User's Manual

Model 810518803
AQ2200-631
10Gbit/s Optical Receiver

YOKOGAWA
Yokogawa Electric Corporation

IM 810518803-01E
1st Edition

Introduction

Thank you for your purchasing of this AQ2200-631 10Gbit/s Optical Receiver.

This user's manual describes the functions, operating procedures, and handling precautions necessary to operate the AQ2200-631 in correct and safe manner.

Before starting operation of this module, thoroughly read this manual to use the product properly.

After reading this manual, always store it in a safe place where all concerned personnel can refer to it immediately.

This manual is useful if the operator have forgotten proper operation steps during operation. In addition to this manual, two kinds of manuals shown below are provided for the AQ2200-631.

Therefore, you need to read the following two manuals, as well as this user's manual.

Manual Item	Manual No.	Description
AQ2200-631 10Gbit/s Optical Receiver User's Manual	IM810518803-01E	This user's manual. The manual describes all functions of the AQ2200-631 except for the communication functions, and proper operating procedures.
AQ2200-631 10Gbit/s Optical Receiver Remote Commands User's Manual	IM810518803-17E	This manual describes the communication functions (remote control functions) of the AQ2200-631.

Additionally, you must also read the manual for AQ2201/AQ2202 Frame Controller, a main unit, on which the AQ2200-631 is to be mounted.

Furthermore, when performing the BER measurement of the 10Gbit/s-band optical interface by combining optional units, such as BERT module*1, light source module*2, and optical modulation module *3 of the AQ2200-series, thoroughly read relevant manuals.

*1: AQ2200-601 10Gbit/s BERT Module
*2: AQ2200-111 DFB-LD Module
*3: AQ2200-621/622 10Gbit/s Optical Modulator

Notes

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

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Revisions

- 1st Edition: March 2005

1st Edition : March 2005 (YK)

Functions Described in This Manual and Version

This manual is applicable to the version "01.00" of the AQ2200-631 10Gbit/s Optical Receiver (which is sometimes abbreviated as "OE" or "OE module") and the main unit version "04.00." or later of the AQ2201/AQ2202 Frame Controller, on which this module is to be mounted.

The following Table shows the relationship among the main unit version, additional functions of this module, and applicable module.

If your module does not have the latest version, you cannot use all functions described in this manual.

The version of the main unit can be checked through **SOFT VERSION** of the device information, which is displayed using the following operating procedures.

1. Press the [SYSTEM] key. → Move the cursor to "Information".
2. Press the <OK> function key or [ENTER] key.

For details about how to display the version of the main unit, see section 7.7, Displaying the device information, in the user's manual for AQ2201/AQ2202 Frame Controller.

The version of this module can be checked through Rev info, which is displayed using the following operating procedures on the SUMMARY screen or BERT APPLICATION screen.

1. Press the <Information> function key.

Check **OE Firm of Rev info** that appears after the above operation.

For details about how to display the version of this module, see section 4.3-(7) or 5.6-(4), Displaying the version information, in this user's manual.

Versions of AQ2201/2202 Main Unit and AQ2200-631 OE Module

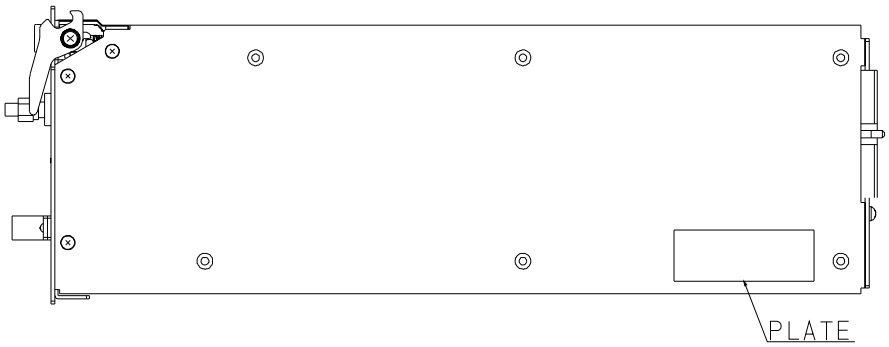
Main Unit Version	OE Version	Suffix Code	New Functions	Reference Page/Section/Chapter
04.00 or later	01.00	Standard	–	

Checking the Contents of the Package

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

AQ2200-631 OE Module

Check that the model name and suffix code given on the name plate on the right side of the module unit match those on the order. When contacting the dealer from which you purchased the instrument, please give them the instrument number.



Right Side View

MODEL	SUFFIX	Specifications
810518803		AQ2200-631 10Gbit/s Optical Receiver configuration with standard specifications (1.31um/1.55um)
Optical connector	-S	SC connector
	-F	FC connector
Options	/U	U-link coaxial cable

- No. (Instrument Number)
  When contacting the dealer from which you purchased the instrument, please give them the instrument number.

Standard Accessories

The standard accessories below are supplied with the instrument. Check that all contents are present and that they are undamaged.

Name	Q'ty	Remarks
Protective cap	1	This protective cap is already attached to the optical terminals.
Terminator for circuit protection	1	This terminator is already attached to the electrical terminal.
User's Manual	1	This manual.
User's Manual for remote commands	1	

Optional Accessories (Sold Separately)

The optional accessories below are available for purchase separately. Check that all contents are present and that they are undamaged. For information and ordering, contact your nearest YOKOGAWA dealer.

Name	Q'ty	Remarks
U-link coaxial cable	1	For connection with DATAIN of BERT module

Safety Precautions

This instrument is an IEC safety class I instrument (provided with terminal for protective earth grounding).

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

The Following Symbols Are Used on This Instrument.

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

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

WARNING

- Power Supply
  Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the instrument and that it is within the maximum rated voltage of the provided power cord.
- Power Cord and Plug
  To prevent the possibility of electric shock or fire, be sure to use the power cord supplied by YOKOGAWA. The main power plug must be plugged into an outlet with a protective earth terminal. Do not invalidate this protection by using an extension cord without protective earth grounding.
- Protective Grounding
  Make sure to connect the protective earth to prevent electric shock before turning ON the power. The power cord that comes with the instrument is a three-pin type power cord. Connect the power cord to a properly grounded three-pin outlet.
- Necessity of Protective Grounding
  Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so poses a potential shock hazard.
- Defective Protective Grounding
  Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.
- Do Not Operate in an Explosive Atmosphere
  Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such environments constitutes a safety hazard.
- Do Not Remove Covers
  The cover should be removed by YOKOGAWA's qualified personnel only.
  Opening the cover is dangerous, because some areas inside the instrument have high voltages.
- External Connection
  Securely connect the protective grounding before connecting to the item under measurement or an external control unit. If you are going to touch the circuit, make sure to turn OFF the circuit and check that no voltage is present.

- In Using the Modules
  - Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage.
  - To prevent the possibility of electric shock, be sure to furnish protective earth grounding of the main frame.
  - To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical protection function and the mechanical protection function will not be activated.
  - Avoid continuous connection under an environment in which the allowable surge voltage or greater voltage may occur.
- InGaAs

  The devices used in this product contains indium gallium arsenide (InGaAs). Particles and vapors of InGaAs are very dangerous. The product must therefore never be burnt, destroyed, cut, crushed or chemically disassembled. It must be separated from general industrial waste and household rubbish, and disposed of according to local regulations.
- Disposal of the Unit

  When disposing of this unit, do not attempt to throw it into the fire. Doing so may cause the unit to explode, resulting in fire, personal injury, or burn hazard.

How To Use This Manual

Structure of This Manual

This user's manual consists of the following sections:

Chapter	Title	Description
1	Functional Description	This Chapter describes the overview of this unit, part names and functions, measurement principle and function of this unit. This Chapter does not describe the operating procedures. However, when reading this Chapter before starting each operation, the contents of operation can be understood easily.
2	Before Starting Measurement	This Chapter describes the unpacking and acceptance inspection, cautions on operation, how to mount or remove the module, and how to connect the cables.
3	Basic Operation	This Chapter describes the panel part names, various screens, and their functions.
4	Operation on SUMMARY/DETAIL Screens	This Chapter describes the display screen, setup screen, and operation examples on the SUMMARY and DETAIL screens.
5	BERT Application	This Chapter describes the BERT application display screen, setup screen, parameter setting, and measuring procedures focusing on the EO/OE module.
6	Troubleshooting, Maintenance, and Inspection	This Chapter describes probable causes and corrective actions if any trouble occurs, and the maintenance and inspection of this module.
7	Daily Maintenance	This Chapter describes the daily maintenance of this module.
8	Specifications	This Chapter describes the specifications of this module.
	Appendix	This Appendix describes the initial set values and outside views of this module.

Conventions Used in This Manual

- Used Characters
  In the operational description, keys are indicated as described below.
  - Hard key: [ ]
  - Parameter item: " "
  - Function key: < >

- Symbols
  The following symbols are used in this manual.

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

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

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

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

- Symbols Used for Descriptions of Operations
  The following symbols are used in Chapters 2 to 7 to distinguish certain features in descriptions.

Operating Procedures — Carry out steps in the order shown. The operating procedures are given with the assumption that you are not familiar with the operation. Thus, it may not be necessary to carry out all the steps when changing settings.

Explanation — Describes settings and restrictions relating to the operation. A detailed description of the function is not provided. For a detailed description of the function, refer to Chapter 1.

Cautions on Handling of Optical Fiber and Optical Connector

- **Dust and Contamination Are Strictly Prohibited.**

  The contamination of the optical connector may cause the performance to deteriorate. Always keep the optical connector clean.

  Additionally, when the optical fiber and optical connector are not used, attach the cap supplied with this module to the optical fiber and optical connector of this unit to prevent the dust from entering or the optical fiber and optical connector from being contaminated.

- **Cleaning the Optical Fiber**

  Before using this module, clean the top end of the optical fiber plug using a wiping paper sheet with a small amount of absolute alcohol put or blow off dirt or dust with a spray for optical parts.

- **Cleaning the Optical Connector**

  Turn OFF the power to this unit. Twist a wiping paper sheet thinly and put a small amount of absolute alcohol on it. With this wiping paper sheet, clean the inside of the optical connector or blow off dirt or dust with a spray for optical parts.

- **Handling the Optical Fiber**

  The top end of the optical fiber is sensitive. If the optical fiber is made in contact with the screw when connecting it to the connector, its top end is damaged, causing the performance to deteriorate.

  Therefore, when connecting the optical fiber, always handle the top end of the optical fiber with great care. If the optical fiber is not used, attach the cap to the optical fiber to protect its top end.

- **Handling the Optical Connector**

  Carefully connect the optical fiber to the optical connector so that the laser beam emitted from the optical connector does not enter your eye. If the optical connector is not used, attach the cover to the optical signal input/output terminals.

CAUTION

Always keep the optical fiber and optical connector clean.

- **Using the Optical Attenuator**

  Do not input the optical power exceeding the rating to this module. Otherwise the module may be damaged. Take appropriate protective measures, such as connection of the optical attenuator.

Contents

1.1 Overview

This unit is a 10Gbit/s-band optical receiving module (optical receiver) to be mounted on the AQ2200-series Frame Controller.

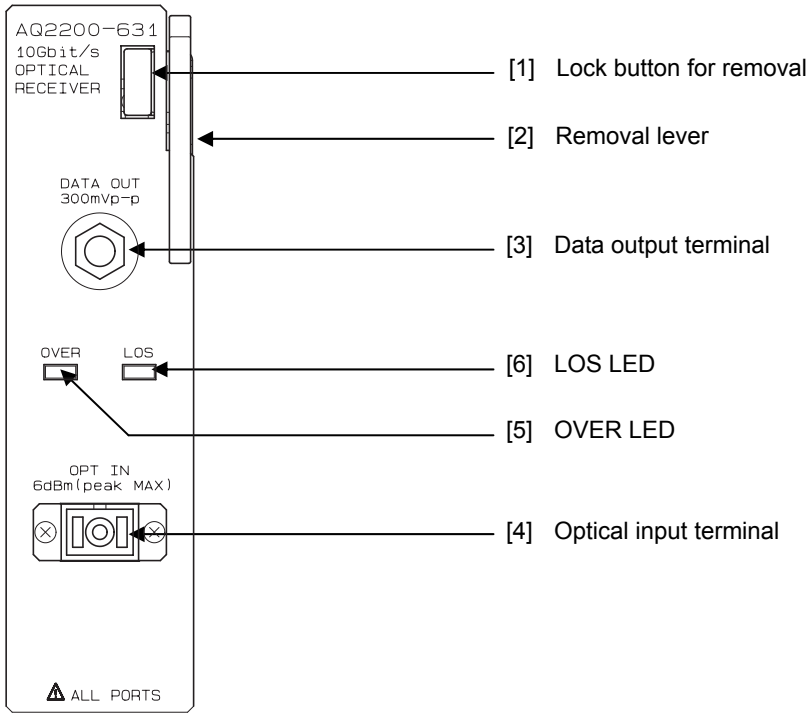
Major Features

- This module is a compact optical receiving module *2 to be mounted on the AQ2200-series Frame Controller.
- Applicable coding is NRZ and mark ratio is 1/2.
- A threshold value adjustment function is provided.
- An output ON/OFF function (operated only through GUI) is provided.
- Overload or Loss of signal is detected and LED on the front panel is lit.
- A simple power monitor function (-19dBm to +5dBm) is provided.
- This optical receiving module can easily be made applicable to the BER measurement of the 10Gbit/s-band optical interface by combining it with the BERT module *3, light source module *4, and/or optical modulation module *5 of the AQ2200-series.
- By combining various modules of the AQ2200-series, a test system is constructed easily, in which the BERT is integrated with other applications.

*1:	AQ2201	Frame Controller (3-slot type)
	AQ2202	Frame Controller (9-slot type)
*2:	AQ2200-631	10Gbit/s Optical Receiver
*3:	AQ2200-601	10Gbit/s BERT Module
*4:	AQ2200-111	DFB-LD Module
*5:	AQ2200-621	10Gbit/s Optical Modulator (1550nm)
	AQ2200-622	10Gbit/s Optical Modulator (1310nm)

1.2 Part Names and Functions

Front Panel



Front Panel

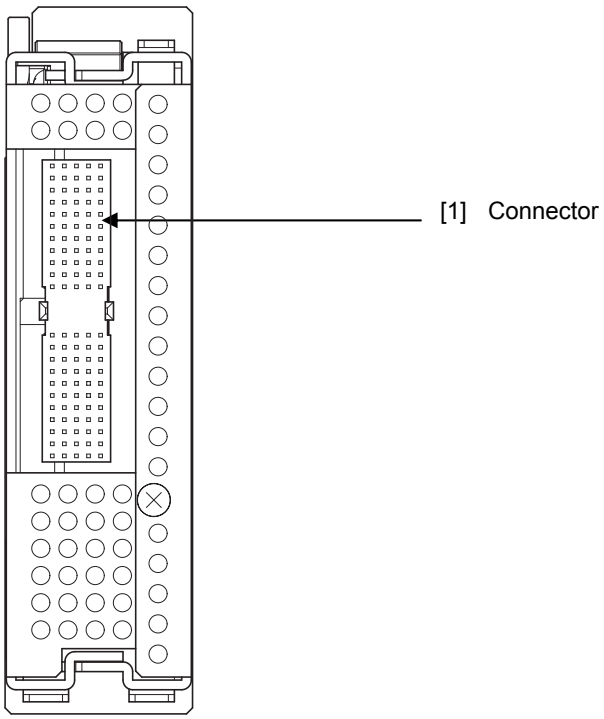
No.	Name	Function
[1]	Lock button for removal	Lock button for removal of the module. This lock button is used to mount or remove this module on/from the frame controller. For details, see sections 2.3 and 2.4.
[2]	Removal lever	Lever for removal of the module. This removal lever is used to mount or remove this module on/from the frame controller. For details, see sections 2.3 and 2.4.
[3]	DATA OUT Data output terminal	Electric output 300 mVpp, AC-coupling. Data output terminal. This terminal is connected to the DATA IN1 (CDR) terminal of the ED of the BERT module with the U-link (optional) or coaxial cable.
[4]	OPT IN Optical input terminal	Optical input 6dBm (peak Max). Optical input terminal. The absolute maximum rating is 6dBm (peak) or 3dBm (ave.). If the optical input exceeds the absolute maximum rating, this may cause the unit to break. Check the input level. If the input level may exceed the absolute maximum rating, protect the terminal using the optical ATT.
[5]	OVER LED (Red)	The average power level of the receiving light is monitored to indicate whether or not it exceeds the OVERLOAD level. Lit *1: This shows that the average power level exceeds the OVERLOAD level. Off: This shows that the average power level is less than the OVERLOAD level.
[6]	LOS (Loss of Signal) LED (Red)	The average power level of the receiving light is monitored to indicate whether or not it is lower than the LOS level. Lit *1: This shows that the average power level is less than the LOS level. Off: This shows that the average power level exceeds the LOS level.

*1: Since the bit error is not detected, the bit error does not always occur even though the OVER or LOS LED is lit.

Note

When the performance stability of the minimum light receiving sensitivity is required, it is recommended to use this unit after it has been warmed up for about 30 min. after the power has been turned ON.

Rear Panel



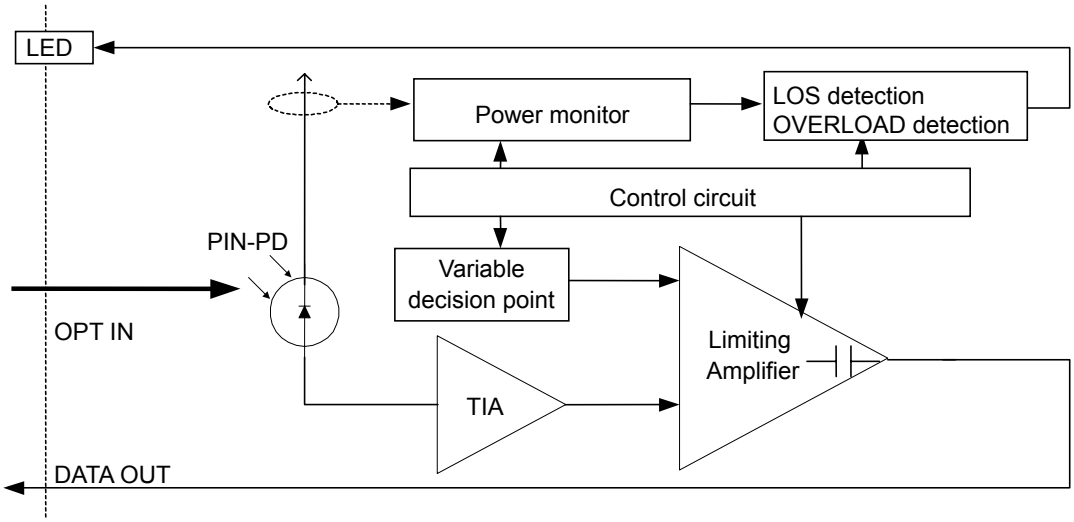
Rear Panel

No.	Name	Function
[1]	Connector	This connector is used to connect the frame controller. After checking that any foreign matter is not sticking to the connector, mount the module on the frame controller.

1.3 Block Diagram

Block Diagram

The following shows the block diagram of this module.



Description of Block Diagram

The PIN-Photodiode (hereafter referred to as PIN-PD) is used as the optical receiver.

The optical signal input via the OPT IN terminal is converted to an electric signal and amplified by the Transimpedance Amplifier (hereafter referred to as TIA).

This electric signal is identified at the preset threshold level (i.e. decision point) by the Limiting Amplifier (hereafter referred to as LA) in the next stage and output from the DATA OUT terminal as a digital signal.

The module is also equipped with a simple power monitor function, which monitors the optical current of the PIN-PD.

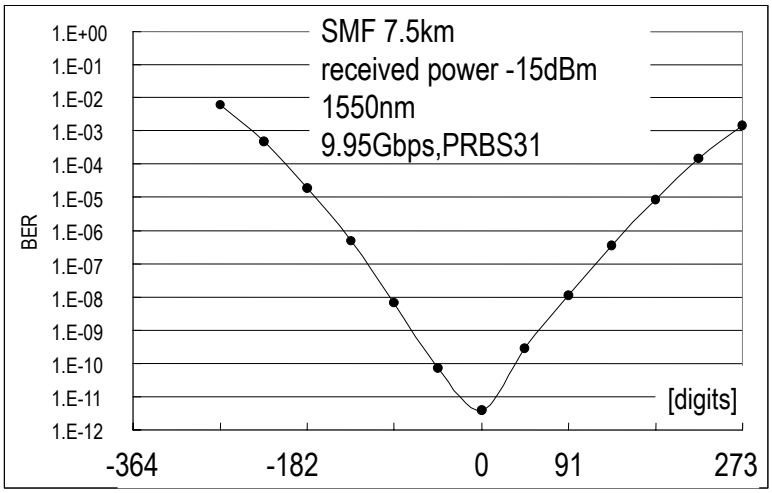
1.4 Functional Description

(1) Data Threshold

A threshold value is set to identify the logic to the electric data after completion of the optical-electric conversion.

Setting range: -364 to 273

The following Fig. shows an example of the BER measurement by changing the threshold value.



* This shows a measurement example and does not guarantee the numeric values.

(2) Wavelength

A wavelength band (1.3μm/1.5μm) of the receiving light signal is set. With this function, the wavelength band sensitivity of the Input Power Monitor described in (3) Input Power Monitor below is corrected.

(3) Input Power Monitor

Simple power monitor function.

The average optical input power is displayed.

Measurement range: -19dBm to +3dBm (accuracy: ±1dB)

Note that the sensitivity correction by the temperature and wavelength within the wavelength band is not made strictly.

(4) OUTPUT ON/OFF

The data output (i.e. electric output) from the DATA OUT port is turned ON/OFF.

(5) Setting Function of Overload Point and LOS Point

The detection levels for the Overload and LOS can be set.

- Overload point: -19dBm to +2dBm 0.1dBm step
- LOS point: -19dBm to +2dBm 0.1dBm step

(6) Detecting Function of Overload and LOS

The LED goes on if the value exceeds the Overload level or falls below the LOS level.

2.1 Unpacking and Acceptance Inspection

This unit has been mechanically and electrically inspected strictly to assure the proper operation before shipment from the factory. After this unit has been received, immediately unpack it to check for transportation damage.

Mechanical Inspection

After unpacking this unit, check the appearance of this unit, switch operation, and connectors for transportation damage or functional fault.

Additionally, make sure that all accessories are included while referring to the description stated in Chapter 8, Specifications.

WARNING

To avoid serious electric shock trouble, do not carry out the functional test if transportation damage is found in the exterior (cover or panel).

Note

It is recommended to carefully store inner corrugated boxes and cushion materials except for consumable packaging materials, such as packaging paper sheets for reuse, such as re-transportation of the unit so that they are not damaged.

Functional Inspection

When no fault is found in the mechanical operation, the functional test is actually carried out to check that the unit functions as specified and to inspect the performance.

If Any Damage or Fault Is Found:

If any damage or trouble different from the specification is found in this unit during mechanical inspection or functional test after unpacking, immediately contact your local sales dealer, or YOKOGAWA's sales department or sales branch office.

The contact addresses of YOKOGAWA's sales departments and sales branch offices are described at the back of this manual.

2.2 Handling Precaution

Safety Precautions

The following describes the cautions about installation environment and handling.

If you are using this instrument for the first time, make sure to thoroughly read the "Safety Precautions" given on page v to vi.

1. Do not apply any excessive impact to this unit.
2. Do not operate or store this unit in an environment beyond the specifications.
3. Do not place this unit close to an object that radiates the strong radio wave or magnetic field.
4. Do not remove the cover of this unit.
5. Do not store or operate this unit in a place where the static electricity is produced.
6. Do not touch any metallic terminal of the connector of the module by hand.

Installation Environment

Always operate this unit only in an indoor place. Do not operate this unit in a place where it is exposed to the outside atmosphere, flammable gas, or smoke.

This unit can be operated in the environmental range described below.

Temperature: 5 to 40°C

Altitude: Up to 2000m

Humidity: Relative humidity 20 to 80%

Appropriate measures must be taken to avoid dew condensation caused by extreme temperature changes.

Note

When the performance stability of the minimum light receiving sensitivity is required, it is recommended to use this module **after it has been warmed up for about 30 min.** after the power has been turned ON.

CAUTION

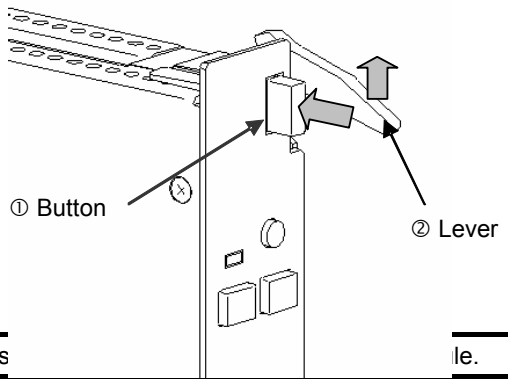
●Ventilation requirements
When installing this unit in a rack or cabinet, do not block any ventilation port in the rear or side panel of this unit. Additionally, mount this unit with sufficient ventilation kept so that the heat is not remained inside the rack or cabinet.

Do Not Install the Instrument in the Following Places.

- In direct sunlight or near heat sources.
- Where an excessive amount of soot, steam, dust, or corrosive gas is present.
- Near strong magnetic field sources.
- Near high voltage equipment or power lines.
- Where the level of mechanical vibration is high.
- In an unstable place.

2.3 Mounting the Module

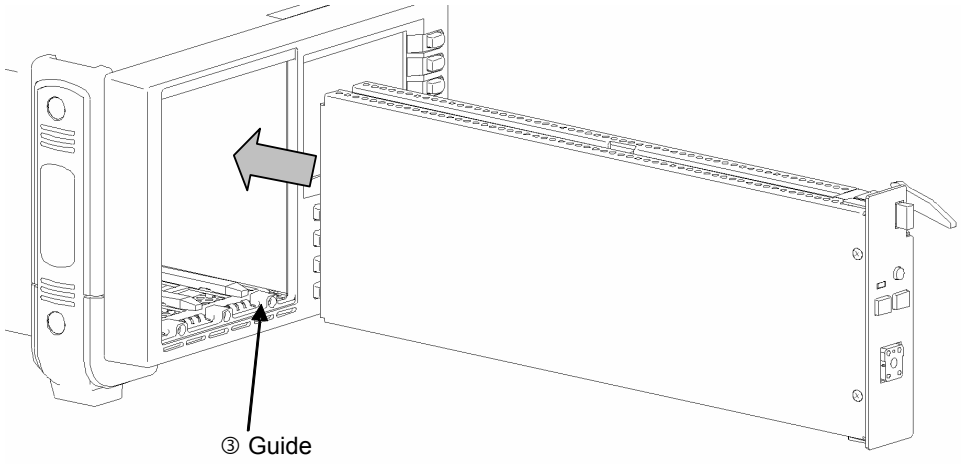
1. Pull up the lever ② with the button ① on the module panel kept pressed.



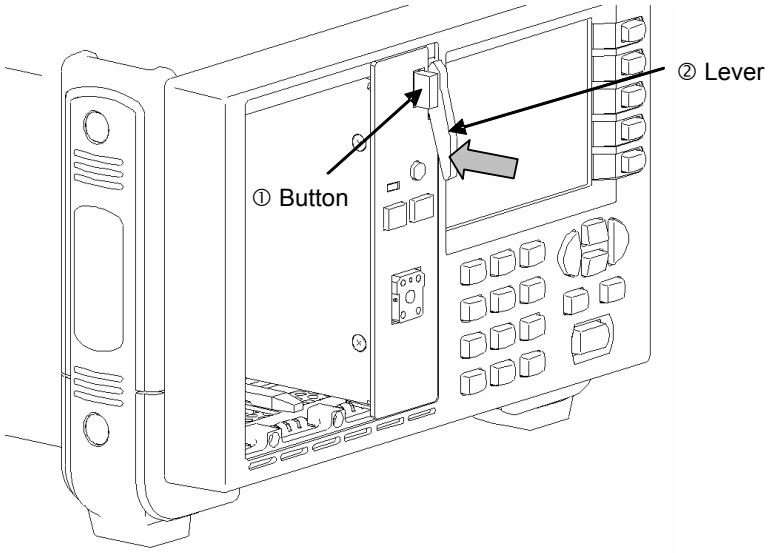
Note

When mounting the module, always le.

2. Make the dent on the bottom of the module matched with the guide ③ of a desired slot of the frame where the module is to be mounted, and then gradually insert the module.

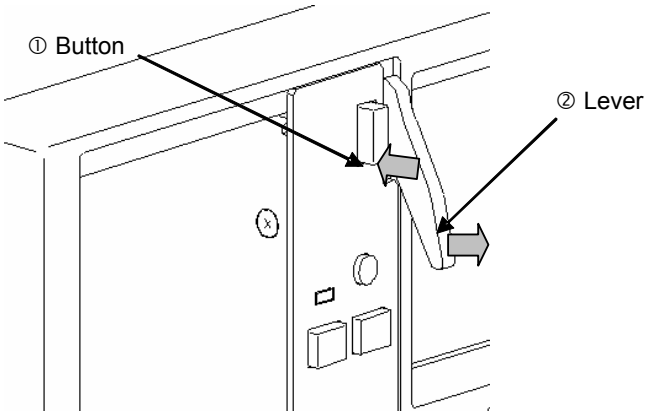


3. When the module is inserted and it is in contact with the far side, gradually push the lever ② with strong force until the button ① clicks.

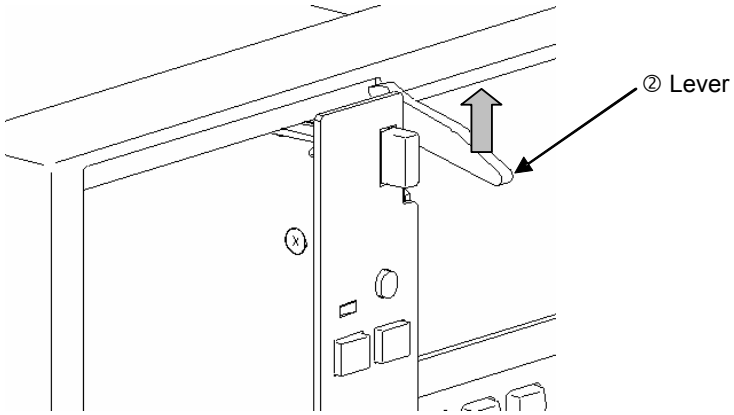


2.4 Removing the Module

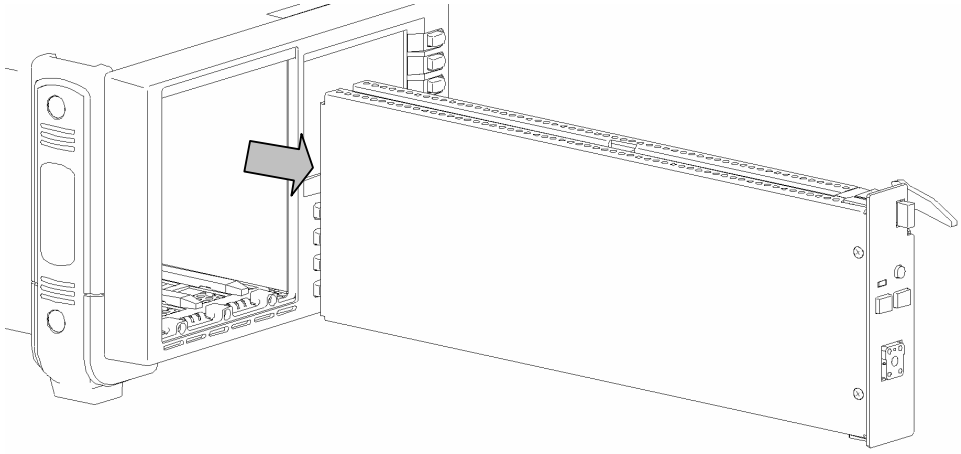
1. Lightly push up the lever ② with the button ① kept pressed until the lever ② is unlocked.



2. Gradually pull up the lever ② until the module is projected approximately 1cm from the frame.



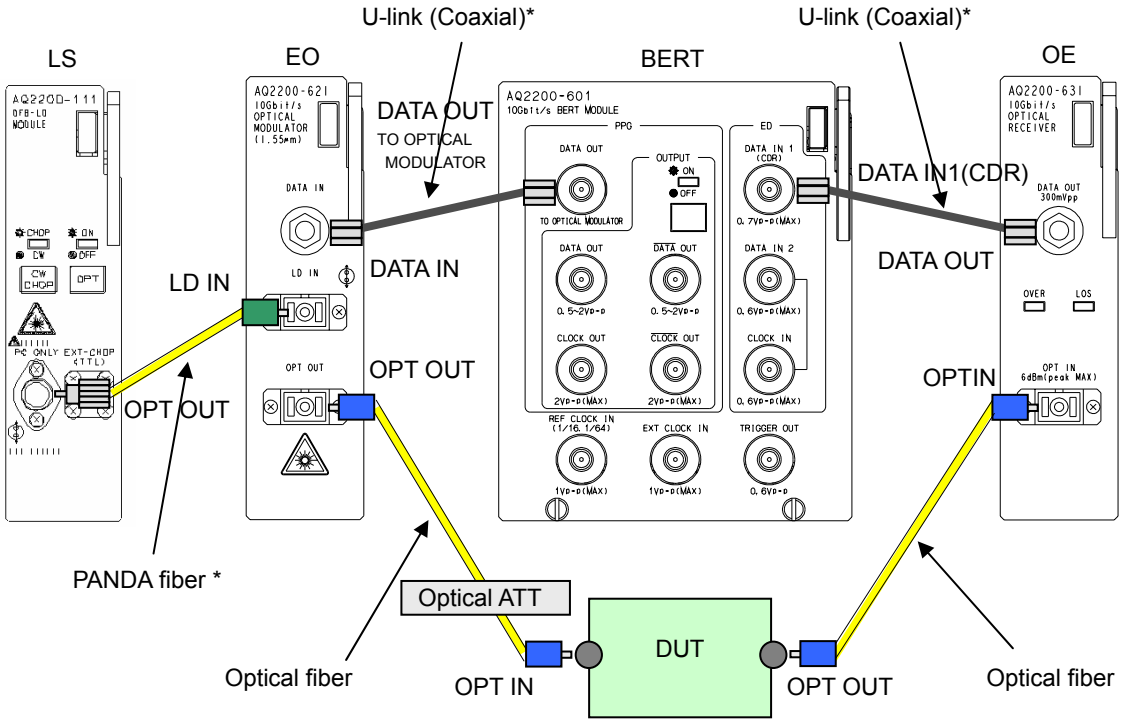
3. Gradually pull out the module from the slot of the frame.



2.5 Connecting the Cables

(1) Optical IF Is Used.

The following shows the connections when the DUT has the optical interface and the BERT module (BERT)*1 is operated with it combined with the light source module (LS)*2, optical modulation module (EO)*3, and/or optical receiving module (OE)*4 of the AQ2200-series.



*1: AQ2200-601 10Gbit/s BERT Module
*2: AQ2200-111 DFB-LD Module
*3: AQ2200-621 10Gbit/s Optical Modulator (1550nm)
AQ2200-622 10Gbit/s Optical Modulator (1310nm)
*4: AQ2200-631 10Gbit/s Optical Receiver

Note

- To assure the performance, always use EO and OE optional units (sold separately) for the optional U-link and PANDA fiber.
- To protect the DUT, insert the optical attenuator, when necessary.

Connecting the Cables

When connecting this unit to the DUT, other module, or measuring instrument with the connection cables, take appropriate measures to protect the unit from static electricity.

CAUTION

When connecting the cable or terminator to the connector of this unit, always ground it firmly or make the operator in contact with the metallic part of the main frame to prevent static electricity.

If the static electricity is charged, this may cause the unit to malfunction.

Connector

1. If this unit is not used, attach the terminator to the coaxial connector and protective cap to the optical connector.
2. Before connecting the cable to the connector, always turn OFF the outputs of the signal generator and light source.
3. Tighten the coaxial connector with a **torque wrench**. The proper tightening torque is **0.9N-m**. Excessive torque may cause the connector to break.

CAUTION

When connecting the U link cable or connection cable to the connector, make the connector of this unit matched with the connector type of the cable end and carry out the proper connection.

If a connector other than that specified is connected, this may cause the connector to break.

3.1 Flow of Operation

Flow of Operation

Preparation

- Installation (→ Section 2.2, User's Manual for AQ2201/2202 Frame Controller)
- Mounting the module (→ Section 2.3)
- Connecting the power supply (→ User's Manual for AQ2201/2202 Frame Controller)
- Connecting with the DUT (→ Section 2.5)
- Connecting with a PC (→ User's Manual for AQ2201/2202 Frame Controller)
- Turning ON the power switch (→ User's Manual for AQ2201/2202 Frame Controller)

↓

Measurement Conditions Setup

- PPG IF conditions: Optic setting * (→ (2) in Section 5.5 of AQ2200-601 10Gbit/s BERT Module User's Manual [hereafter referred to as "10GBERT manual"])
- Measurement pattern and pattern length: PRBS/Prog, Length (→ (15) through (18) in Section 5.5 of 10GBERT manual)
- Error rate (→ (19) in Section 5.5 of 10GBERT manual)
- Logic settings of PPG, ED, and EO (→ (4) in Section 5.5 of this manual, (20) in Section 5.5 of 10GBERT manual)
- DriverGain (→ (1) in Section 5.5)
- CrossPoint (→ (2) in Section 5.5)
- Auto Bias Control (→ (3) in Section 5.5)
- Data threshold (→ (6) in Section 5.5)

  etc.

↓

Measurement

- Turning ON OFF the output (→ (3) in Section 5.6)
- Starting the measurement (→ (1) in Section 5.6)
- Adding the error (→ (2) in Section 5.6)
- Stopping the measurement (→ (1) in Section 5.6)
- Displaying the measurement result (→ Section 5.2)

↓

End

For details, see the sections within parentheses.

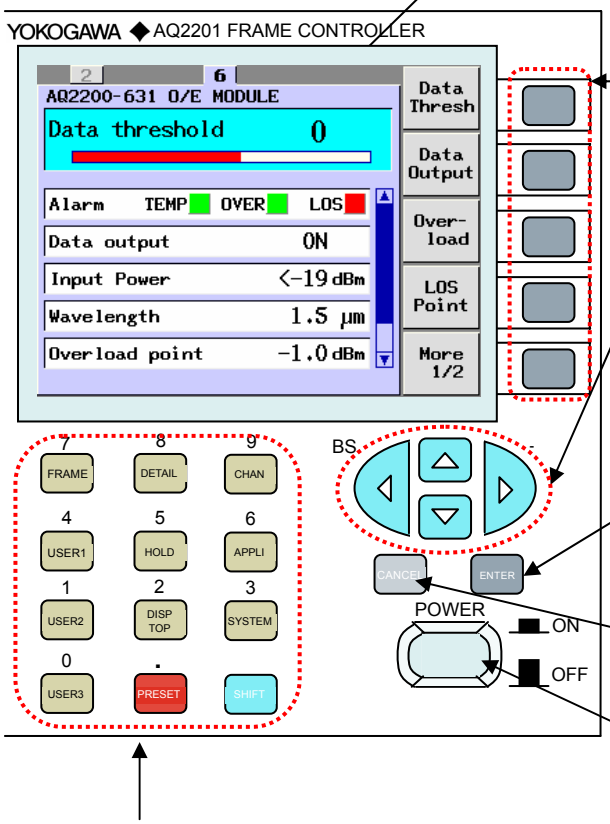
*: If you set PPG IF to Optic, no signal is output to the DATA OUT terminal nor the $\overline{\text{DATA}}$ OUT terminal.

Note

Perform "Measurement conditions setup" and "Measurement" in the BERT Application (Chapter 5).

3.2 Panel Part Names and Functions

(1) Display and Key Operation Console



Display
Shows the measured value, set value, and status.

Function key
Keys corresponding to the items shown on the right of the display.
Function key is used to select or execute relevant item shown on the right of the display.

Cursor key
[▲] and [▼] are used to change the module to be controlled, move the cursor, and change the numeric value.
[◄] and [►] are used to change the numeric value input digit position and input a backspace or negative sign in the ten-key pad mode.

ENTER key
This key is used to set the selected item and input value.

CANCEL key
This key is used to cancel the operation.

POWER switch
This switch is used to turn ON or OFF the power.

Hard key
12 keys are arranged and they have the following functions.

[PRESET]: Returns the parameters of the module actually mounted on the frame to their default statuses.
[SYSTEM]: Displays the SYSTEM SETUP screen.
[DISP TOP]: Closes the PARAMETER CHANGE screen. *1
[FRAME]: When this key is pressed on the BERT APPLICATION screen, the tabs (pages) of the items to be controlled are changed in the reverse direction.
[APPLI]: Displays the APPLICATION SELECT screen.
[HOLD]: When the module at the cursor position is the sensor, the updating of the measured data display is stopped. *1
[CHAN]: When this button is pressed on the SUMMARY or DETAIL screen, the modules to be controlled are changed in the slot No. order.
When this button is pressed on the BERT APPLICATION screen, the tabs (pages) of the items to be controlled are changed in the normal direction.
[USER1]: A desired function can be assigned to this button. *1
[USER2]: A desired function can be assigned to this button. *1
[USER3]: A desired function can be assigned to this button. *1
[DETAIL]: Switches the display between the SUMMARY screen and DETAIL screen.
[SHIFT]: Changes to the ten-key pad mode (numeric value direct input).

*1: Not available when this module is installed.

Note

For details, see the User's Manual for AQ2201/AQ2202 Frame Controller.

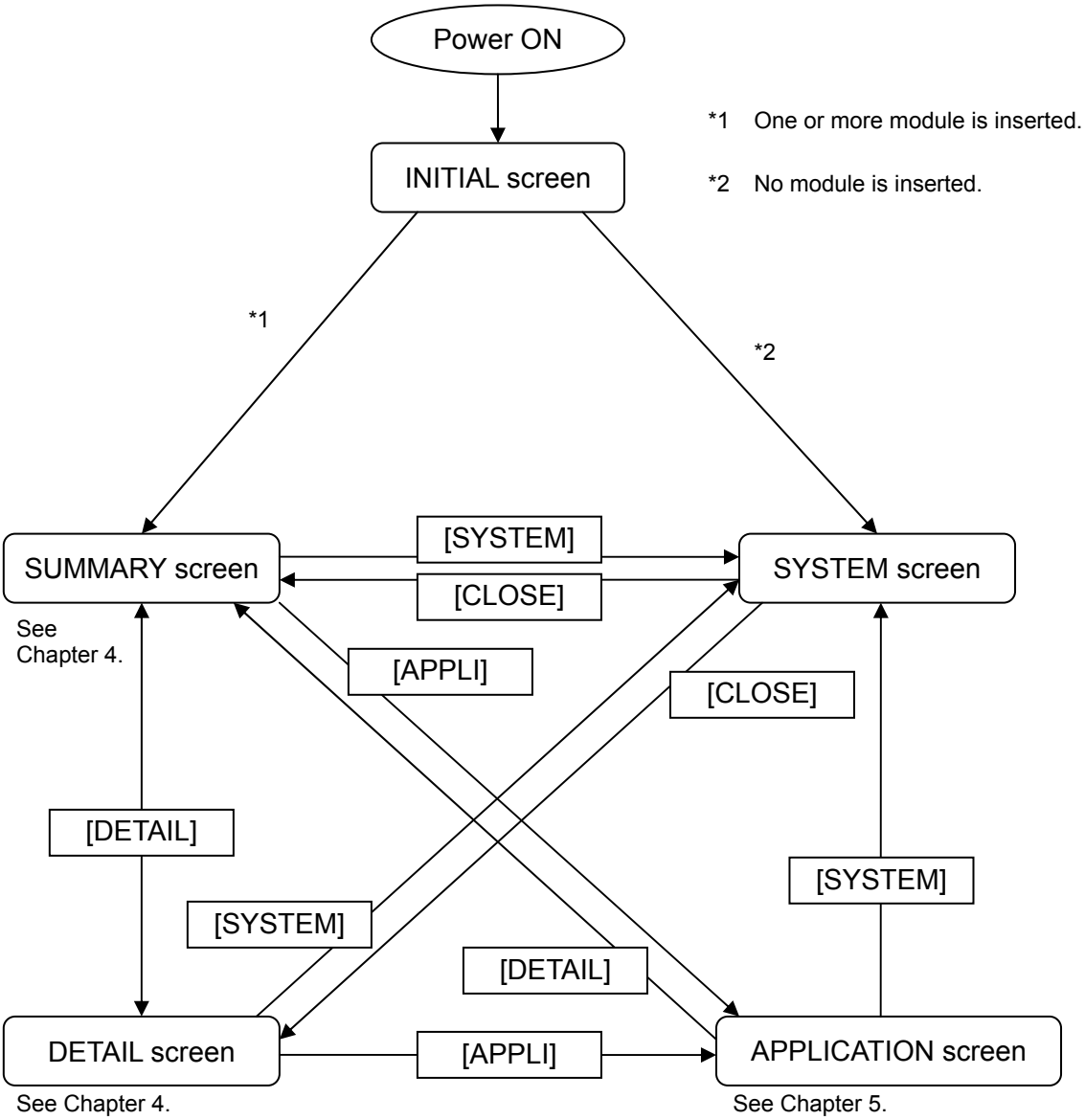
3.3 Various Screens and Functions

(1) Display Screen

The display screen is mainly classified into five screens shown below.

- INITIAL screen
- SYSTEM screen
- SUMMARY screen
- DETAIL screen
- APPLICATION screen

The following screen transition diagram shows the relationship among these screens.

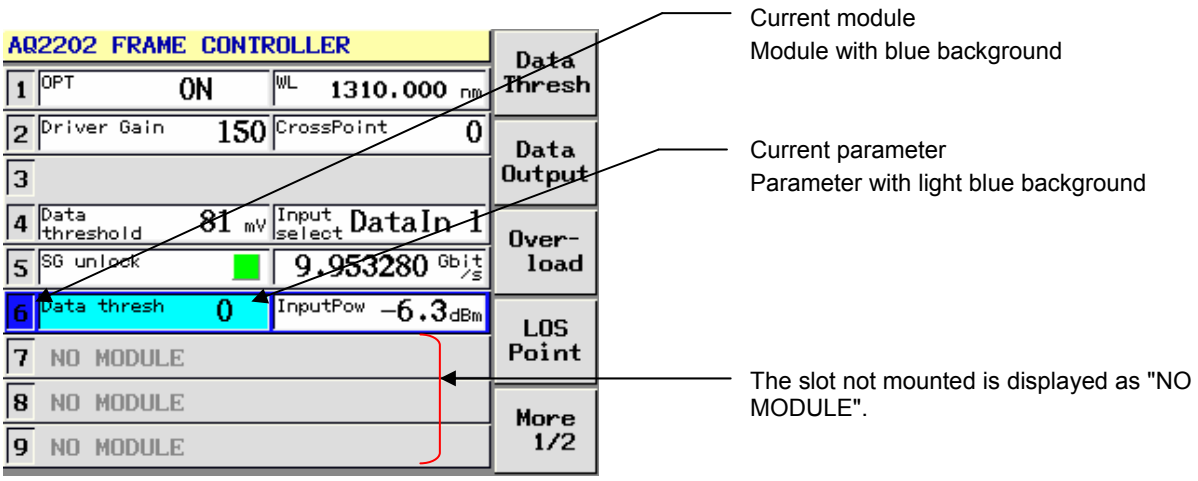


Note

For details about INITIAL screen and SYSTEM screen, see the User's Manual for AQ2201/AQ2202 Frame Controller.

(2) SUMMARY Screen

On the SUMMARY screen, the information on all mounted modules is displayed at once.
You can display, check, and change the main parameters.
The fields equivalent to the slots of the chassis are displayed.
For details, see Chapter 4.



SUMMARY Screen of 9-Slot Type (AQ2202 FRAME CONTROLLER)

Note

Contents common to SUMMARY screen, DETAIL screen, and APPLICATION screen.

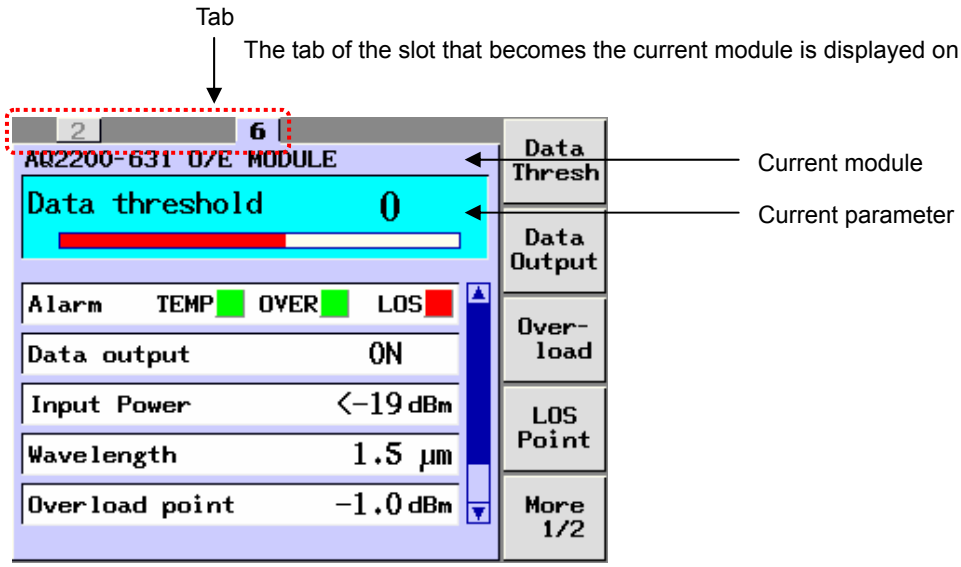
- Current module: Module with blue background
  This module allows changing of the parameters.
  The current modules are changed in the slot No. order with the [CHAN] key or [▲] or [▼] key.
- Current parameter: Parameter with light blue background
  This parameter can be changed.
  With the [◀] or [▶] key, the selection item of the current parameter is changed.

(3) DETAIL Screen

On the DETAIL screen, the detailed information on one module (current module) selected from those mounted is displayed.

You can display, check, and change all parameters of the current module.

For details, see Chapter 4.

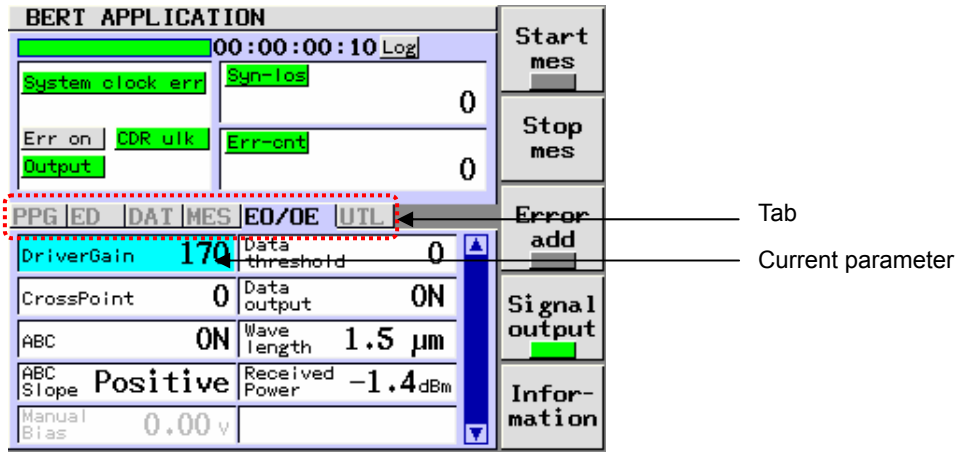


(4) APPLICATION Screen

The application is software that performs the control with one or multiple modules combined.

Normally, use this BERT APPLICATION screen.

For details, see Chapter 5.

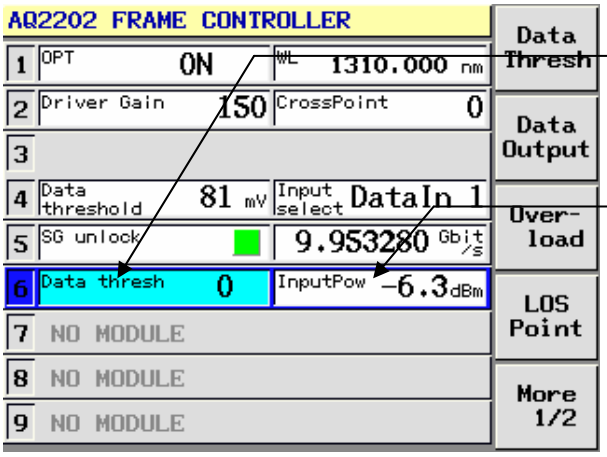


4.1 Display Screen

This section describes the display contents of the SUMMARY screen and DETAIL screen.

(1) SUMMARY Screen

9-slot Type



- Data threshold

  Shows the threshold value setting for identification of the logic to the electric data after completion of the optical-electric conversion.

  - Display range: -364 to 273

- Input Pow

  Shows the average optical input power.

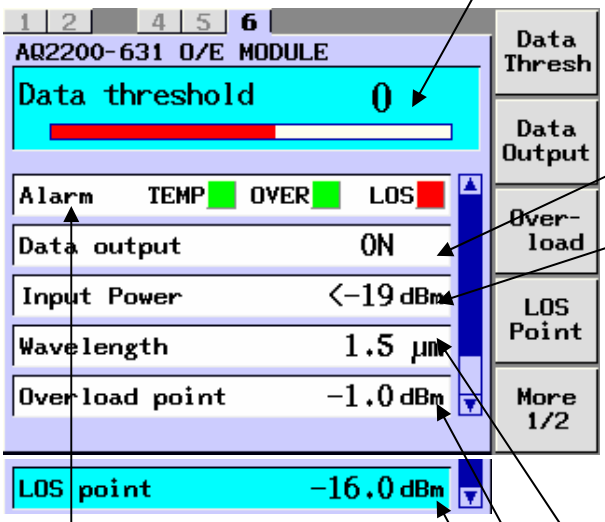
  - Measurement range:

    -19.0dBm to +3.0dBm (accuracy: ±1dB)

Input Status	Display
Within measurement range	-19.0dBm to +3.0dBm
Beyond measurement range	<-19dBm >+3dBm

Note that the sensitivity correction by the temperature and waveform length is not made.

(2) DETAIL Screen



- Data threshold

  Shows the threshold value setting for identification of the logic to the electric data after completion of the optical-electric conversion.

  - Display range: -364 to 273

- Data output

  Shows the output port status.

- Input Power

  Shows the average optical input power.

  - Measurement range:

    -19.0dBm to +3.0dBm (accuracy: ±1dB)

Input Status	Display
Within measurement range	-19.0dBm to +3.0dBm
Beyond measurement range	<-19dBm >+3dBm

Note that the sensitivity correction by the temperature and waveform length is not made.

- Wavelength

  Shows the wavelength band of the receiving light signal.

  1.5um / 1.3um

- Overload point

  Shows the Overload detection level.

  -19.0dBm to +2.0dBm

- Los point

  Shows the Los detection level.

  -19.0dBm to +2.0dBm

- Alarm

  Detects the alarm status of the module to indicate it.

  - TEMP

    Shows the temperature alarm.

Indication	Description
Red	The temperature exceeds the upper limit of the storage temperature. Since the component may be broken thermally in this status, the power supply from the frame to the module is automatically stopped. Immediately stop the operation and lower the ambient temperature.
Yellow	The temperature exceeds the upper limit of the operating temperature. If the operation is continued, this may cause operation fault.
Green	Correct status

  - OVER *1, *2

    Monitors the average power of the optical input. If the average power exceeds the Overload level, the LED (red) is lit. (Detection accuracy: ±1dB)

Indication	Status
Green	Correct status
Red	Overload status

  - LOS (Loss of Signal) *1, *2

    Monitors the average power of the optical input. If the average power is less than the LOS level, the LED (red) is lit. (Detection accuracy: ±1dB)

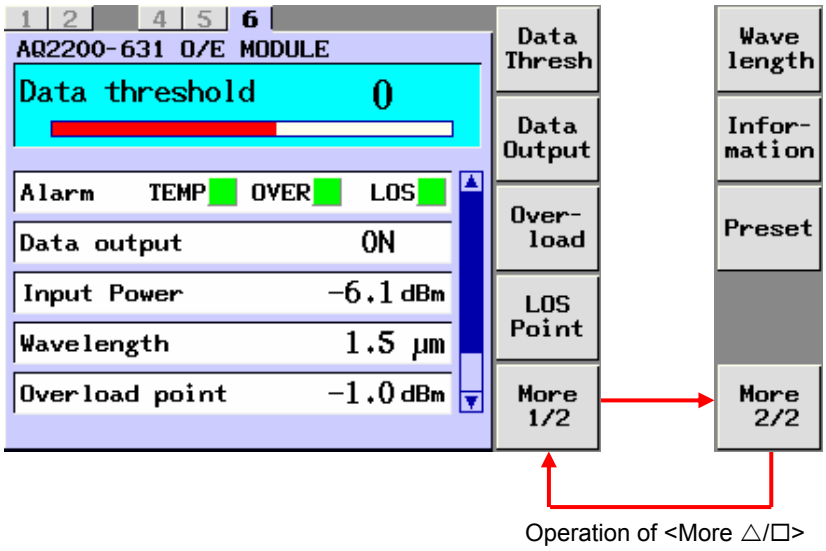
Indication	Status
Green	Correct status
Red	LOS status

*1: Since the bit error is not detected, the bit error does not always occur even though the alarm LED is lit in red.

*2: The alarm indication is interlocked with the LED on the front panel.

4.2 Setup Screen

(1) Outline of DETAIL Screen



The items at the right end of the screen correspond to the function keys. Pressing a desired function key on the right of the items shown on the screen will change the item display or make the setting.

Additionally, “More △/□” is displayed on the bottom line of the function key display on this screen, showing that the function key display is shown on △ page of □ pages. When pressing the “More △/□” function key, the screen is changed cyclically. The above Fig. shows an example of the function key when the screen is changed with the More key.

The lower half portion of the screen shown in the Fig. above is the scroll display. This display can be scrolled with the [▲] or [▼] cursor key.

When pressing [Enter] with a function key pressed or an item cursor selected, the Setup popup screen will appear.

Select an item with the [▼] or [▲] key and press the [ENTER] key or <OK> function key to set it.

To set a numeric value, select a desired numeric value with the [▼] or [▲] key or input a numeric value directly with the ten-key pad.

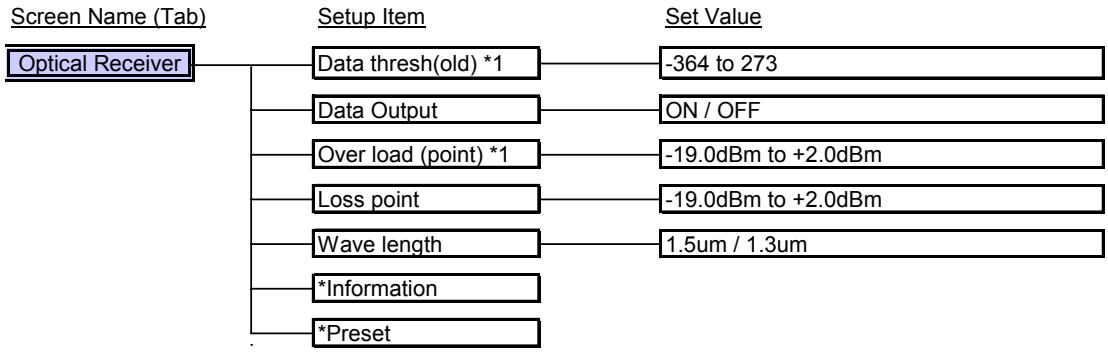
Normally, pressing the [SHIFT] key will enter the ten-key pad input status. However, when the popup screen is shown, you can input a numeric value with the ten-key pad even though the [SHIFT] key is pressed first.

Additionally, to exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel> function key.

Note

In the optical receiver, the items you can set with the function keys are common to the DETAIL screen and SUMMERY screen.

(2) Screen Configuration Diagram



*: Operated only with function key.
*1: Function key is shown with the word(s) in ( ) omitted.

(3) Display and Setup Items

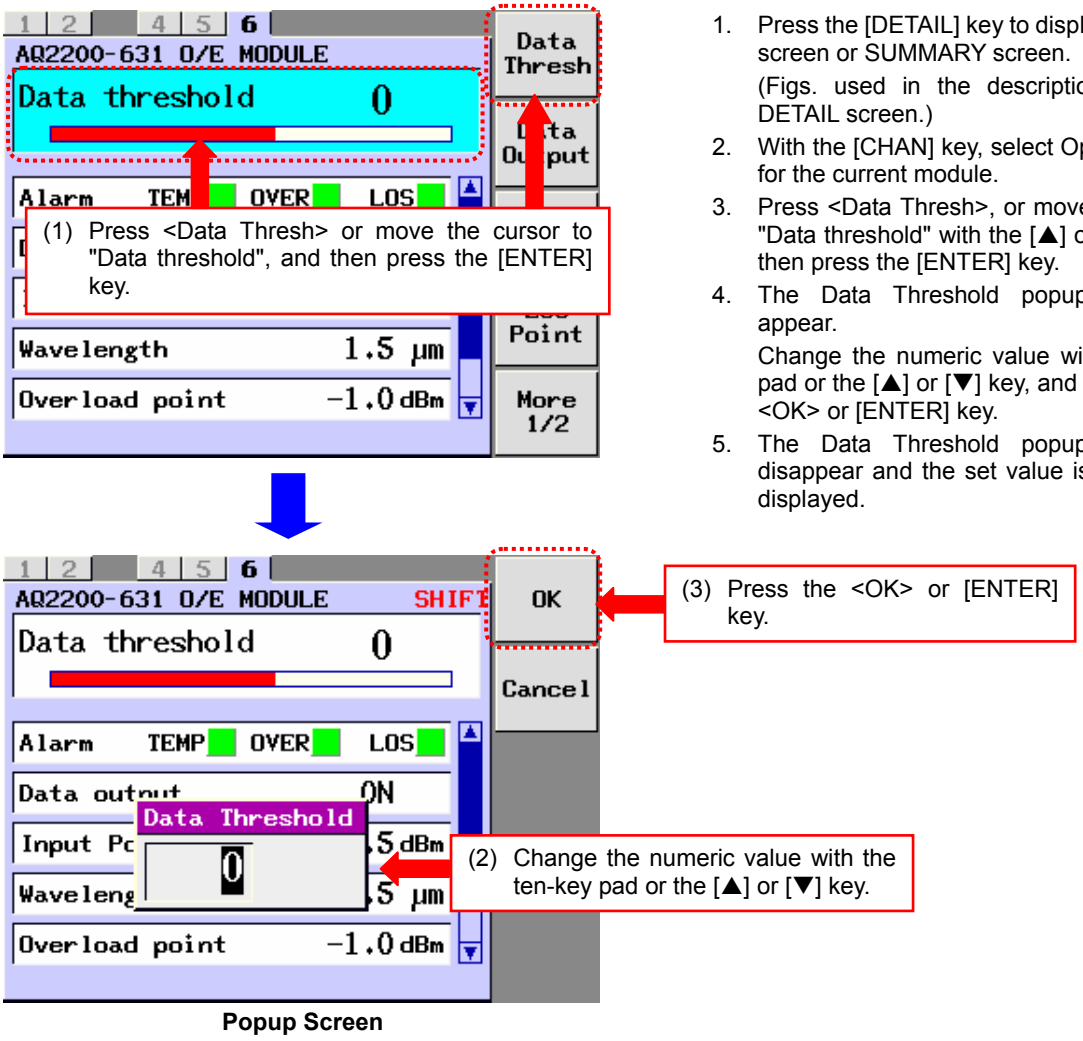
Item Name	Set Value	Description
Data thresh(old) *1	-364 to 273 Step value: 1	The threshold value for identification of the logic to the electric data after completion of the optical-electric conversion is set.
Data output	ON / OFF	The DATA OUT port (electric output) is turned ON or OFF. • ON: Data is output. • OFF: Data output is stopped. (GND level)
Wavelength	1.5um / 1.3um	The wavelength band of the receiving light signal is set. With this setting, the sensitivity of the Input Power Monitor is simply corrected. If the wavelength band setting is changed, the values for Overload point and LOS point are reset to the factory default settings. • 1.5um: Select this when 1.5um-wavelength band is used. • 1.3um: Select this when 1.3um-wavelength band is used.
Overload (point) *1	-19.0 to +2.0 [dBm] Step value: 0.1 [dBm]	The Overload detection level is set.
LOS point	-19.0 to +2.0 [dBm] Step value: 0.1 [dBm]	The LOS (Loss of signal) detection level is set.
*Information	—	The type and version information of the optical receiver are displayed.
*Preset	—	Each set value is returned to that set at shipment of the factory. For details about factory default settings, see Appendix 1.

*: Operated only with function key.
*1: Function key is shown with the word(s) in ( ) omitted.

4.3 Starting the Operation

(1) Setting the Data Threshold Value

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Data Thresh>, or move the cursor to "Data threshold" with the [▲] or [▼] key, and then press the [ENTER] key.
4. The Data Threshold popup screen will appear.
   Change the numeric value with the ten-key pad or the [▲] or [▼] key, and then press the <OK> or [ENTER] key.
5. The Data Threshold popup screen will disappear and the set value is then set and displayed.

Explanation

The threshold value for identification of the logic to the electric data after completion of the optical-electric conversion is set and displayed.

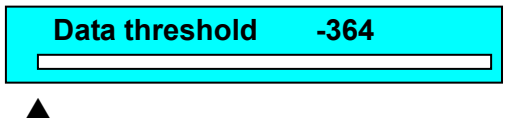
Data threshold: -364 to 273 1 step

Note

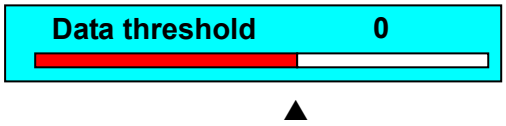
- When changing the numeric value with the [▲] or [▼] key, the set value is set accordingly.
- When “SHIFT” is displayed, the ten-key pad can be used. To use the ten-key pad if “SHIFT” is not displayed, press the [SHIFT] key.
- If a value beyond the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

The following shows the relationship between the numeric value and graph display of the data threshold. According to the data threshold value, the graph display is painted in red.

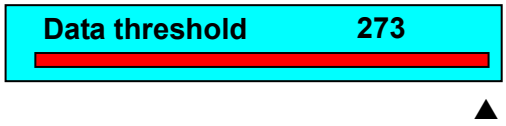
- Data threshold is “-364”.



- Data threshold is “0”.

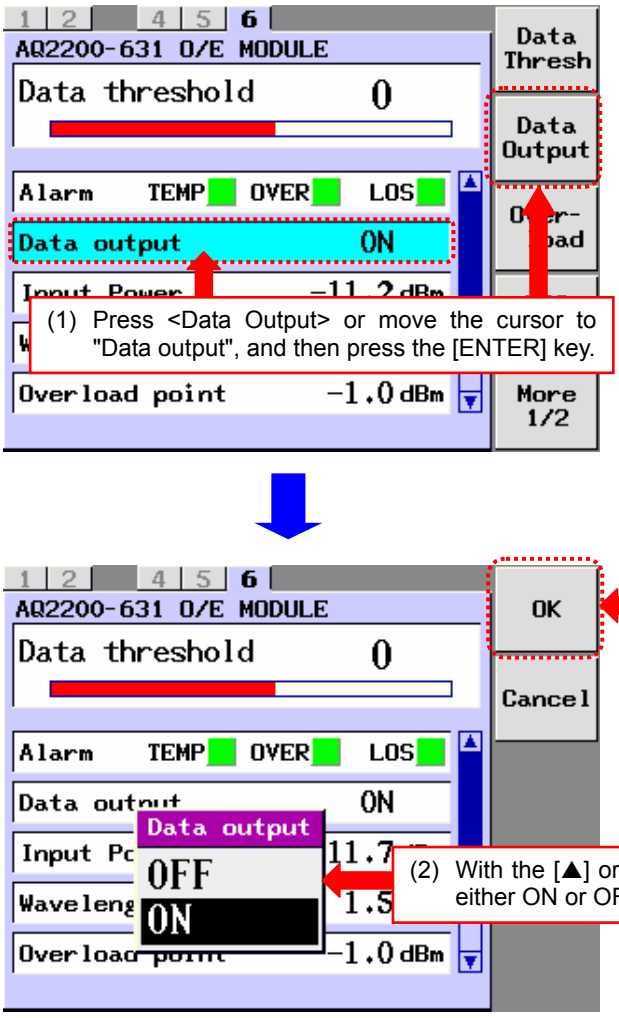


- Data threshold is “273”.



(2) Turning ON or OFF the Data Output

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Data Output>, or move the cursor to "Data output" with the [▲] or [▼] key, and then press the [ENTER] key.
4. The Data output popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either ON or OFF, and press the <OK> or [ENTER] key.
5. The Data output popup screen will disappear and the item you have selected is then set and displayed.

Explanation

The ON/OFF status of the data output of the DATA OUT port is set and displayed.

Data output

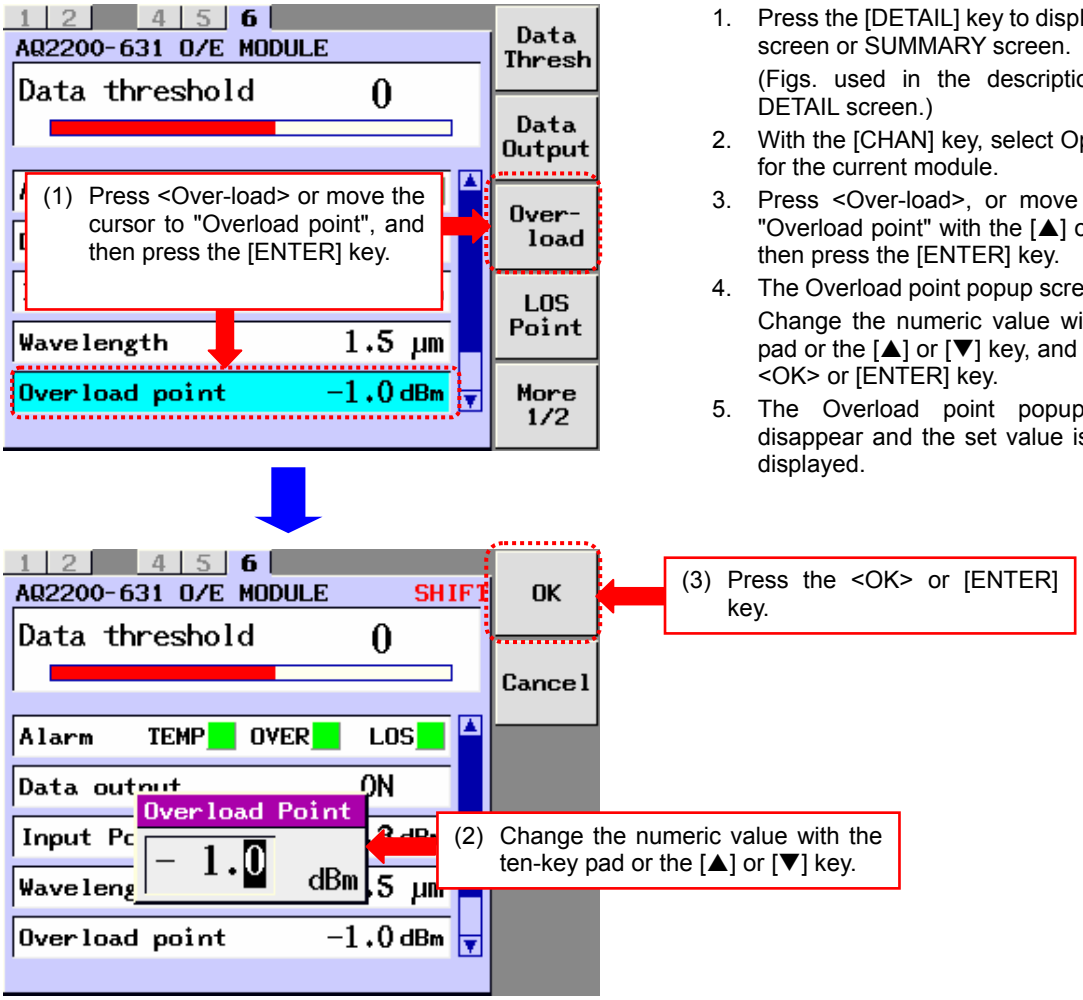
- ON: Data is being output.
- OFF: Data output is stopped.

Note

- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

(3) Setting the Overload Detection Level

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Over-load>, or move the cursor to "Overload point" with the [▲] or [▼] key, and then press the [ENTER] key.
4. The Overload point popup screen will appear.
   Change the numeric value with the ten-key pad or the [▲] or [▼] key, and then press the <OK> or [ENTER] key.
5. The Overload point popup screen will disappear and the set value is then set and displayed.

Explanation

The OVERLOAD detection level is set and displayed.

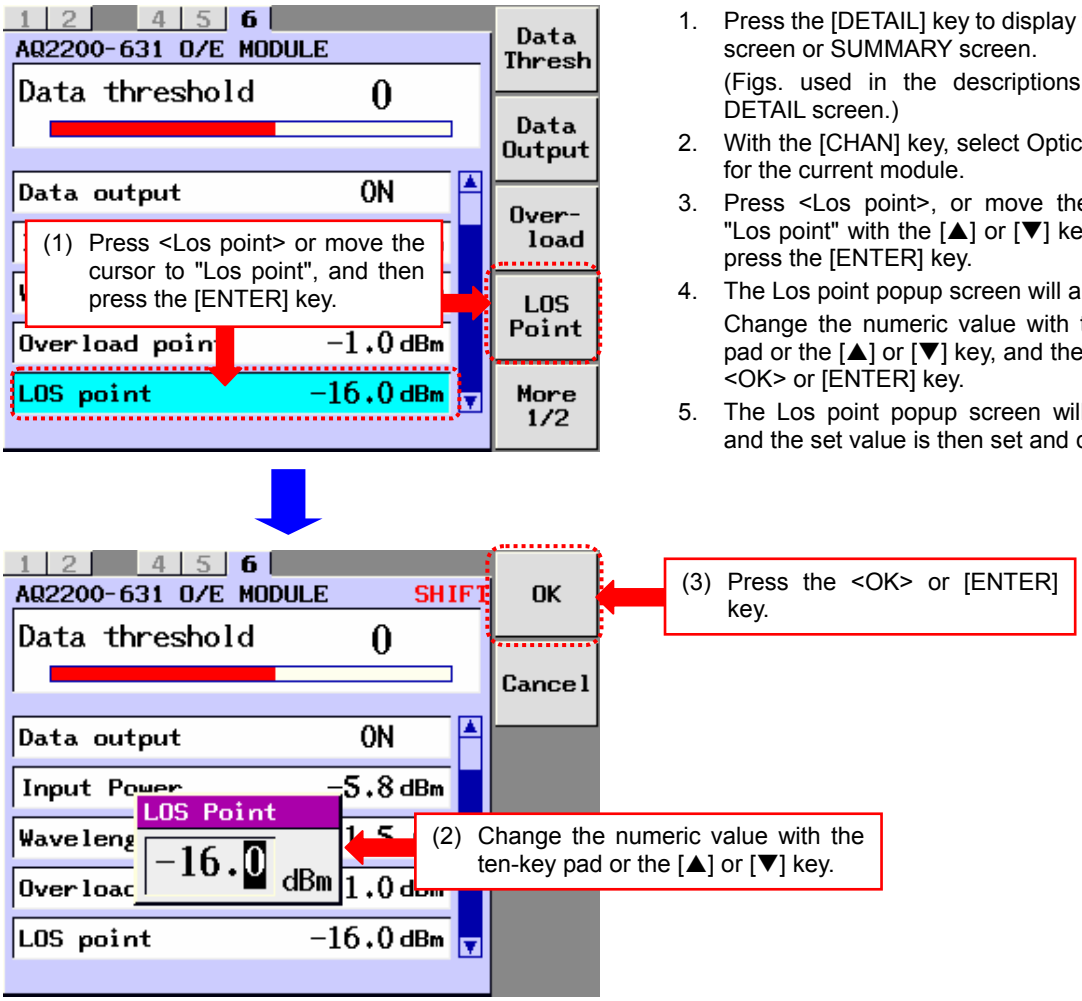
Overload point: -19.0 to +2.0 [dBm] 0.1 [dBm] step

Note

- If an optical signal exceeding the detection level set in Overload point is input, the OVER LED (red) on the panel is lit and the OVER indicator of the Alarm is changed to the red indication.
- When changing the numeric value with the [▲] or [▼] key, the set value is set accordingly.
- When “SHIFT” is displayed, the ten-key pad can be used. To use the ten-key pad if “SHIFT” is not displayed, press the [SHIFT] key.
- If a value beyond the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

(4) Setting the Loss Detection Level

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Los point>, or move the cursor to "Los point" with the [▲] or [▼] key, and then press the [ENTER] key.
4. The Los point popup screen will appear.
   Change the numeric value with the ten-key pad or the [▲] or [▼] key, and then press the <OK> or [ENTER] key.
5. The Los point popup screen will disappear and the set value is then set and displayed.

Explanation

The LOS (Loss of signal) detection level is set and displayed.

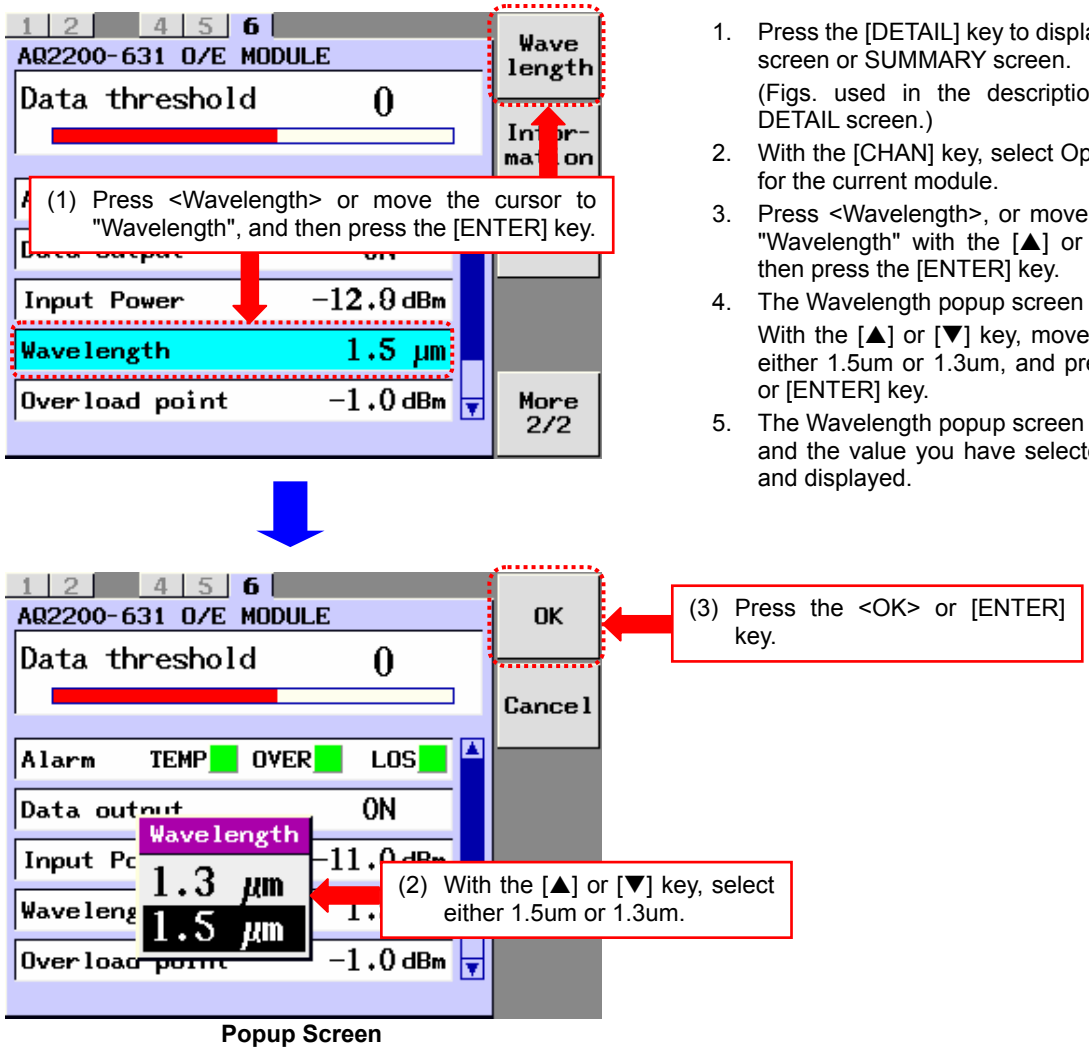
Los point: -19.0 to +2.0 [dBm] 0.1 [dBm] step

Note

- If an optical signal below the detection level set in Overload point is input, the OVER LED (red) on the panel is lit and the OVER indicator of the Alarm is changed to the red indication.
- When changing the numeric value with the [▲] or [▼] key, the set value is set accordingly.
- When “SHIFT” is displayed, the ten-key pad can be used. To use the ten-key pad if “SHIFT” is not displayed, press the [SHIFT] key.
- If a value beyond the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

(5) Selecting the Wavelength Band of the Receiving Light Signal

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Wavelength>, or move the cursor to "Wavelength" with the [▲] or [▼] key, and then press the [ENTER] key.
4. The Wavelength popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either 1.5um or 1.3um, and press the <OK> or [ENTER] key.
5. The Wavelength popup screen will disappear and the value you have selected is then set and displayed.

Explanation

The wavelength band of the receiving light is set and displayed.

By setting the wavelength band, the wavelength of the simple power monitor (Received Power) is corrected easily.

The wavelength is not corrected within the wavelength band.

Wavelength

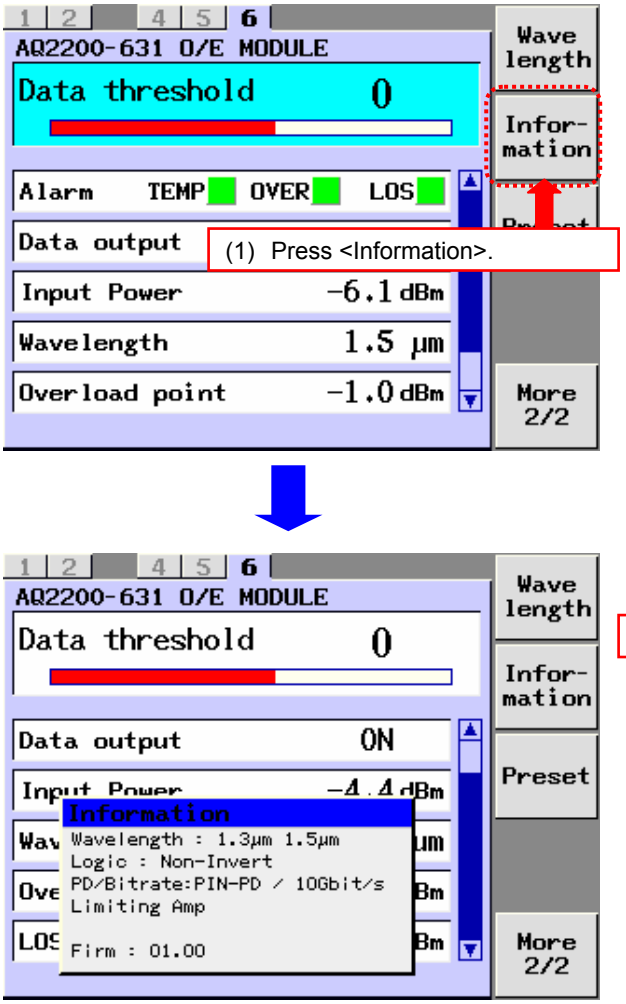
- 1.5um: When the wavelength of the receiving light is 1.5um-band
- 1.3um: When the wavelength of the receiving light is 1.3um-band

Note

- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

(6) Displaying the Version

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Information>.
4. The Information popup screen will appear.
5. Press the [ENTER] key, and the Information popup screen will disappear.

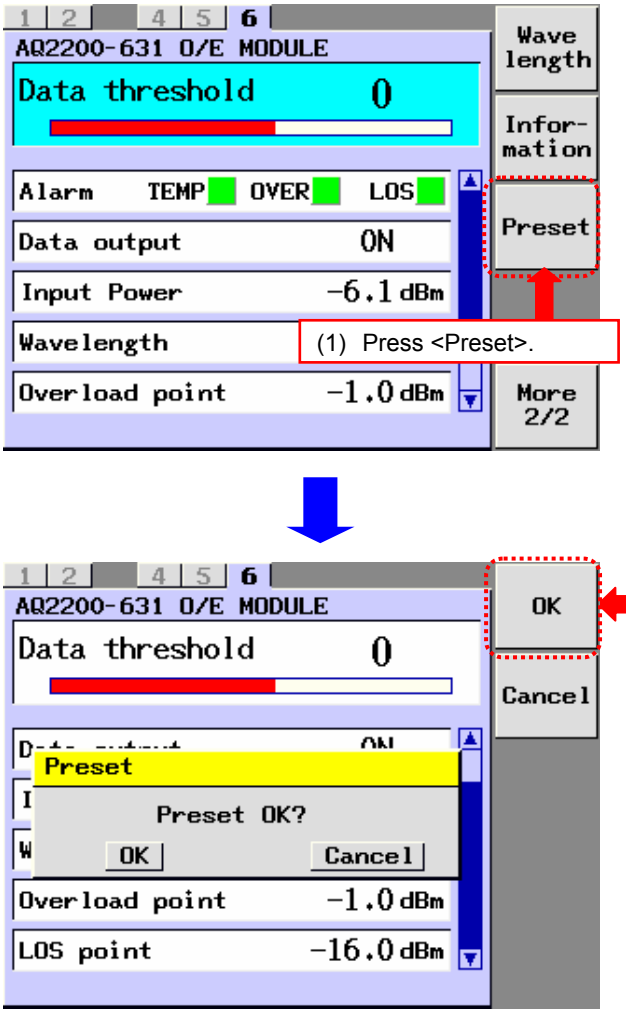
Explanation

Note

- The Information (version display) can be operated only with the function key.

(7) Returning to the Factory Default Settings

Operating Procedures



Popup Screen

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.
   (Figs. used in the descriptions show the DETAIL screen.)
2. With the [CHAN] key, select Optical Receiver for the current module.
3. Press <Preset>.
4. The Preset popup screen will appear.
   Press the <OK> or [ENTER] key.
5. The Preset popup screen will disappear, and then the Optical Modulator is returned to its factory default settings.

Explanation

Note

- The Preset (factory default setting) can be operated only with the function key.
- For details about factory default setting (initial setting) values, see Appendix 1.
- To exit the popup screen without changing of settings, press the [CANCEL] key or <Cancel>.

5.1 BERT Application

BERT Application

When operating the BERT module and BERT related module, it is convenient if you use this BERT application function.

When operating the BERT application, the BER measurement can be performed while operating the related modules.

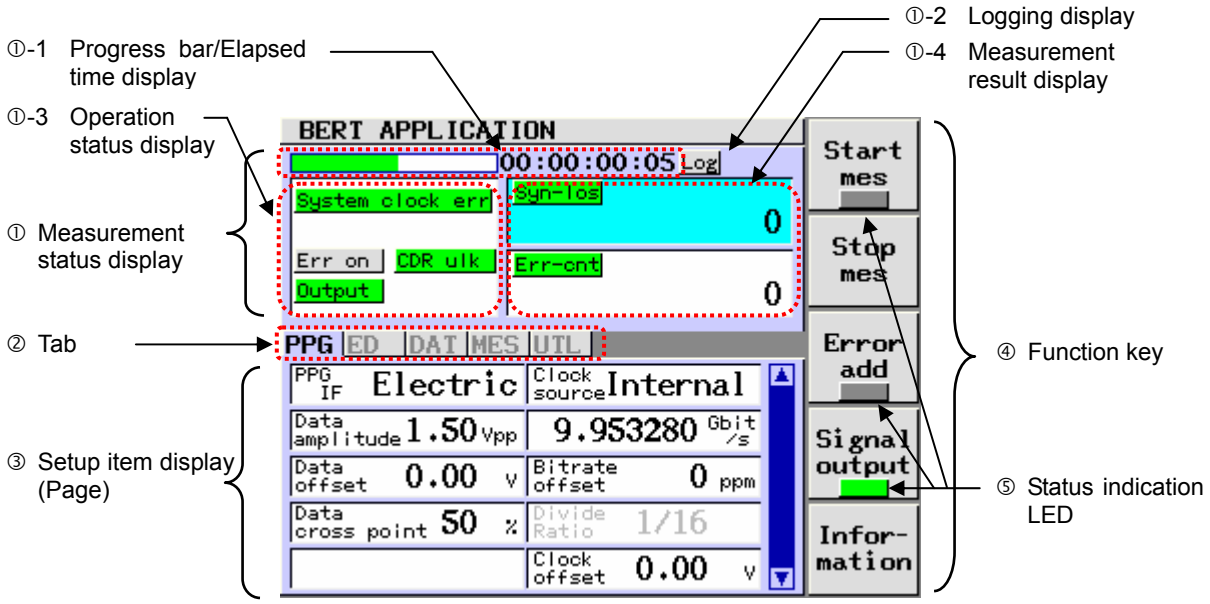
For example, when monitoring the BER measurement results while adjusting the send/receive settings including the optical interface, it is convenient if you use this function.

The parameter items set in Chapter 4 are succeeded to the parameter items of the BERT APPLICATION. Additionally, the parameter items set in the BERT APPLICATION are also succeeded to the parameter items stated in Chapter 4.

5.2 Display Screen

(1) Description of Screen

The BERT APPLICATION screen consists of items shown below.



BERT APPLICATION screen (PPG page)

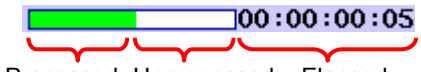
① Measurement status display:

Shows the operation status, progress status, elapsed time, and measurement result of the BER measurement module.

①-1 Progress bar/Elapsed time display:

- Progress bar: Shows the progress status of the BER measurement using the progress bar.
  When “Measure mode” is set at “Single", the progress bar shows the processed portion in green and unprocessed portion in white according to the progress status. As the status is progressed, the bar is painted from the left to the right.
  When “Measure mode” is set at "Manual", the bar is always shown in green regardless of the elapsed time.
- Elapsed time display: Shows the elapsed time.
  [dd]:[hh]:[mm]:[ss], Max: 10 days = 10:00:00:00

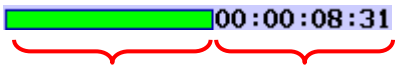
- When “Measure mode” is set at "Single":



Processed portion (Green) | Unprocessed portion (White) | Elapsed time

The progress bar shows the progress status of the BER measurement when compared to the measurement time set in the Measure day/Measure time.
The processed portion is shown in green while the unprocessed portion is shown in white.

- When “Measure mode” is set at "Manual":



The bar is always shown in green regardless of the elapsed time. | Elapsed time

The progress bar is always shown in green regardless of the progress status of the BER measurement.

①-2 Logging display:
Shows the execution status of the logging process using the indicator.

Item	Description
Log	Shows the execution status of the logging process. "Green": The logging process is running. * "Gray": The logging process is stopped.

*: The BER measurement is being executed with "Logging" set at ON on the UTL page.

①-3 Operation status display:
Shows the operation status of the BER measurement module using the indicators.

Item	Description
System clock err	Shows the system clock status. "Green": Correct status "Red": Faulty status In the faulty status, the following may be the cause according to the Clock Mode you have selected. Internal: The built-in SG is faulty. REF Clk: The input reference clock is faulty. EXT Clk: The input external 10G-clock is faulty.
Err on	Shows the error add ON/OFF status of the PPG. "Green": Error add ON status "Gray": Error add OFF status This indication is interlocked with the Error add LED in the function key.
Output	Shows the output signal ON/OFF status of the PPG. "Green": Output signal ON status "Gray": Output signal OFF status This indication is interlocked with the Signal output LED in the function key.
CDR ulk	Shows the operation status of the CDR function of the ED (regeneration of the clock synchronized with the input data signal). "Green": Clock regeneration succeeded status "Gray": Clock regeneration failed status
Sync-los	Shows the synchronization status of the ED. "Red": Sync loss status "Off": Synchronization established status
Bit-err	Shows the bit error detection status of the ED. "Red": Bit error detection status "Off": Correct status
OPT Los *1	Shows the Los (Loss of signal) detection status of the OE. "Red": OPT Los status "Off": Correct status

*1: Displayed only when EO/OE is mounted.

①-4 Measurement result display:

Shows the BER measurement results using the status and numeric value.

On the measurement result display, the item to be displayed can be changed during measurement.

Up to two desired items can be selected from Syn-Loss, Error Count, Error Rate, TX Bitrate, RX Bitrate, and Received opt pwr *1.

For details about operating procedures, see section 5.5 (1).

Item	Description
Syn-los	Shows the synchronization status of the ED using the indicators and sync loss time [unit: us]. • Synchronization status indicator display "Green": Synchronization has been established between measurement start and current operation. "Yellow": Synchronization was not established in the past, but it is established currently. "Red" Sync loss status • Sync loss time Display range: 0 to 999999999 [us] and 1.000000E+09 to 8.640000E+11 [us]
Err-cnt	Shows the coding error status of the receive data of the ED using the indicators, and also shows the number of coding errors (number of bit errors) [unit: bit]. • Coding error status indicator display "Green": No error has occurred between measurement start and current operation. "Yellow": Error occurred in the past, but no error occurs currently. "Red": Error status • Number of coding errors Display range: 0 to 999999999 [bit] and 1.000000E+09 to 9.780480E+15 [bit]
Err-rate	Shows the coding error rate (error rate) of the receive data of the ED using the numeric value. • Coding error rate Display range: 0.000000E-10 (to E-16) *4 (error free) to 1.022444E-16 (error occurs.) to 1.000000E-00 (all are errors.)
TX bitrate *2 *3	Shows the send bitrate of the PPG using the numeric value. • Send bitrate Display range: 9.950000 to 11.320000 [Gbit/s]
PPG clk	Shows the status of the clock to be input to the PPG using the indicators. • PPG clock indicator display "Green": Correct status "Red": Error status
RX bitrate *2 *3	Shows the receive bitrate of the ED using the numeric value. • Receive bitrate Display range: 9.950000 to 11.320000 [Gbit/s]
ED clk	Shows the receive clock status of the ED using the indicators. • Indicator display of receive clock of ED "Green": Correct status "Red": Error status
Received opt power *1 *2	Shows the average optical input power to be input to the receiver using the numeric value (simple power monitor). • Average optical input power Display range: -19.0dBm to +3.0dBm Beyond display range: <-19dBm >+3dBm

*1: Displayed only when OE is mounted.

*2: TX bitrate / RX bitrate / Received opt power display the current.

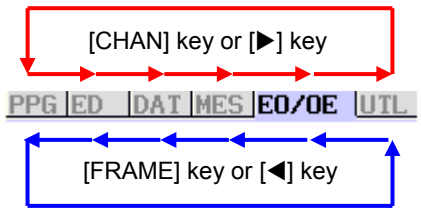
*3: Since the internal SG is not synchronized with the measurement clock, a slight frequency error to the set value may occur.

*4: The exponential may vary depending on the period of measurement. However, the resulting value is identical.

② Tab:

Shows the screen name (= page) of the currently displayed setup item display.

Press the [FRAME] key or [CHAN] key, or move the cursor to a tab or press the [◀] or [▶] key to change the page.



The page is changed in the normal direction.

The page is changed in the invert direction.

③ Setup item display (page):

Shows the setup item related to the tab position.

When the cursor is located on the setup item, press the [ENTER] key. You can change the set value.

For details about each screen name of the BERT application, see (2). For details about screen configuration diagram, and display and setup items, see section 5.3. For details about operating procedures, see section 5.5.

④ Function key:

When pressing a key on the right of the LCD on the front panel of the frame controller, you can start operation corresponding to the screen display.

Item	Description
Start mes	Starts the measurement. The measurement status is shown using the LED. (See also ⑤ Start mes.)
Stop mes	Stops the measurement.
Error add	Turns ON or OFF the error add. The error add status is shown using the LED. (See also ⑤ Error add.)
Signal output	Turns ON or OFF the data output and clock output of the PPG. The output status is shown using the LED. (See also ⑤ Signal output.)
Information	Shows the firmware version.

⑤ Status indication LED:

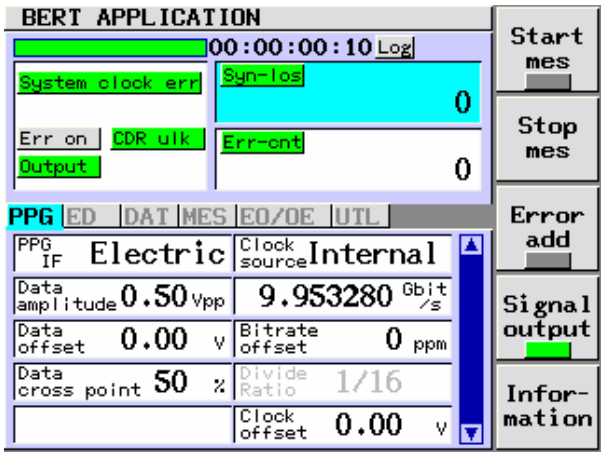
Shows the status of relevant function key process. When this process is running, the LED is shown in green.

Item Name	Color	Description
Start mes	Green	Shows the measurement status using the LED. Lit (Green): Measurement is in progress. Off (Gray): Measurement is stopped.
Error add	Green	Shows the error add status using the LED. Lit (Green): Error add is activated. Off (Gray): Error add is not activated (normal status).
Signal output	Green	Shows the output status of the data/clock of the PPG using the LED. Lit (Green): Data/Clock is being output. Off (Gray): Data/Clock output is stopped.

(2) Each Screen of BERT Application

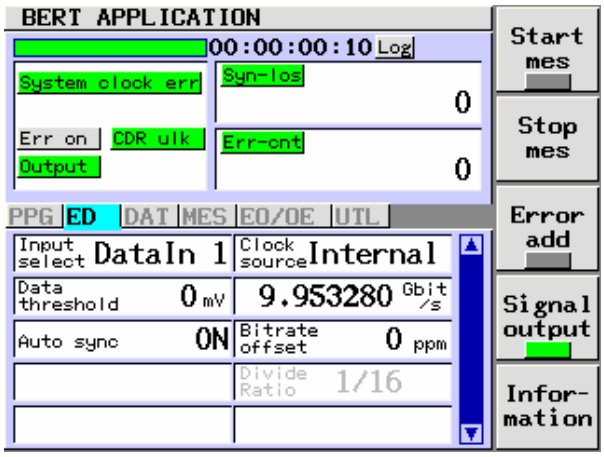
● PPG Page

You may set up the items related to the PPG (Pulse Pattern Generator) and SG (Signal Generator) of the BERT module.



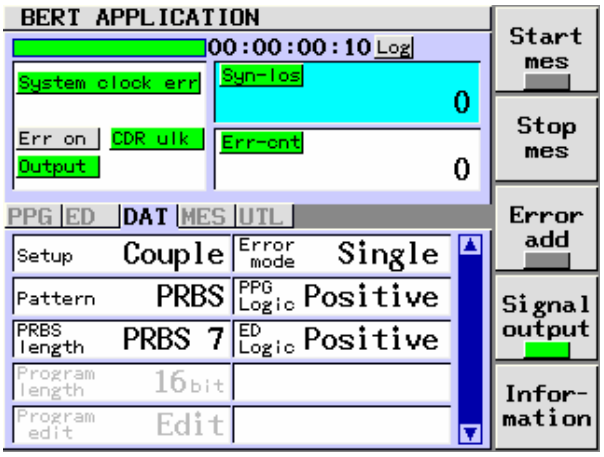
● ED Page

You may set up the items related to the ED (Error Detector) and SG (Signal Generator) of the BERT module.



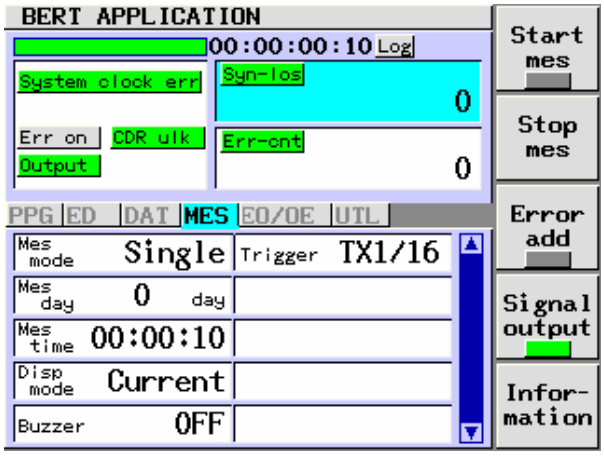
● DAT Page

You may set up the items related to the send and receive data of the BERT module.



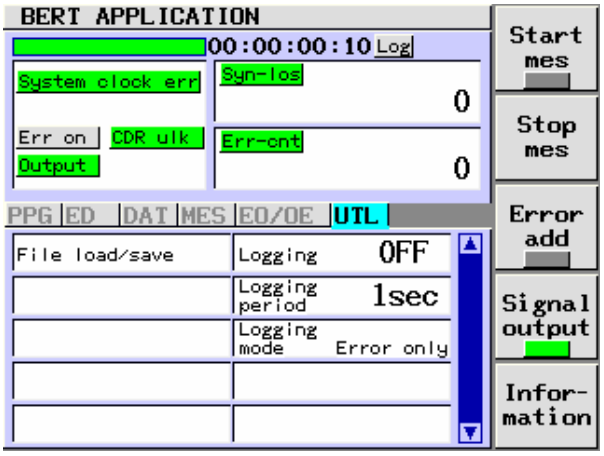
● MES Page

You may set up the items related to the measurement conditions of the BERT module.



● UTL Page

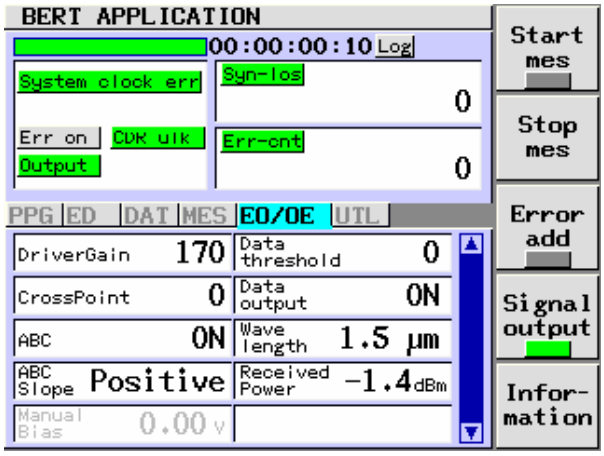
You may set up the items related to the utility of the BERT module.



● EO/OE Page

You may set up the items related to the EO/OE module.

(Only when EO/OE is installed)

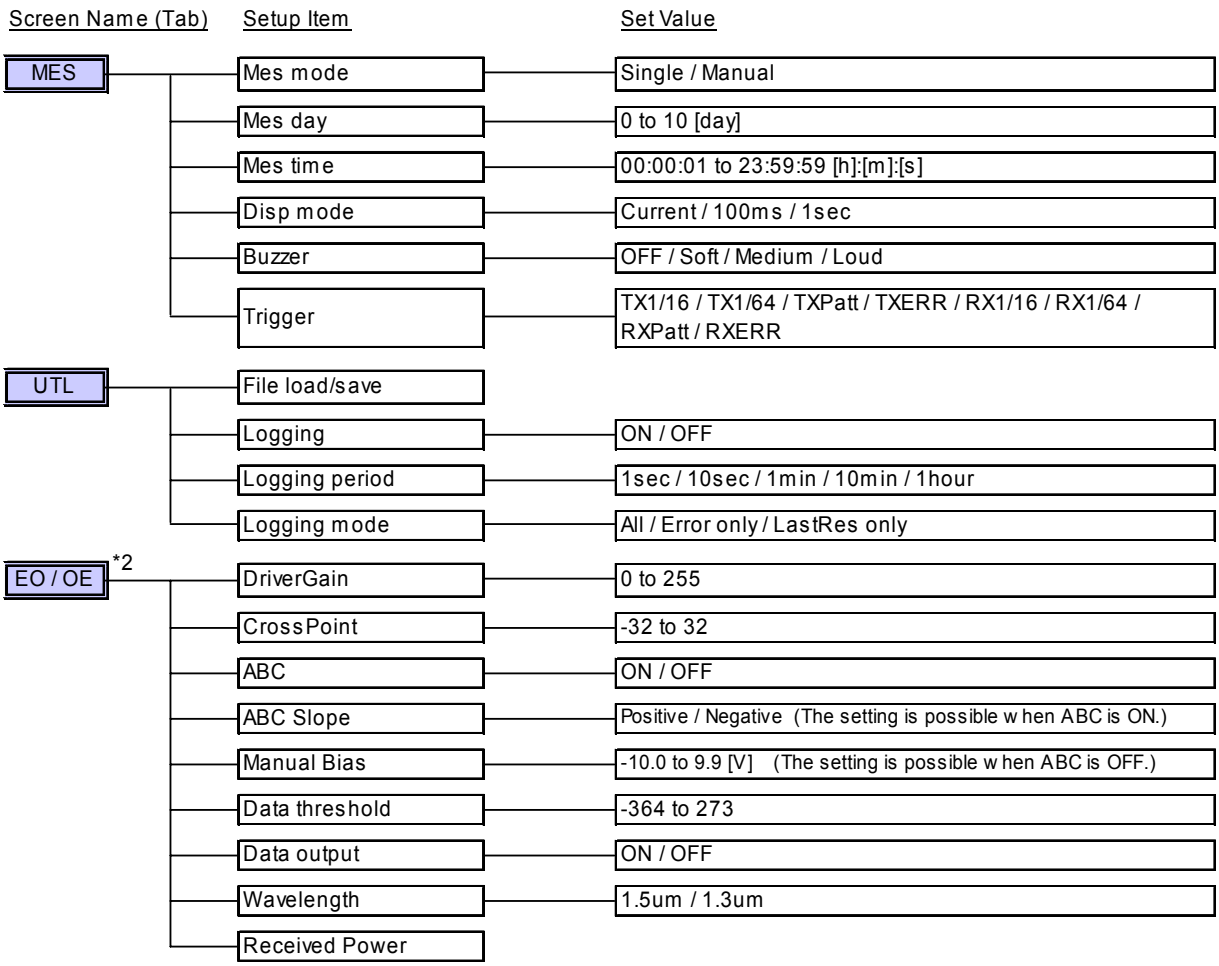


5.3 Setup Items

(1) Screen Configuration Diagram

Screen Name (Tab)	Setup Item	Set Value
PPG	PPG IF	Electric / Optic
	Data amplitude	0.50 to 2.00 [Vpp]
	Data offset	-2.00 to 3.00 [V]
	Data cross point	30 to 70 [%]
	Clock source	Internal / REF Clk / Ext Clock
	Bitrate	9.95 to 11.32 [Gbit/s]
	Bitrate Offset	-100 to 100 [ppm]
	Divide ratio	1/16 / 1/64
	Clock offset	-2.00 to 3.00 [V]
ED	Input select	Data In1 / Data In2
	Data threshold	-350 to 350 [mV] when Input select is Data In 1(CDR). -300 to 300 [mV] when Input select is Data In 2(Normal).
	Auto sync	ON / OFF
	Clock source	Internal / REF Clk / Ext Clock
	Bitrate	9.95 to 11.32 [Gbit/s]
	Bitrate Offset	-100 to 100 [ppm]
	Divide ratio	1/16 / 1/64
DAT	Setup	PPG / ED / Couple
	Pattern	PRBS / Prog256 / {Prog64M} *1
	PRBS length	PRBS7 / PRBS9 / PRBS10 / PRBS11 / PRBS15 / PRBS23 / PRBS31
	Program length	16 to 256 [bit] / {256 to 67,108,864 [bit]}*1
	Program edit	00 to FF in hexadecimal notation, 0/1 in binary notation.
	Error mode	Single / 1.0E-3 / 1.0E-4 / 1.0E-5 / 1.0E-6 / 1.0E-7 / 1.0E-8 / 1.0E-9 / 1.0E-10 / 1.0E-11 / 1.0E-12
	PPG Logic	Positive / Negative
	ED Logic	Positive / Negative

*1: Items in { } are valid only when optional function is selected.



*2: Displayed only when EO/OE is mounted.

(2) Display and Setup Items

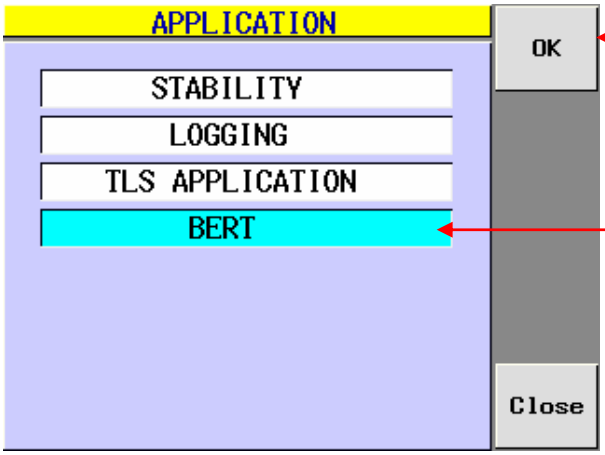
● Display and Setup Items of EO/OE Page

Item Name	Setting Range	Description
DriverGain	0 to 255 Step value: 1	The output amplitude of the optical modulator driver is set and displayed.
Cross point	-31 to 32 Step value: 1	The cross point of the optical modulator driver is set and displayed.
ABC	ON / OFF	Whether or not the auto bias control (ABC) of the optical modulator is used is set and displayed. • ON: ABC is used. • OFF: ABC is not used.
ABC Slope	Positive / Negative	The ABC slope status of the optical modulator is set and displayed. This item can be set when the ABC is set at ON. • Positive: ABC is locked on the Positive side. • Negative: ABC is locked on the Negative side.
Manual Bias	-10.0 to 9.9 [V] Step value: 0.01 [V]	The DC Bias voltage of the optical modulator is set and displayed. This item can be set when the ABC is set at OFF.
Data threshold	-364 to 273 Step value: 1	The data threshold value of the optical receiver is set and displayed.
Data output	ON / OFF	The data output of the optical receiver is turned ON or OFF. • ON: Output is turned ON. • OFF: Output is turned OFF (GND-level).
Wavelength	1.5um / 1.3um	The wavelength band of the receiving light is set and displayed. •1.5um: When the wavelength of the receiving light is 1.5um-band •1.3um: When the wavelength of the receiving light is 1.3um-band
Received Power	—	The average optical input power of the optical receiver is shown.

* For details about setup and display items of other pages, see the User's Manual for AQ2200-601 10Gbit/s BERT Module.

5.4 Starting Up the BERT Application

Operating Procedures



APPLICATION SELECT Screen

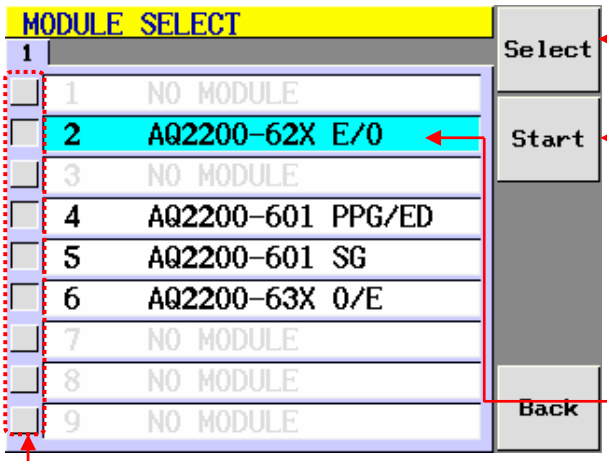
1. When pressing the [APPLI] key on the front panel of the frame controller, the APPLICATION SELECT screen will appear.
2. With the [▲] or [▼] key, move the cursor so that "BERT" becomes the current parameter, and press the <OK> or [ENTER] key. The MODULE SELECT screen will appear.

(2) Press the <OK> or [ENTER] key.

(1) With the [▲] or [▼] key, move the cursor to "BERT".

Note

To close the screen, press the <Close> or [CANCEL] key.



MODULE SELECT Screen

3. In the BERT application, move the cursor with the [▲] or [▼] key so that "desired module you want to use" becomes the current parameter, and press <Select>.
4. If there are multiple modules you want to select, repeat step 3.
5. When pressing <Start>, the popup message, “"Caution" Start Application OK?”, will appear.

(4) Press <Select>.

(5) Press <Start>.

(3) With the [▲] or [▼] key, move the cursor to "desired module you want to use".

Note

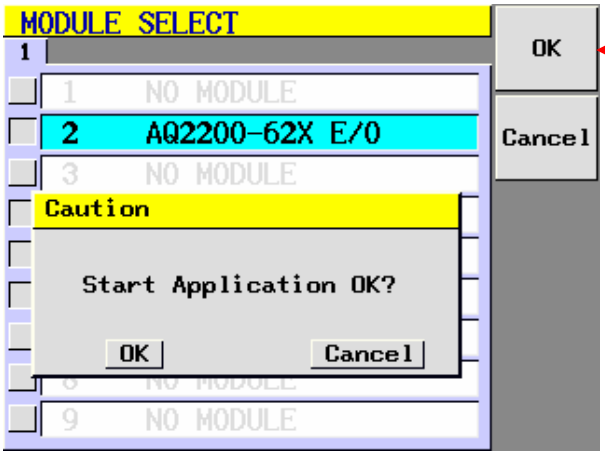
Pressing <Back> will return to the APPLICATION SELECT screen.

Popup Screen

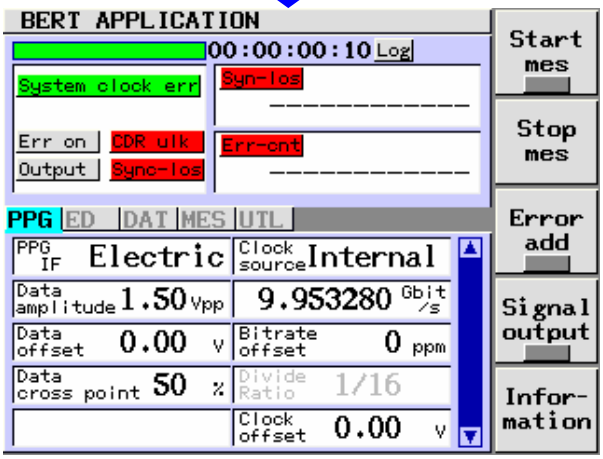
Note

- The left portion of the module you have selected becomes the concave indication while that of unselected module becomes the convex indication.
- The BERT module is always selected and you cannot make it unselected (inactive).
- You cannot select the light source module. To do so, you must make the settings on the SUMMARY screen/DETAIL screen.

From MODULE SELECT Screen



Popup Screen



BERT APPLICATION Screen (PPG page)

6. If no problems are found, press <OK>. The popup message, "Now Setting", will appear and the BERT application is started up.

(6) Press <OK>.

Note

To close the screen, press the <Close> or [CANCEL] key.

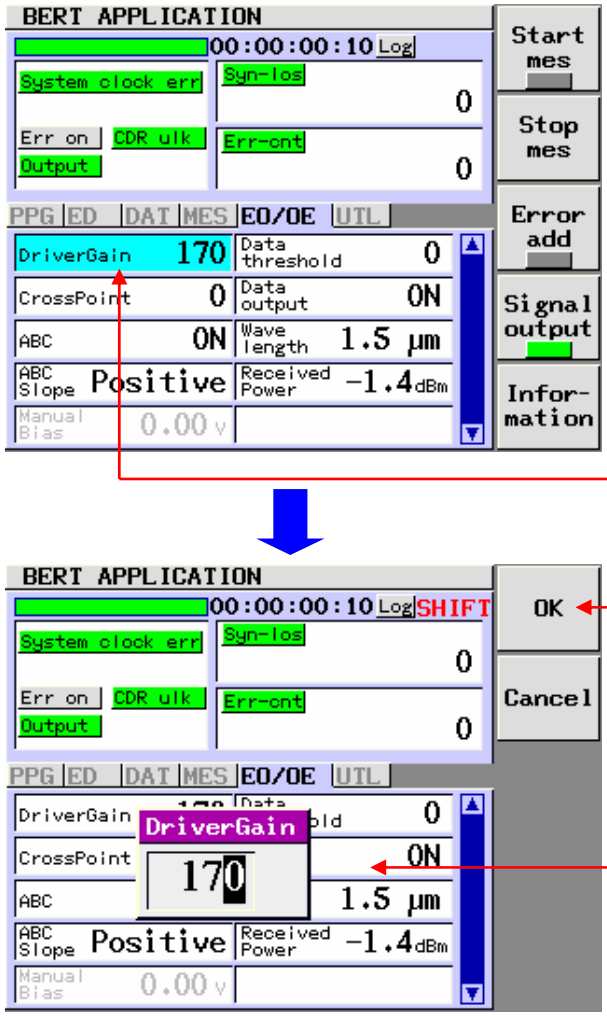
Note

- Precautions for staring/stopping the BERT application
  (1) If you start or stop the BERT application during a measuring operation, the measuring operation will be cancelled.
  (2) When staring the BERT application, the previous values are kept retained and used as the preset values. However, Error add and OUTPUT become OFF.

5.5 Setting the Parameters

(1) Setting the Gain of the Driver for the Optical Modulator (DriverGain)

Operating Procedures



Popup Screen

1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "DriverGain" becomes the current parameter and press the [ENTER] key.
3. The DriverGain popup screen will appear.
   With the ten-key pad or the [▲] or [▼] key, change the numeric value and press the <OK> or [ENTER] key.
4. The DriverGain popup screen will disappear and the set value is then set and displayed.

Explanation

The output amplitude of the optical modulator driver is set and displayed.

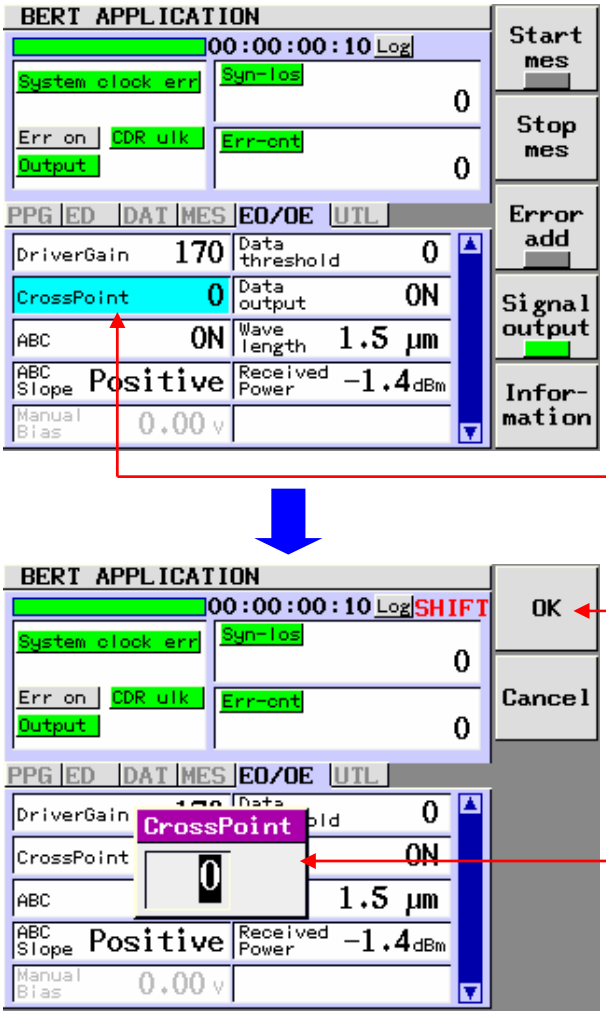
DriverGain: 0 to 255 1 step

Note

- When changing the set value with the [▲] or [▼] key, it is set accordingly.
- When "SHIFT" is displayed, the ten-key pad can be used.
  To use the ten-key pad if "SHIFT" is not displayed, press the [SHIFT] key.
- If a value out of the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- For details of the function, see the User's Manual for AQ2200-621/622 10Gbit/s Optical Modulator.

(2) Setting the Cross Point of the Driver for the Optical Modulator (CrossPoint)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "CrossPoint" becomes the current parameter and press the [ENTER] key.
3. The CrossPoint popup screen will appear.
   With the ten-key pad or the [▲] or [▼] key, change the numeric value and press the <OK> or [ENTER] key.
4. The CrossPoint popup screen will disappear and the set value is then set and displayed.

(1) Move the cursor to "CrossPoint" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the ten-key pad or the [▲] or [▼] key, change the numeric value.

Popup Screen

Explanation

The cross point of the optical modulator driver is set and displayed.

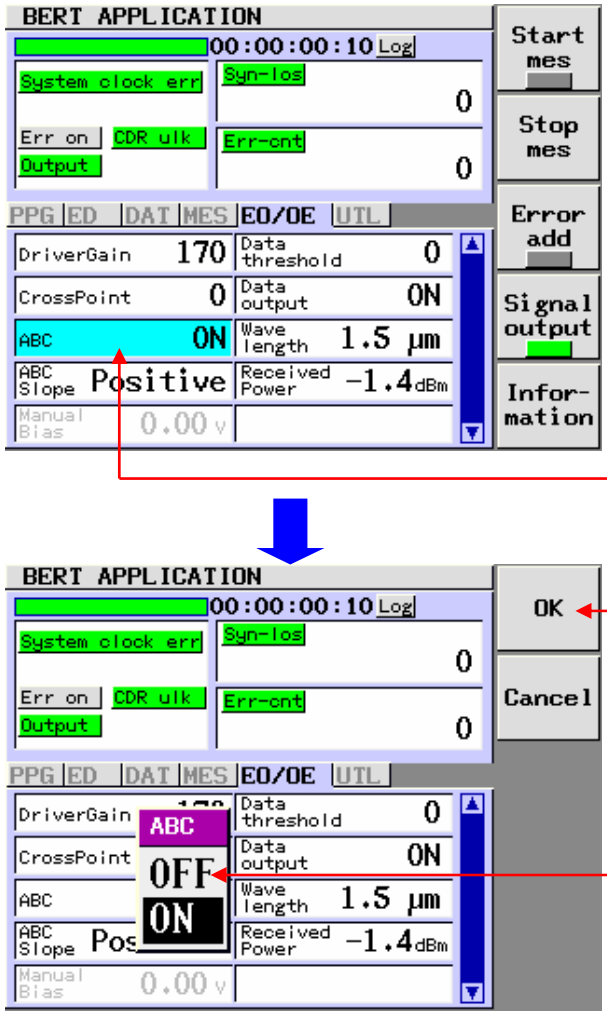
CrossPoint: -31 to 32 1 step

Note

- When changing the set value with the [▲] or [▼] key, it is set accordingly.
- When "SHIFT" is displayed, the ten-key pad can be used.
  To use the ten-key pad if "SHIFT" is not displayed, press the [SHIFT] key.
- If a value out of the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- For details of the function, see the User's Manual for AQ2200-621/622 10Gbit/s Optical Modulator.

(3) Selecting Whether the Auto Bias Control of the Optical Modulator Is ON or OFF (ABC)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "ABC" becomes the current parameter and press the [ENTER] key.
3. The ABC popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either ON or OFF, and press the <OK> or [ENTER] key.
4. The ABC popup screen will disappear and the item you have selected is then set and displayed.

(1) Move the cursor to "ABC" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the [▲] or [▼] key, select either ON or OFF.

Popup Screen

Explanation

Whether or not the auto bias control (ABC) of the optical modulator is used is set and displayed.

ABC

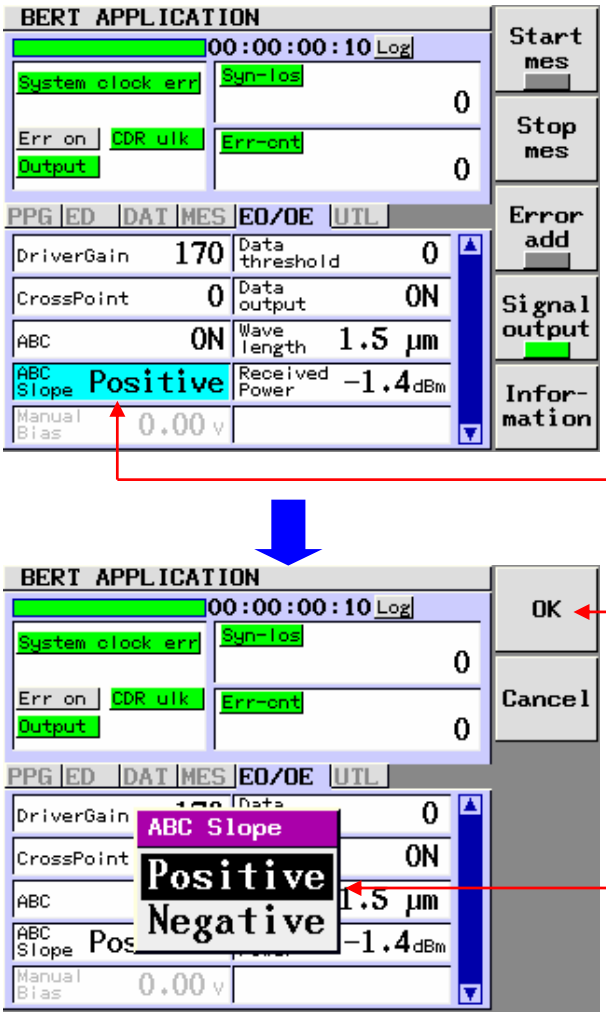
- ON: ABC is used (enabled).
- OFF: ABC is not used (disabled).

Note

- Normally, the ABC is set at ON.
  For the case when this module is used with the ABC set at OFF, see the User's Manual for AQ2200-621/622 10Gbit/s Optical Modulator.

(4) Selecting the ABC Slope of the Optical Modulator (ABC Slope)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "ABC Slope" becomes the current parameter and press the [ENTER] key.
3. The ABC Slope popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either Positive or Negative, and press the <OK> or [ENTER] key.
4. The ABC Slope popup screen will disappear and the item you have selected is then set and displayed.

(1) Move the cursor to "ABC Slope" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the [▲] or [▼] key, select either Positive or Negative.

Popup Screen

Explanation

The ABC slope status of the optical modulator is set and displayed.

ABC Slope

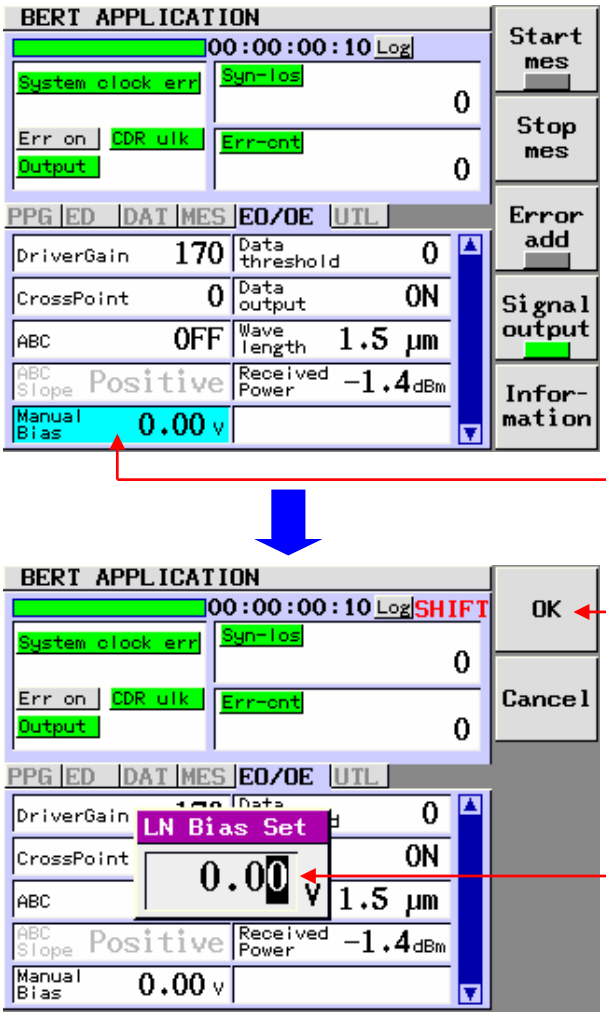
- Positive: ABC is locked on the Positive side.
- Negative: ABC is locked on the Negative side.

Note

- This item becomes valid when “ON” is selected for the ABC.
  When the ABC is set to OFF, this item is dimmed (shown in gray) and it cannot be selected.
- For details of the function, see the User's Manual for AQ2200-621/622 10Gbit/s Optical Modulator.

(5) Setting the DC Bias of the Optical Modulator Manually (Manual Bias)

Operating Procedures



Popup Screen

1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "Manual Bias" becomes the current parameter and press the [ENTER] key.
3. The LN Bias Set popup screen will appear.
   With the ten-key pad or the [▲] or [▼] key, change the numeric value and press the <OK> or [ENTER] key.
4. The LN Bias Set popup screen will disappear and the set value is then set and displayed.

Explanation

The DC bias voltage of the optical modulator is manually set and displayed.

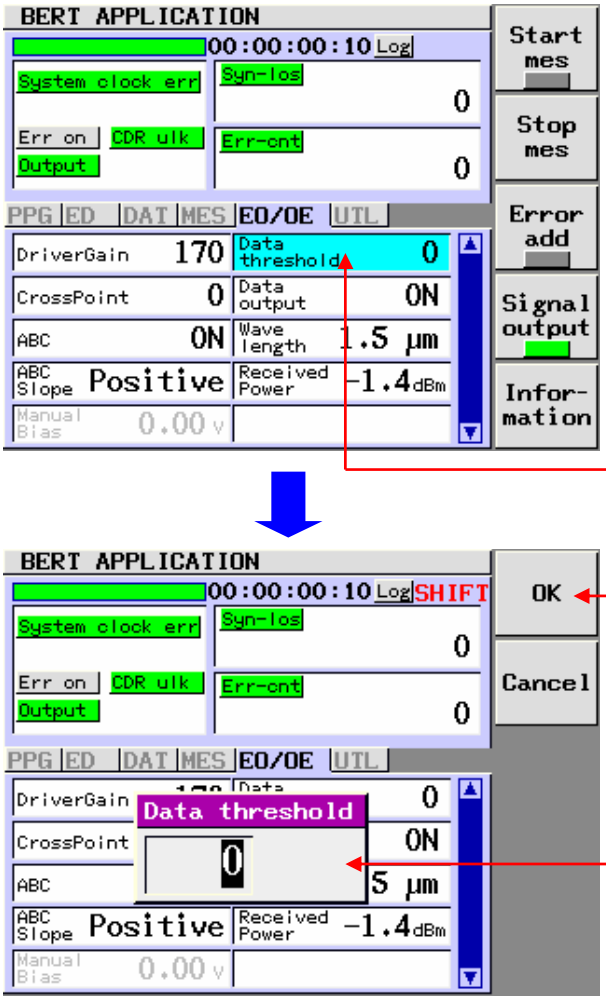
Manual Bias: -10.0 to 9.9 [V] 0.01 [V] step

Note

- This item becomes valid when “OFF” is selected for the ABC. When the ABC is set to “ON”, this item is dimmed (shown in gray) and it cannot be selected.
- When changing the set value with the [▲] or [▼] key, it is set accordingly.
- When "SHIFT" is displayed, the ten-key pad can be used.
  To use the ten-key pad if "SHIFT" is not displayed, press the [SHIFT] key.
- If a value out of the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- For details of the function, see the User's Manual for AQ2200-621/622 10Gbit/s Optical Modulator.

(6) Setting the Data Threshold Value of the Optical Receiver (Data Threshold)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "Data threshold" becomes the current parameter and press the [ENTER] key.
3. The Data threshold popup screen will appear.
   With the ten-key pad or the [▲] or [▼] key, change the numeric value and press the <OK> or [ENTER] key.
4. The Data threshold popup screen will disappear and the set value is then set and displayed.

(1) Move the cursor to "Data threshold" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the ten-key pad or the [▲] or [▼] key, change the numeric value.

Popup Screen

Explanation

The data threshold value of the optical receiver is set and displayed.

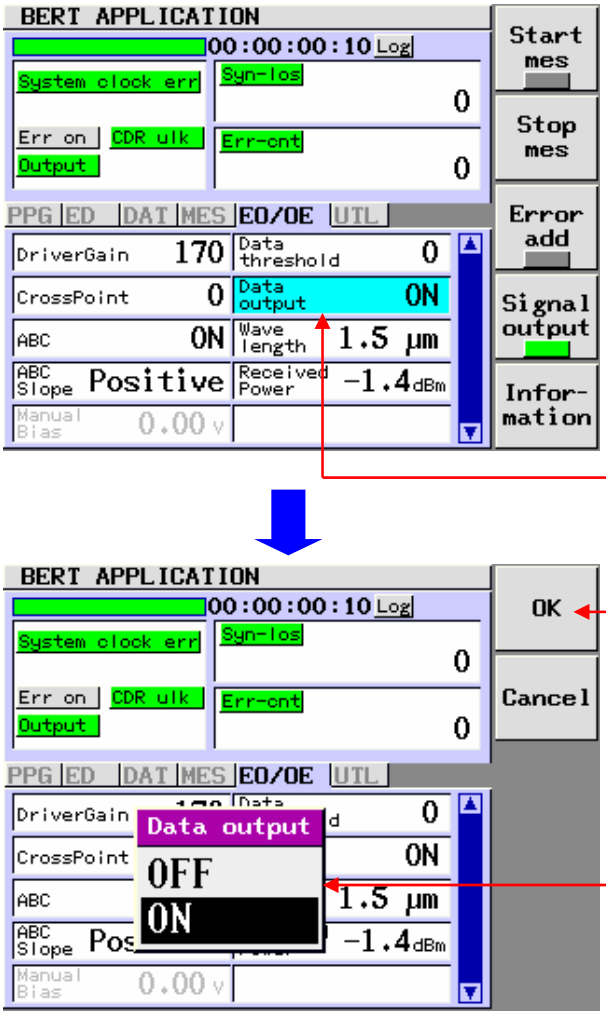
Data threshold: -364 to 273 1 step

Note

- When changing the set value with the [▲] or [▼] key, it is set accordingly.
- When "SHIFT" is displayed, the ten-key pad can be used.
  To use the ten-key pad if "SHIFT" is not displayed, press the [SHIFT] key.
- If a value out of the setting range of the specification is input with the ten-key pad, and then the <OK> or [ENTER] key is pressed, a value most close to that within the setting range of the specification is then set.
- For the function, see section 1.4.

(7) Turning ON or OFF the Data Output of the Optical Receiver (Data Output)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "Data output" becomes the current parameter and press the [ENTER] key.
3. The Data output popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either ON or OFF, and press the <OK> or [ENTER] key.
4. The Data output popup screen will disappear and the item you have selected is then set and displayed.

(1) Move the cursor to "Data output" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the [▲] or [▼] key, select either ON or OFF.

Popup Screen

Explanation

Whether the data output of the optical receiver is turned ON or OFF is set and displayed.

Data output

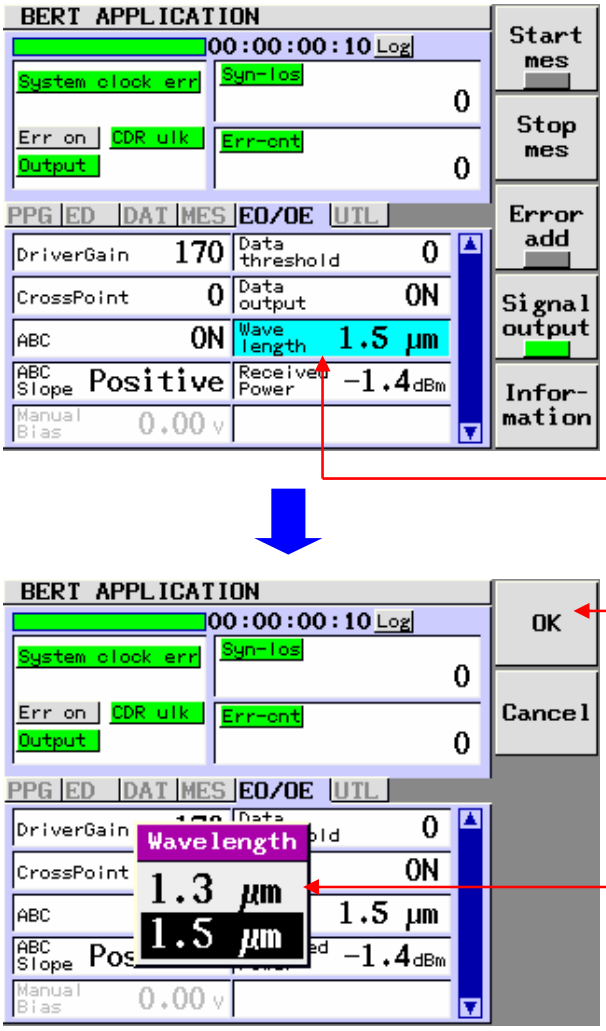
- ON: Data is being output.
- OFF: Data output is stopped (GND level).

Note

- For the function, see section 1.4.

(8) Setting the Wavelength Band of the Receiving Light (Wavelength)

Operating Procedures



1. With the [CHAN] or [FRAME] key, select EO/OE for the current module.
2. With the [▲], [▼], [◀], or [▶] key, move the cursor so that "Wavelength" becomes the current parameter and press the [ENTER] key.
3. The Wavelength popup screen will appear.
   With the [▲] or [▼] key, move the cursor to either 1.5um or 1.3um, and press the <OK> or [ENTER] key.
4. The Wavelength popup screen will disappear and the item you have selected is then set and displayed.

(1) Move the cursor to "Wavelength" and press the [ENTER] key.

(3) Press the <OK> or [ENTER] key.

(2) With the [▲] or [▼] key, select either 1.5um or 1.3um.

Popup Screen

Explanation

The wavelength band of the receiving light is set and displayed.

By setting the wavelength band, the sensitivity of the simple power monitor (Received Power) is corrected easily.

The waveform is not corrected within the wavelength band.

Wavelength

- 1.5um: When the wavelength of the receiving light is 1.5um-band
- 1.3um: When the wavelength of the receiving light is 1.3um-band

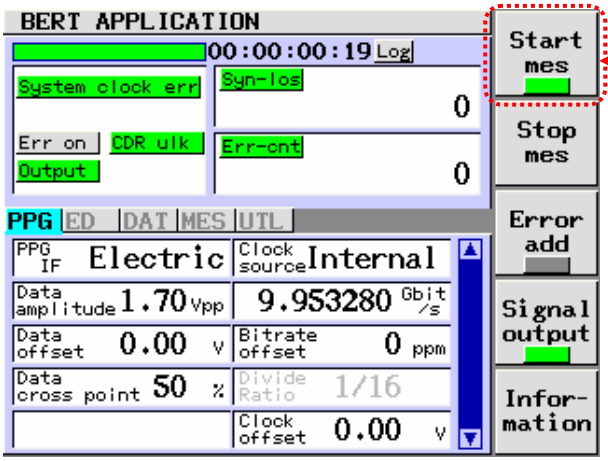
Note

- For the function, see section 1.4.

5.6 Making a Measurement

(1) Starting or Stopping the BER Measurement

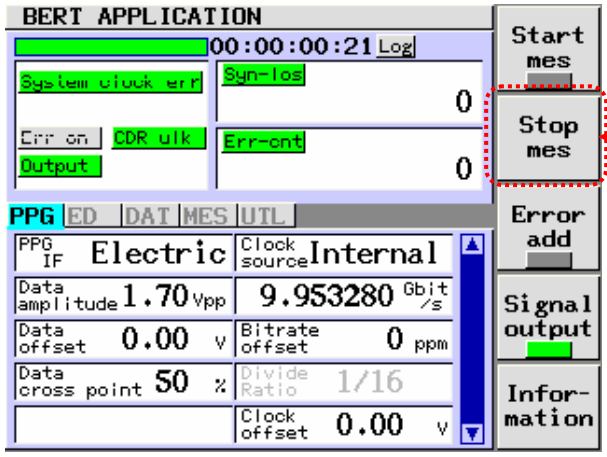
Operating Procedures



Starting the Measurement

1. On the BERT APPLICATION screen, press <Start mes> to start the BER measurement.
   The LED in <Start mes> is lit (indicated in green) during measurement.

(1) Press <Start mes>.
The LED in <Start mes> is lit during measurement.



Stopping the Measurement

2. When pressing <Stop mes> during BER measurement, the BER measurement is stopped.
   The LED in <Start mes> is off (indicated in gray) during stopping of the measurement.

(2) Press <Stop mes>.
The LED in <Start mes> is off during stopping of the measurement.

Explanation

LED indication in <Start mes>

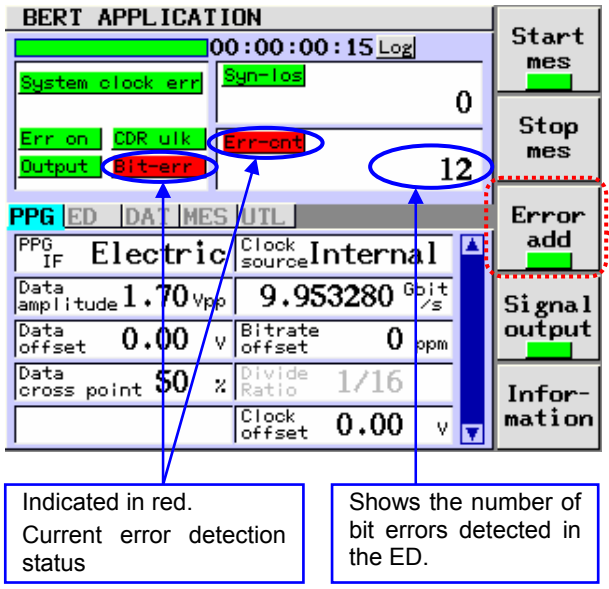
Indication	Status
Lit (indicated in green)	Measurement is in progress.
Off (indicated in gray)	Measurement is stopped.

Note

- Before executing the BER measurement (Start mes is turned ON), set the Signal output to ON (indicated in green). If you attempt to start the BER measurement with the Signal output set at OFF (indicated in gray), the ED enters the sync loss status and the measurement cannot be started.
- If you press <Startmes> during the BER measurement, the BER measurement will restart.
- If any of the following ED setting items is changed or reset during a BER measurement, the BER measurement will restart:
  Mes mode, Mes day, Mes time, Pattern, PRBS length, Program length, Program edit.

(2) Adding the Error or Stopping the Error Add

Operating Procedures



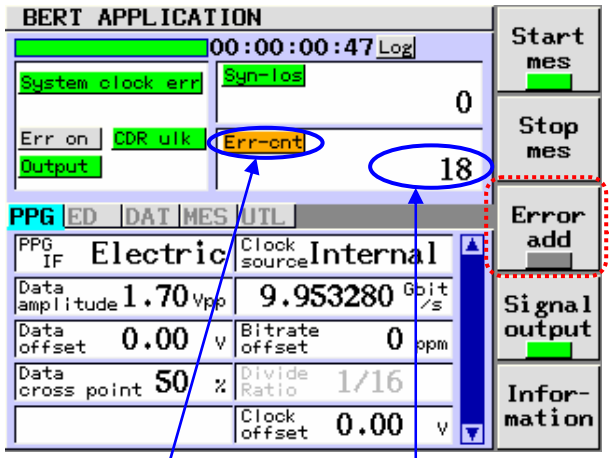
Indicated in red.
Current error detection status

Shows the number of bit errors detected in the ED.

Adding the Error

1. On the BERT APPLICATION screen, press <Error add> to add an error to the output data from the PPG. The LED in <Error add> is lit (indicated in green) during execution of the error add.

(1) Press <Error add>.
The LED in <Error add> is lit during execution of the error add.



Indicated in yellow.
The error occurred in the past, but the error does not occur currently.

Shows the number of bit errors detected in the ED.

Stopping the Error Add

2. When pressing <Error add> during execution of the error add, the error add to the output data of the PPG is stopped. The LED in <Error add> is off (indicated in gray) during stopping of the error add.

(2) Press <Error add>.
The LED in <Error add> is off during stopping of the error add.

Explanation

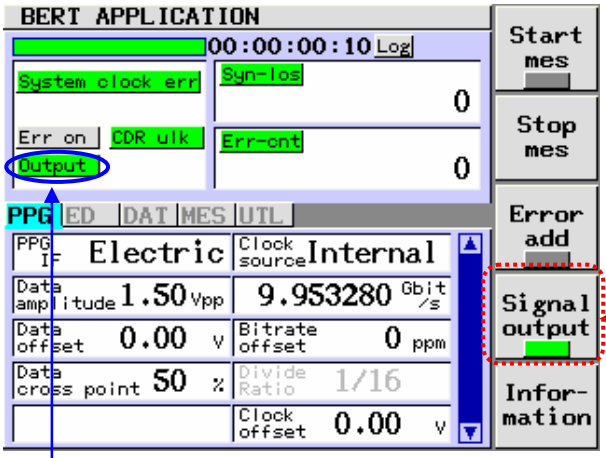
LED indication in <Error add>

Indication	Status
Lit (indicated in green)	Error add is performed.
Off (indicated in gray)	Error add is stopped.

When the set update duration elapses while the time display has been set in the Disp mode, the counter (Syn-los/Err-cnt/Err-rate) of the measurement result display is cleared.

(3) Turning ON or OFF the Output

Operating Procedures

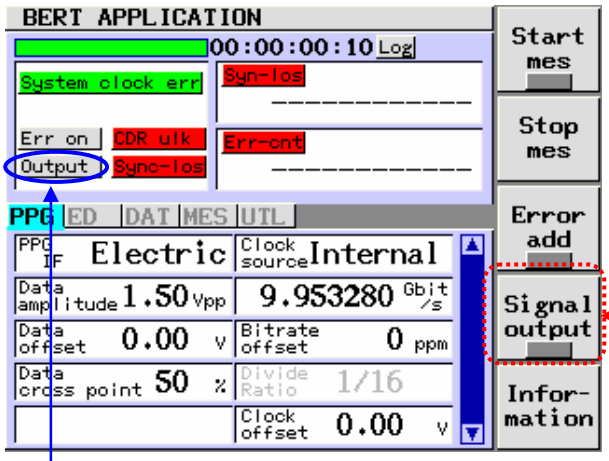


Indicated in green: Output is performed.

Turning ON the Output

1. On the BERT APPLICATION screen, press <Signal output> to turn ON the data/clock output from the PPG.
   The LED in <Signal output> is lit (indicated in green) during outputting and the Output indicator on the measurement status display is also shown in green.

(1) Press <Signal output>.
The LED in <Signal output> is lit during outputting.



Indicated in gray: Output is stopped.

Turning OFF the Output

2. Press <Signal output> while the data/clock is being output, the data/clock output from the PPG is turned OFF.
   The LED in <Signal output> is off (indicated in gray) during stopping of the output and the Output indicator on the measurement status display is also shown in gray.

(2) Press <Signal output>.
The LED in <Signal output> is off during stopping of the output.

Explanation

CAUTION

Before turning ON the output, check the following points.

- Is the output terminal connected to the DUT correctly? Or, is the terminator is mounted?
- Are appropriate values set for the Data amplitude/Data offset/Clock offset?

When connecting this module to the DUT, etc., adjust the output level so that it does not exceed its absolute maximum rating or insert the attenuator.

LED/Output indicator in <Signal output>

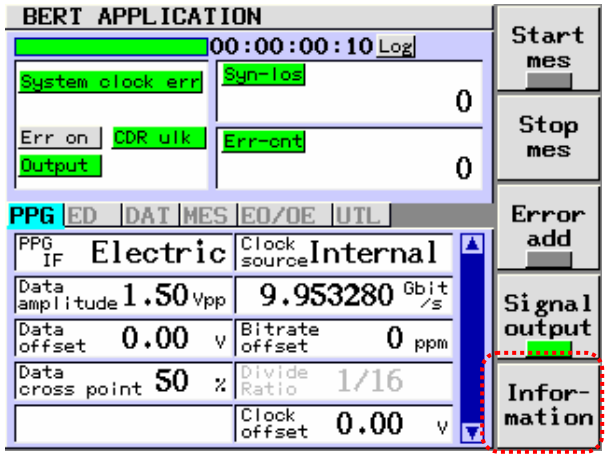
Indication	Status
Green	Output is performed (ON status).
Gray	Output is stopped (OFF status).

Note

- The Signal output can also be turned ON or OFF with the OUTPUT ON/OFF switch on the panel of the BERT module. This setting is interlocked with the operation.
- To use the PPG output, turn ON the Signal output (indicated in green).
  If you attempt to start the BER measurement with the Signal output set at OFF (indicated in gray), the sync loss occurs and the measurement cannot be started.

(4) Displaying the Version Information

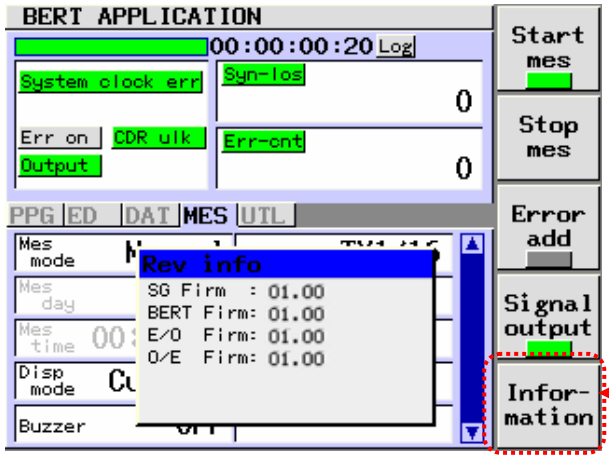
Operating Procedures



(1) Press <Information>.

Displaying the Version Information

1. On the BERT APPLICATION screen, press <Information>. The Rev Info popup screen will appear, showing the version information on each of the selected module.



(2) Press the <Information>, [ENTER], or [CANCEL] key.

Clearing the Version Display

2. When pressing <Information> or the [ENTER] key or [CANCEL] key while the Rev Info popup screen is being displayed, the Rev info popup screen will disappear and the screen is then returned to the previous screen.

Popup Screen

Explanation

Contents of Rev info

The version of the selected module is displayed.

6.1 Check Items Before Calling for the Service Engineer

Troubleshooting

If your system does not function correctly, check the following items before calling for the service engineer.

Trouble		Probable Cause	Corrective Action	Related Section
Common items	The power is not turned ON.	The power cable or connector is not connected firmly.	Check the connections of the power cable and connector. If any cable or connector is loose, connect it firmly.	User's Manual for AQ2201 / 2202
		The fuse is blown out.	Check the fuse of the frame controller. If the fuse is blown out, replace it.	
	The operation panel cannot be operated.	The unit is put in the remote mode.	When <LOCAL> is indicated on the function key, this shows that the unit is in the remote mode, such as GP-IB. To operate the operation panel, cancel the remote mode from the remote controller or press <LOCAL> to put the unit in the local mode.	
Electric IF is used.	The synchronization is not established.	The cable is not connected firmly.	Check the cable connection. If any cable is loose, connect it firmly.	Section 5.5 of BERT manual (hereafter, called BERT)
		The Interface setting of the PPG is not set at "Electric".	Check the IF setting of the PPG. If the IF setting is set at "Optic", change the setting to "Electric".	
		The input port setting is incorrect.	Check the input port settings (DATAIN1, DATAIN2) of the ED and actual connections. If the settings are different from the actual connections, make the settings matched with the connections.	
		The PPG output is not ON.	Check the Signal output. If the Signal output is OFF, change the output to ON.	Section 5.6 (3)
		The setting of the PPG is not matched with that of the ED. (Setting: Pattern, PRBS length, Program length, Logic, etc.)	Check the DAT setting of the PPG and ED. If the setting of the PPG is different from that of the ED, make these settings matched with each other.	Section 5.5 of BERT
		The amplitude of the data is small.	Check the value of the Data amplitude. If the amplitude is small, change the amplitude.	
		The threshold value of the data is incorrect.	Check the value of the Data threshold. If the threshold value is incorrect, set it correctly.	
		When using DATAIN2, the data does not meet the phase of the clock.	When using DATAIN2, it is necessary to externally adjust the phase of the clock to be input using the phase shifter, etc. If the phase is not adjusted, adjust it using the phase shifter, etc.	
	Error occurs.	The pattern of the PPG is not matched with that of the ED.	Check the Pattern of the PPG and ED. If the pattern of the PPG is not matched with that of the ED, make them matched with each other.	
		Error-add is ON.	Check the Error-add setting. If the Error-add setting is ON, change it to OFF.	Section 5.6 (2)
		The amplitude of the data is small.	Check the value of the Data amplitude. If the amplitude is small, change it correctly.	Section 5.5 of BERT
		The threshold value of the data is incorrect.	Check the value of the Data threshold. If the threshold value is incorrect, set it correctly.	

Trouble		Probable Cause	Corrective Action	Related Section
Electric IF is used.	The output waveform is not clear.	The cable is not connected firmly.	Check the cable connections. If any cable is loose, connect it firmly.	Section 2.5 of BERT
		The output terminal not in use is not terminated.	Check the output terminal. If the output terminal is open, terminate it using the terminator supplied with this unit.	Section 1.2 of BERT
		The cable and connector having excellent high-frequency characteristics are not used.	Check the cable and connector. If the cable and connector having excellent high-frequency characteristics is not used, replace it with a one having excellent high-frequency characteristics.	—
Optical IF is used.	The LOS alarm is displayed on the OE.	The end face of the optical fiber is contaminated.	Check the end face of the optical fiber. If the end face of the optical fiber is contaminated, clean it completely.	Section 7.2
		The optical fiber is not connected firmly.	Check the connection of the optical fiber. If the optical fiber is not connected firmly, connect it firmly.	Section 2.5
		The optical input power of the OE is the minimum optical input sensitivity or less.	Check the optical input power of the OE. If the optical input power of the OE is the minimum light receiving sensitivity or less, insert the optical AMP, etc.	—
		The output of the LD light source is OFF.	Check the output status of the LD light source. If the output status of the LD light source is OFF, change it to ON.	—
		The output power setting of the LD light source is too low.	Check the output power setting of the LD light source. If the setting is too low, set it to an appropriate level.	—
	The OVERLOAD alarm is displayed on the OE.	The optical input power of the OE is too large.	Check the optical input power of the OE. If the optical input power is too large, insert the optical ATT for protection.	—
	The sync loss error occurs.	The Interface setting of the PPG is not set at "Optic".	Check the setting of the PPGIF. If the setting is set at "Electric", change it to "Optic".	Section 5.5 of BERT
		The output of the OE is not ON.	Check the Data output of the OE. If this data output is OFF, change it to ON.	Section 5.5 (7)
		The optical input power of the OE is beyond the light receiving range level.	Check the optical input power of the OE. If the optical input power is beyond the light receiving range level, insert the optical ATT or optical AMP so that the optical input power enters the light receiving range.	—
		The wavelength band of the LD is not matched with that of the EO.	Check the wavelength bands of the LD and EO. If the wavelength band of the LD is not matched with that of the EO, use a unit having proper wavelength band. The AQ2200-621 of the EO is set to 1.5um-band and the AQ2200-631 is set to 1.3um-band.	—
		The polarization direction of the PMF connecting the LD and EO is incorrect.	Use PMF, an optional device of the EO.	Section 2.5
		The logic settings of the PPG and ED are conflict with the ABC slope settings of the EO.	Set all settings to "Positive" once to check the operation.	Section 5.5 (4)
		The threshold value of the OE data is incorrect.	Check the Data threshold value of the OE. If the threshold value is incorrect, set it correctly.	Section 5.5 (6)

If the Trouble Cannot Be Solved:

If the cause cannot be located or if the faulty status cannot be restored to the original status, contact your local sales dealer, YOKOGAWA's sales department, or support department.

Additionally, check the following items when contacting above department.

1. **Unit Name**

   The unit name is shown on the nameplate attached to the front, rear, or side panel.

2. **Software Version of Main Unit**

   Check the software version of the frame controller using the "Information" menu on the SYSTEM screen.

3. **Software Version of Each Module**

   Check the software version of each module using the <Information> function key.

4. **Symptom**

   - Operating environment you have used for this unit.
     Indoor/outdoor, temperature, or mounted module, etc.
   - What trouble occurs in what operation.
     Freezing of the panel operation or remote control, etc.
   - Settings you have used for this unit.
     Settings, etc.
   - Message shown on the screen.
     Display screen or message, etc.

5. **Trouble Occurrence Date and Time**

6.2 Maintenance and Inspection

Outline

It is recommended to carry out the daily maintenance and inspection to test a part of the specifications stated in Chapter 8 in order to make sure that this module functions correctly.

Calibration Cycle

It is recommended to check the performance of the module related to the environmental conditions in the specifications once a year according to the performance test described below.

Performance Test

After the inspection has been completed, the performance results are recorded in the performance test record sheet. The performance test record sheet is a list stating all tested specifications and allowable limits. The test result records are used to compare the data after completion of the periodic maintenance, troubleshooting, repair, and adjustment.

Recommended Test Instruments

The following list shows the measuring instruments necessary to carry out the performance test.

Measuring instruments, which have the performance and functionality better than those shown in the following list, can be used as alternative instruments.

Recommended test instruments

Name	Required Performance	Recommended Model
AQ2200-601	10Gbit/s BERT	AQ2200-601 is specified.
AQ2200-111	DFB LD (option PMF)	AQ2200-111 is specified.
AQ2200-621/622	OPTICAL MODULATOR	AQ2200-621/622 is specified.
Digital oscilloscope	Main unit Optical input channel (DC to 28GHz)	86100B manufactured by Agilent 86106B manufactured by Agilent
Optical fixed attenuator	10dB	
Optical fiber	Single mode fiber	

(1) Output Electric Waveform Test

Description

This test is intended to check that the electric output waveform of the DATA OUT is within the specification range.

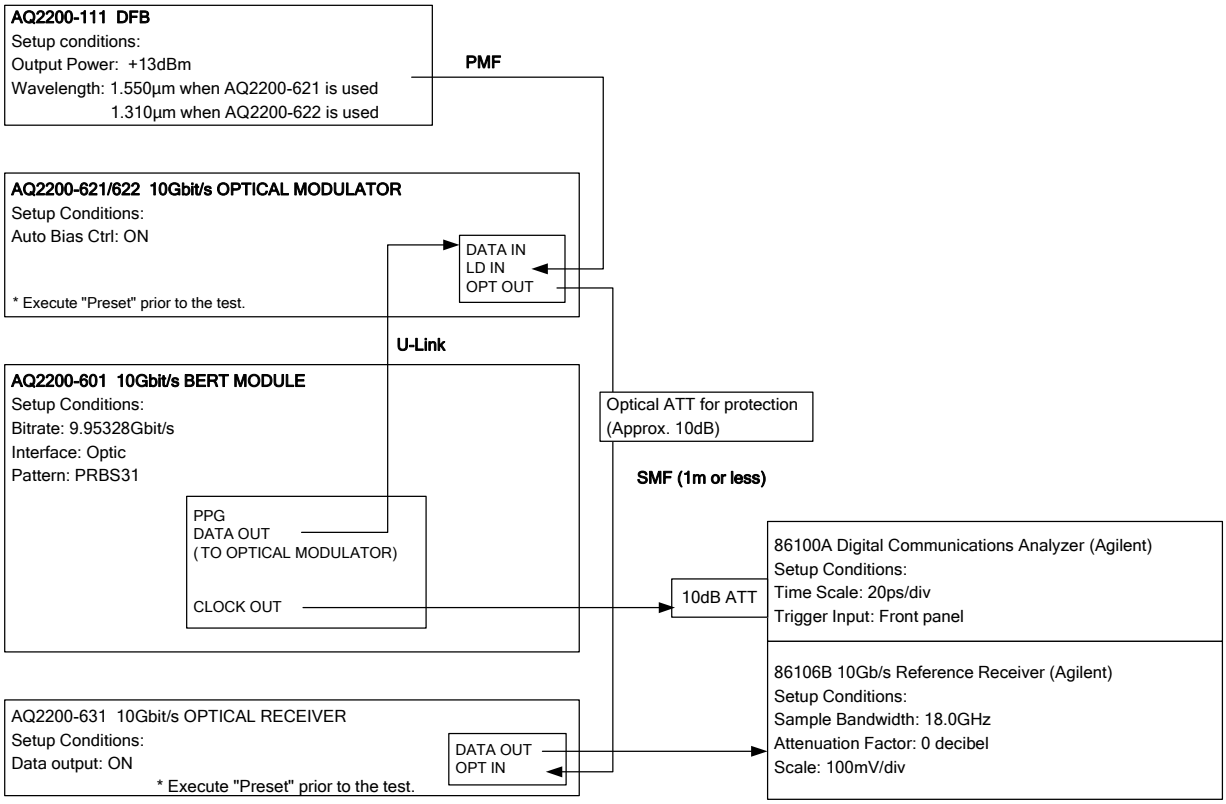
Specifications

Output amplitude 300mV or greater

Procedures

1. Connect the output terminal of the AQ2200-111 DFB LD Module (hereafter referred to as “AQ2200-111 DFB LD”) and the LD IN terminal of the AQ2200-621/622 10Gbit/s Optical Modulator (hereafter referred to as “AQ2200-621/622 EO”) with the PMF fiber (optional).
2. Connect the DATA OUT (TO OPTICAL MODULATOR) terminal of the AQ2200-601 10Gbit/s BERT Module (hereafter referred to as “AQ2200-601 10GBERT”) and the DATA IN terminal of the AQ2200-621/622 EO with the U-link (optional).
3. Connect the OPT OUT terminal of the AQ2200-621/622 EO and the OPT IN terminal of the AQ2200-631 OPTICAL RECEIVER (hereafter referred to as “AQ2200-631 OE”) with the SMF having a length of approximately 1m through an optical ATT with an attenuation level of 10dB.
4. Connect the DATA OUT terminal of the AQ2200-631 OE to the oscilloscope. At this time, it is recommended to insert the ATT in order to protect the oscilloscope.
5. Set the PPG of the AQ2200-601 10GBERT as follows.
   Interface: Optic
6. Press the OUTPUT ON button on the AQ2200-601 10GBERT to output the electric signal.
7. Press the OUTPUT ON button on the AQ2200-111 DFB LD to output the optical signal.
8. Run "Preset" from the GUI screen of the AQ2200-621/622 EO or the AQ2200-631 OE.
9. Check with the oscilloscope that relevant output satisfies the specified value. For the trigger signal to be supplied to the oscilloscope, use the 10GHz-band clock out of the AQ2200-601.

Connection Diagram



*** Always use the optional U-link and PMF fiber (sold separately).**

(2) Optical Reflection Test

Description

It is checked that no bit errors occur in this optical reflection test.

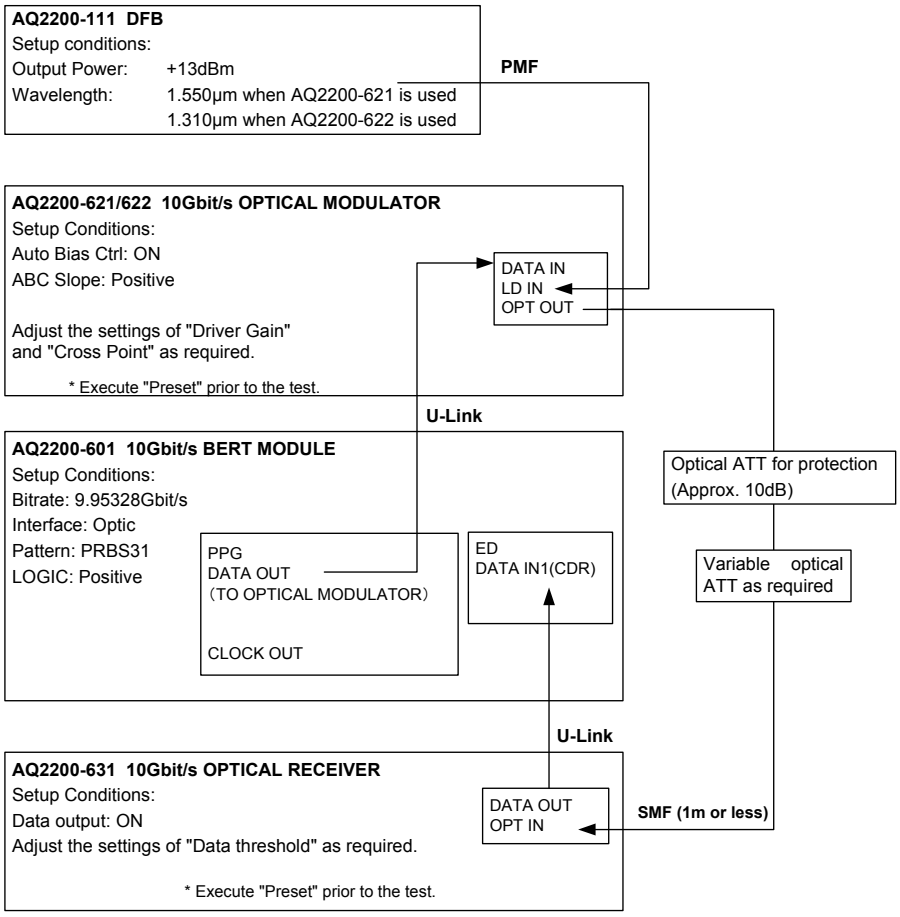
Specifications

No bit errors occur for 10 min.

Procedures

1. Connect the output terminal of the AQ2200-111 DFB LD and the LD IN terminal of the AQ2200-621/622 EO with the PMF fiber (optional).
2. Connect the DATA OUT (TO OPTICAL MODULATOR) terminal of the AQ2200-601 10GBERT and the DATA IN terminal of the AQ2200-621/622 EO with the U-link (optional).
3. Connect the OPT OUT terminal of the AQ2200-621/622 EO and the OPT IN terminal of the AQ2200-631 OE with the SMF having a length of approximately 1m through an optical ATT with an attenuation level of 10dB.
4. Connect the DATA OUT terminal of the AQ2200-631 OE and the DATA IN (CDR) terminal of the AQ2200-601 10GBERT with the U-link (optional).
5. Set the PPG of the AQ2200-601 10GBERT as follows.
   Interface: Optic
6. Press the OUTPUT ON button on the AQ2200-601 10GBERT to output the electric signal.
7. Press the OUTPUT ON button on the AQ2200-111 DFB LD to output the optical signal.
8. Run "Preset" from the GUI screen of the AQ2200-621/622 EO or the AQ2200-631 OE.
9. Check that no bit errors occur through the ED of the AQ2200-601 10GBERT.

Connection Diagram



*** Always use the optional U-link and PMF fiber (sold separately).**

Performance Test Record Sheet

AQ2200-631	
10Gbit/s OPTICAL RECEIVER	
Place:	Manufacture No.:
	Tested by:
Temperature:	Approved by:
Humidity:	Date:

Description of Test	Results		
	Min.	Actual	Max.
Amplitude of electric output	—	mVpp	—
BER measurement	—	No bit error shall occur.	—

Test Conditions	
AQ2200-601 settings	
Bitrate	9.95328 Gbit/s
Test coding (number of PRBS steps)	PRBS31
AQ2200-111	
Wavelength of LD light source	1550nm or 1310nm
AQ2200-621/622	
LD input power	dBm
Auto Bias Control	ON status
Amplitude of electric input	500mVpp±100mVpp
ABC Bias Slope	
AQ2200-631	
Optical input power	dBm
DATA Threshold	Describe the optimal value.

7.1 Cleaning the Main Unit and Module

To operate this unit at its optimal operating level for an extended period of time and to prevent any trouble or malfunction, the daily maintenance is absolutely required.

- Clean the panel and exterior of the main unit, and the panel of the module with a cloth rag soaked in lukewarm water to remove the dirt, and then wipe them off with a dry cloth rag.
- With a dry cloth rag, clean the parts other than the panel surface of the module and electric interface.
- To clean the electric interface, blow the air to the electric interface using an air spray to remove dust, and cover the terminals not in use with the terminator (for output terminals) or cap (for input terminals).

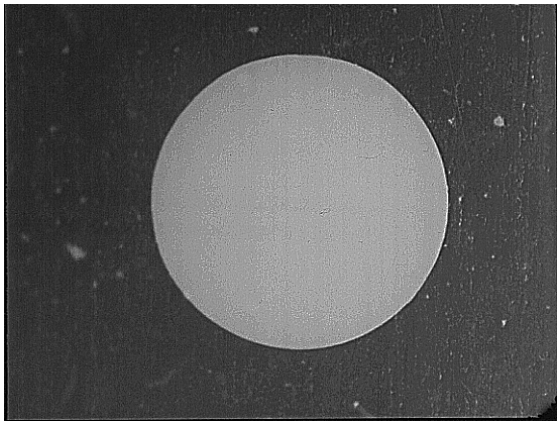
CAUTION

- Before starting the maintenance, always turn OFF the power completely. Failure to do so may cause the unit to malfunction.
- Do not use any chemical, such as paint thinner, benzene, or alcohol.
  Doing so may cause discoloration or deterioration.

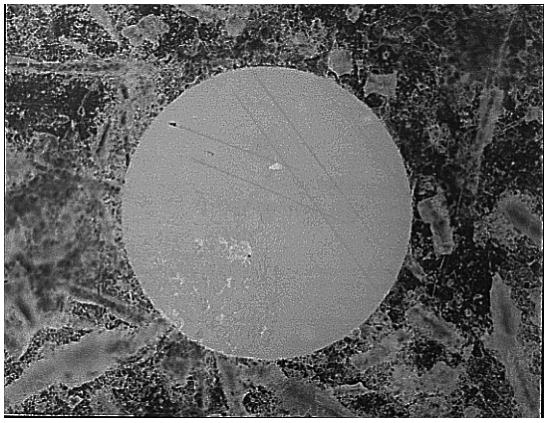
7.2 Cleaning the Optical Interface

(1) Necessity to Clean the Optical Interface

The optical connector is only an optical component, the optical transmission of which is exposed to the outside. Even a scratch on the end face, which cannot be checked visually, greatly affects its optical performance. Therefore, if the optical connector is connected improperly, if it is connected without removal of dust or dirt, or if it is cleaned improperly, this may cause the end face of the optical connector to be scratched.

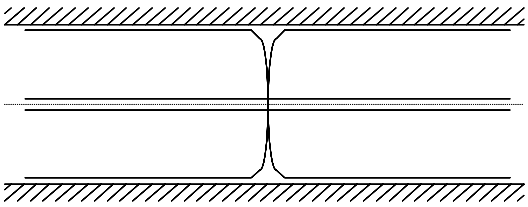


Enlarged photo of correct optical connector connection part

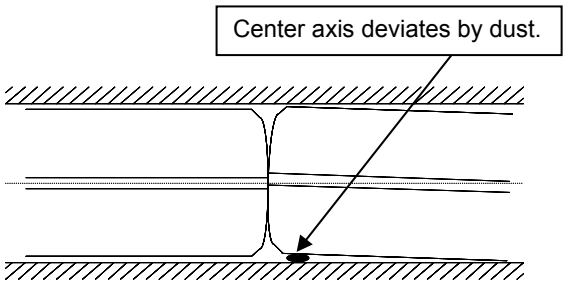


Enlarged photo of scratched optical connector connection part

Additionally, to connect the optical connector, it is absolutely required to properly joint the ferrule cores of both optical connectors. An optical adaptor is used for the connection. However, if the connection is made with dust sticking to the ferrule side face or ferrule guide of the optical adaptor, the cores cannot be jointed correctly. In this status, the loss of the optical power, disturbance of the transmission mode, and/or optical reflection at the connection point may become large, causing the measurement not to be performed correctly.



Optical connector in correct joint status



Optical connector in axis deviation status by dust

To prevent such troubles, when connecting the optical connector to the measuring instrument or other optical connector, it is necessary to make the correct connection and cleaning at the same time.

When using this unit, clean the ferrule every time it is connected and the precision sleeve every time it is connected 30 times.

In particular, when using the following optical connector, it is strongly recommended to clean it every time it is connected.

- Optical connector to be connected after other metallic sleeve has been inserted.
  → In particular, metallic sleeve worn-out particles may easily stick to the ferrule side face or end face.
- Optical connector made of ferule material to be easily worn-out, such as metallic ferrule or crystallized glass ferrule.
  → Ferrule worn-out particle may be produced by connection and disconnection.
- Optical connector and sleeve, with which the plastic shell type optical connector is engaged repeatedly.
  → Plastic worn-out particles may be produced easily during shell engagement.

(2) Tools Required for Cleaning.

The following tools are needed to clean the optical interface.

- Isopropyl alcohol
- Cleaning paper
- Stick type cleaner
- Air spray
- Optical connector end face magnifying microscope

WARNING

- Do not attempt to clean the optical connector or optical adaptor while the laser beam is being emitted.
  The laser beam is invisible. However, if the laser beam is in contact with your eye, this may cause eye injury, resulting in serious accident.

(3) Cleaning the Optical Connector

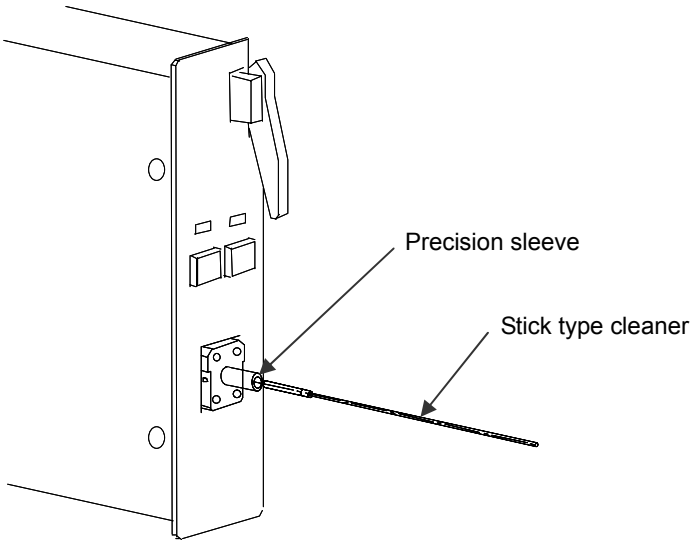
1. Soak the cleaning paper in the isopropyl alcohol, hold the optical ferrule end face by this cleaning paper, and clean the end face properly.
2. Soak another cleaning paper in the isopropyl alcohol and clean the ferrule end face with this cleaning paper by rubbing it.
3. Furthermore, wipe off the moisture content with another cleaning paper. After that, blow out dust sticking to the end face with an air spray.
4. With the optical connector end face magnifying microscope, check the status of the end face. If the end face is contaminated or dust is sticking to the end face, clean it again.

CAUTION

- If any contaminated cleaning paper is used, this may cause the end face to be scratched. To prevent such trouble, always use new cleaning paper.

(4) Cleaning the Optical Input and Output

1. Soak the stick type cleaner in the isopropyl alcohol and gradually insert it into the precision sleeve of the optical input/output to clean the inner wall.
2. With another stick type cleaner, wipe off the moisture content completely. After that, blow out dust sticking to the end face with an air spray.



(5) Cautions on Daily Work

To protect the optical interface, always strictly observe the following points during daily work.

- To prevent dust from sticking, do not leave the optical connector and/or the optical interface of the unit with the dust-proof cap attached.
- To prevent the connector end face from being contaminated or scratched, do not touch the end face of the optical interface at any time (except for adjustment and cleaning).
- When connecting the optical connector, always insert it straight so that the end face of the connector may not be in contact with the connection adaptor, or the panel or component around the unit.

8.1 Specifications

Item	Specifications	
Wavelength range	1290nm to 1330nm, 1530nm to 1570nm	
Minimum optical receiving sensitivity *1,*2	< -15dBm @1550nm, Ex=12dB, 9.953Gbit/s, PRBS31 < -14dBm @1310nm, Ex=12dB, 9.953Gbit/s, PRBS31	
Maximum optical input	6dBm peak, 3dBm ave.	
Overload *1,*2	-1 dBm or more	
Saturated output amplitude *1	300mVpp or more (AC-coupling)	
Electric connector	3.5mm (Jack) or equivalent	
Optical connector *3	SC/PC standard (FC/PC: Optional function set at factory)	
Optical fiber	SMF	
Storage temperature	-10°C to +50°C	
Operating temperature	+5°C to +40°C	
Operating humidity	80% or less (No condensation allowed.)	
Size	1-slot width	
Weight	1kg	
Safety standard	Complying standard	EN61010-1:2001 ・Overvoltage category (Installation category) CAT II *4 ・Measurement category CAT I *5 ・Pollution degree 2 *6
Emission	Complying standard	EN 61326:1997 +A1:1998 +A2:2001 Class A EN 55011:1998 +A1:1999 +A2:2002 Class A
Immunity	Complying standard	EN 61326:1997 +A1:1998 +A2:2001 Annex A

*1 Data Out (PPG side) and Data in (ED side) of the AQ2200-601 BERT MODULE for the Optical Modulator, AQ2200-111 DFB-LD MODULE (Option PMF), and AQ2200-621/622 OPTICAL MODULATOR are used.For connection among modules, use the specified U-link (optional) and PMF (optional). The optical reflection is connected with the SMF having a length of 1m or less.

*2 Performance guarantee temperature range: 23°C±5°C

*3 Either one is selected.

*4 The Overvoltage Category is a value used to define the transient overvoltage condition and includes the impulse withstand voltage regulation. CAT II applies to electrical equipment that is powered through a fixed installation such as a wall outlet wired to a distribution board.

*5 This equipment is for Measurement Category I (CAT I). Do not use it with Measurement Category II (CAT II),Measurement Category III (CAT III), nor Measurement Category IV (CAT IV).

CAT I applies to electrical equipment on a circuit that is not connected directly to the power source and measurement performed on such wiring. CAT II applies to electrical equipment that is powered through a fixed installation such as a wall outlet wired to a distribution board and measurement performed on such wiring. CAT III applies to measurement of the distribution level, that is , building wiring, fixed installations. CAT IV applies to measurement of the primary supply level, that is, overhead lines, cable systems, and so on.

*6 Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity. Pollution Degree 1 applies to closed atmospheres (with no, or only dry, non-conductive pollution). Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).

Unless otherwise specified particularly, the specifications apply to the NRZ or PRBS31 (mark ratio is 1/2) coding.

Appendix 1 Initial Set Values

Pressing the [PRESET] key will return the settings of the frame controller and mounted module to their initial set values.

The following Table shows the initial set values of this module.

Initial Set Values

Item	Set Value
Data threshold	0
Data output	ON
Wavelength	1.5 [um]
Overload	-1.0 [dBm]
LOS	-16.0 [dBm]

Appendix 2 Outside View

UNIT : mm