User's Manual

AQ2200 Series
Multi Application Test System
[Application Operation]

Thank you for purchasing this AQ2200 Series Multi Application Test System. This user's manual explains the features, operating procedures, and handling precautions of the AQ2200 Series. To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference in the event a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the AQ2200 Series. Please read all manuals.

Manual Title	Manual No.	Description
AQ2200 Series Multi Application Test System User's Manual Startup Guide	IM 735101-01EN	The supplied CD contains the PDF file of this manual. This manual describes the handling precautions for, the names and functions of all parts of, and the firmware upgrade procedure for the AQ2200 Series.
AQ2200 Series Multi Application Test System Frame and Module Operation User's Manual	IM 735101-03EN	The supplied CD contains the PDF file of this manual. This manual describes all the features of the AQ2200 Series and how to use them, with the exception of some of the application and communication features.
AQ2200 Series Multi Application Test System Application Operation User's Manual	IM 735101-04EN	This manual. The supplied CD contains the PDF file of this manual. This manual describes the AQ2200 Series application features and how to use them.
AQ2200 Series Multi Application Test System Communication Interface User's Manual	IM735101-17EN	The supplied CD contains the PDF file of this manual. This manual describes the AQ2200 Series communication interface features and how to use them.
64 Mbit Program Pattern Option User's Manual	IM 810518801-61E	This manual describes how to create program patterns for the AQ2200-601 10 Gbit/s BERT module with the /M option.
SDH/SONET Frame Option User's Manual	IM 810518801-62E	This manual describes how to create SDH/SONET patterns for the AQ2200-601 10 Gbit/s BERT module with the /P1 option.
AQ2200 Series Modules Checking the Contents of the Package and Handling Precautions of the Modules	IM 810518901-04E	This is included with AQ2200 Series modules. It explains the handling precautions of the module and lists the package contents.
Connector Adapter for Multi-Fiber Cable User's Manual	IM AQ9340-01EN	This manual explains the handling precautions of the connector adapters and how to use them.

The "EN" and "E" in the manual numbers are the language codes.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Manual No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

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

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1

1.1   Application Functions

The AQ2200 Multi-Application Test System can comprise measurement and evaluation applications for measurements of a variety of communication optical devices and optical transmitters combining the various AQ2200 series modules.

Common measurement applications can be performed as a single application function separate from the operation of individual modules. For details, see chapters 2 through 7.

Application Functions	Items Measured
Stability	Long-term optical power stability
Logging	Short-term optical power stability
ORL/IL	Optical reflection attenuation, Insertion loss
SWEPT	Measuring wavelength sweep
BERT	Bit Error Rate

1.2   Measuring Optical Power Stability

You can measure fluctuations in optical power. The following two functions can be used for measurements of long- and short-term fluctuations.

• Stability Measurement
  By measuring the optical signal over a long period of time, you can check the optical power stability.

• Logging Measurement
  By measuring optical signals that fluctuate over very short periods of time, you can check the transient characteristics.
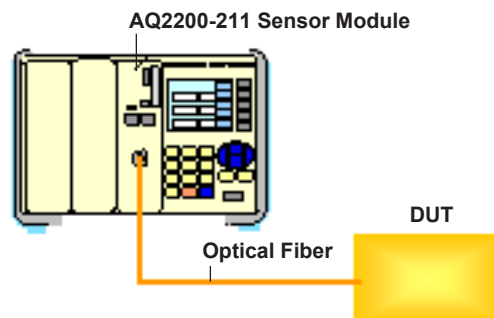
1.3 Optical Reflection Attenuation/Insertion Loss Measurement

You can measure the return loss and Insertion loss of the optical device (ORL/IL measurement).

Light Source Module
Sensor Module

Optical Fiber

Coupler   **DUT**   **Optical termination**
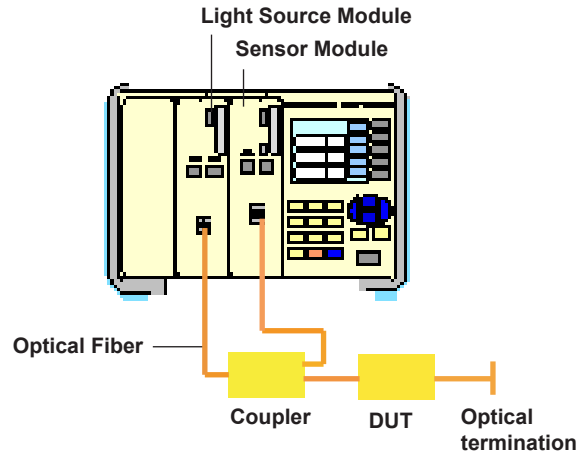
The following is an example of a measurement system in which a coupler is connected externally. Use a sensor module appropriate for the DUT.

Measuring Only the Optical Reflection Attenuation (ORL)
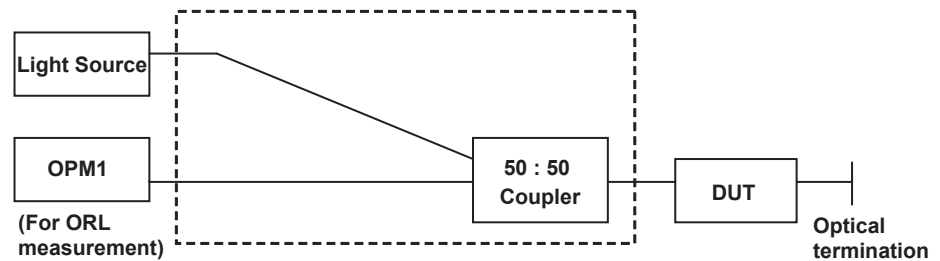
Light Source

OPM1

(For ORL measurement)

50 : 50 Coupler

DUT

Optical termination

Measuring the Optical Reflection Attenuation (ORL) and Insertion Loss (IL)

Light Source

OPM1

(For ORL measurement)

50 : 50 Coupler

DUT

OPM2
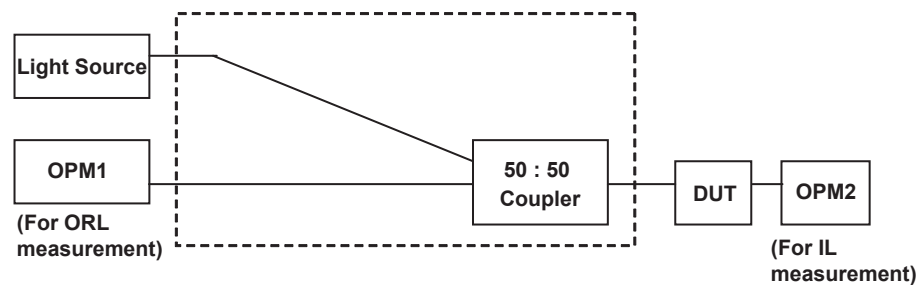
(For IL measurement)

Measuring the Optical Reflection Attenuation (ORL) with the Light Source Output Variation Monitor

```
┌──────────────┐         ┌──────────────────────────────────┐         ┌──────────┐
│ Light source │─────────│  ┌────────────┐                   │─────────│   OPM2   │
└──────────────┘         │  │   50 : 50  │                   │         └──────────┘
                         │  │   Coupler  │                   │         (For monotor)
                         │  └────────────┘                   │
┌──────────────┐         │                  ┌────────────┐   │         ┌──────┐
│     OPM1     │─────────│                  │   50 : 50  │───│─────────│ DUT  │───┤
└──────────────┘         │                  │   Coupler  │   │         └──────┘
(For ORL                 └──────────────────────────────────┘         (Optical
Measurement)                                                          termination)
```
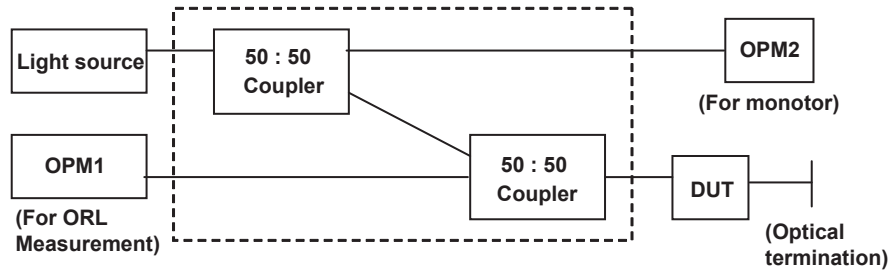
Measuring the Optical Reflection Attenuation (ORL) and Insertion Loss (IL) with the Light Source Output Variation Monitor

```
┌──────────────┐         ┌──────────────────────────────────┐         ┌──────────┐
│ Light source │─────────│  ┌────────────┐                   │─────────│   OPM3   │
└──────────────┘         │  │  50: :50   │                   │         └──────────┘
                         │  │   Coupler  │                   │         (For monitor)
                         │  └────────────┘                   │
┌──────────────┐         │                  ┌────────────┐   │         ┌──────┐  ┌──────┐
│     OPM1     │─────────│                  │   50 : 50  │───│─────────│ DUT  │──│ OPM2 │
└──────────────┘         │                  │   Coupler  │   │         └──────┘  └──────┘
(For ORL                 └──────────────────────────────────┘         (For IL
measurement)                                                          measurement)
```
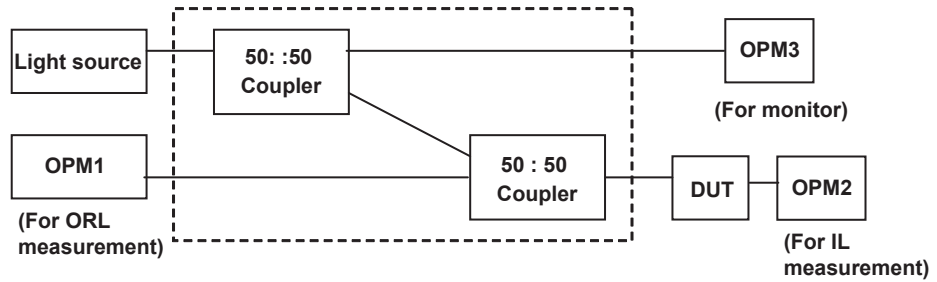
Measuring Only the Optical Return Loss (ORL) (When Using the AQ2200-271)

```
                          AQ2200-271 (ORLModule)
┌────────────────────┐   ┌─────────────────────────────┐   ┌──────┐
│   AQ2200-1xx       │   │ OPT IN            MEAS       │───│ DUT  │───┤
│ Light source module│───│                             │   └──────┘
└────────────────────┘   │                             │   (Optical
                         │                             │   Termination)
┌────────────────────┐   │                             │
│   AQ2200-2xx       │   │ OPT OUT                     │
│  Sensor module     │───│                             │
└────────────────────┘   └─────────────────────────────┘
(For ORL Measurement)
```
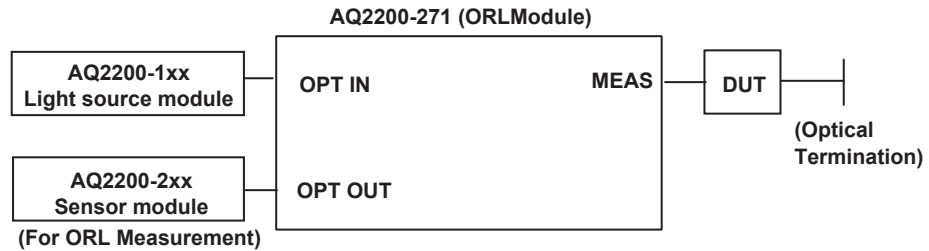
Measuring Only the Optical Return Loss (ORL) and Insertion Loss (IL) (When Using the AQ2200-271)

```
                          AQ2200-271 (ORLModule)
┌────────────────────┐   ┌─────────────────────────────┐   ┌──────┐   ┌────────────────────┐
│   AQ2200-1xx       │   │ OPT IN            MEAS       │───│ DUT  │───│   AQ2200-2xx       │
│ Light source module│───│                             │   └──────┘   │  Sensor module     │
└────────────────────┘   │                             │              └────────────────────┘
                         │                             │              (For IL Measurement)
┌────────────────────┐   │                             │
│   AQ2200-2xx       │   │ OPT OUT                     │
│  Sensor module     │───│                             │
└────────────────────┘   └─────────────────────────────┘
(For ORL Measurement)
```
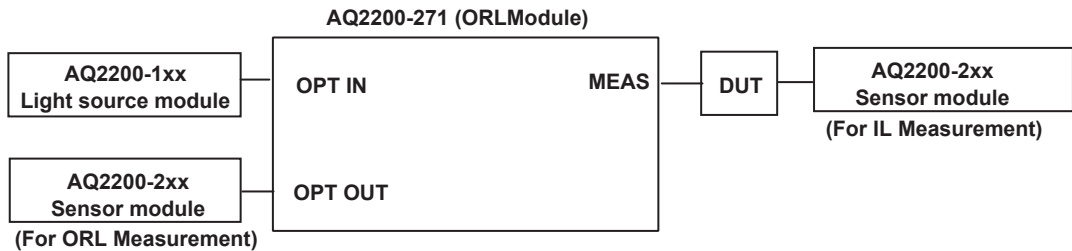
1.4　Measuring Wavelength Sweep

By measuring optical power with the sensor module while sweeping the wavelength of the turnable laser source, you can measure the wavelength dependent characteristics of the optical device or the flatness of the filter.

The following application measurement function is available.

- Swept measurement
  Wavelength automatically swept within a specified range.

AQ2200-136 TLS Module

AQ2200-211 Sensor Module

Optical Fiber

DUT
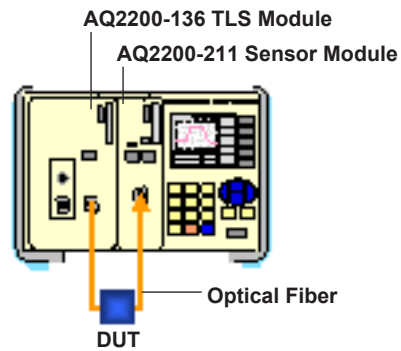
1.5　Bit error rate measurement

You can perform BERT (bit error rate tests) using the signal generation function (Pulse Pattern Generator) and the error detection function (Error Detector). The BERT application function is useful when operating the BERT module and BERT related modules.
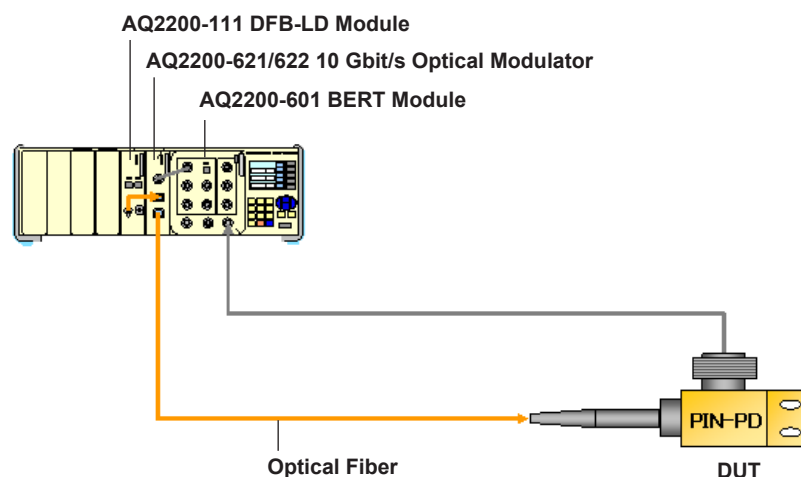
When using the BERT APPLICATION, BER can be measured while operating the related modules. For example, this function is useful when monitoring the BER measurement results while adjusting the send/receive settings including the optical interface.

On the detail screen for operation of individual modules, only the module-specific functions are displayed on screen. However, with the BERT APPLICATION (which combines related modules), BER measurement and measured results are shown no matter which page (screen) is displayed. It is also recommended to use the BERT APPLICATION function even when only one BERT module is used.

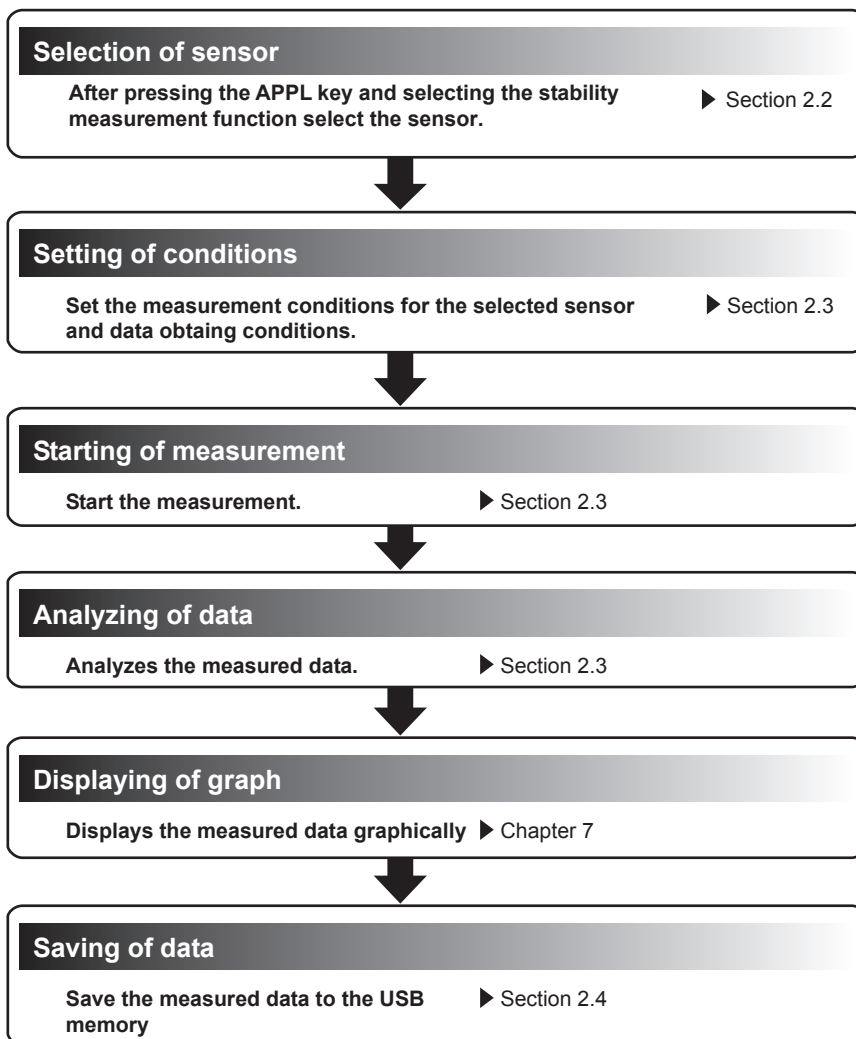Furthermore, the parameter items (module-specific) set in chapter 9 of IM735101-03EN are included in the parameter items of the BERT APPLICATION, and vice versa.

Modules Used
*   BERT module
*   When measuring an optical device: 10 Gbit/s optical module/receiver and light source module

AQ2200-111 DFB-LD Module

AQ2200-621/622 10 Gbit/s Optical Modulator

AQ2200-601 BERT Module

Optical Fiber

PIN-PD

DUT

2.1   Flow of Operation

Selection of sensor

After pressing the APPL key and selecting the stability measurement function select the sensor.   ▶ Section 2.2

↓

Setting of conditions

Set the measurement conditions for the selected sensor and data obtaing conditions.   ▶ Section 2.3

↓

Starting of measurement

Start the measurement.   ▶ Section 2.3

↓

Analyzing of data

Analyzes the measured data.   ▶ Section 2.3

↓

Displaying of graph

Displays the measured data graphically   ▶ Chapter 7

↓

Saving of data

Save the measured data to the USB memory   ▶ Section 2.4
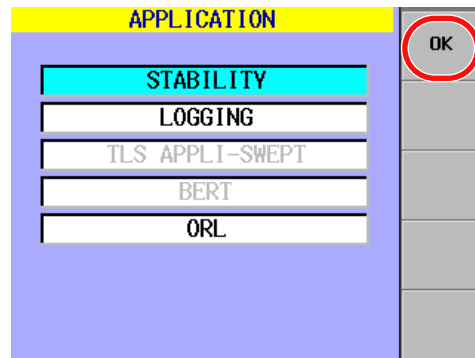

2.2 Starting Up Application

Procedure

1. Press **APPLI** to display the APPLICATION screen.
2. Use the arrow keys to move the cursor to STABILITY, and press the **OK** soft key or **ENTER**.
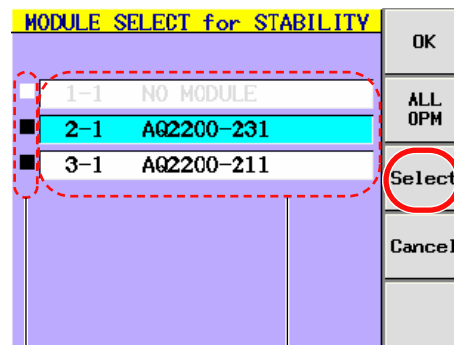   The MODULE SELECT for STABILITY screen appears.

3. Use the arrow keys to move the cursor to a sensor that you want to use for measurement, and press the **Select** soft key or **ENTER**.
    The box to the left of the selected sensor module will turn black.
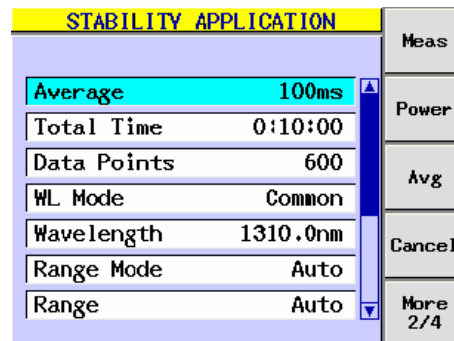
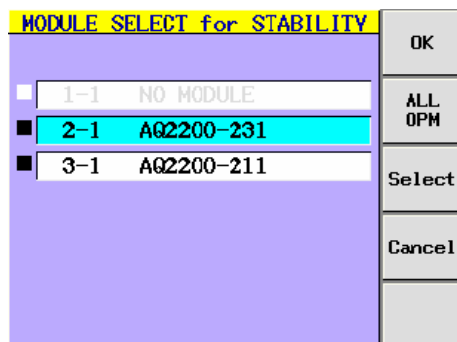   **Display Example for the AQ2211**

    Selection check box   Mounted sensor

4. Press the **OK** soft key to end sensor selection and display the measurement condition setup screen.

2

Explanation

Selecting a Sensor

To perform stability measurement, first select the STABILITY application, and then select the module that you intend to obtain data from.

Selecting a Sensor (Display Example for the AQ2211)

Selection check box

Shows the module selected/not selected. ■ shows that the module is selected while □ shows that the module is not selected.
Press the ENTER key to toggle selection/non-selection of selection check box.

Mounted module

Shows the mounted slot and sensor name. You cannot select any dimmed module.

Soft Key Menu

Name	Function
OK	Sets the selected module and changes the screen to the STABILITY APPLICATION screen or the LOGGING APPLICATION screen. If no selection check boxes are checked on, character strings are dimmed and the screen does not change to the next screen.
ALL OPM	Selects all selectable sensors.
Select	Switches the sensor selection check box at the cursor position between selected and non-selected. You cannot select a sensor, the mounted sensor name of which is dimmed.
Cancel	Returns to the application selection screen.

• **When You Select the AQ2200-221**

When you use the arrow keys to select the AQ2200-221 and then press the Select soft key or ENTER, a list for selecting the device appears.

Dev1/Dev2: Both devices
None: Neither device (the AQ2200-221 is not selected)
Dev1: Device 1
Dev2: Device 2

2.3 The Stability Measurement

To start the stability measurement, it is absolutely necessary to set the following items. Start measurement after you have set the appropriate items.

- Averaging time
- Measurement time (Total time)
- Number of measurement samples
- Measurement wavelength
- Measurement power range
- Display unit
- Reference mode
- Input trigger mode
- Measurement optical modulation mode

STABILITY Measurement Condition Setup Screen

Soft Key Menu

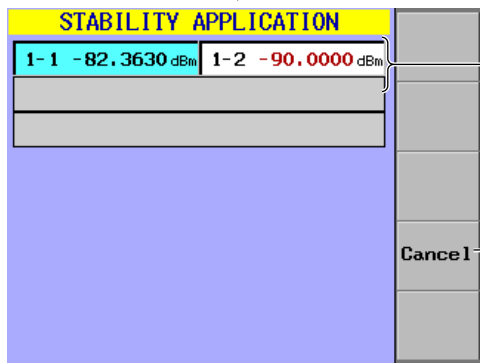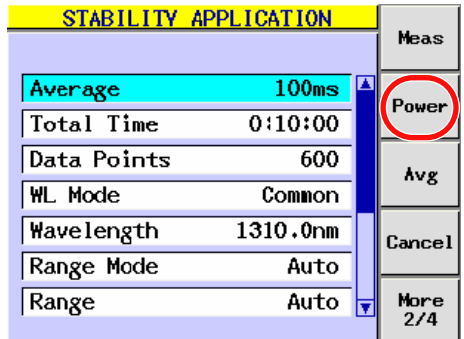| Name	Function
Meas	Changes to the Measurement Start Check screen.
Power	Shows the current measurement value of the selected sensor.
Avg	Sets the averaging time.
Cancel	Returns to the sensor selection screen.
Total Time	Sets the measurement time.
Data Points	Sets the number of measurement samples.
WL Mode	Sets the measurement wavelength mode and wavelength.
Wavelength	Sets the measurement wavelength.
Range Mode	Sets the measurement power range switching mode.
Range	Sets the measurement power range.
Ref Mode	Sets the reference mode.
Ref	Sets the reference value.
Unit	Sets the display unit.
Input Trig	Sets the trigger input.
Mod	Sets the measurement optical modulation mode.

Note

- If the selected sensor includes the AQ2200-221 or AQ2200-215, settings for the measurement optical modulation mode cannot be entered (CW mode only). The settings fields are dimmed.
- In the application mode, the buttons on the panel of the sensor module are inactive.

Displaying the Current Measurement Value

You can display the optical input power value obtained through stability measurement.

Procedure

1. Press the **Power** soft key to display the measurement value display screen.

Display Example for the AQ2211

Note

Only the measurement value of the module that has been selected for stability measurement is displayed.

Setting the Averaging Time

The data of the time set in this section is averaged to one measurement data.

For the allowable averaging time, see section 3.1 in the IM 735101-03EN.

Procedure

1. Press the **Avg** soft key. Or use the arrow keys to move the cursor to Average, and press **ENTER**.

A list for selecting the averaging time appears.

2. Use the arrow keys to move the cursor to an averaging time, and press the **OK** soft key or **ENTER**.
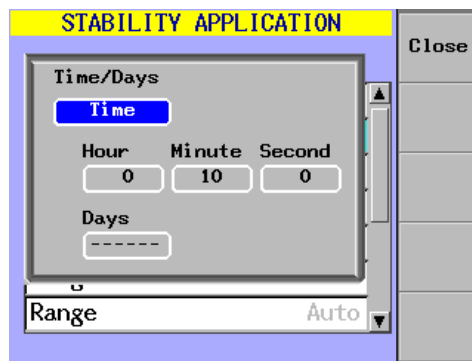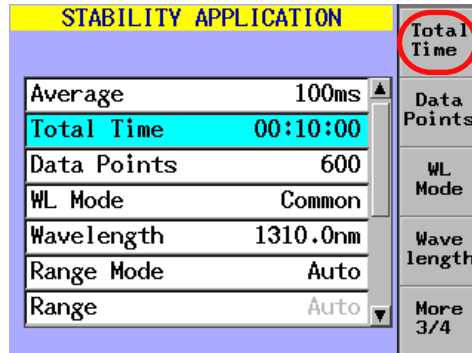

Note

You can select from any of the averaging times that are allowed on all selected sensors.

### Setting the Measurement Time (Total Time)

Procedure

1. Press the **Total Time** soft key. Or use the arrow keys to move the cursor to Total Time, and press **ENTER**.
The Time/Days dialog box appears.

2. Use the arrow keys to move the cursor to Time / Days, and press **ENTER**.
When you select Time, you can set the time in hours, minutes, and seconds. When you select Days, you can set the number of days. A broken line appears in boxes under the option that you didn't choose.

• **When Setting the Time**

3. Use the arrow keys to move the cursor to Hour, Minute, or Second, and press **ENTER**.
A numeric input dialog box appears.
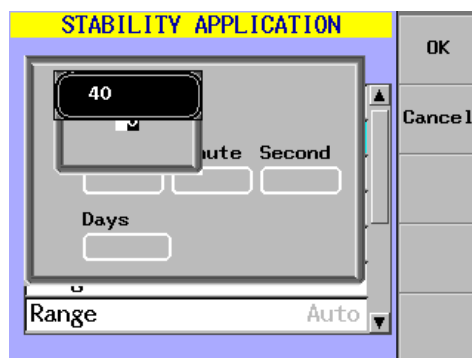
4. Use the arrow keys or the numeric keypad to change the value, and press the **OK** soft key or **ENTER**.

Note

- For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.
- You can set the time within the range of 0 hours, 0 minutes, 1 second and 23 hours, 59 minutes, 59 seconds.

- **When Setting the Number of Days**

3. Use the arrow keys to move the cursor to Days, and press **ENTER**.
   A numeric input dialog box appears.

4. Use the arrow keys or the numeric keypad to change the value, and press the **OK** soft key or **ENTER**.

Note

- You can set the number of days to a value between 1 and 99.
- For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Setting the Number of Measurement Samples

Procedure

1. Press the **Data Points** soft key. Or use the arrow keys to move the cursor to Data Points, and press **ENTER**.

A numeric input dialog box appears.

2. Use the arrow keys or the numeric keypad to change the value, and press the **OK** soft key or **ENTER**.

Note

• When the selected sensor modules include an AQ2200-221, you can set the number of measurement samples to a value between 1 and 10000.

• For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

Setting the Number of Measurement Samples

The measurement samples you have set here are measured.

The following shows the relationship among the measurement interval (Measurement Interval), averaging time (Average), measurement time (Total Time), and the number of measurement samples (Data Points).

Measurement interval (Measurement Interval) is calculated from the following formulas.

> Measurement Interval = Total Time / Data Points
> and Measurement Interval => 100ms

[In case of "Total Time / Data Points < 100ms"]

> Measurement Interval = 100ms
> Data points = Total Time / 100ms

[In case of "Measurement Interval < Average"]

> Measurement Interval = Average
> Data points = Total Time / Average (Decimal fractions are cut off.)
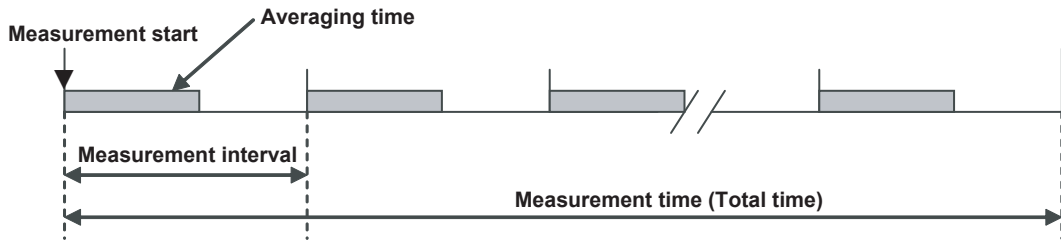
When you configure the optical input modulation mode to enable CHOP modulation, the minimum measurement interval is determined by the averaging time as shown in the table below, and measurement interval settings are automatically adjusted in accordance with the values shown in the table.

Averaging Time and Minimum Measurement Interval

Averaging Time	Minimum Measurement Interval
50ms	500ms
100ms	1s
200ms	
500ms	
1s	2s
2s	5s
5s	
10s	10s

2

Setting the Measurement Wavelength Mode and Measurement Wavelength

When multiple modules are mounted, you can set the wavelengths of all sensors commonly (Common) or individually (Individual) according to the wavelength mode setting.

Procedure

Setting the Measurement Wavelength Mode

1. Press the **WL Mode** soft key. Or use the arrow keys to move the cursor to WL Mode, and press **ENTER**.

A list for selecting the measurement wavelength mode appears.
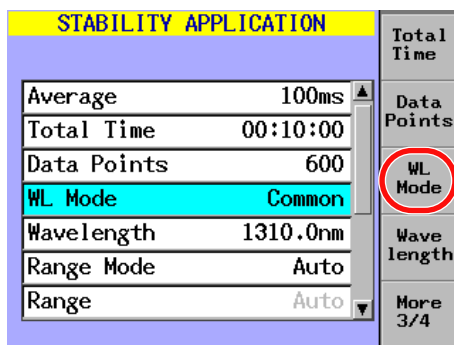
2. Use the arrow keys to move the cursor to Common or Individual, and press the **OK** soft key or **ENTER**.

Setting the Measurement Wavelength

You can set a desired measurement wavelength for the current measurement wavelength mode setting.

Procedure
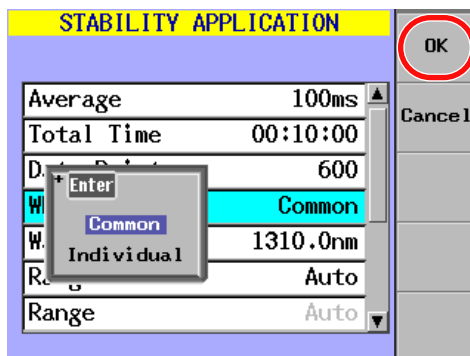
- **Common Measurement Wavelength Mode**

    1. Press the **Wavelength** soft key. Or use the arrow keys to move the cursor to Wavelength, and press **ENTER**.

    A numeric input dialog box appears.

    To set a specific measurement wavelength, proceed to step 2. To enter a preregistered typical wavelength, proceed to step 3.

    2. Use the numeric keypad or the arrow keys to enter the measurement wavelength, and press the **OK** soft key or **ENTER**. Proceed to step 4.

    3. Press the **Typical** soft key to enter one of the typical wavelength values. Press the soft key repeatedly to shift through the registered values.

    4. Press the **OK** soft key or **ENTER**.

2

- **Individual Measurement Wavelength Mode**

    1. Press the **Wavelength** soft key. Or use the arrow keys to move the cursor to Wavelength, and press **ENTER**.

    The module selection screen appears.

STABILITY APPLICATION		
Average	100ms	Total Time
Total Time	00:10:00	Data Points
Data Points	10000	
WL Mode	Individual	WL Mode
Wavelength	**Individual**	Wave length
Range Mode	Auto	
Range	Auto	More 3/4

    2. Use the arrow keys to move the cursor to the module whose wavelength you want to set, and press the **Edit** soft key or **ENTER**.

    A numeric input dialog box appears.

STABILITY APPLICATION		
1-1 1310.0nm	1-2 1310.0nm	Edit
		Close

    Note

    Only the value specified for the module that is installed in the slot that has been selected for stability measurement is displayed.

    3. Use the numeric keypad or the arrow keys to enter the measurement wavelength, and press the **OK** soft key or **ENTER**. To enter a preregistered typical wavelength, proceed to step 4.

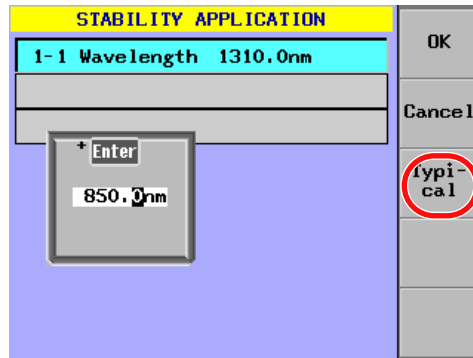| STABILITY APPLICATION	
1-1 Wavelength 1310.0nm	OK
	Cancel
1310.0	Typi-cal
0.0nm	

    Note

    For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

4. Press the **Typical** soft key to enter one of the typical wavelength values. Press the soft key repeatedly to shift through the registered values.

5. Repeat steps 2 through 4 until the wavelength settings for all of the modules have been completed. Then, press the **Close** soft key.

Note

- The measurement wavelength that you can set varies depending on the sensor. When the measurement wavelength mode is Common, you can select a value from within the common range of all of the selected sensors.
- The typical wavelength values for each sensor are listed below.
    AQ2200-211 Sensor: 850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
    AQ2200-215 Sensor: 1300.0 nm, 1310.0 nm, 1550.0 nm
    AQ2200-221 Sensor: 850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
    AQ2200-231 Sensor Head: 850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
    AQ2200-232 Sensor Head: 850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
    AQ2200-241 Sensor Head: 850.0 nm
    AQ2200-242 Sensor Head: 850.0 nm

Setting the Measurement Power Range Mode and Measurement Power Range

When multiple modules are installed, you can use the measurement power range mode setting to choose whether to specify a common power range for all sensors or to specify individual power ranges for each sensor.

Procedure

Setting the Measurement Power Range Mode

1. Press the **Range Mode** soft key. Or use the arrow keys to move the cursor to Range Mode, and press **ENTER**.

A list for selecting the measurement power range mode appears.
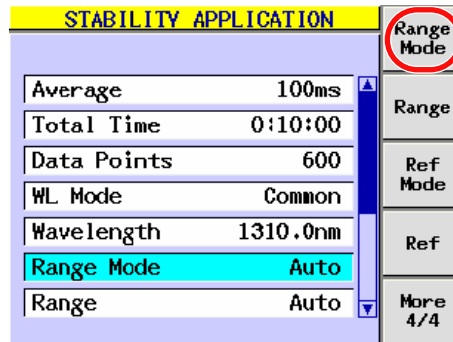
2. Use the arrow keys to move the cursor to Auto, Common, or Individual, and press the **OK** soft key or **ENTER.**

Note
When "Auto" is selected, all modules start the measurement in the auto range mode.

Setting the Measurement Power Range

You can set a measurement power range for the current measurement power range mode setting.

Note

You can specify the measurement power range when the measurement power range mode is set to Common or Individual. In auto range mode, the Range soft key is unavailable.

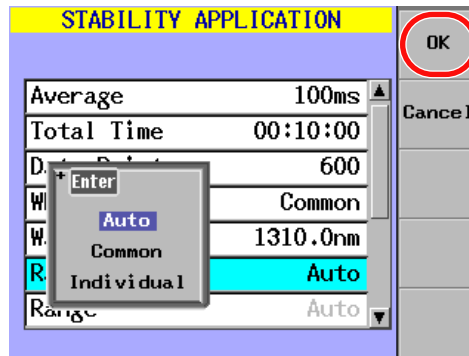- **Common Measurement Power Range Mode**

    1. Press the **Range** soft key. Or use the arrow keys to move the cursor to Range, and press **ENTER**.

    A list for selecting the measurement power range appears.

    2. Use the arrow keys to move the cursor to the power range that you want to measure, and press the **OK** soft key or **ENTER**.

- **Individual Measurement Power Range Mode>**

    1. Press the **Range** soft key. Or use the arrow keys to move the cursor to Range, and press **ENTER**.

    The module selection screen appears.

2. Use the arrow keys to move the cursor to the sensor whose range you want to set, and press the **Edit** soft key or **ENTER**.
A list for selecting the measurement power range appears.
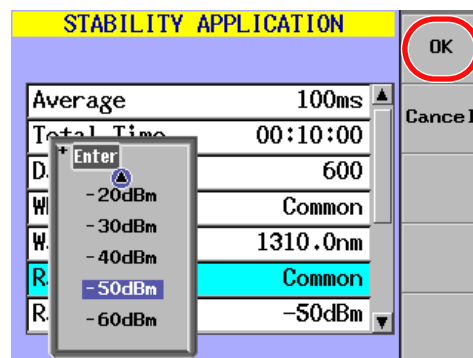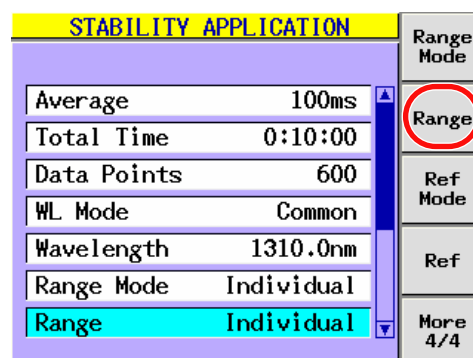

Note

Only the value specified for the module that is installed in the slot that has been selected for stability measurement is displayed.

3. Use the arrow keys to move the cursor to the power range that you want to measure, and press the **OK** soft key or **ENTER**.

4. Repeat steps 2 and 3 until the power range settings for all of the sensors have been completed. Then, press the **Close** soft key.

Note
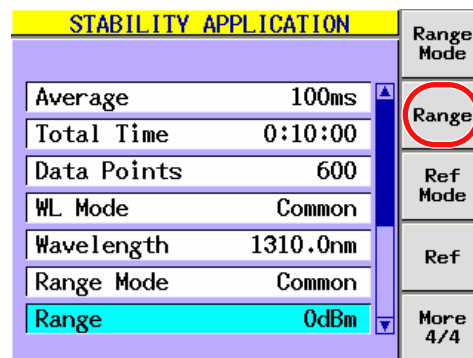
• The setting range of the measurement power range varies depending on the sensor.
• If the measurement power range mode is Common, you can select any of the settings that are available on all selected sensors.
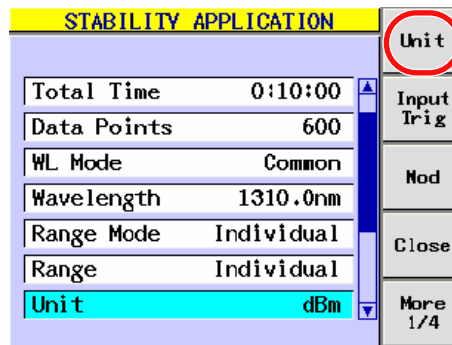
Setting the Display Unit

Procedure

This section explains how to set the unit of measurement.

If you set the measurement unit to dB or W(rel), the measurement results are indicated using relative values.

When the relative measurement is performed with "dB" or "W(rel)" set, the measurement results become relative values to the reference values specified in the reference mode.

1. Press the **Unit** soft key. Or use the arrow keys to move the cursor to Unit, and press **ENTER**.

A list for selecting the unit appears.

2. Use the arrow keys to move the cursor to the unit that you want to select, and press the **OK** soft key or **ENTER**.

Setting the Reference Mode

Procedure

1. Press the **Ref Mode** soft key. Or use the arrow keys to move the cursor to Ref Mode, and press **ENTER**.

   The Ref Mode screen appears.

2. Press the **Mode** soft key. (The currently selected reference mode is indicated below "Mode.")

   A list for selecting the reference mode appears.

3. Use the arrow keys to move the cursor to Value, x-y-z, or First, and press the **OK** soft key or **ENTER**.

- **If You Select x-y-z**

   4. Use the arrow keys to move the cursor to the sensor module that you want to use as the reference, and press the **x-y-z Select** soft key or **ENTER**.
   The box to the left of the selected sensor module will turn black.

   Check Box

Note

When setting the reference mode, the relative measurement reference value is shown in the Reference field.

"Value" is set.:   Reference value set in <Reference>

"x-y-z" is set.:   Measurement value of the sensor specified for the relative measurement

"First" is set.:   Reference value set in <Reference>

Explanation

Setting the Reference Mode

When the display unit is set at "dB" or "W(rel)", the relative measurement to the reference set in this section is performed.
Follow the steps below to set the reference.

Value setting: Relative measurement to desired reference value (dBm) set in
                        <Reference>
x-y-z setting: Relative measurement to the value measured by the specified sensor
                        x: Frame No. ("0")
                        y: Slot No.
                        z: Device No.
First setting: Relative measurement to the 1st measurement value of its own sensor

Setting a Reference Value

Procedure

You can set a reference value when the reverence mode is set at "Value".

1. Press the **Ref** soft key. Or use the arrow keys to move the cursor to Reference, and press **ENTER**.

A numeric input dialog box appears.

2. Use the numeric keypad or arrow keys to change the value, and press the **OK** soft key or **ENTER**.

When the unit (Unit) is W (abs) or W (rel), select the sub unit as well.

Note
- You can only set the reference value when Ref Mode is set to Value.
- For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Setting the Input Trigger Mode

The stability measurement can be started by the external input trigger.

This section describes how to make the external trigger enabled or disabled.

Procedure

1. Press the **Input Trig** soft key. Or use the arrow keys to move the cursor to Input Trig, and press **ENTER**.

A list for selecting the input trigger mode appears.
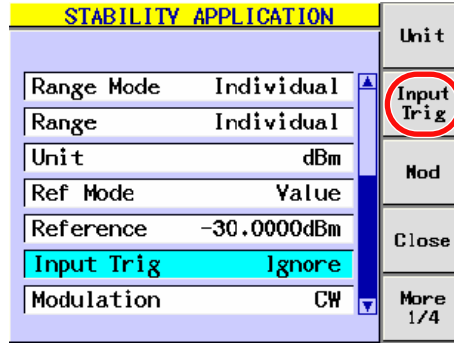
2. Use the arrow keys to move the cursor to Ignore (disables the input trigger) or Compl (enables the input trigger), and press the **OK** soft key or **ENTER**.
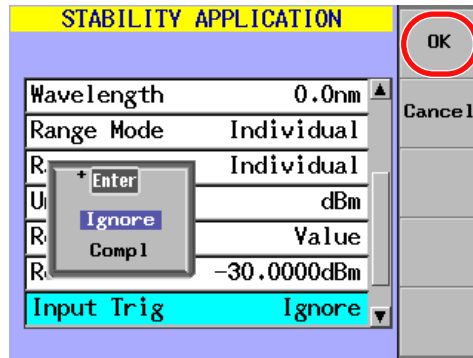
Note

When the input trigger is set enabled, the measurement cannot be started unless the external trigger is input.

Setting the Measurement Optical Modulation Mode

To accurately measure the optical power, you must set an optimal modulation mode suitable for the optical input modulation status.

For the modulation mode, you can select CW light or CHOP (50%DUTY).

For the CHOP modulation light, you can select "270Hz", "1kHz", or "2kHz".

Procedure

1. Press the **Mod** soft key. Or use the arrow keys to move the cursor to Modulation, and press **ENTER.**

A list for selecting the modulation mode appears.
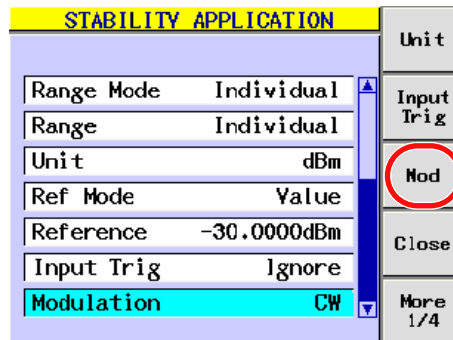
2. Use the arrow keys to move the cursor to the mode that you want to select, and press the **OK** soft key or **ENTER**.

When you select CHOP modulation light mode, the sensor panel LED lights.
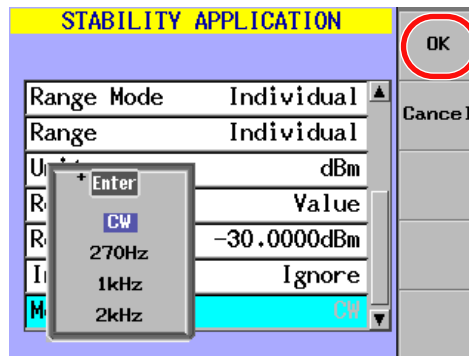
Note

- If the CW light is received in the CHOP modulation light mode, the modulation mode error occurs. If this happens, set a modulation suitable for the optical input.
- A modulation mode error occurs if the chop modulation light mode and optical input modulation frequency are not compatible.
- If the selected sensor includes the AQ2200-221 or AQ2200-215, settings for the measurement optical modulation mode cannot be entered (CW mode only).

The Stability Measurement

This section explains how to execute stability measurement.

Stability Measurement Screen

Name	Function
Start	Starts the measurement.
Graph	Displays acquired measurement data and measurement data that is being acquired in a graph. For details, see chapter 7.
Stop	Stops the measurement.
Cancel	Returns to the setup screen.
Analyze	Analyzes acquired measurement data. The Analyze soft key cannot be selected during measurement.
Save Data	Saves acquired measurement data to USB memory.
Average	Shows the averaging time.
Total Time	Shows the measurement time.
Period	Shows the data obtaining interval.
Data Points	Shows the remaining number of data to be obtained. When this value is "0", the measurement is then completed.

If you press the Save Data soft key during measurement, the measurement data at that point in time will be saved to USB memory.
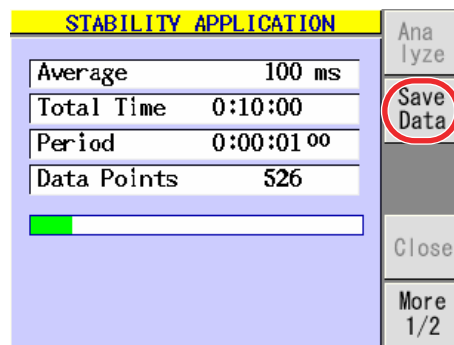
Procedure

1. Press the **Meas** soft key to display the stability measurement screen.
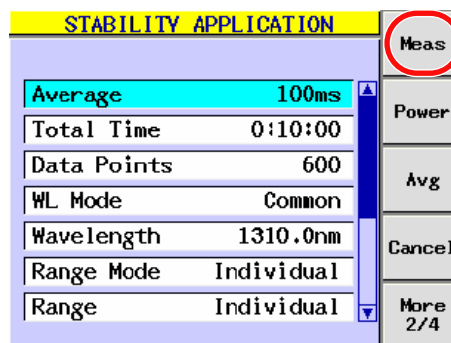
Note

If the relationship between the measurement interval and the number of measurement samples does not meet the criterion, the measurement interval is automatically adjusted. Check the measurement interval in the measurement confirmation screen before you begin measurement.

2. Press the **Start** soft key to start measurement.

The number next to Data Points will begin decreasing. Measurement has been completed when the progress bar is full and the number next to Data Points has reached zero.

Press the **Graph** soft key during measurement to display a graph of the data that is being measured.

To stop measurement, press the **Stop** soft key.
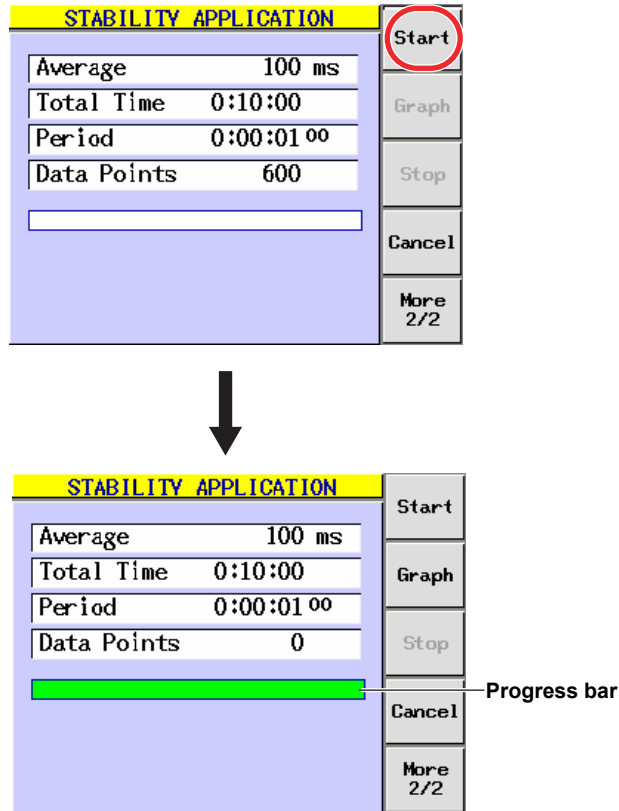
Note

When Input Trig is set to Compl, measurement is started by the trigger input.

Setting the Measurement Result Analysis Conditions

After measurement has been completed, press the Analyze soft key to display the analysis condition setup screen.
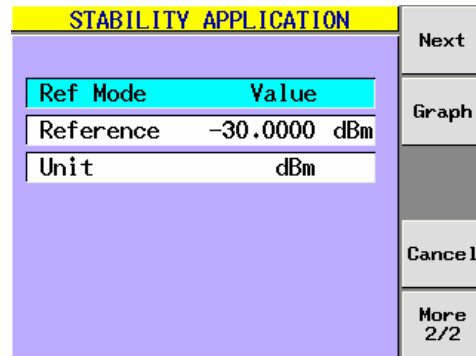
Analysis Condition Setup Screen

Name	Function
Ref Mode	Shows the reference mode. When the display unit is set at "dB" or "W(rel)", the comparison with this reference object is performed.
Reference	Shows the reference standard value when the reference mode is set at "Value".
Unit	Shows the display unit of the measurement results. When set at "dB" or "W(rel)", the reference analysis is performed.
Next	Starts the analysis.
Graph	Shows the graph of the data, which has already been obtained.
Cancel	Returns to the measurement stopped screen.
Ref Mode	Sets the reference mode.
Ref	Sets the reference value.
Unit	Sets the measurement unit.

Displaying the Analysis Condition Setup Screen

You can analyze measurement data and change analysis parameters from the analysis condition setup screen.

Procedure

1. Press the **Analyze** soft key to display the analysis condition setup screen.

Setting the Reference Mode

Procedure

1. Press the **Ref Mode** soft key. Or use the arrow keys to move the cursor to Ref Mode, and press **ENTER**.
   The Ref Mode screen appears.

2. Press the **Mode** soft key. (The currently selected reference mode is indicated below "Mode.")
   A list for selecting the reference mode appears.

   Display Example for the AQ2212

3. Use the arrow keys to move the cursor to Value, x-y-z, or First, and press the **OK** soft key or **ENTER**.

   Display Example for the AQ2212

• If You Select x-y-z

4. Use the arrow keys to move the cursor to the sensor module that you want to use as the reference, and press the **x-y-z Select** soft key or **ENTER**.

The box to the left of the selected sensor module will turn black.

Display Example for the AQ2212

Note

When setting the reference mode, the relative measurement reference value is shown in the Reference field.

"Value" is set.: Reference value set in <Reference>

"x-y-z" is set.: Current measurement value of the sensor specified for the relative measurement

"First" is set.: Reference value set in <Reference>

Explanation

Setting the Reference Mode

When the display unit is set at "dB" or "W(rel)", the relative measurement to the reference set in this section is performed.

Follow the steps below to set the reference.

Value setting: Relative measurement to desired reference value (dBm) set in <Reference>

x-y-z setting: Relative measurement to the value measured by the specified sensor

　　　　x: Frame No. ("0")

　　　　y: Slot No.

　　　　z: Device No.

First setting: Relative measurement to the 1st measurement value of its own sensor

Setting a Reference Value

You can set a reference value when the reference mode is set at "Value".

Procedure

1. Press the **Ref** soft key. Or use the arrow keys to move the cursor to Reference, and press **ENTER**.

A numeric input dialog box appears.

2. Use the numeric keypad or arrow keys to change the value, and press the **OK** soft key or **ENTER**.

When the unit (Unit) is W (abs) or W (rel), select the sub unit as well.

Note
- You can only set the reference value when Ref Mode is set to Value.
- For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Selecting a Unit

This section explains how to set the unit of measurement.

If you set the measurement unit to dB or W (rel), relative values are analyzed.

When the relative measurement is performed with "dB" or "W(rel)" set, the measurement results become relative values to the reference values specified in the reference mode.

Procedure

1. Press the **Unit** soft key. Or use the arrow keys to move the cursor to Unit, and press **ENTER**.

A list for selecting the unit appears.

2. Use the arrow keys to move the cursor to the appropriate unit, and press the **OK** soft key or **ENTER**.

Starting the Analysis

Procedure

1. Press the **Next** soft key to execute data analysis.

   After data analysis is completed, the analysis results display screen will appear.
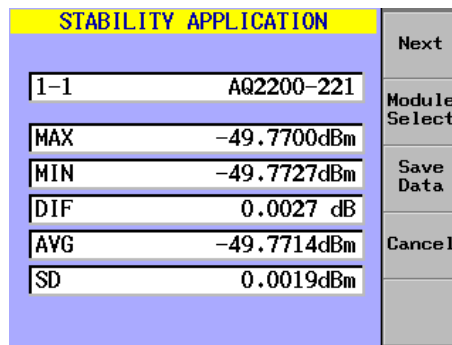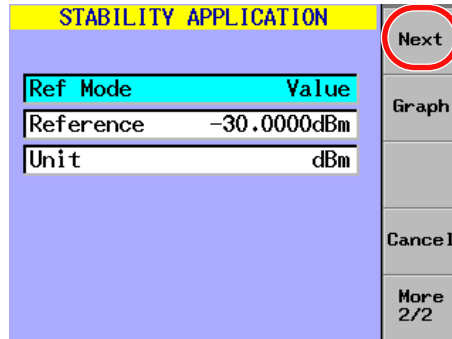
Analysis Results Display Screen

Name	Function
MAX	Shows the maximum value of the selected module.
MIN	Shows the minimum value of the selected module.
DIF	Shows the difference (maximum value - minimum value) of the selected module.
AVG	Shows the average value of the selected module.
SD	Shows the standard deviation of the selected module.
Next	Changes to the analysis condition setup screen.
Module Select	Changes the module whose measurement data is analyzed.
Save Data	Saves the measured data to the selected storage device.
Cancel	Returns to the measurement stopped screen.

The average value and standard deviation can be calculated from the following formulas. Assuming that i-th measurement value is determined to "Xi" after the measurement has been performed "n" times, the following calculation formulas can be obtained.

$$AVG = \frac{1}{n}\sum_{i=1}^{n} Xi$$

$$SD = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(Xi - X\right)^2}$$ *** X is an average value.**

Note

The average value and standard deviation value are calculated based on the numeric values in the display unit.

Changing the Analysis Object Sensor

Procedure

1. Press the **Module Select** soft key to display the MODULE SELECT for ANALYSIS screen.

Currently selected module

2. Use the arrow keys to move the cursor to the sensor that you want to analyze, and press the **Select** soft key or **ENTER**.

3. Press the **Close** soft key.
Data analysis will start. After analysis finishes, the analysis results display screen will appear.

2.4 Saving the Measurement Data

This section explains how to save measurement data to USB memory.

Procedure

1. Press the **Save Data** soft key.

   The file list screen appears.

   For the rest of the procedure, see chapter 12 in IM 735101-03EN.

3.1   Flow of Operation

Selection of sensor

After pressing the APPL key and selecting the logging
measurement function select the sensor.   ▶ Section 3.2

Setting of conditions

Set the measurement conditions for the selected sensor   ▶ Section 3.3
and data obtaing conditions.

Starting of measurement

Start the measurement.   ▶ Section 3.3

Analysis of measurement data

Analyzes the measured data.   ▶ Section 2.3

Displaying of graph

Displays the measured data graphically ▶ Chapter 7

Saving of data

Save the measured data to the USB   ▶ Section 2.4
memory

3

Logging Measurement
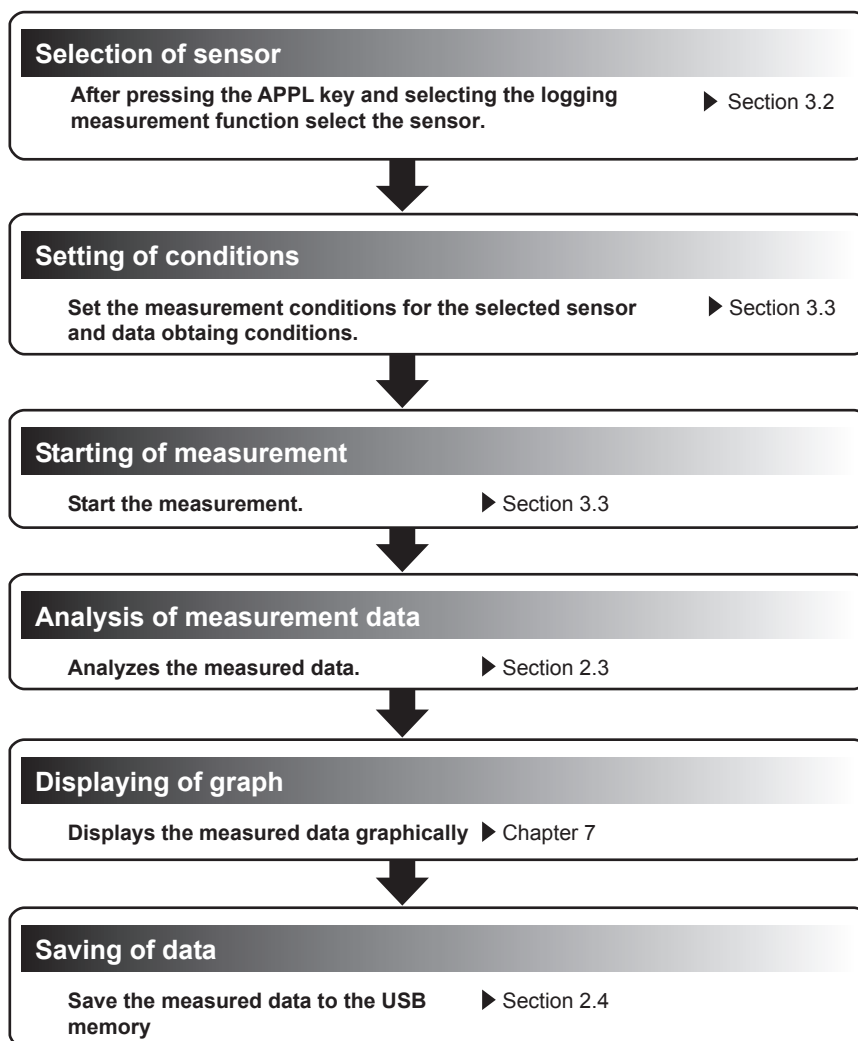
3.2   Starting Up Application

Procedure

1. Press **APPLI** to display the APPLICATION screen.

2. Use the arrow keys to move the cursor to LOGGING, and press the **OK** soft key
   or **ENTER**.
   The MODULE SELECT for LOGGING screen appears.
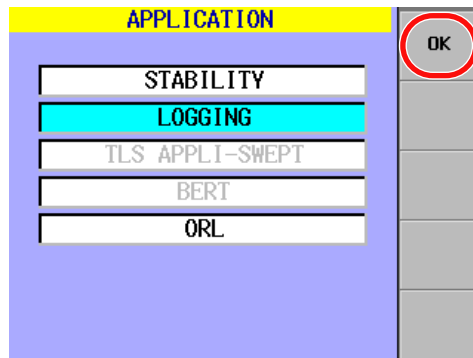
3. Use the arrow keys to move the cursor to a sensor that you want to use for
   measurement, and press the **Select** soft key or **ENTER**.
   The box to the left of the selected sensor module will turn black.

Display Example for the AQ2211

Selection check box   Mounted sensor
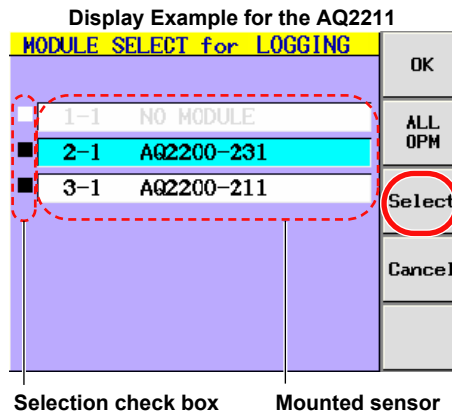
Note
The setup items for this screen are the same as those for stability measurement. For details
about these setup items, see section 2.2.

4. Press the **OK** soft key to end sensor selection and display the measurement
   condition setup screen.
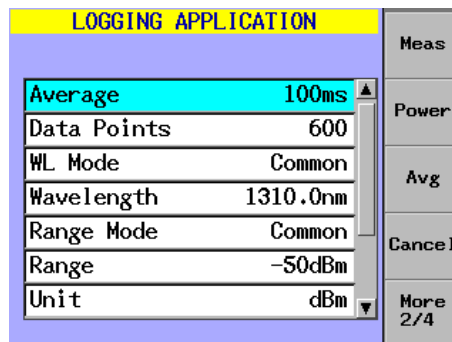
3.3   The Logging Measurement

To perform logging measurement, you must configure the following items.
You must start the measurement after all items have been set completely.
*   Averaging time
*   Number of measurement samples
*   Measurement wavelength
*   Measurement power range
*   Display unit
*   Reference mode
*   Input trigger mode

LOGGING Measurement Condition
Setup Screen

Soft Key Menu

Name	Function
Meas	Changes to the Measurement Start Check screen.
Power	Shows the current measurement value of the selected sensor.
Avg	Sets the averaging time.
Data Points	Sets the number of measurement samples.
Wave Mode	Sets the measurement wavelength mode and wavelength.
Wavelength	Sets the measurement wavelength.
Range Mode	Sets the range change mode and measurement range.
Range	Sets the measurement range.
Ref Mode	Sets the reference mode and reference value.
Ref	Sets the reference value.
Unit	Sets the display unit.
Input Trig	Sets the trigger input.
Cancel	Returns to the sensor selection screen. If you are in the sensor selection screen, press this soft key to exit application mode.

Displaying the Current Measurement Value

You can display the optical input power value obtained through logging measurement.

Procedure

1. Press the **Power** soft key to display the measurement value display screen.

Display Example for the AQ2211

Note

Only the measurement value of the module that has been selected for logging measurement is displayed.

Setting the Averaging Time

The data of the time set in this section is averaged to one measurement data.

For the allowable averaging time, see section 3.1 in the IM735101-03EN.

Procedure

1. Press the **Avg** soft key. Or use the arrow keys to move the cursor to Average, and press **ENTER**.

   A list for selecting the averaging time appears.

2. Use the arrow keys to move the cursor to an averaging time, and press the **OK** soft key or **ENTER**.

Note

You can select any of the averaging time settings that are available on all selected sensors.

Setting the Number of Measurement Samples

The measurement samples you have set here are measured.

Procedure

1. Press the **Data Points** soft key. Or use the arrow keys to move the cursor to Data Points, and press **ENTER**.

   A numeric input dialog box appears.
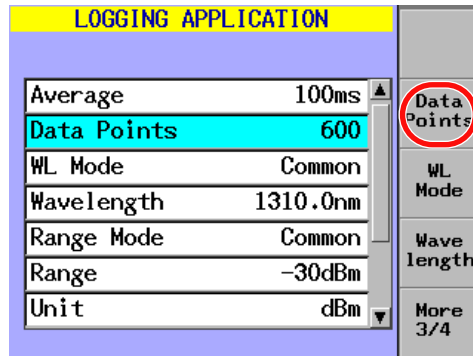
2. Use the arrow keys or the numeric keypad to change the value, and press the **OK** soft key or **ENTER**.
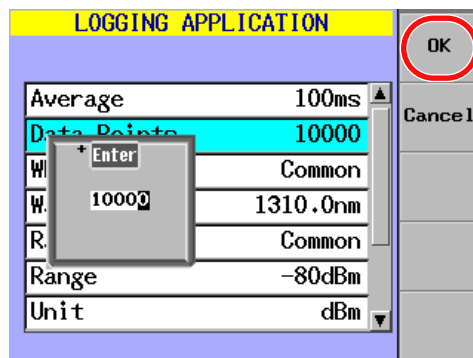
Note

When the selected sensor modules include an AQ2200-221, you can set the number of measurement samples to a value between 1 and 10000.

Setting the Measurement Wavelength Mode and Measurement Wavelength

When multiple sensors are selected, you can set the wavelengths of all sensors commonly (Common) or individually (Individual) according to the wavelength mode setting.

Procedure

Setting the Measurement Wavelength Mode

1. Press the **WL Mode** soft key. Or use the arrow keys to move the cursor to WL Mode, and press **ENTER**.
A list for selecting the measurement wavelength mode appears.

```
LOGGING APPLICATION
┌─────────────────────────┐  ┌──────┐
│ Average        100ms  ▲ │  │ Data │
│ Data Points     600     │  │Points│
│ WL Mode      Common     │  │ WL   │
│ Wavelength   1310.0nm   │  │ Mode │
│ Range Mode   Common     │  │ Wave │
│ Range        -30dBm   ▬ │  │length│
│ Unit            dBm   ▼ │  │ More │
└─────────────────────────┘  │ 3/4  │
                             └──────┘
```

2. Use the arrow keys to move the cursor to Common or Individual, and press the **OK** soft key or **ENTER.**

```
LOGGING APPLICATION           ┌──────┐
┌─────────────────────────┐   │  OK  │
│ Average        100ms  ▲ │   ├──────┤
│ Data Points     600     │   │Cancel│
│ ┌Enter────────┐ Common  │   │      │
│ │ Common      │1310.0nm │   │      │
│ │ Individual  │ Common  │   │      │
│ └─────────────┘ -30dBm  │   │      │
│ Unit            dBm   ▼ │   │      │
└─────────────────────────┘   └──────┘
```

Setting the Measurement Wavelength

You can set a desired measurement wavelength for the current measurement wavelength mode setting.

- **Common Measurement Wavelength Mode**

    1. Press the **Wavelength** soft key. Or use the arrow keys to move the cursor to Wavelength, and press **ENTER**.

    A numeric input dialog box appears.

    To set a specific measurement wavelength, proceed to step 2.

    To enter a preregistered typical wavelength, proceed to step 3.

    2. Use the numeric keypad or the arrow keys to enter the measurement wavelength, and press the **OK** soft key or **ENTER**. Proceed to step 4.

    3. Press the **Typical** soft key to enter one of the typical wavelength values. Press the soft key repeatedly to shift through the registered values.

Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

    4. Press the **OK** soft key or **ENTER**.

- **Individual Measurement Wavelength Mode**

    1. Press the **Wavelength** soft key. Or use the arrow keys to move the cursor to Wavelength, and press **ENTER**.

    The module selection screen appears.

    2. Use the arrow keys to move the cursor to the sensor whose wavelength you want to set, and press the **Edit** soft key or **ENTER**.

    A numeric input dialog box appears.

Note

Only the measurement value of the module that is installed in the slot that has been selected for logging measurement is displayed.

    3. Use the numeric keypad or the arrow keys to enter the measurement wavelength, and press the **OK** soft key or **ENTER**. To enter a preregistered typical wavelength, proceed to step 4.

Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

3

Logging Measurement

4. Press the **Typical** soft key to enter one of the typical wavelength values. Press the soft key repeatedly to shift through the registered values.

5. Repeat steps 2 through 4 until the wavelength settings for all of the modules have been completed. Then, press the **Close** soft key.

Note

• The measurement wavelength that you can set varies depending on the sensor. When the measurement wavelength mode is common, you can select a value from within the common range of all of the selected sensors.
• The typical wavelength values for each sensor are listed below.

AQ2200-211 Sensor:	850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
AQ2200-215 Sensor:	1300.0 nm, 1310.0 nm, 1550.0 nm
AQ2200-221 Sensor:	850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
AQ2200-231 Sensor Head:	850.0 nm, 1300.0 nm, 1310.0 nm, 1550.0 nm
AQ2200-241 Sensor Head:	850.0 nm
AQ2200-242 Sensor Head:	850.0 nm

Setting the Measurement Power Range Mode and Measurement Power Range

When multiple sensors are selected, you can use the measurement power range mode setting to choose whether to specify a common power range for all sensors or to specify individual power ranges for each sensor.
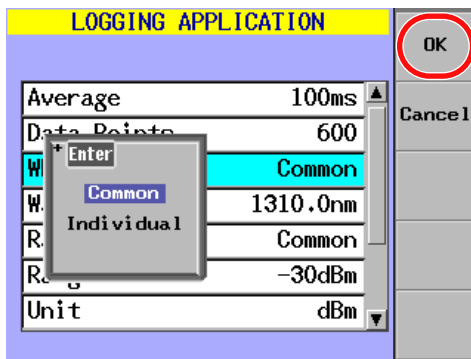
Procedure

Setting the Measurement Power Range Mode

1. Press the **Range Mode** soft key. Or use the arrow keys to move the cursor to Range Mode, and press **ENTER**.

A list for selecting the measurement power range mode appears.

2. Use the arrow keys to move the cursor to Common or Individual, and press the **OK** soft key or **ENTER**.
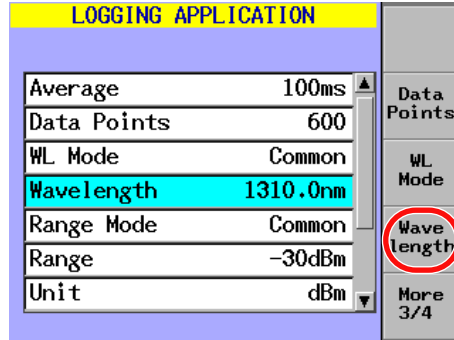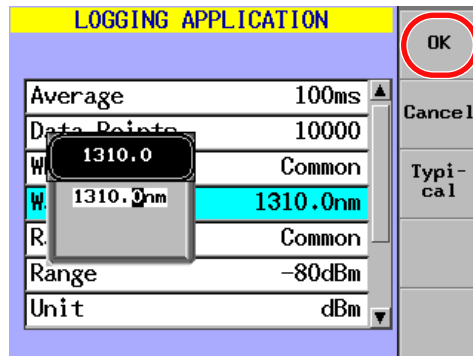
Setting the Measurement Power Range

You can set a measurement power range for the current measurement power range mode setting.

- **Common Measurement Power Range Mode**

    1. Press the **Range** soft key. Or use the arrow keys to move the cursor to Range, and press **ENTER**.

    A list for selecting the measurement power range appears.

    2. Move the cursor to the power range that you want to measure, and press the **OK** soft key or **ENTER**.

- **Individual Measurement Power Range Mode**

    1. Press the **Range** soft key. Or use the arrow keys to move the cursor to Range, and press **ENTER**.

    The module selection screen appears.

    2. Use the arrow keys to move the cursor to the sensor whose range you want to set, and press the **Edit** soft key or **ENTER**.

    A list for selecting the measurement power range appears.

    Note

    Only the measurement value of the module that is installed in the slot that has been selected for logging measurement is displayed.

    3. Use the arrow keys to move the cursor to the power range that you want to measure, and press the **OK** soft key or **ENTER**.

    4. Repeat steps 2 and 3 until the power range settings for all of the sensors have been completed. Then, press the **Close** soft key.

    Note

    - The setting range of the measurement power range varies depending on the sensor.
    - If the measurement power range mode is Common, you can select any of the settings that are available on all selected sensors.

3

Logging Measurement

Selecting a Unit

This section explains how to set the unit of measurement.

If you set the measurement unit to dB or W(rel), the measurement results are indicated using relative values.

When the relative measurement is performed with "dB" or "W(rel)" set, the measurement results become relative values to the reference values specified in the reference mode.

Procedure

1. Press the **Unit** soft key. Or use the arrow keys to move the cursor to Unit, and press **ENTER**.

   A list for selecting the unit appears.

2. Use the arrow keys to move the cursor to the unit that you want to select, and press the **OK** soft key or **ENTER**.

Setting the Reference Mode

Procedure

1. Press the **Ref Mode** soft key. Or use the arrow keys to move the cursor to Ref Mode, and press **ENTER**.

The Ref Mode screen appears.

2. Press the **Mode** soft key. (The currently selected reference mode is indicated below "Mode.")

A list for selecting the reference mode appears.

Display Example for the AQ2212

3. Use the arrow keys to move the cursor to Value, x-y-z, or First, and press the **OK** soft key or **ENTER**.

Display Example for the AQ2212

- **If You Select x-y-z**

4. Use the arrow keys to move the cursor to the sensor module that you want to use as the reference, and press the **x-y-z Select** soft key or **ENTER**.

The box to the left of the selected sensor module will turn black.

Display Example for the AQ2212

Note

When setting the reference mode, the relative measurement reference value is shown in the Reference field.

"Value" is set.: Reference value set in <Reference>

"x-y-z" is set.: Current measurement value of the sensor specified for the relative measurement

"First" is set.: Reference value set in <Reference>

Explanation

Setting the Reference Mode

When the display unit is set at "dB" or "W(rel)", the relative measurement to the reference set in this section is performed.

Follow the steps below to set the reference.

Value setting: Relative measurement to desired reference value (dBm) set in <Reference>

x-y-z setting: Relative measurement to the value measured by the specified sensor

x: Frame No. ("0")

y: Slot No.

z: Device No.

First setting: Relative measurement to the 1st measurement value of its own sensor

Setting a Reference Value

You can set a reference value when the reference mode is set at "Value".

Procedure

1. Press the **Ref soft** key. Or use the arrow keys to move the cursor to Reference, and press **ENTER**.

A numeric input dialog box appears.

2. Use the numeric keypad or arrow keys to change the value, and press the **OK** soft key or **ENTER**.

When the unit (Unit) is W (abs) or W (rel), select the sub unit as well.

Note

You can only set the reference value when Ref Mode is set to Value.

Setting the Input Trigger Mode

The logging measurement can be started by the external input trigger using any of three procedures.

Ignore: Ignores the trigger input.

Single: Performs measurement once whenever a trigger occurs.

Compl: Performs the specified logging measurement operation when a trigger occurs.

1. Press the **Input Trig** soft key. Or use the arrow keys to move the cursor to Input Trig, and press **ENTER**.

A list for selecting the input trigger mode appears.
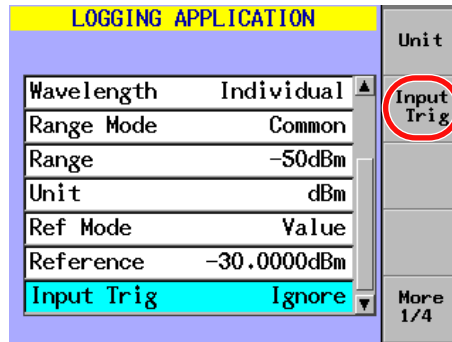
2. Use the arrow keys to move the cursor to the appropriate measurement starting method, and press the **OK** soft key or **ENTER**.
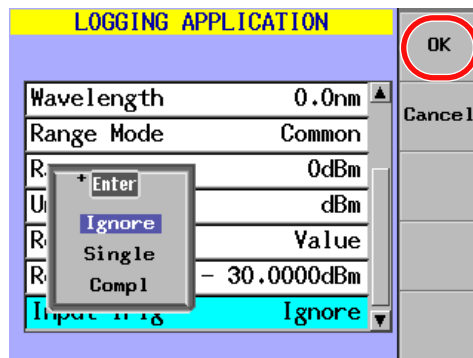
Note

If the input trigger mode is set to Single or Compl, measurement cannot start unless there is an external trigger input.

The Logging Measurement

This section explains how to execute logging measurement.

Logging measurement screen

Name	Function
Start	Starts the measurement.
Stop	Stops the measurement.
Graph	Displays the data graphically, which is currently being obtained and has been obtained in the measurement. If there is no data to be displayed graphically, the button display becomes dimmed. For details, see Chapter 7, Displaying the Graph of the Measurement Result.
Analyze	Analyzes acquired measurement data. The Analyze soft key cannot be selected during measurement.
Save Data	Saves acquired measurement data to USB memory. The Save Data soft key cannot be selected during measurement.
Cancel	Returns to the setup screen.
Average	Shows the averaging time.
Data Points	Shows the remaining number of data to be obtained. When this value is "0", the measurement is then completed.

Procedure

1. Press the **Meas** soft key to display the logging measurement screen.
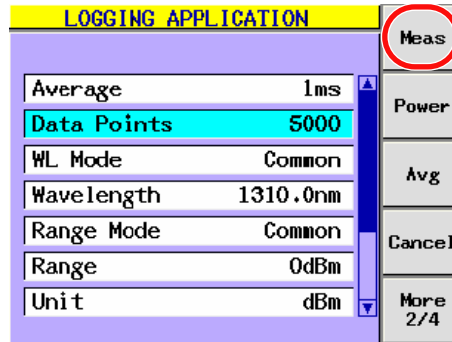
Note

In logging measurement, the product of the averaging time and the number of measurement samples cannot exceed 12 hours. If the product does exceed 12 hours, the number of measurement samples is automatically adjusted, and this adjustment is reflected in the measurement confirmation screen. Check the measurement conditions in the measurement confirmation screen before you begin measurement.

2. Press the **Start** soft key to start measurement.
   The number next to Data Points will begin decreasing. Measurement has been completed when the progress bar is full and the number next to Data Points has reached zero.

   Press the **Graph** soft key during measurement to display a graph of the data that is being measured.
   To stop measurement, press the **Stop** soft key.
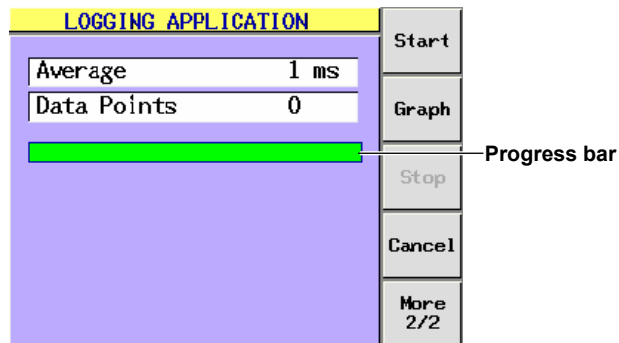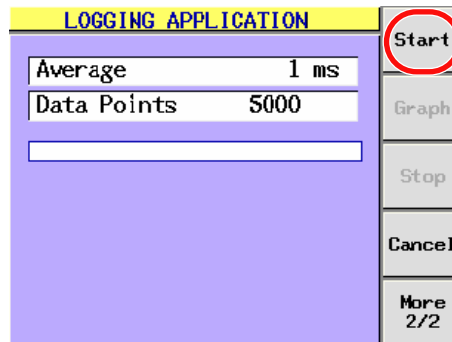
Note

When Input Trig is set to Single or Compl, measurement is started by the trigger input.

Setting the Measurement Result Analysis Conditions

When pressing the Analyze soft key after completion of the measurement, Analysis Condition Setup Screen will appear.

The measurement result analysis procedure is the same as that for stability measurement. For details, see page 2-26.

3.4 Saving the Measurement Data

The measurement data save procedure is the same as that for stability measurement. For details, see section 2.4.

4.1   Flow of Operation

Selection of sensor

Press the APPL key, select the reflection attenuation   ▶ Section 4.2
measurement function, and select the sensor.

Calibretion of measurement system

Calibrates the measurement system.   ▶ Section 4.3
• Measuring the directivity
• Measuring the reference reflection value
• Perform master reference measurement

Setting of measurement conditions

Enter the required conditions for each measurement item.   ▶ Section 4.4
• Reference reflection
• Averaging time
• Measurement wavelength
• Setting for the number of display digits

Displaying of optinal reflection attenuation and insertion loss

Measures the optical reflection attenuation or insertion loss   ▶ Section 4.5
of a connected object to be measured (DUT).

Note

When using the ORL module (AQ2200-271) for measurement, terminal calibration is not
required if the ORL module's calibration data and measurement conditions match.

4.2 Starting Up the Application

Procedure

1. Press **APPLI** to display the APPLICATION screen.

2. Use the arrow keys to move the cursor to ORL, and press the **OK** soft key or **ENTER**.
   The MODULE SELECT for ORL screen appears.

```
   APPLICATION              ┌──────┐
                            │  OK  │
   ┌─────────────────┐      └──────┘
   │    STABILITY    │
   ├─────────────────┤      ┌──────┐
   │    LOGGING      │      │      │
   ├─────────────────┤      └──────┘
   │ TLS APPLI-SWEPT │
   ├─────────────────┤      ┌──────┐
   │      BERT       │      │      │
   ├─────────────────┤      └──────┘
   │      ORL        │
   └─────────────────┘      ┌──────┐
                            │      │
                            └──────┘
```
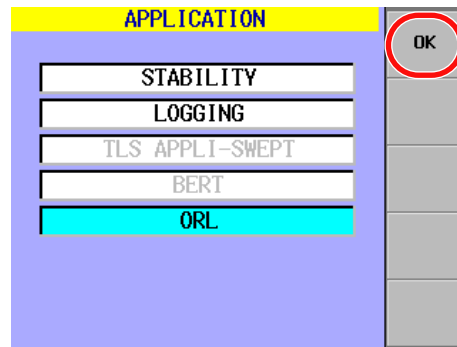
Note

If the sensor module is not mounted, the ORL application cannot be started up.

3. Use the **SLOT** keys to select the tab that you want to configure.

4. Press the appropriate soft key. Or move the cursor to the appropriate setup item (OPM1 to OPM3), and press the OK soft key or ENTER.
   A module selection screen appears.

```
 MODULE SELECT for ORL   ┌────────┐
 1 │2│3│4│5│6│7│8│9│     │   OK   │
 OPM1(ORL):              └────────┘
 ┌─────────────────────┐ ┌────────┐
 │ 0-1-1 AQ2200-215    │ │  OPM1  │
 └─────────────────────┘ │ Select │
 OPM2(IL):               └────────┘
 ┌─────────────────────┐ ┌────────┐
 │ 0-6-1 AQ2200-211    │ │  OPM2  │
 └─────────────────────┘ │ Select │
 OPM3(Monitor):          └────────┘
 ┌─────────────────────┐ ┌────────┐
 │      Not Select     │ │  OPM3  │
 └─────────────────────┘ │ Select │
 ORL(Coupler):           └────────┘
 ┌─────────────────────┐ ┌────────┐
 │ 0-7-1 AQ2200-271    │ │  More  │
 └─────────────────────┘ │  2/2   │
 LS:                     └────────┘
 ┌─────────────────────┐
 │ 0-2-1 AQ2200-141    │
 └─────────────────────┘
```

Note

• If only one sensor is installed and that sensor is not an AQ2200-221, the OPM2 Select and OPM3 Select soft keys are dimmed and unavailable.

• When the settings in the selected tab cannot be implemented by the current system, they are initialized.

5. Use the arrow keys to move the cursor to a sensor that you want to use for measurement, and press the **Select** soft key or **ENTER**.

```
MODULE SELECT for ORL          Select
  1-1      AQ2200-221
■ 2-1      AQ2200-271
  3-1      AQ2200-111
  4-1      NO MODULE
  5-1      NO MODULE
  6-1      NO MODULE
  7-1      NO MODULE
  8-1      NO MODULE
  9-1      NO MODULE          Close
```
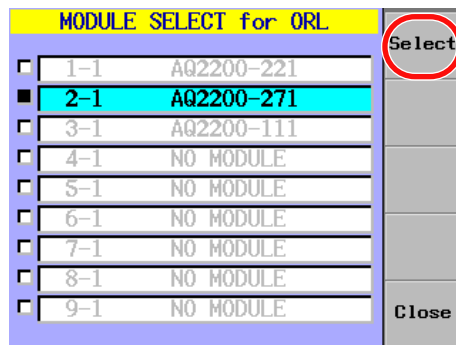
Note

- This sensor selected for OPM2 or 3 cannot be the one selected for OPM1.
- If the sensor selected for OPM2 or 3 is selected for OPM1, that OPM becomes "Not Select."
- If the AQ2200-271 is selected as an ORL module, OPM3 becomes "Not Select" and cannot be set.
- You cannot select AQ2200-241 and AQ2200-242 when a light source module is selected.

Measuring with an ORL Module

6. Press the **ORL Select** soft key. Or use the arrow keys to move the cursor to ORL, and press the **ENTER**.

A module selection screen appears.

```
MODULE SELECT for ORL
1 2 3 4 5 6 7 8 9            OK
OPM1(ORL)
  1-1      AQ2200-221        ORL
OPM2(IL)                     Select
  1-2      AQ2200-221
OPM3(Monitor)                LS
         Not Select          Select
ORL(Coupler)
  2-1      AQ2200-271        Cancel
LS
  3-1      AQ2200-111        More
                            1/2
```
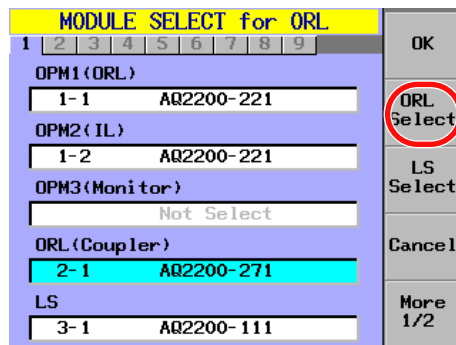
7. Use the arrow keys to move the cursor to the ORL module that you want to use for measurement, and press the **Select** soft key or **ENTER**.

The box to the left of the selected ORL module will turn black.
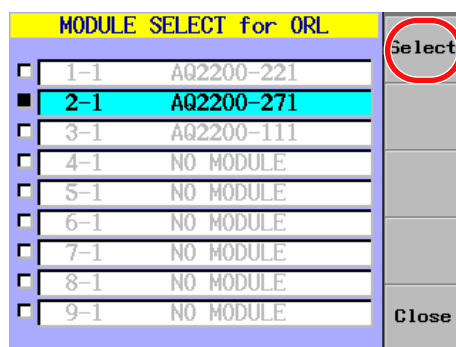
```
MODULE SELECT for ORL          Select
  1-1      AQ2200-221
■ 2-1      AQ2200-271
  3-1      AQ2200-111
  4-1      NO MODULE
  5-1      NO MODULE
  6-1      NO MODULE
  7-1      NO MODULE
  8-1      NO MODULE
  9-1      NO MODULE          Close
```

Display Example for the AQ2212

4

Optical Reflection Attenuation/Insertion Loss Measurement

Note

- The settings are unavailable if an ORL module is not installed.
- Under the default settings, the lowest numbered slot in which an ORL module is installed is set.

Measuring with a Light Source Module

8. Press the **LS Select** soft key. Or use the arrow keys to move the cursor to LS, and press the **OK** soft key or **ENTER**.
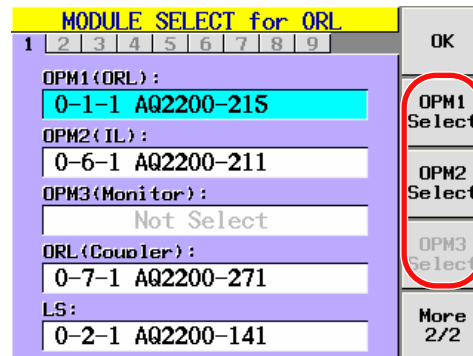   A module selection screen appears.

9. Use the arrow keys to move the cursor to the light source module that you want to use for measurement, and press the **Select** soft key or **ENTER**.
    The box next to the left of the selected light source module will turn black.

    Display Example for the AQ2212

Note

- The settings are unavailable if a light source module is not installed.
- Cannot be set if AQ2200-241 or AQ2200-242 is selected for OPM1.
- Under the default settings, the lowest numbered slot in which a light source module is installed is set.
- If the initially set light source module is the AQ2200-142, a short wavelength is set.

Displaying the ORL Application Screen

10. Press the **OK** soft key to display the ORL APPLICATION screen.

4

Optical Reflection Attenuation/Insertion Loss Measurement

Explanation

Selecting a Module

To measure the optical reflection attenuation or insertion loss, first select the ORL application, and then select a sensor.
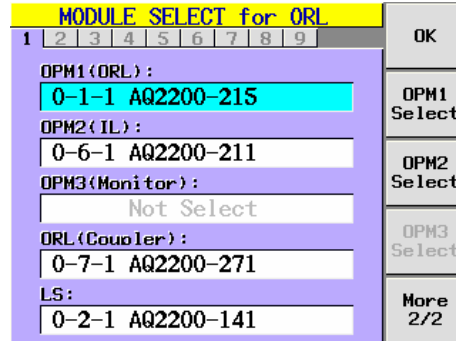
Module selection screen

Tab

You can save selected contents to any of the 9 tabs individually.

Use the SLOT keys or the left and right arrow keys to switch between tabs.

Soft Key Menu

Name	Function
OK	Sets the selected sensor and changes the screen to the ORL APPLICATION screen.
OPM1 Select	Select a sensor for measurement of the optical reflection attenuation (ORL).
OPM2 Select	Select a sensor for measurement of the insertion loss (IL). If only one sensor is mounted, the dimmed message, "Not Select", will appear and you cannot select any sensor. Even if there is only one sensor, you can select this soft key if the sensor is an AQ2200-221.
OPM3 Select	Select a sensor for monitoring of the light source output. If only one sensor is mounted, the dimmed message, "Not Select", will appear and you cannot select any sensor.
ORLSelect	To measure with a mounted ORL module, select the ORL module. If an ORL module is not installed, "Not Select" is displayed (dimmed), and that module cannot be selected.
LSSelect	To measure with a mounted light source module, select the light source module. If a light source module is not installed, "Not Select" is displayed (dimmed), and that module cannot be selected.
CANCEL	Returns to the APPLICATION selection screen.

Note

In the application mode, the buttons on the panel of the sensor module become inactive.

4.3 Calibrating the Measurement System

In this ORL application, correction values, such as the directivity value and insertion loss per the master code obtained using the coupler used for the description of section 1.3, are already set at typical values. Therefore, some measurement values are displayed. However, before starting the measurement, it is absolutely necessary to calibrate the measurement system.

Note

When using the ORL module (AQ2200-271) for measurement, terminal calibration is not required.

Procedure

Measuring the Directivity

Measure the directivity.

1. Connect the optical terminator to the position shown in the Fig. below and turn ON the optical output of the light source.

Light source	**50 : 50 Coupler**	**OPM3**
		(For monitor)
OPM1	**50 : 50 Coupler**	**Optical terminator**
(For ORL measurement)		
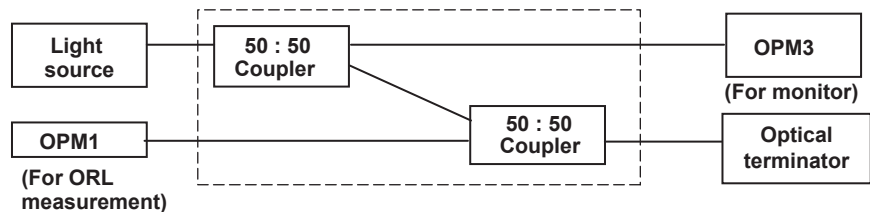
2. Press the **Term Set** soft key to start measurement.
When measurement finishes, the word "Term" to the upper right of the ORL measurement value box will disappear.
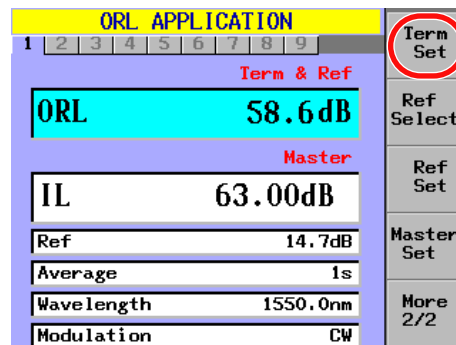
ORL APPLICATION	Term Set
1 2 3 4 5 6 7 8 9	
Term & Ref	Ref Select
ORL 58.6 dB	
Master	Ref Set
IL 63.00dB	
Ref 14.7dB	Master Set
Average 1s	
Wavelength 1550.0nm	More 2/2
Modulation CW	

The word "Term" to the upper right of the ORL measurement value box will disappear.

ORL APPLICATION	Term Set
1 2 3 4 5 6 7 8 9	
Ref	Ref Select
ORL 58.6 dB	
Master	Ref Set
IL 63.00dB	
Ref 14.7dB	Master Set
Average 1s	
Wavelength 1550.0nm	More 2/2
Modulation CW	
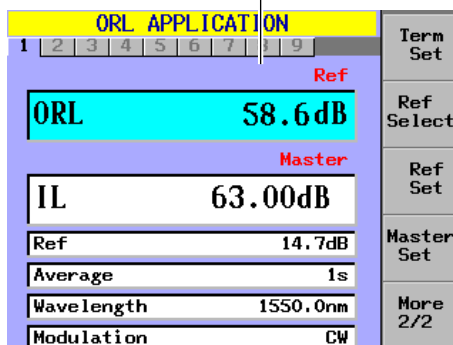
Measuring the Reference Reflection Value

1. Connect the reference reflection device having the reference reflection value you have selected to the position shown in the Fig. below and turn ON the optical output of the light source.

When not using an ORL module
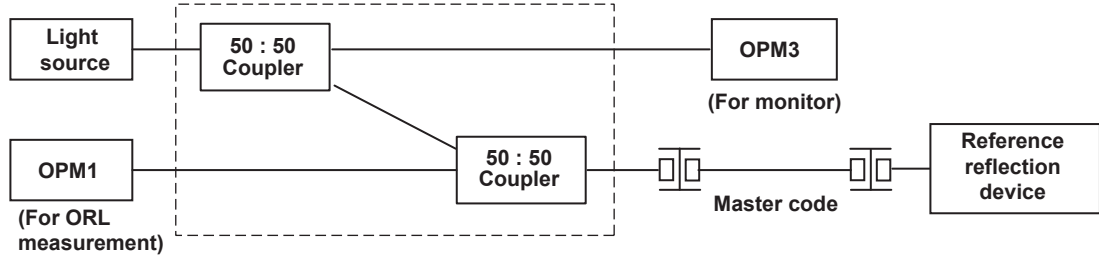
When not using an ORL module
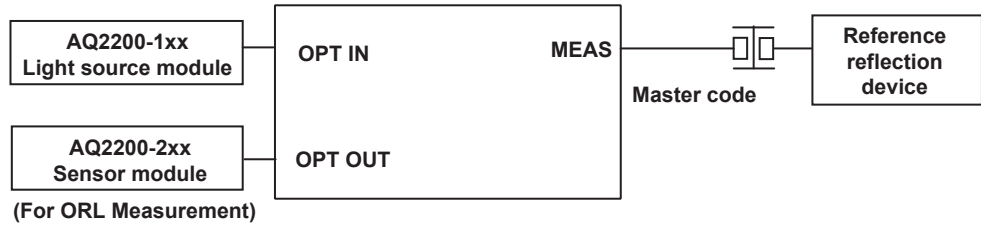
2. Press the **Ref Set** soft key to start measurement.
When measurement finishes, the word "Ref" to the upper right of the ORL measurement value box will disappear.
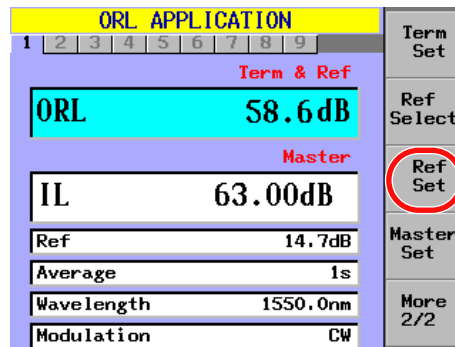
The word "Ref" to the upper right of the ORL measurement value box will disappear.
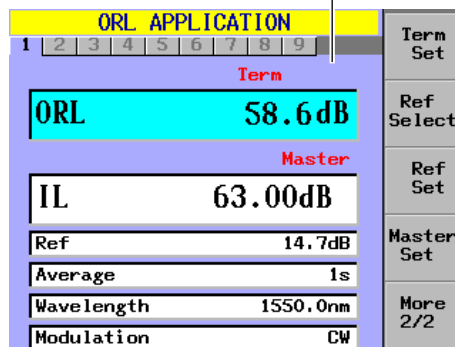
3. When directivity and reference reflection measurement have been completed successfully, the words "Term & Ref" to the upper right of the ORL measurement value box will disappear.

The words "Term & Ref" to the upper right of the ORL measurement value box will disappear.

4

Optical Reflection Attenuation/Insertion Loss Measurement

Perform master reference measurement.

1. Connect the master code to the position shown in the Fig. below and turn ON the optical output of the light source.
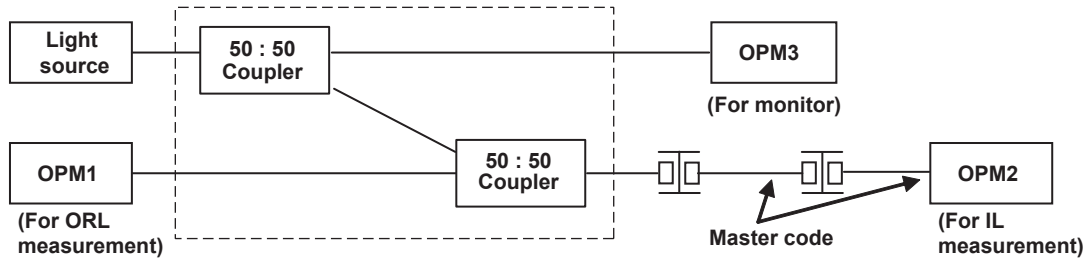
2. Press the **Master Set** soft key to start measurement.
When measurement finishes, the word "Master" to the upper right of the IL value box will disappear.

The word "Master" to the upper right of the IL value box will disappear.

Note

Master reference measurement can not be performed if an OPM2 sensor (for insertion loss measurement) is not selected.

4.4 Setting the Measurement Conditions for the Optical Reflection Attenuation

Procedure

Setting the Reference Reflection Value

To measure the reference reflection value, select a value used for the reference from two values shown below.

- 14.7dB: Fresnel reflection is used as reference.
- 0.2dB: Full reflection is used as reference.

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Press the **Ref Select** soft key. Or use the arrow keys to move the cursor to Ref, and press **ENTER**.

A list for selecting the reference value appears.
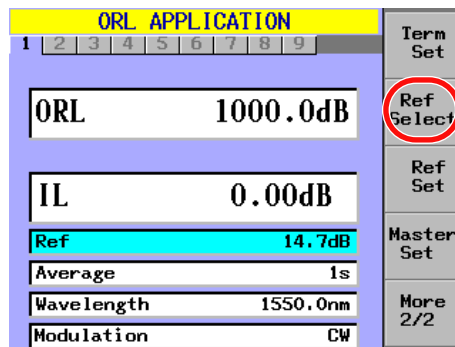
3. Use the arrow keys to select the value that you want to use as the reference, and press the **OK** soft key or **ENTER**.

Setting the Averaging Time

You can select an averaging time for measurement results in a range of 100 ms to 10 s.

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Press the **Avg** soft key. Or use the arrow keys to move the cursor to Average, and press **ENTER**.

A list for selecting the averaging time appears.
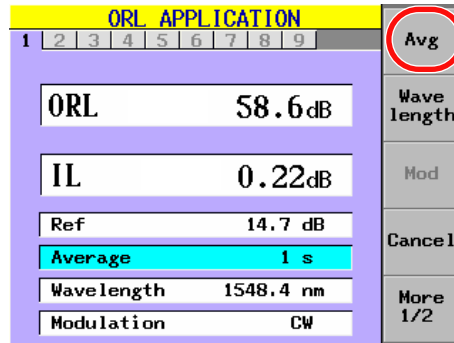
3. Use the arrow keys to move the cursor to the value that you want to use as the averaging time, and press the **OK** soft key or **ENTER**.
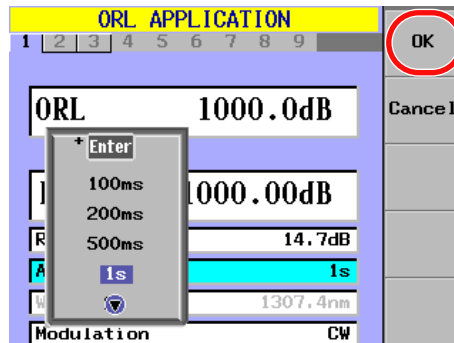
Setting the Measurement Wavelength

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Press the **Wavelength** soft key. Or use the arrow keys to move the cursor to Wavelength, and press **ENTER**.
A numeric input dialog box appears.

To set a specific measurement wavelength, proceed to step 3. To enter a preregistered typical wavelength, proceed to step 4.
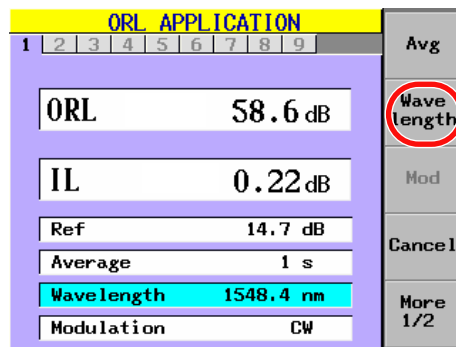
Note

- If the measurement wavelength is changed, all the values stored during calibration of the measurement system become invalid. Perform the calibration of the measurement system again.
- For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

3. Use the numeric keypad or the arrow keys to enter the measurement wavelength, and press the **OK** soft key or **ENTER**.

4. Press the **Typical** soft key to enter one of the typical wavelength values. Press the soft key repeatedly to shift through the registered values.

4
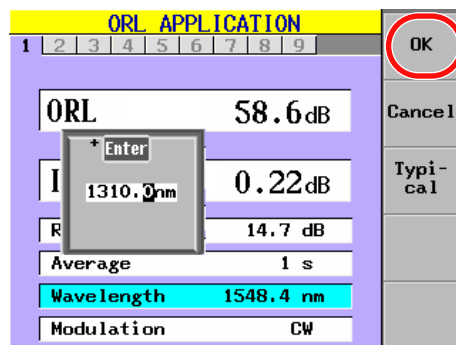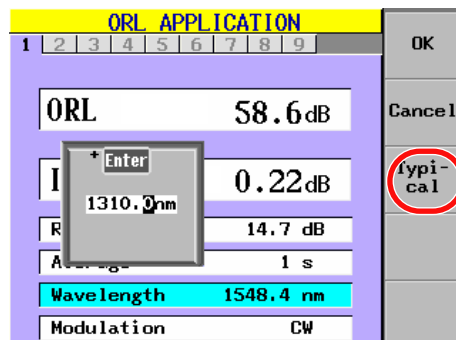
Optical Reflection Attenuation/Insertion Loss Measurement

Note

- When LS Select is set to AQ2200-111/131/132/136, you can set the wavelength within the ranges of the selected sensor and light source.
  (Grid TLS modules (AQ2200-131/132) are supported on firmware version (FIRM VER) 3.00 and later.)
- You cannot set the wavelength when LS Select is set to AQ2200-112/141/142.
  (LS module (AQ2200-112) is supported on firmware version (FIRM VER) 3.08 and later.)

Setting the Modulation Mode

Select a modulation mode of CW, 270 Hz, 1 kHz, or 2 kHz.

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Press the **More** soft key to display page 2/2, and press the **Mod** soft key. Or use the arrow keys to move the cursor to Modulation, and press **ENTER**.
A list for selecting the modulation mode appears.
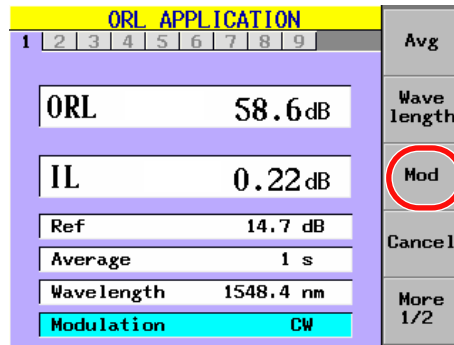
3. Use the arrow keys to move the cursor to the mode that you want to select, and press the **OK** soft key or **ENTER**.
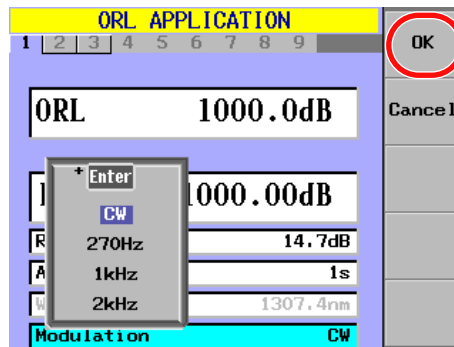
Note

- In the following cases, the modulation mode is fixed to CW.
  - When selecting the AQ2200-221/215 as a sensor module.
  - When selecting the AQ2200-112/131/132/136 as a light source module.
    (LS module (AQ2200-112) is supported on firmware version (FIRM VER) 3.08 and later.
    Grid TLS modules (AQ2200-131/132) are supported on firmware version (FIRM VER) 3.00 and later)
- When the modulation mode is changed, values stored during calibration of the measurement system become invalid. After changing the modulation mode, calibrate the measurement system again.

Setting a Display Decimal Place of the Optical Reflection Attenuation

You can display the measurement result of the optical reflection attenuation at a decimal place of 1/10, 1/100, 1/1000, or 1/10000.

Select a decimal place necessary for the measurement result.

Note that the value at the least significant decimal place is made by rounding the value at the most significant decimal place that is not displayed.

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Use the arrow keys to move the cursor to ORL, and press **ENTER**.
   A list for selecting the number of digits appears.
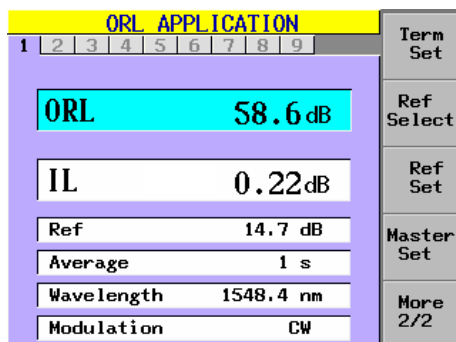
3. Use the arrow keys to move the cursor to the number of digits that you want to select, and press the **OK** soft key or **ENTER**.

4
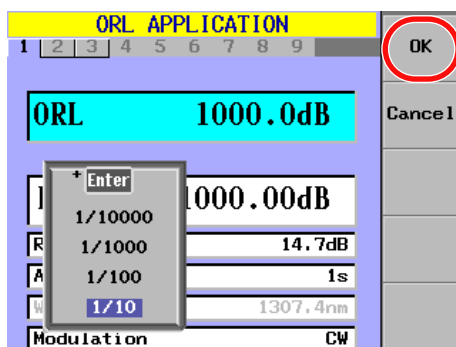
Optical Reflection Attenuation/Insertion Loss Measurement

Setting a Display Decimal Place of the Insertion Loss

You can display the measurement result of the insertion loss at a decimal place of 1/10, 1/100, 1/1000, or 1/10000. Select a decimal place necessary for the measurement result. Note that the value at the least significant decimal place is made by rounding the value at the most significant decimal place that is not displayed.

1. In the ORL APPLICATION screen, use the **SLOT** keys to select the tab that you want to configure.

2. Use the arrow keys to move the cursor to IL, and press **ENTER**.
A list for selecting the number of digits appears.
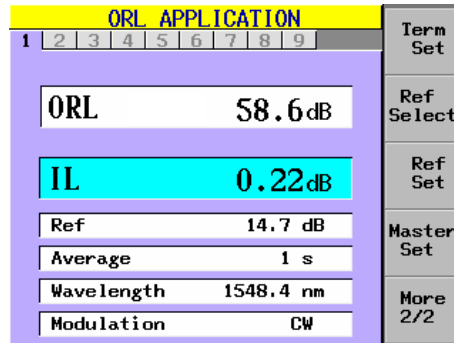
3. Use the arrow keys to move the cursor to the number of digits that you want to select, and press the **OK** soft key or **ENTER**.
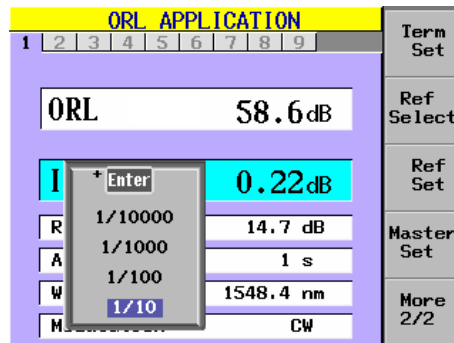
Note

If an OPM2 sensor is not selected, the IL field is dimmed and the number of display digits cannot be set.

Explanation

To measure the optical reflection attenuation, set the following items.

- Sets the reference reflection.
  Fresnel reflection (14.7 dB),
  Full reflection (0.2 dB)
- Averaging time
- Measurement wavelength
- Modulation mode

```
     ORL APPLICATION         │Term │
 1 │2│3│4│5│6│7│8│9│         │Set  │
                             ├─────┤
 ┌──────────────────────┐    │Ref  │
 │ ORL        58.6 dB    │    │Select│
 └──────────────────────┘    ├─────┤
                             │Ref  │
 ┌──────────────────────┐    │Set  │
 │ IL         0.22 dB    │    ├─────┤
 └──────────────────────┘    │Master│
 │ Ref         14.7 dB   │    │Set  │
 │ Average        1 s    │    ├─────┤
 │ Wavelength  1548.4 nm │    │More │
 │ Modulation     CW     │    │2/2  │
```
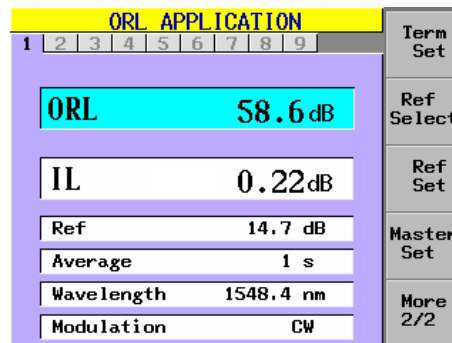
Tab

You can save and set the following for each of the 9 tabs set in section 4.2.
- ORL and IL display digits and calibration values
- Reference reflection settings
- Averaging time settings
- Measured wavelength settings
- Modulation mode settings

Use the SLOT keys to switch between tabs.

Note

If the settings in the switched tab cannot be re-implemented in the current system, the settings that cannot be implemented are initialized.

Soft Key Menu

Name	Function
Term Set	Measures the directivity value.
Ref Select	Measures the reference reflection value.
Ref Set	Sets the reference reflection value.
Master Set	Measures the insertion loss of the measurement system.
Avg	Set an average time.
Wavelength	Set a measurement wavelength.
Mod	Sets the modulation mode.
Cancel	Returns to the SENSOR MODULE SELECT screen.

Note

- When directivity and reference reflection quantity measurement are not taking place or the measurement wavelength and modulation mode are changed, the words "Term & Ref" appear to the upper right of the ORL field.
- When master reference measurement is not taking place or the measurement wavelength and modulation mode are changed, the word "Master" appears to the upper right of the IL field. However, if the OPM2 sensor is not selected, the IL field is dimmed and "Master" is not displayed.

4

Optical Reflection Attenuation/Insertion Loss Measurement

Setting the Measurement Wavelength

The values set when using a light source module are different than those when not using a light source module.

• **When not using a light source module**

Specify a value or select a typical value.

Arbitrary value: The value of the wavelength ranges that are available on all the selected sensors.

Typical value: The following value within the wavelength ranges that are available on all the selected sensors.

850 nm, 1300 nm, 1310 nm, 1550 nm

• **When using the AQ2200-111/131/132/136**

Set within the setting range of the light source module and sensor module (Grid TLS modules (AQ2200-131/132) are supported on firmware version (FIRM VER) 3.00 and later)

• **When using the AQ2200-112/141/142**

Fixed to the wavelength of the light source module (cannot be set.)

(For the AQ2200-112, this applies to firmware versions 3.08 and later.)

4.5 Displaying the Measurement Results

The optical reflection attenuation and insertion loss are always measured and displayed under the set conditions.

Shows the measurement result of the reflection attenuation.

Shows the measurement result of the insertion loss.

Note

- If an OPM2 sensor is not selected, the IL field is dimmed and no value is displayed.
- If the output level of the light source is low and measurement is not possible, or during calibration measurement, "-------" is displayed for the value in the ORL and IL fields.

Holding the Measurement Value Display and Canceling the HOLD Mode

When you press HOLD, the entire screen display is frozen. While the display is held, "Hold" appears at the top of the screen. You can press any key to release the held display.

"Hold" appears.

5.1   Flow of Operation

The following shows the outline flow necessary to operate this unit.

Starting up of application screen

Press APPL, and select TLS APPLI-SWEPT.   ▶ Section 5.2

Selection of sensor

Select the sensor module that you want to use with   ▶ Section 5.2
the TLS module.

Calibration and Zero- set

Calibrate the measurement system.   ▶ Section 5.3
 • Calibrate the TLS module wavelength
 • Perform zero-set on the sensor module

Setting of conditions

Configure the various measurement items.   ▶ Section 5.4
 • Sweep start wavelength, end wavelength, and span
 • Dynamic range, output level, and line width

Swept measurement

Perform swept measurement on the connected DUT.   ▶ Section 5.4
 • Reference measurement
 • Swept measurement
 • Graph display

Saving Measurement Data

Save measurement data to USB memory.   ▶ Section 5.4
 • Auto save
 • Automatic file name generation

5.2 Starting Up the Application

This section describes how to start up the screen necessary to operate the SWEPT function.

Procedure

1. Press **APPLI** to display the APPLICATION screen.
2. Use the arrow keys to move the cursor to TLS APPLI-SWEPT, and press the **OK** soft key or **ENTER**.
   The MODULE SELECT for SWEPT screen appears.
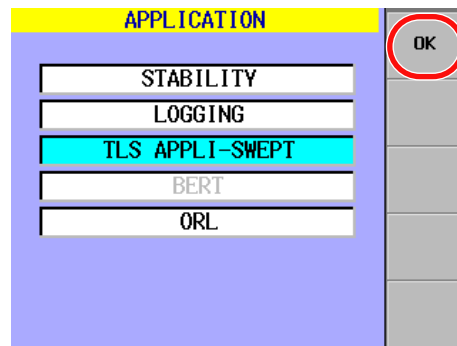
Note

- The APPLICATION screen will not appear if only TLS modules are installed. You must also install a sensor module.
- Do not press APPLI while executing wavelength calibration or zero-set. If you press this while wavelength calibration or zero-set is being performed on the Detail screen, the APPLICATION screen is displayed, but you cannot select applications.

Select a module you want to combine.

3. Use the arrow keys to move the cursor to one of the modules that you want to use, and press the **Select** soft key or **ENTER**.

When you select a TLS module (the AQ2200-136), the box to the left of the module changes from white to green.

When you select a sensor module (AQ2200-2xx), its box changes from white to black.

Once you have selected one of each module, the OK soft key is undimmed and becomes available.

Press the **OK** soft key or **ENTER**.

The SWEPT APPLICATION screen appears.

Note

Select one of the AQ2200 series sensor modules as the sensor module. The SWEPT APPLICATION screen will not appear unless you have chosen at least one TLS module and one sensor module.

5

Swept Measurement Function

5.3 The Wavelength Calibration and ZERO-SET

Perform wavelength calibration whenever you turn laser output on.

You cannot perform Swept measurement unless you perform wavelength calibration (WL Cal).

Procedure

Performing Zero-Set

1. Press the **Zero** soft key to perform zero-set on the sensor modules.
   While zero-set is being performed, a message appears.

   For information about zero-set, see section 5.1 in IM 735101-03EN.
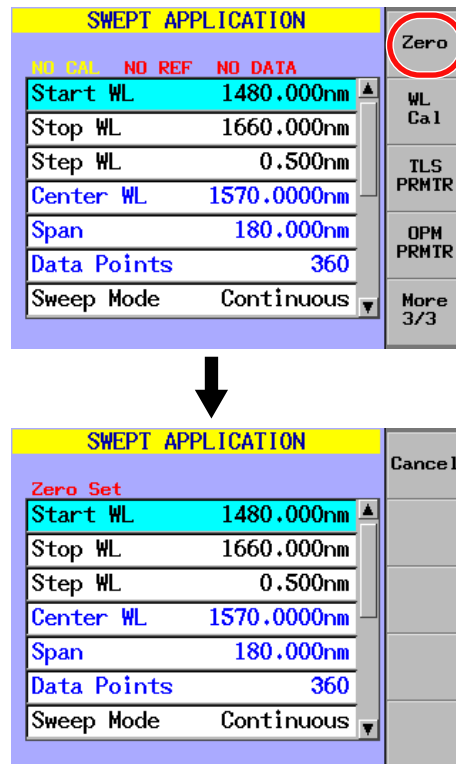
Screen during Execution of ZERO-SET

Performing Wavelength Calibration

1. Press the **WL Cal** soft key to begin the wavelength calibration of the TLS module. While wavelength calibration is being performed, a message appears.

For more information about wavelength calibration, see section 5.1 in IM 735101-03EN.

This indication is shown if "WL Cal" is not completed.

Screen during Execution of Wavelength Calibration

Note

If you press the Stop soft key during wavelength calibration, all wavelength calibration completed up to that point is lost, so be sure to perform calibration again before using the instrument.

5.4 Swept Measurement

Setting the Sweep Conditions

This section describes how to set up the sweep wavelength parameters, such as the sweep start wavelength, stop wavelength, and interval.

Procedure

1. Press the **TLS PRMTR** soft key to display a screen for setting TLS parameters.

There are two methods to set the sweep conditions. You can set Start WL, Stop WL, and Step WL or Center WL, Span, and Data Points. Whichever set of parameters you set, the other set of parameters will be recalculated automatically.

2. Use the arrow keys to move the cursor to the item that you want to specify, and press **ENTER**. For information about setting the various items, see section 5.1 in IM 735101-03EN.

Explanation

Appropriate sweep conditions are used corresponding to the applications shown below.
*   Overall wavelength needs to be measured: StartWL/StopWL/StepWL
*   One wavelength and its surrounding need to be measured:
    CenterWL/Span/Data Points
*   Measurement needs to be performed by increasing the measurement dynamic range:
    Select "Step" for SweepMode setup.
*   Measurement results need to be known early:
    Select "Continuous" for SweepMode setup.

Note

*   A sweep step of 0.001nm or less cannot be set.
*   Up to 20000 measurement points can be set per one sensor module. However, if you use a dual sensor, which contains two sensors in a module, up to 10000 measurement points can be set per one sensor because the measurement points are shared by two sensors.
    When a single sensor model (such as AQ2200-211) and a dual sensor model (AQ2200-221) are used together, the maximum number of measurement points you can set per a sensor is exclusively restricted to the smaller number.
*   Since the sweep wavelength range is determined by the sweep span and the number of measurement points, make the setting so that the wavelength range you want to measure is satisfied.

5

Swept Measurement Function

Setting the Measurement Dynamic Range

This section describes how to set up the measurement dynamic range for the sweep.

Procedure

1. Press the **OPM PRMTR** soft key to display a dialog box for setting the averaging time and the measurement range.
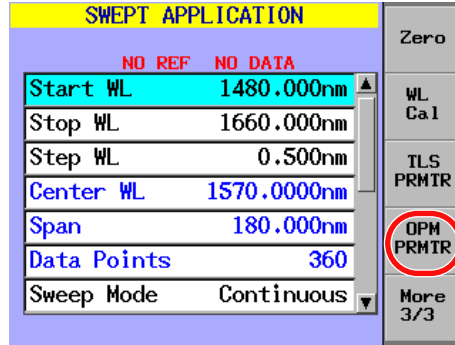
2. Use the arrow keys to move the cursor to Average or Range Mode, and press the **OK** soft key or **ENTER**.

   For the rest of the procedure, see section 3.1 in IM 735101-03EN.
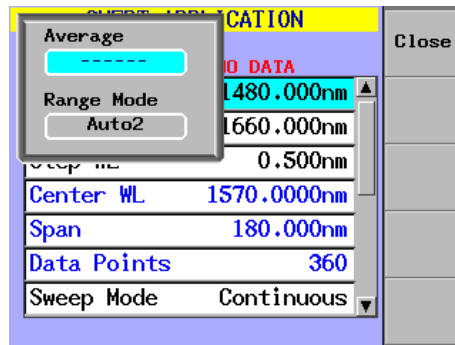
The measurement dynamic range varies depending on the sweep mode.

	Auto1	Auto2	Hold
Stepped	Yes	Yes	No
Manual	Yes	Yes	Yes
Continuous	No	Yes	Yes
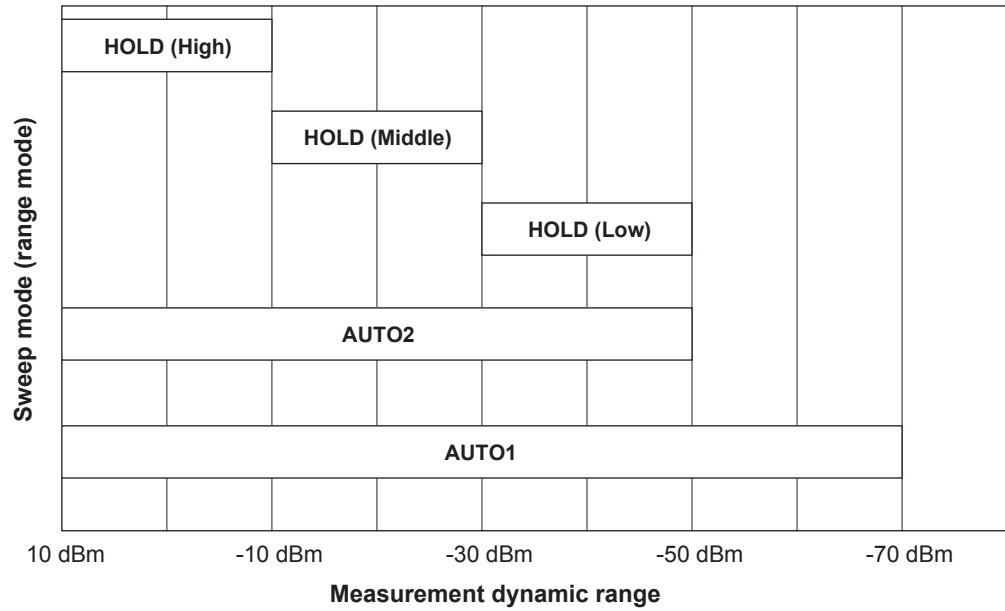
Starting the Reference Measurement

Before starting the Swept measurement, you must always perform the reference measurement. Since the output characteristics of the TLS module cannot output the constant level to the wavelength axis, it is absolutely necessary to perform the reference measurement before measuring the device.

This section describes how to operate the reference measurement.

Procedure

Setting the Reference Mode

1. Press the **Ref Mode** soft key to display the Ref Mode screen.
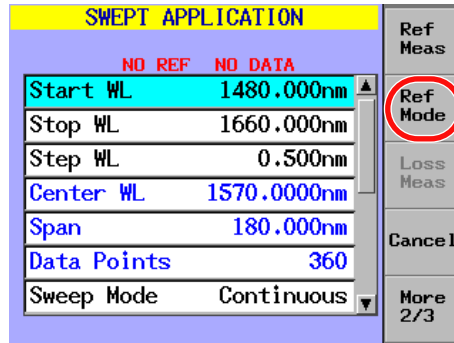
2. Press the **Ind x-y-z** soft key.

The selected mode will have a blue background. The mode changes whenever you press this soft key.

Select Ind or x-y-z. If you select x-y-z, proceed to step 3.
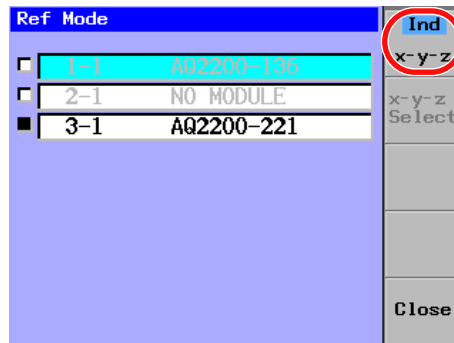
• **If You Select x-y-z**

3. Use the arrow keys to move the cursor to the sensor module that you want to use as the reference, and press the **x-y-z Select** soft key or **ENTER**.

The box to the left of the selected sensor module will turn black.
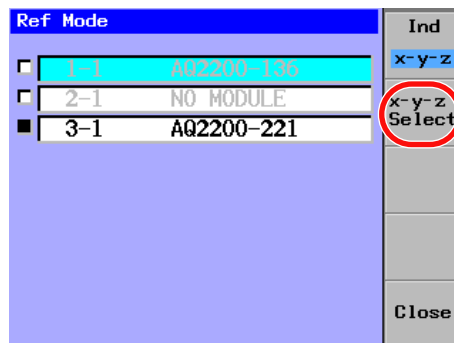
Note

In Ind mode, reference measurement is performed on all of the sensor modules that have been selected in the MODULE SELECT for SWEPT screen. In x-y-z mode, reference measurement is performed on the selected module.

Reference Measurement

1. Press the **Ref Meas** soft key.

A screen for executing swept measurement appears.

Note

The Ref Meas soft key is unavailable if wavelength calibration (WL Cal) has not been performed on the TLS module.

2. Press the **Ref Start** soft key to display the Reference Measurement connection message.

3. Press the **OK** soft key or **ENTER** to start measurement.

During measurement, the progress bar indicates how far measurement has proceeded. If measurement ends properly, "NO REF" will disappear from the top of the screen.

To stop measurement, press the **Stop** soft key.

The "NO REF" indication will disappear.

Progress bar

Note

You can only start reference measurement if you have first performed wavelength calibration (WL Cal).

Explanation

The following Table shows Ref valid/invalid when each parameter setting is changed.

Parameter Settings

Item	Ref Valid/Invalid	Remarks
Start WL	Conditional	Valid when the value is within the specified range of "Ref".
Stop WL	Conditional	Valid when the value is within the specified range of "Ref".
Step WL	Conditional	Valid when the value is within the specified range of "Ref".
Center WL	Conditional	Valid when the value is within the specified range of "Ref".
Span	Conditional	Valid when the value is within the specified range of "Ref".
Data Points	Conditional	Valid when the value is within the specified range of "Ref".
Sweep Mode	Valid	
Power	Invalid	
Linewidth	Valid	
Range Mode	Valid	
Average	Valid	
WL Cal	Invalid	Re-execution of WL Cal is invalid.

Module Settings

When using multiple sensor modules, the reference measurement data is valid even though any sensor module is unmounted after completion of the reference measurement. (When at least one sensor module remains, which has been set during reference measurement, the reference measurement data is valid.)
However, if a new sensor module is mounted after completion of the reference measurement, the reference measurement data becomes invalid.
At this time, you must perform the reference measurement again.
Even though the sensor module is unmounted, which has been measured actually with "ALL OPM" during reference measurement, the reference measurement data is valid.

• **About Invalid Reference Measurement Data**

  If any of the following conditions arises, the reference measurement data becomes invalid.
  • Power is turned ON again.
  • Module is added.
  • Reference measurement is aborted.
  • Conditions for reference measurement are not satisfied by setting the parameters.
  • Wavelength calibration becomes invalid.
  • Laser output is turned OFF.
  • Application is changed.
  • <Ref Clear> is executed.

• **Conditions for Execution of Reference Measurement**

  Wavelength calibration is completed.

The SWEPT Measurement

When you want to perform the SWEPT measurement, you must first complete the reference measurement. If the reference measurement has not been completed or when the reference measurement is invalid, you cannot execute the SWEPT measurement. Complete the reference measurement, and confirm that "NO REF" is not displayed on the screen. Use one of the following methods to execute the SWEPT measurement.

Procedure

1. Press the **Loss Meas** soft key to display the Loss Measurement screen.
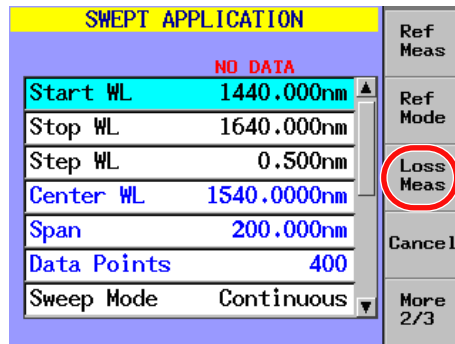
Los Measurement Screen
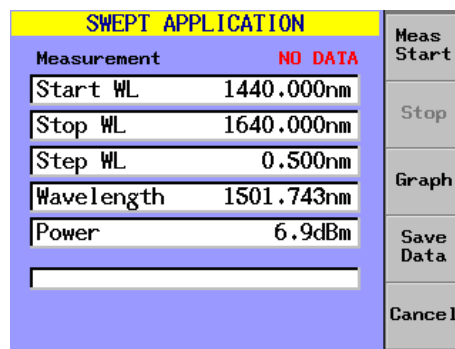
Note

- When reference measurement can be performed, the otherwise dimmed Loss Meas soft key is undimmed. Pressing this soft key opens the swept measurement screen.
- On the Swept measurement screen, you can start the measurement, the graph screen, and/ or the analysis screen.
- If there is no Swept measurement data, "NO DATA" is shown.

2. Press the **Meas Start** soft key to display the confirmation screen. Press the **OK** soft key to begin the measurement.

During measurement, the progress bar indicates how far measurement has proceeded.

To stop measurement, press the **Stop** soft key.

```
SWEPT APPLICATION          Meas
Measurement      NO DATA    Start
Start WL      1440.000nm
Stop WL       1640.000nm    Stop
Step WL          0.500nm
Wavelength    1501.743nm    Graph
Power            6.9dBm
                            Save
                            Data

                            Cancel
```

↓

```
SWEPT APPLICATION           OK
Measurement      NO DATA

Measurement                Cancel
Please connect a TEST DEVICE,
and press Enter to continue.

Power            6.9dBm     S/N
```

↓
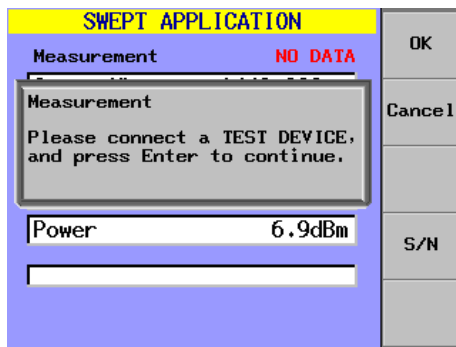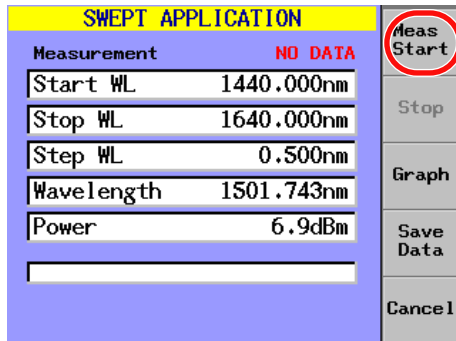
When the measurement is completed successfully, the "NO DATA" indication will disappear.

```
SWEPT APPLICATION          Meas
Measurement      NO DATA    Start
Start WL      1440.000nm
Stop WL       1640.000nm    Stop
Step WL          0.500nm
Wavelength    1512.718nm    Graph
Power            6.9dBm
                            Save
                            Data

                            Cancel
```

Progress bar

5

Swept Measurement Function
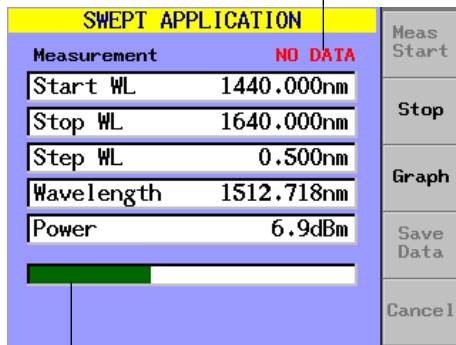
When Writing the Serial Number to the Measurement Results File

If you have set Input S/N to On, the serial number that you have entered will be written to the measurement results file.

Entering the Serial Number

1. As shown in step 2 on the previous page, press the **Meas Start** soft key. On the screen that appears, press the **S/N** soft key to display the soft keyboard.
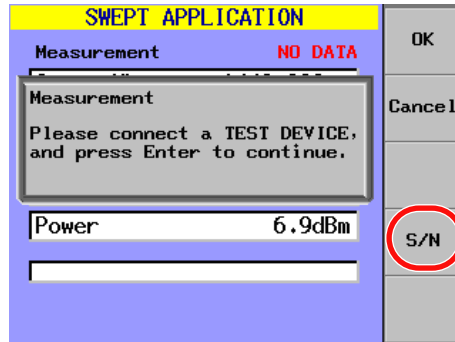
2. Use the soft keyboard to enter text, and press the **Commit** soft key.
The serial number is confirmed.
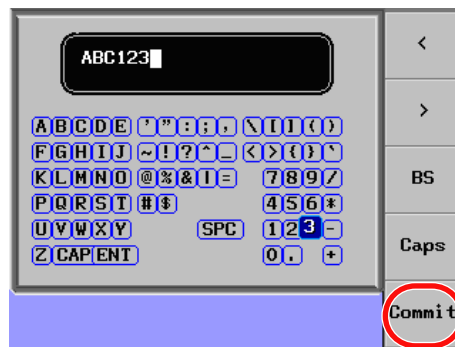
Note

- If Input S/N, explained on the following page, is set to Off, the characters on the S/N soft key are dimmed, and you cannot set the serial number.
- The maximum length of the serial number is 13 characters. You cannot enter double quotation marks (").
- For information about how to enter text, see section 2.4 in IM 735101-03EN.

ON/OFF Setting of the Serial Number Feature

1. Press the **Input S/N** soft key.

A dialog box for turning the setting on or off appears.
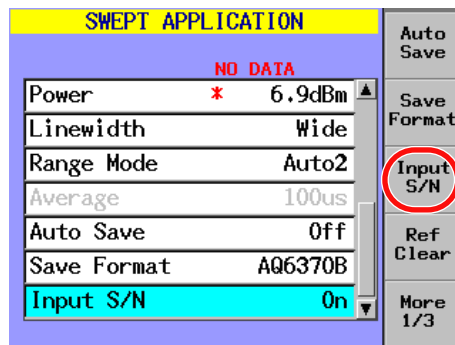
2. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.

5

Swept Measurement Function
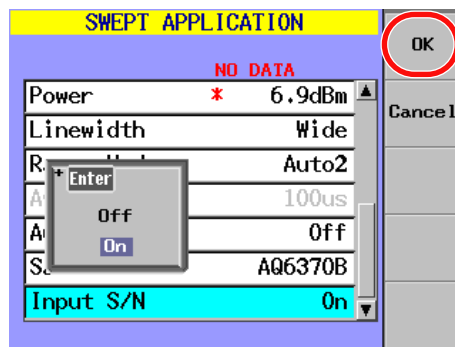
Setting the Save Data Format

1. Press the **Save Format** soft key to display the data format setup screen.
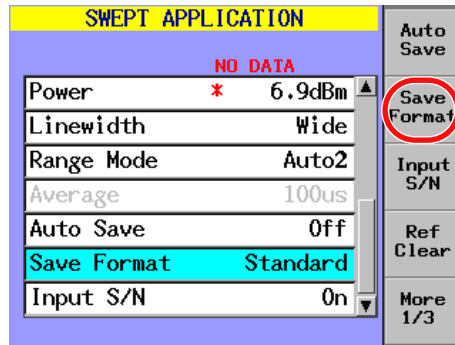
2. Use the arrow keys to move the cursor to **Standard** or **AQ6370B**, and press the **OK** soft key or **ENTER**.
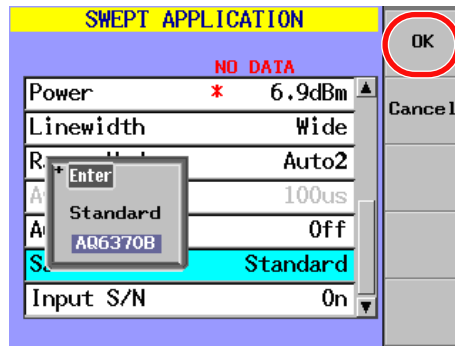
Saving the Measurement Results
This section explains how to save measurement data to storage device.

Selects the storage destination

1. Press the **Save Data** soft key.
    The file list screen appears.

    For the rest of the procedure, see chapter 12 in IM 735101-03EN.
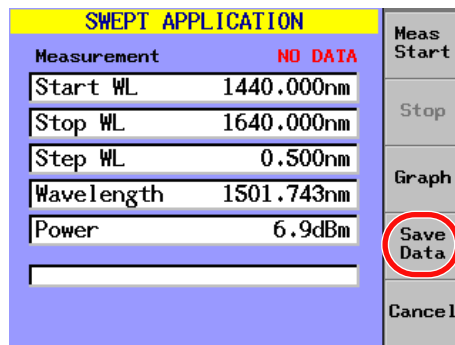
Setting the Auto Save

When saving the measurement results, make the following settings to automatically save the data with a desired file name put.

1. Press the **Auto Save** soft key.

A dialog box for turning the setting on or off appears.
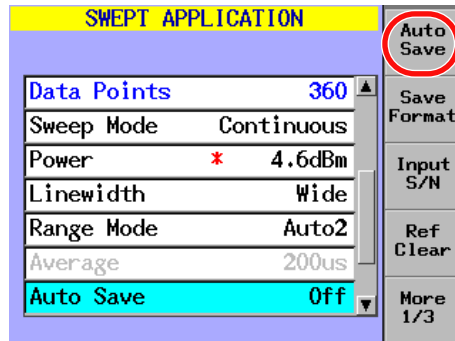
2. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.
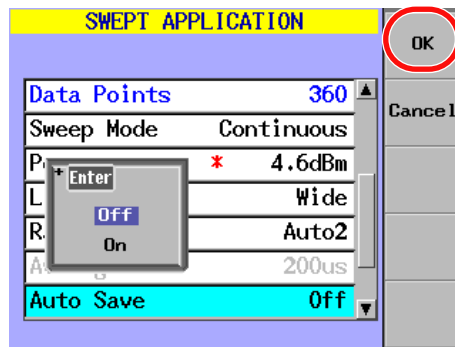
Explanation

You can save the measured results in one of the following formats.

Standard: Data is saved in CSV format.

AQ6370B: Data is saved in the AQ6370B (optical spectrum analyzer) analysis format.

Note

If you save data in the AQ6370B analysis format, you can use the viewer software for the AQ6370B to analyze the data.

Measured results that are saved in the AQ6370B analysis format are saved to the "6370B_ number" folder that is created within the specified folder.

If the AutoNumbering feature is turned off, the name of the created folder is "6370B."

5

Swept Measurement Function

6.1   Display Screen

Description of Screen

The BERT APPLICATION screen consists of items shown below.

1-1 Progress bar/Elapsed time display

1-3 Operation status display

1-2 Logging display

1-4 Measurement result display

1 Measurement status display

2 Tab

3 Setup item display (Page)

4 Function keys

5 Status indication LED

BERT APPLICATION screen (PPG page)
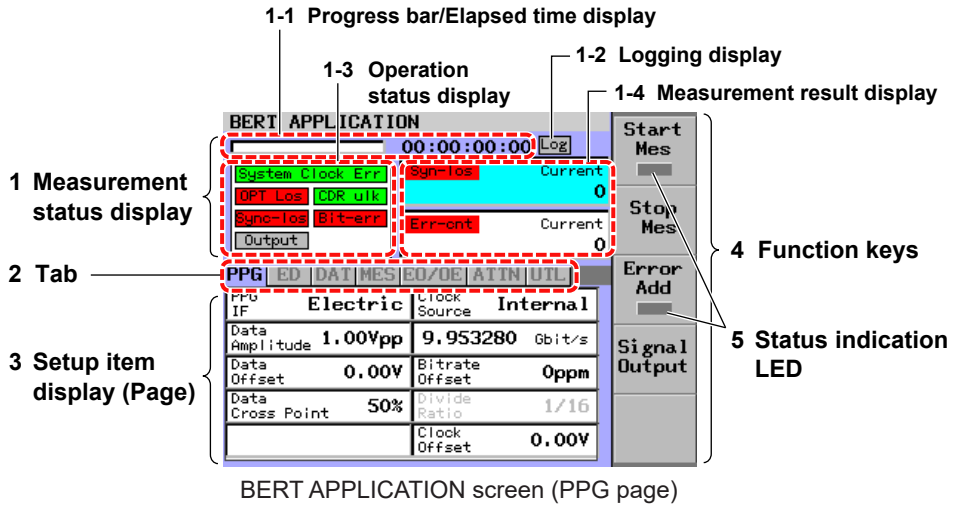
1 Measurement status display

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" or "Repeat", the progress bar shows the progress status.

  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" or "Repeat"

  `00:00:00:05`

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

  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"

  `00:00:08:31`

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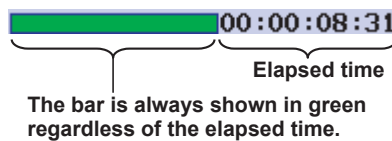
  The progress bar is always shown in green regardless of the progress status of the BER measurement.

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.
Output	Shows the output signal ON/OFF status of the PPG. "Green": Output signal ON status "Gray": Output signal OFF status
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 "Yellow": Sync-loss has occurred in the past, but synchronization is established now. "Green": Synchronization established status
Bit-err	Shows the bit error detection status of the ED. "Red": Bit error detection status "Yellow": There was a bit error in the past, but there are no errors now. "Green": Correct status
OPT Los[1]	Shows the Los (Loss of signal) detection status of the OE. "Red": OPT Los status "Green": Correct status

1 Displayed only when 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, OH Error Count, OH Error Rate, TX Bitrate, RX Bitrate, Received opt pwr(displayed only when OE is mounted.), and ATT Power mon(displayed only when ATTN-OPM is mounted.)

Select the display mode from among Current, 100ms, and Last, and the timing to update the screen is set and displayed.

- Current: Shows the value accumulated from the start of measurement in real time.
- 100ms: Shows the value measured for 100ms at intervals of 100ms.
- Last: Shows the value for one cycle until the measurement for the next cycle completes.

For details about operating procedures, see section 6.4.

Item	Description

Syn-loss (Syn-los)[1]	Shows the synchronization status of the ED using the indicators and sync loss time [unit: μs].
	• 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 [μs] and 1.000000E+09 to 8.640000E+11 [μs]

Error Count (Err-cnt)[1]	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]

Error 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)[2] (error free)
	        to 1.022444E-16 (error occurs.)
	        to 1.000000E-00 (all are errors.)

OH Error Count[3] (OH Err-cnt)[1]	Shows the coding error status detected only in the first line of the SDH/SONET frame's overhead section among the receive data of the ED using the indicators, along with the number of coding errors (bit errors) [unit: bit].
	• Coding error status indicator
	  "Green": No error has occurred between the start of measurement and current operation.
	  "Yellow": Error occurred in the past, but no error occurs currently.
	  "Red": Error status
	• Number of overhead coding errors
	  Display range: 0 to 999999999 [bit] and 1.000000E to 3.622400E+13 [bit]

OH Error Rate[3]	Shows the ratio of the number of coding errors (OH Error count) detected only in the first line of the SDH/SONET frame's overhead section among the receive data of the ED, to the number of coding errors (Error count) in the receive data as a whole. • Ratio of the number of overhead coding errors Display range: 0.00% to 100.00%

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BER Measurement Function

Item	Description

TX Bitrate [4, 5] (PPG clk)[1]	Shows the status of the clock to be input to the PPG using the indicators, and also shows the send bitrate of the PPG using the numeric value.
	• PPG clock indicator display
	  "Green": Correct status
	  "Red": Error status
	• Send bitrate
	  Display range: 9.940000 to 11.3299999 [Gbit/s]

RX Bitrate [4, 5] (ED clk)[1]	Shows the receive clock status of the ED using the indicators, and also shows the receive bitrate of the ED using the numeric value.
	• Indicator display of receive clock of ED
	  "Green": Correct status
	  "Red": Error status
	• Receive bitrate
	  Display range: 9.940000 to 11.329999 [Gbit/s]

Received opt power [6, 3]	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 It is an indicator display.

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

3 The targeted overhead section is only the shaded part (576 bytes) of the following figure:
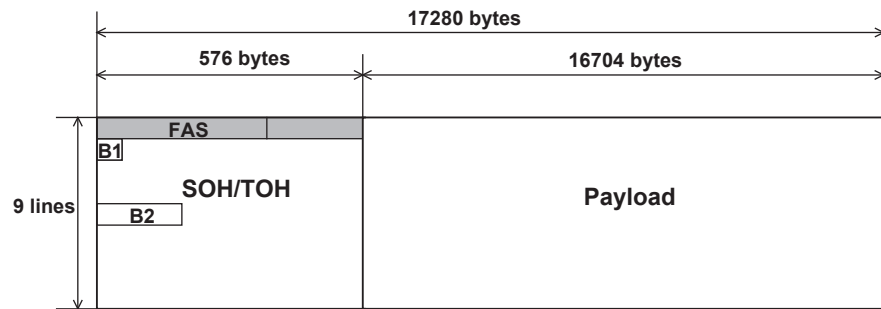
4 TX bitrate / RX bitrate / Received opt power. The measurement results are not displayed, but the current status is monitored and displayed.

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

6 Displayed only when OE is mounted.

2 Tab

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

You can move between tabs by pressing the SLOT keys.

SLOT key or ▶ key (Press SLOT ◀ to go in the opposite direction.)   **The page is changed in the normal direction.**

PPG |ED |DAT |MES |EO/OE |ATTN |UTL. |
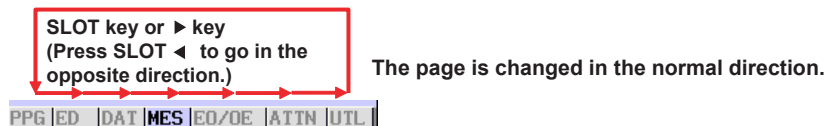
3 Setup item display (page)

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 a screen configuration diagram and a list of display and setup items, see section 6.2. For details about operating procedures, see section 6.4.

4 Function keys

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.

5 Status indication LED

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

Item	Color	Description
Start Mes	Green	Shows the measurement status using the LED (When Error Mode is not set to Single).
		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).

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.

• **EG Page**

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

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BER Measurement Function

- **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)

- **ATTN Page**
  You may set up the items related to the ATTN module. (Only when ATTN is installed)

You may set up the items related to the ATTN-OPM module. (Only when ATTN-OPM is installed)

6.2 Setup Items

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 Clk
	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 In 1, Data In 2
	Data Threshold	-350 to 350 [mV] when Connector is Data In 1 (CDR). -300 to 300 [mV] when Connector is Data In 2 (Normal).
	Auto Sync	ON, OFF
	Clock Source	Internal, REF Clk, Ext Clk
	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 (Copy PPG -> ED), Couple (Coppy -> PPG)
	Pattern	PRBS, Prog256, Prog64M [1], SDH/SONET [1]
	PRBS Length	PRBS7, PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, PRBS31
	Program Length	16 to 256 [bit], 256 to 67[bit][1],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
	Payload	{PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, PRBS31} [1]

1   When optional function is selected.

Screen Name (Tab)	Setup Item	Set Value
MES	Mes Mode	Single, Manual, Repeat
	Mes Day	0 to 10 [day]
	Mes Time	00:00:01 to 23:59:59 [h]:[m]:[s]
	Buzzer	OFF, Soft, Medium, Loud
	Trigger	TX1/16, TX1/64, TXPatt, TXERR, RX1/16, RX1/64, RXPatt, RXERR
UTL	Parameter Load	
	Parameter Save	
	Long Prog Load	
	SOH / TOH Load	
	Logging	ON, OFF
	Logging Period	1 sec, 10 sec, 1 min, 10 min, 1 hour
	Logging Mode	All, Error only, LastRes only
EO/OE [2]	DriverGain	0 to 255
	CrossPoint	-31 to 32
	ABC	ON, OFF
	ABC Slope	Positive, Negative (The setting is possible when ABC is ON.)
	Manual Bias	-10.0 to 9.9 [V] (The setting is possible when ABC is OFF.)
	Data Threshold	-364 to 273
	Data Output	ON, OFF
	Wavelength	1.5 [µm], 1.3 [µm]
	Received Power	
ATTN [3]	Output	Enable, Disable
	Power Set [4]	-50.000 to 19.000 [dBm]
	ATT	0.000 to 60.000 [dB]
	ATT Offs	-200.000 to 200.000 [dB]

2 Displayed only when EO/OE is mounted.
3 Displayed only when ATTN or ATTN-OPM is mounted.
4 Displayed only when ATTN-OPM is mounted.

Display and Setup Items

Display and Setup Items of PPG Page

Item Name	Setting Range	Description
PPG IF	Electric, Optic	Whether the electrical interface (BERT module only) is used or optical interface (optional optical modulation module) is used together is set and displayed. • Electric: Electrical interfaceHowever, the signal is also output to [8] Data (for optical modulator) output terminal. • Optic: Optical interfaceThe signal is not output to [4] Non-invert data output terminal and [5] Invert data output terminal.
Data Amplitude	0.50 to 2.00 [Vpp] Step value: 0.01 [Vpp]	The amplitude of the PPG data output signal is set and displayed. Both [4] Non-invert data output terminal and [5] Invert data output terminal are set with the same amplitude at the same time.
Data Offset	−2.00 to 3.00 [V] Step value: 0.01 [V]	The DC offset voltage of the PPG data output signal is set and displayed. Both [4] Non-invert data output terminal and [5] Invert data output terminal are set with the same offset voltage at the same time.
Data Cross Point	30 to 70 [%] Step value: 1 [%]	The cross point position of [4] Non-invert data output terminal of the PPG data output signal is set and displayed. The cross point signal, that the setting ranging from 100[%] to set value is subtracted, is output to [5] Invert data output terminal.
Clock Source	Internal, REF Clk, Ext Clk	The clock source of the PPG is set and displayed. • Internal: The internal SG is used. • REF Clk: The clock signal synchronized with the clock input to [14] External synchronization signal input terminal is used. • Ext Clk: Operated with 10GHz-band clock input to [15] External clock signal input terminal.
Bitrate	9.950000 to 11.320000 [Gbit/s] Step value: 0.000001 [Gbit/s]	The bitrate of the built-in SG clock is set and displayed.
Bitrate Offset	−100 to 100 [ppm] Step value: 1 [ppm]	The frequency displacement amount from the set bitrate is set and displayed in units of ppm.
Divide Ratio	1/16, 1/64	When the clock source is REF Clk, the frequency dividing ratio of the reference clock signal for external synchronization to bitrate is set and displayed. • 1/16: Clock is input, which is 1/16 of the bitrate. • 1/64: Clock is input, which is 1/64 of the bitrate.
Clock Offset	−2.00 to 3.00 [V] Step value: 0.01 [V]	The DC offset voltage of the clock output signal is set and displayed. The same offset voltage is output to both [6] Non-invert clock signal output terminal and [7] Invert clock signal output terminal.

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BER Measurement Function

Display and Setup Items of ED Page

Item Name	Setting Range	Description
Input Select	Data In 1, Data In 2	The input terminal of the ED data signal is set and displayed. • Data In 1: Measures the signal of [11] Data input 1 terminal built-into the CDR. • Data In 2: Measures the signal of [12] Data input 2 terminal. When selecting this item, the clock input is required.
Data Threshold	When Input select = Data In 1 −350 to 350[mV] When Input select = Data In 2 −300 to 300[mV] Step value: 1 [mV]	The threshold voltage of the data input of the ED is set and displayed.
Auto Sync	ON, OFF	Whether the auto synchronization of the ED is turned ON or OFF is set and displayed. • ON: Turns ON the auto synchronization. • OFF: Turns OFF the auto synchronization. Normally, this setup item is set at ON. However, if the error rate of the signal or variation in error rate is large, set this setup item to OFF. For details, see section 1.5 in IM 735101-03EN.
Clock Source	Internal, REF Clk, Ext Clk	The clock source of the PPG is set and displayed. • Internal: The internal SG is used. • REF Clk: The clock signal synchronized with the clock input to [14] External synchronization signal input terminal is used. • Ext Clk: Operated with 10GHz-band clock input to [15] External clock signal input terminal.
Bitrate	9.950000 to 11.320000 [Gbit/s] Step value: 0.000001 [Gbit/s]	The bitrate of the built-in SG is set and displayed.
Bitrate Offset	−100 to 100 [ppm] Step value: 1 [ppm]	The frequency displacement amount from the set bitrate is set and displayed in units of ppm.
Divide Ratio	1/16, 1/64	When the clock source is REF Clk, the frequency dividing ratio of the reference clock signal for external synchronization to bitrate is set and displayed. • 1/16: Clock is input, which is 1/16 of the bitrate. • 1/64: Clock is input, which is 1/64 of the bitrate.

Display and Setup Items of DAT Page

Item Name	Setting Range	Description
Setup	PPG, ED, Couple	Whether the PPG and ED patterns of the data setting are set individually or the same setting is performed is displayed. • PPG: Only PPG is set individually. • ED: Only ED is set individually. • Couple: The same setting is made for the PPG and ED.
Pattern	PRBS, Prog256, {Prog64M}, {SDH/SONET}	The type of the PPG output data/ED measurement data is set and displayed. • PRBS: PRBS (pseudo random pattern) • Prog256: Arbitrary pattern (program pattern) Up to 256 bits {Optional} • Prog64M: Arbitrary pattern (program pattern) Up to 67108864 bits • SDH/SONET: SDH/SONET frame pattern
PRBS Length	PRBS7, PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, PRBS31	When "Pattern = PRBS (pseudo random pattern)" is selected, the number of PRBS steps is set and displayed.
Program Length	16 to 256 [bit] Step value: 1 [bit] {256 to 67108864 [bit] Step value: 128 [bit] }	When "Pattern = Prog256 (program pattern)" is selected, the bit length of the arbitrary pattern is set and displayed. {Optional} When "Pattern = Prog64M (program pattern)" is selected, the bit length of the arbitrary pattern is set and displayed.
Program Edit	00 to FF in hexadecimal notation, 0/1 in binary notation	When "Pattern = Prog256 (program pattern)" is selected, the arbitrary pattern is edited. When "Pattern = Prog64M" is selected, the pattern cannot be edited.
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	Conditions for coding error to be added when Error add is ON are set and displayed. • Single: When the Error add key is pressed, only 1-bit coding error is added. • 1.0E-3 to 1.0E-12: Coding error is added at the selected coding error rate.
PPG Logic	Positive, Negative	Whether the PPG data output signal is positive logic or negative logic is set and displayed. • Positive: The positive logic is output from [4] Non-invert data output terminal and the negative logic is output from [5] Invert data output terminal. • Negative: The negative logic is output from [4] Non-invert data output terminal and the positive logic is output from [5] Invert data output terminal.
ED Logic	Positive, Negative	Whether the ED data input signal is positive logic or negative logic is set and displayed. • Positive: The positive logic is input to [11] Data input 1 terminal and [12] Data input 2 terminal. • Negative: The negative logic is input to [11] Data input 1 terminal and [12] Data input 2 terminal.
Payload	PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, PRBS31	When "Pattern = SOH/SONET (frame pattern)" is selected, the PRBS pattern length of payload is set and displayed.

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BER Measurement Function

Display and Setup Items of MES Page

Item Name	Setting Range	Description
Mes Mode	Single, Manual, Repeat	The measurement mode is set and displayed. • Single: The measurement is performed for a period of measurement time set in Measure day/Measure time. • Manual: The measurement is performed until the measurement is stopped.(However, note that the maximum measurement period is 10 days.) • Repeat: The measurement is performed repeatedly for a period of measurement time set in Measure day/Measure time.
Mes Day	0 to 10 [day] Step value: 1 [day]	The measurement period (number of days) is set and displayed.
Mes Ttime	00:00:01 to 23:59:59 [h]:[m]:[s] Step value: 1[h] / 1[m] / 1[s]	The measurement period (hour, minute, second) is set and displayed.
Buzzer	OFF /Soft /Medium /Loud	The buzzer sound volume, which is given if the error is detected, is set and displayed.Buzzer • OFF: No buzzer sound • Soft: Small buzzer sound • Medium: Medium buzzer sound • Loud: Loud buzzer sound
Trigger	TX1/16, TX1/64, TXPatt, TX ERR, RX1/16, RX1/64, RXPatt, RX ERR	The signal to be output to [16] Trigger output terminal is set and displayed. • TX1/16: Outputs the signal, which is 1/16 of the clock frequency. • TX1/64: Outputs the signal, which is 1/64 of the clock frequency. • TXPatt: Outputs the trigger signal synchronized with the output pattern. • TX ERR: Outputs the signal every time the error is added to the PPG. • RX1/16: Outputs the signal, which is 1/16 of the input clock or regeneration clock frequency. • RX1/64: Outputs the signal, which is 1/64 of the input clock or regeneration clock frequency. • RXPatt: Outputs the trigger signal synchronized with the input pattern. • RX ERR: Outputs the signal every time the error is detected in the input signal.

Display and Setup Items of UTL Page

Item Name	Setting Range	Description
Parameter Load[1]	—	Loads the setting parameter file from the USB memory.
Parameter Save[1]	—	Saves the setting parameter file into the USB memory.
Long prog Load[1]	—	Loads an arbitrary pattern (program pattern) file from the USB memory.
SOH/TOH Load[1]	—	Loads an overhead data file of SOH/TOH frame pattern from the USB memory.
Logging[1]	ON, OFF	Whether or not the log of the BER measurement results is obtained is set and displayed. • ON: Log is obtained. • OFF: Log is not obtained.
Logging Period	1 sec, 10 sec, 1 min, 10 min, 1 hour	A period of time to obtain the log is set and displayed. • 1 sec: 1-sec period • 10 sec: 10-sec period • 1 min: 1-min. period • 10 min: 10-min. period • 1 hour: 1-hr. period
Logging Mode	ALL, Error only, LastRes only	The log obtaining operation mode is set and displayed. • ALL: All measurement results are written into the USB memory at logging intervals set in Logging Period. • Error only: The measurement results if an error occurs are written into the USB memory at logging intervals set in Logging Period. • LastRes only: The total measurement results from the measurement start are written into the USB memory when the measurement is completed (measurement time has elapsed, The STOP Meas soft key is pressed, or measurement is restarted after the setting has been changed).

1 The operation and setting cannot be made if any USB memory is not mounted on the front of the frame controller.

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BER Measurement Function

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	1.5 [µm], 1.3 [µm]	The wavelength band of the receiving light is set and displayed. • 1.5 [µm]: When the wavelength of the receiving light is 1.5 [µm] • 1.3 [µm]: When the wavelength of the receiving light is 1.3 [µm]
Received Power	—	The average optical receiving power of the optical receiver is shown.

Display and Setup Items of ATTN Page

Item Name	Setting Range	Description
Output	Enable / Disable	The data output of the optical attenuator is turned ON or OFF. • Enable: Output is turned ON. • Disable: Output is turned OFF (GND-level).

ATT	SMF
	  0.000 to 60.000 [dB]
	MMF
	  0.000 to 45.000 [dB]
	Step value: 0.001 [dB]
		The optical attenuation is set and displayed.

Power Set (ATTN-OPM)	−50.000 to 19.000 [dBm] Step value: 0.001 [dBm]	The output range of the optical attenuation is set and displayed.
ATT offs	−200.000 to 200.000 [dB] Step value: 0.001 [dB]	The offset value of the optical attenuation is set and displayed.

*   This application cannot control the AQ2200-342 module.

6.3 Starting Up the Application

When the BERT module is mounted on the AQ2211 Frame Controller (3-Slot type) or only the BERT module is mounted on the AQ2212 Frame Controller (9-Slot type)

1. Press **APPLI** to display the APPLICATION screen.

2. Use the arrow keys to move the cursor to BERT, and press the **OK** soft key or **ENTER**.
   The BERT APPLICATION screen appears.

APPLICATION SELECT Screen

BERT APPLICATION Screen (PPG Tab)

Note

To close the screen, press CANCEL.

When the BERT module is mounted on the AQ2212 Frame Controller (9-Slot type) together with other modules

Procedure

1. Press **APPLI** to display the APPLICATION screen.

2. Use the arrow keys to move the cursor to BERT, and press the **OK** soft key or **ENTER**.
   The MODULE SELECT for BERT screen appears.
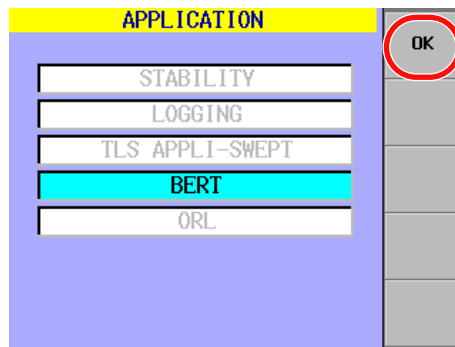
Note

To close the screen, press CANCEL.

3. Use the arrow keys to move the cursor to a module that you want to use for BER measurement, and press the **Select** soft key.

4. To select multiple modules, repeat step 3.

5. Press the **Start** soft key to display the BERT APPLICATION screen.
   Press the **Cancel** soft key to return to the APPLICATION screen.
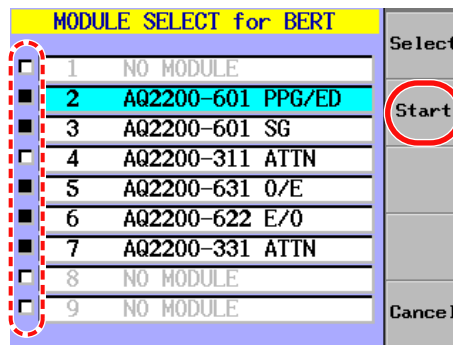
BERT APPLICATION Screen (PPG Tab)

Note

- The boxes to the left of the selected modules are black.
- 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.
- You cannot select the ATTN module and ATTN-OPM module at same time.

Note

Precautions for staring/stopping the BERT application

If you start or stop the BERT application during a measuring operation, the measuring operation will be cancelled.

6

BER Measurement Function

6.4 Setting the Measurement Conditions

Selecting the measurement item display (Result)

Procedure

1. Use the arrow keys to move the cursor to Result, and press **ENTER**.
   A dialog box for selecting what results to display and how to display them appears.
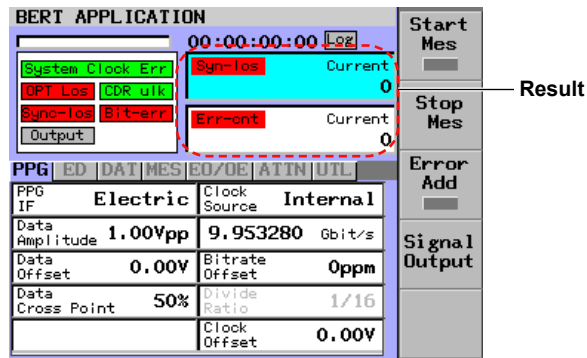
- **Selecting What Measurement Items to Display**

2. Use the arrow keys to move the cursor to Result Select, and press **ENTER**.
   A dialog box for selecting what results to display appears.
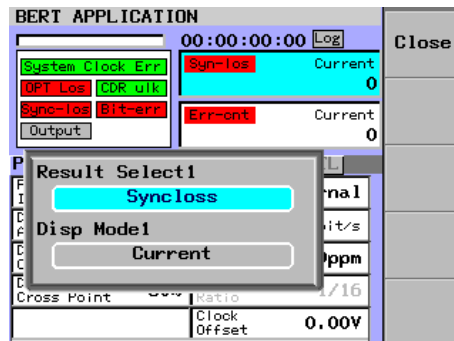
3. Use the arrow keys to move the cursor to one of the following options: Sync loss, Error Count, Error Rate, OH Error Count, OH Error Rate, TXbitrate, RX Bitrate, or Receive Opt power, ATT Power mon. Then, press the **OK** soft key or **ENTER**.

   You can select Receive Opt pwr when using an optical receiver module (AQ2200-631). You can select ATT Power mon when using an ATTN module (AQ2200-331).
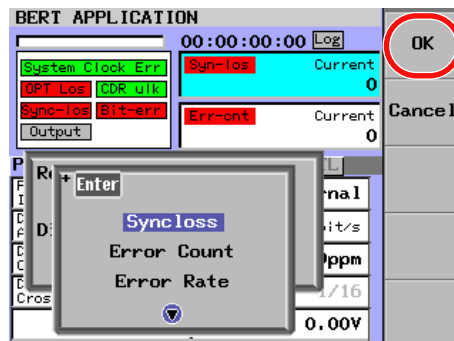
• **Selecting the Display Mode**

2. Use the arrow keys to move the cursor to Disp Mode, and press **ENTER**.
A list for selecting the display mode appears.
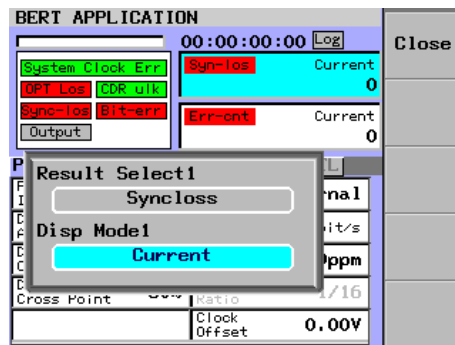
3. Use the arrow keys to move the cursor to Current, 100ms, or Last, and press the **OK** soft key or **ENTER**.

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BER Measurement Function
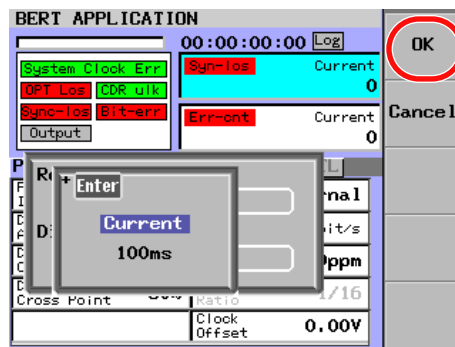
Explanation

On this screen, you can set measurement items (Result) to be displayed during measurement and their display modes (Disp mode). Select two setup items from the following list.

For details about items, see "1-4 Measurement result display" in section 6.1.

Result select
- Sync loss: Shows the synchronization status of the ED using the lamp, and the sync loss time using the numeric value.
- Error Count: Shows the error status using the lamp, and the number of error bits using the numeric value.
- Error Rate: Shows the error rate using the numeric value.
- OH Error Count [1]: Shows the error status detected only in the first line of the SDH/SONET frame's overhead section using the indicator lamps, along with the number of error bits.
- OH Error Rate [1]: Shows the ratio of the number of error bits (OH Error count) detected only in the first line of the SDH/SONET frame's overhead section, to the total number of error bits received (Error count).
- TX Bitrate: Shows the send bitrate of the PPG.
- RX Bitrate: Shows the receive bitrate of the ED.
- Receive Opt pwr [2]: Shows the average light receiving power.
- ATT Power mon [3]: Shows the power monitor of the optical attenuation.

  1 Only selectable if SDH/SONET is supported.
  2 This item can be selected only when this module is used together with the Optical Receive Module (AQ2200-631).
  3 This item can be selected only when this module is used together with the ATTN Module (AQ2200-331).

The timing to update the screen is set and displayed.

Disp mode
- Current: Shows the value accumulated from the start of measurement in real time.
- 100ms: Shows the value measured for 100 ms at intervals of 100 ms.
- Last: Shows the value for one cycle until the measurement for the next cycle completes.

Note
- When the set update duration elapses in the time display setting, the counter (Sync loss, Error count, or Error rate) of the measurement result display is cleared.
- Even though the Disp mode is changed, only the measurement result display is changed and it does not affect the measurement itself.
- Current display
  The Current display is used to assure the error rate, such as inspection of the DUT. When the Disp mode is set to the Current display, the BER measurement is performed for a constant period of time to check that even 1-bit error does not occur after starting.
- 100 ms display and Last display
  When finding an optimal value, such as testing or adjustment of the DUT, the 100 ms display or Last display is used.
  If the adjustment of the DUT is not the optimal value and the error occurs frequently, check the increase/decrease of the error according to the adjustment using the display by time.

Selecting the PPG interface (PPG IF)

Procedure

1. Use the **SLOT** keys to make PPG the current module.

2. Use the arrow keys to move the cursor to PPG IF, and press **ENTER**.
   A list for selecting the interface appears.

Select PPG for the current module
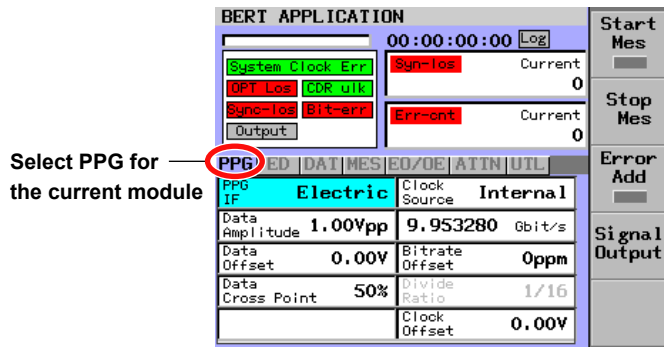
3. Use the arrow keys to move the cursor to Electric or Optic, and press the **OK** soft key or **ENTER**.

Explanation

Whether the PPG IF uses the electric interface or optical interface is set and displayed.

PPG IF
- Electric: Electric interface is used. (Only BERT module is used.)
- Optic: Optical interface is used. (Optional modulation module[1] is used together.)

   1 Optical modulation module (AQ2200-621/622)

Note

If you set PPG IF to Optic, no signal is output to the DATA OUT terminal nor the DATA OUT terminal.
Additionally, you cannot configure Data amplitude, Data offset, nor Data cross point.

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BER Measurement Function

Setting the data amplitude (Data Amplitude)

Procedure

1. Use the **SLOT** keys to make PPG the current module.

2. Use the arrow keys to move the cursor to Data Amplitude, and press **ENTER**.
   A numeric input dialog box appears.
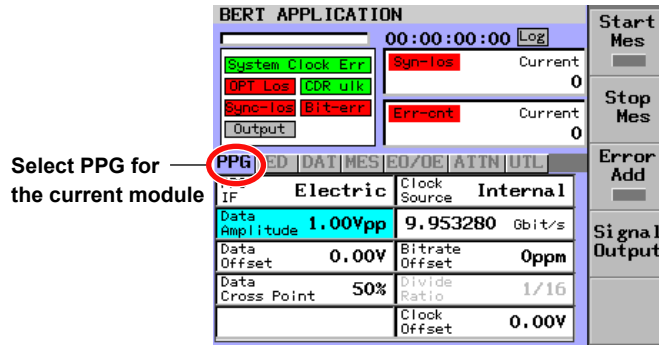
Select PPG for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.

Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The amplitude of the PPG data output signal is set and displayed.

Data amplitude: 0.50 to 2.00 [Vpp]   0.01 [Vpp] step

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

CAUTION

Always set the output level correctly so that it does not exceed the absolute maximum rating of the DUT or measuring instrument.

French

ATTENTION

Toujours définir un niveau de sortie correct afin de ne pas dépasser la valeur nominale maximum absolue du DUT ou de l'instrument de mesure.

Note

- This item becomes valid when "Electric" is selected for the PPG IF. When the PPG IF is set to "Optic", this item is dimmed (shown in gray) and it cannot be selected.
- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

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BER Measurement Function

Setting the offset voltage of the data (Data Offset)

Procedure

1. Use the **SLOT** keys to make PPG the current module.

2. Use the arrow keys to move the cursor to Data Offset, and press **ENTER**.
   A numeric input dialog box appears.
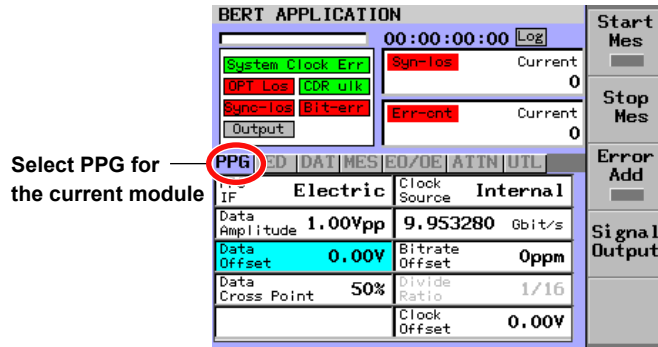
Select PPG for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
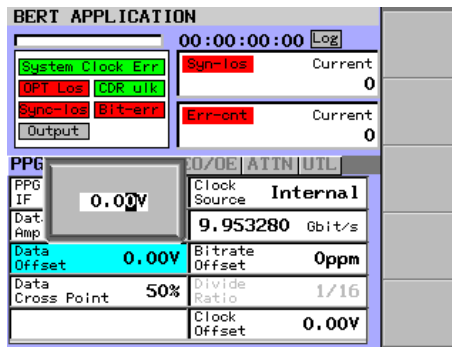
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The DC offset voltage of the PPG data output signal is set and displayed.

Data offset: −2.00 to 3.00 [V]   0.01 [V] step

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

CAUTION

Always set the output level correctly so that it does not exceed the absolute maximum rating of the DUT or measuring instrument.

French

ATTENTION

Toujours définir un niveau de sortie correct afin de ne pas dépasser la valeur nominale maximum absolue du DUT ou de l'instrument de mesure.

Note

- This item becomes valid when "Electric" is selected for the PPG IF. When the PPG IF is set to "Optic", this item is dimmed (shown in gray) and it cannot be selected.
- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

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BER Measurement Function

Setting the data cross point (Data Cross Point)
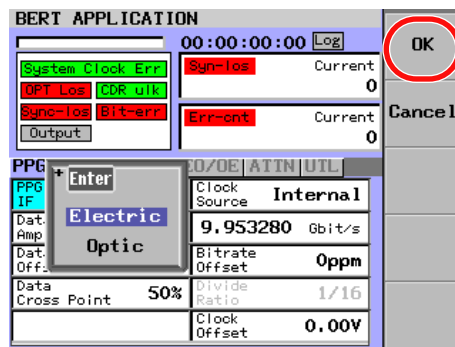
Procedure

1. Use the **SLOT** keys to make PPG the current module.

2. Use the arrow keys to move the cursor to Data Cross Point, and press **ENTER**.
   A numeric input dialog box appears.
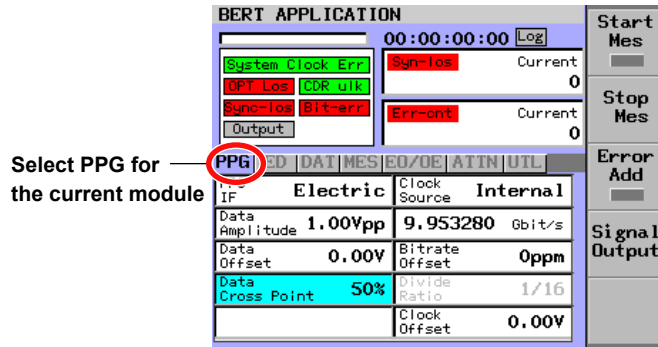
Select PPG for
the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
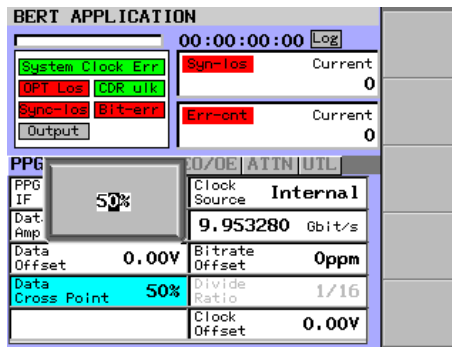
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.
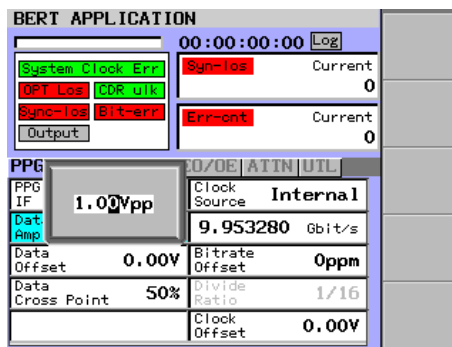
Explanation

The cross point position of the data non-invert output terminal of the PPG data output signal is set and displayed.
The signal of the cross point, that a value ranging from 100[%] to the set value is subtracted, is output to the data invert output terminal.

Data Cross Point: 30 to 70 [%]   1 [%] step

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

Note

- This item becomes valid when "Electric" is selected for the PPG IF. When the PPG IF is set to "Optic", this item is dimmed (shown in gray) and it cannot be selected.
- When changing the set value with the arrow keys, it is set accordingly.
- When "SHIFT" is displayed, the numeric keypad can be used.
  To use the numeric keypad while "SHIFT" is not displayed, press the [SHIFT] key.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

Selecting the clock source (Clock Source)

Procedure

1. Use the **SLOT** keys to make PPG or ED the current module.

2. Use the arrow keys to move the cursor to Clock Source, and press **ENTER**. A list for selecting the clock source appears.

Select PPG or ED for the current module

3. Use the arrow keys to move the cursor to Internal, REF Clk, or Ext Clk, and press the **OK** soft key or **ENTER**.

Explanation

The clock source of the PPG is set and displayed.

Clock Source
- Internal: The internal SG is used.
- REF Clk: The clock signal synchronized with the clock input to External synchronization input terminal is used.
- Ext Clk: Operated with 10GHz-band clock input to External clock input terminal.

Setting the bitrate (Bitrate)

Procedure

1. Use the **SLOT** keys to make PPG or ED the current module.

2. Use the arrow keys to move the cursor to Bitrate, and press **ENTER**.
   A numeric input dialog box appears.
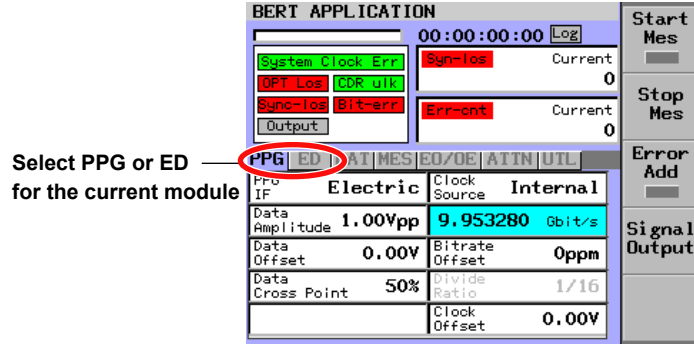
Select PPG or ED for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
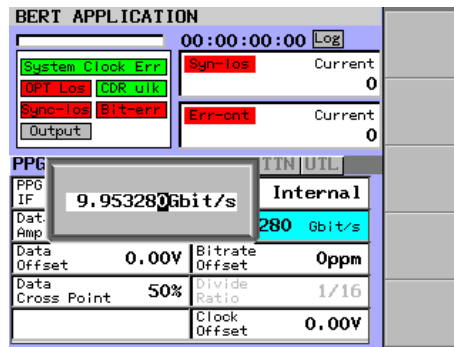
Note
For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The bitrate of the built-in SG clock is set and displayed.

Bitrate: 9.950000 to 11.320000 [Gbit/s]   0.000001 [Gbit/s] step (= 1 [kbit/s] step)

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

Note
- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

Setting the bitrate offset (Bitrate Offset)

Procedure

1. Use the **SLOT** keys to make PPG or ED the current module.

2. Use the arrow keys to move the cursor to Bitrate Offset, and press **ENTER**.
A numeric input dialog box appears.

Select PPG or ED
for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press
ENTER.
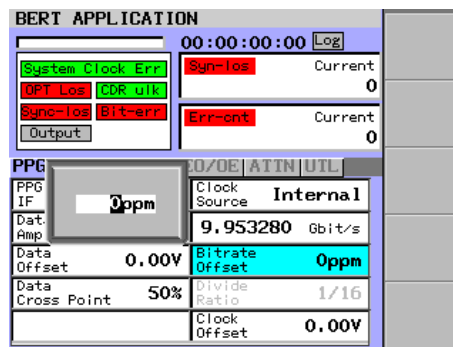
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The frequency displacement amount from the set bitrate is set and displayed in units of ppm.

Bitrate Offset: −100 to 100 [ppm]   1 [ppm] step

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

Note

- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

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BER Measurement Function

Selecting the frequency dividing ratio of the reference clock (Divide Ratio)

Procedure

1. Use the **SLOT** keys to make PPG or ED the current module.

2. Use the arrow keys to move the cursor to Divide Ratio, and press **ENTER**.
A list for selecting the frequency dividing ratio appears.

Select PPG or ED
for the current module
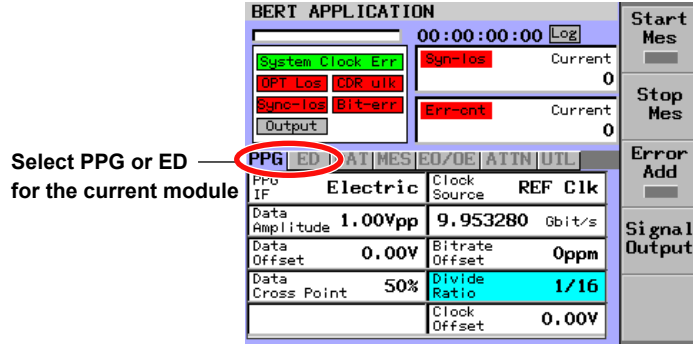
3. Use the arrow keys to move the cursor to 1/16 or 1/64, and press the **OK** soft key
or **ENTER**.

Explanation

When the clock source is the reference clock (REF Clk), the frequency dividing ratio
when compared to the bitrate is set and displayed.

Divide Ratio
• 1/16: Clock is input, which is 1/16 of the bitrate.
• 1/64: Clock is input, which is 1/64 of the bitrate.

Note

This item becomes valid when "REF Clk" is selected for the Clock source.
When the Clock source is set to "Internal" or "Ext Clk", this item is dimmed (shown in gray) and
it cannot be selected.

Setting the clock offset voltage (Clock Offset)

Procedure

1. Use the **SLOT** keys to make PPG the current module.

2. Use the arrow keys to move the cursor to Clock Offset, and press **ENTER**.
   A numeric input dialog box appears.
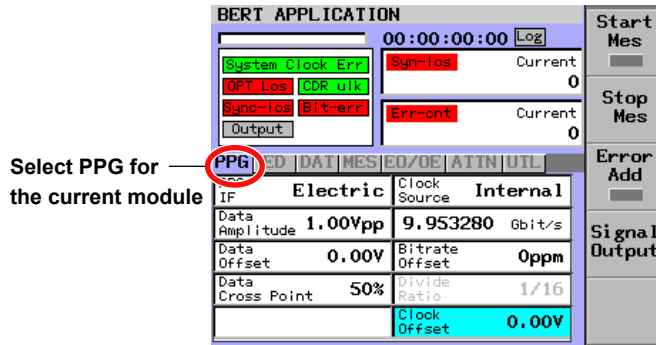
Select PPG for
the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
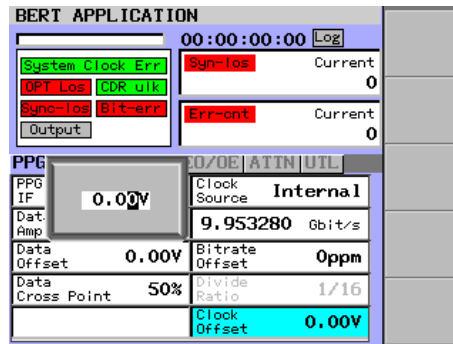
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The DC offset voltage of the clock output signal is set and displayed.
The same offset voltage is output to both Clock (non-invert) output terminal and Clock (invert) output terminal.

Clock Offset: −2.00 to 3.00 [V]   0.01 [V] step

For the function, see "Output Variable Change Function" in section 1.6 of IM 735101-03EN.

CAUTION

Always set the output level correctly so that it does not exceed the absolute maximum rating of the DUT or measuring instrument

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French

ATTENTION

Toujours définir un niveau de sortie correct afin de ne pas dépasser la valeur nominale maximum absolue du DUT ou de l'instrument de mesure.
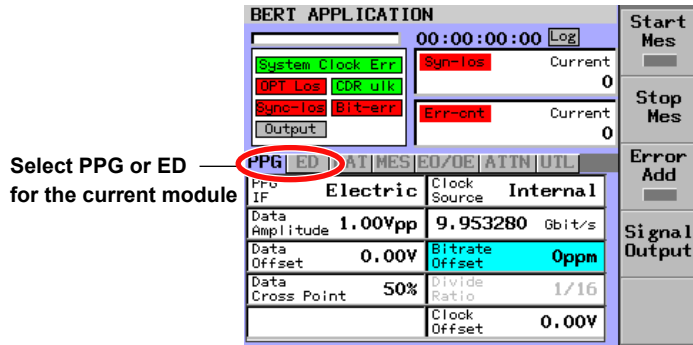

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BER Measurement Function

Note

- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
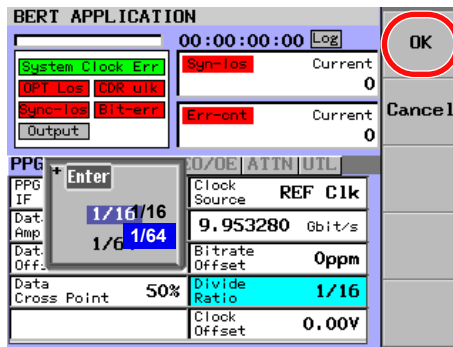
Selecting the data input terminal (Input Select)

Procedure

1. Use the **SLOT** keys to make ED the current module.

2. Use the arrow keys to move the cursor to Input Select, and press **ENTER**.
A list for selecting the data input terminal appears.

Select ED for the current module
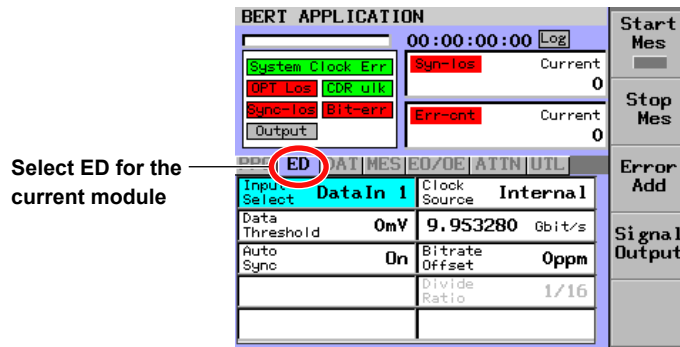
3. Use the arrow keys to move the cursor to DataIn 1 or DataIn 2, and press the **OK** soft key or **ENTER**.

Explanation

The data signal input terminal of the ED is set and displayed.

Input Select
- DataIn 1: CDR is used.
  The signal of [11] Data input 1 terminal built into the CDR is measured.
- DataIn 2: CDR is not used.
  The signal of [12] Data input 2 terminal is measured. When selecting this item, the clock input is required.

Setting the data threshold value (Data Threshold)

Procedure

1. Use the **SLOT** keys to make ED the current module.
2. Use the arrow keys to move the cursor to Data Threshold, and press **ENTER**.
   A numeric input dialog box appears.
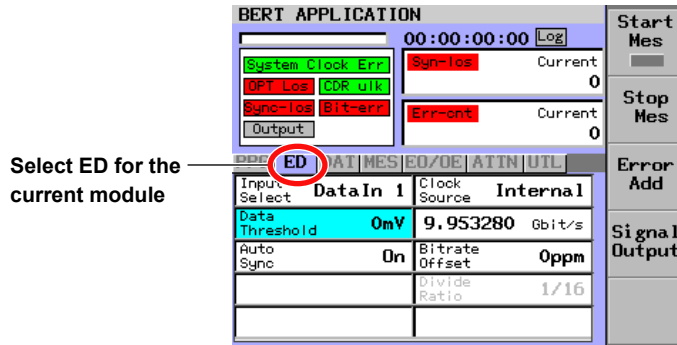
Select ED for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
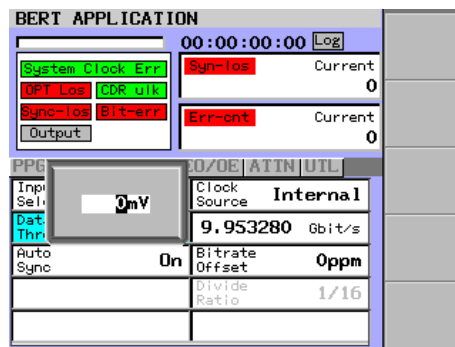
Note
For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The threshold voltage of the data input signal of the ED is set and displayed.

Data Threshold:
  When "Input select" is "DataIn 1 (CDR)":   −350 to 350 [mV]   1 [mV] step
  When "Input select" is "DataIn 2 (Normal)": −300 to 300 [mV]   1 [mV] step

For the function, see "Threshold Level Variable Change Function" in section 1.6 of IM 735101-03EN.

Note
• When changing the set value with the arrow keys, it is set accordingly.
• If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

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BER Measurement Function

Selecting the synchronization method (Auto Sync)

Procedure

1. Use the **SLOT** keys to make ED the current module.

2. Use the arrow keys to move the cursor to Auto Sync, and press **ENTER**.
   A list for selecting the synchronization method appears.
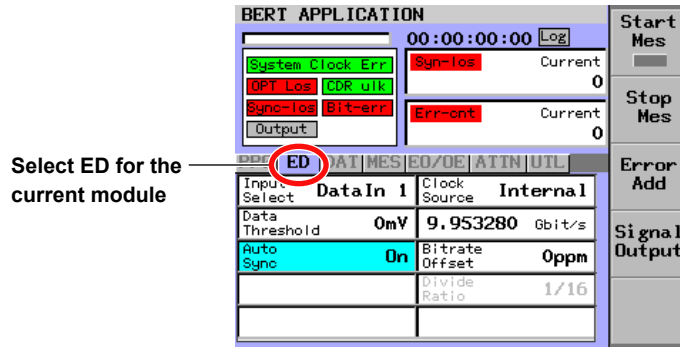
Select ED for the current module

3. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.

Explanation

Whether the auto synchronization of the ED is turned ON or OFF is set and displayed.

Auto Sync
- ON: Turns ON the auto synchronization.
- OFF: Turns OFF the auto synchronization

For the function, see "Auto Sync Function", "PRBS Pattern Synchronization Method", "Program Pattern Synchronization" in section 1.6 of IM 735101-03EN.

Selecting the data setup method (Setup)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Setup, and press **ENTER**.
   A list for selecting the data setup method appears.

Select DAT for
the current module
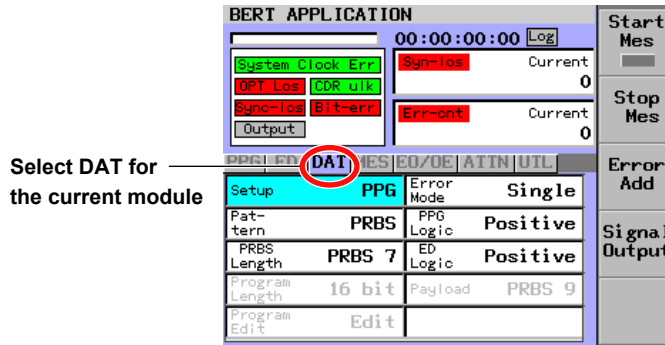
3. Use the arrow keys to move the cursor to PPG, ED, Couple Copy PPG->ED, or Couple Copy ED->PPG, and press the **OK** soft key or **ENTER**.

Explanation

Whether the PPG and ED patterns of the data setting are set individually or the same setting is performed is displayed.

Setup
- PPG: Only PPG is set individually.
- ED: Only ED is set individually.
- Couple (Copy PPG->ED): The data setting of PPG is copied to ED.
- Couple (Copy ED->PPG): The data setting of ED is copied to PPG.
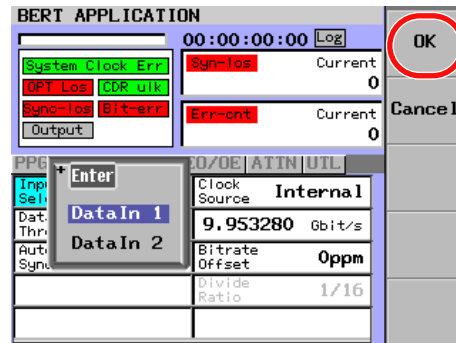
6

BER Measurement Function

Selecting the pattern (Pattern)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Pattern, and press **ENTER**.
   A list for selecting the pattern appears.

Select DAT for the current module
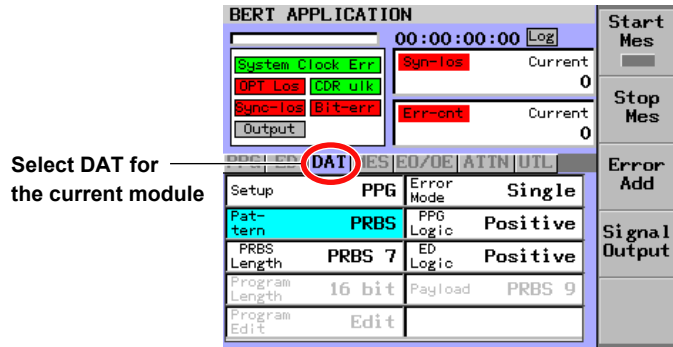
3. Use the arrow keys to move the cursor to PRBS, Prog256, Prog64M, or SDH/SONET and press the **OK** soft key or **ENTER**.

Explanation

The type of the PPG output data/ED measurement data is set and displayed.

Pattern
- PRBS: PRBS (Pseudo random pattern)
- Prog256:   Arbitrary pattern of up to 256 bits (Program pattern)
- Prog64M: Arbitrary pattern of up to 64 Mbit (Program pattern)
- SDH/SONET: Frame pattern of SDH/SONET

Prog64M and SDH/SONET can be selected when a module with option is installed.

Selecting the pattern length of PRBS (PRBS Length)

Procedure

1. Use the **SLOT** keys to make DAT the current module.
2. Use the arrow keys to move the cursor to PRBS Length, and press **ENTER**.
    A list for selecting the pattern length appears.

Select DAT for the current module
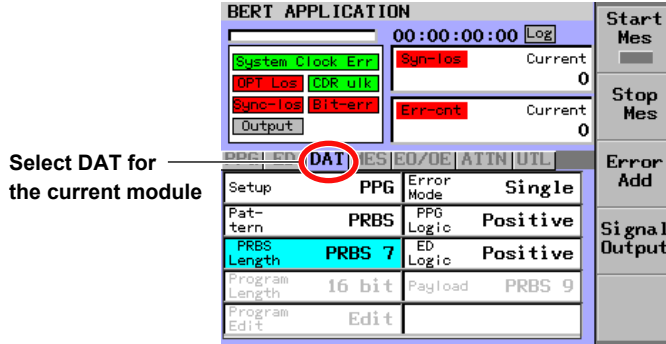
3. Use the arrow keys to move the cursor to PRBS7, PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, or PRBS31, and press the **OK** soft key or **ENTER**.
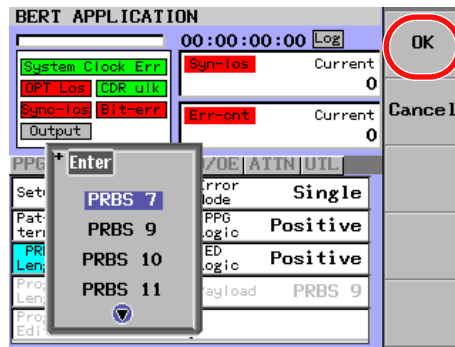
Explanation

When "Pattern = PRBS (Pseudo random pattern)" is selected, the pattern length of PRBS is set and displayed.

PRBS Length: PRBS7, PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, PRBS31

For the function, see "Pseudo Random Pattern (PRBS Pattern) Generation" in section 1.6 of IM 735101-03EN.

Note

This item becomes valid when "PRBS" is selected for the Pattern.
When the Pattern is set to "Prog256", "Prog64M", or "SDH/SONET", this item is dimmed (shown in gray) and it cannot be selected.

6

BER Measurement Function

Setting the program length (Program Length)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Program Length, and press **ENTER**.
   A numeric input dialog box appears.
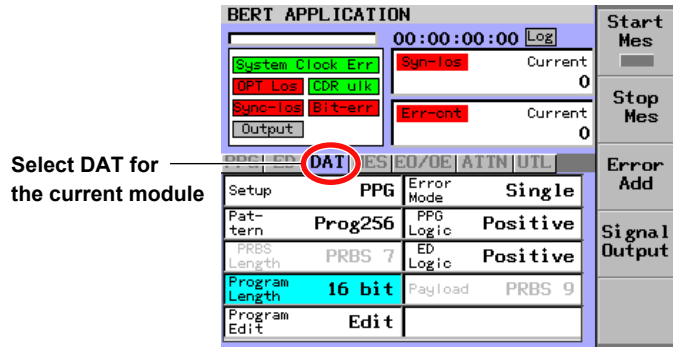
Select DAT for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press the **OK** soft key or **ENTER**.
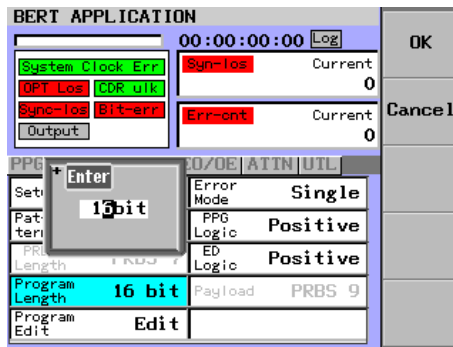
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

When "Pattern = Prog256 / Prog64M (program pattern)" is selected, the bit length of the arbitrary pattern is set and displayed.

Program Length:

16 to 256 [bit]	1 [bit] step (When "pattern = prog256" is selected.)
256 to 671088064 [bit]	128 [bit] step (When "pattern = prog64M" is selected.)

Note

• This item becomes valid when "Prog256" or "Prog64M" is selected for the Pattern.
   When the Pattern is set to "PRBS" or "SDH / SONET", this item is dimmed (shown in gray) and it cannot be selected.

• When changing the set value with the arrow keys, it is set accordingly.

• If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
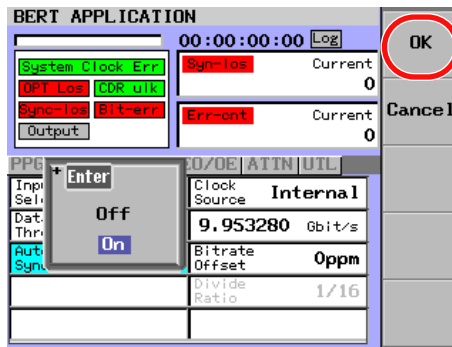
Editing the program pattern (Program Edit)
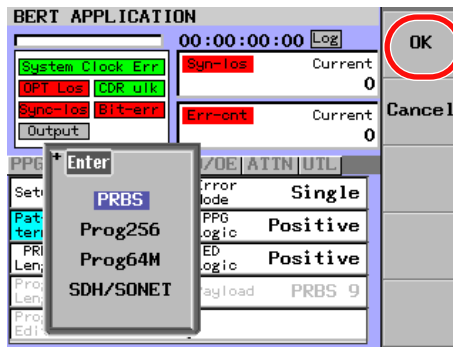
Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Program Edit, and press **ENTER**.
   The program edit display appears in the bottom of the screen.

Select DAT for the current module
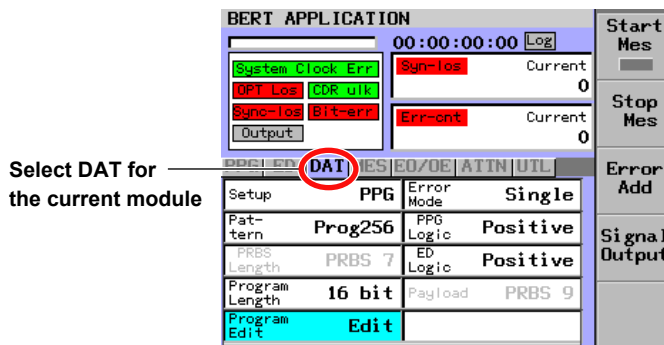
Selecting the Input Mode

3. Press the **Mode** soft key.
   A list for selecting the data display format appears.
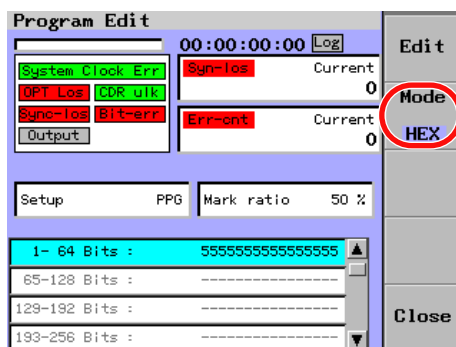
4. Use the arrow keys to move the cursor to BIN or HEX, and press the **OK** soft key or **ENTER**.

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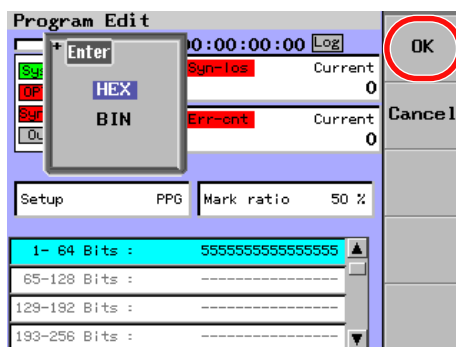
Editing the Program Pattern

5. Use the arrow keys to move the cursor to the editing area of the program pattern that you want to edit, and press the **Edit** soft key or **ENTER**.

In HEX mode a soft keyboard appears, while in BIN mode a numeric keypad appears.
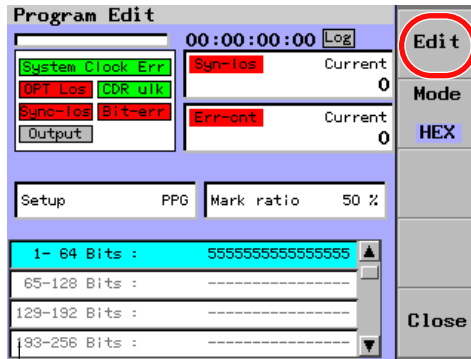
Program pattern editing area

6. Input data using the soft keyboard or the numeric keypad.

In HEX Mode   **In BIN Mode**
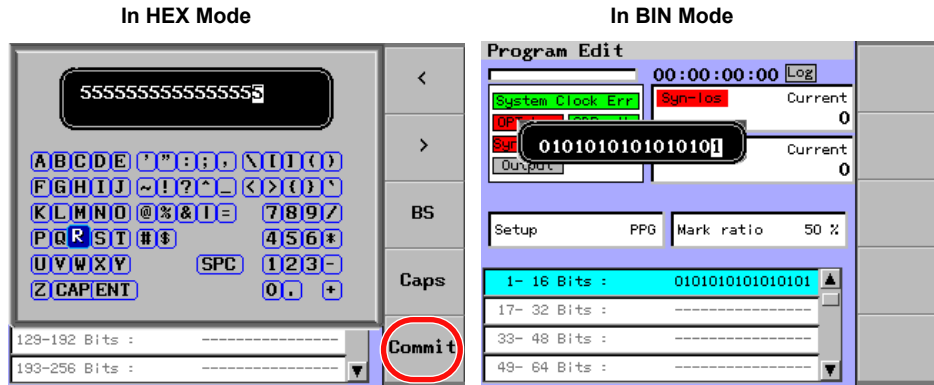
- **In HEX Mode**

7. Use the soft keyboard to enter text, and press the **Commit** soft key.
The data is confirmed and displayed.

To edit other areas, repeat steps 5 through 7.

- **In BIN Mode**

7. Use the numeric keypad to enter a value, and press **ENTER**.
The data is confirmed and displayed.

To edit other areas, repeat steps 5 through 7.

Note

- This item becomes valid when "Prog256" is selected for the Pattern.
When the Pattern is set to "PRBS", "Prog64M", or "SDH/SONET", this item is dimmed (shown in gray) and it cannot be selected.
- If a value out of the setting range of the specification is input with the numeric keypad, 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 information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.
- For information about how to enter text, see section 2.4 in IM 735101-03EN.

Explanation

The Program edit screen consists of display elements described below.
When "Pattern = Prog256 (program pattern)" is selected, the arbitrary pattern is edited.

• 00 to FF (Hexadecimal notation)
• 0/1 (Binary notation)
You cannot edit the program pattern when Pattern is set to Prog64M.

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Selecting the error rate (Error Mode)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Error Mode, and press **ENTER**.
   A list for selecting the error rate appears.

Select DAT for the current module
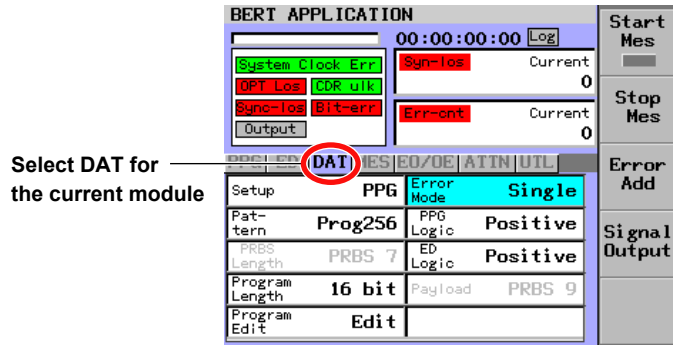
3. Use the arrow keys to move the cursor to Single, 1.0E-3, 1.0E-4, 1.0E-5, 1.0E-6, 1.0E-7, 1.0E-8, 1.0E-9, 1.0E-10, 1.0E-11, or 1.0E-12, and press the **OK** soft key or **ENTER**.
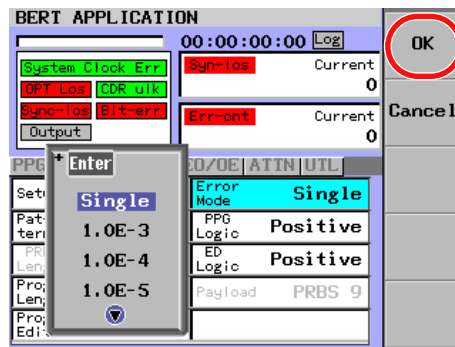
Explanation

Conditions for coding error to be added when Error add is ON are set and displayed.

Error Mode

- Single: When you press the Error add soft key, only a code error of 1 bit is added.
- 1.0E-3 to 1.0E-12: Coding error is added at the selected coding error rate.

Selecting the output data logic (PPG Logic)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to PPG Logic, and press **ENTER**.
   A list for selecting the output data logic appears.
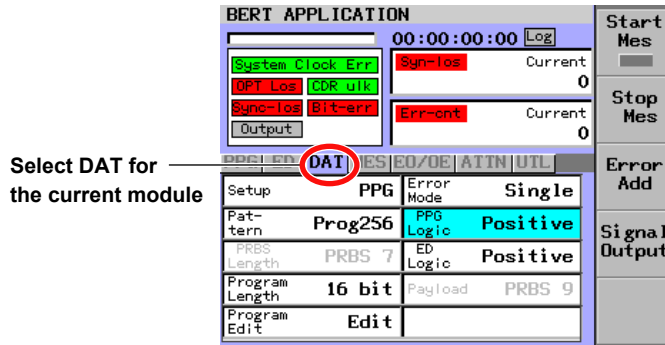
Select DAT for the current module

3. Use the arrow keys to move the cursor to Positive or Negative, and press the **OK** soft key or **ENTER**.
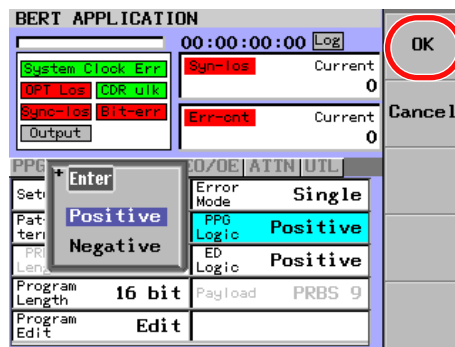
Explanation

Whether the PPG data output signal is the positive logic or negative logic is set and displayed.

Logic
- Positive: The positive logic is output from the data (non-invert) output terminal and the negative logic is output from the data (invert) output terminal.
- Negative: The negative logic is output from the data (non-invert) output terminal and the positive logic is output from the data (invert) output terminal.

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BER Measurement Function

Selecting the input data logic (ED Logic)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to ED Logic, and press **ENTER**.
   A list for selecting the input data logic appears.
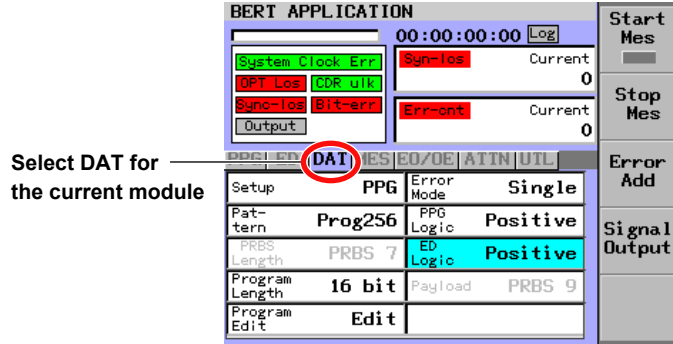
Select DAT for the current module

3. Use the arrow keys to move the cursor to Positive or Negative, and press the **OK** soft key or **ENTER**.
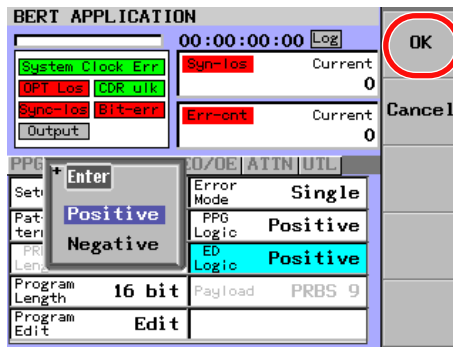
Explanation

Whether the ED data input signal is the positive logic or negative logic is set and displayed.

ED Logic
- Positive: The positive logic is input to the data input terminal.
- Negative: The negative logic is input to the data input terminal.

Selecting the payload pattern (Payload)

Procedure

1. Use the **SLOT** keys to make DAT the current module.

2. Use the arrow keys to move the cursor to Payload, and press **ENTER**.
   A list for selecting the pattern appears.
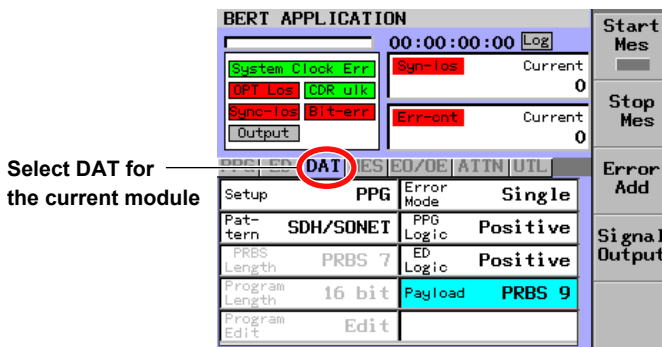
3. Use the arrow keys to move the cursor to PRBS9, PRBS10, PRBS11, PRBS15, PRBS23, or PRBS31, and press the **OK** soft key or **ENTER**.

Explanation

The PRBS pattern length of the payload within the frame when "Pattern = SDH/SONET (SDH/SONET frame pattern)" is selected, is set and displayed.

Payload: PRBS9, PRBS10, PRBS11, PRBS15, PRBS23 and PRBS31

For the function, see section 1.6 in IM 735101-03EN.

Note

This item becomes valid when "SDH/SONET" is selected for the Pattern.
If the Pattern is set to "PRBS", Prog256 or Prog64M, this item is grayed out and cannot be selected.

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BER Measurement Function

Selecting the measurement mode (Mes Mode)

Procedure

1. Use the **SLOT** keys to make MES the current module.

2. Use the arrow keys to move the cursor to Mes Mode, and press **ENTER**.
   A list for selecting the measurement mode appears.

Select MES for
the current module
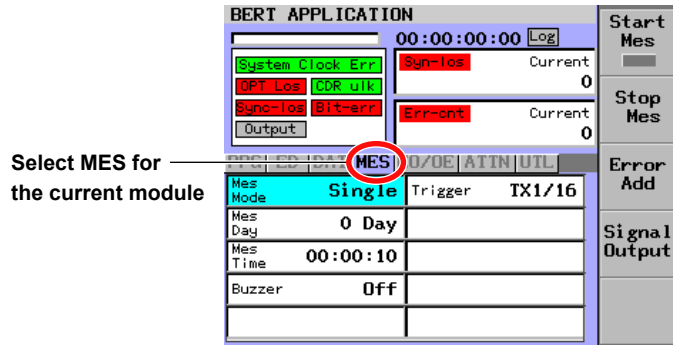
3. Use the arrow keys to move the cursor to Single, Manual, or Repeat, and press
   the **OK** soft key or **ENTER**.

Explanation

The measurement mode is set and displayed.

Measure Mode
- Single: The measurement is performed for the set measurement period.
- Manual: The measurement is performed until it is stopped. (However, the maximum
          period is 10 days.)
- Repeat: The measurement is performed repeatedly for the set measurement period.

Note

- When "Single" is selected for the Measure mode, the measurement is started with Start Mes
  and it is continued for the measurement period set in the Measure Day or Measure Time.
  When the set measurement period has elapsed, the measurement is stopped automatically.
- When "Manual" is selected for the Measure mode, the measurement is performed from
  starting with Start Mes to stopping with Stop Mes.
  At this time, when the elapsed measurement period becomes 10 days, the measurement is
  stopped automatically.
- When "Repeat" is selected for the Measure mode, the measurement is started with Start
  Mes and it is performed repeatedly for the measurement period set in the Measure Day or
  Measure tTime. The measurement is continued until stopped by Stop Mes.

Setting the measurement period (Mes Day/Mes Time)

Procedure

1. Use the **SLOT** keys to make MES the current module.

2. Use the arrow keys to move the cursor to Mes Day or Mes Time, and press **ENTER**.
   A numeric input dialog box appears.
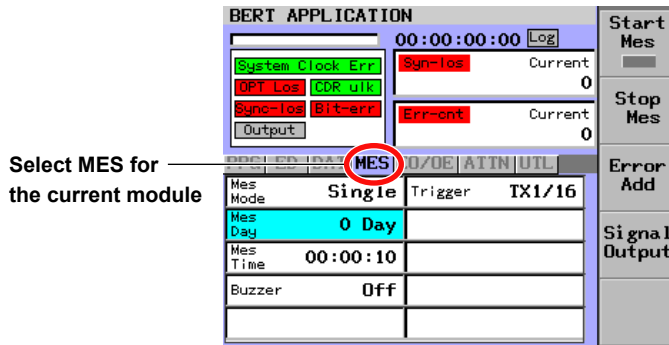
Select MES for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press the **OK** soft key or **ENTER**.
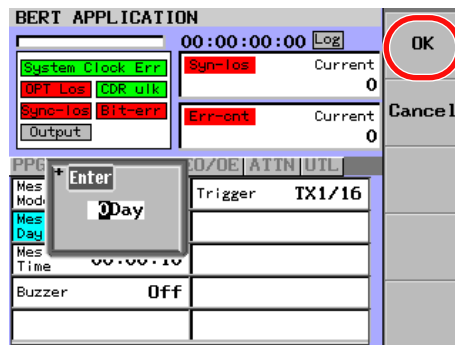
Dialog box for setting the number of days over which to measure
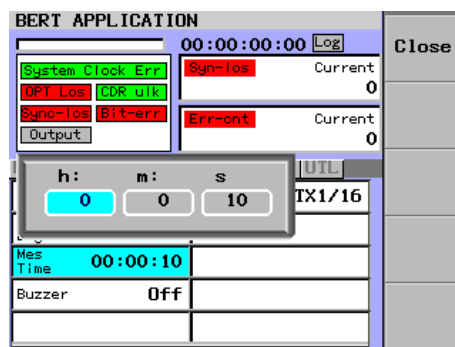
Dialog box for setting the measurement time

Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

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BER Measurement Function

Explanation

The measurement period (number of days)(hour, minute, second) is set and displayed.

Measure Day: 0 to 10 [day]   1 [day] step
Measure Time: 00:00:01 to 23:59:59 [h]:[m]:[s]   1[H]: 1[m]:1[s] step

Note

- This item becomes valid when "Single" is selected for the Measure mode. When the Measure mode is set to "Manual", this item is dimmed (shown in gray) and it cannot be selected.
- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

Selecting the buzzer sound volume (Buzzer)

Procedure

1. Use the **SLOT** keys to make MES the current module.

2. Use the arrow keys to move the cursor to Buzzer, and press **ENTER**.
   A list for selecting the buzzer volume appears.

Select MES for
the current module
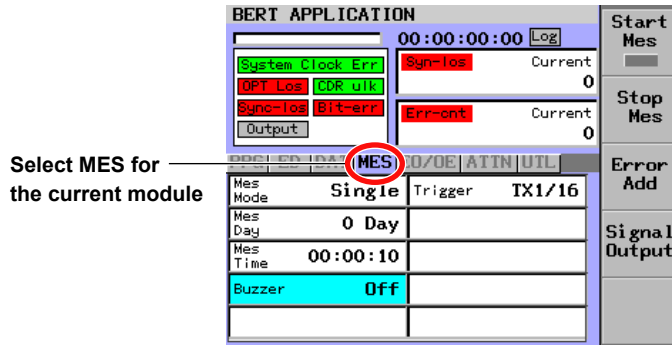
3. Use the arrow keys to move the cursor to Off, Soft, Medium, or Loud, and press
   the **OK** soft key or **ENTER**.
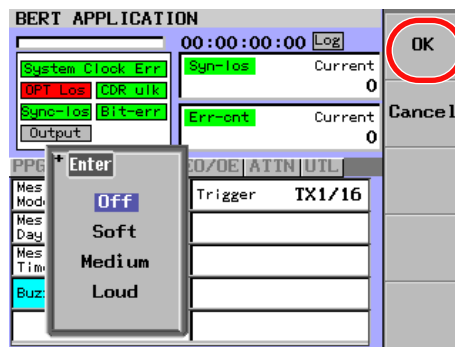
Explanation

The buzzer sound volume, which is given if the error is detected, is set and displayed.

Buzzer
- OFF: No buzzer sound
- Soft: Small buzzer sound
- Medium: Medium buzzer sound
- Loud: Loud buzzer sound

Note

This function is used to set the buzzer sound volume if an error is detected.

The buzzer sound volume for key operation is set using "Volume" on the system screen.

For details, see section 13.5 in IM 735101-03EN.
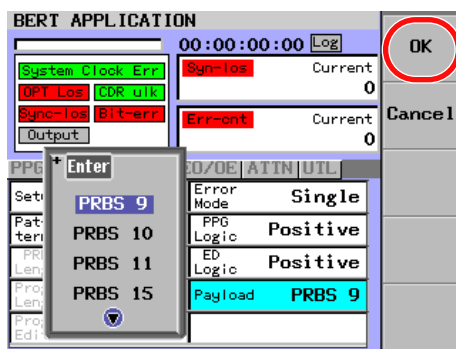
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Selecting the trigger (Trigger)

Procedure

1. Use the **SLOT** keys to make MES the current module.

2. Use the arrow keys to move the cursor to Trigger, and press **ENTER**.
   A list for selecting the trigger appears.

Select MES for the current module
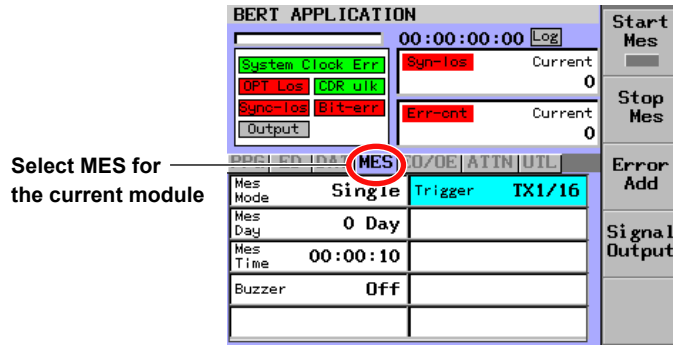
3. Use the arrow keys to move the cursor to TX1/16, TX1/64, TXPatt, TXERR, RX1/16, RX1/64, RXPatt, or RXERR, and press the **OK** soft key or **ENTER**.
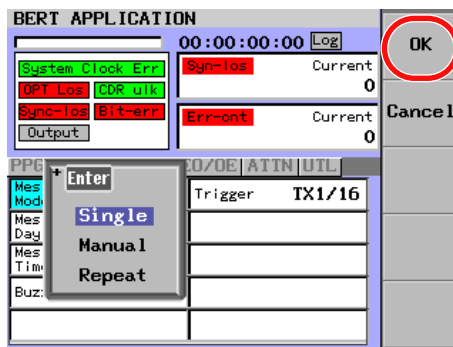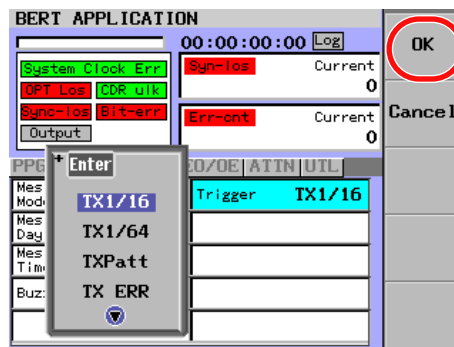
Explanation

The signal to be output to Trigger output terminal is set and displayed.

Trigger
- TX1/16: Outputs the signal, which is 1/16 of the clock frequency.
- TX1/64: Outputs the signal, which is 1/64 of the clock frequency.
- TXPatt: Outputs the trigger signal synchronized with the output pattern. In case of PRBS, the pulse is output once every 128 cycles.
- TX ERR: Outputs the signal every time the error is added to the PPG.
- RX1/16: Outputs the signal, which is 1/16 of the input clock or regeneration clock frequency.
- RX1/64: Outputs the signal, which is 1/64 of the input clock or regeneration clock frequency.
- RXPatt: Outputs the trigger signal synchronized with the input pattern. In case of PRBS, the pulse is output once every 128 cycles.
- RX ERR: Outputs the signal every time the error is detected in the input signal.

For the function, see "Trigger Output Fuction" in section 1.6 of IM 735101-03EN.

Loading/saving a file (Prameter Load, Parameter Save, Long Prog Load, SOH/TOH Load)

Procedure

1. Use the **SLOT** keys to make UTL the current module.

2. Use the arrow keys to move the cursor to Parameter Load, Parameter Save, Long Prog Load, or SOH/TOH Load, and press **ENTER**.
The file list screen appears.
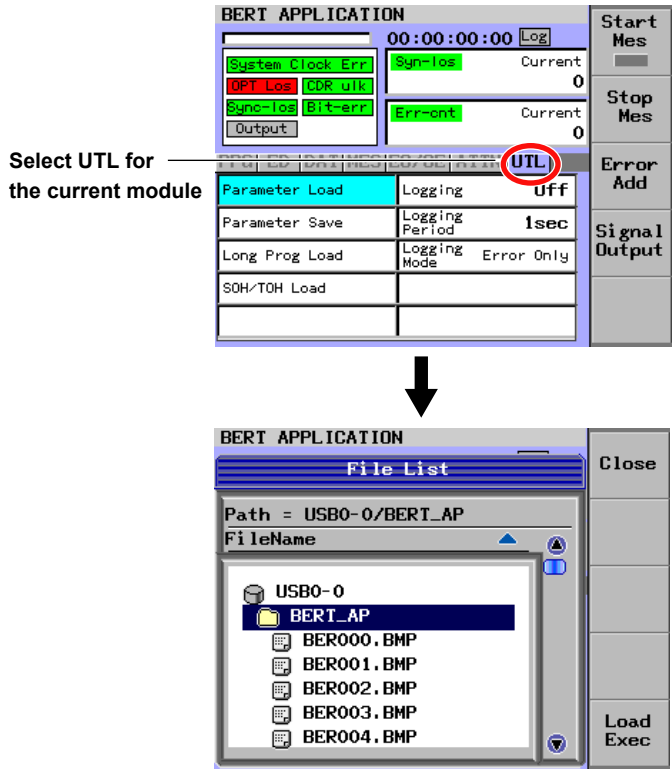
Note

For information about how to operate the file list screen, see chapter 12 in IM 735101-03EN.

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Explanation

A file is loaded/saved.

- Parameter Load: Loads the setting parameter file from the Compact Flash.
- Parameter Save: Saves the setting parameter file into the Compact Flash.
- Long Prog Load: Loads an arbitrary pattern (program pattern) file from the Compact Flash.

  Long prog load is available when the optional Prog256 has been selected.
- SOH/TOH Load: Loads an overhead data file of SOH/TOH frame pattern from the Compact Frash.

  SOH/TOH load is available when the optional SDH/SONET has been selected.

Note

- Error add and Output are kept OFF while a file is being loaded.
- The program pattern data is loaded from the USB memory that is connected to the frame controller.
- File loading using Long Pog Load
  When Long Prog Load is selected and a pattern file is loaded, Pattern is forcibly set to Prog64M.
- Restrictions when loading a file using Long Prog Load
  When executing Long Prog Load while the AQ2212 Frame Controller is equipped with two or more number of BERT modules, the measurement of any BERT module that does not use the BERT application is forcibly stopped.
- Data initialization after file loading using Long Prog Load
  The loaded program pattern data will be initialized if the power to the frame controller is turned off and on again, or the BERT module is inserted and removed.
- File loading using SOH/TOH Load
  When SOH/TOH Load is selected and an overhead pattern file is loaded, Pattern is forcibly set to SDH/SONET.
- Data saving after file loading using SOH/TOH Load
  Only one item of the loaded overhead pattern data is saved to the frame controller.
  If the frame controller is restarted with two or more BERT modules mounted or if a process of module recognition is executed from the Insert Module menu of [SYSTEM], the same overhead pattern is set to all of the modules. Note that the overhead pattern thus set is the last-loaded one.

Selecting Whether or Not to Perform Logging (Logging)

**Procedure**

1. Use the **SLOT** keys to make UTL the current module.

2. Use the arrow keys to move the cursor to Logging, and press **ENTER**.
   A dialog box for turning logging on or off appears.
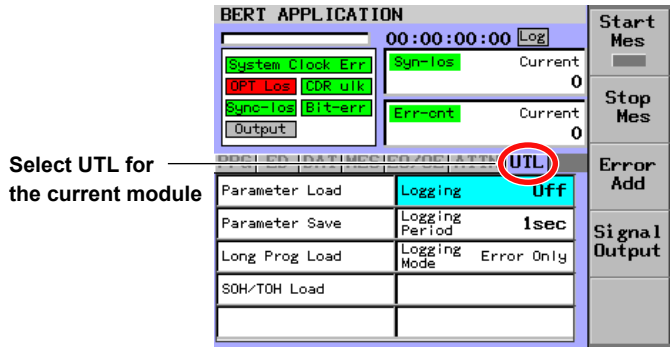
Select UTL for the current module

3. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.
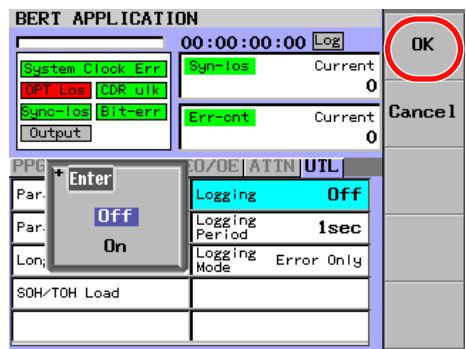
Explanation

Whether or not the logging is performed is selected.

Logging
- ON: Logging is performed.
- OFF: Logging is not performed.

Note

Logged data is saved to USB memory.

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Selecting the Logging Period (Logging Period)

Procedure

1. Use the **SLOT** keys to make UTL the current module.

2. Use the arrow keys to move the cursor to Logging Period, and press **ENTER**.
   A list for selecting the logging period appears.

Select UTL for
the current module
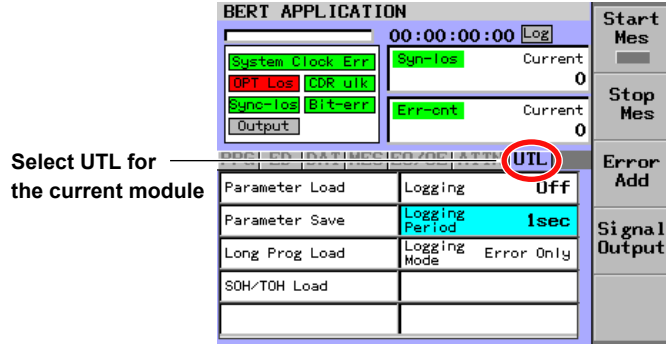
3. Use the arrow keys to move the cursor to 1sec, 10sec, 1min, 10min, or 1hour, and press the **OK** soft key or **ENTER**.
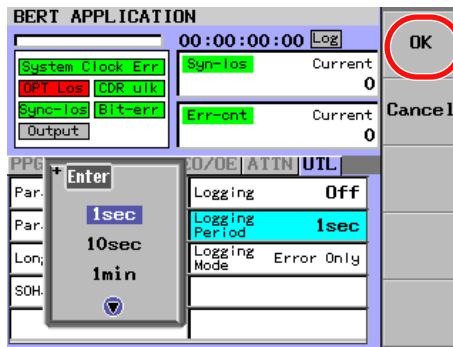
Explanation

The log obtaining time interval is set and displayed.

Logging Period
• 1sec, 10sec, 1min, 10min, 1hour

Selecting the Logging Mode (Logging Mode)

Procedure

1. Use the **SLOT** keys to make UTL the current module.
2. Use the arrow keys to move the cursor to Logging Mode, and press **ENTER**.
   A list for selecting the logging mode appears.

Select UTL for the current module
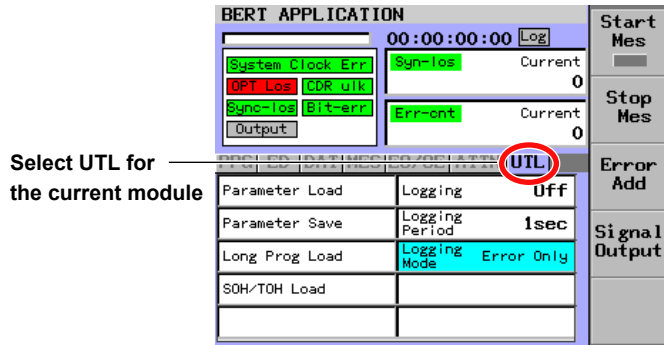
3. Use the arrow keys to move the cursor to All, Error only, or LastRes only, and press the **OK** soft key or **ENTER**.
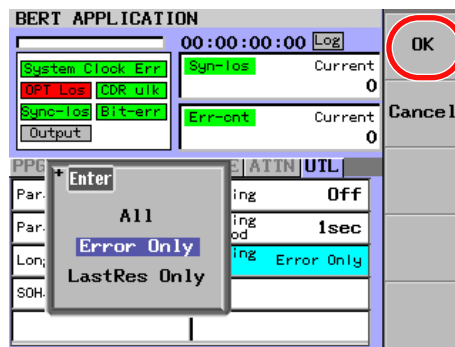
Explanation

The log obtaining operation mode is set and displayed.

Logging Mode
- ALL: All measurement results are written into the USB memory at logging intervals set in Logging Period.
- Error Only: The measurement results if an error occurs are written into the USB memory at logging intervals set in Logging Period.
- LastRes Only: The total measurement results from the measurement start are written into the usb memory when the measurement is completed (measurement time has elapsed, the Stop meas soft key is pressed, or measurement is restarted after the setting has been changed).

Setting the gain of the driver for the optical modulator (Driver Gain)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Driver Gain, and press **ENTER**.
   A numeric input dialog box appears.
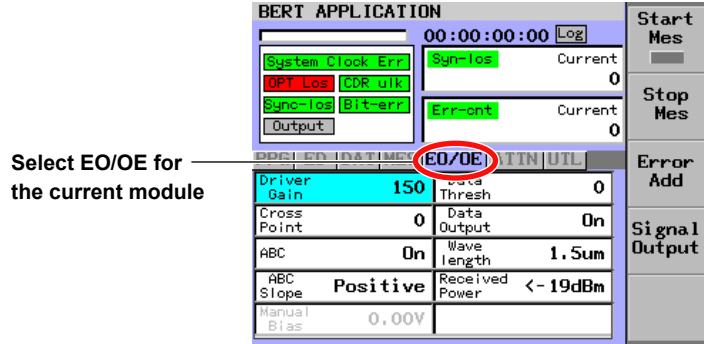
Select EO/OE for
the current module

3. Use the numeric keypad or the arrow keys to change the value, and press
   ENTER.
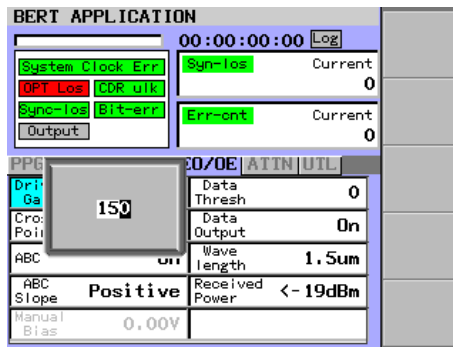
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

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 arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
- For details of the function, see "Driver Gain" in section 1.7 of IM 735101-03EN.

Setting the cross point of the driver for the optical modulator (Cross Point)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Cross Point, and press **ENTER**.
   A numeric input dialog box appears.

Select EO/OE for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
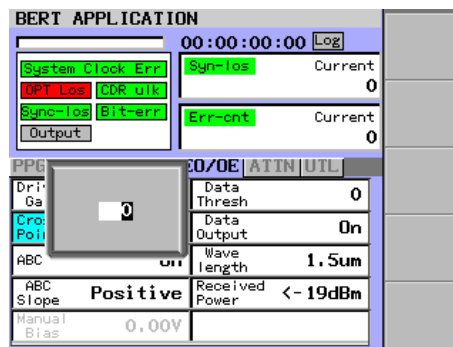
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

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 arrow keys, it is set accordingly.
• If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
• For details of the function, see "Cross Point" in section 1.7 of IM 735101-03EN.

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BER Measurement Function

Selecting whether the auto bias control of the optical modulator is ON or OFF (ABC)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to ABC, and press **ENTER**.
   A dialog box for turning automatic bias control on or off appears.
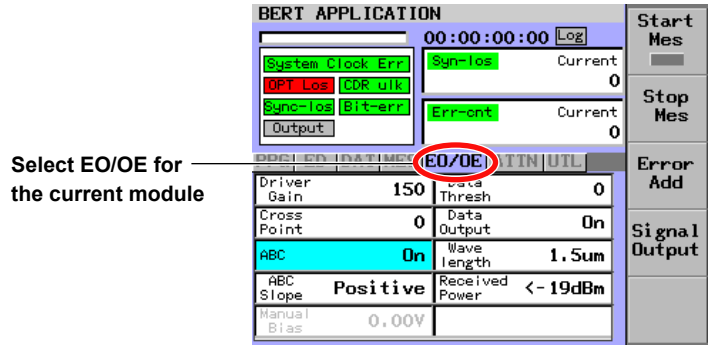
Select EO/OE for the current module

3. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.
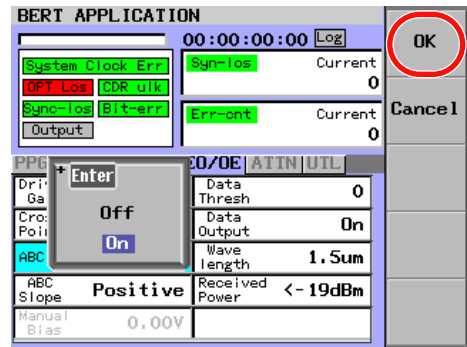
Explanation

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

ABC
- ON: ABC is used.
- OFF: ABC is not used.

Note

Normally, the ABC is set at ON.

When this module is used with the ABC set at OFF, see "ABC ON/OFF" in section 1.7 of IM 735101-03EN.

Selecting the ABC slope of the optical modulator (ABC Slope)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to ABC Slope, and press **ENTER**.
A list for selecting the ABC slope appears.
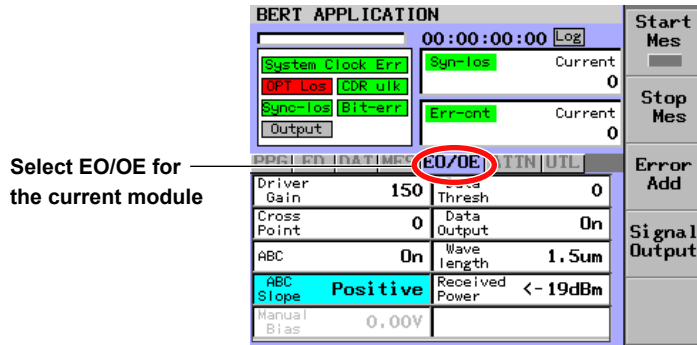
Select EO/OE for
the current module

3. Use the arrow keys to move the cursor to Positive or Negative, and press the **OK** soft key or **ENTER**.
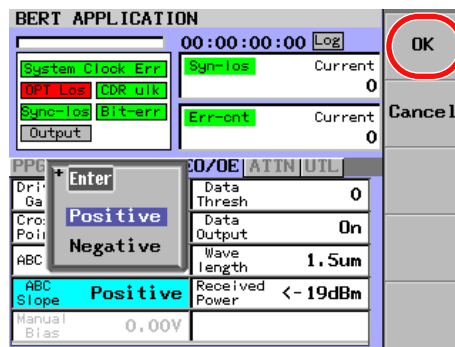
Explanation

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 "ABC Slope Change-over" in section 1.7 of IM 735101-03EN.

Setting the DC bias of the optical modulator manually (Manual Bias)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Manual Bias, and press **ENTER**.
   A numeric input dialog box appears.
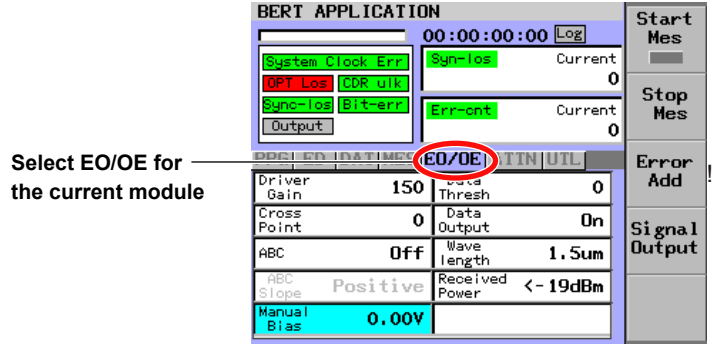
Select EO/OE for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
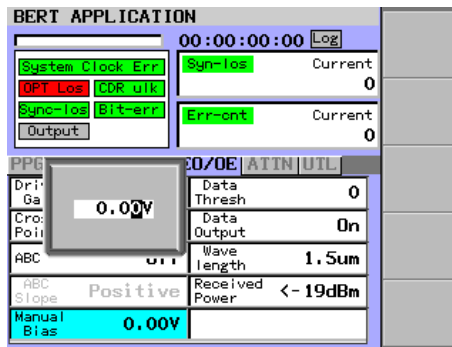
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

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 arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
- For details of the function, see section 1.7 in IM 735101-03EN.

Setting the data threshold value of the optical receiver (Data Thresh)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Data Thresh, and press **ENTER**.
   A numeric input dialog box appears.

Select EO/OE for the current module
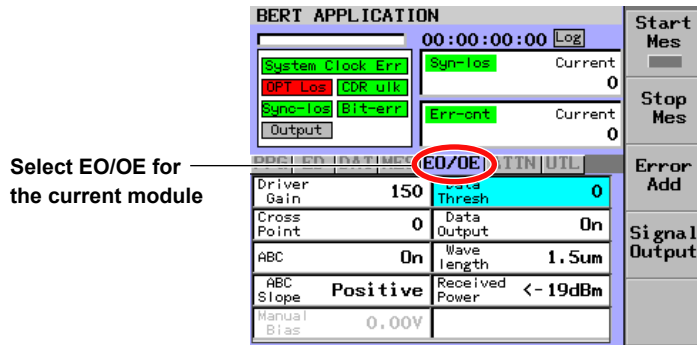
3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
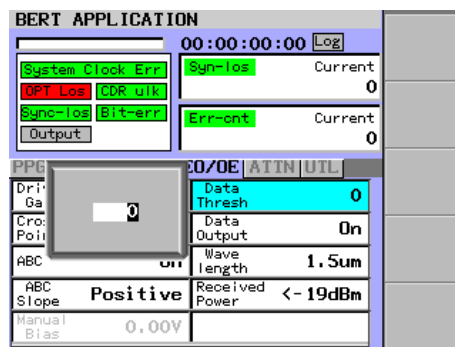
Explanation

The data threshold value of the optical receiver is set and displayed.
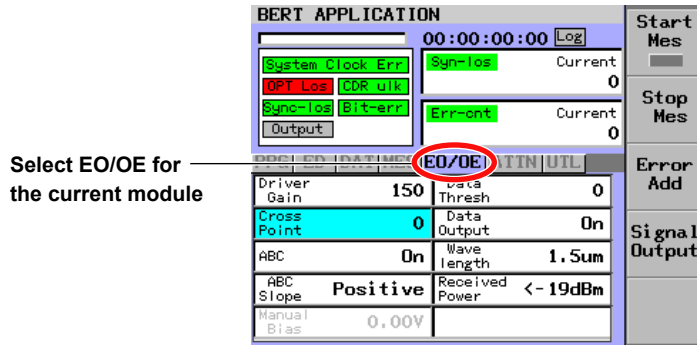
Data Threshold: −364 to 273   1 step

Note

- When changing the set value with the arrow keys, it is set accordingly.
- If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.
- For details of the function, see "Data Threshold" in section 1.8 of IM 735101-03EN.

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BER Measurement Function

Turning ON or OFF the data output of the optical receiver (Data Output)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Data Output, and press **ENTER**.
   A dialog box for turning automatic bias control on or off appears.
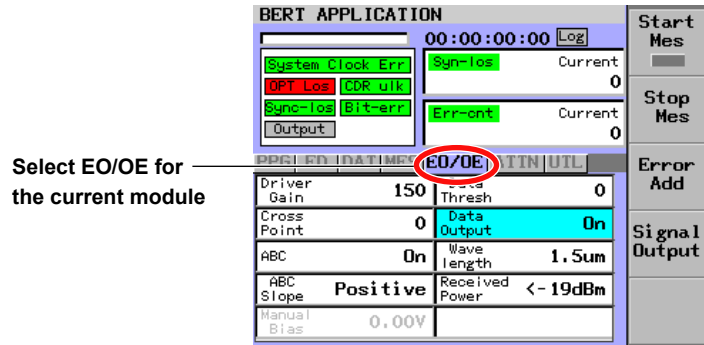
Select EO/OE for the current module

3. Use the arrow keys to move the cursor to On or Off, and press the **OK** soft key or **ENTER**.
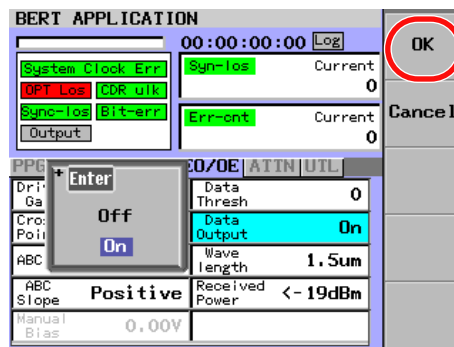
Explanation

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 details of the function, see section 1.8 in IM 735101-03EN.

Setting the wavelength band of the receiving light (Wavelength)

Procedure

1. Use the **SLOT** keys to make EO/OE the current module.

2. Use the arrow keys to move the cursor to Wavelength, and press **ENTER**.
   A list for selecting the wavelength band appears.

Select EO/OE for the current module
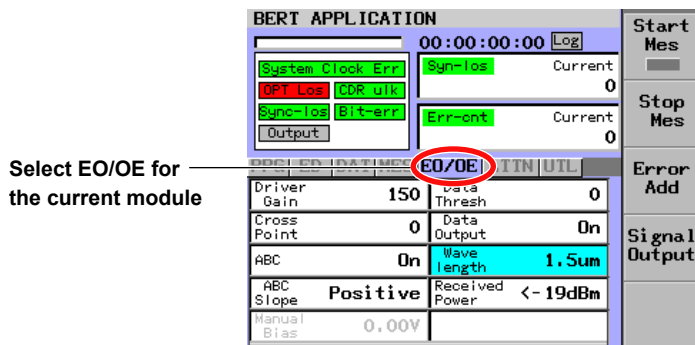
3. Use the arrow keys to move the cursor to 1.5µm or 1.3µm, and press the **OK** soft key or **ENTER**.
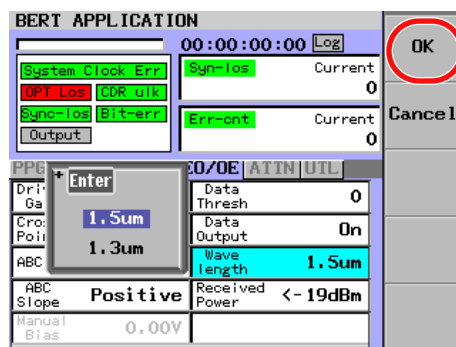
Explanation

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

Note

For details of the function, see "Sets the Wavelength" in section 1.8 of IM 735101-03EN.

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BER Measurement Function

Enabling/disabling the laser output from the optical attenuator (Output)

Procedure

1. Use the **SLOT** keys to make ATTN the current module.

2. Use the arrow keys to move the cursor to Output, and press **ENTER**.
   A list for selecting whether to enable or disable laser output appears.

Select ATTN for the current module
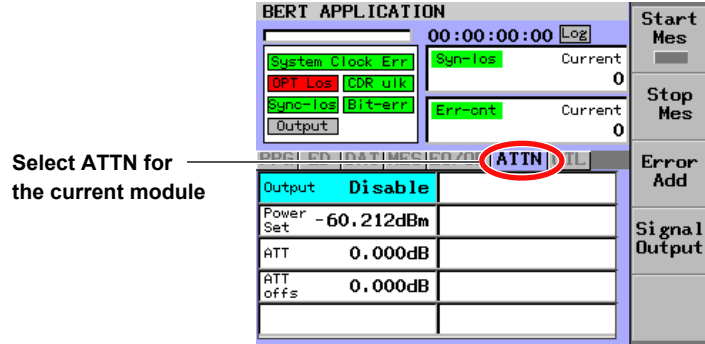
3. Use the arrow keys to move the cursor to Enable or Disable, and press the **OK** soft key or **ENTER**.
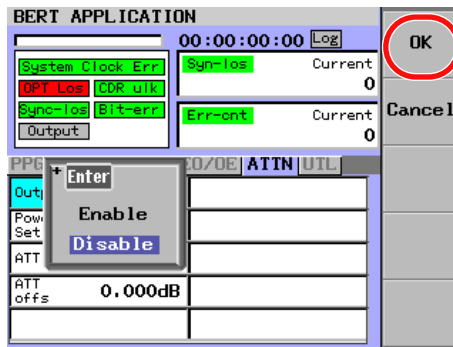
Explanation

The laser output form the optical attenuator is enabled or disabled.

Output
- Enable: The laser output is enabled.
- Disable: The laser output is disabled.

Note

For details of the function, see section 1.4 in IM 735101-03EN.

Setting the amount of optical attenuation (ATT)

Procedure

1. Use the **SLOT** keys to make ATTN the current module.

2. Use the arrow keys to move the cursor to ATT, and press **ENTER**.
   A numeric input dialog box appears.

Select ATTN for
the current module
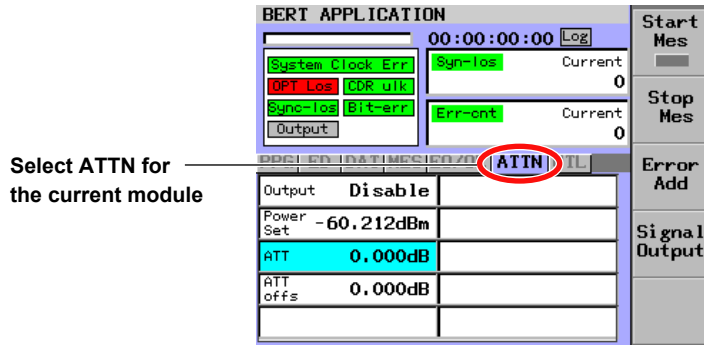
3. Use the numeric keypad or the arrow keys to change the value, and press **ENTER**.
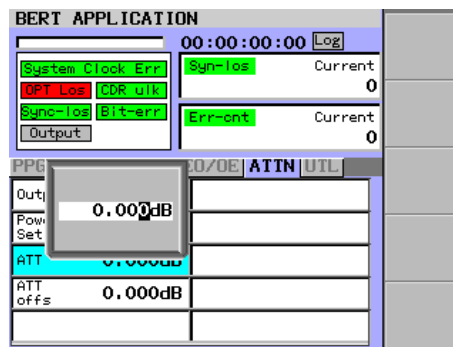
Note
For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The amount of optical attenuation is set and displayed.

ATT
* Display range: −200.000 to 260.000 [dB]
* Setting range: (Currently displayed value +) 0.000 to 60.000 [dB] 0.001 [dB] step

Note
* The formula below shows the relationship between the display range and the amount of optical attenuation:
  Displayed value = Amount of optical attenuation (ATT) + Optical attenuation offset (ATT Offset).
  Additionally, the setting range of the optical attenuation offset is as follows:
  Setting range of the optical attenuation offset: −200.000 to 200.000 [dB]
* When changing the set value with the arrow keys, it is set accordingly.
* If you use the numeric keypad to specify a value outside of the determined range and then press the OK soft key or ENTER, the value will change to the value within the determined range that is closest to the value you specified.

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BER Measurement Function

Setting the optical attenuation offset (ATT offs)

Procedure

1. Use the **SLOT** keys to make ATTN the current module.

2. Use the arrow keys to move the cursor to ATT offs, and press **ENTER**.
   A numeric input dialog box appears.
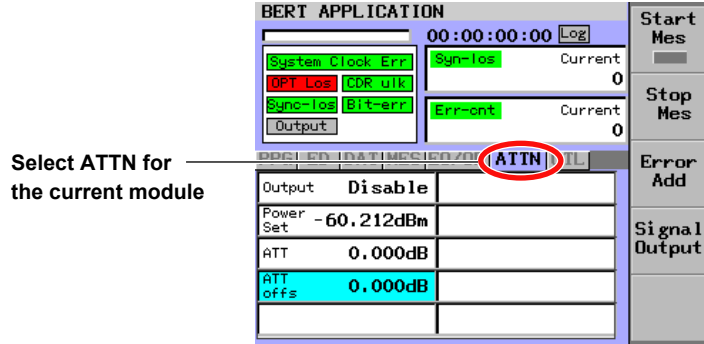
Select ATTN for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press the **OK** soft key or **ENTER**.
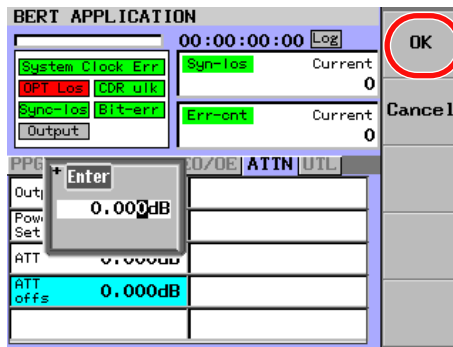
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

The offset of amount of optical attenuation is set and displayed.

ATT offset
• Setting range: −200.000 to 200.000 [dB] 0.001 [dB] step

Setting the output range (Power Set) (When the ATTN module with a built-in optical power monitor)

Procedure

1. Use the **SLOT** keys to make ATTN the current module.

2. Use the arrow keys to move the cursor to Power Set, and press **ENTER**.
   A numeric input dialog box appears.
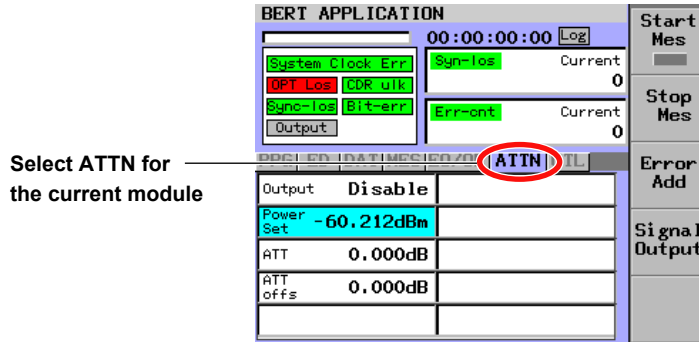
Select ATTN for the current module

3. Use the numeric keypad or the arrow keys to change the value, and press the **OK** soft key or **ENTER**.
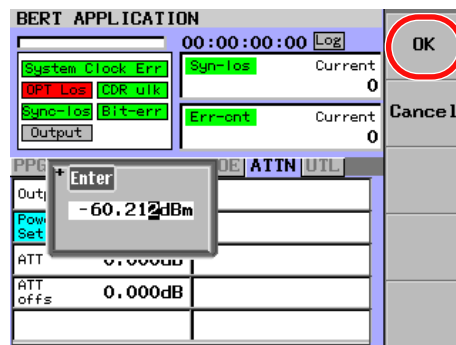
Note

For information about how to operate the numeric keypad, see section 2.3 in IM 735101-03EN.

Explanation

Power Set
• Setting range: −50.000 to 19.000 [dBm] 0.001 [dBm] step

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BER Measurement Function

6.5 BER Measurement

Starting and Stopping BER Measurement

Starting the measurement

1. Press the **Start Mes** soft key to start BER measurement.

While measurement is in progress, the LED in the Start Mes soft key lights in green.
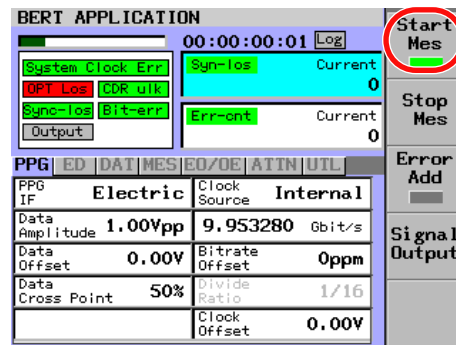
Stopping the measurement

2. To stop BER measurement, press the **Stop Mes** soft key.

While measurement is stopped, the LED in the Start Mes soft key is gray.
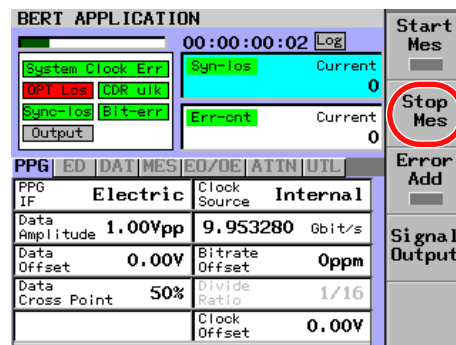
Explanation

Start Mes Soft Key LED Colors

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

Note

- You can restart BER measurement by pressing the Start Mes soft key while measurement is in progress.
- 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, Payload.

Adding the error or stopping the error add

Procedure

Adding the error

1. Press the **Error Add** soft key to add errors to the PPG output data.
While errors are being added, the LED in the Error Add soft key lights in green.
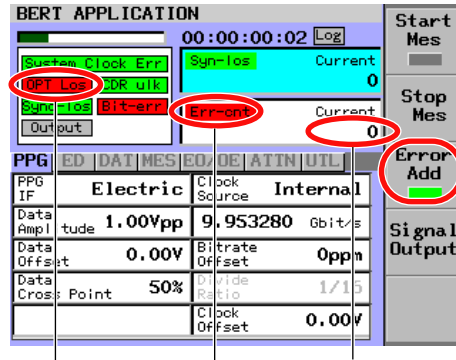
Shows the number of bit errors detected in the ED.

Indicated in red.
Current error detection status

Stopping the error add

2. Press the **Error Add** soft key while errors are being added to stop the addition of errors to the PPG output data.
While error addition is stopped, the LED in the Error Add soft key is gray.
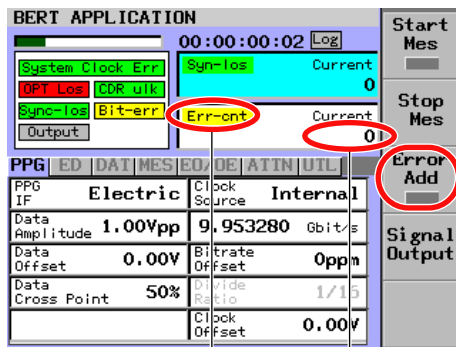
Shows the number of bit errors detected in the ED.

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

Explanation

Error Add Soft Key LED Colors

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

When Error Mode is set to Single, the LED in the Error Add soft key is not displayed.

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BER Measurement Function

Turning ON or OFF the output

Procedure

Turning ON the output

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.

French

ATTENTION

Avant de mettre la sortie sous tension, vérifier les points suivants.
- La borne de sortie est-elle correctement raccordée au DUT ? Ou bien la borne est-elle installée ?
- Les valeurs d'amplitude de données, d'écart pour les données et l'horloge sont-elles adéquates ?
  Lors du branchement de ce module au DUT, etc., régler le niveau de sortie afin qu'il ne dépasse pas la valeur nominale maximum absolue ou insérer l'atténuateur.

---

1. Press the **Signal Output** soft key to turn on the PPG data and clock output.
   The Output indicator in the measurement status display is green.
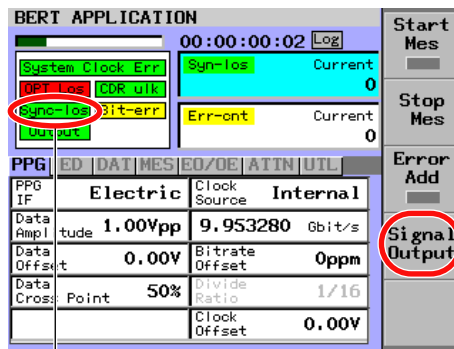
Indicated in green: Output is performed.

Turning OFF the output

2. After turning on PPG data and clock output, press the **Signal Output** soft key again to turn the output off.
   The Output indicator in the measurement status display is also gray.
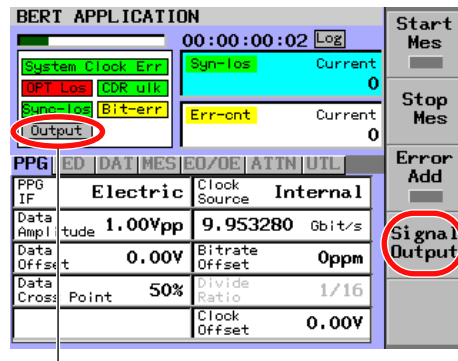
Indicated in gray: Output is stopped.

Explanation

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.
If you attempt to start the BER measurement with the Signal output set at OFF, the sync loss occurs.

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BER Measurement Function

6.6 Starting Logging and Stopping Logging

Procedure

Starting Logging

1. Insert a USB memory device into the front panel of the frame controller.

2. Specify the logging conditions.

Note

- Logging cannot be performed if a USB memory device is not inserted into the front panel or if the device cannot be detected.
- For information about how to perform logging, see the following areas of section 6.4.
  - Selecting whether or not the log is obtained. (Logging)
  - Selecting the log obtaining period (Logging period)
  - Selecting the log obtaining operation mode (Logging mode)

3. Press the **Start Mes** soft key to start measurement.
   When measurement starts, logging starts as well, and the Log indicator at the top of the screen lights in green. You cannot change the logging conditions during measurement.

Indication that logging is in progress
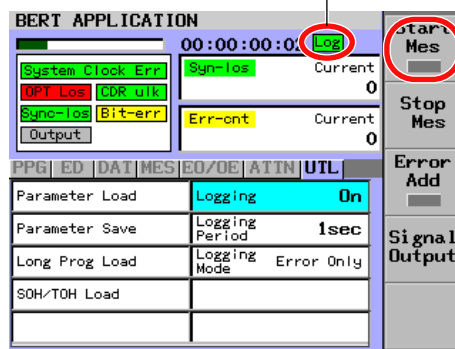
Measurement Screen During Execution of Logging

Stopping Logging

4. Press the **Stop Mes** soft key to stop measurement.
Or, measurement will also stop after the specified measurement time (determined by the Mes Day and Mes Time settings) has passed. (When measurement is restarted, the logged data up to that point is saved.) Logging stops automatically when measurement stops.

Logging indicator
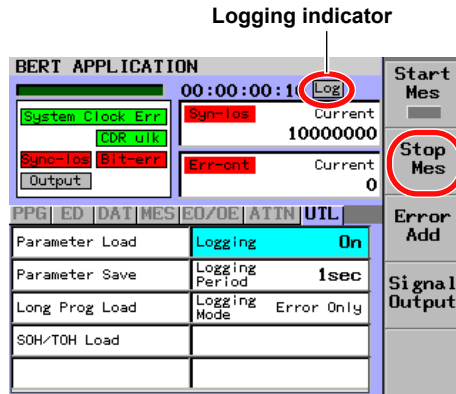
UTL Screen at Completion of Logging (Measurement)

Explanation

About Logging File

For log file output destination, the log file is output as text file with a fixed file name of "AQ2200.csv" in the root folder of the USB memory on the front. If the same file name(AQ2200.csv) already exists, the data is added to this existing file.
The file size may become large (exceeding 1MB) depending on the measurement conditions. If the file size exceeds 1MB, the file is separated with a 3-digit sequence No. attached to "AQ2200.csv" (log_***.csv) to save the log.
For example, when the log results are saved into "log.txt" and the file size exceeds 1MB, the file name is changed from "IAQ2200.csv" to "AQ2200_001.csv", "AQ2200.csv" file is newly created, and then the log is written into this file.

Format of Logging File

The following shows the format of the log file.
Each item is separated by TAB code.

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BER Measurement Function

1	Logfile	001			···Information for file identification and separation
2	Start	Feb/26/2004 12:10:00			···Measurement start time (Month/Day/Year, Hour: Minute: Second)
3	BitRate	10.000000 Gbit/s			···TX bitrate set value
4	Pattern	Program 16			···Pattern length of data pattern
5	Period	1sec			···Log writing interva
6	Mode	Error only			···Output mode
7	No.	SyncLoss	ErrorCount	OH-ErrorCount	
	000001	0.000000e+00	1.000000e+01	0.000000e+00	···Measurement result by set time
	000002	0.000000e+00	1.000000e+01	0.000000e+00	
	000003	0.000000e+00	1.000000e+01	0.000000e+00	
	000004	0.000000e+00	1.000000e+01	0.000000e+00	
	000005	0.000000e+00	1.000000e+01	0.000000e+00	
	000006	0.000000e+00	1.000000e+01	0.000000e+00	
	000007	0.000000e+00	1.000000e+01	0.000000e+00	
	000008	0.000000e+00	1.000000e+01	0.000000e+00	
	000009	0.000000e+00	1.000000e+01	0.000000e+00	
	000010	0.000000e+00	1.000000e+01	0.000000e+00	
8	Stop	Feb/26/2004 12:10:10			···Measurement end time (Month/Day/Year, Hour: Minute: Second)
9	ElapsedTime	00:00:00:10.0			···Measurement elapsed time (Day: Hour: Minute: Second)
10	LastResult				···Last measurement results
	SyncLoss	0.000000e+00			
	ErrorCount	1.000000e+02			
	ErrorRate	1.000000e-07			
	OH-ErrorCount	00.00%			

Item No.	Name	Description
1	Logfile	Records the information for the file identification ID and separation.
2	Start	Records the measurement start time (month/day/year, hour: minute: second).
3	BitRate	Records the bitrate of the TX during measurement. (The TX bitrate set value shows "External" when inputting the External.)
4	Pattern	Records the data pattern of the TX during measurement and the length of this data pattern. (PRBS/Program PRBS length/Program length)
5	Period	Records the value set in "Logging period" on the BERT application screen-UTL screen.
6	Mode	Records the value set in the "Logging mode" on the BERT application screen-UTL screen.
7	No.	This "No." shows the sequence No. (6-digit integer value) of the measurement results, Syncloss, ErrorCount, alarm information CDR-unlock, and ED-LOS. This sequence No. is put at intervals set in "Logging period" on the BERT application screen - UTL screen. For example, when "1 sec." is set for the "Logging period", "No.000001" becomes the measurement data obtained for 1 sec. from the measurement start. "No.000002" becomes the measurement data obtained for 1 sec. from No.000001. Accordingly, "No.000003" becomes the measurement data obtained for 1 sec. from No.000002. • Syncloss: Records the measurement results of Syncloss obtained at intervals set in "Logging period" on the BERT application screen-UTL screen. • ErrorCount: Records the measurement results of ErrorCount obtained at intervals set in "Logging period" on the BERT application screen-UTL screen. • OH- ErrorCount: Records the measurement results of Overhead ErrorCount obtained at interrals set in "Logging period" on the BERT application Screen-UTL screen.(If the received pattern is other than SDH/SONET frame patterns, this item is not output.) • CDR-unlock: Records the CDR-unlock alarm occurrence status during measurement.(The alarm status is expressed by "0/1", 0 (no alarm has occurred.)/1 (alarm has occurred.).)
8	Stop	Records the measurement stop time (month/day/year hour: minute: second).
9	Elapsed Time	Records the measurement time (day hour: minute: second) from the measurement start to the measurement completion.
10	LastResult	Records the cumulative values of SyncLoss and BitError from the measurement start to the measurement completion using the exponential display. In the same manner, ErrorRate during measurement period is also recorded using the exponential display.

The following shows the log files by "Logging mode" (All, Error only, and LastRes only).

- Logging mode = All, Receive pattern = PRBS

Logfile	001		
Start	Jul/11/2004 14:21:28		
BitRate	9.953280 Gbit/s		
Pattern	PRBS 7		
Period	1sec		
Mode	All		
No.	Syncloss	ErrorCount	CDR-unlock
000001	1.000000e+06	0.000000e+00	0
000002	1.000000e+06	0.000000e+00	0
000003	1.000000e+06	0.000000e+00	0
000004	1.000000e+06	0.000000e+00	0
000005	1.000000e+06	0.000000e+00	0
000006	1.000000e+06	0.000000e+00	0
000007	1.000000e+06	0.000000e+00	0
000008	1.000000e+06	0.000000e+00	0
000009	1.000000e+06	0.000000e+00	0
000010	1.000000e+06	0.000000e+00	0
Stop	Jul/11/2004 14:21:38		
ElapsedTime	00:00:00:10.0		
LastResult			
SyncLoss	1.000000e+07		
ErrorCount	0.000000e+00		
ErrorRate	0.000000e+00		

- Logging mode = All, Receive pattern = SDH/SONET

Logfile	001			
Start	Jul/11/2004 14:21:28			
BitRate	9.953280 Gbit/s			
Pattern	Frame			
Period	1sec			
Mode	All			
No.	Syncloss	ErrorCount	OH-ErrorCount	CDR-unlock
000001	1.000000e+06	0.000000e+00	0.000000e+00	0
000002	1.000000e+06	0.000000e+00	0.000000e+00	0
000003	1.000000e+06	0.000000e+00	0.000000e+00	0
000004	1.000000e+06	0.000000e+00	0.000000e+00	0
000005	1.000000e+06	0.000000e+00	0.000000e+00	0
000006	1.000000e+06	0.000000e+00	0.000000e+00	0
000007	1.000000e+06	0.000000e+00	0.000000e+00	0
000008	1.000000e+06	0.000000e+00	0.000000e+00	0
000009	1.000000e+06	0.000000e+00	0.000000e+00	0
000010	1.000000e+06	0.000000e+00	0.000000e+00	0
Stop	Jul/11/2004 14:21:38			
ElapsedTime	00:00:00:10.0			
LastResult				
SyncLoss	1.000000e+07			
ErrorCount	0.000000e+00			
ErrorRate	0.000000e+00			
OH-ErrorRate	00.00%			

- Logging mode = Error only, Receive pattern = PRBS

Logfile	001		
Start	Jul/11/2004 14:19:53		
BitRate	9.953280 Gbit/s		
Pattern	PRBS 7		
Period	1sec		
Mode	Error Only		
No.	Syncloss	ErrorCount	CDR-unlock
000001	1.000000e+06	0.000000e+00	0
000002	1.000000e+06	0.000000e+00	0
000003	1.000000e+06	0.000000e+00	0
000004	1.000000e+06	0.000000e+00	0
000005	1.000000e+06	0.000000e+00	0
000006	1.000000e+06	0.000000e+00	0
000007	1.000000e+06	0.000000e+00	0
000008	1.000000e+06	0.000000e+00	0
000009	1.000000e+06	0.000000e+00	0
000010	1.000000e+06	0.000000e+00	0
Stop	Jul/11/2004 14:20:03		
ElapsedTime	00:00:00:10.0		
LastResult			
SyncLoss	1.000000e+07		
ErrorCount	0.000000e+00		
ErrorRate	0.000000e+00		

- Logging mode = LastRes only, Receive pattern = PRBS

Logfile	001
Start	Jul/11/2004 14:23:23
BitRate	9.953280 Gbit/s
Pattern	PRBS 7
Period	1sec
Mode	LastRes Only
Stop	Jul/11/2004 14:23:33
ElapsedTime	00:00:00:10.0
LastResult	
SyncLoss	1.000000e+07
ErrorCount	0.000000e+00
ErrorRate	0.000000e+00

7.1   Outline of Graph Display

Outline of Graph Display

You can display the measured data graphically.
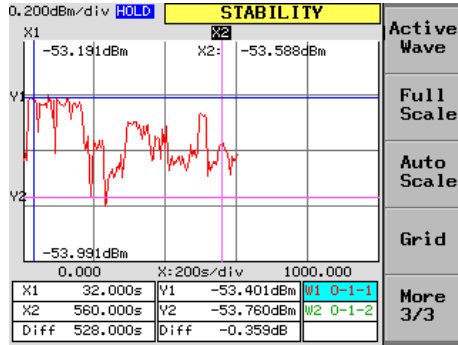
Graph display screen

Waveform Display
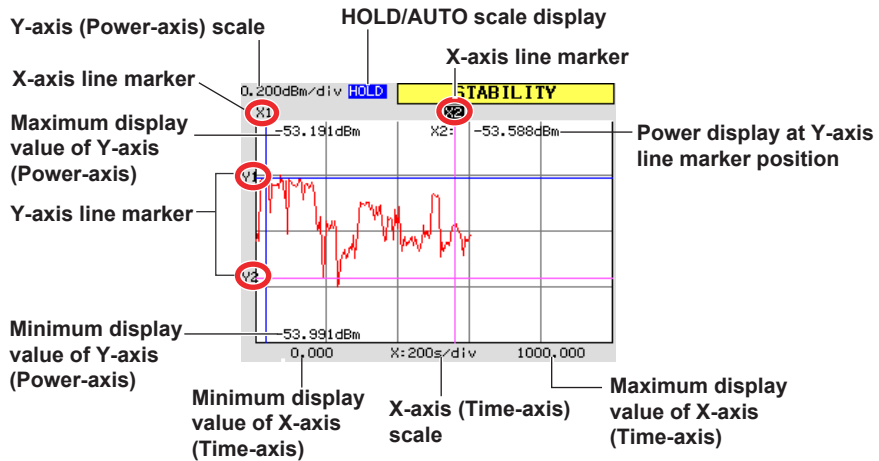
Y-axis (Power-axis) scale

HOLD/AUTO scale display

X-axis line marker

X-axis line marker

Maximum display value of Y-axis (Power-axis)

Power display at Y-axis line marker position

Y-axis line marker

Minimum display value of Y-axis (Power-axis)

Minimum display value of X-axis (Time-axis)

X-axis (Time-axis) scale

Maximum display value of X-axis (Time-axis)

Numeric Value Display

- **The Waveform display sensor background color of the active waveform is blue.**

- **Power display at Y-axis line marker position DIFF shows (Y1 - Y2).**

- **Time display at X-axis line marker position DIFF shows (X1 - X2).**

The following functions are provided to display the data graphically.

- Zoom function: Enlarges or reduces the display scale around the marker.
- Scale change function: Enlarges or reduces the display scale.
- Measurement function: Measures the power and time between line markers.
- Data pickup function: When Select Marker is set to X1 or X2, the level at which the active displayed waveform and X1 or X2 intersect appears in the upper right of the graph display.
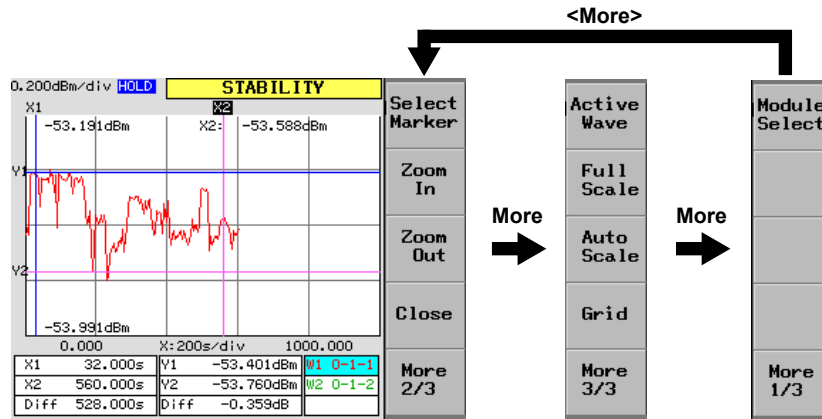
Soft Key Menu

Name	Function
Remove Marker	Changes the active marker in order, like X1 X2 Y1 Y2. (The active line marker is highlighted.)
Zoom In	Enlarges the scale around the active line marker.
Zoom Out	Reduces the scale around the active line marker.
Close	Returns to the previous screen (measurement check screen or measurement in progress screen).
Active Wave	Changes the active display waveform.
Grid	Shows or hides the grid line.
Module Select	Select a waveform you want display it graphically.
Full Scale	Changes the X-axis and Y-axis scales so that the entire waveform can be displayed.
Save BMP	Saves the display waveform to the selected storage device.
Auto Scale	Changes the display scale so that all waveforms are displayed only on the Y-axis scale.

Arrow keys: Moves the line marker.

7.2 Displaying method of screen

Enlarging or Reducing the Display Scale

Procedure

To change the display scale, four kinds of methods are provided.
Select a desired method suitable for the application.
- Enlarging or reducing the display scale around the active line marker
- Enlarging the display scale between the line markers of the active line marker axis
- Changing the display scale to the scale so that all the selected waveforms are displayed.
- Changing the display scale so that the measurement data enters the Y-axis scale at real-time during measurement.

- **Enlarging or Reducing the Display Scale around the Active Line Marker**

    1. Press the **Select Marker** soft key to select the active line marker.

       If the active marker is an x-axis line marker or a y-axis line marker, you can move it to the position that you want to be the scale center using the left and right keys or the up and down keys, respectively.

    2. Press the **Zoom In** soft key to increase the magnification, and press the **Zoom Out** soft key to decrease it.
       The scale changes, like 1↔2↔5↔10↔…

- **Changing the Display Scale to the Scale so that All the Selected Waveforms are Displayed**

  1. Press the **Full Scale** soft key to display all of the selected waveforms.
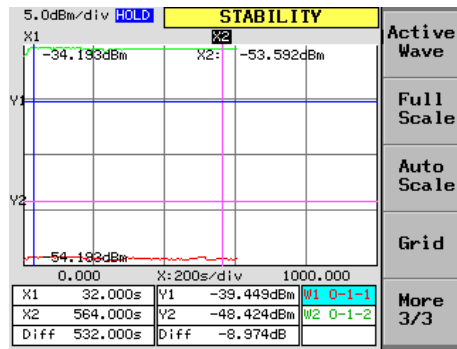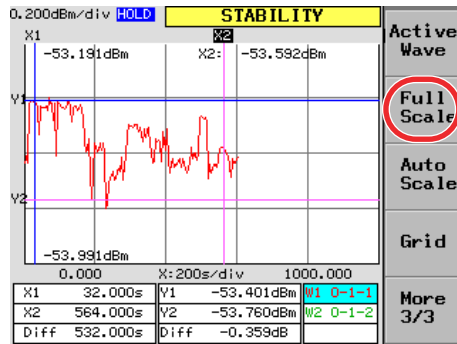
- **Updating the Display Scale so that the Measurement Data Enters the Y-axis Scale at Real-time during Measurement**

    1. Press the **Auto Scale** soft key.

    The dialog box will appear.
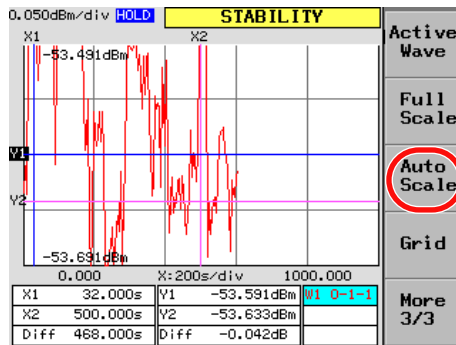
    2. Use the arrow keys to move the cursor to ON, and press the **OK** soft key or **ENTER**.

    The waveform, which cannot be shown within the Y-axis display area, is updated so that it is displayed within the display scale. HOLD/AUTO scale display will indicate AUTO.
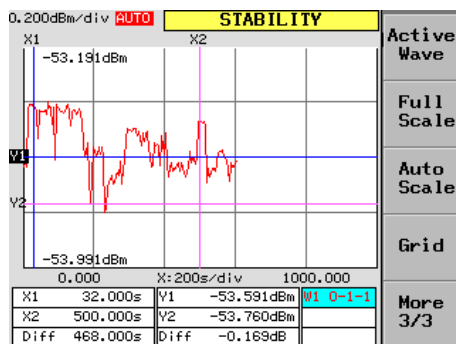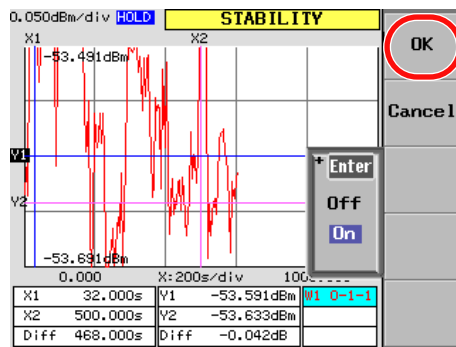
Showing or Hiding the Grid Display

The display grid is shown or hidden.

Procedure

1. Press the **Grid** soft key to display a list for enabling or disabling the grid display.
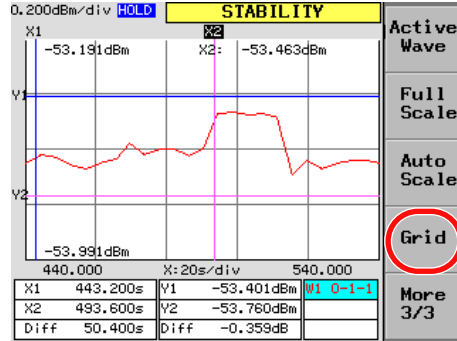
2. Use the arrow keys to move the cursor to On, and press the **OK** soft key or **ENTER**.
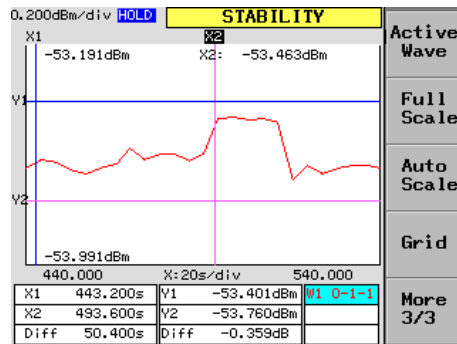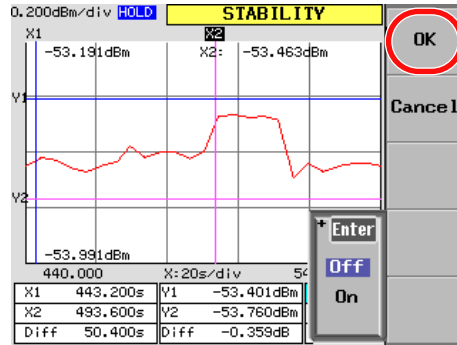
Selecting a Display Waveform

Procedure

1. Press the **Module Select** soft key to display the Module Select for Graph screen.
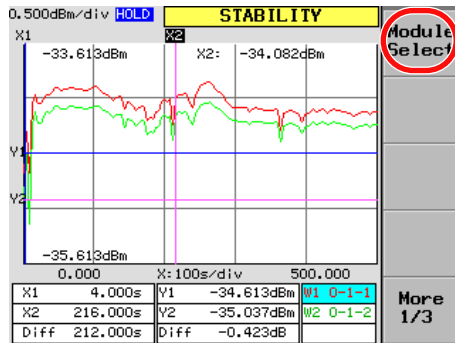
2. Use the arrow keys to move the cursor to a module whose waveform you want to display, and press the **Set W1**, **Set W2**, or **Set W3** soft key.
A mark will appear in one of the boxes to the left of the selected sensor module.

> **For the AQ2200-221, the left box is device 1 and the right box is device 2.**
> **You cannot set the same color twice for the same module.**
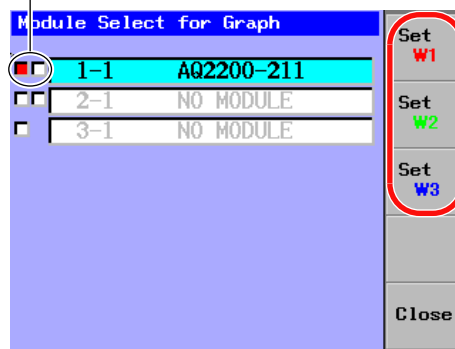
Note
- When the AQ2200-221 is installed in the frame controller, you can choose whether or not to display the waveforms of each of its devices.
- The box color indications are as follows:
  Set W1: Red
  Set W2: Green
  Set W3: Blue

| Explanation |

Selecting a Display Waveform

If multiple waveforms are overlapped and it is difficult to see the waveforms, selecting a display waveform will make it easy-to-see. Additionally, only three kinds of waveform data can be displayed even though multiple waveform data exists.

To display the waveform currently being hidden, it is necessary to select a waveform using this function.
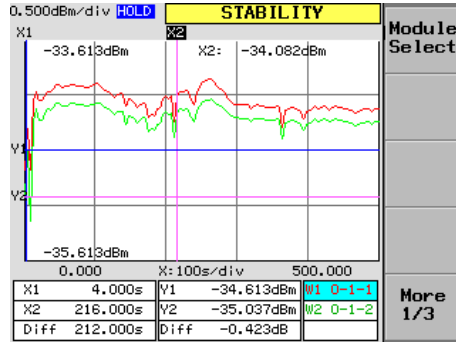
Only W2 waveform is displayed.
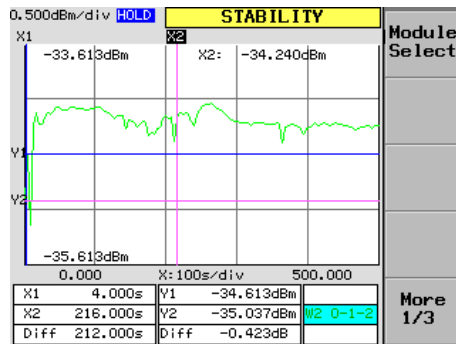
7.3 Saving the Display Waveform

This section explains how to save the waveforms displayed on the screen to USB memory.

1. Insert a USB memory device into the USB port on the front panel of the frame controller.

2. Press the **PRTSC** key to save the displayed waveforms.

Note
For detailed information about saving data, see chapter 12 in IM735101-03EN.

8.1   Trigger Input

Setting the Measurement Synchronized with the Internal Trigger

The sensor starts the single measurement by the trigger signal output from the module mounted on the same frame.

Follow the steps below to make the necessary settings.

1. Press **SYSTEM** to display the SYSTEM screen.

2. Use the arrow keys to move the cursor to Trigger, and press the **Select** soft key or **ENTER**.

A list for selecting the trigger appears.
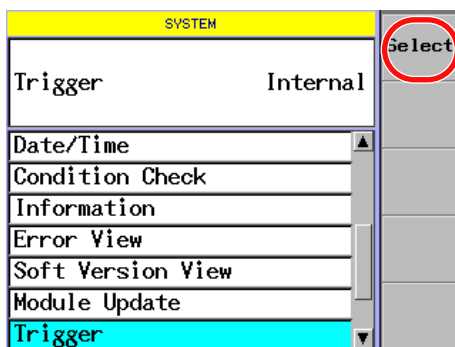
Trigger Input Setup Screen

3. Use the arrow keys to move the cursor to Internal, and press the **OK** soft key or **ENTER**.
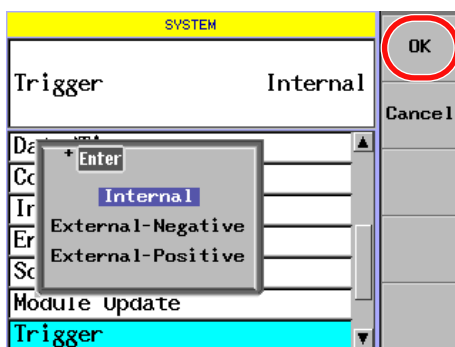
Note

The factory default setting is Internal.

Example of operation

The following describes how to make the setting to start the measurement of other sensor module synchronized with the measurement start of one sensor module with two or more sensor modules mounted on the same frame.

Preparations for Measurement

1. Set the SYSTEM trigger setting to "Internal".

2. Set the trigger output of one sensor module to "Meas Started".

3. Set the measurement mode of other sensor module to "Input Trig".

Note

For information about how to operate the sensor modules, see chapter 3 in IM 735101-03EN.

Starting the Measurement

4. Use the **SLOT** keys to make the sensor module whose trigger output has been set to Meas Started the current module.

5. Press the **Meas Mode** soft key. Or use the arrow keys to move the cursor to Meas Mode, and press **ENTER**.

A list for selecting the measurement mode appears.
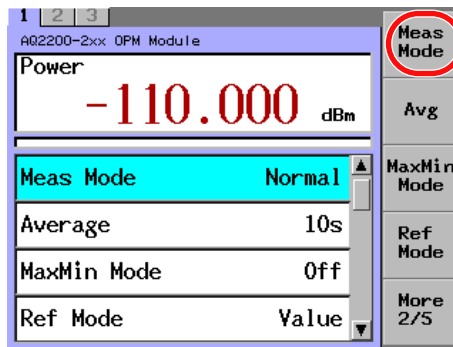
6. Use the arrow keys to move the cursor to Single, and press the **OK** soft key or **ENTER**.

The selected sensor module will perform single measurement, and so will the other sensor modules.
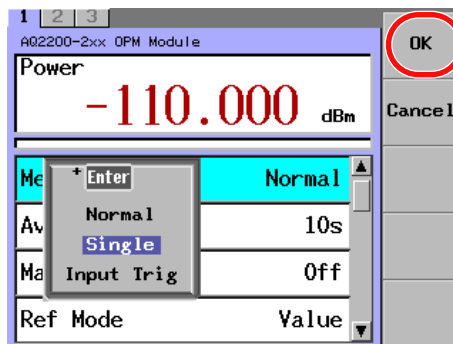
7. To perform multiple measurements, repeat steps 5 and 6.

Setting the Measurement Synchronized with the External Trigger

When the external trigger signal is input, the sensor starts the single measurement.

Follow the steps below to make the necessary settings.

1. Press **SYSTEM** to display the SYSTEM screen.

2. Use the arrow keys to move the cursor to Trigger, and press the **Select** soft key or ENTER.
A list for selecting the trigger appears.

3. Use the arrow keys to move the cursor to External-Negative or External-Positive, and press the **OK** soft key or **ENTER**.
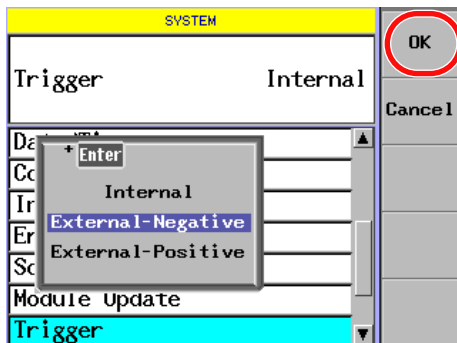
4. Press **DETAIL** to display the detail screen.

5. Use the **SLOT** keys to make the sensor module whose measurement you want to synchronize with the trigger the current module.

6. Press the **Meas Mode** soft key. Or use the arrow keys to move the cursor to Meas Mode, and press **ENTER**.
A list for selecting the measurement mode appears.
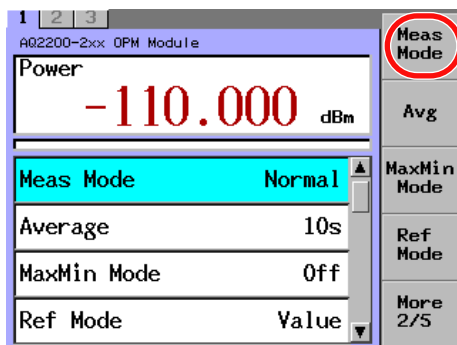
7. Use the arrow keys to move the cursor to Input Trigger, and press the **OK** soft key or **ENTER**.

8

Trigger Measurement
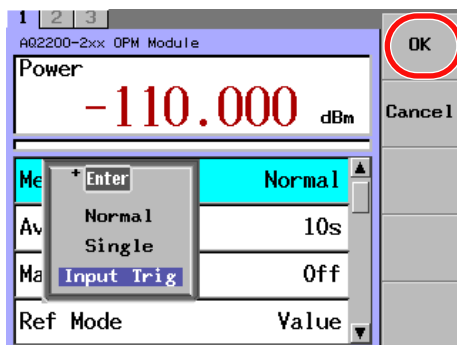
Explanation

Trigger Input

The trigger inputput can be set in the following three modes.

- Internal: The sensor starts the single measurement by the trigger signal output from the module mounted on the same frame.
- External-Negative: When the negative logic of external trigger signal is input, the sensor starts the single measurement.
- External-Positive: When the positive logic of external trigger signal is input, the sensor starts the single measurement.

8.2 Trigger Output

The trigger signal is output corresponding to the measurement of the sensor to inform that the measurement to the module mounted on the same frame or external device is started or completed.

The trigger output can be set in the following three modes(four for the AQ2200-202).

- Disable: Makes the external output trigger disabled. (The trigger signal is not output.)
- Avg Time Over: Outputs the trigger signal at completion of the measurement.
- Meas Started: Outputs the trigger signal at start of the measurement.
- Event Detect: Outputs a trigger signal when an event occurs (AQ2200-202).

According to the measurement mode, the trigger is output in each trigger mode as described below.

- **"Normal" Measurement Mode**

Command input   Measurement start

Measurement in progress

Output Trigger

Meas Started

Avg Time Over

Averaging time
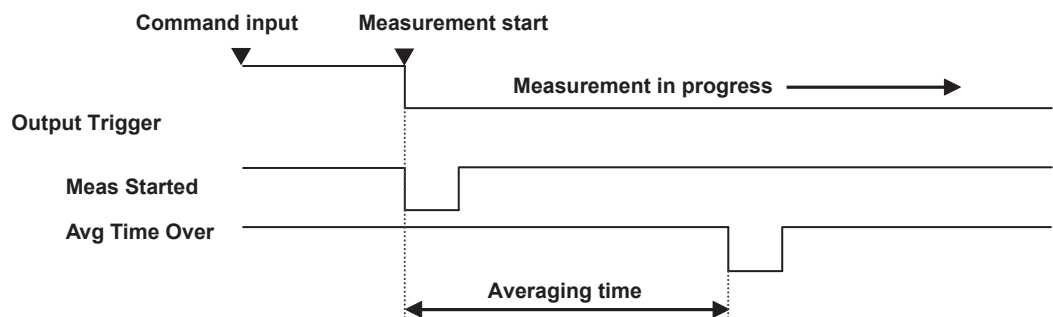
- **"Single" or "Input Trigger" Measurement Mode**

Command input or trigger input   Measurement start   Measurement complete

Measurement in progress

Output Trigger

Meas Started

Avg Time Over
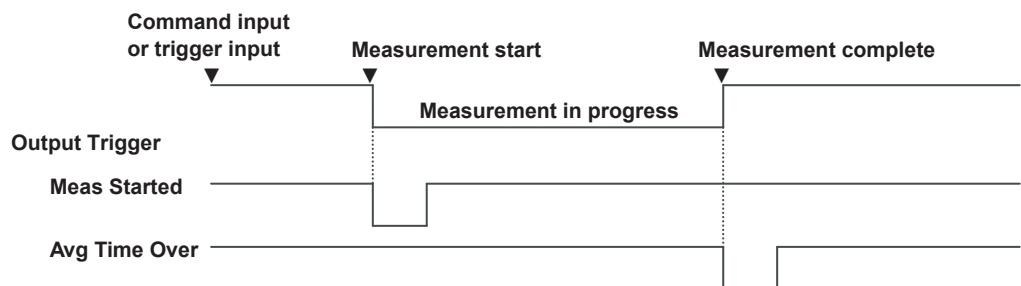
In Event Detect mode, a trigger is output as follows when an event occurs.
This can be set only for the AQ2200-202.

Power

Power Thresh

Measurement Start   Trigger   Time
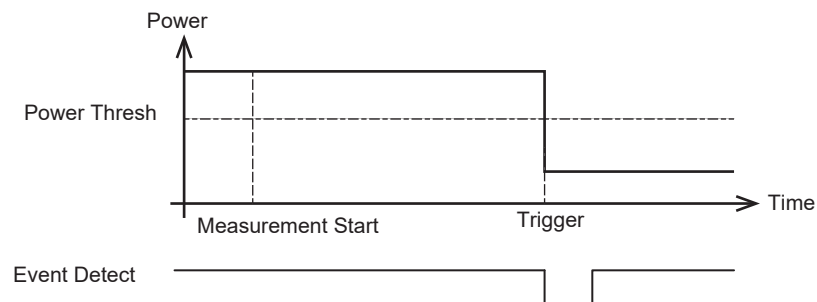
Event Detect

Setting the Trigger Output

1. Use the **SLOT** keys to make the module that you want to use for trigger output the current module.

2. Press the **Output Trig** soft key. Or use the arrow keys to move the cursor to Output Trig, and press **ENTER**.

   A list for selecting the type of trigger output appears.
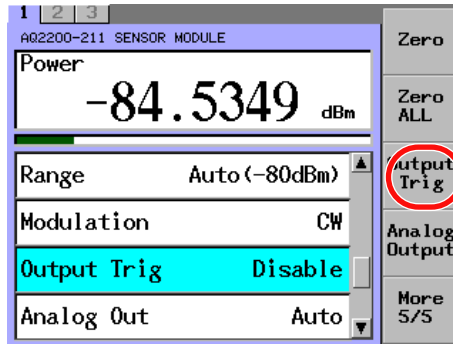
3. Use the arrow keys to move the cursor to the appropriate trigger mode, and press the **OK** soft key or **ENTER**.

Modules other than AQ2200-202   AQ2200-202
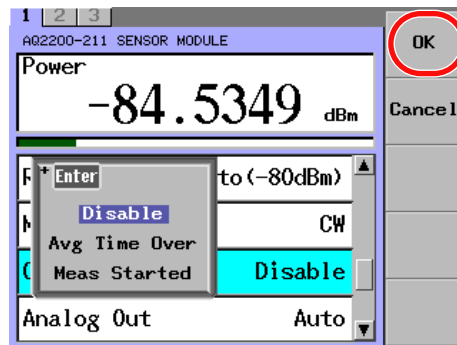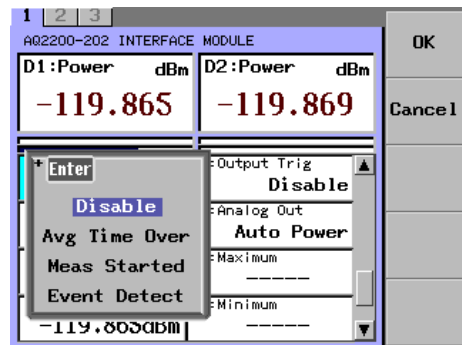
Note

In the AQ2200-221 and the AQ2200-202, "Output Trigger" of both devices cannot be made enabled at the same time.

When one module is set at "Avg Time Over", "Meas Started", or "Event Detect", another device is set at "Disable".

9.1   Overview of the Macro Feature

By loading a program file that has been created through the use of an external software utility into the AQ2211 or AQ2212 frame controller, you can perform various types of optical device measurement, such as loss measurement and optical return loss measurement, and save the results.

You can load up to three measurement-macro program files into a single frame controller. You can use the following external software utility:

Macro Editor for AQ2210
This software is provided free of charge. You can download it from the following website.
https://tmi.yokogawa.com/library/

You can use the macro feature with the following modules.

MODEL	Module Name		Device
810518901	AQ2200-111	DFB-LD Module	Light source
AQ2200112	AQ2200-112	LS Module	Light source
810518902	AQ2200-141	FP-LD Module	Light source
810518903	AQ2200-142	DUAL FP-LD Module	Light source
810518904	AQ2200-136	TLS Module	Tunable light source
AQ2200131	AQ2200-131	Grid TLS Module	Tunable light source
AQ2200132	AQ2200-132	Grid TLS Module	Tunable light source (Dual)
810518905	AQ2200-201	Interface Module	Sensor
AQ2200202	AQ2200-202	Interface Module	Sensor (Dual)
810518906	AQ2200-231	Optical Sensor Head	Sensor (for long wavelengths)
AQ2200232	AQ2200-232	Optical Sensor Head	Sensor (for long wavelengths)
810518907	AQ2200-241	Optical Sensor Head	Sensor (for short wavelenghts)
AQ2200242	AQ2200-242	Optical Sensor Head	Sensor (for short wavelenghts)
810518908	AQ2200-211	Sensor Module	Sensor (high sensitivity)
735122	AQ2200-221	Sensor Module	Sensor (dual)
735125	AQ2200-215	Sensor Module	Sensor (high power)
735131	AQ2200-311A	ATTN Module	Attenuator
AQ2200312	AQ2200-312	ATTN Module	Attenuator
735133	AQ2200-331	ATTN Module	Attenuator built-in monitor power meter
AQ2200332	AQ2200-332	ATTN Module	Attenuator built-in monitor power meter
AQ2200342	AQ2200-342	DUAL ATTN Module	Attenuator built-in monitor power meter (Dual)
735141	AQ2200-411	OSW Module	Optical switch (1x4, 1x8)
735142	AQ2200-421	OSW Module	Optical switch (1x2, 2x2)
735143	AQ2200-412	OSW Module	Optical switch (1x16)

Note
- Some modules cannot be used with older versions of the AQ2211/AQ2212 software. Refer to the table below for version requirements.

Module Name	AQ2211/AQ2212 Version (FIRM VER)
AQ2200-131/132 Grid TLS Module	3.00 and later
AQ2200-342 DUAL ATTN Module	3.01 and later
AQ2200-312/332 ATTN Module	3.04 and later
AQ2200-202 Interface Module	3.05 and later
AQ2200-232 Optical Sensor Head	3.05 and later
AQ2200-242 Optical Sensor Head	3.06 and later
AQ2200-112 LS Module	3.08 and later

- You can use the macro feature on frame controllers whose boot version is 2.0 or later. The boot version is indicated next to BOOT in the overview screen that appears when you press SYSTEM and then select Information.
- For information about updating the boot version, contact your nearest YOKOGAWA dealer.

9

Measurement Macros

9.2 Workflow for Using Macros

Edit the Macro

Create a macro program using an external software utility.

▶ Appendix, macro editor application's Help

Save the Macro

Save the macro program that you have created to the frame controller.

▶ Section 9.4

Execute the Macro

Execute the macro saved on the frame controller.

▶ Section 9.5
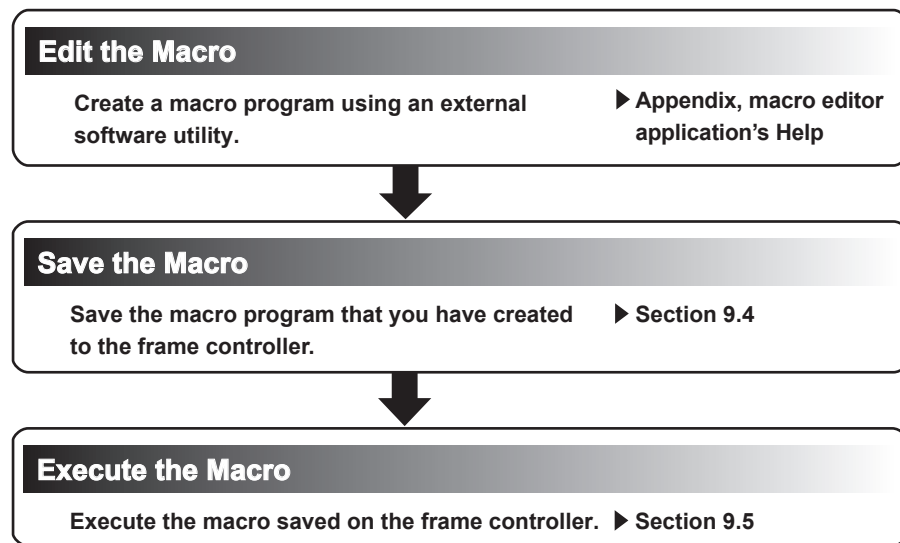
9.3 Starting a Macro

1. Press **MACRO** to display the Macro Function screen.

**The titles of the macros saved to Macro1 to Macro3
on the frame controller are displayed.**
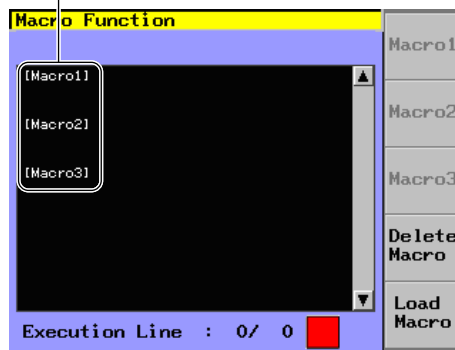
Note

- Up to three macro programs can be displayed on a single screen.
- There are no macro programs saved on the frame controller by default.
- You cannot use remote commands while a macro is being executed.

Explanation

The titles of the macro programs saved on the frame controller are displayed in the Macro Function screen. If titles are not displayed, it means that no macro programs have been saved to the frame controller.
The frame controller does not have any macro programs saved in it by default, so follow the procedure in section 9.4 to save macro programs to the frame controller.

9

Measurement Macros

9.4 Saving and Deleting Macro Programs

The two methods for saving macro programs to the frame controller are listed below.
- Load macro programs from USB memory onto the frame controller.
- Transfer macro programs from the macro editor application to the frame controller.

Loading a Macro Program from USB Memory onto the Frame Controller

1. Connect the USB memory device that contains the macro program to the USB port (type A).

2. Press the **Load Macro** soft key to display the File List screen.

Deletes a saved macro program
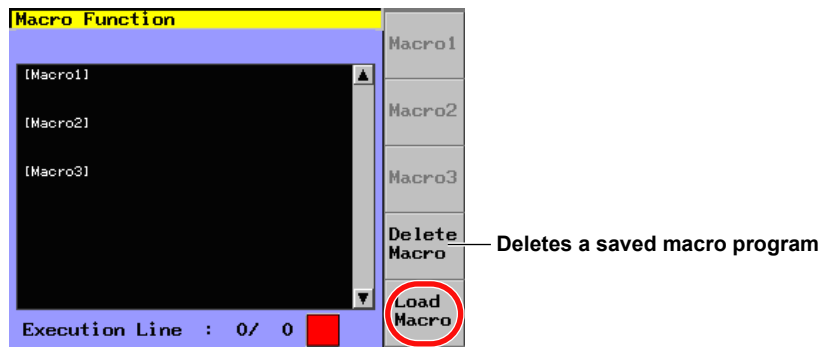
3. Use the arrow keys to select the macro program file that you want to save, and then press the **Macro** soft key.
   A window for selecting the macro number to save to appears.

Select the file type to display.
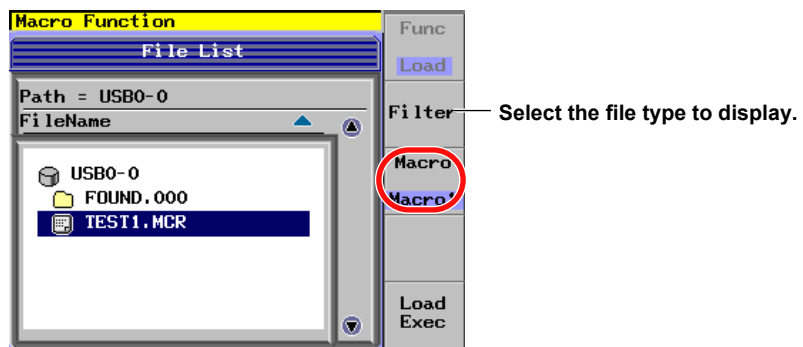
4. Use the arrow keys to move the cursor to the macro number that you want to save the macro to, and then press the **OK** soft key or **ENTER**.
   The macro number that you have chosen appears on the Macro soft key.
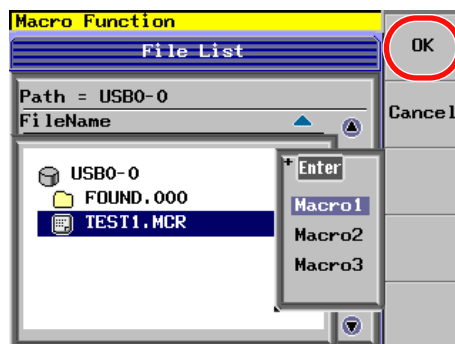
5. Press the **Load Exec** soft key to save the macro program.

Indicates the macro number that the macro program will be saved to
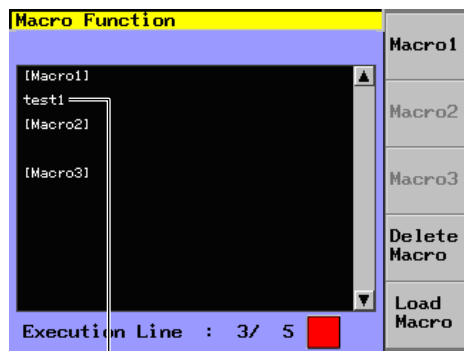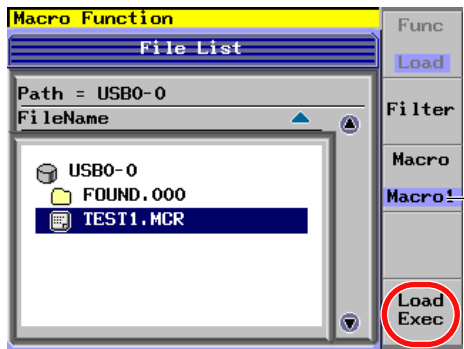
The title of a saved macro program

Note

An error message will appear if the format of the title of the macro program is not correct. For more information about error messages, see appendix 4.

Transferring a Macro Program from the Macro Editor Application to the Frame Controller

Use the macro editor application installed on the PC to transfer a file to the frame controller through a USB, Ethernet, or GP-IB connection.

For the procedure, see the macro editor application's Help.

Explanation

Saving Macro Programs

• You can save files with .mcr extensions.
• Do not transfer a macro to the frame controller from the macro editor application while a macro is running. If you attempt to do so, an error message will appear.
• Saved macro programs remain saved even after the frame controller is turned off.

Deleting Macro Programs

• The procedure for deleting macros is the same as the procedure for saving them, except that you press the Delete Macro soft key instead of the Load Macro soft key.
• You can delete an individual macro from Macro1 to Macro3 or select All to delete all the macro programs.

9

Measurement Macros

9.5 Executing a Macro

Executing a Macro

1. Press the soft key of the macro that you want to execute (Macro1 to Macro3) to display the macro execution screen.
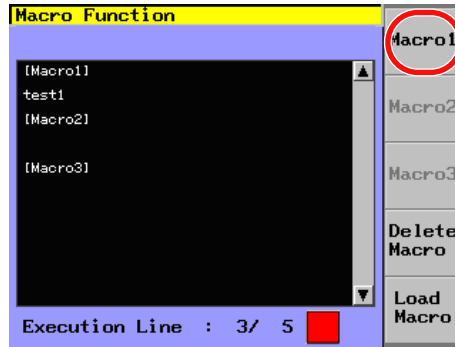
Shows the contents of the macro program's title line

Run — Executes the entire macro program

Step — Executes the macro program one line at a time

Shows macro program messages (from PRINT commands executed in the macro program)

Macro Select — Returns to the previous screen

Module Info — Shows a list of the modules that are necessary for the execution of the macro program
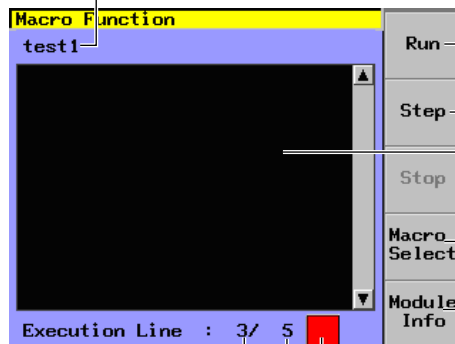
Currently executed line number

Execution status indicator

Total number of program lines (from the title line to the end line)

▷ : Executing

‖ : Paused

■ : Stopped

2. Press the **Run** or **Step** soft key.
   The execution status indicator shows that the macro is being executed.

Note

Make sure that the modules that are necessary for executing the macro are installed in the slots. The modules that are necessary for executing the macro are indicated in the footer information of the macro program. For details about the footer information, see appendix 4.

Pausing a Macro

1. When the execution status indicator shows that the macro is being executed, press the **Pause** soft key.

The execution status indicator will show that the macro is paused.

Stop — Stops the execution of the macro program

Cont — Restarts the execution of the macro program

Step — Executes the next line in the macro program and then pauses

Stop — Stops the execution of the macro program

Module Info — Shows a list of the modules that are necessary for the execution of the macro program
(only when the macro has been paused through the pressing of the Pause soft key)

Explanation

Executing a Macro

- **Run**

  The entire macro program, from the title line to the end line, is executed. Execution stops after the entire macro has been executed. When a Pause control statement in a macro program is executed, a message appears on the screen, and the macro program is paused.

- **Step**

  The macro program is executed line by line, starting from the title line. A new line is executed each time you press the Step soft key. If you press the Run soft key when you are in the middle of stepping through a macro, the macro execution restarts from the title line.

Pausing a Macro

When a macro is running, the macro will pause if you press the Pause soft key or if a Pause control statement is executed.

When a Pause control statement is executed and the execution of the macro is paused, the Module Info soft key cannot be used.

9

Measurement Macros

Program Structure

Macro programs are written in text format. Macro programs consist of the following four components.
- Control statements
- Comments and blank lines
- Remote commands
- Footer information lines

Program Structure
Programs start with the title line, which is a control statement, and end with the footer information.

Between the title line and the end line are the remote commands, which are the heart of the macro. You can use comments to explain the contents of the program as necessary. The footer information comes at the end of the program (after the end line). The footer contains the following three types of information.
- The type of frame controller (3 slot or 9 slot)
- File format information
- The names of the modules that are installed in the slots.

Structure of the Macro Program File Test1.mcr

```
┌─ Test1.mcr ──────────────────────────────────────────────┐
│                                                            │
│  TITLE Test001      (The title line. Declares the start of the macro program.) │
│                     (A blank line. You can insert these for readability.)      │
│  ' LS Power ON      (Use single quotation marks for comments.)                 │
│  :OUTPut1:CHANnel1:STATe ON  ┐                             │
│  FILE:NAME O,result          │ (The body of the macro program, │
│  :OUTPut1:CHANnel1:STATe OFF ┘  the part that is executed)  │
│                     (Blank line)                           │
│  END                (The end line. Declares the end of the macro program.)     │
│                     (Blank line)                           │
│  FRAME AQ2211       ┐                                      │
│  VERSION 01.00      │                                      │
│  SLOT1 AQ2200-142   │ (Footer information)                 │
│  SLOT2 AQ2200-211   │                                      │
│  SLOT3 NONE         ┘                                      │
│                                                            │
└────────────────────────────────────────────────────────────┘
```

Note
- In macro programs, only temporary variables are case sensitive.
- Use CR+LF as the line-feed code.

Comments and Blank Lines
Lines that start with single quotation marks are treated as comments and are not processed when the macro is executed. Blank lines are also not processed.

Footer Information

Write footer information as indicated below.

Statement	Parameters	Description
FRAME	AQ2211, AQ2212	The AQ2211 is the three-slot frame controller. The AQ2212 is the 9-slot frame controller.
VERSION	01.00	This is information about the file format. This parameter is fixed at 01.00.
SLOT1 to SLOT9	AQ2200-xxx, AQ2200-411<1x4>, AQ2200-411<1x8>, AQ2200-412<1x16>, AQ2200-421<1x2>, AQ2200-421<2x2>, NONE	For each slot, enter the name of the module that is necessary for measurement. For the values for "xxx," see section 9.1. • When the parameter for frame is "AQ2211," enter the names of the modules that should be installed in SLOT1 to SLOT3. • When the parameter for FRAME is "AQ2212," enter the names of the modules that should be installed in SLOT1 to SLOT9. • For slots that do not need to have modules installed in them, enter NONE. • If the module is an optical switch, enter the port configuration (1x4, 1x8, etc.) enclosed by <> after the module's name.

Note

• Enter the statements in the same order that they are listed in the table above.
• When you create a macro program using the macro editor application, the footer information is automatically attached, so you don't need to enter it.

Control Statements

You can use the following control statements in macro programs.

Control Statement	Description
TITLE	Declares the start of the macro program.
WAIT	Makes the controller wait for the specified amount of time before executing the next control statement.
PAUSE	Displays a message on the screen and pauses the execution of the macro.
FILE:NAME	Specifies the name of the file that the FILE:PRINT statement will write to.
FILE:PRINT	Writes a string of characters to a file.
FILE:PRINTLN	Writes a string of characters and a line feed to a file.
FOR	Repeats the control statements up to NEXT.
NEXT	Specifies where the FOR statement loops.
IF	Executes statements only when the specified conditions are met.
ELSE	Specifies what control statements to execute if the conditions of the IF statement are not met.
ENDIF	Specifies where the IF statement ends.
LABEL	Specifies the label that indicates where the GOTO statement jumps to.
GOTO	Jumps to the specified label.
PRINT	Displays characters in the macro execution screen.
LET	Assigns a value to a variable.
CALC	Performs computations.
END	Declares the end of the macro program.

TITLE

Statement name	TITLE	
Syntax	TITLE<space><title text><line feed>	
Parameters	<title text>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions."
Example	TITLE Test No.2	
Description	Declares the start of the macro program. The text between this title line and the end line is recognized as the macro program. Only the first 25 characters are recognized.	

END

Statement name	END
Syntax	END<line feed>
Parameters	None
Example	END
Description	Declares the end of the macro program. Do not enter control statements or remote commands after this line.

WAIT

Statement name	WAIT	
Syntax	WAIT\<space\>\<wait time\>\<line feed\>	
Parameters	\<wait time\>	100 to 86400000 (ms, 100 ms steps)
Example	WAIT 3000	
Description	The controller waits for the amount of time specified by the parameter.	

PAUSE

Statement name	PAUSE	
Syntax	PAUSE\<space\>\<message\>\<line feed\>	
Parameters	\<message\>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions." You can include temporary variables and loop variables in the text.
Example	PAUSE test No.%I result = %V0	
Description	Displays a message on the screen and pauses the execution of the macro. The message contains the characters that you specified for the parameter. There is no control statement for resuming the execution of the macro. To resume the execution of the macro, you need to press the CONT soft key that appears on the screen when the macro is paused. For information about how to enter temporary variables and loop variables, see "Format" later in this appendix. Only the first 25 characters are recognized. Entering an unassigned loop variable results in an "Uninitialized Value" error.	

FILE:NAME

Statement name	FILE:NAME	
Syntax	FILE:NAME\<space\>\<mode\>,\<file name\>\<line feed\>	
Parameters	\<file name\>	Specify the relative path from /USB0-0. You can use loop variables in the file name. You can enter up to 25 characters for the file name.
	\<mode\>	A: Append
		O: Overwrite
Example	FILE:NAME result/test%I-1	
Description	Specifies the name of the file that will be written to when the FILE:PRINT statement is executed. For information about how to enter loop variables, see "Format" later in this appendix. The file name extension is automatically set to .txt. Only the first 25 characters are recognized. Entering an unassigned loop variable results in an "Uninitialized Value" error.	

FILE:PRINT

Statement name	FILE:PRINT	
Syntax	FILE:PRINT\<space\>\<message\>\<line feed\>	
Parameters	\<message\>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions." You can include temporary variables and loop variables in the text.
Example	FILE:PRINT Power,%V0,Ref,%V2	
Description	Writes the message specified by the parameter to the file specified by the FILE:NAME statement. When the message is written, a line feed is not inserted in the end. For information about how to enter loop variables, see "Format" later in this appendix. Only the first 25 characters are recognized. Entering an unassigned loop variable results in an "Uninitialized Value" error.	

FILE:PRINTLN

Statement name	FILE:PRINTLN	
Syntax	FILE:PRINTLN<space><message><line feed>	
Parameters	<message>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions." You can include temporary variables and loop variables in the text.
Example	FILE:PRINTLN Power,%V0,Ref,%V2	
Description	Writes the message specified by the parameter into an individual line in the file specified by the FILE:NAME statement. When the message is written, a line feed is inserted at the end. For information about how to enter loop variables, see "Format" later in this appendix. Only the first 25 characters are recognized. Entering an unassigned loop variable results in an "Uninitialized Value" error.	

FOR

Statement name	FOR	
Syntax	FOR<space><loop variable>=<start number>to<end number><line feed>	
Parameters	<loop variable>	I, J, K, M, or N. For details, see "Loop Variables" later in this appendix.
	<start number>	Loop variable start number, 0 to 50000
	<end number>	Loop variable end number, 0 to 50000
Example	FOR I=0to5	
Description	The commands between the FOR and NEXT statements are repeated until the value of the loop variable is equal to the end number. Set the start number to a value that is smaller than the end number. You can nest up to five FOR statements.	

NEXT

Statement name	NEXT	
Syntax	NEXT<space><loop variable>	
Parameters	<loop variable>	Specify I, J, K, M, or N. For details, see "Loop Variables" later in this appendix.
Example	NEXT I	
Description	Makes the for statement start over and begins the next loop.	

IF

Statement name	IF	
Syntax	IF<space><variable 1><relational operator><variable 2><line feed>	
Parameters	<variable 1>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
	<relational operator>	Specify >, <, <=, >=, <>, or ==. For details, see "Operators" later in this appendix.
	<variable 2>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
Example	IF V0>=V2 ... ELSE ... ENDIF	
Description	Creates a branch based on conditions. The relational operator is used to compare variable 1 and variable 2, and if the comparison condition is true, the portion of the macro between IF and ELSE or ENDIF is executed. If the comparison condition is false, the portion of the macro between IF and ELSE or ENDIF is skipped. Entering an unassigned loop variable results in an "Uninitialized Value" error. You can nest up to five IF statements.	

ELSE

Statement name	ELSE
Syntax	ELSE<line feed>
Parameters	None
Example	IF V0>=V2
	...
	ELSE
	...
	ENDIF
Description	The ELSE statement causes the statements that follow it to be executed if the comparison condition for the IF statement is false.

ENDIF

Statement name	ENDIF
Syntax	ENDIF<line feed>
Parameters	None
Example	IF V0>=V2
	...
	ELSE
	...
	ENDIF
Description	Declares the end of the IF statement.

LABEL

Statement name	LABEL	
Syntax	LABEL<space><character string><line feed>	
Parameters	<character string>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions."
Example	LABEL dut2test	
Description	Specifies a jump destination for a GOTO statement. Only the first 25 characters are recognized. This statement cannot be entered in an IF or FOR statement. You cannot enter the same character string in more than one LABEL statement.	

GOTO

Statement name	GOTO	
Syntax	GOTO<space><label><line feed>	
Parameters	<label>	Specify a character string that has been specified in a LABEL statement. For information about the characters you can use, see "Restrictions."
Example	GOTO dut2test	
Description	Jumps to the label specified in a LABEL statement.	

PRINT

Statement name	PRINT	
Syntax	PRINT<space><character string><line feed>	
Parameters	<character string>	You can enter up to 25 characters. For information about the characters you can use, see "Restrictions." You can include temporary variables and loop variables in the text.
Example	PRINT Slot%IPower=%V0 LET %V1=DATE PRINT date:%V1	
Description	Displays the character string that you specified for the parameter in the macro execution screen. Only the first 25 characters are recognized. Entering an unassigned loop variable results in an "Uninitialized Value" error.	

LET

Statement name	LET	
Syntax	LET<space><temporary variable>=<special variable><line feed>	
	LET<space><temporary variable>=<number><line feed>	
	LET<space><temporary variable>=<loop variable><line feed>	
	LET<space><temporary variable>=<temporary variable><line feed>	
Parameters	<temporary variable>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
	<special variable>	For details, see "Special Variables" later in this appendix.
	<number>	Enter an integer value from –2147483648 to 2147483647 or a signed decimal value up to 11 characters in length including the decimal point.
	<loop variable>	Specify I, J, K, M, or N. For details, see "Loop Variables" later in this appendix.
Example	LET V1=S1D1P	
Description	Assign one of the following values to the temporary variable. <special variable>, <number>, <loop variable> If a special variable character string value is assigned to the temporary variable, the temporary variable is also treated as a character string. If a variable other than a character string is assigned, the temporary variable is treated as a double type value.	

CALC

Statement name	CALC	
Syntax	CALC<space><temporary variable 1>=<temporary variable 2><binary operator><temporary variable 3><line feed>	
Parameters	<temporary variable 1>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
	<temporary variable 2>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
	<binary operator>	Specify +, –, *, or /. For details, see "Operators" later in this appendix.
	<temporary variable 3>	Specify a temporary variable from V0 to V255. For details, see "Temporary Variables" later in this appendix.
Example	CALC V255=V2+V3	
Description	Applies the binary operator to temporary variable 2 and temporary variable 3 and assigns the result to temporary variable 1. If a value is not assigned to temporary variable 2 or temporary variable 3, an "Uninitialized Value" error occurs.	

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Format

The format for the various variables used when displaying messages using the PRINT, FILE:PRINT, FILE:PRINTLN, and PAUSE statements is indicated below.

Variable type	Format
Temporary variable (double type)	Displayed using decimal notation when the first character of the variable is an uppercase V (the %.4f format in C). Displayed using exponential notation when the first character of the variable is a lowercase V (the %.8E format in C).
Temporary variable (character string type)	Character string (the %s format in C)
Loop variable	Integer (the %d format in C)

Note

- The %.4f format in C is a decimal notation format in which four decimal places are displayed.
- The %.8E format in C is a signed exponential notation format in which eight decimal places of the mantissa are displayed.

Operators

You can enter the following operators into CALC and IF statements.

Type	Operator	Description
Relational operators	<	True if the right term is greater than the left term
	>	True if the left term is greater than the right term
	<=	True if the right term is greater than or equal to the left term
	>=	True if the left term is greater than or equal to the right term
	<>	True if the right term and the left term are not equal
	==	True if the right term and the left term are equal
Binary operators	+	Adds the right and left terms
	–	Subtracts the right term from the left term
	*	Multiplies the right and left terms
	/	Divides the left term by the right term. Division by zero results in a "Macro Calculate Exception" error.

Note

For both relational and binary operators, the left and right terms are treated as double type values.

Temporary Variables

Variable Name	Description
V0 to V255	Variables used in computation. They are treated as double type or character string type values.

Loop Variables

Variable Name	Description
I, J, K, M, or N	Variables used in FOR statement loops. The incrementations of these variables are used to count the number of loops.

Special Variables

Variable Name	Applicable Module Types	Data Type	Description
S[m]D[d]P	Sensors, attenuators with an optical power monitor	double	Queries the power value of device [d] in slot [m]. The value is queried in the specified unit (dBm or W). Because single measurement is performed at the time of the query, the measurement mode is set to single.
S[m]D[d]R	Sensors	double	Queries the reference value of device [d] in slot [m]. The value is queried in the specified unit (dBm or W).
S[m]D[d]S	Sensors, attenuators with an optical power monitor	double	Queries the register status of device [d] in slot [m] and returns a number. 0: Within range (normal) 1: Under range 2: Over range
TIME	—	Character string	Queries the current time. The time is returned in the following format: 'yyyy/mm/dd/hh:mm:ss'.

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Remote Commands

You can enter the following remote commands into macro programs.

Remote Command	Applicable Modules	Description
`:INITiate[m][:CHANnel[d]]:CONTinuous`	Sensors	Executes or queries continuous measurements through the trigger system.
`:INPut[m][:CHANnel[d]]:ATTenuation`	Attenuators	Sets or queries the optical attenuation.
`:INPut[m][:CHANnel[d]]:WAVelength`	Attenuators	Sets or queries the wavelength (all ATTN modules).
`:OUTPut[m][:CHANnel[d]][:STATe]`	Light sources and tunable light sources	Sets or queries the output's on/off status.
`:OUTPut[m][:CHANnel[d]]:ATIMe`	Attenuators built-in monitor power meter	Sets or queries the averaging time.
`:OUTPut[m][:CHANnel[d]]:POWer`	Attenuators built-in monitor power meter	Sets or queries the optical output power.
`:OUTPut[m][:CHANnel[d]]:POWer:UNIT`	Attenuators built-in monitor power meter	Sets or queries the power unit (dBm or W).
`:OUTPut[m][:CHANnel[d]]:POWer:CONTrol`	Dual Attenuator	Enables or disables the automatic optical output power adjustment function.
`:ROUTe[m][:CHANnel[d]]`	Optical switches	Sets or queries the connection port of an optical switch. (This command only sets the connections on one side of a 2 × 2 switch.)
`:SENSe[m][:CHANnel[d]]:AM:FREQuency`	Sensors	Sets or queries the CHOP frequency.
`:SENSe[m][:CHANnel[d]]:AM:STATe`	Sensors	Sets or queries the optical signal modulation method.
`:SENSe[m][:CHANnel[d]]:POWer:ATIMe`	Sensors	Sets or queries the averaging time.
`:SENSe[m][:CHANnel[d]]:POWer:RANGe`	Sensors	Sets or queries the range.
`:SENSe[m][:CHANnel[d]]:POWer:RANGe:AUTO`	Sensors	Sets or queries the range switch mode.
`:SENSe[m][:CHANnel[d]]:POWer:REFerence`	Sensors	Sets or queries the relative measurement's reference value.
`:SENSe[m][:CHANnel[d]]:POWer:REFerence:DISPlay`	Sensors	Sets the reference value to the current measured value.
`:SENSe[m][:CHANnel[d]]:POWer:REFerence:STATe`	Sensors	Sets or queries the relative measurement mode.
`:SENSe[m][:CHANnel[d]]:POWer:REFerence:STATe:RATio`	Sensors	Sets or queries the relative measurement mode parameters.
`:SENSe[m][:CHANnel[d]]:POWer:UNIT`	Sensors	Sets or queries the unit (dBm or W).
`:SENSe[m][:CHANnel[d]]:POWer:WAVelength`	Sensors	Sets or queries the measurement wavelength.
`:SLOT[m]:PRESet`	All	Sets all the modules' parameters to their default values.
`:SOURce[m][:CHANnel[d]]:AM:FREQuency`	Light sources	Sets or queries the internal modulation frequency.
`:SOURce[m][:CHANnel[d]]:AM:SOURce`	Light sources	Sets or queries the modulation mode.
`:SOURce[m][:CHANnel[d]]:AM:STATe`	Light sources	Sets or queries the modulation feature's on/off status.
`:SOURce[m][:CHANnel[d]]:FREQuency[/]`	DFB-LD light sources and tunable light sources	Sets or queries the optical frequency.
`:SOURce[m][:CHANnel[d]]:LINewidth`	DFB-LD light sources and tunable light sources	Sets or queries the spectrum line width.
`:SOURce[m][:CHANnel[d]]:POWer[:AMPLitude][/]`	Light sources and tunable light sources	Sets or queries the optical output power.
`:SOURce[m][:CHANnel[d]]:POWer:ATTenuation[/]`	Light sources	Sets or queries the optical attenuation.
`:SOURce[m][:CHANnel[d]]:POWer:STATe`	Light sources and tunable light sources	Sets or queries the optical output's on/off status.
`:SOURce[m][:CHANnel[d]]:POWer:WAVelength`	Light sources (DUAL FP-LD)	Sets or queries the laser output wavelength.
`:SOURce[m][:CHANnel[d]]:WAVelength[/]`	Tunable light sources	Sets or queries the wavelength.
`:SYSTem:ERRor:VIEW:CLEar`	All	Clears the errors in the error view.
`:SOURce[m][:CHANnel[d]]:FREQuency:TOGRid`	Tunable light sources (Grid TLS)	Sets the frequency to the grid frequency closest to the specified optical frequency.
`:SOURce[m][:CHANnel[d]]:WAVelength:TOGRid`	Tunable light sources (Grid TLS)	Sets the wavelength to the grid wavelength closest to the specified frequency.

Remote Command	Applicable Modules	Description
`:SOURce[m][:CHANnel[d]]:MODulation:INTernal[:STATe]`	Tunable light sources (Grid TLS)	Sets or queries the on/off status of the dither feature.
`:SOURce[m][:CHANnel[d]]:MODulation:INTernal:SBSControl[:LEVel]`	Tunable light sources (Grid TLS)	Sets or queries the SBS suppression dither frequency.
`:SOURce[m][:CHANnel[d]]:MODulation:INTernal:AMPLitude`	Tunable light sources (Grid TLS)	Sets or queries the AM amplitude of the dither feature.
`:SOURce[m][:CHANnel[d]]:FREQuency:CHANnel`	Tunable light sources (Grid TLS)	Sets or queries the grid number.
`:SOURce[m][:CHANnel[d]]:FREQuency:OFFSet`	Tunable light sources (Grid TLS)	Sets or queries the fine tuning value of the frequency.
`:SOURce[m][:CHANnel[d]]:GRIDmode`	Tunable light sources (Grid TLS)	Sets or queries the grid mode on/off status.
`:SOURce[m][:CHANnel[d]]:FREQuency:REFerence`	Tunable light sources (Grid TLS)	Sets or queries reference frequency of the grid number.
`:SOURce[m][:CHANnel[d]]:FREQuency:GRID`	Tunable light sources (Grid TLS)	Sets or queries the frequency spacing of each grid.

Note

For details about each command, see the communication interface user's manual, IM735101-17EN.

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Restrictions

Usable Characters

You can use the following characters in control statement parameters.

Control Statement	Usable Characters	Additional Character Type Information
TITLE	a-z, A-Z, 0-9, <space>, !*+,-/:>=<?()[]{}, _	Lowercase and uppercase letters of the alphabet, numbers, spaces, symbols, and underscores
PAUSE	a-z, A-Z, 0-9, <space>, !*+,-/:>=<?()[]{}, _	Lowercase and uppercase letters of the alphabet, numbers, spaces, symbols, and underscores
FILE:PRINT	a-z, A-Z, 0-9, <space>, !*+,-/:>=<?()[]{}, _	Lowercase and uppercase letters of the alphabet, numbers, spaces, symbols, and underscores
GOTO	a-z, A-Z, 0-9, _	Lowercase and uppercase letters of the alphabet, numbers, and underscores
LABEL	a-z, A-Z, 0-9, _	Lowercase and uppercase letters of the alphabet, numbers, and underscores
PRINT	a-z, A-Z, 0-9, <space>, !*+,-/:>=<?()[]{}, _	Lowercase and uppercase letters of the alphabet, numbers, spaces, symbols, and underscores

Length Restrictions

You can enter up to 100 characters on a single line, not including the line feed character.

A single macro program can contain up to 256 lines.

About Overlap Commands

Overlap operation is not supported.

All overlap commands are executed sequentially.

Sample Macro Program

This is a sample program for measuring the optical loss of the DUT.

Overview of the Program
The program is for transmitting light from the light source to the DUT and measuring the power value using a sensor.
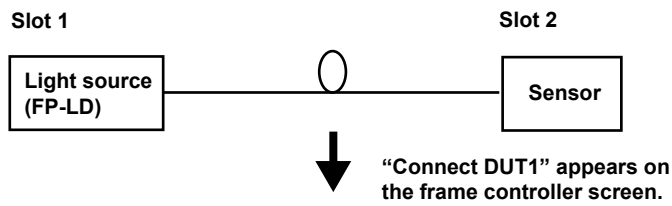The measured results are saved to a file.
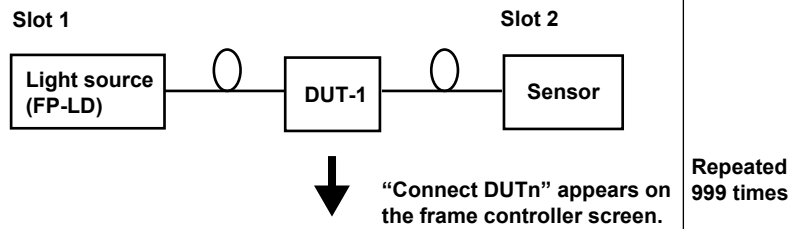This measurement is repeated 999 times.

Configuration
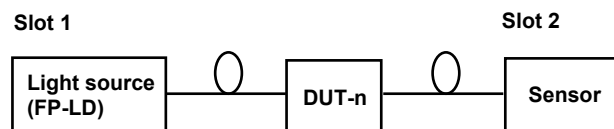The test configuration is indicated below.

1. Reference measurement is performed.

"Connect DUT1" appears on the frame controller screen.

2. The power value of DUT 1 is measured.

"Connect DUTn" appears on the frame controller screen.

3. The power value of DUT n is measured.

Repeated 999 times

Sample Program

TITLE Loss Measurement Sample1

' --- Frame setting ---
:SYSTem:ERRor:VIEW:CLEar
:SLOT1:PRESet
:SLOT2:PRESet

Initializes the frame controller, light source, and sensor

' --- Sensor setting ---
:SENSe2:CHANnel1:AM:STATe OFF
:SENSe2:CHANnel1:POWer:ATIMe 100MS
:SENSe2:CHANnel1:POWer:RANGe:AUTO 1
:SENSe2:CHANnel1:POWer:UNIT 0
:SENSe2:CHANnel1:POWer:WAVelength 1310NM

Sets the measurement conditions for the sensor in slot 2.

' --- LS setting---
:OUTPut1:CHANnel1:STATe 1
:SOURce1:CHANnel1:AM:STATe OFF
:SOURce1:CHANnel1:POWer:ATTenuation 0DB
:SOURce1:CHANnel1:POWer:WAVelength LOW

Sets the optical output conditions for the light source in slot 1.

' --- Ref ---
PAUSE Run the Ref.measurement.
:SENSe2:CHANnel1:POWer:REFerence:STATe 1
LET V0 = S2D1R
:SENSe2:CHANnel1:POWer:REFerence:DISPlay
:INITiate2:CHANnel1:CONTinuous ON
PRINT REF: %V0 dBm

Performs reference measurement and displays the measured values on the screen.

' --- Loss Meas. ----
FOR I = 1 TO 999
PAUSE Connect the DUT%I
LET V1 = S2D1P
:INITiate2:CHANnel1:CONTinuous ON
PRINT MEAS: %V1 dB
PAUSE %V1 dB
FILE:NAME A,LossData
FILE:PRINTLN %V1
NEXT I

Displays "Connect the DUT1" on the screen, measures the DUT's power value, displays the results on the screen and pauses, adds the measured results to the file 'LossData', and repeats 999 times.

END

FRAME AQ2211
VERSION 01.00
SLOT1 AQ2200-142
SLOT2 AQ2200-211
SLOT3 NONE

Footer information

Error Messages

Messages may appear on the screen while a macro is being executed. This section describes the error messages and the corrective action to take. If servicing is necessary to solve the problem indicated by a message, contact your nearest YOKOGAWA dealer.

Code	Message	Description	Corrective Action	Page
101	Macro Command Empty	There are no valid macro commands.	• Macro command lines that start with single quotation marks are ignored, so please delete any single quotation marks before macro command lines.	App-1
			• Check the spelling of the control statements.	App-3
102	Macro Command Over Flow	There are too many lines in the macro.	Keep the number of lines in a macro to 256 or less.	App-11
103	Macro Command Too long	There are too many characters in one of the commands.	You can enter up to 100 characters on a single line. To enter more than 100 characters, enter the additional characters on a new line.	App-11
104	Macro Parameter Empty	A parameter value is not specified.	Some control statements have parameters that must be specified. Check the control statements, and specify their parameters.	App-3
105	Macro Not Found Space between Head and param	There is no space between a header and a parameter.	Insert a space. Check the syntax of the control statements.	App-3
106	Macro Illegal character	The macro may contain an unsupported character.	Check the usable characters.	App-11
107	Macro Illegal character	The parameter syntax is incorrect.	• Check the module-name and format-information text in the footer information.	App-2
			• Enter parameters using 25 characters or less.	App-3
			• There are some control statements with parameters in which certain characters cannot be used.	App-11
108	Macro Syntax Error	The value specified for WAIT is outside of the acceptable range.	Set WAIT to a value between 100 and 86400000.	App-4
109	Macro Out Of Range Loop Counter	A value specified for a FOR statement is outside of the acceptable range.	Set start and end numbers to values between 0 and 500000.	App-5
113	Macro Syntax Error	There is no TITLE statement.	Enter a TITLE statement at the start of the program.	App-3
114	Macro Syntax Error	You cannot enter multiple TITLE statements.	You can only enter one TITLE statement in a single program.	App-3
115	Macro Syntax Error	There is no END statement.	Enter an END statement at the end of the program (before the footer).	App-1 and 4-3
116	Macro Syntax Error	There is an IF statement that is not closed by an ENDIF statement.	Enter an ENDIF statement at the end of the conditional branch you have entered (the end of the sequence of statements after the ELSE statement).	App-6
117	Macro Syntax Error	There is a FOR statement that is not closed by a NEXT statement.	Enter a NEXT statement at the place where you want the FOR statement to loop.	App-5
118	Macro Syntax Error	Nested LABEL statements are not permitted.	Do not enter LABEL statements within IF or FOR statements.	App-6
119	Macro Too Many Nest	The nesting is too deep.	You can nest up to five control structures.	App-5
120	Macro Label Already exist	The same label is being used for more than one LABEL statement.	Enter a unique character string parameter for each LABEL statement.	App-6
122	Macro Calculate Exception	A computation exception has occurred.	In division, the value of the denominator has been set to 0. Check the control statements, and fix them.	App-7
132	Macro Eof Exception	An unexpected EOF has been detected.	• There is a FOR statement that is not closed by a NEXT statement. Enter a NEXT statement at the place where you want the FOR statement to loop. • There is an IF statement that is not closed by an ENDIF statement. Enter an ENDIF statement at the place where you want the IF statement to end.	App-5

Error Messages

Code	Message	Description	Corrective Action	Page
134	Macro File Not Found	The file path is incorrect.	• Specify the relative path from /USB0-0. • Specify the file name using 25 characters or less.	App-4
			• Check the usable characters.	App-11
			• Check whether USB memory is connected.	—
135	Macro File Error	The frame controller failed to write to the USB memory.	• There is not enough available memory. Delete unneeded files, or use another USB memory device. • The frame controller could not recognize the USB memory. Insert the memory correctly. For information on devices that are supported, contact your nearest YOKOGAWA dealer. • The memory is corrupted. Use a new USB memory device.	—
136	Macro Fatal Error	There is an abnormal temporary variable.	Check the formats of the values (special variables, number, and loop variables) that you assigned to the temporary variables.	App-7 and 4-8
137	Macro Fatal Error	There is an abnormal slot number.	The slot number range varies depending on the frame type you enter in the footer information, so check the frame type. If you enter FRAME AQ2211, the range for m is 1 to 3. If you enter FRAME AQ2212, the range for m is 1 to 9.	App-2
138	Macro Fatal Error	There is an abnormal device number.	You can set the device number to 1 or 2. You can only specify 1 for modules that do not have multiple devices. Check the numbers.	—
141	Macro Fatal Error	There has been an SRAM access error.	The internal SRAM may be damaged. Servicing is required.	—
142	Macro Syntax Error	Multiple ELSE statements have been entered.	You cannot enter multiple ELSE statements in a single IF statement.	—
145	Macro Syntax Error	There is a GOTO statement that is not closed by a LABEL statement.	Make sure that the parameter (label) specified as the jump destination is defined in a LABEL statement.	App-6
146	Macro Illegal Command	An unsupported command has been entered into the macro.	• Check the spelling of the control statements.	App-3
			• Check the remote commands that can be used.	App-10
147	Macro State Error	The frame controller is not currently capable of performing macro operations.	If application or macro functions are running when you try to transfer a macro program from the macro editor application, this message will appear. To continue the transfer, stop the various functions.	—
148	Macro File Access Error	A file access error has occurred.	The file may be corrupt. Check the file.	—
149	Macro Frame Type Invalid	An invalid frame type has been entered in the footer information.	The valid frame types are AQ2211 and AQ2212.	App-2
150	Macro Invalid Header	There is an error in the footer syntax.	The order of the items in the footer information is fixed. Enter the items in the following order: FRAME, VERSION, SLOT1, SLOT2...SLOT9.	App-2
151	Macro Invalid Module	The module configuration in the footer information does not match the frame controller's module configuration.	Check the installed modules.	—
152	Macro Uninitialized Value	An uninitialized variable has been used.	Assign values to the temporary variables and loop variables that you use in parameters.	App-4

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