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If you wish to buy or sell an [AQ2201, AQ2202, AQ2211 or AQ2212](#) mainframe, visit our product page [here](#) to see our current stock of Yokogawa mainframes and also AQ2200 modules that fit those mainframes.

## The Simbol Test Systems expertise

With more than 25 years of expertise in repairing OSA, Tunable Lasers, Wavemeters, Attenuators and many more, the quality of our services is renowned amongst the service centers community and highly appreciated by our partners and customers. In the case of **Yokogawa** mainframes, the tests and calibration required is to prove the mainframe capable of holding a full load of modules and ensure that each module can be controlled individually. Our laboratory has most module models in stock so AQ2200 331, AQ2200 311, AQ2200 221, AQ2200 421... The list would be too long to type it all here! If you need service or calibration for one such module, let us know. With 25 years experience in lab testing and calibration, if you send your unit to us or buy one from us, you can be sure it has **really** been tested. We have seen ISO 17025 certified labs publishing incomplete reports with no data. So, a report from other labs with less data points than ours reflects a not completely calibrated unit. Also, when buying, be careful of other sellers saying their equipment is "tested good", "powered on, self-tested", "pulled from a working environment". When you choose Simbol Test Systems for service or AssetRelay for purchase, you can be confident that we actually test everything we sell so you know it will work when it gets to your workplace. Optical equipment needs more than just power on to be proven working!

### Ando/Yokogawa AQ2201, AQ2202, AQ2211, AQ2212 Mainframes Repair and Calibration

As mentioned above, the AQ2200 series mainframes are not products that really need to be calibrated although a thorough test is warranted.

We have calibration capabilities for all these modules that fit those mainframes:

- AQ2200-111 DFB-LD module (1310nm, 1490nm, full C band, etc.)
  - AQ2200-131 Grid TLS module (C/L band, 1 channel)
  - AQ2200-132 Grid TLS module (C/L band, 2 channels)
  - AQ2200-111 DFB-LD module
  - AQ2200-211 Sensor module (high sensitivity, long wavelength)
  - AQ2200-221 Sensor module (2-channel, long wavelength)
  - AQ2200-231 Optical sensor head (large diameter, long wavelength)
  - AQ2200-241 Optical sensor head (large diameter, short wavelength)
  - AQ2200-215 Sensor module (high power +30 dBm) module (C/L band, 1 channel)
  - AQ2200-132 Grid TLS module (C/L band, 2 channels)
  - AQ2200-311A ATTN module (standard, monitor output option)
  - AQ2200-331 ATTN module (with a built-in optical power meter)
  - AQ2200-421 OSW module (1x2 or 2x2)
  - AQ2200-411 OSW module (1x4 or 1x8)
  - AQ2200-412 OSW module (1x16)
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**User's  
Manual**

**Model 810518900  
AQ2201/AQ2202  
Frame Controller**

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# Introduction

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Thank you for your purchasing of this AQ2201/AQ2202 Frame Controller.

This AQ2201/AQ2202 Frame Controller (hereafter referred to as “this unit”) is launched as a frame controller for the AQ2200 Multi-application System. The AQ2200 Multi-application System is a test system applicable to various applications. In addition to the light source, optical power meter, optical switch, and optical variable change attenuator, other module lineup, such as bit error tester, E/O, and O/E can also be controlled by the common platform.

| Manual Item  | Manual No.      | Description  |
|--|-----------------|--|
| AQ2201/AQ2202 Frame Controller<br>User's Manual                            | IM810518900-01E | This user's manual. The manual describes all functions of the AQ2201/AQ2202, AQ2200-111, 141, 142, 201, 211, 215, 221, 231, 241, 311, 331, 411, and 421 except for the communication functions, and proper operating procedures. |
| AQ2200<br>Multi-Application Test System<br>Remote Command Reference Manual | IM810518900-17E | This manual describes the communication functions (remote control functions) of the AQ2201/AQ2202, AQ2200-111, 141, 142, 201, 211, 215, 221, 231, 241, 311, 331, 411, and 421.   |

## Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from the actual screen.  
This manual is applicable to the AQ2201/AQ2202 Frame Controller with a firmware version of “6.00” or higher.
- 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.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.

## Trademarks

- This unit uses Montavista™ Linux®.
- Montavista™ is a registered trademark of Montavista Software, Inc.
- Linux and Linux® are registered trademarks of Linus Torvalds.

## Revisions

- 1st Edition : September 2004
- 2nd Edition : July 2005
- 3rd Edition : March 2007

## Warranty

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- The warranty period is one year from the date of purchase.
- Should breakdown occur during the warranty period, repairs shall be made free of charge according to the warranty policy.
- Breakdown arising from operating mistakes or modifications performed by the user or breakdown/damage caused by natural disasters shall be exempt from this warranty policy, even if it occurs during the warranty period.
- Prior to shipment, every YOKOGAWA product undergoes strict inspections that are carried out according to its quality assurance system. However, should breakdown occur arising from defects in manufacturing or accidents during transport, please contact your local sales dealer or YOKOGAWA's sales branch.


# Conventions Used in This Manual

## Pictorial Symbols for Safe Operation




The following signal words and pictorial symbols are intended to prevent operator's or other personnel's accidents, and property damages in order to ensure the safe operation. Before reading this manual, fully understand the contents shown below.

The following signal words describe the level of the danger or damage arising from negligence of described contents and/or improper operation.

|   |
|---|
|  <b>WARNING</b>                      |
| Indicates a potentially hazardous situation that may result in serious personal injury or even death, if not avoided. |

|  |
|--|
|  <b>CAUTION</b>                         |
| Indicates a potentially hazardous situation that may result in minor personal injury or property damage, if not avoided. |




Additionally, the level of the danger or damage is also indicated with combination of the symbol and pictorial symbol shown below.

|   |   |
|---|---|
|  | The picture in the symbol $\triangle$ indicates the notice showing the warning or caution.<br>The example on the left shows that flammable materials causing fire hazard exist. |
|  | The picture in the symbol $\circ$ indicates the action not allowed to take.<br>The example on the left shows that the disassembly work is absolutely prohibited.                |
|  | The picture in the symbol $\bullet$ indicates the action you have to take.<br>The example on the left shows that the AC adaptor must be disconnected from the power outlet.     |

## Other Pictorial Symbols

**NOTE** | Indicates the reference information useful to operate this unit.

Additionally, the following symbol marks are also used for this unit.

|   |             |   |   |
|---|-------------|---|---|
|  | ON (Power)  |  | Functional grounding terminal.<br>Do not use this terminal as protective installation terminal. |
|  | OFF (Power) |   |   |

# Safety Precautions

To safely operate this unit, carefully read the contents stated in "Safety Precautions" in this manual. After reading this manual, store it in a safe place where all concerned personnel can refer to it immediately during operation.

## Cautions about Safe Operation of Laser Product

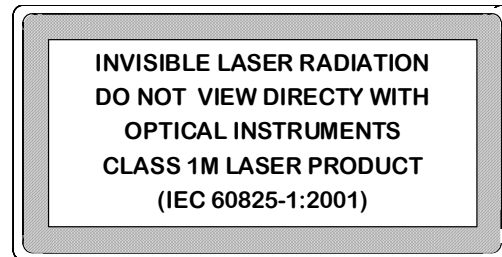
This unit uses a laser light source. This unit complies with "Class 1M laser product" and "Class 1 laser product" of "IEC60825-1, 2001".

|  | AQ2200-111             | AQ2200-141  | AQ2201-142 |
|--|------------------------|-------------|------------|
| Laser type   | DFB-Laser              | FP-Laser    |            |
| Laser class<br>IEC 60825-1:2001<br>21CFR 1040.10 (* <sup>1</sup> ) | 1M                     | 1           |            |
| Maximum output power (* <sup>2</sup> )                             | 40mW                   | 10mW        |            |
| Diameter of mode field   | 9μm                    | 9μm         |            |
| Numerical Aperture (NA)  | 0.1                    | 0.1         |            |
| Wavelength   | 1310.000 to 1620.500nm | 1310/1550nm |            |

### Laser Safety Labels

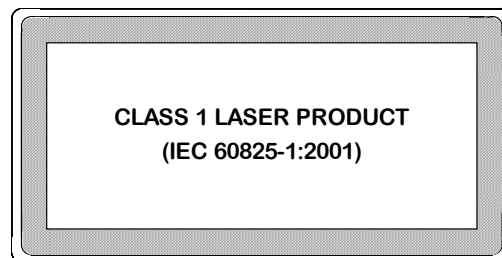
#### Laser Class 1M Label (AQ2200-111)

If the laser output is observed at a distance of 100mm or less from the laser beam emitting part by means of optical method (loupe, magnifying glass, microscope, etc.), this may cause eye injury.








#### Laser Class 1 Label (AQ2200-141, AQ2200-142)

If the laser output is observed at a distance of 100mm or less from the laser beam emitting part by means of optical method (loupe, magnifying glass, microscope, etc.), this may cause eye injury.





(\*<sup>1</sup>) This specification complies with "21CFR1040.10" except for deviation points arising from strict observation of "Laser Notice No.50" issued on May 27, 2001.

(\*<sup>2</sup>) This value is obtained under single-failure conditions.

|  <b>WARNING</b> |  |
|--|--|
|                 | If the control or adjustment is performed in incorrect manner not specified in this manual, you may be exposed to the hazardous laser beam.  |
|                 | <p>The invisible laser beam is output from the optical output connector. The optical output connector is located on the front panel of the laser product and the mark shown on the left is printed close to the optical output connector.</p> <p>The green LED on the front panel is lit while the laser beam is being output. The laser beam output is turned ON or OFF by pressing the Optical Output switch. The Optical Output switch is located at a position close to the optical output connector on the front panel.</p>   |
|                 | <ul style="list-style-type: none"> <li>• Do not output the laser beam if the optical fiber is not connected to the optical output connector.</li> <li>• Before disconnecting the optical fiber from the optical output connector, stop the optical output completely.</li> <li>• Never look at the optical output connector or the top end of the optical fiber connected to the optical output connector while the laser beam is being output.</li> </ul> <p>➔ The invisible laser beam cannot be seen. However, if the laser beam enters your eye(s), this may cause eye injury and the eyesight to be ruined excessively.</p> |
|               | <p>If the inside of the laser product is disassembled or modified, the high power laser beam may be output.</p> <p>If any repair is required, contact your local sales dealer or YOKOGAWA's sales branch office. Only authorized engineers are allowed to repair this unit.</p>  |


## Notes on Power Supply

Before using the unit, the following precautions must be observed.




|   |   |
|---|---|
| <b>⚠ WARNING</b>  |   |
|  | <p>Before using the unit, make sure that it is grounded properly.</p> <p>→ Operating the unit without grounding may result in electric shock or breakdown. However, grounding is not necessary if the 3-pin power cord (with an earth pin) supplied with the unit is connected to a 3-pin power outlet.</p> |
| <b>⚠ CAUTION</b>  |   |
|  | <p>Do not connect or disconnect the power cord while the unit is powered ON.</p> <p>→ Doing so may result in breakdown.</p>   |

## Notes on Operating Environment and Conditions




### Restrictions Regarding Operating Environment

|  |   |
|--|---|
| <b>⚠ WARNING</b>   |   |
|  | <p>Always pay special attention so that the water does not enter this unit or the unit does not get wet.</p> <p>→ Failure to do so may result in fire, electric shock or malfunction.</p> |

### Restrictions Regarding Operating Conditions


|   |  |
|---|--|
| <b>⚠ CAUTION</b>  |  |
|  | <p>The unit must be used with the specified power supply voltage only.</p> <p>→ Failure to do so may result in fire, electric shock or accident.</p> |
|  | <p>When using commercial power supply, make sure that the unit is connected to a dedicated power outlet.</p>   |
|  | <p>Do not use an extension cord.</p> <p>→ Using an extension cord may result in heat generation or fire.</p>   |

**Notes on Installation****For Personnel Performing Installation**








|  <b>WARNING</b> |   |
|--|---|
|                 | Do not share the AC power outlet with other devices and instruments.<br>→ Doing so may result in heat generation or setting fire to the power cord.                     |
|                 | Make sure that the power plug is inserted into the AC outlet properly.<br>→ If the power plug comes into contact with metal objects, fire or electric shock may result. |

**Restricted and Prohibited Items Regarding Operating Environment and Conditions**



**⚠ WARNING**


|   |   |
|---|---|
|  | <p>Do not insert or drop a metallic rod into the inside of this unit through the opening.</p> <p>→ Doing so may result in fire, electric shock or accident.</p> |
|---|---|

**⚠ CAUTION**

|   |   |
|---|---|
|    | <p>Do not put this unit in a place where the humidity is high or a large amount of dust exists.</p> <p>→ Doing so may result in electric shock or malfunction.</p>  |
|    | <p>Do not place the unit on an unstable surface like a shaky table or slope.</p> <p>→ The unit may drop or turn over, causing injury.</p>   |
|    | <p>Do not place the unit in areas where there is excessive vibration or impact.</p> <p>→ The unit may drop or turn over, causing injury.</p>  |
|   | <p>Do not connect or disconnect the power plug with wet hands.</p> <p>→ Doing so may result in electric shock.</p>  |
|  | <p>Keep the power cord away from heaters etc.</p> <p>→ Failure to observe this may damage the power cord's cladding, resulting in fire or electric shock.</p>   |
|  | <p>When disconnecting the power cord, always hold the plug and pull it out.</p> <p>→ Pulling the power cord may damage the cord, resulting in fire or electric shock.</p>   |
|  | <p>Do not put this unit in a place where it is exposed to the direct sunlight or the temperature is high, such as the inside of the car under the burning sun.</p> <p>→ Doing so may cause the temperature inside this unit to increase, causing the unit to malfunction.</p> |






## Prohibited Items Regarding Installation Method




| <b>⚠ WARNING</b>  |  |
|---|--|
|  | Do not place heavy objects on the power cord, heat or pull it, and do not modify the power cord.<br>→ Doing so may damage the cord, resulting in fire or electric shock. |
|  | Do not block the ventilation holes on the unit.<br>→ Failure to observe this will keep heat inside the unit, possibly resulting in fire.                                 |

| <b>⚠ CAUTION</b>  |   |
|---|---|
|  | Before transferring the unit to another site, make sure that the power plug is removed from the AC outlet and all the external connecting cables are disconnected.<br>→ Failure to observe this may damage the cord, resulting in fire or electric shock. |

## Notes on Handling




The unit must be handled according to the procedures given in this manual.  
Warning marks (“WARNING”, “CAUTION”) must be strictly observed.

| <b>⚠ WARNING</b>  |   |
|---|---|
|  | Do not leave small metal objects or containers of liquid, such as water, near the unit.<br>→ Doing so may allow them to enter the unit, resulting in fire, electric shock or breakdown.   |
|  | Do not modify the power cord, bend, twist or pull it excessively.<br>→ Failure to observe this may result in fire or electric shock.  |
|  | Do not disassemble or modify the unit.<br>→ Failure to observe this may result in fire, electric shock or accident.   |
|  | Fuses that conform to the specified rating and properties specified by YOKOGAWA must be used. (Do not use short-circuit bars or similar.)<br>→ Failure to observe this may increase the severity of damage or fire when abnormality occurs.                                     |
|  | Do not replace the battery by yourself. The unit uses lithium batteries. If you need to replace the battery because it is exhausted, contact your local sales dealer or YOKOGAWA's sales branch.<br>→ Inappropriate replacement of the battery may result in fire or breakdown. |






|  <b>CAUTION</b> |  |
|--|--|
|                 | When closing panels and covers, take care not to trap your fingers.  |
|                 | If you are not going to use the unit for a long period of time, the power plug must be removed from the AC outlet for safety reasons. It must also be removed in the event of thunderstorms.<br>→ Failure to observe this may result in fire, electric shock or breakdown. |

### Notes on Maintenance and Inspection


Periodic maintenance and inspection of the unit are recommended. For inquiries regarding maintenance and inspection, contact your local sales dealer or YOKOGAWA's sales branch.


|  <b>CAUTION</b> |  |
|--|--|
|                 | Clean the inside of the unit periodically to prevent collection of dust or dirt.<br>→ Collection of dust or dirt inside the unit may result in fire or breakdown.  |
|                | When cleaning this unit, remove the contamination with a soft dry cloth rag. If the unit is contaminated excessively, remove the contamination with a cloth rag, which has been soaked in the water, and then it has been wrung completely. Do not use any benzene or paint thinner. |

**Actions to be Taken in Case of Abnormalities**

| <b>⚠ WARNING</b>   |   |
|--|---|
|   | <p>Even if this unit is faulty or defective, do not attempt to repair it by the customer.</p> <p>→ Doing so may cause an electric shock or personal injury. If such unit is repaired without prior permission, it becomes beyond the coverage of YOKOGAWA's guarantee.</p>  |
|   | <p>Should the unit be dropped or damaged, turn OFF the power switch on the unit, disconnect the power plug from the AC outlet, and then contact your local sales dealer or YOKOGAWA's sales branch.</p> <p>→ Continuing to use it may result in fire, electric shock or breakdown.</p>  |
|   | <p>Should foreign items enter the unit, turn OFF the power switch on the unit, disconnect the power plug from the AC outlet, and then contact your local sales dealer or YOKOGAWA's sales branch.</p> <p>→ Continuing to use it may result in fire, electric shock or breakdown.</p>  |
|   | <p>Should smoke or odd smells be detected, turn OFF the power switch on the unit immediately, disconnect the power plug from the AC outlet, make sure there is no smoke present, and then contact your local sales dealer or YOKOGAWA's sales branch.</p> <p>→ Failure to observe this may result in fire, electric shock or breakdown.</p> |
|  | <p>If the power cord is damaged, contact the agent for replacement.</p> <p>→ Continuing to use it may result in fire or electric shock.</p>   |

**Notes on Disposal**

| <b>⚠ WARNING</b>  |  |
|---|--|
|  | <p>When disposing of this unit, do not attempt to throw it into the fire.</p> <p>→ Doing so may cause the unit to explode, resulting in fire, personal injury, or burn hazard.</p> |

| <b>⚠ CAUTION</b>  |   |
|---|---|
|  | <p>This unit uses lithium batteries, gallium arsenide and mercury.</p> <p>When disposing of the unit, handle it as industrial waste and dispose of it in accordance with local laws</p> |

# Structure of This Manual

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## **Chapter 1 Before Starting Operation**

This chapter describes the contents necessary to install, mount, and store this unit. Thoroughly read this chapter.

## **Chapter 2 Operation**

This chapter describes basic operation necessary to operate this unit. Thoroughly read this chapter.

## **Chapter 3 Changing the System Setup Values**

This chapter describes how to change the system setup values that control the frame controller. Read this chapter when necessary.

## **Chapter 4 Power Measurement**

This chapter describes how to operate the sensor. Read this chapter when necessary.

## **Chapter 5 Laser Light Source**

This chapter describes how to operate the laser light source. Read this chapter when necessary.

## **Chapter 6 Auxiliary Measurement Units**

This chapter describes how to operate the auxiliary measurement units (optical attenuator, etc.). Read this chapter when necessary.

## **Chapter 7 Convenient Operation**

This chapter describes convenient hints on operation. Read this chapter when necessary.

## **Chapter 8 Daily Maintenance**

This chapter describes the contents necessary to operate this unit for an extended period of time. Thoroughly read this chapter.

## **Chapter 9 Updating**

This chapter describes how to get the latest software of this unit or module and how to update the software. Read this chapter when necessary.

## **Chapter 10 Specifications**

This chapter describes the specifications of this unit. Read this chapter when necessary.

## **Chapter 11 Appendix**

This chapter describes the troubleshooting and various kinds of information. Read this chapter when necessary.

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# Chapter 1

## Before Starting Operation

## 1.1 Unpacking and Acceptance Inspection

---

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

### ■ Checking the Package Contents

After unpacking the package, make sure that all accessories are supplied with this unit while referring to Chapter 10, Specifications.

### ■ Mechanical Inspection

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

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

### ■ Functional Inspection and Specifications Check

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

After that, follow the steps stated in section 7.7, Displaying the Unit Information, to make sure that the "ORDER CODE" information meets that you have ordered.

Note that the unit order code is described in Chapter 10, Specifications.

### ■ If Any Damage or Fault Is Found:

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

## 1.2 Handling Precautions

### 1.2.1 Handling Precautions

The following describes the cautions about installation environment and handling.

#### ■ Frame Controller

1. This is a Class A (IEC61326) instrument. Using it in a domestic environment may cause radio countermeasures. So, appropriate steps must be taken.
2. Do not apply any excessive impact to this unit.
3. Do not operate or store this unit in an environment beyond the specifications.
4. Do not place this unit close to an object that radiates the strong radio wave or magnetic field.
5. When mounting this unit, make sure that sufficient space shown below is provided around it.
6. A fuse is used to protect the unit. If it is blown, disconnect the power cord, and replace the fuse with a new one according to “Replacing the Fuses” (page 1-21).
7. Do not remove the cover of this unit.
8. When carrying the AQ2202 Frame Controller with modules mounted, make sure this is done by two or more people.

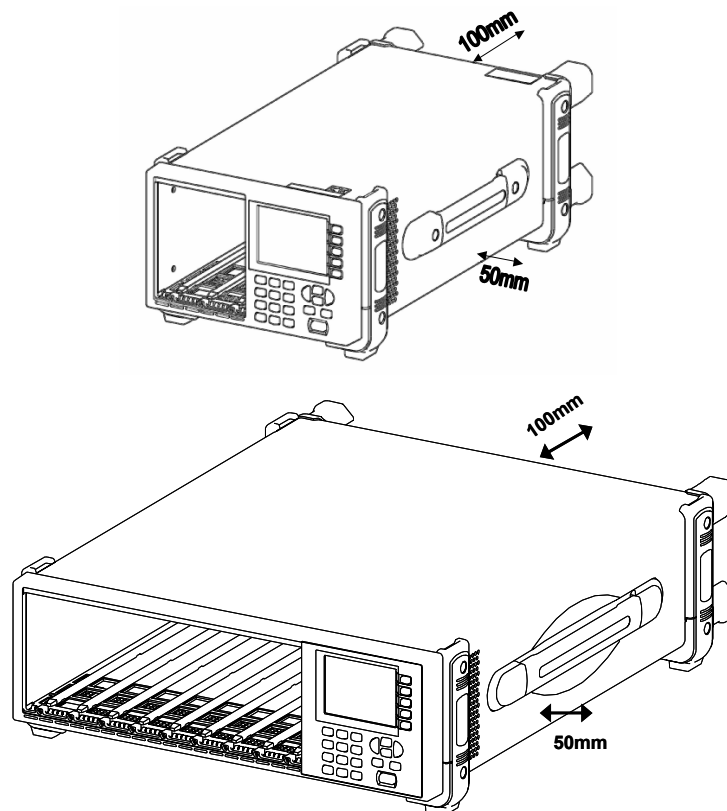


Fig. 1-1 Required Installation Space

## Module

The following modules are applicable to this unit.

- AQ2200-111 DFB-LD Module
- AQ2200-141 FP-LD Module
- AQ2200-142 DUAL FP-LD Module
- AQ2200-201 Interface Module
- AQ2200-211 Sensor Module
- AQ2200-215 Sensor Module
- AQ2200-221 Sensor Module
- AQ2200-231 Optical Sensor Head
- AQ2200-241 Optical Sensor Head
- AQ2200-311 ATTN Module
- AQ2200-331 ATTN Module
- AQ2200-411 OSW Module
- AQ2200-421 OSW Module

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

## 1.2.2 Part Names and Functions

### AQ2201/AQ2202 Frame Controller

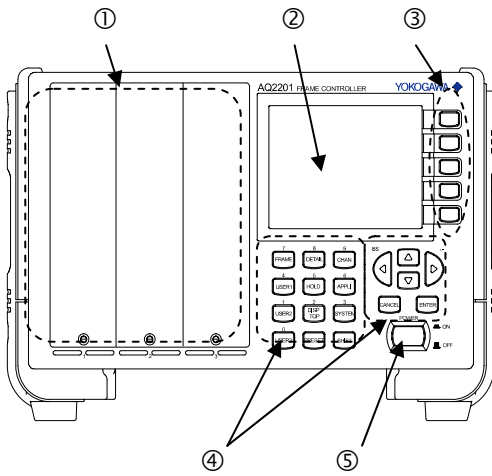


Fig. 1-2 Front View of AQ2201

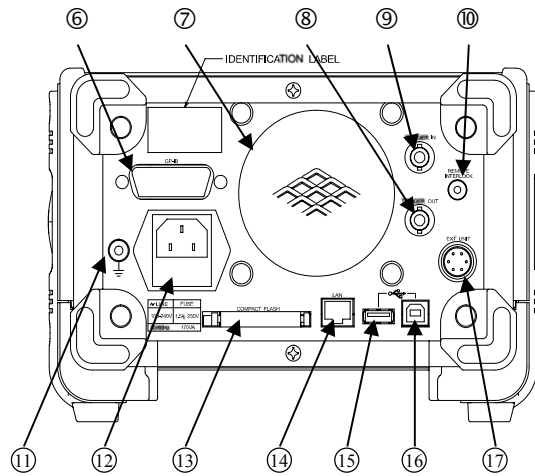


Fig. 1-3 Rear View of AQ2201

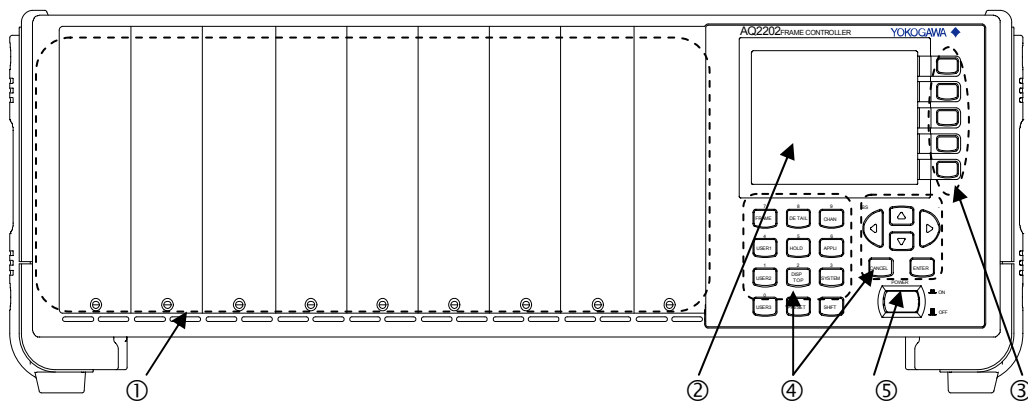


Fig. 1-4 Front View of AQ2202

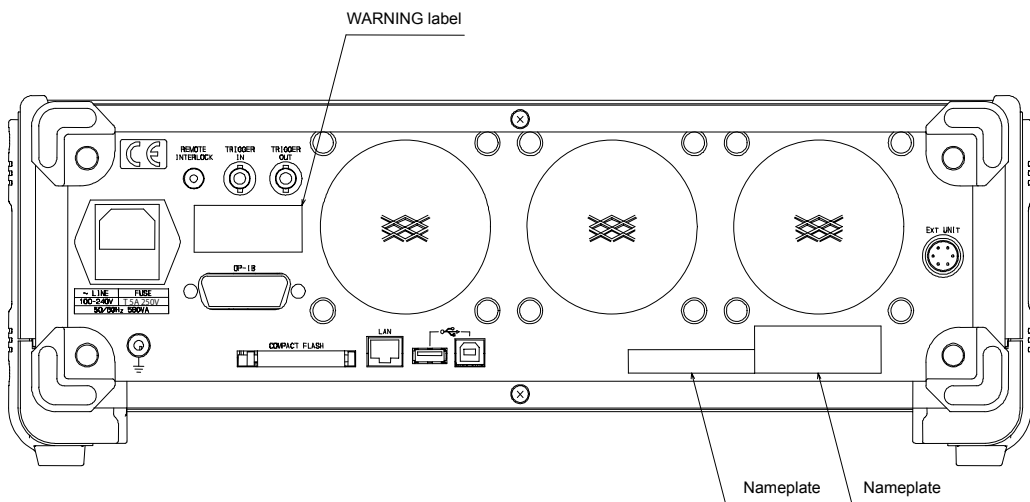


Fig. 1-5 Rear View of AQ2202

Table 1-1 Part Names and Functions of AQ2201/AQ2202 Frame Controller

| No. | Name                          | Function   |
|-----|-------------------------------|--|
| ①   | Slot                          | For AQ2200 series module installation  |
| ②   | Display screen                | For control and display of frame controller or module.<br>(See also Chapters 2, 3, 4, 5, and 6.) |
| ③   | Function key                  |  |
| ④   | Hard key                      |  |
| ⑤   | Power switch                  | Turns ON or OFF the power.   |
| ⑥   | GP-IB connector               | In conformity with IEEE-488  |
| ⑦   | Fan                           | For cooling of this unit   |
| ⑧   | Trigger-Out connector         | Trigger signal output terminal, BNC connector  |
| ⑨   | Trigger-In connector          | Trigger signal input terminal, BNC connector   |
| ⑩   | Interlock connector           | Pin connector  |
| ⑪   | Functional grounding terminal | Grounding terminal   |
| ⑫   | Power inlet                   | Power connector with fuse  |
| ⑬   | CF card slot                  | For mounting of compact flash memory   |
| ⑭   | LAN connector                 | 10BASE-T compatible RJ-45 connector for connection of Ethernet                                   |
| ⑮   | USB connector                 | Type A connector in conformity with USB (Type-A) Rev1.1  |
| ⑯   | USB connector                 | Type B connector in conformity with USB (Type-B) Rev1.1  |
| ⑰   | Extension connector           | —  |



Fig. 1-6 Front and Side Views of AQ2200-111 DFB-LD Module

Table 1-2 Part Names and Functions of AQ2200-111 DFB-LD Module

| No. | Name                         | Function  |
|-----|------------------------------|---|
| ①   | CW/CHOP key                  | Changes the laser output modulation.<br>When set at "CHOP", the modulation of the currently set frequency is performed. |
| ②   | Modulation indication LED    | Lit when the laser output is set at CHOP modulation.  |
| ③   | OPT ON/OFF key               | Changes the laser output ON/OFF.  |
| ④   | Laser output indication LED  | Lit when the laser output is ON.  |
| ⑤   | Button                       | For locking of the lever  |
| ⑥   | Lever                        | Used to mount or remove the module.   |
| ⑦   | Laser output                 | Outputs the laser beam.   |
| ⑧   | External modulation terminal | Modulation signal input terminal (This terminal is used only when using the option 03/04.)                              |
| ⑨   | Connector                    | Connects the electric signals between the frame and module.   |

**AQ2200-141 FP-LD Module**



**Fig. 1-7 Front and Side Views of AQ2200-141 FP-LD Module**

**Table 1-3 Part Names and Functions of AQ2200-141 FP-LD Module**

| No. | Name                        | Function  |
|-----|-----------------------------|---|
| ①   | CW/CHOP key                 | Changes the laser output modulation.<br>When set at "CHOP", the modulation of the currently set frequency is performed. |
| ②   | Modulation indication LED   | Lit when the laser output is set at CHOP modulation.  |
| ③   | OPT ON/OFF key              | Changes the laser output ON/OFF.  |
| ④   | Laser output indication LED | Lit when the laser output is ON.  |
| ⑤   | Button                      | For locking of the lever  |
| ⑥   | Lever                       | Used to mount or remove the module.   |
| ⑦   | Rear shell                  | By connecting the AQ9441 Connector Adaptor, the laser beam can be output.   |
| ⑧   | Connector                   | Connects the electric signals between the frame and module.   |

### AQ2200-142 DUAL FP-LD Module

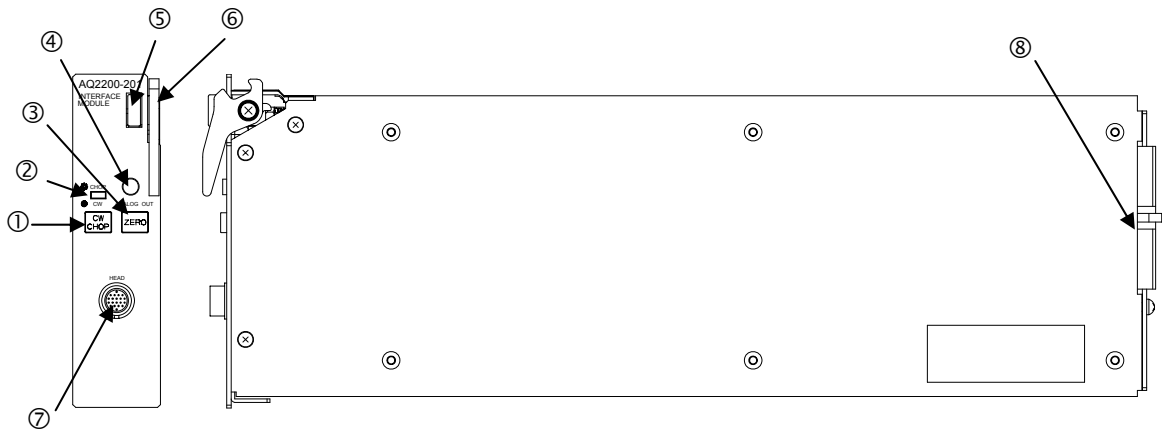


Fig. 1-8 Front and Side Views of AQ2200-142 DUAL FP-LD Module

Table 1-4 Part Names and Functions of AQ2200-142 DUAL FP-LD Module

| No. | Name                        | Function   |
|-----|-----------------------------|--|
| ①   | CW/CHOP key                 | Changes the laser output modulation.<br>When set at "CHOP", the modulation of the currently set frequency is performed.  |
| ②   | Modulation indication LED   | Lit when the laser output is set at CHOP modulation.   |
| ③   | OPT ON/OFF key              | Changes the laser output ON/OFF.   |
| ④   | Laser output indication LED | When the LED on the 1310nm-side is lit, this shows the 1310nm-laser output is ON. Accordingly, when the LED on the 1550nm-side is lit, this shows that the 1550nm-laser output is ON.<br>When both LEDs are lit, this indicates that both laser output wavelengths are ON. |
| ⑤   | Button                      | For locking of the lever   |
| ⑥   | Lever                       | Used to mount or remove the module.  |
| ⑦   | Rear shell                  | By connecting the AQ9441 Connector Adaptor, the laser beam can be output.  |
| ⑧   | Connector                   | Connects the electric signals between the frame and module.  |

**AQ2200-201 Interface Module**



**Fig. 1-9 Front and Side Views of AQ2200-201 Interface Module**

**Table 1-5 Part Names and Functions of AQ2200-201 Interface Module**

| No. | Name                       | Function  |
|-----|----------------------------|---|
| ①   | CW/CHOP key                | Changes the laser output modulation.<br>When set at "CHOP", the modulation of the currently set frequency is performed. |
| ②   | Modulation indication LED  | Lit when the laser output is set at CHOP modulation.  |
| ③   | ZERO-SET key               | Starts the ZERO-SET.  |
| ④   | Analog-out output terminal | Outputs the voltage corresponding to the input light according to the analog output setting.                            |
| ⑤   | Button                     | For locking of the lever  |
| ⑥   | Lever                      | Used to mount or remove the module.   |
| ⑦   | Connector                  | Cable for connection of the optical sensor head is connected to this connector.   |
| ⑧   | Connector                  | Connects the electric signals between the frame and module.   |

### AQ2200-211/AQ2200-215 Sensor Module

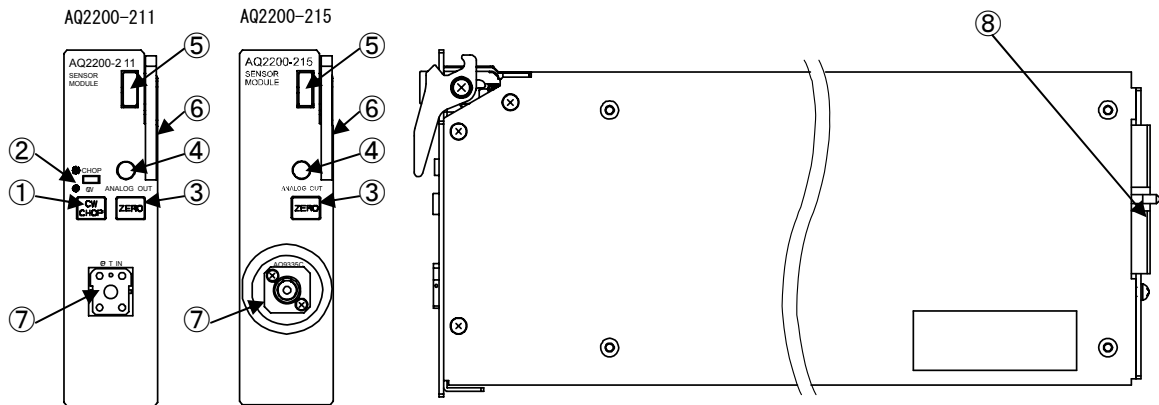
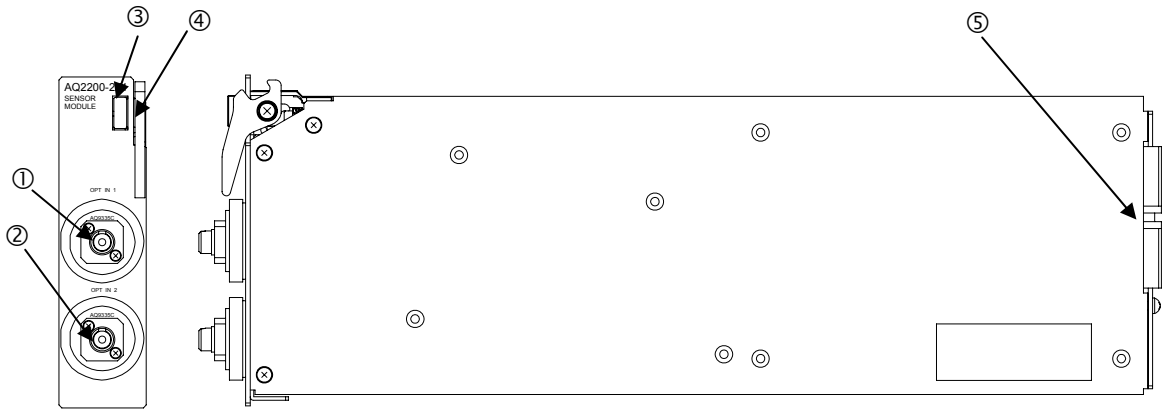


Fig. 1-10 Front and Side Views of AQ2200-211/AQ2200-215 Sensor Module

Table 1-6 Part Names and Functions of AQ2200-211-AQ2200-215 Sensor Module

| No. | Name                                      | Function  |
|-----|---|---|
| ①   | CW/CHOP key<br>(AQ2200-211)               | Changes the laser output modulation.<br>When set at "CHOP", the modulation of the currently set frequency is performed. |
| ②   | Modulation indication LED<br>(AQ2200-211) | Lit when the laser output is set at CHOP modulation.  |
| ③   | ZERO-SET key                              | Starts the ZERO-SET.  |
| ④   | Analog-out output terminal                | Outputs the voltage corresponding to the input light according to the analog output setting.                            |
| ⑤   | Button                                    | For locking of the lever  |
| ⑥   | Lever                                     | Used to mount or remove the module.   |
| ⑦   | Rear shell<br>(AQ2200-211)                | By connecting the AQ9447 Connector Adaptor, the optical signal can be input.  |
|     | Rear shell<br>(AQ2200-215)                | By connecting the AQ9335C Connector Adaptor, the optical signal can be input.   |
| ⑧   | Connector                                 | Connects the electric signals between the frame and module.   |

**AQ2200-221 Sensor Module**



**Fig. 1-11 Front and Side Views of AQ2200-221 Sensor Module**

**Table 1-7 Part Names and Functions of AQ2200-221 Sensor Module**

| No. | Name                                | Function  |
|-----|-------------------------------------|---|
| ①   | Rear shell<br>(OPT IN 1 (Device 1)) | By connecting the AQ9335C Connector Adaptor, the optical signal can be input. |
| ②   | Rear shell<br>(OPT IN 2 (Device 2)) | By connecting the AQ9335C Connector Adaptor, the optical signal can be input. |
| ③   | Button                              | For locking of the lever  |
| ④   | Lever                               | Used to mount or remove the module.   |
| ⑤   | Connector                           | Connects the electric signals between the frame and module.                   |

### AQ2200-231/-241 Optical Sensor Head

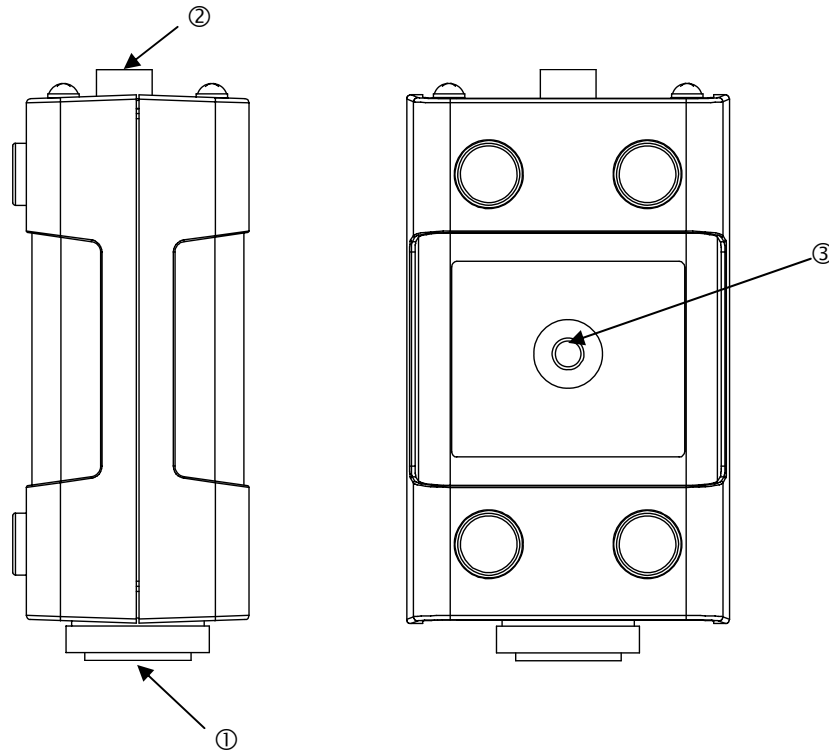
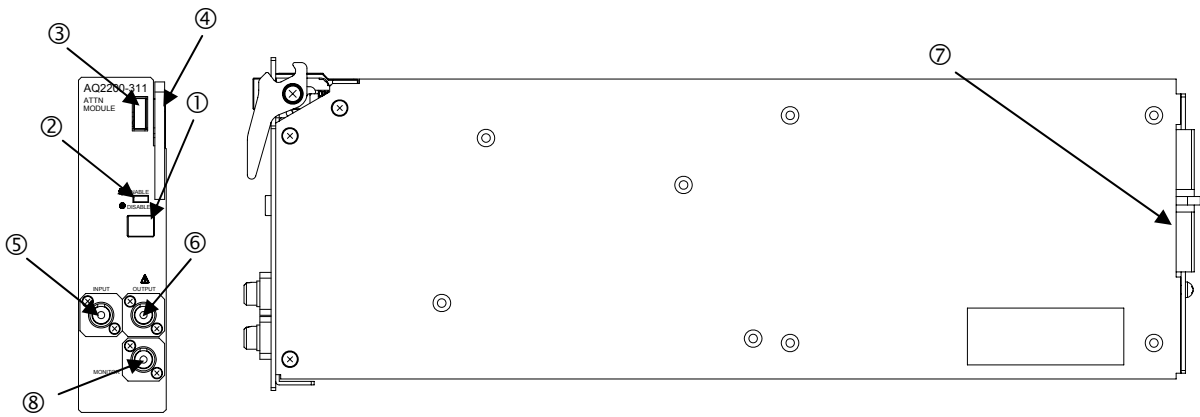


Fig. 1-12 Side and Bottom Views of AQ2200-231/241 Optical Sensor Head

Table 1-8 Part Names and Functions of AQ2200-231/241 Optical Sensor Head

| No. | Name            | Function   |
|-----|-----------------|--|
| ①   | Rear shell      | By inputting the spatial light or by mounting the AQ9335C Connector Adaptor, the light can be input using the optical fiber. |
| ②   | Connector       | By connecting the connection cable to this connector, this unit is connected to the AQ2200-201 Interface Module.             |
| ③   | Mounting groove | This groove is used to fix this unit. The groove is threaded with a size of M6 and a depth of 5mm.                           |

**AQ2200-311 ATTN Module**



**Fig. 1-13 Front and Side Views of AQ2200-311 ATTN Module**

**Table 1-9 Part Names and Functions of AQ2200-311 ATTN Module**

| No. | Name                          | Function  |
|-----|-------------------------------|---|
| ①   | ENABLE/DISABLE key            | Makes the optical output enabled or disabled. ENABLE allows the optical output and DISABLE interrupts it.     |
| ②   | Optical output indication LED | Lit when the optical output is enabled.   |
| ③   | Button                        | For locking of the lever  |
| ④   | Lever                         | Used to mount or remove the module.   |
| ⑤   | Laser input                   | Optical signal is input to this connector.  |
| ⑥   | Laser output                  | Outputs the attenuated optical signal.  |
| ⑦   | Connector                     | Connects the electric signals between the frame and module.   |
| ⑧   | Laser monitor output          | Outputs the attenuated optical signal on the monitor side. (Only when the optional monitor port is equipped.) |

### AQ2200-331 ATTN Module

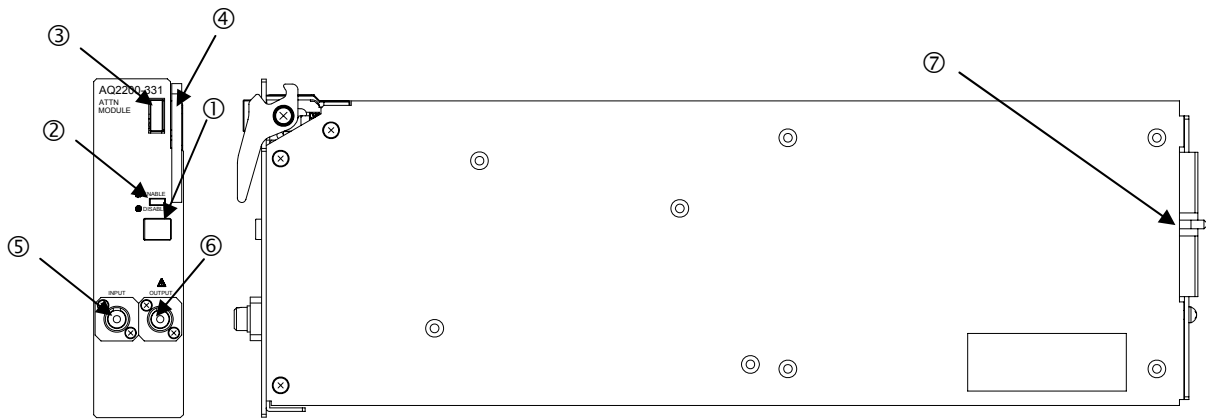
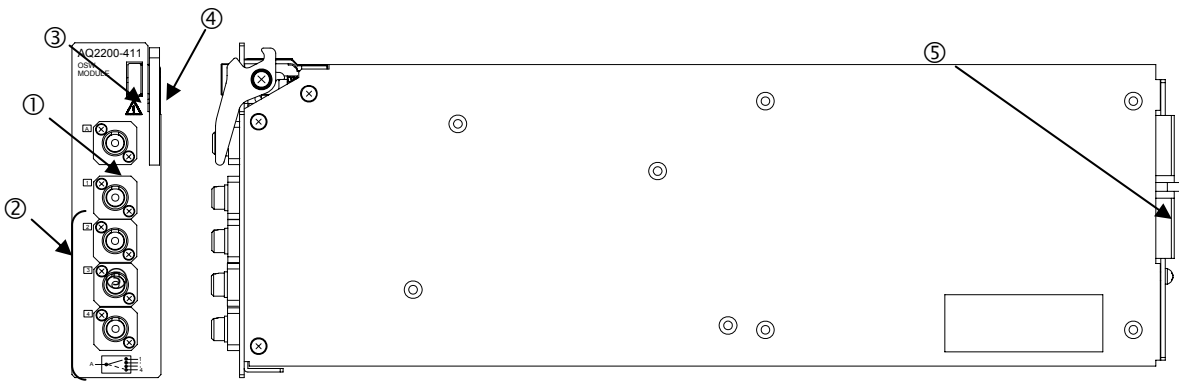


Fig. 1-14 Front and Side Views of AQ2200-331 ATTN Module

Table 1-10 Part Names and Functions of AQ2200-331 ATTN Module

| No. | Name                          | Function   |
|-----|-------------------------------|--|
| ①   | ENABLE/DISABLE key            | Makes the optical output enabled or disabled.<br>ENABLE allows the optical output and DISABLE interrupts it. |
| ②   | Optical output indication LED | Lit when the optical output is enabled.  |
| ③   | Button                        | For locking of the lever   |
| ④   | Lever                         | Used to mount or remove the module.  |
| ⑤   | Laser input                   | Optical signal is input to this connector.   |
| ⑥   | Laser output                  | Outputs the attenuated optical signal.   |
| ⑦   | Connector                     | Connects the electric signals between the frame and module.  |

**AQ2200-411 OSW Module**



**Fig. 1-15 Front and Side Views of AQ2200-411 OSW Module (1 x 4 type)**



**Fig. 1-16 Front and Side Views of AQ2200-411 OSW Module (1 x 8 type)**

**Table 1-11 Part Names and Functions of AQ2200-411 OSW Module**

| No. | Name                                       | Function   |
|-----|--|--|
| ①   | Optical input/output part<br>(Common port) | This port is connected to that you have selected in ②.                     |
| ②   | Optical input/output part<br>(Select port) | The port you have selected is connected to the common port described in ①. |
| ③   | Button                                     | For locking of the lever   |
| ④   | Lever                                      | Used to mount or remove the module.  |
| ⑤   | Connector                                  | Connects the electric signals between the frame and module.                |

### AQ2200-421 OSW Module (1 x 2 type)

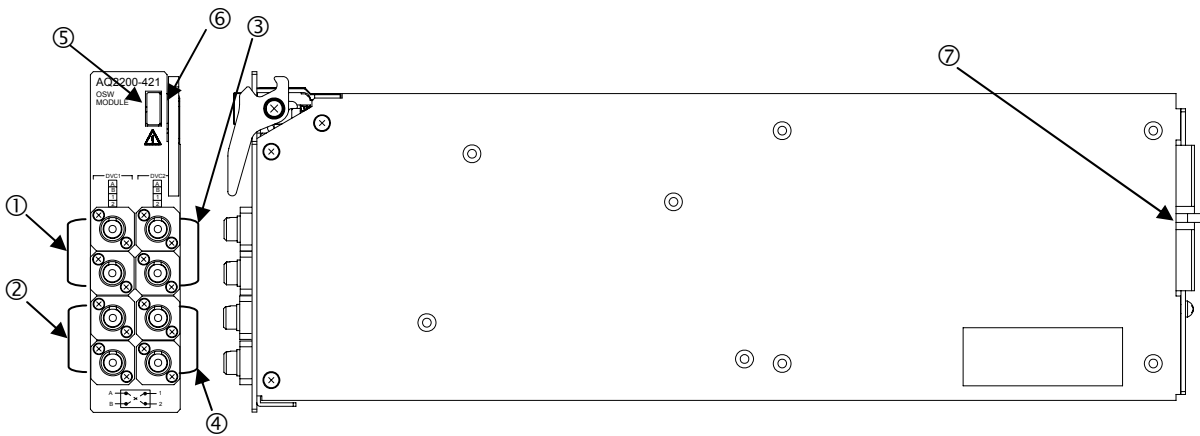


Fig. 1-17 Front and Side Views of AQ2200-421 OSW Module (1 x 2 type)

Table 1-12 Part Names and Functions of AQ2200-421 OSW Module

| No. | Name   | Function  |
|-----|--|---|
| ①   | Optical input/output part<br>(Device 1, Port [A])      | Port [A] of ① is connected to the port [1] or [2] of ②.     |
| ②   | Optical input/output part<br>(Device 1, Port [1], [2]) |   |
| ③   | Optical input/output part<br>(Device 2, Port [A])      | Port [A] of ③ is connected to the port [1] or [2] of ④.     |
| ④   | Optical input/output part<br>(Device 2, Port [1], [2]) |   |
| ⑤   | Button   | For locking of the lever                                    |
| ⑥   | Lever  | Used to mount or remove the module.                         |
| ⑦   | Connector  | Connects the electric signals between the frame and module. |

**AQ2200-421 OSW Module (2 x 2 type)**



**Fig. 1-18 Front and Side Views of AQ2200-421 OSW Module (2 x 2 type)**

**Table 1-13 Part Names and Functions of AQ2200-421 OSW Module**

| No. | Name   | Function   |
|-----|--|--|
| ①   | Optical input/output part<br>(Device 1, Port [A], [B]) | Port [A] or [B] of ① is connected to the port [1] or [2] of ②. |
| ②   | Optical input/output part<br>(Device 1, Port [1], [2]) |  |
| ③   | Optical input/output part<br>(Device 2, Port [A], [B]) | Port [A] or [B] of ③ is connected to the port [1] or [2] of ④. |
| ④   | Optical input/output part<br>(Device 2, Port [1], [2]) |  |
| ⑤   | Button   | For locking of the lever                                       |
| ⑥   | Lever  | Used to mount or remove the module.                            |
| ⑦   | Connector  | Connects the electric signals between the frame and module.    |

### 1.2.3 Notes on Power Connection

The following precautions must be observed regarding handling of the power supply and power cord.

#### Power

This unit is designed to operate with AC power (100 to 120/200 to 240 VAC, 50/60Hz). When supplying AC power, appropriate measures must be taken to prevent the following problems.

- Accident by electric shock
- Internal damage of the unit by abnormal voltage
- Problems due to ground current

Therefore, the precautions given below must be strictly observed.

#### Power Cable

The power cord with a 3-pin plug supplied with the unit must be used. The power outlet to which the power cord plug is to be connected must also be a 3-pin type. The round pin of the three pins is provided for grounding. The 3-pin power plug with an earth pin (E) is composed of a live line (L), neutral line (N) and protective earth line (E), to ensure correct power polarity when it is connected to a 3-pin power outlet.

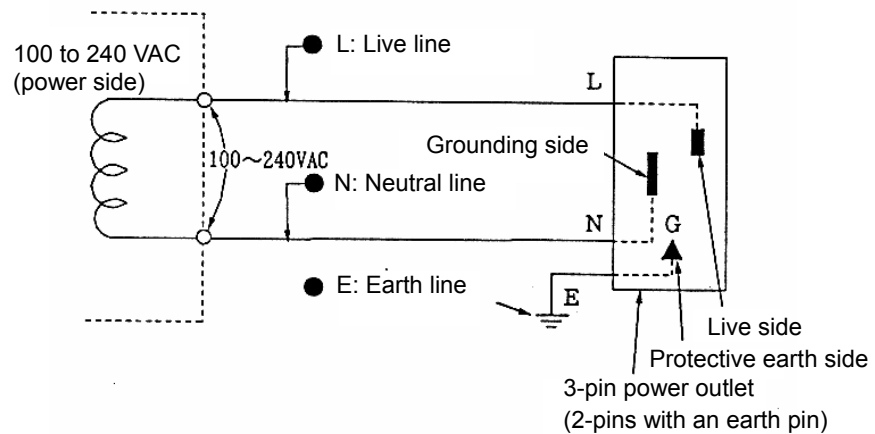
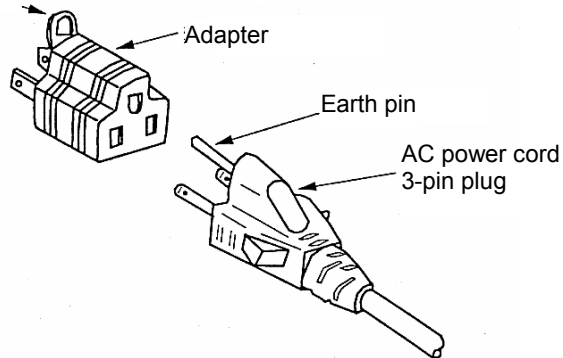


Fig. 1-19 3-Pin Power Plug

To connect the power cord to a 2-pin power outlet, attach a 2-pin adapter (3-pin-to-2-pin adapter) to the power plug. In this case, make sure that the earth wire is connected to an external earth terminal or the earth.

Connect this terminal to the earth.



**Fig. 1-20 Connecting the Power cord to a 2-Pin Power Outlet**

This unit meets Class I safety requirements and provides sufficient protective grounding. It is constructed in such a way to prevent electric shocks. In addition, it conforms to IEC65 and 348 safety standards. By plugging the earth pin of the 3-pin power cord to the 3-pin-to-2-pin adapter and connecting the adapter to an AC power outlet, electric shocks by AC power can be prevented.

## Replacing the Fuses

The power fuses are provided inside the AC LINE connector module on the rear panel of the unit.

Replace the power fuses when necessary.

- ① Turn OFF the power switch and disconnect the power cord.
- ② Pull out the fuse holder.
- ③ Remove both the two fuses and insert recommended fuses.  
Even if only one fuse has been blown, replace both, since the other might have also been damaged.
- ④ Push in the fuse holder firmly and connect the power cord.

|                             |  |
|-----------------------------|--|
| Recommended fuse for AQ2201 | Time-lag fuse (5 x 20mm)<br>Rating: 250V, T 5A<br>215005 (by Littelfuse) |
| Recommended fuse for AQ2202 | Time-lag fuse (5 x 20mm)<br>Rating: 250V, T 5A<br>215005 (by Littelfuse) |

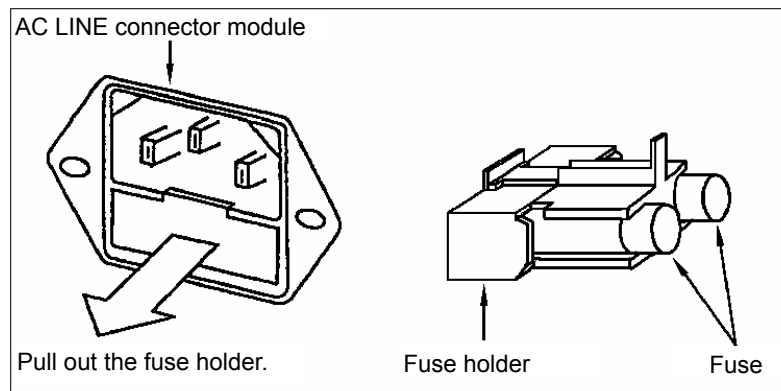


Fig. 1-21 Replacement Method of the Power Fuses

### ⚠ CAUTION

When replacing the fuses, first turn OFF the power switch and disconnect the power plug from the power outlet. Replacing the fuses with the power turned ON may cause electric shock, resulting in personal injury. After the fuses have been replaced, make sure before turning ON the power that the power cord is grounded properly and the AC power voltage is correct. Turning ON the power without grounding may cause electric shock, resulting in personal injury.

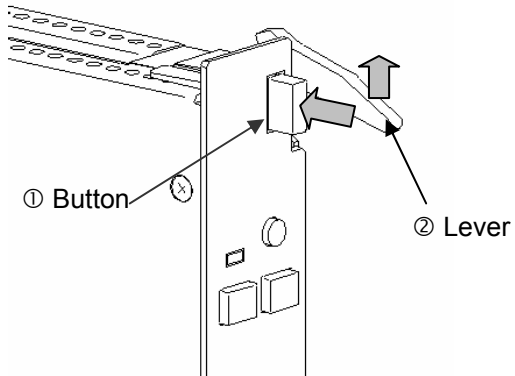
In addition, if the AC power voltage is incorrect, the unit may be damaged internally due to abnormal voltages.

## 1.2.4 Mounting/Removing the Module

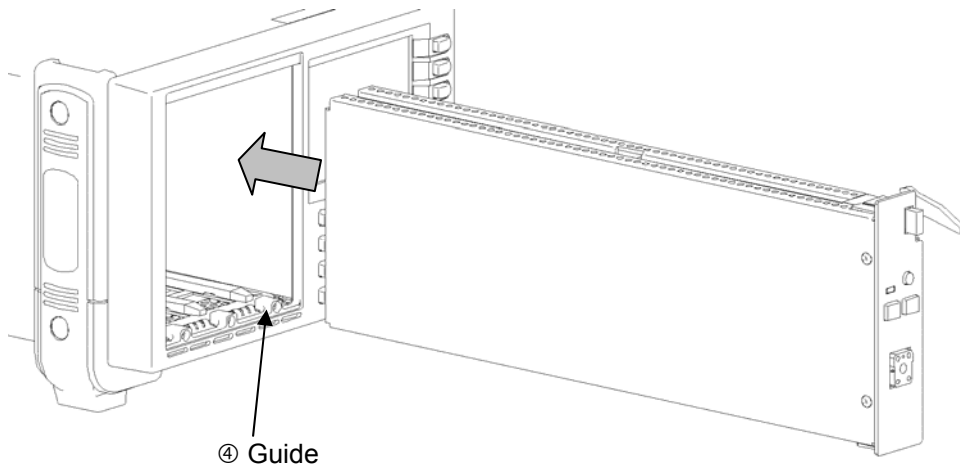
### Mounting/Removing the Module

#### <Mounting the Module>

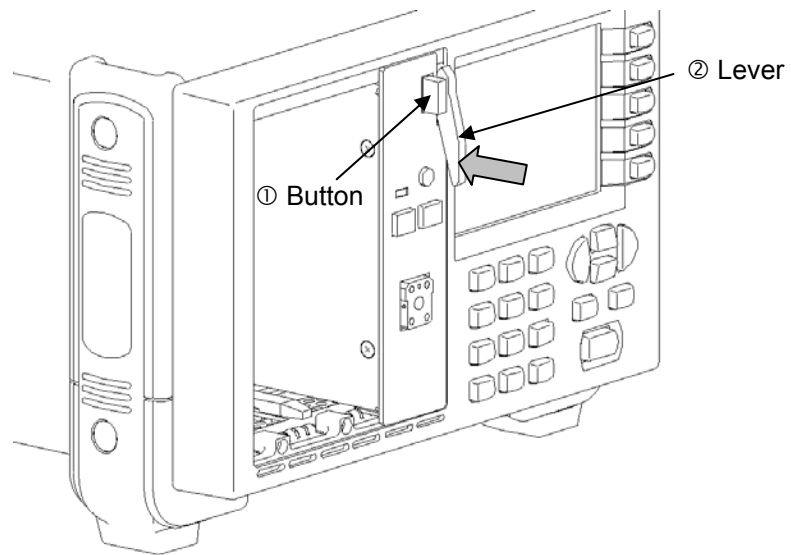
1. Pull up the lever ② with the button ① on the module panel kept pressed.



2. Make the dent on the bottom of the module matched with the guide ④ of a desired slot of the frame where the module is to be mounted, and then gradually insert the module.

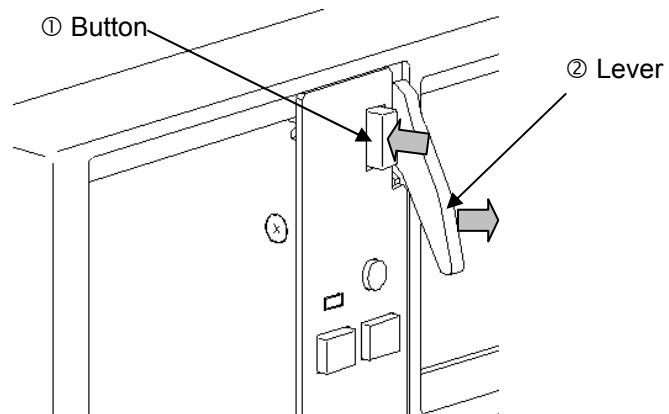


3. When the module is inserted and it is in contact with the far side, gradually push the lever ② with strong force until the button ① clicks.

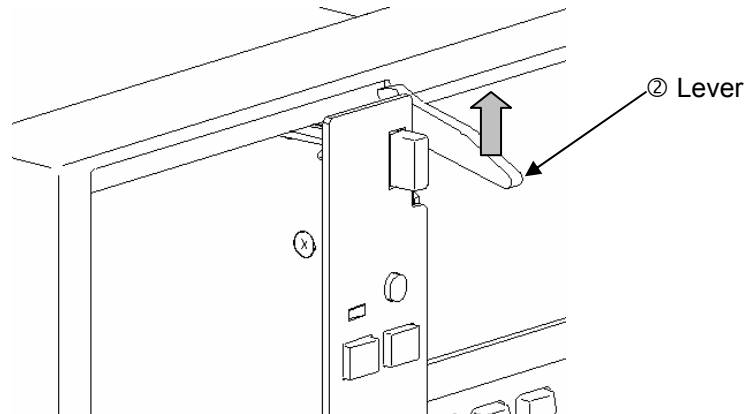


**<Removing the Module>**

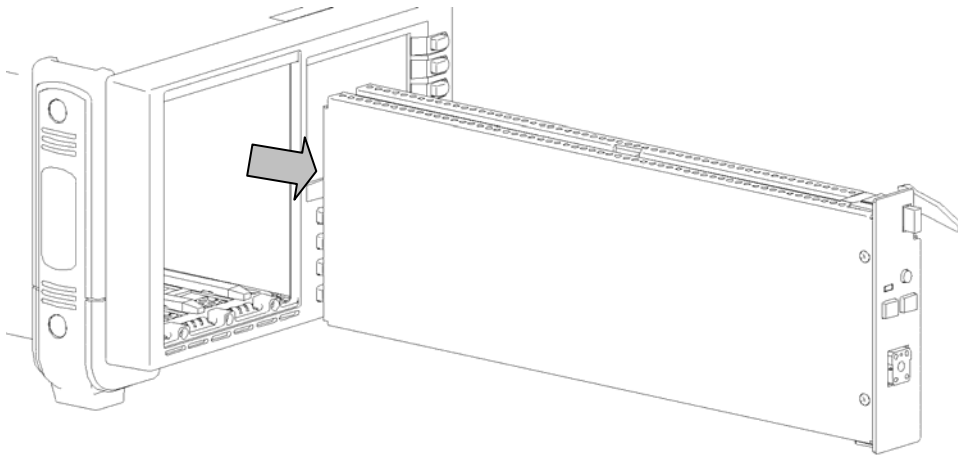
1. Lightly push up the lever ② with the button ① kept pressed until the lever ② is unlocked.



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



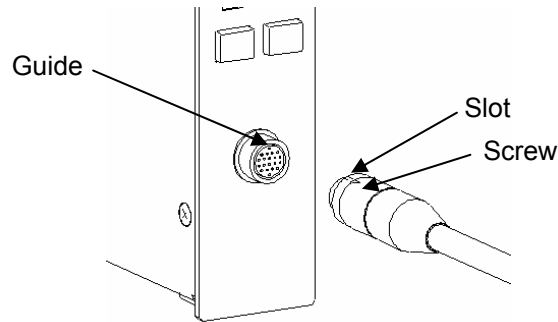
3. Gradually pull out the module from the slot of the frame.



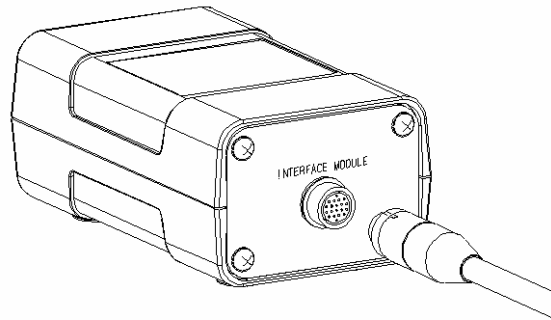
## 1.2.5 Connecting the Optical Sensor Head and Interface Module

### <Connecting>

1. Insert the cable connector into the panel connector on the interface module (make sure that the guide pin of the panel connector fits into the slot of the cable connector), and then tighten the screw to secure them.



2. Similarly, connect the cable into the connector on the rear panel of the optical sensor head.



### CAUTION

If the interface module is currently mounted in the unit, make sure before connecting it to the optical sensor head that the power is turned OFF or the module is removed from the frame controller.

## 1.2.6 Connecting/Disconnecting the Connector Adapter

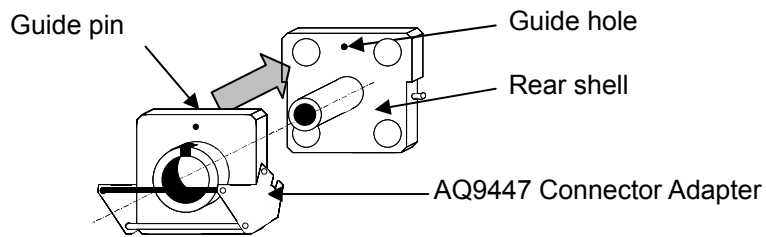
The laser light source (except for DFB-LD) and sensor can be connected to various optical connectors by replacing the connector adapter with an appropriate one.

### Connecting/Disconnecting the AQ9447 Connector Adapter

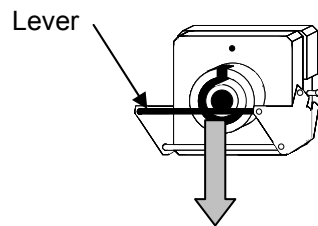
The AQ9447 Connector Adapter can be used for the AQ2200-211 Sensor Module.

#### <Connecting>

1. Fit the guide pins of the connector adapter into the guide holes on the rear shell.

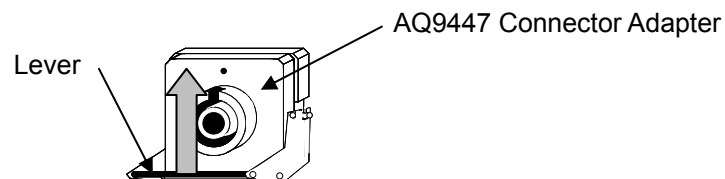


2. Push the lever down until a click is heard, to lock the connector adapter.

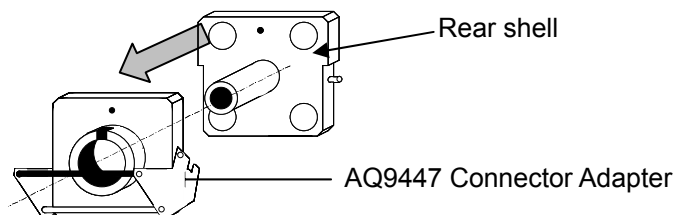


#### <Disconnecting>

1. Lift the lever to unlock the AQ9447 Connector Adapter.



2. Pull the lever toward you and remove the connector adapter from the rear shell.

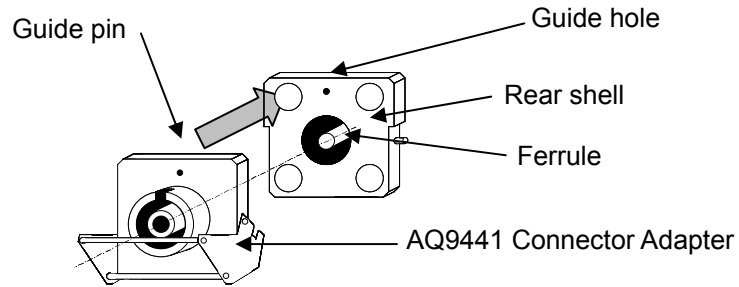


**Connecting/Disconnecting the AQ9441 Connector Adapter**

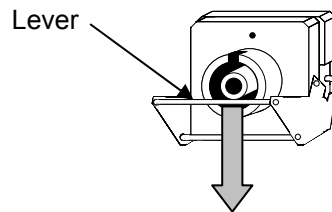
The AQ9441 Connector Adapter can be used for the AQ2200-141 FP-LD Module and AQ2200-142 DUAL FP-LD Module.

**<Connecting>**

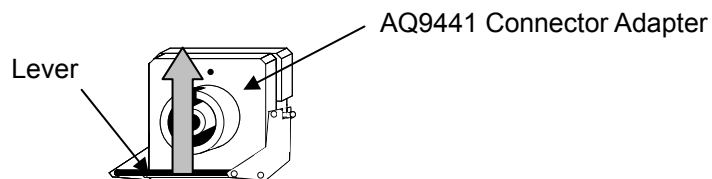
1. Fit the guide pins of the connector adapter into the guide holes on the rear shell. Take care not to let the connector adapter contact the end of the ferrule that extends from the rear shell.



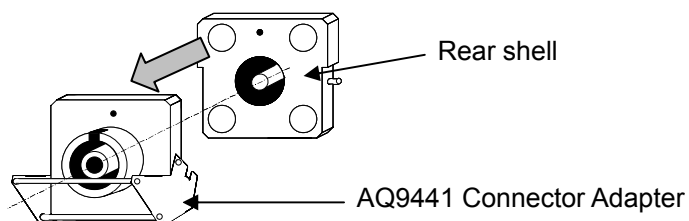
2. Push the lever down until a click is heard, to lock the connector adapter.

**<Disconnecting>**

1. Lift the lever to unlock the connector adapter.



2. Pull the lever toward you and pull out the connector adapter from the rear shell slowly.



### Connecting/Disconnecting the AQ9335C Connector Adapter

The AQ9335C connector adapter can be used for the AQ2220-231 Optical Sensor Head, AQ2200-241 Optical Sensor Head, AQ2200-215 Sensor Module and AQ2200-221 Sensor Module.

#### <Connecting>

1. Fit the guide pin of the rear shell into the guide hole of the connector adapter.
2. Screw in the connector adapter's ring to secure the adapter firmly.

#### <Disconnecting>

1. Turn the ring to remove the connector adapter.

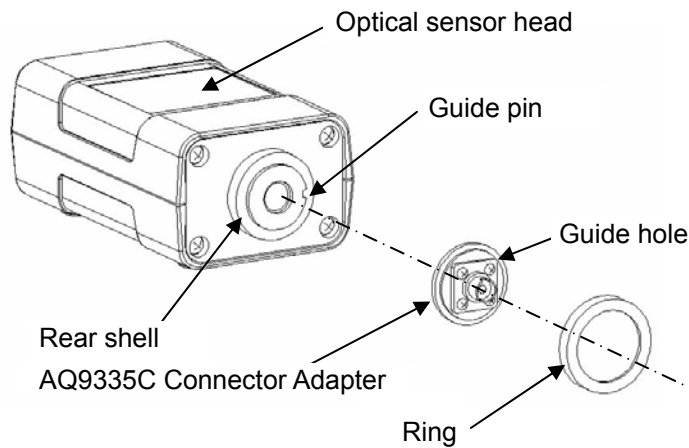


Fig. 1-22 Connecting the Connector Adapter to the Optical Sensor Head

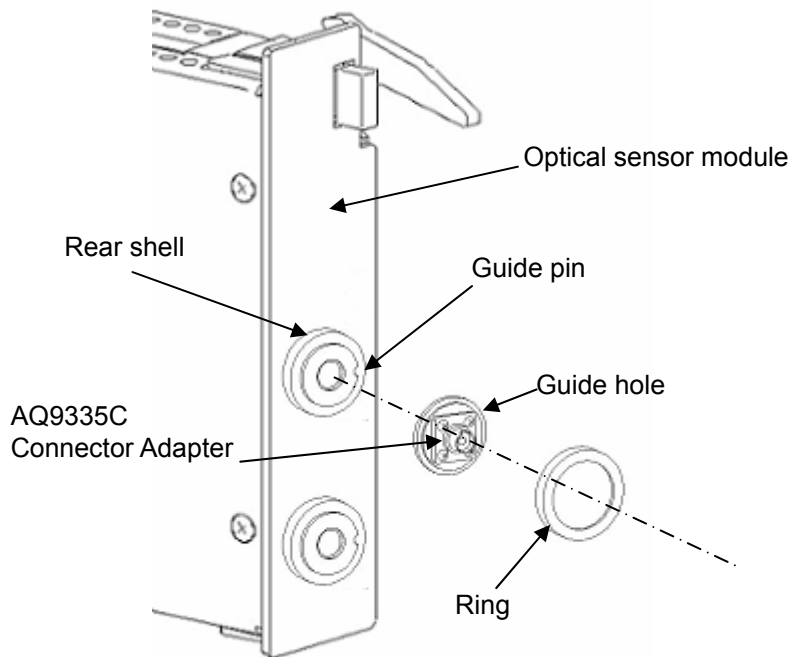


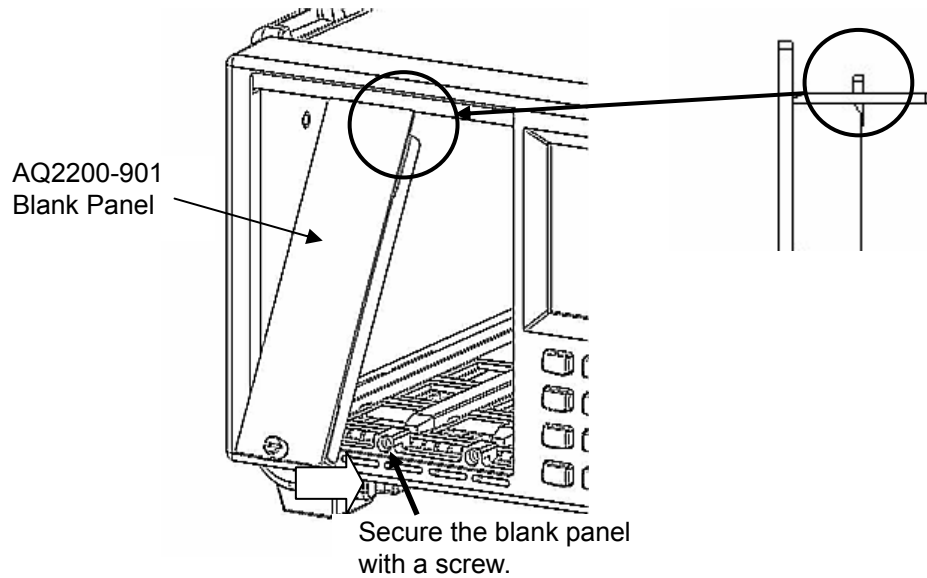
Fig. 1-23 Connecting the Connector Adapter to the Sensor Module

## 1.2.7 Attaching/Removing the Blank Panel

AQ2200-901 Blank Panels can be used to put a blindfold on slots where no measurement module is mounted.

### <Attaching>

1. Place the blank panel over the desired slot (make sure that the projection on the upper edge of the blank panel fits into the upper edge of the slot).
2. Secure the blank panel by tightening the screw into the screw hole at the bottom of the slot.



## 1.3 Interfaces

---

### Interlock Connector

An interlock connector is provided as a laser output safety device.

When this connector is open (i.e. the connector is unconnected), the laser light source cannot emit a laser beam (OPT LOCK).

#### <How to Use the Interlock Function>

Connect a switch to the interlock connector. Install this switch so that it operates simultaneously with the door or window. Make sure that this switch opens when the door/window opens, and closes when the door/window closes.

#### NOTE

- When the interlock connector is open, "LOCK" is displayed in the "OPT" field on the DFB-LD module and FP-LD module.
- Use a cable of 3 m or less in length.

#### <Disabling the Interlock Function>

Connect a short-circuit plug to the interlock connector.

### GP-IB Connector

A GP-IB interface is provided as a standard accessory.

This enables setting/changing of various parameters and transfer of data via the GP-IB bus.

An IEEE-488 compatible receptacle connector is used for this interface.

#### NOTE

- The total length of connecting cables must be 20m or shorter.
- The length of each cable between devices must be 2m or shorter.
- The number of devices connected at the same time to the interface must be 15 or smaller (the number of devices that are turned ON must be 10 or smaller).

### Trigger-in Connector / Trigger-out Connector

The sensor measurement start signal can be input/output using these connectors.  
The signal can be received by all the sensors at the same timing.

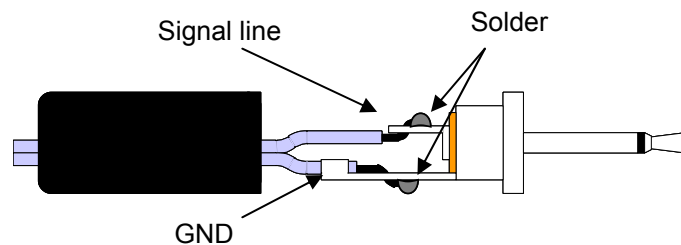
Connector: BNC  
Trigger-in: TTL level input  
Input impedance approx.  $5k\Omega$   
Low active  
Input pulse width  $50\mu\text{s}$  or longer  
Trigger-out: TTL level out  
Output impedance approx.  $1k\Omega$   
Low active  
Output pulse width approx.  $50\mu\text{s}$

### Sensor Analog Output Connector

This connector can output a voltage according to the level of the optical signal input to the sensor.

Modify the plug (supplied with the sensor) as shown below, and insert it into "ANALOG OUT" on the sensor's panel to output the voltage.  
Ensure that the length of the wiring is 2 m or less.

Connector: Mini plug  
Output impedance: Approx.  $1k\Omega$   
Maximum output voltage: Approx. 2V



### Light Source External Modulation Input

The light source external modulation input is supported only by the external modulation option of the AQ2200-111.

A signal satisfying the following requirements must be input to the external modulation input connector located on the front panel of the AQ2200-111.

- When the external sine modulation option is selected

|                        |                 |
|------------------------|-----------------|
| Connector:             | SMA             |
| Input impedance:       | Approx. 50Ω     |
| Maximum input voltage: | 2Vp-p           |
| Frequency:             | 100Hz to 300kHz |

- When the external CHOP modulation option is selected

|                        |                 |
|------------------------|-----------------|
| Connector:             | SMA             |
| Input impedance:       | Approx. 50Ω     |
| Maximum input voltage: | 5Vp-p           |
| Frequency:             | 100Hz to 300kHz |

### Compact Flash Memory Card

Use of a compact flash memory card enables data save, parameter save/read and firmware update.

Before using a compact flash memory card, it must be formatted in VFAT format. This unit does not have the format function, so format must be carried out using an appropriate device.

Additionally, if you insert and remove a compact flash memory card very quickly (i.e. within one second), the unit may go out of order. For general precautions for handling a compact flash memory card, see the user's manual attached to your compact flash memory card.

#### NOTE

- When turning ON the power with a compact flash memory card mounted, it may not be recognized correctly depending on the type of compact flash memory card. If this occurs, remove the compact flash memory card and mount it again. The compact flash memory card is then recognized properly.
- There are restrictions on the number of files that can be saved depending on the format of the medium. With FAT (16), a maximum of 512 files with MS-DOS file names can be saved, but only about 200 files can be saved depending on the file name. When attempting to save a file beyond this limit, a "1012 Corrupt Error" occurs. In this case, you can delete files to reduce their number, or format the medium using the FAT32 format.

## USB Memory

As a USB flash memory device is connected to the USB connector (host) on the rear panel of this unit, you can use it as a data saving memory.

### Operating Conditions

| Item           | Operating Conditions                 |
|----------------|--------------------------------------|
| Specifications | USB1.1                               |
|                | Applicable to USB Mass Storage Class |
| Format         | FAT format                           |
| Supply current | 200mA                                |

Yokogawa does not guarantee normal operation of all the USB flash memory devices on the market. For reference purposes, we list the USB flash memory devices of which the proper operation has been verified.

The following shows USB flash memory devices, the operation of which has already been confirmed.

| MAKER        | TYPE          |
|--------------|---------------|
| BUFFALO INC. | RUF-C64ML/U2  |
|              | RUF-C128ML/U2 |
|              | RUF-C256ML/U2 |
|              | RUF-C512ML/U2 |
|              | RUF-C1GL/U2   |
|              | RUF2-R1G-S    |
|              | RUF-C32ML     |
|              | RUF-C64ML     |

**NOTE** There are restrictions on the number of files that can be saved depending on the format of the medium. With FAT (16), a maximum of 512 files with MS-DOS file names can be saved, but only about 200 files can be saved depending on the file name. When attempting to save a file beyond this limit, a "1012 Corrupt Error" occurs. In this case, you can delete files to reduce their number, or format the medium using the FAT32 format.

## Temporary Storage Memory (Temporary Memory)

You can use a memory built-into this unit as a data saving memory.

A memory capacity of 10 Mbytes is prepared.

| Item           | Operating Conditions        |
|----------------|-----------------------------|
| Specifications | CPU bus access within frame |
| Capacity       | 10 Mbytes                   |

**NOTE**

- As the temporary memory uses FAT formatting, there is a restriction on the number of files that can be saved. A maximum of 512 files with MS-DOS file names can be saved, but only about 200 files can be saved depending on the file name. When attempting to save a file beyond this limit, a "1012 Corrupt Error" occurs. In this case, you can delete files to reduce their number.
- The data, which has been saved into the temporary storage memory, is cleared if any of the following conditions arises.
  - Power OFF
  - Application mode is executed.
  - File Delete is executed.

## 1.4 Ethernet Communication

This unit can be controlled remotely from a PC using communication commands via Ethernet interface.

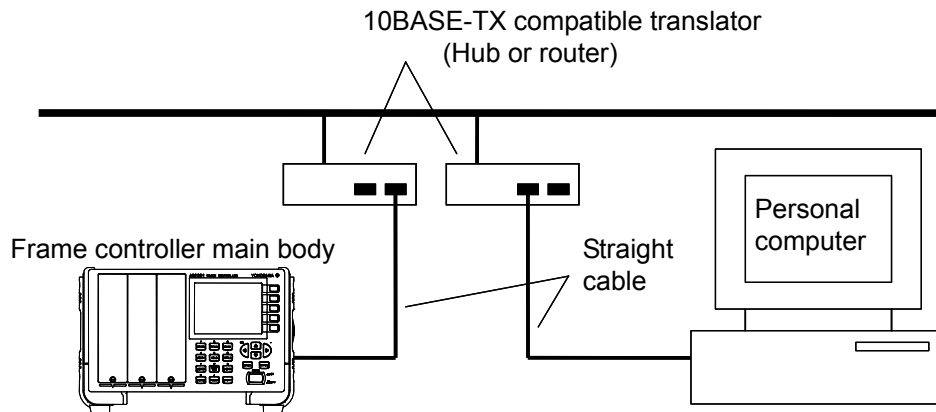
### Ethernet Communication Specifications

|                                       |                        |
|---------------------------------------|------------------------|
| Number of communication ports:        | 1                      |
| Electrical/mechanical specifications: | Conforms to IEEE802.3. |
| Transmission method:                  | Ethernet (10BASE-T)    |
| Transmission speed:                   | Max. 10Mbps            |
| Communication protocol:               | TCP/IP                 |
| Connector:                            | RJ-45                  |

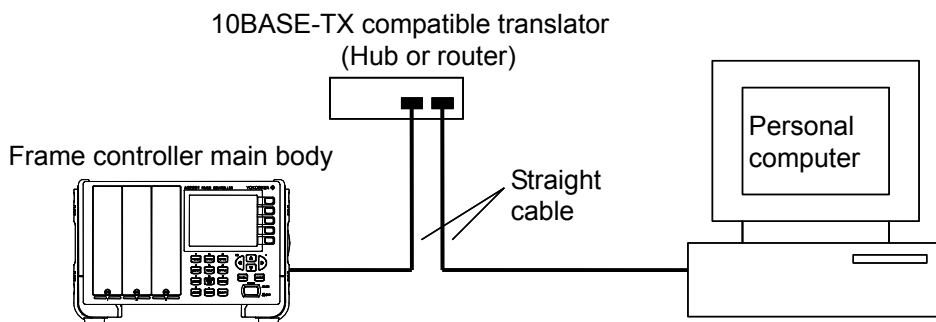
### Connecting Method

Connect the unit to the PC as shown below.

#### <Connecting to PC via Network>

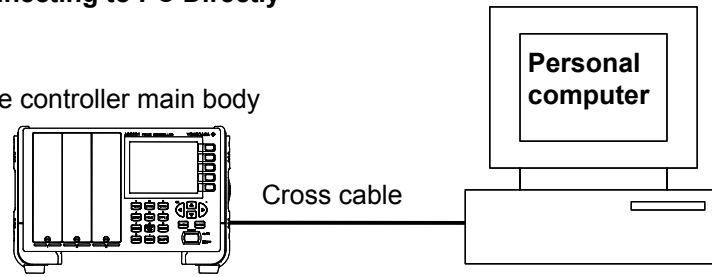


#### <Connecting to PC via Hub>



## &lt;Connecting to PC Directly&gt;

Frame controller main body

**NOTE**

- If the unit is connected to the PC with a cross cable, it normally operates without problems, however, there is a possibility of improper operation because this connecting method is not supported by Ethernet requirements. In this case, connect them using straight cables and a hub.
- The total length of the cables must be 30m or shorter.

## 1.5 Exchanging a File with External PC

### 1.5.1 USB Storage Function

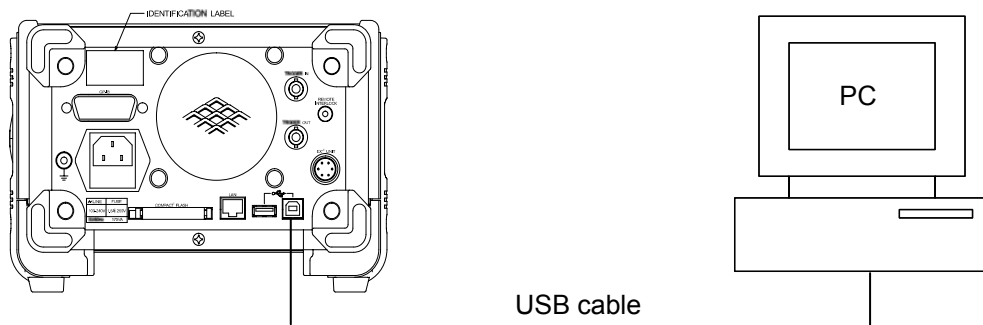
This unit can be connected as a storage device of the PC through the PC and USB cable, allowing you to save or load a file from/into this storage device into/from the internal temporary storage memory, mounted compact flash memory card, or USB flash memory device.

#### Operating Conditions

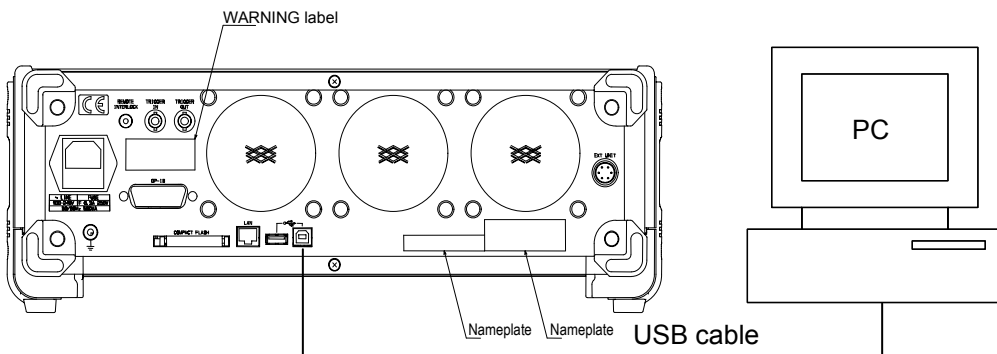
| Item                                   | Operating Conditions              |
|--|-----------------------------------|
| Connector shape                        | USB type B connector (receptacle) |
| Electric and mechanical specifications | In conformity with USB rev. 1.1   |
| Number of ports                        | 1                                 |
| Applicable system environment          | Windows2000/XP                    |

#### Connecting Procedures

Connect the cables to the connectors on the rear panel as described below.



Rear panel of AQ2201 Frame Controller



Rear panel of AQ2202 Frame Controller

**NOTE**

- The USB storage function cannot be used in the application screen mode.
- The remote control and LAN FTP function cannot be used with the USB storage connected.
- The USB storage cannot be connected while the remote control is being connected or the LAN FTP function is being executed.
- The memory you can save or load a file with the USB storage function is any of the internal temporary storage memory, compact flash memory card, and USB flash memory device. For details about how to select a storage device, see section 7.7, Selecting a storage device.

## 1.5.2 LAN FTP Function

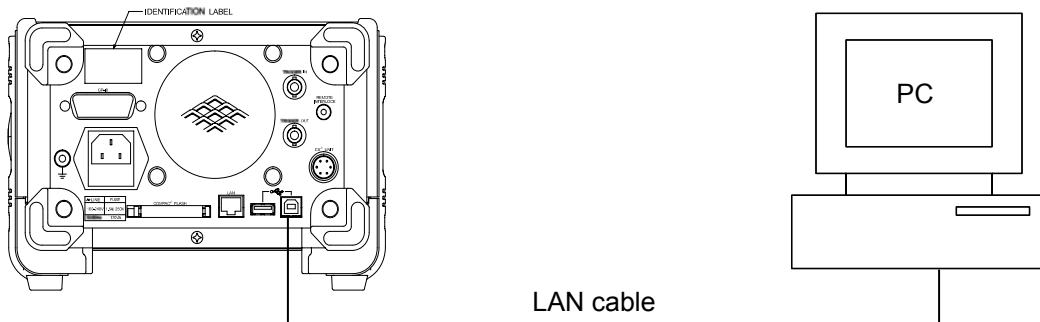
This unit can transfer a file to its internal temporary storage memory, mounted compact flash memory card, or USB flash memory device through the PC and Ethernet interface.

### Operating Conditions

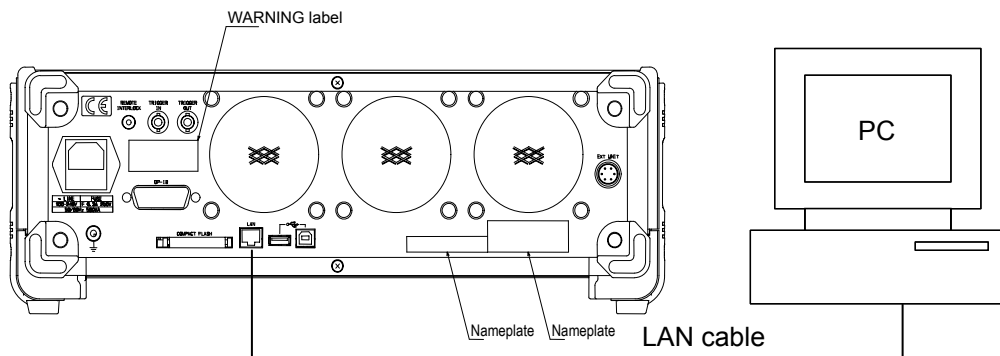
| Item        | Operating Conditions                            |
|-------------|---|
| PC          | PC/AT compatible<br>In conformity with 10BASE-T |
| OS          | Windows2000/XP                                  |
| File format | FAT format                                      |

### Connecting Procedures

Connect the cables to the connectors on the rear panel as described below.



Rear panel of AQ2201 Frame Controller



Rear panel of AQ2202 Frame Controller

### NOTE

- An UPDATE file cannot be transferred using the LAN FTP function.
- The remote control and USB storage function cannot be used while the file is being transferred using the LAN FTP function.
- The LAN FTP function cannot be used during remote control or when using the USB storage function.
- An error may occur in the time count of the measurement operation while the file is being transferred.
- If the process was terminated forcefully during file transfer, wait about one minute and try to transfer the file again.
- When removing a storage device after terminating LAN FTP, wait for 15 seconds before removing it.

---

## 1.6 Notes on Storage and Transport

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### 1.6.1 Notes on Storage

This section explains precautions to be observed when storing the instrument for long periods of time.

#### ■ Notes Before Storage

Dust, fingerprints, dirt and stains etc. collected on the instrument must be wiped off with a piece of cloth.

For the method for cleaning the exterior of the instrument, refer to Chapter 8, "Daily Maintenance".

Carry out operation inspection to check that the instrument operates correctly.

#### ■ Storage Conditions

When storing the instrument for a long period of time, make sure it is stored under the following environmental conditions.

- Temperature -20 to 60°C (5 to 40°C during measurement)
- Humidity 20 to 80%RH
- Location Temperature/humidity should not change excessively throughout the day.

The instrument should not be stored in the following areas or under the following conditions, since doing so may cause breakdown.

- Areas where the instrument will be exposed to direct sunlight or excessive dust
- High-humidity areas where water drops are generated or collect on the instrument
- Areas where the instrument will be exposed to active gases or oxidized

#### ■ Notes on Reuse

When using the instrument again after storing it for a long period of time, first carry out operation inspection to check that the instrument operates correctly.

## 1.6.2 Notes on Transport

This section explains precautions to be observed regarding repacking and transport when using the instrument at a distance or when repairing it.

### ■ Repacking

The packing materials used to deliver the instrument must be used to repack the instrument. If they have been discarded or damaged, pack the instrument as explained below.

- ① Remove the currently installed modules.
- ② Place cushioning material on projecting parts on the front and rear panels of the instrument to protect them.
- ③ Wrap the instrument with a thick vinyl sheet to prevent entry of dust.
- ④ Prepare a corrugated, wooden or aluminum box that is large enough to accommodate the instrument and allows 10 to 15 cm space between the surface of each part of the instrument (front, rear, right/left panels) and the sides of the box.
- ⑤ Place the instrument in the center of the box, and fill the spaces (between the box's internal surface and each surface of the instrument: front, rear, right/left panels) with shock absorbent materials. The instrument must be packed so that any impact or vibration on the instrument is 50G or less.
- ⑥ Secure the outside of the box with packing cord, adhesive tape or bands.

### NOTE

|| The packing materials used to deliver the instrument must be kept in a safe place.  
|| Using these materials will facilitate packing work when transporting the instrument.

### ■ Transport

During transport, make sure that vibration is avoided and the storage conditions recommended in 1.6.1 "Notes on Storage", (page 1-39) are satisfied.

Also make sure that all the modules are removed from the instrument.

# Chapter 2

## Operation

## 2.1 About Frame Controller

---

This unit is a controller designed to allow mounting of modules of the AQ2200 Multi-application System and to perform the control.

This unit allows manual operation using the module mounting part, display, and operation keys, and then it is applicable to various remote controls.

### <Mountable , Controllable Modules>

- AQ2200-111 DFB-LD Module
- AQ2200-141 FP-LD Module
- AQ2200-142 DUAL FP-LD Module
- AQ2200-201 Interface Module
- AQ2200-211 Sensor Module
- AQ2200-215 Sensor Module
- AQ2200-221 Sensor Module
- AQ2200-231 Optical Sensor Head
- AQ2200-241 Optical Sensor Head
- AQ2200-311 ATTN Module
- AQ2200-331 ATTN Module
- AQ2200-411 OSW Module
- AQ2200-421 OSW Module

## 2.2 Part Names and Functions of Panel

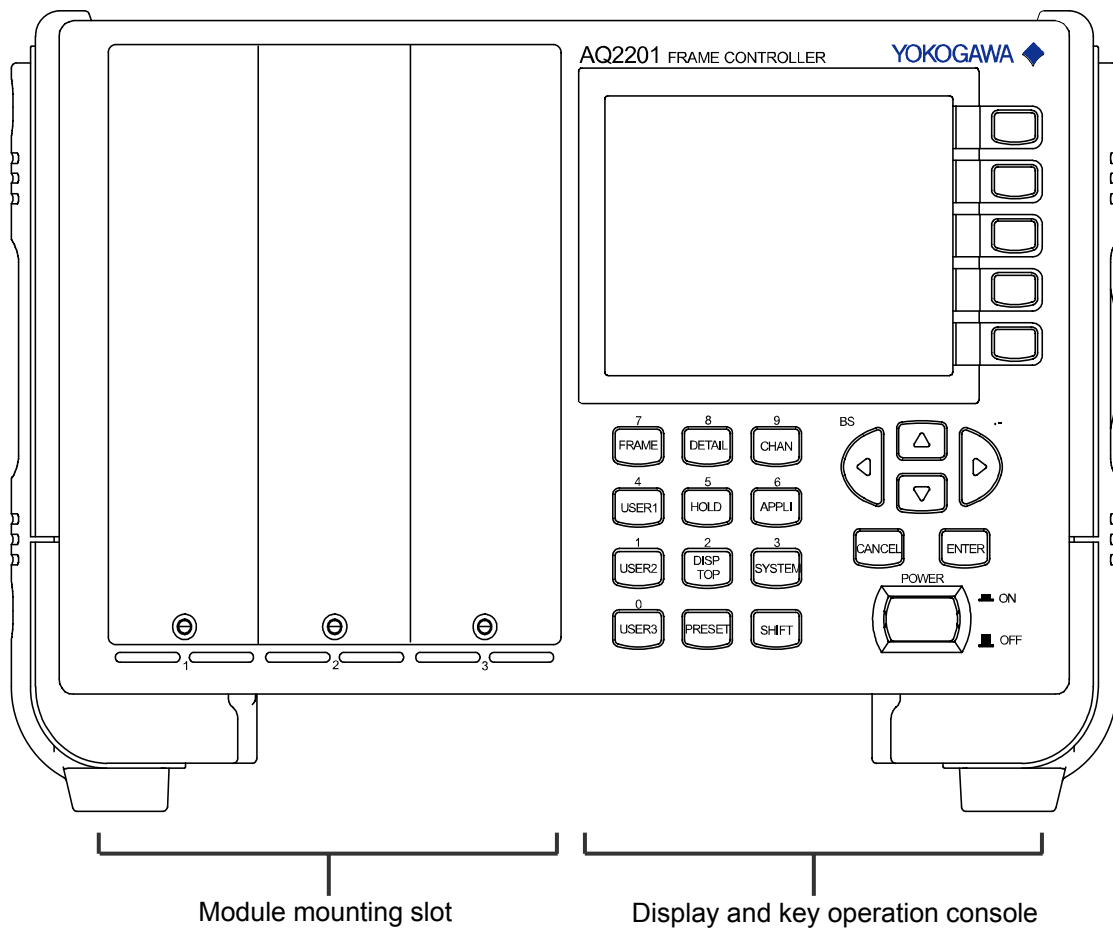


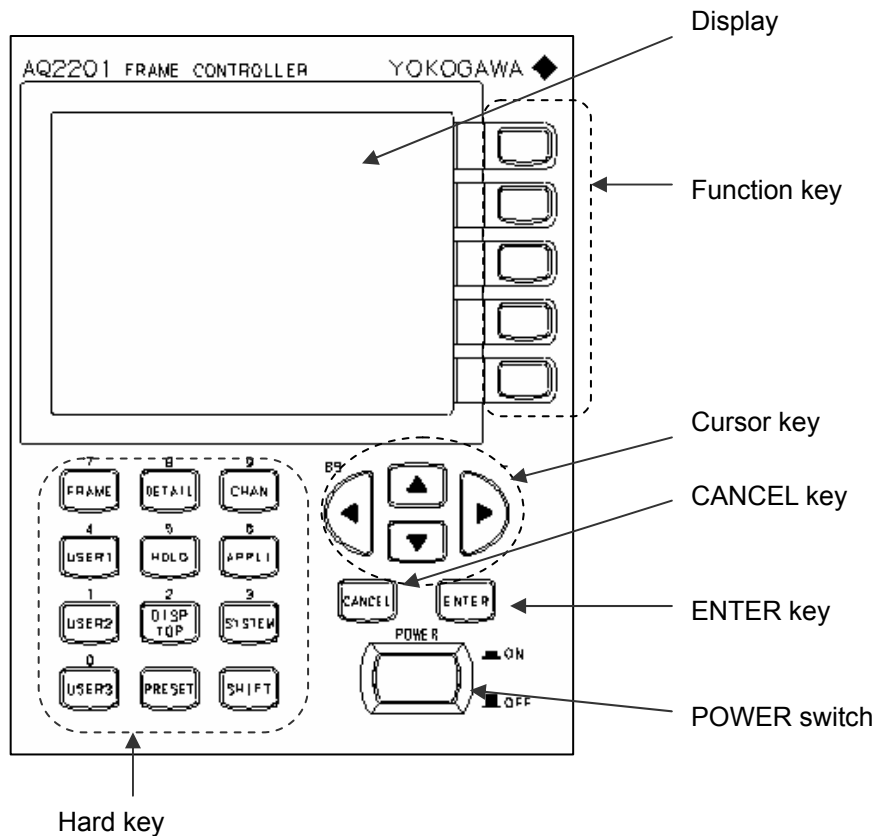
Fig. 2-1 Front Panel of AQ2201

### Module Mounting Slot

Onto the module mounting slots of this unit, you can mount 3 modules (in case of AQ2201 Frame Controller) or 9 modules (in case of AQ2202 Frame Controller) at the maximum. Slot No. 1, 2, and 3 are assigned from the left end when viewed from the front.

Additionally, for details about how to mount the module, see section 1.2.4, Mounting/Removing a Module, (page 1-17).

**Display and Key Operation Console**



**Fig. 2-2 Display and Key Operation Console**

- Function key: Function key is used to select or execute relevant item shown on the display.
- Display: Shows the measured value, set value, and status.
- Cursor key: ▲ and ▼ are used to change the module to be controlled, move the cursor, and change the numeric value.  
◀ and ▶ are used to change the numeric value input digit position and input a backspace or negative sign in the ten-key pad mode.
- ENTER key: This key is used to set the selected item and input value.
- CANCEL key: This key is used to cancel the operation.
- POWER switch: This switch is used to turn ON or OFF the power.

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

- [PRESET]: Returns the parameters of the module actually mounted on the frame to their default statuses.
- [SYSTEM]: Displays the SYSTEM SETUP screen.
- [DISP TOP]: Hides the PARAMETER CHANGE screen.
- [FRAME]: No function
- [APPLI]: Displays the APPLICATION SELECT screen.
- [HOLD]: When the module at the cursor position is the sensor, the updating of the measured data display is stopped.
- [CHAN]: Changes the module to be controlled.
- [USER1]: A desired function can be assigned to this button.
- [USER2]: A desired function can be assigned to this button.
- [USER3]: A desired function can be assigned to this button.
- [DETAIL]: Switches the display between the SUMMARY screen and DETAIL screen.
- [SHIFT]: Changes to the ten-key pad mode (numeric value direct input).

## 2.3 Various Screens and Functions

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

- INITIAL screen
- PASSWORD INPUT screen
- SYSTEM screen
- SUMMARY screen
- DETAIL screen
- APPLICATION screen

Fig. 2-3 Screen Transition Diagram shows the relationship among these screens.

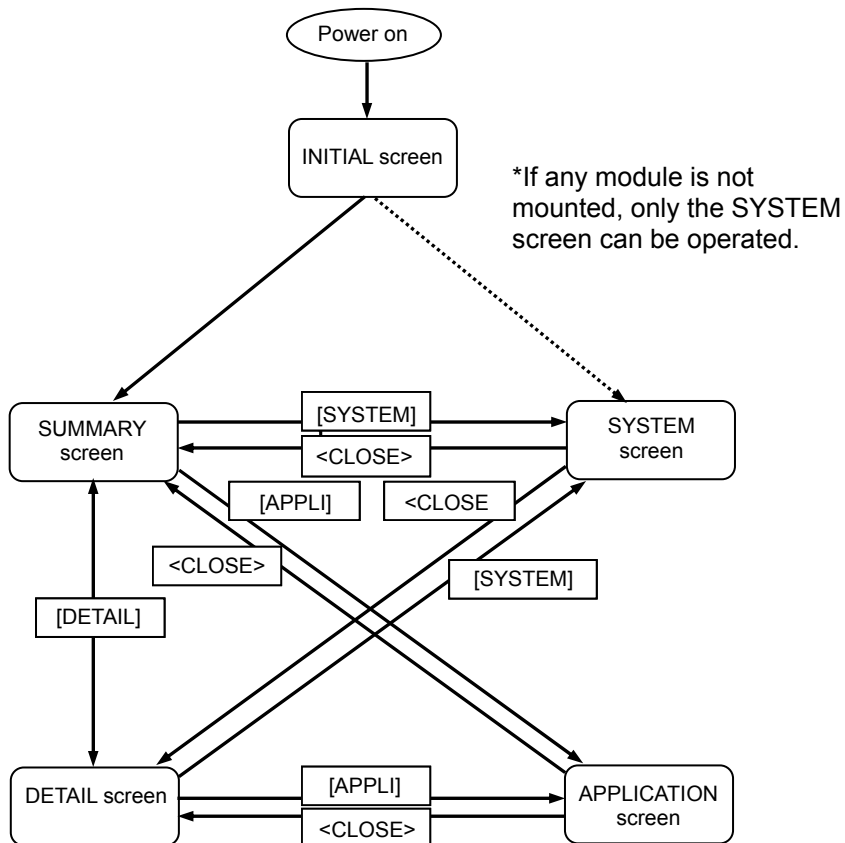


Fig. 2-3 Screen Transition Diagram

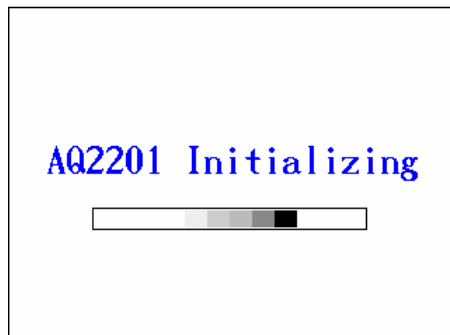
**INITIAL Screen**

After the power has been turned ON, shown in Fig. 2-4 SYSTEM LOADING Screen appears, and then shown in Fig. 2-5 INITIAL Screen appears.

The system information and the module information are loaded while this screen is being displayed.



**Fig. 2-4 SYSTEM LOADING Screen**



**Fig. 2-5 INITIAL Screen**

**NOTE** | The initialization time (INITIAL screen display time) may become long depending on the type of the module mounted on the frame controller and the number of mounted modules.

### SYSTEM Screen

On the SYSTEM screen, you can check or change the following system parameters.

- Date (Year-Month-Day)
- Time
- GP-IB Address
- Network Set (IP Network address)
- Trigger
- Password
- Condition Check
- Lock (Locking of laser output) \*
- Display
- Volume (Sound volume)
- Information (Unit information)
- Insert Module (Re-recognition of module)
- Update
- Load setting (Loading of set parameters)
- Save setting (Saving of set parameters)
- USB Storage Device (Selection of memory device for USB storage)
- File Delete (Clearing of contents in temporary memory, compact flash memory card, or USB flash memory device)
- Storage Memory (Selection of memory device for storage)

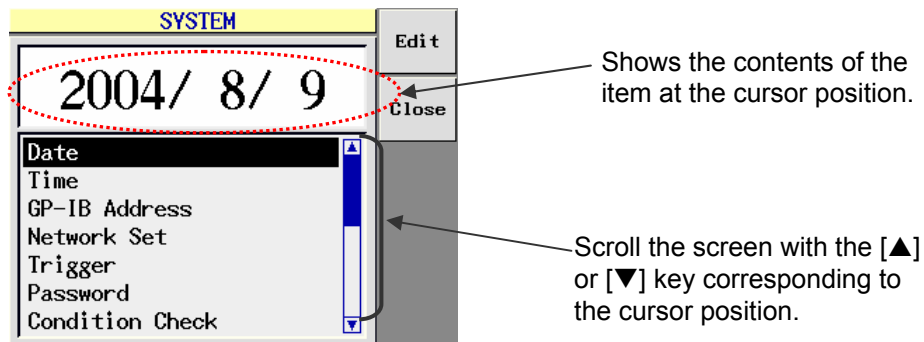


Fig. 2-6 SYSTEM Screen

\* This parameter is shown only when the laser light source module (AQ2200-111, AQ2200-136, AQ2200-141, or AQ2200-142) is mounted.

## SUMMARY Screen

On the SUMMARY screen, the information on all mounted modules is displayed at once. You can display the main parameters, and check and change all the parameters.

- Current module: Module with blue background  
This module allows changing of the parameters.  
The changeable parameters are displayed as function keys.
- Current parameter: Parameter with light blue background

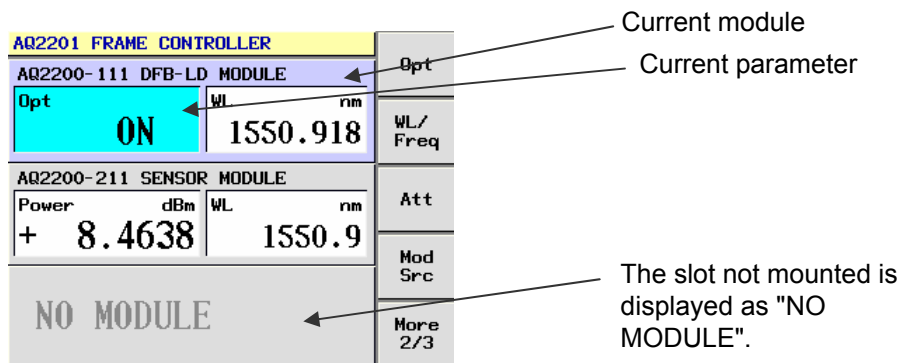


Fig. 2-7 SUMMARY Screen of AQ2201

## NOTE

Error No.1014 may appear on this screen immediately after the unit has been started up. This error shows that the release version of the software installed in the module is not matched with that in the frame controller and a part of the operation may become faulty. If this happens, take appropriate actions, such as updating of the software.

## DETAIL Screen

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

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

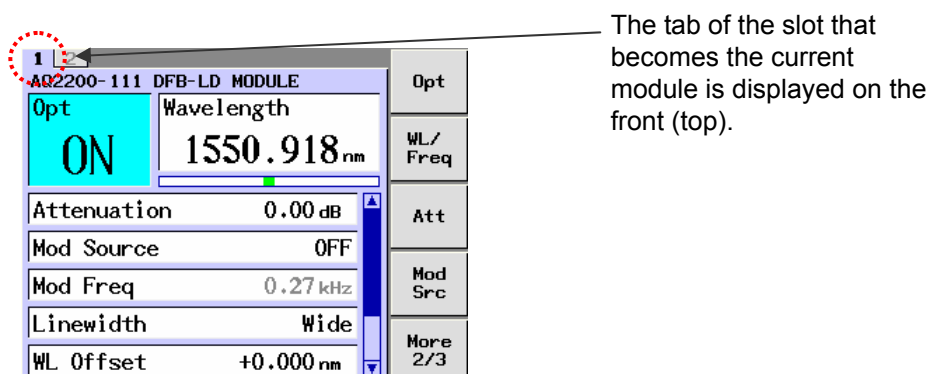


Fig. 2-8 DETAIL Screen

### APPLICATION Screen

The application is an auto measurement function with a combination of one or multiple modules.

On the APPLICATION screen, you can select or execute various applications.

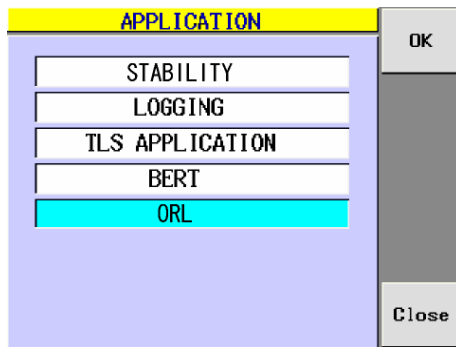


Fig. 2-9 APPLICATION Screen

## 2.4 Basic Operating Procedures

This section describes the basic operating procedures for the frame controller. In the operational descriptions, the keys are shown as follows.

Hard key: [ ]  
 Parameter item: " "  
 Function key: < >

### 2.4.1 Changing the Display Screen

The following describes how to change each screen.

#### ■ Displaying the SYSTEM Screen

To display the SYSTEM screen, press the [SYSTEM] key. Additionally, pressing <Close> will return to the previous screen.

#### ■ Displaying the APPLICATION Screen

To display the APPLICATION screen, press the [APPLI] key. Additionally, pressing <Close> will return to the previous screen.

#### ■ Displaying the SUMMARY Screen or DETAIL Screen

To display the SUMMARY screen or DETAIL screen, press the [DETAIL] key. Additionally, every time the [DETAIL] key is pressed, the screen is switched between the SUMMARY screen and DETAIL screen.

##### <SUMMARY Screen>

| AQ2201 FRAME CONTROLLER  |          | Meas Mode   |
|--------------------------|----------|-------------|
| AQ2200-111 DFB-LD MODULE |          |             |
| Opt                      | ON       | WL nm       |
|                          |          | 1550.918    |
| AQ2200-211 SENSOR MODULE |          |             |
| Power                    | + 8.4638 | dBm         |
|                          |          | WL nm       |
|                          |          | 1550.9      |
| NO MODULE                |          |             |
|                          |          | MaxMin Mode |
|                          |          | Ref Mode    |
|                          |          | More 2/5    |



##### <DETAIL Screen>

| AQ2200-211 SENSOR MODULE |  | Meas Mode   |
|--------------------------|--|-------------|
| Power                    |  |             |
| + 8.4638 dBm             |  |             |
| Meas Mode Normal         |  |             |
| Average 100 ms           |  |             |
| MaxMin Mode Off          |  |             |
| Ref Mode Value           |  |             |
| Reference -30.0000 dBm   |  |             |
|                          |  | MaxMin Mode |
|                          |  | Ref Mode    |
|                          |  | More 2/5    |

The display screen is switched alternately every time the [DETAIL] key is pressed.

### Changing the Current Module

To change the current module, press the [CHAN] key.  
 Every time the [CHAN] key is pressed, the slot No. of the current module is changed, like "slot1→slot2→slot3→slot1...".  
 At this time, the slot where no module is mounted is skipped.  
 Additionally, when the SUMMARY screen is displayed, the current module is changed with the [▲] or [▼] key.

#### <SUMMARY Screen>

|                          |     |          |    |             |
|--------------------------|-----|----------|----|-------------|
| AQ2201 FRAME CONTROLLER  |     |          |    |             |
| AQ2200-111 DFB-LD MODULE |     |          |    | Opt         |
| Opt                      | ON  | WL       | nm | WL/<br>Freq |
|                          |     | 1550.918 |    |             |
| AQ2200-211 SENSOR MODULE |     |          |    | Att         |
| Power                    | dBm | WL       | nm | Mod<br>Src  |
| + 8.4638                 |     | 1550.9   |    |             |
| NO MODULE                |     |          |    | More<br>2/3 |

Current module



Every time the [CHAN] key is pressed, the current module is changed in the order of slot No.

|                          |     |          |    |                |
|--------------------------|-----|----------|----|----------------|
| AQ2201 FRAME CONTROLLER  |     |          |    | Meas<br>Mode   |
| AQ2200-111 DFB-LD MODULE |     |          |    | Avg            |
| Opt                      | ON  | WL       | nm |                |
|                          |     | 1550.918 |    |                |
| AQ2200-211 SENSOR MODULE |     |          |    | MaxMin<br>Mode |
| Power                    | dBm | WL       | nm | Ref<br>Mode    |
| + 8.4638                 |     | 1550.9   |    |                |
| NO MODULE                |     |          |    | More<br>2/5    |

Current module

## &lt;DETAIL Screen&gt;

|             |            |                          |             |             |
|-------------|------------|--------------------------|-------------|-------------|
| 1   2       |            | AR2200-111 DFB-LD MODULE |             | Opt         |
| Opt         | Wavelength | ON                       | 1550.918 nm | WL/<br>Freq |
| Attenuation | 0.00 dB    |                          |             | Att         |
| Mod Source  | OFF        |                          |             | Mod<br>Src  |
| Mod Freq    | 0.27 kHz   |                          |             |             |
| Linewidth   | Wide       |                          |             | More<br>2/3 |
| WL Offset   | +0.000 nm  |                          |             |             |



Every time the [CHAN] key is pressed, the current module is changed in the order of slot No.

|             |              |                          |  |                |
|-------------|--------------|--------------------------|--|----------------|
| 1   2       |              | AR2200-211 SENSOR MODULE |  | Meas<br>Mode   |
| Power       |              | + 8.4638 dBm             |  | Avg            |
| Meas Mode   | Normal       |                          |  | MaxMin<br>Mode |
| Average     | 100 ms       |                          |  | Ref<br>Mode    |
| MaxMin Mode | Off          |                          |  | More<br>2/5    |
| Ref Mode    | Value        |                          |  |                |
| Reference   | -30.0000 dBm |                          |  |                |

## 2.4.2 Selecting a Parameter and Changing the Numeric Value

The following describes how to select various parameters and how to change the numeric value.

### Selecting a Parameter

Two kinds of parameter selections are provided as shown below.

#### <Selection with the Cursor>

Move the cursor to a parameter you want to change, and then press the [ENTER] key or <OK>.

#### <Selection with the Function Key>

Press relevant function key, on which a parameter you want to change is displayed.

### Canceling the Contents of the Parameter during Setting

To cancel the contents of the parameter you are currently setting, press the [CANCEL] key or <Cancel>.

### Changing the Numeric Value

Two kinds of numeric value changing methods are provided as shown below.

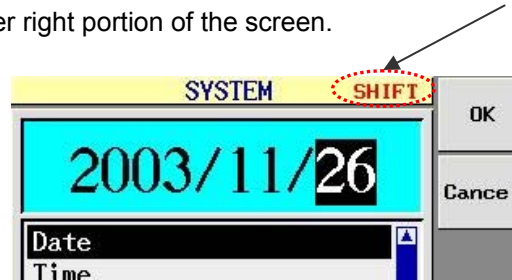
#### <Inputting a Numeric Value with the Cursor Key>

1. With the [▶] or [◀] key, move the cursor to a digit you want to change the numeric value.
2. Increase or decrease the numeric value with the [▲] or [▼] key.  
It is also possible to continuously increase or decrease the numeric value by keeping the key pressed for a while.
3. Repeat above steps 1 and 2 to change the numeric value to a value you want to input.
4. Press the [ENTER] key or <OK> to set the numeric value you have input.

**NOTE** || The value input is automatically limited so that it does not exceed the upper or lower limit value.

**<Inputting a Numeric Value with the Ten-key Pad>**

1. Press the [SHIFT] key.  
If it is possible to input a numeric value, "SHIFT" is shown at the upper right portion of the screen as shown in the Fig. below.
2. Input a numeric value directly.  
To correct the value, use the [◀] key as back space (BS) key.
3. Press the [ENTER] key or <OK> to set the numeric value you have input.  
When inputting a numeric value with the ten-key pad, "SHIFT" is shown at the upper right portion of the screen.



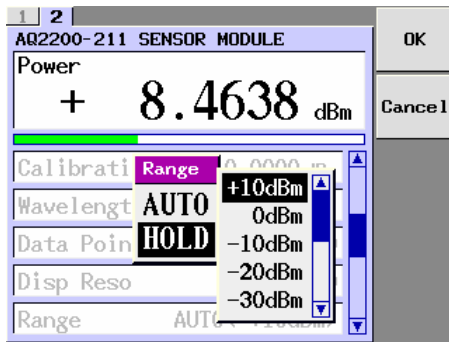
**Fig. 2-10 Screen for Value Input through Ten-key Pad**

**NOTE**

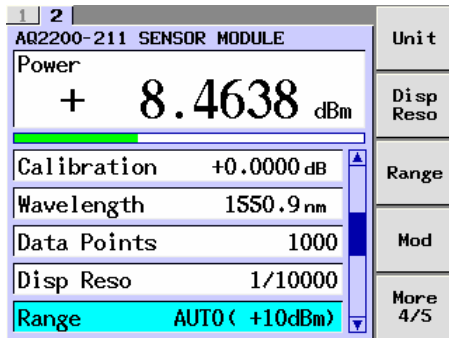
- When pressing the [▲] or [▼] key while inputting a value with the ten-key pad, the input mode is automatically changed to the cursor input mode.
- If the value you have set exceeds the upper or lower limit value when pressing the [ENTER] key or <OK>, it is automatically corrected to the upper or lower limit value.

**Returning the Parameter Display to the Top**

To return the parameter display, which has been moved to the lower layer by selecting the parameter, press the [DISP TOP] key.



Pressing the [DISP TOP] key will return the parameter display to the top at once.



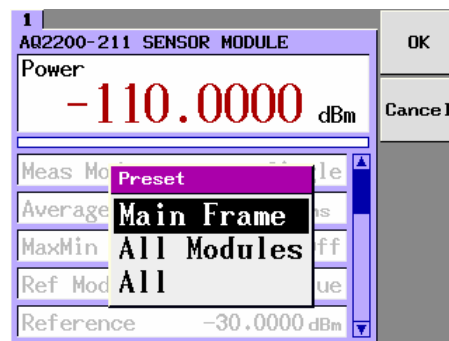
**NOTE** In the status waiting for the ten-key pad input (see Fig. 2-10 Screen for Value Input through Ten-key Pad, page 2-15), pressing the [DISP TOP] key will input the numeric value "2". In this case, press the [SHIFT] key to cancel the status waiting for the ten-key pad input, and then press the [DISP TOP] key.

### Returning Various Parameters to Their Initial Values

Press the [PRESET] key. The pop screen to select the Preset items will appear. Select the items you want to initialize and press the [ENTER] or <OK> key. The selected items will be initialized. You can specify the Preset items from among [Main Frame] (initializes the frame only), [All Modules] (initializes all the mounted modules), and [All] (initializes the frame and all the mounted modules). During execution of initialization, the message "Executing..." will appear.

For details about initial values, see section 11.2, List of Default Settings.

1. Press the [PRESET] key. The popup screen allowing you to select an initialization item will appear as shown in the Fig. below.

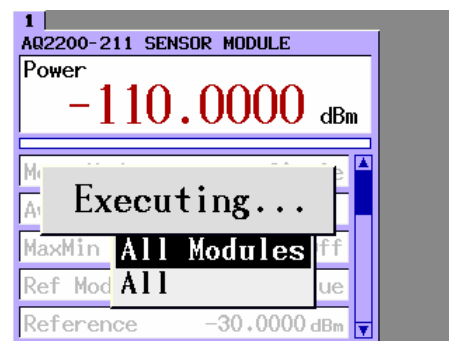


2. With the [▲] or [▼] key, move the cursor to an item you want to initialize. Press the <OK> or [ENTER] key to execute the initialization.

For initialization item, select any of three items shown below.

- [Main Frame]: Initializes the parameters of the frame controller.
- [All Modules]: Initializes the parameters of all mounted modules.
- [All]: Initializes the parameters of the frame controller and all mounted modules.

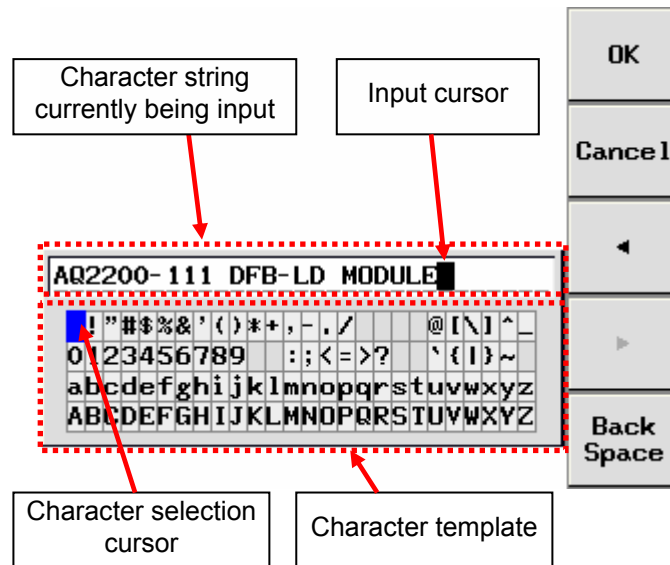
The following popup screen is displayed while the initialization is being executed.



For details about initial values, see section 11.2, List of Default Settings, (page 11-4).

### 2.4.3 Inputting a Character String

For file name and display module name, etc., up to 31 characters can be input using the following procedures.



- <OK>: Sets the character string currently being input to complete the character string input.
- <Cancel>: Cancels the character string input.
- <◀>, <▶>: Moves the input cursor.
- <Back Space>: Deletes the character before the input cursor.
  
- [▲], [▼], [◀], or [▶] key: Moves the character selection cursor.
  
- Ten-key pad: Inputs a numeric value directly at the input cursor position.
- [ENTER] key: Inputs the character at the character selection cursor position to the input cursor position.
- [CANCEL] key: Deletes the character before the input cursor.

## 2.4.4 Canceling the Remote Control

In some operations during GP-IB remote control or LAN remote control, only <Local> is shown on the function key as shown in Fig. 2-11. The panel operation cannot be performed while <Local> is being displayed.

To start the panel operation, press <Local> or <LAN Local> to cancel the remote control.

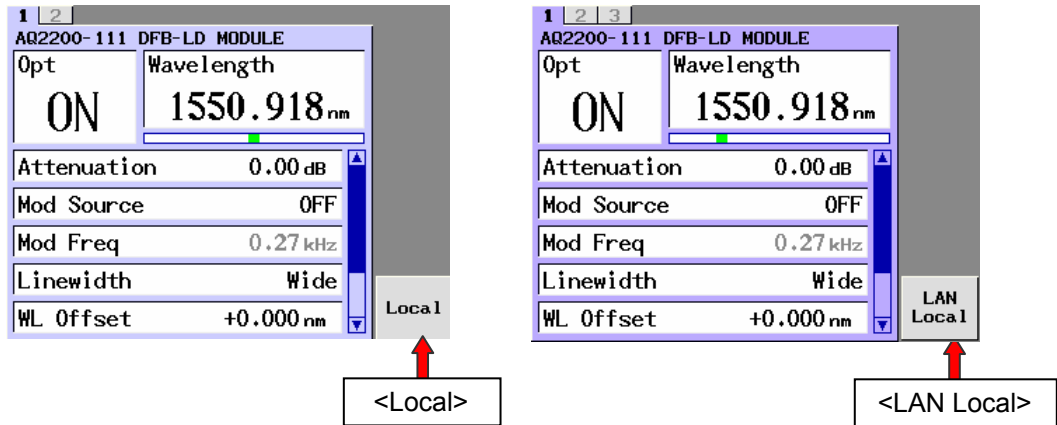


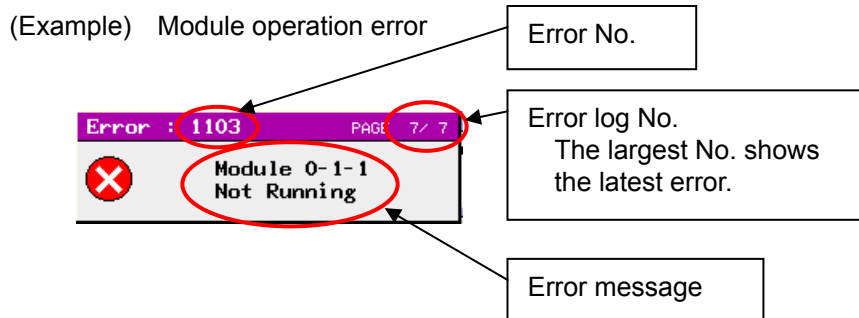
Fig. 2-11 Remote Control Status

## 2.4.5 Various Kinds of Information

Necessary information you must check or observe will appear on the popup screen. Follow the instruction that appears on the popup screen to perform the operation or check.

### Error Message and Confirmation the Error

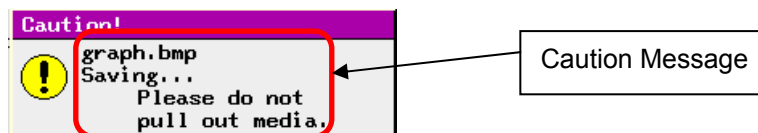
If an error occurs, this error and its contents are informed. In this case, check the display carefully. After removing the cause of the error, press <OK>. If the cause of the error cannot be solved, the same error appears again even after pressing <OK>. Additionally, pressing the [▲] or [▼] key allows you to check the error log. For details about error messages, see section 11.4, Error List, (page 11-13).



### Caution Message

Operations particularly not allowed to take are informed. Check the display carefully and follow the instruction to perform the operation. If you do not follow the instruction, this may cause the unit to break. Additionally, note that this popup screen will disappear automatically.

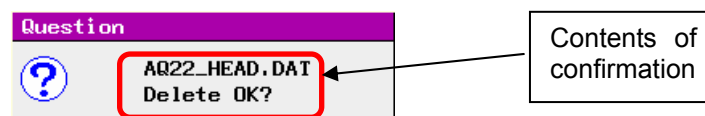
(Example) Caution information about operation of CF when saving data



### Confirmation Message

This confirmation message is shown when it is predicted that the settings cannot be restored if the current operation is executed. After checking the message, to continue the operation, click <OK>. On the contrary, to stop the operation, click <Cancel>.

(Example) Confirmation of data deletion when operating a file saved in the CF.



# Chapter 3

## Changing the System Setup Values

## 3.1 Changing the System Setup Values

This section describes how to change the system setup values of the frame controller.

### Changing the Date

Follow the steps below to change the date.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-1)
2. Move the cursor to "Date" and press the <Edit> or [ENTER] key.

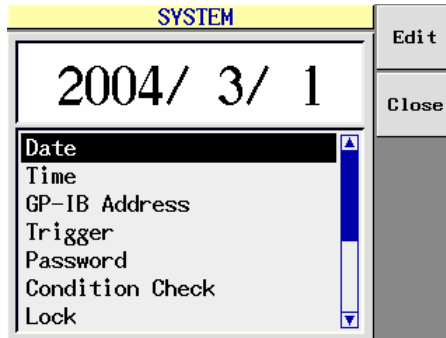
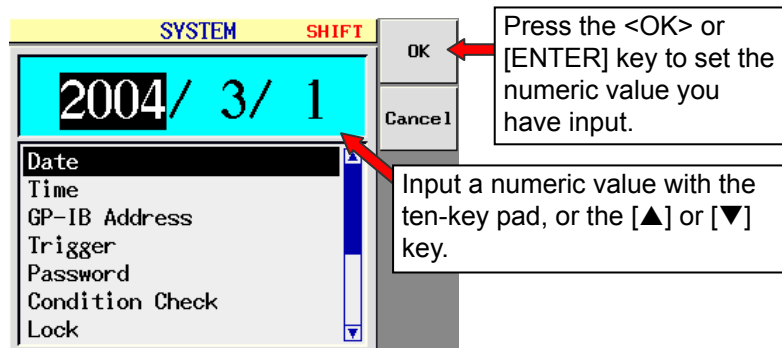


Fig. 3-1 Date Display Screen

3. With the ten-key pad, or the [▲] or [▼] key, change the Christian year, month, and day, and then press the <OK> or [ENTER] key.



#### NOTE

- When inputting a value with the ten-key pad, the cursor is automatically moved to the "Year", "Month", and "Day" fields in that order. However, when the "Month" is "1", the "Day" does not move automatically according to the day of the month. In this case, move the cursor with the [▶] or [◀] key.
- If you attempt to input a date not existing in the calendar, it is automatically corrected or the operation enters the input disabled status.
  - (Example 1) When changing "December, 31" to "November, 31", the value in the "Day" field is automatically corrected to "30" if the value in the "Month" field is changed to "11".
  - (Example 2) When the value in the "Month" field is "2", "30" cannot be input in the "Day" field.

### Changing the Time

Follow the steps below to change the time.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-2)
2. Move the cursor to "Time" and press the <Edit> or [ENTER] key.

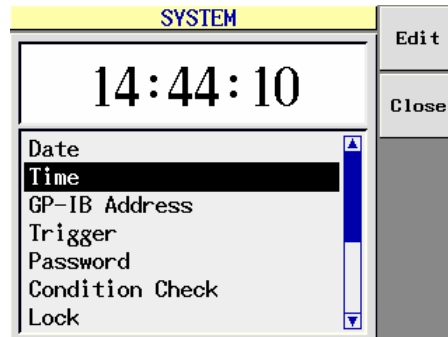
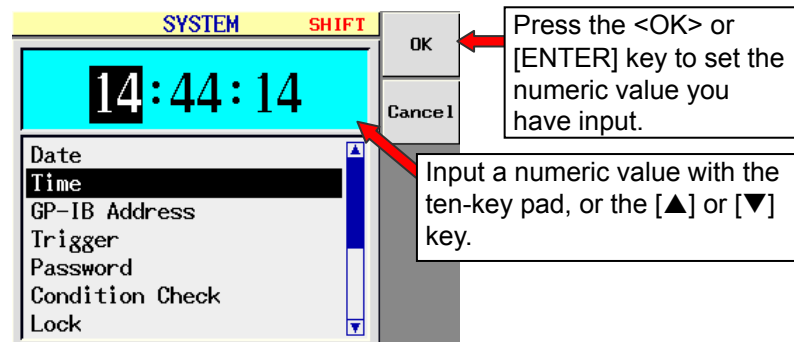


Fig. 3-2 Time Display Screen

3. With the ten-key pad, or the [▲] or [▼] key, change the hour, minute, and second, and then press the <OK> or [ENTER] key.



**NOTE** When inputting a value with the ten-key pad, the cursor is automatically moved to the "Hour", "Minute", and "Second" fields in that order. However, the cursor does not move automatically when the "Hour" is "1" or "2", or the "Minute" or "Second" is between "1" and "5". In this case, move the cursor with the [▶] or [◀] key.

### Changing the GP-IB Address

When two or more number of devices are connected, a different GP-IB address needs to be set for each device.

Follow the steps below to set the GP-IB address.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-3)

2. Move the cursor to "GP-IB Address" and press the <Edit> or [ENTER] key.

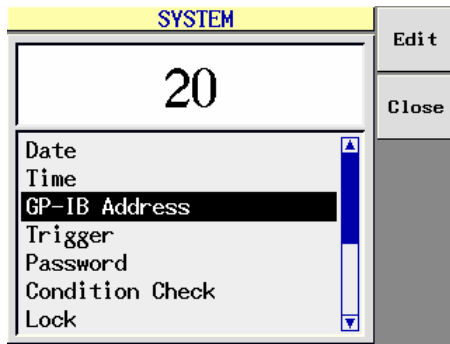
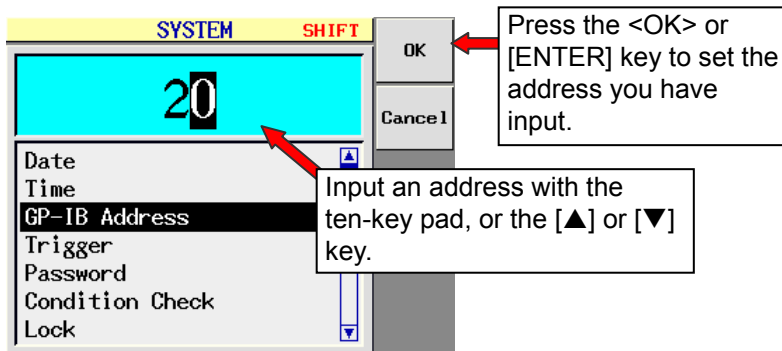


Fig. 3-3 GP-IB Address Display Screen

3. With the ten-key pad, or the [▲] or [▼] key, change the address.
4. After inputting the new address, press the <OK> or [ENTER] key.



**NOTE** || The address setting range is "0" to "30". The initial value has been set at "20" before shipment from the factory.

### Changing the Network Address

A different network address needs to be set for each unit in order to identify the units to be connected to the network.

Follow the steps below to set a network address.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-4)

- Move the cursor to "Network Set" and press the <Edit> or [ENTER] key.

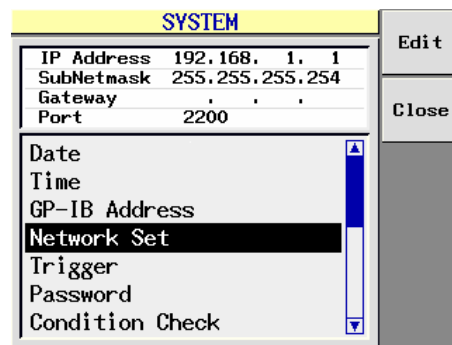
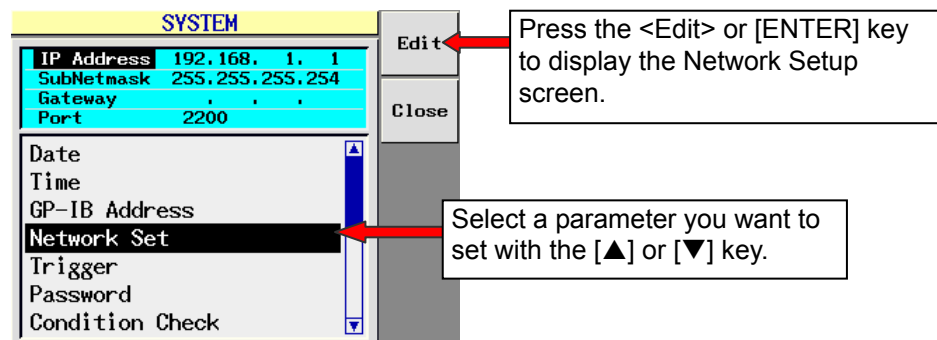
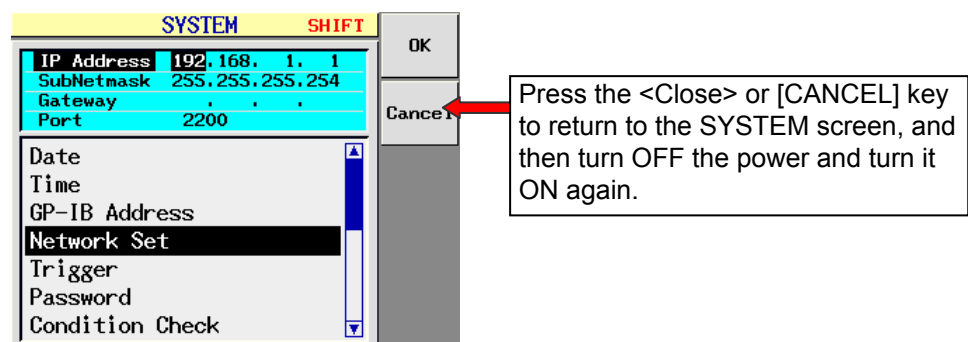


Fig. 3-4 Network Address Display Screen

- Move the cursor to "IP Address", "SubNetmask", "Gateway", or "Port", and press the <Edit> or [ENTER] key to select it.



- Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.
- Repeat above steps 3 and 4 to input all parameters.
- After you have input all parameters completely, press the <Close> or [CANCEL] key.



#### NOTE

- When inputting the numeric value with the ten-key pad, the cursor is moved automatically after inputting a 3-digit value in each field. However, if a numeric value having two or less digits is input, the cursor is not moved automatically. At this time, move the cursor with the [▶] or [◀] key in the same manner as described for data inputting with the [▲] or [▼] key.
- To make the numeric values you have input valid, turn OFF the power, and then turn it ON again.

### Setting or Changing the Password

You can set a password intended to lock or cancel the laser output.

Follow the steps below to set a desired password.

The password specified here is used for "Locking the Laser Output" (P3-10).

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-5)
2. Move the cursor to "Password" and press the <Edit> or [ENTER] key.

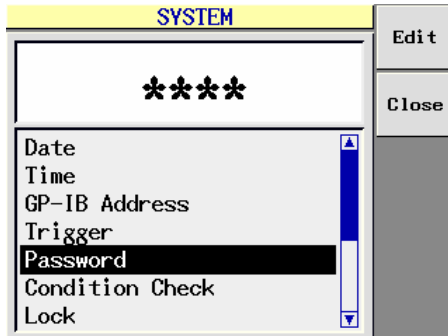


Fig. 3-5 Password Display Screen

3. Input the currently set password with the ten-key pad and press the <OK> or [ENTER] key.

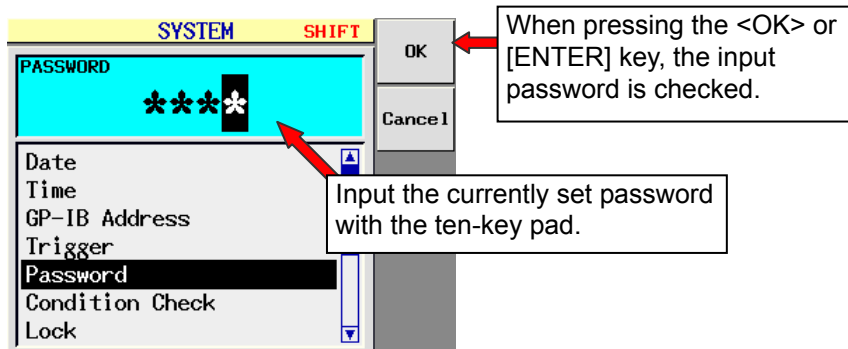
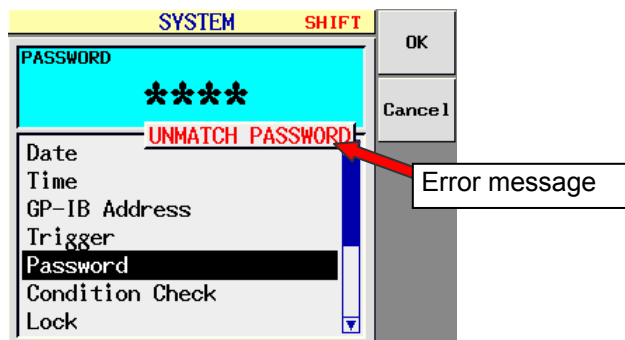


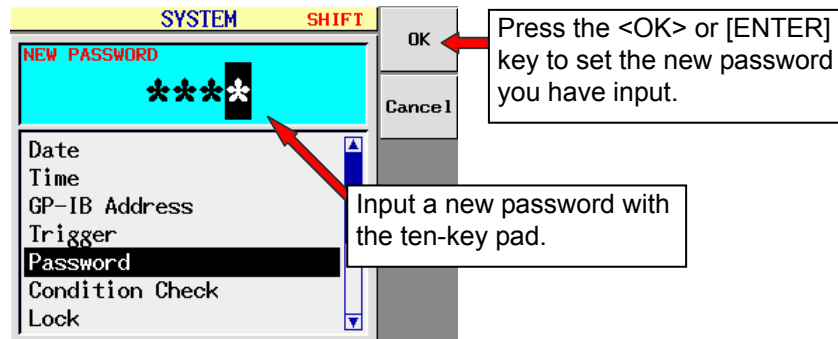
Fig. 3-6 Password Error Screen

If the password you have input is not matched with that currently set in the unit, relevant error is shown. If this happens, input the password again.

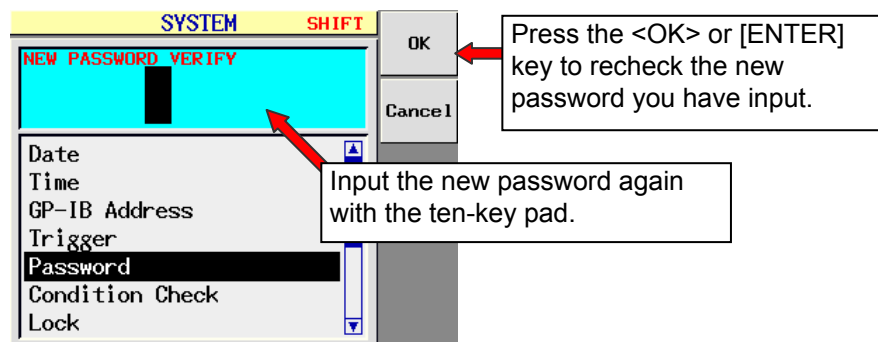


4. When the password you have input is matched with that set in the unit, the message, "NEW PASSWORD", appears and the screen is changed to the new password input screen.

Input a new password (4-digit numeric value ranging from "0000" to "9999") with the ten-key pad and press the <OK> or [ENTER] key.



5. The message, "NEW PASSWORD VERIFY", appears. Input the new password you have input in step 4 again, and then press the <OK> or [ENTER] key.



6. When the new password you have input in step 5 is matched with that set in step 4, the new password setup is then completed.

### CAUTION

If the password is not matched, you cannot perform the lock operation.  
 If you have changed the password, you must record this password.  
 If you forget the password, contact your local sales dealer or YOKOGAWA's sales branch office.

**NOTE** | The password has been set at "1234" before shipment from the factory.

**Checking the Frame Conditions**

You can check three kinds of frame conditions, "FAN drive", "Battery", and "Internal temperature".

Follow the steps below to check the frame condition.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-7)
2. Move the cursor to "Condition Check" and press the <OK> or [ENTER] key.

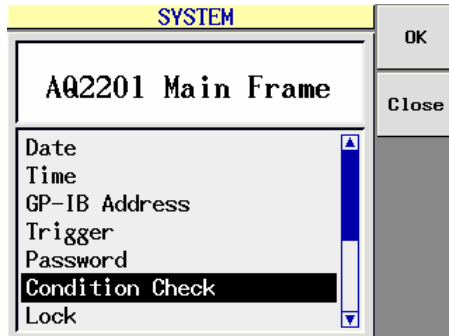
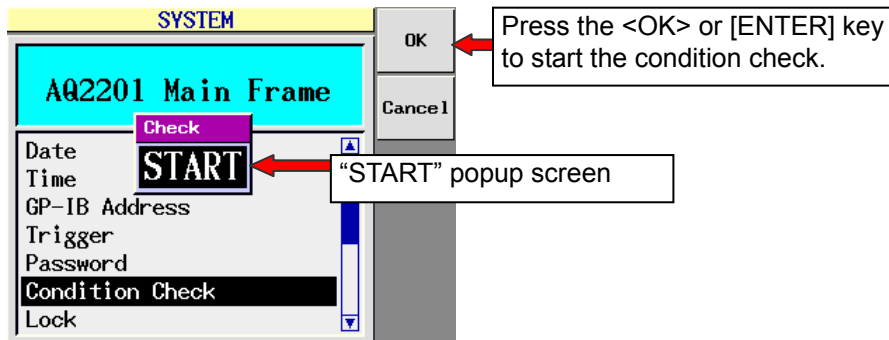
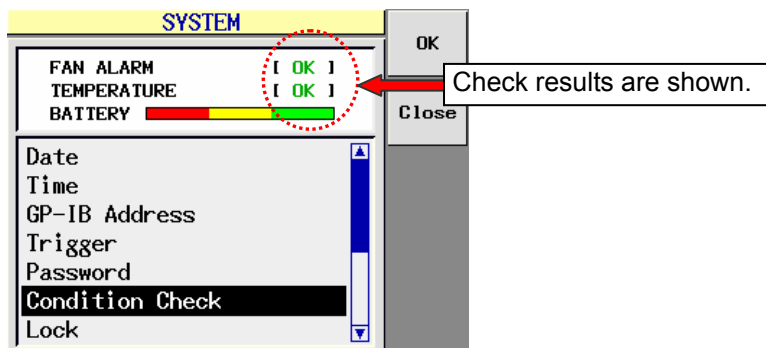


Fig. 3-7 Frame Condition Display Screen

3. The "START" popup screen will appear.  
Press the <OK> or [ENTER] key to start the condition check.



4. When the screen is changed to that shown in the Fig. below, the condition check is then completed.



 **CAUTION**

The internal temperature is abnormal if **“NG”** is displayed for **“TEMPERATURE”**.  
Turn OFF the power immediately, and check that ventilation holes (e.g. fan exhaust holes) are not blocked.  
If **“NG”** still reappears, contact your local sales dealer or YOKOGAWA's sales branch office.

 **CAUTION**

The fan is not operating properly if **“NG”** is displayed for **“FAN ALARM”**.  
Check the fan for entry of any foreign matter.  
If **“NG”** still reappears, contact your local sales dealer or YOKOGAWA's sales branch office.

 **CAUTION**

The remaining backup battery power is low if the **“BATTERY”** bar becomes short.  
Record all the important parameters and data immediately.  
If it is necessary to replace the battery, contact your local sales dealer or YOKOGAWA's sales branch office.  
The battery lasts approximately three years with the power to the instrument turned OFF.

### Locking the Laser Output

By locking the laser output, it is possible to protect the operation by a third person. Follow the steps to lock the laser output.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-8)
2. Move the cursor to "Lock" and press the <Edit> or [ENTER] key.

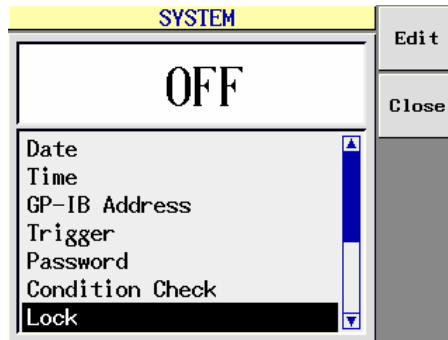
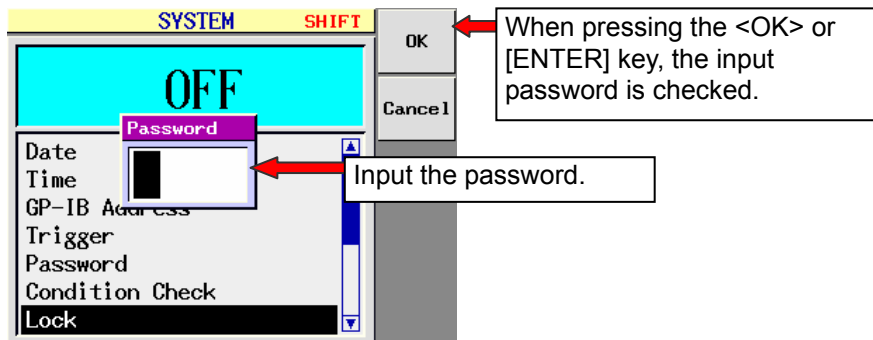
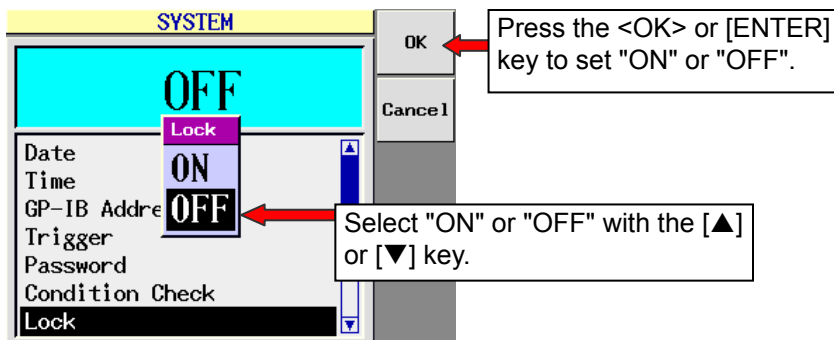


Fig. 3-8 Laser Output Lock Display Screen

3. The "Password" popup screen will appear. Input the password with the ten-key pad and press the <OK> or [ENTER] key.



4. The "Lock" popup screen will appear. Move the cursor to "ON" or "OFF" and press the <OK> or [ENTER] key.



**NOTE**

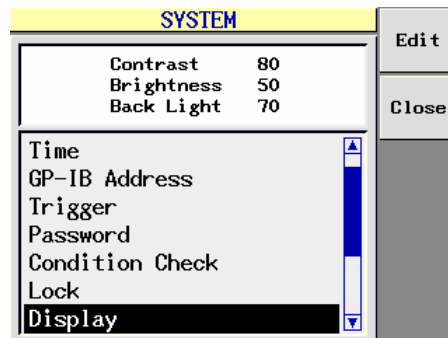
- You must input the password set in the section, Setting and Changing the Password. For details, see the section, Setting and Changing the Password, (page 3-6).
- If any of the following modules is not mounted, this parameter cannot be displayed.

| Model      | Name              |
|------------|-------------------|
| AQ2200-111 | DFB-LD Module     |
| AQ2200-141 | FP-LD Module      |
| AQ2200-142 | DUAL FP-LD Module |

**Adjusting the Display**

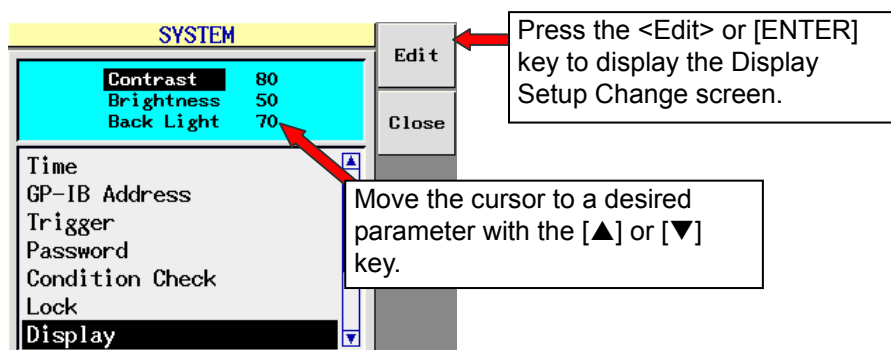
You can adjust the contrast, brightness, and back-light of the display. Follow the steps below to adjust the display.

1. Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-9)
2. Move the cursor to "Display" and press the <Edit> or [ENTER] key.

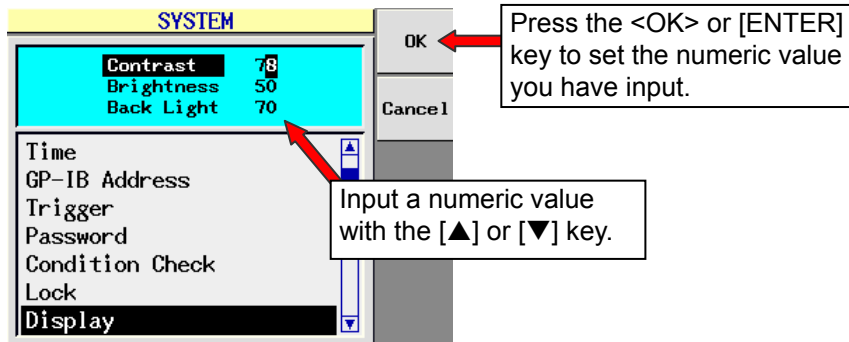


**Fig. 3-9 Display Adjustment Screen**

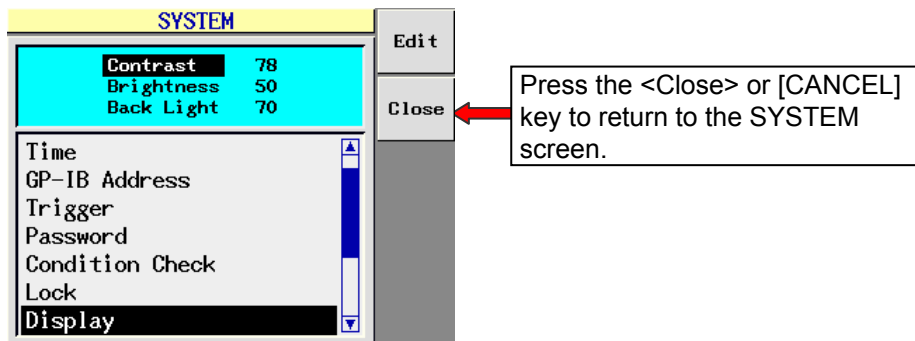
3. Move the cursor to "Contrast", "Brightness", or "Back Light" with the [▲] or [▼] key and press the <Edit> or [ENTER] key to select a desired parameter.



- Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



- Repeat above steps 3 and 4 to input all parameters. After you have input all parameters completely, press the <Close> or [CANCEL] key.



### Changing the Buzzer Sound Volume

In the key operation, when the key you have pressed is recognized, the buzzer will sound. You can adjust this buzzer sound volume. Follow the steps below to set the sound volume to a desired level.

- Press the [SYSTEM] key to display the SYSTEM screen. (Fig. 3-10)
- Move the cursor to "Volume" and press the <Edit> or [ENTER] key.

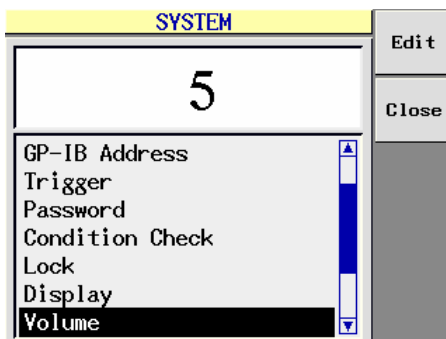
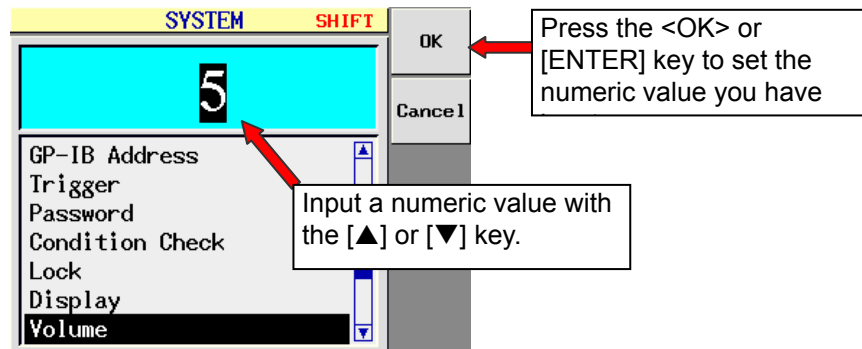


Fig. 3-10 Buzzer Sound Volume Display Screen

3. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



**NOTE** | • When "0" is set, the buzzer is turned OFF.

## 3.2 Saving and Loading the System Setup Values

---

By saving or loading the system setup values and/or application parameters you have input into/from the specified storage device, you can reproduce the measurement system easily.

For details, see section 7-6, Saving or Loading the Set Parameters, (page 7-104).

# Chapter 4

## Power Measurement

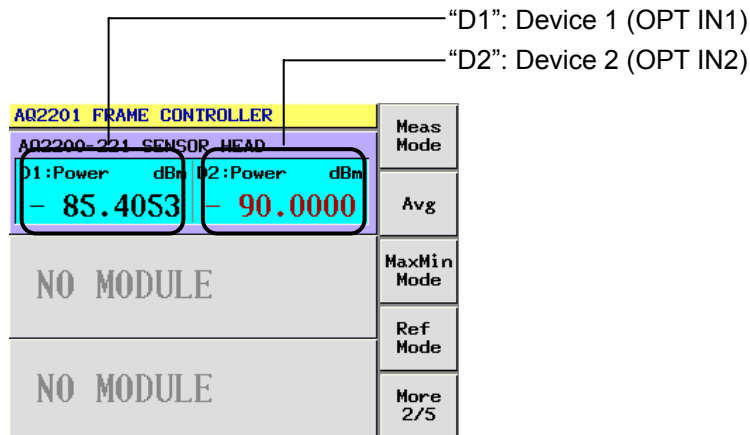
# 4.1 Operating the Optical Power Measurement

By mounting AQ2200-211, AQ2200-215, AQ2200-201+AQ2200-231, AQ2200-201+AQ2200-241, or AQ2200-221 on this unit, you can measure the optical power.

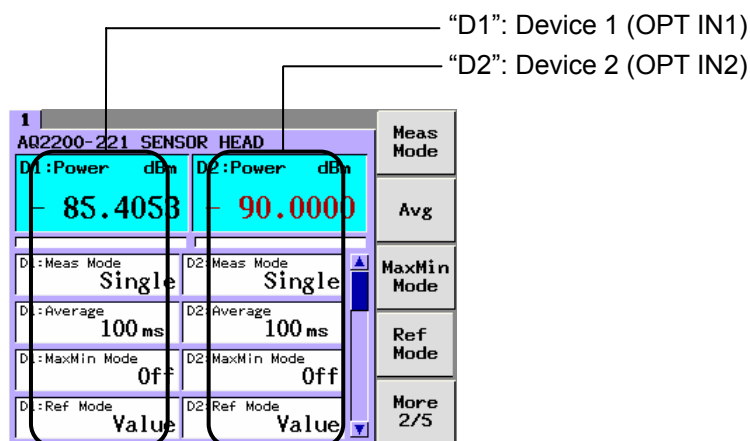
- AQ2200-211 Sensor Module
- AQ2200-215 Sensor Module
- AQ2200-201 Interface Module + AQ2200-231 Optical Sensor Head
- AQ2200-201 Interface Module + AQ2200-241 Optical Sensor Head
- AQ2200-221 Sensor Module

In the following descriptions, the operation screens of the AQ2200-211 are used to explain the contents. To operate the AQ2200-221 sensor module, follow the steps below.

### <Operation Screen of AQ2200-221 Sensor Module>

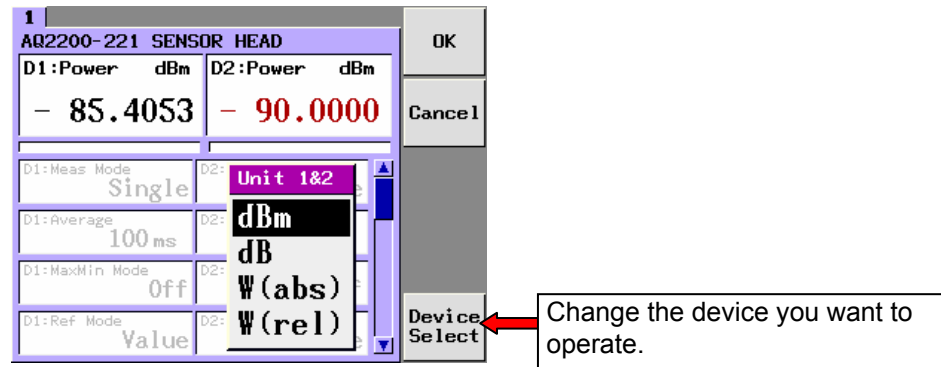


SUMMARY Screen



DETAIL Screen

1. When the function setup popup screen appears, <Device Select> is shown.
2. Press <Device Select>. Every time <Device Select> is pressed, the device you can set up is changed. Toggles through Device 1 -> Device 2 -> Device 1&2 -> ... Note that the same setting cannot be entered for multiple devices.  
In the case of parameters (example: Output Trig), toggles between Device 1 -> Device 2 ...



Operation Screen of AQ2200-221 Sensor Module

### Changing the Power Display Unit

The power display unit is changed to “dBm”, “dB”, “W(abs)”, or “W(rel)”.  
 “dBm” and “W” show the absolute value while “dB” and “W(rel)” show the relative value.

Additionally, the power display unit has the following relationship.

$$P_{dBm} = 10 \times \log(P_{input}(W) / 1 \times 10^{-3}(W))$$

where

P<sub>dBm</sub>: Optical input power (dBm)

P<sub>input</sub>: Optical input power (W)

Furthermore, the display values have the following relationship.

$$P_{dBdisplay}(dBm) = P_{dBm}(dBm) + CAL(dB)$$

$$P_{wdisplay}(W) = 10^{P_{dBdisplay}(dBm) / 10} \times 10^{-3}$$

$$P_{dB} = P_{dBdisplay}(dBm) - P_{dBref}(dBm)$$

$$P_w = P_{wdisplay}(W) / P_{wref}(W)$$

where

P<sub>dBmeasure</sub>: Measurement display value (dBm) when set at “dBm”.

P<sub>wmeas</sub>: Measurement display value (W) when set at “W(abs)”.

P<sub>dBdisplay</sub>: Measurement display value (dB) when set at “dB”.

P<sub>wdisplay</sub>: Measurement display value (no unit) when set at “W(rel)”.

CAL: Power offset value (dB)

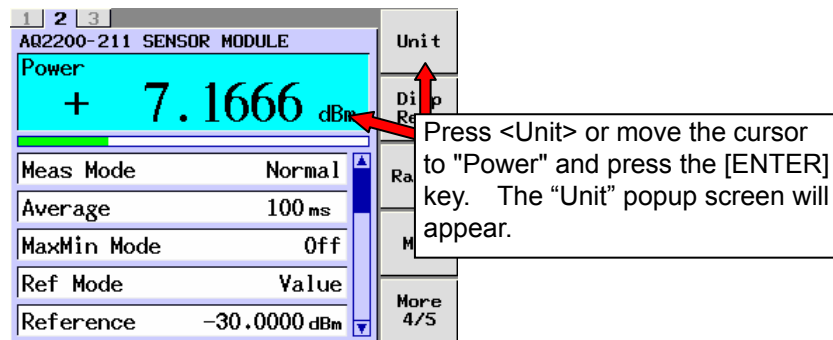
P<sub>dBref</sub>: Relative reference value (dBm)

P<sub>wref</sub>: Relative reference value (W)

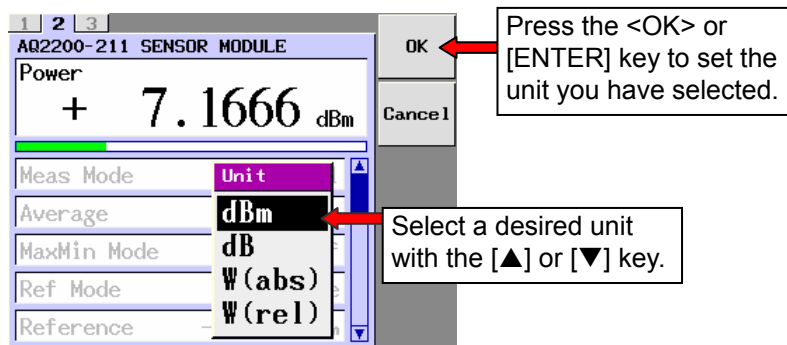
#### NOTE

- The power offset value is the offset value set in "Setting the Power Offset Value". For details, see Setting a Power Offset Value (page 4-5).
- The relative reference value is the value shown in "Reference". For details, see Setting the Reference Mode (page 4-6) and Setting a Reference Value (page 4-7).

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Unit> or move the cursor to "Power" and press the [ENTER] key.



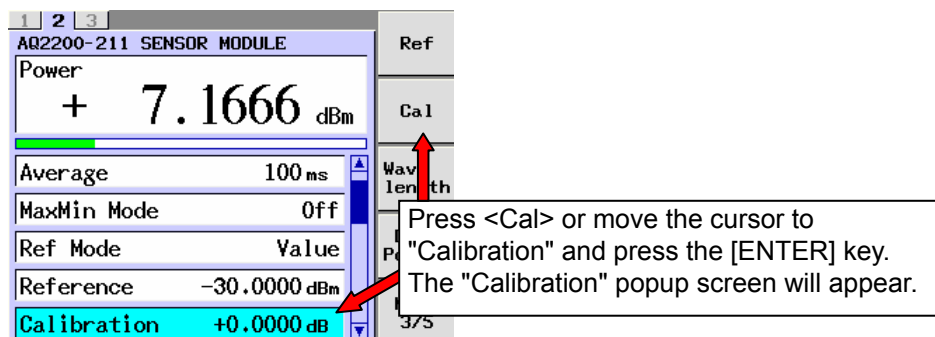
4. The "Unit" popup screen will appear. Move the cursor to a desired display unit and press the <OK> or [ENTER] key.



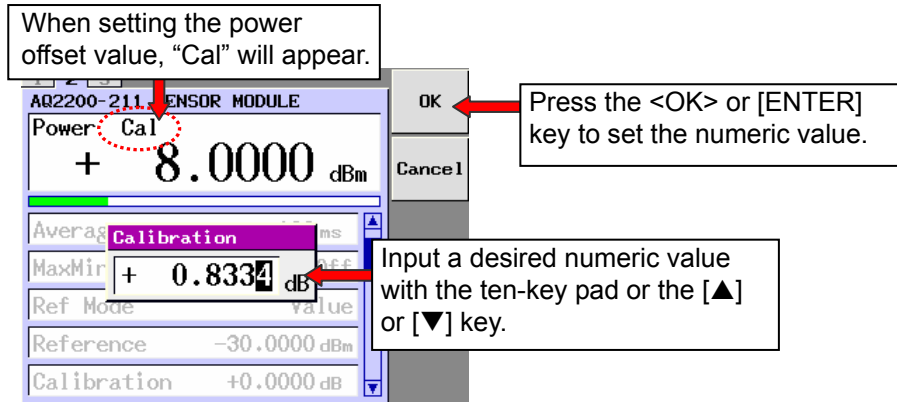
### Setting a Power Offset Value

You can use a value, that a power offset value (-180.0000 to +200.0000dB) is added to the measurement value, as the display value.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Cal> or move the cursor to "Calibration" and press the [ENTER] key.



- The "Calibration" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.  
At this time, when changing the numeric value with the [▲] or [▼] key, the set value is then set immediately and it affects the displayed measurement value quickly.



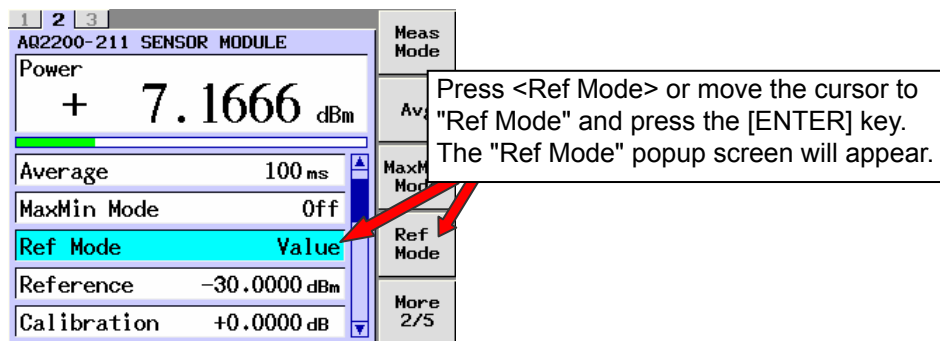
**NOTE** || The setting range is "-180.0000" to "+200.0000dB".

### Setting the Reference Mode

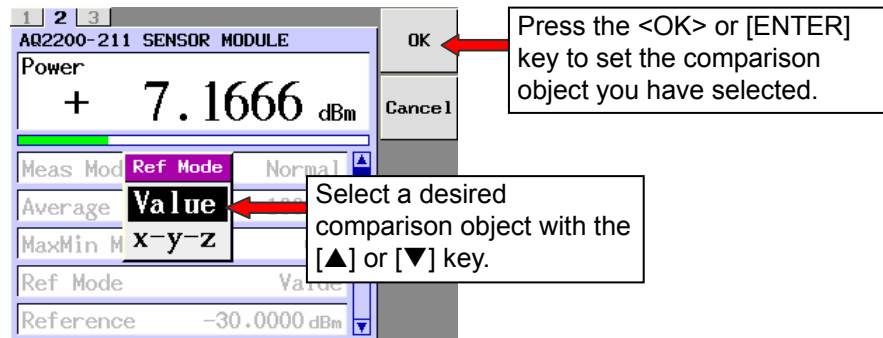
You can set a comparison object for the relative measurement.  
When the display unit is set to "dB" or "W(rel)", the relative measurement value is displayed in the Power display field.

- Value setting: Relative measurement to desired reference value (dBm or W) 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.

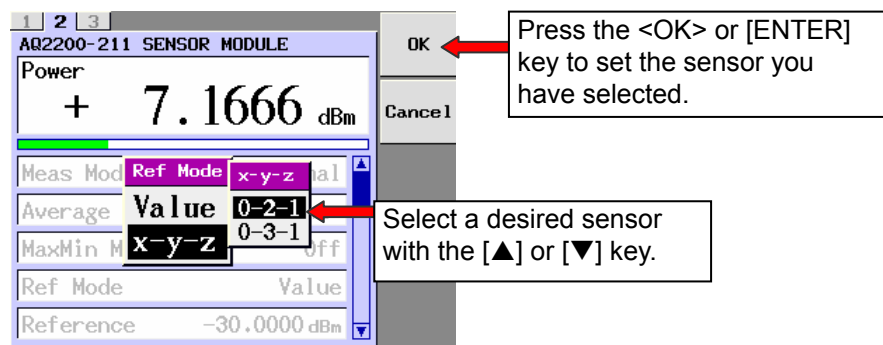
- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Set the sensor module to the current module with the [CHAN] key.
- Press <Ref Mode> or move the cursor to "Ref Mode" and press the [ENTER] key.



4. The "Ref Mode" popup screen will appear.  
Move the cursor to "Value" or "x-y-z" and press the <OK> or [ENTER] key.



5. When selecting "x-y-z", the "x-y-z" popup screen will appear.  
Sensors used for the relative measurement are listed. Move the cursor to a desired sensor for the relative measurement and press the <OK> or [ENTER] key.



**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.

### Setting a Reference Value

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

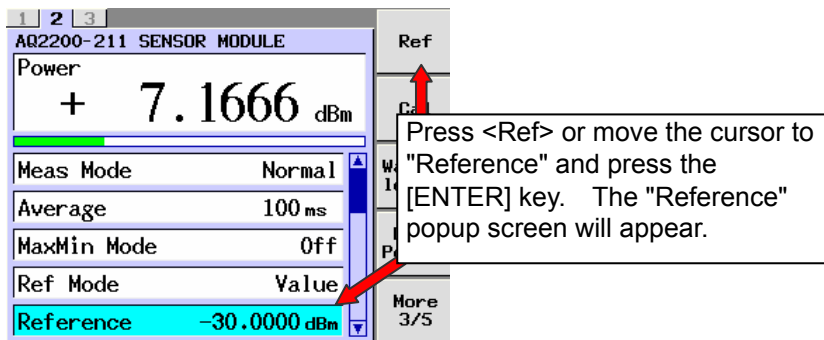
Two kinds of reference value settings are provided as shown below. Use an optimal setting corresponding to the application.

- A desired value is input.
- The currently displayed measurement value is used for the reference value.

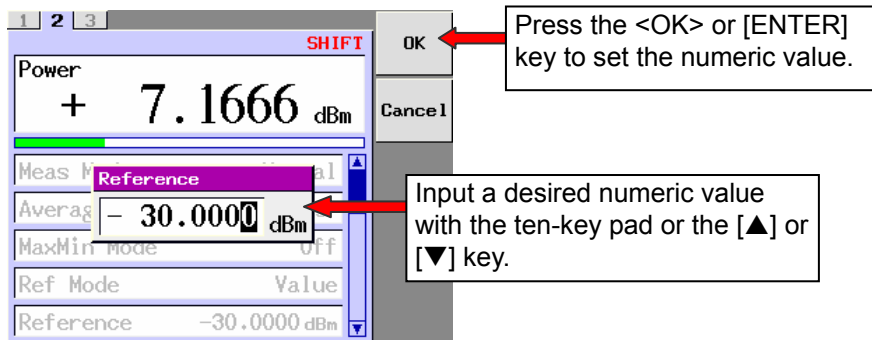
#### <Inputting a Desired Value>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.

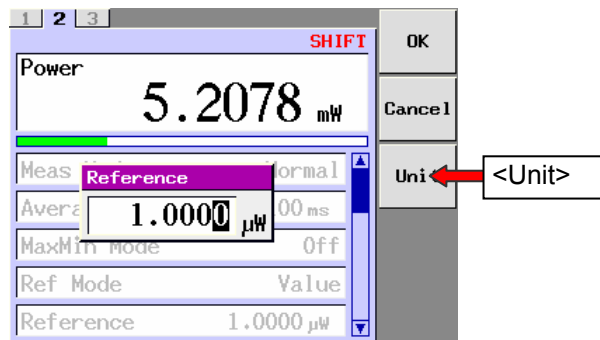
3. Press <Ref> or move the cursor to "Reference" and press the [ENTER] key.



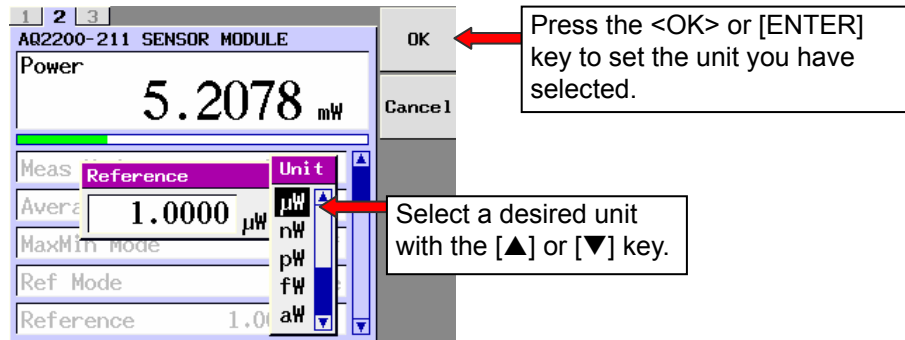
4. The "Reference" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. Additionally, to change the unit when the measurement display is "W(abs)" or "W(rel)", see steps 5 and 6.



5. Press <Unit>.

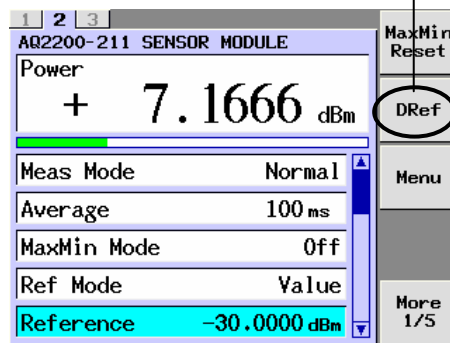


- The "Unit" popup screen will appear.  
Move the cursor to a desired display unit and press the <OK> or [ENTER] key.

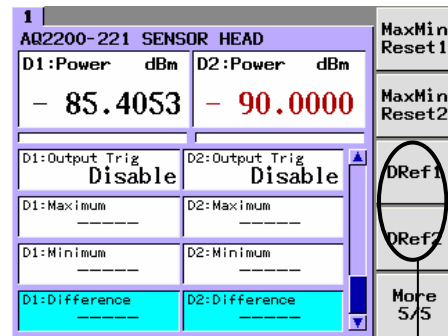


**<Using the Currently Displayed Measurement Value for the Reference Value>**

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Set the sensor module to the current module with the [CHAN] key.
- Press <D Ref>.



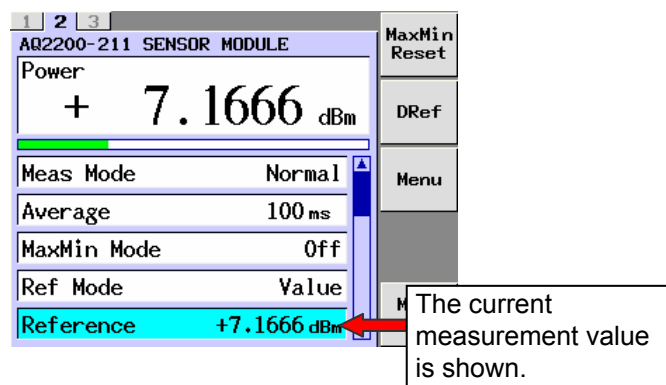
Operation Screen of AQ2200-211



Operation Screen of AQ2200-221

When the AQ2200-221 sensor module is mounted, press <DRef1> and <DRef2> for the device 1 and device 2, respectively.

- The current measurement value is shown in the "Reference" field.



**NOTE**

- At this time, when setting a reference value, the reference mode is automatically changed to "value".
- For details, see Setting the Reference Mode (page 4-6).

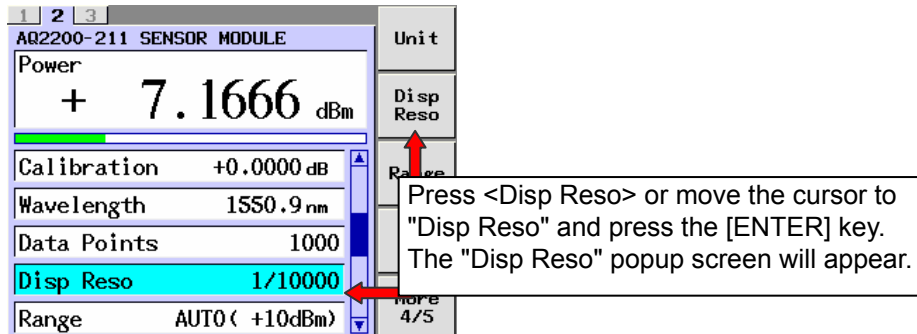
### Changing the Number of Power Display Digits

The power up to 1/10, 1/100, 1/1000, or 1/10000 decimal place can be displayed.

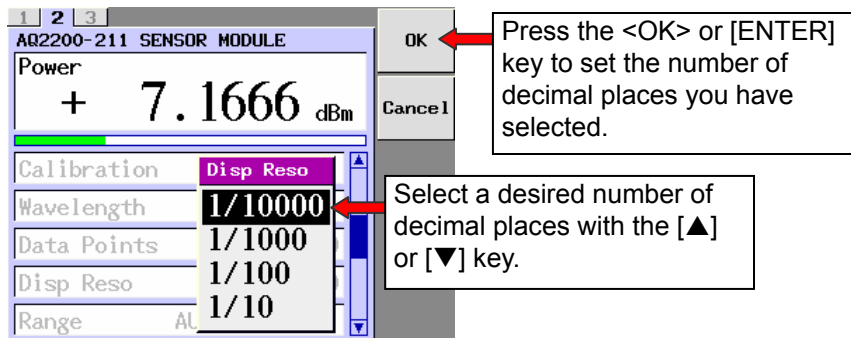
Select the necessary number of decimal places.

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. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Disp Reso> or move the cursor to "Disp Reso" and press the [ENTER] key.



4. The "Disp Reso" popup screen will appear.  
Move the cursor to a desired number of decimal places and press the <OK> or [ENTER] key.  
For units of W, the decimal point can move within the five valid number of digits, therefore there are times when the actual displayed digits are not the same as the specified digits.

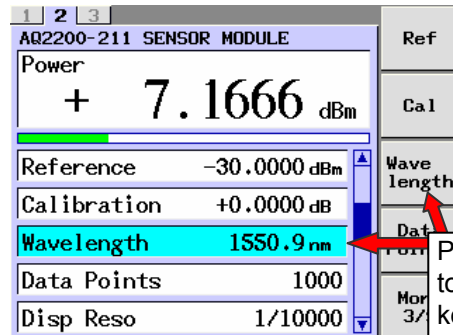


### Changing the Measurement Wavelength

The optical input element has the wavelength sensitivity distribution.

By setting the wavelength of the measurement light, the wavelength correction function of the sensor functions correctly to accurately measure the optical power.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.



Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key. The "Wavelength" popup screen will appear.

4. The "Wavelength" popup screen will appear.  
Change the numeric value using any of two operating procedures shown below and press the <OK> or [ENTER] key.

#### <Changing the Numeric Value with the Ten-key Pad or the [▲] or [▼] Key>

Change the numeric value with the ten-key pad or the [▲] or [▼] key

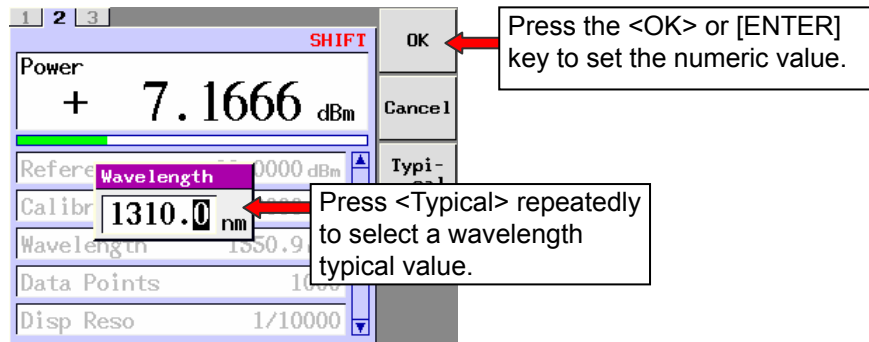


Press the <OK> or [ENTER] key to set the numeric value.

Input a desired numeric value with the ten-key pad or the [▲] or [▼] key.

**<Changing the Numeric Value with the Function Key <Typical>>**

Press <Typical> repeatedly to sequentially change the wavelength typical value.



**NOTE**

- The setting range may vary depending on the model of the sensor.
- The following shows the typical values to be selected with <Typical>.
 

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

### Changing the Measurement Mode

Three kinds of measurement modes are provided.

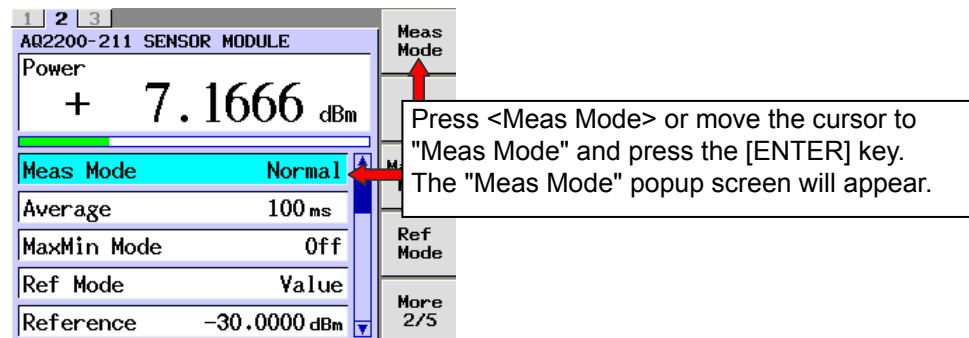
- ① Normal: Measurement is always performed to update the measurement value at any time.
- ② Single: Measurement is performed once and the measurement value is updated after completion of the measurement.
- ③ Input Trigger: Measurement is performed by the trigger input and the measurement value is updated after completion of the measurement.

Select an optimal measurement mode corresponding to the measurement application.

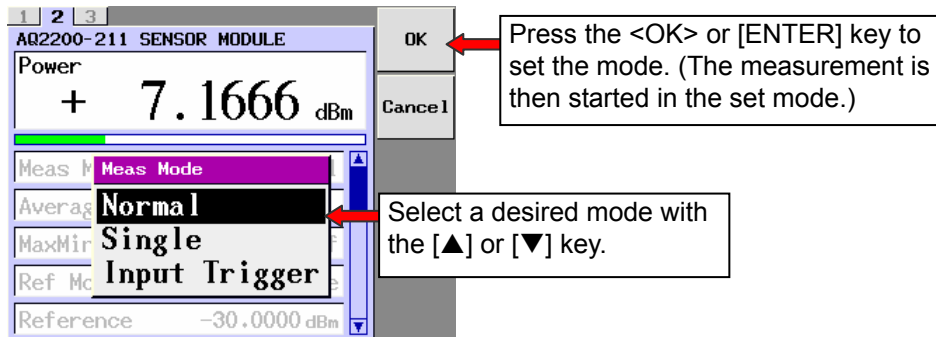
#### NOTE

- For details about how to input the trigger, see section 7.3.1, About Trigger Input, (page 7-81).
- The measurement restart is accepted even while the measurement is running in the Single mode or Input Trigger mode.
- The measurement is performed only once in the Single mode or Input Trigger mode. After that, the measurement is not started until the Normal mode or Single mode is started or the trigger is input.
- When "Input Trigger" is set for both the device 1 and device 2 in the AQ2200-221, the average time setting is changed to a time longer than the value, which has already been set for the device 1 or device 2. Additionally, if the averaging time is changed in this status, the time settings of both the device 1 and device 2 are also changed.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Meas Mode> or move the cursor to "Meas Mode" and press the [ENTER] key.



4. The "Meas Mode" popup screen will appear.  
 Move the cursor to a desired measurement mode and press the <OK> or [ENTER] key.  
 The measurement is then started to update the measurement data in the "Power" field.



**Changing the Averaging Time**

The data of the time set in this section is averaged to one measurement data.  
 Note that the allowable averaging time may vary depending on the modulation setting.  
 (See Table 4-1.)

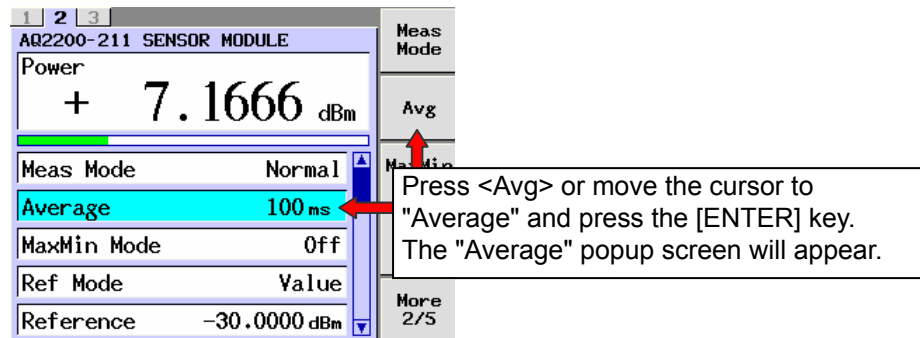
**Table 4-1 Averaging Time by Modulation Setting**

| Averaging time | CW setting            | CHOP setting          |
|----------------|-----------------------|-----------------------|
| 100us          | <input type="radio"/> | -                     |
| 200us          | <input type="radio"/> | -                     |
| 500us          | <input type="radio"/> | -                     |
| 1ms            | <input type="radio"/> | -                     |
| 2ms            | <input type="radio"/> | -                     |
| 5ms            | <input type="radio"/> | -                     |
| 10ms           | <input type="radio"/> | -                     |
| 20ms           | <input type="radio"/> | -                     |
| 50ms           | <input type="radio"/> | <input type="radio"/> |
| 100ms          | <input type="radio"/> | <input type="radio"/> |
| 200ms          | <input type="radio"/> | <input type="radio"/> |
| 500ms          | <input type="radio"/> | <input type="radio"/> |
| 1s             | <input type="radio"/> | <input type="radio"/> |
| 2s             | <input type="radio"/> | <input type="radio"/> |
| 5s             | <input type="radio"/> | <input type="radio"/> |
| 10s            | <input type="radio"/> | <input type="radio"/> |

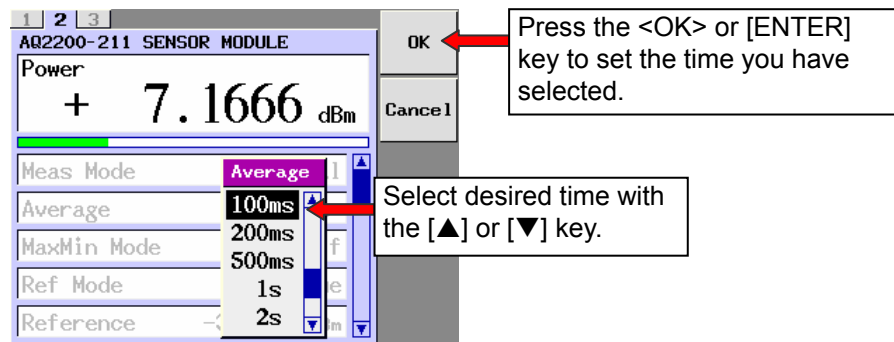
**NOTE**

- The AQ2200-221 sensor module uses only CW setting and its setting range is 200us to 10s.
- For the AQ2200-215 Sensor Module, only for CW, the selectable range is 100 us–10 s.
- When switching from CW mode to CHOP mode, if the averaging time is invalid in chop mode (e.g. 100 us–20 ms), the averaging time is automatically set to 50 ms.
- When setting the averaging time to 100 us–50 ms, if MaxMin mode is set to Window, the averaging time automatically sets to 100 ms.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Avg> or move the cursor to "Average" and press the [ENTER] key.



4. The "Average" popup screen will appear. Move the cursor to a desired averaging time and press the <OK> or [ENTER] key.



#### ■ Displaying the Maximum Value and Minimum Value of the Measurement Value

The following four kinds of modes (Max/Min modes) can be set for totaling of the maximum value and minimum value.

Additionally, MAX (maximum value), MIN (minimum value), and Difference (maximum value - minimum value) can be checked on the DETAIL screen. (See Fig. 4-1.)

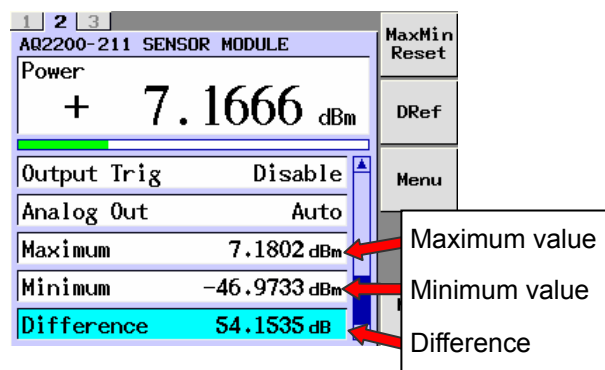
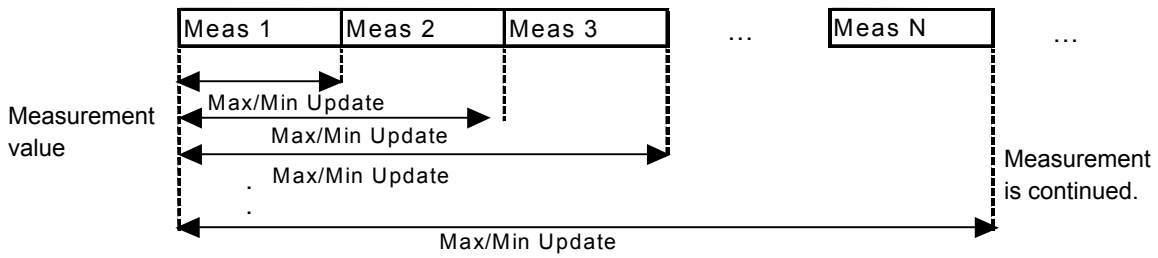
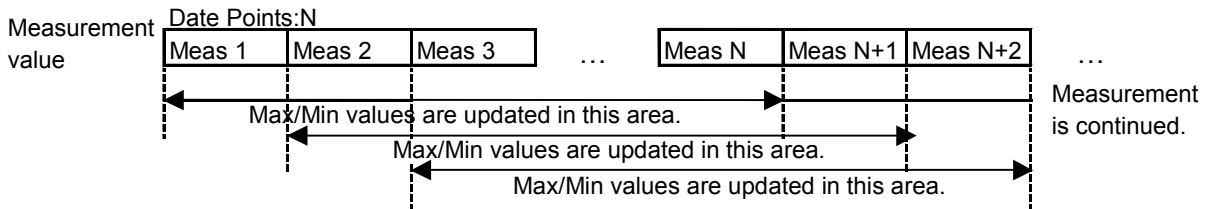


Fig. 4-1 Maximum and Minimum Measurement Value Display Screen

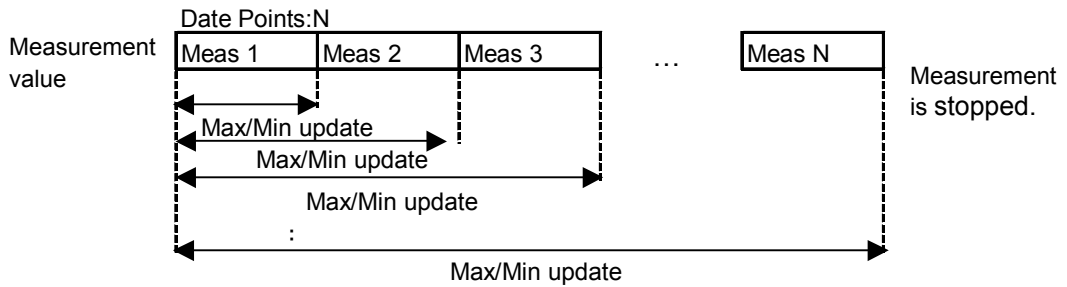
- ① Continuous: The maximum value, minimum value, and (maximum value - minimum value) are updated every time the measurement value is updated between the mode setting and mode OFF.



- ② Window: The maximum value, minimum value, and (maximum value - minimum value) are calculated from the measurement values of sample quantity specified in "Data Points". For data, the latest measurement value is taken to update the measurement value while disposing of the oldest measurement value.



- ③ Refresh: This is the same as in Continuous mode, but after measuring the number of samples specified under "Data Points," measurement stops.

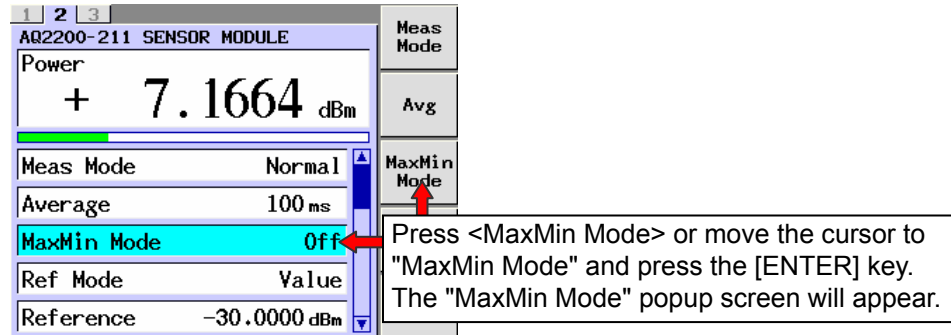


- ④ Off: The modes set in ① to ③ are turned OFF. Unless "OFF" is set, the modes set in ① to ③ cannot be cancelled.

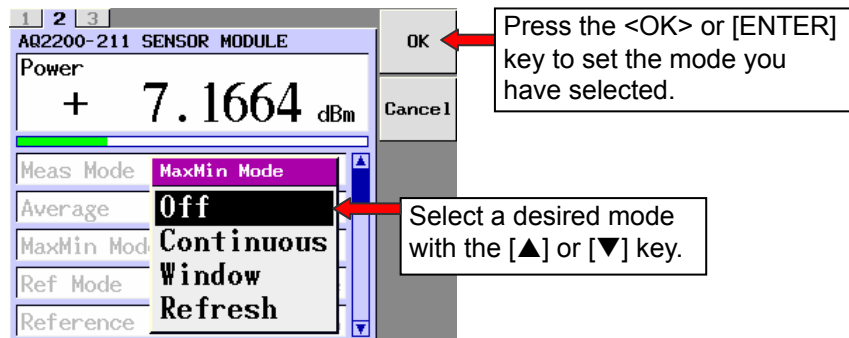
**NOTE**

- The Normal measurement of the Meas Mode cannot be executed as long as the Refresh mode is set. Set "Normal" of "Meas Mode" after the Max/Min mode has been set to "OFF".
- For details about the number of Data Points, see Setting the Number of Data Points (page 4-19).

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <MaxMin Mode> or move the cursor to "MaxMin Mode" and press the [ENTER] key.

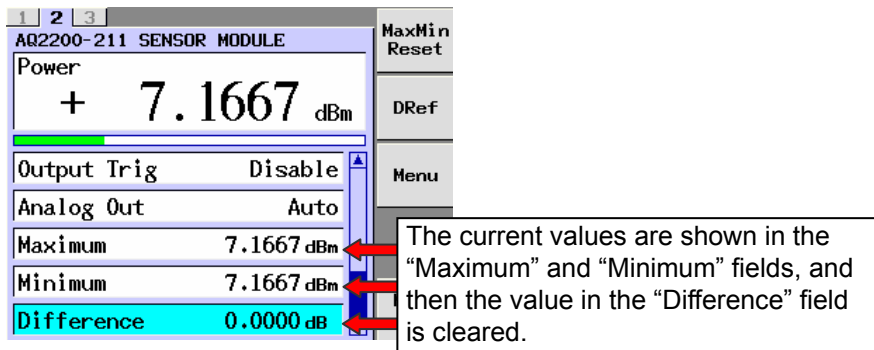
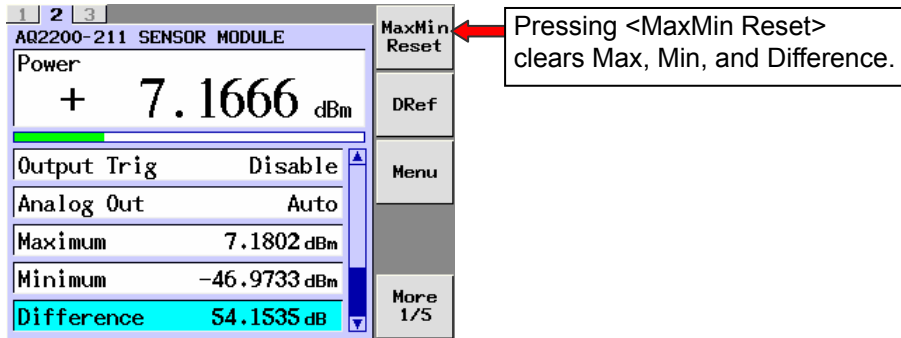


4. The "MaxMin Mode" popup screen will appear.  
Move the cursor to a desired mode and press the <OK> or [ENTER] key.  
When pressing <MaxMin Reset>, Max, Min, and Difference are cleared, and then the measurement is started again (restarted).



**<Clearing the Values during Measurement of Max/Min Values>**

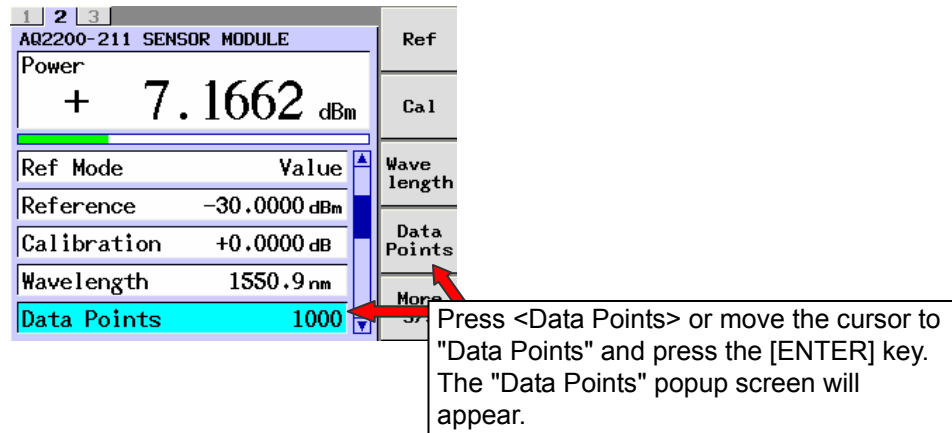
When pressing <MaxMin Reset>, Max, Min, and Difference are cleared, and then the measurement is started again (restarted).



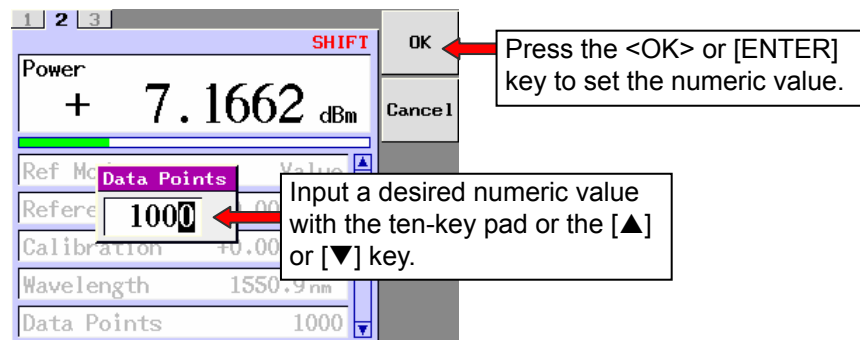
### Setting the Number of Data Points

The number of measurement data points (1 to 20,000) to be used in the Window mode and Refresh mode of the Max/Min measurement can be set for the data points. Follow the steps below to set the number of data points.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Data Points> or move the cursor to "Data Points" and press the [ENTER] key.



4. The "Data Points" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



**NOTE** | For AQ2200-221, the number of data points setting becomes 1 to 10,000.

### Changing the Measurement Range

The measurement range can be set in steps of 10dB. A measurement range can be selected from two modes described below.

- ① AUTO range: An optimal range is set automatically corresponding to the input optical power. Normally, this mode is used.

**NOTE** | The measurement range currently being measured in the AUTO range mode is shown in brackets next to the "AUTO" in the "Range" field on the screen.

② HOLD range: A measurement range can be set manually.

When using the HOLD range, pay special attention so that the optical input power must be within the range during operation.

The optical input power status within the range can be checked through the range bar. (See Fig. 4-2.)

The range bar shows the currently input power graphically. The left end shows the lower limit of the range while the right end shows the upper limit.

Additionally, if the measurement display value is shown in orange, this shows the measurement range-over. If it is shown in dark brown, this shows the measurement range-under. An optimal measurement range is selected so that the measurement value is shown in black, that is, normal color.

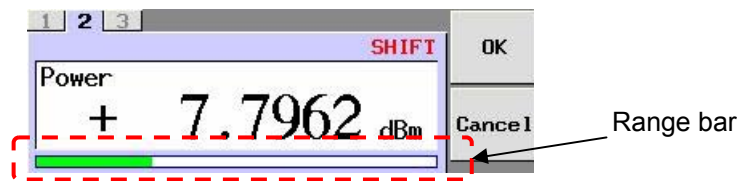
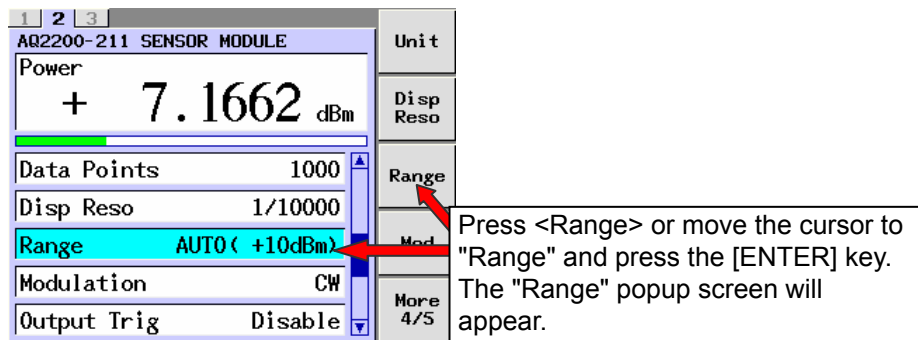
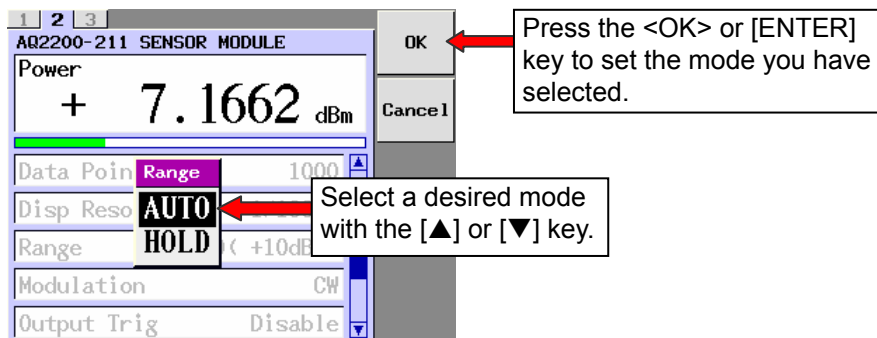


Fig. 4-2 Range Bar on DETAIL Screen

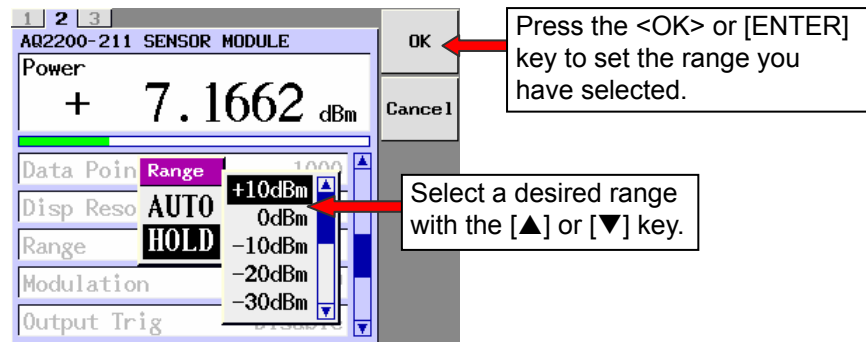
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Range> or move the cursor to "Range" and press the [ENTER] key.



4. The "Range" popup screen will appear. Move the cursor to a desired mode and press the <OK> or [ENTER] key.



- If "HOLD" is selected, a list of available ranges pops up. Move the cursor to a desired range and press the <OK> or [ENTER] key.



### Changing the Modulation Mode (CW/CHOP)

To accurately measure the optical power, you must set the modulation mode corresponding to that of the optical input.

For the modulation mode, the CW light or CHOP (50%DUTY) modulation light can be selected. Additionally, select an optimal CHOP modulation light from 270Hz, 1KHz, or 2KHz.

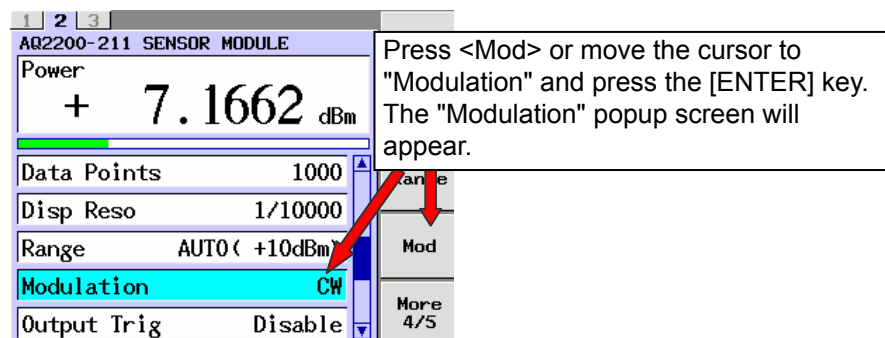
Two kinds of modulation mode setting methods are provided. Select a desired setting method corresponding to the application.

#### <Setting through the Panel of the Sensor Module>

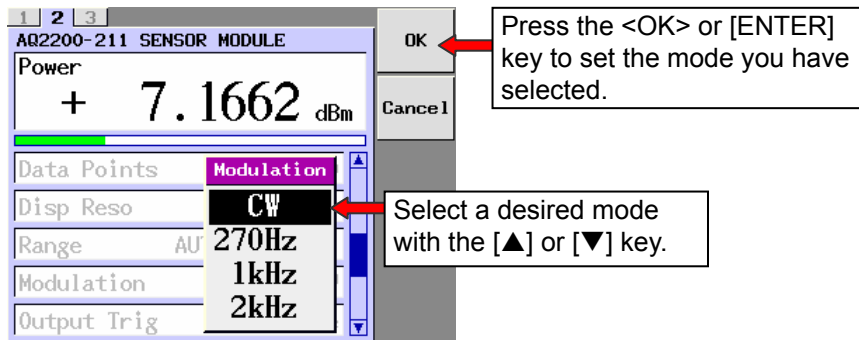
Press the [CW CHOP] key on the sensor panel to change CW/CHOP (270Hz).

#### <Setting through the Panel of the Frame Controller>

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Set the sensor module to the current module with the [CHAN] key.
- Press <Mod> or move the cursor to "Modulation" and press the [ENTER] key.



- The "Modulation" popup screen will appear.  
Move the cursor to a desired mode and press the <OK> or [ENTER] key.  
Additionally, when CHOP is set, the LED on the sensor panel is lit.



**NOTE**

- If the CW light is received in the CHOP modulation light mode, the modulation mode error occurs.  
Make the setting of the modulation corresponding to the optical input.
- The AQ2200-221 sensor module is not applicable to the CHOP light.
- The AQ2200-215 Sensor Module does not support CHOP light.
- A mode error occurs if the chop modulation light mode frequency is not suitable.  
Enter modulation settings that correspond to the optical input.

### Starting the ZERO-SET

When performing the ZERO-SET, the electrical offset inside the sensor is adjusted, allowing you to accurately measure the absolute value.

Two kinds of ZERO-SET modes are provided as described below.

Select a desired mode to execute the ZERO-SET corresponding to your need.

"Zero": Starts the ZERO-SET of the current module.

"Zero ALL": Perform a ZERO-SET of all installed sensor modules and AQ2200-331 ATTN modules.

### <Setting through the Panel of the Sensor Module>

1. Firmly mount the optical shield cap on the optical receiving connector on the sensor you want to perform the ZERO-SET.
2. Press the [ZERO] key on the sensor panel to start the ZERO-SET.  
The following screen appears while the ZERO-SET is being performed.



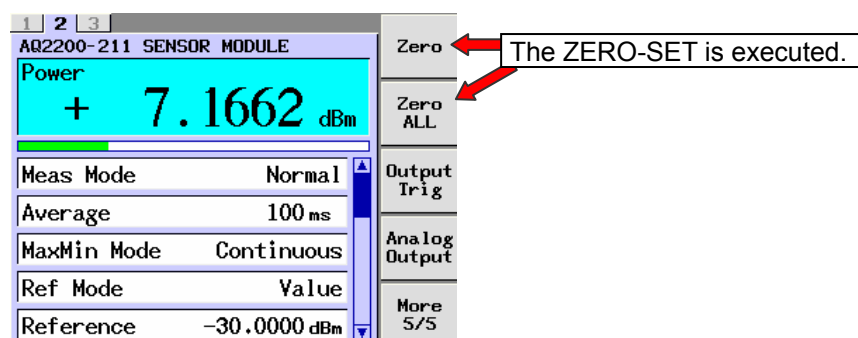
**NOTE** | When pressing the [ZERO] key before the ZERO-SET is completed, the ZERO-SET is aborted.

3. When the ZERO-SET is completed, the screen is returned to the previous screen.

### <Setting through the Panel of the Frame Controller (Other than AQ2200-221 Module)>

1. Firmly mount the optical shield cap on the optical receiving connector on the sensor you want to perform the ZERO-SET.
2. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
3. Set the sensor module to the current module with the [CHAN] key.
4. Press either <Zero> or <Zero All> to start the ZERO-SET.

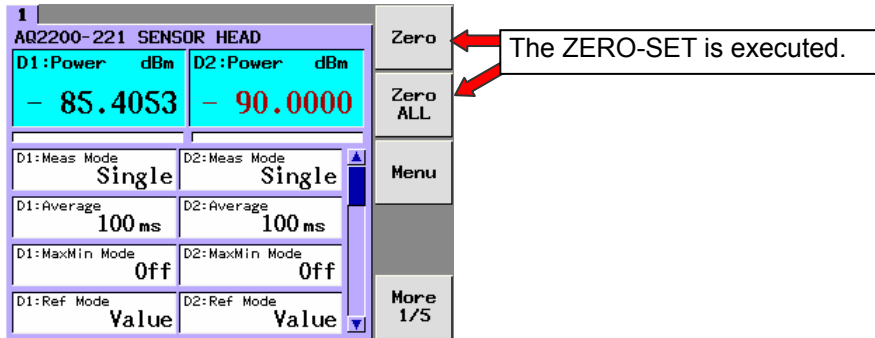
When the ZERO-SET is completed, the screen is returned to the previous screen.



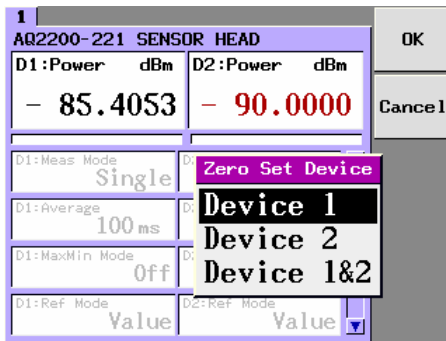
**<Setting through the Panel of the Frame Controller (AQ2200-221 Sensor Module)>**

1. Firmly mount the optical shield cap on the optical receiving connector on the sensor you want to perform the ZERO-SET.
2. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
3. Set the sensor module to the current module with the [CHAN] key.
4. Press either <Zero> or <Zero All>.

The “Zero Set Device” popup screen will appear.

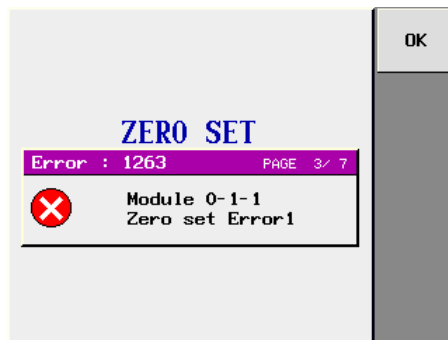


5. Move the cursor to a device you want to perform the ZERO-SET, and then press the <OK> or [ENTER] key. The ZERO-SET is started. When the ZERO-SET is completed, the screen is returned to the previous screen.



**NOTE**

- If the optical interruption is insufficient, the error screen as shown in Fig. 4-3 will appear.  
If this occurs, perform the optical interruption firmly and restart the ZERO-SET.
- When pressing <Cancel> before the ZERO-SET operation is not completed, the ZERO-SET operation is aborted.



**Fig. 4-3 ZERO-SET Error Screen**

## Setting the Analog Output

The analog output function outputs voltages from the analog output terminal on the front panel according to the analog output mode.

This enables analog output that corresponds to the input optical power in real time (voltage output of approximately 0–2 V). The following three modes are available for analog output. Select the mode most suitable for your application.

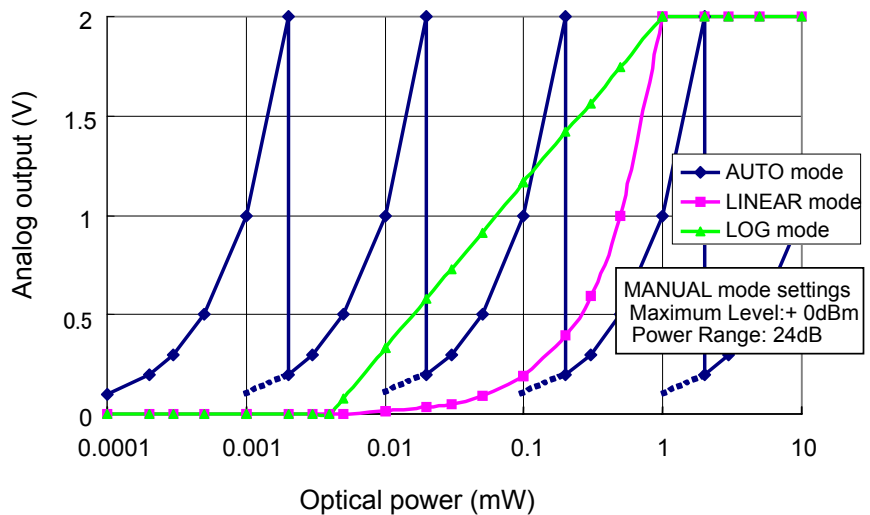
**AUTO mode:** For outputting voltages of approximately 0 to 2 V for each individual measuring range.

**MANUAL mode**

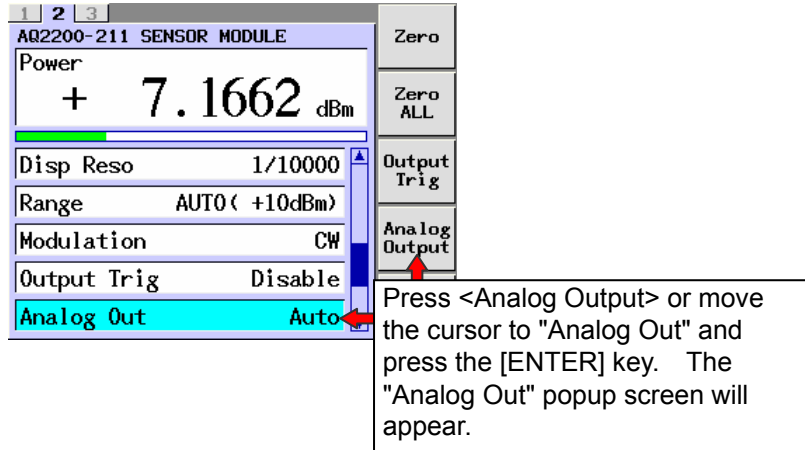
**LINEAR mode:** For setting the maximum level (power level setting for outputting the analog output maximum value: typical maximum range value + 3 dBm—typical minimum range value + 3 dBm (in steps of 0.1 dB)) and power range (power range for analog output: 3–24 dB (in 3 dB steps)), and outputting voltages of approximately 0–2 V in proportion to optical power (W) falling within a specified range.

**LOG mode:** For setting the maximum level (power level setting for outputting the analog output maximum value: typical maximum range value + 3 dBm—typical minimum range value + 3 dBm (in steps of 0.1 dB)) and power range (power range for analog output: 3–60 dB (in 1 dB steps)), and outputting voltages of approximately 0–2 V in proportion to optical power (dB) falling within a specified range.

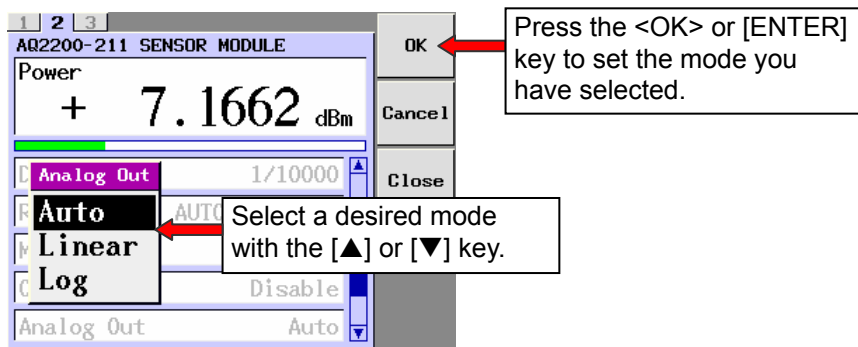
Examples of Analog Output in AUTO Mode and MANUAL Mode



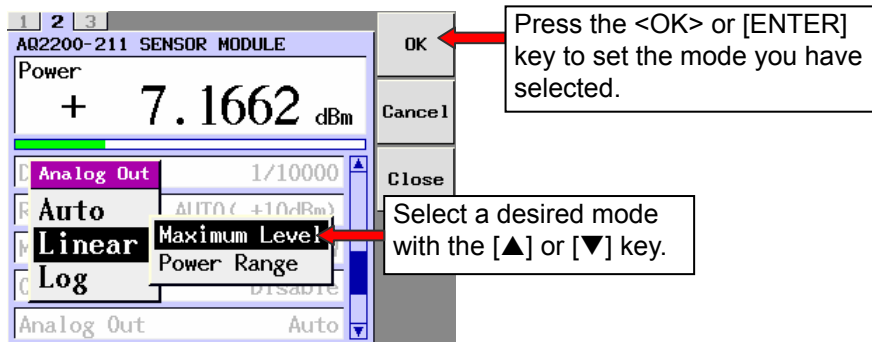
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Set the sensor module to the current module with the [CHAN] key.
3. Press <Analog Output> or move the cursor to "Analog Out" and press the [ENTER] key.



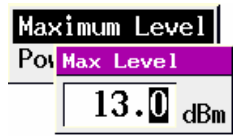
4. The "Analog Out" popup screen will appear. Move the cursor to a desired mode and press the <OK> or [ENTER] key.



5. When specifying the Linear mode or Log mode, the popup screen for selection of Maximum Level and Power Range will appear. Move the cursor to a desired item and press the <OK> or [ENTER] key.



6. The “Maximum Level” or “Power Range” popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



&lt;Maximum Level Popup Screen&gt;



&lt;Power Range Popup Screen&gt;

7. When the input is completed, press <Close> to complete the input.

- NOTE**
- For details about how to connect the analog output, see “Sensor Analog Output Connector” (page 1-31).
  - The AQ2200-221 sensor module is not applicable to the Analog Out function.

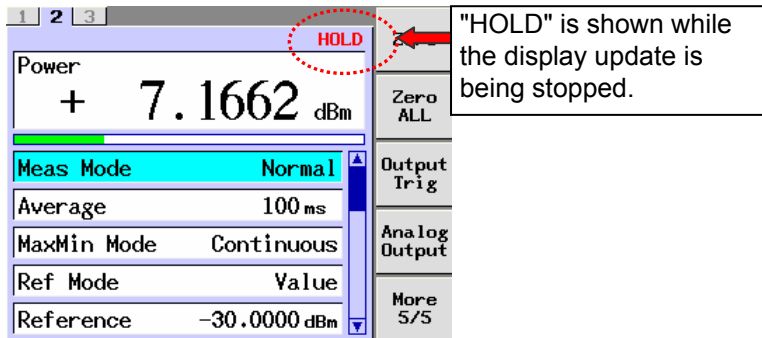
### Holding the Sensor Measurement Value Display

You can stop the measurement data display update. With this function, you can check this measurement data record.

Additionally, even though the display update is stopped, the measurement is continued in the Normal mode.

1. Press the [HOLD] key. "HOLD" is shown at the upper right portion of the screen while the display update is being stopped.

To restart the display update, press the [HOLD] key again.



#### NOTE

On the SUMMARY screen of the AQ2202 Frame Controller, the slot No. tab is displayed in red instead of "HOLD" indication.

This portion is shown in red.



# Chapter 5

## Laser Light Source

By mounting the AQ2200-111, AQ2200-141, or AQ2200-142 on this unit, the laser beam can be output.

- AQ2200-111 DFB-LD                      Light Source Module
- AQ2200-141 FP-LD                      Light Source Module
- AQ2200-142 DUAL FP-LD              Light Source Module

## 5.1 AQ2200-111 DFB-LD Light Source

### Turning ON/OFF the Laser Output

To turn ON or OFF the laser output, two setting methods are provided. Select a desired setting method corresponding to the application.

Follow the steps below to turn ON or OFF the laser output.

Additionally, as the laser output is turned ON, the LED on the light source panel will be lit.

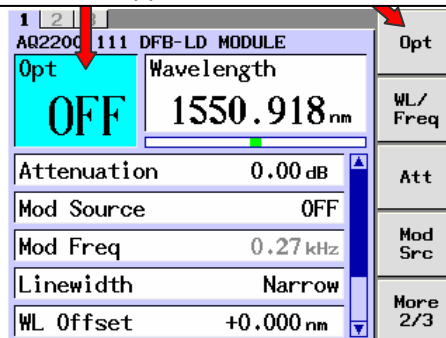
#### <Setting through the Panel of the Light Source Module>

Press the [OPT] key on the light source panel to switch the light source between ON and OFF.

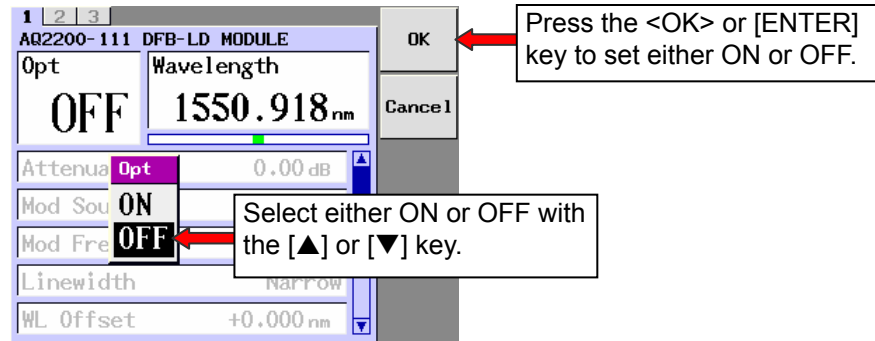
#### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Opt> or move the cursor to "Opt" and press the [ENTER] key.

Press <Opt> or move the cursor to "Opt" and press the [ENTER] key. The "Opt" popup screen will appear.



4. The "Opt" popup screen will appear.  
Move the cursor to either of ON or OFF and press the <OK> or [ENTER] key.



- NOTE** When LOCK is shown in the "Opt" field, the laser output cannot be started. When starting the output, check the following two points.
- ① Interlock connector is open.  
→ Short-circuit the interlock connector with the short-circuit pin.
  - ② Laser output is locked.  
→ Follow the steps stated in "Locking the Laser Output" (page 3-10) to unlock it.

### Outputting the Laser Beam with the Set Power

With the AQ2200-111, you can output the laser beam by specifying an absolute power value.

The following shows the relationship among the laser beam output power, attenuation amount, and power offset value.

$$P_{\text{display}}(\text{dBm}) = P_{\text{default}}(\text{dBm}) - \text{ATTN}(\text{dB}) + P_{\text{offset}}(\text{dB})$$

where

$P_{\text{display}}$ : Output power display value (dBm)

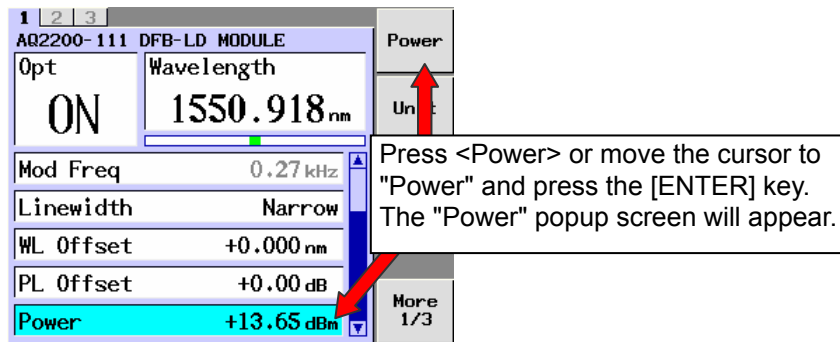
$P_{\text{default}}$ : Maximum output power at shipment (dBm)

ATTN: Attenuation amount (dB) (See Attenuating the Laser Output (page 5-4).)

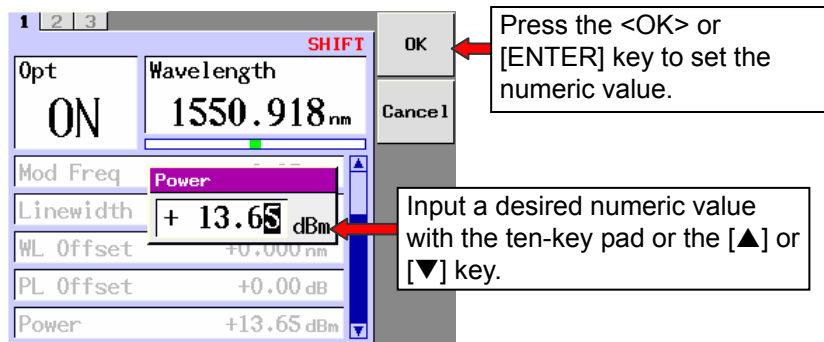
Poffset: Power offset value (dB) (See Changing the Offset of the Display Output Power (page 5-5).)

- NOTE** The connector connection status, environment, and/or secular change may affect the  $P_{\text{default}}$ . Therefore, the values set in  $P_{\text{display}}$  are not guaranteed. These values are used as reference.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Power> or move the cursor to "Power" and press the [ENTER] key.



4. The "Power" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



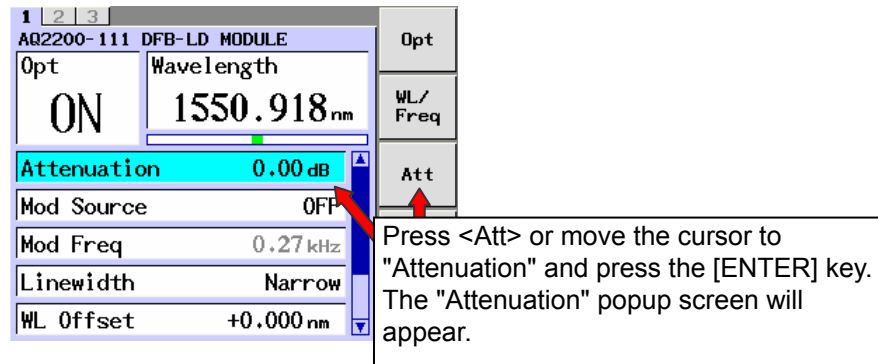
**NOTE** || Even if the unit of power is W, power settings are in units of dBm.

### Attenuating the Laser Output

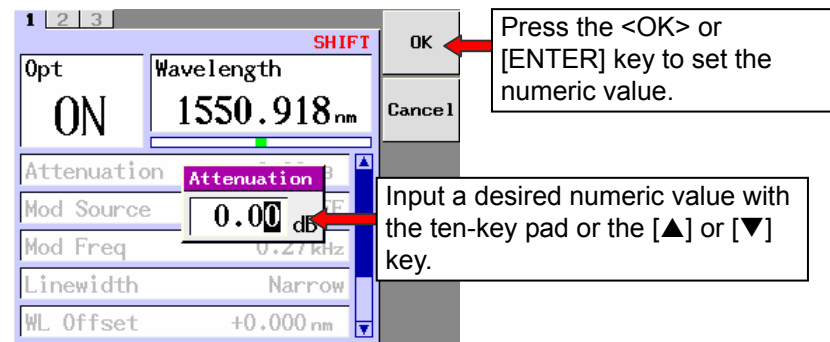
You can attenuate the laser output (0 to 10.00dB).

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.

- Press <Att> or move the cursor to "Attenuation" and press the [ENTER] key.



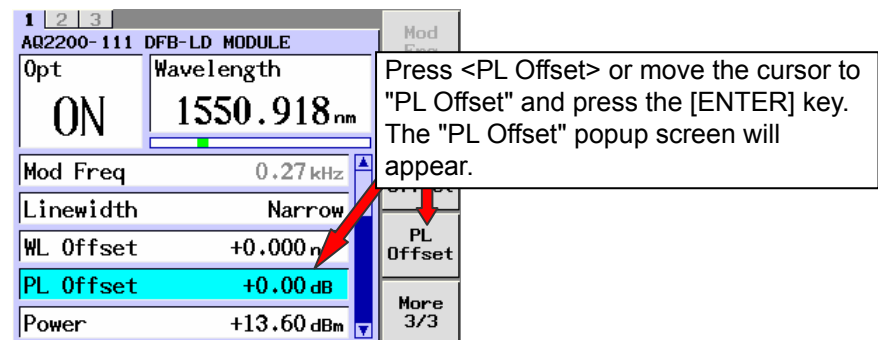
- The "Attenuation" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



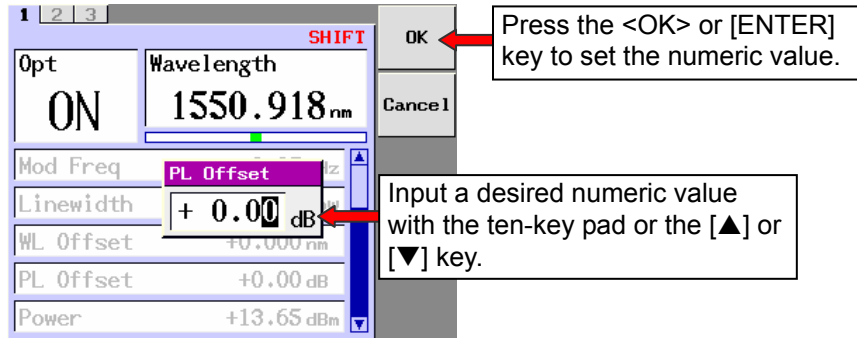
### Changing the Offset of the Display Output Power

You can use a value, that a power offset value (-80.00 to +80.00dB) is added to the output power, as power display value.

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <PL Offset> or move the cursor to "PL Offset" and press the [ENTER] key.



- The "PL Offset" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



### Changing the Wavelength

You can change the laser output wavelength within a width of approximately 1.6nm in steps of 1/1000nm.

The display wavelength has the following relationship.

$$\lambda_{display}(nm) = \lambda_{output}(nm) + \lambda_{cal}(nm)$$

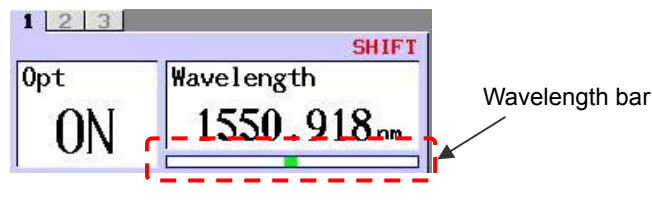
$$\lambda_{display}(nm) \times 10^{-9} = C / ( f(\text{THz}) \times 10^{12} )$$

where

- C: Light velocity in vacuum (2.99792458 x 10<sup>8</sup> m/s)
- $\lambda_{display}$ : Display wavelength (nm)
- $\lambda_{output}$ : Output wavelength (nm)
- $\lambda_{cal}$ : Wavelength offset value (nm)
- f: Display frequency (THz)

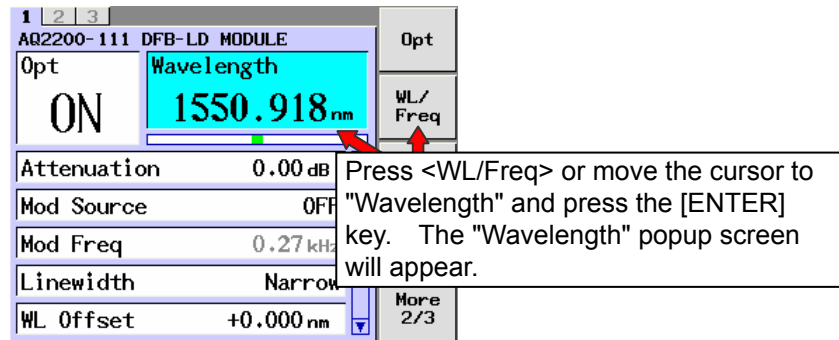
#### NOTE

- For details about  $\lambda_{cal}$ , see Changing the Wavelength Offset (page 5-7).
- The currently set wavelength position to the allowable wavelength setting range can be checked using the wavelength bar on the DETAIL screen. This data is used as reference of the wavelength setting.

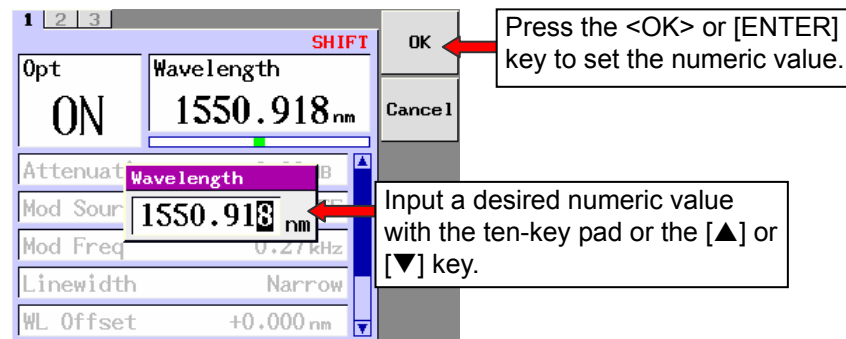


- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.

- Press <WL/Freq> or move the cursor to "Wavelength" and press the [ENTER] key.



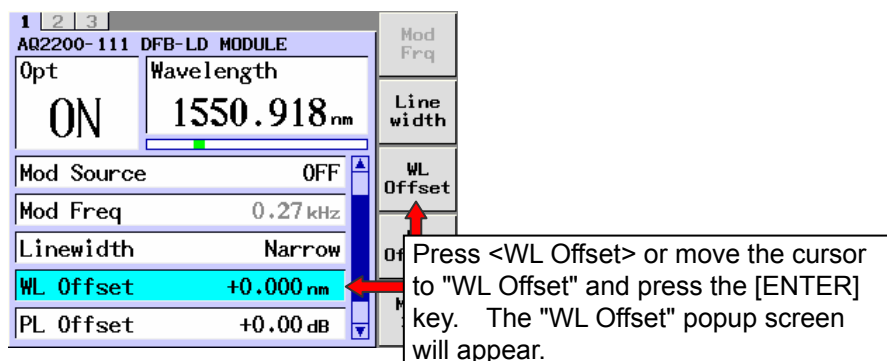
- The "Wavelength" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



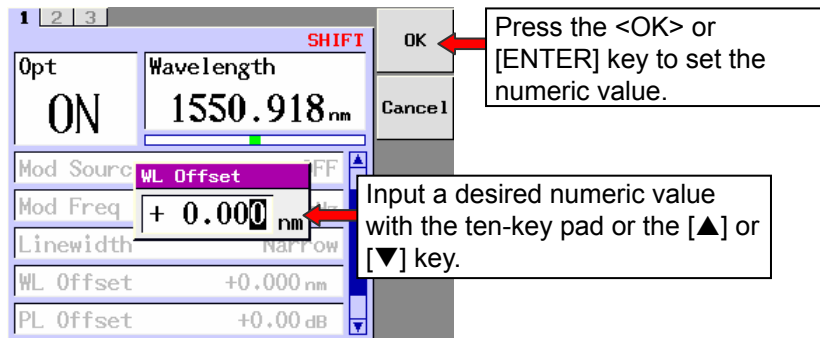
### Changing the Wavelength Offset

You can display a wavelength value that a wavelength offset value (ranging from -10.000nm to +10.000nm) is added to the output wavelength.

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <WL Offset> or move the cursor to "WL Offset" and press the [ENTER] key.



- The "WL Offset" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. Even if the unit of wavelength is THz, the wavelength offset is set in units of nm.



### Modulating the Laser Output

You can perform the CW or CHOP (50%DUTY) modulation of the optical output. For CHOP modulation, 270Hz, 1KHz, 2KHz, or desired frequency (0.1 to 300.0KHz) can be set. For details about how to set the modulation frequency, see Changing the Modulation Frequency (page 5-9).

Two kinds of modulation mode settings are provided. Select a desired setting corresponding to the application.

- NOTE**
- The absolute value power display shows the power level of the peak value in the CHOP modulation.
  - If no external modulation option is mounted, "External CHOP" and "External SINE" are not displayed.

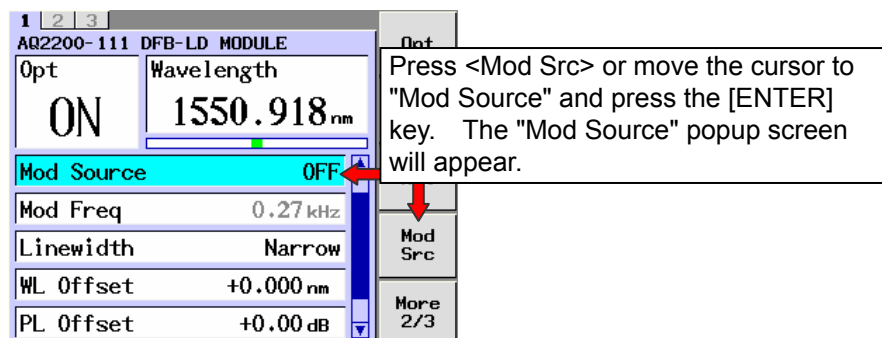
#### <Setting through the Panel of the Light Source Module>

Press the [CW/CHOP] key on the light source panel to switch between CW and CHOP.

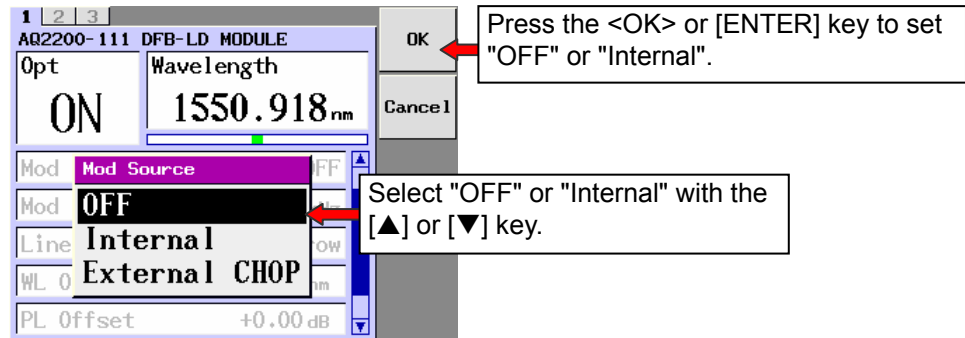
When changing to the CHOP modulation, the LED is lit and "Internal" is shown in "Mod Source" on the screen.

#### <Setting through the Panel of the Frame Controller>

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <Mod Src> or move the cursor to "Mod Source" and press the [ENTER] key.



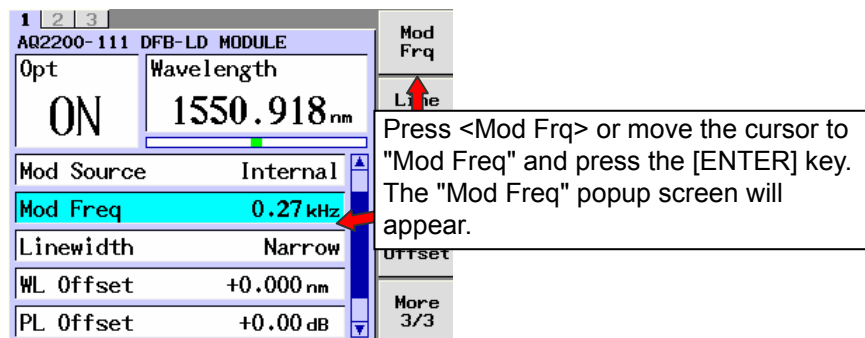
- The "Mod Source" popup screen will appear.  
Move the cursor to "OFF" (for CW) or "Internal" (for CHOP) and press the [ENTER] key.



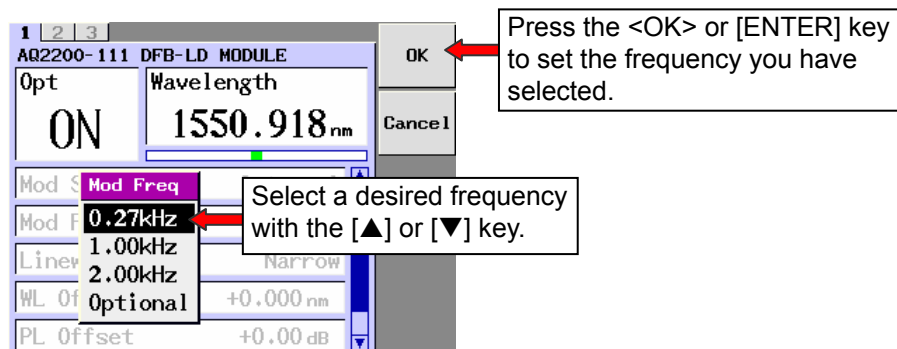
**NOTE** | If the external modulation option is installed, you can select "External CHOP" or "External SINE."

### Changing the Modulation Frequency

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <Mod Frq> or move the cursor to "Mod Frq" and press the [ENTER] key.

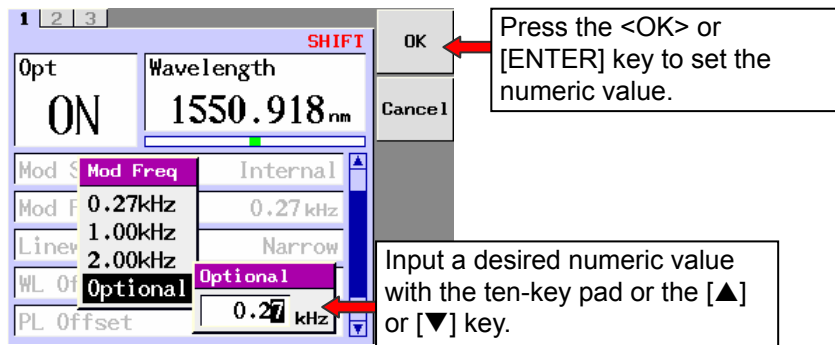


- The "Mod Frq" popup screen will appear.  
Move the cursor to a desired frequency and press the <OK> or [ENTER] key.  
To set a frequency freely (in the range between 0.1 and 300.0kHz), select "Optional".



**NOTE** | If Mod Source has been set to Internal, you can set the modulation frequency.

- When selecting "Optional", follow the steps below.  
The "Optional" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

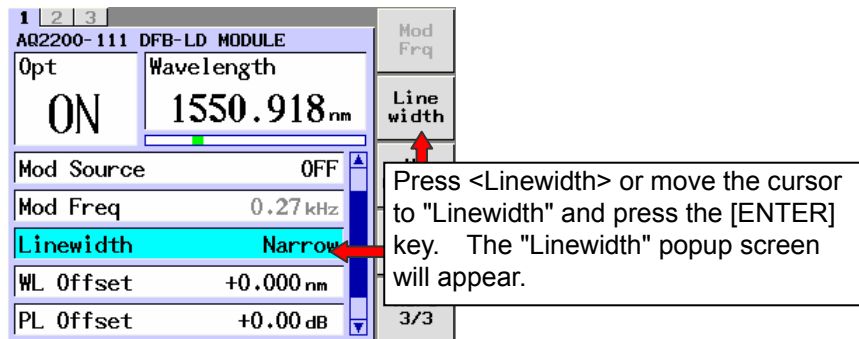


### Changing the Laser Line Width

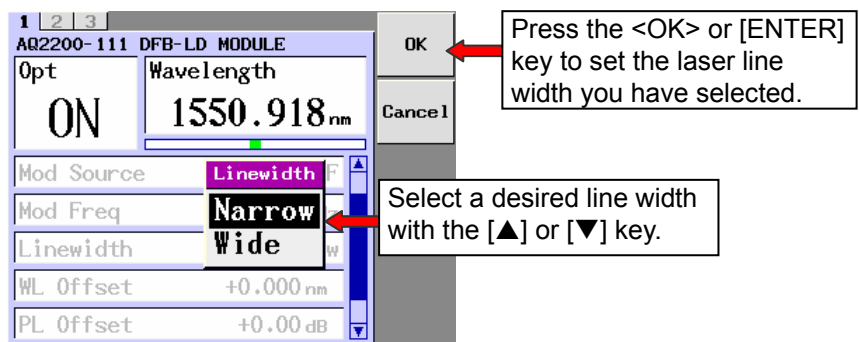
You can select a desired laser line width from two kinds of selections, "Narrow" and "Wide".

To minimize the effects of reflection-induced interference, you can stabilize power measurements by selecting a laser line width of "Wide."

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <Linewidth> or move the cursor to "Linewidth" and press the [ENTER] key.



- The "Linewidth" popup screen will appear.  
Move the cursor to the line width more suitable for the purpose and press the [ENTER] key.



### Changing the Wavelength Display Unit

You can switch the display unit between the wavelength display and frequency display. The following calculation formula shows the relationship between the wavelength and frequency.

$$\lambda_{\text{display}}(\text{nm}) \times 10^{-9} = C / (f_{\text{display}}(\text{THz}) \times 10^{12})$$

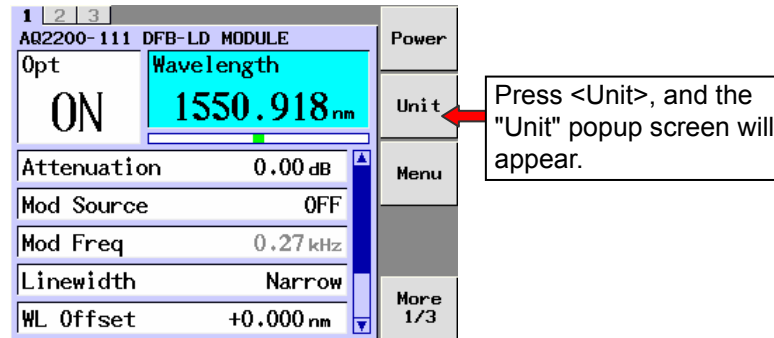
where

$\lambda_{\text{display}}$ : Display wavelength (nm)

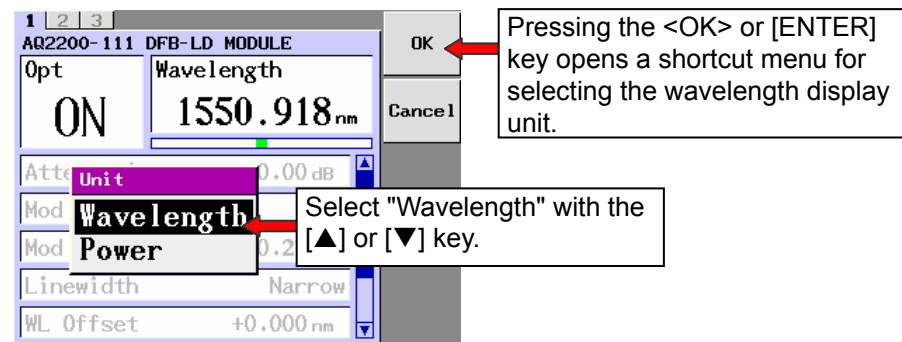
$f_{\text{display}}$ : Display frequency (THz)

C: Light velocity in vacuum ( $2.99792458 \times 10^8$  m/s)

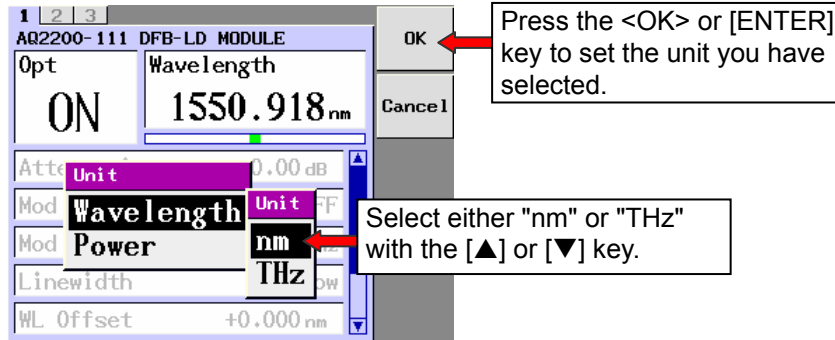
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Unit>.



4. The "Unit" popup screen will appear. Move the cursor to "Wavelength" and press the [ENTER] key.



- The "Unit" popup screen will reappear. Move the cursor to either of "nm" (wavelength display) or "THz" (frequency display) and press the [ENTER] key.



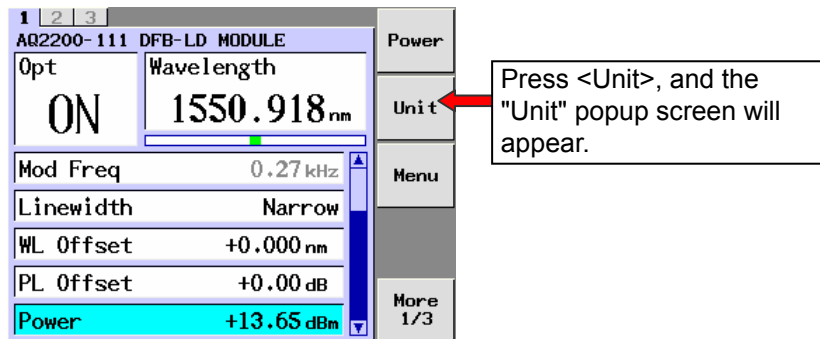
### Changing the Power Display Unit

You can switch the power display unit between the dBm display and W display.

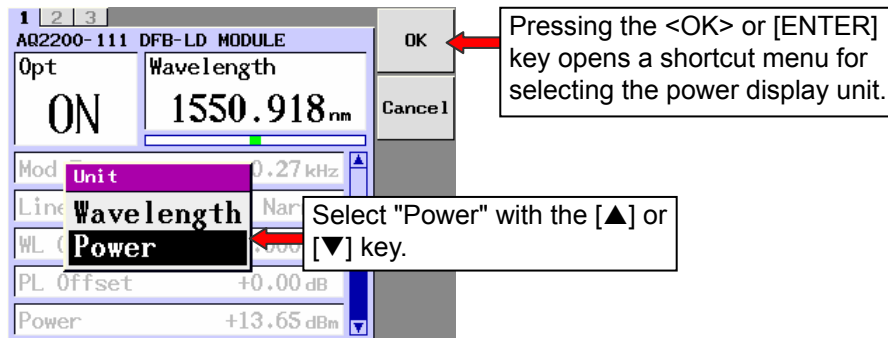
$$Pd_{Bm} = 10 \log P_w$$

$P_w$ : Optical power (mW)  
 $Pd_{Bm}$ : Optical power (dBm)

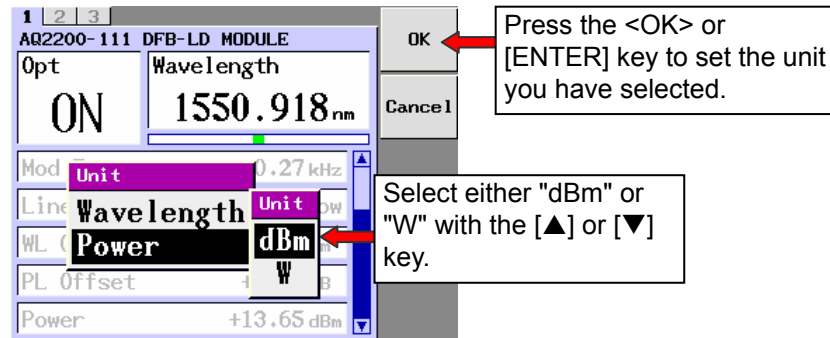
- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <Unit>.



- The "Unit" popup screen will appear. Move the cursor to "Power" and press the [ENTER] key.



5. The "Unit" popup screen will reappear.  
Move the cursor to either of "dBm" or "W" and press the [ENTER] key.



## 5.2 AQ2200-141 FP-LD Light Source

By mounting the AQ2200-141 on this unit, the FP laser beam can be output.

### Turning ON/OFF the Laser Output

To turn ON or OFF the laser output, two setting methods are provided. Select a desired setting method corresponding to the application.

Follow the steps below to turn ON or OFF the laser output.

Additionally, as the laser output is turned ON, the LED on the light source panel will be lit.

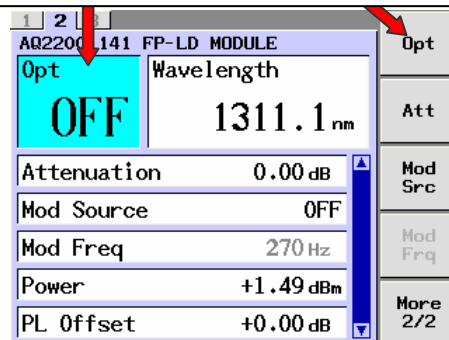
#### <Setting through the Panel of the Light Source Module>

Press the [OPT] key on the light source panel to switch the light source between ON and OFF.

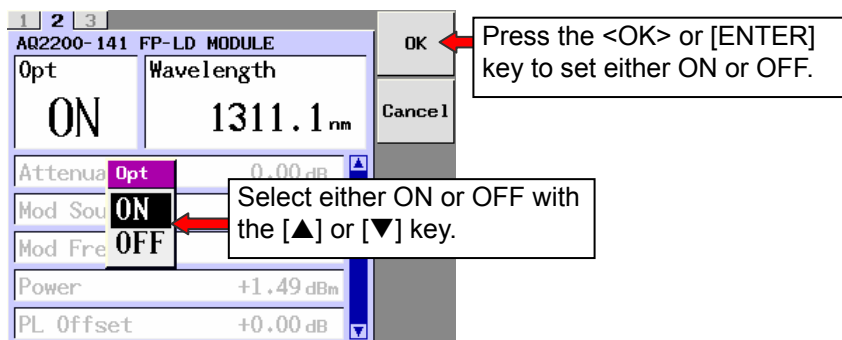
#### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Opt> or move the cursor to "Opt" and press the [ENTER] key.

Press <Opt> or move the cursor to "Opt" and press the [ENTER] key. The "Opt" popup screen will appear.



4. The "Opt" popup screen will appear.  
Move the cursor to either of ON or OFF and press the <OK> or [ENTER] key.



**NOTE**

When LOCK is shown in the "Opt" field, the laser output cannot be started. When starting the output, check the following two points.

- ① Interlock connector is open.  
→ Short-circuit the interlock connector with the short-circuit pin.
- ② Laser output is locked.  
→ Follow the steps stated in "Locking the Laser Output" (page 3-10) to unlock it.

**Outputting the Laser Beam with the Set Power**

With the AQ2200-141, you can output the laser beam by specifying an absolute power value.

The following shows the relationship among the laser beam output power, attenuation amount, and power offset value.

$$P_{\text{display}}(\text{dBm}) = P_{\text{default}}(\text{dBm}) - \text{ATTN}(\text{dB}) + P_{\text{offset}}(\text{dB})$$

where

$P_{\text{display}}$ : Output power display value (dBm)

$P_{\text{default}}$ : Maximum output power at shipment (dBm)

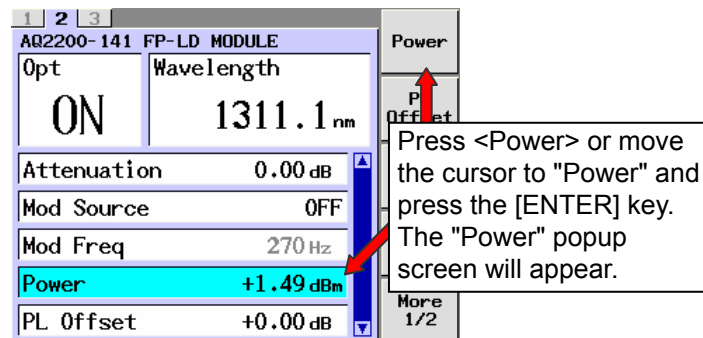
ATTN: Attenuation amount (dB) (See Attenuating the Laser Output (page 5-4).)

Poffset: Power offset value (dB) (See Changing the Offset of the Display Output Power (page 5-5).)

**NOTE**

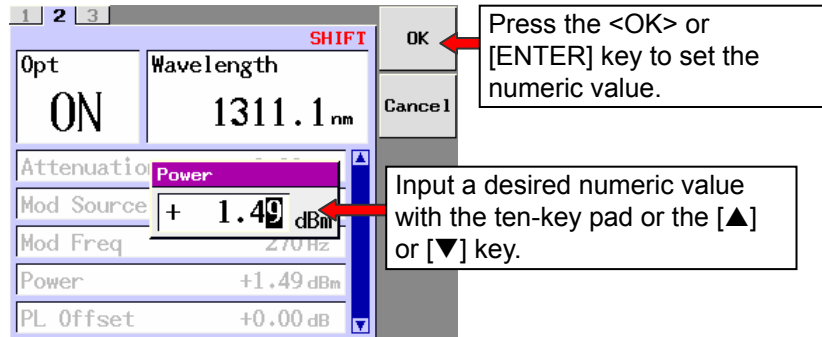
- The environment and/or secular change may affect the  $P_{\text{default}}$ . Therefore, the values set in  $P_{\text{display}}$  are not guaranteed. These values are used as reference.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Power> or move the cursor to "Power" and press the [ENTER] key.



- The "Power" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

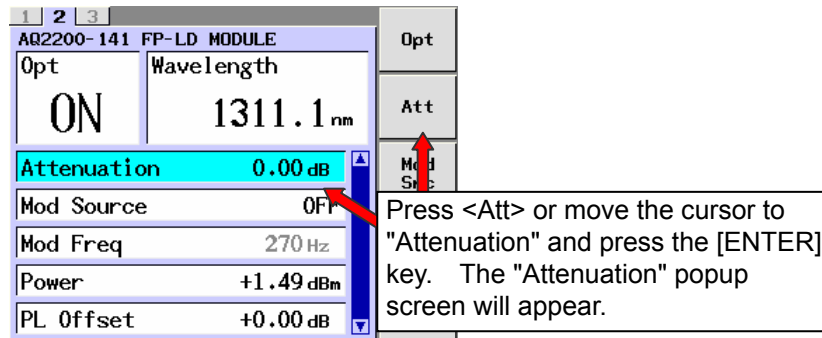
**NOTE** || Even if the unit of power is W, power settings are in units of dBm.



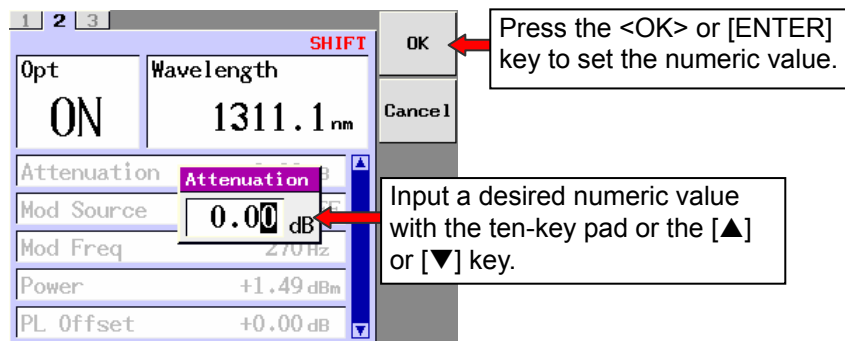
### Attenuating the Laser Output

You can attenuate the laser output (0 to 6.00dB).

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.
- Press <Att> or move the cursor to "Attenuation" and press the [ENTER] key.



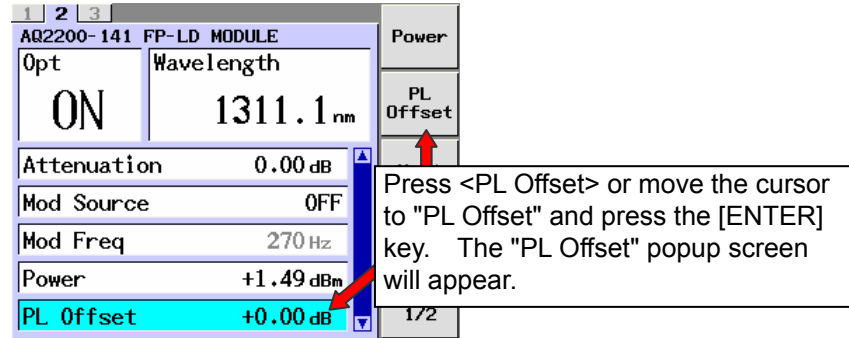
- The "Attenuation" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.  
At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



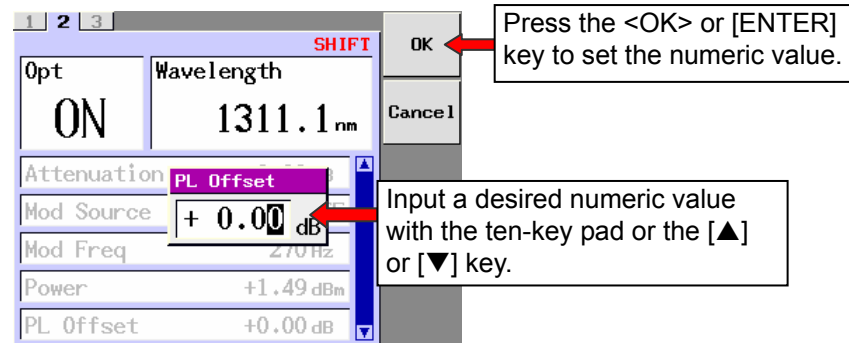
### Changing the Offset of the Display Output Power

You can use a value, that a power offset value (-80.00 to +80.00dB) is added to the output power, as power display value.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <PL Offset> or move the cursor to "PL Offset" and press the [ENTER] key.



4. The "PL Offset" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



### Modulating the Laser Output

You can perform the CW or CHOP (50%DUTY) modulation of the optical output.

For CHOP modulation, 270Hz, 1KHz, or 2KHz can be set.

For details about how to set the modulation frequency, see Changing the Modulation Frequency (page 5-18).

Two kinds of modulation mode settings are provided. Select a desired setting corresponding to the application.

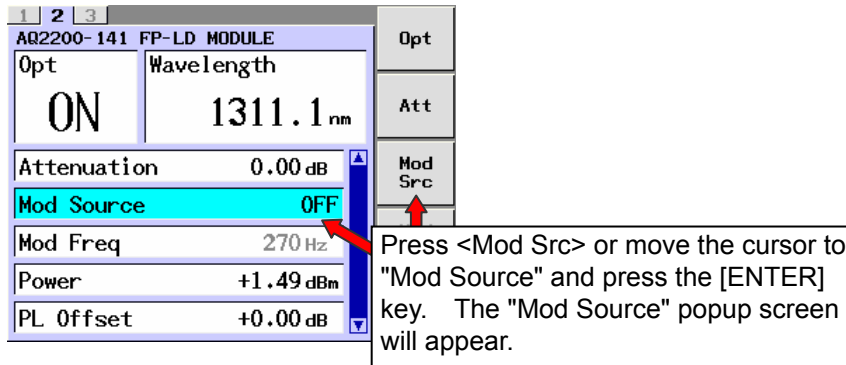
**NOTE** | The absolute value power display shows the power level of the peak value in the CHOP modulation.

**<Setting through the Panel of the Light Source Module>**

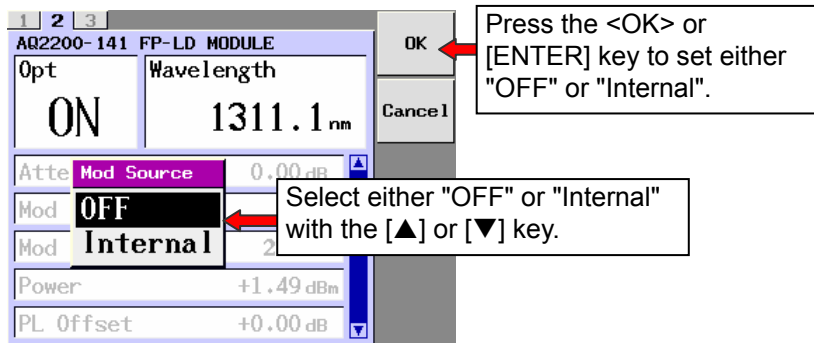
Press the [CW/CHOP] key on the light source panel to switch between CW and CHOP.

When changing to the CHOP modulation, the LED is lit and "Internal" is shown in "Mod Source" on the screen.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Mod Src> or move the cursor to "Mod Source" and press the [ENTER] key.



4. The "Mod Source" popup screen will appear.  
Move the cursor to "OFF" (for CW) or "Internal" (for CHOP) and press the [ENTER] key.

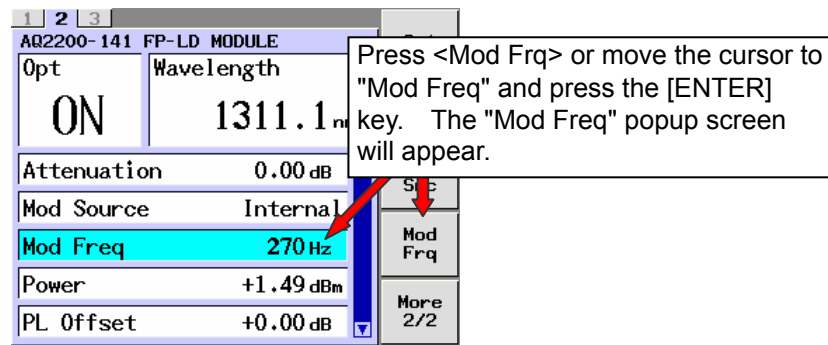


**Changing the Modulation Frequency**

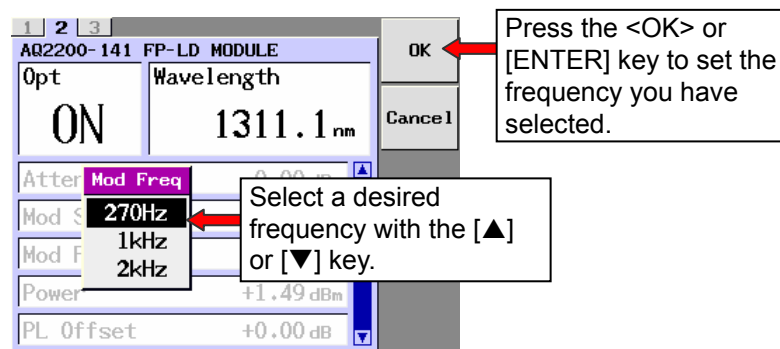
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.

**NOTE** || If Mod Source has been set to Internal, you can set the modulation frequency.

- Press <Mod Frq> or move the cursor to "Mod Frq" and press the [ENTER] key.



- The "Mod Frq" popup screen will appear. Move the cursor to a desired frequency and press the <OK> or [ENTER] key.



### Changing the Wavelength Display Unit

You can switch the display unit between the wavelength display and frequency display. The following calculation formula shows the relationship between the wavelength and frequency.

$$\lambda_{\text{display}}(\text{nm}) \times 10^{-9} = C / (f_{\text{display}}(\text{THz}) \times 10^{12})$$

where

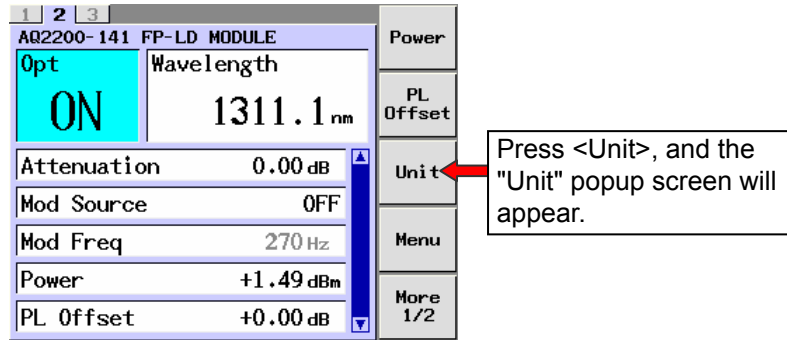
$\lambda_{\text{display}}$ : Display wavelength (nm)

$f_{\text{display}}$ : Display frequency (THz)

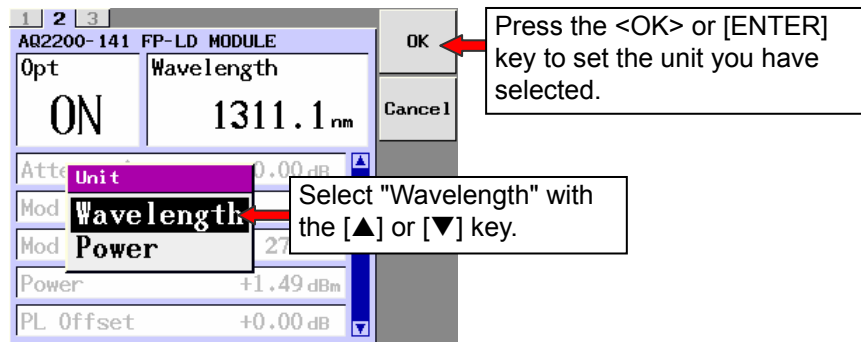
C: Light velocity in vacuum ( $2.99792458 \times 10^8$  m/s)

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
- Select an object light source module for the current module with the [CHAN] key.

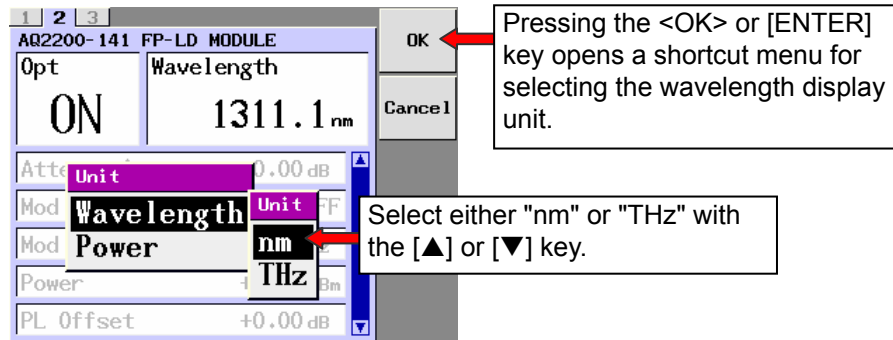
3. Press <Unit>.



4. The "Unit" popup screen will appear. Move the cursor to "Wavelength" and press the [ENTER] key.



5. The "Unit" popup screen will reappear. Move the cursor to either of "nm" (wavelength display) or "THz" (frequency display) and press the [ENTER] key.

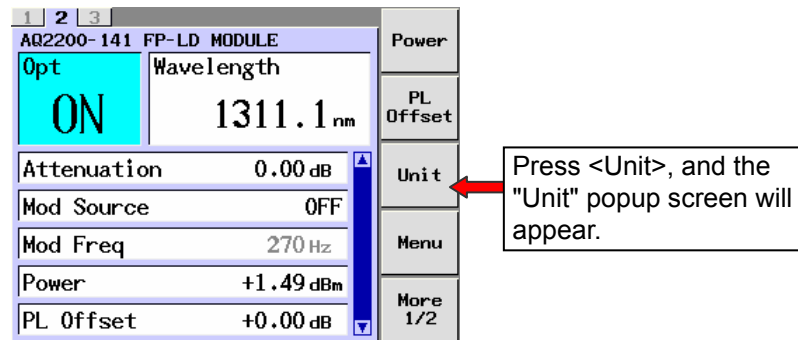


### Changing the Power Display Unit

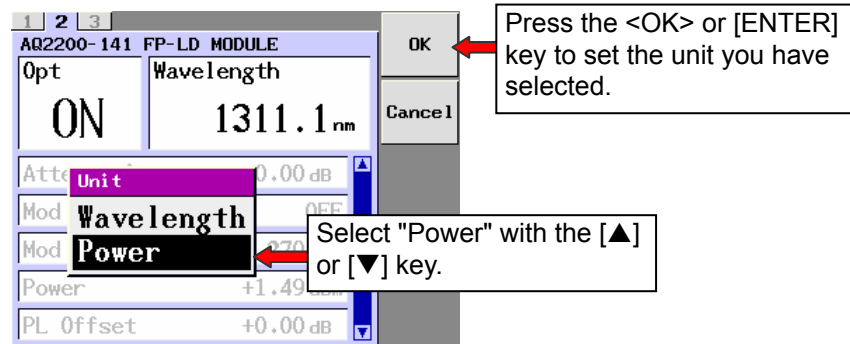
You can switch the power display unit between the dBm display and W display.

- PdBm = 10logPw
- Pw: Optical power (mW)
- PdBm: Optical power (dBm)

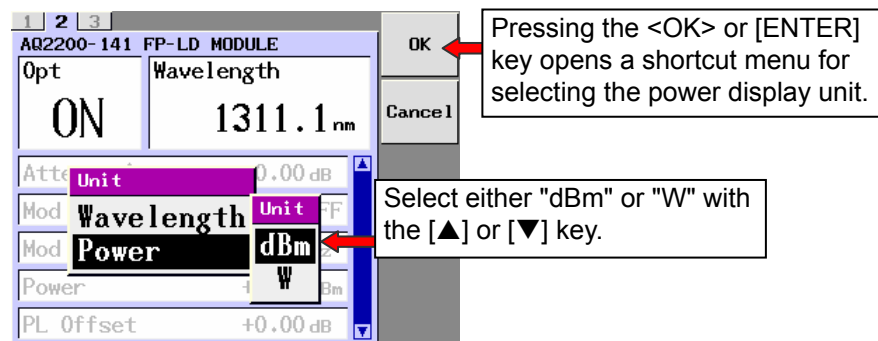
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Unit>.



4. The "Unit" popup screen will appear.  
Move the cursor to "Power" and press the [ENTER] key.



5. The "Unit" popup screen will reappear.  
Move the cursor to either of "dBm" or "W" and press the [ENTER] key.



## 5.3 AQ2200-142 DUAL FP-LD Light Source

By mounting the AQ2200-142 on this unit, you can output the FP laser beam.

FP-LD light sources with wavelengths of 1310nm and 1550nm are built-into the AQ2200-142. Therefore, 1310nm- or 1550nm-laser can be output individually or laser having both 1310nm and 1550nm wavelengths can also be output.

Additionally, in this module, Opt1/Opt2, WL1/WL2, ATT1/ATT2, Power1/Power2, and PL Offset1/PL Offset2, etc. mean the laser light source1/laser light source 2.

The laser light source1 shows the FP-LD light source with a wavelength of 1310nm while the laser light source2 shows the FP-LD light source with a wavelength of 1550nm.

### Turning ON/OFF the Laser Output

To turn ON or OFF the laser output, two setting methods are provided. Select a desired setting method corresponding to the application.

Follow the steps below to turn ON or OFF the laser output.

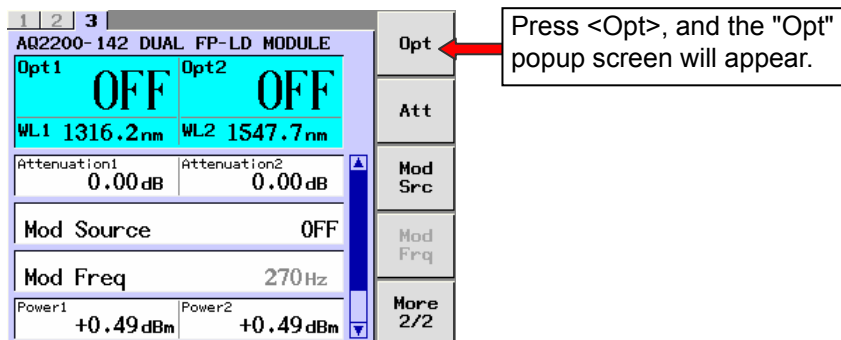
Additionally, as the laser output is turned ON, the LED on the light source panel will be lit.

#### <Setting through the Panel of the Light Source Module>

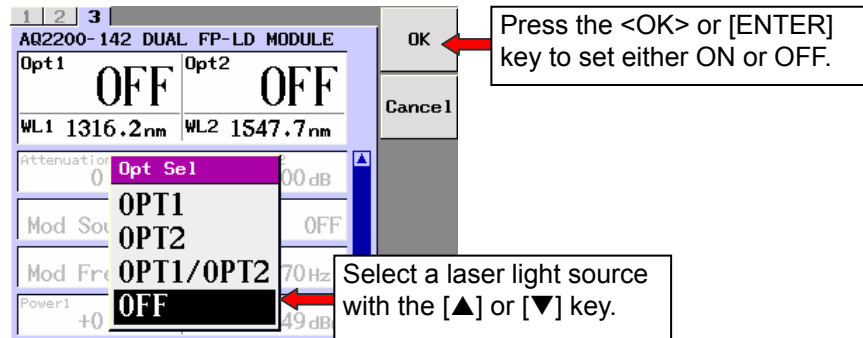
Every time the [OPT] key on the light source panel is pressed, the laser output is changed in order, like OFF → 1310nm laser ON → 1550nm laser ON → 1310nm/1550nm laser ON.

#### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key. (The following describes the operation on the DETAIL screen.)
2. Press <Opt>.



- The "Opt" popup screen will appear.  
Move the cursor to a laser light source, from which the laser is output, and press the <OK> or [ENTER] key.



- NOTE** When LOCK is shown in the "Opt" field, the laser output cannot be started. When starting the output, check the following two points.
- ① Interlock connector is open.  
→ Short-circuit the interlock connector with the short-circuit pin.
  - ② Laser output is locked.  
→ Follow the steps stated in "Locking the Laser Output" (page 3-10) to unlock it.

#### Outputting the Laser Beam with the Set Power

With the AQ2200-142, you can output the laser beam by specifying an absolute power value, Power1 (1310nm) or Power2 (1550nm).

The following shows the relationship among the laser beam output power, attenuation amount, and power offset value.

$$P_{\text{display}}(\text{dBm}) = P_{\text{default}}(\text{dBm}) - \text{ATTN}(\text{dB}) + P_{\text{offset}}(\text{dB})$$

where

$P_{\text{display}}$ : Output power display value (dBm)

$P_{\text{default}}$ : Maximum output power at shipment (dBm)

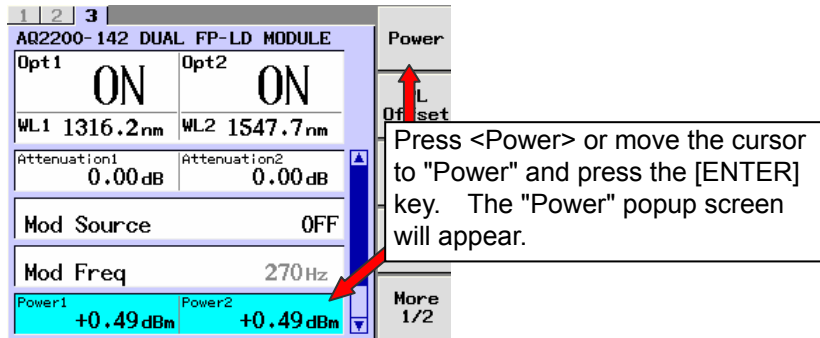
ATTN: Attenuation amount (dB) (See Attenuating the Laser Output(page 5-4).)

Poffset: Power offset value (dB) (See Changing the Offset of the Display Output Power(page 5-5).)

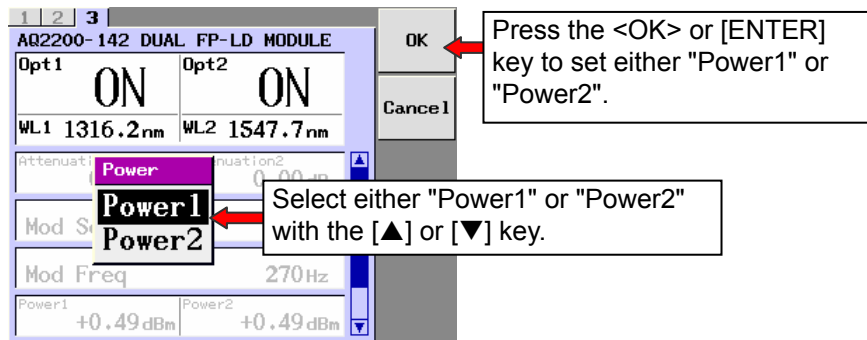
- NOTE** The environment and/or secular change may affect the  $P_{\text{default}}$ . Therefore, the values set in  $P_{\text{display}}$  are not guaranteed. These values are used as reference.

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key. (The following describes the operation on the DETAIL screen.)

2. Press <Power> or move the cursor to "Power" and press the [ENTER] key.

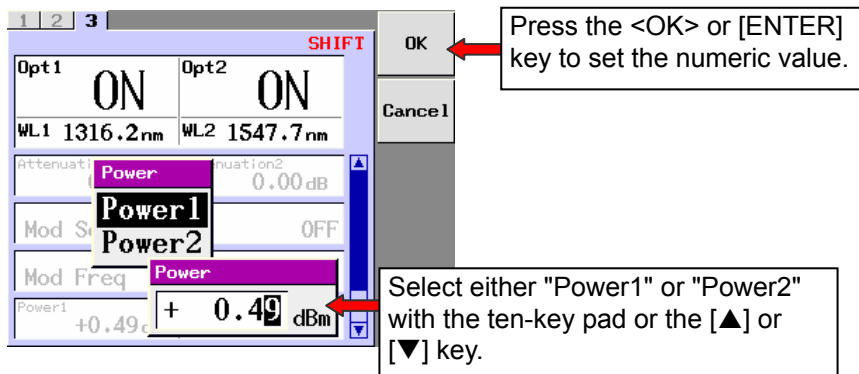


3. The "Power" popup screen will appear. Move the cursor to either of "Power1" or "Power2" and press the <OK> or [ENTER] key. At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



4. The "Power" popup screen (for inputting a numeric value) will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

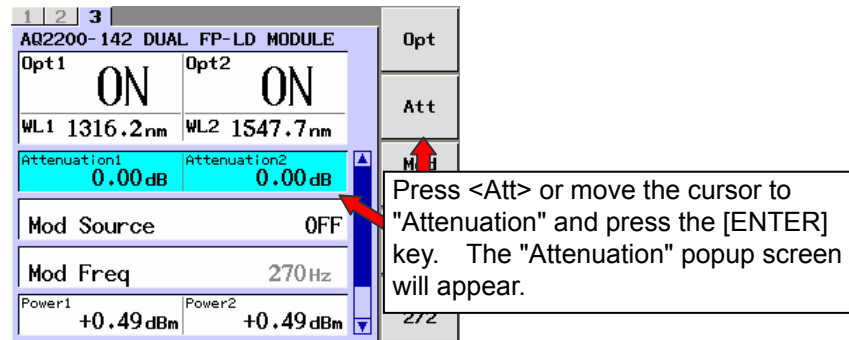
**NOTE** || Even if the unit of power is W, power settings are in units of dBm.



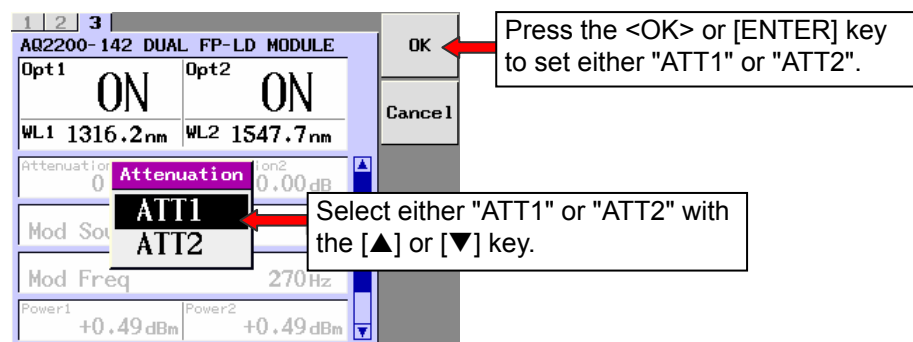
### Attenuating the Optical Output

In the AQ2200-142, the laser output with each wavelength (Power1 (1310nm), Power2 (1550nm)) can be attenuated with a desired value (0 to 6.00dB).

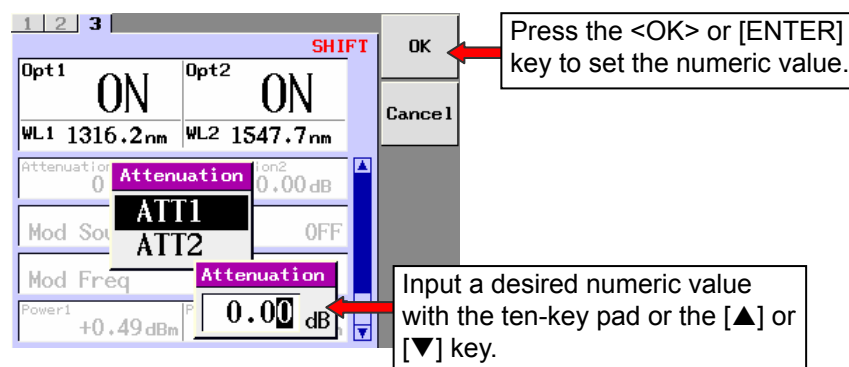
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key. (The following describes the operation on the DETAIL screen.)
2. Press <Att> or move the cursor to "Attenuation" and press the [ENTER] key.



3. The "Attenuation" popup screen will appear. Move the cursor to either of "ATT1" or "ATT2" and press the <OK> or [ENTER] key.



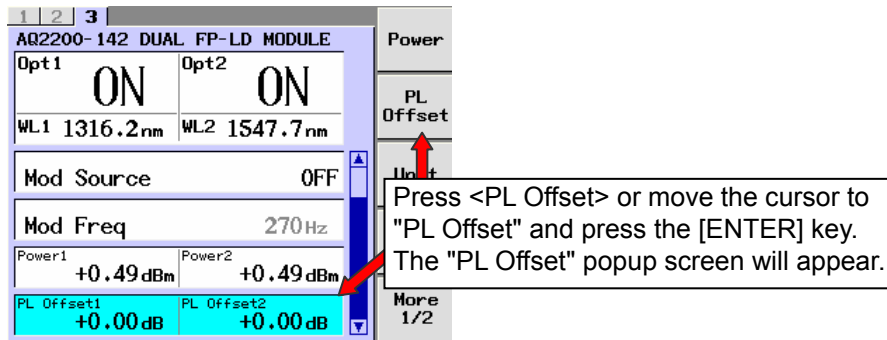
4. The "Attenuation" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



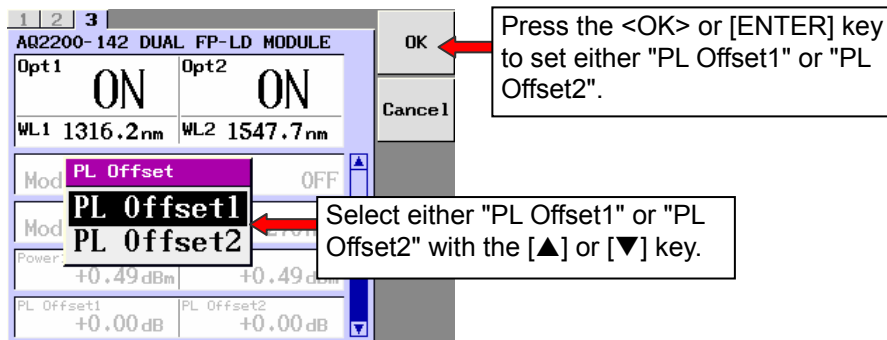
### Changing the Offset of the Display Output Power

By setting a desired value (-80.00 to +80.00dB) to the optical power offset values (PL Offset1, PL Offset2), a value, that a power offset value is added to the laser output power with each wavelength, is used as power display value.

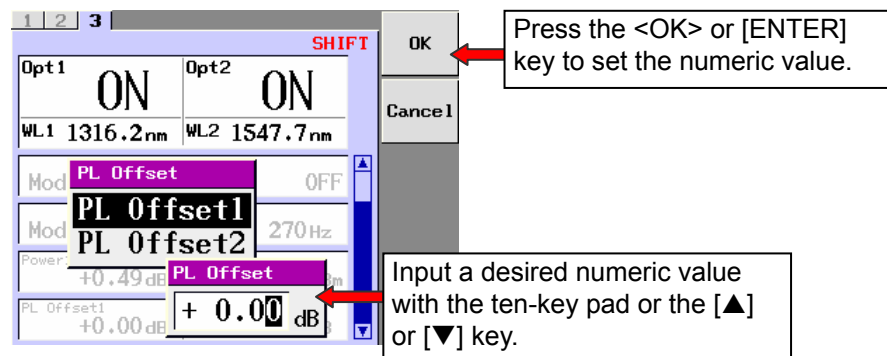
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key. (The following describes the operation on the DETAIL screen.)
2. Press <PL Offset> or move the cursor to "PL Offset" and press the [ENTER] key.



3. The "PL Offset" popup screen will appear. Move the cursor to either of "PL Offset1" or "PL Offset2" and press the <OK> or [ENTER] key.



4. The "PL Offset" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



## Modulating the Optical Output

You can perform the CW or CHOP (50%DUTY) modulation of the optical output.

Two kinds of modulation setting methods are provided. Select a desired method corresponding to the application.

Follow the steps below to set the laser output modulation.

When performing the CHOP modulation output, the LED on the light source panel is lit.

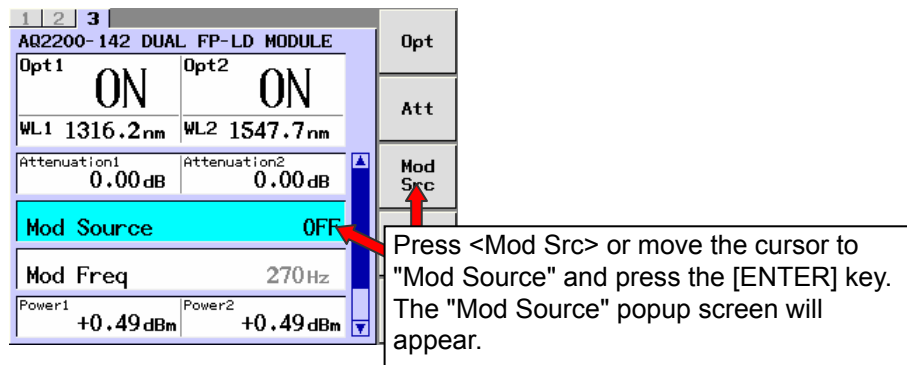
**NOTE** | The absolute value power display shows the power level of the peak value in the CHOP modulation.

### <Setting through the Panel of the Light Source Module>

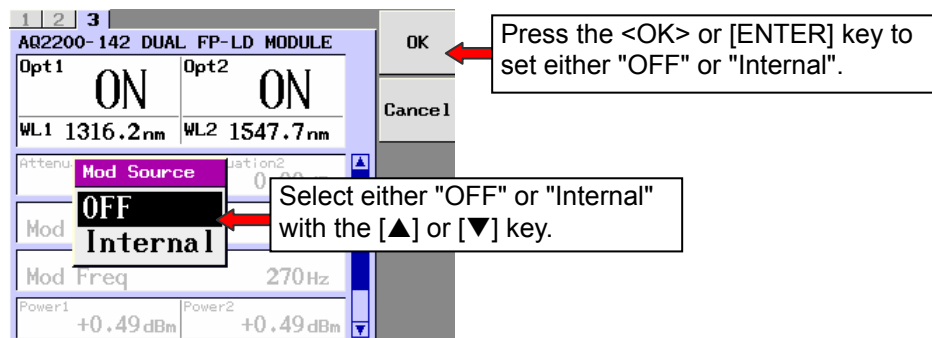
Every time the [CW/CHOP] key on the light source panel is pressed, the modulation can be switched between CW and CHOP.

### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Mod Src> or move the cursor to "Mod Source" and press the [ENTER] key.

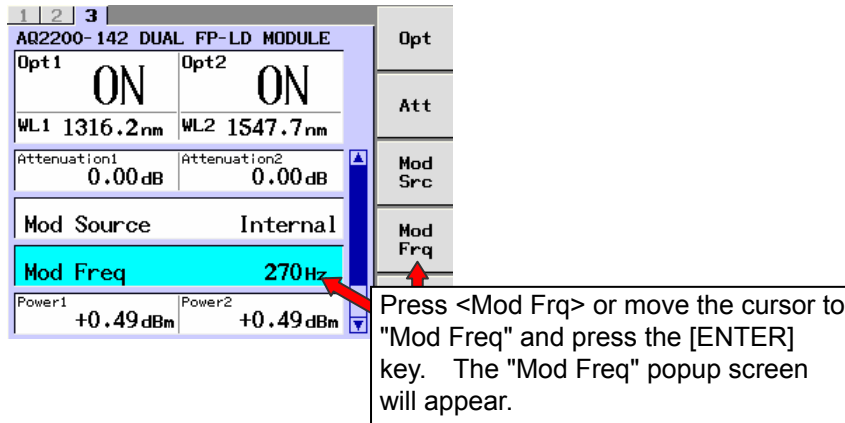


4. The "Mod Source" popup screen will appear. Move the cursor to "OFF" (for CW) or "Internal" (for CHOP) and press the [ENTER] key.

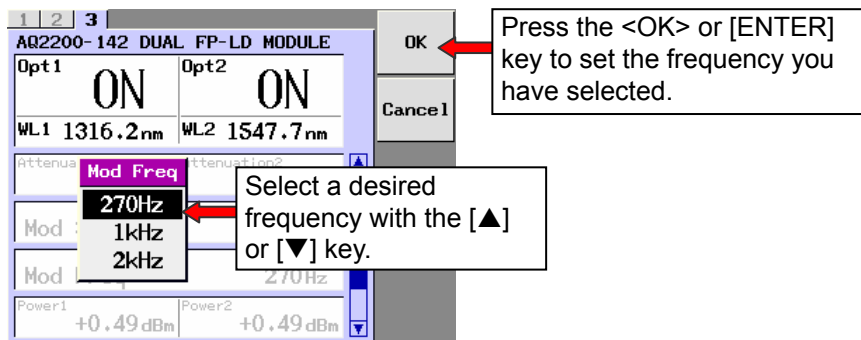


### Changing the Modulation Frequency

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object light source module for the current module with the [CHAN] key.
3. Press <Mod Frq> or move the cursor to "Mod Frq" and press the [ENTER] key.



4. The "Mod Frq" popup screen will appear. Move the cursor to a desired frequency and press the <OK> or [ENTER] key.



**NOTE** || If Mod Source has been set to Internal, you can set the modulation frequency.

### Changing the Wavelength Display Unit

You can switch the display unit between the wavelength display and frequency display. The following calculation formula shows the relationship between the wavelength and frequency.

$$\lambda_{\text{display}} = c / f_{\text{display}}$$

where

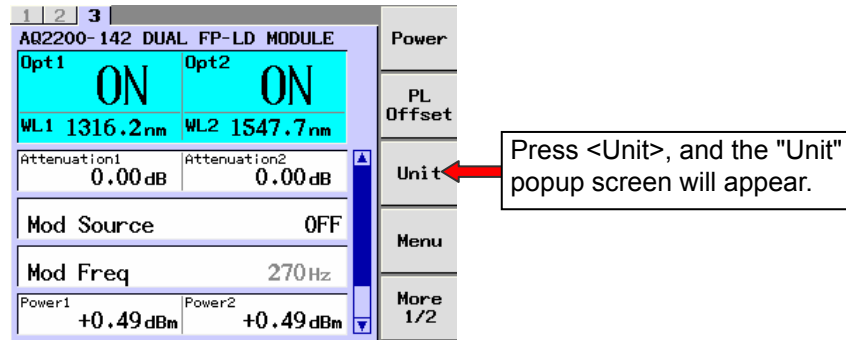
$\lambda_{\text{display}}$ : Display wavelength (nm)

$f_{\text{display}}$ : Display frequency (THz)

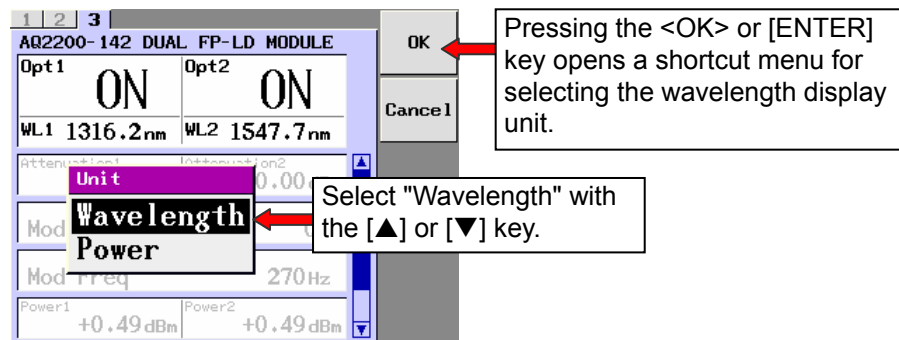
C: Light velocity in vacuum

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key.  
(The following describes the operation on the DETAIL screen.)

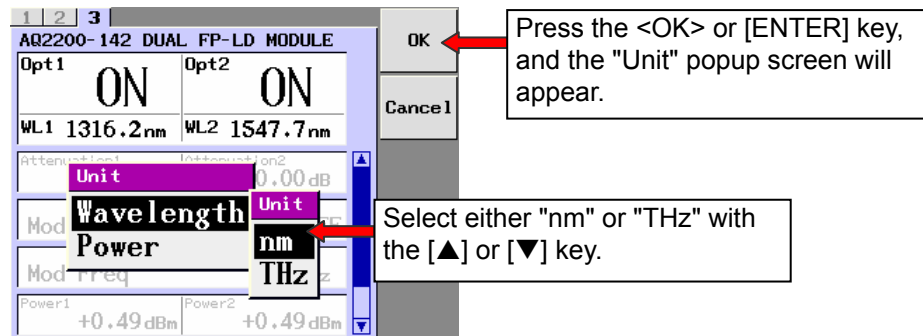
2. Press <Unit>.



3. The "Unit" popup screen will appear. Move the cursor to "Wavelength" and press the [ENTER] key.



4. The "Unit" popup screen will reappear. Move the cursor to either "nm" (wavelength display) or "THz" (frequency display) and press the [ENTER] key.



### Changing the Power Display Unit

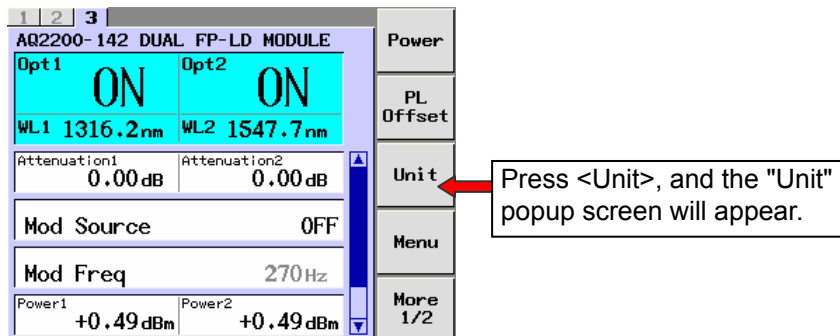
You can switch the power display unit between the dBm display and W display.

$$Pd_{Bm} = 10\log P_w$$

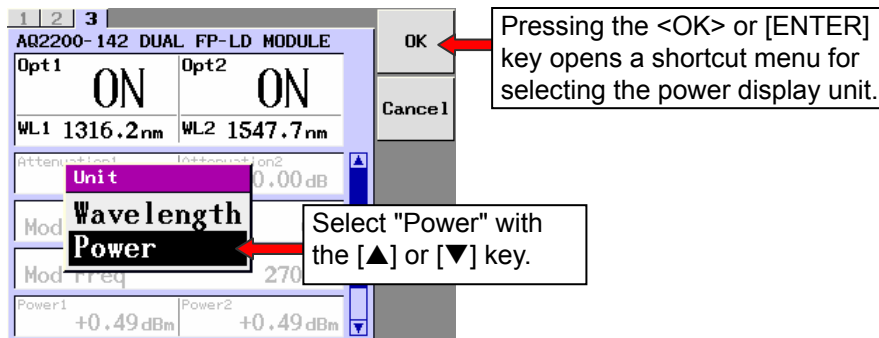
P<sub>w</sub>: Optical power (mW)

P<sub>dBm</sub>: Optical power (dBm)

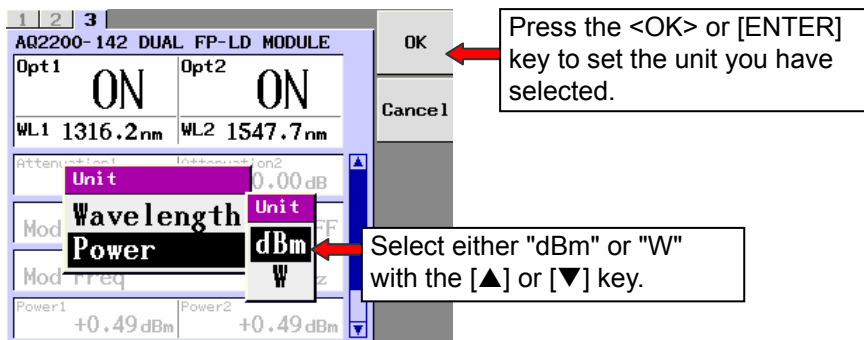
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. Then select a light source module for the current module with the [CHAN] key. (The following describes the operation on the DETAIL screen.)
2. Press <Unit>.



3. The "Unit" popup screen will appear. Move the cursor to "Power" and press the [ENTER] key.



4. The "Unit" popup screen will reappear. Move the cursor to either of "dBm" or "W" and press the [ENTER] key.



# Chapter 6

## Auxiliary Measurement Units

By mounting the following module on this unit, you can construct a flexible measurement application.

- AQ2200-311 ATTN Module
- AQ2200-331 ATTN Module
- AQ2200-411 OSW Module
- AQ2200-421 OSW Module

## 6.1 AQ2200-311 ATTN Module

### ■ Interrupting the Laser Output

You can make the laser output enabled (permit) or disabled (interrupt) using the shutter function.

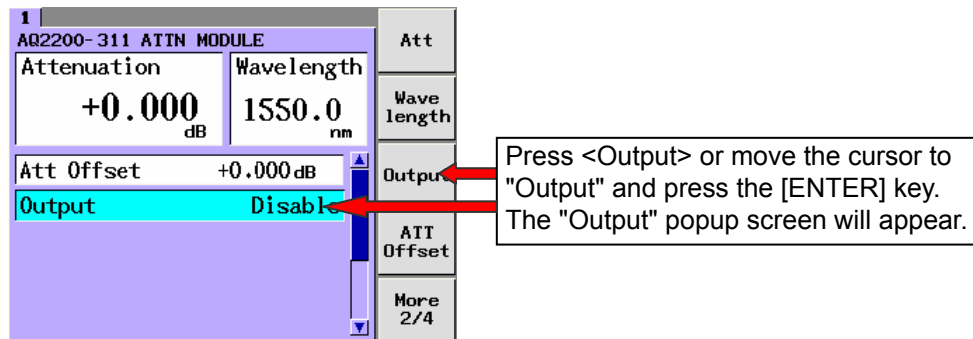
Note that the LED on the module panel is lit when the laser output is made enabled.

#### <Setting through the Panel of the ATTN Module>

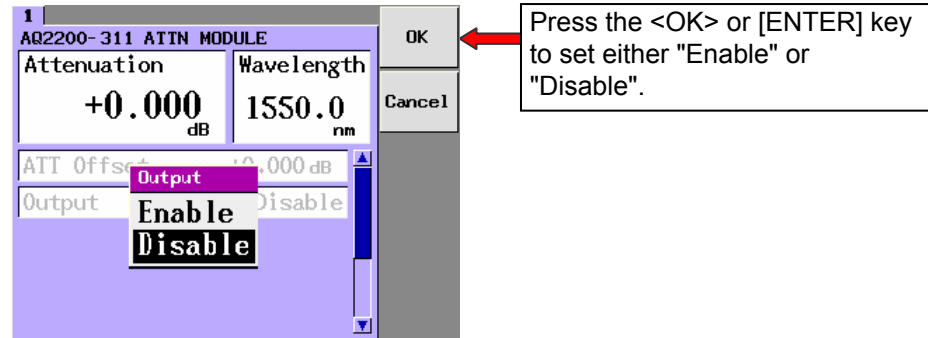
You can make the laser output enabled or disabled by pressing the ENABLE/DISABLE key on the ATTN panel.

#### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATTN module for the current module with the [CHAN] key.
3. Press <Output> or move the cursor to "Output" and press the [ENTER] key.



- The "Output" popup screen will appear.  
Move the cursor to either of "Enable" or "Disable" and press the <OK> or [ENTER] key.



### Changing the Optical Attenuation

In the AQ2200-311, you can attenuate the laser by specifying an attenuation (0.000 to 60.000dB).

The following shows the relationship between the attenuation and attenuation offset value.

$$\text{ATTdisplay(dB)} = \text{ATT(dB)} + \text{ATToffset(dB)}$$

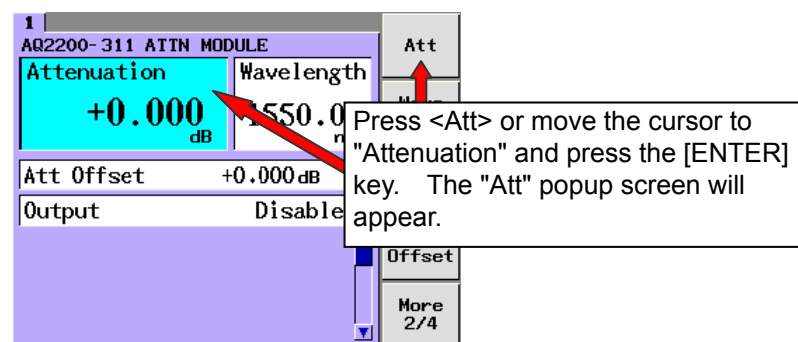
where

ATTdisplay: Output power display value (dBm)

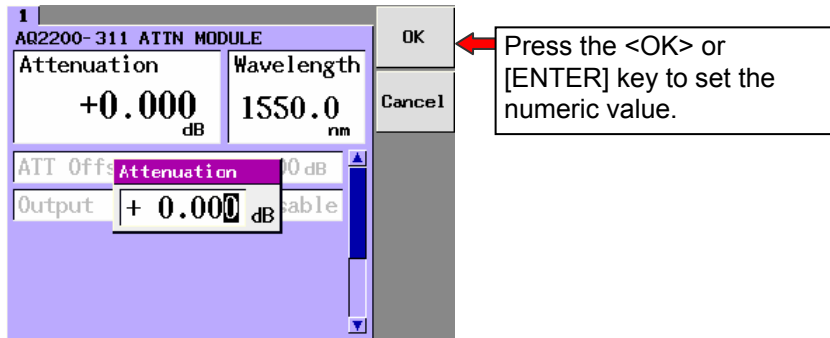
ATT: Attenuation (dB) (0 to 60dB, 0.001dB step)

ATToffset: Attenuation offset value (dB) (See "Changing the Attenuation Offset Value" (page 6-5).

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object ATT module for the current module with the [CHAN] key.
- Press <Att> or move the cursor to "Attenuation" and press the [ENTER] key.



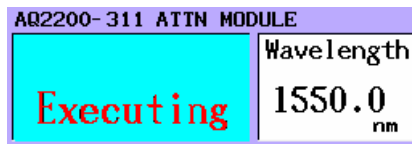
- The "Attenuation" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.  
At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



**NOTE** If you change the attenuation or wavelength, the message shown in the Fig. below may appear.  
You cannot operate any key while such message is being displayed.



← Shown on the DETAIL screen.

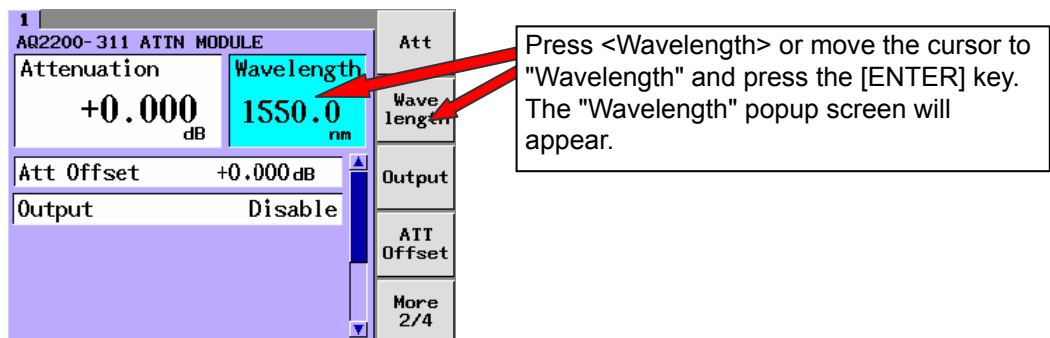


← Shown on the SUMMARY screen.

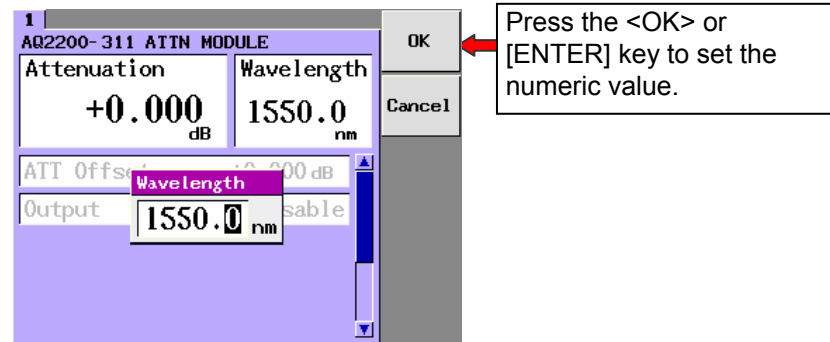
### Changing the Wavelength

In the AQ2200-311, you can set a more accurate attenuation by specifying a wavelength (1200.0 to 1700.0nm).

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object ATT module for the current module with the [CHAN] key.
- Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.



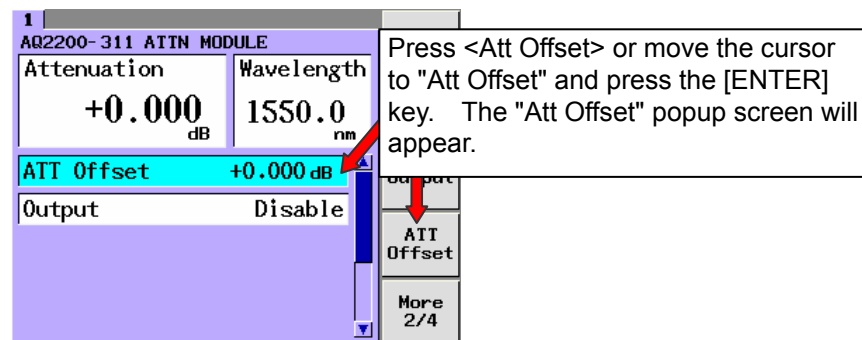
- The "Wavelength" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



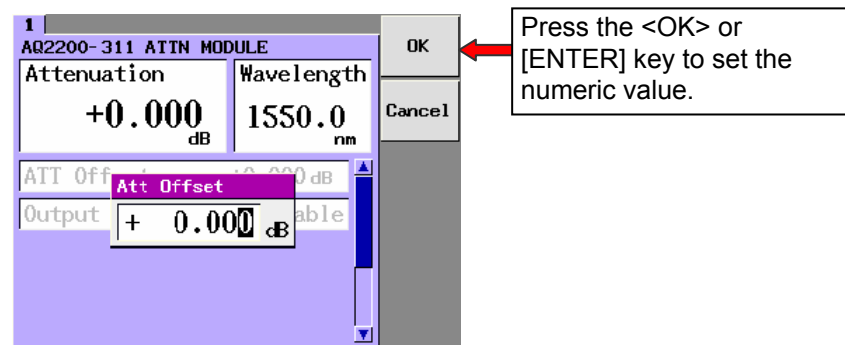
### Changing the Attenuation Offset Value

A value, that an attenuation offset value (-200.000 to +200.000dB) is added to the attenuation, is used as attenuation display value.

- Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
- Select an object ATT module for the current module with the [CHAN] key.
- Press <Att Offset> or move the cursor to "Att Offset" and press the [ENTER] key.



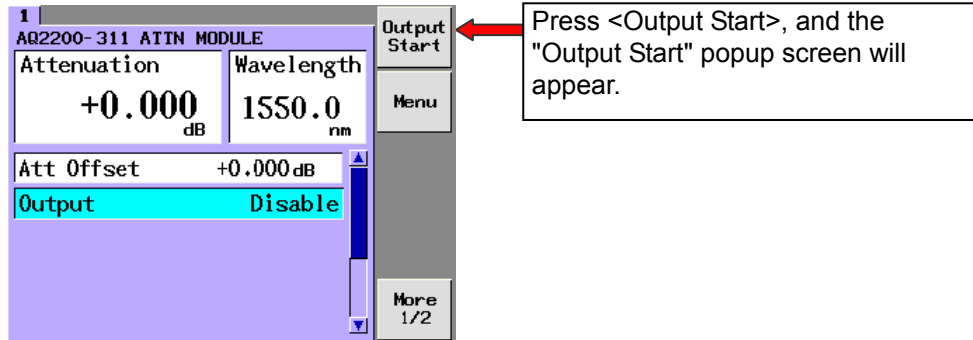
- The "Att Offset" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



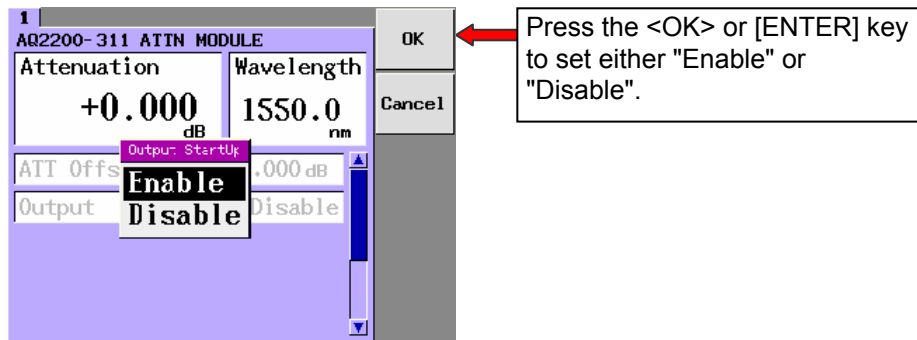
### Changing the Laser Output Interrupt Status at Power ON

You can change the laser output at power ON to "Enable" or "Disable".

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Output Start>.



4. The "Output Start" popup screen will appear.  
Move the cursor to either of "Enable" or "Disable" and press the <OK> or [ENTER] key.



## 6.2 AQ2200-331 ATTN Module

### Interrupting the Laser Output

You can make the laser output enabled (permit) or disabled (interrupt) using the shutter function.

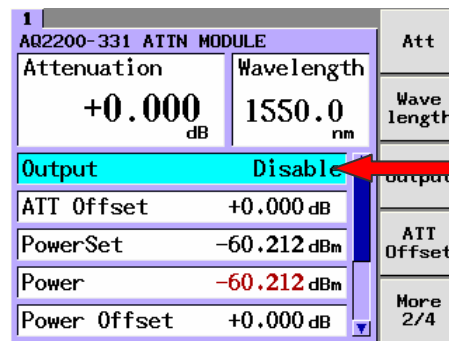
Note that the LED on the module panel is lit when the laser output is made enabled.

### <Setting through the Panel of the ATTN Module>

Every time the key on the ATTN panel is pressed, the optical output is switched between ENABLE and DISABLE.

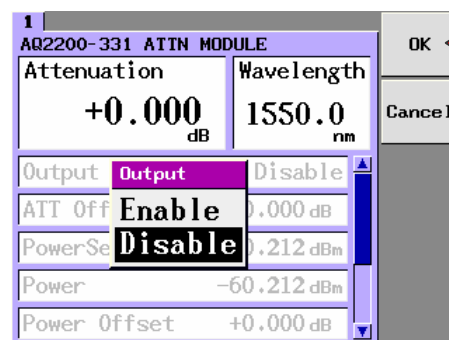
### <Setting through the Panel of the Frame Controller>

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATTN module for the current module with the [CHAN] key.
3. Press <Output> or move the cursor to "Output" and press the [ENTER] key.



Press <Output> or move the cursor to "Output" and press the [ENTER] key. The "Output" popup screen will appear.

4. The "Output" popup screen will appear.  
Move the cursor to either of "Enable" or "Disable" and press the <OK> or [ENTER] key.



Press the <OK> or [ENTER] key to set either "Enable" or "Disable".

### Changing the Optical Attenuation

In the AQ2200-331, you can attenuate the laser by specifying an attenuation. The following shows the relationship between the attenuation and attenuation offset value.

$$ATTdisplay(dB) = ATT(dB) + ATTOffset(dB)$$

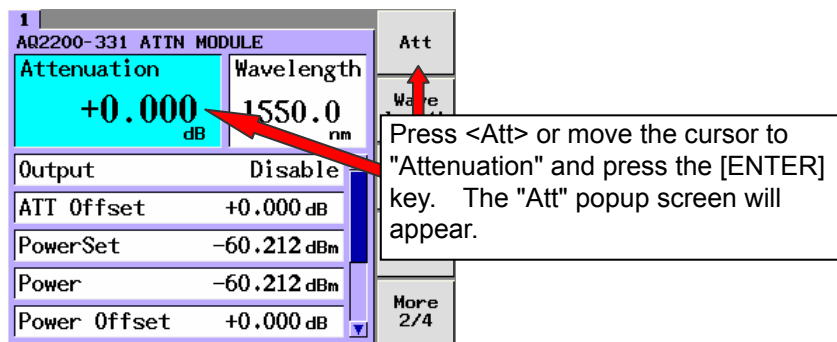
where

ATTdisplay: Output power display value (dBm)

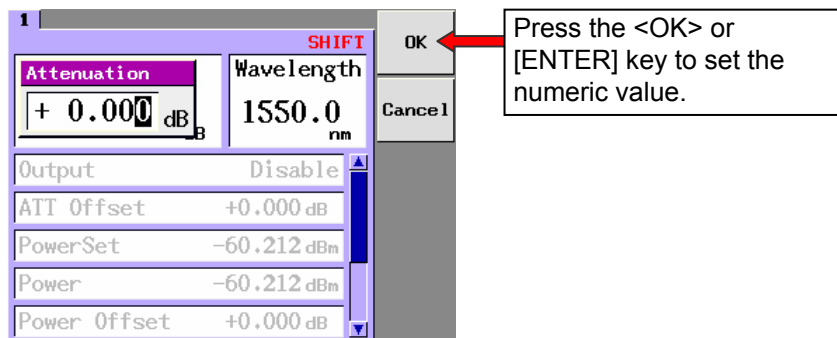
ATT: Attenuation (dB)  
 For SMF: 0 to 60dB, 0.001dB step  
 For MMF: 0 to 45dB, 0.001dB step

ATTOffset: Attenuation offset value (dB) (See "Changing the Attenuation Offset Value" (page 6-5).

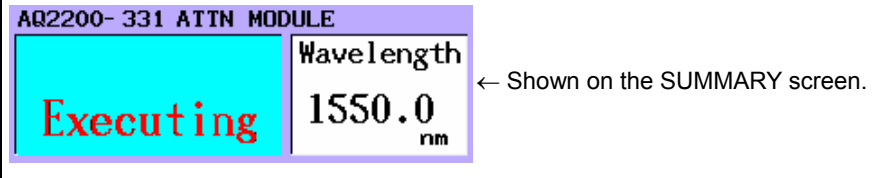
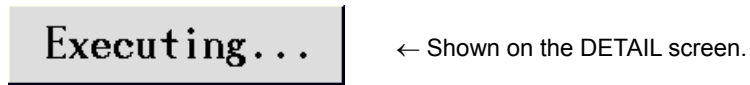
1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Att> or move the cursor to "Attenuation" and press the [ENTER] key.



4. The "Attenuation" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. At this time, when changing the numeric value with the [▲] or [▼] key, the set value is set immediately.



**NOTE** If you change the attenuation or wavelength, the message shown in the Fig. below may appear.  
 You cannot operate any key while such message is being displayed.



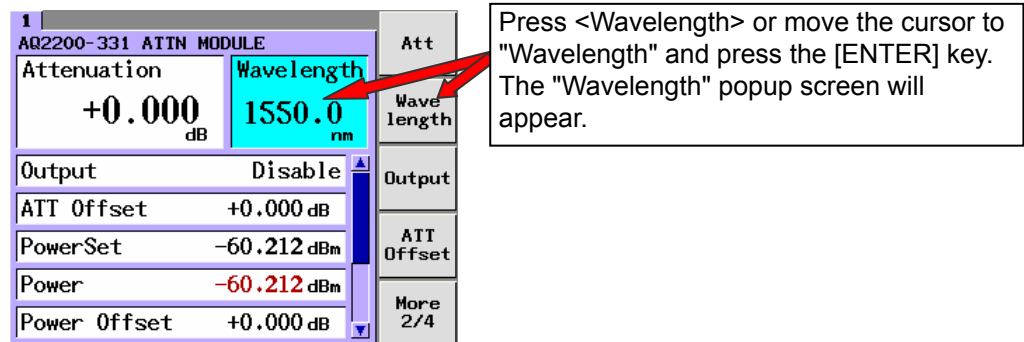
**Changing the Wavelength**

In the AQ2200-331, you can set a more accurate attenuation by specifying a wavelength.

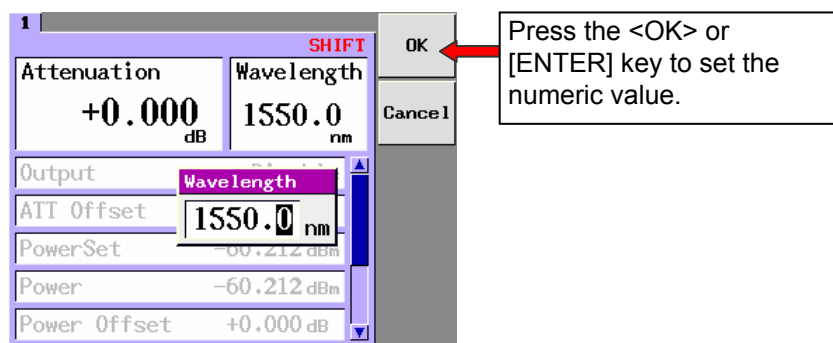
For ATTN module applicable to SMF  
 Maximum settable wavelength: 1700.0nm  
 Minimum settable wavelength: 1200.0nm

For ATTN module applicable to MMF  
 Maximum settable wavelength: 1370.0nm  
 Minimum settable wavelength: 800.0nm

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
 (The following describes the operation on the DETAIL screen.)
2. Select an object ATTN module for the current module with the [CHAN] key.
3. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.



4. The "Wavelength" popup screen will appear.  
 Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



### Changing the Attenuation Offset Value

A value, that an attenuation offset value (-200.000 to +200.000dB) is added to the attenuation, is used as attenuation display value.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Att Offset> or move the cursor to "Att Offset" and press the [ENTER] key.

|                        |             |             |
|------------------------|-------------|-------------|
| AQ2200-331 ATTN MODULE |             | Att         |
| Attenuation            | Wavelength  | Wave length |
| +0.000 dB              | 1550.0 nm   |             |
| Output                 | Disable     | Output      |
| ATT Offset             | +0.000 dB   | ATT Offset  |
| PowerSet               | -60.212 dBm | More 2/4    |
| Power                  | -60.212 dBm |             |
| Power Offset           | +0.000 dB   |             |

Press <Att Offset> or move the cursor to "Att Offset" and press the [ENTER] key. The "Att Offset" popup screen will appear.

4. The "Att Offset" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

|                        |             |       |        |
|------------------------|-------------|-------|--------|
| AQ2200-331 ATTN MODULE |             | SHIFT | OK     |
| Attenuation            | Wavelength  |       | Cancel |
| +0.000 dB              | 1550.0 nm   |       |        |
| Output                 | ATT Offset  |       |        |
| ATT Offset             | + 0.000 dB  |       |        |
| PowerSet               | -60.212 dBm |       |        |
| Power                  | -60.212 dBm |       |        |
| Power Offset           | +0.000 dB   |       |        |

Press the <OK> or [ENTER] key to set the numeric value.

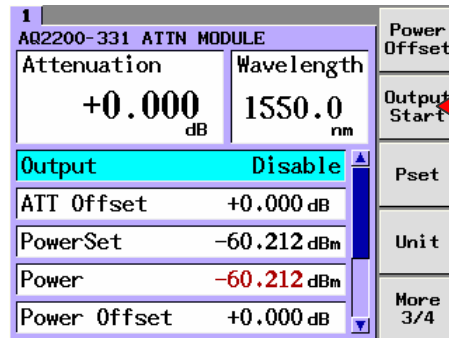
|                        |             |              |
|------------------------|-------------|--------------|
| AQ2200-331 ATTN MODULE |             | D->Aoffs     |
| Attenuation            | Wavelength  | Output Start |
| +0.000 dB              | 1550.0 nm   |              |
| Output                 | Disable     | Pset         |
| ATT Offset             | +0.000 dB   | Unit         |
| PowerSet               | -60.212 dBm | More 3/4     |
| Power                  | -60.212 dBm |              |
| Power Offset           | +0.000 dB   |              |

Press <d->Aoffs>, and the value displayed in the "Attenuation" field changes to the attenuation offset value and it is displayed in the "ATT Offset" field.

### Changing the Laser Output Interrupt Status at Power ON

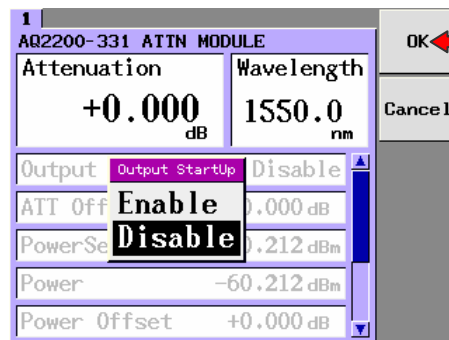
You can change the laser output at power ON to "Enable" or "Disable".

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Output Start>.



Press <Output Start>, and the "Output Start" popup screen will appear.

4. The "Output Start" popup screen will appear.  
Move the cursor to either of "Enable" or "Disable" and press the <OK> or [ENTER] key.



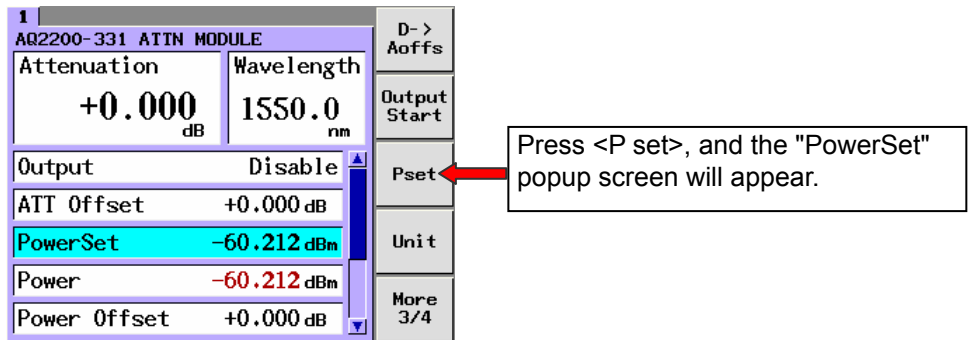
Press the <OK> or [ENTER] key to set either "Enable" or "Disable".

### Changing the Optical Output Set Value

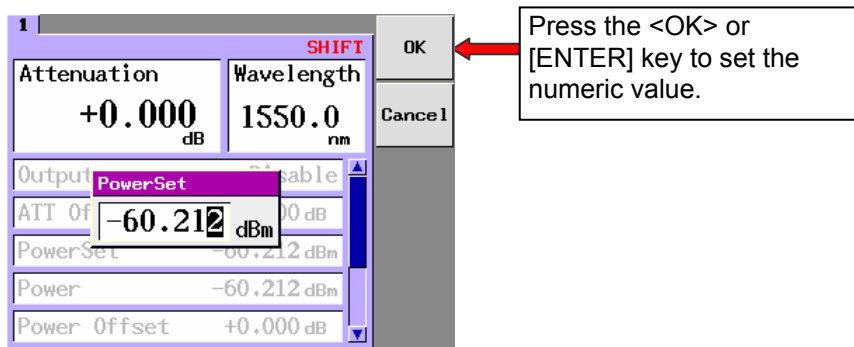
The optical attenuation is adjusted automatically so that the set optical output value is obtained. This optical output value includes the power offset value.

Set output power = Output power + Power offset value

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <P set> or move the cursor to "Power Set" and press the [ENTER] key.



4. The "Power Set" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



**NOTE** The numeric value may be displayed in red after the optical output set value has been input. This shows that the input optical power cannot be adjusted to the value you have set. If this occurs, input an appropriate value again.

**NOTE**

If you change the optical output set value, the message shown in the Fig. below may appear.  
You cannot operate any key while such message is being displayed.



← Shown on the DETAIL screen.

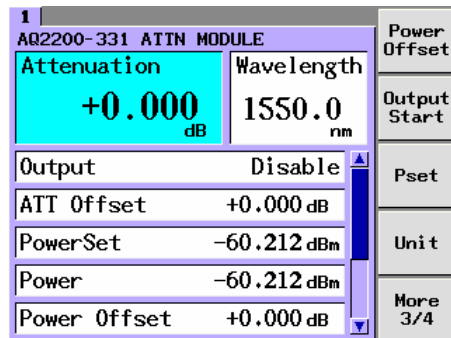


← Shown on the SUMMARY screen.

**Changing the Power Display Unit**

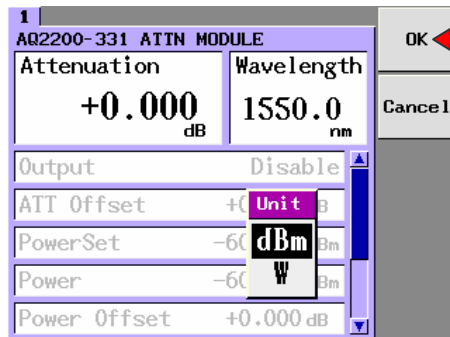
The display unit of the optical output set value (PowerSet) and the optical output monitor value "Power" is changed to "dBm" or "W".

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Unit>.



Press <Unit>, and the "Unit" popup screen will appear.

4. The "Unit" popup screen will appear.  
Move the cursor to either of "dBm" or "W" and press the <OK> or [ENTER] key.

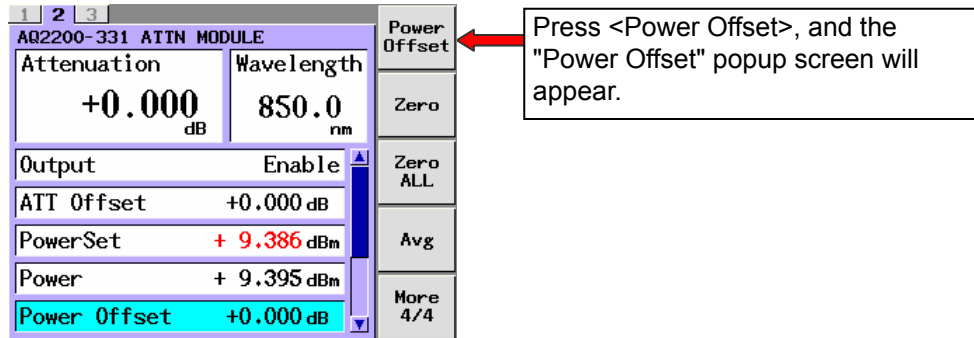


Press the <OK> or [ENTER] key to set either "dBm" or "W".

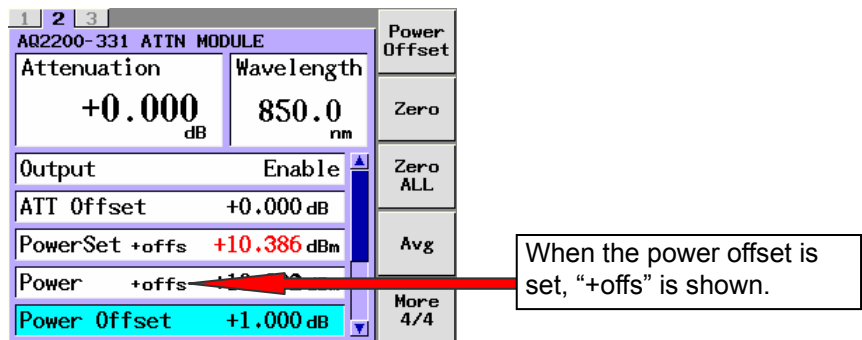
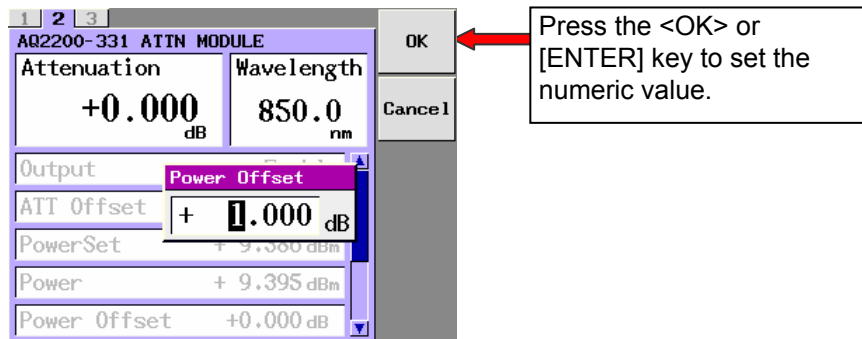
**Setting a Power Offset Value**

You can use a value, that a power offset value (-200.000 to +200.000dB) is added to the optical output set value or optical output monitor value, as the output power display value.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Power Offset> or move the cursor to "Power Offset" and press the [ENTER] key.



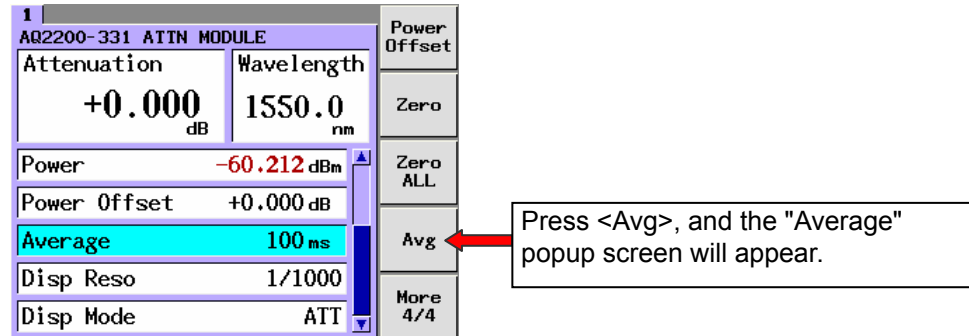
4. The "Power Offset" popup screen will appear.  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



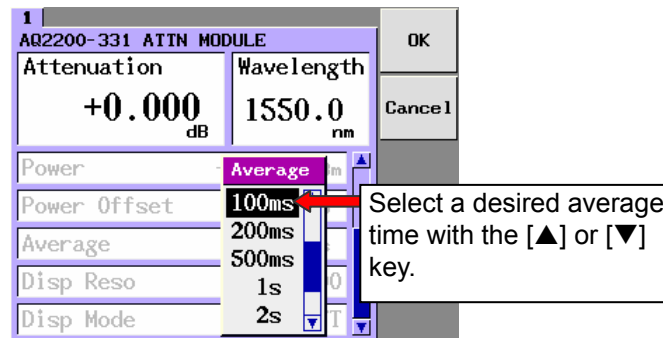
### Setting an Averaging Time

Time data you have set here is averaged and it is used as one measurement data.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Avg> or move the cursor to "Average" and press the [ENTER] key.



4. The "Average" popup screen will appear.  
Move the cursor to a desired average time with the [▲] or [▼] key, and press the <OK> or [ENTER] key.



**Setting a Display Resolution of Each Set Value**

You can display each parameter at a decimal place of 1/10, 1/100, or 1/1000.

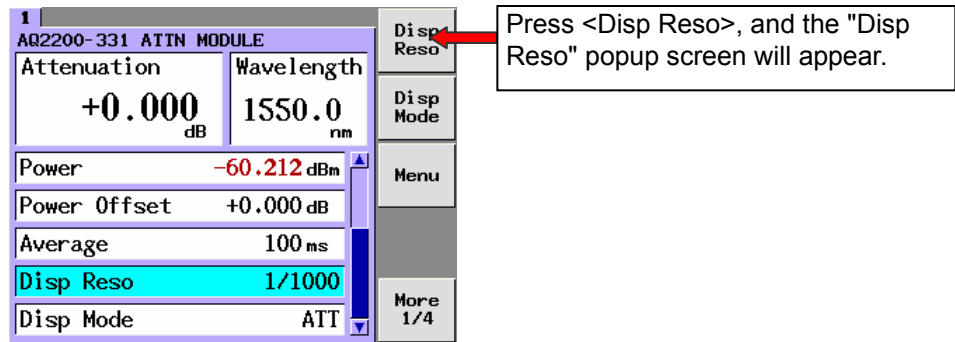
Select a necessary decimal place. Note that the value at the least significant decimal place is made by rounding the value at the most significant decimal place that is not displayed.

For units of W, the decimal point can move within the five valid number of digits, therefore there are times when the actual displayed digits are not the same as the specified digits.

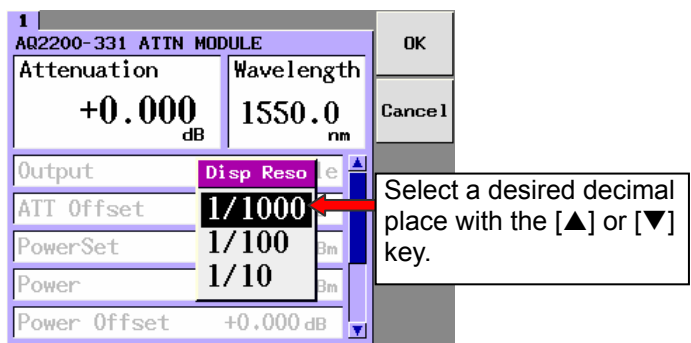
**<Applicable Parameters>**

- Power Set
- Attenuation
- Att Offset
- Power
- Power Offset

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Disp Reso> or move the cursor to "Disp Reso" and press the [ENTER] key.



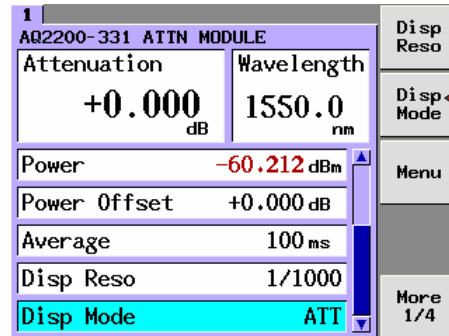
4. The "Disp Reso" popup screen will appear. Move the cursor to a desired decimal place with the [▲] or [▼] key, and press the <OK> or [ENTER] key.



## Changing the Display Mode

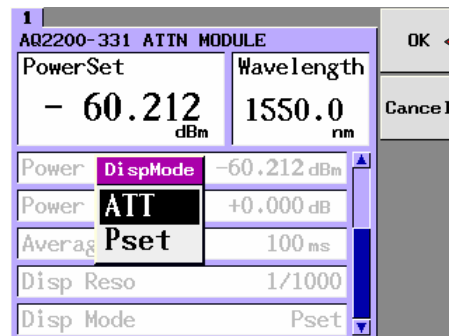
The attenuation display field is swapped with the optical output set value field.

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen.  
(The following describes the operation on the DETAIL screen.)
2. Select an object ATT module for the current module with the [CHAN] key.
3. Press <Disp Mode> or move the cursor to "Disp Mode" and press the [ENTER] key.



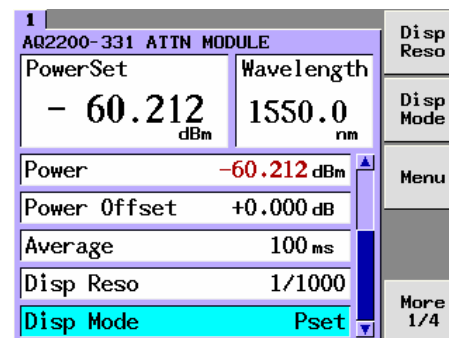
Press <Disp Mode>, and the "Disp Mode" popup screen will appear.

4. The "Disp Mode" popup screen will appear.  
Move the cursor to [ATT] or [Pset], and then press the <OK> or [ENTER] key.  
(This section describes how to change the attenuation display to the output power display as an example. Select "Pset".)



Press the <OK> or [ENTER] key to set "ATT" or "Pset" you have selected.

5. The output power display (Power Set) is then shown.



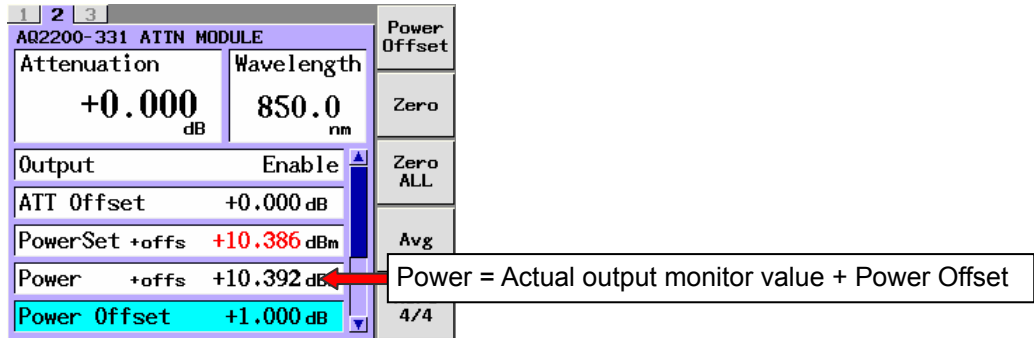
**Displaying the Current Optical Output Monitor Value**

You can display the current optical output monitor value.  
 This optical output monitor value includes the offset value.

Optical output monitor value = Actual output monitor value + Offset value

Optical output monitor value: Display monitor value (dBm or W)

Actual output monitor value: Value when the offset set value is "0" (dBm or W).



**Starting the ZERO-SET**

When performing the ZERO-SET, the electrical offset inside the sensor is adjusted, allowing you to accurately measure the absolute value. Two kinds of ZERO-SET modes are provided as described below.

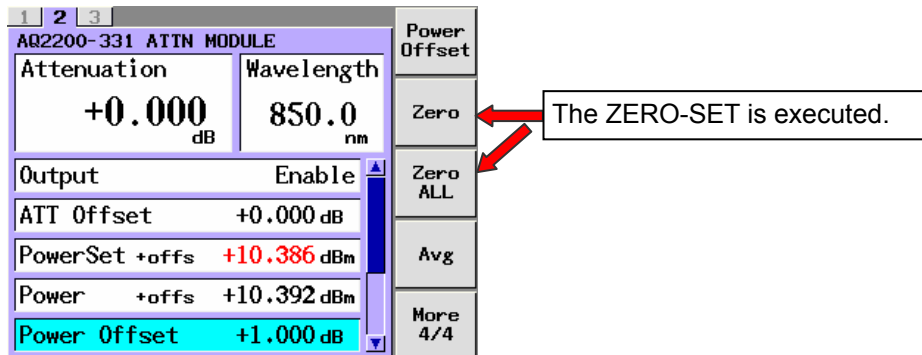
Select a desired mode to execute the ZERO-SET corresponding to your need.

"Zero": Starts the ZERO-SET of the current module.

"Zero All": Starts the ZERO-SET of all mounted sensor modules.

1. Firmly mount the optical shield cap on the optical receiving connector on the sensor you want to perform the ZERO-SET.
2. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. (The following describes the operation on the DETAIL screen.)
3. Set the sensor module to the current module with the [CHAN] key.
4. Press either <Zero> or <Zero All> to start the ZERO-SET.

When the ZERO-SET is completed, the screen is returned to the previous screen.



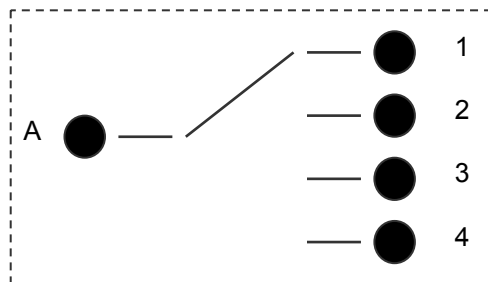
## 6.3 AQ2200-411/421 OSW Module

This OSW module is used to change the connection route among multiple DUTs, which are connected to this module.

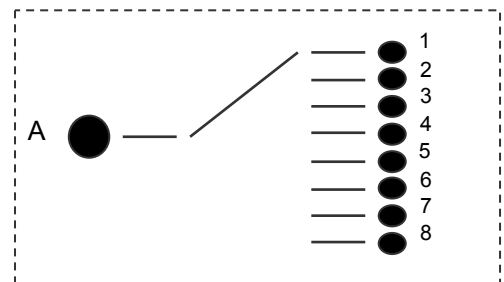
Two kinds of modules are provided, one is the single type module constructing the configuration with one OSW (Optical Switch) and the other is the dual type module constructing the configuration with two OSWs.

The following describes these module types.

**AQ2200-411 OSW Module:** Configuration with single OSW. Two kinds of OSWs are provided, "1 x 4" and "1 x 8". Modules for SM and GI with applicable optical fibers are provided for each OSW type.

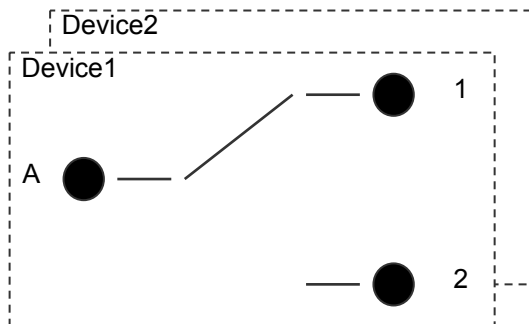


"1 x 4" OSW (For SM and GI)

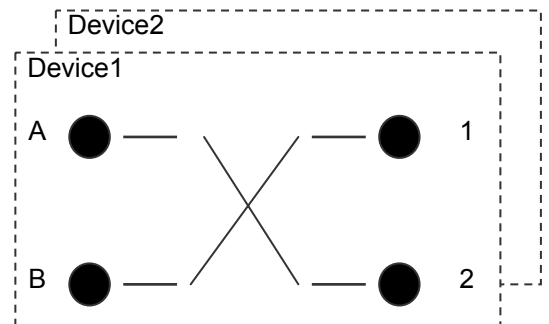


"1 x 8" OSW (For SM and GI)

**AQ2200-421 OSW Module:** Configuration with dual OSWs. Two kinds of OSWs are provided, two "1 x 2" and two "2 x 2". Modules for SM and GI with applicable optical fibers are provided for each OSW type.



"1 x 2" Dual OSWs (For SM and GI)



"2 x 2" Dual OSWs (For SM and GI)

### 6.3.1 AQ2200-411 OSW Module

#### Changing the Connection Port

- The port with port No. "A" is connected to that with any of port Nos. "1" to "n".  
 For "1 x 4", "n" becomes "4".  
 For "1 x 8", "n" becomes "8".

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. On the DETAIL screen, the screen for up to 3 slots is displayed when using the AQ2201 frame controller. When using the AQ2202 frame controller, the screen for up to 9 slots is displayed.

| AQ2201 FRAME CONTROLLER |                     | Route |
|-------------------------|---------------------|-------|
| AQ2200-412 1x8 OSW      |                     |       |
| D1:Route<br><b>A-1</b>  |                     | Menu  |
| AQ2200-421 Dual 1x2 OSW |                     |       |
| D1:Route<br>A-1         | D2:Route<br>A-1     |       |
| AQ2200-421 Dual 2x2 OSW |                     |       |
| D1:Route<br>A-1,B-2     | D2:Route<br>A-1,B-2 |       |

Summary Screen of AQ2201

| AQ2202 FRAME CONTROLLER |                                   | Route |
|-------------------------|-----------------------------------|-------|
| 1                       | PWR -120.1235 dBm WL 1400.0 nm    |       |
| 2                       | D1 A-1                            | Menu  |
| 3                       | PWR -120.1235 dBm WL 1400.0 nm    |       |
| 4                       | D1:Route A-1 D2:Route A-1         |       |
| 5                       | D1:Route A-1,B-2 D2:Route A-1,B-2 |       |
| 6                       | D1 A-1                            |       |
| 7                       | NO MODULE                         |       |
| 8                       | OUT Disable ATT +0.000 dB         |       |
| 9                       | NO MODULE                         |       |

Summary Screen of AQ2202

2. Set the OSW module to the current module with the [CHAN] key.
3. Press <Route> or move the cursor to "Route" and press the [ENTER] key.

Press <Route> or move the cursor to "Route" and press the [ENTER] key.

4. The "Route" popup screen will appear. Move the cursor to a desired connection route you want to set, and then press the <OK> or [ENTER] key. The route setting is then completed.

Press the <OK> or [ENTER] key to determine the route setting.

### 6.3.2 AQ2200-421 OSW Module

#### Changing the Connection Port

The port with port No. "A" or "B" is connected to that with port No. "1" to "2".

For "1 x 2", A-1 or A-2.

For "2 x 2", A-1,B-2 or A-2,B-2

1. Press the [DETAIL] key to display the DETAIL screen or SUMMARY screen. On the DETAIL screen, the screen for up to 3 slots is displayed when using the AQ2201 frame controller. When using the AQ2202 frame controller, the screen for up to 9 slots is displayed.

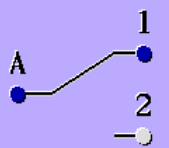
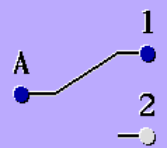
| AQ2201 FRAME CONTROLLER |          | Route |
|-------------------------|----------|-------|
| NO MODULE               |          |       |
|                         |          | Menu  |
| AQ2200-421 Dual 1x2 OSW |          |       |
| D1:Route                | D2:Route |       |
| A-1                     | A-1      |       |
| AQ2200-421 Dual 2x2 OSW |          |       |
| D1:Route                | D2:Route |       |
| A-1,B-2                 | A-1,B-2  |       |

Summary Screen of AQ2201

| AQ2202 FRAME CONTROLLER |                                  | Route |
|-------------------------|----------------------------------|-------|
| 1                       | PWR -120.1235 dBm   WL 1400.0 nm |       |
| 2                       | D1: A-1   D2: A-1                |       |
| 3                       | PWR -120.1235 dBm   WL 1400.0 nm |       |
| 4                       | NO MODULE                        |       |
| 5                       | NO MODULE                        |       |
| 6                       | NO MODULE                        |       |
| 7                       | NO MODULE                        |       |
| 8                       | NO MODULE                        |       |
| 9                       | NO MODULE                        |       |

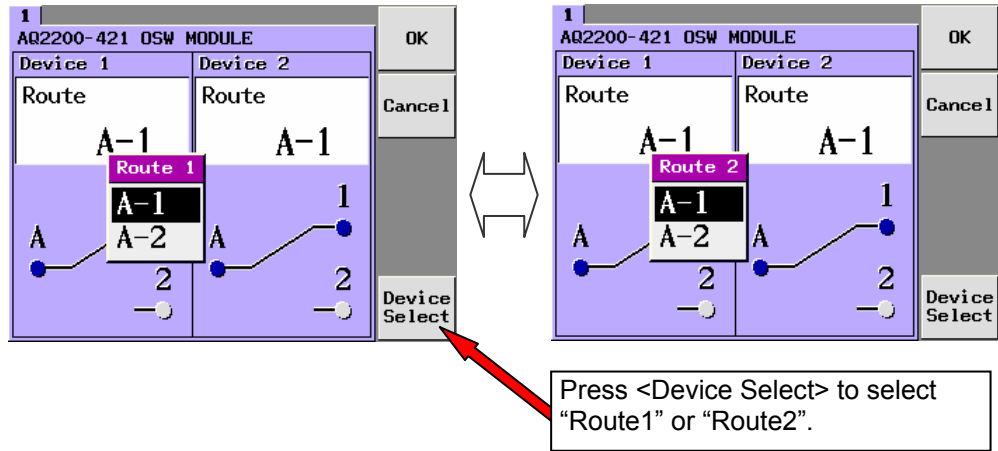
Summary Screen of AQ2202

2. Set the OSW module to the current module with the [CHAN] key.
3. Press <Route> or move the cursor to "Route" and press the [ENTER] key. The "Route1" or "Route2" popup screen will appear.

| AQ2200-421 OSW MODULE   |   | Route |
|---|---|-------|
| Device 1  | Device 2  |       |
| Route   | Route   |       |
| A-1   | A-1   |       |
|  |  |       |

Press <Route> or move the cursor to "Route" and press the [ENTER] key.

4. Press <Device Select>. Every time <Device Select> is pressed, the display on the popup screen is alternately switched between "Route1" and "Route2". On the "Route1" popup screen, the connection route of "Device1" is set. On the "Route2" popup screen, the connection route of "Device2" is set.



5. Move the cursor to a desired connection route you want to set and press the <OK> or [ENTER] key. The route setting is then completed.

# Chapter 7

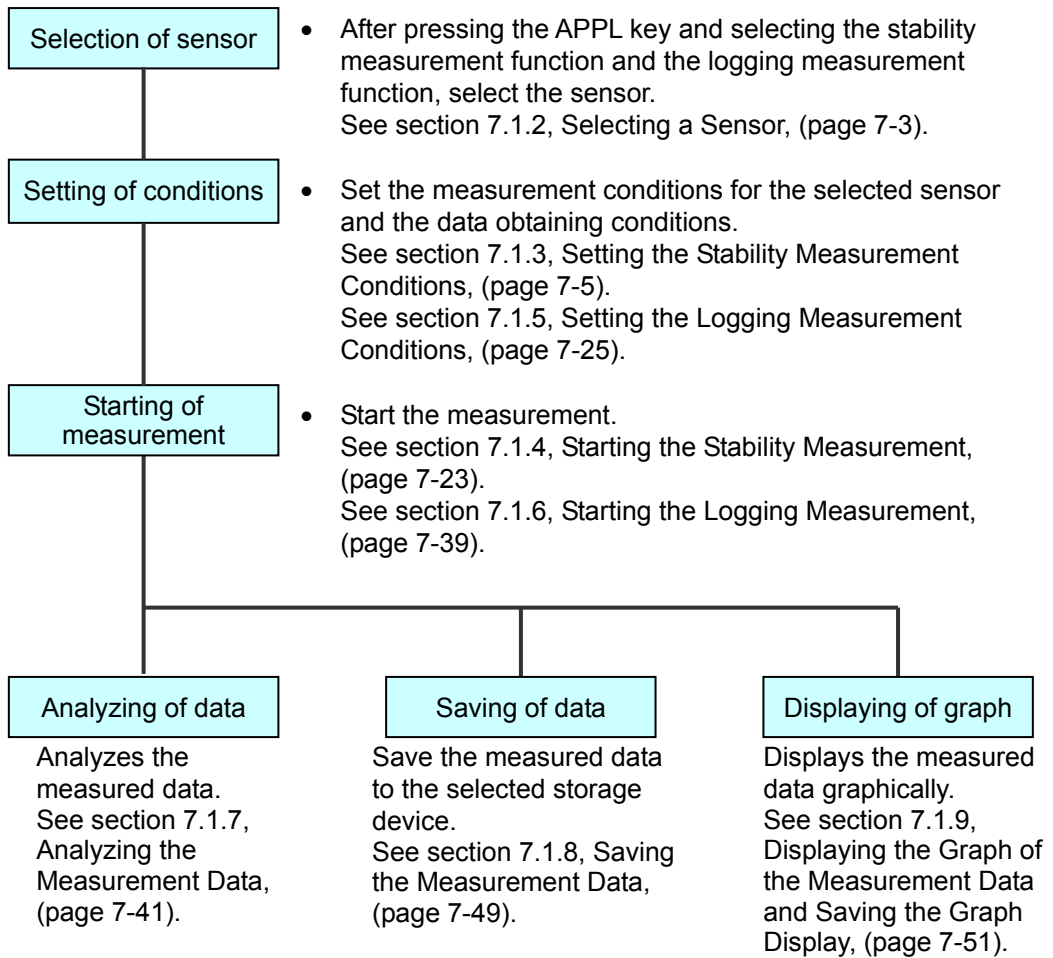
## Convenient Operation

# 7.1 Stability Measurement and Logging Measurement

When obtaining the optical power variation data, use of stability measurement function or logging measurement function makes it possible to easily obtain the data and analyze it.

- **Stability measurement:** Measures variations in optical signal for an extended period of time. This stability measurement is suitable for measurement of the power stability.
- **Logging measurement:** Measures transitions in optical signal that varies within very short time. This logging measurement is suitable for measurement of the transient characteristics.

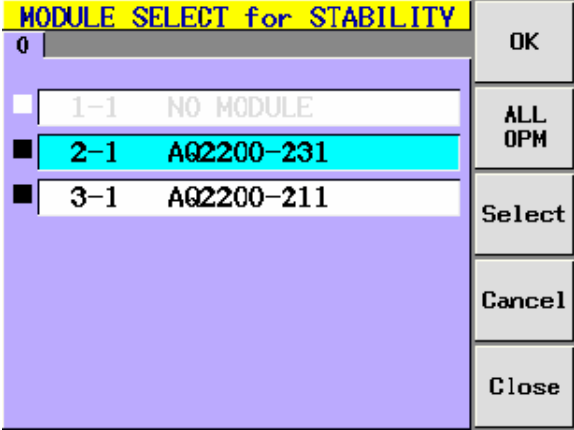
## 7.1.1 Flow of Measurement Operating Procedures



### 7.1.2 Selecting a Sensor

#### Selecting a Sensor

Before starting the stability measurement or logging measurement, select the application (stability measurement or logging measurement), and then select a module, from which you want to obtain the data.



Selecting a Sensor

#### <Function Keys>

- <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.
- <Close>: Exits the application mode.

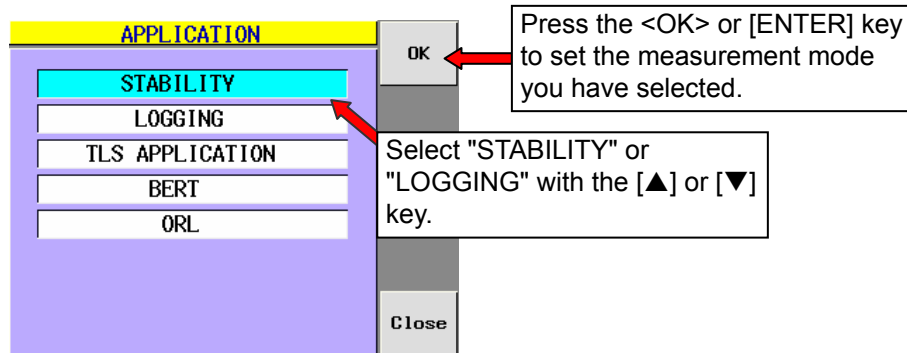
- [CANCEL] key: Returns to the APPLICATION selection screen.
- [▲], [▼] key: Moves the cursor up or down.
- [ENTER] key: Sets the sensor you have selected and changes the screen to the STABILITY APPLICATION screen or LOGGING APPLICATION screen.  
If no selection check boxes are checked on, the screen does not change to the next screen.

Selection check box: Shows the module selected/not selected.  
■ shows that the module is selected while □ shows that the module is not selected.

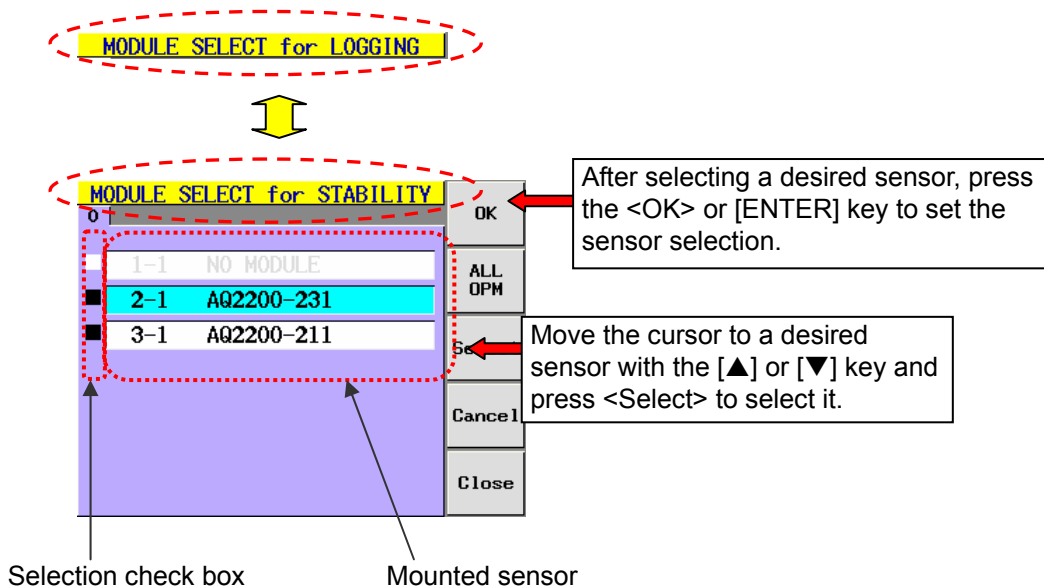
Mounted module: Shows the mounted slot and sensor name.  
You cannot select any dimmed module.

**NOTE** | In the application mode, the buttons on the panel of the sensor module are inactive.

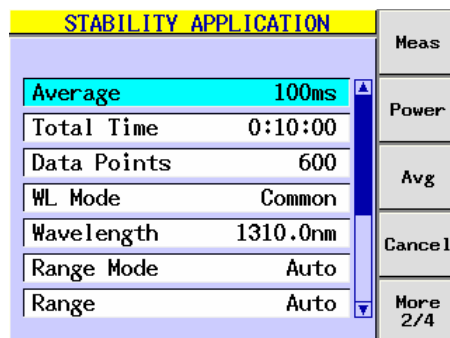
1. Press the [APPL] key to display the APPLICATION selection screen.
2. Move the cursor to "STABILITY" or "LOGGING" and press the <OK> or [ENTER] key.



3. The MODULE SELECT for STABILITY screen or MODULE SELECT for STABILITY screen appears. Move the cursor to a sensor you want to use it for the measurement. Press <Select> to select the sensor. After the sensor has been selected completely, press <OK>.



4. The sensor selection is completed and the measurement condition setup screen appears.



### 7.1.3 Setting the Stability Measurement Conditions

To start the stability measurement, it is absolutely necessary to set the following items. You must start the measurement after all items have been set completely.

- 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

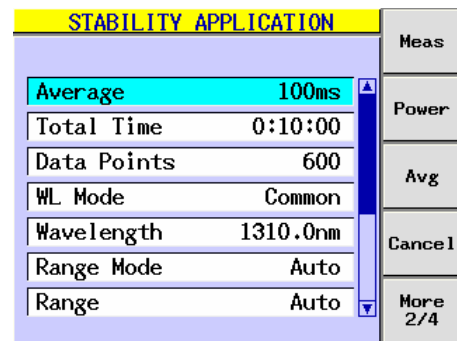


Fig. 7-1 STABILITY Measurement Condition Setup Screen

#### <Function Keys>

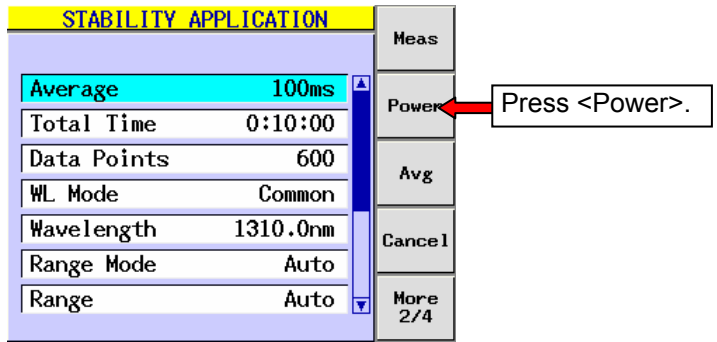
- |                |   |
|----------------|---|
| <Meas>:        | Changes to the Measurement Start Check screen.              |
| <Power>:       | Shows the current measurement value of the selected sensor. |
| <Avg>:         | Sets the averaging time.                                    |
| <Total Time>:  | Sets the measurement 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.                                     |
| <Mod>:         | Sets the measurement optical modulation mode.               |
| <Cancel>:      | Returns to the sensor selection screen.                     |
| <Close>:       | Exits the application mode.                                 |
| [▲], [▼] key:  | Moves the cursor up or down.                                |
| [ENTER] key:   | Sets the contents on the cursor line.                       |

#### NOTE

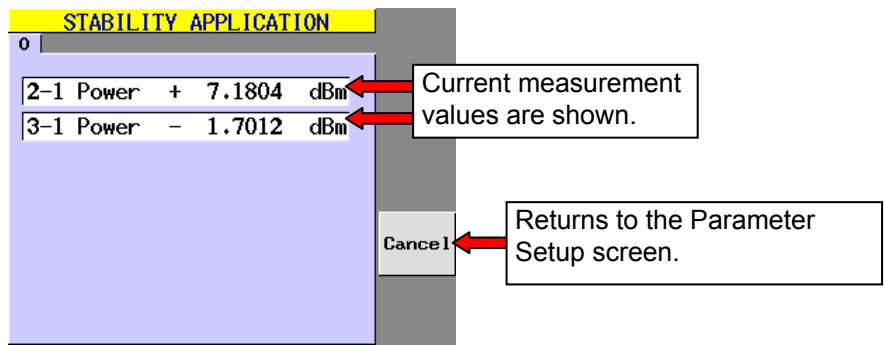
If the selected sensor includes the AQ2200-221 or AQ2200-215, settings for the measurement optical modulation mode cannot be entered (CW mode only). The settings fields are dimmed.

**■ Displaying the Current Measurement Value**

1. Press <Power>.



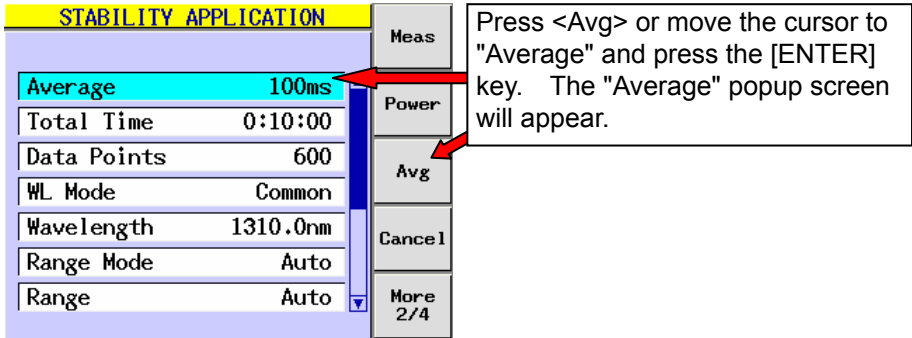
2. The screen changes to the measurement value display screen.



**Setting the Averaging Time**

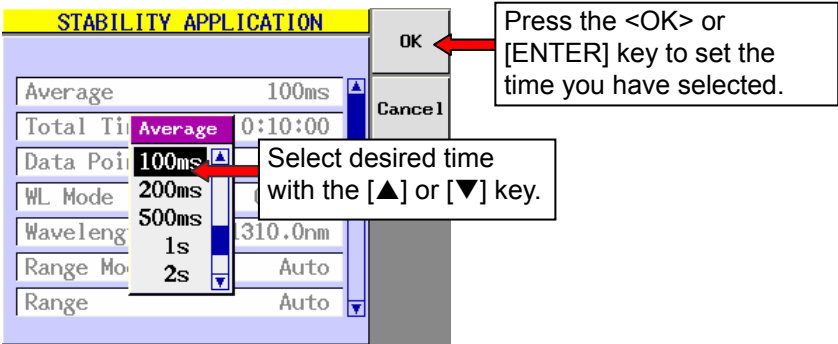
The data of the time set in this section is averaged to one measurement data.  
For the allowable averaging time, see "Table 4.1 Averaging Time by Modulation Setting" (page 4-14).

- 1. Press <Avg> or move the cursor to "Average" and press the [ENTER] key.



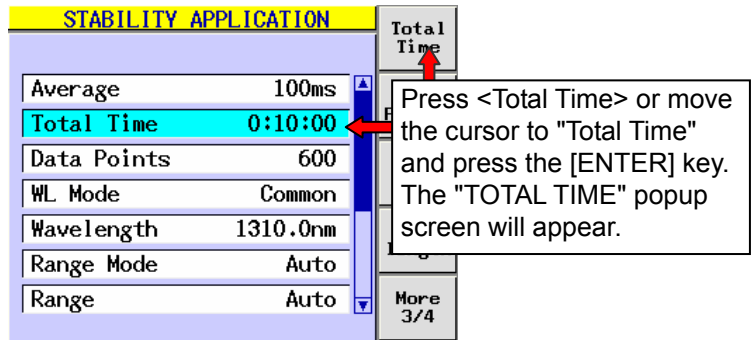
- 2. The "Average" popup screen will appear.  
Move the cursor to a desired averaging time and press the <OK> or [ENTER] key.

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

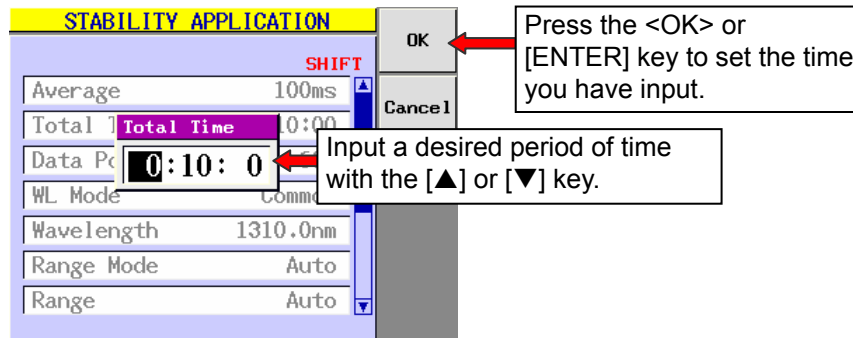


**Setting the Measurement Time (Total Time)**

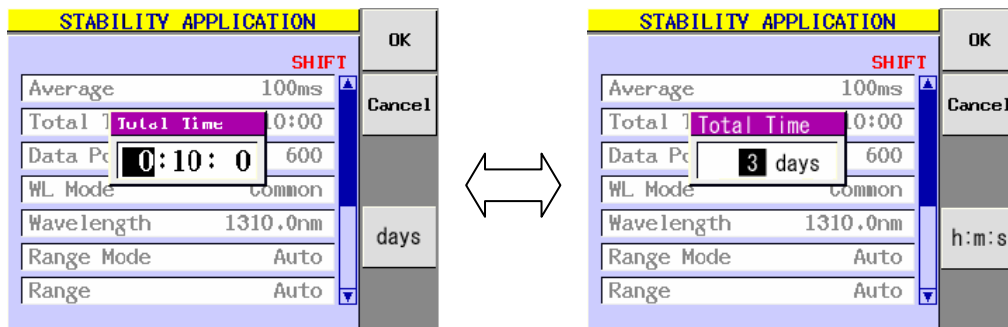
1. Press <Total Time> or move the cursor to "Total Time" and press the [ENTER] key.



2. The "TOTAL TIME" popup screen will appear. Input a desired period of time you want to measure (0 hr. 0 min. 1 sec. to 23 hr. 59 min. 59 sec.) with the ten-key pad or cursor, and then press the <OK> or [ENTER] key.



When pressing <days>, the "Total Time" setting is changed from "h:m:s" to "days". Every time <days> is pressed, the setting method can be changed. The setting range of "days" is 1 to 99 days in steps of days. Pressing <h:m:s> resets the "Total Time" setting to hours, minutes, and seconds.



**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.

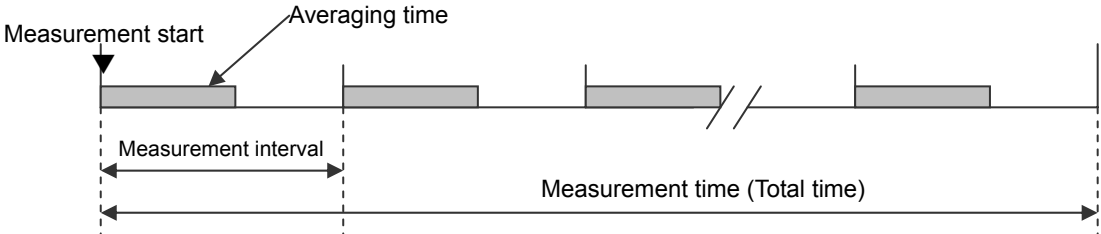
Measurement Interval = Total Time / Data Points  
 and Measurement Interval => 100ms

[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.)

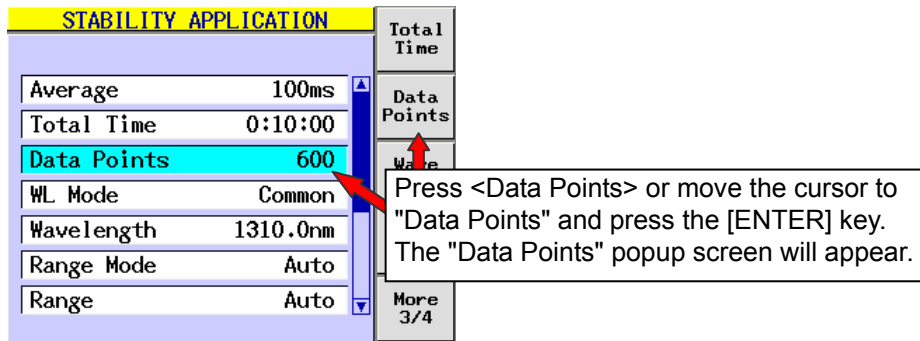


Additionally, when the optical input is set at "CHOP" in the optical input modulation mode, the minimum setting interval is determined by the averaging time as shown in Table 7-1 to automatically correct the minimum setting interval.

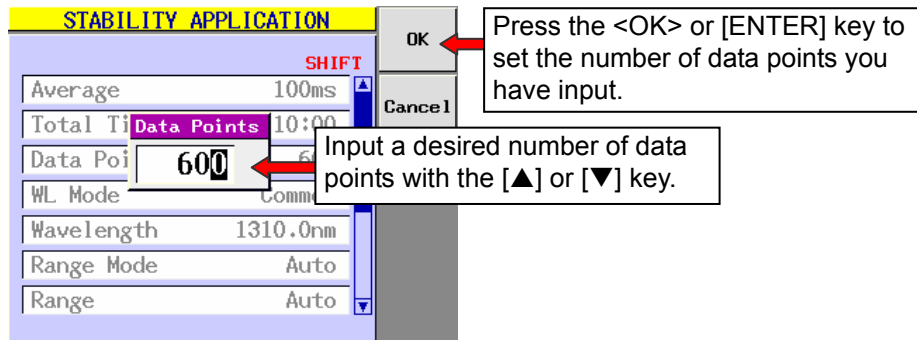
**Table 7-1 Averaging Time and Minimum Measurement Interval**

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

1. Press <Data Points> or move the cursor to "Data Points" and press the [ENTER] key.



2. The "Data Points" popup screen will appear. Input a desired number of data points you want to measure with the ten-key pad or cursor, and then press the <OK> or [ENTER] key.



**NOTE** || For AQ2200-221, the number of data points setting becomes 1 to 10,000.

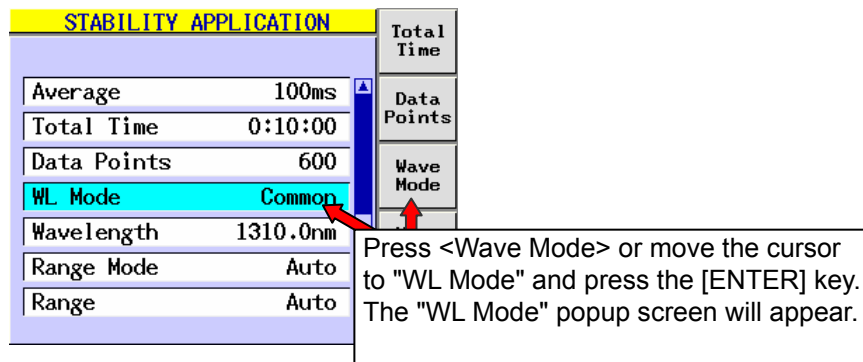
**Setting the Measurement Wavelength Mode and Measurement Wavelength**

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

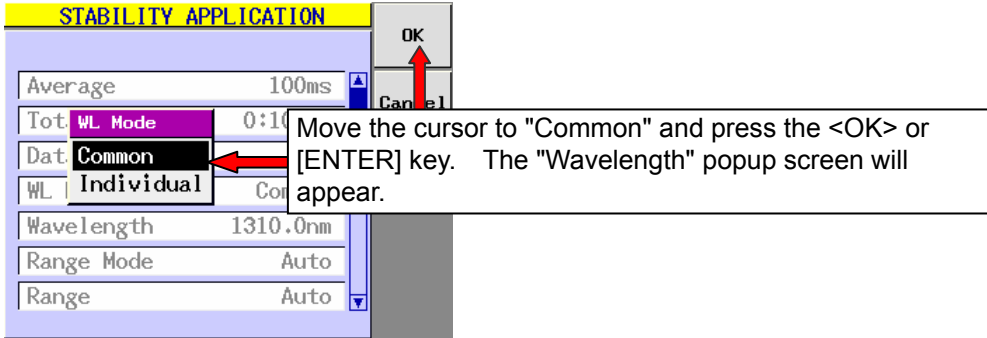
**Setting the Measurement Wavelength Mode**

**<Common Wavelength Setting>**

1. Press <Wave Mode> or move the cursor to "WL Mode" and press the [ENTER] key.

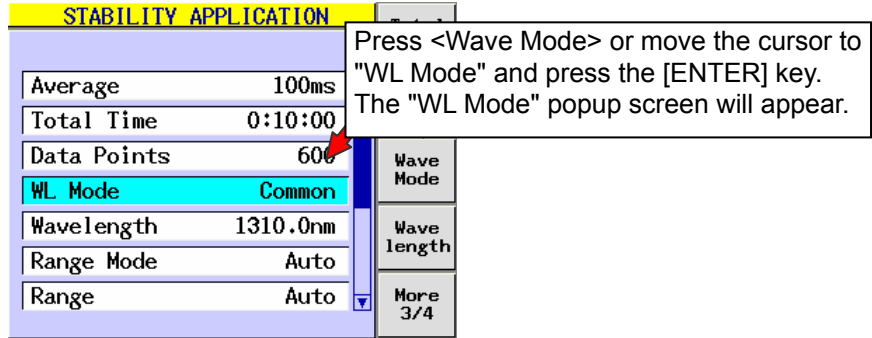


- 2. The "WL Mode" popup screen will appear. Move the cursor to "Common" and press the <OK> or [ENTER] key. The wavelength setting shortcut menu will appear. Enter the wavelength (see item 2 on P7-12).

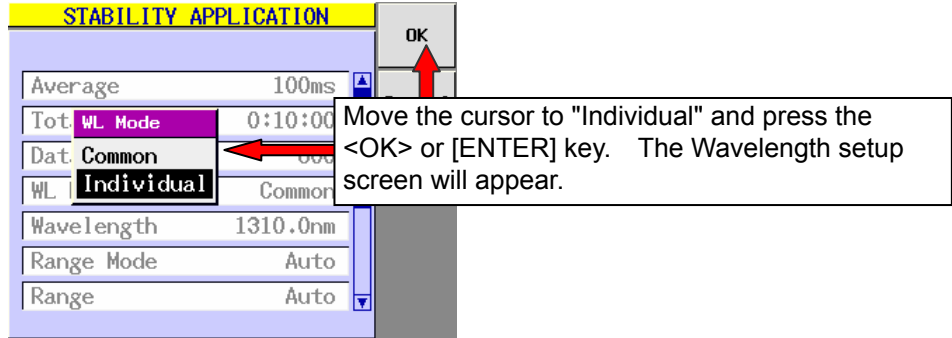


<Individual Waveform Setting>

- 1. Press <Wave Mode> or move the cursor to "WL Mode" and press the [ENTER] key.



- 2. The "WL Mode" popup screen will appear. Move the cursor to "Individual" and press the <OK> or [ENTER] key. The Wavelength setup screen will appear. The wavelength screen is displayed. Enter the individual wavelengths (see item 2 on P7-13).

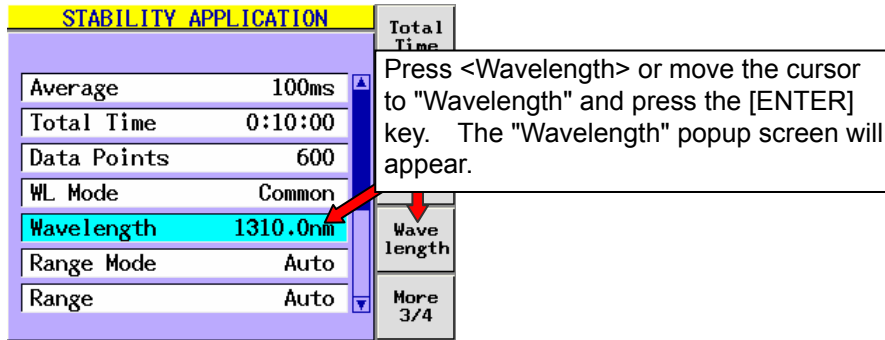


■ **Setting the Measurement Wavelength**

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

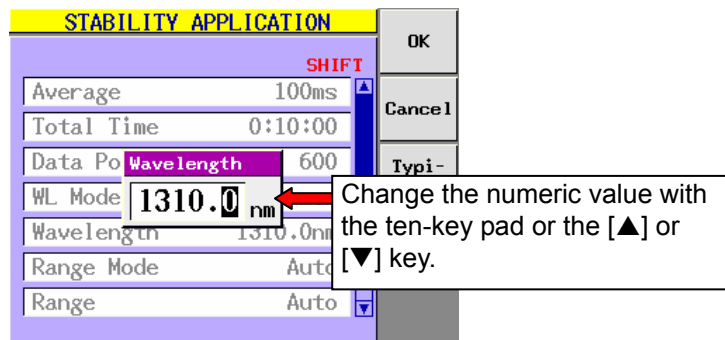
**<Common Measurement Wavelength Mode>**

1. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.

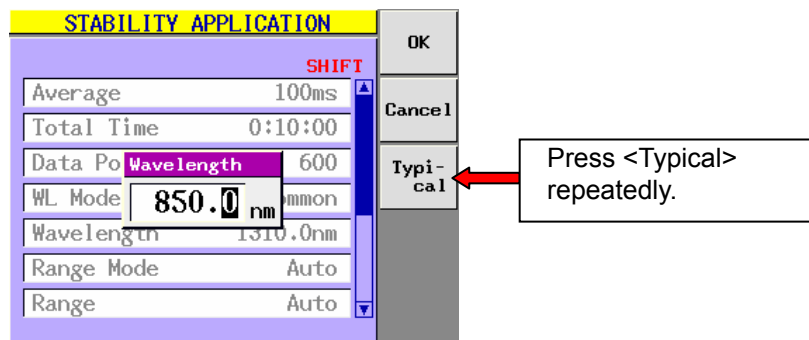


2. The "Wavelength" popup screen will appear. Change the numeric value using any of two operating procedures shown below

- ① Changing the numeric value with the ten-key pad or the [▲] or [▼] key  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

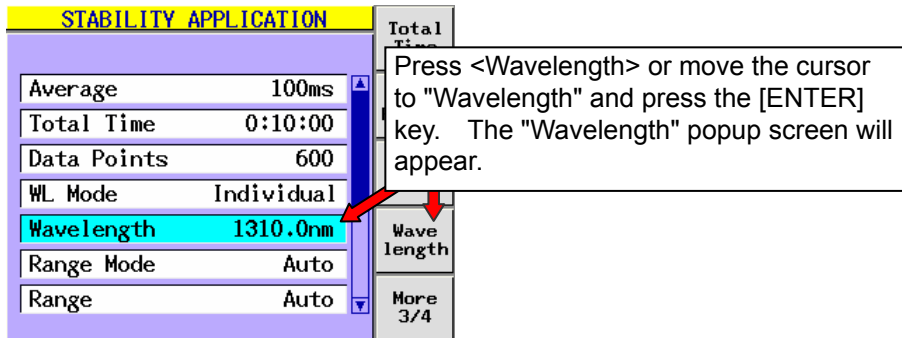


- ② Changing the numeric value with <Typical>  
Press <Typical> repeatedly to sequentially change the typical value.

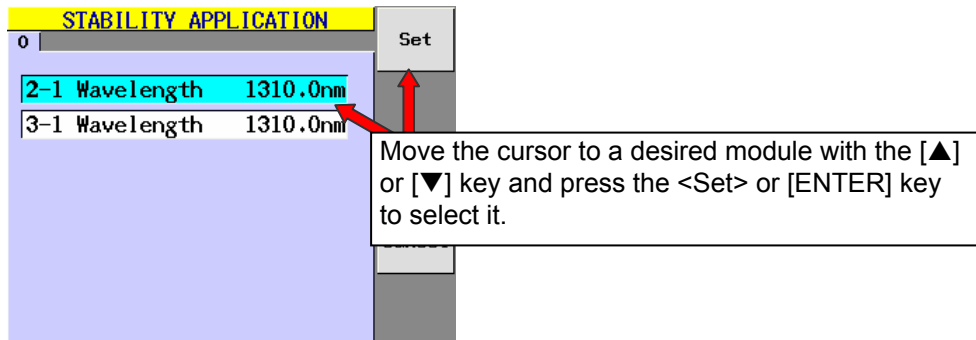


**<Individual Measurement Wavelength Mode>**

1. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.

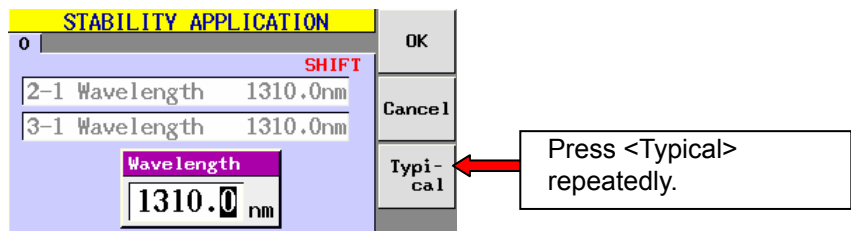


2. Move the cursor to a desired module you want to set the wavelength with the [▲] or [▼] key and press the <Set> or [ENTER] key.



Change the numeric value using any of two operating procedures shown below

- ① Changing the numeric value with the ten-key pad or the [▲] or [▼] key  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.
- ② Changing the numeric value with <Typical>  
Press <Typical> repeatedly to sequentially change the typical value.



3. When the wavelength setting of all modules is completed by repeating step 2, press <Cancel>.

**NOTE**

- The setting range may vary depending on the model of the sensor. If the measurement wavelength mode is Common, you can select any of the settings available on all selected sensors.
- The following shows the typical values to be selected with <Typical>.
 

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

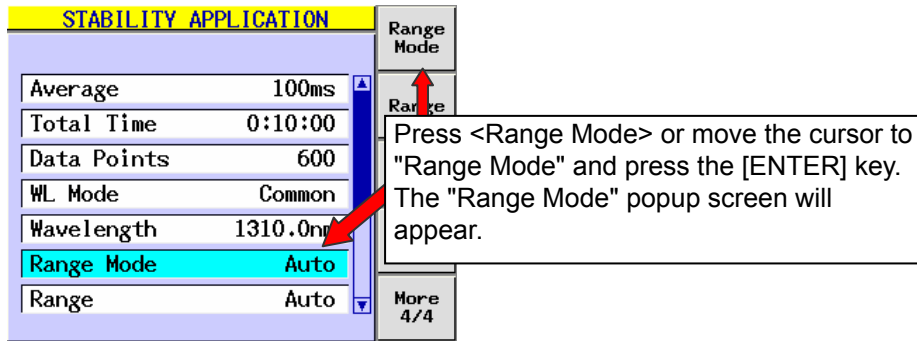
**Setting the Measurement Power Range Mode and Measurement Power Range**

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

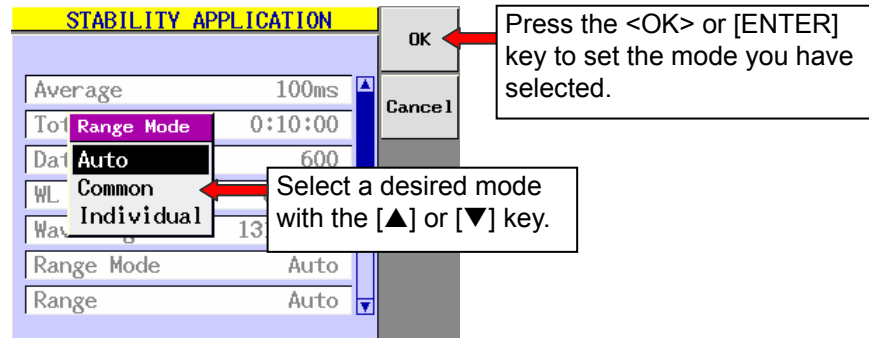
**Setting the Measurement Power Range Mode**

**<Common Range Setting>**

1. Press <Range Mode> or move the cursor to "Range Mode" and press the [ENTER] key.



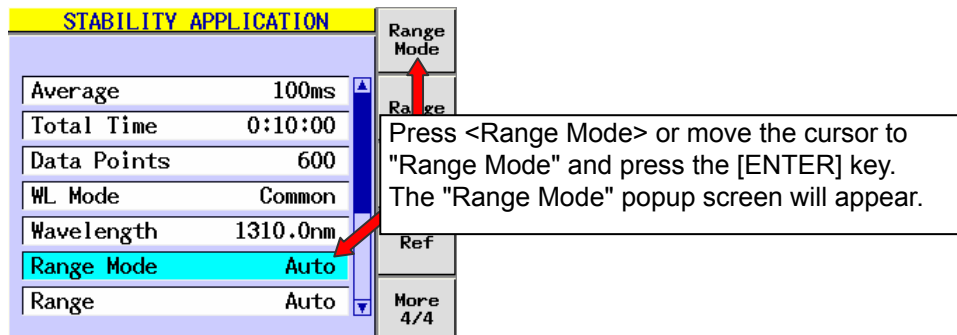
2. The "Range Mode" popup screen will reappear. Move the cursor to either of "Common" or "Auto", and then press the <OK> or [ENTER] key.



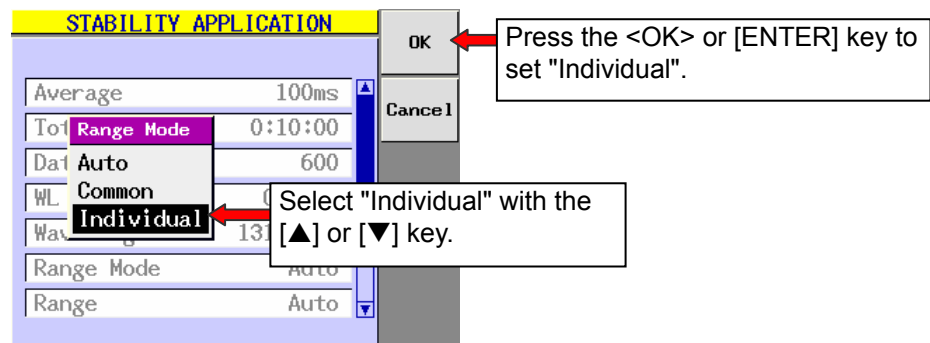
3. When "Auto" is selected, all modules start the measurement in the auto range mode. If you select Common, the Range shortcut menu appears. Set the range (see item 2 on P7-15).

**<Individual Range Setting>**

1. Press <Range Mode> or move the cursor to "Range Mode" and press the [ENTER] key.



- The "Range Mode" popup screen will reappear. Move the cursor to "Individual" and press the <OK> or [ENTER] key. The range settings screen appears. Enter the individual ranges (see item 2 on P7-16).

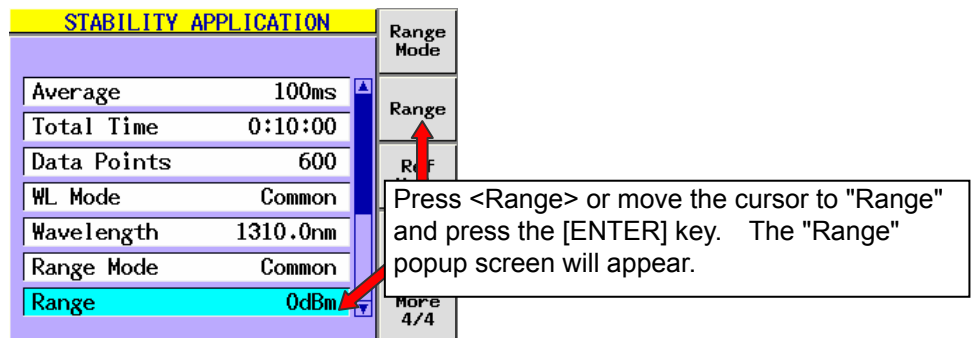


### ■ Setting the Measurement Power Range

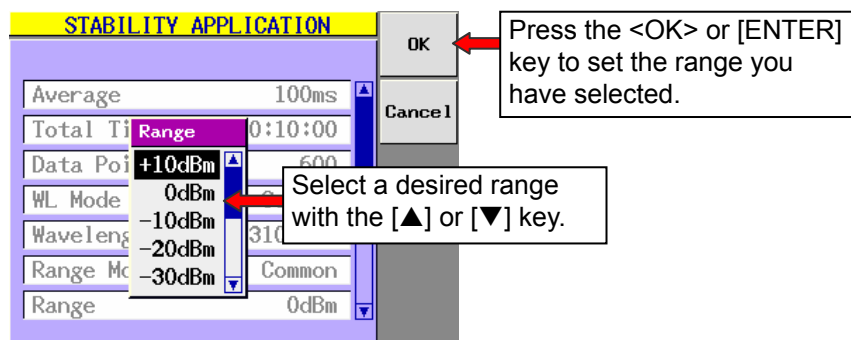
You can set a measurement power range for the current measurement power range mode setting. When the measurement power range mode is set at "Common" or "Individual", you can set a power range.

#### <Common Measurement Power Range Mode>

- Press <Range> or move the cursor to "Range" and press the [ENTER] key.

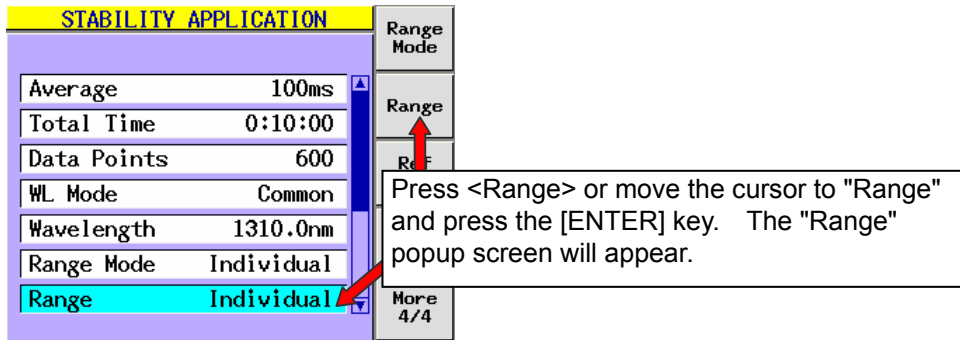


- The "Range" popup screen will appear. Move the cursor to a desired range you want to measure and press the <OK> or [ENTER] key.

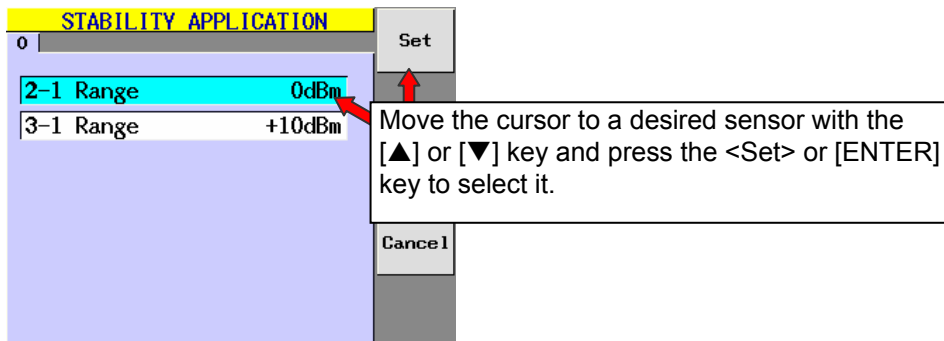


**<Individual Measurement Power Range Mode>**

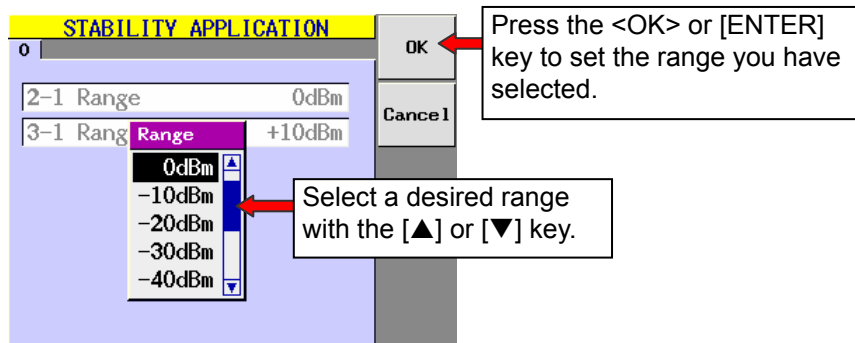
1. Press <Range> or move the cursor to "Range" and press the [ENTER] key.



2. The Range setup screen will appear. Move the cursor to a desired sensor you want to set the range with the [▲] or [▼] key and press the <Set> or [ENTER] key.



3. The "Range" popup screen will appear. Move the cursor to a desired range you want to measure and press the <OK> or [ENTER] key.



4. When the range setting of all sensors is completed by repeating steps 2 and 3, press <Cancel>.

**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.

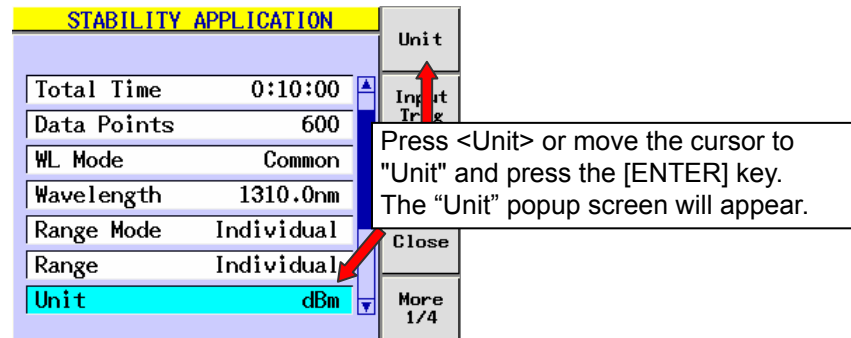
### Setting the Display Unit

You can set a desired measurement display unit.

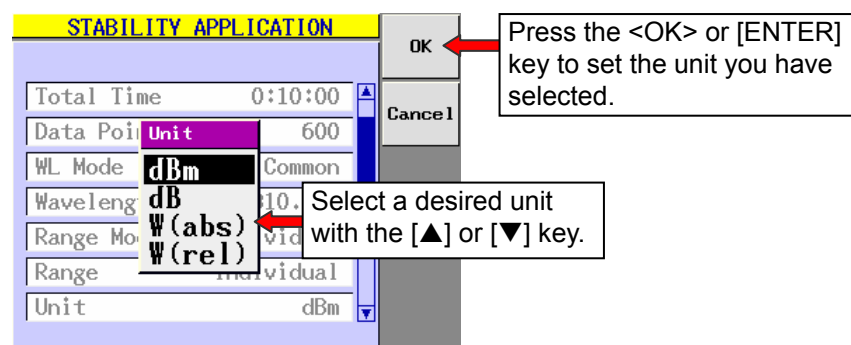
When the measurement unit is set to "dB" or "W(rel)", the relative values become the measurement results.

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 <Unit> or move the cursor to "Unit" and press the [ENTER] key.



2. The "Unit" popup screen will appear. Move the cursor to a desired display unit and press the <OK> or [ENTER] key.



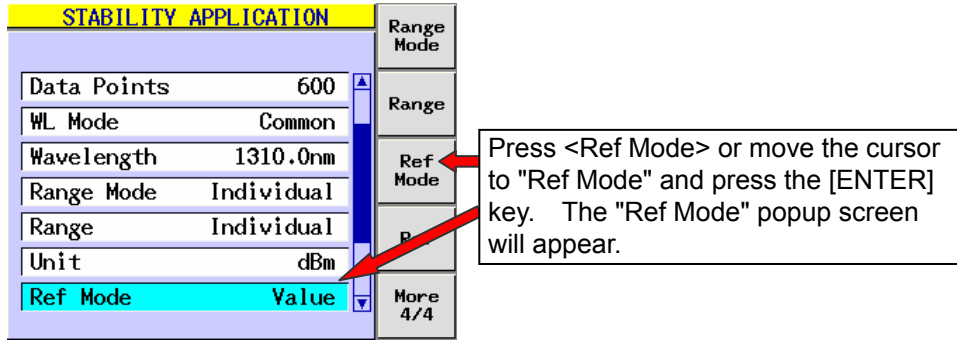
### Setting the Reference Mode

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

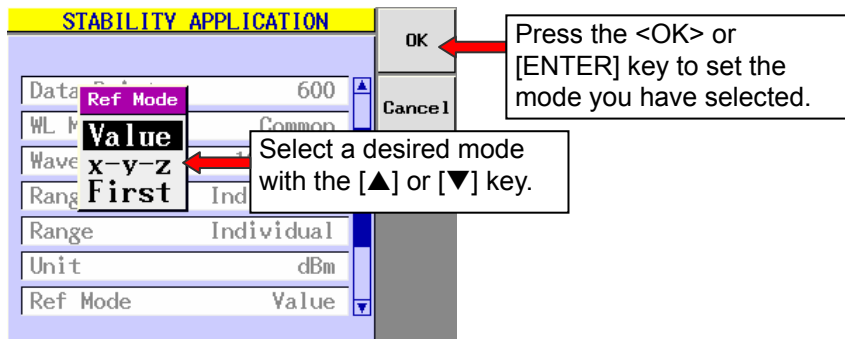
Follow the steps below to set the reference.

- 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

1. Press <Ref Mode> or move the cursor to "Ref Mode" and press the [ENTER] key.

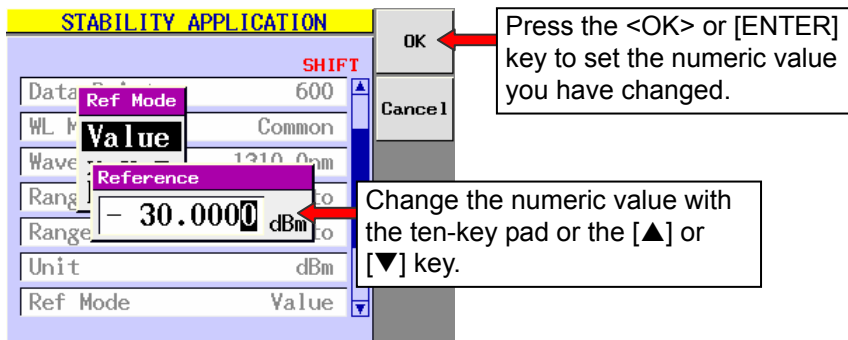


2. The "Ref Mode" popup screen will appear. Move the cursor to "Value", "x-y-z", or "First", and press the <OK> or [ENTER] key. When "Value" or "x-y-z" is selected, perform the subsequent settings.



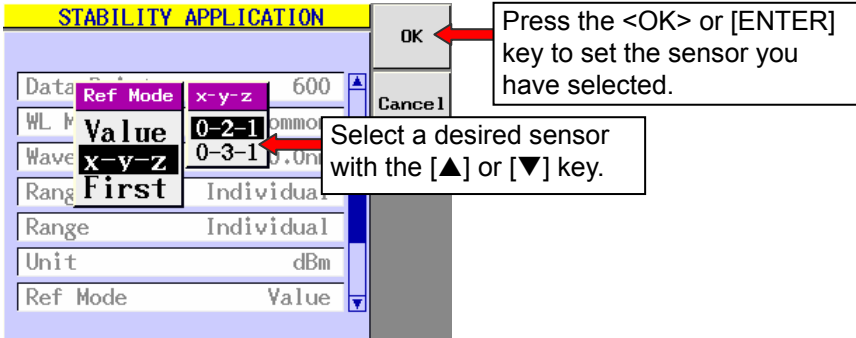
<"Value" Is Selected>

- The "Reference" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.



<"x-y-z" Is Selected>

The "x-y-z" popup screen will appear. Sensors used for the relative measurement are listed. Move the cursor to a desired sensor for the relative measurement and press the <OK> or [ENTER] key.



NOTE

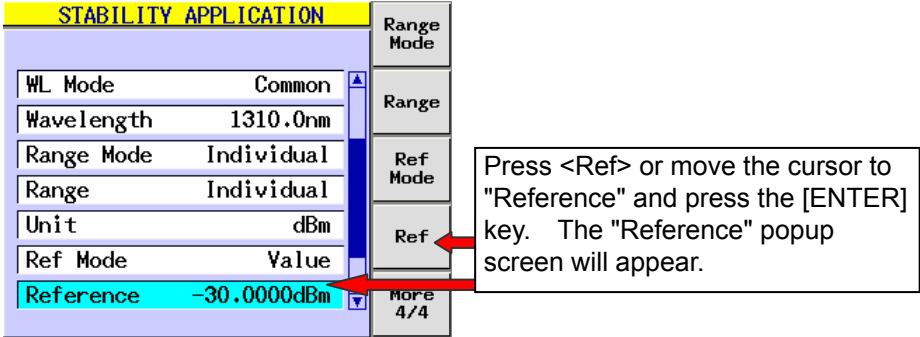
When setting the reference mode, the relative measurement reference value is shown in the Reference field.

- “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>

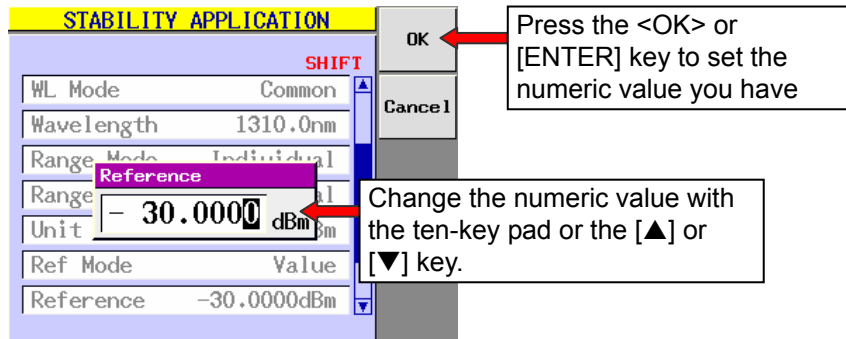
Setting a Reference Value

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

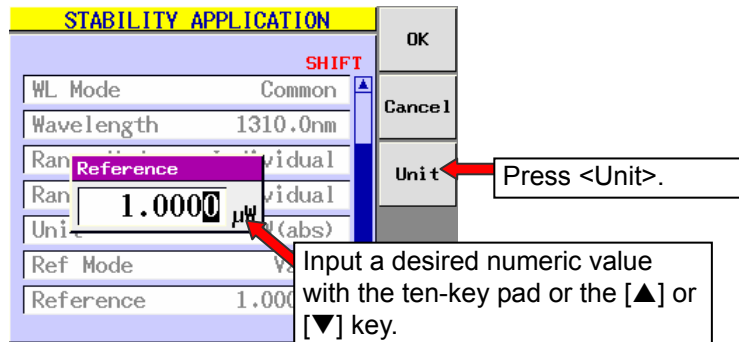
1. Press <Ref> or move the cursor to "Reference" and press the [ENTER] key.



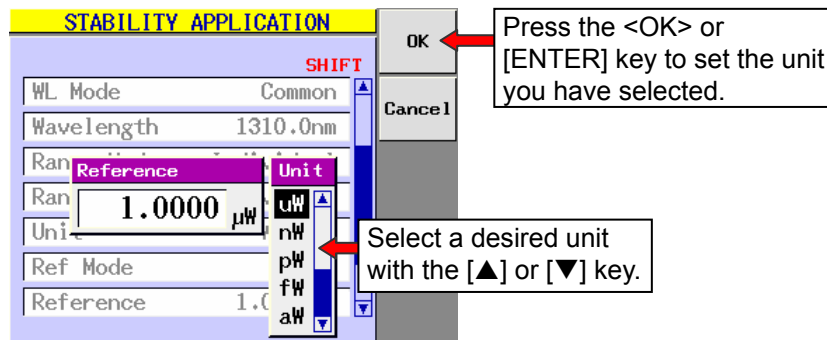
- The "Reference" popup screen will appear.  
 Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.  
 Additionally, to change the unit when the measurement display is "W(abs)" or "W(rel)", see steps 3 and 4.



- Press <Unit>.



- The "Unit" popup screen will appear.  
 Move the cursor to a desired display unit and press the <OK> or [ENTER] key.

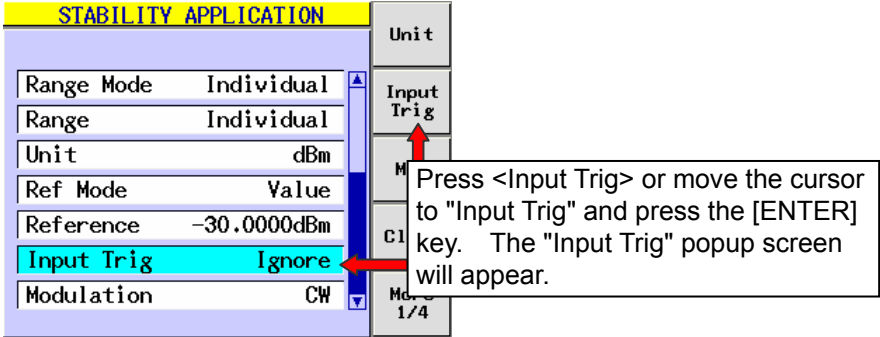


**NOTE** || If the reference mode is x-y-z or First, it changes to Value when setting reference values.

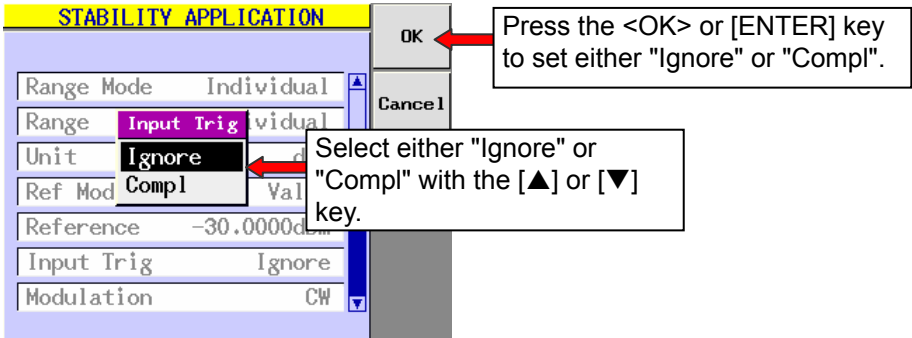
**Setting the Input Trigger Mode**

The stability measurement can be started by the external input trigger. This section describes how to make the external trigger enabled or disabled.

- 1. Press <Input Trig> or move the cursor to "Input Trig" and press the [ENTER] key.



- 2. The "Input Trig" popup screen will appear. Move the cursor to "Ignore" (input trigger is disabled) or "Compl" (input trigger is enabled) and press the <OK> or [ENTER] key.



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

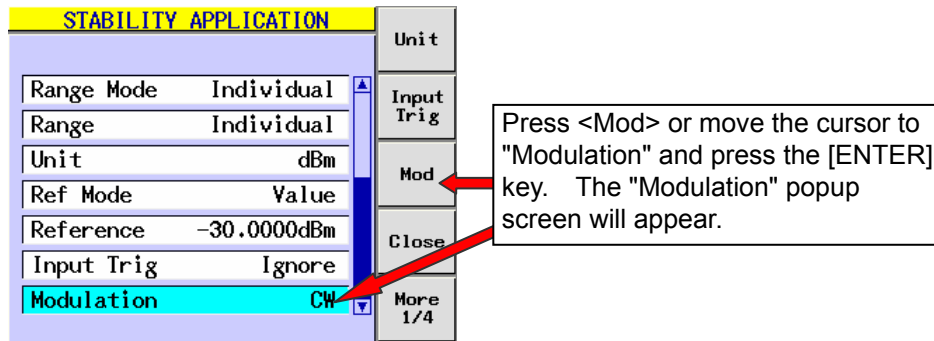
### Setting the Measurement Optical Modulation Mode

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

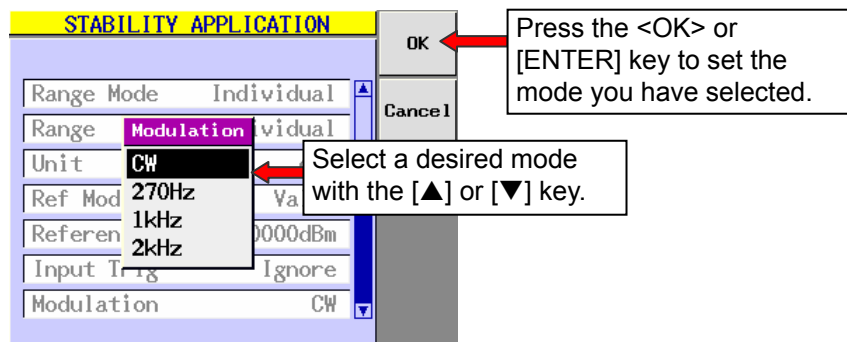
For the modulation mode, you can select CW light or CHOP (50%DUTY).

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

1. Press <Mod> or move the cursor to "Modulation" and press the [ENTER] key.



2. The "Modulation" popup screen will appear. Move the cursor to a desired mode and press the <OK> or [ENTER] key. Additionally, when "CHOP" is set, the LED on the sensor panel is lit.

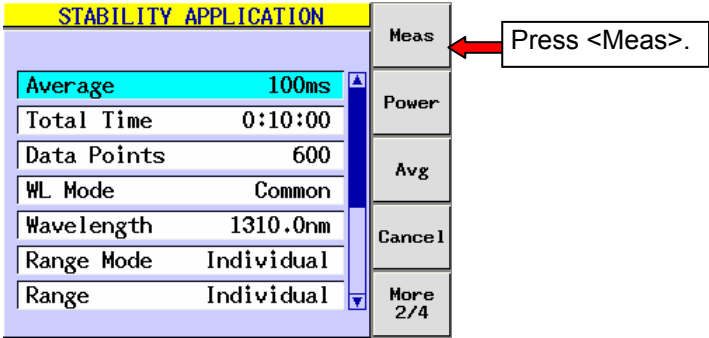


#### NOTE

- 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).

### 7.1.4 Starting the Stability Measurement

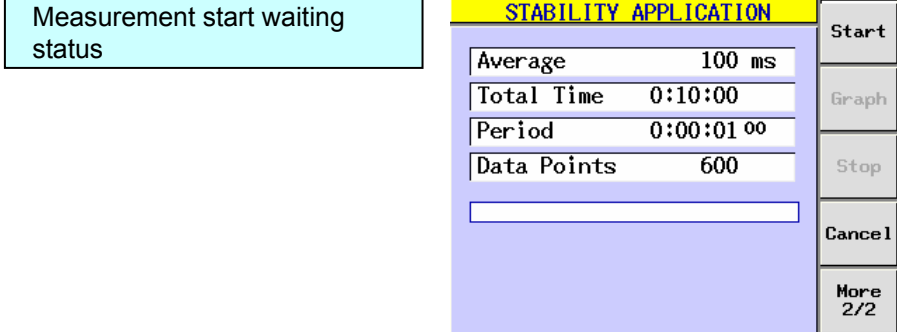
- When pressing <Meas> on the measurement condition setup screen, the measurement check screen will appear. On the measurement check screen, the time setting is shown.



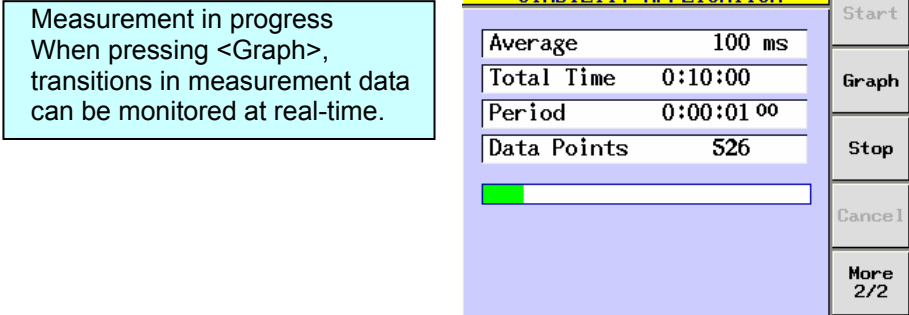
**NOTE** | If the relationship between the measurement interval and number of data points does not meet the criterion, it is automatically adjusted. Start measurement after checking this in the measurement confirmation screen.

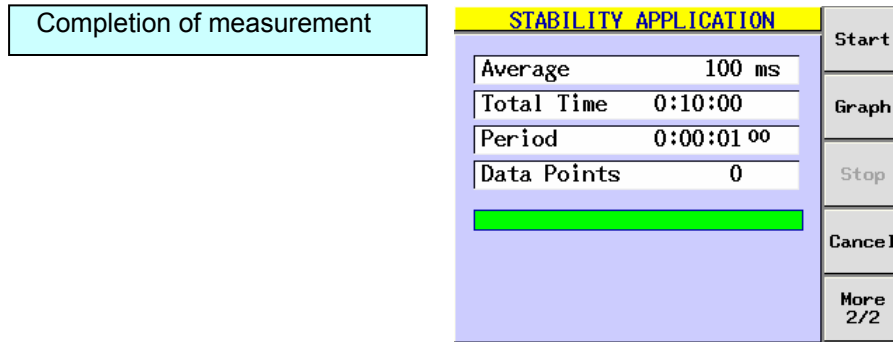
- When pressing <Start>, the measurement is started and the value shown in the "Data Points" field is counted down. When the progress bar reaches the full-scale level and the value shown in the "Data Points" field becomes "0", the measurement is then completed.

#### <Stability Measurement>



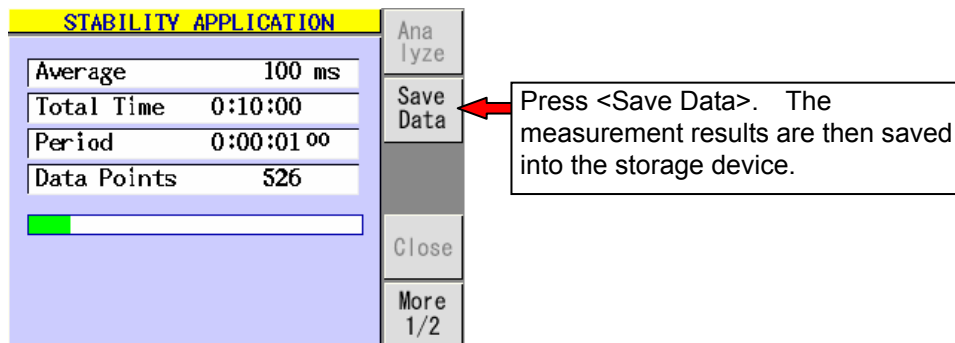
↓ Press <Start>.





- <Start>: Starts the measurement.
- <Stop>: Stops the measurement.
- <Graph>: Displays currently obtaining data and obtained data in the measurement graphically.  
For details, see section 7.1.9, Displaying the Graph of the Measurement Data and Saving the Graph Display, (page 7-51).
- <Analyze>: Analyzes the data, which has been obtained in the measurement. <Analyze> cannot be selected during measurement.  
For details, see section 7.1.7, Analyzing the Measurement Data, (page 7-41).
- <Save Data>: Saves the data, which has been obtained in the measurement, into the storage device.  
For details, see section 7.1.8, Saving the Measurement Data, (page 7-49).
- <Cancel>: Returns to the setup screen.
- <Close>: Exits the application mode.
  
- 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.

When pressing <Save Data> during measurement, the measurement results obtained at the <Save Data> pressing timing are then saved into the storage device. For details, see section 7.1.8, Saving the Measurement Data, (page 7-49).



### 7.1.5 Setting the Logging Measurement Conditions

To start the logging measurement after entering the logging measurement mode, it is absolutely necessary to set 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 APPLICATION |             | Meas        |
|---------------------|-------------|-------------|
| Average             | 100 $\mu$ s | Power       |
| Data Points         | 600         | Avg         |
| WL Mode             | Common      | Cancel      |
| WaveLength          | 1310.0nm    | More<br>2/4 |
| Range Mode          | Common      |             |
| Range               | +10dBm      |             |
| Unit                | dBm         |             |

**Fig. 7-2 LOGGING Measurement Condition Setup Screen**

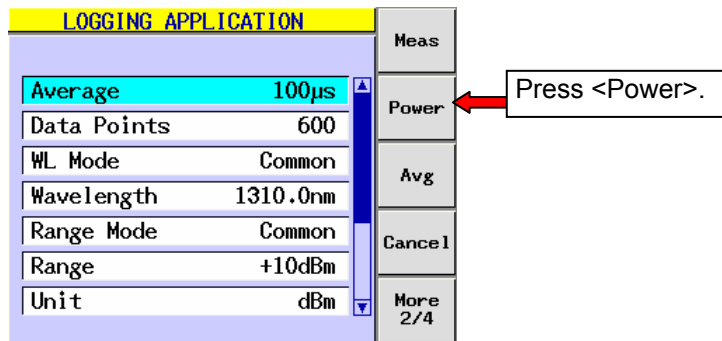
#### <Function Keys>

|                |   |
|----------------|---|
| <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.                     |
| <Close>:       | Exits the application mode.                                 |

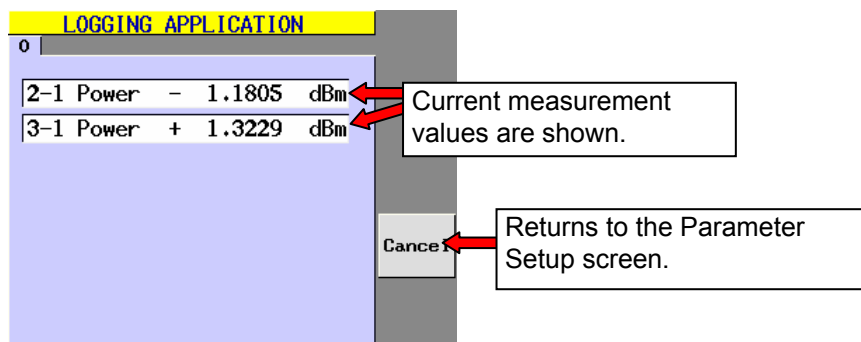
|               |                                       |
|---------------|---------------------------------------|
| [▲], [▼] key: | Moves the cursor up or down.          |
| [ENTER] key:  | Sets the contents on the cursor line. |

### Displaying the Current Measurement Value

1. Press <Power>.



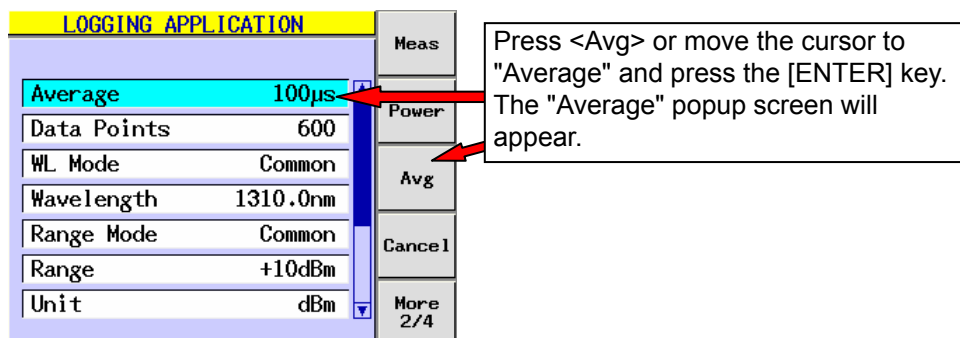
2. The screen changes to the measurement value display screen.



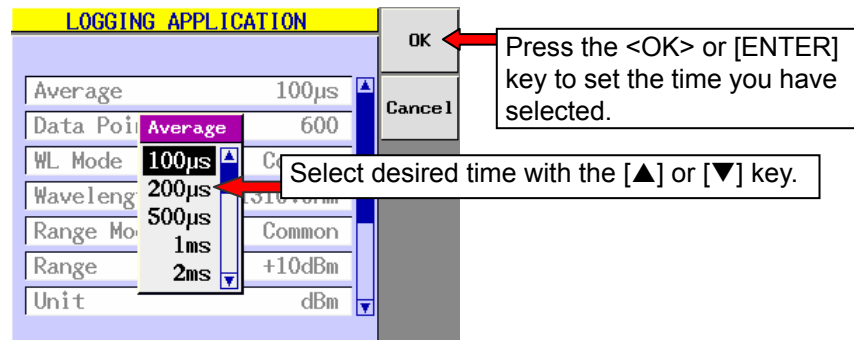
### Setting the Averaging Time

The data of the time set in this section is averaged to one measurement data. For the allowable averaging time, see "CW setting" in table 4-1, "Averaging Time by Modulation Setting," (page 4-14).

1. Press <Avg> or move the cursor to "Average" and press the [ENTER] key.



- The "Average" popup screen will appear.  
Move the cursor to a desired averaging time and press the <OK> or [ENTER] key.

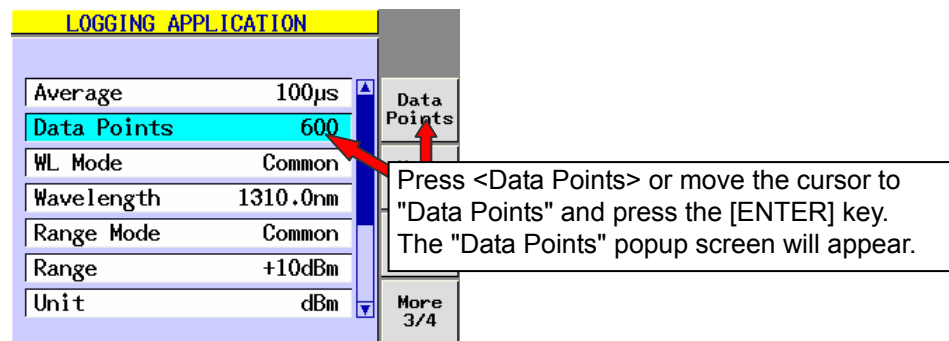


**NOTE** | You can select any of the averaging time settings that are available on all selected sensors.

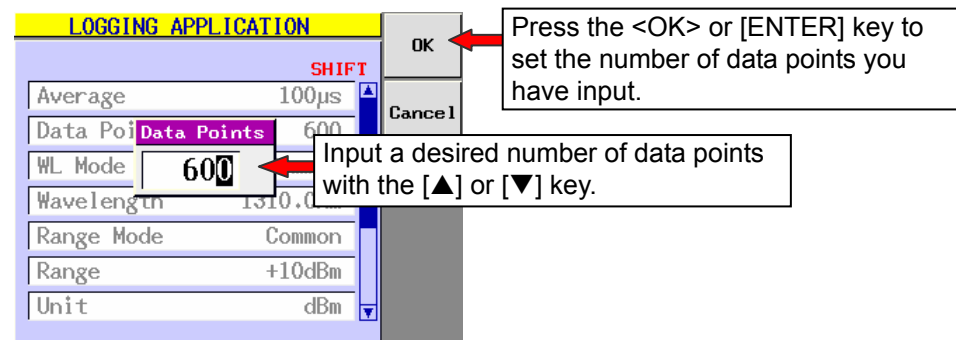
### Setting the Number of Measurement Samples

The measurement samples you have set here are measured.

- Press <Data Points> or move the cursor to "Data Points" and press the [ENTER] key.



- The "Data Points" popup screen will appear.  
Input a desired number of data points you want to measure with the ten-key pad or cursor, and then press the <OK> or [ENTER] key.



**NOTE** | For AQ2200-221, the number of data points setting becomes 1 to 10,000.

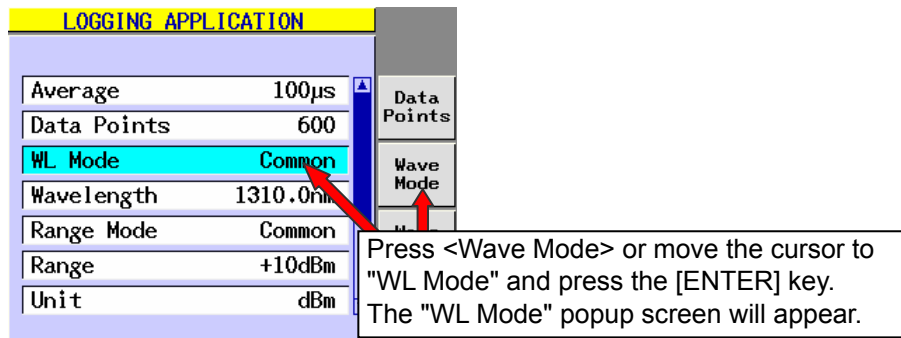
**Setting the Measurement Wavelength Mode and Measurement Wavelength**

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

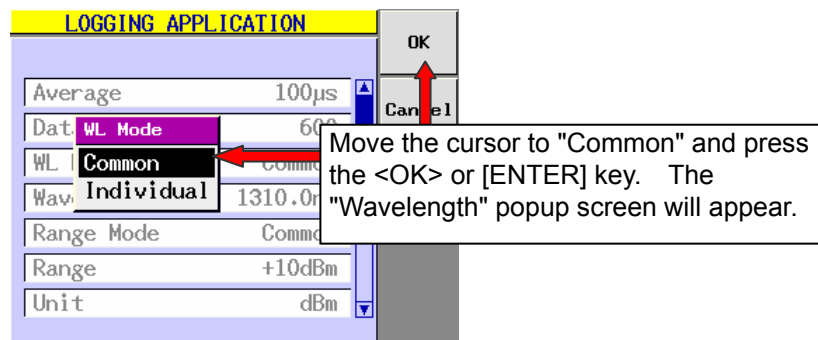
**Setting the Measurement Wavelength Mode**

**<Common Wavelength Setting>**

1. Press <Wave Mode> or move the cursor to "WL Mode" and press the [ENTER] key.

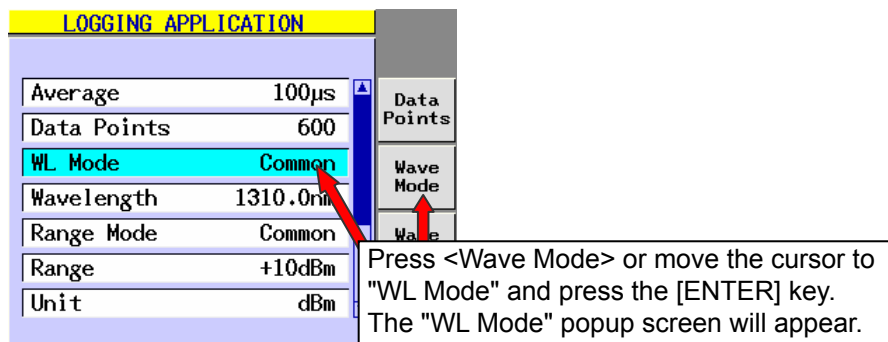


2. The "WL Mode" popup screen will appear. Move the cursor to "Common" and press the <OK> or [ENTER] key. The wavelength setting shortcut menu will appear. Enter the wavelength (see item 2 on P7-29)

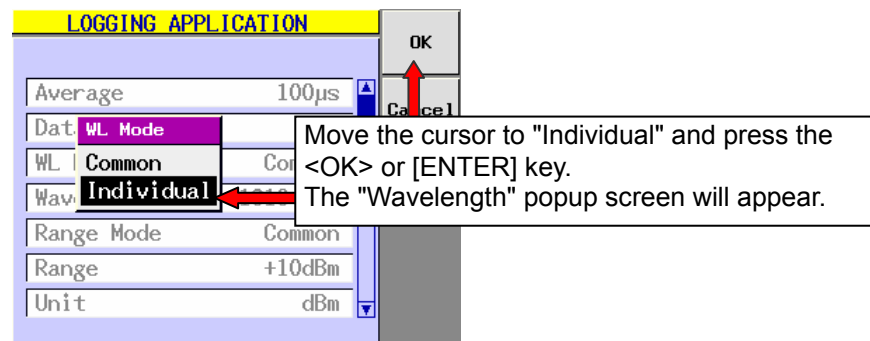


**<Individual Waveform Setting>**

1. Press <Wave Mode> or move the cursor to "WL Mode" and press the [ENTER] key.



- The "WL Mode" popup screen will appear.  
Move the cursor to "Individual" and press the <OK> or [ENTER] key.  
The wavelength screen is displayed. Enter the individual wavelengths (see item 2 on P7-30).

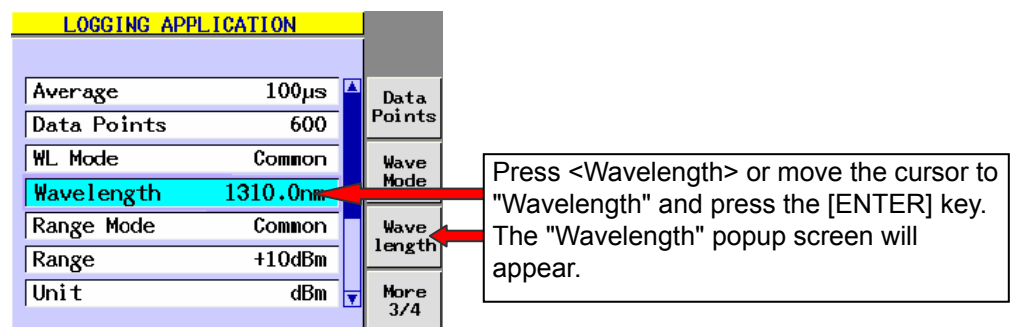


### ■ Setting the Measurement Wavelength

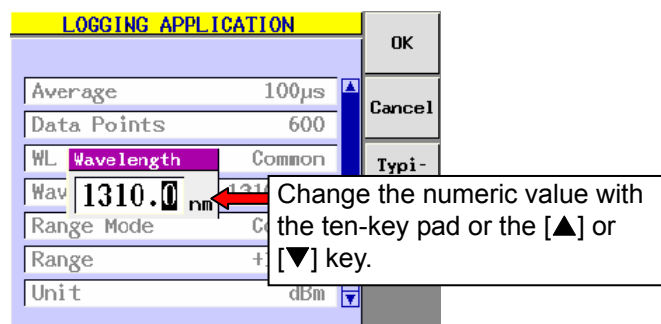
You can set a desired measurement wavelength for the current measurement wavelength mode setting.

#### <Common Measurement Wavelength Mode>

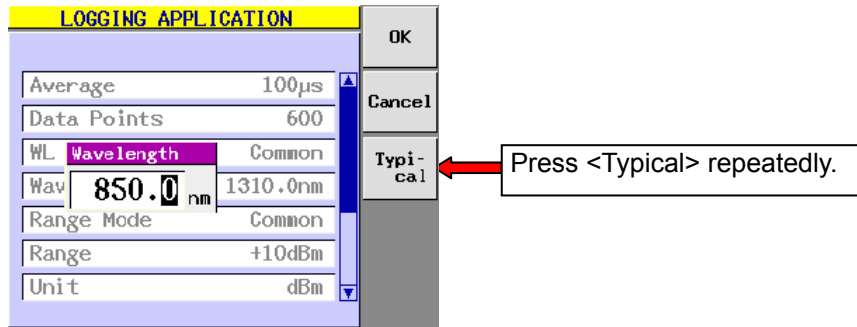
- Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.



- The "Wavelength" popup screen will appear.  
Change the numeric value using any of two operating procedures shown below.
  - Changing the numeric value with the ten-key pad or the [▲] or [▼] key  
Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key.

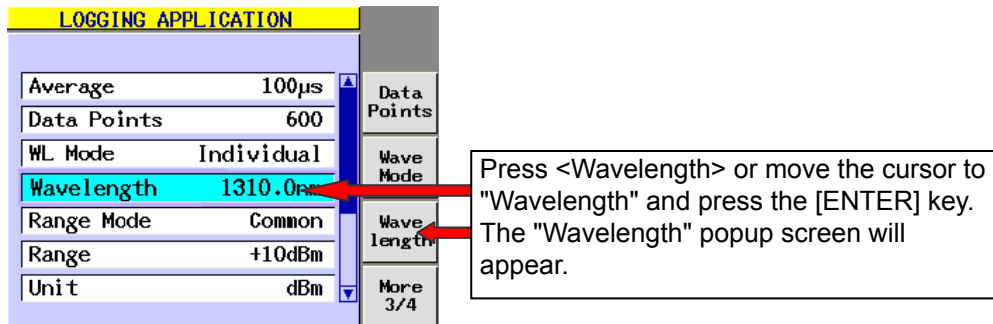


- ② Changing the numeric value with <Typical>  
Press <Typical> repeatedly to sequentially change the typical value.

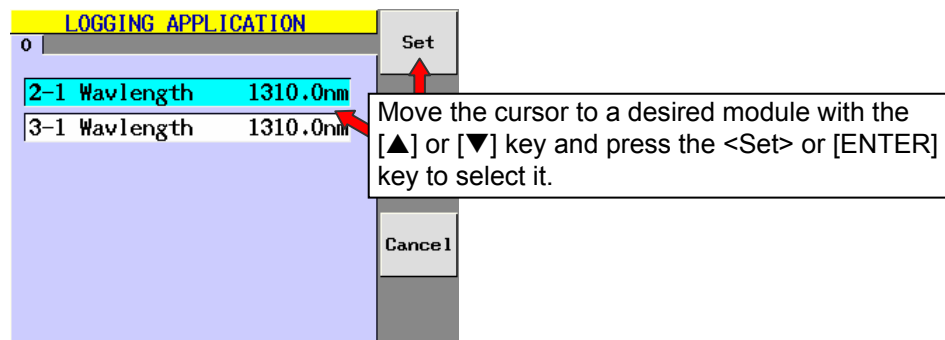


**<Individual Measurement Wavelength Mode>**

- 1. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key.



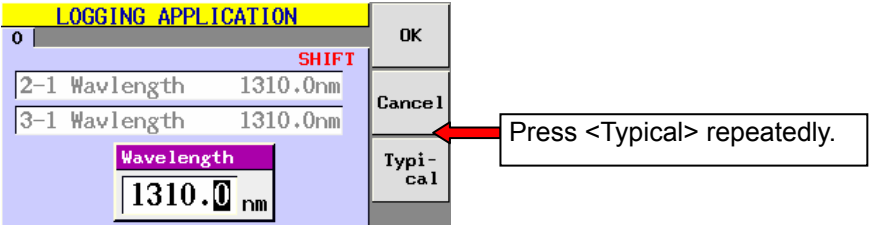
- 2. Move the cursor to a desired module you want to set the wavelength with the [▲] or [▼] key and press the <Set> or [ENTER] key.



Change the numeric value using any of two operating procedures shown below.

- ① Changing the numeric value with the ten-key pad or the [▲] or [▼] key  
Change the numeric value with the ten-key pad or the [▲] or [▼] key and press the <OK> or [ENTER] key.

- ② Changing the numeric value with <Typical>  
Press <Typical> repeatedly to sequentially change the typical value.



- 3. When the wavelength setting of all modules is completed by repeating step 2, press <Cancel>.

**NOTE**

- The setting range may vary depending on the model of the sensor. If the measurement wavelength mode is Common, you can select any of the settings available on all selected sensors.
- The following shows the typical values to be selected with <Typical>.
 

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

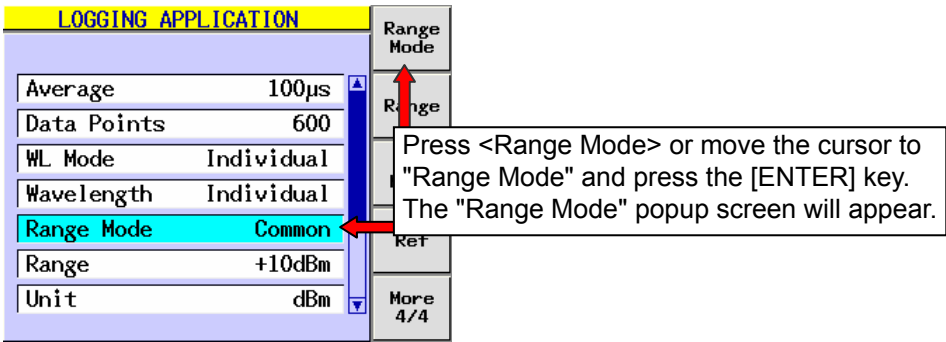
**Setting the Measurement Power Range Mode and Measurement Power Range**

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

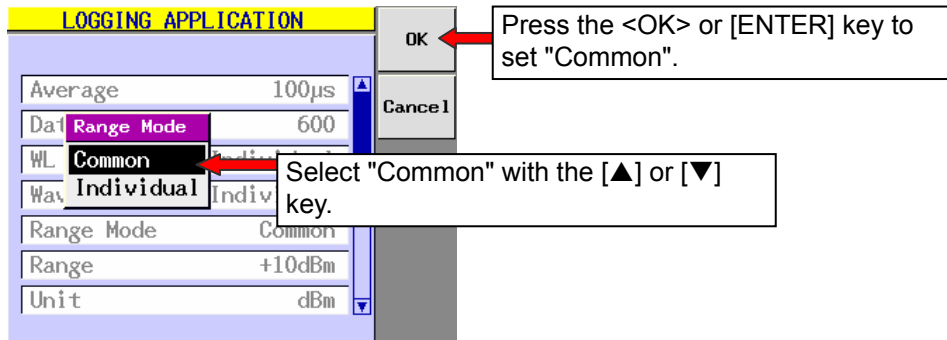
**Setting the Measurement Power Range Mode**

**<Common Range Setting>**

- 1. Press <Range Mode> or move the cursor to "Range Mode" and press the [ENTER] key.

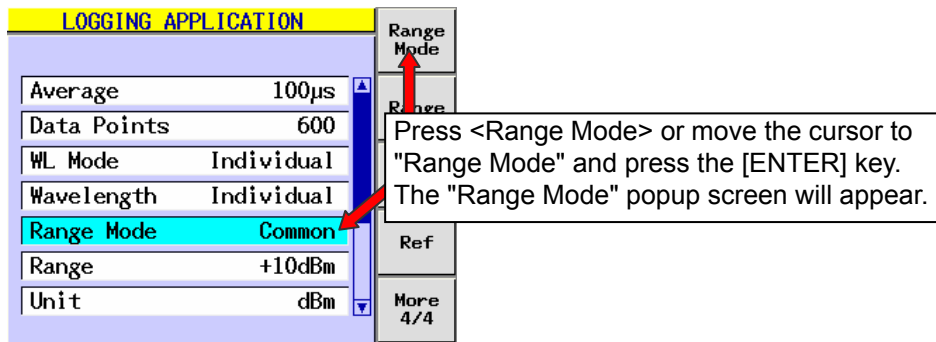


- The "Range Mode" popup screen will reappear. Move the cursor to "Common" and press the <OK> or [ENTER] key. The Range shortcut menu will appear. Enter the range (see item 2 on P7-33).

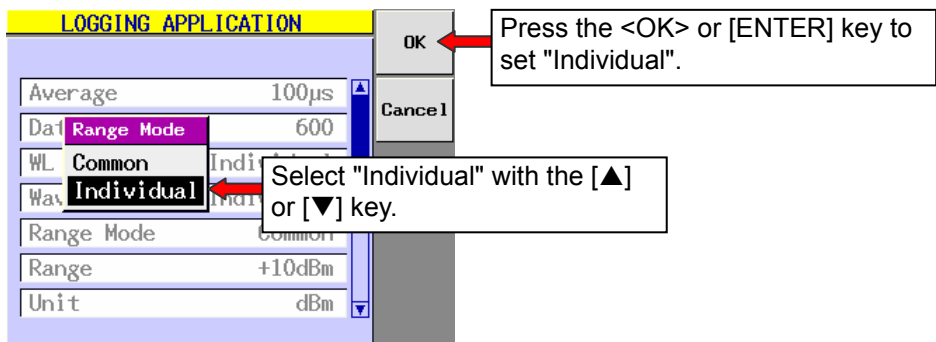


**<Individual Range Setting>**

- Press <Range Mode> or move the cursor to "Range Mode" and press the [ENTER] key.



- The "Range Mode" popup screen will reappear. Move the cursor to "Individual" and press the <OK> or [ENTER] key. The range settings screen appears. Enter the individual ranges (see item 2 on P7-34).

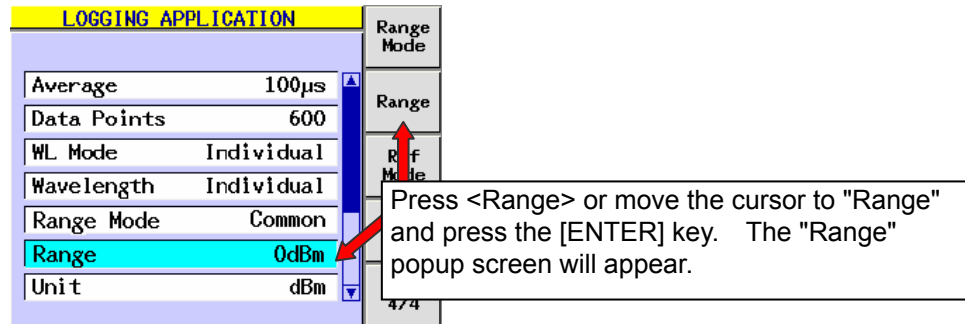


## ■ Setting the Measurement Power Range

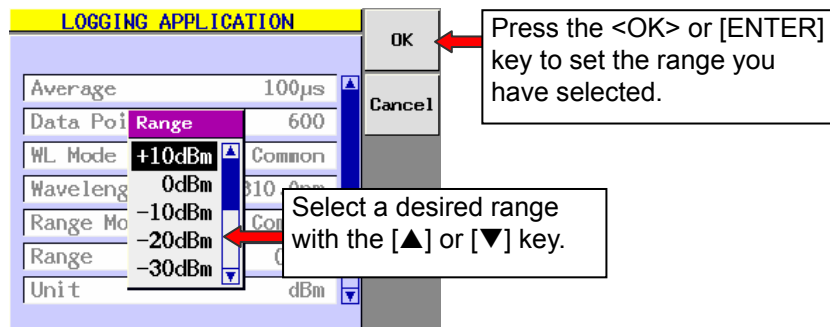
You can set a measurement power range for the current measurement power range mode setting. When the measurement power range mode is set at "Common" or "Individual", you can set a power range.

### <Common Measurement Power Range Mode>

1. Press <Range> or move the cursor to "Range" and press the [ENTER] key.

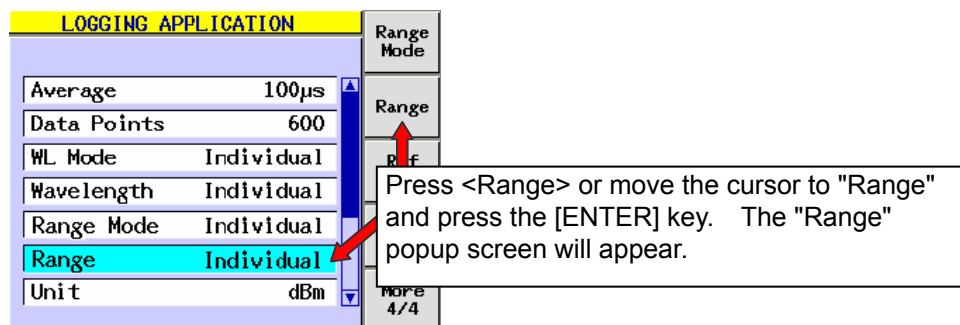


2. The "Range" popup screen will appear. Move the cursor to a desired range you want to measure and press the <OK> or [ENTER] key.

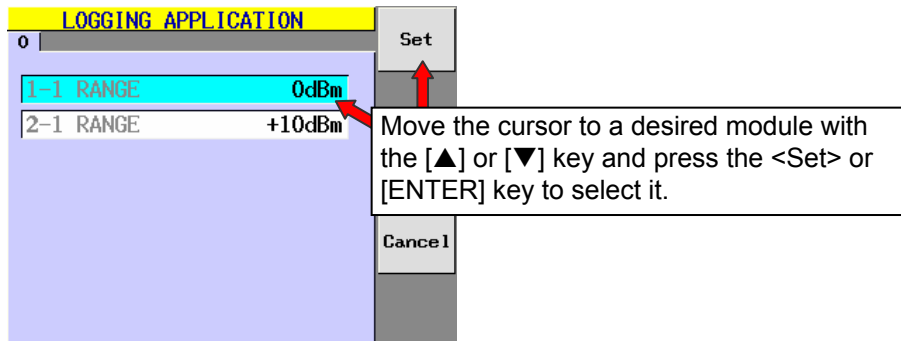


### <Individual Measurement Power Range Mode>

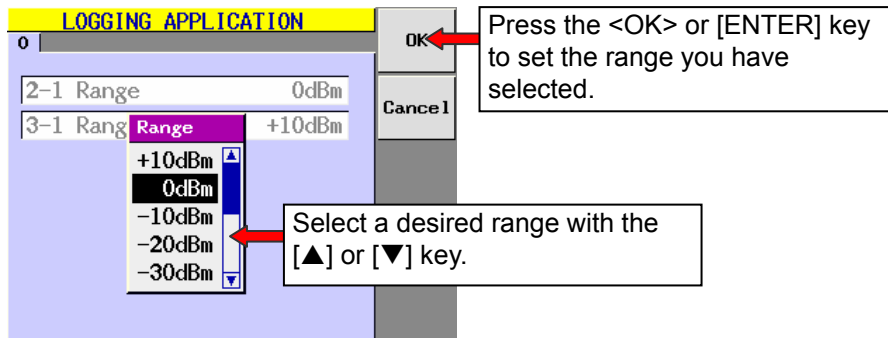
1. Press <Range> or move the cursor to "Range" and press the [ENTER] key.



2. Move the cursor to a desired module you want to set the range with the [▲] or [▼] key and press the <Set> or [ENTER] key.



3. The "Range" popup screen will appear. Move the cursor to a desired range you want to measure and press the <OK> or [ENTER] key.



4. When the range setting of all sensors is completed by repeating steps 2 and 3, press <Cancel>.

**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.

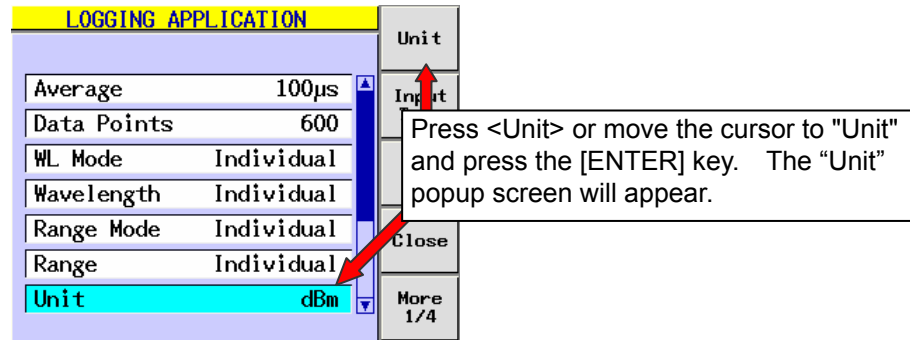
### Setting the Display Unit

You can set a desired measurement display unit.

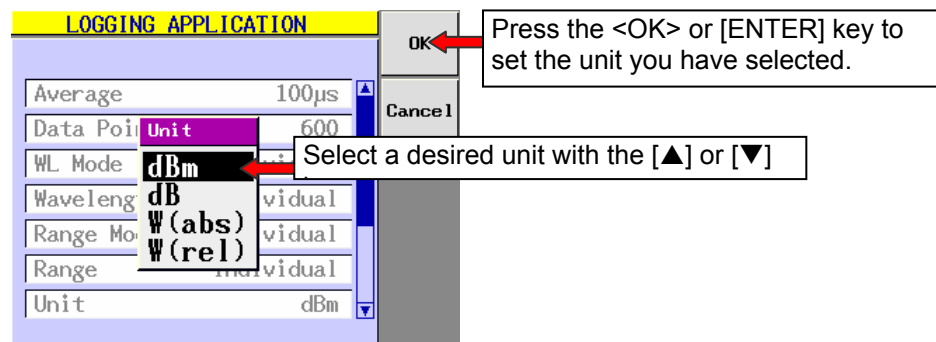
When the measurement unit is set to “dB” or “W(rel)”, the relative values become the measurement results.

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 <Unit> or move the cursor to "Unit" and press the [ENTER] key.



2. The "Unit" popup screen will appear. Move the cursor to a desired display unit and press the <OK> or [ENTER] key.



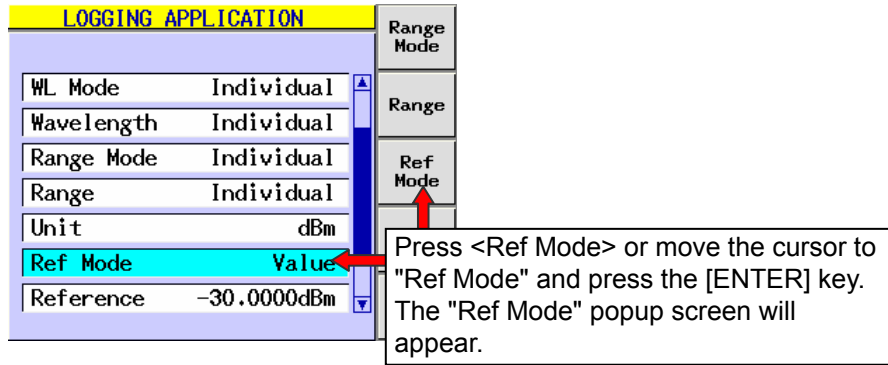
### Setting the Reference Mode

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

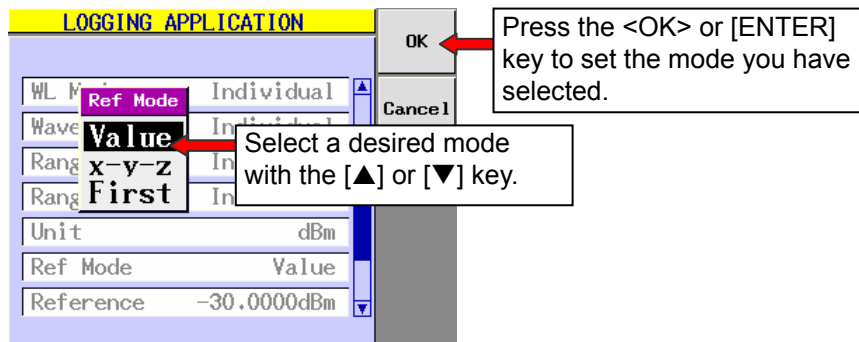
Follow the steps below to set the reference.

- 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

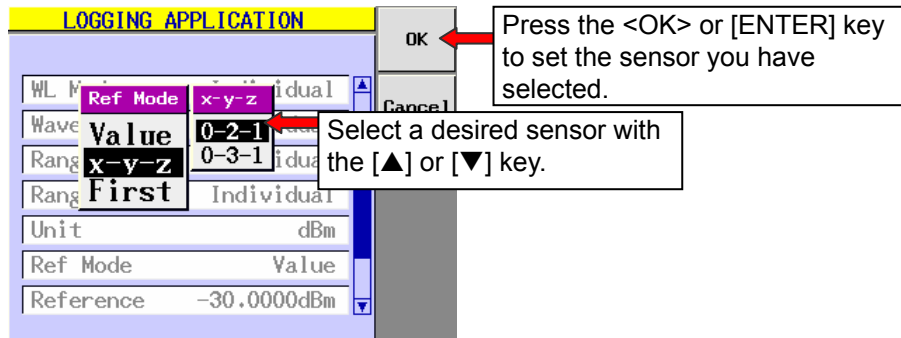
1. Press <Ref Mode> or move the cursor to "Ref Mode" and press the [ENTER] key.



2. The "Ref Mode" popup screen will appear. Move the cursor to "Value", "x-y-z", or "First", and press the <OK> or [ENTER] key.



3. When "x-y-z" is selected, the "x-y-z" popup screen will appear. Sensors used for the relative measurement are listed. Move the cursor to a desired sensor for the relative measurement and press the <OK> or [ENTER] key.



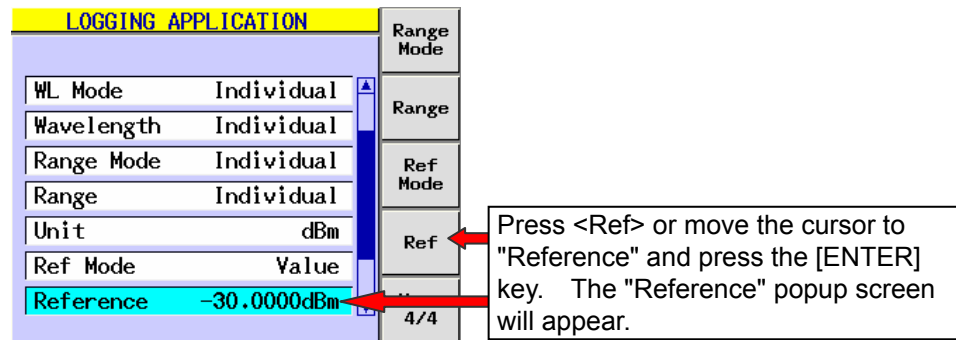
**NOTE** When setting the reference mode, the relative measurement reference value is shown in the Reference field.

- “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>

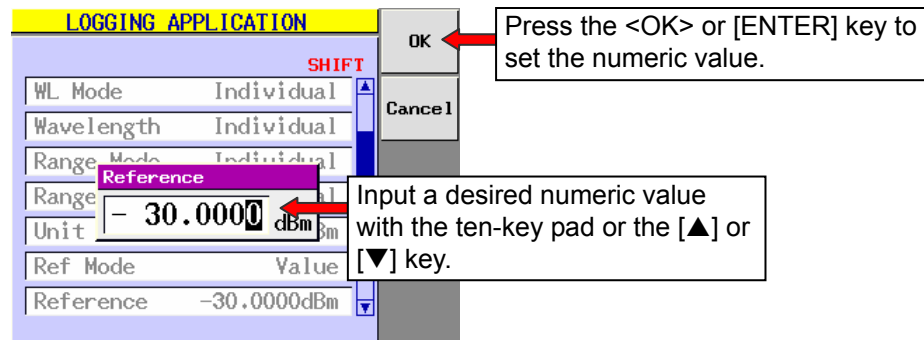
## Setting a Reference Value

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

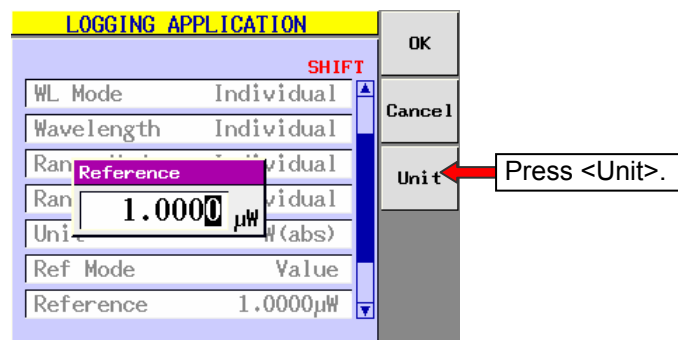
1. Press <Ref> or move the cursor to "Reference" and press the [ENTER] key.



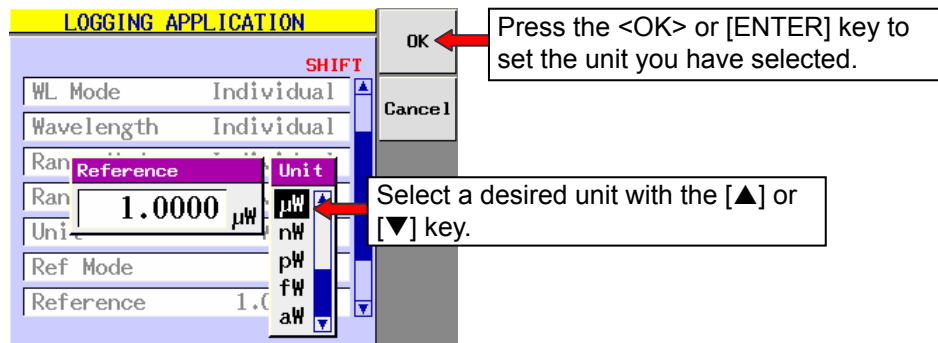
2. The "Reference" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. Additionally, to change the unit when the measurement display is "W(abs)" or "W(rel)", see steps 3 and 4.



3. Press <Unit>.



- The "Unit" popup screen will appear.  
Move the cursor to a desired display unit and press the [ENTER] key.



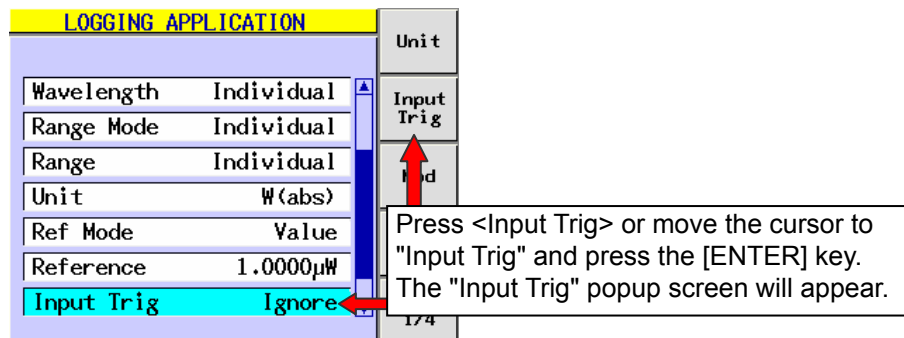
**NOTE** || If the reference mode is x-y-z or First, it changes to Value when setting reference values.

### Setting the Input Trigger Mode

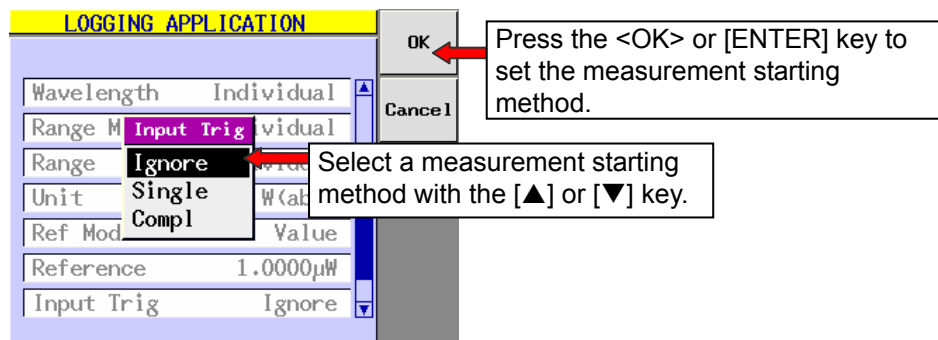
The logging measurement can be started by the external input trigger using any of three procedures.

- Ignore: Ignores the trigger input.
- Single: Starts the measurement once as the trigger is input once.
- Compl: Starts the logging measurement of the set contents by the trigger input.

- Press <Input Trig> or move the cursor to "Input Trig" and press the [ENTER] key.



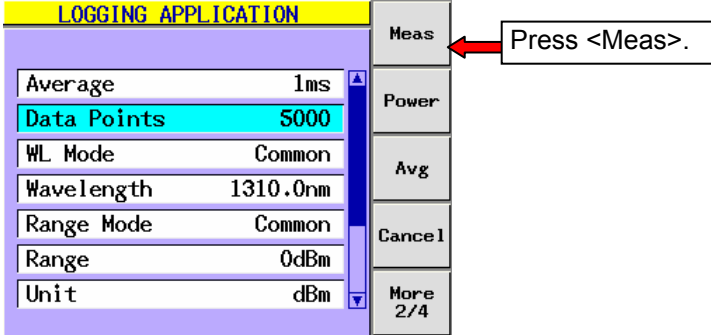
- The "Input Trig" popup screen will appear.  
Move the cursor to a measurement starting method most suitable for the purpose and press the <OK> or [ENTER] key.



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

### 7.1.6 Starting the Logging Measurement

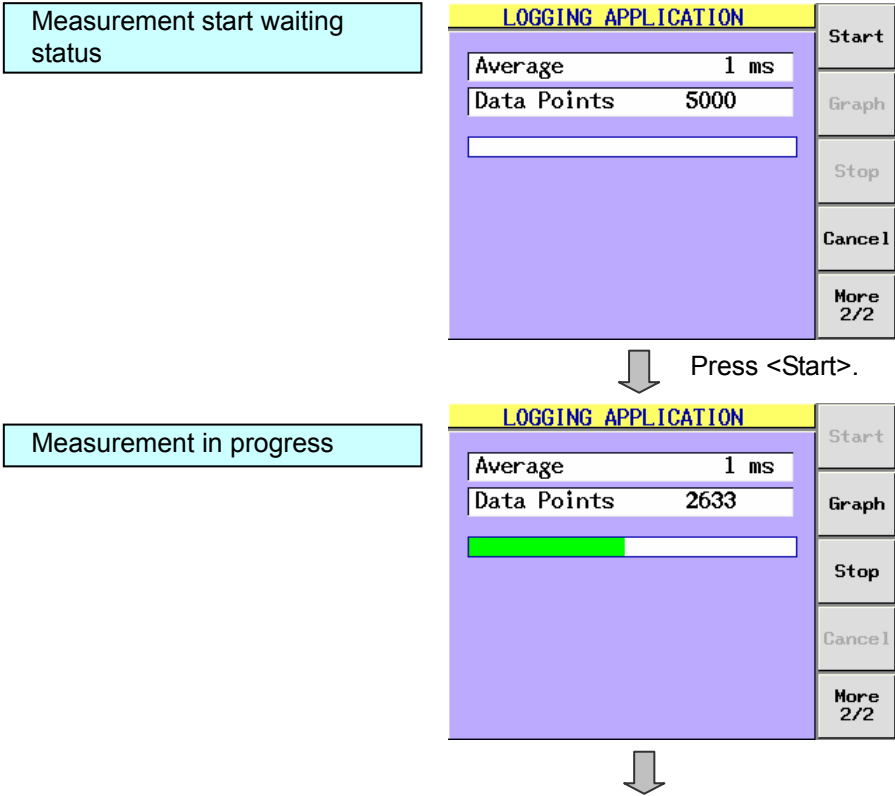
- 1. When pressing <Meas> on the measurement condition setup screen, the measurement check screen will appear. On the measurement check screen, the averaging time and the number of data points are shown.

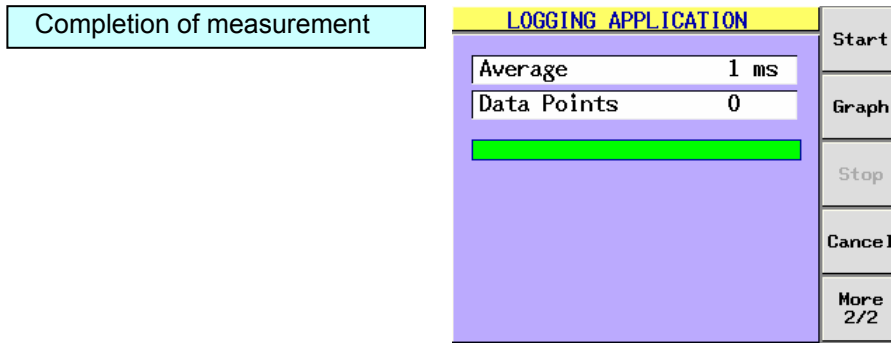


**NOTE** | Logging measurement supports an averaging time x number of data points of up to 12 hours. If 12 hours is exceeded, the number of data points is automatically adjusted and the measurement confirmation screen is displayed. Start measurement after checking measurement conditions in the measurement confirmation screen.

- 2. When pressing <Start>, the measurement is started and the value shown in the "Data Points" field is counted down. When the progress bar reaches the full-scale level and the value shown in the "Data Points" field becomes "0", the measurement is then completed.

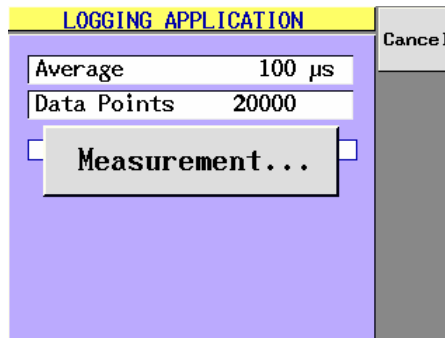
#### <Logging Measurement>





- <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 section 7.1.9, Displaying the Graph of the Measurement Data and Saving the Graph Display, (page 7-51).
- <Analyze>: Analyzes the data, which has been obtained in the measurement.  
<Analyze> cannot be selected during measurement.  
For details, see section 7.1.7, Analyzing the Measurement Data, (page 7-41).
- <Save Data>: Saves the data, which has been obtained in the measurement, into the storage device. <Save Data> cannot be selected during measurement.  
For details, see section 7.1.8, Saving the Measurement Data, (page 7-49).
- <Cancel>: Returns to the setup screen.
- <Close>: Exits the application mode.
- <Graph>: Shows the graph of the data, which has already been obtained.
  
- 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.

**NOTE** When the averaging time is set at 500 $\mu$ s or less, the following screen shown in the Fig. below appears.  
At this time, to stop the measurement, press <Cancel>.  
Additionally, note that the analog bar and Data Points are not updated at real-time.



### 7.1.7 Analyzing the Measurement Data

When pressing <Analyze> after completion of the measurement, Analysis Condition Setup Screen shown in Fig. 7-4 (next page) will appear.

When pressing <Next> on the analysis condition setup screen, Analysis Results Display Screen shown in Fig. 7-3 will appear.

The analysis results of the measurement data can be obtained on Analysis Results Display Screen shown in Fig. 7-3.

| STABILITY APPLICATION |              |            |
|-----------------------|--------------|------------|
| 0                     |              | Next       |
| Mod Select            | 2-1          | Mod Select |
| MAX                   | + 7.1671 dBm | Save Data  |
| MIN                   | + 7.1626 dBm | Cancel     |
| DIF                   | 0.0045 dB    |            |
| AVG                   | + 7.1648 dBm |            |
| SD                    | 0.0007 dBm   |            |

**Fig. 7-3 Analysis Results Display Screen**

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.

<Mod Select>: Changes the module you want to analyze the data.

<Save Data>: Saves the measured data to the selected storage device.

<Cancel>: Changes to the measurement completion 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.

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

$$SD = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (X_i - X)^2}$$

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

Additionally, you can also analyze the data by changing the analysis conditions shown below.

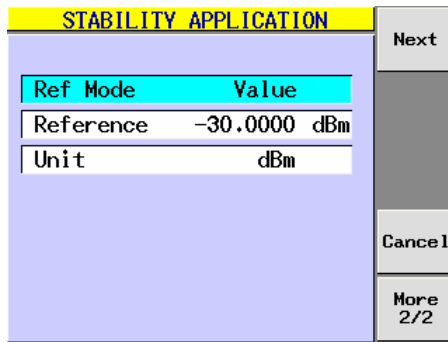


Fig. 7-4 Analysis Condition Setup Screen

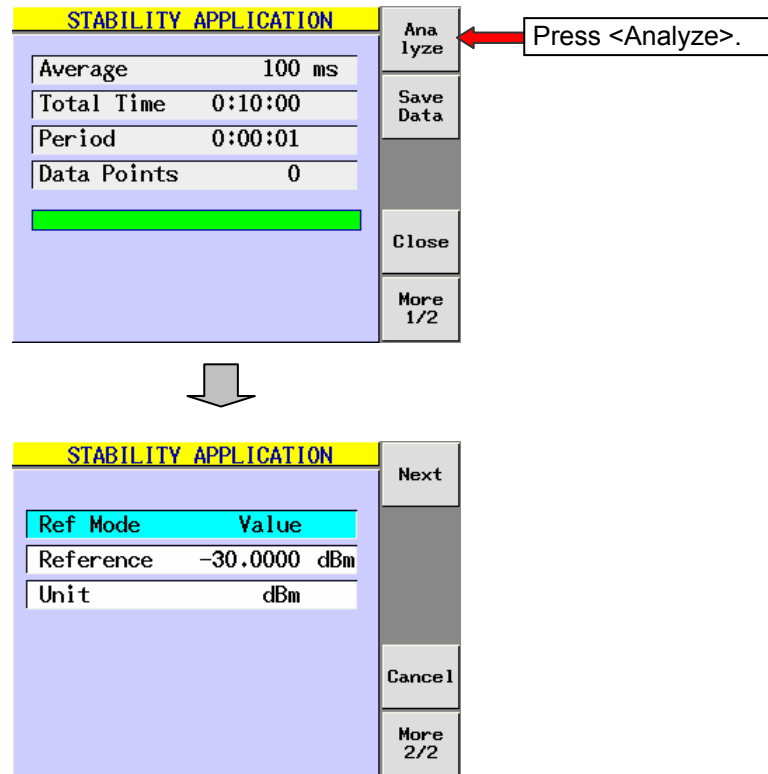
- Ref Mode: Shows the reference mode. When the display unit is set at “dB” or “W(rel)”, the comparison with this reference object is performed.
- Reference: Shows the reference standard value when the reference mode is set at “Value”.
- Unit: Shows the display unit of the measurement results. When set 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.
- <More>: Changes the function menu.

### Changing to the Measurement Data Analysis Mode

You can analyze the measurement and change the analysis parameters in the measurement data analysis mode.

- When pressing <Analyze> on the measurement check screen, the analysis start screen will appear.



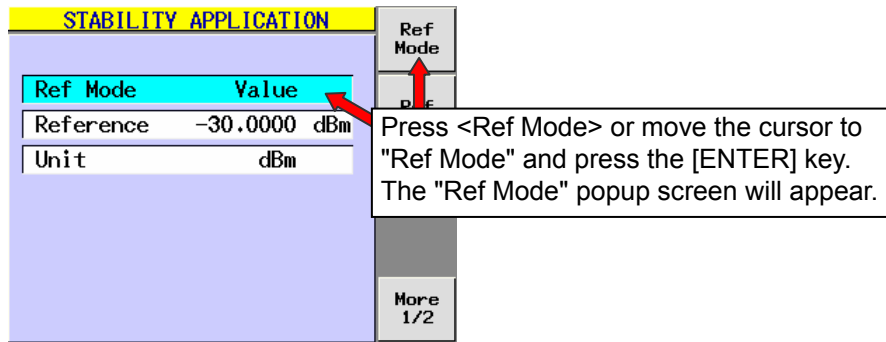
### Setting the Reference Mode

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

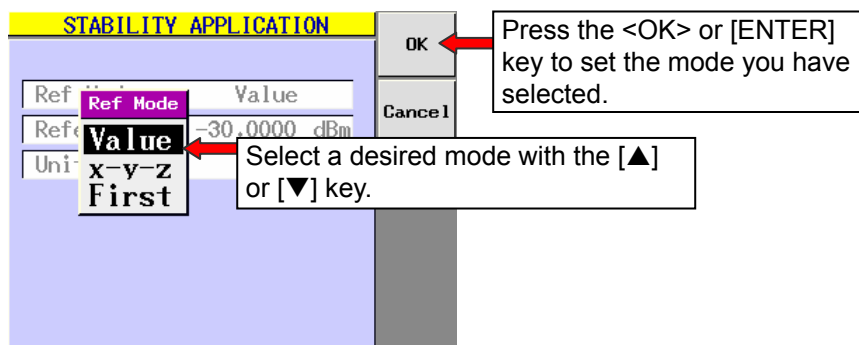
Follow the steps below to set the reference.

- 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

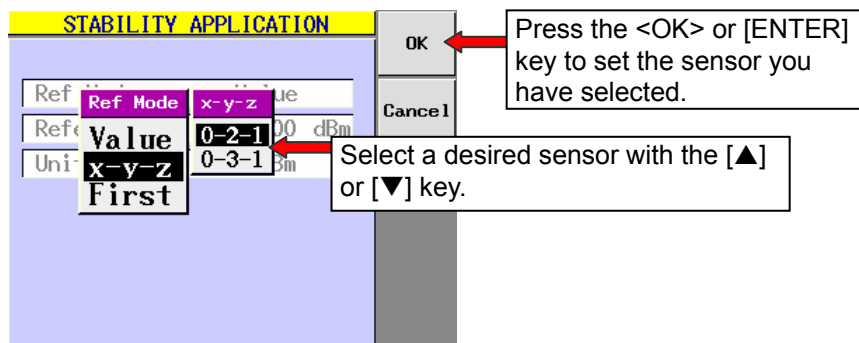
1. Press <Ref Mode> or move the cursor to "Ref Mode" and press the [ENTER] key.



2. The "Ref Mode" popup screen will appear. Move the cursor to "Value", "x-y-z", or "First", and press the <OK> or [ENTER] key.



3. When "x-y-z" is selected, the "x-y-z" popup screen will appear. Sensors used for the relative measurement are listed. Move the cursor to a desired sensor for the relative measurement and press the <OK> or [ENTER] key.



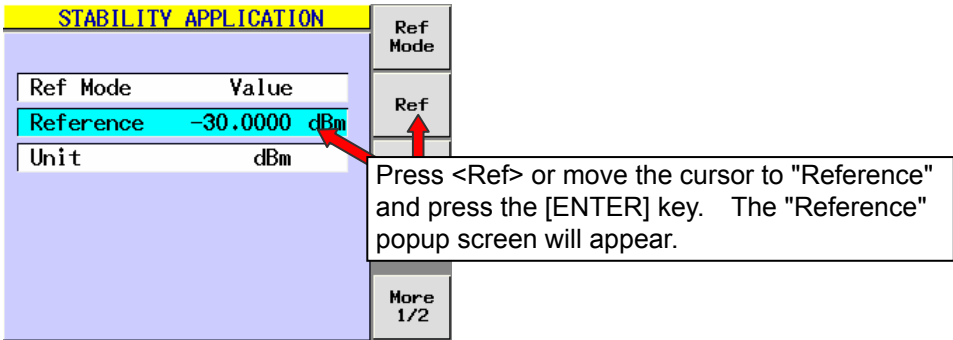
**NOTE** When setting the reference mode, the relative measurement reference value is shown in the Reference field.

- "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>

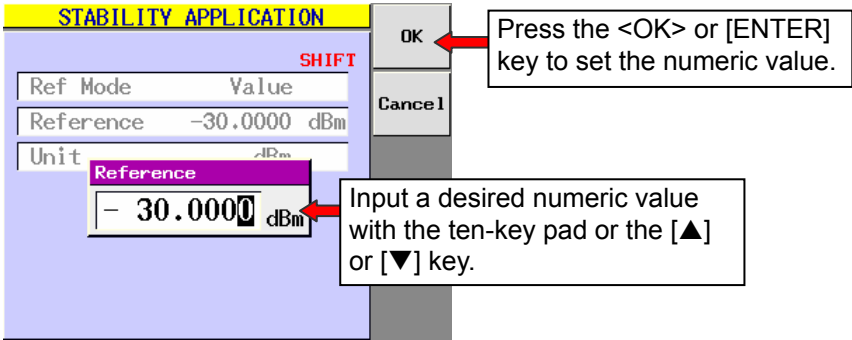
**Setting a Reference Value**

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

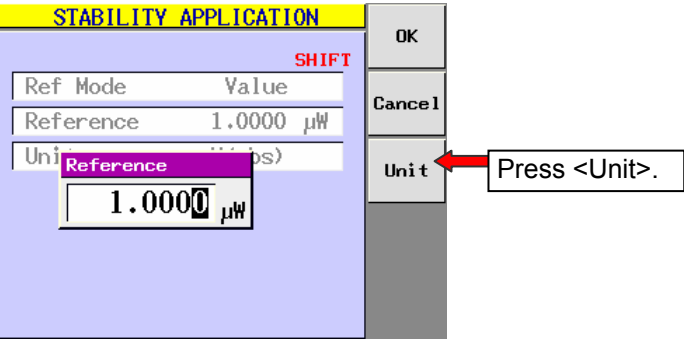
- 1. Press <Ref> or move the cursor to "Reference" and press the [ENTER] key.



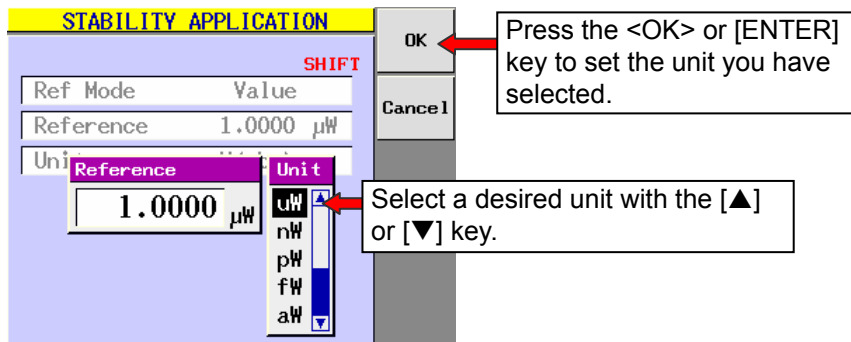
- 2. The "Reference" popup screen will appear. Change the numeric value with the ten-key pad or the [▲] or [▼] key, and press the <OK> or [ENTER] key. Additionally, to change the unit when the measurement display is "W(abs)" or "W(rel)", see steps 3 and 4.



- 3. Press <Unit>.



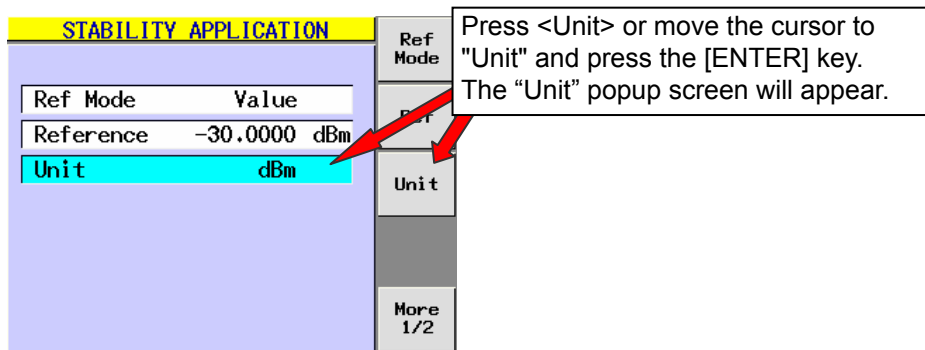
- The "Unit" popup screen will appear.  
Move the cursor to a desired display unit and press the <OK> or [ENTER] key.



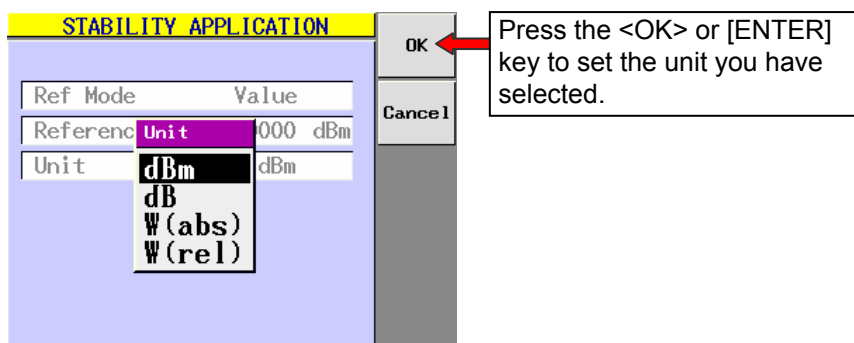
### Setting the Display Unit

You can set a desired measurement display unit.  
If the measurement unit is set to dB or W (rel), analysis is conducted 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.

- Press <Unit> or move the cursor to "Unit" and press the [ENTER] key.

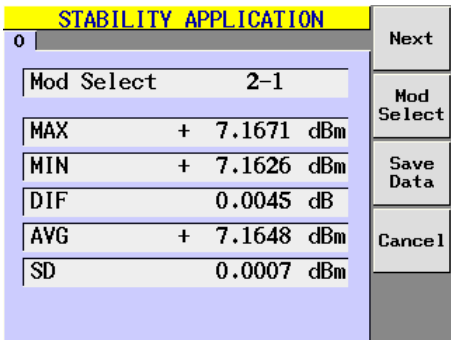
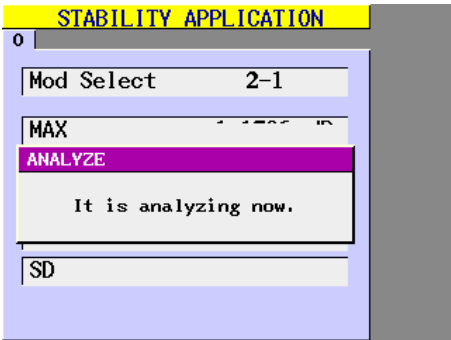
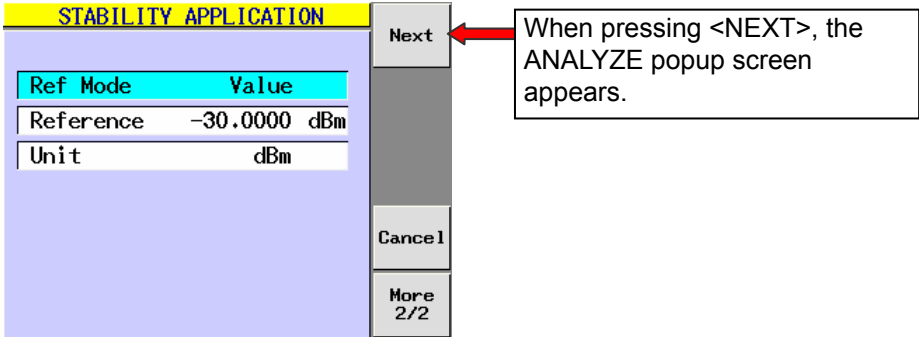


- The "Unit" popup screen will appear.  
Move the cursor to a desired display unit and press the <OK> or [ENTER] key.



**Starting the Analysis**

- 1. When pressing <NEXT> on the analysis start screen, the ANALYZE popup screen appears and the data analysis is started. When the data analysis calculation is completed, the popup screen disappears and the analysis results are shown.



**Changing the Analysis Object Sensor**

1. Press <Mod Select> on the analysis result display screen.

| STABILITY APPLICATION |              |
|-----------------------|--------------|
| 0                     | Next         |
| Mod Select            | 2-1          |
| MAX                   | + 7.1671 dBm |
| MIN                   | + 7.1626 dBm |
| DIF                   | 0.0045 dB    |
| AVG                   | + 7.1648 dBm |
| SD                    | 0.0007 dBm   |
|                       | Mod Select   |
|                       | Save Data    |
|                       | Cancel       |

When pressing < Mod Select >, the "x-y-z" popup screen appears.

2. The "x-y-z" popup screen appears. Move the cursor to a desired sensor you want to analyze and press the <OK> or [ENTER].

When the calculation is completed after the ANALYZE popup screen has appeared, the popup screen will disappear.

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

- x: Frame No. ("0")
- y: Slot No.
- z: Device No.

| STABILITY APPLICATION |              |
|-----------------------|--------------|
| 0                     | OK           |
| Mod Select            | 2-1          |
| MAX                   | + 7.1671 dBm |
| MIN                   | + 7.1626 dBm |
| DIF                   | 0.0045 dB    |
| AVG                   | + 7.1648 dBm |
| SD                    | 0.0007 dBm   |
|                       | Cancel       |

x-y-z

0-2-1

0-3-1

When pressing the <OK> or [ENTER] key, the selected sensor is set and the ANALYZE popup screen appears.

Select a desired sensor with the [▲] or [▼] key.



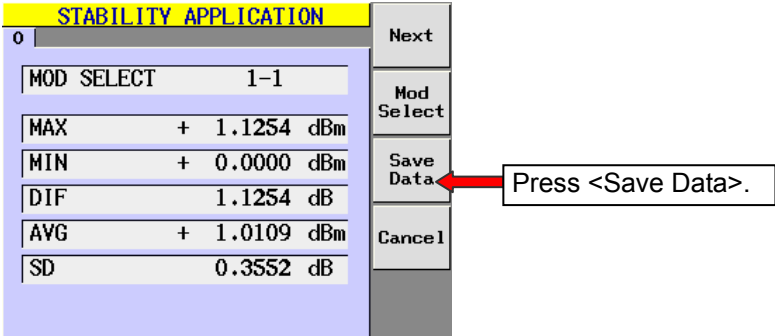
| STABILITY APPLICATION |              |
|-----------------------|--------------|
| 0                     |              |
| Mod Select            | 3-1          |
| MAX                   | - 1.1706 dBm |
| ANALYZE               |              |
| It is analyzing now.  |              |
| SD                    | 0.0012 dBm   |

When the ANALYZE popup screen disappears, this shows that the calculation is completed.

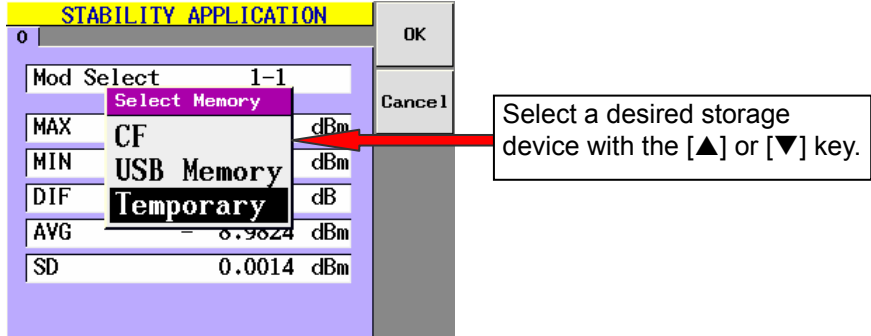
### 7.1.8 Saving the Measurement Data

The measurement data is saved into the storage device.

- 1. Press <Save Data>. The “Select Memory” popup screen will appear.

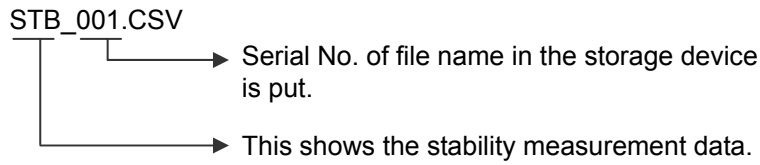


- 2. Move the cursor to a storage device, to which you want to save the data, and press the <OK> or [ENTER] key. The measurement data is then saved.

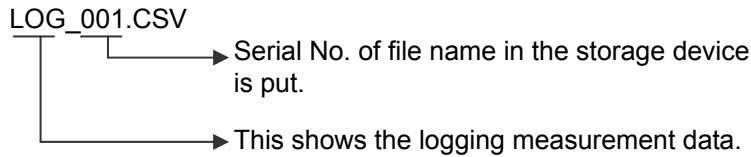


**<Save File Name>**

- Stability measurement data file



- Logging measurement data file



**NOTE**

- A serial number between 001 and 100 is added. When the number is greater than or equal to 100, the message, "A filename is full" appears. Delete files to make room for saving of the new file.
- The "Writing" popup screen is shown while the data is being written into the storage device. Never attempt to remove the storage device while this popup screen is being displayed. At this time, if the storage device is removed, this may cause the storage device to break.
- Temporary data (data temporarily stored in memory) is cleared when the power is turned OFF (see P1-33).
- To save this data, use the USB storage function (P1-36) or LAN FTP function (P1-38).

### 7.1.9 Displaying the Graph of the Measurement Data and Saving the Graph Display

#### Outline of Graph Display

You can display the measured data graphically as shown in Fig. 7-5.

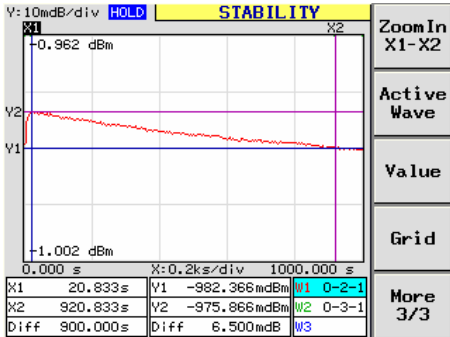
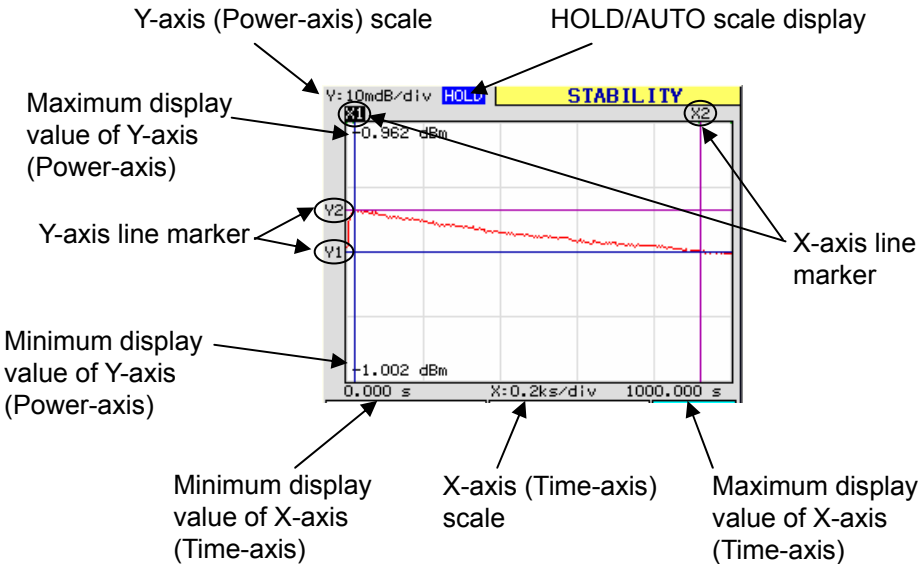


Fig. 7-5 Graph Display

#### <Waveform Display>



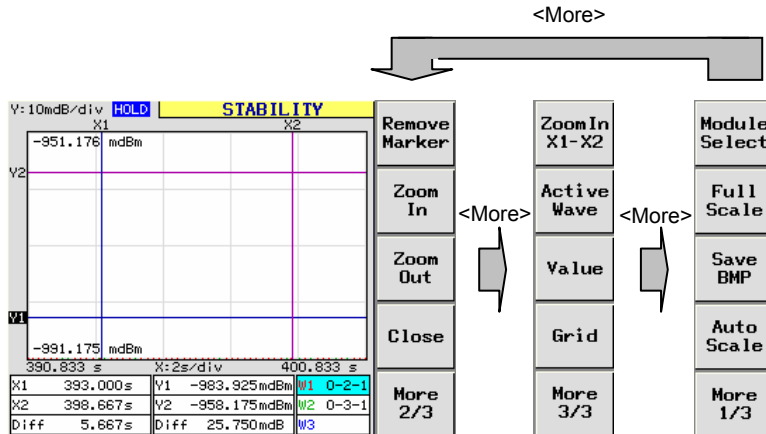
#### <Numeric Value Display>

|      |          |      |               |    |       |
|------|----------|------|---------------|----|-------|
| X1   | 20.833s  | V1   | -982.366m dBm | W1 | 0-2-1 |
| X2   | 920.833s | V2   | -975.866m dBm | W2 | 0-3-1 |
| Diff | 900.000s | Diff | 6.500m dB     | W3 |       |

- 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: Shows the power at the point where the graph intersects with the line marker.
- Graph display save function: Saves the graph display to the selected storage device in the bit-map format.



<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).

<Zoom In X1-X2>, <Zoom In Y1-Y2>: Zooms the waveform and between line markers X1-X2 or Y1-Y2. Each time you press the button, enlarges the waveform between the X1-X2 or Y1-Y2 line markers to its allowable maximum display scale. Either X1-X2 or Y1-Y2 having the active line marker is shown.

<Active Wave>: Changes the active display waveform.

<Value>: Shows the data (power) at the point where the active X-axis line marker intersects with the active waveform on the popup screen. If the selected line marker is Y1 or Y2, it is dimmed and cannot be selected.

<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.

[▲], [▼], [◀], [▶]: Moves the line marker.

## Enlarging or Reducing the Display Scale

To change the display scale, four kinds of methods are provided.

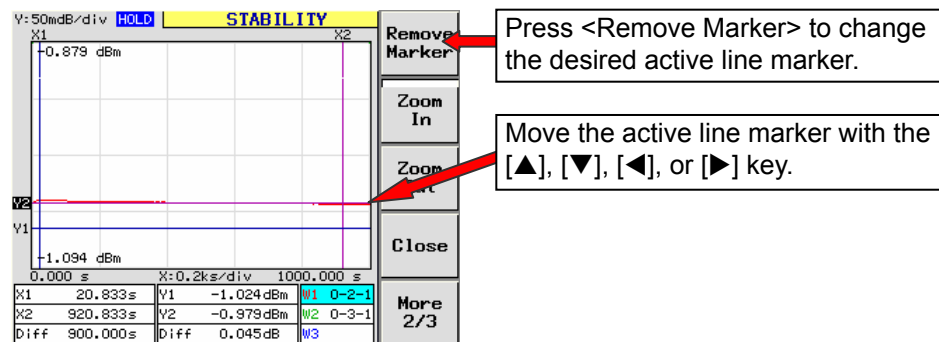
Select a desired method suitable for the application.

- 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>

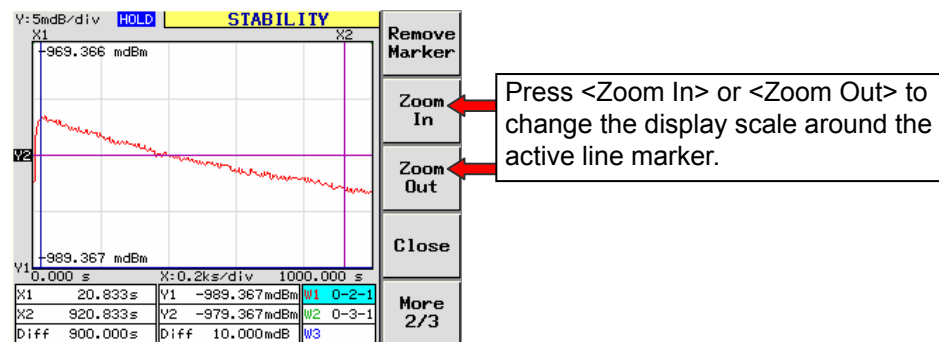
1. Press <Remove Marker> to select a desired active line marker.

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.



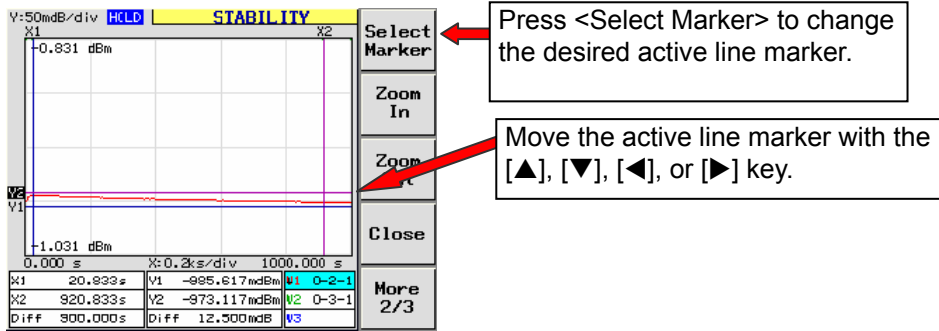
2. To enlarge the scale, press <Zoom In> repeatedly. On the contrary, to reduce the scale, press <Zoom Out> repeatedly.

The scale changes, like 1↔2↔5↔10↔...

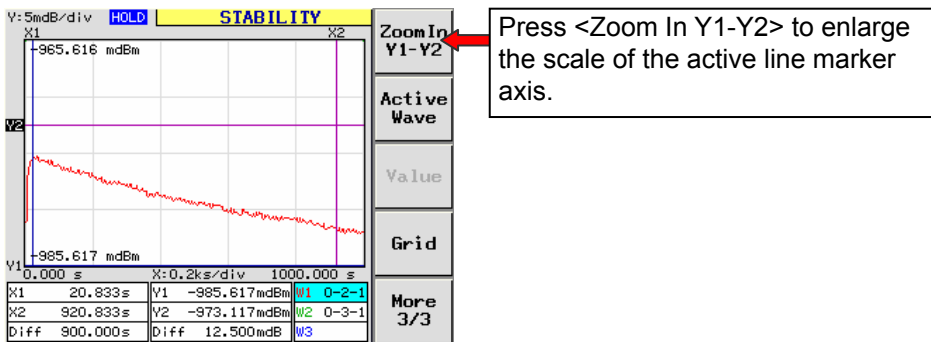


**<Enlarging the Display Scale between the Line Markers of the Active Line Marker Axis>**

1. Press <Select Marker> to select a desired 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.

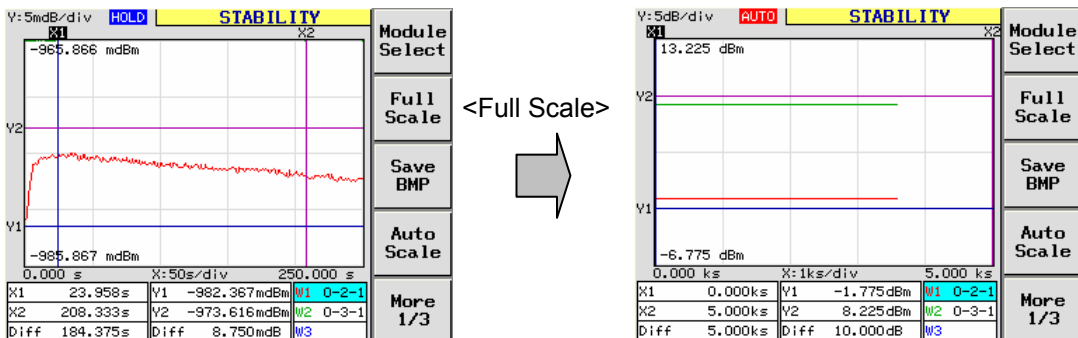


2. To enlarge the scale, press <Zoom In X1-X2>.  
 When the active line markers are Y1 and Y2, <Zoom In Y1-Y2> is shown.  
 The scale changes, like 1↔2↔5↔10↔.....



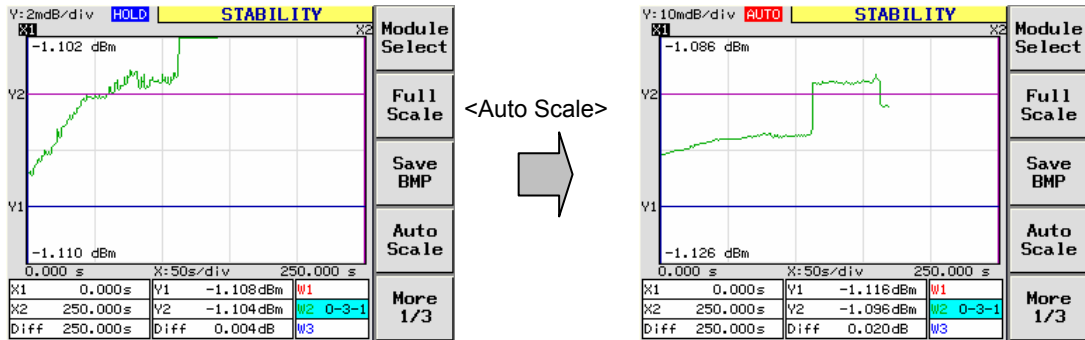
**<Changing the Display Scale to the Scale so that All the Selected Waveforms are Displayed>**

1. Press <Full Scale>. All the selected waveforms are displayed.



**<Updating the Display Scale so that the Measurement Data Enters the Y-axis Scale at Real-time during Measurement>**

1. Press <Auto Scale>. The waveform, which cannot be shown within the Y-axis display area, is updated so that it is displayed within the display scale.

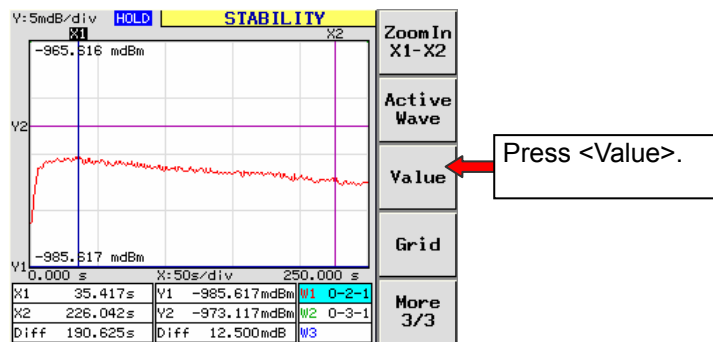


- NOTE**
- The X-axis scale is not updated.
  - If you change the scale using Zoom In or Zoom Out, auto scale is canceled.

**■ Displaying the Data at the Point of the Waveform**

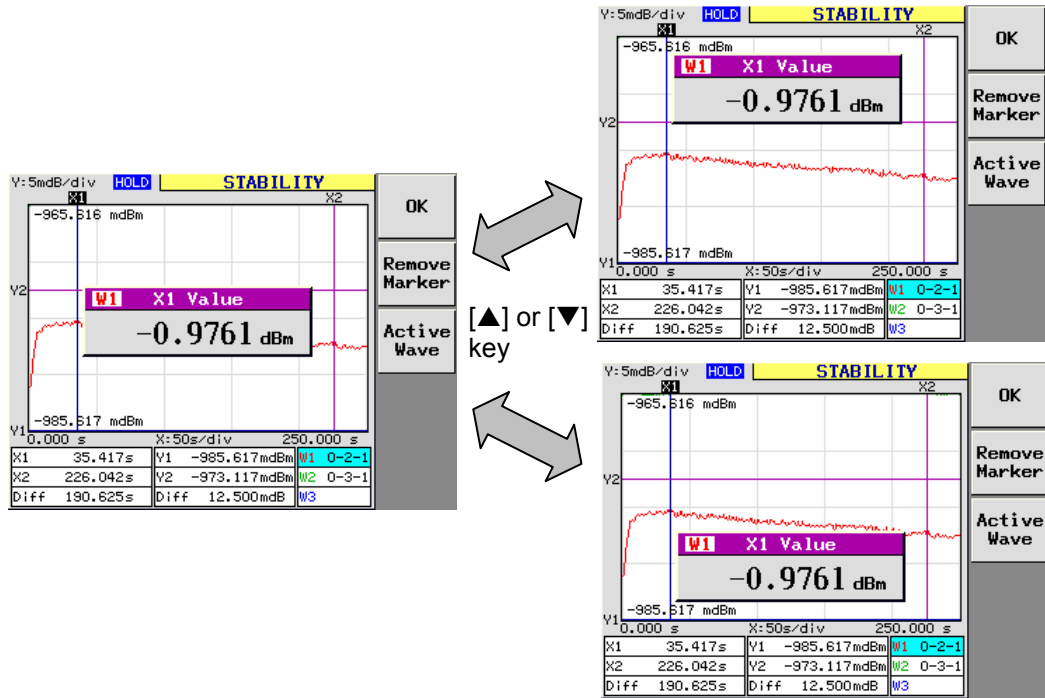
The power data at the point where the displayed waveform intersects with the active X-axis line marker is displayed.

1. Press <Remove Marker> to make the X1 or X2 line marker active and press <Value>.



- NOTE**
- The data at the point is not displayed during measurement.
  - If there is no active line marker on the waveform, NO DATA is displayed.

- The popup screen appears. On this screen, the power at the point where the active X-axis line marker intersects with the waveform is displayed.

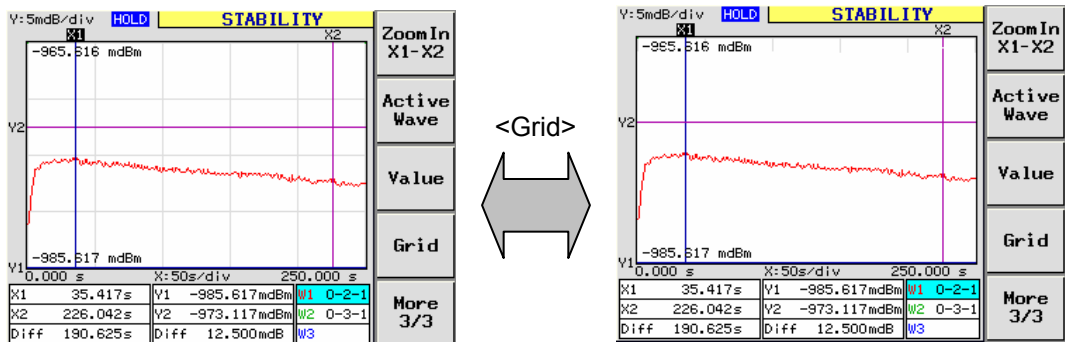


- <Remove Marker>: Changes the active line marker, like X1↔X2.
- <Active Wave>: Changes the active waveform in order, like W1→W2→W3→W1... to change the data display at the waveform point. At this time, inactive waveforms are skipped.
- <OK>: Returns to the graph display screen.
- [▲], [▼] key: Changes the popup screen display position. The position is changed among three positions, that is, upper, middle (position shown in the Fig. above), or lower position.
- [◀], [▶] key: Moves the active line marker.

**Showing or Hiding the Grid Display**

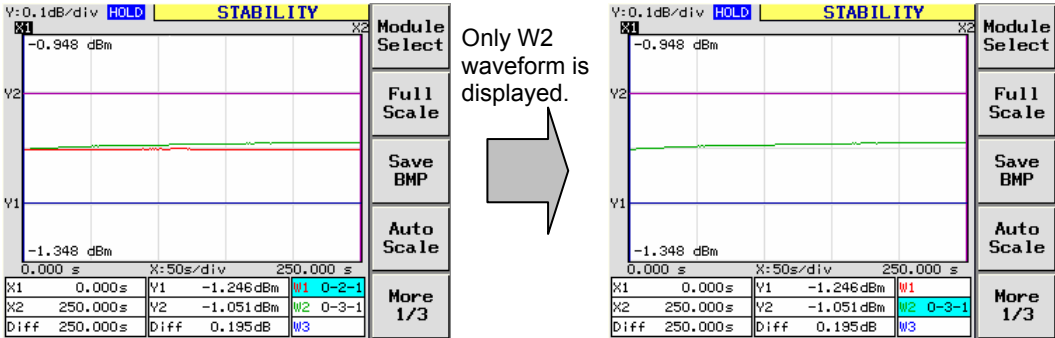
The display grid is shown or hidden.

- Press <Grid>. The grid is shown or hidden.



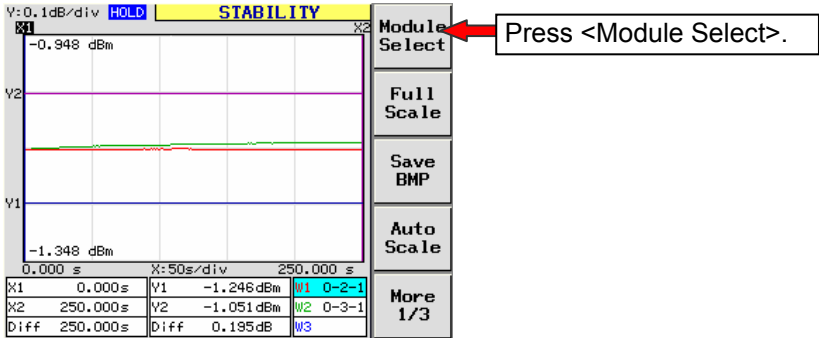
**Selecting a Display Waveform**

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.



When clearing the W1 waveform or displaying only W2, follow the steps to make the settings.

1. Press <Module Select>.



2. The module selection screen appears. The following function key and cursor key functions are provided.

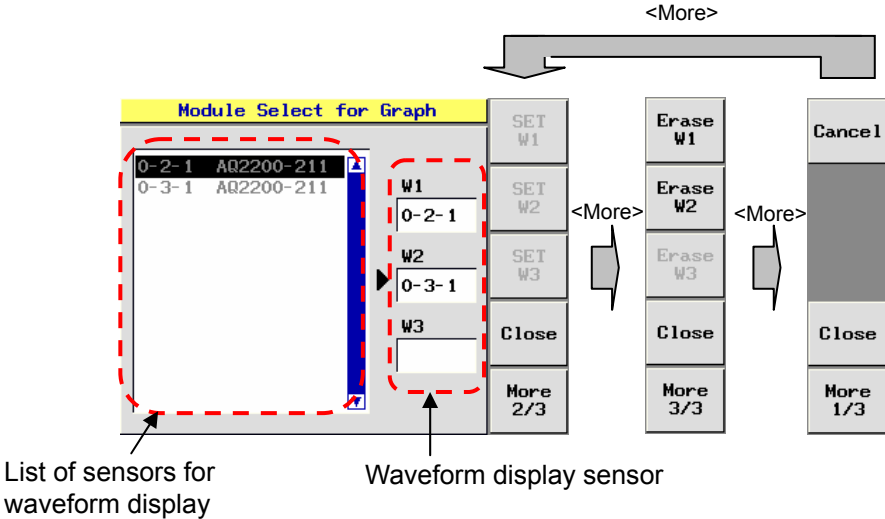


Fig. 7-6 Module Selection Screen

<SET W1>, <SET W2>, <SET W3>:

Sensors at the cursor position in the list of sensors for waveform display are assigned to W1, W2, and W3. At this time, it is not possible to assign the same sensor to multiple Ws, W1 to W3. If it cannot be selected, it is dimmed.

<Erase W1>, <Erase W2>, <Erase W3>:

Cancels the sensor assignments of W1, W2, and W3. If it cannot be selected, it is dimmed.

<Cancel>: Returns to the graph display screen.

<Close>: Returns to the previous screen (measurement check screen or measurement in progress screen).

[▲], [▼] key: Moves the cursor up or down.

[◀], [▶] key: Switches the screen between the module selection screen and sensor assignment cancel screen.

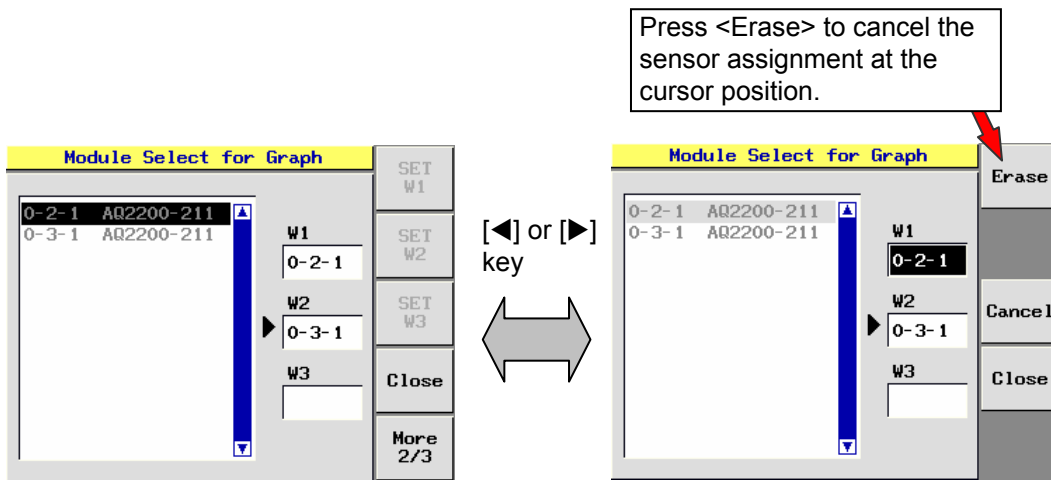
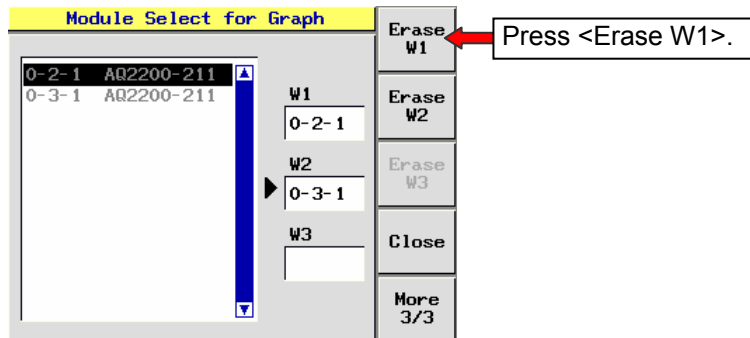
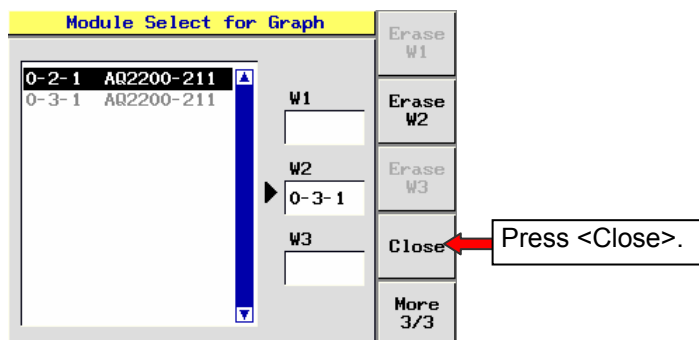


Fig. 7-7 Sensor Assignment Cancel Screen

3. Press <Erase W1> on the module selection screen.



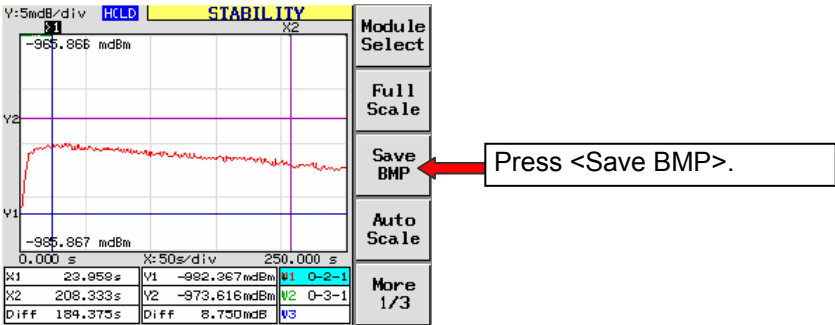
4. Press <Close>.



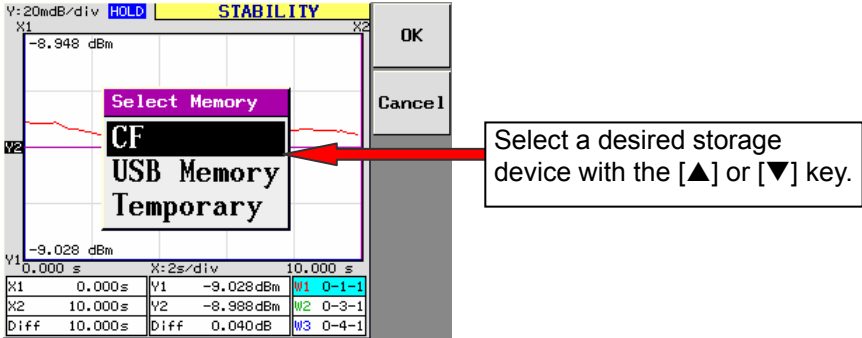
**Saving the Display Waveform**

The waveform displayed on the screen is saved into the storage device.

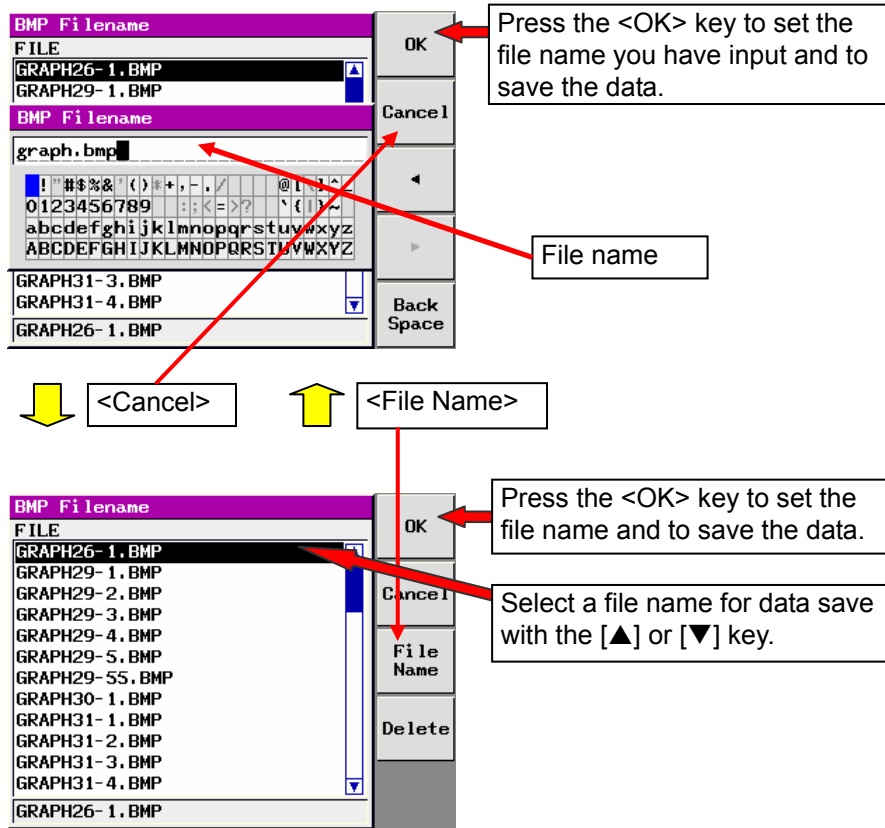
- 1. Press <Save BMP>. The “Select Memory” popup screen will appear.



- 2. Move the cursor to a storage device, to which you want to save the data, and press the <OK> or [ENTER] key. The measurement data is then saved.



- The Save Filename screen appears.  
 Input a file name of the save file while referring to section 2.4.3, Inputting a Character String (page 2-17), and then press <OK>. At this time, when pressing <Cancel>, the file names saved in the storage device are displayed, allowing you to save the data by specifying an existing file name.



**NOTE** If the same file name already exists in the storage device, the Question popup screen appears after pressing <OK>. To overwrite the data, press the <OK> or [ENTER] key. To save the data with another file name, press the <Cancel> or [CANCEL] key, and then input another file name again.

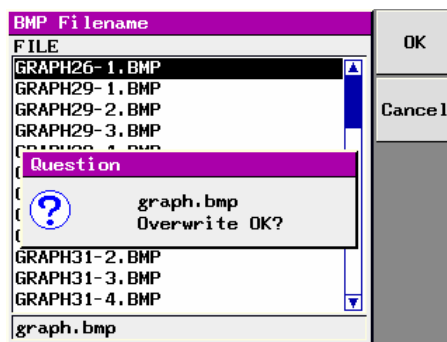
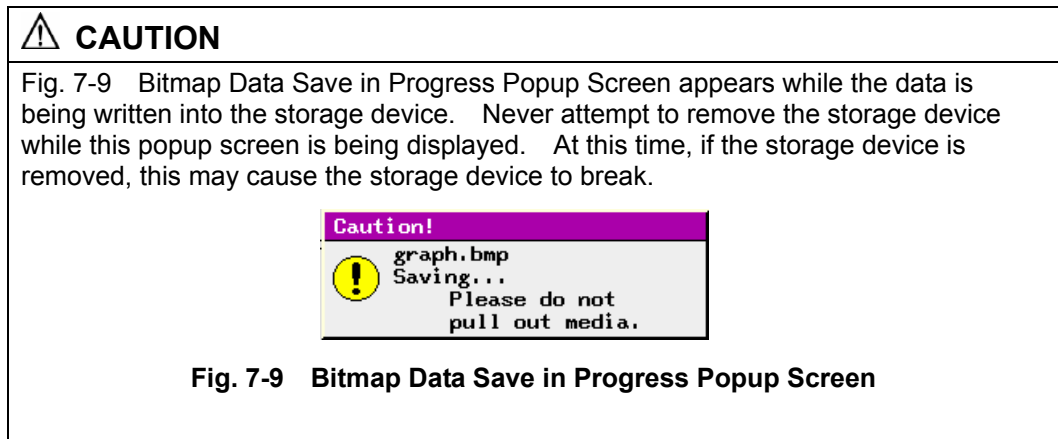


Fig. 7-8 Data Overwrite Confirmation Screen

- When the Caution popup screen disappears, the parameter save operation is completed.

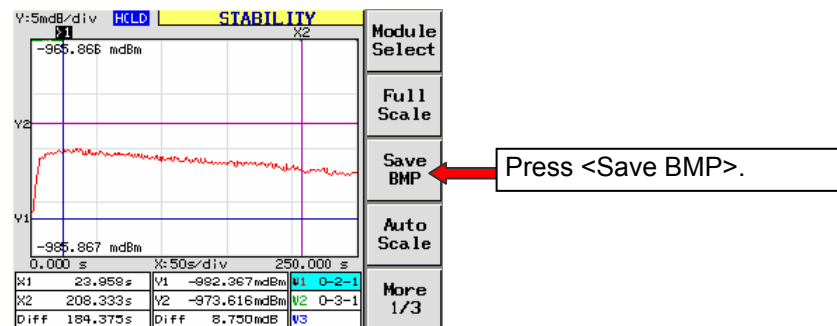
**NOTE**

- Temporary data (data temporarily stored in memory) is cleared when the power is turned OFF (see P1-33).
- To save this data, use the USB storage function (P1-36) or LAN FTP function (P1-38).

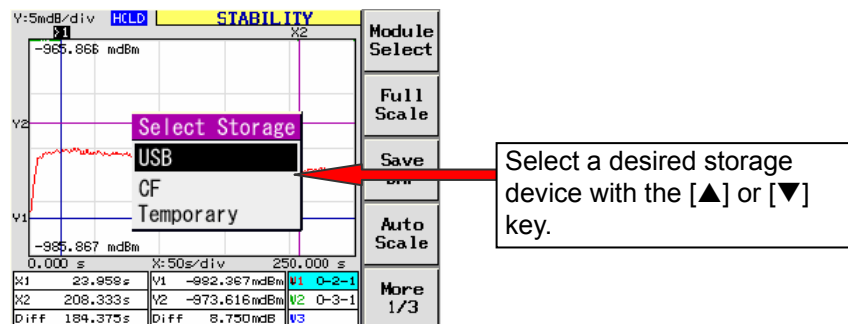
**Deleting Waveform Data**

Waveform data (bitmap data) saved in the storage device can be deleted.

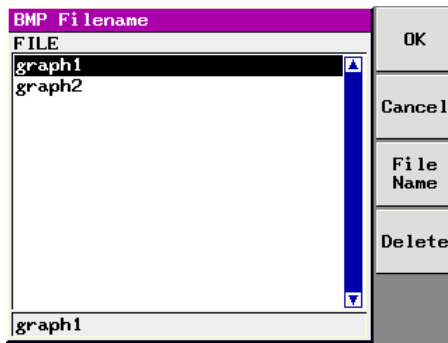
- Press <Save BMP>. The “Select Memory” popup screen will appear.



- Move the cursor to a storage device, from which you want to delete data, and press the <OK> or [ENTER] key. The Save Filename screen will appear.

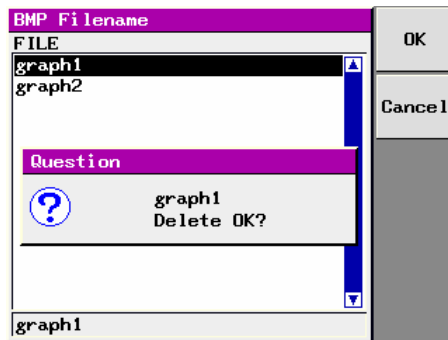


3. Press <Cancel>. File names saved in the storage device are displayed.



**BMP Filename Screen After Pressing <Cancel>**

4. Move the cursor to a file name you want to delete with the [▲] or [▼] key and press <Delete>. The popup screen prompting you to confirm the data deletion will appear.
5. When you want to delete the data, press the <OK> or [ENTER] key. On the contrary, if you do not want to delete the data, press the <Cancel> or [Cancel] key.



**NOTE** || If there are no files, which can be deleted, you cannot select <Delete>.

## 7.2 Optical Reflection Attenuation (ORL) and Connection Loss Measurement (IL)

When connecting the external coupler, this unit can measure the optical reflection attenuation (ORL) and insertion loss (IL) using the “ORL Application” function.

### ■ Applicable Sensor Modules

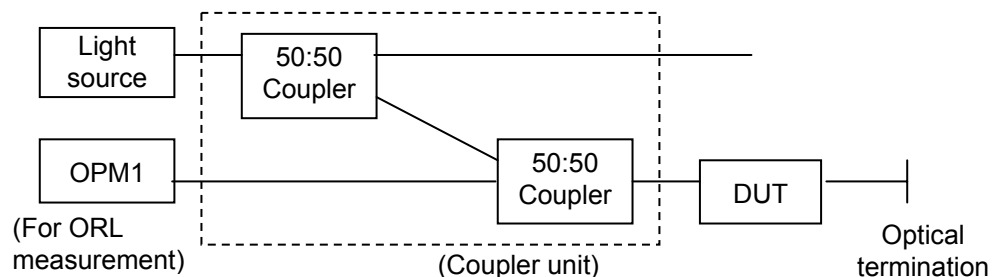
- AQ2200-211 Sensor Module
- AQ2200-215 Sensor Module
- Combination of AQ2200-231 Optical Sensor Head and AQ2200-201 Interface Module
- Combination of AQ2200-241 Optical Sensor Head and AQ2200-201 Interface Module
- AQ2200-221 Dual Sensor Module

### 7.2.1 Measurement System of ORL Application

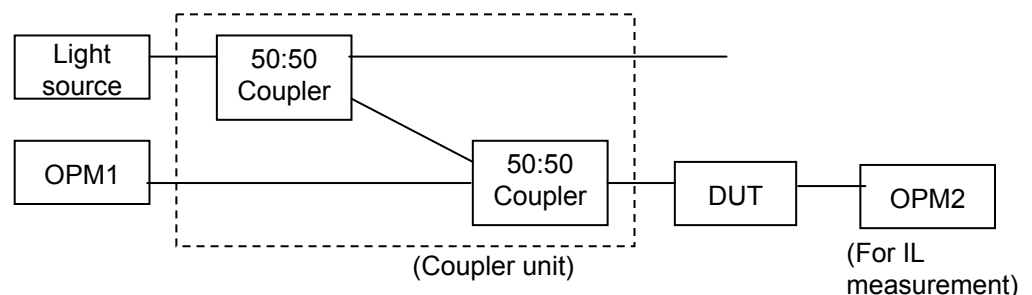
The following shows the measurement system used for the ORL application. Relevant sensor module suitable for an item you want to measure is mounted.

The following describes the measurement system with the coupler manufactured by Tatsuta Electric Wire & Cable Co., Ltd. used as an example.

#### (1) Measuring Only the Optical Reflection Attenuation (ORL)



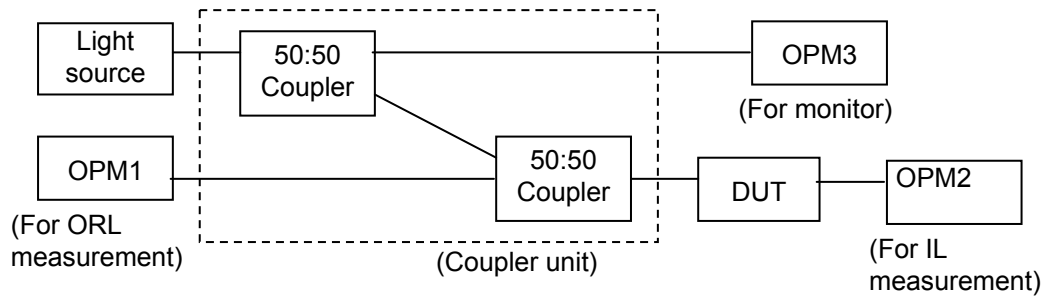
#### (2) Measuring the Optical Reflection Attenuation (ORL) and Insertion Loss (IL)



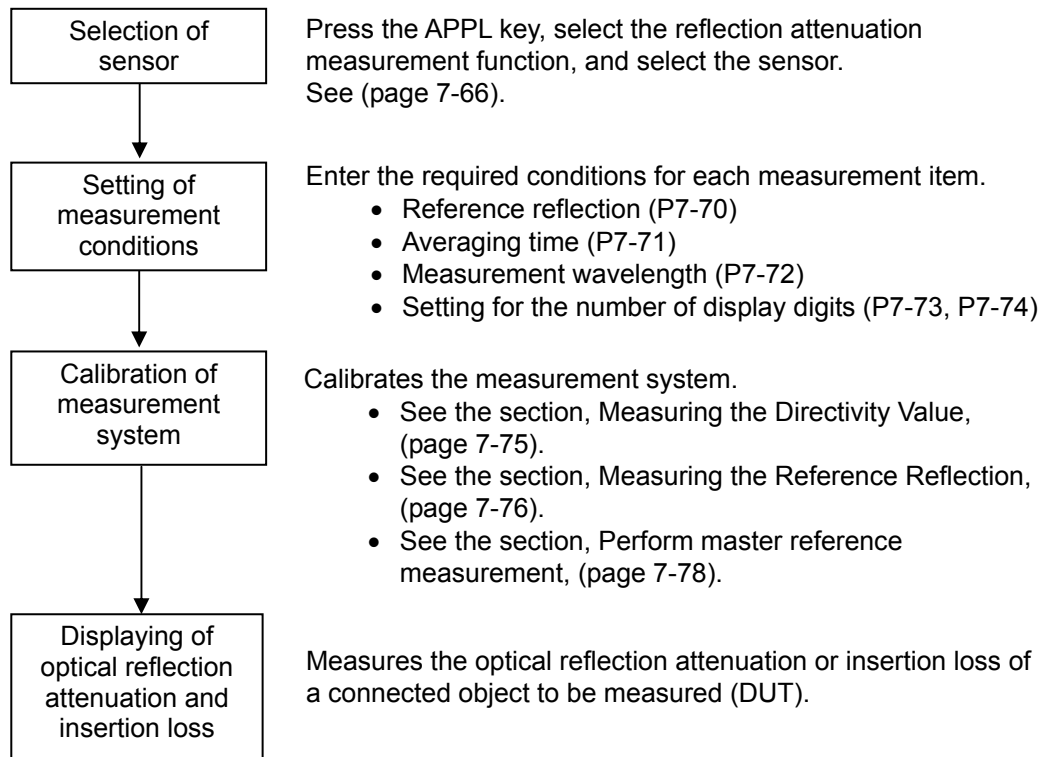
- (3) Measuring the Optical Reflection Attenuation (ORL) with the Light Source Output Variation Monitor



- (4) Measuring the Optical Reflection Attenuation (ORL) and Insertion Loss (IL) with the Light Source Output Variation Monitor



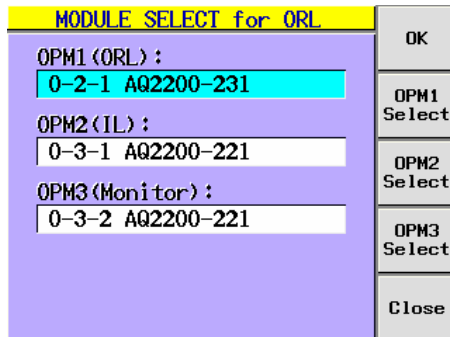
## 7.2.2 Flow of Measurement Operating Procedures



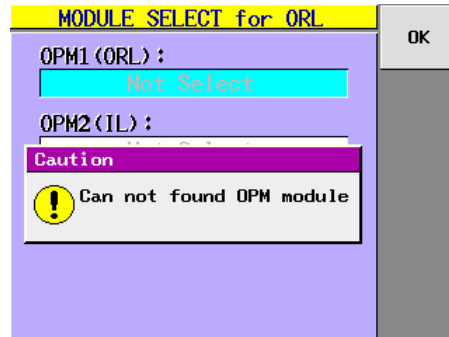
## 7.2.3 Selecting a Sensor

### Selecting a Sensor

To measure the optical reflection attenuation or insertion loss, first select the ORL mode, and then select a sensor.



Sensor Selection Screen



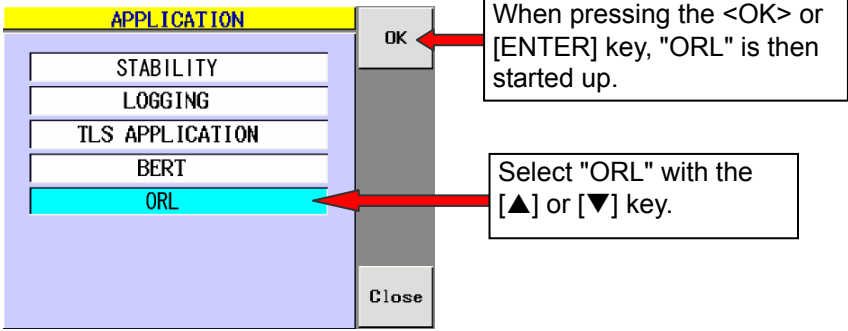
Sensor Unmounted Screen

#### <Function Keys>

- <OK>: Sets the selected sensor and changes the screen to the ORL APPLICATION screen. If any sensor is not mounted, the "Caution" popup screen will appear. If this occurs, mount the sensor module and make the setting again.
- <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 Selected", will appear and you cannot select any sensor.
- <OPM3 Select>: Select a sensor for monitoring of the light source output. If only one sensor is mounted, the dimmed message, "Not Selected", will appear and you cannot select any sensor.
- <Close>: Exits the ORL application mode.
- [CANCEL]: Returns to the APPLICATION selection screen.
- [▲], [▼]: Moves the cursor up or down.
- [ENTER]: Sets the sensor in the item at the cursor position.
- Mounted sensor: Shows the mounted slot and sensor name.  
You cannot select any dimmed module.

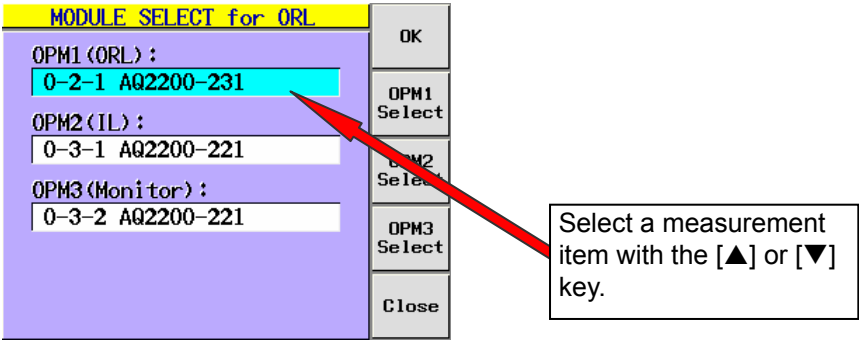
**NOTE** • In the application mode, the buttons on the panel of the sensor module become inactive.

1. Press the [APPLI] key to display the APPLICATION selection screen.
2. Move the cursor to "ORL" and press the <OK> or [ENTER] key.

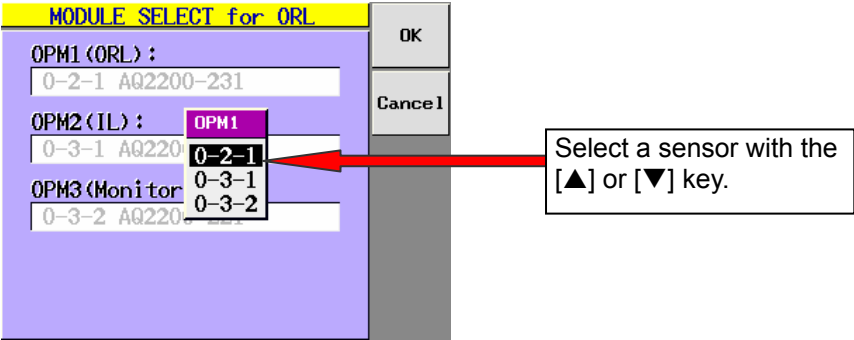


**NOTE** | • If the sensor module is not mounted, the ORL application cannot be started up.

3. The MODULE SELECT for ORL screen will appear. Press a function key (OPM1 to OPM3) suitable for the measurement application or move the cursor to an applicable item and press the <OK> or [ENTER] key.



4. The "OPM1", "OPM2", or "OPM3" popup screen will appear. Move the cursor to a sensor used for the measurement, and press the <OK> or [ENTER] key.

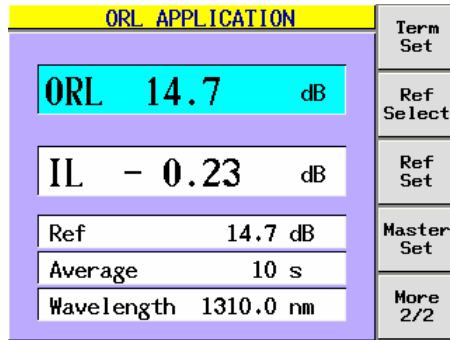


**NOTE** | • This sensor selected for OPM2 or 3 cannot be the one selected for OPM1.  
• If the sensor selected for OPM2 or 3 is selected for OPM1, that OPM becomes "Not Select."

The slot No. and device No., where the sensor module is mounted, are displayed on the items on the popup screen.

- NOTE**
- The first digit of the sensor model number is fixed at 0.
  - "0-2-1" indicates slot number 2, device number 1.

5. Move the cursor to a sensor module used for the measurement with the [▲] or [▼] key.
6. Press the <OK> or [ENTER] key. The ORL APPLICATION screen will appear.



**ORL APPLICATION Screen**

## 7.2.4 Setting the Measurement Conditions for the Optical Reflection Attenuation

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

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

| ORL APPLICATION      |        | Term Set   |
|----------------------|--------|------------|
| NO CAL               |        | Ref Select |
| ORL 3.5 dB           | NO CAL | Ref Set    |
| IL - 3.50 dB         |        | Master Set |
| Ref 14.7 dB          |        | More 2/2   |
| Average 1 s          |        |            |
| Wavelength 1310.0 nm |        |            |

### <Function Keys>

- <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.
- <Cancel>: Returns to the SENSOR MODULE SELECT screen.
- <Close>: Exits the ORL application mode.

### NOTE

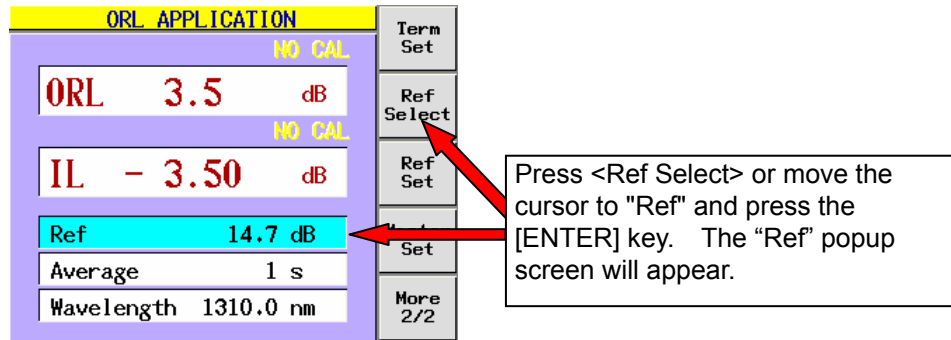
- If directivity and reference reflection measurement have not been conducted and the measured wavelength is changed, NO CAL (not yet calibrated) is displayed in the upper right-hand portion of the ORL field.
- If master reference measurement has not been conducted and the measured wavelength is changed, NO CAL (not yet calibrated) is displayed in the upper right-hand portion of the IL field. However, if an OPM2 sensor is not selected, the IL field is dimmed and NO CAL is not displayed.

### Setting the Reference Reflection Value

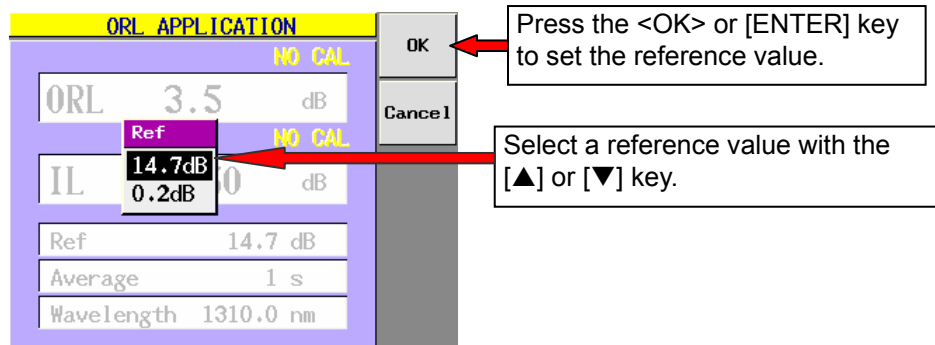
To measure the reference reflection value, select a value used for the reference from two values shown below.

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

1. Press <Ref Select> or move the cursor to "Ref" and press the [ENTER] key. The "Ref" popup screen will appear.



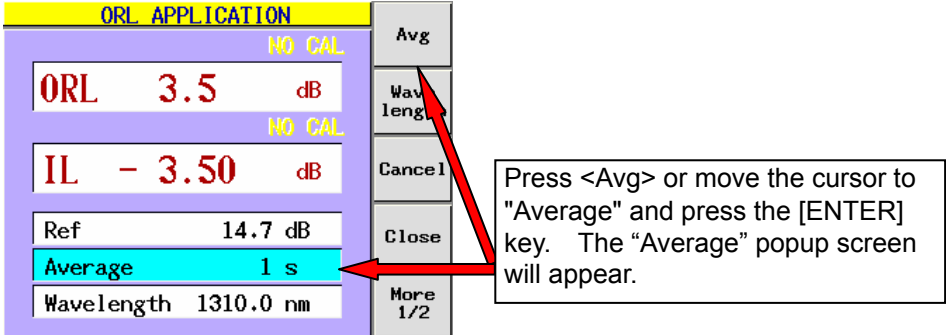
2. With the [▲] or [▼] key, move the cursor to a value you want to use it as reference.
3. Press the <OK> or [ENTER] key. The value you have selected is then set.



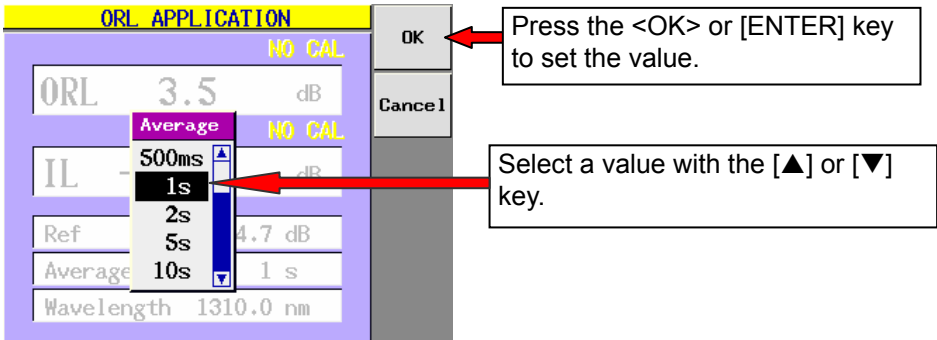
**Setting the Averaging Time**

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

- 1. Press <Avg> or move the cursor to "Average" and press the [ENTER] key. The "Average" popup screen will appear.



- 2. Move the cursor to an average value you want to select with the [▲] or [▼] key.
- 3. Press the <OK> or [ENTER] key. The value you have selected is then set.



### Setting the Measurement Wavelength

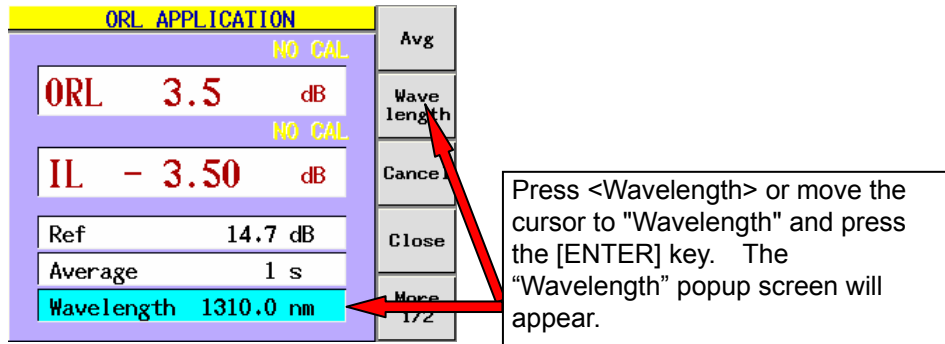
Select a desired value or typical value.

Desired 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.

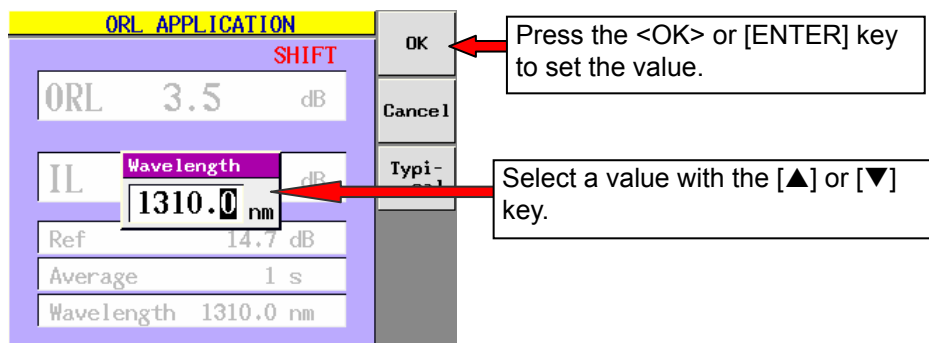
850nm, 1300nm, 1310nm, or 1550nm

1. Press <Wavelength> or move the cursor to "Wavelength" and press the [ENTER] key. The "Wavelength" popup screen will appear.



**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.

2. Input a numeric value with the [▲] or [▼] key or the ten-key pad. Or, press <Typical>. Every time <Typical> is pressed, the typical value is toggled and it is displayed.
3. Press the <OK> or [ENTER] key. The value you have selected is then set.



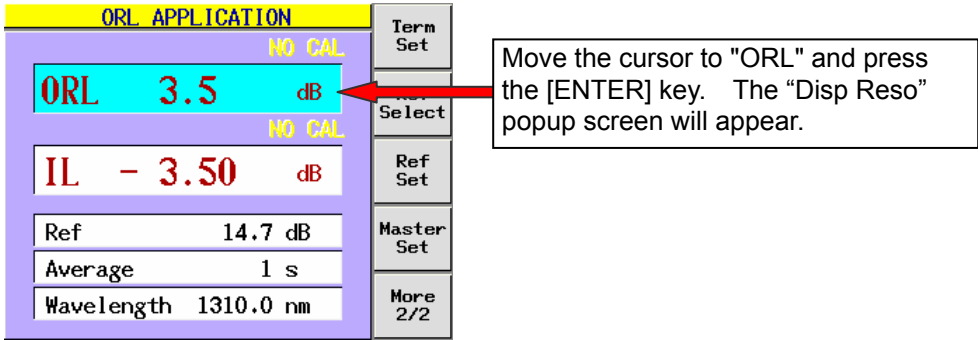
**Setting a Display Decimal Place of the Optical Reflection Attenuation**

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.

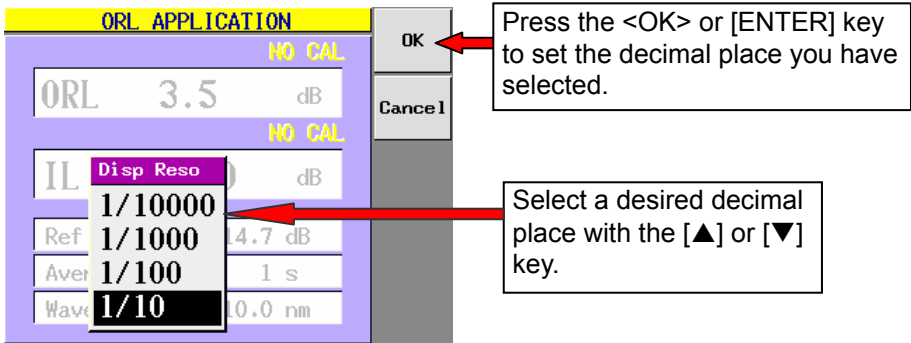
Select a decimal place necessary for the measurement result.

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. Move the cursor to "ORL" with the [▲] or [▼] key.
- 2. Press the [ENTER] key. The "Disp Reso" popup screen will appear.



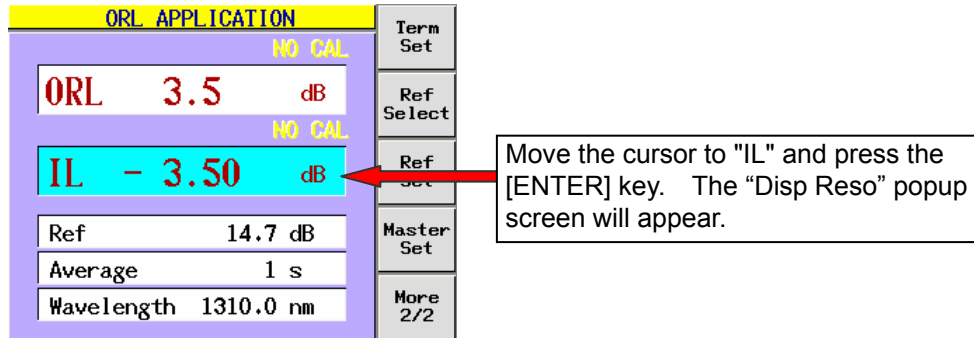
- 3. Move the cursor to a desired decimal place with the [▲] or [▼] key.
- 4. Press the <OK> or [ENTER] key. The value you have selected is then set.



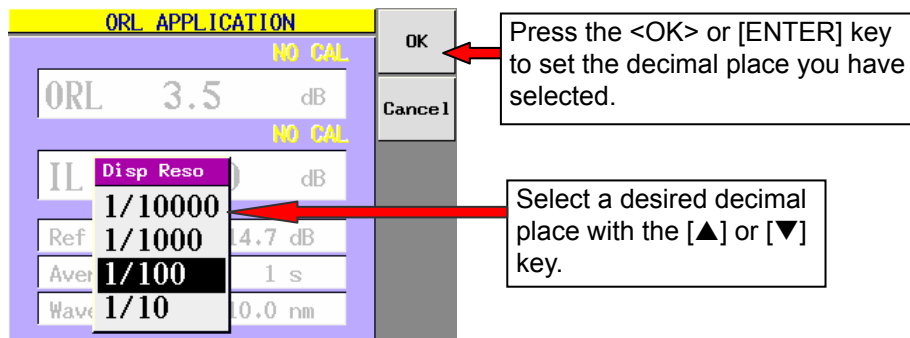
**Setting a Display Decimal Place of the Insertion Loss**

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. Move the cursor to "IL" with the [▲] or [▼] key.
2. Press the <OK> or [ENTER] key. The "Disp Reso" popup screen will appear.



3. Move the cursor to a desired decimal place with the [▲] or [▼] key.
4. Press the <OK> or [ENTER] key. The value you have selected is then set.



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

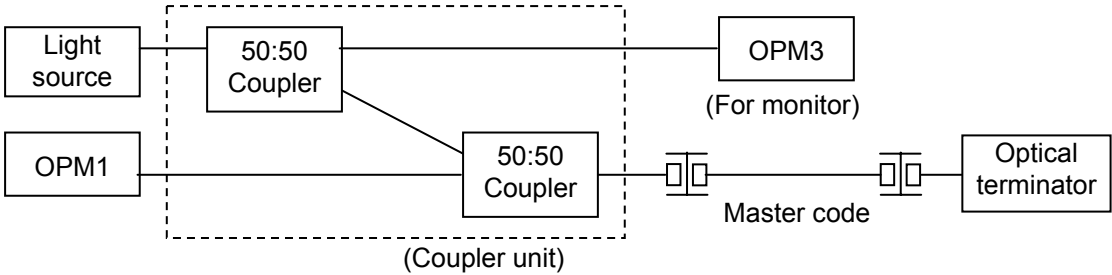
### 7.2.5 Calibrating the Measurement System

In this ORL application, correction values, such as the directivity value and insertion loss per the master code obtained using the coupler manufactured by Tatsuta Electric Wire & Cable Co., Ltd. used for the description of 7.2.1, Measurement System of ORL Application, 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 while referring to the following steps.

#### 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.



2. Press <Term Set>.

|                      |  |            |
|----------------------|--|------------|
| ORL APPLICATION      |  | Term Set   |
| NO CAL               |  | Ref Select |
| ORL 52.0 dB          |  | Ref Set    |
| NO CAL               |  | Master Set |
| IL 93.03 dB          |  | More 2/2   |
| Ref 14.7 dB          |  |            |
| Average 10 s         |  |            |
| Wavelength 1310.0 nm |  |            |

Press <Term Set> to start the measurement.

3. The message, "Measurement", will appear. When the measurement has been completed, this message will disappear.

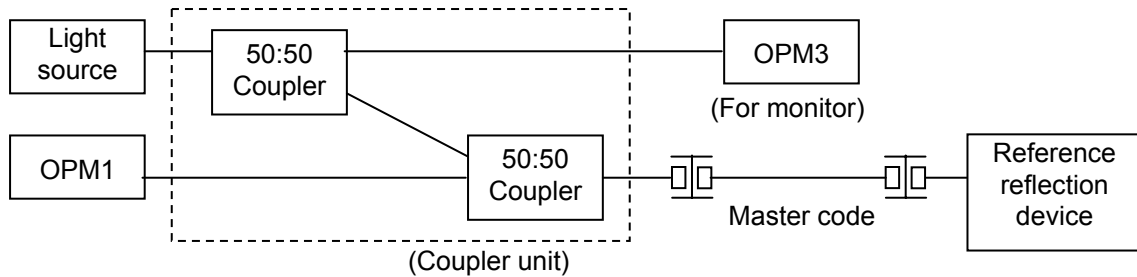
|                      |  |         |
|----------------------|--|---------|
| ORL APPLICATION      |  | OK      |
| ORL 53.6 dB          |  | Cancel  |
| Measurement...       |  | Typical |
| Ref 14.7 dB          |  |         |
| Average 10 s         |  |         |
| Wavelength 1310.0 nm |  |         |

Press <Cancel> to complete the measurement.

**NOTE** | When pressing <Cancel> during measurement, the measurement is aborted forcibly. In this case, the data currently being measured is disposed of.

**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.



2. Press <Ref Set>.

|  |  |   |
|--|--|---|
| <b>ORL APPLICATION</b><br>NO CAL<br><b>ORL 15.3 dB</b><br>NO CAL<br><b>IL - 0.24 dB</b><br>Ref 14.7 dB<br>Average 10 s<br>Wavelength 1310.0 nm |  | Term Set<br>Ref Select<br>Ref Set<br>Master Set<br>More 2/2 |
|--|--|---|

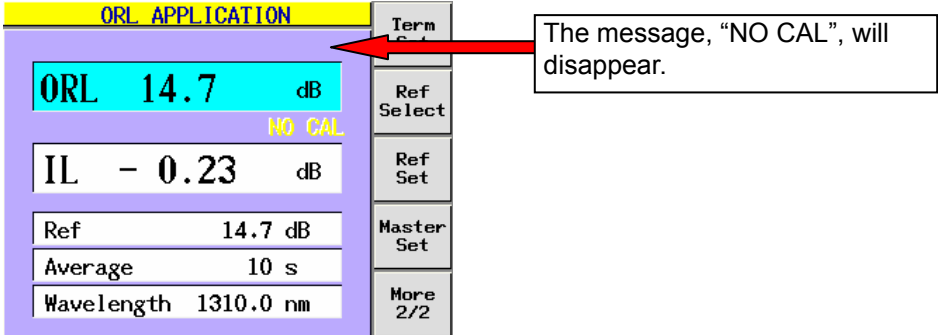
Press <Ref Set> to start the measurement.

3. The message, "Measurement", will appear. When the measurement has been completed, this message will disappear.

|  |  |                          |
|--|--|--------------------------|
| <b>ORL APPLICATION</b><br>ORL 53.6 dB<br>Measurement...<br>Ref 14.7 dB<br>Average 10 s<br>Wavelength 1310.0 nm |  | OK<br>Cancel<br>Typi-cal |
|--|--|--------------------------|

Press <Cancel> to complete the measurement.

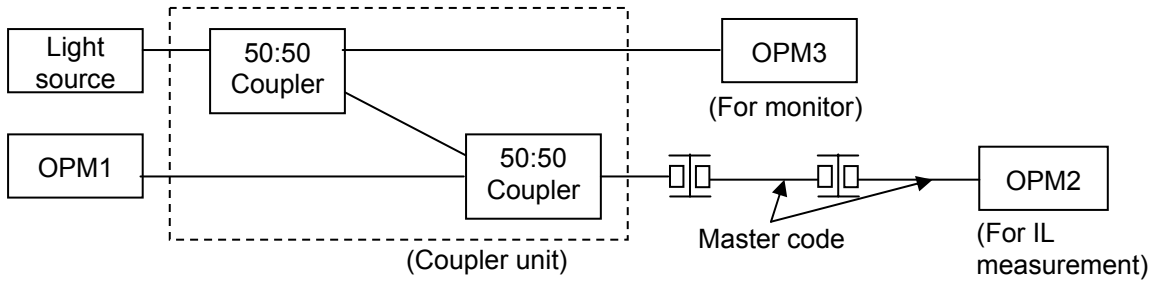
- 4. When the measurement of the directivity and reference reflection value has been completed successfully, the "NO CAL" message will disappear.



**NOTE** | When pressing <Cancel> during measurement, the measurement is aborted forcibly. In this case, the data currently being measured is disposed of.

**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 <Master Set>.

|                      |        |            |
|----------------------|--------|------------|
| ORL APPLICATION      |        | Term Set   |
| ORL 14.7 dB          | NO CAL | Ref Select |
| IL - 0.24 dB         |        | Ref Set    |
| Ref 14.7 dB          |        | Master Set |
| Average 10 s         |        | More 2/2   |
| Wavelength 1310.0 nm |        |            |

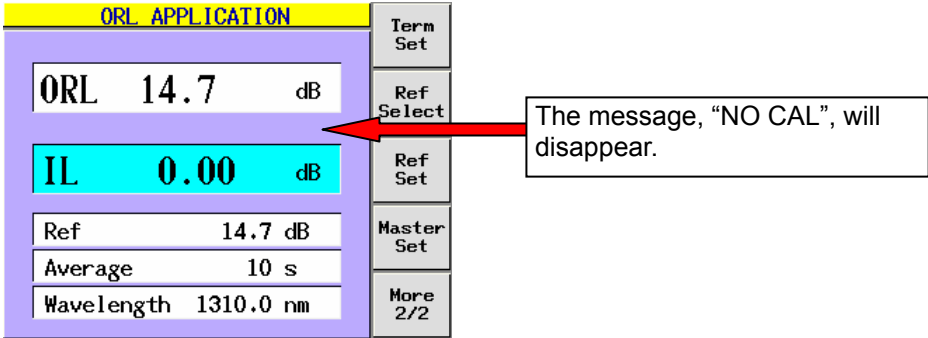
Press <Master Set> to start the measurement.

3. The message, "Measurement", will appear. When the measurement has been completed, this message will disappear.

|                      |  |         |
|----------------------|--|---------|
| ORL APPLICATION      |  | OK      |
| ORL 53.6 dB          |  | Cancel  |
| Measurement...       |  | Typical |
| Ref 14.7 dB          |  |         |
| Average 10 s         |  |         |
| Wavelength 1310.0 nm |  |         |

Press <Cancel> to complete the measurement.

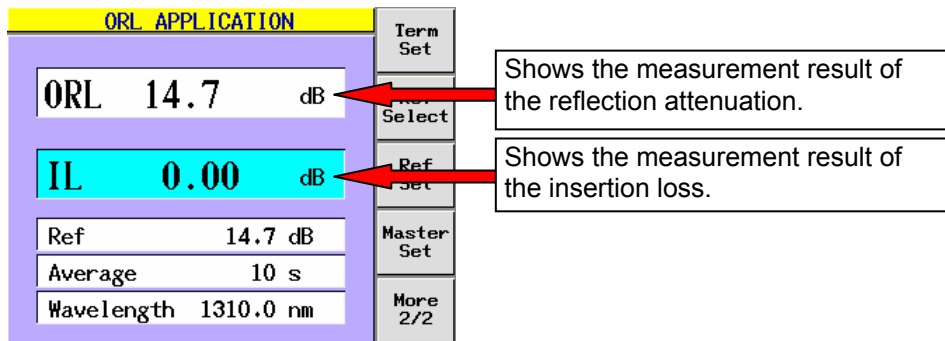
- 4. When the measurement has been completed successfully, the message, "NO CAL" (red indication), at the upper right portion of "IL" will disappear.



- NOTE**
- When pressing <Cancel> during measurement, the measurement is aborted forcibly. In this case, the data currently being measured is disposed of.
  - Master reference measurement can not be performed if an OPM2 sensor (for insertion loss measurement) is not selected.

### 7.2.6 Displaying the Measurement Results

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

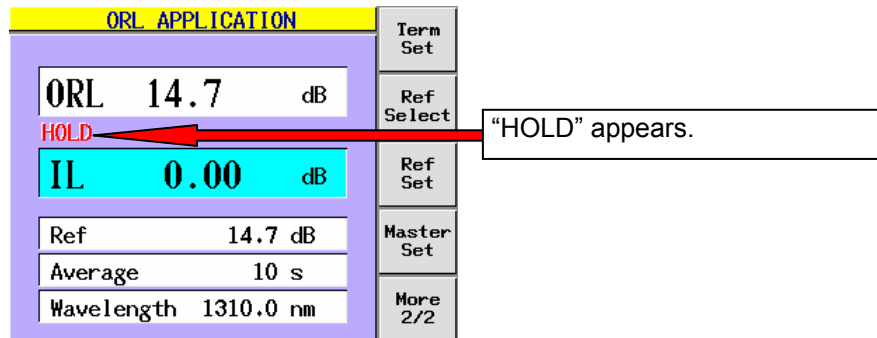


- NOTE**
- If an OPM2 sensor is not selected, the IL field is dimmed and no value is displayed.
  - If the output level of the light source is low and measurement is not possible, or during calibration measurement, "-----" is displayed for the value in the ORL and IL fields.

#### Holding the Measurement Value Display and Canceling the HOLD Mode

The "ORL" and "IL" measurement value displays are individually held (HOLD).

1. With the [▲] or [▼] key, move the cursor to a measurement value you want to hold the display (ORL or IL).
2. Press the [HOLD] key. The message, "HOLD", will appear above the measurement value display field, showing that the HOLD mode is active.



3. Press the [HOLD] key again. The message, "HOLD", above the measurement value field will disappear, showing that the hold status is cancelled.

# 7.3 Measurement with the Trigger

By inputting external trigger signals or by outputting trigger signals at completion of the measurement, you can construct a measurement system synchronized with external measuring instruments.

## 7.3.1 About 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 the [SYSTEM] key to display the SYSTEM screen. (Fig. 7-10)
- 2. Move the cursor to "Trigger" and press the <Edit> or [ENTER] key.

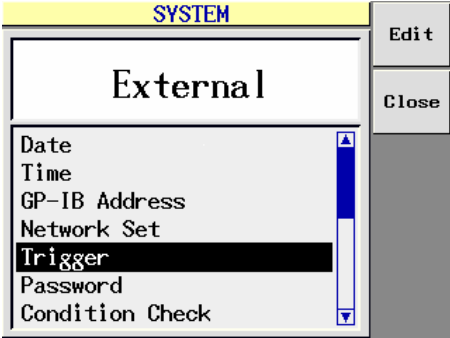
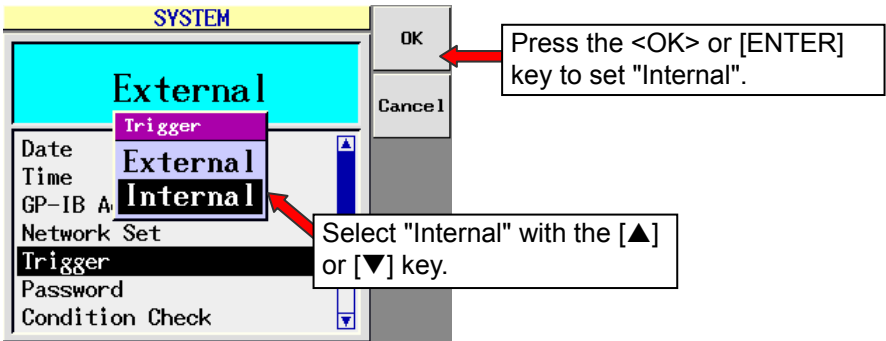


Fig. 7-10 Trigger Input Setup Screen

- 3. The "Trigger" popup screen will appear. Move the cursor to "Internal" and press the <OK> or [ENTER] key.



- 4. Press <Close> to close the SYSTEM screen.

**[Example of operation]**

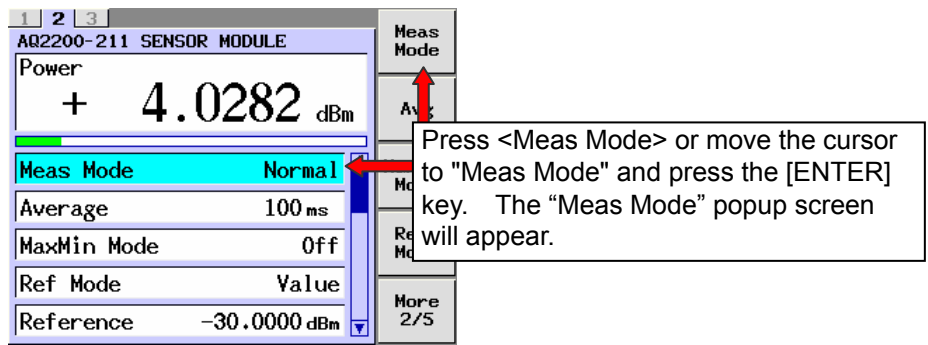
The following describes how to make the setting to start the measurement of other sensor module synchronized with the measurement start of one sensor module with two or more sensor modules mounted on the same frame.

**<Preparations for Measurement>**

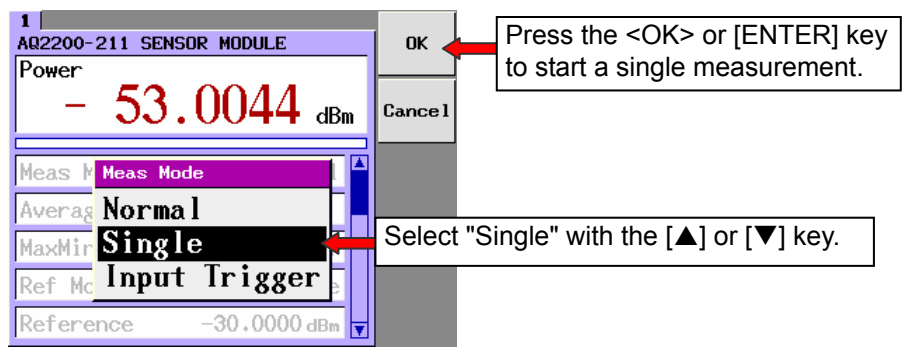
1. Set the SYSTEM trigger setting to "Internal".  
See the section, Setting the Measurement Synchronized with the Internal Trigger, (page 7-81).
2. Set the trigger output of one sensor module to "Meas Started".  
See the section, Setting the Trigger Output, (page 7-85).
3. Set the measurement mode of other sensor module to "Input Trigger".  
See the section, Changing the Measurement Mode, (page 4-14).

**<Starting the Measurement>**

1. Set the sensor module, the trigger output of which is set at "Meas Started", to the current module with the [CHAN] key.
2. Press <Meas Mode> or move the cursor to "Meas Mode" with the [▲] or [▼] key and press the [ENTER] key.



3. The "Meas Mode" popup screen will appear. With the [▲] or [▼] key, move the cursor to "Single" and press the [ENTER] key. The single measurement is started and other sensor module also starts the single measurement at the same time.

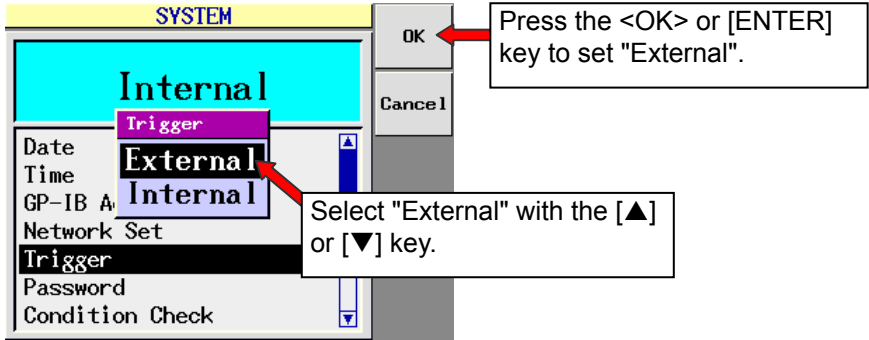


4. To repeat the measurement, repeat above steps 2 and 3.

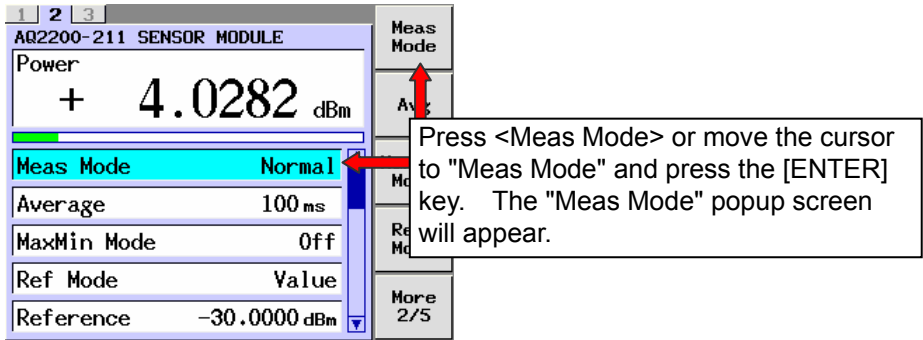
**Setting the Measurement Synchronized with the External Trigger**

When the external trigger signal is input, the sensor starts the single measurement. Follow the steps below to make the necessary settings.

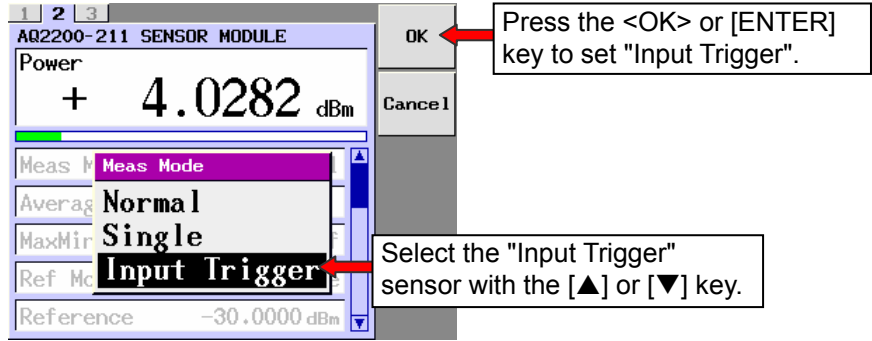
1. Press the [SYSTEM] key to display the SYSTEM screen.
2. Move the cursor to "Trigger" and press the <Edit> or [ENTER] key. (See Fig. 7-10 Trigger Input Setup Screen (page 7-81).)
3. The "Trigger" popup screen will appear. Move the cursor to "External" and press the <OK> or [ENTER] key.



4. Press <Close> to close the SYSTEM screen.
5. As the current module, select with the [CHAN] key a sensor for which you want to make a measurement in synchronization with the trigger signal.
6. Press <Meas Mode> or move the cursor to "Meas Mode" and press the [ENTER] key.



7. The "Meas Mode" popup screen will appear. Move the cursor to "Input Trigger" and press the [ENTER] key.



**NOTE** | For details about the hardware specifications of the input trigger, see "Trigger-in Connector / Trigger-out Connector" (page 1-31).

### 7.3.2 About Trigger Output

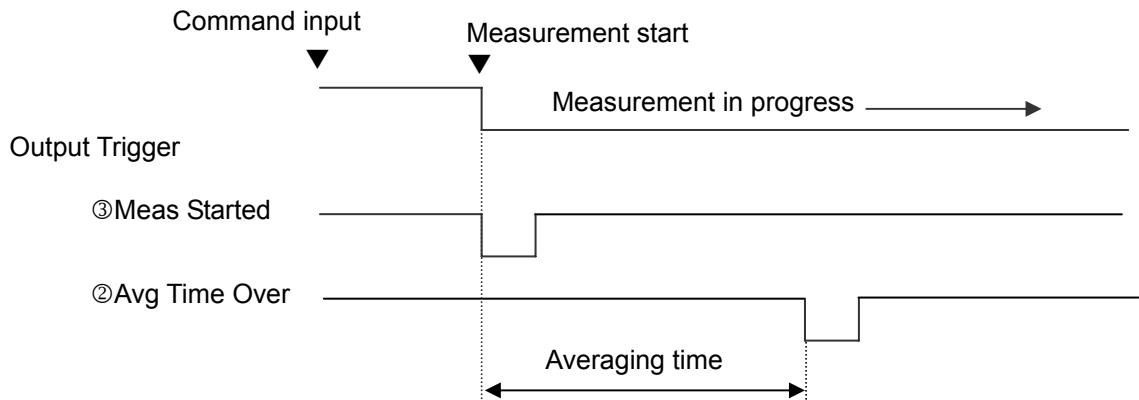
The trigger signal is output corresponding to the measurement of the sensor to inform that the measurement to the module mounted on the same frame or external device is started or completed.

The trigger output can be set in the following three modes.

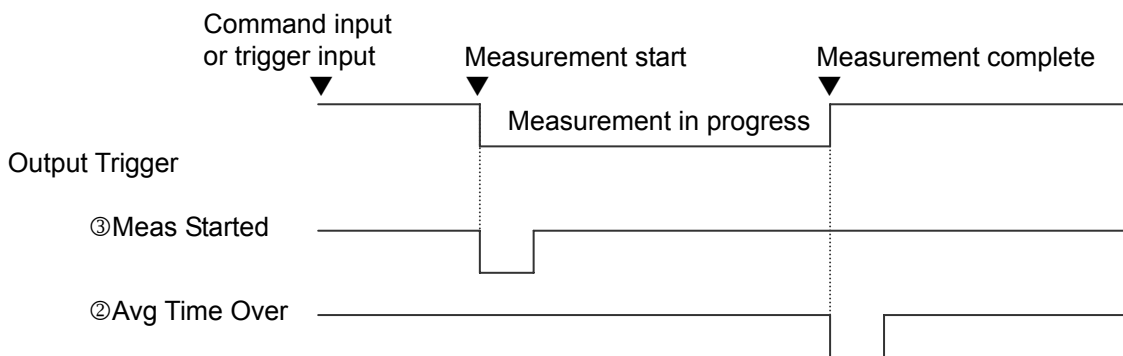
- ① Disable: Makes the external output trigger disabled. (The trigger signal is not output.)
- ② Avg Time Over: Outputs the trigger signal at completion of the measurement.
- ③ Meas Started: Outputs the trigger signal at start of the measurement.

According to the measurement mode, the trigger is output in each trigger mode as described below.

#### <"Normal" Measurement Mode>

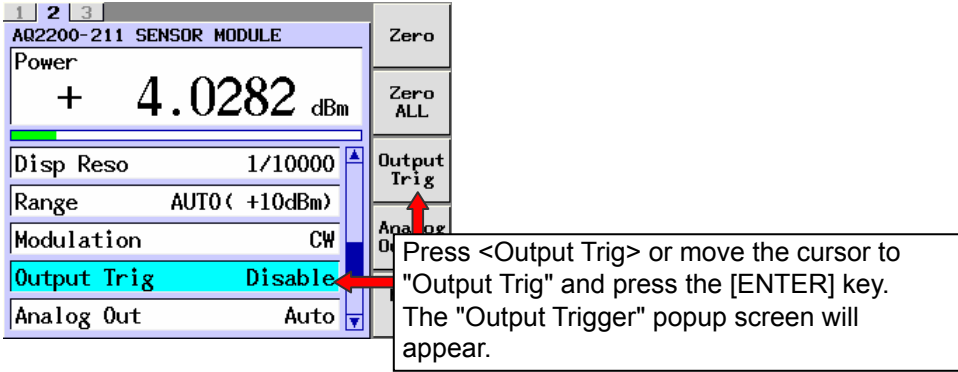


#### <"Single" or "Input Trigger" Measurement Mode>

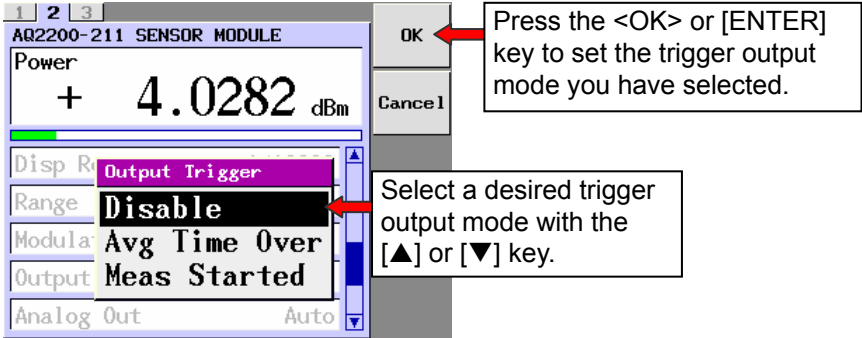


**Setting the Trigger Output**

- 1. Set a module, from which you want to output the trigger, to the current module with the [CHAN] key.
- 2. Press <Output Trig> or move the cursor to "Output Trig" and press the [ENTER] key.



- 3. The "Output Trigger" popup screen will appear. Move the cursor to a desired trigger output mode and press the <OK> or [ENTER] key.



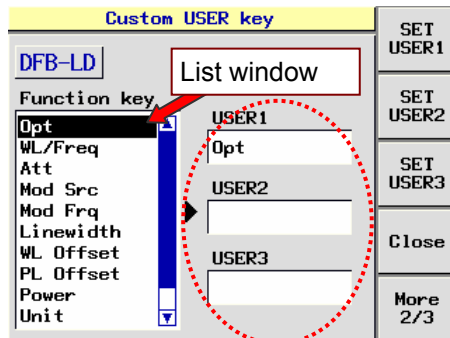
**NOTE** | In the AQ2200-221, "Output Trigger" of both devices cannot be made enabled at the same time. When one module is set at "Avg Time Over" or "Meas Started", another device is set at "Disable".

## 7.4 Assigning the User Keys

You can assign the functions of the function keys of each module to the user keys ([USER1], [USER2], and [USER3]).

By assigning the functions to the hard keys, you can select the function of the current module with one button operation and without changing of the function key page.

- NOTE**
- The user key assignments are grouped by the module model. Even though the insertion slots are different, the same assignments can be used when the same module model is used.

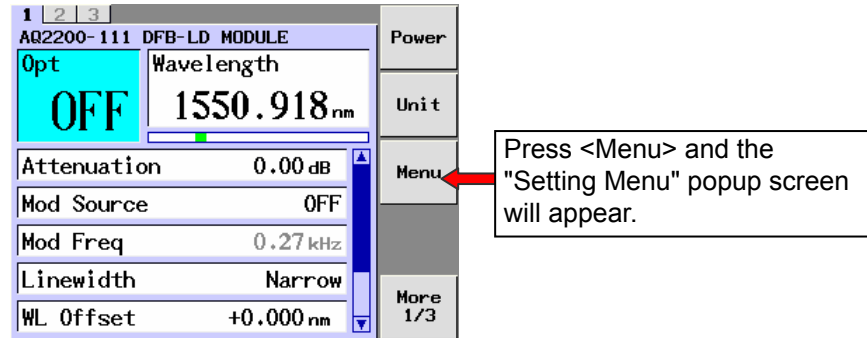


User key assignment parameters. Assigned functions are shown. If a user key is blank, this shows that no function is assigned.

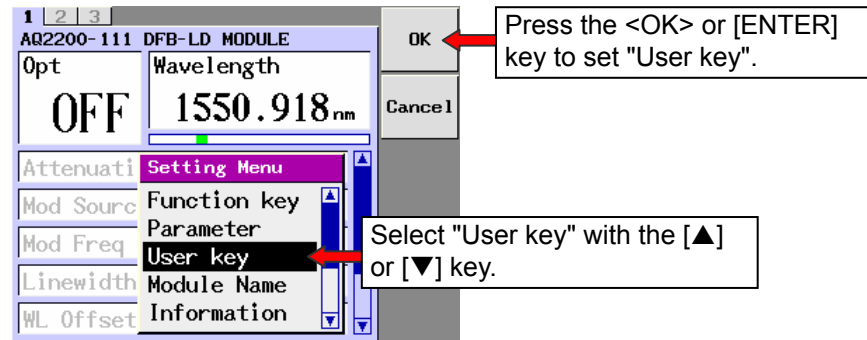
- <SET USER1>: Assigns the function at the cursor position in the list window to [USER1].
- <SET USER2>: Assigns the function at the cursor position in the list window to [USER2].
- <SET USER3>: Assigns the function at the cursor position in the list window to [USER3].
- <Erase USER1>: Cancels the assignment of [USER1].
- <Erase USER2>: Cancels the assignment of [USER2].
- <Erase USER3>: Cancels the assignment of [USER3].

### Assigning the User Keys

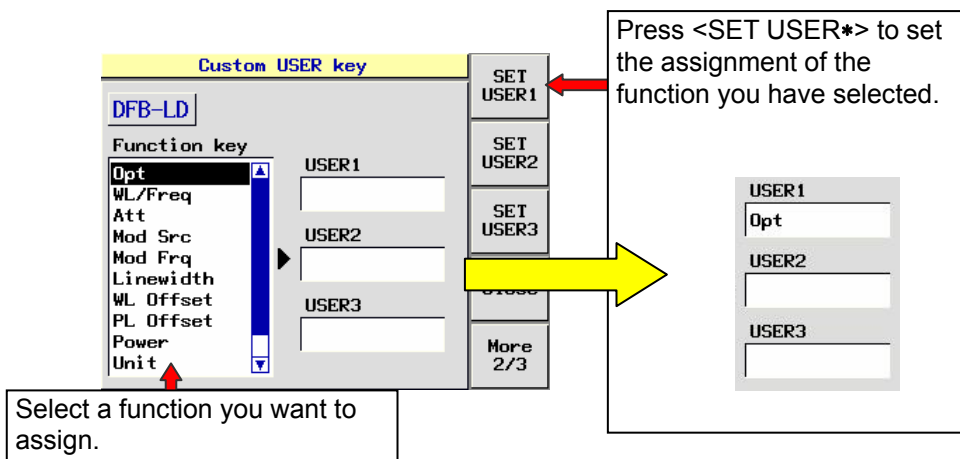
1. Set a module you want to set for the user key to the current module with the [CHAN] key.
2. Press <Menu>.



3. The "Setting Menu" popup screen will appear. Move the cursor to "User key" and press the <OK> or [ENTER] key.



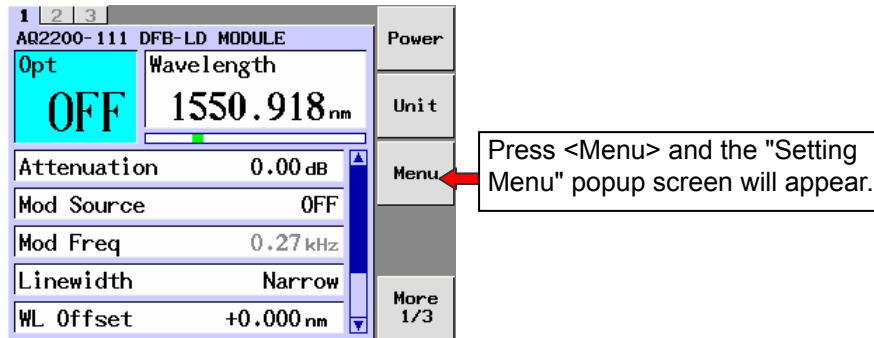
4. The screen changes to the Custom User key screen. Move the cursor to a function in the list window you want to assign it to the user key and press <SET USER\*>. <SET USER\*> shows any function key of <SET USER1> to <SET USER3>.



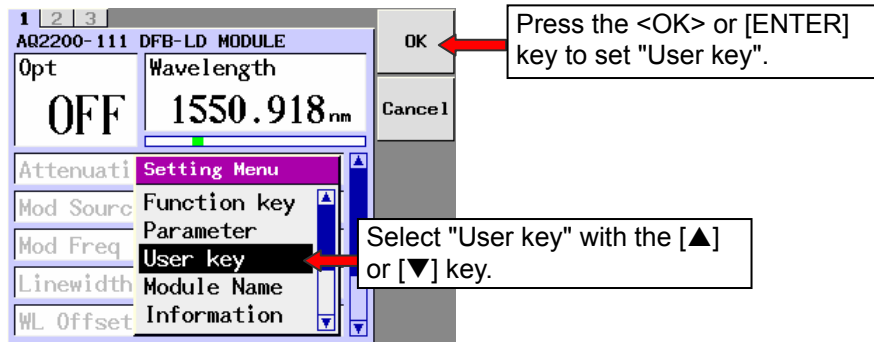
5. Close the user key assignment function. Press <Close>. Return to the previous screen. To cancel the edit, press <Cancel>.

**Canceling the User Key Assignments**

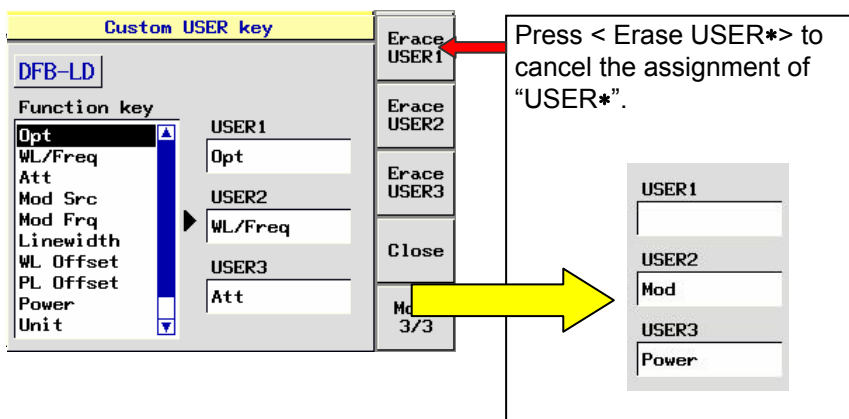
1. Set a module you want to set for the user key to the current module with the [CHAN] key.
2. Press <Menu>.



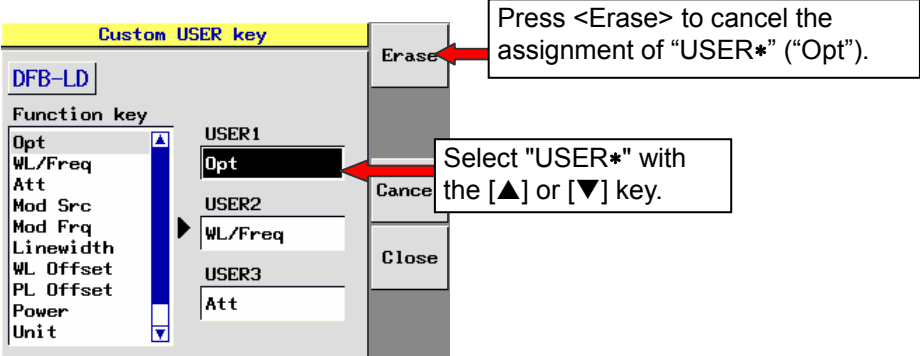
3. The "Setting Menu" popup screen will appear. Move the cursor to "User key" and press the <OK> or [ENTER] key.



4. The screen changes to the Custom User key screen. Press <Erase USER\*> for the user key you want to cancel the assignment. <Erase USER\*> shows any function key of <Erase USER1> to <Erase USER3>.



Additionally, press the [▶] key to move the cursor to the parameter assigned to the user key. Select "USER\*" with the [▲] or [▼] key and press <Erase>. This operation can also cancel the assignment.



## 7.5 Customizing the Display Screen

The display order of the function keys and parameters on the DETAIL screen or SUMMERY screen can be changed by the module type.

Additionally, the display module name can also be changed.

You can change the display to that you can operate easily corresponding to the application.

### 7.5.1 Changing the Display Order of Function Keys

You can select a desired display order of function keys from four kinds of patterns.

Since one of four patterns is set as default setting, this pattern cannot be changed, but rest three patterns can be changed freely as required.

You must select or set a display order suitable for the application.

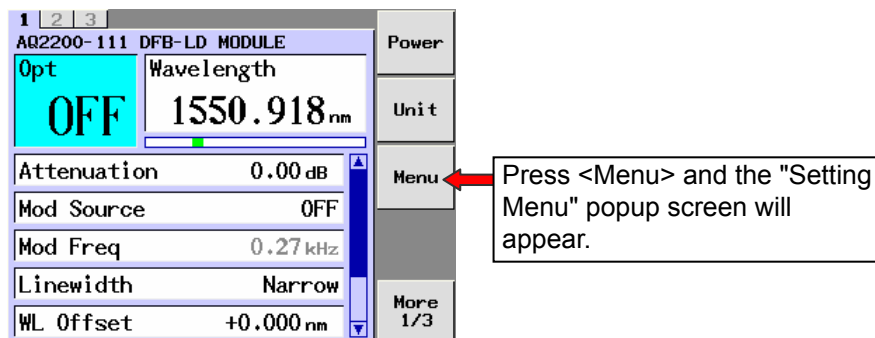
#### Selecting a Display Order of Function Keys

You can select a desired display order of function keys from the following four function display patterns.

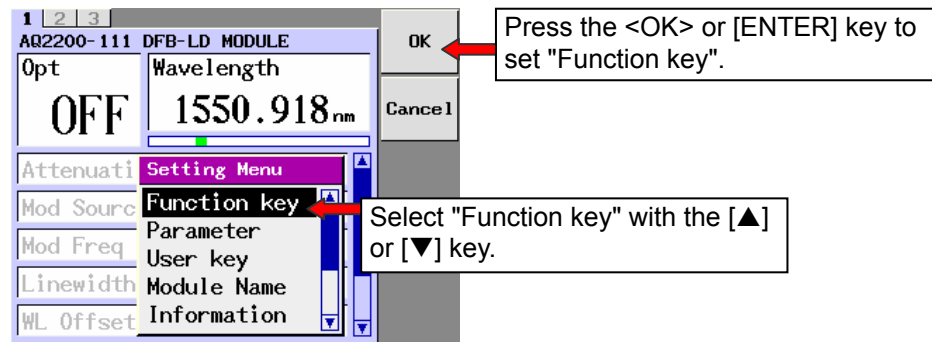
- Default (Display order is fixed and it cannot be changed.)
- Custom1 (Display order can be changed to a desired order.)
- Custom2 (Display order can be changed to a desired order.)
- Custom3 (Display order can be changed to a desired order.)

Follow the steps below to select a desired display order.

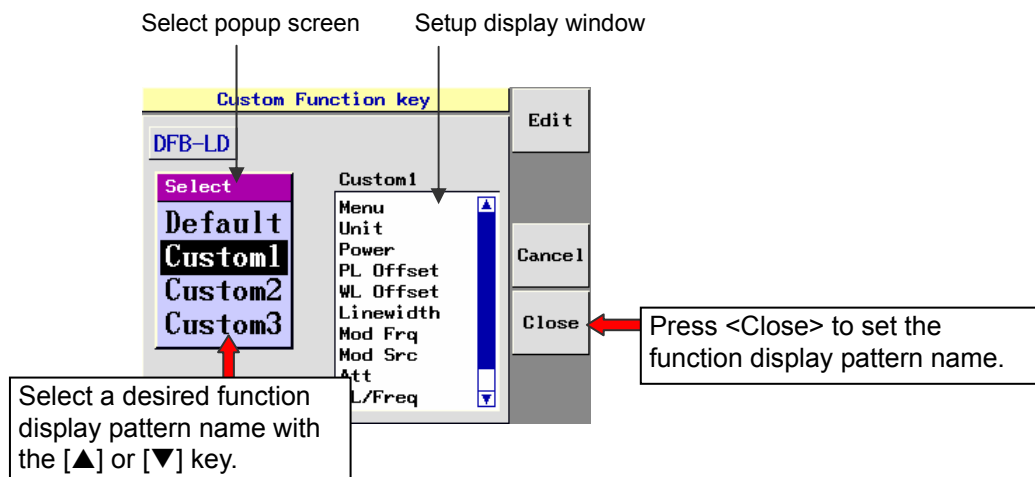
1. Using the [CHAN] key, set the module that sets the function key display order as the current module.
2. Press <Menu>.



3. The "Setting Menu" popup screen will appear.  
Move the cursor to "Function key" and press the <OK> or [ENTER] key.



4. The screen changes to the Custom Function key screen and the "Select" popup screen will appear.  
At this time, the cursor on the Select popup screen shows the currently specified function display pattern.  
When the cursor is moved to a function display pattern name on the Select popup screen, the function display order set for this pattern is shown in the setup display window.  
Move the cursor to a desired function display pattern and press <Close>.

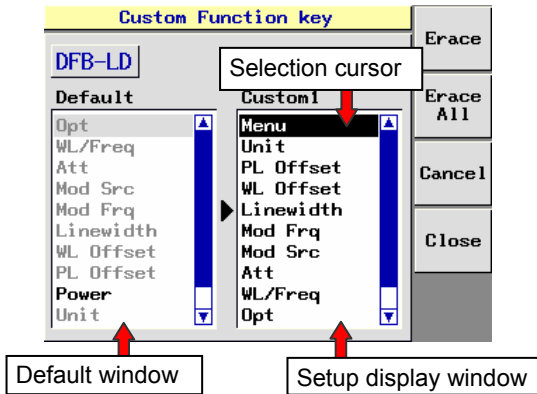


**Changing the Display Order of Function Keys**

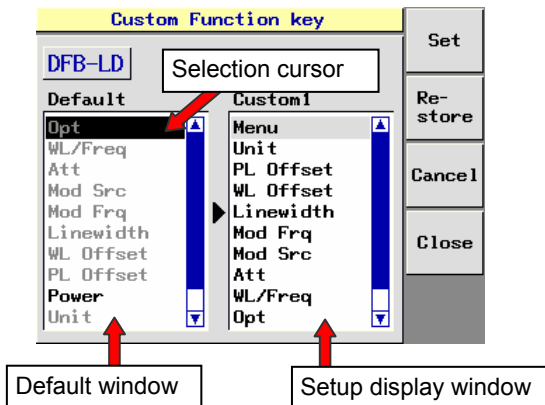
You can set a desired display pattern about the display order of the function keys for each of "Custom1", "Custom2", and "Custom3".

The display order can be changed through two kinds of setup screens shown below.

**<Function Deletion Screen>**



**<Function Addition Screen>**



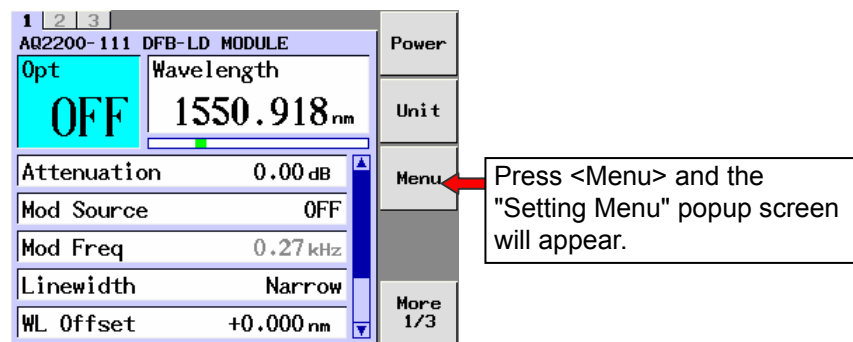
- Default window: The list of functions is displayed in the default display order. Normal and dim character string colors are provided. The normal character string color shows the items not set in the setup display window while the dim character string color shows the items set in the setup display window.
- Setup display window: Set functions are displayed in the ascending order. All items set in the default window must be set in this window.
- Selection cursor: <Erase>, <Set>, and [ENTER] operate the function at this cursor position.

- <Erase>: Shown only on the function deletion screen.  
The function at the selection cursor is deleted from the setup display window. The same operation also happens when you press the [ENTER] key.
- <Erase All>: Shown only on the function deletion screen.  
All functions displayed in the setup display window are deleted from the setup display window.
- <Set>: Shown only on the function addition screen.  
The function at the selection cursor is added to a position before the cursor item in the setup display window. The same operation also happens when you press the [ENTER] key.
- <Re-store>: Shown only on the function addition screen.  
The functions in the default window are directly set to the setup display window as they are.
- [◀], [▶]: Switches the screen between the function addition screen and function deletion screen.
- [▲], [▼]: Moves the selection cursor up or down.

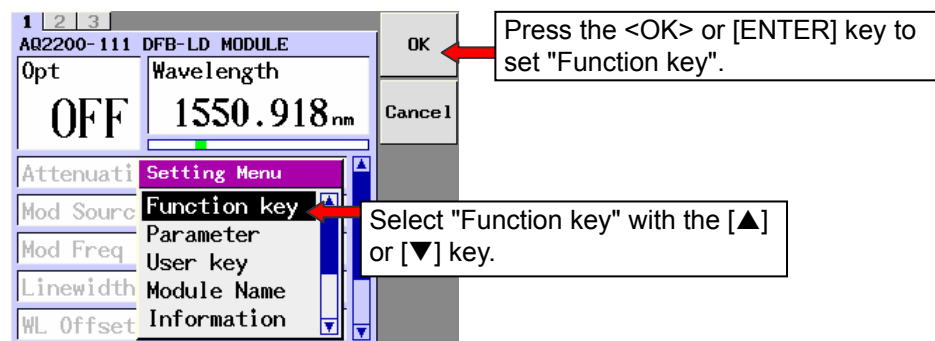
The following describes operating procedures with the AQ2200-111 DFB-LD Module used as an example.

#### <Registering the Order with <Power> Put at the Top of the Function Key into Custom1>

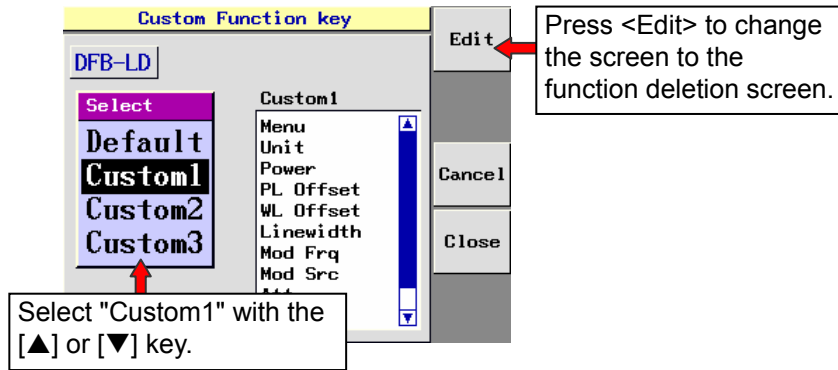
1. Set the AQ2200-111DFB-LD module to the current module with the [CHAN] key.
2. Press <Menu>.



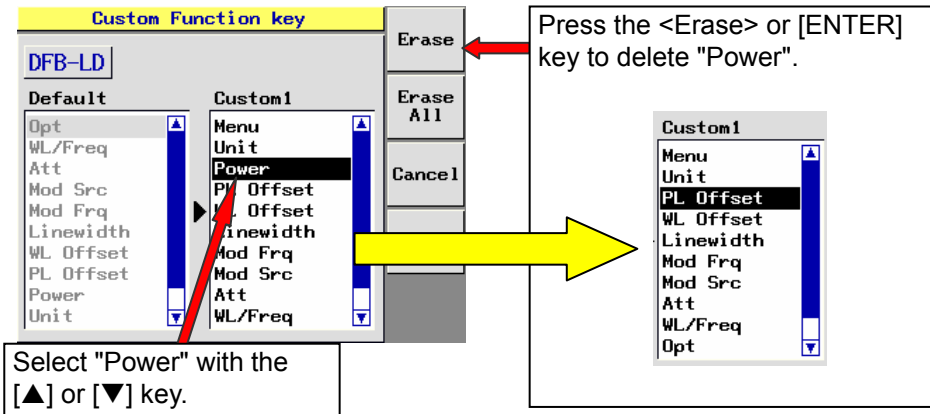
3. The "Setting Menu" popup screen will appear.  
Move the cursor to "Function key" and press the <OK> or [ENTER] key.



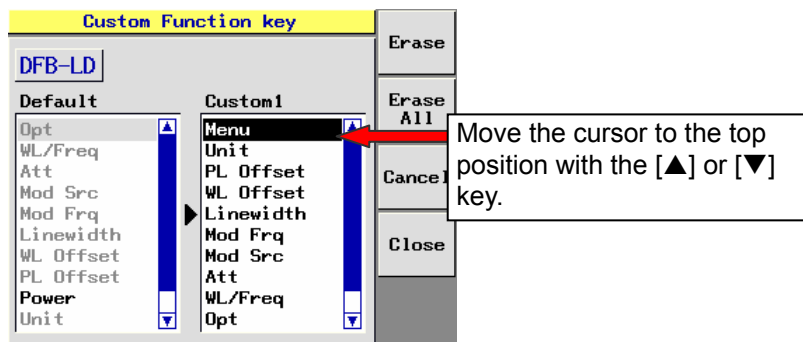
- The screen changes to the Custom Function key screen and the Select popup screen will appear.  
Move the cursor to "Custom1" and press <Edit>.



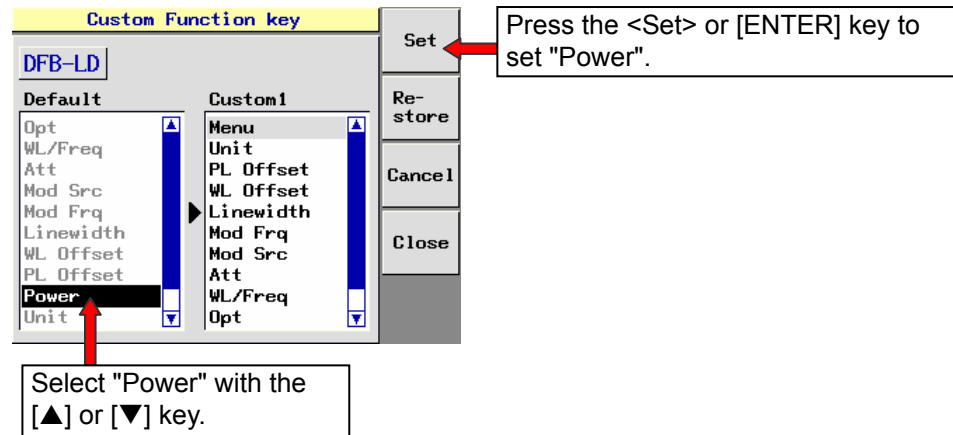
- The function deletion screen will appear.  
Move the cursor to "Power" in the set function list and press the <Erase> or [ENTER] key. "Power" is then deleted from the set function list.



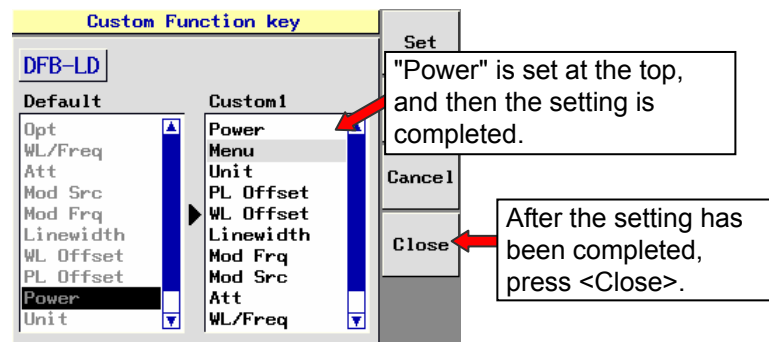
- Move the cursor to the top position.



- Press the [◀] key to move the cursor to the default window on the function addition screen.  
Move the cursor to "Power" and press the <Set> or [ENTER] key.  
"Power" is then set at a position before the cursor, which has been moved in step 6.



- Press <Close> to complete the setting.



## 7.5.2 Changing the Display Order of Parameters

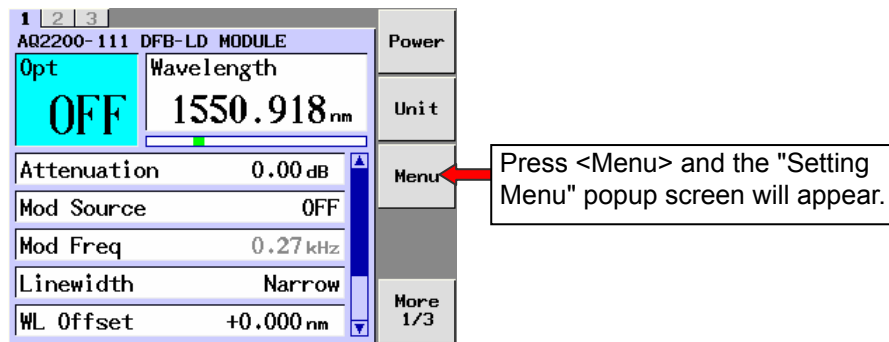
### Selecting a Display Order of Parameters

You can select a desired display order of parameters from the following four parameter display patterns.

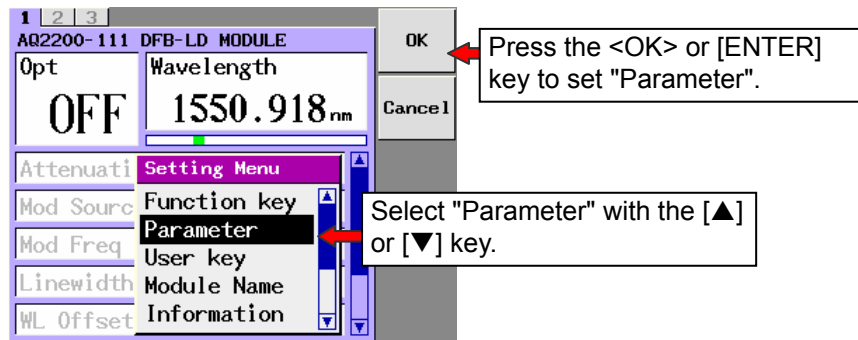
- Default (Display order is fixed and it cannot be changed.)
- Custom1 (Display order can be changed to a desired order.)
- Custom2 (Display order can be changed to a desired order.)
- Custom3 (Display order can be changed to a desired order.)

Follow the steps below to select a desired display order.

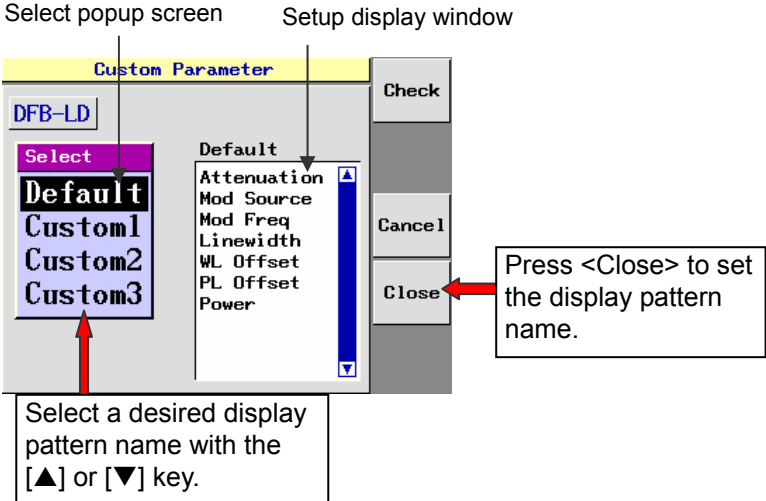
1. Using the [CHAN] key, set the module that sets the parameter display order as the current module.
2. Press <Menu>.



3. The "Setting Menu" popup screen will appear. Move the cursor to "Parameter" and press the <OK> or [ENTER] key.



- 4. The screen changes to the Custom Parameter screen and the "Select" popup screen will appear.  
At this time, the cursor on the Select popup screen shows the currently specified parameter display pattern.  
When the cursor is moved to a parameter display pattern name on the Select popup screen, the parameter display order set for this pattern is shown in the setup display window.  
Move the cursor to a desired parameter display pattern and press <Close>.

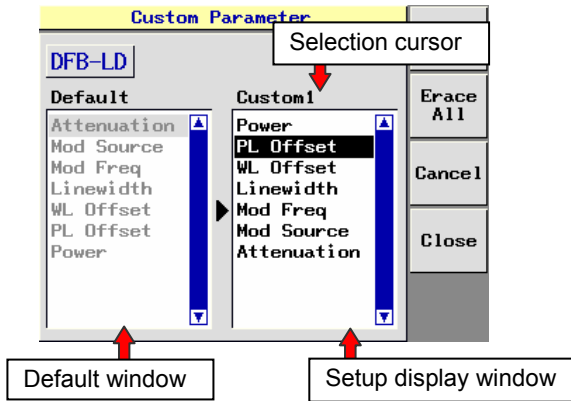


**Changing the Display Order of Parameters**

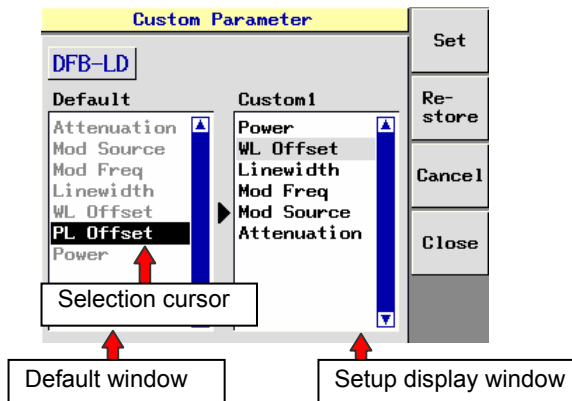
You can set a desired display pattern about the display order of the parameters for each of "Custom1", "Custom2", and "Custom3".

The display order can be changed through two kinds of setup screens shown below.

**<Parameter Deletion Screen>**



**<Parameter Addition Screen>**



Default window:

The list of parameters is displayed in the default display order. Normal and dim character string colors are provided. The normal character string color shows the items not set in the setup display window while the dim character string color shows the items set in the setup display window. Note that the display order of the major parameters displayed on the SUMMARY screen cannot be changed. Therefore, such parameters are not displayed in this window.

Setup display window:

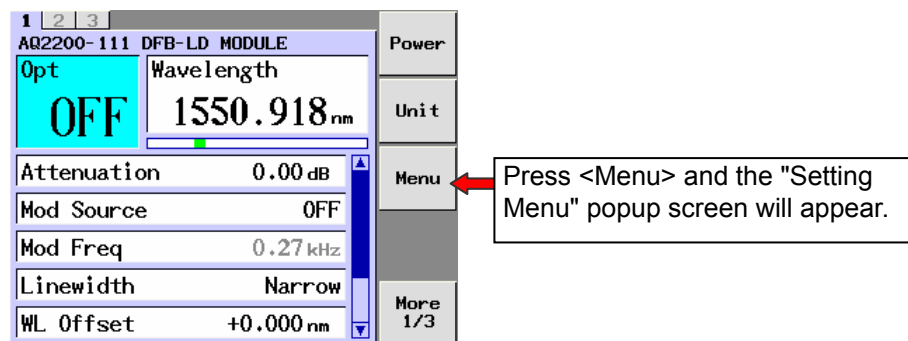
Set parameters are displayed in the ascending order. All items set in the default window must be set in this window.

|                   |  |
|-------------------|--|
| Selection cursor: | <Erase>, <Set>, and [ENTER] operate the parameter at this cursor position.   |
| <Erase>:          | Shown only on the parameter deletion screen.<br>The parameter at the selection cursor is deleted from the setup display window. The same operation also happens when you press the [ENTER] key.                                  |
| <Erase All>:      | Shown only on the parameter deletion screen.<br>All parameters displayed in the setup display window are deleted from the setup display window.  |
| <Set>:            | Shown only on the parameter addition screen.<br>The parameter at the selection cursor is added to a position before the cursor item in the setup display window. The same operation also happens when you press the [ENTER] key. |
| <Re-store>:       | Shown only on the parameter addition screen.<br>The parameters in the default window are directly set to the setup display window as they are.   |
| [◀], [▶]:         | Switches the screen between the parameter addition screen and parameter deletion screen.   |
| [▲], [▼]:         | Moves the selection cursor up or down.   |

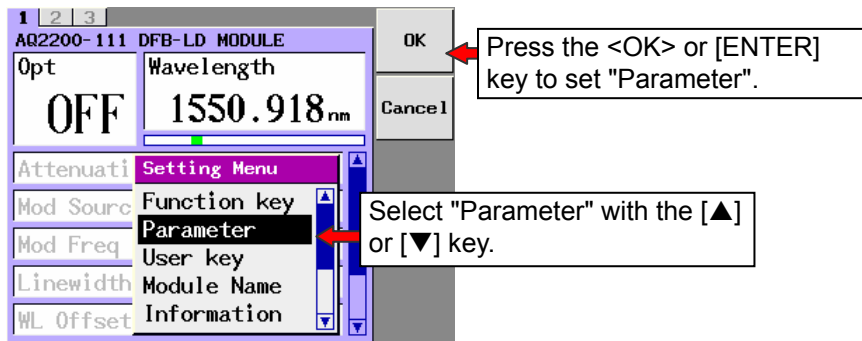
The following describes operating procedures with the AQ2200-111 DFB-LD Module used as an example.

#### <Registering the Order with <WL Offset> Put at the Top of the Parameter into Custom1>

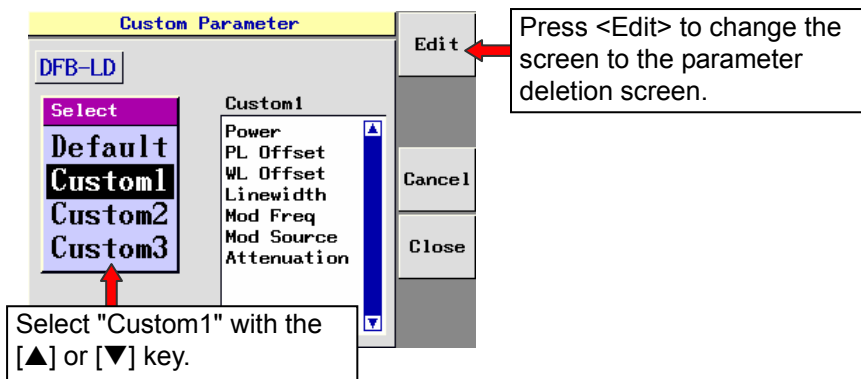
1. Set the AQ2200-111DFB-LD module to the current module with the [CHAN] key.
2. Press <Menu>.



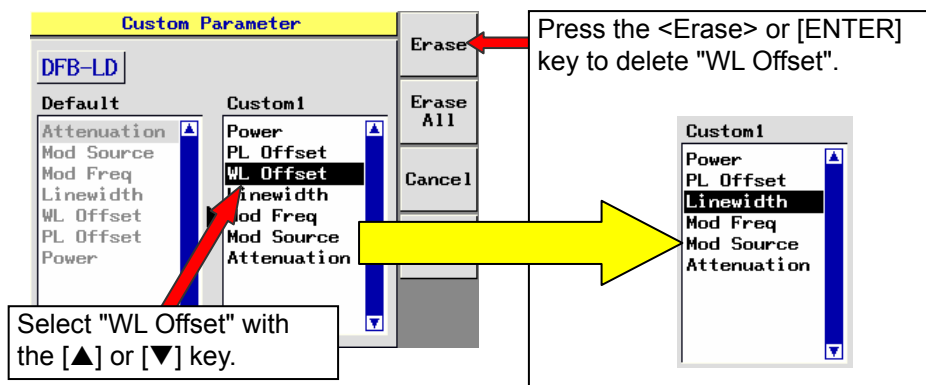
- The "Setting Menu" popup screen will appear.  
Move the cursor to "Parameter" and press the <OK> or [ENTER] key.



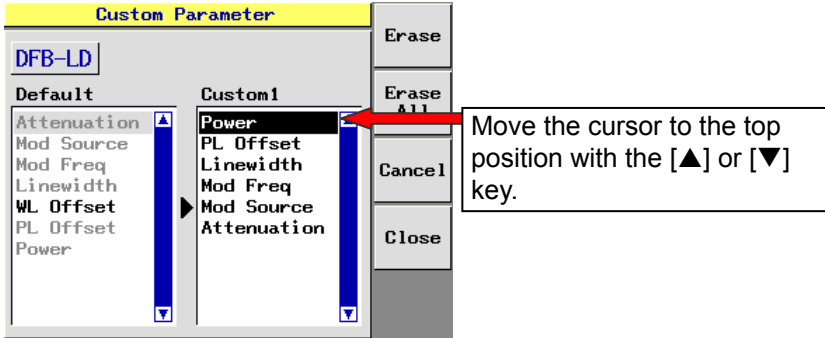
- The screen changes to the Custom Parameter screen and the Select popup screen will appear.  
Move the cursor to "Custom1" and press <Edit>.



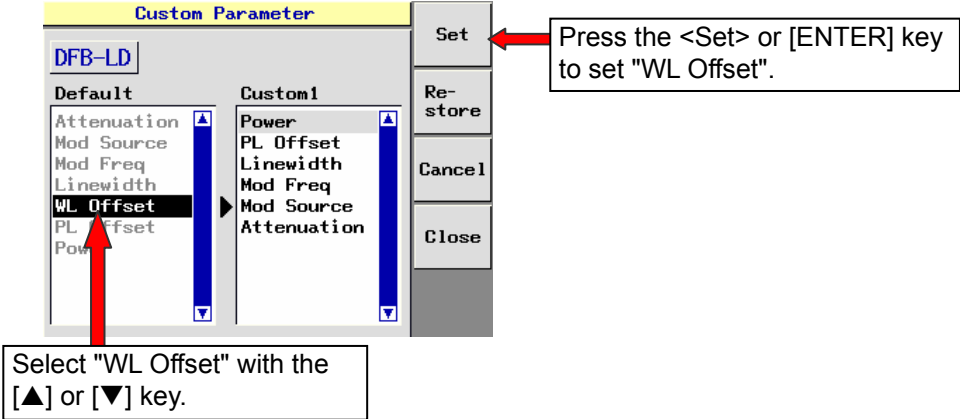
- The parameter deletion screen will appear.  
Move the cursor to "WL Offset" in the setup display window and press the <Erase> or [ENTER] key. "WL Offset" is then deleted from the setup display window.



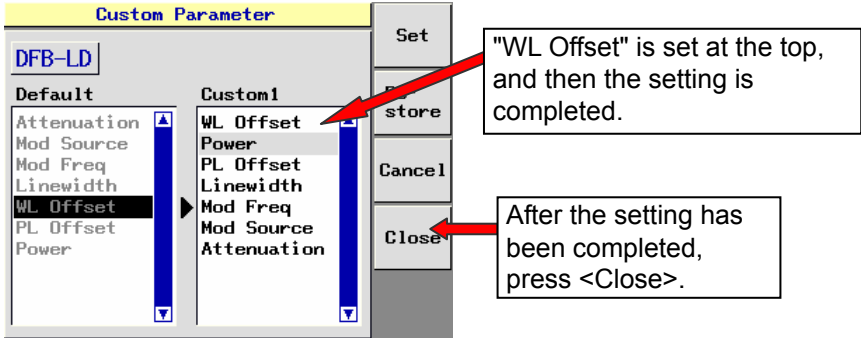
6. Move the cursor to the top position.



7. Press the [◀] key to display the parameter addition screen. Move the cursor to "WL Offset" and press the <Set> or [ENTER] key. "WL Offset" is then set before the parameter at the cursor position, which has been moved in step 6.



8. Press <Close> to complete the setting.



### 7.5.3 Changing the Display Module Name

You can set a desired name suitable for the purpose or application for each slot.

Display module name

|                          |               |    |             |          |
|--------------------------|---------------|----|-------------|----------|
| AQ2201 FRAME CONTROLLER  |               |    |             | Opt      |
| AQ2200-111 DFB-LD MODULE |               |    |             | Opt      |
| Opt                      | ON            | WL | 1550.918 nm | WL/Freq  |
| AQ2200-231 SENSOR HEAD   |               |    |             | Att      |
| Power                    | - 19.6278 dBm | WL | 1550.9 nm   | Mod Src  |
| AQ2200-211 SENSOR MODULE |               |    |             | More 2/3 |
| Power                    | + 9.0204 dBm  | WL | 1550.9 nm   |          |

|                          |    |            |             |           |
|--------------------------|----|------------|-------------|-----------|
| AQ2201 FRAME CONTROLLER  |    |            |             | Opt       |
| AQ2200-111 DFB-LD MODULE |    |            |             | Opt       |
| Opt                      | ON | Wavelength | 1550.918 nm | WL/Freq   |
| Attenuation              |    |            |             | 5.00 dB   |
| Mod Source               |    |            |             | OFF       |
| Mod Freq                 |    |            |             | 0.27 kHz  |
| Linewidth                |    |            |             | Narrow    |
| WL Offset                |    |            |             | +0.000 nm |
|                          |    |            |             | More 2/3  |

Change the display module name.

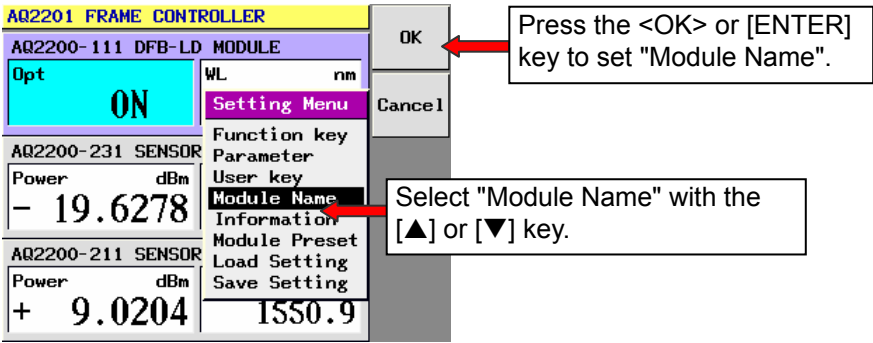
|                         |               |    |             |          |
|-------------------------|---------------|----|-------------|----------|
| AQ2201 FRAME CONTROLLER |               |    |             | Opt      |
| 1550nm +13dBm DFB-LD    |               |    |             | Opt      |
| Opt                     | ON            | WL | 1550.918 nm | WL/Freq  |
| DUT output power        |               |    |             | Att      |
| Power                   | - 19.6278 dBm | WL | 1550.9 nm   | Mod Src  |
| REFERENCE power         |               |    |             | More 2/3 |
| Power                   | + 9.0204 dBm  | WL | 1550.9 nm   |          |

1. Set a module of which the display module name you want to change to the current module with the [CHAN] key.
2. Press <Menu>.

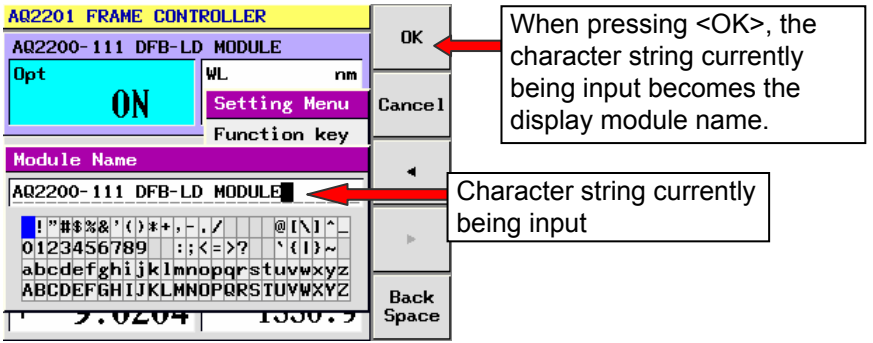
|                          |               |    |             |          |
|--------------------------|---------------|----|-------------|----------|
| AQ2201 FRAME CONTROLLER  |               |    |             | Power    |
| AQ2200-111 DFB-LD MODULE |               |    |             | Unit     |
| Opt                      | ON            | WL | 1550.918 nm | Menu     |
| AQ2200-231 SENSOR HEAD   |               |    |             |          |
| Power                    | - 19.6278 dBm | WL | 1550.9 nm   |          |
| AQ2200-211 SENSOR MODULE |               |    |             | More 1/3 |
| Power                    | + 9.0204 dBm  | WL | 1550.9 nm   |          |

Press <Menu> and the "Setting Menu" popup screen will appear.

- 3. The "Setting Menu" popup screen will appear.  
Move the cursor to "Module Name" and press the <OK> or [ENTER] key.



- 4. The "Module Name" popup screen will appear.  
Change the display module name while referring to section 2.4.3, Inputting a Character String (page 2-17).



**NOTE** | Even though the power is turned OFF, the set display module name is retained. However, if the slot is changed, the set display module name is also changed to the default display (product name).

## 7.6 Saving or Loading the Set Parameters

By saving or loading the set parameters into/from the storage device, you can reproduce the set parameters.

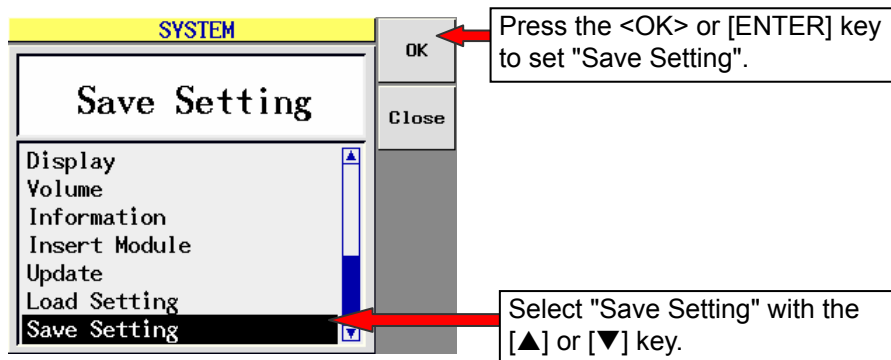
### Parameters to be Saved

For details about parameters to be saved, see section 11.3, List of Save Data, (page 11-10).

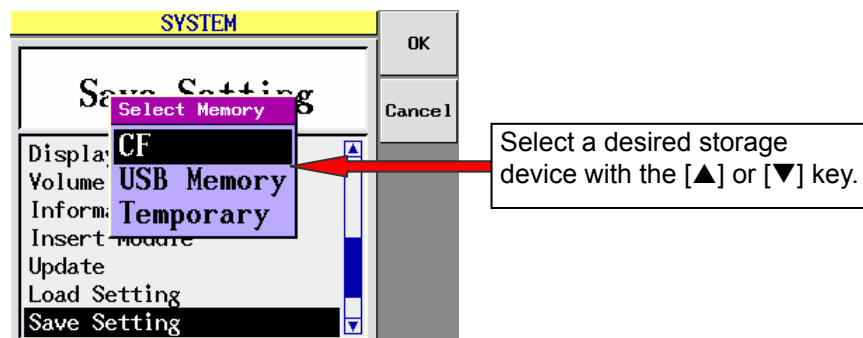
### Saving the Parameters for the Frame Controller

You must save the parameters by the frame controller or measurement module type. Follow the steps below to save the necessary parameters of the frame controller or module.

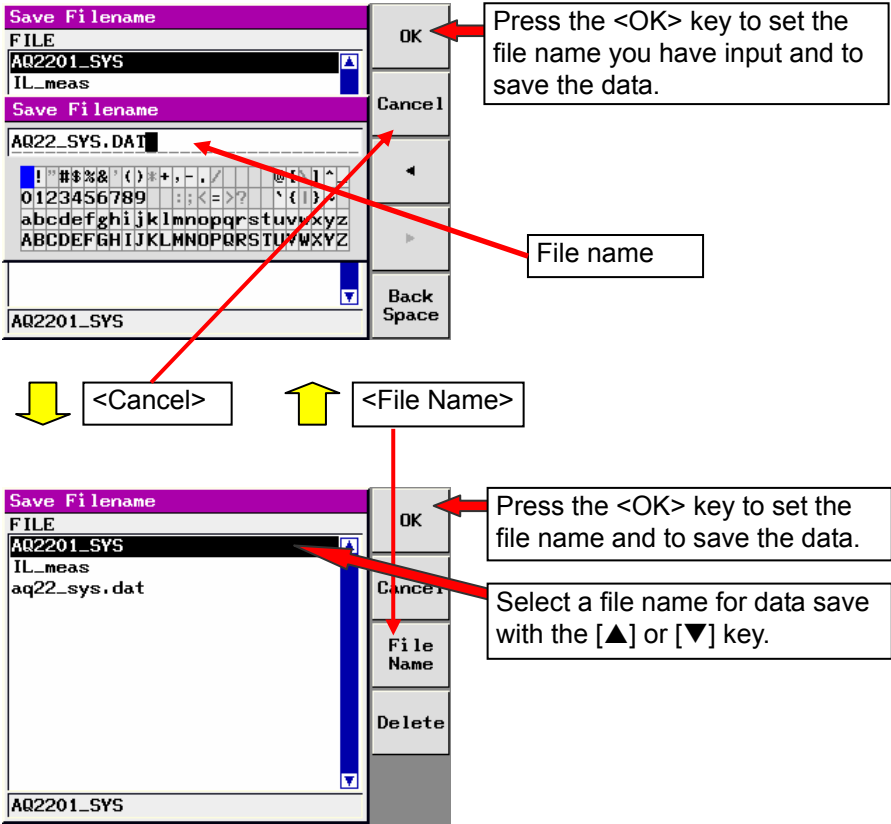
1. Press the [SYSTEM] key. The SYSTEM screen will appear.
2. Move the cursor to "Save Setting" and press the <OK> or [ENTER] key. The "Select Storage" popup screen will appear.



3. Move the cursor to a storage device, to which you want to save the data, and press the <OK> or [ENTER] key. The "Save Filename" popup screen will appear.



- 4. Input a file name of the save file while referring to section 2.4.3, Inputting a Character String (page 2-17), and then press <OK>. At this time, when pressing <Cancel>, the file names saved in the storage device are displayed, allowing you to save the data by specifying an existing file name.



**NOTE** | If the same file name already exists in the storage device, the Question popup screen appear after pressing <OK>. To overwrite the data, press the <OK> or [ENTER] key. To save the data with another file name, press the <Cancel> or [CANCEL] key, and then input another file name again.

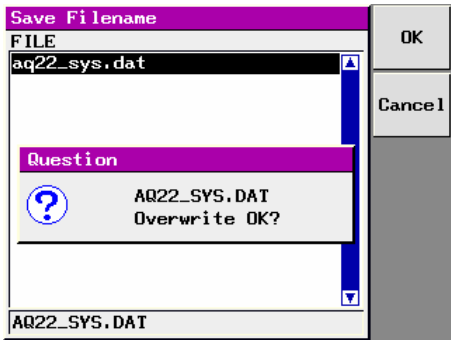


Fig. 7-11 Data Overwrite Confirmation Screen

5. When the Caution popup screen disappears, the parameter save operation is completed.

**⚠ CAUTION**

Fig. 7-12 Parameter Save in Progress Popup Screen appears while the data is being written into the storage device. Never attempt to remove the storage device while this popup screen is being displayed. At this time, if the storage device is removed, this may cause the storage device to break.

**Fig. 7-12 Parameter Save in Progress Popup Screen**

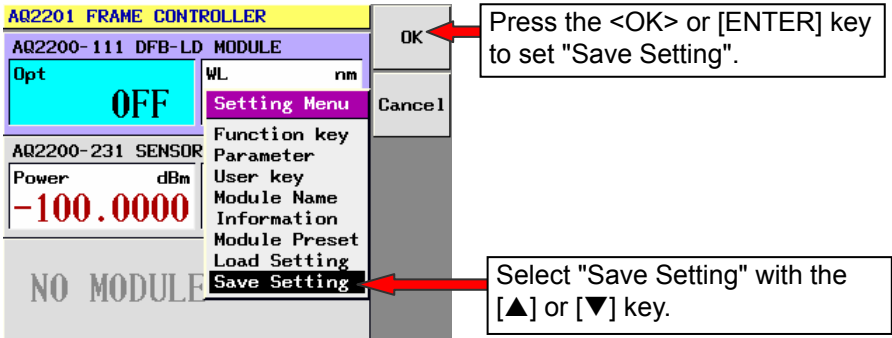
**NOTE**

- Temporary data (data temporarily stored in memory) is cleared when the power is turned OFF (see P1-33).
- To save this data, use the USB storage function (P1-36) or LAN FTP function (P1-38).

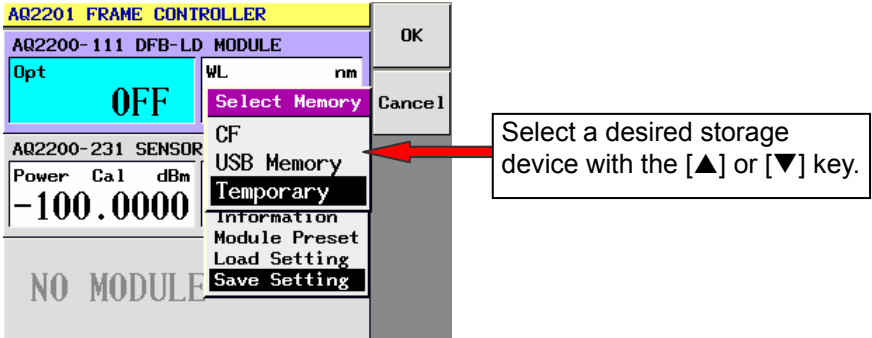
**Saving the Parameters for the Module**

The parameters for the module are saved into the storage device.

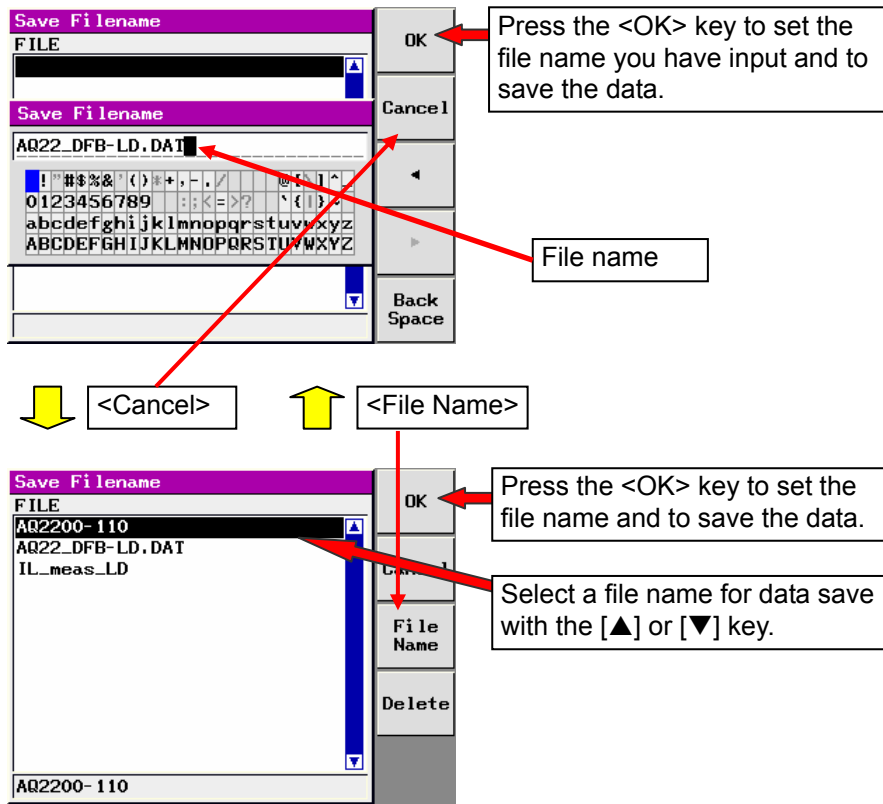
- 1. Set a module, for which you want to save the parameters, to the current module.
- 2. Press the [MENU] key. The "Setting Menu" popup screen will appear.
- 3. Move the cursor to "Save Setting" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.



- 4. Move the cursor to a storage device, to which you want to save the data, and press the <OK> or [ENTER] key. The "Save Filename" popup screen will appear.



- Input a file name of the save file while referring to section 2.4.3, Inputting a Character String (page 2-17), and then press <OK>. At this time, when pressing <Cancel>, the file names saved in the storage device are displayed, allowing you to save the data by specifying an existing file name.



**NOTE** If you attempt to save the data with the same file name as that existing in the storage device, the Question popup screen appears after pressing <OK>. To overwrite the data, press <OK>. To save the data with another file name, press <Cancel>, and then input another file name again.

- When the Caution popup screen disappears, the parameter save operation is completed.

**CAUTION**

Fig. 7-13 Parameter Save in Progress Popup Screen appears while the data is being written into the storage device. Never attempt to remove the storage device while this popup screen is being displayed. At this time, if the storage device is removed, this may cause the storage device to break.

**Fig. 7-13 Parameter Save in Progress Popup Screen**

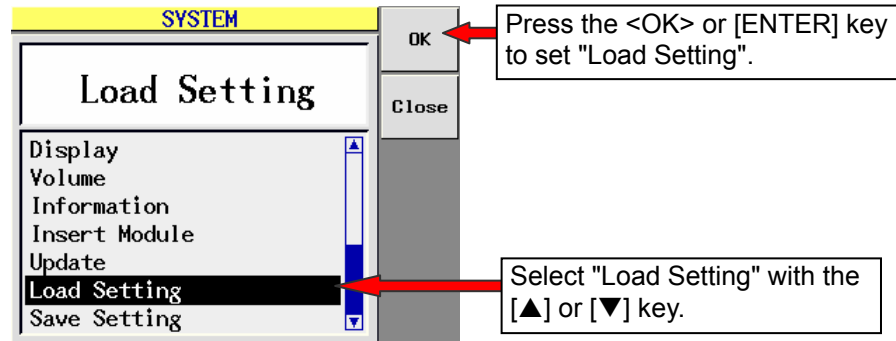
**NOTE**

- Temporary data (data temporarily stored in memory) is cleared when the power is turned OFF (see P1-33).
- To save this data, use the USB storage function (P1-36) or LAN FTP function (P1-38).

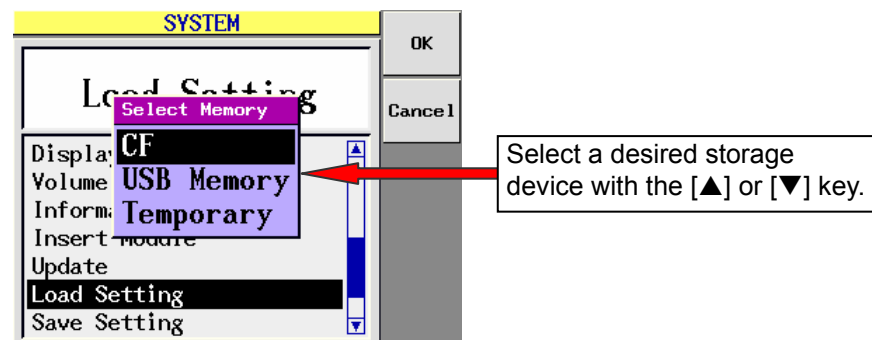
### Loading Saved Parameters for the Frame Controller

The parameters have been saved by the frame controller or measurement module type. Follow the steps below to load the necessary parameters of the frame controller or module.

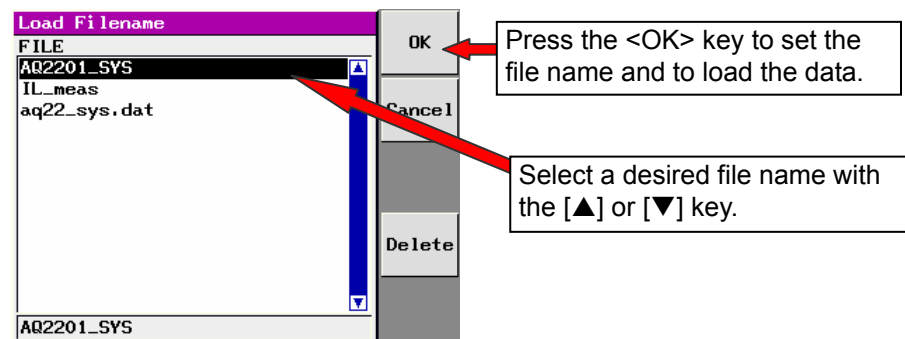
1. Press the [SYSTEM] key. The SYSTEM screen will appear.
2. Move the cursor to "Load Setting" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.




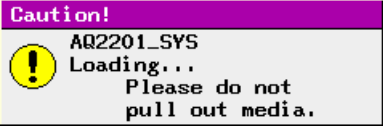
3. Move the cursor to a storage device, to which you want to load the data, and press the <OK> or [ENTER] key. The "Load Filename" popup screen will appear.



4. Move the cursor to a parameter setting file you want to load and press the <OK> or [ENTER] key.



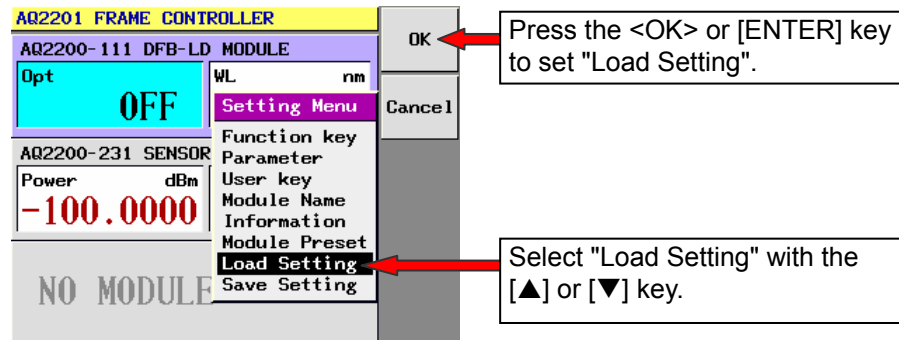
5. When the Caution popup screen disappears, the parameter load operation is completed.

|   |
|---|
|  <b>CAUTION</b>  |
| <p>Fig. 7-14 Parameter Load in Progress Popup Screen appears while the data is being loaded from the storage device. Never attempt to remove the storage device while this popup screen is being displayed. At this time, if the storage device is removed, this may cause the storage device to break.</p> |
|   |
| <p><b>Fig. 7-14 Parameter Load in Progress Popup Screen</b></p>   |

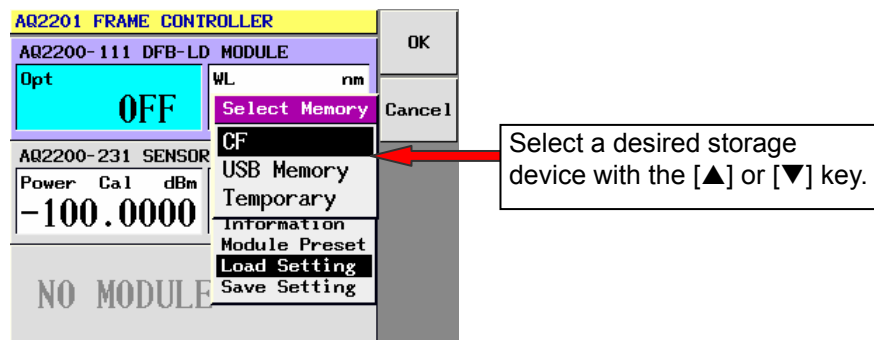
### Loading the Parameters for the Module

The parameters set for the module are loaded from the storage device.

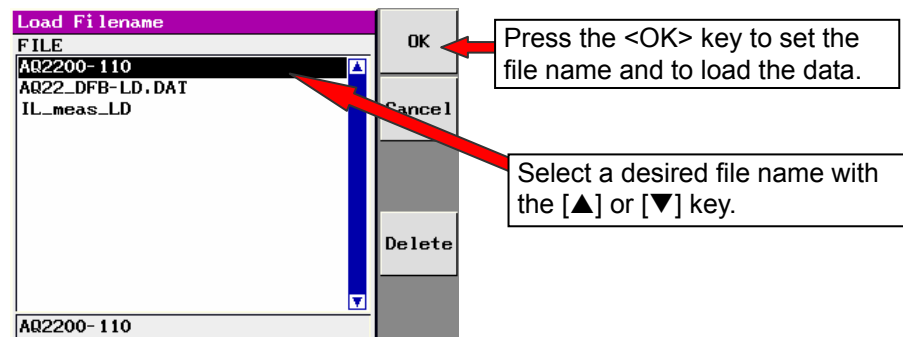
1. Set a module you want to set the parameters to the current module.
2. Press <MENU>. The "Setting Menu" popup screen will appear.
3. Move the cursor to "Load Setting" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.



4. Move the cursor to a storage device, to which you want to load the data, and press the <OK> or [ENTER] key. The "Load Filename" popup screen will appear.



5. Move the cursor to a parameter setting file you want to load and press the <OK> or [ENTER] key.



**NOTE** | On the Load Filename screen, only file names of the modules, the model of which is the same as that of the current module, are displayed.

- When the Caution popup screen disappears, the parameter load operation is completed.

**⚠ CAUTION**

Fig. 7-15 Parameter Load in Progress Popup Screen appears while the data is being loaded from the storage device. Never attempt to remove the storage device while this popup screen is being displayed. At this time, if the storage device is removed, this may cause the storage device to break.

**Caution!**

! AQ2200-110  
Loading...  
Please do not  
pull out media.

**Fig. 7-15 Parameter Load in Progress Popup Screen**

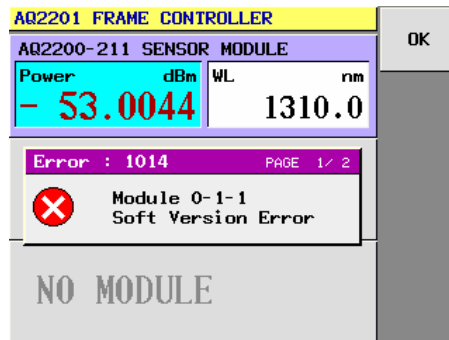
**NOTE**

If the software version when the parameters have been saved is different from the current software version, the “Soft Version Mismatch” popup screen shown in Fig. 7-16 will appear.

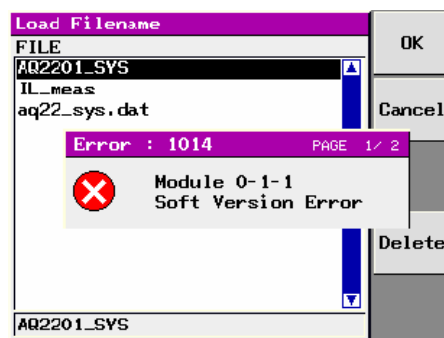
At this time, when pressing the <Cancel> or [Cancel] key, the parameters are loaded. However, the parameters, which have been added by updating the software, may not be loaded.

In this case, the “Soft Version Error” popup screen shown in Fig. 7-17 will appear when loading the parameters.

For details about how to update the firmware version to the latest version, see sections 9.3, Update Procedure for the Frame Controller, and 9.4, Update Procedure for Modules.



**Fig. 7-16 Soft Version Mismatch Popup Screen**



**Fig. 7-17 Soft Version Error Popup Screen**

### ■ Cautions about Loading of Application Parameters

For application (stability and logging) parameters you have loaded, the reproducing of the parameters is partially limited or the parameters cannot be reproduced completely according to the actually mounted sensor and/or selection of the sensor used for the application.

|   | Sensor Configuration | Selected Sensor | Sensor Mounting Position |   |
|---|----------------------|-----------------|--------------------------|---|
|   |                      |                 |                          | ○: Loaded parameters are completely the same as those saved.<br>△: Loaded parameters are partially the same as those saved.<br>×: Loaded parameters are completely different from those saved.  |
| 1 | ○                    | ○               | ○                        | Parameters you have saved are reproduced completely.  |
| 2 | ○                    | △               | ○ / △                    | Common parameters are reproduced.<br>Individual parameters can be reproduced if the same sensor model is mounted in the same slot as those used when saving the parameters.<br>However, if the sensor mounting position is different, the default settings apply to the parameters. |
| 3 | ○                    | ○               | ×                        | Common parameters are reproduced, but individual parameters become default settings.  |
| 4 | ○                    | ×               | —                        | Both common parameters and individual parameters become default settings.   |
| 5 | △ / ×                | —               | —                        | Both common parameters and individual parameters become default settings.   |

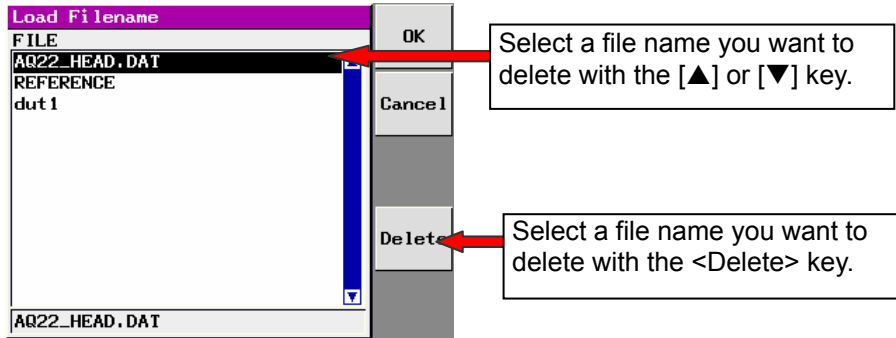
**NOTE** | Common parameters mean the parameters common to all selected sensors.  
Individual parameters mean the parameters set in the Individual mode.

### Deleting Saved Parameters

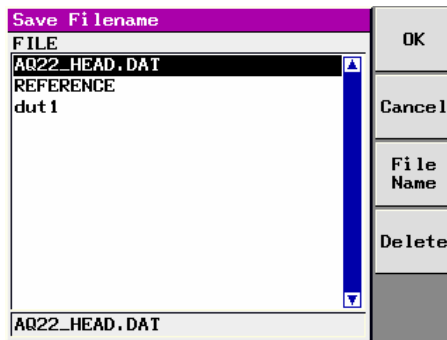
You can delete a parameter file saved in the storage device on the parameter file selection screen.

1. On the load file selection screen or save file name selection screen, move the cursor to a file name you want to delete and press <Delete>.

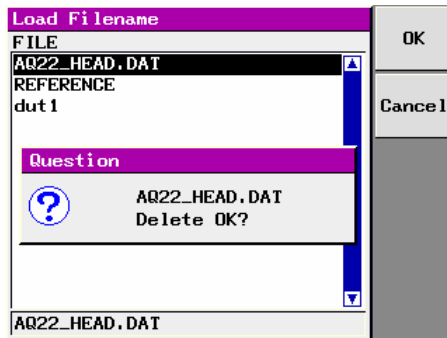
#### <Load File Selection Screen>



#### <Save File Name Selection Screen>



2. The Question popup screen appears. Press the <OK> or [ENTER] key to delete the file. If you do not want to delete the file, press the <Cancel> or [CANCEL] key.



**CAUTION**

Do not remove the storage device until the popup screen disappears and the screen changes to the parameter file selection screen after pressing <Delete> and <OK> in that order.

If the storage device is removed during data deletion, this may cause the storage device to break.

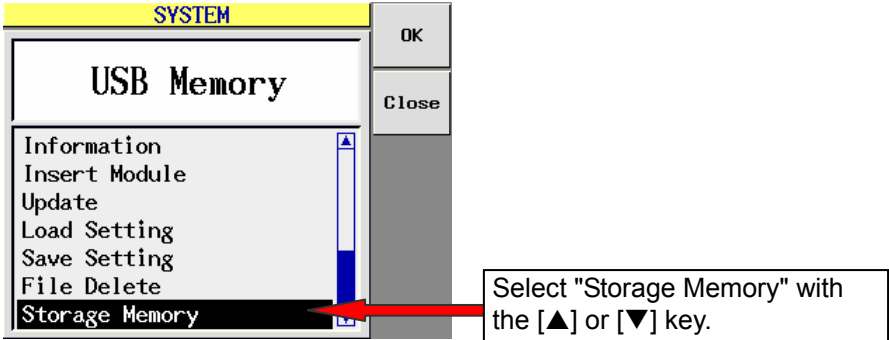
# 7.7 Selecting a Storage Device

When connecting this unit to the PC with the USB cable, you can use the internal memory of this unit, mounted USB flash memory card, or compact flash memory device as a storage device.

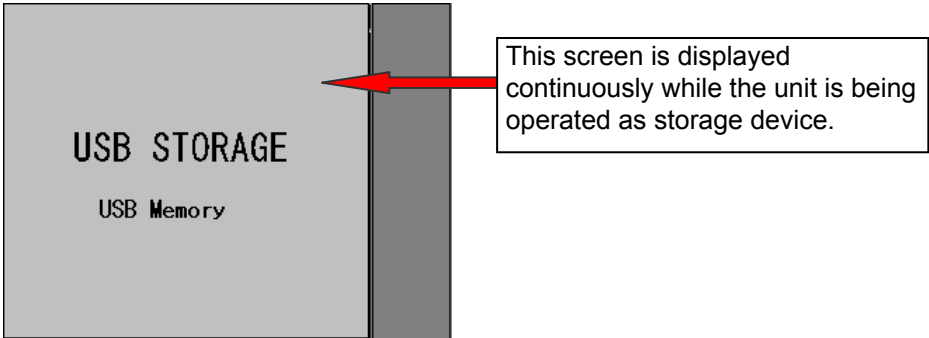
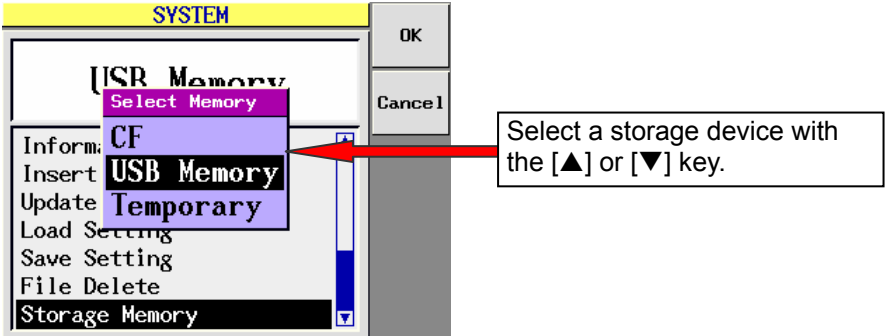
For information on the connection between the instrument and PC, see section 1.5.1, "USB Storage Function" (P1-37).

### Selecting a Memory for the Connection Destination

- 1. Press the [SYSTEM] key. The SYSTEM screen will appear.
- 2. Move the cursor to "Storage Memory" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.



- 3. Move the cursor to a memory you want to use it as a storage device and press <OK> or [ENTER]. If connected according to section 1.5.1, "USB Storage Function" (P1-37), the screen for USB storage operations appears.



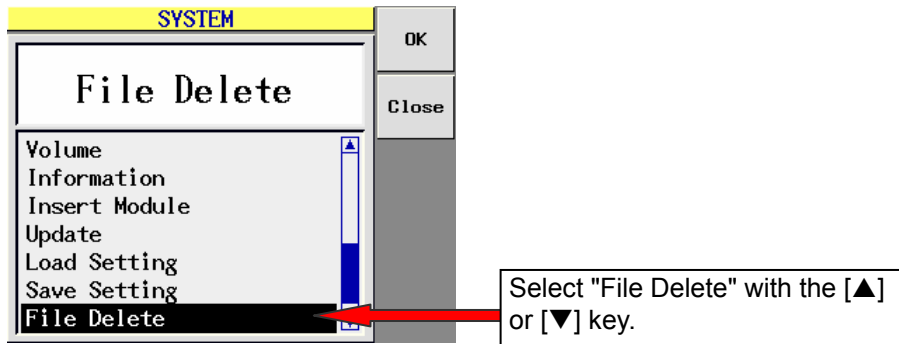
USB Storage Running Screen

## 7.8 Clearing Saved Data

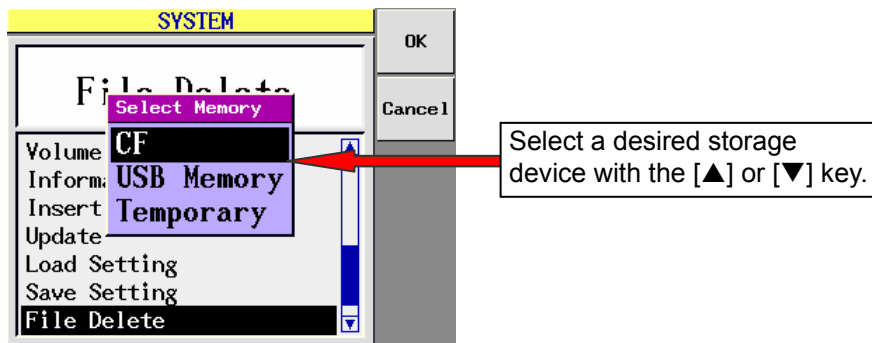
You can clear desired data, which has been recorded in the storage device.

### Clearing Saved Data

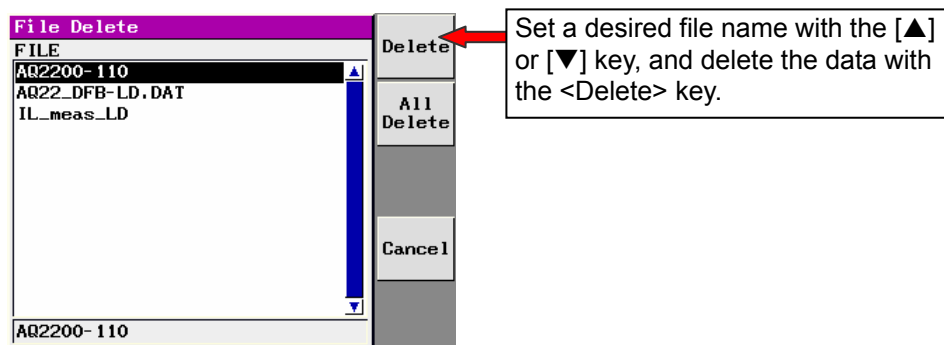
1. Press the [SYSTEM] key. The SYSTEM screen will appear.
2. Move the cursor to "File Delete" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.



3. Move the cursor to a storage device, which contains the data, and press the <OK> or [ENTER] key. The "File Delete" popup screen will appear.



4. Move the cursor to a file name you want to clear and press the <Delete> or [ENTER] key. The popup screen prompting you to confirm the data deletion will appear. When deleting the file name you have selected, press <OK>. To delete all displayed files at the same time, press <All Delete>.



# 7.9 Replacing the Module with the Power Kept Turned ON

The module mounted on this unit is applicable to insertion/removal of the module with the power kept turned ON and recognition of the module.

### ■ Removing the Module

You can remove the mounted module with the power kept turned ON. After the module has been removed, the alarm appears. If this happens, press <OK>.

|                          |          |          |            |
|--------------------------|----------|----------|------------|
| AQ2201 FRAME CONTROLLER  |          |          |            |
| AQ2200-111 DFB-LD MODULE |          |          | Mod Freq   |
| Opt                      | ON       | WL nm    | Line width |
|                          |          | 1550.918 |            |
| AQ2200-211 SENSOR MODULE |          |          | WL Offset  |
| Power dBm                | - 2.0132 | WL nm    | PL Offset  |
|                          |          | 1550.9   |            |
| AQ2200-211 SENSOR MODULE |          |          | More 3/3   |
| Power dBm                | + 1.3198 | WL nm    |            |
|                          |          | 1310.0   |            |



Remove the module from Slot 3.

|                          |    |          |  |
|--------------------------|----|----------|--|
| AQ2201 FRAME CONTROLLER  |    |          |  |
| AQ2200-111 DFB-LD MODULE |    |          | OK   |
| Opt                      | ON | WL nm    | When pressing <OK>, the Error popup screen disappears. |
|                          |    | 1550.918 |  |
| Error : 1205 PAGE 1/1    |    |          |  |
| Module 0-3-1 Not Running |    |          |  |
| NO MODULE                |    |          |  |

Alarm



Press <OK>.

|                          |          |          |          |
|--------------------------|----------|----------|----------|
| AQ2201 FRAME CONTROLLER  |          |          |          |
| AQ2200-111 DFB-LD MODULE |          |          | Opt      |
| Opt                      | ON       | WL nm    | WL/Freq  |
|                          |          | 1550.918 |          |
| AQ2200-211 SENSOR MODULE |          |          | Att      |
| Power dBm                | - 2.0177 | WL nm    | Mod Src  |
|                          |          | 1550.9   |          |
| NO MODULE                |          |          | More 2/3 |

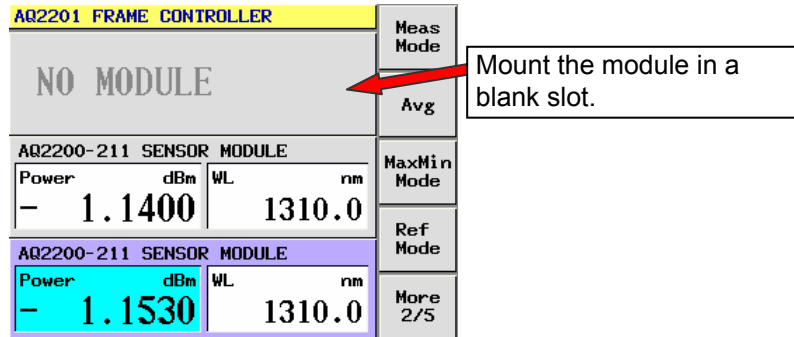
**⚠ CAUTION**

If the module is removed while the application is running, this may cause the unit to malfunction.

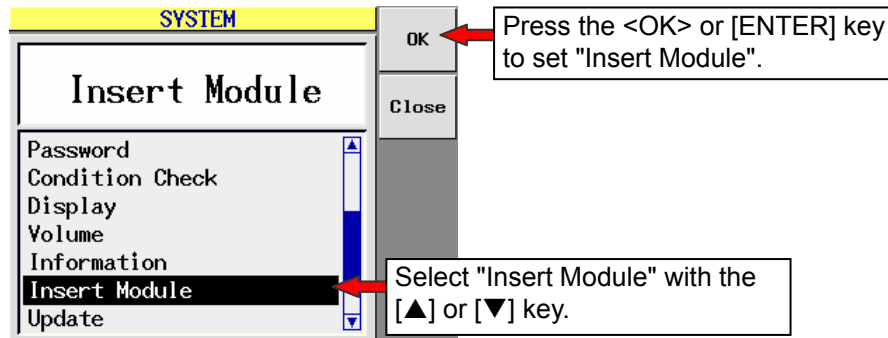
### Mounting the Module

You can mount the module with the power kept turned ON.  
 Follow the steps below to have this unit recognize the module you have mounted.

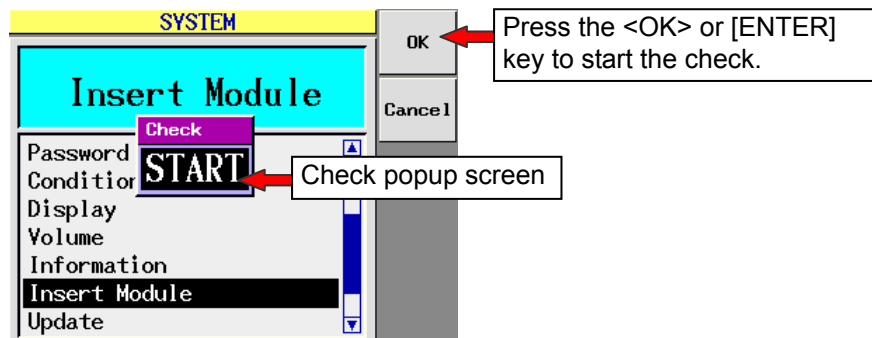
1. Mount the module in a blank slot.

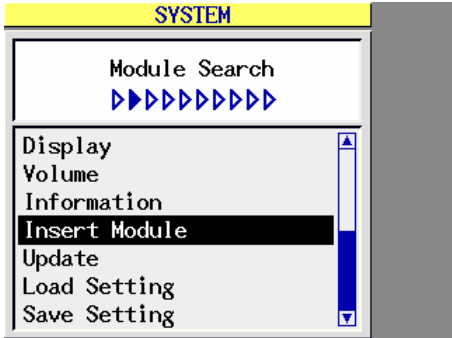


2. Press the [SYSTEM] key to display the SYSTEM screen.  
 Move the cursor to "Insert Module" and press the <OK> or [ENTER] key.



3. The "Check" popup screen will appear.  
 Press the <OK> or [ENTER] key.  
 As the module is recognized, the screen returns to the previous screen.





| AQ2201 FRAME CONTROLLER  |          |        | Meas Mode   |
|--------------------------|----------|--------|-------------|
| AQ2200-111 DFB-LD MODULE |          |        |             |
| Opt                      | WL       | nm     |             |
| OFF                      | 1550.918 |        | Avg         |
| AQ2200-211 SENSOR MODULE |          |        | MaxMin Mode |
| Power                    | dBm      | WL     | nm          |
| - 1.1400                 |          | 1310.0 |             |
| AQ2200-211 SENSOR MODULE |          |        | Ref Mode    |
| Power                    | dBm      | WL     | nm          |
| - 1.1530                 |          | 1310.0 | More 2/5    |

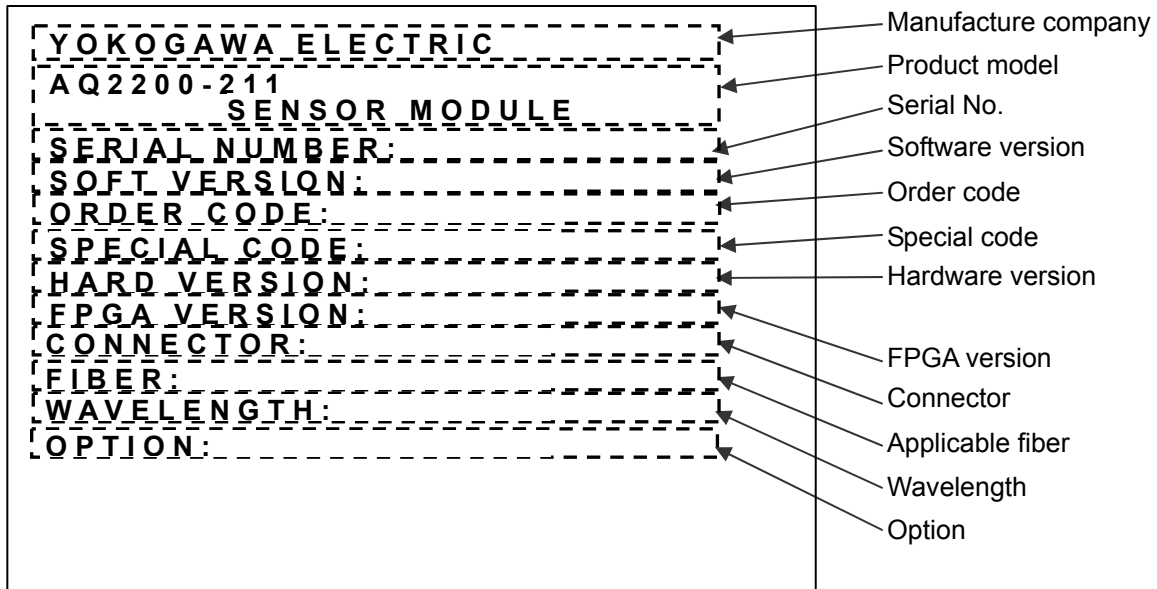
Module recognition status

**NOTE** | The error may appear on the screen immediately after the module has been recognized. This error shows that the proper specifications may not be satisfied or a part of operation may malfunction due to difference in release timing between the module software and frame controller software.  
If this error appears, take appropriate measures, such as updating of the software.

## 7.10 Displaying the Unit Information

The unit information is displayed in the following format.

The information is displayed in the following format. However, the contents may vary depending on the unit.

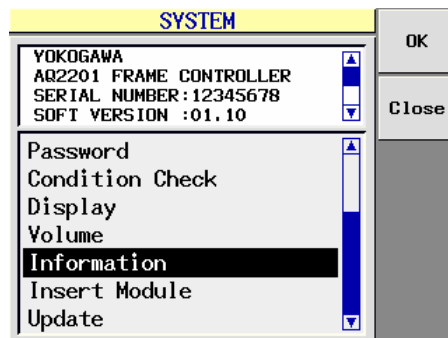


### ■ Displaying the Frame Information

The information about the hardware and software of the frame controller is displayed.

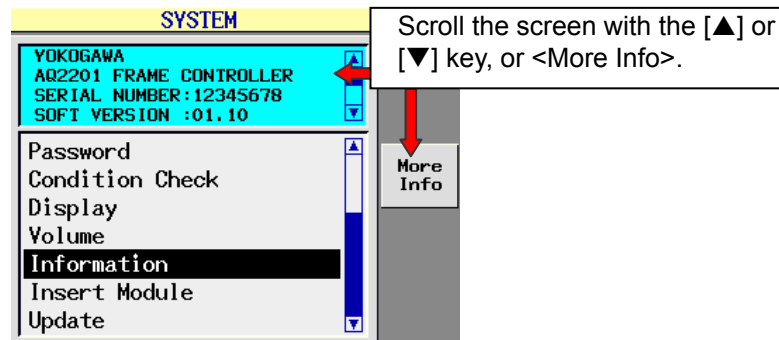
Follow the steps below to check the frame information.

1. Press the [SYSTEM] key to display the SYSTEM screen.
2. Move the cursor to "Information" and press the <OK> or [ENTER] key.



<Frame Information Display Screen>

- The information about this unit is shown.  
You can scroll the screen with the [▲] or [▼] key, or <More Info>.

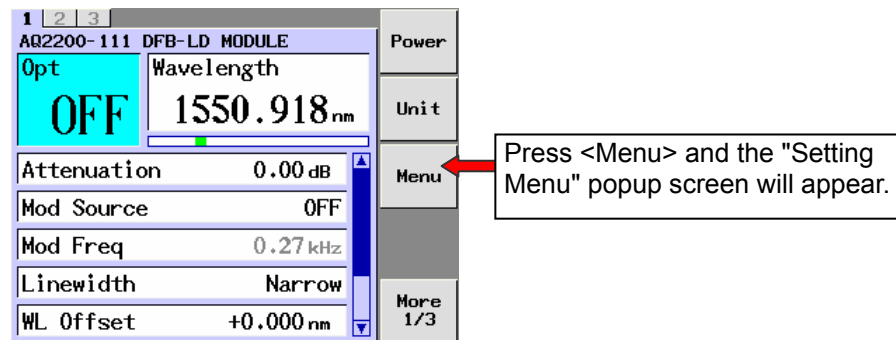


- After checking, press the <OK> or [CANCEL] key.

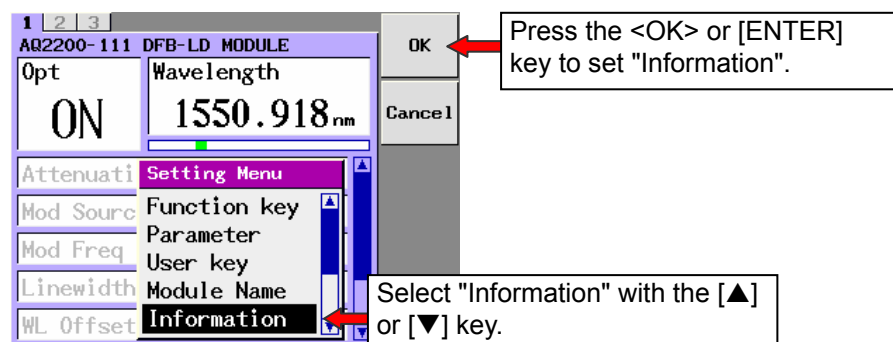
### Displaying the Unit Information of the Module

The unit information of the mounted module is displayed.

- Set a module you want to display the unit information to the current module with the [CHAN] key.
- Press <Menu>.



- The "Setting Menu" popup screen will appear.  
Move the cursor to "Information" and press the <OK> or [ENTER] key.



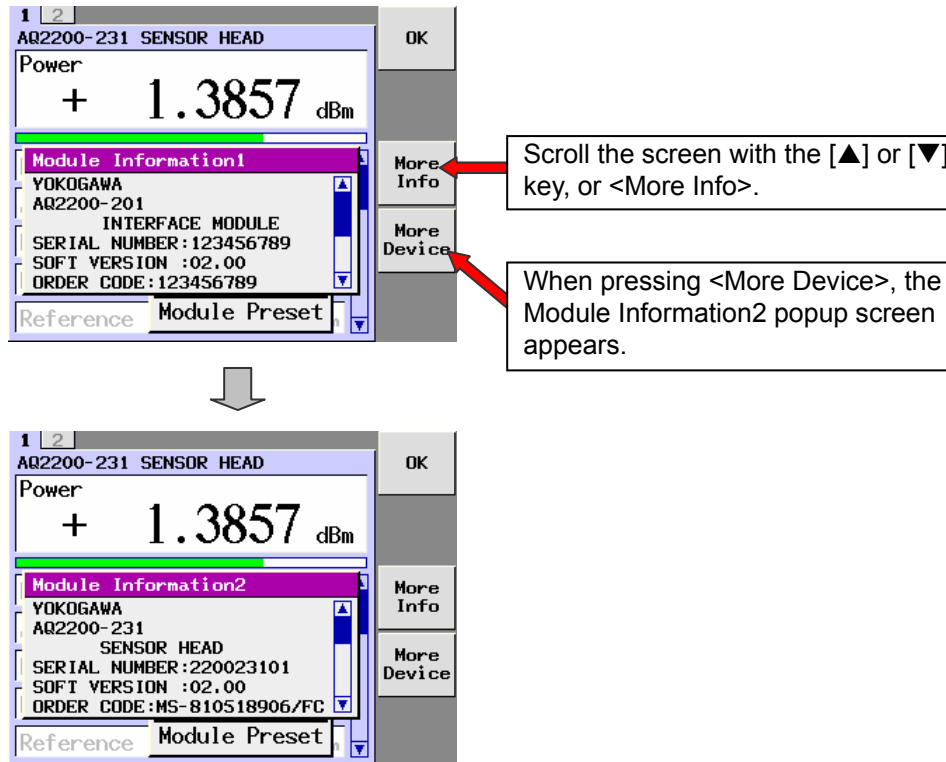
- The display may slightly vary depending on the mounted module.

**<Optical Sensor Head is Mounted>**

The Module Information1 popup screen appears. The unit information of the module is displayed on this screen. You can scroll the screen with the [▲] or [▼] key, or <More Info>.

When pressing <More Device>, the unit information of the optical sensor head is displayed as Module Information2.

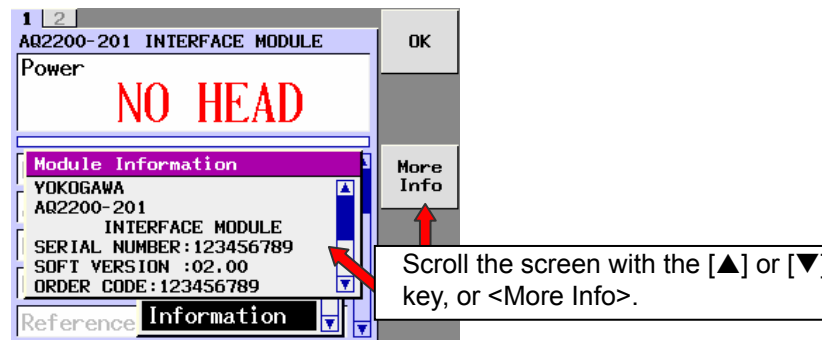
Check the information in the same manner as described for Module Information1.



**<Optical Sensor Head is Not Mounted>**

The Module Information popup screen appears. The unit information of the module is displayed on this screen.

You can scroll the screen with the [▲] or [▼] key, or <More Info>.



- After checking, press the <OK> or [ENTER] key.

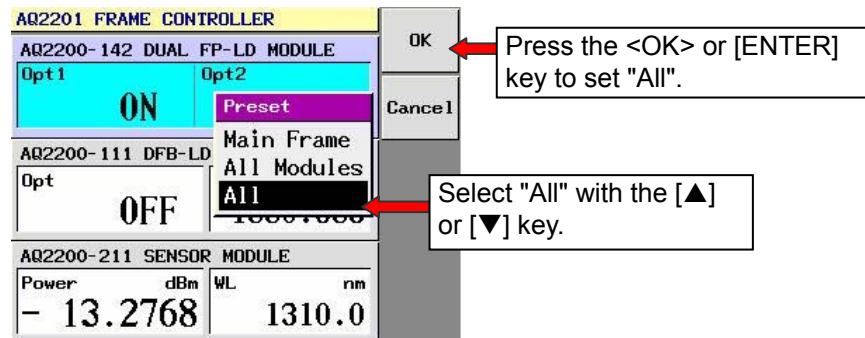
## 7.11 Returning Various Settings to the Initial Settings

Various settings of the frame controller and mounted module are returned to the initial values.

For details about initial values, see section 11.2, List of Default Settings, (page 11-4).

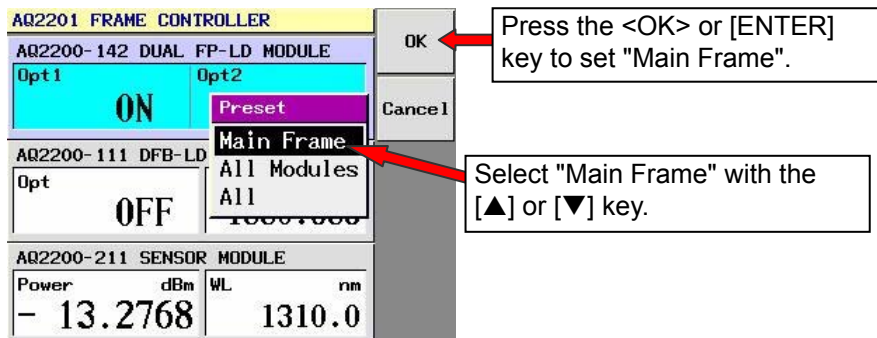
### Returning All the Frame Controller and Mounted Modules to the Initial Values

1. Press the [PRESET] key.
2. The "Preset" popup screen will appear.  
Move the cursor to "All" and press the <OK> or [ENTER] key.



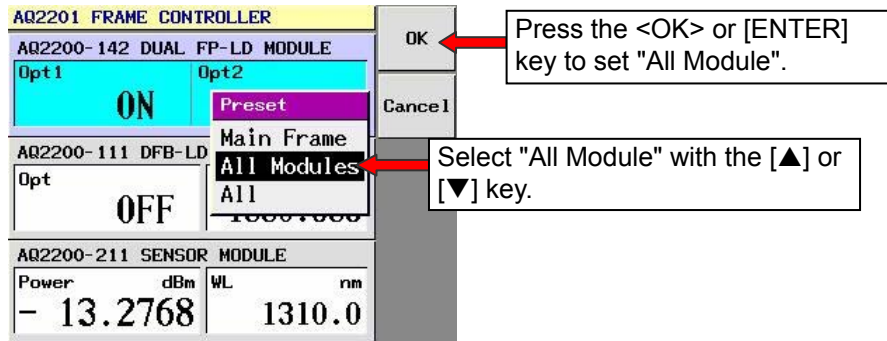
### Returning Only the Frame Controller to the Initial Values

1. Press the [PRESET] key.
2. The "Preset" popup screen will appear.  
Move the cursor to "Main Frame" and press the <OK> or [ENTER] key.



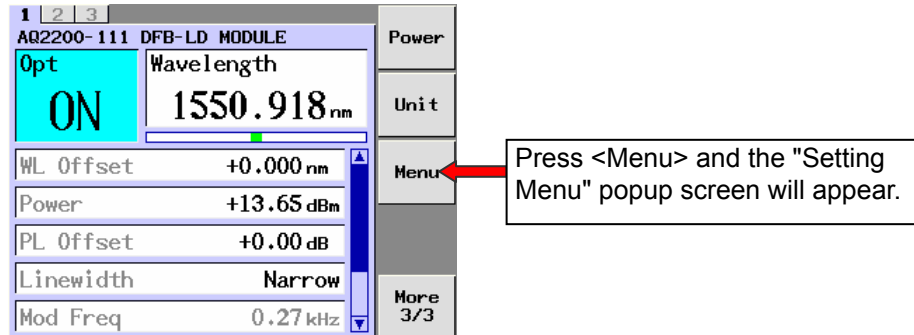
**Returning All the Mounted Modules to the Initial Values**

1. Press the [PRESET] key.
2. The "Preset" popup screen will appear.  
Move the cursor to "All Module" and press the <OK> or [ENTER] key.

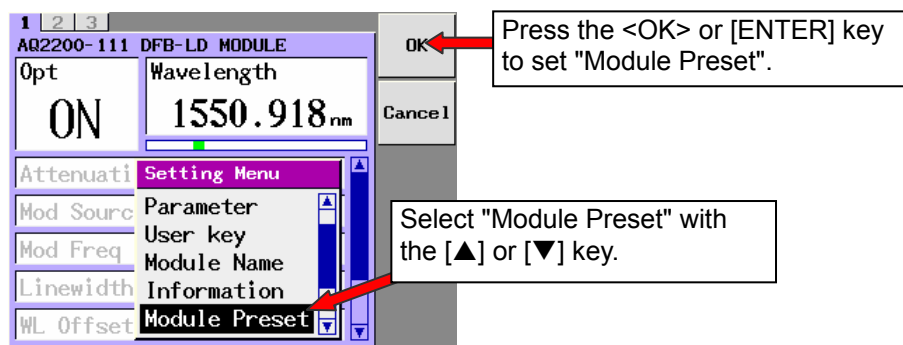


**Returning Individual Mounted Module to the Initial Values**

1. Set a module you want to initialize to the current module with the [CHAN] key.
2. Press <Menu>.



3. The "Setting Menu" popup screen will appear.  
Move the cursor to "Module Preset" and press the <OK> or [ENTER] key.



**NOTE** || During initialization, the Executing shortcut menu is displayed.

# Chapter 8

## Daily Maintenance

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

## 8.1 Cleaning the Main Unit and Module

---

- Clean the panel and exterior of the main unit, and the panel of the module with a cloth rag securely wrung after soaked in lukewarm water to remove the dirt, and then wipe them off with a dry cloth rag.
- With a dry cloth rag, clean the parts other than the panel surface of the module and electric interface.
- To clean the electric interface, blow the air to the electric interface using a spray gun to remove dust, and cover the terminals with a cap.

|  |
|--|
|  <b>CAUTION</b>   |
| <ul style="list-style-type: none"><li>• Before starting the maintenance, always turn OFF the power completely.</li><li>• Do not use any chemical, such as paint thinner, benzene, or alcohol. Doing so may cause discoloration or deterioration.</li></ul> |

## 8.2 Cleaning the Optical Interface

### 8.2.1 Necessity to Clean the Optical Interface

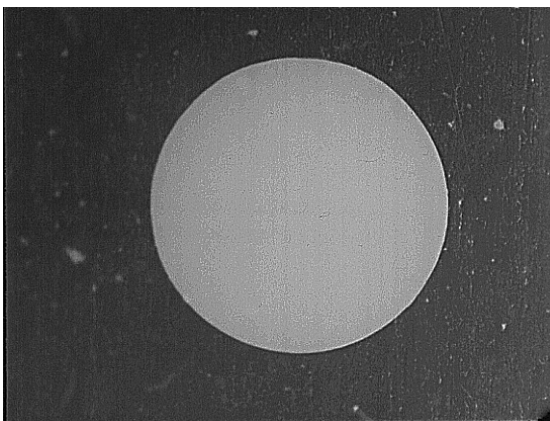
The optical connector is only an optical component, the optical transmission of which is exposed to the outside. Even a scratch on the end face, which cannot be checked visually, greatly affects its optical performance. Therefore, if the optical connector is connected improperly, if it is connected without removal of dust or dirt, or if it is cleaned improperly, this may cause the end face of the optical connector to be scratched. (See Fig. 8-1 and Fig. 8-2.) Additionally, to connect the optical connector, it is absolutely required to properly joint the ferrule cores of both optical connectors. An optical adaptor is used for the connection. However, if the connection is made with dust sticking to the ferrule side face or ferrule guide of the optical adaptor, the cores cannot be jointed correctly. (See Fig. 8-3 and Fig. 8-4.) In this status, the loss of the optical power, disturbance of the transmission mode, and/or optical reflection at the connection point may become large, causing the measurement not to be performed correctly.

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

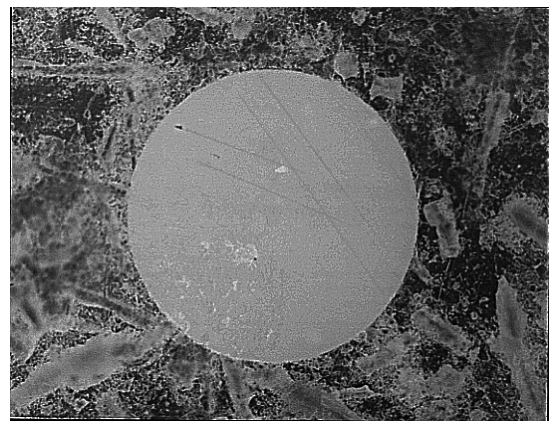
When using this unit, clean the ferrule every time it is connected and the precision sleeve every time it is connected 30 times.

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

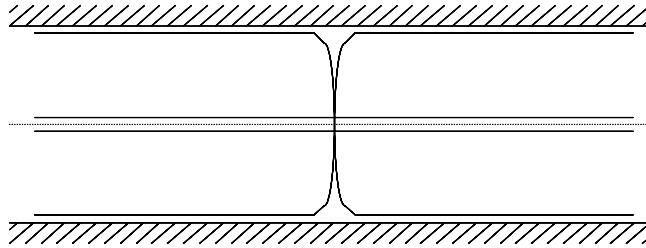
- Optical connector to be connected after metallic sleeve has been inserted.
  - In particular, metallic sleeve worn-out particles may easily stick to the ferrule side face or end face.
- Optical connector made of ferrule material to be easily worn-out, such as metallic ferrule or crystallized glass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



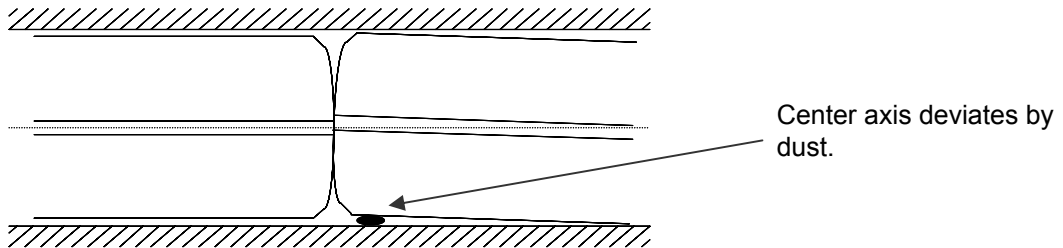
**Fig. 8-1 Enlarged Photo of Correct Optical Connector Connection Part**



**Fig. 8-2 Enlarged Photo of Scratched Optical Connector Connection Part**



**Fig. 8-3 Optical Connector in Correct Joint Status**



**Fig. 8-4 Optical Connector in Axis Deviation Status by Dust**

### 8.2.2 Tools required for cleaning

The following tools are needed to clean the optical interface.

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

**⚠ WARNING**

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

### 8.2.3 Cleaning the Optical Connector

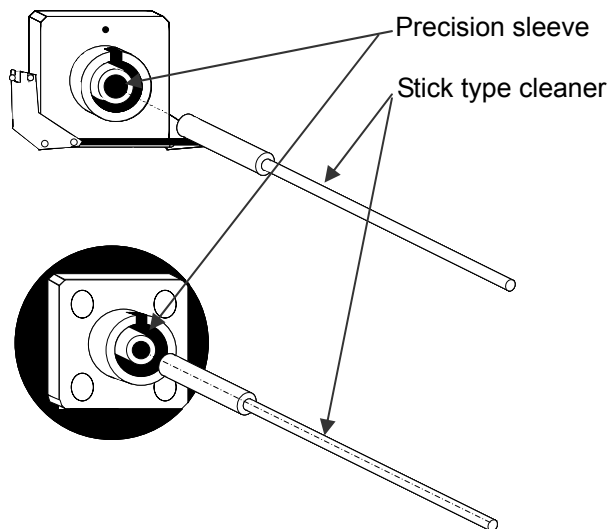
1. Soak the cleaning paper in the isopropyl alcohol, hold the sides of the optical ferrule by this cleaning paper, and clean the ferrule properly.
2. Soak another cleaning paper in the isopropyl alcohol and clean the ferrule end face with this cleaning paper by rubbing it.
3. Furthermore, wipe off the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

#### CAUTION

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

### 8.2.4 Cleaning the Optical Connector Adaptor (AQ9441, AQ9335C)

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



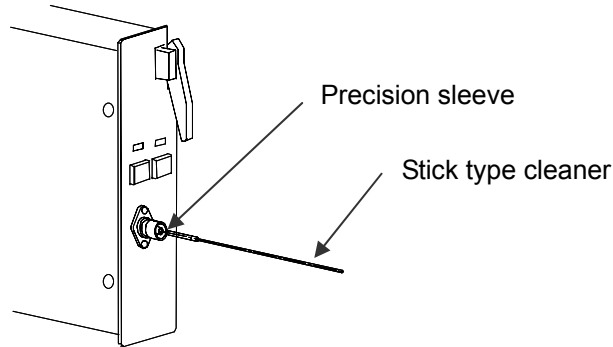
### 8.2.5 Cleaning the Optical Connector Adaptor (AQ9447)

Wipe off the dust, or blow out the sticking dust with an air spray.

## 8.2.6 Cleaning the Optical Input/Output Connector

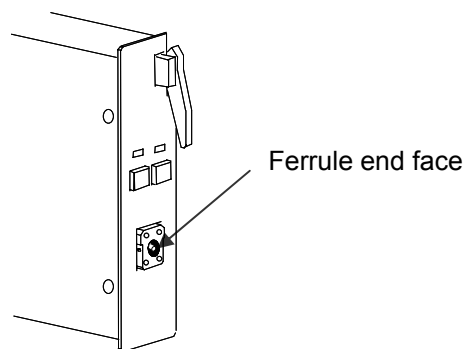
### Cleaning the Optical Output Connector of the AQ2200-111 DFB-LD Module

1. Soak the stick type cleaner in the isopropyl alcohol and gradually insert it into the precision sleeve of the optical output connector. Then rotate it while pressing it against the inner wall.



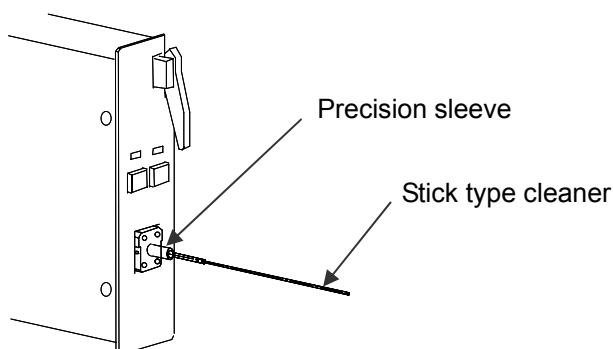
### Cleaning the Optical Output Connector of the AQ2200-141, AQ2200-142 FP-LD Modules

1. Soak the cleaning paper in the isopropyl alcohol and clean the ferrule end face with the cleaning paper by rubbing it.
2. Furthermore, wipe off the moisture content with another cleaning paper. After that, blow out the dust sticking to the end face with an air spray.



### Cleaning the Optical Input Connector of the AQ2200-211 Sensor Module

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



**Cleaning the Optical Input Connector of the AQ2200-215 Sensor Module**

The light receiving surface is very sensitive. NEVER wipe it for cleaning.  
For small sticking dust, blow it off with an air spray.

**Cleaning the Optical Input Connector of the AQ2200-221 Optical Sensor Head**

An antireflection coating is applied to the light receiving glass of the AQ2200-221 Optical Sensor Head. It may be damaged if you use a cleaner which has been used several times or left for a long time. It is recommended to use a new cleaner.

1. For small sticking dust, blow it off with an air spray.
2. If you cannot remove adherents with an air spray, soak the cleaning paper in the isopropyl alcohol and wipe the surface of the light receiving glass softly. Then blow out the lint and other dust with an air spray.

 **CAUTION**

Wipe the light receiving glass softly. Strong pressing may make a scratch on the glass or break the components.

**Cleaning the Optical Input Connector of the AQ2200-231 Optical Sensor Head**

See Cleaning the Optical Input Connector of the AQ2200-221 Optical Sensor Head.

**Cleaning the Optical Input Connector of the AQ2200-241 Optical Sensor Head**

The light receiving surface is very sensitive. NEVER wipe it for cleaning.  
For small sticking dust, blow it off with an air spray.

**Cleaning the Optical Input/Output Connector of the AQ2200-311 ATTN Module**

See Cleaning the Optical Output Connector of the AQ2200-111 DFB-LD Module.

**Cleaning the Optical Input/Output Connector of the AQ2200-331 ATTN Module**

See Cleaning the Optical Output Connector of the AQ2200-111 DFB-LD Module.

**Cleaning the Optical Input/Output Connector of the AQ2200-411 OSW Module**

See Cleaning the Optical Output Connector of the AQ2200-111 DFB-LD Module.

**Cleaning the Optical Input/Output Connector of the AQ2200-421 OSW Module**

See Cleaning the Optical Output Connector of the AQ2200-111 DFB-LD Module.

### 8.2.7 Daily Precautions

The following precautions must be constantly observed to protect the optical interface.

- To prevent collection of dust and dirt, a dust-proof cap must be attached to the optical connectors and interfaces when they are not in use.
- To prevent dirt or scratches on the connector ends, make sure that the optical interfaces never come into contact with any foreign matter (except when performing adjustment and cleaning).
- When connecting optical connectors, insert them straight while taking care not to allow the connector ends to come into contact with adapters, peripheral panel surface and components.

## 8.3 Periodical Calibration

Periodical calibration is an effective means of maintaining the unit's required performance for long periods of time and early detection of breakdown.

It is recommended that this unit be calibrated periodically twice a year.

## 8.4 Recommended Replacement Parts

The following parts are susceptible to wear. It is recommended to replace them with a new one in the following periods. For replacement, please contact your local sales dealer or YOKOGAWA's sales branch.

| Part Name              | Recommended Replacement Period | Remarks          |
|------------------------|--------------------------------|------------------|
| Cooling fan            | 40000 hours                    |                  |
| Cell (lithium battery) | 3 years                        | Power OFF status |

| Part Name                | Operating Life | Remarks                                 |
|--------------------------|----------------|---|
| Liquid crystal backlight | 7000 hours     | Half brightness life for continuous use |

\* The life when the "Back Light" value of the display adjustment settings is set to 70 (default).

# Chapter 9

## Updating the Unit

To improve module lineup and add/correct functions, update of the firmware may be necessary.

The update method is explained below.

## 9.1 Items Required

---

To perform update, the following items must be prepared.

- Frame controller (this unit)
- Modules to be updated
- Compact flash memory card (with the latest firmware)

## 9.2 Obtaining the Firmware

---

The unit may not work correctly unless the firmware is updated to the latest version.

When updating the firmware of a module or purchasing a newly released module, you must also update the firmware of the frame controller.

### **Obtaining the Firmware**

Contact your local sales dealer or YOKOGAWA's sales branch office.

A compact flash memory card with the latest firmware will be lent out to you.

The compact flash memory card must be returned as soon as possible after update is completed.

## 9.3 Update Procedure for the Frame Controller

### Update Procedure

1. Check that necessary cables including the power cord are connected, and then turn ON the power.
2. After the frame controller starts up, insert the CompactFlash memory or USB flash memory containing the latest firmware into the rear panel of the frame controller. Or, use the USB storage function to transfer the latest firmware to the instrument's temporary storage memory.
3. Press the <SYSTEM> key to display the SYSTEM screen.
4. With the [▲] or [▼] key, move the cursor to "UPDATE", and press the <OK> or [ENTER] key. (Fig. 9-1)

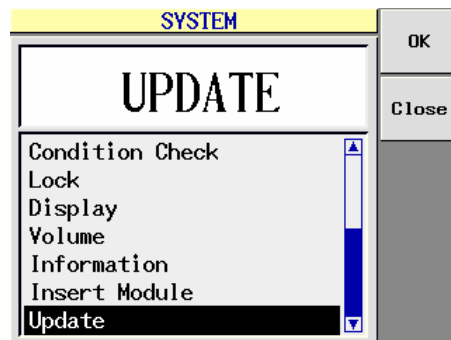
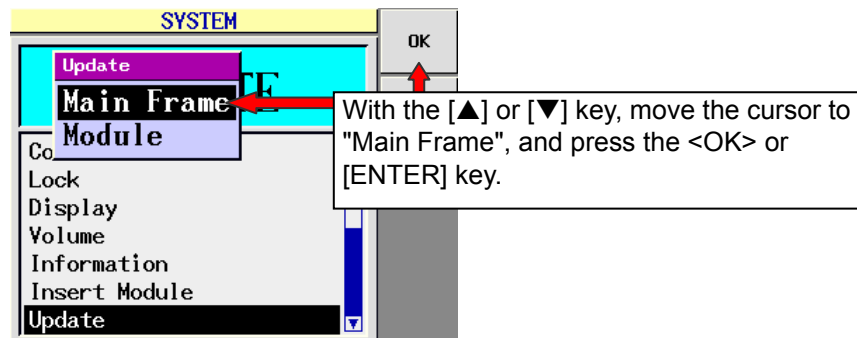
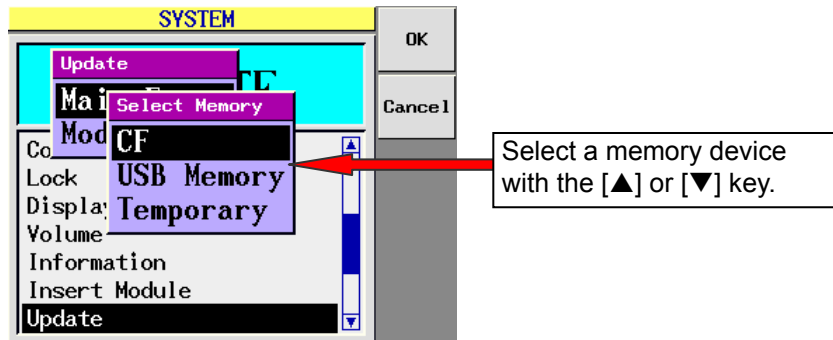


Fig. 9-1 UPDATE Screen

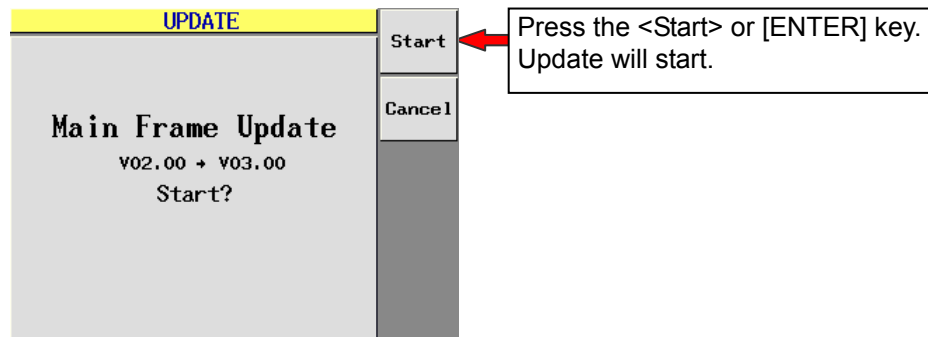
5. The UPDATE popup screen will appear. Move the cursor to "Main Frame", and press the <OK> or [ENTER] key. The "Update" popup screen will appear.



6. Move the cursor to "Main Frame" and press the <OK> or [ENTER] key. The "Select Memory" popup screen will appear.



7. Select the storage device on which the update file is stored.
8. Press the [ENTER] key. If no update file is found, a screen such as the one in figure 9-3 is displayed. Check once again whether the update file is in the medium. If you attempt to upgrade to a version of the firmware prior to the current version, a screen such as the one in figure 9-4 is displayed. To accept the "downgrade," press <OK>. Otherwise press <Cancel>.
9. The following update start confirmation screen will appear. Check that the frame software version is correct, then press the <Start> or [ENTER] key. Update will start.



10. Update is complete when the screen (Fig. 9-2) appears.  
Turn OFF the power, then turn it ON again and check the software version.  
Update has been completed successfully if the new software version is shown.  
For the software version, see section 7.10, "Displaying the Unit Information" (P7-120).

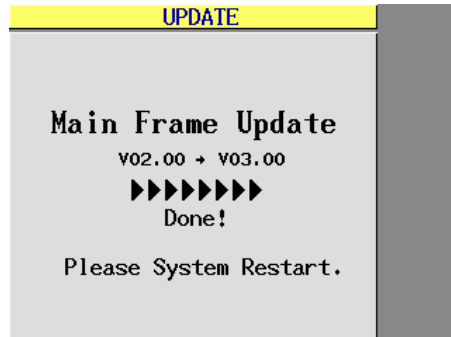


Fig. 9-2 Frame Controller Update Complete Screen

**NOTE**

- The screen shown in Fig. 9-3 appears if the selected storage device contains no firmware.
  - If the update firmware version is older than the current one, the screen shown in Fig. 9-4 will appear.
- In this case, make sure that the compact flash memory card with the latest firmware is inserted. For the compact flash memory card with the latest firmware, contact your local sales dealer or YOKOGAWA's sales branch office.

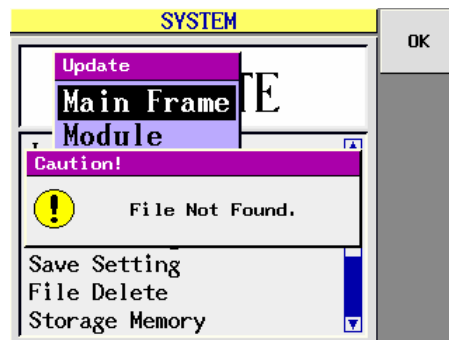


Fig. 9-3 Error when the Selected Storage Device Contains No Firmware

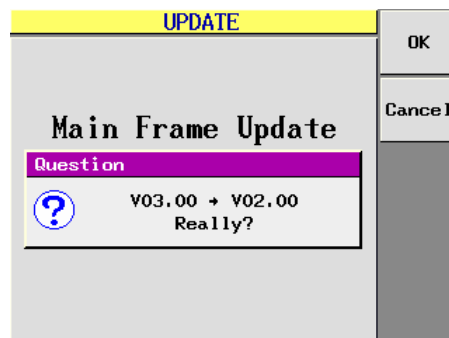


Fig. 9-4 Downversion Confirmation Screen

## 9.4 Update Procedure for Modules

### Update Module Selection Screen and Function Explanation

This screen allows selection of the module to be updated.

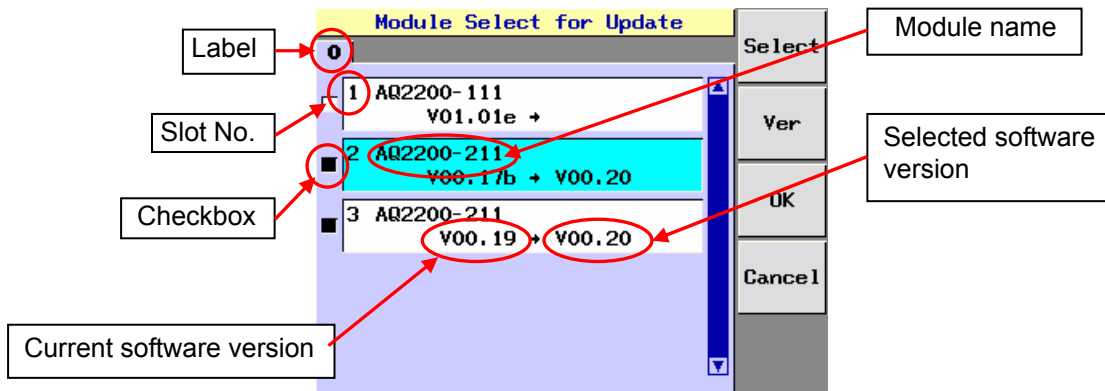


Fig. 9-5 Update Module Selection Screen

|                            |   |
|----------------------------|---|
| Label:                     | Displays the frame No.<br>"0" indicates the frame controller.   |
| Checkbox:                  | Used to select/deselect the modules to be updated.<br>■ indicates that the module is selected, and □ indicates that the module is not selected. Selection/deselection can be made by pressing the <Select> key.   |
| Slot No.:                  | Displays the slot No.   |
| Module name:               | Displays the name of the mounted module.<br>"NO MODULE" will be displayed if module is not mounted.   |
| Current software version:  | Displays the software version of the currently mounted module.  |
| Selected software version: | Displays the version of the software that is contained in the selected storage device and suitable for the module. (If two or more software versions exist, the largest version No. or the selected version No. will be displayed.)<br>None will be displayed if the selected storage device does not contain software suitable for the module. |

|           |   |
|-----------|---|
| <Select>: | Used to select the modules that are not currently selected and deselect the ones that are.<br>If "NO MODULE" is displayed, or if software compatible with the module is not found in the selected storage device, it is displayed in thin characters.   |
| <Ver>:    | Used to select the software version suitable for the module.<br>If this key is pressed, Update Version Selection Screen shown in Fig. 9-6 will appear.<br>If "NO MODULE" is displayed, or if software compatible with the module is not found in the selected storage device, it is displayed in thin characters. |
| <OK>:     | Used to start update if more than one checkbox is selected. The name of this key will be thin if no checkboxes are selected.  |
| <Cancel>: | Returns to the SYSTEM screen.   |

### Update Version Selection Screen and Function Explanation

If two or more software versions exist for the selected module, the version to which the current version is to be updated can be selected.

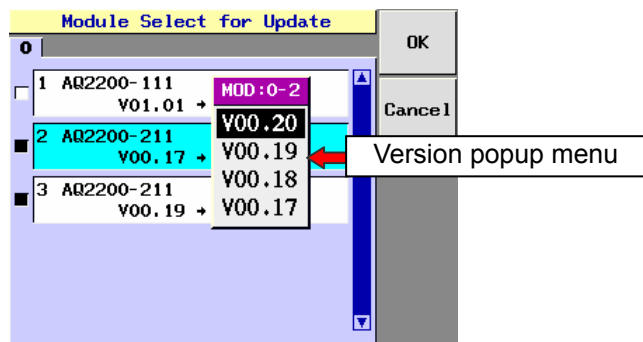


Fig. 9-6 Update Version Selection Screen

Update version selection screen:

Displays all the software versions that are contained in the selected storage device and suitable for the module.

Locate the cursor to the desired version using the [▲] and [▼] keys, and then press the <OK> key to select it.

<OK>:

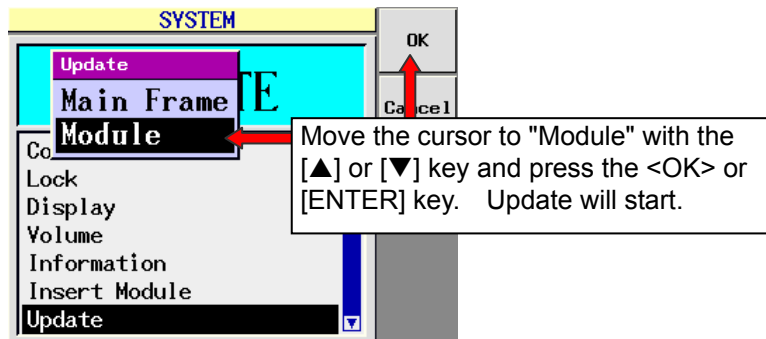
Selects the version displayed at the cursor position.

<Cancel>:

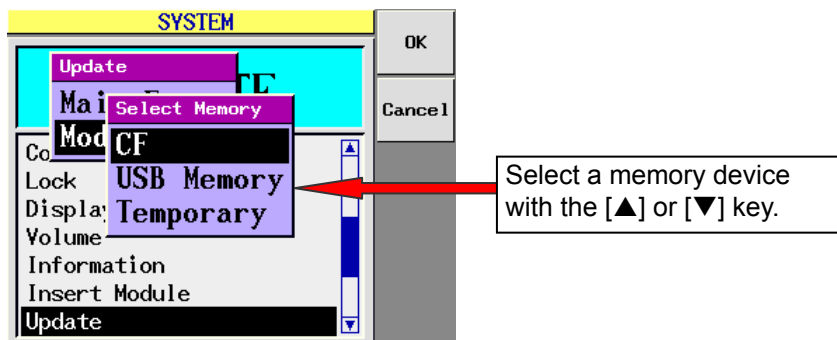
Returns to the update module selection screen.

**Update Procedure**

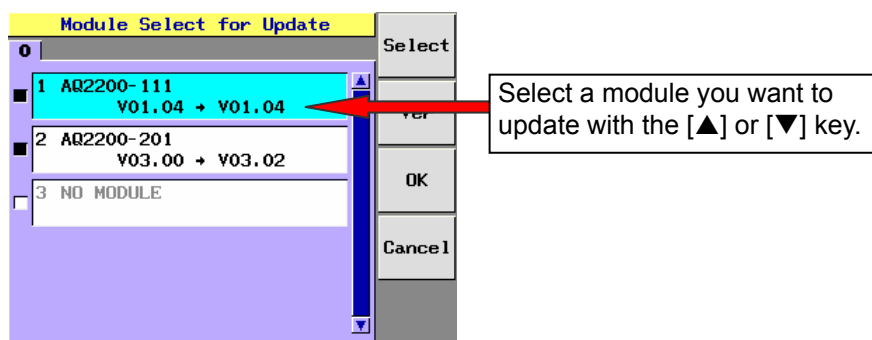
1. Mount the module to be updated into the frame controller.
2. Check that necessary cables including the power cord are connected, and then turn ON the power.
3. After the frame controller starts up, insert the CompactFlash memory or USB flash memory containing the latest firmware into the rear panel of the frame controller.  
Or, use the USB storage function to transfer the latest firmware to the instrument's temporary storage memory.
4. When the frame controller has started up, press the <SYSTEM> key to display the SYSTEM screen.
5. Move the cursor to "UPDATE" with the [▲] or [▼] key and press the <OK> or [ENTER] key. (See Fig. 9-1 UPDATE Screen on page 9-3.)
6. The "UPDATE" popup screen will appear.  
Move the cursor to "Module" and press the [ENTER] key.  
The module update screen will appear.



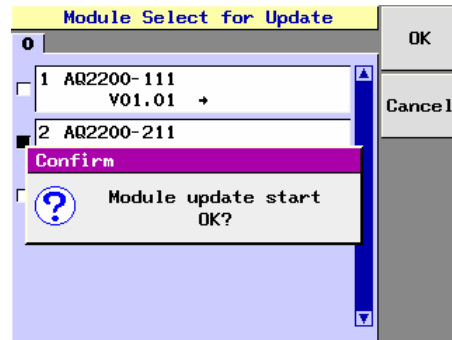
7. Place the cursor on the memory on which the update file is stored and press the <OK> or [ENTER] key. The Select Memory shortcut menu is displayed. Select a storage device.



8. Press the [ENTER] key. The update confirmation screen will appear.

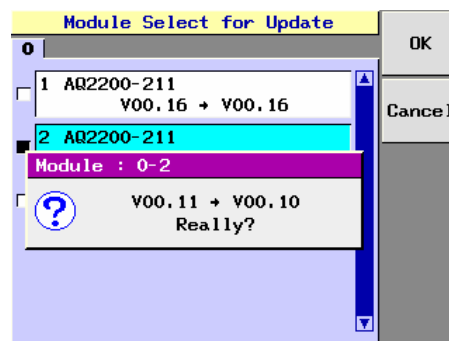


9. With the [▲] or [▼] key, move the cursor to “Module”, and press the <Select> key to select the module to be updated. (By default, all the modules are selected if the corresponding software is stored in the selected storage device.) If two or more software versions exist in the selected storage device, press the <Ver> or [ENTER] key to display Update Version Selection Screen shown in Fig. 9-6. Move the cursor to the desired version, and press the <OK> or [ENTER] key.
10. Press the <OK> key to display the update confirm screen (see Fig. 9-7).



**Fig. 9-7 Update Confirm Screen**

Downversion Confirm Screen shown in Fig. 9-8 appears only when switching the firmware to an older version. Check the version, and press the <OK> key to continue. If you want to cancel, press the <Cancel> key.



**Fig. 9-8 Downversion Confirm Screen**

11. Press the <OK> key to start update.

12. Update is complete when Update Complete Screen shown in Fig. 9-9 appears. Turn OFF the power, then turn it ON again and check the software version. Update has been completed successfully if the new software version is shown. For the software version, see section 7.10, "Displaying the Unit Information" (P7-120).

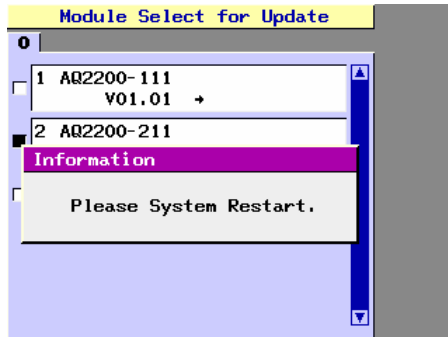


Fig. 9-9 Update Complete Screen

## 9.5 Notes on Update

---

When performing update, the following precautions must be observed.

In the worst case, the built-in software may be damaged, disabling restart.

- Do not turn OFF the power or insert/remove modules, compact flash memory card or USB flash memory during update.
- Do not decode or modify the update software.
- For update, always use the latest version.
- All the settings on the updated devices will be reset to the default settings. If necessary, save the settings before performing update.

# Chapter 10

## Specifications

## 10.1 Frame Controller

---

### AQ2201/AQ2202 Frame Controller

#### Standard Specifications

##### Module slots

- Total number of slots
  - 3 for AQ2201
  - 9 for AQ2202

##### Display

- Color LCD, 320 x 240 dot-display

##### Storage device

- Compact flash memory, USB flash memory

##### Output formats

- Set parameters: Special format
- Measurement data:
  - Logging data: csv
  - Stability data: csv
  - Wavelength sweep data: csv
  - BERT logging data: txt
  - Screen data: bmp

##### Communication (see note 1)

- GP-IB
  - Electrical and mechanical specifications:
    - Conforms to IEEE488
  - Function specifications:
    - SH1, AH1, T6, L4, SR1, RL1, DC1
  - Protocol: Conforms to IEEE488.2
  - Code: ISO (ASCII) code

##### Ethernet

- Number of ports: 1
- Electrical and mechanical specifications:
  - Conforms to IEEE802.3
- Transmission system: Ethernet (10BASE-T)
- Transfer rate: Maximum 10 Mbps
- Communication protocol: TCP/IP
- Connector type: RJ-45

##### Trigger unit

- Connector type: BNC
- Trigger In:
  - TTL level input
  - Low active
  - Input pulse width 50  $\mu$ s or longer
  - Input impedance approximately 5 k $\Omega$
- Trigger Out:
  - TTL level output
  - Low active
  - Output pulse width approximately 50  $\mu$ s
  - Output impedance approximately 1 k $\Omega$

Interlock connector  
 Connector type: Pin jack  
 Contact input

### General Specifications

#### Safety standards

Conforms to EN61010-1  
 Overvoltage category II  
 Pollution level 2

#### EMC standard

Conforms to EN61326

#### Environmental requirements

Operating temperature: +5°C to +40°C  
 Storage temperature: -20°C to +60°C  
 Humidity: 20% to 80% RH

#### Power supply: 100 to 240 V AC, 50/60 Hz

AQ2201: 170 V<sub>Amax</sub> (including installed modules)  
 AQ2202: 580 V<sub>Amax</sub> (including installed modules)

#### Dimensions

AQ2201: Approximately 212 (W) x 132.5 (H) x 400 (D) mm  
 AQ2202: Approximately 425 (W) x 132.5 (H) x 500 (D) mm

#### Weight

AQ2201: Approximately 5.8 kg  
 (not including installed modules)  
 AQ2202: Approximately 10.5 kg  
 (not including installed modules)

#### Accessories:

One User's Manual, one Remote Command Reference, one power cable, one 3-prong/2-prong adapter (included only if option -M is selected), one red interlock connector plug, one black interlock connector, two trigger terminal dust covers, one LAN connector dust cover, one GP-IB connector dustcover, two fuses, one expansion unit connector cover

Note 1: Use a cable of 3 m or less in length.

### Model Numbers

| Model      | Suffix Code | Specification and Description |
|------------|-------------|-------------------------------|
| 810518900  |             | AQ2201 Frame Controller       |
| 810518920  |             | AQ2202 Frame Controller       |
| Power cord | -M          | Japanese domestic standard    |
|            | -D          | UL3P                          |
|            | -F          | CEE-C7                        |
|            | -G          | SAA-3P                        |
|            | -Q          | BS3P square                   |
|            | -H          | BS3P round                    |

## 10.2 Related Units

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### DFB-LD Module

#### Standard Specifications

Wavelength specified range:

1310 nm, 1490 nm, 1524.111 to 1620.500 nm  
(see note 1)

Center wavelength

1310 nm, 1490 nm:  $\pm 10$  nm  
1524.111 to 1620.500 nm: (Specified wavelength)

Wavelength accuracy (see note 2)

1310 nm, 1490 nm: Within  $\pm 0.05$  nm  
1524.111 to 1620.500 nm: Within  $\pm 0.02$  nm

Wavelength setting resolution: 0.001 nm

Applicable fiber

Standard: SM (ITU-T G.652)

Spectrum line width (see note 3)

NARROW: 5 MHz (typical)  
WIDE: 100 MHz (typical)

Optical output level (see notes 2 and 4)

10 mW or more

SMSR (see note 3)

1310 nm, 1490 nm: 30 dB or more  
1524.111 to 1620.500 nm: 45 dB (typical)

Optical output level stability (see note 5)

15 minutes: Within  $\pm 0.005$  dB  
24 hours: Within  $\pm 0.03$  dB

Wavelength stability (see note 2)

15 minutes: Within  $\pm 0.005$  nm  
24 hours: Within  $\pm 0.01$  nm

Wavelength adjustment width (see notes 2 and 6):

1.6 nm or more

Optical attenuation width: 10 dB (in steps of 0.01 dB)

RIN (see notes 3 and 7):  $-145$  dB/Hz (typical)

Optical output modulation

Internal CHOP modulation

Modulation frequency: 100 Hz to 300 KHz

Optical connector (see note 8): FC/Angled PC

**Optional Specifications**

High output option (see note 2)

Optical output (see notes 4 and 16): 20 mW or more

PMF option

Polarization extinction ratio (see note 9):

20 dB or more

External sine modulation option (see notes 10 and 16)

Modulation frequency: 100 Hz to 300 KHz

Input connector: SMA (see note 12)

Input impedance: Approximately 50  $\Omega$

Maximum input voltage: 2 V<sub>p-p</sub>

External CHOP modulation option (see notes 10 and 16)

Modulation frequency: 100 Hz to 300 KHz

External modulation optical pulse delay time:

1  $\mu$ s (typical) (see notes 13 and 14)

External modulation optical pulse rise time:

1  $\mu$ s or less (see notes 13 and 15)

External modulation optical pulse fall time:

1  $\mu$ s (typical) (see notes 13 and 15)

Input connector: SMA (see note 12)

Input impedance: Approximately 50  $\Omega$

Maximum input voltage: 5 V<sub>p-p</sub>

**General Specifications**

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature: -20°C to +60°C

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 31 (W) x 117 (H) x 322 (D) mm

(not including protruding parts)

Weight: Approximately 0.9 kg

Accessories:

One green dust cap, one white dust cap(for use with external modulation option)

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: The specified wavelength range conforms to the ITU-T grid.

Note 2: Ambient temperature: 23±2°C (constant temperature), CW light, attenuation: 0.0 dB, center wavelength, outgoing point of connection fiber (FC/Angled PC-FC/SPC, 2 m, SMF), spectrum line width: NARROW

Note 3: CW light, attenuation: 0.0 dB, center wavelength

Note 4: Using master cord

Note 5: Ambient temperature: 23±2°C (constant temperature), CW light, attenuation: 0.0 dB, center wavelength, outgoing point of connection fiber (FC/Angled C-FC/SPC, 2 m, SMF), spectrum line width: WIDE

Note 6: Setting resolution: 0.001 nm, reference wavelength: Within ±0.4 nm

Note 7: Spectrum line width: NARROW, Frequency: 100 kHz to 2.5 GHz

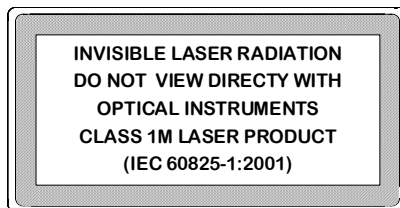
- Note 8: Angled PC manufactured by Seiko Giken or its equivalent (step type)
- Note 9: CW light, attenuation: 0.0 dB, spectrum line width: NARROW, outgoing end of the optical connector mounted on the panel
- Note 10: The external sine modulation option and external CHOP modulation option cannot both be selected.
- Note 11: Input modulation signal: 2 Vp-p or less
- Note 12: 50 Ω-coaxial cable with a length of 3 m or less is used for the cord to be connected to the external modulation input connector
- Note 13: Modulation signal: 100 Hz, attenuation: 0.0 dB, spectrum line width: NARROW
- Note 14: Delay time of the modulated optical output to the input modulation signal
- Note 15: 10% to 90% of the optical output signal rise/fall time
- Note 16: For 1490 nm, the high output option, external sine modulation option and external CHOP modulation option are not available.

**Model Numbers**

| Model                | Suffix Code             | Specification and Description  |
|----------------------|-------------------------|--|
| 810518901            |                         | AQ2200-111 DFB-LD Module   |
| Wavelength           | -<Wavelength Code>      | See Table 10-1 DFB-LD Module Applicable Wavelengths.                               |
| Optical connector    | -FCA                    | FC/Angled PC   |
| Optical output level | -P10<br>-P20            | 10mW output<br>20mW output   |
| Fiber                | -SMF<br>-PMF            | SM fiber<br>PM fiber   |
| External modulation  | -MODN<br>-MODS<br>-MODC | No external modulation<br>External modulation (sine)<br>External modulation (chop) |

**Laser Safety Information**

This laser light source is classified into “IEC60825-1: 2001; Class 1M”.  
 This specification complies with “21CFR 1040.10” except for deviation points arising from strict observation of “Laser Notice No. 50” issued on May 27, 2001.



If the laser output is observed at a distance of 100 mm or less from the laser beam emitting part by means of optical method (loupe, magnifying glass, microscope, etc.), this may cause eye injury.

Table 10-1 DFB-LD Module Applicable Wavelengths

Optical frequency: THz, Wavelength: nm

| Wavelength Code | Optical Frequency | Wavelength | Wavelength Code | Optical Frequency | Wavelength | Wavelength Code | Optical Frequency | Wavelength |
|-----------------|-------------------|------------|-----------------|-------------------|------------|-----------------|-------------------|------------|
| M0290           | 191.60            | 1564.679   | M0085           | 193.55            | 1548.915   | M0480           | 195.50            | 1533.465   |
| M0275           | 191.65            | 1564.271   | M0100           | 193.60            | 1548.515   | M0485           | 195.55            | 1533.073   |
| M0270           | 191.70            | 1563.863   | M0105           | 193.65            | 1548.115   | M0500           | 195.60            | 1532.681   |
| M0255           | 191.75            | 1563.455   | M0120           | 193.70            | 1547.715   | M0505           | 195.65            | 1532.290   |
| M0250           | 191.80            | 1563.047   | M0125           | 193.75            | 1547.316   | M0520           | 195.70            | 1531.898   |
| M0235           | 191.85            | 1562.640   | M0140           | 193.80            | 1546.917   | M0525           | 195.75            | 1531.507   |
| M0230           | 191.90            | 1562.233   | M0145           | 193.85            | 1546.518   | M0540           | 195.80            | 1531.116   |
| M0215           | 191.95            | 1561.826   | M0160           | 193.90            | 1546.119   | M0545           | 195.85            | 1530.725   |
| M0210           | 192.00            | 1561.419   | M0165           | 193.95            | 1545.720   | M0560           | 195.90            | 1530.334   |
| M0195           | 192.05            | 1561.013   | M0180           | 194.00            | 1545.322   | W1310           | 228.85            | 1310.000   |
| M0190           | 192.10            | 1560.606   | M0185           | 194.05            | 1544.924   | W1490           | 201.203           | 1490.000   |
| M0175           | 192.15            | 1560.200   | M0200           | 194.10            | 1544.526   |                 |                   |            |
| M0170           | 192.20            | 1559.794   | M0205           | 194.15            | 1544.128   |                 |                   |            |
| M0155           | 192.25            | 1559.389   | M0220           | 194.20            | 1543.730   |                 |                   |            |
| M0150           | 192.30            | 1558.983   | M0225           | 194.25            | 1543.333   |                 |                   |            |
| M0135           | 192.35            | 1558.578   | M0240           | 194.30            | 1542.936   |                 |                   |            |
| M0130           | 192.40            | 1558.173   | M0245           | 194.35            | 1542.539   |                 |                   |            |
| M0115           | 192.45            | 1557.768   | M0260           | 194.40            | 1542.142   |                 |                   |            |
| M0110           | 192.50            | 1557.363   | M0265           | 194.45            | 1541.746   |                 |                   |            |
| M0095           | 192.55            | 1556.959   | M0280           | 194.50            | 1541.349   |                 |                   |            |
| M0090           | 192.60            | 1556.555   | M0285           | 194.55            | 1540.953   |                 |                   |            |
| M0075           | 192.65            | 1556.151   | M0300           | 194.60            | 1540.557   |                 |                   |            |
| M0070           | 192.70            | 1555.747   | M0305           | 194.65            | 1540.162   |                 |                   |            |
| M0055           | 192.75            | 1555.343   | M0320           | 194.70            | 1539.766   |                 |                   |            |
| M0050           | 192.80            | 1554.940   | M0325           | 194.75            | 1539.371   |                 |                   |            |
| M0035           | 192.85            | 1554.537   | M0340           | 194.80            | 1538.976   |                 |                   |            |
| M0030           | 192.90            | 1554.134   | M0345           | 194.85            | 1538.581   |                 |                   |            |
| M0015           | 192.95            | 1553.731   | M0360           | 194.90            | 1538.186   |                 |                   |            |
| M0010           | 193.00            | 1553.329   | M0365           | 194.95            | 1537.792   |                 |                   |            |
| M0005           | 193.05            | 1552.926   | M0380           | 195.00            | 1537.397   |                 |                   |            |
| M0000           | 193.10            | 1552.524   | M0385           | 195.05            | 1537.003   |                 |                   |            |
| M000H           | 193.15            | 1552.122   | M0400           | 195.10            | 1536.609   |                 |                   |            |
| M0020           | 193.20            | 1551.721   | M0405           | 195.15            | 1536.216   |                 |                   |            |
| M0025           | 193.25            | 1551.319   | M0420           | 195.20            | 1535.822   |                 |                   |            |
| M0040           | 193.30            | 1550.918   | M0425           | 195.25            | 1535.429   |                 |                   |            |
| M0045           | 193.35            | 1550.517   | M0440           | 195.30            | 1535.036   |                 |                   |            |
| M0060           | 193.40            | 1550.116   | M0445           | 195.35            | 1534.643   |                 |                   |            |
| M0065           | 193.45            | 1549.715   | M0460           | 195.40            | 1534.250   |                 |                   |            |
| M0080           | 193.50            | 1549.315   | M0465           | 195.45            | 1533.858   |                 |                   |            |

**FP-LD Module****Standard Specifications**

Center wavelength (see notes 1 and 2)

AQ2200-141: 1310±20 nm (when 1310 nm is specified)  
1550±20 nm (when 1550 nm is specified)

AQ2200-142: 1310±20 nm, 1550±20 nm

Spectral width (see notes 1, 2, and 3)

AQ2200-141: 5 nm or less (when 1310 nm is specified)  
10 nm or less (when 1550 nm is specified)

AQ2200-142: 5 nm or less (when 1310 nm is specified)  
10 nm or less (when 1550 nm is specified)

Optical output level (see note 2)

AQ2200-141: +0 dBm or more

AQ2200-142: -1 dBm or more

Optical output level stability

Temperature stability (see notes 2 and 4)

AQ2200-141: 0.2 dBp-p or less

AQ2200-142: 0.3 dBp-p or less

Time stability (see note 2)

15 minutes (see note 5)

AQ2200-141: Within ±0.003 dB

AQ2200-142: Within ±0.005 dB

24 hours (see note 6): Within ±0.03 dB

Optical attenuation range: 6 dB (in steps of 0.01 dB)

Optical output modulation

Internal CHOP modulation frequency: 270 Hz, 1 kHz, 2 kHz

Optical connector (see note 7): AQ9441 Universal Adapter

**General Specifications**

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature: -20°C to +60°C

Ambient humidity: 20% to 80% RH

External dimensions

Approx. 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)

Weight: Approx. 0.95 kg

Accessories: One dust cap

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: Ambient temperature of mounting frame: 23±2°C

Note 2: Using CW light, attenuation: 0.0 dB, outgoing point of connection fiber (FC/SPC-FC/SPC, 2 m, SMF)

Note 3: RMS (2σ, -20 dB)

Note 4: 5°C to 40°C (8 hours)

Note 5: Constant temperature (one point within a range of 20°C to 30°C)

Note 6: A temperature ranging from 5°C to 40°C ±1°C

Note 7: Select either FC or SC

## Model Numbers

### AQ2200-141

| Model                                 | Suffix Code | Specification and Description      |
|---------------------------------------|-------------|------------------------------------|
| 810518902                             |             | AQ2200-141 FP-LD Module            |
| Wavelength                            | -W1310      | 1310nm                             |
|                                       | -W1550      | 1550nm                             |
| Additional specifications<br>(Option) | /FCC        | With AQ9441 (FC) Connector Adapter |
|                                       | /SCC        | With AQ9441 (SC) Connector Adapter |

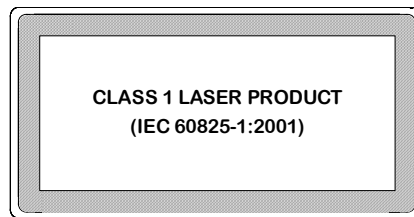
### AQ2200-142

| Model                                 | Suffix Code | Specification and Description      |
|---------------------------------------|-------------|------------------------------------|
| 810518903                             |             | AQ2200-142 DUAL FP-LD Module       |
| Wavelength                            | -W135D      | 1310nm/1550nm                      |
| Additional specifications<br>(Option) | /FCC        | With AQ9441 (FC) Connector Adapter |
|                                       | /SCC        | With AQ9441 (SC) Connector Adapter |

### Laser Safety Information

This laser light source is classified into "IEC60825-1: 2001; Class 1".

This specification complies with "21CFR 1040.10" except for deviation points arising from strict observation of "Laser Notice No. 50" issued on May 27, 2001.



If the laser output is observed at a distance of 100 mm or less from the laser beam emitting part by means of optical method (loupe, magnifying glass, microscope, etc.), this may cause eye injury.

## Interface Module

### General Specifications

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature: -20°C to +60°C

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)

Weight: Approximately 0.8 kg

Accessories: One analog out plug, one optical sensor head connector cable

### Model Number

| Model     | Suffix Code | Specification and Description |
|-----------|-------------|-------------------------------|
| 810518905 |             | AQ2200-201 Interface Module   |

## Sensor Module

### Standard Specifications

Photo sensor element: InGaAs

Measurement wavelength range: 700 to 1700 nm

Power range

CW light: -110 to +10 dBm

CHOP light: -110 to +7 dBm

Minimum display resolution: 1/10,000

Applicable fiber type

$\leq 62.5/125 \mu\text{m}$  (GI),  $\text{NA} \leq 0.275$

Uncertainty at reference conditions (see note 1):  $\pm 2\%$

Total uncertainty (see note 2):  $\pm 3.5\% \pm 0.5 \text{ pW}$

Polarization dependent responsivity (see note 3):

0.005 dBp-p or less

Linearity (see note 4):  $\pm 0.015 \text{ dB} \pm 0.2 \text{ pW}$

Noise (see note 5)

CW light: 0.2 pW or less

CHOP light: 0.2 pW or less

Averaging time (minimum): 100  $\mu\text{s}$

Analog output

AUTO mode: Provides approximately 0–2 V of output in proportion to the measurement power (W) for each power range

LINEAR mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (W)

LOG mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (dBm)

Connector type: Mini plug

Output impedance: Approximately 1 K $\Omega$

Optical connector (see note 6):

AQ9447 (\*) Connector Adapter

Logging measurement

Measurement power range fixed

Minimum data sampling interval: 100  $\mu\text{s}$

Maximum number of data samples: 20,000

Stability measurement

Minimum data sampling interval: 100 ms

Maximum number of data samples: 20,000

Maximum measurement time: 23 hours, 59 minutes, 59 seconds

### General Specifications

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature: -20°C to +60°C

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)

Weight: Approximately 0.8 kg

Accessories: One analog out plug, one dust cap

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: Reference conditions

- ① Power level: 100  $\mu$ W (–10 dBm), CW light
- ② Wavelength: 1310 $\pm$ 20 nm
- ③ Spectral width of light source: 10 nm or less
- ④ Ambient temperature: 23 $\pm$ 2°C
- ⑤ Optical fiber: SM (ITU-T G.652)
- ⑥ Optical connector: FC/PC
- ⑦ Wavelength setting error: 0.5 nm or less
- ⑧ Secular change of the measuring instrument is not included (add 0.5% if it has been more than a year since the last calibration)

Note 2: Operation conditions

- ① Power level: 10 mW to 100 pW (–70 dBm to +10 dBm), CW light
- ② Wavelength range: 1200 to 1600 nm (add  $\pm$ 3% for less than 1200 nm; add  $\pm$ 0.3 pW for 1600–1650 nm)
- ③ Optical fiber:  $\leq$  50 GI, NA  $\leq$  0.2 (add  $\pm$ 1.5% if 62.5 GI and NA  $\leq$  0.275)
- ④ Range: Auto range
- ⑤ Averaging: 1 second
- ⑥ Other conditions are the same as the reference conditions

Note 3: Conditions

- ① Wavelength range: 1550 $\pm$ 30 nm
- ② Ambient temperature: 23°C $\pm$ 2°C
- ③ Optical fiber: SM (ITU-T G.652)
- ④ Optical connector: FC/PC

Note 4: Conditions

- ① Power level: 10 mW to 100 pW (–70 dBm to +10 dBm), CW light
- ② Wavelength range: 1200 to 1600 nm (add  $\pm$ 0.3 pW for 1600–1650 nm)
- ③ Ambient temperature: 23°C $\pm$ 2°C (constant temperature)
- ④ Optical fiber: SM (ITU-T G.652)
- ⑤ Range: Auto range
- ⑥ Averaging: 1 second

Note 5: Conditions

- ① Wavelength range: 1200 to 1600 nm (add  $\pm$ 0.3 pW for 1600–1650 nm)
- ② Ambient temperature: 23°C $\pm$ 2°C (constant temperature)
- ③ Averaging: 1 second

Note 6: Select FC, SC, or ST

### Model Numbers

| Model                                | Suffix Code | Specification and Description                      |
|--------------------------------------|-------------|--|
| 810518908                            |             | AQ2200-211 Sensor Module                           |
| Additional specifications (Optional) | /FCC        | AQ9447(FC) Connector Adapter with Light Shield cap |
|                                      | /SCC        | AQ9447(SC) Connector Adapter with Light Shield cap |
|                                      | /STC        | AQ9447(ST) Connector Adapter with Light Shield cap |

## High-Power Sensor Module

### Standard Specifications

Photo sensor element: InGaAs

Measurement wavelength range: 970 to 1660 nm

Power range: -70 to +30 dBm

Minimum display resolution: 1/10,000

Applicable fiber type:  $\leq 62.5/125 \mu\text{m}$  (GI),  $\text{NA} \leq 0.275$

Uncertainty at reference conditions (see note 1):  $\pm 3\%$

Total uncertainty (see note 2 and 7):  $\pm 5\% \pm 2 \text{ nW}$

Polarization dependent responsivity (see note 3): 0.03 dBp-p (typ.)

Linearity (see note 4 and 7):  $\pm 0.05 \text{ dB} \pm 2 \text{ nW}$

Noise (see note 5): 2 nW or less

Averaging time (minimum): 100  $\mu\text{s}$

Analog output

AUTO mode: Provides approximately 0–2 V of output in proportion to the measurement power (W) for each power range

LINEAR mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (W)

LOG mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (dBm)

Connector type: Mini plug

Output impedance: Approximately 1 k $\Omega$

Optical connector (see note 6):

AQ9335C Connector Adapter

Logging measurement

Measurement power range fixed

Minimum data sampling interval: 100  $\mu\text{s}$

Maximum number of data samples: 20,000

Stability measurement

Minimum data sampling interval: 100 ms

Maximum number of data samples: 20,000

Maximum measurement time: 99 days

### General Specifications

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature: -20°C to +60°C

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)

Weight: Approximately 0.7 kg

Accessories: One ring, one protector plate

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: Reference conditions

① Power level: 100  $\mu\text{W}$  (-10 dBm), CW light

② Wavelength: 1310 $\pm$ 20 nm

- ③ Spectral width of light source: 10 nm or less
- ④ Ambient temperature:  $23 \pm 2^\circ\text{C}$
- ⑤ Optical fiber: SM (ITU-T G.652)
- ⑥ Optical connector: FC/PC
- ⑦ Wavelength setting error: 0.5 nm or less
- ⑧ Secular change of the measuring instrument is not included (add 0.5% if it has been more than a year since the last calibration)

Note 2: Operation conditions

- ① Power level:  $1\ \mu\text{W}$  to 1W ( $-30\ \text{dBm}$  to  $+30\ \text{dBm}$ ), CW light
- ② Wavelength range: 1260 to 1620 nm
- ③ Optical fiber:  $\leq 50\ \text{GI}$ ,  $\text{NA} \leq 0.2$  (add  $\pm 2\%$  if  $62.5\ \text{GI}$  and  $\text{NA} \leq 0.275$ )
- ④ Range: Auto range
- ⑤ Averaging: 1 second
- ⑥ Other conditions are the same as the reference conditions

Note 3: Conditions

- ① Wavelength range:  $1550 \pm 30\ \text{nm}$
- ② Ambient temperature:  $23^\circ\text{C} \pm 2^\circ\text{C}$
- ③ Optical fiber: SM (ITU-T G.652)
- ④ Optical connector: FC/PC

Note 4: Conditions

- ① Power level:  $1\ \mu\text{W}$  to 1W ( $-30\ \text{dBm}$  to  $+30\ \text{dBm}$ ), CW light
- ② Wavelength range: 1260 to 1620 nm
- ③ Ambient temperature:  $23^\circ\text{C} \pm 2^\circ\text{C}$  (constant temperature)
- ④ Optical fiber: SM (ITU-T G.652)
- ⑤ Range: Auto range
- ⑥ Averaging: 1 second

Note 5: Conditions

- ① Wavelength range: 1260 to 1620 nm
- ② Ambient temperature:  $23^\circ\text{C} \pm 2^\circ\text{C}$  (constant temperature)
- ③ Averaging: 1 second

Note 6: Select FC, SC, ST, LC or MU

Note 7: When the input power level is more than 10mW, add 0.001dB/W (typ.)

### Model Numbers

| Model             | Suffix Code | Specification and Description                       |
|-------------------|-------------|---|
| 735125            |             | AQ2200-215 Sensor Module                            |
| Optical connector | -FCC        | AQ9335C(FC) Connector Adapter with Light Shield cap |
|                   | -SCC        | AQ9335C(SC) Connector Adapter with Light Shield cap |
|                   | -STC        | AQ9335C(ST) Connector Adapter with Light Shield cap |
|                   | -LCC        | AQ9335C(LC) Connector Adapter with Dust cap         |
|                   | -MUC        | AQ9335C(MU) Connector Adapter with Dust cap         |

## Dual Sensor Module

### Standard Specifications

Photo sensor element: InGaAs,  $\varnothing 3$  mm  
Measurement wavelength range: 800 to 1700 nm  
Power range:  $-70$  to  $+10$  dBm  
Minimum display resolution: 1/10,000  
Applicable fiber type:  $\leq 62.5/125$   $\mu\text{m}$  (GI),  $\text{NA} \leq 0.275$   
Uncertainty at reference conditions (see note 1):  $\pm 3\%$   
Total uncertainty (see note 2):  $\pm 5\% \pm 50$  pW  
Polarization dependent responsivity (see note 3): 0.02 dBp-p (typ.)  
Linearity (see note 4):  $\pm 0.02$  dB  $\pm 50$  pW  
Noise (see note 5): 50 pW or less  
Averaging time (minimum): 200  $\mu\text{s}$   
Optical connector (see note 6):  
    AQ9335C Connector Adapter  
Logging measurement  
    Measurement power range fixed  
    Minimum data sampling interval: 200  $\mu\text{s}$   
    Maximum number of data samples: 10,000 data/channel  
Stability measurement  
    Minimum data sampling interval: 100 ms  
    Maximum number of data samples: 10,000 data/channel  
    Maximum measurement time: 99 days

### General Specifications

Operating conditions:  
    As per frame controller requirements  
Temperature and humidity requirements for storage  
    Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$   
    Ambient humidity: 20% to 80% RH  
External dimensions  
    Approximately 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)  
Weight: Approximately 0.9 kg  
Accessories: Two rings and two protector plates

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: Reference conditions

- ① Power level: 100  $\mu\text{W}$  ( $-10$  dBm), CW light
- ② Wavelength:  $1310 \pm 20$  nm
- ③ Spectral width of light source: 10 nm or less
- ④ Ambient temperature:  $23 \pm 1^{\circ}\text{C}$
- ⑤ Optical fiber: SM (ITU-T G.652)
- ⑥ Optical connector: FC/PC
- ⑦ Wavelength setting error: 0.5 nm or less
- ⑧ Secular change of the measuring instrument is not included (add 0.5% if it has been more than a year since the last calibration)

**Note 2: Operation conditions**

- ① Power level: 10mW to 100nW (−40 dBm to +10 dBm), CW light
- ② Wavelength range: 1200 to 1600 nm (add ±3% for less than 1200 nm; add ±30 pW for 1600–1650 nm)
- ③ Optical fiber: ≤ 50 GI, NA ≤ 0.2 (add ±2% if 62.5 GI and NA ≤ 0.275)
- ④ Range: Auto range
- ⑤ Averaging: 1 second
- ⑥ Other conditions are the same as the reference conditions

**Note 3: Conditions**

- ① Wavelength range: 1550±30 nm
- ② Ambient temperature: 23°C±1°C
- ③ Optical fiber: SM (ITU-T G.652)
- ④ Optical connector: FC/PC

**Note 4: Conditions**

- ① Power level: 10mW to 100nW (−40 dBm to +10 dBm), CW light
- ② Wavelength range: 1200 to 1600 nm (add ±30 pW for 1600–1650 nm)
- ③ Ambient temperature: 23°C±1°C (constant temperature)
- ④ Optical fiber: SM (ITU-T G.652)
- ⑤ Range: Auto range
- ⑥ Averaging: 1 second

**Note 5: Conditions**

- ① Wavelength range: 1200 to 1600 nm (add ±30 pW for 1600–1650 nm)
- ② Ambient temperature: 23°C±1°C (constant temperature)
- ③ Averaging: 1 second

**Note 6: Select FC, SC, ST, LC or MU****Model Numbers**

| Model             | Suffix Code | Specification and Description                                      |
|-------------------|-------------|--|
| 735122            |             | AQ2200-221 Sensor Module   |
| Optical connector | -NON        | Without optical connector adapter                                  |
|                   | -FCC        | Two sets of AQ9335C(FC) Connector Adapter and FC light shield caps |
|                   | -SCC        | Two sets of AQ9335C(SC) Connector Adapter and SC light shield caps |
|                   | -STC        | Two sets of AQ9335C(ST) Connector Adapter and ST light shield caps |
|                   | -LCC        | Two sets of AQ9335C(LC) Connector Adapter and LC dustproof caps    |
|                   | -MUC        | Two sets of AQ9335C(MU) Connector Adapter and MU dustproof caps    |

## Optical Sensor Head

### Standard Specifications

#### Photo sensor element

AQ2200-231: InGaAs,  $\varnothing$ 5 mm

AQ2200-241: Si,  $\varnothing$ 10 mm

#### Measurement wavelength range

AQ2200-231: 800–1700 nm

AQ2200-241: 400–1100 nm

#### Power range

CW light: –90 to +10 dBm

CHOP light: –90 to +7 dBm

Minimum display resolution: 1/10,000

#### Applicable fiber type (see note 1)

AQ2200-231:  $\leq 100/140 \mu\text{m}$  (SI),  $\text{NA} \leq 0.3$

AQ2200-241:  $\leq 200/230 \mu\text{m}$  (SI),  $\text{NA} \leq 0.5$

#### Uncertainty at reference conditions

AQ2200-231 (see note 2):  $\pm 2\%$

AQ2200-241 (see note 3):  $\pm 2.5\%$

#### Total uncertainty

AQ2200-231 (see note 4):  $\pm 3.5\% \pm 50 \text{ pW}$

AQ2200-241 (see note 5):  $\pm 5\% \pm 50 \text{ pW}$

#### Polarization dependent responsivity

AQ2200-231 (see note 6): 0.025 dBp-p or less

#### Linearity

AQ2200-231 (see note 7):  $\pm 0.015 \text{ dB} \pm 50 \text{ pW}$

AQ2200-241 (see note 8):  $\pm 0.05 \text{ dB} \pm 50 \text{ pW}$

#### Noise (see notes 9 and 10)

CW light: 50 pW or less

CHOP light: 50 pW or less

Averaging time (minimum): 100  $\mu\text{s}$

#### Analog output

AUTO mode: Provides approximately 0–2 V of output in proportion to the measurement power (W) for each power range

LINEAR mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (W)

LOG mode: Provides approximately 0–2 V of output in proportion within the range set for measurement power (dBm)

Connector type: Mini plug

Output impedance: Approximately 1 K $\Omega$

#### Optical connector (see note 11):

AQ9335C (\*) Connector Adapter

#### Logging measurement

Measurement power range fixed

Minimum data sampling interval: 100  $\mu\text{s}$

Maximum number of data samples: 20,000

Maximum nm of data samples: 20,000

#### Stability measurement

Minimum data sampling interval: 100 ms

Maximum nm of data samples: 20,000

Maximum measurement time: 23 hours, 59 minutes, 59 seconds

### General Specifications

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 61 (W) x 42 (H) x 100 (D) mm (not including protruding parts)

Weight: Approximately 0.3 kg

Accessories: One ring, one light shield cap

Note: All values in the specifications assume a warm-up period of one hour.

Note 1: Depends on the AQ9335C (\*) Connector Adapter and sensor light-receiving diameter. Spatial light measurement can also be set by removing the connector adapter.

Note 2: Reference conditions

① Power level: 100  $\mu\text{W}$  ( $-10$  dBm), CW light

② Wavelength:  $1310 \pm 20$  nm

③ Spectral width of light source: 10 nm or less

④ Ambient temperature:  $23 \pm 2^{\circ}\text{C}$

⑤ Optical fiber: SM (ITU-T G.652)

⑥ Optical connector: FC/PC

⑦ Wavelength setting error: 0.5 nm or less

⑧ Secular change of the measuring instrument is not included (add 0.5% if it has been more than a year since the last calibration)

Note 3: Reference conditions

① Power level: 100  $\mu\text{W}$  ( $-10$  dBm), CW light

② Wavelength:  $850 \pm 10$  nm

③ Light source spectral width: 10 nm or less

④ Ambient temperature:  $23 \pm 2^{\circ}\text{C}$

⑤ Optical fiber: SM (ITU-T G.652)

⑥ Optical connector: FC/PC

⑦ Wavelength setting tolerance: 0.5 nm or less

⑧ No changes over time in measuring instrument (add 0.5% if it has been more than a year since the last calibration)

Note 4: Usage conditions

① Power level: 10 mW to 1 nW ( $-60$  dBm to  $+10$  dBm), CW light

② Wavelength range: 1200 to 1600 nm (add  $\pm 3\%$  for less than 1200 nm; add  $\pm 30$  pW for 1600–1650 nm)

③ Optical fiber:  $\leq 50$  GI,  $\text{NA} \leq 0.2$  (add  $\pm 1.5\%$  if 100 SI and  $\text{NA} \leq 0.3$ )

④ Range: Auto range

⑤ Averaging: 1 second

⑥ Other conditions are the same as the reference conditions in Note 2.

Note 5: Usage conditions

① Power level: 10 mW to 1 nW ( $-60$  dBm to  $+10$  dBm), CW light

② Wavelength range: 500 to 900 nm (add  $\pm 2\%$   $\pm 100$  pW for less than 500 nm and more than 900 nm)

- ③Optical fiber:  $\leq 50$  GI,  $NA \leq 0.2$  (add  $\pm 1.5\%$  if 200 SI and  $NA \leq 0.5$ )
- ④Range: Auto range
- ⑤Averaging: 1 second
- ⑥Other conditions are the same as the reference conditions in Note 3.

Note 6: Conditions

- ①Wavelength range: 1550 nm
- ②Ambient temperature:  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- ③Optical fiber: SM (ITU-T G.652)
- ④Optical connector: FC/PC

Note 7: Conditions

- ①Power level: 10 mW to 1 nW ( $-60$  dBm to  $+10$  dBm), CW light
- ②Wavelength range: 1200 to 1600 nm (add  $\pm 30$  pW for 1600–1650 nm)
- ③Ambient temperature:  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (constant temperature)
- ④Optical fiber: SM (ITU-T G.652)
- ⑤Range: Auto range
- ⑥Averaging: 1 second

Note 8: Conditions

- ①Power level: 10 mW to 1 nW ( $-60$  dBm to  $+10$  dBm), CW light
- ②Wavelength range: 500 to 900 nm (add  $\pm 2\% \pm 100$  pW for less than 500 nm and more than 900 nm)
- ③Ambient temperature:  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (constant temperature)
- ④Optical fiber: SM (ITU-T G.652)
- ⑤Range: Auto range
- ⑥Averaging: 1 second

Note 9: Conditions (for AQ2200-231)

- 1Wavelength range: 1200 to 1600 nm (add  $\pm 30$  pW for 1600–1650 nm)
- 2Ambient temperature:  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (constant temperature)
- 3Averaging: 1 second

Note 10: Conditions (for AQ2200-241)

- ①Wavelength range: 500 to 900 nm (add  $\pm 100$  pW for less than 500 nm and more than 900 nm)
- ②Ambient temperature:  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (constant temperature)
- ③Averaging: 1 second

Note 11: Select FC, SC, or ST

**Model Numbers**

| Model                                | Suffix Code | Specification and Description                       |
|--------------------------------------|-------------|---|
| 810518906                            |             | AQ2200-231 Optical Sensor Head                      |
| 810518907                            |             | AQ2200-241 Optical Sensor Head                      |
| Additional specifications (Optional) | /FCC        | AQ9335C(FC) Connector Adapter with Light Shield cap |
|                                      | /SCC        | AQ9335C(SC) Connector Adapter with Light Shield cap |
|                                      | /STC        | AQ9335C(ST) Connector Adapter with Light Shield cap |

## ATTN Module

### Standard Specifications

Wavelength range: 1200 to 1700 nm

Insertion loss:

1.0 dB (typical; see notes 1, 2, 3, and 4)

1.6 dB or less (see notes 1, 2, and 3)

Maximum attenuation: 60 dB

Attenuation accuracy:

Within  $\pm 0.1$  dB (see notes 2, 3, 5, and 6)

Repeatability:

Within  $\pm 0.01$  dB (see notes 1, 2, 7 and 12)

Display resolution: 0.001 dB

Return loss

PC: 45 dB or more (see notes 3, 5, and 8)

Angled PC: 60 dB or more (see notes 3, 5, and 9)

Polarization dependent loss: 0.08 dBp-p or less (see notes 3 and 5)

Maximum input power: +23 dBm

Shutter isolation: 90 dB or more

Approved fiber: SM (ITU-T G.652)

### Optional specifications

Monitor port option

Monitor port output (see note 10):  $-13$  dB (typical)

Insertion loss (output): 2.3 dB or less (see notes 1, 2, and 3)

Return loss (see note 11): 50 dB or more (see notes 3 and 5)

Polarization dependent loss (output): 0.1 dBp-p or less (see notes 3 and 5)

### General Specifications

Operating conditions:

As per frame controller requirements

Temperature and humidity requirements for storage

Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Ambient humidity: 20% to 80% RH

External dimensions

Approximately 31 (W) x 117 (H) x 322 (D) mm (not including protruding parts)

Weight: Approximately 0.9 kg

Accessories:

Two dust caps (three if monitor port option is selected)

Note: All values in the specifications assume a warm-up period of one hour.

Unless otherwise noted, all specified values include connectors.

Note 1: Wavelengths:  $1550 \pm 15$  nm,  $1310 \pm 15$  nm

Note 2: Ambient temperature:  $23^{\circ} \pm 2^{\circ}\text{C}$  (constant temperature)

Note 3: Using master cord

Note 4: Connectors not included

Note 5: Wavelength:  $1550 \pm 15$  nm

Note 6: 0.15 dB (typical) for  $1310 \pm 15$  nm wavelength

Note 7:  $2\sigma$

- Note 8: Specified for connector end PC (return loss 48 dB or more)
- Note 9: Specified for connector end Angled PC (return loss 63 dB or more)
- Note 10: Output ratio
- Note 11: For connector end Angled PC
- Note 12: Polarization dependent loss not included

**Model Numbers**

| Model                                | Suffix Code                  | Specification and Description                |
|--------------------------------------|------------------------------|--|
| 810518915                            |                              | AQ2200-311 ATTN Module                       |
| Optical connector                    | -FCC<br>-SCC<br>-FCA<br>-SCA | FC/PC<br>SC/PC<br>FC/AngledPC<br>SC/AngledPC |
| Additional specifications (Optional) | /MON                         | Monitor port (95:5) included                 |

**ATTN Module (with OPM for monitoring)**

**Standard Specifications**

Wavelength range:

- SMF type: 1200 to 1700 nm
- MMF type: 800 to 1370 nm

Insertion loss:

- SMF type: 1.9 dB (typical) (see notes 1, 2, 3, and 4)
- MMF type: 1.9 dB (typical) (see notes 2, 4, and 14)

Maximum attenuation:

- SMF type: 60 dB
- MMF type: 45 dB

Attenuation accuracy:

- SMF type: Within  $\pm 0.1$  dB (see notes 2, 3, 5, and 6)
- MMF type: Within  $\pm 0.1$  dB (see notes 2 and 12)

Repeatability:

- SMF type: Within  $\pm 0.01$  dB (see notes 1, 2, and 7)
- MMF type: Within  $\pm 0.01$  dB (see notes 2, 7, and 12)

Minimum display resolution: 1/1,000

Accuracy of output monitor:

- SMF type: Within  $\pm 5\%$  (see notes 2, 8, 9, and 10)
- MMF type: Within  $\pm 5\%$  (see notes 2, 10, and 13)

Return loss:

- SMF type: 45 dB or more (see notes 3, 5, and 11)
- MMF type: 20 dB or more (see note 12)

Polarization dependent responsivity: (see notes 3 and 5)

- SMF type: 0.1 dBp-p or less

Maximum input power:

- SMF type: +23 dBm

Shutter isolation: 90 dB or more

Applicable fibers:

SMF type: SM (ITU-T G.652)

MMF type: 62.5/125GI (IEC 60793-2)

Optical connectors: FC/PC, SC/PC

### General Specifications

Operating conditions:

As per the operating environment of the frame controller

Storage temperature and humidity requirements:

Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Ambient humidity: 20% to 80% RH

External dimensions:

Approximately 31 (W) x 117 (H) x 322 (D) mm(not including projecting parts)

Weight: Approximately 0.9 kg

Accessories: Two dust proof caps (white)

Notes:

- All values in the specifications assume a warm-up time of one hour.
- Unless otherwise noted, all specified values include connectors.
- For models with GI specifications, all values in the specifications are assured when a lightsource excited in steady mode is used.

Note 1: Wavelength:  $1310 \pm 15$  nm,  $1550 \pm 15$  nm

Note 2: Ambient temperature:  $23 \pm 2^{\circ}\text{C}$  (constant temperature)

Note 3: When using the master cord (for SMF type only)

Note 4: Connectors not included. 2.3 dB or less if connectors are included

Note 5: Wavelength:  $1550 \pm 15$  nm

Note 6: Within  $\pm 0.15$  dB at a wavelength of  $1310 \pm 15$  nm

Note 7:  $2\sigma$

Note 8: Not including polarization dependent responsivity

Note 9: Any one point within  $1310 \pm 15$  nm or  $1550 \pm 15$  nm

Note 10: Output power:  $-10$  dBm

Note 11: When PC connectors (return loss of 48 dB or more) are used

Note 12: Wavelength: 850 or 1310 nm

Note 13: Wavelength: 850 nm

Note 14: Wavelength: 850 nm. Add 0.5 dB if wavelength is 1310 nm.

### Model Numbers

| Model             | Suffix Code  | Specification and Description |
|-------------------|--------------|-------------------------------|
| 735133            |              | AQ2200-331 ATTN Module        |
| Fibers            | -SA<br>-G6   | SMF<br>MMF (62.5GI)           |
| Optical connector | -FCC<br>-SCC | FC/PC<br>SC/PC                |

## OSW Module

### Standard Specifications

Number of ports: 1 x 4 or 1 x 8

Wavelength range:

SMF type: 1310 nm/1550 nm

MMF type: 850 nm/1310 nm

Insertion loss: 1.0 dB (typical) (see notes 1, 2, 3, and 4)

Repeatability: Within  $\pm 0.01$  dB (see notes 1, 2, and 5)

Crosstalk: (see notes 1 and 3)

SMF type:  $-60$  dB or less

MMF type:  $-50$  dB or less

Return loss: (see notes 1, 3, and 6)

SMF type: 45 dB or more

MMF type: 20 dB or more

Polarization dependent responsivity: (see notes 1 and 3)

SMF type: 0.08 dBp-p or less

Maximum input power:

SMF type: +23 dBm

Applicable fiber:

SMF type: SM (ITU-T G.652)

MMF type: 62.5/125GI (IEC 60793-2)

Optical connectors: FC/PC, SC/PC

### General Specifications

Operating conditions:

As per the operating environment of the frame controller

Storage temperature and humidity requirements:

Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Ambient humidity: 20% to 80% RH

External dimensions:

Approximately 31 (W) x 117 (H) x 322 (D) mm(not including projecting parts)

Weight: Approximately 0.8 kg

Accessories:

1 x 4 type: Five dust proof caps (white)

1 x 8 type: Nine dust proof caps (white)

- Notes:
- All values in the specifications assume a warm-up time of one hour.
  - Unless otherwise noted, all specified values include connectors.
  - For models with GI specifications, all values in the specifications are assured when a lightsource excited in steady mode is used.

Note 1: SMF type:  $1310 \pm 15$  nm or  $1550 \pm 15$  nm wavelength  
MMF type: 850 or 1310 nm wavelength

Note 2: Ambient temperature:  $23 \pm 2^{\circ}\text{C}$  (constant temperature)

Note 3: When using the master cord (for SMF type only)

Note 4: Connectors not included 1.4 dB or less if connectors are included

Note 5:  $2\sigma$

Note 6: SMF type: When PC connectors (return loss of 48 dB or more) are used

**Model Numbers**

| Model              | Suffix Code  | Specification and Description |
|--------------------|--------------|-------------------------------|
| 735141             |              | AQ2200-411 OSW Module         |
| Port configuration | -04<br>-08   | 1 x 4<br>1 x 8                |
| Fibers             | -SA<br>-G6   | SMF<br>MMF (62.5GI)           |
| Optical connector  | -FCC<br>-SCC | FC/PC<br>SC/PC                |

**Dual OSW Module****Standard Specifications**

Number of ports:

1 x 2 type: Dual 1 x 2

2 x 2 type: Dual 2 x 2

Wavelength range:

SMF type: 1310 nm/1550 nm

MMF type: 850 nm/1310 nm

Insertion loss: 1.0 dB (typical) (see notes 1, 2, 3, and 4)

Repeatability: Within  $\pm 0.01$  dB (see notes 1, 2, and 5)

Crosstalk:  $-50$  dB or less (see notes 1 and 3)

Return loss: (see notes 1, 3, and 6)

SMF type: 45 dB or more

MMF type: 20 dB or more

Polarization dependent responsivity: (see notes 3 and 7)

SMF type: 0.08 dBp-p or less

Applicable fiber:

SMF type: SM (ITU-T G.652)

MMF type: 62.5/125GI (IEC 60793-2)

Optical connectors: FC/PC, SC/PC

**General Specifications**

Operating conditions:

As per the operating environment of the framecontroller

Storage temperature and humidity requirements:

Ambient temperature:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Ambient humidity: 20% to 80% RH

External dimensions:

Approximately 31 (W) x 117 (H) x 322 (D) mm(not including projecting parts)

Weight: Approximately 0.7 kg

Accessories:

1 x 2 type: Six dust proof caps (white)

2 x 2 type: Eight dust proof caps (white)

- Notes:
- All values in the specifications assume a warm-up time of one hour.
  - Unless otherwise noted, all specified values include connectors.
  - For models with GI specifications, all values in the specifications are assured when a lightsource excited in steady mode is used.

Note 1: SMF type: 1310 ±15 nm or 1550 ±15 nm wavelength  
 MMF type: 850 or 1310 nm wavelength

Note 2: Ambient temperature: 23 ±2°C (constant temperature)

Note 3: When using the master cord (for SMF type only)

Note 4: Connectors not included 1.4 dB or less if connectors are included

Note 5: 2  $\sigma$

Note 6: SMF type: When PC connectors (return loss of 48 dB or more) are used

Note 7: Wavelength: 1550 ±15 nm

**Model Numbers**

| Model              | Suffix Code  | Specification and Description |
|--------------------|--------------|-------------------------------|
| 735142             |              | AQ2200-421 OSW Module         |
| Port configuration | -21<br>-22   | Dual 1 x 2<br>Dual 2 x 2      |
| Fibers             | -SA<br>-G6   | SMF<br>MMF (62.5GI)           |
| Optical connector  | -FCC<br>-SCC | FC/PC<br>SC/PC                |

# Chapter 11

## Appendix

## 11.1 Troubleshooting

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### ■ When the Unit Appears Faulty

When you think that the unit is faulty, check the following items.

- Cannot turn ON the power.      Is the power connector connected properly?  
Check whether the power connector is connected properly.
- Cannot operate panel keys.      The unit is possibly in remote mode.  
If the <Local> or <LAN Local> function key is displayed, the unit is in remote mode (e.g. GP-IB). In remote mode, no keys except for the <Local> or <LAN Local> key can be operated. To use the panel keys, cancel remote mode from the remote controller or press the <Local> or <LAN Local> key to place the unit in local mode.  
If 12 function keys are blank, this indicates the GP-IB local lockout status.  
To perform panel operations, use a remote control to cancel local lockout status and then change to local status.
- No optical output      Optical output is possibly locked.  
If the optical output is locked, "LOCK" appears in the "Opt" field on the display. Move the cursor to "Lock" in the SYSTEM screen to switch to "OFF".  
If "OFF" does not appear, the interlock connector on the rear panel of the unit is possibly open. Make sure that the interlock connector is short-circuited.
- Cannot remember the password.      By default, the password is "1234".  
If the password is changed, make a note of it so that you will not forget it.

**When the Problem Cannot Be Solved**

If the cause of the problem cannot be identified or the problem cannot be solved, contact your local sales dealer or YOKOGAWA's sales branch office.

Before contacting, check the following.

1. Unit name: The unit name is indicated on the name plate on the front, rear or side panel.
2. Software version: For the software version of the frame controller, move the cursor to "Information" in the SYSTEM screen to display it.
3. Module: Press the <menu> function key on the module and select "Information" to display the information regarding the module.
4. Symptom: Environment in which the unit was used  
→ The information should include indoor/outdoor, temperature, module type, and what you were doing when the symptom occurred.  
→ Messages that appeared on the screen (e.g., freeze during panel key operation/remote control)
5. Date/time on which the program occurred

## 11.2 List of Default Settings

When pressing the [PRESET] key, the settings of this unit and mounted modules are returned to their default settings.

The following Table shows the default settings.

**Table 11-1 AQ2201/AQ2202 Frame Controller Default Settings**

| Item 1                     | Item 2                      | Set Value                        |
|----------------------------|-----------------------------|----------------------------------|
| Display                    | Contrast                    | 80                               |
|                            | Brightness                  | 50                               |
|                            | Back Light                  | 70                               |
| Volume                     |                             | 5                                |
| Screen mode                |                             | SUMMARY screen                   |
| Current module             |                             | Smallest slot No.                |
| Function key display order |                             | Default                          |
| Parameter display order    |                             | Default                          |
| User key display order     |                             | Default                          |
| Stability                  | Selected Modules            | None                             |
|                            | Average* <sup>1</sup>       | 100ms                            |
|                            | Total Time* <sup>1</sup>    | 00:10:00                         |
|                            | Data Points* <sup>1</sup>   | 600                              |
|                            | WL Mode* <sup>2</sup>       | Depending on the selected sensor |
|                            | Wavelength* <sup>2</sup>    | 850nm or 1310nm                  |
|                            | Range Mode* <sup>2</sup>    | Auto                             |
|                            | Range* <sup>2</sup>         | Auto                             |
|                            | Unit* <sup>1</sup>          | dBm                              |
|                            | Ref Mode* <sup>1</sup>      | Value                            |
|                            | Reference* <sup>1</sup>     | -30.0000dBm                      |
|                            | Input Trigger* <sup>1</sup> | Ignore                           |
|                            | Modulation* <sup>1</sup>    | CW                               |
| Logging                    | Selected Modules            | None                             |
|                            | Average* <sup>1</sup>       | 100ms                            |
|                            | Data Points* <sup>1</sup>   | 600                              |
|                            | WL Mode* <sup>2</sup>       | Depending on the selected sensor |
|                            | Wavelength* <sup>2</sup>    | 850nm or 1310nm                  |
|                            | Range Mode* <sup>2</sup>    | Depending on the selected sensor |
|                            | Range* <sup>2</sup>         | Depending on the selected sensor |
|                            | Unit* <sup>1</sup>          | dBm                              |
|                            | Ref Mode* <sup>1</sup>      | Value                            |
|                            | Reference* <sup>1</sup>     | -30.0000dBm                      |
|                            | Input Trigger* <sup>1</sup> | Ignore                           |

\*1 Common parameters

\*2 Individual parameters

(Continued) AQ2201/AQ2202 Frame Controller Default Settings

| Item 1 | Item 2                 | Set Value  |
|--------|------------------------|--|
| ORL    | Ref                    | 14.7dB   |
|        | Average                | 1s   |
|        | Wavelength             | 850nm or 1310nm  |
|        | ORL display resolution | 1/10   |
|        | IL display resolution  | 1/100  |
|        | Selected Modules       | In order of installed sensors starting from the lowest slot number |

Table 11-2 AQ2200-111 DFB-LD Module Default Settings

| Item 1              | Set Value                   |
|---------------------|-----------------------------|
| Optical Output      | OFF                         |
| Wavelength          | Specified wavelength        |
| Attenuation         | 0.00dB                      |
| Mod Source          | OFF                         |
| Mod Frequency       | 0.27KHz                     |
| Line Width          | Narrow                      |
| WL Offset           | 0.000nm                     |
| Unit                | nm, dBm                     |
| PL Offset           | 0.00dB                      |
| Display module name | AQ2200-111 DFB-LD<br>MODULE |

Table 11-3 AQ2200-141 FP-LD Module Default Settings

| Item 1              | Set Value                  |
|---------------------|----------------------------|
| Optical Output      | OFF                        |
| Attenuation         | 0.00dB                     |
| Mod Source          | OFF                        |
| Mod Frequency       | 270Hz                      |
| Unit                | nm, dBm                    |
| PL Offset           | 0.00dB                     |
| Display module name | AQ2200-141 FP-LD<br>MODULE |

**Table 11-4 AQ2200-142 DUAL FP-LD Module Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>             |
|---------------------|------------------------------|
| Optical Output1,2   | OFF                          |
| Attenuation1,2      | 0.00dB                       |
| Mod Source          | OFF                          |
| Mod Frequency       | 270Hz                        |
| Unit                | nm, dBm                      |
| PL Offset           | 0.00dB                       |
| Display module name | AQ2200-142 DUAL FP-LD MODULE |

**Table 11-5 AQ2200-211 Sensor Module Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>         |
|---------------------|--------------------------|
| Measure Mode        | Normal                   |
| Average             | 100ms                    |
| Data Points         | 1,000                    |
| Reference Mode      | Value                    |
| Reference(dBm)      | -30.0000dBm              |
| Calibration         | 0.0000dB                 |
| Wavelength          | 1310.000nm               |
| Unit                | dBm                      |
| Display Resolution  | 1/10000                  |
| Range Mode          | AUTO                     |
| Modulation          | CW                       |
| Output Trigger      | Disable                  |
| Analog Out          | AUTO                     |
| MaxMin Mode         | Off                      |
| Maximum Level       | +13dBm                   |
| Power range         | 24dB                     |
| Display module name | AQ2200-211 SENSOR MODULE |

**Table 11-6 AQ2200-215 Sensor Module Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>            |
|---------------------|-----------------------------|
| Measure Mode        | Normal                      |
| Average             | 100ms                       |
| Data Points         | 1,000                       |
| Reference Mode      | Value                       |
| Reference(dBm)      | -30.0000dBm                 |
| Calibration         | 0.0000dB                    |
| Wavelength          | 1310.000nm                  |
| Unit                | dBm                         |
| Display Resolution  | 1/10000                     |
| Range Mode          | AUTO                        |
| Modulation          | CW                          |
| Output Trigger      | Disable                     |
| Analog Out          | AUTO                        |
| MaxMin Mode         | Off                         |
| Maximum Level       | +33dBm                      |
| Power range         | 24dB                        |
| Display module name | AQ2200-215 SENSOR<br>MODULE |

**Table 11-7 AQ2200-221 Sensor Module Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>            |
|---------------------|-----------------------------|
| Measure Mode        | Normal                      |
| Average             | 100ms                       |
| Data Points         | 1,000                       |
| Reference Mode      | Value                       |
| Reference(dBm)      | -30.0000dBm                 |
| Calibration         | 0.0000dB                    |
| Wavelength          | 1310.000nm                  |
| Unit                | dBm                         |
| Display Resolution  | 1/1000                      |
| Range Mode          | AUTO                        |
| Output Trigger      | Disable                     |
| MaxMin Mode         | Off                         |
| Display module name | AQ2200-221 SENSOR<br>MODULE |

**Table 11-8 AQ2200-231 Sensor Head Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>       |
|---------------------|------------------------|
| Measure Mode        | Normal                 |
| Average             | 100ms                  |
| Data Points         | 1,000                  |
| Reference Mode      | Value                  |
| Reference(dBm)      | -30.0000dBm            |
| Calibration         | 0.0000dB               |
| Wavelength          | 1310.0nm               |
| Unit                | dBm                    |
| Display Resolution  | 1/10000                |
| Range Mode          | AUTO                   |
| Modulation          | CW                     |
| Output Trigger      | Disable                |
| Analog Out          | AUTO                   |
| MaxMin Mode         | Off                    |
| Maximum Level       | +13dBm                 |
| Power range         | 24dB                   |
| Display module name | AQ2200-231 SENSOR HEAD |

**Table 11-9 AQ2200-241 Sensor Head Default Settings**

| <b>Item 1</b>       | <b>Set Value</b>       |
|---------------------|------------------------|
| Measure Mode        | Normal                 |
| Average             | 100ms                  |
| Data Points         | 1,000                  |
| Reference Mode      | Value                  |
| Reference(dBm)      | -30.0000dBm            |
| Calibration         | 0.0000dB               |
| Wavelength          | 850.0nm                |
| Unit                | dBm                    |
| Display Resolution  | 1/10000                |
| Range Mode          | AUTO                   |
| Modulation          | CW                     |
| Output Trigger      | Disable                |
| Analog Out          | AUTO                   |
| MaxMin Mode         | Off                    |
| Maximum Level       | +13dBm                 |
| Power range         | 24dB                   |
| Display module name | AQ2200-241 SENSOR HEAD |

**Table 11-10 AQ2200-311 ATTN Module Default Settings**

| Item 1              | Set Value                 |
|---------------------|---------------------------|
| Optical Output      | Disable                   |
| Attenuation         | 0.000dB                   |
| Wavelength          | 1550.0nm                  |
| Att Offset          | 0.000dB                   |
| Output Start        | Disable                   |
| Display module name | AQ2200-311 ATTN<br>MODULE |

**Table 11-11 AQ2200-331 ATTN Module Default Settings**

| Item 1              | Item 2      | Set Value                 |
|---------------------|-------------|---------------------------|
| Optical Output      |             | Disable                   |
| Attenuation         |             | 0.000dB                   |
| Wavelength          | Multi mode  | 850.0nm                   |
|                     | Single mode | 1550.0nm                  |
| Att Offset          |             | 0.000dB                   |
| Power Set           |             | 0.000dB                   |
| Unit                |             | dBm                       |
| Power Offset        |             | 0.000dB                   |
| Average             |             | 100ms                     |
| Output Start        |             | Disable                   |
| Display module name |             | AQ2200-331 ATTN<br>MODULE |

**Table 11-12 AQ2200-411 OSW Module Default Settings**

| Item 1              | Set Value                |
|---------------------|--------------------------|
| Route               | A-1                      |
| Display module name | AQ2200-411 OSW<br>MODULE |

**Table 11-13 AQ2200-421 OSW Module Default Settings**

| Item 1              | Set Value                |
|---------------------|--------------------------|
| Route               | A-1, B-2                 |
| Display module name | AQ2200-421 OSW<br>MODULE |

## 11.3 List of Save Data

You can save or load the following data into/from the memory.

1. AQ2201/AQ2202 Frame Controller
  - SYSTEM mode setting
 

|               |             |
|---------------|-------------|
| GP-IB Address | Network Set |
| Trigger       | Display     |
| Volume        |             |
  - Stability mode setting
 

|               |           |
|---------------|-----------|
| Data Points   | Average   |
| Input Trigger | Unit      |
| Total Time    | Reference |
| Modulation    |           |
  - Logging mode setting
 

|               |         |
|---------------|---------|
| Data Points   | Average |
| Input Trigger | Unit    |
| Reference     |         |
  - Function Key user setting by module type
  - Parameter user setting by module type
  - User Key user setting by module type
  
2. AQ2200-111 DFB-LD Module
 

|            |               |
|------------|---------------|
| Wavelength | Attenuation   |
| Mod Source | Mod Frequency |
| Line Width | WL Offset     |
| PL Offset  | Power         |
| Unit       |               |
  
3. AQ2200-141 FP-LD Module
 

|               |            |
|---------------|------------|
| Attenuation   | Mod Source |
| Mod Frequency | PL Offset  |
| Power         | Unit       |
  
4. AQ2200-142 DUAL FP-LD Module
 

|              |               |
|--------------|---------------|
| Attenuation1 | Attenuation2  |
| Mod Source   | Mod Frequency |
| PL Offset1   | PL Offset2    |
| Power1       | Power2        |
| Unit         |               |
  
5. AQ2200-201 Interface Module
 

|      |  |
|------|--|
| None |  |
|------|--|

## 6. AQ2200-211 Sensor Module

|              |                 |
|--------------|-----------------|
| Meas Mode    | Average         |
| Max/Min Mode | Data Points     |
| Calibration  | Reference       |
| Unit         | Wavelength      |
| Range Mode   | Disp Resolution |
| Modulation   | Range           |
| Analog Out   | Output Trigger  |

## 7. AQ2200-215 Sensor Module

|              |                 |
|--------------|-----------------|
| Meas Mode    | Average         |
| Max/Min Mode | Data Points     |
| Calibration  | Reference       |
| Unit         | Wavelength      |
| Range Mode   | Disp Resolution |
| Modulation   | Range           |
| Analog Out   | Output Trigger  |

## 8. AQ2200-221 Sensor Module

|                |                 |
|----------------|-----------------|
| Meas Mode      | Average         |
| Max/Min Mode   | Data Points     |
| Ref Mode       | Reference       |
| Calibration    | Wavelength      |
| Unit           | Disp Resolution |
| Range Mode     | Range           |
| Output Trigger |                 |

## 9. AQ2200-231/-241 Optical Sensor Head

|              |                 |
|--------------|-----------------|
| Meas Mode    | Average         |
| Max/Min Mode | Data Points     |
| Ref Mode     | Reference       |
| Calibration  | Wavelength      |
| Unit         | Disp Resolution |
| Range Mode   | Range           |
| Modulation   | Output Trigger  |
| Analog Out   |                 |

## 10. AQ2200-311 ATTN Module

|            |             |
|------------|-------------|
| ATT Offset | Attenuation |
| Wavelength |             |

11. AQ2200-331 ATTN Module

|                |             |
|----------------|-------------|
| ATT Offset     | Attenuation |
| Wavelength     | Output      |
| Output StartUP | Power Set   |
| Unit           | PL Offset   |
| Average        |             |

12. AQ2200-411/421 OSW Module

Route

## 11.4 Error List

**Table 11-7 Error Codes (Frame Controller) (1/3)**

| Code        | Item      | Description   |
|-------------|-----------|---|
| <b>1000</b> | Message   | <b>FAN Alarm</b>  |
|             | Trouble   | Fan alarm was detected.   |
|             | Operation | Continues to operate.   |
|             | Cause     | The fan was stopped.  |
|             | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type        | DDE       |   |
| <b>1001</b> | Message   | <b>Battery Error</b>  |
|             | Trouble   | Battery is abnormal.  |
|             | Operation | Continues to operate.   |
|             | Cause     | Remaining battery power is low.   |
|             | Action    | The battery must be replaced.<br>Contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type        | DDE       |   |
| <b>1002</b> | Message   | <b>Password Error</b>   |
|             | Trouble   | Password error  |
|             | Operation | Continues to operate.   |
|             | Cause     | The password that was input is incorrect.   |
|             | Action    | Check the password, and enter the correct one.  |
| Type        | EXE       |   |
| <b>1003</b> | Message   | <b>Slot Empty</b>   |
|             | Trouble   | Module mounting error   |
|             | Operation | Continues to operate.   |
|             | Cause     | The specified slot is empty.  |
|             | Action    | Check whether a module is present in the specified slot.  |
| Type        | DDE       |   |
| <b>1005</b> | Message   | <b>Temperature Error</b>  |
|             | Trouble   | Internal temperature error  |
|             | Operation | Continues to operate.   |
|             | Cause     | Internal temperature is excessively high.   |
|             | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type        | DDE       |   |

## (Continued) Error Codes (Frame Controller) (2/3)

| Code        | Item      | Description   |
|-------------|-----------|---|
| <b>1006</b> | Message   | <b>Initialization Error</b>   |
|             | Trouble   | Initialization error  |
|             | Operation | Continues to operate.   |
|             | Cause     | Failed to initialize.   |
|             | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|             | Type      | DDE   |
| <b>1007</b> | Message   | <b>Update Error</b>   |
|             | Trouble   | Update error  |
|             | Operation | Update stops.<br>Continues to operate.  |
|             | Cause     | Failed to update.   |
|             | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|             | Type      | DDE   |
| <b>1008</b> | Message   | <b>Memory Check Error</b>   |
|             | Trouble   | Memory check error  |
|             | Operation | Continues to operate.   |
|             | Cause     | An abnormality occurred during memory error check at start-up.  |
|             | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|             | Type      | DDE   |
| <b>1010</b> | Message   | <b>No Media</b>   |
|             | Trouble   | Media installation error  |
|             | Operation | Continues to operate.   |
|             | Cause     | No media (e.g. compact flash memory card) is inserted.  |
|             | Action    | Insert a media.   |
|             | Type      | EXE   |
| <b>1011</b> | Message   | <b>Media Full</b>   |
|             | Trouble   | Insufficient media capacity error   |
|             | Operation | Continues to operate.   |
|             | Cause     | The media (e.g. compact flash memory card) has insufficient storage capacity.   |
|             | Action    | Delete some files to increase the free capacity or replace the media with another one.  |
|             | Type      | EXE   |

## (Continued) Error Codes (Frame Controller) (3/3)

| Code | Item      | Description  |
|------|-----------|--|
| 1012 | Message   | <b>Corrupt Error</b>   |
|      | Trouble   | Media abnormality  |
|      | Operation | Continues to operate.  |
|      | Cause     | The medium (compact flash, etc.) may be corrupt. Or, there are too many files. When the medium uses the FAT format, there are restrictions on the number of files. |
|      | Action    | Delete files to reduce their number, or change the medium.   |
|      | Type      | EXE  |
| 1014 | Message   | <b>Soft Version Error</b>  |
|      | Trouble   | Software version mismatch  |
|      | Operation | Continues to operate.  |
|      | Cause     | The software version for the frame controller differs from that for the module.  |
|      | Action    | Update the software for the frame controller and module.<br>For the latest version, contact your local sales dealer or YOKOGAWA's sales branch office.             |
|      | Type      | DDE  |
| 1015 | Message   | <b>Module Type Error</b>   |
|      | Trouble   | Module type mismatch   |
|      | Operation | Continues to operate.  |
|      | Cause     | The frame controller failed to identify the module.  |
|      | Action    | Update the frame controller's software.<br>For the latest version, contact your local sales dealer or YOKOGAWA's sales branch office.                              |
|      | Type      | DDE  |

**NOTE** | Error codes 1020 to 1099 are handled as remote command errors and mentioned in "AQ2200 Remote Command Reference".

Table 11-8 Error Codes (Light Source Module) (1/3)

| Code | Item      | Description   |
|------|-----------|---|
| 1101 | Message   | <b>Temperature Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Continues to operate.   |
|      | Cause     | The temperature inside the module is excessively high.  |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type | DDE       |   |
| 1102 | Message   | <b>Update Error</b>   |
|      | Trouble   | Update error  |
|      | Operation | Continues to operate.   |
|      | Cause     | Failed to update.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1103 | Message   | <b>Not Running</b>  |
|      | Trouble   | Module operation error  |
|      | Operation | Continues to operate.   |
|      | Cause     | The light source module is not working.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1104 | Message   | <b>Light Output Limit Operation1</b>  |
|      | Trouble   | Optical output limit over (for laser light source 1)  |
|      | Operation | Optical output turns OFF.   |
|      | Cause     | The optical output of the light source (device 1) exceeded the upper limit.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1105 | Message   | <b>Memory Check Error</b>   |
|      | Trouble   | Memory check error  |
|      | Operation | Program execution is stopped.   |
|      | Cause     | An abnormality was found during memory error check at start-up.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |

## (Continued) Error Codes (Light Source Module) (2/3)

| Code | Item      | Description   |
|------|-----------|---|
| 1106 | Message   | <b>Thermistor Temperature Error1</b>  |
|      | Trouble   | Abnormal thermistor temperature (for laser light source 1)  |
|      | Operation | Continues to operate.   |
|      | Cause     | The thermistor detected abnormal temperature.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1107 | Message   | <b>Thermistor Temperature Error2</b>  |
|      | Trouble   | Abnormal thermistor temperature (for laser light source 2)  |
|      | Operation | Continues to operate.   |
|      | Cause     | The thermistor detected abnormal temperature.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1108 | Message   | <b>PEL Over current Error1</b>  |
|      | Trouble   | Abnormal Peltier current (for laser light source 1)   |
|      | Operation | Continues to operate.   |
|      | Cause     | Peltier drive current is abnormal.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1109 | Message   | <b>PEL Over current Error2</b>  |
|      | Trouble   | Abnormal Peltier current (for laser light source 2)   |
|      | Operation | Continues to operate.   |
|      | Cause     | Peltier drive current is abnormal.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1110 | Message   | <b>Temperature Limit Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Turns OFF the power.  |
|      | Cause     | Internal temperature is abnormal.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type | DDE       |   |

**(Continued) Error Codes (Light Source Module) (3/3)**

| <b>Code</b> | <b>Item</b> | <b>Description</b>   |
|-------------|-------------|--|
| <b>1111</b> | Message     | <b>Opt Lock Error</b>  |
|             | Trouble     | Optical output lock error  |
|             | Operation   | Optical output cannot be turned ON.  |
|             | Cause       | Laser output is locked.  |
|             | Action      | Turn OFF the laser output lock.<br>For details, refer to 11.1, "Troubleshooting".<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type        | DDE         |  |
| <b>1112</b> | Message     | <b>Light Output Limit Operation 2</b>  |
|             | Trouble     | Optical output limit over (for laser light source 2)   |
|             | Operation   | Optical output turns OFF.  |
|             | Cause       | The optical output of the light source exceeded the upper limit.   |
|             | Action      | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.                |
| Type        | DDE         |  |

Table 11-16 Error Codes (Sensor Module) (1/4)

| Code | Item      | Description   |
|------|-----------|---|
| 1200 | Message   | <b>Memory Check Error</b>   |
|      | Trouble   | Memory check error  |
|      | Operation | Program execution is stopped.   |
|      | Cause     | An abnormality occurred during memory check.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1201 | Message   | <b>Flash Rom Write Error</b>  |
|      | Trouble   | Flash ROM writing error   |
|      | Operation | Stops writing to the ROM.   |
|      | Cause     | Failed to write to the flash ROM.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1202 | Message   | <b>Header Error</b>   |
|      | Trouble   | Type error  |
|      | Operation | Identifies the module as AQ2200-211 and continues to operate.   |
|      | Cause     | Failed to identify the sensor head type correctly.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1203 | Message   | <b>Temperature Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Continues to operate.   |
|      | Cause     | The internal temperature is excessively high.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type | DDE       |   |
| 1204 | Message   | <b>Update Error</b>   |
|      | Trouble   | Update error  |
|      | Operation | Continues to operate.   |
|      | Cause     | Failed to update.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |

## (Continued) Error Codes (Sensor Module) (2/4)

| Code | Item      | Description   |
|------|-----------|---|
| 1205 | Message   | <b>Not Running</b>  |
|      | Trouble   | Module operation error  |
|      | Operation | Continues to operate.   |
|      | Cause     | The module is not working.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
|      | Type      | DDE   |
| 1206 | Message   | <b>No Head</b>  |
|      | Trouble   | Sensor head error   |
|      | Operation | Continues to operate.   |
|      | Cause     | The sensor head is not connected.   |
|      | Action    | Make sure that the sensor head is connected.  |
|      | Type      | DDE   |
| 1207 | Message   | <b>Temperature Limit Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Turns OFF the power.  |
|      | Cause     | Internal temperature is abnormal.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br><br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |
| 1260 | Message   | <b>PD Module Error1</b>   |
|      | Trouble   | Peltier temperature error   |
|      | Operation | Continues to operate.   |
|      | Cause     | Peltier temperature is abnormal.  |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br><br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |
| 1261 | Message   | <b>PD Module Error2</b>   |
|      | Trouble   | Peltier current error   |
|      | Operation | Continues to operate.   |
|      | Cause     | Peltier drive current is abnormal.  |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br><br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |

## (Continued) Error Codes (Sensor Module) (3/4)

| Code | Item      | Description   |
|------|-----------|---|
| 1262 | Message   | <b>PD Module Error3</b>   |
|      | Trouble   | Abnormal Peltier control IC temperature   |
|      | Operation | Continues to operate.   |
|      | Cause     | The temperature for Peltier control IC is abnormal.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |
| 1263 | Message   | <b>Zero set Error1</b>  |
|      | Trouble   | Zero set error 1  |
|      | Operation | Cancels the zero set operation and then continues to operate.   |
|      | Cause     | Light is not blocked completely during zero setting.  |
|      | Action    | Make sure that the light is blocked, and then perform zero reset again.   |
|      | Type      | DDE   |
| 1264 | Message   | <b>Zero set Error2</b>  |
|      | Trouble   | Zero set error 2  |
|      | Operation | Cancels the zero set operation and then continues to operate.   |
|      | Cause     | The hardware is abnormal.   |
|      | Action    | Restart the unit, and then perform zero reset. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.  |
|      | Type      | DDE   |
| 1265 | Message   | <b>OPT Mode Error</b>   |
|      | Trouble   | Modulation mode error   |
|      | Operation | Continues to operate.   |
|      | Cause     | Optical signal with CHOP mode frequency different from the specified frequency was input.   |
|      | Action    | Check the CHOP frequency setting.   |
|      | Type      | DDE   |
| 1266 | Message   | <b>Input Power Over</b>   |
|      | Trouble   | Maximum light input power error   |
|      | Operation | Continues to operate.   |
|      | Cause     | Light exceeding the maximum light input level was input.  |
|      | Action    | Decrease the light input power below the maximum light input level.   |
|      | Type      | DDE   |

(Continued) Error Codes (Sensor Module) (4/4)

| Code | Item      | Description   |
|------|-----------|---|
| 1268 | Message   | <b>A/D Read Error</b>   |
|      | Trouble   | A/D read error  |
|      | Operation | Cancels measurement and continues to operate.   |
|      | Cause     | The sensor module hardware is abnormal.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |
| 1269 | Message   | <b>Trigger Ignored</b>  |
|      | Trouble   | Trigger mode error  |
|      | Operation | Continues to operate.   |
|      | Cause     | Remote measurement command was received during trigger input mode.  |
|      | Action    | Check the measurement mode.   |
|      | Type      | EXE   |

Table 11-17 Error Codes (ATTN Module) (1/3)

| Code | Item      | Description   |
|------|-----------|---|
| 1301 | Message   | <b>Temperature Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Continues to operate.   |
|      | Cause     | The internal temperature is excessively high.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br><br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|      | Type      | DDE   |
| 1302 | Message   | <b>Update Error</b>   |
|      | Trouble   | Update error  |
|      | Operation | Continues to operate.   |
|      | Cause     | Failed to update.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br><br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
|      | Type      | DDE   |

## (Continued) Error Codes (ATTN Module) (2/3)

| Code    | Item      | Description  |
|---------|-----------|--|
| 1303    | Message   | <b>Not Running</b><br>Module operation error<br>Continues to operate.<br>The ATTN module is not working.<br>Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.<br>DDE   |
|         | Trouble   |  |
|         | Operation |  |
|         | Cause     |  |
|         | Action    |  |
| Type    |           |  |
| 1304    | Message   | <b>Initialization Error</b><br>Initialization error<br>Program execution is stopped.<br>Failed to initialize.<br>Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.<br>DDE  |
|         | Trouble   |  |
|         | Operation |  |
|         | Cause     |  |
|         | Action    |  |
| Type    |           |  |
| 1305    | Message   | <b>Memory Check Error</b><br>Memory check error<br>Program execution is stopped.<br>An abnormality occurred during memory check.<br>Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.<br>DDE   |
|         | Trouble   |  |
|         | Operation |  |
|         | Cause     |  |
|         | Action    |  |
| Type    |           |  |
| 1306    | Message   | <b>Temperature Limit Error</b><br>Abnormal internal temperature<br>Turns OFF the power.<br>Internal temperature is abnormal.<br>Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.<br>DDE |
|         | Trouble   |  |
|         | Operation |  |
|         | Cause     |  |
|         | Action    |  |
| Type    |           |  |
| 1307    | Message   | <b>Over Current Error</b><br>Current error<br>Continues to operate.<br>Abnormal module drive current<br>Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.<br>DDE   |
|         | Trouble   |  |
|         | Operation |  |
|         | Cause     |  |
|         | Action    |  |
| Message |           |  |

## (Continued) Error Codes (ATTN Module) (3/3)

| Code        | Item      | Description  |
|-------------|-----------|--|
| <b>1363</b> | Message   | <b>Zero set Error1</b>   |
|             | Trouble   | Zero set error 1   |
|             | Operation | Cancels the zero set operation and then continues to operate.  |
|             | Cause     | Light is not blocked completely during zero setting.   |
|             | Action    | Make sure that the light is blocked, and then perform zero reset again.  |
|             | Type      | DDE  |
| <b>1364</b> | Message   | <b>Zero set Error2</b>   |
|             | Trouble   | Zero set error 2   |
|             | Operation | Cancels the zero set operation and then continues to operate.  |
|             | Cause     | The hardware is abnormal.  |
|             | Action    | Restart the unit, and then perform zero reset. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|             | Type      | DDE  |
| <b>1366</b> | Message   | <b>Input Power Over</b>  |
|             | Trouble   | Maximum light input power error  |
|             | Operation | Continues to operate.  |
|             | Cause     | Light exceeding the maximum light input level was input.   |
|             | Action    | Decrease the light input power below the maximum light input level.  |
|             | Type      | DDE  |

Table 11-18 Error Codes (OSW Module) (1/2)

| Code | Item      | Description   |
|------|-----------|---|
| 1401 | Message   | <b>Temperature Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Continues to operate.   |
|      | Cause     | The internal temperature is excessively high.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type | DDE       |   |
| 1402 | Message   | <b>Update Error</b>   |
|      | Trouble   | Update error  |
|      | Operation | Continues to operate.   |
|      | Cause     | Failed to update.   |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1403 | Message   | <b>Not Running</b>  |
|      | Trouble   | Module operation error  |
|      | Operation | Continues to operate.   |
|      | Cause     | The OSW module is not working.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1405 | Message   | <b>Memory Check Error</b>   |
|      | Trouble   | Memory check error  |
|      | Operation | Program execution is stopped.   |
|      | Cause     | An abnormality occurred during memory check.  |
|      | Action    | Turn OFF the power, and then turn it ON again to restart the unit.<br>If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office.   |
| Type | DDE       |   |
| 1406 | Message   | <b>Temperature Limit Error</b>  |
|      | Trouble   | Abnormal internal temperature   |
|      | Operation | Turns OFF the power.  |
|      | Cause     | Internal temperature is abnormal.   |
|      | Action    | Turn OFF the power, and check that the ventilation holes on the unit are not blocked.<br>After a while, restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
| Type | DDE       |   |

**(Continued) Error Codes (OSW Module) (2/2)**

| <b>Code</b> | <b>Item</b> | <b>Description</b>   |
|-------------|-------------|--|
| <b>1407</b> | Message     | <b>Over Current Error</b>  |
|             | Trouble     | Current error  |
|             | Operation   | Continues to operate.  |
|             | Cause       | Abnormal module drive current  |
|             | Action      | Turn OFF the power, and then turn it ON again to restart the unit. If the message persists, contact your local sales dealer or YOKOGAWA's sales branch office. |
|             | Message     | DDE  |

## 11.5 Accessories

**Table 11-19 List of Accessories**

| Part Name             | Model                  | Description   | Remarks                                 |
|-----------------------|------------------------|---|---|
| Connector adaptor     | AQ9335C(*)             | For AQ2200-231, AQ2200-241 Sensor Head<br>For AQ2200-221, AQ2200-221 Sensor | *: Select any of FC, SC, ST, MU and LC. |
|                       | AQ9447(*)              | For AQ2200-211 Sensor   | *: Select any of FC, SC, and ST.        |
| MT connector adaptor  | AQ9440B                | For AQ2200-231, AQ2200-241 Sensor Head                                      |   |
| Tape fiber adaptor    | AQ9436                 | For AQ2200-231, AQ2200-241 Sensor Head                                      |   |
| Exposed fiber adaptor | AQ-9302                | For AQ2200-231, AQ2200-241 Sensor Head                                      |   |
| Universal adaptor     | AQ9441(*)              | For AQ2200-141, AQ2200-142 FP-LD  | *: Select either FC or SC.              |
| Protective cap        | Light blocking cap (*) | For ZERO-SET of sensor  | *: Select any of FC, SC, and ST.        |
| Blank panel           | AQ2200-901             | For covering of blank slot  | 1-slot size                             |

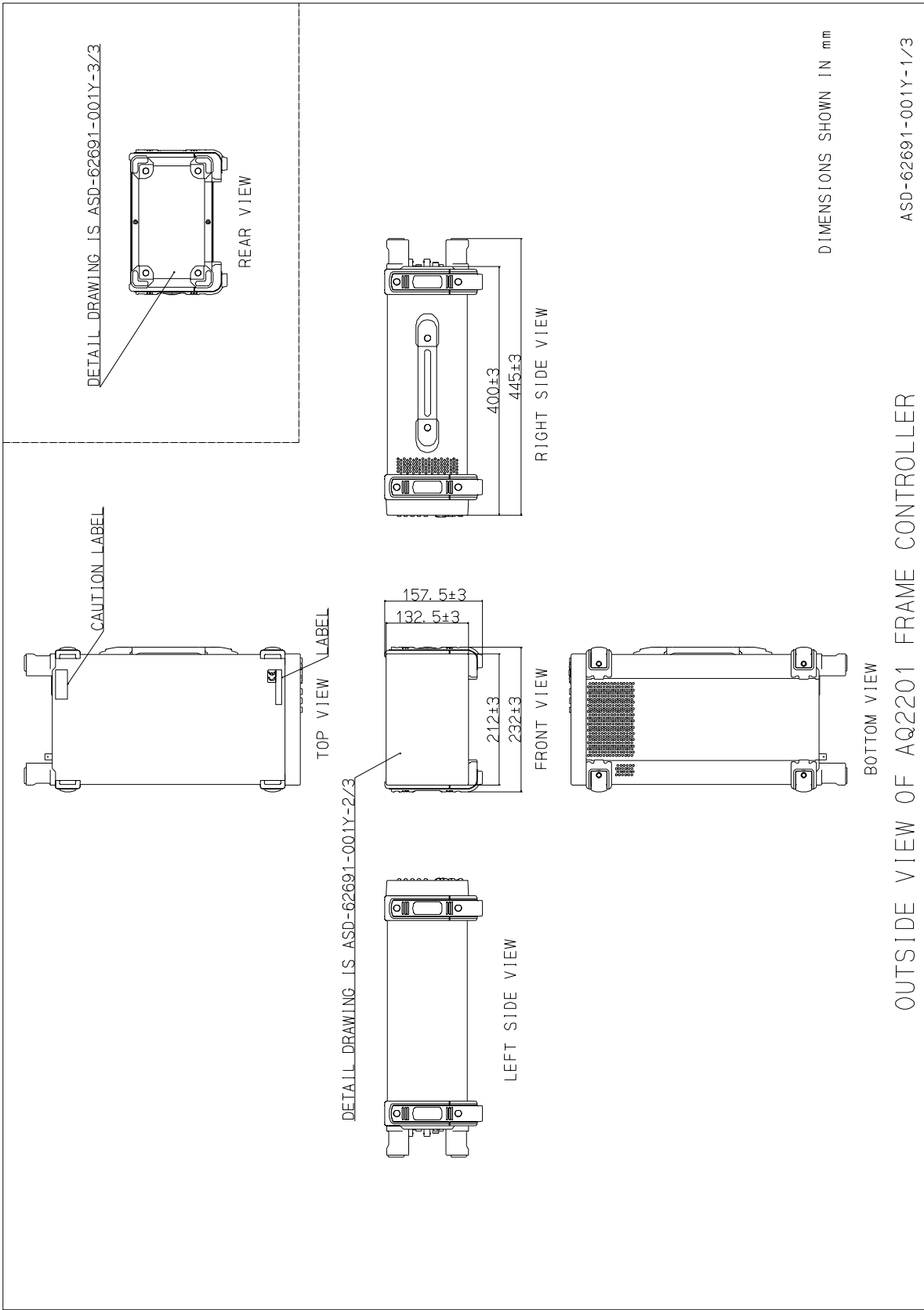
## 11.6 Outside View Drawings

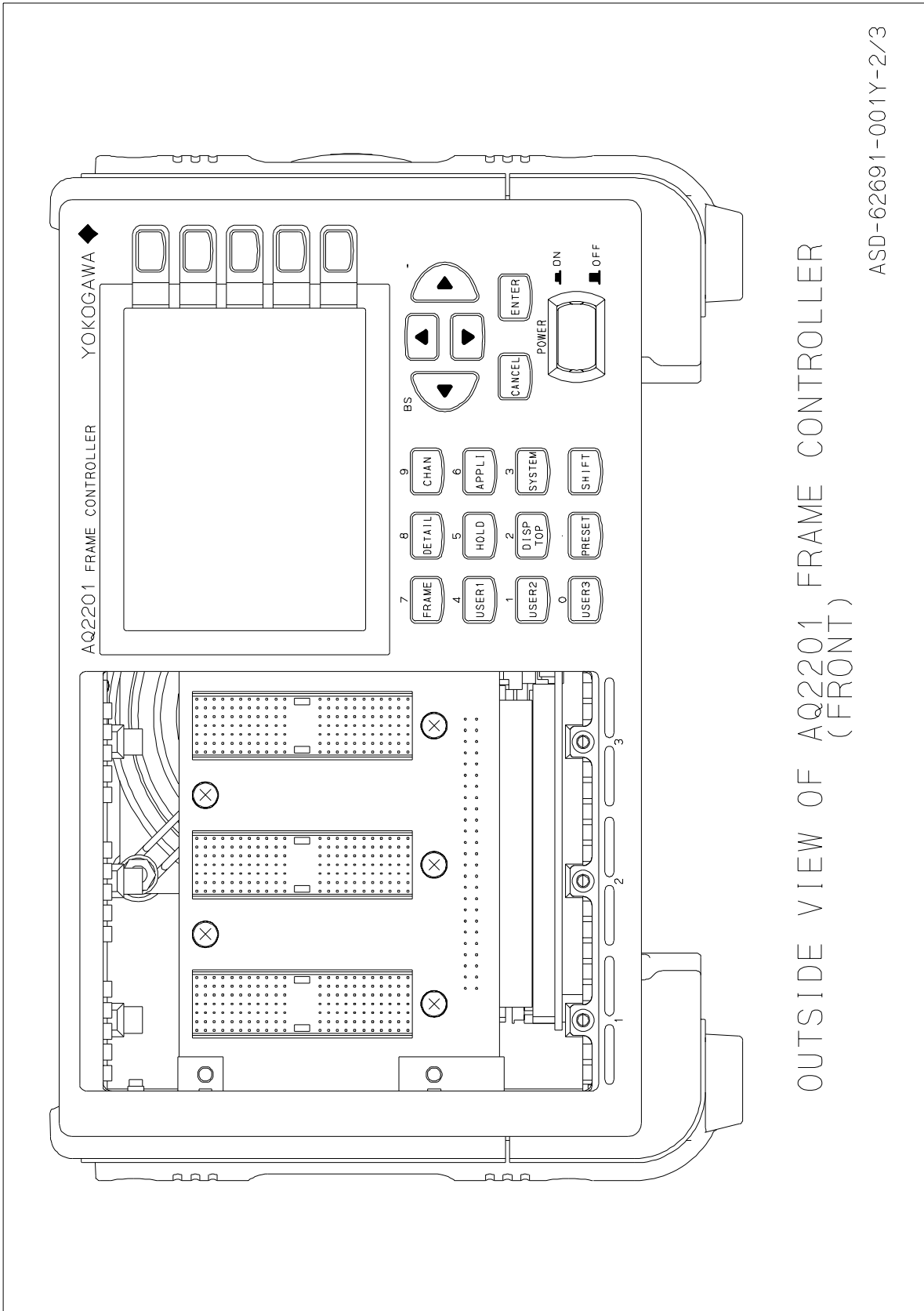
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The outside view drawings of the following units are attached.

- AQ2201           Frame Controller
- AQ2202           Frame Controller
- AQ2200-111       DFB-LD Module
- AQ2200-141       FP-LD Module
- AQ2200-142       DUAL FP-LD Module
- AQ2200-201       Interface Module
- AQ2200-211       Sensor Module
- AQ2200-215       Sensor Module
- AQ2200-221       Sensor Module
- AQ2200-231       Optical Sensor Head
- AQ2200-241       Optical Sensor Head
- AQ2200-311       ATTN Module
- AQ2200-331       ATTN Module
- AQ2200-411       OSW Module
- AQ2200-421       OSW Module

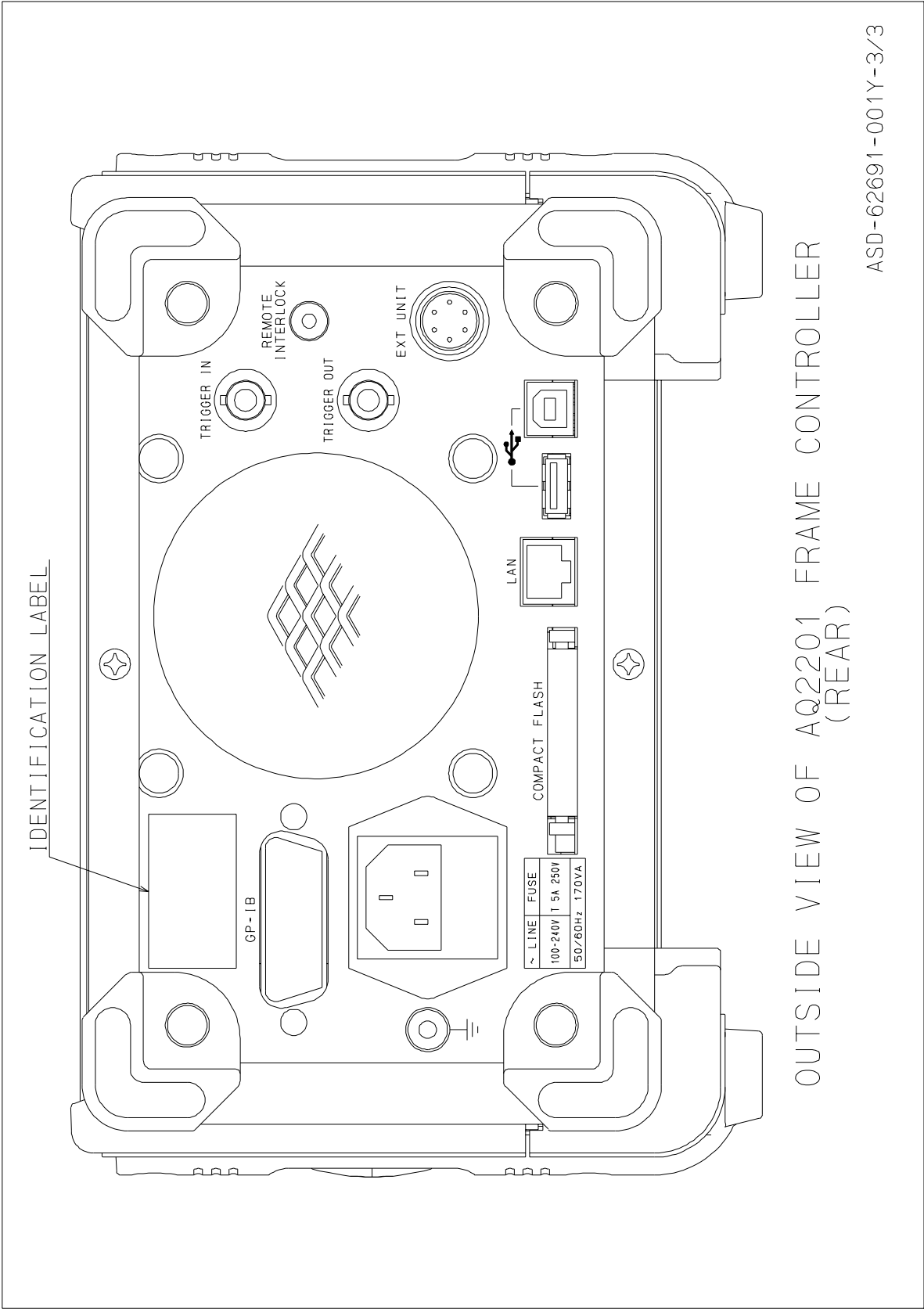
11.6.1 AQ2201 Frame Controller



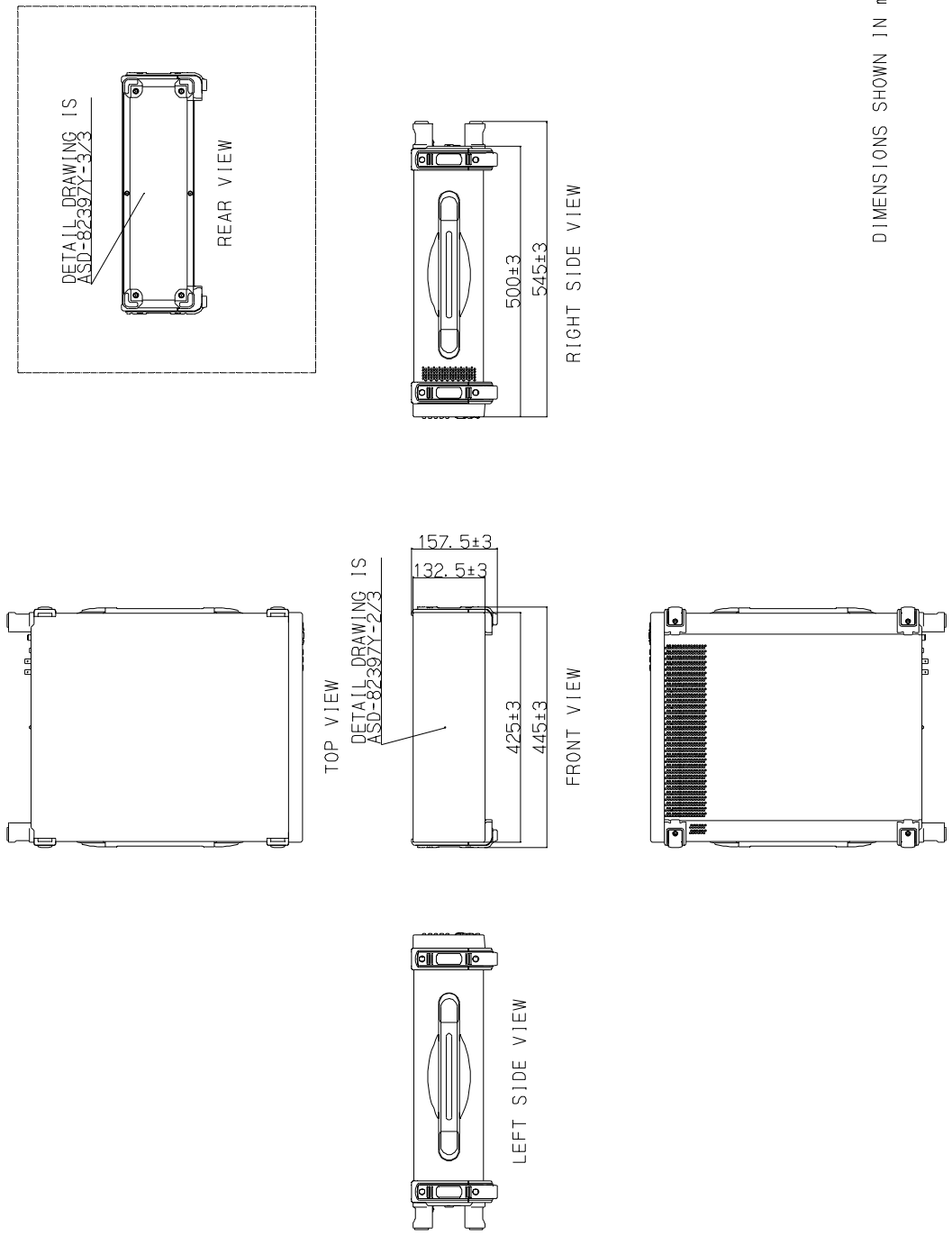


OUTSIDE VIEW OF AQ2201 FRAME CONTROLLER (FRONT)

ASD-62691-001Y-2/3



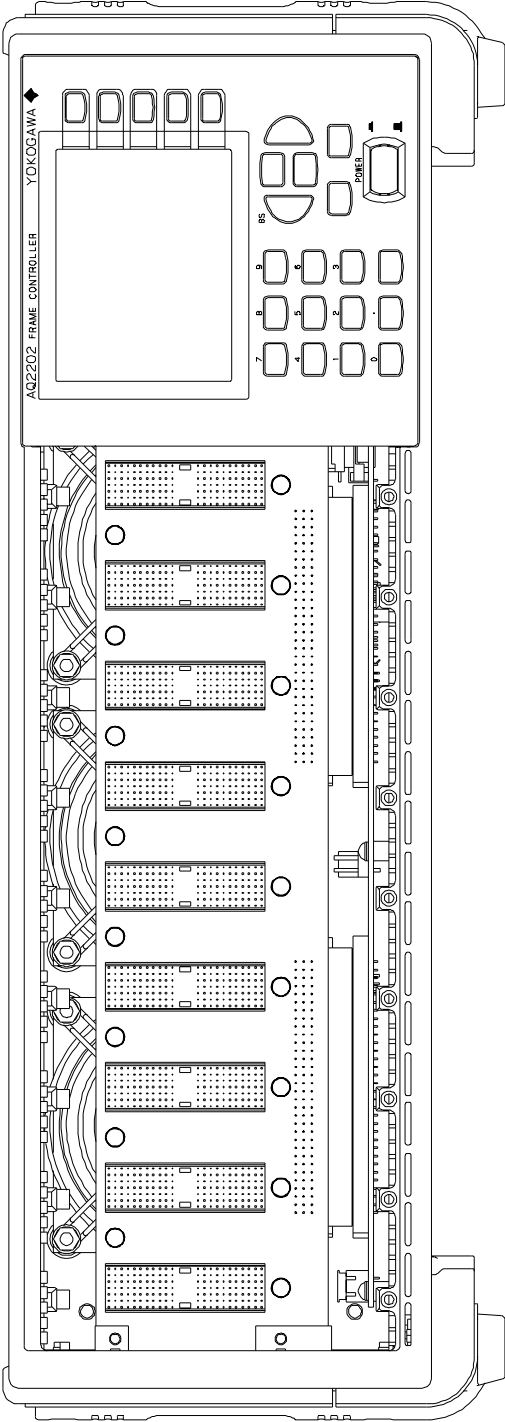
### 11.6.2 AQ2202 Frame Controller



DIMENSIONS SHOWN IN mm

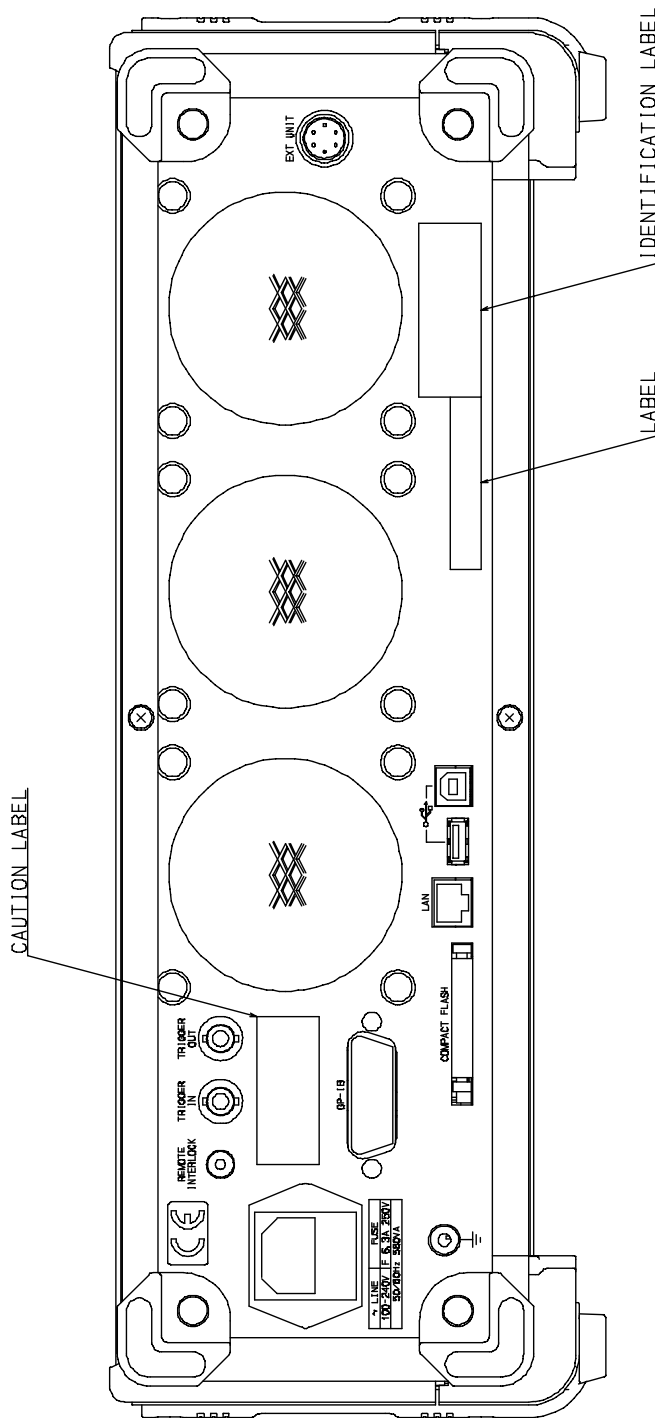
ASD-82397Y-1/3

BOTTOM VIEW  
OUTSIDE VIEW OF AQ2202 FRAME CONTROLLER



OUTSIDE VIEW OF AQ2202 FRAME CONTROLLER (FRONT)

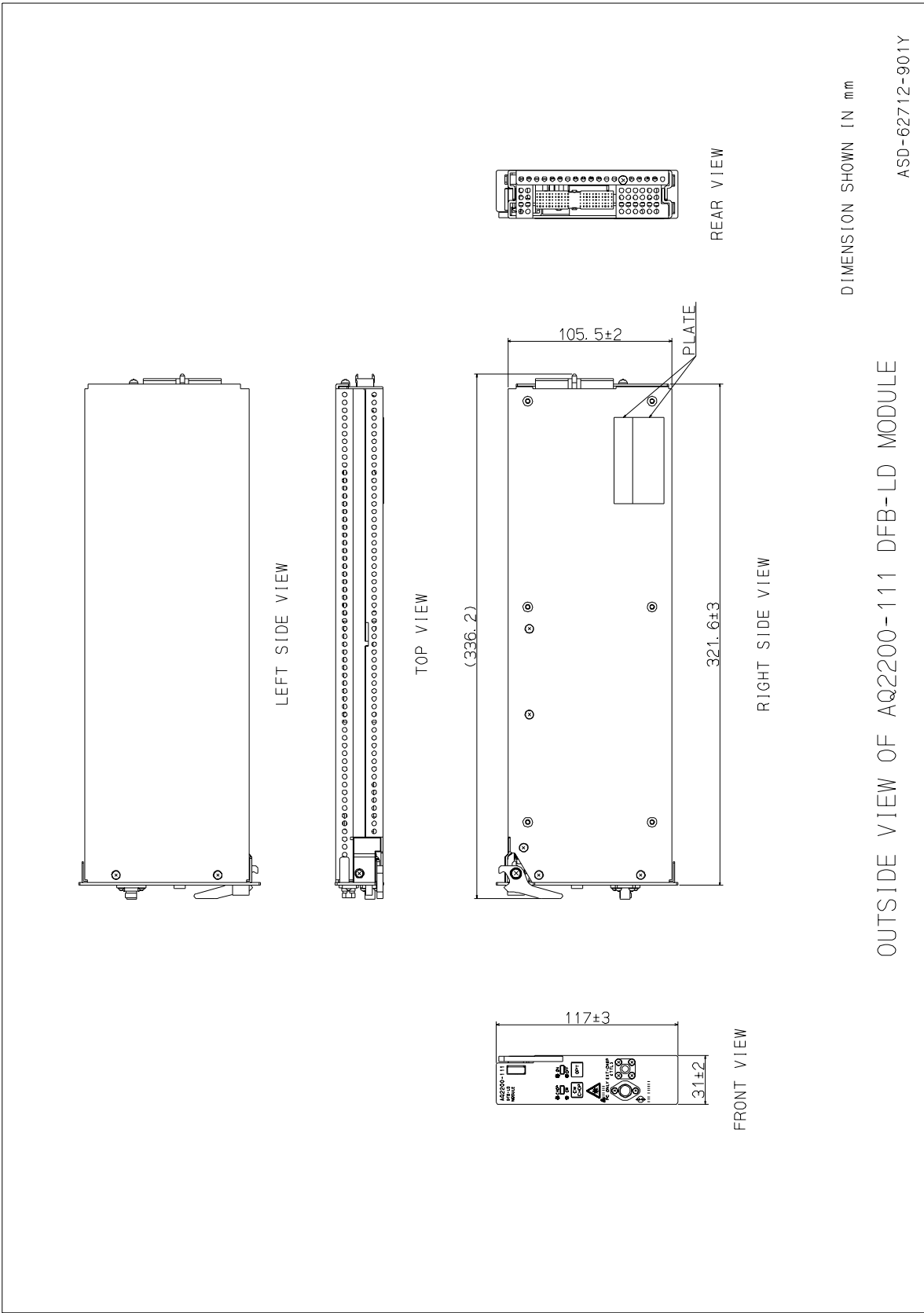
ASD-82397Y-2/3



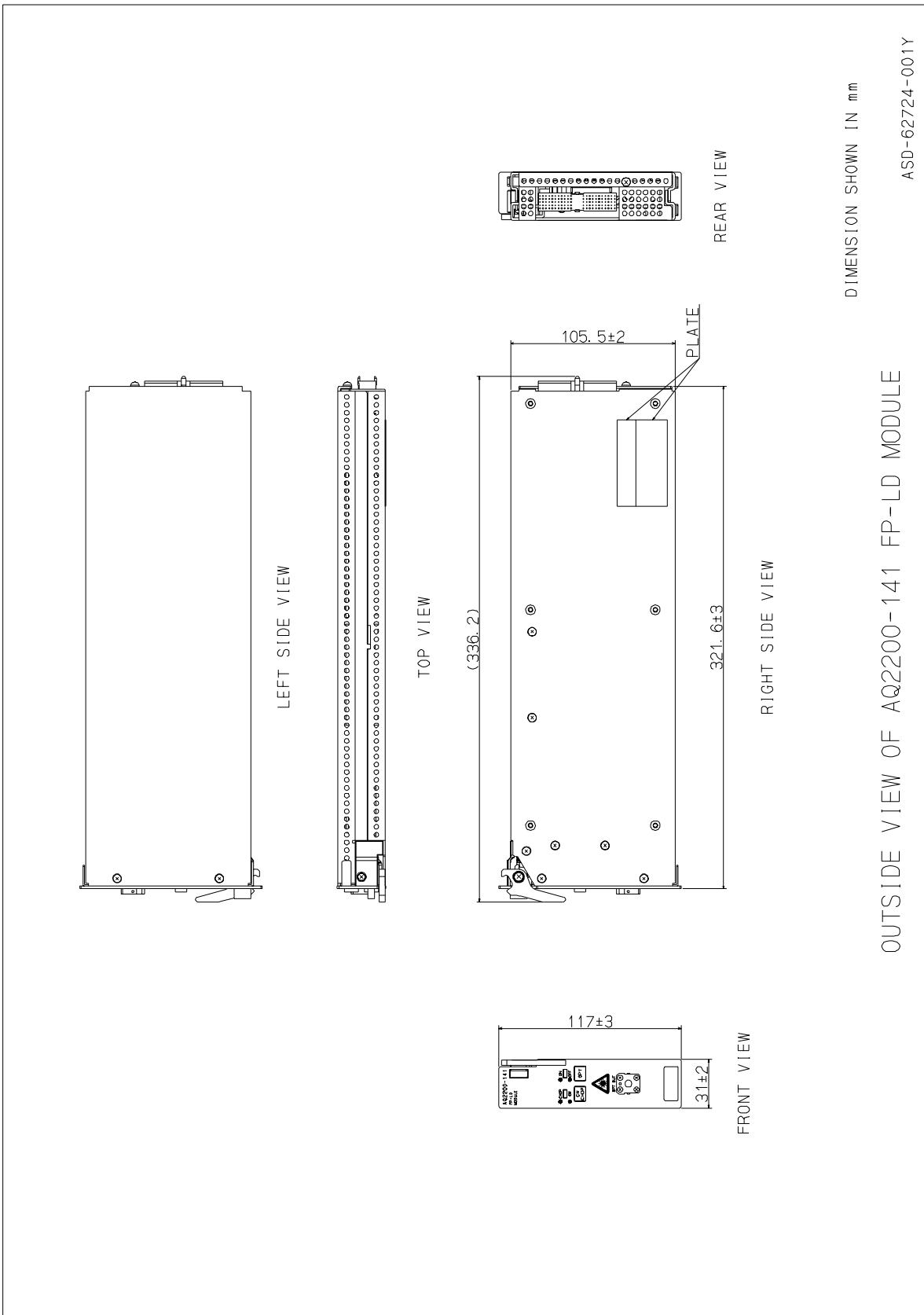
OUTSIDE VIEW OF AQ2202 FRAME CONTROLLER (REAR)

ASD-82397Y-3/3

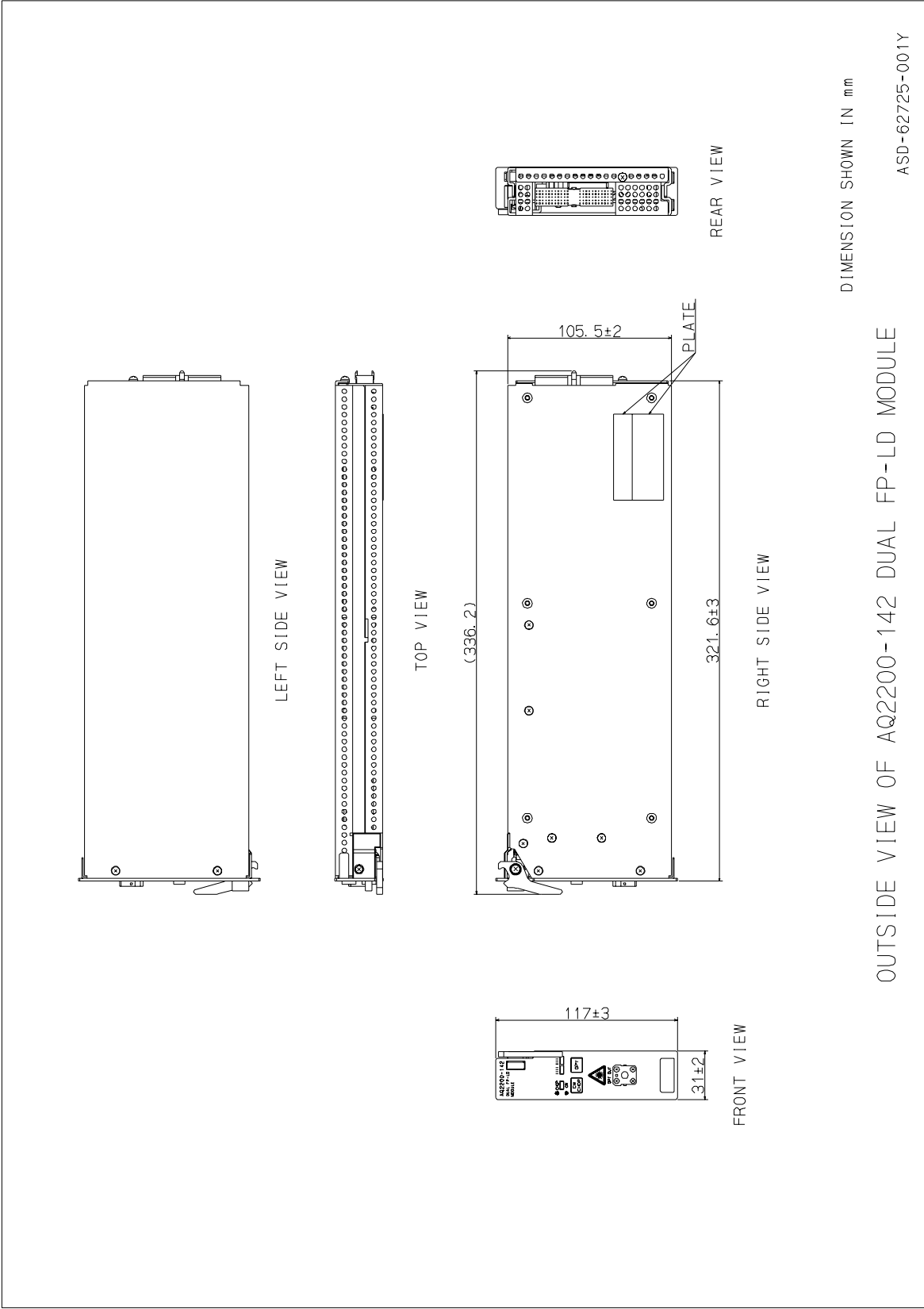
11.6.3 AQ2200-111 DFB-LD Module



### 11.6.4 AQ2200-141 FP-LD Module



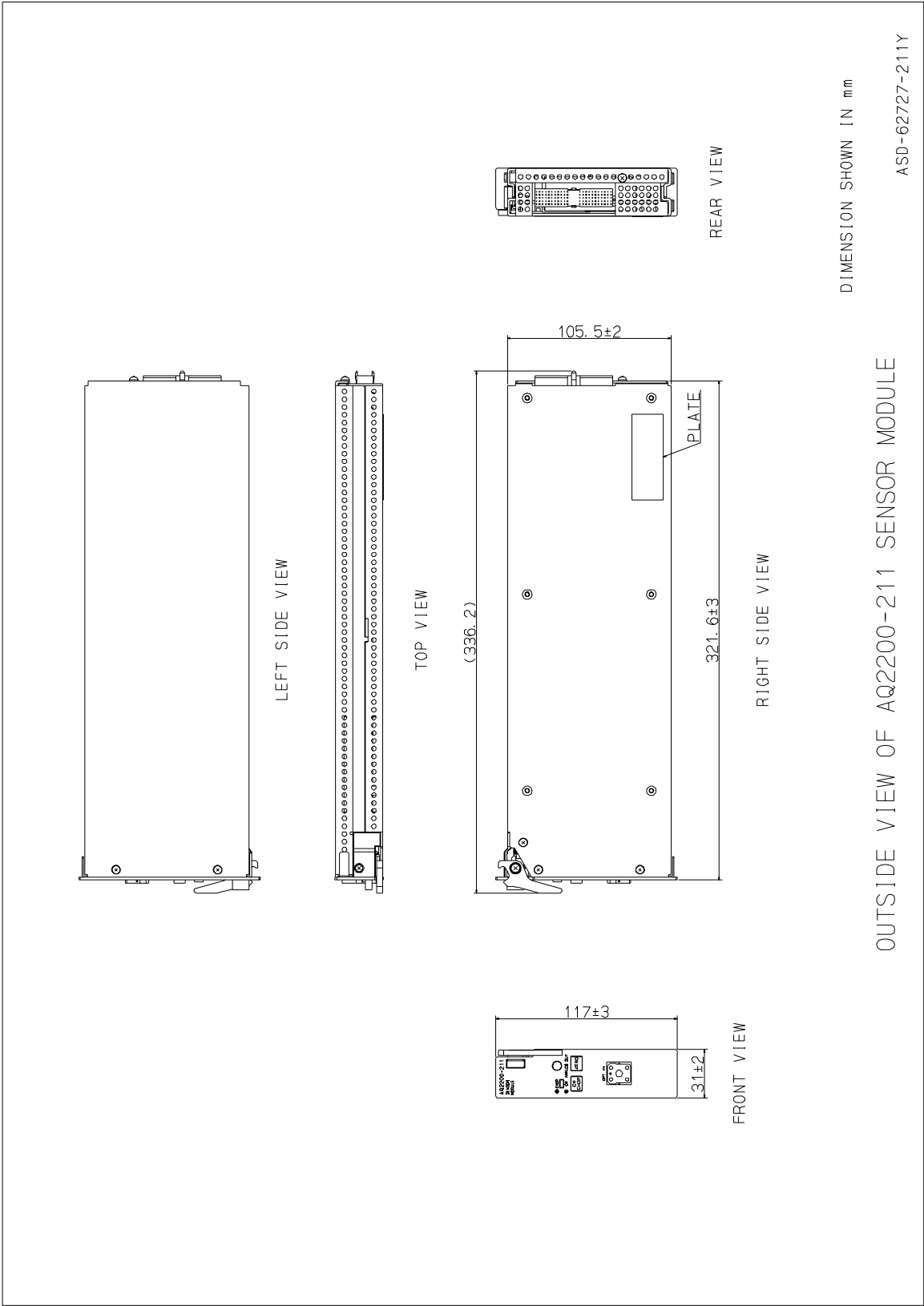
11.6.5 AQ2200-142 DUAL FP-LD Module



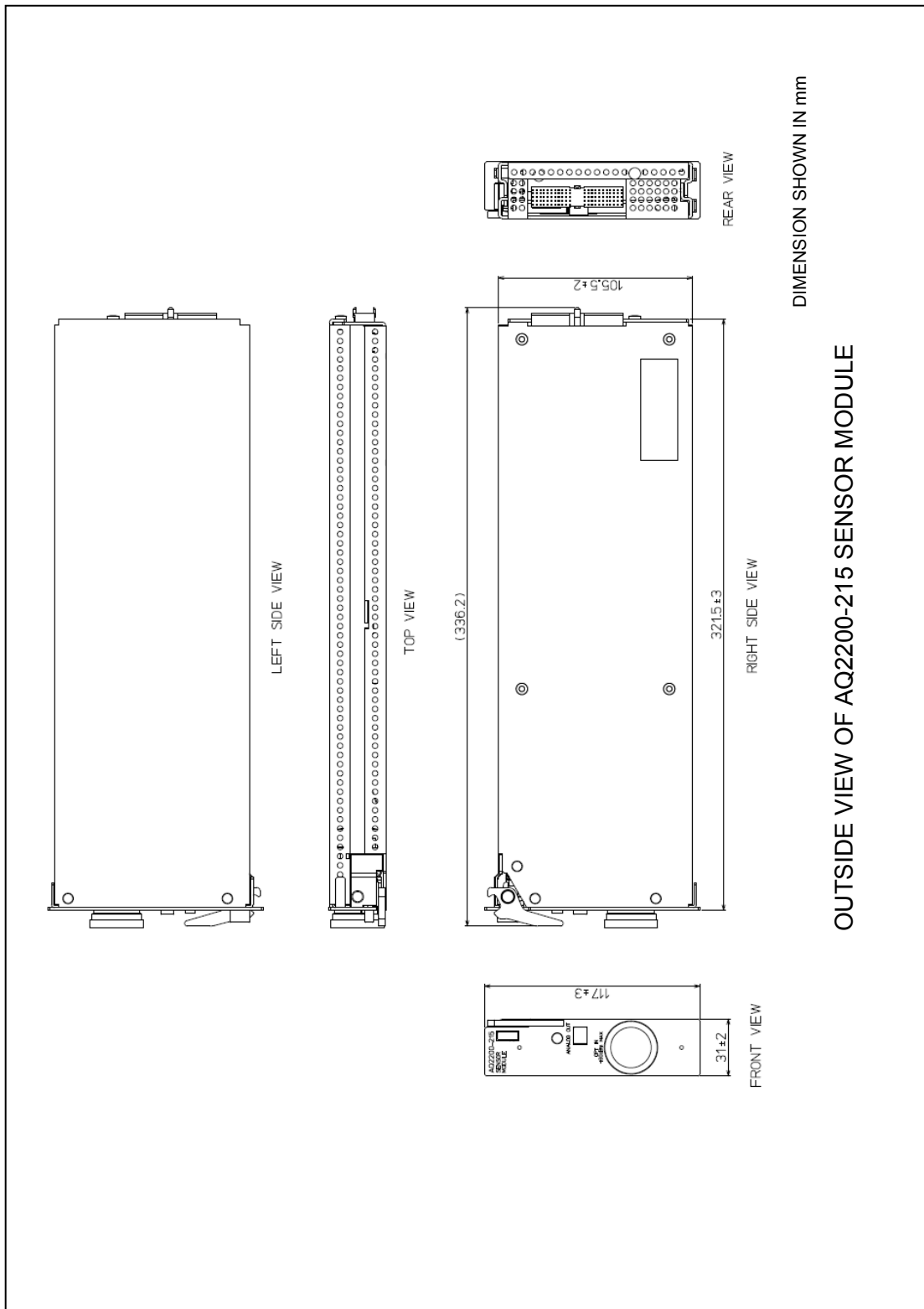
### 11.6.6 AQ2200-201 Interface Module



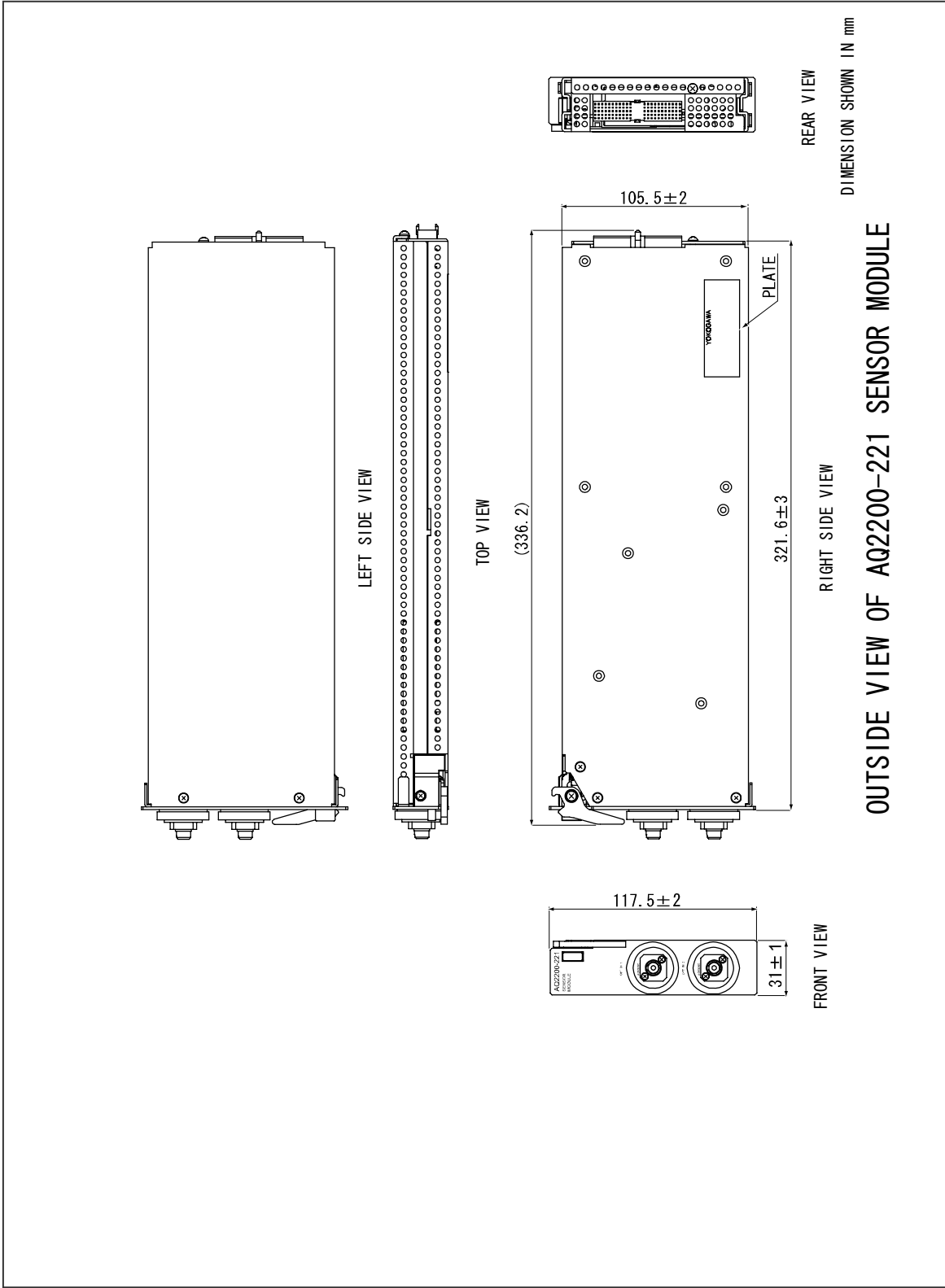
11.6.7 AQ2200-211 Sensor Module



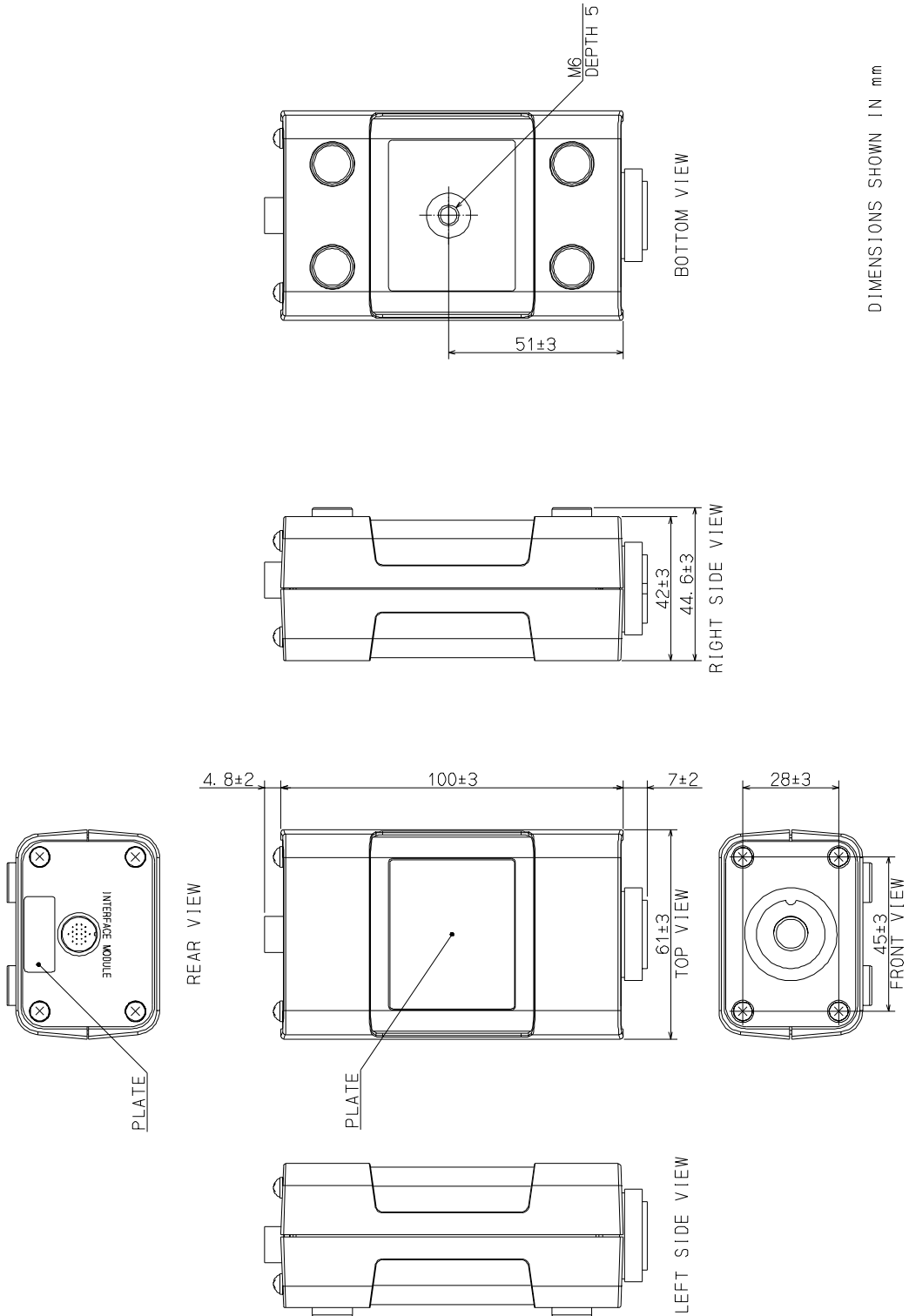
### 11.6.8 AQ2200-215 Sensor Module



11.6.9 AQ2200-221 Sensor Module

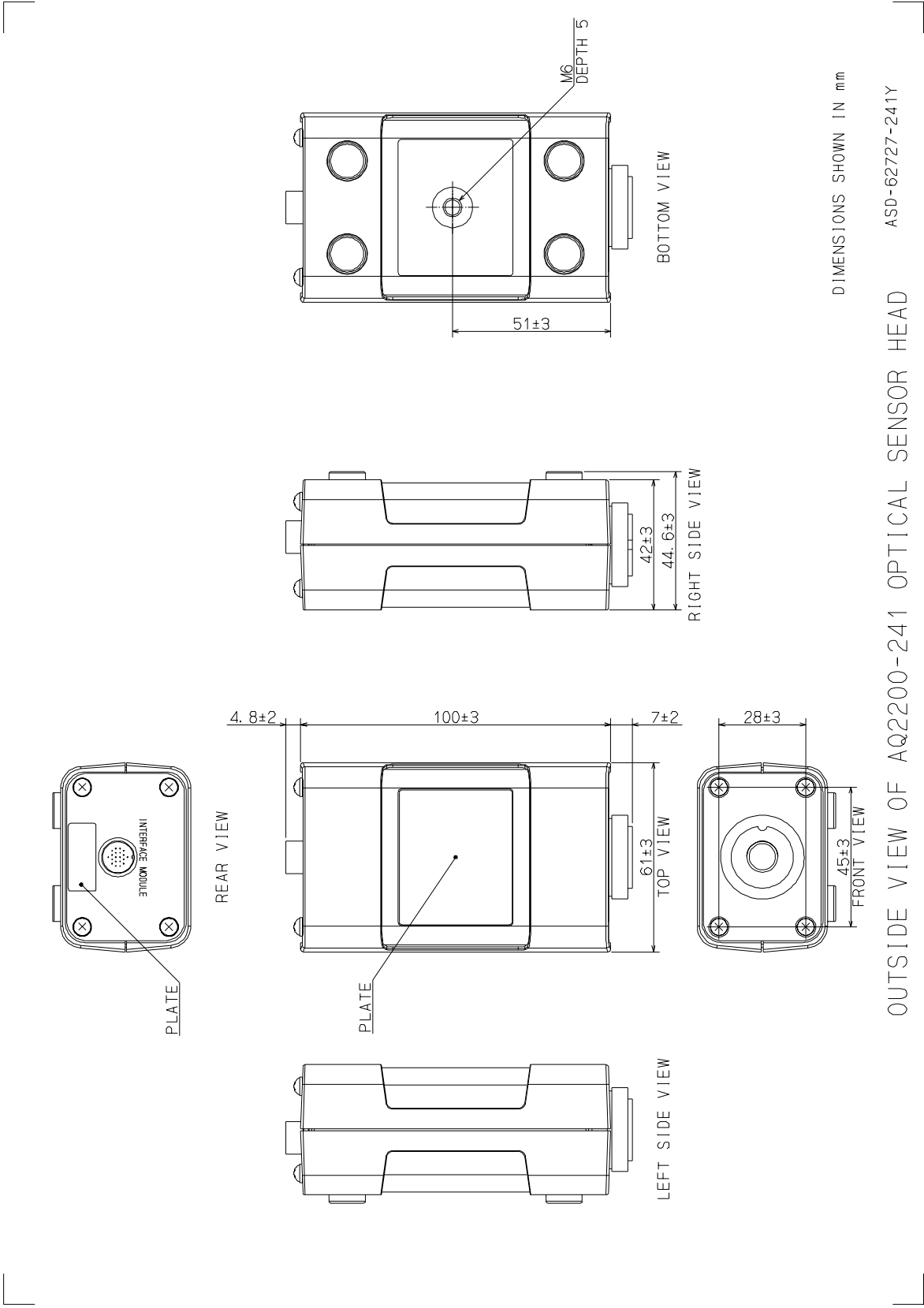


### 11.6.10 AQ2200-231 Optical Sensor Head

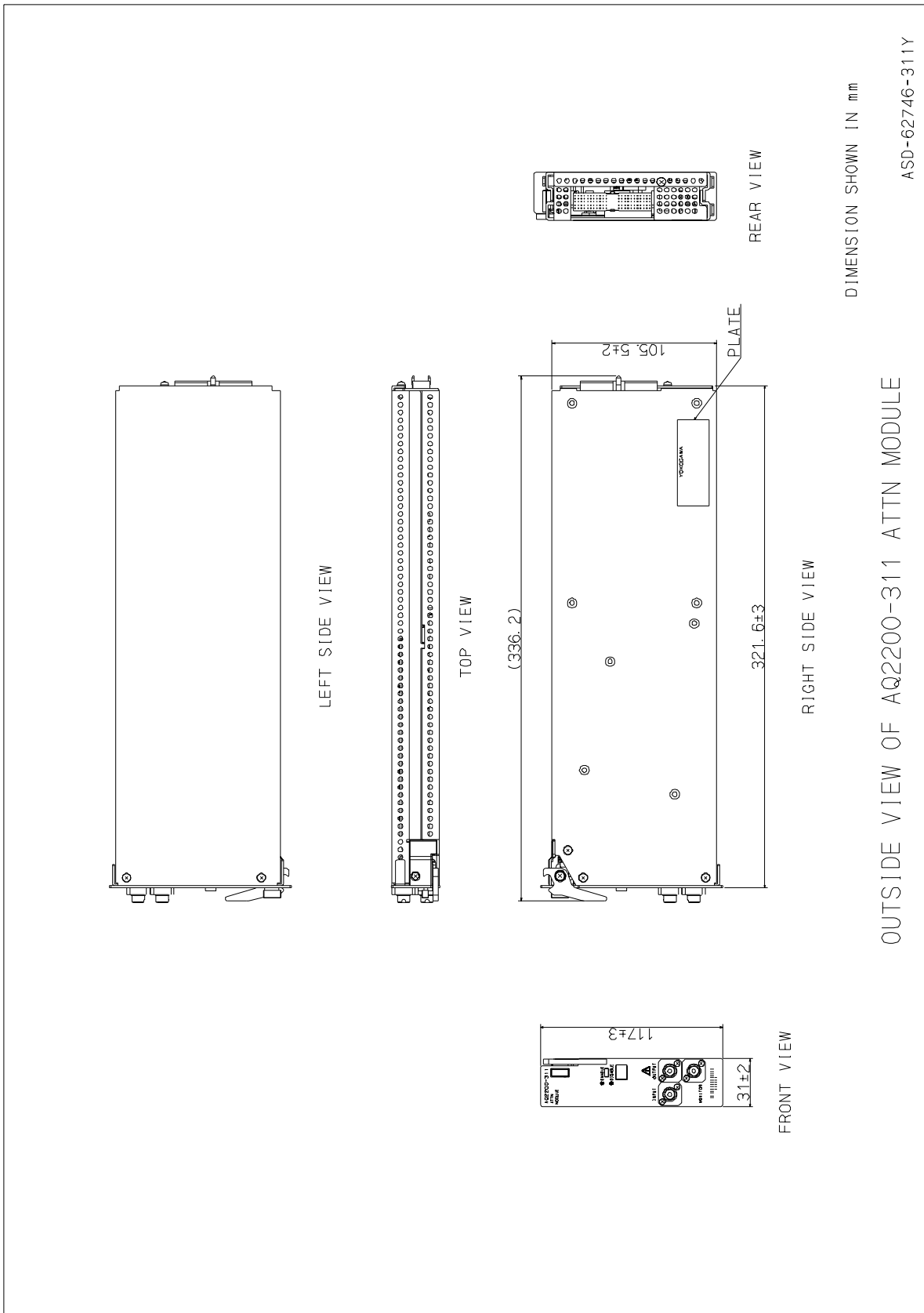


OUTSIDE VIEW OF AQ2200-231 OPTICAL SENSOR HEAD ASD-62727-231Y

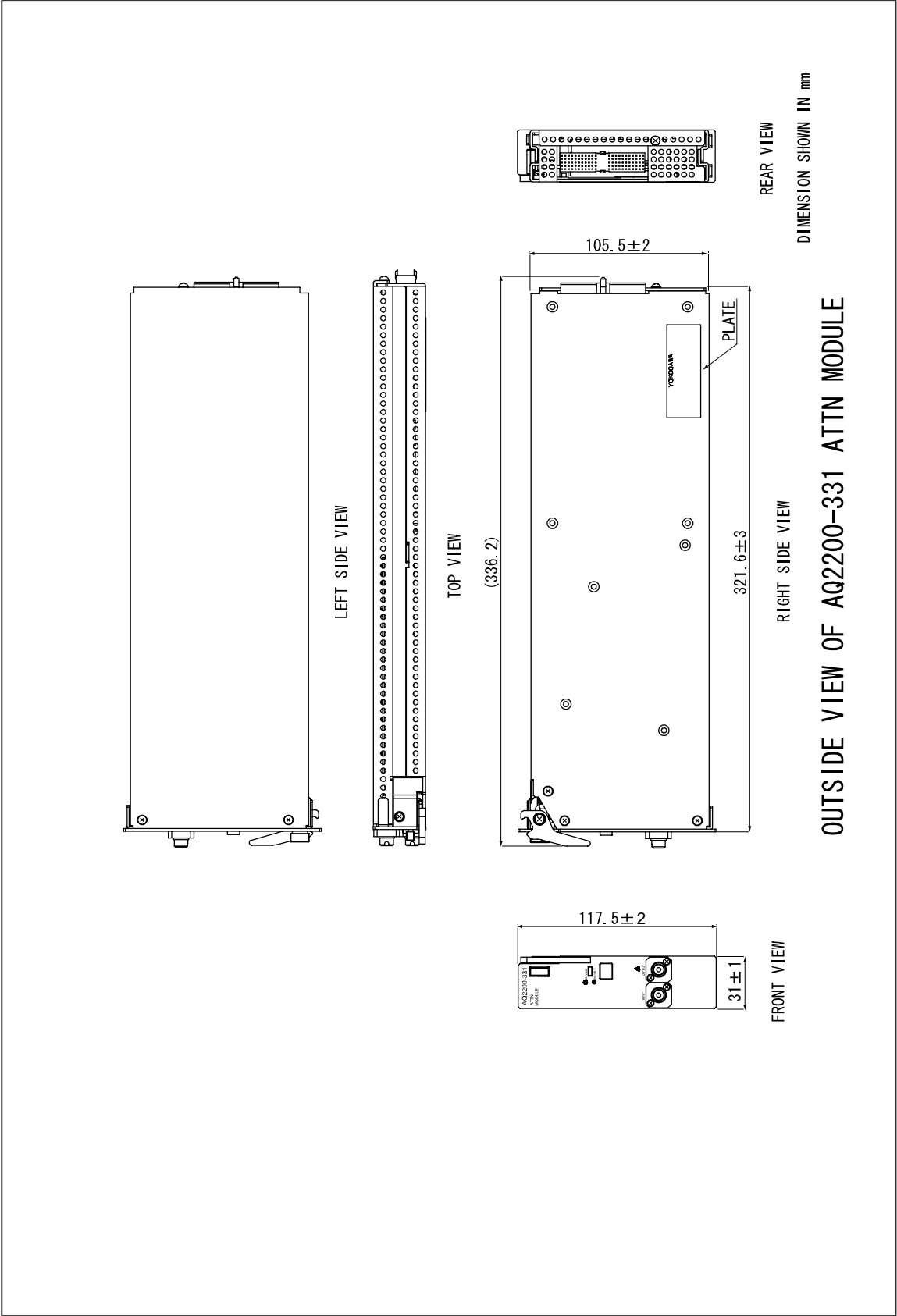
### 11.6.11 AQ2200-241 Optical Sensor Head



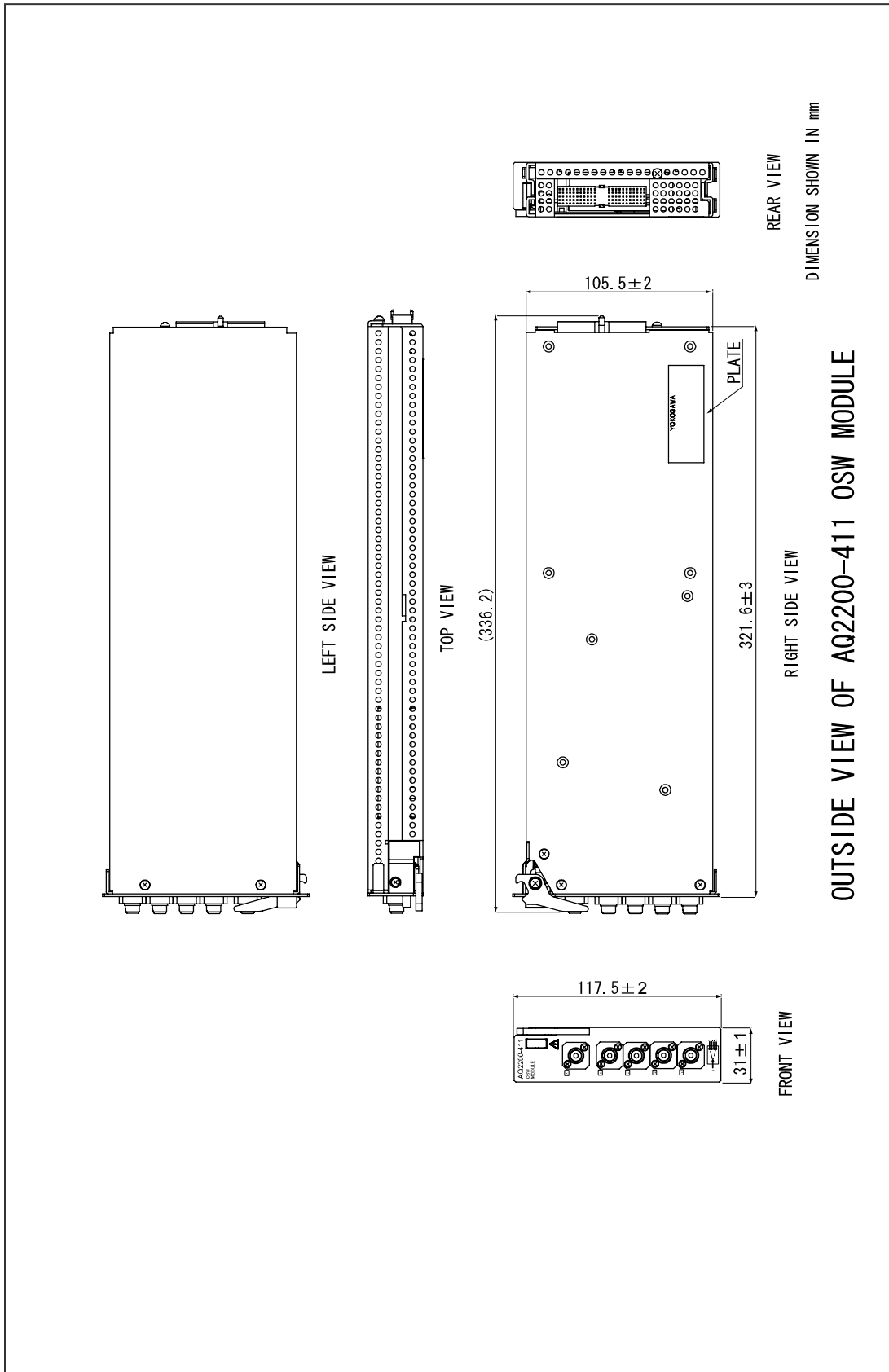
### 11.6.12 AQ2200-311 ATTN Module



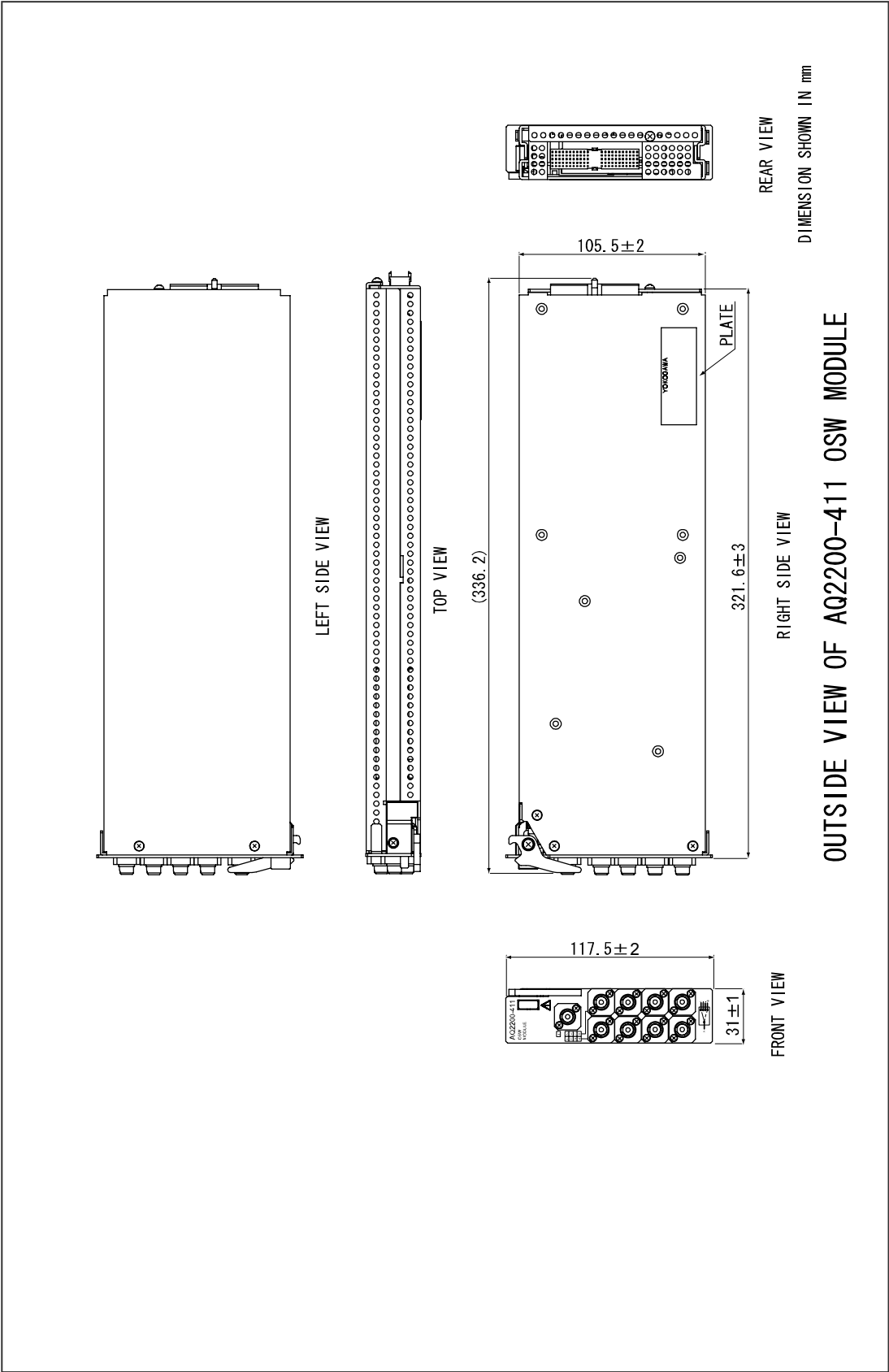
11.6.13 AQ2200-331 ATTN Module



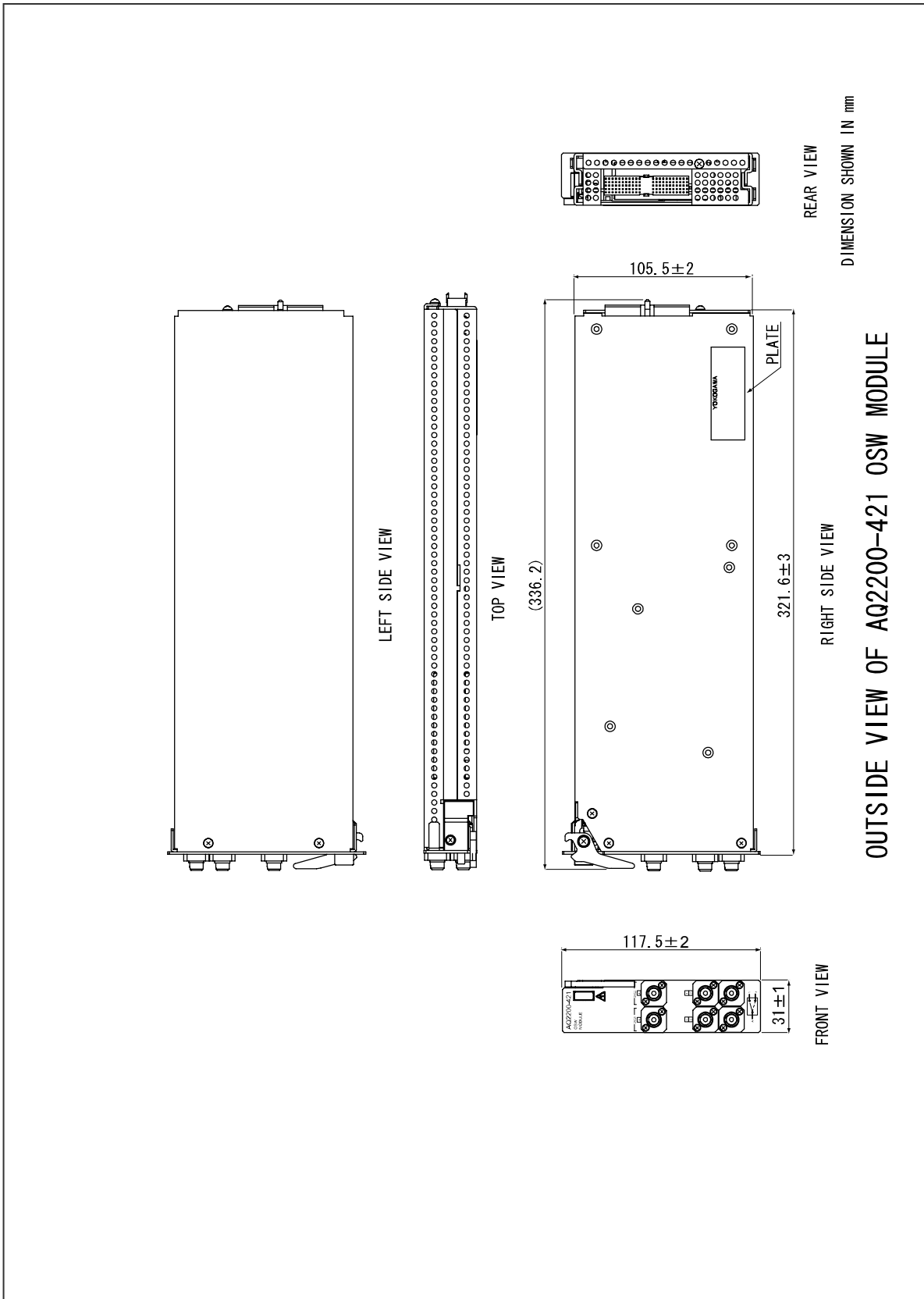
11.6.14 AQ2200-411 OSW Module



11.6.15 AQ2200-411 OSW Module



11.6.16 AQ2200-421 OSW Module



11.6.17 AQ2200-421 OSW Module

