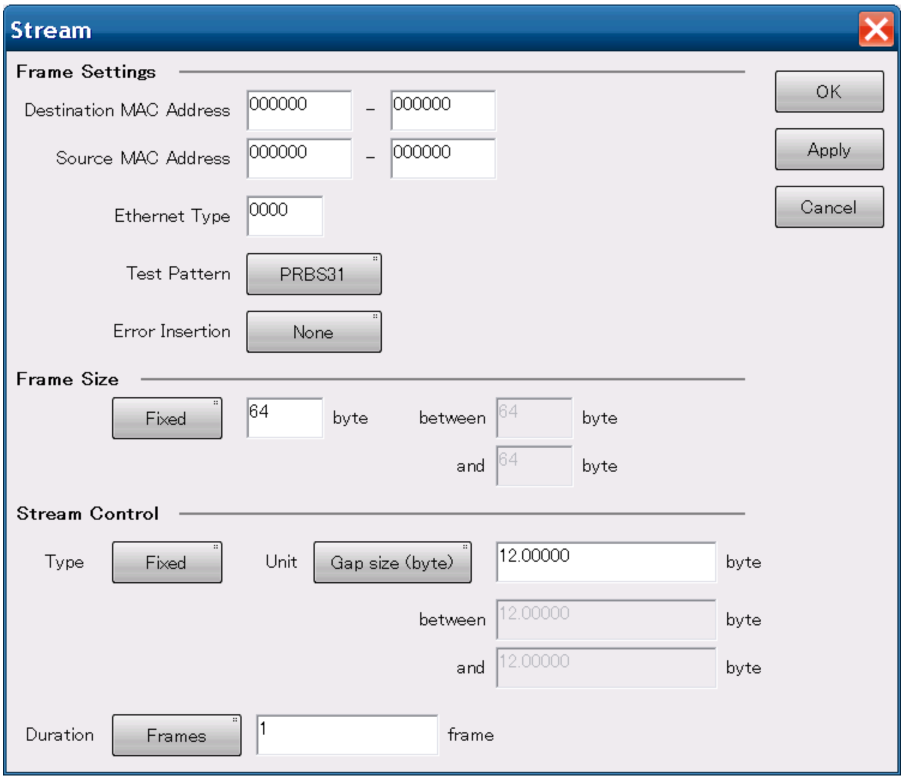


Figure 5.4.8-1 Stream Screen

To start stream, touch the Stream ▶ button at the operation area. The lamp lights while the stream is being sent.

Figure 5.4.8-2 Stream Button

Touch the Stream ■ button at the operation area to stop stream transmission.

Table 5.4.8-1 Setting Items on Stream Screen

Name		Explanation
Frame Settings		Sets MAC frame.
	Source MAC Address	Sets value of source MAC address field (6 bytes) as hexadecimal number.
	Destination MAC Address	Sets value of destination MAC address field (6 bytes) as hexadecimal number
	Ethernet Type	Sets value of Ethernet Type field (2 bytes) as hexadecimal number
	Test Pattern	Selects data of Ethernet frame from the following: PRBS31, Word16, All 0, All 1
	Error Insertion	[None] : Does not insert errors [FCS Error] : Inserts errors in FCS of all frames
Frame Size		Specifies size of sent frame (60 to 16,376 bytes) [Fixed]: Sets fixed frame size [Random]: Changes size of each frame randomly The lower and upper bounds for the frame size can be set.
Stream Control		Specifies frame sending rate and sending method.
	Type *	Specifies the frame transmission interval or transmission rate. [Fixed]: Sets fixed frame size [Random]: Changes frame size randomly The lower and upper bounds of the frame size can be set. Selects stream unit as follows: [Gap Size(byte)], [Rate (%)], [Rate (fps)], [Rate (Gbit/s)], or [Interval (s)]
	Duration	Specifies the number of the time that frame is transmitted. [Continuous]: Transmit frames repeatedly [Frames]: Transmit the number of frames specified in the textbox

*: The minimum specified gap is 9 bytes.
For ODU4-100GbE, when [Frame Size] is set to a value that exceeds 16,000 bytes, the minimum value of the [Gap Size] is 10 bytes.

5.4.9 Inserting errors/alarms

Except for the case when [Transparent] is selected at through mode, set the alarm or error insertion method with the following procedure.

1. Touch [Error/Alarm] at the setting area.
2. Touch the Type button.
3. Touch [Alarm] or [Error].
4. The errors or alarms are displayed corresponding to the settings at 3. Touch the button and select the types of the errors or alarms.

   Refer to Table 5.4.9-1, and Table 5.4.9-2 for the alarm and error type.

   When the port Mode setting is [OH Overwrite] or [Analyzed] in [OTU-Through], some of the error and alarm items cannot be set.
5. Touch the button for Timing error to set the alarm insertion method.

   All: Inserts alarm in all frames

   Alternate: Repeats error/alarm insertion per set number of frames

   Burst: Inserts alarm in set frame number

   Single: Inserts one error

   Rate: Inserts error at fixed rate
6. To set [LOF Lane], [LOR] or [FAS-LLD], touch the lane button to insert errors/alarms so it is dark gray. Error/alarms can be inserted in multiple lanes.
7. Touch [OK].

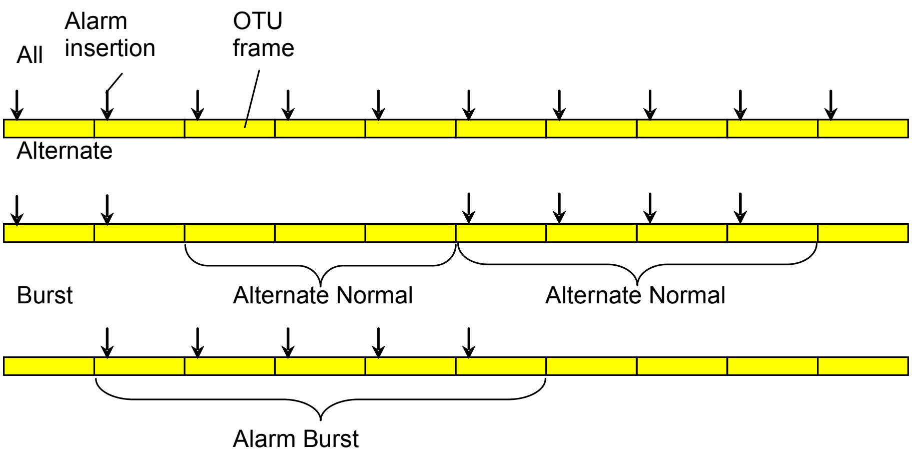


Figure 5.4.9-1 Error/Alarm Insertion Timing

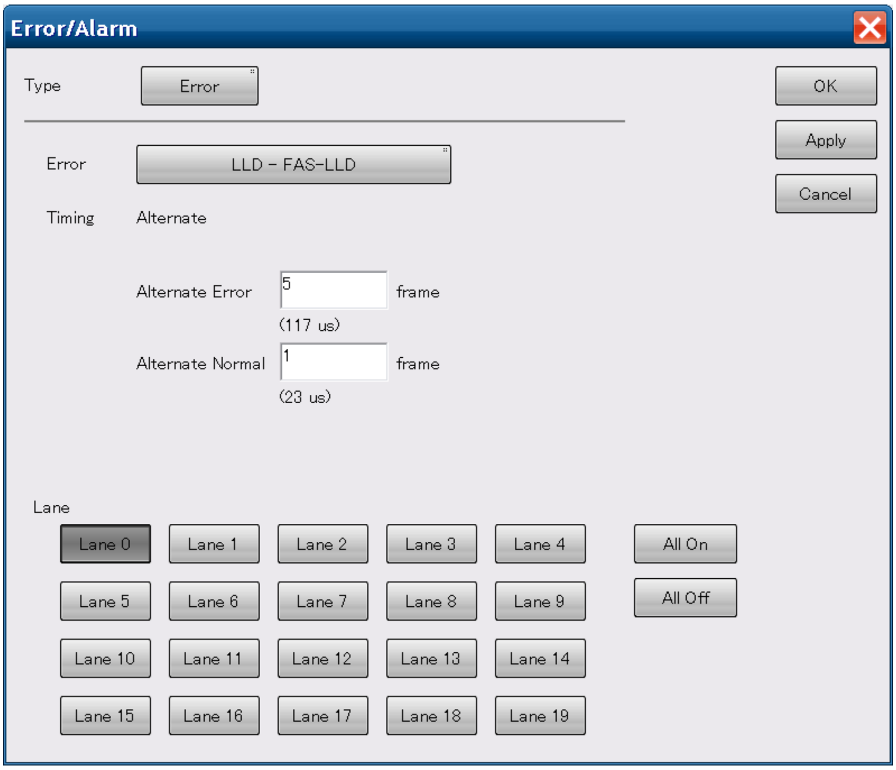


Figure 5.4.9-2 Error/Alarm Screen (OTU4)

To insert an error/alarm, touch the Error/Alarm Ins ▶ button at the operation area.
The error/alarm set at Timing is inserted each time the button is pressed.
The lamp is lit while inserting the error/alarm.

Figure 5.4.9-3 Error/Alarm Ins Button

Table 5.4.9-1 Alarm Setting Items

Layer	Name	Explanation
LLD	LOF-Lane	At OTU4, inverts FAS header 5 bytes (0xF6F6F62828) to (0x090909D7D7) At OTU3, inverts FAS 6 bytes (0xF6F6F6282828) to (0x090909D7D7D7) Inserts errors at the lane specified at [Lane].
	LOR	Sets Lane Marker (the 6th byte of FAS) to 240 (dec) (0xF0), which is out of range.
OTU4/ OTU3	OOM	By performing all bit inversion for MFAS value, an abnormal MFAS sequence occurs. Error is inserted without distinguishing lanes.
	OOF	At OTU4, inverts FAS header 5 bytes (0xF6F6F62828) to (0x090909D7D7) At OTU3, inverts FAS 6 bytes (0xF6F6F6282828) to (0x090909D7D7D7) Inserts error without distinguishing lanes.
	SM-TIM	Inverts TTI bit by multiframe unit (64 frames).
	SM-BIAE	Sets BEI/BIAE (1 to 4 bits) as BIAE invalid (1011).
	SM-BDI	Sets BDI (the 5th bit) to 1.
	SM-IAE	Sets IAE (the 6th bit) to 1.
ODU4/ ODU3	ODU-AIS	Sets the entire area, except for FAS, MAFS, OTU OH, FTFL, and FEC parity, to 1.
	ODU-OCI	Sets the entire area, except for FAS, MAFS, OTU OH, and FEC parity, to 0110 0110 (binary).
	ODU-LCK	Sets the entire area, except for FAS, MAFS, OTU OH, and FEC parity, to 0101 0101 (binary).
	PM-TIM	Inverts TTI bit by multiframe unit (64 frames).
	TCMi-TIM	
	TCMi- BIAE *1	Sets BEI/BIAE (1 to 4 bits) as BIAE invalid (1011).
	PM-BDI	Sets BDI (the 5th bit) to 1.
	TCMi-BDI *1	
	TCMi-IAE	Sets TCM status (6 to 8 bits) to "in use with IAE (010)".
	TCMi-LTC	Sets TCM status (6 to 8 bits) to "No Source TC (000)".
ODU2e/ ODU0 *2	OOF	Sets the value (0x090909D7D7), which is the inverted value of the first 5 bytes of FAS (0xF6F6F62828).
	OOM	By performing all bit inversion for MFAS value, an abnormal MFAS sequence occurs.
OPU(L)	Client-AIS	Sets the OPU payload data to PRBS pattern (2^{11}-1).
	CSF	Sets the PSI[2] Bit 1 to 1 by multiframe unit (256 frames).

*1: i=1~6

*2: It is displayed when the mapping is 10GbE or GbE.

Table 5.4.9-1 Alarm Setting Items (Cont'd)

Layer	Name	Explanation
ODU2e/ ODU0 *2 (Cont'd)	ODU-AIS	The same as the explanation for ODU-AIS, ODU-OCI, and ODU-LCK of ODU4/ODU3.
	ODU-OCI	
	ODU-LCK	
	PM-TIM	The same as the explanation for PM-TIM and PM-BDI of ODU4/ODU3.
	PM-BDI	
OPU(L)	Client-AIS	Sets the OPU payload data to PRBS pattern (2^{11}–1).
	CSF	Sets the PSI[2] Bit 1 to 1 by multiframe unit (256 frames).

Table 5.4.9-2 Error Setting Items

Layer	Name	Explanation
LLD	FAS-LLD	Sets the value (OxD7) with which the 4th byte value of FAS is inverted only for the lane that was specified at [Lane]. The insertion timing is [Alternate].
OTU4/ OTU3	FAS	For FAS, sets the value (OxD7) with which the 4th byte value of FAS is inverted without distinguishing the lane. The insertion timing is [Alternate]. Alternately transmits the specified number of error frame and the normal frame.
	SM-BIP8	Inverts the calculation value of BIP8. The insertion timing can be selected from [Single], [Burst], [All], or [Rate (Constant)]. [Single], [Burst], [All]: Inverts 1 bit per frame [Rate (Constant)]: Inverts multiple bits according to the setting rate
	SM-BEI	Sets BEI or BEI/BIAE (1 to 4 bits) as an error value. The insertion timing can be selected from [Single], [Burst], [All], or [Rate (Constant)]. [Single], [Burst], [All]: Inverts 1 bit per frame [Rate (Constant)]: Inverts multiple bits according to the setting rate
	Correctable Error	Inserts the continuous error of the amount with which the error can be corrected in FEC (40 bits at one time) without crossing the Sub-low. Selects one Sub-low to be inserted.
	Uncorrectable Error	Inserts the continuous error of the amount with which the error can be corrected in FEC (1000 bits at one time) without crossing the Sub-low. Selects one Sub-low to be inserted.
	Bit All	Inserts bit error with the entire frame data after scramble as the target. The insertion timing can be selected from [Single] or [Rate (Random)] (inserts error based on Poisson distribution). For [Rate (Random)], Exclude FAS button is displayed. When Exclude FAS is set to [On], the error cannot be inserted for the rate that exceeds 2.0e-3. This is used so that the connection destination does not become OOF.

Table 5.4.9-2 Error Setting Items (Cont'd)

Layer	Name	Explanation
ODU4/ ODU3	PM-BIP8	Refer to the explanation of SM-BIP8.
	TCMi-BIP8 *1	
	PM-BEI	Refer to the explanation of SM-BEI.
	TCMi-BEI *1	
OPU4/ OPU3	Bit Error	Inserts bit error with which the payload of OTU frame is the target. The insertion timing can be selected from [Single], [Burst], or [Rate (Constant)].
ODU2e/ ODU0 *2, *3	FAS	Sets the value (0xD7), which is the inverted value of the 4th byte of FAS (0x28).
	PM-BIP8	Refer to the explanation of SM-BIP8.
	PM-BEI	Refer to the explanation of SM-BEI.
GMP *2, *3, *4	CRC8 Error	Inserts bit errors to JC3.
	CRC5 Error	Inserts errors in the 4 through 8 bits of JC6
	Invalid JC1	Inserts bit errors inJC1.
	Invalid JC2	Inserts bit errors inJC2.
	Invalid JC1&JC2	Inserts bit errors inJC1 and JC2.
GFP-T *3	cHEC	Inserts bit errors in cHEC(core Header Error Check).
	tHEC	Inserts bit errors in tHEC(type Header Error Check).
	SuperblockCRC	Inserts bit errors in SuperblockCRC.
Ethernet *2, *3, *4, *5	Invalid Sync Header *2, *4	Transmits the block while setting the first 2 bits as 00 or 11.
	Invalid Block Type *2, *4	Transmits control block of the block type, which was selected from 0x00, 0x2d, 0x33, or 0x66. The insertion timing is [Alternate].
	Invalid Alignment Marker *4	Set M_0 of align marker to 0x00 and M_4 to 0xFF and transmit it.
	BIP Error *4	Perform bit inversion of BIP align marker and transmit it.
	66B Error *2, *4	Transmit error control block of 66B.
	10B Error *3	Transmit 10B_ERB code that is defined by 64B/65B conversion of GFP-T.
	LF *2, *4	Transmit local abnormal signal to XGMII, CGMII or XLGMII.
	RF *2, *4	Transmit remote abnormal signal to XGMII, CGMII or XLGMII.

*1: i=1 to 6

*2: Displayed when the mapping is 10GbE.

*3: Displayed when the mapping is GbE.

*4: Displayed when the mapping is 100GbE.

*5: For the FCS error insertion method, refer to Section 5.4.8 Ethernet stream.

5.5 Measurement Screen

The following items can be measured using the OTU3/OTU4 applications.

- Status, numbers of alarms, and number of errors for received frames
- Synchronous status and number of errors per lane
- Overhead information and frame data
- CFP status and received optical power per lane

5.5.1 Starting/stopping measurements

Touch the Counter ▶ button in the operation area to start measurement. The lamp is lit during measurement. The elapsed time is displayed at Counter Elapsed Time of each tab.

Figure 5.5.1-1 Counter Button

Touch the Counter ■ button in the operation area to stop measurement.

5.5.2 Measuring errors/alarms

Touching [Summary] tab displays received signal error, alarm status, and frequency. The items to be displayed differ depending on the mapping selection.

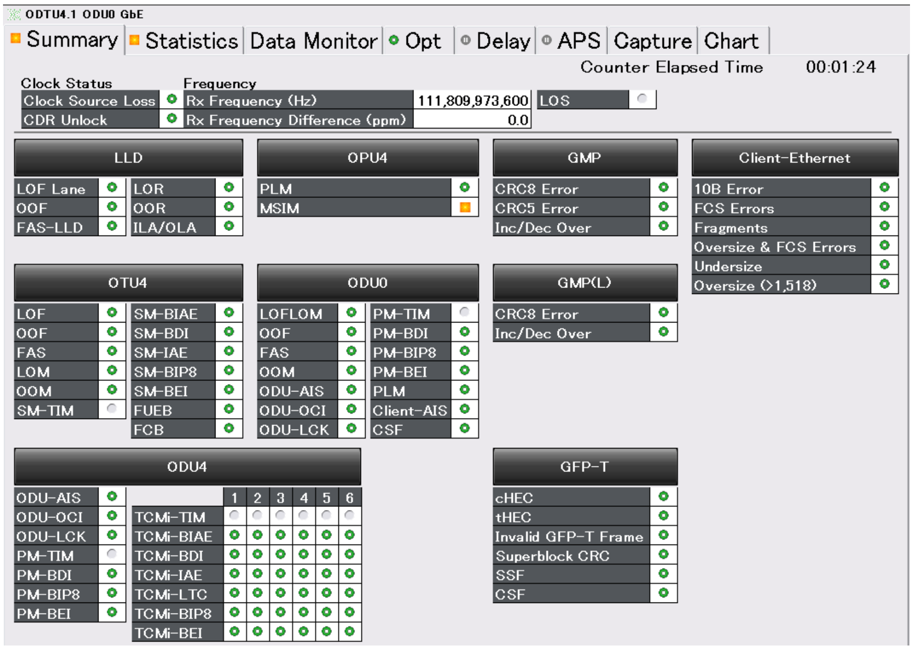


Figure 5.5.2-1 Summary Tab (ODTU4.1-ODU0-GbE)

Table 5.5.2-1 Summary Tab

Name	Explanation
Clock Source Loss *1	Sets clock frequency drift at clock source selected at Section 3.3.3 Clock Green: Clock source signal detected Red : Clock source signal not detected (Clock Source Loss)
CDR Unlock *1	Green: Clock received normally (Lock) Red: Clock not received normally (Unlock)
Rx Frequency (Hz) *1	Received clock frequency (Hz)
Rx Frequency Difference (ppm) *1	Received clock frequency (Hz) and difference from standard clock frequency (ppm) When the clock is not received normally (at CDR Unlock), the value is not displayed. Moreover, if an out-of-range clock is received, the display indicates that the clock is out-of-range.
LOS *1	Green: With input signal in optical interface. Red: No input signal in optical interface. Gray: Optical interface is not connected.
LLD	Error/alarm of measurement per lane of the Statistics tab (LLD) is displayed. Refer to Section 5.5.3 "Measurement per lane" for the detection conditions of error/alarm.
OTU4 *2	OTU4 error/alarm of Statistics tab is displayed.*3
ODU4 *2	ODU4 TCMi error/alarm of Statistics tab is displayed. *4
OPU4 *2	ODU4 error/alarm of Statistics tab is displayed. *4
ODU2e	ODU2e error/alarm of Statistics tab is displayed. *4
ODU0	ODU0 error/alarm of Statistics tab is displayed. *4
GMP	GMP (OTU4) error/alarm of Statistics tab is displayed.
GMP(L)	GMP (ODU2e/ODU0) error/alarm of Statistics tab is displayed.
GFP-T	GFP-T error/alarm of Statistics tab is displayed. *5
Client-Ethernet	Ethernet error/alarm of Statistics tab is displayed. *5

*1: Even if Counter lamp of the operation area is not lit, measurement is performed.

*2: For OTU3 application, convert OTU4, ODU4, and OPU4 in the table to OTU3, ODU3, and OPU3.

*3: Refer to Section .4 "OTU Measurement" for the detection conditions of error/alarm.

*4: Refer to Section 5.5.5 “ODU Measurement” for the detection conditions of error/alarm.

*5: Refer to Section 5.5.7 “GFP-T Measurement” for the detection conditions of error/alarm.

*6: Refer to Section 5.5.8 “Ethernet Measurement” for the detection conditions of error/alarm.

5.5.3 Measurement per lane

Touching the [Statistics] tab and [LLD] tab displays the measurement results per lane.

The displayed number of lanes is 4 for OPU3 and 20 for OTU4.

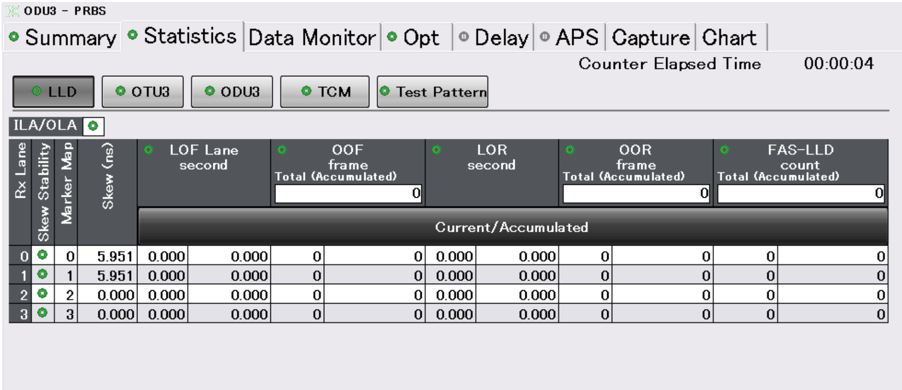


Figure 5.5.3-1 Statistics Tab for OTU3(LLD)

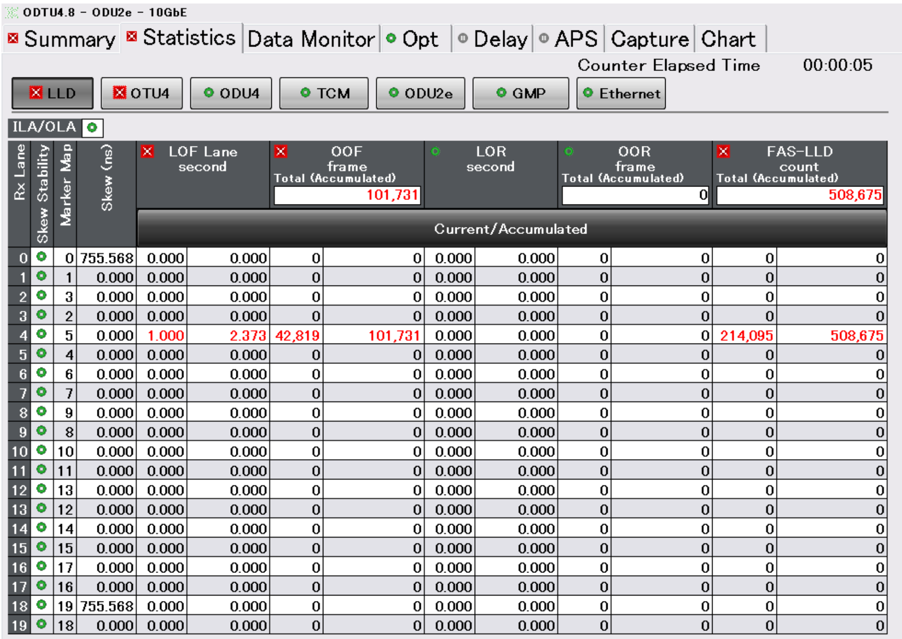


Figure 5.5.3-2 Statistics Tab for OTU4 (LLD)

5

OTU3/OTU4 Applications

Table 5.5.3-1 Statistics Tab Display Items (LLD)

Name	Explanation
ILA/OLA	Green: ILA (In Lane Alignment) Red: OLA (Out of Lane Alignment) OLA is set under any of the following conditions: • Deskew power exceeded • OOR • Overlapped lane number between lanes
Rx Lane	Reception Lane number
Skew Stability	Green: No change in value of Relative Skew Red: Change in value of Relative Skew
Marker Map	Value of alignment marker received at each lane (0 to 3 at OTU3 and 0 to 19 at OTU4) Confirms whether transmission data received at which reception lane The display value is a sample value every one second.
Skew(ns)	Amount of skew between reception lanes Displays drift between alignment markers of each lane when initial reception lane is 0 in 64-bit block units (about 5.951 ns for OTU3 and 11.448 ns for OTU4). The display value is a sample value every one second. The acceptable measurement range is as follows: OTU4: 0 to 5723.997 ns OTU3: 0 to 2975.470 ns A measurement value exceeding the maximum value is displayed as shown below. OTU4: >5723.997, OTU3: >2975.470
LOF Lane second *1	Time from detection to release of LOFOTL (Loss of Frame of optical lane) (seconds) Detection: OOF status continued for 3 ms Release: OOF status released after 3 ms
OOF frame *1, *2	Number of frames from detection to release of OOF (Out of Frame) Detection: Abnormal FAS-LLD received for 5 continuous frames Release: Normal FAS-LLD received for 2 continuous frames
LOR second *1	Time of seconds from detection to release of LOR (Loss of Recovery) Detection: OOR status continued for 3 ms Release: OOF status released after 3 ms
OOR frame *1, *2	Number of frames from detection to release of OOR (Out of Recovery) Detection: Different lane numbers received for 5 continuous frames Release: Same lane numbers received for 5 continuous frames
FAS-LLD count *1, *2	OTU4: The value of FAS [0] to [4] is some bytes different from 0xF6F6F62828 at the reception lane. OTU3: The value of FAS [0] to [5] is some bytes different from 0xF6F6F6282828 at the reception lane.

*1: When status is detected by one or more lane, LED is lit in red.
When all lane statuses are deleted, LED is lit in green.

*2: The total value of all lanes is displayed in Total (Accumulated).

*3: Lane Marker of OTU4 is excluded.

5.5.4 OTU Measurement

Touching [Statistics] tab, and touching [OTU4], or [OTU3] displays measurement results such as alarm generation time of OTU header of received frame, and the number of errors.

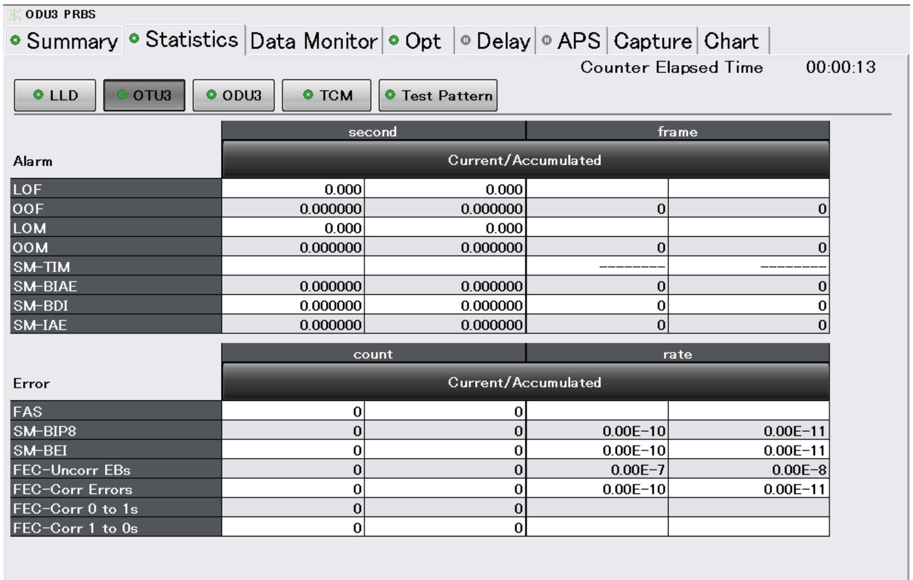


Figure 5.5.4-1 Statistics Tab (OTU3)

Table 5.5.4-1 Statistics Tab (OTU4, OTU3)

Name	Explanation
LOF	Time from detection to release of LOF (Loss of Frame) (seconds) Detection: OOF status continued for 3 ms Release: OOF status released after 3 ms
OOF	Number of frames from detection to release of OOF (Out of Frame) Detection: Abnormal FAS*1 received for 5 continuous frames Release: Normal FAS*1 received for 2 continuous frames
LOM	Time from detection to release of LOM (Loss of Multiframe) (seconds) Detection: OOM status continued for 3 ms Release: OOM status released after 3 ms
OOM	Number of frames from detection to release of OOM (Out of Multiframe) Detection: Abnormal MFAS sequence received for 5 continuous frames Release: Normal MFAS sequence received for 2 continuous frames

*1: Lane Marker of OTU4 is excluded.

5

OTU3/OTU4 Applications

Table 5.5.4-1 Statistics Tab (OTU4, OTU3) (Cont'd)

Name	Explanation
SM-TIM	Number of frames from detection to release of TIM(Trail trace Indicator Mismatch) Detection: SM-TTI sequence, which is different from the expected value, received for 3 continuous multiframes*2 Release: SM-TTI sequence, which is identical to the expected value, received for 3 continuous multiframes*2
SM-BIAE	Conversion value of the number of frames and seconds until a false of BIAE is detected and released. Detection: SM3(bit1~4) ≠1011 received for 3 continuous frames Release: SM3(bit1~4)=1011 received for 3 continuous frames
SM-BDI	Conversion value of the number of frames and seconds until a bit error of BDI (Backward Defect Indicator) is detected and released. Detection: SM3(bit5)=1 received for 5 continuous frames Release: SM3(bit5)=0 received for 5 continuous frames
SM-IAE	Conversion value of the number of frames and seconds until a bit error of IAE(Incoming Alignment Error) is detected and released. Detection: SM3(bit6)=1 received for 5 continuous frames Release: SM3(bit6)=0 received for 5 continuous frames
FAS	OTU4: The value of FAS (Frame Alignment Signal) [0] to [4] is some bytes different from 0xF6F6F62828 at the reception lane. OTU3: The value of FAS (Frame Alignment Signal) [0] to [5] is some bytes different from 0xF6F6F6282828 at the reception lane.
SM-BIP8	The number of parity error occurrences (bit) of SM-BIP8
SM-BEI	The number of error occurrences (bit) of SM-BEI
FEC-Uncorr EBs*3	The number of cord words not corrected
FEC-Corr Errors*3	The total number of corrected bits
FEC-Corr 0s to 1s*3	The number of bits corrected from 0 to 1
FEC-Corr 1s to 0s*3	The number of bits corrected from 1 to 0

*2: One multiframe is 64 frames for one TTI sequence.

*3: Not displayed when the mapping is ODU4-100GbE.

Changing the detection conditions of TIM

Detection conditions of TIM can be changed with the following procedure. TIM alarm is generated if the set data here and the TTI data differ.

1. Touch [Counter] at the setting area.
2. Touch [SM], [PM] of TIM Detection Pattern or [TCM1] to [TCM6] to select the target for change.
3. Touch the Meas button to detect TIM and set the display to [On]. When button display is set to [Off], TIM is not detected.
4. Touch Detection button and select the range for data cross-check.
5. Touch [IS:CC] and [NS:ICC&UAPC] of SAPI or DAPI to set the data. The numerical value of the table can be changed with an external keyboard. Refer to "Editing TTI" in Section 5.4.3 "Overhead" for the operation method.
6. Touch [OK].

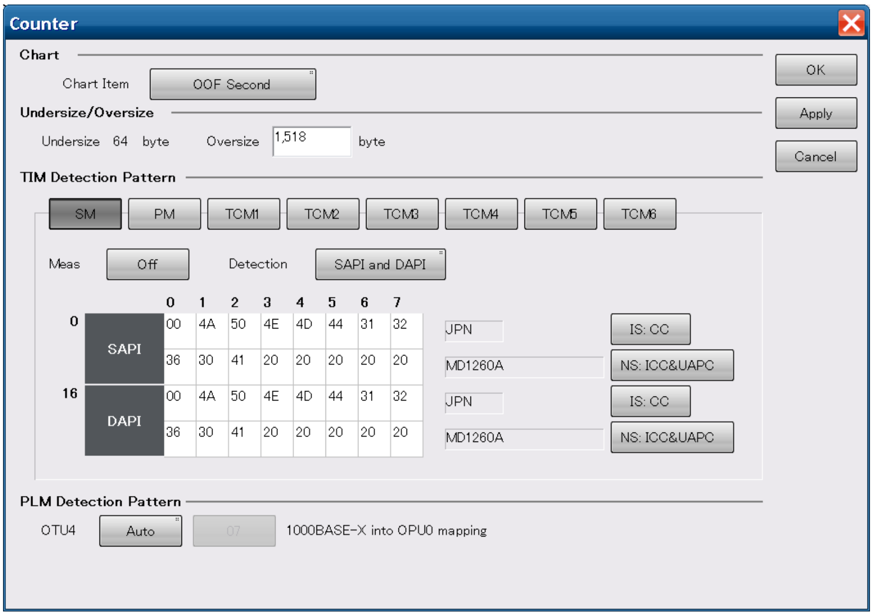


Figure 5.5.4-2 Counter Screen

5

OTU3/OTU4 Applications

5.5.5 ODU Measurement

Touching [Statistics] tab and [ODU4], or [ODU3] displays the measurement results such as ODU header of the received frame, alarm occurrence time of OPU header, and the number of errors.
When ODU2e, or ODU0 is selected in mapping, touch [ODU2e] or [ODU0] to display the measurement results of ODU2e or ODU0 in a similar fashion.
However, among ODU header, TCM measurement result is displayed in a separate screen. Touching [TCM] displays TCM measurement results.

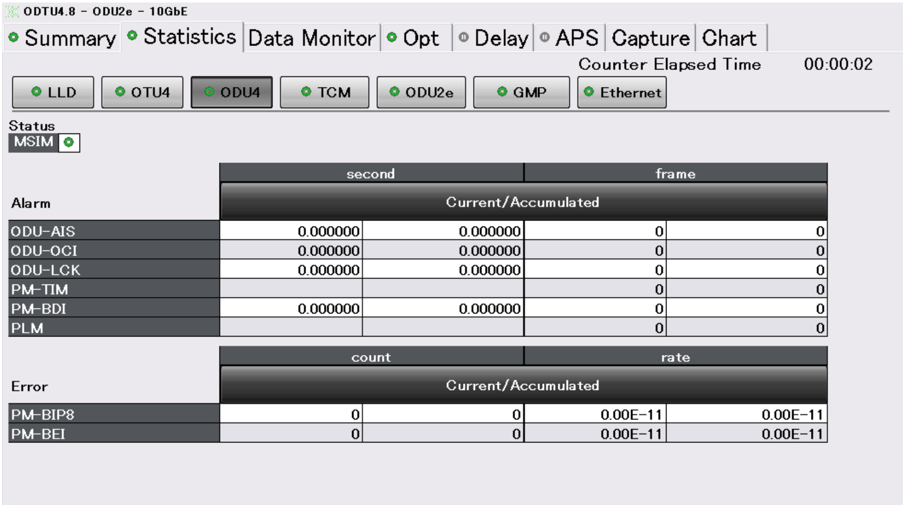


Figure 5.5.5-1 Statistics Tab (ODU4)

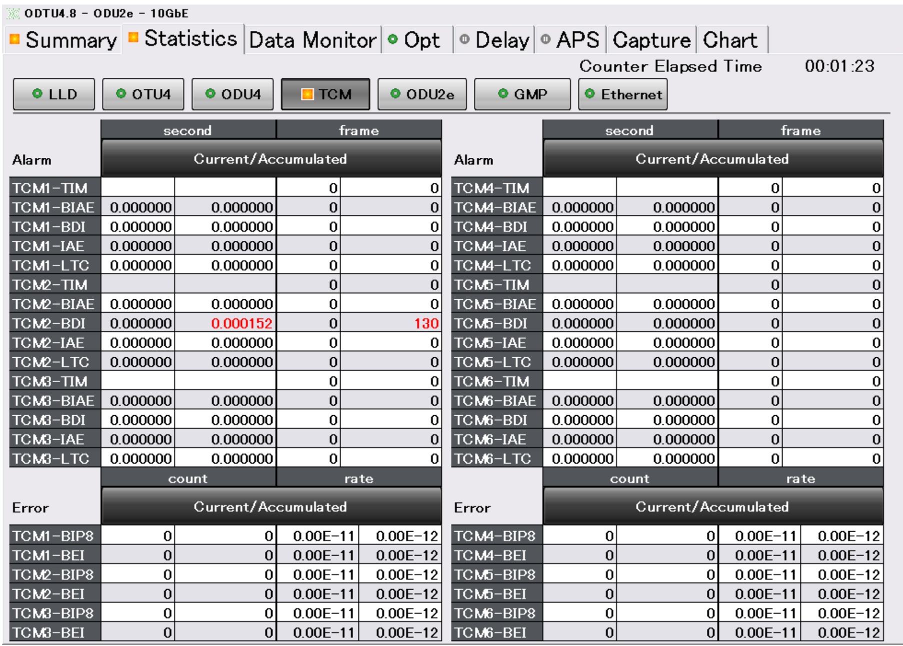
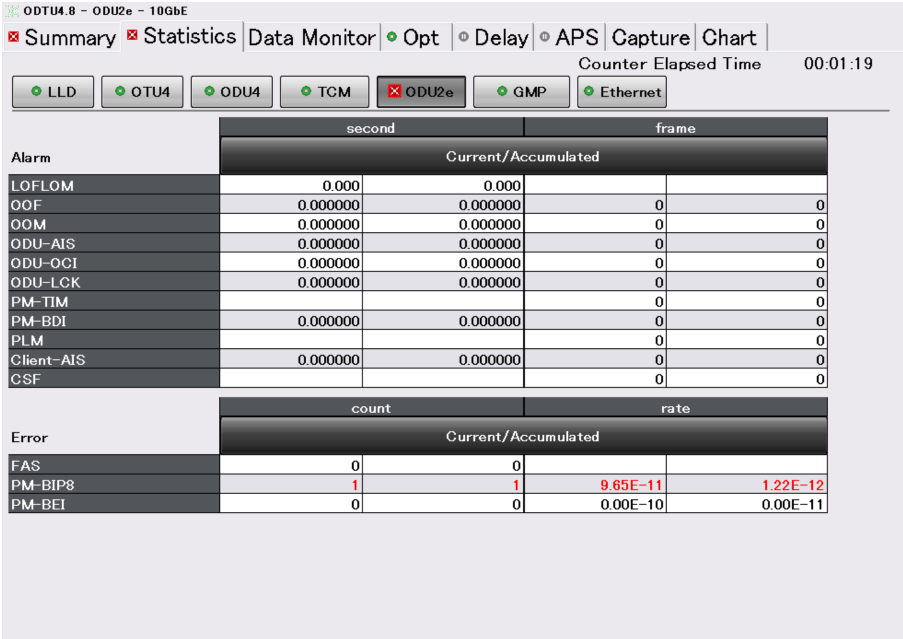


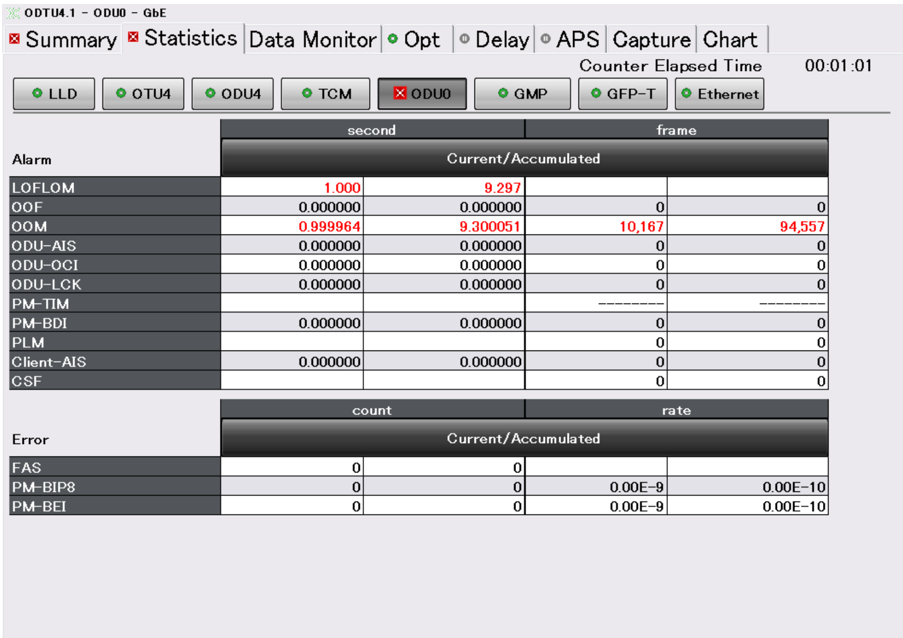
Figure 5.5.5-2 Statistics Tab (TCM)



Alarm	second Current	second Accumulated	frame Current	frame Accumulated
LOFLOM	0.000	0.000		
OOF	0.000000	0.000000	0	0
OOM	0.000000	0.000000	0	0
ODU-AIS	0.000000	0.000000	0	0
ODU-OCI	0.000000	0.000000	0	0
ODU-LCK	0.000000	0.000000	0	0
PM-TIM			0	0
PM-BDI	0.000000	0.000000	0	0
PLM			0	0
Client-AIS	0.000000	0.000000	0	0
CSF			0	0

Error	count Current	count Accumulated	rate Current	rate Accumulated
FAS	0	0		
PM-BIP8	1	1	9.65E-11	1.22E-12
PM-BEI	0	0	0.00E-10	0.00E-11

Figure 5.5.5-3 Statistics Tab (ODU2e)



Alarm	second Current	second Accumulated	frame Current	frame Accumulated
LOFLOM	1.000	9.297		
OOF	0.000000	0.000000	0	0
OOM	0.999964	9.300051	10,167	94,557
ODU-AIS	0.000000	0.000000	0	0
ODU-OCI	0.000000	0.000000	0	0
ODU-LCK	0.000000	0.000000	0	0
PM-TIM			--------	--------
PM-BDI	0.000000	0.000000	0	0
PLM			0	0
Client-AIS	0.000000	0.000000	0	0
CSF			0	0

Error	count Current	count Accumulated	rate Current	rate Accumulated
FAS	0	0		
PM-BIP8	0	0	0.00E-9	0.00E-10
PM-BEI	0	0	0.00E-9	0.00E-10

Figure 5.5.5-4 Statistics Tab (ODU0)

5

OTU3/OTU4 Applications

Table 5.5.5-1 Statistics Tab (ODU4, ODU3)

Name	Explanation
ODU-AIS	Conversion value of the number of seconds and frames, which was received until ODU-AIS (Alarm Indication Signal) is detected and released. Detection: The entire status (bit 6 to 8) of PM and TCMi = 111 received for 5 continuous frames. Release: The entire status (bit 6 to 8) of PM and TCMi ≠111 received for 5 continuous frames.
ODU-OCI	Conversion value of the number of seconds and frames, which was received until ODU-OCI (Open Connection Indication) is detected and released. Detection: The entire status (bit 6 to 8) of PM and TCMi = 110 received for 5 continuous frames. Release: The entire status (bit 6 to 8) of PM and TCMi ≠110 received for 5 continuous frames.
ODU-LCK	Conversion value of the number of seconds and frames, which was received until ODU-LCK (Locked Signal) is detected and released. Detection: The entire status (bit 6 to 8) of PM and TCMi = 101 received for 5 continuous frames. Release: The entire status (bit 6 to 8) of PM and TCMi ≠101 received for 5 continuous frames.
PM-TIM	The number of frames, which was received until TIM (Trail trace Indicator Mismatch) is detected and released. Detection: PM-TTI sequence, which is different from the expected value, received for 3 continuous multiframes*1 Release: PM-TTI sequence, which is identical to the expected value, received for 3 continuous multiframes *1 For the TTI setting as the expected value, refer to “Changing the conditions for detecting TIM”.
PM-BDI	Conversion value of the number of seconds and frames, which was received until BDI(Backward Defect Indicator) is detected and released. Detection: PM3(bit5)=1 received for 5 continuous frames Release: PM3(bit5)=0 received for 5 continuous frames
Client-AIS	Conversion value of the number of seconds and frames, which was received until Client-AIS (Alarm Indication Signal) is detected and released. Detection: The status in which both Condition 1 and Condition 2 are met for 3 continuous times Condition 1: Among the 8192 bit of OPU payload, the number of "1" is 256 or more. Condition 2: Bit error in PRBS11 is 255 or less Release: The status in which either Condition 1 or Condition 2 is met for 3 continuous times. Condition 1: Among the 8192 bit of OPU payload, the number of "1" is 255 or less. Condition 2: Bit error in PRBS11 is 256 or more.

*1: One multiframe is 64 frames for one TTI sequence.

*2: One multiframe is 256 frames for one PSI sequence.

Table 5.5.5-1 Statistics Tab (ODU4, ODU3) (Cont'd)

Name	Explanation
PLM	The number of frames, which was received until PLM(Payload Mismatch) is detected and released. Detection: PT(Payload Type), which is different from the expected value, received for 3 continuous multiframes*1 Release:PT, which is identical to the expected value, received for 3 continuous multiframes *1 For the PT setting as the expected value, refer to “Changing the conditions for detecting PLM”.
MSIM	Detection display of MSIM (Multiple Structure Identifier Mismatch) Green: MSI, which is equivalent to the expected value, received for 3 continuous frames Red: MSI (Multiple Structure Identifier), which is different from the expected value, received for 3 continuous frames.
PM-BIP8	Parity error occurrence number of M-BIP8 (bits)
PM-BEI	Error occurrence number of PM-BEI(Backward Error Indicator) (bits)

Table 5.5.5-2 Statistics Tab (TCM)

Name	Explanation
TCMi-TIM	Number of frames from detection to release of TIM(Trail trace Indicator Mismatch) Detection: Different TCMi-TTI sequence received for 3 continuous frames Release: Same TCMi-TTI sequence received for 3 continuous frames Refer to "Changing the detection conditions of TIM" in Section 5.5.4 "OTU Measurement" for the setting method of TTI, the expected value.
TCMi-BIAE	Detection: TCMi 3(bit1~4) ≠1011 received for 3 continuous frames Release: TCMi 3(bit1~4) =1011 received for 3 continuous frames
TCMi-BDI	Conversion value of the number of seconds and frames, which was received until BDI(Backward Defect Indicator) is detected and released. Detection: TCMi3 (bit5)=1 received for 5 continuous frames Release: TCMi3 (bit5)=0 received for 5 continuous frames
TCMi -IAE	Conversion value of the number of frames and seconds until bit error of IAE (Incoming Alignment Error) is detected and released. Detection: TCMi 3(bit6)=1 received for 5 continuous frames Release: TCMi 3(bit6)=0 received for 5 continuous frames
TCM-LTC	Conversion value of the number of seconds and frames, which was received until LTC(Loss of Tandem Connection) is detected and released. Detection: TCMi status (bit6~8)=000 received for 7 continuous frames Release: TCMi status (bit6~8) ≠111 received for 3 continuous frames
TCMi-BIP8	Parity error occurrence number of TCMi-BIP8 (bits)
TCMi-BEI	Error occurrence number of TCMi-BEI (bits)

Table 5.5.5-3 Statistics Tab (ODU2e, ODU0)

Name*1	Explanation
LOFLOM	Time from detection to release of LOFLOM (Loss of Frame and Loss of Multiframe) (seconds) Detection:OOF or OOM status continued for 3 ms Release: OOF or OOM status released after 3 ms
OOF	Conversion value of number of frames and seconds from detection to release of OOF (Out of Frame) Detection: Frame, which FAS value is different from 0xF6F6F6282828, received for 5 continuous frames Release: Frame, which FAS value is equivalent to 0xF6F6F6282828, received for 2 continuous frames
OOM	Conversion value of number of frames and seconds from detection to release of OOM (Out of Multiframe) Detection: Abnormal MFAS* received for 5 continuous frames Release: Normal MFAS* received for 2 continuous frames
CSF	The number of multiframes, which CSF (Client Signal Fail) bit is 1*2
FAS	The number of frames, which FAS value is different from 0xF6F6F6282828

*1: Refer to Table 5.5.5-1 for the measurement items, which are not listed in the above table.

*2: One multiframe is 256 frames for one PSI sequence.

Changing the detection conditions of PLM

Detection conditions of PLM can be changed with the following procedure. PLM alarm is generated if the set payload type here and the measured payload type differ.

1. Touch [Counter] at the setting area.
   Refer to Figure 5.5.4-2 Counter Screen.
2. When specifying the payload type, touch the OTU4 button of PLM Detection Pattern and set the display to Manual.
   It becomes possible to operate a button for setting PT.
3. Touch the right button of [Manual] to specify PT.
4. In order to set the payload type as the same setting as the payload type of the transmitted frame, set the OTU4 button display to [AUTO].
5. Touch [OK].

Table 5.5.5-4 Payload Type when PLM Detection Pattern is [Auto]

Mapping	OTU3/OTU4	ODU2e	ODU0
ODU3-PRBS,ODU4-PRBS	FE	–	–
ODU4-100GbE	03	–	–
ODTU4.8-ODU2e-PRBS	21	FE	–
ODTU4.8- ODU2e-10GbE	21	03	–
ODTU4.1-ODU0-PRBS	21	–	FE
ODTU4.1-ODU0-GbE	21	–	07

5.5.6 GMP Measurement

Touch [Statistics] tab and touch [GMP] to display the measurement results of Cm(t).

Note;

For through mode, measurement results of Tx is not displayed.

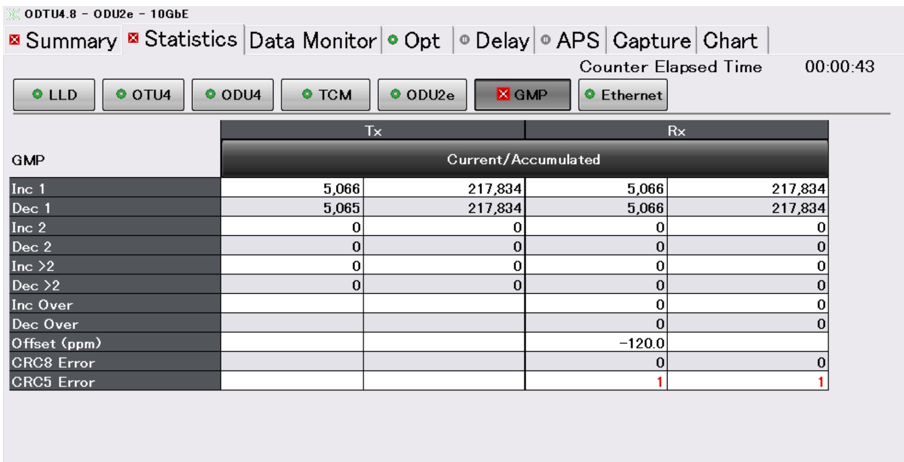


Figure 5.5.6-1 Statistics Tab (GMP)

Table 5.5.6-1 Statistics Tab (GMP)

Name	Explanation
Inc 1	The number of frames, which amount of $C_m(t)$ change is +1*1
Inc 2	The number of frames, which amount of $C_m(t)$ change is +2*1
Dec 1	The number of frames, which amount of $C_m(t)$ change is –1*1
Dec 2	The number of frames, which amount of $C_m(t)$ change is –2*1
Inc >2	The number of frames, which amount of $C_m(t)$ change is +3 or more*1
Dec >2	The number of frames, which amount of $C_m(t)$ change is –3 or less*1
Inc Over	The number of frames, which $C_m(t)$ value exceeds the upper limit of ITU-T specification.
Dec Over	The number of frames, which $C_m(t)$ value is less than the lower limit of ITU-T specification.
Offset	Bit rate offset amount of client data (ppm)
CRC8 Error	The number of frames with which CRC8 error occurred
CRC5 Error	The number of frames with which CRC5 error occurred

*1: II (Increment Indicator) =1, DI (Decrement Indicator) =0

*2: II=0, DI=1

*3: II=1, DI=1

Table 5.5.6-2 Cm(t) Lower Limit and Upper Limit of ITU-T Specification

Mapping	Lower Limit	Upper Limit
OTU4-100GbE	15050	15055
OTU4-ODTU4.8-ODU2e	15177	15182
OTU4-ODTU4.1-ODU0	14527	14529
ODU0-GFP-T-GbE	14405	14410

5.5.7 GFP-T Measurement

When the mapping is GbE, touch [Statistics] tab and [GFP-T] to display the measurement results of the received GFP-T frame.

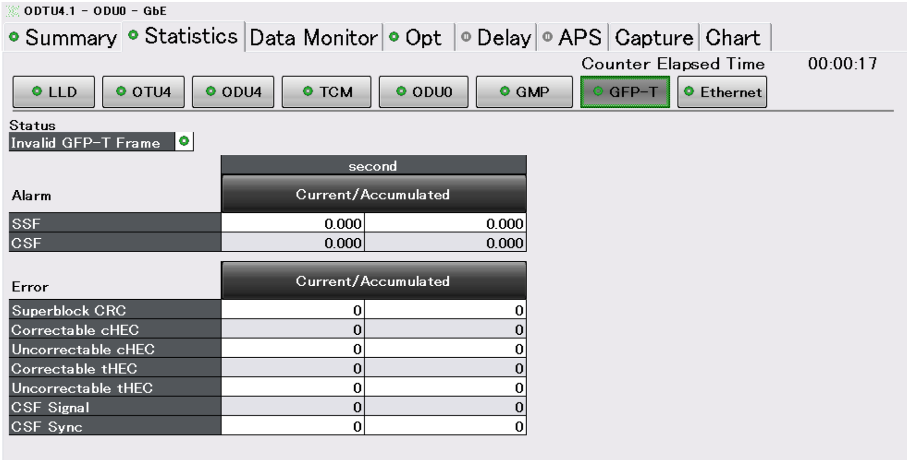


Figure 5.5.7-1 Statistics Tab (GFP-T)

Table 5.5.7-1 Statistics Tab (GFP-T)

Name	Explanation
Invalid GFP-T Frame	Detect a frame, which is different from GFP-T frame (defined in ITU-T G.709 17.7.1.1) to be used for mapping of GbE. Detection: Receive GFP-T frame, which is different from GFP-T frame to be used for mapping of GbE Release: Receive GFP-T frame to be used for mapping of GbE
SSF	The time when Server Signal Fail (transition from SYNC status to HUNT status) occurred.
CSF	The time until when CSF (Client Signal Fail) is detected and released. Detection: Detect CSF Signal or CSF Sync Release: One of the following occur ・ Receive a normal data frame ・ Receive UPI=8'b0000_0011 in CMF ・ CMF is not received during the 3000-ms period
Superblock CRC	The number of Superblock where CRC error occurred.
Correctable cHEC	The number of frames that can correct the payload length error by cHEC.
Uncorrectable cHEC	The number of frames that cannot correct the payload length error by cHEC.
Correctable tHEC	The number of frames that can correct the payload length error by tHEC.
Uncorrectable tHEC	The number of frames that cannot correct the payload length error by tHEC.
CSF Signal	The number of times that a frame is received with a payload header that has loss of client signal (PTI=100, UPI=0000 0001)
CSF Sync	The number of times that a frame is received with a payload header that has loss of client character synchronization (PTI=100, UPI=0000 0010))

5.5.8 Ethernet Measurement

When the mapping is 100GbE, 10GbE, or GbE, touch [Statistics] tab and [PCS Lane] to display the measurement results of the PCS lane.

Touching [Ethernet] displays measurement results such as the number of Ethernet frames and the number of errors.

Note:

For through mode, measurement results of Tx is not displayed.

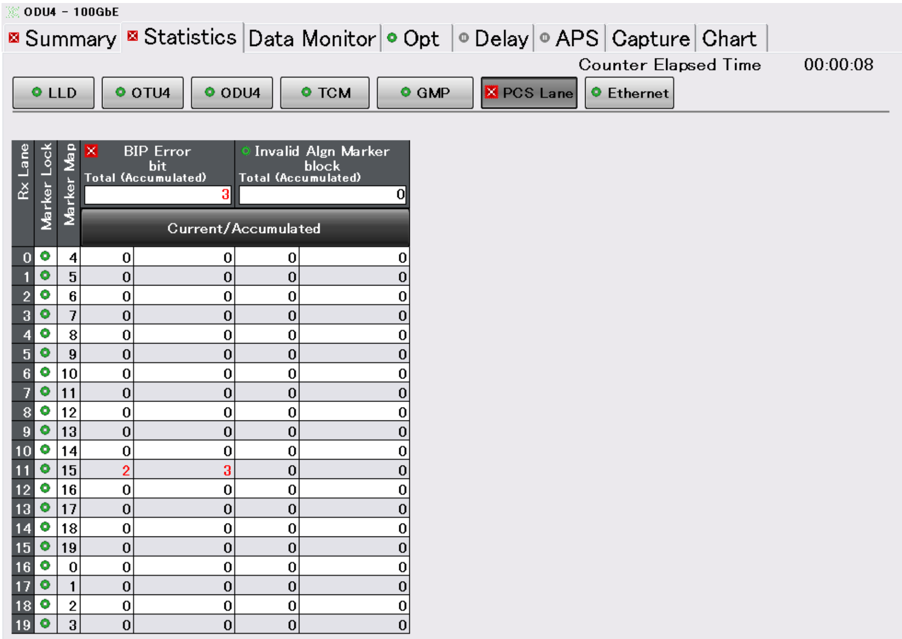


Figure 5.5.8-1 Statistics Tab (PCS Lane)

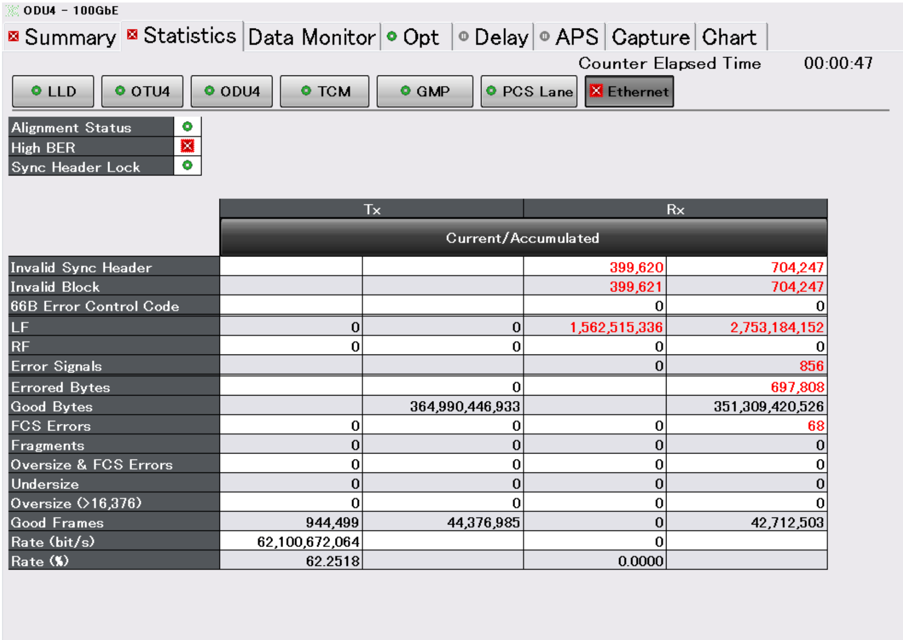


Figure 5.5.8-2 Statistics Tab for 100GbE (Ethernet)

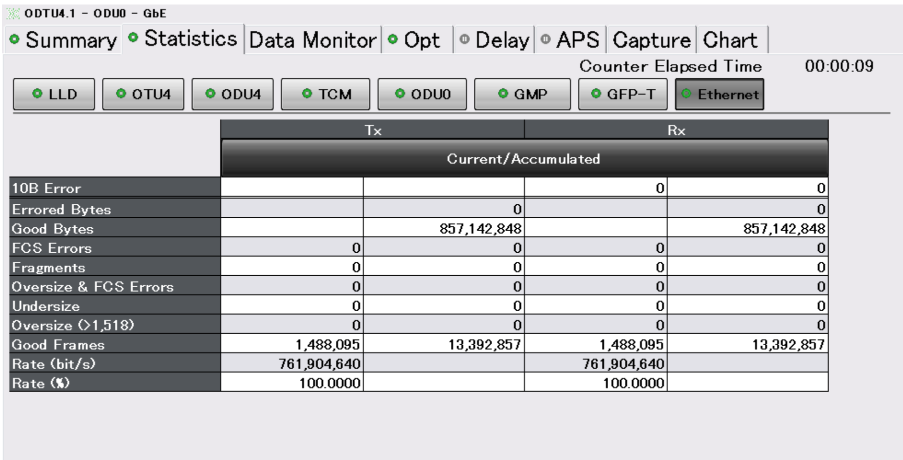


Figure 5.5.8-3 Statistics Tab for 100 GbE (Ethernet)

Table 5.5.8-1 Statistics Tab (PCS Lane)

Name	Explanation
Marker Lock	Green: The marker with which alignment markers per 16384 block are identical twice consecutively Red: Alignment markers per 16384 block resulted in abnormal 4 times consecutively, or they are not identical marker "Normal" means one of the values in IEEE802.3ba Table 82-2.
Marker Map	Value of alignment marker, which is received by each lane (For OTU3, the value is 0 to 3. For OTU4, the value 0 to 19)
BIP Error *	Error bit of BIP_3 field
Invalid Align Marker *	The number of alignment markers, with which the value became abnormal except for the BIP field Specifically, it is the number of times that the value, which is different from the values in IEEE 802.3ba Table 82-2 (100GBASE-R Alignment marker encoding), is detected.

*: The total value of all lanes is displayed in Total (Accumulated).

Table 5.5.8-2 Statistics Tab (Ethernet)

Name	Explanation
Alignment Status *1	Green: Display the status that all the following conditions are met. - Alignment marker is in sync. - No overlap of alignment marker value in all lanes. - Deskew processing is completed. Red: One or more conditions are not met among the three conditions
High BER *1	Green: The number of abnormalities of Sync. Header that is monitored by the window size is 96 or less. Red: The number of abnormalities of Sync. Header that is monitored by the window size is 97 or more. Window size: For 100GBASE-R, 500 μs For 40GBASE-R, 1250 μs
Sync Header Lock *1	Green: Sync Header is in sync. When 16 continuous normal blocks (01 or 10) were received Red: Unable to synchronize Sync Header. When 16 abnormal blocks (00 or 11) among 65 66-bit block was received
Invalid Sync Header *1	The number of blocks with which Sync Header value is abnormal (00 or 11)
Invalid Align Marker	The number of alignment markers, with which the value became abnormal except for the BIP field Specifically, it is the number of times that the value, which is different from the values in IEEE 802.3ba Table 82-2 (100GBASE-R Alignment marker encoding), is detected.

Table 5.5.8-2　Statistics Tab (Ethernet) (Cont'd)

Name	Explanation
Invalid Block Count *1	The number of the following blocks that are explained in IEEE 802.3ba 82.2.3.5 Valid and Invalid Blocks: a) Sync Field value is 00 or 11 b) Block Type Field contains reserve value c) Control character contains the value that does not exist in Table 82-1 d) The combination of 8 characters of XLGMII/CGMII does not match with the format in IEEE 802.3ba Figure 82-5
66B Error *1	The number of 66B error control blocks that are defined in IEEE 802.3 49.2.4 64B/66B transmission code or IEEE 802.3ba 82.2.3 64B/66B transmission code
10B Error *2	The number of 10-bit codes that is not defined in IEEE 802.3 36.2.4 8B/10B transmission code
LF *1	The number of local failure signals
RF *1	The number of remote failure signals
Error Signals *1	The total number of blocks that become CGMII or XGMII error (RXC=1, RXD=0xFE)
Errored Bytes	The number of total bytes of the number of frames, which is displayed in FCS Errors, Fragments, and Oversize & FCS Errors, Oversize
Good Bytes	Total of the number of bytes of normal frame, which is measured as Good Frame
FCS Errors Fragments Oversize & FCS Errors Undersize Oversize *3	The number of Ethernet frames where error occurred FCS Errors, Fragments, and Oversize & FCS Errors indicate the number of Ethernet frames in which the FCS field is incorrect. Fragments and Undersize indicate the number of Ethernet frames in which the frame size is below the Undersize setting value. Oversize indicates the number of Ethernet frames in which the frame size exceeds the Oversize setting value. Oversize setting value is set at "Figure 5.5.4-2 Counter Screen".
Good Frames	The number Ethernet frames that meet both of the following conditions - Frame size is 64 Byte or more and equal to or less than the Oversize setting value - No FCS error
Rate (bit/s)	Bit rate of Ethernet frames where error did not occur
Rate (%)	The ratio of measured frame rate against the maximum frame rate under specifications

*1: It is displayed when the mapping is 10GbE or 100GbE.

*2: It is displayed for GbE.

*3: Refer to Section 5.3.2 "Distribution of frame size" for the Oversize setting method.

5.5.9 Measuring bit error

When the mapping is PRBS, touch [Statistics] tab and [Test Pattern] to display the measurement results of the PRBS bit error.

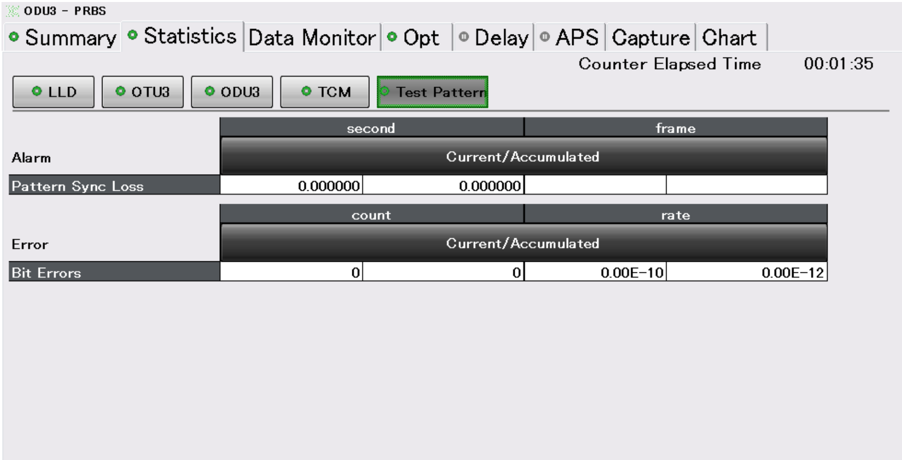


Figure 5.5.9-1 Statistics Tab (Test Pattern)

Table 5.5.9-1 Statistics Tab(Test Pattern)

Name	Explanation
Pattern Sync Loss	The time (second) when OPU payload pattern is out of sync Detection: Errors occurred in 1000 bits among 10000 bits (10% error) Release: No error in 1000 consecutive bits
Bit Errors	The number of OPU payload bit errors

5

OTU3/OTU4 Applications

5.5.10 OTU frame monitor

Touching [Data Monitor] tab displays overhead information, frame data, and staff byte position.

Touch [OH], [TTI], [FTFL], [Frame], or [Stuff] to toggle the display.
Measurement results are updated every second.
Touching [Pause] stops updating the measurement results.
When [Pause] is displayed in dark gray, the screen update is stopped.

When ODU2e or ODU0 is selected at mapping, layer selection buttons are displayed.

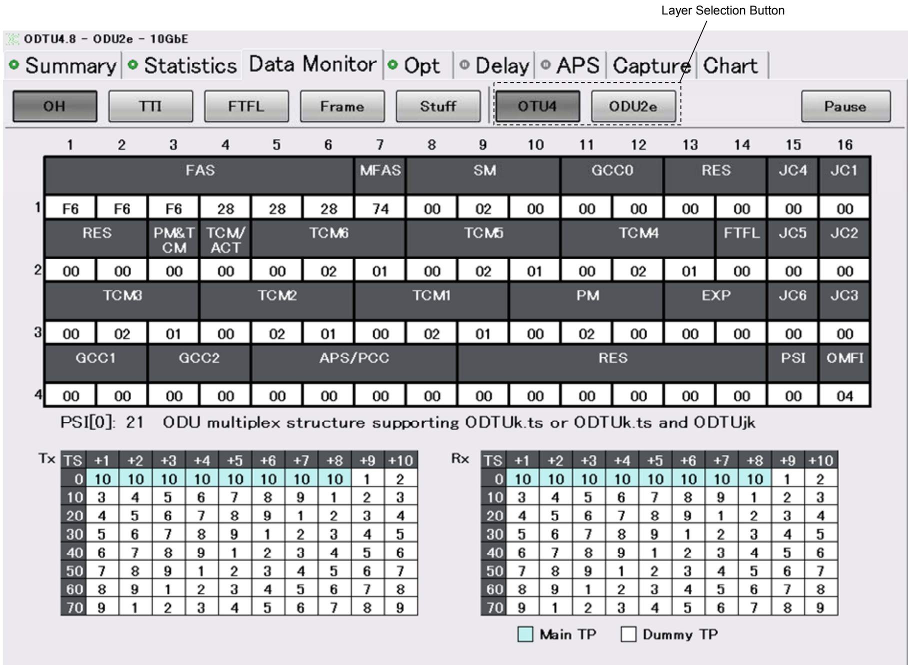


Figure 5.5.10-1 Data Monitor Tab (OH)

For [OH] display, TS and TP are displayed when the mapping is ODU2e or ODU0.
In Tx, the background of TS that is set at Section 5.4.6 "TP/TS" is displayed in light blue.
For Rx, the contents of the received MSI (Multiple Structure Identifier) byte are displayed. For MSI byte, the TS of Main TP, in which the TP value is stored and detected, is displayed with light blue background.
In addition, if abnormality occurs in Rx, the numerical value of the corresponding location is displayed in red.

Note:

For through mode, TS and TP of Tx are not displayed.

For [TTI] and [FTFL] display, data can be displayed in hexadecimal numbers or with ASCII characters.
[HEX]: Display data in hexadecimal numbers.
[ASCII]: Display data with ASCII characters.

When [ODU2e] or [ODU0] is selected, only PM-TTI appears in [TTI] display.

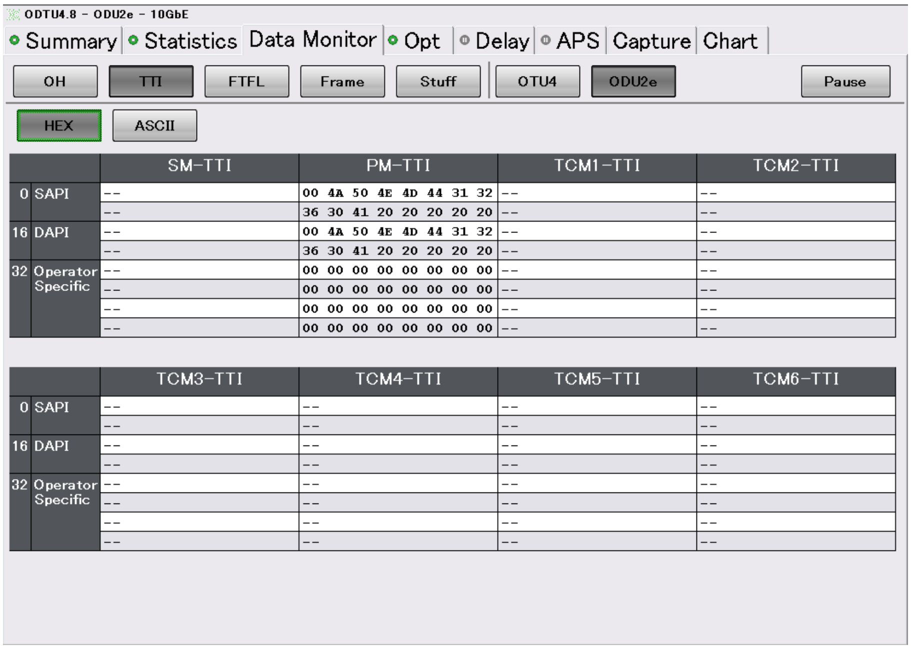


Figure 5.5.10-2 Data Monitor Tab (TTI)-HEX Display

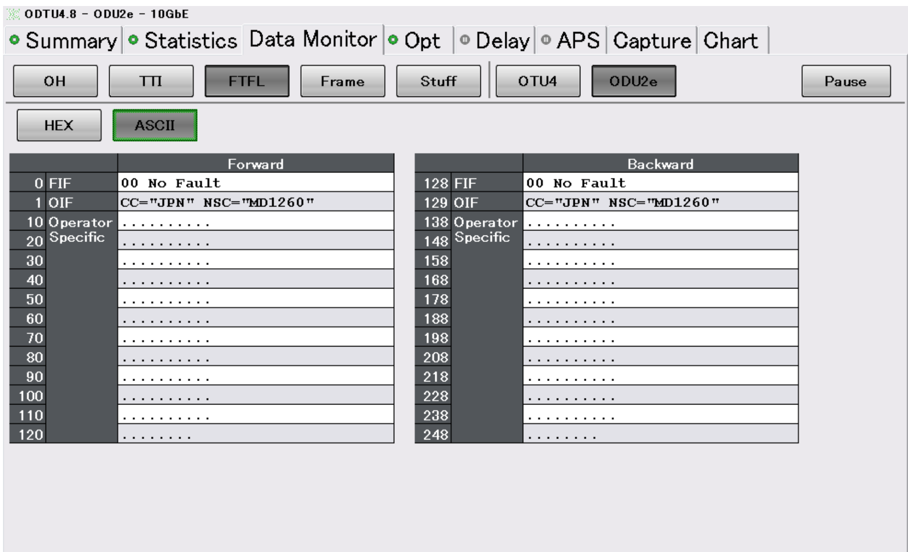


Figure 5.5.10-3 Data Monitor Tab (FTFL)-ASCII Display

5

OTU3/OTU4 Applications

In [Frame] display, specify the display position (Position) with the label number.
Touching [<] and [>] changes the position of the data to be displayed. The column of the specified label number is displayed on the left edge of the screen.
Touch [<<] to move to the beginning and touch [>>] to move to the end.

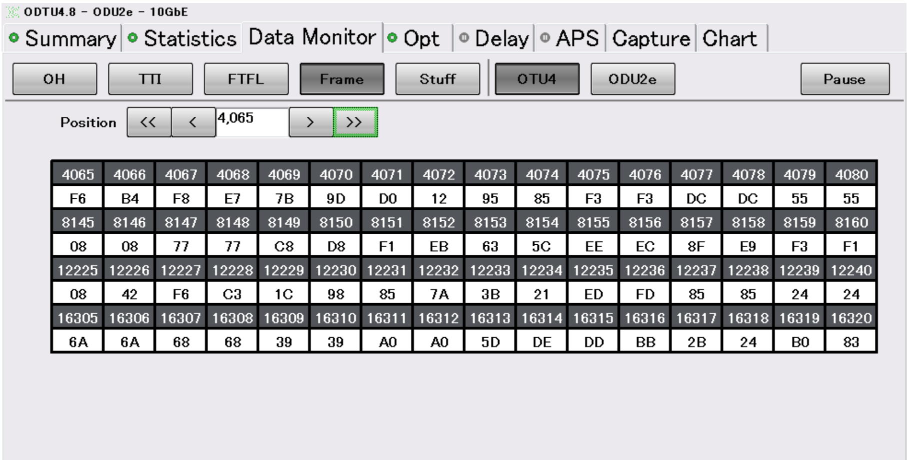


Figure 5.5.10-4 Data Monitor Tab (Frame)

With [Stuff], Cm(t) is displayed.
In the Staff Position List, payload field number including staff byte within ODTU is displayed.
In Staff Position Mapp, payload field position including staff byte within ODTU is displayed.

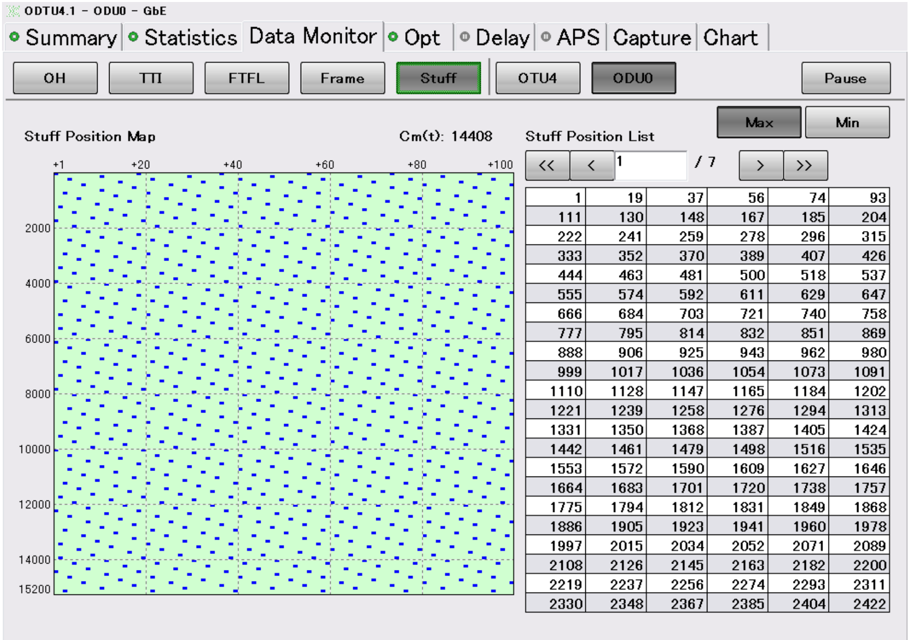


Figure 5.5.10-5 Data Monitor Tab (Stuff)

[Max]: Payload field number with which $C_m(t)$ becomes the maximum is displayed.

[Min]: Payload field number with which $C_m(t)$ becomes the minimum is displayed.

5.5.11 Measuring delay time

Touching [Delay] tab displays delay time of PM and TCM.
Touch [Settings] to set the measurement conditions.

Note:

For through mode, [Delay] tab is not displayed.

Delay time is displayed in OTU frame unit. A multiple number of about 3.035μs for OTU3 and about 1.168μs for OTU4 is displayed in 0.1μs step.

Table 5.5.11-1　Measurement Conditions of Delay

Name	Explanation
Mode	[Single]: Touching [Start] measures delay time once. [Repeat]: Touching [Start] measures delay time repeatedly. Touch [Stop] to end the measurement.
Period	Measurements cycle when Mode is [Repeat] Select from 1 second, 10 seconds, 1 minute, and 15 minutes. Measurement results are updated with this time interval.

*:Due to the software processing, several seconds at interval may be delayed.

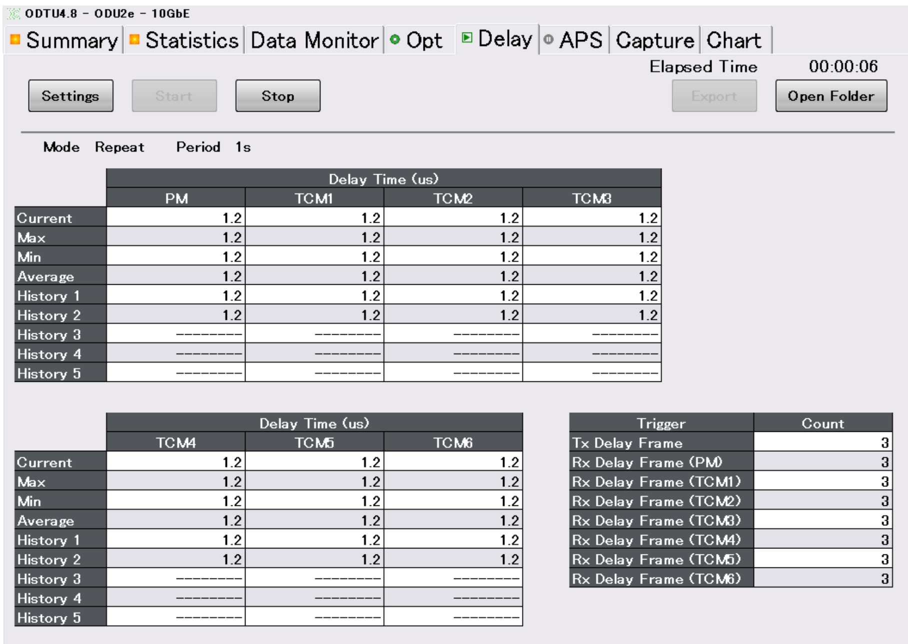


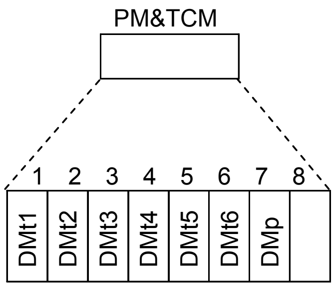
Figure 5.5.11-1　Delay Tab

Table 5.5.11-2 Display Items of Delay

Name	Explanation
Delay Time	Measurement value, maximum value, minimum value, and average value of delay time When the measurement value exceeds 10 seconds, the measurement indicates timeout. “>10 s (>1 s)” is displayed.
Elapsed Time	The time from the start of Delay measurement is displayed.
History	Measurement results of delay time up to 5 times in the past
Trigger	Tx Delay Frame: The number of transmitted delay time measurement frames Rx Delay Frame: The number of received delay time measurement frames

Touching [Start] initiates measurement and a ► symbol is displayed in the icon of the tab during measurement. Touching [Export] saves the measurement results. Saving cannot be performed with [Save] of the [System Menu].
Touching [Open Folder] displays the saved file.

Measurement method



DMt1~ DMt6 tandem connection delay monitoring
DMp Path delay monitoring

Figure 5.5.11-2 Bit Used for Delay Time Measurement

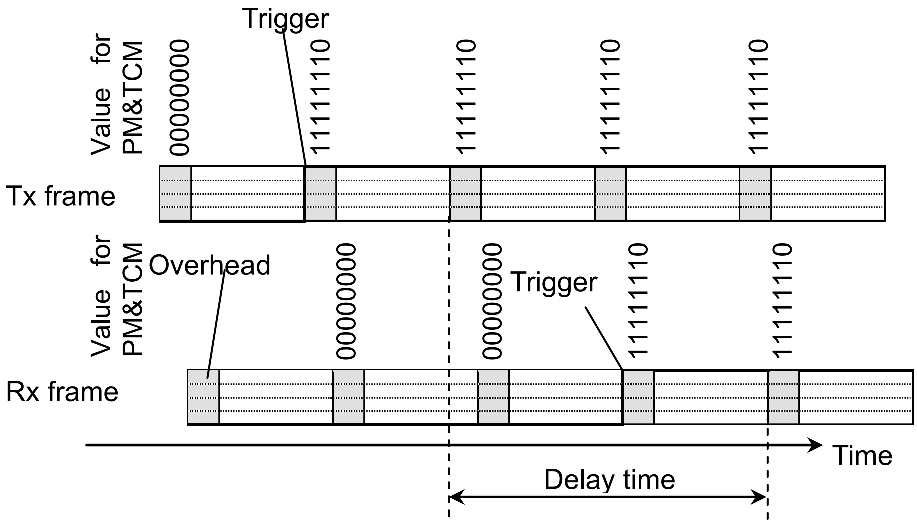


Figure 5.5.11-3 Measurement Method of Delay Time

1. When measurement is started, transmit the frame with which DMt1 to DMt6 and DMp of PM&TCM of overhead is inverted (0→1, or1→0). This frame becomes a trigger for delay time measurement. Record the transmission time and add value 1 to the Tx Delay Frame.
2. Considering the difference between the time when the frame, with which PM&TCM bit is changed, is received and transmission time as the measurement result of delay time, add 1 to the value of the Rx Delay Frame.
3. When Mode is [Repeat], repeat measurement from the above procedure 1 after a Period of time expires.

Note:

When [Start] and [Stop] is touched in a short time interval with large delay time measurement system, there is a case when the actual delay time is not displayed because the trigger of the DM bit, which was transmitted when [Start] is touched first, is received after the next [Start] is touched.

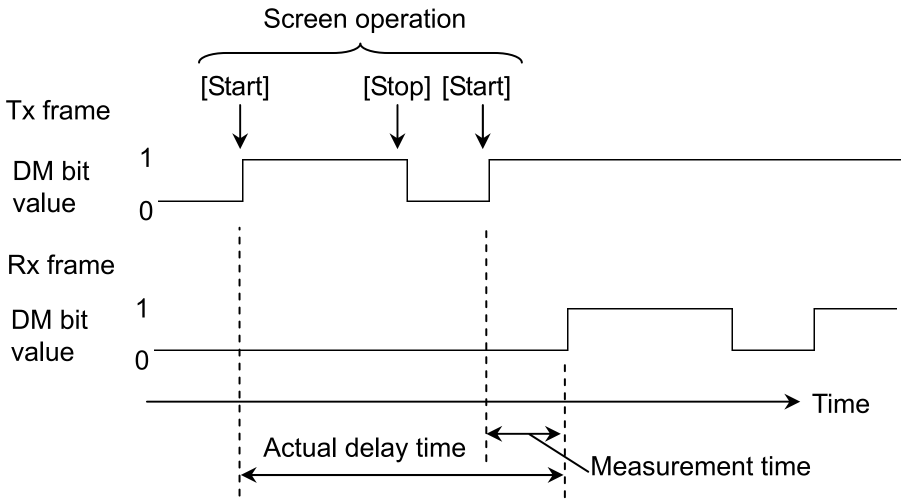


Figure 5.5.11-4 Measurement Example that the Actual Delay Time is not Displayed

5.5.12 APS Measurement

Touching [APS] tab displays Automatic Protection Switching time.
Touch [Settings] to set the measurement conditions.

Table 5.5.12-1 Measurement Conditions of APS

Name	Explanation
Mode	[Repeat]: Touching [Start] measures switching time repeatedly. Touch [Stop] to end the measurement.
Start Trigger	Switching start determination error/alarm When error/alarm occurs, a trigger is generated.
Stop Trigger	Switching stop determination error/alarm When error/alarm disappears, a trigger is generated.
Error Free Period	If stop trigger is not generated within the time of this cycle agaom, end the switching time measurement.
Threshold	If the measured switching time is equal to or higher than this value, measurement results are displayed in red.

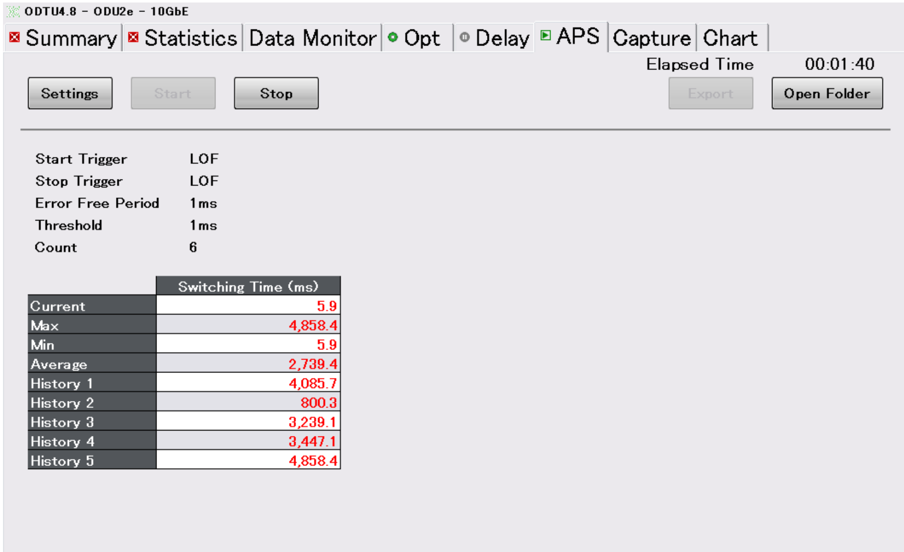


Figure 5.5.12-1 APS Tab

Table 5.5.12-2 Display Items of APS

Name	Explanation
Count	Number of the measurement data
Elapsed Time	The time from the start of APS measurement is displayed.
Switching Time	Measurement value, maximum value, minimum value, and average value of switching time
History	Measurement results of delay time up to 5 times in the past

Touching [Start] initiates measurement and a ► symbol is displayed in the icon of the tab during measurement. Touching [Export] saves the measurement results. Saving cannot be performed with [Save] of the [System Menu].
Touching [Open Folder] displays the saved file.

Measurement Method

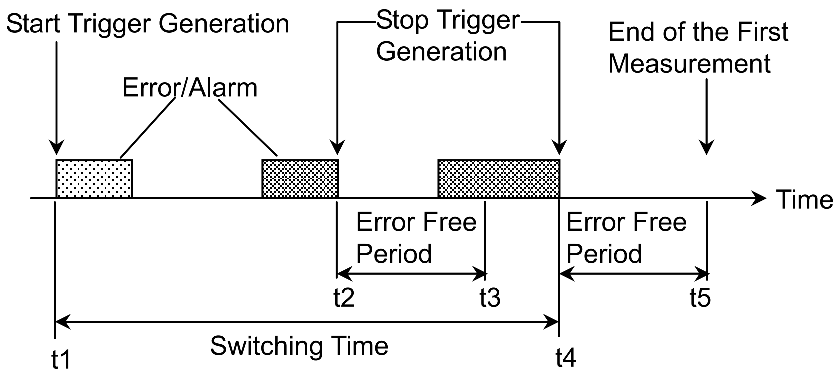


Figure 5.5.12-2 Measurement Method of Switching Time

1. When an error, which was set with Start Trigger, or an alarm occurs (start trigger generation), switching time measurement is started.
2. When an error, which was set with Stop Trigger, or an alarm occurs, the time until the error or alarm disappears (stop trigger generation) is recorded.
   When stop trigger is not generated within 10 seconds after generating start trigger, it indicates timeout. ">10 s" is displayed in the measurement results and return to the above procedure 1 and wait until the next start trigger is generated.
3. After stop trigger is generated, if the stop trigger is not regenerated within the time specified by Error Free Period, the switching time, which was recorded at the above procedure 2 is regarded as the measurement result. The time from t1 to t2 in Figure 5.5.12-2 becomes the measurement result.
   At this point, one switching time measurement ends. Return to the above procedure 1 and wait until the next start trigger is generated. It takes up to 1 second from ending the measurement to starting the measurement.
4. When the stop trigger is generated again within the time specified by Error Free Period, record the time until the stop trigger is generated.
5. After the stop trigger of the above procedure 4 is generated, if the stop trigger is not regenerated within the time specified by Error Free Period, the switching time, which was recorded at the above procedure 4 is regarded as the measurement result. The time from t1 to t4 in Figure 5.5.12-2 becomes the measurement result.

5.5.13 Displaying graph

The change in one measurement result with elapsed time can be displayed as a graph.
Touch [Chart] tab, and touch another [Chart] tab on top left displays the graph screen.

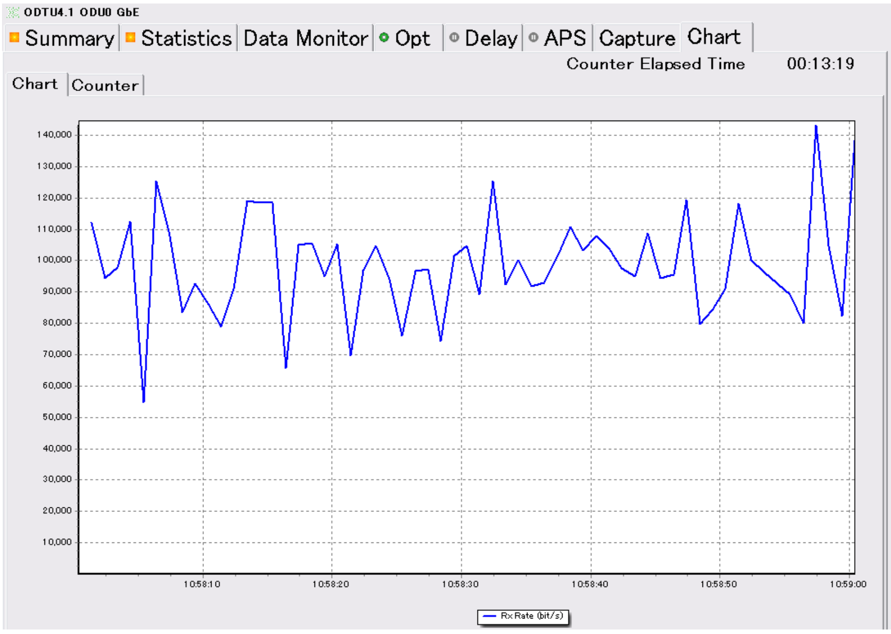


Figure 5.5.13-1 Chart Tab (Chart)

Set the displayed items as follows.

1. Touch [Counter] at the setting area.
2. Touch the button for Chart Item . The screen to select the measurement items is displayed.
3. Touch the button for the measurement items to be displayed on the graph.
   Touching [None] deletes the graph.
4. The button for setting lane number is displayed in the following measurement items. Touch the button and set the lane number.
   - [LOF Lane Second]
   - [OOF Frame]
   - [LOR Second]
   - [OOR Frame]
   - [FAS-LLD Count]
5. Touch [OK] to display the graph in the Chart tab.

6. Touching [Counter] on top left displays enlarged measurement results.
   The results in red letters show an error.
7. The display type can be switched by selecting [Current] or [Accumulated] on the screen.
   Current:　Count value in the last 1 second.
   Accumulated: Count value accumulated in the time shown in [Counter Elapsed Time].

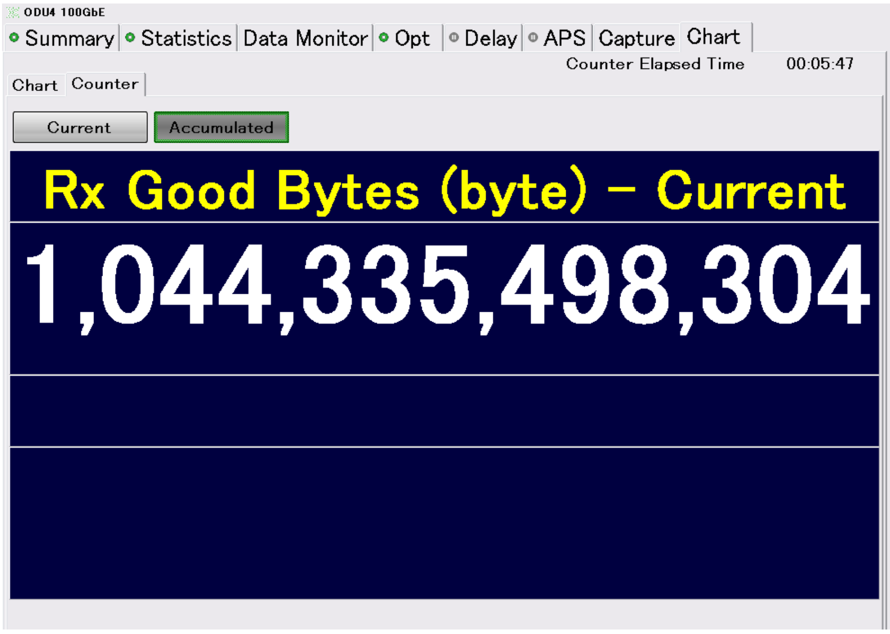


Figure 5.5.13-2　Chart Tab (Counter)

5.5.14 Displaying CFP status

Touching the [Opt] tab displays the CFP status. If the CFP is not connected, the error message is displayed.

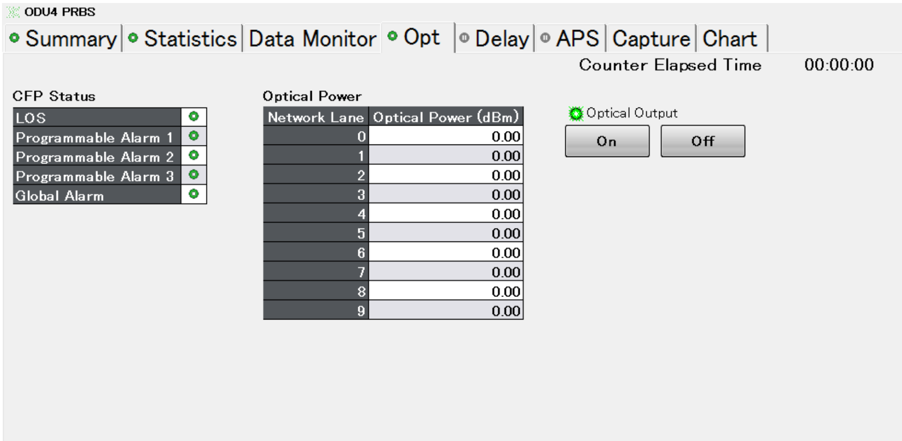


Figure 5.5.14-1 Opt Tab

For details on the display items, refer to Section 4.3.5 " Displaying CFP status ".

5.6 Capture

Capture will save the received OTU frame to the memory when the specified trigger is generated. The number of frames that can be saved differs depending on the range of data to be captured.

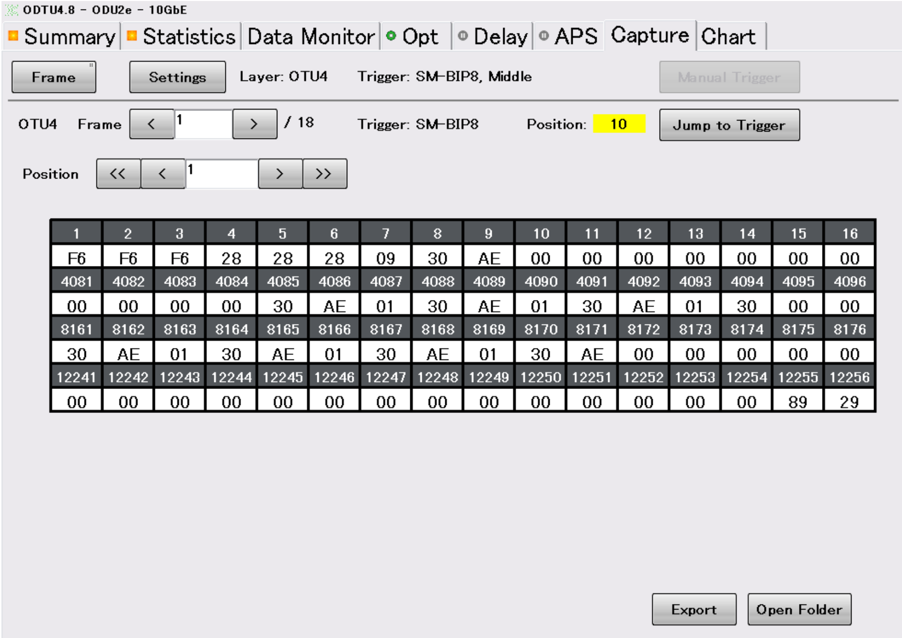


Figure 5.6-1 Capture Tab (Frame)

Table 5.6-1 Display Items of Capture Tab

Name	Explanation
OH Frame GMP *	Select the range of data to be captured. [OH]: Overhead, [Frame]: OTU frame, [GMP]: JC byte of OPU header and analysis result
Settings	Displays the trigger condition setting screen.
Trigger	Trigger type and position, which was set at Settings are displayed.
Layer	The overhead layer to be captured is displayed.
Manual Trigger	When Trigger Type is Manual, touching this button generates a trigger and the OTU frame is saved to the memory.
Frame	Sets the frame number to be displayed. The number of captured frames is displayed on the right side of "/".
Trigger	The trigger type when captured is displayed.
Position	When a trigger is generated, a frame number is displayed.
Jump to Trigger	Display the frame at the trigger position.
Position	For frame display, set the column number on the left edge.
Export	Save the capture result to a file.
Open Folder	Display the folder where capture result file is saved.

*: If mapping is ODU3-PRBS or ODU4-PRBS, it is not displayed.

5.6.1 Setting Trigger and Layer

With trigger setting, start condition of capture is set with the following procedure.

1. Touch the [Capture] tab.
2. Touch [Settings].
3. For ODTU4.8-ODU2e, or ODTU4.1-ODU0, touch the Layer button to select the layer that is to be captured.
4. Touch the Trigger Type button to select the trigger type.
   Depending on the data range that is to be captured, the trigger type differs.
5. Touch the Trigger Position button to select the trigger position.
6. Touch the [OK] button.
   The trigger type and position that were set to Trigger on the line are displayed.

Table 5.6.1-1 Trigger Types

Name	Explanation	Data Range		
		OH	Frame	GMP
Manual	When [Manual Trigger] is touched	✓	✓	✓
MFAS=0	Detects frame with which the value of the MFAS (Multiframe Alignment Signal) is 0	✓	–	–
MFAS	Detects frame of the value that MFAS specified	–	✓	–
OMFI *1	Detects frame of the value that OMFI specified	–	✓	–
OOF *2	Detects OOF (Out of Frame)	✓	–	–
OOM *2	Detects OOM (Out of Multiframe)	✓	✓	–
ODU-AIS *3	Detects ODU-AIS (Alarm Indication Signal)	✓	✓	–
ODU-OCI *3	Detects ODU-OCI (Open Connection Indication)	✓	✓	–
ODU-LCK *3	Detects ODU-LCK (Locked Signal)	✓	✓	–
FAS	OTU4: Detects frame with which the value of FAS[0] to [4] (Frame Alignment Signal) is not 0xF6F6F62828 OTU3: Detect frame with which the value of FAS[0] to [5] is not 0xF6F6F6282828	✓	–	–
SM-BIP8 *4	Parity error of SM-BIP8 has occurred	✓	✓	–
PM-BIP8	Parity error of PM-BIP8 has occurred	✓	✓	–
MSIM *1	MSIM (Multiplex Structure Identifier Mismatch) has occurred	✓	✓	–
CRC8 Error	Error occurred in CRC of JC1 and JC2	–	–	✓
CRC5 Error	Error occurred in CRC of JC4 and JC5	–	–	✓
Lock->Unlock	When GMP synchronization processing is in Hunt status	–	–	✓
Unlock->Lock	When GMP synchronization processing is in Sync status	–	–	✓

*1: Mapping is only for ODTU4.8-ODU2e or ODTU4.1-ODU0.

*2: Refer to Table 5.5.4-1 "Statistics Tab (OTU4, OTU3)" for the detection conditions.

*3: Refer to Table 5.5.5-1 "Statistics Tab(ODU4/OPU4, ODU3/OPU3)" for the detection conditions.

*4: Only for OTU3 and OTU4

5.6.2 Starting/Stopping Capture

To start capture, touch the Capture ▶ button at the operation area. After capture has been started, it stops when the set trigger event occurs. The lamp is lit during capture. Capture is stopped when the lamp is off.

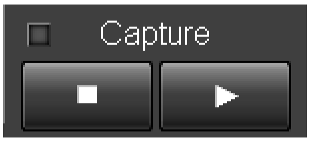


Figure 5.6.2-1 Capture Button

To stop capture, touch the Capture ■ button in the operation area.

Note:

To obtain valid capture data, stop the capture by a trigger, which was set at [Settings], not by the ■ button of Capture in the operation area.

If the capture is stopped with the ■ button when the data range is [OH] or [Frame], the data may be captured only up to the halfway of the capture capacity.

When data range is [GMP], stopping the capture with the ■ button does not display the capture data.

5.6.3 Capture Data Display

When data is captured, the frame number for which the trigger is generated is displayed in the Position of the Capture tab.

When data range is OH or Frame

Touch [<] or [>] of Frame to specify the frame to be displayed.
Touching [Jump to Trigger] displays the frame of the trigger position.
For Frame display, touch [<<], [<], [>], or [>>] of Position and set the column number on the left edge.

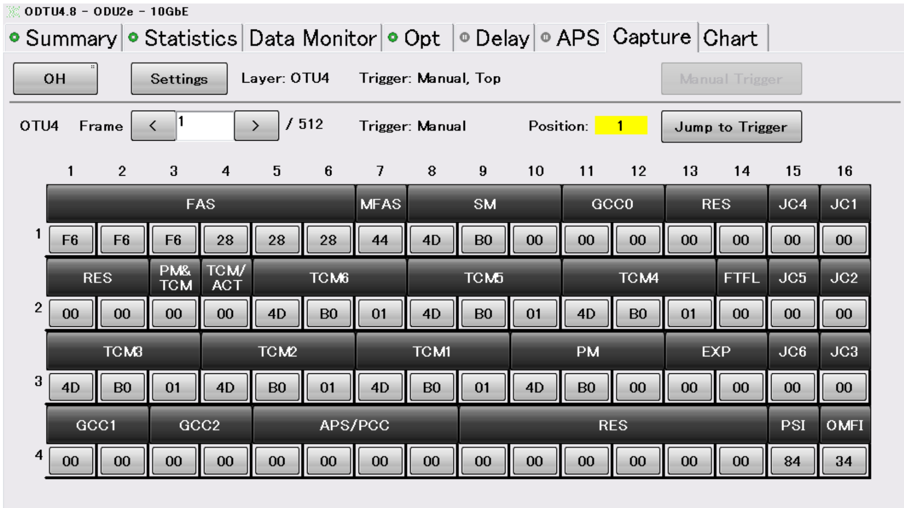


Figure 5.6.3-1 Capture Tab (OH)

For OH display, touching the column of the data displays the multiframe data of the column.
The following figure shows the multiframe display when SM-TTI (Line 1, Column 8) is touched.

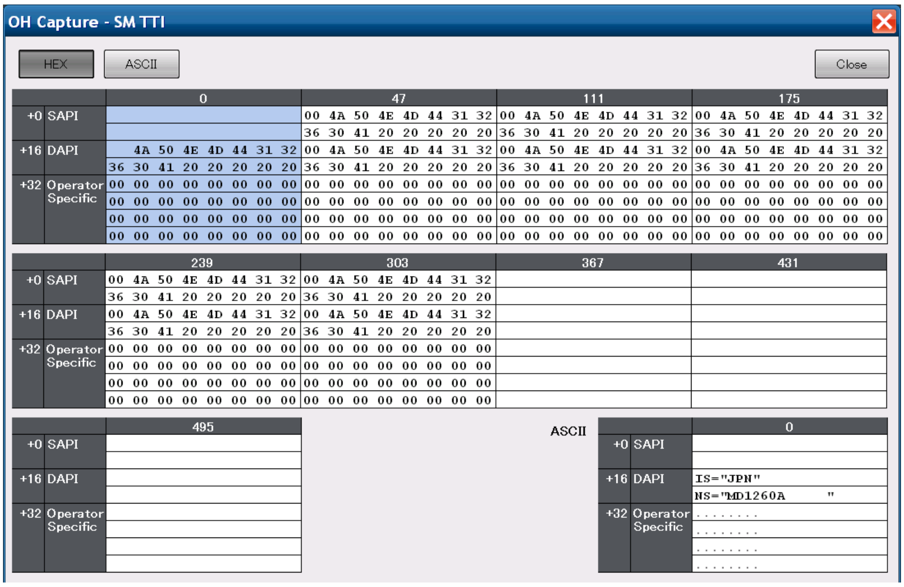


Figure 5.6.3-2 Multiframe Display of Overhead (SM-TTI)

When data range is GMP

When data is captured, [Capture-GMP Viewer] can be operated. Touching [Capture-GMP Viewer] displays GMP capture data. The value, which is judged as abnormal, is displayed in red.

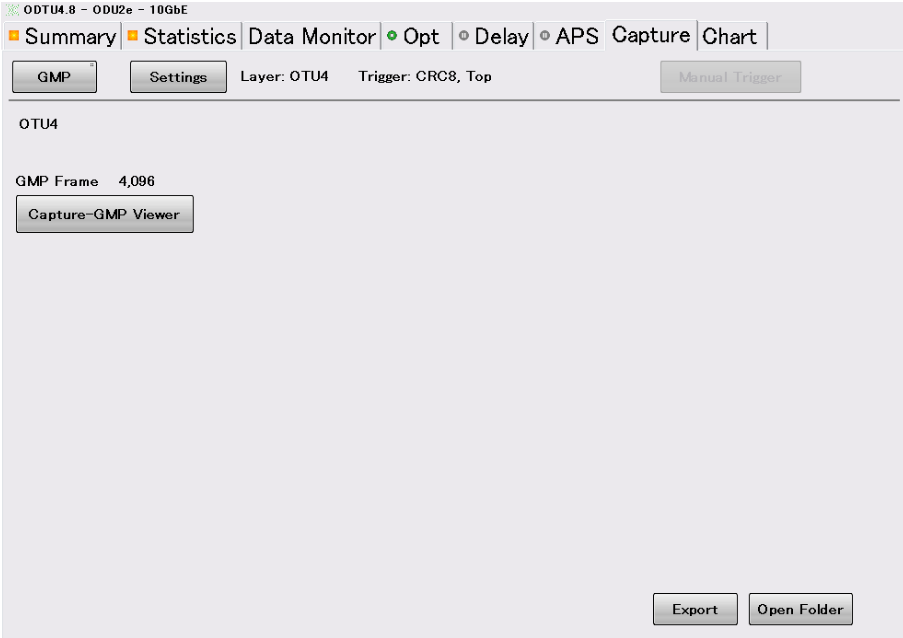


Figure 5.6.3-3 Capture Tab (GMP)

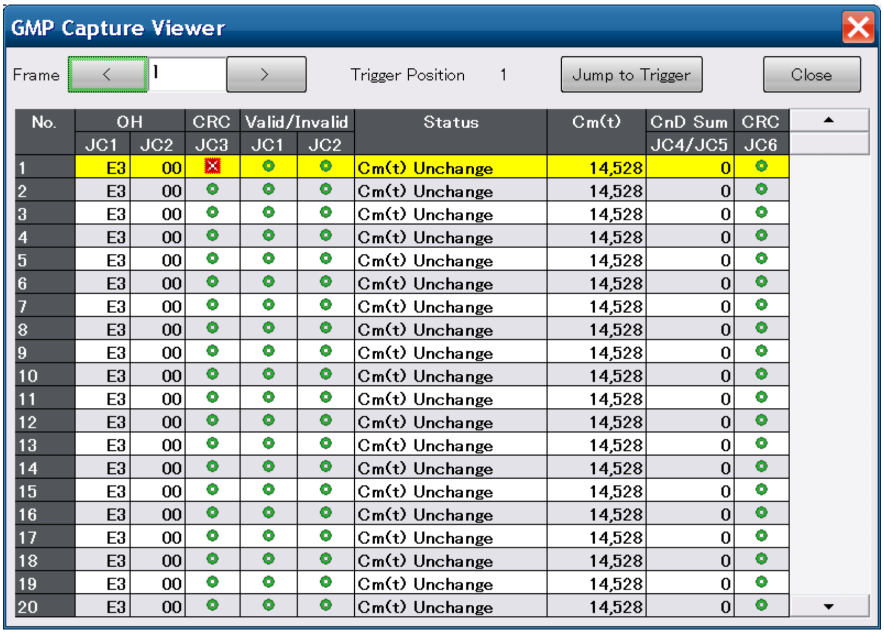


Figure 5.6.3-4 GMP Capture Viewer Screen

Table 5.6.3-1 Items of GMP Capture Viewer Screen

Name	Explanation
Frame	Sets the frame number to be displayed at the beginning of the table.
Trigger Position	Frame number with which a trigger is generated.
No.	Frame number. The line of the frame number that became a trigger is displayed in yellow.
OH	The overhead value is displayed in hexadecimal numbers.
CRC (JC3), CRC (JC6)	: No error occurred. : Error occurred.
Valid/Invalid	
Status	The following synchronization processing status of GMP is displayed: Start Hunt, Hunt-A, Hunt-B, Hunt-C, Hunt-D, Hunt-E, Hunt-F, S+2, S+1, accept received C8, S–1, S–2, Cm(t) Inc >2, Cm(t) Inc 2, Cm(t) Inc 1, Cm(t) Unchange, Cm(t) Dec 1, Cm(t) Dec 2, Cm(t) Dec <2
Cm(t)	Displays Cm(t) per frame.
CnD Sum	Displays CnD value per frame.

5.6.4 Saving Capture Results

Saves the capture result per capture data range to a file.

1. Touch the [Capture] tab.
2. Touching [Export] saves the capture result.
   Saving cannot be performed with [Save] of the [System Menu].

The capture file is saved to the following folder:
C:\ Documents and Settings\Administrator\My Documents
\Anritsu\MD1260A\UserData\Capture Data
Touching [Open Folder] displays the saved file.

```
OTU4 OH Capture

Trigger Type,MFAS = 0
Trigger Position,Top
Trigger Position No.,1

SM-TTI
No.,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
1,00,4A,50,4E,4D,44,31,32,36,30,41,20,20,20,20,20
17,00,4A,50,4E,4D,44,31,32,36,30,41,20,20,20,20,20
33,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
49,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
                    :
                    :
FTFL
No.,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
1,00,4A,50,4E,4D,44,31,32,36,30,00,00,00,00,00,00
17,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
33,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
                    :
                    :
PSI
No.,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
1,FE,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
17,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
                    :
                    :
Frame No,001 OH
No.,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
1,F6,F6,F6,28,28,28,00,00,11,00,00,00,00,00,00,00
2,00,00,00,00,00,11,01,00,11,01,00,11,01,00,00,00
3,00,11,01,00,11,01,00,11,01,00,11,00,00,00,00,00
4,00,00,00,00,00,00,00,00,00,00,00,00,00,00,FE,00

Frame No,002 OH
No.,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
```

Figure 5.6.4-1 Example of Capture File (Overhead)

Frame Capture
Trigger Type,MFAS = 0
Trigger Position,Top
Trigger Position No.,1

Frame No.,1
No.,1,2,3,4
1,F6,00,00,00
2,F6,00,0E,00
3,F6,00,01,00
4,28,00,00,00
5,28,00,0E,00
6,28,0E,01,00
7,00,01,00,00
8,00,00,0E,00
9,0E,0E,01,00
10,00,01,00,00
11,00,00,0E,00
12,00,0E,00,00
:

Figure 5.6.4-2　Example of Capture File (Frame)

OTU4 Frame Capture
Trigger Type,Manual
Trigger Position,Top
Trigger Position No.,2

No.,OH JC1, OH JC2,CRC JC3, Valid/Invalid JC1, Valid/Invalid JC2, Status Cm, CnD Sum JC4/JC5, CRC JC6
1,B8,65,Good,Good,Good,Cm(t) Dec 1,15179,2,Good
2,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,4,Good
3,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,6,Good
4,47,86,Good,Good,Good,Cm(t) Inc 1,15180,0,Good
5,B8,65,Good,Good,Good,Cm(t) Dec 1,15179,2,Good
6,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,4,Good
7,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,6,Good
8,47,86,Good,Good,Good,Cm(t) Inc 1,15180,0,Good
9,B8,65,Good,Good,Good,Cm(t) Dec 1,15179,2,Good
10,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,4,Good
11,ED,2C,Good,Good,Good,Cm(t) Unchange,15179,6,Good
12,47,86,Good,Good,Good,Cm(t) Inc 1,15180,0,Good
13,B8,65,Good,Good,Good,Cm(t) Dec 1,15179,2,Good
:

Figure 5.6.4-3　Example of Capture File (GMP)

5.7 Measurement Procedures

Perform evaluation using the OTU3/OTU4 application as follows.

1. Start the OTU3/OTU4 application.
2. Connect the MD1260A and DUT.
3. Touch [Port/Clock] to set the Mode to [Normal].
   Set GFEC.
4. Touch [Lane mapping] to set the assignment of the Logical lane and the Physical lane.
5. Touch [OH Preset] to set the overhead value.
6. Touch [Test Pattern] to set the payload data.
7. Touch [Counter] to set TIM and PLM detection conditions.
8. Touch the Counter ▶ button at the operation area to start measurement.
9. Touch the tab of the measurement area to select the measurement results to be displayed.
   To reset the measurement (Counter), touch the Counter ▶ button.
10. Touch the [Setting] of [Capture] tab to set the capture trigger.
11. Touch the ▶ button of Capture, which is located in the operation area, and set it to wait for a generation of a trigger.
12. When a frame number is displayed at the Trigger Position of the [Capture] tab, it is the end of the capture.

At this time, the following evaluations are possible.

- Confirms whether or not error/alarm occurred using the [Summary] tab.
- The following items can be confirmed using the [Statistics] tab:
  OTU3/OTU4 LLD status
  OTU3/OTU4 frame status
  OTU3/OTU4 payload bit error measurement result
  Touching the Counter ▶ button at the operation area starts the count.
  Touching the [Pause] button on the [Data Mon] tab stops OTU3/OTU4 overhead monitor.
- Touching the Error/Alarm Ins ▶ button at the operation area inserts errors/alarms
  Set the error insertion type at the [Error/Alarm] screen.
- Insert skew in the Logical lane at [Relative Skew].
- Adjust the Tx clock frequency at [Clock].

Chapter 6 No Frame Application

This chapter explains the screens for the 40GbE No Frame, 100GbE No Frame, and OTN3 No Frame and the OTN4 No Frame applications and the operation methods.

6

No Frame Application

6.1 Outline of No Frame Measurement

At No Frame communications, data is sent and received without Ethernet and OTU frames.

A pulse pattern generator is connected at the sending side of each lane as shown below, and an error detector is connected at the receiving side of each lane.

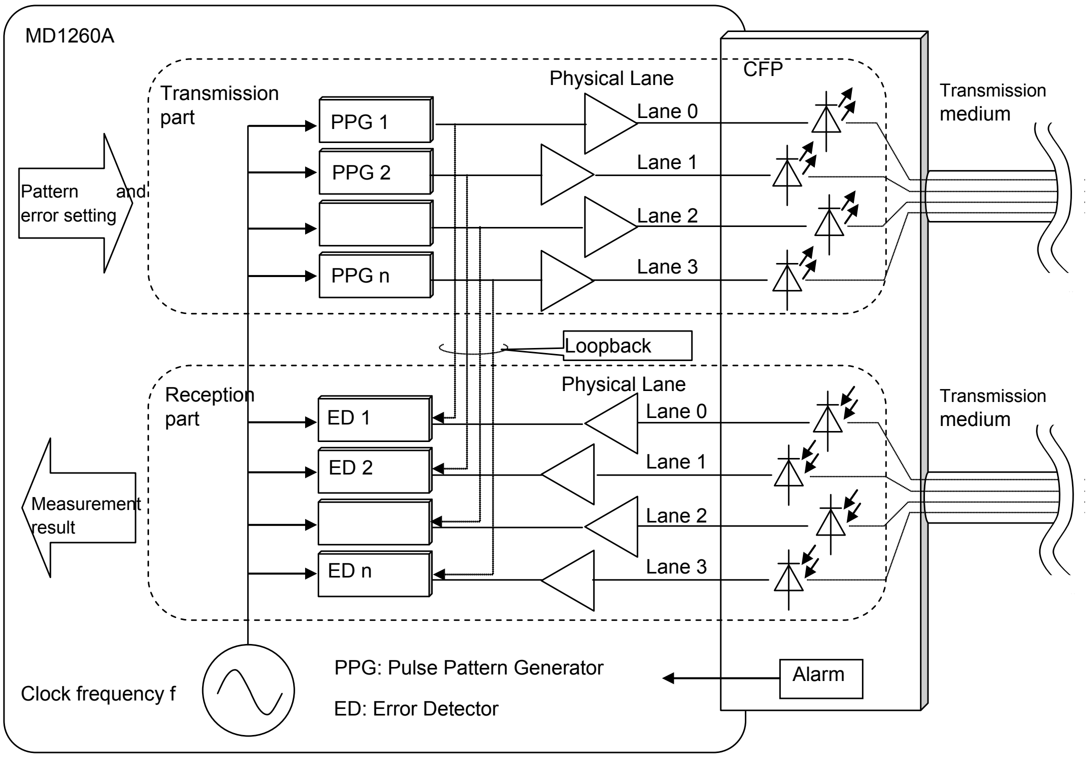


Figure 6.1-1 Signal Flow when Measuring Physical Lane

The number of lanes and the clock frequency vary with the application.

Table 6.1-1 Clock Frequency and Number of Lanes Per Application

Application	Clock frequency (GHz)	Number of Physical Lanes
40GbE No Frame	10.315	4
100GbE No Frame	10.315	10
OTU3 No Frame	10.754 603	4
OTU4 No Frame	11.180 997	10

Measurement can be performed between PCS/Logical lanes using the 100GbE No Frame and OTU4 No Frame applications.

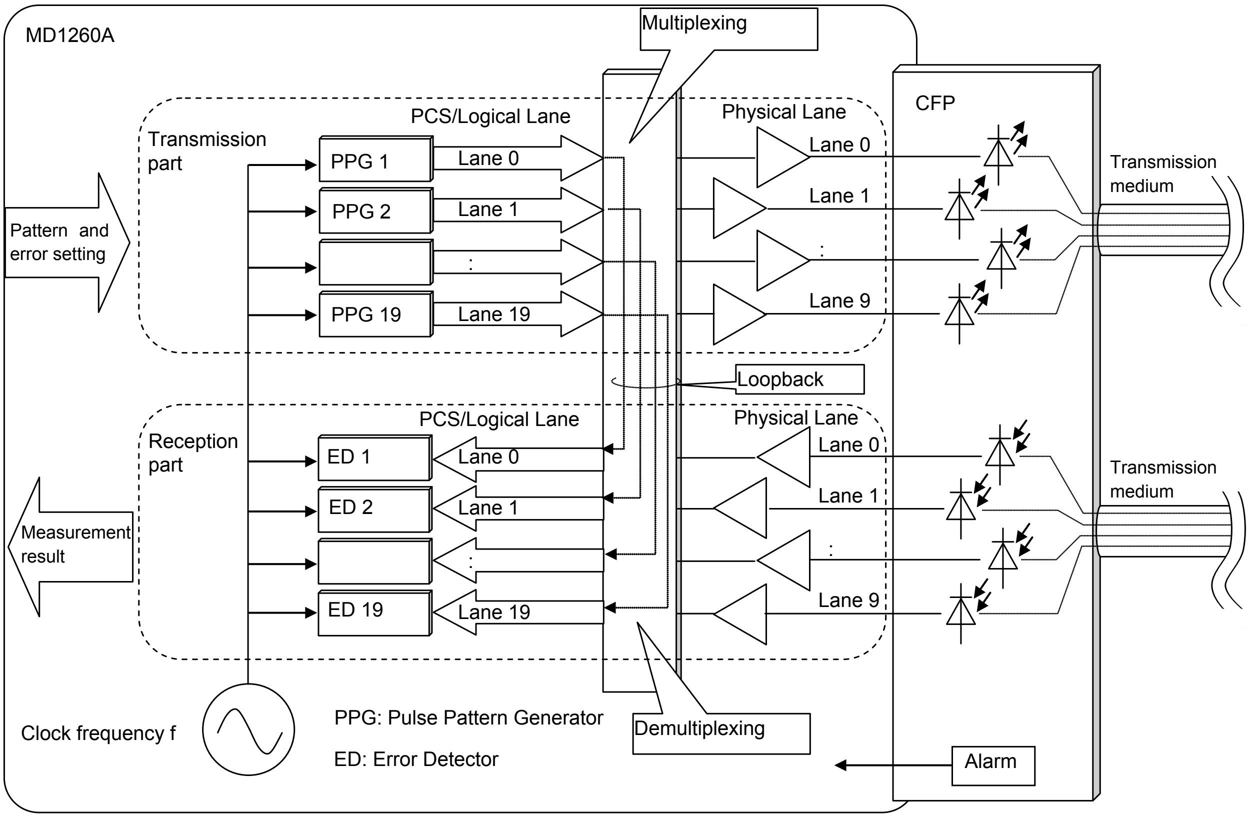


Figure 6.1-2 Flow of Signal when Measuring PCS/Logical Lane

The clock frequency varies with the application.

Table 6.1-2 Clock Frequency and Number of Lanes Per Application

Application	Clock frequency (GHz)	Number of PCS/Logical lanes
100GbE No Frame	5.1575	20
OTU4 No Frame	5.590499	20

6.2 Setting Measurement Conditions

6.2.1 Pattern

The test pattern for the bit error measurement is set as follows:
The same test pattern is set for all lanes.

1. Touch [Test Pattern] at the setting area.
2. Touch the button for Test Pattern.
3. Select the pattern.
4. For reverse logic, touch the PRBS invert button to display On.
   The Tx button sets the logic for the transmission side and the Rx button sets the logic for the receive side.
5. Touch [OK].

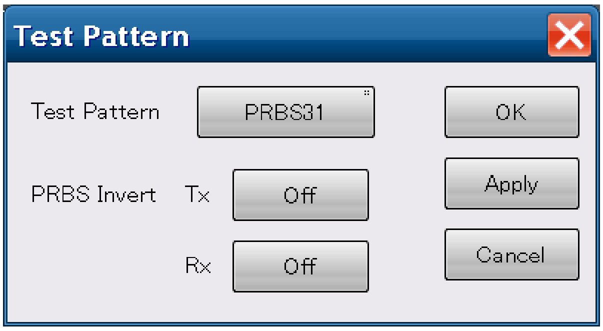


Figure 6.2.1-1 Test Pattern Screen

Table 6.2.1-1 Test Pattern Type

Pattern	Explanation
PRBS7	Pseudorandom bit string of 127 bits
PRBS9	Pseudorandom bit string of 511 bits
PRBS15	Pseudorandom bit string of 32767 bits
PRBS23	Pseudorandom bit string of 8388607 bits
PRBS31	Pseudorandom bit string of 2147483647 bits
Square Wave	Repeated pattern of 8 bits of consecutive 1s and 8 bits consecutive 0s

6.2.2 Setting lane

The lane is set for OTU4 No Frame or 100GbE No Frame as follows:

1. Touch [Port] at the setting area.
2. Touch the button for Lane Select and select the lane.
3. Touch [OK].

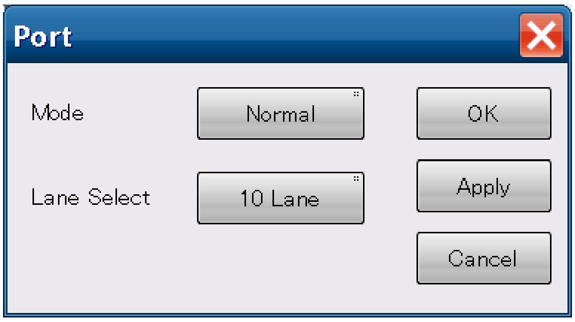


Figure 6.2.2-1 Port Screen (100GbE No Frame)

6.2.3 Error insertion

The error insertion method is set as follows:

1. Touch [Error/Alarm] at the setting area.
2. Touch the [Lane] button for inserting errors to display the error in dark gray.
3. Touch [OK].

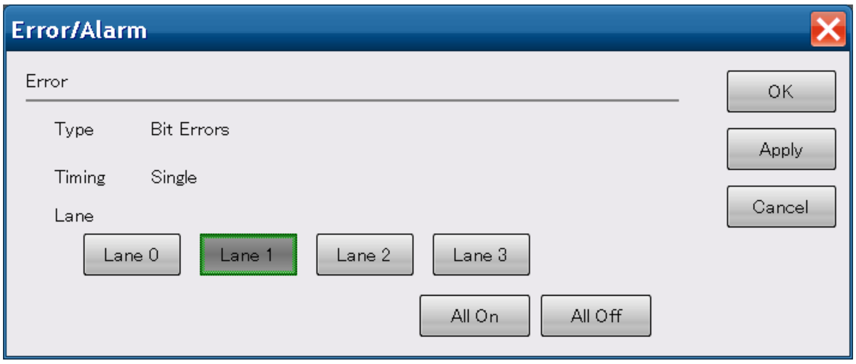


Figure 6.2.3-1 Error/Alarm Screen

6

No Frame Application

Touch the button of Error/Alarm Ins in the operation area to insert the error. One error is inserted in the lane each time the button is touched.

The lamp lights when the error is inserted.

Figure 6.2.3-2 Error/Alarm Insertion Button

6.3 Measurement Screen

The following items can be measured for the 40GbE No Frame, 100GbE No Frame, OTU3 No Frame, and OTU4 No Frame applications.

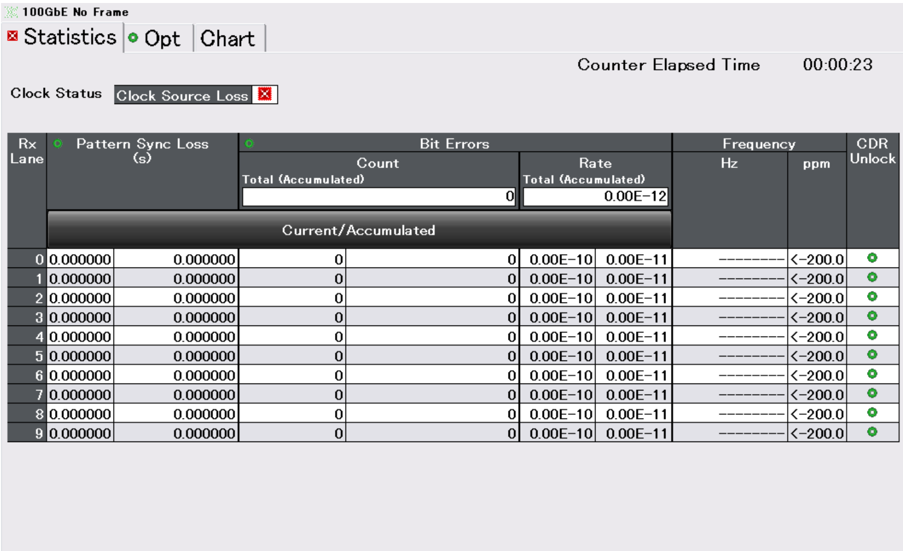
- Clock synchronous status
- Number of synchronous errors of pattern per Physical/PCS/Logical lane
- Number of bit error occurrences per Physical/PCS/Logical lane
- Clock frequency per Physical lane
- CDR status per Physical lane
- Clock frequency in entire PCS/Logical lane and CDR status

The following items can be measured for the 40GbE No Frame and 100GbE No Frame applications.

- CFP status and received optical power per lane

6.3.1 Displaying measurement results

Touching the [Statistics] tab displays the measurement results, such as the number of bit error and frequency per lane.



Rx Lane	Pattern Sync Loss (s)		Bit Errors Count		Bit Errors Rate		Frequency Hz	Frequency ppm	CDR Unlock
0	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
1	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
2	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
3	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
4	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
5	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
6	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
7	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
8	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	
9	0.000000	0.000000	0	0	0.00E-10	0.00E-11	--------	<-200.0	

Figure 6.3.1-1 Statistics Tab (100GbE No Frame)

6

No Frame Application

Table 6.3.1-1 Display Item of Statistics Tab

Item	Explanation
Clock Source Loss	Sets clock frequency drift at clock source selected at Section 3.3.3 Clock Green: ±200 ppm or less Red :±201 ppm or more
Pattern Sync Loss (s)	Time for received pattern synchronization loss (seconds)
Bit Errors	Count: Number of bit errors in received test pattern Rate: Ratio of number of bit errors to number of total bits in received test pattern The following values are displayed in Total (Accumulated). Count: Bit error count for all lanes Rate: Ratio of total bit error count for all lanes to total bit count for test patterns received at all lanes
Frequency (Hz) *1	Hz: Receiving clock frequency (Hz) Ppm: Receiving clock frequency (Hz) and difference from the reference clock frequency (ppm) When clock is not received normally, the value is not displayed (at CDR Unlock). Also, when receiving the clock out of the Rx range, "out of range" is displayed.
CDR Unlock *1	Green: Clock received correctly (lock status) Red: Clock not received correctly (unlock status)

*1: Frequency is measured even when the Counter lamp of the operation area is off.

When generating Clock Source Loss

The transmission will become abnormal later when a Clock Source Loss is generated at least once.

Perform the following procedures when Clock Source Loss is red.

1. Confirm that the clock is input to the 10MHz Clock Input at the rear panel and Tx Reference Clock Input at the front panel correctly.
2. Touch [Clock] at the operation area.
3. Touch the clock source button.
4. Touch [Internal].
5. Touch [OK].
6. Touch [Clock] at the operation area.
7. Touch the clock source button.
8. Touch the button for the connector where the clock is input.
9. Touch [OK].

6.3.2 CFP Status display

Touching the [Opt] tab displays the CFP status for the 40GbE No Frame and 100GbE No Frame applications.

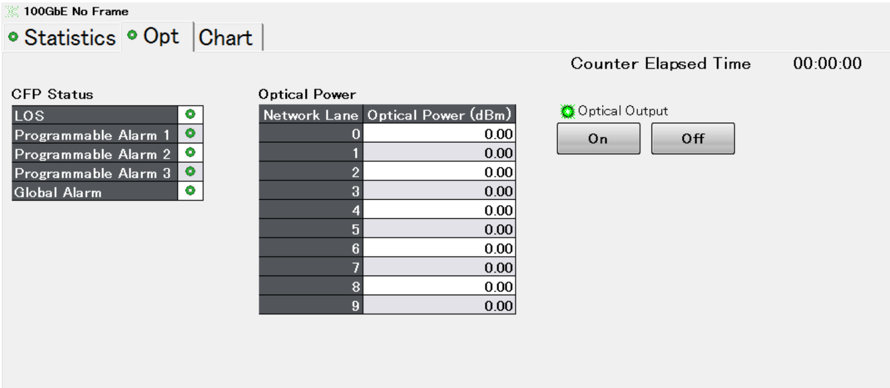


Figure 6.3.2-1 CFP Tab (100GbE No Frame)

For more information about the Opt tab, refer to Section 4.3.5 Displaying CFP status.

6.3.3 Displaying graph

Changes in measurement results with elapsed time can be displayed as a graph.

Touch [Chart] tab, and touch another [Chart] tab on top left displays the graph screen.

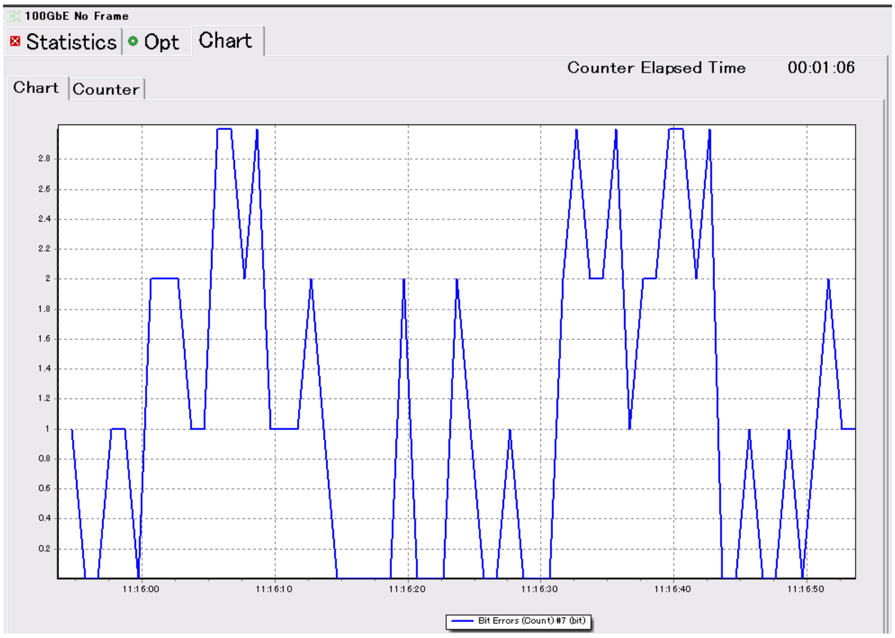


Figure 6.3.3-1 Chart Tab (Chart)

The displayed items are set as follows:

1. Touch [Counter] in the setting area.
2. Touch the Chart Item button. The screen to select the measurement items is displayed.
3. Touch the button for the measurement items displayed in the graph. The graph is deleted by selecting [None].
4. Touch the button for the lane number and set the lane number.
5. Touch [OK] to display the graph at the Chart tab.
6. Touching [Counter] on top left displays enlarged measurement results.

   The item selected for Chart Line 1 is displayed on the top, and the item selected for Chart Line 2 on the bottom. The results in red letters show an error.
7. The display type can be switched by selecting [Current] or [Accumulated] on the screen.

   Current: Count value in the last 1 second.

Accumulated: Count value accumulated in the time shown in [Counter Elapsed Time].

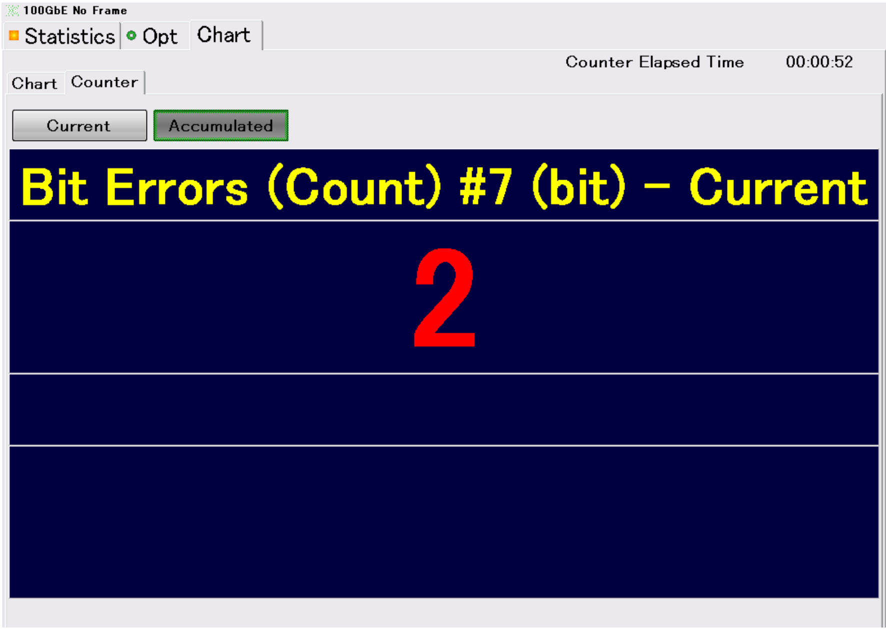


Figure 6.3.3-2 Chart Tab (Counter)

6.3.4 Starting/stopping measurements

To start the measurement, touch the button of the Counter in the operation area. The lamp is lit during measurement. The elapsed time is displayed at the Counter Elapsed Time for each tab.

Figure 6.3.4-1 Counter Button

To stop the measurement, touch the touch the button of the Counter.

6.4 Measurement Procedure

No Frame BER measurement can be performed for each of the following lanes.

- 100GbE CAUI Physical lane (10 lanes)
- 100GbE PCS lane (20 lanes)
- 40GbE PCS lane (4 lanes)
- OTU4 physical lane (10 lanes)
- OTU4 logical lane (20 lanes)
- OTU3 physical lane (4 lanes)

Measure as follows:

1. Connect the MD1260A and the DUT.
2. Start the application.
3. Set Mode to [Normal] at the [Port] screen.
4. Confirm that Error/Alarm of the summary status area is not lit. Confirm that Link lights to green for 40GbE/100GbE.
5. For 100GbE and OTU4, select [10 Lane] or [20 Lane] at the [Lane Select] setting at the [Port] screen.
6. Select the pattern for bit error measurement at the Test Pattern setting.
7. Touch the Counter button in the operation area and start the No Frame BER measurement.
8. Touch the [Statistics] tab. The following measurement results are displayed.

   Each lane: Pattern Sync Loss, Bit Errors (bit), Bit Error Rate
   Total value of all lanes: Bit Errors (bit), Bit Error Rate

   To reset the measurement (counter), touch the Counter button.

At this time, the frequency of the transmission data can be adjusted by inserting bit errors in the test pattern and setting the Clock at Error/Alarm setting.

Moreover, skew can be confirmed using a sampling oscilloscope, etc., when selecting Skew Check at the test pattern at Physical lane measurement.

Note:

The correspondence of the sending/receiving lane (Lane 0 and Lane 1, etc.) might differ depending on the skew of the measurement system.

Chapter 7 Multiport Function

This chapter explains the method for controlling multiple MD1260A units.

7.1 What is Multiport Function?

The MD1260A measurement terminal (optical connector of CFP) is called a port. The Multiport function connects multiple MD1260A units via Ethernet with one master MD1260A controlling the other multiple slave units to measure multiple ports.

The multiport function supports the following functions.

- Aggregate Operation Screen

  By using the multiport function, one MD1260A screen can be used to control other MD1260A units.

  The controlled units are called slaves and the controlling unit is called the master. While in this setup, operations cannot be performed from the screens of the slave units.

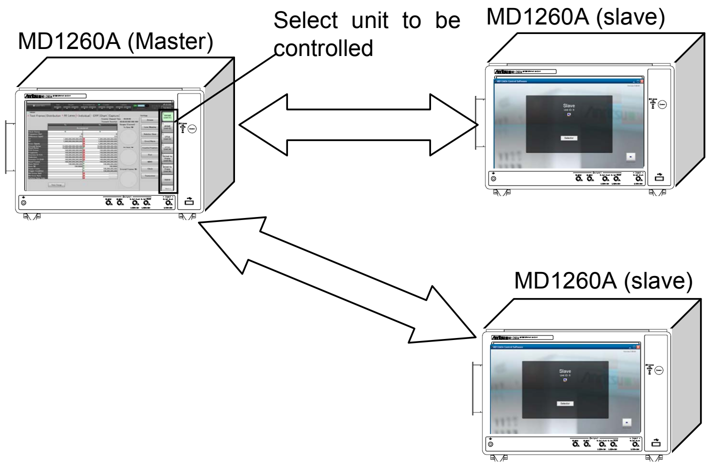


Figure 7.1-1 Example of Multiport Function Control

All slave MD1260A units are controlled via the master when remotely connected by the multiport function.

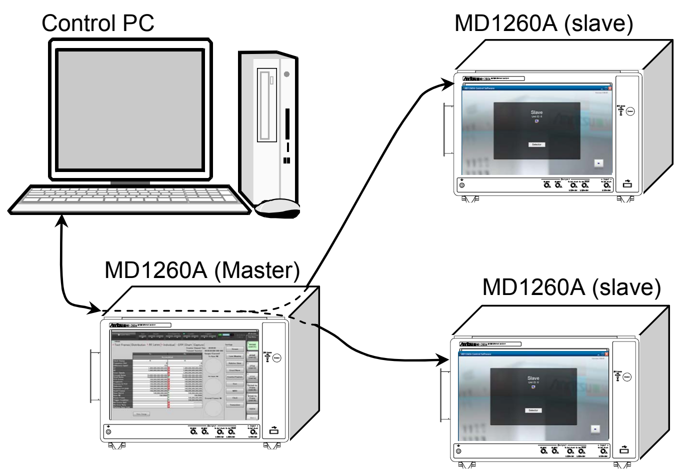


Figure 7.1-2 Remote Control of MD1260A Units by Multiport Function

- Latency Measurement
  Information on the transmission time is written in the test frame sent by the MD1260A. The MD1260A receiving the test frame calculates the latency from the test frame send and receive times. The MD1260A times are synchronized by connecting the Unit Sync Output of one unit to the Unit Sync Input of the next as shown below. When time is synchronized, the latency of a frame received from another MD1260A can be measured.

4.3.1 Test Frame

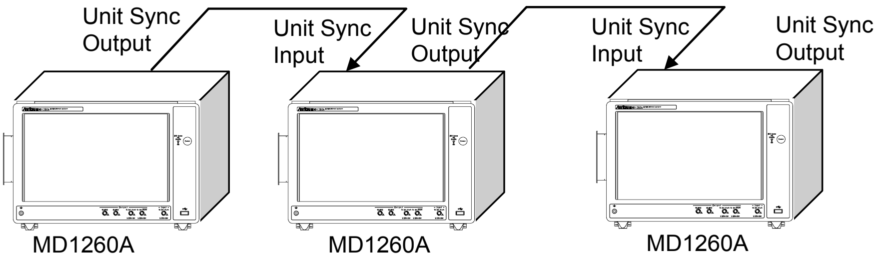


Figure 7.1-3 MD1260A Time Synchronize Method

Note:

The latency measurement accuracy is assured for up to 3 in total connected MD1260A units.

- Synchronous Stream Transmission
  When the MD1260A units are time-synchronized, touching the Stream button in the measurement area starts sending time-synchronized streams. Touching the Stream button stops all stream sending by all MD12870A units.

4.2.7 Sending stream

7.2 Setting and Starting Multi Port

7.2.1 Connection procedures

To use the multiport function, connect the MD1260A units as follows and start the application.

1. Set the Unit ID of each MD1260A.

☞ 7.2.2 Setting Unit ID

2. Connect the MD1260A units using a LAN cable and a coaxial cable.

☞ 7.2.3 Connecting cables

3. Turn on the power of each MD1260A.
4. Decide which MD1260A will be the master unit.
5. Set the other (not master) MD1260A units to the slave mode.

☞ 7.2.4 Setting slave mode

6. Set the application to start in the slave mode from the master MD1260A

☞ 7.2.5 Selecting and starting application

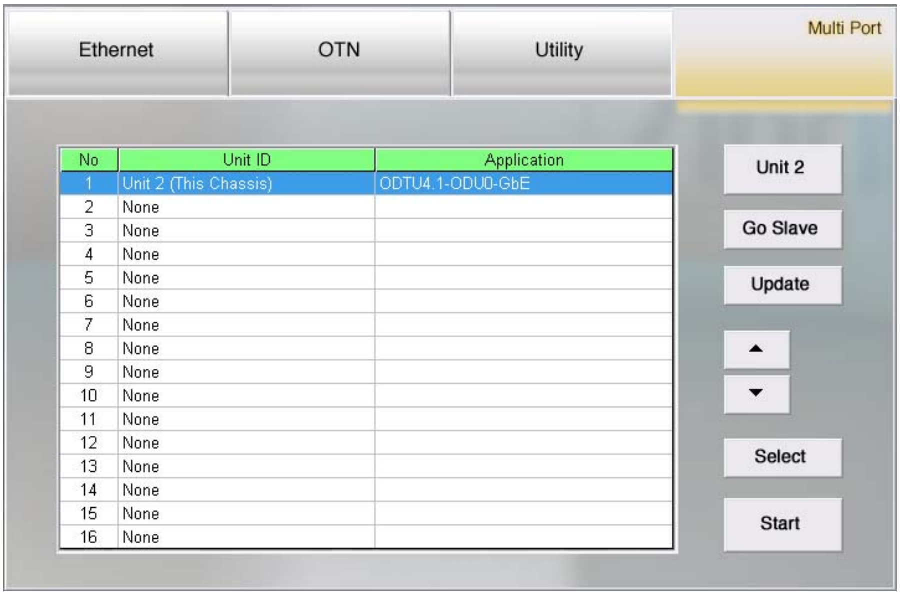
7. Start the application using the Start button at the Multiport screen of the master MD1260A.

7.2.2 Setting Unit ID

The number used by the master to identify slave MD1260A units is called the Unit ID.

The Unit IDs are assigned successively in the range of 1 to 16. If two Unit IDs are the same, the IP addresses between MD1260A units will overlap and communications between MD1260A units will fail. In this case, a Windows error message may be displayed.

1. Touch [Multi Port] at the Selector screen.
   The MD1260A Unit IDs of the MD1260As are at the top right button.



2. Touching the button displaying the Unit ID at the top right side, opens the screen to set the Unit ID. Touch the button to set the number.
   - When a slave is connected over Ethernet, the unit ID used by the slave is not displayed at the setting screen.
   - It takes about 45 seconds to change the Unit ID.

3. The selected Unit ID is displayed at the top right button.

7.2.3 Connecting cables

After setting the Unit ID, connect the MD1260A units as follows:

When connecting two MD1260A units

1. Connect the [Control] connector on the left side of the MD1260A to the [Control] connector on the left side of the other MD1260A using an Ethernet LAN cable.
2. Connect the [Unit Sync Input] connector on the rear panel of the slave MD1260A to the [Unit Sync Output] connector on the rear panel of the master MD1260A using a coaxial cable.
3. After starting the master of the application, set Clock Source to [Sync Input] at the [Clock] screen of the MD1260A with a coaxial cable to the [Unit Sync Input] connector.

☞ 3.3.3 Clock

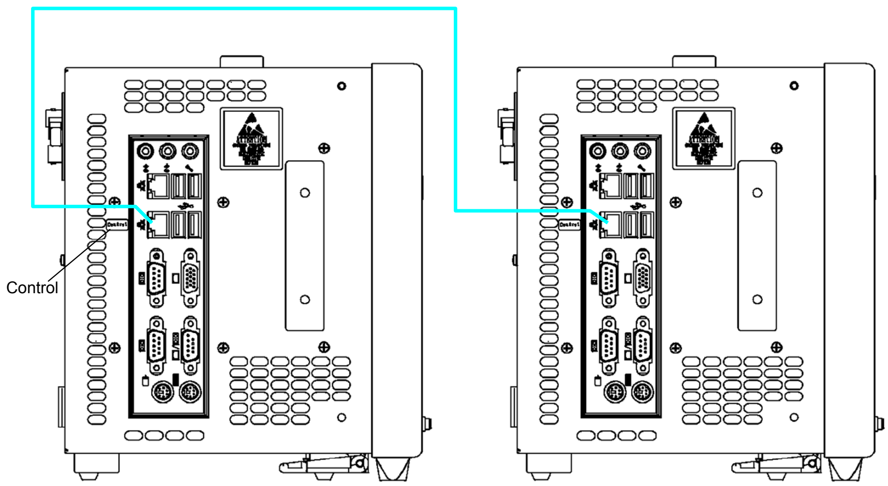


Figure 7.2.3-1 Ethernet Cable Connection

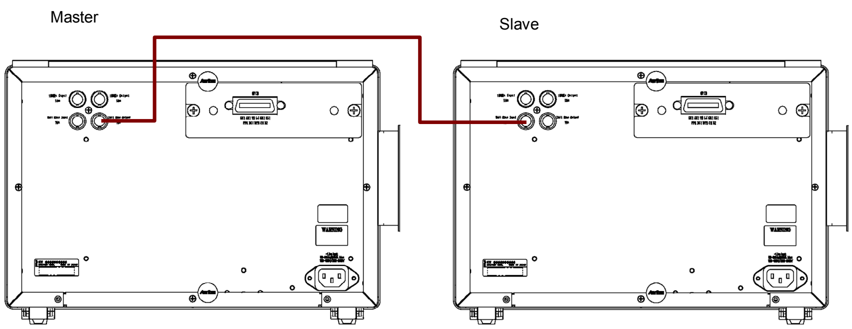


Figure 7.2.3-2 Coaxial Cable Connection

When connecting 3 MD1260A units

When connecting 3 MD1260A units, use a LAN switching hub.

Note:

When measuring Latency using the 40/100GbE application, connect the Unit Sync Clock to 2 or less slaves. Latency measurement is not assured if 4 units are connected.

1. Connect the [Control] connector on the left side of the master MD1260A to the Ethernet hub.
2. Connect the [Control] connectors on the left sides of the slave MD1260A units to the Ethernet hub.
3. Connect the [Unit Sync Output] connector on the rear panel of the master MD1260A to the [Unit Sync Input] connector of the slave MD1260A using coaxial cable.
4. Using coaxial cables, daisy chain the [Unit Sync Output] on the slave connected in step 3 to the [Unit Sync Input] connector on the next slave as shown below.
5. After starting the master of the application, set Clock Source to [Sync Input] at the [Clock] screen of the MD1260A with a coaxial cable to the [Unit Sync Input] connector.

☞ 3.3.3 Clock

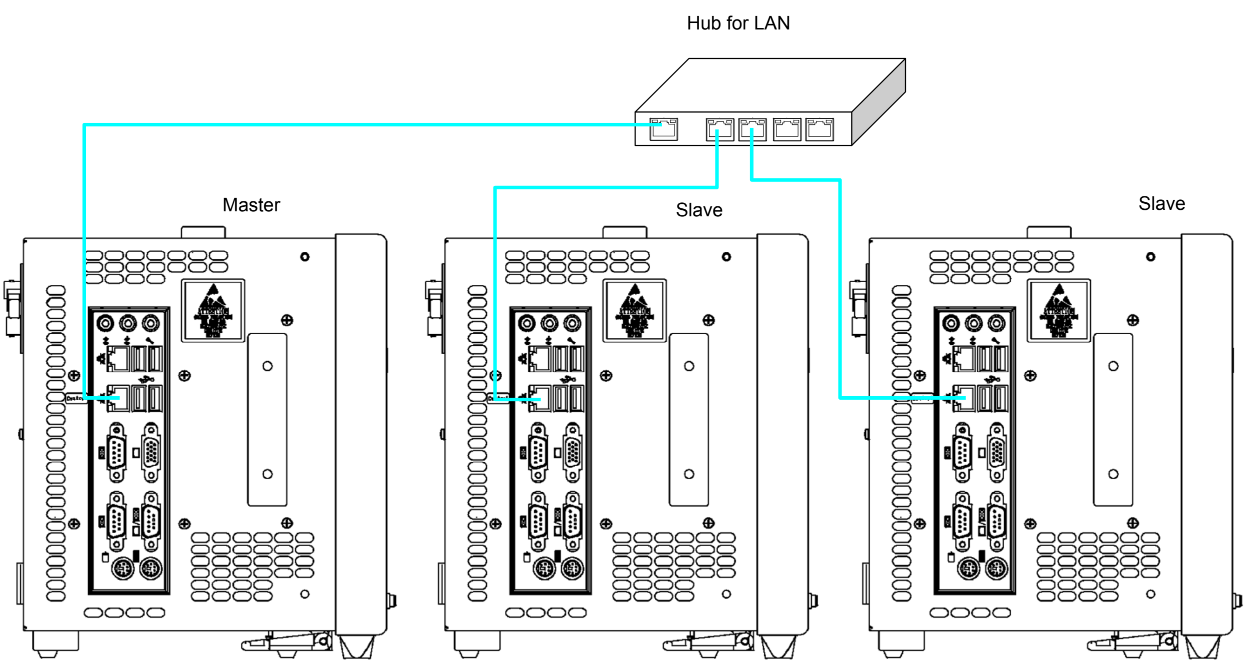


Figure 7.2.3-3 Ethernet Cable Connection (3 MD1260A Units)

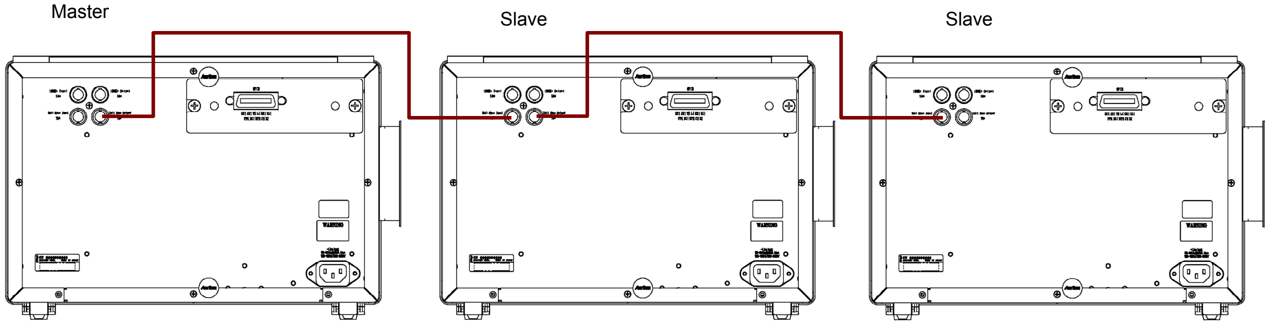


Figure 7.2.3-4 Coaxial Cable Connection between Multiple MD1260A Units

7.2.4 Slave mode setting

When a MD1260A unit is set to the slave mode, it can only be controlled from the master and cannot be operated locally.

1. Touch [Multi Port] at the Selector screen.
2. Touch [Go Slave] to display the slave screen.

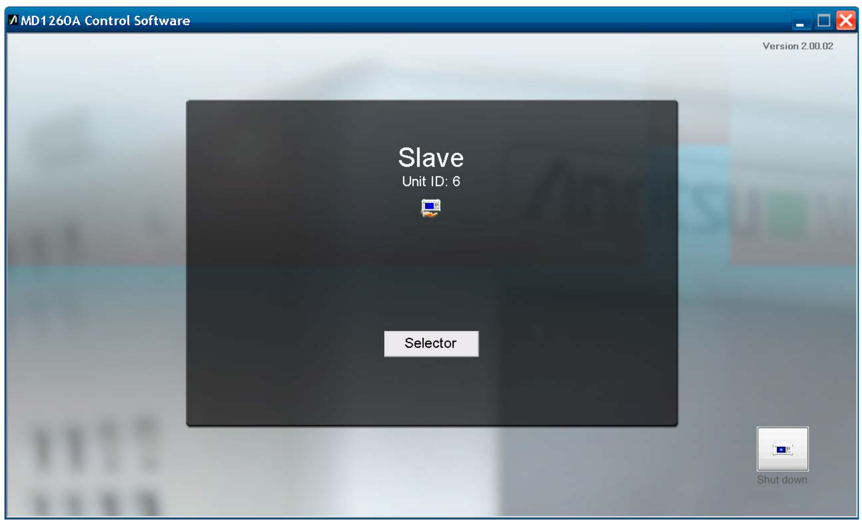


Figure 7.2.4-1 Slave Screen

The slave Unit ID is displayed on the screen.
[Selector]: Releases slave mode and displays Selector screen
[Shut down]: Switches off power in slave mode

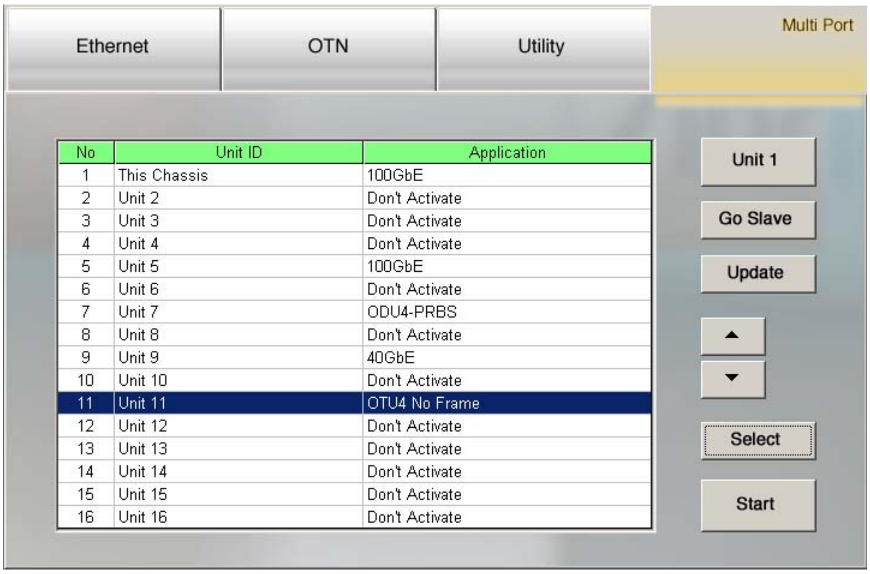
☞ 7.2.6 Power-off

7.2.5 Selecting and starting application

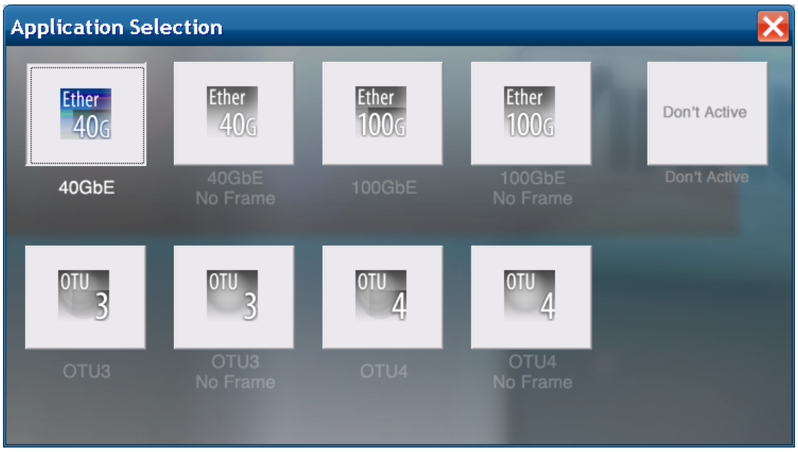
Set the MD1260A starting application.

For the master, slave connections are confirmed as follows:

1. Touch [Multi Port] at the Selector screen.
2. Touch [Update].
   Information is listed on the slave connected by Ethernet. When adding or deleting a slave, use and update the list display in the same manner.
3. Touch [Multi Port] at the Selector screen.



4. Using [▲] or [▼], move the cursor to the number of the MD1260A where the application will be set.
   [This Chassis] under the Unit ID column indicates the master MD1260A. The master Unit ID is displayed at the right button.
5. Touching [Select] opens the screen to select the application.
   Touch the name of the application to start.



The displayed applications depend on the options installed in the selected MD1260A.

Touching [Don't Active] stops the master controlling the slave.

6. Touching [Start] starts the application set at the MD1260A. The more MD1260As are connected, the longer it takes to start.

Note:

The slave cannot be controlled when the application is started from the Ethernet or OTN tab at the Selector screen.

7.2.6 Power-off

Refer to Section 2.4.4 Power-off for how to cut the master power.

There are two ways to cut the slave power.

When displaying Slave screen at next power-on

Touch [Shut down] on the slave screen.

When displaying Selector screen at next power-on

1. Touch [Shut down] on the slave screen.
2. Touch [Shut down] on the Selector screen.

7.3 Multiport Function Screen Operations

When the multiport function is started, the screen operation changes to that shown in Section 3.2 Application Screen. This section explains the basic screen operation for the multiport function.

7.3.1 Top menu

The Unit ID and MD1260A application is displayed at the Top Menu of the master application.
The Top Menu buttons control the selected MD1260A.
A [More] button is displayed when more than 6 slaves are connected. Touching the [More] button switches the Unit IDs displayed on the Top Menu.

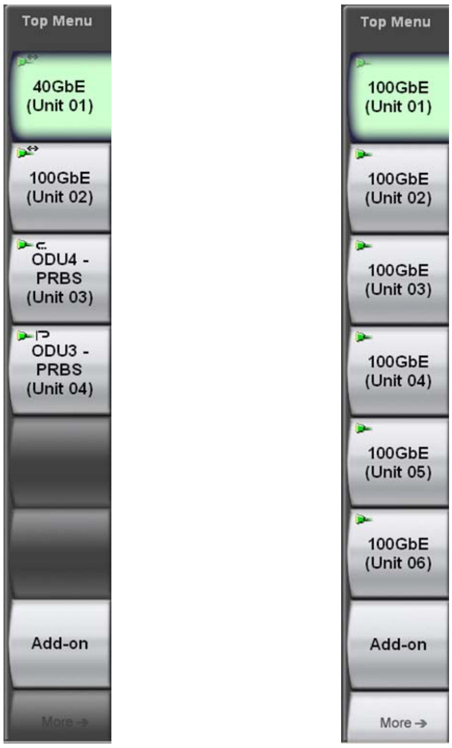


Figure 7.3.1-1 Top Menu Displays

7.3.2 System menu

When executing the multiport function, the system menu is displayed as shown below.

[Save]

Saves following setting information

- Setting conditions for all MD1260A units
- Setting conditions for specified MD1260A

Saves following measurement results

- Measurement results for all MD1260A units
- Measurement results for specified MD1260A

[Open]

Reads setting conditions for each MD1260A unit

[Initialize]

Initializes master and all slave settings

[Log Settings]

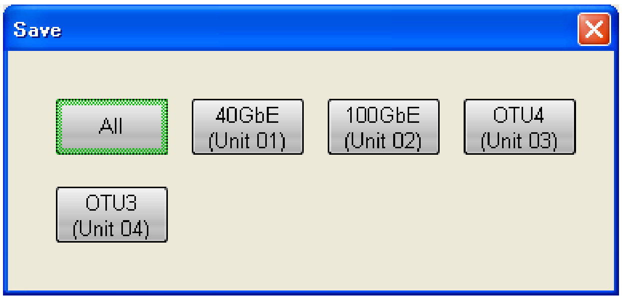
Sets item of MD1260A saved log file selected by top menu

[Log On]

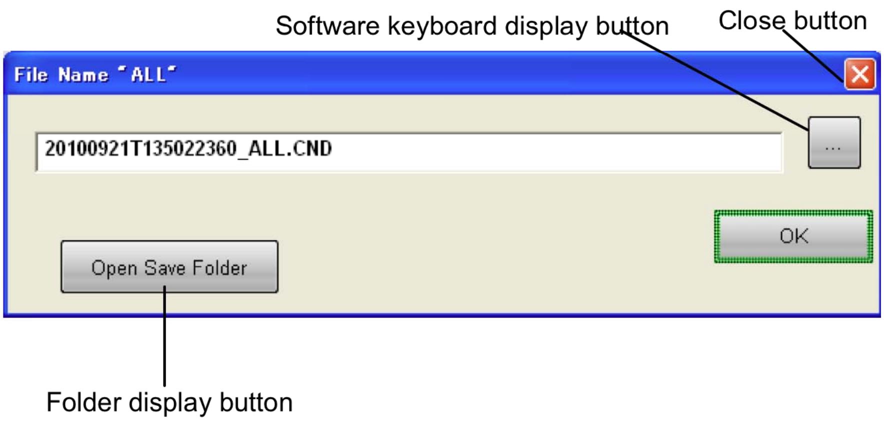
Starts/stops saving of log file simultaneously for master and all slaves

Saving multiport measurement conditions and results to file

1. Touch [Save] to display the Save window.
   The displayed buttons vary with the number of slaves and selected application.



2. Touch [All] to save all MD1260A data.
   When saving individual MD1260A data, touch the button with the displayed Unit ID.
3. Select the data type from the following:
   [Setting]: Measurement conditions
   [Result]: Measurement results
4. The file name is displayed.

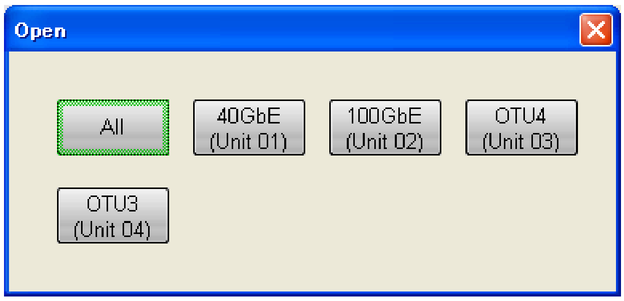


5. To change the file name, touch the keyboard display button.
   Input the file name using the software keyboard.
   Touch [OK] at the software keyboard.
6. To confirm the save destination folder, touch [Open Save Folder].
   The folder display opens. To close the screen, touch the close button.
7. To save the file, touch [OK]. To cancel saving, touch the close button.

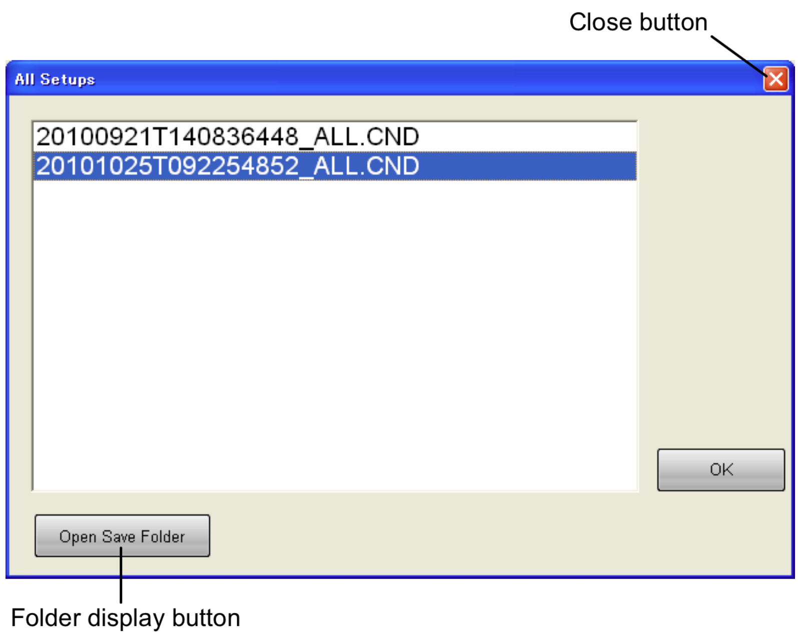
The measurement condition file is saved to the following folder in the path:
C:\Documents and Settings\Administrator\My Documents \Anritsu\MD1260A\UserData\Setting
The measurement result file is saved to the following folder in the path.
C:\Documents and Settings\Administrator\My Documents \Anritsu\MD1260A\UserData\Result

Reading multiport measurement conditions from file.

1. Touch [Open] to display the Open window.
   The displayed buttons vary with the number of slaves and selected application.



2. To read the setting conditions for all MD1260A units, touch [All]. To read the setting conditions after specifying the Unit ID, touch the button for the Unit ID.
3. The window for selecting the file is displayed.



4. Touch the name of the file to read.
   To confirm the save destination folder, touch [Open Save Folder].
   The folder display opens. To close the screen, touch the close button.
5. Touch [OK] to execute reading. To cancel reading, touch the close button.

Note:

When selecting [All] at step 2, an error message is displayed if the conditions of the multiport file to be read and the currently selected multiport are different.
In this case, the measurement condition is not read from the file.
Different multiport conditions are:

- Different number of slave units
- Different master or slave Unit ID
- Different application for same Unit ID

7.3.3 Operation area

The Sync button is enabled when the multiport function is executed. The buttons in the operation area change as the Sync button is set On/Off.

Table 7.3.3-1 Operation Area

Table 7.3.3-1 Operation Area Buttons

Name	Sync on	Sync off
Stream	All MD12160A units with 40/100GbE application running start/stop sending stream	MD1260A selected at Top Menu starts/stops sending stream
Error/Alarm Ins	All MD1260A units start/stop error/alarm insertion	MD1260A selected at Top Menu starts/stops inserting error/alarm
Counter	All MD1260A units start/stop counter	MD1260A selected at Top Menu starts/stops counter
Capture	All MD12160A units with 40/100GbE application running start/stop sending capture	MD1260A selected at Top Menu starts/stops capture

At Sync On, the lamp in the operation area lights when a button operation is executed for one or more MD1260A units.
At Sync Off, the operation of the selected MD1260A is displayed.

Table 7.3.3-2 Lamp Display of Operation Area (Sync on)

Name	Lit	Off
Stream	One or more MD1260A units sending stream	All MD1260A units stopped sending stream
Error/Alarm Ins	One or more MD1260A units inserting error/alarm	All MD1260A units stopped inserting error/alarm
Counter	One or more MD1260A units operating counter	All MD1260A units stopped counter
Capture	One or more MD1260A units starting capture	All MD1260A units stopped capture

7.3.4 Summary status/time display area

The summary status lamps light when one or more MD1260A meets the required condition.

Table 7.3.4-1 Summary Status Display

Name	Explanation
Link	Off: One or more MD1260A units generated Link Down On: MD1260A performs Link Up No Frame, OTU3 and OTU4 application for the MD1260A are always treated as Link Up.
Loopback	Off: All MD1260A units set to Normal On: One or more MD1260A units set to loopback
Log	Off: Log stopped On: Logging
Error/Alarm	Off: No MD1260A with Error/Alarm Red: One or more MD1260A units with Error/Alarm Red light (abnormal status) held for 1 second or more Orange: Currently no MD1260A with Error/Alarm but Error/Alarm generated previously by one or more MD1260A units The orange lamp (history status) goes of when the Counter ▶ button is touched.

7.3.5 Setting area

The application setting buttons for the MD1260A selected by Top Menu are displayed in the setting area.

7.3.6 Measurement result display area

The measurement results for MD1260A selected by Top Menu are displayed in the measurement result display area.

Chapter 8 Maintenance

This chapter describes maintenance, storage and disposal procedures.

8.1 Daily Maintenance

Before daily maintenance of the MD1260A, always turn the power off and unplug from the AC outlet.

Panel surface dirt

If surface dirt is noticeable after the MD1260A has been used in a dusty environment, or when the MD1260A has not been used for an extended period of time, wipe the surface with a damp cloth slightly moistened with detergent and wrung out.

Screen surface dirt

NEVER use organic solvent, such as benzene and thinners for cleaning; otherwise the screen surface may be damaged. Wipe lightly with a dry, soft cloth or a soft cloth slightly moistened with ethanol.

Loose screws

Check for any loose screws and tighten any found using a Phillips screwdriver.

Plugged air vents

This instrument has air vents on the bottom and side panels. Use a vacuum cleaner, etc., to ensure they do not become plugged with dust and dirt, etc.

8.2 Displaying Software Version

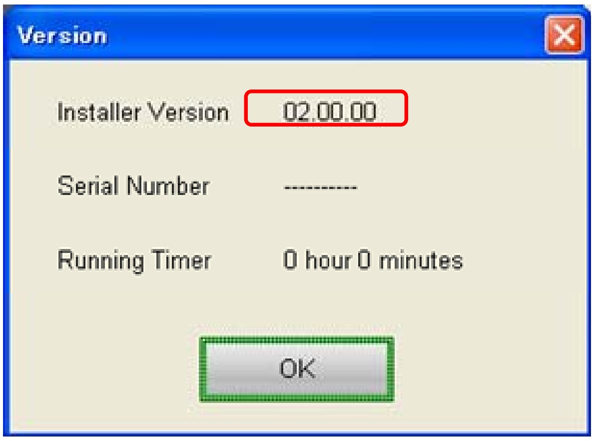
Confirm the software version using the following procedures.

Confirming at Selector Screen

Check the version number displayed in the title at the top right of the Selector screen.

Confirming at Application Screen

Touch [Version] at the System Menu to display the version screen.



8

Maintenance

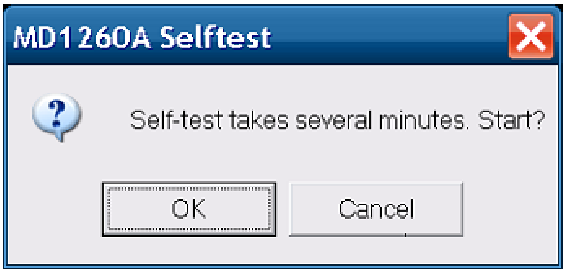
8.3 Self Test

The self test is a diagnostic tool for finding equipment faults.
Run the tool as described below.

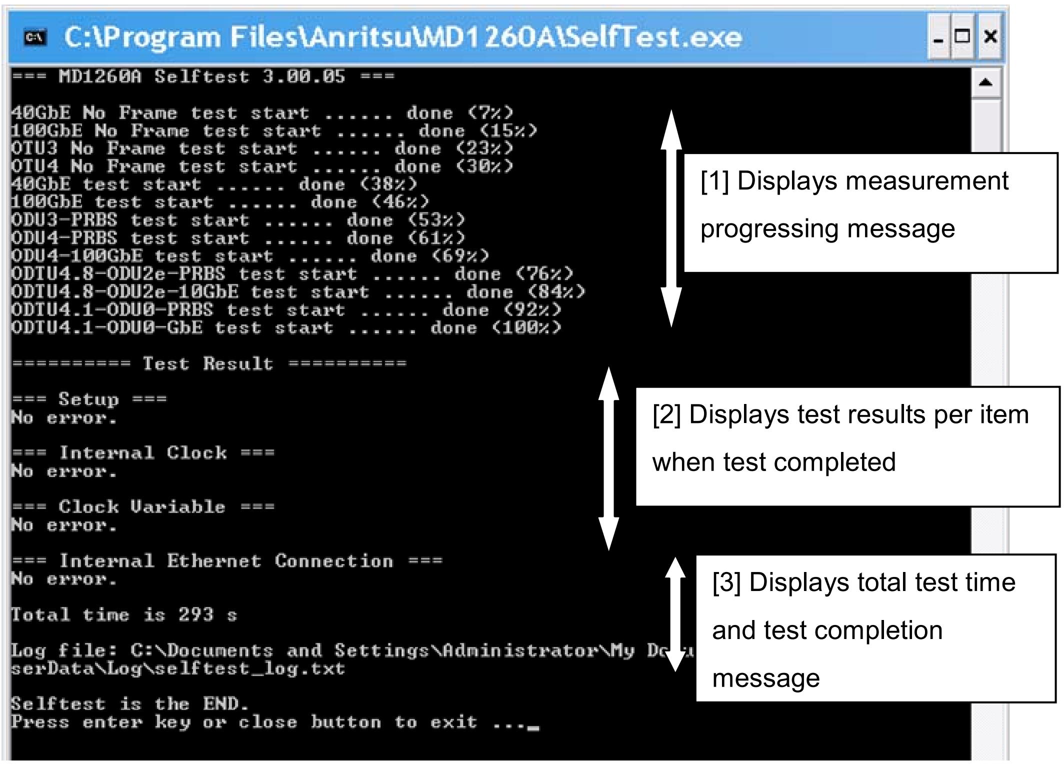
Note:

The signal at the I/O terminal is not confirmed by the self test. Check the I/O terminal by referring to Section 8.4 Confirming I/O Signal.

1. Touch [Self test] at the Selector screen to display the following execution confirmation dialog.



2. Touch [OK] to start the self test. Touch [Cancel] to stop the self test. The self test takes several minutes to run.
3. The following screen is displayed while self-test is executing.



4. Check the displayed results.

The instrument status is normal when ‘No Error’ is displayed at each Test Result item.

If ”ERROR” is displayed as shown below in Setup of Test Result, the instrument setup cannot be completed.

```
========== Test Result ==========

=== Setup ===
ERROR: NoFrame FPGA version 01.00.18 is not match (01.00.17)
```

When updating the software, always refer to the software documentation before running the update and then perform the self test again.

The self test may have detected a hardware fault if:

- ‘ERROR’ is displayed at Setup irrespective of whether or not the software has been upgraded, or
- ‘ERROR’ is displayed at items other than [Setup].

5. Finish the self test after confirming the results by either touching the close icon at the top right of the screen or pressing the Enter key if a keyboard is connected.

8.4 Confirming I/O Signal

Confirm the following items after warming up the MD1260A for 15 to 30 minutes.

- Level and frequency of 10 MHz Output terminal
- Level and frequency of Tx Ref Clock Output terminal
- Operation of 10 MHz Input terminal
- Operation of Tx Ref Clock Input Terminal
- Frequency of Unit Sync Output terminal
  (Option 001 100GbE, Option 003 40GbE)

Note:

When connecting the I/O signal to the MD1260A, observe the precautions described in Section 2.5.1 Precautions when connecting input/output signal.

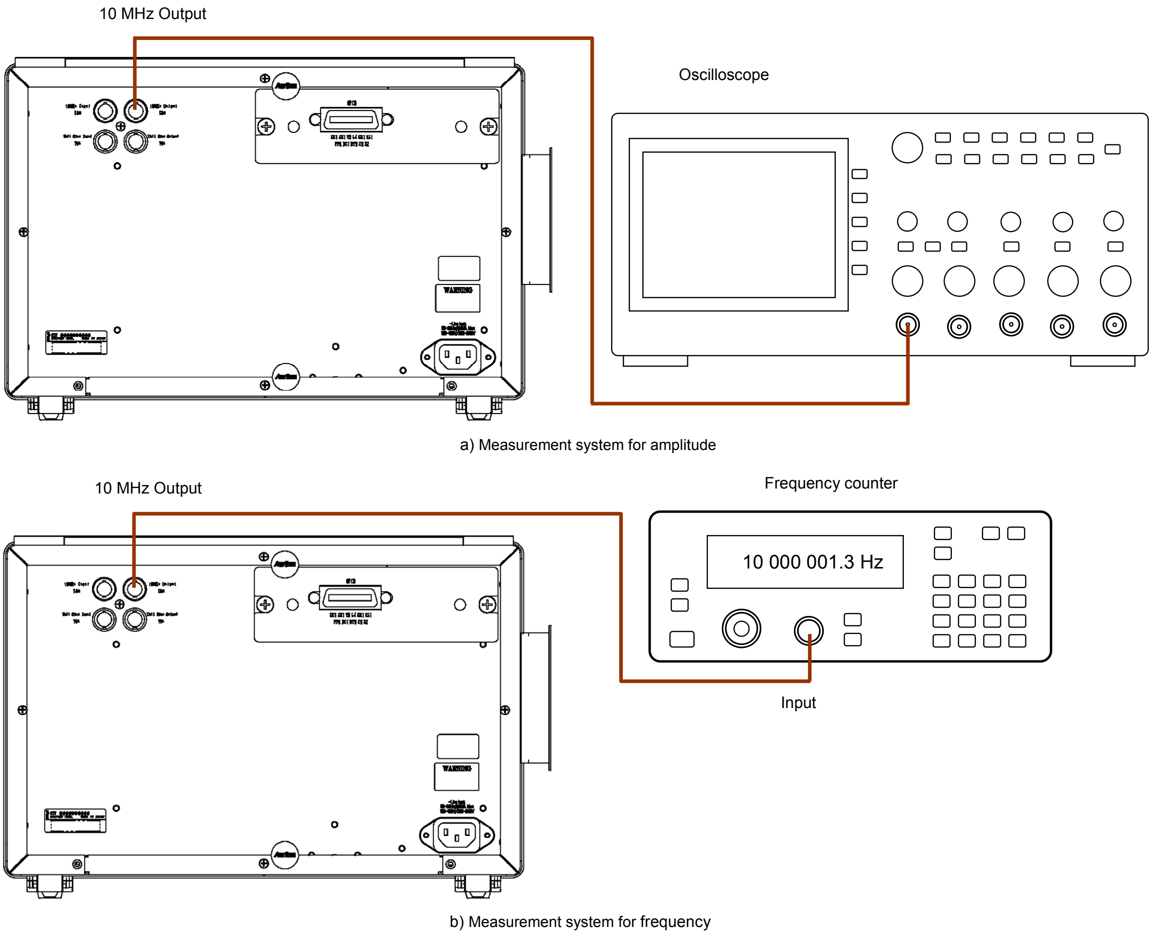


Figure 8.4-1 Measurement System for 10 MHz Output Terminal

Confirmation of terminal 10 MHz Output

1. Connect the 10MHz Output terminal at the rear panel of the MD1260A and the oscilloscope (Figure 8.4-1 a). Set the impedance of the oscilloscope to 50 Ω.
2. Touch [Port] on the application screen.
3. Touch [Mode] and [Loop Back].
4. Touch [Clock].
5. Touch [Clock Source] and [Internal].
6. Touch [Clock].
7. Touch [10 MHz Clock Output] and [Internal 10 MHz].
8. Measure the amplitude using the oscilloscope.
   Confirm that the amplitude is 0.63 Vp-p (0 dBm) or more.
9. Connect the 10 MHz Output terminal and the frequency counter at the rear panel of the MD1260A (Figure 8.4-1 b).
10. Measure the frequency.
    Confirm that the frequency is 10 MHz ±5 ppm (9999950 to 10000050 Hz).
11. Touch [Clock].
12. Touch [10 MHz Clock Output] and [Locked 10 MHz].
13. Measure the frequency.
    Confirm that the measured value is the same as the value measured in step 10.

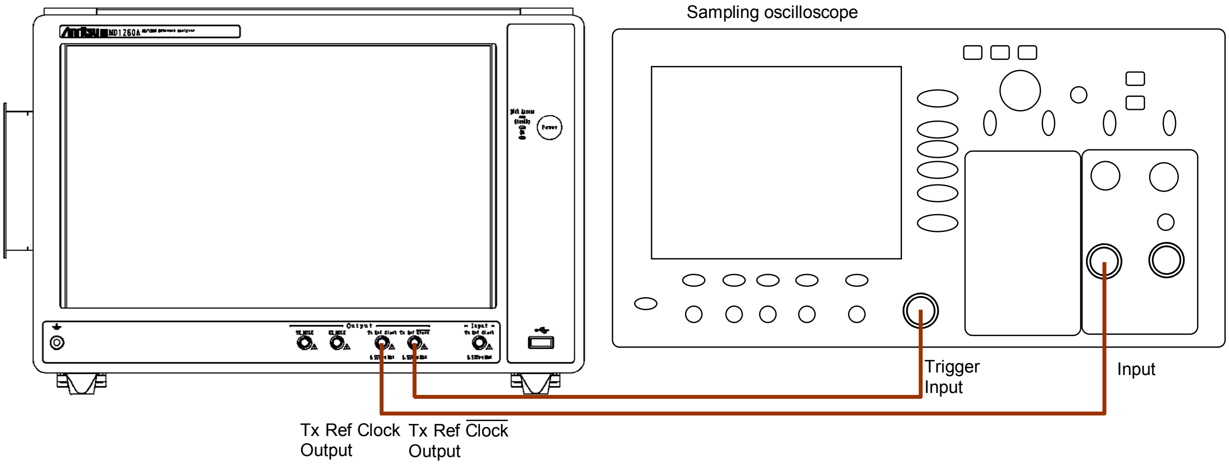


Figure 8.4-2 Measurement System for Tx Ref Clock Output terminal

Confirmation of Tx Ref Clock Output terminal confirmation

1. Connect the 10 MHz Output terminal at the rear panel of the MD1260A and and the sampling oscilloscope input (Figure 8.4-2 a).
2. Connect the Tx Ref $\overline{\text{Clock}}$ Output at the front panel of the MD1260A and and the sampling oscilloscope trigger (Figure 8.4-2 a).
3. Touch [Clock] on the application screen.
4. Touch [Tx Reference Clock Output] and [1/64].
5. Measure the amplitude using the oscilloscope.
   Confirm that the amplitude is 0.25 to 0.65 Vp-p.
6. Touch [Clock] on the application screen.
7. Touch [Tx Reference Clock Output] and [1/16].
8. Measure the amplitude using the oscilloscope.
   Confirm that the amplitude is 0.25 to 0.65 Vp-p.
9. Connect the Tx Ref Clock Output terminal at the front panel of the MD1260A and and the sampling oscilloscope trigger.
10. Connect the Tx Ref $\overline{\text{Clock}}$ Output terminal at the front panel of the MD1260A and and the sampling oscilloscope input (Figure 8.4-2).
11. Repeat steps 3 to 8.

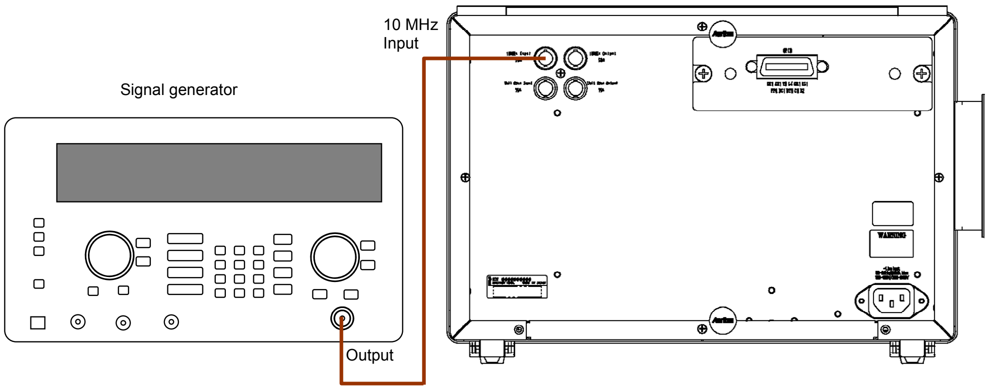


Figure 8.4-3 Measurement System for 10 MHz Input terminal

Confirmation of 10 MHz Input Terminal

1. Connect the 10 MHz Input terminal at the rear panel of the MD1260A and and the signal generator (Figure 8.4-3).
2. Set the frequency of the signal generator to 10 MHz ±50 ppm (9999950 to 10000050 Hz).
3. Set the level of the signal generator to –15 to 20 dBm (0.11 to 6.32 Vp-p).
4. Touch [Clock] on the application screen.
5. Touch [Clock Source] and [10MHz Input].
6. Confirm the following points displayed on the MD1260A screen .
   - The Rx Frequency display is as shown in the following table.

Specifications	Frequency
100GbE	103 125 000 000 Hz ±60 ppm (103 118 812 500 to 103 131 187 500 Hz)
OTU4	111 809 973 568 Hz ±60 ppm (111 803 264 970 to 111 816 682 166 Hz)
40GbE	41 250 000 000 Hz ±60 ppm (41 247 525 000 to 41 252 475 000 Hz)
OTU3	43 018 413 559 Hz ±60 ppm (43 015 832 454 to 43 020 994 664 Hz)

   - Clock Source Loss LED is green (clock source normal).
   - CDR Unlock LED is green (CDR locked).

8

Maintenance

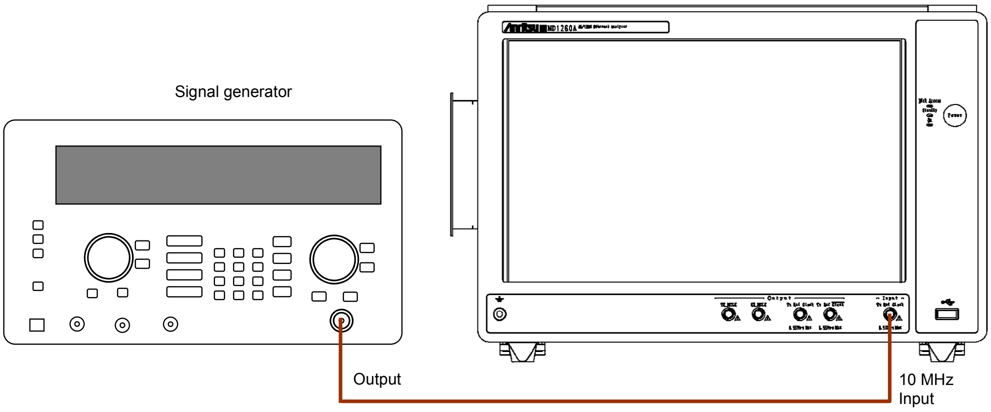


Figure 8.4-4 Measurement System for Tx Ref Clock Input Terminal

Confirmation of Tx Ref Clock Input (Only OTU4 option)

1. Connect the Tx Ref Clock Input terminal at the front panel of the MD1260A and the signal generator (Figure 8.4-4).
2. Set the frequency of the signal generator to 698.812 334 Hz ±200 ppm.

Specifications	Frequency
100GbE	103 125 000 000 Hz ±200 ppm (103 104 375 000 to 103 145 625 000 Hz)
OTU4	111 809 973 568 Hz ±200 ppm (111 787 611 573 to 111 832 335 563 Hz)
40GbE	41 250 000 000 Hz ±200 ppm (41 241 750 000 to 41258250000 Hz)
OTU3	43 018 413 559 Hz ±200 ppm (43 009 809 876 to 43 027 017 242 Hz)

3. Set the level of the signal generator to 260 to 530 mVp-p (–7.7 to –1.5 dBm).
4. Touch [Clock] on the application screen.
5. Touch [Clock Source] and [10MHz Input].

6. Confirm the following points displayed on the MD1260A screen .
   - The Rx Frequency display is as shown in the following table.

Specifications	Frequency
100GbE	103 125 000 000 Hz ±210 ppm (103 103 343 750 to 103 146 656 250 Hz)
OTU4	111 809 973 568 Hz ±210 ppm (111 786 493 473 to 111 833 453 663 Hz)
40GbE	41 250 000 000 Hz ±210 ppm (41 241 337 500 to 41 258 662 500 Hz)
OTU3	43 018 413 559 Hz ±210 ppm (43 009 379 692 to 43 027 447 426 Hz)

   - Clock Source Loss LED is green (clock source normal).
   - CDR Unlock LED is green (CDR locked).

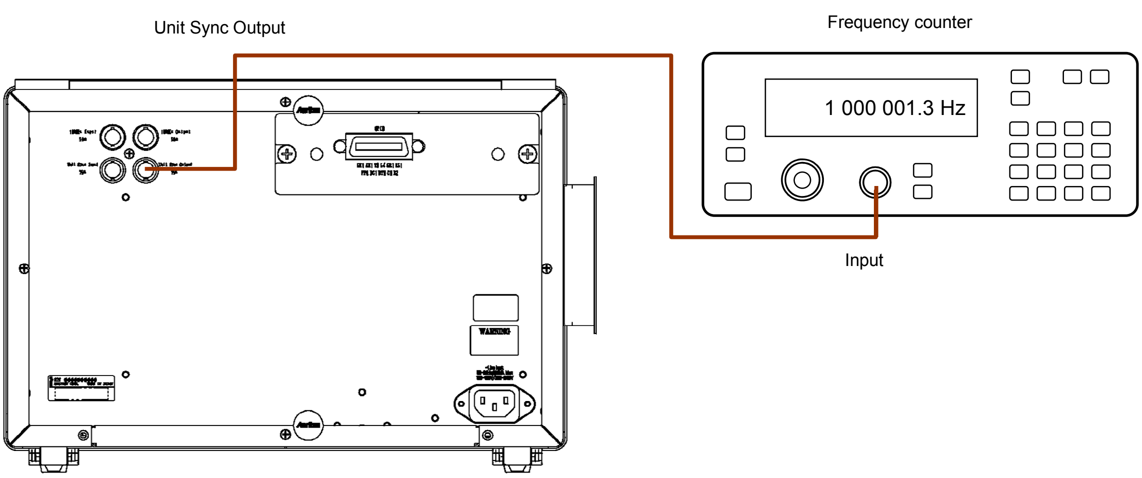


Figure 8.4-5 Measurement System for Unit Sync Output Terminal

Confirmation of Terminal Unit Sync Output

1. Connect the Unit Sync Output terminal at the rear panel of the MD1260A to the frequency counter.
2. Measure the frequency.
   Confirm that the frequency is 1 MHz ±5 ppm (999995 to 1000005 Hz).

8 Maintenance

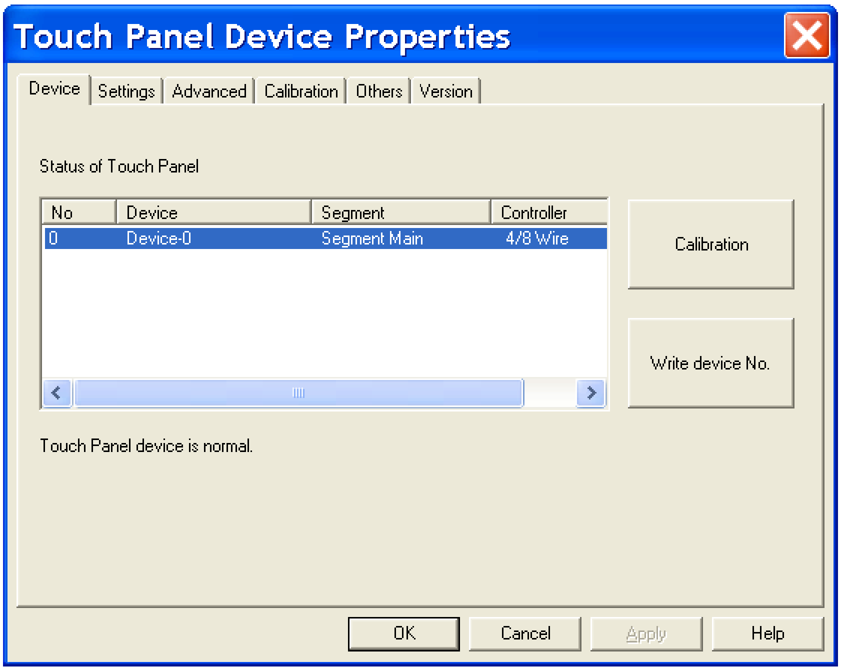
8.5 Calibrating Touch Panel Position

The touch panel accuracy may become misaligned due to changes in the ambient environment (temperature/humidity). If the touch panel accuracy becomes misaligned, calibrate the position as described below. When calibrating the position, use a soft pointer and take great care not scratch the touch panel.

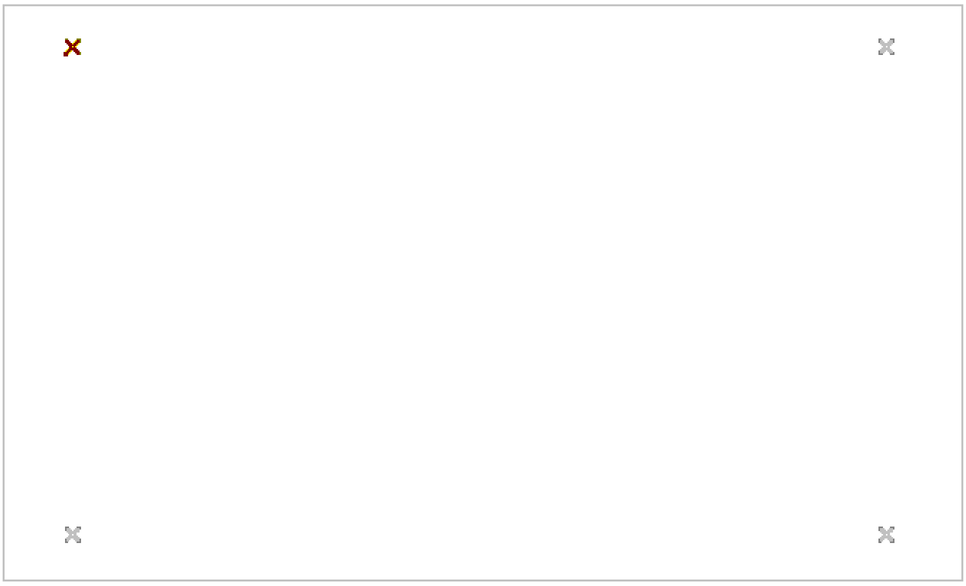
1. Display the Windows desktop.

☞ 2.6.1 Windows Desktop Display

2. Display the Windows Control Panel.
3. Touch [Touch Panel] twice or double-click it.
   The Touch Panel Device Properties window is displayed.



4. Touch [Calibration].
   The calibration screen is displayed.



5. Touch the center of the brown cross using the soft pointer.
   Touch the next cross displayed in brown.
6. After touching each of the four crosses, the Touch Panel Device Properties window is displayed.
7. Touch [OK].

8.6 Storage Precautions

Wipe dust, fingerprints, stains, spots, etc., from the surface of the MD1260A before storing it.

Fit the supplied coaxial connector caps to the coaxial connectors on the front panel.

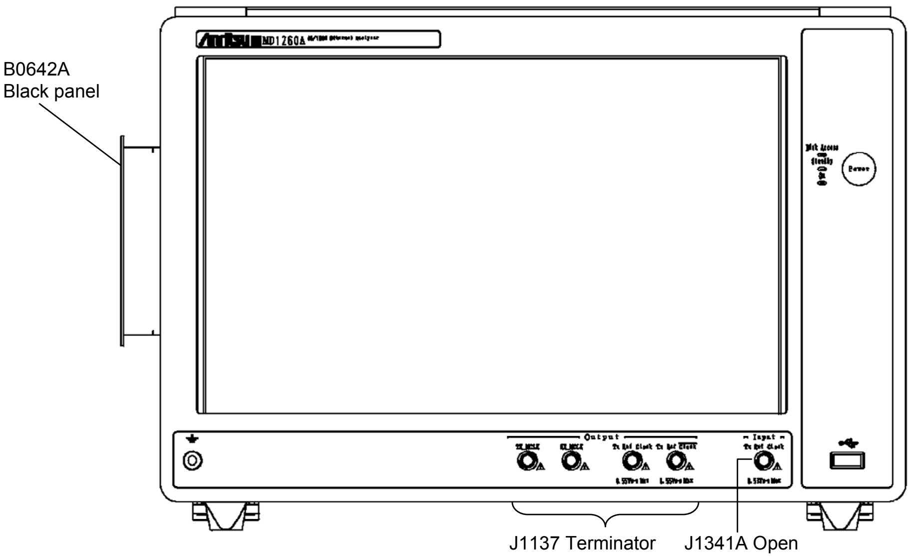


Figure 8.6-1 Installation Position of Accessories

Put the power cord, CD-ROM and other accessories in the accessory box and keep the box with the main frame.

Avoid storing the MD1260A in:

- Places that are exposed to direct sunlight
- Outdoors
- In excessively dusty locations
- Where condensation may occur
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in place chemically active gases sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen chloride etc.) are present
- Where toppling over may occur
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

- Places with extreme temperatures and relative humidity such as:
  Temperature: lower than –20°C or higher than 60°C
  Humidity: 90% or more

Recommended storage conditions

The MD1260A should be stored in a place that meets the ambient conditions above, plus the following conditions if it is not to be used for a long time:

- Temperature: 5° to 45°C
- Humidity: 40% to 80%
- Little daily change in temperature and humidity

8.7 Transporting and Disposal

The following describes precautions for transporting and disposing of the MD1260A.

Repackaging

Repack the MD1260A in the packing material (box) in which it was delivered. If the packing material has been thrown away or damaged, repack the MD1260A as follows:

1. Refer to Section 8.6 Storage Precautions and fit the caps to the coaxial connectors. Put the accessories in the accessory box and keep it with the main frame.
2. Get a corrugated cardboard, wooden, or aluminum box large enough to pack cushioning material in around the MD1260A.
3. Wrap the MD1260A in plastic or a similar material to protect against water droplets, rain, and dust.
4. Put the MD1260A and accessory box in the packing box.
5. Then, pack the MD1260A in cushioning material so it cannot move inside the box.
6. Secure the outside of the box with packing cord, adhesive tape, bands, or other similar materials.

Transporting

Avoiding vibrations as much as possible and meet the recommended storage conditions during transport.

Disposal

Follow the instructions of your local waste disposal office when finally disposing of the MD1260A.

Before disposal, dismantle or physically destroy any non-volatile memory media in the MD1260A to ensure that data in memory cannot be recovered by third parties.

A.1 Product Configuration

Table A.1-1 Product Configuration

Item	Model	Product Name	Quantity	Remarks
Main Unit	MD1260A	40/100G Ethernet Analyzer	1	
Accessory	J0491	Shielded Power Cord (13 A)	1	
	Z1442A	MD1260A Software/Manual CD-ROM	1	
	B0642A	Blank Panel	1	
	J1137	Terminator	4	50 Ω Terminator
	J1341A	Open	1	SMA Protective Cap

Table A.1-2 Applicable Parts

Model	Product Name	Remarks
MZ1223C	10 Lane Extender	
MZ1225A	Adapter for QSFP+	
B0647A	Carrying Case	
B0648A	Front Cover	
G0259A	CFP 100GBASE-LR4	
G0279A	CFP 40GBASE-LR4	
J0008	GPIB Cable, 2 m	
J0660B	SC･PC-SC･PC-2M-SM	
J0775B	Coaxial Cable (BNC 75 Ω), 0.5 m	
J0775D	Coaxial Cable (BNC 75 Ω), 2 m	
J0776D	Coaxial Cable (BNC 50 Ω), 2 m	
J1049A	Fixed Optical ATT:SC	
J1343A	Coaxial Cable, 1.0 m	
Z0306A	List strap	
Z0541A	USB Mouse	
Z0975A	Keyboard (USB)	
W3395AE	MD1260A Operation Manual	Printed, English
W3406AE	Remote Control Operation Manual	Printed, English
W3483AE	Add-on Function Operation Manual	Printed, English

Table A.1-3 Options

Model	Product Name
MD1260A-001	100 G Ethernet
MD1260A-002	OTU4
MD1260A-003	40 G Ethernet
MD1260A-004	OTU3
MD1260A-005*	ODU4-100GbE Mapping
MD1260A-006*	ODTU4.1-ODU0-GbE Mapping
MD1260A-007*	ODTU4.8-ODU2e-10GbE Mapping
MD1260A-030	GPIB
MD1260A-031	CFP MDIO Analysis

*: MD1260A-002 is required.

A.2 MD1260A Specifications

Table A.2-1 Input/Output Terminal

Item	Specifications
Measurement Port	Conforms to CFP MSA Hardware Specification, 1.4 Conforms to CFP MSA Management Interface Specification 1.2, 1.4 and 2.0
Bit Rate	40 GbE: 10.312500000 Gbit/s × 4 100 GbE: 10.312500000 Gbit/s × 10 OTU4: 11.180997357 Gbit/s × 10 OTU3: 10.754603390 Gbit/s × 4
Connector	148 pin Electrical Connector
Variable Frequency	Variable range 40 GbE: 41.250000000 GHz –120 ppm to +120 ppm, 1 ppm steps 100 GbE: 103.125000000 GHz –120 ppm to +120 ppm, 1 ppm steps OTU4: 111.809973568 GHz –120 ppm to +120 ppm, 1 ppm steps OTU3: 43.018413559 GHz –120 ppm to +120 ppm, 1 ppm steps When using CFP, sometimes the above frequency may exceed the CFP specification. Linearity error: ±0.1 ppm
Laser Safety Standard	Class1M (IEC 60825-1 2007) :CFP 40GBASE-SR4,CFP 100GBASE-SR10, QSFP+40GBASE-SR4*1 Class1 (IEC 60825-1 2007):CFP 40GBASE-LR4,CFP 100GBASE-LR4
Insert/Remove Cycles	180 max.
Tx Ref Clock Output	Divided clock output synchronized with Tx clock
Frequency	Can select 1/16 and 1/64 according to Bit Rate of measurement port per lane*2
Level	Min: 250 mVp-p Max: 550 mVp-p * Single ended swing
Termination	Differential 100 Ω/AC
Connector	SMA Jack × 2
Tx Ref Clock Input	Divided clock input synchronized with Tx clock
Frequency	1/16 according to bit rate of measurement port*2
Accuracy	–120 ppm to + 120 ppm
Level	Min: 260 mVp-p Max: 530 mVp-p
Termination	50 Ω/AC
Connector	SMA Jack

*1: MZ1225A is required.

*2: The bit rate per lane is as follows:
40GbE: 10.312500000 Gbit/s, 100GbE: 10.312500000 Gbit/s,
OTU4: 11.180997357 Gbit/s, OTU3: 10.754603390 Gbit/s

Appendix

Appendix A

Table A.2-1 Input/Output Terminal (Cont'd)

Item	Specifications
TX_MCLK Output	Output of TX_MCLK of CFP *3
Frequency	Depending on CFP
Level	Depending on CFP
Termination	Depending on CFP
Connector	SMA Jack
RX_MCLK Output	Output of RX_MCLK of CFP *3
Frequency	Depending on CFP
Level	Depending on CFP
Termination	Depending on CFP
Connector	SMA Jack
10MHz input	10 MHz Clock input synchronized with Tx clock
Frequency	10 MHz
Level	–15 dBm to 20 dBm
Termination	50 Ω/AC
Waveform	Square or sinusoidal wave
Accuracy	–50 ppm to 50 ppm
Connector	BNC Jack
10MHz Output	Can select either Internal 10 MHz (10 MHz output synchronized to built-in 10 MHz output oscillator) or Locked 10 MHz (10 MHz output synchronized to Tx clock)
Frequency	10 MHz
Level	≥0 dBm
Termination	50 Ω/AC
Waveform	Sinusoidal wave
Connector	BNC Jack
Sync Input	Clock Sync, Time Sync signal input (connect Sync Output of other unit)
Termination	75 Ω/DC
Waveform	Square wave 1 MHz
Connector	BNC Jack
Time Sync Delay*4	≤50 ns between two slave units with daisy chain connected
Time Sync accuracy	When MD1260A Sync Output is master: 100 ns When MD1230B Sync Output is master: 1 μs
Sync Output	Clock Sync, Time Sync signal output
Level	TTL
Termination	75 Ω/DC
Waveform	Square wave, 1 MHz
Connector	BNC Jack

*3: Clock is not output when using the MZ1225A .

*4: How much delay of the synchronized time should be accepted for the master time.

Table A.2-2 General Specifications

Item	Specifications
Remote Control	Ethernet or GPIB (Option)
LCD	12.1 inch WXGA (1280 x 768 or 1280 x 800)
LED	Power On, Standby, Disk Access
Connecting Peripheral Devices	VGA output (SVGA) USB (5 Ports, Revision 2.0) Ethernet (2 Ports, 10/100/1000 BASE-T)
Mass Storage	RAM: 1 Gbytes Compact Flash: 8 Gbytes (including OS)
Power	Rated power: AC 100 V to 120 V and 200 V to 240 V* Rated frequency: 50/60 Hz
Power Consumption	≤300 VA
Environment Performance Temperature Range Storage Temperature Range	 +5° to +40°C, 20% to 80% RH (without condensation) –20° to +60°C, 20% to 80% RH (without condensation)
Mechanical Performance Mass Size	 8 kg max. 340 (W) × 221.5 (H) × 200 (D) nm (Excluding projections)

*: Operating voltage: within the range of +10% to –15% from the rated voltage

Appendix

Appendix A

A.3 Specifications for 100G Ethernet (MD1260A-001)

Table A.3-1 Specifications for 100G Ethernet

Item	Specifications
Clock Setting	
Frequency Measurement	(For 100GbE or No Frame 20 lanes) Frequency measurement: 103,125,000,000 Hz ±200 ppm (For No Frame 10 lanes) Frequency measurement: 10,312,500,000 Hz ±200 ppm × 10 lanes
Reference Clock	(For 100GbE) Internal/External 10MHz Input/Tx Reference Clock Input/Unit Sync Input/Received*1 (For No Frame 10 lanes or No Frame 20 lanes) Internal/External 10MHz Input/Tx Reference Clock Input
Monitor	(For 100GbE) CDR Unlock (For No Frame 20 lanes) CDR Unlock Clock Source Loss (For No Frame 10 lanes) CDR Unlock × 10 lanes Clock Source Loss
Transceiver Setting	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP Monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1, Programmable Alarm2, Programmable Alarm3, Global Alarm, Rx power

*1: Using Lane#3 regeneration clock at Received

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
PCS Layer Measurement	
PCS Monitor	Displays each lane independently Marker Map Relative Skew (ns)
PCS Status	Displays each lane independently Sync Header Lock Alignment Marker Lock Skew Stability One display for all lanes Link Status High-BER Alignment Status
Deskew Tolerance	64 Blocks
PCS Counter	Displays each lane independently Invalid Sync Header Count Invalid Alignment Marker Count BIP Error Count One display for all lanes Invalid Block Count
PCS Error/Alarm Insertion	Target lanes: Can specify multiple lanes Mode: Ethernet Frame, PCS Error, PCS Alarm Type/Pattern: (Selections vary by mode.) When lane specified Invalid Sync Header (Can select one of 00 or 11) Invalid Alignment Marker (Set M0 to 0x00, and M4 to 0xFF.) BIP Error (Bit-inverts calculation result) When lane not specified High-BER Invalid Block Type (Select one of 0x00, 0x2d, 0x33, 0x66) PRBS Bit Error, LF, RF Timing:*2 Single, Burst, All
PCS Skew Generation	Target Lane: Tx Lane (0 to 19), Physical Lane (0 to 9) Can specify multiple lanes Skew Generation: Tx Lane: 0 ns to 819.2 ns, 193.94-ps step (0 to 4224 bit) Physical Lane: 0 ns to 819.2 ns, 96.97-ps steps (0 to 8448 bit)

*2: Rate and Alternate are settable for Invalid Sync Header, Invalid Alignment Marker, and BIP Error.

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
PCS Layer Measurement (Cont'd)	
PCS Lane Mapping	Can assign Lane Marker independently to Lane 0 to Lane 19 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descent: In 19–0 sequence Ascent: In 0–19 sequence
Stream Transmission	
Number of Streams	16
Status	Stream Send
Display/Setting Units	Rate (%)/Rate (fps)/Rate (Gbit/s)/Gap Size (byte)/Interval (s)
Duration	Continuous Time (specifies sending time: 1 s to 10 min, 1-s steps) Repeat (specifies generation count:1 to 1,099,511,627,775)
Stream Send Sequence	Sequential /Random
Data Field	All 0, All 1, Word16, PRBS31
Stream Setting	
Transmission Setting	On/Off
Number of Frames/Bursts	1 frame to 1,099,511,627,775 frames / Bursts
Stream Control	Burst Off sets interframe gap and Burst On sets interburst gap Gap Size: 9 bytes to 1,500,017,328,128 bytes (default: 12 bytes)*3 Type: Fixed, Random
Burst	Enable: On/Off Burst Size: 1 frame to 65535 frames Burst Control: 9 bytes to 65535 bytes, 1-byte step (default: 12 bytes)*4 Type: Fixed

*3: Lower limit of gap is 10 bytes when frame size is 16,001 bytes or more.

*4: Lower limit of burst control is 10 bytes when frame size is 16,001 bytes or more.

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd)	
Frame Size	Frame Size: 60 bytes to 32,700 bytes (default: 64 bytes) Type: Fixed, Random
Supported Protocols	Ethernet, MPLS-TP,PBB,VLAN, MPLS,IPv4, IPv6, ARP, ICMPv4, ICMPV6
Frame Setting*5	MPLS-TS: Control Word : On/Off Five-stage Label : Fixed/Increment/Decrement/Random Exp : Fixed/Increment/Decrement/Random TTL : Fixed/Increment/Decrement/Random PBB: B-Tag and I-Tag / I-Tag only PCP: Fixed/Increment/Decrement/Random DEI: Fixed VID: Fixed/Increment/Decrement/Random SID: Fixed/Increment/Decrement/Random Ethernet: Preamble Size: 8 bytes MAC Address: Fixed/Increment/Decrement/Random/MAC Resolve *6 Ethernet Type: Fixed VLAN: Two-stage On/Off TPID: Fixed Priority: Fixed/Increment/Decrement/Random VID: Fixed MPLS: Three-stage Label : Fixed/Increment/Decrement/Random Exp : Fixed/Increment/Decrement/Random TTL : Fixed/Increment/Decrement/Random

*5: Up to three fields are available for Increment/Decrement/Random setting. However, MAC addresses below are excluded.

When MPLS-TP is included: MPLS-TP MAC address
When MPLS-TP is not included but PBB is included: PBB MAC address
When MPLS-TP and PBB are not included: Ethernet MAC address

*6: MAC Resolve is settable only for Source MAC Address.

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd) Frame Setting (Cont'd)	IPv4: Source Address: Fixed/Increment/Decrement/Random Destination Address: Fixed/Increment/Decrement/Random TOS: Fixed/Increment/Decrement/Random TTL: Fixed/Increment/Decrement/Random Protocol: Fixed/Increment/Decrement/Random IPv6: Source Address: Fixed/Increment/Decrement/Random *7 Destination Address: Fixed/Increment/Decrement/Random *7 Traffic Class: Fixed/Increment/Decrement/Random Flow Label: Fixed/Increment/Decrement/Random Hop Limit: Fixed/Increment/Decrement/Random Payload Length: Auto Next Header: HOPOPT/ICMP/IGMP/TCP/UDP/IPv6/Routing Fragment/ESP/Authentication/ICMPv6/IPv6-NoNxt/IPv6-Opts ARP: Sender MAC Address: Fixed/Increment/Decrement/Random Sender IP Address: Fixed/Increment/Decrement/Random Target MAC Address: Fixed/Increment/Decrement/Random Target IP Address: Fixed/Increment/Decrement/Random Operation: Fixed/Increment/Decrement/Random ICMPv4: Type: Echo Reply/Echo Request Code: Fixed/Increment/Decrement/Random Identifier: Fixed/Increment/Decrement/Random Sequence No.: Fixed/Increment/Decrement/Random

*7: For Increment/Decrement/Random, data is changed within the range of up to 32 bits.

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd) Frame Setting (Cont'd)	ICMPv6: Type: Echo Reply/Echo Request/Neighbor Solicitation/Neighbor Advertisement Code: Fixed/Increment/Decrement/Random Identifier: Fixed/Increment/Decrement/Random Sequence No.: Fixed/Increment/Decrement/Random Reserve: Fixed Target Address: Fixed/Increment/Decrement/Random Source Link-Layer Address: Fixed/Increment/Decrement/Random Router: Fixed Solicited: Fixed Override: Fixed Test Frame On/Off
Frame Error Insertion	Ethernet: FCS Error
Error Insertion PRBS Bit Error	Timing: Single*8 Rate $10^{-9}/10^{-8}/10^{-7}/10^{-6}/10^{-5}/10^{-4}/10^{-3}$
LFS	Type: Local Fault/Remote Fault Timing: All

*8: Errors can be inserted when PRBS31 selected as Frame data setting.

Appendix

Appendix A

Table A.3-1 Specification for 100G Ethernet (Cont'd)

Item	Specifications
Counter Measurement	
Tx	Current Tx Rate (bit/s), Tx Rate (%) Accumulated Tx Good Bytes, Tx Errored Bytes, Transmit Duration (ns) Tx Broadcast Bytes, Tx Multicast Bytes Current (fps)/ Accumulated Tx Good Frames, Tx Oversize, Tx Oversize & FCS Error, Tx Undersize, Tx Fragments, Tx FCS Errors, Tx Broadcast Bytes, Tx Multicast Bytes, Tx Broadcast Frames, Tx Multicast Frames, Tx MPLS-TP, Tx PBB, Tx ARP Request, Tx ARP Reply, Tx PINGv4 Request, Tx PINGv4 Reply, Tx NDP(NS), Tx NDP(NA), Tx PINGv6 Request, Tx PINGv6 Reply Current / Accumulated LF, RF
Rx	Current Rx Rate (bit/s), Rx Rate (%) Accumulated Rx Good Bytes, Rx Errored Bytes, Rx Broadcast Bytes, Rx Multicast Bytes Current (fps) / Accumulated Rx Good Frames, Rx Oversize, Rx Oversize & FCS Errors, Rx Undersize, Rx Fragments, Rx FCS Errors, Rx Broadcast Bytes, Rx Multicast Bytes, Rx Broadcast Frames, Rx Multicast Frames, Pause Frame, Rx MPLS-TP, Rx PBB, Rx ARP Request, Rx ARP Reply, Rx PINGv4 Request, Rx PINGv4 Reply, Rx NDP(NS), Rx NDP(NA), Rx PINGv6 Request, Rx PINGv6 Reply Current / Accumulated Bit Errors (bit), Bit Error (Rate), Pattern Sync Loss (s) , LF, RF, Trigger Condition, Error Signal
Frame Size Distribution (Tx/Rx)	<64 bytes, 64 bytes, 65 bytes to 127 bytes, 128 bytes to 255 bytes, 256 bytes to 511 bytes, 512 bytes to 1023 bytes, 1024 bytes to 32700 byte, > 32700 (Oversize)

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
Counter Measurement (Cont'd)	
Gap Size Distribution (Tx/Rx)	Eight gap size setting ranges
Counter setting	Oversize: 1518 bytes to 32700 bytes (default: 1518) Undersize: 64 bytes (fixed) Sequence Error Detect: On/Off
Test Frame Measurement	
Number of Flows	16
Flow Filter	Test Frame Flow ID, User Defined, User defined and Flow ID User Define field : Destination Address, Source Address, Type Offset :0 to 47 bit / 1 bit step Length :1 to 32 bit / 1 bit step
Tx Measurement Item	Number of Frames, Number of Bytes, Rate
Rx Measurement Item	Number of Frames, Number of Bytes, Rate Latency: Measurement accuracy 100 ns, Resolution 6 ns Current Latency(ns), Minimum Latency(ns), Maximum Latency(ns) Sequence Error (only for Flow filter by Test Frame ID)
Capture	
Memory Capacity	128 kbytes
Status Display	Trigger
Trigger	Pattern: On/Off (select pattern from one of following at On) Good Frame, LFS Signal, RFS Signal, Error Signal, FCS Error, Undersize, Fragment, Oversize, Oversize&FCS Error Timing: 1 shot Trigger Position: Middle
Protocol	MII Data: Idle, Sequence, Start, Terminate, Error, Data, Trigger Data Data: FCS

Table A.3-1 Specifications for 100G Ethernet (Cont'd)

Item	Specifications
No Frame Measurement Test Pattern	Tx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off) Square Wave Rx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off)
Error Insertion	Enabled only for Test Pattern PRBS Lane specification: Can specify multiple lanes Timing: Single
Counter	Independent count for each lane Pattern Sync Loss (s) Resolution 100 ns Bit Error Count (bit) Bit Error Rate
Interlane Send PRBS Pattern Phase Error	(see table below)
Port Setting Mode	Normal Loopback
Lane Selection	10 Lane 20 Lane
CFP Setting Optical Output	On/Off
Status Display	Yes

Interlane Send PRBS Pattern Phase Error:

PRBS Pattern	10 Lanes	20 Lanes
PRBS31	21,000 bits	21,000 bits
PRBS23	0 bits	40 bits
PRBS15	0 bits	40 bits
PRBS9	0 bits	40 bits
PRBS7	0 bits	40 bits

A.4 Specifications for OTU4 (MD1260A-002)

Table A.4-1 Specifications for OTU4

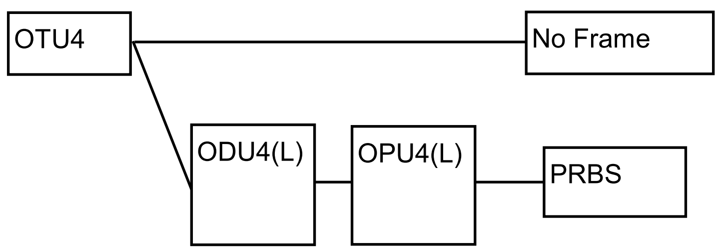
Item	Specifications
Clock Setting Frequency Measurement	 (For OTU4 or No Frame 20 lanes) Frequency measurement: 111,809,973,568 Hz ±200 ppm (For No Frame 10 lanes) Frequency measurement: 11,180,997,357 Hz ±200 ppm × 10 Lane
Reference Clock	(For OTU4) Internal/External 10MHz Input/Tx Reference Clock Input/ Received (For No Frame) Internal/External 10MHz Input/Tx Reference Clock Input
Monitor	(For OTU4 or No Frame 20 lanes) CDR Unlock Clock Source Loss (For No Frame 10 lanes) CDR Unlock × 10 lanes Clock Source Loss
Transceiver setting	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP Monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Rx Power
OTN Setting Mapping	

Table A.4-1 Specifications for OTU4 (Cont'd)

Item	Specifications
Test Pattern (Cont'd)	PRBS15, PRBS23, PRBS31 (Invert On/Off) Word16
OTN OH Measurement	
Transmission OH	OTU4,ODU4,OPU4 (MFAS and parity byte excluded) Decoding setting for each of TTI (SAPI[1]-[15],DAPI[1]-[15]) and FTFL (OIF) is available.
OH Monitor	Multiframe analysis for OTU4/ODU4/OPU4 Header, Payload, PT, TTI, and FTFL
Error/Alarm Measurement	
Alarm	(LLD) LOF Lane (s), OOF (frame), LOR(s), OOR (frame) (OTU) LOF (s), OOF (s, frame), LOM (s), OOM (s, frame), SM-TIM (frame), SM-BIAE (s, frame), SM-BDI (s, frame), SM-IAE(s, frame) (ODU) ODU-AIS (s, frame), ODU-OCI (s, frame), ODU-LCK (s, frame), PM-TIM (frame), PM-BDI (s, frame) (TCM1 .. TCM6) TCM-TIM (frame), TCM-BIAE (s, frame), TCM-BDI (s, frame),TCM-IAE(s, frame), TCM-LTC(s, frame) (OPU) PLM (frame), Client-AIS (s, frame) (Test Pattern) Pattern Sync Loss (s)
Error	(LLD) Displays for each Rx lane. FAS-LLD (count) (OTU) FAS (count), SM-BIP8 (count, rate), SM-BEI(count, rate), FEC-Uncorr EBs (count, rate), FEC-Corr Errors (count, rate), FEC-Corr 1s to 0s (count, rate), FEC-Corr 0s to 1s (count, rate) (ODU) PM-BIP8 (count, rate), PM-BEI(count, rate) (TCM1 .. TCM6) TCM-BIP8 (count, rate), TCM-BEI(count, rate) (OPU) Bit Errors (count, rate)

Table A.4-1 Specifications for OTU4 (Cont'd)

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Error/Alarm Insertion
Alarm insertion
Item</td><td>(LLD)
OOF/LOF, OOR/LOR
(OTU)
OOF/LOF, OOM/LOM, SM-TIM, SM-BIAE, SM-BDI, SM-IAE
(ODU)
ODU-AIS, ODU-OCI, ODU-LCK, PM-TIM, PM-BDI
(TCM1 .. TCM6)
TCM-TIM, TCM-BIAE, TCM-IAE, TCM-BDI, TCM-LTC
(OPU)
Client-AIS</td></tr>
<tr><td>Insertion Timing</td><td>All
Burst: (LLD) 1 to 215,000 (frames)
(OTU) 1 to 4,300,000 (frames)
Alternate:
<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Specified Lane</td><td>Specify insertion Tx Lane (0 to 19) for LLD FAS.
Can specify multiple lanes</td></tr>
</table>

Table A.4-1 Specifications for OTU4 (Cont'd)

<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Error/Alarm Insertion (Cont'd)
Error insertion
Item</td><td>

(LLD)
FAS
(OTU)
FAS, SM-BIP8, SM-BEI, Uncorrectable Error, Correctable Error
(ODU)
PM-BIP8, PM-BEI
(TCM1 .. TCM6)
TCM-BIP8, TCM-BEI
(Test Pattern)
Bit Error
(Others)
Bit all (Poisson distribution 1.0E-2 to 9.9E-9, FAS protection availability setting enabled)</td></tr>
<tr><td>Insertion Timing</td><td>Single
Rate (Random) : $10^{-2}/10^{-3}/10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Rate (Constant) : $10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Alternate:
<table>
<tr><th></th><th>LLD</th><th>OTU</th></tr>
<tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr>
<tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr>
</table>
</td></tr>
<tr><td>Specified Lane</td><td>Specify insertion Tx Lane (0 to 19) for LLD -FAS error.
Can specify multiple lanes</td></tr>
<tr><td>Alarm Detection Release Conditions</td><td>This setting cannot be changed from the standard.</td></tr>
<tr><td>LLD Measurement
Monitor</td><td>
Monitor independently at Rx Lane (20 lanes)
Marker Map
Relative Skew (ns units)</td></tr>
<tr><td>Status</td><td>Status independently at Rx Lane (20 lanes)
Skew Stability
One display for all lanes
ILA/OLA</td></tr>
<tr><td>LLD Skew Generation</td><td>0 bits to 32,000 bits, 1-bit steps
Can specify multiple lanes</td></tr>
</table>

Table A.4-1 Specifications for OTU4 (Cont'd)

Item	Specifications
LLD Lane Mapping	Can assign Lane Marker independently to Lane 0 to Lane 19 (overlap allowed) Mapping Types Odd/Even: Switches odd and even lanes for default setting Random: Software decides random value (no overlap) Define: User defined (overlap allowed) Descend: In 19–0 sequence Ascend: In 0–19 sequence
OH Capture Target data Trigger Number of frames	 OTU4, ODU4, OPU4 MFAS=0, Error/Alarm, Manual 512
Frame Capture Target data Trigger Number of frames	 Entire OTU4 frame (OH+Payload+FEC) OTU MFAS, OMFI, Error/Alarm, Manual 18
Port settings Mode Through mode GFEC	 Normal,Loopback,OTU Through Transparent, Analyzed, OH Overwrite Encode On/Off
OTN APS measurement Trigger Max.detection time Measurement resolution Error Free Period	 SM-BIP8, PM-BIP8, ODU-AIS, ODU-OCI, ODU-LCK, OOF, LOF 10 000.0 ms 0.1 ms 1 ms, 10 ms, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 600 ms, 700 ms, 800 ms, 900 ms, 1000 ms
OTN Delay measurement Mode Measurement resolution	 Single/Repeat 1.167696 µs

Table A.4-1 Specifications for OTU4 (Cont'd)

Item	Specifications
No Frame Measurement	
Test Pattern	Tx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off) Square Wave Rx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off)
Error Insertion	Supported only at Test Pattern PRBS Lane specified: Can specify multiple lanes Timing: Single
Counter	Each lane counted independently Pattern Sync Loss (s) Resolution 100 ns Bit Error Count (bit) Bit Error Rate
CFP Setting	
Optical Output	On/Off
Status Display	Yes

A.5 Specifications for 40G Ethernet (MD1260A-003)

Table A.5-1 Specifications for 40G Ethernet

Item	Specifications
Clock Setting Frequency Measurement	 (For 40GbE) Frequency measurement: 41,250,000,000 Hz ±200 ppm (For No Frame) Frequency measurement: 10,312,500,000 Hz ±200 ppm × 4 lanes
Reference Clock	(For 40GbE) Internal/ External 10MHz Input/Tx Reference Clock Input/Unit Sync Input/Received *1 (For No Frame) Internal/External 10MHz Input/Tx Reference Clock Input
Monitor	(For 40GbE) CDR Unlock Clock Source Loss (For No Frame) CDR Unlock x 4 lanes Clock Source Loss
Transceiver Setting	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP Monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Reception Power

*1: Using Lane 3 Rx regeneration clock at Received

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
PCS Layer Measurement	
PCS Monitor	Displayed independently for each lane Marker Map Relative Skew (ns)
PCS Status	Displayed independently for each lane Sync Header Lock Alignment Marker Lock Skew Stability One display for all lanes Link Status High-BER Alignment Status
Deskew Stress	128 Blocks
PCS Counter	Displayed independently for each lane Invalid Sync Header Count Invalid Alignment Marker Count BIP Error Count One display for all lanes Invalid Block Count
PCS Error/Alarm Insertion	Target lanes: Can specify multiple lane Mode: Ethernet Frame, PCS Error, PCS Alarm Type/Pattern: (Selections vary by mode.) When lane specified Invalid Sync Header (Select from 00 or 11.) Invalid Alignment Marker (Set M0 to 0x00,and M4 to 0xFF.) BIP Error (Bit-inverts calculation result) When lane not specified High-BER Invalid Block Type (Select one from 0x00,0x2d,0x33,0x66.) PRBS Bit Error, LF, RF Timing: *2 Single, Burst, All
PCS Skew Generation	Target lane: Can specify multiple TX lanes (0 to 3) Skew generation (Tx lanes): 0 ns to 819.2 ns , 96.97 ps steps

*2: Rate and Alternate are settable for Invalid Sync Header, Invalid Alignment Marker, and BIP Error.

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
PCS Layer Measurement (Cont'd)	
PCS Lane Mapping	Can assign lane marker independently to Lane 0 to Lane 3 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descent: In 3–0 sequence Ascent: In 0–3 sequence
Stream Transmission	
Number of Streams	16
Status	Stream Send
Display/Setting Units	Rate (%)/Rate (fps)/Rate (Gbit/s)/Gap Size (byte)/Interval (s)
Duration	Continuous Time (Can specify send time: 1 s to 10 min, 1 s steps) Repeat (Can specify occurrence count: 1 to 1,099,511,627,775)
Stream Send Sequence	Sequential/Random
Data Field	All 0, All 1,Word16, PRBS31
Stream Setting	
Transmission Setting	On/Off
Number of Frames/Bursts	1 frame to 1,099,511,627,775 frames/bursts
Stream Control	Burst Off sets interframe gap and Burst On sets interburst gap Gap Size: 9 bytes to 1,500,017,328,128 bytes (default: 12 bytes)*3 Type: Fixed, Random
Burst	Enable: On/Off Burst Size: 1 frame to 65535 frames Burst Control: 9 bytes to 65535 bytes, 1 byte steps (default: 12 bytes)*4 Type: Fixed

*3: Lower limit of gap is 10 bytes when frame size is 16,001 bytes or more.

*4: Lower limit of burst control is 10 bytes when frame size is 16,001 bytes or more.

Appendix

Appendix A

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd)	
Frame Size	Frame Size: 60 bytes to 32,700 bytes (default: 64 bytes) Type: Fixed, Random
Supported Protocol	Ethernet, MPLS-TP,PBB,VLAN, MPLS,IPv4, IPv6
Frame Setting*5	MPLS-TS: Control Word : On/Off Five-stage Label : Fixed/Increment/Decrement/Random Exp : Fixed/Increment/Decrement/Random TTL : Fixed/Increment/Decrement/Random PBB: B-Tag and I-Tag / I-Tag only PCP: Fixed/Increment/Decrement/Random DEI: Fixed VID: Fixed/Increment/Decrement/Random SID: Fixed/Increment/Decrement/Random Ethernet: Preamble Size: 8byte MAC Address: Fixed/Increment/Decrement/Random/MAC Resolve *6 Ethernet Type: Fixed VLAN: Two-stage On/Off TPID: Fixed/Increment/Decrement/Random Priority: Fixed/Increment/Decrement/Random VID: Fixed/Increment/Decrement/Random VID: Static MPLS: Three-stage Label : Fixed/Increment/Decrement/Random Exp : Fixed/Increment/Decrement/Random TTL : Fixed/Increment/Decrement/Random

*5: Up to three fields are available for Increment/Decrement/Random setting.However, MAC addresses below are excluded.

When MPLS-TP is included: MPLS-TP MAC address
When MPLS-TP is not included but PBB is included: PBB MAC address
When MPLS-TP and PBB are not included: Ethernet MAC address

*6: MAC Resolve is settable only for Source MAC Address.

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd)	
Frame Setting (Cont'd)	IPv4: Source Address: Fixed/Increment/Decrement/Random Destination Address: Fixed/Increment/Decrement/Random TOS: Fixed/Increment/Decrement/Random TTL: Fixed/Increment/Decrement/Random Protocol: Fixed/Increment/Decrement/Random IPv6: Source Address: Fixed/Increment/Decrement/Random *7 Destination Address: Fixed/Increment/Decrement/Random *7 Traffic Class: Fixed/Increment/Decrement/Random Flow Label: Fixed/Increment/Decrement/Random Hop Limit: Fixed/Increment/Decrement/Random Payload Length: Auto Next Header: HOPOPT/ICMP/IGMP/TCP/UDP/IPv6/Routing Fragment/ESP/Authentication/ICMPv6/IPv6-NoNxt IPv6-Opts ARP: Sender MAC Address: Fixed/Increment/Decrement/Random Sender IP Address: Fixed/Increment/Decrement/Random Target MAC Address: Fixed/Increment/Decrement/Random Target IP Address: Fixed/Increment/Decrement/Random Operation: Fixed/Increment/Decrement/Random ICMPv4: Type: Echo Reply/Echo Request Code: Fixed/Increment/Decrement/Random Identifier: Fixed/Increment/Decrement/Random Sequence No.: Fixed/Increment/Decrement/Random

*7: For Increment/Decrement/Random, data is changed within the range of up to 32 bits.

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
Stream Setting (Cont'd) Frame Setting (Cont'd)	ICMPv6: Type: Echo Reply/Echo Request/Neighbor Solicitation/Neighbor Advertisement Code: Fixed/Increment/Decrement/Random Identifier: Fixed/Increment/Decrement/Random Sequence No.: Fixed/Increment/Decrement/Random Reserve: Fixed Target Address: Fixed/Increment/Decrement/Random Source Link-Layer Address: Fixed/Increment/Decrement/Random Router: Fixed Solicited: Fixed Override: Fixed Test Frame On/Off
Frame Error Insertion	Ethernet: FCS Error
Error Insertion PRBS Bit Error LFS	 Timing: Single*8 Rate $10^{-9}/10^{-8}/10^{-7}/10^{-6}/10^{-5}/10^{-4}/10^{-3}$ Type: Local Fault/Remote Fault Timing: All

*8: Errors can be inserted when PRBS31 selected as Frame data setting.

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
Counter Measurement	
Tx	Current Tx Rate (bit/s), Tx Rate (%) Accumulated Tx Good Bytes, Tx Errored Bytes, Transmit Duration (ns) Tx Broadcast Bytes, Tx Multicast Bytes Current (fps)/ Accumulated Tx Good Frames, Tx Oversize, Tx Oversize & FCS Error, Tx Undersize, Tx Fragments, Tx FCS Errors, Tx Broadcast Bytes, Tx Multicast Bytes,, Tx Broadcast Frame, Tx Multicast Frames, Tx MPLS-TP, Tx PBB, Tx ARP Request, Tx ARP Reply, Tx PINGv4 Request, Tx PINGv4 Reply, Tx NDP(NS), Tx NDP(NA),Tx PINGv6 Request, Tx PINGv6 Reply Current / Accumulated LF, RF
Rx	Current Rx Rate (bit/s),Rx Rate (%),Current Latency (ns) Accumulated Rx Good Bytes,Rx Errored Bytes, Rx Broadcast Bytes, Rx Multicast Bytes Current (fps) / Accumulated Rx Good Frames,Rx Oversize,Rx Oversize & FCS Errors,Rx Undersize,Rx Fragments,Rx FCS Errors, Rx Broadcast Bytes, Rx Multicast Bytes, Rx Broadcast Frames, Rx Multicast Frames, Pause Frame, Rx MTLS-TP, Rx PBB, Rx ARP Request, Rx ARP Reply, Rx PINGv4 Request, Rx PINGv4 Reply, Rx NDP(NS), Rx NDP(NA), Rx PINGv6 Request, Rx PINGv6 Reply Current / Accumulated Bit Errors (bit),Bit Error (Rate),Pattern Sync Loss (s),LF,RF,Trigger Condition,Error Signal
Frame Size Distribution (Tx/Rx)	<64 bytes 64 bytes 65 bytes to 127 bytes 128 bytes to 255 bytes 256 bytes to 511 bytes 512 bytes to 1023 bytes 1024 bytes to 32700 > 32700 (Oversize)

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Details
Counter Measurement (Cont'd)	
Gap Size Distribution (Tx/Rx)	8 types of gap size setting range
Counter setting	Oversize: 1518 bytes to 32700 bytes (default: 1518) Undersize: 64 bytes (fixed) Sequence Error Detect: On/Off
Test Frame Measurement	
Number of Flows	16
Flow Filter	Test Frame Flow ID, User Defined, User defined and Flow ID User Define field : Destination Address, Source Address, Type Offset :0 to 47 bit / 1 bit step Length :1 to 32 bit / 1 bit step
Tx Measurement Item	Number of Frames, Number of Bytes, Rate
Rx Measurement Item	Number of Frames, Number of Bytes, Rate Latency: Measurement accuracy 100 ns, Resolution 12 ns Current Latency(ns), Minimum Latency(ns), Maximum Latency(ns)
Capture	
Memory Capacity	128 kbytes
Status Display	Trigger
Trigger	Pattern: On/Off (Select one from the following patterns at On.) Good Frame,LFS Signal,RFS Signal,Error Signal, FCS Error,Undersize,Fragment,Oversize, Oversize&FCS Error Timing: 1 shot Trigger Position: Middle
Protocol	MII Data: Idle, Sequence, Start, Terminate, Error, Data, Trigger Data Data: FCS

Table A.5-1 Specifications for 40G Ethernet (Cont'd)

Item	Specifications
No Frame Measurement	
Test Pattern	Tx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off) Square Wave Rx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off)
Error Insertion	Enabled for PRBS test pattern Lane specification: Can specify multiple lanes Timing: Single
Counter	Independent count for each lane Pattern Sync Loss (s) Resolution 100 ns Bit Error Count (bit) Bit Error Rate
Interlane Send PRBS Pattern Phase Error	PRBS31: 21,000 bits PRBS23: 0 bits PRBS15: 0 bits PRBS9: 0 bits PRBS7: 0 bits
Port Setting	
Mode	Normal Loopback
CFP Setting	
Optical Output	On/Off
Status Display	Yes

A.6 Specifications for OTU3

Table A.6-1 Specifications for OTU3 (MD1260A-004)

Item	Specifications
Clock Setting Frequency Measurement	(For OTU3) Frequency measurement: 43 018 413 559 Hz ±200 ppm (For No Frame) Frequency measurement: 10 754 603 390 Hz ±200 ppm × 4 Lanes
Reference Clock	(For OTU3) Internal/External 10 MHz Input/Tx Reference Clock Input /Received (For No Frame) Internal/External 10MHz Input/Tx Reference Clock Input
Monitor	(For OTU3) CDR Unlock Clock Source Loss (For No Frame) CDR Unlock × 4 lanes Clock Source Loss
Transceiver setting	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Rx Power

Table A.6-1 Specifications for OTU3 (Cont'd)

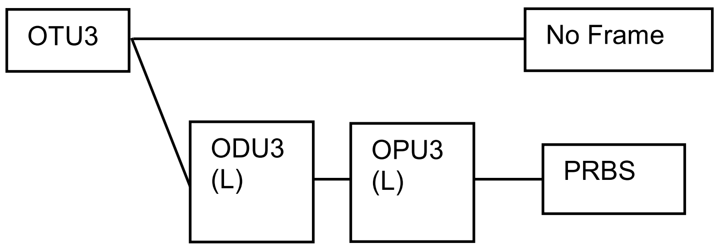
Item	Specifications
OTN Setting Mapping	
Test Pattern	PRBS15, PRBS23, PRBS31 (Invert On/Off) Word16
OTN OH Measurement Transmission OH	OTU3,ODU3,OPU3 (MFAS and parity byte excluded) Decoding setting for each of TTI(SAPI[1]-[15],DAPI[1]-[15]), and FTFL(OIF) is available.
OH Monitor	Multiframe analysis for OTU3/ODU3/OPU3 Header, Payload, PT, TTI, and FTFL

Table A.6-1 Specifications for OTU3 (Cont'd)

Item	Details
Error/Alarm Measurement Counter Alarm Error	 (LLD) LOF Lane (s), OOF (frame), LOR(s), OOR (frame) (OTU) LOF (s), OOF (s, frame), LOM (s), OOM (s, frame) , SM-TIM (frame), SM-BIAE (s, frame), SM-BDI (s, frame), SM-IAE (s, frame) (ODU) ODU-AIS (s, frame), ODU-OCI (s, frame), ODU-LCK (s, frame), PM-TIM (frame) , PM-BDI (s, frame) (TCM1 .. TCM6) TCM-TIM (frame), TCM-BIAE (s, frame), TCM-BDI (s, frame),TCM-IAE (s, frame), TCM-LTC (s, frame) (OPU) PLM (frame), Client-AIS (s, frame) (Test Pattern) Pattern Sync Loss (s) (LLD) FAS-LLD (count) (OTU) FAS (count), SM-BIP8 (count, rate), SM-BEI(count, rate), FEC-Uncorr EBs (count, rate), FEC-Corr Errors (count, rate), FEC-Corr 1s to 0s (count, rate), FEC-Corr 0s to 1s(count, rate) (ODU) PM-BIP8 (count, rate), PM-BEI(count, rate) (TCM1 .. TCM6) TCM-BIP8(count, rate), TCM-BEI(count, rate) (OPU) Bit Errors (count, rate)
Error/Alarm Insertion Alarm Insertion Item	 (LLD) OOF/LOF, OOR/LOR (OTU) OOF/LOF, OOM/LOM, SM-TIM, SM-BIAE, SM-BDI, SM-IAE (ODU) ODU-AIS, ODU-OCI, ODU-LCK, PM-TIM, PM-BDI, (TCM1 .. TCM6) TCM-TIM, TCM-BIAE, TCM-IAE, TCM-BDI, TCM-LTC (OPU) Client-AIS

Table A.6-1 Specifications for OTU3 (Cont'd)

Item	Details
Error/Alarm Insertion (Cont'd) Error insertion Item	(LLD) FAS (OTU) FAS, SM-BIP8, SM-BEI, Uncorrectable Error, Correctable Error (ODU) PM-BIP8, PM-BEI (TCM1 .. TCM6) TCM-BIP8, TCM-BEI (Test Pattern) Bit Error (Others) Bit all (Poisson distribution 1.0E-2 to 9.9E-9, FAS protection availability setting enabled)
Insertion Timing	All Burst : (LLD) 1 to 215,000 (frames) (OTU) 1 to 4,300,000 (frames) Alternate: <table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table>
Lane Specification	Specify Tx insertion lane (0 to 3) for LLD FAS. Can specify multiple lanes
Alarm Detection Release Conditions	This setting cannot be changed from the standard.
LLD Measurement Monitor	Displayed independently for each Rx lane (4 lanes) Marker Map Relative Skew (ns)
Status	Displayed independently for each Rx lane (4 lanes) Skew Stability One display for all lanes ILA/OLA
LLD Skew Generation	0bit to 32,000bit, 1bit Step Can specify multiple lanes

Table A.6-1 Specifications for OTU3 (Cont'd)

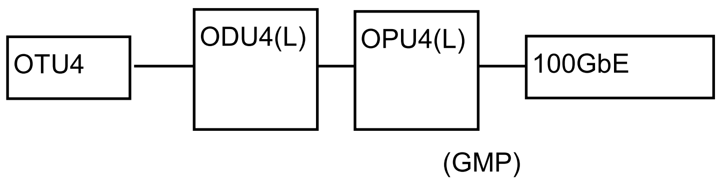
Item	Specifications
LLD Lane Mapping	Can assign lane marker independently to Lane 0 to Lane 3 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descend: In 3–0 sequence Ascend: In 0–3 sequence
OH Capture Target data Trigger Number of frames	 OTU3, ODU3, OPU3 MFAS=0, Error/Alarm, Manual 512
Frame Capture Target data Trigger Number of frames	 Entire OTU3 frame (OH+Payload+FEC) OTU MFAS, Error/Alarm, Manual 18
Port settings Mode Through mode GFEC	 Normal, Loopback, OTN Through Transparent, Analyzed, OH Overwrite Encode On/Off, Decode On/Off
OTN APS Measurement Trigger Max. detection time Measurement resolution Error Free Period	 SM-BIP8, PM-BIP8, ODU-AIS, ODU-OCI, ODU-LCK, OOF, LOF 10 000.0 ms 0.1 ms 1 ms, 10 ms, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 600 ms, 700 ms, 800 ms, 900 ms, 1000 ms
OTN Delay Measurement Mode Measurement resolution	 Single/Repeat 3.03498 μs

Table A.6-1 Specifications for OTU3 (Cont'd)

Item	Details
No Frame Measurement	
Test Pattern	Tx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off) Square Wave Rx: PRBS7, PRBS9, PRBS15, PRBS23, PRBS31 (Invert On/Off)
Error Insertion	Enabled only for Test Pattern PRBS Lane specification: Can specify multiple lanes Timing: Single
Counter	Independent count for each lane Pattern Sync Loss (s) Resolution 100 ns Bit Error Count (bit) Bit Error Rate
CFP Setting	
Optical Output	On/Off
Status Display	Yes

A.7 Specifications for ODU4-100GbE Mapping (MD1260A-005)

Table A.7-1 Specifications for ODU4-100GbE Mapping

Item	Details
Clock Settings	
Frequency measurement	Frequency measurement: 111,809,973,568 Hz ±200 ppm
Reference clock	Internal / External 10 MHz Input / Tx Reference Clock Input / Received *1
Monitor	CDR Unlock,Clock Source Loss
Transceiver Settings	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Reception Power
OTN Settings	
Mapping	
Test Pattern/Client Signal	100 GbE
Payload Offset	±120 ppm

*1: Using Lane3 Rx regeneration clock

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

Item	Details
OTN OH Measurement Transmission OH OH monitor	 OTU4,ODU4,OPU4 (MFAS and parity byte excluded) Decoding setting for each of TTI (SAPI[1]-[15],DAPI[1]-[15]) and FTFL(OIF) is available. Multiframe analysis for OTU4/ODU4/OPU4 Header, Payload, PT, TTI, and FTFL, Stuff monitor
Error/Alarm Measurement Alarm	 (LLD) LOF Lane (s), OOF (frame), LOR(s), OOR (frame) (OTU) LOF (s), OOF (s, frame), LOM (s), OOM (s, frame), SM-TIM(frame), SM-BIAE(s, frame), SM-BDI(s, frame), SM-IAE(s, frame) (ODU) ODU-AIS(s, frame), ODU-OCI(s, frame), ODU-LCK(s, frame), PM-TIM(frame), PM-BDI(s, frame) (TCM1 .. TCM6) TCM-TIM(s, frame), TCM-BIAE(s, frame), TCM-BDI(s, frame), TCM-IAE(s, frame), TCM-LTC(frame) (OPU) PLM(frame), Client-AIS(s, frame), CSF(frame)
Error	(LLD) FAS-LLD (count) (OTU) FAS (count), SM-BIP8 (count, rate), SM-BEI(count, rate) (ODU) PM-BIP8 (count, rate), PM-BEI(count, rate) (TCM1 .. TCM6) TCM-BIP8(count, rate), TCM-BEI(count, rate) (GMP) Rx Inc Over, Rx Dec Over, CRC8 Error, CRC5 Error

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Error/Alarm Insertion
Alarm Insertion
Item</td><td>(LLD)
OOF/LOF, OOR/LOR
(OTU)
OOF/LOF, OOM/LOM, SM-TIM, SM-BDI, SM-IAE
(ODU)
ODU-AIS, ODU-OCI, ODU-LCK, PM-TIM, PM-BDI
(TCM1 .. TCM6)
TCM-TIM, TCM-BIAE, TCM-BDI, TCM-IAE, TCM-LTC
(OPU)
Client-AIS, CSF
(PCS)
High BER</td></tr>
<tr><td>Insertion timing</td><td>All
Burst : (LLD) 1 to 215,000 (frames)
(OTU) 1 to 4,300,000 (frames)
Alternate:
<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD OOF/LOF or OOR/LOR.
Multiple lanes can be specified.</td></tr>
</table>

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Error/Alarm Insertion (Cont'd)
Error insertion</td><td></td></tr>
<tr><td>Item</td><td>(LLD)
FAS
(OTU)
FAS, SM-BIP8, SM-BEI
(ODU)
PM-BIP8, PM-BEI
(TCM1 .. TCM6)
TCM-BIP8, TCM-BEI
(GMP)
CRC8 Error, CRC5 Error, Invalid JC1, Invalid JC2, Invalid JC1&JC2
(Others)
Bit all (Single)</td></tr>
<tr><td>Insertion timing</td><td>Single
Rate (Random) : $10^{-2}/10^{-3}/10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Rate (Constant) : $10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Alternate:
<table>
<tr><th></th><th>LLD</th><th>OTU</th></tr>
<tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr>
<tr><td>Normal</td><td>1 to 215,000 frames</td><td>1 frame to 4,300,000 frames</td></tr>
</table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD FAS errors.
Multiple lanes can be specified.</td></tr>
<tr><td>Alarm Detection Release Condition</td><td>This cannot be changed from the standard.</td></tr>
</table>

Appendix

Appendix A

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

Item	Details
LLD measurement	
Monitor	Monitor independently at Rx Lane (20 lanes) Marker Map Relative Skew (ns units)
Status	Status independently at Rx Lane (20 lanes) Skew Stability One display for all lanes ILA/OLA
LLD Skew Generation	0 bit to 32,000 bit, 1 bit Step Multiple lanes can be specified.
LLD Lane Mapping	Can assign lane marker independently to Lane 0 to Lane 3 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descend: In 19–0 sequence Ascend: In 0–19 sequence

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

Item	Details
PCS layer Measurement	
PCS monitor	Displayed independently for each lane Marker Map
PCS status	Displayed independently for each lane Alignment Marker Lock One display for all lanes Sync Header Lock High-BER Alignment Status
PCS counter	Counted independently for each lane Invalid Alignment Marker Count BIP Error Count One count for all lanes Invalid Sync Header Count Invalid Block Count 66B Error
PCS Error/Alarm insertion	Type: Invalid Sync Header (Select one form 00 or 11) Invalid Alignment Marker (Set M_0 to 0x00 and M4 to 0xFF) BIP Error (Bit inversion of calculation result) High-BER Invalid Block Type (Select one from 0x00, 0x2d, 0x33, or 0x66) 66B Error Timing: Single, Burst, All
Stream Transmission	
Number of streams	1
Status	Stream Send
Display/Setting Units	Rate(%) / Rate(fps) / Rate(Gbit/s) / Gap Size(byte)
Duration	Continuous Repeat (Can specify number of frames: 1 to 1,099,511,627,775)
Data field	All 0, All 1,Word16, PRBS31

Appendix

Appendix A

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

Item	Details
Stream Settings	
Stream control	Sets the gap between frames. Gap Size: 9 bytes to 1,500,017,328,128 bytes (default: 12 bytes) *2 Type: Fixed , Random
Frame size	Frame Size: 60 bytes to 16,376 bytes (default: 64 bytes) Type: Fixed, Random
Frame settings	Ethernet: Preamble Size: 8 bytes MAC Address: Static Ethernet Type: Static
Frame error insertion	Ethernet: FCS Error
Stream error insertion	
LFS	Type: Local Fault / Remote Fault Timing: All
Stream measurement	
Tx	Current Tx Rate (bit/s), Tx Rate (%) Accumulated Tx Good Bytes, Tx Errored Bytes, Transmit Duration (ns) Current (fps)/ Accumulated Tx Good Frames, Tx Oversize, Tx Oversize & FCS Error, Tx Undersize, Tx Fragments, Tx FCS Errors, Tx Broadcast Bytes, Tx Multicast Bytes, Tx Broadcast Frames, Tx Multicast Frames, Tx MPLS-TP, Tx PBB, Tx ARP Request, Tx ARP Reply, Tx PINGv4 Request, Tx PINGv4 Reply, Tx NDP(NS), Tx NDP(NA), Tx PINGv6 Request, Tx PINGv6 Reply Current / Accumulated LF, RF

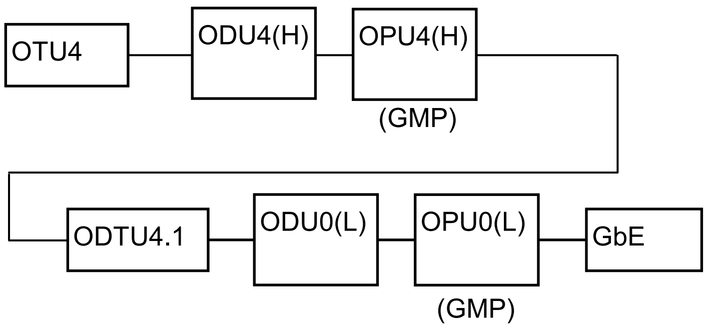
*2: Lower limit of gap is 10 bytes when frame size is 16,001 bytes or more.

Table A.7-1 Specifications for ODU4-100GbE Mapping (Cont'd)

Item	Details
Stream measurement (Cont'd)	
Rx	Current Rx Rate (bit/s), Rx Rate (%) Accumulated Rx Good Bytes, Rx Errored Bytes Current (fps) / Accumulated Rx Good Frames, Rx Oversize, Rx Oversize & FCS Errors, Rx Undersize, Rx Fragments, Rx FCS Errors, Rx Broadcast Bytes, Rx Multicast Bytes, Rx Broadcast Frames, Rx Multicast Frames, Pause Frame, Rx MPLS-TP, Rx PBB, Rx ARP Request, Rx ARP Reply, Rx PINGv4 Request, Rx PINGv4 Reply, Rx NDP(NS), Rx NDP(NA), Rx PINGv6 Request, Rx PINGv6 Reply Current / Accumulated LF, RF, Error Signal
Counter settings	Oversize : 1518 bytes to 16376 bytes Undersize : 64 bytes (fixed)
OH capture	
Target data	OTU4, ODU4, OPU4
Trigger	MFAS=0, Error/Alarm, Manual
Number of frames	512
Frame capture	
Target data	Entire OTU4 frame (OH+Payload+FEC)
Trigger	OTU MFAS, OMFI, Error/Alarm, Manual
Number of frames	18
Port settings	
Mode	Normal, Loopback, OTU Through
Through mode	Transparent,Analyzed,OH Overwrite
GFEC	Encode On/Off
OTN APS measurement	
Trigger	SM-BIP8, PM-BIP8, ODU-AIS, ODU-OCI, ODU-LCK, OOF, LOF
Max. detection time	10 000.0 ms
Measurement resolution	0.1 ms
Error Free Period	1 ms, 10 ms, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 600 ms, 700 ms, 800 ms, 900 ms, 1000 ms
OTN Delay measurement	
Mode	Single/Repeat
Measurement resolution	1.167696 μs

A.8 Specifications for ODTU4.1-ODU0-GbE Mapping (MD1260A-006)

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE

Item	Details
Clock Settings Frequency measurement Reference clock Monitor	 Frequency measurement: 111,809,973,568 Hz ±200 ppm Internal / External 10 MHz Input / Tx Reference Clock Input / Received *1 CDR Unlock,Clock Source Loss
Transceiver Setting	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP Monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Rx Power
OTN Settings Mapping*2	
Test Pattern/Client Signal	GbE over GFP-T, PRBS31 (Invert On/Off), Word16
Payload Offset	High Order: ±40 ppm Low Order: ±120 ppm
ODTU channel selection	TP: Select one from 1 to 80. TS: Select TS that belongs to the selected TP from 1 to 80 arbitrarily.

*1: Using Lane3 Rx regeneration clock

*2: PRBS31 and Word16 in addition to GbE can be generated.

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

Item	Details
OTN OH Measurement Tx OH OH monitor	 OTU4,ODU4,OPU4,ODU0,OPU0 (MFAS and parity byte excluded) Decoding setting for each of TTI(SAPI[1]-[15],DAPI[1]-[15]) and FTFL(OIF) is available. Multiframe analysis for OTU4/ODU4/OPU4 Header, Payload, PT, TTI, and FTFL, Stuff monitor
Error/Alarm Measurement Alarm	 (LLD) LOF Lane (s), OOF (frame), LOR(s), OOR (frame) (OTU) LOF (s), OOF (s, frame), LOM (s), OOM (s, frame), SM-TIM(frame), SM-BIAE(s, frame), SM-BDI(s, frame), SM-IAE(s, frame) (ODU) ODU-AIS(s, frame), ODU-OCI(s, frame), ODU-LCK(s, frame), PM-TIM(frame), PM-BDI(s, frame), PLM(frame), LOFLOM(s) (TCM1 .. TCM6) TCM-TIM(s, frame), TCM-BIAE(s, frame), TCM-BDI(s, frame), TCM-IAE(s, frame), TCM-LTC(frame) (OPU) PLM(frame), Client-AIS(s, frame), CSF(frame) (GFP-T) CSF (s,), SSF(s) (Test Pattern) *3 Pattern Sync Loss (s)
Error	(LLD) FAS-LLD (count) (OTU) FAS (count), SM-BIP8 (count, rate), SM-BEI(count, rate), FEC-Uncorr EBs (count, rate), FEC-Corr Errors (count, rate), FEC-Corr 1s to 0s (count, rate), FEC-Corr 0s to 1s(count, rate) (ODU) PM-BIP8 (count, rate), PM-BEI(count, rate) (TCM1 .. TCM6) TCM-BIP8(count, rate), TCM-BEI(count, rate) (OPU) Bit Errors (count, rate) (GMP) Rx Inc Over, Rx Dec Over, CRC8 Error, CRC5 Error (GFP-T) Superblock CRC, Correctable cHEC, Uncorrectable cHEC Correctable tHEC, Uncrrectable tHEC, CSF Signal, CSF Sync

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Error (Cont'd)</td><td>(Test Pattern) *3
Bit Errors (count, rate)</td></tr>
<tr><td>Status display</td><td>(OPU)
MSIM
(GFP-T)
Invalid GFP-T Frame</td></tr>
<tr><td>Error/Alarm insertion
Alarm insertion
Item</td><td>

(LLD)
OOF/LOF, OOR/LOR
(OTU)
OOF/LOF, OOM/LOM, SM-TIM, SM-BDI, SM-IAE
(ODU)
ODU-AIS, ODU-OCI, ODU-LCK, PM-TIM, PM-BDI, OOF/LOF, OOM/LOM
(TCM1 .. TCM6)
TCM-TIM, TCM-BIAE, TCM-BDI, TCM-IAE, TCM-LTC
(OPU)
Client-AIS, CSF</td></tr>
<tr><td>Insertion timing</td><td>All
Burst : (LLD) 1 to 215,000 (frames)
(OTU) 1 to 4,300,000 (frames)
Alternate:<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD OOF/LOF or OOR/LOR.
Multiple lanes can be specified.</td></tr>
</table>

*3: In the case of the PRBS mapping

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Error/Alarm insertion (Cont'd)
Error insertion
Item</td><td>

(LLD)
FAS
(OTU)
FAS, SM-BIP8, SM-BEI
(ODU)
PM-BIP8, PM-BEI
(TCM1 .. TCM6)
TCM-BIP8, TCM-BEI
(GMP)
CRC8 Error, CRC5 Error, Invalid JC1, Invalid JC2, Invalid JC1&JC2
(GFP-T, Ethernet, Test Pattern)
Superblock CRC Error, cHEC Error, tHEC Error, 10B Error, PRBS Bit Error
(Others)
Bit all (Single)</td></tr>
<tr><td>Insertion timing</td><td>Single
Rate (Random) : $10^{-2}/10^{-3}/10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Rate (Constant) : $10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Alternate:
<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD FAS errors.
Multiple lanes can be specified.</td></tr>
<tr><td>Alarm Detection Release Condition</td><td>This cannot be changed from the standard.</td></tr>
</table>

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

Item	Details
LLD measurement Monitor Status LLD Skew Generation	 Monitor independently at Rx Lane (20 lanes) Marker Map Relative Skew (ns units) Status independently at Rx Lane (20 lanes) Skew Stability One display for all lanes ILA/OLA 0 bit to 32,000 bit, 1 bit Step Multiple lanes can be specified.
LLD lane Mapping	Can assign lane marker independently to Lane 0 to Lane 19 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descent: In 19–0 sequence Ascent: In 0–19 sequence
Stream transmission Number of streams Status Display/Setting Units Duration Data field	 1 Stream Send Rate(%) / Rate(fps) / Rate(Gbit/s) / Gap Size(byte) Continuous Repeat (Can specify number of frames:1 to 1,099,511,627,775) All 0, All 1,Word16, PRBS31
Stream settings Stream control Frame size Frame setting Frame error insertion	 Sets the gap between frames. Gap Size: 9 bytes to 1,500,017,328,128 bytes (Default: 12 bytes) *4 Type: Fixed , Random Frame Size: 60 bytes to 16,376 bytes (Default: 64 bytes) Type: Fixed, Random Ethernet: Preamble Size: 8 bytes MAC Address: Static Ethernet Type: Static Ethernet: FCS Error

*4: Lower limit of gap is 10 bytes when frame size is 16,001 bytes or more.

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

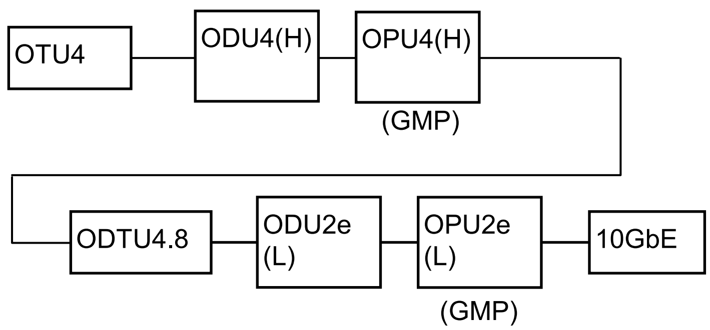
Item	Details
Stream error insertion LFS	 Type: Local Fault / Remote Fault Timing: All
Stream measurement Tx	 Current Tx Rate (bit/s), Tx Rate (%) Accumulated Tx Good Bytes, Tx Errored Bytes Current (fps)/ Accumulated Tx Good Frames, Tx Oversize, Tx Oversize & FCS Errors, Tx Undersize, Tx Fragments, Tx FCS Errors
Rx	Current Rx Rate (bit/s), Rx Rate (%) Accumulated Rx Good Bytes, Rx Errored Bytes Current (fps) / Accumulated Rx Good Frames, Rx Oversize, Rx Oversize & FCS Errors, Rx Undersize, Rx Fragments, Rx FCS Errors
Counter setting	Oversize: 1518 to 16376 bytes Undersize: 64 bytes (Fixed)
OH capture Target data Trigger Number of frames	 OTU4, ODU4, OPU4, ODU0, OPU0 MFAS=0, Error/Alarm, Manual 512
Frame capture Target data Trigger Number of frames	 Entire OTU4 frame (OH+Payload+FEC) OTU MFAS, OMFI, Error/Alarm, Manual 18

Table A.8-1 Specifications for ODTU4.1-ODU0-GbE (Cont'd)

Item	Details
Port settings Mode Through mode GFEC GbE Auto Negotiation	 Normal,Loopback,OTN Through Transparent, Analyzed, OH Overwrite Encode On/Off, Decode On/Off On/Off
OTN APS measurement Trigger Max. detection time Measurement resolution Error Free Period	 SM-BIP8, PM-BIP8, ODU-AIS, ODU-OCI, ODU-LCK, OOF, LOF 10 000.0 ms 0.1 ms 1 ms, 10 ms, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 600 ms, 700 ms, 800 ms, 900 ms, 1000 ms
OTN Delay measurement Mode Measurement resolution	 Single/Repeat 1.167696 μs

A.9 Specifications for ODTU4.8-ODU2e-10GbE Mapping (MD1260A-007)

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE

Item	Details
Clock settings	
Frequency measurement	Frequency measurement: 111,809,973,568 Hz ± 200 ppm
Reference clock	Internal / External 10 MHz Input / Tx Reference Clock Input / Received *1
Monitor	CDR Unlock,Clock Source Loss
Transceiver settings	TX Voltage Output Differential (VOD): 0 to 6 Pre-Emphasis First Post Tap: 0 to 31 Pre-Emphasis Pre Tap: –15 to 15 Pre-Emphasis Second Post Tap: –15 to 15 RX Equalizer DC gain: 0 to 4 Equalizer Control: 0 to 15
CFP monitor	Reads and displays CFP MDIO register value LOS, Programmable Alarm1,Programmable Alarm2, Programmable Alarm3,Global Alarm, Rx Power
OTN settings	
Mapping *2	
Test Pattern/Client Signal	10GbE over PCS, PRBS31 (Invert On/Off), Word16
Payload/Offset	±120 ppm
ODTU channel selection	TP: Select one from 1 to 10. TS: Select TS that belongs to the selected TP from 1 to 80 arbitrarily.

*1: Using Lane3 Rx regeneration clock

*2: PRBS31 and Word16 in addition to 10GbE can be generated.

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

Item	Details
OTN OH measurement	
Tx OH	OTU4,ODU4,OPU4,ODU2e,OPU2e (MFAS and parity byte excluded) Decoding setting for each of TTI(SAPI[1]-[15],DAPI[1]-[15]) and FTFL(OIF) is available.
OH monitor	Multiframe analysis for OTU4/ODU4/OPU4/ODU2e/OPU2e Header, Payload, PT, TTI, and FTFL, Stuff monitor
Error/Alarm measurement	
Alarm	(LLD) LOF Lane (s), OOF (frame), LOR(s), OOR (frame) (OTU) LOF (s), OOF (s, frame), LOM (s), OOM (s, frame), SM-TIM (frame), SM-BIAE (s, frame), SM-BDI (s, frame), SM-IAE (s, frame) (ODU) ODU-AIS (s, frame), ODU-OCI (s, frame), ODU-LCK (s, frame), PM-TIM (frame), PM-BDI (s, frame), LOFLOM (s) (TCM1 .. TCM6) TCM-TIM (s, frame), TCM-BIAE (s, frame), TCM-BDI (s, frame), TCM-IAE (s, frame), TCM-LTC (frame) (OPU) PLM (frame), Client-AIS (s, frame), CSF (frame) (Test Pattern) *3 Pattern Sync Loss (s)
Error	(LLD) FAS-LLD (count) (OTU) FAS (count), SM-BIP8 (count, rate), SM-BEI (count, rate), FEC-Uncorr EBs (count, rate), FEC-Corr Errors (count, rate), FEC-Corr 1s to 0s (count, rate), FEC-Corr 0s to 1s(count, rate) (ODU) PM-BIP8 (count, rate), PM-BEI (count, rate) (TCM1 .. TCM6) TCM-BIP8 (count, rate), TCM-BEI (count, rate) (GMP) Rx Inc Over, Rx Dec Over, CRC8 Error, CRC5 Error (Test Pattern) *3 Bit Errors (count, rate)

*3: In the case of the PRBS mapping

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Status display</td><td>(OPU)
MSIM</td></tr>
<tr><td>Error/Alarm Insertion
Alarm insertion
Item</td><td>(LLD)
OOF/LOF, OOR/LOR
(OTU)
OOF/LOF, OOM/LOM, SM-TIM, SM-BDI, SM-IAE
(ODU)
ODU-AIS, ODU-OCI, ODU-LCK, PM-TIM, PM-BDI, OOF/LOF, OOM/LOM
(TCM1 .. TCM6)
TCM-TIM, TCM-BIAE, TCM-BDI, TCM-IAE, TCM-LTC
(OPU)
Client-AIS, CSF
(PCS)
High BER</td></tr>
<tr><td>Insertion timing</td><td>All
Burst : (LLD) 1 to 215,000 (frames)
(OTU) 1 to 4,300,000 (frames)
Alternate:
<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD OOF/LOF or OOR/LOR.
(Multiple lanes can be specified.)</td></tr>
</table>

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

<table>
<tr><th>Item</th><th>Details</th></tr>
<tr><td>Error/Alarm insertion (Cont'd)
Error insertion</td><td></td></tr>
<tr><td>Item</td><td>(LLD)
FAS
(OTU)
FAS, SM-BIP8, SM-BEI
(ODU)
PM-BIP8, PM-BEI
(TCM1 .. TCM6)
TCM-BIP8, TCM-BEI
(GMP)
CRC8 Error, CRC5 Error, Invalid JC1, Invalid JC2, Invalid JC1&JC2
(Others)
Bit all (Single), PRBS Bit Error</td></tr>
<tr><td>Insertion timing</td><td>Single
Rate (Random) : $10^{-2}/10^{-3}/10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Rate (Constant) : $10^{-4}/10^{-5}/10^{-6}/10^{-7}/10^{-8}/10^{-9}$
Alternate:<table><tr><th></th><th>LLD</th><th>OTU</th></tr><tr><td>Alarm</td><td>0 to 215,000 (frames)</td><td>0 to 4,300,000 (frames)</td></tr><tr><td>Normal</td><td>1 to 215,000 (frames)</td><td>1 to 4,300,000 (frames)</td></tr></table></td></tr>
<tr><td>Lane specified</td><td>Specify Tx insertion lane (0 to 19) for LLD FAS errors.
(Multiple lanes can be specified.)</td></tr>
<tr><td>Alarm Detection Release Condition</td><td>This cannot be changed from the standard.</td></tr>
</table>

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

Item	Details
LLD Measurement Monitor Status LLD Skew Generation	 Monitor independently at Rx Lane (20 lanes) Marker Map Relative Skew (ns units) Status independently at Rx Lane (20 lanes) Skew Stability One display for all lanes ILA/OLA 0 bit to 32,000 bit, 1 bit Step Multiple lanes can be specified.
LLD Lane Mapping	Can assign lane marker independently to Lane 0 to Lane 19 (Can set overlapping lanes) Mapping types Odd/Even: Switches odd and even lanes for default setting Random: Random with no overlap Define: User defined (can set overlapping lanes) Descent: In 19–0 sequence Ascent: In 0–19 sequence
PCS layer Measurement PCS status PCS counter PCS Error/Alarm insertion	 Sync Header Lock High-BER Invalid Sync Header Count Invalid Block Count 66B Error Type: Invalid Sync Header (Select form 00 or 11) Invalid Alignment Marker (Set M0 to 0x00 and M4 to 0xFF) BIP Error (Bit inversion of calculation result) High-BER Invalid Block Type 66B Error Timing: Single, Burst, All

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

Item	Details
Stream Transmission	
Number of streams	1
Status	Stream Send
Display/Setting units	Rate(%) / Rate(fps) / Rate(Gbit/s) / Gap Size(byte)
Duration	Continuous Repeat (Can specify number of frames: 1 to 1,099,511,627,775)
Data field	All 0, All 1, Word16, PRBS31
Stream Settings	
Stream control	Sets the gap between frames. Gap Size: 9 bytes to 1,500,017,328,128 bytes (Default: 12 bytes) *2 Type: Fixed , Random
Frame size	Frame Size: 60 bytes to 16,376 bytes (Default: 64 bytes) Type: Fixed, Random
Frame settings	Ethernet: Preamble Size: 8 bytes MAC Address: Static Ethernet Type: Static
Frame error insertion	Ethernet: FCS Error
Stream Error Insertion	
LFS	Type: Local Fault / Remote Fault Timing: All

*2: Lower limit of gap is 10 bytes when frame size is 16,001 bytes or more.

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

Item	Details
Stream measurement	
Tx	Current Tx Rate (bit/s), Tx Rate (%) Accumulated Tx Good Bytes, Tx Errored Bytes, Transmit Duration (ns) Current (fps)/ Accumulated Tx Good Frames, Tx Oversize, Tx Oversize & FCS Error, Tx Undersize, Tx Fragments, Tx FCS Errors,Tx Broadcast Bytes, Tx Multicast Bytes, Tx Broadcast Frames, Tx Multicast Frames, Tx MPLS-TP, Tx PBB, Tx ARP Request, Tx ARP Reply, Tx PINGv4 Request, Tx PINGv4 Reply, Tx NDP(NS), Tx NDP(NA), Tx PINGv6 Request, Tx PINGv6 Reply Current / Accumulated LF, RF
Rx	Current Rx Rate (bit/s), Rx Rate (%) Accumulated Rx Good Bytes, Rx Errored Bytes Current (fps) / Accumulated Rx Good Frames, Rx Oversize, Rx Oversize & FCS Errors, Rx Undersize, Rx Fragments, Rx FCS Errors Rx Broadcast Bytes, Rx Multicast Bytes, Rx Broadcast Frames, Rx Multicast Frames, Pause Frame, Rx MPLS-TP, Rx PBB, Rx ARP Request, Rx ARP Reply, Rx PINGv4 Request, Rx PINGv4 Reply, Rx NDP(NS), Rx NDP(NA), Rx PINGv6 Request, Rx PINGv6 Reply Current / Accumulated Bit Errors (bit), Bit Error (Rate), Pattern Sync Loss (s), LF, RF, Trigger Condition, Error Signal
Counter setting	Oversize : 1518 bytes to 16376 bytes Undersize : 64 bytes (Fixed)

Table A.9-1 Specifications for ODTU4.8-ODU2e-10GbE (Cont'd)

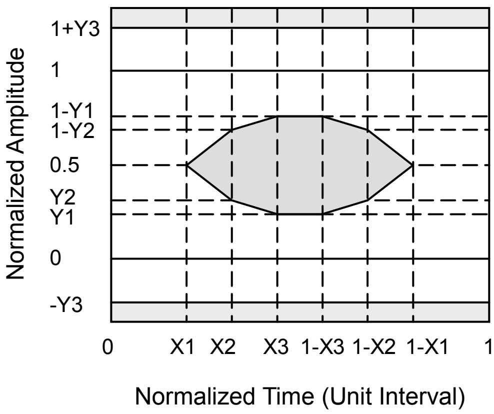
Item	Details
OH capture	
Target data	OTU4, ODU4, OPU4, ODU2e, OPU2e
Trigger	MFAS=0, Error/Alarm, Manual
Number of frames	512
Frame capture	
Target data	Entire OTU4 frame (OH+Payload+FEC)
Trigger	OTU MFAS, OMFI, Error/Alarm, Manual
Number of frames	18
Port settings	
Mode	Normal,Loopback,OTU Through
Through mode	Transparent, Analyzed, OH Overwrite
GFEC	Encode On/Off, Decode On/Off
OTN APS measurement	
Trigger	SM-BIP8, PM-BIP8, ODU-AIS, ODU-OCI, ODU-LCK, OOF, LOF
Max. detection time	10 000.0 ms
Measurement resolution	0.1 ms
Error Free Period	1 ms, 10 ms, 100 ms, 200 ms, 300 ms, 400 ms, 500 ms, 600 ms, 700 ms, 800 ms, 900 ms, 1000 ms
OTN Delay measurement	
Mode	Single/Repeat
Measurement resolution	1.167696 μs

A.10 Specifications for CFP Module

A.10.1 CFP 100GBASE-LR4

Table A.10.1-1 Specifications for CFP 100GBASE-LR4

Item	Details
Model Name	G0259A
Conformable Fiber	Single mode fiber (ITU-T G.652)
Rate per Lane	25.78125 GBd ±100ppm
Optical Connector	SC
Laser Safety	Class1 (IEC60825-1, 21 CFR 1040.10 Laser Safety Notice 50)
Transmission Part *1	
Wavelength	1294.5 nm to 1296.6 nm 1299.0 nm to 1301.1 nm 1303.5 nm to 1305.6 nm 1308.1 nm to 1310.2 nm
SMSR	≥30 dB
Total optical output	≤10.5 dBm
Averaged optical output per lane *2	–4.3 to 4.5 dBm
Light amplitude per lane (OMA) *3	–1.3 to 4.5 dBm
Extinction ratio	≥4 dB
Return loss tolerance	≤20 dB
Eye mask	{X1, X2, X3, Y1, Y2, Y3 } : {0.25, 0.4, 0.45, 0.25, 0.28, 0.4}



*1: An optical signal of each lane is multiplexed by WDM in this module and output from SC connector.

*2: Average launch power, each lane (min.) is informative and not principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

*3: Even if the TDP < 1dB, the OMA (min) must exceed this value.

Table A.10.1-1 Specifications for CFP 100GBASE-LR4 (Cont'd)

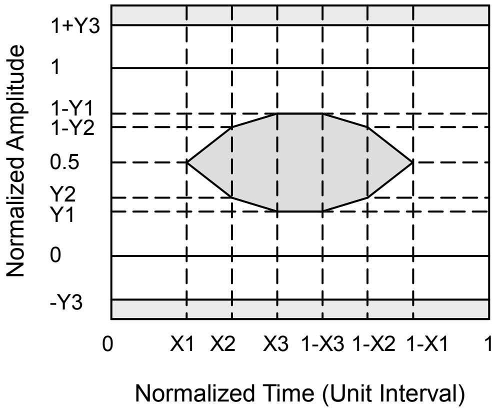
Item	Details
Reception Part	
Wavelength	1294.5 nm to 1296.6 nm 1299.0 nm to 1301.1 nm 1303.5 nm to 1305.6 nm 1308.1 nm to 1310.2 nm
Maximum optical input*4	≥5.5 dBm
Averaged received light level per lane*5	–10.6 dBm to 4.5 dBm
Received light level per lane (OMA)	≤4.5 dBm
Return loss	≤–26 dB
Received stress sensitivity per lane (OMA)	≤–6.8 dBm
Power	≤34 W
Size	82×144.75×13.6mm

*4: The receiver shall be able to tolerate, without damage, continuous exposure an optical input signal having this average power level.

*5: Average receiver power, each lane(min.) is informative and not principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

A.10.2 CFP 40GBASE-LR4

Table A.10.2-1 Specifications for CFP 40GBASE-LR4

Item	Details
Model Name	G0259A
Conformable Fiber	Single mode fiber (ITU-T G.652)
Rate per Lane	10.3125 GBd ±100 ppm
Optical Connector	SC
Laser Safety	Class1 (IEC60825-1, 21 CFR 1040.10 Laser Safety Notice 50)
Transmission Part *1	
Wavelength	1264.5 nm to 1277.5 nm 1284.5 nm to 1297.5 nm 1304.5 nm to 1317.5 nm 1324.5 nm to 1337.5 nm
SMSR	≥30 dB
Total optical output	≤8.3 dBm
Averaged optical output per lane*2	–7 dBm to 2.3 dBm
Light amplitude per lane (OMA)*3	–4 dBm to 3.5 dBm
Extinction ratio	≥3.5 dB
Return loss tolerance	≤20 dB
Eye mask	{X1, X2, X3, Y1, Y2, Y3 } : {0.25, 0.4, 0.45, 0.25, 0.28, 0.4}  Using 2.114 GHz 4th Bessel-Thomson filter

*1: An optical signal of each lane is multiplexed by WDM in this module and output from SC connector.

*2: Average launch power, each lane (min.) is informative and not principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

*3: Even if the TDP < 1dB, the OMA (min) must exceed this value.

Table A.10.2-1 Specifications for CFP 40GBASE-LR4 (Cont'd)

Item	Details
Reception Part	
Wavelength	1264.5 nm to 1277.5 nm 1284.5 nm to 1297.5 nm 1304.5 nm to 1317.5 nm 1324.5 nm to 1337.5 nm
Maximum optical input*4	≥3.3 dBm
Averaged received light level per lane*5	–13.7 dBm to 2.3 dBm
Received light level per lane (OMA)	≤3.4 dBm
Return loss	≤–26 dB
Received stress sensitivity per lane (OMA)	≤–9.9 dBm
Power	≤8 W
Size	82×144.75×13.6 mm

*4: The receiver shall be able to tolerate, without damage, continuous exposure an optical input signal having this average power level.

*5: Average receiver power, each lane(min.) is informative and not principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

Appendix B Data Input Method

The measurement setting item selection, numeric data, and character data are input from the panel displayed on the screen.
The displayed panel varies depending on the input data types.

Arrow Key Entry Panel

Touch the numeric data area when entering the numeric data of the bit rate or power voltage.
The arrow key entry panel as shown in Figure B-1 is displayed.
Touch the right and left arrow keys and select the line to change the value.
Touch the up and down arrow keys or scroll the mouse up and down to change the value.

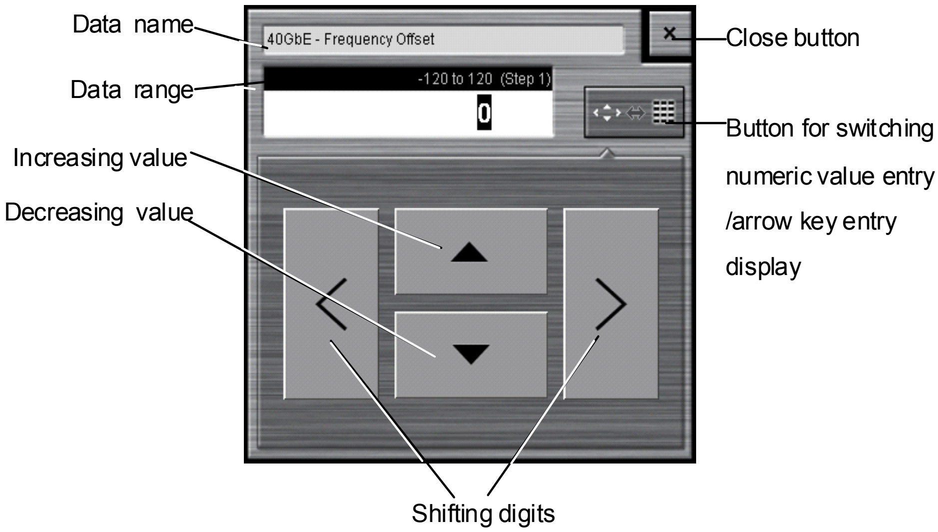


Figure B-1 Arrow Key Entry Panel

Numeric value entry panel

Touch the button for switching the display of the numeric value entry/ arrow key entry panel as shown in Figure B-1, and then the numeric value entry panel as shown in Figure B-2 is displayed. The key type, unit and input range displayed on the panel vary depending on the data. Touch the arrow key entry panel display button, and then the arrow key entry panel as shown in Figure B-1 is displayed.

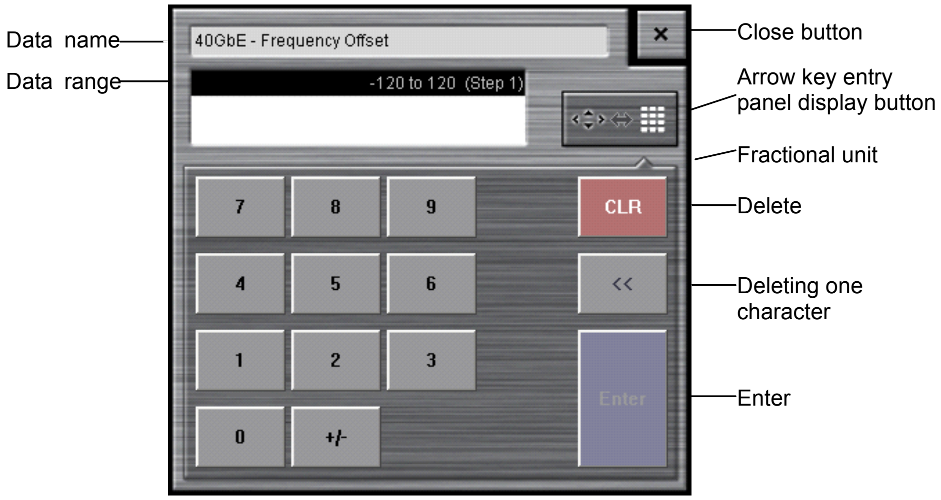


Figure B-2 Numeric Value Entry Panel

Software Keyboard

When entering character string data such as file name, touch the exact character string directly. The keyboard as shown in Figure B-3 is displayed, and then touch the key and enter the character. If you touch [Shift] or [Caps] once, all keys are locked. To unlock them, touch [Shift] or [Caps]　again.

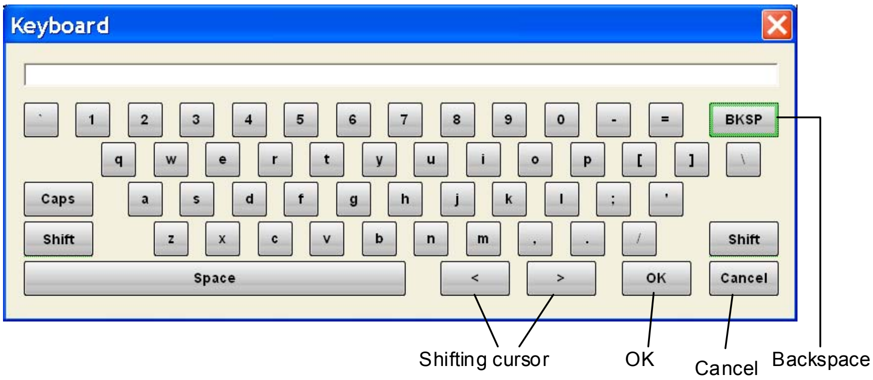


Figure B-3　Software Keyboard

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This product includes the following software.

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Package Name	License
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Ruby	GPL
exerb	GPL
NSIS	zlib/libpng
Lua	MIT

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The Ruby source code is available on the following website:
http://www.ruby-lang.org/en/downloads/

The NSIS source code is available on the following website:
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D.1 Common Setting

Table D.1-1 System Menu

Item		Initial Value
Log*1		
	Timing	Whenever an error occurs
	File Prefix	Log
	(Measurement) *2	Off

Note:

1. The value is not initialized at the [Initialize] of the system menu.
2. The measurement item varies with the application.

Table D.1-2 Operation Area

Item	Initial Value
Sync*	off
Stream	Stop
Error/Alarm Ins	Stop
Counter	Start
Capture *	Stop

Note:

The value is not initialized at the [Initialize] of the system menu.

Table D.1-3 Clock

Item	Initial Value
Frequency Offset	0 ppm
Clock Source	Internal
Tx Reference Clock Output	1/64
10 MHz Output	Internal 10 MHz

Table D.1-4 MDIO

Item	Initial Value
Address	0000
Hex	0000

Table D.1-5 Chart

Item		Initial Value
Counter		
	Current/Accumulated	Accumulated

D.2 40GbE and 100GbE Application

Table D.2-1 Stream (When Frame BERT is Off)

Item				Initial Value
Control Unit				Gap Size (byte)
Duration				Repeat
	count			1
Test Pattern				PRBS31
Transmission Type				Sequential
Enable/Disable				
	Stream 1 to 16			1:On, 2 to 16:Off
MAC Resolve				
	Resolve Type			Resolve and Ping
	Resolve Target			Destination IP Address
	Gateway IP Address (IPv4)			192.168.0.0
	Gateway IP Address (IPv6)			::0
	Stream			All Stream
	Ping Setting			
		ARP/NS Count		4
		ARP,NS/NA Timeout		3
		Ping Count		4
		Ping Timeout		3
		Payload		Default
Control/Header				
	Auto			On
	Control			
		Frame Size		
			Type	Fixed
			Size	64
		Gap Size		
			Type	Fixed
			Size	12.00000
		Burst		Off
			Frame	1
			Gap	12
		Number of Frames		1

Table D.2-1 Stream (When Frame BERT is Off) (Cont'd)

Item				Initial Value
Control/Header (Cont'd)				
	Header			
		Frame Format		Ethernet
		IP		Off
			Source Address	192.168.0.0
			Destination Address	192.168.0.0
			TOS	00
			Protocol	17
FCS Error Insertion				
	Stream 1 to 16			Off
Test Frame				
	Enable			
		Stream 1 to 16		On
	Flow ID			
		Stream 1		0
		Stream 2		1
		Stream 3		2
		Stream 4		3
		Stream 5		4
		Stream 6		5
		Stream 7		6
		Stream 8		7
		Stream 9		8
		Stream 10		9
		Stream 11		10
		Stream 12		11
		Stream 13		12
		Stream 14		13
		Stream 15		14
		Stream 16		15

*: Refer to Table D.2-2 for the header initial value.

Table D.2-2 Header of Stream (When Frame BERT is Off) (Cont'd)

Item			Initial Value
MPLS-TP			
	Destination MAC Address		000000-000000,Fixed
	Source MAC Address		000000-000000,Fixed
	Type		8847-MPLS Unicast
	MPLS Tags		
		Label	00010,Fixed
		Exp	0,Fixed
		TTL	128,Fixed
PBB			
	Destination MAC Address		000000-000000,Fixed
	Source MAC Address		000000-000000,Fixed
	PBB Tags		
		B-TAG PCP	0,Fixed
		B-TAG DEI	0
		B-TAG VID	0,Fixed
		I-TAG PCP	0,Fixed
		I-TAG DEI	0
		I-TAG SID	0,Fixed
		I-TAG reserved	0
Ethernet			
	Destination MAC Address		000000-000000,Fixed
	Source MAC Address		000000-000000,Fixed
	VLAN (Outer)		Off
		TPID	88A8
		PCP	0,Fixed
		VID	0,Fixed
	VLAN (Inner)		Off
		TPID	8100
		PCP	0,Fixed
		VID	0,Fixed
	Type		0000

Table D.2-2 Header of Stream (When Frame BERT is Off) (Cont'd)

Item			Initial Value
MPLS			
	MPLS Tags		
		Label	00010,Fixed
		Exp	0,Fixed
		TTL	128,Fixed
IPv4			
	Source MAC Address		192.168.0.0,Fixed
	Destination MAC Address		192.168.0.0,Fixed
	TOS		00000000,Fixed
	TTL		64,Fixed
	Protocol		17-UDP,Fixed
IPv6			
	Source MAC Address		0000:0000:0000:0000:0000:0000:0000:0000,Fixed
	Destination MAC Address		0000:0000:0000:0000:0000:0000:0000:0000,Fixed
	Traffic Class		00000000,Fixed
	Flow Label		00000,Fixed
	Hop Limit		255,Fixed
	Next Header		59-IPv6-NoNxt

Table D.2-2 Header of Stream (When Frame BERT is Off) (Cont'd)

Item	Initial Value
ARP	
Sender MAC Address	000000-000000,Fixed
Sender IP Address	192.168.0.0,Fixed
Target MAC Address	000000-000000,Fixed
Target IP Address	192.168.0.0,Fixed
Operation	1-ARP Request,Fixed
ICMPv4	
Type	0-Echo Reply
Code	0x00,Fixed
Identifier	0x0000,Fixed
Sequence No.	0x0000,Fixed
ICMPv6	
Type	128 Echo Request *1 135 Neighbor Solicitation *2 136 Neighbor Advertisement *3
Code	0x00,Fixed
Identifier *1	0x0000,Fixed
Sequence No. *1	0x0000,Fixed
Reserve *2	00000000000000000000000000000000
Target Address *2	0000:0000:0000:0000:0000 :0000:0000:0000,Fixed
Source Link Layer Address *2	000000-000000,Fixed
Router *3	0
Solicited *3	0
Override *3	0
Reserve *3	00000000000000000000000000000000
Target Address *3	0000:0000:0000:0000:0000 :0000:0000:0000,Fixed
Source Link Layer Address *3	000000-000000,Fixed

*1: Echo is selected in frame format.

*2: NS is selected in frame format.

*3: NA is selected in frame format.

Table D.2-3 Stream (When Frame BERT is On)

Item		Initial Value
Source MAC Address		000000-000000
Destination MAC Address		000000-000000
Ethernet Type		0000
Error Insertion		None
Frame Size		
	Control	Fixed
	Size	64 byte
Stream Control		
	Control Unit	Gap Size (byte)
	Size	12.0000
	Control	Fixed

Table D.2-4 Lane Mapping

Item		Initial Value
Tx Lane		
	0	Lane 0
	1	Lane 1
	2	Lane 2
	3	Lane 3
	4 *	Lane 4
	5 *	Lane 5
	6 *	Lane 6
	7 *	Lane 7
	8 *	Lane 8
	9 *	Lane 9
	10 *	Lane 10
	11 *	Lane 11
	12 *	Lane 12
	13 *	Lane 13
	14 *	Lane 14
	15 *	Lane 15
	16 *	Lane 16
	17 *	Lane 17
	18 *	Lane 18
	19 *	Lane 19

*: Only 100GbE

Table D.2-5 Relative Skew

Item		Initial Value
Skew		0*1
Lane		Tx Lane
Enable		
	Lane 0	On
	Lane 1 to 3 *2	Off

*1: bit unit

*2: Any of Lane 0 to 19 is set when using the 00GbE application.

Table D.2-6 Error/Alarm

Item		Initial Value
Mode		PCS Error
Pattern		Invalid Sync Header (00)
Timing		Single
	Count	1
Lane		0:On 1 to 3:Off (40GbE) 1 to 19:Off (100GbE)

Table D.2-7 Counter/Capture

Item	Initial Value
Oversize	1518
Stop Counting when Sequence Error Detected	Off
Gap Size Counter	2
Gap Size Counter step	1
Trigger Condition	Any Frame
Chart Line 1	Tx Good Frames
Chart Line 1 Lane	0
Chart Line 2	Rx Good Frames
Chart Line 2 Lane	0
Chart Bar	Rx Errored Frames
Chart Bar Lane	0

Table D.2-8 Port

Item		Initial Value
Mode		Normal
Frame BERT		Off
LFS Reply		Off
Flow Control		Off
Rx MPLS-TP Control Word		On
VLAN		
	Number of Filter	2
	VLAN Stack	No.1:2, No.2:1
	VLAN1 TPID	No.1:0x88A8, No.2:0x8100
	VLAN2 TPID	No.1:0x8100, No.2:-

Table D.2-9 Test Frame Tab/ Distribution Tab/All Lanes Tab/ Individual Tab

Item	Initial Value
Current/Accumulated	Current/Accumulated

Table D.2-10 Individual Tab

Item	Initial Value
Counter/Rate	Counter

Table D.2-11 Protocol Tab

Item			Initial Value
ARP/ICMP			
	Enable/Disable		000000-000000,Fixed
		ARP/NS Reply	Stream 1 to 16: Off
		Ping Reply	Stream 1 to 16: Off
		GARP Send	Stream 1 to 16: Off
	Gratuitous ARP		
		Mode	Single
		Interval	10
		ARP Type	Request
Ping			
	IP Mode		IPv4
	Send Count		4
	Packet Size		64, Increment Off
	Step		1
	Source MAC Address		000000-000000
	Source IP Address (IPv4)		192.168.0.0
	Source IP Address (IPv6)		::0
	Target MAC Address		000000-000000
	Target IP Address (IPv4)		192.168.0.0
	Target IP Address (IPv6)		::0
	VLAN Stack		0
	VLAN (Outer)		Off
		TPID	88A8
		PCP	0
		VID	0
	VLAN (Inner)		Off
		TPID	8100
		PCP	0
		VID	0
	Timeout		10
	Payload Type		0/1 bit

D.3 OTU3 and OTU4 Application

Table D.3-1 Test Pattern

Item	Initial Value
Payload Data	PRBS31
Invert	Off

Table D.3-2 Stream *

Item		Initial Value
Frame Settings		
	Source MAC Address	000000-000000
	Destination MAC Address	000000-000000
	Ethernet Type	0000
	Test Pattern	PRBS31
	Error Insertion	None
Frame Size		Fixed, 64 byte
Stream Control		
	Type	Fixed
	Unit	Gap size (byte), 12 byte
	Duration	Continuous

*: Only for MD1260A-005/006/007

Table D.3-3 GFP-T *

Item	Initial Value
PTI	000-User data
UPI	0000 0110
cHEC Presync Times	1
CSF Recovery	3
CSF Replacement	Ethernet Block Replacement

*: Only for MD1260A-006

Table D.3-4 TP/TS

Item	Initial Value
Combination	Off
Rx Mode	Manual
Tx Main TP	1 (MD1260A-006) 1,2,3,4,5,6,7,8 (MD1260A-007)
Dummy	Copy

Table D.3-5 OH Preset

Item		Initial Value
SM		
	BEI/BIAE	0000
	BDI	0
	IAE	0
	RES	0
PM		
	BEI	0000
	BDI	0
	STAT	000
TCM		
	BEI/BIAE	0000
	BDI	0
	STAT	000
SM-TTI, PM-TTI, TCM-TTI		
	SAPI	IS: JPN NS: MD1260A
	DAPI	IS: JPN NS: MD1260A
FTFL		
	FIF	0000
	OIF	CC: JPN NSC: MD1260
PSI		
	PT (OTU4)	FE (MD1260A-002/004) 03 (MD1260A-005) 21 (MD1260A-006/007)
	PT (OTU0) *1	FE (PRBS) 07 (GbE)
	PT (OTU2e) *2	FE (PRBS) 03 (10GbE)

*1: Only for MD1260A-006

*2: Only for MD1260A-007

Table D.3-6 Lane Mapping

Item		Initial Value
Tx Lane		
	0	Lane 0
	1	Lane 1
	2	Lane 2
	3	Lane 3
	4 *	Lane 4
	5 *	Lane 5
	6 *	Lane 6
	7 *	Lane 7
	8 *	Lane 8
	9 *	Lane 9
	10 *	Lane 10
	11 *	Lane 11
	12 *	Lane 12
	13 *	Lane 13
	14 *	Lane 14
	15 *	Lane 15
	16 *	Lane 16
	17 *	Lane 17
	18 *	Lane 18
	19 *	Lane 19

*: Only OTU4

Table D.3-7 Relative Skew

Item		Initial Value
Skew		0*1
Lane		Tx Lane
Enable		
	Lane 0	On
	Lane 1 to 3 *2	Off

*1: bit unit

*2: Any of Lane 0 to 19 is set when using the OTU4 application.

Table D.3-8 Error/Alarm

Item		Initial Value
Type		Error LLD - FAS
Alternate Error		0
Alternate Normal		1
Tx Lane		
	Lane 0	On
	Lane 1 to 19	Off

Table D.3-9 Counter

<table>
<tr><th colspan="2">Item</th><th>Initial Value</th></tr>
<tr><td colspan="2">Chart Item</td><td>None</td></tr>
<tr><td colspan="2">Oversize</td><td>1518</td></tr>
<tr><td colspan="2">TIM Detection Pattern</td><td></td></tr>
<tr><td rowspan="3"></td><td>SM</td><td>On</td></tr>
<tr><td>Meas</td><td>Off</td></tr>
<tr><td>Detection</td><td>SAPI and DAPI</td></tr>
<tr><td colspan="2">PLM Detection Pattern</td><td>Auto</td></tr>
</table>

Table D.3-10 Port/Clock

Item	Initial Value
Mode	Normal
GFEC Encode	On
GFEC Decode	On
GbE Auto Negotiation *	On
Frequency Offset	0
Payload Offset - High	0
Payload Offset - Low	0
Clock Source	Internal
Tx Reference Clock Output	1/64
10 MHz Output	Internal 10 MHz

*: MD1260A-006 only

Table D.3-11 Statistics Tab

Item	Initial Value
Current/Accumulated	Current/Accumulated

Table D.3-12 Data Monitor Tab

Item	Initial Value
Pause	Off
Position	1

Table D.3-13 Delay Tab

Item	Initial Value
Mode	Single
Period	–

Table D.3-14 APS Tab

Item	Initial Value
Start Trigger	LOF
Stop Trigger	LOF
Error Free Period	1 ms
Threshold	1 ms

Table D.3-15 Capture Tab

Item	Initial Value
Capture type	OH
Layer *	OTU4
Trigger Position	Top
Trigger Type	Manual

*: Only for MD1260A-006/007 when Capture type is OH or GMP

D.4 No Frame Application

Table D.4-1 Test Pattern

Item		Initial Value
Test Pattern		PRBS7
PRBS Invert		
	Tx	Off
	Rx	Off

Table D.4-2 Error/Alarm

Item		Initial Value
Tx Lane		
	0	On
	1	Off
	2	Off
	3	Off
	4 *1	Off
	5 *1	Off
	6 *1	Off
	7 *1	Off
	8 *1	Off
	9 *1	Off
	10 *2	Off
	11 *2	Off
	12 *2	Off
	13 *2	Off
	14 *2	Off
	15 *2	Off
	16 *2	Off
	17 *2	Off
	18 *2	Off
	19 *2	Off

*1: When selecting 100GbE No Frame or OTU4 No Frame applications and setting Lane Select to 10 For Lane

*2: When selecting 100GbE No Frame or OTU4 No Frame applications and setting Lane Select to 20 Lane

Table D.4-3 Counter

Item	Initial Value
Chart Item	None

Table D.4-4 Port

Item	Initial Value
Mode	Normal
Lane Select	10 Lane

Table D.4-5 Statistics Tab

Item	Initial Value
Current/Accumulated	Current/Accumulated

Appendix E Connecting to MD1230B

The 40GbE/100GbE applications can measure latency by the using several MD1260A and MD1230B quality analyzers (hereafter, MD1230B). Here, the connection method of hardware and the screen operation are explained.

Note:

The Ethernet module for setting Flow ID to Type in the test frame is used for MD1230B.

E.1 Hardware Connection

Connecting coaxial cables for unit synchronous clock

The Unit Sync Input connector of the MD1260A rear panel is connected to the Unit Sync Output connector of the MD1230B rear panel using coaxial cables.

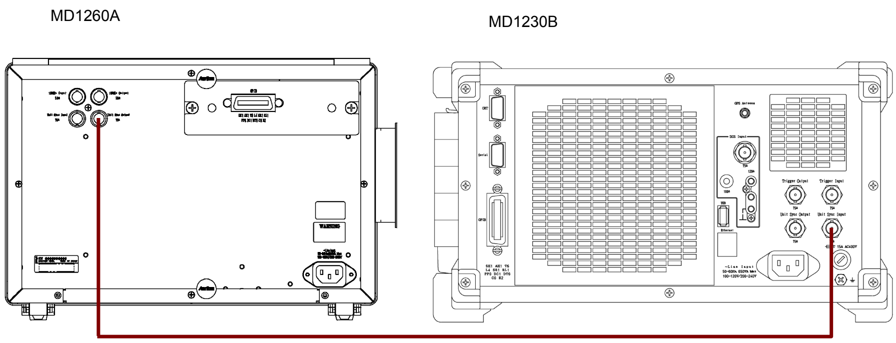

Figure E.1-1 Connecting Coaxial Cable

Note:

The unit synchronous clock is supplied from MD1260A to MD1230B. In this case, the latency measurement accuracy is at least about 0.1 μs.

When connecting the Unit Sync Output on the MD1230B rear panel to the Unit Sync Input on the MD1260A, the latency measurement accuracy is about 1μs.

Latency measurement time is guaranteed when using up to three MD1260A/MD1230A units.

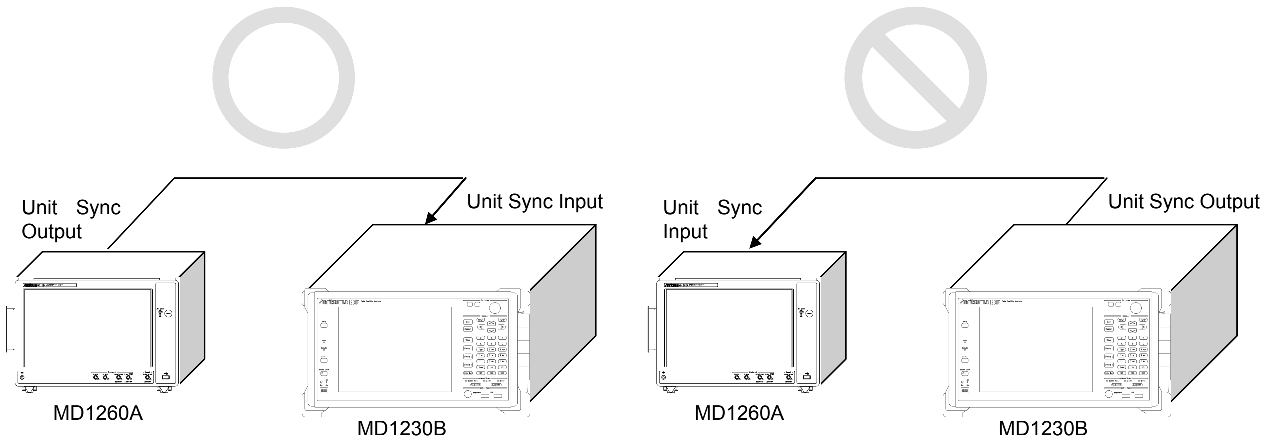

Figure E.1-2 Direction of Synchronous Clock

When connecting multiple MD1260A and MD1230B units using coaxial cables, the coaxial cable must be connected to the master of the MD1260A first. And then, the coaxial cable is connected to MD1230B.

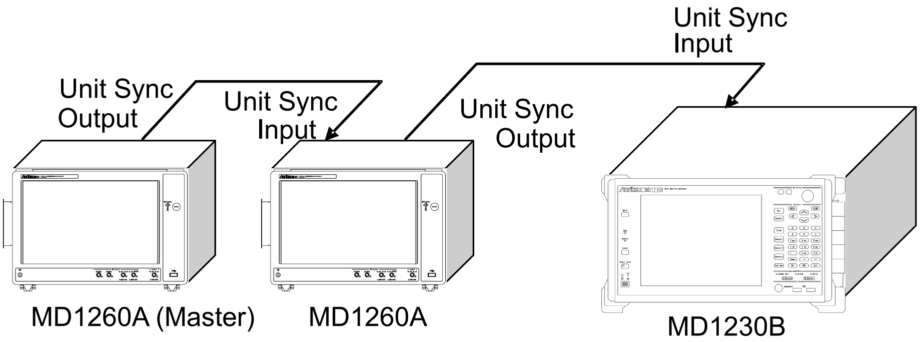

Figure E.1-3 Order of Connecting Coaxial Cable of Two or More Units

Connecting MD1260A/MD1230A to DUT

1. The DUT and MD1260A measurement port are connected to the optical fiber.
2. The DUT and MD1260A measurement port for module are connected to the optical fiber.

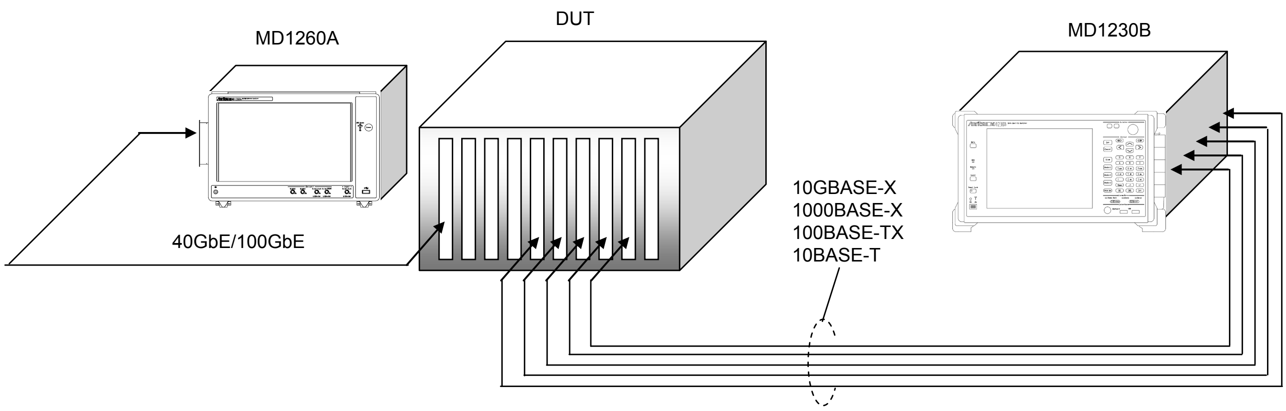

Figure E.1-4 Connecting MD1260A/MD1230A to DUT

E.2 Screen Operation

Transmission setting of MD1260A

1. Start the 40GbE or 100GbE application.
2. Enable the test frame on the stream screen.

☞ 4.2.4 Editing two or more streams

3. Set the IP address of the stream header to the IP address of the MD1230A port on the stream screen.
4. Start the stream transmission.

Transmission setting of MD1230B

Refer to Section 5.1.2 “Defining transmission data pattern” in the “MX123001A Data Quality Analyzer Control Software Operation Manual”.

1. Set the IP address of the stream header to the IP address of the MD1260A port on the frame setting screen.
2. Set the test frame to the pattern of data fields on the frame setting screen.
3. Set the type of the test frame to Flow ID.
4. Start the stream transmission.

Measurement setting of MD1260A

1. Touch the Test Frames tab of 40GbE or 100GbE application.
2. Time until the frame transmitted from MD1230B is received at MD1260A is displayed in the latency item.

☞ 4.3.1 Test Frame

Measurement setting of MD1230B

Refer to Section 5.5 " Measuring Frame Arrival Time (Latency)” in the MX123001A Data Quality Analyzer Control Software Operation Manual.

Appendix F Introduction to Wireshark

Wireshark is GPL-licensed open-source software for analyzing network protocols. Frames captured by Wireshark can be analyzed using the 40/100GbE application. Wireshark must be installed in the MD1260A to use this function. This chapter explains how to use Wireshark.

F.1 About Wireshark

Wireshark is a network protocol analyzer that runs on PCs. It captures frames on the network connected on the PC, and translates, displays and saves the captured frames. The Wireshark translation function supports various protocols.

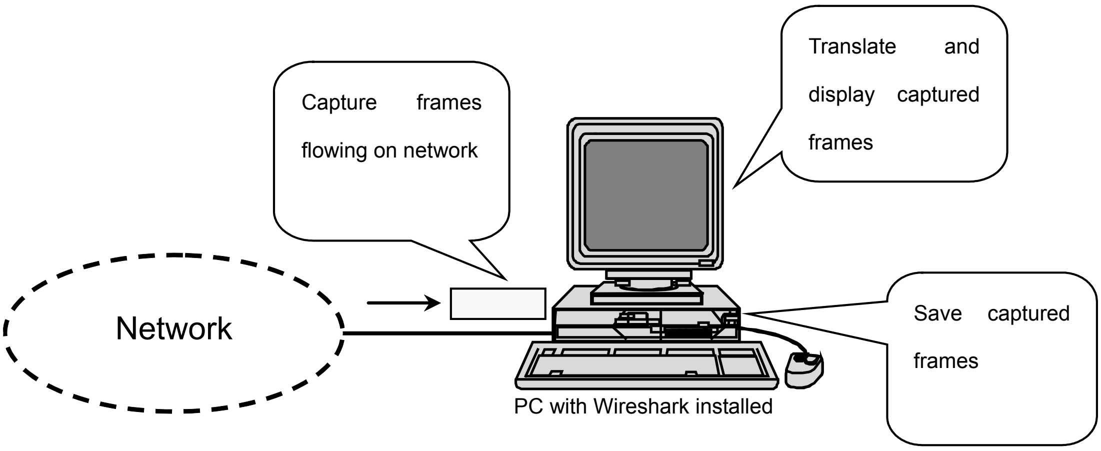

Figure F.1-1 Wireshark Operation

Wireshark is free, open-source software supplied under the GPL license. It can be downloaded from the website below (at September 2010).

http://www.wireshark.org/

Refer to this website for the latest information on Wireshark.

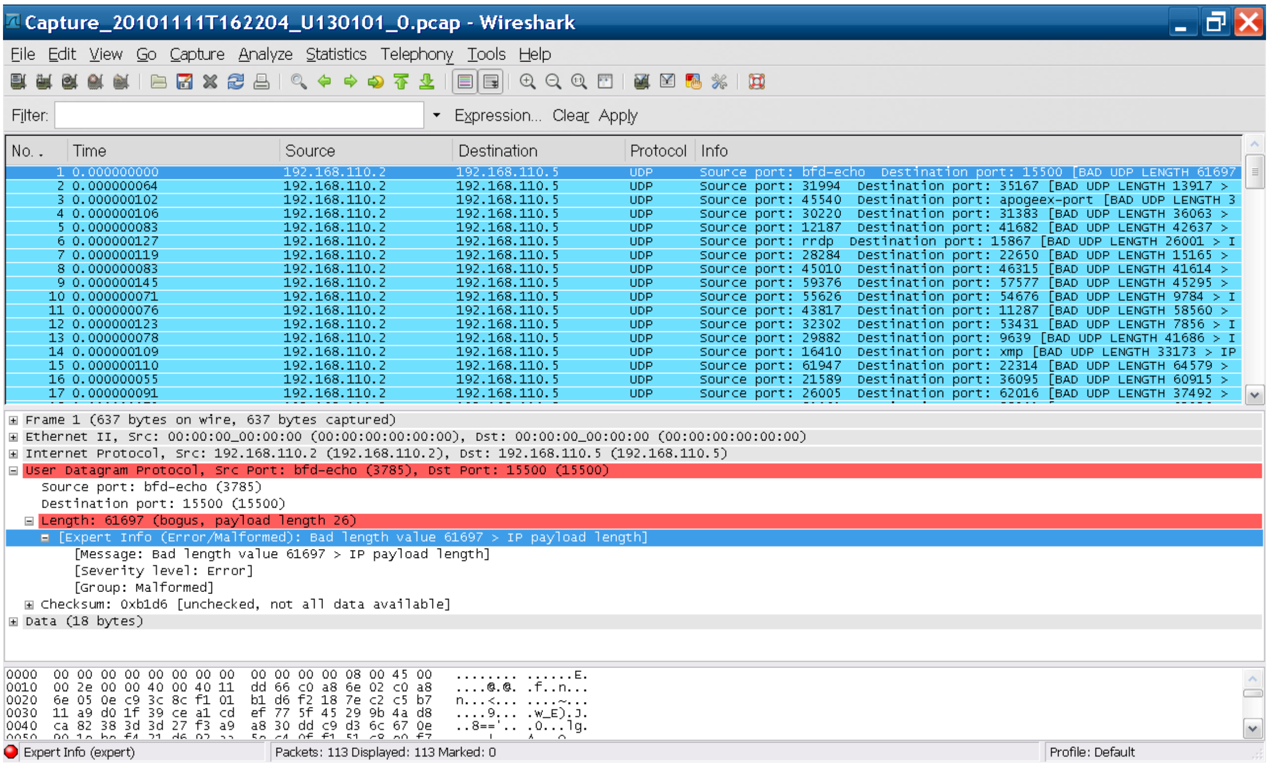

Figure F.1-2 Example of Wireshark Display

Note:

The time displayed under the Time column is the time of the first bit of the MAC address. The time displayed at the Capture tab shown in Figure 4.4.3-1 is the time of the first bit of the preamble. Therefore, the difference between the timestamp time and the time at the Capture tab is the difference due the 8 bytes of the preamble.

F.2 Tandem Operation with Wireshark

When Wireshark is installed in the MD1260A, the capture functions of the 40/100GbE application and Wireshark can operate in tandem.

☞ 4.4 Capture

When a frame is captured using the 40/100GbE application, the Wireshark button of the Capture tab is enabled.

Touching the Wireshark button starts Wireshark and displays the capture results.

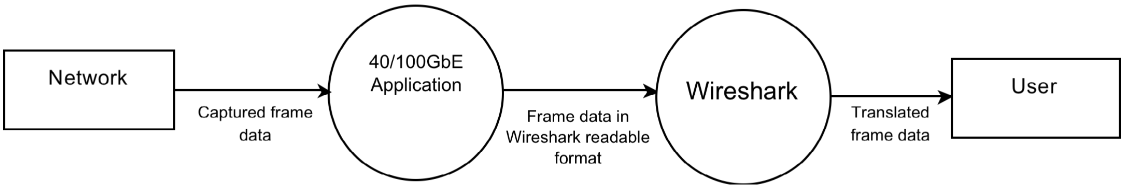

Figure F.2-1 Data Flow at Tandem Operation

This function has the following advantages.

(a) Protocols that cannot be analyzed by the 40/100GbE application are displayed.
Wireshark supports translation of protocols that cannot be translated by the control software.

(b) Captured frames can be viewed on a PC.
Frame data saved by Wireshark can be read on a PC with Wireshark installed.

Note:

1. Frame data saved by Wireshark cannot be read by the 40/100GbE application. To read 40/100GbE application stream header files, save from the 40/100GbE application.

2. Tandem operation between the 40/100GbE applications and Wireshark is assured for Wireshark Version 1.2.7. Operation with later versions of Wireshark is not guaranteed.

F.3 Notes on Installing Wireshark

Obtain the Wireshark installer for Windows® from the website (http://www.wireshark.org/). This function can be used after installing Wireshark in the MD1260A.

Notes on installation are as follows.

(a) About WinPcap
In general, when Wireshark is installed, it is required to install the WinPcap software to capture the packet at the same time.

However, if Wireshark is operated with the 40 GbE/100 GbE application, the 40 GbE/100 GbE application can capture the packet. So, it is not necessary to install WinPcap.

(b) Installed in MD1260A
When installing Wireshark in the MD1260A, copy the installer to the MD1260A. At this time, you need a lot of attention on the following points, depending on how to copy the installer.

When using network

Using the schematic of the common files proved by Windows® , FTP and etc., makes possible to transmit the file to the MD1260A via the network. However, if the connected network is not secured enough, the MD1260A may infect the electronic virus.

Nothing is displayed on the screen.

When the screen display has been set to external monitor, nothing is displayed on the screen of MD1260A.

In this case, connect the external monitor and keyboard, and switch the screen display with the keystroke combination below.
For the external monitor resolution, 1280×800 or more is recommended.

[CTRL] + [ALT] + [F1] : Switched to the external monitor display
[CTRL] + [ALT] + [F3] : Switched to MD1260A screen display

The application cannot be started from the selector screen.

When setting the IP address of the MD1260A from the control panel, the application may not operate from the selector screen.

In this case, restore the settings using the following procedures.

1. Disconnect all connected Ethernet cables.
2. Touch [Multi Port] on the selector screen.
3. Touch the Unit ID button.

☞ 7.2.2 Setting Unit ID

4. Set the Unit ID.
   The same number can be set as the set Unit ID.
5. Touch the [Utility] tab.
   Confirm the IP address of the remote control interface.
6. When the IP address is set within the following range, change it to the other address.
   169.254.0.0/16, 169.254.1.0/16
7. Touch the [Ethernet] tab or [OTN] tab.
   Confirm that the button operation can be performed.

Appendix H Bibliography

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Index

References are to page numbers.

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