MX123001A
Data Quality Analyzer
Control Software
Operation Manual

25th Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided within the MD1230B Data Quality Analyzer Operation Manual. . Please also refer to this document before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W1928AE-25.0

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

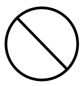
DANGER — This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

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

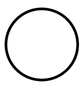
CAUTION — This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manual

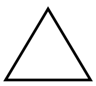
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.



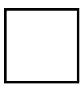
This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



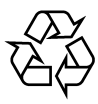
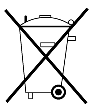
This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.



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.

MX123001A
Data Quality Analyzer Control Software
Operation Manual

17 September 2004 (First Edition)
10 October 2012 (25th Edition)

Equipment Certificate

Anritsu Corporation guarantees that this equipment was inspected at shipment and meets the published specifications.

Anritsu Warranty

- During the warranty period, Anritsu Corporation will repair or exchange this software free-of-charge if it proves defective when used as described in the operation manual.
- The warranty period is 6 months from the purchase date.
- The warranty period after repair or exchange will remain 6 months from the original purchase date, or 30 days from the date of repair or exchange, depending on whichever is longer.
- This warranty does not cover damage to this software caused by Acts of God, natural disasters, and misuse or mishandling by the customer.

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.

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.

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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.

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.

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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.

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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.

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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.

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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.

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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.

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

Software: MX123001A Data Quality Analyzer Control Software

2. Applied Directive and Standards

When the MX123001A Data Quality Analyzer Control Software is installed in the MD1230B, the applied directive and standards of this unit conform to those of the MD1230B main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MX123001A can be used with.

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 marking

N274

1. Product Model

Software: MX123001A Data Quality Analyzer Control Software

2. Applied Directive and Standards

When the MX123001A Data Quality Analyzer Control Software is installed in the MD1230B, the applied directive and standards of this unit conform to those of the MD1230B main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MX123001A can be used with.

About This Manual

The MD1230 family operation manuals consist of separate documents for the main unit, control software, module(s), remote control operation, and options, as shown below.

Note:

MD1230 family is a general name for the MD1230A/B Data Quality Analyzer, the MD1231A/A1 IP Network Analyzer, and the MT7407A Multislot Chassis.

Note that the MD1230A, MD1231A/A1, and MT7407A are not supported in Ver. 7.0 and above.

Configuration of MD1230 Family Operation Manual

(shaded box) indicates this document.

- **MD1230B Data Quality Analyzer Operation Manual**
  Describes basic operations of the MD1230B.
- **MX123001A Data Quality Analyzer Control Software Operation Manual** (shaded)
  Describes how to use the software that controls the mainframe of the MD1230 family.
- **Ethernet Module Operation Manual**
  Describes basic operations of Ethernet modules.
- **MU120103A/B 2.5G (1.31) Module**
  MU120104A/B 2.5G (1.55) Module
  MU120105A 10G (1.31) Module
  MU120106A 10G (1.55) Module
  Operation Manual
  Describes basic operations of SDH/SONET modules.
- **MU120119A OC-3/12 STM-1/4 Module (1310 nm)**
  MU120120A OC-3 STM-1 Module (1310 nm)
  Operation Manual
  Describes basic operations of SDH/SONET modules.
- **MD1230B Remote Control Operation Manual**
  Describes remote control via RS-232C, GPIB, and Ethernet interfaces.

Decode Module
Operation Manual

Describes basic operations of Decode modules.

Tcl Interface
Operation Manual

Describes basic operations of Tcl Interface.

Expert Analysis Module
Operation Manual

Describes basic operations of Expert Analysis modules.

Application Traffic Monitor
Operation Manual

Describes how to operate the software for monitoring Ethernet traffic.

MD1230B-26 PPPoE
Operation Manual

Describes how to operate the software for measuring traffic on PPPoE/Ethernet.

This manual deals with the devices shown below:

Model	Name
MD1230B	Data Quality Analyzer (Note 1)
MP1590B	Network Performance Tester (Note 2)
MP1591A	Network Performance Tester (Note 3)

Note:

1. Note that the MD1230A, MD1231A/A1 and MT7407A are not supported in Ver. 7.0 and above.

2. This document explains the functions that are common to the MD1230 family in the MP1590B and MP1591A (MP1590 family). For explanations of functions for equipment other than the MP1590 family, refer to the MX159001B Network Performance Test Control Software. (The control software for the MP1590 family is the MX159001B and not the MX123001A.)

3. The description in this manual shows the case of using the MD1230B.

In this manual, abbreviations of module names are used.

(1) Module names

Correspondence of the abbreviations and full module names are shown in the table below:

Abb.	Full Name
01A	MU120101A: 10M/100M Ethernet Module
02A	MU120102A: Giga-bit Ethernet Module
03A	MU120103A: 2.5G (1.31) Module
03B	MU120103B: 2.5G (1.31) Module
04A	MU120104A: 2.5G (1.55) Module
04B	MU120104B: 2.5G (1.55) Module
05A	MU120105A: 10G (1.31) Module
06A	MU120106A: 10G (1.55) Module
11A	MU120111A: 10/100M Ethernet Module
12A	MU120112A: Giga-bit Ethernet Module
18A	MU120118A: 10 Giga-bit Ethernet Module
18B	MU120118B: 10 Giga-bit Ethernet Module
18C	MU120118C: 10 Giga-bit Ethernet Module
19A	MU120119A: OC-3/12 STM-1/4 Module (1310 nm)
20A	MU120120A: OC-3 STM-1 Module (1310 nm)
21A	MU120121A: 10/100/1000M Ethernet Module
22A	MU120122A: Giga-bit Ethernet Module
31A	MU120131A: 10/100/1000M Ethernet Module
32A	MU120132A: Giga-bit Ethernet Module
38A	MU120138A: 10 Giga-bit Ethernet Module

Multiple modules are expressed as shown below:

- MU120101A and MU120102A:
  "MU120101A/02A"

(2) Indications when option(s) must be installedSome of the functions Described in this manual require installation of options. This case is indicated as shown below.

- When requires installation of IPv6 Expansion option:
  "Requires IPv6 Expansion option"

The option functions do not operate without the supported module. Refer to "Appendix E Options" for the correspondence between options and modules.

Table of Contents

Section 1 Overview

This section provides a functional overview and describes features of the MX123001A Data Quality Analyzer Control Software (hereafter referred to as "this software").

☞ Refer to Appendix B "Options" in "MD1230B Data Quality Analyzer Operation Manual" for the options and related products.

1.1 Outline

(1) Installation

To use this software, install it from the CD-ROM to the PC performing remote control of the MD1230B.

☞ For details on installation, refer to the Installation Guide on the CD.

(2) IP address setting

This software is connected to each the MD1230B unit via 10BASE-T/100BASE-TX. IP addresses must be set on both PCs installed with this software and on the MD1230B in order to control it remotely. Using the setup utility, set the IP address for the MD1230B after starting this software.

☞ Refer to Section 5.3 “Setting IP Address” in the MD1230B operation manual.

(3) Detailed operation procedures

☞ For detailed operation procedures, refer to Section 2 “Each Section Name and Functions of Major Screens” and Section 4 “Basic Operations.”

1

Overview

1.2 Features

This software can realize the same operation environment on a PC as the operation functions on the MD1230B.

Guaranteed operating environment

PC: IBM-PC/AT compatible
OS: Windows 2000 (English/Japanese)/
Windows XP (English/Japanese) / Windows 7 (English/Japanese)
Memory: 128 MB or more
CPU: Intel Pentium/Celeron 600 MHz or faster
HDD: 100 MB or more free space

Notes:

This software cannot be installed to the PC that has the Windows Vista operating system installed.

The following options can be installed when the operating system is Windows 7 but their operations cannot be guaranteed.

- MX123001A-06 Tcl Interface
- MX123001A-07 RS-232C Control
- MX123001A-09 GPIB Control
- MX123001A-01 Remote Control Software for MD1230A-04
- MX123003A Remote Control Software for MX123002A

This software is capable of centralized control of a maximum of the eight remote MD1230B units.

Using this software allows the following remote operations:

- Setting various data streams for the MD1230B
- Protocol analysis of captured data
- Router load test
- Benchmark tests regulated by RFC2544 and RFC2889

* The MD1230B allows measurement condition setting and display screen selection using a mouse, or by using the front panel keys.

1.3 Precautions

1.3.1 Differences between Versions

(1) Note the following cautions in Ver. 7.0 and above:

- The MD1230A, MD1231A/A1 and MT7407A are not supported.
- The Graphical **View** button and **Graphical View** screen are disabled. (Refer to Section 2.1 "Graphical View".)

(2) Note the following procedure for Version 9.0 and later.

- The Traffic Monitor and Traffic Map functions cannot be used. (Refer to Section 5.8 "Viewing Traffic Status".)
- Measure the Service Disruption Time using the counter function. (See Section 10.2.2 "Measuring Service Disruption Time between Ports".)

1.3.2 Other

- Available buttons and their layout may vary depending on module configuration and installed options.

Section 2 Each Section Name and Functions of Major Screens

This section describes how to set the screens and parameters of this software.

2.1 Graphical View

This function is disabled in Ver. 7.0 and above.

2.2 Tree View

The Tree View screen shows a tree-like configuration and the functions of the maximum 8 units remotely controlled by this software. Each unit, module and port setting and operation are performed from this screen.

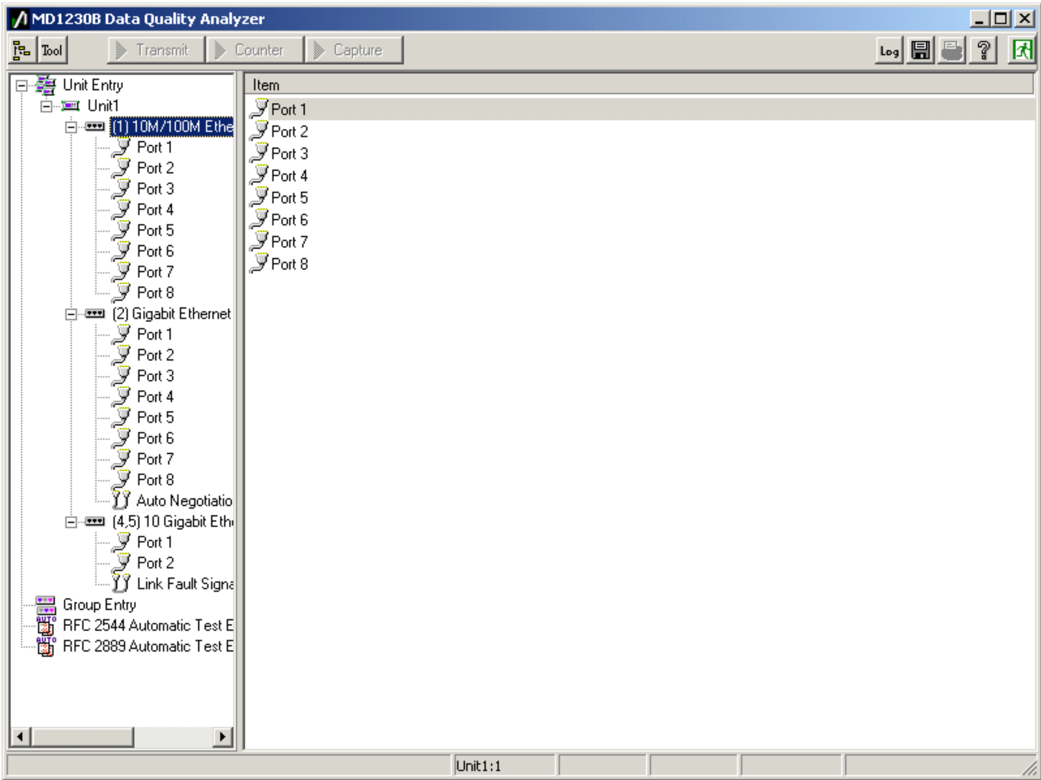


Figure 2.2-1 Tree View screen

Aside from displaying the allocation and setting of each unit, module and port; the Tree View allows you to perform the Automatic Test and group entries.

The color of the icon of each measurement port indicates the status of Reserve and Link.

Color	Reserve status	Link status
Gray	Not reserved (Vacant or Occupied)	

Color	Reserve status	Link status
Green	Reserved (Owner status)	Link Up status (PPP of the POS module is linked up to IPCP.)
Red		Link Down status

When an icon is in green or red, the status of each measurement port is displayed in the neighborhood of the icon.

- If an error or alarm occurs, the outer frame of the corresponding icon is displayed in red.
- While the capture function is in operation, characters “CAP” are displayed.
- While data is transmitted, the right arrow (→) is displayed.
- While data is received, the left arrow (←) is displayed.

2.3 Operating Each Component

2.3.1 Setting parameters

This section describes the controls used for this software and describes operation using the front panel keys and the mouse.

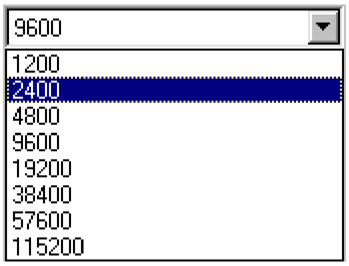
(1) Command button

Ex:

Press a button to execute the corresponding function.
Starting/stopping measurement, displaying the editor, enabling/disabling editor setting and others.
Select only one function from the buttons. To operate with key input, select a button with the cursor keys and press **Set** to execute the function. When a mouse is used, click the button to execute the function.

(2) Dropdown list box

Ex:



This box allows you to select one item from many items on the drop list. Item currently selected from the drop list box is displayed on the screen. To operate with key input, press the cursor keys to switch to the displayed item. When the mouse is used, click the figure to display the available item list. Click to select one item from the dropdown list.

(3) Check box

Ex:

The multiple items in the box allows you to select more than one item at once. Select an item by pressing **Set** with key entry or clicking the square with the mouse. A check mark appears in the selected square.

(4) Radio buttons

Ex: 

The buttons allow you to select one of the items. Use the cursor keys, and click the button for key input or use the mouse, respectively, to select items.

(5) Text box

Ex: 

The box allows input and edit. A cursor is provided in the box. Numeric and alphabet keys are used for input and edit of a text.

(6) Spin box

Ex: 

The box is used to input numeric values. Increase or decrease the numeric value with the up and down cursor keys or directly input the value with the numeric keys.

Operation screen example

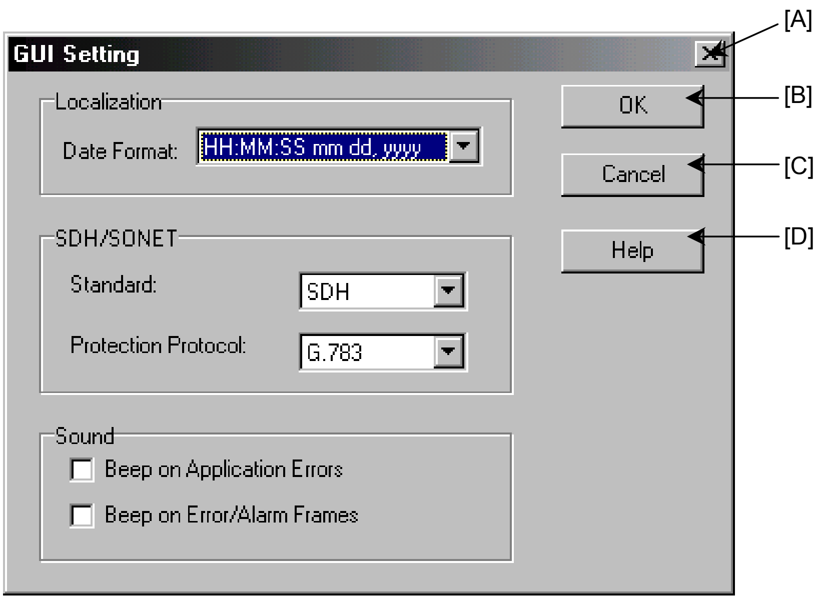


Figure 2.3.1-1 Example of operation screen

	Item	Function
[A]	×	Forcibly closes an open screen, and entered input data will not be set.
[B]	OK	Sets the input data and closes the screen.
[C]	Cancel	Closes the screen without setting the input data.
[D]	Help	Displays the help screen.

(7) Binary Data Editor

The Binary Data Editor is used to set binary patterns. Binary patterns can be set as hexadecimals (Raw Data tab) or by using templates (Template tab).

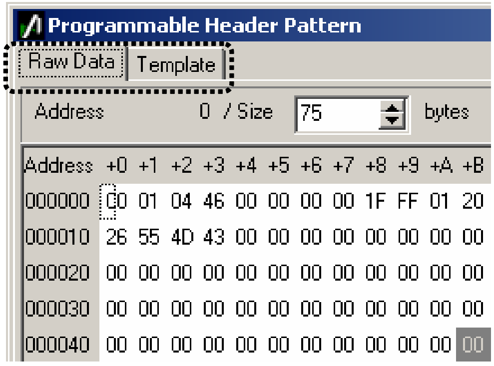


Figure 2.3.1-2 Binary Data Editor (Raw Data tab, Template tab)

Note:

The Template tab is displayed only when templates are available. The Raw Data/Template tabs do not appear when no templates are available.

(a) Raw Data tab

Set Binary pattern as a hexadecimal string. It can also be imported from a text file.

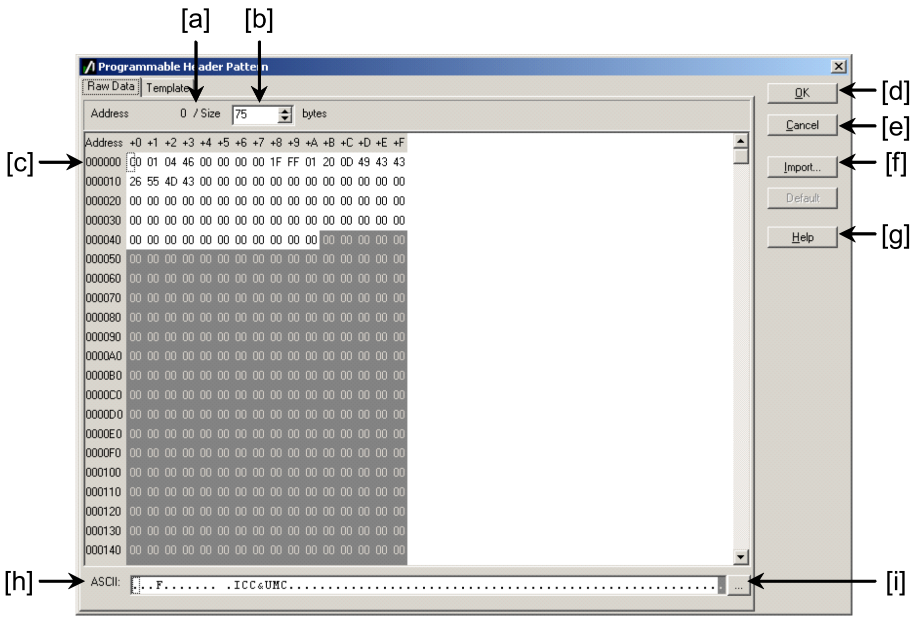


Figure 2.3.1-3 Binary Data Editor (Raw Data tab) screen

	Item	Function
[a]	Address	Indicates the cursor position.
[b]	Size	Sets the data size.
[c]	Edit area	Sets the data value in hexadecimal.
[d]	OK	Sets the input data and closes the screen.
[e]	Cancel	Closes the screen without setting the input data.
[f]	Import...	Reflects the selected text file contents to the set data. Refer to Section 5.1.4 (1) “Text file editing method and sample formats” for the format of text file that can be imported.
[g]	Help	Displays the help screen.
[h]	ASCII	Sets the input data with ASCII characters. The ASCII code corresponding to the value set here is stored in the Edit area [c].
[i]	...	Opens the Virtual Keyboard screen. Input data values can be set with ASCII characters entered from the Virtual Keyboard. Refer to (8) Virtual Keyboard for details.

(b) Template tab

The Template tab is displayed when templates are available. Patterns can be set according to the format of the template definition.

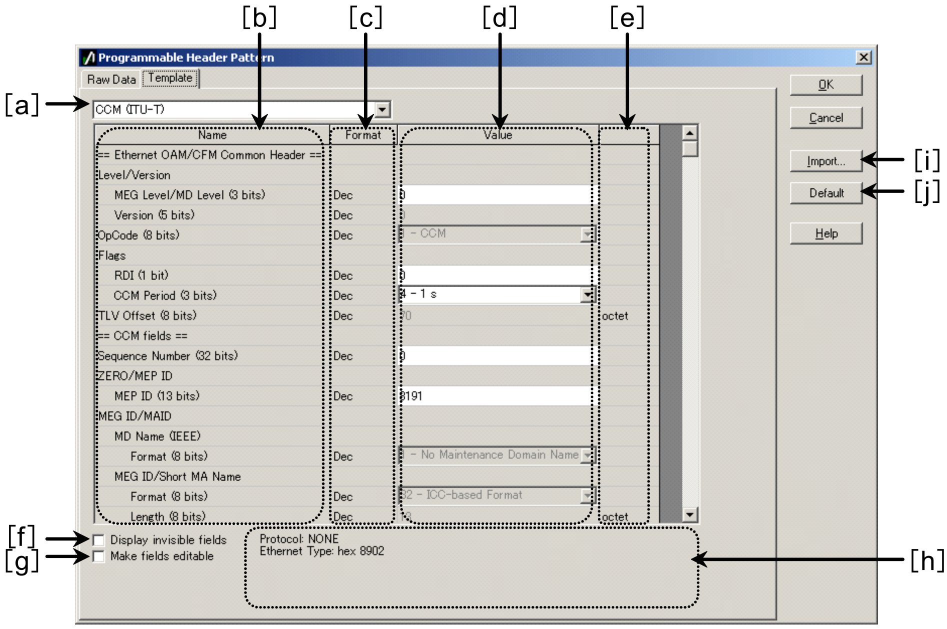


Figure 2.3.1-4 Binary Data Editor (Templates tab) screen

Note:

If MD1230B-28 Ethernet OAM is not installed, the Template tab is displayed but it cannot be used.

To set a pattern using the **Template** tab:

[1] Select the **Template** tab.*1, 2

[2] Click [a] and select the template to set.*3

[3] Set each of the field [d].

[4] If you want to force edit the grayed out field, turn [g] On.

[5] If you want to force display/edit of fields that normally do not require setting such as Reserved fields, turn [f] On.

[6] Click **OK** when finish setting the value of each field.*4

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[a]</td><td>Template</td><td>Selects a template.</td></tr>
<tr><td>[b]</td><td>Name</td><td>Shows the field name followed by the field length in parentheses.</td></tr>
<tr><td>[c]</td><td>Format</td><td>Shows the field input format.
<table>
<tr><th>Format</th><th>Description</th></tr>
<tr><td>Hex</td><td>Enter hexadecimal values (0 to F) for the length of the field. For example, if the field length is "4 octets", enter as "0123CDEF". A space is automatically inserted between every 4 digits.</td></tr>
<tr><td>Dec</td><td>Enter decimal values within the bit length indicated by the field length. For example, if the field length is 32 bits, enter a value between 0 and 4294967295. Depending on the field, the description of the value may be displayed in list format.</td></tr>
<tr><td>Bin</td><td>Enter binary values within the bit length indicated by the field length. For example, if the field length is "8 bits", enter as "0000 0000". A space is automatically inserted between every 4 digits.</td></tr>
<tr><td>IPv4</td><td>Enter in IPv4 address format such as "10.0.0.1".</td></tr>
<tr><td>IPv6</td><td>Enter in IPv6 address format. Abbreviated form such as "2001::1" may be used.</td></tr>
<tr><td>Ascii</td><td>Enter a character string. The length of the entered or displayed character must not exceed the field length.
(1) Control characters that cannot be displayed are entered/displayed as "¥XX". Where "X" is a hexadecimal value. Enter "¥¥" to display/enter "¥".
(2) If the entered string is shorter than the specified length, "¥00" is entered automatically. However, the trailing "¥00" is not displayed.</td></tr>
</table>
</td></tr>
<tr><td>[d]</td><td>Value</td><td>Sets value of the field in the format displayed in Format.</td></tr>
<tr><td>[e]</td><td>(Suffix)</td><td>Displays a supplementary description of the value such as units.</td></tr>
</table>

	Item	Function
[f]	Display invisible fields	Turn On to force displaying of invisible fields (fields that normally require no editing such as Reserved fields). Default: Off
[g]	Make fields editable	Turn On to force edit the grayed out fields (fields that normally require no editing). Default: Off
[h]	(Lower right area)	Displays the changed content if there is change in the selected format other than the pattern set with Binary Data Editor. For example, in the case of Ethernet OAM PDU, the Protocol setting and Ethernet Type field are changed and their changed contents are displayed. The template description is also displayed if it is available.
[i]	Import...	Reflects the content of the selected text file to the set data. Refer to Section 5.1.4 (1) "Text file editing method and sample format" for the format of the text file that can be imported.
[j]	Default	Sets the binary pattern as the default for the selected format.

*1: The template selected when you open the **Template** tab is the same as the template when you previously used the Binary Data Editor. This information is not saved for each stream number or port.

*2: The following dialog appears when the length of the data set with Raw Data does not match the length of the format selected with the **Template** tab when you move from the **Raw Data** tab to the **Template** tab.

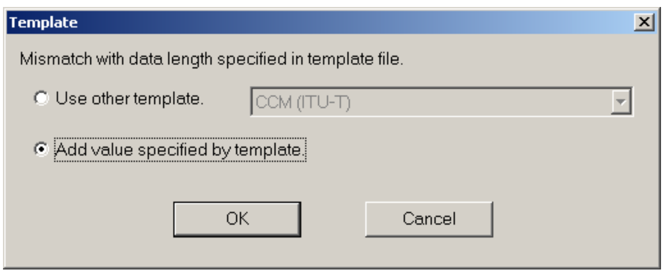


Figure 2.3.1-5 Template dialog

- Click **OK** to set as the default of the selected template format.

- If the selected template is incorrect or if you do not want to change the binary pattern, click **Cancel** to return to the previous state or select another template in the dialog and click **OK**.

*3: When you change the template, a dialog asking you to confirm changing of data to the default of the selected format appears.

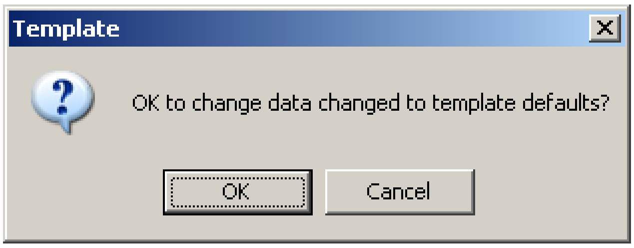


Figure 2.3.1-6 Template dialog

- Click **OK** to set to the default of the selected template.
- If you do not want to change the binary pattern, click **Cancel** and return to the status before selection.

*4: The following dialog appears if there are setting changes other than the data set with Binary Data Editor.

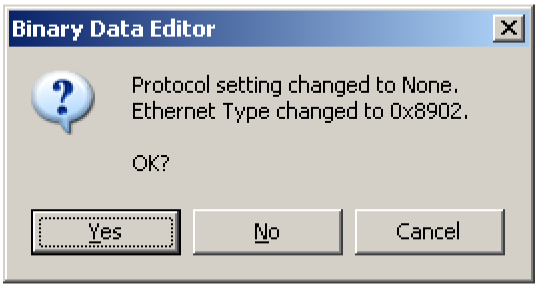


Figure 2.3.1-7 Binary Data Editor dialog

- The content of the changed setting also appears in the area [d].
- Click **Yes** to change automatically to the displayed setting.
- Click **No** to reflect only the change in the binary pattern without changing the setting.
- Click **Cancel** to return to the Binary Data Editor edit screen without changing the setting.

(8) Virtual Keyboard

The Virtual Keyboard is used to enter ASCII characters with mouse and/or front panel operations.

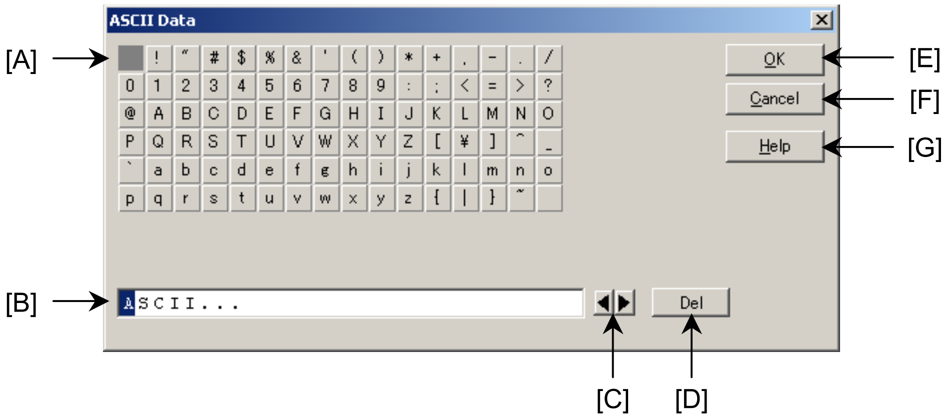
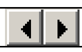


Figure 2.3.1-8 Virtual Keyboard scree

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Character buttons</td><td>Click each character to enter the input data.
The entered value is displayed in [B].</td></tr>
<tr><td>[B]</td><td>Edit area</td><td>Values entered from [A] are displayed in this field.
The data can also be edited directly in this field.
Alphabets and symbols can be entered by pressing a numeric key repeatedly. See the table below for correspondence between the numeric key and the input characters.
<table>
<tr><td>Numeric key</td><td>Input characters</td></tr>
<tr><td>–</td><td>– +</td></tr>
<tr><td>0</td><td>0 [Space] - . , : ; / ! ? * + = ( )</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>2</td><td>2abcABC</td></tr>
<tr><td>3</td><td>3defDEF</td></tr>
<tr><td>4</td><td>4ghiGHI</td></tr>
<tr><td>5</td><td>5jklJKL</td></tr>
<tr><td>6</td><td>6mnoMNO</td></tr>
<tr><td>7</td><td>7pqrsPQRS</td></tr>
<tr><td>8</td><td>8tuvTUV</td></tr>
<tr><td>9</td><td>9wxyWXY</td></tr>
</table></td></tr>
<tr><td>[C]</td><td></td><td>Moves the cursor in [B].</td></tr>
<tr><td>[D]</td><td>Del</td><td>Deletes the character next to the cursor in [B].</td></tr>
<tr><td>[E]</td><td>OK</td><td>Sets the value in [B] and closes the screen.</td></tr>
<tr><td>[F]</td><td>Cancel</td><td>Closes the screen without setting the value in [B].</td></tr>
<tr><td>[G]</td><td>Help</td><td>Displays the help screen.</td></tr>
</table>

2.3.2 Inputting

(1) Front panel key

The cursor keys and the numeric keypad on the front panel of the MD1230B enables operation. Use [R|←] or [→|F] for movement, while the up, down, left and right cursor keys are for selection. These keys enable operation when the MX123001A software is operating on the MD1230B.

(2) Keyboard

Connecting the keyboard to the MD1230B or the PC on which the MX123001A software operates, enables operation of the MX123001A by using the keyboard. The following table shows the corresponding keys:

MD1230B Front panel keys	Keyboard
Set	Enter
Cancel	ESC
R|←	Shift + TAB
→|F	TAB
∧ ∨ < >	↑↓←→
A to F	A to F
0 symbol to 9 wxyz	0 to 9
./:	.
+/–	–
BS	Back Space
DEL	Delete
View	F5
Display 1	F6
Display 2	F7
Display 3	F8
Print Now	CTRL + F4
History	CTRL + H
H.Reset	CTRL + R
Help	F1
Local	CTRL + L
Panel Lock	F2

(3) Mouse

When the mouse is connected to the MD1230B or the PC on which the MX123001A software operates, the MX123001A can be operated in the same way as the Windows®.

For the MD1230B, the front-panel pointing device enables the same operation as those by the mouse.

Section 3 Screen Configuration

This section describes the configuration of the operation screens for this software.

3.1 Screen Configuration Tree

This section describes the operations to move to each screen.

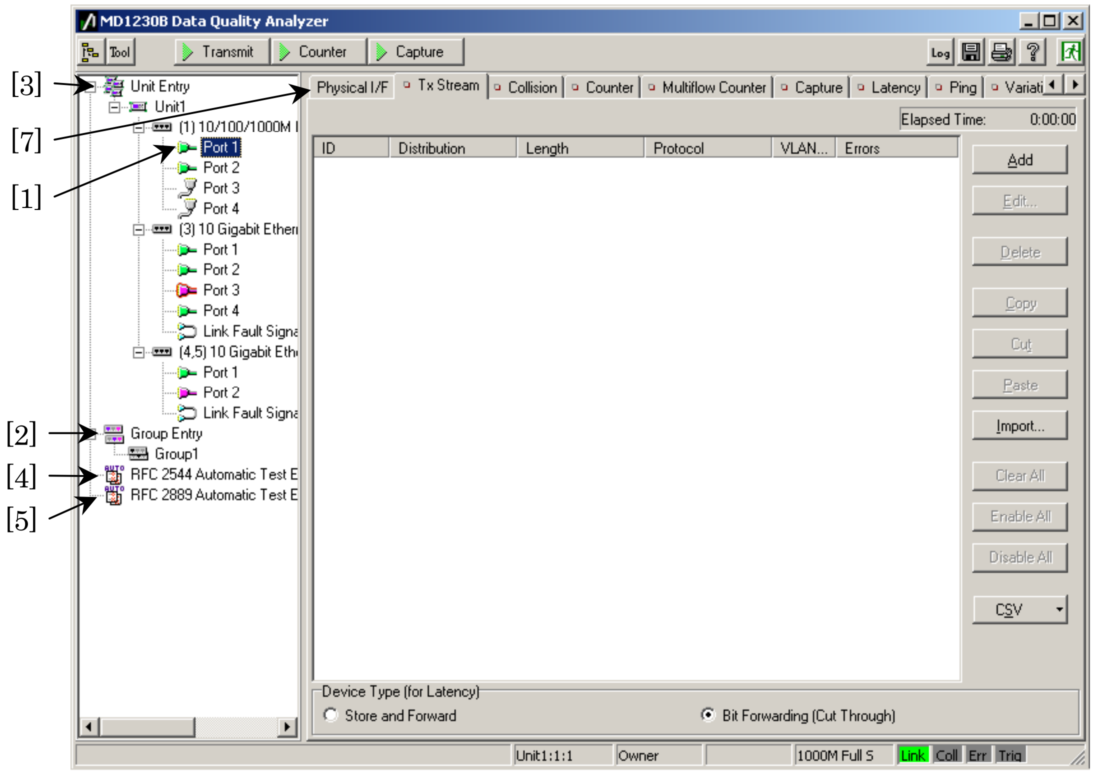


Figure 3.1-1 Tree View screen

Tree view screen

Port Setting screen

- Right-click [1], **Port Setting**.

MDIO Registers screen*1

- Right-click [1], **MDIO Registers**.

Show Status screen

- Right-click [1], **Show Status**.

Reservation screen

- Right-click [1], **Reservation**.

Group member edit screen

- Select [2] and then double-click **Add new** from **Item**.
- Right-click existing group to select **New Group** or **Edit Group**.

GUI Setting screen

- Right-click [3] to select **GUI Setting**.

Unit Entry screen

- Right-click [3] to select **New Entry**.
- Right-click existing unit to select **New Entry** or **Edit Entry**.
- Select [3] and then double-click on **Add new** from **Item**.

Unit Setting screen

- Right-click existing unit to select **Unit Setting**.

Unit Date/Time screen

- Click **Adjust** button.

RFC2544 Automatic Test Setting screen

- Select [4] and then click **Auto test setting** button.

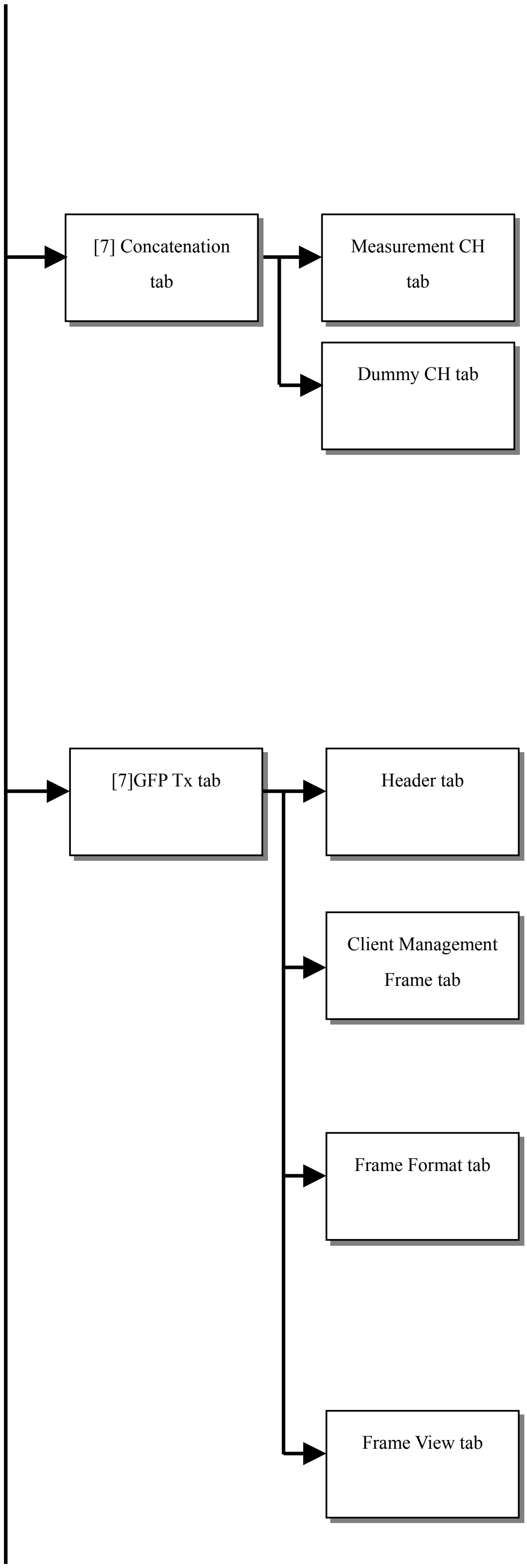
RFC2889 Automatic Test Setting screen *2

- Select [5] and then click **Auto test setting** button.

[7] Error Insertion tab

☞ Refer to Section 5.10 “Adding Error” for details.

- [7] Physical I/F tab
  - ☞ Refer to Section 6.4.3 “Operating as PoE powered device”, 6.5 “Functions Specific to MU120121A/22A/31A/32A” Modules” for details.
- [7] SDH Tx tab
  - OH Preset tab — ☞ Refer to Section 7.1.2.1 “OH Preset” for details.
  - Alarm Error tab — ☞ Refer to Section 7.1.2.4 “Adding alarms and errors” for details.
  - K1,K2 Pointer tab — ☞ Refer to Section 7.1.2.2 “Setting K1 and K2” for details.
  - APS Sequence Generator tab
    - APS Setting screen
      - Select existing APS Sequence and then click **Edit** button.
      - Double-click existing APS Sequence.
- [7] SDH Rx tab
  - Power Meter tab
  - OH Monitor tab — ☞ Refer to Section 7.1.3.1 “OH Monitoring” for details.
  - K1,K2 Pointer Monitor tab — ☞ Refer to Section 7.1.3.3 “K1/K2 monitoring” for details.
  - APS Switch Time tab — ☞ Refer to Section 7.1.5.4 “Measuring switch time (APS Switch Time measurement)” for details.
  - APS Sequence Capture tab — ☞ Refer to Section 7.1.5.3 “APS sequence capture” for details.
  - Performance tab — ☞ Refer to Section 7.1.4 “Measuring Performance” for details.



Refer to Section 7.1.6.1 “Setting Measurement CH (Contiguous)” or 7.1.6.2 “Setting Measurement CH (Virtual)” for details.

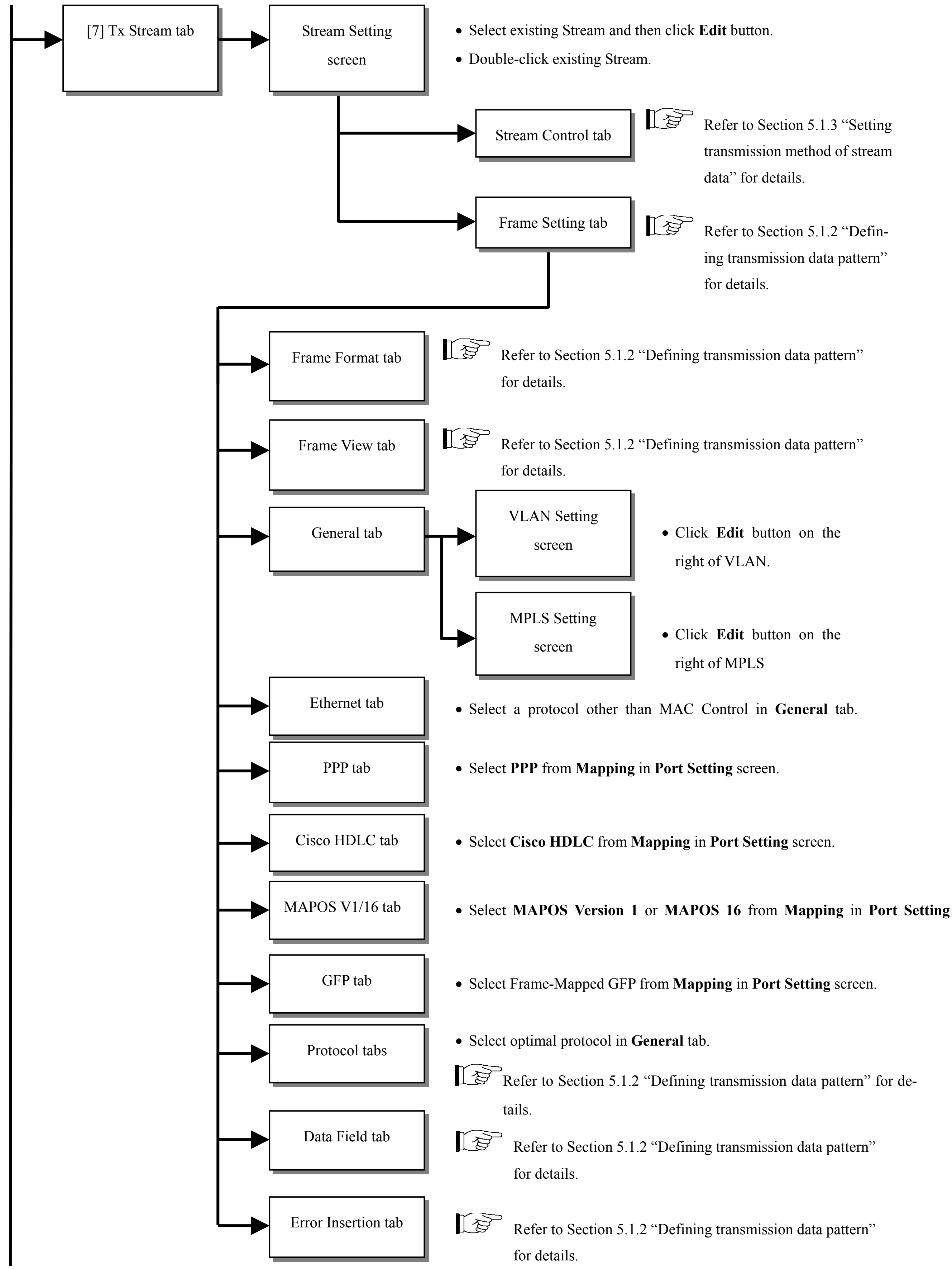
Refer to Section 7.1.6.3 “Setting Dummy CH” for details.

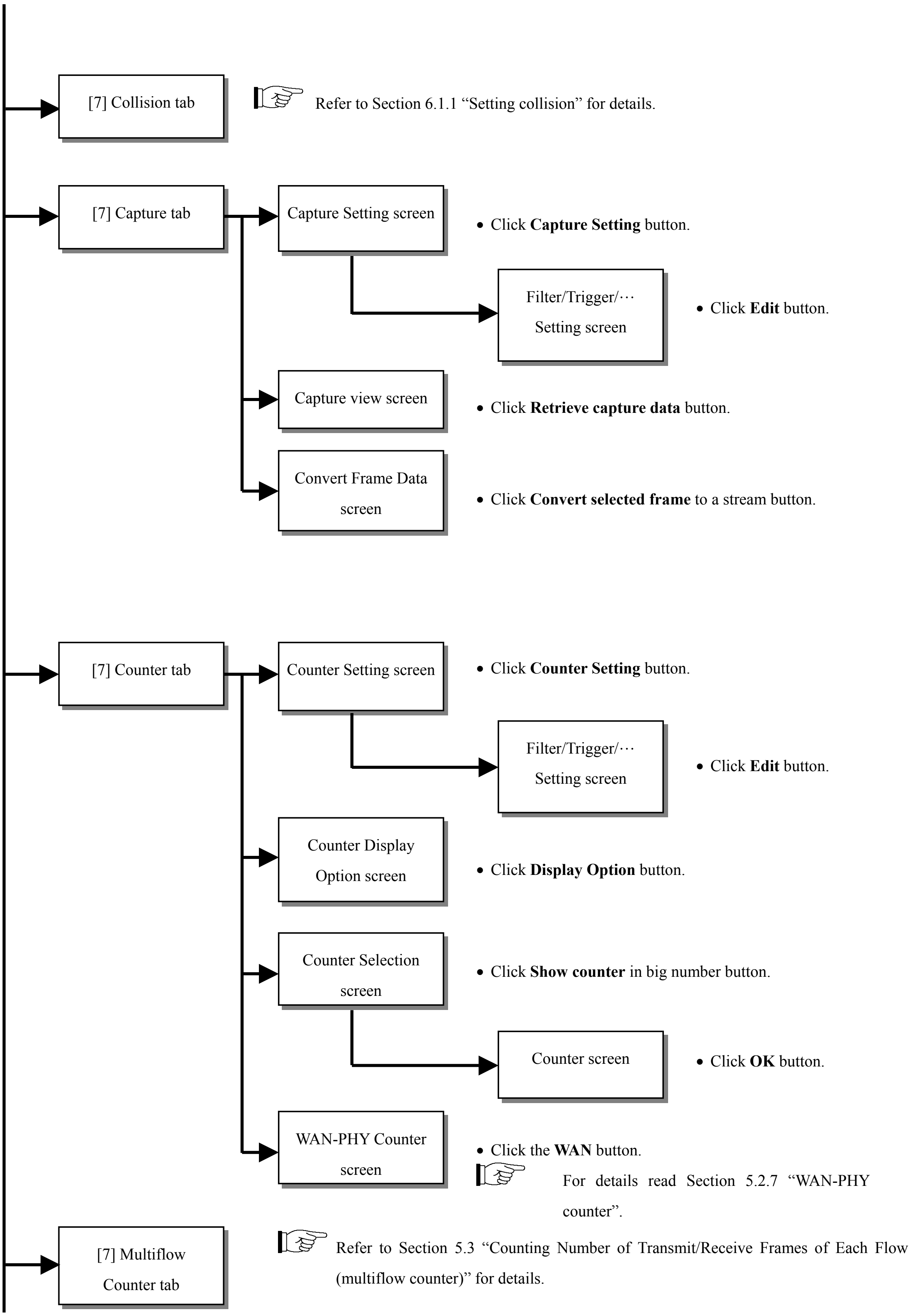
Refer to Section 7.1.7.1 “Setting Header” for details.

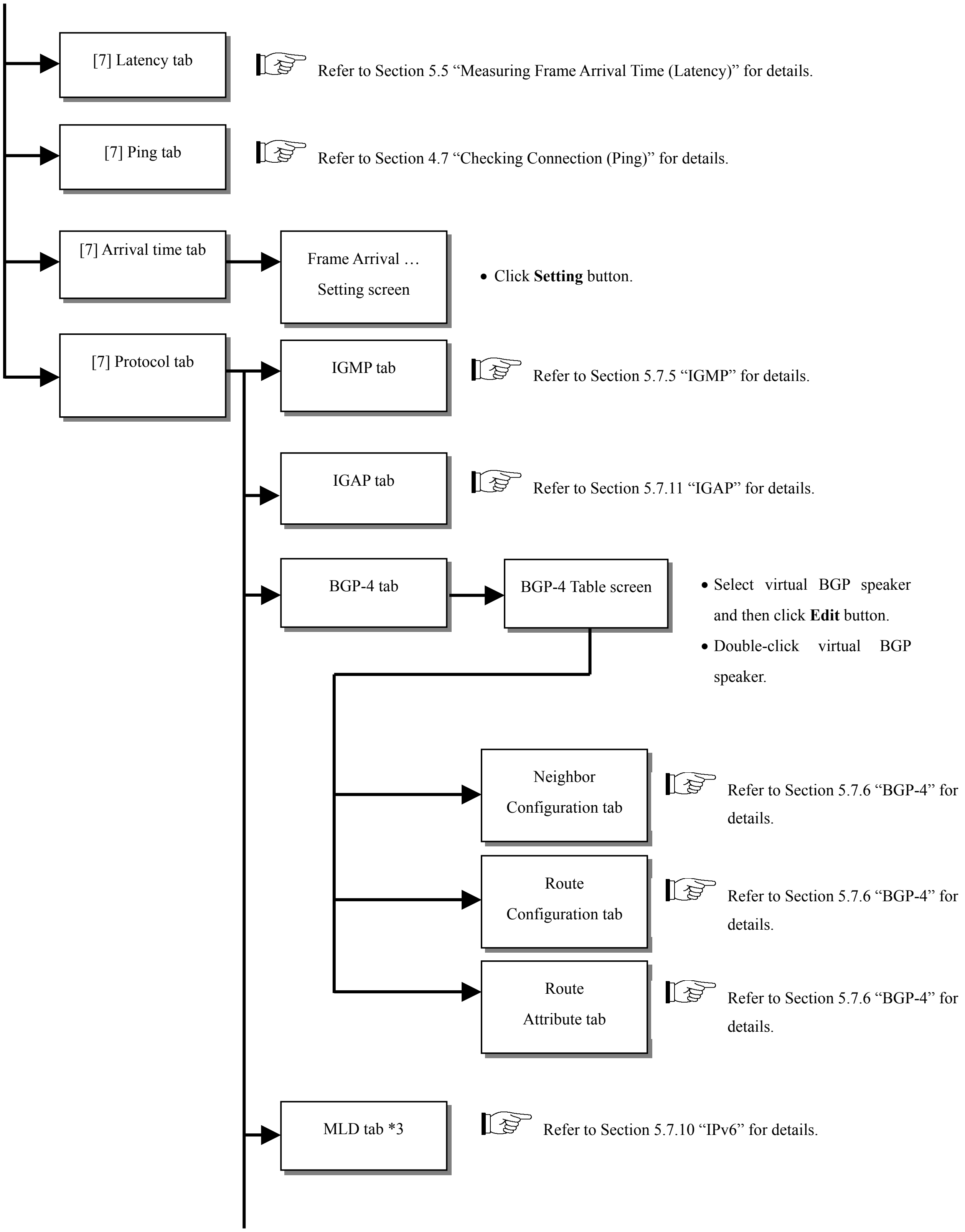
Refer to Section 7.1.7.2 “Setting Client Management Frame” for details.

Refer to Section 7.1.7 “Setting GFP Tx” for details.

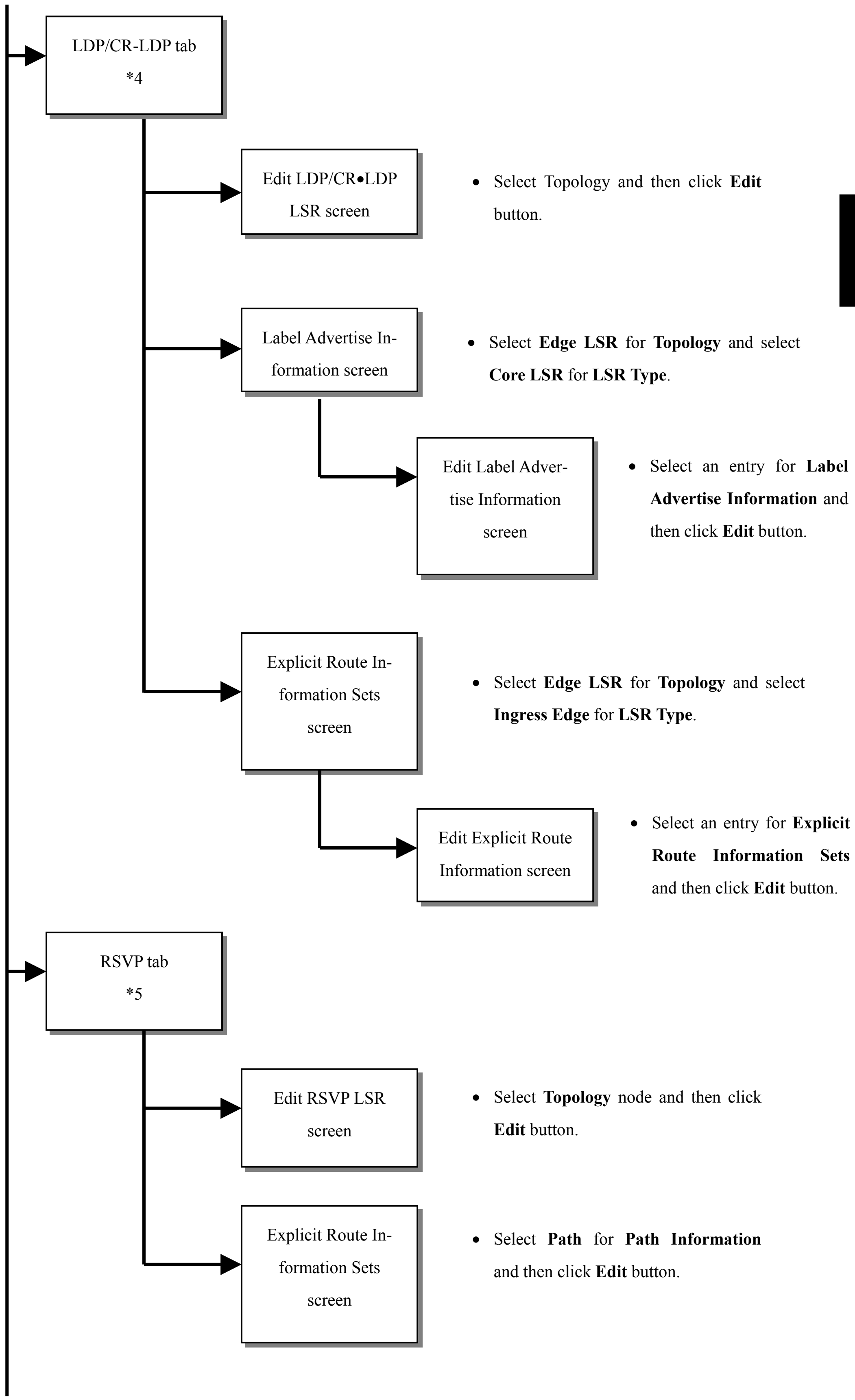
Refer to Section 5.1.2 (8) “Editing GFP field values” for details.

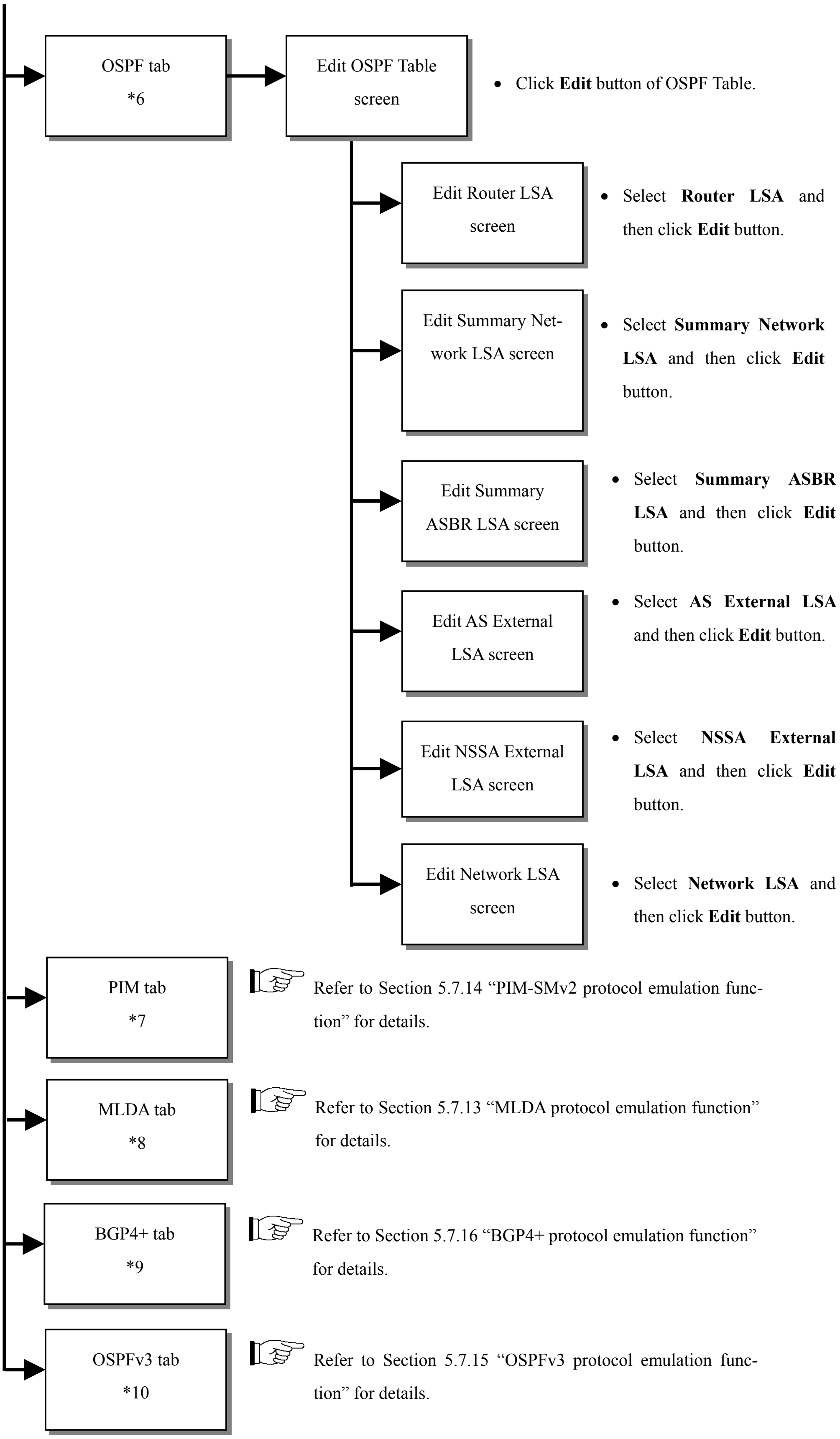

[7] Tx Stream tab
Stream Setting screen
• Select existing Stream and then click **Edit** button.
• Double-click existing Stream.
Stream Control tab
Refer to Section 5.1.3 "Setting transmission method of stream data" for details.
Frame Setting tab
Refer to Section 5.1.2 "Defining transmission data pattern" for details.
Frame Format tab
Refer to Section 5.1.2 "Defining transmission data pattern" for details.
Frame View tab
Refer to Section 5.1.2 "Defining transmission data pattern" for details.
General tab
VLAN Setting screen
• Click **Edit** button on the right of VLAN.
MPLS Setting screen
• Click **Edit** button on the right of MPLS
Ethernet tab
• Select a protocol other than MAC Control in **General** tab.
PPP tab
• Select **PPP** from **Mapping** in **Port Setting** screen.
Cisco HDLC tab
• Select **Cisco HDLC** from **Mapping** in **Port Setting** screen.
MAPOS V1/16 tab
• Select **MAPOS Version 1** or **MAPOS 16** from **Mapping** in **Port Setting**
GFP tab
• Select Frame-Mapped GFP from **Mapping** in **Port Setting** screen.
Protocol tabs
• Select optimal protocol in **General** tab.
Refer to Section 5.1.2 "Defining transmission data pattern" for details.
Data Field tab
Refer to Section 5.1.2 "Defining transmission data pattern" for details.
Error Insertion tab
Refer to Section 5.1.2 "Defining transmission data pattern" for details.


[7] Collision tab
Refer to Section 6.1.1 “Setting collision” for details.
[7] Capture tab
Capture Setting screen
• Click **Capture Setting** button.
Filter/Trigger/···
Setting screen
• Click **Edit** button.
Capture view screen
• Click **Retrieve capture data** button.
Convert Frame Data
screen
• Click **Convert selected frame** to a stream button.
[7] Counter tab
Counter Setting screen
• Click **Counter Setting** button.
Filter/Trigger/···
Setting screen
• Click **Edit** button.
Counter Display
Option screen
• Click **Display Option** button.
Counter Selection
screen
• Click **Show counter** in big number button.
Counter screen
• Click **OK** button.
WAN-PHY Counter
screen
• Click the **WAN** button.
For details read Section 5.2.7 “WAN-PHY counter”.
[7] Multiflow
Counter tab
Refer to Section 5.3 “Counting Number of Transmit/Receive Frames of Each Flow (multiflow counter)” for details.



[7] Latency tab
Refer to Section 5.5 "Measuring Frame Arrival Time (Latency)" for details.
[7] Ping tab
Refer to Section 4.7 "Checking Connection (Ping)" for details.
[7] Arrival time tab
Frame Arrival … Setting screen
• Click **Setting** button.
[7] Protocol tab
IGMP tab
Refer to Section 5.7.5 "IGMP" for details.
IGAP tab
Refer to Section 5.7.11 "IGAP" for details.
BGP-4 tab
BGP-4 Table screen
• Select virtual BGP speaker and then click **Edit** button.
• Double-click virtual BGP speaker.
Neighbor Configuration tab
Refer to Section 5.7.6 "BGP-4" for details.
Route Configuration tab
Refer to Section 5.7.6 "BGP-4" for details.
Route Attribute tab
Refer to Section 5.7.6 "BGP-4" for details.
MLD tab *3
Refer to Section 5.7.10 "IPv6" for details.


LDP/CR-LDP tab
*4
Edit LDP/CR•LDP LSR screen
• Select Topology and then click **Edit** button.
Label Advertise Information screen
• Select **Edge LSR** for **Topology** and select **Core LSR** for **LSR Type**.
Edit Label Advertise Information screen
• Select an entry for **Label Advertise Information** and then click **Edit** button.
Explicit Route Information Sets screen
• Select **Edge LSR** for **Topology** and select **Ingress Edge** for **LSR Type**.
Edit Explicit Route Information screen
• Select an entry for **Explicit Route Information Sets** and then click **Edit** button.
RSVP tab
*5
Edit RSVP LSR screen
• Select **Topology** node and then click **Edit** button.
Explicit Route Information Sets screen
• Select **Path** for **Path Information** and then click **Edit** button.


OSPF tab
*6
Edit OSPF Table screen
• Click **Edit** button of OSPF Table.
Edit Router LSA screen
• Select **Router LSA** and then click **Edit** button.
Edit Summary Network LSA screen
• Select **Summary Network LSA** and then click **Edit** button.
Edit Summary ASBR LSA screen
• Select **Summary ASBR LSA** and then click **Edit** button.
Edit AS External LSA screen
• Select **AS External LSA** and then click **Edit** button.
Edit NSSA External LSA screen
• Select **NSSA External LSA** and then click **Edit** button.
Edit Network LSA screen
• Select **Network LSA** and then click **Edit** button.
PIM tab
*7
Refer to Section 5.7.14 "PIM-SMv2 protocol emulation function" for details.
MLDA tab
*8
Refer to Section 5.7.13 "MLDA protocol emulation function" for details.
BGP4+ tab
*9
Refer to Section 5.7.16 "BGP4+ protocol emulation function" for details.
OSPFv3 tab
*10
Refer to Section 5.7.15 "OSPFv3 protocol emulation function" for details.

*1: Displayed only when the MU120138A is installed.

*2: Displayed only when the RFC2889 Benchmarking Option Test is installed.

*3: Displayed only when the IPv6 Expansion Option is installed.

*4: Displayed only when the MPLS(LDP/CR-LDP) Protocol Option is installed.

*5: Displayed only when the MPLS(RSVP) Protocol Option is installed.

*6: Displayed only when the OSPF Protocol Option is installed.

*7: Displayed only when the IPv6 Expansion Option and MD1230B-21 PIM-SMv2 Protocol are installed.

*8: Displayed only when the IPv6 Expansion Option and MD1230B-22 MLDA Protocol are installed.

*9: Displayed only when the IPv6 Expansion Option and MD1230B-19 BGP4+ Protocol are installed.

*10: Displayed only when the IPv6 Expansion Option and MD1230B-18 OSPFv3 Protocol are installed.

*11: 2 through 10 above cannot be used with the MU120101A/02A/03A/04A/03B/04B/05A/06A.

Section 4 Basic Operations

This section describes how to set basic parameters.

4

Basic Operations

4.1 Setting Operating Environment

The GUI Setting screen sets the functions for this software.

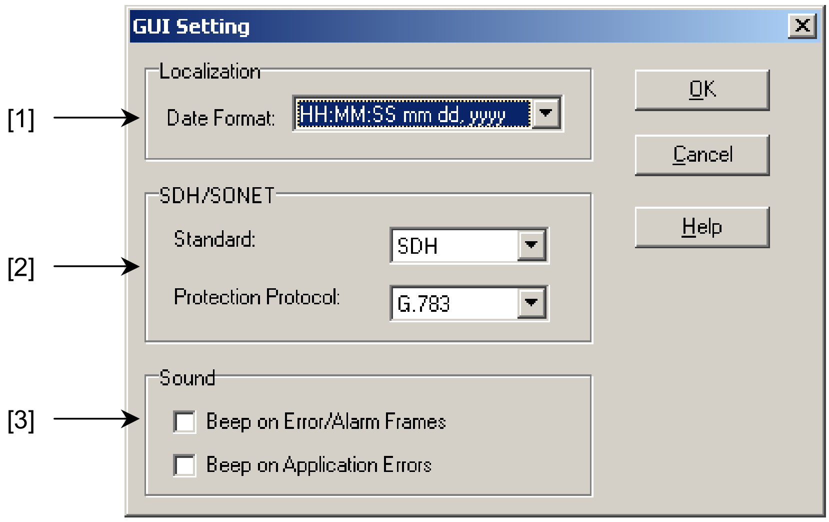


Figure 4.1-1 GUI Setting screen

[1] Localization
Performs localization setting.

(a) Date Format
Set the date and time format displayed on the screen.
Select one from the following formats:
HH:MM:SS mm dd,yyyy
HH:MM:SS dd mm,yyyy
yyyy-mm-dd HH:MM:SS

[2] SDH/SONET
Performs SDH/SONET settings.

(a) Standard
Switches between SDH and SONET terminologies. Select SDH or SONET.

For the terminology, refer to Appendix B "Corresponding of SDH/SONET Terms List."

(b) Protection Protocol
Selects G.783 or G.841 for K1/K2 code.

For terminology, refer to Appendix C "Corresponding of K1 and K2 Bytes List."

[3] Sound

Set Beep On/Off. The Beep sounds the following errors have occurred when the error check box is checked.

(a) Beep on Error/Alarm Frames

The Beep sounds when an error/alarm frame is detected from the Owner port.

(b) Beep on Application Errors

The Beep sounds when an error occurs due to setting mistakes or misoperations.

4.2 Registering Unit

Register the unit to be connected.

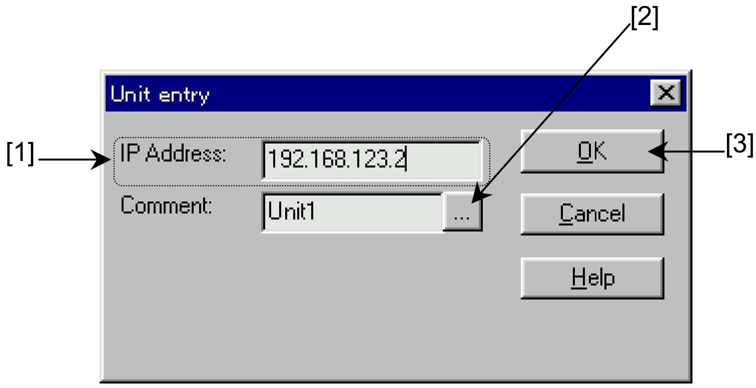


Figure 4.2-1 Unit entry screen

[1] Enter the IP address of the unit to be registered. The unit IP Address setting is performed using the setup utility.

[2] Enter a comment for the unit to be registered. Use the keyboard, or virtual keyboard displayed by pressing the ... (up to 6 characters). To edit comments, it is necessary to temporarily disconnect the unit.

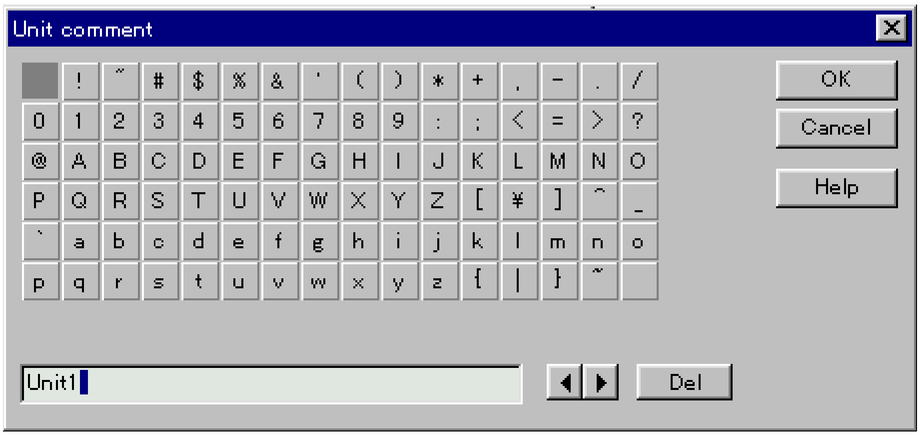
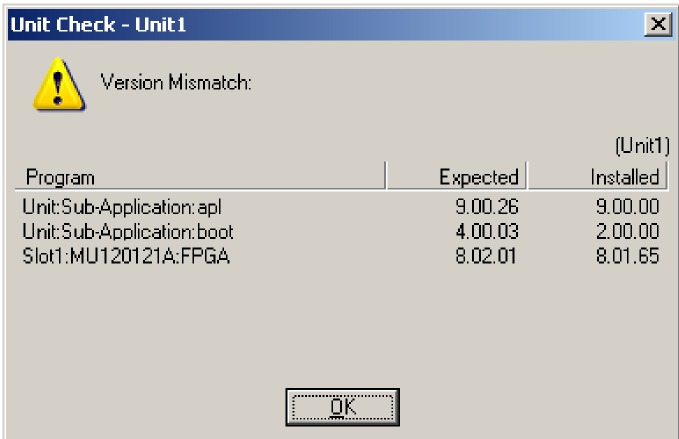


Figure 4.2-2 Unit comment screen (virtual keyboard)

[3] Press **OK** to register the unit.

Caution

If the unit and module firmware versions are incorrect at unit registration, the following error message is displayed. Correct operation is not guaranteed in this condition.



In this case, software upgrade is required. For the version upgrade procedure, refer to the MD1230/MP1590 Family Upgrade Manual.

4.3 Reserving Ports to be Used

Vacant ports can be reserved.

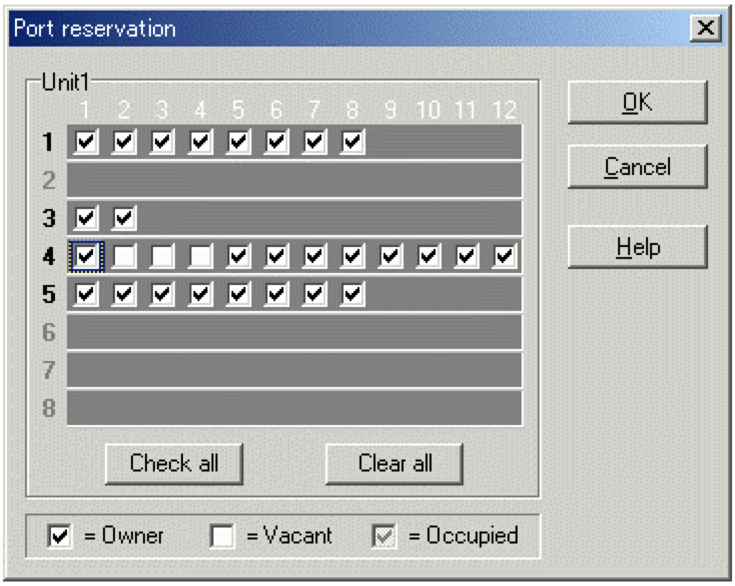


Figure 4.3-1 Port reservation screen

Procedures:

[1] Select the check box to reserve the port.
Press **Check all** to selects all ports on the unit.
Remove the checks in the check box to cancel reservation.
Press **Clear all** to remove the selected checks for all ports on the unit.

[2] Press **OK** to apply port reservation/cancel settings.

4.4 Setting Unit (Unit Setting Dialog)

Set parameters specific to the unit in the Unit Setting dialog box.

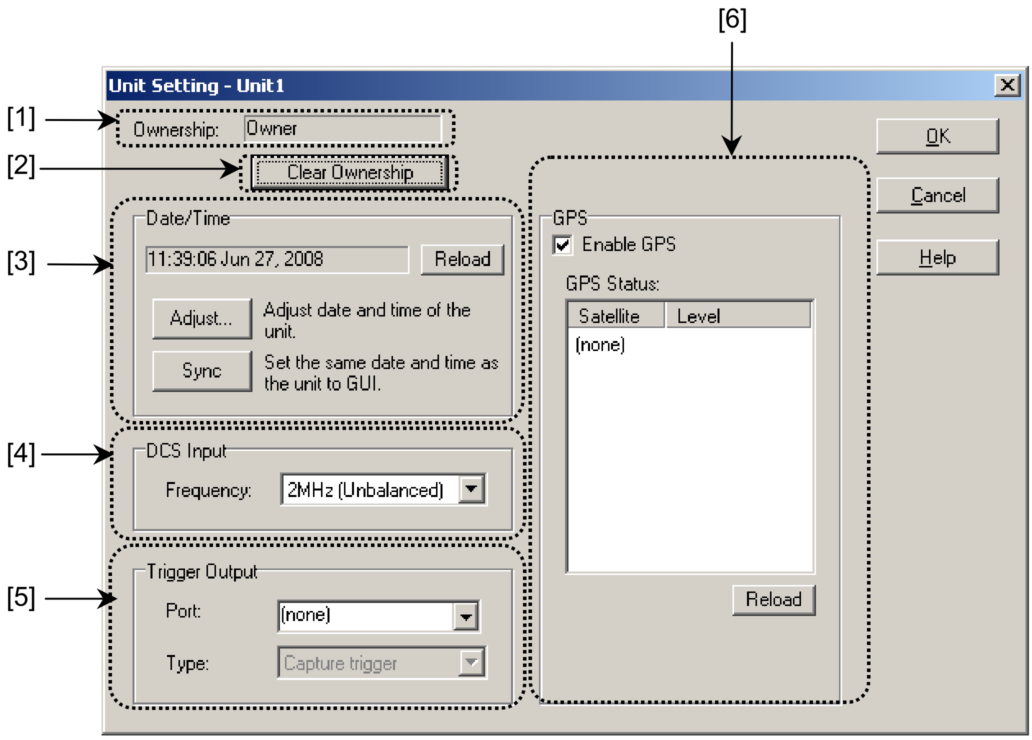


Figure 4.4-1 Unit Setting screen

[1] Ownership
Displays the occupation status for the unit setting. Settings can be performed only when **Owner** is displayed here.

[2] Take Ownership/Clear Ownership

(a) Take Ownership
Press the **Take Ownership** button to perform occupation for the unit setting. This button appears only when **Vacant** is displayed in **Ownership**.

(b) Clear Ownership
Press the **Clear Ownership** button to cancel occupation for the unit setting. This button appears only when **Owner** is displayed in **Ownership**.

[3] Date/Time

(a) Adjust
Sets time for Unit. Press this button to open the **Unit Date/Time** screen. Set Year, Month, Day, Hour, Minute and Second.

Note:

Time information on this product is managed according to UTC. Be sure to set the Windows time zone to the location where this product is used.

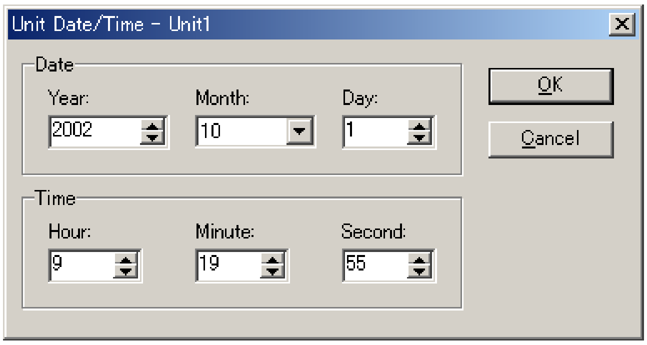


Figure 4.4-2 Unit Date/Time screen

(b) Sync

The Unit date/time and this software are aligned with the Windows clock. Pressing this button sets the Unit time to the Windows clock time.

(c) Reload

Update the time display.

[4] DCS Input

(a) Frequency

Selects DCS input source signal.

2 MHz (Unbalanced)	2 MH external input clock (2,048,000 Hz, Unbalanced)
2 MHz (Balanced)	2 MHz external input clock (2,048,000 Hz, Balanced)
2 Mbit/s (Unbalanced)	2 Mbps external input data signal (Low-speed data signal, Unbalanced)
2 Mbit/s (Balanced)	2 Mbps external input data signal (Low-speed data signal, Balanced)
1.5 MHz (Balanced)	1.5 MHz external input clock (1,544,000 Hz, Balanced)
1.5 Mbit/s (Balanced)	1.5 Mbit/s external input data signal (Low-speed data signal, Balanced)
64k+8kHz	64 kHz external input data signal (ISDN basic data signal)

Note:

Using the MP1590B/MP1591A, if a value outside the above range is selected at **Reference clock input** of the **Setup** - **Signal** - **Interface** screen in the SDH/OTN/Jitter mode, the display for the above setting changes to **none**.

[5] Trigger Output

Sets Trigger Output.

(a) Port

Select the Port that uses Trigger Output. Only the Port of **Owner** is selectable.

(b) Type

Select the type of Trigger Output.

[6] GPS

(Requires GPS Module option.)

Performs the GPS module setting.

(a) Enable GPS

GPS is enabled when it is checked.

(b) GPS Status

Shows the GPS status when GPS is enabled.

Satellite	Shows the satellite number.
Level	Shows reception level in dBHz unit.

(c) Reload

Updates the GPS status display.

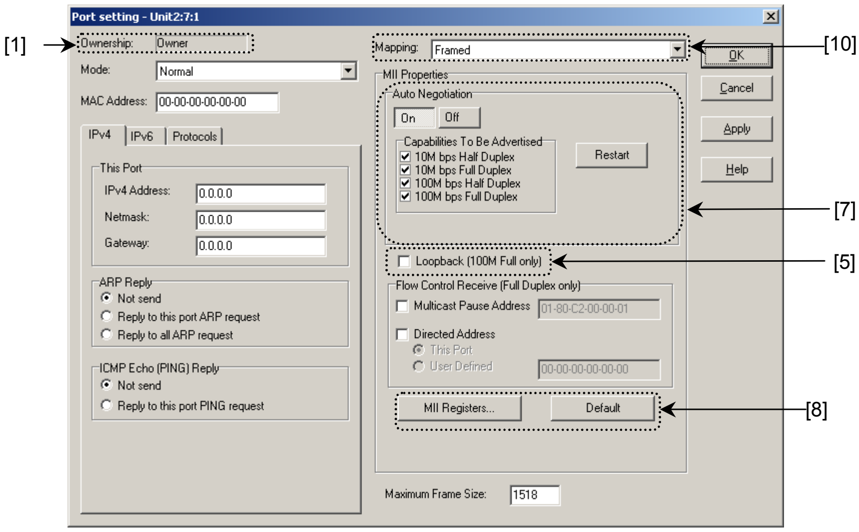
4.5 Setting Port (Port Setting Dialog)

Settings related to the basic operation are made at the **Port Setting** dialog.

4.5.1 Settings for Basic Operations and Physical Layer

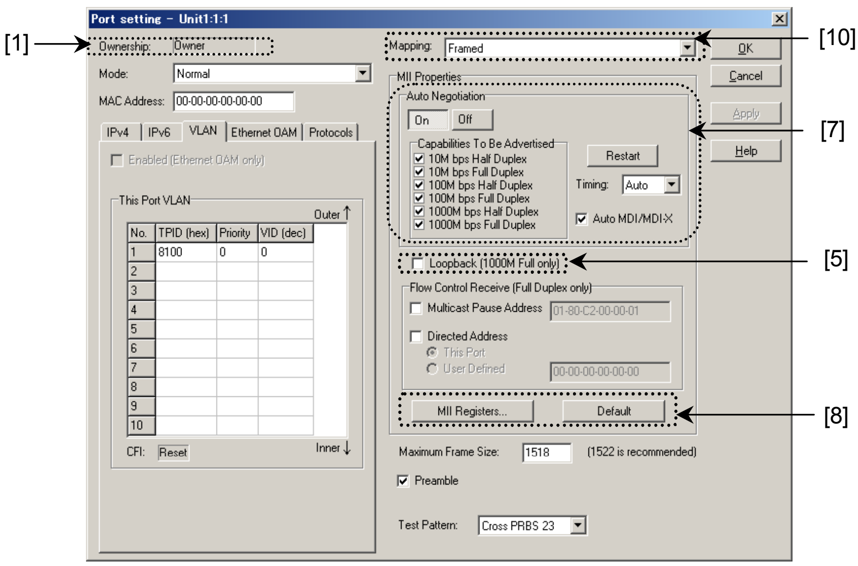
For settings not explained here, refer to Section 4.5.3 “Mapping related settings”.

(1) Ethernet module



MU120101A/11A

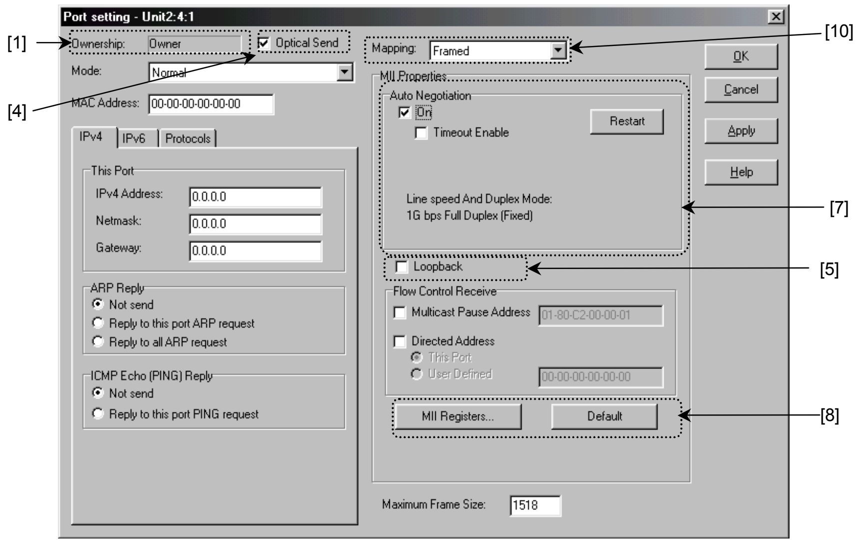
* **Mapping** can only be set for the MU120111A.



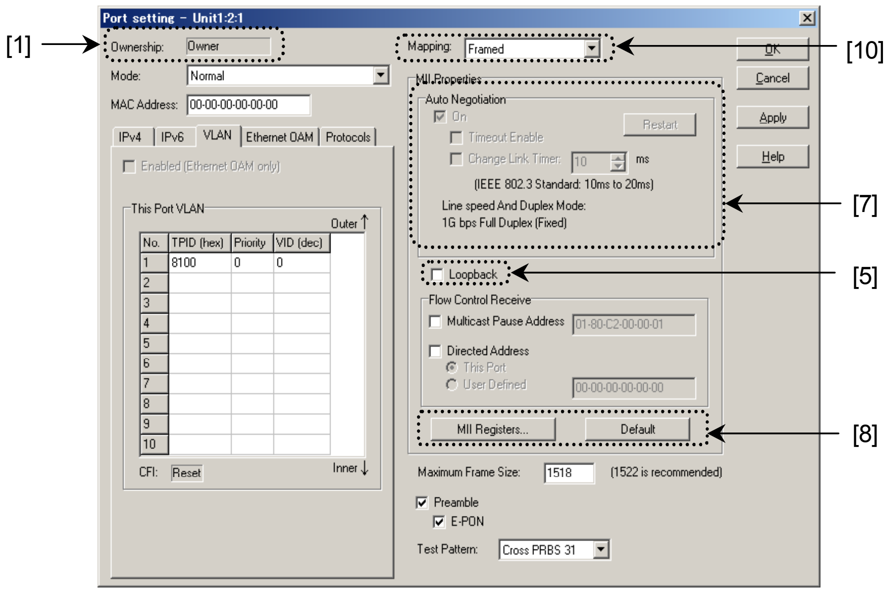
MU120121A/22A (RJ-45)/31A

* **Preamble** and **Test Pattern** can only be set for the MU120131A.

Figure 4.5.1-1 Port Setting screen (10/100/1000M Ethernet)

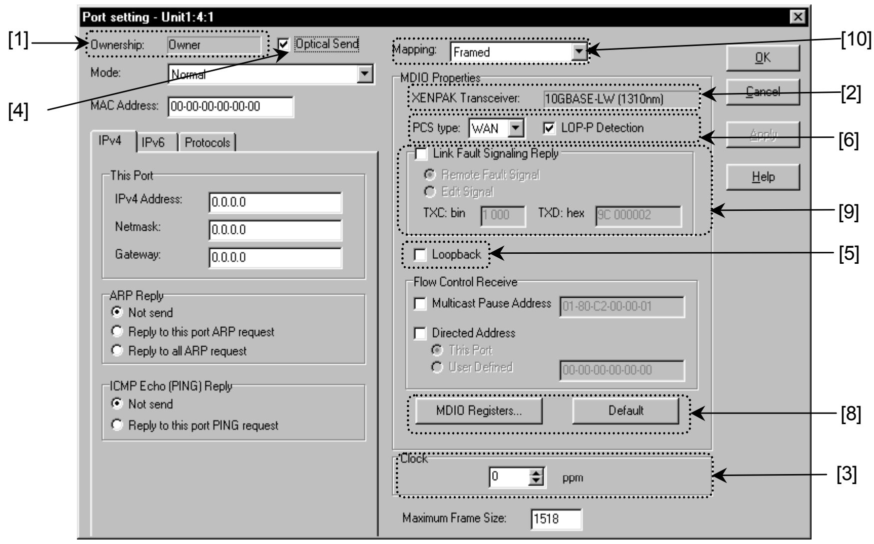


MU120102A/12A

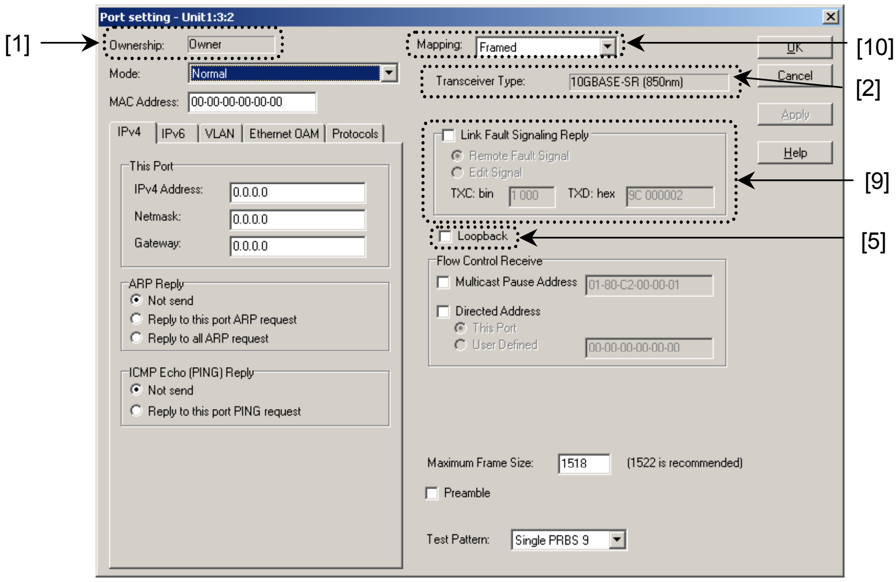


MU120122A (SFP)/32A

Figure 4.5.1-2 Port Setting screen (Gigabit Ethernet)



MU120118A/18B/18C



MU120138A

Figure 4.5.1-3 Port Setting screen (10 Gigabit Ethernet)

Name		Description
[1]	Ownership	This displays the port occupation status. Only a reserved port (with **Owner** displayed) can be set. To set a port to **Owner**, reserve the port. (Refer to Section 4.3 "Reserving Port to be Used".)
[2]	Transceiver Type (MU120138A) , XENPAK Transceiver (MU120118A/18B/18C)	This displays the name of the transceiver (XENPAK or SFP+) installed at the port. • 10GBASE-SR (850 nm) • 10GBASE-LR (1310 nm) • 10GBASE-ER (1550 nm) • 10GBASE-LW (1310 nm) The – symbol is displayed when no transceiver is installed. ***Note:*** 10GBASE-LW requires the WAN-PHY option. If 10GBASE-LW is installed when the WAN-PHY option is not installed, "option required" is displayed. **Caution** **When installing XENPAK, be sure to read the precautions described in Section 2.4 "Installing the XENPAK" in the Ethernet module operation manual (M-W1931AW). If a mistake is made with the installation, there is a risk of damage to the XENPAK and module.**
[3]	Clock (MU120118A/B/C)	The XENPAK Test option is required. The Tx clock frequency is changed in the range of –100 to +100 ppm. For example, at 10 ppm, the Tx clock of this port is speeded up by 10 times ppm compared to the standard TX clock. When **Mode** (refer to Section 4.5.4) is set to **Through** or **Address Swap**, this setting is disabled (because the Rx clock is used as the Tx clock). With the MU120131A/32A/38A, the change in the TX clock frequency is performed by a Physical I/F sheet. (Refer to Section 6.5.2 "Varying frequency".)
[4]	Optical Send (MU120102A/12A/18A/18B/18C)	When this setting is On, optical output from a port is enabled. With the MU120132A/38A, the optical output is switched On/Off by the **Physical I/F** sheet (refer to Section 6.5.1 "Link Status Control").
[5]	Loopback	At On, loopback operation is performed and the Tx data is looped back inside the equipment. This can be used to check operation before connecting cables.

Name		Description
[6]	PCS type (MU120118A/18B/18C)	This can be set when the WAN-PHY option is installed and when the XENPAK for 10GBASE-LW is inserted. Select the PCS operation mode from **LAN** (LAN-PHY) or **WAN** (WAN-PHY). When the **Loopback** setting is on, this setting is disabled and the operation is LAN-PHY.
	LOP-P Detection (MU120118A/18B/18C)	This setting is enabled when the **PCS type** setting is set to **WAN**. It specifies whether or not to detect the LOP-P alarm. When Off is set the LOP-P alarm is not detected. ***Note:*** The LOP-P alarm is detected when the Rx frame Concatenation Indication bit (SS) is a value other than 00. When connecting a device when the value of SS is other than 00 (e.g., SDH standard device), set this setting to Off.
[7]	Auto Negotiation (MU120101A/02A/11A/12A/21A/22A/31A/32A)	This configures settings related to Auto Negotiation. For details, refer to Section 4.5.2 “Auto Negotiation Settings”.
[8]	MII Registers (MU120101A/02A/11A/12A/21A/22A/31A/32A) MDIO Registers (MU120118A/18B/18C)	This displays the MII/MDIO Register Setting screen. For details, refer to Section 4.5.5 “MII/MDIO Register settings”. ***Note:*** With the MU120138A, the MDIO Register Setting screen is displayed by right-clicking the Tree View port icon (refer to Section 3.1 [1]).
	Default (Ethernet module excluding MU120138A)	This resets the **MII Properties** or **MDIO Properties** to the defaults.
[9]	Link Fault Signaling Replay (MU120118A/18B/18C/38A)	At On, when a fault is detected, either RF or the set pattern XGMII data is sent continuously. The Link Fault Signalling option is required. For details, refer to Section 6.3.4 “LFS Emulation”.
[10]	Mapping	Select **Framed** or **Unframed**. For details, refer to Section 4.5.3 “Mapping Related Settings”. This is not supported by the MU120101A. The setting is fixed to **Framed**.

(2) EoS/POS module

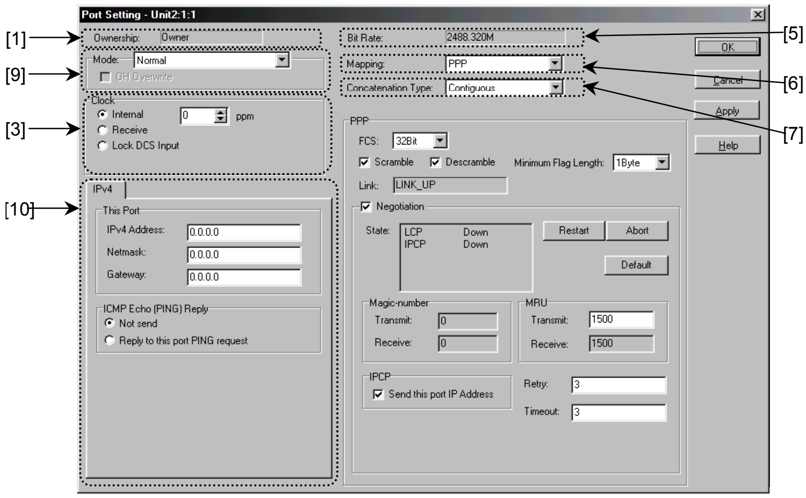


Figure 4.5.1-4 Port Setting screen (MU120103A/04A/05A/06A/03B/04B)

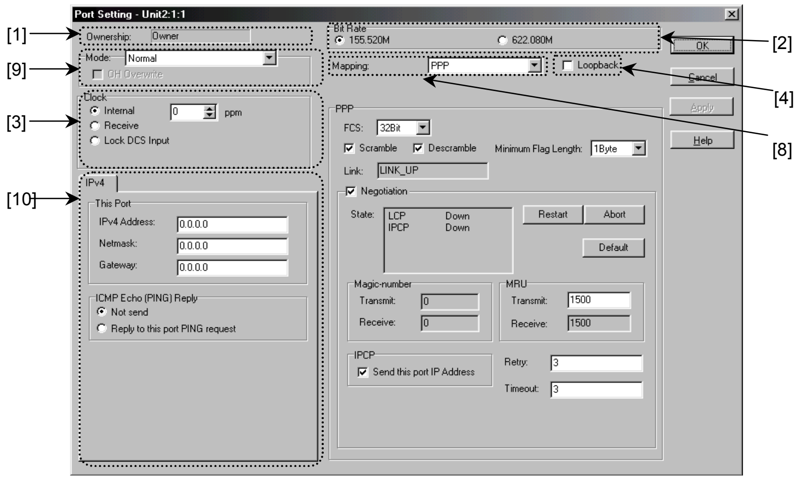


Figure 4.5.1-5 Port Setting screen (MU120119A/20A)

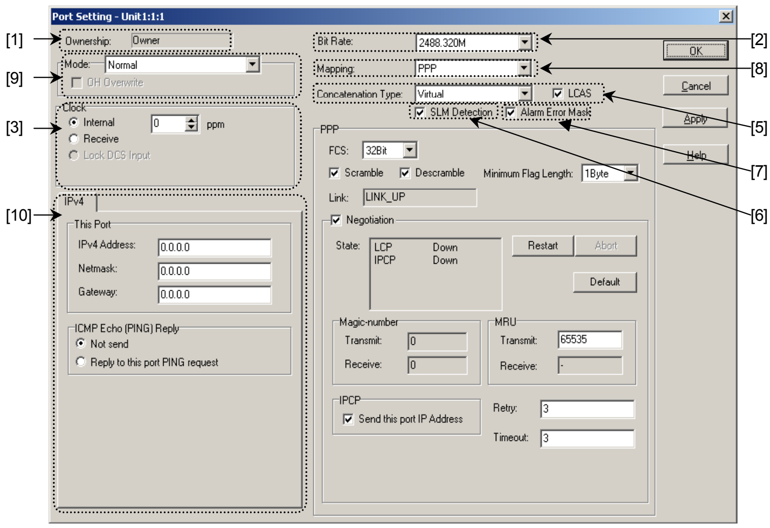


Figure 4.5.1-6 Port Setting screen (MU150101A)

<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td>[1]</td><td>Ownership</td><td>This displays the port occupation status. Only a reserved port (with Owner displayed) can be set. To set a port to Owner, reserve the port. (Refer to Section 4.3 “Reserving Port to be Used”.)</td></tr>
<tr><td>[2]</td><td>Bit Rate</td><td>This displays or selects the bit rate.
For the MU120119A, select 155.520 M or 622.080 M.
For the MU150101A, select 2488.320 M, 622.080 M or 155.520 M.</td></tr>
<tr><td>[3]</td><td>Clock</td><td>This selects the clock source for the transmission signal.
<table>
<tr><td>Internal</td><td>Synchronizes with measuring instrument internal clock
An offset between –100 and +100 ppm can be added to the transmission clock.</td></tr>
<tr><td>Receive</td><td>Synchronizes with Received SDH/SONET frame signal</td></tr>
<tr><td>Lock ***</td><td>Synchronizes with DCS (Digital Clock Source) signal
The DCS selected by Unit Setting is displayed for ***.</td></tr>
<tr><td>Lock 10M (GPS)</td><td>10 MHz synchronous signal from GPS
Requires GPS option</td></tr>
</table></td></tr>
<tr><td>[4]</td><td>Loopback (MU120119A/20A)</td><td>At On, loopback operation is performed and the Tx data is looped back inside the equipment. With the MU120119A/20A, frames are also sent externally. This can be used to check operation before connecting cables.</td></tr>
</table>

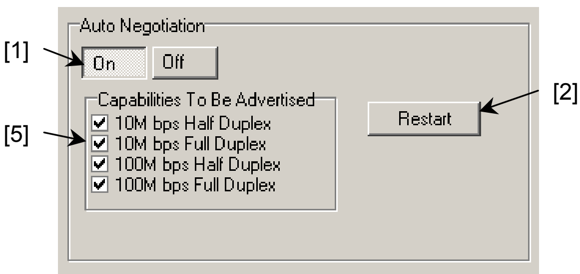
<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td rowspan="2">[5]</td><td>Concatenation Type
(MU120103B/04B,
MU150101A)</td><td>Select the Concatenation type from Contiguous or Virtual.
This setting requires the following options:
<table>
<tr><td>MU120103B/04B</td><td>Requires EOS mapping option or virtual concatenation option
The virtual concatenation option is required to select Virtual.</td></tr>
<tr><td>MU150101A</td><td>The HO virtual concatenation option or the LO virtual concatenation option required to select Virtual.</td></tr>
</table>
The available mappings are shown below:
<table>
<tr><td>MU120103B/04B</td><td>Contiguous:
STS-48c/STS-24c/STS-12c/STS-9c/STS-6c/
STS-3c/STS-1 (SONET Notation)
Virtual:
STS3c-8v/STS3c-7v/STS3c-6v/STS3c-5v/
STS3c-4v/STS3c-3v/STS3c-2v/STS1-24v/
STS1-21v/STS1-18v/STS1-15v/STS1-12v/
STS1-9v/STS1-6v/STS1-3v (SONET Notation)</td></tr>
<tr><td>MU150101A</td><td>Contiguous:
VC4-16c/VC4-8c/VC4-4c/VC4-2c/VC4/VC3/VC4-Xc
Virtual:
High order: VC4-Xv/VC3-Xv
Low order: VC12-Xv/VC11-Xv</td></tr>
</table></td></tr>
<tr><td>LCAS
(MU150101A)</td><td>This is supported when Virtual is selected in the Concatenation Type setting. When this is set to On, measuring/monitoring/capturing of LCAS and LCAS sequence generation are possible. The LCAS option is required.</td></tr>
<tr><td>[6]</td><td>SLM Detection
(MU150101A)</td><td>This enables/disables SLM measurement.</td></tr>
<tr><td>[7]</td><td>Alarm Error Mask
(MU150101A)</td><td>This sets whether to display lower-level alarm errors when an upper-level alarm has occurred.</td></tr>
<tr><td>[8]</td><td>Mapping</td><td>Select the data encapsulation method for the SDH/SONET payload. For details, refer to Section 4.5.3 “Mapping Related Settings”.</td></tr>
<tr><td>[9]</td><td>Mode</td><td>This selects the port operation mode. For details, refer to Section 4.5.4 “Operation Mode Settings”.</td></tr>
<tr><td>[10]</td><td>IPv4</td><td>This configures IPv4 port settings. For details, refer to Section 4.5.6 “Protocol Operation Settings”.</td></tr>
</table>

4.5.2 Auto Negotiation Settings

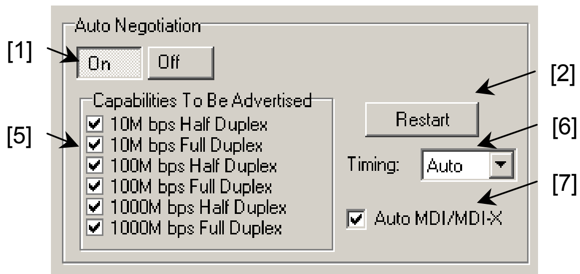
This Section explains MU120101A/02A/11A/12A/21A/22A/31A/32A–related Auto Negotiation settings.

Note:

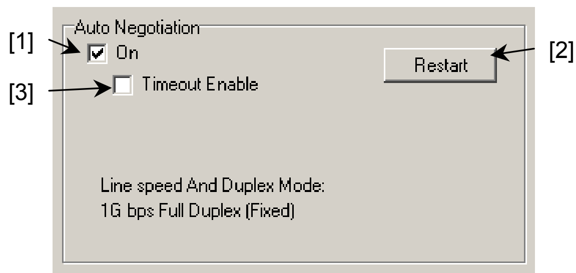
Auto Negotiation settings cannot be configured for the MU120118A/18B/18C/38A. The Line Speed at this time is fixed to 10 Gbps, and the Duplex Mode is fixed to Full.



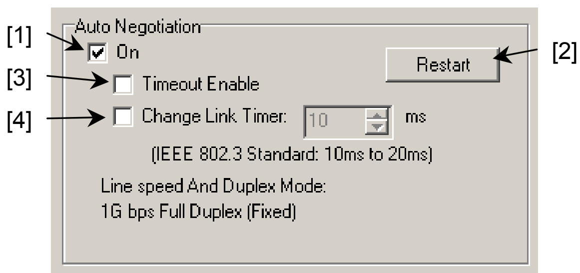
MU120101A/11A



MU120121A/22A (RJ-45)/31A



MU120102A/12A



MU120122A (SFP)/32A

Figure 4.5.2-1 Auto Negotiation setting screens

Name		Description
[1]	On	When set to On, this configures Auto Negotiation related settings.
[2]	Restart	This setting is enabled when **Auto Negotiation** is set to On. Auto negotiation is re-executed.
[3]	Timeout Enable (MU120102A/12A/22A(SFP)/32A)	This setting is enabled when **Auto Negotiation** is set to On. When this setting is On, if the Auto Negotiation sequence does not proceed for some reason, a timeout occurs and linkup is performed to proceed with the sequence.

Name		Description
[4]	Change Link Timer (MU120112A/22A(SFP)/32A)	This setting is enabled when **Auto Negotiation** is set to On. It sets the Link Timer value (0 to 100 ms) for Auto Negotiation. The Auto Negotiation Analysis option is required. For details about the Auto Negotiation Analysis option, refer to Section 6.2.1 “Auto negotiation analysis function”. ***Note:*** IEEE802.3 specifies 10 to 20 ms as the valid range for Link Timer. As a result, when a value outside this range is set, there is a risk that Auto Negotiation will not be performed correctly.
[5]	Capabilities To Be Advertised Line Speed And Duplex Mode (MU1201/01A/11A/21A/22A (RJ-45)/31A)	When **Auto Negotiation** set to On: Specify the advertised Line Speed and Duplex Mode. Link Speed can be selected from 10/100/1000 Mbps and Duplex Mode can be selected from Half/Full. The Auto Negotiation result using the best values are selected here. When **Auto Negotiation** set to Off: Select the Link Speed and Duplex Mode to use. Link Speed can be selected from 10/100/1000 Mbps and Duplex Mode can be selected from Half/Full. ***Note:*** • A Link Speed of 1000 Mbps can be selected with the MU120121A/22A (RJ-45)/31A. However, when **Auto Negotiation** is set to Off, 1000 Mbps cannot be selected. In addition, Carrier Extension and Late Collision are not supported at 1000 Mbps Half Duplex. • With the MU120121A/22A (RJ-45), when Line Speed is set to 10 Mbps when **Auto Negotiation** is set to Off, Link Up is not achieved even when the cable is connected while sending the frame from the DUT. • With the MU120102A/12A/22A (SFP)/32A, Line Speed is fixed to 1 Gbps and Duplex Mode is fixed to Full. • Half Duplex cannot be set when **Mode** is set to **Impairment** (refer to Section 4.5.4).
[6]	Auto MDI/MDI-X (MU120121A/22A (RJ-45)/31A)	This is supported when **Auto Negotiation** is set to On. When set to On, the Auto MDI/MDI-X function is enabled.
[7]	Timing (MU120121A/22A (RJ-45)/31A)	This is enabled when **Auto Negotiation** is set to on and 1000 Mbps is selected. It specifies the timing (Auto/Master/Slave) for Auto Negotiation at 1000Base-T. When the auto negotiation result is Master, operation is at the port clock and Link Partner also operates at the port timing. However, when the result is Slave, operation is in accordance with the Link Partner timing. • When the opposite port is set to **Auto**, which port becomes Master is determined at each Auto Negotiation. • When the port itself is **Master** or **Slave**, when Link Partner is set to **Auto**, Link is performed at the set contents (Master or Slave). • It becomes Slave when the **Mode** setting (refer to Section 4.5.4) is **Through** or **Address Swap**.

4.5.3 Mapping Related Settings

This section explains the contents of each setting for the frame mappings selected at the **Mapping** setting (refer to Section 4.5.1).

The following frame mappings can be selected for the Ethernet module.

- Framed
- Unframed

The following frame mappings can be selected for the EoS/POS module.

- PPP
- Cisco HDLC
- MAPOS Version 1
- MAPOS 16
- Frame-Mapped GFP (EoS module)
- LEX (EoS module)
- LAPS (X.86) (EoS module)
- Bulk
- SDH Unframed

Note:

With the MU120103B/04B, the mappings that can be selected vary according to the module firmware. Refer to the MD1230B Data Quality Analyzer operation manual for the firmware switching method.

Firmware	Supported Mappings
GFP	Frame-Mapped GFP Bulk Unframe
PPP	PPP Cisco HDLC MAPOS Version1 MAPOS16 LEX LAPS(X.86)

(1) Framed (Ethernet module)

This mapping is used when transmitting/receiving normal Ethernet frames.

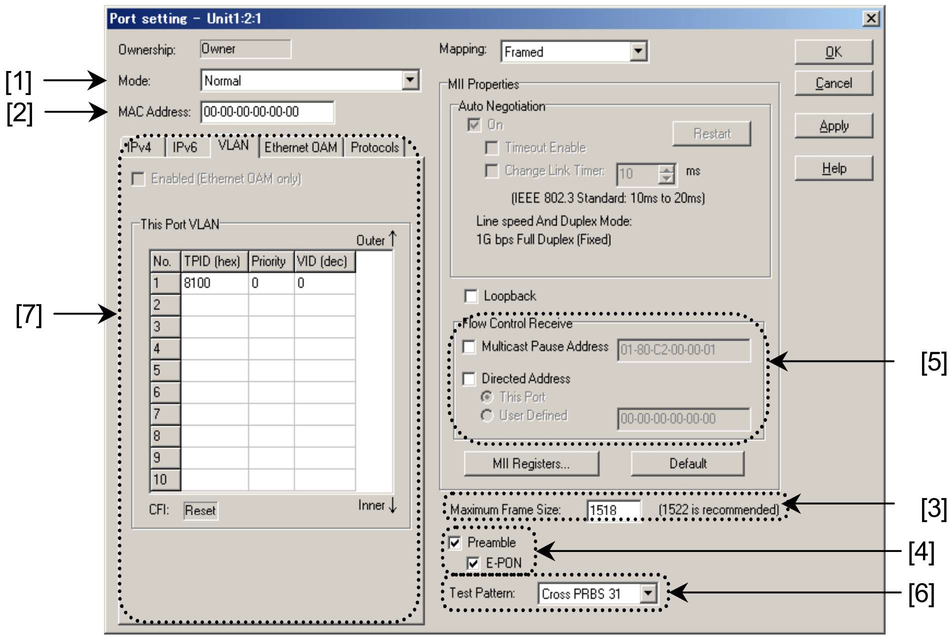


Figure 4.5.3-1 Port Setting (Framed) screen

Name		Description
[1]	Mode	This selects the port operation mode. For details, refer to Section 4.5.4 “Operation Mode Settings”.
[2]	MAC Address	This sets the MAC address (6-byte hexadecimal) used by ARP Reply, Ping Reply, TxStream, Automatic Test, Flow Control, etc. ***Note:*** When this setting is set to multicast/broadcast address, there may be an adverse impact on the connected network. When this setting is set to multicast (least significant bit of header byte set to 1), the source addresses for the frame sent by the port protocol emulation function are all set to multicast. Since the destinations for frames responding to these packets is also set to all multicast, the operation of the connected network may become abnormal.
[3]	Maximum Frame Size	This specifies the maximum length (from MAC DA to FCS field) of the Rx frame. This setting is the evaluation condition for the Oversize error. The setting range varies according to the module as shown below. MU120101A/11A/21A/22A/31A/32A/38A: 64 to 10000 byte MU120102A/12A/18A/18B/18C: 64 to 65280 byte

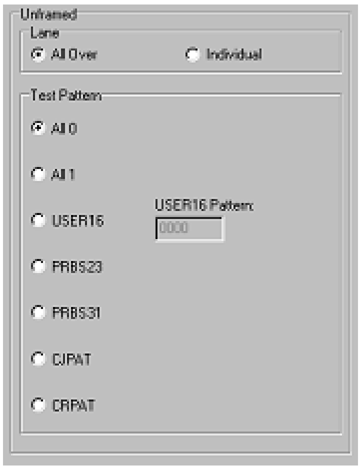
<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td rowspan="2">[4]</td><td>Preamble
(MU120121A/22A/31A/32A/38A)</td><td>This sets whether or not to capture the preamble.
Note:
• When link speed is 10 Mbps, but the preamble cannot be received correctly.
• The preamble is not displayed with the Decode Module option and Expert Analysis Module option.</td></tr>
<tr><td>E-PON
(MU120132A)</td><td>When the preamble is captured, it is decoded as the E-PON preamble and displayed. However, when an error occurs when the preamble CRC is calculated, the Preamble CRC Error count at the Counter screen is incremented. Refer to IEEE802.3ah for the preamble decode display and the CRC calculation.
Note:
When E-PON is set to On, the Auto Negotiation Setting is fixed to Off.</td></tr>
<tr><td>[5]</td><td>Flow Control Receive</td><td>This sets whether or not to control sending when the PAUSE frame (MAC Control Frame (PAUSE Function)) is received.
• Multicast Pause Address
At On, sending is controlled when the destination MAC address of the received pause frame is 01-80-C2-00-00-01.
• Directed Address
At On, sending is controlled when the destination MAC address of the received pause frame is the specified value. The MAC address specification may either use the This Port-MAC Address setting or the setting specified at User Defined.
Note:
This function is disabled when the Mode setting (refer to Section 4.5.4) is other than normal.</td></tr>
<tr><td>[6]</td><td>Test Pattern
(MU120131A/32A/38A)</td><td>When Data Field 1 at the Stream Setting screen is set to PRBS for Test Frame (refer to Section 5.1.2 (26)), the type of PRBS pattern set at Test Frame can be specified from any of [Single PRBS 9], [Cross PRBS 23] and [Cross PRBS 31]. For details of Cross PRBS, refer to Section 6.4.1 “Cross PRBS for Each Frame”.</td></tr>
<tr><td>[7]</td><td>IPv4/IPv6/VLAN/Ethernet OAM/Protocols</td><td>This sets each protocol operation. For details, refer to Section 4.5.6 “Setting Each Protocol Operation”.</td></tr>
</table>

(2) Unframed (Ethernet module)

At this mapping, all Ethernet frames (excluding the FCS field) are sent as the test pattern to confirmed bit errors at the receive side.

Note:

- Supported by Ethernet modules except MU120101A
- Only ports 1 and 5 can be selected with the MU120111A module.
- The XENPAK Test option is required with the MU120118A/18B/18C and can be used when **PCS type** is **LAN**.
- When **Unframed** is selected, functions related to frame sending and receiving, such as Tx Stream, cannot be used.



* **Lane** can only be set with the MU120118A/18B/18C.

Figure 4.5.3-2 Port Setting (Unframed) screen

Name		Description
[1]	Lane (MU120118A/18B/18C)	This sets the transmission method for test patterns to **All Over** or **Individual**. When **Individual** is set, the send test pattern is a continuous value at each of Lane 0 to Lane 3 and BER measurement can be performed at each lane of the receive side. When **All Over** is set, the send test pattern is continuous for all lanes and the BER can be measured at the receive side without identifying the lanes.
[2]	Test Pattern	This selects the type of test pattern. All 0: All bits are zero All 1: All bits are one USER16: User-defined pattern of 16 bits (four-digit hexadecimal) PRBS23 PRBS31 CJPAT*1 CRPAT*1 *1: Selected with MU120102A/12A/22A (SFP)/18A/18B/18C/32A/38A

(3) PPP (EoS/POS module)

This setting performs sending and receiving of PPP frames.

The POS option is required with the MU150101A.

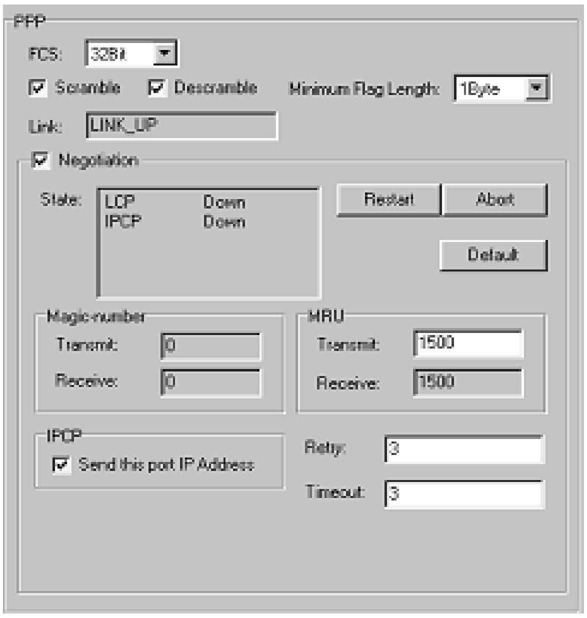


Figure 4.5.3-3 Port Setting (PPP) screen

Name		Description
[1]	FCS	This displays the number of FCS bits. It is fixed to 32 bits with the MU120103A/04A/19A/20. 16 or 32 bits can be selected with the MU120103B/04B/MU150101A.
[2]	Scramble	When this is set to On, Tx frames are scrambled.
[3]	Descramble	When this is set to Off, Rx frames are not scrambled.
[4]	Minimum Flag Length	This selects 1 or 2 bytes as the flag sequence between PPP frames. It affects the setting range for the minimum gap in the Tx stream.
[5]	Link	This displays the port Link state. LINK_UP: Port linked LOS: Loss Of Signal status LOF: Loss Of Frame status OOF: Out Of Frame status {MS_AIS | AIS_L}: MS-AIS/AIS-L status {AU_AIS | AIS_P}: AU-AIS/AIS-P status {AU_LOP | LOP_P}: AU-LOP/LOP-P status PPP_DOWN: No Negotiation or Negotiation failed status PPP_RESTART: Re-executing Negotiation status ***Note:*** [LINK_UP] is displayed when the LCP and IPCP statuses are UP or Off. If either status is DOWN, [PPP_DOWN] is displayed.
[6]	Negotiation	PPP negotiation is performed at On.
[7]	State	This displays the LCP and IPCP link states.
[8]	Restart	This restarts Negotiation processing.

Name		Description
[9]	Abort	This aborts the current Negotiation processing.
[10]	Default	This resets the **Negotiation** settings to the default values.
[11]	Magic-number	This displays the value of the Magic-number sent by Negotiation processing in the **Transmit** box. The value of the Magic-number is generated automatically. The Magic-number received as the Negotiation processing result is displayed in the **Receive** box.
[12]	IPCP	When the **Send this port IP Address** setting is On, the value of the **IP Address setting** (refer to Section 4.5.6 (2)) at Negotiation is sent.
[13]	MRU	This specifies the maximum length of the Information Field for the receive frame in the **Transmit** box. This setting is used by Negotiation processing as the Oversize frame evaluation condition. The value of MRU obtained as the Negotiation result is displayed in a **Receive** box.
[14]	Retry	This specifies the Retry count to resend an LCP/IPCP request that was not replied to.
[15]	Timeout	This specifies the wait time (seconds) until a response to the request by LCP and IPCP is obtained

(4) Cisco HDLC/MAPOS Version 1/MAPOS 16 (EoS/POS module)

HDLC frame sending and receiving is performed at Cisco HDLC. However, MAPOS frame sending and receiving is performed at MAPOS Version 1/MAPOS 16 (the frame header Address field is 8 bits at MAPOS Version 1 and 16 bits at MAPOS 16).

The POS option is required with the MU150101A.

Note:

When MAPOS Version 1 or MAPOS 16 is selected, each protocol function, such as Ping, cannot be used.

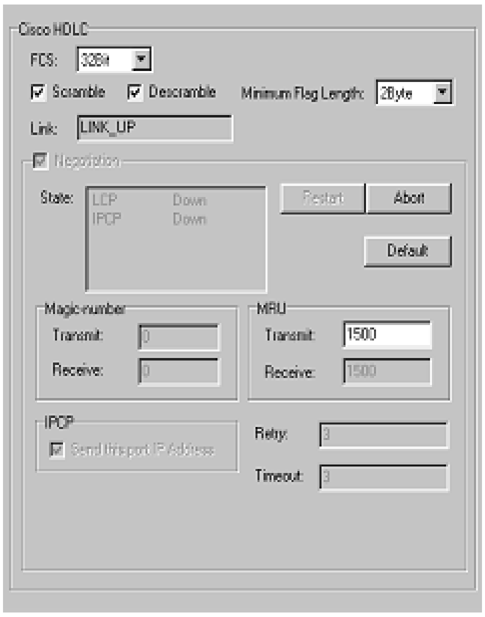


Figure 4.5.3-4 Port Setting (Cisco HDLC/MAPOS) screen

Name		Description
[1]	FCS	This displays the FCS bit count. It is fixed to 32 bits with the MU120103A/04A/19A/20A; 16 or 32 bits can be selected with the MU120103B/04B/MU150101A.
[2]	Scramble	When this is set to On, transmission frames are scrambled.
[3]	Descramble	When this is set to Off, receive frames are not scrambled.
[4]	Minimum Flag Length	This switches the Flag Sequence between Cisco HDLC and MAPOS frames. Select from 1 and 2 bytes. This setting affects the setting range of the Tx Stream minimum gap.
[5]	MRU	This specifies the maximum length of the Information Field for the receive frame in the **Transmit** box. It is used as the Oversize frame evaluation condition.

(5) Frame-Mapped GFP (EoS module)

This mapping is used when transmitting/receiving GFP frames.

The EOS Mapping option is required with the MU120103B/04B.
The GFP-F/LEX/LAPS option is required with the MU150101A.

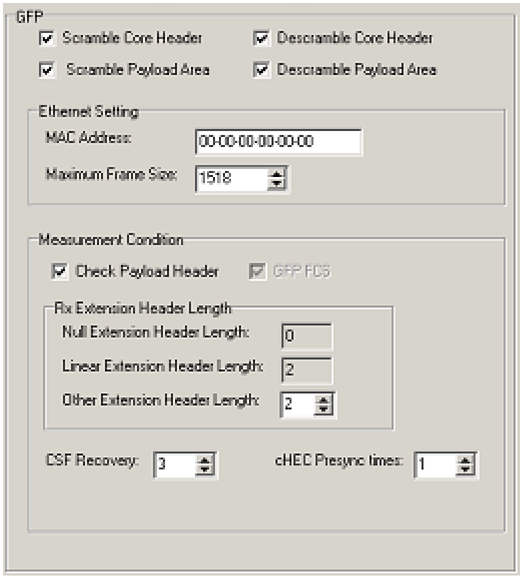


Figure 4.5.3-5 Port Setting (Frame-Mapped GFP) screen

Name		Description
[1]	Scramble Core Header	This scrambles the Core Header part in the send GFP frame when set to On.
[2]	Descramble Core Header	This descrambles the Core Header part in the receive GFP frame when set to On.
[3]	Scramble Payload Area	This scrambles the payload part (including Payload Header and FCS) in the send GFP frame when set to On.
[4]	Descramble Payload Area	This descrambles the payload part (including Payload Header and FCS) in the receive GFP frame when set to On.
[5]	MAC Address	This sets the MAC addresses used for ARP Reply, Ping Reply, stream transmission, Automatic Test, etc. It enables the MU150101A port to emulate an Ethernet port.
[6]	Maximum Frame Size	This specifies the maximum length (64 to 65535 bytes) of the Ethernet frame where the receive GFP frame is stored (from Destination Address to FCS field). It is used as the Oversize frame evaluation condition.
[7]	Check Payload Header	The receive GFP frame Payload Header is ignored when this is set to Off.
[8]	GFP FCS	This setting is required when **Check Payload Header** is unchecked to ignore the payload header in a reception GFP frame because it is impossible to detect FCS from the reception frame in this event. Check this when measuring data with FCS on its GFP frame.

Name		Description
[9]	Other Extension Header Length	This is set when receiving GFP frame with an Extension Header other than Null/Linear. At receive, the MU120103B/04B assumes this setting is the Extension Header length (2 to 58 bytes) of GFP frames (excluding eHEC) with EXI values other than Null/Linear for all measurement processing.
[10]	CSF Recovery	This specifies N (1 to 16). When the Client Management Frame is received less than N times (set value) within N x 1000 ms, it is assumed that the Client Signal Fail status is recovered. The Client Signal Fail status is recovered even when a frame other than Idle, or Client Management Frame is received.
[11]	cHEC Presync times	This sets the count from Presync to Sync (1 to 16) for GFP frame synchronization processing (refer to ITU-T G.7041. 6.3.1).

(6) LEX (EoS module)

This mapping is used when sending and receiving frames using PPP-LEX.

The EOS mapping option requires the MU120103B/04B.
The GFP-F/LEX/LAPS option requires the MU150101A.

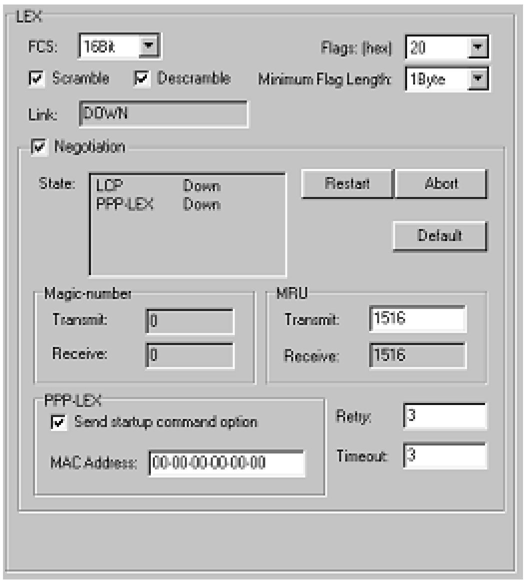


Figure 4.5.3-6 Port Setting (LEX) screen

Name		Description
[1]	FCS	This displays the FCS bit count; it is fixed to 16 bits.
[2]	Flags (hex)	Sets the 8 bits in PPP-LEX frame consisting of Flag field (4-bit) and Pad (4-bit). The set value of this item is applied to frames transmitted voluntarily by the MU120103B/04B via the protocol emulation function. Select from 0x20 and 0x00.
[3]	Scramble	When this is set to On, transmission frames are scrambled.
[4]	Descramble	When this is set to Off, receive frames are not scrambled.
[5]	Minimum Flag Length	This selects 1 or 2 bytes as the Flag Sequence between PPP frames. It affects the setting range for the minimum gap in the Tx stream.

Name		Description
[6]	Link	This displays the port Link state. MU120103B/04B: LINK_UP: Port linked LOS: Loss Of Signal status LOF: Loss Of Frame status OOF: Out Of Frame status {MS_AIS | AIS_L}: MS-AIS/AIS-L status {AU_AIS | AIS_P}: AU-AIS/AIS-P status {AU_LOP | LOP_P}: AU-LOP/LOP-P status LEX_DOWN: No Negotiation or Negotiation failed status LEX_RESTART: Re-executing Negotiation status MU150101A: LINK_UP: Port linked LOS: Loss Of Signal status LOF: Loss Of Frame status AIS: Alarm Indication Signal status LEX_DOWN: No Negotiation or Negotiation failed status PPP-LCP: Negotiation (LCP) processing status PPP_LCP_UP: Negotiation (LCP) successful status PPP-LEX: Negotiation (PPP-LEX) processing status PPP-LEX_UP: Negotiation (PPP-LEX) successful status RESTART: Re-executing Negotiation ststus ***Note:*** LINK_UP is shown when the LCP and PPP-LEX statuses are UP or Off. If either status is DOWN, LEX_DOWN is displayed. The LEX negotiation cannot perform Link UP for 1-port loop back. To perform Link UP, the port pair of negotiation must be the port in LAN Extension Interface mode and the port in Host Router mode.
[7]	Negotiation	Negotiation is performed at On.
[8]	Restart	Negotiation restarts when the button is pressed.
[9]	Abort	The current negotiation is aborted when this button is pressed.
[10]	Default	This returns the **Negotiation** settings to the default values.
[11]	Magic-number	This displays the value of the Magic-number sent by Negotiation processing in the **Transmit** box. The value of the Magic-number is generated automatically. The magic number received as the Negotiation processing result is displayed in the **Receive** box.
[12]	PPP-LEX	This returns the Startup command option when the **Send startup command** option is set to On and Negotiation processing is performed by PPP-LEX. At this time, the MAC Address included in the Startup command options is set at **MacC Address**. This address is also used in ARP reply and Tx Stream Source.
[13]	MRU	This specifies the maximum length of the Information Field for the receive frame in the **Transmit** box. This setting is used by Negotiation processing as the Oversize error evaluation condition. The value of MRU obtained as the negotiation result is displayed in a **Receive** box.
[14]	Retry	This sets the retry count to resend an LCP/PPP-LEX request that was not replied to.

Name		Description
[15]	Timeout	This sets the waiting time until an LCP/PPP-LEX request is replied to.

(7) LAPS (X.86) (EoS module)

This mapping is selected when sending and receiving frames using LAPS (Ethernet over LAPS).

The EOS Mapping option requires the MU120103B/04B.
The GFP-F/LEX/LAPS option requires the MU150101A.

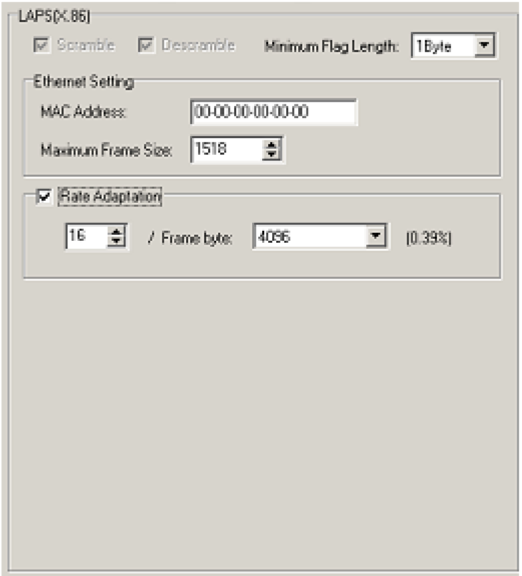


Figure 4.5.3-7 Port Setting (LAPS (X.86)) screen

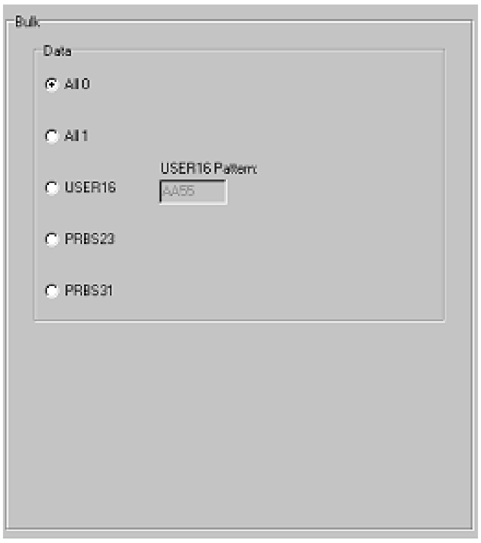
Name		Description
[1]	Scramble	This scrambles send frames (usually On).
[2]	Descramble	This stops scrambling of send frames (usually On).
[3]	Minimum Flag Length	This selects 1 or 2 bytes as the Flag Sequence between frames. It affects the setting range for the minimum gap in the Tx stream.
[4]	MAC Address	This sets the MAC addresses used by ARP Reply, Ping Reply, Tx stream, Automatic Test, etc. It enables the MU120103B/04B port to emulate an Ethernet port.
[5]	Maximum Frame Size	This specifies the maximum length (64 to 65535 bytes) of the Ethernet frame where the receive LAPS frame is stored (from Destination Address to FCS field). It is used as the Oversize error evaluation condition.
[6]	Rate Adaptation	When checked, this performs Rate Adaptation at sending. As shown, a 16-byte Adaptation byte (0x7DDD for 4 times) is inserted at 4096-byte intervals of generated frames. Adaptation Byte is performed before Stuffing.

(8) Bulk (EoS/POS module)

This mapping is selected when directly storing PRBS and fixed pattern data in the payload of SDH/SONET frames (without encapsulation) and sending and receiving.

Note:

When Bulk is selected, functions related to frame Tx and Rx, such as Tx Stream, cannot be used.



(MU120103A/04A/05A/06A/03B/04B)

Figure 4.5.3-8 Port Setting (Bulk) screen

The test pattern set in the payload can be selected from one of the following:

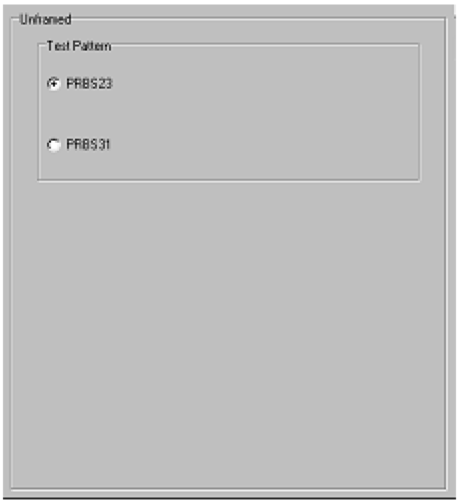
All 0: All bits are 0
All 1: All bits are 1
USER16: User-defined pattern of 16 bits (4-digit hexadecimal)
PRBS11 (MU120119A/20A, MU150101A)
PRBS15 (MU120119A/20A, MU150101A)
PRBS20 (MU120119A/20A)
PRBS23

(9) SDH/SONET Unframed (EoS/POS module)

This mapping is selected when sending and receiving a PRBS pattern with no SDH/SONET frame structure.

Note:

When SDH/SONET Unframed is selected, functions related to frame Tx and Rx, such as Tx Stream, and functions related to SDH/SONET cannot be used.



(MU120103A/04A/05A/06A/03B/04B)

Figure 4.5.3-9 Port Setting (SDH Unframed) screen

The test pattern set in the payload can be selected from one of the following:

PRBS11 (MU120119A/20A, MU150101A)
PRBS15 (MU120119A/20A, MU150101A)
PRBS20 (MU120119A/20A)
PRBS23
PRBS31

4.5.4 Setting Operation Mode

This section explains the operation mode for sending and receiving frames selected at the **Mode** setting.

- Normal Mode
- Through Mode
- Monitor Mode
- Address Swap Mode (MU12011A/12A/21A/22A/31A/32A/38A)
- Impairment Mode (MU120121A/22A Port1/2)

These operation modes can be selected when something other than **Bulk** or **Unframed** is selected at **Mapping** (refer to Section 4.5.3).

<table>
<tr><th>Mode Setting Value</th><th>Description</th></tr>
<tr><td>Normal</td><td>The Normal Mode is used when using the frame sending and receiving functions. It is selected when generating and sending frames from this equipment, for example when using the Tx Stream function, protocol emulation function, RFC2544/2889 automatic testing, etc.</td></tr>
<tr><td>Through</td><td>The Through Mode is used when inserting frames into a running network link and performing monitoring. Sending is performed without changing the received frames. The operation contents change as shown below, depending on the module.
MU120101A/02A/11A/12A/19A/20A/21A/22A/31A/32A/38A:
The received frames are sent from each port as pairs. For example, when Port 1 is set to Through Mode, the paired Port 2 is also set to Through Mode and the frame received at Port 1 is sent from Port 2. The port pairs that can be set at each module shown below.
<table>
<tr><td>MU120102A/12A/19A/20A</td><td>Port 1-2</td></tr>
<tr><td>MU120101A/11A</td><td>Port 1-2, Port 5-6
*Cannot be set at ports 3/4/7/8</td></tr>
<tr><td>MU120121A/22A/38A</td><td>Port 1-2, Port 3-4</td></tr>
<tr><td>MU120132A</td><td>Port 1-2, Port 3-4, Port 5-6, Port 7-8</td></tr>
<tr><td>MU120131A</td><td>Port 1-2, Port 3-4, Port 5-6,
Port 7-8, Port 9-10, Port 11-12</td></tr>
</table>
EoS/POS module, MU120118A/B/C:
The received frame is looped back and is sent back to the same port. The operation options are shown below.
<table>
<tr><td>OH Overwrite
(EoS/POS module)</td><td>This sets whether or not to overwrite SOH. At On, the OH preset data is overwritten.
At Off, the received data is looped back and output as is.</td></tr>
<tr><td>Differential Delay
(MU150101A)</td><td>This sets whether or not to execute Differential Delay.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Mode Setting Value</th><th>Description</th></tr>
<tr><td>Monitor</td><td>This sets the Monitor Mode to monitor the operating network by connecting to it. At this time, functions that may interfere with the network such as packet sending, are disabled. Monitoring is performed by connecting a switch mirror port and coupler to the running network.</td></tr>
<tr><td>Address Swap
(MU120111A/12A/
21A/22A/31A/32A/38A)</td><td>The Address Swap Mode is used to perform loopback sending by swapping the send source and destination. The operation is as follows:

When the received Ethernet frame destination MAC Address matches the value set at Mac Address (refer to Section 4.5.1), the destination MAC Address and the source MAC Address for that frame are swapped, the FCS is recalculated, the received preamble is attached, and loopback sending is performed.
When the target frame has an IPv4 header, the destination IPv4 address and the source IPv4 address are swapped.

IPv6 Addresses cannot be swapped.
When there is a VLAN tag attached, the operation depends on the module as follows:
<table>
<tr><td>MU12011A/12A</td><td>IPv4 address swap when level 1 VLAN tag</td></tr>
<tr><td>MU120121A/22A/31A/32A/38A</td><td>IPv4 address swap when TIPS VLAN tag (level 1 to 10) specified at This Port VLAN setting (refer to 4.5.5 (1))</td></tr>
</table>

The following frames are discarded and loopback sending is not performed.

When destination MAC Address does not match MAC Address setting (Refer to 4.5.1.)
When preamble outside following range:
<table>
<tr><td>MU120111A/21A/22A (RJ-45)/31A</td><td>4 to 12 byte</td></tr>
<tr><td>MU120112A/22A (SFP)/32A/38A</td><td>2 to 16 byte</td></tr>
</table>

This operation mode can be used when the MU120111A/21A/22A(RJ-45)/31A Duplex Mode is Full. However, with the MU120111A, it can only be used with Port 1 and Port 5.</td></tr>
<tr><td>Impairment
(MU120121A/22A
Port1/2)</td><td>This mode is used when using the Traffic Impairment Emulator function. It requires the Traffic Impairment Emulator option. For details, refer to Section 6.6 “Traffic Impairment Emulator”.</td></tr>
</table>

Note:

- Frame sending functions, such as Tx Stream and protocol emulation cannot be used when the mode is not Normal Mode.

- When using the Through Mode or Address Swap Mode with the MU120101A/02A/11A/12A/18A/18B/18C/21A/22A, it may sometimes be necessary to confirm the link between this equipment and connected equipment before switching the mode. After confirming the link in Normal Mode, switch to the Through/Address Swap Mode. Do not interrupt the link after mode switching. If the link is interrupted, return to the Normal Mode, re-establish the link and then switch again to

Through/Address Swap Mode.

- There is a possibility that communication will not be normal in Through Mode if the entrance and exit link statuses (10M/100M/1000M, Half/Full) are mismatched.

4.5.5 MII/MDIO Register Setting (Ethernet module)

This section explains how to set the Ethernet module MII/MDIO registers. When the **MII Registers** and **MDIO Registers** buttons are pressed at the **Port Setting** dialog (in the case of the MU120138A, when the Tree View port icon is selected (refer to Section 3.1 [1])), the screen for displaying and setting the registers is displayed.

Note:

If a setting mistake is made at the MII/MDIO Registers screen, operation may be abnormal. Abnormal operation due to mis-setting is not warranted. Be sure that you understand the meaning of each register and how to set it correctly.

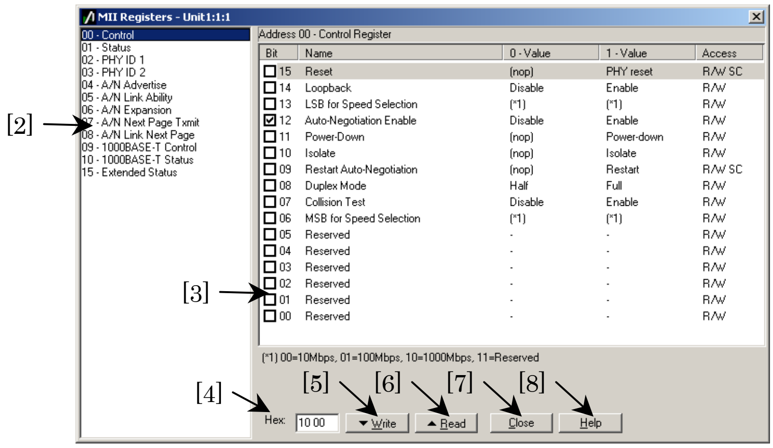


Figure 4.5.5-1 MII Registers screen

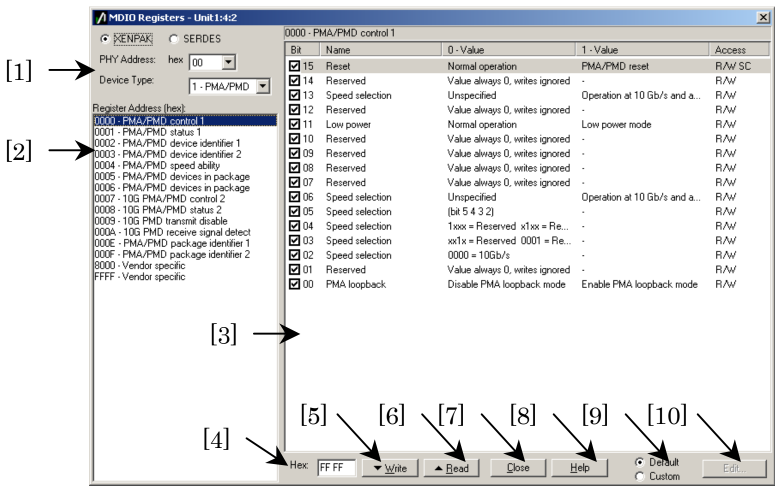


Figure 4.5.5-2 MDIO Registers screen (MU120118A/18B/18C)

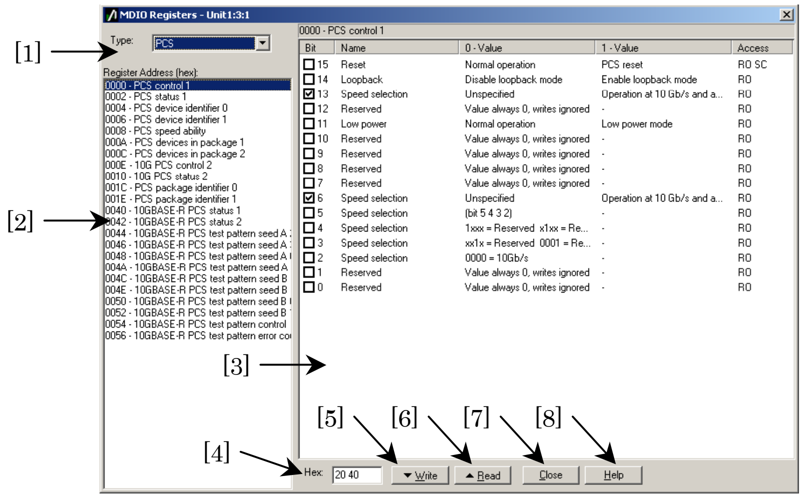


Figure 4.5.5-3 MDIO Registers screen (MU120138A)

<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td>[1]</td><td>XENPAK/SERDES
Device Type
PHY Address
(MU120118A/18B/18C)
Type
(MU120138A)</td><td>This selects the register/address to display and set.</td></tr>
<tr><td>[2]</td><td>Register Address</td><td>This selects the register to display and set.</td></tr>
<tr><td>[3]</td><td>Bit table</td><td>This displays or sets the register selected at Register Address.
<table>
<tr><td>Bit</td><td>Displays register bit locations and sets bit value. Checking a bit sets that bit to 1. (Use Write to set a bit values at the register.)</td></tr>
<tr><td>Name, 0-Value, 1-Value</td><td>Displays register name and meaning of 1 and 0 values</td></tr>
<tr><td>Access</td><td>Displays register access information</td></tr>
</table>
The meaning of the Access column are shown below.
<table>
<tr><td>R/W</td><td>Read/Write possible</td></tr>
<tr><td>RO</td><td>Read only possible</td></tr>
<tr><td>WO</td><td>Write onlypossible</td></tr>
<tr><td>NA</td><td>Access impossible</td></tr>
<tr><td>R/W SC</td><td>Read/Write enabled
The register bit is set to 0 at read (self-cleaning function).</td></tr>
<tr><td>RO LH</td><td>Read only
Latched display when High and cannot be read depending on timing</td></tr>
<tr><td>RO LL</td><td>Read only
Latched display when Low and cannot be read depending on timing</td></tr>
<tr><td>-</td><td>undefined</td></tr>
</table>
</td></tr>
</table>

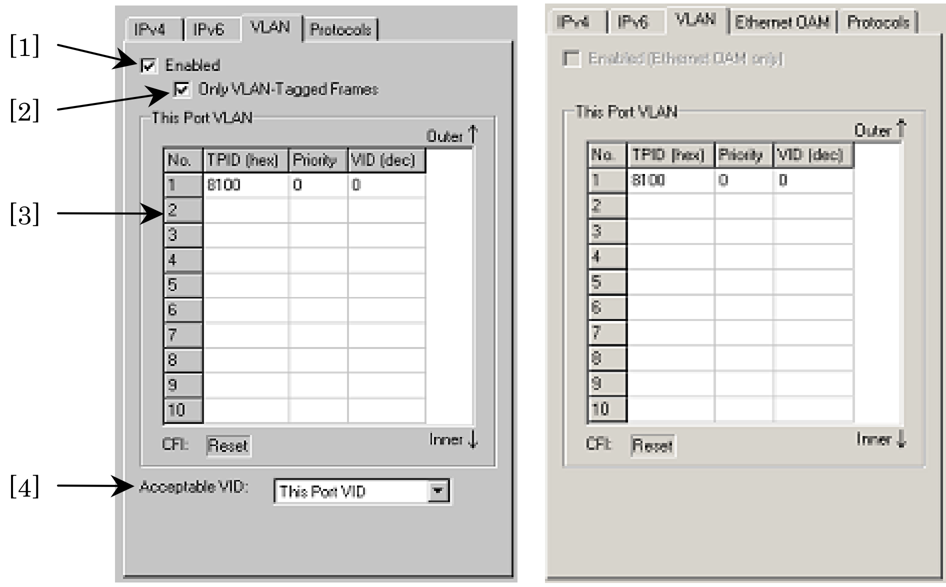
Name		Description
[4]	Hex	This displays the selected register value in hexadecimal.
[5]	Write	This writes the displayed hexadecimal value to the selected register.
[6]	Read	This reads the selected register contents and updates the display.
[7]	Close	This closes this screen.
[8]	Help	This displays Help.
[9]	Default/Custom	This selects the addressing method for the register name and bit definition at **Register Address** and **Bit table**. When **Custom** is selected, the name set in **Edit** is used. When **Default** is selected, the name set at Edit is not used and the default is used. This can only be used with the MU120118A/18B/18C.
[10]	Edit...	This opens the **Edit MDIO Register** screen. The address contents can be edited at this screen when the address setting method for the register name and bit definition at **Register Address** and **Bit table** is set to **Custom.** This can only be used with the MU120118A/18B/18C.

4.5.6 Setting Each Protocol Function

This section explains basic settings related to each protocol function, such as VLAN, IP, Ethernet OAM, etc. These settings are enabled when the **Mode** setting is **Normal** (refer to Section 4.5.4).

(1) VLAN (MU120121A/22A/31A/32A/38A)

The VLAN function is set here. The supported VLAN contents depend on the function and module. For details, refer to Section 5.7.2 “VLAN ”.



(MU120121A/22A) (MU120131A/32A/38A)

Figure 4.5.6-1 Port Setting (VLAN) screen

Name		Description
[1]	Enabled	The VLAN function is enabled for some Protocol Support function when set to On. For details, refer to Section 5.7.2 (5) “Protocol Support”. This is enabled when the Ethernet OAM option is installed with the MU120131A/32A/38A.
[2]	Only VLAN-Tagged Frames (MU120121A/22A)	When this is On, frames without VLAN tags are discarded. When it is Off, frames without VLAN tags are processed. This setting is supported for some Protocol Support functions. For details, refer to Section 5.7.2 (5) “Protocol Support”.

<table>
<tr><th colspan="2">Name</th><th colspan="2">Description</th></tr>
<tr><td rowspan="5">[3]</td><td rowspan="5">This Port VLAN</td><td colspan="2">This sets the value for each field of the VLAN tag identified/ sent by this port.</td></tr>
<tr><td>TPID</td><td>Sets TPID (Tag Protocol Identifier, 0000 to FFFF (hex)).
8100 defined by IEEE802.1Q. 0800 (IP), 0806 (ARP), and 86dd (IPv6) cannot be set.</td></tr>
<tr><td>Priority</td><td>This field is used to set the value of the User Priority field (0 to 7 (dec)) of the VLAN tag of the frame transmitted by this port.</td></tr>
<tr><td>VID</td><td>This field is used to set the VID (1 to 4094 (dec)) of this port.</td></tr>
<tr><td>CFI</td><td>This field indicates that the CFI bit (of the VLAN tag of the frame transmitted by this port) is reset (0).</td></tr>
<tr><td>[4]</td><td>Acceptable VID (MU120121A/22A)</td><td colspan="2">When This Port VID is set, only the received frame with a VID that matches the VID setting of This Port VLAN is processed. When All VID is set, all frames are processed irrespective of the VID setting.
This setting is enabled for some Protocol Support functions.
Refer to 5.7.2 (5) “Protocol Support” for details.</td></tr>
</table>

(2) IPv4

Settings related to IPv4 functions are performed here.

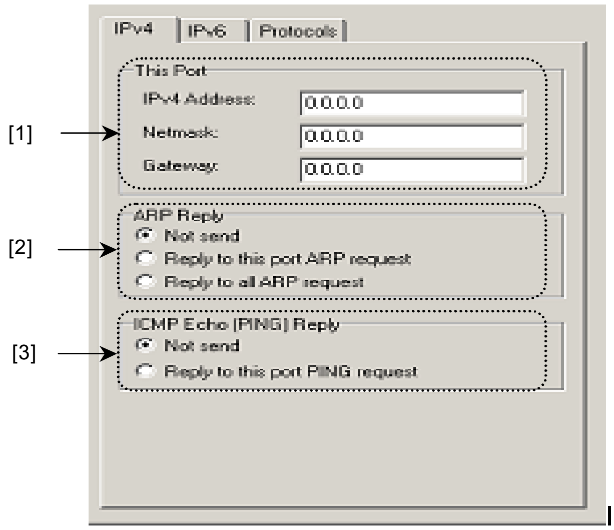


Figure 4.5.6-2 Port Setting (IPv4) screen

Name		Description
[1]	This Port	The IPv4 Address setting is used by the ARP Reply, Ping Reply, Tx Stream, Automatic Test, etc., functions. The **Netmask** and **Gateway** settings are used when connecting to a router. Each is set using the IPv4 address format.
[2]	ARP Reply (Ethernet module)	This sets whether to respond to an ARP request or not. (a) Not send No reponse to ARP request (b) Reply to this port ARP request Respond when receiving ARP request from address set at **IPv4 Address** (c) Reply to all ARP request Respond to all ARP requests ***Note:*** When this setting is **Reply to all ARP request**, since all requests are responded to, the operation of a network connected with multiple ports may be abnormal. Do not use the **Reply to all request** setting without a good understanding of network operations. Normally, **use Reply to this port**.
[3]	ICMP Echo (PING) Reply	This sets whether to respond to ICMP Echo or not. (a) Not send No response to ICMP Echo (b) Reply to this port PING request Respond to ICMP Echo from address set at **IPv4 Address**

(3) IPv6 (IPv6 Expansion Option)

Settings related to IPv6 functions are set here.

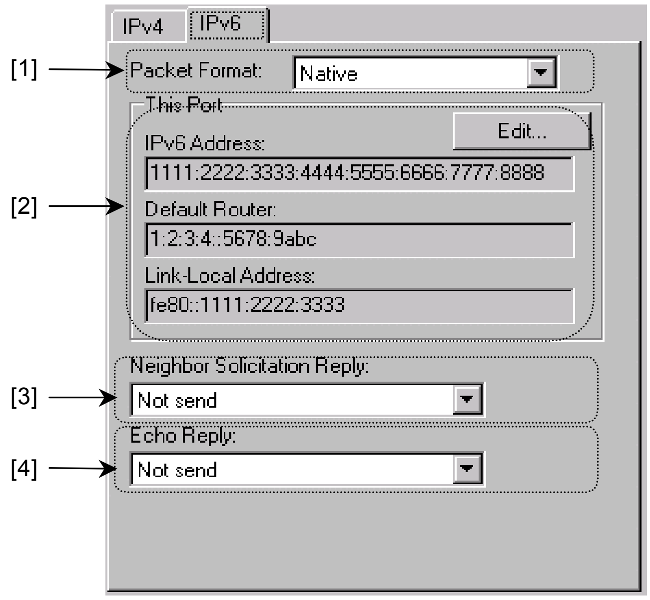


Figure 4.5.6-3 Port Setting (IPv6) screen

Name		Description
[1]	Packet Format	This indicates that the Packet Format is Native.
[2]	This Port	This sets the IPv6 address used by functions such as Neighbor Solicitation Reply, Echo Reply, Tx Stream, Automatic Test, etc. Press the **Edit** button and perform setting at the **Edit IPv6 Address** screen as described below.
[3]	Neighbor Solicitation Reply	This sets whether to respond to Neighbor Solicitation (NS) or not. (a) Not send No response to NS (b) Reply to This Port IPv6 addresses Respond to NS from address set at **IPv6 Address** and **Link Local Address**. (c) Reply to all IPv6 addresses Respond to all NS ***Note:*** When this is set to **Reply to all NS,** since all requests are responded to, the operation of a network connected with multiple ports may be abnormal. Do not use the **Respond to all NS** setting without a good understanding of network operations. Normally, **use** Reply to This Port IPv6 addresses.

Name		Description
[4]	Echo Reply	This sets whether to respond to the Echo request. (a) Not send No response to Echo request (a) Reply to This port Echo Request Respond to Echo Request from address set at **IPv6 Address** and **Link Local Address**.

This Port IP Address is set at the Edit IPv6 Address screen. For the IPv6 address description, refer to Section 5.7.10 (2) "Address Description".

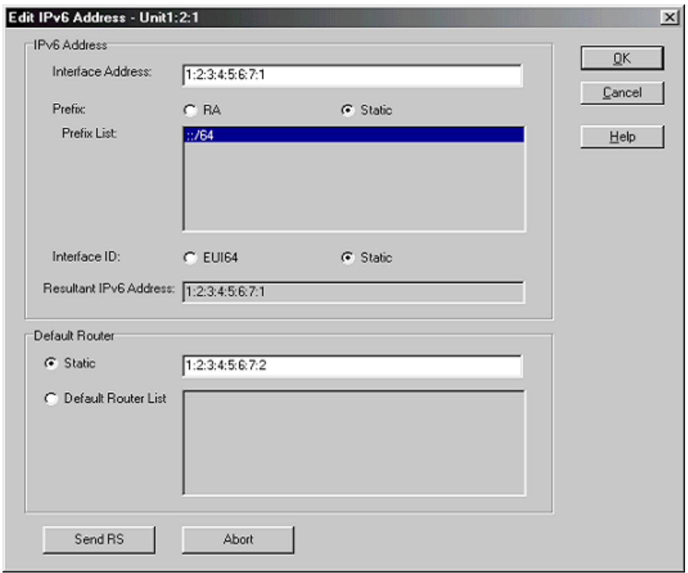


Figure 4.5.6-4 Edit IPv6 Address screen

Name		Description
[1]	IPv6 Address	This sets the IPv6 address and local link address for this port. The created IPv6 address is displayed in the **Resultant IPv6 Address** box. The address is set as described below. • When inputting the entire addressed directly, select **Static** at **Prefix** and **Interface ID**. • When using the received RA at the most significant 64 bits of the address (Prefix), select **RA** at **Prefix**. **RS** is sent when the **Send RS** button is pressed; when receiving RA, the received prefix is listed in the **Prefix List** column. Select the prefix to use from this list. • When creating the least significant 64 bits (Interface ID) of the address using the EUI64 method, select **EUI64** at **Interface ID**. The value created by the EUI64 method from the **MAC Address** setting (refer to Section 4.5.3 (1)) is set as the Interface ID.

Name		Description
[2]	Default Router	This sets the router default address when connecting to a router. The address can be set by any of the following methods. • Select **Static** when inputting the address directly. • When using a received RA address, select Default Router List. RS is sent when the **Send RS** button is pressed; the router address is listed when RA is received. Select the address to use as the Default Router from this list.
[3]	Send RS	This sends the Router Solicitation (RS) message. When receiving the response (Router Advertisement (RA) message) to RS, the **Prefix** and **Default Router List** are updated using the received RA information.
[4]	Abort	This aborts the **Send RS** processing.

(4) Ethernet OAM (Ethernet OAM Option)

Settings for the Ethernet OAM function are performed here. For details, refer to Section 5.7.18 “Ethernet OAM Protocol Emulation Function”.

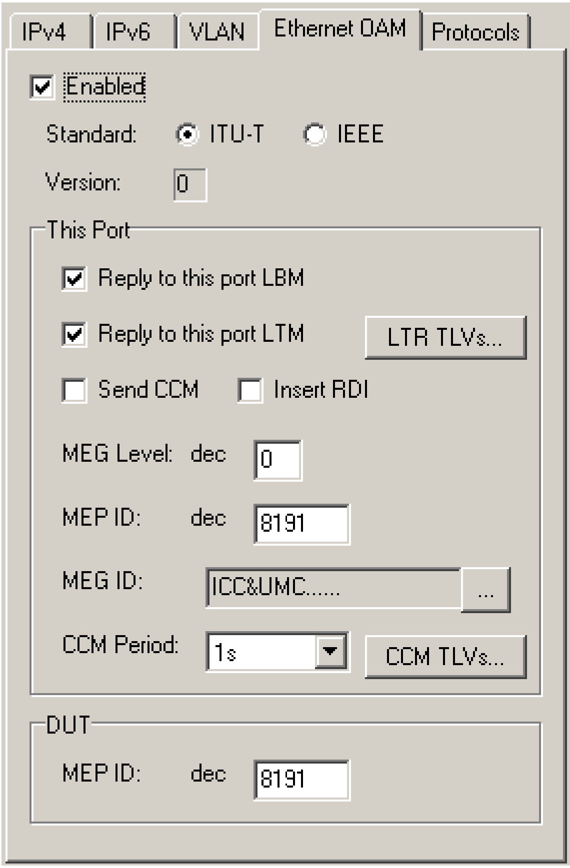


Figure 4.5.6-5 Port Setting (Ethernet OAM Tab) screen

Name		Description
[1]	Enabled	The Ethernet OAM function is enabled when this is set to On.
[2]	Standard	Select ITU-T or IEEE as the standard to use for operation and display.
[3]	Version	This indicates that Version 0 is supported.
[4]	Reply to this port LBM	When this is set to On, replies to LBM matching the conditions in Section “(2) LBM/LTM Response.”
[5]	Reply to this port LTM	When set to On, replies to LBM matching the conditions in Section “(2) LBM/LTM Response.”
[6]	LTR TLVs	This sets the pattern of TLV of the replied LTR by starting the Binary Data Editor (refer to Section 2.3.1 (7)).
[7]	Send CCM	CCM is sent periodically when this is set to On.
[8]	Insert RDI	When this setting is On when **Send CCM** is On, RDI is attached to the sent CCM.

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Name		Description
[9]	MEG Level/MD Level	This specifies the MEG Level/MD Level (0 to 7) of the Ethernet OAM device to emulate. This setting is reflected at the sent CCM when **Send CCM** is On. When the **Standard** setting is **ITU-T**, **MEG Level** is displayed; when it is **IEEE**, **MD Level** is displayed.
[10]	MEP ID	This specifies the MEP ID (0 to 8191) of the Ethernet OAM device to emulate. This setting is reflected at the sent CCM when **Send CCM** is On.
[11]	MEG ID/MAID	This specifies MEGID/MAID of the Ethernet OAM device to emulate. When the **...** button is pressed, the Binary Data Editor is started (refer to Section 2.3.1 (7)). When the **Standard** setting is **ITU-T**, **MEG ID** is displayed; when it is **IEEE**, **MAID** is displayed. This setting is reflected at the sent CCM when **Send CCM** is On.
[12]	CCM Period	This selects the CCM send interval (1 s, 10 s, 1 minute and 10 minutes).
[13]	CCM TLVs	This opens the Binary Data Editor (refer to 2.3.1 (7)) to set the TLV pattern of the CCM to send.
[14]	MEP ID	This specifies the DUT MEP ID (0 to 8191). This setting is used for LOC detection of the LOC counter.

(5) Protocols (Ethernet modules excluding MU120101A/02A)

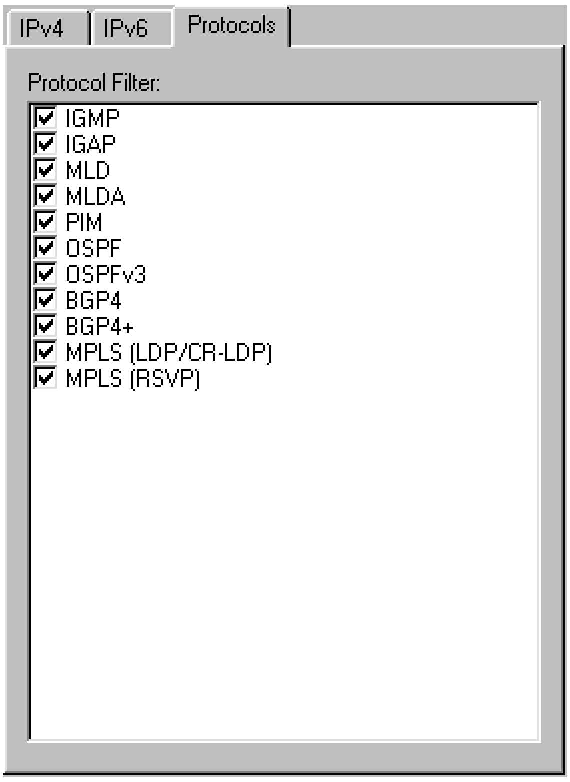

Figure 4.5.6-6 Protocols (Protocol Filter) Setting screen

This sets whether to enable various protocol emulation functions (refer to Section 5.7 "Performing Processes Related to Various Protocols"). Each protocol emulation function is enabled when its checkbox is On. Enabled means the function can be executed by clicking the **Start** button.

A protocol emulation function cannot be executed without checking its checkbox on this tab. Note that the checkbox status cannot be changed while the corresponding protocol emulation function is executing.

OFF (unchecked) is set for all protocols by default. Set the corresponding protocol to On (checked) before using protocol emulation.

The protocol packets set to OFF (i.e., unchecked) in this setting are excluded from the hardware-level protocol processing target to reduce the internal processing load for protocol packets received at the measurement port. Therefore, if some protocol emulation functions should not be used and a large amount of corresponding protocol packets may be received, the processing performance of the

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protocol emulation functions to be used can be improved by unchecking the corresponding protocols.

4.6 Checking Transmission/Reception Status

Check the port membership and each function status.

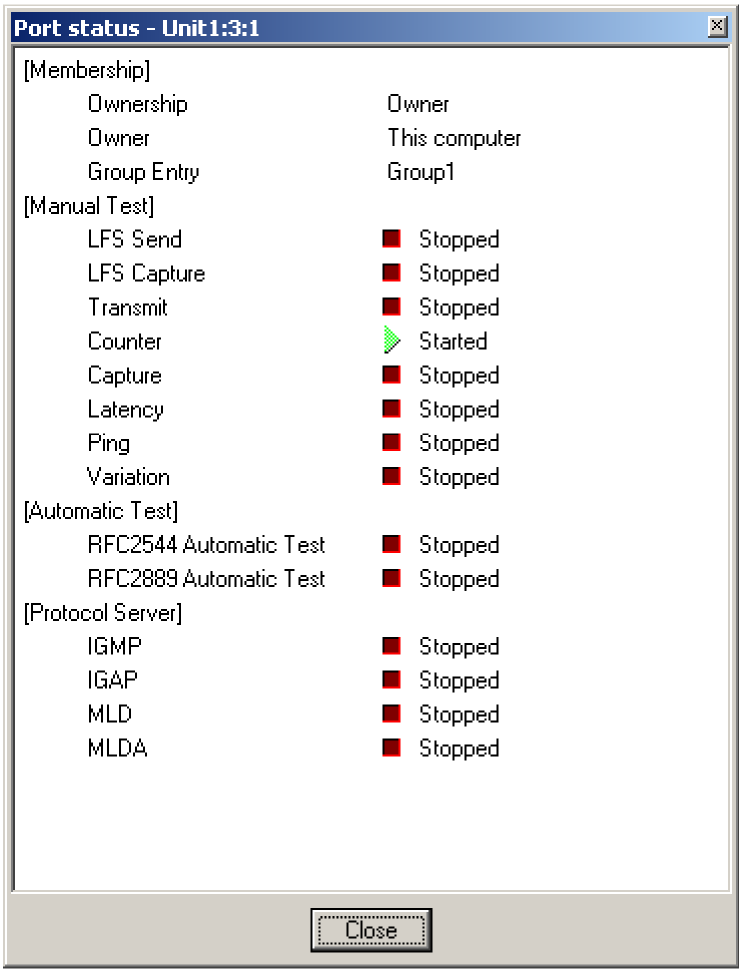


Figure 4.6-1 Port status screen

[Membership] Ownership Owner Group Entry	Displays the port membership. Displays the port occupation status Displays the IP address for a module with a reserved port. Displays the groups registered.
[Manual Test]	Displays operating status of each function (Started or Stopped).
[Automatic Test]	Displays RFC2544/2889 automatic measurement status as Started/Stopped
[Protocol Server]	Displays protocol handling status of functions (IGMP, BGP-4, etc.) in **Protocols** tab of Tree View

4.7 Checking Connection (Ping)

Transmit PING to an arbitrary IP address and check the connection.

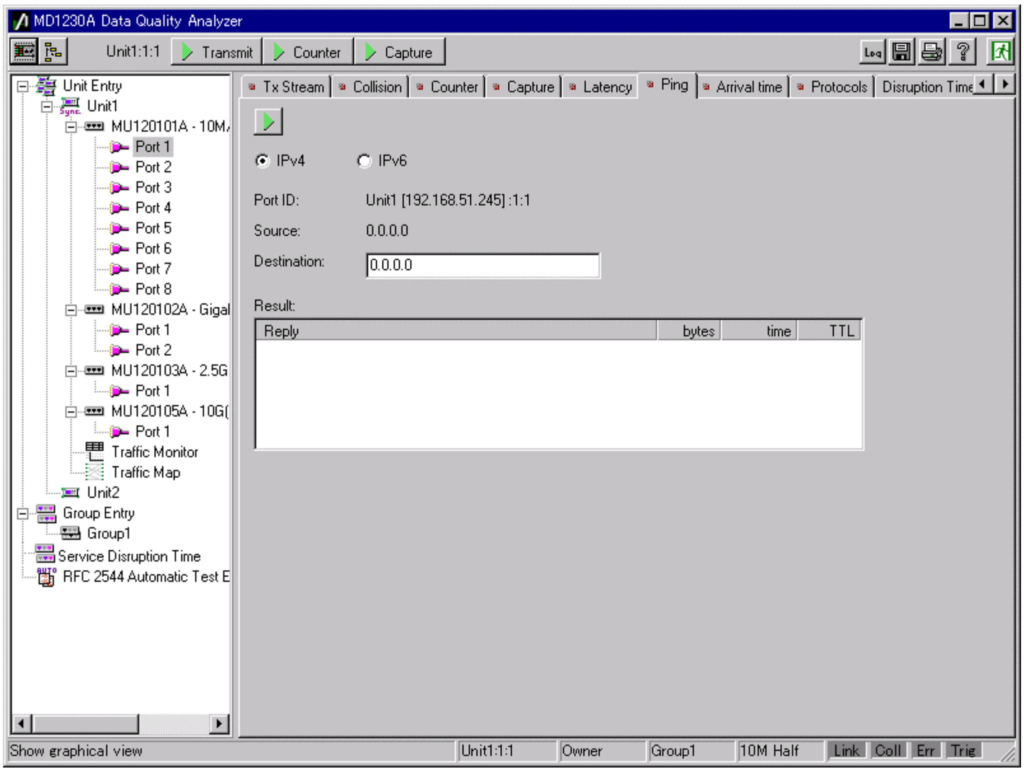


Figure 4.7-1 Ping screen

Procedure:

(1) Switch the address format. Select one from IPv4 or IPv6. (However, IPv6 requires the IPv6 Expansion option.)

(2) Set the target IP address as Destination.

(3) Send Ping.

(4) The results are displayed in the "Result" field.

The result is the following displayed reply information:

Reply	Target IP address, or fail reason
bytes	For IPv4, displays the ICMP Echo Reply packet length. For IPv6, displays the IPv6 payload length of the ICMPv6 Echo Reply packet.
time	Reply time
TTL/Hop Limit	For IPv4, displays TTL (Time to Live) of the ICMP Echo Reply packet. For IPv6, displays the Hop Limit of the ICMPv6 Echo Reply packet.

Section 5 Basic Measurement (Manual Test)

This section describes the procedure for the MD1230B basic measurement.

5.1 Transmitting Stream Data

Pattern and transmission methods should be set to transmit stream data. The MD1230B sets the data pattern and the transmission method in Frame Setting and Stream Setting, respectively.

Frame Setting sets various protocols or any pattern for the basic frame.

Stream Setting sets the transmission count, pattern and transmission procedure with other streams for the set frame in Frame Setting.

Also, IP-fragmented Stream Settings can also be made. For details, refer to Section 11.3 “Creating IP-fragmented Stream”.

Note:

The maximum number of streams that can be set for each port is 256 but for modules other than the MU120138A, the number of streams that can be set depends on the frame length.

Module name	Maximum frame length for setting 256 streams	Number of streams for setting maximum frame length on all streams
MU120101A/11A	2,032 bytes*	51
MU120102A/12A	4,094 bytes*	16
MU120118A/18B/18C	16,352 bytes*	64
MU120121A/22A/31A/32A	4,096 bytes	85
MU120103A/04A/05A/06A	16,352 bytes	51
MU120103B/04B	16,352 bytes	51
MU120119A/20A	4,096 bytes	16
MU150101A	16,352 bytes	51

*: Includes preamble

Maximum number of the setting streams at each Unit is 3700, however it may become smaller due to the inserted module type, the stream settings, etc.

5.1.1 Stream data display

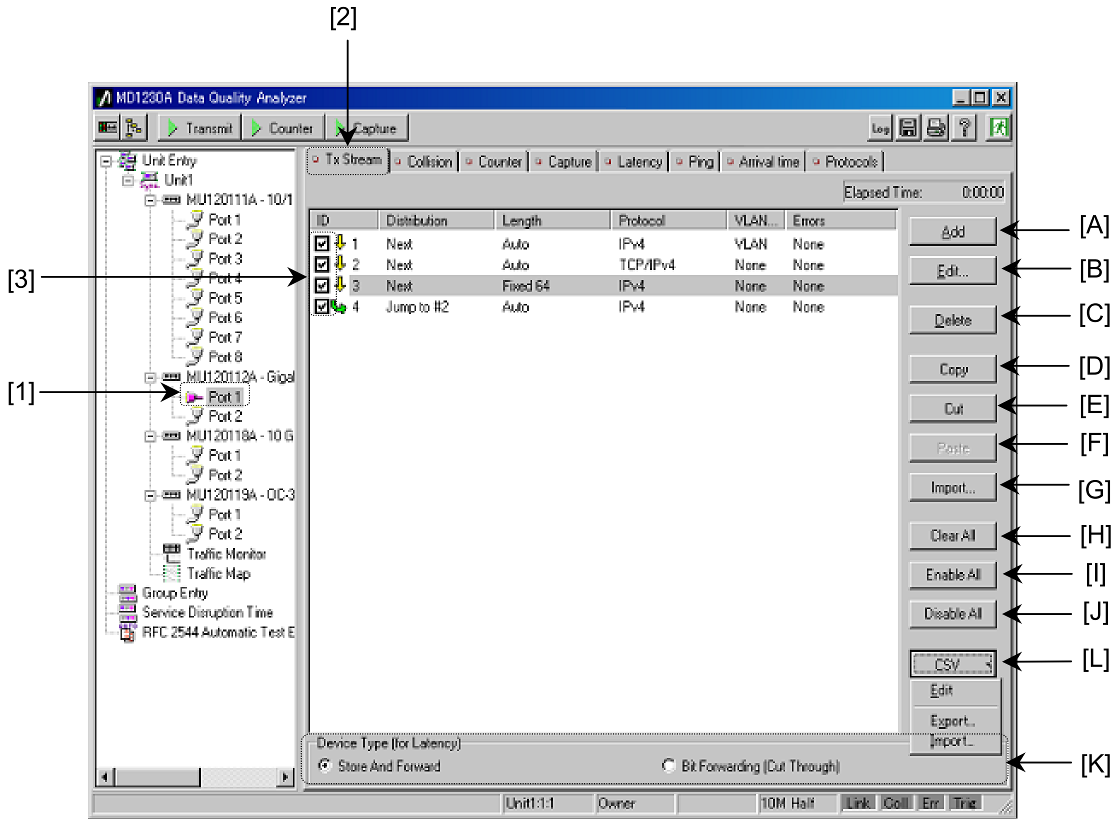


Figure 5.1.1-1 Tree View – stream setting screen

[1] Selects the port to be used for transmission. Stream setting can be performed only at a port where the Owner is specified.

[2] Selects **Tx Stream** tab.

[3] Enables/disables stream.
A stream enabled and transmitted when checked. Unchecking the check box disables the stream and it is not transmitted.

Notes:

1. The MU120101A has no check box.
2. Stream settings that cross units cannot be pasted.
3. Changing the Unit module configuration clears the stream setting.

	Item	Description
[A]	Add	Registers a new stream.
[B]	Edit	Edits the registered stream. For the edit screen, refer to 5.1.2 "Defining transmission data pattern".
[C]	Delete	Deletes the registered stream.
[D]	Copy	Copies the registered stream.
[E]	Cut	Cuts the registered stream.
[F]	Paste	Pastes copied or cut stream Paste is not supported when the copy source and destination modules and the port **Mapping** settings are not the same.
[G]	Import	Reflects the edited contents in text format to Frame Setting. For the editing text file, refer to 5.1.4 "Editing transmission data pattern in text format".
[H]	Clear All	Deletes all registered streams
[I]	Enable All	Enables (checks) all registered streams
[J]	Disable All	Disables (unchecks) all registered streams
[K]	Device Type (for Latency)	Selects method for attaching timestamp to test frame (Refer to 5.1.2 (26).) This is set to measure the arrival time (latency) of a frame. This setting is in compliance with RFC1242, Section 3.8.
	Store And Forward	Select when the DUT (Store and Forward method) reads the entire frame once, analyzes the frame, and then transmits the data. The time of the time stamp becomes the last time of the frame.
	Bit Forwarding (Cut Through)	Select when the DUT (Cut Through method) starts the transmission when receiving the frame. The time of the time stamp becomes the beginning time of the frame.

	Item		Description
[L]	CSV		Exports/imports the stream setting contents to a CSV file. ☞ For details, refer to Section 5.1.5 "Exporting/importing stream settings."
		Edit	Exports the setting contents of a single selected stream to a CSV file and starts the application program that is related to the *.csv file. Edit the CSV file and exit the application. The edited CSV file is imported to replace the selected stream data.
		Export	Exports the setting contents of a single selected stream to a CSV file.
		Import	Imports a single selected CSV file and inserts the stream settings above the selected stream.

5.1.2 Defining transmission data pattern

The MD1230B can transmit frames combining several protocols using the Ethernet frame, the PPP frame, the Cisco HDLC frame, MAPOS frame, GFP frame, LAPS frame and LEX frame as basic frames. This transmit frame pattern is set on the Frame Setting screen.

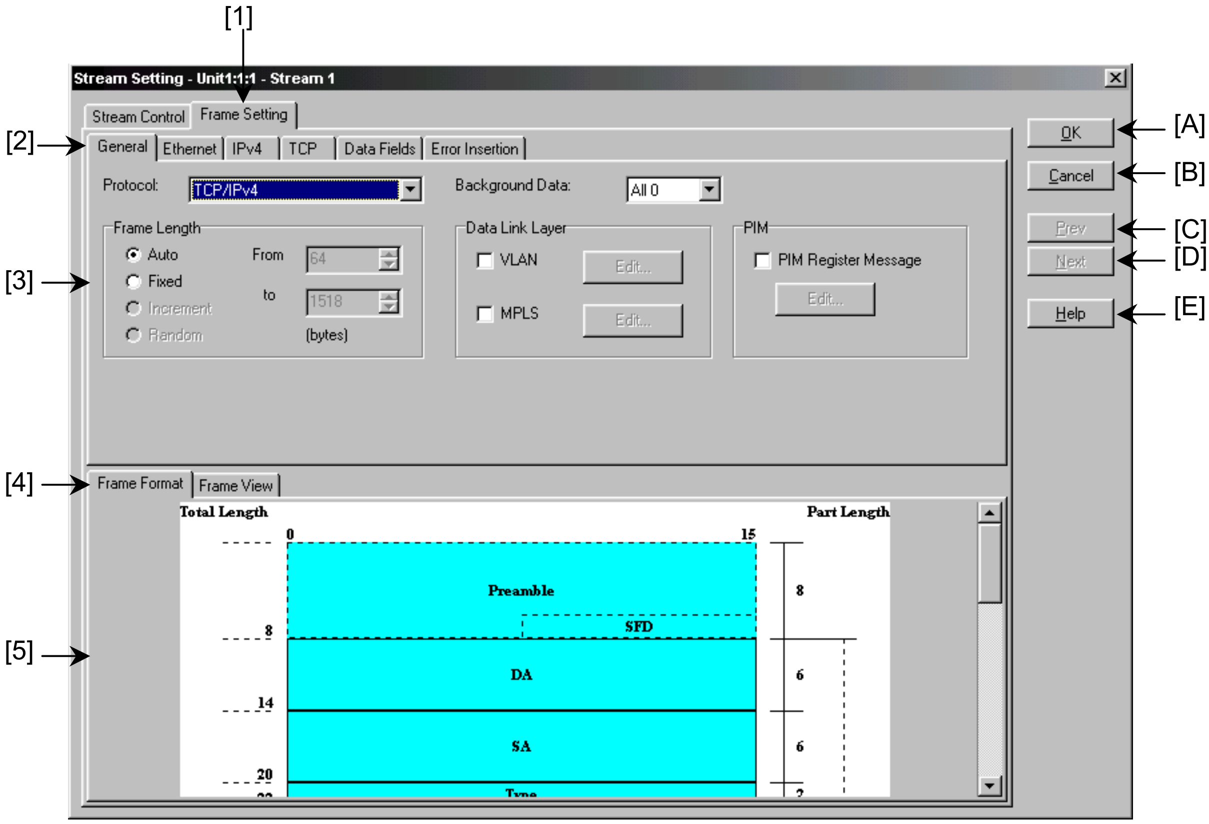


Figure 5.1.2-1 Frame Setting screen

[1] Selects **Frame Setting** tab.

[2] Selects the tab for frame parameter setting. Available tabs are shown below:

- General
- Ethernet/PPP/GFP/LAPS/LEX
- Various protocols such as IP, TCP, etc. (varies depending on Protocol selection in the **General** tab.)
- Data Fields
- Error Insertion

[3] Displays parameters that can be set for the selected tab in [2].

[4] Selects frame structure display.

- Frame Format: Displays the protocol structure of the frame
- Frame View: Displays decoded results and hexadecimal number indication results for the frame.

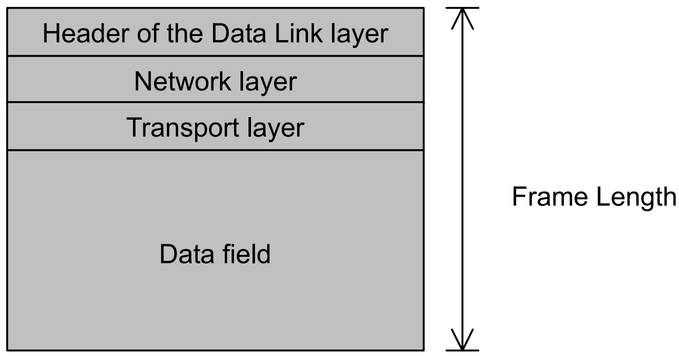
[5] Displays frame structure selected in [4].

Item		Description
[A]	OK	Registers the edited frame to the measuring instrument and closes the Stream Setting window.
[B]	Cancel	Closes the Stream Setting window without registering the edited frame to the measuring instrument.
[C]	Prev	Registers the edited frame to the measuring instrument and returns to the previous stream edit screen.
[D]	Next	Registers the edited frame to the measuring instrument and returns to the next stream edit screen.
[E]	Help	Opens help.

(1) Setting basic frame configuration

Sets the basic configuration for the frame, at first. The basic configuration items are shown below:

- Frame length
- Upper Protocol type to be inserted to the frame
- VLAN tag, MPLS label
- Pattern in the data field



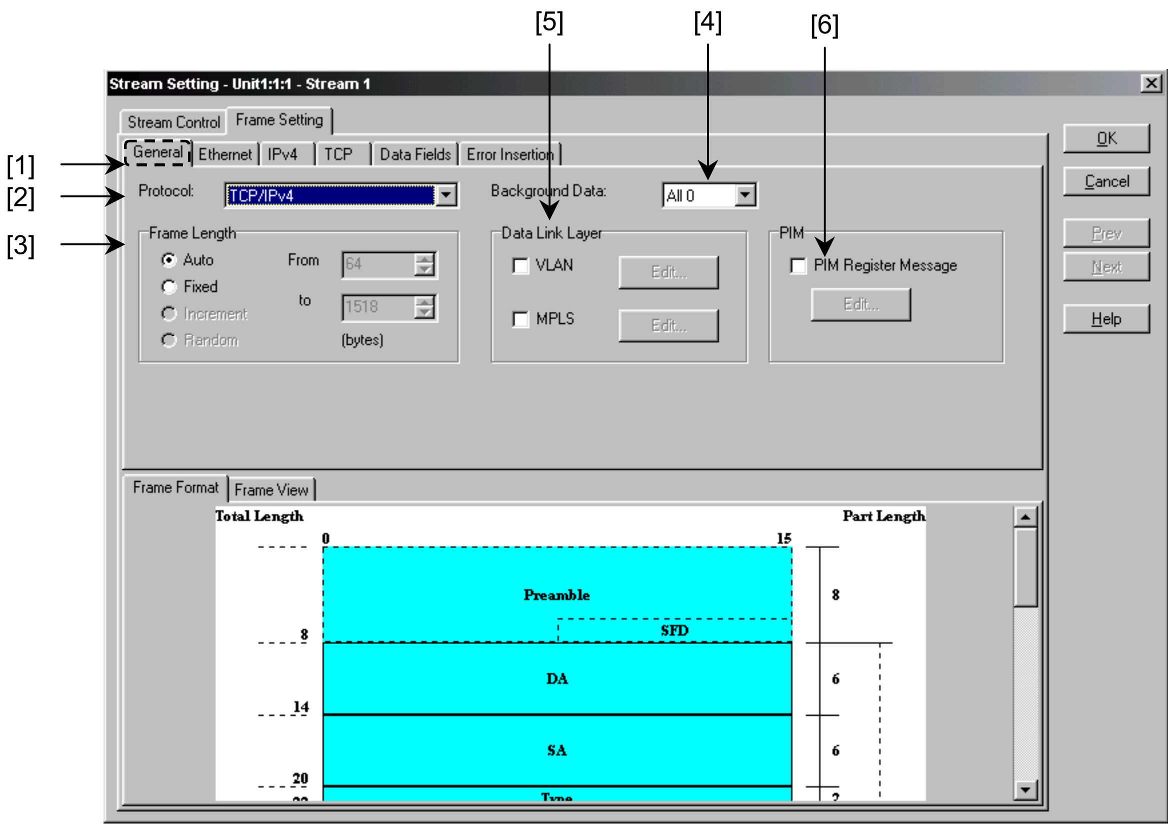


Figure 5.1.2-2

[1] Selects **General** tab.

[2] Selects the protocol combination over Data Link layer from the followings:

None
ARP (*2)
Ethernet (*1)
IPv4
IGMP/IPv4
IGAP (*4)
ICMP/IPv4
TCP/IPv4
UDP/IPv4
RIP/UDP/IPv4
DHCP/UDP/IPv4
IPv6
ICMPv6/IPv6 (*3)
TCP/IPv6 (*3)
UDP/IPv6 (*3)
IPv6 over IPv4 (*3)
ICMPv6/IPv6 over IPv4 (*3)
TCP/IPv6 over IPv4 (*3)
UDP/IPv6 over IPv4 (*3)
IPX (*2)
IS-IS
MAC Control Frame (PAUSE Function) (*2)
LEX Control Packet (*5)
BPDU (*6)
Link Aggregation (*6)

*1: Can be used only when GFP or LEX is selected with the MU120103B/04B/MU150101A.

*2: Can be used only with the MU120101A/02A/03B/04B11A/12A/18A/18B/18C/21A/22A/31A/32A and MU150101A (LEX, LAPX, GFP Mapping). (For the MU120103B/04B, EOS Mapping Option is required.)

*3: IPv6 Expansion Option is required.

*4: IGPA Protocol Option is required.

*5: Can be used only when LEX is selected with the MU120103B/04B and MU150101A.

*6: Spanning tree / link aggregation Option is required.

[3] Specifies the frame length. There are four specifying methods as follows:

(a) Auto

The frame containing the protocol is automatically adjusted to the minimum frame length to comply with the protocol.

(b) Fixed

Any frame length is set regardless of the protocol embedded in the frame. The settable range is dependent upon the type of the module.

(c) Increment

This can be selected when the Protocol setting at [2] is None (Note 1). The frame length increases by 1 byte every time the frame is transmitted. The frame length starts from the minimum length when sending of each Stream starts (Note 4); when the maximum value is exceeded, it returns to the minimum value again. The settable range depends on the module type.

(d) Random

Selected when protocol is set to None in [2] above. (Note:1)
The frame is transmitted with a random frame length between the minimum and maximum values. The settable range is dependent upon the type of the module.

List of Frame Length (Fixed, Increment, Random) Settable Ranges

Module	Settable range (bytes)
MU120101A/11A	18 to 10000
MU120102A/12A/18A/18B/18C (Note: 2)	48 to 65280
MU120103A/04A/05A/06A (Note: 3)	8 to 65535
MU120103B/04B (Note: 3)	8 to 65535 (Fixed) 64 to 65535 (Increment, Random)
MU120119A/20A	8 to 65535
MU120121A/22A/31A/32A/38A	48 to 10000
MU150101A (Note: 4)	8 to 65535 (Fixed) 64 to 65535 (Increment, Random)

Notes:

1. When using the MU120118A/18B/18C, do not set Increment or Random at the port where the XENPAK Transceiver physical layer is WAN-PHY. Otherwise, illegal frames may be sent.

2. When using the MU120118A/18B/18C modules, the clock between the XENPAK and module is not synchronized, so the actual maximum frame length that can be sent depends on the clock difference between the XENPAK and module and on the capacity of the XENPAK FIFO.

3. When using the MU120103A/03B/04A/04B/05A/06A and MU150101A, Random cannot be set for IFG (inter-frame gap) when the frame length is less than 64 bytes.

4. With the MU120101A/02A/11A/12A, there is no return to the minimum value at the start of sending of each Stream.

[4] Sets the value for data not defined in the frame. The settable range is dependent upon the type of the module.

All 0 Sets all bits to 0.
All 1 Sets all bits to 1.

[5] Adds the VLAN tag (Ethernet only) and the MPLS label stack. Refer to 5.1.2 (2) “Editing VLAN field values” and 5.1.2 (3) “Editing MPLS field values” for details.

[6] A frame can be encapsulated as PIM-SMv2 Register message. For details, see “5.1.2 (31) Editing PIM Register Message fields”. This function can be used only when the PIM-SMv2 protocol option is installed.

(2) Editing VLAN field values

Edits the VLAN tag defined in IEEE 802.1Q.

0		15
Tag Protocol ID (Fixed to 0x8100)		
User Priority	CFI	VLAN ID

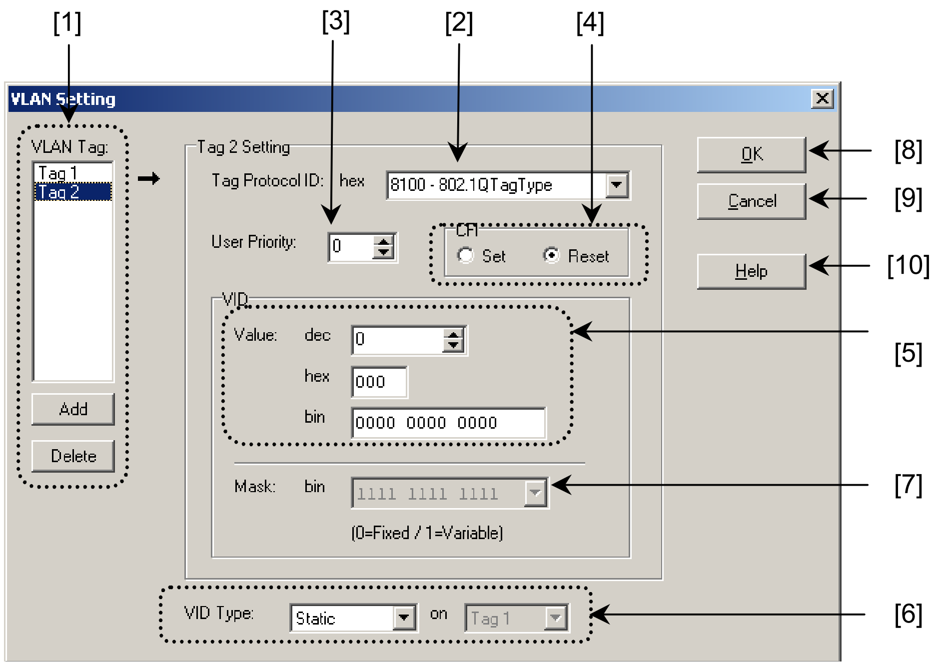


Figure 5.1.2-3 VLAN Setting screen

[1] This area is used to set the number of stages of the VLAN tag. "Tag *n*" means the *n*th VLAN tag. The setting of the highlighted tag is displayed at the center of the screen. Pressing the **Add** button increases the number of stages of VLAN. Pressing the **Delete** button deletes the highlighted tag. A tag can be set up to 10 stages.

Note:

Only one stage of the VLAN tag can be set with a module other than the MU120121A/22A/31A/32A/38A. In this case, the **Add** and **Delete** buttons are not displayed.

[2] This field is used to set the value of the Tag Protocol ID field. IEEE802.1Q defines that this field be set to 8100 (hex), but some vendors may use a value other than this. If this is the case, change the value of this field.

Value: 0000 to ffff (hex)

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[3] Edits User Priority.

Value: 0 to 7

[4] Edits CFI. Following values can be set.

(dec)

Reset 0

Set 1

[5] Sets VLAN ID value. "dec" indicates decimal number, "hex" indicates hexadecimal number, and "bin" indicates binary number.

Value: 0 to 4095 (dec)
000 to fff (hex)
00000000 0000 to 11111111 1111 (bin)

[6] These drop-down list boxes are used to change the VLAN ID of each frame. Select a VLAN tag to be changed in the right drop-down list box. Select how it is to be changed, by using the left drop-down list box. When **Increment/Decrement** is specified, it starts from the value specified in [5] when sending of each Stream starts; when the maximum or minimum value is exceeded, it returns to the value specified at [5] again.

- Static: fixed value
  - Increment: increments the value in frame step
  - Decrement: decrements the value in frame step
  - Random: value for each frame

[7]In this drop-down list box, only the VLAN tag for which Increment, Decrement, or Random is specified in [6] above can be set. Specify a bit in the VLAN ID field that is to be changed. The field that is masked by 1 is subject to Increment, Decrement, and Random

[8] Applies the settings.

[9] Cancels the settings.

[10] Displays help.

(3) Editing MPLS field values

Up to 10 MPLS labels can be edited from the screen below.

	0			31
Label 1	Label	EXP	S	TTL
Label 2	Label	EXP	S	TTL
	· · ·			

EXP	Experimental Use
S	Bottom of Stack
TTL	Time to Live

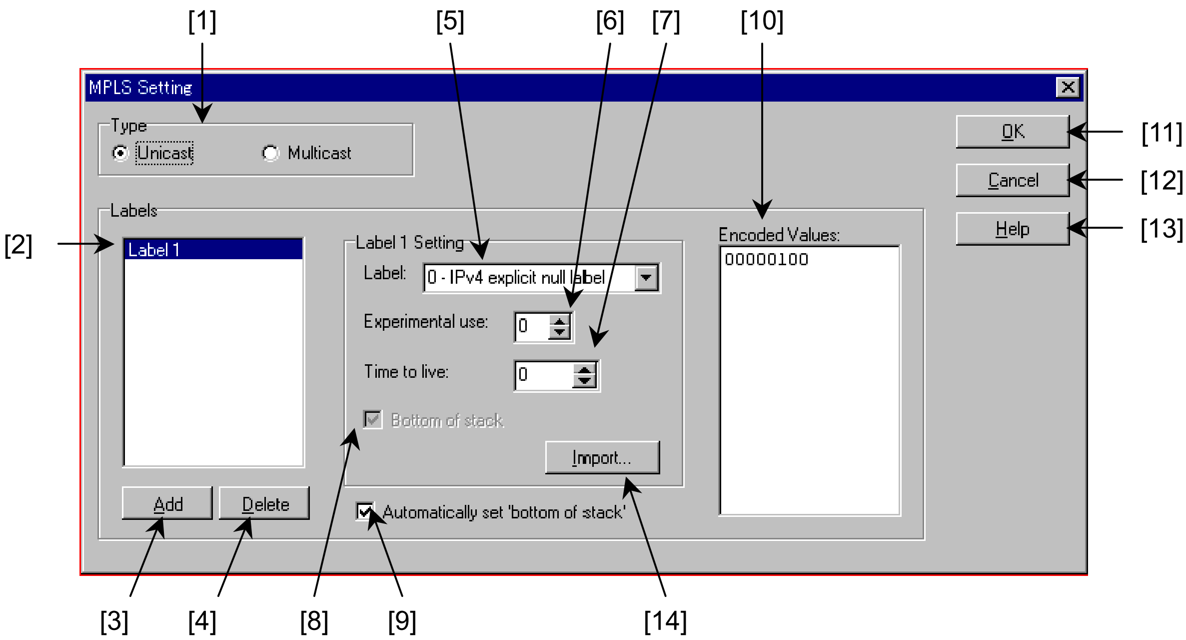


Figure 5.1.2-4

[1] Specifies MPLS type. This value does not affect the MPLS label, but changes the values in the Type field for Ethernet and the Protocol field for PPP and Cisco HDLC.

[2] Displays the set label.

[3] Adds a new label. Up to 10 labels can be created.

[4] Deletes the label selected in [2].

[5] Sets the Label field for the label selected in [2].

Value: 0 to 1,048,575

[6] Sets the Experimental Use field for the label selected in [2].

Value: 0 to 7

[7] Sets the Time to Live field for the label selected in [2].

Value: 0 to 255

[8] Sets the Bottom of Stack field for the label selected in [2].

Value: 0, 1

Normally, the last label should be set to “1”.

[9] Automatically performs the setting in [8]. The last label is automatically set to “1”.

[10] The set label values are displayed.

[11] Applies the set values and closes the window.

[12] Cancels the set values and closes the window.

[13] Displays help.

[14] Opens the MPLS Label Import screen to select MPLS label acquired by protocol support function. Press **OK** on the MPLS Label Import screen to apply label selection to the Label Setting contents. The MPLS Label Import screen is shown below.

Note:

This button is enabled only when the MPLS(LDP/CR-LDP) protocol option or the MPLS(RSVP) protocol option is installed.

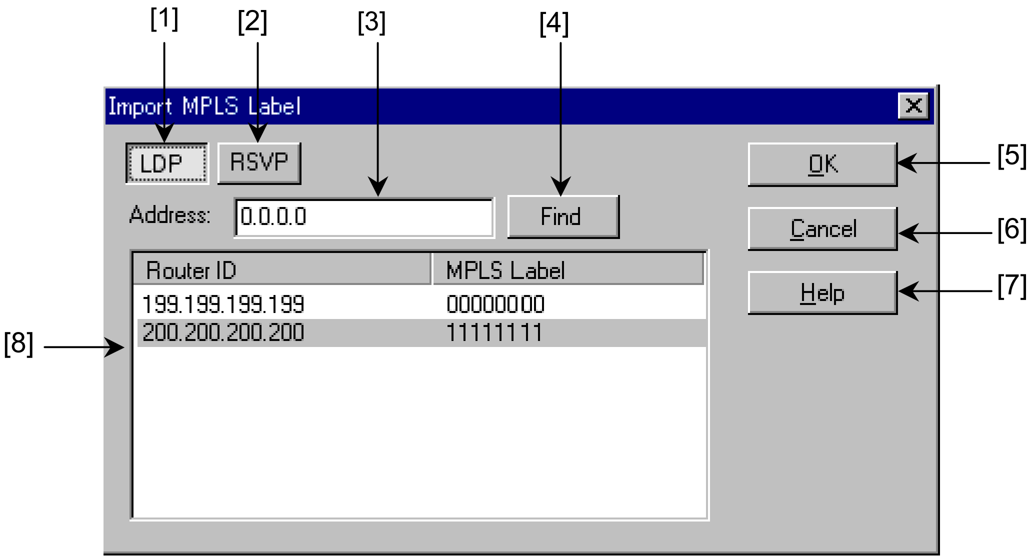


Figure 5.1.2-5

[1] Displays a list of MPLS labels acquired by LDP or CR-LDP.

[2] Displays a list of MPLS labels acquired by RSVP.

[3] Input the address to be searched.

[4] Displays the address in the list that matches to the inputted one and selects it. When no matching address found, an error message appears.

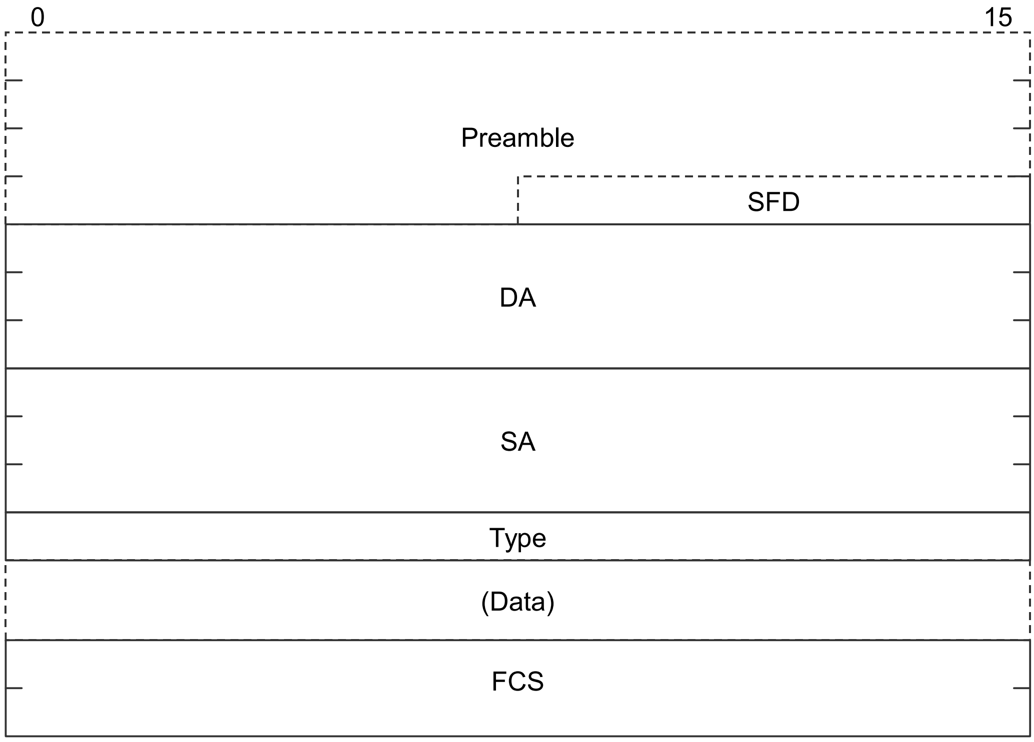
[5] Applies the set values and closes the screen.

[6] Cancels the set values and closes the window.

[7] Displays help.

[8] Displays a list of acquired MPLS labels. Select a label and then press **OK** to apply it to the MPLS Setting screen.

(4) Editing Ethernet field values



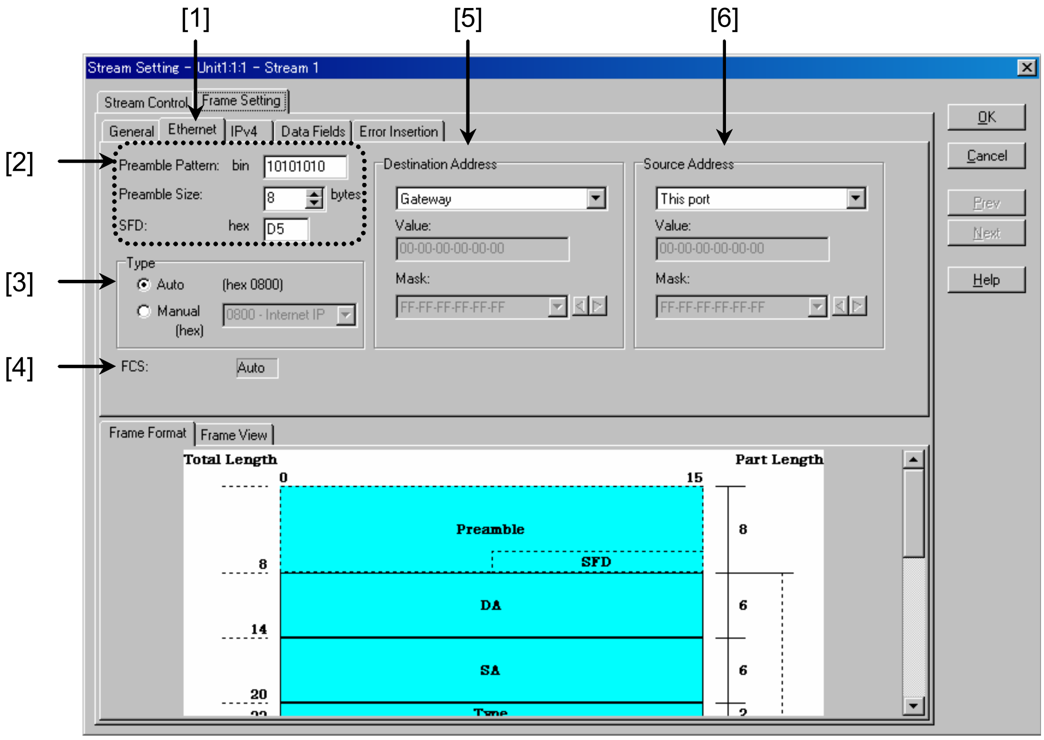


Figure 5.1.2-6 With other than MU120121A/22A/31A/32A/38A

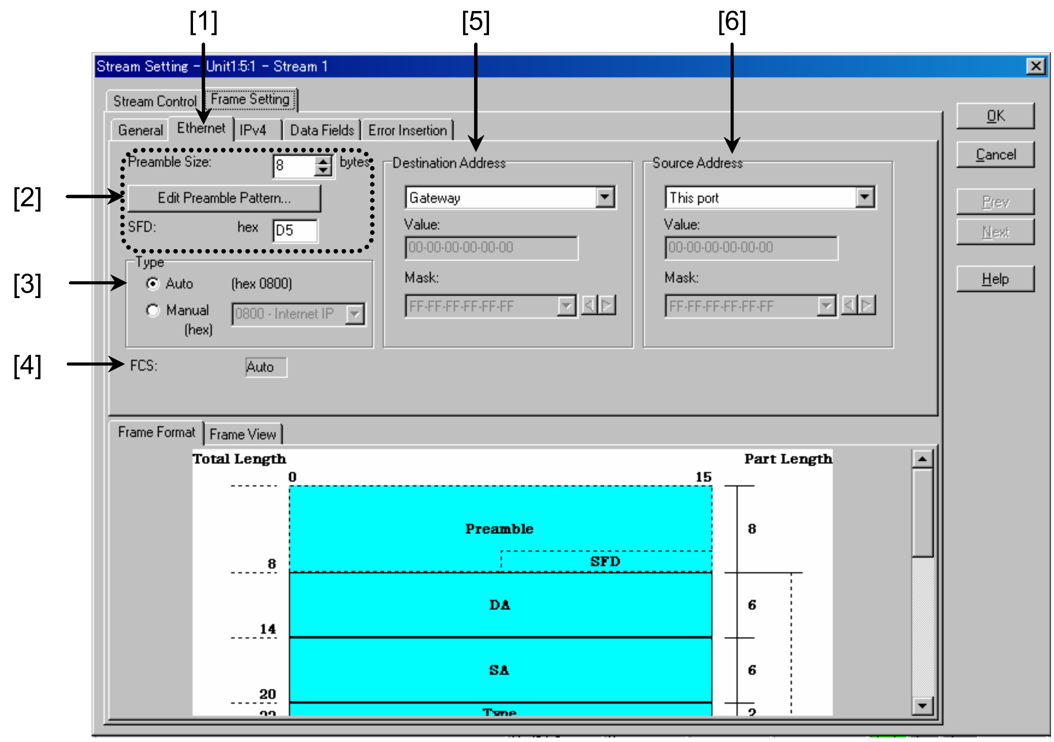


Figure 5.1.2-7　With MU120121A/22A/31A/32A/38A

[1]　Selects **Ethernet** tab.

[2]　Sets the Preamble.
The definition of the Preamble field of this system is as follows.

Preamble size			
1 byte	Variable length	1 byte	
Preamble (fixed) 10101010 (bin)	Preamble (variable)	SFD	DA

Figure 5.1.2-8　Preamble format

(A) Preamble Size
Sets Preamble Size. The maximum susceptible size is 255 bytes. In addition, the minimum value is 4 bytes for the electrical interfaces (MU120101A/11A/21A/22 (RJ-45)/31A and MU120112A 1000 Base-T GBIC) and 2 bytes for the optical interfaces (MU120102A/12A/18A/18B/18C/22A (SFP)/32A/38A).

(B) Edit Preamble Pattern
Sets Preamble (variable).
The setting of this field differs between the MU120121A/22A/31A/32A/38A and other modules.

Note:

Sometimes, it may be impossible to receive frames when this setting is changed.

Other than MU120121A/22A/31A/32A/38A

An 8-bit binary pattern is set.
Repetition of this pattern is set in the Preamble (variable) field.

MU120121A/22A/31A/32A/38A

The Preamble (variable) field is directly set by Binary Data Editor. For details about the Binary Data Editor, refer to Section 2.3.1 (7) “Binary Data Editor”.

Note:

When using the MU120121A/22A (RJ-45)/31A with a Link Speed of 1000 Mbps, the 1 byte header of the send frame Preamble (variable) field is overwritten to 55 (hex).

(C) SFD
Sets SFD as 8-bit hexadecimal data, MSB first.

Note:

Sometimes, it may be impossible to receive frames when this setting is changed.

[3] Sets the Type field. The Type field indicates the protocol next to the Ethernet header.

Auto: Automatically changes the value according to the value set for Protocol or MPLS in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol or MPLS in the **General** tab.

[4] Shows the automatic calculation for the FCS value.

[5] Sets the Destination Address. Select one from the followings:

• Gateway	(Gateway value in Port Setting. ARP Request/NS is transmitted to the IP address of the Gateway set in the Port Setting dialog box, and the returned MAC address is set. The setting of the VLAN tag of ARP Request/NS is in accordance with This Port.)
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

Also set the Mask value when Increment, Decrement, or Random is set. The field for which Mask is set to F, is the target field of Increment, Decrement, or Random. In addition, when **Increment/Decrement** is specified, it starts from the value specified at **Value** when sending of each Stream starts; when the maximum or minimum value is exceeded, it returns to the specified value again.

[6] Sets the Source Address. Select one from the followings:

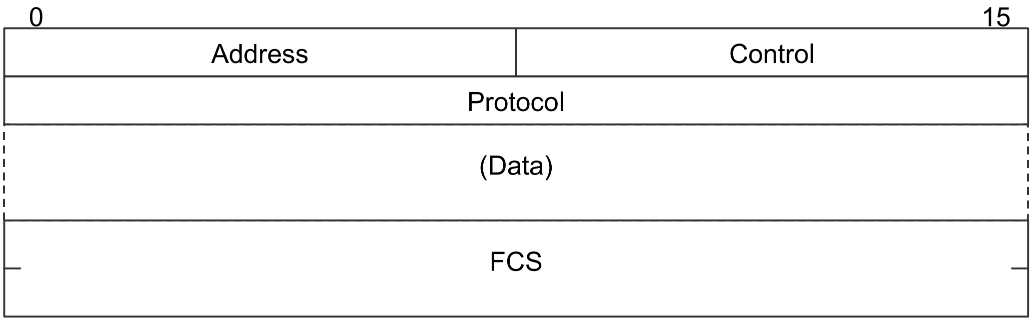
• This Port	(MAC address value set by Port Setting)
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

The setting method is the same as for Destination Address.

Note:

Preamble Pattern, Preamble Size, and SFD are not set for an Ethernet frame that is accommodated in the GFP/LAPS/LEX frame when MU120103B/04B or MU150101A is used. Accordingly, Frame Format/Frame View is not displayed.

(5) Editing PPP field values



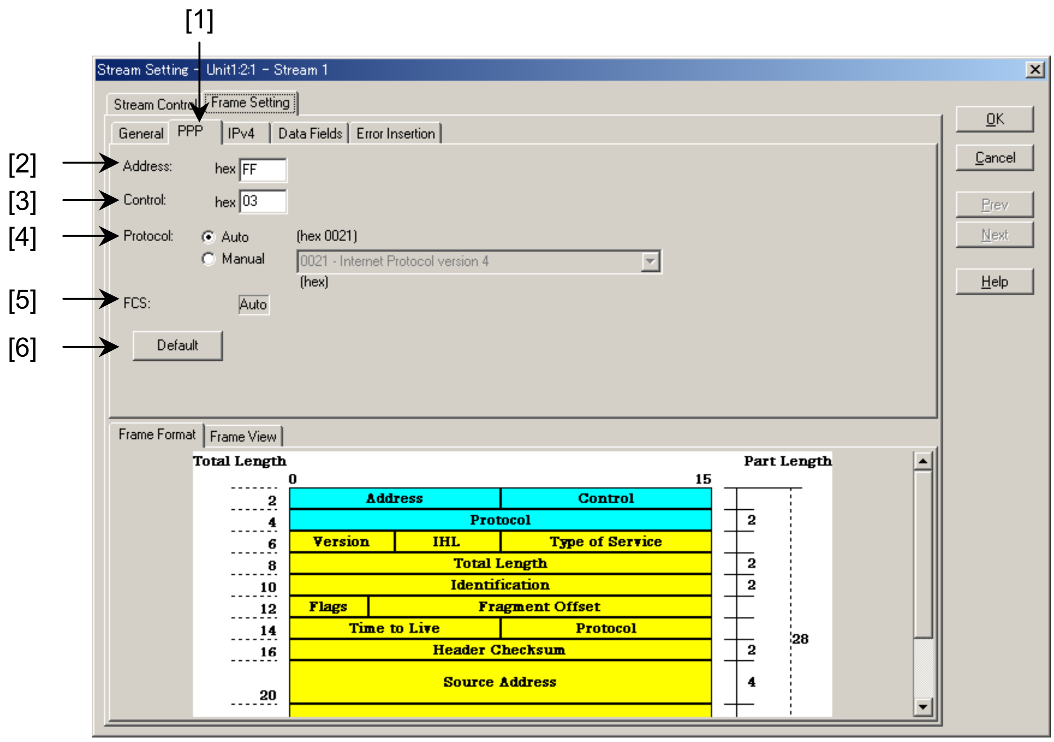


Figure 5.1.2-9

[1] Selects PPP tab.

[2] Sets the Address field.

Value: 00 to FF (hex)

[3] Sets the Control field.

Value: 00 to FF (hex)

[4] Sets the Protocol field. Protocol field indicates the protocol next to the PPP header.

Value: 0000 to FFFF (hex)

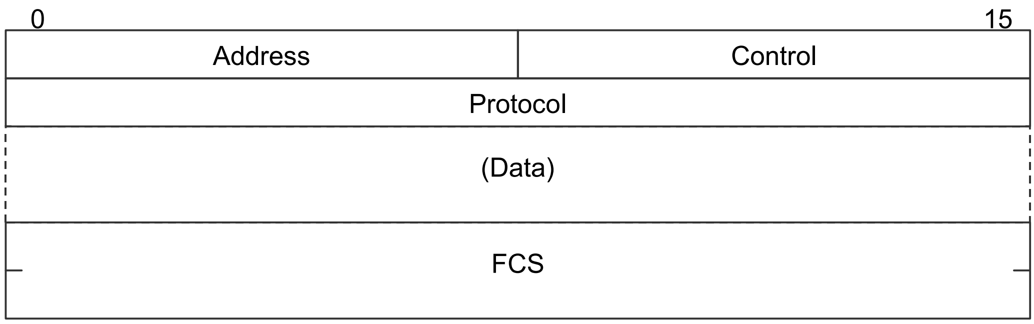
Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

[5] Shows the automatic calculation for the FCS value.

[6] Initializes the PPP settings.

(6) Editing CiscoHDLC field values



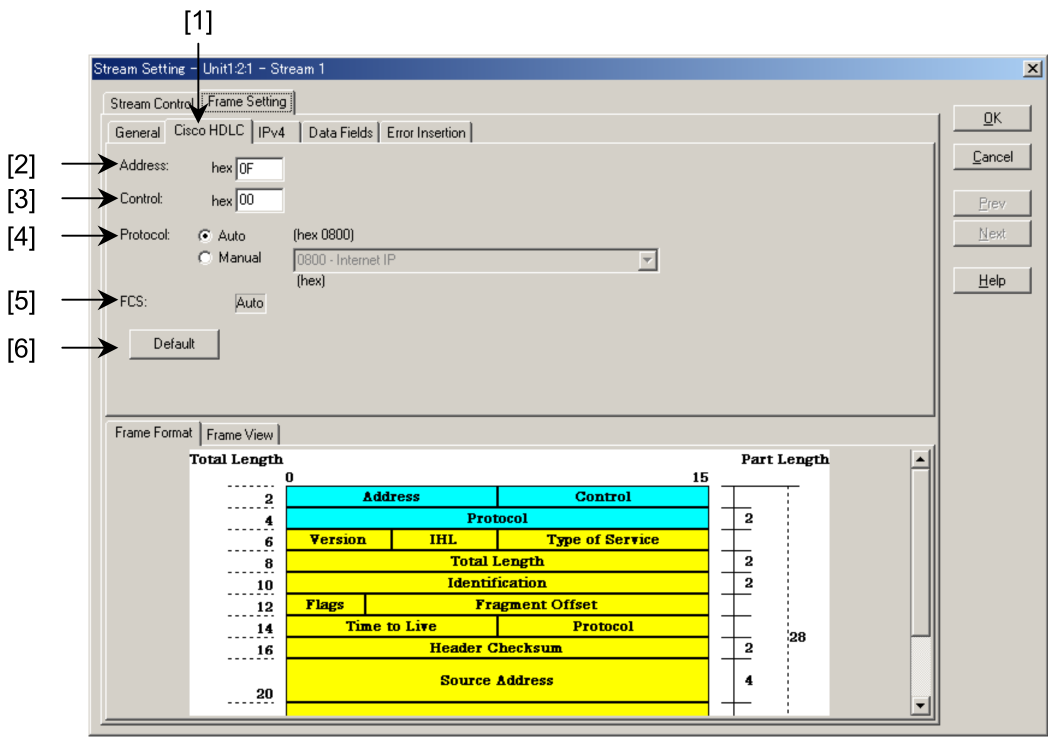


Figure 5.1.2-10

[1] Selects **Cisco HDLC** tab.

[2] Sets the Address field.

Value: 00 to FF (hex)

[3] Sets the Control field.

Value: 00 to FF (hex)

[4] Sets the Protocol field. The Protocol field indicates the protocol next to the Cisco HDLC header.

Value: 0000 to FFFF (hex)

Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

[5] Shows the automatic calculation for the FCS value.

[6] Initializes the Cisco HDLC settings.

(7) Editing MAPOS field values

MAPOS field contents vary depending on the setting for Mapping in the Port Setting screen.

For MAPOS Version 1:

0	15
Address	Control
Protocol	
(Data)	
FCS	

For MAPOS 16:

0	15
Address	
Protocol	
(Data)	
FCS	

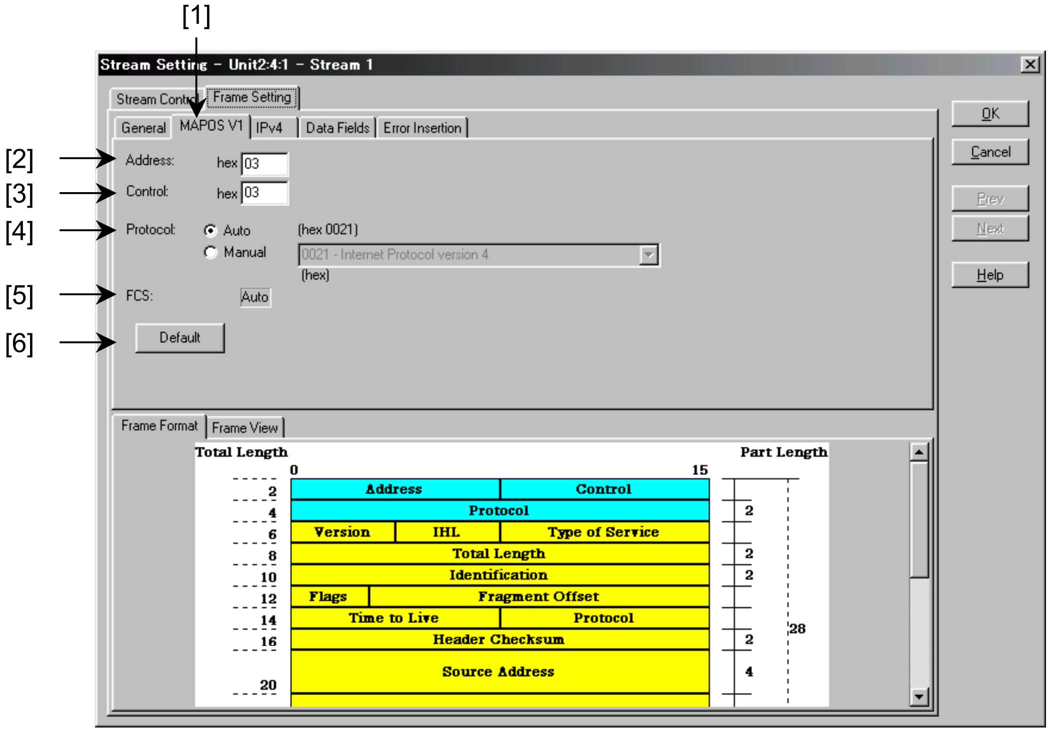


Figure 5.1.2-11

[1] Selects **MAPOS V1** tab or **MAPOS 16** tab.

[2] Sets the Address field. The setting ranges differ between MAPOS Version 1 and MAPOS 16.

Value: 00 to FF (hex) MAPOS Version 1

Value: 0000 to FFFF (hex) MAPOS 16

[3] Sets the Control field. This field is available when MAPOS Version 1 is selected.

Value: 00 to FF (hex)

[4] Sets the Protocol field. The Protocol field indicates the protocol next to the MAPOS header.

Value: 0000 to FFFF (Hex)

Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

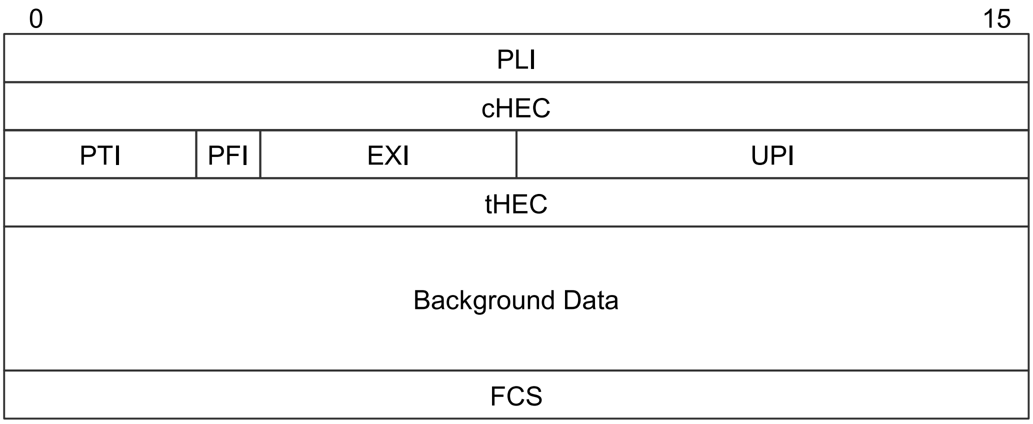
[5] Expresses the automatic calculation for the FCS value.

[6] Returns MAPOS settings to the initial status.

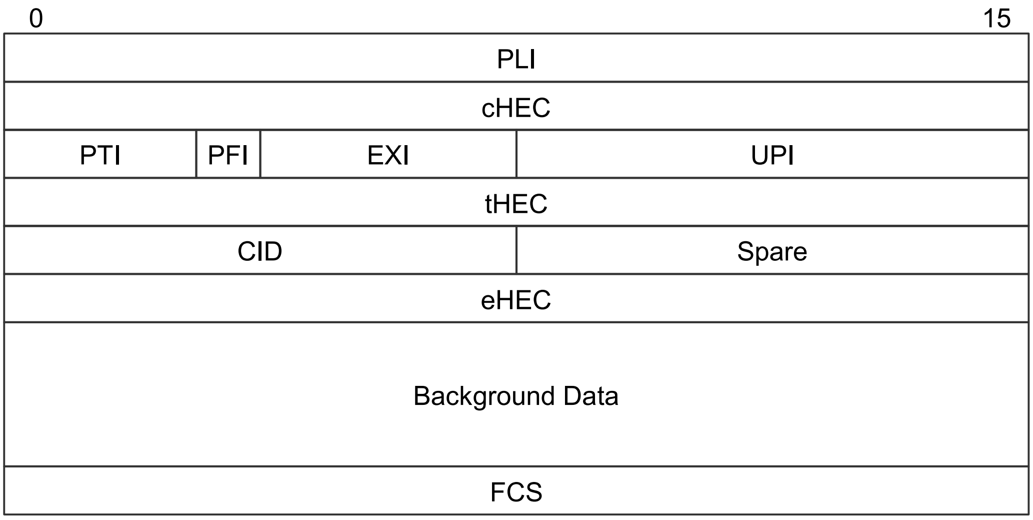
(8) Editing GFP field values

GFP field contents vary depending on the selection for the EXI field.

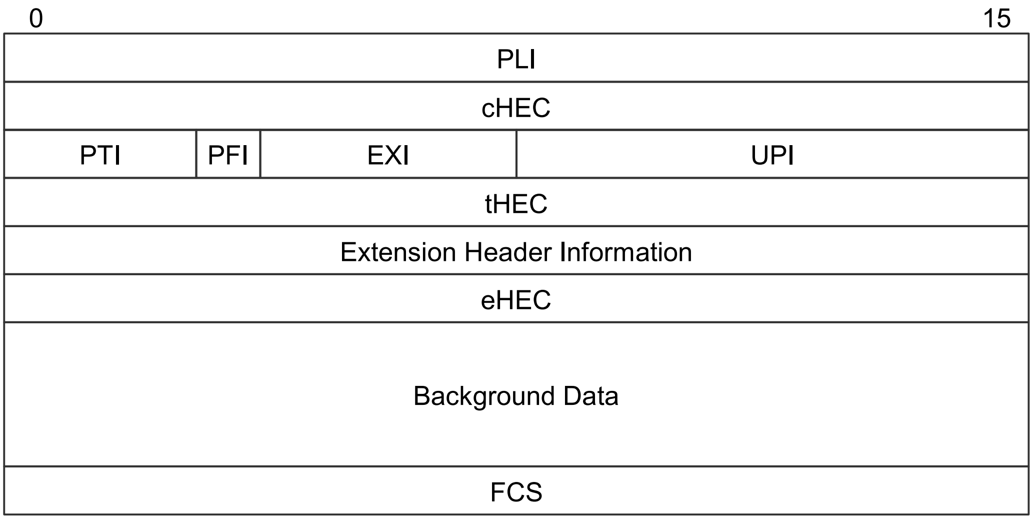
For EXI =0 : Null Extension Header:



For EXI =1 : Linear Extension Header:



For EXI =2 : Ring Extension Header and EXI≥3:



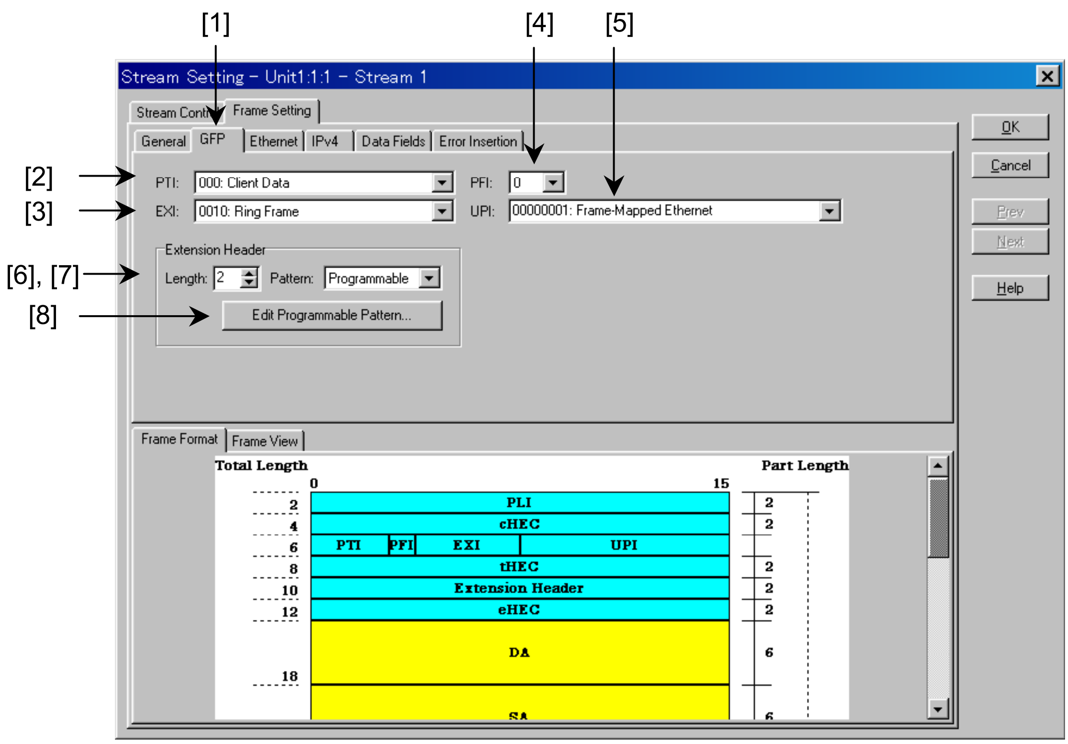


Figure 5.1.2-12

[1] Selects **GFP** tab.

[2] PTI combo-box: Sets PTI field (3-bit).

- 000: Client Data
- 001: Reserved
- 010: Reserved
- 011: Reserved
- 100: Client Management
- 101: Reserved
- 110: Reserved
- 111: Reserved

[3] EXI combo-box: Selects Extension Header type. Up to 16 settings can be selected.

- 0000: Null Extension Header
- 0001: Linear Frame
- 0010: Ring Frame
- 0011: Reserve
- 0100: Reserve
  to
- 1111: Reserve

[4] PFI combo-box: Sets presence/absence of GFP Payload FCS as 1 or 0.

[5] UPI: Sets signal type (Client Type) on Payload. Selection items vary depending on PTI setting. Not all of the 256 options are displayed. Use the keypad to set an option that is not displayed.

Setting value list for UPI field

UPI value	Display
<When PTI=000>	
0000 0000, 1111 1111	0000 0000: Reserved and not available 1111 1111: Reserved and not available
0000 0001	0000 0001: Frame-Mapped Ethernet
0000 0010	0000 0010: Framed Mapped PPP
0000 0011	0000 0011: Transparent Fiber Channel
0000 0100	0000 0100: Transparent FICON
0000 0101	0000 0101: Transparent ESCON
0000 0110	0000 0110: Transparent Gb Ethernet
0000 0111	0000 0111: Reserved for future
0000 1000	0000 1000: MAPOS
0000 1001	0000 1001: Transparent DVB ASI
0000 1010	0000 1010: Framed Mapped RPR
0000 1011	0000 1011: Frame-Mapped FC-BBW
0000 1100	0000 1100: Asynco Transparent FC
0000 1101 to 1110 1111	0000 1101: Reserved to 1110 1111: Reserved

UPI value	Display
1111 0000 to 1111 1110	1111 0000: Reserved for proprietary use to 1111 1110: Reserved for proprietary use
<When PTI=100>	
0000 0000	Reserved
0000 0001	Loss of Client Signal
0000 0010	Loss of Character Synchronization
Other	Reserved
<When PTI is not 000 or 100>	
All	Reserved

(Extension Header)

[6] Length textbox: When Extension Header is other than Null/Linear while the size is not defined by ITU-T, its length can be set (except eHEC.)

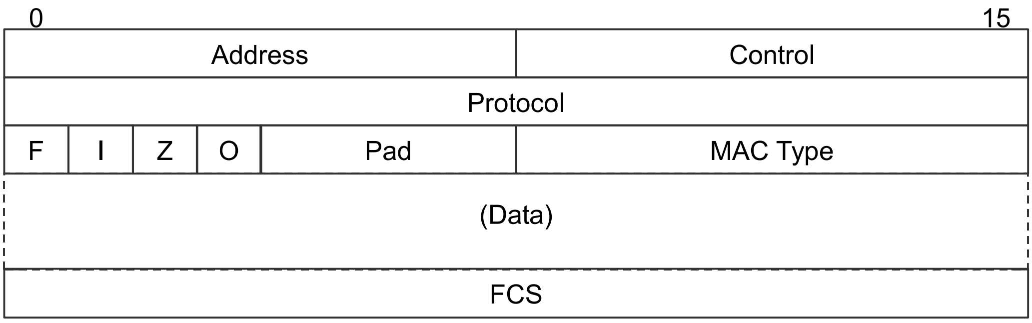
Value: 2 to 58

* To receive an Extension Header other than Null/Linear by using this equipment, perform settings explained in "Other Extension Header Length."(refer to Section 4.5.3, (9))

[7] Pattern: Select Programmable, ALL0 or ALL1.

[8] Edit Programmable Pattern: When [6] Extension Header Pattern is set to Programmable, Pattern Editor can be activated to edit the pattern.

(9) Editing LEX field values



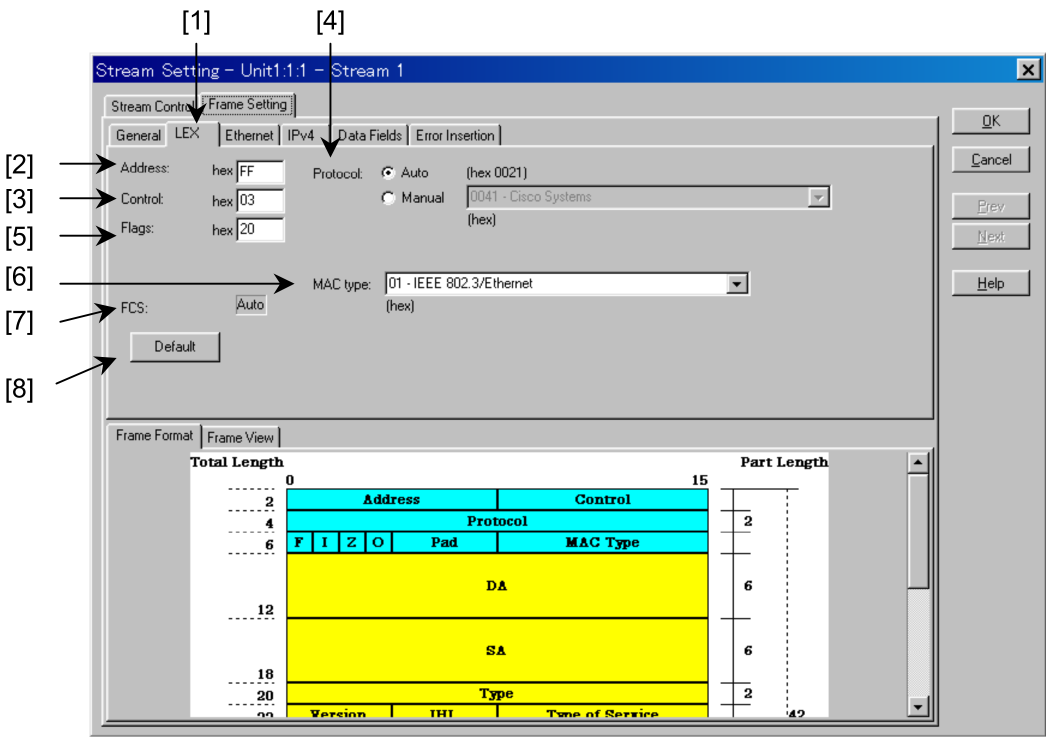


Figure 5.1.2-13

[1] Selects **LEX** tab.

[2] Sets the Address field.

Value: 00 to FF (hex)

[3] Sets the Control field.

Value: 00 to FF (hex)

[4] Sets the Protocol field. The Protocol field indicates the protocol next to the LEX header.

Value: 0000 to FFFF (hex)

Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

[5] Sets the Flags field. The Flag field is an 8-bit field consisting of 4 bit flags (F, I, Z, O) and a Pad field of the lower 4 bits.

Value: 00 to FF (hex)

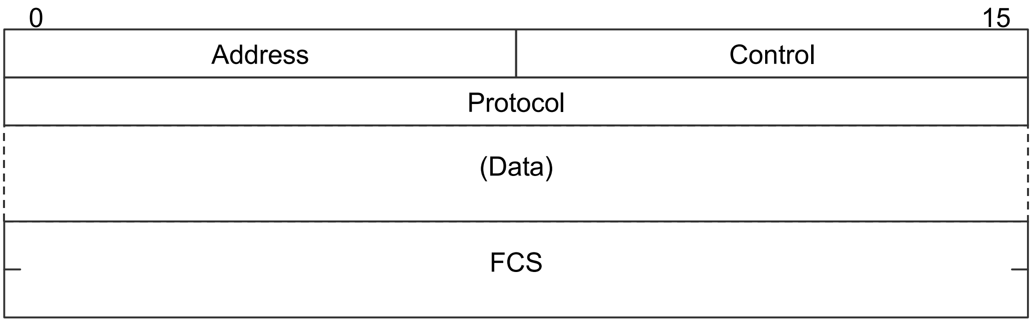
[6] Sets the MAC Type field.

Value: 00 to FF (hex)

[7] Indicates that the FCS value is being calculated automatically.

[8] Returns LEX settings to the initial status.

(10) Editing LAPS field values



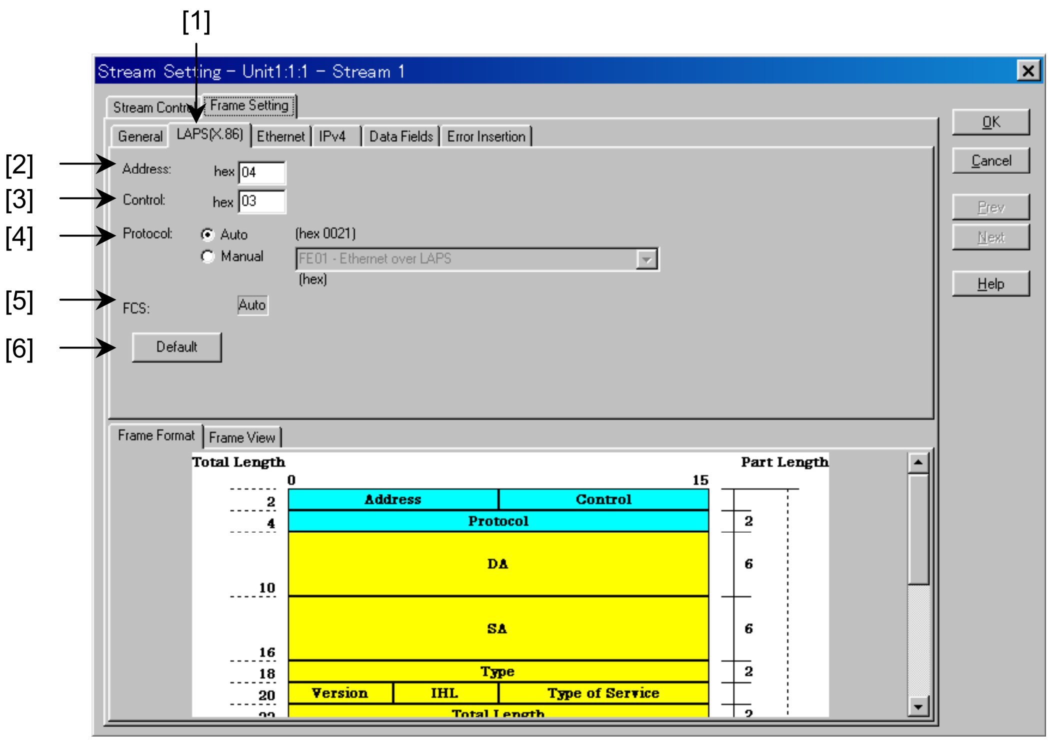


Figure 5.1.2-14

[1] Selects **LAPS (X.86)** tab.

[2] Sets the Address field.

Value: 00 to FF (hex)

[3] Sets the Control field.

Value: 00 to FF (hex)

[4] Sets the Protocol field. The Protocol field indicates the protocol next to the LAPS header.

Value: 0000 to FFFF (hex)

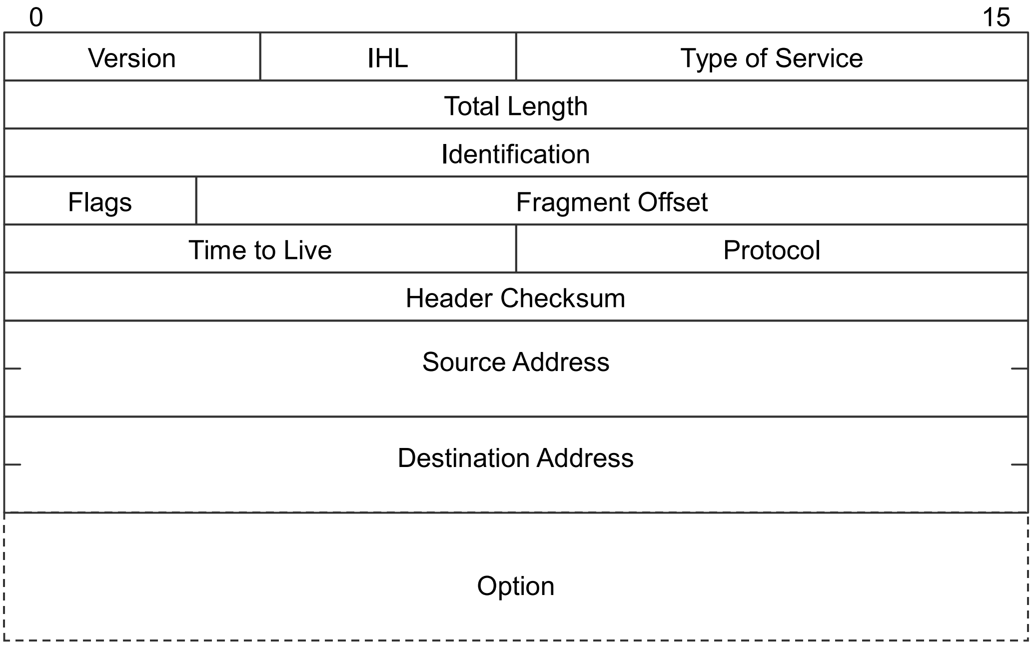
Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

[5] Indicates that the FCS value is being calculated automatically.

[6] Returns LAPS settings to the initial status.

(11) Editing IPv4 field values



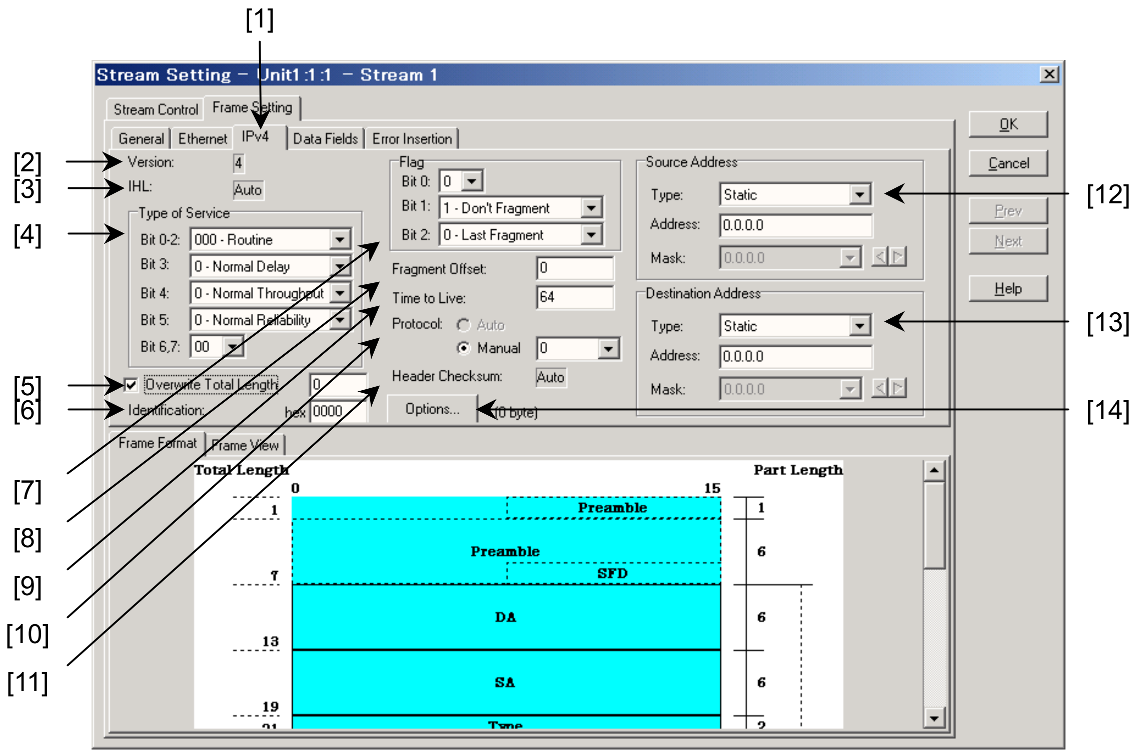


Figure 5.1.2-15

[1] Selects IPv4 tab.

[2] Shows the Version field. Value is always “4”.

[3] Shows the automatic calculation for IHL field value.

[4] Sets the Type of Service field.

Bit 0-2	Specifies priority (Precedence).
Bit 3	Specifies delay order (Delay).
Bit 4	Specifies throughput order (Throughput).
Bit 5	Specifies reliability order (Reliability).
Bit 6,7	Specifies the values for 6th and 7th bits.

[5] Sets Total Length field. This is enabled when 'Overwrite Total Length' is checked. If not checked, the automatic calculated value by **General** tab setting etc. is used.

Value: 0 to 65,535 (dec)

[6] Sets the Identification field.

Value: 0000 to FFFF (hex)

[7] Sets the Flag field.

Bit 0	Specifies the 0th bit. Normally specify "0".
Bit 1	Specifies whether it can be divided.
Bit 2	Specifies whether it is the middle or the last data when divided.

[8] Sets the Fragment Offset field.

Value: 0 to 8,191 (dec)

[9] Sets the Time to Live field.

Value: 0 to 255 (dec)

[10] Sets the Protocol field. Specify the protocol next to the IP header.

Value: 0 to 255 (dec)

Auto: Automatically changes the value according to the value set for Protocol in the **General** tab.

Manual: Manually sets the value regardless of the value set for Protocol in the **General** tab.

[11] Shows the automatic calculation for the Header Checksum field value.

[12] Selects the Source Address. Select one from the followings:

- This Port (IPv4 Address value set for Port Setting)
- Static Fixed value
- Increment Value increments in frame step
- Decrement Value decrements in frame step
- Random Random value for each frame

Also set the Mask value when Increment, Decrement, or Random is set. The field for which Mask is set to 1 is the target field of Increment, Decrement, or Random. In addition, when **Increment/Decrement** is specified, it starts from the value specified at **Value** when sending of each Stream starts; when the maximum or minimum value is exceeded, it returns to the specified value.

5

Basic Measurement (Manual Test)

[13] Sets the Destination Address. Select one from the followings:

• Gateway	(IPv4 Gateway value set on Port Setting)
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

The setting method is the same as for Source Address.

[14] Sets the Option Field. Binary data (0 to 40 bytes long) can be set. If the data length is not a multiple of 4, it is padded with 0 and adjusted to a multiple of 4.

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

(12) Setting Tunneling

Sets tunneling when IPv6 over IPv4 is selected for Protocol in the General sheet.

[1]

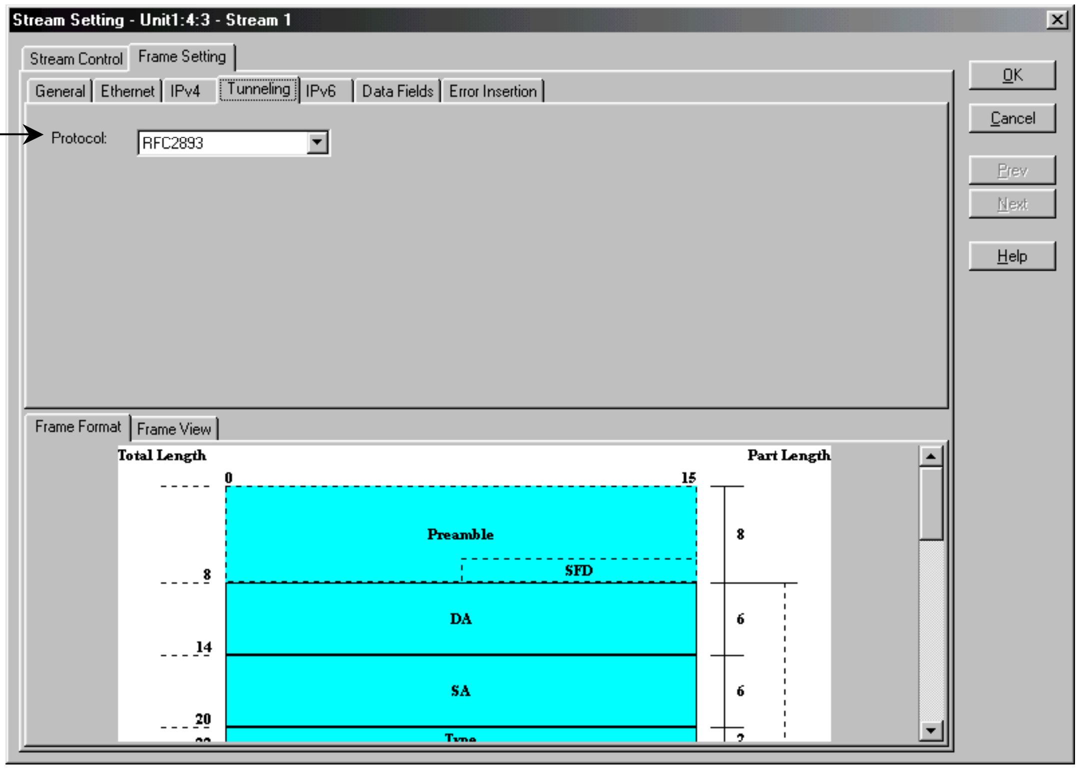
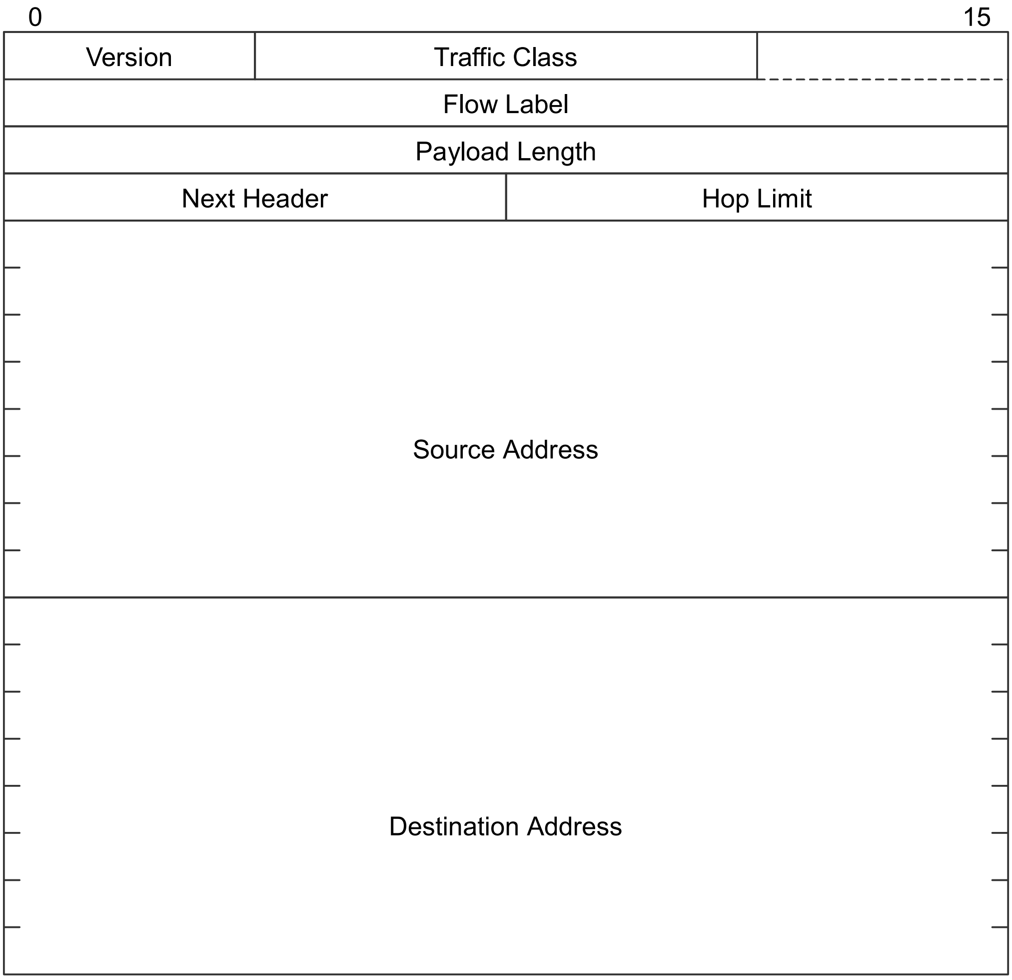


Figure 5.1.2-16

[1] Indicates the IPv6 encapsulation method is RFC2893.

(13) Editing IPv6 field values



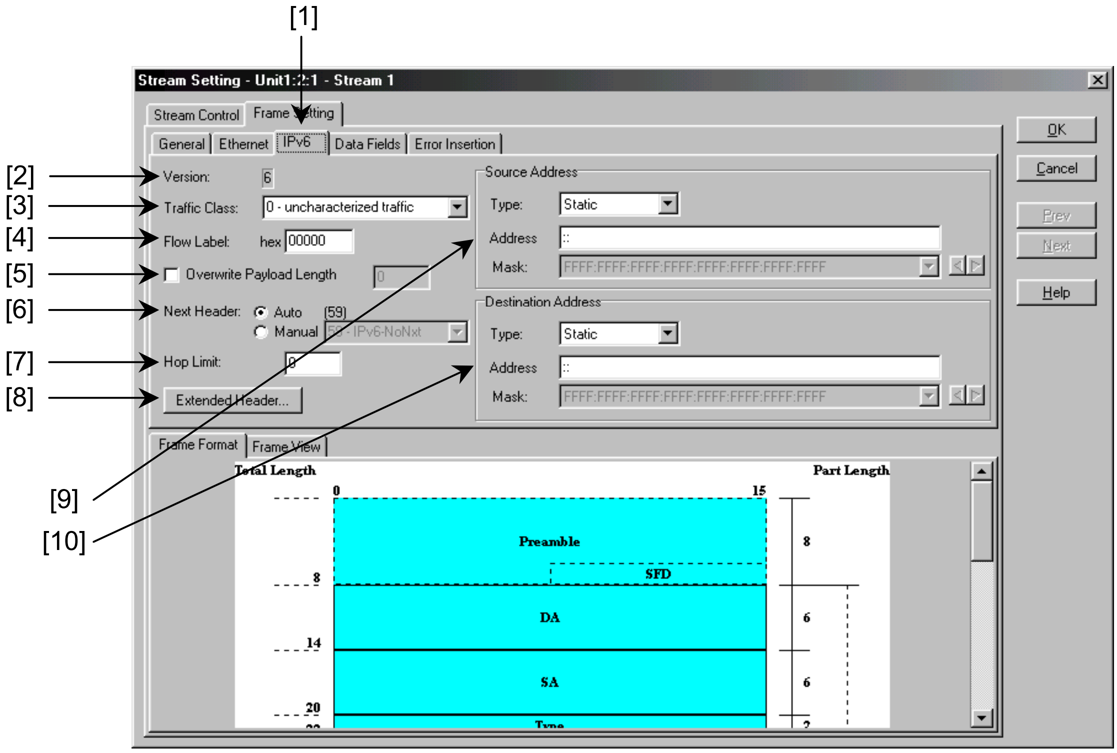


Figure 5.1.2-17

[1] Selects **IPv6** tab.

[2] Shows the Version field. The value is always "6".

[3] Sets the Traffic Class field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

0 Uncharacterized traffic
1 "Filler" traffic
2 Unattended data transfer
3 Reserved
4 Attended bulk transfer
5 Reserved
6 Interactive traffic
7 Internet control traffic

[4] Sets the Flow Label field.

Value: 00000 to FFFFF (hex)

[5] Sets Payload Length field. This is enabled when 'Overwrite Payload Length' is checked. If not checked, the automatic calculated value by **General** tab setting etc. is used.

Value: 0 to 65,535 (dec)

[6] Sets the Next Header field. The following range can be set:

Value: 0 to 255 (dec)

Auto: Sets the value automatically according to the setting of IPv6 extended header.

Manual: Sets the value manually regardless of the setting of the IPv6 extended header.

Select one of the followings:

0 – HOPOPT
1 – ICMP
2 – IGMP
6 – TCP
17 – UDP
41 – IPv6
43 – Routing
44 – Fragment
50 – ESP
51 – Authentication
58 – ICMPv6
59 – IPv6-NoNxt
60 – IPv6-Opts

[7] Sets the Hop Limit field.

Value: 0 to 255 (dec)

[8] Sets the IPv6 extended header in the window shown below.
(This setting cannot be performed with the MU120101A module.)

When the extended header is Hop-by-Hop Option Header:

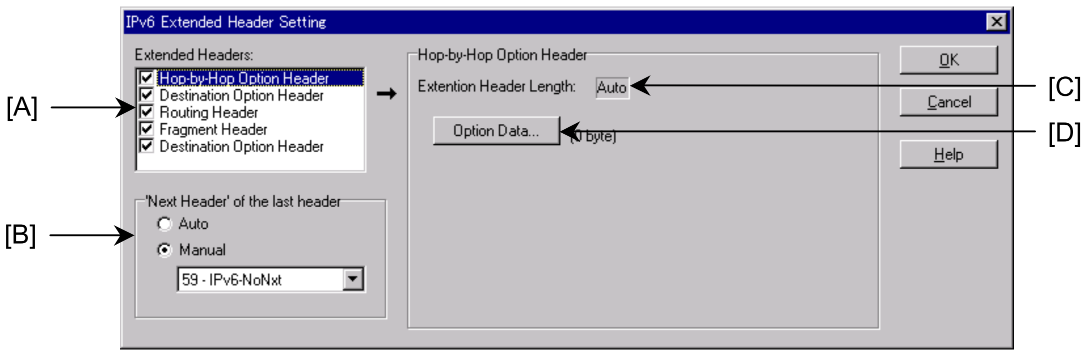


Figure 5.1.2-18

[A] Sets the extended header. The checked extended header is added to the stream. Select one of the followings:
- Hop-by-Hop Option Header
- Destination Option Header
- Routing Header
- Fragment Header
- Destination Option Header

[B] Sets the value of "Next Header" field that attached to the last of the extension header.

Value: 0 to 255 (dec)

Auto: Sets the value automatically to that set for Protocol in General.

Manual: Sets the value manually regardless of the set value for Protocol in General.

[C] Indicates that the value for the Extension Header Length field is being calculated automatically.

[D] Sets Option Data:

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

When the extended header is Routing Header:

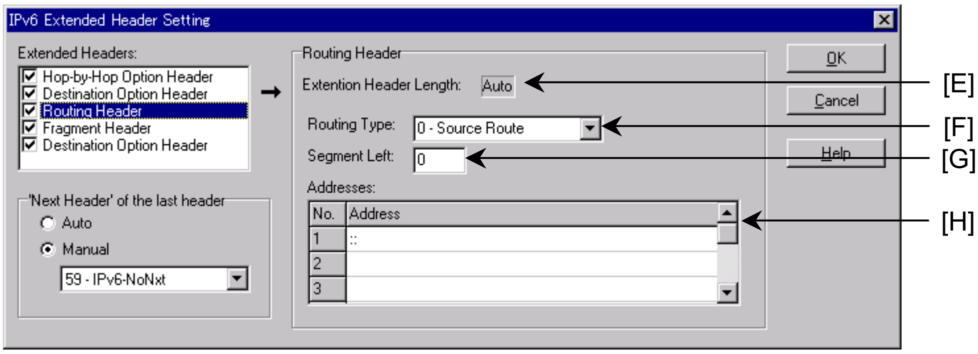


Figure 5.1.2-19

[E] Indicates that the value for the Extension Header Length field is being calculated automatically.

[F] Sets the value of "Routing Type" field of the extension header. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

0 – Source Route
1 – Nimrod

[G] Sets the value of "Segment Left" field of the extension header.

Value: 0 to 255 (dec)

[H] Sets the route address. Up to 16 addresses can be inputted.

When the extended header is Fragment Header:

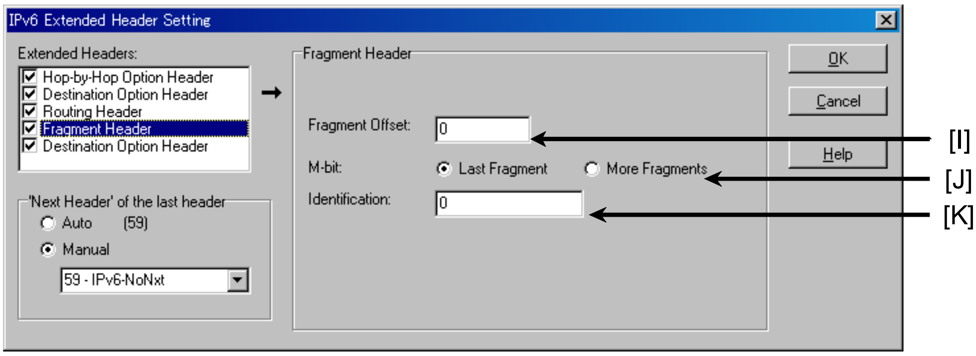


Figure 5.1.2-20

[I] Sets the value of "Fragment Offset" field of the extension header.

Value: 0 to 8191 (dec)

[J] Sets the M bit field of the extension header. Select one of the followings:

- Last Fragment
- More Fragment

[K] Sets the value of "Identification" field of the extension header.

Value: 0 to 4294967295 (dec)

When the extended header is Destination Option Header:

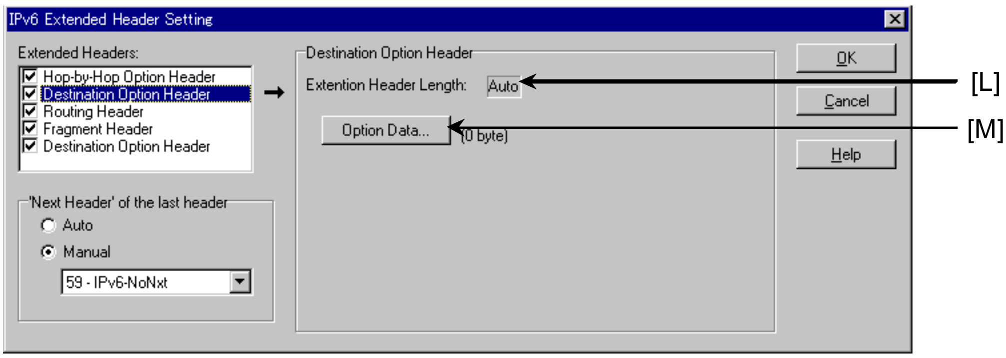


Figure 5.1.2-21

[L] Indicates that the value for the Extension Header Length field is being calculated automatically.

[M] Sets Option Data:

For the Binary Data settings, refer to “(7) Binary Data Editor” in Section 2.3.1.

[9] Sets the Source Address field. Select one from the followings:

• This Port	(IPv6 Address value set on Port Setting)
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

Also set the Mask value when Increment, Decrement, or Random is set. The field for which Mask is set to “1”, is the target field of Increment, Decrement, or Random. In addition, when **Increment/Decrement** is specified, it starts from the value specified at **Address** when sending of each Stream starts; when the maximum or minimum value is exceeded, it returns to the specified value.

Note:

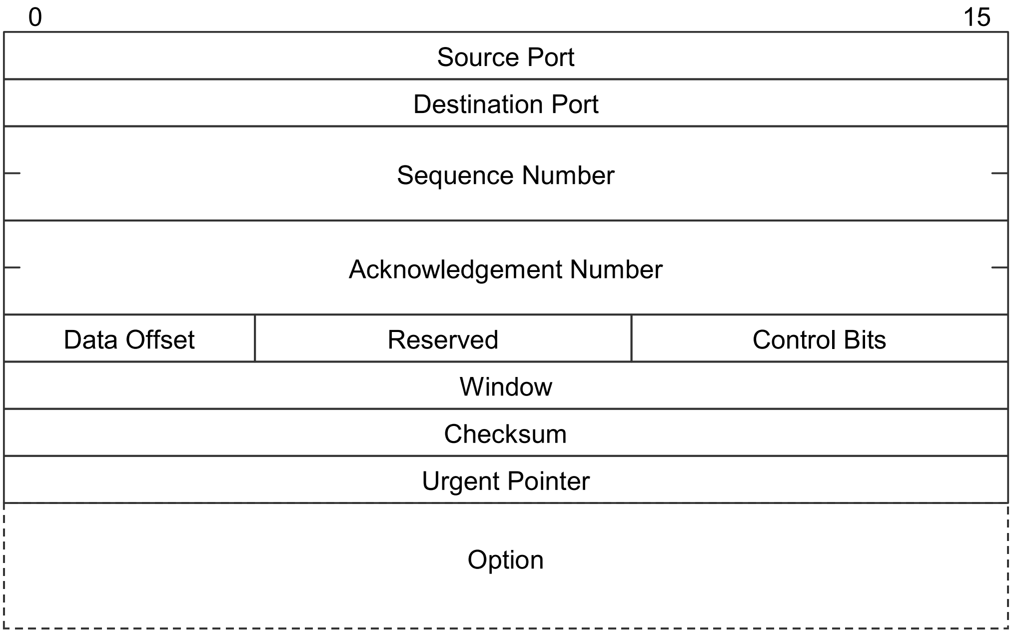
- With the MU120101A/02A, MU120103A/03B/04A/05A/06A/04B/19A/20A, and MU150101A, at **Mask** setting, up to 32 bits can be set when bit is “1”.
- Using the MU120103A/04A/05A/06A/03B/04B and MU150101A, Increment/Decrement/Random can be set only to either Source Address or Destination Address.

[10] Sets the Destination Address field. Select one from the followings:

• Default Router	(IPv6 Default Router value set on Port Setting)
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

The setting method is the same as that for Source Address.

(14) Editing TCP field values



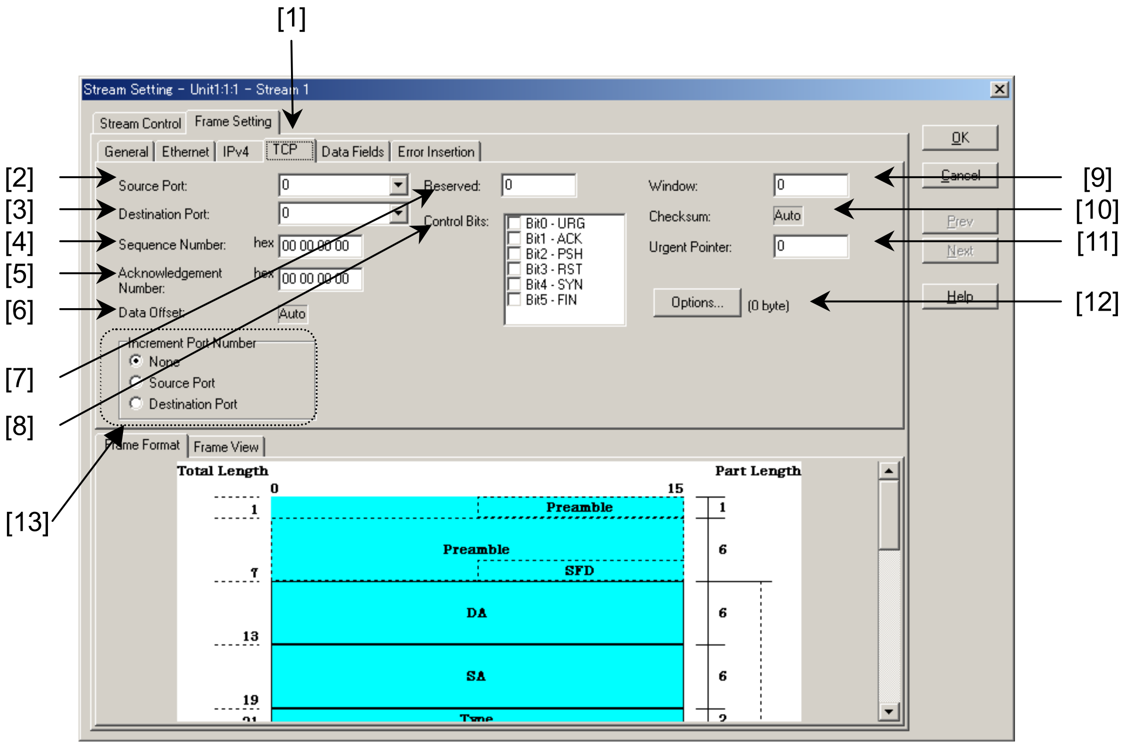


Figure 5.1.2-22

[1] Select **TCP** tab.

[2] Sets the Source Port field. The following range can be set:

Value: 0 to 65535 (dec)

Or select one of the followings:

7 – echo
19 – chargen
20 – ftp-data
21 – ftp
23 – telnet
25 – smtp
37 – time
42 – nameserver
43 – nicname
53 – domain
70 – gopher
79 – finger
80 – www-http
101 – hostname
109 – pop2
110 – pop3
119 – nntp
123 – ntp
143 – imap
177 – xdmcp
179 – bgp
220 – imap3
443 – https

[3] Sets the Destination Port field. The setting method is the same as that for Source Port.

[4] Sets the Sequence Number field.

Value: 00 00 00 00 to ff ff ff ff (hex)

[5] Sets the Acknowledgement Number field.

Value: 00 00 00 00 to ff ff ff ff (hex)

[6] Indicates that Data Offset is automatically calculated.

[7] Sets the 6-bit Reserved field.

Value: 0 to 63 (dec)

[8] Sets each of the Control Bits.

Bit 0	URG	Urgent pointer field identification
Bit 1	ACK	Check field identification
Bit 2	PSH	Push function
Bit 3	RST	Connection reset
Bit 4	SYN	Synchronized sequence number
Bit 5	FIN	No data from transmitter side.

[9] Sets the Window field.

Value: 0 to 65,535 (dec)

[10] Shows the automatic calculation for the Checksum field value.

Note:

In any of the following cases, the value of the automatically calculated Checksum field is illegal.

- If Sequence Number, Time Stamp, or Hardware Random Pattern is set in Data Field
- If MU120101A is used and Test Frame is set for Data Field (If a module other than MU120101 is used and Test Frame for MU120101A is set for Data Field, a correct value is set in the Checksum field.

[11] Sets the Urgent Pointer field.

Value: 0 to 65,535 (dec)

[12] Sets the Option Field. Binary data 0 to 40 bytes long can be set.

☞ For the Binary Data settings, refer to “(7) Binary Data Editor” in Section 2.3.1.

[13] Sets the Port which field value is incremented by 1 (dec).
It starts from the specified value when sending of each Stream starts; when the maximum value is exceeded, it returns to the specified value again.
If this setting is enabled, Data Field of the TCP data block is set for Test Frame.

☞ For the Data Fields, refer to “(26) Editing Data fields” in Section 5.1.2.

Notes:

1. When using the Increment function of the Port field with the MU120102A/11A/12A/18A/18B/18C, the Sequence Error counts.
2. Both this function and the function to increment the sequence number field of Programmable Header Pattern cannot be used at the same time.

(15) Editing UDP field values

0 — 15
Source Port
Destination Port
Length
Checksum

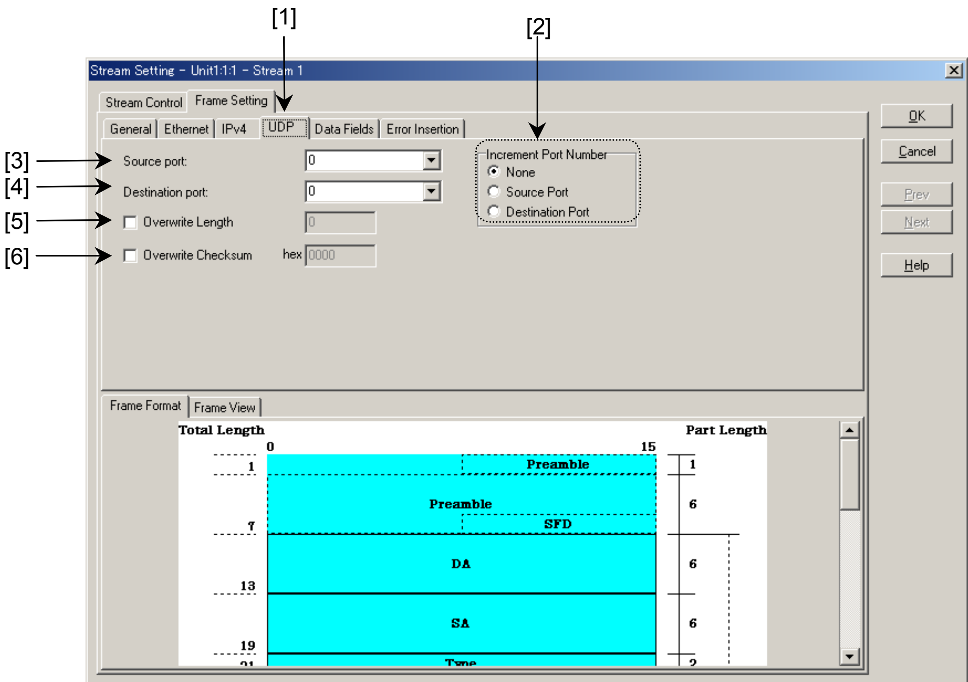


Figure 5.1.2-23

[1] Selects **UDP** tab.

[2] Sets the Port which field value is incremented by 1 (dec).
It starts from the specified value when sending of each Stream starts; when the maximum value is exceeded, it returns to the specified value again.
If this setting is enabled, Data Field of the UDP data block is set for Test Frame.

☞ For the Data Fields, refer to "(26) Editing Data fields" in Section 5.1.2.

Notes:

1. When using the Increment function of the Port field with the MU120102A/11A/12A/18A/18B/18C, the Sequence Error counts.

2. Both this function and the function to increment the sequence number field of Programmable Header Pattern cannot be used at the same time.

[3] Sets the Source Port field. The following range can be set:

Value: 0 to 65535 (dec)

Or select one of the followings:

7 – echo
19 – chargen
37 – time
39 – rlp
53 – domain
67 – bootps
68 – bootpc
69 – tftp
123 – ntp
137 – netbios-ns
138 – netbios-dgm
139 – netbios-ssn
161 – snmp
162 – snmptrap
177 – xdmcp
520 – router

[4] Sets the Destination Port field. The setting method is the same as that for Source Port.

[5] Sets Length field. This is enabled when 'Overwrite Length' is checked. If not checked, the automatic calculated value by **General** tab setting etc. is used.

Value: 0 to 65,535 (dec)

[6] Sets the Checksum field. This item is enabled when Overwrite Checksum is checked. When Overwrite Checksum is unchecked, the automatically calculated value is used.

Value: 0000 to FFFF (hex)

Note:

In any of the following cases, the value of the automatically calculated Checksum field is illegal.

- If Sequence Number, Time Stamp, or Hardware Random Pattern is set in Data Field
- If MU120101A is used and Test Frame is set for Data Field (If a module other than MU120101A is used and Test Frame for MU120101A is set for Data Field, a correct value is set in the Checksum field.

(16) Editing IGMP field values

0	15
Type	Max Response Time
Checksum	
Group Address	

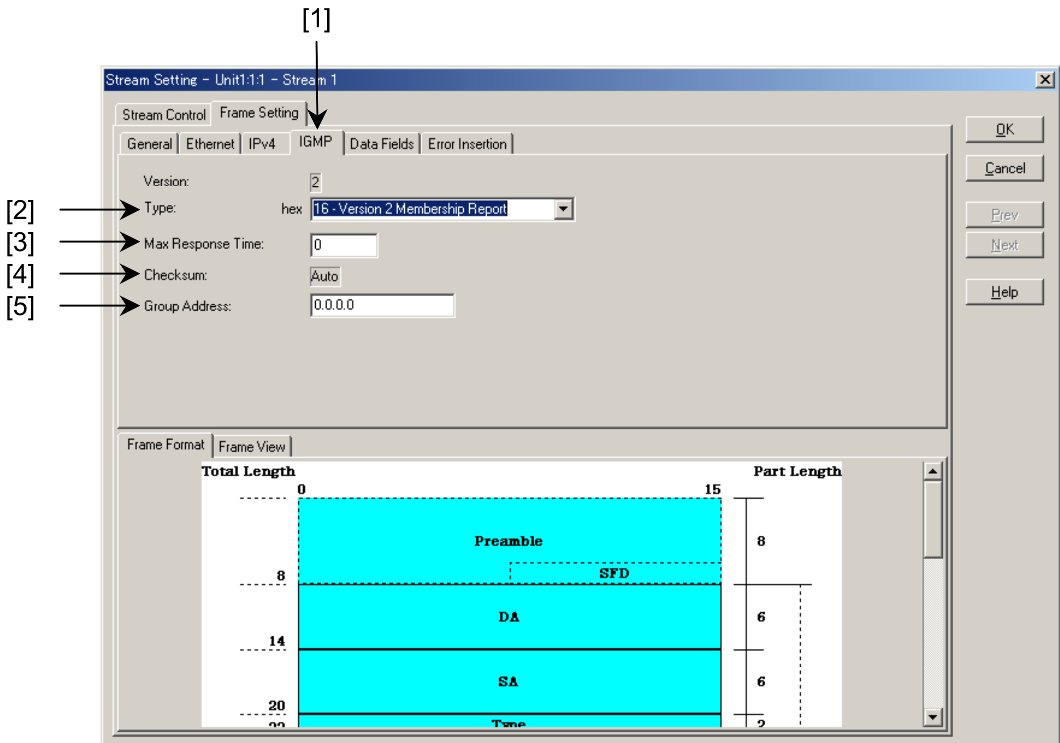


Figure 5.1.2-24

[1] Selects IGMP tab.

[2] Sets the Type field. The following range can be set:

Value: 00 to FF (hex)

Or select one of the followings:

(hex)

11 Membership Query
12 Version 1 Membership Report
16 Version 2 Membership Report
17 Leave Group

[3] Sets the Max Response Time field.

Value: 0 to 255 (dec)

[4] Shows the automatic calculation for the Checksum field value.

[5] Sets the Group Address field. Normally set the multicast address "224.0.0.0 to 239.255.255.255".

(17) Editing ICMP field values

0	15
Type	Code
Checksum	
Identifier	
Sequence Number	

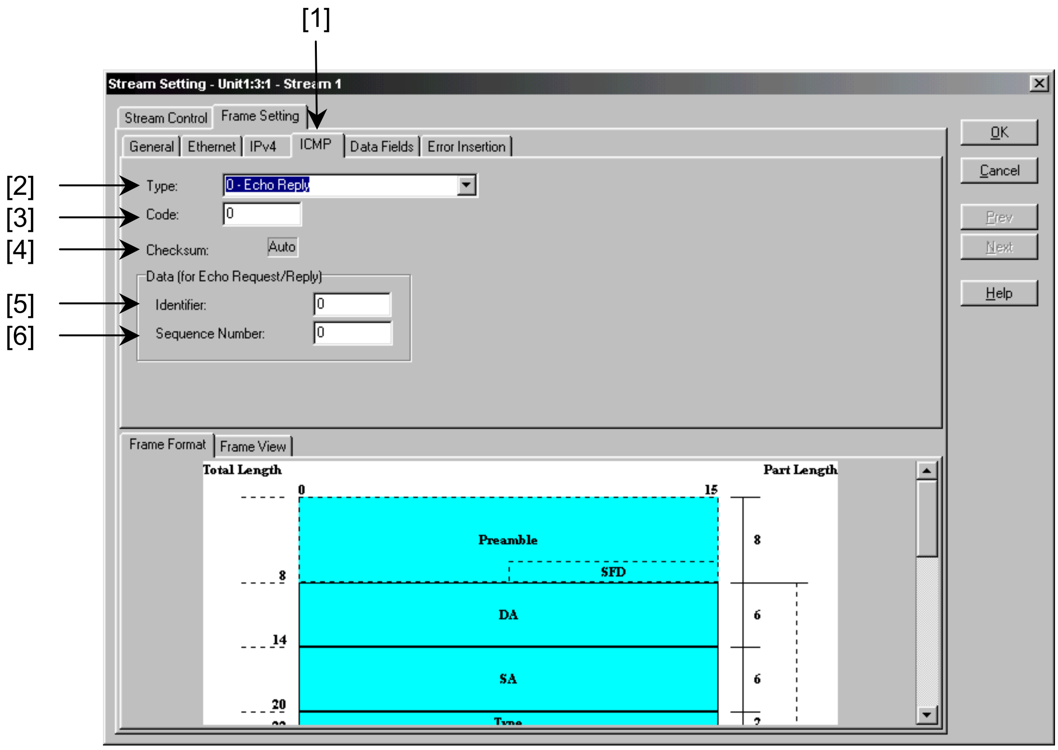


Figure 5.1.2-25

[1] Selects **ICMP** tab.

[2] Sets the Type field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

0 Echo Reply
3 Destination Unreachable
4 Source Quench
5 Redirect
8 Echo
9 Router Advertisement
10 Router Selection
11 Time Exceeded
12 Parameter Problem
13 Timestamp
14 Timestamp Reply
15 Information Request
16 Information Reply
17 Address Mask Request
18 Address Mask Reply

[3] Sets the Code field. The following range can be set:

Value: 0 to 255 (dec)

[4] Shows the automatic calculation for the Checksum field value.

[5] Sets the Identifier field. This can be set when 0: Echo Reply or 8: Echo is set for the Type field.

Value: 0 to 65,535 (dec)

[6] Sets the Sequence Number field. As for the Identifier field, this can be set when 0: Echo Reply or 8: Echo is set for the Type field.
Value: 0 to 65,535 (dec)

(18) Editing ICMPv6 field values

Note:

Requires IPv6 Expansion option

When Type is 128 - Echo Request or 129 - Echo Reply:

0	15
Type	Code
Checksum	
Identifier	
Sequence Number	

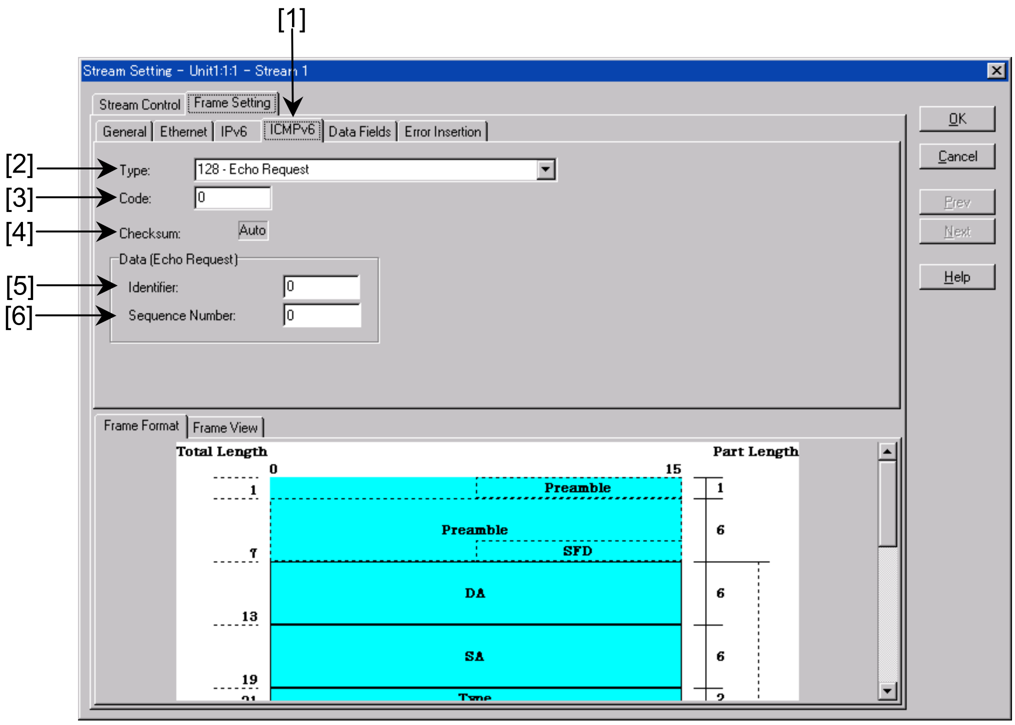


Figure 5.1.2-26

[1] Selects **ICMPv6** tab.

[2] Sets the Type field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

1	Destination Unreachable
2	Packet Too Big
3	Time Exceeded
4	Parameter Problem
128	Echo Request
129	Echo Reply
130	Multicast Listener Query
131	Multicast Listener Report
132	Multicast Listener Done
133	Router Solicitation
134	Router Advertisement
135	Neighbor Solicitation
136	Neighbor Advertisement
137	Redirect Message
150	MLDA Listener Query
151	MLDA Listener Acknowledgement
152	MLDA Listener Report

150/151/152 are displayed only when MLDA protocol option is installed.

[3] Sets the Code field. The following range can be set:

Value: 0 to 255 (dec)

[4] Shows the automatic calculation for the Checksum field value.

[5] Sets the Identifier field.

Value: 0 to 65,535 (dec)

[6] Sets the Sequence Number field.

Value: 0 to 65,535 (dec)

When Type is 2 - Packet Too Big:

0	15
Type	Code
Checksum	
MTU	

[7]

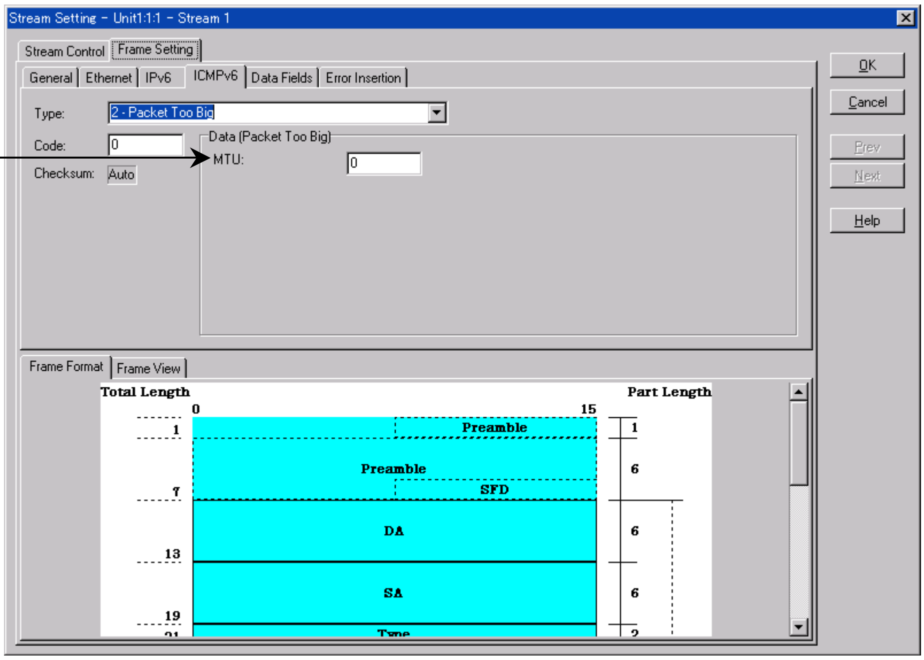


Figure 5.1.2-27

[7] Sets the MTU field.

Value: 0 to 4, 294, 967, 295 (dec)

When Type is 4 - Parameter Problem:

0	15
Type	Code
Checksum	
Pointer	

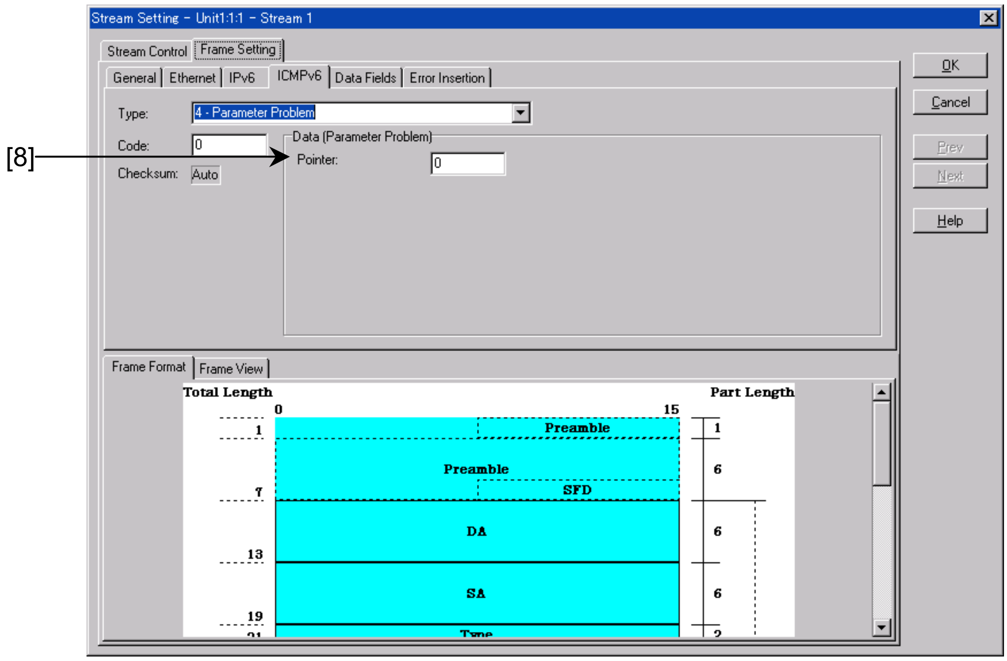


Figure 5.1.2-28

[8] Sets the Pointer field.

Value: 0 to 4, 294, 967, 295 (dec)

When Type is 130 - Multicast Listener Query, 131 - Multicast Listener Report or 132 - Multicast Listener Done:

0	15
Type	Code
Checksum	
Maximum Response Delay	
Reserved	
Multicast Address	

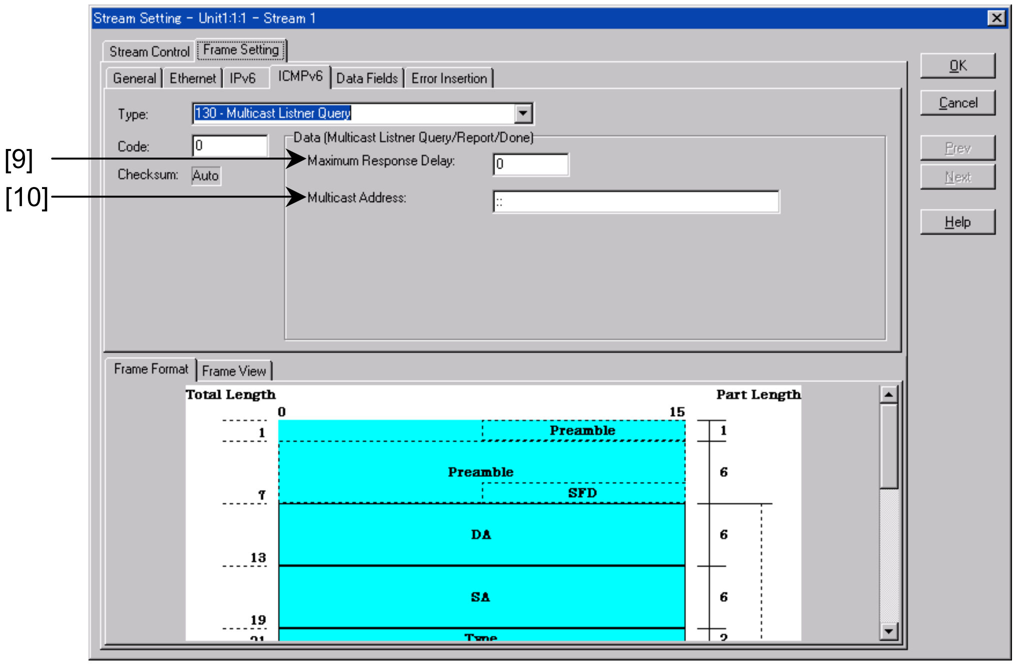


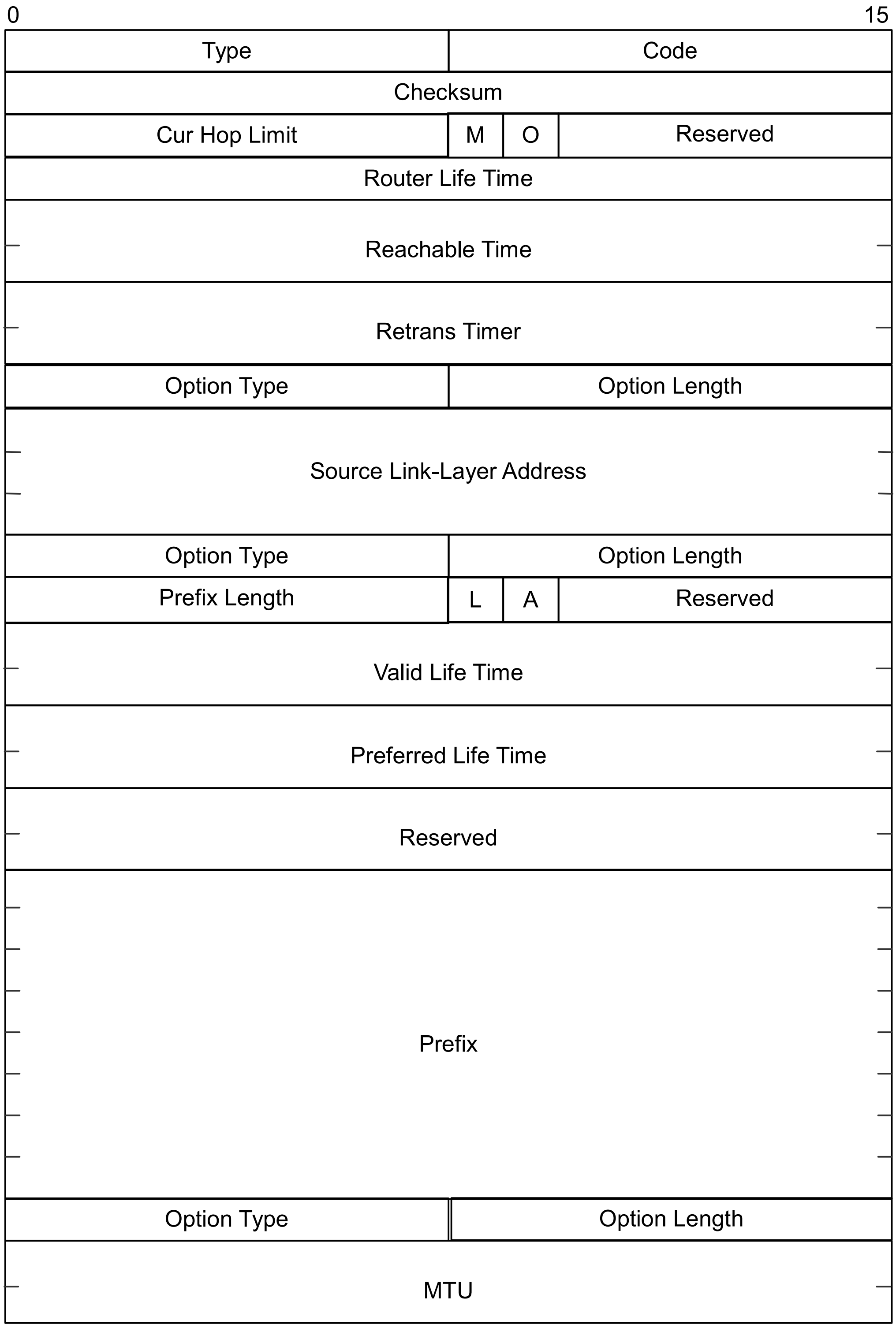
Figure 5.1.2-29

[9] Sets the Maximum Response Delay field.

Value: 0 to 4, 294, 967, 295 (dec)

[10] Sets the Multicast Address field.

When Type is 134 - Router Advertisement:



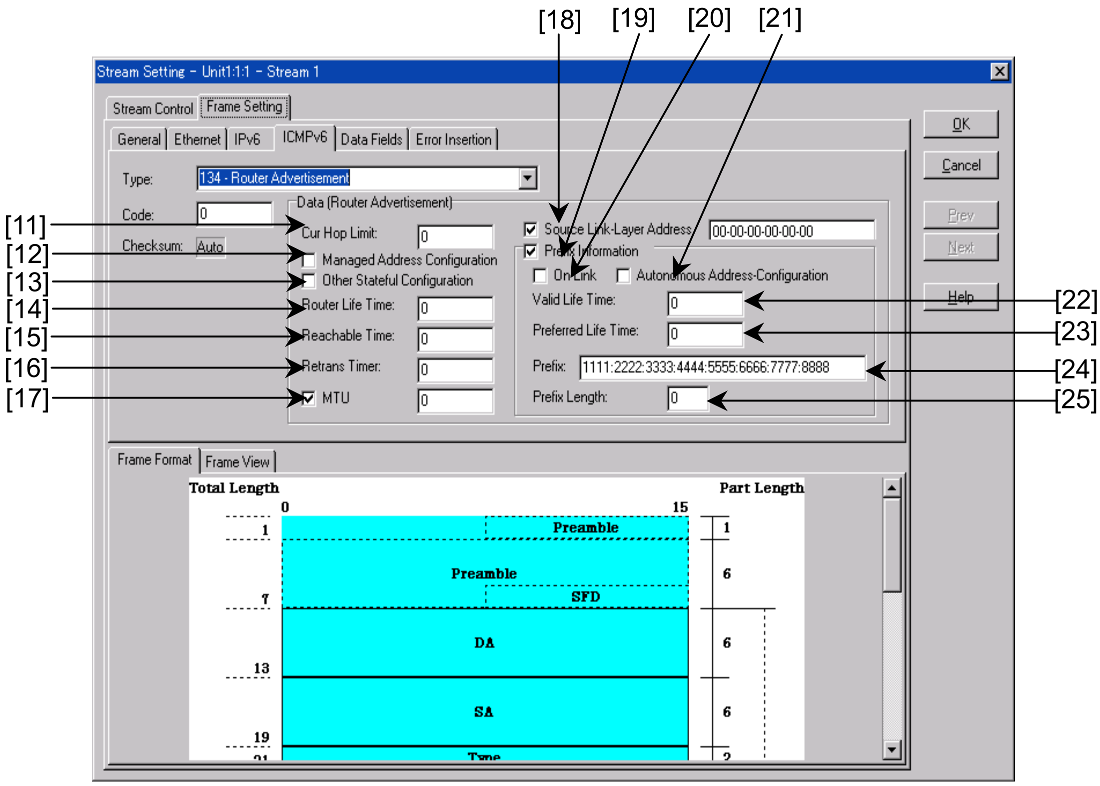


Figure 5.1.2-30

[11] Sets the Cur Hop Limit field.

Value: 0 to 255 (dec)

[12] Sets the M bit field.

Set to 1 when checked, or 0 when unchecked.

[13] Sets the O bit field.

Set to 1 when checked, or 0 when unchecked.

[14] Sets the Router Lifetime field.

Value: 0 to 65, 535 (dec)

[15] Sets the Reachable Time field.

Value: 0 to 4, 294, 967, 295 (dec)

[16] Sets the Retrans Timer field.

Value: 0 to 4, 294, 967, 295 (dec)

[17] Sets the MTU option field.

This field is enabled only when it is checked.

Value: 0 to 4, 294, 967, 295 (dec)

[18] Sets the Source Link-Layer Address option field.

This field is enabled only when it is checked.

[19] Sets the Prefix Information option field.

This field is enabled only when it is checked.

[20] Sets the L bit field.

[21] Sets the A bit field.

[22] Sets the Valid Lifetime field.

Value: 0 to 4, 294, 967, 295 (dec)

[23] Sets the Preferred Lifetime field.

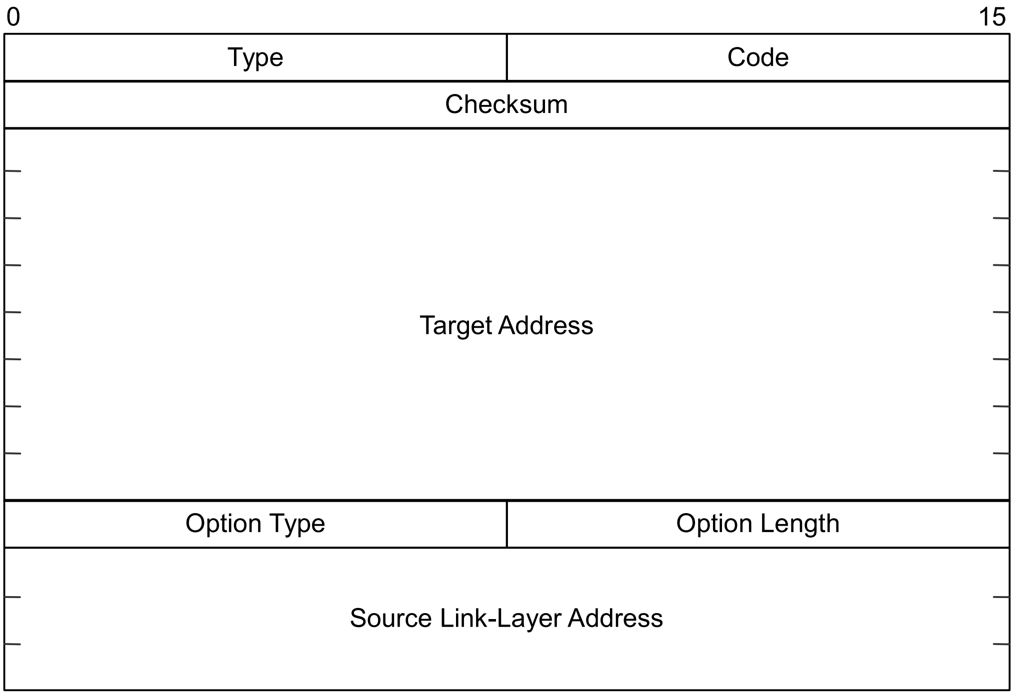
Value: 0 to 4, 294, 967, 295 (dec)

[24] Sets the Prefix field.

[25] Sets the Prefix Length field.

Value: 0 to 128 (dec)

When Type is 135 - Neighbor Solicitation:



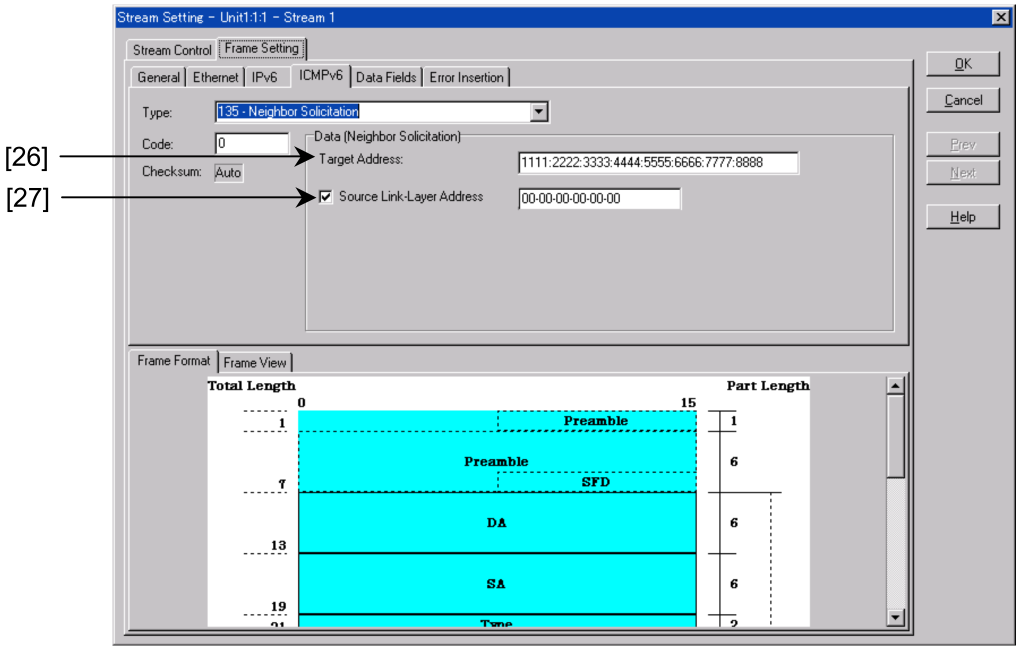


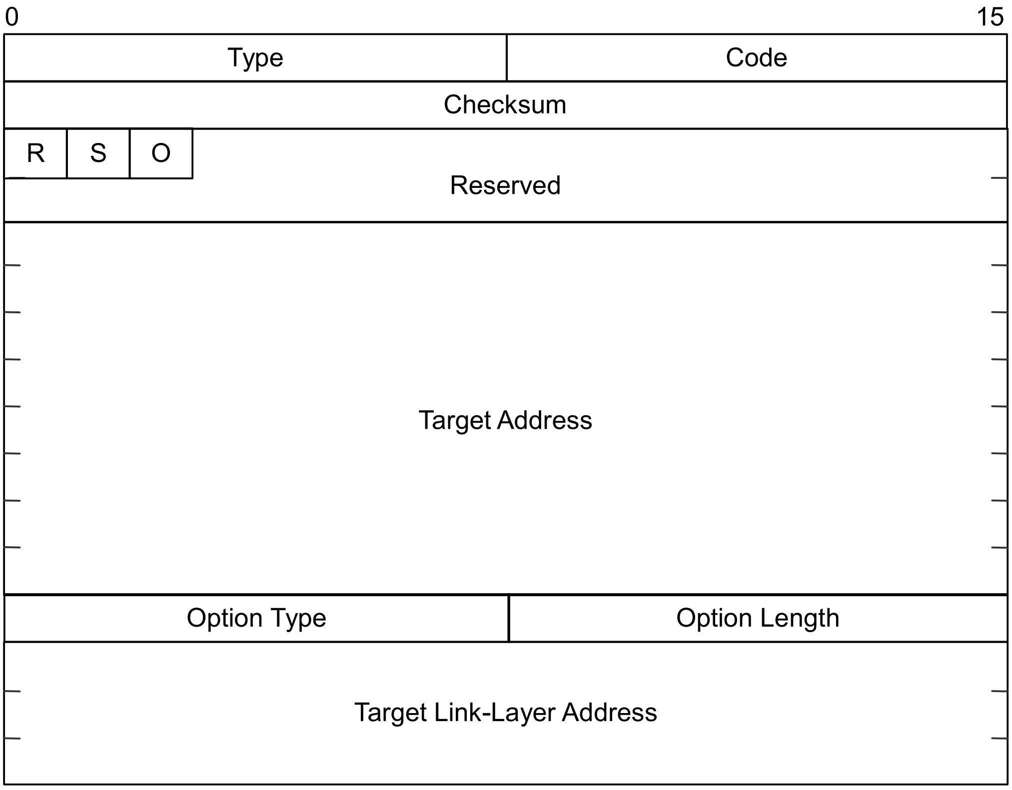
Figure 5.1.2-31

[26] Sets the Target Address.

[27] Sets the Source Link-Layer Address option field.

This field is enabled only when it is checked.

When Type is 136 - Neighbor Advertisement:



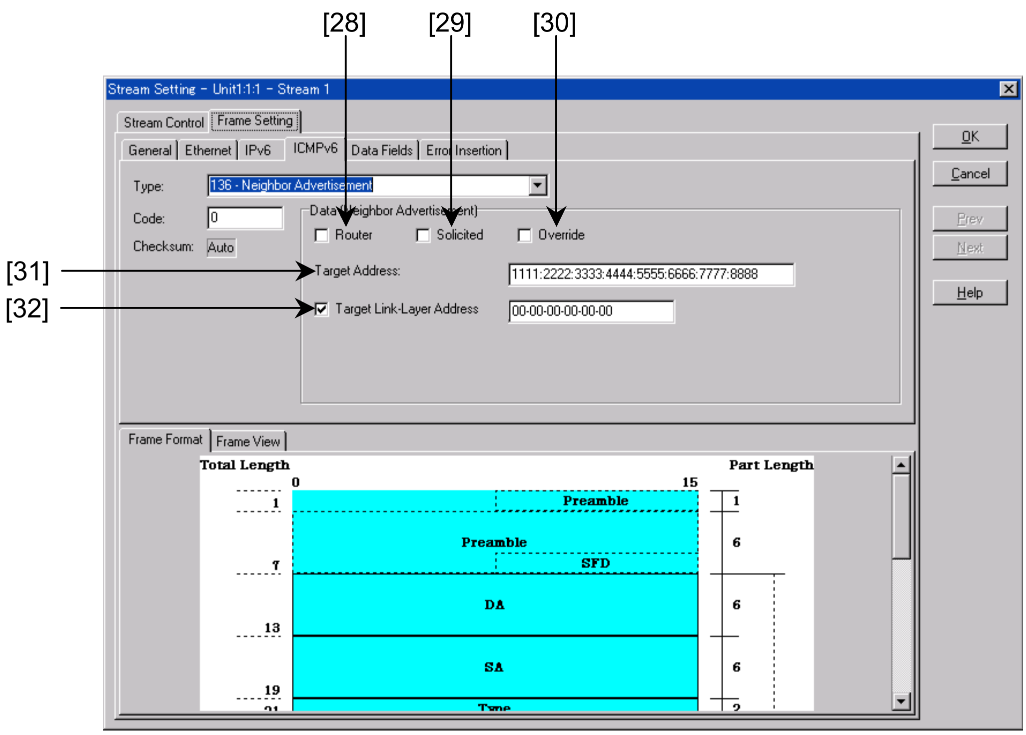


Figure 5.1.2-32

[28] Sets the R bit field.

Set to 1 when checked, or 0 when unchecked.

[29] Sets the S bit field.

Set to 1 when checked, or 0 when unchecked.

[30] Sets the O bit field.

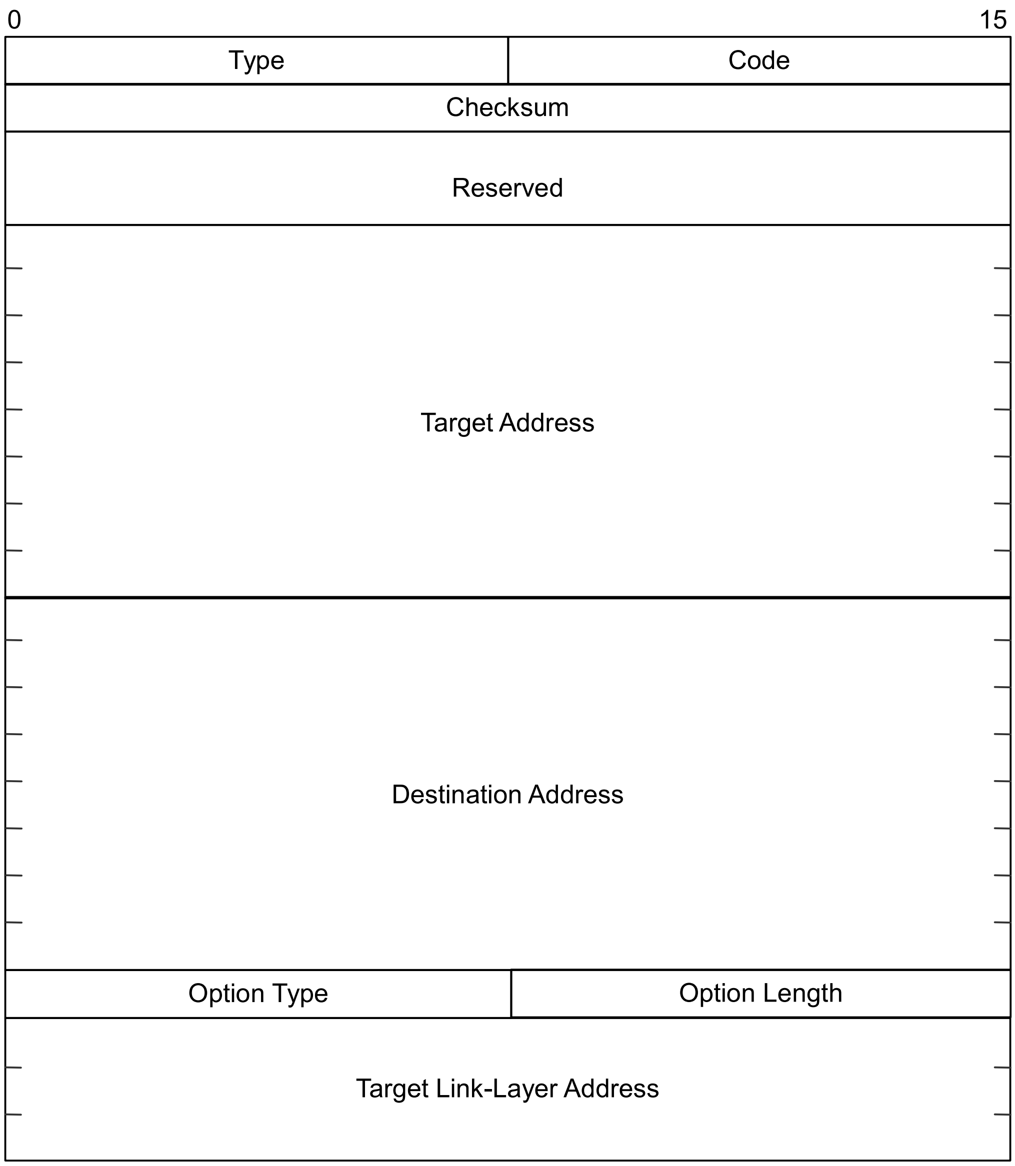
Set to 1 when checked, or 0 when unchecked.

[31] Sets the Target Address.

[32] Sets the Target Link-Layer Address option field.

This field is enabled only when it is checked.

When Type is 137 - Redirect Message:



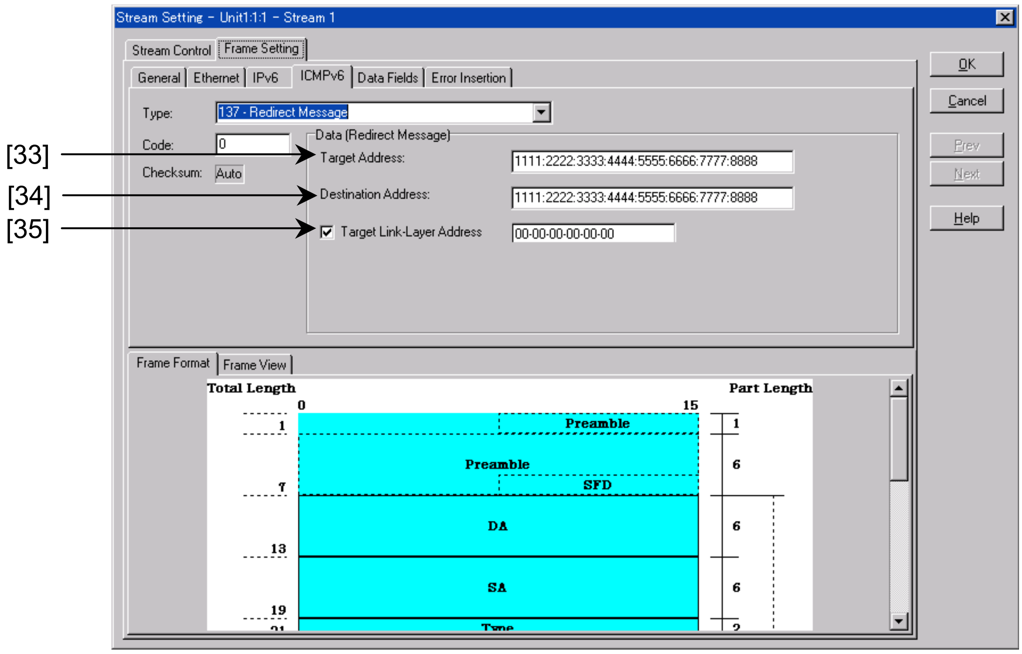


Figure 5.1.2-33

[33] Sets the Target Address.

[34] Sets the Destination Address.

[35] Sets the Target Link-Layer Address option field.

This field is enabled only when it is checked.

(19) Editing RIP field values

0	15
Command	Version
must be zero	
RIP Entry	

The contents of the RIP Entry vary depending on the Version field value.

When Version is set to 1:

0 … 15
Address Family Identifier
must be zero
IP Address
must be zero
must be zero
Metric

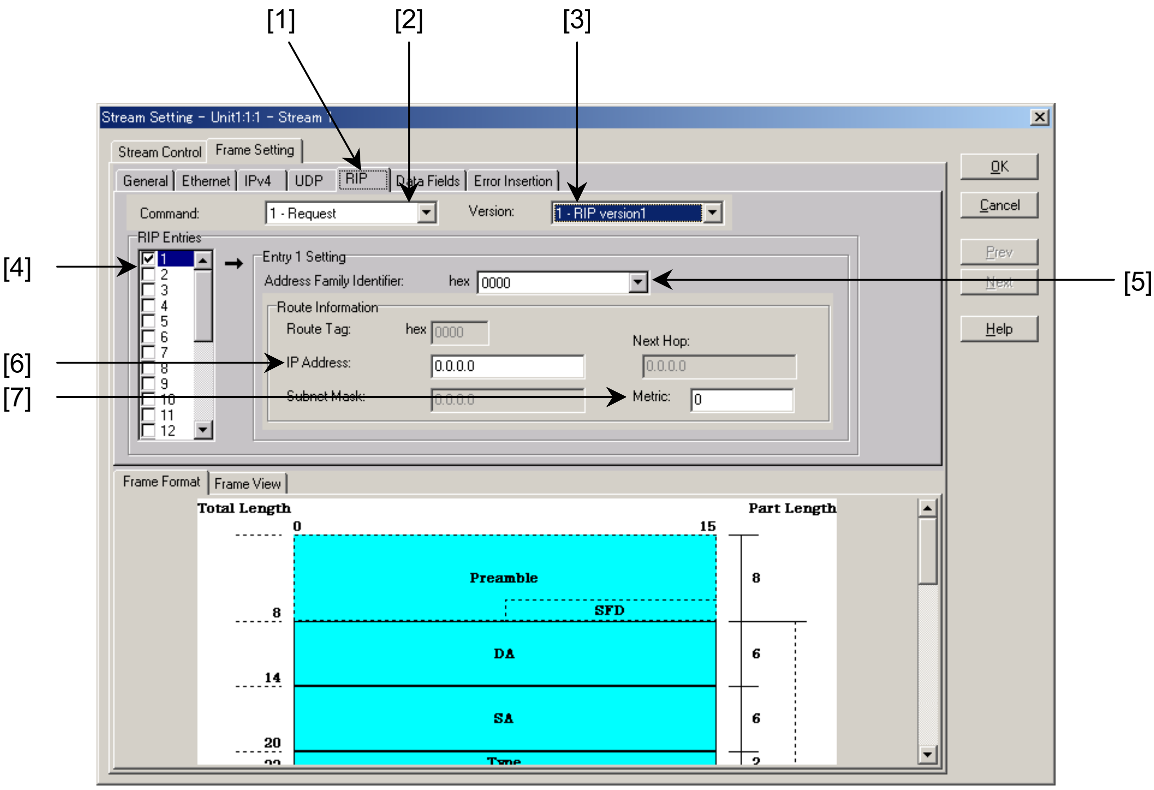


Figure 5.1.2-34

[1] Selects **RIP** tab.

[2] Select the value for Command from the followings:

1: Request

2: Response

[3] Sets the Version field.

1: Version 1

2: Version 2

However, the RIP Entry field settings vary according to the set value for the Version field.

[4] Enables/disables RIP Entry.
RIP Entry can be set in the range from 1 to 25.
An Entry is enabled when checked, and disabled when unchecked.

[5] Sets the Address Family Identifier field. The following range can be set:

(hex)

0002 IP protocol
FFFF Authentication

[6] Sets the IP Address field. Input the value in the address format.

Ex. 192.168.1.1

[7] Sets the Metric field.

Value: 0 to 4,294,967,295 (dec)

When Metric of RIP is set to 16, this means infinity.

When Version is set to 2:

0   15
Address Family Identifier
must be zero
IP Address
Subnet Mask
Next Hop
Metric

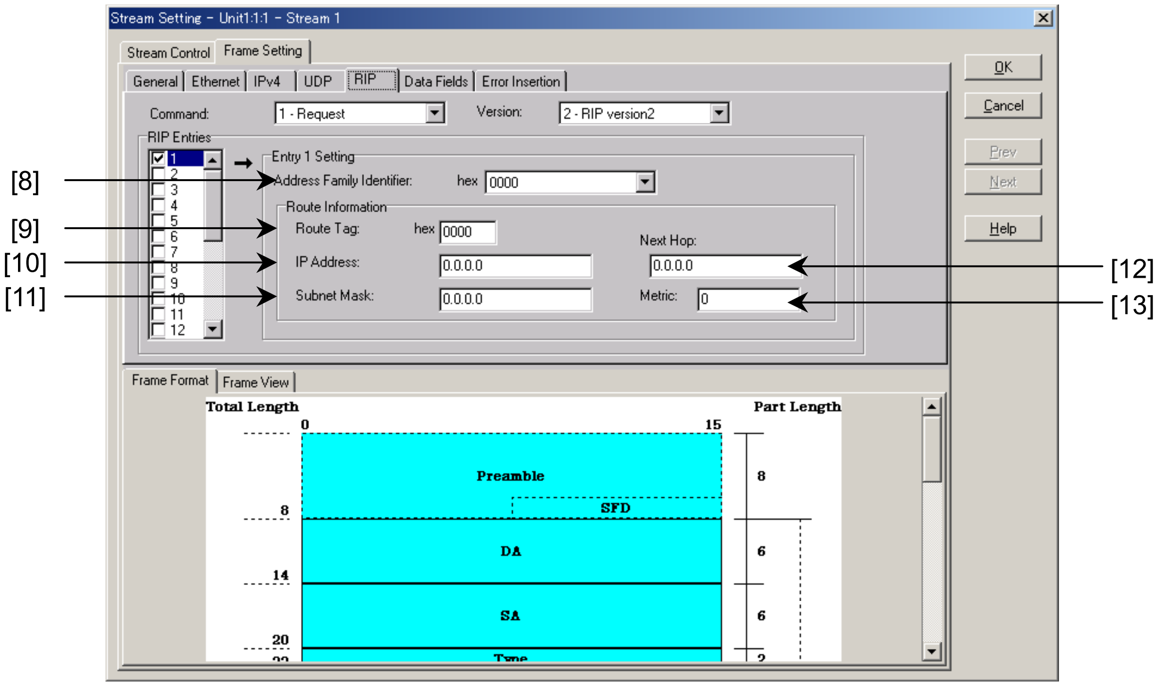


Figure 5.1.2-35

[8] Sets the Address Family Identifier field. The following range can be set:

(hex)

0002 IP protocol
FFFF Authentication

Setting FFFF changes the settings for the RIP Entry field.

[9] Sets Route Tag field.

Value: 0000 to FFFF (hex)

[10] Sets the IP Address field. Input the value in the IP address format.

Ex. 192.168.1.1

[11] Sets the Subnet Mask field. Input the value in the IP address format. This setting is valid only for RIP version 2.

Ex. 192.168.1.1

[12] Sets the Next Hop field. Input the value in the IP address format. This setting is valid only for RIP version 2.

Ex. 192.168.1.1

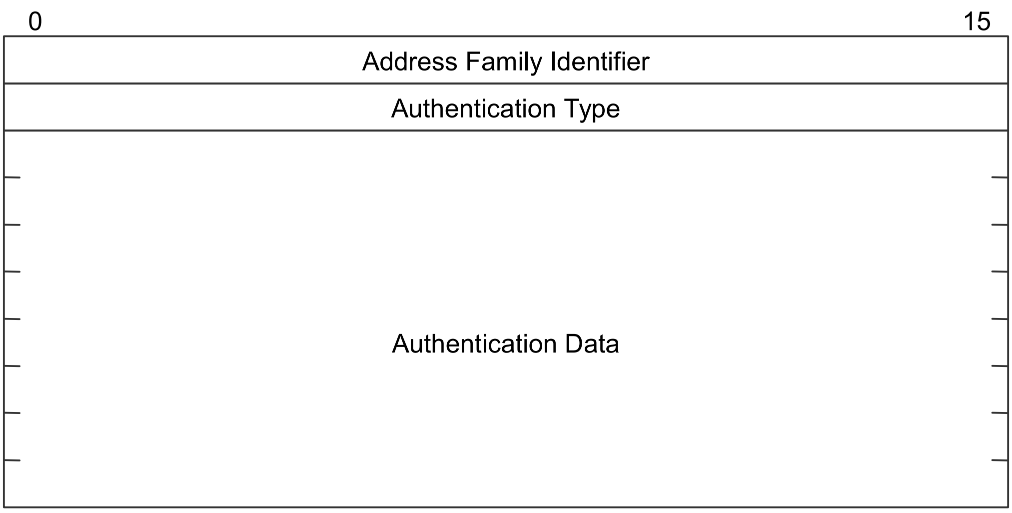
[13] Sets the Metric field.

Value: 0 to 4,294,967,295 (dec)

When Metric of RIP is set to 16, this means infinity.

An identification field can be set when Version is set to 2 and the Address Family Identifier field is set to FFFF (hex).

When Version is set to 2 and the Address Family Identifier field is set to FFFF (hex):



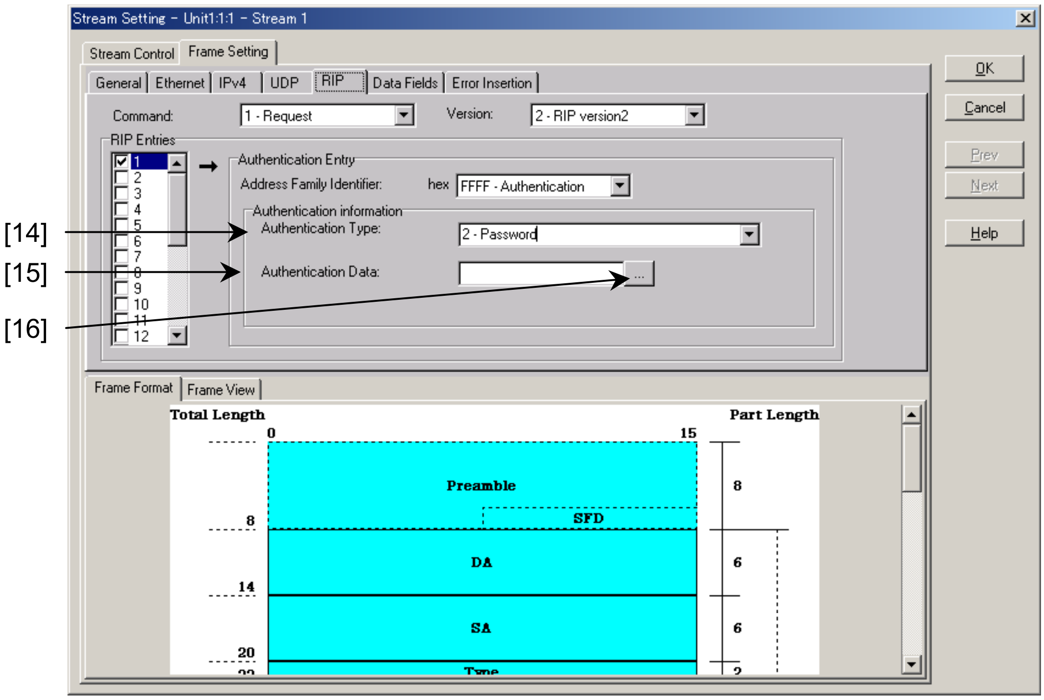


Figure 5.1.2-36

[14] Sets the Authentication Type. The following range can be set:

Value: 0 to 65535 (dec)

Or select one of the followings:

(dec)

1 IP Route

2 Password

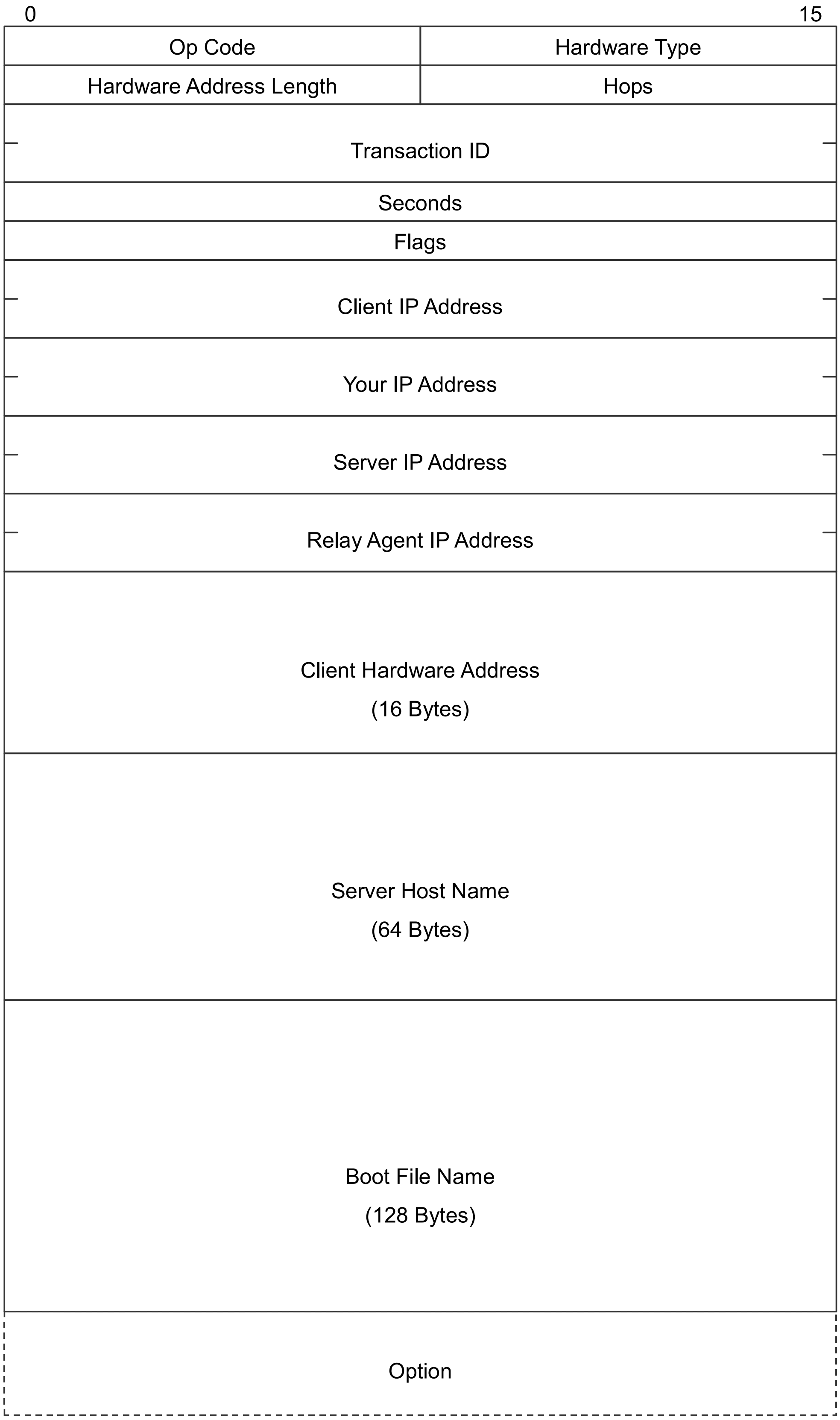
3 Keyed Message Digest Algorithm

[15] Sets the Authentication Data field. Set the value in an ASCII string. This setting can be performed by [16].

[16] Sets the Authentication Data field from the Virtual Keyboard.

☞ For the Virtual Keyboard, refer to "(8) Virtual Keyboard" in Section 2.3.1.

(20) Editing DHCP field values



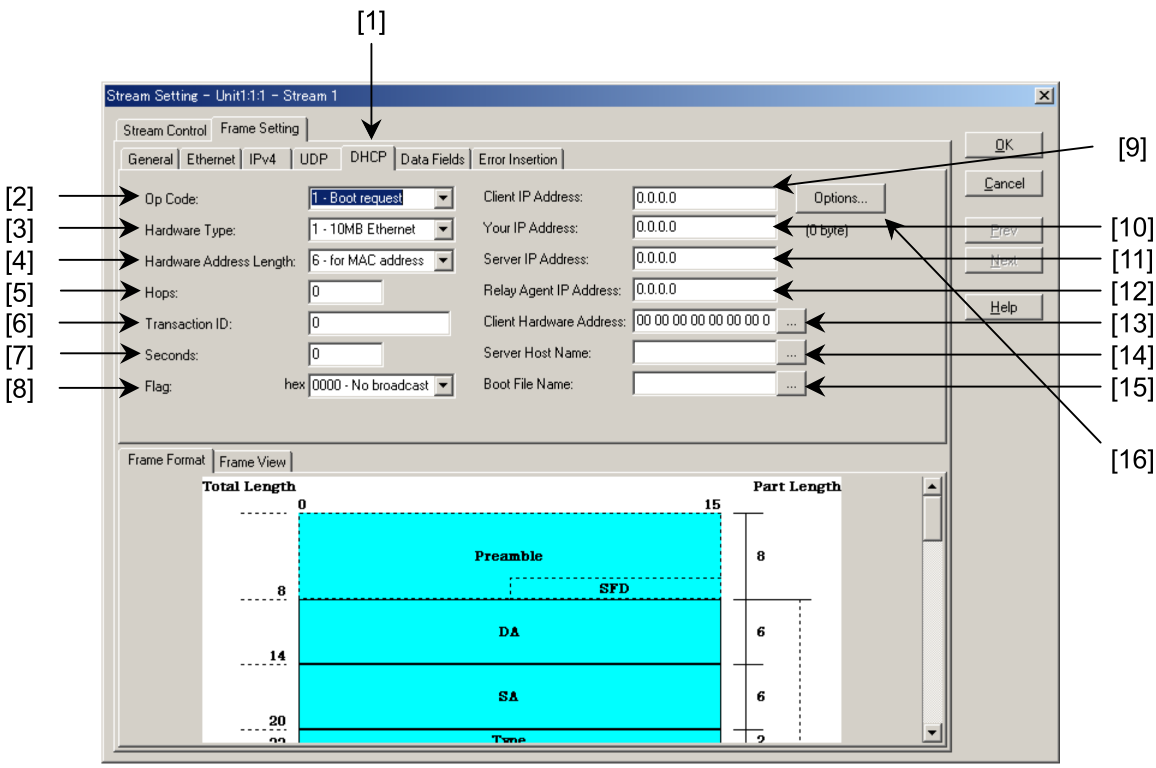


Figure 5.1.2-37

[1] Selects **DHCP** tab.

[2] Sets the Op Code field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

1 Boot Request
2 Boot Reply

[3] Sets the Hardware Type field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

1 10 MB Ethernet

[4] Sets the Hardware Address Length field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

6 for MAC Address

[5] Sets the Hops field.

Value: 0 to 255 (dec)

[6] Sets the Transaction ID field.

Value: 0 to 4,294,967,295 (dec)

[7] Sets the Seconds field.

Value: 0 to 65,535 (dec)

[8] Sets the Flag field.

Value: 0000 to FFFF (hex)

Or select one of the followings:

(hex)

0000 No broadcast
8000 broadcast

[9] Sets the Client IP Address field. Any IPv4 address can be set.

[10] Sets the Your IP Address field. Any IPv4 address can be set.

[11] Sets the Server IP Address field. Any IPv4 address can be set.

[12] Sets the Relay Agent IP Address field. Any IPv4 address can be set.

[13] Sets the Client Hardware Address field. Any binary data (16 bytes long) can be set.

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

[14] Sets the Server Host Name field from the Virtual Keyboard.

☞ For the Virtual Keyboard, refer to "(8) Virtual Keyboard" in Section 2.3.1.

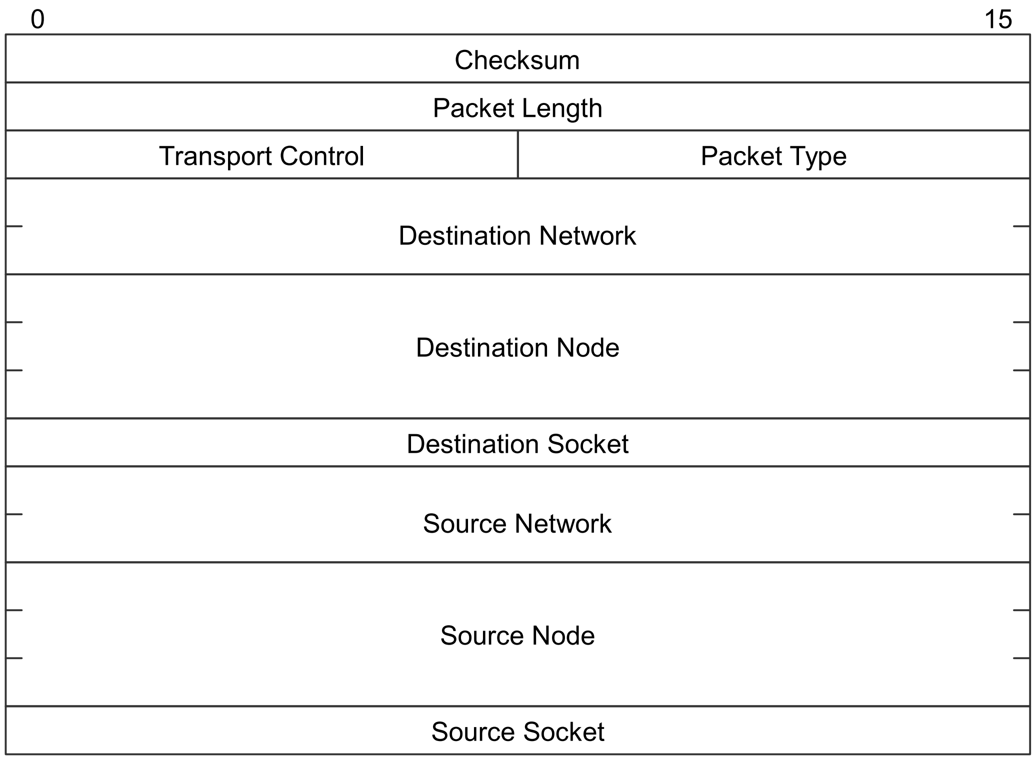
[15] Sets the Boot File Name field from the Virtual Keyboard.

☞ For the Virtual Keyboard, refer to "(8) Virtual Keyboard" in Section 2.3.1.

[16] Sets the Option field on the window below. Binary data (0 to 64 bytes long) can be set.

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

(21) Editing IPX field values



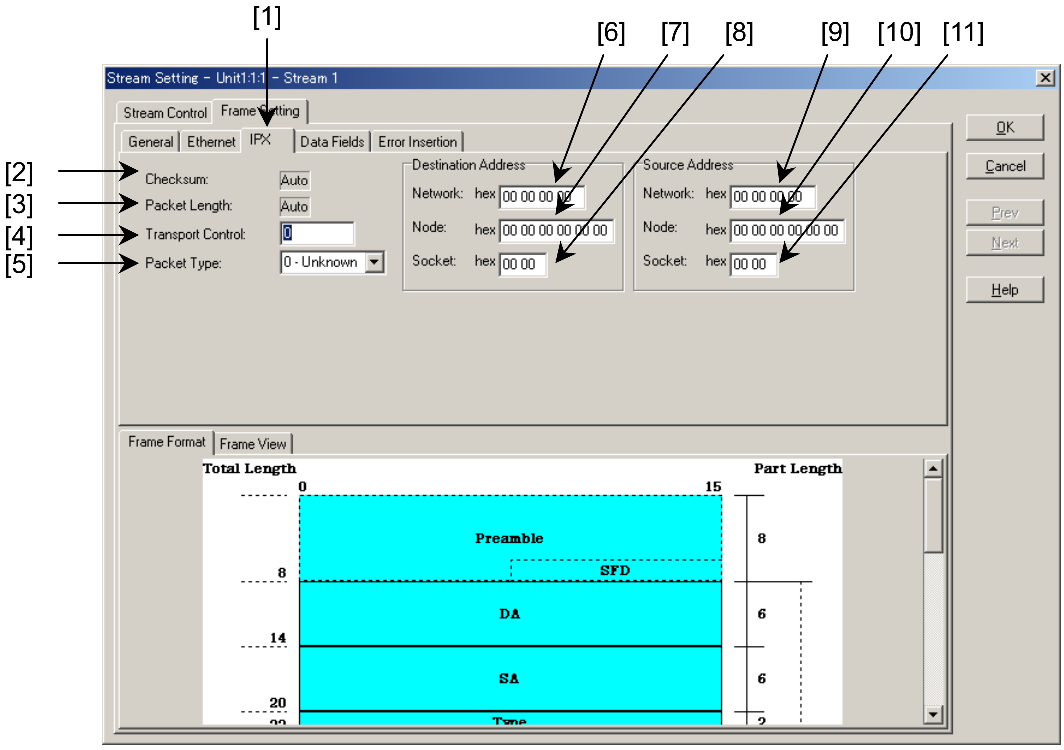


Figure 5.1.2-38

[1] Selects **IPX** tab.

[2] Shows the automatic calculation for the Checksum field value.

[3] Shows the automatic calculation for the Packet Length field.

[4] Sets the Transport Control field.

Value: 0 to 255 (dec)

[5] Sets the Packet Type field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

0	Unknown
1	RIP
2	Echo
3	Error
4	IPX
5	SPX
17	NCP

[6] Sets the Destination Network field.

[7] Sets the Destination Node field.

[8] Sets the Destination Socket field.

[9] Sets the Source Network field.

[10] Sets the Source Node field.

[11] Sets the Source Socket field.

(22) Editing LLC field values

0	15
DSAP	SSAP
Control	

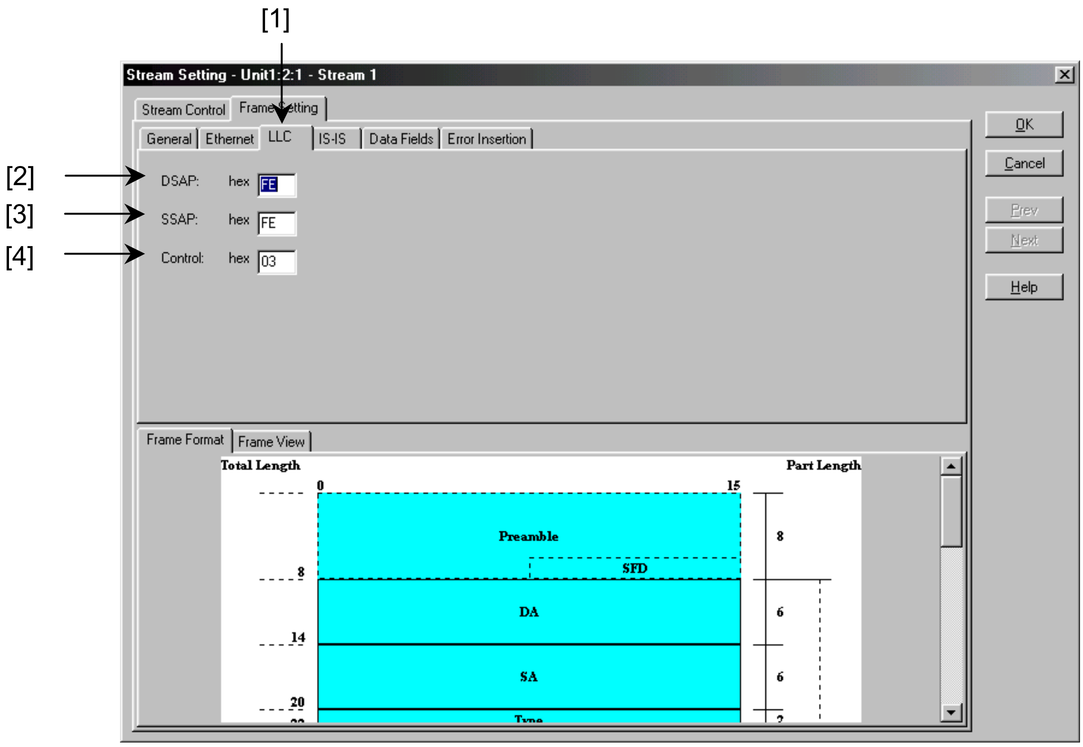


Figure 5.1.2-39

[1] Selects **LLC** tab.

[2] Set the DSAP field.

Value: 00 to FF (hex)

[3] Set the SSAP field.

Value: 00 to FF (hex)

[4] Set the Control field.

Value: 00 to FF (hex).

(23) Editing IS-IS field values

When PDU Type is 15 - Level 1 LAN IS to IS Hello PDU or 16 - Level 2 LAN IS to IS Hello PDU:

<table>
<tr><th colspan="2">0</th><th>15</th></tr>
<tr><td colspan="2">Intradomain Routing PD</td><td>Length Indicator</td></tr>
<tr><td colspan="2">Version/Protocol ID</td><td>ID Length</td></tr>
<tr><td>R</td><td>PDU Type</td><td>Version</td></tr>
<tr><td colspan="2">Reserved</td><td>Maximum Area Addresses</td></tr>
<tr><td colspan="2">Circuit Type</td><td></td></tr>
<tr><td colspan="3">Source ID</td></tr>
<tr><td colspan="3">Holding Time</td></tr>
<tr><td colspan="3">PDU Length</td></tr>
<tr><td>R</td><td>Reserved</td><td></td></tr>
<tr><td colspan="3">LAN ID</td></tr>
</table>

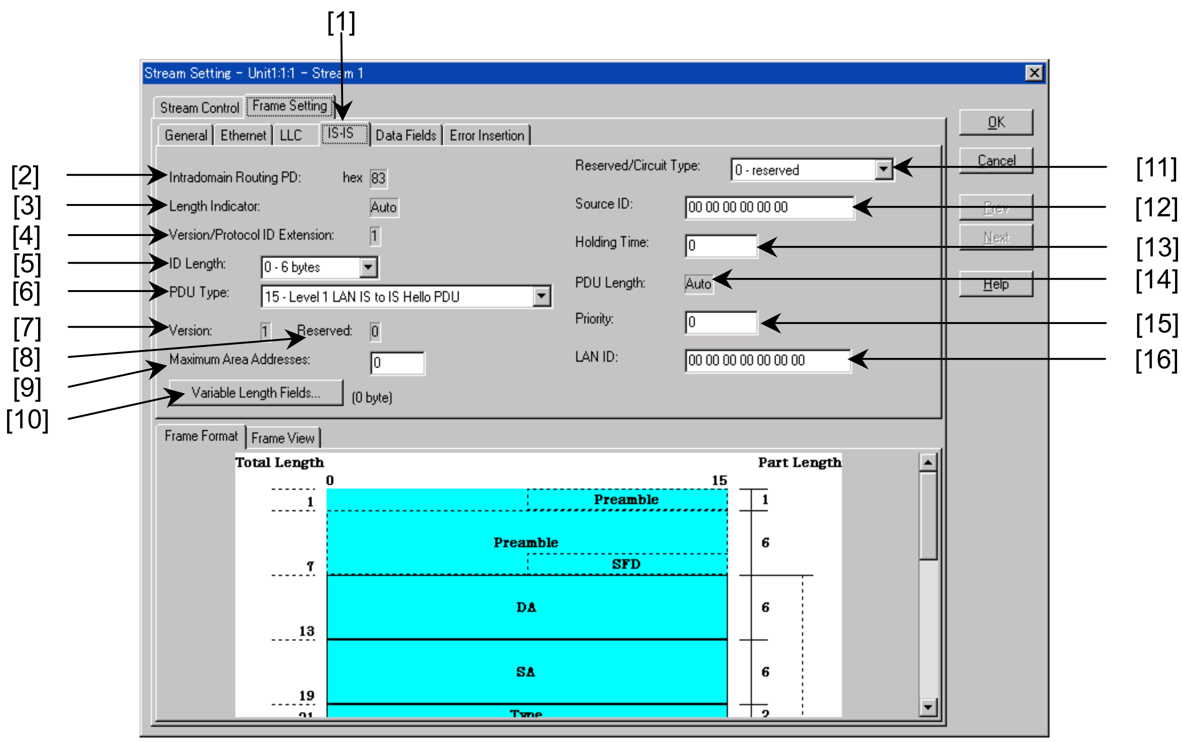


Figure 5.1.2-40

[1] Selects **IS-IS** tab.

[2] Displays the Intradomain Routing PD field. The value is always "83 (hex)".

[3] Shows the automatic calculation for the Length Indicator field.

[4] Displays the Version/Protocol ID Extension field. The value is always "1 (dec)".

[5] Sets the ID Length field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

0	6 bytes
1	1 byte
2	2 bytes
3	3 bytes
4	4 bytes
5	5 bytes
6	6 bytes
7	7 bytes
8	8 bytes
255	0 bytes

[6] Sets the PDU Type field. The following range can be set:

Value: 0 to 31 (dec)

Or select one of the followings:

(dec)

15	Level 1 LAN IS to IS Hello PDU
16	Level 2 LAN IS to IS Hello PDU
17	Point-to-Point IS to IS Hello PDU
18	Level 1 Link State PDU
20	Level 2 Link State PDU
24	Level 1 Complete Sequence Numbers PDU
25	Level 2 Complete Sequence Numbers PDU
26	Level 1 Partial Sequence Numbers PDU
27	Level 2 Partial Sequence Numbers PDU

[7] Displays the Version field. The value is always "1 (dec)".

[8] Displays the Reserved field. The value is always "0 (dec)".

[9] Sets the Maximum Area Address field.

Value: 0 to 254 (dec)

[10] Sets the Variable Length Fields.

For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

5

Basic Measurement (Manual Test)

[11] Sets the Reserved/Circuit Type field. The following range can be set:

Value: 0 to 255 (dec)

Or select one of the followings:

(dec)

0 reserved
1 Level 1 Only
2 Level 2 Only
3 Level 1 and Level 2

[12] Sets the Source ID field. The input size is the value set in [5].

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

[13] Sets the Holding Time field.

Value: 0 to 65,535 (dec)

[14] Shows the automatic calculation for the PDU Length field.

[15] Sets the Priority field.

Value: 0 to 127 (dec)

[16] Sets the LAN ID field. The input size is the value set in [5] + 1 byte.

☞ For the Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

When PDU Type is 17 - Point-to-Point IS to IS Hello PDU:

0		15
Intradomain Routing PD		Length Indicator
Version/Protocol ID		ID Length
R	PDU Type	Version
Reserved		Maximum Area Addresses
Circuit Type		
Source ID		
Holding Time		
PDU Length		
Local Circuit ID		

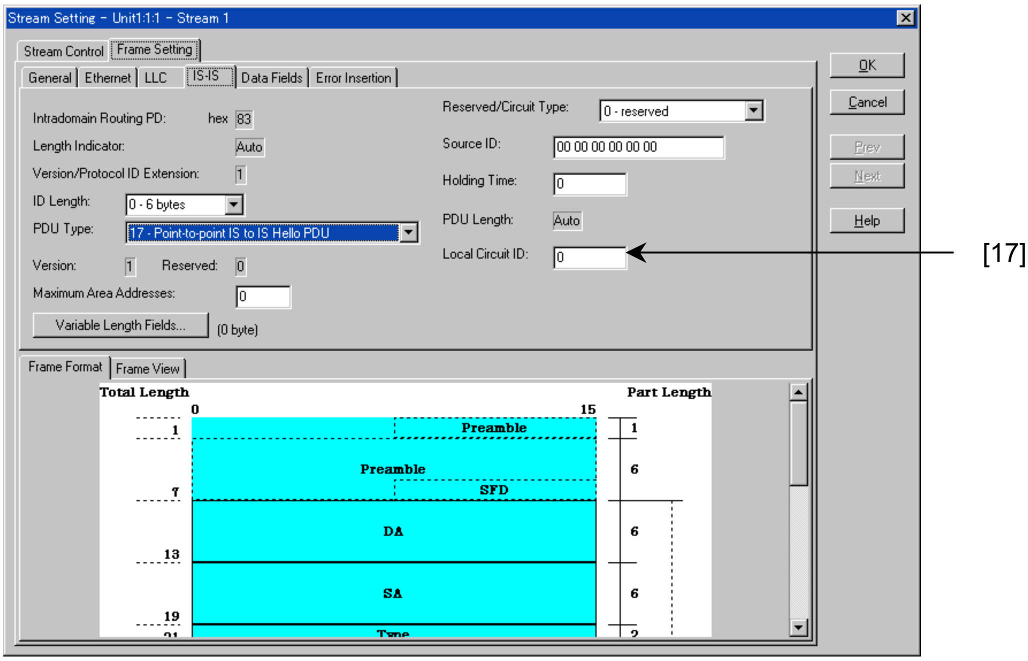


Figure 5.1.2-41

[17] Sets the Local Circuit ID field.

Value: 0 to 255 (dec)

When PDU Type is 18 - Level 1 Link State PDU or 19 - Level 2 Link State PDU:

<table>
<tr><td colspan="2">0</td><td colspan="2">15</td></tr>
<tr><td colspan="2">Intradomain Routing PD</td><td colspan="2">Length Indicator</td></tr>
<tr><td colspan="2">Version/Protocol ID</td><td colspan="2">ID Length</td></tr>
<tr><td>R</td><td>PDU Type</td><td colspan="2">Version</td></tr>
<tr><td colspan="2">Reserved</td><td colspan="2">Maximum Area Addresses</td></tr>
<tr><td colspan="4">PDU Length</td></tr>
<tr><td colspan="4">Remaining Lifetime</td></tr>
<tr><td colspan="4">LSP ID</td></tr>
<tr><td colspan="4">Sequence Number</td></tr>
<tr><td colspan="4">Checksum</td></tr>
<tr><td>P</td><td>ATT</td><td>O</td><td>IS</td></tr>
</table>

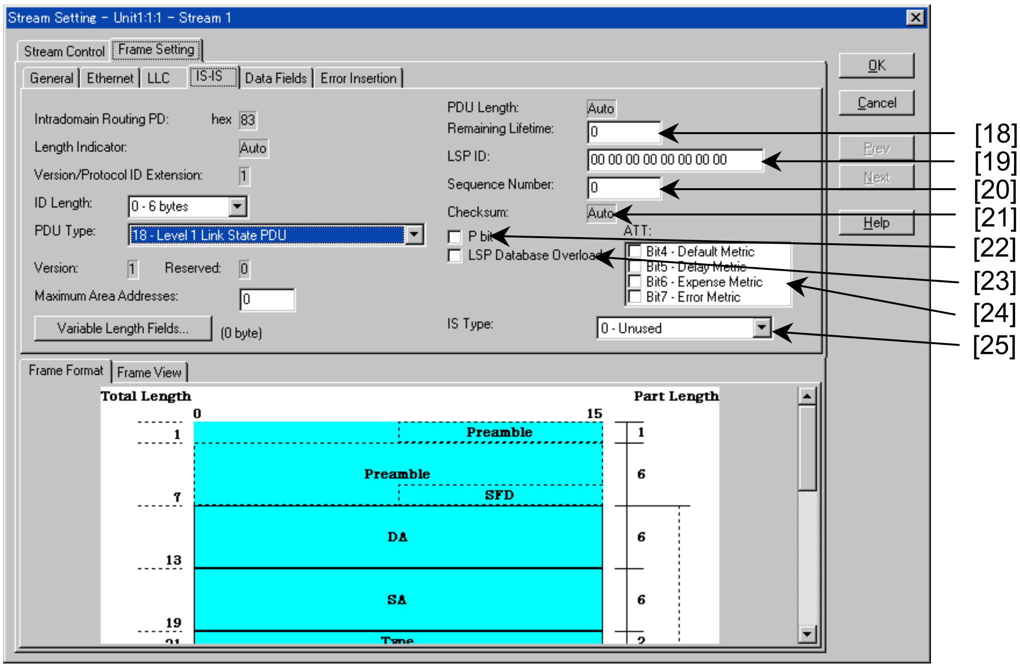


Figure 5.1.2-42

[18] Sets the Remaining Lifetime field.

Value: 0 to 65,535 (dec)

[19] Sets the LSP ID field. The input size is the value set in [5] + 2 bytes.

[20] Sets the Sequence Number field.

Value: 0 to 4, 294, 967, 295 (dec)

[21] Shows the automatic calculation for the Checksum field.

[22] Sets the Partition Repair option.

Set to 1 when checked, or 0 when unchecked.

[23] Sets the LSP Database Overload field.

Set to 1 - LSP Database Overload when checked, or 0 - no LSP Database Overload when unchecked.

[24] Sets ATT in bit unit.

Bit 4 Default Metric

Bit 5 Delay Metric

Bit 6 Expense Metric

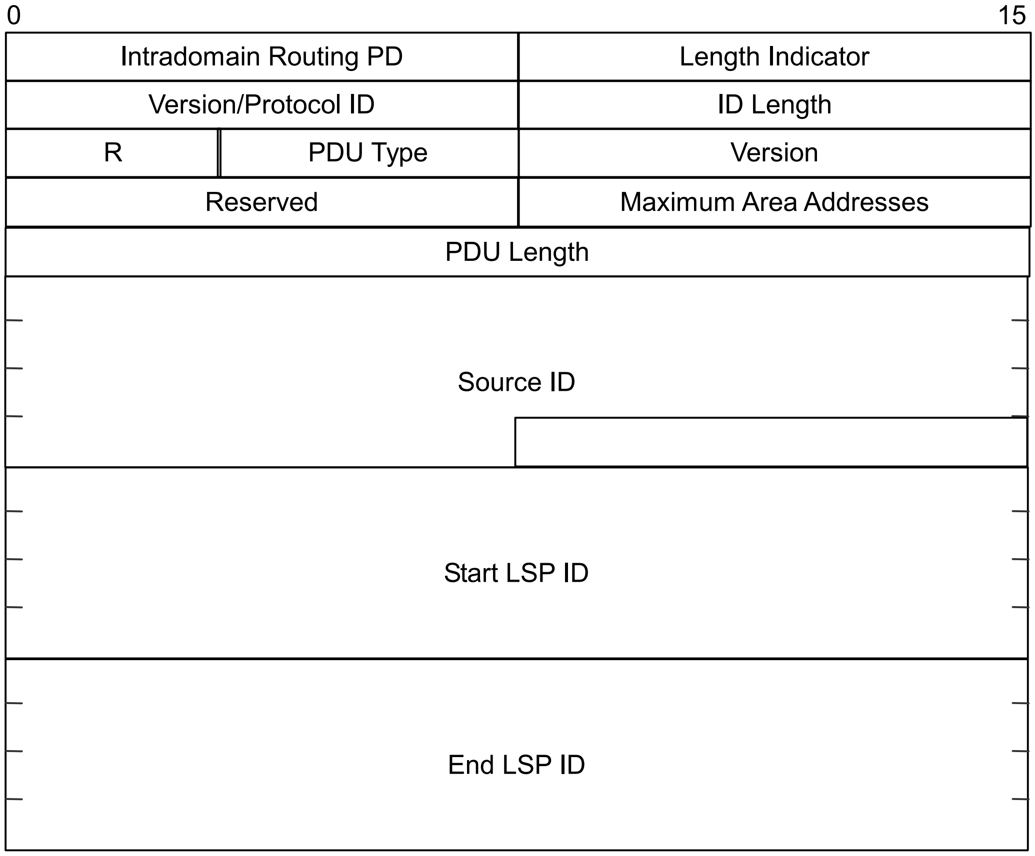
Bit 7 Error Metric

[25] Sets the IS Type field. Select one of the followings:

(dec)

0 Unused
1 Level 1 Intermediate system
2 Unused
3 Level 2 Intermediate system

When PDU Type is 24 - Level 1 Complete Sequence Numbers PDU or 25 - Level 2 Complete Sequence Numbers PDU:



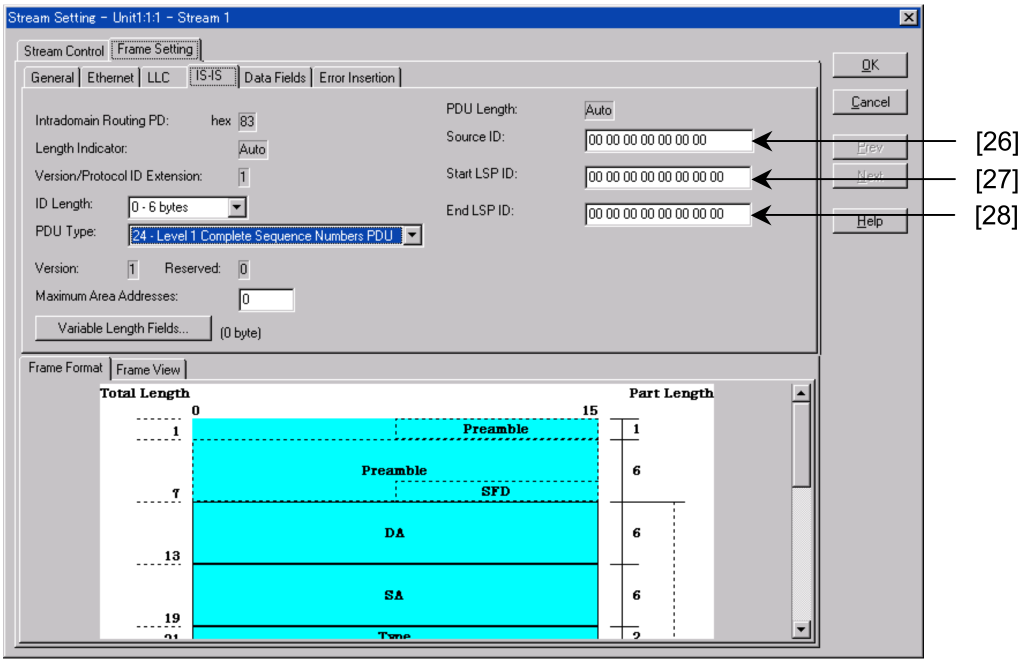


Figure 5.1.2-43

[26] Sets the Source ID field. The input size is the value set in [5] + 1 byte.

[27] Sets the Start LSP ID field. The input size is the value set in [5] + 2 bytes.

[28] Sets the End LSP ID field. The input size is the value set in [5] + 2 bytes.

When PDU Type is 26 - Level 1 Partial Sequence Numbers PDU or 27 - Level 2 Partial Sequence Numbers PDU:

0		15
Intradomain Routing PD		Length Indicator
Version/Protocol ID		ID Length
R	PDU Type	Version
Reserved		Maximum Area Addresses
PDU Length		
Source ID		

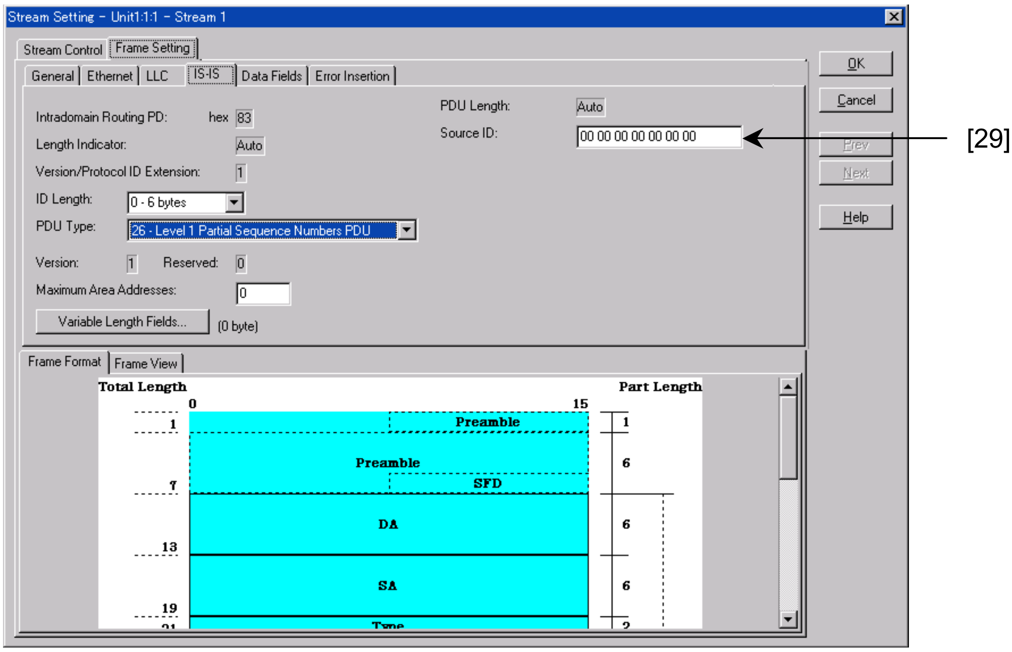


Figure 5.1.2-44

[29] Sets the Source ID field. The input size is the value set in [5] + 1 byte.

(24) Editing ARP field values

ARP field contents vary depending on the lower-layer protocol.

For Ethernet:

0	15
Hardware Type	
Protocol Type	
HA Length	PA Length
Operation	
Destination Socket	
Sender MAC Address	
Sender IP Address	
Target MAC Address	
Target IP Address	

For MAPOS:

0	15
Hardware Type	
Protocol Type	
HA Length	PA Length
Operation	
Destination Socket	
Sender HDLC Address	
Sender IP Address	
Target HDLC Address	
Target IP Address	

For Ethernet:

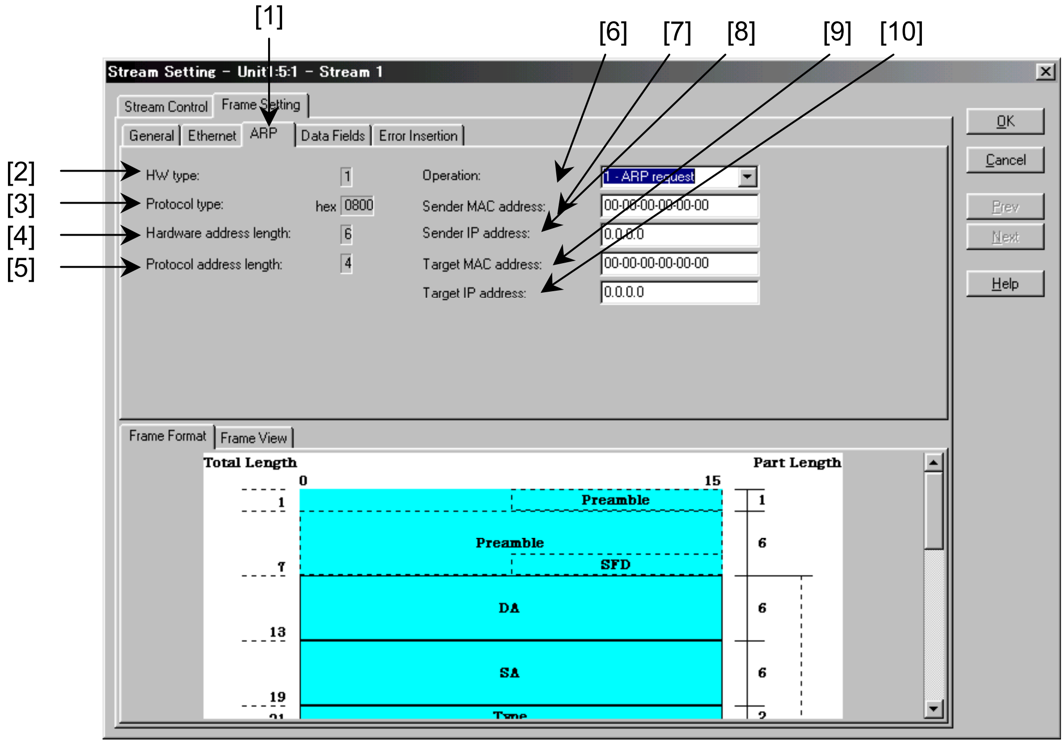


Figure 5.1.2-45

For MAPOS:

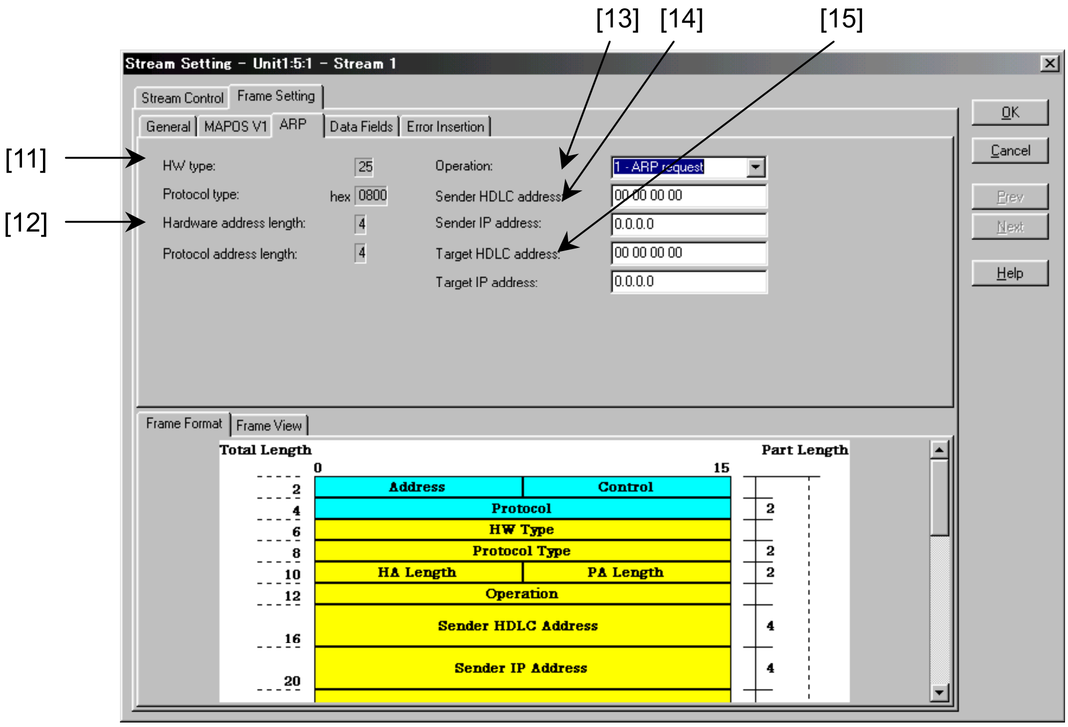


Figure 5.1.2-46

[1] Selects **ARP** tab.

[2] Displays the Hardware Type field. The value is always “1”.

[3] Displays the Protocol Type field. The value is always “0x0800”.

[4] Displays the Hardware Address Length field. The value is always “6”.

[5] Displays the Protocol Address Length field. The value is always “4”.

[6] Select the value for the Operation field from the followings:

(dec)

1 ARP request
2 ARP reply
3 RARP request
4 RARP reply

[7] Sets the Sender MAC Address field. Any MAC address can be set.

[8] Sets the Sender IP Address field. Any IPv4 address can be set.

[9] Sets the Target MAC Address field. Any MAC address can be set.

[10] Sets the Target IP Address field. Any IPv4 address can be set.

[11] Displays the Hardware Type field. The value is always “25”.

[12] Displays the Hardware Address Length field. The value is always “4”.

[13] Select the value for the Operation field from the followings:

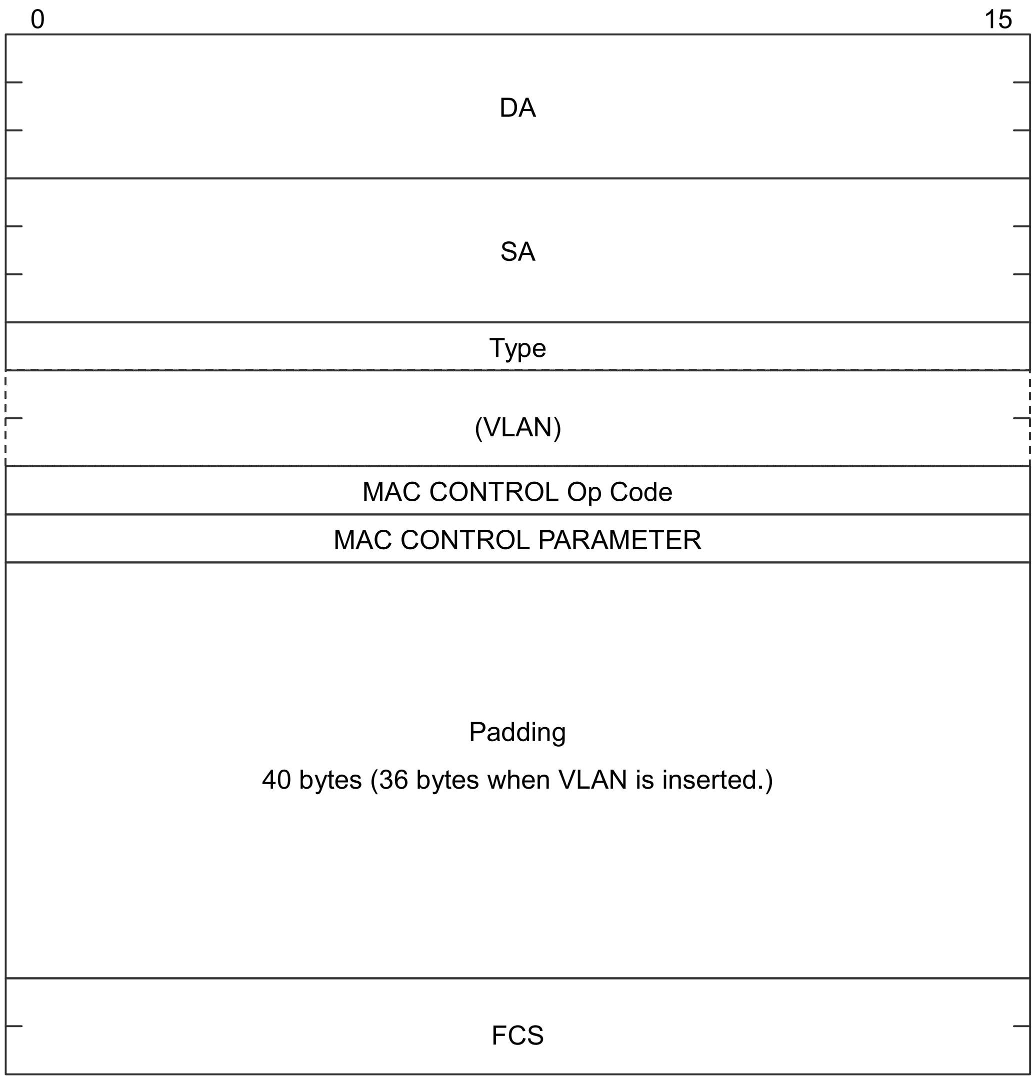
(dec)

1 ARP request
2 ARP reply
23 MAPOS-UNARP

[14] Sets the Sender HDLC Address field.

[15] Sets the Target HDLC Address field.

(25) Editing MAC Control Frame field values



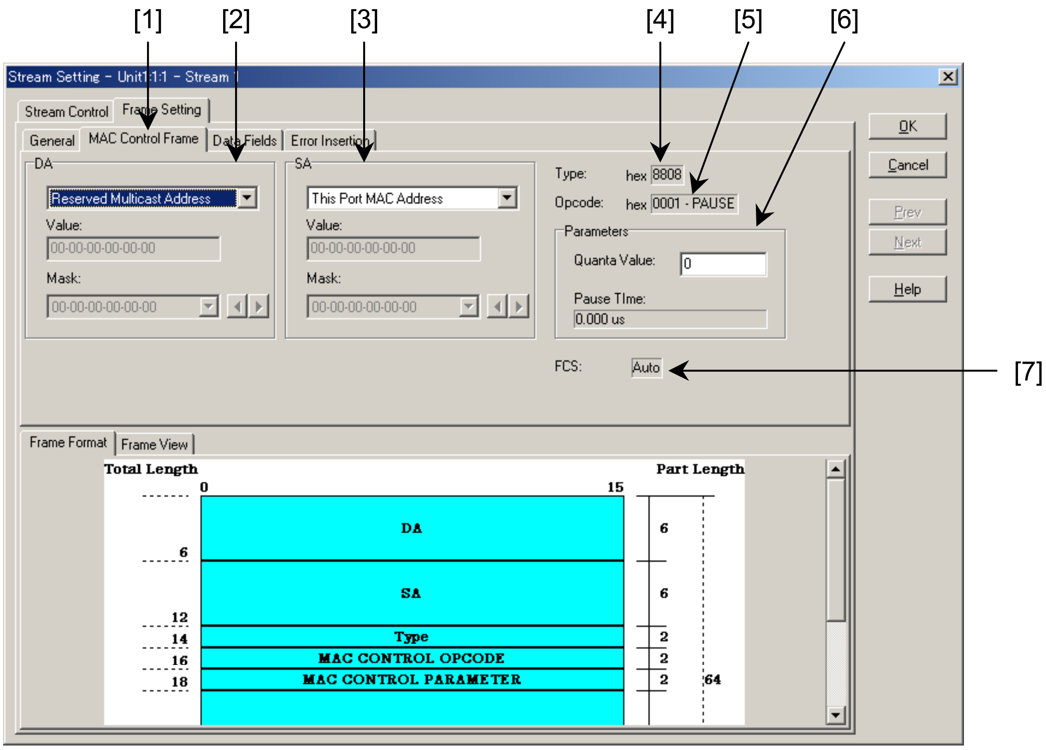


Figure 5.1.2-47

[1] Selects **MAC Control Frame** tab.

[2] Sets the Destination Address. Select one from the followings:

• Reserved Multicast Address	Address for Multicast
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

Also set the Mask value when Increment, Decrement, or Random is set. The field for which Mask is set to F, is the target field of Increment, Decrement, or Random. When **Increment/Decrement** is specified, it starts from the value specified at **Value** when sending of each Stream starts; when the maximum or minimum value is exceeded, it returns to the specified value.

[3] Sets the Source Address. Select one from the followings:

• This Port MAC Address	This Port value in Port Setting
• Static	Fixed value
• Increment	Value increments in frame step
• Decrement	Value decrements in frame step
• Random	Random value for each frame

The setting method is the same as for Destination Address.

[4] Shows the Type field value. The value is always “8808 (hex)”.

[5] Shows the MAC Control Opcode field value. The value is always "0001 (hex) -PAUSE".

[6] Sets the MAC Control Parameter field.

Value: 0 to 65,535 (dec)

Pause Time shows the wait time for the device that received the frame.

[7] Shows the automatic calculation for the FCS field value.

(26) Editing Data fields

Sets data for the area in a frame not specified with protocol data.

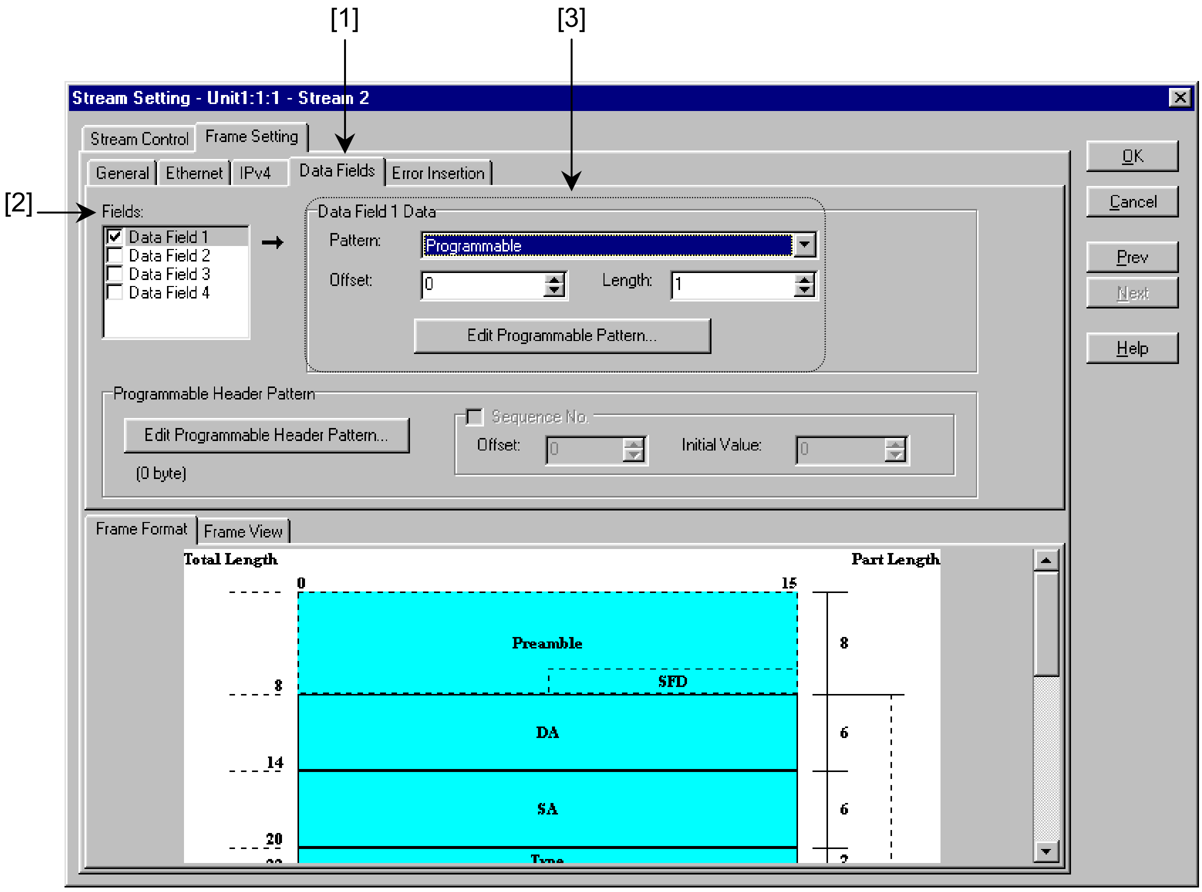


Figure 5.1.2-48

[1] Selects **Data Fields** tab.

[2] 4 data fields can be set. When settings are duplicated, processing priority to frame settings is given in ascending order (Data Field 1 > 4).

[3] Sets the parameters for the data field selected in [2].

(a) Pattern

Sets the pattern. The following patterns can be set:

All 0
All 1
Alternative 1/0 by 1 bit (1010101010…)
Alternative 1/0 by 2 bits (11001100…)
Alternative 1/0 by nibble (1111 0000…)
Alternative 1/0 by byte
Alternative 1/0 by 2 bytes
Increment by byte (00 01 02 03 …)
Decrement by byte (FF FE FD FC …)
Random bytes (00 to FF)
PRBS 9
Hardware Random Pattern (MU120121A/22A/31A/32A/38A only)
Programmable (Data Field 1 Only)
Sequence Number (Data Field 1 Only)
Time Stamp (Data Field 1 Only)
Test Frame (Data Field 1 Only)
Test Frame for MU120101A (Data Field 1 Only)

Note:

1. Test Frame cannot be specified when Frame Length is Increment or Random.
2. If Undersize or Oversize is enabled, Test Frame is not added to the frame even if Test Frame is specified.
3. When Sequence Number, Time Stamp, or Hardware Random Pattern is selected, the value of the checksum fields (such as TCP, UDP, ICMP) calculated for that data area is incorrect.
4. When **Sequence Number** is selected, it starts from the value specified at **Initial Sequence No.** when sending of each stream starts; when the maximum value is exceeded, it returns to the specified value.

(b) Offset

Specifies a position at which the pattern of a specified data field is to be located, as an offset from the beginning of this field.

(c) Length

Specifies the length (in bytes) of the data field.
If Hardware Random pattern is selected for (a) above, value 2 or greater must be specified.

Test Frame

The test frame is a data frame used at latency measurement, packet BER measurement, sequence error counting, multiflow counting, and by the automatic measurement function. When the test frame is displayed using the capture function, the latency measurement result display and the test frame translation display can be selected. In addition, when Flow ID is set at the test frame, counting can be performed for each Flow ID using the multiflow counter (section 5.3).

The format and settable values of Test Frame are as follows.

4 bytes	2 bytes	Variable length	2 bytes	5 bytes + 2 bits	3 bits	3 bits
Test Frame ID f6f62828 (hex)	Length	Test Pattern	Sequence Number	Time Stamp	Type	Reserved

Figure 5.1-49 Test Frame Format

Description of field of test frame:

Field name	Length	Description
Test Frame ID	4 bytes	This field sets the ID (f6f62828 (hex)) for identifying the test frame.
Length (*1)	2 bytes	This field indicates the length (in bytes) of the Test Pattern field.
Test Pattern	Variable length	Pattern specified at Type field and 2-byte supplementary value
Sequence Number	2 bytes	Sequence number (described later)
Time Stamp	5 bytes + 2 bits	This field sets the field of the time stamp described below from which Reserved is excluded.
Type (*2)	3 bits	Test Pattern field classification 000 Test frame prior to Ver. 2.0 001 Single PRBS9, or Test Frame for MU120101A (described later) 011 Flow ID 100 Cross PRBS23 101 Cross PRBS31 Others Not used
Reserved	3 bits	Not used

*1: With the MU120101A, Length is fixed to 4. Therefore, the length from the Test Frame ID field to the Reserved field is 18 bytes.

*2: With the MU120121A/22A, the setting of the Type field can be selected from the following.

- PRBS9 (Single) This setting is selected to measure a bit error with Packet BER Test Option.

- Flow ID: This setting is selected to set a Flow ID. The Flow ID can be set to a value in a range of 0 to 65535.

With the MU120131A/32A/38A, the setting of the Type field can be selected from the following.

- PRBS: This setting is selected to measure a bit error with Packet BER Test Option. Selection of the PRBS pattern classification is performed by the **Test pattern** setting of **Port Setting** (refer to section 4.5.3 (1)).
- Flow ID: Select this when specifying Flow ID (0~255)

Time Stamp

Time Stamp refers to time information inserted at any location within the data field in the following format. The inserted time differs according to the **Device Type** setting of the **Tx Stream** tab (refer to section 5.1.1). When **Time Stamp** is selected instead of **Test Frame**, the objective is not latency measurement. The capture frame display function cannot display its translation.

<table>
<tr><td>0</td><td></td><td>15</td></tr>
<tr><td>min (6 bit)</td><td>s (6 bit)</td><td>ms (10 bit)</td></tr>
<tr><td>ms (10 bit)</td><td colspan="2">μs (10 bit)</td></tr>
<tr><td colspan="2">ns (10 bit)</td><td>Reserved (6 bit)</td></tr>
</table>

Test Frame for MU120101A

The Test Frame for MU120101A is used at frame latency measurement when transmitted by a module other than the MU120101A and received by the MU120101A via DUT, etc.

Random Pattern

The random pattern created by **Random bytes (00 to FF)** or **PRBS9** is random in a frame but the same pattern is output between different frames. Therefore, if these patterns are set for **Continuous**, the contents of all the output frames are the same.

Hardware Random Pattern outputs different patterns between different frames. If these patterns are set for **Continuous**, therefore, different frames are output.

Sequence number

In cases of **Sequence Number**, **Test Frame**, and **Test Frame for MU120101A**, a sequence number field is set in a frame.

With a module other than MU120121A/22A/31A/32A/38A, the sequence number is reset if it extends over streams. For example, if Test Frame with **Frames per Burst** set to 4 is set in two streams, a Sequence Error occurs because the sequence number is reset at the 5th frame in which the stream is switched. Conversely, if one stream of Test Frame for which **Continuous** is selected, no Sequence Error occurs because the stream is not changed.

With the MU120121A/22A/31A/32A/38A, the sequence number is not reset even when stream sending is stopped and restarted even with extended streams. Therefore, no Sequence Error occurs in any of the above two examples.

For the MU120131A/32A/38A, continuous sequence numbers are assigned for each Flow ID.

Example:
Stream1: FlowID0 (Number of frames: 1, Next Stream)
Stream2: FlowID1 (Number of frames: 1, Next Stream)
Stream3: FlowID0 (Number of frames:1, Next Stream)
Stream4: FlowID0 (Number of frames: 1, Jump to Stream 1)

	Sequence number								
Stream1	0	3	6	9	12	15	18	21	24
Stream2	0	1	2	3	4	5	6	7	8
Stream3	1	4	7	10	13	16	19	22	25
Stream4	2	5	8	11	14	17	20	23	26

t

[4]　Sets Programmable Header Pattern.

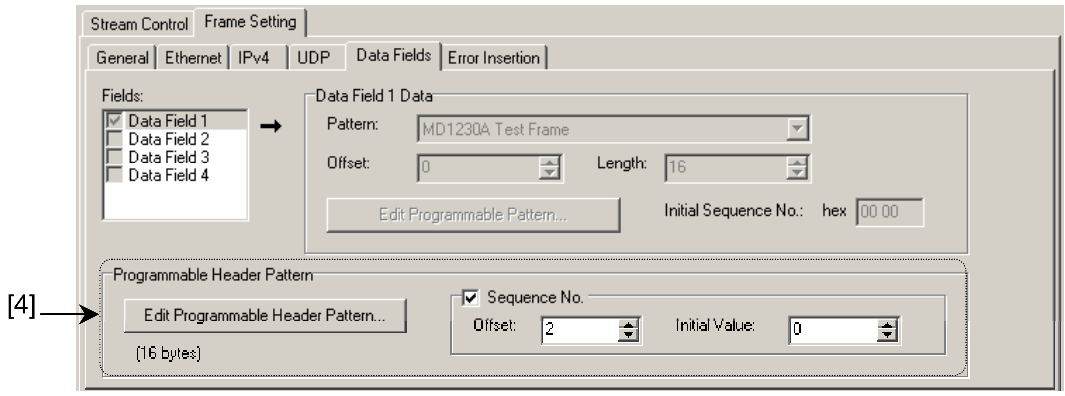


Figure 5.1.2-50　Programmable Header Pattern setting screen

A Programmable Header Pattern is user-defined pattern that can be set between the header pattern selected in the Protocol setting and the data pattern set in Data Field. In addition, a 16-bit sequence number field (a field to be incremented) can be specified in the Programmable Header Pattern.

L2 Header (Ethernet, PPP, etc.)	Protocol Header (IP, TCP, UDP, etc.)	Programmable Header Pattern	Data Fields 1 to 4	L2 Trailer (FCS)

Figure 5.1.2-51　Insert position of Programmable Header Pattern

Click the **Edit Programmable Header Pattern...** to set the Programmable Header Pattern. The Binary Data Editor dialog box appears. For Size, specify the size of the header to be inserted and set the data pattern in hexadecimal format. The data pattern can be set directly on the dialog box or by importing a text file containing a hexadecimal pattern (refer to "(7) Binary Data Editor" in Section 2.3.1).

☞ For the Binary Data Editor, see "(7) Binary Data Editor" in Section 2.3.1.

Setting sequence number field
A 16-bit fixed-length field (sequence number field) incrementing at each frame transmission can be set to the created Programmable Header Pattern. To set the sequence number field, set Sequence No. to On and specify the sequence number field position for Offset. Also set the start value of the sequence number for Initial Value.
Starts from the value specified at **Initial Value** at each Stream send start and returns to the specified value when maximum value exceeded.

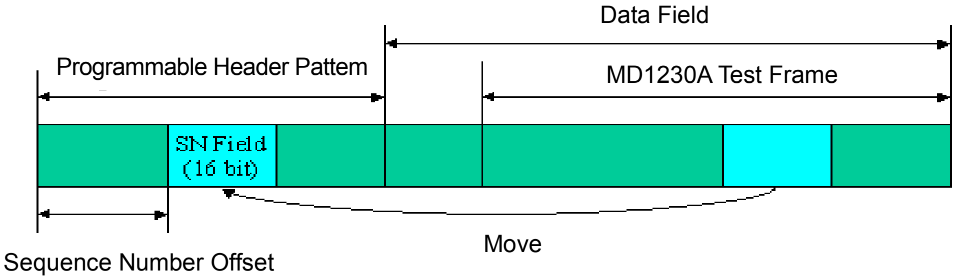


Figure 5.1.2-52 Setting Sequence Number (SN) field to the Programmable Header Pattern

Usage precautions

The sequence number field in the Programmable Header Pattern uses the Test Frame of Data Field 1 as shown in the figure above.

The following usage restrictions therefore apply:

- To use the increment function of the sequence number field in the Programmable Header Pattern, Test Frame of Data Field 1 must be set.
- When using the Increment function of the Programmable Header Pattern's Sequence number field with the MU120102A/11A/12A/18A/18B/18C, the Sequence Error counts.
- The increment function of the sequence number field in the Programmable Header Pattern cannot be used simultaneously with the increment function of the TCP/UDP Port number.

(27) Editing IGAP field value

0	15
Type	Max Resp Time
Checksum	
Group Address	
Version	Report Type
Reserved	CHAP ID
Account Size	Message Size
Reserved	
User Account	
Message	

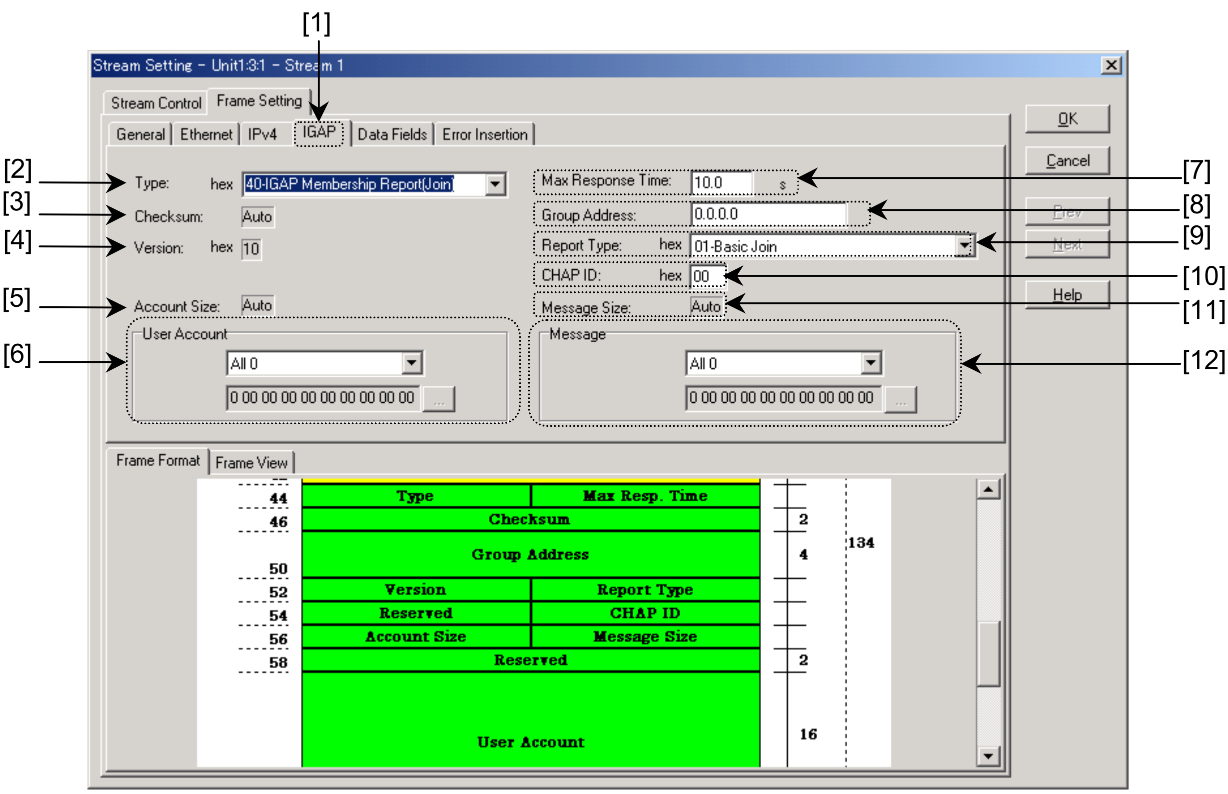


Figure 5.1.2-53

[1] Selects **IGAP** tab.

[2] Sets Type field. Following values can be set.
Value: 00 to FF (hex)

Or, select the followings:

(hex)

40 IGAP Membership Report (join)

41 IGAP Membership Query

42 IGAP Leave Group

[3] Indicates that Checksum field value is calculated, automatically.

[4] Displays Version field. The value is always 10 (hex).

[5] Indicates that User Account field size is calculated, automatically.

[6] Sets User Account field. Following values can be set.

All 0	Fills all area with 00 (hex).
All 1	Fills all area with FF (hex).
Programmable	Sets all area with user-defined values. Press Edit button to display the Binary Data Editor.

☞ For the Binary Data Editor, see “(7) Binary Data Editor” in Section 2.3.1.

[7] Sets Max Response Time field.

Value: 0 to 25 s

[8] Sets Group Address field. Normally, specify the multi-cast address “224.0.0.0 to 239.255.255.255”.

[9] Sets Report Type field. Settable items depend on Type field setting.

(i) For Type of IGAP Membership Report (join):

(hex)

01 Basic Join

02 PAP Join Authentication Request

03 CHAP Join Challenge Request

04 CHAP Join Response

5

Basic Measurement (Manual Test)

(ii) For Type of IGAP Membership Query:

(hex)

21:Basic Query

22:User Specific Query

23:CHAP Challenge

24:Authentication Message

25:Accounting Message

26:Notification Message

27:Error Message

(iii) For Type of IGAP Leave Group:

(hex)

41:Basic Leave

42:PAP Leave Authentication Request

43:CHAP Leave Challenge Request

44:CHAP Leave Response

[10] Sets CHAP ID field.

Value: 00 to FF (hex)

[11] Indicates that Message field size is calculated, automatically.

[12] Sets Message field. The set value is the same as that of User Account field.

(28) Editing LEX Control Packet field value

0	15
Address	Control
Protocol	
Code	Identifier
Length	
(Option)	

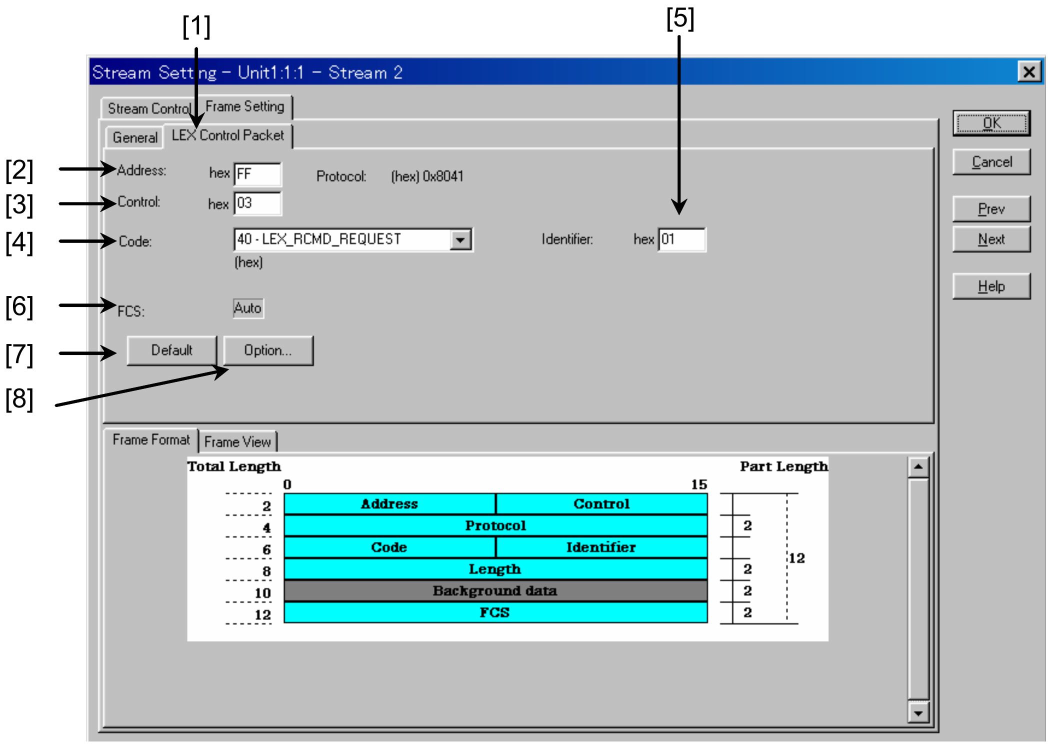


Figure 5.1.2-54

[1] Selects **LEX Control Packet** tab.

[2] Sets Address field.

Value: 00 to FF (hex)

[3] Sets Control field.

Value: 00 to FF (hex)

[4] Sets Code field.

(hex)

01 Configure Request

02 Configure Ack

03 Configure Nak

04 Configure Rej

40 LEX Remote Command Request

41 LEX Remote Command Ack

42 LEX Remote Command Nak

43 LEX Remote Command Reject

[5] Sets Identifier field.

Value: 00 to FF (hex)

[6] Indicates that the FCS value is being calculated automatically.

[7] Returns LEX Control Packet settings to the initial status.

[8] Sets Option Field.

☞ For Binary Data settings, refer to "(7) Binary Data Editor" in Section 2.3.1.

(29) Inserting error in frame

Inserts an error into a frame.

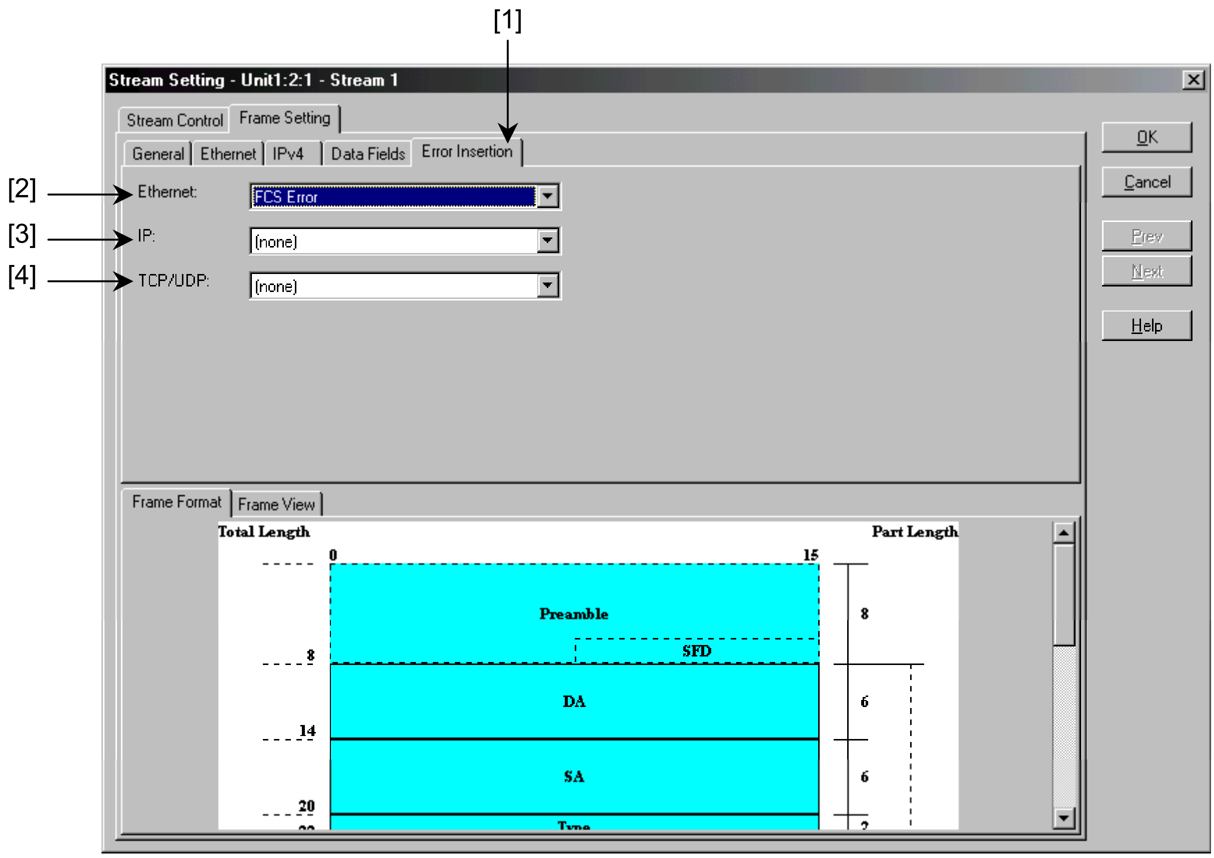


Figure 5.1.2-55

[1] Selects **Error Insertion** tab. When selecting any of GFP/LAPS/LEX at Mapping of Port Setting, the Ethernet layer and GFP/LAPS/LEX layer can be set independently. (see the figure “GFP” below).

[2] Inserts an error into the data link layer.

[3] Inserts IP Header Checksum Error.

[4] Inserts Checksum Error into TCP or UDP.

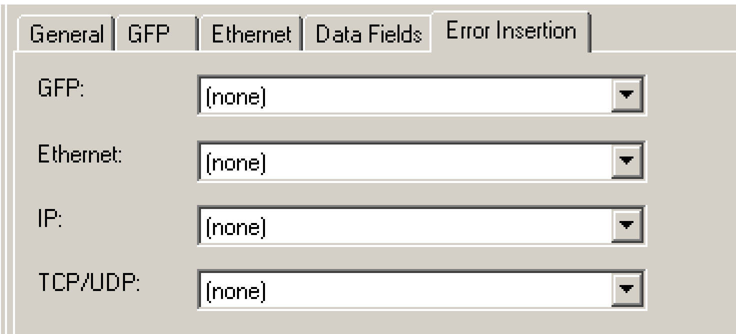


Figure 5.1.2-56 GFP

(30) Creating MLDA message

Note:

This function can be used only when both the IPv6 Expansion Option and the MLDA Protocol Option are installed.

An MLDA message can be created. The message format conforms to the IETF internet draft (draft-hayashi-mlda-01.txt).

Procedure

Select ICMPv6/IPv6 at Protocol setting on the **Frame Setting** tab - **General** tab of the Stream Setting dialog box. The **IPv6** and **ICMPv6** tabs appear. For Type on the **ICMPv6** tab, select one from 150-MLDA Listener Query, 151-MLDA Listener Acknowledgement or 152-MLDA Listener Report. The setting items for each field of the MLDA message are displayed.

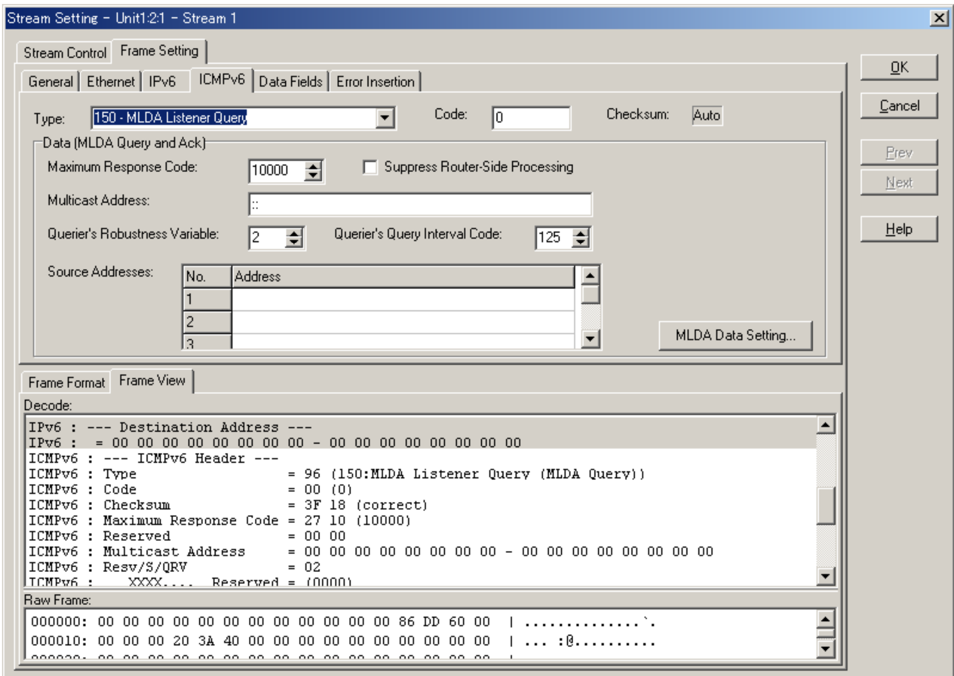


Figure 5.1.2-57 MLDA Message creating screen

As in other Type of ICMPv6 Message, Code can be set to a value from 0 to 255 and the Checksum field is calculated automatically. The settings available for each Type of MLDA message are explained below.

When MLDA Listener Query or MLDA Listener Acknowledgement is selected for Type:

Setting item	Range	Initial value
Maximum Response Code	0 to 65535 (decimal)	10000 (10 s)
Multicast Address	(IPv6 address)	::
S Flag (Suppress Router-Side Processing)	Checkbox (set to 1 when checked)	0
QRV (Querier's Robustness Variable)	0 to 7	2
QQIC (Querier's Query Interval Code)	0 to 255	125 (125 s)
Sources:		
Number of Sources	0 to 89	0
Source Address	(IPv6 address list)	(None)

When MLDA Report is selected for Type:

Setting item	Range	Initial value
Multicast Address Records:		
Nr of Mcast Address Records	0 or more (*)	1
Record Type	0 to 255 Select one from the followings: 1 - MODE_IS_INCLUDE 2 - MODE_IS_EXCLUDE 3 - CHANGE_TO_INCLUDE_MODE 4 - CHANGE_TO_EXCLUDE_MODE 5 - ALLOW_NEW_SOURCES 6 - BLOCK_OLD_SOURCES	1 (MODE_IS_INCLUDE)
Multicast Address	(IPv6 address)	::
Sources:		
Number of Sources	(IPv6 address)	1
Source Address	(IPv6 address list)	::

*: The maximum value at which the entire MLDA message pattern becomes 1518 bytes or less.

The Sub Type and subsequent fields can be set in the dialog box that appears by clicking the **MLDA Data Setting...**. The setting items are common for all Types (MLDA Query/MLDA ACK/MLDA Report).

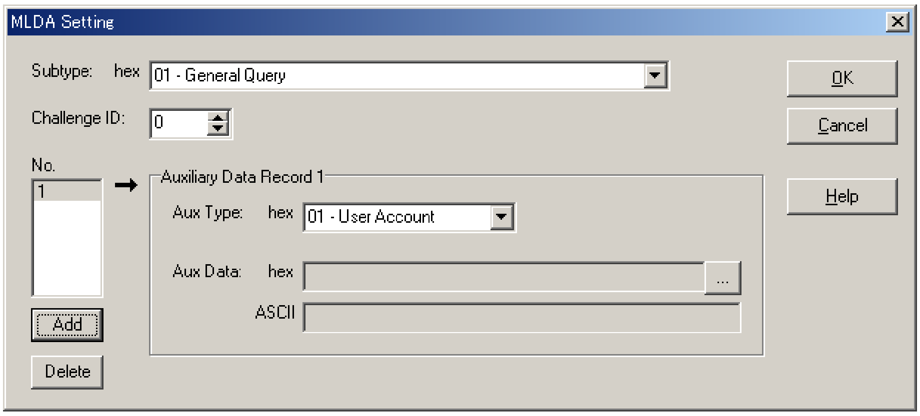


Figure 5.1.2-58 MLDA Data setting screen

- Multiple records can be set for Multicast Record of the MLDA Report message or Auxiliary Data Record subsequent to Sub Type. Add a Record by clicking the **Add** on the right of Multicast Record / Auxiliary Data Record.
- Aux Data of Auxiliary Data Record is set in the Binary Data Editor dialog box (refer to Section 2.3.1, (7)) that is opened by clicking the ... . Aux Data can be set in hexadecimal number, ASCII character string or by importing a text file containing a pattern in hexadecimal format.

☞ For the Binary Data Editor, see “(7) Binary Data Editor” in Section 2.3.1.

Setting item	Range	Initial value
Subtype	0x00 to 0xFF Select one from the followings: When Type is 0x96 (MLDA Listener Query): 0x01 - General Query 0x02 - User-Specific Query for Re-authentication (User Query) 0x11 - Challenge-Response Mechanism Challenge (Challenge) When Type is 0x97 (MLDA Listener Acknowledgement): 0x21 - Authentication Message 0x22 - Accounting Message 0x23 - Notification Message When Type is 0x98 (MLDA Listener Report): 0x31 - Password Mechanism Report (Password Report) 0x32 - Challenge-Response Mechanism Report Challenge Request (Challenge-Response Report Request) 0x33 - Challenge-Response Mechanism Report Response (Challenge-Response Report Response) 0x34 - Basic Report	When Type is 0x96: 0x01 (General Query) When Type is 0x97: 0x21 (Authentication Message) When Type is 0x98: 0x31 (Password Mechanism Report)
Challenge ID	0 to 255	0
Auxiliary Data Records:		
# of Aux	0 to255	0
Aux Type	0x00 to 0xFF Select one from the followings: 0x01 - User Account 0x02 - User Password 0x03 - Message	0x01 (User Account)
Aux Data (variable)	0 to 255-byte hexadecimal number or character string can be set. The length of the set character string is set in the Aux Data Len field.	(None)

5

Basic Measurement (Manual Test)

(31) Editing PIM Register Message fields

Note:

This function can be used only when the PIM-SMv2 Protocol Option is installed.

Create a PIM Register Message (encapsulated multicast data packet). The packet format conforming to the IETF internet draft (draft-ietf-pim-sm-v2-new-08.txt) is shown below:

```
        +-----+-----+------+-- Values indicating on upper layer such as Ethernet Type are set
        |     |     |      |   according to the General-Protocol setting.
        |     |     |      |
        |     |     |      |     +- The IP header version is the same as that set in the General-Protocol
        |     |     |      |     |  setting (only */IPv4 or */IPv6 can be set for Protocol.)
        |     |     |      |     |
+-------+--+--+--+--+--+---+--+--+-------------+-----------+----------------+------------+-----+
| Ethernet |(LLC)|(VLAN)|(MPLS)| IPv4/IPv6 Header |PIM Header | (Protocol Header  | Data Field | FCS |
|          |     |      |      |                  |           | including IPv4/IPv6)|          |     |
+----------+-----+------+------|-----------------+-----------|----------------+------------+-----+
                               |<------------------------->|
                                Part inserted by PIM Register
                                Message
```

Figure 5.1.2-59 PIM Register Message configuration

The PIM header format is shown below:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|PIM Ver| Type  |   Reserved    |           Checksum            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|B| |                       Reserved2                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
.                     Multicast data packet                     .
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 5.1.2-60 PIM Register Message format

Procedure

In Protocol on the **General** tab, select the data packet type to be encapsulated by the PIM Register Message. In this step, only items containing an IPv4/IPv6 header can be selected.

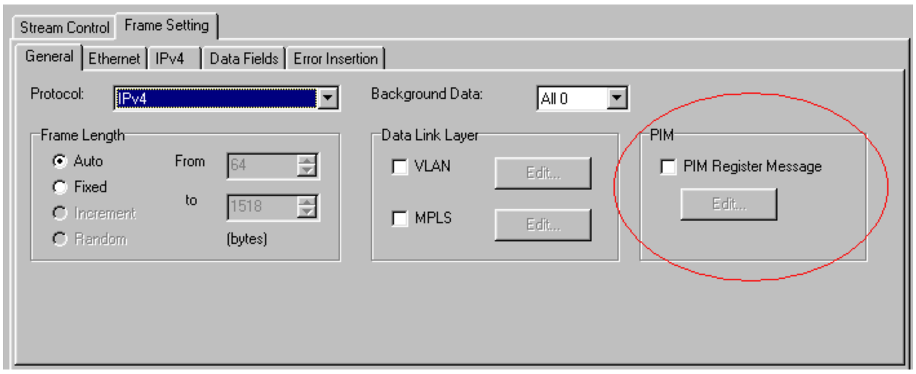


Figure 5.1.2-61 PIM Register Message check box

Click the PIM Register Message checkbox in the PIM group setting on the **General** tab. Then click the **Edit** to open the PIM Register Message setting dialog box. Set the Register Message header (IP header and PIM header). The IP header version that can be edited is the same as that set in the General-Protocol setting. The set header is inserted just before the Protocol header.

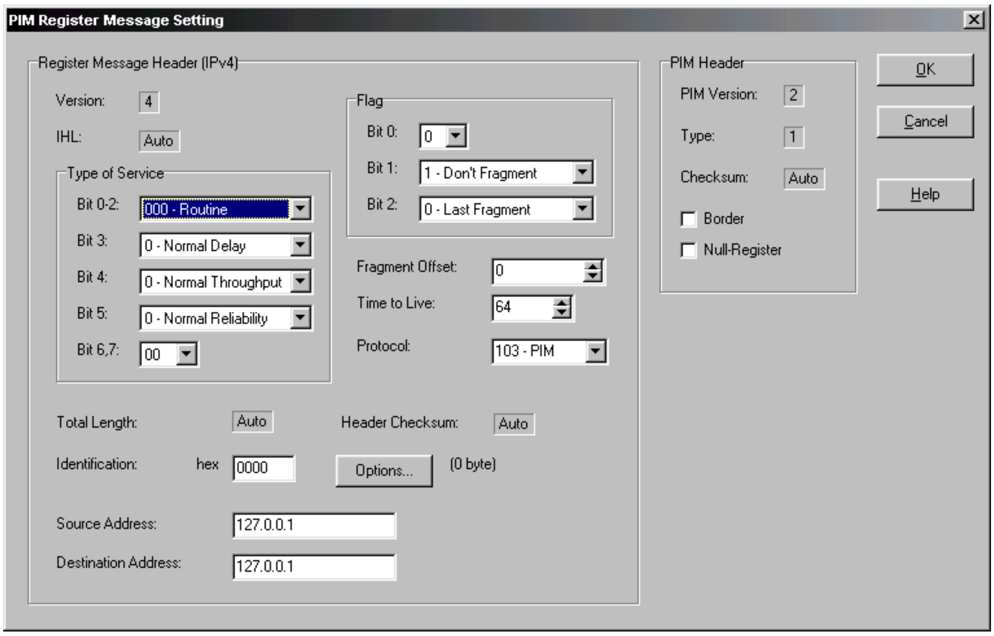


Figure 5.1.2-62 Register Message Header setting screen (IPv4)

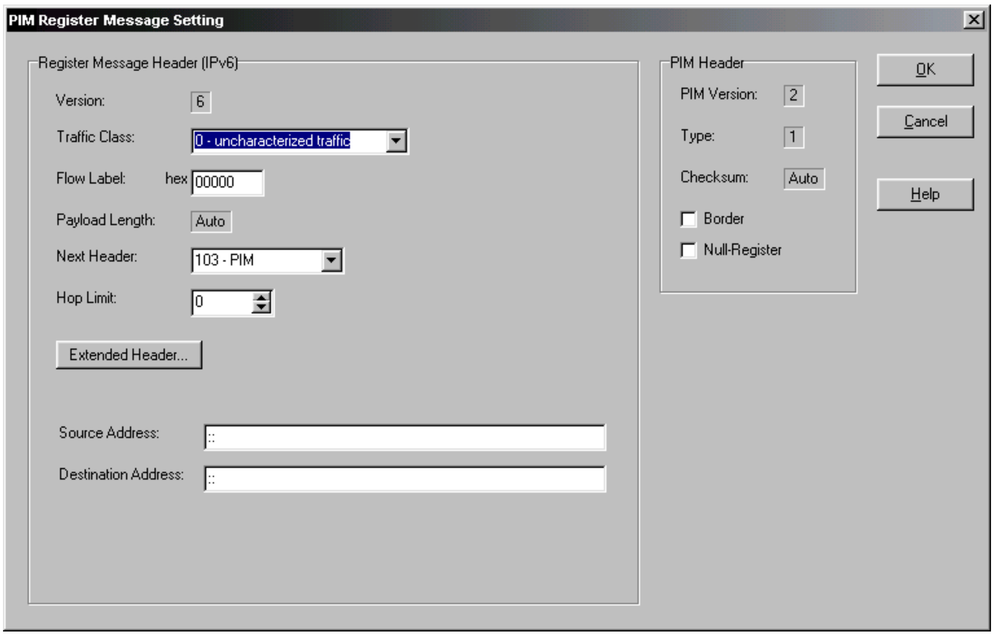


Figure 5.1.2-63 PIM Register Message Header setting screen (IPv6)

IP header settings are the same as those available on the current **IPv4/IPv6** tab (*). (IPv6 expansion header can also be set.) Refer to (11) and (13) in Section 5.1.2 for details.

*: This Port/Increment/Decrement/Random settings for IP addresses are not available.

Items that can be set for the PIM header are shown below:

Setting item	Range	Initial value
PIM Version	4 bits	2 (Fixed value)
Type	4 bits	1 (Fixed value)
Checksum	2 octets	(Automatically calculated value)
[B]order bit	1 bit	Off (0)
[N]ull-Register bit	1 bit	Off (0)

(32) Editing Link Aggregation fields

Note:

This function can be used only when the Spanning Tree/Link Aggregation Option is installed.

The following PDUs related to link aggregation defined in IEEE Std 802.3-2002 can be created.

- LACPDU
- Marker PDU
- Marker Response PDU

Procedure

Select Link Aggregation in Protocol on the **General** tab. The **LACP** tab appears.

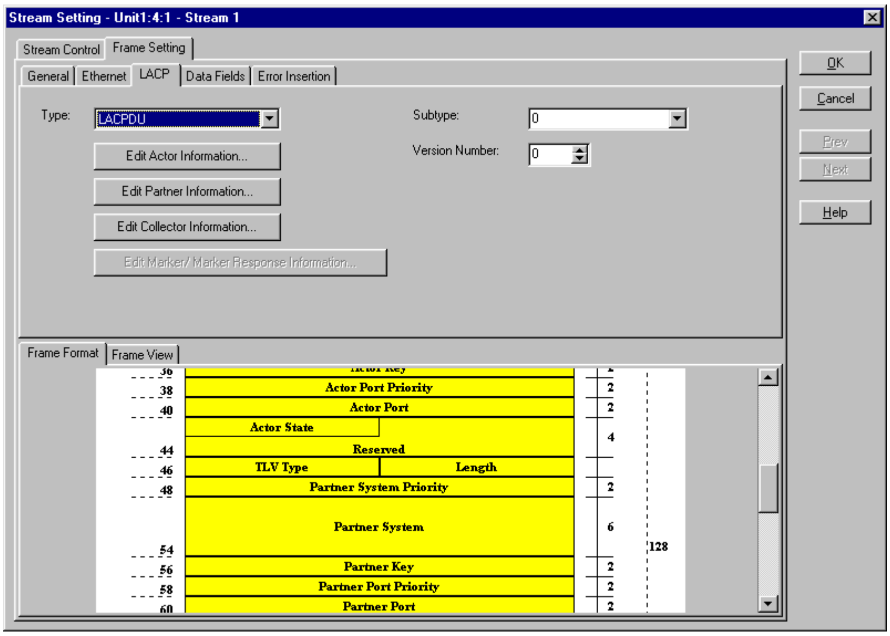


Figure 5.1.2-64 PDU for Link Aggregation creating screen

The contents of the **Ethernet** tab are changed as shown below:

Setting item	Value
Type	Auto, 0x8809 (Slow_Protocols_Type field)
Destination Address	Static, 01-80-C2-00-00-02 (Slow_Protocols_Multicast address)

Other item values are not changed.

On the **LACP** tab, make a selection for Type and also select the PDU type to be transmitted (LACPDU, Marker PDU, Marker Response PDU). The set values for the selected PDU are displayed. Set a value for each field of PDU. The setting items available for each type of PDU are shown below.

When LACPDU is selected:

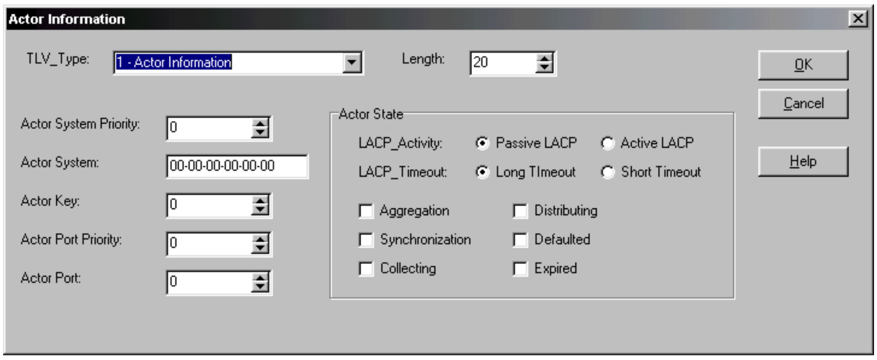


Figure 5.1.2-65 Actor Information setting screen

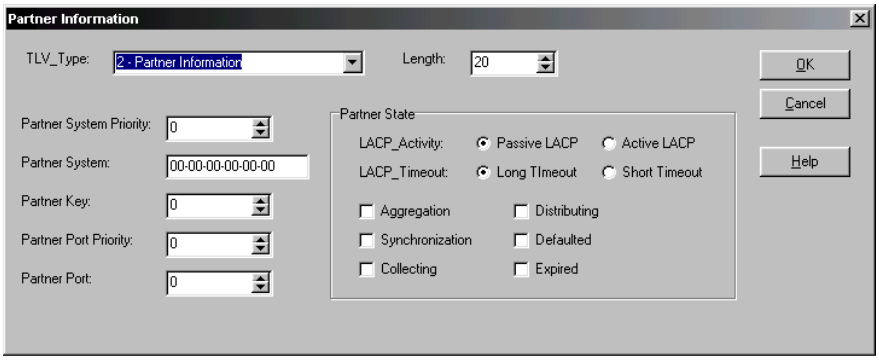


Figure 5.1.2-66 Partner Information setting screen (IPv6)

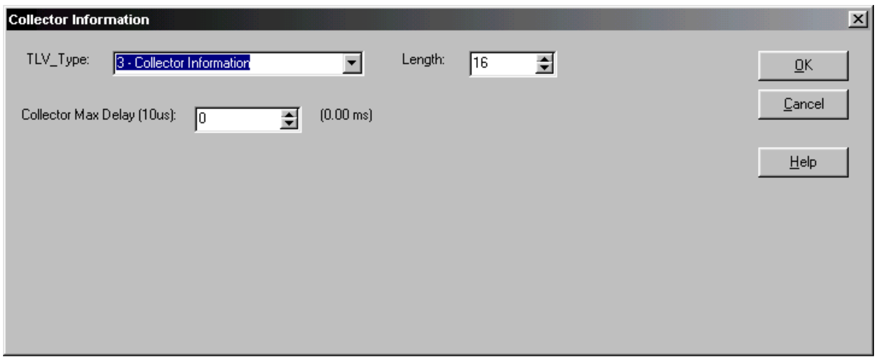


Figure 5.1.2-67 Collector Information setting screen (IPv6)

Setting item		Range (octets)	Format	Initial value
Subtype		1	(dec)	1
Version Number		1	(dec)	1
Actor Information		–	–	–
	TLV_type	1	(dec)	1
	Length (octets)	1	(dec)	20
	Actor System Priority	2	(dec)	0
	Actor System	6	(MAC address)	00-00-00-00-00-00
	Actor Key	2	(dec)	0
	Actor Port Priority	2	(dec)	0
	Actor Port	2	(dec)	0
	Actor State	1	Refer to <Actor_State and Partner_State>	All 0
Partner Information		–	–	–
	TLV_type	1	(dec)	2
	Length (octets)	1	(dec)	20
	Partner_System_Priority	2	(dec)	0
	Partner_System	6	(MAC address)	00-00-00-00-00-00
	Partner_Key	2	(dec)	0
	Partner_Port_Priority	2	(dec)	0
	Partner_Port	2	(dec)	0
	Partner_State	1	Refer to <Actor_State and Partner_State>	All 0
Collector Information		–	–	–
	TLV_type	1	(dec)	3
	Length (octets)	1	(dec)	16
	CollectorMaxDelay (10 μs)	2	(dec)	0

<Actor_State and Partner_State>

bit	Setting item	When set to 0	When set to 1
0	LACP_Activity	Passive LACP	Active LACP
1	LACP_Timeout	Long Timeout	Short Timeout
2	Aggregation	FALSE	TRUE
3	Synchronization	FALSE	TRUE
4	Collecting	FALSE	TRUE
5	Distributing	FALSE	TRUE
6	Defaulted	FALSE	TRUE
7	Expired	FALSE	TRUE

When Marker PDU / Marker Response PDU is selected:

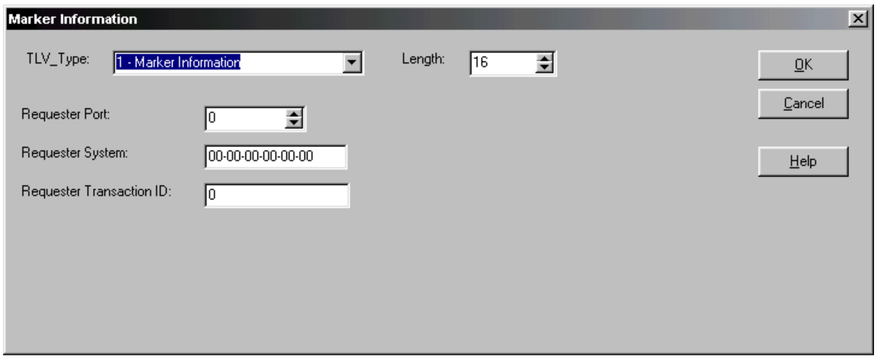


Figure 5.1.2-68 Marker Information / Marker Response Information setting screen

Setting item	Range (octets)	Format	Initial value
Subtype	1	(dec)	2
Version Number	1	(dec)	1
Information	–	–	–
TLV_type	1	(dec)	1 (For Type: Marker PDU) 2 (For Type: Marker Response PDU)
Length (octets)	1	(dec)	16
Requester_Port	2	(dec)	0
Requester_System	6	(MAC address)	00-00-00-00-00-00
Requester_Transaction_ID	4	(dec)	0

(33) Editing BPDU fields

Note:

This function can be used only when the Spanning Tree/Link Aggregation Option is installed.

The following BPDUs related to STP (Spanning Tree Protocol) can be created.

- STP Configuration BPDU
- STP TCN BPDU
- RST BPDU
- MST BPDU

Each BPDU data format conforms to the following standards.

- IEEE Std 802.1D-1998
- IEEE Std 802.1w-2001
- IEEE Std 802.1t-2001
- IEEE Std 802.1s-2002

Procedure

Select BPDU in Protocol on **General** tab. The **LLC** and **BPDU** tabs appear. In this case, the contents of the **Ethernet** tab are changed as shown below:

Setting item	Value
Type	Auto (Length)
Destination Address	Static, 01-80-C2-00-00-00

Other item values are not changed. The setting items and their initial values on the **LLC** tab are shown below:

Setting item	Range (Octet)	Initial Value
DSAP	1	0x42
SSAP	1	0x42
Control	1	0x03

On the **BPDU** tab, make a selection by Type for the BPDU type to be transmitted (STP Configuration BPDU, STP TCN (Topology Change Notification) BPDU, RST BPDU, MST BPDU). The required set items for the selected BPDU are displayed.

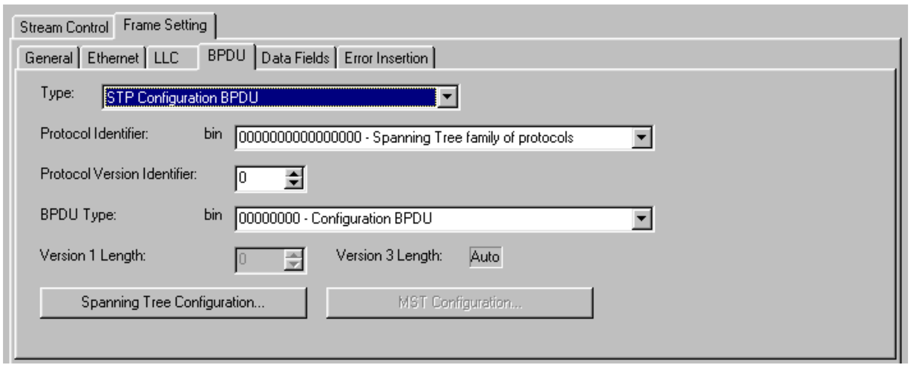


Figure 5.1.2-69 STP BPDU setting screen

Setting item	Range	Format	Initial value			
			STP Con-figuration BPDU	STP TCN BPDU	RST BPDU	MST BPDU
Protocol Identifier	2 octets	(bin)	0000000000000000 (Spanning Tree family of protocols)			
Protocol Version Identifier	1 octet	(dec)	0	0	2	3
BPDU Type	1 octet	(bin)	00000000 (Configuration BPDU)	10000000 (Topology Change Notification BPDU)	00000010 (Rapid Spanning Tree BPDU)	00000010 (Rapid Spanning Tree BPDU)
Version 1 Length	1 octet	(dec)	–	–	0	0
Version 3 Length	2 octets	(dec)	–	–	–	*

*: The initial value is 64 + 16 × <Number of MSTI Configuration Messages> (octets). In addition, the value varies in conjunction with <Number of MSTI Configuration Messages>.

When STP Configuration BPDU, RST BPDU, or MST BPDU is selected by Type setting on **BPDU** tab, the **Spanning Tree Configuration** becomes enabled. Click this button to display the following dialog.

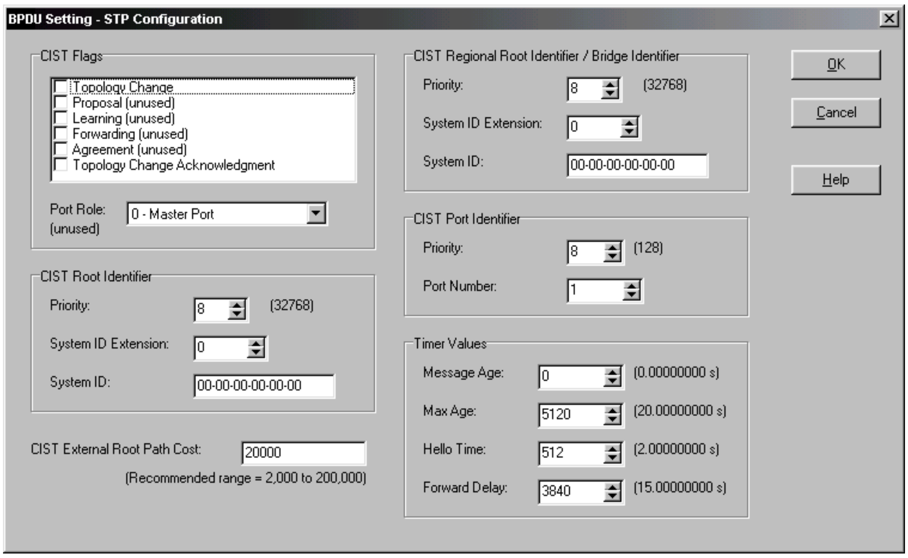


Figure 5.1.2-70 STP Configuration setting screen

Setting item	Range	Format	Initial value			
			STP Configuration BPDU	STP TCN BPDU	RST BPDU	MST BPDU
CIST Flags	1 octet	–	–			
Topology Change	1 bit	(Checkbox)	0	–	0	0
Proposal	1 bit	(Checkbox)	0 (unused)	–	0	0
Port Role	2 bits	Refer to <Port Role>	0 (unused)	–	0	0
Learning	1 bit	(Checkbox)	0 (unused)	–	0	0
Forwarding	1 bit	(Checkbox)	0 (unused)	–	0	0
Agreement	1 bit	(Checkbox)	0 (unused)	–	0	0
Topology Change Acknowledgment	1 bit	(Checkbox)	0	–	0 (unused)	0 (unused)
CIST Root Identifier	8 octets	Refer to <Bridge Identifier>		–	Refer to <Bridge Identifier>	
CIST External Root Path Cost	4 octets	Refer to <Path Cost>		–	Refer to <Path Cost>	
CIST Regional Root Identifier / Bridge Identifier	8 octets	Refer to <Bridge Identifier>		–	Refer to <Bridge Identifier>	
CIST Port Identifier	2 octets	–	–			
Priority	4 bits	(dec) (Displays the value of the setting value × 16 at the side of the setting value)	8	–	8	8
Port Number	12 bits		1	–	1	1
Timer Values	8 octets	–	–			
Message Age *	2 octets	(dec) (Displays the second-converted value at the side of the setting value)	0	–	0	0
Max Age *	2 octets		5120	–	5120	5120
Hello Time *	2 octets		512	–	512	512
Forward Delay *	2 octets		3840	–	3840	3840

*: Input a numerical value in 1/256 s unit

When MST BPDU is selected by Type setting on **BPDU** tab, the **MST Configuration** becomes enabled. Click this button to display the following dialog.

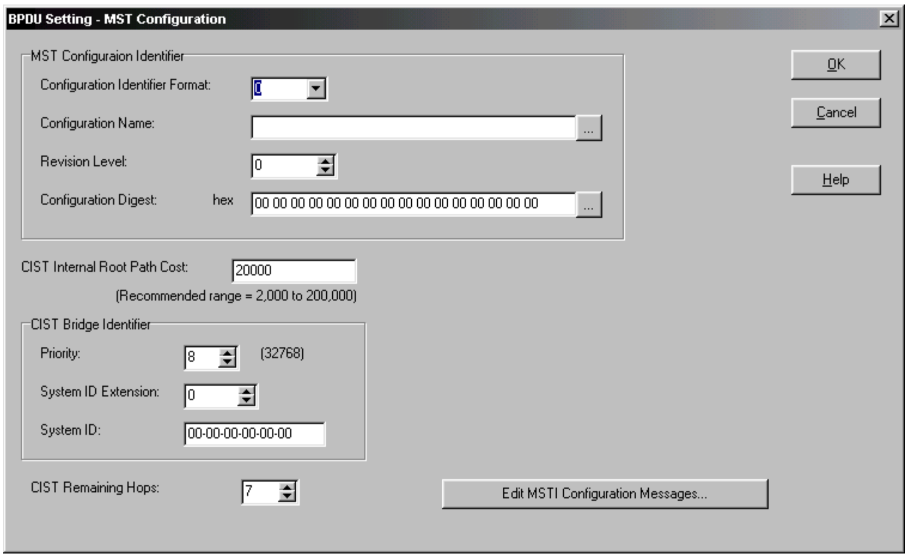


Figure 5.1.2-71 MST Configuration setting screen

Setting item		Range	Format	Initial value			
				STP Configuration BPDU	STP TCN BPDU	RST BPDU	MST BPDU
MST Configuration Identifier		51 octets	–	–			
	Configuration Identifier Format Selector	1 octet	(dec)	–	–	–	0
	Configuration Name	0 to 32 octets	(string)	–	–	–	("")
	Revision Level	2 octets	(dec)	–	–	–	0
	Configuration Digest	16 octets	(hex)	–	–	–	(All 0)
CIST Internal Root Path Cost		4 octets	Refer to <Path Cost>	–	–	–	Refer to <Path Cost>
CIST Bridge Identifier		8 octets	Refer to <Bridge Identifier>	–	–	–	Refer to <Bridge Identifier>
CIST Remaining Hops		1 octet	(dec)	–	–	–	7

Click the **Edit MSTI Configuration Messages…** to display the following dialog.

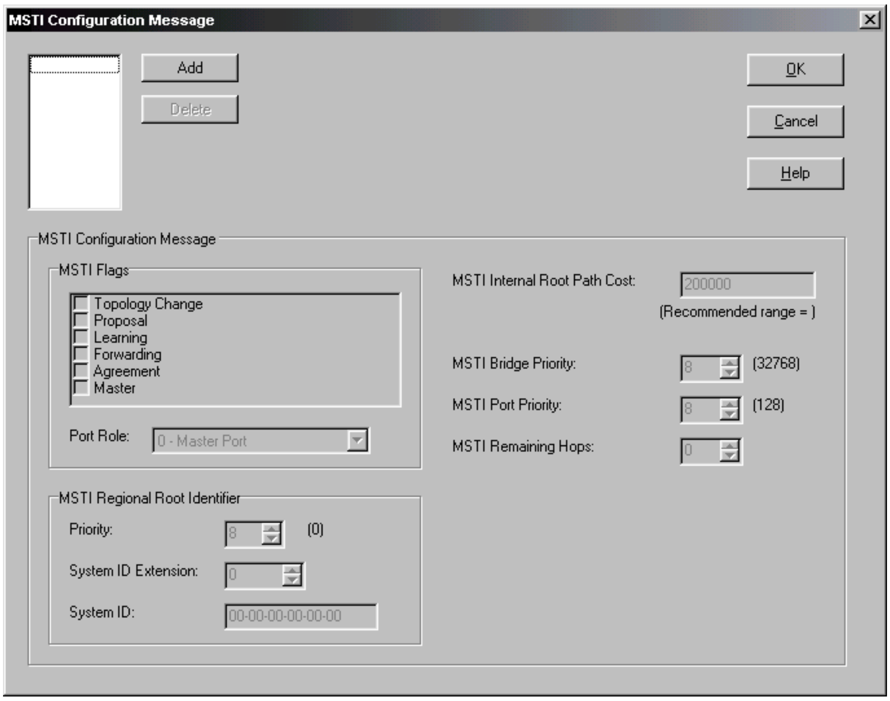


Figure 5.1.2-72 MSTI Configuration Message setting screen

Click the **Add** or **Delete** to add or delete the 64 maximum of MSTI Configuration Messages in MSTI BPDU, respectively.

Setting item	Range	Format	Initial value			
			STP Configuration BPDU	STP TCN BPDU	RST BPDU	MST BPDU
MSTI Configuration Message	16 octets	–	–			
MSTI Flags	1 octet	–	–			
Topology Change	1 bit	(Checkbox)	–	–	–	0
Proposal	1 bit	(Checkbox)	–	–	–	0
Port Role	2 bits	Refer to <Port Role>	–	–	–	0
Learning	1 bit	(Checkbox)	–	–	–	0
Forwarding	1 bit	(Checkbox)	–	–	–	0
Agreement	1 bit	(Checkbox)	–	–	–	0
Master flag	1 bit	(Checkbox)	–	–	–	0
MSTI Regional Root Identifier	8 octets	Refer to <Bridge Identifier>	–	–	–	Refer to <Bridge Identifier>
MSTI Internal Root Path Cost	4 octets	Refer to <Path Cost>	–	–	–	Refer to <Path Cost>
MSTI Bridge Priority	4 bits	(dec) (Displays the value of the setting value × 4096 at the side of the setting value)	–	–	–	8
MSTI Port Priority	4 bits	(dec) (Displays the value of the setting value × 16 at the side of the setting value)	–	–	–	8
MSTI Remaining Hops	1 octet	(dec)	–	–	–	7

<Bridge Identifier>

Setting item	Range	Format	Initial value
Bridge Identifier	8 octets	–	–
Priority	4 bits	(dec) (Displays the value of the setting value × 4096 at the side of the setting value)	8
System ID Extension	12 bits	(dec)	0
System ID	48 bits	(hex)	00-00-00-00-00-00

<Port Role>

Value	Description
0	0-Master Port
1	1-Alternate or Backup
2	2-Root
3	3-Designated

<Path Cost>

The initial value varies as shown below depending on the link speed at the measurement port. (For MU120101A/11A, the value at 100 M becomes the initial value. For MU120121A/31A or RJ-45 Port of MU120122A, the value at 1G becomes the initial value.)

Link Speed	Initial value	Recommended range display
≤ 100 kbit/s	200 000 000	20 000 000 to 200 000 000
1 Mbit/s	20 000 000	2 000 000 to 200 000 000
10 Mbit/s	2 000 000	200 000 to 20 000 000
100 Mbit/s	200 000	20 000 to 2 000 000
1 Gbit/s	20 000	2 000 to 200 000
10 Gbit/s	2 000	200 to 20 000
100 Gbit/s	200	20 to 2 000
1 Tbit/s	20	2 to 200
10 Tbit/s	2	1 to 20

(34) Editing Ethernet OAM PDU

Note:

Requires Ethernet OAM option

The Ethernet OAM PDU can be edited according to the format defined in ITU-T Y.1731l (05/2006), IEEE P802.1ag/D8.1 if the Ethernet OAM option is installed. Ethernet OAM PDU is edited from the Programmable Header Pattern edit screen as follows:

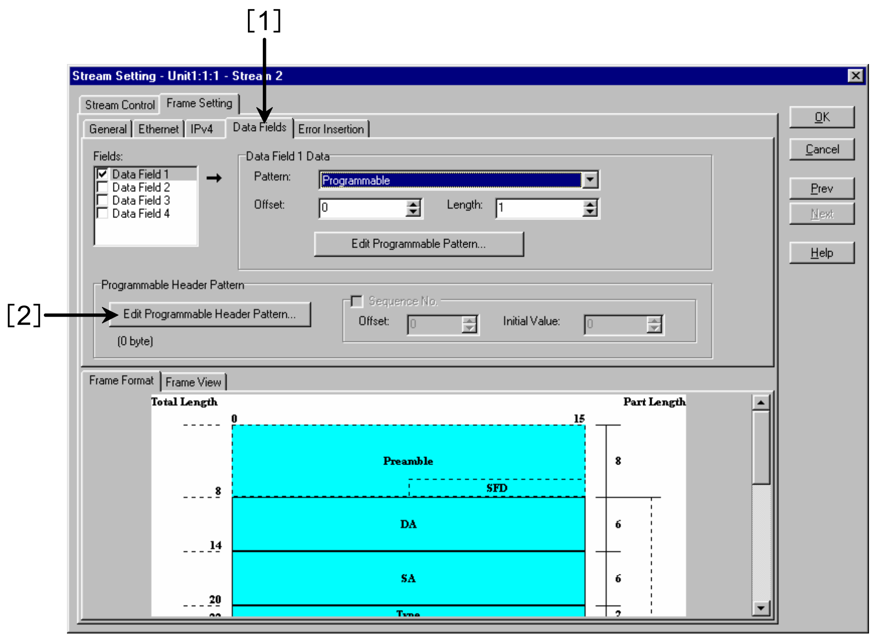


Figure 5.1.2-73 Stream Setting (Frame Setting tab, Data Fields tab) screen

[1] Select the **Data Fields** tab.

[2] Click Edit Programmable Header Pattern... and open the Binary Data Editor.

☞ For the Binary Data Editor, see “(7) Binary Data Editor” in Section 2.3.1.

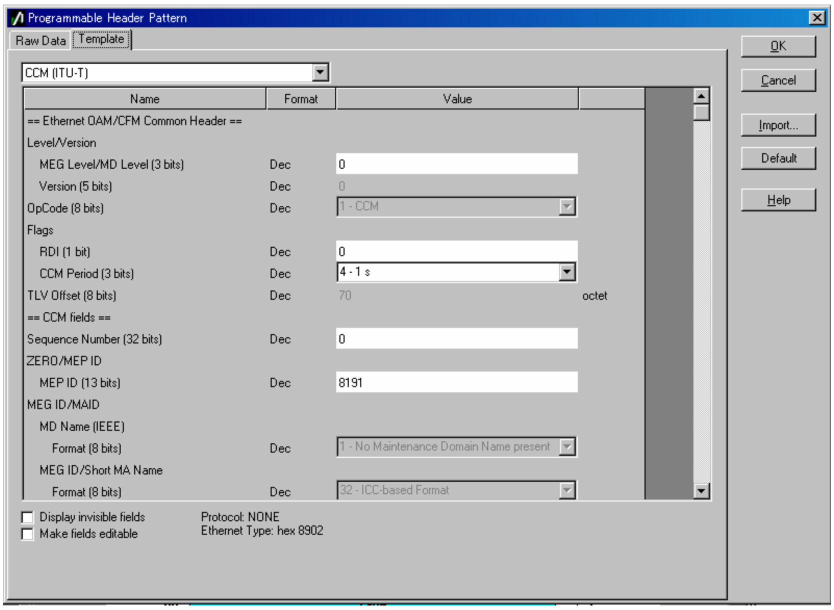


Figure 5.1.2-74 Binary Data Editor (Template tab) screen

Select the format of the Ethernet OAM PDU to create in the **Template** tab, enter the value in each field, and click OK to create the Ethernet OAM PDU stream data. The Protocol of the stream setting is automatically set to None and the Ethernet Type field is set to 8902 (hex).

For the details on Protocol setting, see "(1) [2] " in Section 5.1.2.

Table 5.1.2-1 shows the selectable Ethernet OAM PDU templates. Template names followed by "…no End TLV" are used when adding TLV or data not in the provided template. In this case, TLV or data and End TLV pattern must be set in the Programmable Pattern of the Data Field.

For the details on Programmable Pattern setting of the Data Field, see "(26) [3] " in Section 5.1.2.

Table 5.1.2-1 Binary Data Editor (Template tab) screen

OpCode	Template Name
CCM	CCM (ITU-T) CCM (IEEE) CCM (IEEE) with no Sender ID TLV and End TLV CCM (IEEE) with no TLVs
LBR	LBR (ITU-T) LBR (ITU-T) with no End TLV LBR (IEEE) LBR (IEEE) with no TLVs
LBM	LBM (ITU-T) LBM (ITU-T) with no End TLV LBM (IEEE) LBM (IEEE) with no TLVs
LTR	LTR (ITU-T) with Reply Ingress TLV LTR (ITU-T) with Reply Egress TLV LTR (ITU-T) with Reply Ingress and Egress TLV LTR (IEEE) with Reply Ingress TLV LTR (IEEE) with Reply Egress TLV LTR (IEEE) with Reply Ingress and Egress TLV LTR (IEEE) with no TLVs
LTM	LTM (ITU-T) LTM (IEEE) LTM (IEEE) with no TLVs
AIS	AIS (ITU-T)
LCK	LCK (ITU-T)
TST	TST (ITU-T) with no End TLV
APS	APS (ITU-T) with no End TLV
MCC	MCC (ITU-T) MCC (ITU-T) with no End TLV
LMR	LMR (ITU-T)
LMM	LMM (ITU-T)
1DM	1DM (ITU-T)
DMR	DMR (ITU-T)
DMM	DMM (ITU-T)
EXR	EXR (ITU-T) EXR (ITU-T) with no End TLV
EXM	EXM (ITU-T) EXM (ITU-T) with no End TLV
VSR	VSR (ITU-T) VSR (ITU-T) with no End TLV
VSM	VSM (ITU-T) VSM (ITU-T) with no End TLV

5.1.3 Setting transmission method of stream data

In the **Stream Control** tab, sets the transmission method for stream data defined in the **Frame Setting** tab.

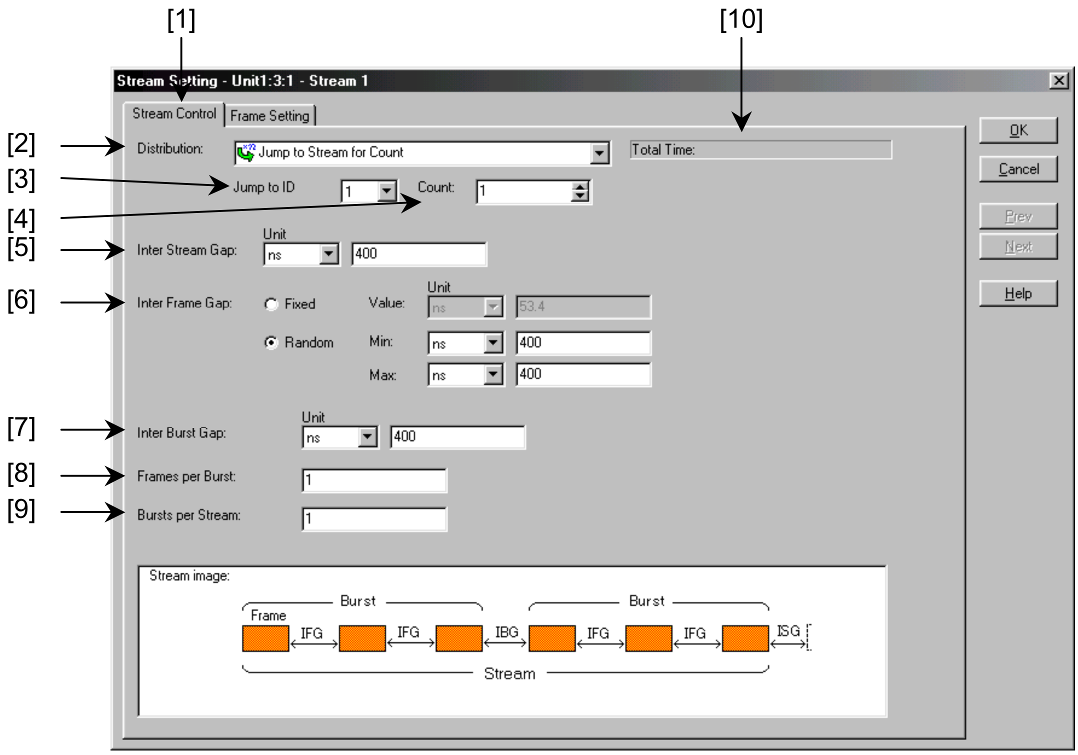
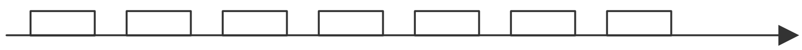


Figure 5.1.3-1

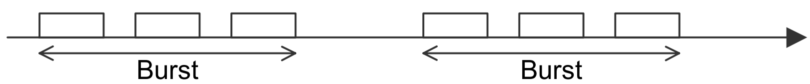
[1] Selects **Stream Control** tab.

[2] Sets the frame distribution within one stream (Distribution).

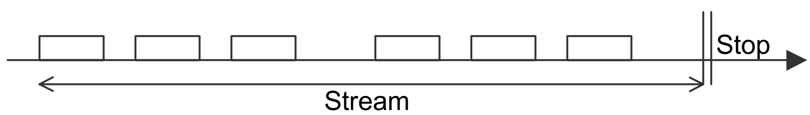
- Continuous — Transmits the set frame continuously.



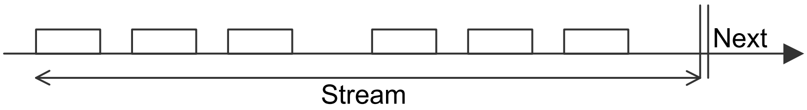
- Continuous Burst — Transmits the set frame continuously and in burst.



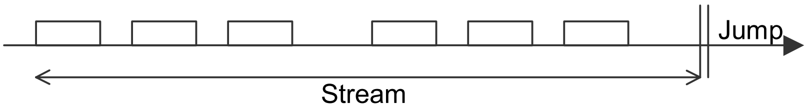
- Stop After This Stream — Stops transmission when current stream is transmitted.



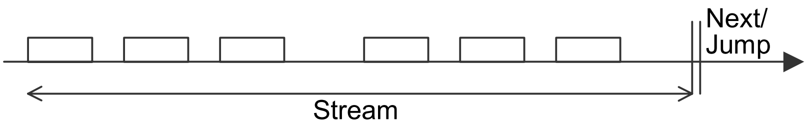
- Next Stream — Transmits next stream after current one is transmitted. Stops the transmission when next stream does not exist.



- Jump to Stream — Jumps to the specified stream after current one is transmitted.

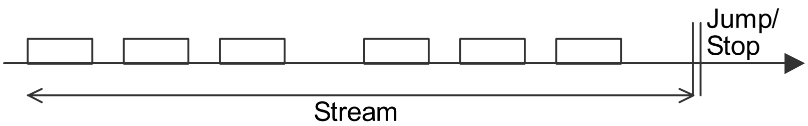


- Jump to Stream for Count — After the stream is transmitted, jumps to the set stream. This operation is repeated for the specified number of times. Transmits the next one when the specified count is exceeded. Jumps to the specified stream when next stream does not exist.



- Jump to Stream for Count and Stop

  After the stream is transmitted, jumps to the set stream. This operation is repeated for the specified number of times and the transmission then stops.



[3] Sets the target stream to jump when Jump to Stream or Jump to Stream for Count is selected.

[4] Sets the retry count when Jump to Stream for Count is selected.

[5] Sets the ISG (inter-stream gap)*. It can be set in units of time (s, ms, μs, or ns) or bytes.

Note:

The MU120102A, MU120112A, MU120122A SFP Port, and MU120132A have multiple Tx stream settings; when either the Frame or gap length is set to an odd number, the actually sent ISG is 1 Byte shorter than the set ISG. Consequently, the actual Tx rate may exceed the set rate.

[6] Sets the IFG (inter-frame gap)*. Select Fixed (fixed length) or Random. When Random is selected, specify the minimum and maximum values. IFG can be set in units of time (s, ms, μs, or ns), bytes, %, fps (frames/s), bps (bits/s), or bytes. If Increment or Random is selected as the frame length in the Frame Setting tab and if the unit is %, fps, or bps (bits/s), IFG is set, assuming that the average value of the minimum value (from) and maximum value (to) of the frame length is the frame length.

☞ For the conversion formula of time, %, fps, bps, and byte, refer to Appendix D "Calculation Formula".

Notes:

1. When setting IFG in % unit, minimum IFG value becomes 100 %.
   When Random selected, set as follows.
   Min: 100 % to Max: 1 %

2. If the frame length is changed, the value of IFG is held in time units. If the unit is %, fps, or bits/s that indicates a rate per time, therefore, the value of IFG is changed if the frame length is changed.

3. With the MU120103A/03B/04A/04B/05A/06A and MU150101A, a frame length less than 64 bytes cannot be set when IFG (inter-frame gap) is set to Random.

[7] Sets the IBG (inter-burst gap)(*). It can be set in units of time (s, ms, μs, or ns) or bytes.

[8] Sets the number of frames for one burst.

[9] Sets the number of bursts for one stream.

[10] Displays the streaming time when Stop After This Stream, Next Stream, Jump to Stream or Jump to Stream for Count is selected. Fixed must then be selected for IFG, and Auto or Fixed must be selected for the frame length in the Frame Setting tab.

*: ISG/IBG/IFG is displayed in the units set previously in this Stream Control tab when the dialog box is opened the next time. The unit changed for another Stream is also reflected. For example, if IFG of Stream A is set in ns, next, IFG of Stream B is set in %, and then Stream A is opened again, its IFG is displayed in %.

List of ISG/IBG/IFG settable ranges

Module		Parameter	Setting range
MU120101A/11A	10M	ISG/IBG/IFG	8000 ns (10 bytes) to 1700 s
	100M	ISG/IBG/IFG	800 ns (10 bytes) to 170 s
MU120121A/31A MU120122A (RJ-45 Port)	10M	ISG/IBG/IFG	8000 ns (10 bytes) to 12000 s
	100M	ISG/IBG/IFG	800 ns (10 bytes) to 1200 s
	1000M	ISG/IBG/IFG	80 ns (10 bytes) to 120 s
MU120102A/12A/32A MU120122A (SFP Port)		ISG/IBG/IFG	64 ns (8 bytes) to 120 s(*3)
MU120118A/18B/18C/38A		ISG	9.6 ns (12 bytes) to 120 s
		IBG/IFG	7.2 ns (9 bytes) to 120 s
MU120103A/04A		ISG	427.4 ns (128 bytes) to 120 s
		IBG/IFG	3.3 ns (1 byte) to 120 s (*2)
MU120105A/06A		ISG	106.8 ns (128 bytes) to 120 s
		IBG/IFG	0.8 ns (1 byte) to 120 s (*2)
MU120103B/04B (*1)	GFP	ISG	267.0 ns (80 bytes) to 120 s
		IBG	13.4 ns (4 bytes) to 120 s (*2)
		IFG	0 ns (0 bytes) to 120 s
	PPP/LEX/LAPS/ MAPOS/Cisco HDLC	ISG	427.4 ns (128 bytes) to 120 s
		IBG/IFG	3.3 ns (1 byte) to 120 s (*2)
MU120119A/20A	156M	ISG	427.4 ns (8 bytes) to 120 s
		IBG/IFG	53.4 ns (1 byte) to 120 s
	622M	ISG	106.8 ns (8 bytes) to 120 s
		IBG/IFG	13.4 ns (1 byte) to 120 s
MU150101A (*1)	GFP	ISG	267.0 ns (80 bytes) to 120 s
		IBG	13.4 ns (4 bytes) to 120 s (*2)
		IFG	0 ns (0 byte) to 120 s
	PPP/LEX/LAPS/ MAPOS/Cisco HDLC	ISG	427.4 ns (128 bytes) to 120 s
		IBG/IFG	3.3 ns (1 byte) to 120 s (*2)

*1: This setting is when STM-16/OC-48 is specified. When Contiguous/Virtual Concatenation is specified, the value is in inverse proportion to the set bit rate.

*2: With the MU120103A/04A/05A/06A/03B/04B and MU150101A modules, IBG must be set to 16 bytes or more when Frame Length is set to Random. In this event, therefore, the minimum value of IBG is 53.4 ns for the MU120103A/04A/03B/04B modules, and is 13.4 ns for the MU120105A/06A modules.

*3: The minimum value of IFG/IBG/ISG when the frame length is an odd number or Increment and Random is 72 ns (9 bytes).

List of count/Frame per Burst/Bursts per Stream settable ranges

Module	Parameter	Range
MU120101A/02A/11A/12A	Count	1 to 16,000,000
	Frame per Burst	1 to 16,777,215
	Bursts per Stream	1 to 16,777,215
MU120121A/22A/31A/32A	Count	1 to 16,000,000
	Frame per Burst	1 to 16,777,215
	Bursts per Stream	1 to 1,099,511,627,775
MU120118A/18B/18C/38A MU120103A/04A/05A/06A/19A/20A/03B/04B	Count	1 to 16,000,000
	Frame per Burst	1 to 1,099,511,627,775
	Bursts per Stream	1 to 1,099,511,627,775

5.1.4 Editing transmission data pattern in text format

Reflects the text-format-edited contents of the file to Frame Setting. Pressing button [G] shown in Section 5.1.1 “Stream data display” opens the screen shown below:

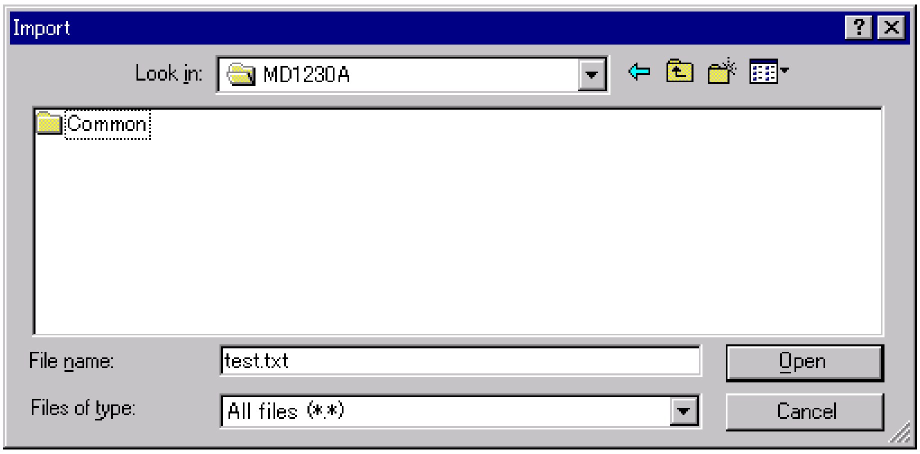


Figure 5.1.4-1 Import screen

Select a file in the Import screen and then press the [Import] button. The contents of the selected text file is reflected to Frame Setting.

(1) Text file editing method and sample formats

The editing method and sample formats for text files are shown below:

Editing method

- Describe the frame data in hexadecimal numbers (“0” to “9”, “a” to “f”, “A” to “F”).
- Two digits of hexadecimal numbers represents one byte data. 0 or more dividers (Space (0x20), tab (0x09), CR (0x0a), LF (0x0d)) can be used to divide the bytes.
- When hexadecimal numbers do not form a 2-character pair (for example, in the case that there is a divider between the characters or one character is remaining at the end of the file), an error occurs.
- The field (from a character other than hexadecimal number and space to the line end) is ignored. (For example, character; can be used as a comment field start.)

Sample format

Ex. 1:

00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

Ex. 2:

00010203
04050607
; Comment
08090a0b
0c0d0e0f

Examples of error

Ex. 1: The character strings following a comma, are processed as comment.

00, 01, 02, 03

Ex. 2: Error because two characters not paired

000 102 03

Ex. 3: Error because file end not two paired characters

00 01 02 03 0

5.1.5 Exporting/importing stream settings

Exports/imports the stream setting contents to a CSV file. This function allows editing of stream settings without operating the MD1230B screen; edit the exported CSV file using any text editor or spreadsheet application and then import the file. In addition, multiple stream settings can be created at one time by adding lines to the exported CSV file and then importing it.

Pressing button [L] shown in 5.1.1 "Stream data display" displays the menu for selection from [Edit], [Export] and [Import].

Export (Export)

Exports the setting contents of a single selected stream to a CSV file. The CSV file can be specified using any name.

Import

Imports a single selected CSV file and inserts the stream settings above the selected stream.

Edit

Exports the setting contents of a single selected stream to a CSV file and starts the application program that is related to the *.csv file. Edit the CSV file and exit the application. The edited CSV file is imported to replace the selected stream data.

CSV file format

The first line describes the file information that is used for check at importing.
The second line describes the setting group name.
The third line describes the setting item names.
The fourth and subsequent lines describe the setting value for each setting item.

Immediately after being exported, the setting values for the exported stream are shown on the fourth line. Modify the values on the fourth line to edit the stream setting. To create multiple stream settings, copy the fourth line and paste it to the fifth or subsequent lines to add setting value lines.

Describing the setting values

- When multiple setting values exist for one setting item, use an underscore (_) to separate them.
- Attach "#B" at the beginning of a binary setting value.
- Attach "#H" at the beginning of a hexadecimal setting value.

Notes:

1. When an error such as out of range occurs while reflecting the setting during import processing, an error dialog box appears and the setting during the import processing stops halfway.

2. Export can be performed for a single stream; multiple stream data cannot be exported to one file. In addition, streams with different protocol headers cannot be created by a single CSV file because the setting item contents vary depending on the protocol header type.

5.2 Counting Transmit/Receive Data

5.2.1 Operating counter

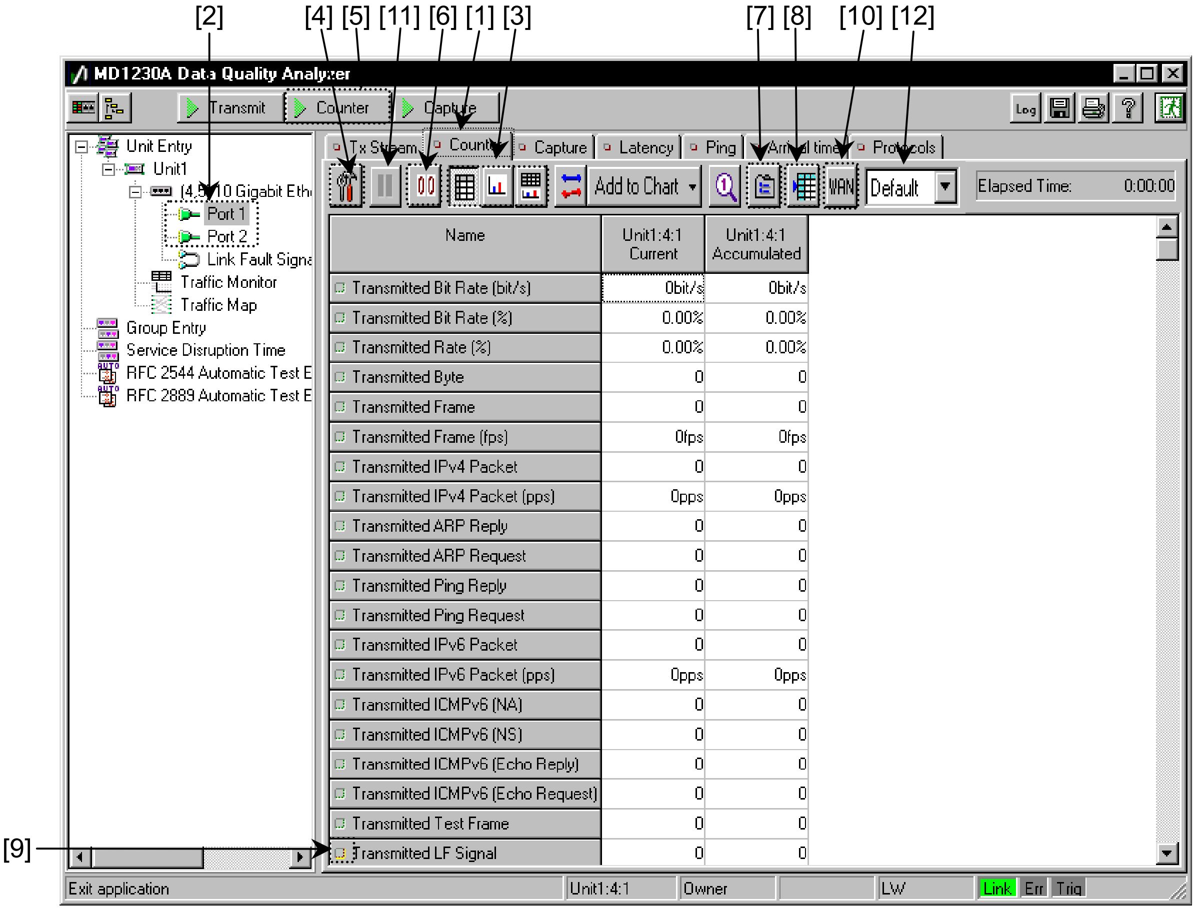


Figure 5.2.1-1 Tree View – Counter screen

[1] Selects **Counter** tab.

[2] Selects a "Port" where you want to count data.

[3] Switches the display between "Table" / "Table+Graph" / "Graph".

[4] Sets the counter filter.

For the details, refer to Section 5.9.1 "Setting counter filter".

[5] Press **Counter**.

[6] Clears the counter.

[7] Selects the counter display items.

Note:

The counter display is updated only at the start of counting.

For the details, refer to Section 5.2.2 "Selecting displayed item".

[8] The currently displayed contents, including the title, are saved in a CSV-format file as is.
The first line is the title line. For the second and subsequent lines, the name, current value, and accumulated value of each counter are output in this order. The units and commas (as separators) are also output. The following figure shows an output example.

```
Name,Unit1:3:2 Current,Unit1:3:2 Accumulated
Transmitted Bit Rate (bit/s),"761,905,704bit/s","526,107,100bit/s"
Transmitted Bit Rate (%),76.19%,52.61%
Transmitted Rate (%),100.00%,69.05%
Transmitted Byte,"95,238,213","1,446,794,524"
Transmitted Frame,"1,488,097","22,606,165"11
```

Figure 5.2.1-2 Counter CSV export example

[9] Lights up for the counters that are incremented. This is enabled only during counting operation.

[10] Displays WAN-PHY Counter screen. This screen displays error/alarm counts in the physical layer of the WAN-PHY XENPAK Transceiver and pointer monitor values. The button color changes to red after an error/alarm is detected as follows:

When error/alarm not detected

When error/alarm detected

Press the [6]  button to clear the counter and return the red button to the original color.

This button is displayed only when the WAN-PHY option is installed in the MU120118A/18B/18C and WAN-PHY XENPAK Transceiver is installed and the PCS type is set to WAN.

For the WAN-PHY Counter screen, read Section 5.2.7 “WAN-PHY counter”.

[11] Stops counter updating. This button is enabled during counting operation only.

[12] Frequently used counter items are provided in this list box.

See Section 5.2.2 “Selecting displayed item” for details.

5.2.2 Selecting displayed item

Pressing the [7] button in 5.2.1 “Operating counter” displays the following screen:

For the counter items, refer to Appendix F “Counter Item List”.

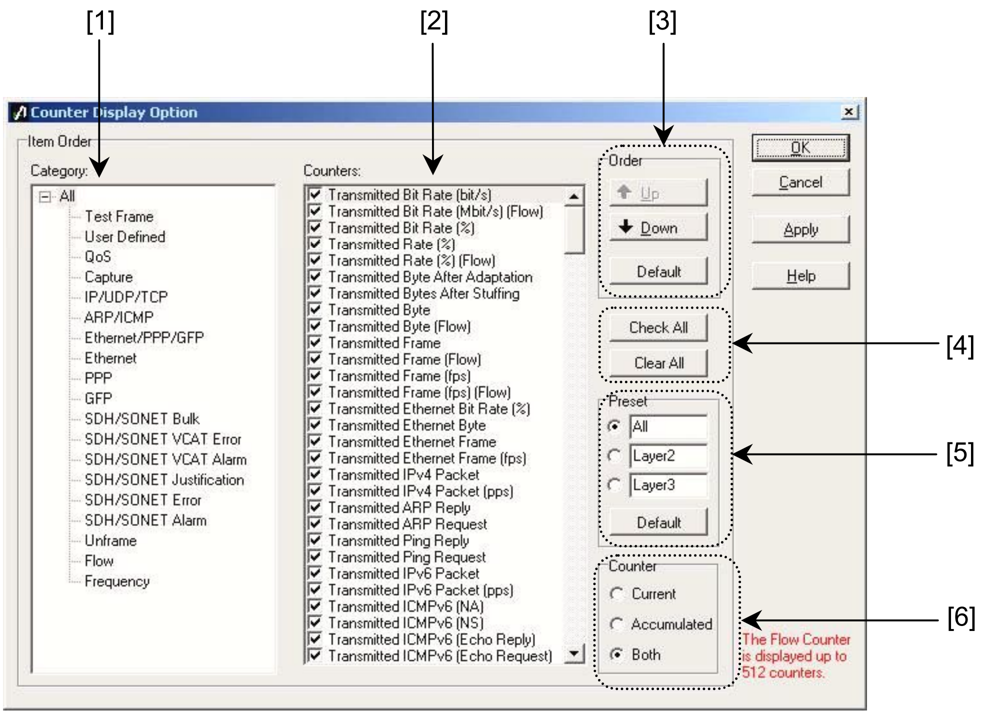


Figure 5.2.2-1 Counter display item setting screen

[1] Groups and displays the counter names to be displayed in Counters.

Table 5.2.2-1 Counter Category List

Category	Description
All	All counters
Test Frame	Counters related to measurement using test frames
User Defined	Counters defined by the user from the Counter filter setting screen
QoS	Counters that classify received frames according to the QoS field. (Whether the QoS field is the TOS field or the User Priority field of the VLAN tag can be selected from the Counter filter setting screen.)
Capture	Counters related to capture filter/trigger
IP/UDP/TCP	Counters related to IP/UDP/TCP
ARP/ICMP	Counters related to ARP/ICMP
Ethernet/PPP/GFP	Counters common to Ethernet/PPP/GFP
Ethernet	Counters specific to Ethernet
PPP	Counters specific to PPP
GFP	Counters specific to GFP
SDH/SONET Bulk	Counters related to bulk mapping of SDH/SONET

Category	Description
SDH/SONET VCAT Error	Error counters related to virtual concatenation of SDH/SONET
SDH/SONET VCAT Alarm	Alarm counters related to virtual concatenation of SDH/SONET
SDH/SONET Justification	Counters related to justification of SDH/SONET
SDH/SONET Error	Error counters related to SDH/SONET and independent of multiplexing and mapping
SDH/SONET Alarm	Alarm counters related to SDH/SONET and independent of multiplexing and mapping
Unframe	Counters related to Unframed Mapping and SDH/SONET Unframed Mapping
Flow	Counters related to the multiflow counter
Frequency	Counters related to frequency measurement
Impairment	Counters related to Traffic Impairment Emulator function

Note:

Some counters selected in this screen may not be displayed. The selected counters are displayed if the conditions required for display, such as module types, modes, and installed option are satisfied.

[2] Groups the displayed counters. Checked counters are displayed while unchecked ones are not.

[3] Sorts the displayed order of counters. Pressing **Default** restores the initial order.

[4] Views or hides all items displayed in Counters.

[5] Up to three Preset settings of counter display items can be set. Items set here can be selected in [12] in Figure 5.2.1-1. Pressing [Default] restores the initial status. (Initial status can also be restored by the operation described in Section 11.1.4 “Initializing set data.”)

Initial Preset settings:

1.All: Displays all counter items.
2.Layer2: Displays Layer 2 counter items.
3.Layer3: Displays counter items up to Layer 3.

[6] Selects counter display item (Current, Accumulated or Both).

Pressing **OK** or **Apply** reflects the settings. Pressing **Cancel** does not reflect the settings. These settings are common for all port counters.

Note:

Even if the invalid counter by option composition and setup of each port is checked on Counter display item setting screen, it is not displayed on a counter screen.

5.2.3 Displaying table

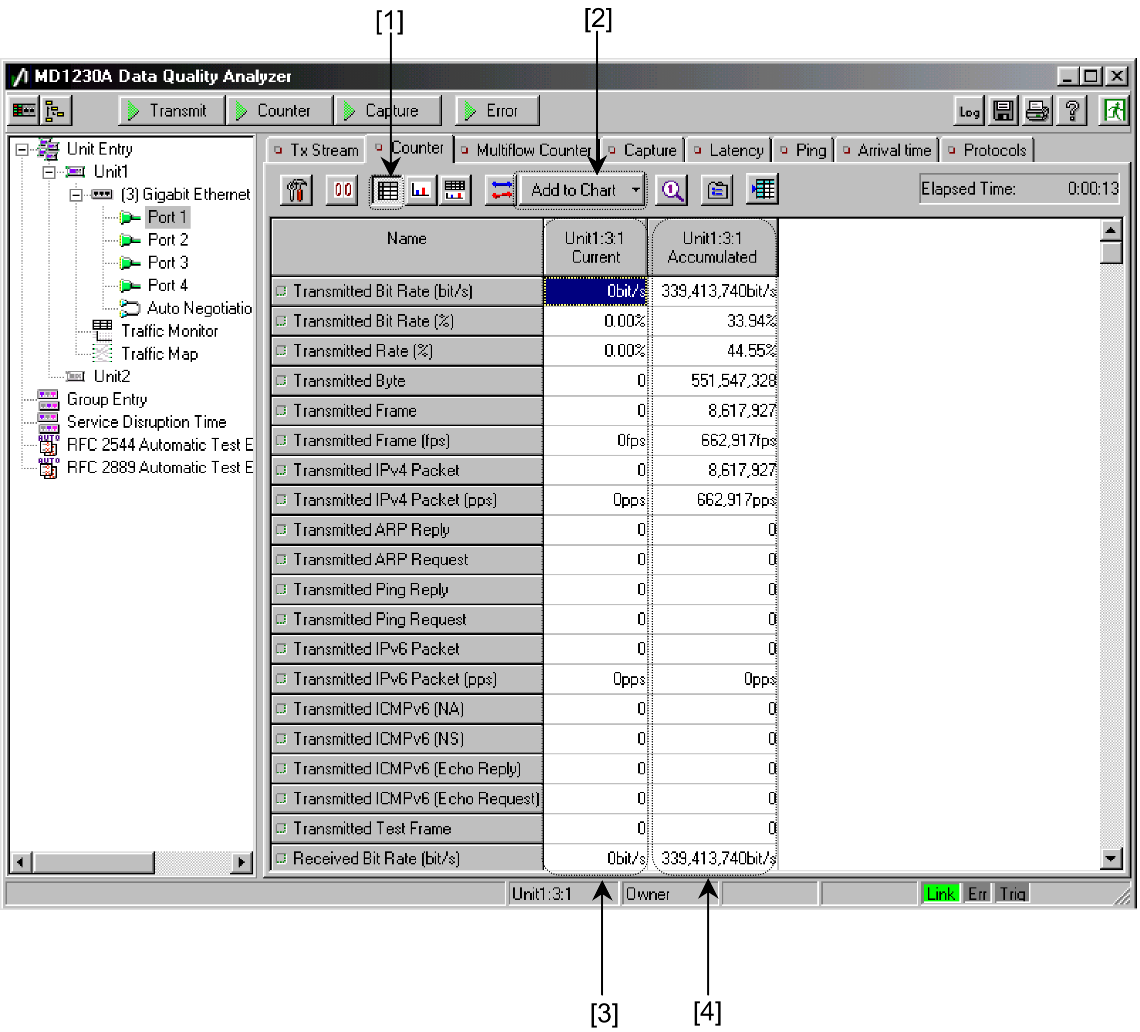


Figure 5.2.3-1 Tree View – Counter (table display) screen

[1] Sets the display method to the table display.

[2] Displays the Current value of the selected counter items in the graph.

For the graph display, refer to Section 5.2.4 "Displaying graph".

[3] Current indicates the value counted in the latest one-second interval.

[4] Indications in the "Accumulated" row differ in terms of item counter and ratio measurement counter. It indicates the accumulated counter value from the measurement start time to the current time for the item counter. The ratio against the accumulated time from the measurement start time to the current time for the ratio measurement counter.

Notes:

The pop-up menu is displayed when the right button of the mouse is clicked on each cell or the Set button is pressed. The following operations are available using this pop-up menu.

1. When **Line n (n = 1 to 7)** or **Bar 1** is selected, the current value of the counter that corresponds to the clicked cell is displayed in the graph.

2. **(none)** can be selected for the cells that are already displayed in the graph. If **(none)** is selected, the counter corresponding to the cell is deleted from the graph.

3. When **Copy** is selected, the content displayed in the cell is copied to the clipboard.
   The contents of two or more cells can be copied at the same time by specifying the copy area in advance. The copy area can be selected by dragging the mouse, or by moving the cursor while holding down the shift key on the keyboard. When the contents of several cells are copied, the rows are delimited by line feed codes and the columns are delimited by tabs. The copied contents, therefore, can be pasted onto any text editor or spreadsheet application.

When displaying the table, multiple ports can be displayed all together by selecting the port group instead of individual ports.

☞ For the port group settings, refer to Section 10.1 “Simultaneous Operation of Multiple Ports (Port Group Function)”.

5.2.4 Displaying graph

The current value of the counter is displayed in broken line graph or bar graph. Up to eight values can be displayed at the same time.

Note:

The Accumulated value is not displayed.

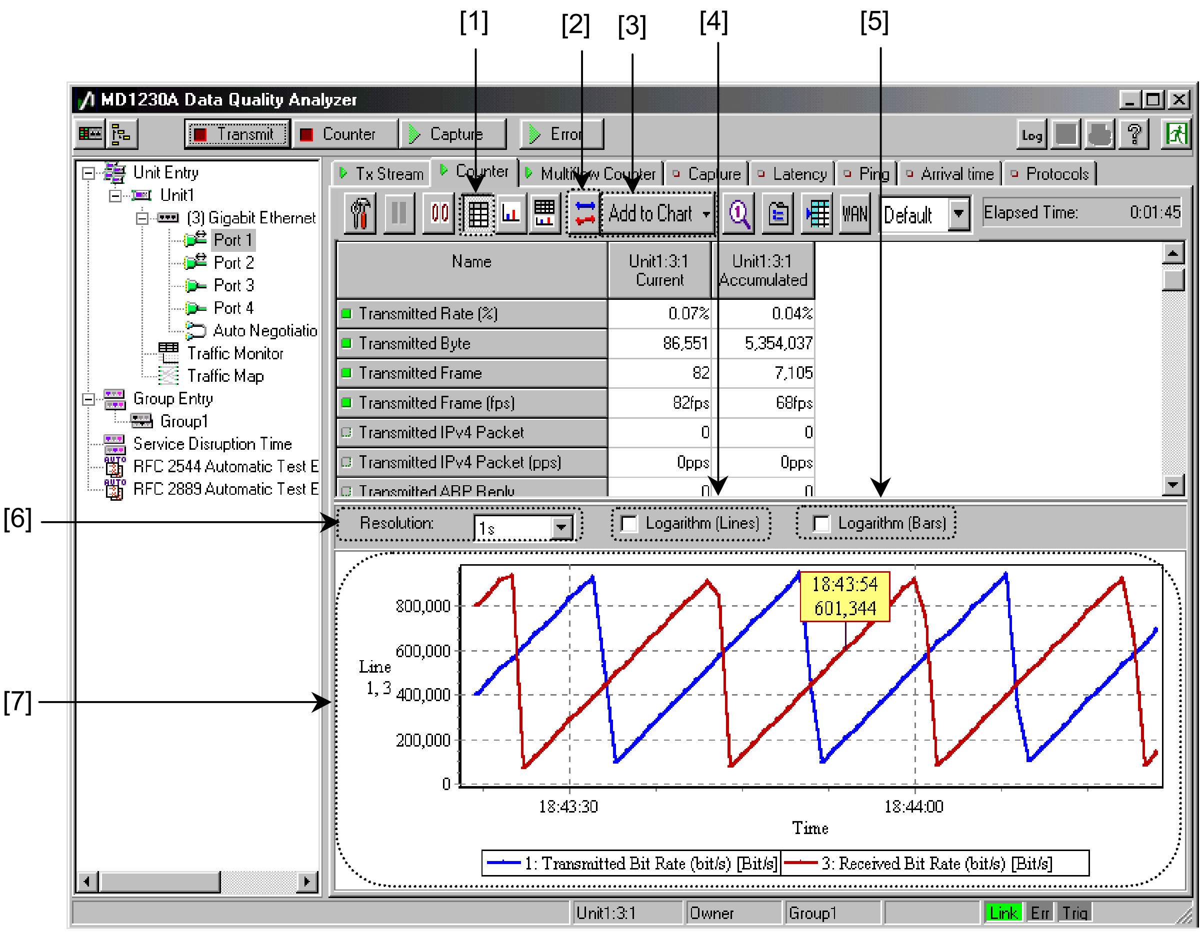


Figure 5.2.4-1 Tree View – Counter screen (graph display)

[1] Switches the display to the graph.

[2] Selects the port and item for display in the graph. The following Counter Chart Selection screen is displayed.

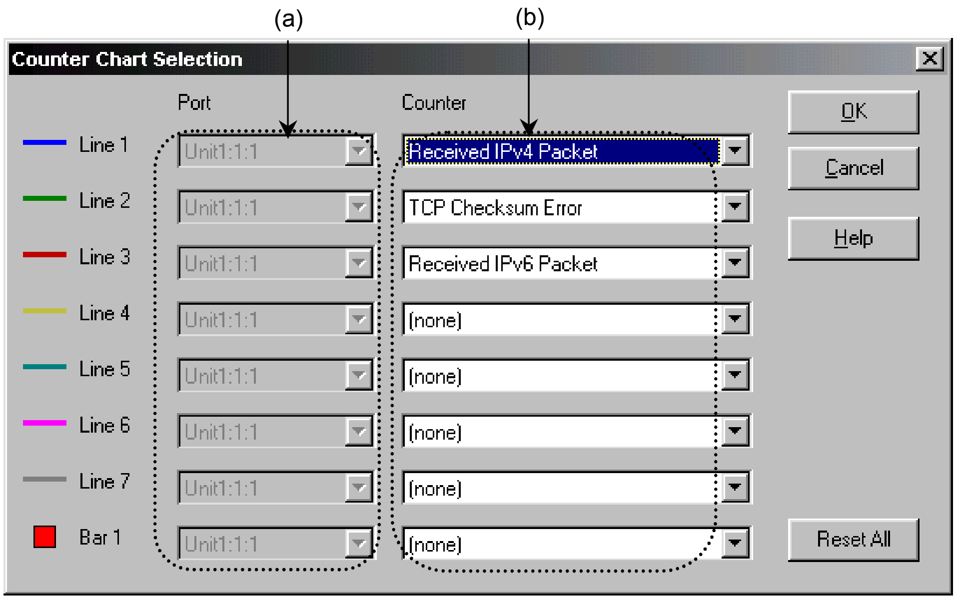


Figure 5.2.4-2 Counter Chart Selection screen

(a) Selects the port for display in the graph. The measured port is set. When the measured port is a port group, a port in the port group can be selected and set.

(b) Selects the item for display in the graph.

[3] Display the Current value of the counter selected in the table in the Graph format.

[4] Displays the vertical axis of the line graph in the logarithmic scale.

[5] Displays the vertical axis of the bar graph in the logarithmic scale.

[6] Selects the graph resolution. The following values can be selected:

- 1 second
- 1 minute
- 15 minutes
- 60 minutes

[7] The graph of the measurement result is displayed. The following operation can be performed in this field by using the mouse.

- Clicking on a point on the graph marks its point. The marker displays horizontal axis value (time) and the vertical axis value (count data) of the marked point.
- If the mouse is dragged with the left button to the lower-right direction on the graph, that range is enlarged for display.
- If the mouse is dragged with the left button to the upper-left direction on the graph, the zoom display is cancelled.
- If the mouse is dragged with the right button on the graph, the graph display area is moved parallel with it.

- If the right mouse button is clicked on this screen, the following menus are displayed. The image of the graph can be copied to clipboard or save to a file.
  - Undo Zoom — Cancels expansion display.
  - Copy as Bitmap — Records the image of the graph in bitmap format to clipboard.
  - Copy as Metafile — Records the image of the graph in metafile format to clip board.
  - Save — Saves the image of the graph to a file. Bitmap format (*.bmp) and metafile format (*.wmf, *.emf) are selectable.

5.2.5 Display by zooming in

Zooms and displays the counted value of 1 item or 2 items.

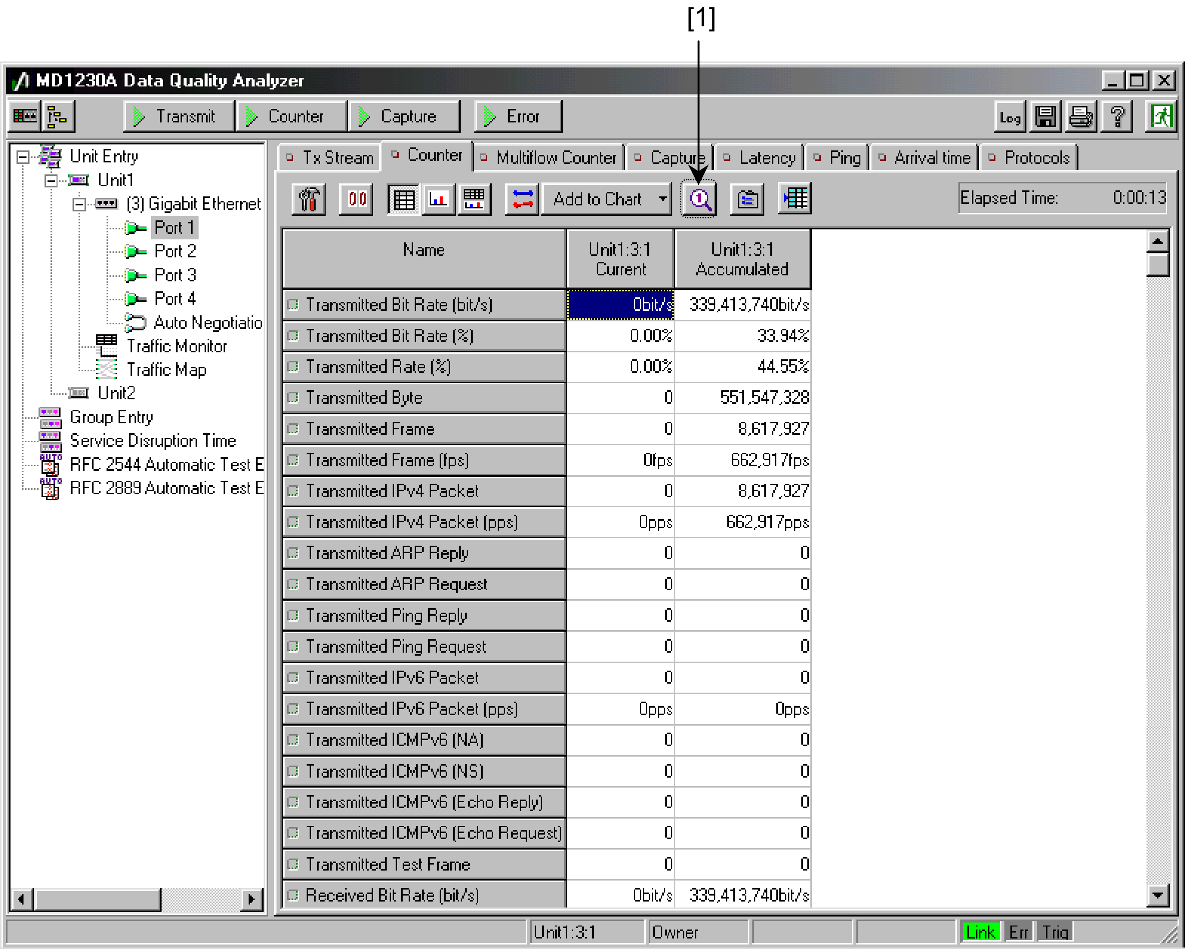


Figure 5.2.5-1 Tree View – Counter screen

[1] Opens the Counter Selection.

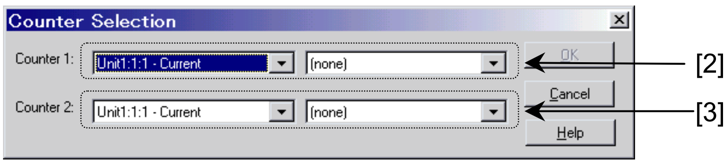


Figure 5.2.5-2 Display item selection screen

[2] Selects the first counter item to be displayed by zooming in.

[3] Selects the second counter item to be displayed by zooming in.

Basic Measurement (Manual Test)

5

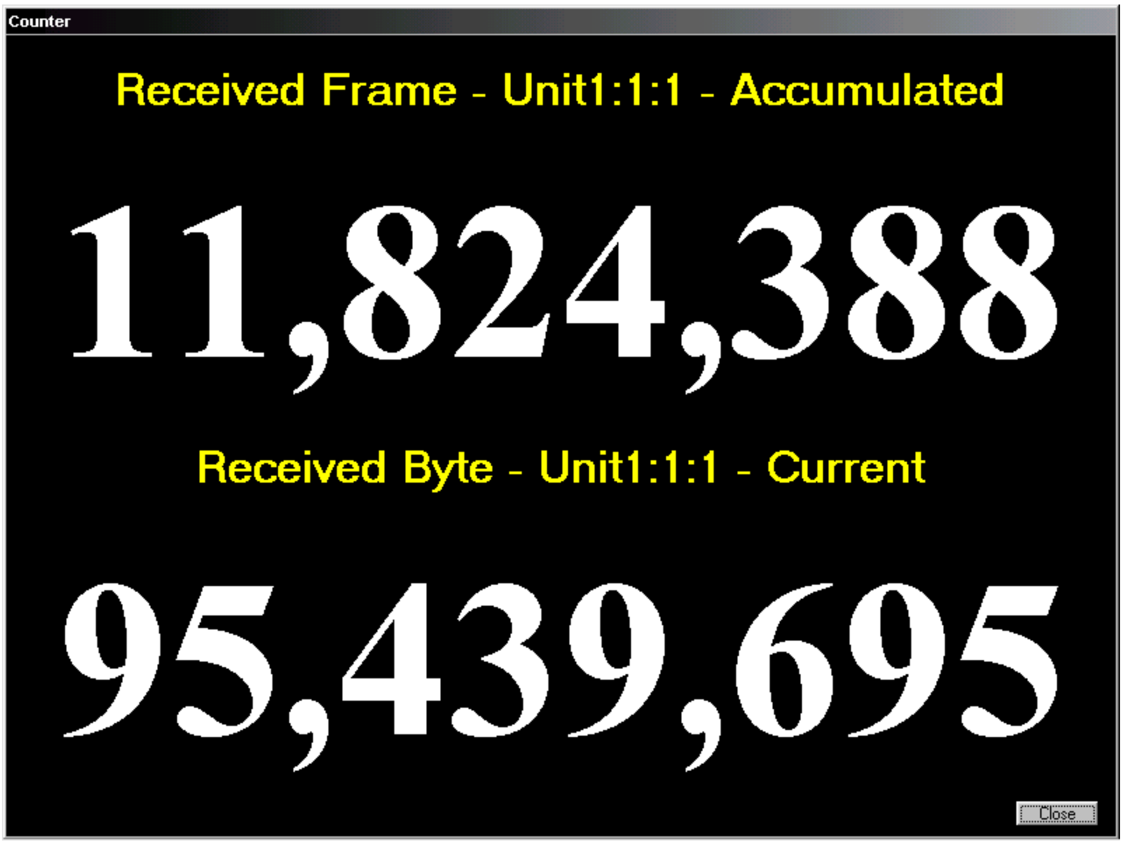


Figure 5.2.5-3 Display-by-zooming-in screen

5.2.6 Saving counter result in log

Counter results can be saved in the log with an interval from 1 second to 24 hours. The log files are to be created in CSV (Comma Separated Values) format. The value of the counter selected in section 5.2.2 "Selecting displayed item" is output to the log.

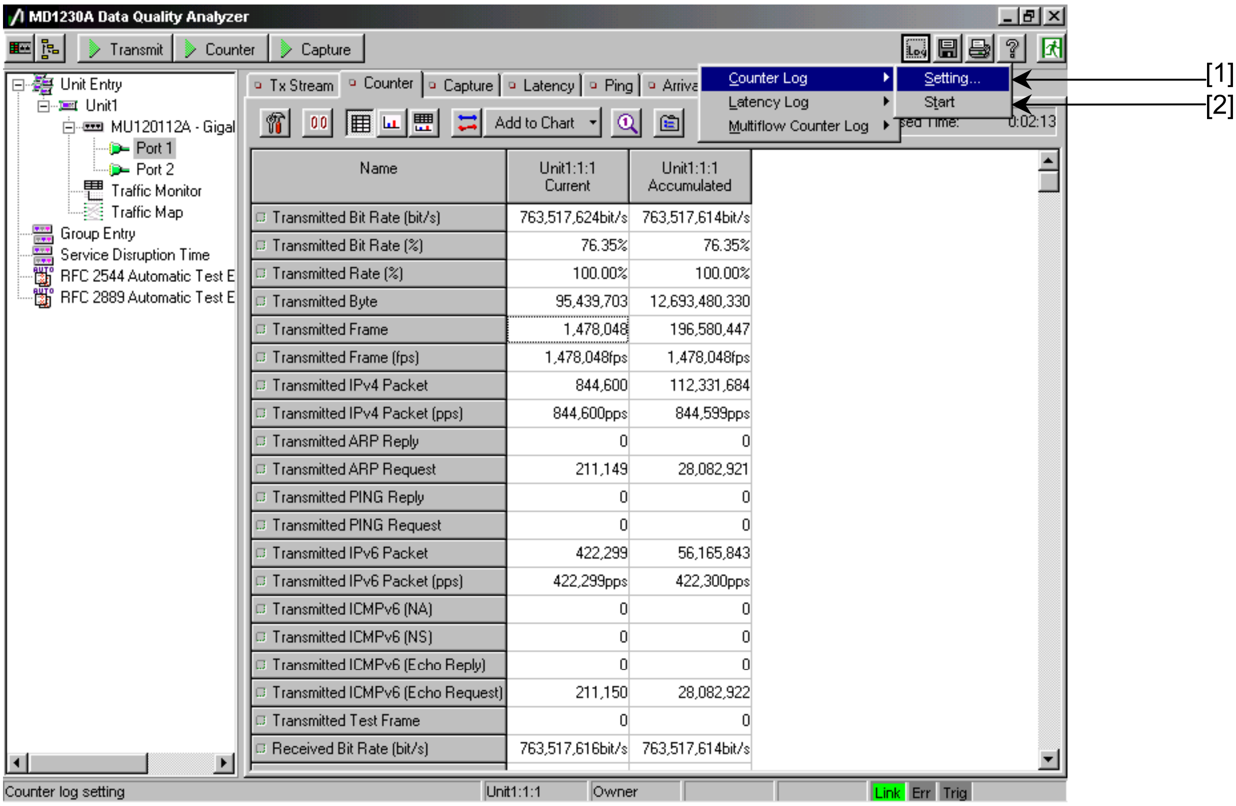


Figure 5.2.6-1 Tree View – Counter screen (Log)

[1] Opens the Counter Log Setting.

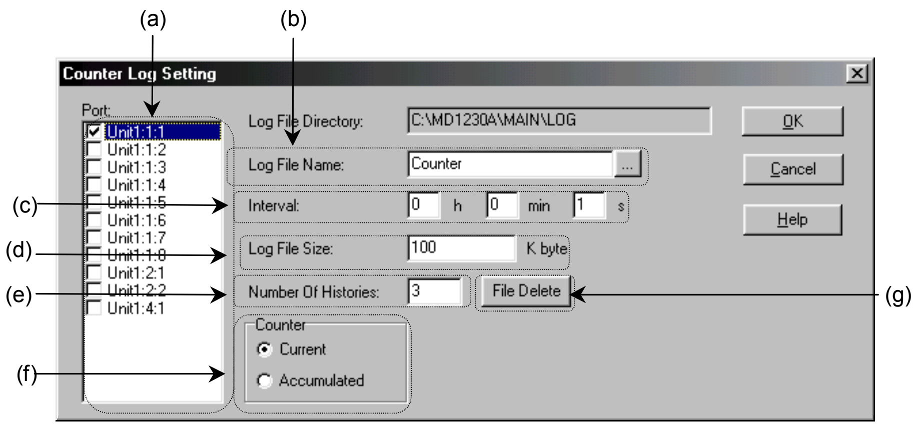


Figure 5.2.6-2 Counter log setting screen

(a) Selects the port where the log is saved.
The ports checked in the check box become targets for log saving.

(b) Sets the log file name to be saved.

(c) Sets the log saving interval (0 s to 24 h, initial value: 10 s). If 0 is specified, data is output only once to the log file on starting.

(d) Sets the maximum log file size in KB units (100 KB to 262144 KB, initial value: 1000 KB). If the size of the log file reaches this size, the following processing is performed.

- Suffix 1.cvs is appended to the file name of the log file. This file is called a log history file.
- If a log history file which already has suffix 1.cvs already exists, this suffix 1.cvs is changed to 2.cvs. The same applies to 2.cvs, 3.cvs, and so on.
- A new log file of the name specified in (b) is created, and the subsequent log is written to this file.

(e) Sets the number of log history files (0 to 256, initial value: 3). When the number of log history files exceeds this value, the old log history file is deleted.
If 0 is set, the log history file is not changed as described in (d).

(f) Set the counter type to be saved (initial value: Accumulated).

- Current Outputs the Current value of the count result to the log file.
- Accumulated Outputs the Accumulated value of the count result to the log file.

(g) Deletes all log and log history files set in Step (b).

[2] Starts log saving. The log file is cleared when saving the log is started.

Notes:

1. The output interval of the log differs depending upon the load status of the system and may not be as set by Interval.
2. If a file of the specified log file name already exists when the log function is started, it is overwritten.
3. Remote command operations and file saving/loading cannot be executed when the log function is operating.
4. Up to 40 ports can be saved in log.

5.2.7 WAN-PHY counter

The following screen is displayed when the [10] button explained in Section 5.2.1 "Operating counter" is pressed. It displays error/alarm counts for the WAN-PHY XENPAK Transceiver physical layer and monitoring pointer values.

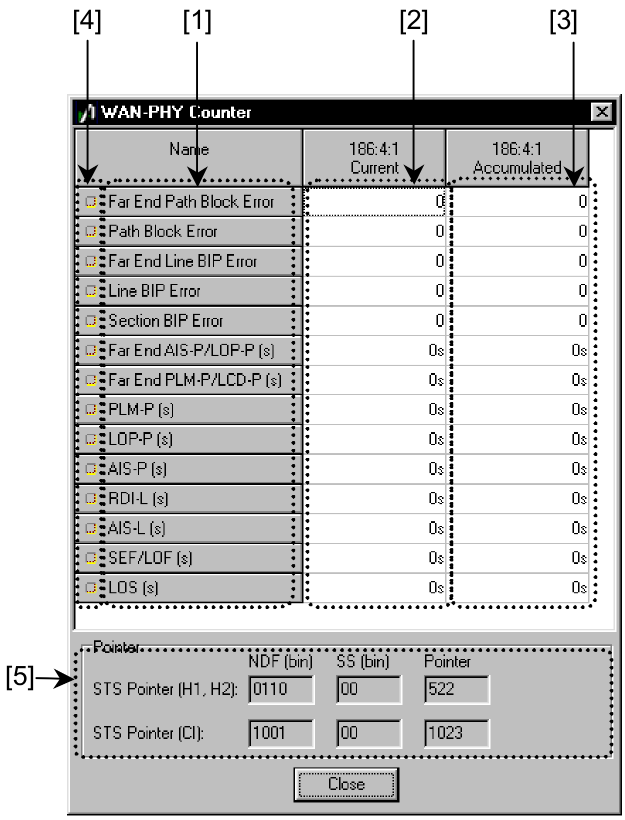


Figure 5.2.7-1 WAN-PHY counter screen

[1] The WAN-PHY error and alarm counts are displayed collectively. Error counts are displayed as follows. The counts value is the number of detected errors.
- Far End Path Block Error
- Path Block Error
- Far End Line BIP Error
- Line BIP Error
- Section BIP Error

Alarm counts are displayed as follows. The counts value is the detected alarm time in seconds.
- Far End AIS-P/LOP-P
- Far End PLM-P/LCD-P
- PLM-P
- LOP-P (Note 1)

- AIS-P
- RDI-L
- AIS-L
- SEF/LOF (Note 2)
- LOS

Notes:

1. To detect LOP-P alarms, LOP-P Detection must be set at the Port Setting screen. However when connecting equipment with a Concatenation Indication Bit (SS) value other than 00(bin) (e.g. SDH standard equipment), set off. If on is set, LOP-P alarm are detected continuously.

2. The specification to detect/remove SEF/LOP is different from IEEE802.3ae. To detect SEF/LOF alarms, receive four continuous error frames. To release SEF/LOF alarms, receive five continuous normal frames. The specification for other counters meets the IEEE802.3ae recommendations.

[2] Displays count in last 1-second interval.

[3] Displays total count from measurement start to current time.

[4] Lights when count incremented. This is enabled only when the counter is operating.

[5] Displays STS Pointer (H1,H2) and STS Pointer (CI). Following items are displayed.
NDF(bin): NDA is displayed in binary.
SS(bin): SS is displayed in binary.
Pointer: Pointer is displayed in decimal.

5.3 Counting Number of Transmit/Receive Frames of Each Flow (Multiflow Counter)

* This function can be used at the MU120131A/32A/38A and ports 1 and 2 of MU120121A/22A.

5.3.1 Outline of multiflow counter function

The multiflow counter can count the number of frames transmitted or received of each Flow ID. A Flow ID is the value of a specific field of a frame. The user can specify a field to have the Flow ID. For example, by setting the Flow ID for a UDP destination port number filed, all the received UDP packets of each UDP destination port number can be counted. During counting, the number of frames of some Flows can be monitored. After counting, the total number of frames of all Flows can be displayed.

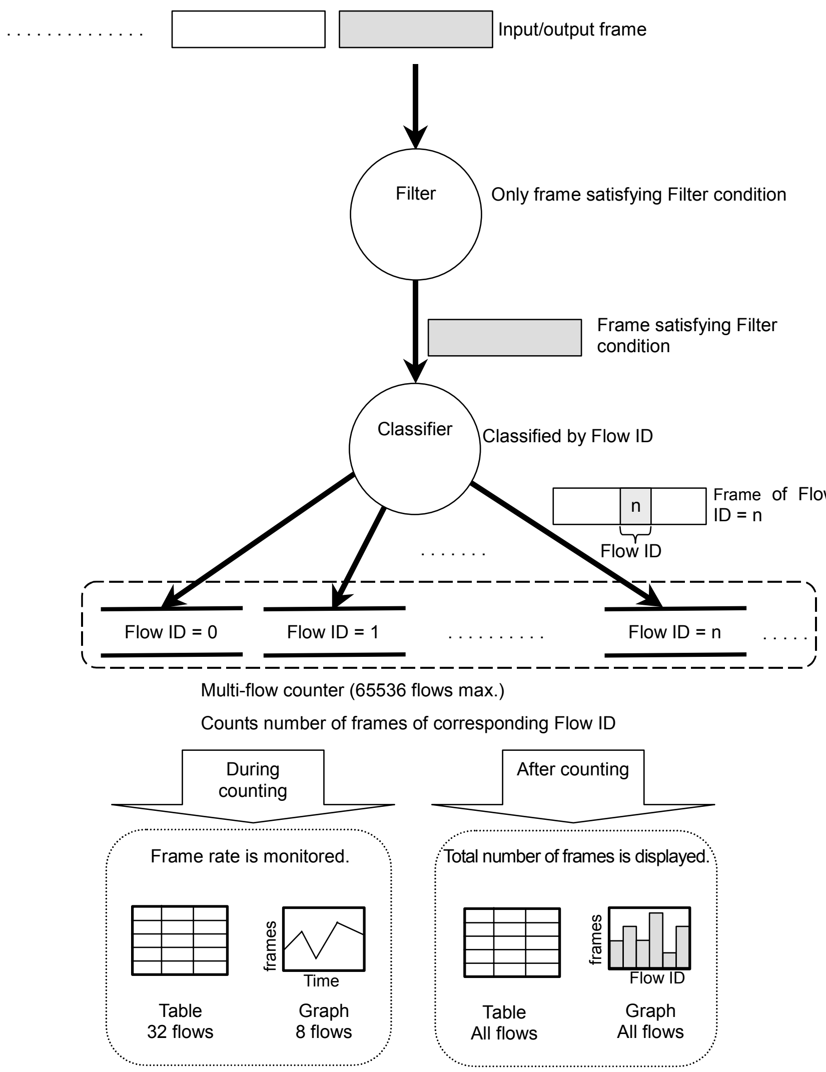


Figure 5.3.1-1 Multi Flow Counter outline

5.3.2　Measuring with MU120121A/22A

5.3.2.1　Operation before counting

Before counting is started, specify the type of the frame to be counted, definition of the Flow ID, and the Flow ID to be monitored during counting.

(1) Calling setting of Multiflow Counter

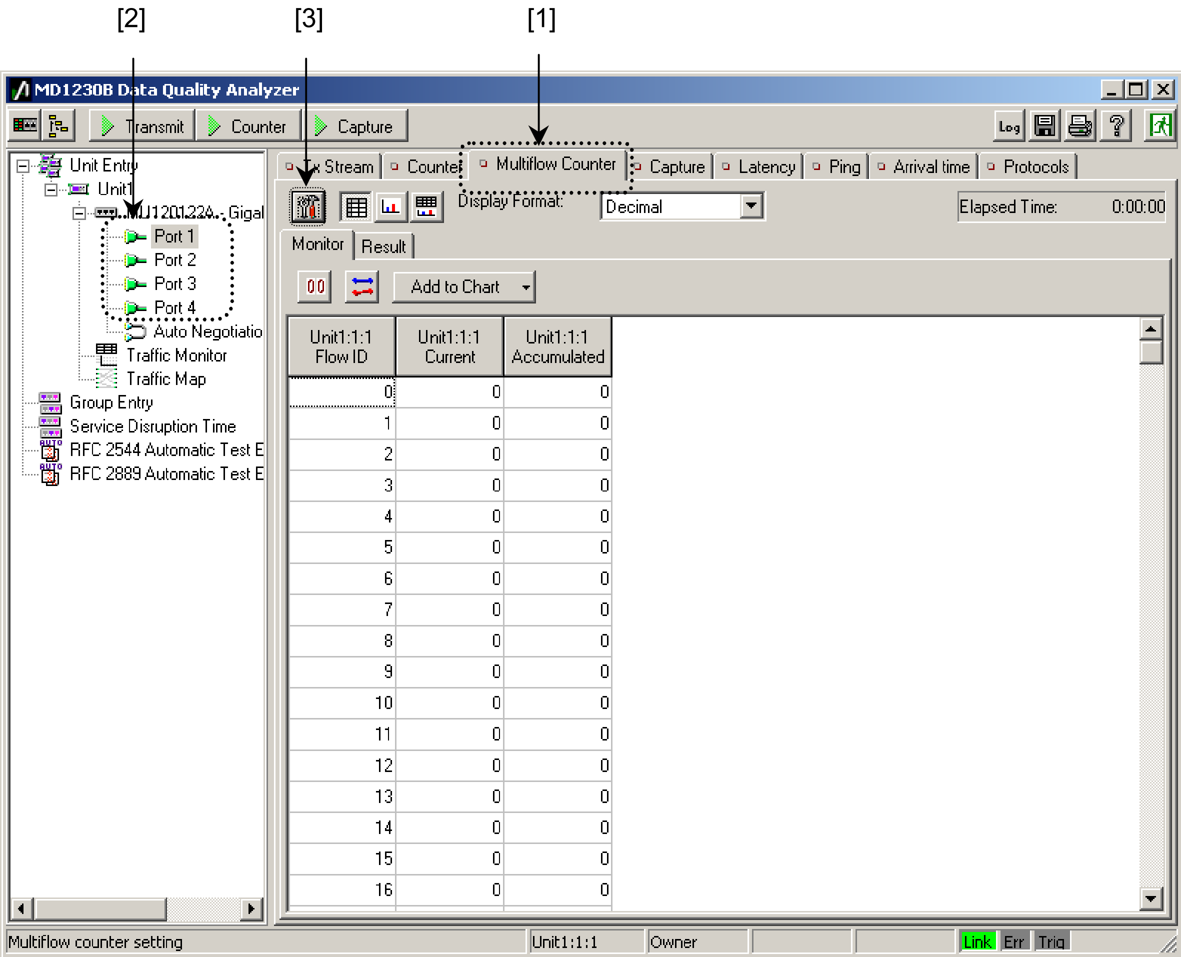


Figure 5.3.2.1-1　Multiflow Counter Tab screen

[1]　Selects **Multiflow Counter** tab.

[2]　Selects **Port** to be counted.

[3]　Sets Multiflow Counter.

☞ For details, refer to “(2) Setting Flow ID” in Section 5.3.2.1.

(2) Setting Flow ID

When button [3] in “(1) Calling setting of Multiflow Counter” in Section 5.3.2.1 is pressed, the following screen is displayed. On this screen, the Flow ID is mainly defined.

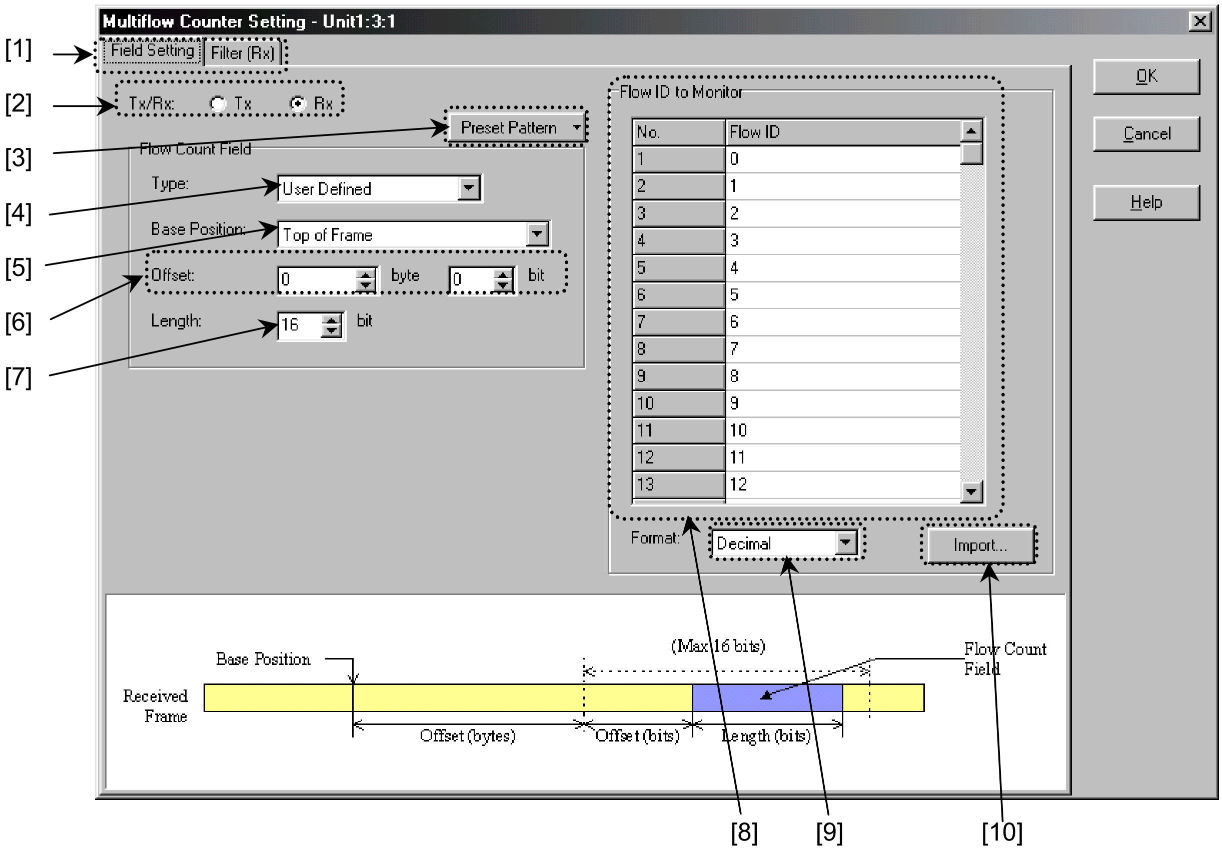


Figure 5.3.2.1-2 Multiflow Counter Setting (Field Setting tab) screen

[1] Select **Field Setting** tab or **Filter (RX)** tab.
Select **Field Setting** tab to set the Flow ID on this screen.

For details, refer to “(3) Setting filter” in Section 5.3.2.1.

[2] Specify whether the frame to be counted is a frame transmitted (Tx) or received (Rx) from MD1230B. Both cannot be selected at the same time.

- Tx
- Rx

[3] Click this button to set the settings for Flow ID ([4] to [7]) using a preset pattern. [9] Format is also changed at this time. When a preset pattern is selected from the list, the corresponding parameters are set accordingly, as shown in the table below.
A set pattern can be used as is, but it can also be used after being partially modified.

Table 5.3.2.1-1 List of preset pattern settings

Preset Pattern	Base Position	Offset (byte)	Offset (bit)	Length
MAC DA (Note)	Top of Frame	4	0	16
MAC SA (Note)	Top of Frame	10	0	16
Ether Type	Top of Frame	12	0	16
VLAN Priority #1	Top of VLAN Tag 1	2	0	3
VLAN Priority #2	Top of VLAN Tag 2	2	0	3
VLAN ID #1	Top of VLAN Tag 1	2	4	12
VLAN ID #2	Top of VLAN Tag 2	2	4	12
Ethernet OAM MEG Level	Top of Ethernet OAM PDU	0	0	3
Ethernet OAM MD Level	Top of Ethernet OAM PDU	0	0	3
Ethernet OAM OpCode	Top of Ethernet OAM PDU	1	0	8
Ethernet OAM Period	Top of Ethernet OAM PDU	2	5	3
IPv4 Source Address (Note)	Top of IPv4 Header	14	0	16
IPv4 Destination Address (Note)	Top of IPv4 Header	18	0	16
IPv4 Protocol	Top of IPv4 Header	9	0	8
IPv4 TOS Precedence	Top of IPv4 Header	1	0	3
IPv4 DSCP	Top of IPv4 Header	1	0	6
IPv4 TTL	Top of IPv4 Header	8	0	8
IPv6 Source Address (Note)	Top of IPv6 Header	22	0	16
IPv6 Destination Address (Note)	Top of IPv6 Header	38	0	16
IPv6 Next Header	Top of IPv6 Header	6	0	8
IPv6 Traffic Class	Top of IPv6 Header	0	4	8
IPv6 Hop Limit	Top of IPv6 Header	7	0	8
UDP Source Port	Top of UDP Header	0	0	16
UDP Destination Port	Top of UDP Header	2	0	16
TCP Source Port	Top of TCP Header	0	0	16
TCP Destination Port	Top of TCP Header	2	0	16

Note:

When the length of a preset pattern is longer than 16, which is the maximum value specified for Length, the last 16 bits of the preset pattern are set as Flow ID. When IPv6 Source Address is set as a preset pattern, for example, the lower 16 bits of the IPv6 Source Address are set as Flow ID. To set the upper 16 bits of the IPv6 Source Address, decrease offset by 14 bytes.

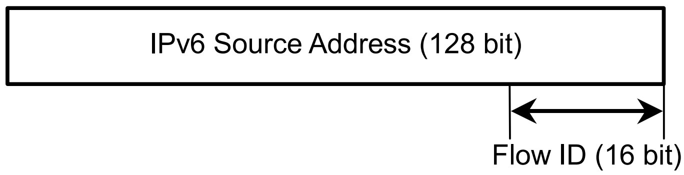


Figure 5.3.2.1-3 When IPv6 Source Address is selected as preset pattern

[4] Select Type of Flow ID from the following.

- User Defined — Sets the field to have Flow ID as described in [4], [5], and [6].
- Test Frame Flow ID — Sets Flow ID of Test Frame.

For setting the Flow ID of Test Frame, refer to “(26) Editing Data fields” in Section 5.1.2.

[5] Select Base Position from the following (*1).

- Top of Frame
- Top of VLAN Tag 1 (Note 2)
- Top of VLAN Tag 2 (Note 2)

  . . .

- Top of VLAN Tag 10 (Note 2)
- Top of Ethernet OAM PDU (Note 3)
- Top of IPv4 Header
- Top of IPv6 Header (Note 4)
- IPv6 Hop-by-hop Option Header (Note 4)
- IPv6 Destination Option Header (Note 4)
- IPv6 Routing Header (Note 4)
- IPv6 Fragment Header (Note 4)
- Top of TCP Header
- Top of UDP Header

Notes:

1. The frame which doesn’t have the selected Base Position is not counted.
2. When setting VLAN Tag at Base Position, set TPID at **VLAN** tab of Port Setting (refer to Section 4.5.6 (1)).
   Detects VLAN Tag according to this setting.
   The Base Position is at the top of the TPID field. (Refer to Example 1 of *1 below.)
3. The Ethernet OAM option is required.
4. The IPv6 Expansion option is required.

[6] Set an Offset from Base Position by a combination of byte and bit (*1).
Offset (byte) Value: 0 to 65535 (dec)
Offset (bit) (*2) Value: 0 to 7 (dec)

[7] Set the Length of the Flow ID filed in bit units (*1) (*2).
Value: 1 to 16 (dec)

[8] Set the Flow ID to be monitored real-time during counting. Thirty-two Flow IDs can be registered.
Value: 0 to 65535 (dec)
0000 to ffff (hex)
00000000 00000000 to 11111111 11111111 (bin)

[9] Select the base number of the Flow ID value to be displayed in [8].

- Decimal Decimal number
- Hexadecimal Hexadecimal number
- Binary Binary number

[10] Import the setting of the Flow ID field from the text file.
The text file format describes Flow ID of decimal number in the order of No., separated by line feed code.
For example, shown below; each Flow ID at No. 1, No. 2, and No. 3 is set to the data at 11, 12, and 13, below. Flow IDs at No. 4 and the subsequent No., are not set.

```
11
12
13
```

Figure 5.3.2.1-4 Example of format of text file to be imported

*1: If Type is User Defined, the Flow ID is defined as follows.

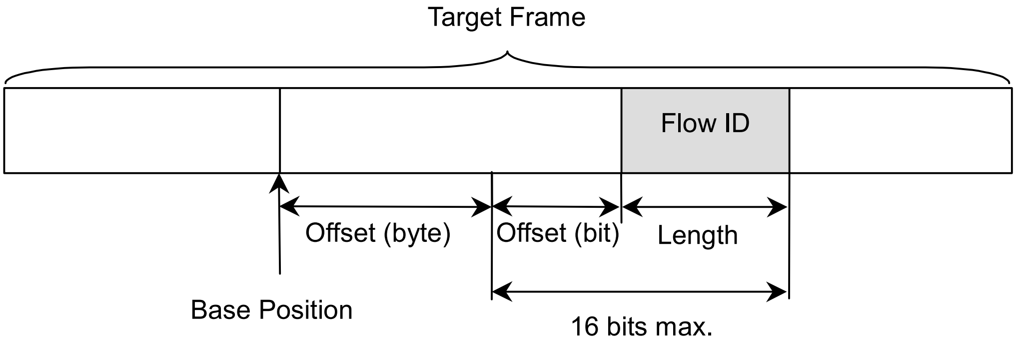


Figure 5.3.2.1-5 Definition of the Flow ID

Example 1:

Make the following setting to count each VLAN ID for the first-stage VLAN tag.

- Filter Any frame
- Base Position Top of VLAN Tag 1
- Offset (byte) 2
- Offset (bit) 4
- Length 12

Example 2:

Make the following setting to count each destination UDP port number.

- Filter Any frame
- Base Position Top of UDP Header
- Offset (byte) 2
- Offset (bit) 0
- Length 16

*2: The condition Length + Offset (bit) ≤ 16 must be satisfied.

(3) Setting filter

When "Filter (Rx)" is selected in [1] in "(2) Setting Flow ID" in Section 5.3.2.1, the following screen is displayed.

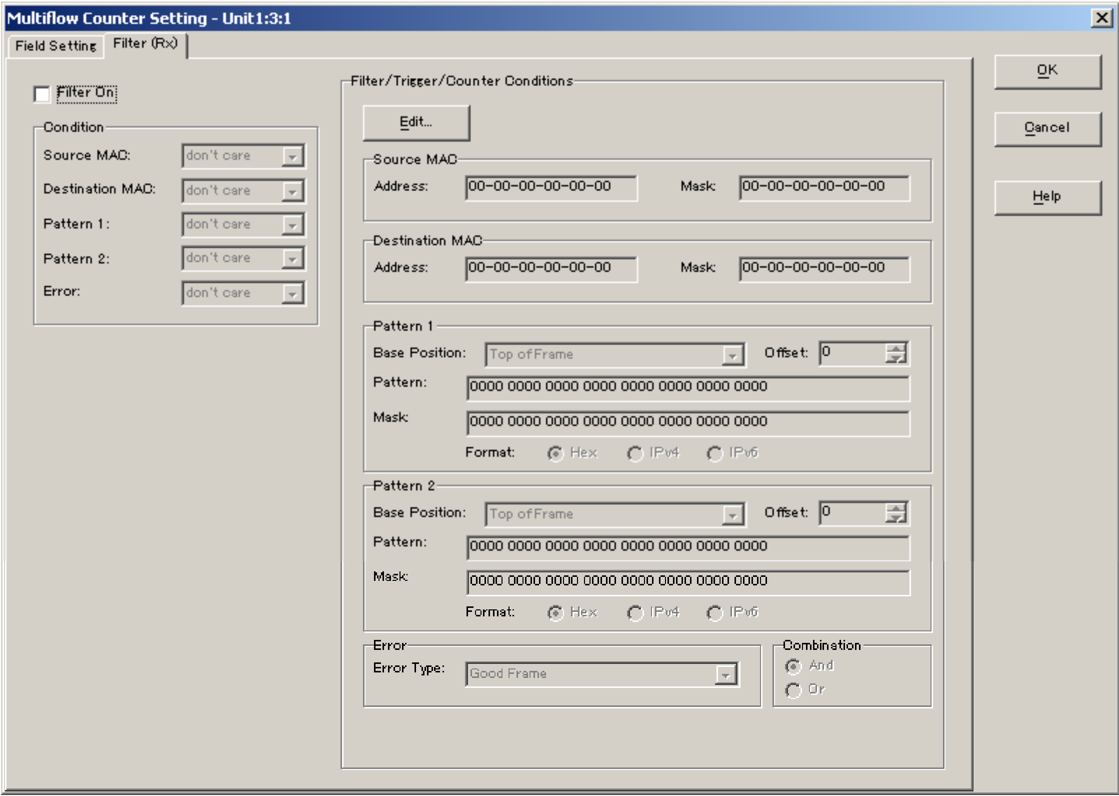


Figure 5.3.2.1-6 Multiflow Counter Setting (Filter (Rx) tab) screen

This screen sets the filter. If the setting of the filter is valid, the reception frame that does not match this filter is not counted, while any transmission frames are counted regardless of the filter setting. The filter is set in the same manner as the counter.

For details, refer to Section 5.9.1 "Setting counter filter".

5.3.2.2 Operation during counting

During counting, the number of frames can be monitored in the table format and graph format. In addition, the log of monitoring can be saved in the CSV format.

(1) Starting counting

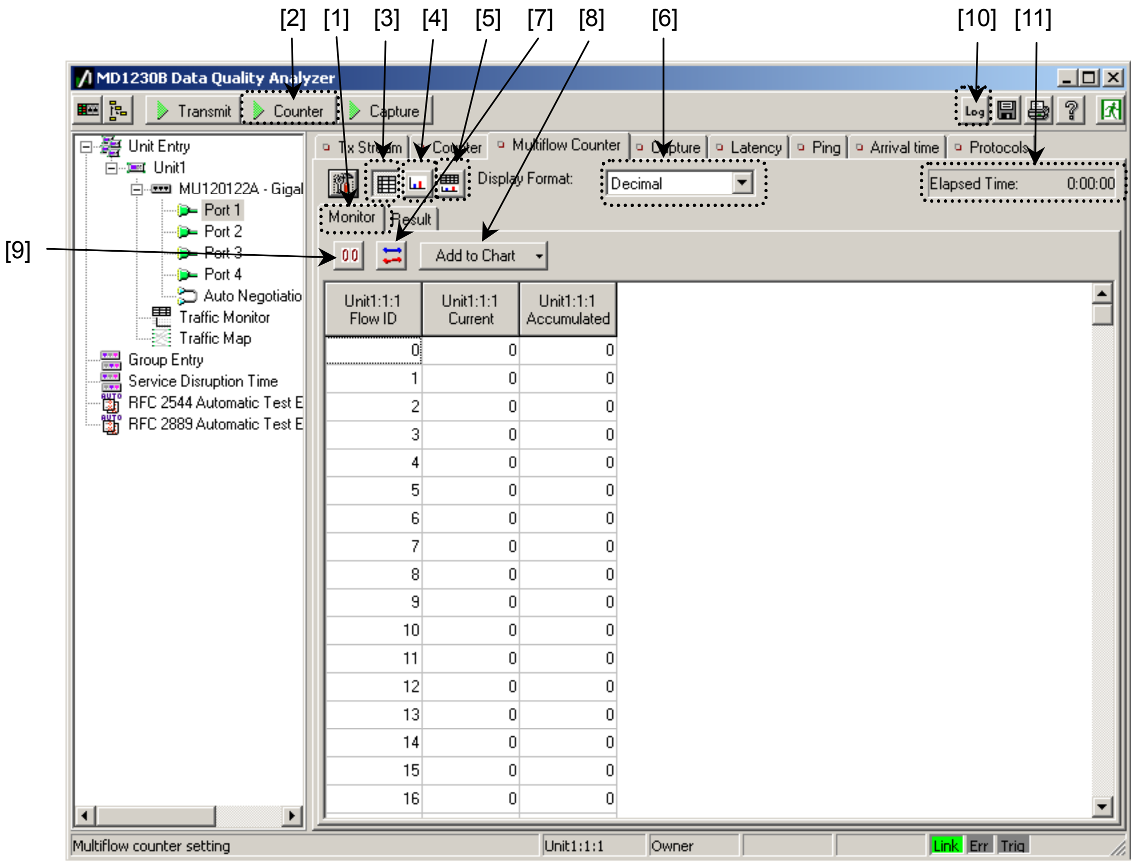


Figure 5.3.2.2-1 Multiflow Counter tab screen

[1] Select **Monitor** tab.

[2] When **Counter** is pressed, the counter is cleared and then counting is started. If **Counter** is pressed again during counting, counting is stopped. These operations are performed in coordination with the conventional counter at hardware level.

[3] Select Table display.

For details, refer to "(2) Monitoring counter (Table display)" in Section 5.3.2.2.

[4] Select Graph display.

For details, refer to "(3) Monitoring counter (Graph display)" in Section 5.3.2.2.

[5] Select Table+Graph display.

For details, refer to "(4) Monitoring counter (Table+Graph display)" in Section 5.3.2.2.

[6] Select the display format of Flow ID from the following.

- Decimal Decimal number
- Hexadecimal Hexadecimal number
- Binary Binary number

[7] Select the Flow ID to be monitored in the Graph format. The following Multiflow Chart screen is displayed.

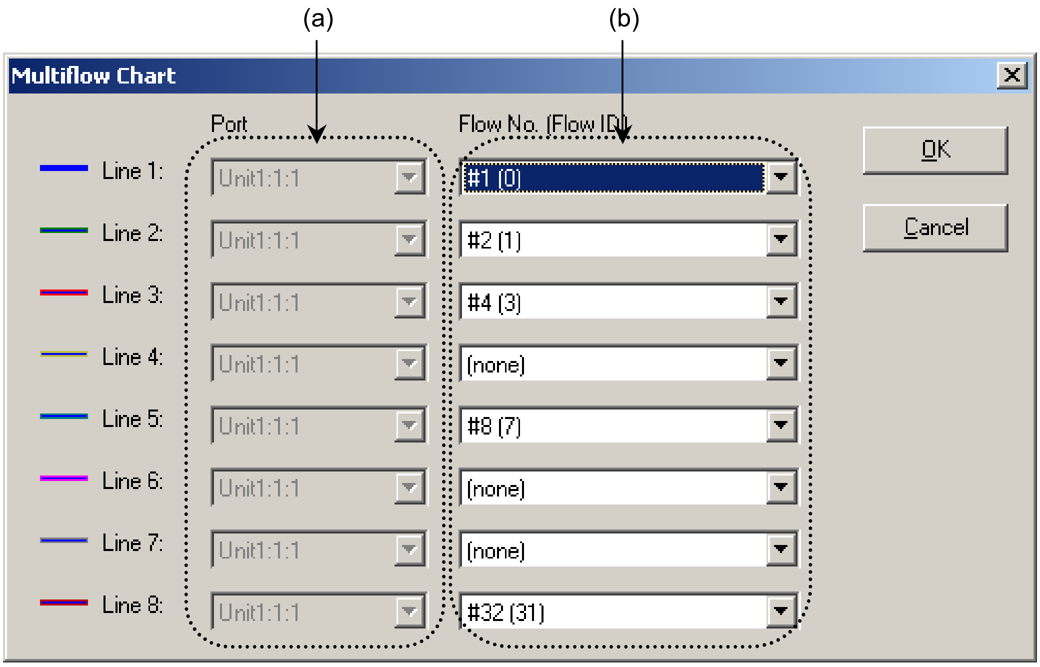


Figure 5.3.2.2-2 Multiflow Chart screen

(a) Specify a port to be displayed. The measured port is set. When the measured port belongs to a port group, a port in the port group can be selected.

(b) Select a Flow ID to correspond to each Line. The number on the right of # is the Index of the Flow ID. The number in parentheses is the corresponding Flow ID.

[8] Display the Current value of the counter selected in the table in the Graph format.

[9] Clear the Multiflow Counter.

[10] Save the log of the count result in the CSV format.

For details, refer to "(5) Saving log of counter" in Section 5.3.2.2.

[11] The time from the start of counting is displayed. This value continues increasing until the counter is stopped.

(2) Monitoring counter (Table display)

When button [3] in "(1) Starting counter" in Section 5.3.2.2 is pressed, the following screen is displayed. On this screen, the Multiflow counter of the specified Flow ID can be displayed real-time.

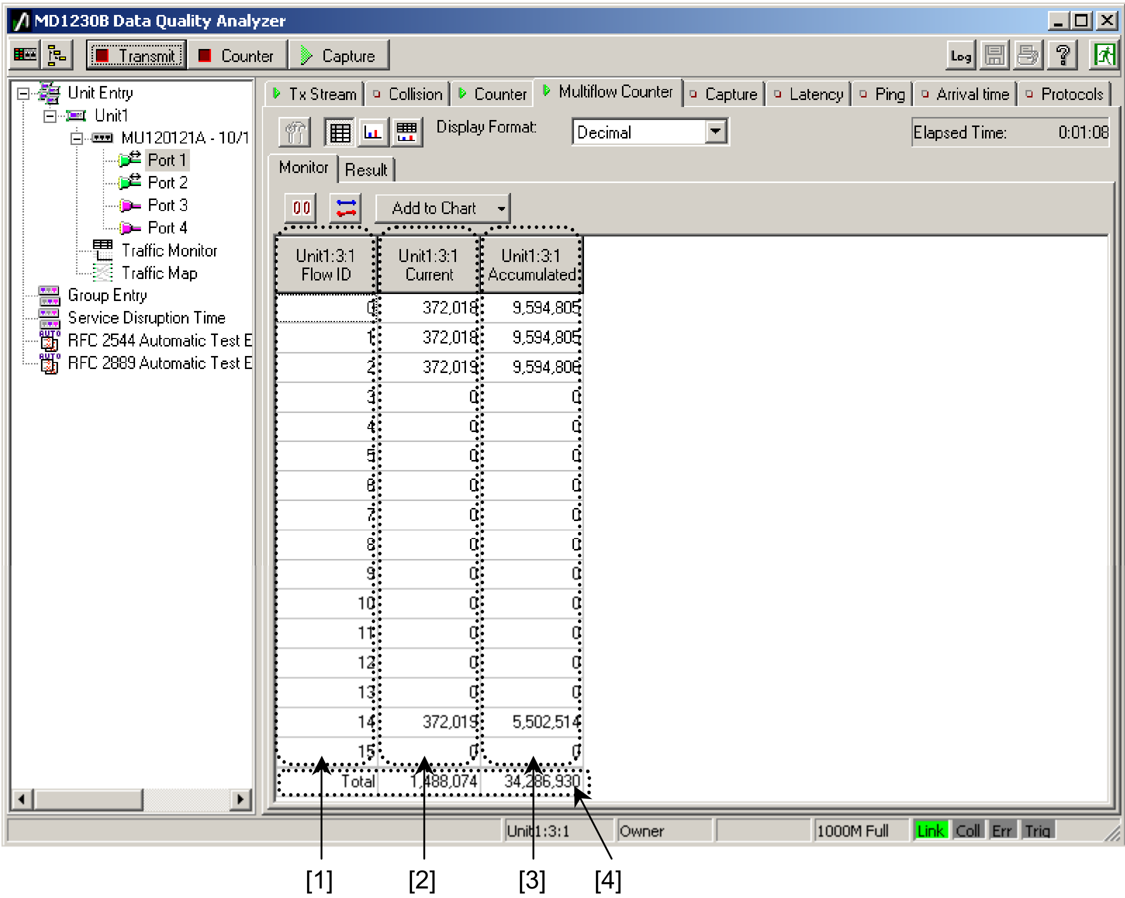


Figure 5.3.2.2-3 Multiflow Counter Tab (Table display) screen

[1] The Flow ID set in [7] in "(2) Setting Flow ID" in Section 5.3.2.1 is displayed.

[2] The value counted in the latest 1 second is displayed.

[3] The total value from the start of measurement to the present is displayed.

[4] The total values of the Current and Accumulate values of the flow displayed in [1] are displayed.

Notes:

The pop-up menu is displayed when the right button of the mouse is clicked on each cell or the Set button is pressed. The following operations are available using this pop-up menu.

1. When **Line n (n = 1 to 7)** or **Bar 1** is selected, the current value of the counter that corresponds to the clicked cell is displayed in the graph.

2. **(none)** can be selected for the cells that are already displayed in the graph. If **(none)** is selected, the counter corresponding to the cell is deleted from the graph.

3. When **Copy** is selected, the content displayed in the cell is copied to the clipboard.
   The contents of two or more cells can be copied at the same time by specifying the copy area in advance. The copy area can be selected by dragging the mouse, or by moving the cursor while holding down the shift key on the keyboard. When the contents of several cells are copied, the rows are delimited by line feed codes and the columns are delimited by tabs. The copied contents, therefore, can be pasted onto any text editor or spreadsheet application.

(3) Monitoring counter (Graph display)

When button [4] in “(1) Starting counter” in Section 5.3.2.2 is pressed, the following screen is displayed. On this screen, the Multiflow counter of the Flow ID set by button [7] in “(1) Starting counter” in Section 5.3.2.2 can be displayed in graph. Up to eight Current values can be displayed.

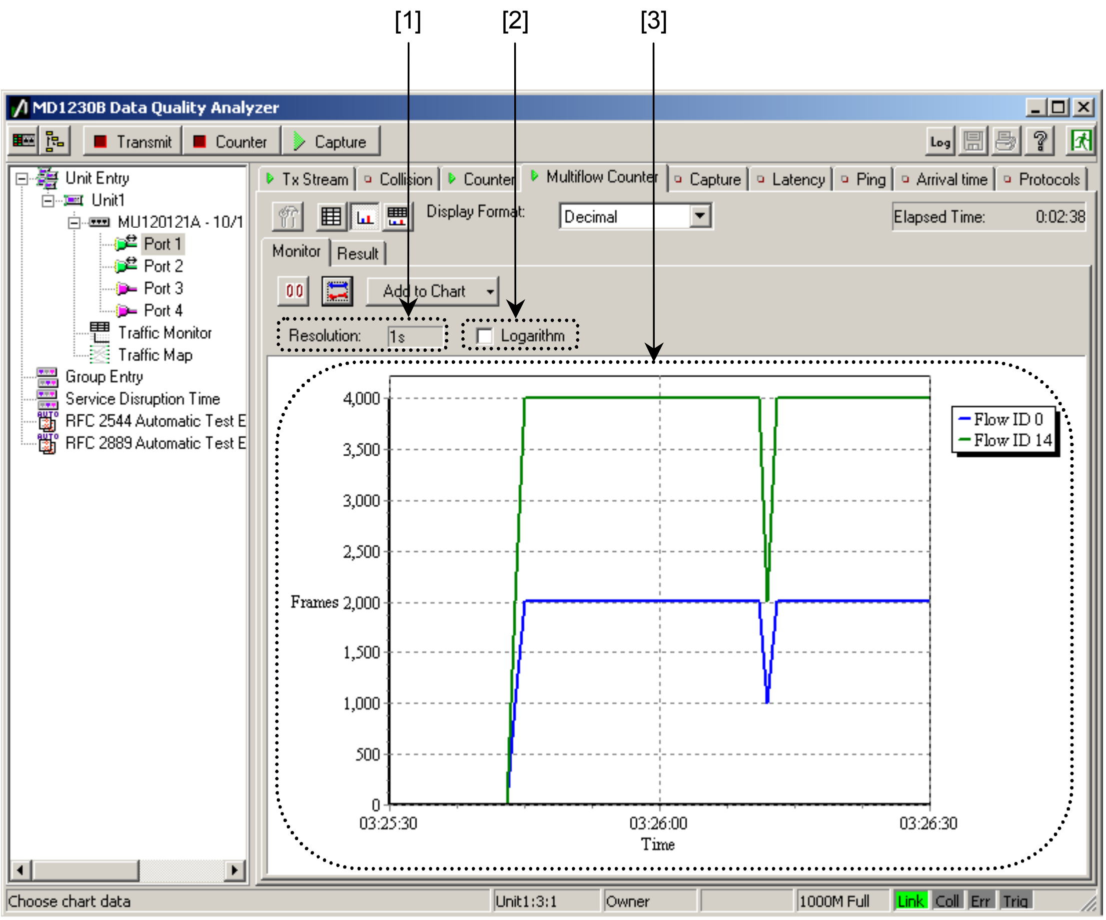


Figure 5.3.2.2-4 Multiflow Counter tab (Graph display) screen

[1] Select the resolution of the graph. This setting is in accordance with the resolution of the graph of the counter function.

[2] The divisions of the vertical axis of the graph is logarithmic.

[3] The graph of the measurement result is displayed. The following operation can be performed in this field by using the mouse.

- If the mouse is dragged with the left button to the lower-right direction on the graph, that range is enlarged for display.
- If the mouse is dragged with the left button to the upper-left direction on the graph, the zoom display is cancelled.
- If the mouse is dragged with the right button on the graph, the graph display area is moved parallel with it.
- If the right mouse button is clicked on this screen, the following menus are displayed. The image of the graph can be copied to clipboard or save to a file.
    - Undo Zoom — Cancels expansion display.
    - Copy as Bitmap — Records the image of the graph in bitmap format to clipboard.
    - Copy as Metafile — Records the image of the graph in metafile format to clip board.
    - Save — Saves the image of the graph to a file. Bitmap format (*.bmp) and metafile format (*.wmf, *.emf) are selectable.

(4) Monitoring counter (Table+Graph display)

When button [5] in “(1) Starting counter” in Section 5.3.2.2 is pressed, the following screen is displayed. The Table and Graph are displayed at the same time.

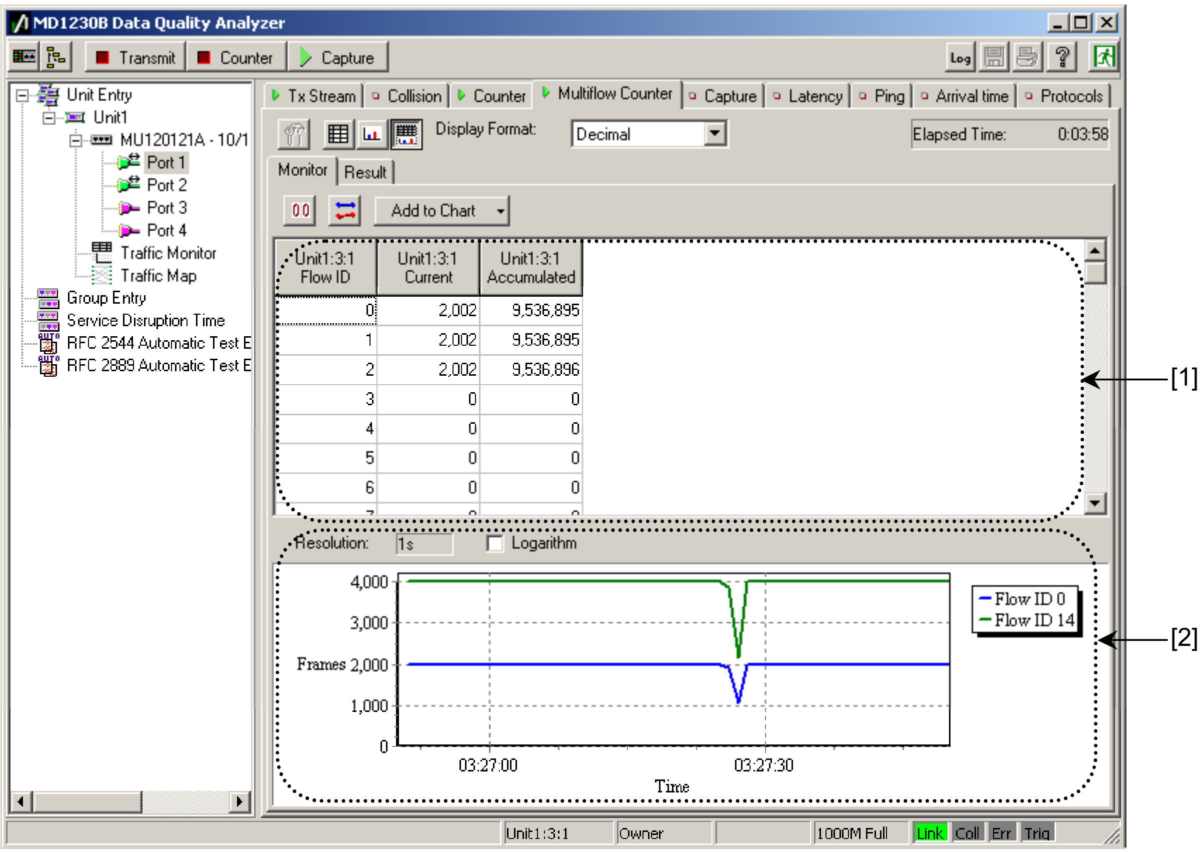


Figure 5.3.2.2-5 Multiflow Counter tab (Table+Graph display) screen

[1] Same as the **Monitor** tab in “(2) Monitoring counter (Table display)” in Section 5.3.2.2.

[2] Same as the **Monitor** tab in “(3) Monitoring counter (Graph display)” in Section 5.3.2.2.

(5) Saving log of counter

The log of the counter value in the monitor format can be saved at time intervals of 1 second to 24 hours. The value of the counter selected at section 5.2.2 "Selecting displayed item" is output to the log. The file format is CSV (Comma Separated Values). When button [10] in "(1) Starting counter" in Section 5.3.2.2 is pressed, the following screen is displayed.

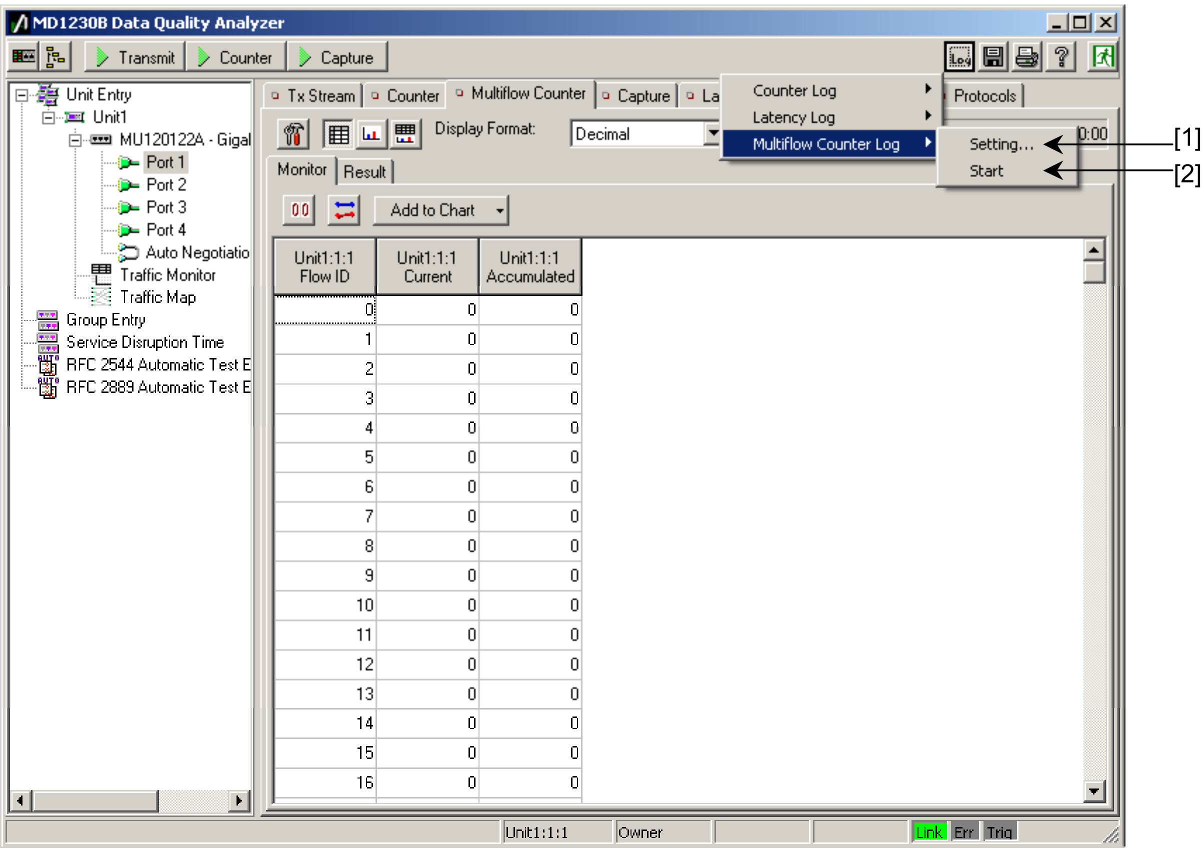


Figure 5.3.2.2-6 Multiflow Counter tab (log) screen

[1] Open the Multiflow Counter Log Setting screen. The contents of setting are the same as those on the counter log setting screen in Section 5.2.6 "Saving counter result in log".

[2] Start saving the log. The log file is cleared when saving the log is started.

5.3.2.3 Operation after counting

After counting has been completed, the count results of all the Flow ID can be displayed in table format or history format.

(1) Ending counting

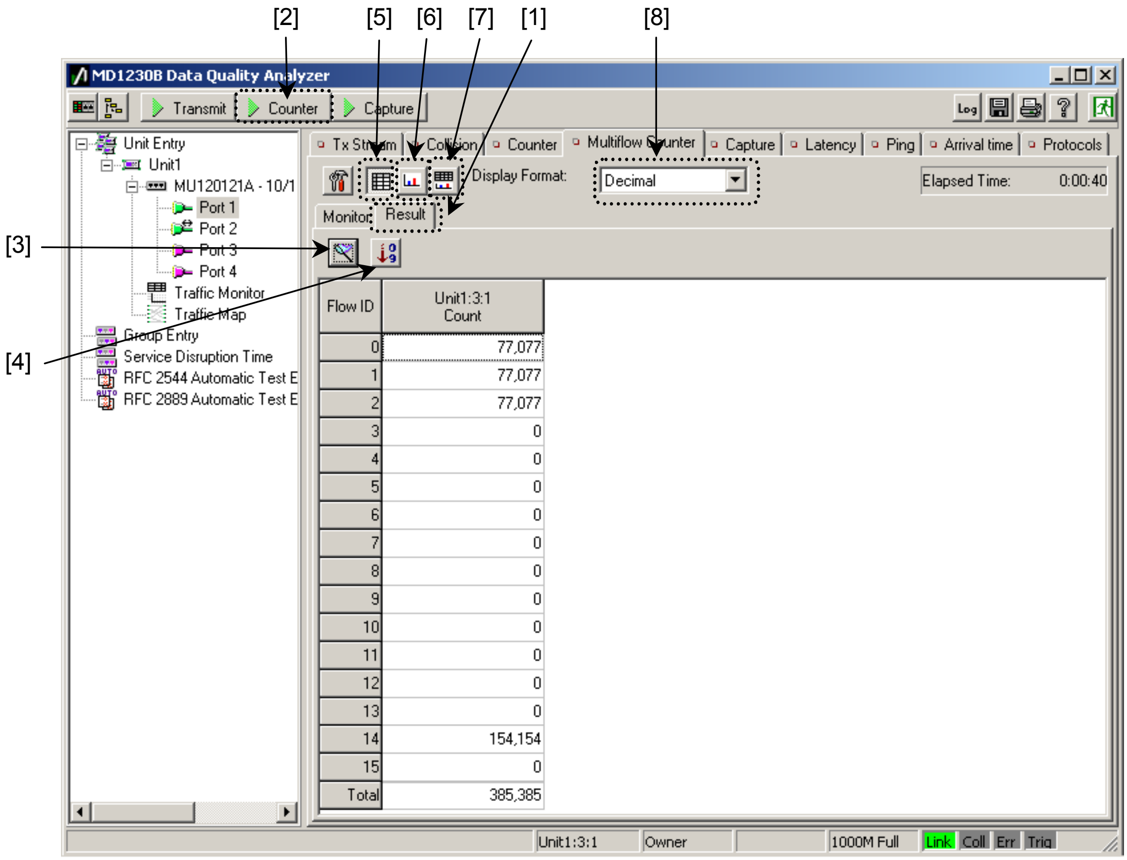


Figure 5.3.2.3-1 Multiflow Counter tab screen

[1] Select **Result** tab.

[2] If **Counter** is pressed during counting, counting is stopped.

[3]　Restore the total value. The following Multiflow View screen is displayed.

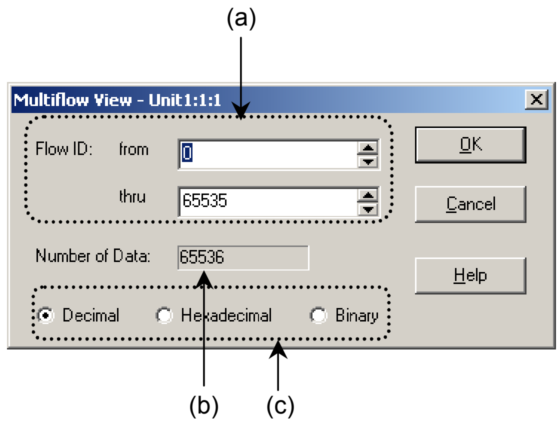


Figure 5.3.2.3-2　Multiflow View screen

(a)　Specify the start point and end point of the range of the Flow IDs to be restored by from and thru.
Value:　0 to 65535 (dec)

(b)　The number of flows to be restored is displayed.

(c)　Set the display format of “from” and “thru” of (a).
Select any one of the followings:

- Decimal　　Decimal number
- Hexadecimal　　Hexadecimal number
- Binary　　Binary number

[4]　Sort the count results. The following Sort Multiflow Counter screen is displayed.

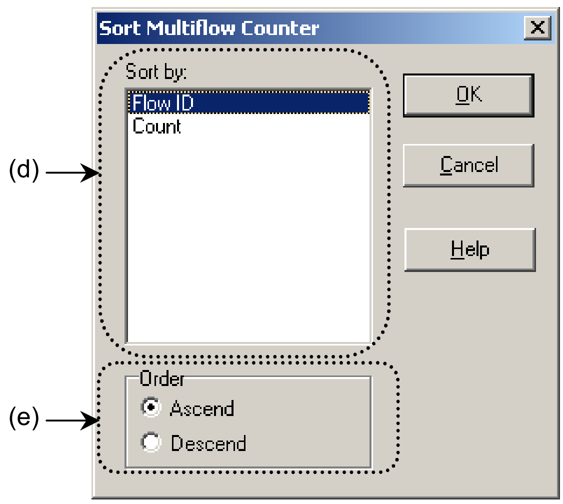


Figure 5.3.2.3-3　Multiflow View screen

(d) Select a key used for sorting from the following.

- Flow ID Sorts the values of Flow IDs.
- Count Sorts the counter values.

(e) Select a sorting order from the following.

- Ascend (A-Z) Ascending order
- Descend (Z-A) Descending order

[5] Select the Table display.

For details, refer to "(2) Displaying count result (Table display)" in Section 5.3.2.3.

[6] Select the Graph display.

For details, refer to "(3) Displaying count result (Graph display)" in Section 5.3.2.3.

[7] Select the Table+Graph display.

For details, refer to "(4) Displaying count result (Table+Graph display)" in Section 5.3.2.3.

[8] Select the display format of the Flow ID from the following.

- Decimal Decimal number
- Hexadecimal Hexadecimal number
- Binary Binary number

(2) Displaying count result (Table display)

When button [5] in Section 5.3.2.3 "Ending counting" is pressed, the following screen is displayed. The total value of the counter value of each Flow ID is displayed in table format.

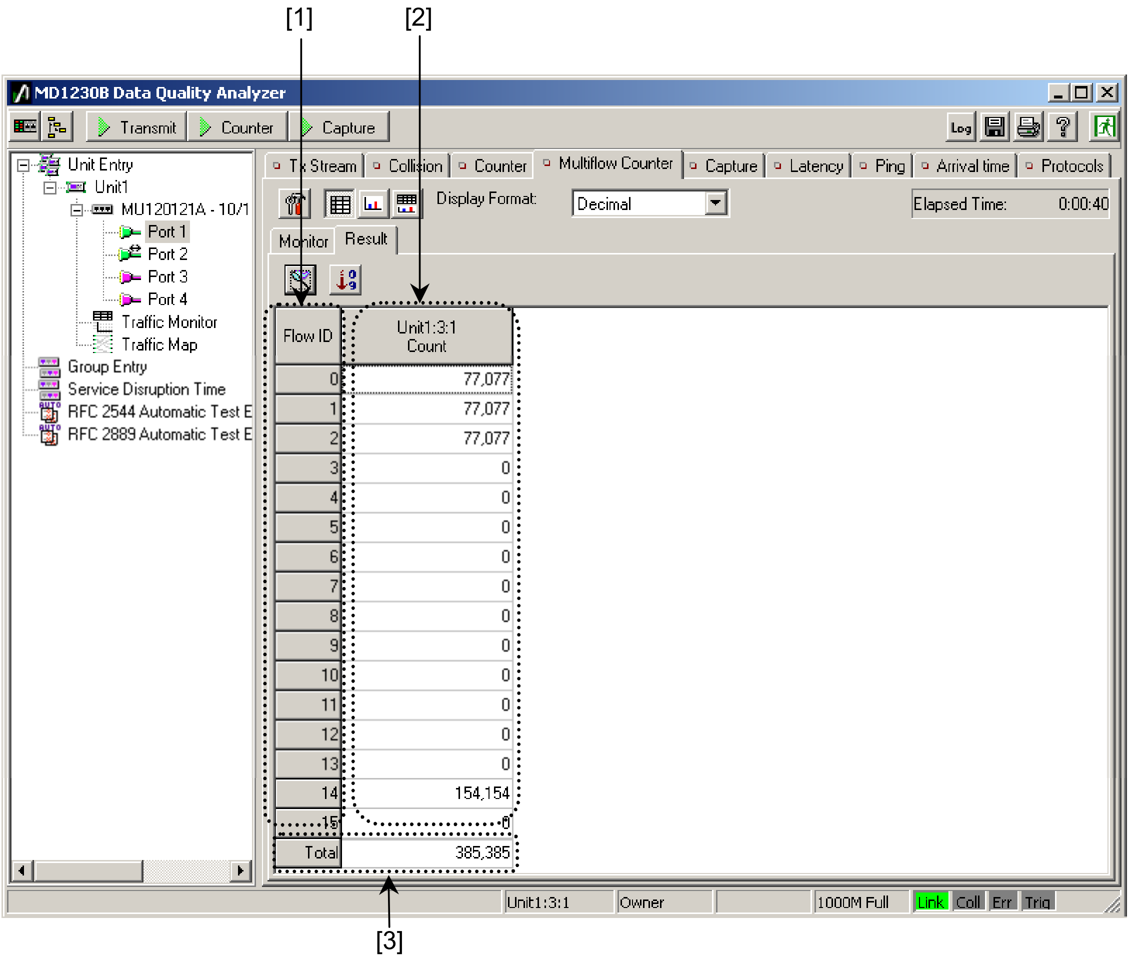


Figure 5.3.2.3-4 Multiflow Counter tab (Table display) screen

[1] The Flow ID set in [3], "(1) Ending counting" in Section 5.3.2.2, is displayed.

[2] The total value from the start of counting to the end is displayed.

[3] The total Current value of each flow displayed in [1] is displayed.

Note:

The pop-up menu is displayed when the right button of the mouse is clicked on each cell or the Set button is pressed. The following operation is available using this pop-up menu.

When “Copy” is selected, the content displayed in the cell is copied to the clipboard.
The contents of two or more cells can be copied at the same time by specifying the copy area in advance. The copy area can be selected by dragging the mouse, or by moving the cursor while holding down the shift key on the keyboard. When the contents of several cells are copied, the rows are delimited by line feed codes and the columns are delimited by tabs. The copied contents, therefore, can be pasted onto any text editor or spreadsheet application.

(3) Displaying count result (Graph display)

If button [6] in “(1) Ending counting” in Section 5.3.2.3 is pressed, the following screen is displayed. The total value of the counter value of each Flow ID is displayed in the histogram format.

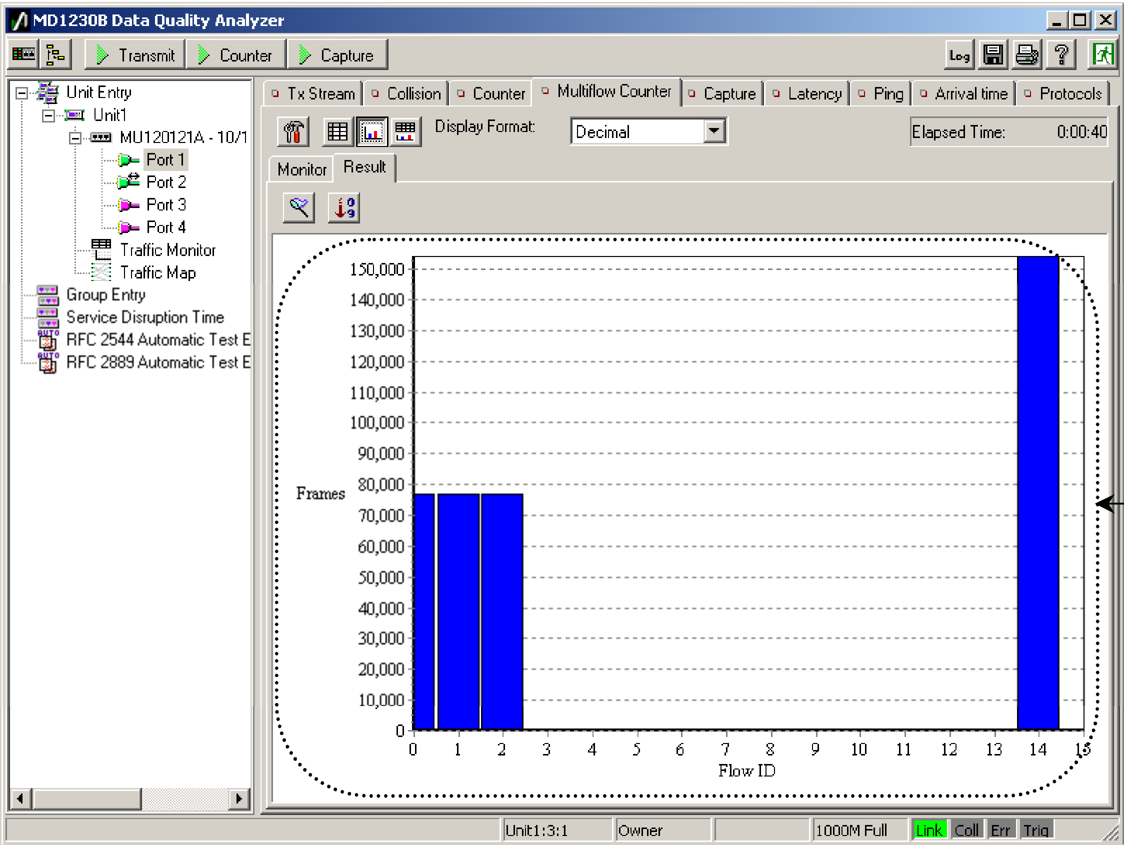


Figure 5.3.2.3-5 Multiflow Counter tab (Graph display) screen

[1] The graph of the measurement result is displayed. The following operation can be performed in this field by using the mouse.

- If the mouse is dragged with the right button on the graph, the graph display area is moved parallel with it.
- If the right mouse button is clicked on this screen, the following menus are displayed. The image of the graph can be copied to clip-board or save to a file.
  - Copy as Bitmap — Records the image of the graph in bitmap format to clipboard.
  - Copy as Metafile — Records the image of the graph in metafile format to clip board.
  - Save — Saves the image of the graph to a file. Bit-map format (*.bmp) and metafile format (*.wmf, *.emf) are selectable.

(4) Displaying count result (Table+Graph display)

When button [7] in “(1) Ending counting” in Section 5.3.2.3 is pressed, the following screen is displayed. Table and Graph are displayed at the same time.

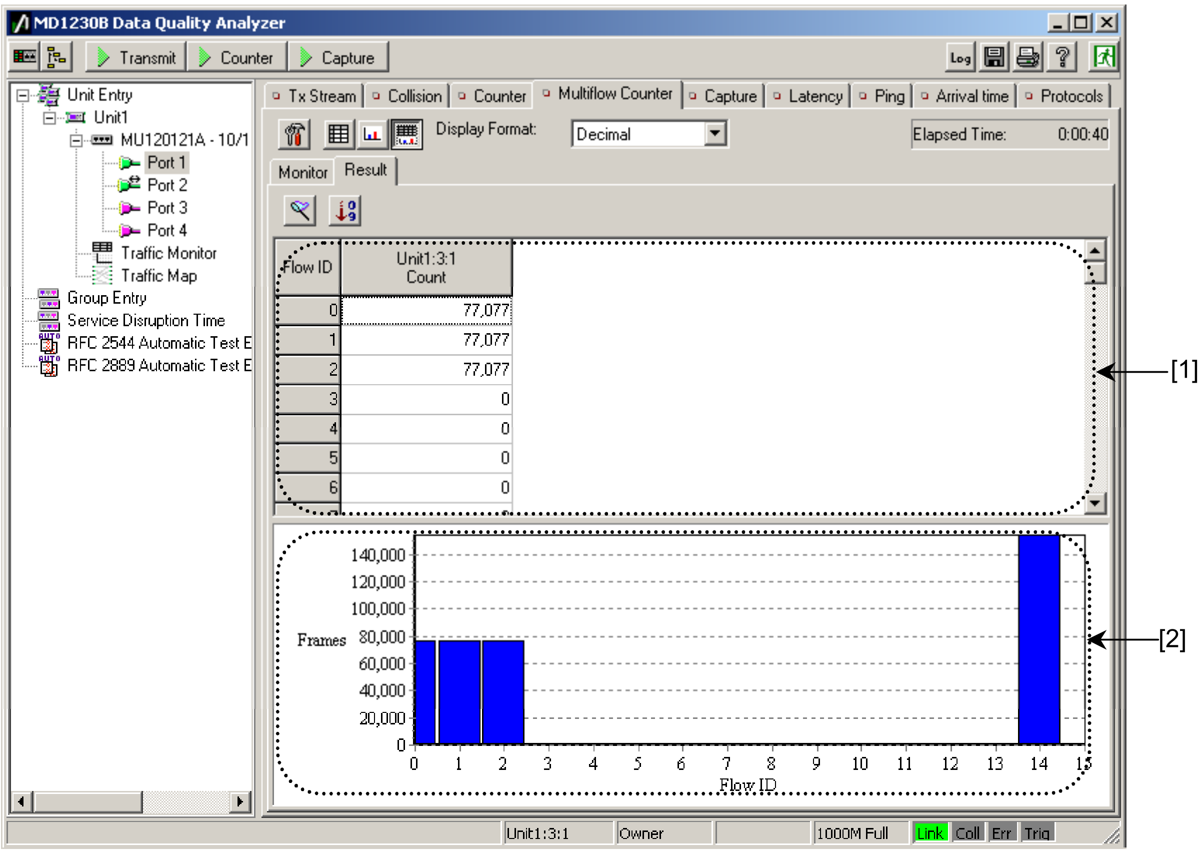


Figure 5.3.2.3-6 Multiflow Counter tab (Table+Graph display) screen

[1] Same as the **Result** tab in “(2) Displaying count result (Table display)” in Section 5.3.2.3.

[2] Same as the **Result** tab in “(3) Displaying count result (Graph display)” in Section 5.3.2.3.

5.3.3 Measuring with MU120131A/32A/38A

5.3.3.1 Operation before counting

Before counting, set the frame type to be counted, Flow ID definition and Flow IDs to be monitored during counting.

(1) Calling setting of Multi Flow Counter

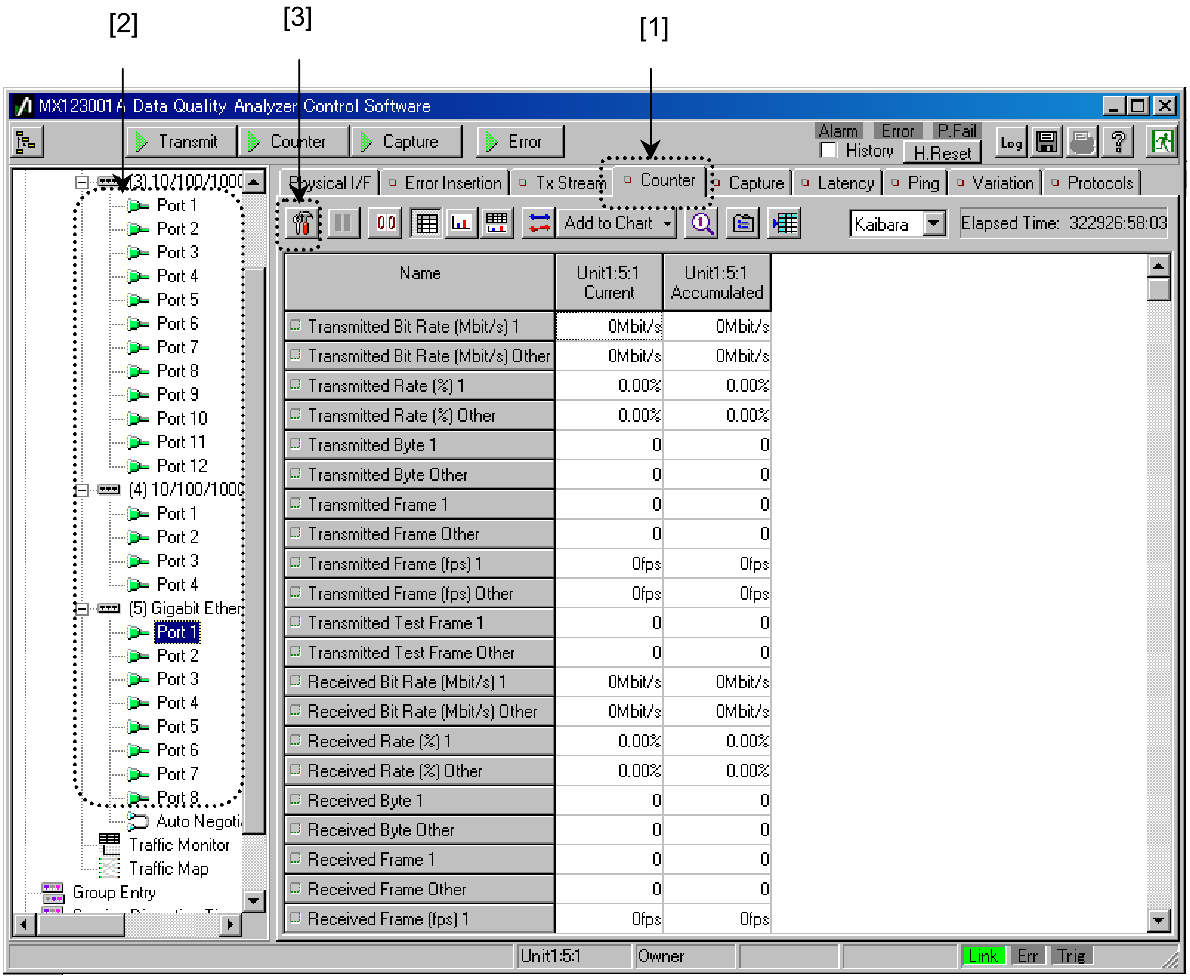


Figure 5.3.3.1-1 Counter tab screen

[1] Selects **Counter** tab.

[2] Selects **Port** to be counted.

[3] Sets Multi Flow Counter.

☞ For details, refer to "(2) Setting Flow ID" in Section 5.3.3.1.

(2) Setting Flow ID

When button [3] in “(1) Calling setting of Multi Flow Counter” in Section 5.3.3.1 is pressed, the following screen is displayed. On this screen, the Flow ID is mainly defined.

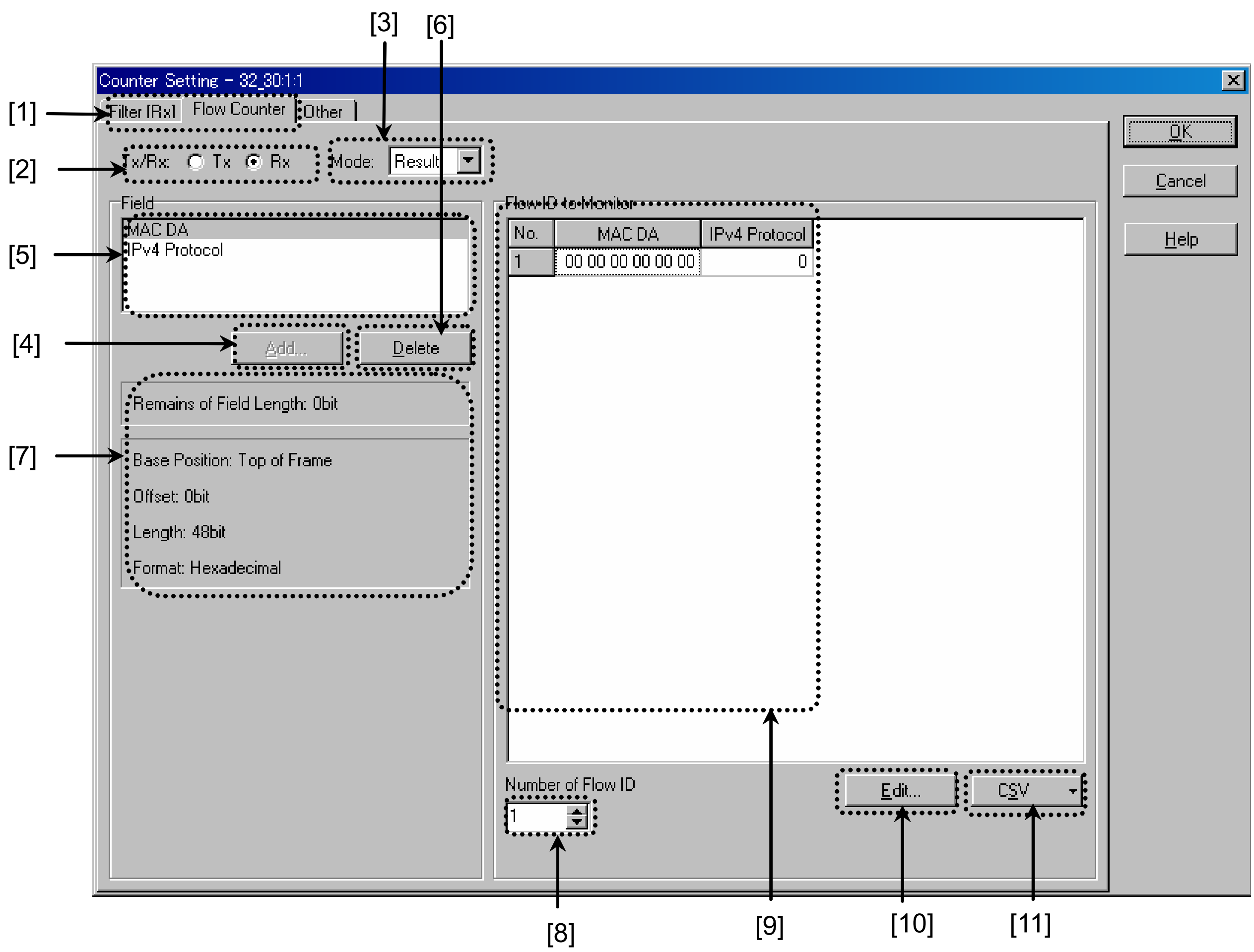


Figure 5.3.3.1-2 Counter Setting (Field Setting tab) screen

[1] Select **Flow Counter** tab or **Filter (RX)** tab.
Select **Flow Counter** tab to set the Flow ID on this screen.

For details on filter settings, refer to “(5) Setting filter” in Section 5.3.3.1.

[2] Specify whether the frame to be counted is a frame transmitted (Tx) or received (Rx) from MD1230B. Both cannot be selected at the same time.

- Tx
- Rx

5

Basic Measurement (Manual Test)

[3] Switches between the Monitor and Result modes.
Monitor: Updates measured results each second during Counter operation.
Result: Shows accumulated measured results when Counter is stopped.

Note:

Latency (Avg.) and graph display are available when Monitor is selected.
When Result is selected for the port, log/report output is enabled after Counter stops.

[4] Sets/adds a field as sorting condition. A field of up to 16 bits × 4 blocks can be set. When the field is full, the buttons are disabled.

☞ For details on the setting, refer to "(3) Setting field" in Section 5.3.3.1.

Note: Limitation on number of fields

When the remainder of dividing Offset by 8 and Length exceeds 16 bits, use 2 or more blocks in one setting.
For example, a setting with Offset: 13 bits and Length: 33 bits, the field to be used is of 38 bits, so 3 blocks are used.

[5] Displays the field items selected in [4]. Select an item here to be deleted by the [Delete] button, [6]. The setting contents of the items selected here are displayed in the area indicated by [7].

[6] Deletes a field selected in [5].

[7] Displays details of the field selected in [5] and the field amount that can be set.

[8] Sets the number of flows.
Value: 1 to 255

Note:

When Monitor is selected in step [3], up to 256 flow counters can be displayed per main unit. In this case, the total number of flows that can be set in step [8] is 256 minus number of ports for which Monitor is specified (because the limit of the number of counters includes Other counters).
Example: If Monitor is selected for 10 ports, up to 256-10=246 flows can be set per main unit.

[9] Sets a value for sorting Flow IDs. The following 3 operations can be performed.

Edit	Double-click the item or click the Edit button, [10]. The input format is that set in "(3) Setting field" in Section 5.3.3.1.
Increment	This sets the incremented value. Click to select the starting cell, drag the cursor through a continuous data area, and then right-click to select **Increment**.
Copy/Paste	Select by dragging an area to be copied, and then right-click to select **Copy**. Right-click on the starting cell of the destination to select **Paste**. When one item is selected, the same value is pasted at the destination. When multiple items are selected, the same number of items are pasted, starting from the selected destination cell. The selected items cannot be pasted into fields with different setting formats.

[10] Opens a dialog box for setting a value of the selected cell.

[11] Imports/exports Flow ID field settings from/to a text file.
The text file format is CSV.
The setting contents shown in Figure 5.3.3.1-2 are as shown below:

```
Version,7.00.06
Field Name,MAC DA,VLAN ID #1
Base Position,FRAME,VLAN1
Offset,0,20
Length,48,12
Format,HEX,DEC
1,#H000000000001,0
2,#H000000000002,0
3,#H000000000003,0
4,#H000000000004,0
5,#H000000000005,0
6,#H000000000006,0
7,#H000000000007,0
8,#H000000000008,0
9,#H000000000001,1
10,#H000000000002,1
11,#H000000000003,1
12,#H000000000004,1
13,#H000000000005,1
14,#H000000000006,1
15,#H000000000007,1
16,#H000000000008,1
```

Figure 5.3.3.1-3 Sample CSV file

(3) Setting field

When button [4] in “(2) Setting Flow ID” in Section 5.3.3.1 is pressed, the following screen is displayed. On this screen, the field is defined.

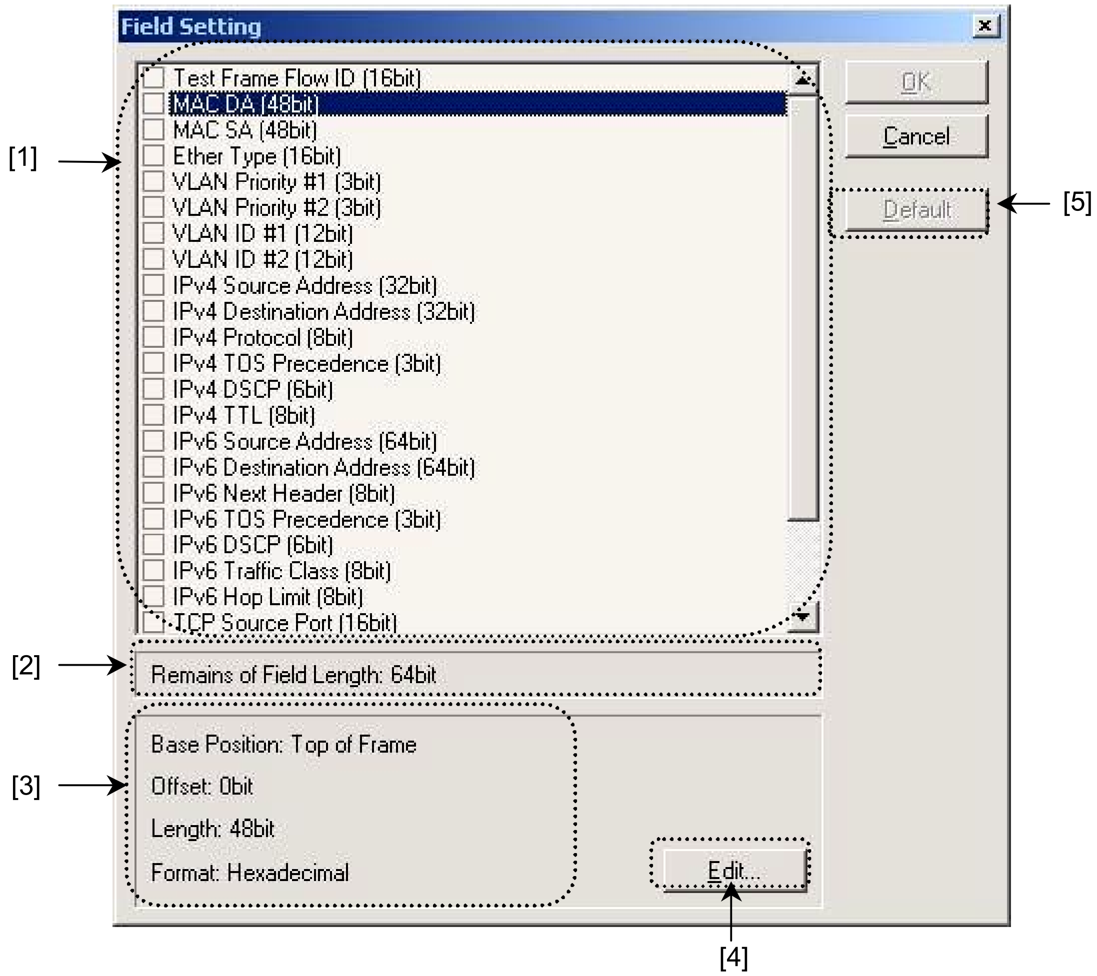


Figure 5.3.3.1-4 Field Setting screen

[1] Selects the frequently used setting.
Setting can be edited by pressing the Edit button, [4], to change some parts before use.

For details, refer to “(4) Editing field” in Section 5.3.3.1.

[2] Displays the size of the field that can be set.

[3] Displays information on the field selected in [1].

[4] Edits the field selected in [1].

[5] Restores the initial value of the field selected in [1].

Table 5.3.3.1-1 List of initial field values

Field (Note 1)	Base Position	Offset (bit)	Length (bit)	Format
LLID	Top of Preamble	40	16	Hex.
Test Frame Flow ID	–	–	16	Dec.
MAC DA	Top of Frame	0	48	Hex.
MAC SA	Top of Frame	48	48	Hex.
Ether Type	Top of Frame	96	16	Hex.
VLAN Priority #1	Top of VLAN Tag 1	16	3	Dec.
VLAN Priority #2	Top of VLAN Tag 2	16	3	Dec.
VLAN ID #1	Top of VLAN Tag 1	20	12	Dec.
VLAN ID #2	Top of VLAN Tag 2	20	12	Dec.
Ethernet OAM MEG Level	Top of Ethernet OAM PDU	0	3	Dec.
Ethernet OAM MD Level	Top of Ethernet OAM PDU	0	3	Dec.
Ethernet OAM OpCode	Top of Ethernet OAM PDU	8	8	Dec.
Ethernet OAM Period	Top of Ethernet OAM PDU	21	3	Dec.
IPv4 Source Address	Top of IPv4 Header	96	32	IPv4
IPv4 Destination Address	Top of IPv4 Header	128	32	IPv4
IPv4 Protocol	Top of IPv4 Header	72	8	Dec.
IPv4 TOS Precedence	Top of IPv4 Header	8	3	Dec.
IPv4 DSCP	Top of IPv4 Header	8	6	Dec.
IPv4 TTL	Top of IPv4 Header	64	8	Dec.
IPv6 Source Address (Note 2)	Top of IPv6 Header	128	64	IPv6
IPv6 Destination Address (Note 2)	Top of IPv6 Header	256	64	IPv6
IPv6 Next Header	Top of IPv6 Header	48	8	Dec.
IPv6 TOS Precedence	Top of IPv6 Header	4	3	Dec.
IPv6 DSCP	Top of IPv6 Header	4	6	Dec.
IPv6 Traffic Class	Top of IPv6 Header	4	8	Dec.
IPv6 Hop Limit	Top of IPv6 Header	56	8	Dec.
TCP Source Port	Top of TCP Header	0	16	Dec.
TCP Destination Port	Top of TCP Header	16	16	Dec.
UDP Source Port	Top of UDP Header	0	16	Dec.
UDP Destination Port	Top of UDP Header	16	16	Dec.

Notes:

1. For modules and settings where the base positions shown in Table 5.3.3.1-1 do not exist, the Field item is not displayed.

   ☞ Refer to “(4) Editing field” in Section 5.3.3.1 for details.

2. When the length of a field is longer than 64, which is the maximum value specified for Length, the last 64 bits of the field are set as Flow ID. When IPv6 Source Address is set as a

field, for example, the lower 64 bits of the IPv6 Source Address are set as Flow ID. To set the upper 64 bits of the IPv6 Source Address, decrease offset by 64 bits.

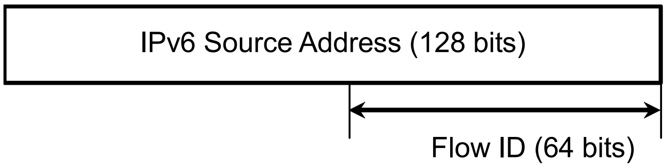


Figure 5.3.3.1-5 When IPv6 Source Address is selected as field

(4) Editing field

When button [4] in “(3) Setting Field” in Section 5.3.3.1 is pressed, the following screen is displayed. On this screen, the field is edited.

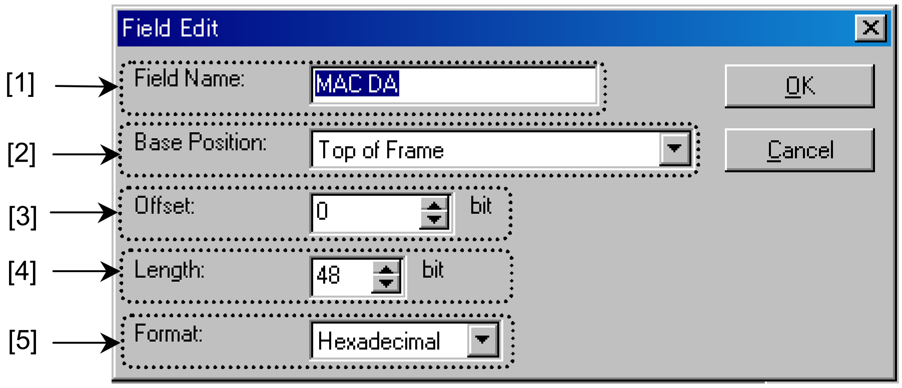


Figure 5.3.3.1-6 Field Edit screen

[1] Edit the field name.

[2] Select Base Position from the following (*1):

- Top of Preamble (Note 3)
- Top of Frame
- Top of VLAN Tag 1(Note 2)
- Top of VLAN Tag 2 (Note 2)

  ...
- Top of VLAN Tag 10 (Note 2)
- Top of Ethernet OAM PDU (Note 4)
- Top of IPv4 Header
- Top of IPv6 Header (Note 5)
- IPv6 Hop-by-hop Option Header (Note 5)
- IPv6 Destination Option Header (Note 5)
- IPv6 Routing Header (Note 5)
- IPv6 Fragment Header (Note 5)
- Top of TCP Header
- Top of UDP Header
- Flow ID

Notes:

1. Frames that do not include the selected base position are not counted.

2. When setting Base Position to VLAN Tag, set TPID in the **VLAN** tab on the Port Setting screen(refer to Section 4.5.6 (1)). The VLAN Tag is detected according to the setting. Note that the base position is the top of the TPID field (refer to Example 1 in *1).

3. Can be selected when the Preamble check box in the Port Setting screen is selected (On) (refer to Section 4.5.3 (1)). When the Preamble check box is cleared (Off), this setting changes to "Top of Frame."

4. The Ethernet OAM option is required.

5. The IPv6 Expansion option is required.

[3] Set offset from the base position in bit units (*1)
Value: 0 to 524280 (dec)

[4] Set Length of the Flow ID field in bit units (*1)
Value: 1 to 64 (dec)

[5] Select the radix of Flow ID value from the following:

- Decimal Decimal number
- Hexadecimal Hexadecimal number
- IPv4Address
- IPv6Address

*1: "Field" is defined as shown below.

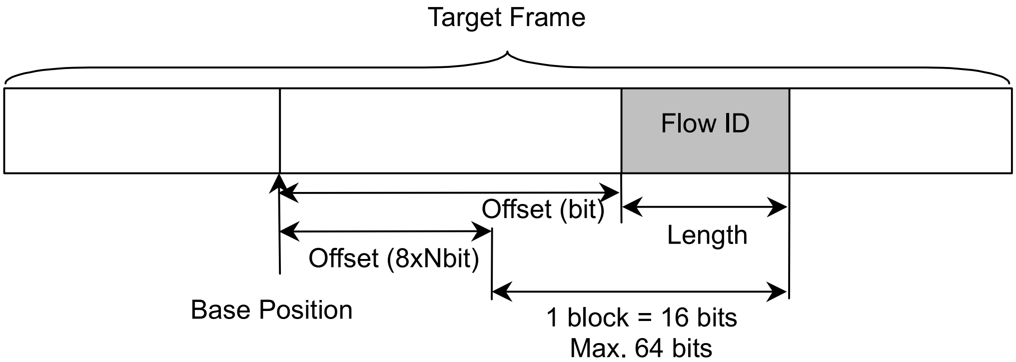


Figure 5.3.3.1-7 Field definition

(5) Setting filter

When “Filter (Rx)” is clicked in [1] in “(2) Setting Flow ID” in Section 5.3.3.1, the following screen is displayed.

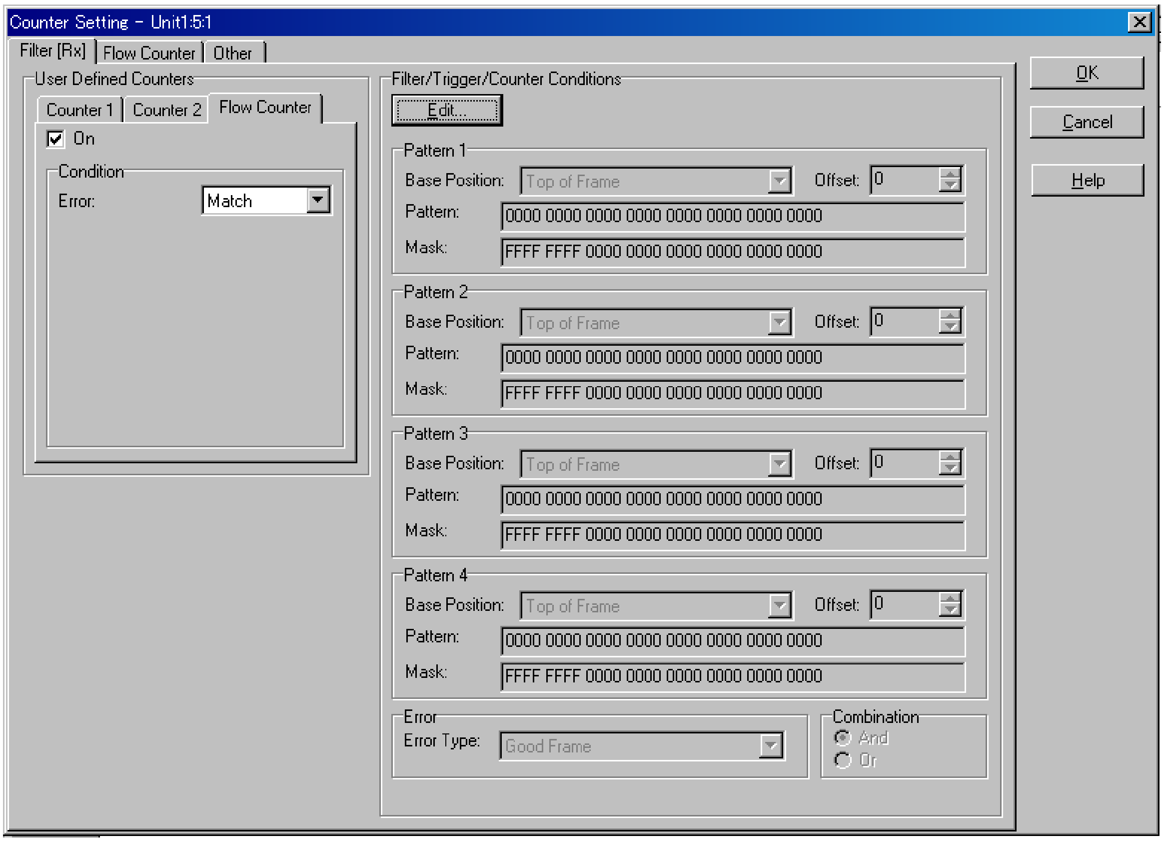


Figure 5.3.3.1-8 Counter Setting (Filter [Rx] : Flow Counter tab) screen

This screen sets the filter. If the setting of the filter is valid, the reception frame that does not match this filter is not counted, while any transmission frames are counted regardless of the filter setting. The filter is set in the same manner as the counter. The filter for Multiflow Counter consists of Error item only.

For details, refer to Section 5.9.1 “Setting counter filter”.

5.3.3.2 Count result

The count results are displayed in the Counter screen.

☞ For details on the Counter function, refer to Section 5.2 "Counting Transmit/Receive Data."

☞ For details on the Counter items, refer to Appendix F "Counter Item List."

Notes:

1. The maximum count of the Multiflow Counter is 512 per Port. This value does not include counters other than the Multiflow Counter.

2. Latency is measured as described below. Refer to section 5.5 "Measuring frame latency".

   Latency measurement is performed as shown below
   Min/Max: Results of measurement all frames.
   Current: Sampling result of one frame per second.
   Average: The averaged results of sampling 1 frame every 1 second are displayed.

5.3.4 Operation with port group

The multiflow counter function can also be used for a port group. All the ports in a port group can be simultaneously set, manipulated, and displayed, as follows.

☞ For setting of the port group, refer to Section 10.1 "Simultaneous Operation of Multiple Ports (Port Group Function)".

(1) Setting counter

Filter and Flow ID can be set at one time for all the ports in a port group. This can be done by operating button [3] in "(1) Calling setting of Multiflow Counter" in Section 5.3.2.1 for the port group. The setting made by this operation is reflected on all the ports in the port group.

In addition, each port in the port group can be set individually. In this case, operate button [3] in "(1) Calling setting of Multiflow Counter" in Section 5.3.2.1 on the setting screen of each port.

(2) Starting and stopping counting

Counting can be started and stopped for a port group. This can be done by operating button [2] in "(1) Starting counting" in Section 5.3.2.2.

(3) Displaying counter

The count result of a different port in the port group can be displayed simultaneously during monitoring while counting is in progress and when the result of counting is displayed. A graph can also be displayed during counting, and the count values of different ports can be counted.

5.4 Capturing Receive Data

The MD1230B can capture the Ethernet frame, PPP frame, Cisco HDLC frame, MAPOS frame, GFP frame, LAPS frame and LEX frame. The capacity that can be captured at one time differs from one module to another.

Capture capacity

Module	Capacity
MU120101A/11A	8 Mbytes/port
MU120102A/12A	32 Mbytes/port
MU120118A/18B/18C/38A	256 Mbytes/port
MU120121A/22A	64 Mbytes/port
MU120131A/32A	16 Mbytes/port
MU120103A/04A/05A/06A/03B/04B	256 Mbytes/port
MU120119A/20A	32 Mbytes/port
MU150101A	256 Mbytes/port

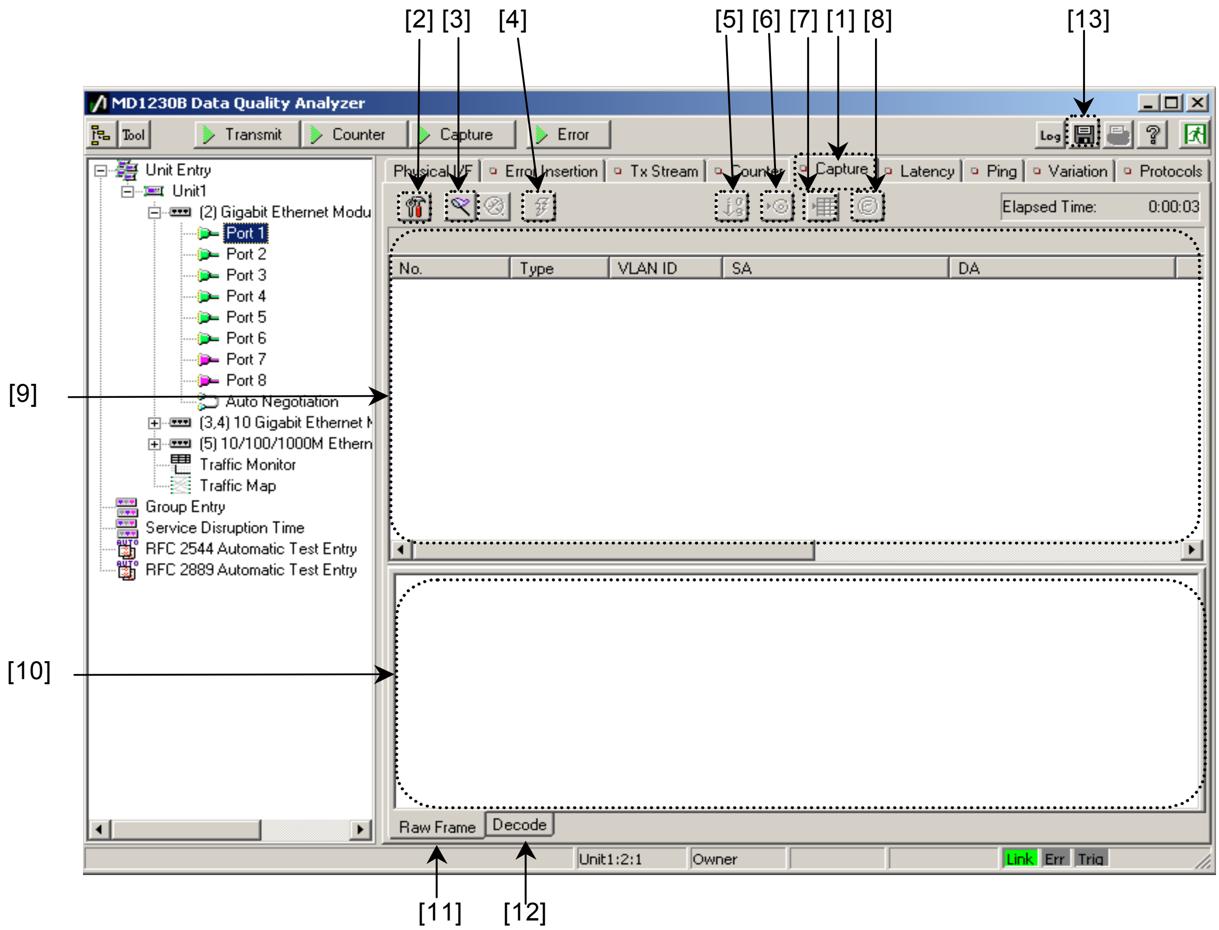


Figure 5.4-1 Capture screen

[1] Selects **Capture** tab.

[2] Sets the capture filter and trigger.

For details, refer to Section 5.9.3 “Setting filter and trigger patterns”.

[3] Retrieves captured frame.

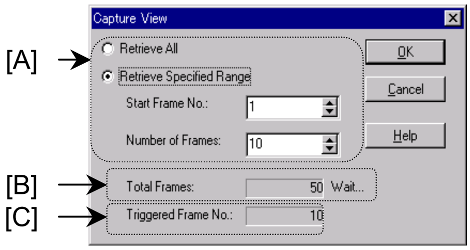


Figure 5.4-2 Displayed frame specify screen

	Item	Description
[A]	Retrieve All	Selects the frames for display. Displays all frames.
	Retrieve Specified Range	Selects the frames for display. Displays the frames specified by the capture frame number and the number of frames.
[B]	Total Frames	Displays the number of frames that can be captured.
[C]	Triggered Frame No	Displays the triggered frame numbers from those that can be captured.

[4] Generates the trigger, manually.

[5] Sorts the retrieved frames. Press the button to display the following dialog.

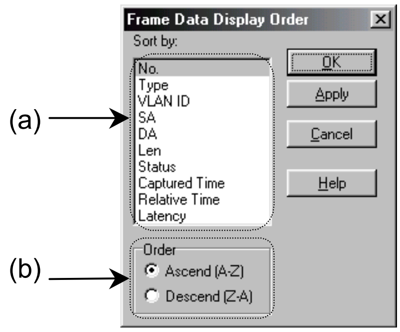


Figure 5.4-3 Sort item setting screen

(a) Selects the items for sorting.

- No. Captured order
- Type Frame type
- VLAN ID VLAN ID
- SA Source Address
- DA Destination Address
- Len Frame length
- Status Frame status
- Captured Time Captured time
- Relative Time Difference of captured times
- Latency Latency

(b) Specifies the sort order.

- Ascend (A-Z) Ascending order
- Descend (Z-A) Descending order

[6] Converts the selected frames to the transmission stream. The Protocol setting becomes None after conversion regardless of the type of the captured frame. For example, a frame in which the data link layer is Ethernet is set as an Ethernet frame, and the FCS in the data link layer is re-calculated to the correct value.

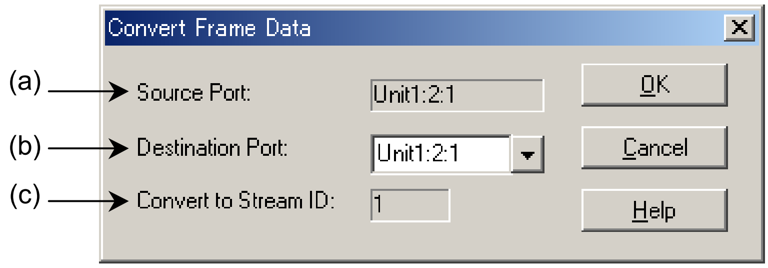


Figure 5.4-4 Frame conversion screen

(a) Displays the conversion source port.

(b) Selects the conversion destination port.

(c) Displays the stream ID number when the frame is converted for the conversion destination port.

[7] The extracted frame is saved in the CSV format. All the items displayed in [9] are saved as shown in the format example below. The item names in each column are recorded in the first line. The information of the captured frames are recorded in the second and subsequent lines in ascending order of No.

```
No.,Type,VLAN ID,SA,DA,Len,Status,Captured Time,Relative Time,Latency
1,TCP,-,192.168.1.10,192.168.59.63,64,Good,16:32:23.408682272,0.000000000,-
2,TCP,-,192.168.1.10,192.168.59.63,64,Good,16:32:23.408682940,0.000000668,-
3,TCP,-,192.168.1.10,192.168.59.63,64,Good,16:32:23.408683604,0.000000664,-
4,ICMP,1,192.168.1.10,192.168.1.20,64,Good,16:32:23.408684288,0.000000684,-
```

Figure 5.4-5 Format example

[8] The extracted frame is translated by Ethereal/Wireshark.
This function can be used when Ethereal/Wireshark is installed.

☞ For the Ethereal/Wireshark, refer to Appendix G "Introduction of Ethereal/Wireshark".

[9] Displays the frame list.

Note:

In the Status column, Good is displayed if the capture frame format does not include any error. If the capture frame includes an error, the type of the error is displayed.
The following errors are supported. For the frames that do not have these errors, Good is displayed.

FCS Error
Dribble Bit Error
Alignment Error
Undersize
Fragment
Oversize
Oversize & FCS Error
IP Header Checksum Error
TCP Checksum Error
UDP Checksum Error

[10] Displays the individual frame configuration. The contents differ depending on tabs in [11] and [12].

[11] Displays the data from the first to the last byte of the frame in hexadecimal numbers at the area of [10].

[12] Displays the decoded result of the frame at the area of [10].
The capture frame display function can display multiple ports at the same time by selecting a port group instead of a port.
However, the maximum number of characters that can be displayed is 64 Kbytes. The part exceeding 64 Kbytes is not displayed.

☞ For the port group settings, refer to Section 10.1 “Simultaneous Operation of Multiple Ports (Port Group Function)”.

[13] Each setting is saved or read. Unit setting, pot setting, capture setting, and capture data can be saved or read. The capture data can be read by reading it on the Main Window ([9]) or on a dedicated window.
When the data is read on the Main Window, it can be converted into a transmit stream as described in [6] or translated by Ethereal/Wireshark as described in [7]. However, this operation can be performed only between the module by which the data has been captured and a module of the same type with it.

If the data is read on a dedicated window, operations [6] and [7] cannot be performed, though no restrictions because of module are applied.

☞ For details, refer to Section 11.1 “Saving/Loading Set Data and Measured Results”.

5.5 Measuring Frame Arrival Time (Latency)

When a Test Frame (refer to Section 5.1.2 (26)) is detected in the received frame, the maximum/ minimum/average/current values for the latency obtained from the time stamp within the frame and its arrival time are displayed.

Note:

The MU120131A/32A/38A multiflow counter can be used to measure the latency of each of flow. For the usage method, refer to Section 5.3.3 "Measurement with MU120131A/32A/38A".

When using this function, preset the DUT type (Store And Forward/Bit Forwarding) at the **Device Type** setting of the **Tx Stream** tab (refer to section 5.1.1).

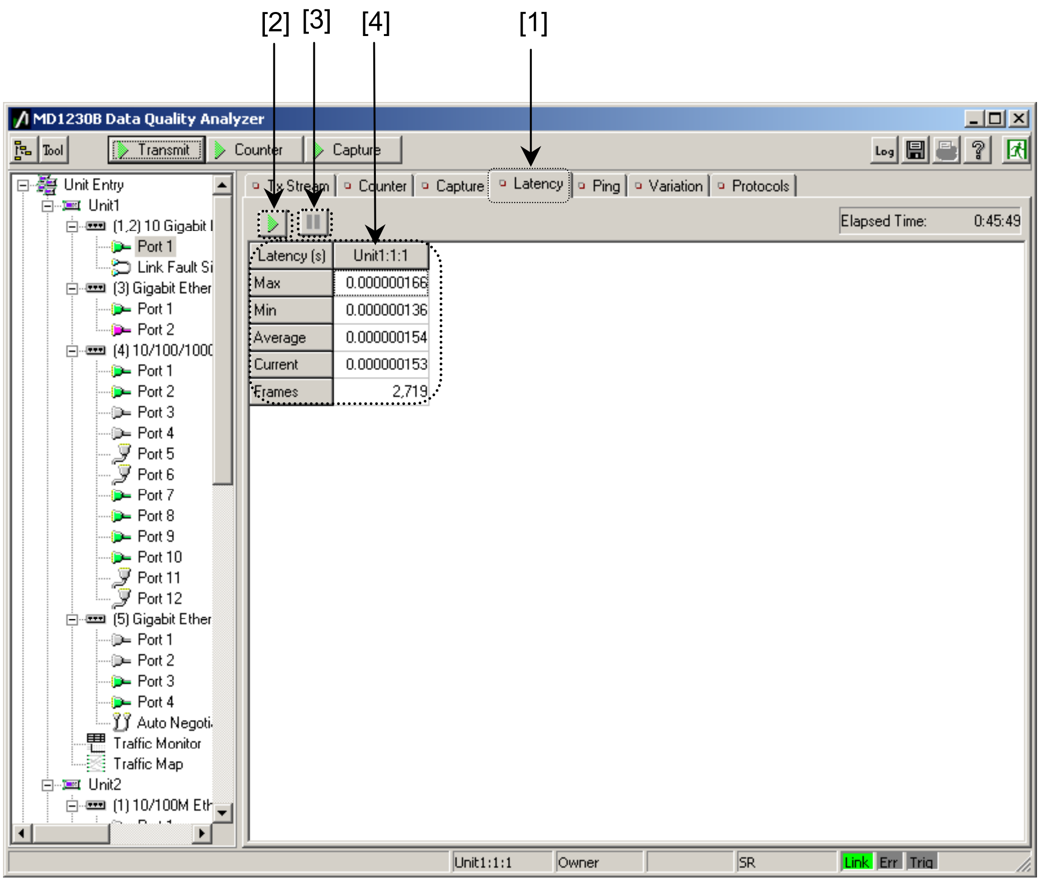


Figure 5.5-1 Latency screen

[1] Selects **Latency** tab.

[2] Starts/stops measurement.

[3] Stops measurement temporally.

[4] Displays measured result. Latency is measured by sampling one frame per 1 second (Note 4).

- Max Displays the maximum value of the acquired latency.
- Min Displays the minimum value of the acquired latency.
- Average Displays the average value of the acquired latency.
- Current Displays the latest latency.
- Frames Displays the number of measured frames.

Notes:

1. The pop-up menu is displayed when the right button of the mouse is clicked on each cell or the Set button is pressed. The following operation is available using this pop-up menu.
   When **Copy** is selected, the content displayed in the cell is copied to the clipboard.
   The contents of two or more cells can be copied at the same time by specifying the copy area in advance. The copy area can be selected by dragging the mouse, or by moving the cursor while holding down the shift key on the keyboard. When the contents of several cells are copied, the rows are delimited by line feed codes and the columns are delimited by tabs. The copied contents, therefore, can be pasted onto any text editor or spreadsheet application.

2. Because the WAN-PHY XENPAK module has a buffer, the Latency dispersion is large compared to the LAN-PHY XENPAK module.

3. When using the MU120103A/04A/03B/04B/05A/06B, Latency cannot be measured when the Test Frame straddles the SDH/SONET overhead. In this case, the measurement result displays the – symbol.

4. The MU120131A/32A/38A multiflow counter Max Latency and Min Latency does not perform sampling but instead measures all frames. (Refer to 5.3.3.2 Counter Results.)

5.5.1 Saving latency result in log

Latency results can be saved in log with an interval from 1 second to 24 hours.

The log files are to be created in CSV (Comma Separated Values) format.

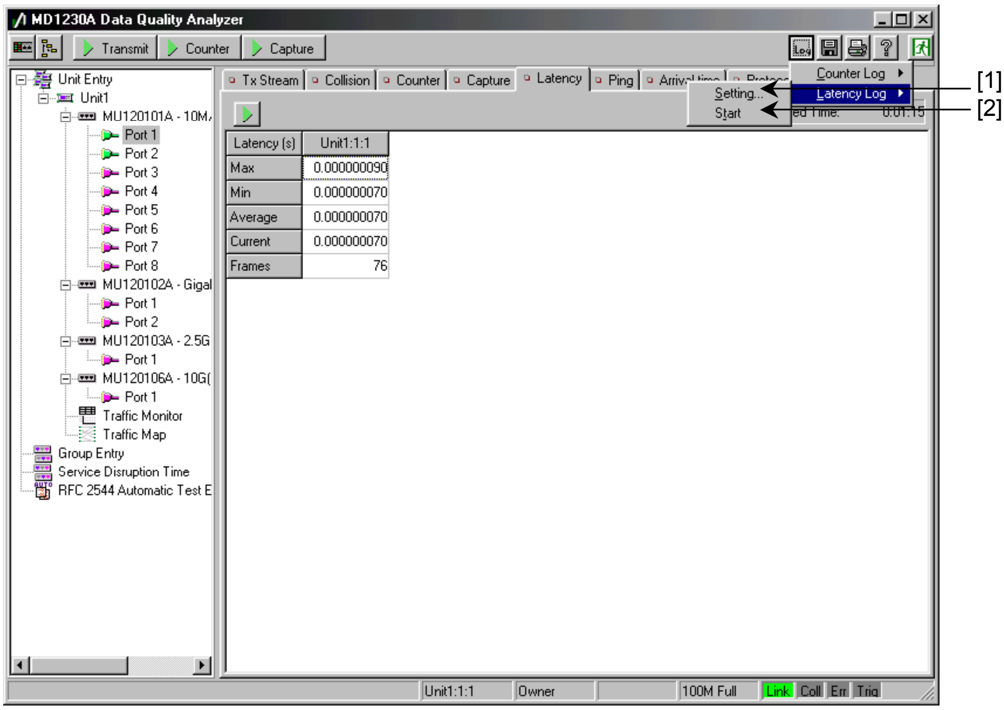


Figure 5.5.1-1 Latency screen (Log)

[1] Opens the Latency Log Setting. Refer to Section 5.2.6 Saving Counter Results to Log.

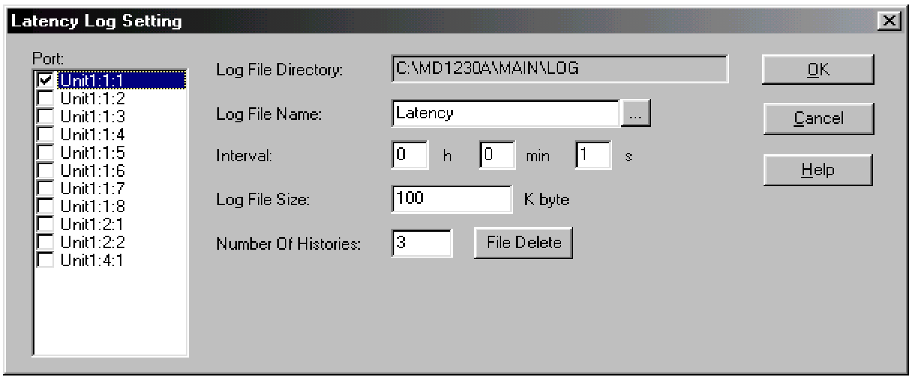


Figure 5.5.1-2 Latency log setting screen

[2] Starts log saving.
The log file is cleared when saving of the log is started.

5.6 Distribution Measurement

Displays the received frame arrival intervals or delay times in a histogram.

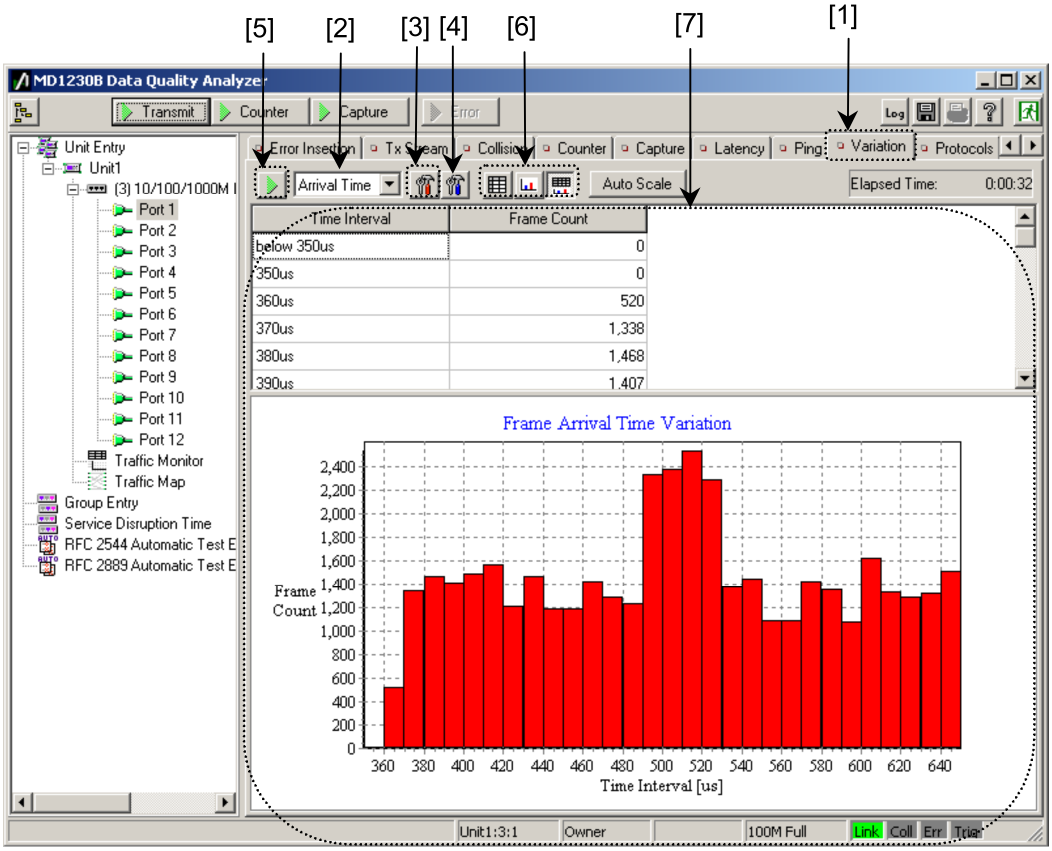


Figure 5.6-1 Frame Arrival Time screen

[1] Selects **Variation** tab.

[2] To perform distribution measurement for the reception frame arrival interval, select Arrival Time. Select Latency to perform distribution measurement for delay time.

Note:

Latency can be selected with any of the MU120121A, MU120122A, MU120131A, and MU120132A/38A modules.

[3] Sets the distribution measurement range and resolution in the window shown below:

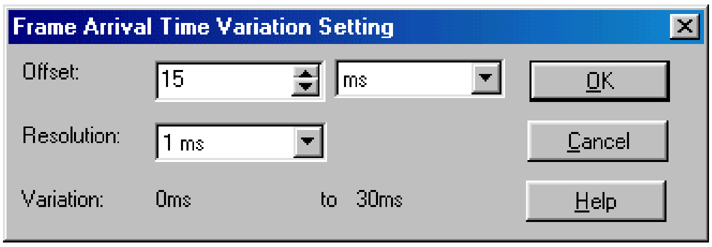


Figure 5.6-2 Measurement range and resolution setting screen

The setting ranges of Offset, Resolution and Variation differ between Frame Arrival and Latency measurement. In addition, the setting ranges of Resolution and Variation are determined by the setting of Offset.

For Frame Arrival measurement

Resolution	Offset	Variation
1 µs	0 to 179,999,970 × 1 µs	Offset to Offset+30 µs
10 µs	0 to 179,999,70 × 10 µs	Offset to Offset+300 µs
100 µs	0 to 179,997,0 × 100 µs	Offset to Offset+3000 µs
1 ms	0 to 179,970 × 1 ms	Offset to Offset+30 ms
10 ms	0 to 179,70 × 10 ms	Offset to Offset+300 ms
100 ms	0 to 177,0 × 100 ms	Offset to Offset+3000 ms
1 s	0 to 150 × 1 s	Offset to Offset+30 s

For Latency measurement

Resolution	Offset	Variation
50 ns	0 to 59,999,970 × 50 ns	Offset to Offset+1500 ns
100 ns	0 to 29,999,970 × 100 µs	Offset to Offset+3000 ns
1 µs	0 to 2,999,970 × 1 µs	Offset to Offset+30 µs
10 µs	0 to 299,700 × 10 µs	Offset to Offset+300 µs
100 µs	0 to 29,970 × 100 µs	Offset to Offset+3000 µs
1 ms	0 to 2,970 × 1 ms	Offset to Offset+30 ms
10 ms	0 to 270 × 10 ms	Offset to Offset+300 ms
100 ms	0 ms	Offset to Offset+3000 ms

[4] Sets filtering conditions for target frames of distribution measurement.

☞ For details, refer to Section 5.9.1 “Setting counter filter.”

[5] Starts/stops measurement.

[6] Switches among Table / Table + Graph / Graph displays.

[7] Displays measured results. The following operation can be performed in this field by using the mouse.

- If the mouse is dragged with the left button to the lower-right direction on the graph, that range is enlarged for display.
- If the mouse is dragged with the left button to the upper-left direction on the graph, the zoom display is cancelled.
- If the mouse is dragged with the right button on the graph, the graph display area is moved parallel with it.
- If the right mouse button is clicked on this screen, the following menus are displayed. The image of the graph can be copied to clipboard or save to a file.
    - Undo Zoom — Cancels expansion display.
    - Copy as Bitmap — Records the image of the graph in bitmap format to clipboard.
    - Copy as Metafile — Records the image of the graph in metafile format to clip board.
    - Save — Saves the image of the graph to a file. Bitmap format (*.bmp) and metafile format (*.wmf, *.emf) are selectable.

In the field displaying a table, the pop-up menu is displayed when the right button of the mouse is clicked on each cell or the Set button is pressed. The following operation is available using this pop-up menu.

When Copy is selected, the content displayed in the cell is copied to the clipboard.
The contents of two or more cells can be copied at the same time by specifying the copy area in advance. The copy area can be selected by dragging the mouse, or by moving the cursor while holding down the shift key on the keyboard. When the contents of several cells are copied, the rows are delimited by line feed codes and the columns are delimited by tabs. The copied contents, therefore, can be pasted onto any text editor or spreadsheet application.

5.6.1 Auto Scale function

The Auto Scale function increases or reduces the resolution or adjusts the offset to provide the best view of the Frame Arrival Time Variation distribution.

Operation

- Pressing **Auto Scale** changes the setting values for Resolution and Offset to make all data are displayed within the histogram area and then retries measurement repeatedly and automatically.
  To disable the Auto Scale function and continue measurement, press **Auto Scale** again to cancel it.

5.7 Performing Processes Related to Various Protocols (Protocol Support Function)

5.7.1 PPP

When PPP is selected for the mapping by using the Port Setting of the MU120103A/04A/05A/06A/19A/20A/03B/04B and MU150101A, the POS link can be established with an opposite device by using LCP (Link Control Protocol) and IPCP (Internet Protocol Control Protocol).

(1) Configuration Options used for the LCP Configure-Request
This function transmits the LCP Configure-Request containing MRU (Maximum Receive Unit) and Magic Number. The MRU value can be set by using the Port Setting screen.
Magic Number cannot be set because it is automatically generated inside the MD1230B.

(2) Configuration Options used for the IPCP Configure-Request
When [Send this port IP Address] is enabled on the Port Setting screen, the MD1230B transmits the IPCP Configure-Request containing the IP Address option to save the IP address of this port. IP Address option is not included when [Send this port IP Address] is disabled.

(3) Timeout and Retry
For both LCP and IPCP, users can set the waiting time (until receiving a response such as Ask for a request) and the number of re-transmissions (when receiving no responses).The same packet is used for the re-transmission (the Identifier is also the same).

When there are connection requests from both devices, the POS link confirmation operation is performed automatically (passive connection). When connecting from the MD1230B, press **Restart** on the Port Setting screen (active connection).

5.7.2 VLAN

VLAN trunking conforming to VLAN(IEEE802.IQ) is a technology to multiplex two or more VLANs with one physical circuit. This is done by encapsulating each frame with a VLAN tag that is the identifier of VLAN.

IEEE802.1Q tunneling (QinQ) is a technology to multiplex various frames with VLAN tag with one VLAN. This is done by encapsulating a frame that has already been encapsulated with a VLAN tag with a new VLAN tag. Consequently, two or more VLAN tags are provided.

MD1230B supports these VLAN technologies. However, the content of VLAN support depends on the function and module. This section describes the details of the supported contents.

(1) Transmitting stream data
A frame with VLAN tag can be transmitted. TPID and VID can be set for any number of VLAN tags.

With MU120121A/22A/31A/32A/38A, up to 10 VLAN tags can be set. Only one VLAN tag can be set on other modules.

☞ See Section 5.1.2 "(2) Editing the VLAN field" for details.

(2) Counter
Frames with VLAN tag are also counted by the counter of the higher layer (*1). If IPv4 frame with VLAN tag is input, for example, the value of Received IPv4 Packet counter is updated.
On modules other than MU120121A/22A/31A/32A/38A, frame with one VLAN tag (TPID is 8100 (hex)) and frame with no VLAN tag are counted.

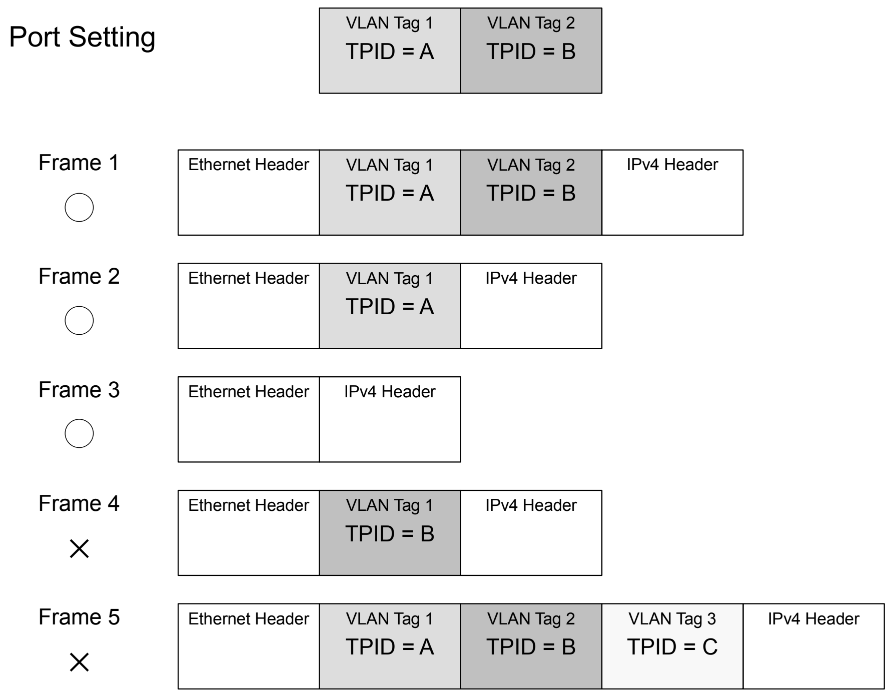
On MU120121A/22A/31A/32A/38A, up to 10 VLAN tag frames can be counted. VLAN tag is identified with the value of TPID in the Port Setting-This Port VLAN setting and the corresponding counter is counted.

☞ See Section 4.5.6 "[1] VLAN" for details

The following conditions apply to the number of VLAN tags:

- Frame having the number of VLAN tags equal to the number of tags set in the Port Setting dialog box, and equal to “TPID” of the corresponding number in the Port Setting dialog box
- Frame having fewer VLAN tags than that set in the Port Setting dialog box, and equal to “TPID” of the corresponding number in the Port Setting dialog box
- Frame without VLAN tag

For example, “frame 1”, “frame 2”, and “frame 3” in the figure below are recognized as IPv4 Packet. However, “frame 4” with a different TPID and “frame 5” having more VLAN tags than that set in the Port Setting dialog box are not recognized as IPv4 Packet.



Base Position of a user-defined counter also supports the VLAN tag (*1). For example, the position of IPv4 Header of a frame with VLAN tag can be detected.

(3) Multiflow counter
A VLAN tag can be set as Flow ID. Base Position of a filter also supports the VLAN tag in the same manner as the counter (*1).

(4) Capture
Base Position of a filter trigger also supports the VLAN tag in the same manner as the counter (*1). Also, frames with VLAN tag are translated and displayed according to the TPID setting of the Port Setting. Other than MU120121A/22A/31A/32A/38A with no TPID setting of the Port Setting are translated and displayed with TPID of 8100 (hex) as VLAN tag.

Notes:

1. Only the "TPID" of the Port Setting is used as the VLAN related setting of the counter capture function. For example the "VID" setting has no effect. Counter capture is performed regardless of the VID value of the received frame.

2. The TPID setting of Port Setting used by the counter capture function is enabled regardless of whether the VLAN Enable setting is On or Off.

(5) Protocol Support
The following protocols support VLAN.

☞ See Section 4.5.6 "[1] VLAN" for details

(A) ARP, NDP (ICMPv6)
With the MU120121A/22A, ARP can be sent and received with multilevel VLAN tags.

(a) ARP Request/NS transmission
ARP Request/NS transmission is only supported by MU120121A/22A. When “Enabled” in the Port Setting dialog box is On, a VLAN tag which is defined in the This Port VLAN setting is attached to the ARP Request/NS frame when the following transmission are performed.

- MAC address resolution of Gateway for stream transmission
- MAC address resolution when ICMP/ICMPv6 Echo Request (PING) is transmitted

(b) ARP Request/NS reception response
With MU120111A/12A/18A/18B/18C/31A/32A/38A, ARP Request/NS with one VLAN tag (TPID is 8100 (hex)) and with no VLAN tag are responded.

When “VLAN Enabled” in the Port Setting dialog box is On, up to 10 ARP Request/NS frames with VLAN tag can be responded. The type of the frame that can be responded depends on the setting of the Port Setting dialog box (*2,4). If more than one VLAN tags are set in the Port Setting dialog box, frames having VLAN tags equal to or less than that set is responded, in the same manner as the counter. The VLAN tag is also attached to the ARP Reply/NA packet that responds to the ARP Request/NS.

(B) PING (ICMP/ICMPv6)
MU120121A/22A is only supported. PING with more than one VLAN tag can be transmitted or received.

(a) Echo Request transmission
When “VLAN Enabled” in the Port Setting dialog box is On, a VLAN tag in accordance with the setting in the This Port VLAN Setting dialog box is attached to the Echo Request packet.

(b) Echo Request reception
When “VLAN Enabled” in the Port Setting dialog box is On, Echo Request responds to an Echo replay packet with VLAN tag. The type of the frame that can be responded is the same as that during ARP reply/NA reception described above.
The VLAN tag is also attached to the Echo Replay packet that is a response to Echo Request.

(C) Ethernet OAM
CCM transmission with up to 10 VLAN tags and LBM/LTM response, and LOC/AIS/RDI alarm count are possible.
This function requires Ethernet OAM option.

(a) CCM transmission
When VLAN Enabled of Port Setting is On, VLAN tag based on This Port VLAN setting is added to the transmitted CCM.

(b) LBM/LTM reception response
When VLAN Enabled of Port Setting is On, LBM/LTM with VLAN tag is responded to. This Port VLAN setting applies to the TPID/VID value of the responded VLAN tag. Also, when there are more than one This Port VLAN settings, similar to counter, response is made when the number of frames is equal to or less than the number set. *3,4
VLAN tag is also added to LBR/LTR which are response to LBM/LTM.

(c) LOC/AIS/RDI Alarm count
Irrespective of whether VLAN Enabled is On or Off, frames below the number of levels specified at the Port VLAN setting are detected as alarms. However, only the TPID setting is used at VLAN detection. (The Priority/VID setting cannot be used.)

*1: The counter function, multiflow function, and capture function also sets a filter trigger. This filter trigger also supports a frame with VLAN tag. For example, a filter whose Base Position is “Top of UDP Header” can also filter a packet with tag. The condition of a frame with VLAN tag supported by the trigger filter is the same as the condition in which the counter of the higher layer counts.

*2: Whether a response is made when a request for a protocol such as of APR Request/NA with VLAN tag is received depends on the type of the requested frame, setting of Acceptable VID, and setting of Only VLAN-Tagged Frame. The following table shows the relationship of these. If the CFI it of the VLAN tag is set (1), however, a response is not made without condition.

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Only VLAN-Tagged Frames setting</th></tr>
<tr><th>On</th><th>Off</th></tr>
<tr><th rowspan="2">Acceptable VID setting</th><th>This Port</th><td>VID = Port Setting VID</td><td>VID = Port SettingVID
VID = 0
Without VLAN tag</td></tr>
<tr><th>All</th><td>1 ≤ VID ≤ 4094</td><td>0 ≤ VID ≤ 4094
Without VLAN tag</td></tr>
</table>

For example, if setting of Acceptable VID is All and if Only VLAN-Tagged Frames is On, the ARP Request frame with VLAN tag of any VID of 1 to 4094 is responded, regardless of the setting of VID in the Port Setting dialog box, but the ARP Request frame without VLAN tag is not responded.

*3: The protocol emulation function of Ethernet OAM does not use the Only VLAN-Tagged Frame and Acceptable VID settings. The behavior is the same as when Only VLAN-Tagged Frames is Off and Acceptable VID is This Port.

*4: The value of the received packet is used for Priority. No response is made when the CFI bit is Set (1).

5.7.3 ARP

ARP (Address Resolution Protocol) provides a function to combine the IP address to the physical address (MAC address). This function is enabled in the MU120101A/02A/11A/12A/18A/18B/18C/21A/22A/31A/32A/38A. For the MU120103B/04B and MU150101A, it is enabled when one of GFP/LAPS/
LEX is selected in Mapping.

(1) Solution of destination MAC address
When **Gateway** is selected for the Destination Address of Ethernet frame in the stream transmission, this function resolves the gateway MAC address. In addition, the Ping function also resolves the Destination MAC address from the Destination IP address. At that time, the solution process of Destination MAC address is internally performed and there are no user settings.

Note:

When no appropriate ARP reply is acquired, no MAC address solution is performed. The status varies depending on the function when there is no solution.

(2) Transmission of ARP reply
For the received ARP request, the ARP reply is transmitted according to the user settings.
The following three operation modes can be selected. The setting is performed on the Port Setting screen.

(a) Not send
No ARP request packet is monitored and no ARP reply is transmitted.

(b) Reply to this port ARP request
The ARP reply is transmitted only for the ARP request of the IP address set as this port.

(c) Reply to all ARP request
The ARP reply is also transmitted for the ARP request of other than the IP address set as this port.

Note:

The MD1230B transmits the ARP replay even when the Sender MAC Address of ARP request is the same as the MAC address of the receiving port.

5.7.4 ICMP

ICMP is an important protocol to report errors on TCP/IP network. ICMP of the MD1230B generates only two types of reports: the Echo request and the Echo reply. It is equipped to issue the so-called “Ping” command to check the accessibility to any host on the network.

Ping function

(a) Destination IP address is determined.
The ARP function is used in the Ethernet module to resolve the MAC address. The PPP/LEX link is established in the MU120103A/04A/05A/06A/19A/20A/03B/04B and MU150101A modules as required.

(b) The ICMP Echo request packet is generated and transmitted.

(c) There is a 2-second wait time for the ICMP Echo reply.
When an (correct) echo reply is received within 2 seconds, the round trip time is recorded and notified. When it exceeds 2 seconds, it becomes the Request timed out.

(d) Repeat Steps b and c 4 times.

(e) Even when the Destination IP address is the same as the IP address of This Port setting, the packets are transmitted on the line.

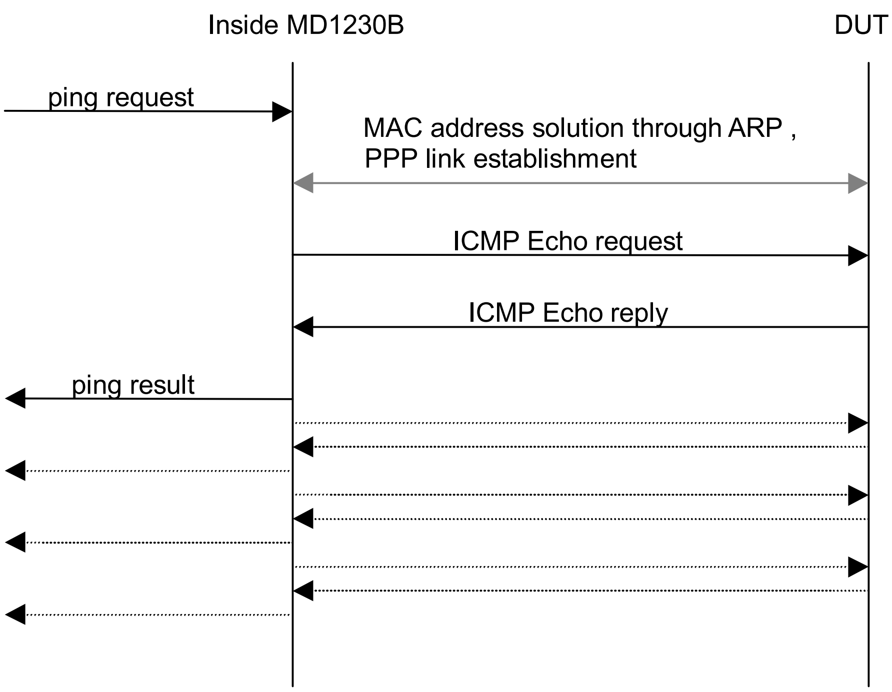


Figure 5.7.4-1 Ping function

When an Echo reply with correct contents is received, the following information is reported. The correct received Echo reply contents mean the contents that match the transmitted Echo request contents.

(a) ICMP packet size

(b) IP address of the host that transmitted the ICMP packet

(c) TTL

(d) round trip time

Any message appears when “Destination Unreachable” or “Time Exceeded” occurs.

ICMP Echo reply transmission function

When [Reply to this port Ping request] is enabled on the Port Setting screen and an ICMP Echo request packet addressed to the IP address of this port is received, the ICMP Echo reply is transmitted to the transmission source IP address.

5.7.5 IGMP

The IGMP mounting of the MD1230B generates multiple virtual host Membership Reports for receiving multicast, and transmits them to the DUT router.
This function can test the IGMP processing of the DUT router and the Group management ability, and is also applied to the IP multicast and traffic test.

☞ When using the MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A, refer to Section 5.7.17 “IGMPv3/MLDv2 protocol emulation function.”

Basic procedure

(1) Set the IGMP Version in use and presence/absence of Router Alert.

(2) Select the report transmission method.

(3) Set the IP address range of the virtual host and the multicast address range to which the virtual host belongs.

(4) Press the start button to start the report transmission according to the settings (the PPP link establishment is performed in the MU120103A/03B/04A/04B/05A/06A/19A/20A and MU150101A as required).

(5) Press the stop button to stop the report transmission.

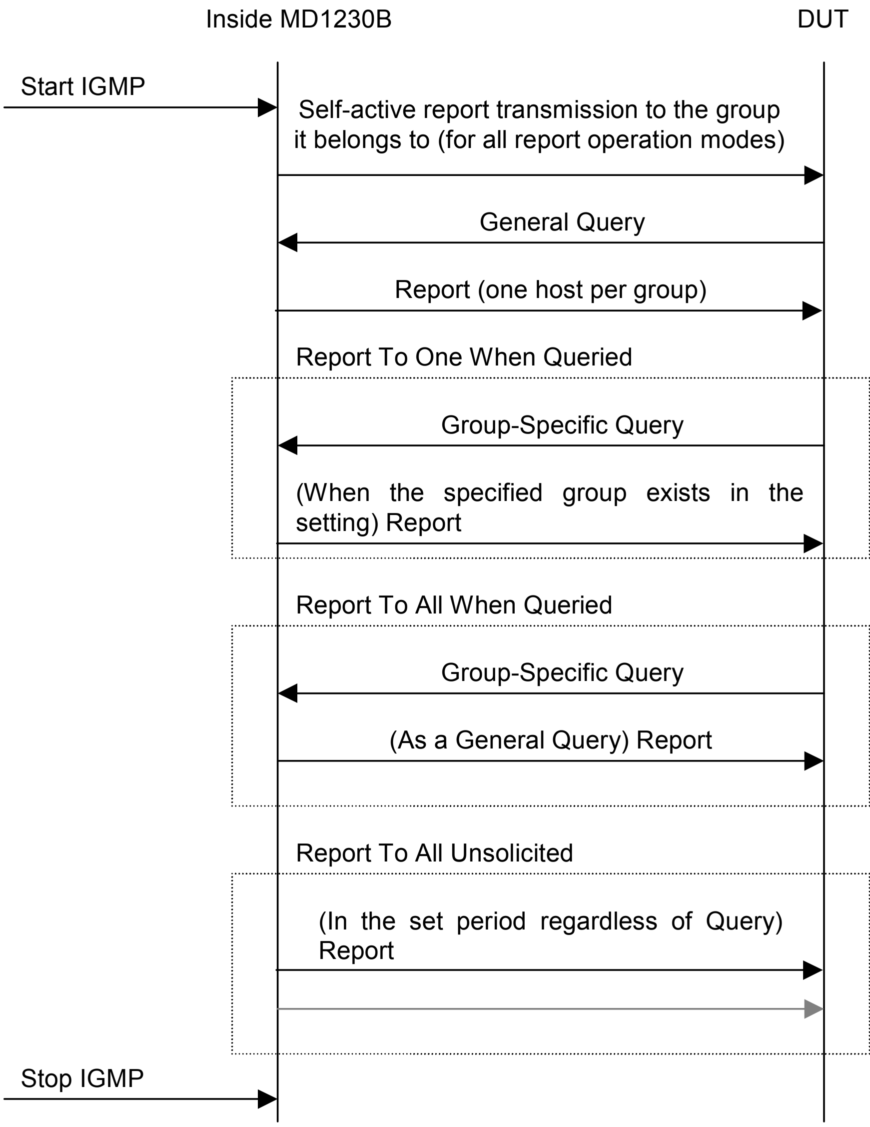


Figure 5.7.5-1 IGMP function

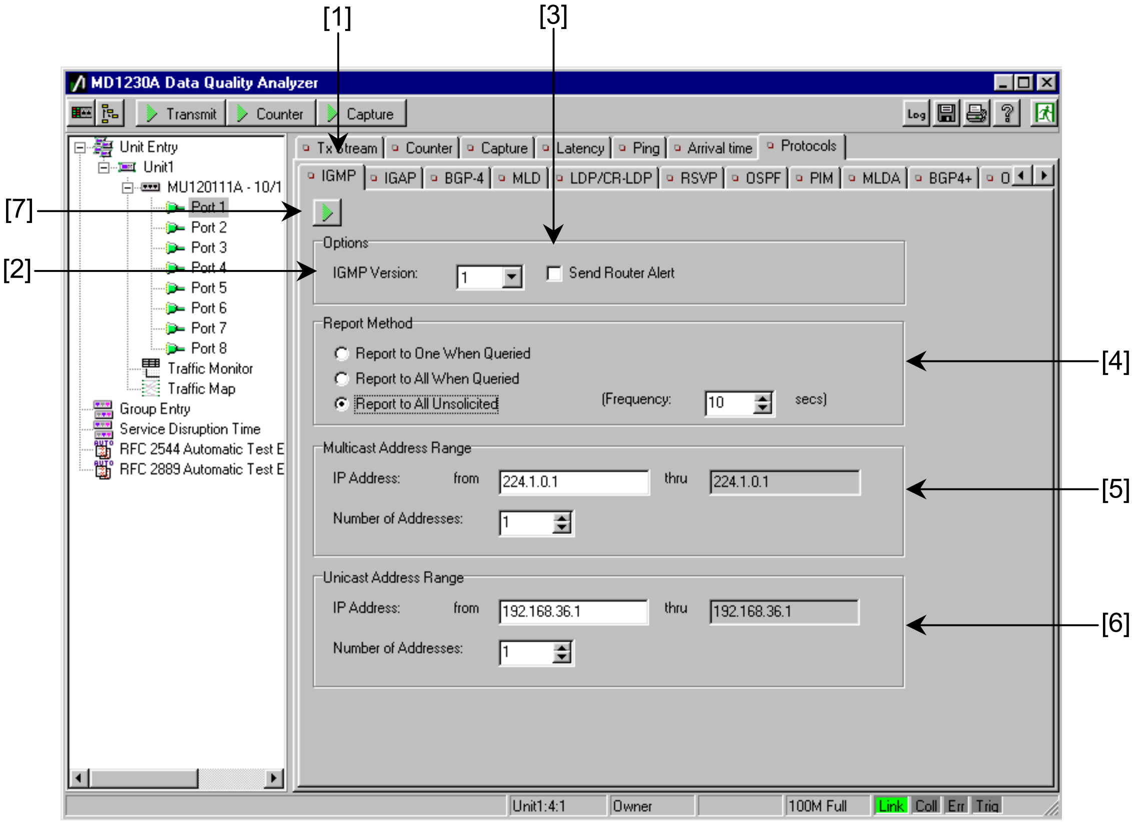


Figure 5.7.5-2 IGMP setting screen

[1] Selects IGMP tab.

[2] IGMP version

Version 1: 0x12 is used for “Type” of report.
Version 2: 0x16 is used for “Type” of report.

Note:

IGMPv2 must transmit reports after checking whether the Query is a General Query or a Group-Specific Query. However, the MD1230B complies with the Report operation mode setting regardless of the version setting. These conditions are also true for the Router Alert.

[3] Send Router Alert

On: Adds IP Router Alert Option to the IP header.
Off: Does not add IP Router Alert Option to the IP header.

[4] Report Method

(a) Report To One When Queried
Only reports related to the specified group are transmitted for the Group-Specific Query.

(b) Report To All When Queried
Every query is always assumed to be a General Query and all reports of set groups are transmitted.

(c) Report To All Unsolicited
All reports of set groups are transmitted in every specified period regardless of queries (queries are ignored).

(d) Frequency
The transmission period referred by [Report To All Unsolicited] (10 to 600 seconds) is set.

[5] Multicast Address Range
Specifies the IP multicast address to which the virtual host belongs.
A maximum 255 addresses can be specified in a continuous address range.
The valid range of IP multicast addresses is from 224.0.0.0 to 239.255.255.255. However, setting from 0.0.0.0 to 255.255.255.255 is possible for the MD1230B.

[6] Unicast Address Range
Specifies the IP address of virtual host.
A maximum 255 addresses can be specified in a continuous address range.
Specified IP addresses (host) here belong to the above multicast groups. However, all hosts do not transmit reports at the same time.

[7] Starts/stops IGMP emulation.

Report transmission rule

When a report is transmitted to a group address, a single transmission-source virtual host is retrieved from the Unicast Address Range. A marker is assumed to be present in the Unicast Address Range indicating the any virtual host address. The address specified for the marker is used for the report. When the address is used, the marker moves one position to the addition direction to prepare for the next report transmission. When the marker reaches the end of Unicast Address Range, it moves to the beginning at the next time (the initial value of marker is the beginning of the range).

Example:

Multicast Group Address Range: 224.1.1.1 to 224.1.1.2
Unicast Address Range: 192.168.1.1 to 192.168.1.8
When General Queries are periodically received in the above ranges:

	Group		Unicast Loop
1st report	224.1.1.1	←	192.168.1.1
	224.1.1.2	←	192.168.1.2
2nd report	224.1.1.1	←	192.168.1.3
	224.1.1.2	←	192.168.1.4
3rd report	224.1.1.1	←	192.168.1.5
	224.1.1.2	←	192.168.1.6
4th report	224.1.1.1	←	192.168.1.7
	224.1.1.2	←	192.168.1.8
5th report	224.1.1.1	←	192.168.1.1
	224.1.1.2	←	192.168.1.2
	.		.
	.		.

Host status and timer management

The MD1230B omits the host status management and the timer management even in statuses where multiple virtual hosts participate a group because a single virtual host handles the report for the particular group.

Therefore, the Max Response Time does not affect the report transmission set to the Version 2 Query (it is ignored).

Operation immediately after switching from the stop status to start

Reports are automatically transmitted to all the set groups immediately after the start command regardless of the report operation mode.

Operation immediately after the stop

Nothing is performed. The IGMP processing at the port stops.

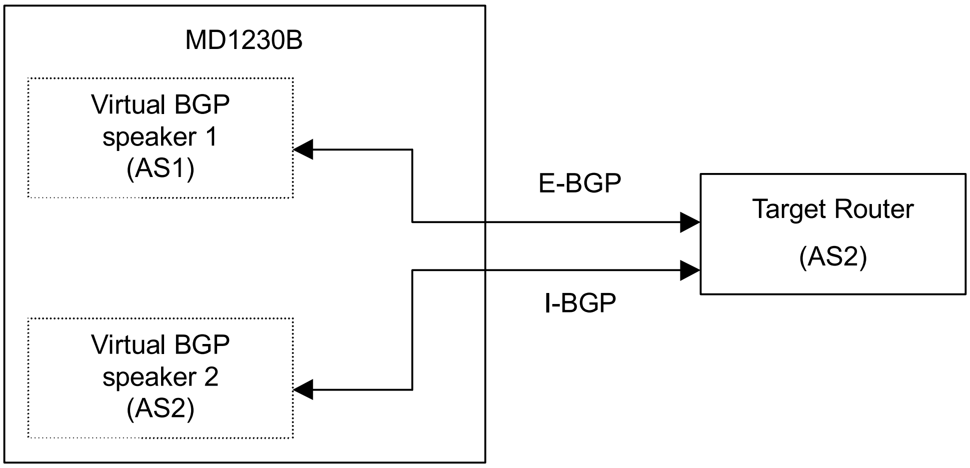
Restrictions

Do not allow any host except for the MD1230B that transmits reports to exist.
All reports are ignored, even if received.

5.7.6 BGP-4

The MD1230B internally generates multiple virtual BGP speakers to operate as the opposite for the target router.

It transmits through the virtual route according to user settings and enables the periodical generation of route and link flaps.



In addition, it also enables either simulation of E-BGP or I-BGP as in the above example (between R2 and R3 for I-BGP or between R1 and R3 for E-BGP).

The route received from the target router is not reflected to the route transmission. The specified route is transmitted by the specified schedule.

The available route is IPv4 only.

Note:

BGP-4: available for MU120101A/02A/11A/12A/18A/18B/18C/21A /22A.

In case of MU120111A/12A/18A/18B/18C/21A/22A, The BGP parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

Basic procedure

(1) Add the IP prefix and so on advertised by the virtual router and its virtual router as the BGP test entry (maximum 8 entries). They are generated when the automatic generation is specified in the IP prefix or the PATH attribute.

* Entry additions, changes, and deletions are possible when the BGP-4 test port is in the stop state.

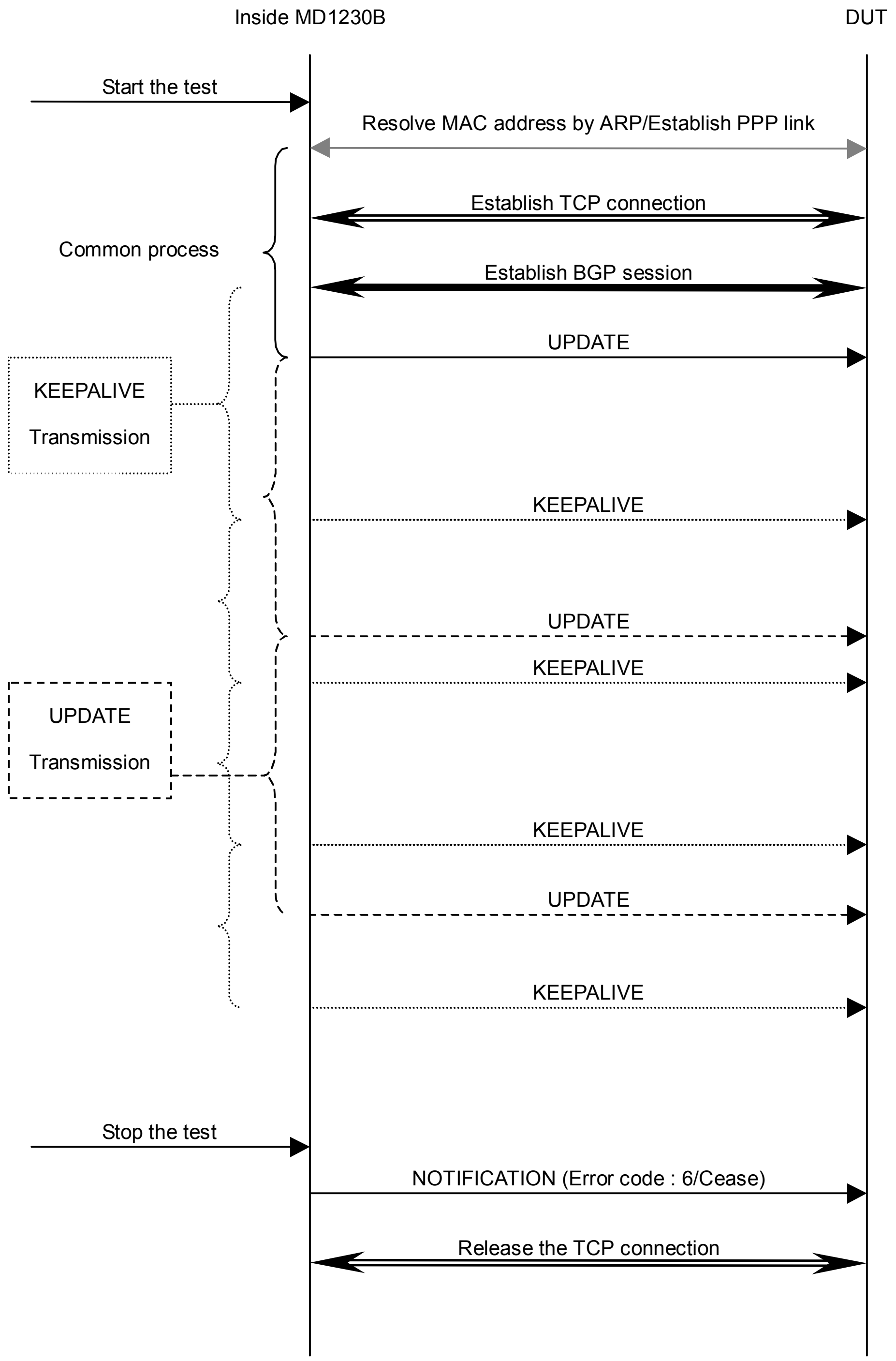
(2) Press the start button to establish the TCP connection (port number 179) with the specified router and to advertise the route according to the specified schedule (Active Open).
Multiple entries are connected in descending order.

* The MU120101A/02A/11A/12A/18A/18B/18C/21A/22A require MAC address resolution by ARP before establishing the TCP connection. In some cases the test port must be in the Reply to all ARP request mode so that the virtual router accepts the packet from the opposite router (Just the Reply to This Port ARP request setting is sufficient when the opposite router uses This Port setting as the default router or the virtual router allocates the same address with This Port address).

* The PPP link is established in the MU120103A/04A/05A/06A/19A/20A/03B/04B as required.

(3) When the link flap or the route flap is enabled, **Link disconnection/reconnection**, **Route cancellation/restoration** and so on are performed according to the schedule. The UPDATE and KEEPALIVE transmissions are also the same.

(4) Pressing the stop button transmits “NOTIFICATION (Cease)” and closes the TCP connection (all active sessions) by TCP RST transmission.


Inside MD1230B
DUT
Start the test
Resolve MAC address by ARP/Establish PPP link
Establish TCP connection
Common process
Establish BGP session
UPDATE
KEEPALIVE
Transmission
KEEPALIVE
UPDATE
KEEPALIVE
UPDATE
Transmission
KEEPALIVE
UPDATE
KEEPALIVE
Stop the test
NOTIFICATION (Error code : 6/Cease)
Release the TCP connection

Setting information

A maximum 8 entries (number of virtual routers) per one port are the limitation.

E-BGP and I-BGP are not specifically distinguished. The AS number setting of the virtual router is used to identify E-BGP and I-BGP.

(1) Common entry setting

(a) Number of link retries (0 to 10 times: Default 0)

(b) Link retry interval (0 to 180 seconds: Default 10 seconds)
Sets the number of reconnection attempts and their interval at a TCP connection failure.
These are also applied to the link flap.

(2) Individual entry setting (basic setting)

(a) IP address of virtual router

(b) AS number of virtual router

(c) IP address of target router

(d) UPDATE re-transmission period (0-600 seconds: 0 is only for the transmission immediately after the connection)

(e) KEEPALIVE transmission period (0-600 seconds: 0 is for no transmission)

(f) Link flap

- Execution Yes/No
- Value Link establishment time (10-600 seconds)
  Link disconnection time (10-600 seconds)

(3) Individual entry setting (route setting)

(a) Virtual IP prefix (automatic generation)

- Number of generations 0-100

  This setting cannot be made with the MU120111A/12A/18A/18B/18C/21A/22A. The number of prefixes generated by these modules is determined by the following "value".

- Value Specify the BGP-4 packet format (the length and the 8-bit prefix value multiplied by an integer).
  Generated parameters
  - Reference IP address
  - Start bit mask (1-32)
  - End bit mask (1-32)

A specified number of items is generated automatically in the range obtained from the reference IP address and the bit mask value. However, when the maximum number of items that can be generated is lower than the specified number of items, items are generated to the maximum number.

(b) Sets the maximum number (20 to 100) of prefixes that can be saved in a single packet.

(c) Route flap

- Execution Yes/No
- Value The time to cancel the route transmitted as NLRI (10 to 600 seconds)
  The time to transmit the cancelled route as NLRI (10 to 600 seconds)

Note:

The time specified here is measured starting from the establishment of the BGP session.

Individual entry setting (path attribute)

Note:

Default setting for all of the following is [No Addition].

(1) ORIGIN
- Addition Yes/No
- Value IGP, EGP, INCOMPLETE (select one)

(2) AS_PATH (AS_SET)
- Addition Yes/No
- Value From 0 to 32 AS numbers ranging from 0 to 65,535 can be edited.

(3) AS_PATH (AS_SEQUENCE)
- Addition Yes/No
- Value From 0 to 32 AS numbers ranging from 0 to 65,535 can be edited.

(4) AS_PATH (AS_CONFED_SET)
- Addition Yes/No
- Value From 0 to 32 AS numbers ranging from 0 to 65,535 can be edited.

(5) AS_PATH (AS_CONFED_SEQUENCE)
- Addition Yes/No

- Value   From 0 to 32 AS numbers ranging from 0 to 65,535 can be edited.

(6) NEXT_HOP
- Addition   Yes/No
- Value   The IP address of NEXT_HOP router

(7) MULTI_EXIT_DISC
- Addition   Yes/No
- Value   From 0 to 4,294,967,295

(8) LOCAL_PREF
- Addition   Yes/No
- Value   From 0 to 4,294,967,295

(9) ATOMIC_AGGREGATE
- Addition   Yes/No

(10) AGGREGATOR
- Addition   Yes/No
- Value   The AS number and the IP address ranging from 0 to 65,535

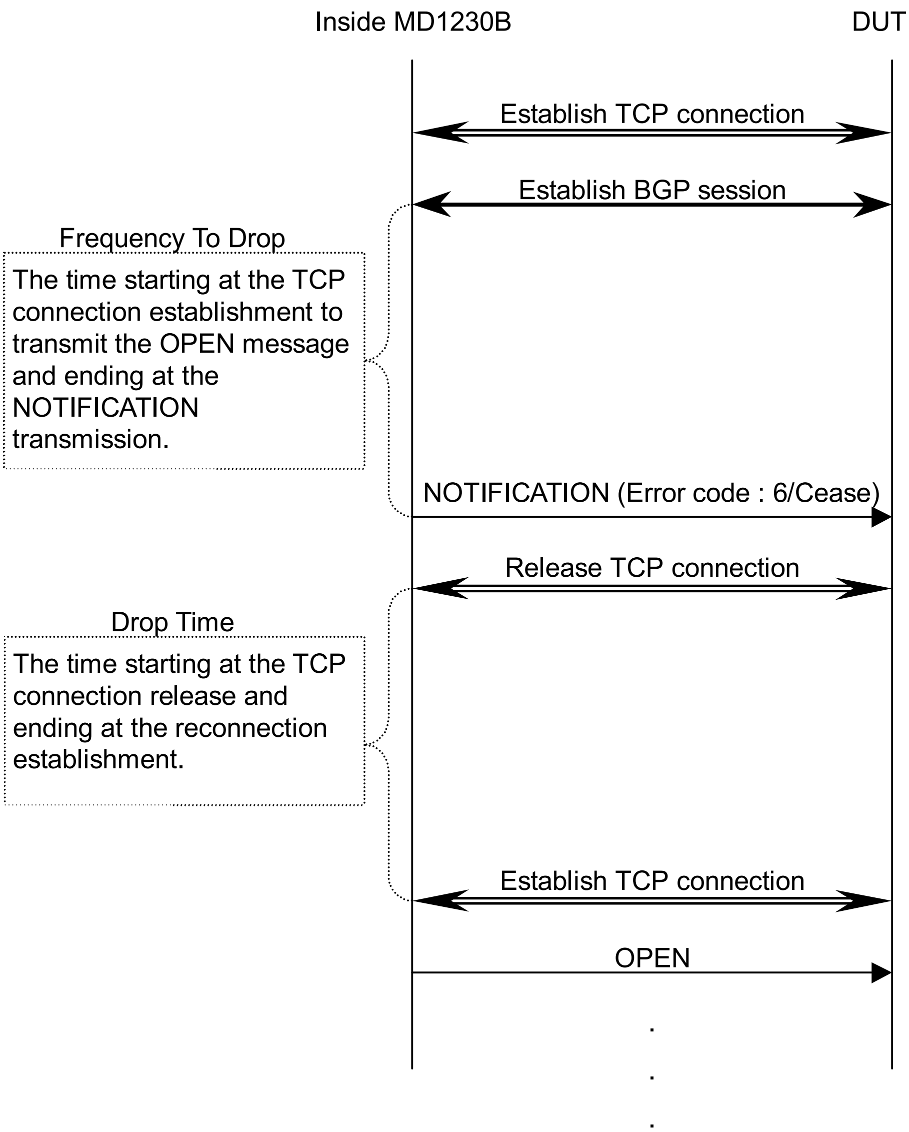
(11) COMMUNITIES
- Addition   Yes/No
- Value   From 0 to 32 community values ranging from 0 to 4,294,967,295 can be edited.

(12) ORIGINATOR_ID
- Addition   Yes/No
- Value   IP address

(13) CLUSTER_LIST
- Addition   Yes/No
- Value   From 0 to 32 CLUSTER_LIST values ranging from 0 to 4,294,967,295 can be edited.

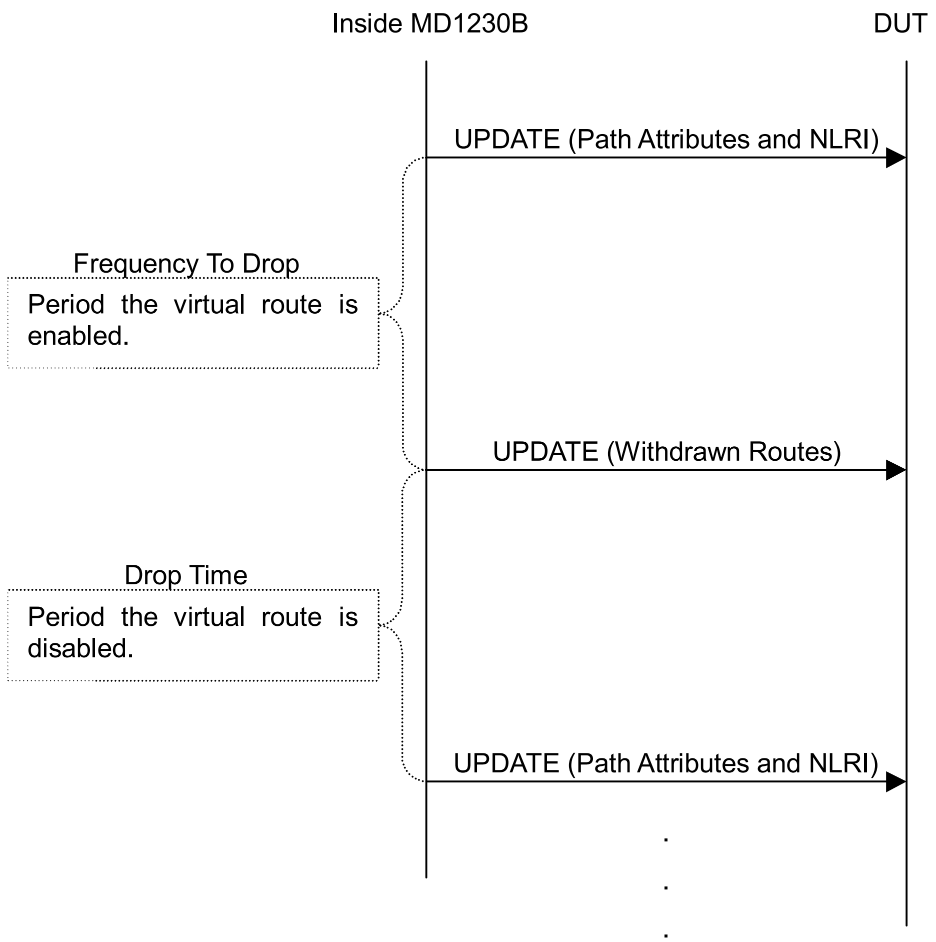
Link flap

Link flap is a function to periodically perform the BGP session establishment and release according to the period specified by the user.



Route flap

Route flap is a function to periodically generate the virtual route presence notification and the cancellation notification according to the specified period.

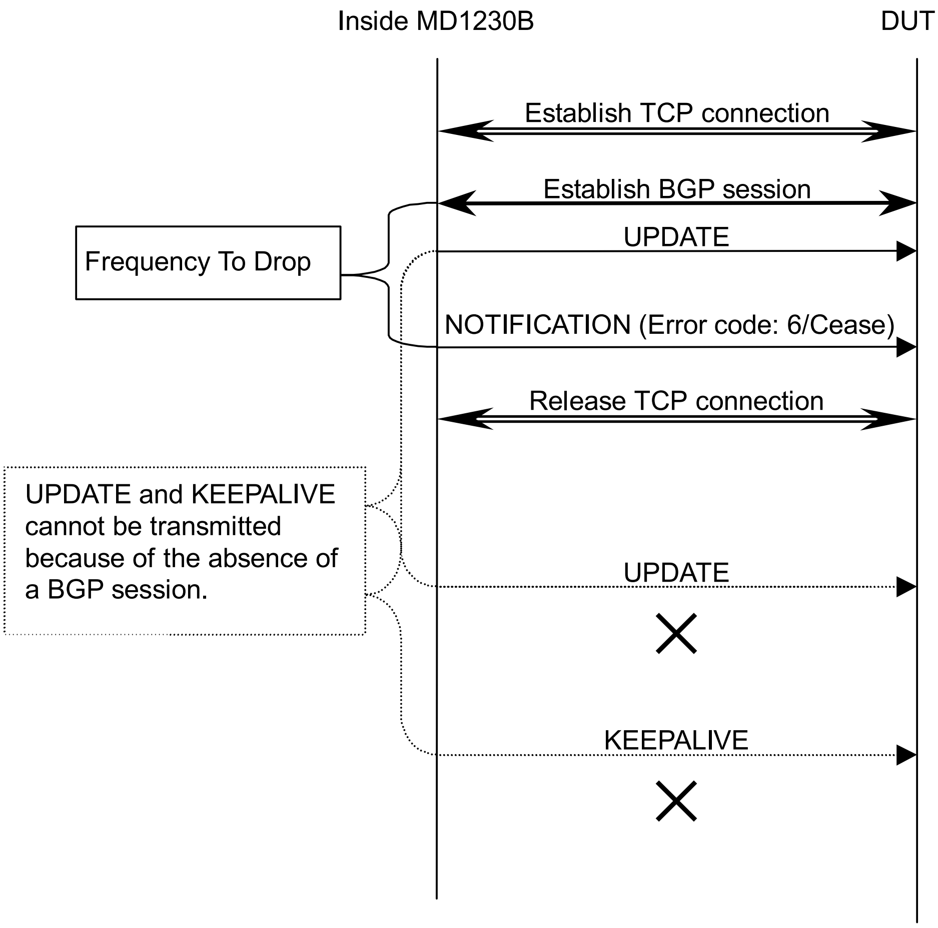


Schedule collision

(1) Link flap

(a) When a KEEPALIVE transmission period longer than **Frequency To Drop** is set, the KEEPALIVE cannot be transmitted.

(b) When an UPDATE transmission period longer than **Frequency To Drop** is set, the UPDATE cannot be transmitted.

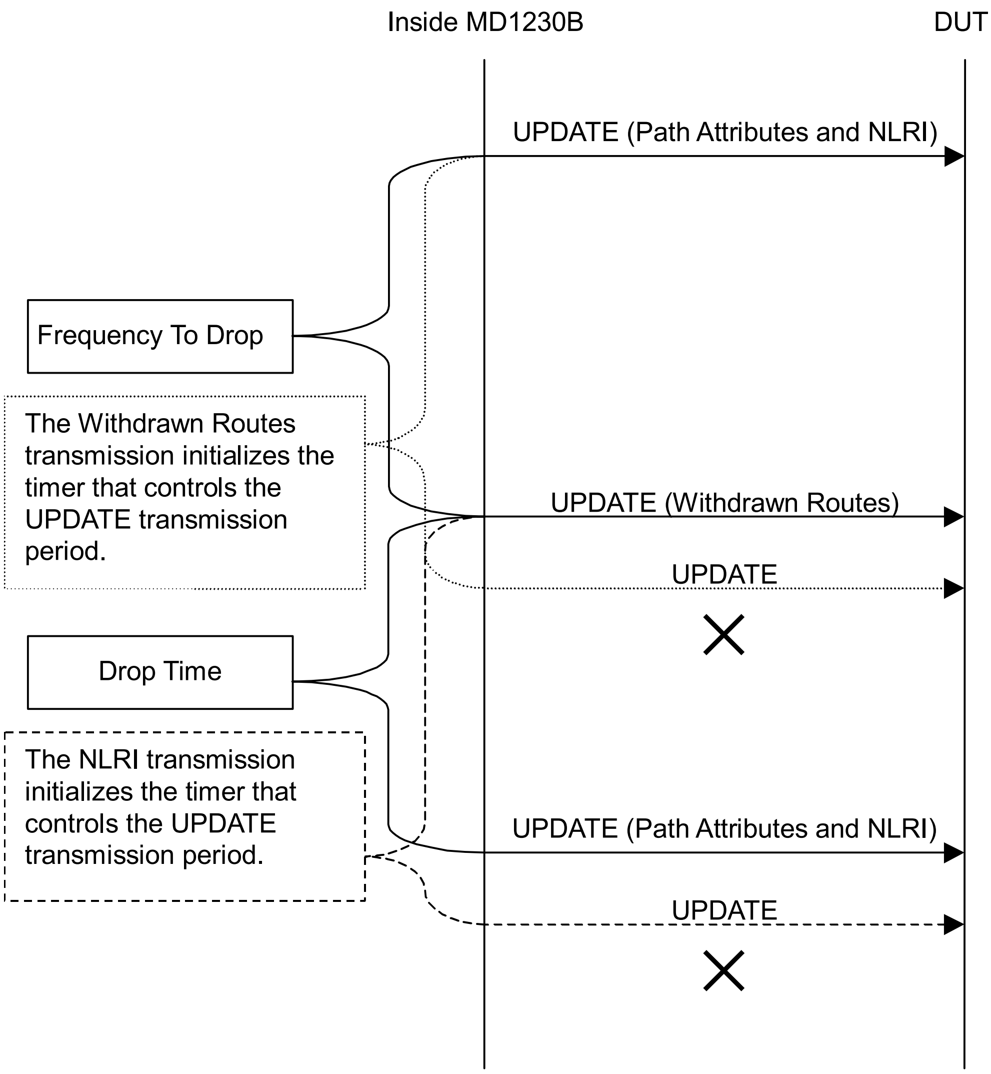


(2) Route flap

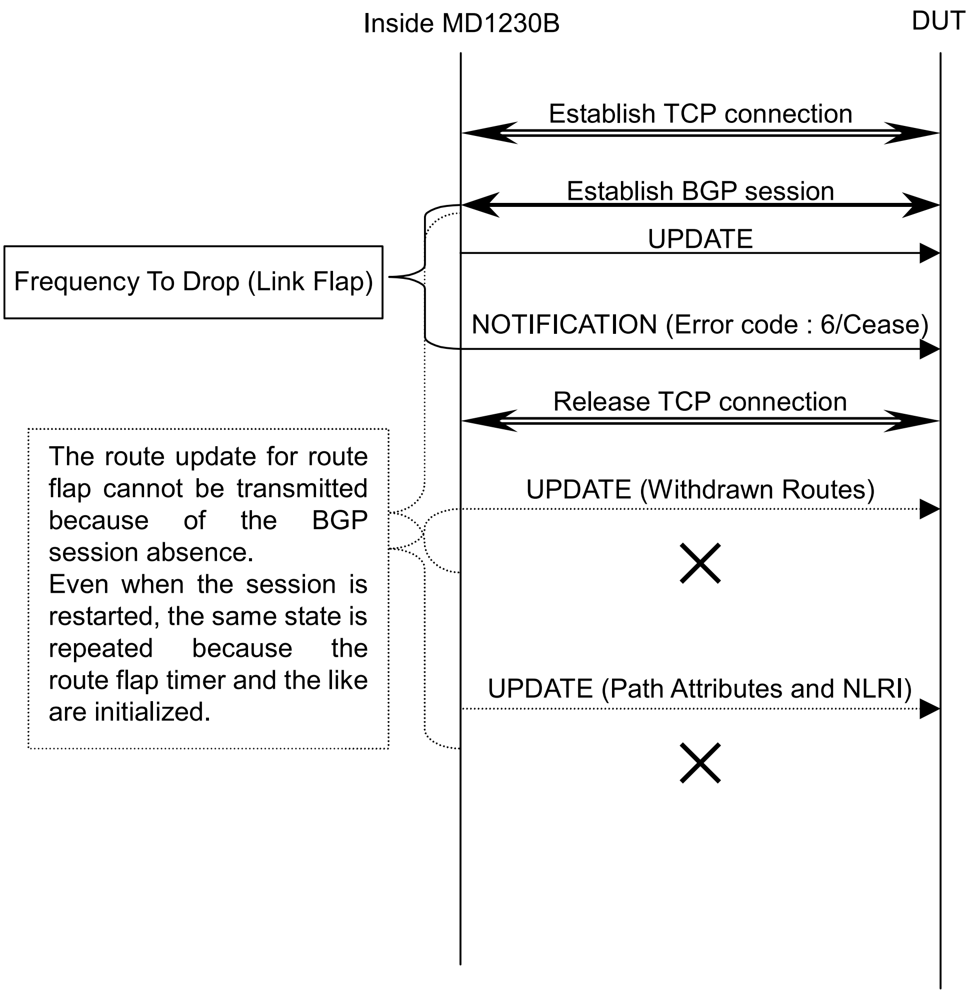
(a) KEEPALIVE is transmitted at every specified period.

(b) When the UPDATE transmission period is longer than **Frequency To Drop**, the Withdrawn UPDATE is transmitted at the Frequency To Drop termination and the UPDATE transmission period timer is reset at the same time.

(c) When the UPDATE transmission period is longer than **Drop Time**, the UPDATE messages of Path Attributes and NLRI are transmitted at the Drop Time termination and the UPDATE transmission period timer is reset at the same time.



(3) Collision between a link flap and a route flap
When a link flap and a route flap schedule collide, the link flap takes priority.
For example, even if a **Frequency To Drop** of a route flap longer than the **Frequency To Drop** of a link flap is set, the route flap does not function because of the BGP session release.



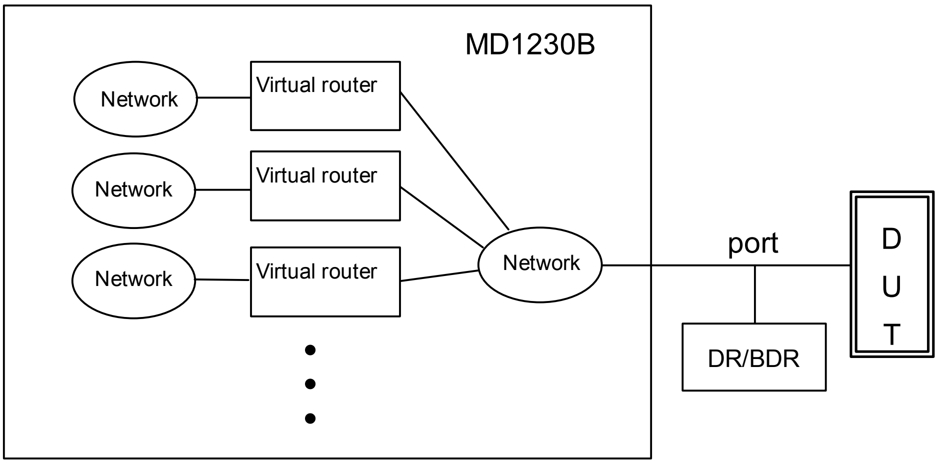
Termination of number of retries and operation at target disconnection
When the number of retries terminates or the target router disconnects the BGP session of an entry, the entry activity stops (while other entries continue operations).

When ARP address resolution or PPP link establishment has failed
When ARP or PPP processing failed before establishing TCP connection, the entry activity stops (not affected by link retry count and interval).

5.7.7 OSPF

The MD1230B functions as an OSPF virtual router shown below by building a link status database.

Items required for the link status data (LSA) conform to OSPF Version2, RFC2328.



The number of virtual routers for each port is 200, and that of link states to which a virtual router corresponds is unlimited. But the memory capacity of the Protocol CPU is limited, thus the actual number of link states is also limited according to the Protocol CPU memory capacity.

The virtual router cannot function as a DR/BDR.

Notes:

1. This function requires the OSPF Protocol option.
2. The OSPF parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

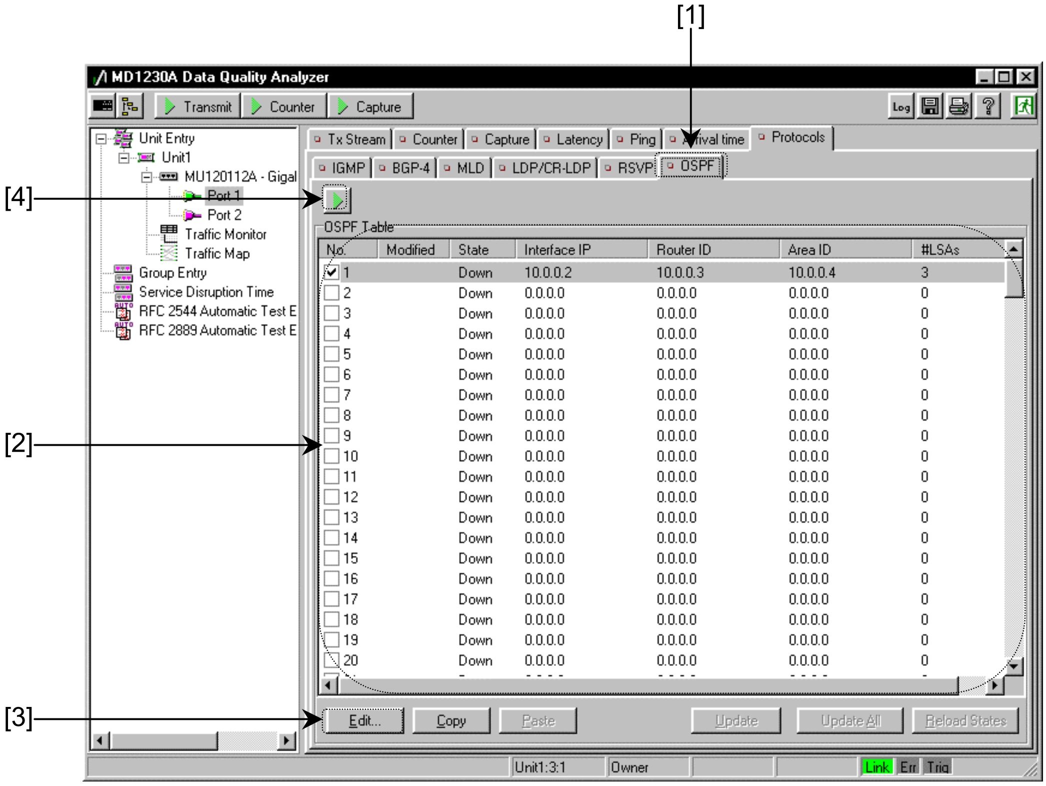


Figure 5.7.7-1 OSPF setting screen

[1] Selects **OSPF** tab.

[2] Creates database from LSAs set in [3] below.

[3] Set the virtual router interface data of virtual router (such as the virtual router address, Area ID, and Router ID), Router-LSA, Network-LSA, Summary-LSA (information outside the area), Summary-LSA (information about the AS boundary router), AS-External-LSA, and NSSA-LSA to configure the virtual router. Clicking the **Edit** opens the Virtual router setting screen as shown in Figure 5.7.7-2 on the next page.

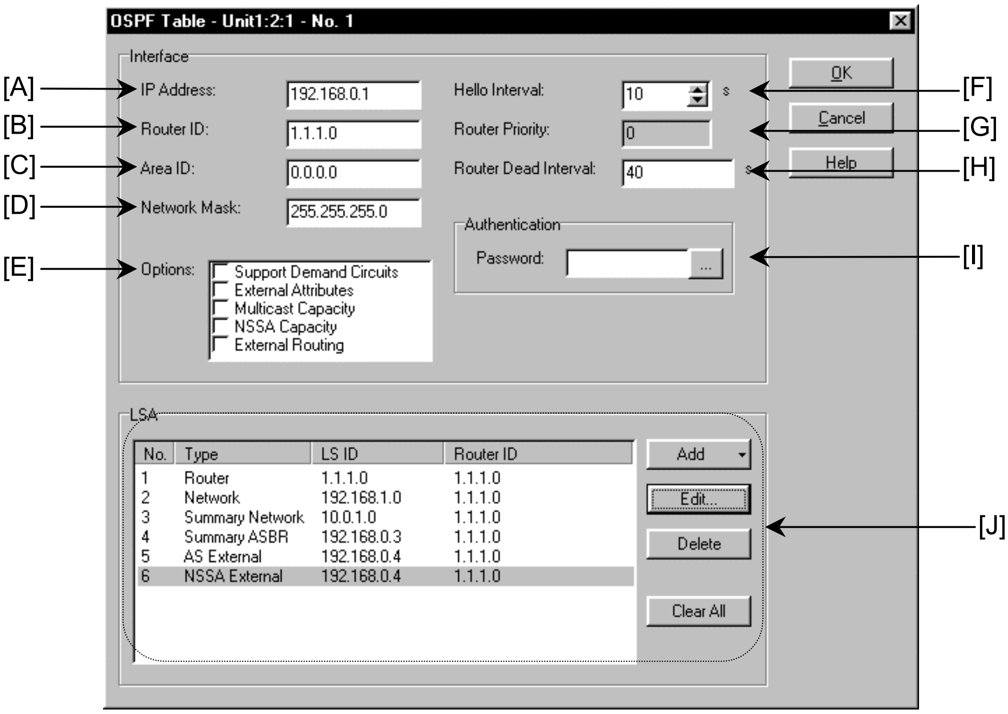


Figure 5.7.7-2 Virtual router setting screen

[A] Sets the IP address of the virtual router.

[B] Sets the ID of the router that transmitted an OSPF packet. Set one of the IP addresses assigned to the router interface.

[C] Sets the ID of the area where the router that transmitted an OSPF packet belongs.

[D] Sets the subnet mask of the transmission interface.

[E] Sets the Option field. The following settings are available:

- Support Demand Circuits:
  Indicates whether the router supports RFC1793 "Extending OSPF to Support Demand Circuit."
- External Attributes:
  Indicates whether the router supports External-Attribute-LSA.
- Multicast Capacity:
  Indicates whether the IP multicast packet is transferred according to the RFC1584 "Multicast Extensions to OSPF" definition.
- NSSA Capacity:
  Indicates whether the router supports the RFC1587 "The OSPF NSSA Option."
- External Routing:
  Indicates the flow of AS-External route.

[F] Sets an interval for transmitting a Hello packet. The setting range is 10 to 65534 (s).

[G] Sets the Router Priority field. Since the setting value is fixed to 0 (dec), the virtual router of the MX123001A cannot function as a DR/BDR.

[H] Sets the time (second) to judge the communication with Neighbor shuts down.
If a Hello packet does not arrive within the specified time, the router judges that the communication with the Neighbor has shut down.

[I] Indicates the information for authentication. For example, when AuType is "1," a password for authentication should be entered here. When AuType is "0," any value can be entered in this field since OSPF authentication is not performed in this event.

[J] Sets LSAs to be included in Link-state Update.
The following six types of LSAs can be selected by clicking the **Add**:

(1) Router LSA

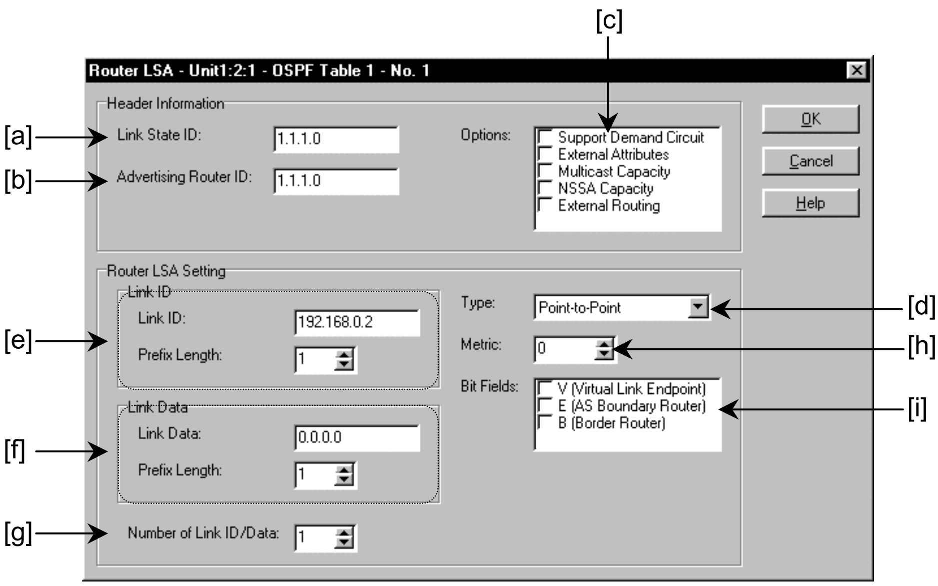


Figure 5.7.7-3 Router LSA setting screen

[a] Sets the router ID for the router that has created Router-LSA.

[b] Sets the router ID for the router that has created Router-LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Selects a type of Link from the followings:

- Point-to-Point: Point-to-Point connection
- Transit: Connection to transit network
- Stub: Connection to stub network
- Virtual: Virtual link

[e] Link ID:
Sets a link ID. The setting differs depending on the type of Link.

- For Point-to-Point: Router ID of Neighbor router
- For Transit: IP address of DR of the network
- For Stub: Network address of the network
- For Virtual: Router ID of Neighbor router

Prefix Length:
Specifies the range of increment set in [g] below. The setting range is 1 to 32 bits from the header.

[f] Link Data:
Sets Link Data. The setting differs depending on the type of Link.

- For Point-to-Point: MIB-II if Index value of the interface
- For Transit: IP address of the router interface
- For Stub: Subnet mask of the network
- For Virtual: IP address of the router interface

Prefix Length:
Specifies the range of increment set in [g] below. The setting range is 1 to 32 bits from the header.

[g] Sets the number of increments for Link ID and Link Data, which are set in [e] and [f] respectively, according to the value set in Prefix Length.
For example, when Link ID is set to 1.1.1.0 and Prefix Length is set to 24 in [e], and when Number of Link ID/Data is set to 3 in [g], the Link IDs are created as follows:
Link ID: 1.1.1.0
Link ID: 1.1.2.0
Link ID: 1.1.3.0

[h] Sets the cost used in the Link.

[i] Sets V, E and B bits.

- V bit: Indicates that it is the end point of virtual link when checked.
- E bit: Indicates that the router is the AS boundary router when checked.
- B bit: Indicates that the router is the area boundary router when checked.

(2) Network LSA

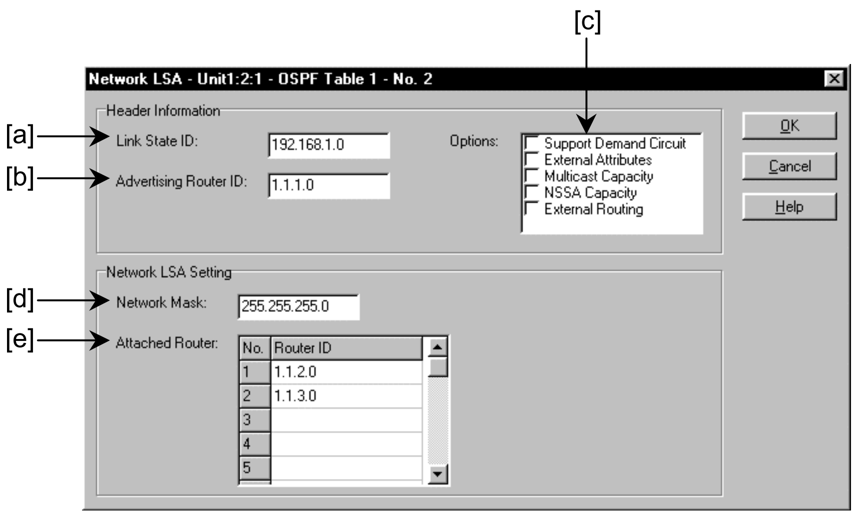


Figure 5.7.7-4 Network LSA setting screen

[a] Sets the IP address of the DR interface for the network.

[b] Sets the router ID for the router that created the LSA. This is the router ID of the DR since the LSA is set by the DR in the Network-LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Sets the network mask of the network.

[e] Creates a list of the router IDs of all the routers connected to the network, including DR itself.

(3) Summary Network LSA

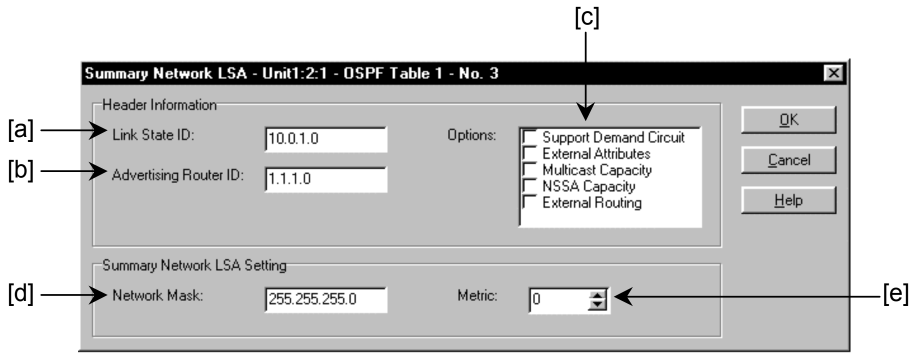


Figure 5.7.7-5 Summary Network LSA setting screen

[a] Sets the address of the network outside of the area.

[b] Sets the router ID for the router that created the LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Sets the network mask of the network. The network is identified by the network address set in [a] and the network mask set here.

[e] Sets the cost until the network.

(4) Summary ASBR LSA

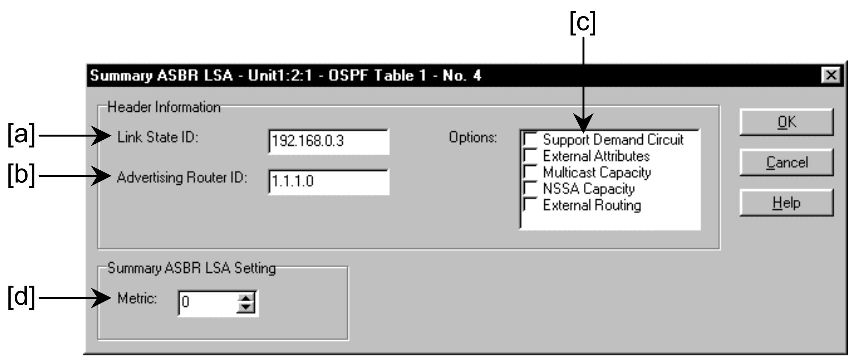


Figure 5.7.7-6 Summary ASBR LSA setting screen

[a] Sets the router ID of the AS boundary router.

[b] Sets the router ID for the router that created the LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Sets the cost until the AS boundary router.

(5) AS External LSA

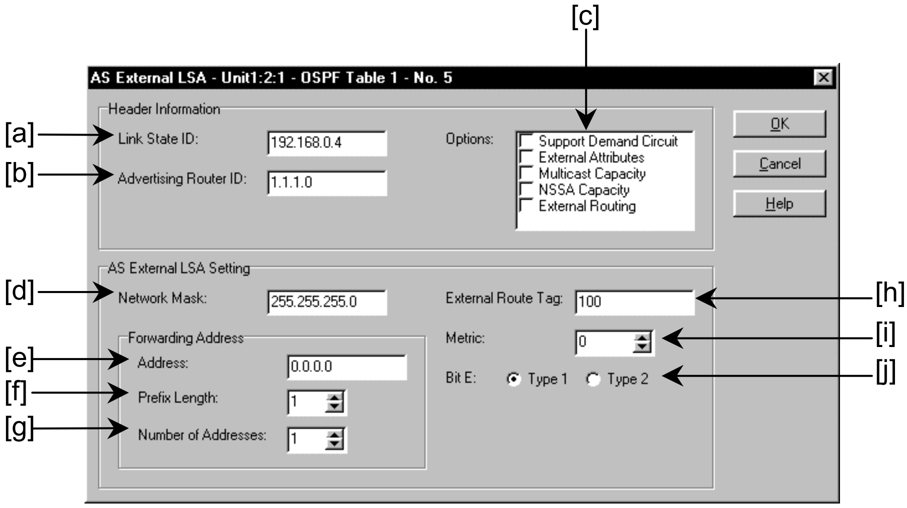


Figure 5.7.7-7 AS External LSA setting screen

[a] Sets the address of the network for the AS-External route.

[b] Sets the router ID for the router that created Router-LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Sets a network mask of the network for the AS-External route.

[e] Sets the address to which the data traffic outgoing to the advertised network is transferred. When “0.0.0.0” is set, the data traffic is sent to the router that created the LSA.

[f] Specifies the range of increment set in [g] below. The setting range is 1 to 32 bits from the header.

[g] Sets the number of addresses to be incremented.

[h] Sets a tag to be affixed to the AS-External route. This is a 32-bit length setting field.

[i] Sets the cost of the network.

[j] Sets the type of metric on the AS-external route.

- Type 1: The cost from a router to the AS-External network is a value adding the cost until the AS boundary router to the External metric.
- Type 2: The cost from any router to the AS-External network is the value of the External metric.

(6) NSSA External LSA

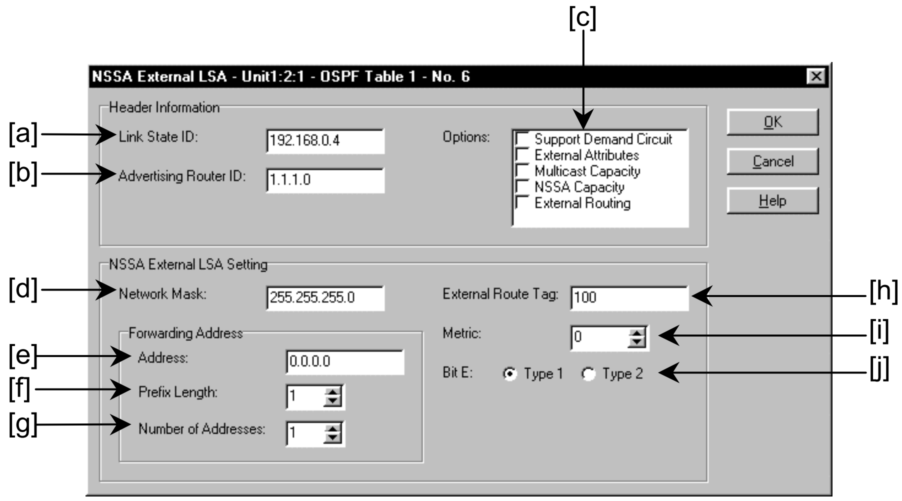


Figure 5.7.7-8 NSSA External LSA setting screen

[a] Sets the address of the network for the AS-External route.

[b] Sets the router ID for the router that created Router-LSA.

[c] Sets OSPF option capability supported by the router. The setting value is the same as that in [E] described above.

[d] Sets the network mask of the network for the AS-External route.

[e] Sets the address to which the data traffic outgoing to the advertised network is transferred. When “0.0.0.0” is set, the data traffic is sent to the router that created the LSA.

[f] Specifies the range of increment set in [g] below. The setting range is 1 to 32 bits from the header.

[g] Sets the number of addresses to be incremented.

[h] Sets a tag to be affixed to the AS-External route. This is a 32-bit length setting field.

[i] Sets the cost of the network.

[j] Sets the type of metric on the AS-External route.

- Type 1: The cost from a router to the AS-External network is a value adding the cost until the AS boundary router to the External metric.
- Type 2: The cost from any router to the AS-External network is the value of the External metric.

5

Basic Measurement (Manual Test)

[4] Press the start button to start the virtual router emulation function according to the following sequence:

a) Detection of neighbor (adjacent) routers based on the Hello protocol

b) Database information exchange

c) Request of additional information by the link status request (LSR)

d) Link status update (LSU) packet transmission

e) Update packet transmission in the specified period

Press the stop button to send a message to cancel the transmitted LSA in the stop operation so that the link state goes down.

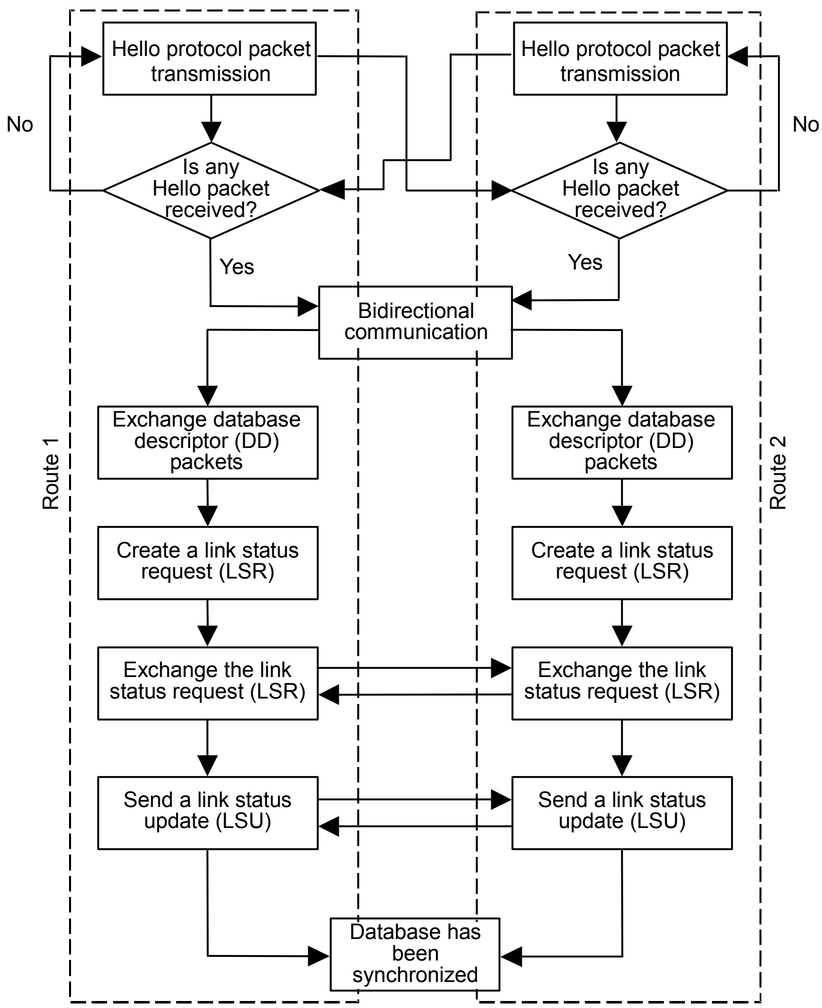


Figure 5.7.7-9 Virtual router emulation

5.7.8 MPLS (RSVP)

The MPLS (RSVP) emulation function in the MD1230B creates traffic in the MPLS domain so that verification (to check that traffic engineering performed in the domain for traffic that flows in the MPLS domain is working effectively) is possible.
This traffic is made up of streams (to which the MPLS system header is added) and is transferred to LSR. It makes arrangements so that a correspondence table of the prefixes and label values (obtained in RSVP) can be used for creating such streams.

Notes:

1. This function requires the MPLS (RSVP) Protocol option.

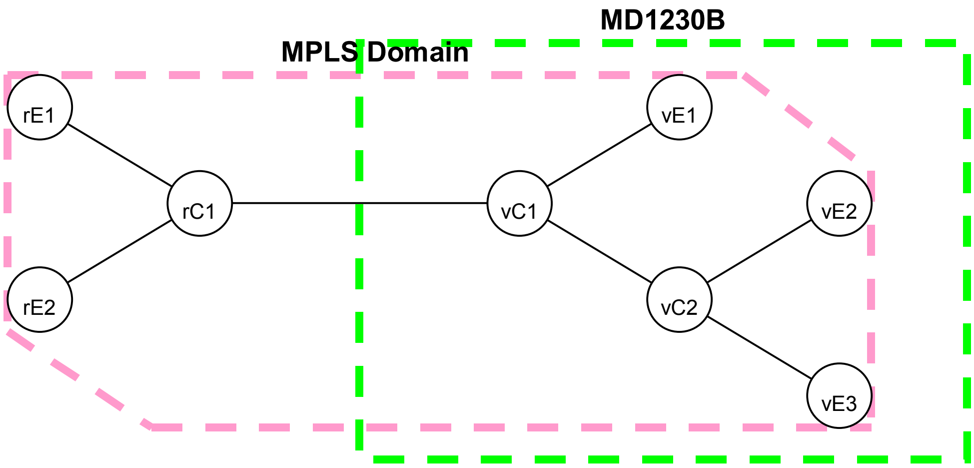
2. The MPLS (RSVP) parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

Basic procedure

(1) Set the object described in RFC2205 (RSVP), that described in RFC3209 (RSVP-TE), and that described in RFC2210 (RSVP).

(2) Press the start button to build multiple edge routers, and also to build a topology of edge LSR (The numbers of layers, cores, and edges are unlimited).



- Each virtual edge router can provide multiple paths in the direction of vEn → rEn.
- Each virtual edge router can provide multiple paths in the direction of rEn → vEn.

- Each path can be specified with an explicit path.
- Each virtual LSR can be set using an IPv4 address or AS number.
- For each virtual LER, the path information can be edited by IPv4.
- Paths connecting virtual edges cannot be created.

(3) Press the stop button to release all reservations and paths.

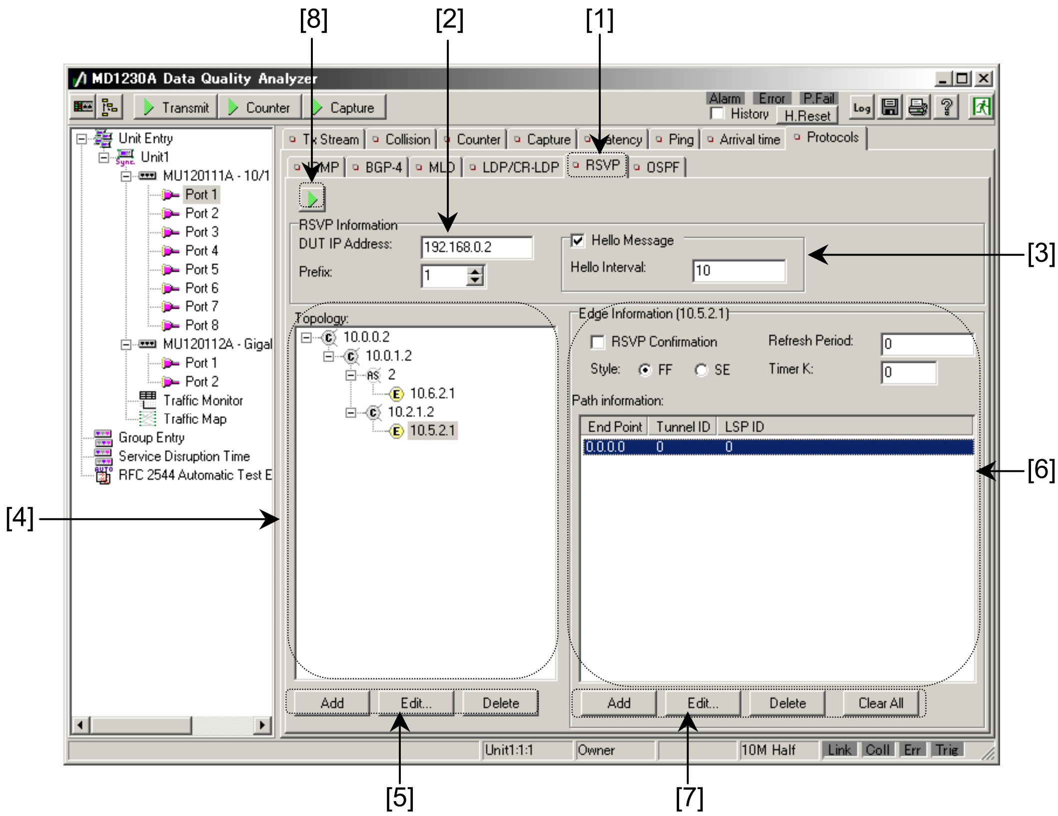


Figure 5.7.8-1 RSVP setting screen

[1] Selects **RSVP** tab.

[2] Sets the IP address and prefix of the DUT to be connected.

[3] Sets the interval for transmitting a Hello message in seconds.

[4] Displays the configuration of each LSR.

[5] Adds an LSR by clicking the **Add**, and sets the IP address of each LSR or AS No. by clicking the **Edit**.

[6] Sets the edge information.

- RSVP Confirmation: Enables/disables RSVP Confirm.
- Style: Selects FF or SE.
- Refresh Period: Sets the refresh timer.
- Timer K: Sets the timer coefficient K.
- Path Information: Displays summary path information.

[7] Adds path information by clicking the **Add**, and edits path information by clicking the **Edit**.

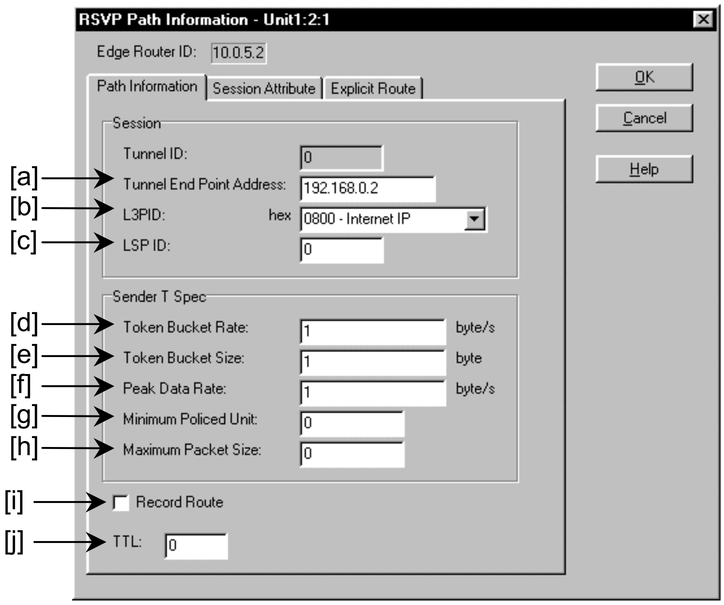


Figure 5.7.8-2 Path Information setting screen

[a] Sets the address of the LSR at the end of the Tunnel.

[b] Sets the Layer3 protocol number of EtherType. The default setting is IP (0x0800).

[c] Sets the ID of the LSP. Any ID can be set if it is unique within the edge information.

[d] Sets the rate for transmitting Token Bucket in byte/s.

[e] Sets the size of the Token Bucket to be transmitted in bytes.

[f] Sets the peak rate of the transmission Data Rate in byte/s.

[g] Sets the minimum number of unit groups.

[h] Sets the maximum packet size.

[i] Enables/Disables Record Route.

[j] Sets TTL.

5

Basic Measurement (Manual Test)

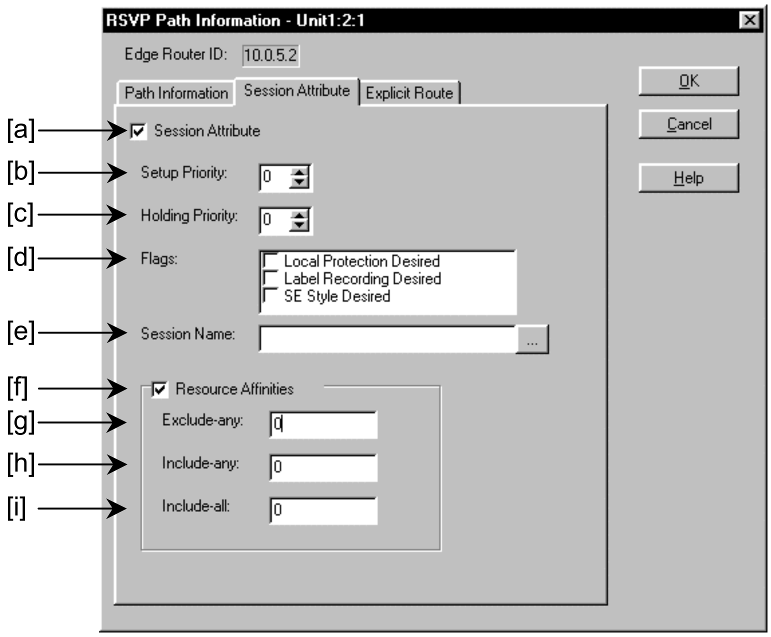


Figure 5.7.8-3 Session Attribute setting screen

[a] Enables/Disables Session Attribute.

[b] Sets the Setup Priority from 0 to 7. The greater the setting value, the higher the priority.

[c] Sets the Holding Priority from 0 to 7. The greater the setting value, the higher the priority.

[d] Sets the Flags field. Checking the checkbox enables the setting.

[e] Enter the Session name.

[f] Enables/Disables Resource Affinities.

[g] Sets a node (link) to be excluded.

[h] Sets a node (link) to be included.

[i] Sets all nodes (links) that can be included.

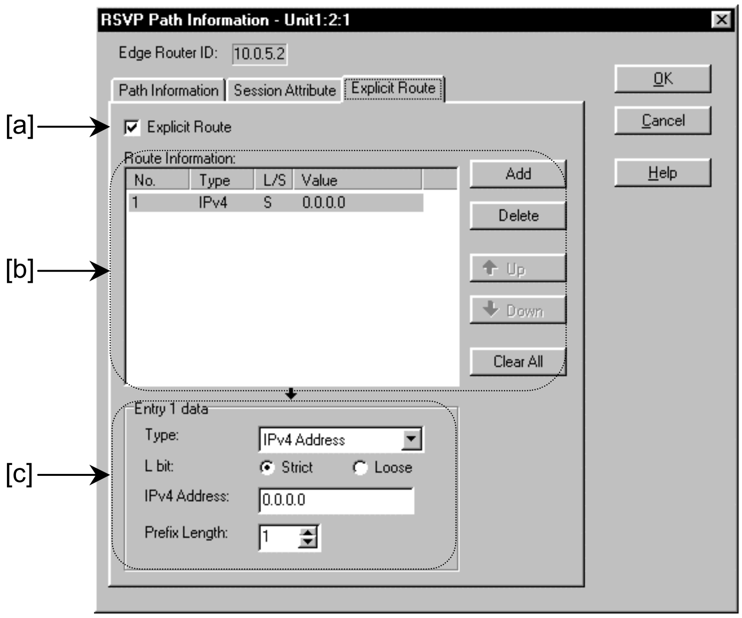


Figure 5.7.8-4 Explicit Route setting screen

[a] Enables/Disables Explicit Route.

[b] Displays summary route information. Clicking the **Add** adds a route in this field. Up to 32 routes can be set.

[c] Edits the route information selected in [b].

- Type: Selects IPv4 Address or AS No.
- L bit: Selects Strict or Loose.
- IPv4 Address: Sets the IP address of the LSR. This is enabled only when IPv4 Address is selected in Type.
- Prefix Length: Sets an address prefix.
- AS No: Sets the AS No. This is enabled only when AS No is selected in Type.

[8] Starts/stops RSVP emulation.

5.7.9 MPLS (LDP/CR-LDP)

LDP is a stand-alone protocol used to distribute labels in MPLS. CR-LDP is an extension of LDP and fetches explicit routing and resource allocation. LDP is standardized by RFC3036.

The LDP function of the MD1230B exists on a network as an edge router in MPLS or a label switch router (LSR) in the MPLS domain, and exchanges label information with other LSR. When transmitting data to which labels are added such as using the TxStream function, the data is transmitted to adjacent LSR using label information obtained in advance with the protocol support. The CR-LDP function sets, as an edge router, explicit routes to LSR in the MPLS domain.

Notes:

1. This function requires the MPLS (LDP/CR-LDP) Protocol option.
2. The MPLS (LDP-CR-LDP) parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

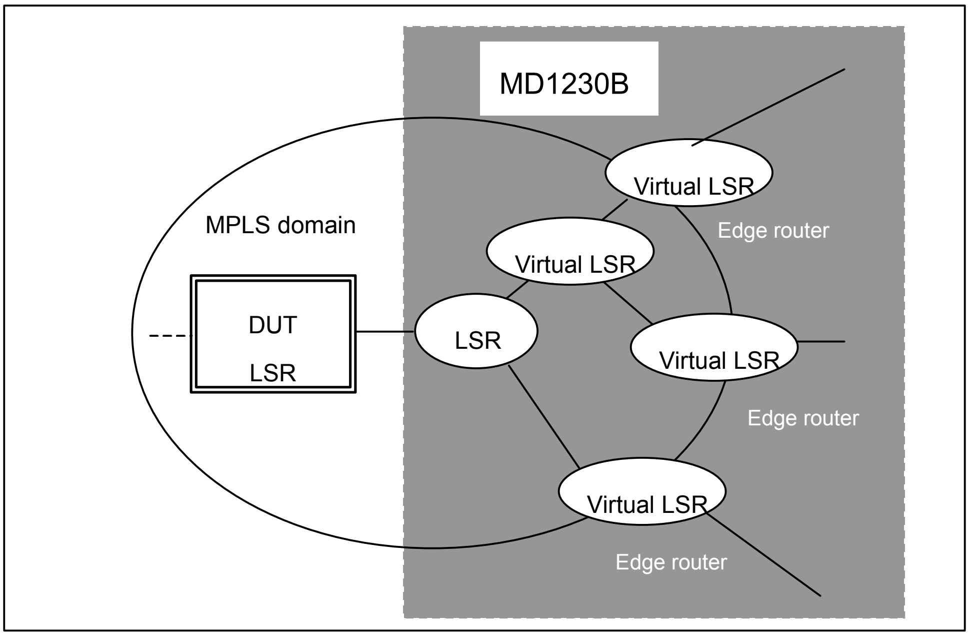
Basic procedure

(1) Set the node information, LDP/CR-LDP basic information, LDP information, CR-LDP information, FEC information, and explicit route-hop information.

(2) To implement the label switch router function by LDP/CR-LDP, build the following topology configuration based on the node information from input information.

(3) Press the start button for operation as a label switch router (LSR) in the MPLS domain. This makes the LSR look as if there were multiple virtual LSR behind it.
The LDP emulation sets FEC information to the virtual LSR of each edge. The CR-LDP emulation sets explicit route-hop information to each edge. In this case, LSPID (that identifies the explicit route in the MPLS domain) is used, and this ID is unique in the whole domain.

(4) Press the stop button to revoke the label information so that the session goes down.



MPLS LDP conforms to RFC3036, and CR-LDP conforms to FRC3212. For the number of virtual LSR, see the following table.

No.	Description	Maximum value
1	Edge LSR	200
2	Core LSR	300
3	Layer	255
4	Number of FEC	51200
5	Explicit route-hop information	51200
6	Maximum capacity of FEC information or explicit route-hop information	1 MByte

Label switch router function

a) LSR neighbor detection function

LSR detects a neighbor DUT using the discovery protocol and establishes an adjacency relation with it. LSR uses UDP to perform multicasting of the Hello message to DUT periodically. If the DUT address is entered in advance through GUI to specify the DUT directly, UDP is also used in the same manner to perform unicasting of the Hello message.

b) Session management function
This function establishes a TCP connection with DUT to exchange the Initialization message. When establishing a TCP connection, the port address of DUT and the local port address are compared after converting them into unsigned absolute values. The side with a larger value becomes the transmission source, and that with a smaller value waits for receiving an Initialization message. The Initialization message after establishing the TCP connection is also transmitted first by the side with a larger value and the side with a smaller value waits for a message. After receiving such a message, the side with a smaller value sends its Initialization message to the side with a larger value. If a DUT address is advertised as an option parameter in the Hello packet, the advertised address is used. If not advertised, the source address of the Hello packet is used.

c) LSP exchange function
When the state becomes Operational after exchanging the Initialization messages, FEC held locally and allocated label information are transmitted to DUT using a Label Mapping message. Since the A bit of the Initialization message is fixed to 0, no Label Request message is transmitted. Since DUT also sends a Label Mapping message in the same manner, the message is received and then held.
Specify HopCount in the option parameter. If the D bit is On in the Initialization message, PathVector is added.

d) Explicit route setting function
When the exchange of label information is completed using the LSP exchange function, set the explicit route based on the trigger on the main side. Create a message using the explicit route information held by the label information setting function. It is assumed that the A bit of the Initialization message is On.

e) Stop command
Press the stop button to revoke the label information so that the session goes down.

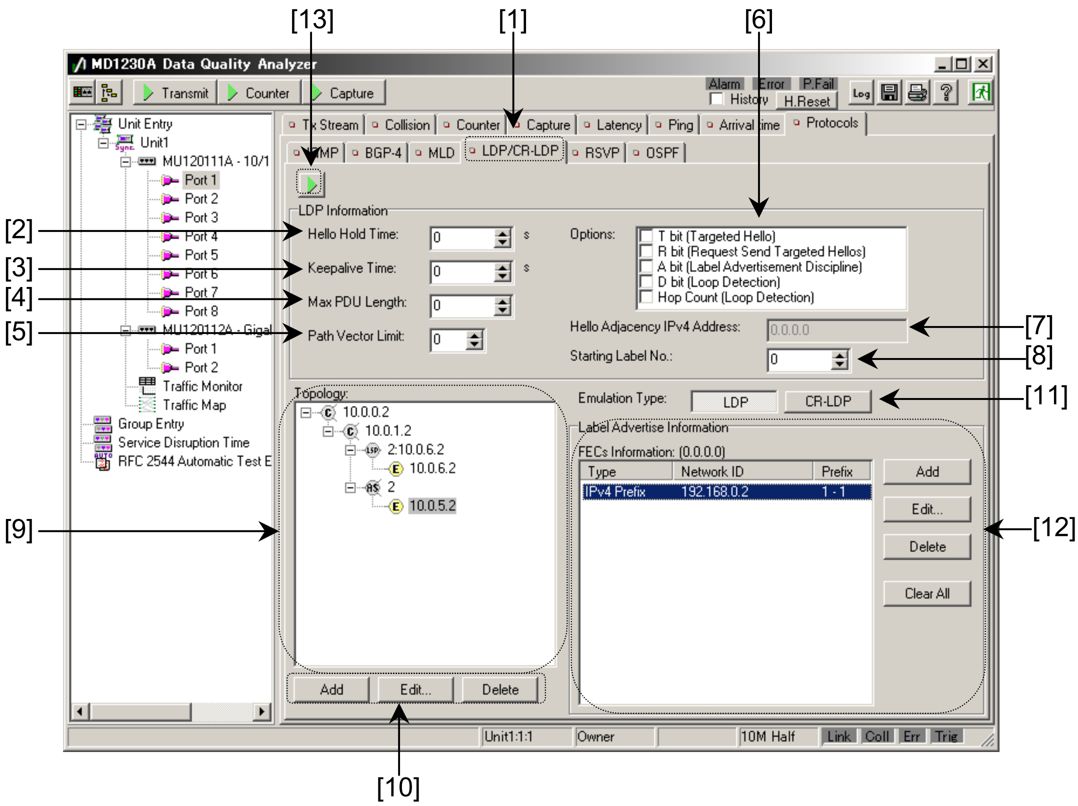


Figure 5.7.9-1 LDP setting screen

[1] Selects LDP/CR-LDP tab.

[2] Sets the Hold time for Hello message. The setting range is 0 to 65535 (s).

[3] Sets the time to transmit a Keepalive message. The setting range is 0 to 65535 (s).

[4] Sets the maximum size of the PDU data to be requested to Adjacency. The setting range is 0 to 65535.

[5] Sets the path vector range. The setting range is 0 to 255.

[6] Sets the Options field.

- T bit: When this bit is 1, the corresponding Hello message refers to Targeted Hello. When this is 0, the Hello message refers to Link Hello.
- R bit: When this bit is 1, it is requested to transmit a Hello message repeatedly. When a Hello message is received while this bit is 1, the Hello message must be transmitted repeatedly within the Hold time. When this bit is 0, repetitive Hello message transmission is not requested.

- A bit: Indicates the label advertisement type. When this bit is 0, it means Downstream Unsolicited advertisement. When this bit is 1, it means Downstream on Demand.
- D bit: Indicates whether the loop detection based on the path vector is enabled. When this bit is 1, loop detection is enabled.
- Hop count: Enables/Disables the total number of the hops in the LSR under operation according to the LSP set by the label message.

[7] Sets the IP address of the destination to which a Hello message is transmitted. This can be set only when the T bit is enabled.

[8] Sets the label start number.

[9] Displays the configuration of each LSR.

[10] Adds an LSR by clicking the **Add**, and sets the IP address of each LSR, AS No. or LSPID by clicking the **Edit**.

[11] Selects the type of emulation from LDP or CR-LDP.

[12] Sets the label advertisement information. Adds FEC information by clicking the **Add**, and edits FEC information by clicking the **Edit**.

(1) For LDP

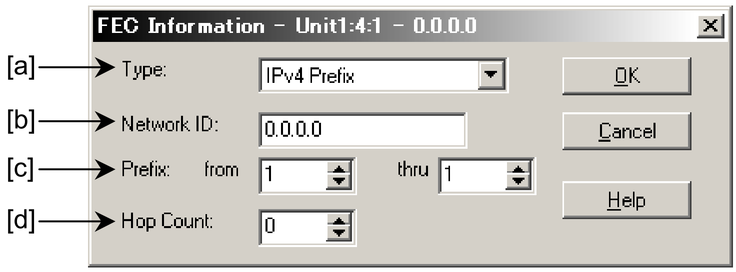


Figure 5.7.9-2 FEC Information setting screen

[a] Selects Type from IPv4 Prefix or IPv4 Host Address.

[b] Sets the network ID.

[c] Sets the effective range of Hop Count that is set in [d] below. For example, when 16 is set for "from" and 24 is set for "thru", the effective range is 8 bits between the 16th bit and 24th bit from the header of the network ID.

[d] Sets the number of Hops in the network ID.

(2) For CR-LDP

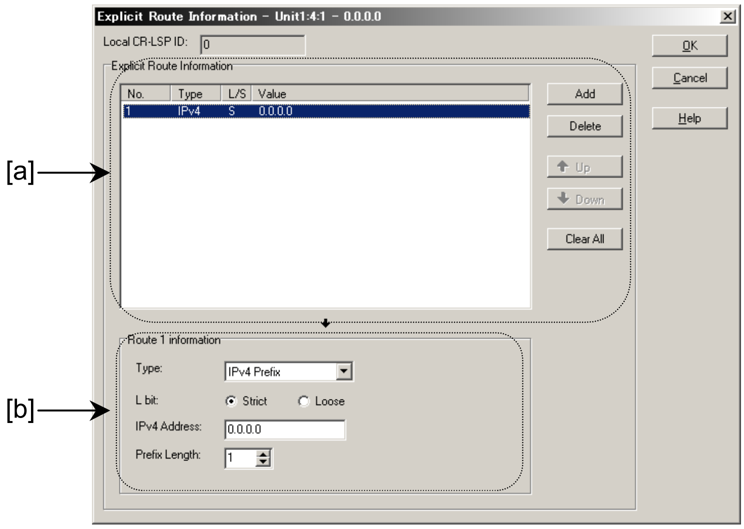


Figure 5.7.9-3 Explicit Route Information setting screen

[a] Displays the Explicit Route information. Clicking the **Add** adds Explicit Route information in this field.

[b] Edits the Explicit Route information added in [a].

- Type: Selects IPv4 Prefix, AS No or LSPID.
- L bit: Selects Strict or Loose.
- IPv4 Address: Sets the IP address of the LSR. This is enabled only when IPv4 Address is selected in Type.
- Prefix Length: Sets an address prefix.
- AS No: Sets the AS No. This is enabled only when AS No is selected in Type.
- Local CR-LSP ID: Sets a local CR-LSP identifier that is unique within the LSR at the ingress, which generates CR-LSP. This is enabled only when LSPID is selected in Type.
- Ingress LSR ID: Sets the router ID for the LSR at the ingress.

[13] Starts/stops LDP/CR-LDP emulation.

5.7.10 IPv6

ICMPv6 (Internet Control Message Protocol for IPv6)

ICMPv6 is used to exchange errors that occur in IPv6 network communication and network diagnostic results. The basic functions (to connect to an IPv6 network such as the resolution protocol ARP of the data-link layer carried out for IPv4, multicast address reception protocol IGMP, and automatic address setting) are also performed by this ICMPv6.

In the MD1230B, the basic functions of ICMPv6 are emulated so that one host that is connected to the IPv6 network exists on the measuring port. This enables communication with routers and hosts with piled IPv6 stacks. Also, measurements made using IPv4 can be performed using IPv6.

Overview of IPv6

As compared with IPv4, IPv6 has the following features:

- A wide address space of 128 bits.
- A feature to determine the address automatically without using DHCP.
- The ARP and IGMP functions are integrated.

(1) Terminology

Node	Device that can use IPv6
Router	Node with a function to transfer IPv6 packets to other nodes
Host	Node other than routers
ICMPv6	Internet Control Message Protocol for IPv6
NDP	Neighbor Discovery Protocol
MLD	Multicast Listener Discovery
RS	Router Solicitation
RA	Router Advertisement
NS	Neighbor Solicitation
NA	Neighbor Advertisement

(2) Address notation

The address of IPv6 is represented by hexadecimal numbers separated by a colon (:) in each 16 bits.

2002:0425:0000:0000:0123:4567:89AB:CDEF

The top 0 in each separated part can be omitted.

2002:425:0:0:123:4567:89AB:CDEF

If 0000 continues, the double colon (::) can be used to indicate that 0000 continues.

2002:425::123:4567:89AB:CDEF

However, this omission can be used only once. For example,

1:1:0:0:2:0:0:3 cannot omitted to 1:1::2::3

Examples:

0000:0000:0000:0000:0000:0000:0000:0000	::
2000:0000:0000:0000:0000:0000:0000:0002	2000::2

When representing a Prefix length, like IPv4, write /n after the address.

Examples:

2001:0137:0081:0000:0000:0000:0000:0000/64
2001:137:81::/64

(3) Scope

If any of the following addresses is attached, the communication is different from the normal one:

- The loopback address (::1) is a self-address that completes communication inside the host.
- The link local address (FE80::/10) is an address that completes communication within the same site. This type of address is used when NS or NA is used.
- The site local address (FEC0::/10) is an address that completes communication within the same site.
- The multicast address (FF00::/8) used to send packets is an address used by all hosts that participate in the multicast address to receive packets.

  If, at this point, the network is an Ethernet, the MAC address is also the target for multicasting.

  Multicast MAC Address

0x33	0x33	DST[13]	DST[14]	DST[15]	DST[16]

  Participation in the multicast address is declared to the router using MLD.

(4) Checksum calculation

- If there is TCP, UDP, or ICMPv6 at higher than IPv6, the checksum of TCP, UDP, or ICMPv6 is calculated after adding the following pseudo-header.

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
+                                                               +
|                                                               |
+                         Source Address                        +
|                                                               |
+                                                               +
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
+                                                               +
|                                                               |
+                      Destination Address                      +
|                                                               |
+                                                               +
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Upper-Layer Packet Length                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      zero                     |  Next Header  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Next Header
Protocol number of TCP/UDP/ICMPv6
Upper-Layer Packet Length
Length of TCP/UDP/ICMPv6 data

Host Model

The following features are set up so that communication with the measured device under IPv6 can be conducted smoothly:

(1) Neighbor cache
Manages the correspondence between the IPv6 address and the Data Link layer address such as the MAC address of each node in the same link. There is a flag to indicate a router or host.
This cache is updated when NA is received.

(2) End-point cache
Records information about the end-point node. In the MD1230B, the prefix to which the end-point node belongs, the router to be sent, and the Link MTU to link up to its prefix are held.
This cache is updated when a packet is transmitted to a new prefix or an error is sent back after sending a packet.

(3) Prefix list
When belonging to multiple prefixes, the multiple prefixes are managed by the prefix list. In the following cases, it is possible to belong to multiple prefixes:
- If there is a router with multiple prefixes in the same link
- If multiple routers have different prefixes

This list is updated when RA is received.

(4) Default router list
List used to determine the default router for each prefix to which one belongs. This list holds the IPv6 address of the router, the pointer to the Neighbor cache, and the expiration timer.
This list is updated when RA is received.

Specifying the address

☞ For the IPv6 address format, see “(2) Address notation” in Section 5.7.10.

A 128-bit address is used to specify an address. For the upper 64 bits, you can select from the following two methods:
- Method in which RA results are reflected
- Method in which the address specified by using 128 bits is used regardless of the RA results

For the lower 64 bits, you can select from the following two methods:
- Method in which the value calculated from the MAC address using the EUI-64 format is used
- Method in which the address specified by using 128 bits is used

5 Basic Measurement (Manual Test)

For the MU120103A/04A/05A/06A/19A/20A and MU150101A (for the PPP/CiscoHDLC/MAPOS mapping), RA and the EUI-64 format cannot be used. (Only the fixed 128 bits can be selected.)

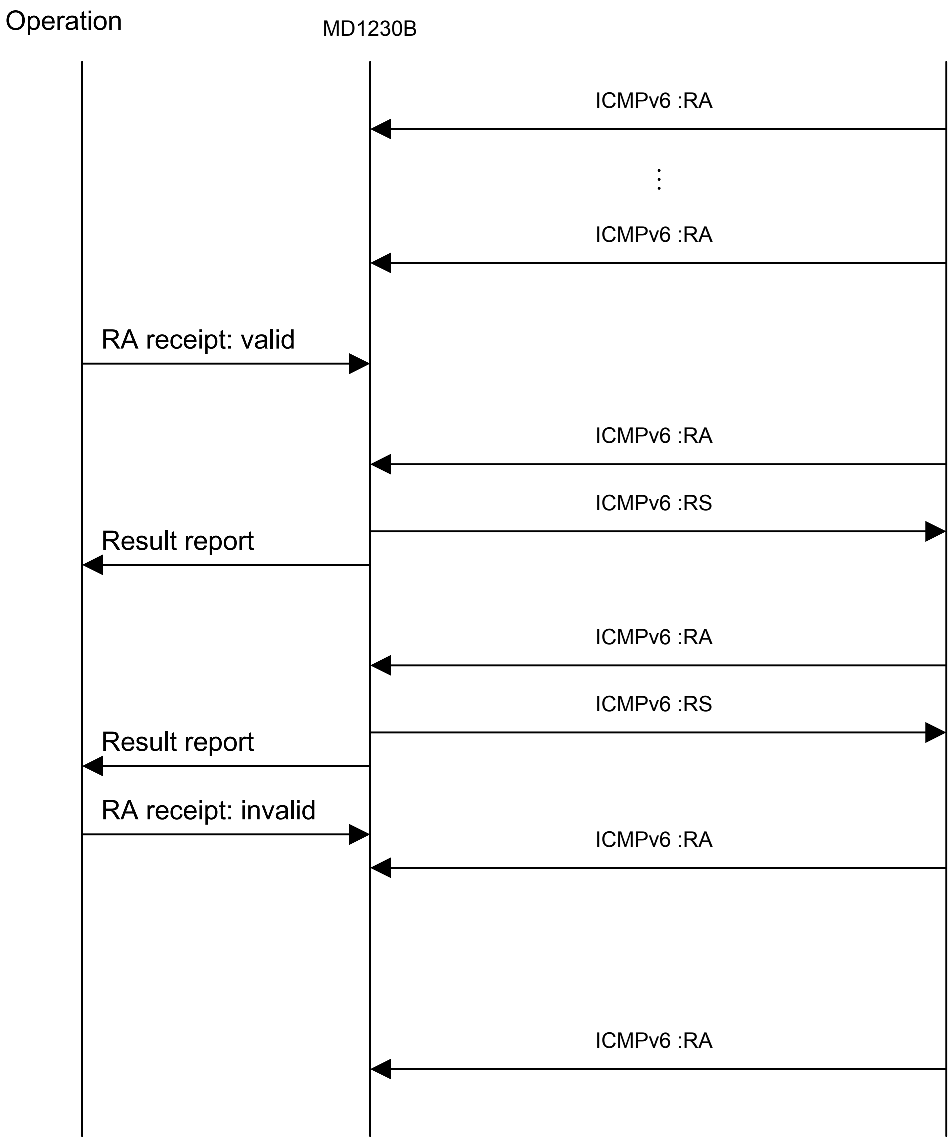
(1) Using RA
When RA is used, multiple prefixes are managed.
Also, the default router for each prefix is managed.

(2) EUI-64 format conversion
The EUI-64 format converts the MAC address as shown below:

MAC	cccccc0g	cccccccc	cccccccc	mmmmmm	mmmmmm	mmmmmm		
EUI-64	cccccc1g	cccccccc	cccccccc	11111111	11111110	mmmmmm	mmmmmm	mmmmmm

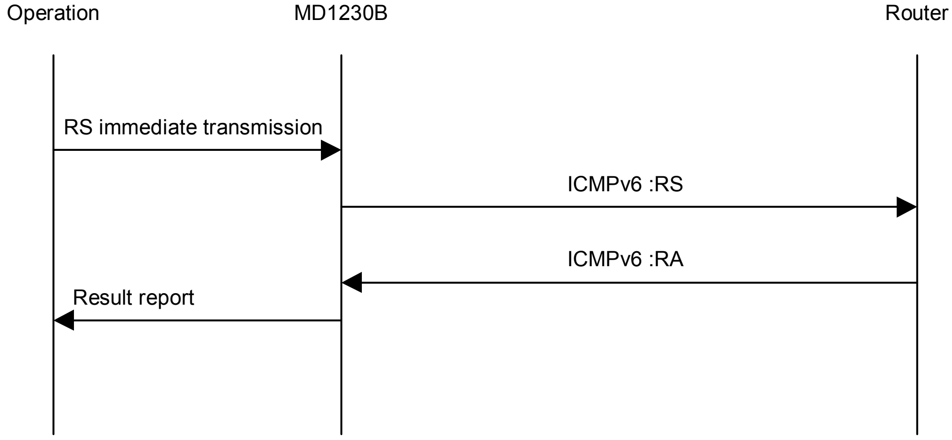
bit 0 to 5, 8 to 23 (c): Company code (IEEE management OUI-code)
bit 6 (g): U/L bit (0: universal, 1: global)
bit 7: I/G bit (0: individual address, 1: group address)
bit 24 to 47 (m): Device code (vendor managed)

- Operation when RA is received
  If the use of RA is valid, RA is received from the router to update the prefix list.
  At this point, if necessary, the default router is also updated.



Immediate resolution by RS

RA is requested for itself by sending RS so that a list of prefixes can be created immediately.



The user can set the number of retries and the timeout value (default: three times and 1 s).

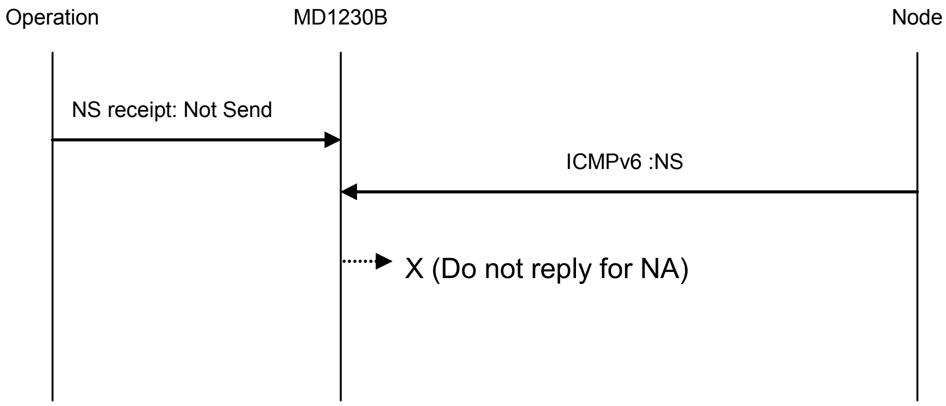
Operation when NS is received

You can select the following three methods as an operation when receiving NS:

- Not send
- Reply to This Port IPv6 addresses
- Reply to all IPv6 addresses

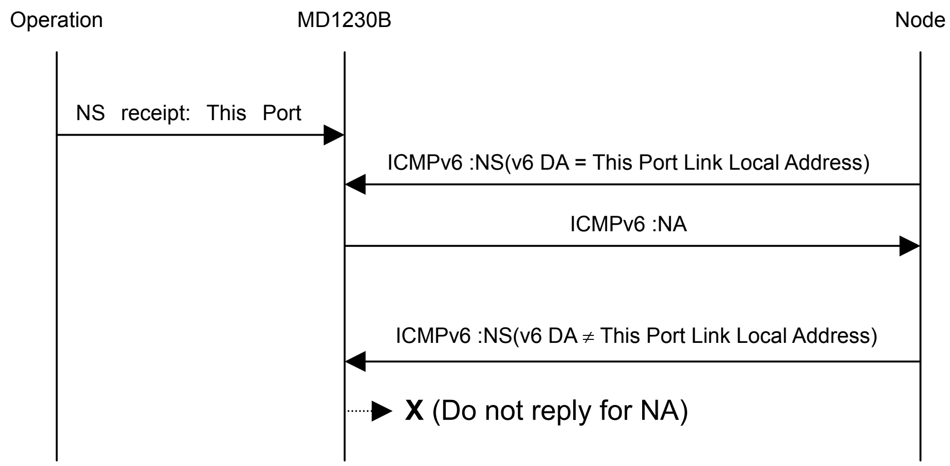
(1) Not send

No reply is sent back even if NS is received.



(2) Reply to This Port IPv6 addresses

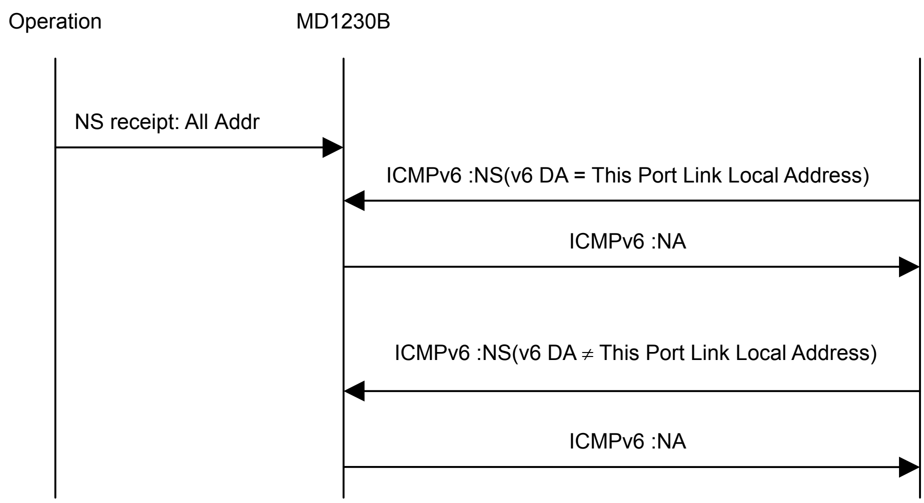
If the query address of NS is the link local address given to this port, NA is sent back.



(3) Reply to All IPv6 addresses

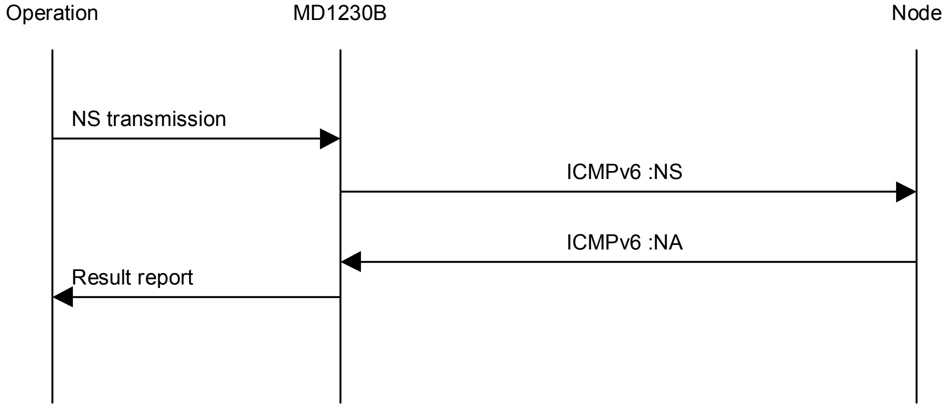
NA is sent back regardless of the query address of NS.

This is used to determine whether duplicate address detection is possible.



Address resolution by NA

If no MAC address corresponding to the target IPv6 address exists in the adjacent cache, the MAC address is resolved by transmitting NA.



If no NA is sent back or an error occurs, Neighbor Unreachable is assumed.

The user shall be able to set the number of retries and the timeout value to determine whether NA is sent back or not (default: three times and 1 s).

Operation when an ICMPv6 Echo Request is received

You can select the following two methods as an operation when receiving an ICMPv6 Echo Request:

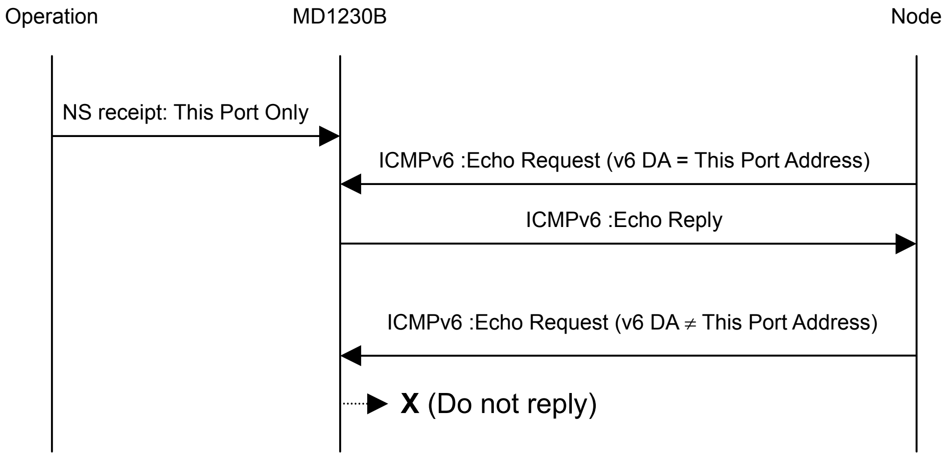
- Not send
- Reply to This Port Request

(1) Not send

No reply is sent back even if an Echo Request is received.

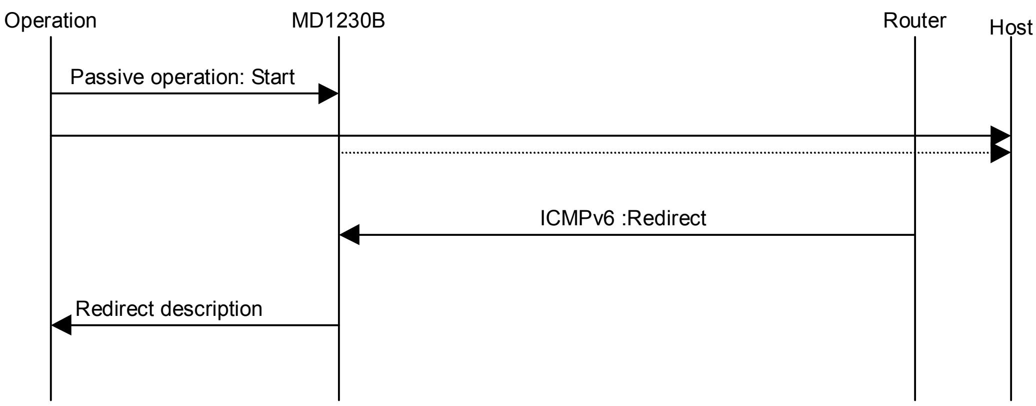
(2) Reply to This Port IPv6 addresses

If the query address of NS is the link local address given to this port, NA is sent back.



When Redirect is received

When a packet transmitted by a stream or Protocol CPU is sent to a router, the router sends back a Redirect message to make a notification of the optimum router. In the MD1230B, at this point, the end-point cache is rewritten and a Redirect notification is reported.



On/Off of this end-point cache rewrite can be switched.

Operation of MLD

When a Multicast Listener Query is received, the host function is emulated. Using this function, the MLD processing and MLD management capabilities of the router to be the DUT can be tested. This can also be applied to the IPv6 multicast traffic testing.

> ☞ When using the MU120111A/12A/18A/18B/18C/19A/20A/21A/22A/31A/32A/38A, refer to Section 5.7.17 "IGMPv3/MLDv2 protocol emulation function."

To test the management capabilities to a certain extent, the virtual host is made to look as if there were multiple virtual hosts with respect to multiple multicast addresses. Select multiple multicast addresses and the number of hosts that exist for each address by specifying their range.

- Report To One When Queried:
  For General Queries, report messages are sent to all addresses in the range for which the Multicast Address is specified. For Multicast-Address-Specific Queries, report messages are sent to their target addresses.
- Report To ALL When Queried:
  All queries are assumed to be General Queries and all report messages are sent to the set Multicast Addresses.
- Report To ALL When Unsolicited:
  All Report messages are sent to the set Multicast Addresses at designated frequency regardless of Queries (ignoring Queries). The following parameter is used as the designated frequency:
  Report Frequency: 10 to 600 s

a) Basic operation

1. Set the presence/absence of Router Alert.
2. Select the transmission method of the report.
3. Set the IPv6 address range of virtual hosts and the range of multicast addresses to which virtual hosts belong.
4. Press the start button to start transmission of the report according to the specified transmission method (For the MU120103A/ 04A/05A/06A/19A/20A module, a PPP link is established as required).
5. Press the stop button to stop transmission of the report.

Linkage with the user settings

Router Alert:

On: Adds an IP Router Alert Option to the IP header.

Off: Adds no IP Router Alert Option to the IP header.

If On, an MLD message is sent by adding the optional Type5: Router Alert to the Hop-by-Hop Option header.

0	15
Type = 0x05	Length = 0x02
Value = 0x0000	

Value	
0	Datagram contains a Multicast Listener Discovery message [RFC-2710].
1	Datagram contains RSVP message.
2	Datagram contains an Active Networks message.
3 to 65535	Reserved to IANA for future use.

Report operation mode (Report Method):

Report To One When Queried:

Report To All When Queried:

Report To All Unsolicited:

Report Frequency:

Multicast Address Range:

Specify the IPv6 multicast address to which the virtual host belongs.

Consecutive addresses ranging from 1 to 255 can be specified.

Unicast Address Range:

Specify the IPv6 address of the virtual host.

Consecutive addresses ranging from 1 to 255 can be specified.

b) Report transmission rules

Only one virtual host selected from the list is allowed to send reports for each multicast, even in circumstances in which multiple virtual host addresses are set, in order to verify whether a host participating in the Multicast Address exists in a sub-network.

To send a Report to a Multicast Address, one source virtual host is fetched from the Unicast Address Range for the transmission.

It is assumed that a marker (that points to an arbitrary virtual host address) exists in the Unicast Address Range, and thus the address specified by the marker will be used for the report. If an address is used, the marker moves in an incremental direction by one unit to get ready for the transmission of the next report.

When the marker reaches the end point of the Unicast Address Range, it moves to the top of the Unicast Address Range in the next move. (The initial value of the marker is the top of the Unicast Address Range.)

Examples:

If General Queries are received periodically in the following ranges:

Multicast Group Address Range: ff00::1 to ff00:2

Unicast Address Range: 2001::1 to 2001::8

	Group		Unicast Loop
First Report	ff00::1	←	2001::1
	ff00::2	←	2001::2
Second Report	ff00::1	←	2001::3
	ff00::2	←	2001::4
Third Report	ff00::1	←	2001::5
	ff00::2	←	2001::6
Fourth Report	ff00::1	←	2001::7
	ff00::2	←	2001::8
Fifth Report	ff00::1	←	2001::1
	ff00::2	←	2001::2
	·		·
	·		·

c) Host status and timer management
In the MD1230B, if multiple virtual hosts participate in some Multicast Address, the host status management and timer management are simplified by selecting only one of the virtual hosts that takes charge of the report with respect to the Multicast Address. This does not allow the Max Response Time set to the Query to affect the report transmission (ignored).

d) Behavior immediately after switching to the start from the stopped state
Immediately after the start is instructed, a report is spontaneously transmitted to all setup Multicast Addresses regardless of the report operation mode.

e) Behavior immediately after stopping
Nothing happens. MLD processing for the applicable port is stopped.

ping6

By transmitting an ICMPv6 Echo Request to the target node and analyzing its reply ICMPv6 Echo Reply, it is possible to confirm its arrival and to measure the time required for the request and reply.

(1) User settings
Destination Address: :: - ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff
The ICMP Size is fixed to 64 bytes, the Hop Limit to 255, the repetition count to 4, and the repetition interval to 1 s.

(2) Report
If an Echo Reply with the correct content is received, report the following information. The correct receipt content indicates that the Echo Reply content matches the Echo Request content.

ICMPv6 packet size
IP address of the host that transmitted an ICMPv6 packet
Hop Limit
round trip time

For Destination Unreachable and Time Exceeded, the Hop Limit and Round trip time are arbitrary messages.

5.7.11 IGAP

Notes:

1. This function can be used only when the IGAP Protocol Option is installed.

2. The IGAP parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to "(5) Protocols" in Section 4.5.6.

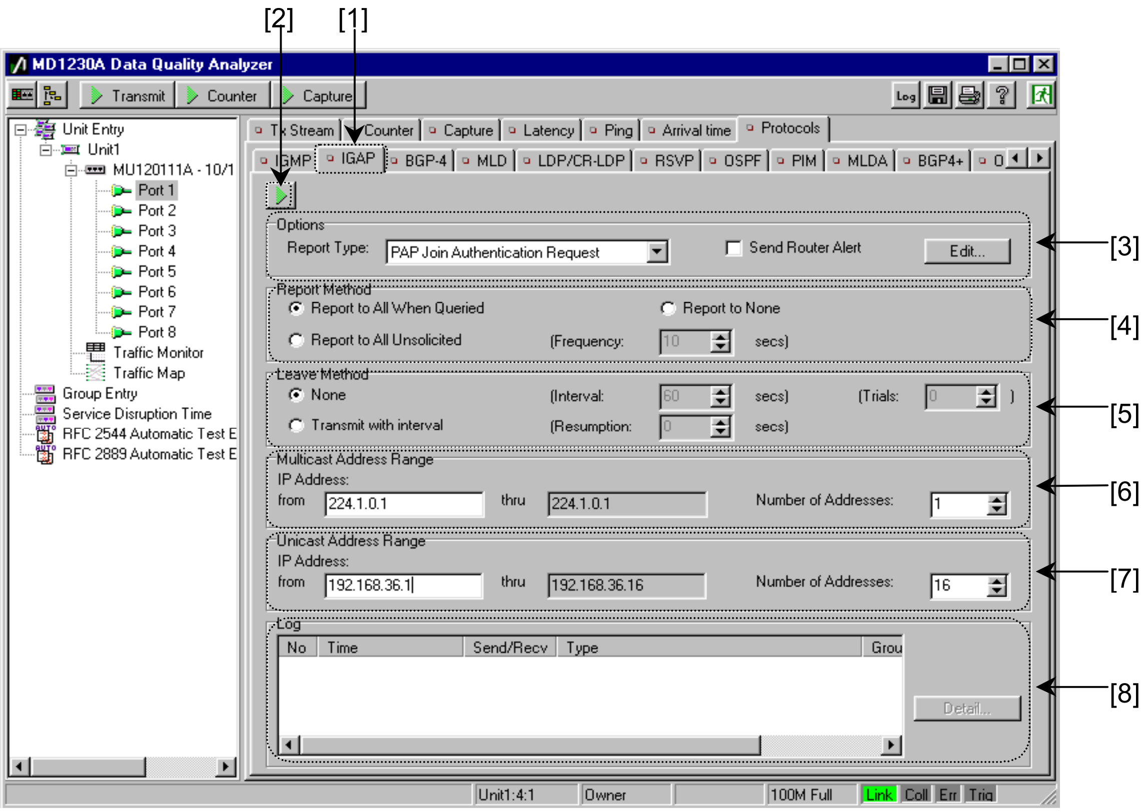


Figure 5.7.11-1 IGAP protocol support setting screen

[1] Selects IGAP tab.

[2] Starts/stops IGAP protocol measurement.

[3] Sets Option.

Report Type:	Sets Report Type. Fixes this to PAP Join Authentication Request.
Send Router Alert:	Controls Send Router Alert of Router Alert Option of IP Packet Format.
Edit:	Edits User Account and Message.

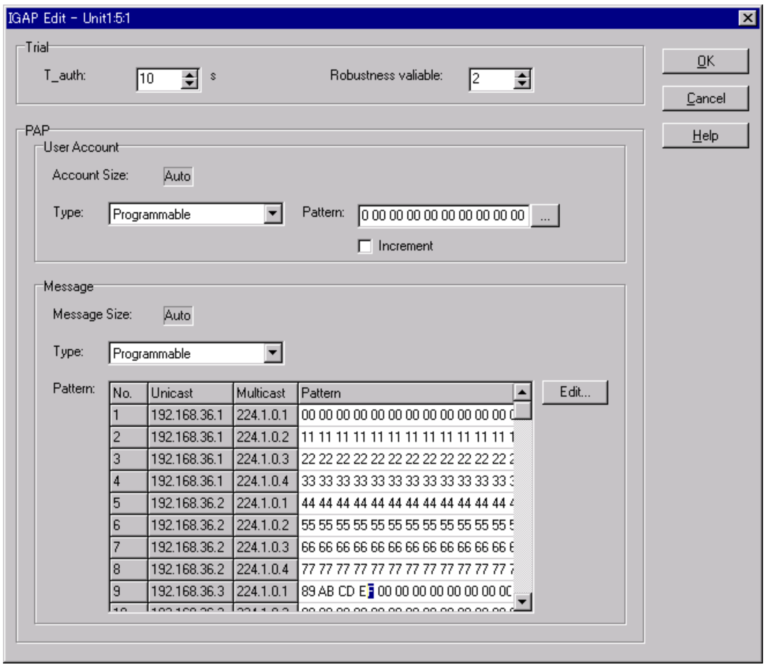


Figure 5.7.11-2 IGAP Edit screen

T_auth:	Sets Timeout value (10 to 100 s) for receiving Authentication Message, after transmitting unsolicited PAP Join Authentication Request.
Robustness variable:	Sets number of message re-transmissions (1 to 10 times).
User Account:	Edits User Account (16 bytes). At Increment On, increments the last data and the last data byte with ASCII numeric characters, automatically. The range is 01 to 16. Increment setting is effective in Programmable mode.
Message:	Message can be edited by one message.

Note:

Before editing Message, set Multicast Address Range and Unicast Address Range at first.
If Multicast Address Range and Unicast Address Range are set after editing Message, the edited Message becomes All 0.

[4] Sets Report Method using followings:

Report To All When Queried
Assuming that the received query is always General-and-Basic query, transmits Report (Join) of all set Groups.

Report To All Unsolicited
Transmits Report (Join) of all the set Groups with the specified period, not depending on query reception/not-reception. The transmission period (Frequency) can be specified 10 to 600 s.

Report To None
Does not transmit Report (Join), not depending on the received query type.

[5] Sets Leave Method using followings:

None
Does not transmit Leave.

Transmit with interval
Transmits First Leave (with the period set by transmission period (Interval)) to the set Group which received Authentication Message (Start). Setting range of transmission period is 60 to 1800 s.
Resumption set the wait time from Leave transmission to the next First Join transmission. The setting range is 0 to 10 s in 1 s unit.
Trials set the repetition times of the procedure from First Join transmission to Leave transmission. The setting range is 0 to 10 00.
At 0, repeats the operation till operator ends IGAP Emulation.

[6] Sets IP multi-cast address to which virtual host belongs. 255 sets of continuous address ranges can be set.
Setting range of 0.0.0.0 to 223.255.255.255 can be available.

[7] Sets IP address of virtual host.
255 sets of continuous address ranges can be set.
Setting range of 0.0.0.0 to 223.255.255.255 can be available.

[8] Displays log of Protocol-CPU operation state using the following format. All the display contents are cleared at Emulation start.

1	22:58.01 10 28,2002	Send	PAP Join Authentication Request
2	22:58.02 10 28,2002	Recv	Authentication Message
3	22:58.04 10 28,2002	Recv	Accounting Message
:			
11	22:59.10 10 28,2002	Send	Basic Leave
12	22:59.11 10 28,2002	Recv	Accounting Message
(1)	(2)	(3)	(4)

(1) No.
Displays number.

(2) Date
Displays date with date format set on GUI Setting.

(3) S/R
Displays Send/Receive type.

(4) Status
Displays Message by the received Message Size.

5

Basic Measurement (Manual Test)

5.7.12 PPP-LEX

When LEX is selected for Mapping in Port Setting on the MU120103B/04B and MU150101A, linkage with the opposite measured equipment can be established by using LCP (Link Control Protocol) and PPP-LEX (RFC1841.)

(1) Configuration Options used for LCP Configure-Request
LCP Configure-Request transmitted by the MU120103B/04B contains MRU (Maximum Receive Unit) and Magic Number. The value for MRU can be set from the Port Setting screen.
Magic Number is automatically generated inside the MD1230B and cannot be set.

(2) Startup Options used for PPP-LEX Configure-Request
When [Send startup Command option] is enabled in the Port Setup screen, the MD1230B transmits Startup Command options including the MAC Address option, thus the MAC address for This Port is saved. When it is disabled, the MAC address option is not added.

(3) Timeout and Retry
For LCP and PPP-LEX, the timeout to reception of Ack, etc., for Request and the retry count after timeout can be set by the user.
The same packet is used for retry (also the same for Identifier.)

Link establishment is performed automatically at a connection request from the opposite equipment (passive connection). To connect from this product, press **Restart** at the Port Setting screen (active connection.)

5.7.13 MLDA protocol emulation function

The MLDA protocol emulation function can emulate operation of multiple virtual hosts. The following virtual host operations can be emulated:

- Report transmission
- Query reply
- Password authentication
- Changing virtual host status (flap operation for join/leave)

The MLDA virtual host operates conforming to the IETF internet draft (draft-hayashi-mlda-01.txt).

The Tx Stream function includes MLDA message templates. Refer to Section 5.1.2 for details of their usage.

Notes:

1. This function requires the IPv6 Expansion and MLDA Protocol options.

2. The MLDA parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to "(5) Protocols" in Section 4.5.6.

Procedure

The MLDA protocol emulation function is operated from the MLDA screen on the **Protocols** tab.

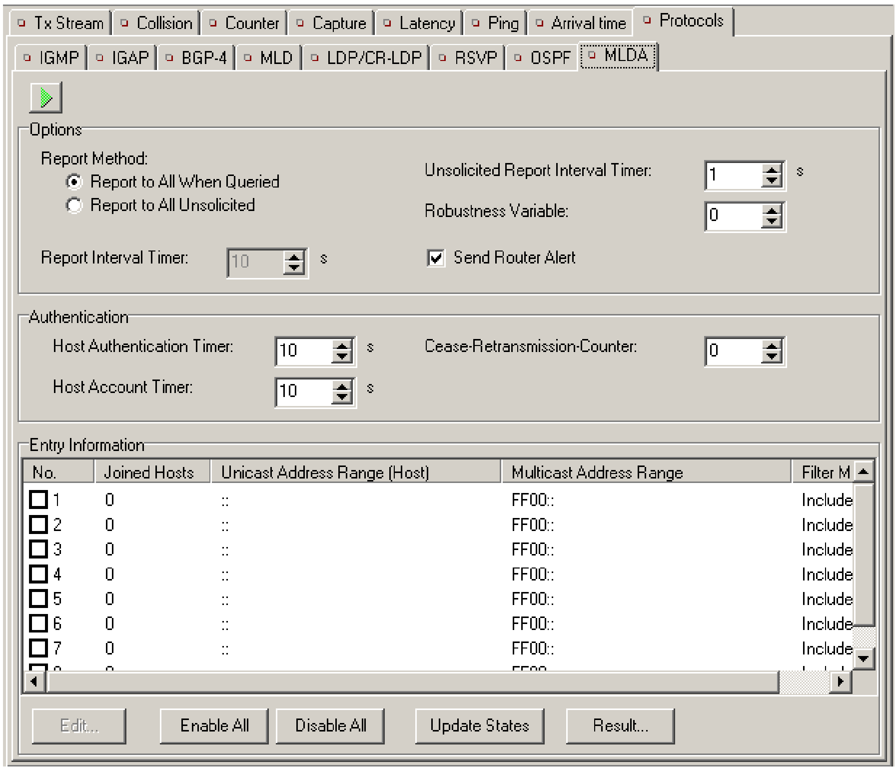


Figure 5.7.13-1 MLDA screen

Setting operations common to all virtual hosts:

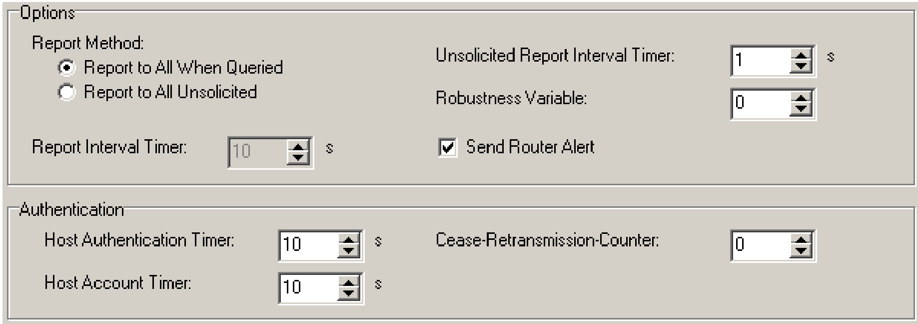


Figure 5.7.13-2 Options setting screen

First, perform settings common to all virtual hosts in the Options setting group.

Setting name	Description	
Report Method	Specifies the report transmission method from virtual hosts. Select one from the following two methods.	
	Report to All When Queried	Transmits report when a query is received.
	Report to All Unsolicited	Transmits reports of the interval (10 to 600 seconds, initial value: 10) set for Report Interval Timer regardless of query reception. Report transmission is not performed even if a query is received.
Unsolicited Report Interval Timer	Sets the report retransmission interval (1 to 10 seconds, initial value: 1).	
Robustness Variable	Sets the number of report retransmissions (0 to 10 times, initial value: 0).	
Send Router Alert	Sets whether to add Router Alert Option to the transmission message (initial value: checked).	

Then, perform settings for authentication operations in the Authentication setting group.

Setting name	Description
Host Authentication Timer	Sets the waiting time (0 to 100 seconds, initial value: 10) from Password Report transmission to Authentication Message (success) reception.
Host Account Timer	Sets the waiting time (0 to 100 seconds, initial value: 10) from Report transmission for Leave operation to Accounting Message reception.

Setting name	Description
Cease-Retransmission-Counter	Sets the number of retransmissions (0 to 10 times, initial value: 0) when Accounting Message is not received within the set time for Host Account Timer.

Setting virtual hosts:

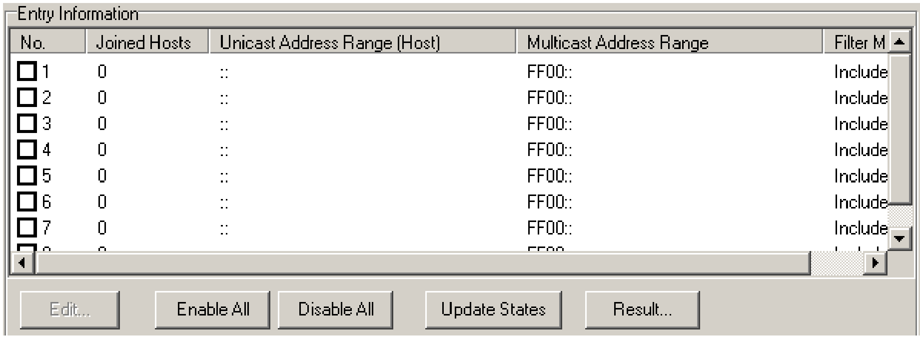


Figure 5.7.13-3 Entry Information setting screen

The settings and status display for each virtual host are provided in the Entry Information table. Up to 8 groups of virtual hosts that express multiple virtual hosts (255 hosts max) composing continuous IP addresses can be set. This allows emulation of up to 255 × 8 virtual hosts (*).

*: The number of virtual hosts that can be set or operated may be limited by the operation status and settings of other protocol emulation functions.

One line in the Entry Information table corresponds to a virtual host group. Check the checkbox for each virtual host group in the table to enable its settings. Use the **Enable All/Disable All** to enable/disable all groups.

The Entry Information table contains the following information on virtual host groups:

Name	Description
Joined Hosts	Shows the number of authenticated users (virtual hosts).
Unicast Address Range	Shows the set address range of the virtual host.
Multicast Address Range	Shows the range of multicast addresses where the virtual host joins/leaves.
Filter Mode	Shows the filter mode of the virtual host.

Select the line in the table that corresponds to the virtual host group to be set, and then click the **Edit...** to open a dialog box. Use this dialog box for setting virtual hosts belonging to the virtual host group. Clicking the **Next/Prev** moves to the next/previous virtual host group setting in the Entry Information table.

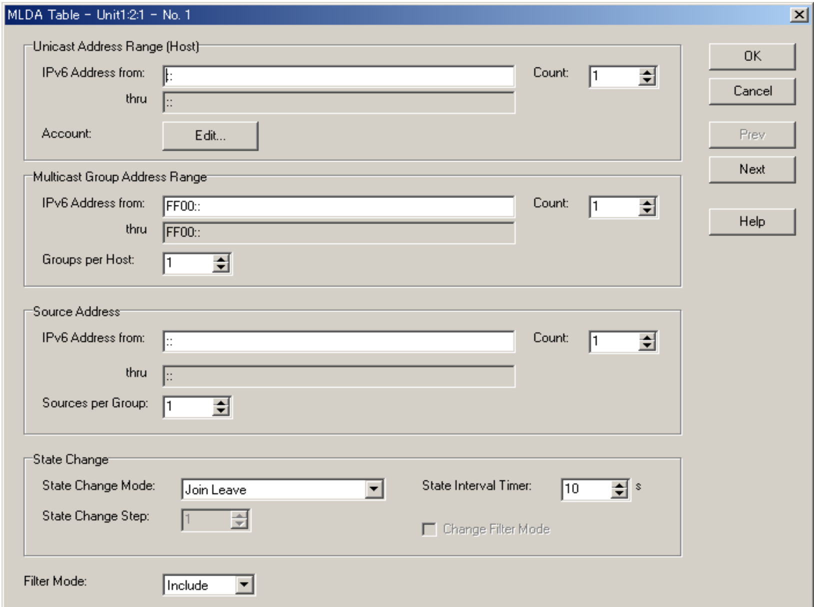


Figure 5.7.13-4 Virtual Host Group setting screen

In the Unicast Address Range setting group, set the virtual host IP address and authentication information.

Setting name	Description
Count	Sets the number of virtual hosts. (1 to 255 (*1), Initial value: 1)
IPv6 Address from	Sets the start address of the virtual host IP addresses. The start address is incremented and assigned to the number of virtual hosts set in Count. (Initial value is ::)
Account	Sets user information of the virtual host. Click the **Edit** to open the MLDA Account dialog box. In the Authentication Information table of the dialog box, set User ID, Password and Message for each virtual host address. The setting values for these items can be imported/exported to/from a text file in CSV format. Click the **Import/Export** to specify the import/export file.

In the Multicast Group Address Range setting group, set multicast address information where the virtual host joins/leaves.

Setting name	Description
Count	Sets the number of multicast addresses to join/leave. (1 to 255, Initial value: 1)
IPv6 Address from	Sets the start address of the multicast address. This address incremented by the set Count value is used as the multicast address to join/leave. (Initial value is ::)
Groups per Host	Specifies the number of multicast addresses where a virtual host joins/leaves among the multicast addresses within the specified range (1 to 255 (*1) (*2), Initial value: 1). (Refer to the next section, "Allocating address information where the virtual host joins/leaves.")

In the Source Address setting group, set source address information where the virtual host joins/leaves.

Setting name	Description
Count	Sets the number of source addresses to join/leave. (1 to 255, Initial value: 1)
IPv6 Address from	Sets the start address of the source address. This address incremented by the set Count value is used as the source address to join/leave. (Initial value is ::)
Sources per Group	Specifies the number of source addresses included in a multicast address among the source addresses within the specified range (1 to 255 (*1) (*2), Initial value: 1). (Refer to the next section, "Allocating address information where the virtual host joins/leaves.")

*1: Count of Unicast Address Range and the set values of Groups per Host and Sources per Groups have the following restrictions.
$<\text{Count}> \times <\text{Groups per Host}> \times <\text{Sources per Group}> \leq 2000$

*2: Groups per Host and Sources per Group cannot be set exceeding the value of Count.

In the State Change setting group, set how the virtual host joins/leaves.

Setting name	Description	
State Change Mode State Interval Timer State Change Step	Sets how the virtual host joins/leaves the set multicast/source addresses.	
	Join Leave	Joins/leaves all (S,G) channels continuously. Joins/leaves continuously at the interval set for State Interval Timer (0 to 1800 seconds, initial value: 10). When State Interval Timer is set to 0, no repeated operation is performed (just joins at first).
	Change	Changes between (S,G) channels. Performs channel change for the number of channels set for State Change Step at the interval set for State Interval Timer. State Change Step cannot be set exceeding the following value. <Sources per Group> × <Groups per Host>/2
	Increase (Source) Decrease (Source) Increase (Multicast Group) Decrease (Multicast Group)	Increases/decreases S or G of the join/ leave (S,G) channels, by the set number for State Change Step, in the set interval for State Interval Timer. State Change Step cannot be set exceeding the following value. Sources per Group (in the case of Source) Groups per Host (in the case of Multicast Group)
Filter Mode	Indicates that Filter Mode is Include.	

Allocating address information where the virtual host joins/leaves:

The multicast/source address information (where each virtual host [set by Unicast Address Range] joins/leaves) is determined according to the settings in the Multicast Group Address Range and Source Address setting groups, as shown below.

- Specify the lists of 1) virtual host address, 2) group address and 3) source address with their initial address values and the number of addresses (Count). The address list can contain up to 255 addresses generated by incrementing the initial address.

- Specify the number of group addresses (Groups per Host) to be related to the host address.
- Specify the number of source addresses (Sources per Group) to be related to the group address in the same manner.
- Addresses are related from the top of the list. It returns to the top when the end of the list is reached.

For example, with the set values shown below:

Setting item	Set value
Unicast Address	::1
Count of Unicast Address	2
Multicast Group Address	ff00::1
Count of Multicast Group Address	6
Groups per Host	3
Source Address	2001::1
Count of Source Address	4
Sources per Group	2

The multicast/source addresses allocated to each virtual host are as follows:

Virtual host address (Unicast Address)	Multicast Address	Source Address
::1	ff00::1	2001::1
		2001::2
	ff00::2	2001::3
		2001::4
	ff00::3	2001::1
		2001::2
::2	ff00::4	2001::3
		2001::4
	ff00::5	2001::1
		2001::2
	ff00:6	2001::3
		2001::4

Start/stop of emulation:

When the settings are completed, click the start/stop button at the top of the MLDA screen to start emulation. A virtual host joins (leaves) according to the settings. A virtual host leaves when the start/stop button is clicked again. The start/stop button is disabled until the leave operation is completed.

Operation status display of virtual host:

Clicking the **Update Status** at the bottom of the MLDA screen during emulation, updates the status information in the Entry Information table. Clicking the **Result** opens a dialog box displaying the status of each virtual host.

Figure 5.7.13-5 Virtual Host State displaying screen

Specify the virtual host group number in Entry No. to display the following information set on the specified virtual host. The information is updated each time the **Reload** clicked.

Setting name	Description
Unicast Address	The IP address for the virtual host whose status is being displayed.
State	Shows the representative state of the multiple channels contained in the virtual host, according to the following priority order: 1. Waiting Authentication Message: Indicates that a channel waiting for Authentication Message is present. 2. Waiting Accounting Message: Indicates that a channel waiting for Accounting Message is present. 3. Listener: Indicates that a channel in join is present. 4. Non Listener: Indicates that a channel in leave is present.
Result	Shows the following contents: <Number of received Authentication-successes/ Accounting-stops>/<Total planned number of received Authentication-successes/Accounting-stops>

5.7.14 PIM-SMv2 protocol emulation function

The PIM-SMv2 protocol emulation function can emulate virtual PIM routers. The virtual PIM router of the PIM-SMv2 protocol emulation function provides the operations shown below:

- Supports PIM-SMv2 (draft-ietf-pim-sm-v2-new-08.txt).
- Exchanges PIM-SM packets to maintain neighbor router information.
- Allows Join/Prune message transmission to multiple multicast groups. Alternative transmission of Join and Prune messages can be performed as well as automatic change from PIM (*,G) Join/Prune message to PIM (S,G) Join/Prune message.
- Automatic acquisition of RP IP address (draft-ietf-pim-sm-bsr-03.txt)
- Supports IPv4 and IPv6 (see Note 2)

The Tx Stream function includes templates for creating PIM Register Message (encapsulated multicast data packet). Refer to Section 5.1.2 "Defining transmission data pattern" for details of their usage.

Notes:

1. This function requires the PIM-SMv2 Protocol option.

2. The IPv6 Extension option is required to use the IPv6 function.

3. The PIM parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to "(5) Protocols" in Section 4.5.6.

Procedure

The PIM-SMv2 protocol emulation function is operated from the PIM-SMv2 screen on the **Protocols** tab.

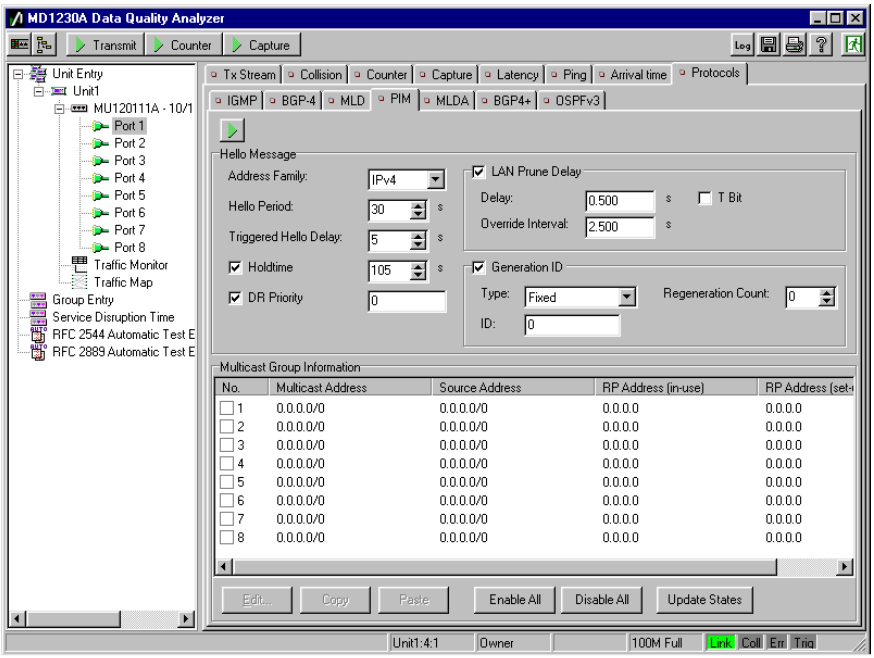


Figure 5.7.14-1 PIM screen

In the upper section of the screen (the Hello Message setting group), perform settings required for basic operation of the virtual PIM router. The lower section of the screen (the Multicast Group Information table) shows the setting information (Join/Prune message contents transmitted by the virtual PIM router) of multicast groups maintained by the virtual PIM router. Up to 8 types of multicast group information can be set. Use the checkboxes in the “No.” column to enable/disable each multicast group setting.

Note:

As the transmission source address of the PIM packet and the address of Address List Option (in the case of IPv6) transmitted by the virtual PIM router, This Port address in the Port Setting dialog box is set.

☞ For This Port address settings, refer to Section 4.5 “Setting Port (Port Setting Dialog).”

The setting contents for the Hello Message setting group are shown below.

Hello Message setting group:

Item	Description
Address Family	Specifies Address Family for the Hello Message transmitted by the virtual PIM router. Select IPv4, IPv6 or Both. (Initial value: IPv4)
Hello Period	Specifies the transmission interval for the Hello Message transmitted by the virtual PIM router (1 to 65,535 seconds, Initial value: 30)
Triggered Hello Delay	Sets the value of Triggered Hello Delay (0 to 65,535 seconds, Initial value: 5). Triggered Hello Delay is the transmission waiting time of the Hello message at any event (when a neighbor router is newly added, etc.). When 0 is specified, the Hello message is transmitted immediately after the event occurs.
Holdtime	Sets the value for Holdtime of the Hello Message (0 to 65,535 seconds, Initial value: 105). Holdtime Option informs the destination (DUT) of the time until deleting information on a neighbor router from which Hello message cannot be received (Neighbor liveness Timer). When 0 is specified, the DUT is informed that the transmission source of a PIM Hello message is performing down processing or the IP address has changed. When 65535 (0xffff) is specified, the DUT is informed that the neighbor router information of the message source should not be deleted. To omit the Holdtime Option setting, uncheck its checkbox. (Initial setting: Checked)
LAN Prune Delay (Delay, Override Interval, T Bit)	Sets LAN Prune Delay Option. Uncheck the checkbox not to set LAN Prune Delay Option. (Initial setting: Checked) Delay (0 to 32,767 ms, Initial value: 500 ms): Sets the value of Propagation Delay to be reported to neighbor routers. When set to 0, the PIM Prune Message is transmitted immediately when Prune is required. Override Interval (0 to 65,535 ms, Initial value: 2,500 ms): Sets the value of Override Interval to be reported to neighbor routers. When set to 0, a PIM Join Message is transmitted immediately after receiving a Prune message. Values for Delay and Override Interval are exchanged by the PIM Hello message. The maximum value from that reported by the neighbor router is used for each router. Check the checkbox to set T Bit (Initial setting: Unchecked). T Bit is used to show that the suppression function of Join message can be disabled.

Item	Description
DR Priority	Sets the value of DR Priority (0 to 4,294,967,295, Initial value: 0). Uncheck the checkbox not to set DR Priority Option. (Initial setting: Checked)
Generation ID (Type, ID, Regeneration Count)	Sets Generation ID. Uncheck the checkbox not to set Generation ID Option (Initial setting: Checked). In the Type setting, select the generation method of Generation ID from Fixed, Random or Increment (Initial value: Fixed). When the generation method is Fixed or Increment, set the value of Generation ID (0 to 4,294,967,295, Initial value: 0). When the generation method is Random or Increment, set Regeneration Count (1 to 255, Initial value: 1). Regeneration Count is the number of Hello Message transmissions until the value of Generation ID is changed. After transmitting the specified number of Hello Messages, Generation ID is calculated again.

The display contents in the Multicast Group Information table are shown below.

Multicast Group Information table details:

Item	Description
Checkbox	Check the checkbox to enable the multicast group settings. When enabled, a PIM Join/Prune Message with the set contents is transmitted. Use this checkbox to control each PIM Join/Prune Message transmission.
Multicast Address	Shows the current set value of multicast group information. The set value can be changed in the dialog box opened by clicking the **Edit**. Multicast Address: Shows the set value for Multicast Address of Group in “<Address> / <Mask Length>” format.
Source Address	Source Address: Shows the set value for Source Address. “*” is displayed when Wild Card is On.
RP Address (set-up)	RP Address (set-up): Shows the value for Unicast Address of RP.
RP Address (in-use)	Shows the RP address currently used by the virtual PIM router. Click the **Update States** to update to the latest information.

Button details:

Item	Description
Start/Stop button	Starts/stops operation of the PIM-SMv2 protocol emulation function.
Edit	Shows a dialog box for setting information on the multicast group selected in the table.
Copy	Copies the set contents of the multicast group selected in the table.
Paste	Pastes the set contents of the multicast group information copied by the **Copy** to the setting selected in the table.
Enable All	Enables all checkboxes in the table.
Disable All	Disables all checkboxes in the table.
Update States	Updates the RP Address (in-use) contents.

Setting multicast group information:

Select a line in the Multicast Group Information table and click the **Edit** to open a dialog box for setting multicast group information. Use this dialog box for setting the transmitted Join/Prune message contents. Clicking the **Next/Prev** moves the current setting to the next/previous setting in the table.

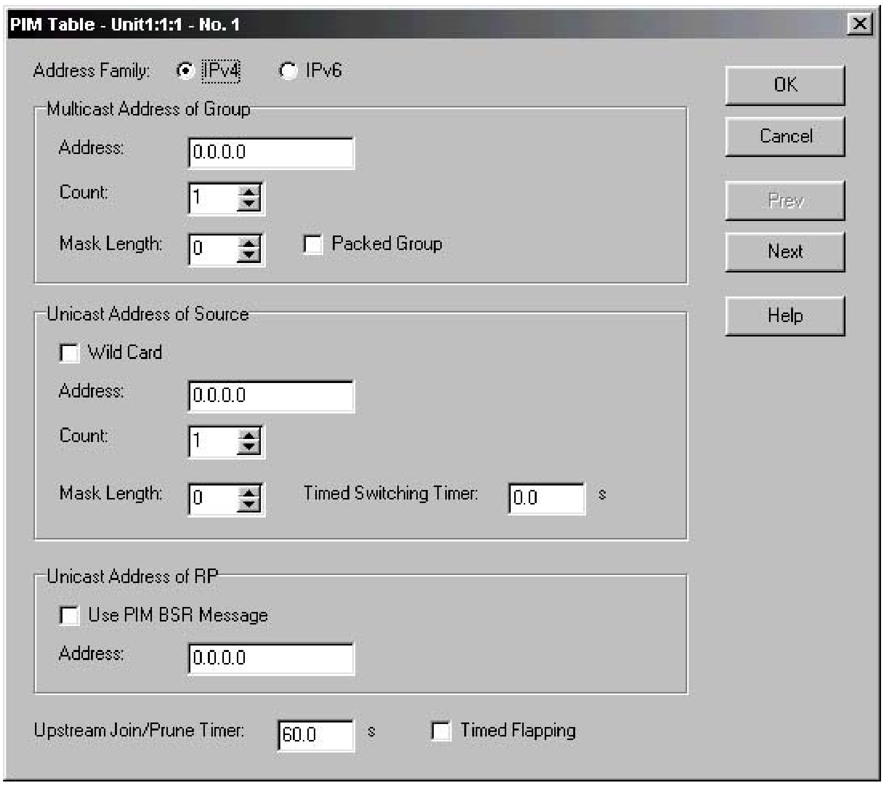


Figure 5.7.14-2 Multicast Group Information setting screen

Setting item details:

Item	Description
Address Family	Select IPv4 or IPv6 as Address Family used for Multicast Address of Group, Unicast Address of Sender and Unicast Address of RP. (Initial value: IPv4)
Multicast Address of Group (Address, Count, Mask Length, Packed Group)	Sets the multicast address. Set Address (multicast address (Initial value: 0.0.0.0)) and Mask Length (group range, 0 to 32, Initial value: 32). When Count (1 to 255 (Initial value: 1)) is set to 1 or more, the number of multicast addresses set for Count are created, with the set value for Address as the initial value. When the Packed Group setting is On, this function tries to bring all multicast group parameters together in one PIM Join/Prune Message. When set to Off, a PIM Join/Prune Message is created and transmitted for each multicast group. (Initial setting: Off)
Unicast Address of Source (Address, Count, Mask Length, Wild Card, Timed Switching Timer)	Sets the source address. Set Address (source address, Initial value: 0.0.0.0) and Mask Length (subnet (0 to 32, Initial value: 0)). When the Wild Card checkbox is On, Source is a wild card (no address specified) (Initial setting: Off (unchecked)). (The set values for Address, Mask Length and Timed Switching Timer are disabled.) Timed Switching Timer is the time from transmission of a PIM (*,G) Join message (when starting the function) until changing to PIM (S,G) Join message transmission (0.0 to 360.0 seconds, Initial value: 0.0). When set to 0.0, PIM (S,G) Join message is immediately transmitted without transmitting a PIM (*,G) Join message. When the Timed Flapping checkbox (explained later) is On, this becomes the time until a change from a PIM (*,G) Join/Prune message to a PIM (S,G) Join/Prune message.
Unicast Address of RP (Address, Use PIM BSR Message)	Sets the RP (Rendezvous Point) address. Set the DUT/SUT RP address for Address (Initial value: 0.0.0.0). To acquire the RP address using a PIM BSR message, check the Use PIM BSR Message checkbox (*1). (Initial setting: Unchecked)
Upstream Join/Prune Timer	Sets the transmission interval of the PIM Join/Prune Message (0.1 to 360.0 seconds, Initial value: 60.0). When the Timed Flapping checkbox (explained later) is Off, Join messages are transmitted at this interval. When it is On, Join and Prune messages are alternatively transmitted at this interval (*2).
Timed Flapping	Selects whether to transmit Join messages only or transmit Join and Prune messages alternatively. Check this checkbox to transmit Join and Prune messages alternatively. (Initial setting: Unchecked)

*1: When the address of RP is determined by the BSR message, only the Priority field is used, and RP is not selected by using Hash Function. When RP is determined by the BSR message, only the first address set by Multicast Address of Group is used.

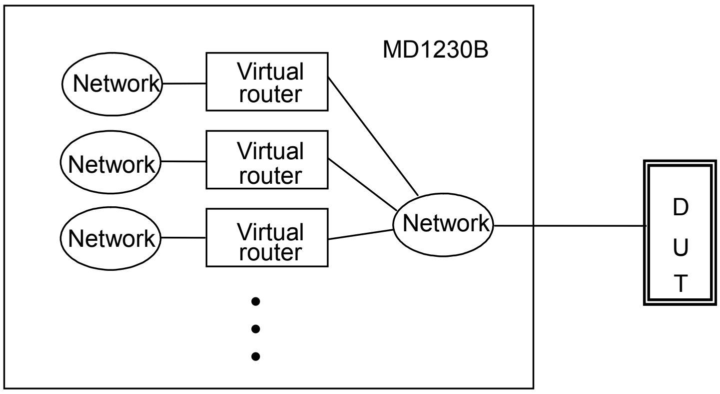
*2: The value of Hold Time of Join/Prune message is set to 3.5 times the value set by Upstream Join/Prune Timer.

5.7.15 OSPFv3 protocol emulation function

The OSPFv3 protocol emulation function can emulate operations of multiple virtual routers. The virtual router of the OSPFv3 protocol emulation function generates LSAs according to the user-set network configuration and advertises it to the DUT router (*1). Up to 200 virtual routers can be set per measurement port (*1). OSPFv3 protocol operation conforms to RFC 2740 (OSPF for IPv6) (*2).

*1: The settable number of LSAs and number of virtual routers that can be operated may be limited by the operation status and settings of other protocol emulation functions.

*2: Note that this function cannot operate as DR/BDR.



Notes:

1. This function can be used only when both IPv6 Expansion Option and the OSPFv3 Protocol Option are installed.

2. The OSPFv3 parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

Procedure

The OSPFv3 protocol emulation function is operated from the OSPFv3 screen on the **Protocols** tab.

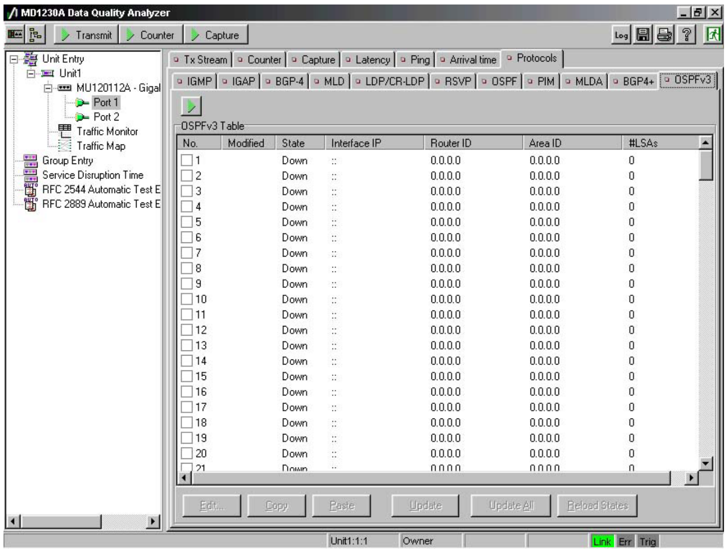


Figure 5.7.15-1 OSPFv3 screen

One line in the table (OSPFv3 Table) on the OSPFv3 screen corresponds to a virtual router. The OSPFv3 screen shows a summary of virtual router setting contents and the operation status of the virtual router (click the **Reload States** to update the operation status display). Use the checkboxes in the "No." column to enable/disable virtual routers.

OSPFv3 Table details:

Item	Description
Checkbox	Enables/disables virtual routers.
Modified	Indicates that virtual router setting contents have been modified during operation.
State	Shows the operation status of the virtual router (Down/2-Way/Full).
Interface IP	Shows the Interface Address of the virtual router.
Router ID	Shows the Router ID of the virtual router.
Area ID	Shows the Area ID of the virtual router.
#LSAs	Shows the number of LSAs advertised by the virtual router.

Button details:

Item	Description
Start/Stop button	Starts/stops operation of the OSPFv3 protocol emulation function.
Edit	Shows a dialog box for setting the virtual router selected in the OSPF Table.
Copy	Copies the set contents of the virtual router selected in the OSPF Table.
Paste	Pastes the set contents of the virtual router copied by the **Copy** to the virtual router selected in the OSPF Table.
Update	Reflects the setting modification contents of the virtual router selected in the OSPF Table in the DUT.
Update All	Reflects the setting modification contents of all virtual routers enabled using the checkboxes in the OSPF Table.
Reload States	Updates the operation status of the virtual router (State in the OSPF Table).

At first, sets virtual router.

Select a line in the OSPFv3 Table and click the **Edit** to open a dialog box for setting a virtual router. Use this dialog box for making the settings necessary for virtual router operation. Clicking the **Next/Prev** moves the current setting to the next/previous virtual router setting in the OSPFv3 Table.

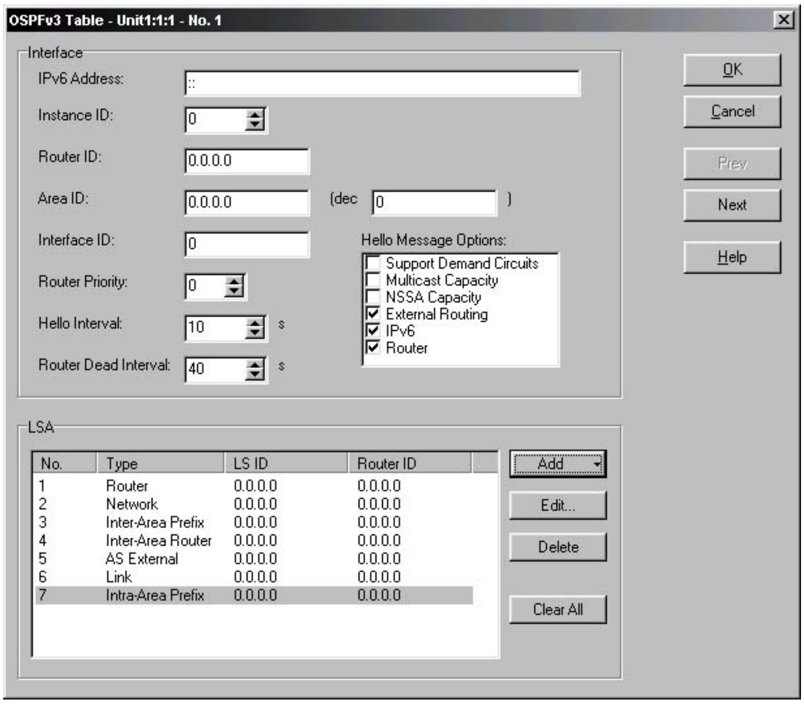


Figure 5.7.15-2 Virtual Router setting screen

Set information on the virtual router itself in the Interface setting group.

Interface setting group details:

Item	Description
IPv6 Address	Sets the Interface Address for the virtual router in the IPv6 address format. (Initial value is ::)
Instance ID	Sets the Instance ID of the virtual router (0 to 255, Initial value: 0).
Area ID	Sets the Area ID of the virtual router in the IPv4 address format or as a numeric value (0 to 4,294,967,295, Initial value: 0).
Router ID	Sets the Router ID of the virtual router in the IPv4 address format. (Initial value: 0.0.0.0)
Interface ID	Sets the Interface ID of the virtual router (0 to 4,294,967,295 (Initial value: 0)).
Router Priority	Sets the value of Router Priority for the virtual router (0 to 255 (Initial value: 0)). Router Priority indicates the priority of how easily the source router can become DR/BDR. When set to 0, it cannot become DR/BDR. ***Note:*** Set to 0 because a virtual router cannot operate as DR.
Hello Interval	Sets the interval of Hello packets transmitted by the virtual router (0 to 65,535 seconds (Initial value: 10)).

Item	Description
Router Dead Interval	Sets the Router Dead Interval of the virtual router (0 to 65,535 seconds, Initial value: 40). Router Dead Interval is used to judge whether the Neighbor is shutdown. If a Hello packet is not received within the time set for Router Dead Interval, the Neighbor is judged to be shutdown.
Hello Message Options	Sets the option field contents of the Hello packet transmitted by the virtual router. (Initial setting: Checked for E-bit, R bit, and V6 bit; Unchecked for others) Support Demand Circuits (DC-bit): Check the check button to show conformance to RFC 1793 (Extending OSPF to Support Demand Circuits). Multicast Capacity (MC-bit): Check the check button to show conformance to RFC 1584 (MOS PF). NSSA Capacity (N-bit): Check the check button to shows conformance to the LS Type 7 LSA. External Routing (E-bit): Shows the AS-External route flow. Uncheck the check button to show belonging to stub area. IPv6 (V6-bit): Uncheck the check button to remove from the object of IPv6 route calculation. Router (R-bit): Uncheck the check button to indicate the router is not active.

Next, set the contents of the LSA to be advertised by the virtual router in the LSA setting group. Add an LSA by using the **Add**. Then click the **Edit** to set the contents of the LSA to be advertised. Summary information of the set LSA (LSA type, Link State ID and Advertising Router ID) is shown in the table.

Details of buttons in the LSA setting group:

Item	Description
Add	Adds an LSA to be advertised by the virtual router. Select the type of the LSA to be added from the menu that appears by clicking the button.
Edit	Shows a dialog box for setting the LSA selected in the table.
Delete	Deletes the LSA setting selected in the table.
Clear All	Deletes all LSA settings displayed in the table.

The following 7 types of LSAs can be added by using the **Add**:

- LS Type 1: Router-LSA
- LS Type 2: Network-LSA
- LS Type 3: Inter-Area-Prefix-LSA
- LS Type 4: Inter-Area-Router-LSA
- LS Type 5: AS-External-LSA
- LS Type 8: Link-LSA
- LS Type 9: Intra-Area-Prefix-LSA

Each LSA setting is explained below.

Settings common to all LSA (Header Information):

Item	Description
Link State ID Advertising Router ID	Contents to be set in the header of the LSA to be advertised by the virtual router. The setting contents of Link State ID vary according to the LSA type. Set in IPv4 address format, or with a numerical value (0 to 4,294,967,295, Initial value: 0). Set the ID of the router that advertises the LSA for Advertising Router ID. (IPv4 address format, Initial value: 0.0.0.0)

Router LSA

At Router LSA, set the status and cost information of the link (network) connected to the router. Router-LSA is generated by all routers.

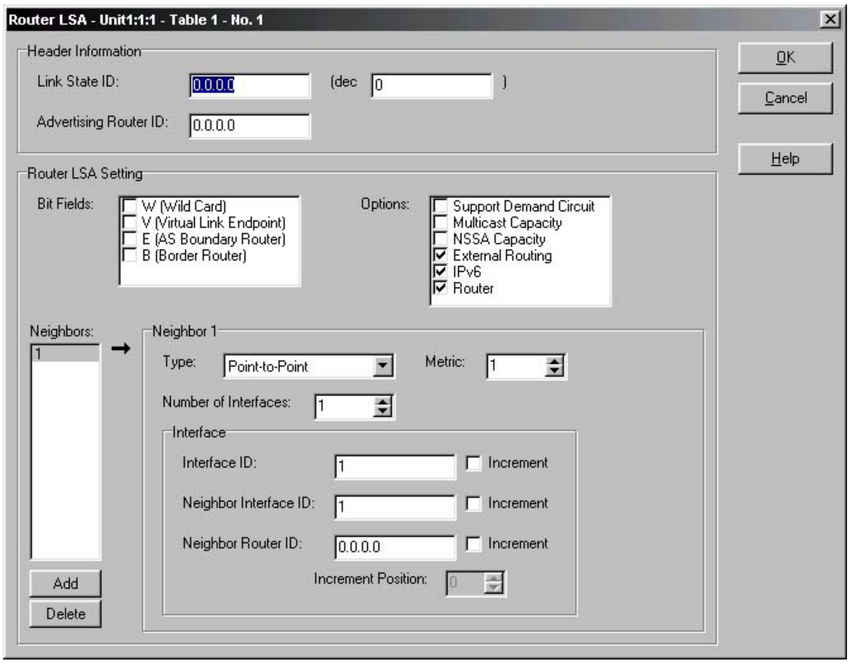


Figure 5.7.15-3 Router LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the ID of the router from which the LSA is generated.
Advertising Router ID	Sets the ID of the router from which the LSA is advertised.

Router LSA Setting:

Item	Description
Bit Fields	W (Wild Card): When this bit is 1, it is a wild card multicast receiver. (Initial setting: All unchecked) V (Virtual Link Endpoint): When this bit is 1, it is the endpoint of the virtual link. E (AS Boundary Router): When this bit is 1, the router is an AS boundary router. B (Border Router): When this bit is 1, the router is an area border router.
Options	Refer to the explanation of Hello Message Options in the Interface setting group.

Neighbors setting:
Click the **Add** to create multiple LSAs. In addition, multiple LSAs can be generated automatically by setting Number of Interfaces.

Item	Description
Type	Select one from the followings: Point-to-Point: Point-to-Point connection (Initial value) Transit: Connects to the transit network. Transit network refers to a multi-access network where multiple routers are connected. A transit network can include data traffic that passes through it from one network to another. DR also exists. Virtual: Virtual link
Metric	Sets the cost for using a router interface (0 to 65,535, Initial value: 1).
Interface ID	Sets the Interface ID (0 to 4,294,967,295, Initial value: 1).
Neighbor Interface ID	Sets the Neighbor Interface ID (0 to 4,294,967,295, Initial value: 1).
Neighbor Router ID	Sets the Neighbor Router ID (IPv4 address format, Initial value: 0.0.0.0).
Number of Interfaces Increment Interface ID /Increment Neighbor Interface ID/Increment Neighbor Router ID checkboxes Increment Position	Multiple LSAs (up to 65,535) can be generated automatically by setting Number of Interfaces to more than 1. (Initial value: 1) When Number of Interfaces is set to more than 1, select whether to generate the incremented LSA information using the value (set for each of Interface ID, Neighbor Interface ID, and Neighbor Router ID as the start value), with checkboxes (of Increment Interface ID, Increment Neighbor Interface ID and Increment Neighbor Router ID) (Initial setting: All unchecked). When Neighbor Router ID is set to be incremented, set the increment position of Neighbor Router ID in Increment Position setting (0 to 31, Initial value: 0).

Network LSA

At Network LSA, set the information of the routers connected to the network. DR summarizes all Network LSAs to a single Network LSA, and advertises it.

Note:

A virtual router cannot operate as DR, so set the router behind the virtual router as DR for the Network LSA setting, so that this DR is advertising the LSA. Specifically, input the DR value for the Link State ID and Advertising Router ID settings.

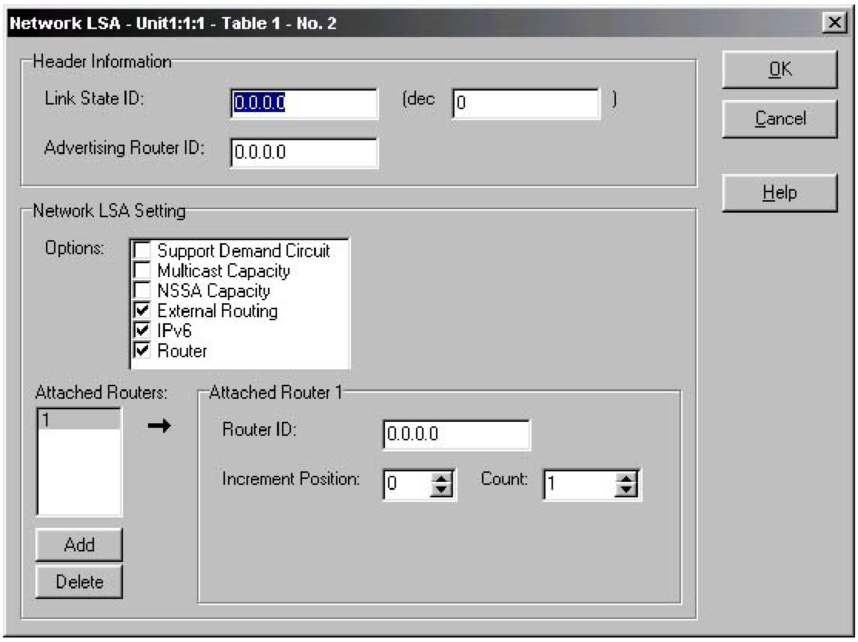


Figure 5.7.15-4 Network LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the interface ID of DR in the network.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Network LSA Setting:

Item	Description
Options	Refer to the explanation of Hello Message Options setting in the Interface setting group.

Attached Routers settings:
Click the **Add** to create multiple LSAs. In addition, multiple LSAs can be generated automatically by Count setting.

Item	Description
Router ID	Sets the ID of the router connected to the network. (IPv4 address format, Initial value: 0.0.0.0)
Count	Multiple LSAs (up to 65,535) can be generated automatically by setting Count to more than 1. (Initial value: 1)
Increment Position	When Count is set to more than 1, multiple LSA information that is incremented from the value (as start value) set for Router ID is generated. In this case, set the increment position of Neighbor Router ID in Increment Position setting. (0 to 31, Initial value: 0)

Inter-Area Prefix LSA

At Inter-Area Prefix LSA, set the network information (prefix) generated by OSPF outside of the area. Inter-Area Prefix LSA in OSPF for IPv6 is equivalent to IPv4 Type 3 (summary-LSA). The area border router advertises this kind of LSA to exchange prefix information among areas. It can be used in the default route description reported to the stub area.

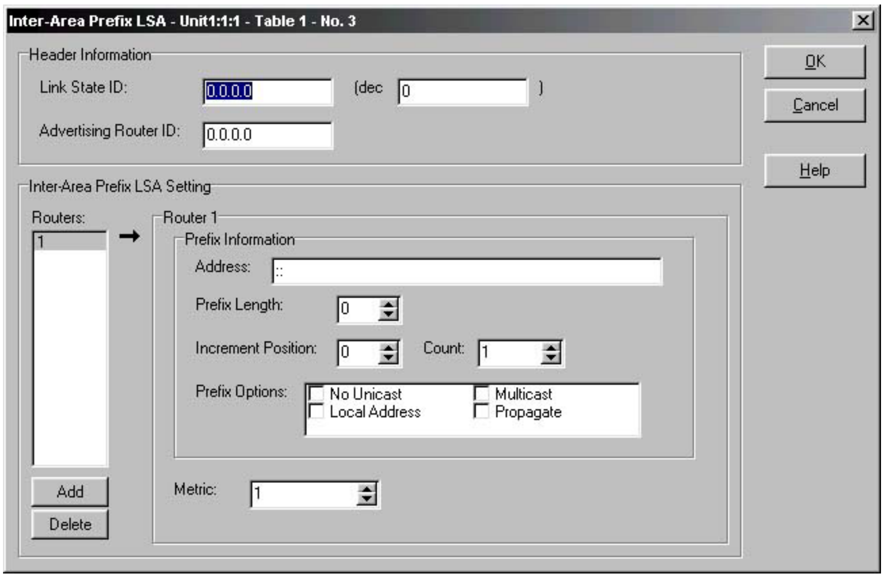


Figure 5.7.15-5 Inter-Area Prefix LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the values used to identify multiple Inter-Area Prefix LSAs transmitted from the same router.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Inter-Area Prefix LSA settings:

Click the **Add** to create multiple LSAs. In addition, multiple LSAs can be generated automatically by Count setting.

Item	Description
Prefix Information (Address, Prefix Length, Prefix Options)	Sets the prefix address for Address (IPv6 address format, Initial value is ::) and prefix length (0 to 128, Initial value: 0) for Prefix Length. Also sets the following Prefix Options. (Initial setting: All unchecked) No Unicast (NU-bit): When this bit is 1, the prefix is excluded from the IPv6 unicast calculation. Local Address (LA-bit): When this bit is 1, the prefix is set as the IPv6 interface address of the Advertising Router. Multicast (MC-bit): When this bit is 1, the prefix is included in the IPv6 multicast calculation. Propagate (P-bit): When this bit is 1, the prefix is set as the NSSA area prefix that should be reported to the NSSA area border.
Metric	Sets the cost up to the network (0 to 16,777,215, Initial value: 1).
Count	Multiple LSAs (up to 65,535) can be generated automatically by setting Count to more than 1. (Initial value: 1)
Increment Position	When Count is set to more than 1, multiple LSA information that is incremented from the value (as start value) set for Address is generated. In this case, set the increment position of Address in Increment Position setting. (0 to 127, Initial value: 0)

Inter-Area Router LSA

At Inter-Area Router LSA, set the network information outside of the area (AS boundary router information). Inter-Area Router LSA in OSPF for IPv6 is equivalent to IPv4 Type 4 (Summary-LSA). The area border router advertises this kind of LSA to exchange AS boundary router information among areas (to inform other areas that which AS boundary router is connected to which area).

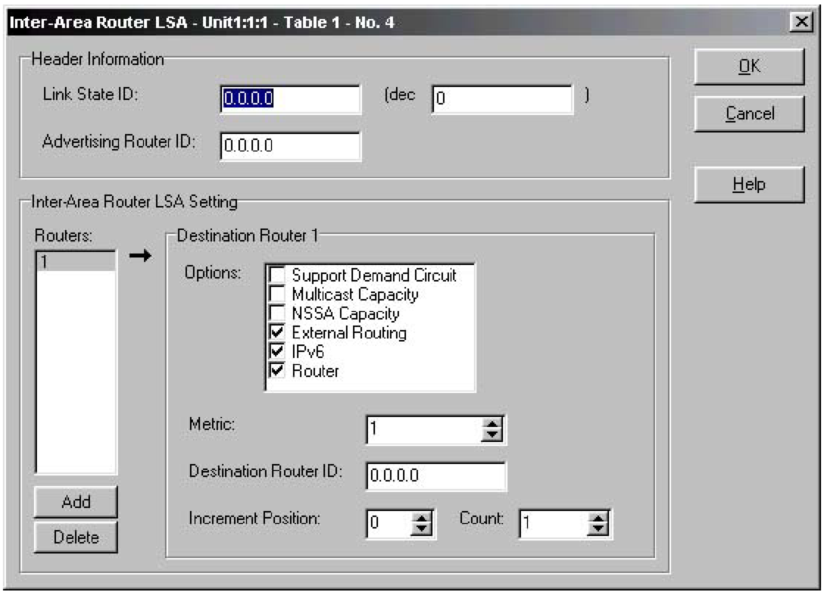


Figure 5.7.15-6 Inter-Area Router LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the values used to identify multiple Inter-Area Router LSAs transmitted from the same router.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Destination Router settings:
Click the **Add** to create multiple LSAs. In addition, multiple LSAs can be generated automatically by setting Count.

Item	Description
Options	Refer to explanation of Hello Message Options setting in the Interface setting group.
Metric	Sets the route cost (0 to 16,777,215 (Initial value: 1)).
Destination Router ID	Sets the Router ID. (IPv4 address format, Initial value: 0.0.0.0)
Count	Multiple LSAs (up to 65,535) can be generated automatically by setting Count to more than 1. (Initial value: 1)
Increment Position	When Count is set to more than 1, multiple LSA information that is incremented from the value (as start value) set for Destination Router ID is generated. In this case, set the increment position of Router ID in Increment Position setting. (0 to 31, Initial value: 0)

AS External LSA

At AS External LSA, set the address prefix of the AS external route (network information of other routing areas). AS-External is created by the AS boundary router.

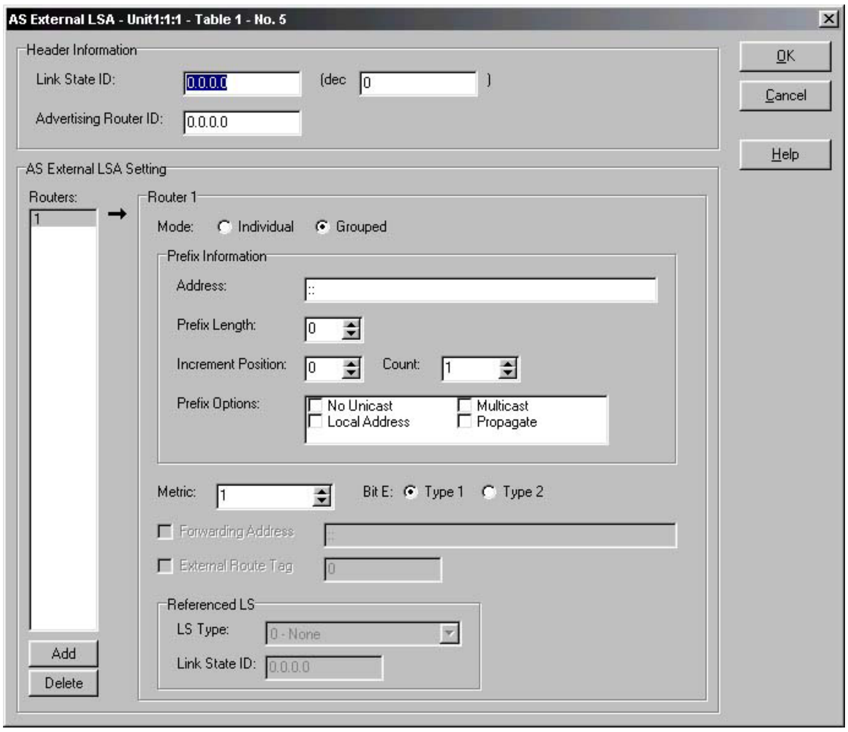


Figure 5.7.15-7 AS External LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the values used to identify multiple AS External LSAs transmitted from the same router.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Router settings:

Click the **Add** to create multiple LSAs. In addition, multiple LSAs can be generated automatically by setting Count.

Item	Description
Prefix Information (Address, Prefix Length, Prefix Options)	Refer to the explanation of Prefix Information in Inter-Area Prefix LSA.
Metric Bit E	Sets the Metric (cost for the link) (0 to 16,777,215 (Initial value: 1)). Also sets the processing method for Metric in Bit E (Type 1/Type 2). When Type 1 (Initial value) is selected, the value of Metric is handled in the same way as the OSPF interface cost. When Type 2 is selected, the External metric becomes more important than the cost within OSPF, so the cost is not added.
Forwarding Address	Sets the Forwarding Address (IPv6 address format, Initial value is ::). Check this checkbox to set the Forwarding Address. (Initial value: Unchecked)
External Route Tag	Sets the External Route Tag (tag attached to the AS- External route, from 0 to 4,294,967,295 (Initial value: 0)). Check this checkbox to set the External Route Tag. (Initial value: Unchecked)
Referenced LS Type Referenced Link State ID	Sets the Referenced LS Type and Referenced Link State ID. Select one from the followings for Referenced LS Type (Initial value: 0): 0 - None 1 - Router LSA 2 - Network LSA 3 - Inter-Area Prefix LSA 4 - Inter-Area Router LSA 5 - AS External LSA 8 - Link LSA 9 - Intra-Area Prefix LSA When Referenced LS Type is set to other than 0, Referenced Link State ID (0 to 4,294,967,295, Initial value: 0) is set.

Item	Description
Mode Count Increment Position	Multiple LSAs (up to 65,535) can be generated automatically by setting Count to more than 1. (Initial value: 1) When Count is set to more than 1, multiple LSA information that is incremented from the value (as start value) set for Address is generated. In this case, set the increment position of Address in Increment Position setting (0 to 127, Initial value: 0). Set Mode to Grouped (Initial value) to enable the Count setting. However, Forwarding Address, External Route Tag, Referenced LS Type and Referenced Link State ID cannot be set when Grouped is selected.

Link LSA

At Link LSA, set the prefix information of the link. Link LSA is used to inform the representative router of the address prefix allocated to the router interface of each router in a multi-access network. It is used to inform the representative router of functions supported by other routers, and to advertise the functions (supported by the network) in the Option field of Network-LSA.

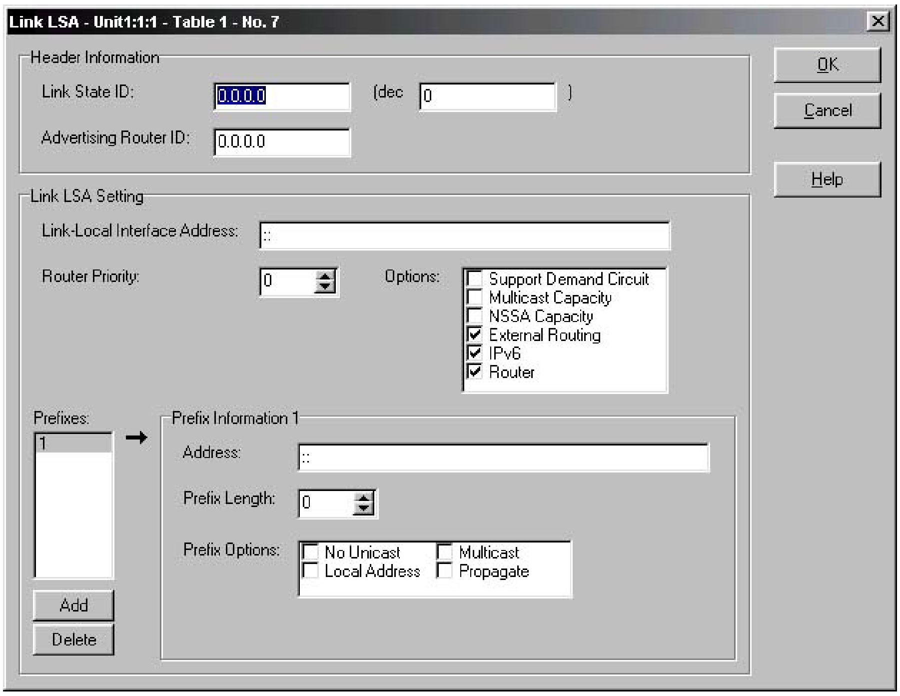


Figure 5.7.15-8 Link LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the interface ID of the router that transmits this packet.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Link LSA Setting:

Item	Description
Link-Local Interface Address	Sets the Link-Local Interface Address of the router that transmits the LSA. (IPv6 address format, Initial value is ::)
Router Priority	Sets the Router Priority (0 to 255, Initial value: 0).
Options	Refer to the explanation of Hello Message Options setting in the Interface setting group.

Prefix Information settings:

Click the **Add** to create multiple LSAs.

Item	Description
Prefix Information (Address, Prefix Length, Prefix Options)	Refer to the explanation of Prefix Information in Inter-Area Prefix LSA.

Intra-Area Prefix LSA

At Intra-Area Prefix LSA, set the address prefix information (Referenced Link State ID, and Referenced Advertising Router ID) of the network segment within the Link area. Specify Router-LSA or Network-LSA at Referenced LS Type, to specify that with which network or router the address prefix information is accompanied.

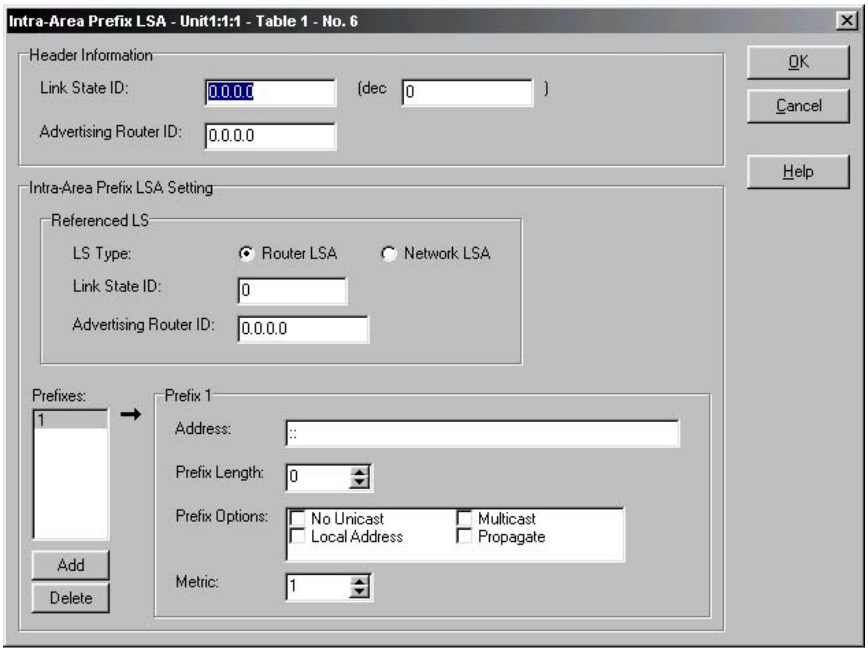


Figure 5.7.15-9 Intra-Area Prefix LSA setting screen

Header Information settings:

Item	Description
Link State ID	Sets the values used to identify multiple Intra-Area Prefix LSAs transmitted from the same router.
Advertising Router ID	Sets the ID of the router that advertises the LSA.

Referenced LS settings:

Item	Description
Referenced LS Type Referenced Link State ID Referenced Advertising Router ID	For the prefix related to Router-LSA, select Router LSA (Initial value) by Referenced LS Type setting. In this case, set Referenced Link State ID (0 to 4,294,967,295, Initial value: 0) to 0. At Referenced Advertising Router ID (IPv4 address format, Initial value: 0.0.0.0), set the Router ID of Router-LSA that specifies a stub. For the prefix related to Network-LSA, select Network LSA by Referenced LS Type setting. In this case, set the DR interface ID and Router ID at Referenced Link State ID and Referenced Advertising Router ID, respectively.

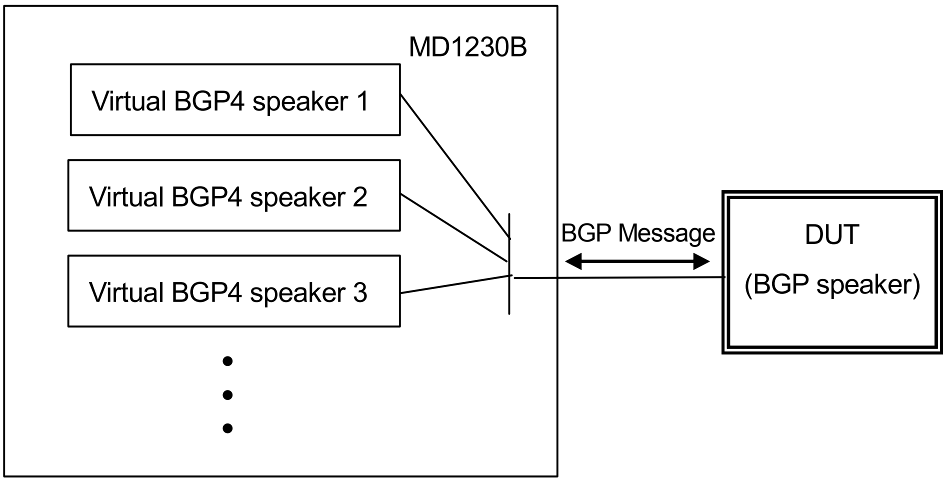
Prefix settings:

Click the **Add** to create multiple LSAs.

Item	Description
Prefix Information (Address, Prefix Length, Prefix Options)	Refer to the explanation of Prefix Information in Inter-Area Prefix LSA.
Metric	Sets the Metrics (cost for the link, from 0 to 65,535, Initial value: 1).

5.7.16 BGP4+ protocol emulation function

The BGP4+ protocol emulation function can emulate multiple virtual BGP speakers. A virtual BGP speaker establishes/maintains a BGP session with the DUT router and advertises the route according to the user-set contents (up to 2^{32}–1 routes (*1)). It can also performs link-flap/root-flap operations. Up to 200 virtual BGP speakers can be set per measurement port (*1).



BGP4+ represents the BGP4 that supports the multi-protocol extension defined in RFC 2858 (extension enabling advertising route information other than IPv4) and IPv6 described in RFC 2545. The virtual BGP speaker operation of the BGP4+ protocol emulation function conforms to these standards.

The BGP4+ protocol emulation function also includes the features shown below:

- Address type that can be advertised: Unicast, multicast, unicast & multicast
- One user-defined path attribute can be added.
- Status for the virtual BGP speaker itself can be displayed at user-assigned timing.
- The NOTIFICATION error code at session disconnection can be set (during link flap operation).

*1: The number of settable routes or virtual BGP speakers that can operate may be limited by the operation status and settings of other protocol emulation functions. In addition, the address family that can be advertised is limited to IPv6, and the transport layer that can be used is limited to TCP over IPv6 (port number: 179).

Notes:

1. This function can be used only when both IPv6 Expansion Option and the BGP4+ Protocol Option are installed.

2. The BGP4+ parameter of Protocol Filter must be set to On for the ports for which this function is to be used.

☞ For the Protocol Filter, refer to “(5) Protocols” in Section 4.5.6.

Procedure

The BGP4+ protocol emulation function is operated from the BGP4+ screen on the **Protocols** tab.

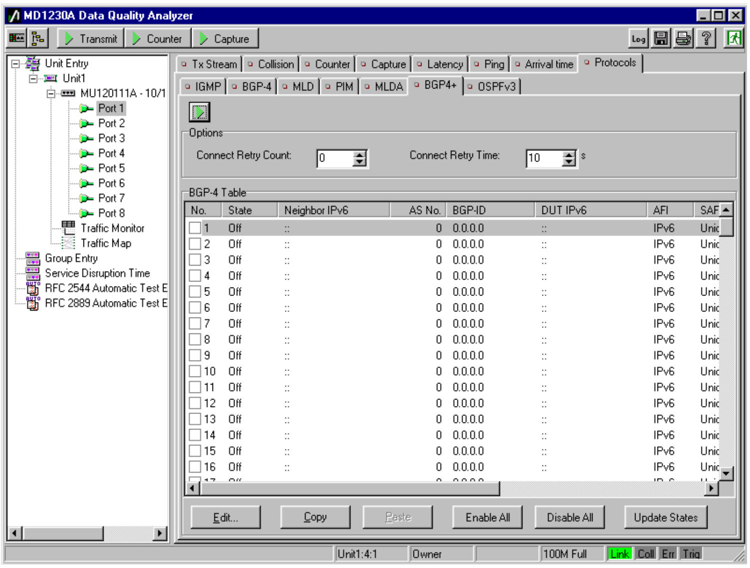


Figure 5.7.16-1 BGP4+ screen

One line in the table (BGP-4 Table) on the BGP4+ screen corresponds to a virtual BGP speaker. The BGP4+ screen shows a summary of the virtual BGP speaker setting contents and operation status of the virtual BGP speaker (click the **Update States** to update the operation status display). Use the checkboxes in the “No.” column to enable/disable virtual BGP speakers.

Option settings:

Item	Description
Connect Retry Count Connect Retry Time	When TCP connection establishment of virtual BGP speaker is retried, set Connect Retry Count setting value (0 to 10 times, Initial value: 0) to one or more, and specify the retry period with Connect Retry Time setting (0 to 180 seconds, Initial value: 30 seconds). • Connect Retry Count indicates the number of times the TCP connection is to be retried. It is counted at either of the following transitions. Connect → Active Active → Connect If an event (timeout of Connect Retry Timer) is generated when the number of times of retry has reached the set value, the Idle state is set. • Connect Retry Timer is the time remaining at Connect or Active state. If a TCP event (such as TCP connection failure/success), the state changes to that before timeout. If Connect Retry Timer is set to 0, the same state continues unless a TCP event is generated.

BGP-4 Table details:

Item	Description
Checkbox	Enables/disables virtual BGP speakers.
State	Shows the operation status of the virtual BGP speaker. For the display contents, refer to “State column display details” below.
Neighbor IPv6, AS No., BGP-ID	Shows the setting contents of the IPv6 address, the AS number to which the virtual BGP speaker belongs, and the BGP ID of the virtual BGP speaker.
DUT-IPv6	Shows the setting contents of the IPv6 Address for the DUT.
AFI, SAFI, Prefix Range, Routes	Shows the setting contents of the route advertised by the virtual BGP speaker. Prefix Range shows the contents shown below. “Routes” shows the number of advertising routes (Prefix). <Network Number>/from – thru Refer to the following explanation of MP_REACH_NLRI settings for details of route settings.
Link Flap	Shows whether the virtual BGP speaker is set so as to perform a Link Flap operation.
Route Flap	Shows whether the virtual BGP speaker is set so as to perform a Route Flap operation.

State column display details:

Display	Description
Off	Indicates that the virtual BGP speaker is disabled.
Stop	Indicates that the virtual BGP speaker is set normally, and not in operation start.
Idle	Idle status. Indicates that TCP connection is not established. A connection request from the destination can not be accepted in this status.
Connect	Wait status for connection. Waiting for reply to connection request.
Active	Active wait status. Wait status after failure to establish connection. A connection request from the destination can be accepted in this status.
OpenSent	Wait status for OPEN. Waiting for OPEN Message from the destination.
OpenConfirm	Wait status for OPEN result. Waiting for reply to the connection conditions transmitted to the destination.
Established	BGP session established status. The OPEN procedure is completed and UPDATE Message can be transmitted in this status.

Button details:

Item	Description
Start/Stop button	Starts/stops operation of the BGP4+ protocol emulation function. When operation stopped, transmits NOTIFICATION Message and requests TCP disconnection. (This button is disabled until the State columns of all virtual BGP speakers become Stop or Off.)
Edit	Shows a dialog box for setting the virtual BGP speaker selected in the BGP-4 Table.
Copy	Copies the set contents of the virtual BGP speaker selected in the BGP-4 Table.
Paste	Pastes the set contents of the virtual BGP speaker copied by the **Copy** to the virtual BGP speaker selected in the BGP-4 Table.
Enable All	Enables all checkboxes in the BGP-4 Table.
Disable All	Disables all checkboxes in the BGP-4 Table.
Update States	Updates the operation status of the virtual BGP speaker (State in the BGP-4 Table).

At first, sets virtual BGP speaker.

Select a line in the BGP-4 Table and click the **Edit** to open a dialog box for setting a virtual BGP speaker. Use this dialog box for making the settings necessary for virtual BGP speaker operation. Clicking the **Next/Prev** moves the current setting to the next/previous virtual BGP speaker setting in the BGP-4 Table.

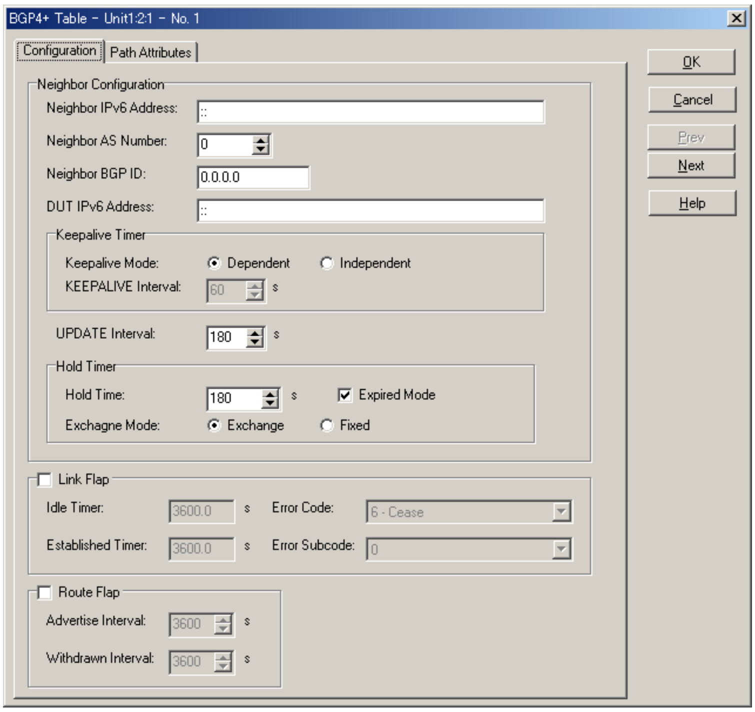


Figure 5.7.16-2 Configuration setting screen

Set information on the virtual BGP speaker and its operation method on the **Configuration** tab.

Neighbor Configuration settings:

Item	Description
Neighbor IPv6 Address Neighbor AS Number Neighbor BGP ID	Sets the IPv6 Address (Initial value is ::) for the virtual BGP speaker, the AS number to which the virtual BGP speaker belongs (0 to 65,535 (Initial value: 65000)), and the BGP ID (IPv4 address format, Initial value: 0.0.0.0).
DUT IPv6 Address	Sets the IPv6 Address for the DUT. (Initial value is ::)
Keepalive Timer (Keepalive Mode, KEEPALIVE Interval)	Sets the transmission interval of the KEEPALIVE Message. To automatically calculate (Hold Timer value/3) the transmission interval of the KEEPALIVE Message from the value of the hold timer, set Keepalive Mode to Dependent (Initial value). To set timer value of KEEPALIVE to a fixed value, set Keepalive Mode to Independent and set the transmission interval of the KEEPALIVE Message in KEEPALIVE Interval (0 to 600 seconds (Initial value: 60)). When 0 is set, KEEP ALIVE Message is not transmitted.
UPDATE Interval	Sets the transmission interval of the UPDATE Message that advertises the route (0 to 600 seconds (Initial value: 180)). When 0 is set, UPDATE Message is transmitted only once at the first time.
Hold Timer (Hold Time, Expired Mode checkboxes, Exchange Mode)	Sets the hold timer value and the related items. First, set the hold timer value to be presented to the DUT, for Hold Time (0 or 3 to 1800 seconds (Initial value: 180)). Then, set the determination method of the hold timer value for the virtual BGP speaker. To conform to the RFC 1771 rules, set Exchange Mode to Exchange. To fix the hold timer value to the value set for Hold Time, set Exchange Mode to Fixed. (Initial value: Exchange) Finally, set the operation when the hold-timer times out. To disconnect the BGP session at timeout, check the Expired Mode checkbox. Uncheck it so as not to disconnect. (Initial setting: Checked) ***Note:*** Even if Expired Mode is checked(On), disconnection is not performed when Hold Timer value is 0.

Link-Flap/Route-Flap operation settings:

Item	Description
Link Flap (Link Flap checkbox, Idle Timer, Established Timer, Error Code, Error Subcode)	Check the checkbox to perform emulation of a link flap operation. (Initial setting: Unchecked) In this case, set the time (for Idle status) and time (for Established status) in Idle Timer and Established Timer (0.0 to 3600.0 seconds, in 100-ms unit, Initial value: 3600.0), respectively. Also set the error code and error subcode of NOTIFICATION (issued when the status shifts from Established to Idle during link flap operation) in Error Code and Error Subcode, respectively. Select an error code from 4 - Hold Timer Expired, 5 - Finite State Machine Error, or 6 - Cease (Initial value: 6). The error subcode can only be set to 0.
Route Flap (Route Flap checkbox, Advertise Interval, Withdrawn Interval)	Check the checkbox to perform emulation of a route flap operation (Initial setting: Unchecked). In this case, set the time (until the next route advertisement after route withdrawal) and the time (until the next route withdrawal after route advertisement) in Advertise Interval and Withdrawn Interval (0 to 3600 seconds, Initial value: 3600), respectively.

Next, set the contents of the route to be advertised by the virtual BGP speaker on the **Path Attributes** tab.

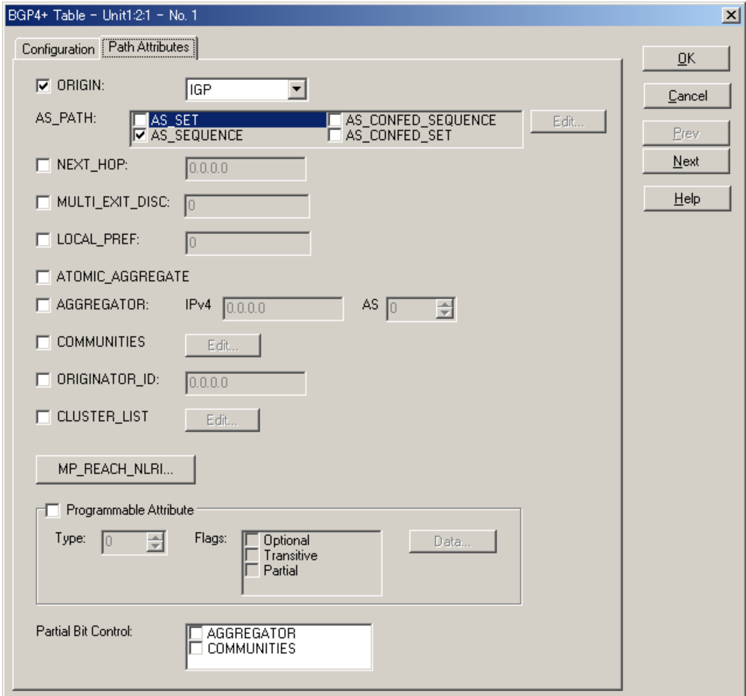


Figure 5.7.16-3 Path Attributes setting screen

Path Attributes settings:

Item	Description
ORIGIN	Check the checkbox to set the ORIGIN attribute (Initial setting: Checked). Specify the ORIGIN type. ORIGIN is a path attribute indicating the origin of the route (NLRI) for report. IGP: Route information acquired internally via IGP (Initial value) EGP: Route information acquired externally via EGP INCOMPLETE: Route acquired in another way

Item	Description
AS_PATH	Sets the AS_PATH attribute. AS_PATH is a path attribute indicating ASs that have been passed through. To set the AS_PATH attribute, first check the checkbox corresponding to the path segment type to be set. AS_SET: AS group regardless of order (Initial setting: Unchecked) AS_SEQUENCE: AS group in the route order (Initial setting: Checked with one element of AS number 65000) AS_CONFED_SET: Sub AS group regardless of order (Initial setting: Unchecked) AS_CONFED_SEQUENCE: Sub AS group in the route order (Initial setting: Unchecked) AS_CONFED_SET and AS_CONFED_ SEQUENCE are used only within an AS confederation. An AS confederation is a configuration for administering ASs by dividing them into several sub ASs. Then click the **Edit** with the selected path segment type to be set, and set the list of AS numbers that have been passed through. At this time, click the **UP** or **DOWN** to exchange the sequence of the value on the list.
NEXT_HOP	Check the checkbox to set the NEXT_HOP attribute (Initial setting: Unchecked). NEXT_ HOP indicates the next transfer destination of the route to be reported (NLRI) (IPv4 address format, Initial value: 0.0.0.0). This attribute is essential, but cannot be added by BGP4+, which does not use NLRI. So it is not required to set this attribute (even if it is added, it will not be handled as significant data).
MULTI_EXIT_DISC	Check the checkbox (Initial setting: Unchecked) to set the MULTI_EXIT_DISC attribute (0 to 4,294,967,295, Initial value: 0). MULTI_EXIT_ DISC (MED) is used to set the link usage priority when there are multiple links with other ASs. The lower the value, the higher the priority.
LOCAL_PREF	Check the checkbox (Initial setting: Unchecked) to set the LOCAL_PREF attribute (0 to 4,294,967,295, Initial value: 0). LOCAL_PREF is used to specify the priority for the route within the AS learned from another AS (the priority of the router at the exit of the packets when sent to other AS for the route). The larger the value, the higher the priority. This attribute is essential for I-BGP.

Item	Description
ATOMIC_AGGREGATE	Check the checkbox (Initial setting: Unchecked) to set the ATOMIC_AGGREGATE attribute. This indicates that the path attribute of the prefix is lost during AGGREGATE (aggregation). Aggregation means compiling several prefixes as one (for example, 1.0.0.0/24 and 1.0.1.0/24 are aggregated into 1.0.0.0/16).
AGGREGATOR	Check the checkbox (Initial setting: Unchecked) to set the AGGREGATOR attribute. AGGREGATOR is added during AGGREGATE (aggregation) of routes. Set the AS number (0 to 65,535, initial value: 0) to which it belongs and the IPv4 Address (Initial value: 0.0.0.0).
COMMUNITIES	Check the checkbox (Initial setting: Unchecked) to set the COMMUNITIES attribute. COMMUNITIES indicates that the route belongs to a group of the same policy. Multiple Community values can be set as a 4-octet value. Set Community values by clicking the **Edit**. In the dialog box that appears, set the Community values in the "(2 octets):(2 octets)" notation. At this time, click the **UP** or **DOWN** to exchange the sequence of the set value on the list. The following three specified values (Well-Known) can be input by clicking a button at the bottom of the dialog box. NO_EXPORT (65535:65281): Re-notification of the route to an external AS is not allowed (it is allowed among sub ASs) NO_ADVERTISE (65535:65282): Re-notification of the route to any AS is not allowed. NO_EXPORT_SUBCONFED (65535:65283): Re-notification of the route is allowed only within sub AS. It is not allowed for other ASs. The following values are reserved: 0:0 (0x00000000) to 0:65535 (0x0FFFF0000) 65535:0 (0x0FFFF0000) to 65535:65535 (0xFFFFFFFF)
ORIGINATOR_ID	Check the checkbox (Initial setting: Unchecked) to set the ORIGINATOR_ID attribute (IPv4 address format, Initial value: 0.0.0.0). ORIGINATOR_ID is used within the AS for a configuration called "route reflection". The route reflector (RR) receives a route from the route reflector client (RR-C), and then sets the router ID of the RR-C in ORIGINATOR_ID to re-advertise the route. This attribute prevents re-re-advertisement to the RR-C, the source of the advertisement.

Item	Description
CLUSTER_LIST	Check the checkbox (Initial setting: Unchecked) to set the CLUSTER_LIST attribute (List of 4 octets). Click the Edit to set CLUSTER_LIST. At this time, click the **UP** or **DOWN** to exchange the sequence of the value on the list. CLUSTER_LIST is used in router reflection in the same way as ORIGINATOR_ID. Cluster means the group of RR and RR-C which manages it. This attribute is added when RR performs advertising to another RR. If UPDATE to be advertised does not include an attribute, an attribute is newly added. Otherwise, it is added at the end of the list. The purpose of this attribute is to record the clusters to which advertisement is performed, in order to prevent from re-advertisement to clusters to which advertisement has already been performed.
MP_REACH_NLRI	Sets the route for advertisement (MP_REACH_NLRI attribute). MP_REACH_NLRI is an attribute used to advertise the route information except IPv4 Address Prefix, at BGP4. Set the MP_REACH_NLRI attribute in the dialog box displayed by clicking the **MP_REACH_NLRI**. The setting procedure is explained in detail below.
Programmable Attribute (Programmable Attribute checkbox, Type, Flags, Data)	Check the Programmable Attribute checkbox to set user-defined attributes. In this case, set the attribute code (0 to 255, Initial value: 0) and attribute flag (Optional/Transit/Partial), then set the hexadecimal data attribute in the dialog box displayed by clicking the **Data**. Data can also be set by importing a text file. Refer to (7) in Section 2.3.1 for a detailed explanation of the data setting.
Partial Bit Control	Sets whether to set the Partial Bit for the path attributes shown below: AGGREGATOR COMMUNITIES Set the Partial Bit to 1 after an option that cannot be interpreted by the option path attribute is passed. Set to 0 in other cases. (Initial value: Off (0))

Set the route to be advertised in the MP_REACH_NLRI dialog box displayed by clicking the **MP_REACH_NLRI** on the **Path Attributes** tab. The setting contents in the MP_REACH_NLRI dialog box are explained below.

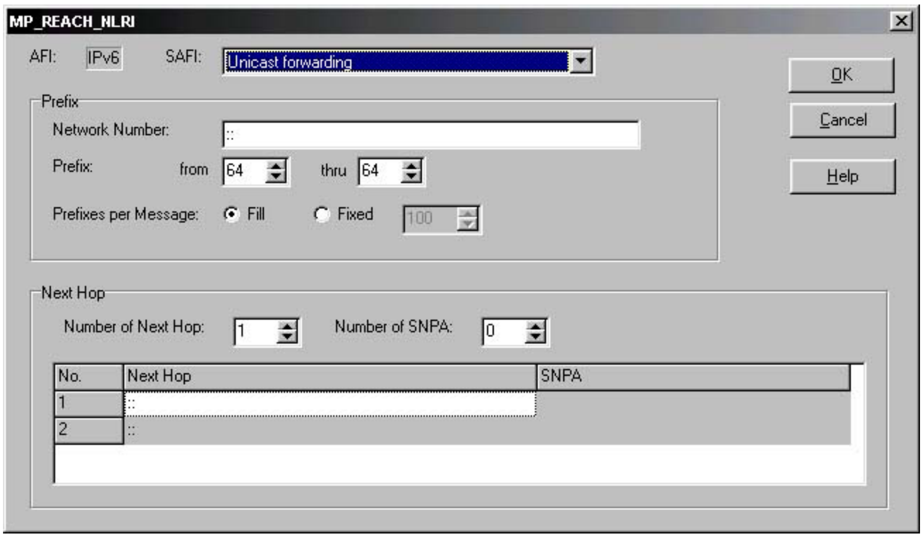


Figure 5.7.16-4 MP_REACH_NLRI setting screen

MP_REACH_NLRI settings:

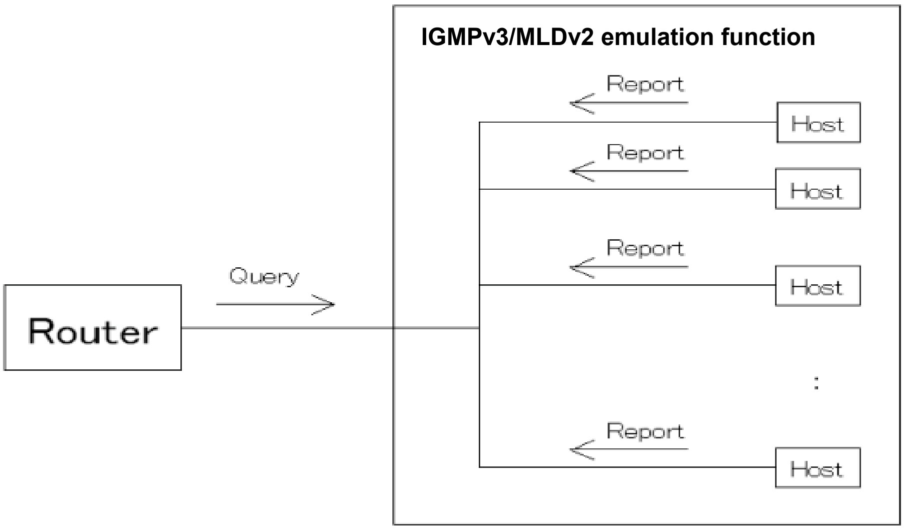
Item	Description
AFI	The route (via which the virtual BGP speaker of the BGP4+ emulation function can advertise) is limited to IPv6 route information. The setting for the AFI (Address Family Identifier) is therefore fixed to "IPv6". At AFI, specify the protocol of the address in the advertising route and the Network Address of Next Hop field.
SAFI	Subsequent AFI (SAFI: subsequent address identifier) specifies the type of the advertising route. Select one from the followings: Unicast forwarding (Initial value) Multicast forwarding Both unicast and multicast forwarding
Prefix (Network Number, Prefix from/thru)	Sets the advertising route (Prefix) in Network Number. When Prefix from/thru is set, multiple routes are generated automatically according to Prefix set in Network Number. from: Start bit for Prefix generation (1 to 128) thru: Stop bit for Prefix generation ([from] to [from+31]) The number of Prefixes automatically generated is calculated using the from and thru settings as shown below: $N = 2^{THRU-FROM} + 2^{THRU-FROM} - 1 = 2^{THRU-FROM+1} - 1$

Item	Description
Prefixes per Message (Fill/Fixed)	Sets the number of prefixes contained within one UPDATE Message. When Fill/Fixed is set to Fill, a message is created with the maximum number of prefixes with which the UPDATE Message size does not exceed the upper limit (4096 octets). When set to Fixed, the number of prefixes contained within one UPDATE Message is fixed to the set value (20 to 100, Initial value: 100).
Next Hop (Number of Next Hop, Next Hop, Number of SNPA, SNPA)	Sets Next Hop and SNPA (SubNetwork Points of Attachment) within the MP_REACH_NLRI attribute. At Next Hop, specify the next transfer destination address of the advertising route in the NLRI field. At Number of Next Hop, specify the number of Next Hop (1 to 2 (Initial value: 1)) and set the value of Next Hop (Initial value is ::). At SNPA, specify the layer-2 address used to identify the Next Hop address. At Number of SNPA, specify the number of SNPA (0 to 2 (Initial value: 0)) and set the value of SNPA (Hexadecimal notation, 11 bytes maximum).

5.7.17 IGMPv3/MLDv2 protocol emulation function

☞ Refer to Section 5.7.5 IGMP when using the MU120101A/02A/03A/04A/05A/06A/19A/20A/03B/04B.

The IGMPv3/MLDv2 protocol emulation function can create a situation where multiple hosts are joining/leaving multiple multicast groups.



In this function, a virtual host (Listener) that performs an operation to join/leave a multicast group is called "virtual host." A virtual host transmits reports, replies to queries, and repeats the following operations in the set interval.

- Joining multicast group (Join)
- Leaving multicast group (Leave)
- Changing between multicast groups (Change)

Multiple virtual hosts can exist. Up to 2000(*) virtual hosts with the same interval of join/leave/change operations, per entry. Up to four entries (*) of host groups with different operations.

*: The maximum value is affected by other settings. Refer to "Setting precautions" described below.

The address information (host/group/source addresses) of the virtual host is automatically created by incrementing the initial setting values.

Virtual hosts operate, referring to RFC 3810.

Restrictions

(1) Router operation cannot be performed.

(2) MAC addresses of all virtual hosts are the same (set in Port Setting - This Port).

(3) IGMP/MLD messages with VLAN tag cannot be processed.

(4) Operation settings of virtual hosts cannot be changed during operation.

Note:

The MLD parameter of Protocol Filter must be set to On for the ports using this function.

Refer to Section 4.5.6 (5) Protocols for the Protocol Filter.

Procedure

Setting IGMPv3/MLDv2 function

This section explains the MLDv2 function as an example. For IGMv3, change the IP address of MLDv2 to IPv4. Setting/execution of the MLDv2 function and operation status display are performed in the screen appears by selecting the **MLD** tab in the **Protocols** tab. Set the operation contents in the table under Entry Information. One line in this table indicates one entry (virtual host group performs the same operation).

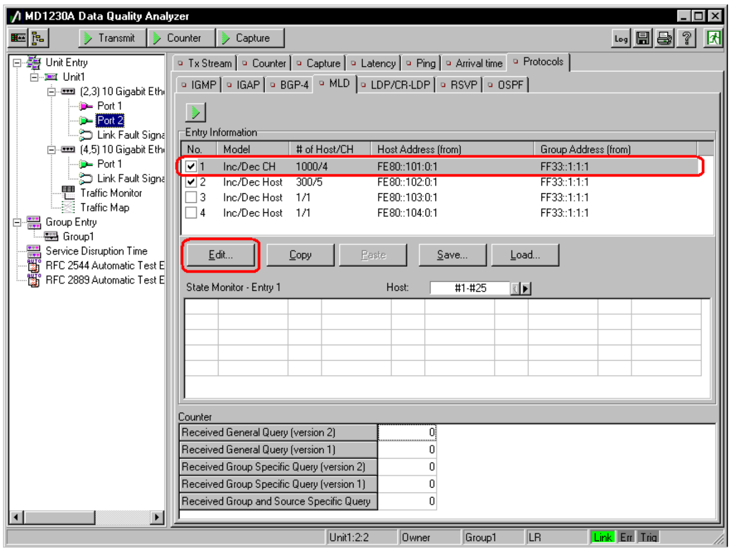


Figure 5.7.17-1 HLD screen

Set virtual host operations in the dialog box displayed by clicking **Edit...**. The setting dialog box is a three-step wizard. The setting contents for each step are explained below.

Step 1: Setting operation model

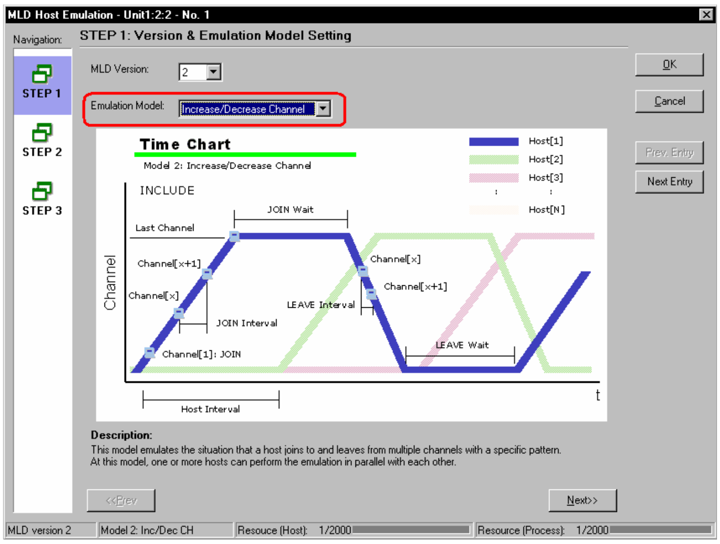


Figure 5.7.17-2 Operation model setting screen

In Step 1, select the operation model of the virtual hosts. During Emulation Model setting, select one from three operation models. When Emulation Model setting is changed on the screen, the illustration for explanation of operation changes. Each operation model is explained below.

Emulation Model	Description
Increase/ Decrease Host Increase/Decrease Channel	These two operation models increase/decrease channels to which the virtual host joins. Increase/Decrease Host and Increase/ Decrease Channel are similar operations, though the setting methods differ, as shown below: 1) Setting of Increase/Decrease Host is focused on sequences where “hosts” joining a “channel” increase/decrease. 2) Setting of Increase/Decrease Channel is focused on sequences where “channels” to which a “host” in joining increase/decrease. Multiple sequences with the same operation can be specified in both models, resulting similar operations. In the Increase/Decrease Channel model, channels to join can be changed for each sequence (host), so combinations of join/leave addresses can be set more flexibly.
Change Channels	In this operation model, the virtual host changes between channels. Multiple sequences (hosts) can be set similar to the two models above.

When the operation model is determined, click the **Next** to proceed.

Step 2: Setting operation sequence

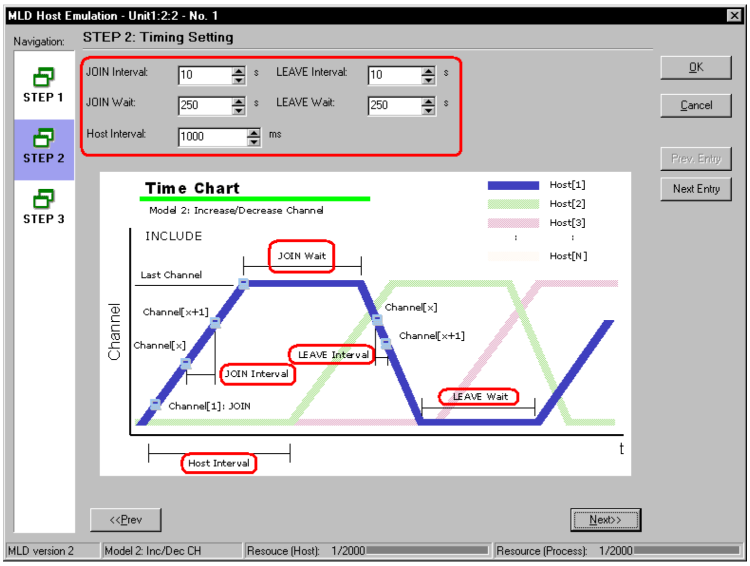


Figure 5.7.17-3 Operation sequence setting screen

In Step 2, set the operation sequence interval. The setting contents vary, depending on the operation model, as shown below.

Operation model	Setting item	Description	Operation range
Increase/Decrease Host	JOIN Interval	Host increasing interval	1 to 7200 s (2 hours)
	JOIN Wait	Time until leaving starts, after the set number of hosts complete joining	1 to 86400 s (24 hours)
	LEAVE Interval	Host decreasing interval	1 to 7200 s (2 hours)
	LEAVE Wait	Time until joining starts after all hosts complete leaving	1 to 86400 s (24 hours)
	Group Interval	Operation interval of each sequence	0.1 to 7200.0 s (2 hours) (100 ms units)
Increase/Decrease Channel	JOIN Interval	Channel increasing interval	1 to 7200 s (2 hours)
	JOIN Wait	Time until leaving starts, after all channels complete joining	1 to 86400 s (24 hours)
	LEAVE Interval	Channel decreasing interval	1 to 7200 s (2 hours)
	LEAVE Wait	Time until joining starts, after all channels complete leaving	1 to 86400 s (24 hours)
	Host Interval	Operation interval of each sequence	0.1 to 7200.0 s (2 hours) (100 ms units)
Change Channels	Channel Interval	Channel change interval	1 to 7200 s (2 hours)
	Host Interval	Operation interval of each sequence	0.1 to 7200.0 s (2 hours) (100 ms units)

When interval settings are finished, click the [Next] button to proceed.

Step 3: Setting virtual host and channel

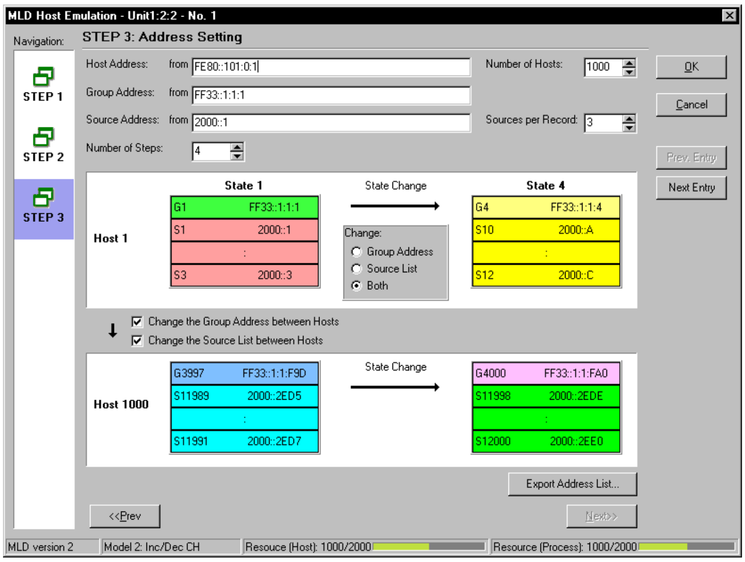


Figure 5.7.17-4 Virtual host and channel setting screen

In Step 3, set virtual hosts and channels. In "Setting virtual host," set the number of virtual hosts and their address values. In "Setting channel," set the number of channels for each virtual host to join/leave/change (combination of group and source) and their address values.

Setting virtual host

Set the number of virtual hosts and their addresses.

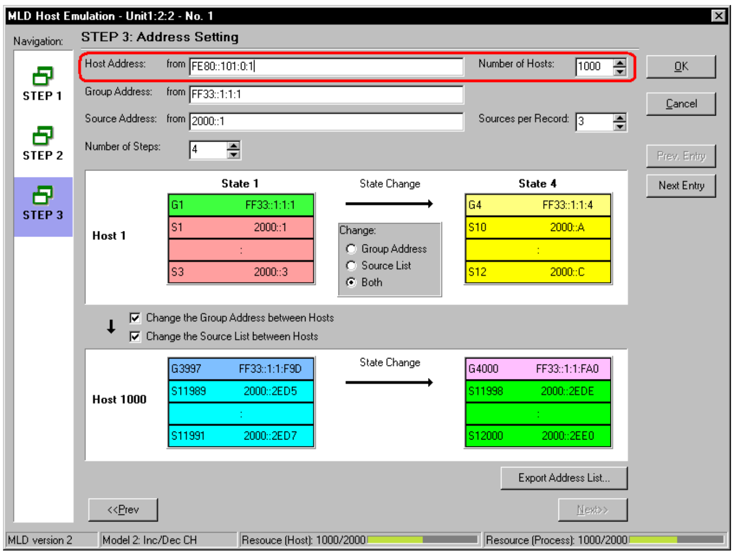


Figure 5.7.17-5 Virtual host setting screen

Item	Description
Number of Host	Set the number of virtual hosts (1 to 2000*).
Host Address	Set the virtual host address. When a value larger than 1 is set in Number of Hosts (when multiple virtual hosts are set), the set address here becomes the initial value and the virtual host addresses are set by incrementing it. * The address set here becomes the source address of report messages transmitted by the MLDv2 function. According to RFC3810, the transmission source address of report messages must be set to link local address (FE80::/10).

Setting channel

Set the number of channels (combination of group and source) to which the virtual host joins and their addresses. The setting contents vary depending on the operation model.

a) Increment

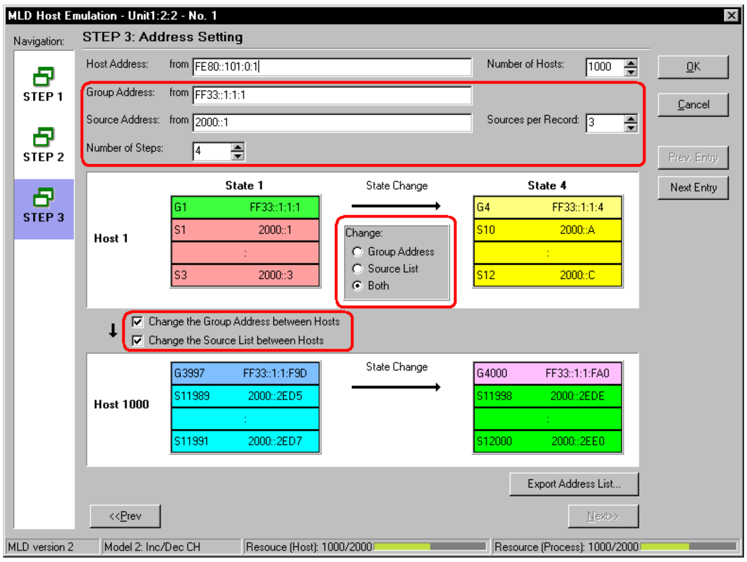


Figure 5.7.17-6 Channel setting screen

1. Set the number of groups to which a virtual host joins.

Operation model	Description
Increase/Decrease Host	Set the number of groups to which a virtual host joins, in Number of Group (1 to 2000*).
Increase/Decrease Channel Change Channels	Set Number of Step and Change. To set multiple groups, set a value larger than 1 in Number of Step (1 to 256) and set Change to Group Address (or Both).

*: The maximum value is limited by other settings. Refer to “Setting precautions” described below.

2. Set whether to specify a different source address for each group only if a value larger than 1 is set in Number of Group in 1.

Operation model	Description
Increase/Decrease Host	Select Use the Common Source List or Change the Source List between Groups. To specify a different source address for each group, select Change the Source List between Groups. To use the same source address for all groups, select Use the Common Source List.
Increase/Decrease Channel Change Channels	Specify in Change. To specify a different source address for each group, select Both in Change. To use the same source address for all groups, select Group Address.

3. Set the number of source addresses to be specified for a group address.

Operation model	Description
Increase/Decrease Host Increase/Decrease Channel Change Channels	Set in Sources per Record (1 to 64). Set the number of source addresses to be specified for a group.

4. Source address can be specified to be increased/decreased/changed gradually if 1 is set as the number of groups to which a virtual host joins.

Operation model	Description
Increase/Decrease Host	Cannot be set in this operation model.
Increase/Decrease Channel Change Channels	Set a value larger than 1 in Number of Step (1 to 256), and select Source List in Change.

5. Specify as follows only if a value larger than 1 is set in “Setting virtual host”.

   Set whether the virtual hosts join different groups.

Operation model	Description
Increase/Decrease Host	Cannot be set in this operation model. All virtual hosts join the same group.
Increase/Decrease Channel Change Channels	When the virtual hosts join different groups, select Change the Group Address between Hosts. Deselect it when all virtual hosts join the same group.

   Set whether to set a different source address for each virtual host.

Operation model	Description
Increase/Decrease Host	Cannot be set in this operation model. A different source address is set for each virtual host.
Increase/Decrease Channel Change Channels	To set a different source address for each virtual host, select Change the Source List between Hosts. Deselect it when the same address is set for all virtual hosts.

What address channels would be created as a result of the settings can be seen in the setting screen diagram. If the operation model is Increase/Decrease Channel or Change Channels, click **Export Address List...** to output a detailed address list to be output as a result to a text file.

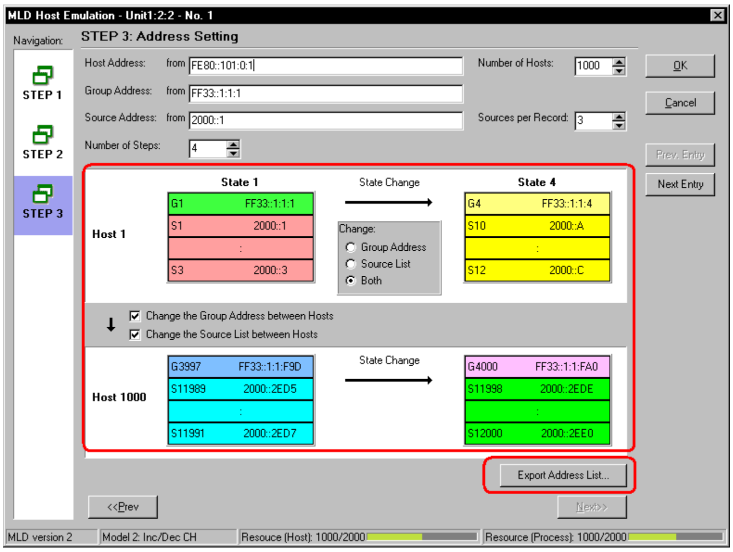


Figure 5.7.17-7 Setting operation diagram screen

b) List

This additional function is available only when Emulation Model is set to Change Channels. In this mode, setting item Channels (change channel setting method) is added in Address Setting.

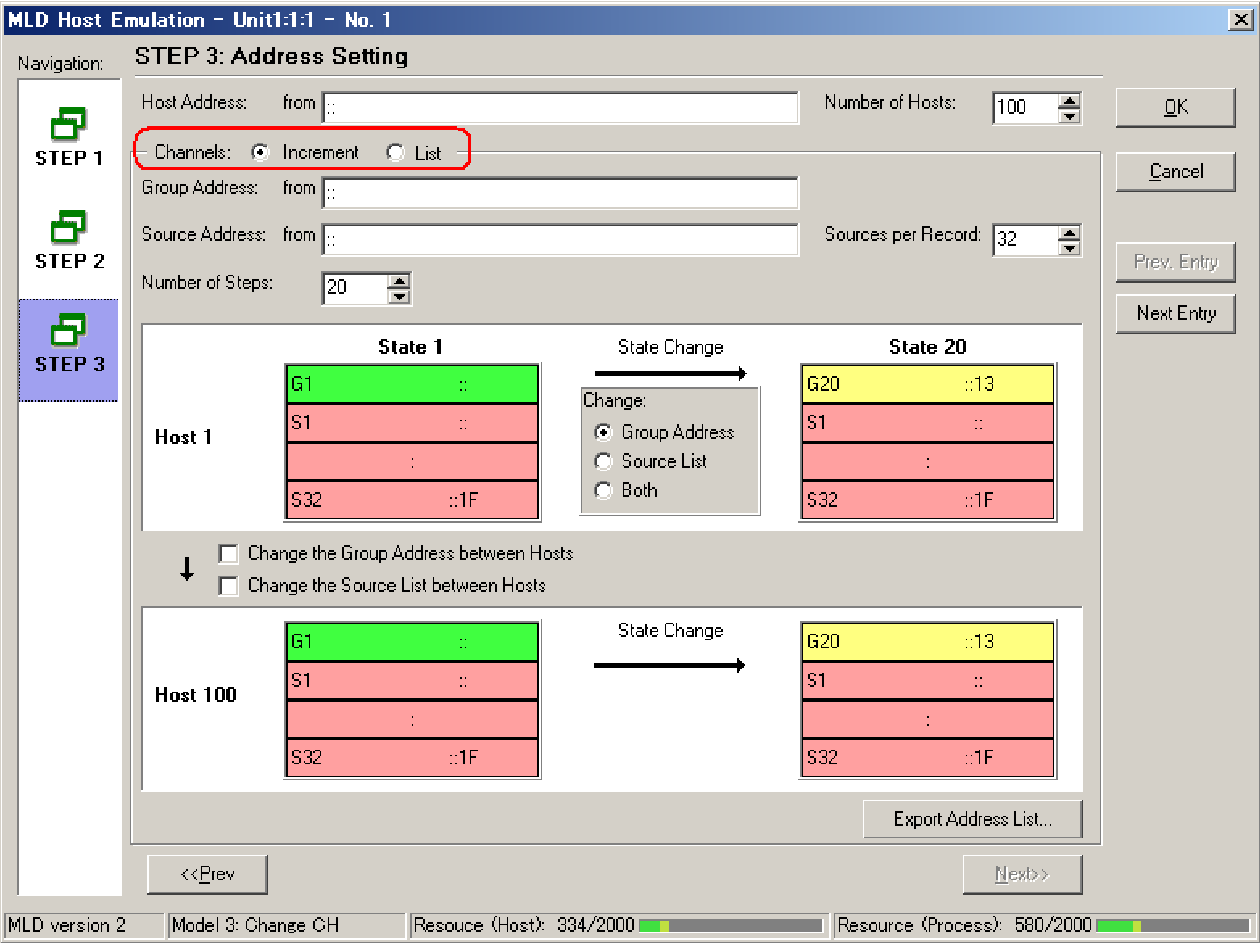


Figure 5.7.17-8 Addition of Channels setting

In this setting item, select "Increment" to perform conventional settings with the initial address and the number of hosts. Select "List" to perform settings in a list of group address and source address. The virtual host changes channels according to the list. In this case, the following setting items are disabled:

- Group Address
- Source Address
- Source per Record
- Number of Step
- Change (Group Address/Source List/Both)
- Change the Group Address between Hosts (On/Off)
- Change the Source List between Hosts (On/Off)

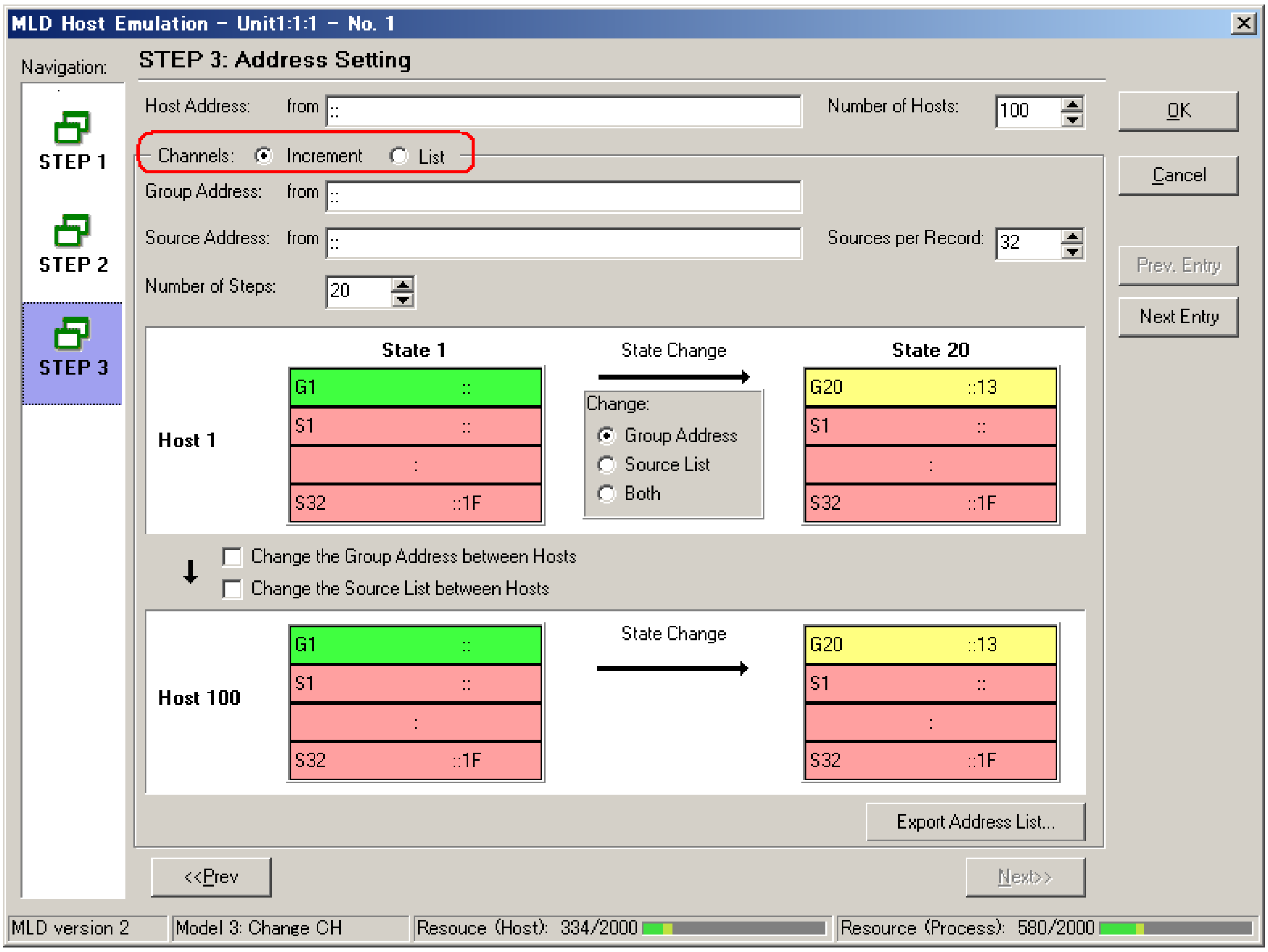


Figure 5.7.17-9 Channels: List setting

The address list is set by importing a CSV file. The CSV file format that can be loaded is shown below:

```
# A line starting with # is a comment.
<GroupAddress>,<SourceAddress>[,<SourceAddress>
<GroupAddress>,<SourceAddress>[,<SourceAddress>]..
<GroupAddress>,<SourceAddress>[,<SourceAddress>]..
```

A line in the CSV file corresponds to a channel, including a group address (<GroupAddress>) and one or more source addresses (<SourceAddress>).

Restrictions:

- The number of <SourceAddress> must be the same in all lines.
- The sum of the numbers of <GroupAddress> and <SourceAddress> in a CSV file is 60, max.

A sample CSV file is shown below:

```
# Group, Source1, Source2, ...
FF33::1:1:1, 2000::1, 2000::2, 2000::3
FF33::1:1:2, 2000::4, 2000::5, 2000::6
FF33::1:1:3, 2000::7, 2000::8, 2000::9
FF33::1:1:4, 2000::A, 2000::B, 2000::C
```

Channel changes are performed in order, starting from the top line of the address list. When multiple virtual hosts exist, whether to use the same address list for all virtual hosts or to use a different address list for each virtual host can be selected. This setting is performed by using the [Change Channels between Hosts] switch.

When this setting is disabled, the same channel change operation is performed for all virtual hosts (the number of channel changes is equal to the number of lines in the list).

When this setting is enabled, each virtual host reports on different channels. The list is divided equally by the virtual hosts, resulting in <Number of lines in the list>/<Number of hosts>. The equally-divided change channel list is allocated for host 1, host 2, etc., starting from the top of the list.

To allow each host to change channels, at least 2 channels (number of lines in the list) are required per host. Note that the adjacent channels cannot be the same (cannot be changed to the same channel).

Ex.: When the number of address lists is 6 while the number of virtual hosts is 2, the list contents are divided among the two hosts, as shown below:

FF33::1:1:1, 2000::1, 2000::2, 2000::3 <- Host 1, step 1
FF33::1:1:2, 2000::4, 2000::5, 2000::6 <- Host 1, step 2
FF33::1:1:2, 2000::4, 2000::5, 2000::6 <- Host 1, step 3
FF33::1:1:3, 2000::7, 2000::8, 2000::9 <- Host 2, step 1
FF33::1:1:4, 2000::A, 2000::B, 2000::C <- Host 2, step 2
FF33::1:1:2, 2000::4, 2000::5, 2000::6 <- Host 2, step 3

This completes the settings for one entry. Perform settings for entry 2 to 4, if necessary. Move to setting for other entry by clicking the **Next Entry** and **Prev Entry** buttons.

Setting precautions

When configuring the settings with IGMPv2/MLDv1 only, the maximum number of settable hosts and operation sequences is 2,000 for all modules.

When configuring the settings with IGMPv3/MLDv2 only, the maximum number of settable hosts and operation sequences is 200 for all modules.

The current set amount is shown in the lower right of the setting screen. The yellow part indicates the number of entries currently being set. The green part indicates the set number for other entries.

When IGMPv2/MLDv1 and IGMPv3/MLDv2 are used in combination, check the number of settable hosts and operation sequences on this screen.

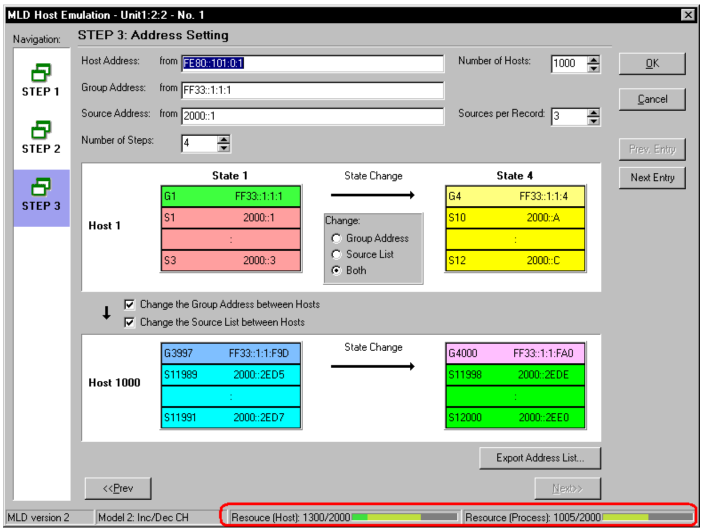


Figure 5.7.17-10 Setting amount display screen

Executing MLDv2 function

Check that the setting entries to be used for operation are selected, then click the start button to start the MLDv2 protocol simulation operation.

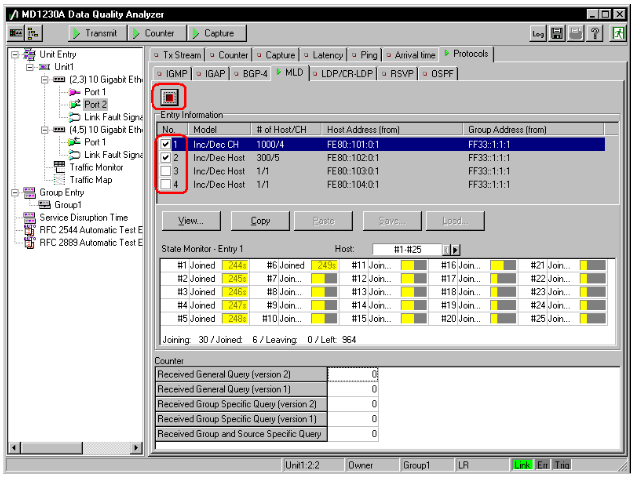


Figure 5.7.17-11 MLDv2 execution screen

When MLDv2 function starts, the operation status is displayed in the lower area of the **MLD** tab.

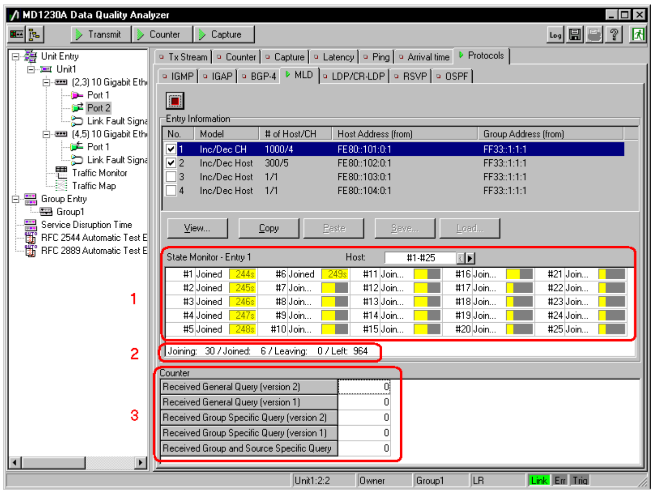


Figure 5.7.17-12 MLDv2 execution screen

In State Monitor field, the operation status and statistical information for each virtual host(*) of the entry selected in the setting table are displayed (1, in the above figure). Moreover, the total number of virtual hosts in each status is displayed (2 in the above figure). Display contents vary depending on the operation model.

*: When the operation model is Increase/Decrease Host, information for each group, instead of host, is displayed.

In the Counter field, the number of queries that the MLDv2 function has received is shown (3, in the above figure).

Stopping MLDv2 function

Click the stop button (the button clicked to start operation) to stop the function.

5.7.18 Ethernet OAM Protocol Emulation Function

The Ethernet OAM protocol emulation function enables periodic transmission of CCM and automatic response when LBM/LTM is received.

*: ITU-T standard (ITU-T Y.1731 (05/2006)) and IEEE standard (IEEE P802.1ag/D8.1) can be selected for behavior and displaying of terms.

Notes:

1. This function requires the Ethernet OAM option.
2. On the port using this function, Enabled on the **Ethernet OAM** tab must be turned On.

☞ See Section 4.5.6 "(4) Ethernet OAM" for the details on port setting.

This function can be used to:

(1) CCM periodic transmission
CCM is periodically transmitted to artificially maintain the Ethernet OAM link. It is used when you need to flow traffic with the Ethernet OAM link maintained. You can also add RDI during CCM transmission.

The following settings are used as the content of periodically transmitted CCM:

- MAC Address
- This Port VLAN
- MEG Level
- MEP ID
- MEG ID
- **CCM TLVs...**
- CCM Period

☞ See Section 4.5.6 "(4) Ethernet OAM" for details of each setting.

Figure 5.7.18-1 shows the CCM transmission start and end timing.

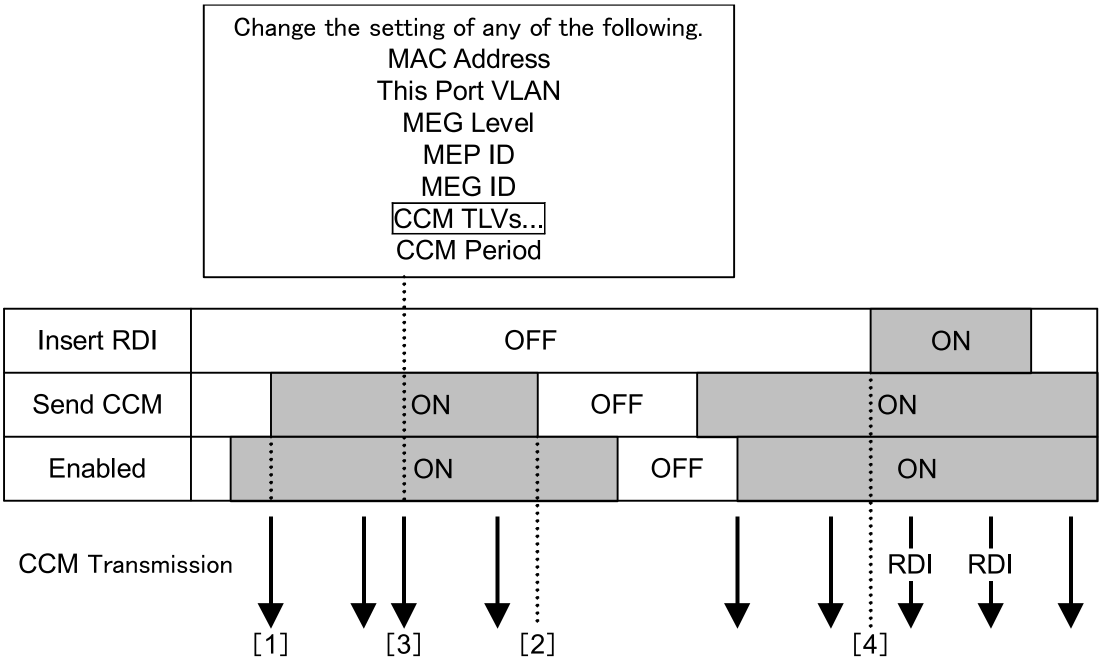


Figure 5.7.18-1 CCM Transmission start and end timing

[1] CCM is transmitted when Enabled and Send CCM are On and then transmitted periodically at the specified Period.

[2] Transmission of CCM stops when Enable or Send CCM is turned Off.

[3] Transmission is restarted if the CCM transmission content is changed while Send CCM is On (transmitting). The settings for this case includes Send CCM On/Off and CCM Period.

[4] The CCM periodic transmission timing can not be restarted with the turning On/Off of the Insert RDI checkbox.

Restrictions

- The destination MAC address of the transmitted CCM is Multicast address.
  The Sequence Number and counter fields are 0.
- This function periodically transmits 1 second or longer CCM. The template function of Tx Stream is used for periodic transmission of CCM less than 1 second, verification of error processing, and load providing usage.

☞ See Section 5.1.2 "(34) Editing Ethernet OAM PDU" for details on Tx Stream.

(2) LBM/LTM response

Responds to LBM/LTM with less than the specified number of VLAN tags.

(a) LBR is transmitted when the received LBM satisfies the following conditions:

1. MAC DA is "Unicast" and "To local port" or is multicast Address *01-80-C2-00-00-3x (x 0 to 7).
2. MAC SA is not a multicast address.

(b) LTR is transmitted when the received LTM satisfies the following conditions:

1. MAC DA is multicast Address *01-80-C2-00-00-3x (x 8 to F).
2. MAC SA is not a multicast address.
3. TTL field of LTM is not 0 (1 or greater).
4. Target MAC address of LTM is "To local port".

The following settings are used with the LBM/LTM response function:

- This Port VLAN
- Reply to This Port LBM
- Reply to This Port LTM
- **LTR TLVs...**

☞ See Section 4.5.6 "(4) Ethernet OAM" for the details on port setting.

☞ See Section 5.7.2 "(5) (C) Ethernet OAM" for operation concerning VLAN.

Restrictions

- The MEG Level is not checked.

(3) LOC/AIS/RDI alarm counter

LOC detection condition*

LOC is detected when all of the following are satisfied:

- Opecode=1 (CCM)
- MEP ID of received frame matches the DUT MEP ID of Port Setting, and does not receive the target frame within Period value of the last received frame x 3.5.

LOC release condition*

LOC is released after Period value x 3.5 when all of the following are satisfied: If the Period value is changed, the count is started fresh from that point with the new Period value.

- LOC status
- Opecode=1 (CCM)
- MEP ID of received frame matches the DUT MEP ID of Port Setting and at least three target frames are received within Period value of the first received frame x 3.5.

*: The initial value of Period is 1 s. In this case, if the target frame is not received after power on, LOC alarm is issued after 3.5s.

AIS detection condition

AIS is detected when Ethernet OAM frame matching Opecode=33 (d) (AIS) is received.

AIS Release condition

When in AIS state, AIS is released after Period x 3.5 if no AIS is received within AIS frame Period x 3.5. AIS is also released when LOC is released.

RDI detection condition

RDI is detected when all of the following are satisfied:

- Opecode=1 (CCM)
- MEP ID matches DUT MEP ID of Port Setting and Ethernet OAM CCM frame with RDI=1 is received.

RDI release condition

RDI is released when all of the following are satisfied:

- Opecode=1 (CCM)
- MEP ID matches DUT MEP ID of Port Setting and Ethernet OAM CCM frame with RDI=0 is received.

LOC, AIS, RDI counter (resolution?)

Alarm detection state is counted rounded up to 0.1 ms.

☞ See Appendix "F Counter Item List" for the counter items.

Restrictions

- The MEG Level is not checked.

5.8 Viewing Traffic Status

This function cannot be used with version 9.0 and later.

5.9 Setting Filter and Trigger Patterns

The MD1230B allows you to set filters to the counter, the capture filter, and the capture trigger. These settings are used to perform the filtering according to the 5 parameters and the individual filter setting to use information that matches those parameters.

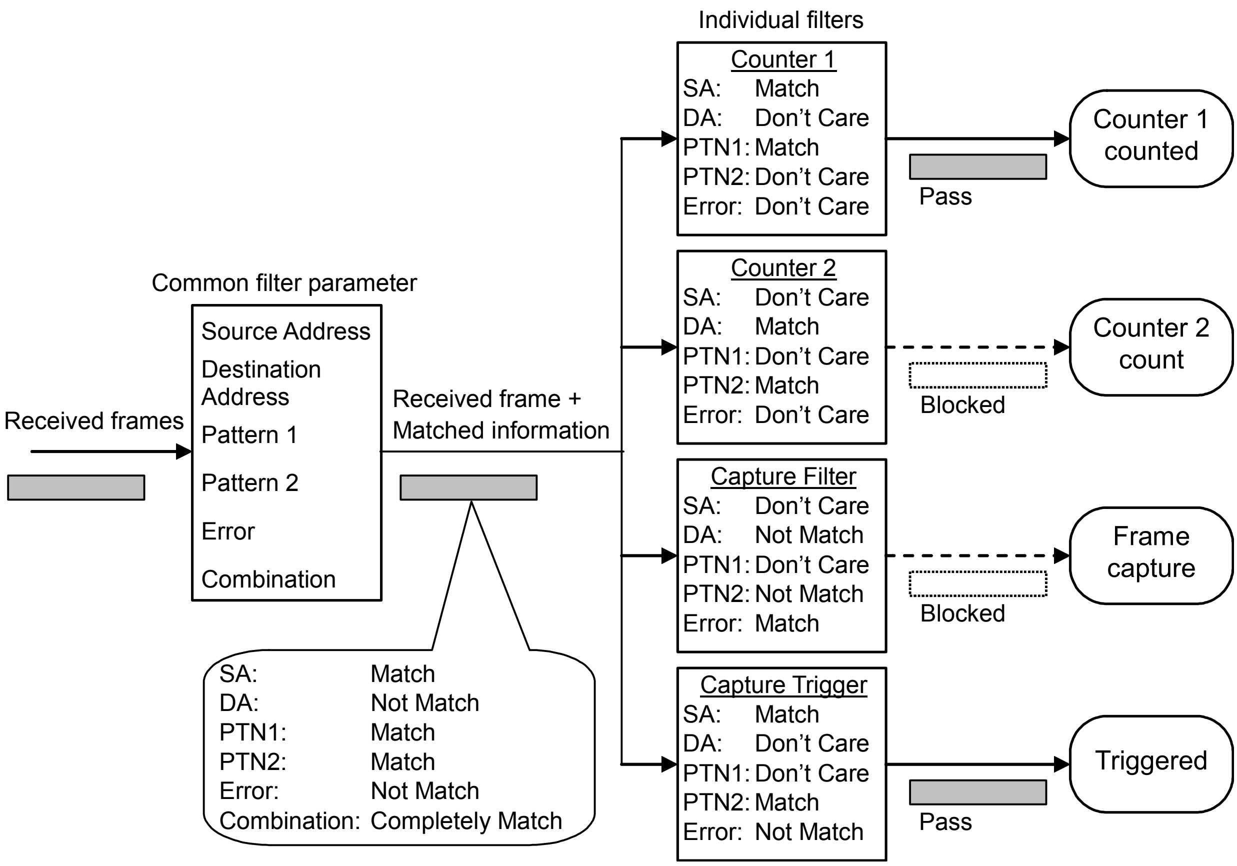


Figure 5.9-1 Filter/Trigger setting conceptual diagram

5.9.1 Setting counter filter

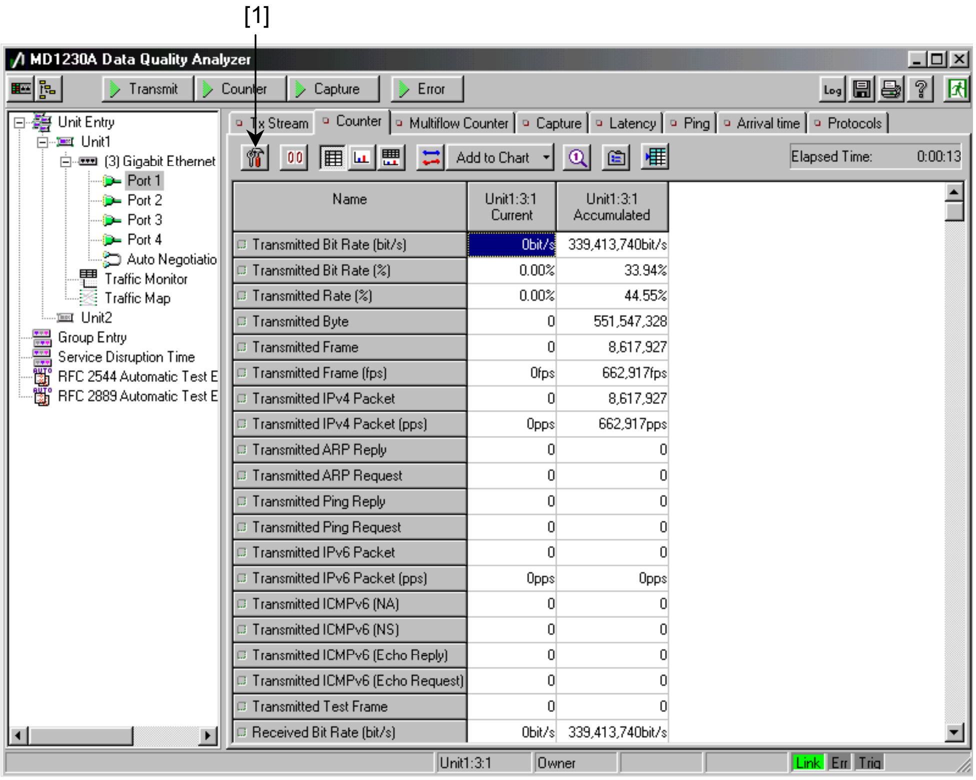


Figure 5.9.1-1 Counter screen

[1] Displays the following screen.

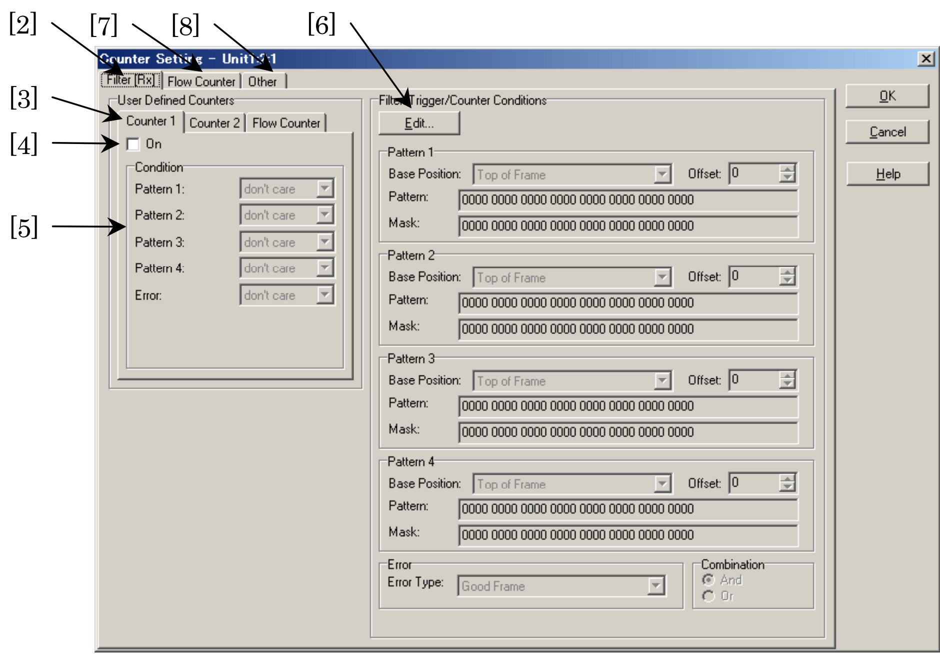


Figure 5.9.1-2 Counter filter setting screen

[2] Switches to receive data filter setting screen.

[3] Switches the 2 kinds.

[4] Switches the filter between enabled/disabled.

[5] Selects the agreement condition of each parameter between matched (Match), unmatched (Not match), and ignored (don't care).

[6] Sets the filter/trigger pattern.

For the details, refer to Section 5.9.3 "Setting filter and trigger patterns"

[7] Displays Flow ID setting screen (MU120131A/32A/38A only).

For details of the setting, refer to Section 5.3.3.1 (2) "Setting Flow ID".

[8] Displays screen for other settings.

[9]

[10]

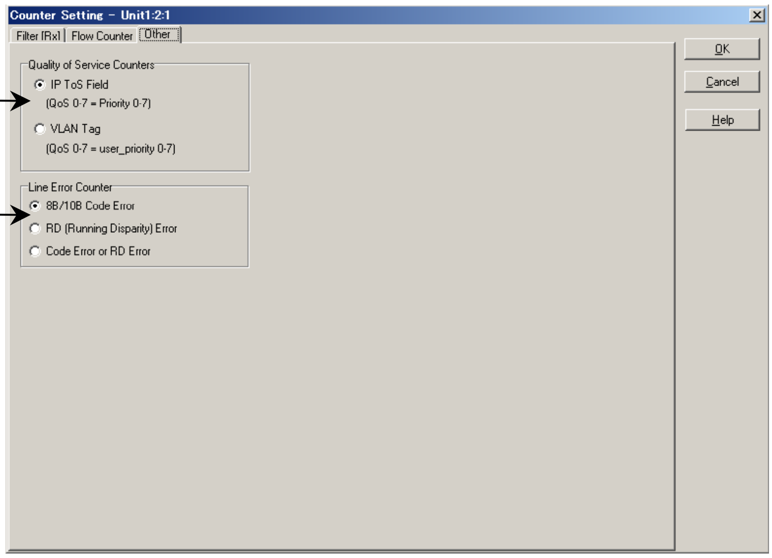


Figure 5.9.1-3 Counter Setting Screen

[9] Selects QoS counter 0 to 7 filter from IP (ToS) and VLAN TAG.

[10] Selects Line Error counter conditions from following (only SFP port of MU120112A/32A and MU120122A).

8B/10B Code Error	When 8B/10B conversion failed (no Rx data in 8B/10B conversion table)
RD (Running Disparity) Error	When error at RD inversion operation
Code Error or RD Error	When either 8B/10B Code Error or RD occurred

Refer to Section 5.10 "Adding Error" for the Line Error insertion method.

5.9.2 Setting capture filter and capture trigger

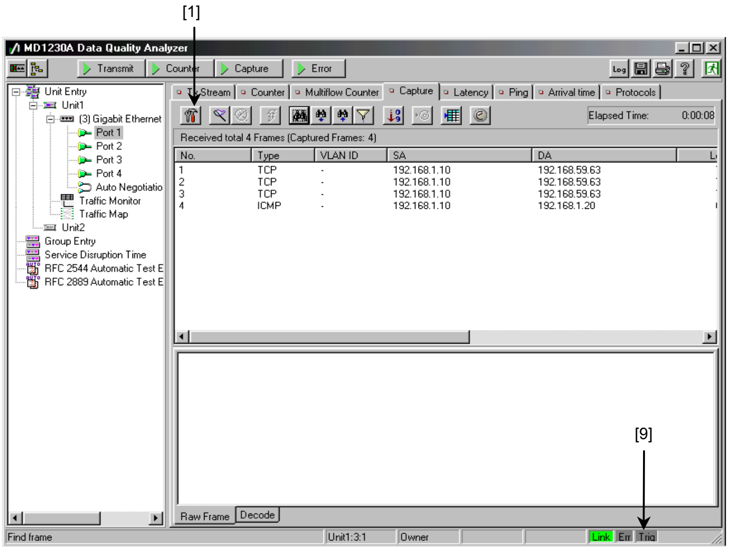


Figure 5.9.2-1 Capture screen

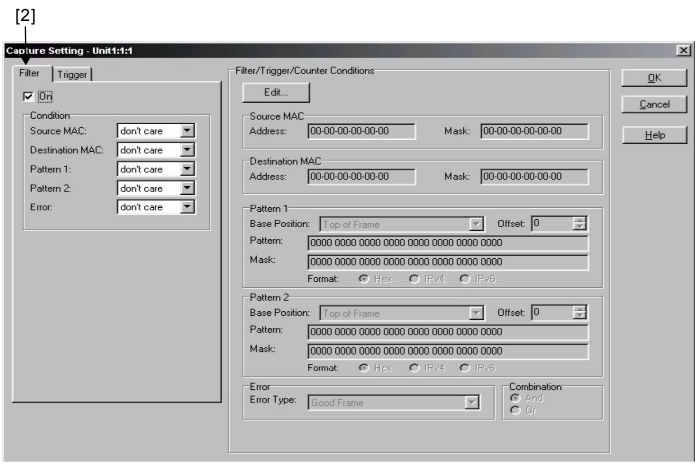


Figure 5.9.2-2 Capture filter setting screen

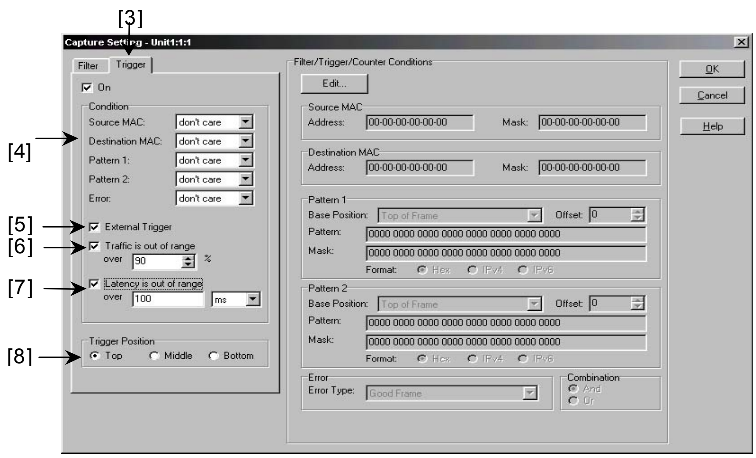


Figure 5.9.2-3 Capture trigger setting screen

[1] Displays capture filter and capture trigger setting screen.

[2] Displays the capture filter setting.

[3] Displays the capture trigger setting.

[4] Selects the agreement condition of each parameter from matched (Match), unmatched (Not match), and ignored (don't care).

[5] Enables the external trigger signal.

[6] Generates the trigger signal according to the data quantity that flows in traffic.

[7] When the Latency measurement value at the Test Frame receipt exceeds the set value, generates a trigger signal.

Note:

Except Multiflow Counter of the MU120131A/32A/38A.

[8] Specifies position of trigger frame in capture buffer.

(a) Top
Preferentially captures a triggered frame and the frames following it. When the buffer has become full, packets preceding the triggered frame are preferentially discarded. If capturing continues for a sufficiently long time after triggering has occurred, the first frame is a packet that is triggered.

(b) Middle
Preferentially captures frames before and after, and in the neighborhood of a triggered frame.

(c) Bottom
Preferentially captures the triggered frame and the preceding frames.

[9] Lights yellow when trigger frame received (not lit when trigger generated)

Note:

1. When a frame that does not match the capture filter conditions and is longer than the following frame length, data amount that can be captured becomes smaller than the capacity of the internal memory.

MU120101A/111A	1000 bytes
MU120102A	920 bytes
MU120112A/121A/122A	1948 bytes
MU120118A/B/C	3328 bytes
MU120103A/104A/105A/106A/103B/104B	1266 bytes

MU120119A/120A	400 bytes
MU120131A/132A	8064 bytes
MU120138A	10000 bytes

2. The capture conditions vary with the Ethernet module and EoS/POS module when setting and capturing a capture filter and capture trigger.

Ethernet module	Captures all triggered frames
EoS/POS module	Captures triggered frames and frames passing thru filter

3. When using the Through mode with the MU120131A/32A/38A, a trigger generated at one port side is also generated at the other port. With other modules, a trigger generated at one port side is not generated at the other port.

5.9.3 Setting filter and trigger patterns

The filter and trigger pattern settings are shared by the capture function and user-defined counters. The setting contents are different according to the module type.

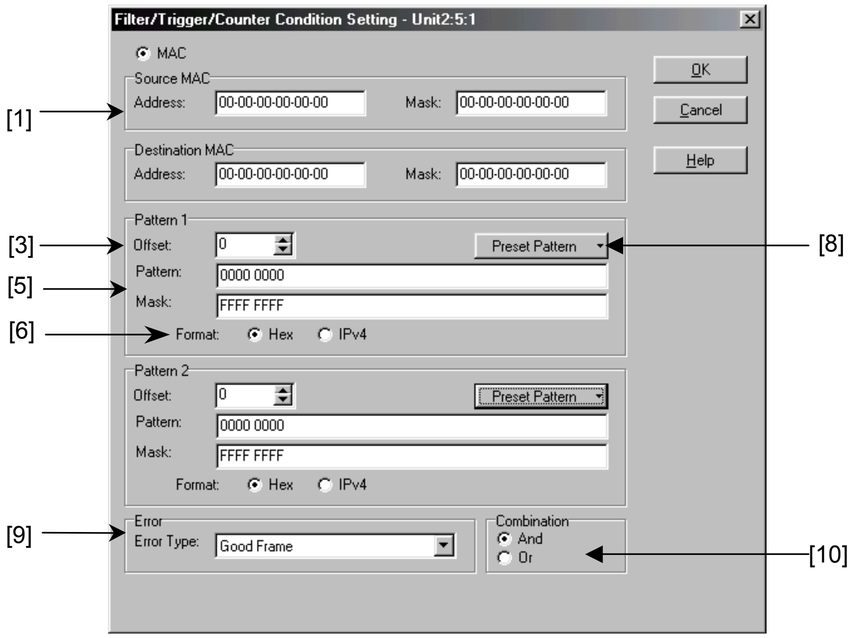


Figure 5.9.3-1 Filter/trigger/counter common setting screen (MU120101A/02A)

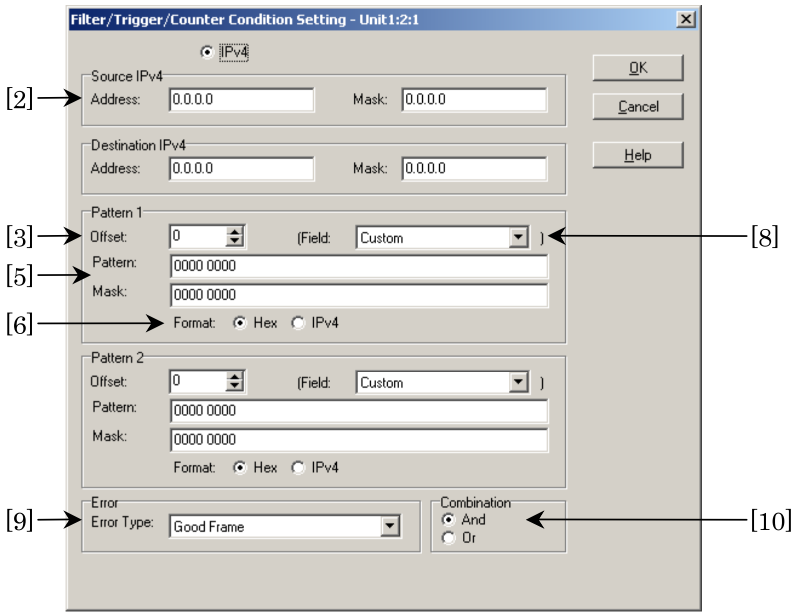


Figure 5.9.3-2 Filter/trigger/counter common setting screen (PPP/Cisco HDLC/MAPOS Mapping MU120103A/04A/05A/06A/19A/20A and MU120103B/04B/MU150101A)

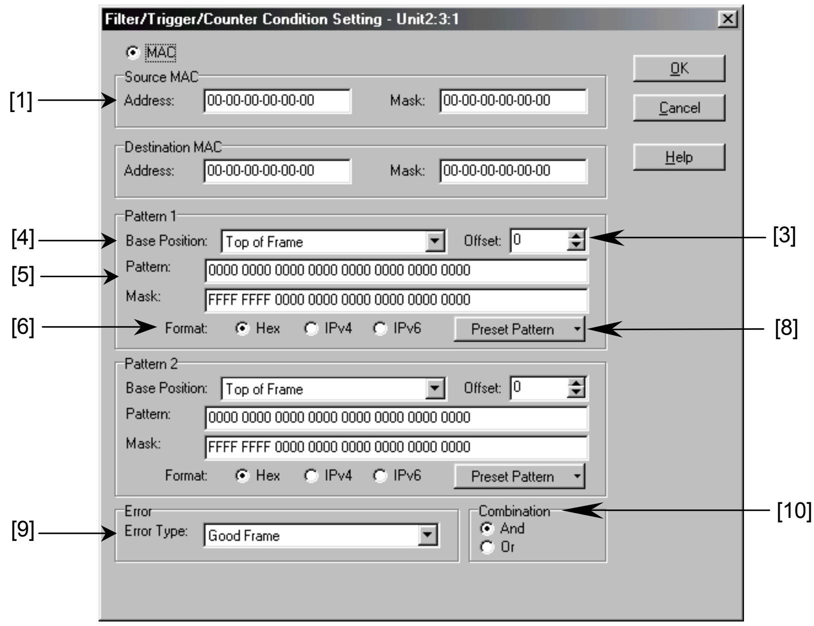


Figure 5.9.3-3 Filter/trigger/counter common setting screen (GFP, LEX, LAPS Mapping at MU120111A/12A/18A/18B/18C, and MU120103B/04B/MU150101A)

* [Preset Pattern] setting is only supported by the MU120111A/12A/18A/18B/18C.

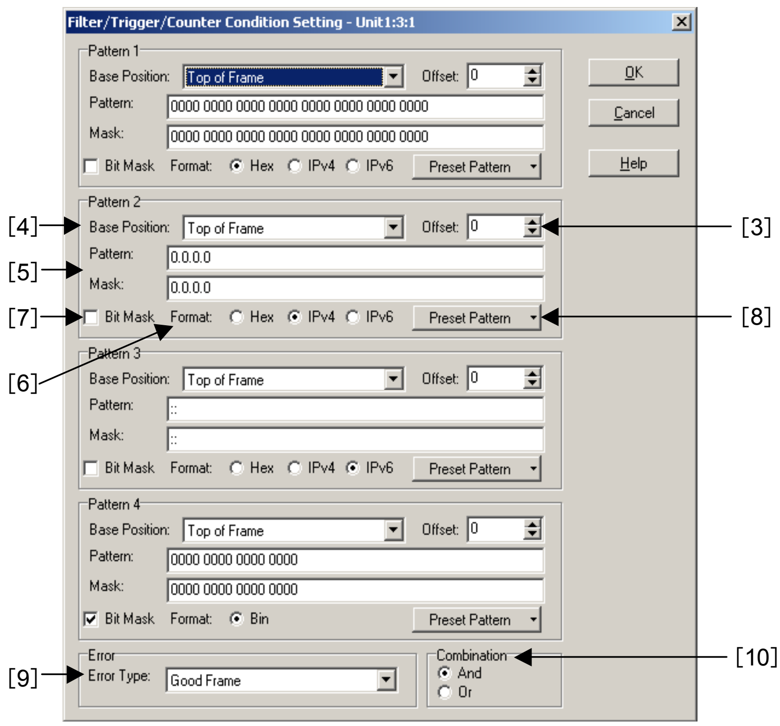


Figure 5.9.3-4 Filter/trigger/counter common setting screen (MU120121A/22A/31A/32A/38A)

[1] Source MAC, Destination MAC

Sets the judgment conditions based on the Source MAC address.

Address: 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF
Mask: 00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF

Bits that are 1 in the 48-bit Mask are handled as Don't Care.

[2] Source IPv4, Destination IPv4

Sets the judgment conditions based on the Source IP address.

Address :0.0.0.0 to 255.255.255.255
Mask :0.0.0.0 to 255.255.255.255

Bits that are 1 in the 32-bit Mask are handled as Don't Care.

[3] Offset

Sets header position of field used at evaluation (0 to 65,535 byte)

[4] Base Position

Sets header position of field used at evaluation. The Offset (byte) from the Base Position is the start position.

Base Position: Select one of the following.

- Top of Preamble *5
- Top of Frame
- Top of Ethernet Frame *4
- Top of VLAN Tag 1 to 10 *1,2
- Top of Ethernet OAM PDU *6
- Top of IPv4 Header
- Top of IPv6 Header *3
- IPv6 Hop-by-hop Option Header *3
- IPv6 Destination Option Header *3
- IPv6 Routing Header *3
- IPv6 Fragment Header *3
- IPv6 Authentication Header *3
- IPv6 ESP Header *3
- Top of IP Payload
- Top of TCP Header *1
- Top of UDP Header *1
- Flow ID *7

*1: Can be selected with MU120121A/22A/31A/32A/38A

*2: When setting **VLAN** Tag at **Base Position**, set **TPID** at **VLAN** tab of Port Setting (refer to Section 4.5.6 (1)). VLAN Tag is detected according to this setting. The **Base Position** is at the top of the **TPID** field. Consequently, the VID field is after bit 20 from the Base Position.

*3: Requires IPv6 Expansion option

*4: Selection supported for GFP/LEX/LAPS Mapping at MU120103B/04B/MU150101A

*5: Selection supported when **Port Setting Preamble** On (refer to Section 4.5.3 (1)). This setting changes to **Top of Frame** when the **Preamble** checkbox is unchecked.

*6: Requires Ethernet OAM Expansion option

*7: Selection supported by MU120131A/32A/38A

[5] Pattern, Mask
Sets evaluation pattern. Bits in the Mask that are 1 are handled as Don’t Care.

Pattern: 0000 0000 0000 0000 0000 0000 0000 0000 to
FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
(hex)
0.0.0.0 to 255.255.255.255(IPv4)
::to ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff(IPv6)

Mask: 0000 0000 0000 0000 0000 0000 0000 0000 to
FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
(hex)
0.0.0.0 to 255.255.255.255(IPv4)
:: to ffff:ffff:ffff:ffff:ffff:ffff:ffff:ffff(IPv6)

Note:

Pattern and Mask are 32-bits long with the MU120101A/02A/03A/04A/05A/06A/19A/20A/03B/04B/MU150101A.

[6] Format
Select the Pattern and Mask field display format from the following.

Pattern:

- Hex 128 bit (hexadecimal input format)
- IPv4 IPv4 address format
- IPv6 IPv6 address format
- Bin 16 bit binary input format (displayed when Bit mask On)

In the IPv4 and IPv6 formats, the set value is justified to the beginning of 16 bytes. The remaining part is treated as Don’t Care and is not used for evaluation.

[7] Bit Mask
At On, the Mask (pattern valid range) can be set in bit units. However, the pattern length is restricted to 16 bits. At Off, the mask can be specified in byte units (00 or FF), but set pattern length is limited to 16 bytes max.

[8] Preset Pattern
Base Position, Offset, Pattern, and Mask can be set from the pre-registered list.

For details, refer to Section 5.9.4 “Setting User-Define Pattern using Preset Pattern”.

[9] Error
This set screen evaluation conditions based on the received frame error status.

- Good Frame*1
- FCS Error
- Undersize
- Fragment
- Oversize
- Oversize & FCS Error
- Dribble Bit Error*4
- Alignment Error*4
- IP Header Checksum Error
- TCP Checksum Error
- UDP Checksum Error
- Sequence Error*2
- PRBS Frame Error*2
- GFP FCS Error*3
- Uncorrectable cHEC Error*3
- Correctable cHEC Error*3
- Uncorrectable tHEC Error*3
- Correctable tHEC Error*3
- Correctable eHEC Error*3

*1: Good Frame indicates a frame without error in the data link layer (layer 2).

*2: This can only be set when the packet BER Measurement option is installed.

*3: This can only be set when **GFP** is selected at **Mapping** with the MU120103B/04B/MU150101A.

*4: This can be used with the MU120101A/11A/21A/22A (RJ-45/31A).

[10] Combination
Sets either the complete match (logical AND) or a partial match (logical OR) when multiple conditions are selected from [1] to [5]. Specifies conditions used at filter/trigger/counter common setting screen (Figures 5.9.3-3 and 5.9.3-4).

Note:

- The Base Position position cannot be changed with modules that do not support Base Position setting. For example, even when UDP it is specified at Field and Preset Pattern selection, the operation cannot be guaranteed when inputting frames with different header positions, such as VLAN Tag, MPLS, IP option, etc.
  The Base Position position can be changed with modules supporting Base Position setting. For example, even when UDP is specified at Preset Pattern selection, operation is guaranteed when inputting frames with different header positions, such as VLAN Tag, MPLS, IP option, etc.

- When the following frames received, that frame is not a target for pattern matching.

MU120118A/18B/18C/21A/22A/31A/32A/38A	When pattern set at Pattern and Mask (excluding mask field) seems likely to exceed FCS field. However, when 16-bit pattern scenes likely to exceed FCS field when Bit Mask selected
MU120111A	When less than 16 bytes from position specified at Base Position and Offset to frame end
MU120112A	When less than 22 bytes from position specified at Base Position and Offset to frame end
MU120101A/02A	When less than 8 bytes from position specified at Base Position and Offset to frame end

5.9.4 Setting user-defined pattern from preset pattern

When setting a user-defined pattern for the filter trigger pattern, it can be selected from a preset pattern. Click the [Preset Pattern] button to display the drop-down list of preset patterns.

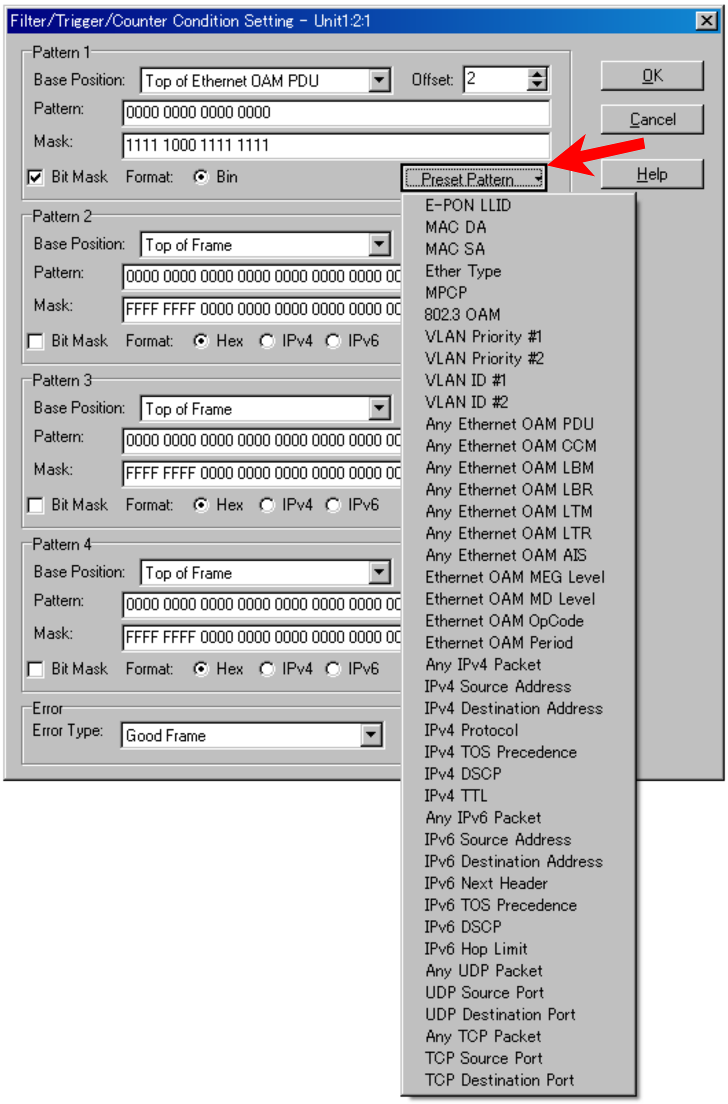


Figure 5.9.4-1 [Preset Pattern] button (Filter/trigger/counter common setting screen)

When a preset pattern is selected from the list, the corresponding parameters are set accordingly as shown in the table below. It can also be used by partially overwriting after setting.

Table 5.9.4-1 List of preset pattern settings

Preset Pattern (Note 1)	Base Position	Offset	Mask
E-PON LLID	Top of Preamble	5	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
MAC DA	Top of Frame	0	0000 0000 0000 FFFF FFFF FFFF FFFF FFFF
MAC SA	Top of Frame	6	0000 0000 0000 FFFF FFFF FFFF FFFF FFFF
Ether Type	Top of Frame	12	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
MPCP	Top of Frame	12	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
802.3 OAM	Top of Frame	12	0000 00FF FFFF FFFF FFFF FFFF FFFF FFFF
VLAN Priority #1	Top of VLAN Tag 1	2	0001 1111 1111 1111
VLAN Priority #2	Top of VLAN Tag 2	2	0001 1111 1111 1111
VLAN ID #1	Top of VLAN Tag 1	2	1111 0000 0000 0000
VLAN ID #2	Top of VLAN Tag 2	2	1111 0000 0000 0000
Any Ethernet OAM PDU	Top of Ethernet OAM PDU	1	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM CCM	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM LBM	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM LBR	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM LTM	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM LTR	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any Ethernet OAM AIS	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Ethernet OAM MEG Level	Top of Ethernet OAM PDU	0	0001 1111 1111 1111
Ethernet OAM MD Level	Top of Ethernet OAM PDU	0	0001 1111 1111 1111
Ethernet OAM OpCode	Top of Ethernet OAM PDU	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Ethernet OAM Period	Top of Ethernet OAM PDU	2	1111 1000 1111 1111

5

Basic Measurement (Manual Test)

Table 5.9.4-1 List of preset pattern settings(Continued)

Preset Pattern (Note 1)	Base Position	Offset	Mask
Any IPv4 Packet	Top of IPv4 Header	0	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
IPv4 Source Address	Top of IPv4 Header	12	0000 0000 FFFF FFFF FFFF FFFF FFFF FFFF
IPv4 Destination Address	Top of IPv4 Header	16	0000 0000 FFFF FFFF FFFF FFFF FFFF FFFF
IPv4 Protocol	Top of IPv4 Header	9	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
IPv4 TOS Precedence	Top of IPv4 Header	1	0001 1111 1111 1111
IPv4 DSCP	Top of IPv4 Header	1	0000 0011 1111 1111
IPv4 TOS/DS	Top of IPv4 Header	1	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
IPv4 TTL	Top of IPv4 Header	8	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any IPv6 Packet	Top of IPv6 Header	0	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
IPv6 Source Address	Top of IPv6 Header	8	0000 0000 0000 0000 0000 0000 0000 0000
IPv6 Destination Address	Top of IPv6 Header	24	0000 0000 0000 0000 0000 0000 0000 0000
IPv6 Next Header	Top of IPv6 Header	6	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
IPv6 TOS Precedence	Top of IPv6 Header	0	1111 0001 1111 1111
IPv6 DSCP	Top of IPv6 Header	0	1111 0000 0011 1111
IPv6 Hop Limit	Top of IPv6 Header	7	00FF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any UDP Packet	Top of UDP Header (Note 1)	0	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
UDP Source Port	Top of UDP Header (Note 1)	0	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
UDP Destination Port	Top of UDP Header (Note 1)	2	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Any TCP Packet	Top of TCP Header (Note 1)	0	FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
TCP Source Port	Top of TCP Header (Note 1)	0	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF
TCP Destination Port	Top of TCP Header (Note 1)	2	0000 FFFF FFFF FFFF FFFF FFFF FFFF FFFF

Notes:

1. For modules and settings where the base position shown in Table 5.9.4-1 do not exist, the Preset Pattern item is not displayed. For modules in which Top of UDP/TCP Header cannot be selected for Base Position, however, Top of IP Payload is set instead.

Refer to “[7] Pattern specification 1” in Section 5.9.3 for details.

2. The length of the user-defined pattern that the module can support may be exceeded depending on the selected pattern. In this event, the upper bits are set for the user-defined pattern. When IPv6 Source Address is selected as a preset pattern for the MU120103B/04B and MU150101A modules, for example, the upper 32 bits of IPv6 Source Address are set for the user-defined pattern of the MU120103B/04B and MU150101A. To set the lower 32 bits of IPv6 Source Address, add 12 bytes to the offset.

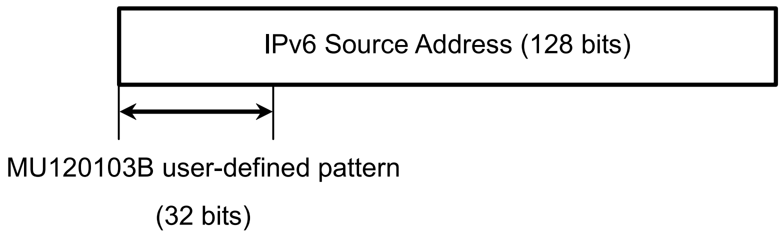


Figure 5.9.4-2 When IPv6 Source Address is selected as preset pattern for MU120103B/04B and MU150101A

3. For modules that do not have Base Position, the Offset value is corrected instead. It is corrected to the length obtained on the assumption that the header is an IPv4 packet, the shortest length. The Offset value must be corrected again if this assumption cannot be applied. For example, when a preset patter related to the IPv4 header is applied to the frame with the first-stage VLAN tag, the VLAN header length “4” must be added to the Offset value that has been set automatically.
   The table below shows the relationships between the Base Positions and the Offset correction values.

Table 5.9.4-2 Offset correction values for module that do not have Base Position

Base Position	Offset Correction Value
Top of Frame	0
Top of VLAN Tag 1	+12
Top of VLAN Tag 2	+16
…	…
Top of VLAN Tag 10	+48
Top of Ethernet OAM PDU	+14
Top of IPv4 Header	+14
Top of IPv6 Header	+14
IPv6 Hop-by-hop Option Header	+14
IPv6 Destination Option Header	+14
IPv6 Routing Header	+14
IPv6 Fragment Header	+14
IPv6 Authentication Header	+14
IPv6 ESP Header	+14
Top of IP Payload	+34
Top of TCP Header	+34
Top of UDP Header	+34

5.10 Adding Error

An error can be added to an output signal.

Errors can also be added using the Traffic Impairment Emulator (refer to section 6.6).

5.10.1 When Mapping is set to Framed

A Line Error can be inserted into the output signal at the MU120132A/38A and the SFP port of MU120122A. When the **Error** button displayed on the upper of the screen (see the figure below) is clicked when the selected port satisfies the conditions, a line error is output.

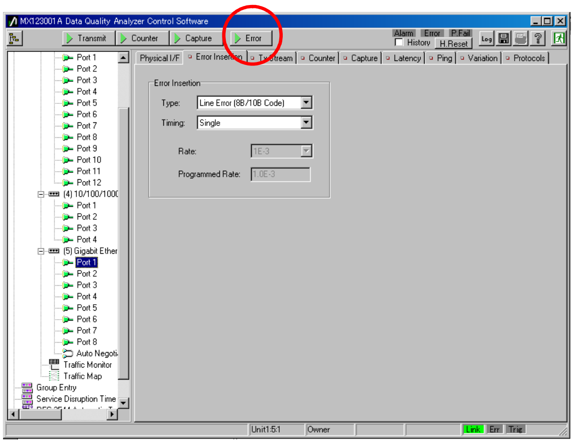


Figure 5.10.1-1 Error Insertion Screen

The types of inserted Line Error differ according to the module as shown below. Line Error-related settings are performed at the **Error Insertion** sheet for the MU120132A/38A or at the **Line Error Counter** setting of the **Counter Setting** screen for the SFP port of the MU120122A. Refer to Section 5.9.1.

Table 5.10-1 Types of Inserted Line Error

Module	Line Error Item	Description
MU120122A (SFP)	8B/10B Code Error	An 8B/10B code error is inserted.*1
MU120132A	RD(Running Disparity) Error	An RD error is inserted.*2 * When this product receives this error, the Line Error counter is incremented by 2.
	Code Error or RD Error	A code error is inserted and then an RD error is inserted. *1, *2
MU120138A	Line Error (XGMII)	An error code (TXC=1, TXD=FE(hex)) is inserted at the Tx XGMII interface. * When this product receives this error, the Line Error counter is incremented by 8*3

*1: The following describes the 8B/10B code error insertion method. When a code error is inserted, the code following the 10B conversion is replaced to another code that is not written in the 8B/10B conversion table. If the RD of the previous code is "–", the code to be output is replaced to (abcdei fghj) = (001111 0001) (bin). If the RD of the previous code is "+", the code to be output is replaced to (abcdei fghj) = (110000 1110) (bin). Note that the RD is not inverted in either case.

Notes:

1. The code that indicates the start of a frame (/S/) and/or the code that indicates the end of a frame (/T/, /R/) may be replaced depending on the error insertion timing. In this event, the frame itself may be lost.

2. The code that configures a gap between frames (/I/) may be replaced depending on the error insertion timing. In this event, the code where error insertion occurs (/K28.5/D16.2/) is replaced to the code "/previous error code/D5.6/". This operation is performed in order to make the condition the same as the case when no error is inserted for the subsequent RDs by inverting the RD twice.

*2: The following describes the RD error insertion method.
When an RD error is inserted, the two codes following the 10B conversion are replaced to other codes of the RD that does not conform to the 8B/10B conversion rule. This operation (replacement of two codes) is performed in order to retain the RD of the subsequent codes by limiting the range of the RD error effect to the error insertion position. According to the 8B/10B conversion rule, the RD of an output code is dependent on the RD of the previous code. IF an RD error is inserted, the next output code is generated based on the inverted RD of the code where the error is inserted. Therefore, an RD error occurs on the code next to the RD error insertion position. Since the RD of the code next to the error insertion position is inverted again as described above, an RD error also occurs on the code after the next to the error insertion position. At this time, since RD inversion is operated twice, the condition is the same as the case when no error is inserted for the subsequent RDs.
The following shows an example.

Example 1: When RD error is inserted to position where RD is inverted

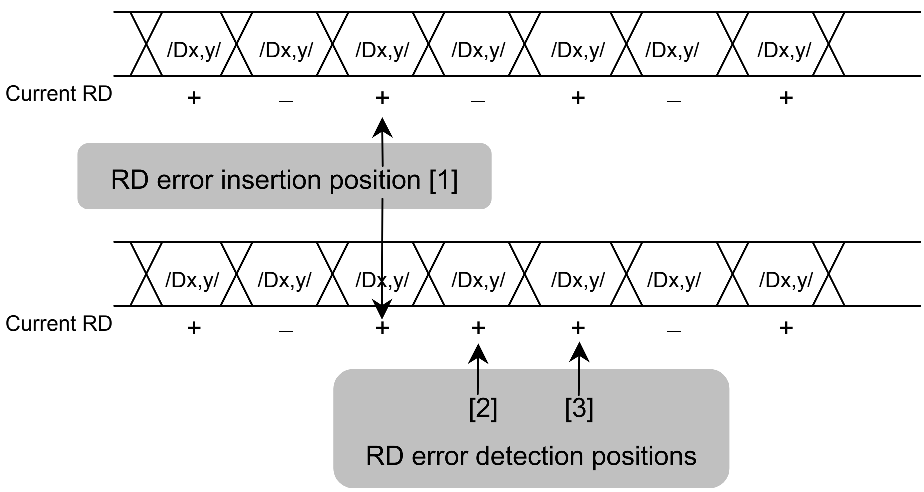


Figure 5.10.1-2 RD error insertion example 1

1. An RD error is inserted at [1].
2. For the code at [1], RD is regarded as “RD–” while it must be “RD+” under normal conditions.
   The code with “RD+” is therefore output at [2].

3. Originally, "RD–" must be output at [3] since "RD+" is output at [2]. But the MD1230B regards that an error is automatically inserted at [2] again in order to retain the RD of the original code. Therefore, it is regarded that "RD–" is output at [2], and the code with "RD+" is output at [3].
   Consequently, when the MD1230B received this signal, an RD error is detected at [2] and [3], and the line error counter is incremented by 2.

Example 2: When RD error is inserted to position where RD is not inverted

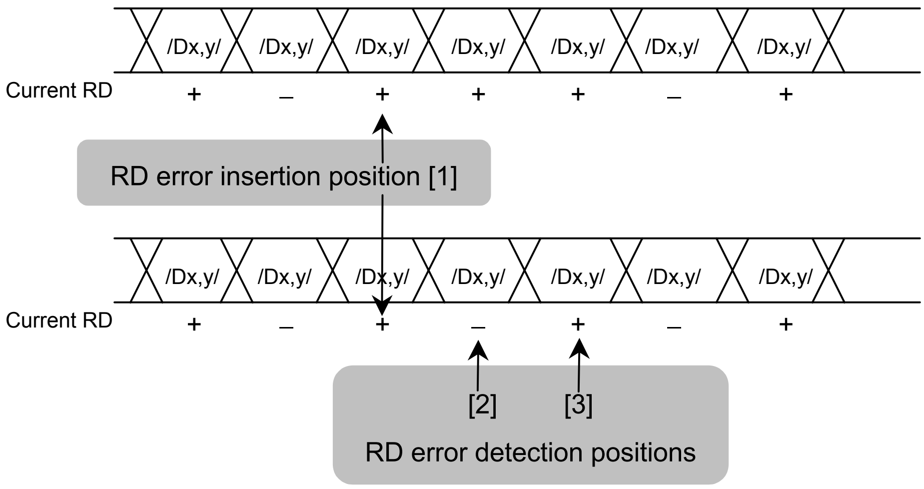


Figure 5.10.1-3 RD error insertion example 2

1. An RD error is inserted at [1].
2. For the code at [1], RD is regarded as "RD–" while it must be "RD+" under normal conditions.
   The code with "RD–" is therefore output at [2].
3. Originally, "RD–" must be output at [3] since "RD+" is output at [2]. But the MD1230B regards that an error is automatically inserted at [2] again in order to retain the RD of the original code. Therefore, it is regarded that "RD+" is output at [2], and the code with "RD+" is output at [3].
   Consequently, when the MD1230B received this signal, an RD error is detected at [2] and [3], and the line error counter is incremented by 2.

*3: When this error is received, the error blocks at the 10G BASE-R interface 64B/66B conversion blocks are all converted to Error Code. As a result, there is an 8-byte Error Code at the Rx XGMII interface and the Line Error counter counts 8.

5.10.2 When Mapping is set to Unframed

When Unframed is set for Mapping in port setting, performs error insertion settings to the test pattern to be transmitted.

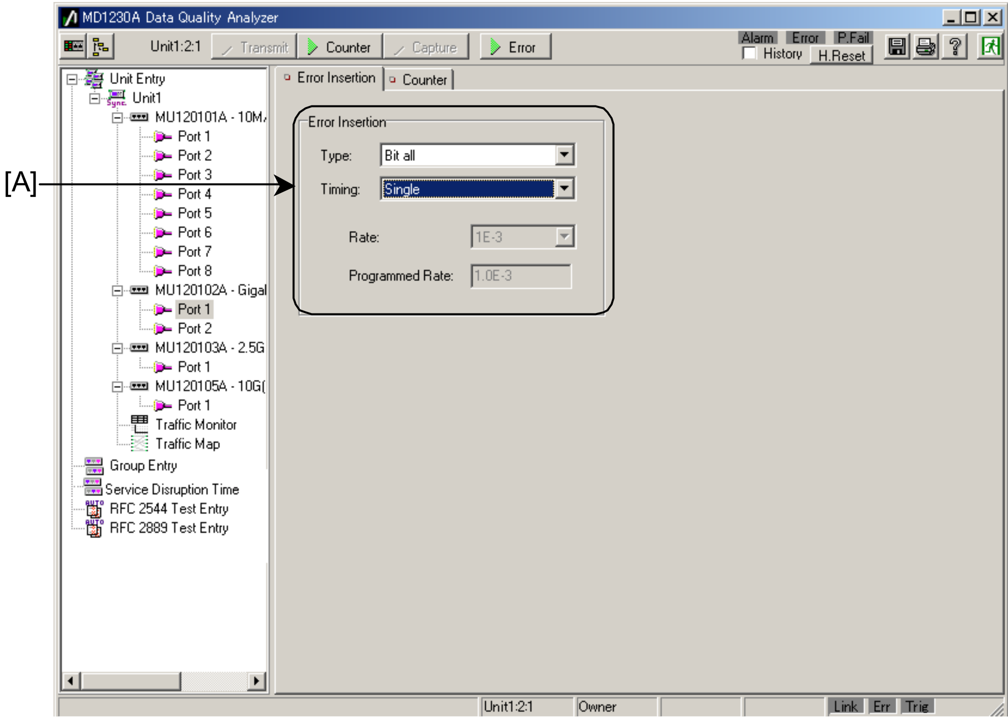


Figure 5.10.2-1 Error Insertion screen

	Item		Description
[A]	Error Insertion	Type	Selects the error type. Available errors are shown below: • Bit all • Bit all (Lane 0) (*) • Bit all (Lane 1) (*) • Bit all (Lane 2) (*) • Bit all (Lane 3) (*) (*) Can be set only for the MU120118A/18B/18C module.
	Error Insertion	Timing	Selects the error timing. Available timings are shown below: • Single • Rate • Programmed Rate Rate can be inputted only when it is selected. Programmed Rate can be inputted only when it is selected.
		Rate	Selects Rate from 1E-3, 1E-4, 1E-5, 1E-6, 1E-7, 1E-8 and 1E-9.
		Programmed Rate	Inputs Error Rate. Input format: A × E – B The setting range is as follows: MU120118A/18B/18C/38A:1.0E-10 to 2.0E-3 except for MU120118A/18B/18C/38A:1.0E-10 to 9.9E-3

5.11 Checking Alarm/Error Status of Reserved Port

Checks an alarm or an error status for the reserved port.

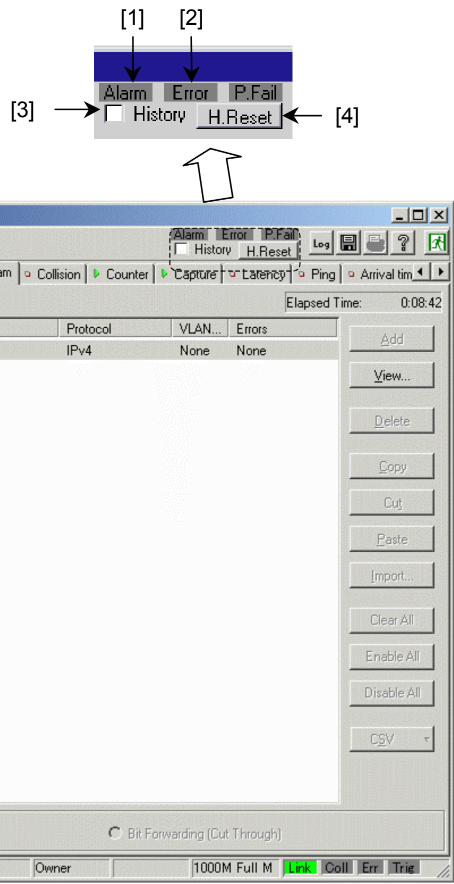


Figure 5.11-1 Tree View screen

Items [1] to [4] above are displayed only when using the MX123001A installed in the PC and are not displayed at the operation screen of the main frame. On the main frame, the equivalent functions are the front-panel Alarm/Error LED and History/H.Reset buttons.

[1] [2] Light when Alarm/Error occurs

These light when an alarm or an error specified at Display Option of Counter occurs at a reserved Port.

☞ Refer to Section 5.2.2 Selecting Display Items for the Display Option settings.

[3] At On, the lit Alarm/Error LED for an alarm or error occurring once is held. This can be used to confirm whether or not even one error or alarm has occurred from on until the present time. At Off, the LED lights only when the alarm or error occurs.

[4] This is enabled when History of [3] is on. It resets the lit status.

5.12 Checking Power Failure Occurrence During Measurement

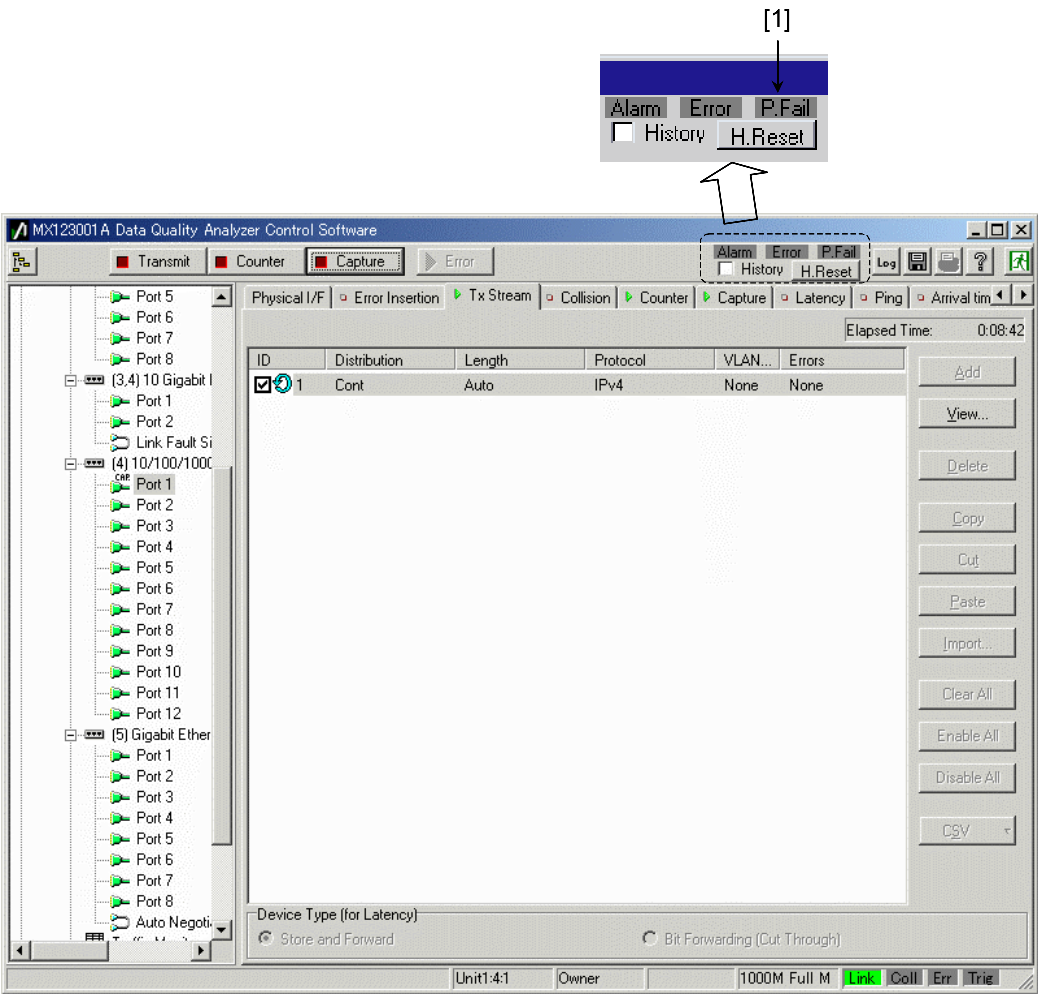


Figure 5.12-1 Tree View screen

Item [1] above is displayed only when using the MX123001A installed in the PC and is not displayed at the operation screen of the main frame. It has the same function as the Power Fail LED on the front panel of the main frame.

[1] It lights when the power is cut while Windows is running on the main frame. When the Power button is set to Off after Windows on the main frame has been shut down, it goes off at the next restart. In addition, it can also be extinguished by pressing the H. Reset button. However, in this case, it lights again when the main applications software is rebooted.

Section 6 Functions Specific to Ethernet Modules

This section describes the MD1230B measurement functions specific to the MU120101A/11A/12A/18A/18B/18C/21A/22A/31A/32A/38A and MU150101A modules and how to analyze the measurement results.

* This explanation is given assuming that measurement system connections and basic settings have been completed. (Refer to Section 4 “Basic Operations.”)

6.1 Functions Specific to MU120101A/11A/21A/22A/31A

6.1.1 Setting collision

Collision can be generated in the MU120101A/11A/21A/31A and the RJ-45 Port of MU120122A.

This setting is possible when Duplex Mode is set to Half.

☞ For details, refer to 4.5 "Setting Port (Port Setting Dialog)."

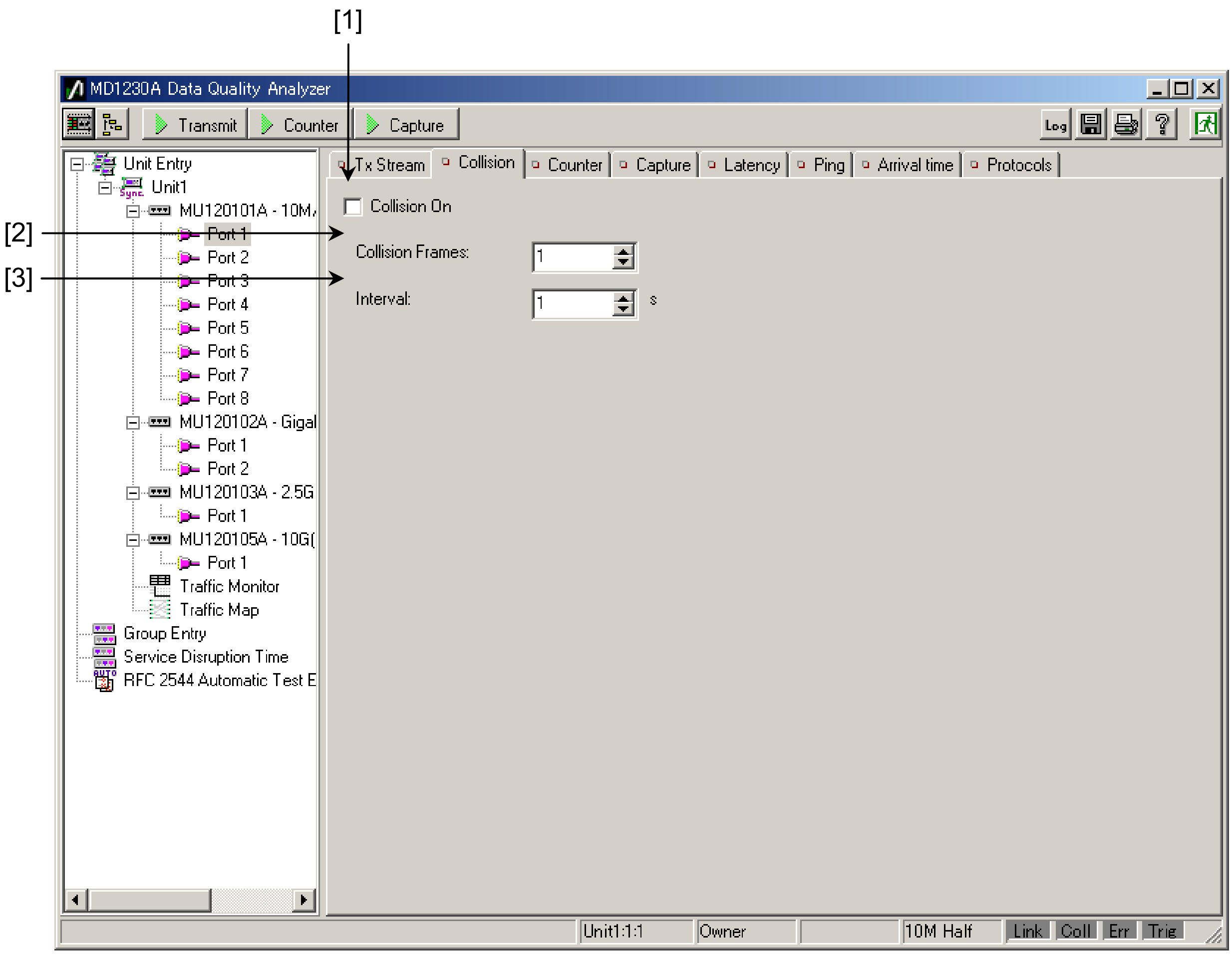


Figure 6.1.1-1 Collision setting screen

[1] Collision On
Sets whether or not to generate collision. Collision is enabled when it is checked.
When a frame is received while this item is enabled, ten 32-bit patterns are transmitted as a jam signal.

[2] Collision Frames
Sets the count to cause collisions within the specified interval.

[3] Interval
Sets the period for resetting the Collision Frames count in 1-second units.

6.2 Functions Specific to MU120112A/22A/32A

6.2.1 Auto negotiation analysis function

The auto negotiation analysis function on the SFP Port of the MU120112A/22A/32A is available only when the Auto Negotiation Analysis option is installed.

Note:

To use the auto negotiation function on the MU120112A, the Firmware must be switched to that for auto negotiation on the Firmware Functionality setting screen in Setup Utility.
In addition, when switching to use auto negotiation, an auto negotiation analysis function has been added but the Variation measurement function can no longer be used.

☞ For firmware switching method, refer to Section 4.7 "Setting Firmware Functionality" in the MD1230B Data Quality Analyzer Operation Manual.

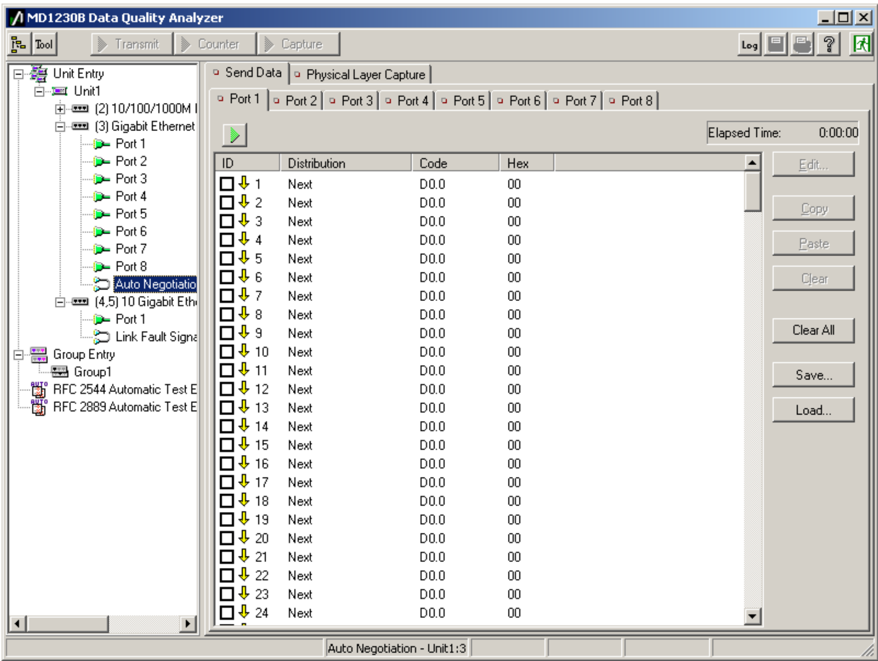


Figure 6.2.1-1 Auto Negotiation screen

6.2.2 Displaying auto negotiation pattern setting screen

Set a transmission pattern type and transmission method before transmitting an auto negotiation pattern.

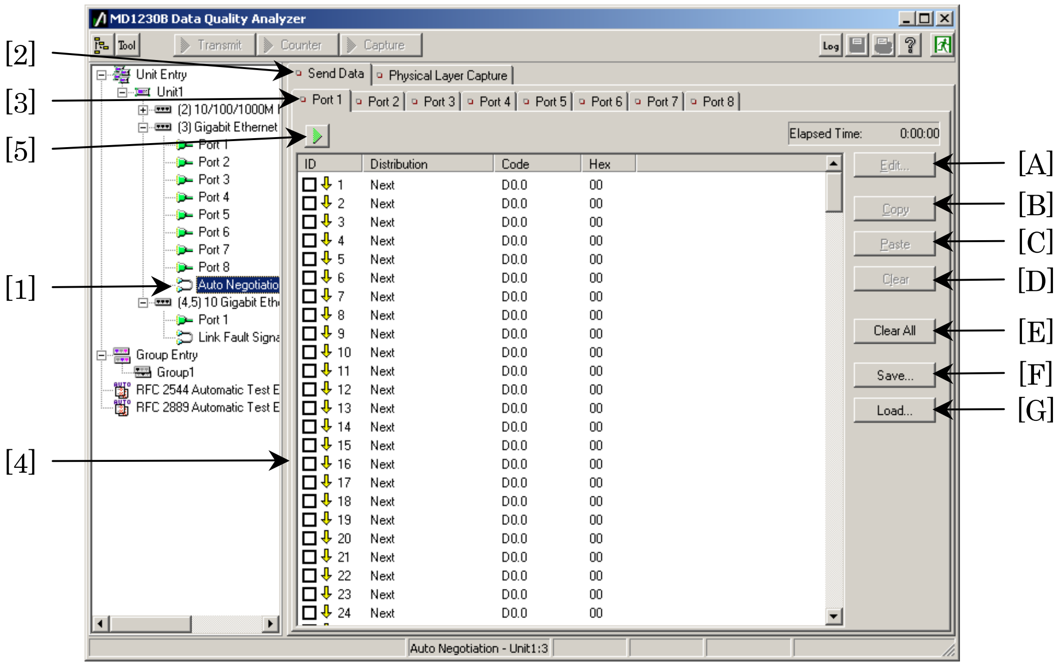


Figure 6.2.2-1 Tree View - auto negotiation pattern setting screen

[1] Set the port to use to Owner and select **Auto Negotiation**}

[2] Select **Send Data** tab.

[3] Select target port for transmission data setting.

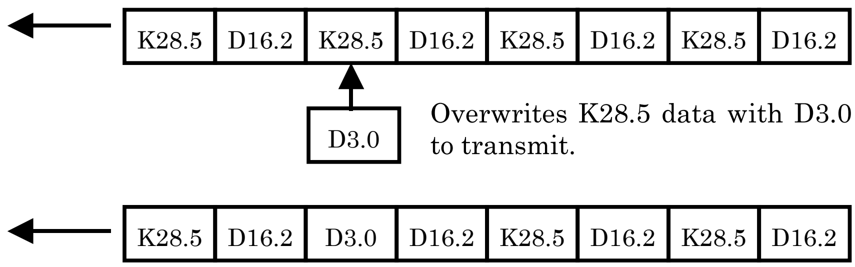
[4] Set whether to enable/disable setting data.
Checkmark the checkbox of the data to be transmitted. Uncheck the checkbox of the data not to be transmitted.

[5] Start/stop transmission of the set data. Up to 256 bytes data can be set.
Note that data transmission is disabled when Mode is set to Through or Monitor modes on the Port Setting screen.

Type		Description
[A]	Edit	Edits the selected data. For edit screen, refer to Section 6.2.3 "Defining auto negotiation pattern to be transmitted."
[B]	Copy	Copies the settings of the selected ID.
[C]	Paste	Overwrites the setting data of the selected ID with the copied data.
[D]	Clear	Clears (initializes) the settings of the selected ID.
[E]	Clear All	Clears (initializes) the settings of all IDs.
[F]	Save	Saves the selected data in the setting port to a file. The extension of the saved file is .ans.
[G]	Load	Loads the setting values from the saved file.

Note:

This function transmits data by overwriting IDLE pattern. For example, 1-byte D3.0 Code data is transmitted as shown below:



The data is actually transmitted as shown above.

6.2.3 Defining auto negotiation pattern to be transmitted

Set an auto negotiation pattern.

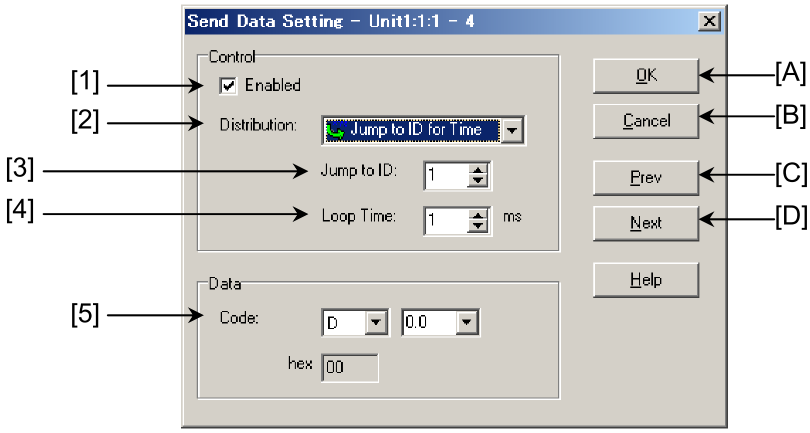


Figure 6.2.3-1 Send Data Setting screen

[1] Set whether to enable/disable the setting data.
Checkmark the checkbox of data to be enabled and transmitted.
Uncheck the checkbox of data to be disabled and not transmitted.

[2] Set data distribution for the setting data.
Select from the following four Distribution types:

- Next
  Transmits the current data and then transmits the data for the next ID.
- Stop
  Transmits the current data and then stops transmission.
- Jump to ID
  Transmits the current data, and then transmits the data for the specified ID.
- Jump to ID for Time
  Transmits the current data for the specified time period, and then transmits the data for the specified ID.

[3] Specifies a jump destination used when Jump to ID or Jump to ID for Time is selected for Distribution.

[4] Sets transmission repetition time used when Jump to ID for Time is selected for Distribution.

[5] Sets an auto negotiation pattern code for the transmission stream.

Type		Description
[A]	OK	Registers the edited data to the measuring equipment and closes the Send Data Setting screen.
[B]	Cancel	Closes the Send Data Setting screen without registering the edited data to the measuring equipment.
[C]	Prev	Registers the edited data to the measuring equipment and returns to the Send Data Setting screen for the previous ID.
[D]	Next	Registers the edited frame to the measuring equipment and proceeds to the Send Data Setting screen for the next ID.

6.2.4 Setting Link Timer

Set the Link Timer value for auto negotiation when conducting auto negotiation with opposite equipment.

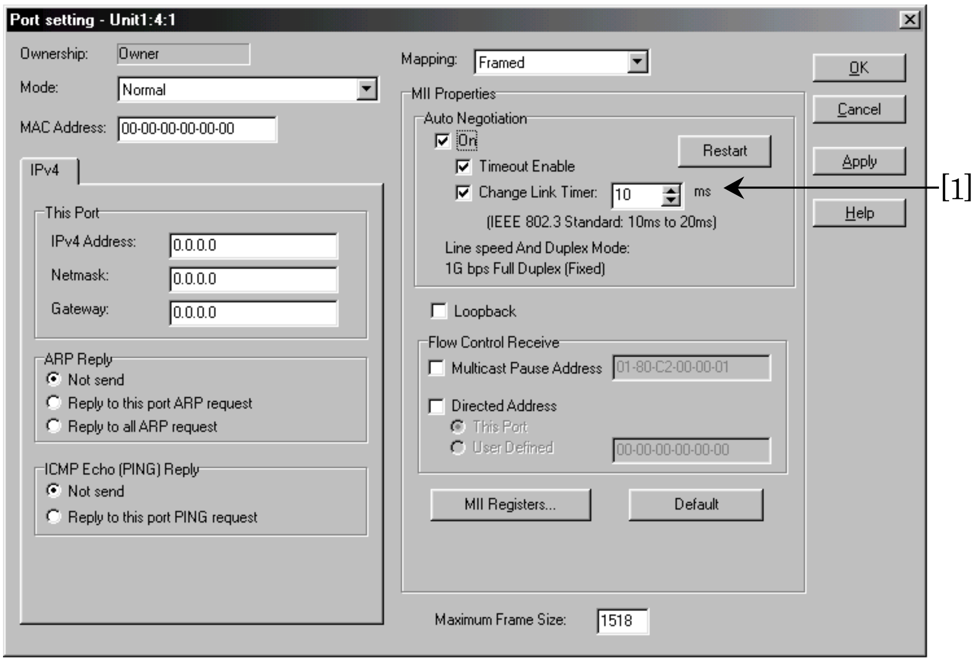


Figure 6.2.4-1 Port Setting screen

[1] Set Link Timer value.
Setting range: 0 to 100 ms in 1-ms steps

For details, refer to Section 4.5.1 "Settings Related to Basic Functions and Physical Layer".

6.2.5 Capturing received auto negotiation data

Received auto negotiation data can be captured for decode display of the results.

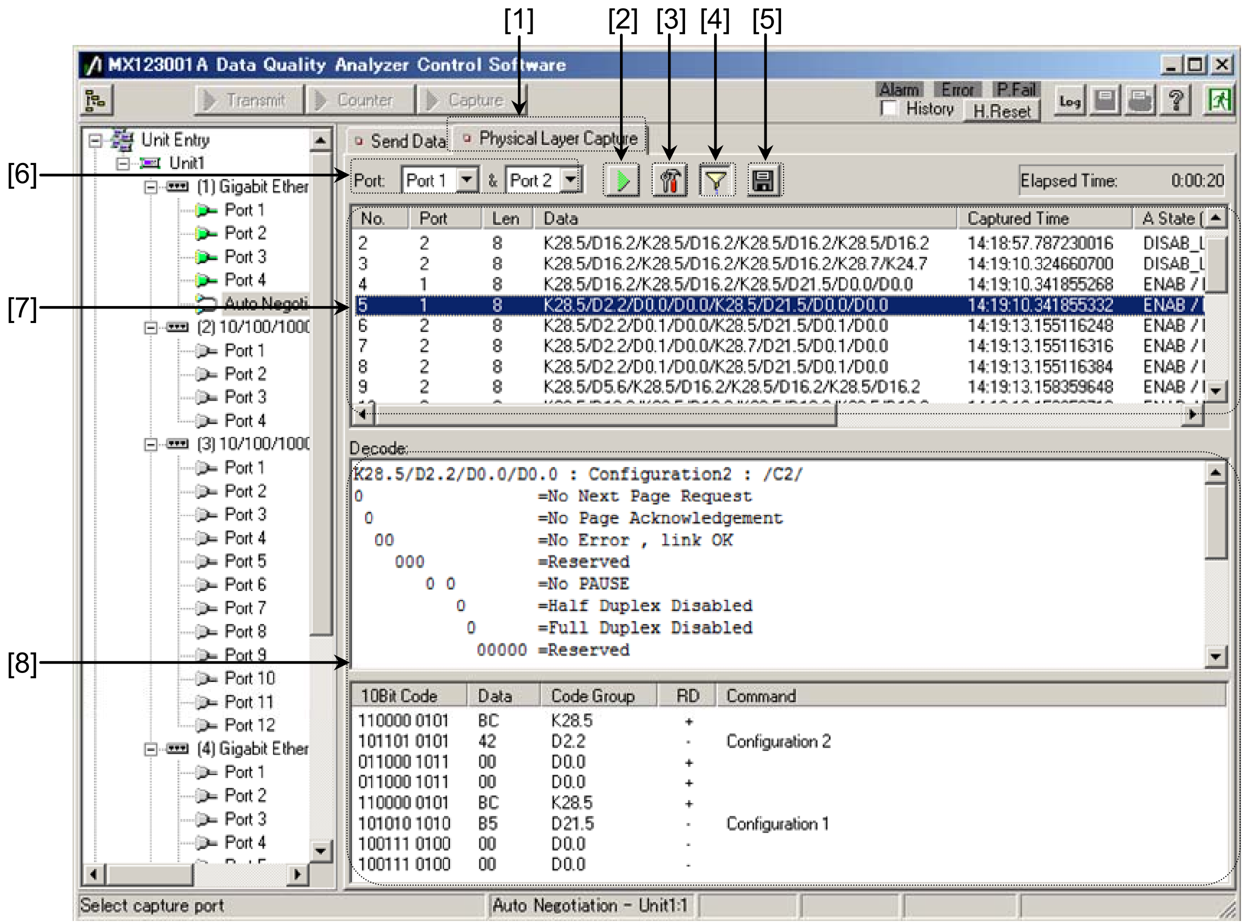


Figure 6.2.5-1 Capture screen

[1] Select **Physical Layer Capture** to display the Physical Layer Capture screen where auto negotiation sequence can be captured.

[2] Start/stop capturing reception data.
When capturing is started, it continues until it is stopped by clicking this button or the capturing data capacity becomes full. Up to 1024 events can be captured per port.

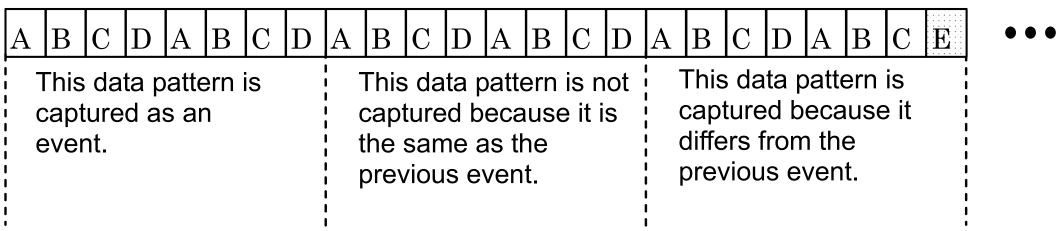
In a process of auto negotiation, configuration data is repeatedly and continuously transmitted at the interval set in Link Timer. In this event, capturing of all repetitive data causes their analysis to take time.

The auto negotiation analysis function simplifies analysis by capturing data as shown below:

(a) When Kxx.x code is received, pattern identification is performed with the assumption that each 8 bytes is one event.

(b) Capturing of each event starts when the capture start command is received. If captured event data is the same as the previous, the latter event is not captured.

(c) When the received data is different from the previous, it is captured.



Here, A, B, C, D and E represent a 1-byte code data type.

Up to 1024 events can be captured per port in this way.

[3] Set a capture trigger. The following screen appears where a 2-byte trigger pattern can be set for each port.

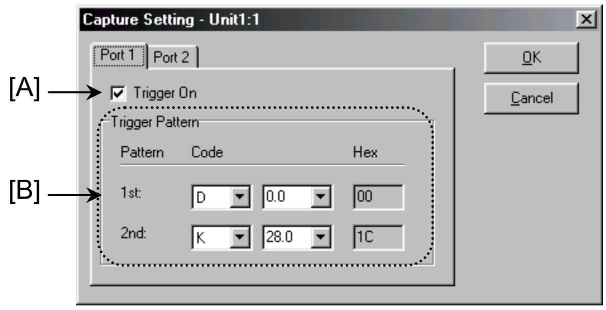


Figure 6.2.5-2 Capture setting screen

[A] Set whether to enable/disable the capture trigger.

[B] Selects a capture trigger pattern.
Set a 2-byte trigger pattern as the capture trigger. A single byte pattern cannot be set. Set the first/second byte patterns in 1st/2nd lines, respectively.

[4] Set a screen display filter for the captured data.

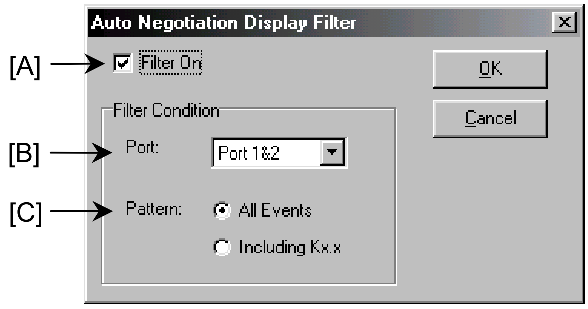


Figure 6.2.5-3 Display Filter setting screen

[A] Set whether to enable/disable the display filter.

[B] Select a port for display filter setting.

[C] Select a pattern for display filter condition.
Select from the following two pattern types:

- All Events
- Including Kx.x: Displays only events containing control code.

6

Functions Specific to Ethernet Modules

[5] Save/load the captured data.

(a) Save

The captured data can be saved in one of the following three formats:

- Saves data in the captured data list [7] into a CSV file. The extension of the saved file is .txt.
- Saves the decode contents of a selected event in the captured data list area into a text file. The extension of the saved file is .txt.
- Saves the captured results into a loadable format file. The extension of the saved file is .anc.

(b) Load

The captured results can be loaded in either of the following two formats:

- Loads the captured results from a file (.anc file) in a loadable format to display it on the Load screen.
- Loads the dumped captured results (.txt file) to display it on the Load screen.

[6] Select the port to be captured.

[7] Display the list of captured data. Captured data is 8 bytes in length per event. Up to 1024 events can be captured per port. This shows the following data in a list display.

Type	Description
No.	Sequence number assigned in order of capture time stamp. When capturing Ports 1 and 2 at the same time, the sequence numbers are assigned across Ports 1 and 2.
Port	Shows the captured port number. When capturing is performed in Through mode, data stream direction is also displayed.
Len	Shows the number of bytes per event (line.) Fixed to 8 bytes per event.
Data	Shows data for an event in Code display. For Code, refer to IEEE802.3 Standards.
Captured Time	Shows the time when data is captured.

<table>
<tr><th>Type</th><th>Description</th></tr>
<tr><td>A State
[port 1]</td><td>Estimates and shows the auto negotiation process status for the device connected to Port 1 by referring to the data received at Port 1. For details on the status, refer to IEEE802.3 Standards.
An estimation is made by referring to only the transmitted data. Multiple statuses are displayed when a specific status is not determined. Note that the status shown here may differ from that of the actually connected device.
The status types are as follows:
<table>
<tr><th>No.</th><th>IEEE802.3 state name</th><th>Abbreviation on MD1230B</th></tr>
<tr><td>1</td><td>AN_ENABLE</td><td>ENAB</td></tr>
<tr><td>2</td><td>AN_RESTART</td><td>RESTRT</td></tr>
<tr><td>3</td><td>AN_DISABLE_LINK_OK</td><td>DISAB_LNKOK</td></tr>
<tr><td>4</td><td>ABILITY_DETECT</td><td>ABTY_DECT</td></tr>
<tr><td>5</td><td>ACKNOWLEDGE_DETECT</td><td>ACK_DECT</td></tr>
<tr><td>6</td><td>COMPLETE_ACKNOWLEDGE</td><td>CMP_ACK</td></tr>
<tr><td>7</td><td>IDLE_DETECT</td><td>IDL_DECT</td></tr>
<tr><td>8</td><td>LINK_OK</td><td>LNKOK</td></tr>
<tr><td>9</td><td>NEXT_PAGE_WAIT</td><td>NXT_PG_WAIT</td></tr>
</table></td></tr>
<tr><td>B State
[port 2]</td><td>Estimates and shows the auto negotiation process status for the device connected to Port 2 by referring to the data received at Port 2. For details on the status, refer to IEEE802.3 Standards.
An estimation is made by referring to only the transmitted data. Multiple statuses are displayed when a specific status is not determined. Note that the status shown here may differ from that of the actually connected device.
For status types, refer to "A State [port 1]" above.</td></tr>
<tr><td>Delta Time</td><td>Shows difference in reception time with the previous event in the list display.</td></tr>
</table>

[8] Show translated (decoded) results of the captured data.

An example of capturing procedures for actual auto negotiation sequence data is shown below:

(a) Connect the opposite equipment to any port on the MU120112A/22A/32A.

(b) On the Port Setting screen for the connected port, checkmark **On** in **Auto Negotiation** to enable auto negotiation.

(c) Start capturing for auto negotiation.

(d) Display the Port Setting screen. Click the **MII Registers** button to display the MII Registers screen.

(e) Click **00-Control** in the area to the left of the MII Registers screen to select it.

(f) Checkmark **Reset** in the area to the right of the MII Registers screen and then click the **Write** button. This resets PHY IC setting for the selected port. Auto negotiation sequence will now start.

(g) Stop capturing when the Link LED for the connected port comes on.

In this way, auto negotiation sequence with opposite equipment can be captured.

6.3 Functions Specific to MU120118A/18B/18C/38A

6.3.1 Link Fault Signaling (LFS) function

The LFS (Link Fault Signaling) function in 10-Gigabit Ethernet notifies of a fault at the physical layer. When any abnormality is detected at the physical layer or transmission media, this function continuously sends downlink LF (Local Fault) sequence signals. The RS (reconciliation sub-layer) which received LF sequence signals continuously returns RF (Remote Fault) sequence signals. Fault occurrence is notified in this way.

This function requires Link Fault Signaling option. The following LFS functions are enabled.

(1) XGMII data transmission function
Transmits the set XGMII data.

(2) XGMII data capture function
Captures and decodes XGMII data.

(3) LFS emulation function
Continuously transmits RF sequence signals or the set XGMII data when a fault is detected.

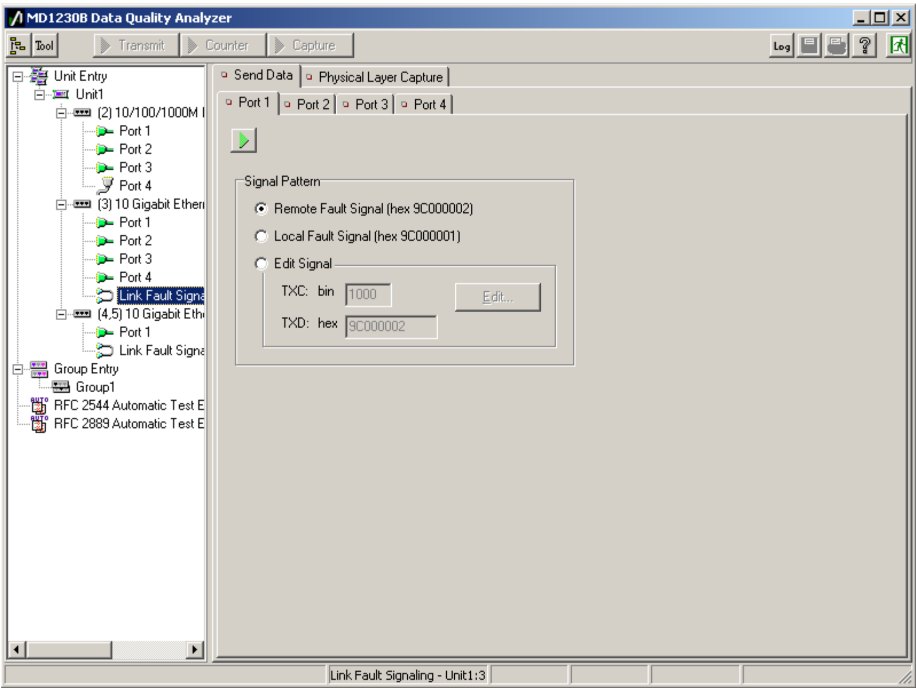


Figure 6.3.1-1 LFS screen

6.3.2 Displaying LFS pattern setting screen

The set XGMII data can be transmitted continuously.

Note:

When using the MU120118A/18B/18C, when the continuously sent signal passes via XAUI, it is basically converted to an idle signal by the EMI attenuation, etc. As a result, the signal pattern set at capture appears only once or so in columns 17 to 32.

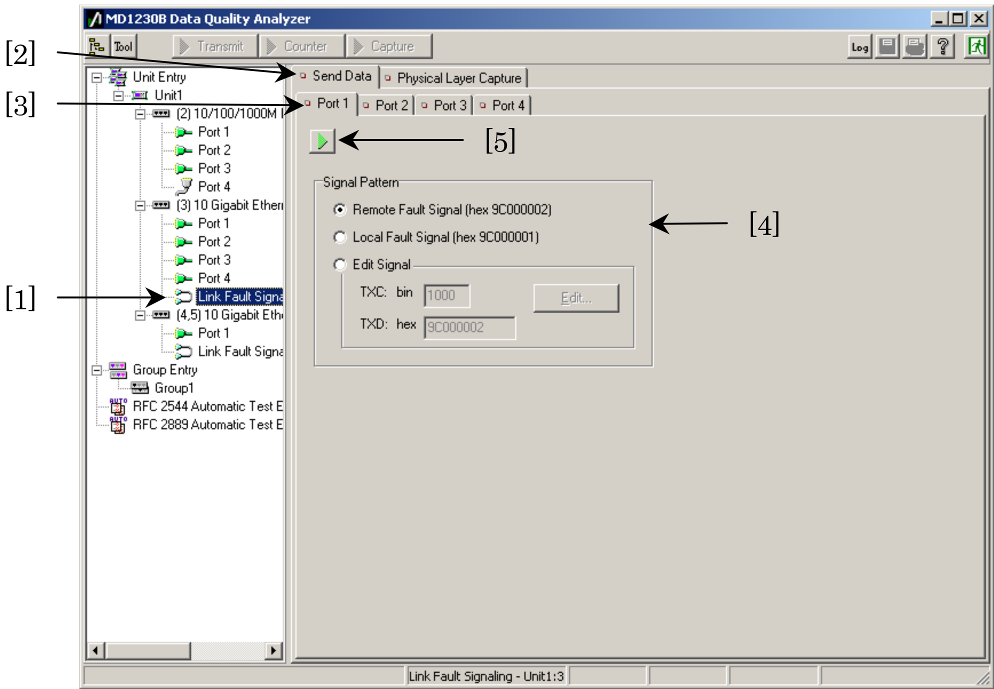


Figure 6.3.2-1 Tree View LFS setting screen

[1] Set the port to use to Owner and select **Link Fault Signaling**.

[2] Select **Send Data** tab.

[3] Select the port for transmission data setting.

[4] Select the transmission XGMII data pattern from the followings:

- Remote Fault Signal: 9C000002 (hex)
- Local Fault Signal: 9C000001 (hex)
- Edit Signal: The transmission data can be edited.

Refer to Section 6.3.3 "Defining LFS pattern to be transmitted" for the edit screen.

[5] Start/stop transmission of the set data.
However, when Mode at the Port Setting screen is not set to **Normal**, data cannot be sent.

6.3.3 Defining LFS pattern to be transmitted

Set an LFS pattern.

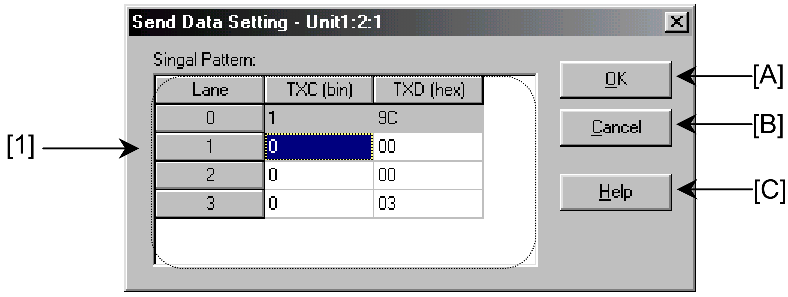


Figure 6.3.3-1 Send Data Setting screen

[1] Edits transmission data pattern.
Lane 0 is fixed to TXC=1 (bin) and TXD=9C (hex)
Editing is possible on Lane 1 thru Lane 3.

Type		Description
[A]	OK	Registers the edited data to the measuring equipment and closes the Send Data Setting screen.
[B]	Cancel	Closes the Send Data Setting screen without registering the edited data to the measuring equipment.
[C]	Help	Displays help.

6.3.4 LFS Emulation, setting LFS signal pattern

When a fault is detected, RF or the set XGMII data pattern are transmitted continuously.

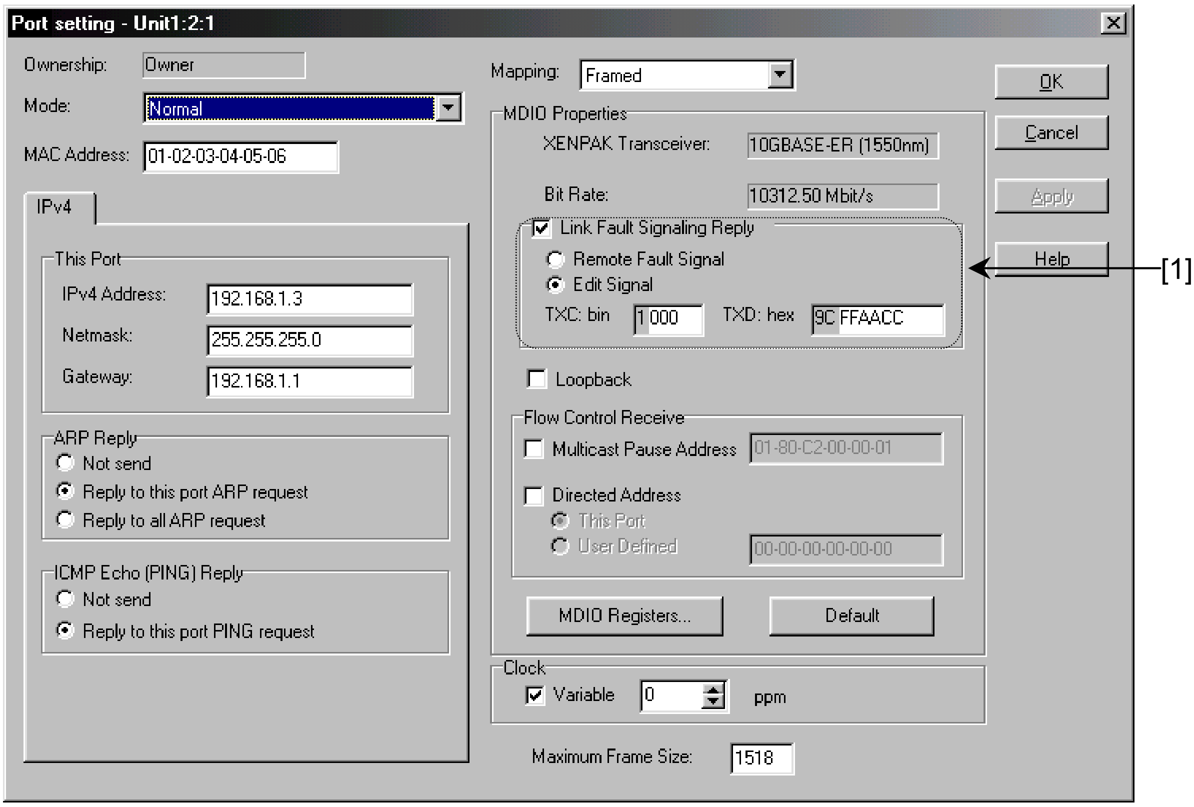


Figure 6.3.4-1 Port Setting screen

[1] The following operations are performed when the Link Fault Signaling Reply setting is On.

When Rx signal cannot be received (fiber at Rx side disconnected)	Sends RF when Remote Fault Signal selected Sends XGMII data for set pattern when Edit Signal selected
When three or more contiguous LF received	
When RF received	Sends Idle code

6.3.5 Counting transmitted/received LFS data

Transmitted/received XGMII data can be counted.

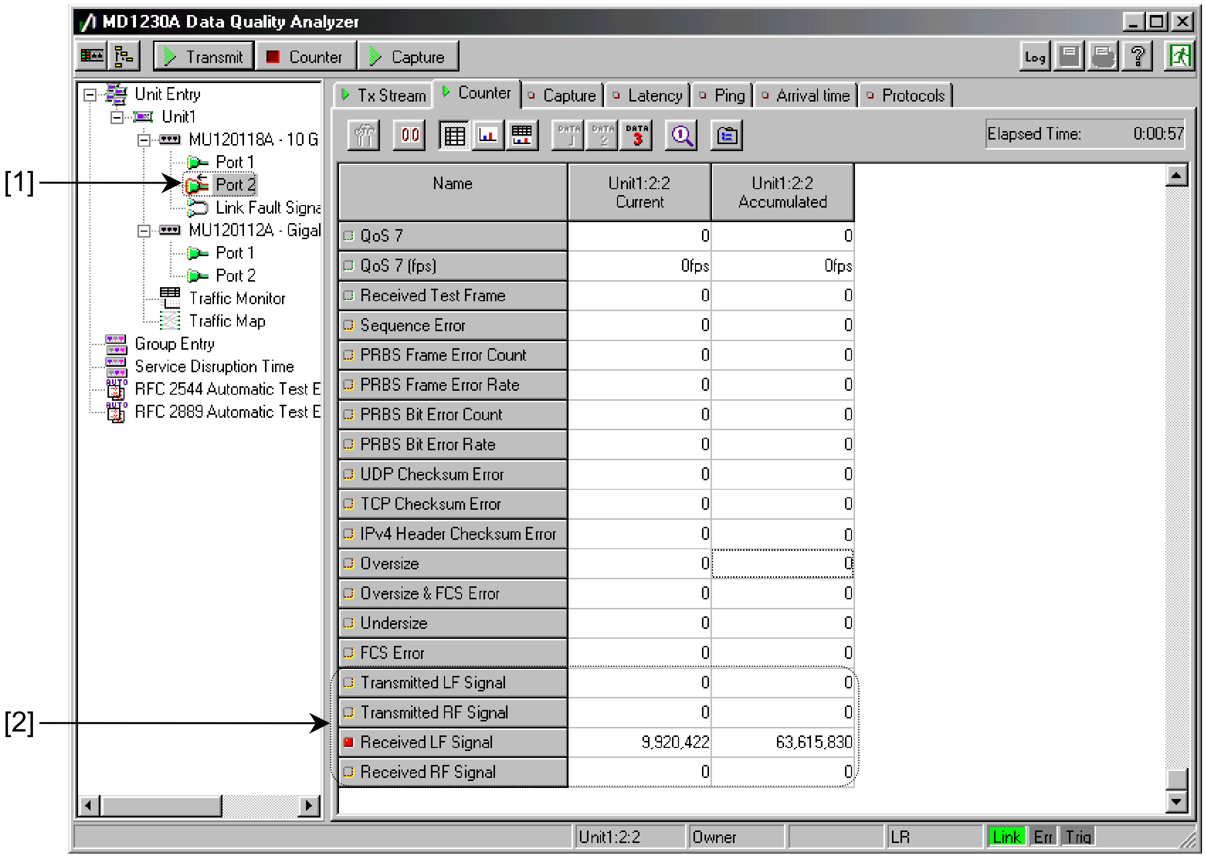


Figure 6.3.5-1 Counter screen

[1] The reception port lights up in red when Local Fault Signal or Remote Fault Signal is received during counter operation.

[2] Counts the following items:

- Transmitted LF Signal: Number of transmission LF signals.
- Transmitted RF Signal: Number of transmission RF signals.
- Received LF Signal: Number of reception LF signals.
- Received RF Signal: Number of reception RF signals.

6.3.6 Capturing received LFS data

Received XGMII data can be captured for decode display of the results. The amount of data that can be captured one time at one port (capture buffer size) is 512 columns for the MU120118A/18B/18C and 4096 columns for the MU120138A.

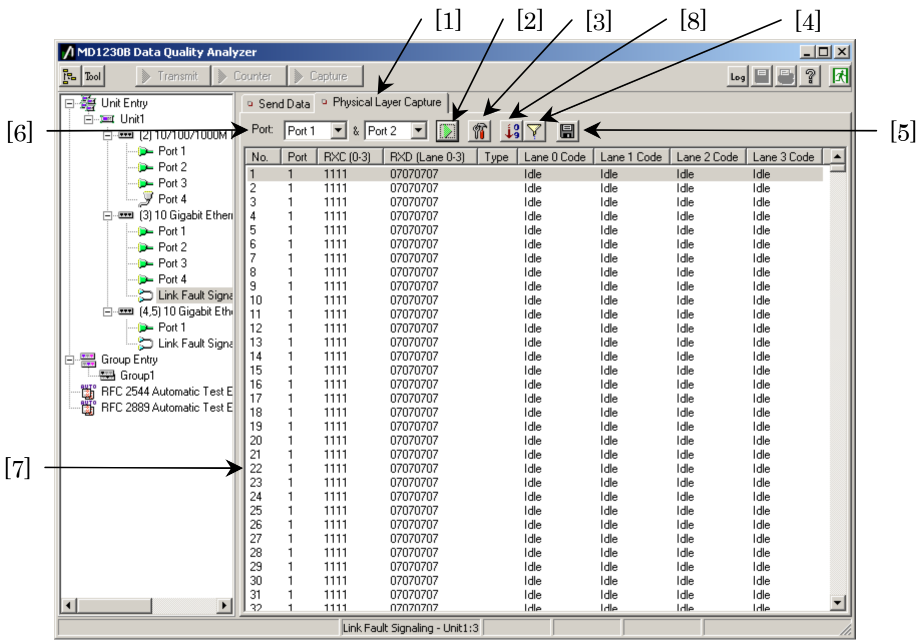


Figure 6.3.6-1 Capture screen

[1] Select **Physical Layer Capture** to display the Physical Layer Capture screen where XGMII data can be captured.

[2] Start/stop capturing reception data.
When the buffer size is exceeded, the oldest data is overwritten by the newest data. Again, click this button to stop capturing.

[3] Set a capture trigger. The following screen appears and a 1-column data trigger pattern can be set for each port.

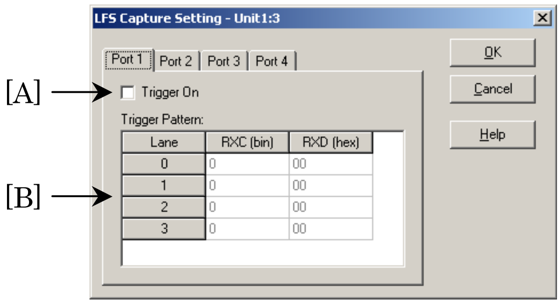


Figure 6.3.6-2 Capture setting screen

[A] Set whether to enable/disable the capture trigger.

[B] Select a column data pattern for the capture trigger.
Set a 1-column data pattern as the capture trigger for Lane 0 thru Lane 3.
When the capture trigger is enabled, capture starts from the trigger pattern and stops automatically when the capture buffer becomes full.

Note:

When capture is performed in trigger mode, the trigger pattern may be displayed second instead of first because XGMII is DDR interface.

[4] Set a screen display filter for the captured data.

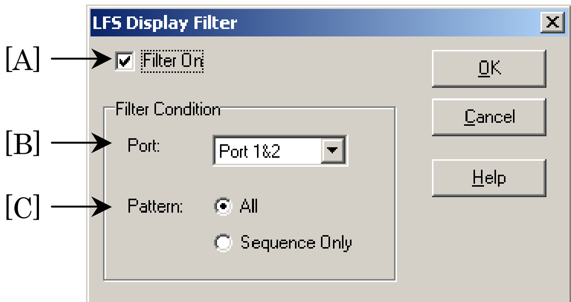


Figure 6.3.6-3 Display filter setting screen

[A] Set whether to enable/disable the display filter.

[B] Select a port for display filter setting.

[C] Select a pattern for display filter.
Select from the following two pattern types:

- All
- Sequence Only: Displays only column data containing sequence data.

[5] Save/load the captured data.

(a) Save

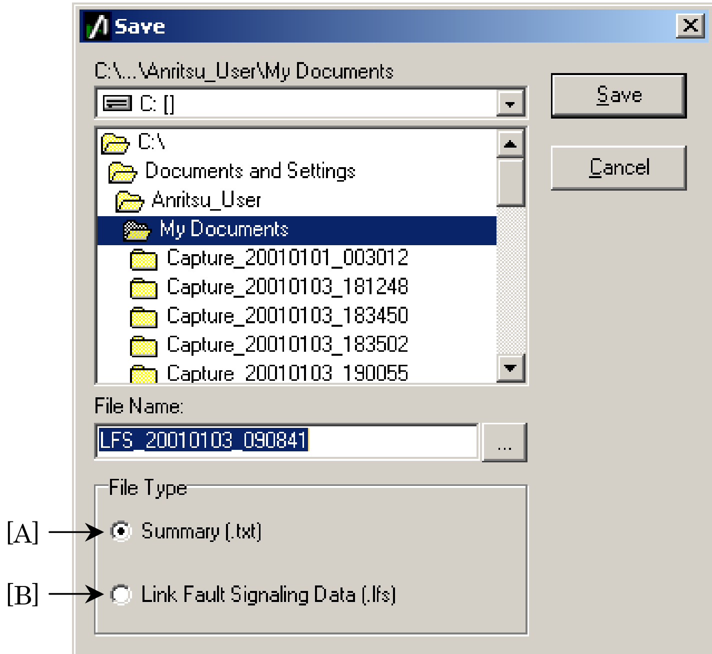


Figure 6.3.6-4 Save screen

The captured data can be saved in one of the following two formats:

[A] Saves data in the captured data list [7] into a CSV file. The extension of the saved file is .txt.

[B] Saves the captured results into a loadable format file. The extension of the saved file is .lfs.

(b) Load
The captured results can be loaded from a loadable format file (.lfs file) and displayed on the Load screen.

[6] Select the port to be captured.The same ports cannot be selected.

[7] Displays contents of captured XGMII data. The following types of data are displayed as a list.

Item	Description
No.	Sequence number assigned in captured order.
Port	Shows the captured port number.
RXC	Shows the control bit for each lane (0 thru 3). The leftmost one is the control bit for Lane 0.
RXD	Shows byte data on each lane (0 thru 3). The leftmost byte is the byte data for Lane 0.
Type	Signal Pattern type
Lane 0 to 3 Code	Shows decode result for each lane.

[8] Sorts captured data sequence.

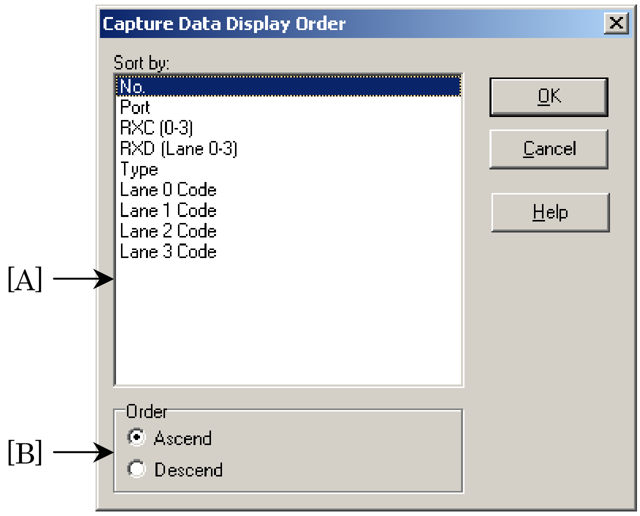


Figure 6.3.6-5 Sorting Item setting screen

[A] Select the items in [7] that are the target of sorting.

[B] Specifies the sort order.

- Ascend Ascending Order
- Descend Descending Order

6.4 Functions Specific to MU120131A/32A/38A

6.4.1 Different PRBS per frame (Cross PRBS)

(1) Transmitting cross PRBS

The MU120131A/32A/38A are capable of transmitting test frames containing a different PRBS for each frame (Cross PRBS).

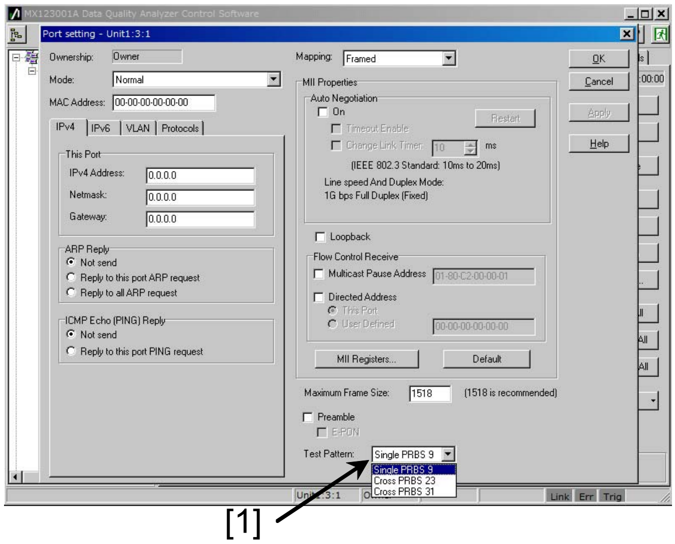


Figure 6.4.1-1 Port Setting Test Pattern selection screen

[1] Select a test pattern on the Port Setting screen for the port transmitting a PRBS. Select Cross PRBS 23 or Cross PRBS 31 to use a different PRBS for each frame.

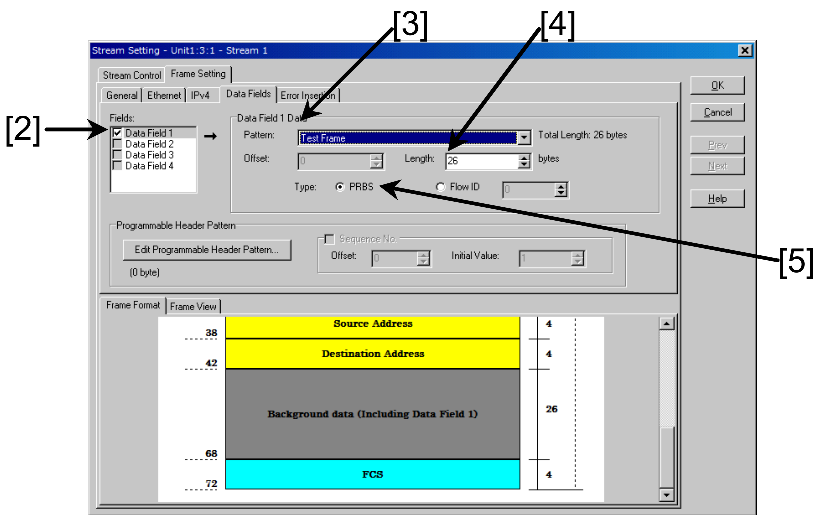


Figure 6.4.1-2 Port Setting Test Pattern selection screen

[2] On the Stream Setting screen of the stream transmitting a PRBS, checkmark Data Field 1.

[3] Select Test Frame for Pattern.

[4] Input any number of bytes in Length.

[5] Select PRBS for Type.

☞ For data frame format, refer to 5.1.2 (26) "Editing data field."

Notes:

1. Cross PRBSs are not continuous between the Test Pattern fields of each frame. The PRBS generation circuit operates while transmitting data other than Test Pattern.

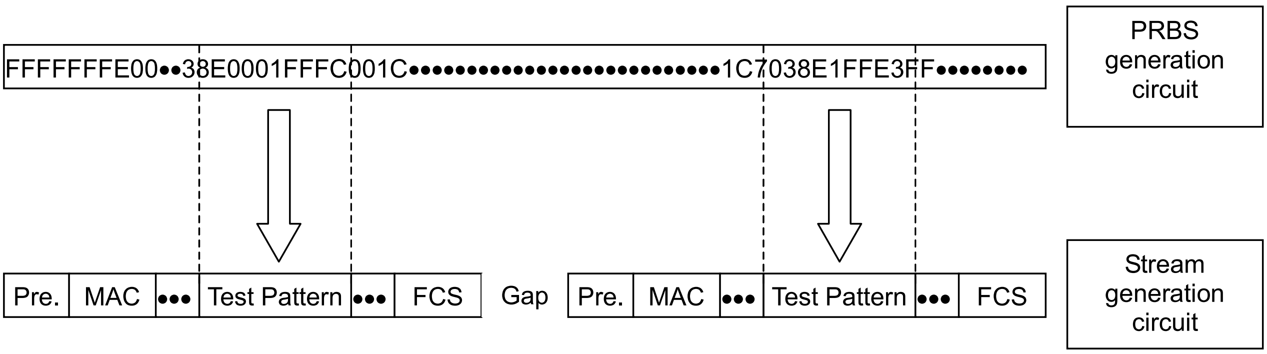


Figure 6.4.1-3 Conceptual diagram of Cross PRBS transmission

2. Length setting is enabled only when Frame Length Auto is selected in the General tab.

3. To perform BER measurement, Test Pattern must be of 12 bytes or more (Data Field 1 must be of 28 bytes or more). For a Test Pattern below 12 bytes, errors cannot be detected.

4. All bits of the Test Pattern field is the target of BER measurement.

(2) Adding bit error to cross PRBS

The MU120131A/32A/38A are capable of adding a bit error to PRBSs, which differ according to frame (Cross PRBS).

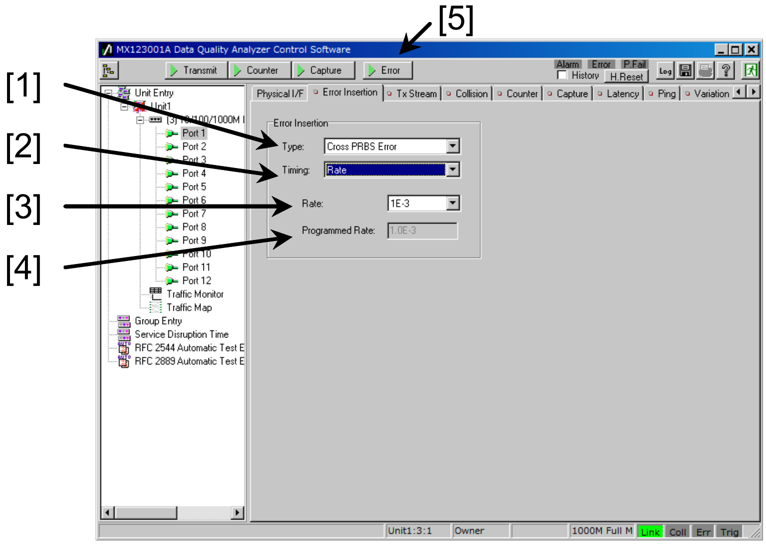


Figure 6.4.1-4 Error Insertion screen

[1] Select Cross PRBS Error for Type.

[2] Select Single, Rate or Programmable Rate for Timing.

[3] When Rate is selected for Timing, specify Bit Error Rate.

[4] When Programmable Rate is selected for Timing, specify Bit Error Rate.

[5] Starts/stops error addition.

(3) Measuring BER of cross PRBS

The MU120131A/32A/38A are capable of measuring the bit error rates (BER) of the PRBSs, which differ according to frame (Cross PRBS).

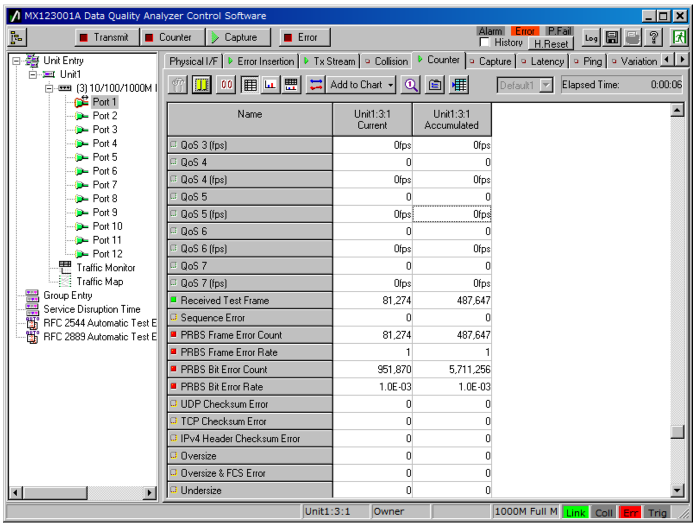


Figure 6.4.1-5 Counter screen

Notes:

1. This function is available only when the packet BER measurement option is installed.

2. To perform BER measurement, set the test pattern to be received in the Port Setting screen. If the received test pattern does not match the one selected in the Port Setting screen, the BER is not counted.

   For Test Pattern settings, refer to 6.4.1 (1) "Transmitting cross PRBS."

3. To perform BER measurement, Test Pattern must be of 12 bytes or more (Data Field 1 must be of 28 bytes or more). For a Test Pattern below 12 bytes, errors cannot be detected.

4. All bits of the Test Pattern field is the target of BER measurement.

   For test frame formats, refer to 5.1.2 (26) "Editing data field."

6.4.2 Receiving E-PON frame

The MU120132A is capable of capturing, decoding and Preamble CRC Error detection of E-PON frames by setting both Preamble and E-PON to On in the Port Setting screen.

6.4.3 Operating as PoE powered device

The MU120131A with PoE Option installed can operate as a PoE (IEEE802.3af) powered device. Power pin assignment conforms to Alternative A and Alternative B.

The voltage value is monitored after power supply has started and is displayed as Normal or Under. When Under or Off, the alarm LED turns on.

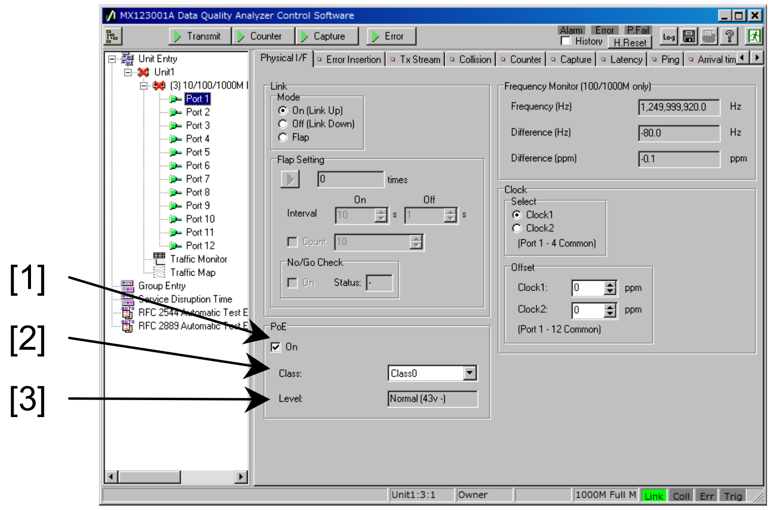


Figure 6.4.3-1 Physical I/F PoE screen

	Item	Function
[1]	On	Select whether to enable or disable the PoE function. On: Enables the PoE function. Off: Disables the PoE function.
[2]	Class	Set powered device class when the PoE function is enabled. Value: Class 0 to Class 4
[3]	Level	Shows the voltage supplied from the power supply device. Normal: 44 V or more Under: 32 V or more, less than 44 V Off: Less than 32 V (Detection is not completed)

Note:

The detected voltage when Level changes from Normal to Under has a hysteresis voltage of 5% to 44 V, the detected voltage when Level changes from Under to Normal.

6.5 Functions Specific to MU120121A/22A/31A/32A/38A

6.5.1 Controlling link status

The MU120121A/22A/31A/32A/38A are capable of controlling optical/electrical output by using the Link field in the Physical I/F tab.

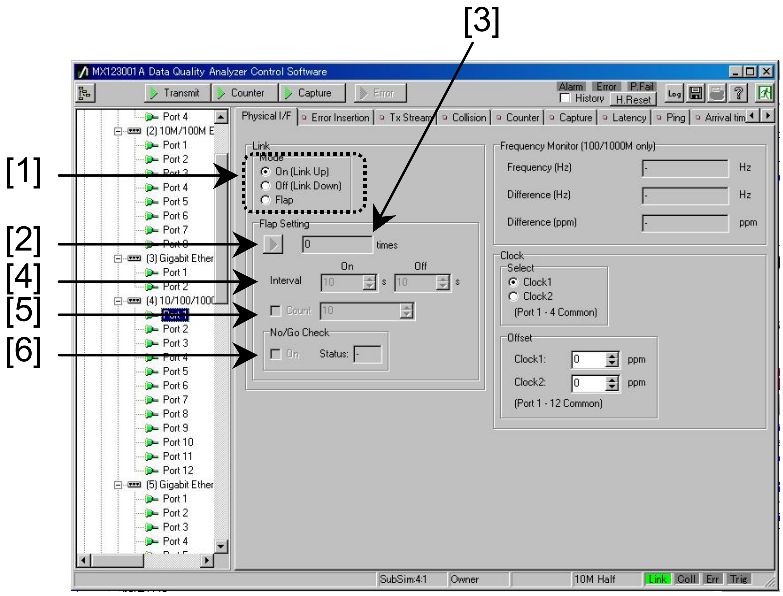
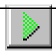


Figure 6.5.1-1 Link setting screen

	Item	Function
[1]	Mode	Controls link. On (Link Up): Turns optical/electrical output on. Off (Link Down): Disconnects link by stopping output signal. Flap: Repeats on/off of link according to settings in [2] to [6]. Not displayed on the MU120121A/22A. When Flap is selected, items [2] to [6], below, are enabled.
[2]	 Start/Stop	Link Flap test start/stop button. This button is displayed as a "Stop button" while Link Flap test is being performed, and as "Start button" while Link Flap test is stopped.
[3]	times	Shows the number of the Link Flap test execution. Counts up when Mode is changed from Off to On.

	Item		Function
[4]	Interval	On	Set the time to set Link On during Link Flap test in second units. Value: 10 to 3600 seconds
		Off	Set the time to set Link Off during Link Flap test in second units. Value: 1 to 3600 seconds
[5]	Count		When checked, repeats On/Off of Link Flap tests for the set number of times. Set the number of times for On/Off of Link Flap tests. Value: 1 to 65535 times When unchecked, repeats On/Off of Link Flap tests with no limit of times.
[6]	No/Go Check	On	When checked, stops Flap test if detects an error in case that the link is not restored when changing from On to Off status during Link Flap test. This function is not supported by the MU120138A.
		Status	Displays "–" during measurement or at non-measurement status. When Link Flap test has completed normally, "OK" is displayed. If the link is not restored when changing from On to Off status, "NG" is displayed.

6.5.2 Varying frequency

The MU120121A/22A, and MU120131A/32A/38A with Clock Measurement Option installed are capable of variable frequency setting by using the Physical I/F tab.

With the MU120121A/22A, individual variable values can be set for each port.

With the MU120131A/32A/38A, two variable values can be set per module. With the MU120131A, the clock to be used can be selected for Ports 1 to 4, 5 to 8 and 9 to 12. With the MU120132A/38A, the clock to be used can be selected for each port.

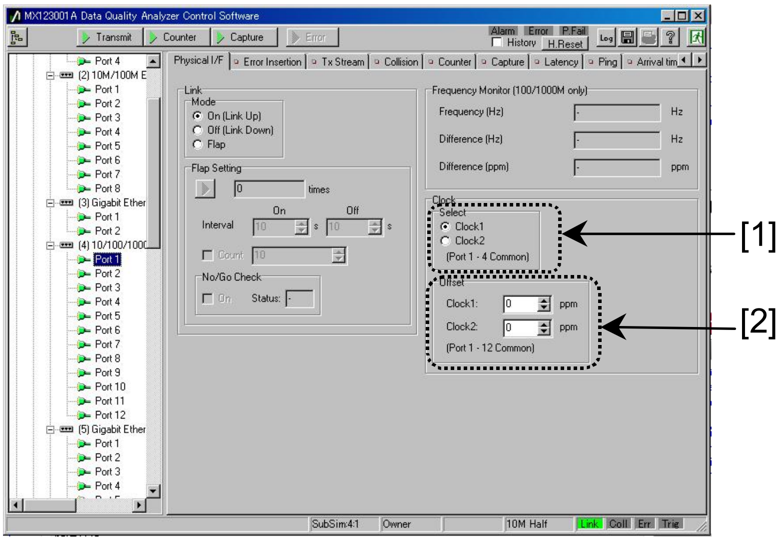


Figure 6.5.2-1 Variable frequency setting screen

	Item	Function
[1]	Select	Select the clock source. With the MU120131A, the clock is selectable only when all of Ports 1 to 4, 5 to 8 and 9 to 12 are reserved (Note 1).
[2]	Offset	Set the Clock 1 and Clock 2 offset (–100 to 100 ppm). Can be set only when all ports on the module are reserved (Note 1).

Notes:

1. When reading saved settings while the **Clock** setting cannot be changed (section 11.1), the **Clock** setting cannot be loaded.
2. When the **Mode** setting of Port Setting (section 4.5.3 (1)) is **Through** or **Address Swap**, this setting is disabled to use the Rx clock as the Tx clock.
3. During 1000M Link of the MU120131A, the frequency offset range ensuring normal operation varies depending on the transmission/reception frame length.

Table 6.5.2-1 Frequency offset limits with MU120131A 1000M

Frequency offset limit (ppm)	Maximum frame length (byte)
±78 ppm	10,000
±86 ppm	9,600
±100 ppm	8,989

6.5.3 Measuring frequency

The MU120121A/22A, and MU120131A/32A/38A with Clock Measurement Option installed are capable of measuring frequency.

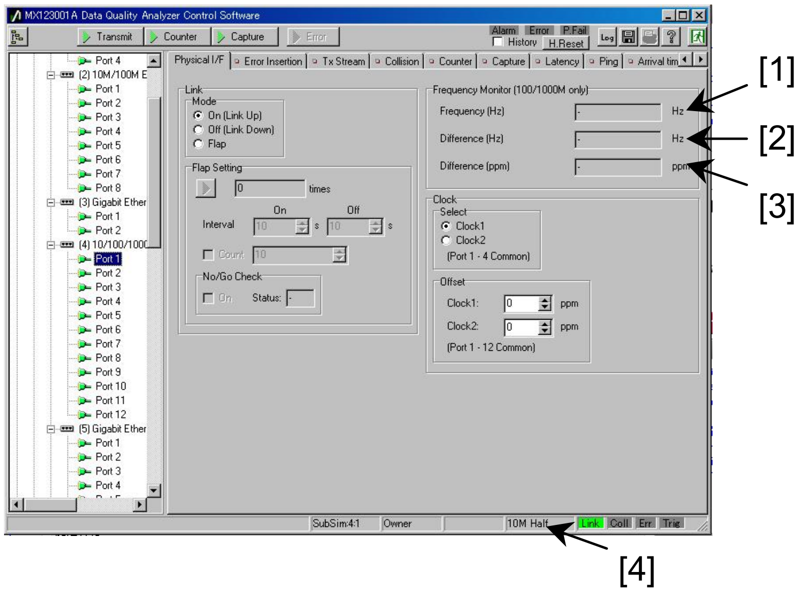


Figure 6.5.3-1 Frequency measurement screen

	Item	Function
[1]	Frequency (Hz)	Shows line speed of the reception signal.
[2]	Difference (Hz)	Shows the difference of the reception signal from the reference frequency. Reference frequency: At 100M Link: 125 (MHz) At 1000M Link: 1250 (MHz) At 10G Link: 12500(MHz) The measurement range is –1000 to +1000 ppm. Displays **Underflow** or **Overflow** when measured value is out of range.
[3]	Difference (ppm)	Shows the difference of the reception signal from the reference frequency in ppm.
[4]	Link Speed/Duplex (MU120121A/22A (RJ45) /31A)	Shows Link Speed (10M, 100M, 1000M), Duplex Mode (Full, Half) and Timing (M: Master, S: Slave) at link establishment.

Notes:

1. When Link Speed is set to 10M, frequency measurement cannot be performed.

2. When linking at 100BASE-T Master, the reception signal is of the same timing as the local port. To measure the clock of Link Partner, check that linking at Slave.

☞ Refer to Section 6.5.4 “Setting Clock Master of Auto Negotiation” for the Master/Slave settings.

6.5.4 Setting Clock Master of Auto Negotiation

Clock Master can be set for RJ-45 Port on the MU120121A/31A and MU120122A.

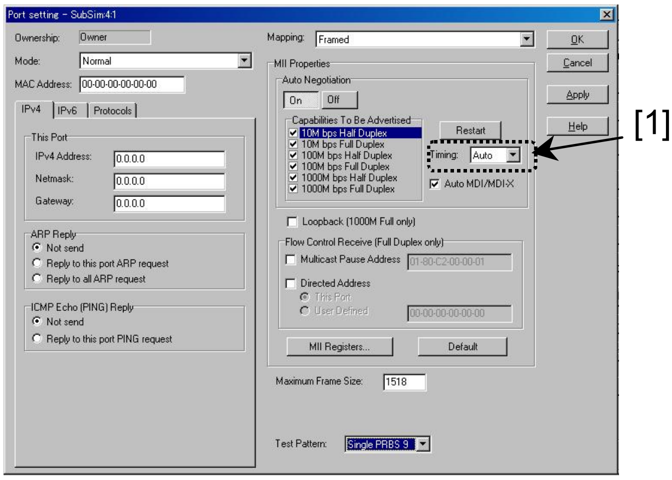


Figure 6.5.4-1 Clock Master setting screen

	Item	Function
[1]	Timing	Sets the Clock Master authority at 1000M Link to Auto, Master or Slave. Auto Negotiation: Enabled when turned on and either 1000 Mbps Half Duplex or 1000 Mbps Full Duplex is selected.

6

Functions Specific to Ethernet Modules

6.5.5 EoMPLS

(1) Transmitting EoMPLS frame

The MU120121A/22A/31A/32A/38A are capable of EoMPLS frame transmission by using a data link layer programmable pattern.

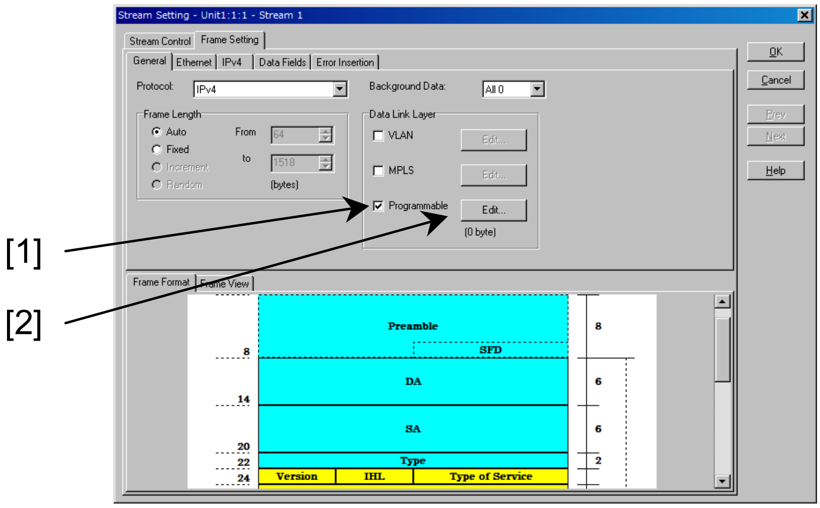


Figure 6.5.5-1 Data link layer programmable pattern selection screen

[1] Select Programmable of Data Link Layer field in the Frame Setting tab on the Stream Setting screen.

[2] Click the **Edit** button.

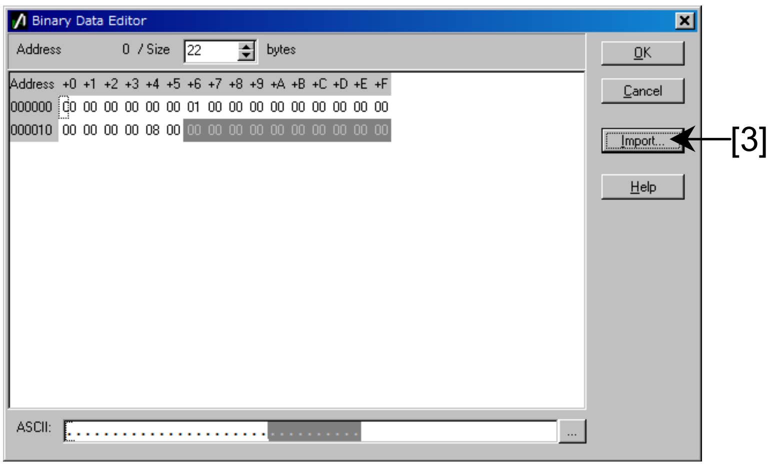


Figure 6.5.5-2 Binary Data Editor screen

[3] Press the **Import** button on the Binary Data Editor screen. Select a sample data, EoMPLS.txt, on the Import Binary Data screen.

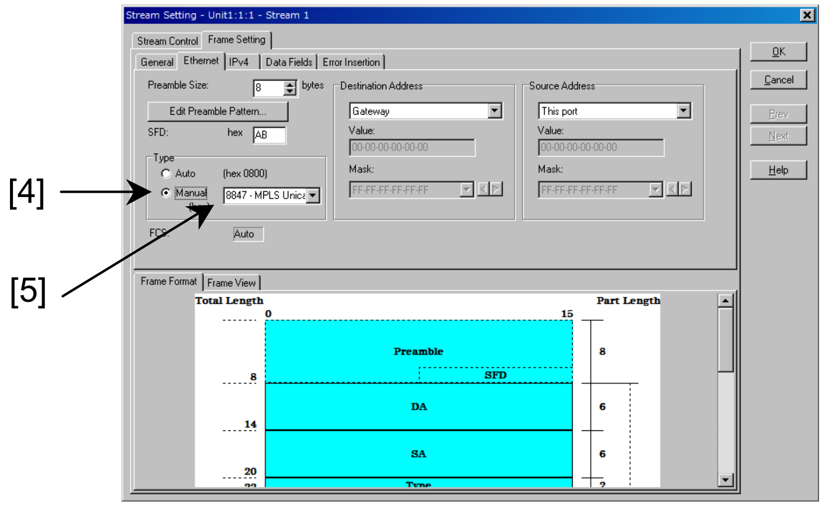


Figure 6.5.5-3 Data link layer programmable pattern selection screen

[4] Select Manual for Type field in the Ethernet tab.

[5] Enter 8847 - MPLS Unicast or 8848 - MPLS Multicast in Type.

Note:

When Programmable is selected in Data Link Layer field, Ethernet Type must be set to Manual.

(2) Editing EoMPLS frame

Data link layer programmable pattern can be changed using the Binary Data Editor.

☞For the Binary Data Editor, refer to Section 2.3.1 (7) "Binary Data Editor."

Programmable Pattern can also be changed by creating a text data using sample data, EoMPLS.txt, and then import it.

Procedure to create a text data to be imported by using a sample data EoMPLS.txt is shown below.

[1] A character string starting from # to line feed is handled as a comment.

[2] Set the hexadecimal data to be imported. Space and tab are ignored.

[3] If the data is the last one of a MPLS stack, set Bottom of Stack bit to 1.

[4] Set layer 2 header.

(3) Decoded display of EoMPLS frame

With the MU120121A/22A/31A/32A/38A, EoMPLS frame can be decoded in the Stream Setting and Capture screens.

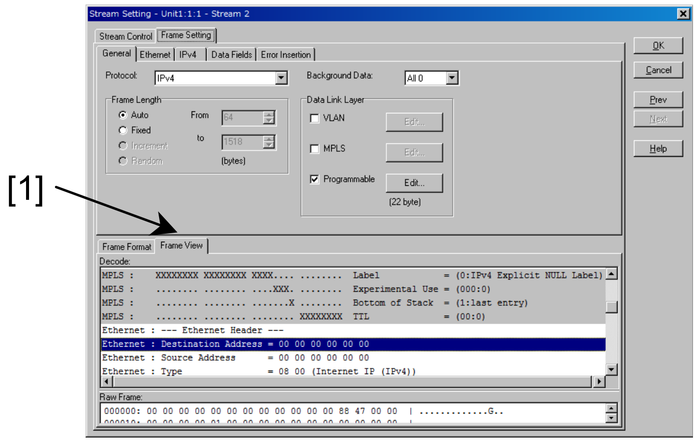


Figure 6.5.5-4 EoMPLS Stream Frame View screen

[1] Select Frame View in the Stream Setting screen.

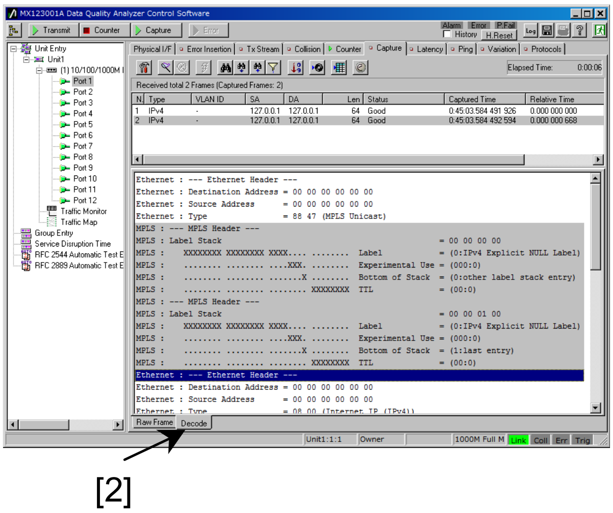


Figure 6.5.5-5 EoMPLS Capture Decode screen

[2] Select Decode in the Capture screen.

Note:

When the next byte of the MPLS stack (top byte of the MAC destination address) is 4 or 6, it is identified as a non-EoMPLS frame. In this case, the next data of the MPLS stack is decoded as an IPv4 orIPv6 header, not as an Ethernet header.

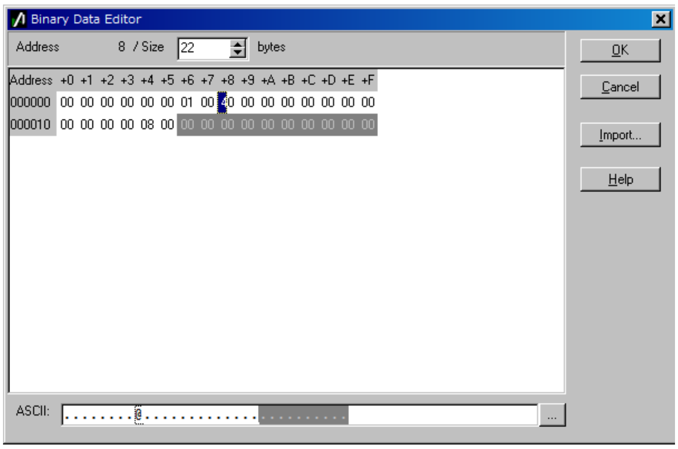


Figure 6.5.5-6 Top byte of EoMPLS MAC destination address

6.5.6 Sync Ethernet

This section describes the following functions related to Sync Ethernet:

- Addition of protocols to be decoded (SSM messages (ESMC PDU))
- Addition of Tx Stream templates (ESMC PDU)
- Addition of a preset menu of Filter/Trigger conditions (ESMC PDU)

(1) Decoded display of SSM messages

On the screens for data view and stream setting of Capture function (Stream Setting dialog), SSM messages are decoded according to G.8264 11.3.1 ESMC Format.

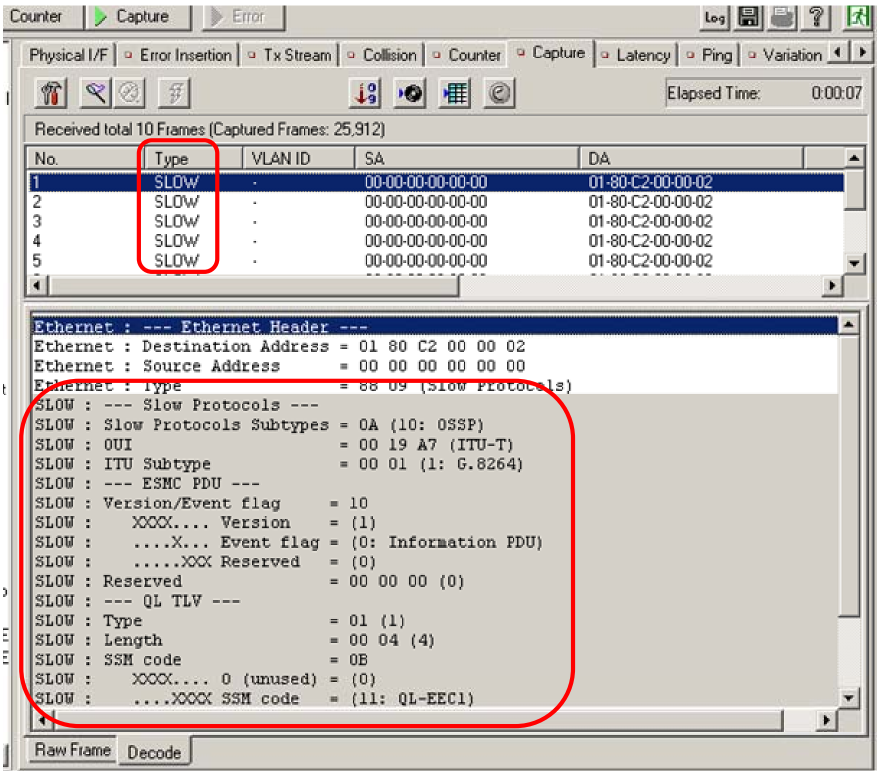


Figure 6.5.6-1 Decoded display of SSM messages

Note:

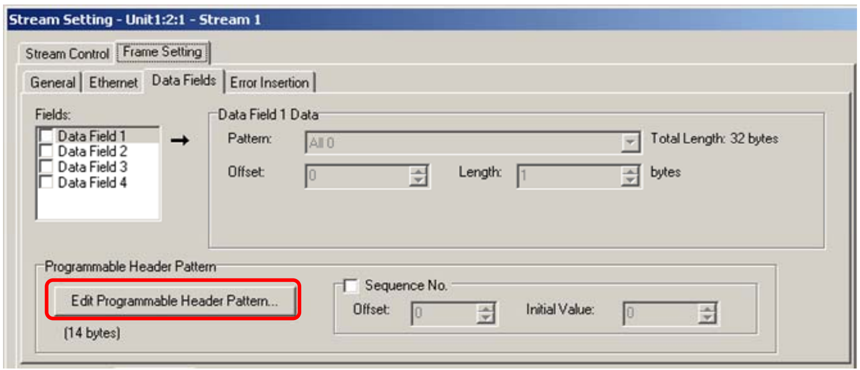
ESMC PDU is listed as “SLOW” (Slow Protocol).

(2) Tx Stream template

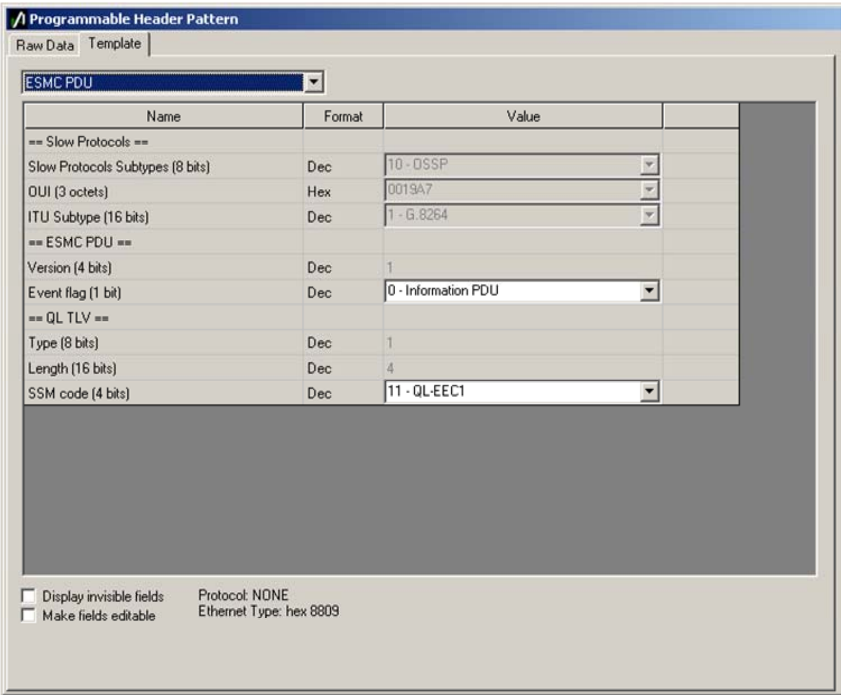
The Tx Stream function provides templates for sending SSM messages (ESMC PDU).

To use the templates:

1. Select **Stream Setting** and **Frame Setting**, and then press the **Edit Programmable Header Pattern...** button on the **Data Fields** tab.



2. In the displayed dialog, select the **Template** tab and **ESMC PDU**, and then type a value in each field.



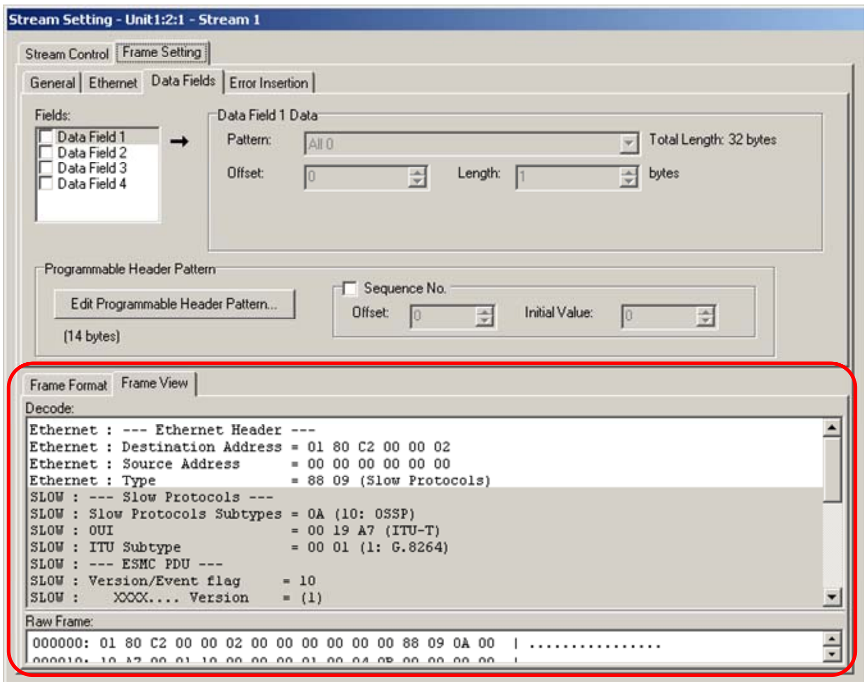
Press the **OK** button to set the specified values. This automatically changes the **Protocol** setting on the **General** tab and the **Type** setting on the **Ethernet** tab to “None” and “0x8809”, respectively.

Refer to Section 2.3.1 “Setting parameters, (b) Template tab” for details on other behaviors of the **Template** tab.

Note:

Destination MAC address (01 - 80 - C2 - 00 - 00 - 02) must be set manually.

3. You can confirm the setting with the template in decoded display on the **Frame View** tab at the bottom of the setting screen.



(3) Preset menus of Filter/Trigger conditions

The preset menu of **Filter/Trigger/Counter Condition Setting** shows "ESMC PDU".
This allows you to easily set conditions for filtering and counting ESMC PDU or capturing it.

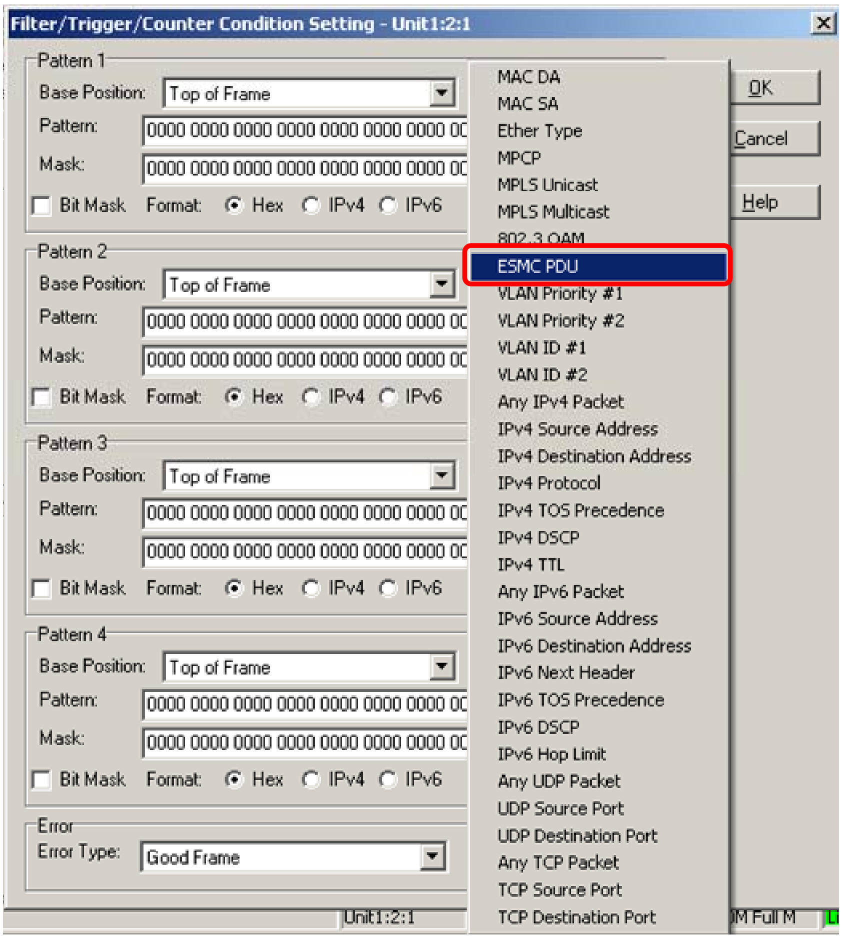


Figure 6.5.6-2 Filter/Trigger Condition menu

Refer to Section 5.9 "Setting Filter and Trigger Patterns" for details on Filter and Trigger functions.

6.5.7 MPLS-TP

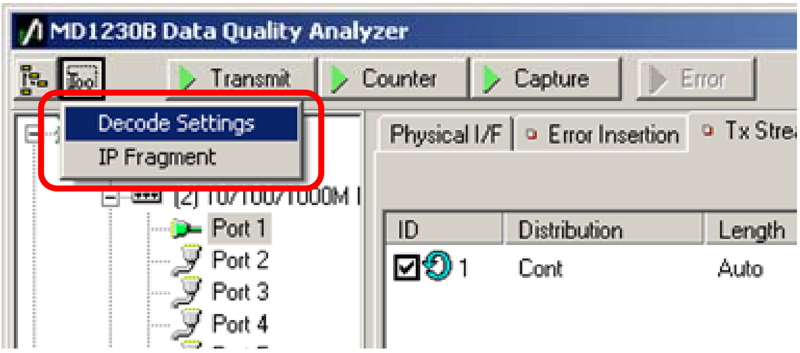
This section describes the following functions related to MPLS-TP:

- Addition of protocols to be decoded (MPLS Control Word)
- Addition of Tx Stream templates (Ethernet over MPLS (with Control Word))
- Addition of a preset menu of Filter/Trigger conditions (MPLS Unicast, MPLS Multicast)

(1) Decoded display of Ethernet over MPLS

On the screens for data view and stream setting of Capture function (Stream Setting dialog), Ethernet over MPLS is decoded according to RFC4448 (Encapsulation of Ethernet over MPLS). On the Decode Settings screen you can specify whether or not to decode it with Control Word. To set a decoded display:

1. Click the **Tool** button on top left of the screen, and select **Decode Settings** in the displayed menu.



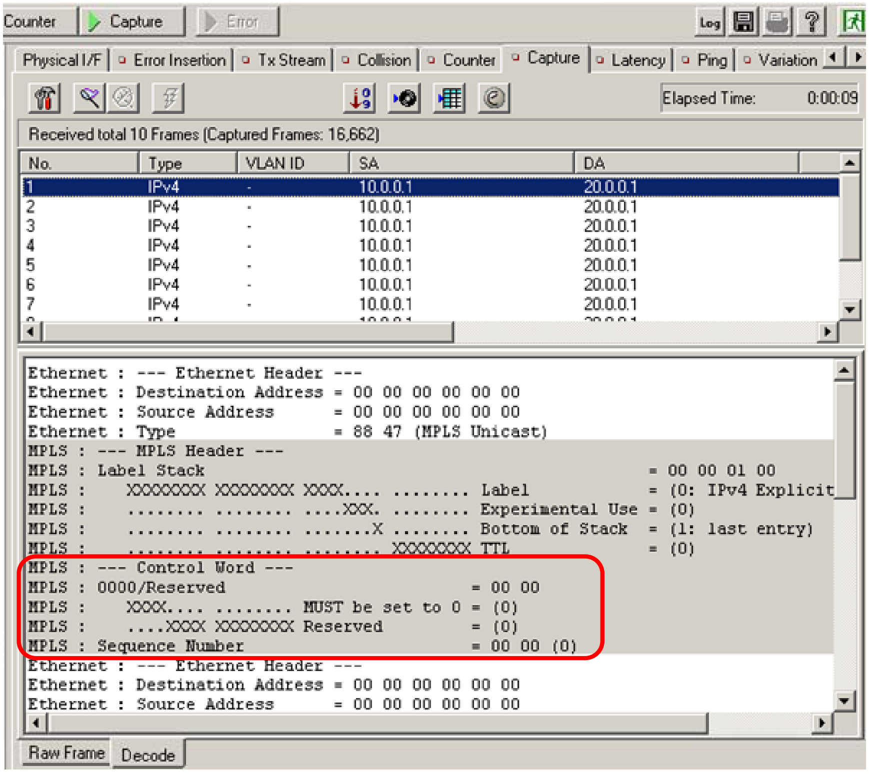
2. On the Decode Settings screen, set **Control Word**. Selecting the check box decodes it with Control Word.

Note:

The Decode Setting screen may hide moving behind of the Main

Application screen, because it is not a dialog of the Main Application screen.

3. Selecting the **Control Word** check box decodes it with Control Word.



Note:

The changes to the Decode Settings screen are reflected when the decoded display is updated by changing displayed items, etc.

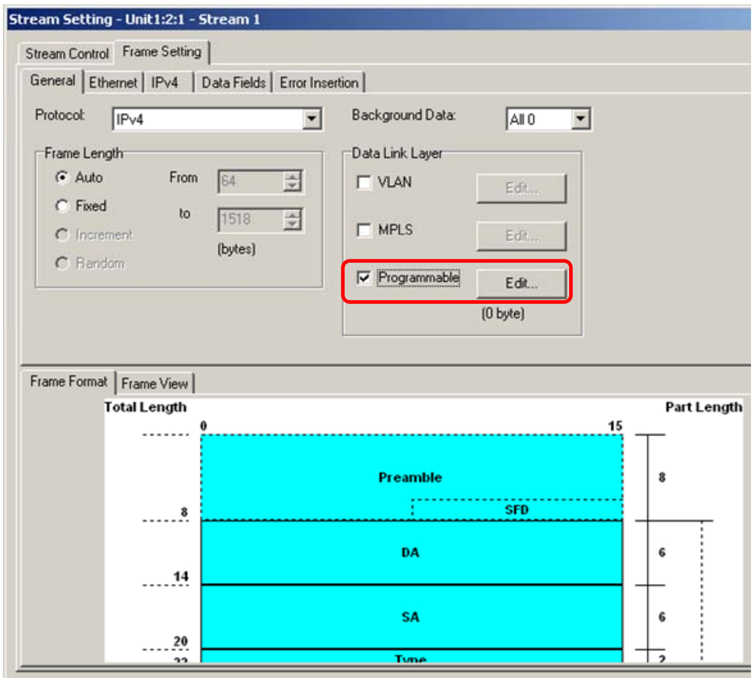
(2) Tx Stream template

Tx Stream function provides templates for sending Ethernet over MPLS frames.

- Ethernet over 1 MPLS
- Ethernet over 2 MPLS
- Ethernet over 3 MPLS
- Ethernet over 1 MPLS with Control Word
- Ethernet over 2 MPLS with Control Word
- Ethernet over 3 MPLS with Control Word

To use the templates:

1. Select **Stream Setting** and **Frame Setting** tab. On the **General** tab, select the **Programmable** check box in **Data Link Layer**, and press the **Edit ...** button.



When the dialog below appears, press **OK**.

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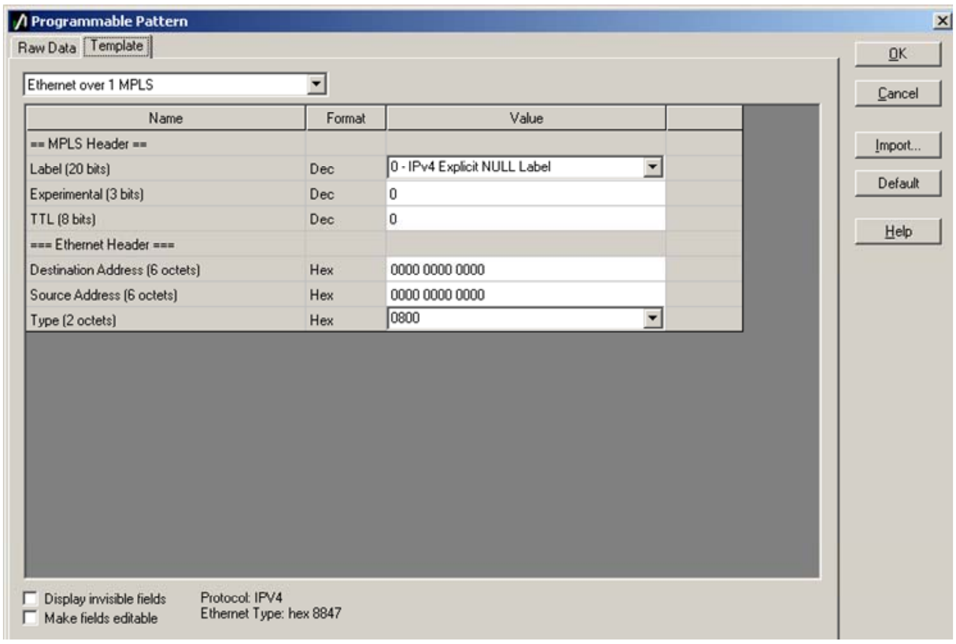
Functions Specific to Ethernet Modules

2. Select the **Template** tab in the **Programmable Pattern** dialog. Select a type for MPLS Encapsulation and type a value in each field.



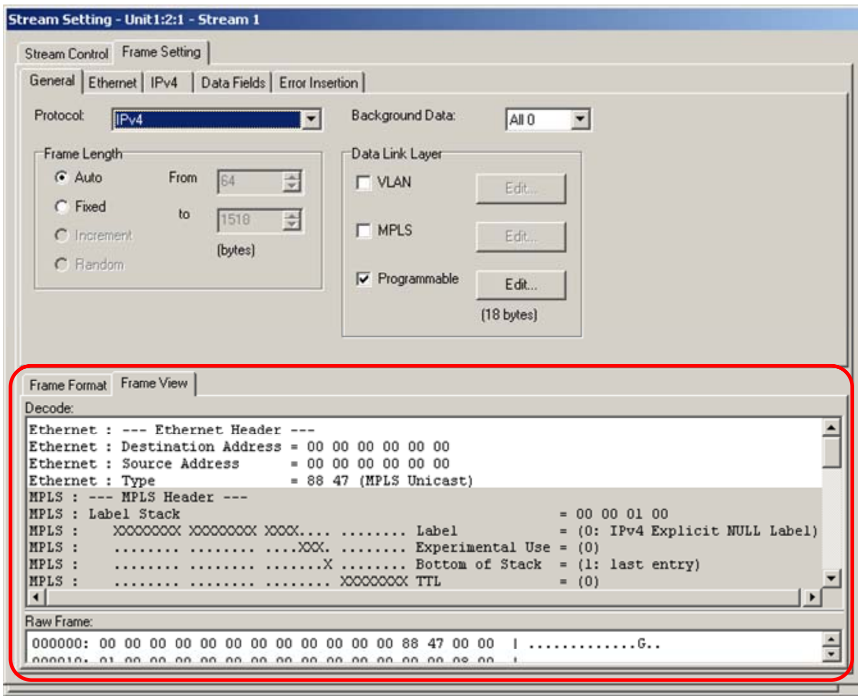
Press the **OK** button to set the specified values. This automatically changes the **Protocol** setting on the **General** tab and the **Type** setting on the **Ethernet** tab to “IPv4” and “0x8847”, respectively.

Refer to Section 2.3.1 “Setting parameters, (b) Template tab” for details on other behaviors of the Template tab.

Note:

You should set contents of network-side Ethernet headers and IP headers on the **Ethernet** and **IPv4** tabs rather than using this template.

3. You can confirm the setting with the template in decoded display on the **Frame View** tab at the bottom of the setting screen.



(3) Preset menus of Filter/Trigger conditions

The preset menu of **Filter/Trigger/Counter Condition Setting** shows "MPLS Unicast" and "MPLS Multicast".
This allows you to easily set conditions for filtering and counting packets with MPLS labels or capturing them.

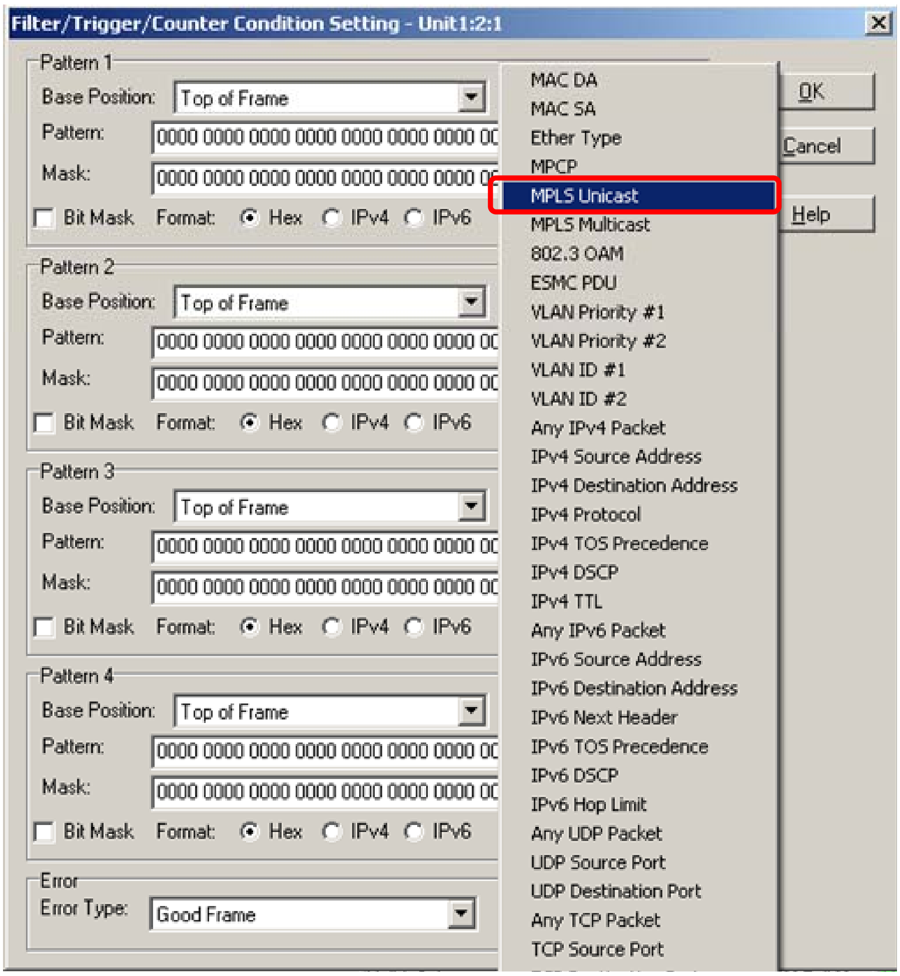


Figure 6.5.7-2 Filter/Trigger Condition menu

Refer to Section 5.9 "Setting Filter and Trigger Patterns" for details on Filter and Trigger functions.

6.6 Traffic Impairment Emulator

6.6.1 Traffic Impairment Emulator Function Overview

The Traffic Impairment Emulator function can be used to generate simulated network faults and check for resistance against network faults.

The following faults can be simulated with this function:

- Frame selection by filter
- Frame discard (Loss)
- Overwrite/error addition (Overwrite/Error Insertion)
- Delay
- Line error

Figure 6.6.1-1 shows a conceptual view of the Traffic Impairment Emulator.
Each function can be turned On or Off. When turned On, the function is applied to the frame matching the filter.

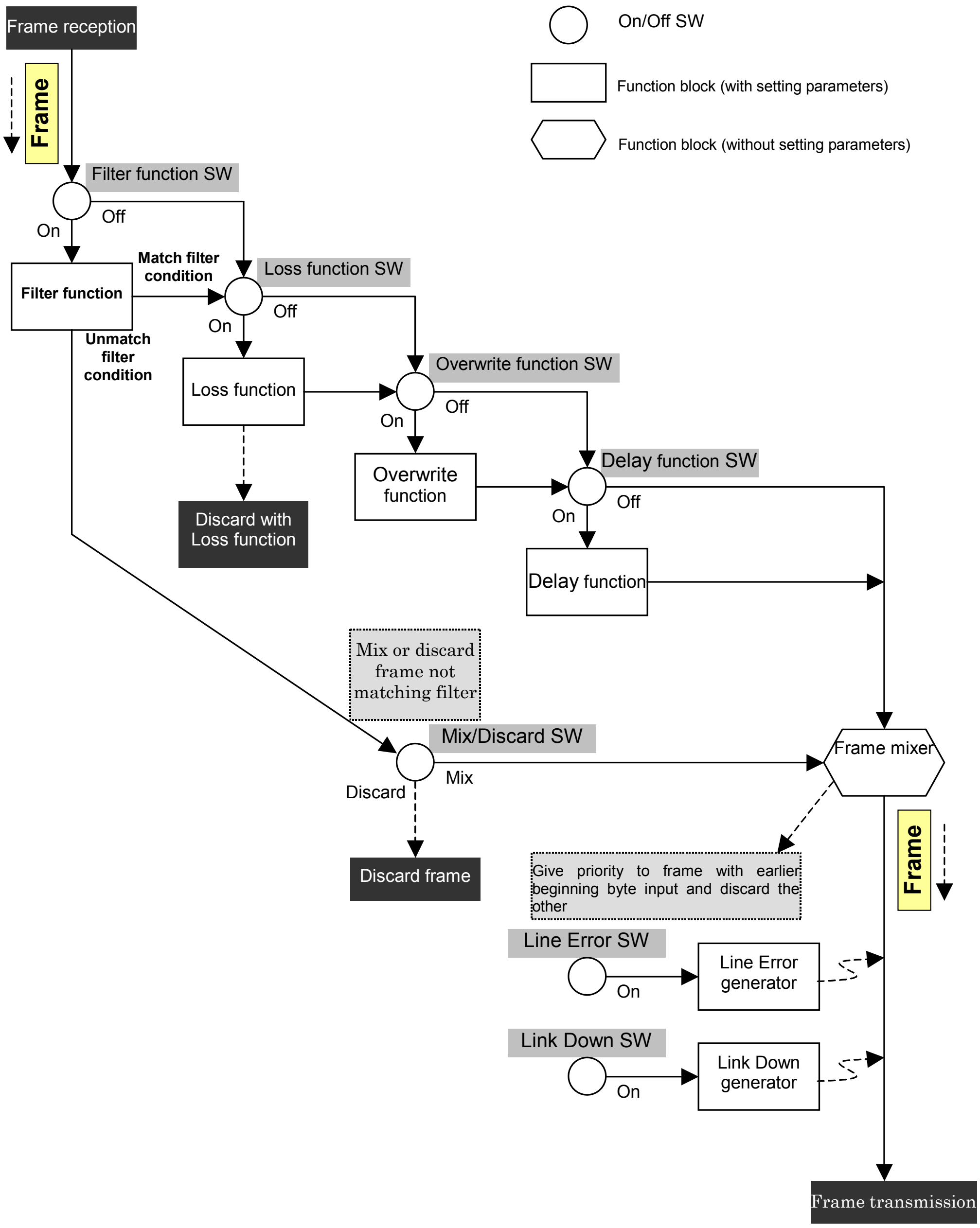


Figure 6.6.1-1 Traffic Impairment Emulator conceptual diagram

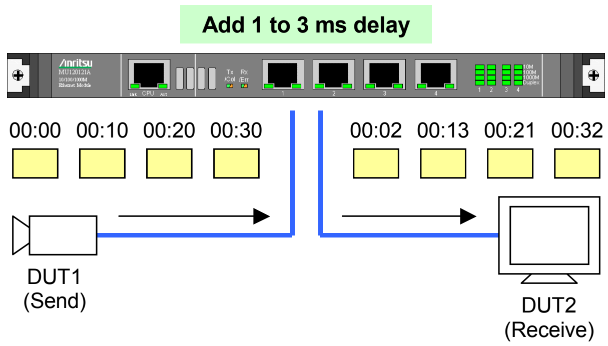


Figure 6.6.1-2 Test system reference diagram 1 (Jitter generation)

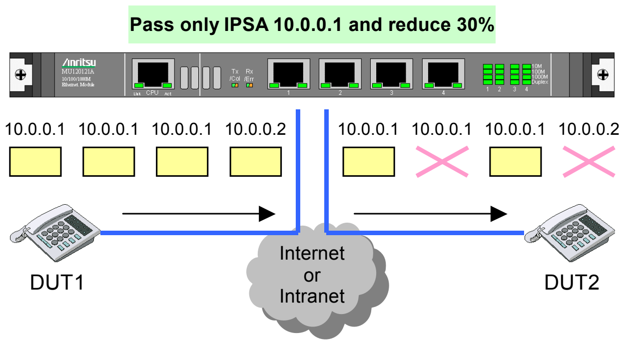


Figure 6.6.1-3 Test system reference diagram 2 (filtering specific condition)

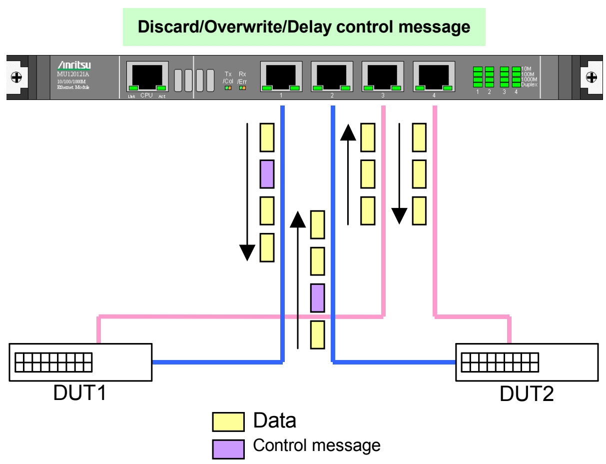


Figure 6.6.1-4 Test system reference diagram 3 (SIP control message fault test)

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Functions Specific to Ethernet Modules

Notes:

1. This function is available only when the Traffic Impairment Emulator is installed.
2. This function works on port 1 and 2 of MU120121A/22A .
   In this case, ports 1 and 2 are switched simultaneously because they are used in Through Mode.
3. Cascade connection of MU120121A/22A running as Traffic Impairment Emulator is not guaranteed.
4. Half Duplex is not supported.

6.6.2 Basic Operation

This section describes the basic operation of the Traffic Impairment Emulator function.

(1) Mode switching procedure

The relevant port must be changed to Impairment mode in order to use the Traffic Impairment Emulator function.

[1] Open the Setup Utility screen from the Selector screen.

[2] Open the **Firmware Functionality** tab and set the Firmware Configuration of the target slot to Traffic Impairment Emulator.

[3] Close the Setup Utility screen.

[4] Start the Main Application.

See Section 5.7 "Setting the Firmware Functionality" in the "MD1230B Data Quality Analyzer Instruction Manual" for information on how to switch the mode.

(2) Main screen

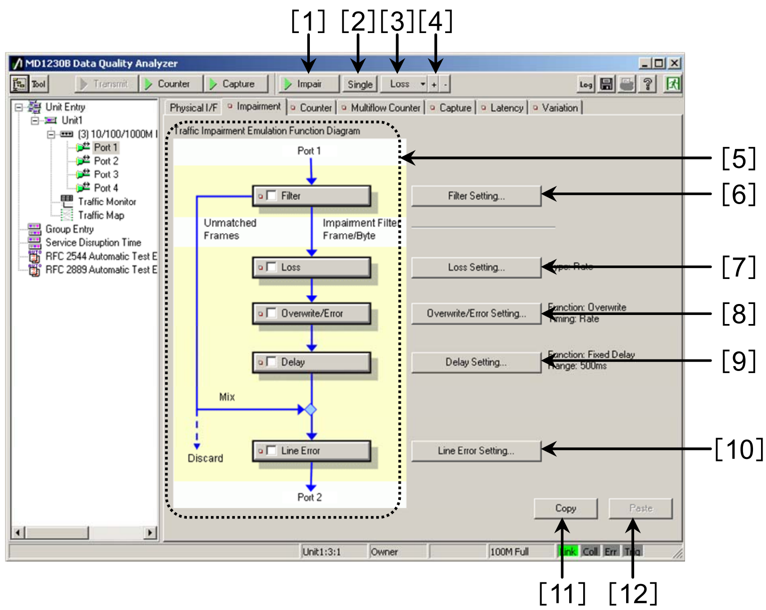

Figure 6.6.2-1 Impairment tab screen

Table 6.6.2-1 Impairment tab screen

	Item	Function
[1]	Impair	Turns On/Off the entire Traffic Impairment Emulator function. Default: Off
[2]	Single	Generate Loss, Overwrite/Error Insertion, Line Error at the desired timing.

	Item	Function
[3]	Loss / Ovr/Err / Delay *2	Select Loss, Overwrite/Error Insertion, or Delay and set the Rate. The selected function name is displayed on the button.
[4]	＋ － *2	Increments/decrements the Rate at interval set in [3].
[5]	Filter	Turns On/Off the Filter function. Default: Off
	Loss	Turns On/Off the Loss function. Default: Off
	Overwrite/Error	Turns On/Off the Overwrite/Error Insertion function. Default: Off
	Delay	Turns On/Off the Delay function. Default: Off
	Line Error	Turns On/Off the Line Error function. Default: Off
[6]	Filter Setting... *1	Displays the Impairment Filter Setting screen.
[7]	Loss Setting... *1	Displays the Impairment Setting (Loss tab) screen.
[8]	Overwrite/Error Setting... *1	Displays the Impairment Setting (Overwrite/Error Insertion tab) screen.
[9]	Delay Setting... *1	Displays the Impairment Setting (Delay tab) screen.
[10]	Line Error Setting... *1	Displays the Impairment Setting (Line Error tab) screen.
[11]	Copy	Copies the Traffic Impairment Emulator, Counter, Capture parameters.
[12]	Paste	Pastes the setting parameter copied in [11] to the port. ***Note:*** Unavailable if Traffic Impairment Emulator, Counter, or Capture is active.

*1: See Section 6.6.2 “(4) Preset and Step setting Function” for details.

*2: This settings cannot be changed while the Traffic Impairment Emulator function is running.

(3) Basic measurement procedure

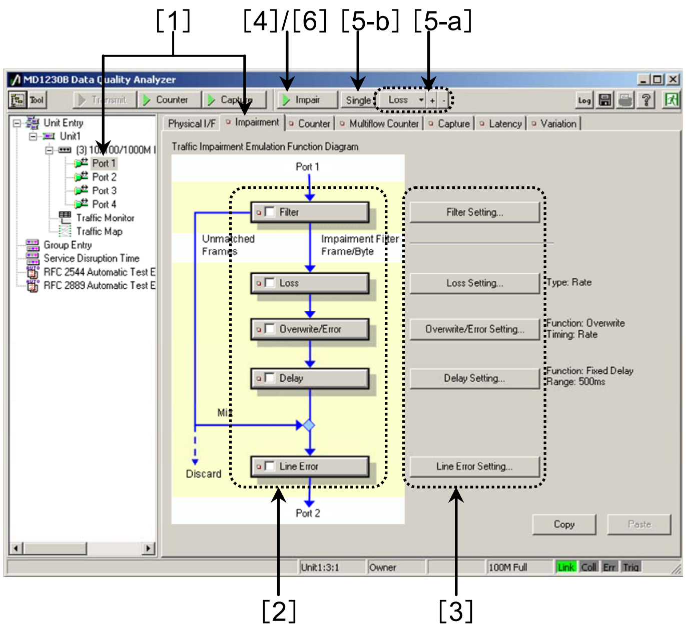

Figure 6.6.2-2 Impairment tab screen

[1] Select Port1 or Port2 and select the **Impairment** tab.

[2] Turn On/Off each checkbox in the Traffic Impairment Emulation Function Diagram to select the function block to enable simulated effect. More than one item can be selected at the same time.

[3] Select the effect Loss, Overwrite/Error Insertion, Delay, and Line Error and set the Filter.

See Section 6.6.3 "Setting Various Effects" for details on Loss, Overwrite/Error Insertion, Delay, and Line Error settings.

See Section 6.6.4 "Filter Settings" for details on Filter settings.

[4] Click **Impair** to start the simulated effect. All functions selected in [2] are activated.

[5] Perform the following operation as necessary while the Traffic Impairment Emulator function is active.

[a] Increment Loss, Overwrite/Error Insertion, or Delay rate at specific interval.

See Section 6.6.2 "(4) Preset and Step setting Function" for details.

[b] Click **Single** to generate Loss, Overwrite/Error Insertion, or Line Error.

Note:

Loss and Overwrite/Error Insertion can be executed only when Type or Timing is set to Single Burst.

[6] Click **Impair** to end the simulated effect. All Traffic Impairment Emulator functions are halted.

(4) Preset and Step setting function

This is a function to adjust the Increment Loss, Overwrite/Error Insertion, and Delay rate. It can be set while viewing screen other than the **Impairment** tab.

This function can be set while executing other functions.

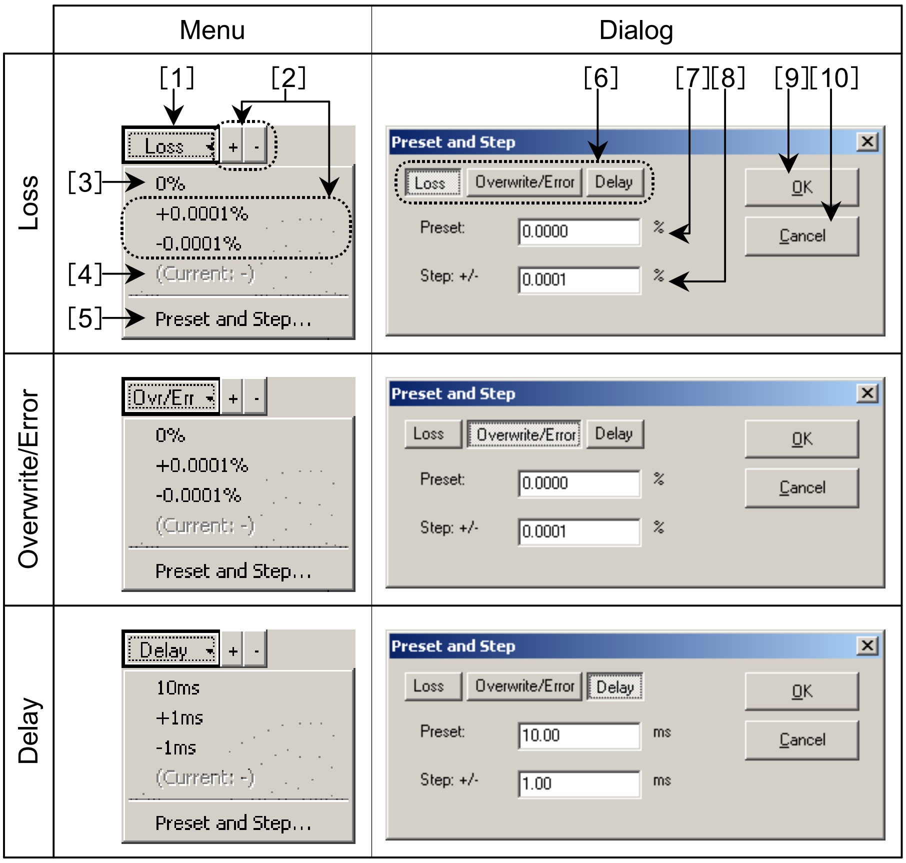

Figure 6.6.2-3 Preset and Step menu and dialog

Table 6.6.2-2 Preset and Step menu

	Item	Function
[1]	Loss / Ovr/Err / Delay	Displays the Preset and Step menu. The selected effect is displayed on the button.
[2]	+ - or +, - menu	Increments or decrements the rate of the selected effect by the value set in [8]. ***Note:*** If the increment/decrement amount exceeds the setting range, the upper/lower limit of the setting range is set. See [8] for the setting range.
[3]	Preset value	Sets the rate of the selected effect to the value in [7].

	Item	Function
[4]	Preset value	Displays the current rate of the selected effect.
[5]	Preset and Step...	Displays the Preset and Step dialog.
[6]	Loss Overwrite/Error Delay	Select an effect. The selected effect appears as the button name [1] and the dialog and menu changes as shown in Figure 6.6.2-3.
[7]	Preset	Sets the preset value of the effect selected in [6]. Range Loss : 0 to 100% Overwrite/Error : 0 to 100% Delay : 0.00 to 512.00 ms
[8]	Step	Sets the step value of the effect selected in [6]. Range Loss : 0 to 100% Overwrite/Error : 0 to 100% Delay : 0.00 to 512.00 ms
[9]	OK	Saves the changed settings and closes the dialog. ***Note:*** Only the settings for the selected effect [6] are saved.
[10]	Cancel	Closes the dialog without saving the changes.

Notes:

1. For Loss and Overwrite/Error Insertion, this function is valid only when Type or Timing is set to Rate.
2. Frames lost with the Loss function are counted as Lost Frames.
3. The following restrictions apply when Delay is selected.

Table 6.6.2-4 Restriction list at Delay is selected

Range	Description
500 ms	Delay is not changed unless the gap between frames is at least 44 bytes.
5 s	If the Link speed is 100 Mbps or 10 Mbps, Delay is not changed unless the gap between frames is at least 44 bytes. If the Link speed is 1000 M, the gap between frames must be at least (frame length x10+440) bytes.
50 s	If the Link speed is 10 Mbps, Delay is not changed unless the gap between frames is at least 44 bytes. If the Link speed is 100 M, the gap between frames must be at least (frame length x10+440) bytes. If the Link speed is 1000 M, the gap between frames must be at least (frame length x100+4400) bytes.

☞See Section 6.6.3 "Setting Various Effects" for details on Loss, Overwrite/Error Insertion settings.

6.6.3 Setting Various Effects

This section describes how to set frame discard (Loss), Overwrite/Error Addition (Overwrite/Error Insertion), Delay, and Line Error.

(1) Frame discard (Loss)

Frame discard (Loss) is a function to discard specific frame at specified rate.

It can be used to test the following cases:

- Insert errors in the normal sequence of a given protocol and check that error is properly avoided.
- Discard frames containing voice and image data and check the effect on service.

Frame discard (Loss) consists of Frame Loss function and Policing function.

- Frame Loss function
  Monitors frame rate and blocks data exceeding the set frame rate.

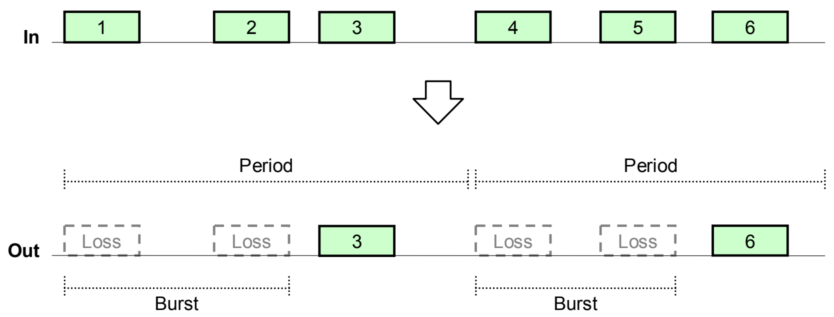

Figure 6.6.3-1 Frame Loss function conceptual diagram

- Policing function
  Monitors the data rate and blocks data exceeding the set data rate. This is suitable for simulating the behavior of line with narrow communication bandwidth.

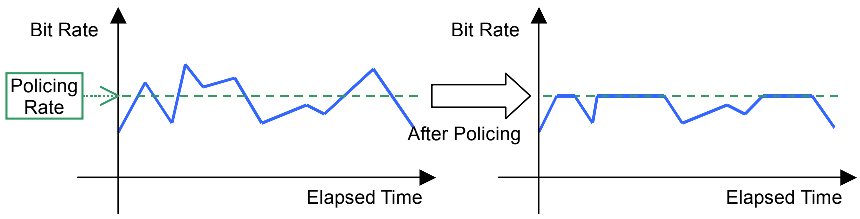

Figure 6.6.3-2 Policing function conceptual diagram

Setting Loss

Loss is set from the **Loss** tab of the Impairment Setting screen.

See Section 6.6.2 "Basic Operation" for information on how to display the Impairment Setting screen.

The frame discarding method changes according to the Type selection. The default Type is Rate. The setting for each Type is shown below.

[1] Type: All

Discards all frames while the Loss function is On.

Note:

Type is the only available setting.

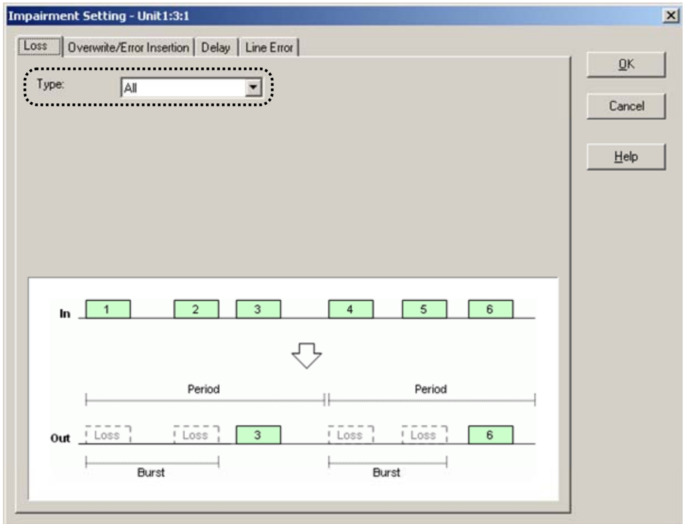

Figure 6.6.3-3 Impairment Setting (Loss tab) screen Type: All

[2] Type: Single Burst

When **Single** is clicked on the main screen, the number of frames set with [A] Burst are discarded.

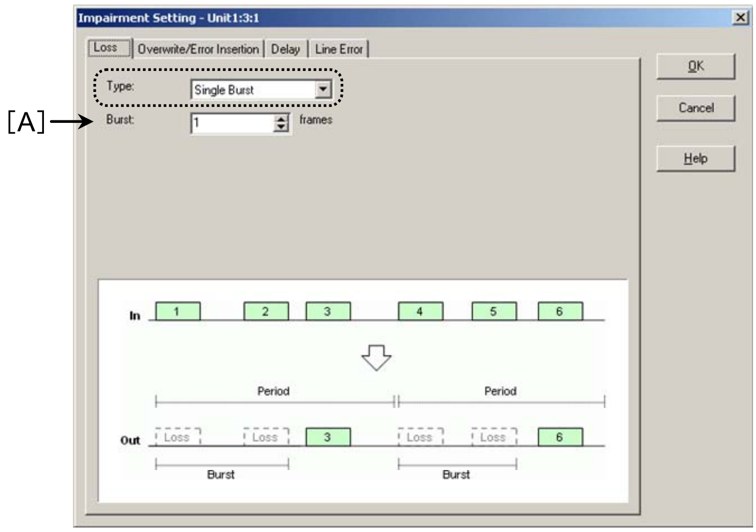

Figure 6.6.3-4 Impairment Setting (Loss tab) screen Type: Single Burst

Table 6.6.3-1 Impairment Setting (Loss tab) screen Type: Single Burst

	Item	Function
[A]	Burst	Sets the number of frames to discard. Range : 1 to 1,000,000 Default : 1

[3] Type: Periodic Burst

Discards the number of frames set with [A] Burst at the interval set with [B] Period.

Note:

When Burst and Period are set to the same value, the operation is the same as Type: All.

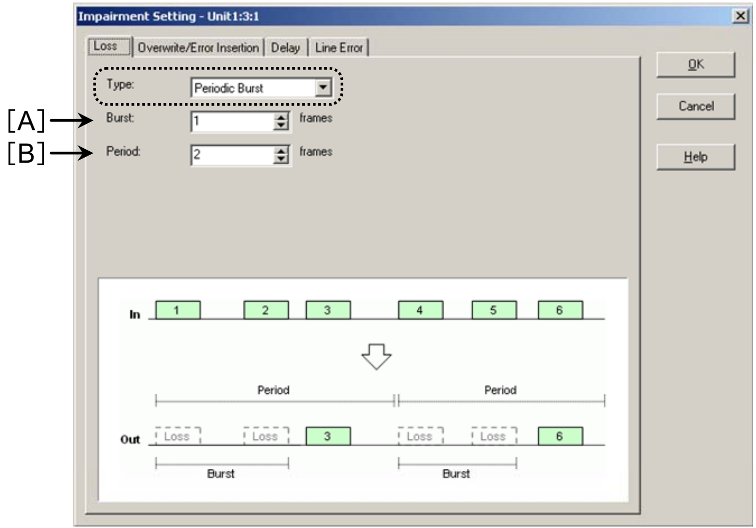

Figure 6.6.3-5 Impairment Setting (Loss tab) screen Type: Periodic Burst

Table 6.6.3-2 Impairment Setting (Loss tab) screen Type: Periodic Burst

	Item	Function
[A]	Burst	Sets the number of frames to discard. The value is the same as Period when value greater than [B] Period is set. Range : 1 to 1,000,000 Default : 1
[B]	Period	Sets the interval to discard frames. Range : 1 to 1,000,000 Default : 2

[4] Type: Rate

Discards frames at the rate set with [A] Rate while the Loss function is On.

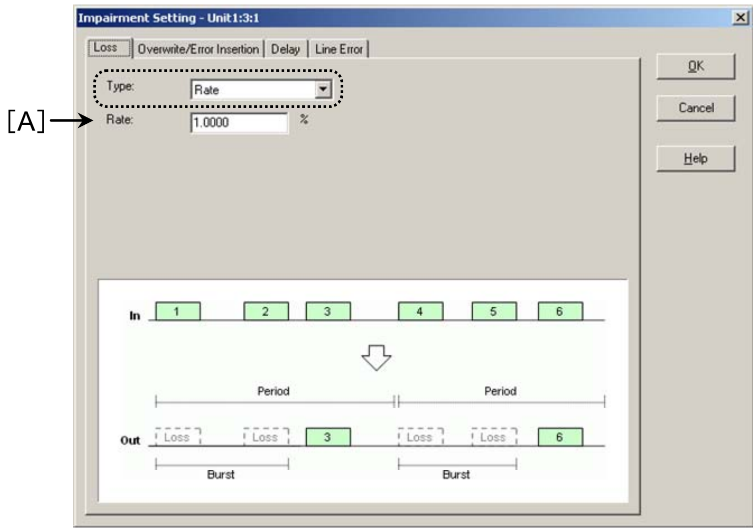

Figure 6.6.3-6 Impairment Setting (Loss tab) screen Type: Rate

Table 6.6.3-3 Impairment Setting (Loss tab) screen Type: Rate

	Item	Function
[A]	Rate	Sets the rate of frames to discard. Range : 0 to 100% Default : 1.0000%

[5] Type: Policing

Discards frames exceeding [A] Policing Rate while the Loss function is On.

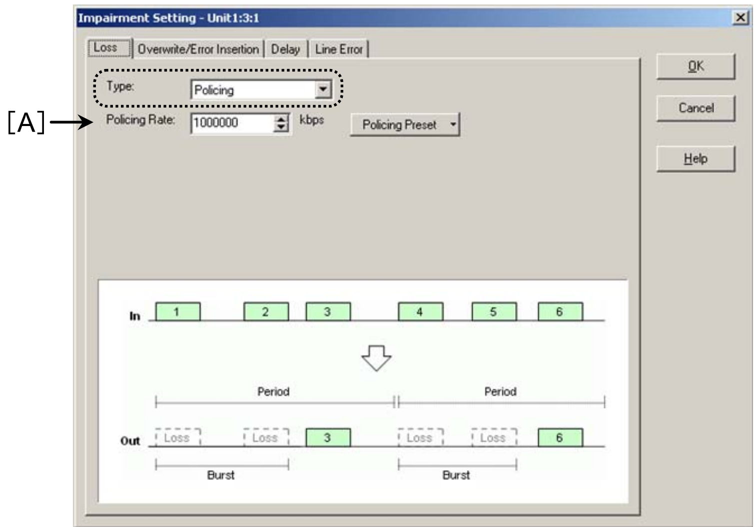

Figure 6.6.3-7 Impairment Setting (Loss tab) screen Type: Policing

Table 6.6.3-4 Impairment Setting (Loss tab) screen Type: Policing

	Item	Function
[A]	Policing Rate	Blocks data exceeding the data rate set with this item. Set the data rate directly with the spin box or select from the preset values displayed in **Policing Preset**. Range :0 to 1,000,000 kbps Default :1,000,000 kbps Preset values

Preset	Rate(bps)
64k	64k
384k	384k
1.5M(T1)	1.544M
2M(E1)	2.048M
10M(10BASE-T)	10.000M
34M(E3)	34.368M
45M(T3)	44.736M
52M(OC-1/STM-0)	51.840M
100M(100BASE-TX)	100.000M
139M(E4)	139.264M
155M(OC-3/STM-1)	155.520M
622M(OC-12/STM-4)	622.080M

Notes:

1. Policing monitors the passing bits at 1 ms interval.
   Policing may be up to "bit length of passing frame x 1000" greater than the set bit rate.

2. The bandwidth set with preset value becomes the wire rate.
   The bandwidth of the actual line is less than this depending on the mapping method and frame length.

(2) Overwrite/Error Addition (Overwrite/Error Insertion)

Overwrite (Overwrite/Error Insertion) is a function to overwrite specific portion of the data or overwrite error detection field to intentionally generate an error

It can be used to test the following cases:

- Insert errors in the normal sequence of a given protocol and check that the device or application behaves as specified.
- Discard the data portion and check that error correction function such as FEC works properly and there is no abnormal termination.

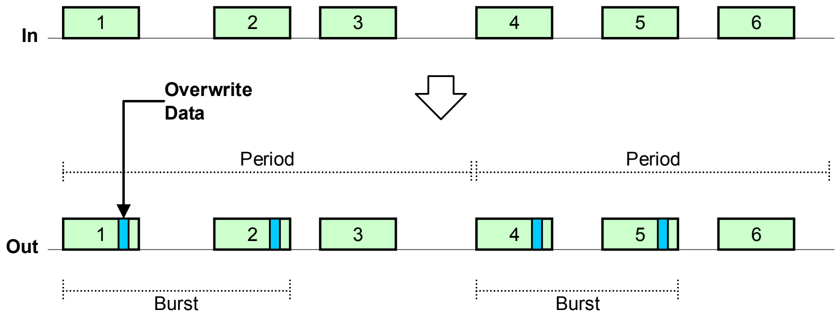

Figure 6.6.3-8 Overwrite/Error Insertion function conceptual diagram

Setting Overwrite/Error Insertion

Overwrite/Error Insertion is set from the **Overwrite/Error Insertion** tab of the Impairment Setting screen.

See Section 6.6.2 "Basic Operation" for information on how to display the Impairment Setting screen.

The displayed and set contents change depending on whether **Overwrite** or **Error Insertion** is selected. The setting for each is shown below.

Notes:

1. **Overwrite** and **Error Insertion** cannot be set/executed at the same time.

2. Up to four locations can be overwritten per frame.
   Each overwrite area is 16 bits (with mask).

3. Data overwrite range is from the beginning of the Ethernet MAC address to the first byte of FCS.

4. The following setting is effective when the data overwrite positions are overlapped.

5. When the data overwrite location is Checksum calculation range or FCS calculation range, Checksum and FCS are recalculated using the overwritten value. However, recalculation is not performed in the following cases:

   - When the data overwrite position and Checksum position overlap, data overwrite takes precedence.
   - When UDP Checksum of input data is 0000 (h), Checksum is not recalculated even when data is overwritten.
   - When there is a TCP/UDP Header and IHL, Protocol, and Length values in the IPv4 header or Next Header and Length values in the IPv6 header are overwritten, TCP/UDP Checksum is not recalculated. However, if Next header and Length values in IPv6 Header are not overwritten and only Next Header and Length values in the IPv6 Extension Header are overwritten, TCP/UDP Checksum is recalculated.
   - When the frame includes an IP packet and judged as fragment packet TCP/UDP Checksum is not recalculated. Condition to be judged as flagment packet is that Flagment MFbit of IPv4 is 1, Flagment MFbit of IPv6 is 1, or Flagment Offset is not 0.

[1] Overwrite

This is a function to overwrite the specific portion of data.

The overwrite timing changes according to the Timing selection. The default Timing is Rate. The setting for each Timing is shown below.

(a) Timing: All

Overwrites all frames while the Overwrite/Error Insertion function is On.

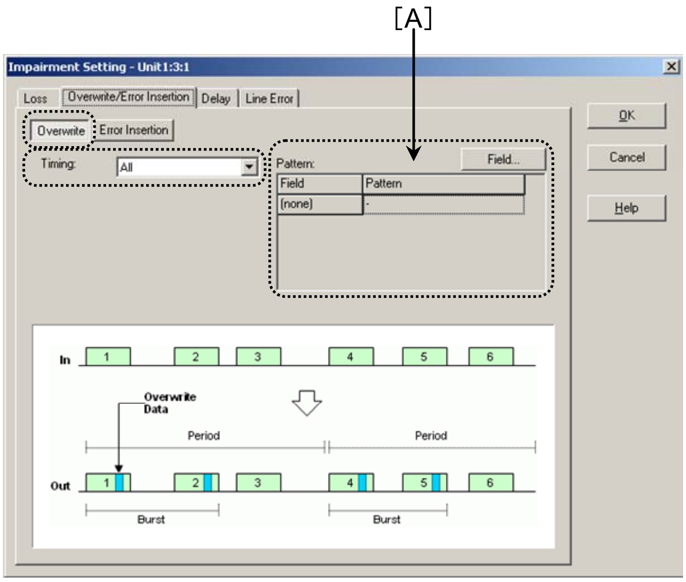

Figure 6.6.3-9 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: All

Table 6.6.3-5 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: All

	Item	Function
[A]	Pattern	Sets the overwrite pattern for each field. First, open the Field Setting screen from **Field...** and select the field to overwrite. Up to four fields can be selected. Then, edit the overwrite pattern of the selected field with the table portion of this setting. ***Note:*** If the overwritten parts of the selected field overlap, precedence is given from the top of the table. See "(i) Field Setting" for the details of the Field Setting Screen. Default :None

(i) Field Setting

Select the field to overwrite. Or edit various settings of the field.

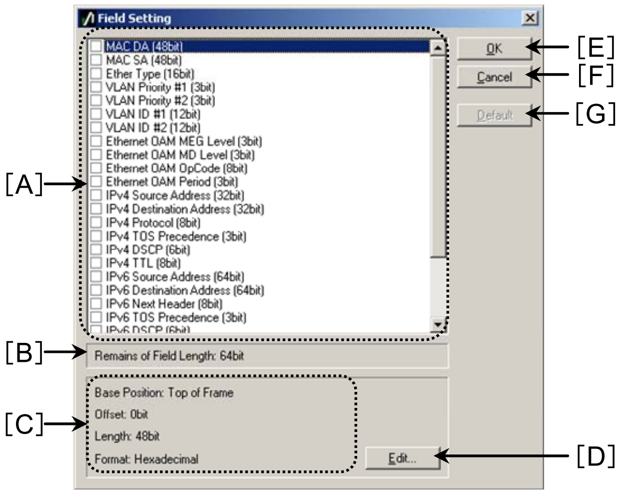

Figure 6.6.3-10 Field Setting screen

Table 6.6.3-6 Field Setting screen

	Item	Function
[A]	Selects the field to overwrite. Up to four fields for a total of up to 64 bits can be selected. Checkmark the checkbox to select. However, grayed items cannot be selected.	
[B]	Remains of Field Length	Displays the remaining field length in number of bits.
[C]	Displays the Base Position, Offset, Length, and Format of the field selected with the cursor.	
[D]	Edit...	Edits various settings of the field selected with the cursor. Opens the Field Edit screen. ***Note:*** Editing is disabled when selected field is checked.
[E]	OK	Saves the field selection and closes the screen.
[F]	Cancel	Closes the screen without saving the field selection. ***Note:*** The field settings edited in the Field Edit screen are saved.
[G]	Default	Returns various settings of all fields to default.

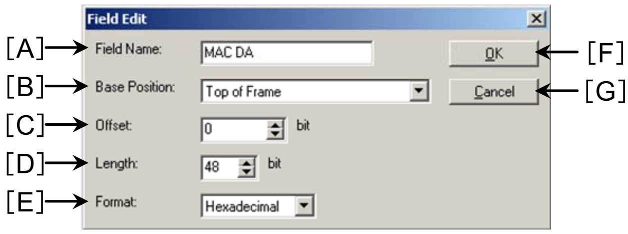

Figure 6.6.3-11 Field Edit screen

Table 6.6.3-7 Field Edit screen

	Item	Function
[A]	Field Name	Sets field name. Maximum length : 24 bytes
[B]	Base Position	Selects the Base Position. See Section "5.9.3 [3] Pattern specification 1
[C]	Offset	Sets the Offset. Range : 0 to 524280 bits
[D]	Length	Sets the field width. Range : 1 to 64 bits
[E]	Format	Selects the input format for setting the overwrite pattern from the following. [Decimal] [Hexadecimal] [IPv4 Address] [IPv6 Address] Default : Decimal
[F]	OK	Saves the settings and closes the screen.
[G]	Cancel	Closes the screen without saving the setting.

(b) Timing: Single Burst

When **Single** is clicked on the main screen, the number of frames set with [B] Burst are overwritten.

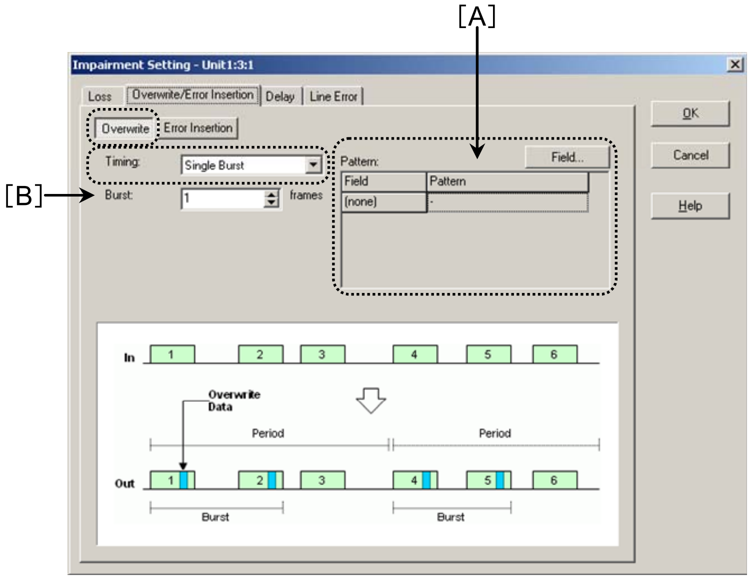

Figure 6.6.3-12 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Single Burst

Table 6.6.3-8 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Single Burst

	Item	Function
[A]	Pattern	Sets the overwrite pattern for each field. First, open the Field Setting screen from **Field...** and select the field to overwrite. Up to four fields can be selected. Then, edit the overwrite pattern of the selected field with the table portion of this setting. ***Note:*** If the overwritten parts of the selected field overlap, precedence is given from the top of the table. See "(a) (i) Field Setting" for the details of the Field Setting Screen. Default : None
[B]	Burst	Sets the number of frames to overwrite. Range : 1 to 1,000,000 Default : 1

(c) Timing: Periodic Burst

Overwrites the number of frames set with [B] Burst at the interval set with [C] Period.

Note:

When Burst and Period are set to the same value, the operation is the same as Type: All.

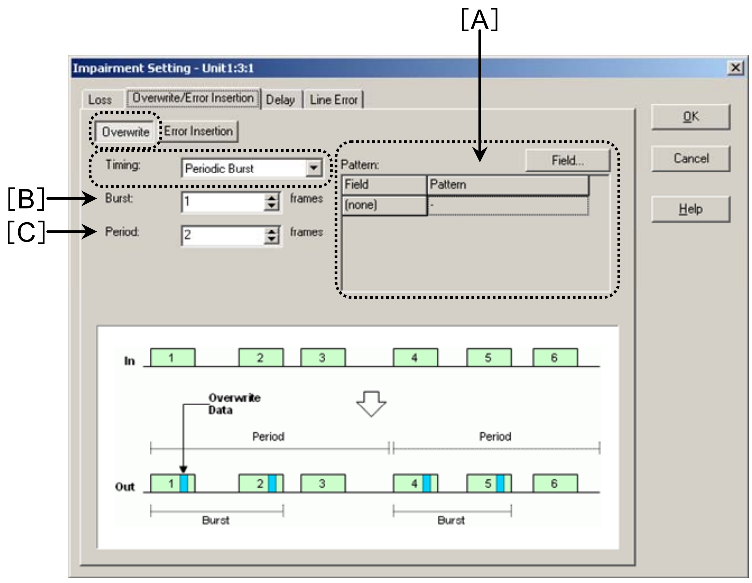

Figure 6.6.3-13 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Periodic Burst

Table 6.6.3-9 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Periodic Burst

	Item	Function
[A]	Pattern	Sets the overwrite pattern for each field. First, open the Field Setting screen from **Field...** and select the field to overwrite. Up to four fields can be selected. Then, edit the overwrite pattern of the selected field with the table portion of this setting. ***Note:*** If the overwritten parts of the selected field overlap, precedence is given from the top of the table. See "(a) (i) Field Setting" for the details of the Field Setting Screen. Default : None
[B]	Burst	Sets the number of frames to overwrite. Range : 1 to 1,000,000 Default : 1

	Item	Function
[C]	Period	Sets the interval to overwrite frames. Range : 1 to 1,000,000 Default : 2

(d) Timing: Rate

Overwrites the frames at the rate set with [B] Rate while the Overwrite/Error Insertion function is On.

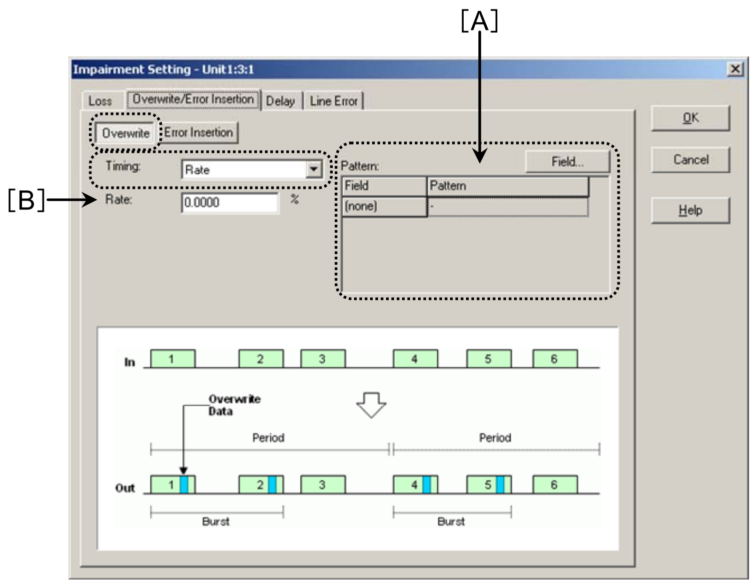

Figure 6.6.3-14 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Rate

Table 6.6.3-10 Impairment Setting (Overwrite/Error Insertion tab) screen Overwrite, Timing: Rate

	Item	Function
[A]	Pattern	Sets the overwrite pattern for each field. First, open the Field Setting screen from **Field...** and select the field to overwrite. Up to four fields can be selected. Then, edit the overwrite pattern of the selected field with the table portion of this setting. ***Note:*** If the overwritten parts of the selected field overlap, precedence is given from the top of the table. See "(a) (i) Field Setting" for the details of the Field Setting Screen. Default : None
[B]	Rate	Sets the rate of frames to overwrite. Range : 0 to 100% Default : 0.0000%

[2] Error Insertion

This is a function to overwrite the error detection field to intentionally generate an error. The overwrite timing changes according to the Timing selection. The default Timing is Rate. The setting for each Timing is shown below.

(a) Timing: All

Inserts error in all frames while the Overwrite/Error Insertion function is On.

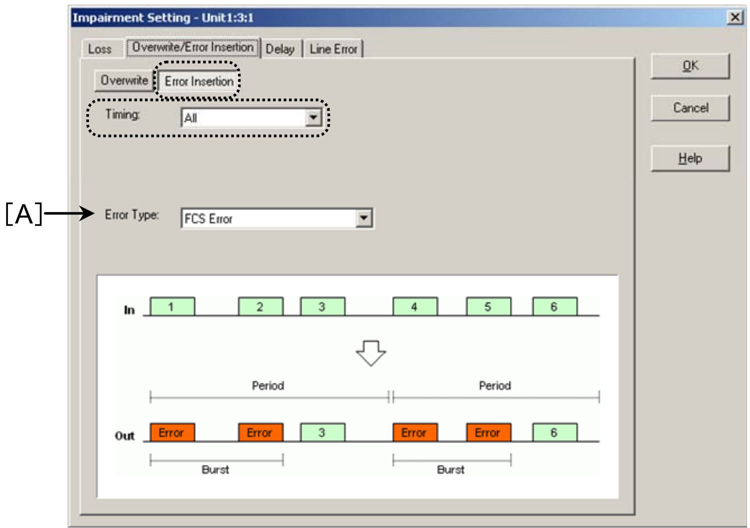

Figure 6.6.3-15 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: All

Table 6.6.3-11 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: All

	Item	Function
[A]	Error Type	Select the tipe of error to insert from the following: FCS Error • Inverts the bits of FCS 4 bytes. IPv4 Header Checksum Error • Subtracts 1 from IP Header Checksum. TCP Checksum Error • Subtracts 1 from TCP Checksum. UDP Checksum Error • Subtracts 1 from UDP Checksum. However, if the Checksum is 0, Checksum is incremented by 1.

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(b) Timing: Single Burst

Inserts error in the number of frames set with [A] Burst when **Single** is clicked on the main screen.

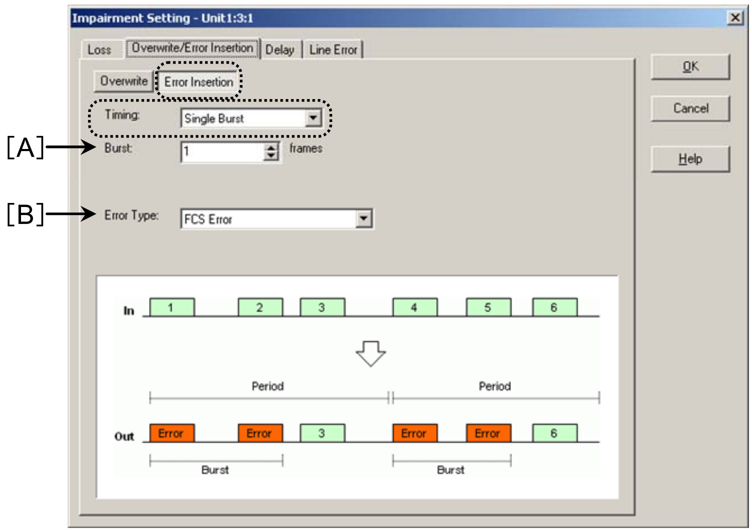

Figure 6.6.3-16 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Single Burst

Table 6.6.3-12 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Single Burst

	Item	Function
[A]	Burst	Sets the number of frames to insert errors. Range :1 to 1,000,000 Default :1
[B]	Error Type	Selects the type of error to insert.

(c) Timing: Periodic Burst

Inserts errors in the number of frames set with [A] Burst at the interval set with [B] Period.

Note:

When Burst and Period are set to the same value, the operation is the same as Type: All.

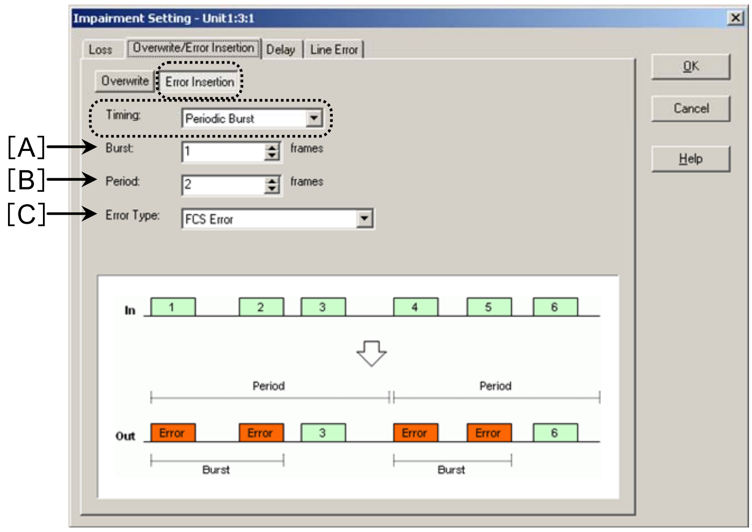

Figure 6.6.3-17 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Periodic Burst

Table 6.6.3-13 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Periodic Burst

	Item	Function
[A]	Burst	Sets the number of frames to insert errors. Range :1 to 1,000,000 Default :1
[B]	Period	Sets the interval to insert errors in the frame. Range :1 to 1,000,000 Default :2
[C]	Error Type	Selects the type of error to insert.

(d) Timing: Rate

Inserts errors at the rate set with [B] Rate while the Overwrite/Error Insertion function is On.

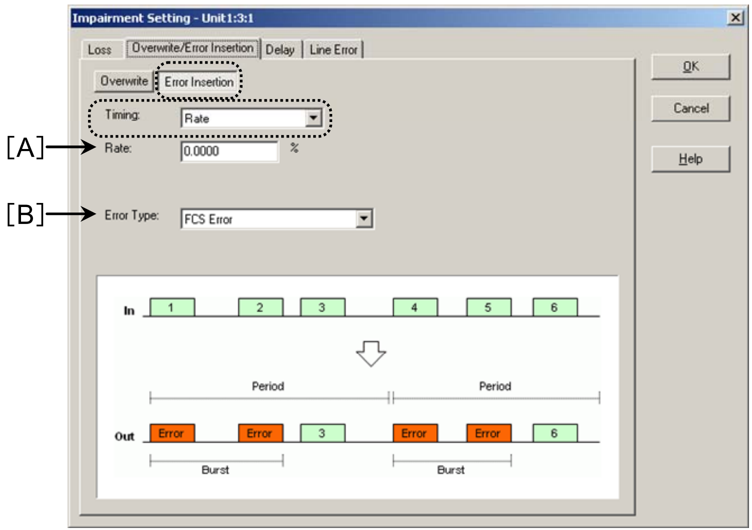

Figure 6.6.3-18 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Rate

Table 6.6.3-14 Impairment Setting (Overwrite/Error Insertion tab) screen Error Insertion, Timing: Rate

	Item	Function
[A]	Rate	Sets the rate of frames to insert errors. Range :0 to 100% Default :0.0000%
[B]	Error Type	Selects the type of error to insert.

(3) Delay

Delay is a function to add delay to a frame. Delay from 0 to 51.2 s*2 can be added based on the absolute delay*1 generated with the execution of Delay. It can be used to test the following cases:

- Check operation for bi-directional communication service (VoIP).
- Cause delay in the exchange of protocol and check the operation.

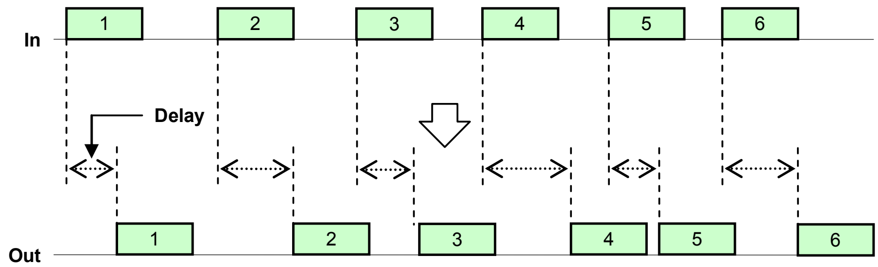

Figure 6.6.3-19 Delay function conceptual diagram

*1: Absolute delay is the time it takes for data to enter Port 1 (or Port 2), pass through Filter, Loss, Overwrite/Error Insertion, and Delay (0s) functions and exit from Port 2 (or Port 1).

*2: The bit rate of the passing frame is restricted by Range.

See [1] Fixed Delay table 6.6.3-15 "[B] Delay "for information on Range.

Delay consists of Fixed Delay function and Delay Variation function.

- Fixed Delay function
  A fixed delay is added to all frames matching the filter. This is suitable for limit test.
- Delay Variation function
  A delay that fluctuates according to probability distribution is added to all frames matching the filter. This is suitable for test simulating an actual line.
  Probability distribution can be selected from the following:
  - Uniform Distribution
  - Normal Distribution
  - Exponential Distribution
  - Custom Distribution

Setting Delay

Delay is set from the **Delay** tab of the Impairment Setting screen.

See Section 6.6.2 "Basic Operation" for information on how to display the Impairment Setting screen.

The displayed and set contents change depending on whether **Fixed Delay** or **Delay Variation** is selected. The setting for each is shown below.

Notes:

1. **Fixed Delay** and **Delay Variation** cannot be set/executed at the same time.

2. The settings can be changed only when the Traffic Impairment Emulator is Off.
   However, the amount of Delay can be changed without turning the Traffic Impairment Emulator function to Off, by using the Preset and Step function at Fixed Delay.

3. Even if the Delay function is changed in the negative direction, the Current Delay may not necessarily change immediately to the changed value. It gradually approaches the changed value using the interval between frames.

4. Port1: Received Frame and sum of Port1: Unavoidably Dropped Frame, Lost Frame, Port2: Transmitted Frame will be equal.

5. When the Delay function is turned Off, the frame in the buffer is dropped. That number is counted as the Avoidably Drooped Frames.

6. When used on 10 M Link, the preamble must be at least 7 bytes. If it is less, packets may not pass through correctly.

[1] Fixed Delay

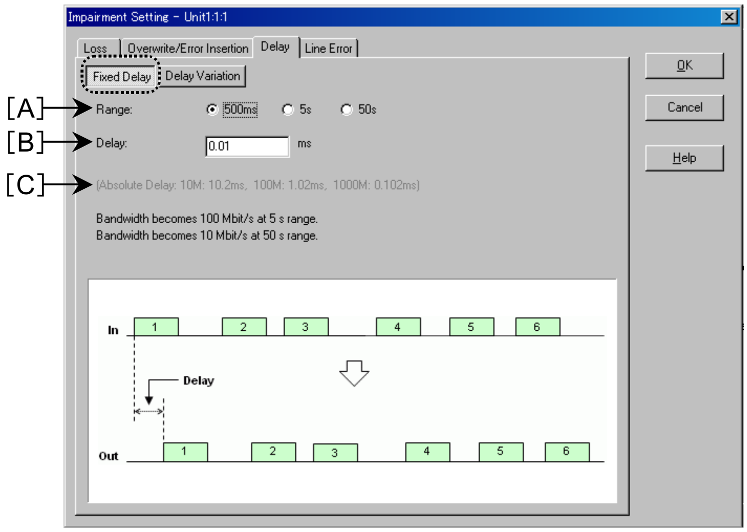

Figure 6.6.3-20 Impairment Setting (Delay tab) screen Fixed Delay

Table 6.6.3-15 Impairment Setting (Delay tab) screen Fixed Delay

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Range</td><td>Sets the range.
Default: 500ms</td></tr>
<tr><td>[B]</td><td>Delay</td><td>Sets the delay time. The range depends on the Range selection.
<table>
<tr><th>Range</th><th>Setting Range</th><th>Bandwidth guaranteed range</th></tr>
<tr><td>500ms</td><td>0.01 to 512.00 ms</td><td>1000 Mbps</td></tr>
<tr><td>5s</td><td>0.1 to 5120.0 ms</td><td>100 Mbps</td></tr>
<tr><td>50s</td><td>1 to 51200 ms</td><td>10 Mbps</td></tr>
</table>
Default : (Range) (Default)
500ms ··· 0.01 ms
5s ··· 0.1 ms
50s ··· 1 ms</td></tr>
<tr><td>[C]</td><td>Absolute Delay</td><td>Displays the absolute delay.</td></tr>
</table>

Notes:

1. The settings have the following margin of error.
   Range 500 ms : ±256 ns
   Range 5 s : ±2560 ns
   Range 50 s : ±25600 ns

2. When the Range is 5 s, loss occurs when the amount of delayed frame exceeds 100 Mbit/s. In addition, the delay becomes greater than the setting.

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When the Range is 50 s, loss occurs when the amount of delayed frame exceeds 10 Mbit/s. In addition, the delay becomes greater than the setting.

[2] Delay Variation

The delay setting method changes according to the Distribution selection. The default Distribution is Uniform. The setting for each Distribution is shown below.

Notes:

1. The following conditions must be satisfied in order for the specified distribution to be generated.

   (1) Gap of the input frame exceeds Probability Distribution. (Frame gap is greater than resolution.)
   (2) There is no frame jitter in the input frame.

   When frame other than (1) or (2) above is input, the output frame may not be in the specified distribution.

2. The settings have the following margin of error.
   1000 M : ±256 ns
   100 M : ±2560 ns
   10 M : ±25600 ns

(a) Distribution: Uniform

Sets the delay time according to Uniform Distribution.

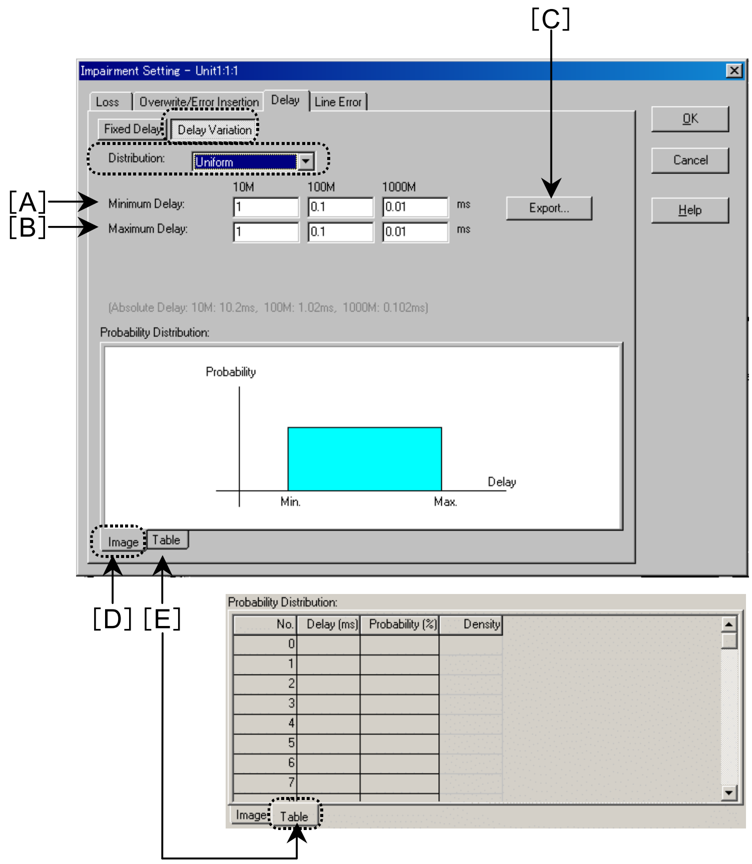

Figure 6.6.3-21 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Uniform

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Table 6.6.3-16 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Uniform

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Minimum Delay</td><td rowspan="2">Sets the minimum delay [A] and maximum delay [B].
Range : 10 M … 1 to 51200 ms
100 M … 0.1 to 5120.0 ms
1000 M … 0.01 to 512.00 ms
Default : 10 M … 1 ms
100 M … 0.1 ms
1000 M … 0.01 ms</td></tr>
<tr><td>[B]</td><td>Maximum Delay</td></tr>
<tr><td>[C]</td><td>Export...</td><td>Outputs the delay time distribution data to CSV file.</td></tr>
<tr><td>[D]</td><td>Image tab</td><td>Displays the probability distribution image for each Distribution.</td></tr>
<tr><td>[E]</td><td>Table tab</td><td>Displays a probability distribution table based on [A] and [B] settings.<table>
<tr><td>No.</td><td>Item No. of delay for which probability density is provided.</td></tr>
<tr><td>Delay [ms]</td><td>Displays the delay for which probability density is provided.</td></tr>
<tr><td>Probability [%]</td><td>Calculated probability*1 obtained from the setting of each Delay Variation mode.</td></tr>
<tr><td>Density</td><td>The set probability density of each instrument MD1230B.</td></tr>
</table></td></tr>
</table>

*: The probability of actual occurrence is determined by Density.

(b) Distribution: Normal

Sets the delay time according to Normal Distribution.

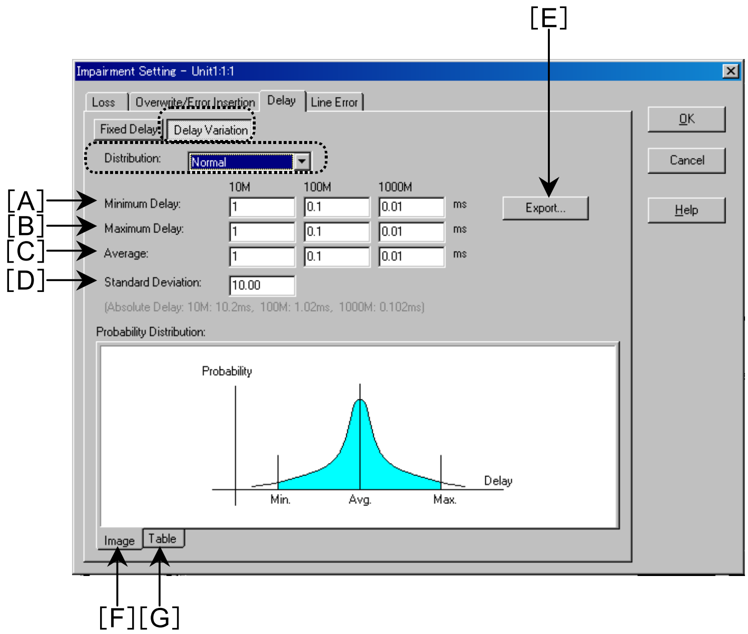


Figure 6.6.3-22 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Normal

Table 6.6.3-17 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Normal

	Item	Function
[A]	Minimum Delay	Sets the minimum delay [A] and maximum delay [B]. Range : 10 M ... 1 to 51200 ms 100 M ... 0.1 to 5120.0 ms 1000 M ... 0.01 to 512.00 ms Default : 10 M ... 1 ms 100 M ... 0.1 ms 1000 M ... 0.01 ms
[B]	Maximum Delay	
[C]	Average	Sets the average (μ) of the normal distribution. ***Note:*** Range default are the same as [A] and [B].
[D]	Standard Deviation	Sets the standard deviation (σ) of the normal distribution. Range : 1.00 to 100.00 Default : 10.00
[E]	Export...	Outputs the delay time distribution data to CSV file.
[F]	Image tab	Displays the probability distribution image for each Distribution.

	Item	Function
[G]	Table tab	Displays a probability distribution table based on [A], [B], [C], and [D] settings. ☞ See "(a) Distribution: Uniform [E]" for details.

(c) Distribution: Exponential

Sets the delay time according to Exponential Distribution.

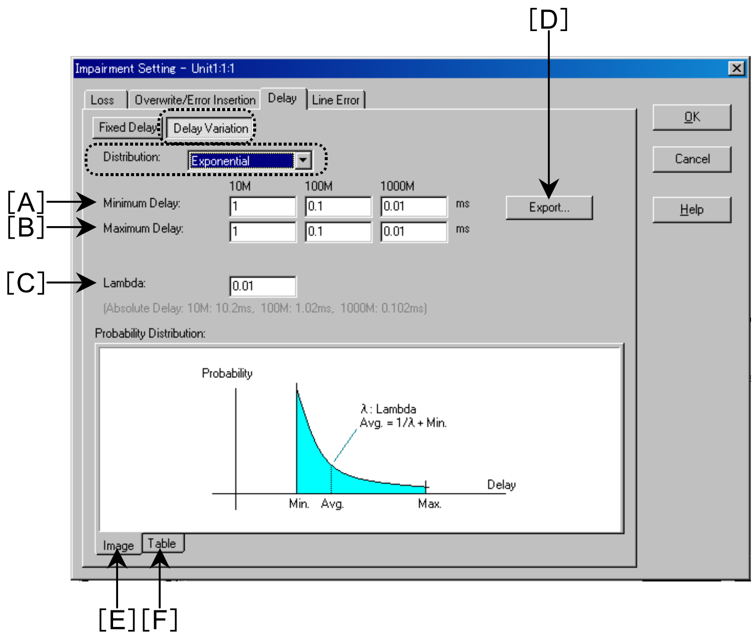


Figure 6.6.3-23 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Exponential

Table 6.6.3-18 Impairment Setting (Delay tab) screen Delay Variation, Distribution: Exponential

	Item	Function
[A]	Minimum Delay	Sets the minimum delay [A] and maximum delay [B]. Range : 10 M ... 1 to 51200 ms 100 M ... 0.1 to 5120.0 ms 1000 M ... 0.01 to 512.00 ms Default : 10 M ... 1 ms 100 M ... 0.1 ms 1000 M ... 0.01 ms
[B]	Maximum Delay	
[C]	Lambda	Sets the parameter (λ) of the exponential distribution (expected value=1/λ). Range : 0.01 to 2.00 Default : 0.01
[D]	Export...	Outputs the delay time distribution data to CSV file.
[E]	Image tab	Displays the probability distribution image for each Distribution.
[F]	Table tab	Displays a probability distribution table based on [A], [B], and [C] settings. See "(a) Distribution: Uniform [E]" for details.

(d) Distribution: User Defined

Sets the delay time according to Custom Distribution. Creates a custom definition of delay time distribution data. You can also load a predefined definition file.

Note:

Data for which all probability frequencies become 0 cannot be loaded.

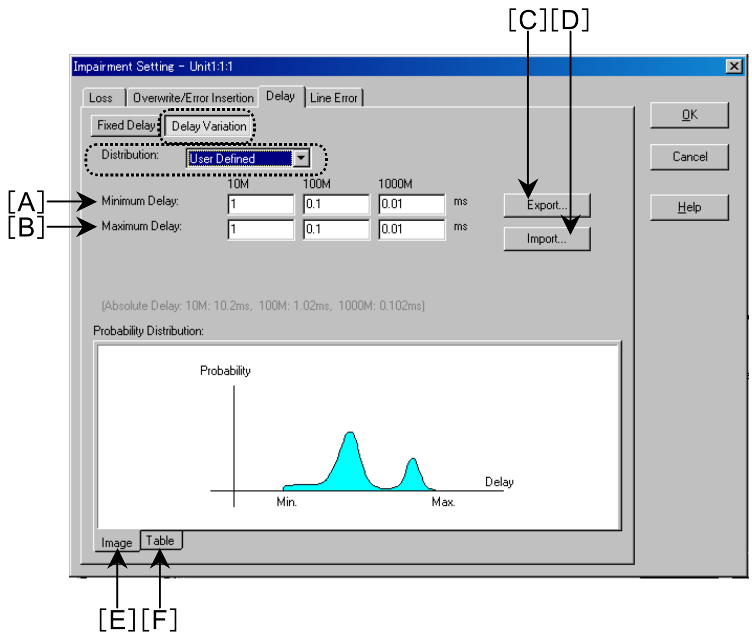


Figure 6.6.3-24 Impairment Setting (Delay tab) screen Delay Variation, Distribution: User Defined

Table 6.6.3-19 Impairment Setting (Delay tab) screen
Delay Variation, Distribution: User Defined

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Minimum Delay</td><td rowspan="2">Sets the minimum delay [A] and maximum delay [B].
Range : 10 M … 1 to 51200 ms
100 M … 0.1 to 5120.0 ms
1000 M … 0.01 to 512.00 ms
Default : 10 M … 1 ms
100 M … 0.1 ms
1000 M … 0.01 ms</td></tr>
<tr><td>[B]</td><td>Maximum Delay</td></tr>
<tr><td>[C]</td><td>Export...</td><td>Outputs the delay time distribution data to CSV file.</td></tr>
<tr><td>[D]</td><td>Import...</td><td>Loads the delay time distribution data from CSV file.</td></tr>
<tr><td>[E]</td><td>Image tab</td><td>Displays the probability distribution image for each Distribution.</td></tr>
<tr><td>[F]</td><td>Table tab</td><td><table>
<tr><td>No.</td><td>Item No. of delay for which probability density is provided.</td></tr>
<tr><td>Delay [ms]</td><td>Displays the delay for which probability density is provided, based on [A] and [B] settings.</td></tr>
<tr><td>Probability [%]</td><td>Calculated probability*1 obtained from the setting of each Delay Variation mode.</td></tr>
<tr><td>Density</td><td>Sets probability density corresponding to delay.
Range: 0 to 1,000</td></tr>
</table>
Note:
Can not set all Density to 0</td></tr>
</table>

(4) Line Error

This is a function to generate line errors.

Notes:

1. For MU120121A, line errors cannot be inserted when 10 Mbps.
2. Line error is added to a frame. If it is added when no frame is received, error is inserted in the first frame that is received thereafter.
3. Only one error is added, but in the case of MU120121A, more than one line error may be detected depending on the connected PHY chip.

Setting Line Error

Line Error is set from the **Line Error** tab of the Impairment Setting screen.

See Section 6.6.2 "Basic Operation" for information on how to display the Impairment Setting screen.

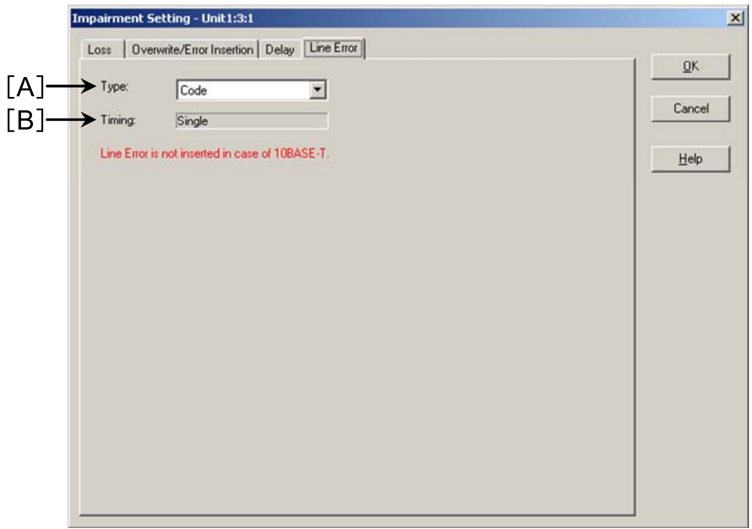


Figure 6.6.3-25 Impairment Setting (Line Error tab) screen

Table 6.6.3-20 Impairment Setting (Line Error tab) screen

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Type</td><td>Selects the type of error to generate.
<table>
<tr><th>Module</th><th>Type</th></tr>
<tr><td>MU120121A
(RJ-45)</td><td>Code</td></tr>
<tr><td>MU120122A
(SFP)</td><td>8B/10B Code
RD
8B/10B Code & RD</td></tr>
</table>
Note:
The following types of error are generated.
<table>
<tr><th>Type</th><th>Description</th></tr>
<tr><td>Electrical</td><td>100BASE-TX/1000BASE-T:
Line Error
Note:
Line Error does not occur for 10BASE-T.</td></tr>
<tr><td>Optical</td><td>Line Error (8B/10B Code)
Line Error (RD)
Line Error (8B/10B Code & RD)</td></tr>
</table></td></tr>
</table>

	Item	Function
[B]	Timing	Displays the error generation method. ***Note:*** Line Error Timing is Single only. An error occurs when Single is clicked on the main screen.

6.6.4 Filter Setting

This is a function to pass or block specific protocol and data packet in the Traffic Impairment Emulation function. It is possible to narrow down to only abnormal state or information to be checked. In addition, it selects the target frame to implement other effects.

Setting filter

Filter is set on the Impairment Filter Setting screen.

☞ See Section 6.6.2 "Basic Operation" for information on how to display the Impairment Filter Setting screen.

Notes:

1. Filter can be changed only when the Filter function is Off.

2. The settings cannot be changed in the following cases because the Filter/Trigger/Counter Condition Settings are used in common among Filter, Counter, and Capture functions.

   - When the Filter function is On
   - When the Counter function is active
   - When the Capture function is active

3. The frame matching the filter is counted as Impairment Filter Frame/Byte.

4. The frame not matching the filter is not counted as Unavoidable Dropped Frame/Lost Frame. It can be calculated by subtracting Impairment Filter Frame from Received Frame.

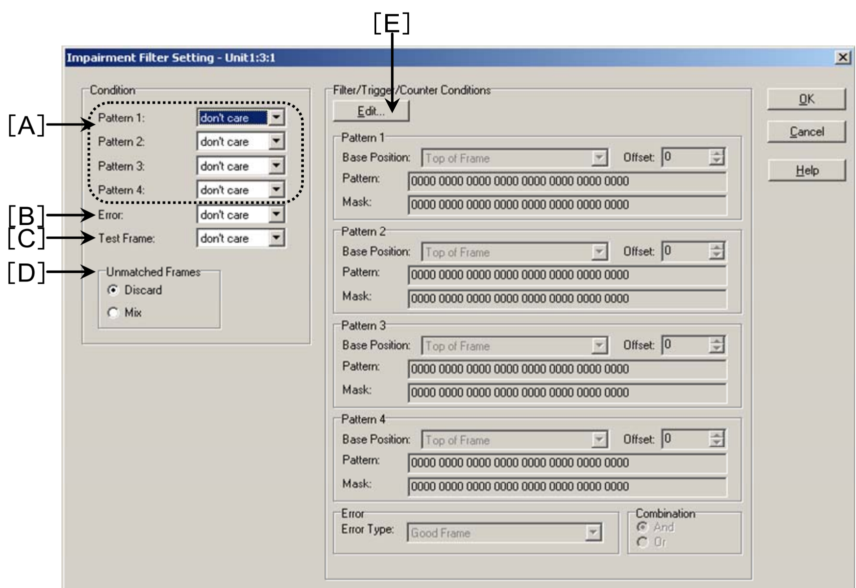


Figure 6.6.4-1 Impairment Filter Setting screen

Table 6.6.4-1 Impairment Filter Setting screen

<table>
<tr><th></th><th>Item</th><th>Function</th></tr>
<tr><td>[A]</td><td>Pattern 1 to 4</td><td>Enables/disables Pattern 1 to 4.
<table>
<tr><th>Options</th><th>Description</th></tr>
<tr><td>Don't Care</td><td>Pattern is not used.</td></tr>
<tr><td>Match</td><td>Frame matching Pattern is passed.</td></tr>
<tr><td>Not Match</td><td>Frame not matching Pattern is passed.</td></tr>
</table></td></tr>
<tr><td>[B]</td><td>Error</td><td>Selects whether there is error judgment.
<table>
<tr><th>Options</th><th>Description</th></tr>
<tr><td>Don't Care</td><td>Error judgment is not performed.</td></tr>
<tr><td>Match</td><td>Frame matching Error is passed.</td></tr>
<tr><td>Not Match</td><td>Frame not matching Error is passed.</td></tr>
</table></td></tr>
<tr><td>[C]</td><td>Test Frame</td><td>Selects whether there is Test Frame judgment.
<table>
<tr><th>Options</th><th>Description</th></tr>
<tr><td>Don't Care</td><td>Test Frame judgment is not performed.</td></tr>
<tr><td>Match</td><td>Test Frame is passed.</td></tr>
<tr><td>Not Match</td><td>Frame other than Test frame is passed.</td></tr>
</table></td></tr>
<tr><td>[D]</td><td>Unmatched Frames</td><td>Selects the processing of frame not matching the filter's pass condition.
<table>
<tr><th>Options</th><th>Description</th></tr>
<tr><td>Discard</td><td>Frame is discarded.</td></tr>
<tr><td>Mix</td><td>Mixed with frame passing the filter.</td></tr>
</table></td></tr>
<tr><td>[E]</td><td>Edit...</td><td>Displays the Filter/Trigger/Counter Condition Setting screen and sets Pattern 1 to 4 and Error details.
See Section 5.9.3 "Setting Filter, Trigger Pattern" for the details of Filter/Trigger/Counter Condition Setting screen.</td></tr>
</table>

6.6.5 Received Frame Data

Depending on the received frame data, the Traffic Impairment Emulator function may or may not be able to pass it.
Table 6.6.5-1 shows the detail list.

Table 6.6.5-1 Received Frame Data

Received Frame	Processing
Normal frame	Passed (appropriate size&FCS good)
Undersize	47 bytes or less is not guaranteed. 48 bytes or more is passed.
Fragment	47 bytes or less is not guaranteed. 48 bytes or more is passed.
Oversize	10,000 bytes or less is passed. 10,001 bytes or more is not guaranteed.
Oversize & FCS Error	10,000 bytes or less is passed. 10,001 bytes or more is not guaranteed.
FCS Error	Passed (64 bytes to 9,999 bytes)
Dribble Bit Error	Passed
Alignment Error	Passed
Byte Alignment Error	Not passed
Line Error	Optical : Not passed Electrical : Not passed
RD Error	Not passed
Unframed data	Passed
IPv4 Header Checksum Error	Passed
TCP Checksum Error	Passed
UDP Checksum Error	Passed
Auto Negotiation data	Not passed

Section 7 Functions Specific to EoS/POS Modules

This section describes the MD1230B measurement functions specific to the MU120103A/04A/05A/06A/19A/20A/03B/04B modules and how to analyze the measurement results.

* Description in this section is given assuming that measurement system connections and basic settings have been completed. (Refer to Section 4 "Basic Operations.")

7.1 Functions Specific to MU120103A/04A/05A/06A/19A/20A/03B/04B Modules

7.1.1 Power Meter

The power meter shows the optical reception level. The display is updated every second.

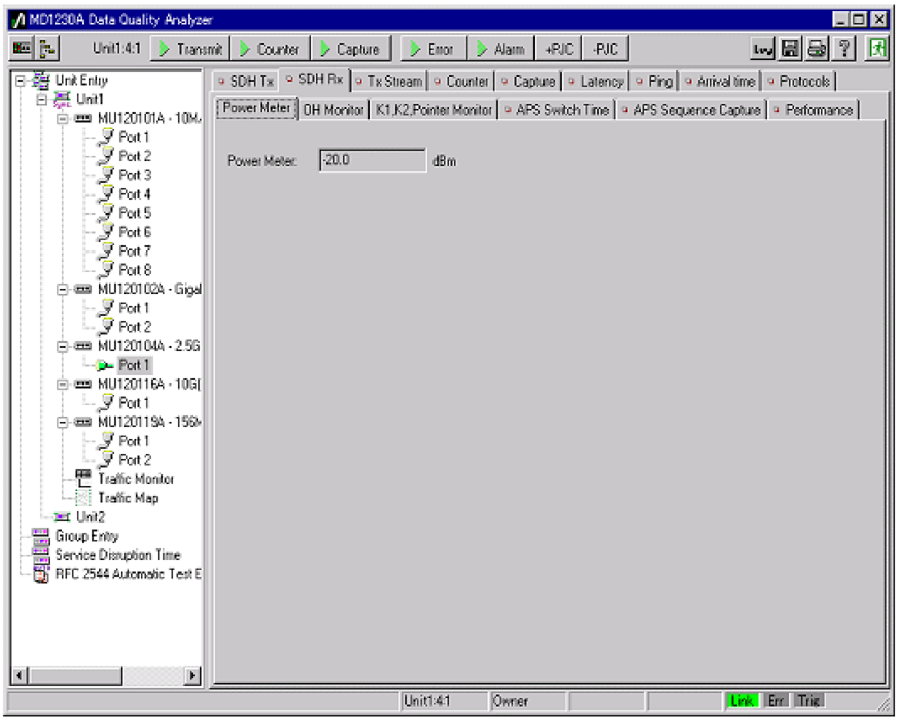


Figure 7.1.1-1 Power Meter screen

Note:

For the MU120119A/20A, this function is available only when the MU120119A-01/MU120120A-01 Optical Power Meter is installed.

7

Functions Specific to EoS/POS Modules

7.1.2 Setting Overhead Information

7.1.2.1 OH Preset

Set SOH/TOH and POH.

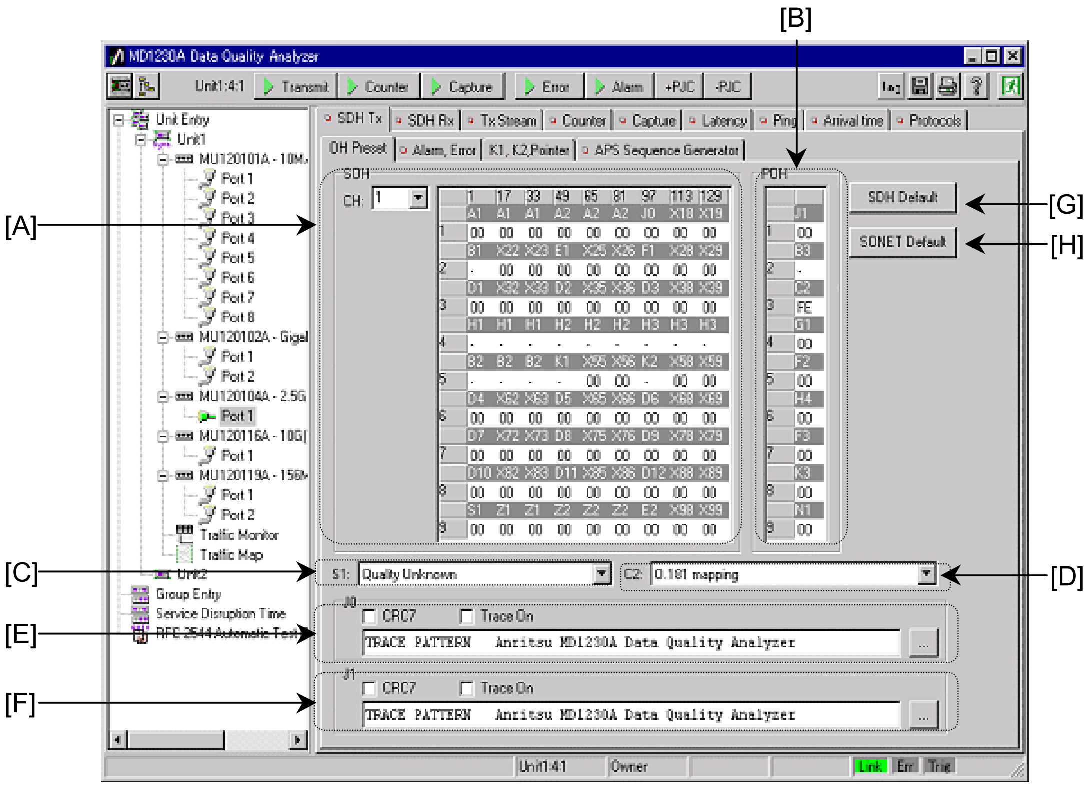


Figure 7.1.2.1-1 OH Preset screen

Values for H1, H2, H3, K1 or K2 cannot be set on this tab.
Refer to Section 7.1.2.3 “Setting Pointer” for the steps in setting the H1, H2 and H3 values and Sections 7.1.2.2 “Setting K1 and K2” and 7.1.5.2 “Generating APS sequence pattern” for the steps in setting the K1 and K2 values.
However, B1, B2 and B3 values cannot be set.

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>SOH</td><td>CH</td><td>Select or directly enter the CH number to display the SOH. The setting ranges are shown below:
<table>
<tr><th>Module</th><th>Bit Rate</th><th>Setting range</th></tr>
<tr><td>MU120103A/04A /03B/04B</td><td></td><td>1 to 16</td></tr>
<tr><td>MU120105A/06A</td><td></td><td>1 to 64</td></tr>
<tr><td rowspan="2">MU120119A</td><td>156 M</td><td>1</td></tr>
<tr><td>622 M</td><td>1 to 4</td></tr>
<tr><td>MU120120A</td><td></td><td>1</td></tr>
</table></td></tr>
</table>

	Item		Description
[A]	SOH	SOH	Edit SOH. The SOHs that can be edited at each CH are given in the tables below. Values are entered in hexadecimal.

SDH

SOH Ch1

A1	A1	A1	A2	A2	A2	J0	X18	X19
B1	X22	X23	E1	X25	X26	F1	X28	X29
D1	X32	X33	D2	X35	X36	D3	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	K1	X55	X56	K2	X58	X59
D4	X62	X63	D5	X65	X66	D6	X68	X69
D7	X72	X73	D8	X75	X76	D9	X78	X79
D10	X82	X83	D11	X85	X86	D12	X88	X89
S1	Z1	Z1	Z2	Z2	Z2	E2	X98	X99

SOH Ch3

A1	A1	A1	A2	A2	A2	Z0	X18	X19
X21	X22	X23	X24	X25	X26	X27	X28	X29
X31	X32	X33	X34	X35	X36	X37	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	X54	X55	X56	X57	X58	X59
X61	X62	X63	X64	X65	X66	X67	X68	X69
X71	X72	X73	X74	X75	X76	X77	X78	X79
X81	X82	X83	X84	X85	X86	X87	X88	X89
Z1	Z1	Z1	M1	Z2	Z2	X97	X98	X99

SOH Ch2, Ch4 and later

A1	A1	A1	A2	A2	A2	Z0	X18	X19
X21	X22	X23	X24	X25	X26	X27	X28	X29
X31	X32	X33	X34	X35	X36	X37	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	X54	X55	X56	X57	X58	X59
X61	X62	X63	X64	X65	X66	X67	X68	X69
X71	X72	X73	X74	X75	X76	X77	X78	X79
X81	X82	X83	X84	X85	X86	X87	X88	X89
Z1	Z1	Z1	Z2	Z2	Z2	X97	X98	X99

Figure 7.1.2.1-2 Multiplexing SDH Frame

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>SOH</td><td>TOH</td><td>
SONET

TOH Ch1
<table>
<tr><td>A1</td><td>A1</td><td>A1</td><td>A2</td><td>A2</td><td>A2</td><td>J0</td><td>Z0</td><td>Z0</td></tr>
<tr><td>B1</td><td>X22</td><td>X23</td><td>E1</td><td>X25</td><td>X26</td><td>F1</td><td>X28</td><td>X29</td></tr>
<tr><td>D1</td><td>X32</td><td>X33</td><td>D2</td><td>X35</td><td>X36</td><td>D3</td><td>X38</td><td>X39</td></tr>
<tr><td>H1</td><td>H1</td><td>H1</td><td>H2</td><td>H2</td><td>H2</td><td>H3</td><td>H3</td><td>H3</td></tr>
<tr><td>B2</td><td>B2</td><td>B2</td><td>K1</td><td>X55</td><td>X56</td><td>K2</td><td>X58</td><td>X59</td></tr>
<tr><td>D4</td><td>X62</td><td>X63</td><td>D5</td><td>X65</td><td>X66</td><td>D6</td><td>X68</td><td>X69</td></tr>
<tr><td>D7</td><td>X72</td><td>X73</td><td>D8</td><td>X75</td><td>X76</td><td>D9</td><td>X78</td><td>X79</td></tr>
<tr><td>D10</td><td>X82</td><td>X83</td><td>D11</td><td>X85</td><td>X86</td><td>D12</td><td>X88</td><td>X89</td></tr>
<tr><td>S1</td><td>Z1</td><td>Z1</td><td>Z2</td><td>Z2</td><td>Z2</td><td>E2</td><td>X98</td><td>X99</td></tr>
</table>

TOH Ch3
<table>
<tr><td>A1</td><td>A1</td><td>A1</td><td>A2</td><td>A2</td><td>A2</td><td>Z0</td><td>Z0</td><td>Z0</td></tr>
<tr><td>X21</td><td>X22</td><td>X23</td><td>X24</td><td>X25</td><td>X26</td><td>X27</td><td>X28</td><td>X29</td></tr>
<tr><td>X31</td><td>X32</td><td>X33</td><td>X34</td><td>X35</td><td>X36</td><td>X37</td><td>X38</td><td>X39</td></tr>
<tr><td>H1</td><td>H1</td><td>H1</td><td>H2</td><td>H2</td><td>H2</td><td>H3</td><td>H3</td><td>H3</td></tr>
<tr><td>B2</td><td>B2</td><td>B2</td><td>X54</td><td>X55</td><td>X56</td><td>X57</td><td>X58</td><td>X59</td></tr>
<tr><td>X61</td><td>X62</td><td>X63</td><td>X64</td><td>X65</td><td>X66</td><td>X67</td><td>X68</td><td>X69</td></tr>
<tr><td>X71</td><td>X72</td><td>X73</td><td>X74</td><td>X75</td><td>X76</td><td>X77</td><td>X78</td><td>X79</td></tr>
<tr><td>X81</td><td>X82</td><td>X83</td><td>X84</td><td>X85</td><td>X86</td><td>X87</td><td>X88</td><td>X89</td></tr>
<tr><td>Z1</td><td>Z1</td><td>Z1</td><td>M1</td><td>Z2</td><td>Z2</td><td>X97</td><td>X98</td><td>X99</td></tr>
</table>

TOH Ch2, Ch4 and later
<table>
<tr><td>A1</td><td>A1</td><td>A1</td><td>A2</td><td>A2</td><td>A2</td><td>Z0</td><td>Z0</td><td>Z0</td></tr>
<tr><td>X21</td><td>X22</td><td>X23</td><td>X24</td><td>X25</td><td>X26</td><td>X27</td><td>X28</td><td>X29</td></tr>
<tr><td>X31</td><td>X32</td><td>X33</td><td>X34</td><td>X35</td><td>X36</td><td>X37</td><td>X38</td><td>X39</td></tr>
<tr><td>H1</td><td>H1</td><td>H1</td><td>H2</td><td>H2</td><td>H2</td><td>H3</td><td>H3</td><td>H3</td></tr>
<tr><td>B2</td><td>B2</td><td>B2</td><td>X54</td><td>X55</td><td>X56</td><td>X57</td><td>X58</td><td>X59</td></tr>
<tr><td>X61</td><td>X62</td><td>X63</td><td>X64</td><td>X65</td><td>X66</td><td>X67</td><td>X68</td><td>X69</td></tr>
<tr><td>X71</td><td>X72</td><td>X73</td><td>X74</td><td>X75</td><td>X76</td><td>X77</td><td>X78</td><td>X79</td></tr>
<tr><td>X81</td><td>X82</td><td>X83</td><td>X84</td><td>X85</td><td>X86</td><td>X87</td><td>X88</td><td>X89</td></tr>
<tr><td>Z1</td><td>Z1</td><td>Z1</td><td>Z2</td><td>Z2</td><td>Z2</td><td>X97</td><td>X98</td><td>X99</td></tr>
</table>

Figure 7.1.2.1-3 Multiplexing SONET Frame
</td></tr>
</table>

	Item		Description
[B]	POH		Edit POH. Values are entered in hexadecimal. POH: J1, B3, C2, G1, F2, H4, F3, K3, N1 **Figure 7.1.2.1-4 Multiplexing SDH Frame** POH: J1, B3, C2, G1, F2, H4, Z3, Z4, Z5 **Figure 7.1.2.1-5 Multiplexing SONET Frame** When using Virtual Concatenation, settings are common to all members consisting the VC group. In this case, editing of H4 bite is disabled.
[C]	S1		Select the S1 byte value.
[D]	C2		Select the C2 byte value.
[E]	J0	CRC7	Set CRC7. Checked: CRC7 is enabled and J0 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J0 consists of 64 bytes.
		Trace On	Set whether or not to enable tracing. Trace is enabled when checked.
		J0	Enter J0 in ASCII code.
[F]	J1	CRC7	Set CRC7. Checked: CRC7 is enabled and J1 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J1 consists of 64 bytes.
		Trace On	Set whether or not to enable tracing. Trace is enabled when checked.
		J1	Enter J1 in ASCII code. When using Virtual Concatenation, this setting is common to all members consisting the VC group.
[G]	SDH Default		Initializes the SDH settings.
[H]	SONET Default		Initializes the SONET settings.

7.1.2.2 Setting K1 and K2

Set K1 and K2.

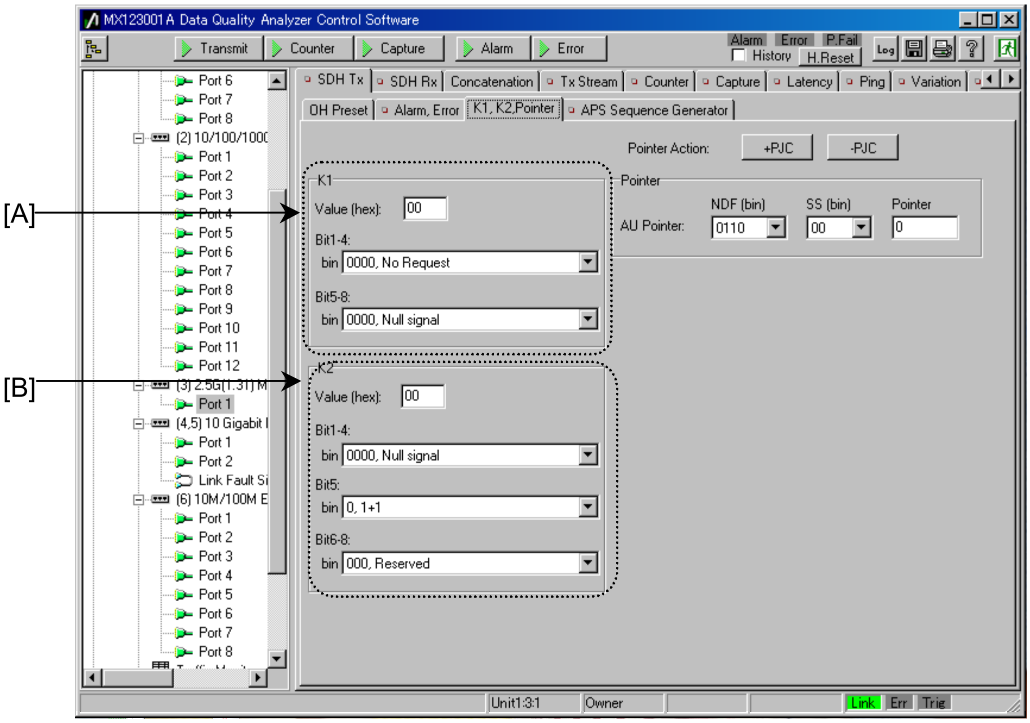


Figure 7.1.2.2-1 K1, K2, Pointer screen

	Item		Description
[A]	K1	Value(hex)	Enter the K1 value in hexadecimal.
		Bit1-4	Select the values for K1 bits 1 to 4 from 0000 to 1111.
		Bit5-8	Select the values for K1 bits 5 to 8 from 0000 to 1111.
[B]	K2	Value(hex)	Enter the K2 value in hexadecimal.
		Bit1-4	Select the values for K2 bits 1 to 4 from 0000 to 1111.
		Bit5	Select the value for K2 bit 5 from 0 or 1.
		Bit6-8	Select the values for K2 bits 6 to 8 from 000 to 111.

7.1.2.3 Setting pointer

Set the pointer.

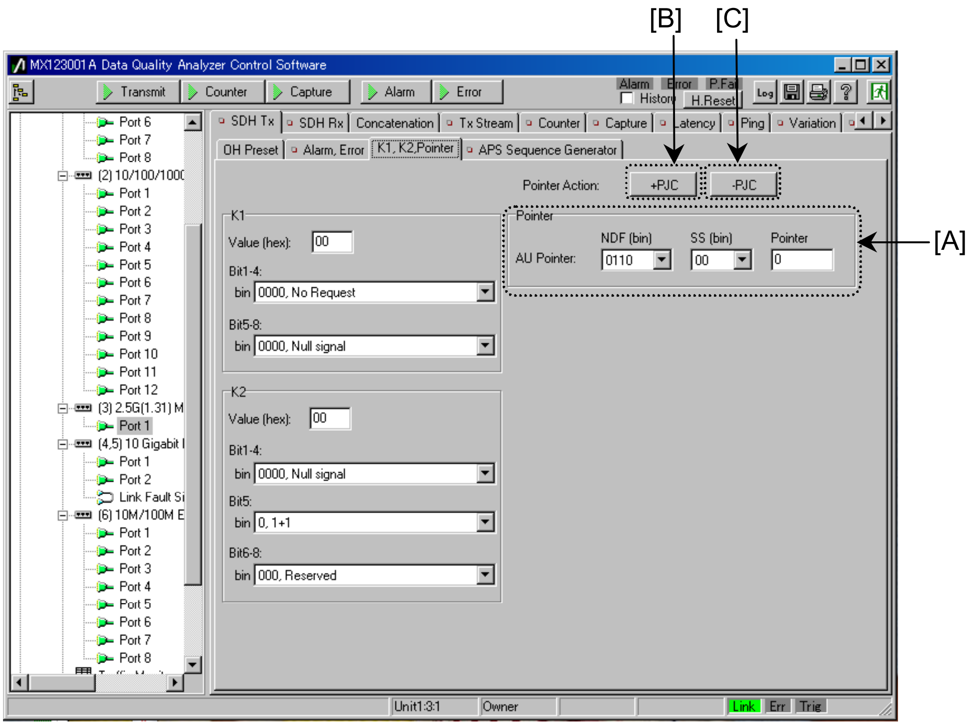


Figure 7.1.2-3-1 K1, K2, Pointer screen

	Item			Description
[A]	Pointer	AU Pointer	NDF (bin)	Select the NDF value from 0000 to 1111.
			SS (bin)	Select the SS value from 00 to 11.
			Pointer	Enter the pointer.
[B]	+PJC			Increment Pointer in positive direction.
[C]	–PJC			Decrement Pointer in negative direction.

When using Virtual Concatenation, Pointer settings can be performed independently for each member.

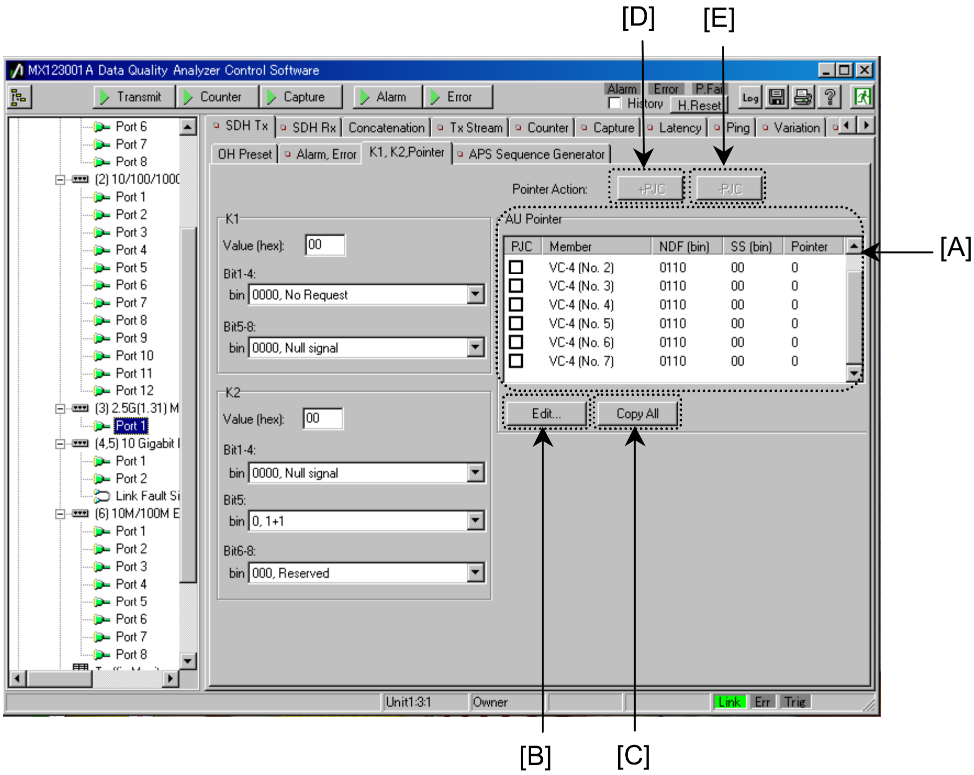


Figure 7.1.2.3-2 K1, K2, Pointer screen

	Item		Description
[A]	Pointer	(List display)	Show setting status for each member of the VC group.
		PJC	The checkmarked member is the target for pointer operation using +/– button.
		Member	Show member sequence.
		NDF (bin)	Show set value for NDF.
		SS (bin)	Show set value for SS.
		Pointer	Show Pointer value.
[B]	Edit		Open a dialog box for setting NDF, SS and Pointer of the member selected in the list.
[C]	Copy All		Align pointer values of all members to that of the top one.
[D]	+PJC		Increment Pointer in positive direction.
[E]	–PJC		Decrement Pointer in negative direction.

7.1.2.4 Adding alarms and errors

Perform Alarm Insertion and Error Insertion settings.

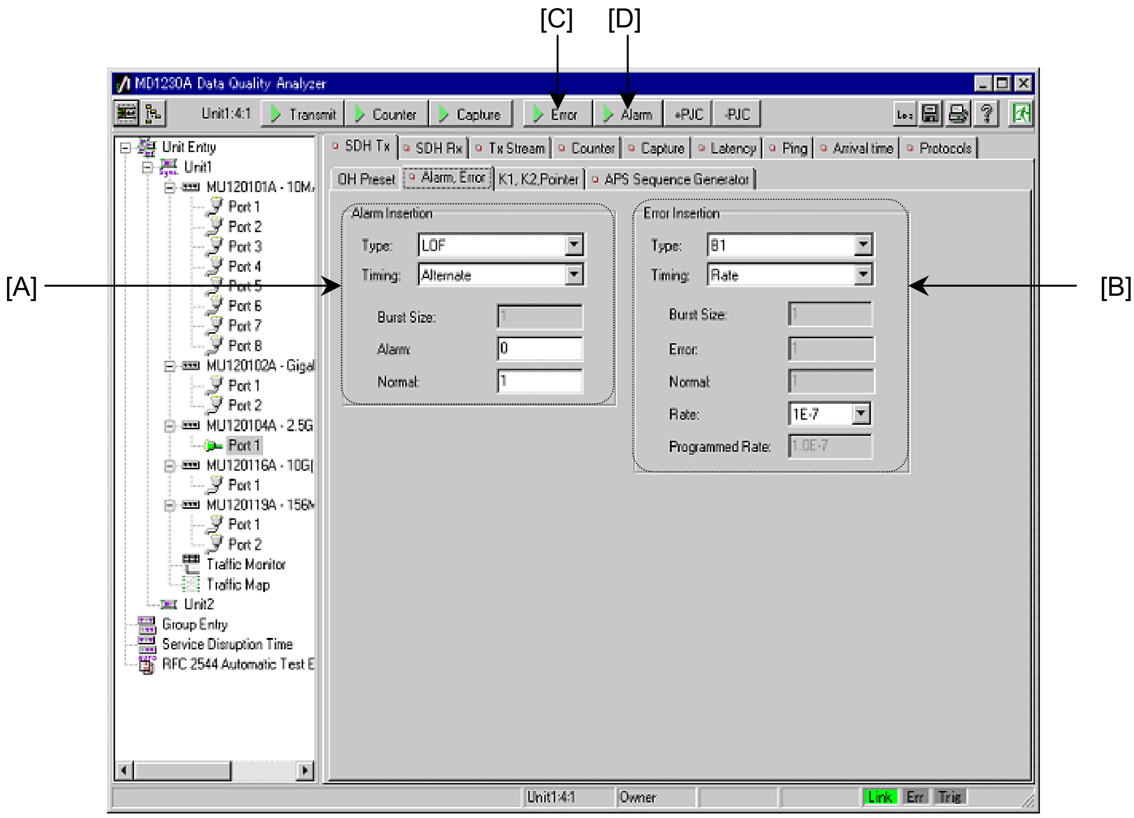


Figure 7.1.2.4-1 Alarm, Error screen

<table>
<tr><th colspan="3">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Alarm Insertion</td><td>Type</td><td>Select the alarm-type. The table below gives available types for SDH and SONET.
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>LOS</td><td>LOS</td></tr>
<tr><td>LOF</td><td>LOF</td></tr>
<tr><td>MS-AIS</td><td>AIS-L</td></tr>
<tr><td>MS-RDI</td><td>RDI-L</td></tr>
<tr><td>MS-TIM</td><td>TIM-L</td></tr>
<tr><td>AU-AIS</td><td>AIS-P</td></tr>
<tr><td>AU-LOP</td><td>LOP-P</td></tr>
<tr><td>HP-RDI</td><td>RDI-P</td></tr>
<tr><td>HP-SLM</td><td>PLM-P</td></tr>
<tr><td>HP-TIM</td><td>TIM-P</td></tr>
<tr><td>HP-UNEQ</td><td>UNEQ-P</td></tr>
</table>
If Through Mode has been selected in Port Setup (refer to Section 4.5 “Setting Port”), the types available are LOS, LOF, MS-AIS, MS-RDI, MS-TIM, AU-AIS or AU-LOP.</td></tr>
</table>

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td rowspan="4">[A]</td><td rowspan="4">Alarm Insertion</td><td>Timing</td><td>Select the alarm timing. The timings available are given below.
• Single
• Single Burst Frame
• Alternate
• All
When LOS has been selected for Type, only All is available.
Burst Size is available only when the Single Burst frame has been selected.
Alarm and Normal are available only when Alternate has been selected.</td></tr>
<tr><td>Burst Size</td><td>Set Burst Size in frames. The unit is in “Frame.”
(Setting range: 1 to 64000)</td></tr>
<tr><td>Alarm</td><td>Set the number of alarm frames.
(Setting range: 1 to 8000)</td></tr>
<tr><td>Normal</td><td>Set the number of normal frames.
(Setting range: 1 to 8000)</td></tr>
<tr><td>[B]</td><td>Error Insertion</td><td>Type</td><td>Select the error-type. The table below gives types available for SDH and SONET.
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>FAS</td><td>FAS</td></tr>
<tr><td>B1</td><td>B1</td></tr>
<tr><td>B2</td><td>B2</td></tr>
<tr><td>B3</td><td>B3</td></tr>
<tr><td>MS-REI</td><td>REI-L</td></tr>
<tr><td>HP-REI</td><td>REI-P</td></tr>
<tr><td>HP-IEC</td><td>HP-IEC</td></tr>
<tr><td>Bit all</td><td>Bit all</td></tr>
<tr><td>Bit Info.</td><td>Bit Info.</td></tr>
</table>
Bit Info. is enabled only when Bulk has been set for Mapping in Port Setup (refer to Section 4.5 “Setting Port”).
If Through Mode has been selected in Port Setup (refer to Section 4.5 “Setting Port”), the available types are FAS, Bit all, B1, B2, or MS-REL (REL-L).</td></tr>
</table>

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td rowspan="6">[B]</td><td rowspan="6">Error Insertion</td><td>Timing</td><td>Select the error timing. The timings available are given below.
• Single
• Single Burst Bit
• Rate
• Programmed Rate
• Alternate
• All
When Bit all has been selected for Type, only Single, Rate, or Programmed Rate is available.
When FAS has been selected for Type, only Alternate is available.
Burst Size is available only when Single Burst Bit has been selected.
Rate is available only when Rate has been selected.
Programmed Rate is available only when Programmed Rate has been selected.
Error and Normal are available only when Alternate has been selected.</td></tr>
<tr><td>Burst Size</td><td>Set Burst Size in bits. The unit is in “Bit.”</td></tr>
<tr><td>Error</td><td>Set the number of error frames.</td></tr>
<tr><td>Normal</td><td>Set the number of normal frames.</td></tr>
<tr><td>Rate</td><td>Select the rate from IE-3, IE-4, IE-5, IE-6, IE-7, IE-8 or IE-9.
The maximum rates are shown in the table below:
<table>
<tr><th></th><th>156 M</th><th>622 M</th><th>2.5 G</th><th>10 G</th></tr>
<tr><td>B1</td><td>4.1E-4</td><td>1.0E-4</td><td>2.5E-5</td><td>6.4E-6</td></tr>
<tr><td>B2</td><td>1.2E-3</td><td>1.2E-3</td><td>1.2E-3</td><td>1.2E-3</td></tr>
<tr><td>B3</td><td>4.2E-4</td><td>1.0E-4</td><td>2.6E-5</td><td>6.6E-6</td></tr>
<tr><td>MS-REI</td><td>1.2E-3</td><td>1.2E-3</td><td>8.2E-4</td><td>2.0E-4</td></tr>
<tr><td>HP-REI</td><td>4.2E-4</td><td>1.0E-4</td><td>2.6E-5</td><td>6.6E-6</td></tr>
<tr><td>HP-IEC</td><td>4.2E-4</td><td>1.0E-4</td><td>2.6E-5</td><td>6.6E-6</td></tr>
<tr><td>Bit all</td><td>1.0E-3</td><td>1.0E-3</td><td>1.0E-3</td><td>1.0E-3</td></tr>
<tr><td>Bit info</td><td>1.0E-3</td><td>1.0E-3</td><td>1.0E-3</td><td>1.0E-3</td></tr>
</table></td></tr>
<tr><td>Programmed Rate</td><td>Enter the Error Rate.
The error rate should be in the form A × E – B.
The maximum rates are shown in the table above.</td></tr>
<tr><td>[C]</td><td colspan="2">>Error</td><td>Insert the Error specified in [B]. When using Virtual Concatenation, the errors are inserted in unison to all members of the VC group.</td></tr>
<tr><td>[D]</td><td colspan="2">>Alarm</td><td>Insert the Alarm specified in [A]. When using Virtual Concatenation, the alarms are inserted in unison to all members of the VC group.</td></tr>
</table>

7.1.3 Monitoring Overhead Information

7.1.3.1 OH Monitoring

Display the SOH/TOH and POH data, and the decoded S1 and C2 data.

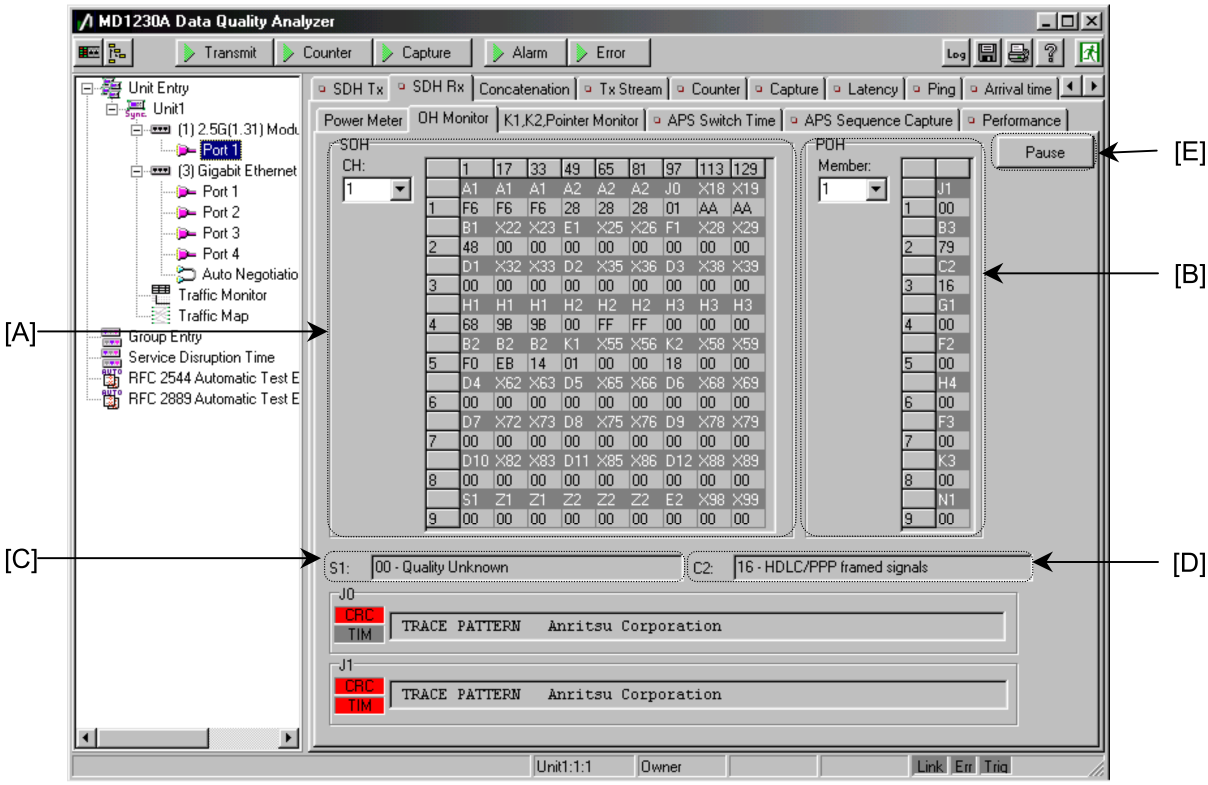


Figure 7.1.3.1-1 OH Monitor screen

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td rowspan="2">[A]</td><td rowspan="2">SOH</td><td>CH</td><td>Select or directly enter the CH number to display the SOH. The setting ranges are shown below:
<table>
<tr><th>Module</th><th>Bit Rate</th><th>Setting range</th></tr>
<tr><td>MU120103A/04A
/03B/04B</td><td></td><td>1 to 16</td></tr>
<tr><td>MU120105A/06A</td><td></td><td>1 to 64</td></tr>
<tr><td rowspan="2">MU120119A</td><td>156 M</td><td>1</td></tr>
<tr><td>622 M</td><td>1 to 4</td></tr>
<tr><td>MU120120A</td><td></td><td>1</td></tr>
</table></td></tr>
<tr><td>SOH</td><td>Shows the SOH data in hexadecimal.</td></tr>
<tr><td rowspan="2">[B]</td><td rowspan="2">POH</td><td>Member</td><td>Displayed only when using Virtual Concatenation.</td></tr>
<tr><td>POH</td><td>Shows the POH data in hexadecimal.</td></tr>
<tr><td>[C]</td><td colspan="2">S1</td><td>Decodes and shows the S1 data.</td></tr>
</table>

	Item	Description
[D]	C2	Decodes and shows the C2 data.
[E]	Pause	Stops updating of the screen temporally. Restarts the update by pressing the Pause button once again. This function is not operated for the printing function and the measurement results saving function. For example, when save of the measurement results is executed during Pause, the measurement results at executing save are saved, but not measurement results displayed on the screen.

7.1.3.2 Path trace monitoring

Show the Path Trace (J0, J1) data.

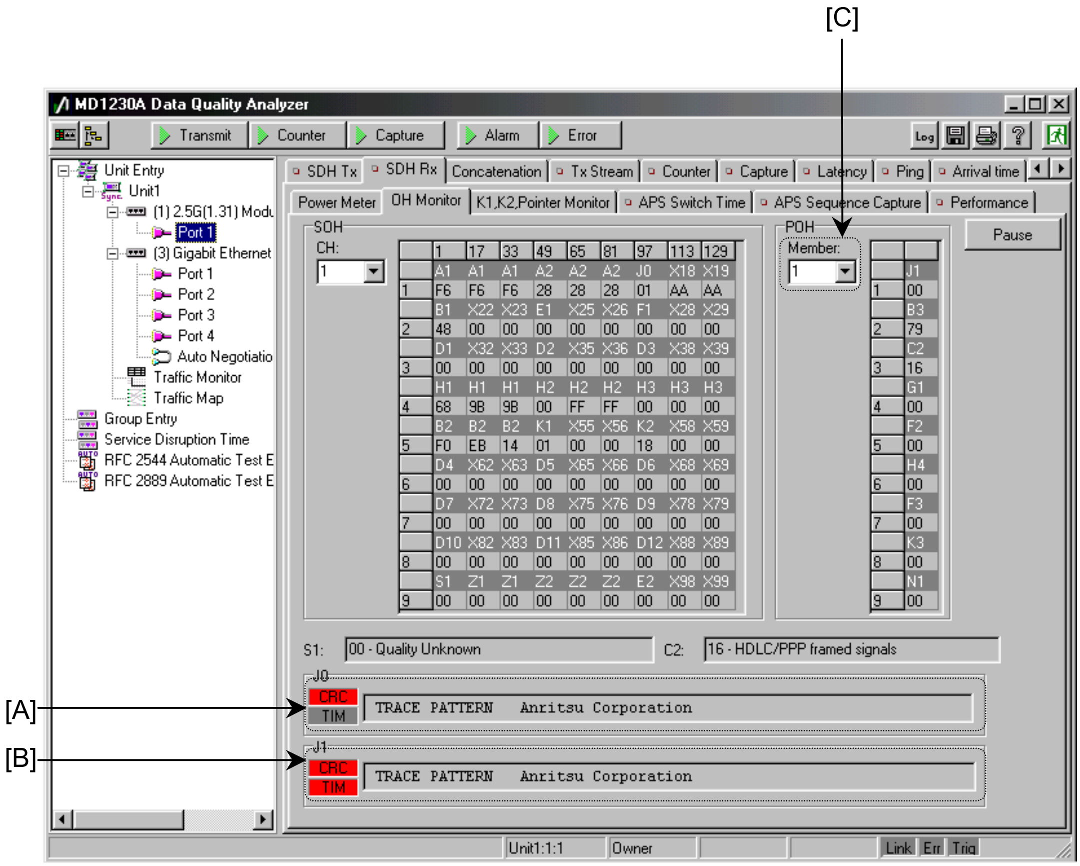


Figure 7.1.3.2-1 OH Monitor screen

	Item		Description
[A]	J0	CRC	The indicator becomes red when a CRC error has occurred, or gray when none is found.
		TIM	The indicator becomes red when TIM has occurred, or gray when none is found.
		J0	Shows the J0 data in ASCII code. Data that cannot be shown in ASCII appear as '.'.
[B]	J1	CRC	The indicator becomes red when a CRC error has occurred, or in gray when none is found.
		TIM	The indicator becomes red when TIM has occurred, or gray when none is found.
		J1	Shows the J1 data in ASCII code. Data that cannot be shown in ASCII appears as '.'.
[C]	Member		Enabled only when using Virtual Concatenation. J1 trace results are of the member specified here.

7.1.3.3 K1/K2 monitoring

Show K1 and K2.

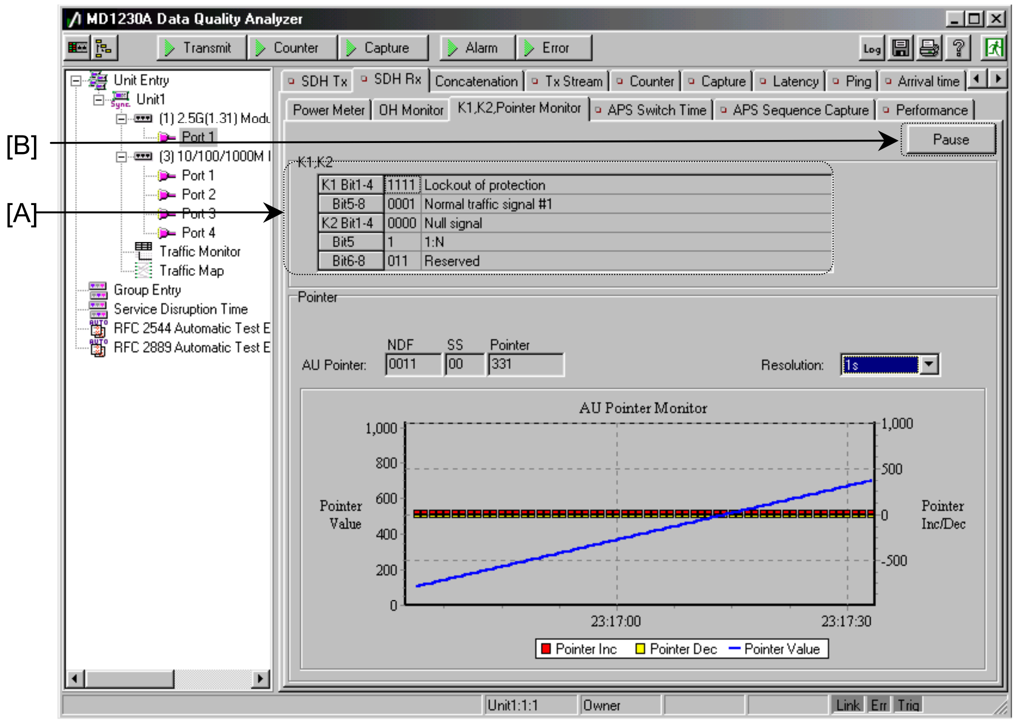


Figure 7.1.3.3-1 K1, K2, Pointer Monitor screen

	Item		Description
[A]	K1, K2	K1 Bit1-4	Shows the binary and decoded values of data for K1 bits 1 to 4.
		Bit5-8	Shows the binary and decoded values of data for K1 bits 5 to 8.
		K2 Bit1-4	Shows the binary and decoded values of data for K2 bits 1 to 4.
		Bit5	Shows the binary and decoded values of data for K2 bit 5.
		Bit6-8	Shows the binary and decoded values of data for K2 bits 6 to 8.
[B]	Pause		Stops updating of the screen temporally. Restarts the update by pressing the Pause button once again. This function is not operated for the printing function and the measurement results saving function. For example, when save of the measurement results is executed during Pause, the measurement results at executing save are saved, but not measurement results displayed on the screen.

7.1.3.4 Pointer monitoring

Show the pointer values.

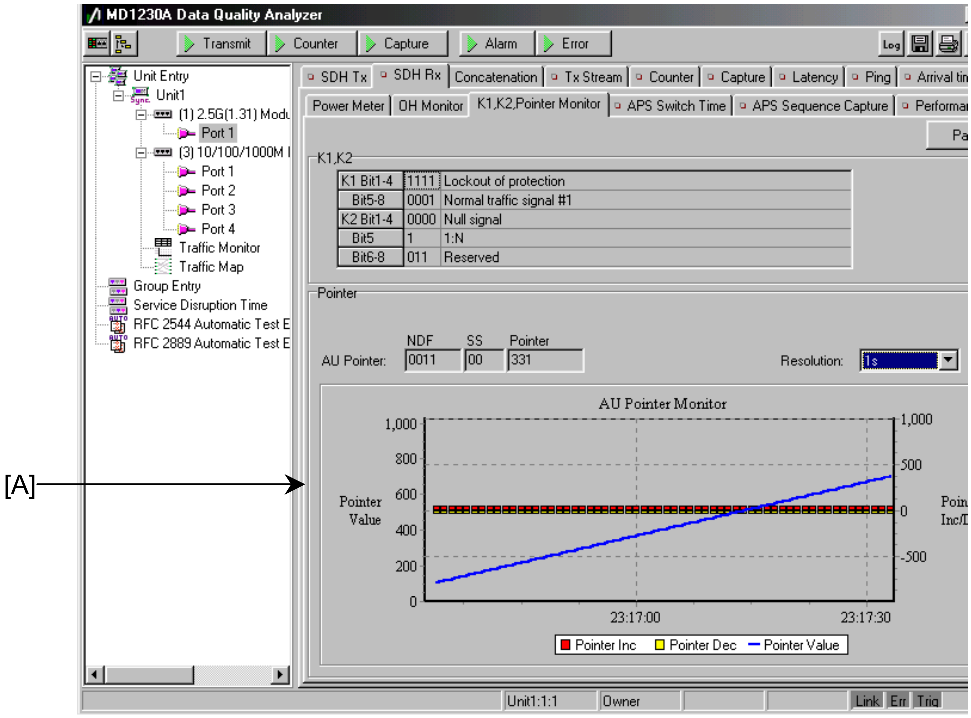


Figure 7.1.3.4-1 K1, K2, Pointer Monitor screen

<table>
<tr><th></th><th colspan="3">Item</th><th>Description</th></tr>
<tr><td rowspan="5">[A]</td><td rowspan="5">Pointer</td><td rowspan="3">AU Pointer</td><td>NDF</td><td>Shows NDF OF AU pointer.</td></tr>
<tr><td>SS</td><td>Shows SS of AU pointer.</td></tr>
<tr><td>Pointer</td><td>Shows Pointer of AU pointer.</td></tr>
<tr><td colspan="2">Resolution</td><td>Set the graph resolution.
Select one from 1 s, 1 min, 15 min and 60 min.</td></tr>
<tr><td colspan="2">AU Pointer Monitor Graph</td><td>Displays the graph of Pointer Inc/Dec (+PJC and –PJC) and Pointer Value (pointer value for each sample) with the set resolution.</td></tr>
</table>

When using Virtual Concatenation, Pointer display for each member can be monitored independently.

[A]

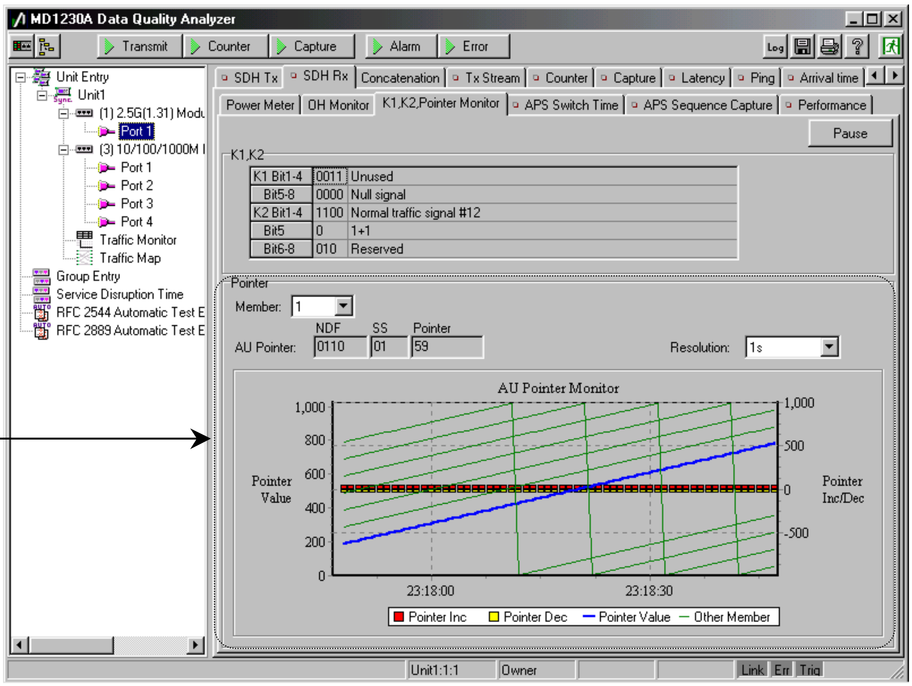


Figure 7.1.3.4-2 K1, K2, Pointer Monitor screen

	Item	Description
[A]	Member	Displayed only when using Virtual Concatenation. Pointer value for the member specified here is plotted in blue as "Pointer Value." All other members are plotted in green as "Other Value."

7.1.4 Measuring Performance

Shows the performance and evaluate quality based on standards conforming to the ITU-T performance measurement. The standard to be used is G.826.

When using Virtual Concatenation, the measured results are of the total of all members consisting the VC group.

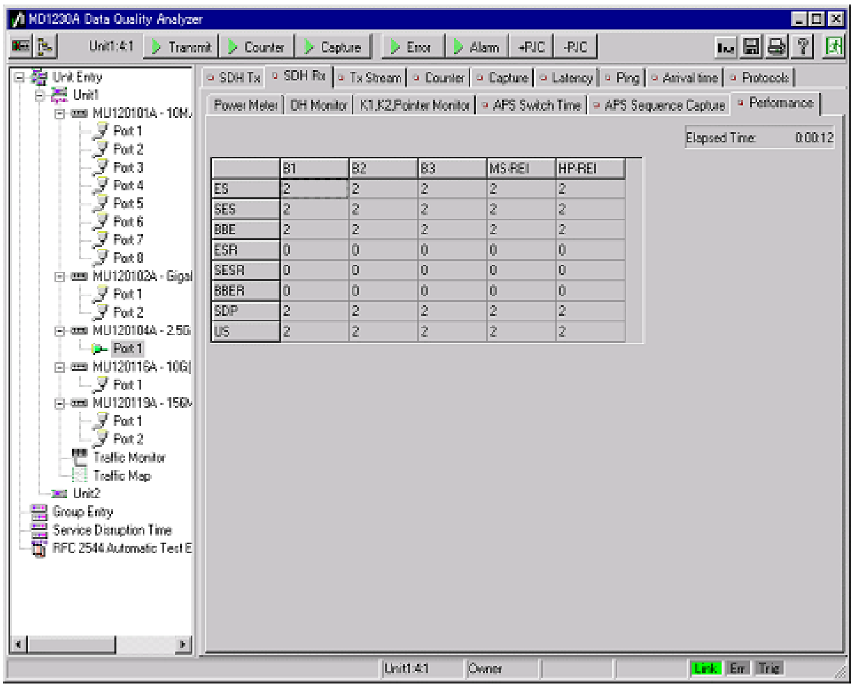


Figure 7.1.4-1 Performance screen

Shows the performance measurement results:

- ES
- SES
- BBE
- ESR
- SESR
- BBER
- SDP
- US

7.1.5 Measurement Related to APS (Automatic Protection Switch)

7.1.5.1 Setting protection protocols

Select G.783 or G.841 for K1/K2 code.

For details, refer to Section 4.1 “Setting Operation Environment”.

7.1.5.2 Generating APS sequence pattern (Setting APS sequence generator)

Specify the K1 and K2 bytes using the sequence.

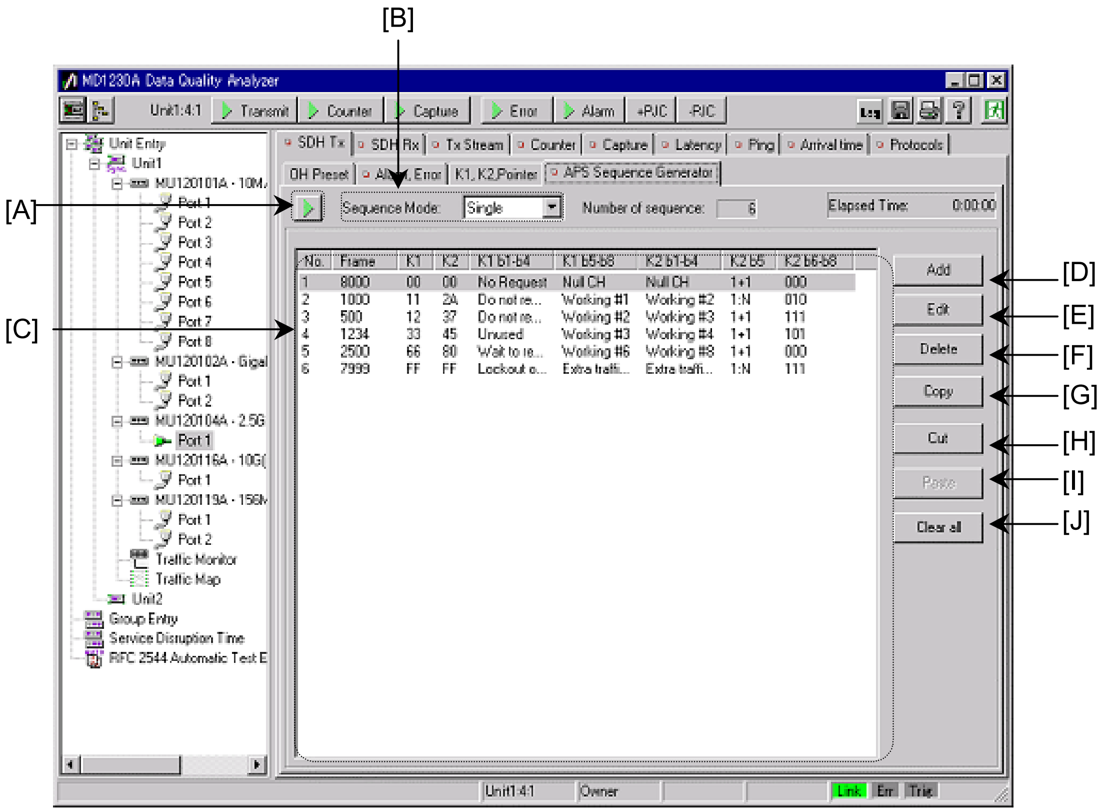
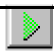


Figure 7.1.5.2-1 APS Sequence Generator screen

	Item		Description
[A]	 Start/Stop		This button starts/stops the APS sequence generator. It becomes a Stop button when the APS sequence generator has started and a Start button when it has stopped.
[B]	Sequence Mode		Selects the sequence mode. The sequence modes available are the followings. • Single • Repeat
[C]	Generate	No.	Shows the sequence number.
		Frame	Shows the number of frames.
		K1	Shows the K1 data in hexadecimal.
		K2	Shows the K2 data in hexadecimal.
		K1 b1-b4	Shows data for K2 bits 1 to 4.
		K1 b5-b8	Shows data for K1 bits 5 to 8.
		K2 b1-b4	Shows data for K2 bits 1 to 4.
		K2 b5	Shows data for K2 bit 5.
		K2 b6-b8	Shows data for K2 bits 6 to 8.
[D]	Add		Shows the APS Setting screen to add the APS sequence to the end (refer to Figure 7.1.5.2-2). This button is disabled when 64 APS sequences have been set.
[E]	Edit		Shows the APS Setting screen to edit the selected APS sequence (refer to Figure 7.1.5.2-2).
[F]	Delete		Deletes the selected APS sequence.
[G]	Copy		Copies the set contents of the selected APS sequence.
[H]	Cut		Cuts the selected APS sequence.
[I]	Paste		Adds the copied APS-sequence set contents as a new APS sequence. The new APS sequence is added to the end of the selected APS sequence, if any; or to the end of the last APS sequence if no APS sequence has been selected.
[J]	Clear all		Deletes all APS sequences.

Set the APS sequence.

Press **Add** or **Edit** on APS Sequence Generator screen (refer to Figure 7.1.5.2-1) to display the following screen:

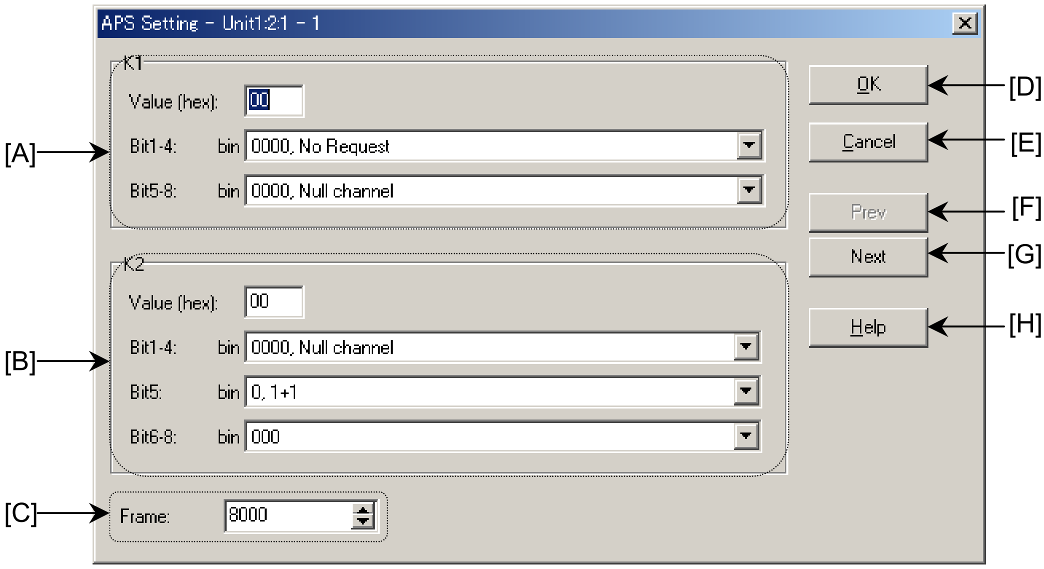


Figure 7.1.5.2-2 APS Setting screen

	Item		Description
[A]	K1	Value(hex)	Set the K1 data in hexadecimal.
		Bit1-4	Select the data for K1 bits 1 to 4 from 0000 to 1111.
		Bit5-8	Select the data for K1 bits 5 to 8 from 0000 to 1111
[B]	K2	Value(hex)	Set the K2 data in hexadecimal.
		Bit1-4	Select the data for K2 bits 1 to 4 from 0000 to 1111.
		Bit5	Select the data for K2 bit 5 from 0 and 1.
		Bit6-8	Select the data for K2 bits 6 to 8 from 000 to 111.
[C]	Frame		Enter a numeric value for the frame data from 1 to 8000.
[D]	OK		Sets the entered data and closes the screen.
[E]	Cancel		Closes the screen without setting the entered data.
[F]	Prev		Updates the APS sequence information to set the previous APS sequence. This button is disabled if the previous APS sequence does not exist.
[G]	Next		Updates the APS sequence information to set the next APS sequence. This button is disabled if the next APS sequence does not exist.
[H]	Help		Shows the help screen.

7.1.5.3 APS sequence capture

Capture and show the K1- and K2-byte sequences with the specified trigger. One capture sequence is defined as the received K1- and K2-byte patterns before changing. A maximum of 64 sequences are captured and displayed. The captured sequences are displayed when a capture is finished.

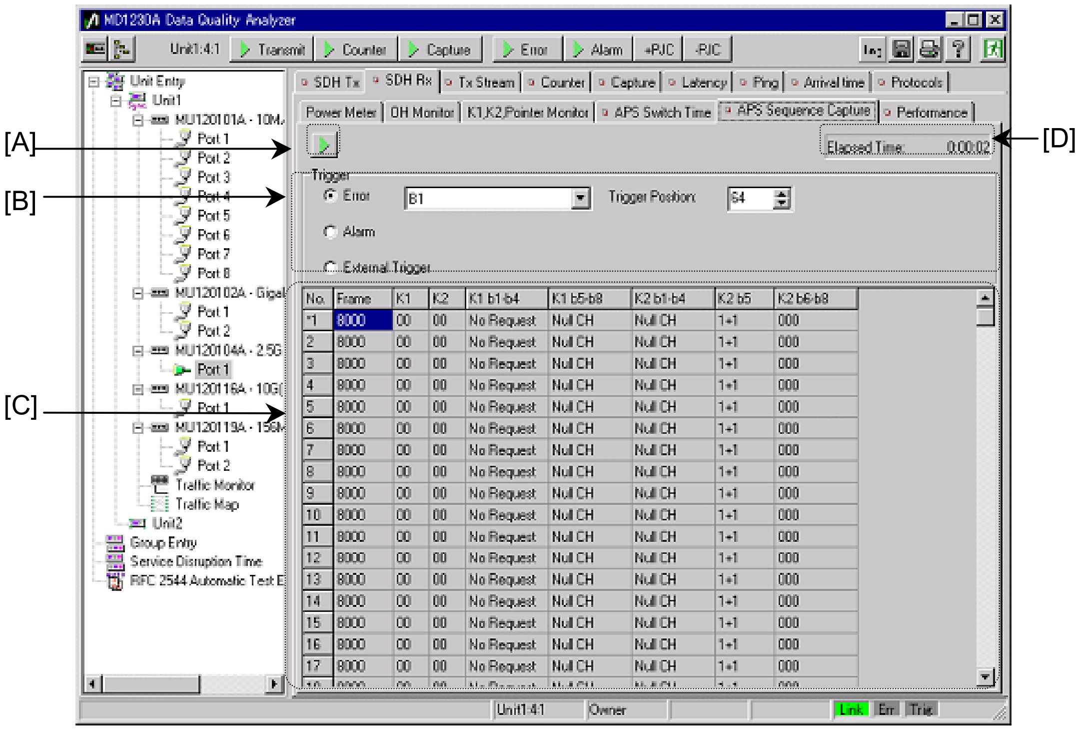


Figure 7.1.5.3-1 APS Sequence Capture screen

	Item	Description
[A]	Start/Stop	This button starts or stops APS Sequence Capture. It becomes a Stop button when APS Sequence Capture has started and a Start button when it has stopped.

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td rowspan="2">[B]</td><td rowspan="2">Trigger</td><td>Error</td><td>Specifies the trigger to an error. The table below shows the errors available for SDH and SONET.
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>B1</td><td>B1</td></tr>
<tr><td>B2</td><td>B2</td></tr>
<tr><td>B3</td><td>B3</td></tr>
<tr><td>MS-REI</td><td>REI-L</td></tr>
<tr><td>HP-REI</td><td>REI-P</td></tr>
<tr><td>HP-IEC</td><td>HP-IEC</td></tr>
<tr><td>Fragments</td><td>Fragments</td></tr>
<tr><td>Undersize</td><td>Undersize</td></tr>
<tr><td>Oversize</td><td>Oversize</td></tr>
<tr><td>Oversize & FCS Error</td><td>Oversize & FCS Error</td></tr>
<tr><td>FCS Error</td><td>FCS Error</td></tr>
<tr><td>Aborted Frame</td><td>Aborted Frame</td></tr>
<tr><td>IP Header Checksum Error</td><td>IP Header Checksum Error</td></tr>
<tr><td>TCP Checksum Error</td><td>TCP Checksum Error</td></tr>
<tr><td>UDP Checksum Error</td><td>UDP Checksum Error</td></tr>
<tr><td>Latency Over</td><td>Latency Over</td></tr>
</table>
When GFP is selected for Mapping on the MU120103B/04B, the following errors are added.
• GFP FCS Error
• Correctable cHEC Error
• Uncorrectable cHEC Error
• Correctable tHEC Error
• Uncorrectable tHEC Error
• eHEC Error</td></tr>
<tr><td>Alarm</td><td>Specifies the trigger to an alarm.
The table below shows the alarms available for SDH and SONET.
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>LOF</td><td>LOF</td></tr>
<tr><td>OOF</td><td>OOF</td></tr>
<tr><td>MS-AIS</td><td>AIS-L</td></tr>
<tr><td>MS-RDI</td><td>RDI-L</td></tr>
<tr><td>AU-AIS</td><td>AIS-P</td></tr>
<tr><td>AU-LOP</td><td>LOP-P</td></tr>
<tr><td>HP-RDI</td><td>RDI-P</td></tr>
<tr><td>HP-SLM</td><td>PLM-P</td></tr>
<tr><td>HP-UNEQ</td><td>UNEQ-P</td></tr>
</table></td></tr>
</table>

	Description		Item
[B]	Trigger	Trigger Position	Set the trigger position with a sequence number.
		External Trigger	Specifies to use external trigger or not.
[C]	APS Sequence		Shows the APS Sequence Capture data in hexadecimal and decoded code. When a trigger has occurred, the sequence number of that trigger is marked as “*”.
[D]	Elapsed Time		Shows the elapsed time of APS Sequence Capture measurement.

7.1.5.4 Measuring switch time (APS Switch Time measurement)

The line switching time can be obtained by measuring how long errors or alarms occurred while switching the line.

When using MU120103A/04A/05A/06A

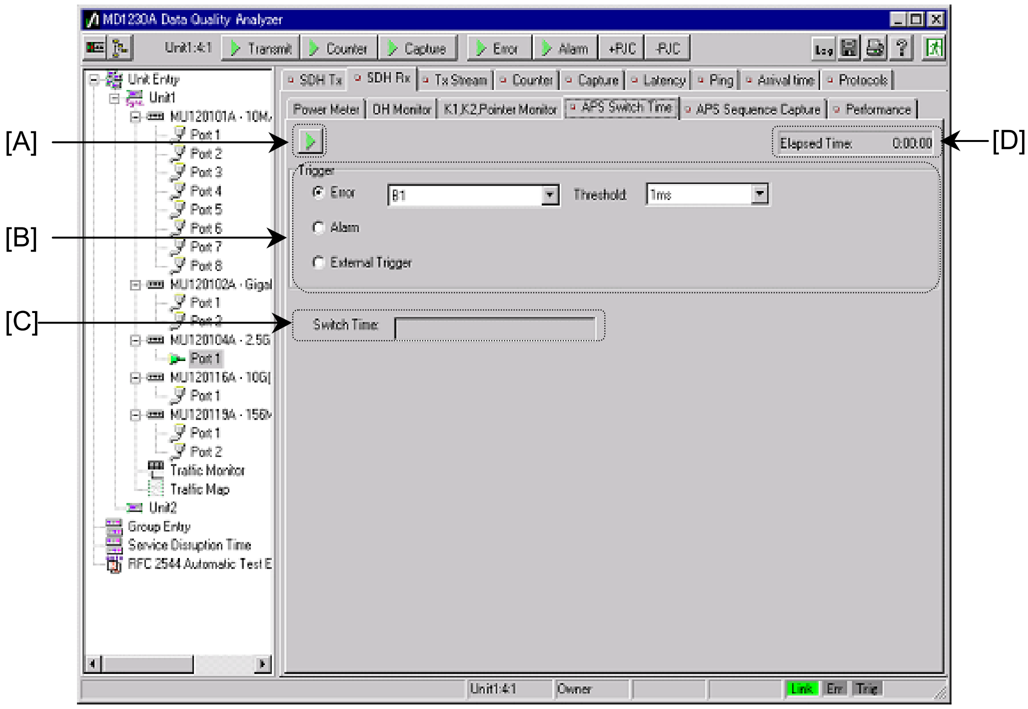


Figure 7.1.5.4-1 APS Switch Time screen (MU120103A/04A/05A/06A)

	Item	Description
[A]	Start/Stop	This button starts or stops APS Switch Time. It becomes a Stop button when APS Switch Time has started and a Start button when it has stopped.

	Item		Description
[B]	Trigger	Error	Sets the trigger to an error. The available errors are the same as those in 7.1.5.3 “APS sequence capture.”
		Alarm	Sets the trigger to an alarm. The available alarms are the same as those in 7.1.5.3 “APS sequence capture.”
		Threshold	Selects Threshold. The available thresholds are given below. • 1 ms • 10 ms • 100 ms
		External Trigger	Specifies to use external trigger or not.
[C]	Switch Time		Shows the switch time in s.
[D]	Elapsed Time		Shows the elapsed time of APS Switch Time measurement.

When using MU120103B/04B

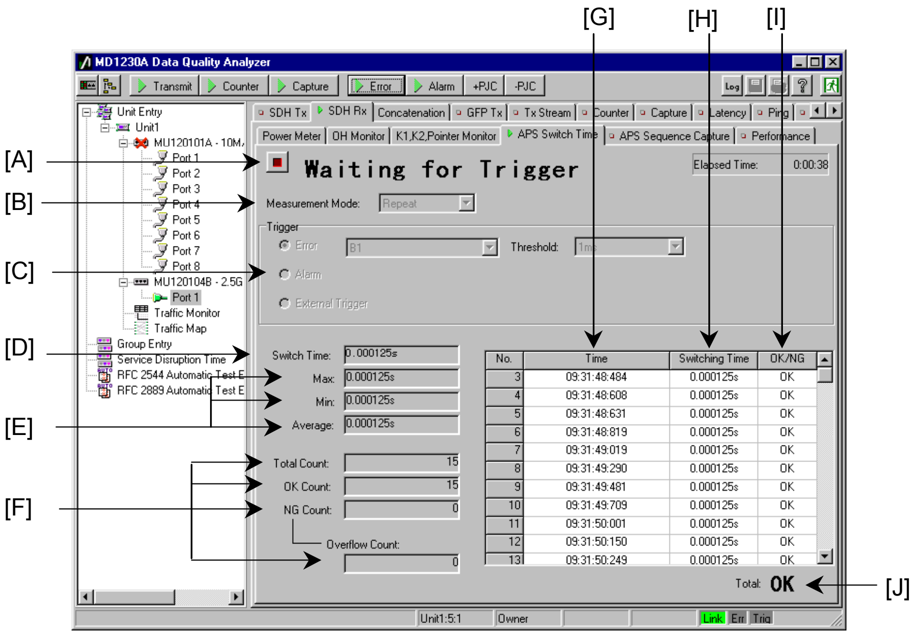
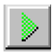


Figure 7.1.5.4-2 APS Switch Time screen (MU120103B/04B)

	Item		Description
[A]	 Start/Stop		This button starts or stops APS Switch Time. It becomes a Stop button when APS Switch Time has started and a Start button when it has stopped.
[B]	Measurement Mode		Single: Performs measurement only once. Repeat: Performs measurement up to 1,000 times.
[C]	Trigger	Error	Sets the trigger to an error. The available errors are the same as those in 7.1.5.3 “APS sequence capture.”
		Alarm	Sets the trigger to an alarm. The available alarms are the same as those in 7.1.5.3 “APS sequence capture.”
		Threshold	Selects Threshold. The available thresholds are given below. • 1 ms • 10 ms • 100 ms
		External Trigger	Specifies to use external trigger or not.
[D]	Switch Time		Shows the switch time in s. In the Repeat mode, results for the current measurement period are displayed.
[E]	Max,Min,Average		Maximum, minimum and average value of results for APS Switch Time measurements.
[F]	Total/OK/NG Count		Shows measured result count value. OK: Count of result in which switching time is 50 ms or less NG: Count of result in which switching time is over 50 ms Total: Total measured count Over Flow: Count of stopped measurement after switching time exceeded 2 seconds.
[G]	Time		Time when APS switching occurred.
[H]	Switching Time		Shows the switch time in s.
[I]	OK/NG		Pass/fail judgment using 50 ms as the criteria.
[J]	Total judgment		Pass/fail judgment for all measurements. Becomes OK only when the all measurements are judged to be OK.

7.1.6 Settings Related to Concatenation

The Contiguous/Virtual Concatenation functions are enabled only when Option 01 EOS Mapping or Option 02 Virtual Concatenation is installed on the MU120103B/04B.

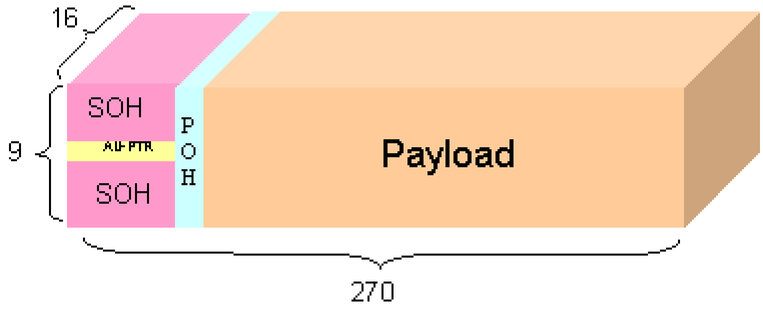
Settings for Concatenation are performed in the Measurement CH and Dummy CH tabs.

Switch between Contiguous Concatenation and Virtual Concatenation from the Port Setting screen (refer to Section 4.5.1 (2)).

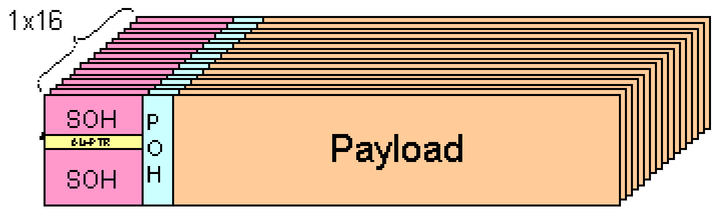
Concept of Measurement CH on the MD1230B

Figure 7.1.6-1 shows a conceptual image of band division by the Contiguous Concatenation function. In VC4-16c, all bands within the payload are allocated to one communication route (Figure 7-6-1 (a)). In STM-16, it is assumed to be containing 16 VC4 components (Figure 7-6-1 (b)). In VC4-16c, all these components are combined to realize a communication speed of 299,520,000 bytes/s.

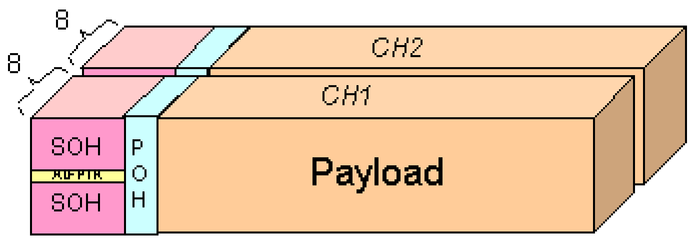
In VC4-8c (Figure 7.1.6-1 (c)) and VC4-4c (Figure 7.1.6-1 (d)), the VC4-16c band is divided equally into 2 or 4 to be allocated as independent communication routes. The MU120103B/04B selects one for transmission and one for reception and handles them as Measurement CH. Channels that are not selected as Measurement CH are called Dummy CH.



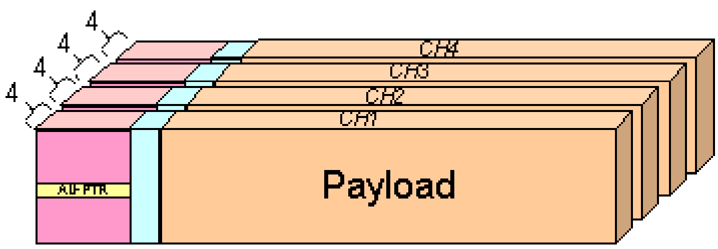
(a) Image for VC4-16c



(b) Image for STM-16



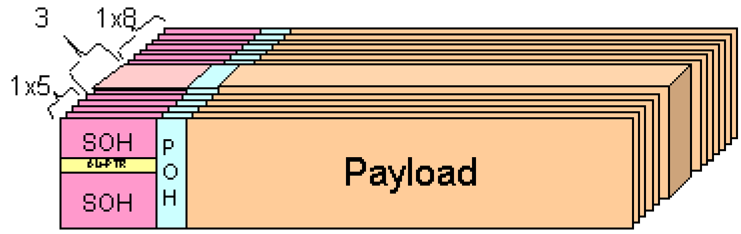
(c) Image for VC4-8c



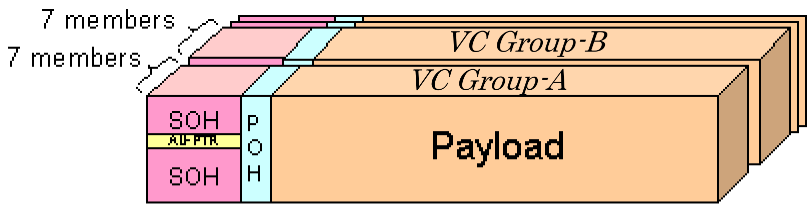
(d) Image for VC4-4c

Figure 7.1.6-1 Channel division concept for Concatenation

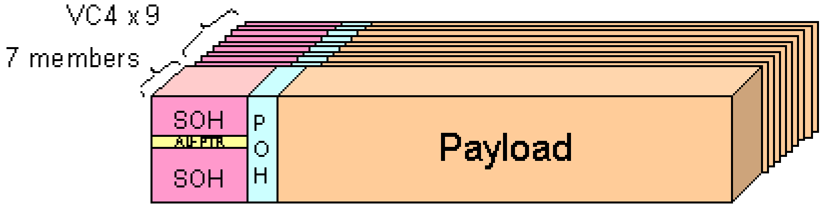
In VC4-3c, the VC4-16c band cannot be divided equally. In this case, specify the top VC4 in VC-3c components to set Measurement CH. Figure 7.1.6-2 (a) shows an example of when Measurement CH is set to 6 in VC4-3c.



(a) Example when measurement CH is set to 6 in VC4-3c



(b) VC4-7v



(c) Transmission signal image in VC4-7v

Figure 7.1.6-2 VC4-3c and Virtual Concatenation

In Virtual Concatenation, each communication route is called a VC Group. Each VC (Virtual Container) consisted in a VG Group is called a Member (Figure 7.1.6-2 (b).)

When using Virtual Concatenation with the MU120103B/04B, there is a restriction that all Members within a VC Group should be in contiguity on byte interleave in AUG1 configuration. For this reason, set the Measurement CH in the same way as the VC4-3c.

In addition, when using Virtual Concatenation with the MU120103B/04B, all Dummy CHs that were not selected as Measurement CHs are transmitted as VCs (Virtual Containers), a minimum unit. For example, in VC4-7v (Figure 7.1.6-2 (c)), 9 VC4s are Dummy CHs. In VC3-12v, 36 VC3s are Dummy CHs.

7.1.6.1 Setting Measurement CH (Contiguous)

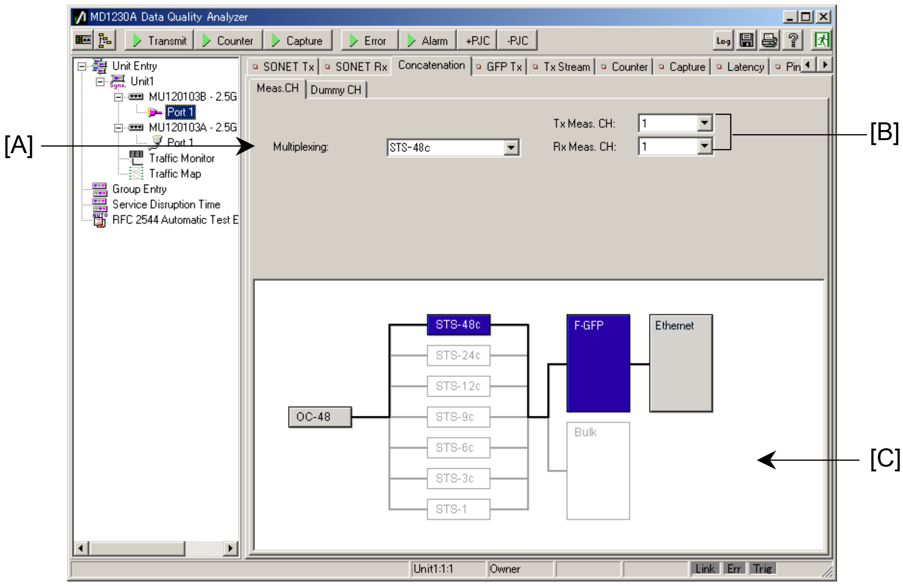


Figure 7.1.6.1-1 Measurement CH screen (Contiguous Concatenation)

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Multiplexing</td><td>Select from the following:
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>VC-4-16c</td><td>STS-48c</td></tr>
<tr><td>VC-4-8c</td><td>STS-24c</td></tr>
<tr><td>VC-4-4c</td><td>STS-12c</td></tr>
<tr><td>VC-4-3c</td><td>STS-9c</td></tr>
<tr><td>VC-4-2c</td><td>STS-6c</td></tr>
<tr><td>VC-4</td><td>STS-3c</td></tr>
<tr><td>VC-3</td><td>STS-1</td></tr>
</table></td></tr>
<tr><td>[B]</td><td>Tx Meas.CH,
Rx Meas.CH</td><td>Select Tx/Rx Measurement CH. The setting ranges vary depending on selection in Multiplexing.
• VC-4-16c / STS-48c 1
• VC-4-8c / STS-24c 1 to 2
• VC-4-4c / STS-12c 1 to 4
• VC-4-3c / STS-9c 1 to 14
• VC-4-2c / STS-6c 1 to 8
• VC-4 / STS-3 1 to 16
• VC-3 / STS-1 1 to 48</td></tr>
<tr><td>[C]</td><td></td><td>Shows image of the item selected in Multiplexing.</td></tr>
</table>

7.1.6.2 Setting Measurement CH (Virtual)

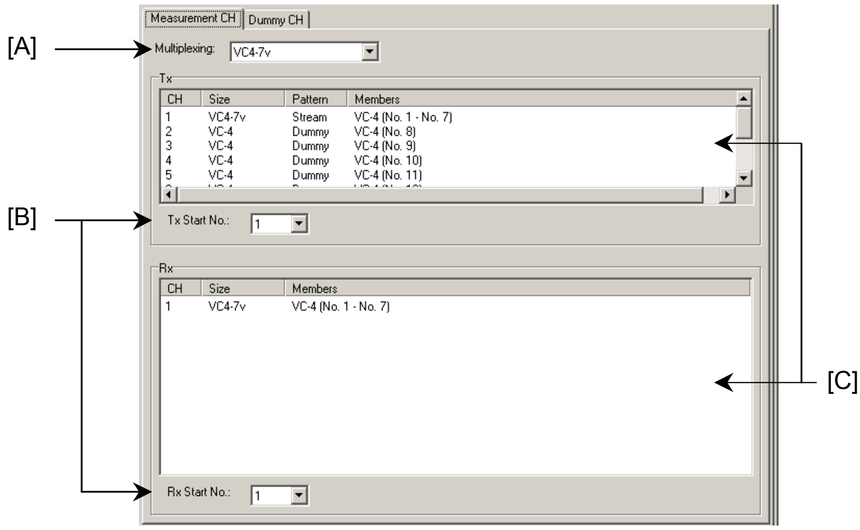


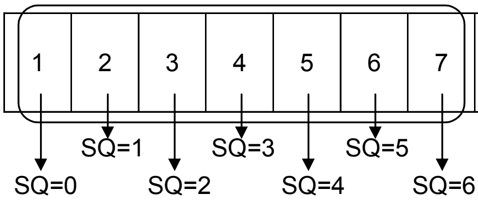
Figure 7.1.6.2-1 Measurement CH screen (Virtual Concatenation)

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Multiplexing</td><td>Select from the following:
<table>
<tr><th>SDH</th><th>SONET</th></tr>
<tr><td>VC4-8v</td><td>STS3c-8v</td></tr>
<tr><td>VC4-7v</td><td>STS3c-7v</td></tr>
<tr><td>VC4-6v</td><td>STS3c-6v</td></tr>
<tr><td>VC4-5v</td><td>STS3c-5v</td></tr>
<tr><td>VC4-4v</td><td>STS3c-4v</td></tr>
<tr><td>VC4-3v</td><td>STS3c-3v</td></tr>
<tr><td>VC4-2v</td><td>STS3c-2v</td></tr>
<tr><td>VC3-24v</td><td>STS1-24v</td></tr>
<tr><td>VC3-21v</td><td>STS1-21v</td></tr>
<tr><td>VC3-18v</td><td>STS1-18v</td></tr>
<tr><td>VC3-15v</td><td>STS1-15v</td></tr>
<tr><td>VC3-12v</td><td>STS1-12v</td></tr>
<tr><td>VC3-9v</td><td>STS1-9v</td></tr>
<tr><td>VC3-6v</td><td>STS1-6v</td></tr>
<tr><td>VC3-3v</td><td>STS1-3v</td></tr>
</table></td></tr>
</table>

	Item	Description
[B]	Tx Meas.CH, Rx Meas.CH	Select Tx/Rx Measurement CH. The setting ranges vary depending on selection in Multiplexing. • VC4-8v / STS3c-8v 1 to 9 / Step1 • VC4-7v / STS3c-7v 1 to 10 / Step1 • VC4-6v / STS3c-6v 1 to 11 / Step1 • VC4-5v / STS3c-5v 1 to 12 / Step1 • VC4-4v / STS3c-4v 1 to 13 / Step1 • VC4-3v / STS3c-3v 1 to 14 / Step1 • VC4-2v / STS3c-2v 1 to 15 / Step1 • VC3-24v / STS1-24v 1 to 9 / Step1 • VC3-21v / STS1-21v 1 to 10 / Step 1 • VC3-18v / STS1-18v 1 to 11 / Step 1 • VC3-15v / STS1-15v 1 to 12 / Step 1 • VC3-12v / STS1-12v 1 to 13 / Step 1 • VC3-9v / STS1-9v 1 to 14 / Step 1 • VC3-6v / STS1-6v 1 to 15 / Step 1 • VC3-3v / STS1-3v 1 to 16 / Step 1
[C]		Shows CH setting status in a list display.

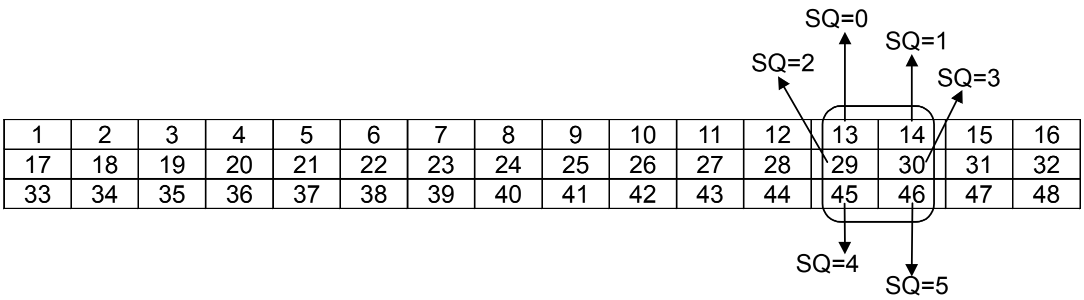
Tx(Rx) Start No. settings and correspondence between Member and SQ:
Numbers displayed as Members correspond to VC (Virtual Container) as shown below. Sequence Indicator (SQ) is set in this order.

Conceptual diagram of 16 VC4s consisting an STM-16 is shown below:



Ex.: VC4-7v, Start No.=1

Conceptual diagram of 48 VC3s consisting an STM-16 is shown below:



Ex.: VC3-6v, Start No.=13

7.1.6.3 Setting Dummy CH

Set Dummy CH. Dummy CH refers to channels except the Tx Measurement CH. Set the pattern type that is to be transmitted from a Dummy CH in this screen.

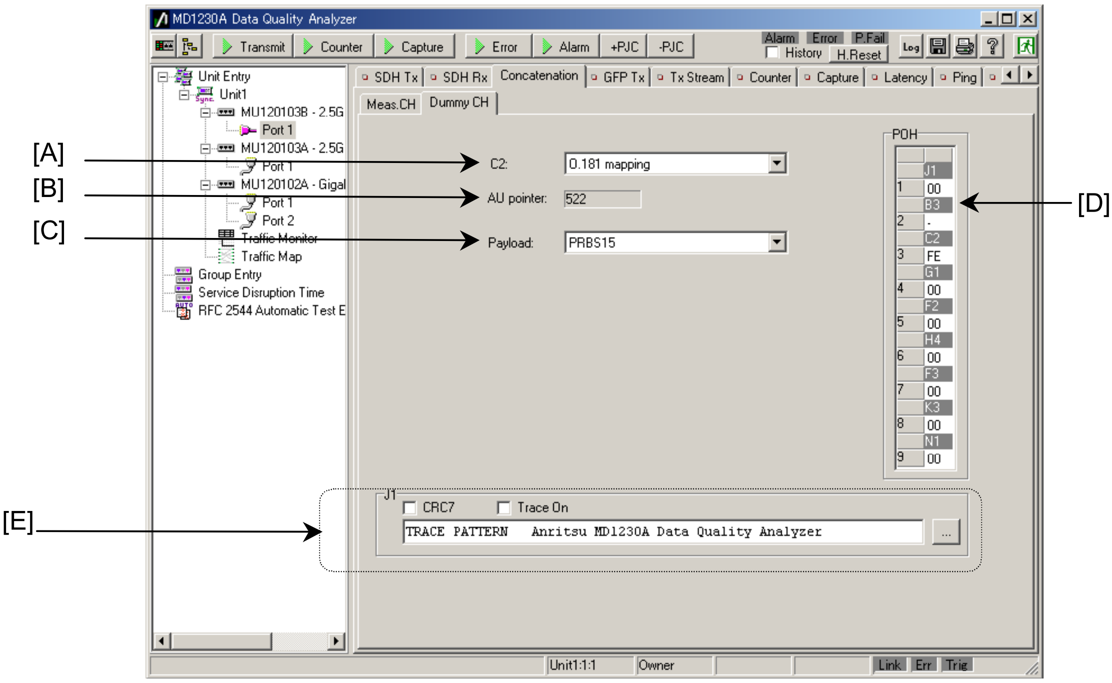


Figure 7.1.6.3-1 Dummy CH screen

	Item	Description
[A]	C2 combo-box	Sets C2 in Dummy CH. Same as C2 in the OH Preset screen, this item changes according to the C2 byte setting for POH.
[B]	STS (AU) pointer	Shows STS (AU) pointer. Pointer for Dummy CH is always 522.

	Item		Description
[C]	Dummy Payload		Selects pattern type to be set for Payload of Dummy CH to be transmitted. • Copy: Transmits the same pattern as Tx Measurement CH. *1 • All0: Sets all bits to 0. • All1: Sets all bits to 1. • PRBS15: Sets Dummy CH pattern to PRBS15. • PRBS23: Sets Dummy CH pattern to PRBS23. • PRBS31: Sets Dummy CH pattern to PRBS31. • Idle/Flag: Sets Dummy CH pattern to GFP Idle Frame.*2 *1 Copy cannot be selected for STS-9c (VC-4-3c), or when using Virtual Concatenation. *2 Padded with Idle frame when Mapping is set to Frame-Mapped GFP; padded with flag byte (0x7E) when Mapping is set to PPP/Cisco HDLC/MAPOS/LAPS/LEX. Cannot be selected when Mapping is set to Bulk.
[D]	POH		Edit POH in Dummy CH. Values are entered in hexadecimal. POH: J1, B3, C2, G1, F2, H4, F3, K3, N1 — **SDH Frame** POH: J1, B3, C2, G1, F2, H4, Z3, Z4, Z5 — **SONET Frame**
[E]	J1	CRC7	Set CRC7. Checked: CRC7 is enabled and J1 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J1 consists of 64 bytes.
		Trace On	Set whether or not to enable tracing. Trace is enabled when checked.
		J1	Enter J1 in ASCII code. When using Virtual Concatenation, this setting is common to all members consisting the VC group.

7.1.7 Setting GFP Tx

7.1.7.1 Setting Header

Sets Header screen for transmission GFP frame. Set values on this item are not applied to transmission frame set in Tx Stream screen. They are applied to frames that the MU120103B/04B transmits voluntarily. A voluntarily transmitted frame refers to, for example, Reply for Ping Request in the Protocol function.

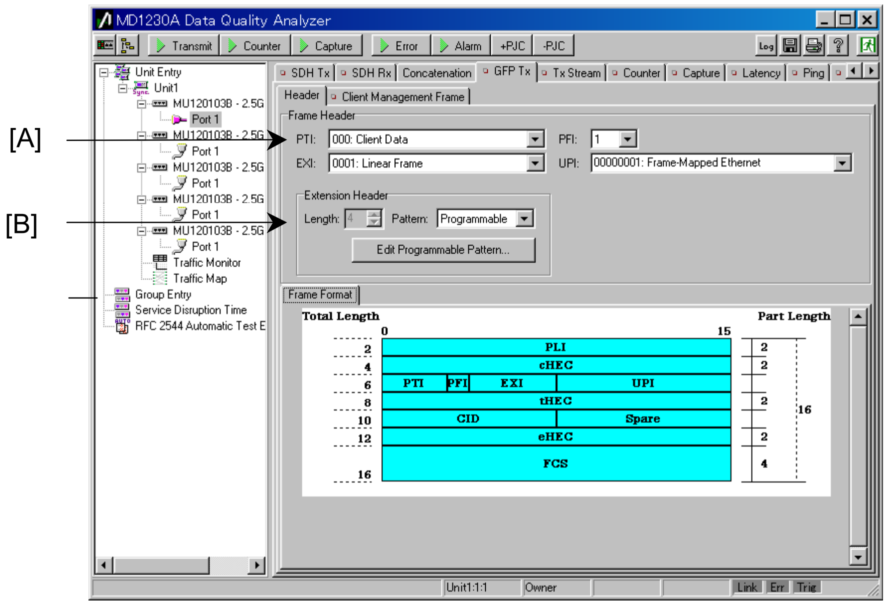


Figure 7.1.7.1-1 GFP Header screen

	Item		Description
[A]		PTI	Selects the PTI field.
		EXI	Selects Extension Header type.
		PFI	Selects presence/absence of Payload FCS.
		UPI	Selects the UPI field.
[B]	Extension Header		Valid when EXI is set to other than Null Extension Header / Linear Extension Header.
		Length	Sets Extension Header size. Value: 2 to 58 bytes
		Pattern	Select All0, All1 or Programmable. For Binary Data settings, refer to 2.3.1, (7) “Binary Data Editor.”

7.1.7.2 Setting Client Management Frame

Sets Client Management Frame screen. Client Management Frame transmission is not synchronized with Stream transmission. Total size of Client Management Frame is from 4 to 1024 bytes in 4-byte steps.

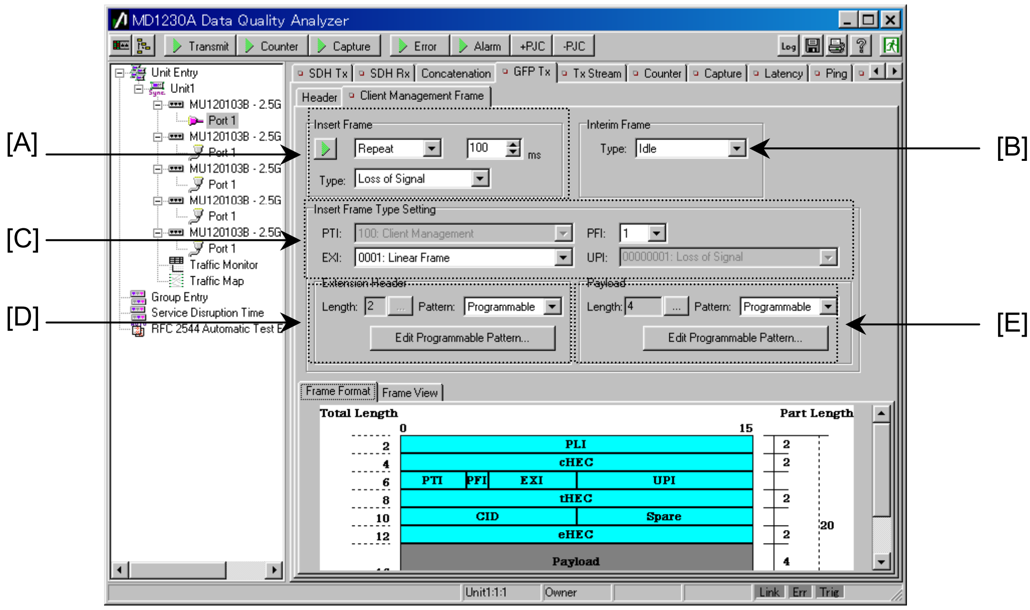
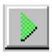


Figure 7.1.7.2-1 Client Management Frame screen

	Item		Description
[A]	Insert Frame	 Start/Stop	This button starts/stops Client Management Frame transmission.
		(Mode)	Single: Transmits only one frame. Repeat: Transmits frames continuously until Stop button is pressed.
		(Transmission interval)	Sets the transmission interval for Repeat mode. Value: 10 to 2,560 ms (step: 10 ms)
		Type	Selects Client Management Frame type. Select one from Loss of Signal / Loss of Sync / User1 / User2. User1 / User2 are user-defined frames.
[B]	Interim		Select signal type to be inserted between frames for Repeat transmission. Idle: Padded with GFP idle frames. Client Data: Padded with stream during stream transmission, or with GFP idle frames when stream transmission is stopped.
[C]		PTI	Fixed value display. Cannot be set in this screen.
		EXI	Selects Extension Header type.
		PFI	Selects presence/absence of Payload FCS.
		UPI	Cannot be set when Type is set to Loss of Sync or Loss of Signal.
[D]	Extension Header		Valid when EXI is set to other than Null Extension Header / Linear Extension Header.
		Length	Set this item so that total size of Client Management Frames is multiples of 4. Value: 2 to 58 bytes
		Pattern	Select All0, All1 or Programmable. ☞ For Binary Data settings, refer to 2.3.1, (7) "Binary Data Editor."
[E]	Payload		Sets Payload.
		Length	Set this item so that total size of Client Management Frames is multiples of 4. Value: 8 to 2,048 – (total header + Payload FCS size)
		Pattern	Select All0, All1 or Programmable. ☞ For Binary Data settings, refer to 2.3.1, (7) "Binary Data Editor."

7.2 Functions Specific to MU150101A Module

7.2.1 Optical attenuate and Power Meter

The optical attenuation can adjust the optical output power. The power meter shows the optical reception level.

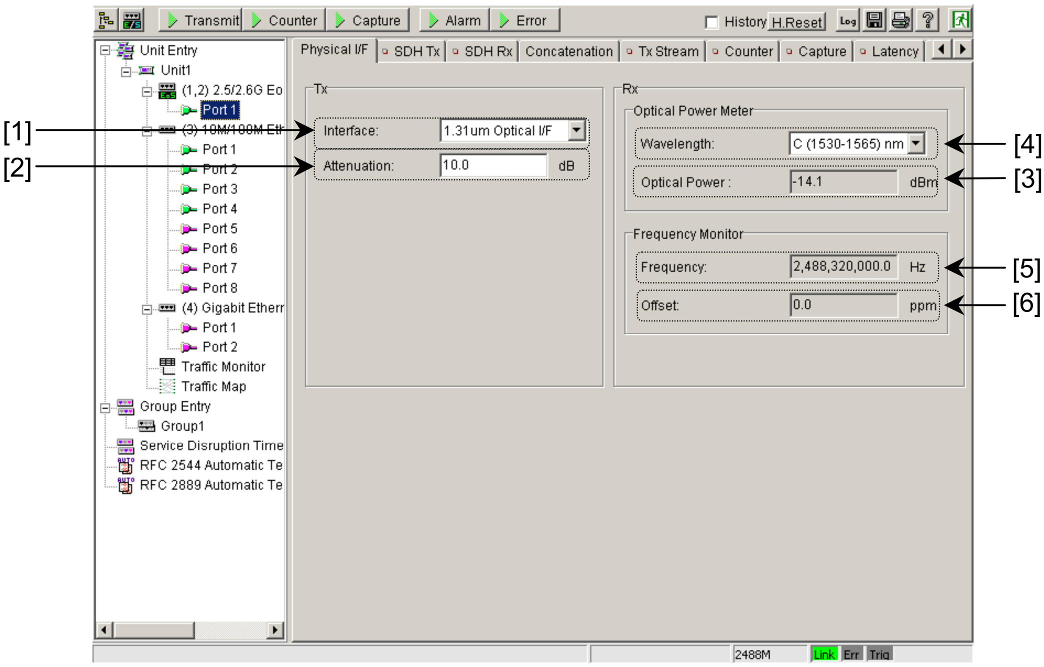


Figure 7.2.1-1 Physical I/F screen

[1] Interface

Select the wavelength of optical output signals from 1.31 um and 1.55 um. The selectable wavelength differs depending on the installed options.

When MU150101A-01 installed: Only 1.31 um can be selected.

When MU150101A-02 installed: Only 1.55 um can be selected.

When MU150101A-03 installed: Either 1.31 um or 1.55 um can be selected.

[2] Attenuation

Set an attenuation value used to adjust the power of an optical output signal. This is enabled when the MU150101A-04 Optical Output Power Adjustable is installed.

Setting range: 0 to 30.0

[3] Optical Power

Displays the power of the optical input signal. The measurable range is −7 dBm to −40 dBm. When the measurable range is exceeded, it is displayed as out of range.

[4] Wavelength

Used to select the wavelength for the optical power meter. Select the wavelength of the incident light from the following wavelength bands:

O (1260 thru 1360) nm

S (1460 thru 1530) nm

C (1530 thru 1565) nm

L (1565 thru 1625) nm

This setting is valid for optical power measurement only, and does not affect any performance tests other than optical power measurement.

[5] Frequency

Displays the counted frequency of the input signals. The measurable range is ±100 ppm. When the measurable range is exceeded, it is displayed as out of range.

[6] Offset

Displays the offset between the frequency measured from the input signals and the standard frequency in ppm. The measurable range is ±100 ppm. When the measurable range is exceeded, it is displayed as out of range.

7.2.2 Setting Overhead Information

7.2.2.1 OH Preset

Edit SOH and POH.

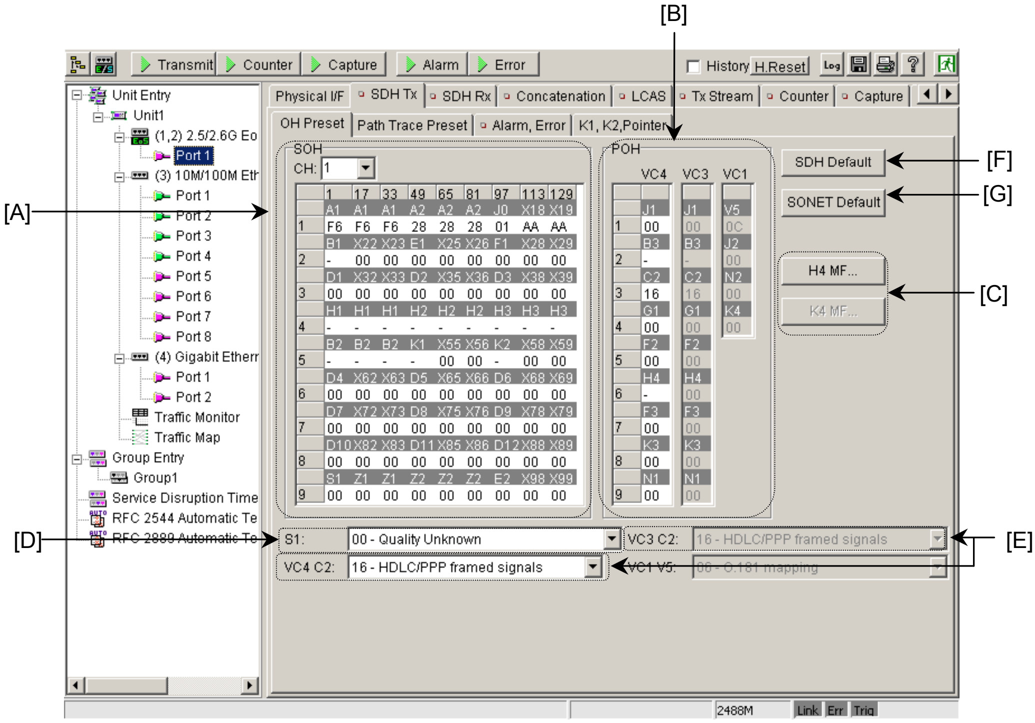


Figure 7.2.2.1-1 OH Preset screen

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>SOH</td><td>CH</td><td>Select or directly enter the CH number to display the SOH. The setting ranges are shown below:
<table><tr><th>Bit Rate</th><th>Setting range</th></tr><tr><td>156 M</td><td>1</td></tr><tr><td>622 M</td><td>1 to 4</td></tr><tr><td>2488 M</td><td>1 to16</td></tr></table></td></tr>
</table>

Note:

The values of the AU pointers (H1, H2), TU pointers (V1, V2), and K1 and K2 cannot be set on this screen.

Refer to Section 7.2.2.4 “Setting pointer” for how to set the AU pointers and TU pointers, and refer to Section 7.2.2.3 “Setting K1 and K2” for how to set the K1 and K2 values.

Note that the values of B1, B2, B3, and BIP-2 cannot be set.

	Item		Description
[A]	SOH	SOH	Edit SOH. The SOH that can be edited at each CH are given in the tables below. Values are entered in hexadecimal.

SOH Ch1

A1	A1	A1	A2	A2	A2	J0	X18	X19
B1	X22	X23	E1	X25	X26	F1	X28	X29
D1	X32	X33	D2	X35	X36	D3	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	K1	X55	X56	K2	X58	X59
D4	X62	X63	D5	X65	X66	D6	X68	X69
D7	X72	X73	D8	X75	X76	D9	X78	X79
D10	X82	X83	D11	X85	X86	D12	X88	X89
S1	Z1	Z1	Z2	Z2	Z2	E2	X98	X99

SOH Ch3

A1	A1	A1	A2	A2	A2	Z0	X18	X19
X21	X22	X23	X24	X25	X26	X27	X28	X29
X31	X32	X33	X34	X35	X36	X37	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	X54	X55	X56	X57	X58	X59
X61	X62	X63	X64	X65	X66	X67	X68	X69
X71	X72	X73	X74	X75	X76	X77	X78	X79
X81	X82	X83	X84	X85	X86	X87	X88	X89
Z1	Z1	Z1	M1	Z2	Z2	X97	X98	X99

SOH Ch2,Ch4~

A1	A1	A1	A2	A2	A2	Z0	X18	X19
X21	X22	X23	X24	X25	X26	X27	X28	X29
X31	X32	X33	X34	X35	X36	X37	X38	X39
H1	H1	H1	H2	H2	H2	H3	H3	H3
B2	B2	B2	X54	X55	X56	X57	X58	X59
X61	X62	X63	X64	X65	X66	X67	X68	X69
X71	X72	X73	X74	X75	X76	X77	X78	X79
X81	X82	X83	X84	X85	X86	X87	X88	X89
Z1	Z1	Z1	Z2	Z2	Z2	X97	X98	X99

Figure 7.2.2.1-2 Multiplexing SDH Frame (2488M)

	Item	Description
[B]	POH	Edit POH. Values are entered in hexadecimal. POH(VC4/VC3): J1, B3, C2, G1, F2, H4, F3, K3, N1 POH(VC1): V5, J2, N2, K4 When using Virtual Concatenation, the value set here is applied to the POHs of all channels. Setting of the H4 byte is executed by the H4 MF setting, and setting of the K4 byte (*) is executed by the K4 MF setting.
[C]	H4 MF...	The H4 byte multi-frame can be set when Virtual Concatenation VC4-Xv or VC3-Xv is selected. Clicking this button displays the H4 byte setting screen. Setting is impossible when VC12-Xv or VC11-Xv is selected (the TU multi-frame indicator will be automatically transmitted).
	K4 MF...	The K4 byte multi-frame can be set when Virtual Concatenation VC12-Xv or VC11-Xv is selected. Clicking this button displays the K4 byte setting screen. Setting is impossible when VC4-Xv or VC3-Xv is selected.
[D]	S1	Select the S1 byte value.
[E]	C2	Select the C2 byte value.
[F]	SDH Default	Set the OH value as the SDH initial value.
[G]	SONET Default	Set the OH value as the SONET initial value.

Note:

Setting related to the H4 MF… is possible only when the MU150101A-11 HO Virtual Concatenation is installed.

Settings related to the low-order mapping (such as the TU pointer and VC1 POH) are possible only when the MU150101A-12 LO Virtual Concatenation is installed.

7.2.2.2 Path Trace Preset

Set a path trace pattern.

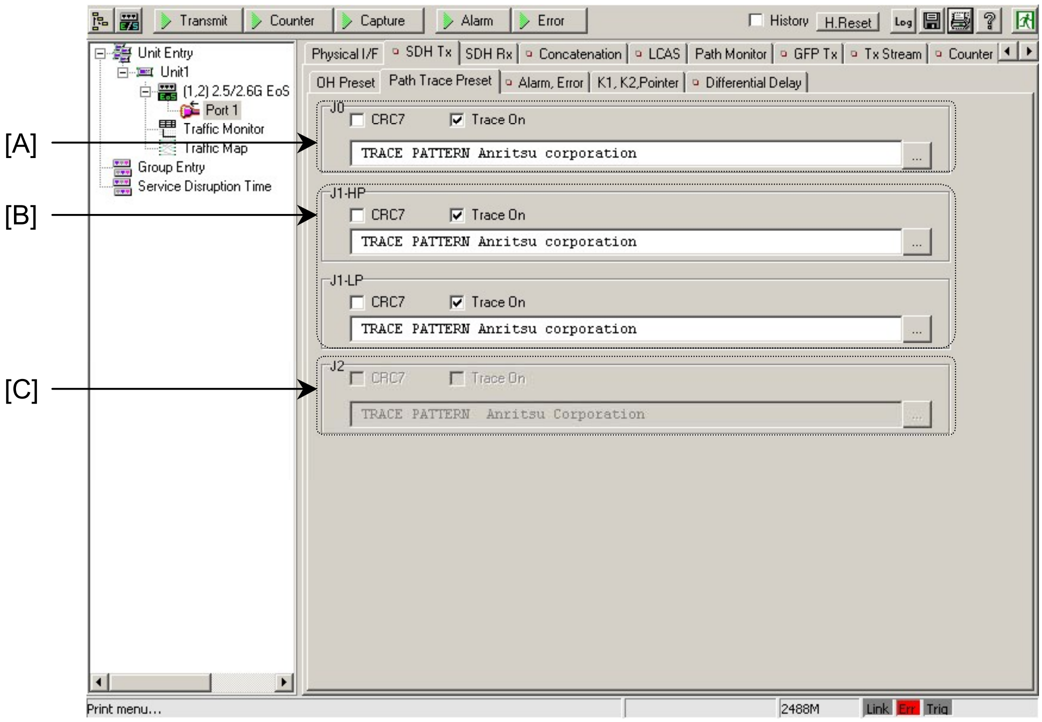


Figure 7.2.2.2-1 Path Trace Preset screen

	Item		Description
[A]	J0	CRC7	Set CRC7. Checked: CRC7 is enabled and J0 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J0 consists of 64 bytes.
		Trace On	Set whether or not to enable tracing. Trace is enabled when checked.
		J0	Enter a trace pattern using either of the following two methods. The entered trace pattern is output after being converted to ASCII code. (1) Enter directly from the keyboard. (2) Enter from the graphical keyboard displayed on the screen.
[B]	J1/ J1-HP/ J1-LP	CRC7	Set CRC7. Checked: CRC7 is enabled and J1 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J1 consists of 64 bytes.
		Trace On	Set whether or not to enable tracing. Trace is enabled when checked.
		J1	Enter a trace pattern using either of the following two methods. The entered trace pattern is output after being converted to ASCII code. (1) Enter directly from the keyboard. (2) Enter from the graphical keyboard displayed on the screen. When using Virtual Concatenation, the value set here is applied to the POHs of all channels.
[C]	J2	CRC7	Set CRC7. Checked: CRC7 is enabled and J2 consists of 16 bytes with 15 bytes and CRC7. Unchecked: CRC7 is disabled and J2 consists of 64 bytes.
		Trace On	Select whether to perform Trace. Trace is performed when this checkbox is checked.
		J2	Enter a trace pattern using either of the following two methods. The entered trace pattern is output after being converted to ASCII code. (1) Enter directly from the keyboard. (2) Enter from the graphical keyboard displayed on the screen. When using Virtual Concatenation, the value set here is applied to the POHs of all channels.

HEX can be input at [A], [B] and [C].

7.2.2.3 Setting K1 and K2

Set K1 and K2.

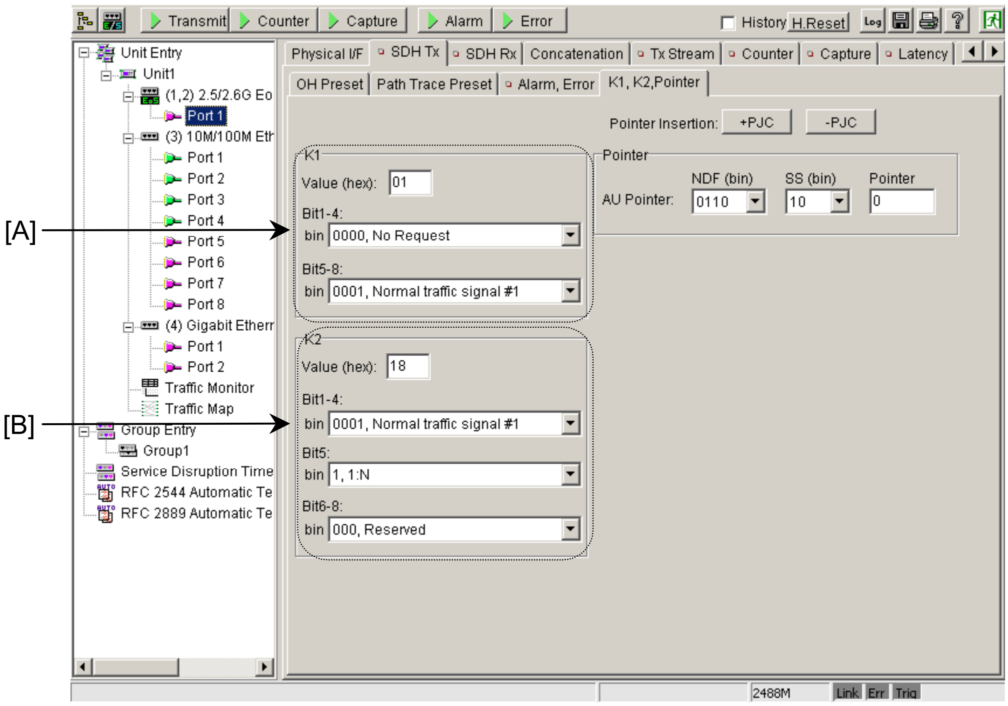


Figure 7.2.2.3-1 K1, K2, Pointer screen

	Item		Description
[A]	K1	Value(hex)	Enter the K1 value in hexadecimal.
		Bit1-4	Select the values for K1 bits 1 to 4 from 0000 to 1111(bit).
		Bit5-8	Select the values for K1 bits 5 to 8 from 0000 to 1111(bit).
[B]	K2	Value(hex)	Enter the K2 value in hexadecimal.
		Bit1-4	Select the values for K2 bits 1 to 4 from 0000 to 1111(bit).
		Bit5	Select the value for K2 bit 5 from 0 or 1(bit).
		Bit6-8	Select the values for K2 bits 6 to 8 from 000 to 111(bit).

7.2.2.4 Setting pointer

Set the pointer.

The Pointer settings (except for NDF and SS) on the screen are enabled for Virtual Concatenation when the MU150101A-14 is not installed and for Contiguous Concatenation.

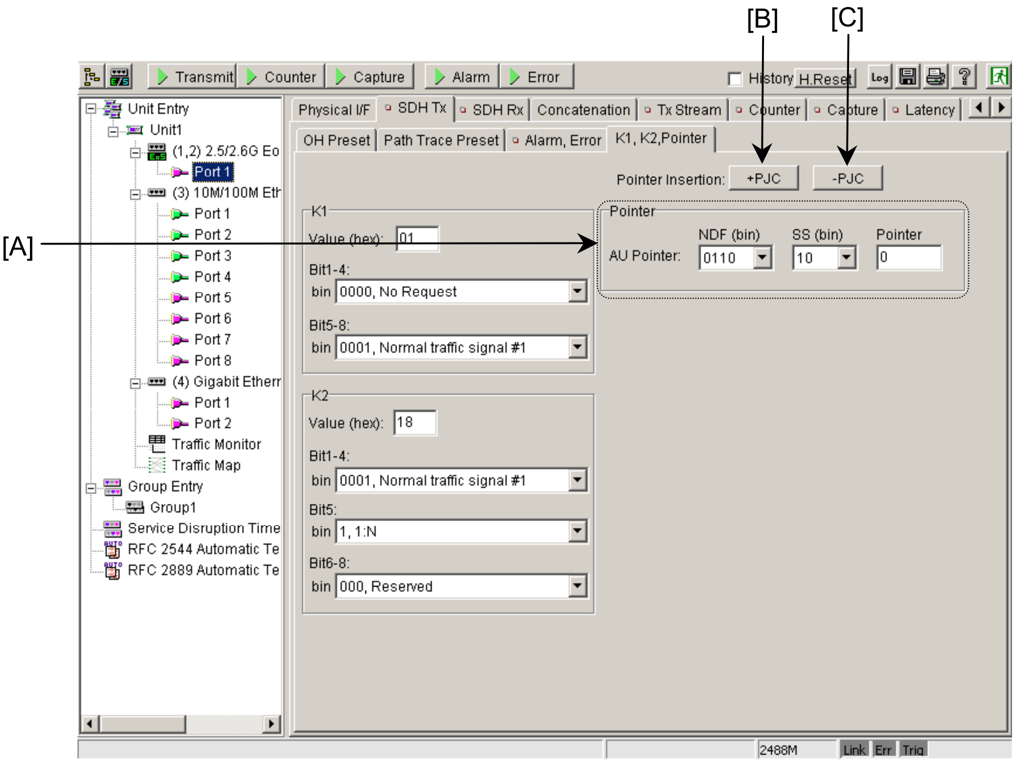


Figure 7.2.2.4-1 K1, K2, Pointer screen (when Contiguous Concatenation is selected)

When Contiguous Concatenation is selected, only the pointers on the measurement channel can be set. For the other pointers, i.e., those not on the measurement channels, the same value as that set here will be output.

	Item			Description
[A]	Pointer	AU Pointer	NDF (bin)	Select the NDF bit value from 0000 to 1111.
			SS (bin)	Select the SS bit value from 00 to 11.
			Pointer	Enter a pointer value. Changing the pointer value here generates an NDF. Although a value that exceeds the maximum value can be entered here, an LOP will be detected on the reception side in this event.
[B]	+PJC			Increments the pointer value.
[C]	–PJC			Decrements the pointer value.

When using Virtual Concatenation, pointer setting can be performed independently for all channels.

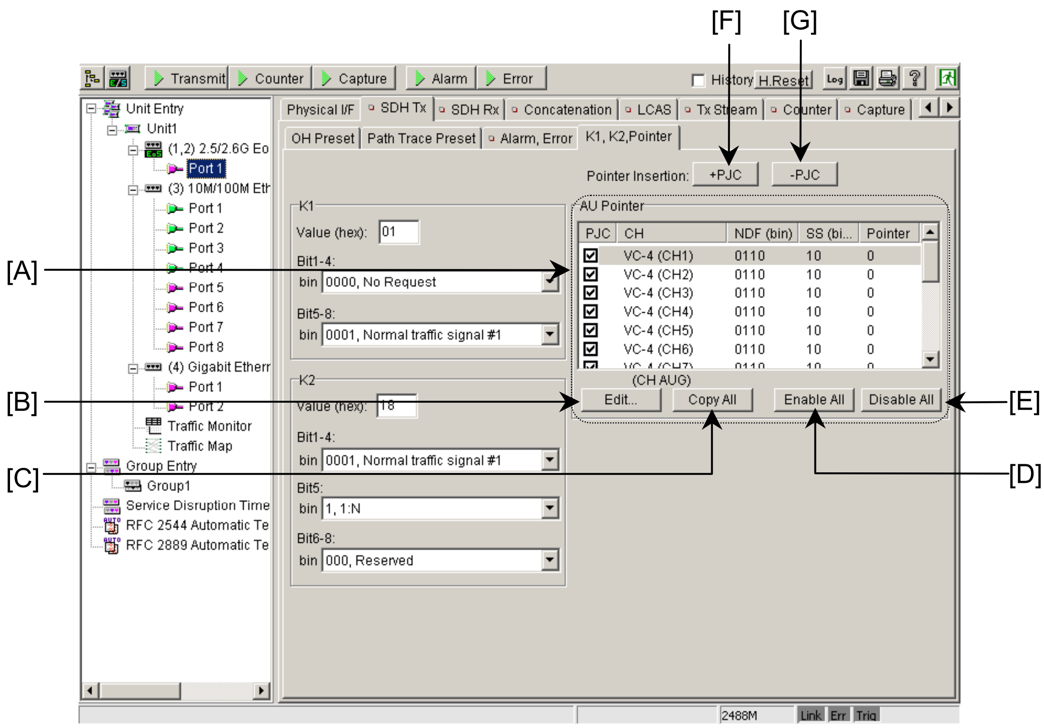


Figure 7.2.2.4-2　K1, K2, Pointer screen (when HO/LO Virtual Concatenation is selected or Differential Delay Option is not installed)

	Item			Description
[A]	Pointer	(List display)		Displays the setting statuses of the pointers on all channels.
			PJC	The checked channel items are the targets for pointer action (increment/decrement) using the +PJC and –PJC buttons.
			CH	Displays the information on the channel.
			NDF (bin)	Displays the NDF bit setting value in binary.
			SS (bin)	Displays the SS bit setting value in binary.
			Pointer	Displays the pointer value in decimal.
[B]	Edit			Clicking this button opens the dialog box used to edit (change) the NDF bit, SS bit and pointer value on the channel selected in the list. When the pointer value is changed, an NDF operation is performed when the dialog box is closed.
[C]	Copy All			Align the pointer values of all channels to the value of the first channel on the list.
[D]	Enable All			Checks all the PJC checkboxes in the list.
[E]	Disable All			Unchecks (leaves blank) all the PJC checkboxes in the list.
[F]	+PJC			Increments the pointer value.
[G]	–PJC			Decrements the pointer value.

Note:

When LO Virtual Concatenation is selected, only the AU pointers on the measurement channel can be set. For the TU pointers, setting is possible for all the TU pointers in the selected AU channels. When HO Virtual Concatenation is selected, however, TU pointer setting is impossible.

Only NDF and SS bit can be set on this screen when the MU150101A-14 Differential Delay is installed.

Refer to Section 7.2.4 "Setting Differential Delay" for details on the pointer settings when the MU150101A-14 is installed.

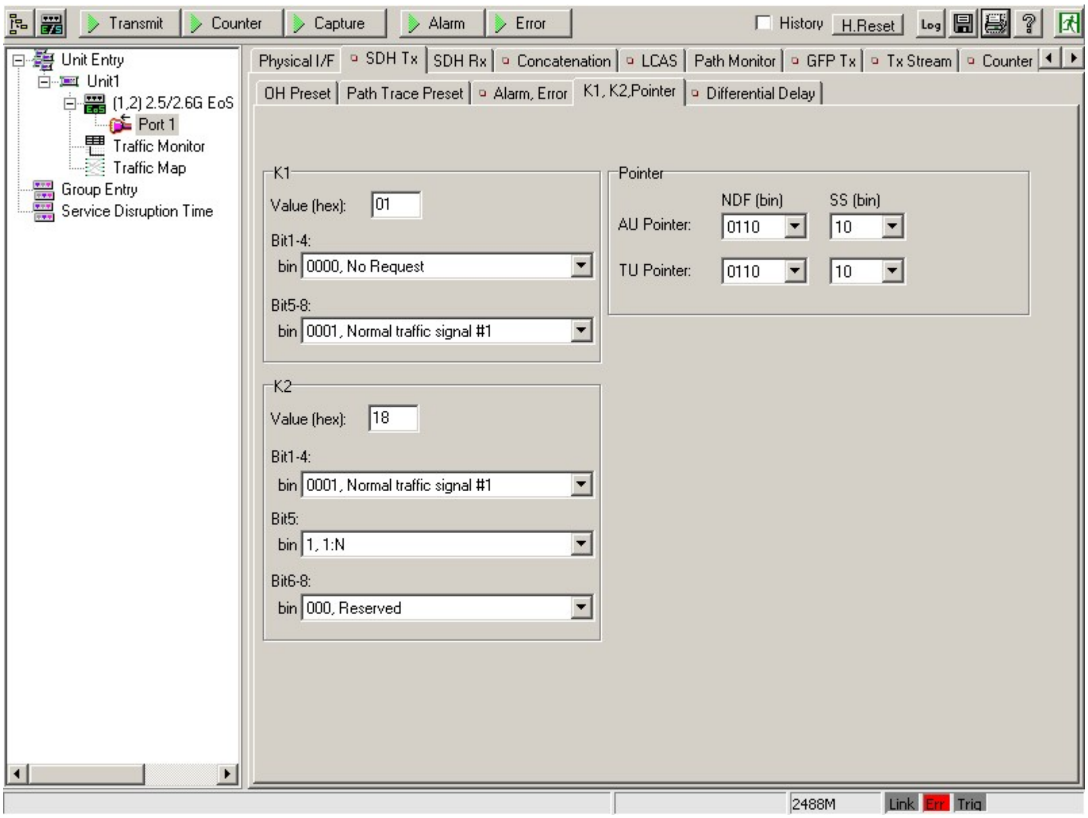


Figure 7.2.2.4-3 K1, K2, Pointer screen (with MU150101A-14 Differential Delay)

7.2.2.5 Adding alarms and errors

Perform Alarm Insertion and Error Insertion settings.

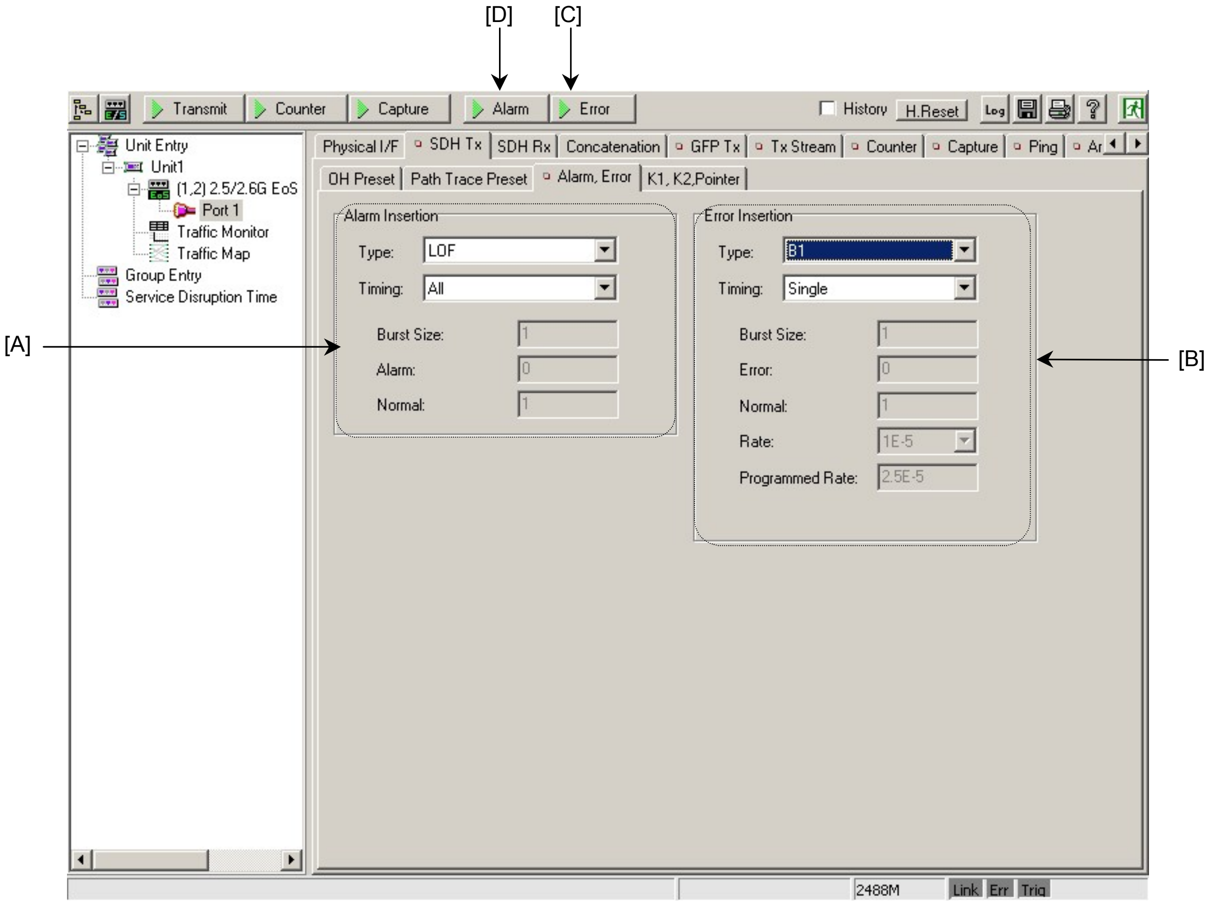


Figure 7.2.2.5-1 Alarm, Error screen(Contiguous Concatenation)

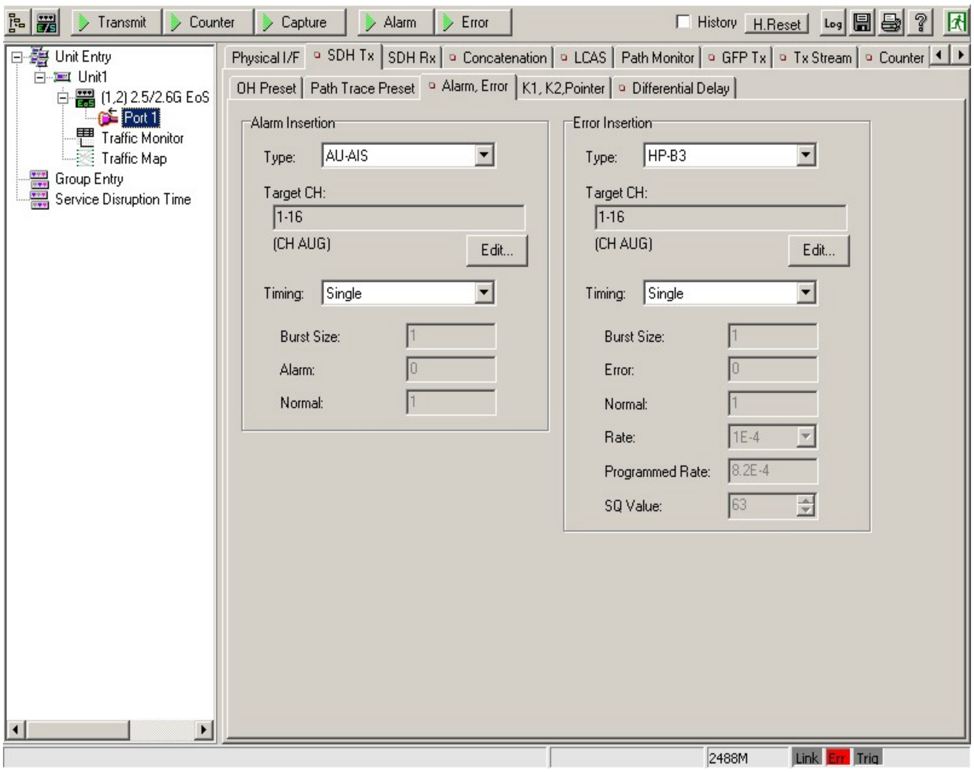


Figure 7.2.2.5-2 Alarm, Error screen (Virtual Concatenation)

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Alarm Insertion</td><td>Type</td><td>Select the type of Alarm insertion. The available alarm types differ depending on the mapping settings. CC stands for Contiguous Concatenation, and VCAT for Virtual Concatenation.
<table>
<tr><th rowspan="3">Alarm type</th><th colspan="3">Mapping settings</th></tr>
<tr><th rowspan="2">CC</th><th colspan="2">VCAT</th></tr>
<tr><th>HO</th><th>LO</th></tr>
<tr><td>LOS</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>LOF</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>MS-AIS</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>MS-RDI</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>RS-TIM</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>AU-AIS</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>AU-LOP</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>HP-RDI</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>HP-TIM</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>HP-UNEQ</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>HP-SLM</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VCAT-LOM</td><td>–</td><td>✓</td><td>✓</td></tr>
<tr><td>SQNC</td><td>–</td><td>✓</td><td>✓</td></tr>
<tr><td>TU-AIS</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>TU-LOM</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>TU-LOP</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>LP-SLM</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>LP-TIM</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>LP-RDI</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>LP-RFI</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>LP-UNEQ</td><td>–</td><td>–</td><td>✓</td></tr>
</table>
If Through Mode has been selected in Port Setup (refer to Section 6.2), LOS, LOF, MS-AIS, MS-RDI, RS-TIM, AU-AIS or AU-LOP TU-AIS or TU-LOP insertion are available.
Moreover, the item can be changed according to the conditions or Option.</td></tr>
</table>

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Alarm Insertion</td><td>Target CH</td><td>CH that inserts alarm is chosen.
(This item is valid only when Virtual Concatenation is selected.)
<table>
<tr><th>Alarm type</th><th>Edit</th></tr>
<tr><td>LOS</td><td>–</td></tr>
<tr><td>LOF</td><td>–</td></tr>
<tr><td>MS-AIS</td><td>–</td></tr>
<tr><td>MS-RDI</td><td>–</td></tr>
<tr><td>RS-TIM</td><td>–</td></tr>
<tr><td>AU-AIS</td><td>✓</td></tr>
<tr><td>AU-LOP</td><td>✓</td></tr>
<tr><td>HP-RDI</td><td>✓</td></tr>
<tr><td>HP-TIM</td><td>–</td></tr>
<tr><td>HP-UNEQ</td><td>✓</td></tr>
<tr><td>HP-SLM</td><td>✓</td></tr>
<tr><td>VCAT-LOM</td><td>✓</td></tr>
<tr><td>SQNC</td><td>–</td></tr>
<tr><td>TU-AIS</td><td>✓</td></tr>
<tr><td>TU-LOM</td><td>✓</td></tr>
<tr><td>TU-LOP</td><td>✓</td></tr>
<tr><td>LP-SLM</td><td>✓</td></tr>
<tr><td>LP-TIM</td><td>–</td></tr>
<tr><td>LP-RDI</td><td>✓</td></tr>
<tr><td>LP-RFI</td><td>✓</td></tr>
<tr><td>LP-UNEQ</td><td>✓</td></tr>
</table>
When Contiguous Concatenation is selected, Error/Alarm is inserted to the measurement CH(refer to 7.2.6).</td></tr>
</table>

		Item	Description
[A]	Alarm Insertion	Timing	Select the alarm timing. The timings available are given below. The available alarm insertion timings and their details are shown below. • Single An alarm is inserted for one time / frame when the alarm insertion button is clicked. Alarm insertion is stopped when it is complete. • Single Burst Frame An alarm having the specified length is inserted for one time / frame when the alarm insertion button is clicked. Alarm insertion is stopped when it is complete. • Single Burst Multiframe An alarm having the specified length is inserted for one time / multiframe when the alarm insertion button is clicked. Alarm insertion is stopped when it is complete. • Alternate An alarm state (Alarm) having the specified length and a normal state are alternately repeated when the alarm insertion button is clicked. Alarm insertion is stopped when the alarm insertion button is clicked again. • All When the alarm insertion button is clicked, alarms are continuously transmitted until the alarm insertion button is clicked again. When LOS has been selected for Type, only All is available. Burst Size is available only when the Single Burst frame or Single Burst Multiframe has been selected. Alarm and Normal are available only when Alternate has been selected.
		Burst Size	Set Burst Size in frames. The unit is in "Frame" or "Multiframe".
		Alarm	Set the number of alarm frames.
		Normal	Set the number of normal frames.

	Item		Description
[B]	Error Insertion	Type	Select the error-type. CC stands for Contiguous Concatenation, and VCAT for Virtual Concatenation.

Error type	Mapping settings		
	CC	VCAT	
		HO	LO
FAS	✓	✓	✓
Bit all	✓	✓	✓
B1	✓	✓	✓
B2	✓	✓	✓
MS-REI	✓	✓	✓
HP-B3	✓	✓	✓
HP-REI	✓	✓	✓
LP-B3	–	–	✓
BIP2	–	–	✓
LP-REI	–	–	✓
1st MFI	–	✓	–
2nd MFI	–	✓	–
MFI	–	–	✓
SQM	–	✓	✓
SQ Change	–	✓	✓
GID	–	✓ (*)	✓ (*)
CRC8	–	✓ (*)	–
CRC3	–	–	✓ (*)
Bit Info	✓	✓	✓

Bit Info. is enabled only when Bulk has been set for Mapping in Port Setup (refer to Section 6.2). If Through Mode has been selected in Port Setup (refer to Section 6.2), the available types are FAS, Bit all, B1, B2, MS-REL, HP-B3, HP-REI or BIP2.

GID, CRC8, and CRC3 errors can be selected when LCAS is ON.

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td>[B]</td><td>Error Insertion</td><td>Target CH</td><td>CH that inserts alarm is chosen.
(This item is valid only when Virtual Concatenation is selected.)
<table>
<tr><th>Error type</th><th>Edit</th></tr>
<tr><td>FAS</td><td>–</td></tr>
<tr><td>B1</td><td>–</td></tr>
<tr><td>B2</td><td>–</td></tr>
<tr><td>MS-REI</td><td>✓</td></tr>
<tr><td>HP-B3</td><td>✓</td></tr>
<tr><td>HP-REI</td><td>✓</td></tr>
<tr><td>LP-B3</td><td>✓</td></tr>
<tr><td>BIP2</td><td>✓</td></tr>
<tr><td>LP-REI</td><td>✓</td></tr>
<tr><td>1st MFI</td><td>✓</td></tr>
<tr><td>2nd MFI</td><td>✓</td></tr>
<tr><td>MFI</td><td>✓</td></tr>
<tr><td>SQM</td><td>✓</td></tr>
<tr><td>SQ Change</td><td>✓</td></tr>
<tr><td>GID</td><td>✓</td></tr>
<tr><td>CRC8</td><td>✓</td></tr>
<tr><td>CRC3</td><td>✓</td></tr>
<tr><td>Bit all</td><td>–</td></tr>
<tr><td>Bit Info</td><td>–</td></tr>
</table>
· For HO VCAT
Channel to which VCG is set for HO errors/alarms
· For LO VCAT
·AU channel that includes VCG for HO errors/alarms
·Channel to which VCG is set for LO errors/alarms</td></tr>
</table>

		Item	Description
[B]	Error Insertion	Timing	Select the error timing. The timings available are given below. • Single A single bit error is inserted when the error insertion button is clicked. Error insertion is stopped when it is complete. • Single Burst Bit An error having the specified bit length is inserted when the error insertion button is clicked. Error insertion is stopped when it is complete. • Single Burst Frame An error having the specified length is inserted for one time / frame when the error insertion button is clicked. Error insertion is stopped when it is complete. • Single Burst Multiframe An error having the specified length is inserted for one time / multiframe when the error insertion button is clicked. Error insertion is stopped when it is complete. • Rate, Programmed Rate An error is inserted according to the set error rate. When the error insertion button is clicked, errors are continuously transmitted until the error insertion button is clicked again. A typical error rate can be selected by Rate, while an arbitrary error rate can be set by Programmed Rate. • Alternate An error state (Error) having the specified length and a normal state (Normal) are alternately repeated when the error insertion button is clicked. Error insertion is stopped when the error insertion button is clicked again. • All When the error insertion button is clicked, errors are continuously transmitted until the error insertion button is clicked again. When Bit all has been selected for Type, only Single, Rate, or Programmed Rate is available. When FAS has been selected for Type, only Alternate is available. When 1st MFI, 2nd MFI, MFI, SQM, GID, CRC8, or CRC3 has been selected for Type, only Single or All is available. Burst Size is available only when Single Burst frame, Single Burst Multiframe has been selected. Rate is available only when Rate has been selected. Programmed Rate is available only when Programmed Rate has been selected. Error and Normal are available only when Alternate has been selected.

	Item		Description
[B]	Error Insertion	Burst Size	Set Burst Size in bits. The unit is in "Bit."
		Error	Set the number of error frames.
		Normal	Set the number of normal frames.
		Rate	Select the rate from IE-3, IE-4, IE-5, IE-6, IE-7, IE-8 or IE-9. Note that some rates may be not available depending on the error type. The maximum rates are shown in the table below:

	156M	622M	2.5G
B1	4.1E-4	1.0E-4	2.5E-5
B2	1.2E-3	1.2E-3	1.2E-3
MS-REI	1.2E-3	1.2E-3	8.2E-4
Bit all	1.0E-3	1.0E-3	1.0E-3
Bit info	1.0E-3	1.0E-3	1.0E-3

	CC		
	VC4-Xc	**VC4**	**VC3**
B3	4.2E-4	4.2E-4	1.2E-3
HP-REI	X		

	VCAT	
	VC4-Xv, VC12-Xv (AU4), VC11-Xv (AU4)	**VC3-Xv, VC12-Xv (AU3), VC11-Xv (AU3)**
B3	4.2E-4	1.2E-3
HP-REI		

	VCAT	
	VC12-Xv	**VC11-Xv**
BIP-2	1.7E-3	2.4E-3
HP-REI	8.9E-4	1.2E-3

	Item		Description
[B]	Error Insertion	Programmed Rate	Enter the Error Rate. The error rate should be in the form A × E – B. The maximum rates are shown in the table above. A value that exceeds the maximum value cannot be set.
[C]	>Error		Inserts an error to the specified channel.
[D]	>Alarm		Inserts an alarm to the specified channel.

7.2.3 Monitoring Overhead Information

7.2.3.1 OH Monitoring

Display the SOH and POH data, and the decoded S1 and C2 data.

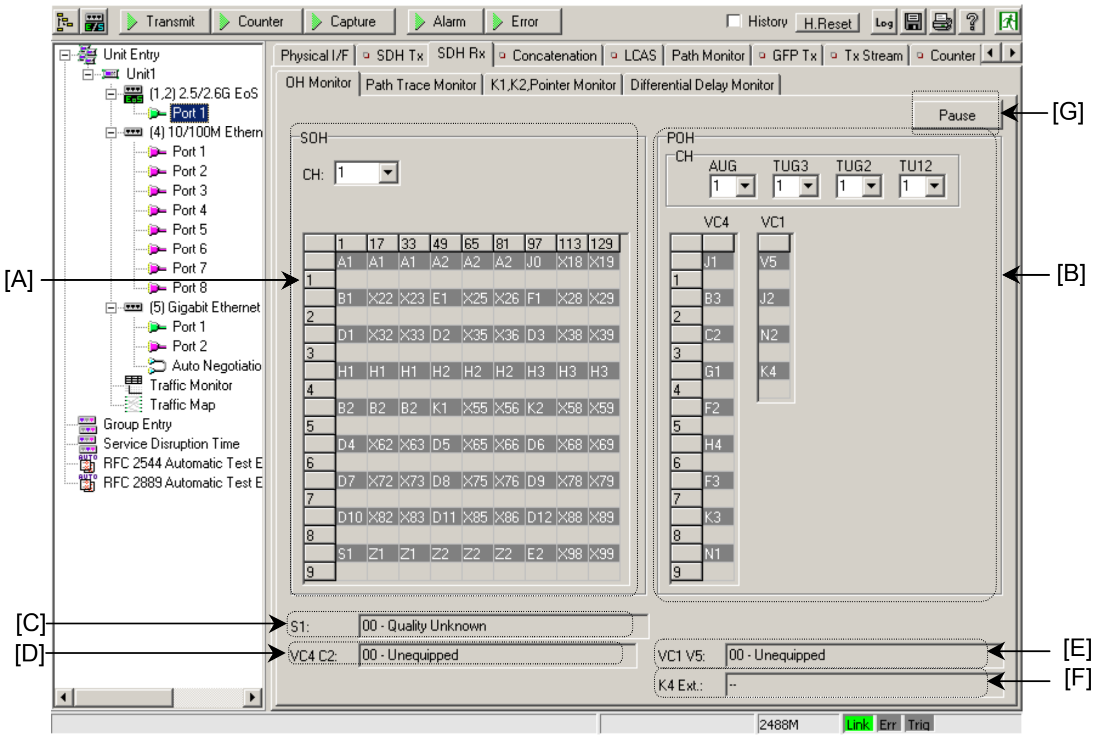


Figure 7.2.3.1-1 OH Monitor screen

<table>
<tr><th></th><th colspan="2">Item</th><th>Description</th></tr>
<tr><td rowspan="2">[A]</td><td rowspan="2">SOH</td><td>CH</td><td>Select or directly enter the CH number to display the SOH. The setting ranges are shown below:
<table><tr><th>Bit Rate</th><th>Setting range</th></tr><tr><td>2488 M</td><td>1 to 16</td></tr><tr><td>622 M</td><td>1 to 4</td></tr><tr><td>156 M</td><td>1</td></tr></table></td></tr>
<tr><td>SOH</td><td>Shows the SOH data in hexadecimal.</td></tr>
<tr><td rowspan="2">[B]</td><td rowspan="2">POH</td><td>CH</td><td>Select the channel of the POH to be monitored. This is displayed only when Virtual Concatenation is selected. When Contiguous Concatenation is selected, the POH on the measurement channel is displayed.</td></tr>
<tr><td>POH</td><td>Shows the POH data in hexadecimal.</td></tr>
<tr><td>[C]</td><td colspan="2">S1</td><td>Displays the data and decoding result of S1.</td></tr>
<tr><td>[D]</td><td colspan="2">C2</td><td>Displays the data and decoding result of C2.</td></tr>
<tr><td>[E]</td><td colspan="2">V5</td><td>Displays the data and decoding result (label) of V5.</td></tr>
<tr><td>[F]</td><td colspan="2">K4 Ext.</td><td>Displays the data and decoding result (label) of the K4 multi-frame.</td></tr>
<tr><td>[G]</td><td colspan="2">Pause</td><td>The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.</td></tr>
</table>

Note:

V5 and K4 Ext. are displayed only when LO Virtual Concatenation is selected for mapping.

7.2.3.2 Path trace monitoring

Show the Path Trace (J0, J1, J2) data.

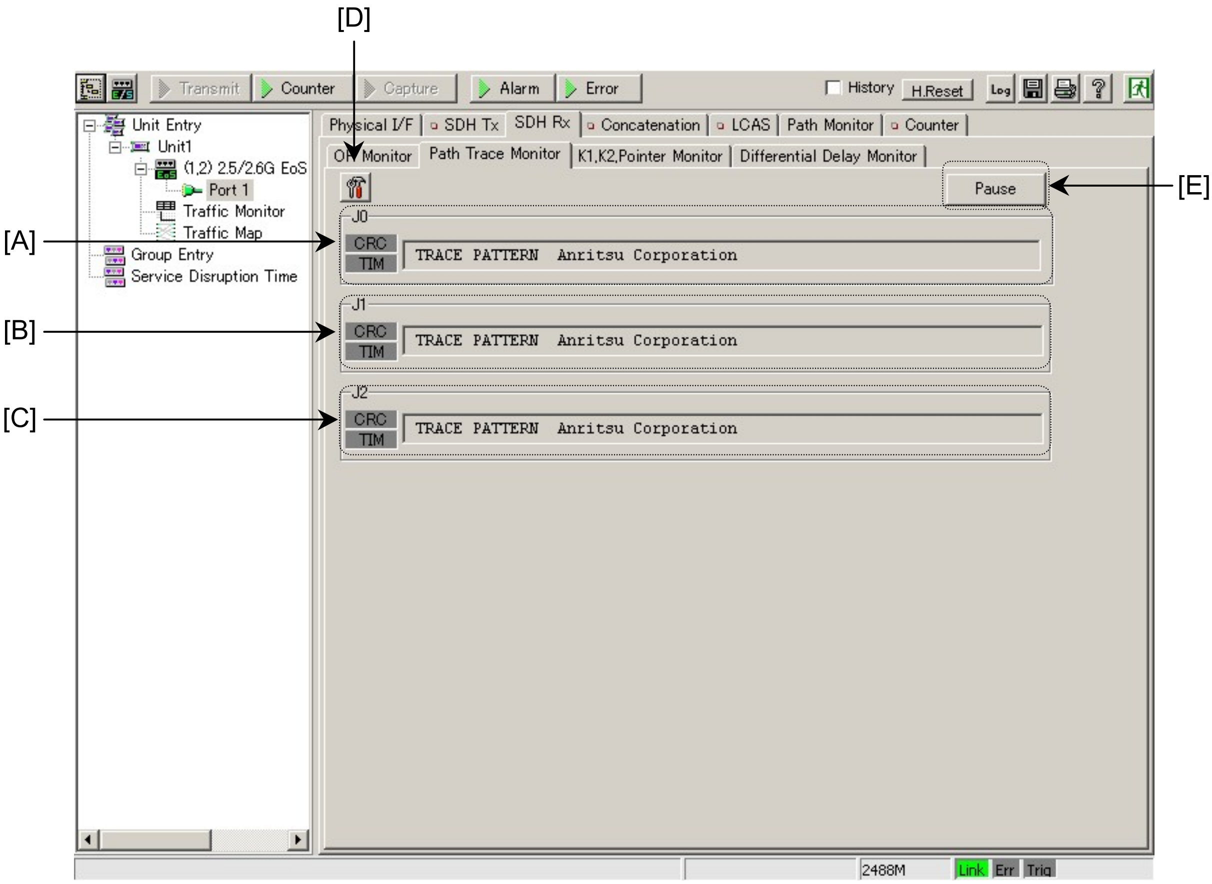


Figure 7.2.3.2-1 Path Trace Monitor screen

	Item		Description
[A]	J0	CRC	The indicator becomes red when a CRC error has occurred, or gray when none is found.
		TIM	The indicator becomes red when TIM has occurred, or gray when none is found.
		J0	Shows the J0 data in ASCII code. Data that cannot be shown in ASCII appear as '?'.
[B]	J1-HP	CRC	The indicator becomes red when a CRC error has occurred, or in gray when none is found.
		TIM	The indicator becomes red when TIM has occurred, or gray when none is found.
		J1	Shows the J1 data in ASCII code. Data that cannot be shown in ASCII appears as '?'.
[C]	J1-LP/J2	CRC	The indicator becomes red when a CRC error has occurred, and gray when none is found.
		TIM	The indicator becomes red when TIM has occurred, and gray when none is found.
		J1/J2	Shows the J1/J2 data in ASCII code. Data that cannot be shown in ASCII appears as '?'.
[D]	Path Trace Monitor		Sets the path trace pattern on the reception side.
[E]	Pause		The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.

Note:

When Virtual Concatenation is selected, the J1 and J2 bytes indicate the path trace of the channel selected on the POH monitor screen. When Contiguous Concatenation is selected, the J1 and J2 byte indicate the path traces of the measurement channel.

7.2.3.3 K1/K2 monitoring

Show K1 and K2.

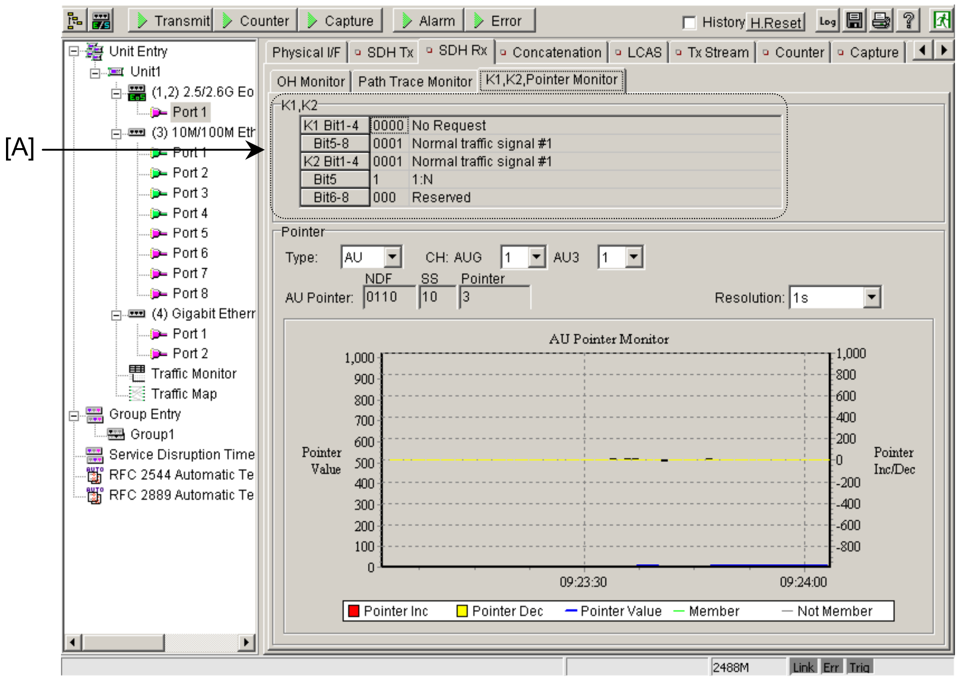


Figure 7.2.3.3-1 K1, K2, Pointer Monitor screen

	Item		Description
[A]	K1, K2	K1 Bit1-4	Shows the binary and decoded values of data for K1 bits 1 to 4.
		Bit5-8	Shows the binary and decoded values of data for K1 bits 5 to 8.
		K2 Bit1-4	Shows the binary and decoded values of data for K2 bits 1 to 4.
		Bit5	Shows the binary and decoded values of data for K2 bit 5.
		Bit6-8	Shows the binary and decoded values of data for K2 bits 6 to 8.

7.2.3.4 Pointer monitoring

Show the pointer values.

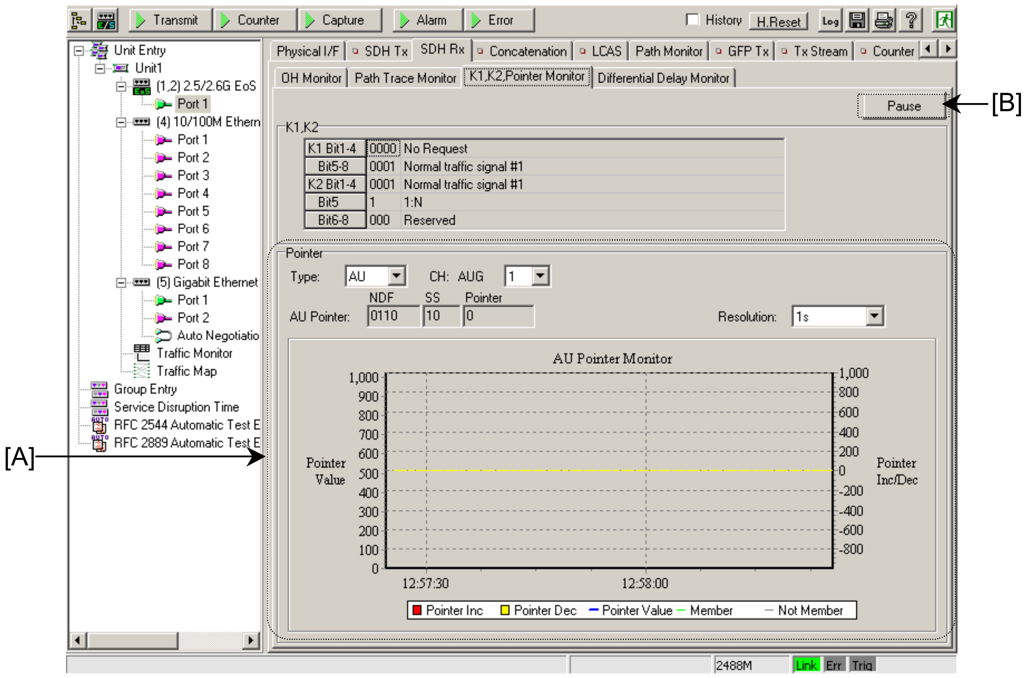


Figure 7.2.3.4-1 K1, K2, Pointer Monitor screen

<table>
<tr><th></th><th colspan="3">Item</th><th>Description</th></tr>
<tr><td rowspan="7">[A]</td><td rowspan="7">Pointer</td><td colspan="2">Type</td><td>Select the type of pointer to be monitored from AU and TU. The TU pointer is available only when VC3-Xv,VC12-Xv or VC11-Xv is selected.</td></tr>
<tr><td colspan="2">CH</td><td>Set the channel of the pointer to be monitored. This is displayed only when Virtual Concatenation is selected. The value of the pointer on the specified channel is plotted in blue as “Pointer Value.” The values of the pointers on the channel other than the one specified are plotted in green as “Other Value.”</td></tr>
<tr><td rowspan="3">AU/TU Pointer</td><td>NDF</td><td>Displays the NDF bit in binary.</td></tr>
<tr><td>SS</td><td>Displays the SS bit in binary.</td></tr>
<tr><td>Pointer</td><td>Displays the pointer value in decimal</td></tr>
<tr><td colspan="2">Resolution</td><td>Set the graph resolution. Select one from 1 s, 1 min, 15 min and 60 min.</td></tr>
<tr><td colspan="2">Pointer Monitor Graph</td><td>Displays the graph of Pointer Inc/Dec (+PJC and –PJC) and Pointer Value (pointer value for each sample) with the set resolution.</td></tr>
</table>

	Item	Description
[B]	Pause	The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.

7.2.4 Setting Differential Delay

Sets Differential Delay.

Can be used when MU150101A-14 Differential Delay is installed.

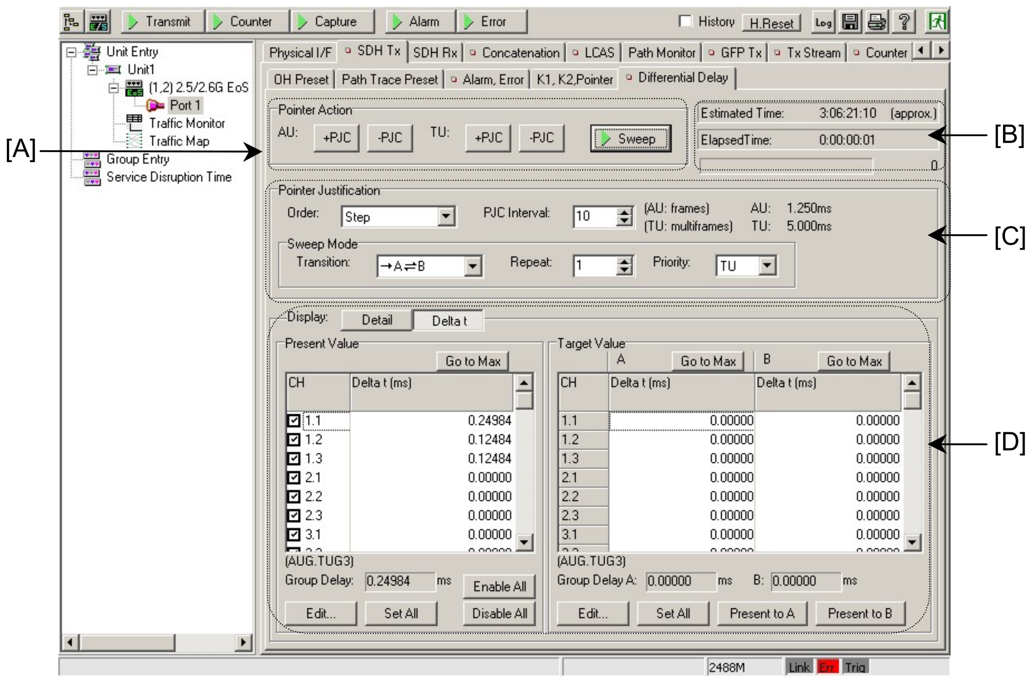


Figure 7.2.4-1 Differential Delay screen

	Item	Description
[A]	+PJC	Increments the pointer value. This is disabled when the number of pointers for all the selected channels reaches the maximum.
	–PJC	Decrements the pointer value. This is disabled when the number of pointers for all the selected channels reaches the minimum.
	Sweep	Sweeps the Differential Delay value to the Target value.
[B]	Estimated Time	Indicates approximate time required for sweeping the Differential Delay value to the Target value.
	Elapsed Time	Indicates the Sweep elapsed time.

	Item	Description
[C]	Order	Selects the justification occurrence method in Sweep. Step: Justification is executed to the Target value for each selected channel. Simultaneous: Justification is executed to the Target value for all the selected channels at once.
	PJC Interval	Sets the justification occurrence interval during Sweep.
	Transition	Selects the justification operation during Sweep. →A Justification is executed from the Present value to the Target A value. →B Justification is executed from the Present value to the Target B value. →A→B Justification is executed from the Present value to the Target A value, and then to the Target B value. →A⇔B Justification is executed from the Present value to the Target A value, then to the Target B value. And then the justification operation transits between Target A and Target B repeatedly for the number of times specified by Repeat.
	Repeat	Sets the transition repetition number when "→A⇔B" is selected for Transition.
	Priority	Selects whether to execute justification giving priority to AU and TU pointers when VC3Xv (AU4) is set. AU Justification is executed giving priority to AU pointers. TU Justification is executed giving priority to TU pointers. When the AU is selected, the channel for which the delay value can be changed is based on the AU units.

	Item	Description
[D]	Present Value	The Differential Delay value transmitted from the transmission side.
	Target Value	The Differential Delay value to be targeted when executing Sweep. Can be set for A and B separately.
	Detail	Displays the Pointer, MFI, and Differential Delay value.
	Delta t	Displays the Differential Delay value only. Present and TargetA/B indicate the delay value based on their respective displays in the Delta t display mode. Therefore, even if TargetA/B is displayed as “0”, the initial value is set to include a pointer and a MFI. The Sweep operation may thus be performed even if Target is “0”, when Delta t is displayed.
	Go to Max	Among the selected channels, the cursor is moved to the channel on which the Differential Delay value is the largest.
	Enable All	Checks all the PJC checkboxes in the list (all the channels). Justification is generated for the channels for which the PJC box is selected.
	Disable All	Unchecks (leaves blank) all the PJC checkboxes in the list (all the channels).
	Present to A	Copies the transmitted Differential Delay value to Target A.
	Group Delay	Indicates a difference between the maximum delay and the minimum delay for Present and TargetA/B, respectively. (Regardless of what channel is selected.)
	Present to B	Copies the transmitted Differential Delay value to Target B.
	Edit	Changes the Differential Delay value of the selected channel.
	Set All	Sets the same Differential Delay value for all the channels.

Differential Delay Sweep Function

- Transition and Order

When Order is Step:

A pointer value for each channel is changed up to Target A, in ascending order of channels in 1-channel steps.
When Transition is set to "→A→B" or "→A⇔B", the pointer values for all channels are changed up to Target A, and then the pointer values are changed up to Target B in ascending order of channels.
In addition, when Transition is set to "→A⇔B", the pointer values are changed between Target A and Target B for the number of times specified in Repeat.

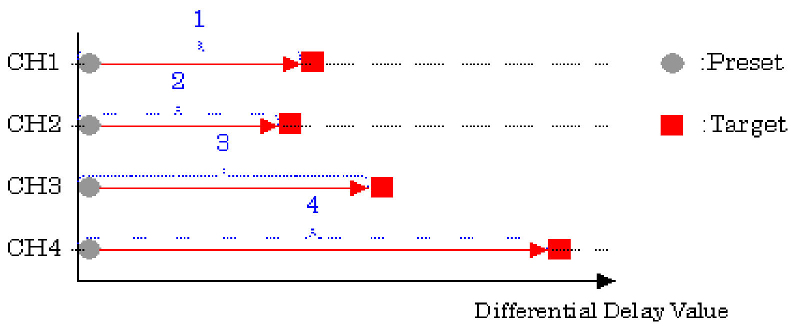


Figure 7.2.4-2 Sweep action for Step mode

When Order is Simultaneous:

Pointer values for all the selected channels are changed up to Target A simultaneously. Note that the time required for processing varies depending on the Target value for each channel when Order is set to Simultaneous.
When Transition is set to "→A→B" or "→A⇔B", the Delay values for all channels are changed up to Target A, and then the Delay values for all channels are changed up to Target B simultaneously.

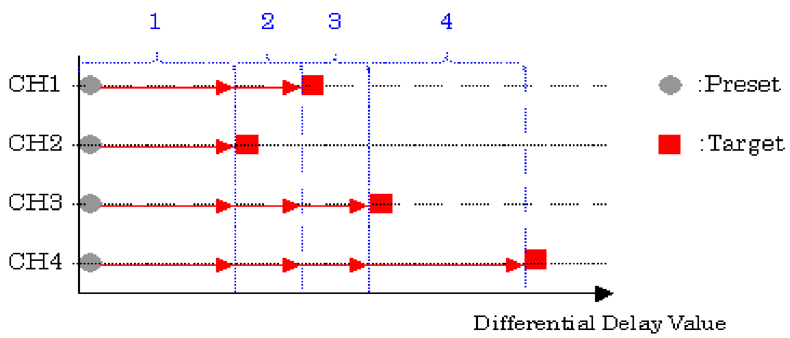


Figure 7.2.4-3 Sweep action for Simultaneous mode

- **Order and Priority**

  Priority can be set only when VC3(AU4) is set.
  When TU is selected for Priority, the operation is performed in the same manner as for other Mapping operations.
  When AU is selected for Priority, the Delay value is changed using an AU pointer, and three channels within an AU are operated at the same time. At first the operation is performed using an AU pointer, up to the minimum MFI value within the same AU. It is then performed using a TU pointer since AU pointers cannot be used after that point.

When Order is Step:

Priority AU

Present value (before Sweep)

	AU Ptr	TU MF	TU Ptr
CH 1.1	0	0	0
CH 1.2	0	0	0
CH 1.3	0	0	0

Target Value A

AU Ptr	TU MF	TU Ptr
391	2	200
391	3	300
391	4	400

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	0
CH 1.2	391	2	0
CH 1.3	391	2	0

The AU pointer values are incremented (+PJC) for two frames (783 × 2). Each TU MF is set to 2, and the AU pointer values are continuously incremented up to 391.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	2	0
CH 1.3	391	2	0

The TU pointer value of CH 1.1 is incremented (+PJC) up to 200.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	2	0

The TU pointer value of CH 1.2 is incremented (+PJC) for one frame (765). Each TU MF is set to 3, and the TU pointer value is continuously incremented up to 300.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	4	400

The TU pointer value of CH 1.3 is incremented (+PJC) for two frames (765 × 2). Each TU MF is set to 4, and the TU pointer value is continuously incremented up to 400.

Priority TU

Present value (before Sweep)

	AU Ptr	TU MF	TU Ptr
CH 1.1	0	0	0
CH 1.2	0	0	0
CH 1.3	0	0	0

Target Value A

AU Ptr	TU MF	TU Ptr
391	2	200
391	3	300
391	4	400

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	0	0
CH 1.2	391	0	0
CH 1.3	391	0	0

The AU pointer values are incremented (+PJC) up to 391.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	0	0
CH 1.3	391	0	0

The TU pointer value of CH 1.1 is incremented (+PJC) for two frames (765 × 2). Each TU MF is set to 2, and the TU pointer values is continuously incremented up to 200.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	0	0

The TU pointer value of CH 1.2 is incremented (+PJC) for three frames (765 × 3). Each TU MF is set to 3, and the TU pointer value is continuously incremented up to 300.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	4	400

The TU pointer value of CH 1.3 is incremented (+PJC) for four frames (765 × 4). Each TU MF is set to 4, and the TU pointer value is continuously incremented up to 400.

● When Order is Simultaneous:

Priority AU

Present value (before Sweep)

	AU Ptr	TU MF	TU Ptr
CH 1.1	0	0	0
CH 1.2	0	0	0
CH 1.3	0	0	0

Target Value A

AU Ptr	TU MF	TU Ptr
391	2	200
391	3	300
391	4	400

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	0
CH 1.2	391	2	0
CH 1.3	391	2	0

The AU pointer values are incremented (+PJC) for two frames (783 × 2). Each TU MF is set to 2, and the AU pointer values are continuously incremented up to 391.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	2	200
CH 1.3	391	2	200

The TU pointer value of CH 1.1, CH 1.2 and CH 1.3 is incremented (+PJC) up to 200.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	3	300

The TU pointer value of CH 1.2 and CH 1.3 is incremented (+PJC) for one frame (765). Each TU MF is set to 3, and the TU pointer value is continuously incremented up to 300.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	4	400

The TU pointer value of CH 1.3 is incremented (+PJC) for one frame (765). Each TU MF is set to 4, and the TU pointer value is continuously incremented up to 400.

Priority TU

Present value (before Sweep)

	AU Ptr	TU MF	TU Ptr
CH 1.1	0	0	0
CH 1.2	0	0	0
CH 1.3	0	0	0

Target Value A

AU Ptr	TU MF	TU Ptr
391	2	200
391	3	300
391	4	400

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	0
CH 1.2	391	2	0
CH 1.3	391	2	0

The AU pointer values are incremented (+PJC) up to 391.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	2	200
CH 1.3	391	2	200

The TU pointer value of CH 1.1 and CH 1.2 and CH 1.3 is incremented (+PJC) for two frames (765 × 2). Each of TU MF is set to 2, and the TU pointer value is continuously incremented up to 200.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	3	300

The TU pointer value of CH 1.2 and CH 1.3 is incremented (+PJC) for one frame (765). Each TU MF is set to 3, and the TU pointer value is continuously incremented up to 300.

↓

	AU Ptr	TU MF	TU Ptr
CH 1.1	391	2	200
CH 1.2	391	3	300
CH 1.3	391	4	400

The TU pointer value of CH 1.3 is incremented (+PJC) for one frame (765). Each TU MF is set to 4, and the TU pointer value is continuously incremented up to 400.

Differential Delay through operation

The MP1590B can add Differential Delay in the Through mode.
The MP1590B absorbs the Delay received by the reception side and transmits a transmission signal. When transmitting a signal including the Delay (pointer value) that was received by the reception side as is (Through), set the Differential Delay function to Off.
The Delay set in this screen is transmitted as the Delay for the transmission side.

Notes:

1. The following events may occur depending on the Justification state of an input signal.
   These events do not occur if no Justification is generated in an input signal.

   - When a pointer value of the transmission signal is changed, the actual set value may differ from the intended value.
   - Justification may be generated automatically in the transmission signal.
   - The Sweep operation may take more time than expected.
   - A value different from the set Target value may result after a Sweep operation.

2. MFI maximum value of the Target Value is a value that is smaller than one maximum value.
   MFI minimum value of the Target Value is 1.

3. When MFI value reaches 0 or MAX value by Justification, Justification cannot be executed.

7.2.5 Differential Delay Monitor

Updates the current channel status.

Can be used when MU150101A-14 Differential Delay is installed.

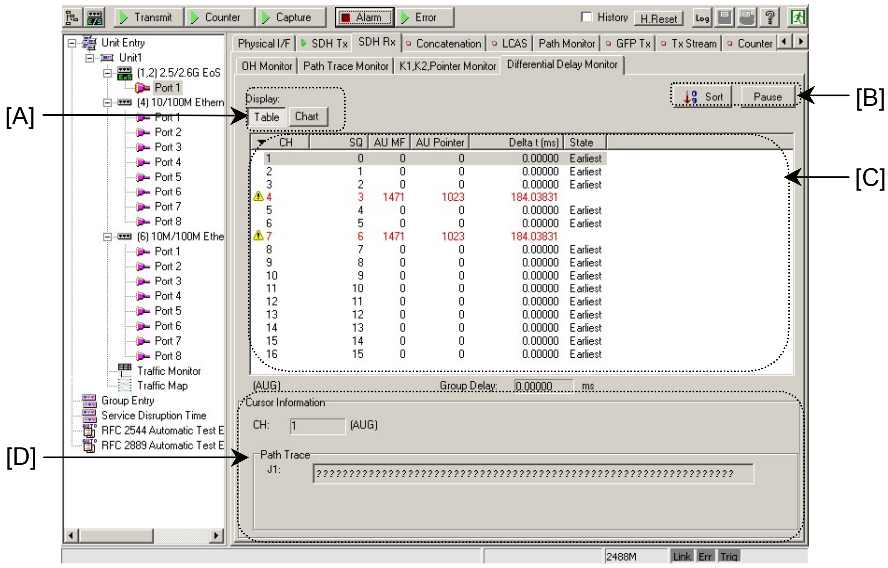


Figure 7.2.5-1 Differential Delay Monitor Table screen

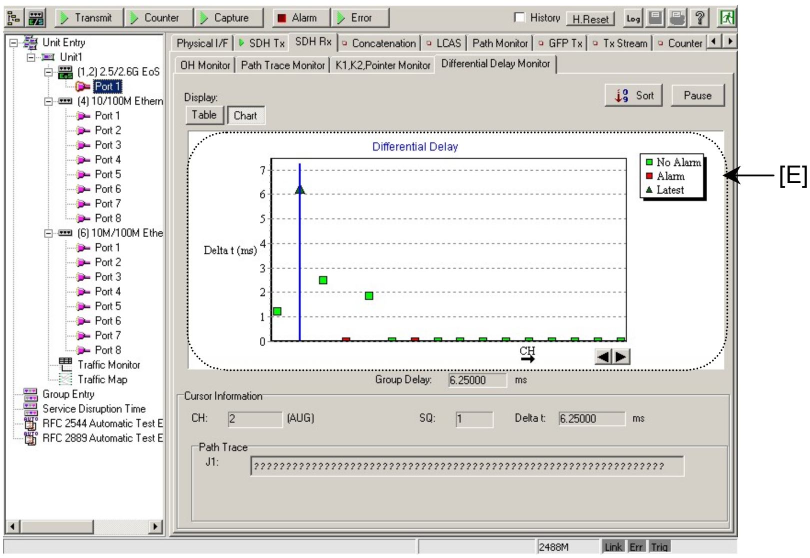


Figure 7.2.5-2 Differential Delay Monitor Chart screen

	Item	Description
[A]	Table	The CH, SQ, Pointer, MFI, Differential Delay, and State are displayed in table form.
	Chart	Differential Delay values for each channel are displayed in graph form.
[B]	Sort	The CH, SQ, and Differential Delay values are sorted and displayed again.
	Pause	The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.
[C]	Display:Table	Indicates the SQ, Pointer, MFI, Differential Delay, and State of Differential Delay for the target channel. Channels on which alarms occur are clearly remarked as such, on the CH portion.
[D]	Cursor Information	Displays the detailed information when selected by the cursor.
[E]	Display:Chart	The Differential Delay for the target channel is displayed in a graph format. The channel that has the largest Delay is indicated by Δ, and the channel on which an alarm occurs is displayed in red.

Note:

Differential Delay added to Provision CH can be corrected. However, the error might occur because it might be able to correct Differential Delay added besides Provision CH of VCG CH.

7.2.6 Settings Related to Concatenation

Virtual Concatenation can also be tested by installing the MU150101A-11 HO Virtual Concatenation or MU150101A-12 LO Virtual Concatenation. When neither of them is installed, only Contiguous Concatenation mapping is possible.

Concatenation settings are performed from the Measurement CH tab and Dummy tab.

Contiguous Concatenation and Virtual Concatenation are switched on the Port Setting screen.

7.2.6.1 Setting Measurement CH (Contiguous)

Select Contiguous Concatenation on the Port Setting screen.

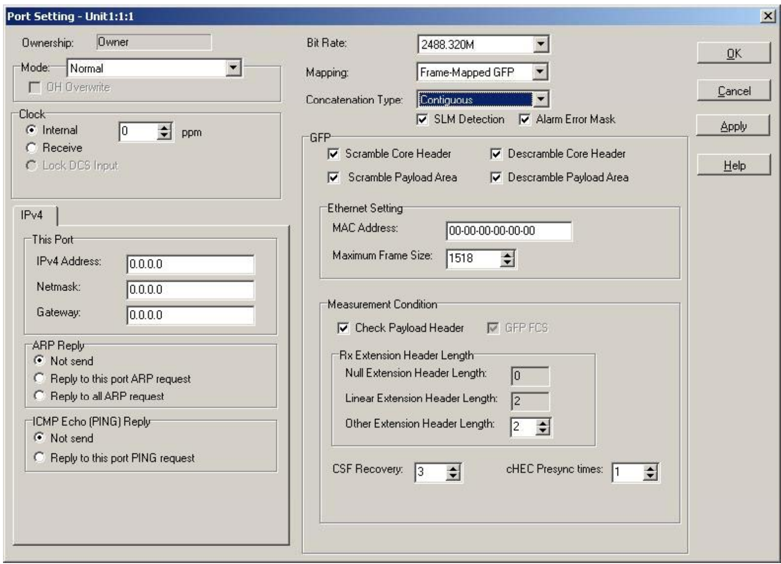


Figure 7.2.6.1-1 Port Setting Screen

Select a Contiguous Concatenation pattern on the Measurement CH tab under the Concatenation tab.

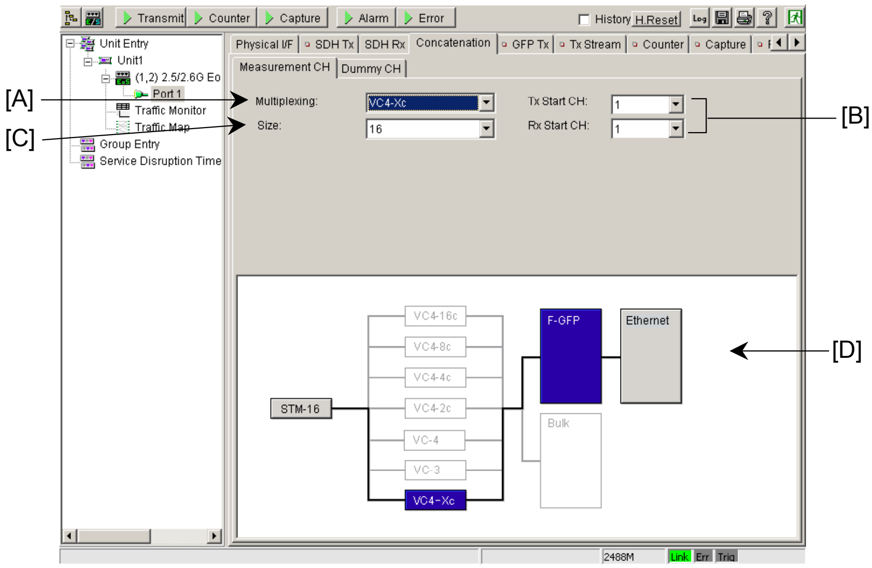


Figure 7.2.6.1-2 Measurement CH tab (Contiguous Concatenation)

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Multiplexing</td><td>Select the payload from the following. The selectable items differ depending on the bit rate.
<table>
<tr><th rowspan="2"></th><th colspan="3">Bit rate</th></tr>
<tr><th>156M</th><th>622M</th><th>2488M</th></tr>
<tr><td>VC4-16c</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>VC4-8c</td><td>–</td><td>–</td><td>✓</td></tr>
<tr><td>VC4-4c</td><td>–</td><td>✓</td><td>✓</td></tr>
<tr><td>VC4-2c</td><td>–</td><td>✓</td><td>✓</td></tr>
<tr><td>VC4</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VC3</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>VC4-Xc</td><td>–</td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td rowspan="2">[B]</td><td>Tx Meas. CH,
Rx Meas. CH</td><td>Select the measurement channel for transmission and reception. The setting range varies depending on the set bit rate and the payload selected in Multiplexing.
<table>
<tr><th rowspan="3"></th><th colspan="4">Setting range</th></tr>
<tr><th rowspan="2">Min.</th><th colspan="3">Max.</th></tr>
<tr><th>156M</th><th>622M</th><th>2488M</th></tr>
<tr><td>VC4-16c</td><td>1</td><td>–</td><td>–</td><td>1</td></tr>
<tr><td>VC4-8c</td><td>1</td><td>–</td><td>–</td><td>2</td></tr>
<tr><td>VC4-4c</td><td>1</td><td>–</td><td>1</td><td>4</td></tr>
<tr><td>VC4-2c</td><td>1</td><td>–</td><td>2</td><td>8</td></tr>
<tr><td>VC4</td><td>1</td><td>1</td><td>4</td><td>16</td></tr>
<tr><td>VC3</td><td>1</td><td>3</td><td>12</td><td>48</td></tr>
</table></td></tr>
<tr><td>Tx Start CH,
Rx Start CH</td><td>Set the first channel of the container when VC4-Xc is selected in Multiplexing. The setting range varies depending on the setting in Size. The relationship between this setting and the Size setting is as follows:
This setting ≤ N – (Size – 1)
N: 16 (2488 M), 4 (622 M)</td></tr>
<tr><td>[C]</td><td>Size</td><td>This is enabled when VC4-Xc is selected in Multiplexing. Set the value of X. The setting range varies depending the set bit rate. Note that this is not displayed when the bit rate is set to 156 Mbit/s.
<table>
<tr><th>Bit rate</th><th>Setting range</th></tr>
<tr><td>2488M</td><td>1 to 16</td></tr>
<tr><td>622M</td><td>1 to 4</td></tr>
</table></td></tr>
<tr><td>[D]</td><td></td><td>Displays an image of the payload selected in Multiplexing.</td></tr>
</table>

7.2.6.2 Setting VCAT group member (Virtual)

Select Virtual Concatenation on the Port Setting screen.

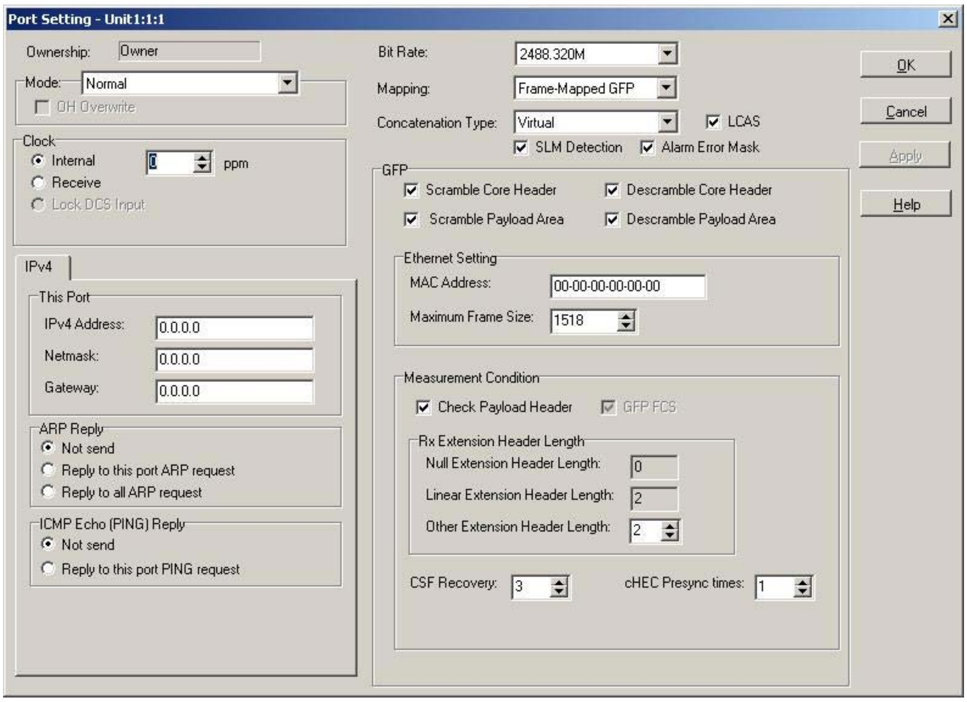


Figure 7.2.6.2-1 Port Setting screen

The currently-set Virtual Concatenation pattern can be viewed on the Concatenation tab. The setting items vary depending on the LCAS ON/OFF setting.
Click the Edit button to display the editing screen when editing the Virtual Concatenation pattern

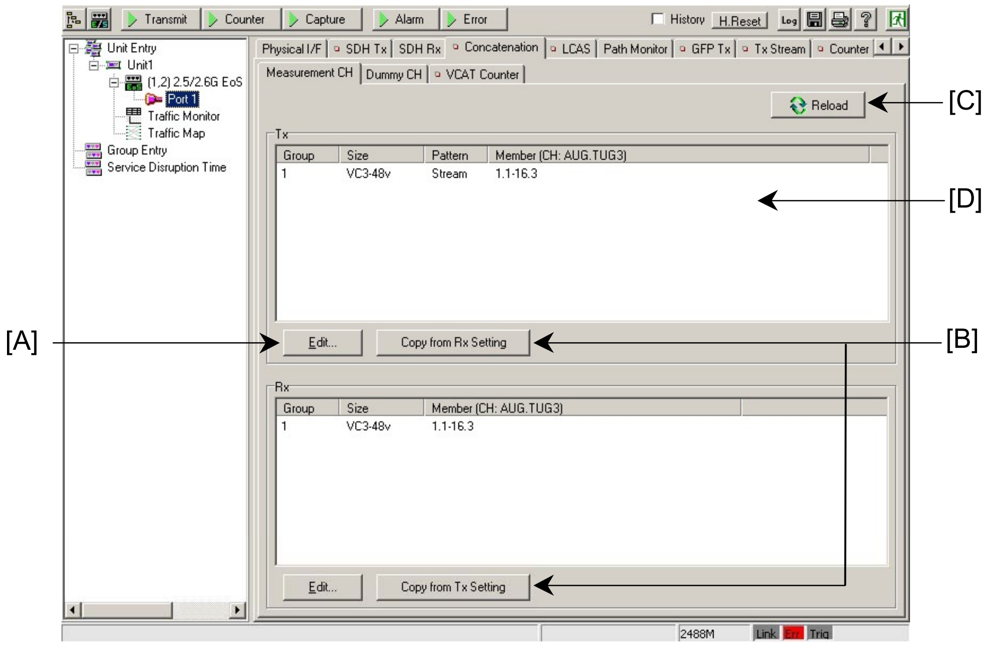


Figure 7.2.6.2-2　VCAT Pattern View screen (LCAS Off)

	Item	Description
[A]	Edit...	Clicking the Edit button displays the Virtual Concatenation member setting screen. Setting can be performed for transmission and reception independently. **View...** is displayed during counter operation and while a stream is being generated, for both the transmission side and reception side.
[B]	Copy from Tx (Rx) Setting	The settings on the transmission side are copied to the reception side, and vice versa.
[C]	Reload	Updates the current channel status.
[D]		Displays the VCAT member setting status.

Note:

In the case of Through mode or Monitor mode, Tx setting is not displayed. When the channel information changes without receiving a legal LCAS command while negotiation is set to On, the measuring instrument automatically starts channel assembly according to the received channel information.

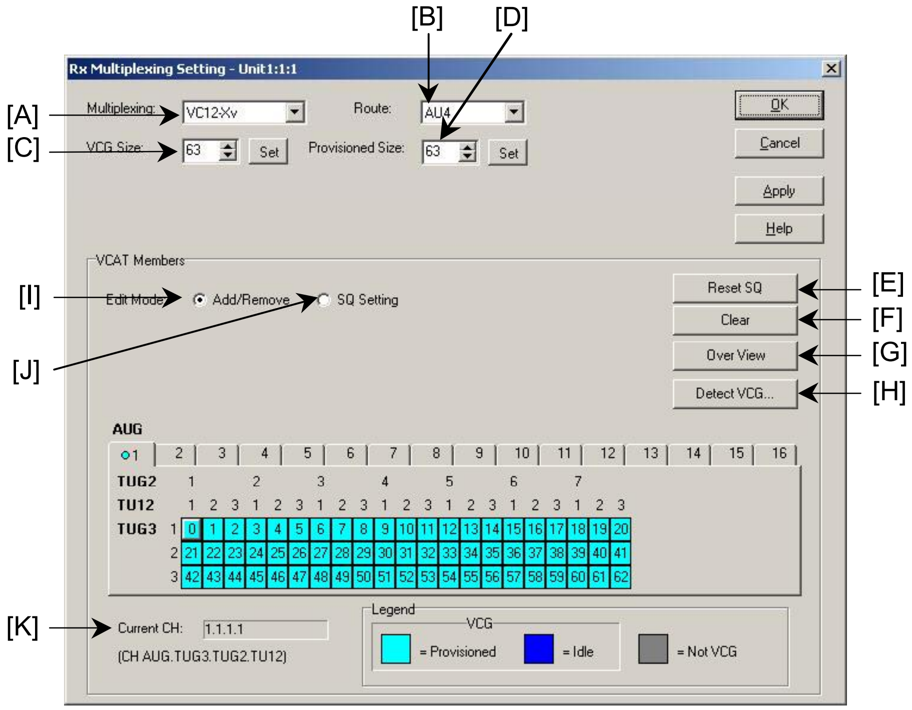


Figure 7.2.6.2-3 VCAT Member setting screen

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[A]</td><td>Multiplexing</td><td>Select the payload from the following. The selectable items differ depending on the installed option.
<table>
<tr><th>MU150101A-11</th><th>MU150101A-12</th></tr>
<tr><td>VC4-Xv</td><td>VC12-Xv (AU4/AU3)</td></tr>
<tr><td>VC3-Xv (AU3)</td><td>VC11-Xv (AU4/AU3)</td></tr>
<tr><td></td><td>VC3-Xv (AU4)</td></tr>
</table></td></tr>
<tr><td>[B]</td><td>Route</td><td>Select the higher-order route from AU3 and AU4 when VC3-Xv or VC12-Xv or VC11-Xv is selected in Multiplexing.</td></tr>
<tr><td>[C]</td><td>VCG Size</td><td>Set the size (the number of members) of the Virtual Concatenation group. The following tables show the setting range. When a member is edited directly on the VCAT member setting screen, Size varies accordingly.
<table>
<tr><th></th><th colspan="3">Setting range</th></tr>
<tr><th></th><th>156M</th><th>622M</th><th>2488M</th></tr>
<tr><td>VC4-Xv</td><td>–</td><td>1 to 4</td><td>1 to 16</td></tr>
<tr><td>VC3-Xv</td><td>1 to 3</td><td>1 to 12</td><td>1 to 48</td></tr>
</table>
<table>
<tr><th></th><th>AU3</th><th>AU4</th></tr>
<tr><td>VC3-Xv</td><td>1 to 48</td><td>1 to 48</td></tr>
<tr><td>VC12-Xv</td><td>1 to 63</td><td>1 to 63</td></tr>
<tr><td>VC11-Xv</td><td>1 to 84</td><td>1 to 84</td></tr>
</table></td></tr>
</table>

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[D]</td><td>Provisioned Size</td><td>Sets the Provision Size in the following setting range.
If the member is directly edited in the VCAT Member setting screen, the size is automatically changed accordingly.
<table>
<tr><th rowspan="2"></th><th colspan="3">Setting range</th></tr>
<tr><th>156M</th><th>622M</th><th>2488M</th></tr>
<tr><td>VC4-Xv</td><td>–</td><td>1 to 4</td><td>1 to 16</td></tr>
<tr><td>VC3-Xv</td><td>1 to 3</td><td>1 to 12</td><td>1 to 48</td></tr>
</table>
<table>
<tr><th></th><th>AU3</th><th>AU4</th></tr>
<tr><td>VC3-Xv</td><td>1 to 48</td><td>1 to 48</td></tr>
<tr><td>VC12-Xv</td><td>1 to 63</td><td>1 to 63</td></tr>
<tr><td>VC11-Xv</td><td>1 to 64</td><td>1 to 64</td></tr>
</table>
</td></tr>
<tr><td>[E]</td><td>Reset SQ</td><td>Resets the SQ number. The SQ number is assigned to each channel set for the members from the first channel. The numbering starts from 0.</td></tr>
<tr><td>[F]</td><td>Clear</td><td>Sets the VCG Size and Provision Size to 1. Provision is set for the first channel.</td></tr>
<tr><td>[G]</td><td>Over View</td><td>Displays all the channels that are set across the AU channel simultaneously when VC3-Xv (LO), VC12-Xv or VC11-Xv is selected.</td></tr>
<tr><td>[H]</td><td>Detect VCG</td><td>Enables detection of the virtual concatenation group within the received signal. When VCG Detect is executed, the VCG detection result display screen is displayed.
This is enabled when LCAS is set to On. See the following.</td></tr>
<tr><td>[I]</td><td>Add/Remove</td><td>Clicking this radio button sets the mode where a VCAT member is added or removed. When a block that is not a member is clicked, it is added to the members. When a block that is already a member is clicked, it is removed from the members.</td></tr>
<tr><td>[J]</td><td>SQ Setting</td><td>Clicking this radio button sets the mode where an SQ number is assigned to a set member. Click a block that is a member to enable the SQ number input state, and enter the desired SQ number. When the entered SQ number duplicates another member’s SQ number, the SQ number of the latter is automatically changed.</td></tr>
</table>

<table>
<tr><th></th><th>Item</th><th>Description</th></tr>
<tr><td>[K]</td><td>AUG</td><td>Settings for VCAT members are performed. The selected channel changes as in “Not VCG → If no signal is input, the data at the point when the last data was input may be detected, since the data to be detected is not updated in this event. VCG → provision” with each click, simplifying the channel setting operations.
<table><tr><th></th><th>Available AUG</th></tr><tr><td>2488M</td><td>16CH</td></tr><tr><td>622M</td><td>4CH</td></tr><tr><td>156M</td><td>1CH</td></tr></table></td></tr>
<tr><td>[L]</td><td>Current CH</td><td>Displays the position information of the channel currently focused.</td></tr>
</table>

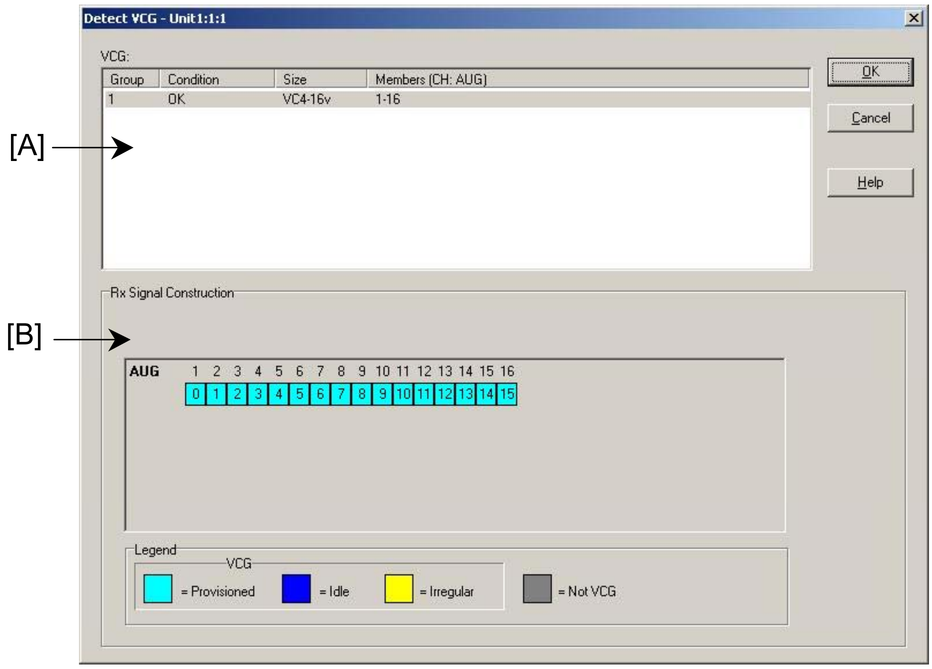


Figure 7.2.6.2-4 VCG Detect screen

	Item	Description
[A]	VCG	Displays the detected group. When the detected group has a normal configuration, “OK” is displayed and Size is displayed. When the detected group has an erroneous configuration, “NG” is displayed.
[B]	Rx Signal Construction	Displays the VCG selected in the VCG screen described above. The channel position and SQ values of the members are displayed.

Note:

When a VCG is selected and the OK button is clicked, the same member setting as that of the selected VCG is applied. When canceling the member setting, click the Cancel button to exit the screen. When a group with an erroneous configuration is selected, only the Cancel button is enabled.

If no signal is input, the data at the point when the last data was input may be detected, since the data to be detected is not updated in this event.

7.2.6.3 Setting Dummy CH

Set the Dummy channel.

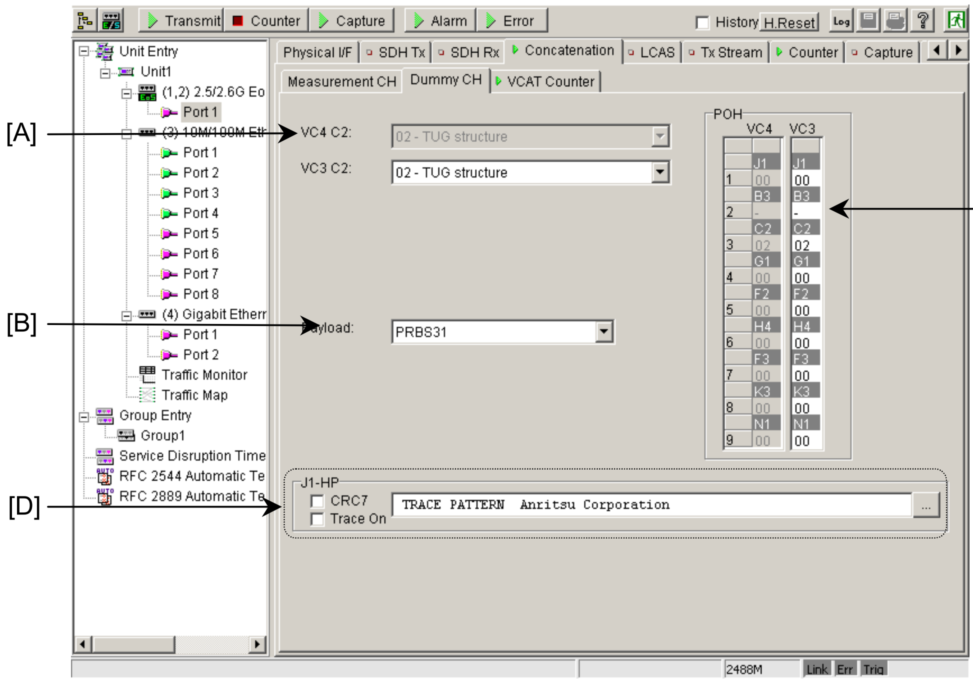


Figure 7.2.6.3 -1 Dummy CH screen
(when Contiguous Concatenation is selected)

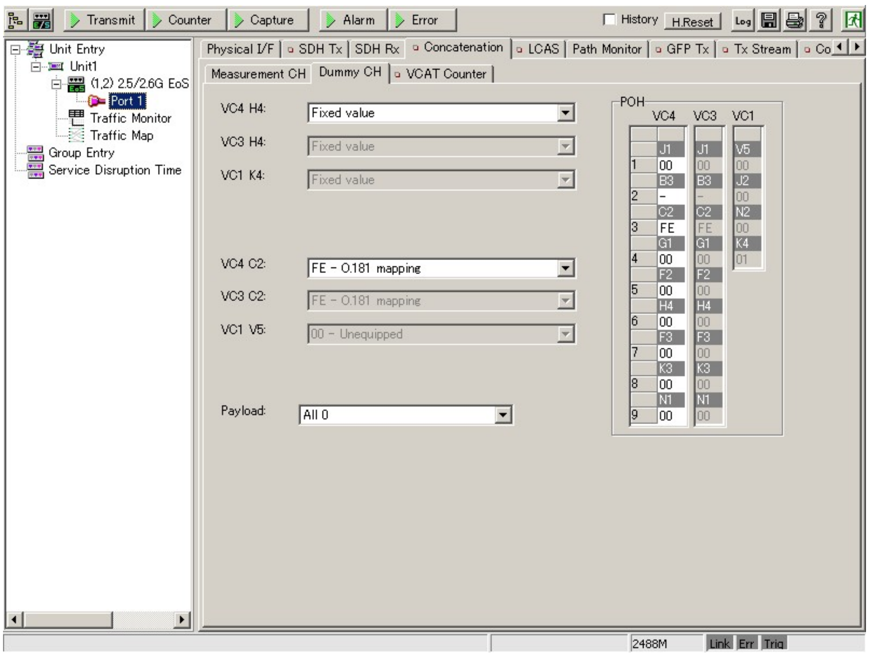


Figure 7.2.6.3 -2 Dummy CH screen
(when HO/LO Virtual Concatenation is selected)

7

Functions Specific to EoS/POS Modules

	Item	Description
[A]	VC4 C2	Set C2 of the VC4 Dummy channel. The C2 value set here is applied to all POHs of the Dummy channel.
	VC3 C2	Set C2 of the VC3 Dummy channel. The C2 value set here is applied to all POHs of the Dummy channel.
[B]	Dummy Payload	Set the pattern of the Dummy channel payload to be transmitted. • Copy • All 0 • All 1 • PRBS15 • PRBS23 • PRBS31 *1 Only All0 or All1 can be selected when Virtual Concatenation is selected. *2 Copy can be selected only a part of Multiplexing of Contiguous Concatenation.
[C]	POH	Edit POH of the Dummy channel. The C2 value set here is applied to all POHs of the Dummy channel. Enter a value in hexadecimal. POH (VC4/VC3): J1, B3, C2, G1, F2, H4, F3, K3, N1 POH (VC1): V5, J2, N2, K4
[D]	J1	Sets the J1 path trace. This item can be set only when Contiguous Concatenation is selected.
	CRC7	Set CRC7. When checked: CRC7 is valid and the data length of J1 is 16 bytes consisting of 15 bytes and CRC7. When unchecked: CRC7 is invalid and the data length of J1 is 64 bytes.

	Item	Description
	Trace On	Select whether to perform Trace. Trace is performed when this checkbox is checked. Outputs a trace pattern when selected.
	J1	Enter a trace pattern using either of the following two methods. The entered trace pattern is output after being converted to ASCII code. (1) Enter directly from the keyboard. (2) Enter from the graphical keyboard displayed on the screen.

Note:

The size of the Dummy channel container is VC4 when the measurement channel goes through VC4, and is VC3 when the measurement channel goes through VC3, regardless of the concatenation type (Contiguous/Virtual).

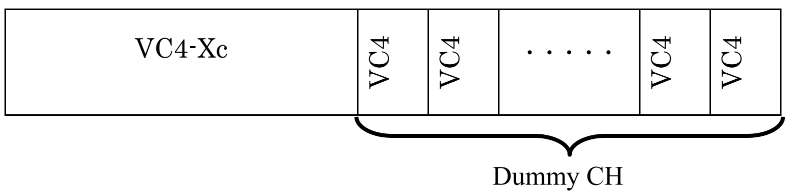
For the Dummy channel pointer value, the pointer value set in the SDH Tx screen is applied to all Dummy channels.

POH of the Dummy channel can be set on the Dummy CH setting screen. This is a common setting, and the set value will be applied to all Dummy channels.

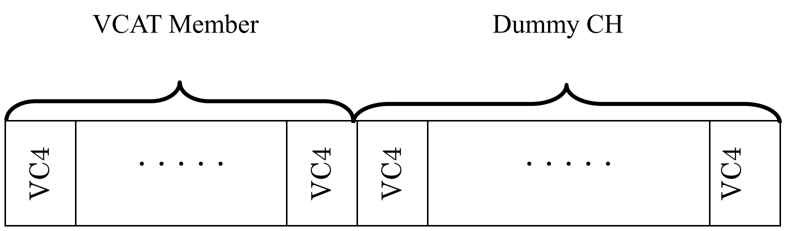
The payload type can be set for the Dummy channel on the path that configures VCAT. For the other Dummy channels, the payload and POH can be set.

The conceptual format of the Dummy channel is as follows:

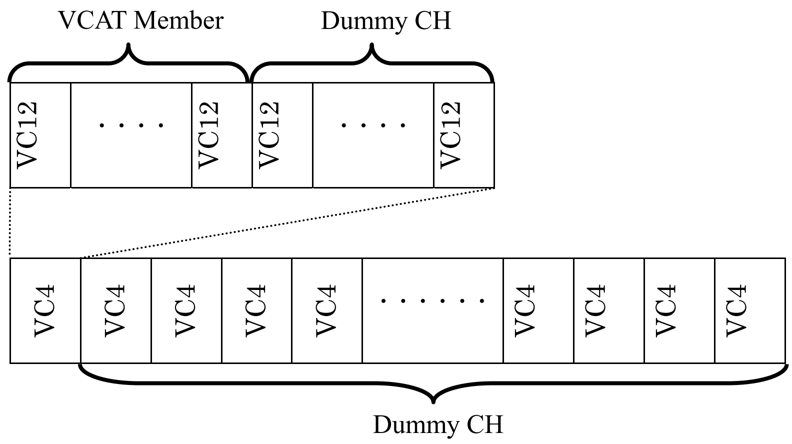
(1) For Contiguous Concatenation



(2) For HO Virtual Concatenation (VC4-Xv)



(3) For LO Virtual Concatenation (AU4-VC12-Xv)



7.2.7 VCAT counter screen

Displays the parity (B3, BIP-2) error count result on the channels that are selected as VCG during VCAT, for each channel, as well as the SQ value of the received signal. Display is possible when Virtual Concatenation is selected.
When LCAS Option is installed, VCG or Provisioned can be selected with Scope of LCAS Setting.

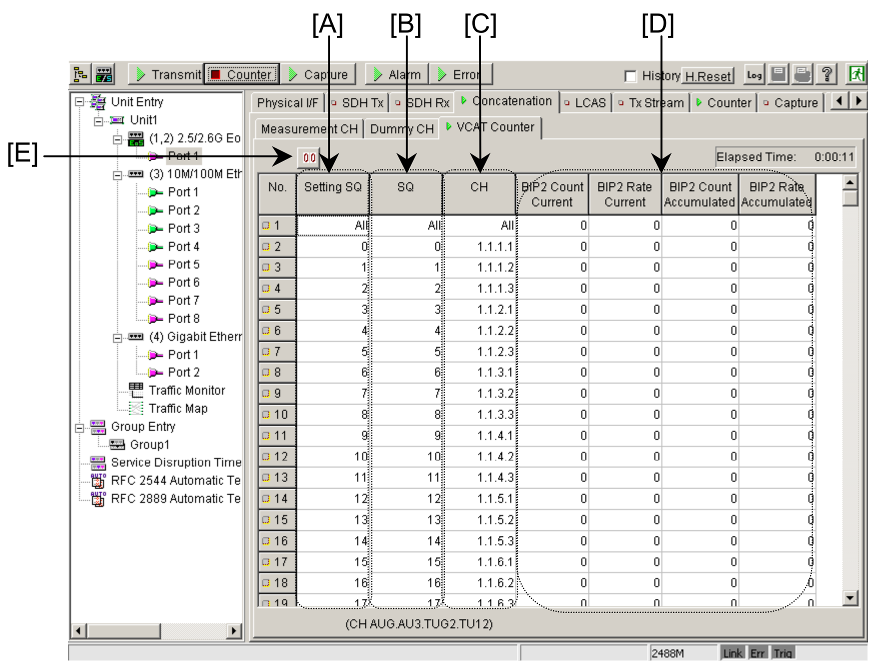


Figure 7.2.7-1 VCAT counter screen

	Item	Description
[A]	Setting SQ	Displays the information of the SQ set on the reception side. This is not displayed when Negotiation is set to On.
[B]	SQ	Displays the SQ value within the received signal.
[C]	CH	Displays the position information of the channel in response to the setting in Setting SQ above.
[D]	B3/BIP2	Displays the B3 error count results for each channel. The top line displays the total number of errors for each channel. Displays the BIP2 error count results when VC12-Xv or VC11-Xv is selected.
[E]	00	The VCAT counter is reset and the counting operation continues.

7.2.8 Setting LCAS

Sets LCAS.

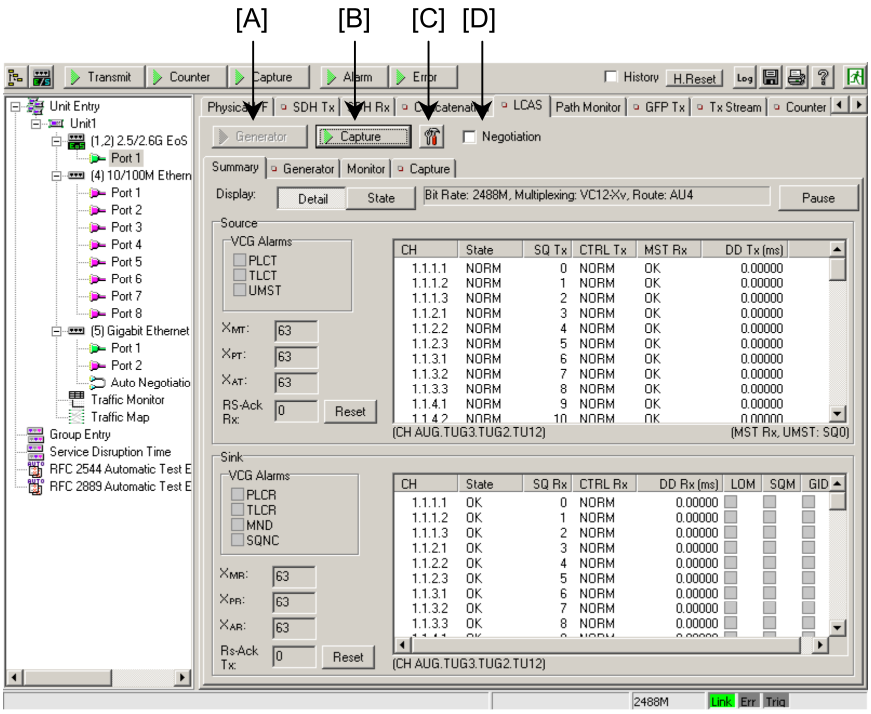


Figure 7.2.8-1 LCAS screen

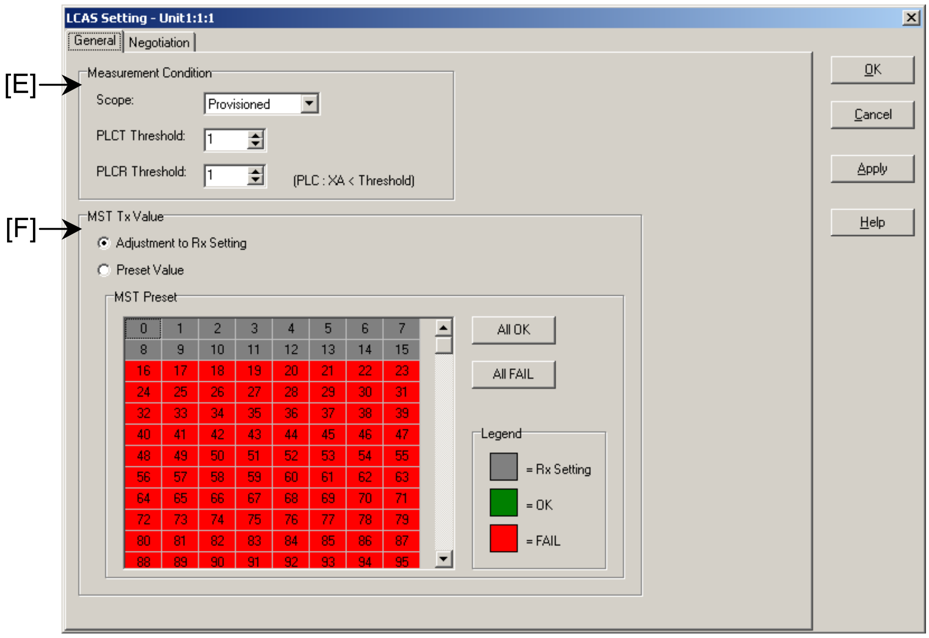


Figure 7.2.8-2 LCAS Setting General screen

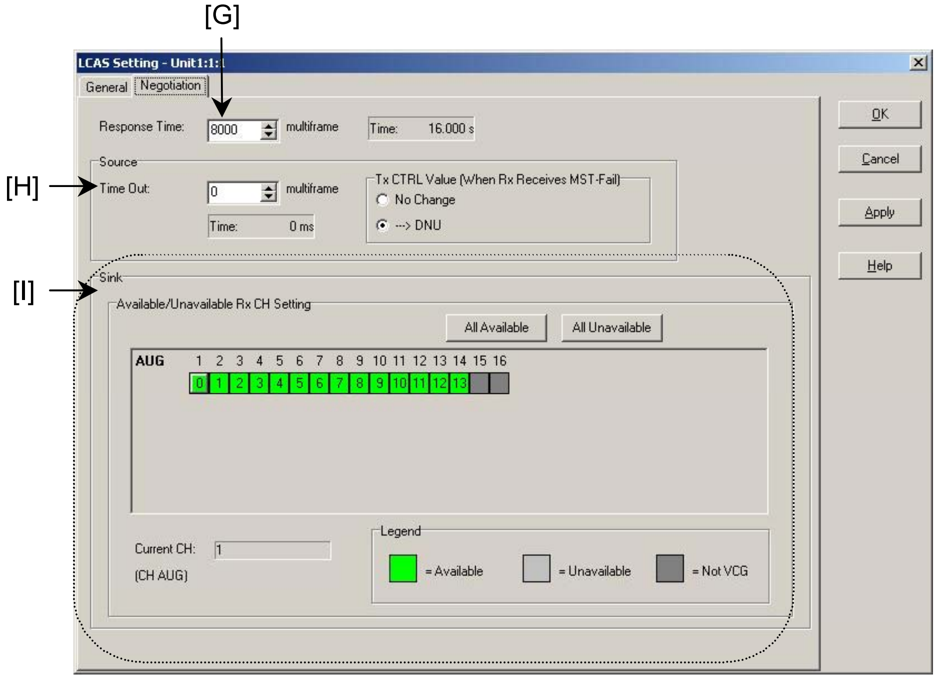


Figure 7.2.8-3 LCAS Setting Negotiation screen

	Item	Description
[A]		This is the LCAS Generator start/stop button. This button is displayed as "Stop button" while LCAS Generator is operating, and as "Start button" while LCAS Generator is stopped.
[B]		This is the LCAS Capture start/stop button. This button is displayed as "Stop button" while LCAS Capture is operating, and as "Start button" while LCAS Capture is stopped.
[C]		Displays the LCAS setting screen.
[D]	Negotiation	Sets whether the measuring instrument automatically executes LCAS negotiation. The measuring instrument automatically starts LCAS negotiation when this checkbox is selected. The measuring instrument does not start LCAS negotiation. MST Setting becomes enabled and the settings related to MST can be set. The name becomes "Auto" in the Through mode.

	Item	Description
[E]	Scope	Selects a target for error alarm measurement. This setting is reflected to the Counter screen and not to the Path Monitor. VCG: The set VCG is selected as the error alarm measurement target. Provisioned: Only the valid members on the reception side are selected as the error alarm measurement target. The measuring target changes when a channel is added or removed. The HO error and alarm at LO are always measured by VCG, since the set VCAT level is targeted.
	PLCT Threshold	Sets the conditions for detecting/releasing the PLC on the transmission side.
	PLCR Threshold	Sets the conditions for detecting/releasing the PLC on the reception side.
[F]	MST Tx Value	Sets the MST value of the signals on the transmission side.
	All OK	Sets OK to all MST.
	All FAIL	Sets FAIL to all MST.
[G]	Response Time	Sets in multiframes the time from when the change in CTRL or MST value is received by the reception side to when a response is transmitted from the transmission side.
[H]	Time Out	Sets in multiframes the wait time between command transmission and a response from the Sink.
	Tx CTRL Value	Sets the Tx CTRL value to be transmitted when MST FAIL is received.
[I]	All Available	The MST values of all the channels vary depending on the received CTRL value.
	All Unavailable	FAIL is transmitted for the MST values of all the channels, regardless of the received CTRL value.
	Over View	Displays the entire signal structure.
	Current CH	Displays the location information of the currently focused channel.

7.2.9 Transmitting LCAS Sequence

The functions related to LCAS are enabled when the MU150101A-13 LCAS is installed.

LCAS Sequence is set and transmitted on this screen. The operation changes depending on the setting of the LCAS Negotiation checkbox (On/Off) on the Concatenation tab.

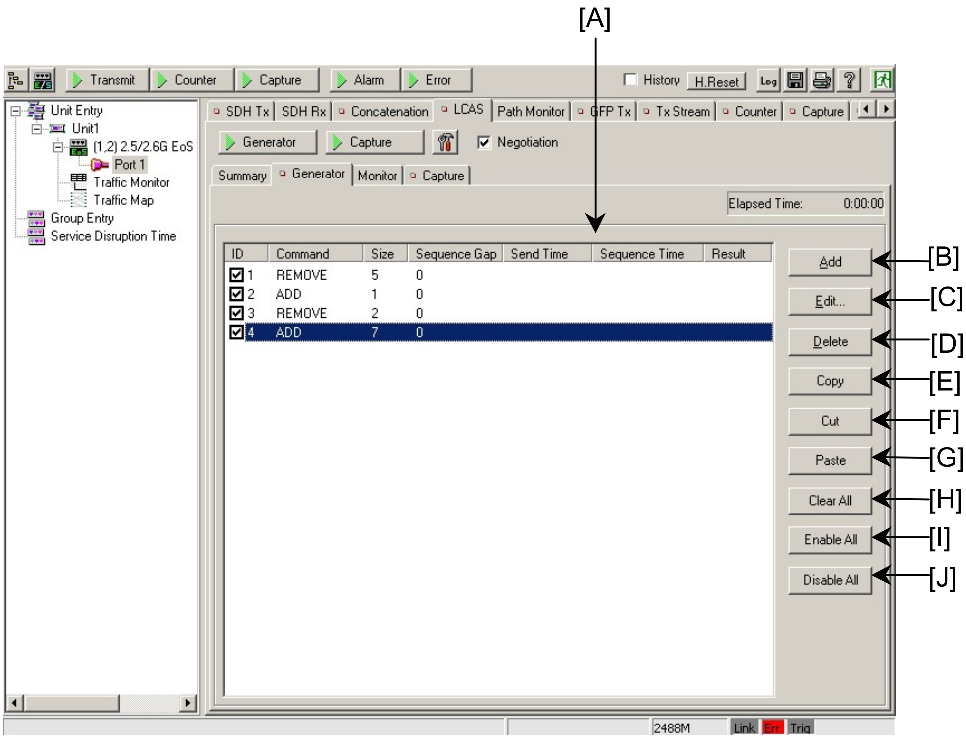


Figure 7.2.9-1 Generator screen

	Item		Description
[A]	Generate	ID	Displays the sequence number. When a checkbox is checked, the corresponding sequence is enabled and will be executed. When a checkbox is unchecked, the corresponding sequence is disabled and will not be executed.
		Command	Displays the command type.
		Size	Displays the target channel to execute the sequence.
		Sequence Gap	Displays the time interval between the current sequence and the next sequence.
		Send Time	Displays the CTRL command transmission time.
		Sequence Time	Displays the Sequence time.

	Item		Description
[A]	Generate	Result	Displays the sequence execution result. • OK: The command is transmitted normally. • MST Time Out: When MST OK is not detected for ADD within the timeout set by [B] (Refer to Section 7.2.8.) • RS-Ack Time Out: When inverted RS-Ack is not detected for Command within the timeout set by [B] (Refer to Section 7.2.8.) • Invalid Command: The following causes are possible if Command is received.: a. ADD is executed for a channel that is already Member. b. REMOVE is executed for a channel that is not Member. c. Tmp. REMOVE is executed for a channel that is not Member.
[B]	Add		Adds an LCAS sequence to the last line. This button is disabled when 64 LCAS sequences have already been set.
[C]	Edit		Displays the LCAS setting screen to edit the selected LCAS sequence.
[D]	Delete		Deletes the selected LCAS sequence.
[E]	Copy		Copies the settings of the selected LCAS sequence.
[F]	Cut		Copies and deletes (cuts) the selected LCAS sequence.
[G]	Paste		Adds the copied LCAS sequence settings as a new LCAS sequence. When an LCAS sequence is selected, the new LCAS sequence will be added next to it. When no LCAS sequence is selected, the new LCAS sequence will be added next to the last LCAS sequence.
[H]	Clear All		Deletes all LCAS sequences.
[I]	Enable All		Checks all checkboxes for LCAS sequences.
[J]	Disable All		Unchecks all checkboxes for LCAS sequences.

(1) Editing ADD sequence

Set an ADD sequence.

The operations of the ADD sequence are as follows.

After transmitting CTRL:ADD, the operation waits until the ADD-target MST on the receiving signals becomes OK.
When MST becomes OK, CTRL is changed from ADD to EOS, and payloads are increased simultaneously. Then the operation waits until RS-Ack is inverted. When RS-Ack is inverted or when the Time Out time and Sequence Gap time have elapsed, the operation moves to the next sequence. If RS-Ack is not inverted within the Time Out time, “RS-Ack Time Out” is displayed in Result without canceling the ADD sequence.
If MST does not become OK within the Time Out time after ADD transmission, CTRL is returned from ADD to IDLE and the operation moves to the next sequence after the Sequence Gap time has elapsed. In this event, “MST Time Out” is displayed in Result.

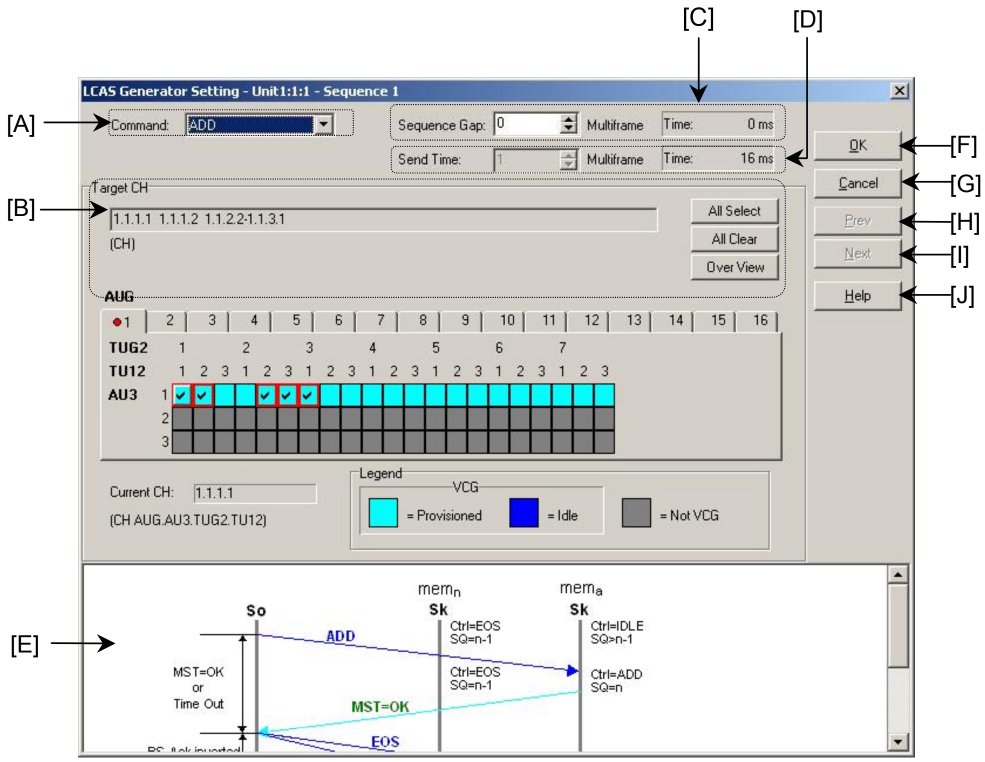


Figure 7.2.9-2 ADD Sequence editing screen

	Item		Description
[A]	Command		Select the command type from the following: •ADD •REMOVE •Tmp. REMOVE •USER
[B]	Target CH		Select the target channel to execute a sequence. Can support the channels that are set as VCG.
		All Select	Selects all the channels of measurement VCG.
		All Clear	Unselects all the channels.
		Over View	Displays the Target CH Setting Over View dialog box that shows the entire information of the signal.
[C]	Sequence Gap		Set the time interval from when the current sequence is completed to when the next sequence is started. The setting unit is multiframe, and the value converted to time is displayed in "Time:". One multiframe for HO-VCAT is the 1st MFI cycle (2 ms) and that for LO-VCAT is the K4 cycle (16 ms). Value: 0 to 8,000
[D]	Send Time		When ADD operates, this value is not reflected in operation.
[E]			Displays the ADD sequence transmission procedure.
[F]	OK		Registers the edited sequence to the measuring instrument and closes the Sequence editing window.
[G]	Cancel		Closes the Sequence editing window without registering the sequence being edited to the measuring instrument.
[H]	Prev		Registers the edited sequence to the measuring instrument and opens the editing screen for the previous sequence.
[I]	Next		Registers the edited sequence to the measuring instrument and opens the editing screen for the next sequence.
[J]	Help		Opens the help function.

(2) Editing REMOVE sequence

Set a REMOVE sequence.

The operations of the REMOVE sequence are as follows.

CTRL of the target channel is changed to IDLE and payloads are decreased simultaneously, and then the SQ values and CTRL values of other channels that may be affected by these operations are changed. The operation waits then until the MST on the channel for which REMOVE was executed becomes Fail and RS-Ack is inverted. When MST FAIL is received and RS-Ack is inverted or when the Time Out time has elapsed, the operation moves to the next sequence after waiting for the Sequence Gap time. If MST does not become FAIL within the Time Out time, “MST FAIL” is displayed in Result. If RS-Ack is not inverted within the Time Out time, “RS-Ack Time Out” is displayed in Result without canceling the REMOVE sequence.

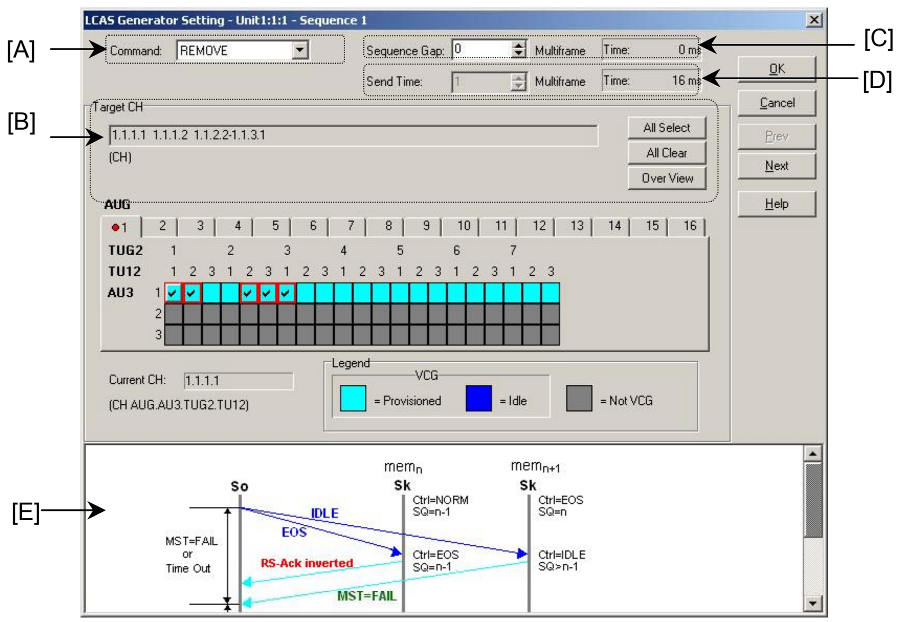


Figure 7.2.9-3 REMOVE Sequence editing screen

	Item		Description
[A]	Command		Select the command type from the following: •ADD •REMOVE •Tmp. REMOVE •USER
[B]	Target CH		Select the target channel to execute a sequence.
		All Select	Selects all the channels of measurement VCG.
		All Clear	Unselects all the channels.
		Over View	Displays the Target CH Setting Over View dialog box that shows the entire information of the signal.
[C]	Sequence Gap		Set the time interval from when the current sequence is completed to when the next sequence is started. The setting unit is multiframe, and the value converted to time is displayed in "Time:". One multiframe for HO-VCAT is the 1st MFI cycle (2 ms) and that for LO-VCAT is the K4 cycle (16 ms). Value: 0 to 8,000
[D]	Send Time		When Remove operates, this value is not reflected in operation.
[E]			Displays the REMOVE sequence transmission procedure.

(3) Editing Tmp. REMOVE sequence

Set a Tmp. REMOVE sequence.

The operations of the Tmp. REMOVE sequence are as follows.

CTRL of the target channel is changed to DNU and payloads are decreased simultaneously, and then the CTRL values of other channels that may be affected by these operations are changed. When the Send Time has elapsed after that, CTRL and the payloads are restored to the original values. When the Sequence Gap time has elapsed after that, the operation moves to the next sequence.

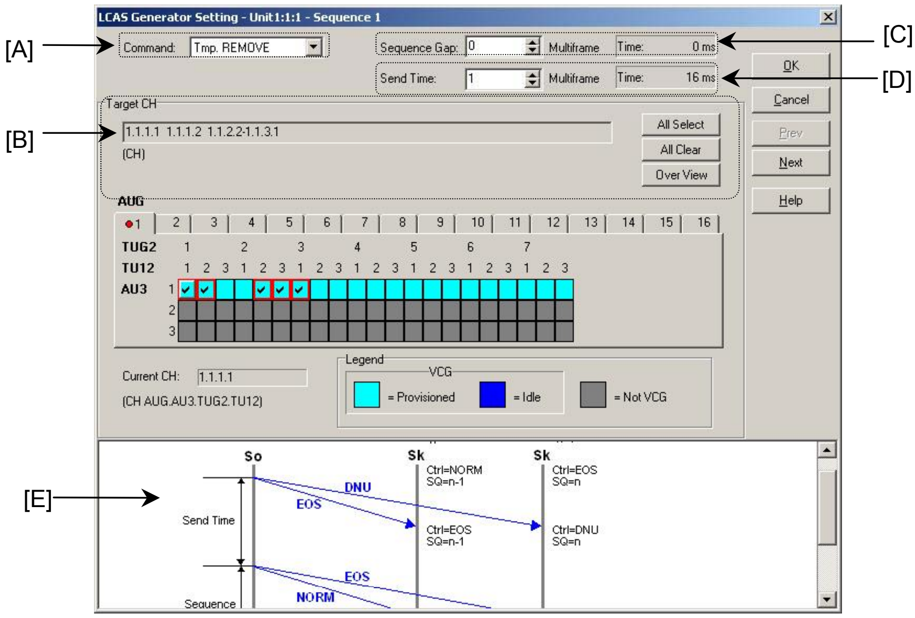


Figure 7.2.9-4 Tmp. REMOVE Sequence editing screen

	Item		Description
[A]	Command		Select the command type from the following: •ADD •REMOVE •Tmp. REMOVE •USER
[B]	Target CH		Select the target channel to execute a sequence.
		All Select	Selects all the channels of measurement VCG.
		All Clear	Unselects all the channels.
		Over View	Displays the Target CH Setting Over View dialog box that shows the entire information of the signal.
[C]	Sequence Gap		Set the time interval from when the current sequence is completed to when the next sequence is started. The setting unit is multiframe, and the value converted to time is displayed in “Time:”. One multiframe for HO-VCAT is the 1st MFI cycle (2 ms) and that for LO-VCAT is the K4 cycle (16 ms). Value: 0 to 8,000
[D]	Send Time		Set the time to transmit CTRL=DNU. The setting unit is the same as that for Sequence Gap. Value: 1 to 8,000
[E]			Displays the Tmp. REMOVE sequence transmission procedure.

(4) Editing USER sequence

Set a USER sequence.

With the USER sequence, an arbitrary MST value can be transmitted and RS-Ack can be inverted. These operations are same regardless of whether Negotiation is set to On or Off.

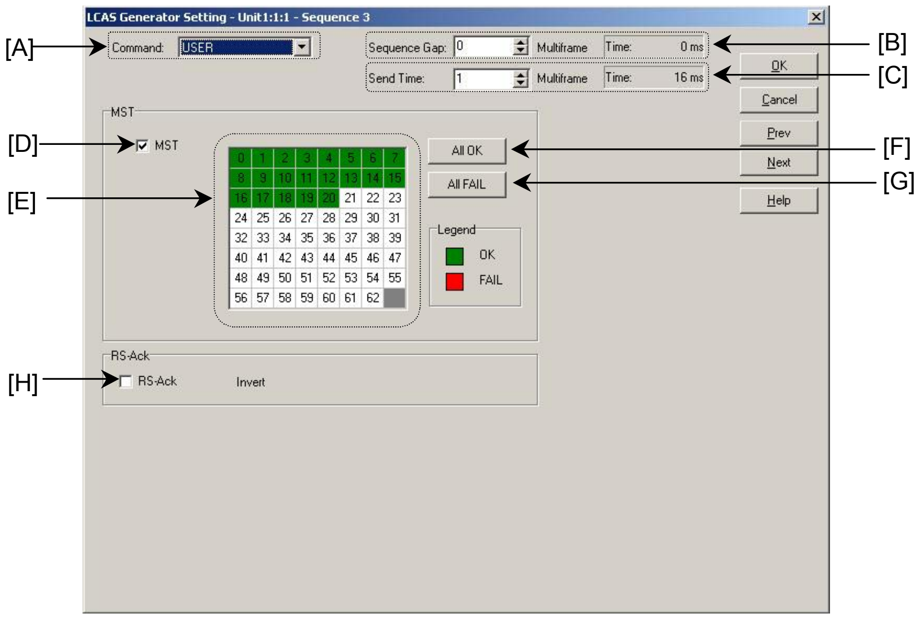


Figure 7.2.9-5 USER Sequence editing screen

	Item	Description
[A]	Command	Select the command type from the following: • ADD • REMOVE • Tmp. REMOVE • USER
[B]	Sequence Gap	Set the time interval from when the current sequence is completed to when the next sequence is started. The setting unit is multiframe, and the value converted to time is displayed in “Time:” on the right. One multiframe for HO-VCAT is the 1st MFI cycle (2 ms) and that for LO-VCAT is the K4 cycle (16 ms). Value: 0 to 8,000
[C]	Send Time	Set the time to transmit the set MST. The setting unit is the same as that for Sequence Gap. This is enabled only when MST is selected (checked). Value: 1 to 8,000
[D]	MST	Checking this checkbox enables the function to transmit the set MST for the current sequence. This checkbox and the RS-Ack checkbox cannot be selected (checked) at the same time.
[E]	Member Number	Set the MST value to be transmitted.
[F]	All OK	Sets all Member Numbers to OK.
[G]	All FAIL	Sets all Member Numbers to FAIL.
[H]	RS-Ack	Checking this checkbox enables the function to invert RS-Ack for the current sequence. This checkbox and MST checkbox cannot be selected (checked) at the same time.

7.2.10 Viewing LCAS summary information

(1) LCAS Summary

Displays the LCAS information on the channel that is set as a VCG channel simultaneously for both Source and Sink.

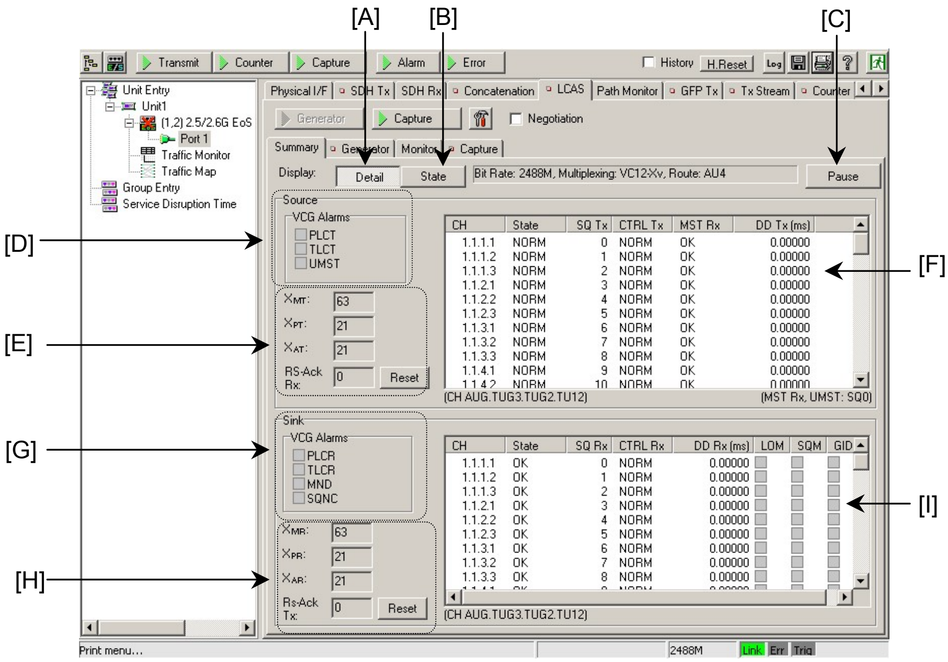


Figure 7.2.10-1 LCAS Summary Detail screen

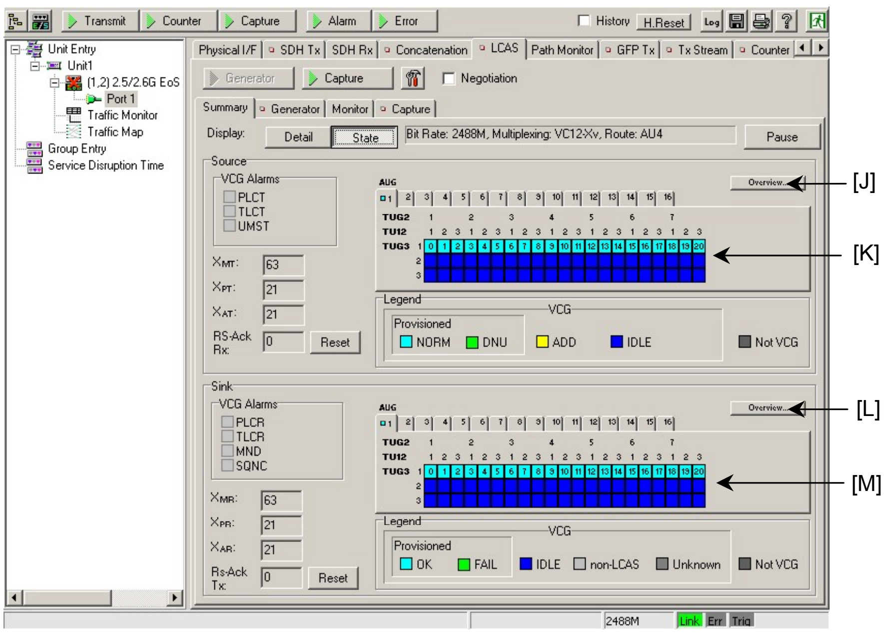


Figure 7.2.10-2 LCAS Summary State screen

	Item	Description
[A]	Detail	Displays all the information on VCAT, LCAS, and Differential Delay of each channel in table form.
[B]	State	Displays the LCAS state information of each channel in figure form.
[C]	Pause	The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.
[D]	VCG Alarm (Source)	Displays VCG alarms on the Source side.
[E]	X_{MT}	Displays the VCG Size setting value on the Source side.
	X_{PT}	Displays the total number of Provision Members on the Source side.
	X_{AT}	Displays the total number of Members on the Source side for which the LCAS state information is NORM and EOS.
	RS-Ack Rx	Displays the total number of received RS-Acks.
	Reset	Resets the number of received RS-Acks to 0.
[F]		Displays the current information on the Source side.
[G]	VCG Alarm (Sink)	Displays VCG alarms on the Sink side.
[H]	X_{MR}	Displays the VCG Size setting value on the Sink side.
	X_{PR}	Displays the total number of Provision Members on the Sink side.
	X_{AR}	Displays the total number of Members on the Sink side for which the LCAS state information is NORM and EOS.
	RS-Ack Tx	Displays the total number of transmitted RS-Acks.
	Reset	Resets the number of transmitted RS-Acks to 0.
[I]		Displays the current information on the Sink side.
[J]	OverView	Displays the Summary Source State Over View dialog box that shows the state of the entire signal.

	Item	Description
[K]		Displays the LCAS state information of the Source side.
[L]	OverView	Displays the Summary Sink State Over View dialog box that shows the state of the entire signal.
[M]		Displays the LCAS state information of the Sink side.

(2) LCAS Monitor

The LCAS Monitor screen displays the results of sampling the LCAS Control field (H4 for HO-VCAT; K4 for LO-VCAT) data each second.

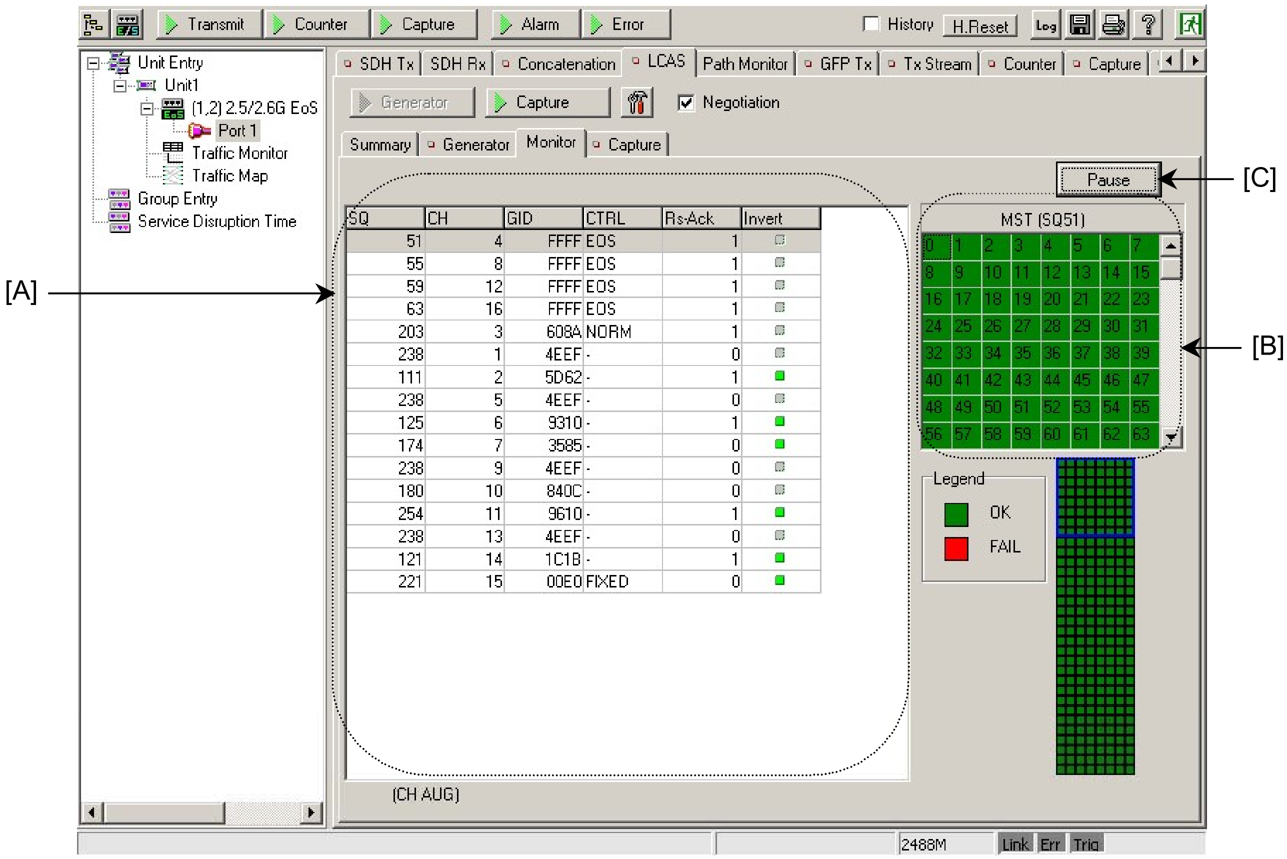


Figure 7.2.10-3 LCAS Monitor screen

	Item		Description
[A]	Monitor	SQ	Displays the SQ value in the received LCAS Control packet (H4/K4 byte).
		CH	Displays the SDH channel information.
		GID	Displays the 16-bit contiguous GID included in the received LCAS Control packet (H4/K4 byte). This is disabled when Measurement CH is selected in Display.
		CTRL	Displays the decoded value of CTRL in the received LCAS Control packet (H4/K4 byte).
		RS-Ack	Displays the value of RS-Ack in the received LCAS Control packet (H4/K4 byte).
		Invert	Sets so that the LED lights up when RS-Ack in the received LCAS Control packet (H4/K4 byte) is inverted within one second.
[B]	MST		Displays the value of the MST in the LCAS Control packet (H4/K4 byte) that contains the SQ selected in [A].
[C]	Pause		The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.

Note:

If no signal is input, the display is not updated and the previous information may be displayed as is.

(3) LCAS Capture

The LCAS Capture screen displays the LCAS Control packet sequence captured by a specified trigger. When the pattern of the LCAS Control packet being received is changed, the sequence at that time is defined as one capture sequence. Up to 64 capture sequences are displayed on the LCAS Capture screen. A capture sequence is displayed when the capture operation is complete. The sequence is moved when a change is made in the LCAS Control field. For the MST value, "–" is displayed as invalid data until the data of one MST cycle has been captured.

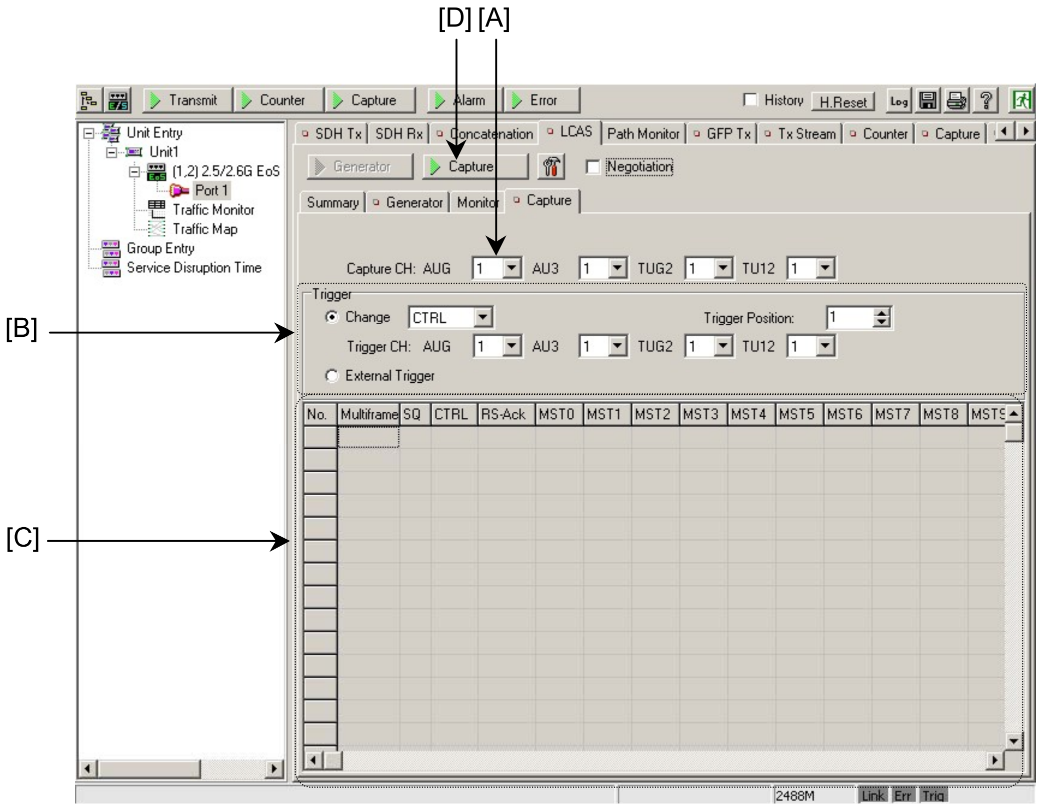


Figure 7.2.10-4 LCAS Capture screen

	Item		Description
[A]	Capture CH		Select the channel for which LCAS Capture is executed.
[B]	Trigger	Change	Specify a change in the LCAS Control packet as the trigger. One of the following CTRL fields can be specified: •SQ •CTRL •MST •RS-Ack When Change is selected, set the trigger target channel using Trigger CH.
		Trigger Position	Set the trigger position using the sequence number.
		External Trigger	Specify whether to use the external trigger.
[C]	LCAS Sequence	No.	Indicates the line number of the sequence. When a trigger is generated, "*" is indicated at the sequence No. where the trigger was generated.
		Multi-frame	Displays the number of multiframes of the generated sequence in decimal. One multiframe for HO-VCAT is the 1st MFI and one multiframe for LO-VCAT is the K4 multiframe.
		SQ	Displays the SQ value of the generated sequence in decimal.
		CTRL	Displays the decoded CTRL value of the generated sequence.
		RS-Ack	Displays the RS-Ack value of the generated sequence in binary.
		MST	Displays the MST value of the generated sequence as "OK", "FAIL", or "–" for each MST.
[D]	Capture		LCAS Capture start/stop button. This button is displayed as "Stop button" while LCAS Capture is operating, and as "Start button" while LCAS Capture is stopped.

7.2.11 Path Monitor

Path Monitor can monitor the targeted channels simultaneously.

The target for monitoring is the set VCG, regardless of Scope of LCAS Setting.

Path Monitor displays whether an error/alarm occurs on each channel.

The detailed count value can be measured by using a counter.

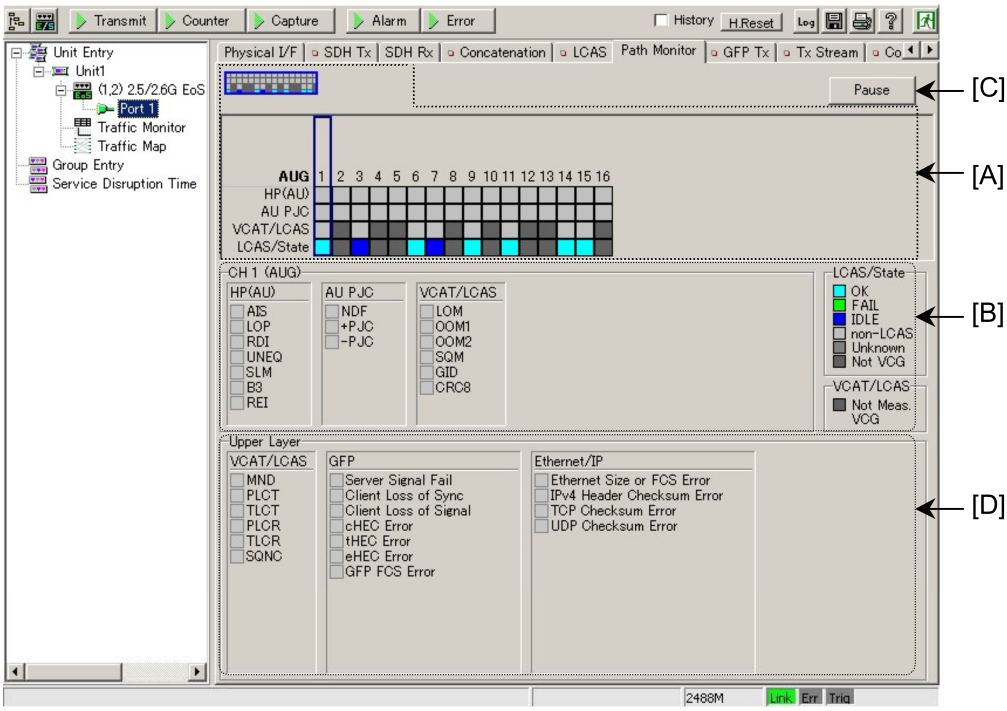


Figure 7.2.11-1 Path Monitor Screen (HO)

7

Functions Specific to EoS/POS Modules

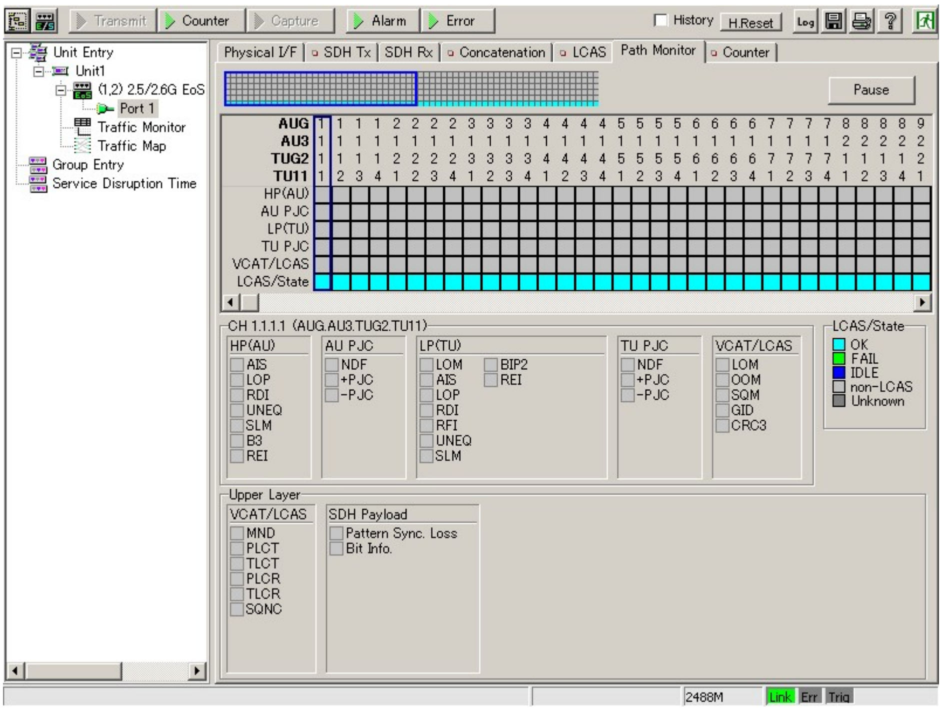


Figure 7.2.11-2 Path Monitor Screen (LO)

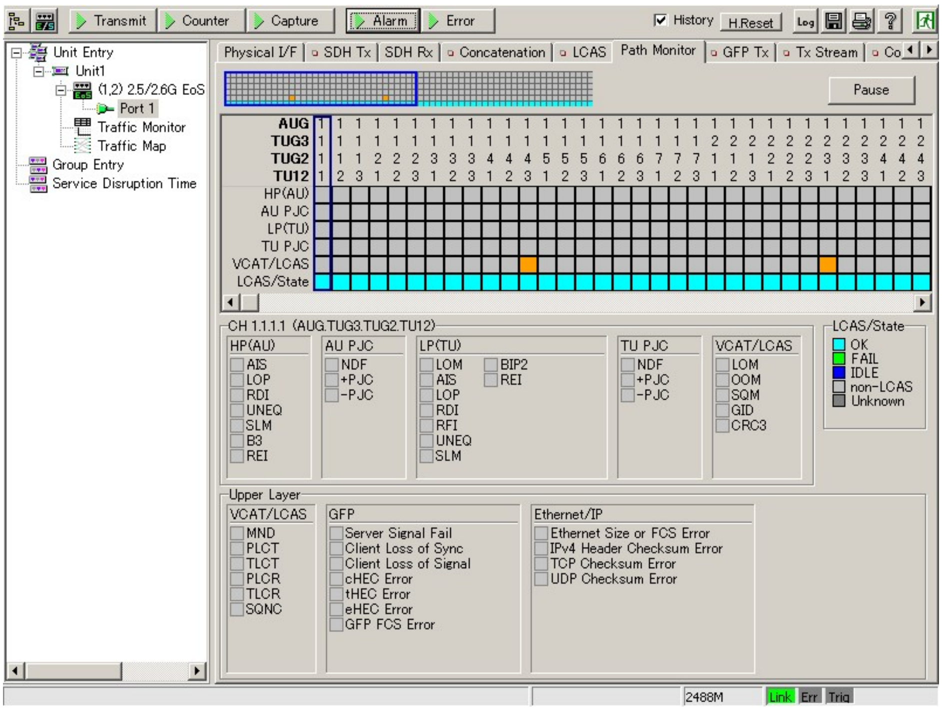


Figure 7.2.11-3 Path Monitor Screen (History ON)

	Item	Description
[A]	OverView	Displays the OverView of the channel. All channels are targeted when VC4 or VC3 is set. Only the OverView of VCG is displayed when VC11 or VC12 is set.
[B]	Detail	Displays the alarm occurrence state and details on PJC for the channel selected in OverView.
[C]	Pause	The update of the screen is stopped temporarily. The update is restarted by pushing again. This function doesn't act on the print function and the measurement result save function. For instance, when you execute the save of the measurement result in Pause, the save data is not the result of display but the result of point in execute preservation.
[D]	Upper Layer	Displays the details on alarms on the upper layer. Three items, VCAT/LCAS, GFP or PPP, and Ethernet IP, are displayed. The display contents vary depending on the selected Mapping.

History and Counter

Channels in which an error/alarm occurs for a long period of time can be checked by using the History function with this monitor.

In addition, the number of errors and/or alarms that occur can be measured at the same time by operating a counter at this time.

7.2.12 Setting GFP Tx

7.2.12.1 Setting Header

Sets Header for transmission GFP frame. Set values on this item are not applied to transmission frame set in Tx Stream screen. They are applied to frames that the MU150101A transmits voluntarily. A voluntarily transmitted frame refers to, for example, Reply for Ping Request in the Protocol function.

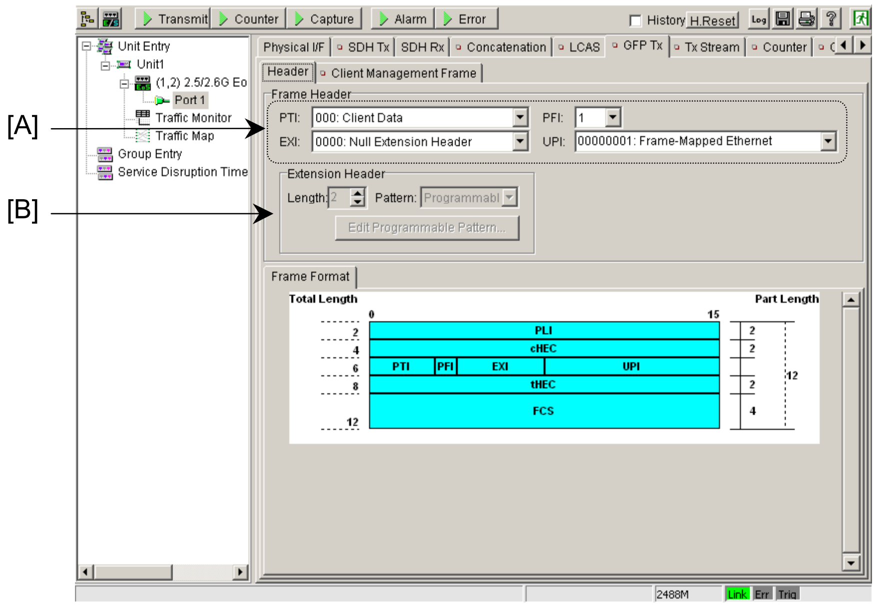


Figure 7.2.12.1-1 GFP Header screen

	Item		Description
[A]		PTI	Selects the PTI field.
		EXI	Selects Extension Header type.
		PFI	Selects presence/absence of Payload FCS.
		UPI	Selects the UPI field.
[B]	Extension Header		Valid when EXI is set to other than Null Extension Header / Linear Extension Header.
		Length	Sets Extension Header size. Value: 2 to 58 bytes
		Pattern	Select All0, All1 or Programmable. ☞ For Binary Data settings, refer to 2.3.1 (7) "Binary Data Editor."

7.2.12.2 Setting Client Management Frame

Sets Client Management Frame. Client Management Frame transmission is not synchronized with Stream transmission. Total size of Client Management Frame is from 4 to 1024 bytes in 4-byte steps.

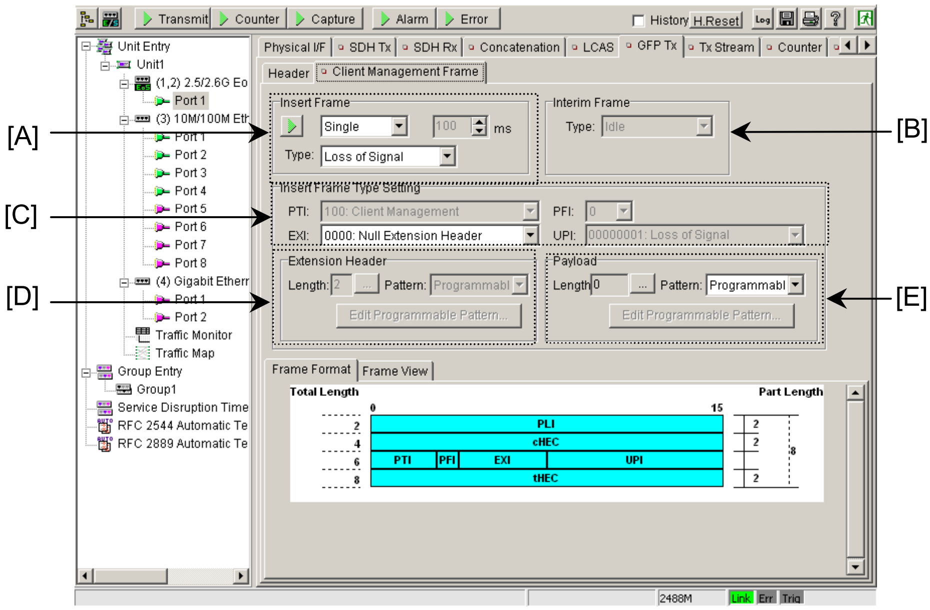
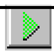


Figure 7.2.12.2-1 Client Management Frame screen

	Item		Description
[A]	Insert Frame	 Start/Stop	This button starts/stops Client Management Frame transmission.
		(Mode)	Single: Transmits only one frame. Repeat: Transmits frames continuously until Stop button is pressed.
		(Transmission interval)	Sets the transmission interval for Repeat mode. Value: 10 to 2,560 ms (step: 10 ms)
		Type	Selects Client Management Frame type. Select one from Loss of Signal / Loss of Sync / User1 / User2. User1 / User2 are user-defined frames.
[B]	Interim		Select signal type to be inserted between frames for Repeat transmission. Idle: Padded with GFP idle frames. Client Data: Padded with stream during stream transmission, or with GFP idle frames when stream transmission is stopped.
[C]		PTI	Fixed value display. Cannot be set in this screen.
		EXI	Selects Extension Header type.
		PFI	Selects presence/absence of Payload FCS.
		UPI	Cannot be set when Type is set to Loss of Sync or Loss of Signal.
[D]	Extension Header		Valid when EXI is set to other than Null Extension Header / Linear Extension Header.
		Length	Set this item so that total size of Client Management Frames is multiples of 4. Value: 2 to 58 bytes
		Pattern	Select All0, All1 or Programmable. ☞ For Binary Data settings, refer to 2.3.1 (7) "Binary Data Editor."
[E]	Payload		Sets Payload.
		Length	Set this item so that total size of Client Management Frames is multiples of 4. Value: 8 to 2, 048 – (total header + Payload FCS size)
		Pattern	Select All0, All1 or Programmable. ☞ For Binary Data settings, refer to 2.3.1 (7) "Binary Data Editor."

Section 8 RFC2544 Automatic Test

This section describes how to set the RFC2544 Automatic Test function.

8.1 Overview

RFC2544 Automatic Test automatically measures the six measurement items stated in "RFC2544-Benchmarking Methodology for Network Interconnect Devices," with the set conditions:

1. Throughput
2. Latency
3. Frame Loss Rate
4. Back-to-back Frames
5. System Recovery
6. Reset

Excluding Reset, multiple test items can be executed by one start operation. The tests can be repeated multiple times to output averaged results (each repetition is called a trial). In addition, it is also possible to test multiple types of frame size and output the test results at one time.

Note:

- The Reset test requires a reset of the DUT so linked tests cannot be performed. At Reset measurement, only one measurement can be performed for one type of frame size (64 bytes) at one port pair.

- RFC2544 Automatic Test utilizes the basic measurement functions. Basic measurement functions cannot be used while RFC2544 Automatic Test is being executed as a result.

8.2 Operation Screen

When the **RFC 2544 Automatic Test** icon in Tree View is selected, the following type of screen is displayed. This is where each operation is executed.

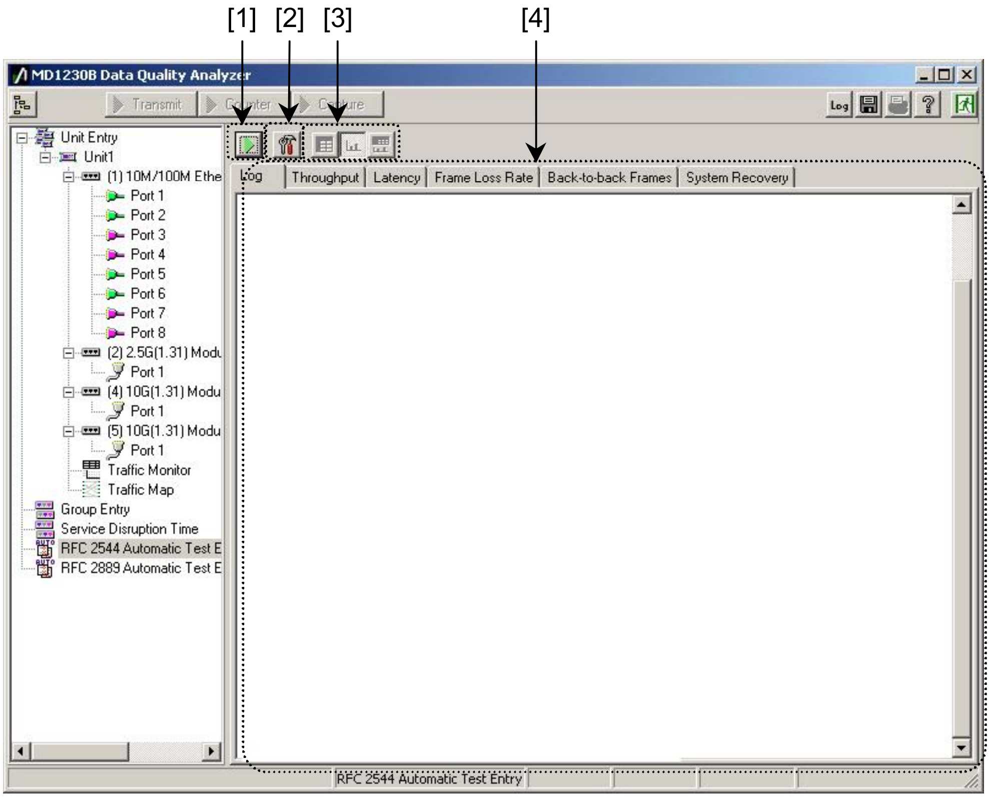
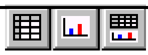


Figure 8.2-1 RFC2544 Automatic Test screen

	Name	Description
[1]	Start/Stop	Starts/stops RFC2544 Automatic Test. When RFC2544 Automatic Test is being performed, the Stop button appears. When RFC2544 Automatic Test is stopped, the Start button appears.
[2]	Automatic Test Setting	Displays the setting screen for RFC2544 Automatic Test.

	Name	Description
[3]	 Result display switching	Switches among result display (Table, Table and chart, Chart). Enabled when result can be displayed.
[4]	Log/result display area	Displays progress or measured result for RFC2544 Automatic Test. Tabs displayed differ depending on measurement item type or measurement status.

8.3 Configuration Screen

When the **Auto test setting** button (refer to Section 8.2 [2]) at this operation screen is pressed, the test setting screen is displayed to select the test items and test conditions.

8.3.1 Port Pairs

The traffic configuration and test ports are selected at the **Port Pairs** tag; settings for each test port can be made individually.

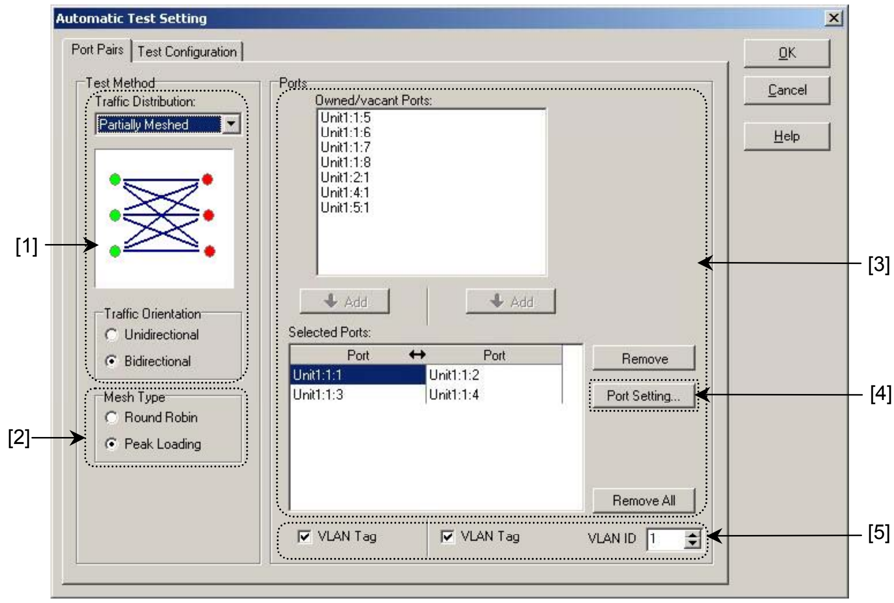


Figure 8.3.1-1 Port Pairs screen

Name		Description
[1]	Traffic Distribution Traffic Orientation	Selects Traffic Distribution and Traffic Orientation. For details, refer to Section 8.4.1 "Traffic Distribution and Traffic Orientation".
[2]	Mesh Type	When **Partially Meshed** or **Fully Meshed** selected at Traffic Distribution, selects test frame destination port mesh type (**Round Robin** or **Peak Loading**). For details, refer to Section 8.4.2 "Mesh Type".

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RFC2544 Automatic Test

Name		Description
[3]	Ports	Selects test ports (port connected to DUT). The **Owned/vacant Ports** column displays the ports than can be used (ports that are not reserved). Select the port to test here press the **Add** button to add them to the **Selected Ports** column and register them as ports for testing. The contents of the **Selected Ports** column vary according to the **Traffic Distribution** setting. When **One to One** and **Partially Meshed** are selected at **Traffic Distribution** setting, the selected ports are split into two groups and test frames are sent between these groups. In addition, when **Unidirectional** is set at **Traffic Orientation**, traffic is sent from the left group to the right group of ports. Up to 128 port pairs can be specified at **One to One**. If a mistake is made in the selected ports, select the problem port at the **Selected Ports** column and press the **Remove** button to unregister them. To unregister all selected ports, press the **Remove All** button and then press the **OK** button at the confirmation dialog.
[4]	Port Setting	Displays **Port Setting** dialog for ports selected at **Selected Ports**. For details of the setting contents, refer to Section 8.4.4 "Port Setting Contents".
[5]	VLAN Tag VLAN ID	When sending and receiving test frames with attached VLAN tag, set the VLAN Tag checkbox to On. In addition, the value (0 to 4095) of the VLAN ID (VID) field set in the VLAN tag is specified by the **VLAN ID** setting. Note: The non-VID values of VLAN tag are shown below. • TPID: 8100 fixed • CFI: 0 fixed • User Priority: 0 fixed

8.3.2 Test Configuration

The settings for test frames and learning frames sent during testing and the test items are selected at the Test Configuration tab.

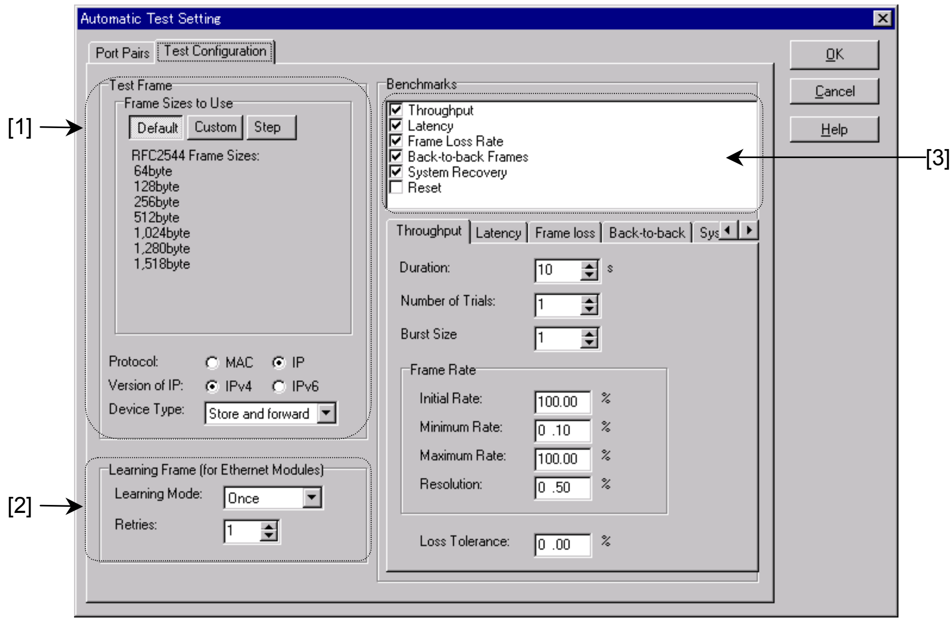


Figure 8.3.2-1 Test Configuration screen

Name		Description
[1]	Test Frame	Sets contents of test frames sent and received at test.
	Frame Size to Use	Selects frame size for performing test. The following with three items can be selected as the selection method. However, at the Reset test these settings cannot be used and the setting is fixed to 64 bytes. • Default Measurement is performed using seven frames size (64, 128, 256, 512, 1024, 1280, 1518 bytes) as defined by RFC2544. However, when the **Version of IP** setting is **IPv6**, the 64 byte measurements is not supported (because the minimum test frame size exceeds 64 bytes due to the IPv6 header). • Custom A maximum of 25 types of frames size can be set. • Step Several frame sizes can be measured using **Count** (1 to 25) at each **Step Size** from **Start from**. Frame size can be input in the range from 64 to 65535 bytes but there are limits on the frame size that can be sent by the Tx Stream function for the actual test port.

<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td></td><td>Protocol</td><td>Enables Ethernet module. The type of device to be tested (DUT hereafter) is specified. As a result the method for specifying the destination MAC Address set in the test frames is changed.
MAC
Select this when the DUT is a hub, layer-2 switch or transmission device. The test frame destination MAC Address becomes the MAC Address fourth of the destination port.
IP
Select this when the DUT is a router or layer-3 switch. The MAC Address of Gateway (refer to Section 4.5.6 (2)) or Default Router (refer to Section 4.5.6 (3)) is obtained using ARP or ICMPv6 and is used as the test frame destination MAC Address. If there is an error in resolving the ARP/ICMPv6 address test frames are not sent.</td></tr>
<tr><td></td><td>Version of IP</td><td>Selects the IP version used by test frames from IPv4 and IPv6.</td></tr>
<tr><td></td><td>Device Type</td><td>Selects the timestamp method for test frames. This setting is used by the Latency, System Recovery, and Reset tests. Set a value matching the frame processing method for the DUT being tested.
Refer to Section 5.1.1 “Displaying Stream Setting screen” for information about Device Type.</td></tr>
<tr><td>[2]</td><td>Learning Frame</td><td>Enables the Ethernet module. It sets operations related to address learning. For details, see Section 8.4.3 “Learning Frame”.
<table>
<tr><td>Learning Mode</td><td>Set whether or not to perform address learning by selecting Never, Once or Every Trial before testing starts.</td></tr>
<tr><td>Retries</td><td>This is enabled when Learning Mode is either Once or Every Trial. The address learning frame resend count is set (1 to 999).</td></tr>
</table></td></tr>
<tr><td>[3]</td><td>Benchmarks</td><td>Select test items to execute from six items. However, the Reset test cannot be executed in combination with other test items. When Traffic Distribution is either Partially Meshed or Fully Meshed, only the Throughput, Frame Loss Rate, and Back-to-Back Frames tests can be executed.
Note: System Recovery and Reset cannot be selected for EoS modules.</td></tr>
</table>

8.3.3 Throughput

These are the setting items when measuring Throughput.

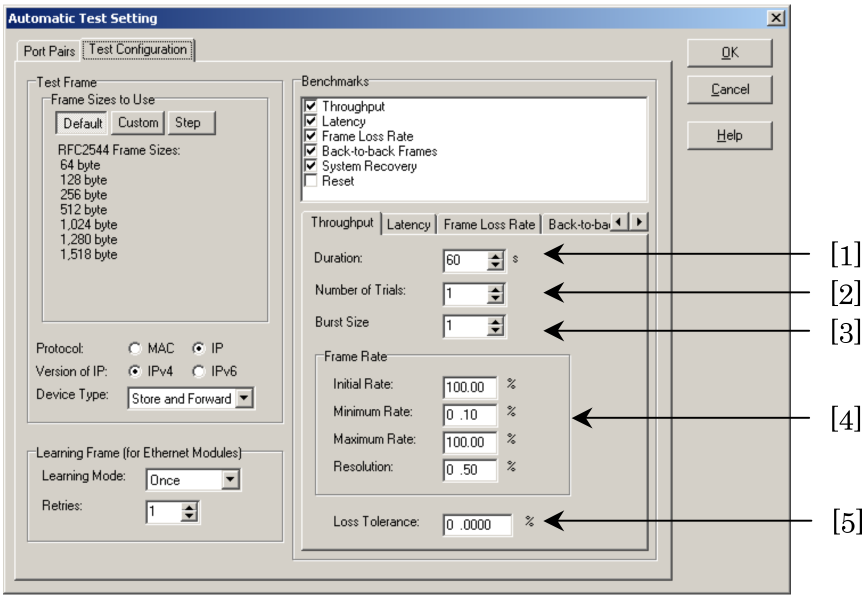


Figure 8.3.3-1 Throughput measurement setting screen

Name		Description
[1]	Duration	Sets the send duration (2 to 999 s) for test frames at each trial. RFC2544 recommends (should) a minimum of at least 60 seconds.
[2]	Number of Trials	Sets number of trials (1 to 50) for each frame size.
[3]	Burst Size	Sets send test frames at burst repetition. The number of frames included in the burst can be set from 1 to 1000. The burst is generated when Burst Size is larger than 1. RFC2544 recommends (should) checking with frame sizes of 16, 64, 256, and 1024.
[4]	Frame Rate	Sets Throughput measurement range and measurement results resolution as percentage (0.01% to 100%). Throughput measurement starts by sending test frames from the Initial Rate and then performs measurement by changing the range in the Minimum Rate to Maximum Rate as binary searches. As a result, if there is some estimate for the Throughput value, the measurement time can be shortened by narrowing the specified range using this setting. In addition, the binary searches are performed at the resolution is set at Resolution. As a result, even if the measurement resolution is coarse, the measurement time can be shortened by increasing the size of the resolution value.
[5]	Loss Tolerance	This is the frame loss tolerance (0.0000% to 100%). At 0%, there is no frame lost tolerance. Although it is possible to set 0 as recommended by RFC2544, in an environment where there is some frame loss, set a value other than 0. Doing this makes it possible to measure frame loss at the specified rate under the tolerance conditions.

8.3.4 Latency

These are the settings when measuring Latency.

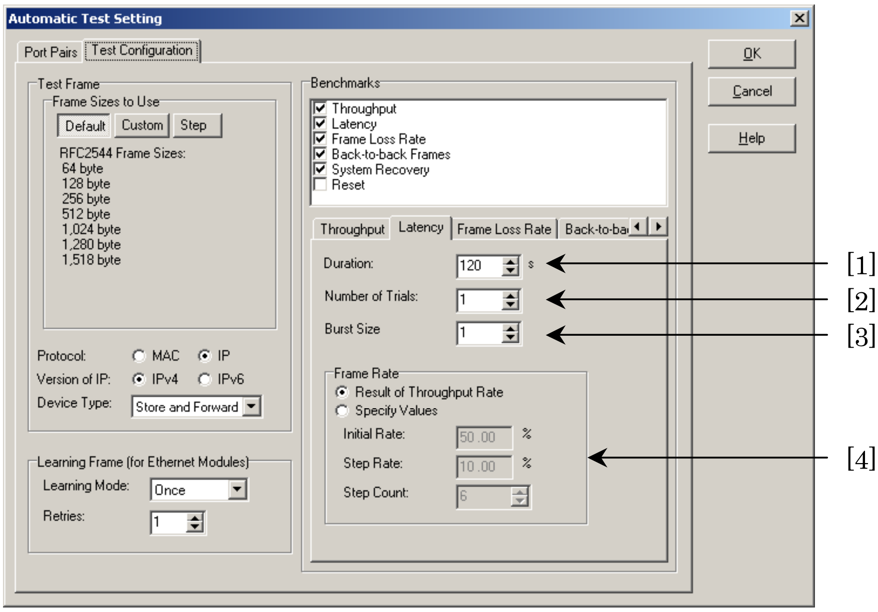


Figure 8.3.4-1 Latency measurement setting screen

	Name	Description	
[1]	Duration	Sets the send duration (2 to 999 s) for test frames at each trial. RFC2544 recommends (should) a minimum of at least 120 seconds.	
[2]	Number of Trials	Refer to Section 8.3.3 "Throughput".	
[3]	Burst Size		
[4]	Frame Rate	Result of Throughput Rate	This can be selected when measuring Throughput at the same time. Measurement is performed at the rate obtained by the Throughout measurement (RFC2544 standard).
		Specify Values	This is used when performing measurement at a specified rate such as when having previously measured the Throughput. Measurement is performed for the count specified by Step Count (1 to 16) from the value of Initial Rate (0.01% to 100%) at each Step Rate (0.01% to 100%).

8.3.5 Frame Loss Rate

These are the setting items for measuring Frame Loss Rate.

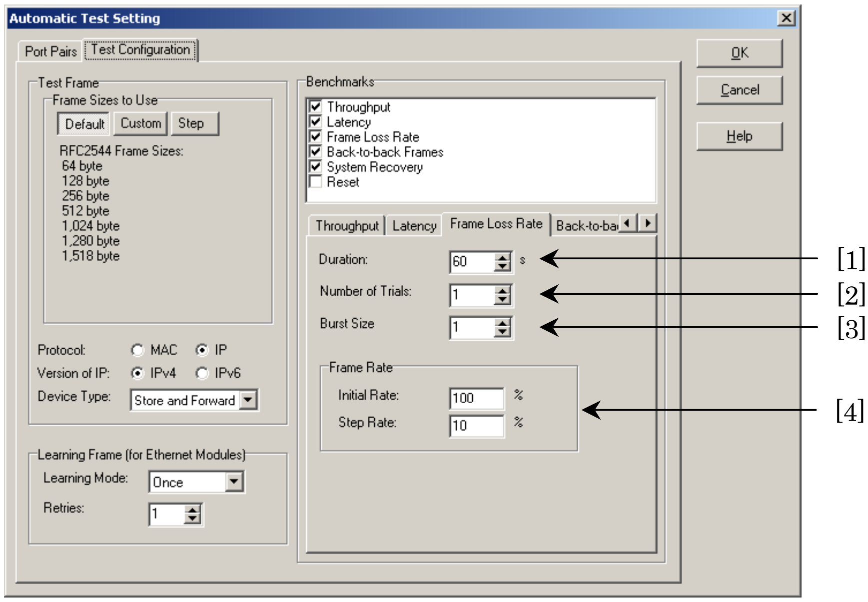


Figure 8.3.5-1 Frame Loss Rate measurement setting screen

Name		Description
[1]	Duration	Refer to Section 8.3.3. Throughput.
[2]	Number of Trials	
[3]	Burst Size	
[4]	Frame Rate	Sets the measurement target rate. Measurement is performed repeatedly from the rate specified at Initial Rate (1% to 100%) by decreasing the rate in steps specified by Step Rate (1% to 100%) until the rate at which frame loss disappears is reached. RFC2544 recommends (should) measuring in steps from 100% to less than 10%.

8.3.6 Back-to-back Frames

These are the setting items when performing Back-to-back Frames measurement.

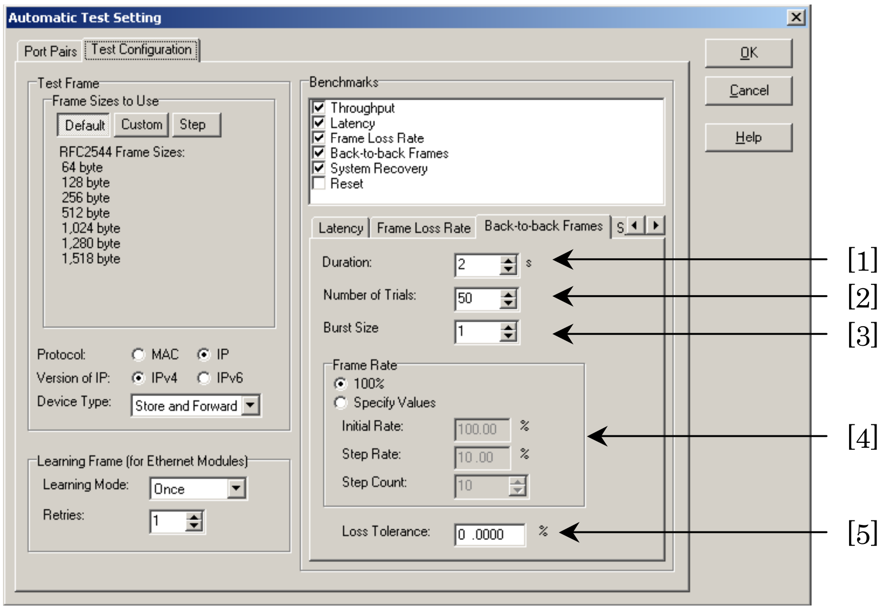


Figure 8.3.6-1 Back-to-back Frames measurement setting screen

	Name	Description	
[1]	Duration	Sets the send duration (2 to 999 s) for test frames at each trial. Back-to-back Frames measurement is performed by changing the send duration (frame count) from this setting using binary searches until the frame loss disappears.	
[2]	Number of Trials	Sets number of trials (1 to 50) performed at each frame size. RFC2544 recommends (should) at least 50 trials.	
[3]	Burst Size	Refer to Section 8.3.3 "Throughput".	
[4]	Frame Rate	100%	Measurement is performed in bursts (minimum gap). This is the RFC2544-recommended method.
		Specify Values	This is specified when performing measurement at a specified rate. Measurement is performed for the count specified by Step Count (1 to 16) from the value of Initial Rate (0.01% to 100%) at each Step Rate (0.01% to 100%).
[5]	Loss Tolerance	Refer to Section 8.3.3 "Throughput".	

8.3.7 System Recovery

These are the setting items for performing System Recovery measurement.

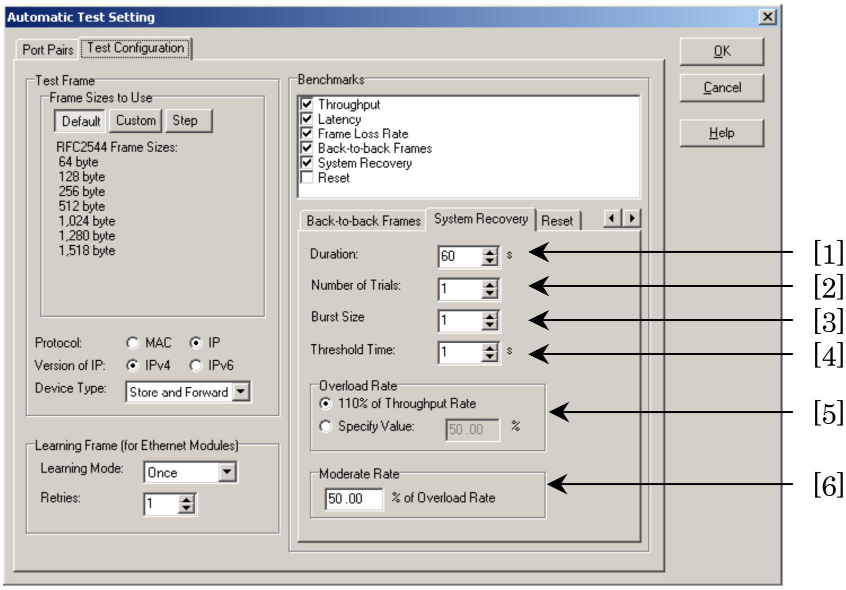


Figure 8.3.7-1 System Recovery measurement setting screen

	Name	Description	
[1]	Duration	Sets duration for sending test frames at overload rate (2 to 999 s). RFC2544 recommends sending for at least 60 s.	
[2]	Number of Trials	Refer to Section 8.3.3 "Throughput".	
[3]	Burst Size		
[4]	Threshold Time	Sets Threshold Time (0 to 999 s).	
[5]	Overload Rate	110% of Throughput Rate	This is selected when measuring Throughput simultaneously. The value of 110% of the measured Throughput (but 100% when exceeds 100%) is used as the overload rate (RFC2544-recommended value).
		Specify Value	This is used when measuring at a specified overload rate such as when the Throughout is already known (0.01 to 100%).
[6]	Moderate Rate	Sets moderate overload rate (0.01 to 100%). The setting is a percentage of the overload rate. RFC2544 recommends 50%.	

8.3.8 Reset

These are the setting items for performing Reset measurement.

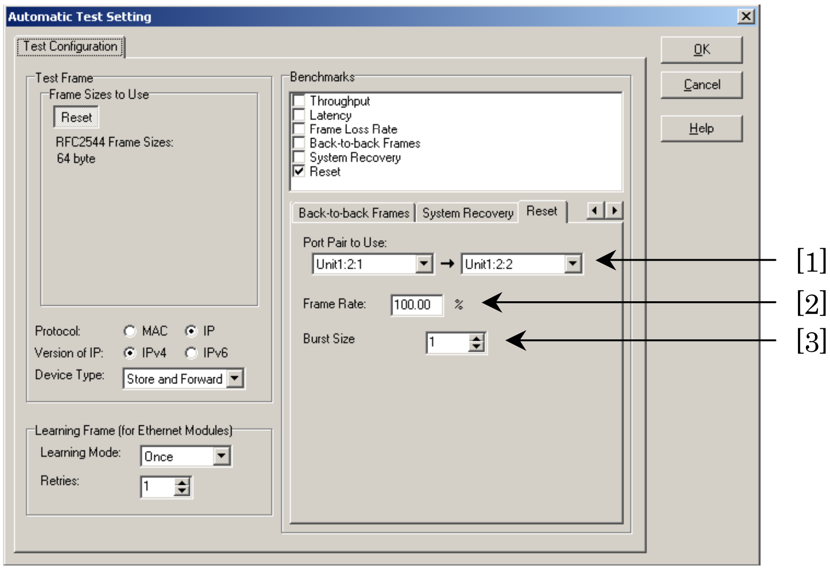


Figure 8.3.8-1 Reset measurement setting screen

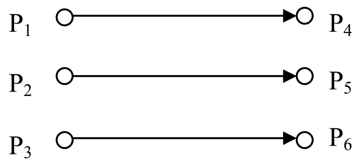
Name		Description
[1]	Port Pair to Use	Selects the send port (left side) and receive port (right side). The same ports can be selected as the send and receive ports.
[2]	Frame Rate	Sets the test frame send rate (0.01 to 100%). RFC2544 describes this using the Throughput Rate.
[3]	Burst Size	Refer to Section 8.3.3 "Throughout".

8.4 Setting Details

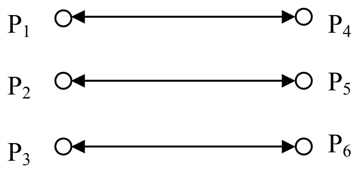
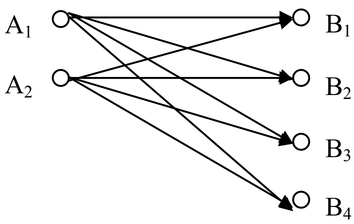
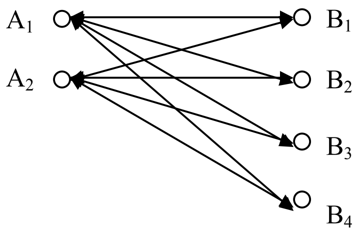
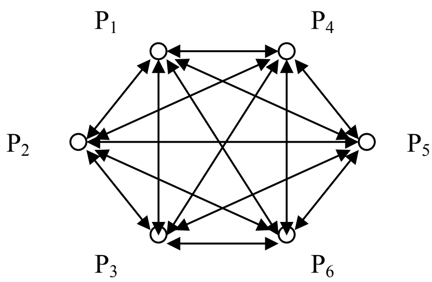
8.4.1 Traffic Distribution and Traffic Orientation

The two **Traffic Distribution** and **Traffic Orientation** settings (refer to Section 8.3.1) determine the traffic send direction.

The traffic configuration is specified by **Traffic Distribution**; the **Traffic Orientation** specifies whether or not to send traffic in both directions. The following table shows how traffic is sent depending on each setting. Refer to this table and select the configuration best approximating the test devices.

<table>
<tr><th>Traffic Orientation
Traffic Distribution</th><th>Unidirectional
Sends traffic one way</th><th>Bidirectional
Sends traffic both ways</th></tr>
<tr><td>One to One (Non-Meshed):
Configuration with one to one match between pairs</td><td>

Specify the same port for sending and receiving as shown below; loopback evaluation can also be performed by looping back at one port.

</td><td>
</td></tr>
<tr><td>Partially Meshed:
Configuration with multiple measured ports divided into two groups*1. The number of ports allocated to each group does not need to be the same.</td><td>
</td><td>
</td></tr>
<tr><td>Fully Meshed:
Configuration generating traffic between all possible combinations of ports*1</td><td></td><td>
</td></tr>
</table>

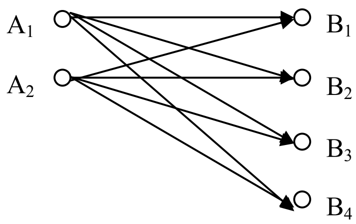
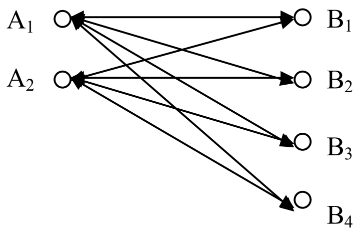
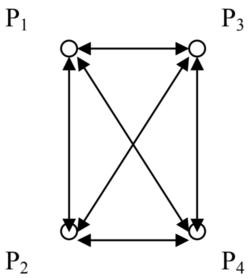
*1: When **Partially Meshed** and **Fully Meshed** are selected, only Throughput, Frame Loss Rate and Back to Back tests are supported. Other tests are not supported.

8.4.2 Mesh Type

The test frame destination send is selected at **Mesh Type** setting. **Mesh Type** is specified when **Partially Meshed** or **Fully Meshed** is selected at Traffic Distribution (refer to Section 8.4.1).

Mesh Type Setting	Description
Round Robin	This send method imposes the same load on each port. The test frame destinations are decided so test frames are sent to all ports at a time. For example, when **Round Robin** of **Fully Meshed** in the following table is selected, frames are sent to all ports from P1 to P4 at the same time.
Peak Loading	This send method imposes the heaviest possible load. The test frame destinations are decided to send frames to the same port as much as possible at the same time. For example, when **Peak Loading** of **Fully Meshed** in the following table is selected, test frame destinations are focussed on P1, P2, and P3 sequentially from the time viewpoint.

The following table shows examples of actual test frame destinations, depending on the combination of **Traffic Distribution**, **Traffic Orientation**, and **Mesh Type** settings.

<table>
<tr><th colspan="2">Mesh Type
Traffic Distribution,
Traffic Orientation</th><th>Round Robin</th><th>Peak Loading</th></tr>
<tr><td rowspan="2">Partially Meshed</td><td>Unidirectional

</td><td>Source Port: Destination Port
A1: B1 B2 B3 B4 B1 B2 B3 B4 ...
A2: B2 B3 B4 B1 B2 B3 B4 B1 ...</td><td>Source Port: Destination Port
A1: B1 B2 B3 B4 B1 B2 B3 B4 ...
A2: B1 B2 B3 B4 B1 B2 B3 B4 ...</td></tr>
<tr><td>Bidirectional

</td><td>Source Port: Destination Port
A1: B1 B2 B3 B4 B1 B2 B3 B4 ...
A2: B2 B3 B4 B1 B2 B3 B4 B1 ...
B1: A1 A2 A1 A2 ...
B2: A2 A1 A2 A1 ...
B3: A1 A2 A1 A2 ...
B4: A2 A1 A2 A1 ...</td><td>Source Port: Destination Port
A1: B1 B2 B3 B4 B1 B2 B3 B4 ...
A2: B1 B2 B3 B4 B1 B2 B3 B4 ...
B1: A1 A2 A1 A2 ...
B2: A1 A2 A1 A2 ...
B3: A1 A2 A1 A2 ...
B4: A1 A2 A1 A2 ...</td></tr>
<tr><td colspan="2">Fully Meshed

</td><td>Source Port: Destination Port
P1: P2 P3 P4 P2 P3 P4 ...
P2: P3 P4 P1 P3 P4 P1 ...
P3: P4 P1 P2 P4 P1 P2 ...
P4: P1 P2 P3 P1 P2 P3 ...</td><td>Source Port: Destination Port
P1: P2 P2 P3 P4 P2 P2 P3 P4 ...
P2: P1 P3 P3 P4 P1 P3 P3 P4 ...
P3: P1 P2 P4 P4 P1 P2 P4 P4 ...
P4: P1 P2 P3 P1 P1 P2 P3 P1 ...
* In case of packet transmission timing that are destined for its own port, it sends packet to the port whose number is added by one.</td></tr>
</table>

8.4.3 Learning Frame

Address learning related operations are set by the **Learning Frame** setting (refer to Section 8.3.2). These settings are enabled with Ethernet modules. In addition, the DUT must have a MAC table (hub or layer 2 switch, etc.)

Address learning is performed by sending a frame called a learning frame. The learning frame includes the MAC address for each test port and when the DUT receives this frame, it records the address of each test port in the DUT MAC table. As a result, the DUT is able to transfer test frames in accordance with this MAC table.

<table>
<tr><th>Learning Frame Setting</th><th>Description</th></tr>
<tr><td>Learning Mode</td><td>Selects whether or not to perform address learning operation (send learning frame) before starting trial.
<table><tr><td>Once</td><td>Perform learning operation once only at first trial</td></tr><tr><td>Every Trial</td><td>Perform learning operation at every trial</td></tr><tr><td>Never</td><td>Do not perform learning operation</td></tr></table>When the DUT has a MAC table, set Once or Every Trial. Selecting Once or Every Trial performs evaluation using the DUT Age Time.
Note: Set Never when the DUT does not have a MAC table. Setting Never shortens the test time because the learning frame is not sent.</td></tr>
<tr><td>Retries</td><td>This is enabled when the Learning Mode setting is set to Once or Every Trial. It sets the learning frame resend count (1 to 999). If the circuit quality is poor, there is a risk that the percent learning frame will not reach the DUT, so setting this value to more than 1 resends the learning frame.</td></tr>
</table>

Note:

The Age Time is the time period that the learned address is saved in the MAC table. If a learning frame is not resent before this time expires, the learned address is deleted from the MAC table. When this Age Time is shorter than the time required for each trial, the trial may not be performed normally because sending of test frames stops during the trial. To prevent this, it is necessary to set the DUT Age Time to a longer time and the time required for the test. When **Learning Frame** is set to **Every Trial**, because a learning frame is sent at every trial, there will be no problem if the DUT Age Time is larger and the time required for one trial. When it is not possible to change the DUT Age Time, set a smaller value for **Duration**, etc., and shorten the time required for one trial.

8.4.4 Port Setting Settings Contents

Set the items in the following table at the **Port Setting** dialog (refer to Section 4.5) for the port to be tested. The **Port Setting** dialog is displayed by pressing the **Port Setting** button (refer to Sections 8.3.1 and 9.3.2).

These assume settings are made from the default (initial) status.

Port Setting Item	Setting Contents	
MAC Address (Ethernet Module)	Do not use the same value for each test port. Set the following according to the conditions for RFC2889 Automatic Test (refer to Section 9).	
	When setting **Address per Port** to more than 1 (refer to Section 9.3.2)	When the **Address per Port** setting is larger than 1, the test frame send destination MAC Address changes in the range of **Mac Address** to **MAC Address** + **Address per Port**. As a result, set a MAC Address value in a space that does not overlap this range.
	Address Caching Capacity test (refer to Section 9.7)	**Learning Port** uses the MAC Address in range from **MAC Address** to **MAC Address** + **Learning Address Count** for the Address Learning Test. Consequently, use a smaller **MAC Address** for **Monitoring Port** and **Test Port** than the **MAC Address** of **Learning Port** so that the MAC Address does not overlap.
	Address Learning Rate test (refer to Section 9.7)	**Learning Port** uses the MAC Address in range from **MAC Address** to **MAC Address** + **Number of Addresses** for the Address Learning Test. Consequently, set so that the **MAC Address** of **Monitoring Port** and **Test Port** do not overlap this range.
IPv4	This setting is required when the **Protocol** setting (refer to Section 8.3.2) of RFC2544 Automatic Test is set to **IP** and **Version of IP** is set to **IPv4** (DUT is IPv4 router). In this case, set as shown below.	
	Netmask Gateway	Set the IP address and netmask of the port for the DUT (router) that each test port is connected to at **Gateway** and **Netmask**.
	IPv4 Address	Set an IP address that does not overlap other addresses on the network at **IPv4 Address**.
	ARP Reply	Set to **Reply to this port ARP request**.
	ICMP Echo Reply	When checking continuity with the DUT by performing a pre-test Ping, set to **Reply to this port PING request**.

<table>
<tr><th>Port Setting Item</th><th>Setting Contents</th></tr>
<tr><td>IPv6</td><td>This setting is required when the Protocol setting (refer to Section 8.3.2) of RFC2544 Automatic Test is set to IP and Version of IP is set to IPv6 (DUT is IPv6 router). In this case, set as shown below.
<table>
<tr><td>Default Router</td><td>Set the IP address of the port for the DUT (router) that each test port is connected to at Default Router.</td></tr>
<tr><td>IPv6 Address</td><td>Set an IP address that does not overlap other addresses on the network at IPv6 Address.
Set a unique IP address on the connected network at IPv6 Address.</td></tr>
<tr><td>Neighbor Solicitation Reply</td><td>Set to Reply to This Port IPv6 addresses.</td></tr>
<tr><td>Echo Reply</td><td>When checking continuity with the DUT by performing a pre-test Ping, set to Reply to this port PING request.</td></tr>
</table></td></tr>
<tr><td>VLAN
(Ethernet Module)</td><td>This setting is not used in RFC2544/2889. When sending test frames with VLAN tags, set VLAN Tag and VLAN ID at the RFC2544/2889 setting screen (refer to Section 8.3.1 and 9.3.2).</td></tr>
<tr><td>Ethernet OAM
(Ethernet Module)</td><td>When Ethernet OAM (CFM) is enabled at the DUT, set Enable to On and set each item according to the DUT status.</td></tr>
<tr><td>Auto Negotiation
(Ethernet Module)</td><td>Selects the Link status at measurement.</td></tr>
<tr><td>Flow Control
(Ethernet Module)</td><td>When flow control is supported, set Multicast of Flow Control Receive to On.</td></tr>
<tr><td>Mapping</td><td>(Ethernet Module)
Set to Framed; Unframed returns an error.
(EoS/POS module)
When the frame mapping selection matches the DUT, the parameters for that mapping are set. Mappings other than PPP, Cisco HDLC, Frame-Mapped GFP, LEX, LAPS (X.86) are not supported in RFC2544 (an error is returned).</td></tr>
<tr><td>Mode</td><td>Set to Normal (other settings return an error).</td></tr>
<tr><td>Maximum Frame Size</td><td>Set a larger value than the value set in Frame Size to Use (refer to Section 8.3.2 and 9.3.2. The default status need not be changed. However, when the VLAN TAG setting (refer to Section 8.3.1 and 9.3.2) is set to On, it is necessary to add +4 to the VLAN tag size.</td></tr>
</table>

8.5 Test Operation Contents

8.5.1 Preprocessing

At RFC 2544 Automatic Test, the following processes are performed to execute each test item.

When these processes are completed normally, measurement processing of each test item is performed. For the operation contents of each test item, refer to each test explanation (sections 8.5.2 to 8.5.7). If operation appears to stop before execution of each test item and the test frames are not sent, re-examine the settings related to the following processes.

(1) Address learning using learning frame
When the test port is an Ethernet module and the **Learning Frame** setting is something other than **Never**, learning frame processing is performed at the test start. Learning frame processing is performed at both the send and receive sides. Refer to Section 8.4.3 for details.

(2) Resolving Address using ARP/ICMPv6
When the test port is an Ethernet module and the **Protocol** setting is **IP**, the MAC Address of the Gateway (DUT connection port) is resolved using ARP/ICMPv6. If the address resolution processing times out, the test fails and is aborted.

(3) PPP Link Establishment
When the test port is an Eos/POS module and the **Mapping** setting of **Port Setting** is either **PPP** (On) or **Negotiation** (On), PPP Link establishment processing is performed at the start of the test.

- Link establishment processing is performed at both the send and receive side at ports that have not linked up. When all the links are established, processing moves to the next stage.
- The link establishment processing contents are the same as pressing the **Restart** button at the port setting **PPP Negotiation** setting.

If link establishment processing times out, the test fails and is aborted.

8.5.2 Throughput measurement

At Throughput measurement, the maximum value of the frame rate is measured while the DUT has no frame loss. Measurement is repeated at the specified frame sizes and the results are displayed as a table for each frame size and trial. In addition, the average and theoretical maximum value are displayed on a graph. The units for the Throughout results display can be selected from %, Frames/s, Byte/s, and bit/s. The measurement results and settings can also be saved in HTML format using the reporting function.

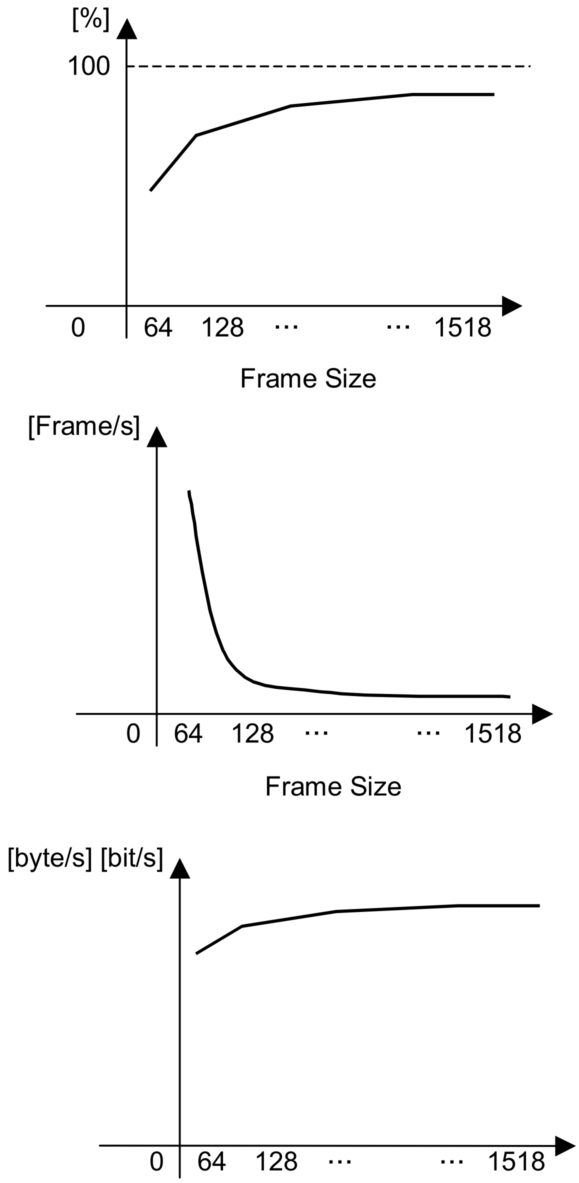


Figure 8.5.2-1 Throughput result graph

8.5.3 Latency measurement

At Latency measurement, the DUT frame processing time under heavy load is measured. Test frames are sent continuously either at the rate obtained at DUT Throughput measurement or at the rate set at Specify Values. At the mid- point of the test duration (time set at **Duration**), test frames with attached send time are sent and received and the difference from the receive time is calculated as the Latency test result.

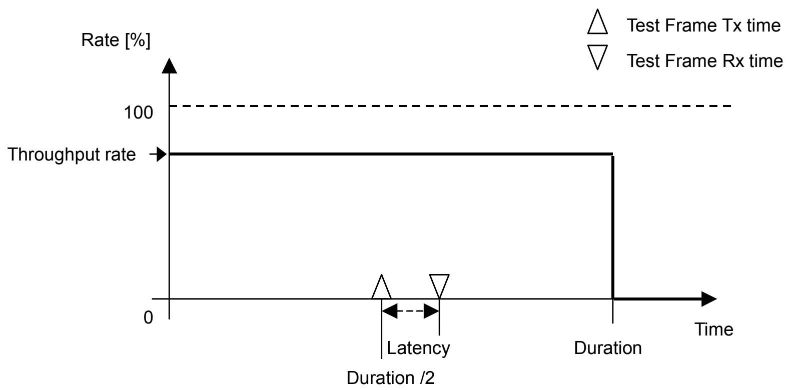


Figure 8.5.3-1 Latency

Measurement is performed repeatedly at the specified frame sizes and send frame rates and the results are displayed as a table. In addition, the average for each frame size is displayed as a graph. The measurement results are displayed in 0.01 μs units.

The measurement results and settings can also be saved in HTML format using the reporting function.

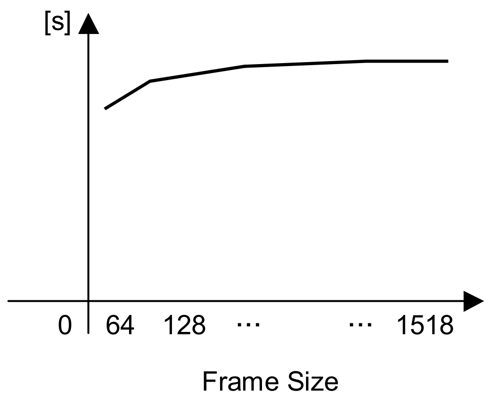


Figure 8.5.3-2 Latency result graph

8.5.4 Frame Loss Rate measurement

At Frame Loss Rate measurement, the number of frames lost by the DUT under high load is measured. The frame loss is calculated from the difference between the number of sent of test frames and received test frames. Test frames are sent at each **Step Rate** starting from the **Initial Rate** setting; measurement is repeated as the frame rate decreases until the frame loss reaches 0%.

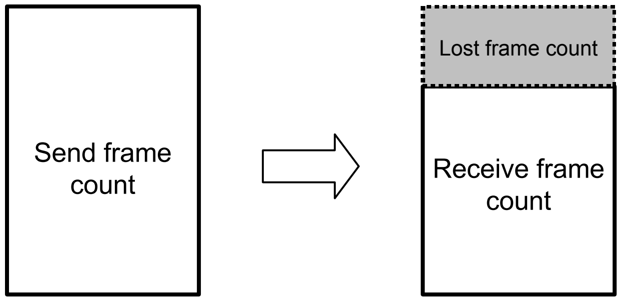


Figure 8.5.4-1 Frame Loss Rate measurement

Measurements are repeated at each specified frame size and the results are displayed as a table. In addition, the average of each send rate and the frame size is displayed as a graph. The measurement results are displayed in 0.01% units. The measurement results and settings can also be saved in HTML format using the reporting function.

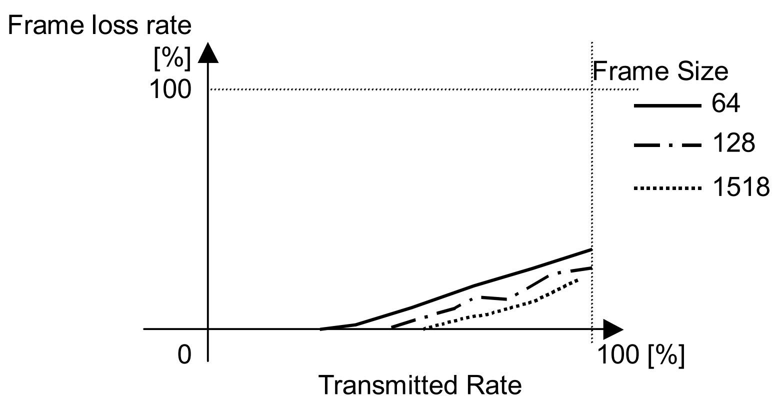


Figure 8.5.4-2 Frame Loss Rate result graph

8.5.5 Back-to-back Frames measurement

At Back-to-back Frames measurement, the ability of the DUT to process frames in different burst sizes is measured.

Test frames with minimum IFG are sent for a fixed time to the DUT and the presence of frame loss is evaluated from the counts of sent frames and received frames. When there is frame loss, the send time (send frame count) is changed using the binary search method and the measurement process is repeated until the maximum send time at which no frame loss occurs is found.

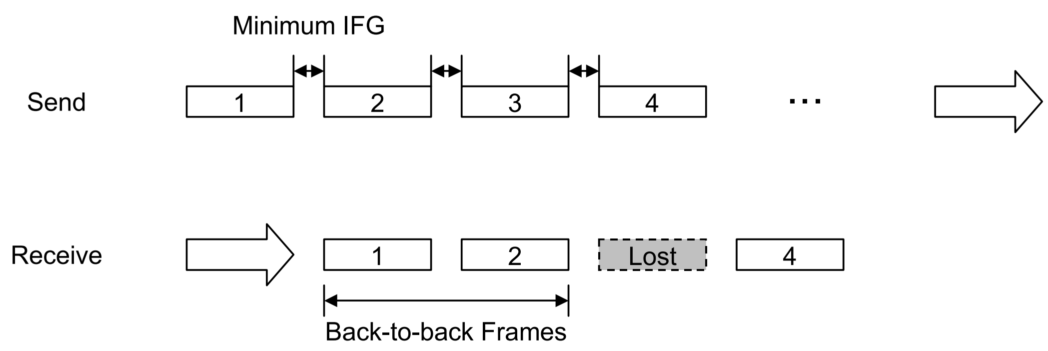


Figure 8.5.5-1 Back-to-back Frames conceptual diagram

In addition, measurement can also be performed at user-specified send frame rates. The user-specified frame rates can be specified using **Initial Rate**, **Step Rate**, and **Step Count**.

Measurements are repeated at the specified frame sizes and the results are displayed as a table. In addition, the average for each frame size is displayed as a graph. The measurement results are displayed in 1 frame units. The measurement results and settings can also be saved in HTML format using the reporting function.

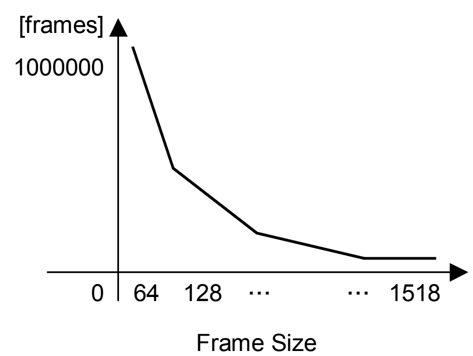


Figure 8.5.5-2 Back-to-back result graph

8

RFC2544 Automatic Test

8.5.6 System Recovery measurement

At System Recovery measurement, the time for the DUT to recover from an overload is measured.

First, test frames are sent to the DUT at the Throughout Overload Rate to intentionally create an overload condition at the DUT (frame loss occurring). Next, the send frame rate is decreased to the Moderate Rate and the time until normal operation (no frame loss) is recovered is measured.

- The Overload Rate is either 110% of the Throughout Rate (or 100% when exceeds 100%) or a rate specified by the user.

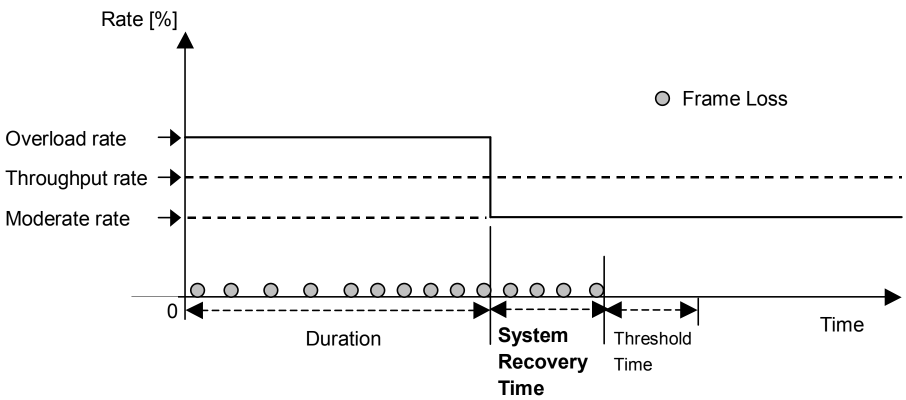


Figure 8.5.6-1 System Recovery conceptual diagram

If no frame loss is detected during the period of the **Threshold Time** when receiving at the Moderate rate, one trial is completed and the measurement result (System Recovery Time) is displayed. The System Recovery Time is the time interval from the point when the Overload Rate changes to the Moderate Rate until **Threshold Time** when no frame loss is detected.

- If there is no point when frame loss stops, the trial aborts at the **Duration** x 2 + **Threshold Time** after the start of test frame sending and the next trial starts automatically.

Measurements are repeated at the specified frame sizes and the results are displayed as a table. In addition, the average for each frame size is displayed as a graph. The measurement results are displayed in the range of –29 minutes 59.999999 seconds to 30 seconds (µs resolution).

The measurement results and settings can also be saved in HTML format using the reporting function.

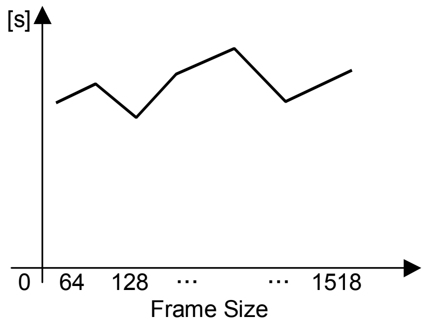


Figure 8.5.6-2 System Recovery result graph

8.5.7 Reset measurement

At Reset measurement, the time from the DUT reset until it recovers is measured.

When the test starts, test frames are sent at the Throughput frame rate and then the DUT is reset.

The time from when frame loss occurs due to the DUT reset until the next frame is received is the measurement result. The results are displayed as a table in the range of 0 to 59.999999 seconds (μs resolution).

The measurement results and settings can also be saved in HTML format using the reporting function.

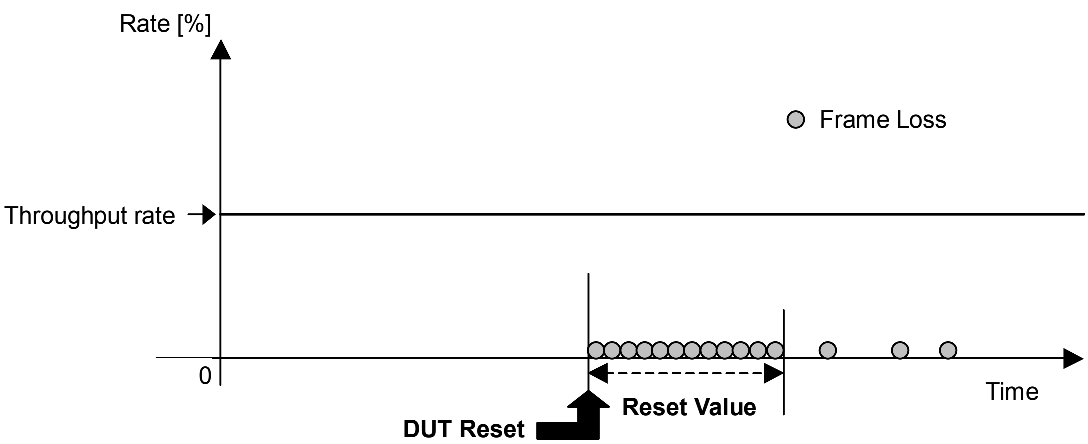


Figure 8.5.7-1 Reset conceptual diagram

Note:

- This measurement required a DUT reset after measurement starts.
- This measurement requires prior Throughout measurement of the DUT and setting the result as Frame Rate.
- This measurement measures the time from when frame loss occurs until the first test frame is received. Consequently, if frame loss after the reset continues, correct measurement cannot be performed.

8.6 Test Procedures

The actual test execution procedure is described below.

(1) Making settings

(a) Select the test items at **Benchmarks** at the **Test Configuration** tab.

(b) Make the settings for each test item at the selected test items tabs. For the actual test settings, refer to sections 8.3.3 to 8.3.8.

(c) Decide on the traffic send direction by setting **Traffic Distribution** and **Traffic Orientation** at the **Port Pairs** tab.

(d) When **Partially Meshed or Fully Meshed** is selected, specify the test frame destination send order at Mesh Type.

(e) Select the test ports (connected to DUT) at **Ports** of the **Port Pairs** tab.

(f) Press the **Port Setting…** button and set each port at the displayed Port Setting dialog. For details of the settings contents, refer to Section 8.4.4 Port Setting Contents.

(g) When sending test frames with attached VLAN tag, put a checkmark in the VLAN Tag checkbox. In addition, specify the value of the VLAN ID (VID) field set at the VLAN tab in **VLAN ID**.

(h) Set the size of the test frame used in the test at **Frame Size to Use** of the **Test Configuration** tab.

(i) Set the **Protocol**, **Version of IP** and **Device Type** corresponding to the type of DUT at the **Test Configuration** tab.

(j) When the test port is Ethernet, set **Learning Frame**.

(2) Press the **OK** button the confirm the settings.

(3) Connect the test port and DUT and check that the link status is established as necessary.

(4) Press the **Start** button to start the test.

Section 9 RFC2889 Automatic Test

This section describes how to set the RFC2889 Automatic Test function. This function can be used only when the MD1230B-10 RFC2889 benchmarking test is installed.

Note:

The MU150101A module does not correspond to RFC2889 Automatic Test.

9.1 Overview

The RFC 2889 Automatic Test perform automatic testing in accordance with RFC 2889-Benchmarking Methodology for LAN Switching Devices. The following 10 types of tests are supported.

Throughput, Frame Loss, Forwarding Rate Measurements

- Fully Meshed Throughput, Frame Loss and Forwarding Rates
- Partially Meshed One-to-Many/Many-to-One
- Partially Meshed Multiple Devices
- Partially Meshed Unidirectional Traffic

Congestion Measurements

- Congestion Control

Maximum Throughput and Operation Under Load Measurements

- Forward Pressure and Maximum Forwarding Rate

MAC Learning related Measurements

- Address Caching Capacity
- Address Learning Rate

Error Frame Processing Measurements

- Errored Frames Filtering

Broadcast Frame Processing Measurements

- Broadcast Frame Forwarding and Latency

Note:

- This function requires RFC2889 Benchmarking Test option.
- Implementation of the RFC2889 Automatic Test uses the basic measurement functions. As a result, the basic measurement functions cannot be used while the RFC2889 Automatic Test is running.

9.2 Operation Screen

Selecting the RFC 2889 Automatic Test incon in the Tree View displays the following screen for running each of the tests.

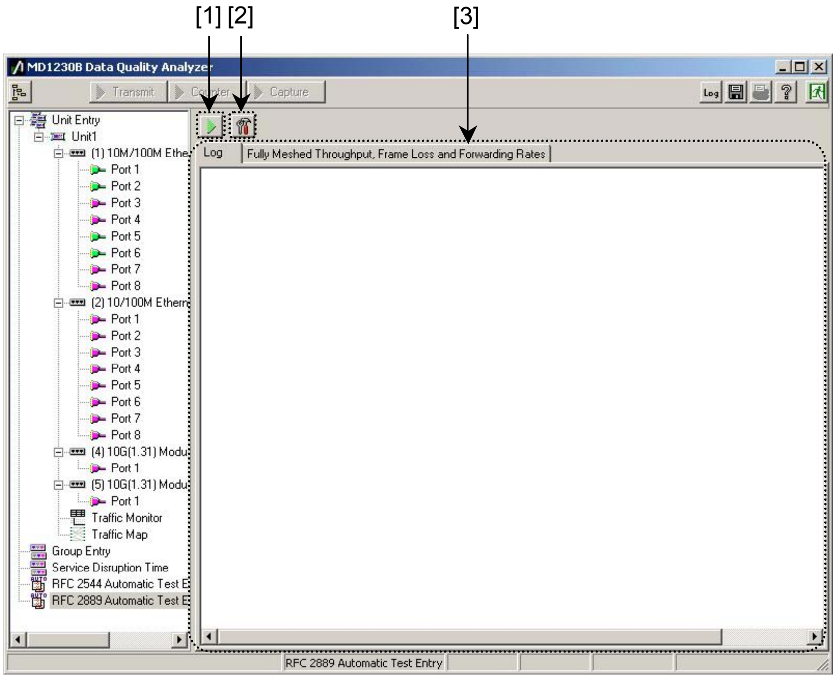


Figure 9.2-1 RFC 2889 Automatic Test operation screen

Name		Description
[1]	Start/Stop	Starts and stops RFC 2889 Automatic Test. Pressing the button when the test is stopped starts the test. Pressing it while the test is running stops the test.
[2]	Auto test setting	Displays configuration screen. Refer to Section 9.3 “Configuration Screen” for the setting contents.
[3]	Log/result display area	Displays progress of RFC 2889 Automatic Test and test results. The display contents vary according to the test items.

9.3 Configuration Screen

Pressing the **Auto test setting** button at the Operation screen (refer to Section 9.2 (2)) displays the Test Configuration screen where the test items and conditions are set.

9.3.1 Common Settings

[1]

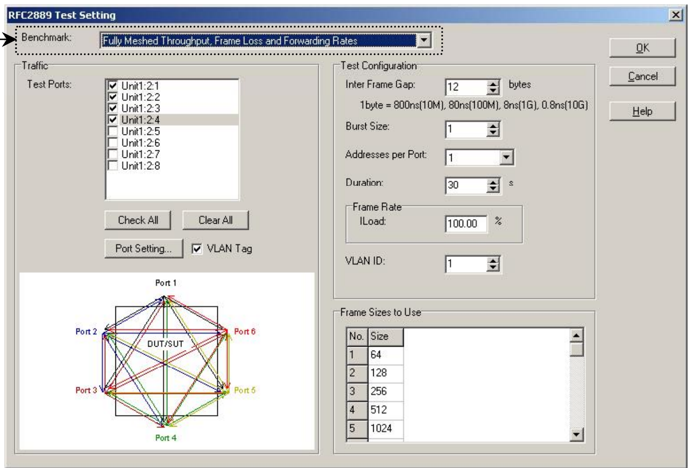


Figure 9.3.1-1 Test Configuration screen

Name		Description
[1]	Benchmark	Sets executed benchmark items. Select one of the following: • Fully Meshed Throughput, Frame Loss and Forwarding Rates • Partially Meshed One-to-Many/Many-to-One • Partially Meshed Multiple Devices • Partially Meshed Unidirectional Traffic • Congestion Control • Forward Pressure and Maximum Forwarding Rate • Address Caching Capacity • Address Learning Rate • Errored Frames Filtering • Broadcast Frame Forwarding and Latency

9.3.2 Setting Test Conditions

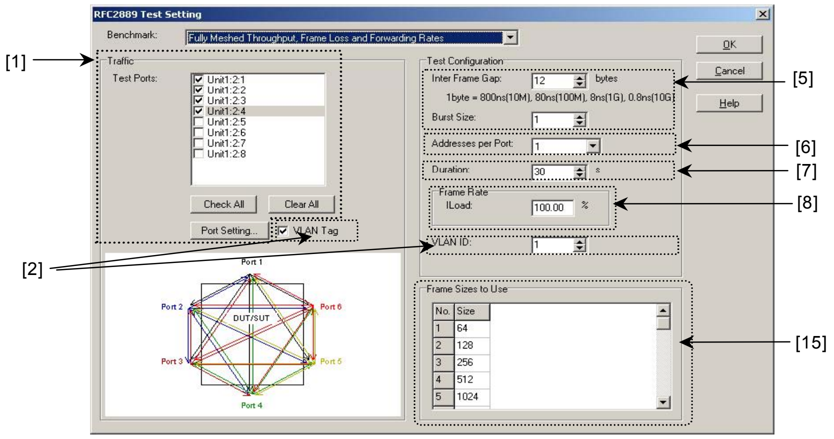


Figure 9.3.2-1 Fully Meshed Throughput, Frame Loss and Forwarding Rates

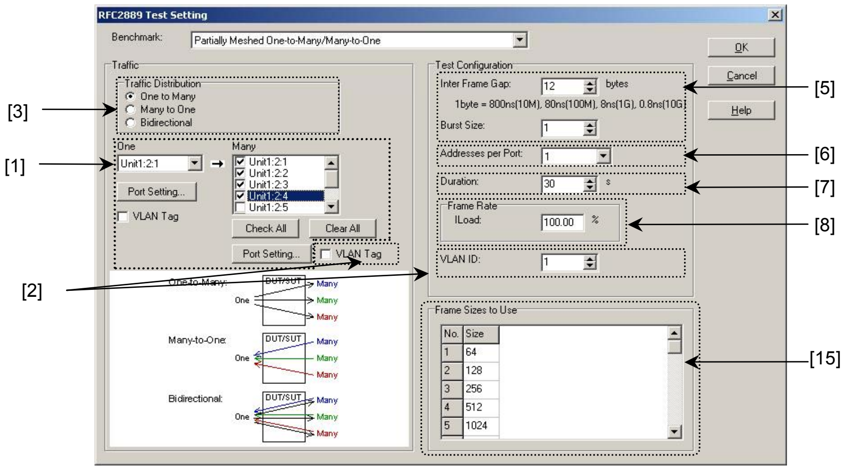


Figure 9.3.2-2 Partially Meshed One-to-Many/Many-to-One

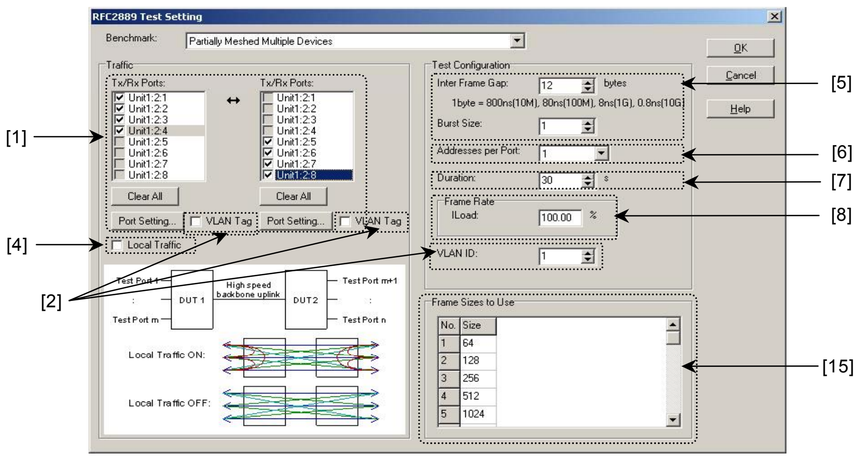


Figure 9.3.2-3 Partially Meshed Multiple Devices

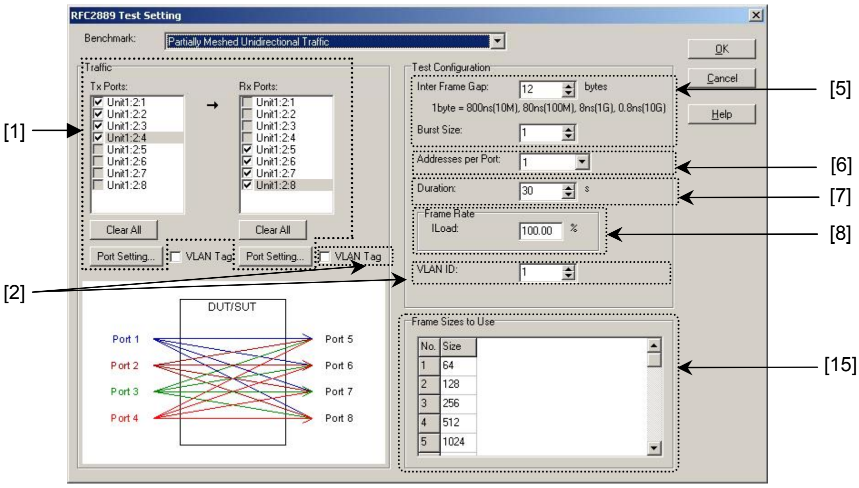


Figure 9.3.2-4 Partially Meshed Unidirectional Traffic

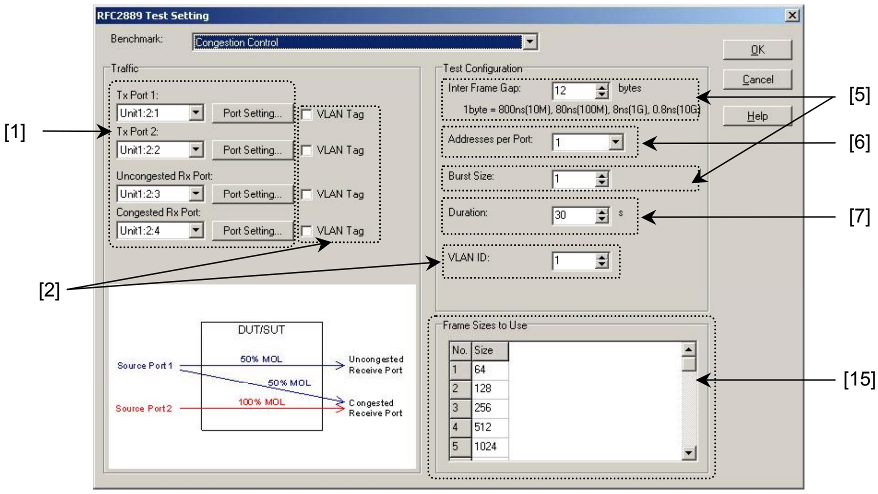


Figure 9.3.2-5 Congestion Control

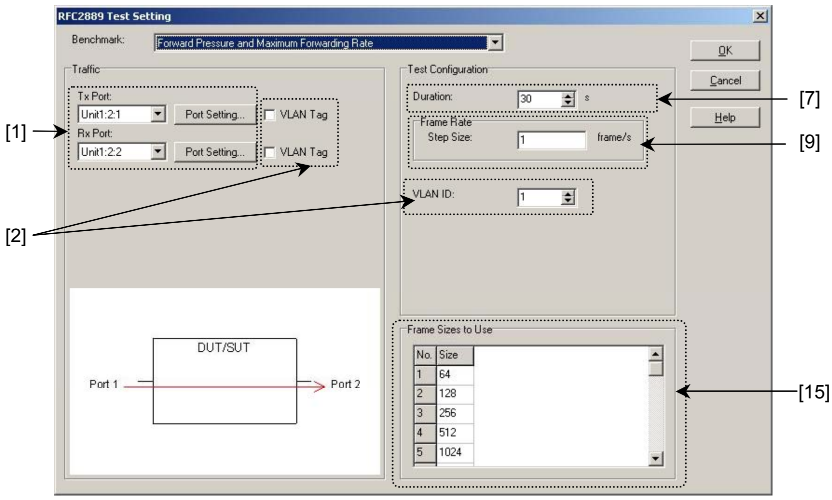


Figure 9.3.2-6 Forward Pressure and Maximum Forwarding Rate

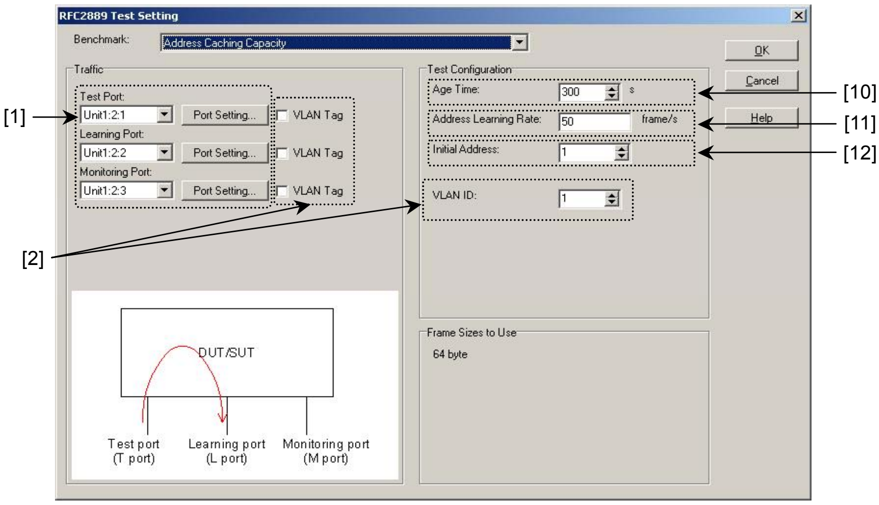


Figure 9.3.2-7 Address Caching Capacity

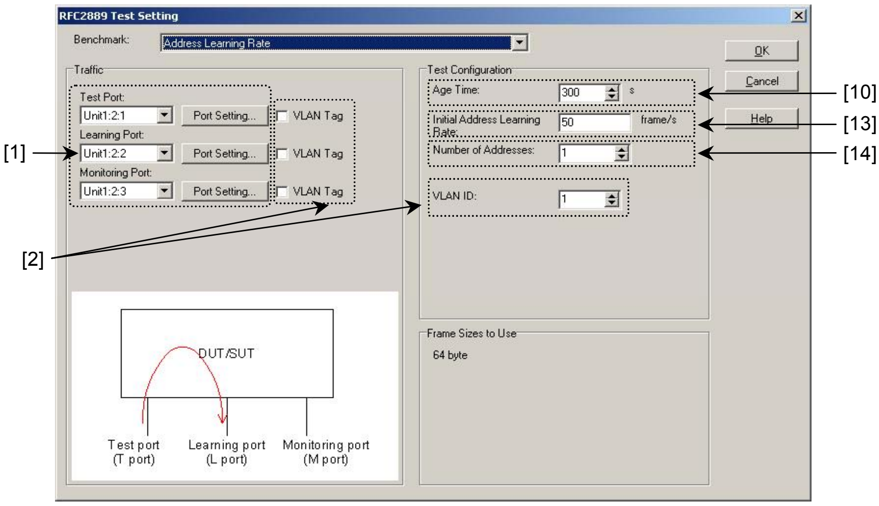


Figure 9.3.2-8 Address Learning Rate

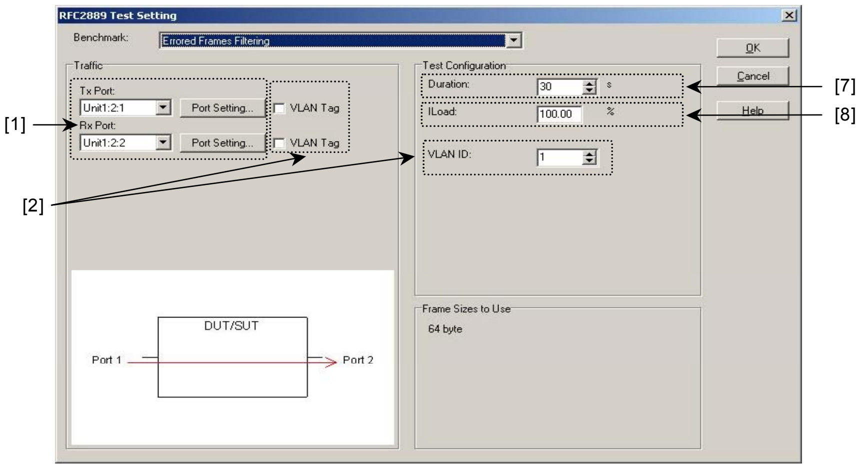


Figure 9.3.2-9 Errored Frames Filtering

9

RFC2889 Automatic Test

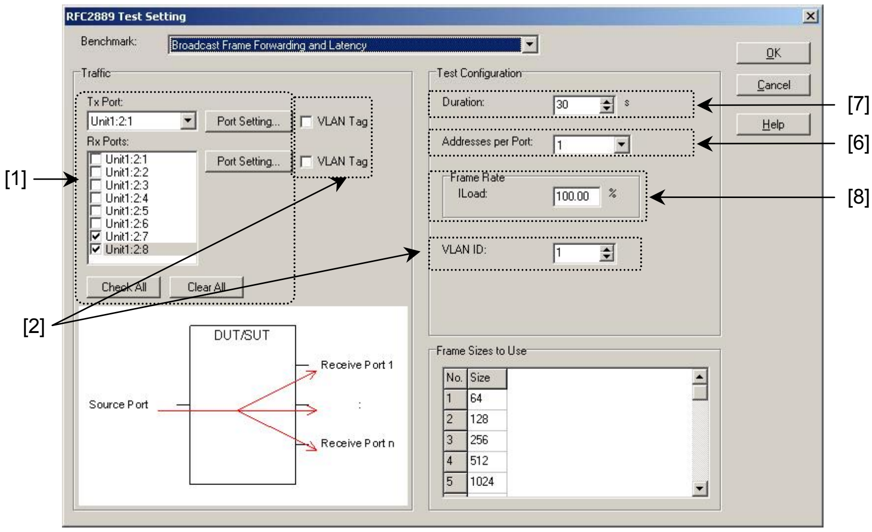


Figure 9.3.2-10 Broadcast Frame Forwarding and Latency

<table>
<tr><th colspan="2">Name</th><th>Description</th></tr>
<tr><td rowspan="2">[1]</td><td>Test Ports</td><td>Selects test ports (ports connected to DUT). Ports can be tested at On. When Check All is selected, all selected ports become On. When Clear All is selected, all selected ports become Off.</td></tr>
<tr><td>Port Setting</td><td>Displays Port Setting dialog for ports selected. For details of the setting contents, refer to Section 8.4.4 Port Setting Contents.</td></tr>
<tr><td>[2]</td><td>VLAN Tag
VLAN ID</td><td>When sending and receiving test frames with attached VLAN tag, set the VLAN Tag checkbox to On. In addition, the value (0 to 4095) of the VLAN ID (VID) field set in the VLAN tag is specified by the VLAN ID setting.
Note: The non-VID values of VLAN tag are shown below.
・TPID: 8100 (hex) fixed
・CFI: 0 fixed
・User Priority: 0 fixed</td></tr>
<tr><td>[3]</td><td>Traffic Distribution</td><td>Sets Partially Meshed One-to-Many/Many-to-One test. Select one of the following traffic formats.<table><tr><td>One to Many</td><td>Sends traffic from one port to many ports</td></tr><tr><td>Many to One</td><td>Sends traffic from many ports to one port</td></tr><tr><td>Bidirectional</td><td>Sends traffic both ways</td></tr></table></td></tr>
<tr><td>[4]</td><td>Local Traffic</td><td>Sets Partially Meshed Multiple Devices test. Generates Local Traffic (traffic at each DUT) when sending test frames at On.</td></tr>
<tr><td>[5]</td><td>Burst Size
Inter Frame Gap</td><td>Sets burst repetition of sent test frames. Burst Size sets the size of the burst (1 to 930 frames in one burst). A burst is generated when Burst Size larger than 1. Inter Frame Gap sets the gap frames in bursts. It is 12 bytes in the burst definition.</td></tr>
<tr><td>[6]</td><td>Addresses per Port</td><td>Sets the number of addresses at each port. Refer to Section 8.4.4 “Port Setting Contents” for an explanation of the MAC Address.</td></tr>
</table>

Name		Description
[7]	Duration	Sets the send duration (2 to 300 s) for test frames.
[8]	ILoad	Specifies the test frame send rate (0.01% to 100%). At Throughput measurement, measurement starts at the rate specified rate.
[9]	Step Size	Set at Maximum Forwarding Rate test. Set the minimum increment for incrementing ILoad.
[10]	Age Time	Set at Address Caching Capacity and Address Learning Rate tests. Sets DUT Age Time value (time period that the learned address is saved in the MAC table) from 1 to 65535 s).
[11]	Address Learning Rate	Set at Address Caching Capacity test. Sets Learning Frame send rate (1 to 4,294,967,295 fps) for learning MAC Address in DUT.
[12]	Initial Addresses	Set at Address Caching Capacity test. Sets learning address count (1 to 16,777,216) at test start.
[13]	Initial Address Learning Rate	Set at Address Learning Rate test. Sets Learning Frame send rate (1 to 4,294,967,295 fps) at test start.
[14]	Number of Addresses	Set at Address Learning Rate test. Specifies number of learning address (1 to 16,777,216).
[15]	Frame Sizes to Use	Sets Frame Size used at test. 1 to 25 types of Frame Size can be used. Frame Size is in input in the range of 64 to 65535 bytes but there may be restrictions on the Frame Size that can be sebt by the Tx Stream function for the actual test port.

9.4 Throughput, Frame loss and Forwarding rates

This section explains the following RFC2889 test items. These tests measure throughput, frame loss, and forwarding rates.

(1) Fully meshed throughput, frame loss and forwarding rates
(2) Partially meshed one-to-many/many-to-one
(3) Partially meshed multiple devices
(4) Partially meshed unidirectional traffic

9.4.1 Test Overview

The purpose and procedure of these four tests is the same—they measure the throughput, frame loss, and forwarding rates of the test device (DUT). The difference is the DUT-dependent traffic patterns. Select a traffic pattern that closely matches the DUT usage environment. For the types of traffic patterns, refer to the diagrams displayed on each test setting screen.

(1) Fully Meshed Throughput, Frame Loss and Forwarding Rates
The throughput, frame loss, and forwarding rates of a DUT/SUT supporting fully meshed traffic is measured.

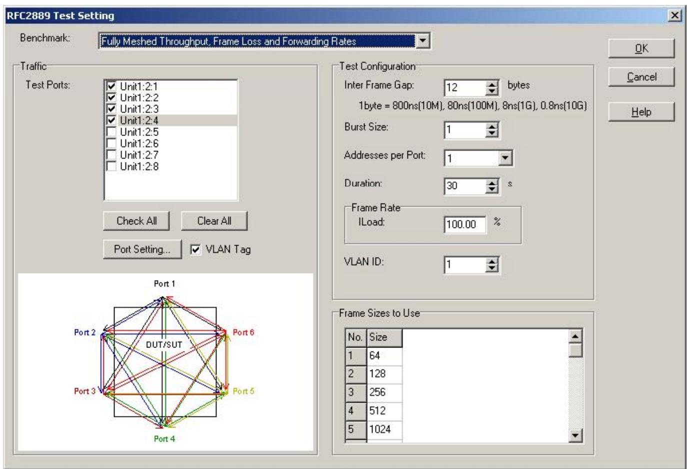


Figure 9.4.1-1 Fully Meshed Throughput, Frame Loss and Forwarding Rates

(2) Partially Meshed One-to-Many/Many-to-One
The switch performance of one to many or many to one ports is measured.

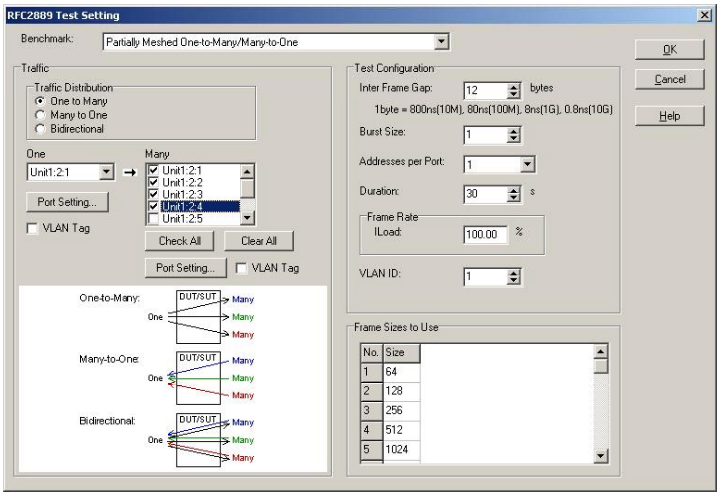


Figure 9.4.1-2 Partially Meshed One-to-Many/Many-to-One

(3) Partially Meshed Multiple Devices
The throughput of two devices with multiple ports and one high-speed uplink is measured.

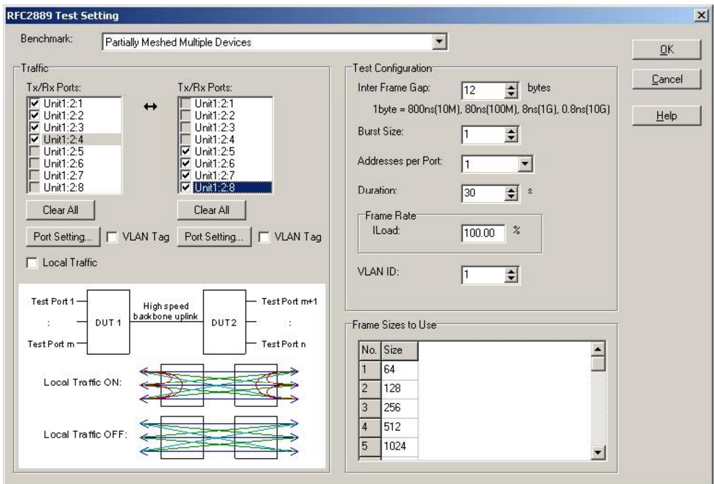


Figure 9.4.1-3 Partially Meshed Multiple Devices

(4) Partially Meshed Unidirectional Traffic
Send frames are sent to half the DUT/SUT ports and the throughput when the frames are transferred to the other remaining half of the ports is measured.

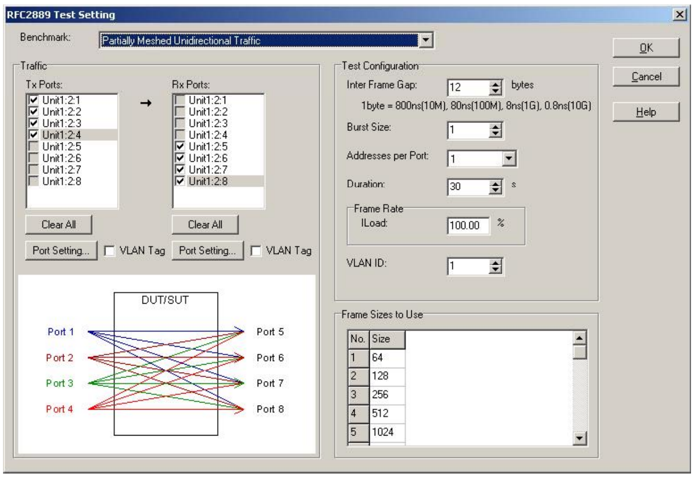


Figure 9.4.1-4 Partially Meshed Unidirectional Traffic

9.4.2 Test Operation Contents

The throughput frame loss and forwarding rate tests are performed as described below.

(1) Send learning frames to update the DUT address table.

↓

(2) Send traffic at the rate specified by the **ILoad** setting.

↓

(3) Check the send and receive frame counts at each port to confirm whether or not frame loss has occurred.

Frame Loss	Decrease ILoad by 10% and repeat steps 1 and 2.
No Frame Loss	Change the send rate between the ILoad value and the previous ILoad value at which frame loss occurred using the binary search method and repeat steps 1 and 2 until the throughput is found.

Measurement is finished when the throughput is found. The above procedure is repeated for all frame sizes.

9.4.3 Test Procedure

The test procedure is described below.

(1) Select the test type at the **Benchmark** setting

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 Port Setting Contents for the setting contents
Test Configuration	When performing basic measurements in accordance with RFC2889, there is no need to change this setting. Decrease the size of the duration is setting to shorten the measurement time for pre-testing etc.
Frame Size to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

9.5 Congestion Control

This section explains the RFC 2889 Congestion Control test. This test is used for confirming operation under congested conditions (high load).

9.5.1 Test Overview

This test evaluates the processing method (HOLB or Back Pressure) when the DUT is suffering high load congestion.

The test measures whether or not traffic input from the two send ports is output from the two transmission destination ports as shown in the diagram on the settings screen to evaluate DUT congestion processing externally. The following items are measured to make the evaluation.

- Frame Loss Rate
- Forwarding Rate

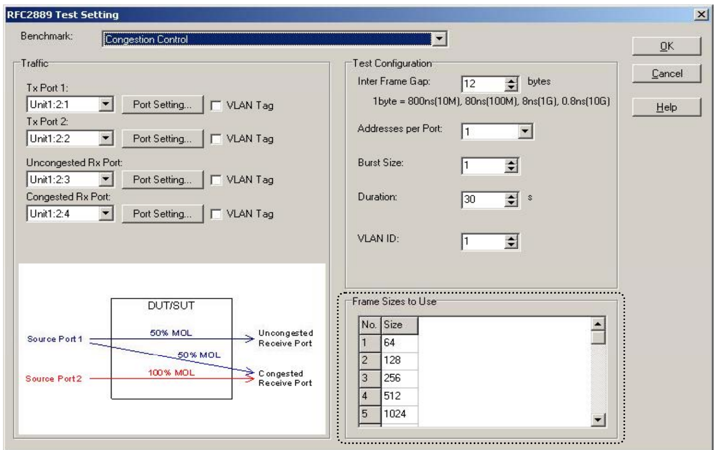


Figure 9.5.1-1 Congestion Control

9.5.2 Test Operation Contents

The test is performed as described below and the following procedure is repeated for all frame sizes.

(1) Send learning frames to update the DUT address table.

↓

(2) Test frames are sent from the two send ports (Tx Port1 and Tx Port2) to the two receive ports (Uncongested Rx Port, Congested Rx Port). Frames are sent alternately at a rate of 50% from one send port (Tx Port1) to the two receive ports. In addition frames are sent from the other send port (Tx Port2) to the Congested Rx Port at a rate of 100% only.

↓

(3) The number of sent and received frames is checked to confirm whether or not to frame loss occurred at the receive port.

↓

(4) The frame loss rate and forwarding rate (FR) of each receive port are displayed as the measurement result. Additionally the evaluation of the congestion control processing is displayed as shown below.

Indication	Description
HOLB ("Head of Line" blocking)	Displayed when frame loss occurs at Uncongested Rx Port (Port with no congestion receiving frames from one send port)
Back Pressure	Displayed when no frame loss occurs at Congested Rx Port (congested port receiving frames from to send ports)

9.5.3 Test Procedure

The test procedure is described below.

(1) Select **Congestion Control** at the **Benchmark** setting.

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 Port Setting Contents for the setting contents.
Test Configuration	Setting configuration is not necessary for basic measurement according to RFC 2889.
Frame Sizes to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

9.6 Forward Pressure and Maximum Forwarding Rate Test

This section explains the Forward Pressure and Maximum Forwarding Rate test. This test measures the maximum transfer rate and confirms the operation under overload.

9.6.1 Test Overview

This test measures the maximum transfer rate of the DUT and confirms the operation when a rate exceeding the DUT specifications (rate of more than 100%) is input. A rate exceeding 100% is input to the DUT ports and the occurrence of forward pressure (frame transfer violating standards) is confirmed. In addition, the maximum value of the forwarding rate is measured.

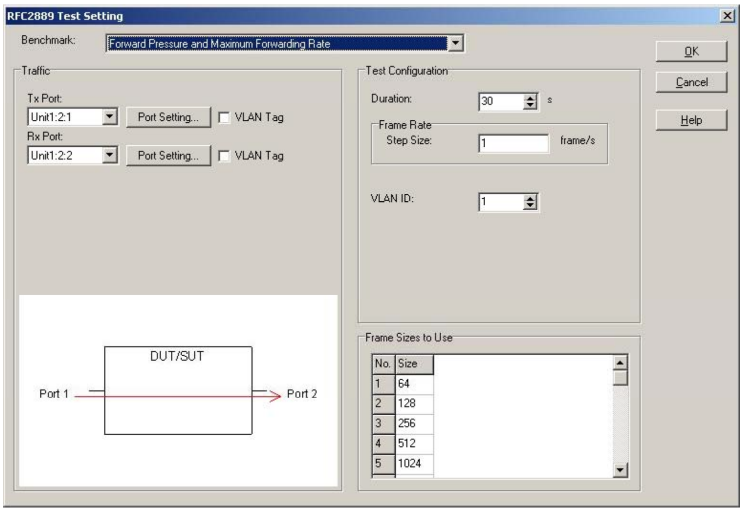


Figure 9.6.1-1 Forward Pressure and Maximum Forwarding Rate

9.6.2 Test Operation Contents

The test is performed as described below.

(1) Throughput is measured in the same way as the Throughput, Frame Loss, and Forwarding Rate measurement.

↓

(2) The Maximum Forwarding Rate is measured by increasing the frame rate by the set step size from the throughput measured in step 1 above up to the 100% rate and measuring the transfer rate. The maximum value of the transfer rate obtained here is the Maximum Forwarding rate result.

↓

(3) The Forward Pressure is confirmed by sending test frames with van 11-byte gap and comparing the sent and received frame counts. When the received frame count is larger than the count when sending test frames with a 12-byte gap, the message Forward Pressure detected is displayed.

9.6.3 Test Procedure

The test procedure is described below.

(1) Select **Forward Pressure and Maximum Forwarding Rate** at the **Benchmark** setting.

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 "Port Setting Contents" for the setting contents.
Duration	When performing the basic measurements recommended by RFC2889, there is no need to change this setting. Set a smaller value to reduce the measurement time for pre-tests, etc.
Step Size	Specifies the increment in the frame is sending rate when measuring Maximum Forwarding Rate. Measurement is repeated from the throughput rate to 100% of the rate at this step size. The default value is 1 to perform measurement at high resolution but this will require some longer time to measure a DUT with lower throughput. As a result, set larger values in these circumstances.
Frame Size to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

9.7 Address Caching Capacity, Address Learning Rate

This section explains the following two RFC2889 measurement items. These tests measured performance related to MAC Address learning.

- Address Caching Capacity
- Address Learning Rate

9.7.1 Test Overview

These tests measured performance related to MAC address learning for the DUT.

- The Address Caching Capacity test finds the maximum number of addresses that can be processed by DUT.

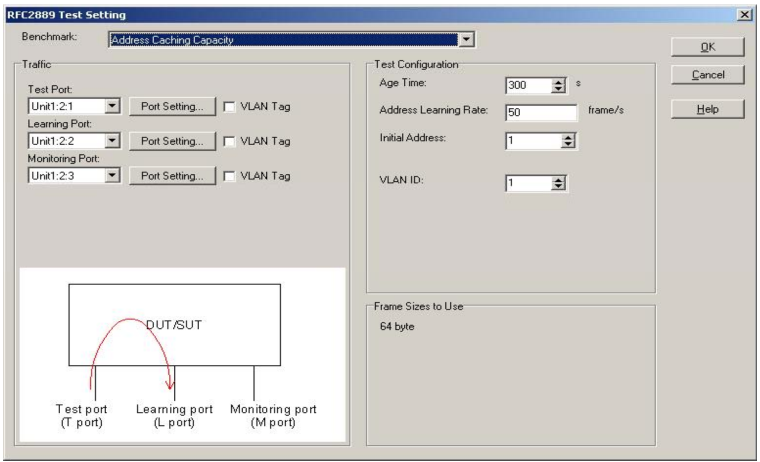


Figure 9.7.1-1 Address Caching Capacity

- The Address Learning Rate test finds the maximum DUT address learning speed.

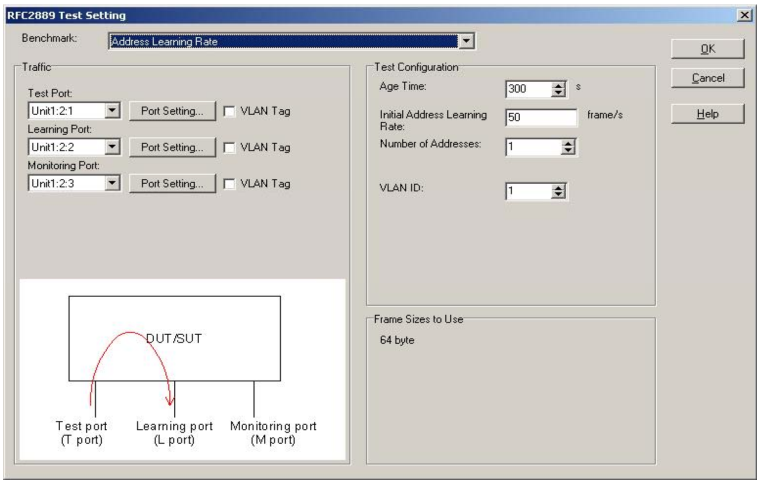


Figure 9.7.1-2 Address Learning Rate

9.7.2 Test Operation Contents

The test is performed as described below.

(1) Wait until the DUT clears the address learning table. (Stops measurement at the time specified at **Age Time**.)

↓

(2) Send a frame (Learning Frame) from the Learning Port to set the address in the DUT address learning table.

↓

(3) Send a test frame with the Learning Port destination and confirmed the frame is received at each port.

↓

(4) Confirm whether or not the sent frame is received only by the Learning Port (whether address has been learned). Change the following parameters according to the confirmation result and repeat steps (1), (2), and (3) again.

Confirmation result	Description	Changed parameter contents	
		Address Caching Capacity Test	Address Learning Rate Test
When sent to frame counted only by Learning Port	Displays all addresses learned by DUT	Increases learning frame address count	Increases learning frames send rate
When sent frame also counted by Monitoring Port and Test Port	Displays all addresses not learned by DUT	Decreases learning frame address count	Decreases learning frames separate

Steps (1) to (4) are repeated using the binary search method to find the maximum number of addresses that can be learned by the DUT (Address Caching Capacity test) or the maximum address learning speed (Address Learning Rate test). The following shows an example of the repetition of the Address Caching Capacity test.

# of Addresses	Result	Next # of Addresses
4096	OK	4096*2
8192	OK	8192*2
16384	NG	8192+(16384-8192)/2
12288	OK	12288+(16384-12288)/2
14336	OK	14336+(16384-14336)/2
15360	NG	14336+(15360-14336)/2
14848	NG	14336+(14848-14336)/2
14592	NG	14336+(14592-14336)/2
14464	OK	14464+(14592-14464)/2
14528	OK	14528+(14592-14528)/2
14560	NG	14528+(14560-14528)/2
14544	NG	14528+(14544-14528)/2
14536	OK	14536+(14544-14536)/2
14540	OK	14540+(14544-14540)/2
14542	OK	← Test Result

9.7.3 Test Procedure

The test procedure is described below.

(1) Select the test type at the **Benchmark** setting.

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 Port Setting Contents for the setting contents.
Age Time	Sets DUT Age Time value (time period that learned address saved in MAC table). If this time is inadequate, the test proceeds without clearing the learning table and testing cannot be performed correctly.
Frame Size to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

Set as follows for the Address Caching Capacity test.

Setting Item	Description
Address Learning Rate	Sets Learning Frame send rate (to learn MAC address by DUT) Larger values shorten the test time but setting too high a value runs the risk of exceeding the DUT address learning capacity. Consequently, set a value that assures successful address learning. RFC2889 recommend setting a value of 50 fps.
Initial Addresses	Sets learning address count for test start. Set the maximum value that the DUT address learning table should hold.

Set as follows for the Address Learning Rate test.

Setting Item	Description
Initial Address Learning Rate	Sets learning frames send rate for test start. Usually, it is not necessary to change this value.
Number of Addresses	Specifies number of addresses used by address learning. Set a value that assures successful address learning (smaller value than result of Address Caching Capacity). If too large of value causing address learning to fail is set, this test is not performed correctly.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

9.8 Errored Frames Filtering

This section explains the Errored Frames Filtering test. This test is used to confirm operations related to errored frames.

9.8.1 Test Overview

This test confirms DUT operation when errored frames are received.

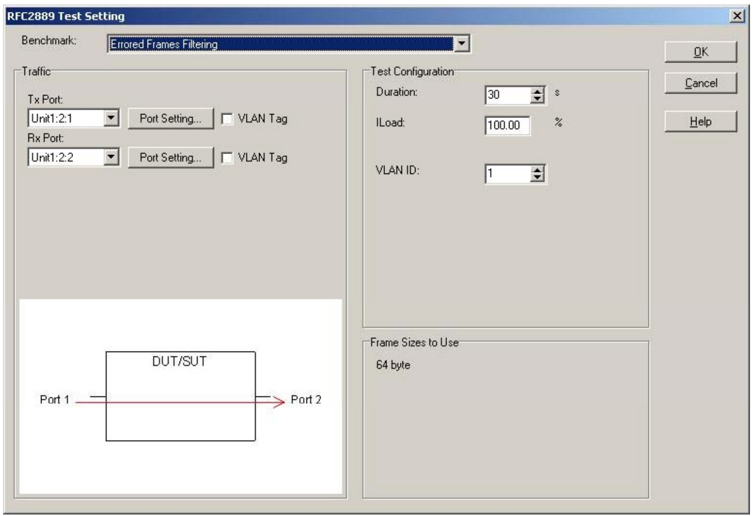


Figure 9.8.1-1 Errored Frames Filtering

9.8.2 Test Operation Contents

The test is performed as described below.

(1) Send the following types of error frames from one port side and confirm reception of frames at the other port side.

Error Frame Name	Description
Oversize	Frame with size (1519 bytes) exceeding 1518 byte
Undersize	Frame with size of less than 64 bytes
CRC Errors	Frame with incorrect value in Ethernet FCS field
Dribble Bit Errors	FCS is a normal frame when the frame size is indivisible by 8 bits. (Note)
Alignment Errors	FCS is an abnormal frame when the frame size is indivisible by 8 bits. (Note)

Note:

Since these errors do not occur with non-10M/100M Ethernet (Gigabit Ethernet), the measurement result is meaningless.

↓

(2) Confirm whether or not errored frame filtering is performed with and without receive frame counts. When errored frames are filtered (not transferred), the result is pass; when errored frames are not filtered (transferred), the result is fail.

9.8.3 Test Procedure

The test procedure is described below.

(1) Select **Errored frames filtering** at the **Benchmark** setting.

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 Port Setting Contents for the setting contents.
Duration	By default, sets the send duration (2 to 300 s) for test frames recommended by RFC2889.
ILoad	Sets the test frame send rate. Adjust as necessary.
Frame Size to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

9.9 Broadcast Frame Forwarding and Latency

This explains the Broadcast Frame Forwarding and Latency test. This test confirms the Broadcast Frame processing function.

9.9.1 Test Overview

This test measures the DUT Broadcast Frame transfer performance. It measures the Forwarding Rate and Latency.

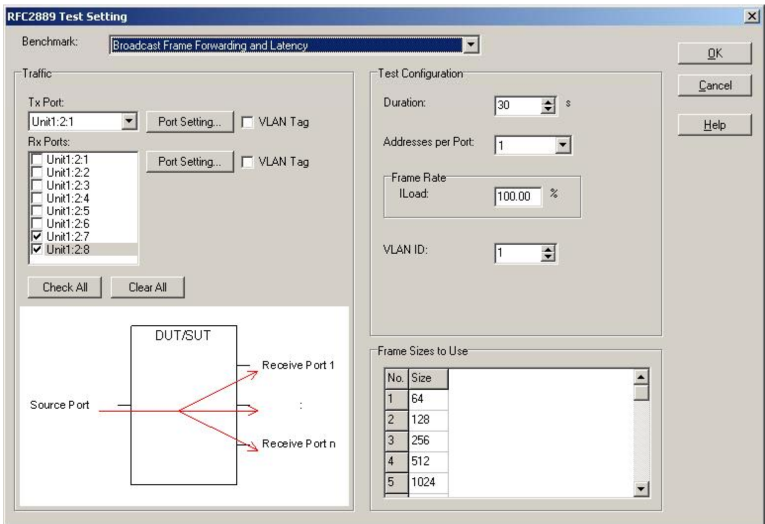


Figure 9.9.1-1 Broadcast Frame Forwarding and Latency

9.9.2 Test Operation Contents

This test measures Throughput and Latency as described below.

Throughput Measurement:

(1) Send the Learning Frame to update the DUT address table.

↓

(2) Send the broadcast address test frame at the rate set at ILoad.

↓

(3) Confirm whether or not frame loss occurred by comparing the sent and received framed counts for each measurement port.

↓

(4) If frame loss occurred, decrease the setting at ILoad by 10% and repeat steps (1) and (2). If no frame loss occurred, use the binary search method to determine a send rate between the previous value of ILoad when frame loss occurred and the present ILoad value and repeat steps (1) and (2) until the throughput is found.

Latency Measurement:

(1) Send one broadcast address test frame and measure the latency at each port.

9.9.3 Test Procedure

The test procedure is described below.

(1) Select **Broadcast Frame Forwarding and Latency** at the **Benchmark** setting.

(2) Select the port used for testing (port connected to DUT) at **Traffic**.

(3) Make the settings.

Setting Item	Description
Port Setting	Make the settings for each port at the **Port Setting** dialog displayed when the **Port Setting** button is pressed. Refer to Section 8.4.4 Port Setting Contents for the setting contents.
Test Configuration	By default, this is set to the values recommended by RFC2889. There is no need to change these values.
Frame Size to Use	By default, this is set to the recommended values for RFC2889 (64, 128, 256, 512, 1024, 1280, 1518 bytes). Change this setting when wanting to measure using different frame sizes.

(4) Connect the DUT measurement ports according to the diagram displayed in the settings screen.

(5) Press **OK** to confirm the settings.

(6) Press the **Start** button to start the test.

Section 10 Advanced Measurement Functions

This section describes advanced measurement procedures using the MD1230B.

10.1 Simultaneous Operation of Multiple Ports (Port Group Function)

This software enables you to group multiple ports. Grouping ports can collectively instruct transmission, capture, and latency measurements. In addition, the grouped ports of counter, capture and latency measurements can be displayed together.

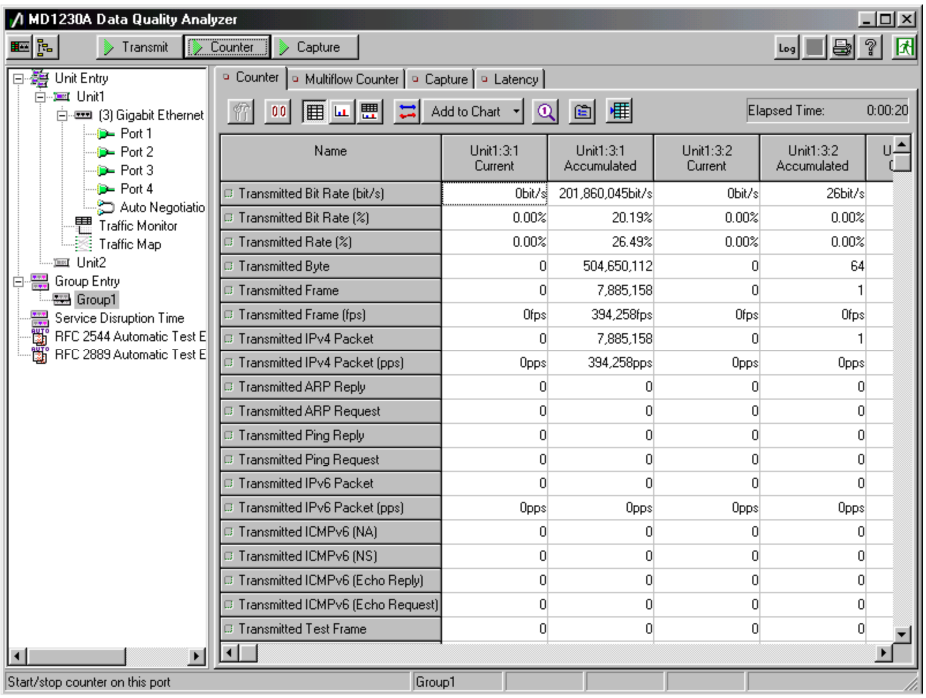


Figure 10.1-1 Counter - group display screen

The Counter Group display automatically calculates and displays the total count for the grouped ports.

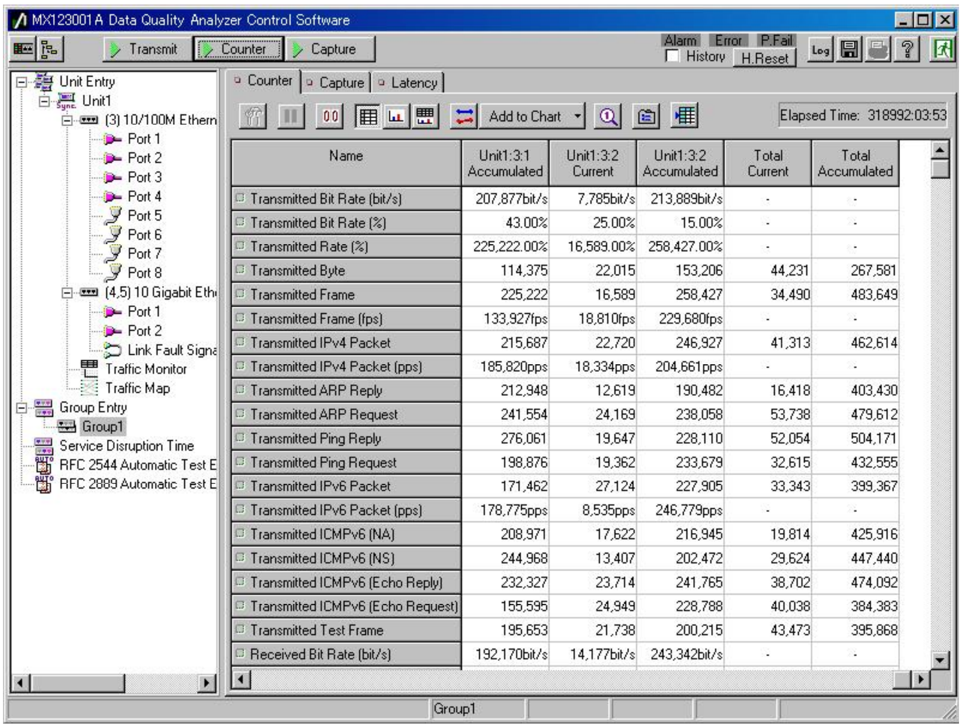


Figure 10.1-2 Total counter display (Addition)

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Advanced Measurement Functions

10.1.1 Registering port group

To collectively operate multiple ports, it is first necessary to register the port group.

The port group can be registered from the Tree View.

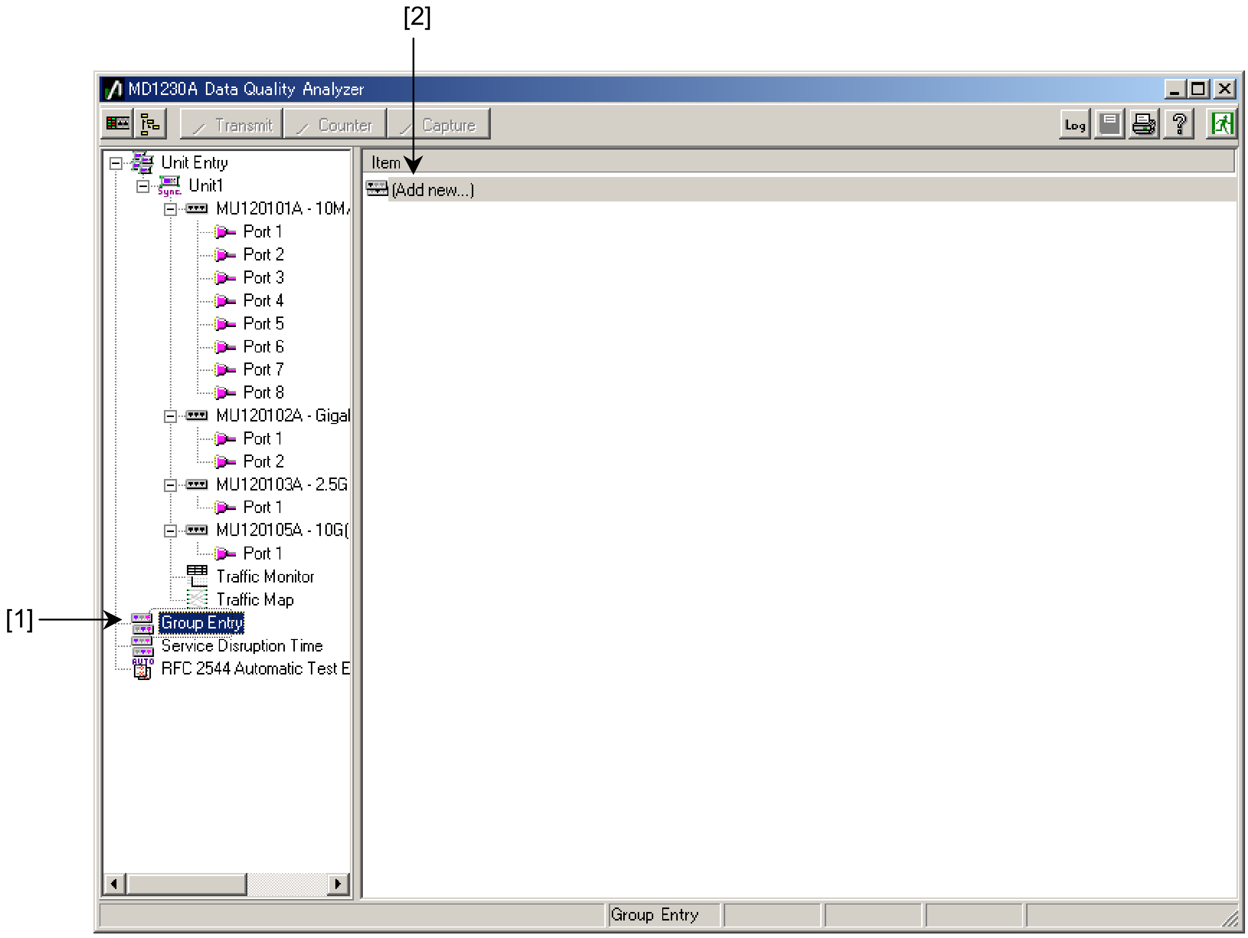

Figure 10.1.1-1 Tree View screen

[1] Performs the operations related to the port group.

[2] Pressing **Add new…** displays the port group registration dialog.

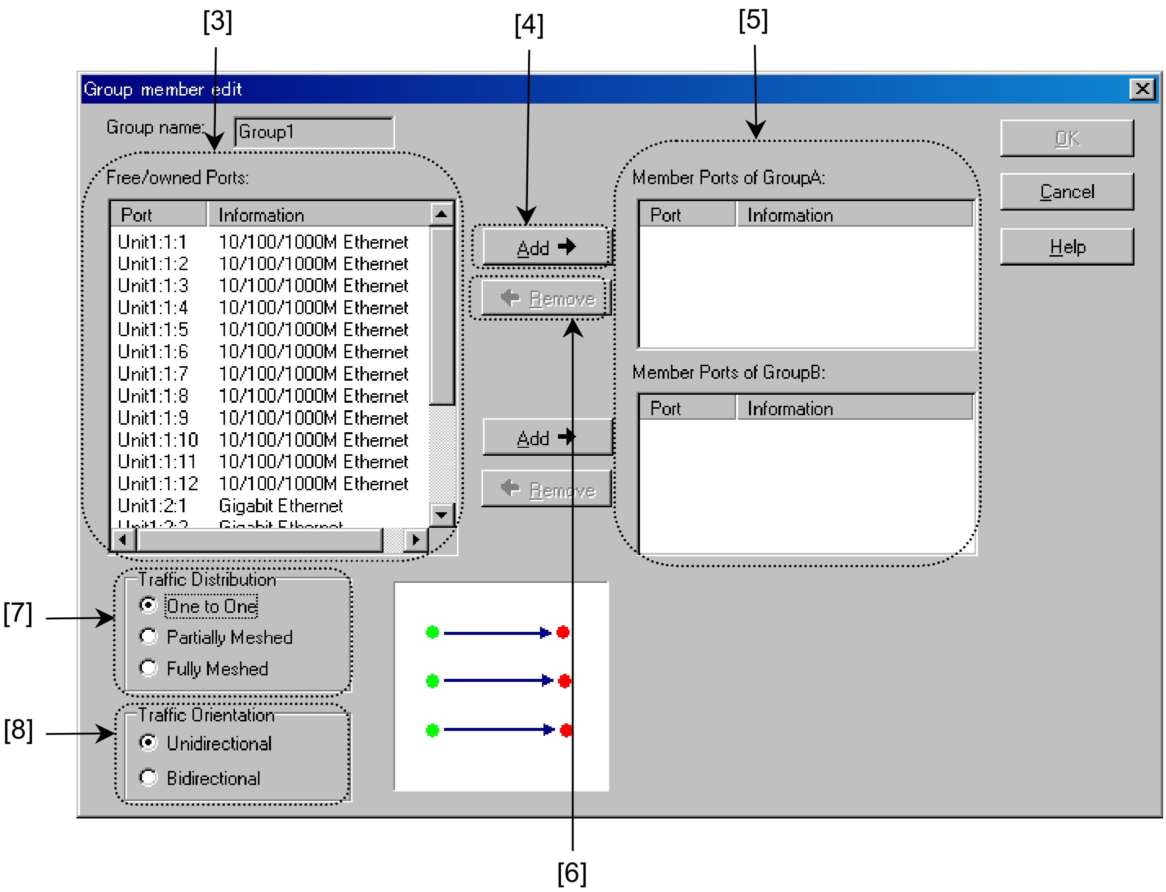

Figure 10.1.1-2 Group member edit screen

[3] Ports that can be registered are displayed in **Free/owned ports**. Select the port to register.

[4] Press **Add** next to the group to be registered.

[5] Ports to be registered are displayed in **Member Ports of Group A** or **Member Ports of Group B**.

[6] To cancel registration, select the ports you want to remove in **Member Ports of Group A** or **Member Ports of Group B** and then press **Remove**.

[7] Select the frame transmission method from **One to One**, **Partially Meshed** or **Fully Meshed**.

[8] Select the frame transmission direction. **Unidirectional** is a one-way transmission from Group A to Group B. **Bidirectional** is bidirectional transmission between Groups A and B. When **Fully Meshed** is selected, this item is fixed to **Bidirectional** and cannot be changed.

[9] Press **OK** to close the dialog box.

Note:

Up to 40 ports can be grouped.

10.1.2 Operating port group

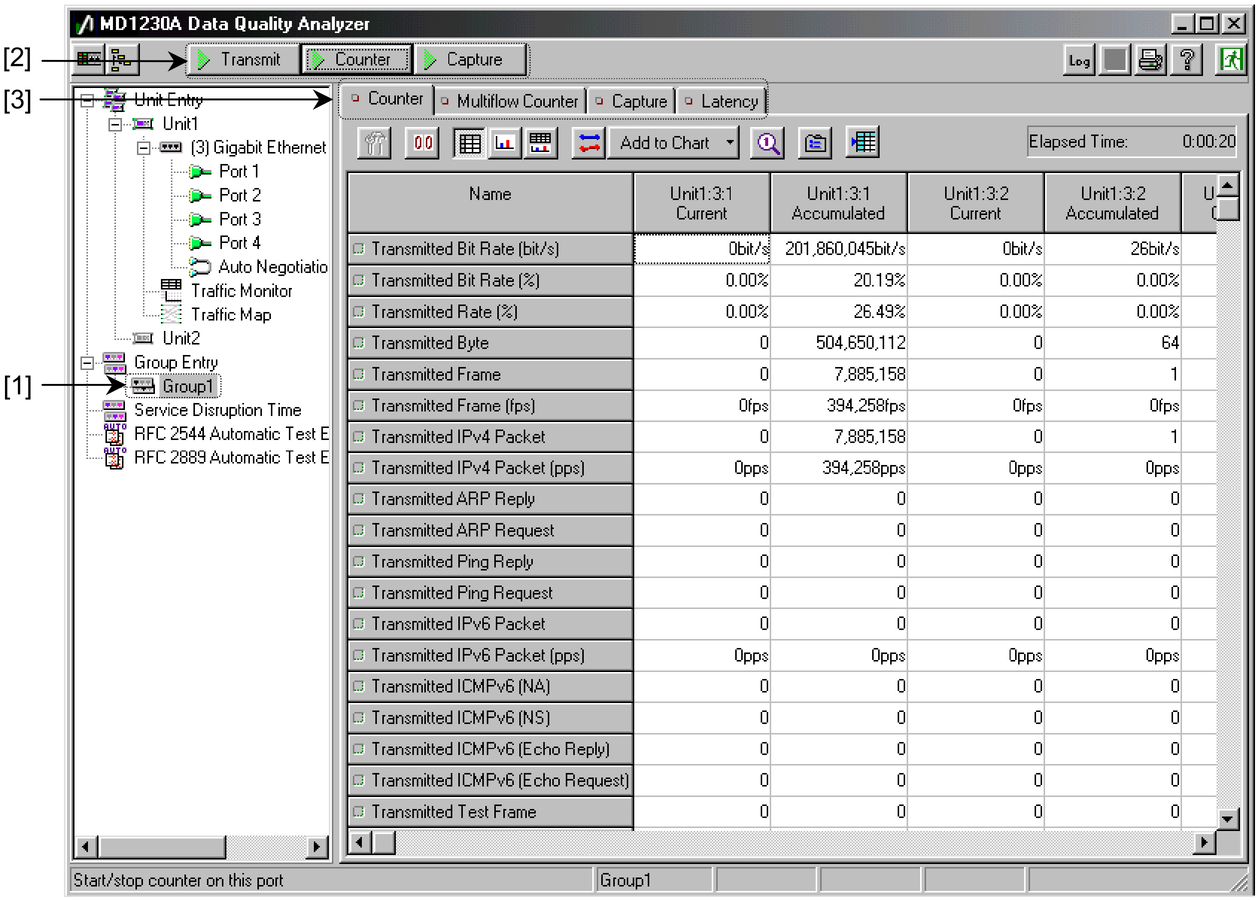

Figure 10.1.2-1 Group display screen

[1] Selects the port group you want to operate.

[2] Instructs the port group member to perform transmit, counter, and capture operations.

[3] Switches between counter display, capture frame display and latency measurement screens.

10.1.3 Operation counter function for port group

The operation counter function for port group automatically performs operation of the value counted by the group.

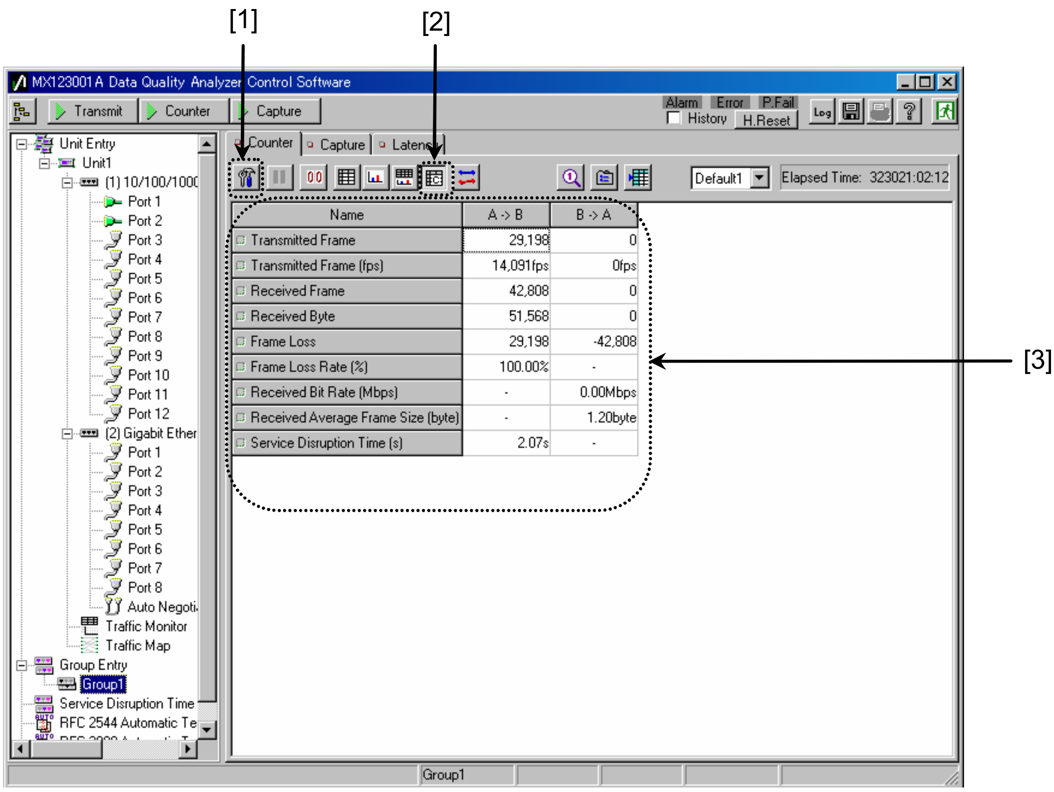

Figure 10.1.3-1 Operation counter display screen

[1] Sets the operation counter to be displayed.
The following screen appears. Check the counter items to display their values on the operation counter screen.
When **Display Operand Counters** is checked, the counter items used for operation and their values are displayed.

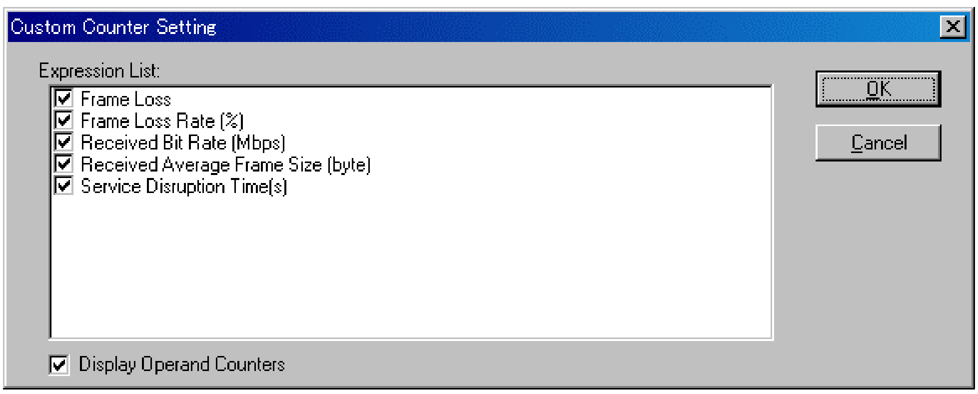

Figure 10.1.3-2 Operation counter display setting screen

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Advanced Measurement Functions

Operation counter item list

Automatically performs operation and display of the counter items listed below:

Operation counter item	Remarks
Frame Loss	Number of frames where frame loss occurred.
Frame Loss Rate [%]	Rate value of the number of frames where frame loss occurred.
Received Bit Rate [Mbps]	Bit rate value of reception frame size
Received Average Frame Size [byte]	Average size of received frames.
Service Disruption Time [s]	Service disruption time

☞ For calculation methods of the operation counter, refer to Appendix D "Calculation Formula."

[2] Switches the operation counter display on/off.

[3] Displays the operation results.

Type	Function
Name	Shows the counter item name.
A->B	Shows the operation results from Group A to Group B set by Group setting.
B->A	Shows the operation results from Group B to Group A set by Group setting.

10.1.4 Capturing port group

Port group capturing control differs from per-port capturing control in the following ways:

(1) Frame list display

(a) All frame data captured at different ports is displayed. They are sorted by time series (captured time) order with the default setting.

(b) A row displaying ports is added at the left of the list screen.

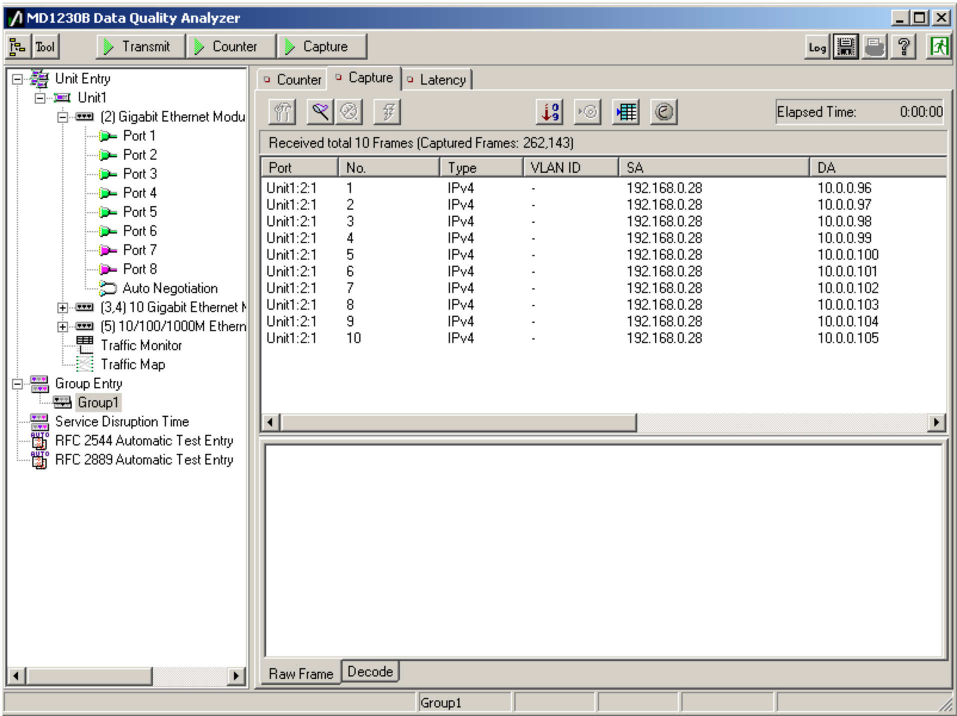


Figure 10.1.4-1 Capture - group display screen

(2) Restrictions and additional notes

(a) Capture filter and capture trigger cannot be set.

(b) Manual trigger cannot be generated.

(c) Elapsed Time shows the maximum value within the port group being captured.

(d) The number of obtained frames is the total of all ports.

(e) When the capture frame is displayed in a capture screen for each port, it is also displayed in the group screen. Likewise, when the capture frame is displayed in the group screen, it is also displayed in a capture screen for each port.

(f) Retrieving the captured data using Ethereal/Wireshark requires setting the mapping for each port registered in the port group to the same format.
Ethernet Module :Framed
EoS/POS Module :Any one PPP/Cisco HDLC

10.2 Measuring Service Disruption Time between Two Ports

To measure the service disruption time with version 9.0 and later, use the Service Disruption Time function of the operation counter. (Refer to Section 10.1.3 “Operation counter function for port group”.)

10.3 Simultaneous Control of Multiple Units (Multiple-Unit Function)

This software can control eight (max.) MD1230B units

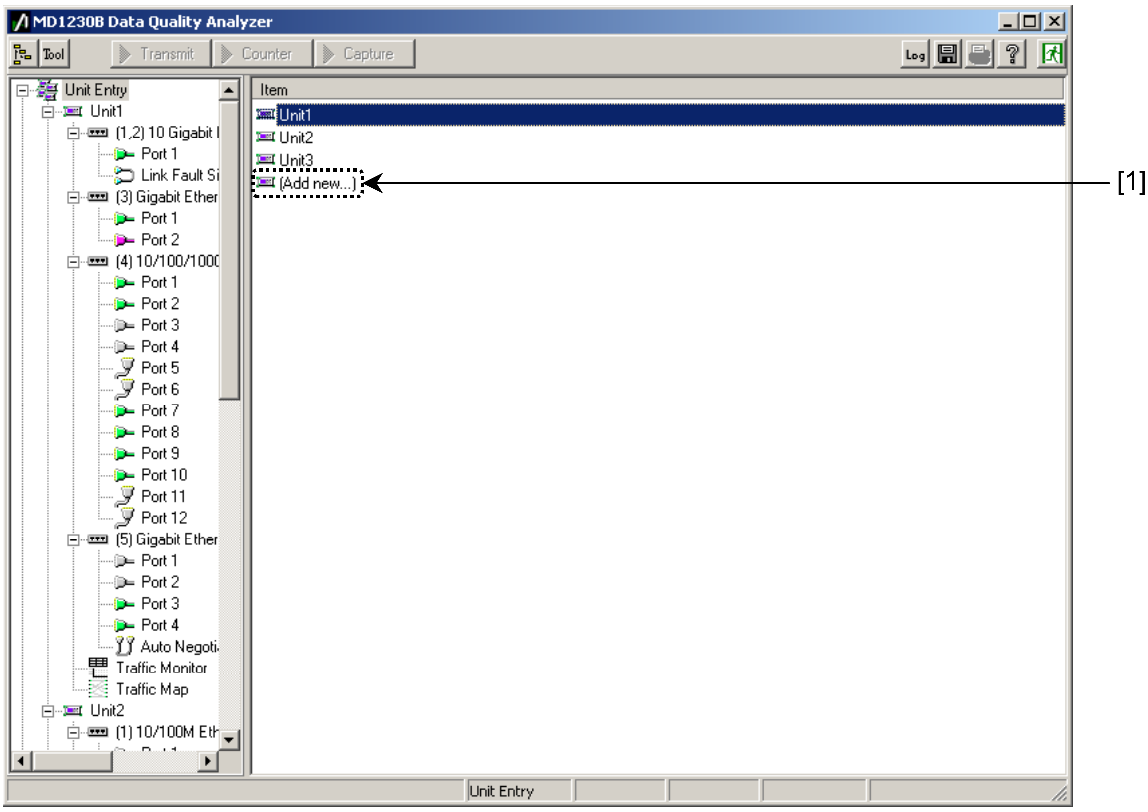


Figure 10.3-1 Multiple-Unit View screen

(1) Double-click the **Add new…** icon [1] displayed by clicking the **Unit Entry** icon of Tree View; the second and subsequent units are registered at the displayed dialog. Refer to Section 4.2 "Registering Units" for the registration method.

(2) The time at multiple registered units is synchronized. If multiple ports between these units are operated simultaneously, the measurement results require matching timestamps. Refer to Section 10.5 "Synchronizing Unit Time" for the time synchronization method.

10.4 Sharing Single Unit with Multiple MX123001A Products (Multiple-User Function)

The multiple (8 maximum) MX123001A products can control a single unit.

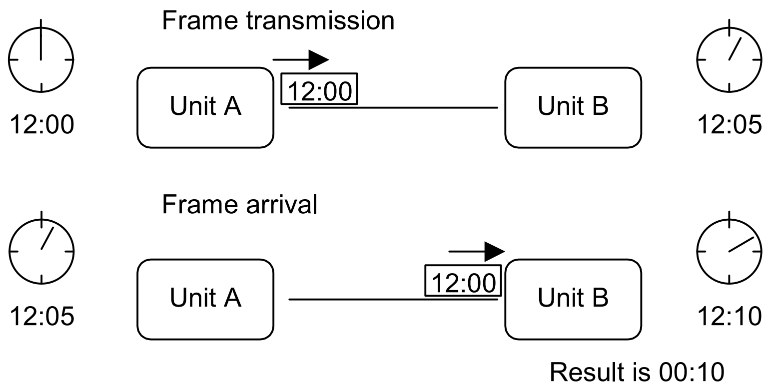
Each port can be controlled only by one among multiple MX123001A products. The controllable port is displayed as **Owner**. When other MX123001A is using the port, it is displayed as **Occupied**. When no software occupy the port, it is displayed as **Vacant**. **Vacant** and **Occupied** ports can be displayed but cannot be operated.

10.5 Synchronizing Unit Time

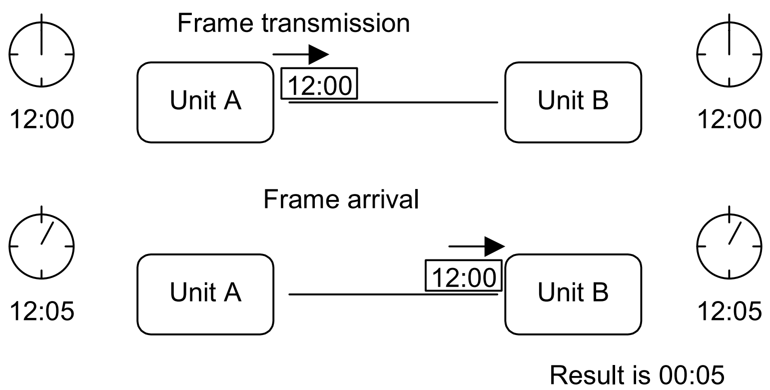
The MD1230B has a clock for each unit, individually. To perform accurate measurements for handling the time information such as latency measurement among different units, the times have to be synchronized.

Times can be synchronized when different units are connected using a BNC cable. In addition, times can be synchronized even in a remote location when you use the optional GPS module.

When times are not synchronized:



When times are synchronized:



Note:

Time information management on the MD1230B uses UTC. Be sure to set Windows® time zone to your location.
The MP1590B is not equipped with this function

10.5.1 Synchronizing times using BNC cable

Connecting "Unit Sync.Output" and "Unit Sync.Input" on the rear panels of the units using a BNC cable, can synchronize the times. This software is not required any setting.

10.5.2 Synchronizing times using GPS module

For synchronizing the times using the GPS module, enable the GPS module by the following method:

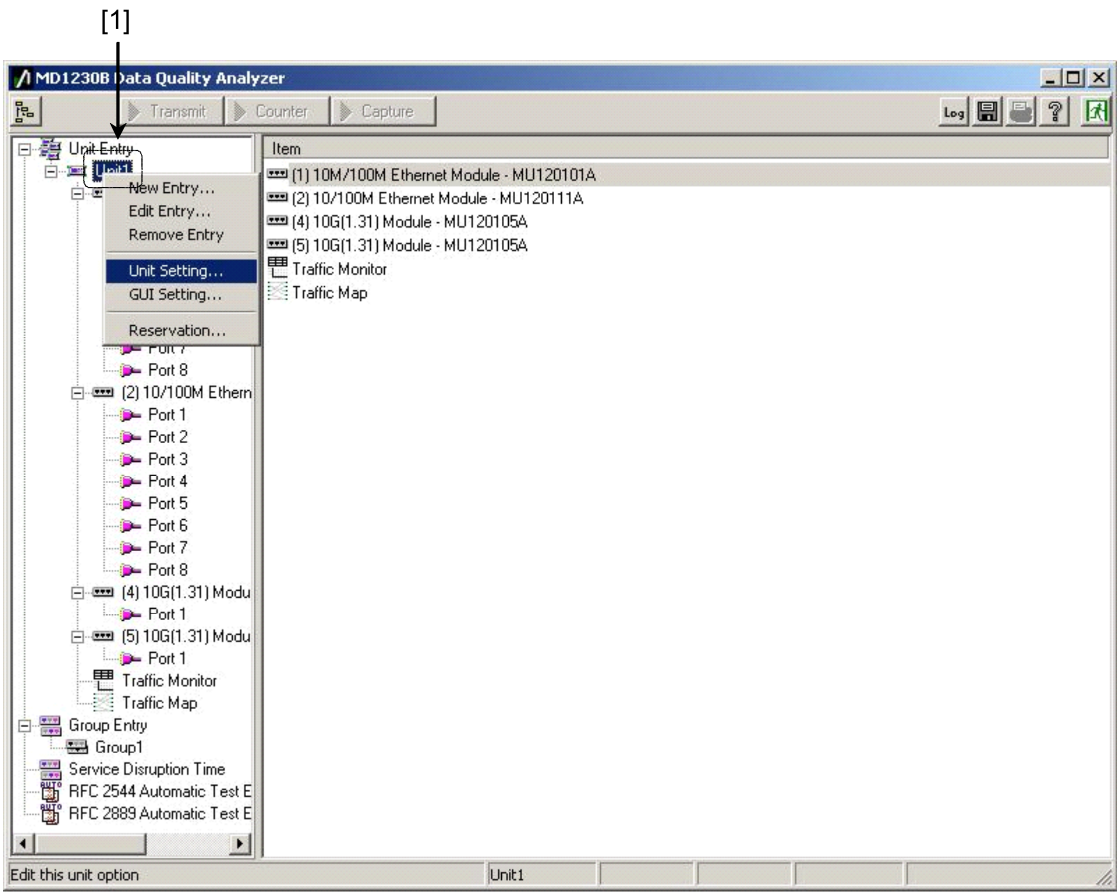


Figure 10.5.2-1

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[1] Right-click [1] to select **Unit Setting**. The dialog box shown below appears.

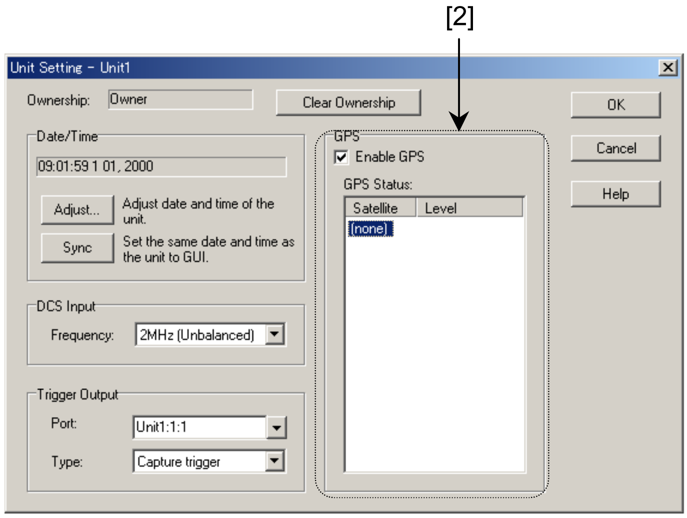

Figure 10.5.2-2 Unit Setting screen

[2] Enables the GPS by checking **Enable GPS**. When the GPS module is mounted while reception level from the GPS satellite and time synchronization are enabled, the reception level at each satellite is displayed.
While the above is displayed, **GPS** unit icon appears on the Tree View.

Section 11 Other Functions

This section describes functions of this software other than contents explained in previous sections.

11.1 Saving/Loading Set Data and Measured Results

There are two types of files as follows:

- Set data file
- Measured result file

There are no limits to the number of files that can be registered to the Hard Disk and Removable Disk.

(1) File types
When setting manually, following files are saved depending on the screen selection status:

(a) (Type a) All unit ports controlled by the Main are saved. However, only the Owner ports are saved.

(b) (Type b) All ports under the selected units are saved. However, only the Owner ports are saved.

(c) (Type c) All ports under the selected modules are saved. However, only the Owner ports are saved.

(d) (Type d) Selected ports are saved. However, only the Owner ports are saved.

(2) Saving/loading files
Different files are saved depending on the screen selection status when saving/loading files.

(a) Set data file

1. Manual set data files
   - In the Single View, the (a) file type is saved/loaded.
   - When “Unit Entry” is selected in the Tree View, the (a) file type is saved/loaded.
   - When a unit is selected, the (b) file type is saved/loaded.
   - When a module is selected, the (c) file type is saved/loaded.
   - When a port is selected, the file type (d) is saved/loaded.
2. Automatic Test set files
   - The files are saved and loaded only on the Automatic screen in the Tree View.

(b) Measured result files

1. Files are saved on each of the result screens.
2. The loaded result data is displayed on a related screen.

Note:

Only the Owner ports are saved and loaded.

11.1.1 Saving to and loading from internal memory

Functions are explained to save/load the set data and the measured results to and from the internal memory.
(Ten files maximum each for the set data and measured results can be registered to the internal memory.)

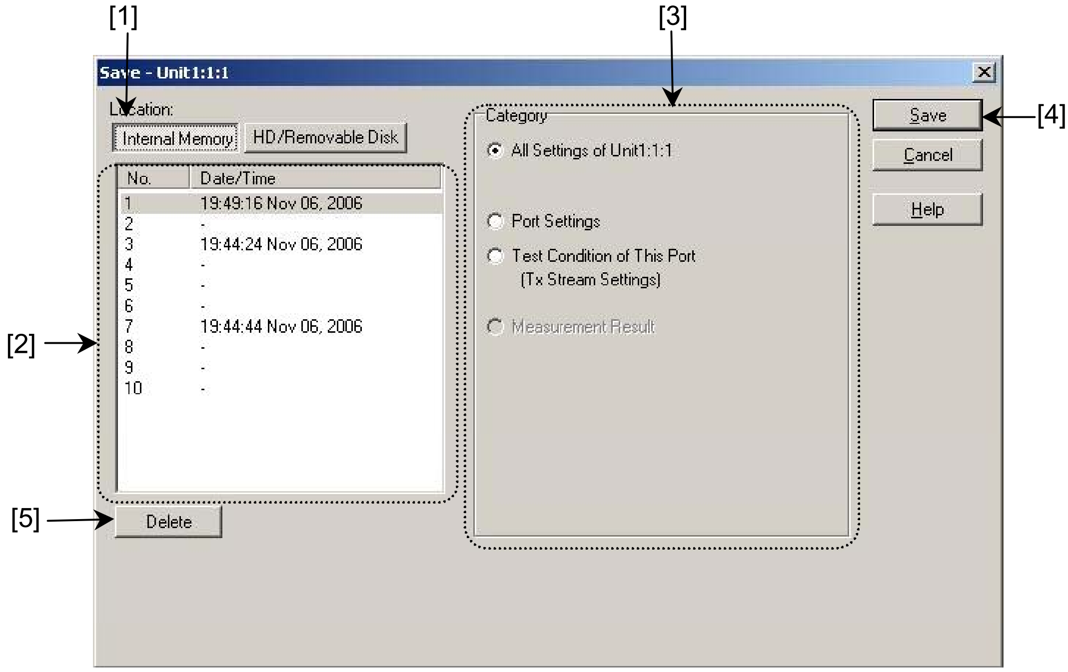

Figure 11.1.1-1 Save screen (for Internal Memory)

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Other Functions

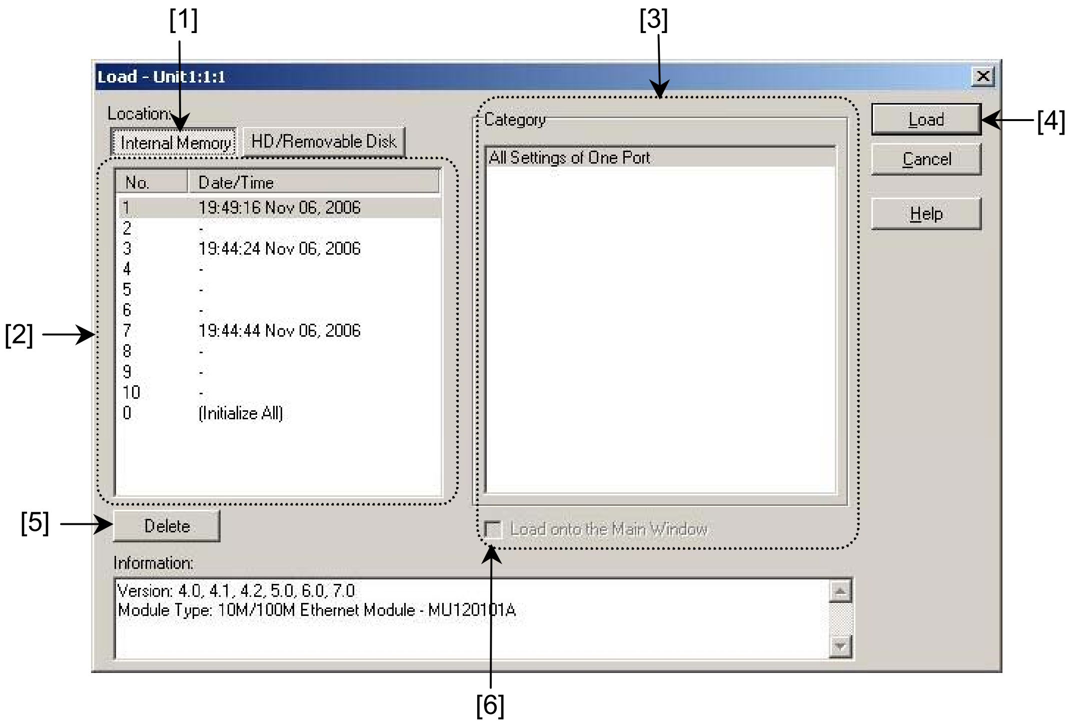

Figure 11.1.1-2 Load screen (for Internal Memory)

Saving/loading the set data files

[1] Set Location to “Internal Memory”.

[2] Select a memory from No. 1 to No. 10 to which you want to save/load files.

[3] Select a set data file from the Category you want to save/load.

[4] Press **Save** or **Load**.

[5] Delete the selected Internal Memory file.

Saving/loading the measured result files

[1] Set Location to “Internal Memory”.

[2] Select a memory from No. 1 to No. 10 to which you want to save/load files.

[3] Select a measured result file from the Category you want to save/load.

[4] Press **Save** or **Load**.

[5] Delete the selected Internal Memory file.

[6] When this item is checked, the selected Capture data is read to the Main Window. Only Capture data can be selected for this item.

11.1.2 Saving to and loading from Hard Disk and Removable Disk

Functions are explained to save/load the set data and measured results to and from Hard Disk and Removable Disk.

There is no limitation for the number of set data and measured result files for Hard Disk and Removable Disk.

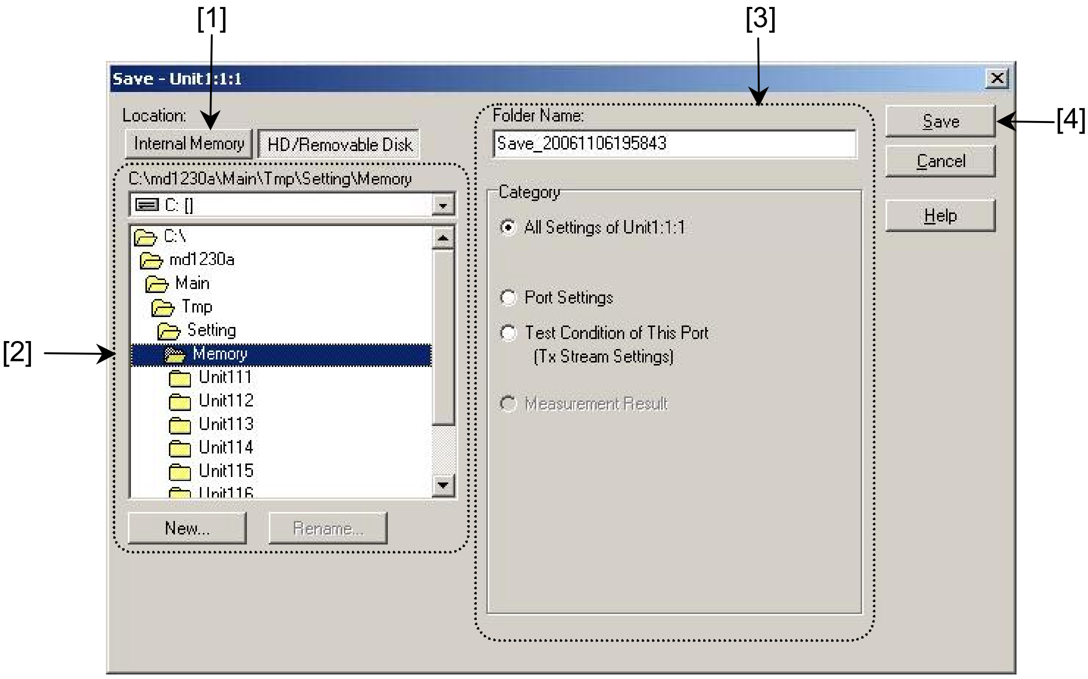

Figure 11.1.2-1 Save screen (for Hard Disk/Removable Disk)

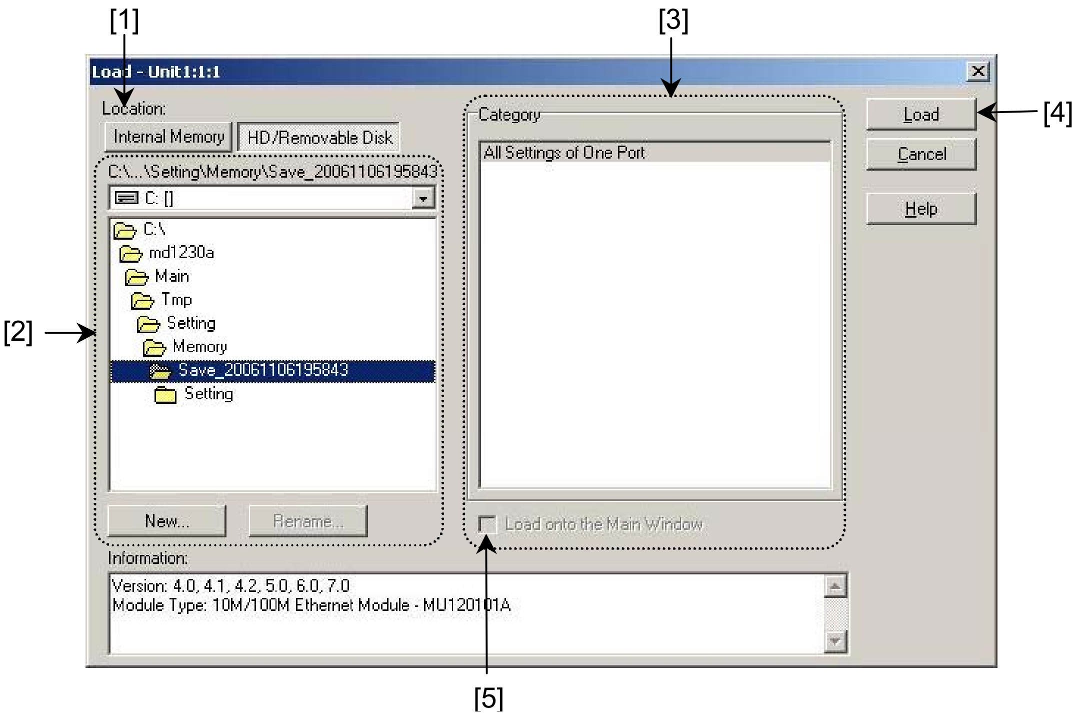

Figure 11.1.2-2　Load screen (for Hard Disk/Removable Disk)

Saving/loading the set data files

[1]　Set Location to Hard Disk or Removable Disk.

[2]　Select the folder to which you want to save/load files.

[3]　Select a set data file from the Category you want to save/load.

[4]　Press **Save** or **Load**.

Saving/loading the measured result files

[1]　Set Location to Hard Disk or Removable Disk.

[2]　Select the folder to which you want to save/load files.

[3]　Select a measured result file from the Category you want to save/load.

[4]　Press **Save** or **Load**.

[5]　When this item is checked, the selected Capture data is read to the Main Window. Only Capture data can be selected for this item.

11.1.3 Backing up set data

When the power is turned Off and then On again in a certain setting status, the previous set data are backed up.
However, be careful that no backup is performed for the stream set data of Programmable pattern on Data Field1.

11.1.4 Initializing set data

Select and execute No. 0 **Initialize All** in Figure 11.1.1-2 Load screen (for Internal Memory) to return the set data to the initial value (factory setting).

Unit setting data is initialized as follows:

- When the above operation has been executed from the MD1230B screen, set data for the units built into the MD1230B is initialized regardless of whether the units are registered on the screen.
- When the above operation has been executed from an external PC, set data for the operating screen is initialized. (Unit registration is canceled, and set data for the units is not initialized.)

11.1.5 Converting set data for older software versions

The setting/results data saved with an older version of this software cannot be used as is with the latest version.
To use it with the latest version, convert it by using the "Setup File Converter" application provided with this software.

Setup File Converter operations/functions

Start Setup File Converter from Windows® Start menu. (Start – Program – MX123001A – Setup File Converter)
When Setup File Converter starts, the main screen appears. The main screen contains the following items.

Input: Information on the setting/results file to be converted

- Location: Specify the location of the setting/results data to be converted.
- Rev.: Displays the version of the setting/results data to be converted.
- Category: Displays the type of the setting/results file to be converted.

Output: Information on the converted setting/results data

- Location: Specify the location of the converted setting/results data.
- Rev.: Select the version of the converted setting/results data.

When the settings are completed, execute conversion. A confirmation message for overwriting appears when the same location is set both Input and Output,.

Setup File Converter restrictions

The following are restrictions for the Setup File Converter.

(1) Conversion from the latest version to an old one is not supported.

(2) When a setting item is not set in the setting data to be converted, default values for those are recorded after conversion.

(3) This application cannot be operated on the MD1230B front panel. It requires a mouse (and keyboard if necessary).

11.1.6 High-speed save/load of stream data

(1) Saving stream data

When all ports on the unit are reserved, stream data can be saved at high speed.

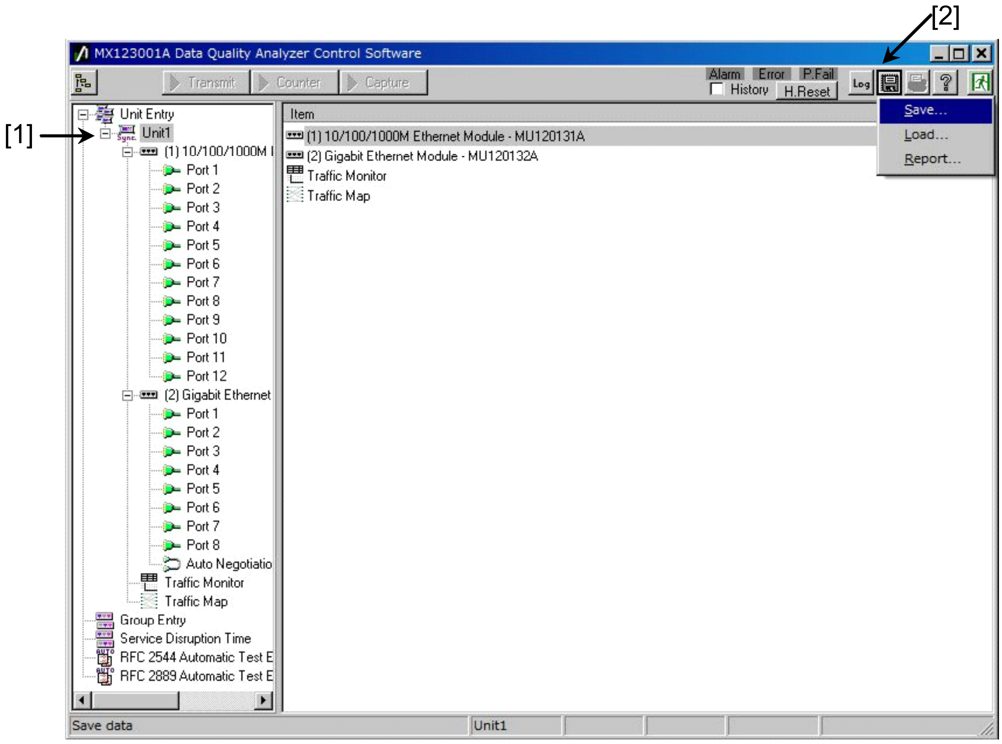

Figure 11.1.6-1 Unit Setting Save screen

[1] Select the unit for saving stream data.

[2] Click the  to select Save.

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Other Functions

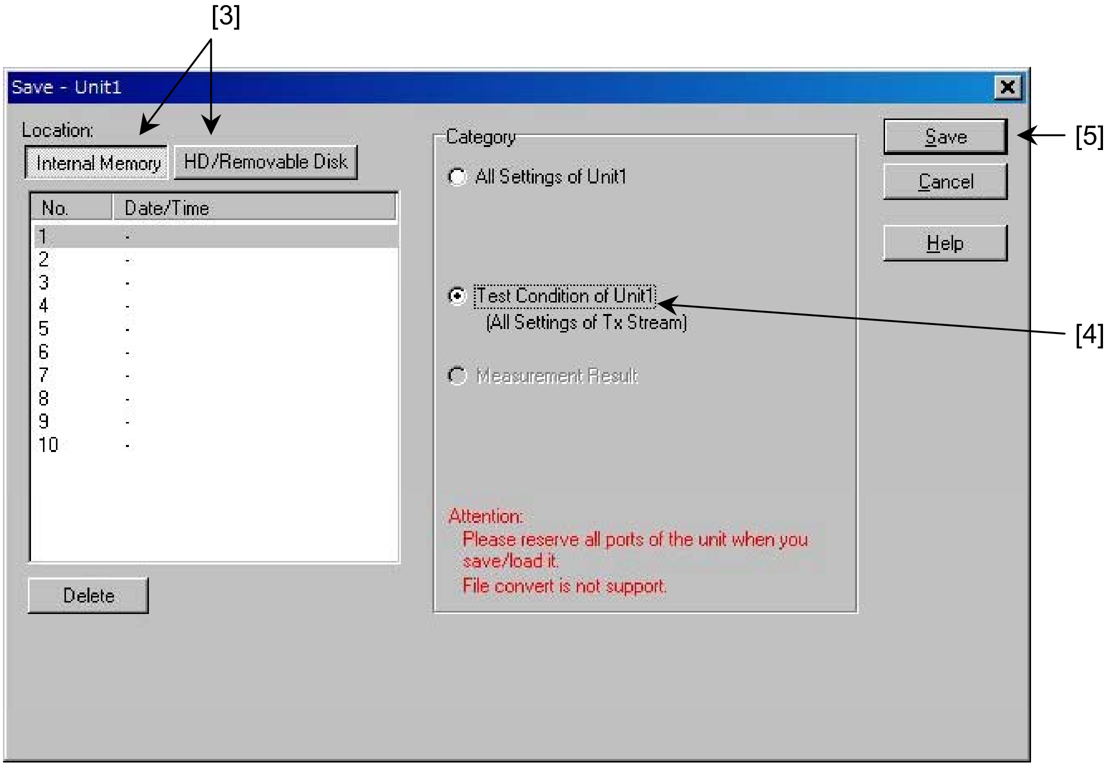

Figure 11.1.6-2 Test Condition of Unit save screen

[3] Select Location for saving data.

[4] Select Test Condition of Unit1 (All Settings of Tx Stream).

Note:

Display varies depending on the set comment for each unit.
If Unit 2 is set as a comment, **Test Condition of Unit2** is displayed.

[5] Click **Save**.

(2) Loading stream data

When the module of the same type is installed into the same slot on the unit of the same version at saving while all ports are reserved, stream data can be loaded at high speed.

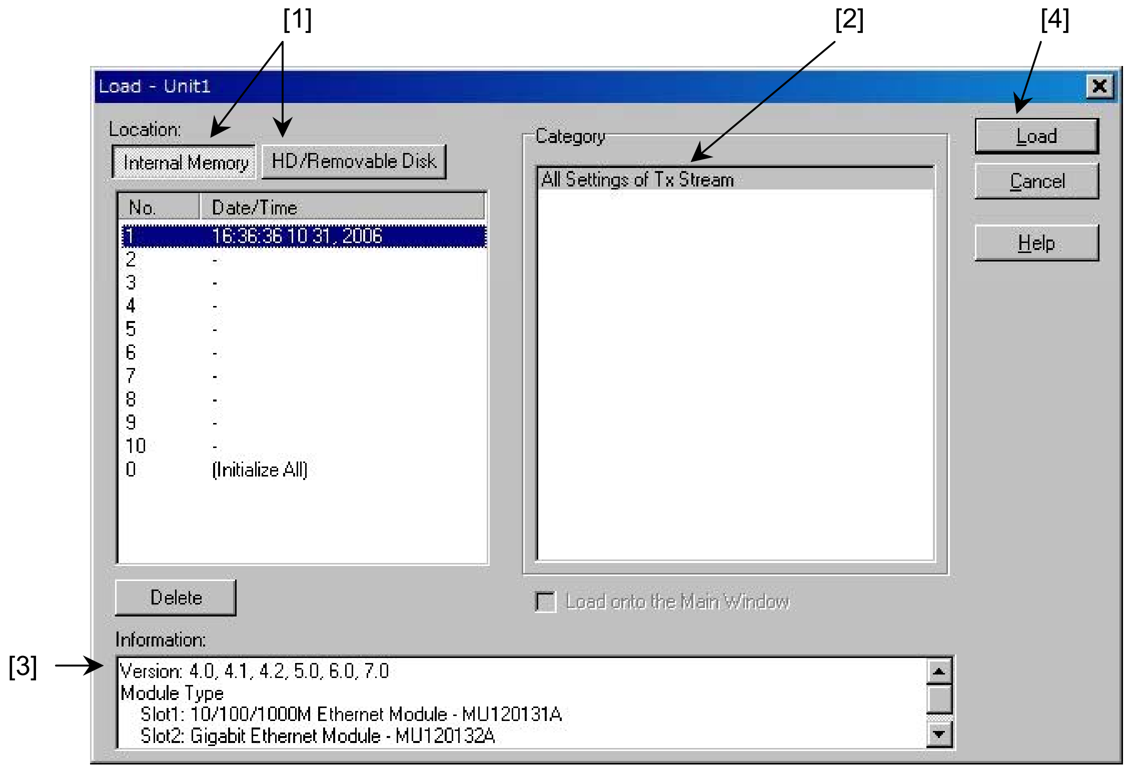

Figure 11.1.6-3 Test Condition of Unit load screen

[1] Select the saved data.

[2] Check that All Settings of Tx Stream is set for Category.

[3] Check that the loading unit configuration is the same as the unit version, module type and slot position shown in the Information box.

[4] Click **Load**.

Note:

Data saved at high speed cannot be loaded with software of different versions. It cannot be converted to a different version by using Setup File Converter. To convert data to a different version, save the settings per port and use Setup File Converter.

For details on set data conversion, refer to Section 11.1.5 “Converting set data for older software versions.”

For details on version check, refer to Section 11.4 “Checking Software Version.”

11.2 Printing/Outputting Set Data and Measured Results

11.2.1 Printing table

Note:

For the MU120103B/04B/MU150101A modules, the settings on GFP-Tx and Concatenation screens cannot be printed.

The table printing is distinguished by the matrix (or table) format, the report format, and other special formats, depending on the contents to print.
In principle, the matrix format is used except when the report format is used as follows:

(a) The record cannot be printed in a single line in the matrix format because of too many fields in the record.

(b) Only a single record is always printed.

Matrix format

Table contents are separated by field and printed.

(1) Basic print format

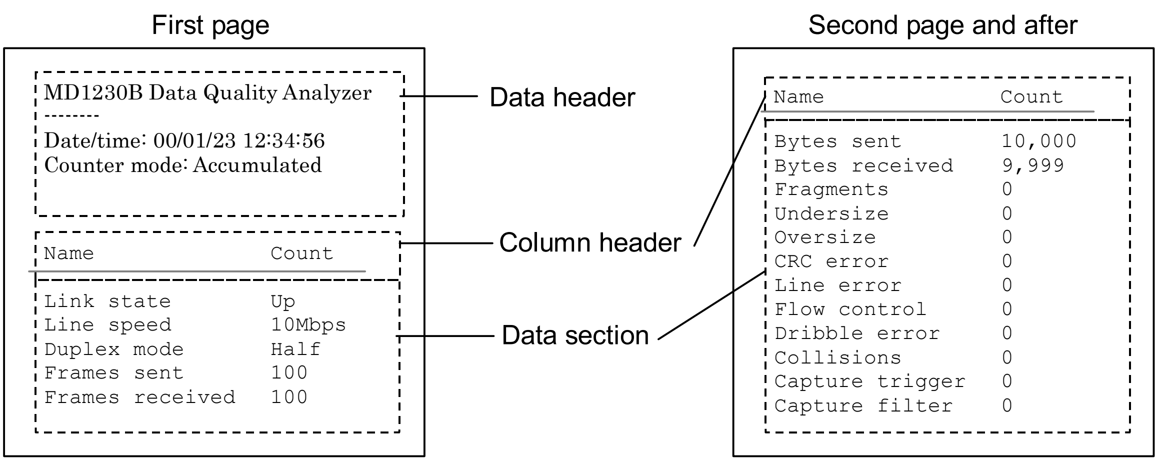

Figure 11.2.1-1 Matrix format layout

(a) Data header

Displayed at the top of the first page. The following logo notation is printed in the beginning of data header:

MD1230B Data Quality Analyzer

Additional information (test condition etc.) is printed after the logo. Contents vary depending on screens.

(b) Column header
Each field names for data is printed at the top (after the data header in the first page) of each page.

(c) Data section
One record per one line is printed one-by-one from record contents in the table.

(2) Print format for wide span page
Wide table is printed by dividing it into several pages that can be restored by combining them (see the next page).
Each division page is filled with fields that can fall within a print area. The rest of the fields fill the following division pages. Where, the record header field (as an example, the counter name for Counter) is copied at the top field of each division page.
The page number in the format [page number before the division - division number] (such page numbers as 1-1, 1-2, and 1-3 when the first page is divided to three, for example) is assigned to every pages after the division. In addition, the characters "(continued)" are printed in the header area of the second page and after to indicate the division page continuation from preceding pages.
The actual printer output order is such that 1-1, 1-2, 1-3, ..., 2-1, 2-2, 2-3, ..., 3-1, 3-2, 3-3, etc.

First page

Counter - Group 1

Name	Unit1:1:1	Unit1:1:2	Unit1:1:3	Unit1:1:4
Frames sent	100	200	300	400
Frames recv	100	200	300	400
Bytes sent	10000	10000	10000	10000
Bytes recv	9999	8888	7777	6666
Fragments	0	100	0	100
Undersize	0	100	0	100
Oversize	0	100	0	100

1

Second page

Counter - Group 1

Name	Unit1:1:1	Unit1:1:2	Unit1:1:3	Unit1:1:4
CRC error	0	100	0	100
Line error	0	100	0	100
Flow control	0	100	0	100
Dribble err	0	100	0	100
Collisions	0	100	0	100

2

Counter - Group 1

Name	Unit1:1:1	Unit1:1:2
Frames sent	100	200
Frames recv	100	200
Bytes sent	10000	10000
Bytes recv	9999	8888
Fragments	0	100
Undersize	0	100
Oversize	0	100

1-1

Counter - Group 1 (continued)

Name	Unit1:1:3	Unit1:1:4
Frames sent	300	400
Frames recv	300	400
Bytes sent	10000	10000
Bytes recv	7777	6666
Fragments	0	100
Undersize	0	100
Oversize	0	100

1-2

Counter - Group 1

Name	Unit1:1:1	Unit1:1:2
CRC error	0	100
Line error	0	100
Flow control	0	100
Dribble err	0	100
Collisions	0	100

2-1

Counter - Group 1 (continued)

Name	Unit1:1:3	Unit1:1:4
CRC error	0	100
Line error	0	100
Flow control	0	100
Dribble err	0	100
Collisions	0	100

2-2

Figure 11.2.1-2 Example of division for wide page

Report format

Table contents are printed by arranging them into a single report for one record.

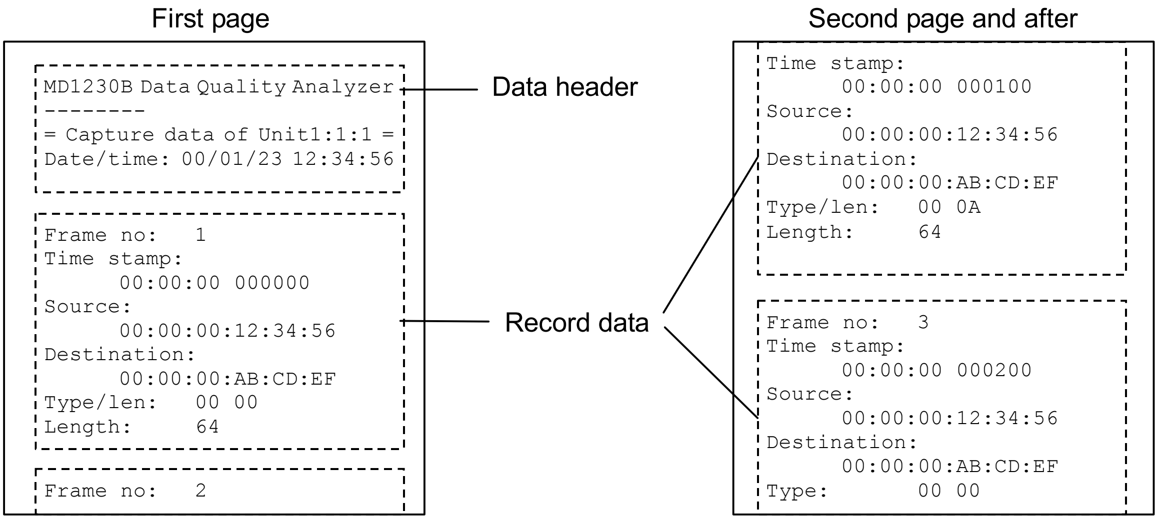

Figure 11.2.1-3 Report format layout

(a) Data header

☞ For data header, refer to "(a) Data header" of "11.2.1 Printing table".

(b) Record data

One field per one line is printed one-by-one from each field contents in the record. Records are separated by a space line.

Data format

Each field is printed in the following format:

Field name_Data

Special format

On some screens, data are printed in an individual format different from matrix and report formats. For example, the special format is used in the following screens:

(a) Stream Setting (frame data)

(b) Capture (frame data)

(c) Ping (Ping result)

Text contents displayed on the above screens are basically printed as they are.

11.2.2 Copying screen

Copying the screen prints the entire screen image when the print is executed.

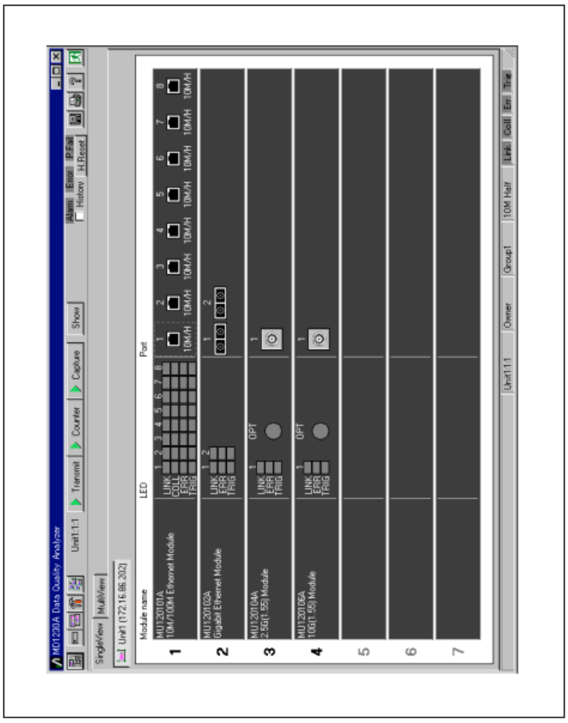

Figure 11.2.2-1 Screen copy image

11.2.3 Report Output

Functions are explained to output the set data and measured results to a file in HTML or TEXT form. The output file can be displayed, edited and printed at a PC, etc.

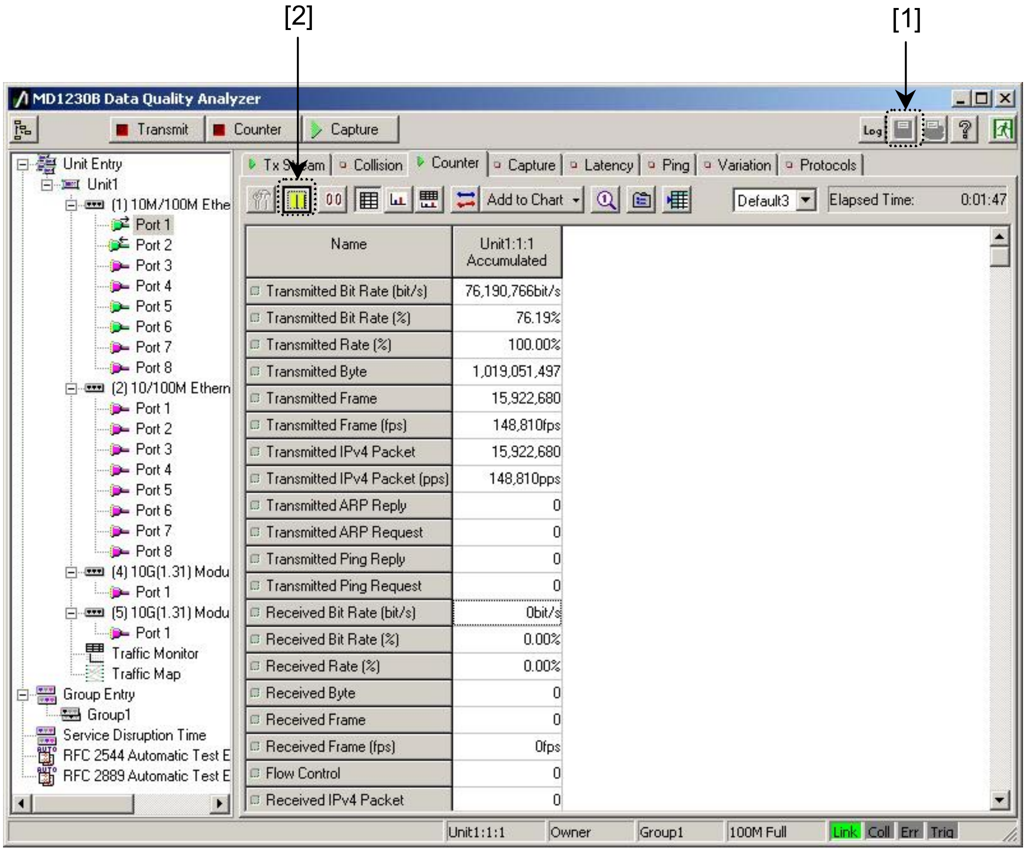

Figure 11.2.3-1 Counter screen example

[1] Press the then choose “Report” from the drop-down menu. The report cannot be output during measurement.

[2] Press the to temporarily stop display refresh; the report can be outputted during Counting, Multiflow counting or Latency measurement.

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Other Functions

The set data and measurement results are reported by the report output function.

Measured Item	Form of file
Counter	HTML
Latency	HTML
Capture	TEXT
RFC2544 Automatic Test	HTML, TEXT (Log)
RFC2889 Automatic Test	HTML, TEXT (Log)

Note:

Although the report output is basically in HTML format (.htm), Capture data and Automatic Test Log data are output in TEXT format (.txt).

The output report items depend on the measurement contents, and installed modules, and options. In addition, report items can be selected. However, items with changed measurement units are output in the selected unit.

A folder and file are created automatically at the report output destination. The folder and file names are allocated automatically but can be changed.

(1) Counter report output

The following folder and files are output to the specified folder.

Counter_YYYYMMDD_hhmmss (Folder)
- Report file:
  Counter_YYYYMMDD_hhmmss.htm
- Image file:
  Counter_YYYYMMDD_hhmmss.jpg (Default setting),
  Counter_YYYYMMDD_hhmmss.bmp
  Counter_YYYYMMDD_hhmmss.png
- Other files:
  logo.gif and style.css

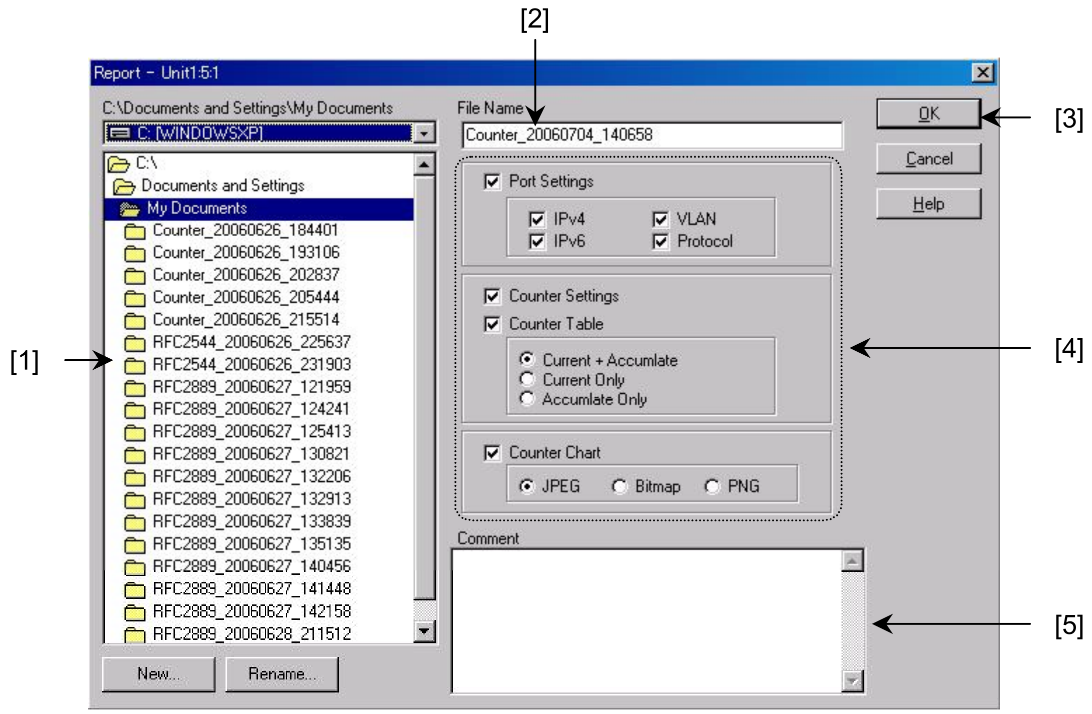

Figure 11.2.3-2 Counter report output screen

[1] Select the destination folder for report output.

[2] The file name can be changed.

[3] Output the report.

[4] Select the output items and image file format.

[5] Comments can be attached to the report.
A maximum of 1000 characters can be input.

(2) Latency report output

The following folder and files are output to the specified folder.

Latency_YYYYMMDD_hhmmss (Folder)
Report file:
Latency_YYYYMMDD_hhmmss.htm
Other files:
logo.gif and style.css

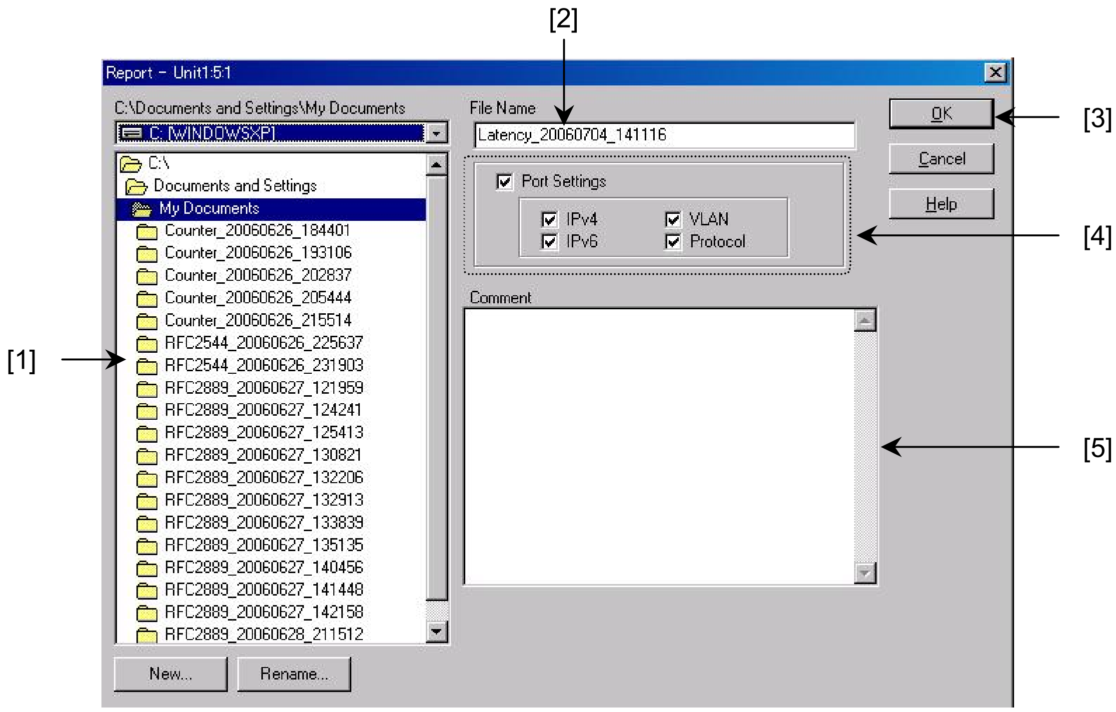

Figure 11.2.3-3 Latency report output screen

[1] Select the destination folder for report output.

[2] The file name can be changed.

[3] Output the report.

[4] Select the output items.

[5] Comments can be attached to the report.
A maximum of 1000 characters can be input.

(3) Capture report output

The following folder and a file are output to the specified folder.

Capture_YYYYMMDD_hhmmss (Folder)
Report file:
Capture_YYYYMMDD_hhmmss.txt

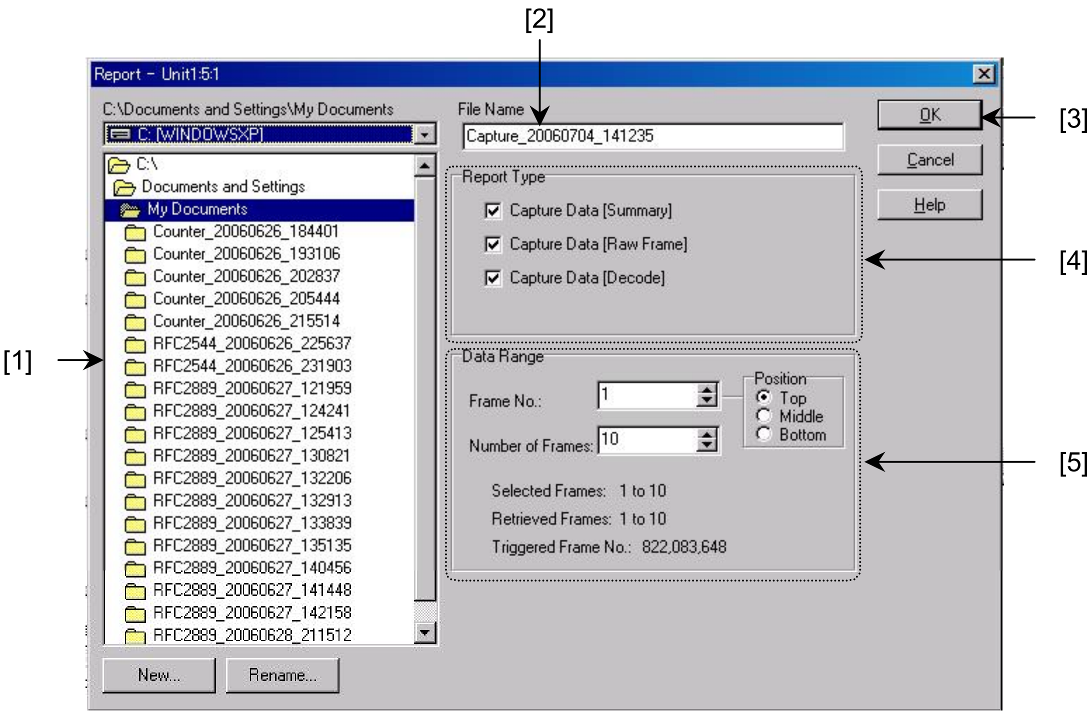

Figure 11.2.3-4 Capture report output screen

[1] Select the destination folder for report output.

[2] The file name can be changed.

[3] Output the report.

[4] Select the output items.

Note:

Capture Data Report **Summary** data is Tab separated.

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Other Functions

[5] Specify the output data range.
Output frames can be specified in the range of “Retrieved Frames” (captured frames displayed on screen).
The number of frames specified at “Number of Frames” is output. Although continuous frames in the frame specified at "Frame No." are output, the output position differs with the "Position" setting.

(a) When “Top” selected at “Position”
The frame specified at “Frame No.” is output at Top.

(b) When “Middle” selected at “Position”
The frame specified at “Frame No.” is output at Middle.

(c) When “Bottom” selected at “Position”
The frame specified at “Frame No.” is output at Bottom.

For example, when Frame No. is 20, Number of Frames is 10 and Position is Middle, frame numbers 15 to 24 are output to the report.

Number of Frames: 10

Frame No. 15
Frame No. 16
Frame No. 17
Frame No. 18
Frame No. 19
Frame No. 20 ← Frame No.: 20 Position: Middle
Frame No. 21
Frame No. 22
Frame No. 23
Frame No. 24

Figure 11.2.3-5 Frame Position Example (Middle)

“Selected Frames” can refer to the number of output frames, and “Triggered Frame No.” can refer to the position of the trigger frame.

(4) Report output for RFC2544 Automatic Test

The following folder and files are output to the specified folder.
Log data output in text format (.txt).

RFC2455_YYYYMMDD_hhmmss (Folder)

- Report files:
  - RFC2455_YYYYMMDD_hhmmss.htm
  - RFC2544_YYYYMMDD_hhmmss.txt (Log)
- Image files:
  - RFC2455_YYYYMMDD_hhmmss_Throughput.jpg,
  - RFC2455_YYYYMMDD_hhmmss_Latency.jpg,
  - RFC2455_YYYYMMDD_hhmmss_FrameLossRate.jpg,
  - RFC2455_YYYYMMDD_hhmmss_BacktoBack.jpg
  - RFC2455_YYYYMMDD_hhmmss_SystemRecovery.jpg
  - <.jpg (Initial setting), .bmp or .png>
- Other files:
  - logo.gif and style.css

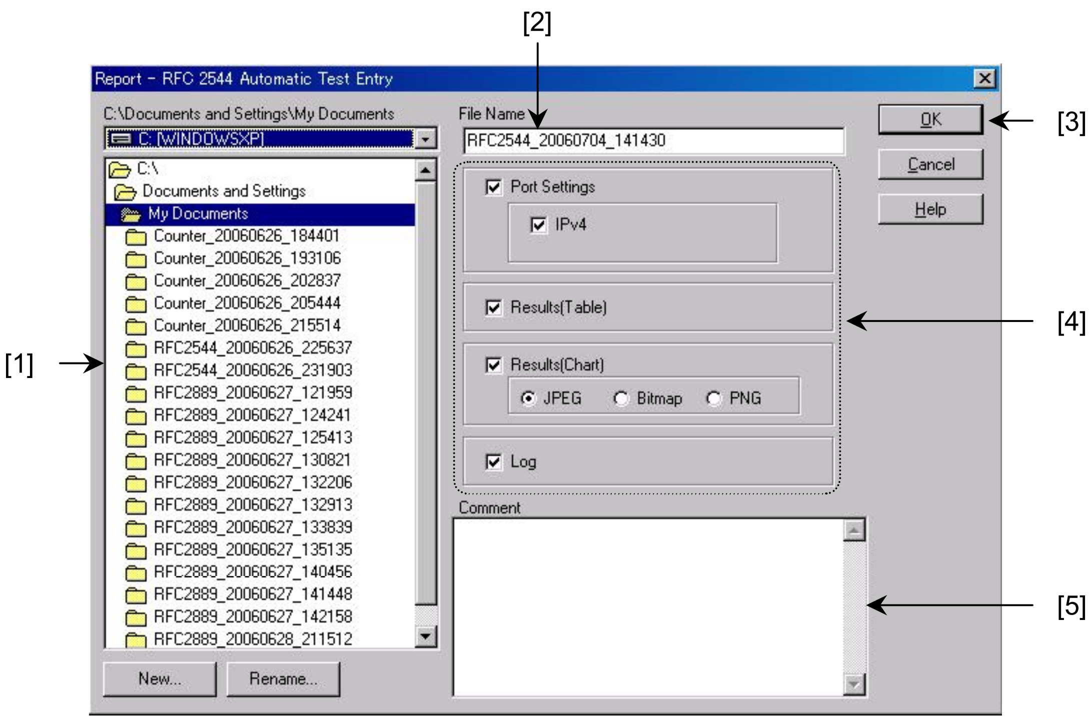


Figure 11.2.3-6 Report output for RFC2544 Automatic Test screen

[1] Select the destination folder for report output.

[2] The file name can be changed.

[3] Output the report.

[4] Select the output items and image file format.

[5] Comments can be attached to the report.
A maximum of 1000 characters can be input.

(5) Report output for RFC2889 Automatic Test

The following folder and files are output to the specified folder.
Log data output in text format (.txt).

RFC2889_YYYYMMDD_hhmmss (Folder)

- Report files:
  - RFC2889_YYYYMMDD_hhmmss.htm
  - RFC2889_YYYYMMDD_hhmmss.txt (Log)
- Image files:
  - RFC2889_YYYYMMDD_hhmmss_Throughput.jpg,
  - RFC2889_YYYYMMDD_hhmmss_Latency.jpg
  - RFC2889_YYYYMMDD_hhmmss_FrameLossRate.jpg
  - <.jpg (Initial setting), .bmp or .png>
- Other files:
  - logo.gif and style.css

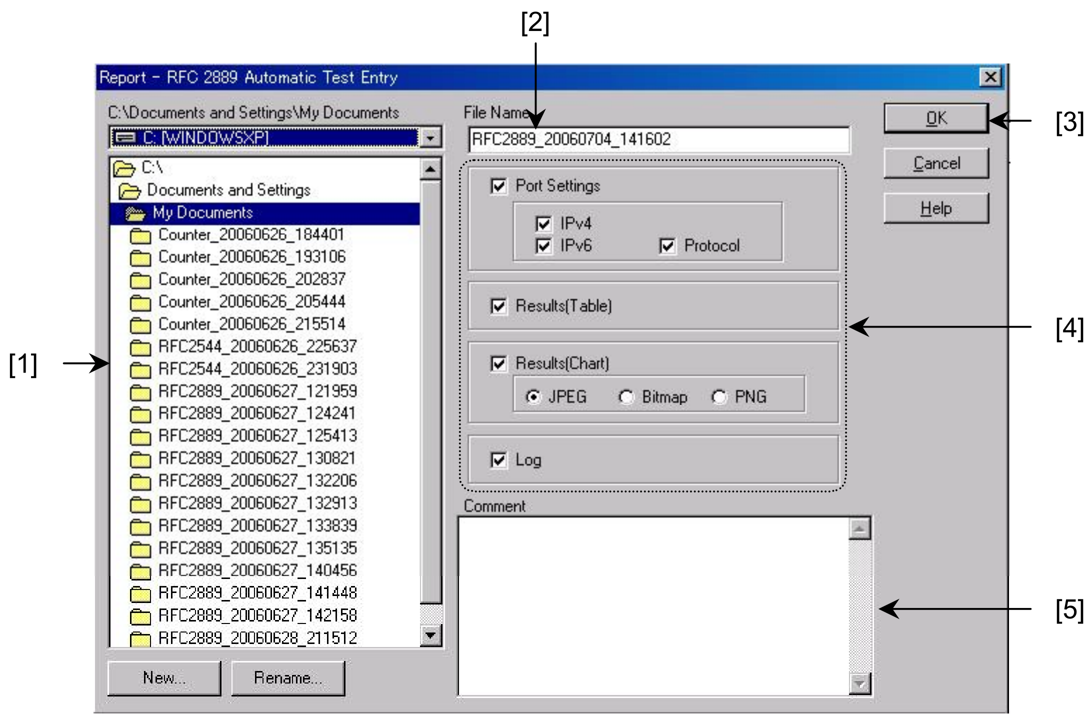


Figure 11.2.3-7 Report output for RFC2889 Automatic Test screen

[1] Select the destination folder for report output.

[2] The file name can be changed.

[3] Output the report.

[4] Select the output items and image file format.

[5] Comments can be attached to the report.
A maximum of 1000 characters can be input.

11.3 Creating IP Fragment Stream

Use the IP Fragment Tool to perform IP packet fragmentation for the specified stream setting. Specify MTU (Maximum Transmission Unit) as the IP packet division units.

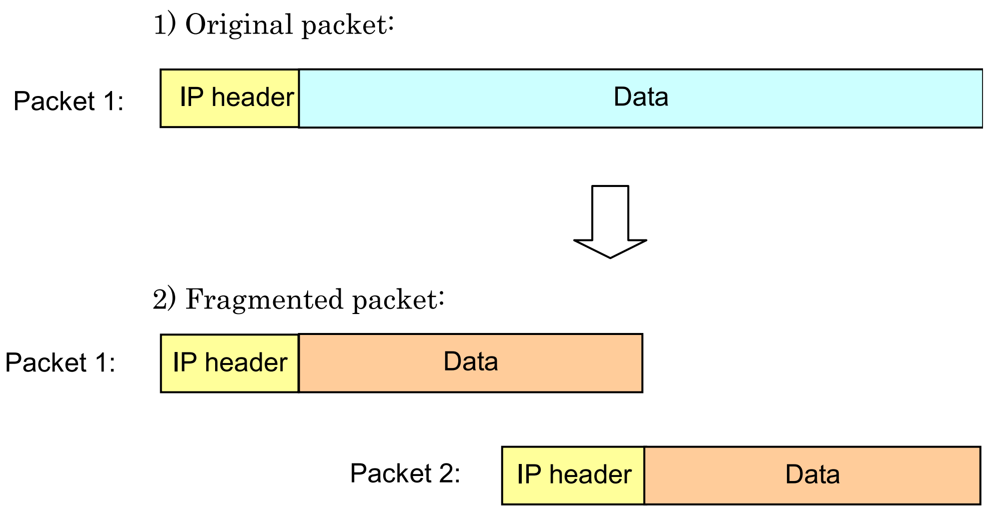


Figure 11.3-1 IP packet fragmentation

Notes on usage

(1) IP Fragment Tool supports Ethernet modules only.

(2) A stream in which a PIM register message is inserted cannot be fragmented.

(3) Stream setting (Frame Setting) that can be fragmented are limited as shown below:

■ General-Protocol

- IP Fragment Tool supports the following protocols only.
  IPv4
  TCP/IPv4
  UDP/IPv4
  IPv6
  TCP/IPv6
  UDP/IPv6

■ Data Field

- IP Fragment Tool supports Data Field 1 only. Streams that have settings of Data Field 2 to Data Field 4 cannot be fragmented.

■ Pattern of Data Field

- IP Fragment Tool supports the following Data Patterns only.
  All0
  All1
  Alternate 1/0 by bit
  Alternate 1/0 by 2 bits
  Alternate 1/0 by nibble
  Alternate 1/0 by byte
  Alternate 1/0 by 2 bytes
  Increment by byte
  Decrement by byte
  PRBS 9
  Programmable

(4) IP Fragment Tool cannot be used during stream transmission.

☞ Refer to Section 5.1.2 “Defining transmission data pattern” for details on stream setting.

(5) With the MP1591A, the IP Fragment Tool can only be used at the GUI where Remote Control is set using Setup Utility. Do not try to start the IP Fragment Tool at the GUI where Remote Control is not set, because it cannot be used.

11.3.1 Displaying fragment setting screen

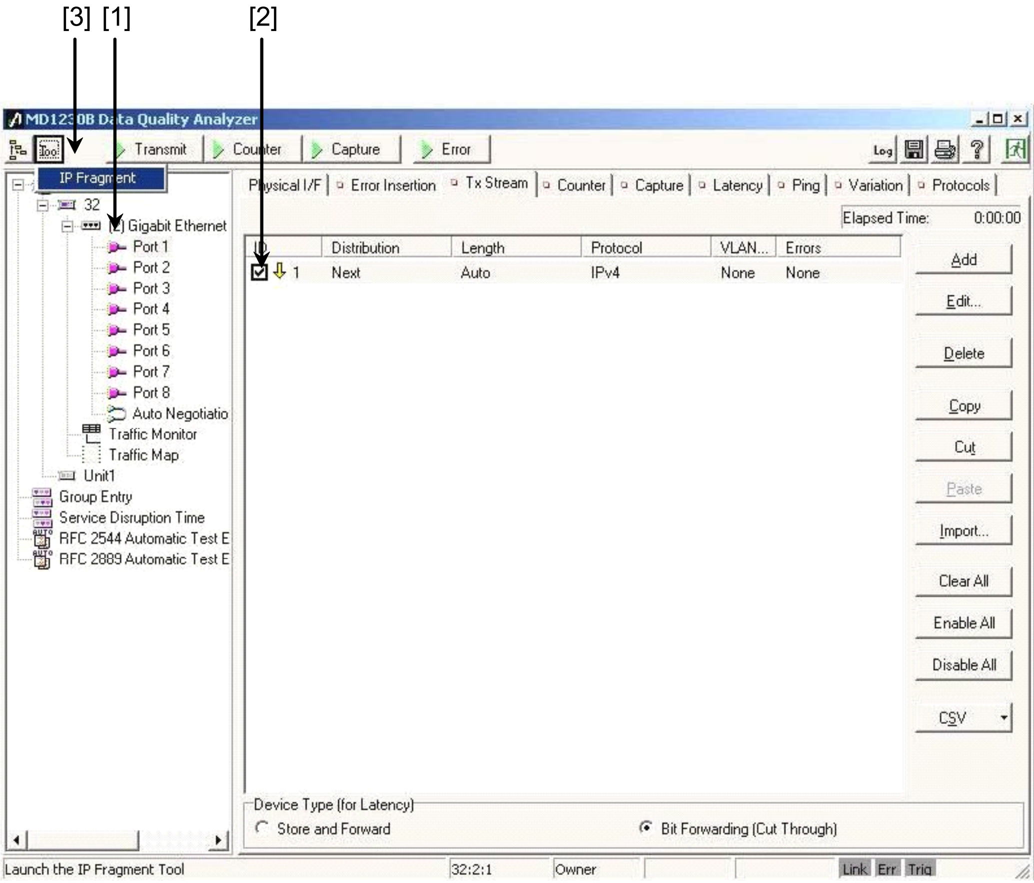


Figure 11.3.1-1 Tree view and stream setting screen

[1] Select the port where the stream to be fragmented exists. Fragmentation can be executed only for Ownership ports.

[2] Select the stream to be fragmented.

[3] From **Tool** button menu – **IP Fragment** to display the IP Fragment setting screen.

Notes:

1. When the remote control option is set to GPIB or RS-232C, IP Fragment Tool cannot be used (an error occurs at startup). Remote control status is set during IP Fragment Tool is being used.

2. The Tool button is enabled when Active Interface of Remote Control setting in Setup Utility is set to none or Ethernet.

3. Refer to Section 4.4 “Setting Remote Control” in the MD1230B Data Quality Analyzer Operation Manual for details on the remote control option settings.

11.3.2 Fragmenting stream

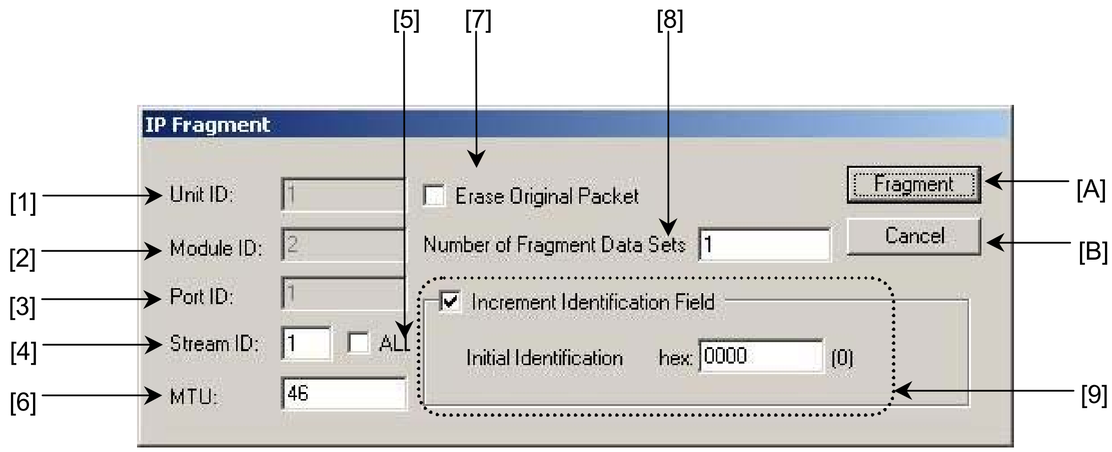


Figure 11.3.2-1 IP Fragment setting screen

[1] Displays the unit number.

[2] Displays the module number.

[3] Displays the port number. Fragmentation can be performed for Ownership ports only.

[4] Specify the selected stream ID.

Note:

[1] to [4] can be specified arbitrarily.

[5] Set whether to perform fragmentation for all streams set in the selected port (initial setting: off).

[6] Specify the MTU (Maximum Transmission Unit: IP packet size after fragmentation).
Range: 46 to 9936 bytes (initial value: 46)

The minimum fragmentation units of the data section of packet is 8 bytes.
The minimum value of MTU is (IP header size of target stream) + 8 bytes.

[7] Set whether to delete the original stream setting data after fragmented stream setting created (initial setting: off).

[8] Specify the number of fragmented stream setting sets to be created.
Range: 1 to 127
Initial value: 1

[9] Increments the Identification field value of IP header based on the set value for Initial Identification. Incrementation is performed per set of fragmented streams created according to this specification.

Specify Initial Identification in hexadecimal. The specified value is converted to a decimal value and displayed in parentheses to the right. Up to 4 bytes can be input.

Range:	IPv4 0000 to FFFF (Hex)	2 bytes
	IPv6 00000000 to FFFFFFFF (Hex)	4 bytes
Initial value:	Increment Identification Field	On
	Initial Identification	0000(Hex)

Note:

When fragmentation of multiple streams including both IPv4 and IPv6 with a value of 3 bytes or more specified, an abnormal input value is detected before starting fragmentation of IPv4 streams, resulting in a setting error.

Type		Function
[A]	Fragment	Starts stream fragmentation.
[B]	Cancel	Closes the IP Fragment setting screen without starting stream fragmentation.

Notes:

1. Fragmentation cannot be performed when the number of available streams required to fragment steam is insufficient.

2. The number of available streams varies depending on module type and stream setting. When the available number of streams becomes insufficient during fragmentation, fragmented stream setting creation is stopped.

   ☞ Refer to Section 5.1 “Transmitting Stream Data” for the number of streams that can be set.

3. When fragment setting processing is aborted due to stop of fragmentation, the fragmented stream setting data under creation is deleted.

11.3.3 Checking fragmentation status

Check fragmentation setting processing progress.

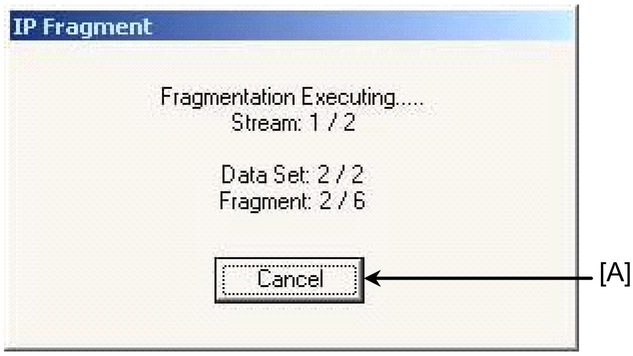


Figure 11.3.3-1 IP Fragment status screen

Fragment setting processing progress is displayed. The stream being fragmented, the number of created fragmented stream setting sets, and the number of set fragmented streams are displayed.

Type		Function
[A]	Cancel	Cancels stream fragmentation and exits IP fragmentation function.

Note:

When fragmentation is stopped, the fragmented stream setting data under creation is deleted.

11.3.4 Checking fragmentation results

Check the fragmentation results.

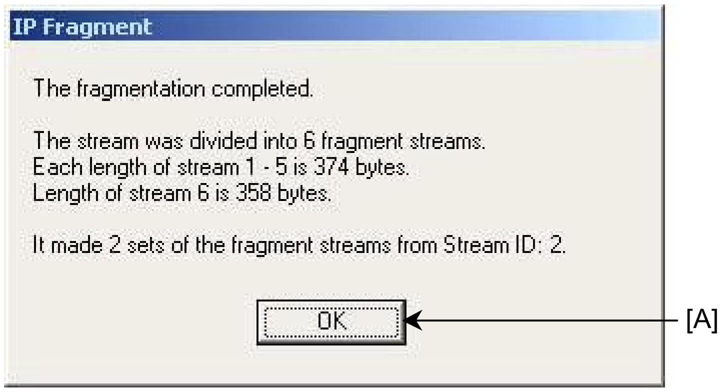


Figure 11.3.4-1 IP Fragment results screen

Fragmentation results are displayed. The number of set streams after fragmentation, frame size, and number of created fragmented stream setting sets are displayed.

Type		Function
[A]	OK	Closes the IP Fragment setting screen and exits IP fragmentation function.

11.4 Checking Software Version

The method for checking the software version is shown below:

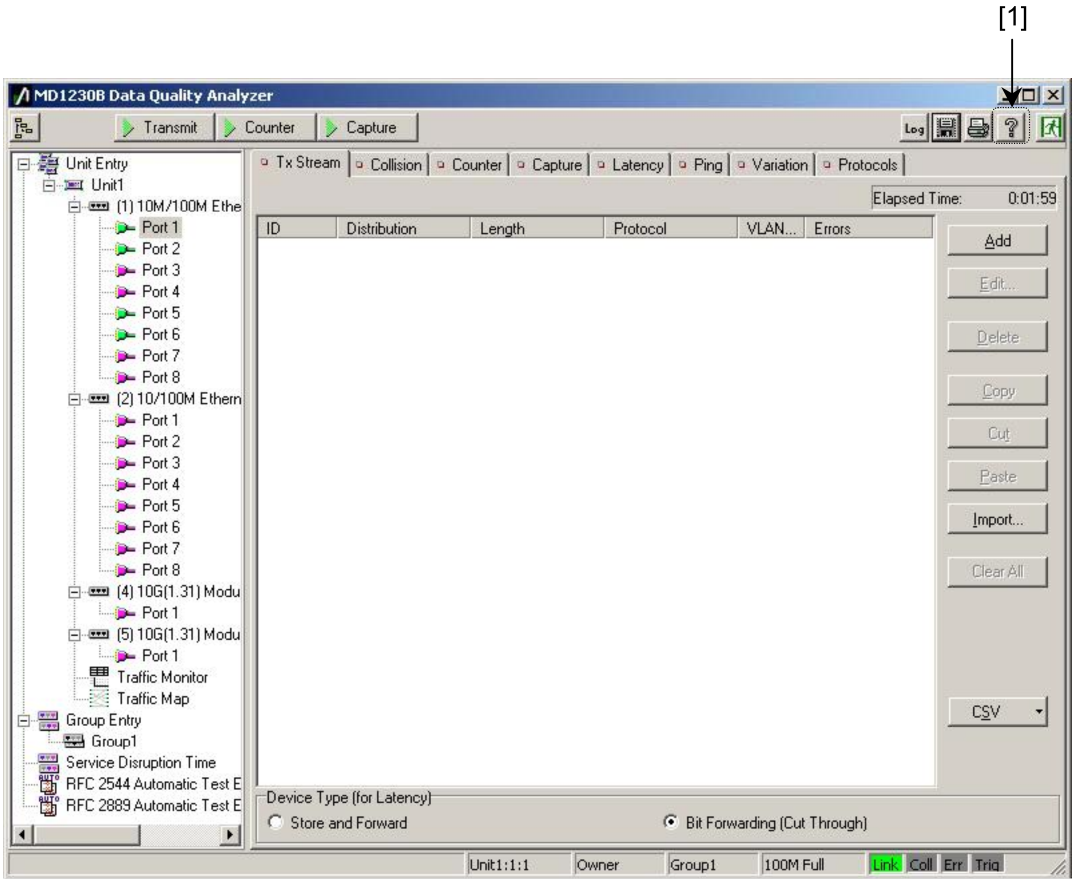


Figure 11.4-1 Tree View screen

[1] Press ? to display the pull-down menu and select Version.

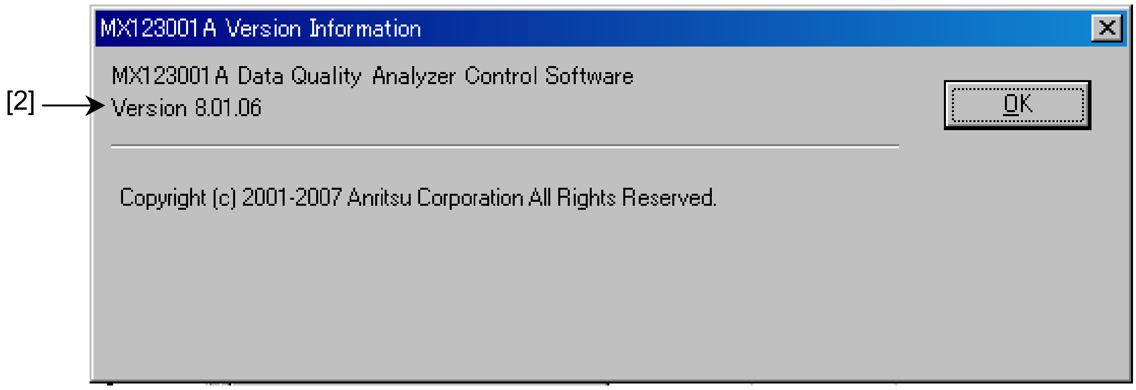


Figure 11.4-2 MD1230B Version Information screen

[2] Displays the software version.

11.5 Displaying Help

This software can display the screen (help screen) where descriptions of this operation manual are simplified. In the help screen, select an item to display detailed information.

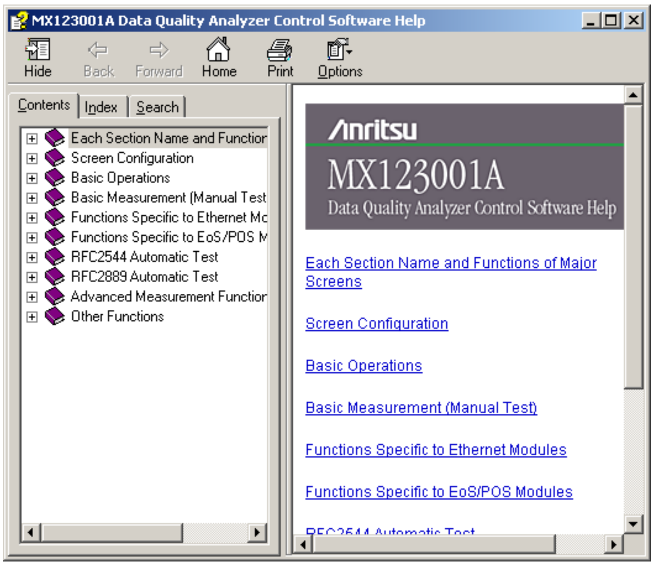


Figure 11.5-1 Help screen

11.5.1 Displaying help screen

The method for displaying the help screen is shown below:

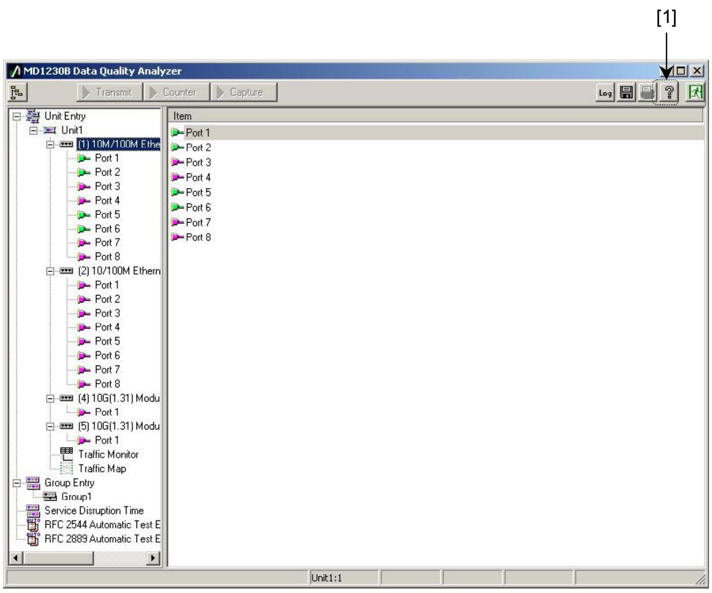


Figure 11.5.1-1 Tree View screen

[1] Press ? to display the pull-down menu and select **Help**.

11.5.2 Switching help screen language

The language for help text display can be switched between English and Japanese.

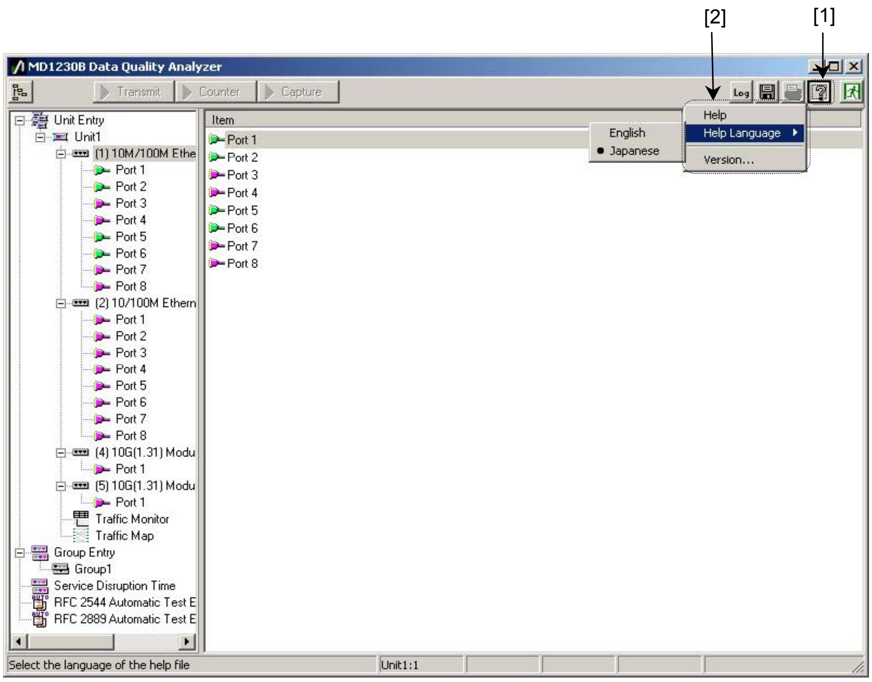


Figure 11.5.2-1 Language switching screen

[1] Press ? to display the pull-down menu and select **Help Language**.

[2] Select English or Japanese from the submenu.

Notes on selecting Japanese display

Note the following restrictions when selecting Japanese for the help display.

(1) The installed Internet Explorer must have Japanese language display support, when using this software on non-Japanese versions of Windows®. If the installed Internet Explorer does not have Japanese language display support, Japanese help text cannot be displayed normally.

(2) When the Japanese help screen is opened from the Start menu, etc. of Windows®, the table of contents or keywords are displayed in English. In this case, only English items can be searched.

Appendix

Appendix A Initial Setting Values

MAC address settings are described in 6-byte hexadecimal
IP address settings are described in standard dotted decimal
Checkboxes with a checkmark indicate **On**, and without a checkmark indicate **Off**.

GUI Setting

Setting item		Initial value
Localization	Date Format	HH:MM:SS mm dd,yyyy
SDH/SONET	Standard	SDH
	Protection Protocol	G783
Sound	Beep on Application Errors	Off
	Beep on Error/Alarm Frames	Off

Unit Setting

Setting item		Initial value
DCS Input	Frequency	Lock 2 MHz (Unbalanced)
Trigger Output	Port	None
	Type	Capture Trigger
GPS	Enable GPS	On

Port Setting

• Ethernet module

Setting item				Initial value
Clock *1				0 (dec)
Optical Send *2				On
Loop back				Off
PCS Type *3				WAN
	LOP-P Detection *3			On
Auto Negotiation *4				On
	Line Speed and Duplex Mode			10 M Half On 10 M Full On 100 M Half On 100 M Full On 1000 M Half On *5 1000 M Full On *5
	Auto MDI/MDI-X *5			On
	Timeout Enable *6			On
	Change Link Timer *7			Off
Link Fault Signaling Reply *8				Off
Mapping *9				Framed
Framed	Mode			Normal
	MAC Address			00-00-00-00-00-00
	Maximum Frame Size			1518
	Preamble *10			Off
		E-PON *11		Off
	Flow Control Receive	Multicast Pause Address		Off
		Directed Address		Off
	Test Pattern *12			Single PRBS 9
	IPv4	IP Address		0.0.0.0
		Netmask		0.0.0.0
		Gateway		0.0.0.0
		ARP Reply		Not send
		ICMP Echo (PING) Reply		Not send
	IPv6 *13	IPv6 Address		::
		Default Router		::
		Link-Local Address		FE80:200:FF:FE00:0
		Neighbor Solicitation Reply		Not send
		Echo Reply		Not send
	VLAN *10	Enabled		Off
		Only VLAN-Tagged Frame *14		Off
		No.1	TPID	8100 (hex)
			User Priority	0
			VID	1 (dec)
		Acceptable VID *14		This Port VID

Setting item				Initial value
	Ethernet OAM *15	Enabled		Off
		Standard		ITU-T
		Reply to this port LBM		On
		Reply to this port LTM		On
		LTR TLVs...	Template: Reply Ingress TLV value: 05 00 07 01 00 00 00 00 00 00 (hex, 10 byte)	
		Send CCM		Off
		Insert RDI		Off
		MEG Level/MD Level		0 (dec)
		MEP ID		8191 (dec)
		MEG ID	01 20 0D 49 43 43 26 55 4D 43 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 (hex, 48byte) 1 to 3 byte: 0x01,0x20 (32) ,0x0D (13) 4 to 10 byte: 0x49 43 43 26 55 4D 43 (ASCII「ICC&UMC」) 11 to 48 byte: 0x00	
		CCM Period		1 s
		CCM TLVs...		(blank)
		DUT MEP ID		8191 (dec)
Unframed *16		Test Pattern		All 0

*1: Requires XENPAK measurement option for MU120118A/18B/18C

*2: Supported by MU120102A/12A/18A/18B/18C

*3: Requires WAN-PHY option and supported when WAN-PHY XENPAK module inserted

*4: Supported by MU120101A/02A/11A/12A/21A/22A/31A/32A

*5: Supported by MU120121A/22A(RJ-45)/31A

*6: Supported by MU120102A/12A/22A(SFP)/32A

*7: Requires Auto Negotiation Analysis option

*8: Requires Link Fault Signaling option

*9: Not supported by MU120101A and fixed to Framed

*10: Supported by MU120121A/22A/31A/32A/38A

*11: Supported by MU120132A

*12: Supported by MU120131A/32A/38A

*13: Requires IPv6 Expansion option

*14: Supported by MU120121A/22A

*15: Requires Ethernet OAM option

*16: Supported by Ethernet Modules except MU120101A; only ports 1 and 5 selectable with MU120111A. The MU120118A/18B/18C requires the XENPAK measurement module and can be used when the PCS Type is LAN.

• EoS/POS module

Setting item			Initial value
Bit Rate	MU120119A/20A		155.520 M
	MU150101A		2488.320 M
Clock			Internal 0 ppm
Loop back [*1]			Off
Concatenation Type [*2]			Contiguous
	LCAS [*3]		On
SLM Detection [*3]			On
Alarm Error Mask [*3]			On
Mapping			PPP
PPP	FCS		32 bit
	Scramble		On
	Descramble		On
	Minimum Flag Length		1 Byte
	Negotiation		On
		MRU Transmit	65535 (dec)
		Send This Port IP Address	On
		Retry	3 (dec)
		Timeout	3 (dec)
Cisco HDLC	FCS		32 bit
	Scramble		On
	Descramble		On
	Minimum Flag Length		2 Bytes
	MRU Transmit		65535 (dec)
MAPOS Version 1, MAPOS 16	FCS		32 bit
	Scramble		On
	Descramble		On
	Minimum Flag Length		1 Byte
	MRU Transmit		65535 (dec)
Frame-Mapped GFP [*2]	Scramble	Core Header	On
		Payload Area	On
	Descramble	Core Header	On
		Payload Area	On
	Ethernet Setting	MAC Address	00-00-00-00-00-00
		Maximum Frame Size	1518
	Check Payload Header		On
	GFP FCS		On
	Other Extension Header Length		2
	CSF Recovery		3
	cHEC Presync times		1
LEX [*2]	FCS		16 bit
	Scramble		On
	Descramble		On

Setting item			Initial value
	Flags		00 (hex)
	Minimum Flag Length		1 Byte
	Negotiation		On
		MRU Transmit	65535 (dec)
		Send startup command option	On
		MAC Address	00-00-00-00-00-00
		Retry	3 (dec)
		Timeout	3 (dec)
LAPS(X.86) *2	Minimum Flag Length		1 Byte
	MAC Address		00-00-00-00-00-00
	Maximum Frame Size		1518
	Rate Adaptation		Off
	(Addition volume: Enter the left value)		16
	(Addition period: Select the right list)		4096
Bulk	Data Field		All 0
Unframed	Test Pattern		PRBS 23
Mode			Normal
	OH Overwrite		Off
	Differential Delay *3		Off
IPv4	This Port	IP Address	0.0.0.0
		Netmask	0.0.0.0
		Gateway	0.0.0.0
	ARP Reply *2		Not send
	ICMP Echo (PING) Reply		Not send

*1: Supported by MU120119A/20A

*2: Set at EoS modules (MU120103B/04B, MU150101A)

*3: Supported by MU150101A

Concatenation (MU120103B/04B)

- **Meas. CH**

Setting item	Initial value
Multiplexing	STS-48c
Tx Meas. CH	1
Rx Meas. CH	1

- **Dummy CH**

Setting item		Initial value
C2		GFP Mapping
Payload		Copy
POH		C2: 1B (hex) Other: 00 (hex)
J1	CRC7	Off
	Trace On	Off

GFP Tx (MU120103B/04B)

• Header

Setting item		Initial value
PTI		000 (bin) Client Data
PFI		1 (bin)
EXI		0000 (bin) Null Extension Header
UPI		0000 0001 (bin) Frame-Mapped Ethernet
Extension Header	Length	2 (dec)
	Pattern	Programmable

• Client Management Frame

Setting item		Initial value
Insert Frame	Insert button	Off
	Repeat/Single selection	Single
	Insert period	100 (dec)
	Type	Loss of Signal
Interim	Type	Idle
Insert Frame Type Setting	PFI	0 (bin)
	EXI	0000 (bin) Null Extension Header
	UPI	0000 0001 (bin) Loss of Signal
Extension Header	Length	2 (dec)
	Pattern	Programmable
Payload	Length	0 (dec)
	Pattern	Programmable

Tx Stream

Setting item	Initial value
Device Type (for Latency)	Bit Forwarding (Cut Through)

• Stream control

Setting item			Initial value
Distribution			Next Stream
	Jump to ID		1 (dec)
	Count		1 (dec)
Inter Frame Gap (Value, Min, Max)			Fixed
	MU120101A/11A/21A/22A(RJ-45)/31A MU120121A/22A(RJ-45)/31A MU120102A/12A/22A(SFP)/32A MU120118A/18B/18C/38A	10 M Ethernet	9600 ns
		100 M Ethernet	960 ns
		1000 M Ethernet Gigabit Ethernet	96 ns
		10 Gigabit Ethernet	9.6 ns
	MU120120A MU120119A	155.520 M	854.7 ns
		622.080 M	213.7 ns
	MU120103A/04A/03B/04B		53.4 ns
	MU120105A/06A		13.4 ns
Inter Burst Gap	MU120101A/11A/21A/22A(RJ-45)/31A MU120121A/22A(RJ-45)/31A MU120102A/12A/22A(SFP)/32A MU120118A/18B/18C/38A	10 M Ethernet	9600 ns
		100 M Ethernet	960 ns
		1000 M Ethernet Gigabit Ethernet	96 ns
		10 Gigabit Ethernet	9.6 ns
	MU120120A MU120119A	155.520 M	1,762.8 ns
		622.080 M	440.7 ns
	MU120103A/04A/03B/04B(PPP)		110.2 ns
	MU120103B/04B(GFP)		53.4 ns
	MU120105A/06A		27.5 ns
Inter Stream Gap	MU120101A/11A/21A/22A(RJ-45)/31A MU120121A/22A(RJ-45)/31A MU120102A/12A/22A(SFP)/32A MU120118A/18B/18C/38A	10 M Ethernet	9600 ns
		100 M Ethernet	960 ns
		1000 M Ethernet Gigabit Ethernet	96 ns
		10 Gigabit Ethernet	9.6 ns
	MU120120A MU120119A	155.520 M	7,745.7 ns
		622.080 M	1,936.4 ns
	MU120103A/04A/03B/04B(PPP)		484.1 ns
	MU120103B/04B(GFP)		267 ns
	MU120105A/06A		121 ns
Frames per burst			1 (dec)
Bursts per Stream			1 (dec)

• General

Setting item				Initial value
Protocol				IPv4
Packet Length				Auto
	From			64 (dec)
	to			1518 (dec)
Background Data				All 0
VLAN				Off
	VLAN Tag 1	Tag Protocol ID		8100 (hex)
		User Priority		0 (dec)
		CFI		Reset
		VID	Value	1 (dec)
			Mask	111111111111(bin)
	VID Type			Static
MPLS				Off
	Type			MPLS Unicast
	MPLS Label 1	Label		0 (dec)=IPv4 explicit null label
		Experimental use		0 (dec)
		Time to live		0 (dec)
		Bottom of stack		Off
	Automatically set			Off
Data Link Layer Programmable				Off

• Ethernet

Setting item			Initial value
Preamble Pattern			55 55 55 55 55 55 (hex)
Preamble Size			8 (dec)
SFD			D5 (hex)
Type			Auto
	Manual	Value	0800 (hex)
Destination Address			Static
	Value		00-00-00-00-00-00
	Mask		FF-FF-FF-FF-FF-FF
Source Address			Static
	Value		00-00-00-00-00-00
	Mask		FF-FF-FF-FF-FF-FF

• MAC Control Frame

Setting item		Initial value
DA		Static
	Value	00-00-00-00-00-00
	Mask	FF-FF-FF-FF-FF-FF
SA		Static
	Value	00-00-00-00-00-00
	Mask	FF-FF-FF-FF-FF-FF
Opcode		0001 PAUSE
Parameters	Quanta Value	0 (dec)

• PPP

Setting item		Initial value
Address	PPP	FF (hex)
	Cisco HDLC	0F (hex)
	MAPOS Version 1	03 (hex)
	MAPOS 16	0003 (hex)
Control	PPP	03 (hex)
	Cisco HDLC	00 (hex)
	MAPOS Version 1	03 (hex)
Protocol		Auto
	PPP	0021 (hex)
	Cisco HDLC	0800 (hex)
	MAPOS Version 1	0021 (hex)
	MAPOS 16	0021 (hex)

• GFP

Setting item		Initial value
PTI		000 (bin) Client Data
PFI		1 (bin)
EXI		0000 (bin) Null Extension Header
UPI		0000 0001 (bin) Frame-Mapped Ethernet
Extension Header	Length	2 (dec)
	Pattern	All 0

• LAPS(X.86)

Setting item	Initial value
Address	04 (hex)
Control	03 (hex)
Protocol	Auto
	FE01 (hex)

• LEX

Setting item	Initial value
Address	FF (hex)
Control	03 (hex)
Protocol	Auto
	0041 (hex)
Flags	20 (hex)
MAC Type	01 (hex)

• LEX Control Packet

Setting item	Initial value
Address	FF (hex)
Control	03 (hex)
Code	40 (hex)
Identifier	01 (hex)

- ## IPv4

Setting item		Initial value
Type of Service	Bit0-2	000 (bin) Routine
	Bit3	0 (bin) Normal Delay
	Bit4	0 (bin) Normal Throughput
	Bit5	0 (bin) Normal Reliability
	Bit6,7	00 (bin)
Identification		0000 (hex)
Flag	Bit0	0 (bin)
	Bit1	1 (bin) Don't Fragment
	Bit2	0 (bin) Last Fragment
Fragment Offset		0 (dec)
Time to Live		64 (dec)
Protocol		Automatic setting value through Protocol Setting
Source Address	Type	Static
	Address	127.0.0.1
	Mask	255.255.255.255
Destination Address	Type	Static
	Address	127.0.0.1
	Mask	255.255.255.255

- ## IPv6

Setting item		Initial value
Traffic class		0-uncharacterized Traffic
Flow Label		00000 (hex)
Overwrite Payload Length		Off
Next Header		59 (dec)
Hop Limit		255 (dec)
Source Address	Type	Static
	Address	::
	Mask	FFFF: FFFF: FFFF: FFFF: FFFF: FFFF: FFFF: FFFF
Destination Address	Type	Static
	Address	::
	Mask	FFFF: FFFF: FFFF: FFFF: FFFF: FFFF: FFFF: FFFF

- ## TCP

Setting item		Initial value
Source Port		0 (dec)
Destination Port		0 (dec)
Sequence Number		00 00 00 00 (hex)
Acknowledgment Number		00 00 00 00 (hex)
Reserved		0 (dec)
Code bit	Bit0 URG	Off
	Bit1 ACK	Off
	Bit2 PSH	Off
	Bit3 RST	Off
	Bit4 SYN	Off
	Bit5 FIN	Off
Window		0 (dec)
Urgent Pointer		0 (dec)
Option		Null (0 byte)
Increment Port Number		None

- ## UDP

Setting item	Initial value
Source Port	0 (dec)
Destination Port	0 (dec)
Increment Port Number	None
Overwrite Length	Off
Overwrite Checksum	Off

- ## IGMP

Setting item	Initial value
Type	0x16 Version 2 Membership Report
Max Response Time	0 (dec)
Group Address	224.0.1.14 (dec)

- ## ICMP

Setting item		Initial value
Type		0 Echo Reply
Code		0 (dec)
Data	Identifier	0 (dec)
	Sequence Number	0 (dec)

- **ICMPv6**

<table>
<tr><th colspan="4">Setting item</th><th>Initial value</th></tr>
<tr><td colspan="4">Type</td><td>128 Echo Request</td></tr>
<tr><td colspan="4">Code</td><td>0 (dec)</td></tr>
<tr><td rowspan="33">Data</td><td colspan="3">Identifier</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Sequence Number</td><td>0 (dec)</td></tr>
<tr><td colspan="3">MTU</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Pointer</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Maximum Response Delay</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Multicast Address</td><td>::</td></tr>
<tr><td colspan="3">Cur Hop Limit</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Managed Address Configuration</td><td>Off</td></tr>
<tr><td colspan="3">Other Stateful Configuration</td><td>Off</td></tr>
<tr><td colspan="3">Router Lifetime</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Reachable Time</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Retrans Timer</td><td>0 (dec)</td></tr>
<tr><td colspan="2" rowspan="2">MTU</td><td></td><td>Off</td></tr>
<tr><td>Value</td><td>0 (dec)</td></tr>
<tr><td colspan="2" rowspan="2">Source Link-Layer Address</td><td></td><td>Off</td></tr>
<tr><td>Value</td><td>00-00-00-00-00-00</td></tr>
<tr><td rowspan="7">Prefix Information</td><td colspan="2"></td><td>Off</td></tr>
<tr><td colspan="2">On-Link</td><td>Off</td></tr>
<tr><td colspan="2">Autonomous Address-Configuration</td><td>Off</td></tr>
<tr><td colspan="2">Valid Life Time</td><td>0 (dec)</td></tr>
<tr><td colspan="2">Preferred Life Time</td><td>0 (dec)</td></tr>
<tr><td colspan="2">Prefix</td><td>::</td></tr>
<tr><td colspan="2">Prefix Length</td><td>0 (dec)</td></tr>
<tr><td colspan="3">Target Address</td><td>::</td></tr>
<tr><td colspan="2" rowspan="2">Source Link-Layer Address</td><td></td><td>Off</td></tr>
<tr><td>Value</td><td>00-00-00-00-00-00</td></tr>
<tr><td colspan="3">Router</td><td>Off</td></tr>
<tr><td colspan="3">Solicited</td><td>Off</td></tr>
<tr><td colspan="3">Override</td><td>Off</td></tr>
<tr><td colspan="3">Target Address</td><td>::</td></tr>
<tr><td colspan="2" rowspan="2">Target Link-Layer Address</td><td></td><td>Off</td></tr>
<tr><td>Value</td><td>00-00-00-00-00-00</td></tr>
<tr><td colspan="3">Target Address</td><td>::</td></tr>
<tr><td colspan="3">Destination Address</td><td>::</td></tr>
<tr><td colspan="2" rowspan="2">Target Link-Layer Address</td><td></td><td>Off</td></tr>
<tr><td>Value</td><td>00-00-00-00-00-00</td></tr>
</table>

- ## RIP

<table>
<tr><th colspan="4">Setting item</th><th>Initial value</th></tr>
<tr><td colspan="4">Command</td><td>1 (dec)=Request</td></tr>
<tr><td colspan="4">Version</td><td>2 (dec)=RIP version2</td></tr>
<tr><td rowspan="8">Entry</td><td rowspan="6">Normal Entry</td><td colspan="2">Address Family Identifier</td><td>0000(hex)</td></tr>
<tr><td rowspan="5">Route Information</td><td>Route Tag</td><td>0000(hex)</td></tr>
<tr><td>IP Address</td><td>0.0.0.0</td></tr>
<tr><td>Subnet Mask</td><td>0.0.0.0</td></tr>
<tr><td>Next Hop</td><td>0.0.0.0</td></tr>
<tr><td>Metric</td><td>1 (dec)</td></tr>
<tr><td rowspan="2">Authentication Entry</td><td colspan="2">Authentication Type</td><td>2-Password</td></tr>
<tr><td colspan="2">Authentication Data</td><td>Null</td></tr>
</table>

- ## IPX

<table>
<tr><th colspan="2">Setting item</th><th>Initial value</th></tr>
<tr><td colspan="2">Transport control</td><td>0 (dec)</td></tr>
<tr><td colspan="2">Packet Type</td><td>0 (dec)=Unknown</td></tr>
<tr><td rowspan="3">Destination Address</td><td>Network</td><td>00 00 00 00 (hex)</td></tr>
<tr><td>Node</td><td>00 00 00 00 00 00 (hex)</td></tr>
<tr><td>Socket</td><td>00 00 (hex)</td></tr>
<tr><td rowspan="3">Source Address</td><td>Network</td><td>00 00 00 00 (hex)</td></tr>
<tr><td>Node</td><td>00 00 00 00 00 00 (hex)</td></tr>
<tr><td>Socket</td><td>00 00 (hex)</td></tr>
</table>

- ## IS-IS

Setting item		Initial value
ID Length		0 (dec)
PDU Type		15 Level 1 LAN IS to IS Hello PDU
Maximum Area Address		0 (dec)
Reserved/Circuit Type		0 (dec)
Source ID		00 00 00 00 00 00 (hex)
Holding Time		0 (dec)
Priority		0 (dec)
LAN ID		00 00 00 00 00 00 (hex)
Local Circuit ID		0 (dec)
Remaining Lifetime		0 (dec)
LSP ID		00 00 00 00 00 00 (hex)
Sequence Number		0 (dec)
P bit		Off
LSP Database Overload		Off
ATT	Bit 4 Default Metric	Off
	Bit 5 Delay Metric	Off
	Bit 6 Expense Metric	Off
	Bit 7 Error Metric	Off
IS Type		0 Unused
Start LSP ID		00 00 00 00 00 00 (hex)
End LSP ID		00 00 00 00 00 00 (hex)

- ## ARP

Setting item	Initial value
Operation	ARP Request
Sender MAC Address	00-de-bb-00-00-00
Sender IP Address	127.0.0.1 (dec)
Target MAC Address	00-de-bb-00-00-01
Target IP Address	127.0.0.1 (dec)

• DHCP

Setting item	Initial value
Op code	1 (dec)= Boot request
Hardware Type	1 (dec)= 10 MB Ethernet
Hardware Address Length	6 (dec)= for MAC address
Hops	0 (dec)
Transaction ID	0 (dec)
Seconds	0 (dec)
Flag	:0000 (hex)=No broadcast
Client IP Address	0.0.0.0
Your IP Address	0.0.0.0
Server IP Address	0.0.0.0
Reply Agent IP Address	0.0.0.0
Client Hardware Address	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 (hex)
Server Host Name	Null
Boot File Name	Null
Option	Null (0 byte)

• Data Fields

<table>
<tr><th colspan="4">Setting item</th><th>Initial value</th></tr>
<tr><td colspan="4">Data Field 1 to Data Field 4</td><td>Off</td></tr>
<tr><td rowspan="6">Data Field Data</td><td colspan="2" rowspan="3"></td><td>Pattern</td><td>All 0</td></tr>
<tr><td>Offset</td><td>0 (dec)</td></tr>
<tr><td>Length</td><td>1 (dec)</td></tr>
<tr><td colspan="3">Programmable Header Pattern</td><td>Null (0 byte)</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Sequence No.</td><td>Offset</td><td>0 (dec)</td></tr>
<tr><td>Initial Value</td><td>0 (dec)</td></tr>
</table>

• Error Insertion

<table>
<tr><th>Setting item</th><th>Initial value</th></tr>
<tr><td>Ethernet/PoS/EOS</td><td rowspan="3">(None)</td></tr>
<tr><td>IP</td></tr>
<tr><td>TCP/UDP</td></tr>
</table>

Impairment

Setting item	Initial value
Filter	Off
Loss	
Overwrite/Error	
Delay	
Line Error	

• Filter

Setting item	Initial value
Pattern 1 to Pattern 4	don’t care
Error	
Test Frame	
Unmatched Frames	Discard

• Loss

Setting item	Initial value
Type	Rate
Rate	1.0000 %

• Overwrite/Error Insertion

Setting item	Initial value
Type	Overwrite
Timing	Rate
Rate	0.0000%

• Delay

Setting item	Initial value
Type	Fixed Delay
Range	500 ms
Delay	0.01 ms

• Line Error

Setting item		Initial value
Type	MU120121A	Code
	MU120122A	8B/10B Code

SDH/SONET TX

• OH Preset

Setting item		Initial value
CH		1 (dec)
SOH		A1:F6 (hex) A2:28 (hex) J0/Z0:01 (hex)*1 Others: 00 (hex)
POH		C2:16 (hex) Others: 00 (hex)
S1		00 (hex) Quality Unknown
C2		FE (hex) Mapping of HDLC/PPP framed signals
J0	CRC7	Off
	Trace On	Off
	J0	TRACE PATTERN Anritsu MD1230B Data Quality Analyzer
J1	CRC7	Off
	Trace On	Off
	J0	TRACE PATTERN Anritsu MD1230B Data Quality Analyzer

*1: When SDH and SOH CH: 1 are set, J0: 01 (hex) is used.
When SOH CH: 2 to 64 are set, Z0: 02 (hex) to 40 (hex) (hex value of SOH CH) are used.
In addition, all X18 and X19 are AA (hex).
When SONET and the MU120105A/06A: TOH CH: 1 to 64 are set, J0: 01 (hex) to 40 (hex), Z0: 41 (hex) to 80 (hex), Z0: 81 (hex) to C0 (hex) are used.
When the MU120103A/04A/03B/04B: TOH CH: 1 to 16 are set, J0: 01 (hex) to 10 (hex), Z0: 11 (hex) to 20 (hex), Z0: 21 (hex) to 30 (hex) are used.

• Alarm, Error

Setting item		Initial value
Alarm Insertion	Type	Off
	Timing	Single
	Burst Size	1 (dec)
	Alarm	0 (dec)
	Normal	1 (dec)
Error Insertion	Type	Off
	Timing	Single
	Burst Size	1 (dec)
	Rate	1E-3
	Programmed Rate(a*E-b)	a = 1.0, b = 3
	Error	0 (dec)
	Normal	1 (dec)

• K1, K2

Setting item		Initial value
K1	Value	01 (hex)
	Bit1-4	0000, No Request (NR)
	Bit5-8	(G.783)0001,Working channel #1 (G.841)0001,Destination Node Identification
K2	Value	18 (hex)
	Bit1-4	(G.783) 0001,Working channel #1 (G.841) 0001,Source Node Identification
	Bit5	(G.783) 1,1:N (G.841) 1,Long path code
	Bit6-8	(G.783) 000 (G.841) 000,Idle
Pointer Setting	NDF	0110 (bin)
	SS	SDH:10 (bin) SONET:00 (bin)
	Pointer	0 (dec)

• APS Sequence Generator

Setting item	Initial value
Sequence Mode	Single

- ## APS Setting

Setting item		Initial value
K1	Value	01 (hex)
	Bit1-4	0000,No Request (NR)
	Bit5-8	(G.783) 0001, Working channel #1 (G.841) 0001, Destination Node Identification
K2	Value	18 (hex)
	Bit1-4	(G.783) 0001,Working channel #1 (G.841) 0001, Source Node Identification
	Bit5	(G.783) 1,1:N (G.841) 1, Long path code
	Bit6-8	(G.783) 000 (G.841) 000, Idle
Frame		1 (dec)

SDH/SONET RX

- ## OH Monitor

Setting item	Initial value
CH	1 (dec)
Member	1 (dec)

- ## K1,K2,Pointer Monitor

Setting item	Initial value
Resolution	1 s
Member	1 (dec)

- ## APS Switch Time

Setting item		Initial value
Trigger	Error	B1
	Alarm	LOF
	Threshold	1 ms

- ## APS Sequence Capture

Setting item		Initial value
Trigger	Error	B1
	Alarm	LOF
	Trigger Position	64 (dec)

Capture

- ## Filter

<table>
<tr><th colspan="2">Setting item</th><th>Initial value</th></tr>
<tr><td rowspan="6">Condition</td><td></td><td>Off</td></tr>
<tr><td>Source IP</td><td rowspan="5">don’t care</td></tr>
<tr><td>Destination IP</td></tr>
<tr><td>Pattern 1</td></tr>
<tr><td>Pattern 2</td></tr>
<tr><td>Error condition</td></tr>
</table>

- ## Trigger

<table>
<tr><th colspan="3">Setting item</th><th>Initial value</th></tr>
<tr><td rowspan="12">Condition</td><td colspan="2"></td><td>Off</td></tr>
<tr><td colspan="2">Source IP</td><td rowspan="5">don’t care</td></tr>
<tr><td colspan="2">Destination IP</td></tr>
<tr><td colspan="2">Pattern 1</td></tr>
<tr><td colspan="2">Pattern 2</td></tr>
<tr><td colspan="2">Error condition</td></tr>
<tr><td colspan="2">External Trigger</td><td>Off</td></tr>
<tr><td rowspan="2">Traffic out of range</td><td></td><td>Off</td></tr>
<tr><td>over</td><td>90%</td></tr>
<tr><td rowspan="2">Latency is out of range</td><td></td><td>Off</td></tr>
<tr><td>over</td><td>100 ms</td></tr>
<tr><td colspan="2">Trigger Position</td><td>Top</td></tr>
</table>

Counter

- ## Filter

<table>
<tr><th colspan="3">Setting item</th><th>Initial value</th></tr>
<tr><td colspan="3">On</td><td>Off</td></tr>
<tr><td rowspan="7">Condition</td><td rowspan="2">Other than MU120121A/ 21A/31A/32A/ 38A</td><td>Source IP</td><td>don’t care</td></tr>
<tr><td>Destination IP</td><td>don’t care</td></tr>
<tr><td rowspan="2"></td><td>Pattern 1</td><td>don’t care</td></tr>
<tr><td>Pattern 2</td><td>don’t care</td></tr>
<tr><td rowspan="2">MU120121A/ 21A/31A/32A/ 38A</td><td>Pattern 3</td><td>don’t care</td></tr>
<tr><td>Pattern 4</td><td>don’t care</td></tr>
<tr><td></td><td>Error</td><td>don’t care</td></tr>
</table>

- ## Flow Counter (MU120131A/32A/38A)

Setting item	Initial value
Tx/Rx	Rx
Field	Null
Flow ID to Monitor	Null

- ## Other

Setting item	Initial value
Quality of Service Counters	IP ToS Field [QoS 0-7 = Priority 0-7]
Line Error Counter	8B/10B Code Error

Multiflow Counter (MU120121A/22A)

• Multiflow Counter Setting

Setting item				Initial value
Field Setting	Tx/Rx			Rx
	Flow Count Field	Type		User Defined
		Base Position		Top of Frame
		Offset		0 byte
				0 bit
		Length		16 bit
	Flow ID to Monitor	Flow ID	No.1	0
			···	···
			No.32	31
		Format		Decimal
Filter	Filter On			Off
		Condition	Source MAC	don't care
			Destination MAC	don't care
			Pattern 1	don't care
			Pattern 2	don't care
			Error condition	don't care

• Sort Multiflow Counter

Setting item	Initial value
Sort by	Flow ID
Order	Ascend

Variation

- ## Frame Arrival Time/Latency Variation Setting

Setting item	Initial value
Offset	0
Resolution	1 ms

- ## Arrival Time/Latency (Filter) Setting (MU120121A/22A/31A/32A/38A)

Setting item	Initial value
On	Off
Pattern 1 to Pattern 4, Error	don't care

Filter/Trigger/Counter Condition Setting

Setting item		Initial value
Source MAC, Destination MAC [*1]	Address	00-00-00-00-00-00
	Mask	
Source IP, Destination IP [*2]	Address	0.0.0.0
	Mask	
Pattern 1, Pattern 2	Base Position [*3]	Top of Frame
	Offset	0 (dec)
	Pattern	0000 0000 (hex) [*4]
	Mask	0000 0000 0000 0000 0000 0000 0000 0000 (hex) [*5]
Pattern 3, Pattern 4 [*6]	Base Position	Top of Frame
	Offset	0 (dec)
	Pattern	0000 0000 0000 0000 0000 0000 0000 0000 (hex)
	Mask	
Error Type		Good Frame
Combination		And

*1: MU120101A/02A/03B/04B/11A/12A/18A/18B/18C

*2: MU120103A/03B/04A/04B05A/06A/19A/20A

*3: MU120103B/04B/11A/12A/18A/18B/18C/21A/22A/31A/32A/38A

*4: MU120101A/02A/03A/04A/05A/06A/19A/20A, MU120103B/04B

*5: MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A

*6: MU120121A/22A/31A/32A/38A

IGMP (MU120101A/02A/03A/04A/05A/06A/19A/20A/03B/04B)

Setting item		Initial value
Options	IGMP Version	1 (dec)
	Send Router Alert	Off
Report method		Report To One When Queried
	Frequency	10 (dec)
Multicast Group Address Range	Group IP Address From	0.0.0.0
	Number of consecutive Addresses	1 (dec)
Unicast Address Range	Group IP Address From	0.0.0.0
	Number of consecutive Addresses	1 (dec)

BGP4

Setting item		Initial value
Options	Number of OPEN Retries	0 (dec)
	OPEN Retry Interval	10 (dec)

• Neighbor Configuration

Setting item		Initial value
Neighbor IP Address		0.0.0.0
Neighbor AS Number		65000 (dec)(*1)
DUT IP Address		0.0.0.0
KEEPALIVE Frequency		60 (dec)(*1)
UPDATE Frequency		180 (dec)(*1)
Link Flap		Off
	Frequency to Drop	10 (dec)
	Drop Time	10 (dec)

*1: The initial value is 0 for the BGP4 function of the MU120101A/02A/03A/04A/05A/03B/04B.

• Route Configuration

Setting item		Initial value
Network Number		0.0.0.0
Prefix	from	16 (dec)
	thru	24 (dec)
Number of Routes		0 (dec)
Prefixes per Packet		100 (dec)
Route Flap		Off
	Frequency to Drop	10 (dec)
	Drop Time	10 (dec)

• Route Attributes

Setting item			Initial value
AS-Path			On (*1)
	AS Sequence	No.1	65000 (dec)
		No.2 and subsequence	Empty (blank)
	AS Set		Off
	AS Confederation Seq		Off
	AS Confederation Set		Off
Next Hop			On (*1)
	Address		0.0.0.0
Origin			On (*1)
	Value		IGP
Local Pref			Off
	Value		0 (dec)
Multi Exit Disc			Off
	Value		0 (dec)
Communities			Off
	Value		Null
Atomic Aggregate			Off
Aggregator			Off
	IP		0.0.0.0
	AS		65000 (dec)(*2)
Originator ID			Off
	Value		0.0.0.0
Cluster List			Off
	Value		Null

*1: The initial value is Off for the BGP4 function of the MU120101A/02A/03A/04A/05A/03B/04B.

*2: The initial value is 0 for the BGP4 function of the MU120101A/02A/03A/04A/05A/03B/04B.

MLD (MU120101A/02A/03A/04A/05A/06A/19A/20A/03B/04B)

Setting item		Initial value
Options	Router Alert	ON
Report Method		Report to One When Queries
	Frequency	10
Multicast Group Address Range	Group IPv6 Address	FF00::0000
	Number of Address	1
Unicast Address Range	IPv6 Address	0000::0000
	Number of Address	1

LDP/CR-LDP

Setting item		Initial value
Options	T bit (Targeted Hello)	OFF
	R bit (Request Send Targeted Hellos)	OFF
	A bit (Label Advertisement Discipline)	OFF
	D bit(Loop Detection)	OFF
	Hello Hold Time	10 s
	Hello Adjacency IPv4 Address	0.0.0.0
	Keep Alive Time	30 s
	Max PDU Length	4096
LSR Type		LDP
Label Advertise Information	Starting Label No.	1

• Edit LDP/CR-LDP LSR

Setting item		Initial value
LSR Information	Type	IPv4 Address
	Value	0.0.0.0

• Edit Label Advertise Information

Setting item		Initial value
FEC Type		IPv4 Prefix
Network Number		0.0.0.0
Prefix	from	0
	thru	0

• Edit Explicit Route Information

Setting item		Initial value
Local CR-LSP ID		1
Route Information	Type	IPv4 Address
	L bit	0
	Value	0.0.0.0

RSVP

Setting item		Initial value
LSR Information	DUT IP Address	0.0.0.0
	Prefix	0
Edge Information	Hello Message	OFF
	Hello Interval	30 s
	RSVP Confirmation	OFF
	Refresh Period	10 s
	Style	FF
	Timer K	3

• Edit RSVP LSR

Setting item		Initial value
LSR Information	Type	IPv4 Address
	IPv4 Address	0.0.0.0
	Local LSP-ID	0 (When LSPID is selected for Type)
	Ingress LSR Router ID	0.0.0.0 (When LSPID is selected for Type)
	AS Number	0 (When As Number is selected for Type)

• Path Information Property of Edit RSVP Path Information

Setting item		Initial value
Session	Tunnel End Point Address	0.0.0.0
	Tunnel ID	1 (Generated automatically)
	L3PID	0800-Internet IP
	LSP ID	0
Sender T Spec	Token Bucket Rate	0 bit/s
	Token Bucket Size	0 bit/s
	Peak Data Rate	0 bit/s
	Minimum Policed Unit	0
	Maximum Packet Size	0
Record Route		OFF
TTL		255

• Session Attribute Property of Edit RSVP Path Information

Setting item		Initial value
Session Attribute		OFF
Start Priority		0
Hold Priority		0
Flags	Local Protection Desired	OFF
	Label Recording Desired	OFF
	SE Style Desired	OFF
Session Name		(blank)
Resource affinities		OFF
Resource affinities	Exclude-any	0
	Include-any	0
	Include-all	0

• Explicit Route Property of Edit RSVP Path Information

Setting item		Initial value
Explicit Route		OFF
Entry 1 data	Type	IPv4 Address
	L bit	Strict
	Address	0.0.0.0
	Prefix Length	0
	Local LSP-ID	0 (When LSPID is selected for Type)
	Ingress LSR Router ID	0.0.0.0 (When LSPID is selected for Type)
	AS Number	0 (When As No is selected for Type)

OSPF

• Edit OSPF Table

Setting item			Initial value
Interface	IP Address		0.0.0.0
	Router ID		0
	Area ID		0
	Network Mask		0.0.0.0
	Options	Support Demand Circuits	Off
		External Attributes	Off
		Multicast Capacity	Off
		NSSA Capacity	Off
		External Routing	On
	Hello Interval		30
	Router Priority		0
	Router Dead Interval		180
	Authentication	Password	Null

• Edit Router LSA

Setting item			Initial value
Header Information	Link State ID		0.0.0.0
	Advertising Router ID		0.0.0.0
	Options	Support Demand Circuits	Off
		External Attributes	Off
		Multicast Capacity	Off
		NSSA Capacity	Off
		External Routing	On
Router LSA Setting	Link ID	Link ID	0.0.0.0
		Prefix Length	1
		Prefix Range	1
	Link Data	Link Data	0.0.0.0
		Prefix Length	1
		Prefix Range	1
	Type		Point-to-Point
	Metric		1
	Bit Fields	V (Virtual Link Endpoint)	Off
		E (AS Boundary Router)	Off
		B (Border Router)	Off

• Edit Summary Network LSA

<table>
<tr><th colspan="3">Setting item</th><th>Initial value</th></tr>
<tr><td rowspan="7">Header Information</td><td colspan="2">Link State ID</td><td>0.0.0.0</td></tr>
<tr><td colspan="2">Advertising Router ID</td><td>0.0.0.0</td></tr>
<tr><td rowspan="5">Options</td><td>Support Demand Circuits</td><td>Off</td></tr>
<tr><td>External Attributes</td><td>Off</td></tr>
<tr><td>Multicast Capacity</td><td>Off</td></tr>
<tr><td>NSSA Capacity</td><td>Off</td></tr>
<tr><td>External Routing</td><td>On</td></tr>
<tr><td rowspan="2">Summary Network LSA Setting</td><td colspan="2">Network Mask</td><td>0.0.0.0</td></tr>
<tr><td colspan="2">Metric</td><td>1</td></tr>
</table>

• Edit Summary ASBR LSA

<table>
<tr><th colspan="3">Setting item</th><th>Initial value</th></tr>
<tr><td rowspan="7">Header Information</td><td colspan="2">Link State ID</td><td>0.0.0.0</td></tr>
<tr><td colspan="2">Advertising Router ID</td><td>0.0.0.0</td></tr>
<tr><td rowspan="5">Options</td><td>Support Demand Circuits</td><td>Off</td></tr>
<tr><td>External Attributes</td><td>Off</td></tr>
<tr><td>Multicast Capacity</td><td>Off</td></tr>
<tr><td>NSSA Capacity</td><td>Off</td></tr>
<tr><td>External Routing</td><td>On</td></tr>
<tr><td>Summary ASBR LSA Setting</td><td colspan="2">Metric</td><td>1</td></tr>
</table>

- ## Edit AS External LSA

Setting item			Initial value
Header Information	Link State ID		0.0.0.0
	Advertising Router ID		0.0.0.0
	Options	Support Demand Circuits	Off
		External Attributes	Off
		Multicast Capacity	Off
		NSSA Capacity	Off
		External Routing	On
AS External LSA Setting	Network Mask		0.0.0.0
	Forwarding Address	Address	0.0.0.0
		Prefix Length	1
		Prefix Range	1
	External Route Tag		1
	Metric		1
	Bit E		Type1

- ## Edit NSSA External LSA

Setting item			Initial value
Header Information	Link State ID		0.0.0.0
	Advertising Router ID		0.0.0.0
	Options	Support Demand Circuits	Off
		External Attributes	Off
		Multicast Capacity	Off
		NSSA Capacity	Off
		External Routing	On
AS External NSSA Setting	Network Mask		0.0.0.0
	Forwarding Address	Address	0.0.0.0
		Prefix Length	1
		Prefix Range	1
	External Route Tag		1
	Metric		1
	Bit E		Type1

- **Edit Network LSA**

Setting item			Initial value
Header Information	Link State ID		0.0.0.0
	Advertising Router ID		0.0.0.0
	Options	Support Demand Circuits	Off
		External Attributes	Off
		Multicast Capacity	Off
		NSSA Capacity	Off
		External Routing	On
Network LSA Setting	Network Mask		0.0.0.0
	Attached Router		None

Error Insertion

- **Error Insertion**

Setting item	Initial value
Type	Bit all (Unframed) Line Error (8B/10B CODE Error) (Framed, MU120122A(SFP)/32A) Cross PRBS Error (Framed, MU120131A) Line Error (XGMII) (Framed, MU120138A)
Timing	Single
Rate	1E-3
Programmed Rate	1.0E - 3

Auto Negotiation

- **Capture Setting**

Setting item		Initial value
Trigger Pattern		Off
	1st Code	D 0.0
	2nd Code	D 0.0

- **Auto Negotiation Display Filter**

Setting item		Initial value
Filter Condition		Off
	Port	Port 1&2
	Pattern	All Events

LFS

- ## LFS Capture Setting

Setting item			Initial value
Trigger Pattern			Off
	Lane 0 to 4	TXC	0 (hex)
		TXD	00 (hex)

- ## LFS Display Filter

Setting item		Initial value
Filter Condition		Off
	Port	Port 1&2
	Pattern	All

RFC2544 Automatic Test Setting

• Port Pairs

Setting item	Initial value
Traffic Distribution	One to One
Traffic orientation	Unidirectional
Mesh Type	Peak Loading
VLAN Tag	Off
VLAN ID	1

• Test Configuration

Setting item				Initial value
Test Frame	Frame Size to Use			Default
		Custom	Size	No.1:64 (dec) No.2 to 25: None
		Step	Start from	64 (dec)
			Step Size	1 (dec)
			Count	1 (dec)
	Protocol			IP
	Version of IP			IPv4
	Device Type			Store and Forward
Learning Frames	Learning Mode			Once
	Retries			1 (dec)
Benchmarks	Throughput			On
	Latency			On
	Frame Loss Rate			On
	Back-to-back Frames			On
	System Recovery			On
	Reset			Off

- ## Throughput

Setting item		Initial value
Duration		60 (dec)
Number of Trials		1 (dec)
Burst Size		1 (dec)
Frame Rate	Initial Rate	100.00 (dec)
	Minimum Rate	0.10 (dec)
	Maximum Rate	100.00 (dec)
	Resolution	0.50 (dec)
Loss tolerance		0.0000 (dec)

- ## Latency

Setting item		Initial value
Duration		120 (dec)
Number of Trials		1 (dec)
Burst Size		1 (dec)
Frame Rate		Result of Throughput Rate
	Initial Rate	50.00 (dec)
	Step Rate	10.00 (dec)
	Step Count	6 (dec)

- ## Frame Loss Rate

Setting item		Initial value
Duration		60 (dec)
Number of Trials		1 (dec)
Burst Size		1 (dec)
Frame Rate	Initial Rate	100.00 (dec)
	Step Rate	10 (dec)

- ## Back-to-back Frames

Setting item		Initial value
Duration		2 (dec)
Number of Trials		50 (dec)
Burst Size		1 (dec)
Frame Rate		100%
	Initial Rate	100.00 (dec)
	Step Rate	10.00 (dec)
	Step Count	10 (dec)
Loss tolerance		0.0000 (dec)

- **System Recovery**

Setting item		Initial value
Duration		60 (dec)
Number of Trials		1 (dec)
Burst Size		1 (dec)
Threshold Time		1 (dec)
Overload Rate		110% of Throughput Rate
	Specify Value	50.00 (dec)
Moderate Rate		50.00 (dec)

- **Reset**

Setting item	Initial value
Port Pair to Use	None
Frame Rate	100.00 (dec)
Burst Size	1 (dec)

RFC2889 Automatic Test Setting

Setting item	Initial value
Benchmark	Fully Meshed Throughput, Frame Loss and Forwarding Rates
VLAN Tag	Off
VLAN ID	1
Traffic Distribution	One to Many
Local Traffic	Off
Burst Size	1
Inter Frame Gap	12 byte
Addresses per Port	1
Duration	30 s
ILoad	100.00%
Step Size	1 frames/s
Age Time	300 s
Address Learning Rate	50 frames/s
Initial Addresses	1
Initial Address Learning Rate	50 frames/s
Number of Address	1
Frame Size to Use	64, 128, 256, 512, 1024, 1280, 1518 byte

B. Corresponding SDH/SONET Terms List

	SDH	SONET
OH byte	SOH	TOH
	F3	Z3
	K3	Z4
	N1	Z5
	AU Pointer	STS Pointer
Error	MS-REI	REI-L
	HP-REI	REI-P
Alarm	MS-AIS	AIS-L
	MS-RDI	RDI-L
	MS-TIM	TIM-L
	AU-AIS	AIS-P
	AU-LOP	LOP-P
	HP-SLM	SLM-P
	HP-TIM	TIM-P
	HP-RDI	RDI-P
	HP-UNEQ	UNEQ-P

C. Corresponding K1 and K2 Bytes List

ITU-T G.783 K1 and K2 Bytes generation rule

K1	Bits 1 to 4	Bits 5 to 8
0000	No request	Null channel
0001	Do not revert	Working channel #1
0010	Reverse request	Working channel #2
0011	Unused	Working channel #3
0100	Exercise	Working channel #4
0101	Unused	Working channel #5
0110	Wait to restore	Working channel #6
0111	Unused	Working channel #7
1000	Manual switch	Working channel #8
1001	Unused	Working channel #9
1010	SD-Low priority	Working channel #10
1011	SD-High priority	Working channel #11
1100	SF-Low priority	Working channel #12
1101	SF-High priority	Working channel #13
1110	Forced Switch	Working channel #14
1111	Lockout of protection	Extra traffic channel

<table>
<tr><th>K2</th><th>Bits 1 to 4</th><th>Bit 5</th><th>Bits 6 to 8</th></tr>
<tr><td>0000</td><td>Null channel</td><td rowspan="8">1+1</td><td rowspan="6">Reserved</td></tr>
<tr><td>0001</td><td>Working channel #1</td></tr>
<tr><td>0010</td><td>Working channel #2</td></tr>
<tr><td>0011</td><td>Working channel #3</td></tr>
<tr><td>0100</td><td>Working channel #4</td></tr>
<tr><td>0101</td><td>Working channel #5</td></tr>
<tr><td>0110</td><td>Working channel #6</td><td>MS-RDI</td></tr>
<tr><td>0111</td><td>Working channel #7</td><td>MS-AIS</td></tr>
<tr><td>1000</td><td>Working channel #8</td><td rowspan="8">1: N</td><td rowspan="6">Reserved</td></tr>
<tr><td>1001</td><td>Working channel #9</td></tr>
<tr><td>1010</td><td>Working channel #10</td></tr>
<tr><td>1011</td><td>Working channel #11</td></tr>
<tr><td>1100</td><td>Working channel #12</td></tr>
<tr><td>1101</td><td>Working channel #13</td></tr>
<tr><td>1110</td><td>Working channel #14</td><td>MS-RDI</td></tr>
<tr><td>1111</td><td>Extra traffic channel</td><td>MS-AIS</td></tr>
</table>

ITU-T G.841 K1 and K2 Bytes generation rule

	Bits 1 to 4	Bits 5 to 8
0000	No Request NR	Destination Node Identification
0001	Reverse Request (Ring) RR-R	
0010	Reverse Request (Span) RR-S	
0011	Exerciser (Ring) EXER-R	
0100	Exerciser (Span) EXER-S	
0101	Wait-To-Restore WTR	
0110	Manual Switch (Ring) MS-R	
0111	Manual Switch (Span) MS-S	
1000	Signal Degrade (Ring) SD-R	
1001	Signal Degrade (Span) SD-S	
1010	Signal Degrade (Protection) SD-P	
1011	Signal Fail (Ring) SF-R	
1100	Signal Fail (Span) SF-S	
1101	Forced Switch (Ring) FS-R	
1110	Forced Switch (Span) FS-S	
1111	Lockout of Protection (Span) LP-S or Signal Fail (Protection) SF-P	

Bits 1 to 4	Bit 5		Bits 6 to 8	
Source Node Identification	0	Short path code (S)	000	Idle
			001	Bridged (Br)
			010	Bridged and Switched (Br&Sw)
			011	Extra Traffic on protection channels
	1	Long path code (L)	100	Reserved for future use
			101	Reserved for future use
			110	MS-RDI
			111	MS-AIS

D. Calculation Formula

[1] Inter-Frame Gap (IFG) Conversion Formula

When the transmitted frame length is set to Auto or Fixed, IFG (inter-frame gap) can be set with time, %, fps (frame/s), bps (bit/s), or byte unit.

$$Second(s) = \frac{IFG}{MediaSpeed}$$

$$Percent(\%) = \frac{PreambleSize + FrameSize + GapSize_{\min} + StretchGap}{PreambleSize + FrameSize + GapSize} \times 100$$

$$FramePerSecond(fps) = \frac{MediaSpeed}{PreambleSize + FrameSize + GapSize}$$

$$BitPerSecond(bit/s) = fps \times FrameSize \times 8$$

Item	Description	
MediaSpeed	Line speed at the target port (byte/s)	
	MU120101A/11A/21A/31A MU120122A RJ-45 Port (10M Ethernet)	1,250,000
	MU120101A/11A/21A/31A MU120122A RJ-45 Port (100M Ethernet)	12,500,000
	MU120121A/22A/31A MU120122A RJ-45 Port (1000M Ethernet)	125,000,000
	MU120102A/12A/32A MU120122A SFP Port	125,000,000
	MU120103A/04A/03B/04B	299,520,000
	MU120105A/06A	1,198,080,000
	MU150101A	299,520,000 (2488M) 74,880,000 (622M) 18,720,000 (156M)
	MU120118A/18B/18C/38A (10GBASE-SR, LR, ER, LW)	1,250,000,000
	MU120119A (155.520M)	18,720,000
	MU120119A (622.080M)	74,880,000
	MU120120A	18,720,000

(For Contiguous / Virtual Concatenation)

<table>
<tr><th>Item</th><th colspan="3">Description</th></tr>
<tr><td rowspan="19">MediaSpeed</td><td colspan="3">Line speed for the set Multiplexing (byte/s)</td></tr>
<tr><td colspan="2">STS-48c</td><td>299,520,000</td></tr>
<tr><td colspan="2">STS3c-8v / STS-24c</td><td>149,760,000</td></tr>
<tr><td colspan="2">STS3c-7v</td><td>131,040,000</td></tr>
<tr><td colspan="2">STS3c-6v</td><td>112,320,000</td></tr>
<tr><td colspan="2">STS3c-5v</td><td>93,600,000</td></tr>
<tr><td colspan="2">STS3c-4v / STS-12c</td><td>74,880,000</td></tr>
<tr><td colspan="2">STS3c-3v / STS-9c</td><td>56,160,000</td></tr>
<tr><td colspan="2">STS3c-2v / STS-6c</td><td>37,440,000</td></tr>
<tr><td colspan="2">STS-3c</td><td>18,720,000</td></tr>
<tr><td colspan="2">STS1c-24v</td><td>145,152,000</td></tr>
<tr><td colspan="2">STS1c-21v</td><td>127,008,000</td></tr>
<tr><td colspan="2">STS1c-18v</td><td>108,864,000</td></tr>
<tr><td colspan="2">STS1c-15v</td><td>90,720,000</td></tr>
<tr><td colspan="2">STS1c-12v</td><td>72,576,000</td></tr>
<tr><td colspan="2">STS1c-9v</td><td>54,432,000</td></tr>
<tr><td colspan="2">STS1c-6v</td><td>36,288,000</td></tr>
<tr><td colspan="2">STS1c-3v</td><td>18,144,000</td></tr>
<tr><td colspan="2">STS-1</td><td>6,048,000</td></tr>
<tr><td rowspan="2">PreambleSize</td><td colspan="2">MU120101A/02A/11A/12A/18A/
18B/18C/21A/22A/31A/32A/38A</td><td>Value set in Frame Setting</td></tr>
<tr><td colspan="2">MU120103A/04A/05A/06A
/19A/20A/03B/04B/MU150101A</td><td>0</td></tr>
<tr><td>FrameSize</td><td colspan="3">Frame length (byte)</td></tr>
<tr><td>GapSize</td><td colspan="3">$GapSize(byte) = IFG + StretchGap$</td></tr>
<tr><td rowspan="2">StretchGap</td><td>10GbE
WAN-PH
Y</td><td colspan="2">$\dfrac{PreambleSize + FrameSize + GapSize_{min}}{13}$</td></tr>
<tr><td>Others</td><td colspan="2">0</td></tr>
<tr><td rowspan="5">GapSize min</td><td colspan="3">Minimum IFG (byte)</td></tr>
<tr><td colspan="2">MU120101A/02A/11A/12A/18A/
18B/18C/21A/22A/31A/32A/38A</td><td>12</td></tr>
<tr><td colspan="2">MU120103A/04A/05A/06A/
19A/20A/MU150101A</td><td>Value set in Port Setting</td></tr>
<tr><td rowspan="2">MU120103B/
04B/
MU150101A</td><td>PPP/MAPOS/
Cisco HDLC/
LAPS/LEX</td><td>Value set in Port Setting</td></tr>
<tr><td>GFP</td><td>0</td></tr>
</table>

[2] Calculation Formula for Operation Counter

Counter item	Calculation formula
Frame Loss	A–B
Frame Loss Rate [%]	(A–B) / A×100
Received Bit Rate [Mbps]	C×8 / RXTIME / 1000000
Received Average Frame Size [byte]	C / B
Service Disruption Time [s]	(A–B) / D

A: Total value of the Transmitted Frame - Accumulated counter of the transmission port.

B: Total value of the Received Frame - Accumulated counter of the reception port.

C: Total value of the Received Byte - Accumulated counter of the reception port.

D: Total value of the Transmitted Frame (fps) - Current counter of the transmission port.

RXTIME: Total value of the counter measurement time (Elapsed Time) of the reception port (unit: s).

E.1 Unit Options

The options that can be added to the main frame and control software as well as the modules that can be used with these options are listed in the following table. The Supported Module column indicates the module(s) using the option functions.

Option Number	Option Name	Supported Module	Remarks
MD1230B-01 MP1590B-01 MX123001A-07 MX159001B-01	RS-232C Control	-	
MD1230B-02 MP1590B-02 MX123001A-09 MX159001B-02	GPIB Control	-	
MD1230B-03 MP1590B-03 MX123001A-10 MX159001B-03	Ethernet Control	-	
MD1230B-04 MX123001A-01	Decode Module	-	
MD1230B-05	GPS Module	-	
MD1230B-06 MX123001A-06	TCL Interface	-	
MD1230B: MX123002A MX123001A: MX123003A	Expert Analysis Module	-	
MD1230B-07 MP1590B-07 MU159101-07	OSPF Protocol	MU120111A/12A/18A/18B/18C/21A/22A	
MD1230B-08 MP1590B-08 MU159101A-08	MPLS (LDP/CR-LDP) Protocol	MU120111A/12A/18A/18B/18C/21A/22A	
MD1230B-09 MP1590B-09 MU159101A-09	MPLS (RSVP) Protocol	MU120111A/12A/18A/18B/18C/21A/22A	
MD1230B-10 MP1590B-10 MU159101A-10	RFC2889 Benchmarking Test	MU120102A/11A/12A/18A/18B/18C/21A/22A/31A/32A/38A	
MD1230B-11 MP1590B-11 MU159101A-11	Packet BER Test	MU120102A/11A/12A/18A/18B/18C/21A/22A/31A/32A/38A, MU120103A/03B/04A/04B/05A/06A/19A/20A, MU150101A	
MD1230B-12 MP1590B-12 MU159101A-12	IPV6 Expansion	MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A	
MD1230B-13 MP1590B-13	XENPAK Test	MU120118A/18B/18C	The MU120138A has the same

Option Number	Option Name	Supported Module	Remarks
MU159101A-13			functions as standard.
MD1230B-14 MP1590B-14 MU159101A-14	IGAP Protocol	MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A	
MD1230B-15 MP1590B-15 MU159101A-15	Auto Negotiation Analysis	MU120112A/22A/32A	
MD1230B-16 MP1590B-16 MU159101A-16	Link Fault Signaling	MU120118A/18B/18C	The same functions of the MU120138A are a module option (not a unit option).
MD1230B-17 MP1590B-17 MU159101A-17	Traffic Impairment Emulator	MU120121A/22A	
MD1230B-18	OSPFv3 Protocol	MU120111A/12A/18A/18B/18C/21A/22A	Requires IPv6 Expansion option
MD1230B-19	BGP4+ Protocol	MU120111A/12A/18A/18B/18C/21A/22A	Requires IPv6 Expansion option
MD1230B-20 MP1590B-20 MU159101A-20	Application Traffic Monitor	MU120112A/21A/22A/31A/32A	
MD1230B-21	PIM-SMv2 Protocol	MU120111A/12A/18A/18B/18C/21A/22A	Requires IPv6 Expansion option when using PIM with IPv6.
MD1230B-22	MLDA Protocol	MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A	Requires IPv6 Expansion option
MD1230B-23	Spanning Tree/Link Aggregation	MU120111A/12A/18A/18B/18C/21A/22A/31A/32A/38A	
MD1230B-26	PPPoE	MU120121A/22A	
MD1230B-28 MP1590B-28 MU159101A-28	Ethernet OAM	MU120121A/22A/31A/32A/38A	

E.2 Module Options

The options added by modules are listed below.

Option Number	Option Name	Remarks
MU120119A-01 MU120120A-01	Optical Power Meter	
MU120103B-01 MU120104B-01	EOS Mapping	
MU120118A-01 MU120118B-01 MU120118C-01	WAN-PHY	
MU120131A-01 MU120132A-01 MU120138A-01	Clock Measurement	
MU120103B-02 MU120104B-02	Virtual Concatenation	
MU120131A-02	PoE	
MU120138A-03	Link Fault Signaling	The same functions of the MU120118A/18B/18C are a main-frame option (not a module option).
MU150101A-06	GFP-F/LEX/LAPS	
MU150101A-07	POS	
MU150101A-11	HO Virtual Concatenation	
MU150101A-12	LO Virtual Concatenation	
MU150101A-13	LCAS	
MU150101A-14	Differential Delay	

F. Counter Item List

Item	Description
Transmitted Frame	Number of transmitted frames (without distinguishing normal or error frames)
Transmitted byte	Number of transmitted bytes (from Ethernet Frame)
Received Frame	Frame that is from 64 bytes to a user-defined size and with valid FCS.
Received Byte	Number of received bytes (from Ethernet Frame)
Fragments	Received frame that under 64 bytes in size and with invalid FCS.
Undersize	Received frame that under 64 bytes in size and with valid FCS.
Oversize	Received frame that exceeds the user-defined size and with valid FCS.
Oversize & FCS Error	Received frame that exceeds the user-defined size and with invalid FCS.
FCS Error	For Ethernet modules: Received frame that is from 64 bytes to user-defined size and with invalid FCS. For non-Ethernet modules: Received frame with invalid FCS at PPP/LAPS/LEX/GFP frames.
Alignment Error	Number of received frames that the number of bits is not a multiple of 8, the size is normal and with invalid FCS.
Byte Alignment Error	Number of comma synchronization failures before Auto Negotiation.
Dribble Bit Error	Number of received frames that the number of bits is not a multiple of 8, the size is normal and with valid FCS.
Line Error	10M/100M Ethernet: Count of received data not in 4B/5B conversion table (4B/5B Code Error) Gigabit Ethernet: Count of received data not in 8B/10B conversion table (8B/10B Code Error). MU120112A/22A(SFP)/32A can also count RD error at RD inversion and/or Code Error. 10 Gigabit Ethernet: At XGMII interface, defined as RXC=1, RXD=FE; detected Receive Error count

Item	Description
MAC Control Frame	Number of MAC Control frames (name changed from Flow Control).
Transmitted ARP Reply	Number of ARP Reply frame transmission
Transmitted ARP Request	Number of ARP Request frame transmission
Transmitted Ping Reply	Number of Ping Reply frame transmission
Transmitted Ping Request	Number of Ping Request frame transmission
Received ARP Reply	Number of ARP Reply frame reception
Received ARP Request	Number of ARP Request frame reception
Received Ping Reply	Number of Ping Reply frame reception
Received Ping Request	Number of Ping Request frame reception
QoS 0	Number of frames with Priority 0 specified for ToS or VLAN.
QoS 1	Number of frames with Priority 1 specified for ToS or VLAN.
QoS 2	Number of frames with Priority 2 specified for ToS or VLAN.
QoS 3	Number of frames with Priority 3 specified for ToS or VLAN.
QoS 4	Number of frames with Priority 4 specified for ToS or VLAN.
QoS 5	Number of frames with Priority 5 specified for ToS or VLAN.
QoS 6	Number of frames with Priority 6 specified for ToS or VLAN.
QoS 7	Number of frames with Priority 7 specified for ToS or VLAN.
User Define 1	User-defined counter 1
User Define 2	User-defined counter 2
Capture trigger	Number of triggers
Capture filter	Number of filtered frames
Transmitted IPv4 Packet	Number of transmitted Ipv4 packets
Transmitted IPv6 Packet	Number of transmitted IPv6 packets
Received IPv4 Packet	Number of received IPv4 packets with valid Checksum
Received IPv6 Packet	Number of received IPv6 packets with valid Checksum *1

Item	Description
Received TCP Packet	Number of received TCP packets with valid Checksum *2
Received UDP Packet	Number of received UDP packets with valid Checksum *2
Transmitted ICMPv6 (NA)	Number of transmitted ICMPv6 (NA) packets. *1
Transmitted ICMPv6 (NS)	Number of transmitted ICMPv6 (NS) packets. *1
Transmitted ICMPv6 (Echo Reply)	Number of transmitted ICMPv6 (Echo Reply) packets. *1
Transmitted ICMPv6 (Echo Request)	Number of transmitted ICMPv6 (Echo Request) packets. *1
Received ICMPv6 (NA)	Number of received ICMPv6 (NA) packets. *1
Received ICMPv6 (NS)	Number of received ICMPv6 (NS) packets. *1
Received ICMPv6 (Echo Reply)	Number of received ICMPv6 (Echo Reply) packets. *1
Received ICMPv6 (Echo Request)	Number of received ICMPv6 (Echo Request) packets. *1
IPv4 Header Checksum Error	Number of packets with invalid Checksum in IPv4 Header
TCP Checksum Error	Number of Checksum Errors of TCP packet *2
UDP Checksum Error	Number of Checksum Errors of UDP packet *2
collision	Number of collision generation: (1) Number of received frames during frame transmission (2) Number of transmitted frames during frame reception

*1: Requires IPv6 Expansion option

*2: In the MU120102A/12A/18A/18B/18C/21A/22A/31A/32A/38A, fragmented TCP/UDP packets are out of the target for Checksum Error judgment.
In the other modules, fragmented TCP/UDP packets are judged as a Checksum Error.

Item	Description
Transmitted Test Frame	Number of transmitted test frames
Received Test Frame	Number of received test frames
Bit Error Count	Number of bit error detection during Unframe PRBS/BER measurement
Bit Error Count Lane0	Number of bit error detection during Unframe PRBS/BER measurement for Lane0
Bit Error Count Lane1	Number of bit error detection during Unframe PRBS/BER measurement for Lane1
Bit Error Count Lane2	Number of bit error detection during Unframe PRBS/BER measurement for Lane2
Bit Error Count Lane3	Number of bit error detection during Unframe PRBS/BER measurement for Lane3
Sequence Error	Number of non-continuous sequence numbers when test frame is received *3
PRBS Bit Error	Number of bit error detection during TestFrame PRBS measurement *3
PRBS Frame Error	Number of received frames with a bit error during TestFrame PRBS measurement *3
PRBS Frame Error Lane0	Number of received frames with a bit error during Inframe PRBS9 measurement for Lane0 *3
PRBS Frame Error Lane1	Number of received frames with a bit error during Inframe PRBS9 measurement for Lane1 *3
PRBS Frame Error Lane2	Number of received frames with a bit error during Inframe PRBS9 measurement for Lane2 *3
PRBS Frame Error Lane3	Number of received frames with a bit error during Inframe PRBS9 measurement for Lane3 *3

*3: Requires Packet BER option

Item	Description
B1 Count	Number of B1 bit errors
B2 Count	Number of B2 bit errors
B3 Count	Number of B3 bit errors
HP-IEC Count	Number of HP-IEC block errors
HP-REI/REI-P Count	Number of HP-REI/REI-P block errors
MS-REI/REI-L Count	Number of MS-REI/REI-L block errors
Bit Info. Count	Number of Bit Info. (number of error bits within Bulk pattern.)
LOS	Number of frame LOS
OOF	Number of frame OOF
LOF	Number of frame LOF
MS-AIS	Number of MS-AIS frames
MS-RDI	Number of MS-RDI frames
AU-AIS	Number of AU-AIS frames
AU-LOP	Number of AU-LOP frames
HP-SLM	Number of HP-SLM frames
HP-RDI	Number of HP-RDI frames
HP-UNEQ	Number of HP-UNEQ frames
Pattern Sync. Loss	Number of Bulk pattern sync losses
NDF	Number of NDF
+PJC	Number of +PJC occurrence
–PJC	Number of –PJC occurrence
Consecutive	Number of CONS occurrence
PPM	Ratio of change in data amount caused by Justification. Units: ppm. Counter value for justification occurrence amount (units: ppm.)
SQ Error	Number of SQ invalid error frame *4
Out of Alignment	Number of frames in which alignment cannot be performed in Multi-frame or the differential delay is more than ±100 pointers. *4

*4: This counter is unique to the MU120103B/04B. It requires the Virtual Concatenation option.

Item	Description
Aborted Frame	Number of received frames that did not make up PPP frame (last byte: 0x7d.) *5
Transmitted Byte After Stuffing	Counts frames after Stuffing at transmission by one of PPP/Cisco HDLC/MAPOS/LEX/LAPS. *5
Transmitted Byte After Adaptation	Number of transmitted bytes after Rate Adaptation by LAPS (X.86). *6
Received Bytes Before Destuffing	Counts frames before Destuffing at reception by one of PPP/Cisco HDLC/MAPOS/LEX/LAPS. *6
Received Byte Before Adaptation	Number of received bytes before Rate Adaptation by LAPS (X.86). *6
Transmitted Ethernet Frame	Number of transmission Ethernet frames (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Transmitted Ethernet Bytes	Number of transmission Ethernet frame bytes (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Received Ethernet Frame	Number of reception Ethernet frames (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Received Ethernet Byte	Number of reception Ethernet frame bytes (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Ethernet Fragments	Number of received frames under 64 bytes in size and with invalid FCS. (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Ethernet Undersize	Number of received frames under 64 bytes in size and with valid FCS. (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Ethernet Oversize	Number of received frames exceeding the user-defined size and with valid FCS. (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Ethernet Oversize & FCS Error	Number of received frames exceeding the user-defined size and with invalid FCS. (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Ethernet FCS Error	Number of received frames from 64 bytes to user-defined size and with invalid FCS. (Counter for the Ethernet frames stored in GFP/LAPS/LEX.) *7
Transmitted Protocol Frame	Number of transmitted Protocol emulation packets.
Received Protocol Frame	Number of received frames passing through the Protocol Filter. *8
Correctable cHEC Error	Number of frames with 1-bit error detected at cHEC in GFP frame. *7
Uncorrectable cHEC Error	Number of frames with 2-bit or more error detected at cHEC in GFP frame. *7

Item	Description
Correctable tHEC Error	Number of frames with 1-bit error detected at tHEC in GFP frame. *7
Uncorrectable tHEC Error	Number of frames with 2-bit or more error detected at tHEC in GFP frame. *7
eHEC Error	Number of frames with an error detected at eHEC in GFP frame. *7
Server Signal Fail Interval	Counter for interval where Server Signal Fail status occurred (1-us interval) *7
Client Loss of Sync Frame	Number of received Client Management Frames that indicate Client Loss of Sync. *7
Client Loss of Sync Interval	Counter for interval where Client Loss of Sync status occurred (1-ms interval) *7
Client Loss of Signal Frame	Number of received Client Management Frames that indicate Client Loss of Signal *7
Client Loss of Signal Interval	Counter for interval where Client Loss of Signal status occurred (1-ms interval) *7
Link Failed	Number of times of changes between Link Down and Link Up.

Item	Description
Transmitted Bit Rate (Mbit/s)(Flow)	Data transmission bit rate shown in the Multiflow Counter (without distinguishing normal or error frames)
Transmitted Rate (%)(Flow)	Transmission rate (%) shown in the Multiflow Counter. Rate assuming that the transmission rate with the minimum gap is 100%. (without distinguishing normal or error frames)
Transmitted Byte (Flow)	Number of transmitted bytes shown in Multiflow Counter (without distinguishing normal or error frames)
Transmitted Frame (Flow)	Number of transmitted frames shown in the Multiflow Counter (without distinguishing normal or error frames) ("Accumulate" indicates the sum.)
Transmitted Frame (fps) (Flow)	Number of transmitted frames per second shown in the Multiflow Counter (without distinguishing normal or error frames) ("Accumulate" indicates the average value.)
Received Bit Rate (Mbit/s) (Flow)	Data reception bit rate shown in the Multiflow Counter.
Received Rate (%)(Flow)	Reception rate (%) shown in the Multiflow Counter. Rate assuming that the reception rate with the minimum gap is 100%.
Received Byte (Flow)	Number of received bytes shown in Multiflow Counter
Received Frame (Flow)	Number of received frames shown in the Multiflow Counter ("Accumulate" indicates the sum.)
Received Frame (fps) (Flow)	Number of received frames per second shown in the Multiflow Counter ("Accumulate" indicates the average value.)
Sequence Error (Flow)	Number of non-continuous sequence numbers when test frame is received shown in the Multiflow Counter *3 Other counts are not provided.
Max Latency (us) (Flow)	Maximum value of Latency shown in the Multiflow Counter. Accumulate display only.
Min Latency (us) (Flow)	Minimum value of Latency shown in the Multiflow Counter. Accumulate display only.
Current Latency (us) (Flow)	Sample value of Latency shown in the Multiflow Counter. Current display only.
Avg Latency (us) (Flow)	Sample value of Latency shown in the Multiflow Counter. Accumulate display only.

Item	Description
Frequency (Hz)	Line speed of the received signal *10
Frequency Difference (Hz)	Difference of the reception signal from the reference frequency (Hz) *10
Frequency Difference (ppm)	Difference of the reception signal from the reference frequency (ppm) *10
PoE Alarm	Time of which the power supply capacity has fallen below the normal value (43v) *11
Preamble CRC Error	Number of received frames where E-PON Preamble CRC error occur.

*5: Enabled when Mapping is set to one of PPP/Cisco HDLC/MAPOS/LEX/LAPS on the MU120103A/03B/04A/04B/05A/06A/19A/20A.

*6: Enabled when Mapping is set to LAPS on the MU120103B/04B.

*7: Enabled when Mapping is set to Frame-Mapped GFP on the MU120103B/04B.

*8: Refer to (5) " Protocols" in Section 4.5.6 for details on the Protocol Filter.

*9: The count is incremented each time the Link Up status that has continued for at least the counter refresh time (1 s) switches to Link Down. As a result, there is no count when Link Up/Link Down occurs multiple times within a shorter time period than the counter refresh time.

*10: Functions specific to MU120121A/22A/31A/32A38A modules but requires clock measurement option withMU120131A/32A/38A

*11: Requires PoE option for MU120131A

Item	Description
LOC [ms]	Length of time LOC is detected (resolution 0.1 ms)*12
AIS [ms]	Length of time AIS is detected (resolution 0.1 ms)*12
RDI [ms]	Length of time RDI is detected (resolution 0.1 ms)*12
Impairment Filter Frame	Number of frames matching the Traffic Impairment Emulator function filter*13 (Applied to all frames when filter is Off)
Impairment Filter Byte	Byte length of frame matching the Traffic Impairment Emulator function filter*13 (Applied to all frames when filter is Off)
Unavoidably Dropped Frame	Number of frames unintentionally dropped by the Traffic Impairment Emulator function*13 The conditions for dropping unintentionally are: (1) Conflict when mixing frames matching the filter and frames that do not match the filter. (2) When frames are remaining in the delay buffer when the Delay block function is turned Off. (3) If traffic exceeding the restricted bandwidth is received when Fixed Delay Range is 5 s or 50 s
Lost Frame	Number of frames intentionally dropped by the Loss function of the Traffic Impairment Emulator function*13
Passage Delay[ms]	The Delay monitor's value of the Delay function of the Traffic Impairment Emulator function*13*14

*12: Requires Ethernet OAM option

*13: Enabled when using the Traffic Impairment Emulator function on MU120121A/22A.

*14: Does not include the amount of delay (Absolute Delay) of the internal circuit.

G. Introduction of Ethereal/Wireshark

Ethereal/Wireshark is software used to analyze network protocols open to the public based on the GPL license. The control software can translate a captured frame by using Ethereal/Wireshark. To use this function, Ethereal/Wireshark must be separately purchased. This section describes this function and points to be noted when introducing Ethereal/Wireshark.

G.1 Ethereal/Wireshark

Ethereal/Wireshark is a network protocol analyzer that runs on PC. Ethereal/Wireshark captures frames flowing on the network to which the PC is connected, and translates, displays, and saves the captured frames. One of the features of Ethereal/Wireshark is that its translation function supports various protocols.

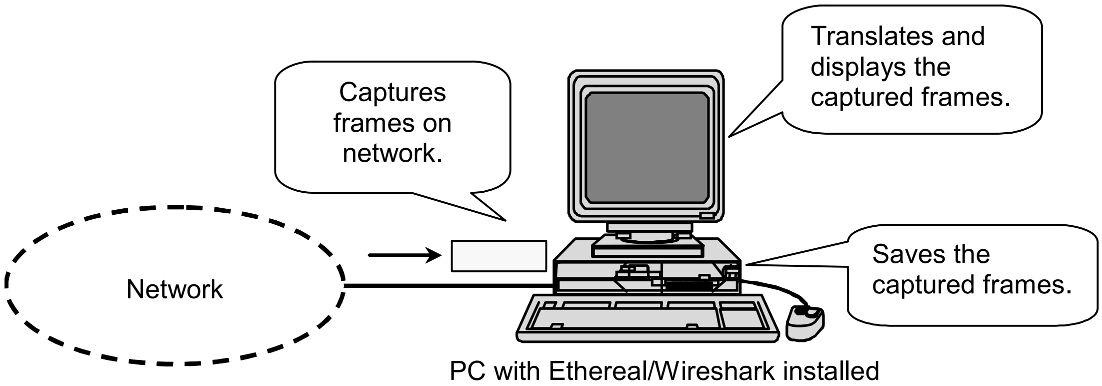


Figure G.1-1 Representative functions of Ethereal/Wireshark

This software is open to the public based on the GPL license and is available free of charge from the Web site of the Internet the following address.

Ethereal: http://www.ethereal.com/
Wireshark: http://www.wireshark.org/

The newest information of Ethereal/Wireshark is also open to the public. Refer to this Web site for further information.

G.2 Cooperation with Ethereal/Wireshark

If Ethereal/Wireshark is installed to the MD1230B or PC on which the control software runs, the capture function of the control software can cooperate with Ethereal/Wireshark.

☞ For the Capture Function, refer to Section 5.4 “Capturing Receive Data”.

If a frame is captured by using the capture function of the control software, the button of the **Capture** tab can be executed. When this button is pressed, the control software starts Ethereal/Wireshark. The captured frame information is converted into the format Ethereal/Wireshark can understand, and then it is passed to Ethereal/Wireshark. Ethereal/Wireshark translates and displays the passed frame information.

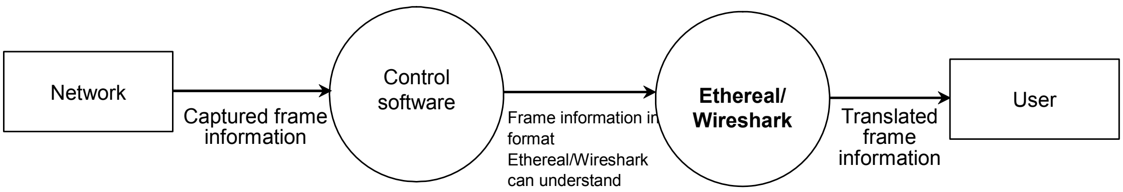


Figure G.2-1 Flow of data during cooperation

Using this function brings the following merits.

(a) Translation of frames that cannot be translated by control software
Because the translation function of Ethereal/Wireshark supports many types of protocols, the protocols that cannot be translated by the control software can be translated.

(b) Viewing capture frame on PC to which control software is not installed
The frame information saved by Ethereal/Wireshark can be read and viewed on a PC to which Ethereal/Wireshark is installed.

Notes:

- The frame information saved by Ethereal/Wireshark cannot be read by the control software. Save the information that is to be restored on the control software on the control software.
- If both Ethereal and Wireshark are installed, Wireshark starts.

G.3 Notes on installing Ethereal/Wireshark

Obtain the installer of Ethereal/Wireshark for Windows® from the Web site (http://www.ethereal.com/ or http://www.wireshark.org/). Install Ethereal/Wireshark to the PC or MD1230B on which the control software runs. Then this function can be used.

Note the following points when installing Ethereal/Wireshark.

(a) Version of Eterreal/Wireshark

The cooperation between the control software and Ethereal of version 0.10.13 has been confirmed, as well as Wireshark of version 0.99.3. This does not mean that this function is valid with the future version of Ethereal/Wireshark.

(b) Installer to use when the operating system is Windows 64-bit version

Use the Wireshark installer for Windows 32-bit version. When Wireshark is installed by using the installer for Windows 64-bit version, MX123001A cannot recognize Wireshark.

(c) WinPcap

Usually, Ethereal/Wireshark processes frames captured on PC. The frames are captured by software called WinPcap. When installing Ethereal/Wireshark, therefore, WinPcap must be also installed.
If Ethereal/Wireshark coordinates with the control software, however, the control software captures frames, and the capture function supplied by WinPcap is not necessary. Therefore, it is not necessary to install WinPcap.

(d) Installing to MD1230B

To install Ethereal/Wireshark to the MD1230B, the installer of Ethereal/Wireshark must be executed on the MD1230B. Therefore, the installer must be moved onto the MD1230B. At this time, the following points must be noted, depending on how the installer is moved.

When using floppy disk

The installer of Ethereal/Wireshark is large in size and cannot fit in one floppy disk. Therefore, a dividing tool must be used.

When using network

By using a mechanism of sharing files supplied by Windows® or FTP, files can be transferred to the MD1230B by using a network. If the network to be connected is not safe, however, the MD1230B may contract computer viruses.

Appendix H Batch Setting Tools

This appendix explains the two types of tools for performing batch settings. For the usage restrictions, read section H.2.

H.1 Outline of Batch Setting Tools

This section explains the following two types of tools.

(1) Multi Port Setting
Sets multiple ports [Port Setting] as a batch.

(2) Multi Stream Setting
Sets multiple ports [Tx Stream] as a batch. This tool can set both the send rate for all streams and the total transmission time.

The above batch setting tools, can be used for efficient editing of each parameter using the copy/paste and increment/decrement functions. The setting contents can be saved/Load. In addition, setting contents can also be edited offline when there is no connection to the main unit.

H.2 Restrictions

The batch setting tools (these tools hereafter) have the following usage restrictions. Check the restrictions before attempting to use these tools.

H.2.1 Software Version

The tools can only be installed in units running firmware version 9.3 or later.

H.2.2 Supported Modules

The following interface modules support settings made using these tools. Other modules are not supported.

- MU120121A 10/100/1000M Ethernet Module
- MU120122A Gigabit Ethernet Module
- MU120131A 10/100/1000M Ethernet Module
- MU120132A Gigabit Ethernet Module
- MU120138A 10 Gigabit Ethernet Module

Note:

Although operation errors may not occur using unsupported modules, operation is not supported or guaranteed.

H.2.3 General Notes

When using this tool, the remote control optional functions can be used to communicate with the main frame. So, when reading and reflecting the main frame settings, the following dialog “Under remote control” is displayed.

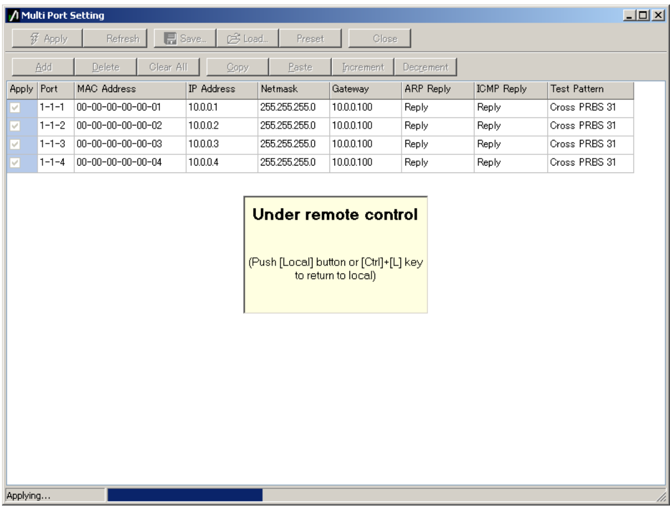


Figure H.2.3-1 Under Remote Control Dialog

H.3 Multi Port Setting

[Multi Port Setting] sets the items in the [Port Setting] dialog as a batch. Since it is not necessary to open the [Port Setting] dialog for each port when using [Multi Port Setting], setting of multiple ports is quicker and more efficient.

H.3.1 Tool Setting Contents

The [Port Setting] dialog setting items supported by [Multi Port Setting] are listed below.

- MAC Address
- IP Address
- Netmask
- Gateway
- ARP Reply
- ICMP Reply
- Test Pattern

In addition, values for the following two items can be set forcibly.

- Mode: Set to [Normal]
- Mapping: Set to [Framed]

Items other than those listed above cannot be set by [Multi Port Setting]. If necessary, set using the [Port Setting] dialog.

H.3.2 Starting and Stopping Tools

There are two start methods.
When making settings while using Main Application, start [Online Editing].
In the case of the control software installed in the PC, when editing settings, the main unit does not require to connect to the main unit. In this case, start [Offline Editing].

Online Editing

1. Reserve the port to be set with Main Application.

Note:

An error occurs at setting if the port has not been previously reserved.

2. Select the icons (Unit/Module/Port) for the unit for setting at the Tree View on the left side of Main Application.
3. Click the [Tool] button at the top-left of Main Application and select [Multi Port Setting] from the displayed menu. Start the tool.
4. Input the settings and Load/save them as described in the next section.
5. Click the [Close] button to stop the tool.

Offline Editing

1. Start from the Windows Start menu.
   Click, [Start] → [Programs] → [MX123001A] (or [MX159001B] → [Utility]) → [Multi Port Setting].
2. Input the settings and Load/save them as described in the next section.
3. Click the [Close] button to stop the tool.

H.3.3 Inputting Settings

The following input setting screen is displayed when [Multi Port Setting] is started.

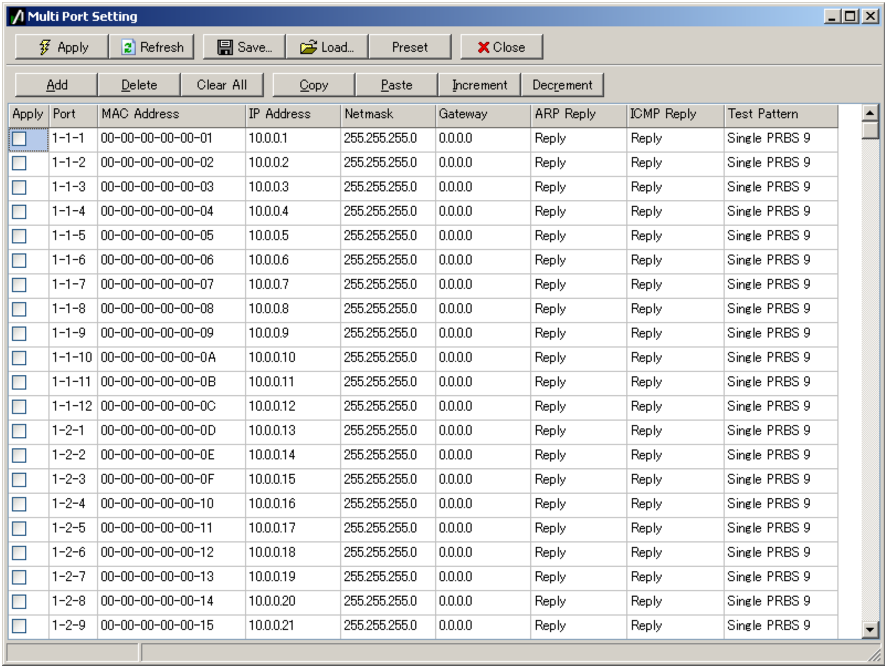


Figure H.3.3-1 Multi Port Setting

The ports of the interface module are displayed here.

Note:

When the [Refresh] button is pressed, ports that are not present on the selected unit and ports of unsupported modules disappear from the list display.

H.3.4 Reading Main Unit Settings

The target port position information is displayed in the format <Unit No.>-<Module No.>-<Port No.> of the [Port] column.

When settings are changed, a check mark is set automatically in the [Apply] checkbox.

H.3.5 Applying Settings

For details of the input method, refer to A.5 Inputting Settings.

H.3.4 Reading Main Unit Settings

The main unit setting can be read when starting these tools online.

***Note*:**

This operation cannot be executed when a tool is started offline.

☞ H.3.2 Starting and Stopping Tools

When the [Refresh] button is clicked, the current main units settings are read and displayed. Non-existent ports and ports of unsupported modules (modules other than MU120121A/122A/131A/132A/138A) are removed from the display.

H.3.5 Applying Settings

The settings can be applied when starting these tools online. The main unit setting can be read when starting these tools online.

***Note*:**

This operation cannot be executed when a tool is started offline.

☞ H.3.2 Starting and Stopping Tools

When the [Apply] button is clicked, the contents of the setting items checked in the [Apply] column are reverse displayed. The setting processing time changes in accordance with the setting amount. The send processing progress is displayed in the status bar.

H.3.6 How to Select Item from Apply Checkbox

When changing settings, a check mark is inserted automatically in the [Apply] checkbox for that item. To check (or uncheck) all checkboxes in the [Apply] column, check (or uncheck) the head item, left-click the Apply row to select all rows and right-click to select [Fill].

Error At Setting

If an error occurs at setting, the error item is displayed in red. Moreover, if a mouse pointer is moved closer to the item, the pop-up message is displayed. Reset as necessary. An error message is also displayed in the status bar.

If there is an error at settings such as [Mode] and [Mapping] not on the screen, an error message is displayed at the head row (Port). If there are several errors for one item, only the message for the last error is displayed.

H.3.7 Save/Load Settings

Settings can be saved to and read from .csv format text files.

Pressing the [Save] button and inputting the file name at the displayed dialog saves the currently input setting contents.

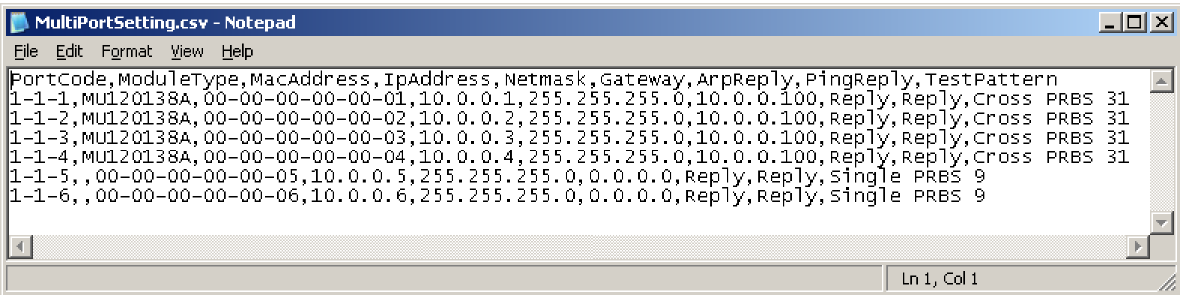
Pressing the [Load] button and selecting the saved file at the displayed dialog reads the saved setting contents.

The default save destination for files created using the Save/Load function is <User–My Documents>.

H.3.8 Save/Load File Format

Excluding the following, screen input contents are output as is in .csv format.

- The checked contents of the [Apply] column are not output.
  At reading, checkmarks are appended to all lines.
- Module model information is output for internal processing. If the module model is undefined, nothing is output.


MultiPortSetting.csv - Notepad

File Edit Format View Help

```
PortCode,ModuleType,MacAddress,IpAddress,Netmask,Gateway,ArpReply,PingReply,TestPattern
1-1-1,MU120138A,00-00-00-00-00-01,10.0.0.1,255.255.255.0,10.0.0.100,Reply,Reply,Cross PRBS 31
1-1-2,MU120138A,00-00-00-00-00-02,10.0.0.2,255.255.255.0,10.0.0.100,Reply,Reply,Cross PRBS 31
1-1-3,MU120138A,00-00-00-00-00-03,10.0.0.3,255.255.255.0,10.0.0.100,Reply,Reply,Cross PRBS 31
1-1-4,MU120138A,00-00-00-00-00-04,10.0.0.4,255.255.255.0,10.0.0.100,Reply,Reply,Cross PRBS 31
1-1-5,,00-00-00-00-00-05,10.0.0.5,255.255.255.0,0.0.0.0,Reply,Reply,Single PRBS 9
1-1-6,,00-00-00-00-00-06,10.0.0.6,255.255.255.0,0.0.0.0,Reply,Reply,Single PRBS 9
```

Ln 1, Col 1

Figure H.3.8-1 Example of File Ouput

H.4 Multi Stream Setting

[Multi Stream Setting] sets the main items in the Tx Stream functions, rate per slim and total transmission time as a batch.

H.4.1 Tool Setting Contents

Transmission flame pattern settings
The [Stream Setting] dialog setting items supported by [Frame Setting] are listed below.

- Destination MAC Type (Static/Gateway)
- Destination MAC Address
- Destination IPv4 Address
- Frame Length
- VLAN (None/1 Level/2 Levels)
- VLAN TPID, VID, Priority
- Data Field 1 Test Frame Type, Flow ID

In addition, values for the following two items can be set forcibly.

- Enabled: Set to [On].
- Destination IPv4 Address Type: Set to [Static].
- Frame Length Type: Set to [Fixed].
- Protocol: Set to [IPv4].
- Source MAC Address: Set to [This Port].
- Source IPv4 Address: Set to [This Port].
- Data Fields: Enabled only when Data Field 1 is set. Set to [Test Frame].

Items other than [Frame Setting] tab listed above cannot be set by [Multi Stream Setting].
If necessary, set using the [Frame Setting] tab in the [Port Setting] dialog.

Note:

> Do not change settings that cause changes in frame size.
> If changed, sending will not be at the rate set at [Multi Stream Setting].

Setting Send Rate and Time

At [Multi Stream Setting], the send rate and time for each stream can be specified by setting the following items.

- Supposed Link Speed: Link speed when calculating rate
- Rate Unit: Rate units
- Rate: Send rate for each stream
- Transmitted Time: Send time for all streams (continuous sending when 0 specified)

The specified value is converted to the setting for the [Stream Control] tab of the [Stream Setting] dialog. For details of the setting conversion method, refer to Converting to Settings from Send Rate/Time.

H.4.2 Starting and Stopping Tools

There are two start methods.
When making settings while using Main Application, start [Online Editing].
When editing settings while not connected to the main unit, start [Offline Editing].

Online Editing

1. Reserve the port to be set with Main Application.

Note:

An error occurs at setting if the port has not been previously reserved.

2. Select the Port icon at the Tree View on the left side of Main Application. When the [Refresh] button is pressed, the selected port settings can be read.

☞ H.3.4 Reading Main Unit Settings

3. Click the [Tool] button at the top-left of Main Application and select [Multi Stream Setting] from the displayed menu. Start the tool.
4. Input the settings and Load/save them as described in the next section.
5. Click the [Close] button to stop the tool.

Offline Editing

1. Start from the Windows Start menu.
   Click, [Start] → [Programs] → [MX123001A] (or [MX159001B] → [Utility]) → [Multi Port Setting].

2. Input the settings and Load/save them as described in the next section.

3. Click the [Close] button to stop the tool.

H.4.3 Inputting Settings

The following input setting screen is displayed when [Multi Stream Setting] is started.

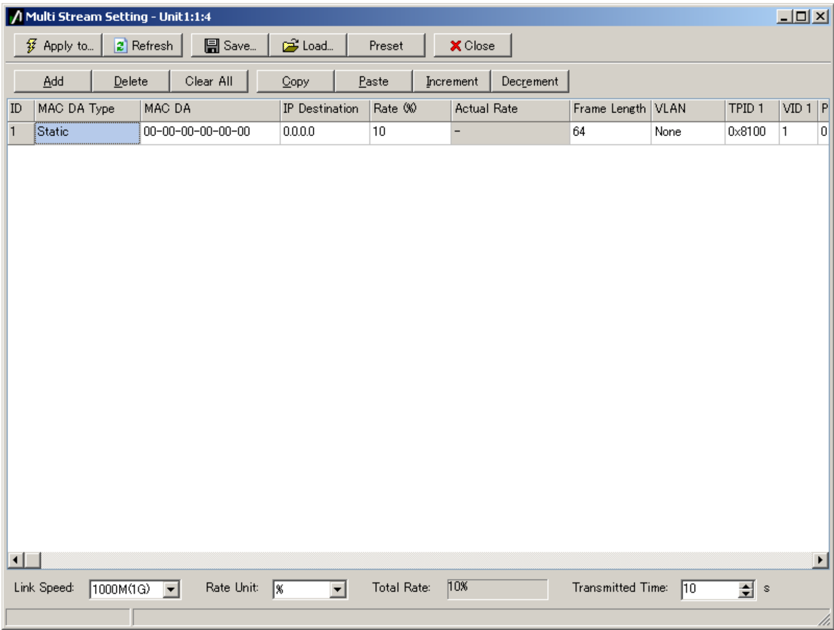


Figure H.4.3-1 Multi Stream Setting

The stream settings for each port are displayed here. However, one item displays the settings for one stream.

The patterns for multiple streams and the rate and send time are set here. For details of the input method, refer to Setting Input Method.

H.4.4 Reading Main Unit Settings

The main unit setting can be read when starting these tools online.

***Note*:**

This operation cannot be executed when a tool is started offline.

☞ H.4.2 Starting and Stopping Tools

When the [Refresh] button is clicked, the current main units settings are read and displayed.

Note:

Items that are forcibly set by [Multi Stream Setting] are reset to the defaults. In addition, the rate setting for each stream is also reset to the default.

H.4.5 Applying Settings

The settings can be applied when starting these tools online.

Note:

This operation cannot be executed when a tool is started offline.

☞ H.4.2 Starting and Stopping Tools

Clicking the [Apply to...] button displays a screen for selecting the ports reflecting the settings as follows. The same Stream setting is copied for all checked ports.

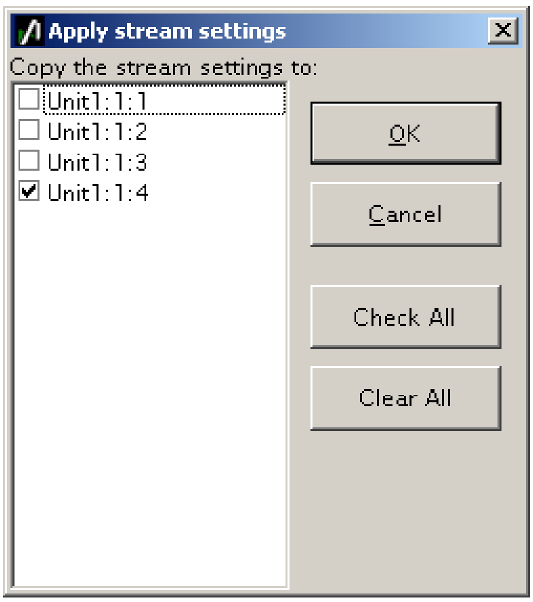


Figure H.4.5-1 Selection Window of Setting Applying Port

The setting processing time changes in accordance with the setting amount. The send processing progress is displayed in the status bar.

Error At Applying Settings

If an error occurs at applying settings, the error item is displayed in red along with an error message comment. Reset as necessary. An error message is also displayed in the status bar.

H.4.6 Save/Load Settings

Settings can be saved to and read from .csv format text files.

Pressing the [Save] button and inputting the file name at the displayed dialog saves the currently input setting contents.

Pressing the [Load] button and selecting the saved file at the displayed dialog reads the saved setting contents.

The default save destination for files created using the Save/Load function is <User–My Documents>.

H.4.7 Save/Load File Format

The screen input contents are output as follows.

- Each value set at all setting items (Link Speed, Rate, Unit, and Duration) is output.
- After a blank line, the list content is output as is in .csv format.

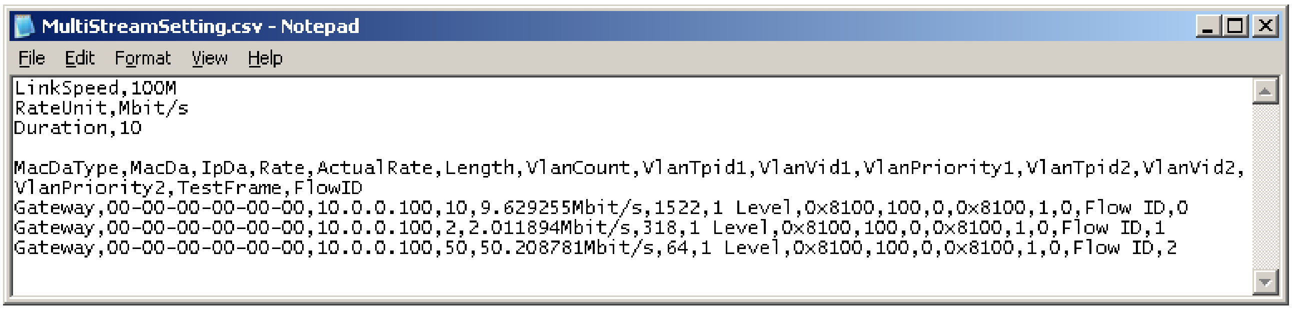


Figure H.4.7-1 Example of File Output

H.4.8 Converting to Setting from Send Rate/Time

Conversion to the [Stream Control] setting from the send rate and send time specified at [Multi Stream Setting] is performed as follows:

Calculating Send Rate

1. Find total %rate for all streams
2. Set gap size for each stream (ISG) to value equivalent to total %rate found in step 1 above.
3. Find frame rate (fps) for each stream.
4. Find integer ratio where minimum value of frame rates for each stream determined in step 3. becomes 1 and set value for this integer ratio as burst size for each stream ([Bursts per Stream]).

Note:

The gap size set at 2. and the burst size set at 4. are rounded to the nearest whole numbers when the results have a decimal point. Due to this rounding error, the actual sending rate may sometimes be different from the specified rate (see following setting examples.) The actual sending rate is displayed in the [Actual Rate] column.

Calculating Send Time

1. The send time is calculated when each stream is sent once in sequence.
2. The rounded-up value of the specified sending time divided by the time found in step 1 is set as the repetition count for all streams ([Count] setting for last stream).

Other Settings

Other [Stream Control] settings are set as follows:

Distribution: Streams other than the last stream are set to [Next] and the last stream is set to [Jump to Stream for Count and Stop].

Frames per Burst: Set to 1

Setting Example

When following three streams sent for 10 seconds at 100 M link:

Stream 1: 1522 byte frame at 10 Mbps
Stream 2: 318 byte frame at 2 Mbps
Stream 3: 64 byte frame at 50 Mbps

The results calculated as described above are as follows:

Calculating Send Rate

1. Total %rate for all streams: 77.88%
2. [ISG] for stream 1, 2, 3: 450 bytes, 108 bytes, 36 bytes
3. fps for stream 1, 2, 3: 821.28, 786.16, 97656.25
4. [Bursts per Stream] for stream 1, 2, 3: 1, 1, 124

Calculating Send Time

1. Time for one send for stream 1, 2, 3: 1.26448 ms
2. Repeat count for stream 1, 2, 3: 7909 times (Jump Count:7908)

The actual stream rates differ as follows:

Stream 1: 9.62.. Mbps
Stream 2: 2.011.. Mbps
Stream 3: 50.20.. Mbps

H.5 Setting Input Method

The following convenient methods are used for the [Multi Port Setting] and [Multi Stream Setting] input settings.

Range Selection

Cells are selected by left-clicking and dragging. In addition, all rows can be selected by clicking the table tile.

Note:

Left-click and drag are not supported for cells for settings performing selections such as [ARP Reply]. Use right-click and drag instead.

Copy/Paste

Pressing the [Copy] button copies the contents of the selected range to the clipboard; pressing the [Paste] button pastes the clipboard contents into the selected range. In addition, the same operation can be executed using the menu displayed by right-clicking the selected range. Moreover, when [Fill] is selected, the contents of the head cell are pasted into the cells of the selected range.

Increment/Decrement

Pressing the [Increment] or [Decrement] button creates continuous data in the selected range based on the header cell. In addition, the same operation can be executed using the menu displayed by right-clicking the selected range.

Deleting Unnecessary Lines

Select the line and press the [Delete] button. Pressing the [Clear all] button deletes all lines.

Adding New Lines

Click the [Add] button.

Initializing Settings

Press the [Preset] button to return settings to the defaults.

I.1 Tool Menu Editor Overview

With Tool Menu Editor, you can configure tool menu items that appear when the **Tool** button is clicked.

Tool Menu Editor is pre-installed for the software Ver. 9.4 or later.

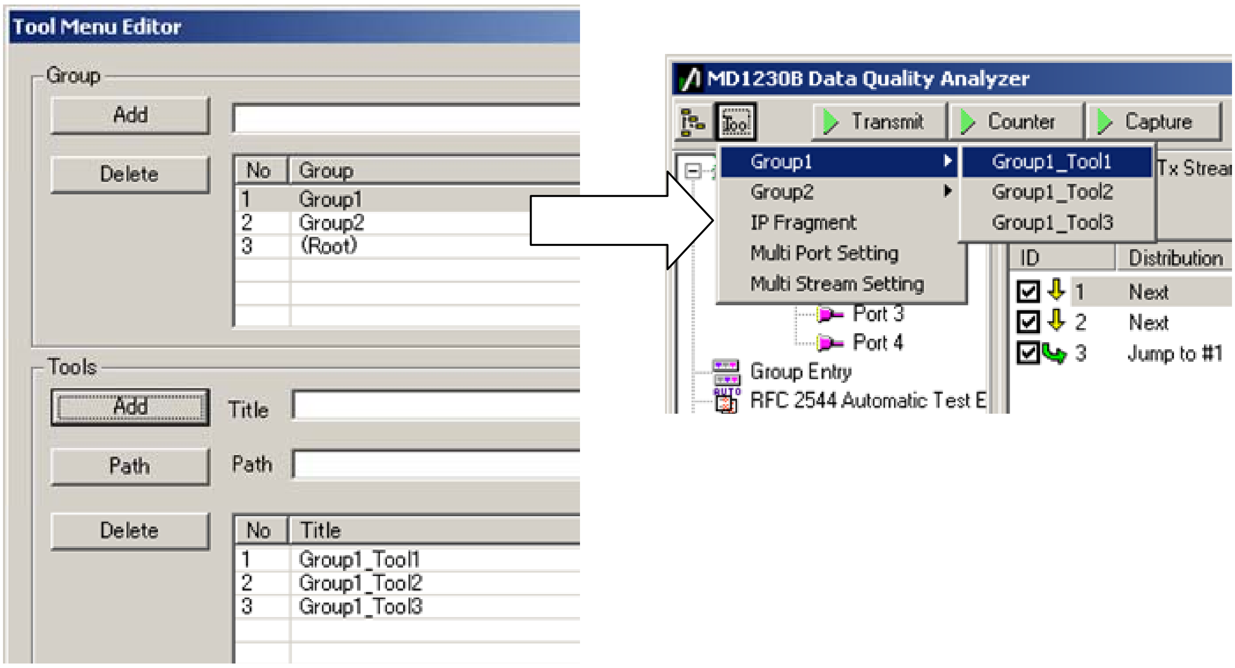


Figure I.1-1 Editing tool menu items with Tool Menu Editor

Following restrictions apply:

- Up to 10 items can be registered to the first layer.
- Up to 10 items can be registered to the second layer.
- The following characters cannot be used for the menu.
  \, \
- You cannot register shortcut to the menu.
- Up to 16 characters can be used for the menu.
- You cannot delete the following programs if such programs display when the **Tool** button is pressed:
  IP Fragment, Multi Port Setting, Multi Stream Setting

I.2 Starting/Exiting Tool Menu Editor

Start the Tool Menu Editor as follows.

Starting from MD1230B/MP1590B:

1. Show the Windows Start menu.
2. Click **Tool Menu Editor**.

Starting from PC:

1. Show the Windows Start menu.
2. Select **Start** → **Programs** → **MX123001A** (or **MX159001B** → **Utility**), and then click **Tool Menu Editor**.

To exit Tool Menu Editor, click **Exit**.

I.3 Screen Display

Table I.3-1 shows the overview of Tool Menu Editor screen.

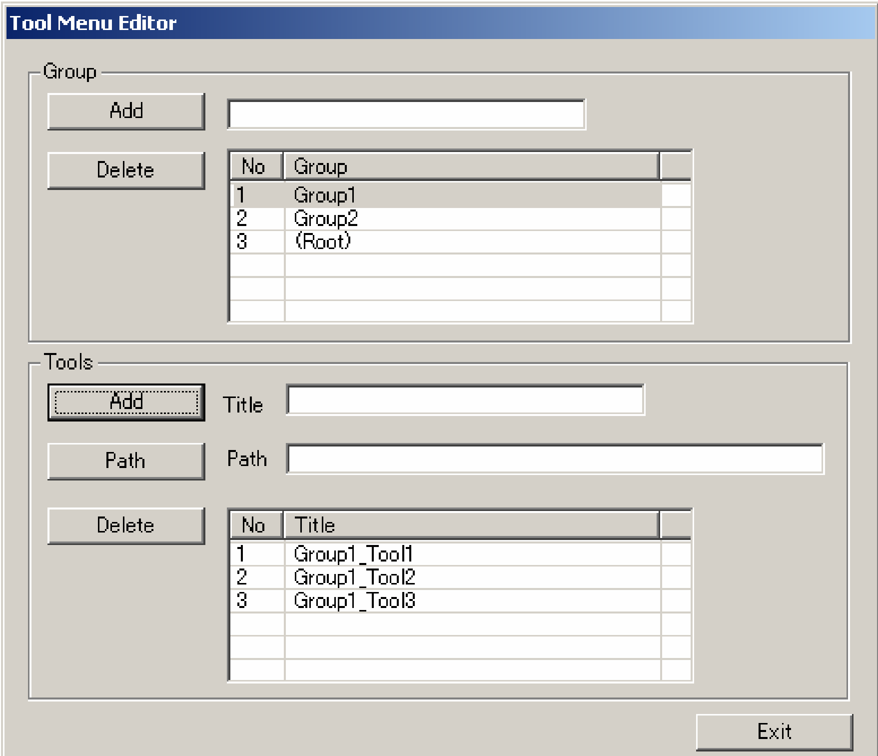


Figure I.3-1 Tool Menu Editor screen

Table I.3-1 Tool Menu Editor screen items

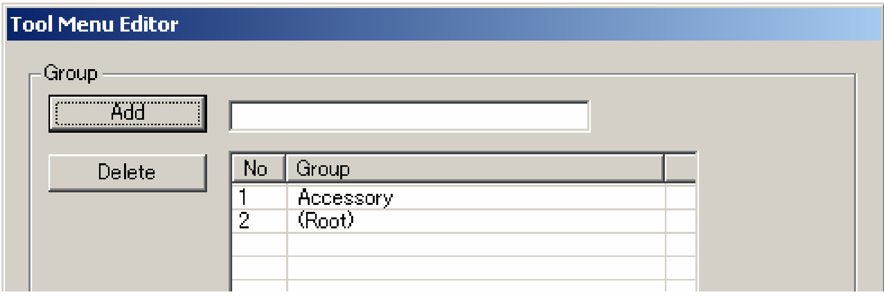
Items		**Explanation**
Group		Edit the menu items to be displayed in the first layer.
	Text box	Type in the name to be displayed in the menu.
	Add	Add the name to the list.
	Delete	Delete the group from the list.
	List	Displays the menu items to be displayed in the first layer.
Tools		Edit the menu items to be displayed in the second layer. When the Group is <root>, the Tools names will be displayed in the first layer.
	Title	Type in the name to be displayed in the menu.
	Path	Input the path and file name whose file will be run when the tool is selected.
	Add	Add the title textbox characters to the list.
	Delete	Delete the tool from the list.
	List	Displays the names to be displayed in the second layer.
Exit		Exits the Tool Menu Editor.

I.4 Procedure

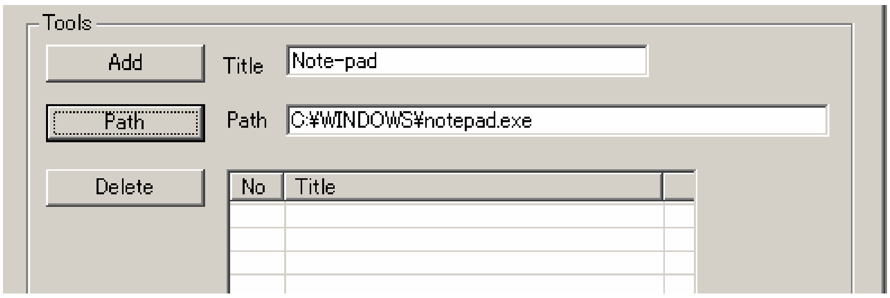
Adding menu items

For example, let's say we are going to add Windows Notepad to the second layer of the tool menu.

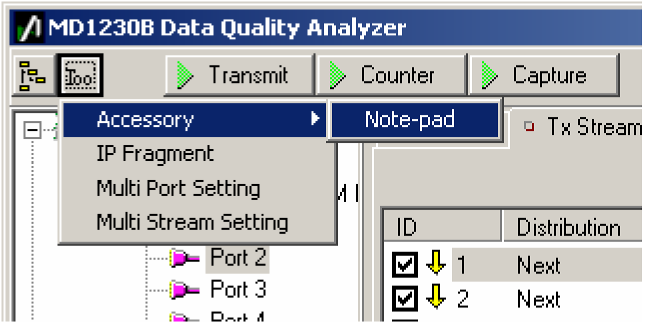
1. Start the Tool Menu Editor.
2. Enter "Accessory" in the Group text box.
3. Click **Add**.
   This will add **Accessory** to the list.



4. Click to select **Accessory** from the Group list.
5. Move to **Tools** group, in the **Title** text box enter "Note-pad".
6. In the **Tools** group box, click **Path**.
   A dialogue box opens to open file.
7. Select C:\WINDOWS\notepad.exe.
8. Click **Open**.
   The file name is displayed in the **Path** text box.



9. Click **Add** in the **Tools** group.
   Now **Note-pad** is added to the list.
10. From the selector, start **Main Application**.
    If **Main Application** is already running, re-start it.
11. Click **Tool** on Main Application.
    Confirm that **Accessory** — **Note-pad** is added to the menu items.



12. Click **Accessory** — **Note-pad**.

Confirm the program is loaded.

When Group <root> is selected in the Step 4 above, a menu item is added to the first layer.

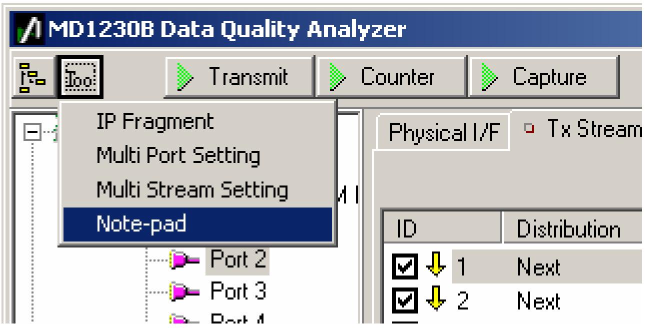


Figure I.4-1 Example of adding menu item to 1st layer of tool menu

Note

For the Step 7 above, you need to assign executable program file (such as *.exe, *.com files) or its shortcut (*.lnk).

No first layer menu displays without having menu item in the second layer.

Deleting menu items

In this example, we will remove the **Note-pad** item registered in "Adding menu items" above from the tool menu.

1. Start the Tool Menu Editor.
2. From the **Tools** list, click **Note-pad**.
3. Click **Delete** in the Tools group.
   Now **Note-pad** is deleted from the list.
4. Click to select **Accessory** from the **Group** list.
5. Click **Delete** in the **Groups** group.
   Now **Accessory** is deleted from the list.
6. From the selector, start **Main Application**.
   If Main Application is already running, re-start it.
7. Click **Tool** on Main Application.
   Confirm that **Accessory** is deleted.

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