User's Manual

Model 810518904
AQ2200-136 TLS Module

YOKOGAWA
Yokogawa Electric Corporation

IM 810518904-01E
1st Edition

Introduction

Thank you for your purchasing of this AQ2200-136 TLS Module.

This AQ2200-136 TLS Module (hereafter referred to as this unit) is launched as a variable change wavelength light source for the AQ2200 Multi-application System.

This user's manual describes how to handle and operate this unit. Before starting operation, always thoroughly read this manual to fully understand its contents. After reading this manual, store it in a safe place where all concerned personnel can refer to it immediately during operation.

Two kinds of manuals including this manual shown below are provided for this module. Therefore, you must thoroughly read both the manuals before starting the measurement.

Manual Item	Manual No.	Description
AQ2200-136 TLS Module User's Manual	IM810518904-01E	This user's manual. This manual describes functions of the TLS module and proper operating procedures (except for application functions).
AQ2200-136 TLS Module Optical Passive Device Measurement and Analysis User's Manual	IM810518904-03E	This manual describes how to operate application functions.

— Notes —

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from the actual screen.
- Every effort has been made in the preparation of this manual to ensure 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® is a registered trademark of Linus Torvalds.

Revisions

- 1st Edition: October 2004

Conventions Used in This Manual

- Pictorial Symbols for Safe Use

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

WARNING

Describes precautions that should be observed to prevent serious injury or death to the user.

CAUTION

Describes precautions that should be observed to prevent minor or moderate injury, or damage to the instrument.

The picture in the symbol ○ indicates the action not allowed to take.
The example on the left shows that the disassembly work is absolutely prohibited.

The picture in the symbol ● indicates the action you have to take.

- Other Pictorial Symbols

Note Provides important information for the proper operation of the instrument.

In the operation description, the character strings showing the operation part names or those displayed on the screens are formatted as described below.

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

WARNING

	If the control or adjustment is performed in incorrect manner not specified in this manual, you may be exposed to the hazardous laser beam.
	This unit complies with "Class 1M laser product" defined in "IEC60825-1 , 2001". 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. 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. 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.
	If the inside of the laser product is disassembled or modified, the high power laser beam may be output. Therefore, never attempt to disassemble or modify the inside of the laser product by the customer. If any repair is required, contact your local sales dealer or YOKOGAWA's sales branch office.
	Always pay special attention so that the water does not enter this unit or the unit does not get wet. Failure to do so may cause a fire, an electric shock, or a malfunction.
	Do not insert or drop a metallic rod into the inside of this unit through the opening. Doing so may cause a fire, an electric shock, or an accident.
	Even if this unit is faulty or defective, do not attempt to repair it by the customer. 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.
	When disposing of this unit, do not attempt to throw it into the fire. Doing so may cause the unit to explode, resulting in fire, personal injury, or burn hazard.
	The light receiving element used in this product contains indium gallium arsenide (InGaAs). Particles and vapors of InGaAs are very dangerous. The product must therefore never be burnt, destroyed, cut, crushed or chemically disassembled. It must be separated from general industrial waste and household rubbish, and disposed of according to local regulations.

CAUTION

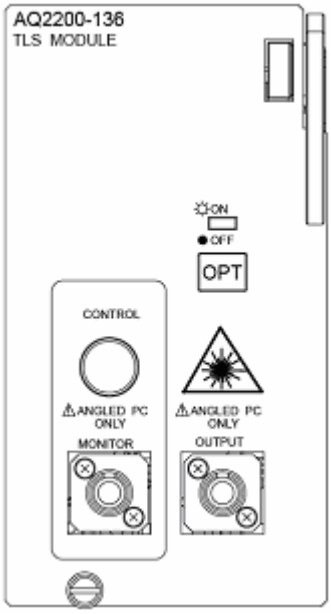
	Do not put this unit in a place where the humidity is high or a large amount of dust exists. Doing so may cause an electric shock or a malfunction.
	Do not put this unit in a place where it is exposed to the direct sunlight or the temperature is high, such as the inside of the car under the burning sun. Doing so may cause the temperature inside this unit to increase, causing the unit to malfunction.
	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.

Product Versions Covered by This Manual

This manual is applicable to the firmware version “1.00” or later of the AQ2200-136 TLS Module.

Checking the Contents of the Package and Performing the Mechanical Inspection

AQ2200-136 TLS Module



MODEL	SUFFIX		Specifications
810518904			Main body
Optical connector	-FCA		FC/Angle PC connector. Made by Seiko Giken. Angled PC or its equivalent (step-type)
Fiber	-SMF		Single-mode fiber
Wavelength		-WLSTD	Wavelength: 1440 to 1640nm

Standard Accessories

Wavelength Meter control cable and dust-proof caps (large and small)

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

Additionally, make sure that all accessories are included.

Note

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

Functional Inspection

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

If any damage or 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 office.

How to Use This Manual

Structure of This Manual

Chapter	Title	Contents
1	Safety Precautions	This chapter describes safety precautions, handling of laser product, and calibration of laser output wavelength.
2	Mounting the Module on the Main Unit	This chapter describes the names and functions of the module, as well as how to mount the module.
3	Overview of General Operation	This chapter describes the basic operation and how to measure the performance of each characteristic (wavelength dependent loss characteristics, configuration of wide-band high wavelength accuracy light source, and wavelength transmission characteristics) with this module combined with peripheral units.
4	Functional Description	This chapter describes the general functions of this unit and shows the illustrations of the functional overview to explain the functionality. This chapter does not describe the operating procedures. However, when reading this chapter before starting each operation, the contents of operation can be understood easily.
5	Calibrating the Wavelength	This chapter describes how to make the settings for the laser output ON/OFF and the wavelength calibration.
6	Setting the Wavelength	This chapter describes how to set the wavelength value.
7	Setting the Line Width	This chapter describes how to set the line width of the laser output.
8	Setting the Power	This chapter describes how to set the laser power manually or automatically.
9	Setting the Sweep	This chapter describes how to set the wavelength values for the sweep start, sweep end, and seep step.
10	Starting the Sweep	This chapter describes how to operate this unit in the manual, step, continuous, and trigger sweep modes.
11	Setting the Trigger Output	This chapter describes how to specify the trigger output timing.
12	Setting the Wavelength Convergence	This chapter describes how to operate this unit with it combined with the AQ6140/6141 Wavelength Meter.
13	Other Operations	This chapter describes how to change the display unit.
14	Remote Control	This chapter describes the meanings and input formats of the commands.
15	Maintenance	This chapter describes cautions about operation, storage, and transportation, as well as how to clean this unit.
16	Specifications	This chapter describes leading particulars and accessories.

Contents

1.1 Safety Precautions

WARNING

General Cautions about Safe Operation

Never attempt to disassemble or modify this unit.

Even though this unit malfunctions, never attempt to disassemble or modify it by the customer. Failure to do so may cause a fire, an electric shock, or an accident. If any repair is required, contact your local sales dealer or YOKOGAWA's sales branch office.

If any trouble is found:

If any trouble, such as smoke or unusual odor is found, immediately turn OFF the POWER switch on the main body and contact your local sales dealer or YOKOGAWA's sales branch office. Additionally, if any foreign object enters the inside of this unit, immediately take the same actions as described above.

CAUTION

General Cautions about Handling

Do not apply any excessive shock.

If any excessive shock is applied to this unit, the adjustment part of the internal mechanism may deviate, causing an error to occur in the output wavelength.

Do not install or store this unit in an environment beyond the specified installation and storage environmental conditions.

If this unit is placed under environmental conditions other than those specified, the adjustment part of the internal mechanism may deviate, causing an error to occur in the output wavelength.

Do not put this unit close to a device emitting strong radio wave and/or magnetic field.

Do not touch any metallic terminal of the module connector by hand.

Doing so may cause contamination or dust sticking. Such contamination or dust may adversely affect the electric signals, causing the unit to malfunction.

Cautions about Handling of Optical Interface

Always strictly observe the following cautions during daily work in order to protect the optical interface.

- To prevent dust from sticking, do not leave the unit with the dust-proof cap of the optical connector or optical interface kept removed.
- Take appropriate measures so that any connector end face is not contaminated or damaged or that any optical interface part is not in contact with any object (except for during adjustment or cleaning).
- When connecting the optical connector, always insert it straight so that the connector end face is not in contact with any connection adaptor, surrounding panel, or component.

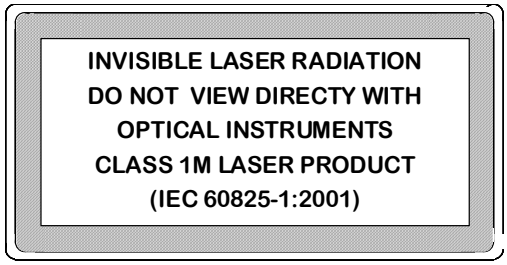
Cautions about Safe Operation of Laser Product

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

	AQ2200-136
Laser type	EC-Laser (Note 1)
Laser class	1M
IEC 60825-1:2001	
21CFR 1040.10 (*1)	
Maximum output power (*2)	50.2mW
Diameter of mode field	9μm
Number of openings (NA)	0.1
Wavelength	1440.000 to 1640.000nm

Laser Class 1M Label

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.



(Note 1) "EC-Laser" is an abbreviation of "External Cavity Laser".

Note

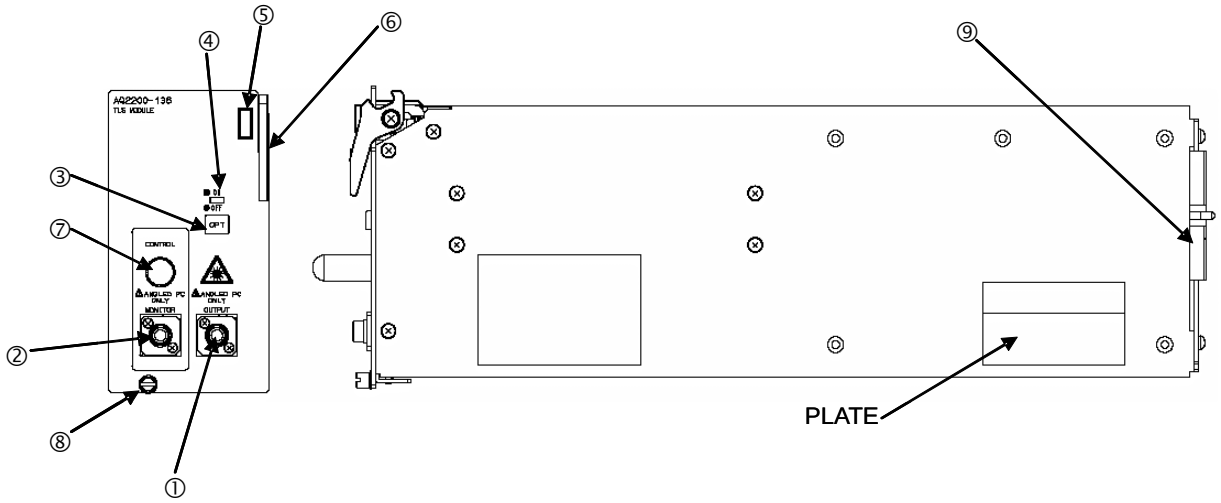
(*1) This specification complies with "21CFR1040.10" except for deviation points arising from strict observation of "Laser Notice No.50" issued on May 27, 2001.

(*2) This value is obtained under single-failure conditions.

Calibration of Output Wavelength

Before operating this unit, always calibrate the output wavelength. When the laser output of this unit is turned OFF, the wavelength calibration becomes invalid. Therefore, always calibrate the wavelength when turning ON the laser output again.

2.1 Part Names and Functions

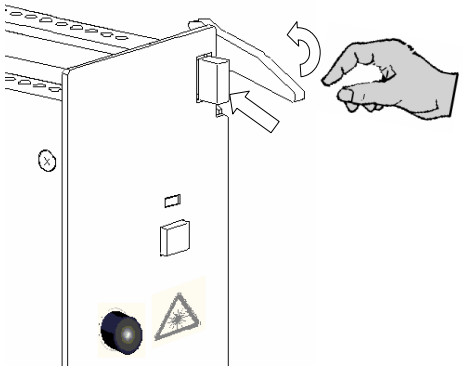


Outside View of Front Panel and Side Panel

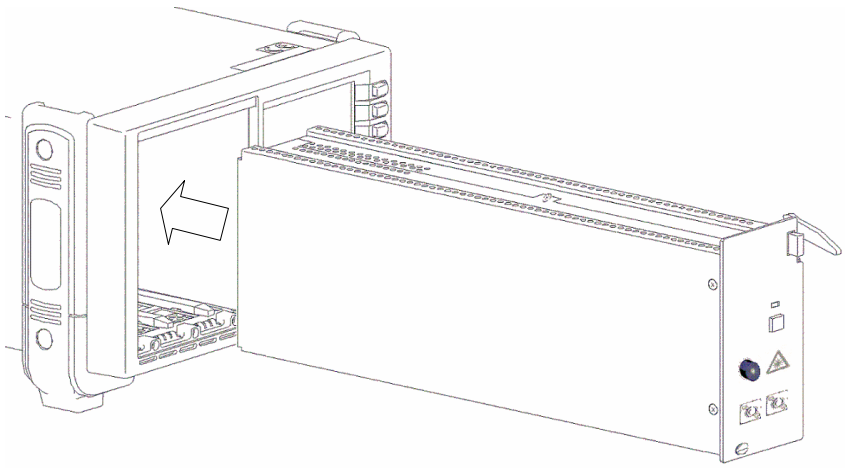
No.	Name	Function
1	OUTPUT	Laser beam is output.
2	MONITOR	Laser beam is emitted for the settling wavelength function of the Wavelength Meter.
3	OPT ON/OFF key	Laser output is switched between ON and OFF.
4	Laser output indication LED	This LED is lit when the laser output is turned ON.
5	Button	This button is used to lock the lever.
6	Lever	This lever is used to mount or unmount the module.
7	CONTROL connector	This connector is used for remote control of the Wavelength Meter for the settling wavelength function.
8	Screw	This screw is used to fix the module.
9	Connector	This connector is used to connect the electric signals between the frame and module.

2.2 Mounting the Module

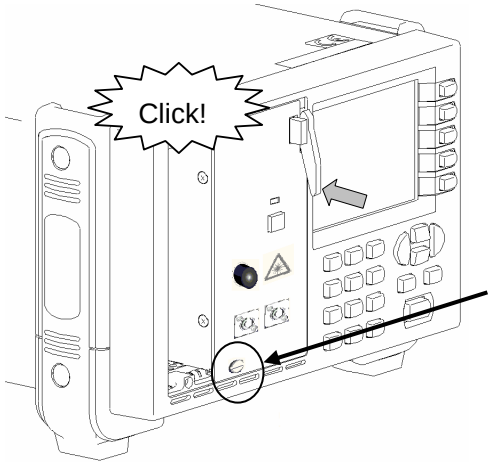
[Step 1] Pull up the lever with the button on the module panel kept pressed.



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

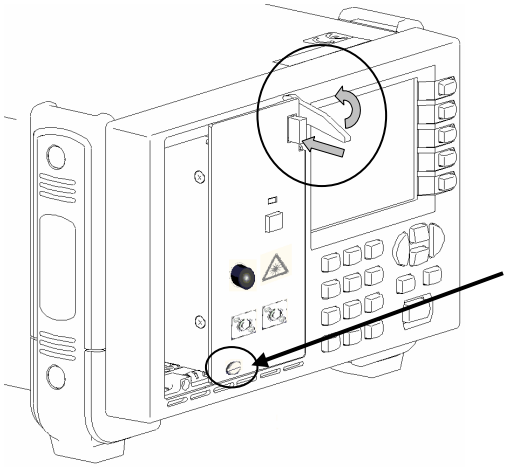


[Step 3] When the module is inserted and it is in contact with the far side, gradually push the lever with strong force until the button clicks.



[Step 4] After the module has been mounted by pushing the lever, tighten the fixing screw firmly.

2.3 Removing the Module

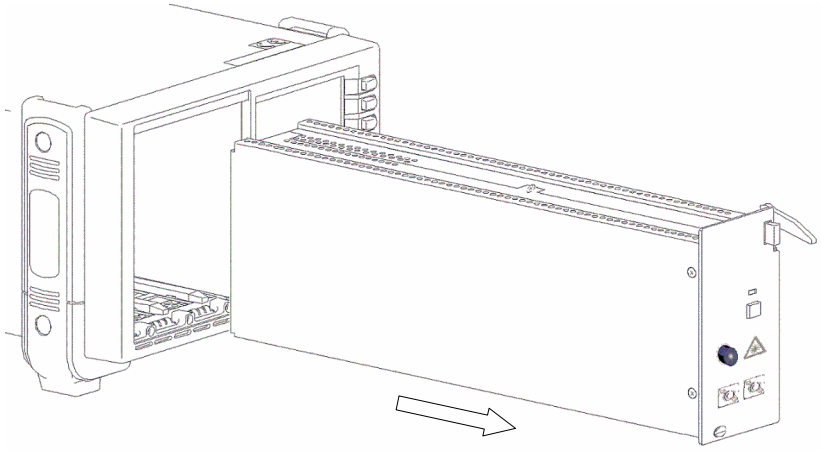


[Step 2] Lightly push up the lever with the button kept pressed until the lever is unlocked.

[Step 1] Loosen the fixing screw. Note that the fixing screw cannot be removed from the module completely to prevent the module from falling down.

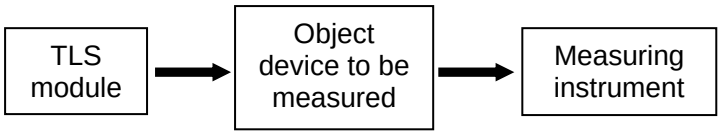
Gradually pull up the lever until the module is projected approximately 1cm from the frame.

[Step 3] Gradually pull out the module from the slot of the frame in a horizontal direction.



3.1 Basic Operation

This unit is a wide band wavelength variable change light source plug-in module for the AQ2200 Multi-application System. The width of the unit is two slots to ensure the compact design. The unit can sweep a wavelength ranging from 1440 to 1640nm only with one light source.

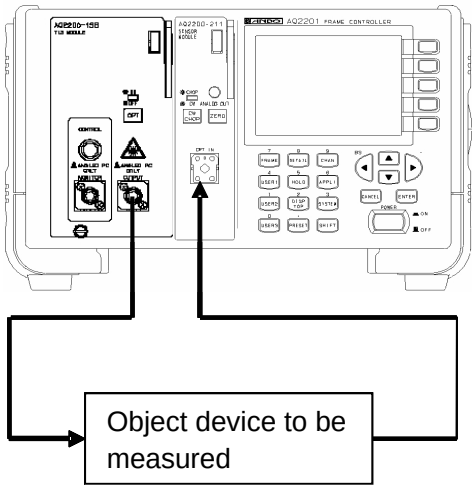


Measurement of Wavelength Transmission Characteristics

3.2 Examples of Applications with TLS Module Combined with Peripheral Units

- Measurement of Wavelength Dependent Loss

TLS module + OPM module



You can configure a Swept Wavelength system with the TLS module and optical power meter module (OPM). With this system, the wavelength dependent characteristics can be measured by high-speed sweep. Object devices to be measured are single-port and multi-port devices of the passive components.

- Configuration of Wide-band High Wavelength Accuracy Light Source

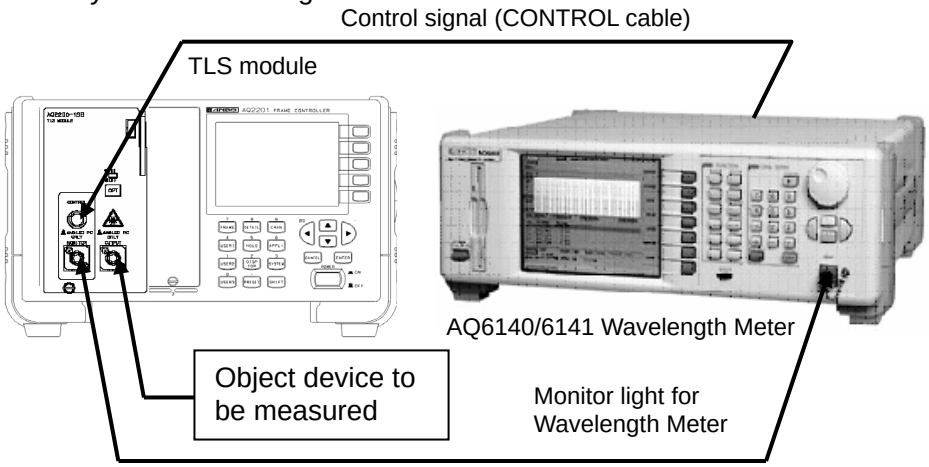
The wavelength convergence function can be used based on the AQ6140/6141 Wavelength Meter.

Each wavelength convergence function

AQ6140 is used. : ±10pm

AQ6141 is used. : ±3pm

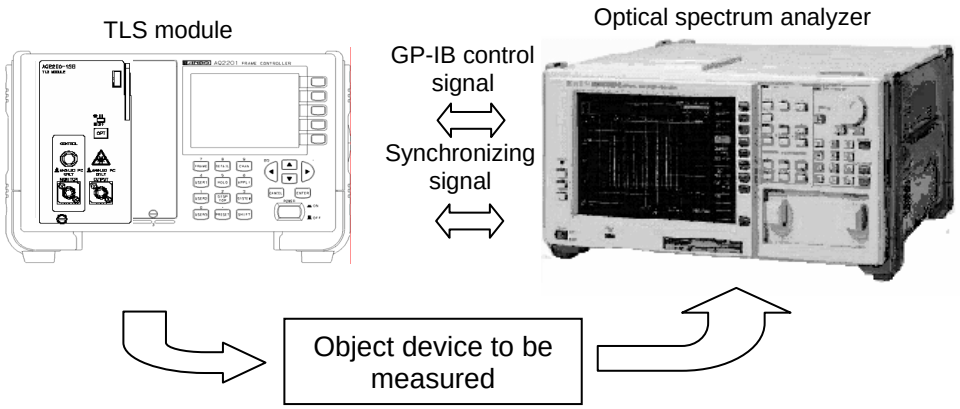
* The wavelength accuracy may depend on the wavelength accuracy of the Wavelength Meter. Since each the Wavelength Meter has a specific wavelength accuracy, that is, AQ6140 ±3pm (at 1550nm) and AQ6141 ±1pm (at 1550nm), the wavelength accuracy of this system becomes the sum of the wavelength set by the wavelength convergence function and the wavelength accuracy of the Wavelength Meter.



You can configure a high wavelength accuracy light source only with the AQ6140/6141 Wavelength Meter and without use of personal computer control and/or external coupler.

● Wavelength Transmission Characteristics

By combining the TLS module with the AQ6317B/C Optical Spectrum Analyzer (OSA), the synchronous sweep measurement can be performed. This makes it possible to measure the high dynamic range, such as narrow bandwidth BEF (Band-Elimination-Filter).



You can configure a synchronous sweep system consisting of TLS module and optical spectrum analyzer with AQ6317B/C and without use of personal control.

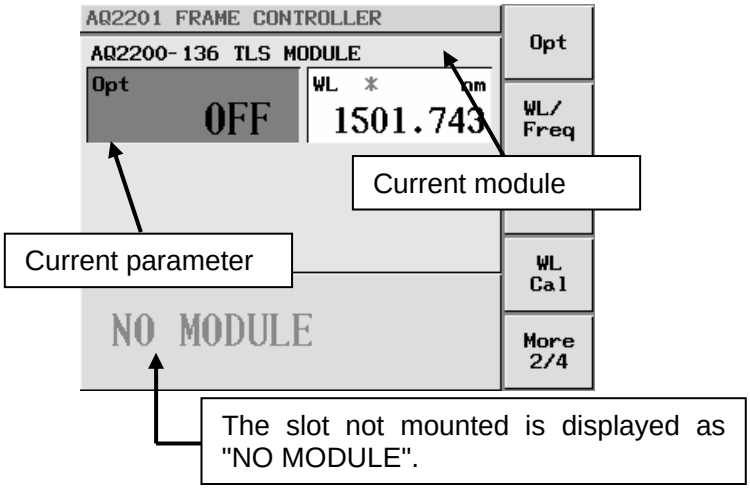
Note

When performing the synchronous sweep with the OSA, the wavelength range becomes 1440 to 1640nm.

4.1 Display Screen Part Names

● SUMMERY Screen

On the SUMMARY screen, the information on all mounted modules is displayed at once.



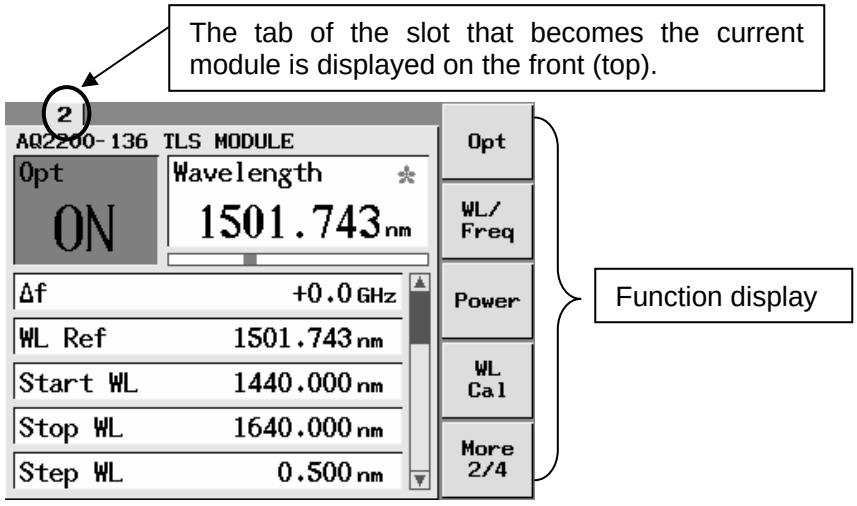
■ Current module: Module with blue background. This module allows changing of the parameters. The changeable parameters are displayed as function keys.

■ Current parameter: Parameter with light blue background

● 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.



- List of Functions (Button Displays)

Display Name	Functional Description	Screen Page
Opt	Turns ON or OFF the optical output.	More1/4
WL/Freq	Sets the wavelength value.	
Power	Sets the power value.	
Wl Cal	Calibrates the wavelength.	
SweepStart	Starts the sweep.	More2/4
SweepStop	Stops the sweep.	
SweepCond	Sets various sweep conditions.	
SweepMode	Sets the sweep method (manual, step, continuous).	
LineWidth	Sets the line width of the optical output.	More3/4
△f	Sets the frequency to the reference wavelength.	
WL→WL0	Registers the current wavelength as reference wavelength.	
Trig	Sets trigger conditions.	
WLMC Settle	Sets the execution of the wavelength convergence function.	More4/4
OSA Sync	Sets the synchronous sweep with the optical spectrum analyzer.	
Unit	Changes the display unit.	
Menu	Shows the information.	

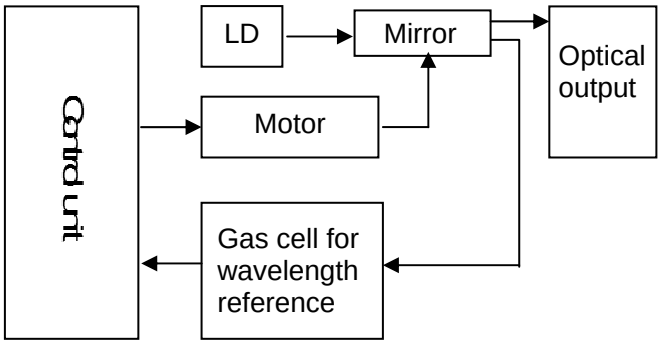
- List of Function Settings

Display Name	Functional Description
△f	Sets the value to the reference wavelength WL0 and displays it.
WL Ref	Sets the wavelength value in “Wavelength” to Ref (WL0) and displays it.
Start WL	Sets and displays the value of the sweep start wavelength.
Stop WL	Sets and displays the value of the sweep end wavelength.
Step WL	Sets and displays the value of the sweep step wavelength.
Power	Sets and displays the value of the Power.
Sweep Cycles	Sets and displays the number of sweep cycles.
Sweep Interval	Sets and displays the sweep interval.
Dwell Time	Sets and displays the dwell time of the set wavelength.
Sweep Mode	Sets and displays the sweep mode (manual, step, continuous).
Sweep Speed	Sets and displays the sweep speed.
Linewidth	Sets and displays the line width of the optical output.
Input Trig	Sets and displays the trigger input conditions.
Output Trig	Sets and displays the trigger output conditions.
WLMC Settle	Sets and displays the settling wavelength function.
OSA Sync	Sets the synchronous sweep with the OSA.

4.2 Calibrating the Output Wavelength

● Block Diagram

This unit calibrates the wavelength using the built-in gas cell.



● Warming Up

The major leading particulars of this unit are specified in the status that the wavelength calibration is executed with the inside temperature of the unit kept stable. It is required to perform the warm-up operation for 1 hr. or longer until the temperature becomes stable from OPT-ON after the power has been turned ON under reference operation conditions (ambient temperature: 23±2°C). Therefore, you must wait until the warm-up operation is completed.

Note

When operating the unit before completion of warming up, variations in wavelength and/or power may occur. Additionally, when restarting the operation immediately once the power has been turned OFF, it is not necessary to warm up the unit for 1 hr. or longer. However, how the temperature inside the unit lowers may vary depending on the ambient temperature conditions. Therefore, the warm-up time for such operation is not specified.

4.3 Setting the Laser Output

- Setting the Wavelength

  To measure the object device to be measured, the wavelength can be set in the following range.

  - Range: 1440.000 to 1640.000nm

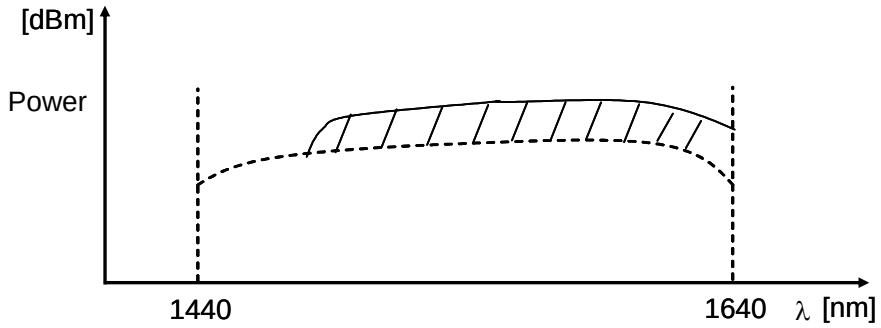
- Setting the Line Width

  If the interference between the measurement system and object device to be measured may adversely affect the unit when starting the measurement, the output line width can be controlled by modulating the output light to relax the effects of the interference.

  - Wide: By modulating “Narrow”, the light having low coherency is output.
  - Narrow: Light having high coherency is output.

● Setting the Power

The following shows the Power of this unit and the adjustable range.



Solid line:	Maximum power of each wavelength
Shading range:	The Power variable change range of each wavelength
Dashed line:	Minimum power of each wavelength

■ Setting a desired power (manual)

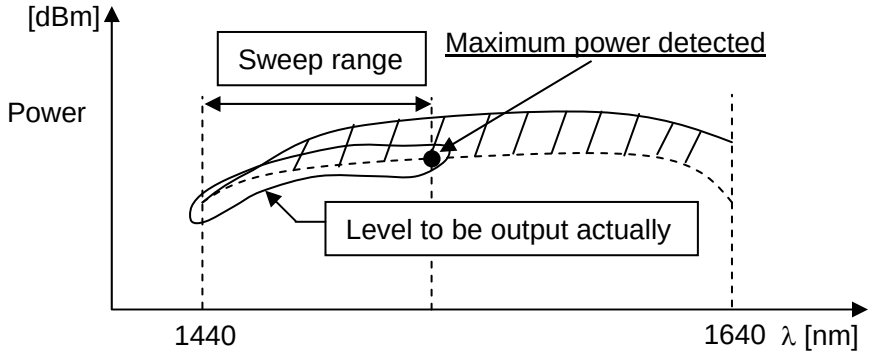
In the shading range shown above, the power of each wavelength can be set in steps of 0.1dB. This power is different from that set for each TLS module. Additionally, this power becomes the fixed output close to a range of 1440 to 1480nm, which cannot be changed variably, according to the type of the module.

■ Auto detection function of maximum power at a desired wavelength (Max)

This function automatically detects the maximum power value of each wavelength shown by the solid line in the Fig. above.

■ Auto detection function of power during sweep (Sweep Max)

In the detection of the power during sweep, the power of each wavelength is lowered so that it is close to the wavelength having the lowest power in the wavelength range to be swept. This detection function is intended to make the power as constant as possible within the sweep wavelength range since this unit has the output characteristics shown in the Fig. above.



4.4 Sweep Function

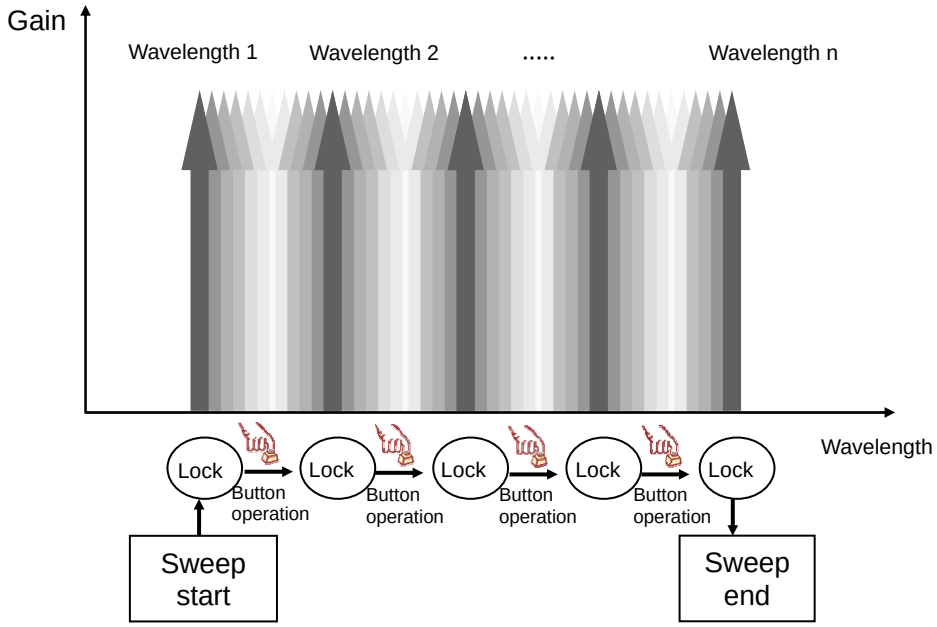
This sweep function variably changes the wavelength within the specified wavelength range according to the set conditions. This function is used to measure the characteristics when each wavelength transmits through the object device to be measured, such as wavelength transmission characteristics and/or wavelength dependent loss characteristics.

An optimal sweep method can be selected from four sweep methods according to the measurement method.

- ■ Manual sweep: The sweep is stopped temporarily at every specified wavelength step in the step sweep.
- ■ Step sweep: The wavelength is changed variably while waiting for a specified period of time at every specified wavelength step.
- ■ Continuous sweep: The wavelength is changed variably in the wavelength range.
- ■ Trigger sweep: This trigger sweep is used to perform the measurement with the sweep while synchronizing with the external measuring instrument using the hardware trigger signal.

● Manual Sweep

After the sweep has been started, the wavelength is moved to the next wavelength within the set wavelength range (wavelength 1 to wavelength n) by operating the button. Only one sweep sequence is performed. Therefore, the sweep is completed when the measurement is performed until the set end wavelength (wavelength “n”).

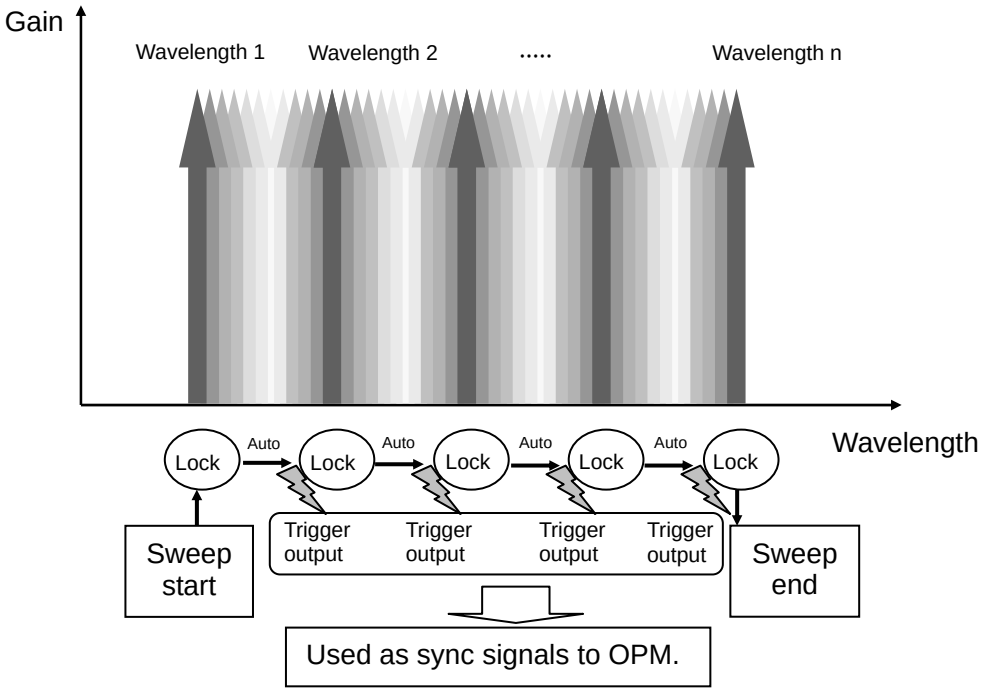


Images of Manual Sweep

● Step Sweep

After the sweep has been started, the wavelength is moved to the next wavelength at intervals of set wavelengths within the set wavelength range (wavelength 1 to wavelength n). Only one sweep sequence is performed. Therefore, the sweep is completed when the output is performed until the set end wavelength.

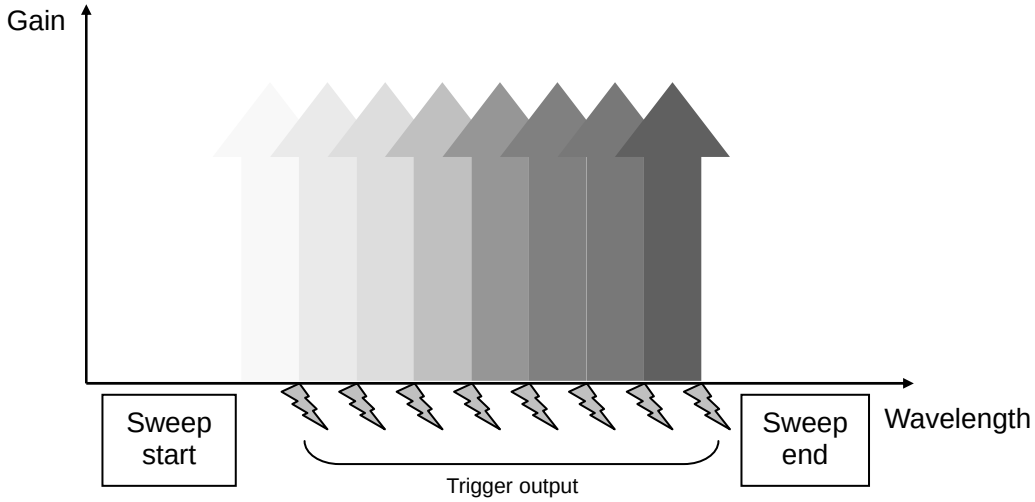
When using other company's OPM, the trigger output operation described in section 11.2 is set to "Step Finished" that outputs the trigger at the end of the step sweep in order to make the synchronization.



Images of Step Sweep

● Continuous Sweep

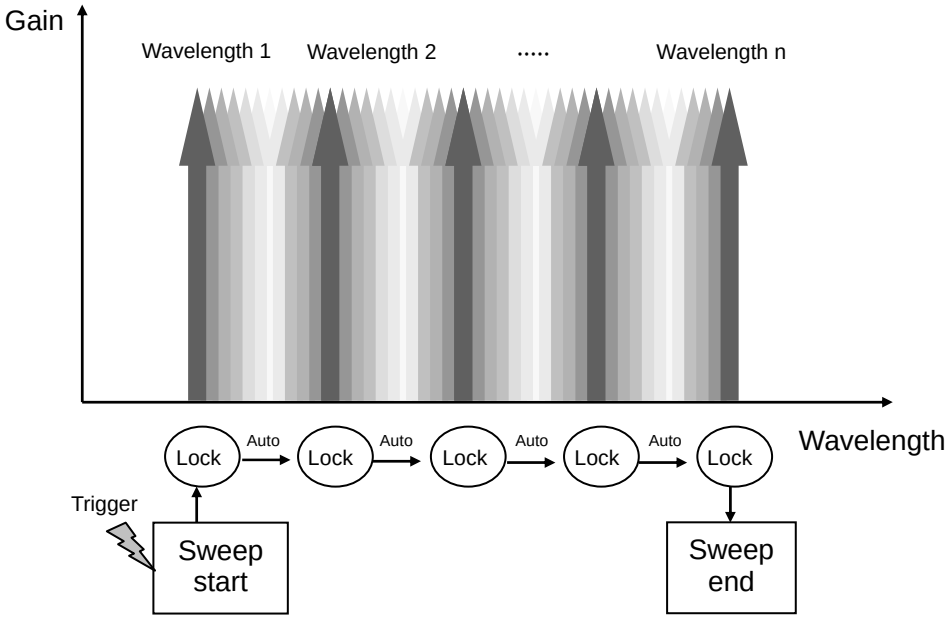
After the sweep has been started, the wavelength is moved to the next wavelength at intervals of set wavelengths within the set wavelength range. In the continuous sweep, the wavelength is not locked, but the trigger is output at set sweep intervals. The trigger output operation described in section 11.3 is set to "Step Finished" that outputs the trigger at the end of the sweep. The synchronization with externally connected OPM unit can be made.



Images of Continuous Sweep

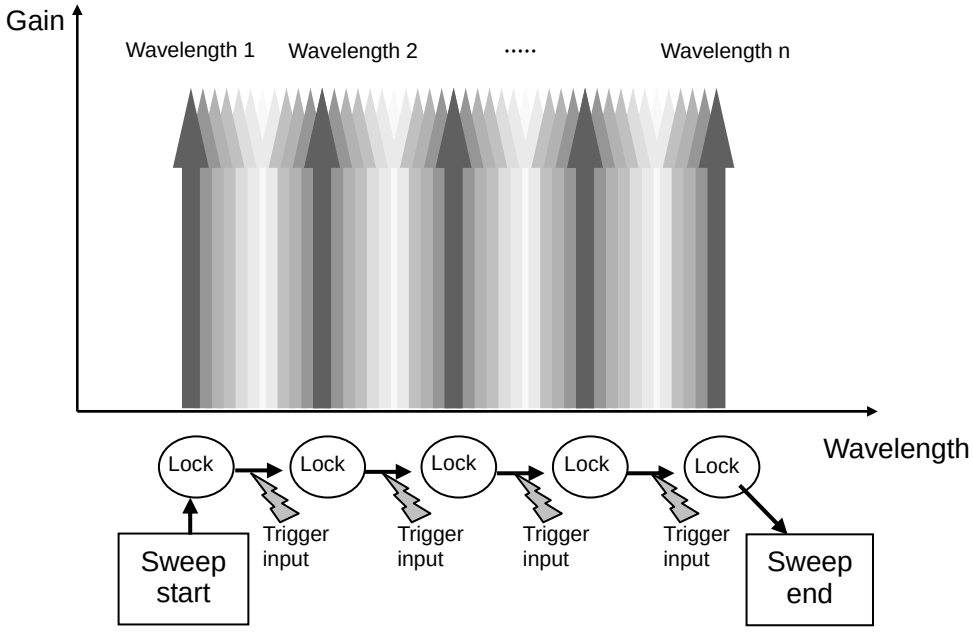
● Trigger Sweep

The sweep is started by the external/internal trigger within the set wavelength range (wavelength 1 to wavelength n). After the sweep has been started, the wavelength is moved to the next wavelength at intervals of set wavelengths. Only one sweep sequence is performed. Therefore, the sweep is completed when the output is performed until the set end wavelength.



Images of Sweep Start by Trigger Input

After the sweep has been started, the operation enters the trigger input wait status within the set wavelength range (wavelength 1 to wavelength n). The wavelength is moved to the next wavelength by the trigger input. Only one sweep sequence is performed. Therefore, the sweep is completed when the output is performed until the set end wavelength.



Images of Step Sweep by Trigger Input

4.5 Other Functions

- Trigger Output

  The trigger can be output every time the sweep conditions, which have been specified beforehand, are executed. Since examples of measurements with unit combinations are described in section 3.2, see also this section.

- Settling Wavelength Function

  When performing the sweep by utilizing the settling wavelength function, it is achieved by connecting YOKOGAWA's Wavelength Meter having high wavelength accuracy (model name: AQ6140/6141) externally. Since examples of measurements with unit combinations are described in section 3.2, see also this section. The wavelength accuracy may depend on that of the externally connected Wavelength Meter.

5.1 Turning ON/OFF the Laser Output

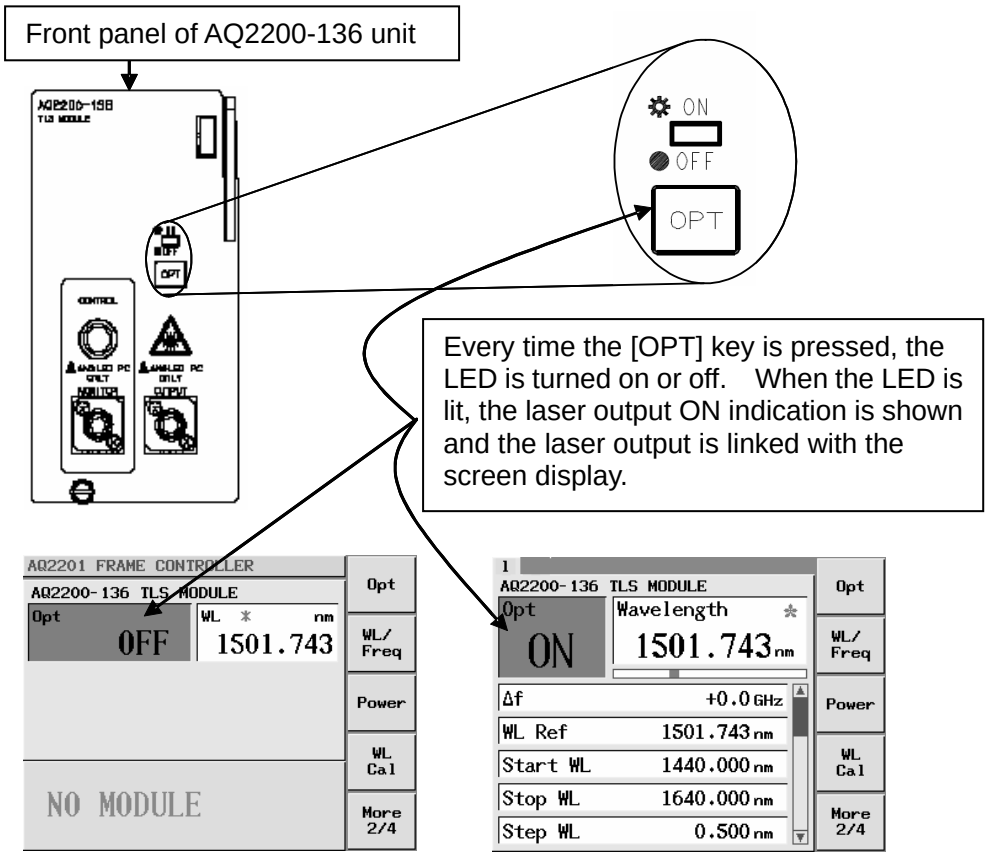
The laser output ON/OFF operation can be performed with the push-button switch on the module main body or through the frame controller screen. Since the default setting is OFF, you must turn ON the laser output before using the laser output. This section describes how to turn ON/OFF the laser output.

- Turning ON/OFF the Laser Output from the Module

Operating Procedures

[Operation 1] To turn ON/OFF the laser output, press the [OPT] key provided on the front of the TLS module to be used.

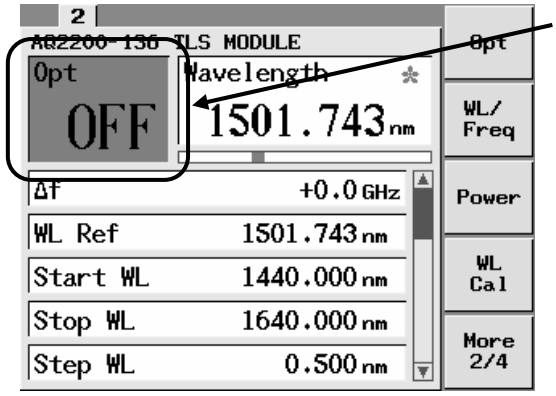
[Operation 2] The LED indication above the [OPT] key shows the laser ON/OFF status. When the laser is turned ON, the LED is lit. On the contrary, when the laser is turned OFF, the LED is off.



● Turning ON/OFF the Laser Output through the Screen

Operating Procedures Operation with the [ENTER] Key and Cursor Key

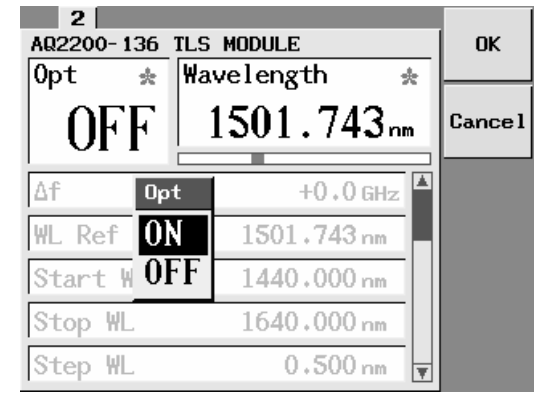
[Operation 1] Select the “Opt” item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Opt", and then press the [ENTER] key.

Press the [ENTER] key.

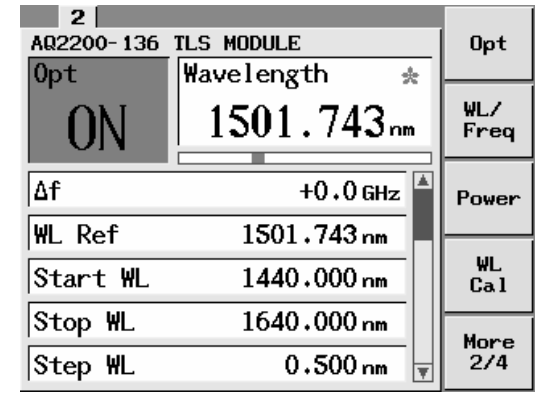
[Operation 2] Set to ON.



The "Opt" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press the [ENTER] key.

Press the [ENTER] key.

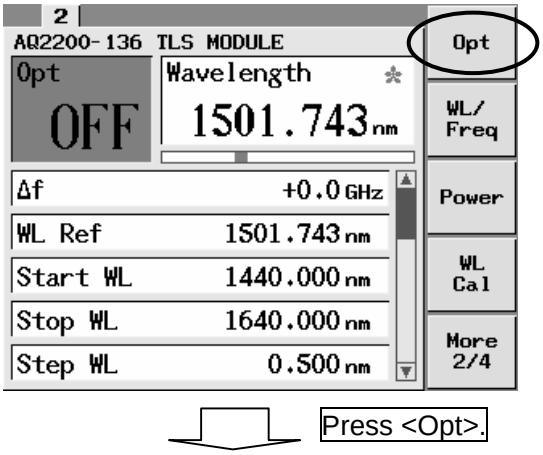
[Completion of Operation]



The "OPT" indication becomes "ON".

Operating Procedures Operation with the Function Key and Cursor Key

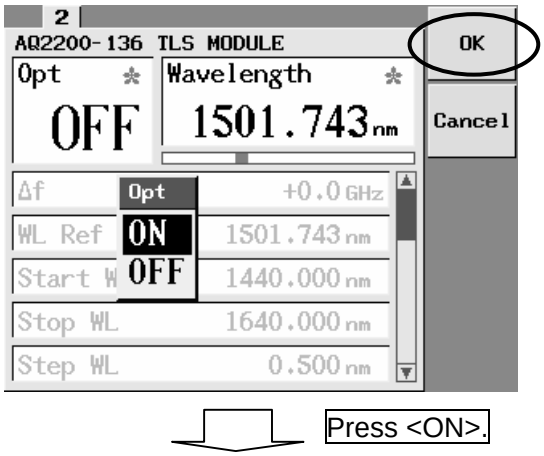
[Operation 1] Select the “Opt” item.



Press <Opt>. The "Opt" popup screen will appear.

Press <Opt>.

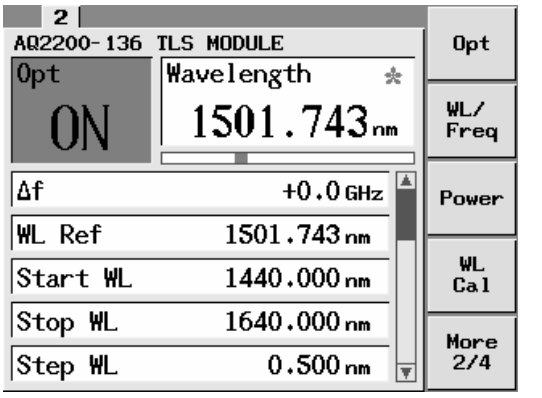
[Operation 2] Set to ON.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press <OK>.

Press <ON>.

[Completion of Operation]



The "OPT" indication becomes "ON".

Explanation

The unit operation is started up with the laser output set at “OFF”.

Two kinds of operating procedures are provided to make the ON/OFF setting of the laser output.

- Switch on the front panel of the module is changed.
- Laser output ON/OFF is changed through the menu screen.

Either operation can be used to change the laser output.

WARNING

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. 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.

Note

- This unit needs the warming up operation for 1 hr. or longer.
- When executing the warming up operation, it is necessary to put the unit in the laser ON status.
- As the laser output is turned OFF, the wavelength calibration is made invalid. Therefore, do not turn OFF the laser output if this operation is not required.

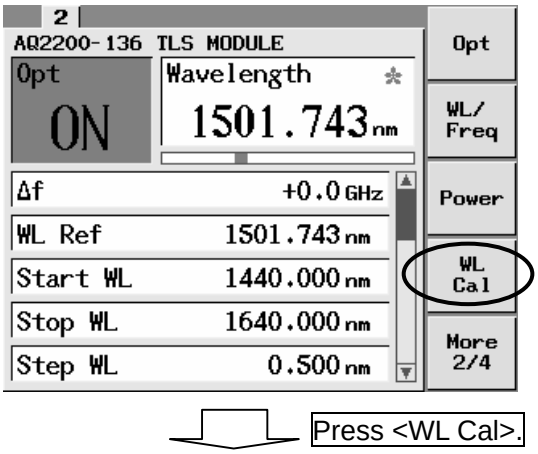
- The laser cannot be output when the "Opt" field shows LOCK.
  When outputting the laser, always check three points shown below.
  - ■ Interlock connector of the frame controller is open.
    → Make the connector short-circuited with the short-circuit pin.
  - ■ Correct password is not set.
    → Input the password while referring to section 3.1 “Setting or Changing the Password” in the User’s Manual for AQ2201/AQ2202 Frame Controller.
  - ■ Laser output is locked.
    → Turn OFF the LOCK while referring to section 3.1 “Setting or Changing the Password” in the User’s Manual for AQ2201/AQ2202 Frame Controller.

5.2 Calibrating the Wavelength

When operating this unit, you must calibrate the wavelength every time the laser output is turned ON. This section describes how to calibrate the wavelength.

Operating Procedures

[Operation 1] Start the calibration.



Press <WL Cal>. When pressing this button, the WL Calibration screen will appear.

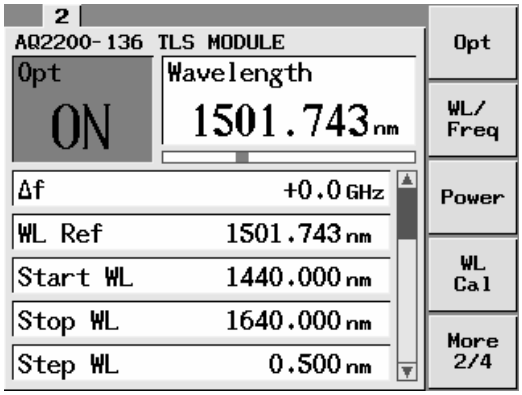
Press <WL Cal>.

[Status Display]

The calibration progress status is shown.

When pressing <Stop>, the WL Calibration is aborted and the screen is returned to the above screen.

[Completion of Operation]



When the calibration is completed successfully, the screen is returned to the initial screen.

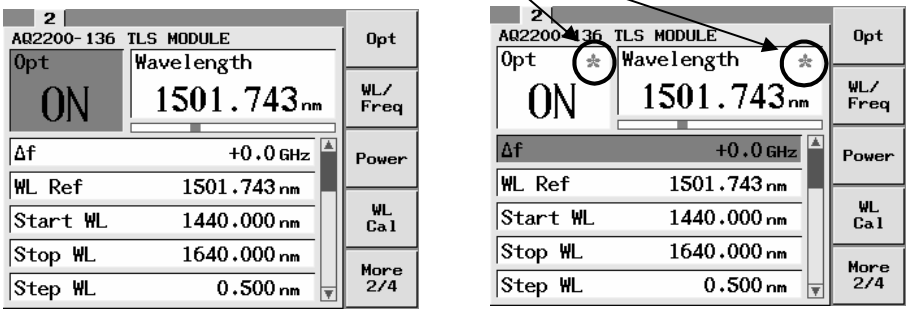
Explanation

When the wavelength calibration is completed successfully, the screen is returned to the previous screen. At this time, the "∗" indication in the “Opt” and “Wavelength” fields showing that the wavelength calibration is not completed will disappear. Even though the wavelength calibration is not completed successfully, the screen is returned to the previous screen, but the "∗" indication showing that the wavelength calibration is not completed does not disappear (remains).

“∗” indication in "Opt" field: The wavelength calibration is not completed. The actual output level is smaller than the output value displayed on the screen.

“∗” indication in "Wavelength" field: The wavelength calibration is not completed.

"∗" indication showing that the wavelength calibration is not completed.



Wavelength Calibration Is Completed. **Wavelength Calibration Is Not Completed.**

Note

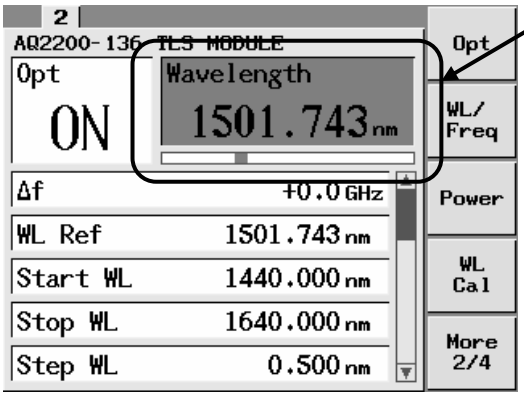
- Before starting the wavelength calibration, warm up the unit for 1 hr. or longer after the optical output of this unit has been turned ON.
- Once the optical output is turned OFF, the wavelength calibration you have made becomes invalid.
- If the wavelength calibration is not performed, the absolute wavelength accuracy and relative wavelength accuracy specified for this unit cannot be satisfied.
- If an error related to the temperature occurs (for details, see section 16.3), the wavelength calibration you have made becomes invalid.

6.1 Changing the Wavelength

When outputting the fixed wavelength value, you must set an output wavelength value. This section describes how to set this output wavelength value.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

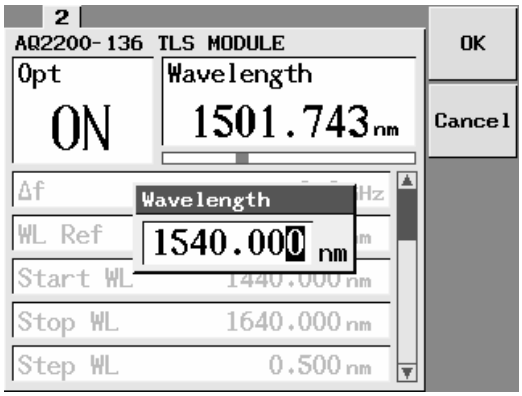
[Operation 1] Select the “Wavelength” item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Wavelength", and then press the [ENTER] key.

Press the [ENTER] key.

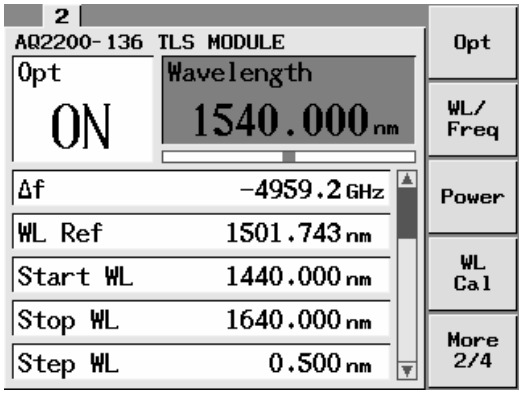
[Operation 2] Set an output wavelength value.



The "Wavelength" popup screen will appear. Input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

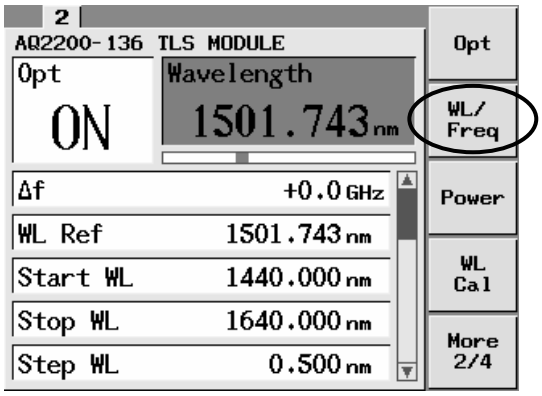
[Completion of Operation]



The numeric value you have set is shown in the "Wavelength" field.

Operating Procedures Operation with the Function Key and Cursor Key

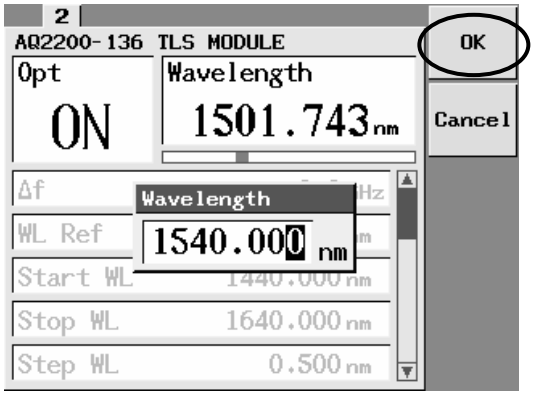
[Operation 1] Select the “WL/Freq” item.



Press <WL/Freq>.
The "Wavelength" popup screen will appear.

Press <WL/Freq>.

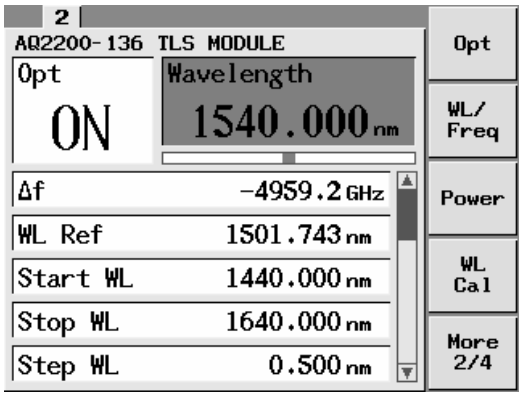
[Operation 2] Set an output wavelength value.



On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Press <OK>.

[Completion of Operation]



The numeric value you have set is shown in the "Wavelength" field.

Explanation

In addition to the setting with the wavelength (nm), you can also make the setting with the frequency (THz). The following description is written assuming that the display unit is wavelength (nm).

The relationship between the wavelength and frequency is shown as follows.

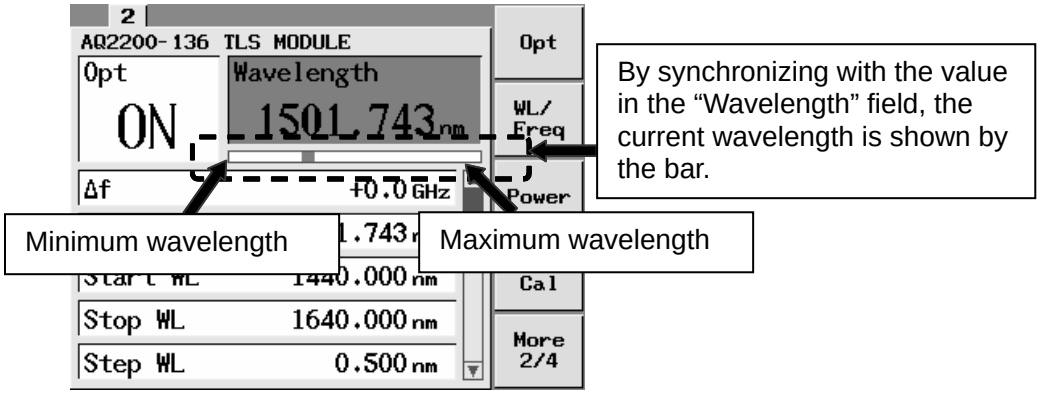
λ (nm) $\times 10^{-9}$= C / (f (THz) $\times 10^{12}$)

(f (THz) $\times$ 1012)= C / (λ (nm) 10^{-9})

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

λ: Display wavelength (nm)

f: Display frequency (THz)



Note

- The wavelength range of the AQ2200-136 is **"1440 to 1640nm"**.
- The minimum significant digit of the AQ2200-136 you can set is **"1/1000nm"**.
- When the slot, which is newly inserted into the frame controller, is started up or preset, the initial wavelength is fixed at **"1501.743nm"**.
- If the insertion position is not changed from that when the frame controller has been turned OFF previously, the value set last in the previous operation is read again to make the settings.

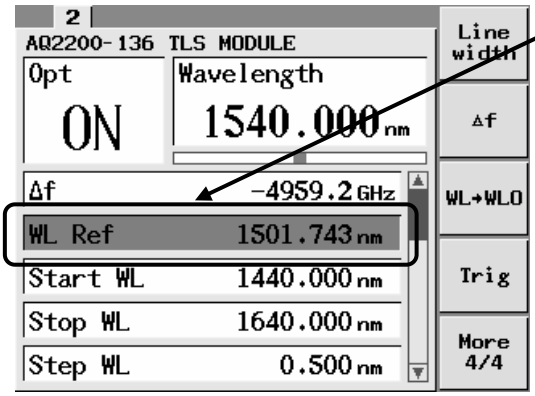
6.2 Setting the Offset

The value of the fixed output wavelength set currently can be offset. First, the wavelength reference of the offset is set (step 1), and then the value of the offset Δf is set (step 2). This section describes how to set each value.

● Step 1 Setting the wavelength reference of the offset

Operating Procedures Operation with the [ENTER] Key and Cursor Key

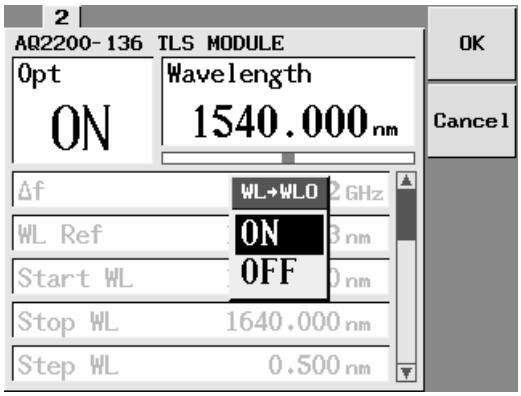
[Operation 1] Select the "WL Ref" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "WL Ref", and then press the [ENTER] key.

Press the [ENTER] key.

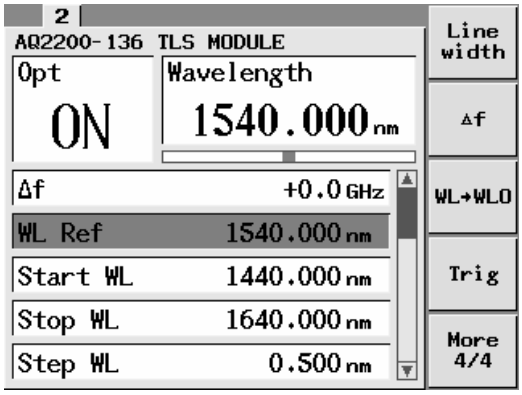
[Operation 2] Set the wavelength reference.



The "WL→WL0" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



The value in the "Wavelength" field is then set in the "WL Ref" field.

Explanation

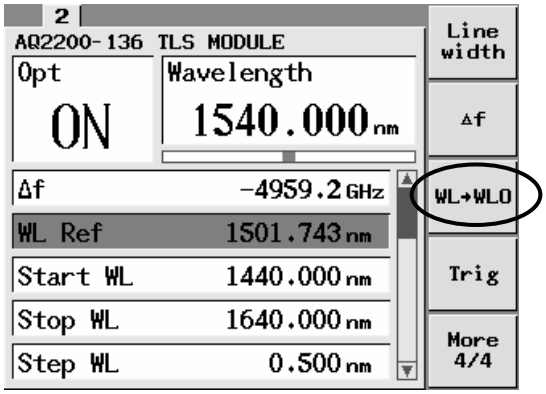
A desired wavelength within the wavelength range can set for “WL Ref”.

“WL Ref” becomes the wavelength reference point when using Δf.

By executing “WL Ref”, the wavelength set in the “Wavelength” field can be assigned to “WL Ref”.

Operating Procedures Operation with the Function Key and Cursor Key

[Operation 1] Select the "WL→WL0" item.

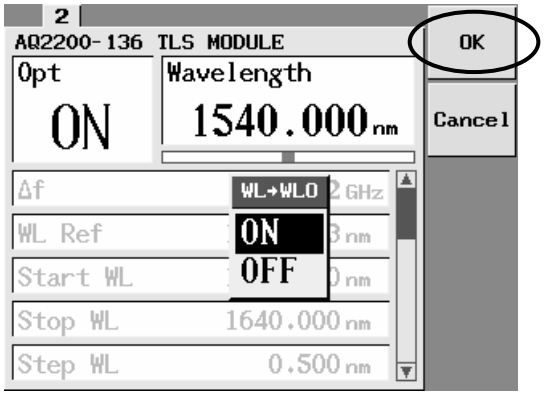


Press <WL→WL0>.

The "WL→WL0" popup screen will appear.

Press <WL→WL0>.

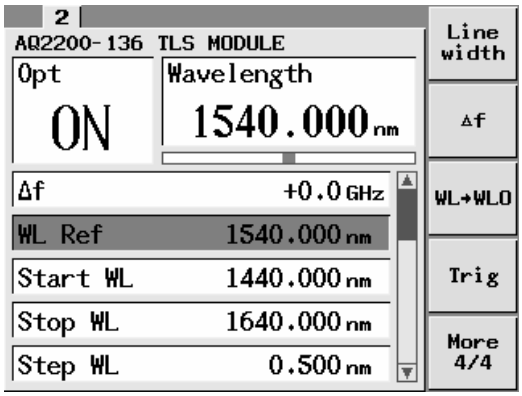
[Operation 2] Set the wavelength reference.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press <OK>.

Press <OK>.

[Completion of Operation]

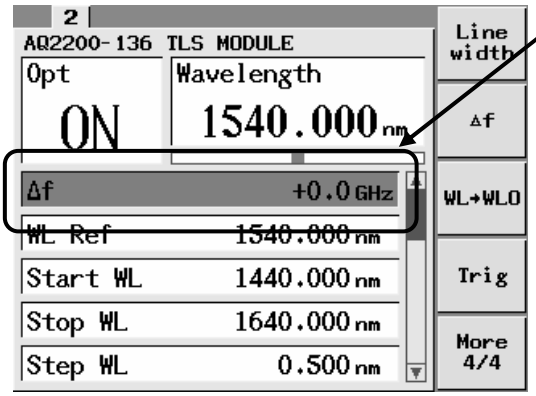


The value in the "Wavelength" field is then set in the "WL Ref" field.

● Step 2 Setting Δf.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

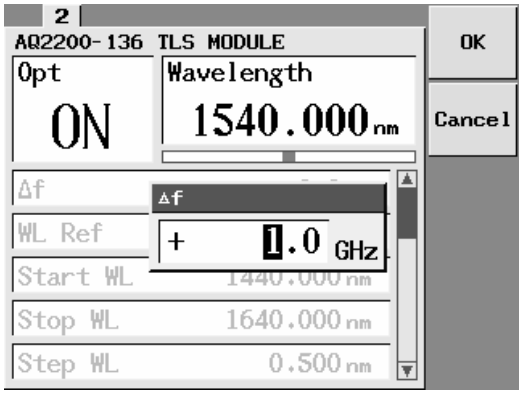
[Operation 1] Select the "Δf" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Δf", and then press the [ENTER] key.

Press the [ENTER] key.

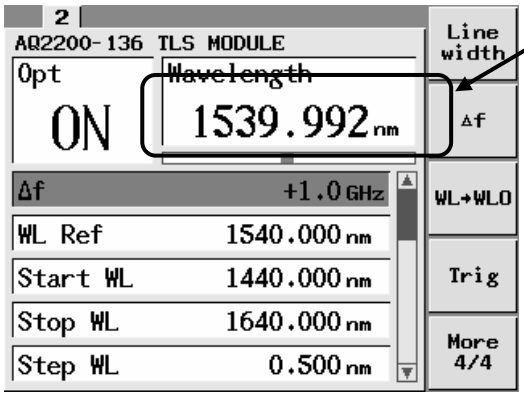
[Operation 2] Set Δf.



The "Δf" popup screen will appear. Input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



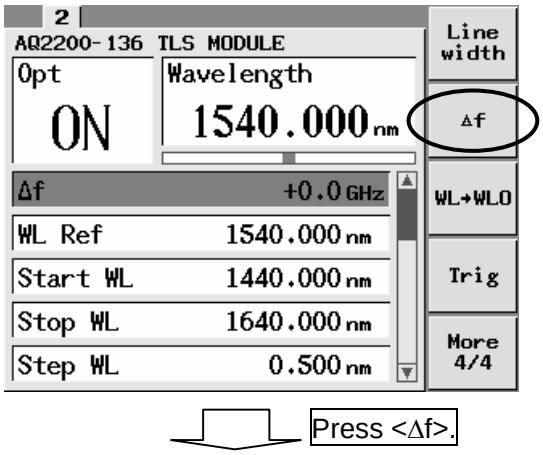
The offset value is then added to the value in the "Wavelength" field.

Explanation

With Δf, you can set a wavelength to the wavelength set in the “WL Ref” field in a range of ±Δf. The fixed unit of Δf is the frequency (GHz). The relationship becomes "Wavelength" = "WL0" + "Δf". The allowable setting range of Δf may depend on the wavelength range of the AQ2200-136.

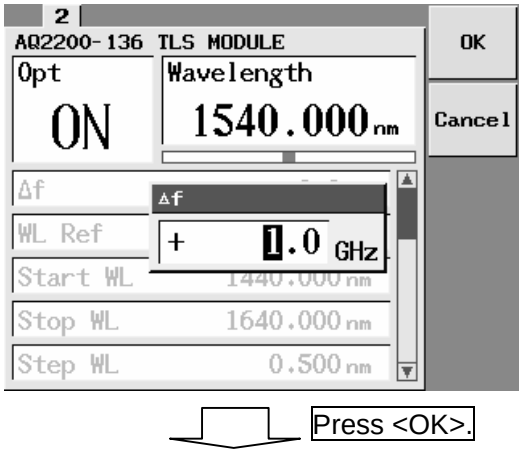
Operating Procedures Operation with the Function Key and Cursor Key

[Operation 1] Select the "Δf" item.



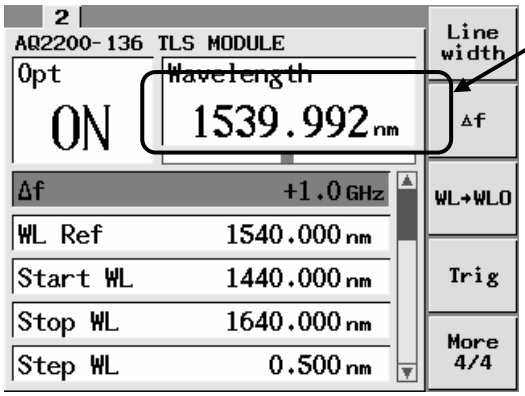
Press <Δf>. The "Δf" popup screen will appear.

[Operation 2] Set Δf.



On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

[Completion of Operation]



The offset value is then added to the value in the "Wavelength" field.

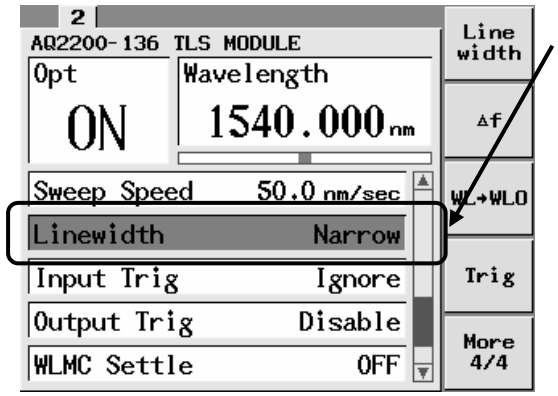
7.1 Changing the Line Width

A desired line width of the laser can be selected from two settings, one is "Narrow", which is not modulated and the other is "Wide", which is modulated.

This section describes how to change the line width.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

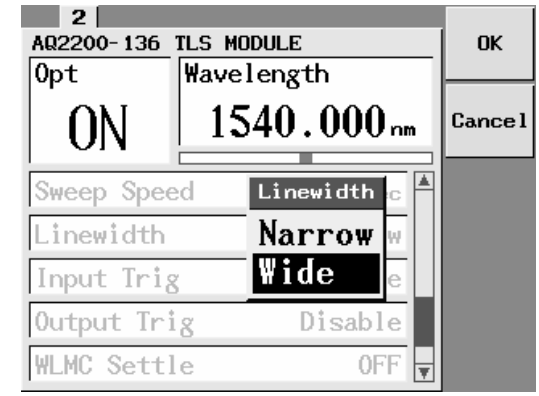
[Operation 1] Select the "Linewidth" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Linewidth", and then press the [ENTER] key.

Press the [ENTER] key.

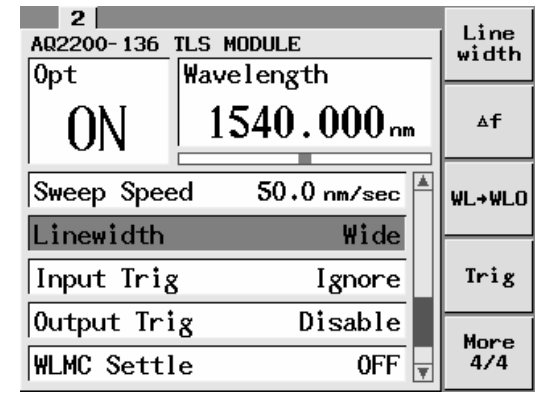
[Operation 2] Select the line width.



The "Linewidth" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Linewidth", select the desired line width with the cursor, and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



The line width you have set is shown in the "Linewidth" field.

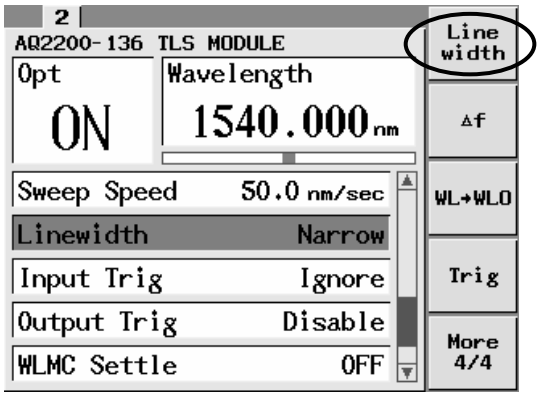
Explanation

A desired line width can be selected from two types of settings, "**Narrow**" and "**Wide**".

By setting the line width to “Wide”, the effects of the interference by reflection are made small to measure the power more steadily.

Operating Procedures Operation with the Function Key and Cursor Key

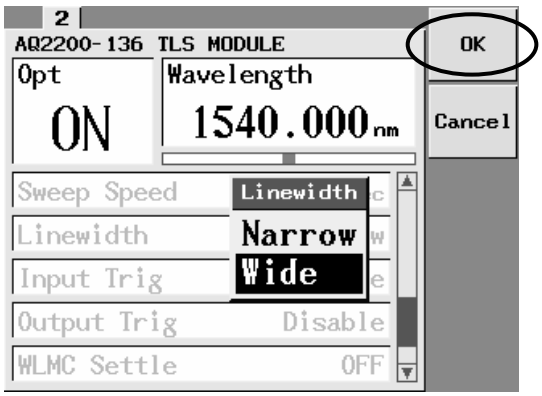
[Operation 1] Select the "Linewidth" item.



Press <Linewidth>.
The "Linewidth" popup screen will appear.

Press <Linewidth>.

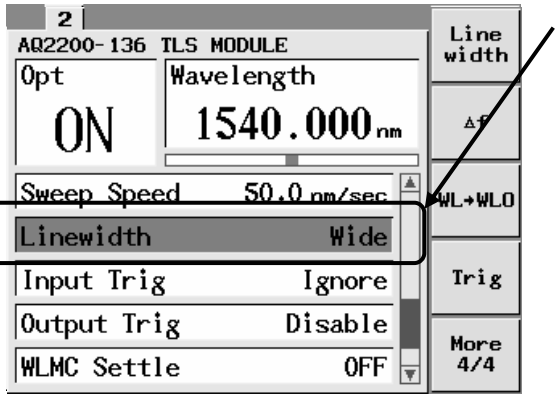
[Operation 2] Select the line width.



Scroll the popup screen display with the [▲] or [▼] cursor key and select the desired line width with the cursor

Press <OK>.

[Completion of Operation]



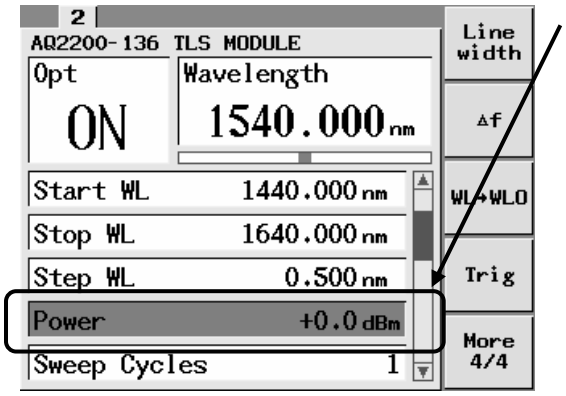
The line width you have set is shown in the "Linewidth" field.

8.1 Changing the Output Value

The laser output level can be set to a desired level. This section describes how to set a level value manually.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

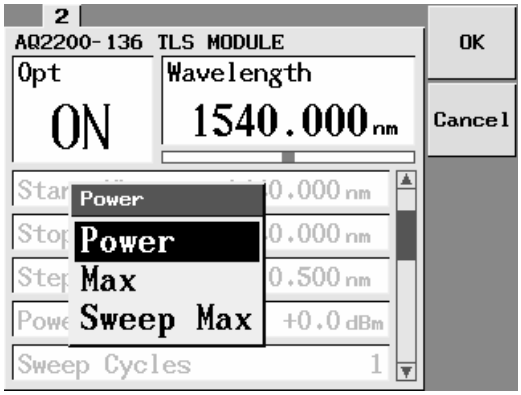
[Operation 1] Select the "Power" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Power", and then press the [ENTER] key.

Press the [ENTER] key.

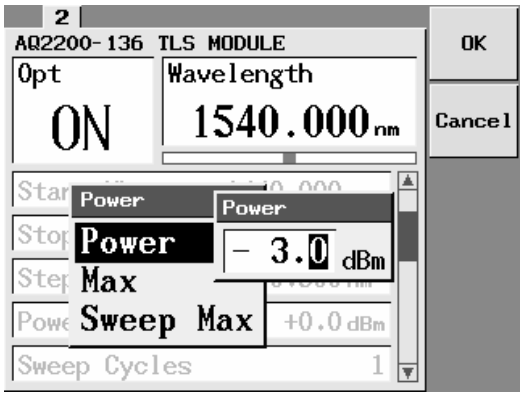
[Operation 2] Select a desired output setup method.



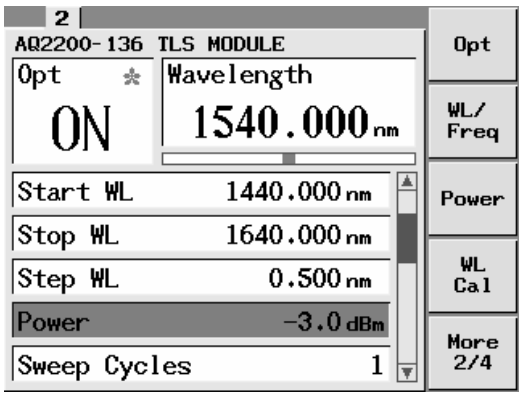
The "Power" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Power", and then press the [ENTER] key.

Press the [ENTER] key.

[Operation 3] Set an output value.



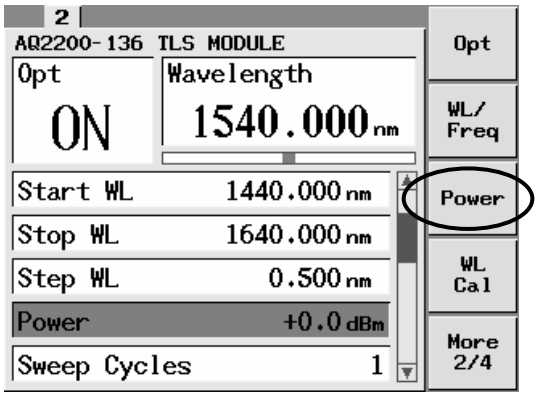
[Completion of Operation]



On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key. When pressing [ENTER], the value you have input is shown in the "Power" field.

Operating Procedures Operation with the Function Key and Cursor Key

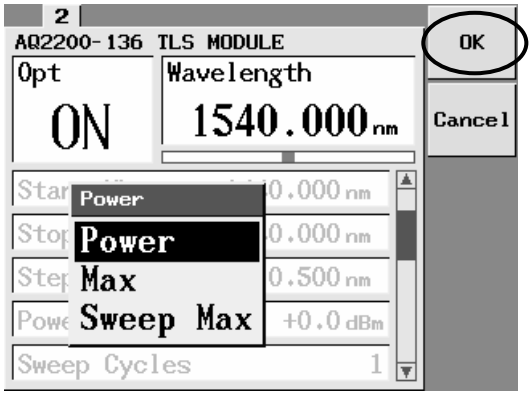
[Operation 1] Select the "Power" item.



Press <Power>. The "Power" popup screen will appear.

Press <Power>.

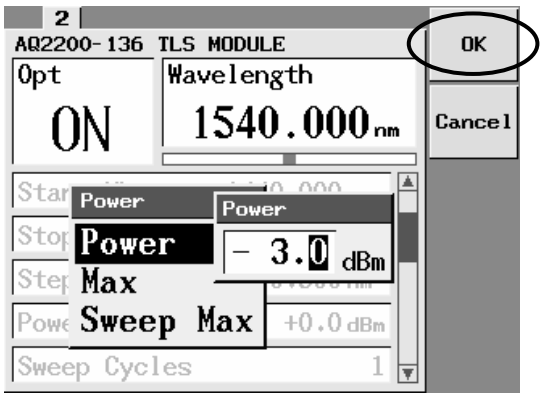
[Operation 2] Select a desired output setup method.



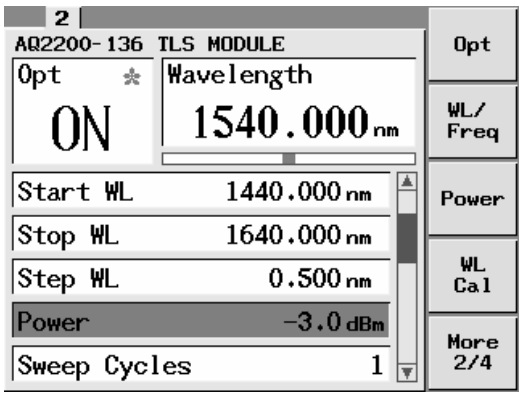
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Power", and then press <OK>.

Press <OK>.

[Operation 3] Set an output value.



[Completion of Operation]



On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key. When pressing <OK>, the value you have input is shown in the "Power" field.

Explanation

There are three kinds of laser output setup methods as listed below.

Changing and setting the laser output value with manual operation

Setting through auto detection of the maximum laser output value at the fixed wavelength

Setting through auto detection of the optimal laser output value during sweep

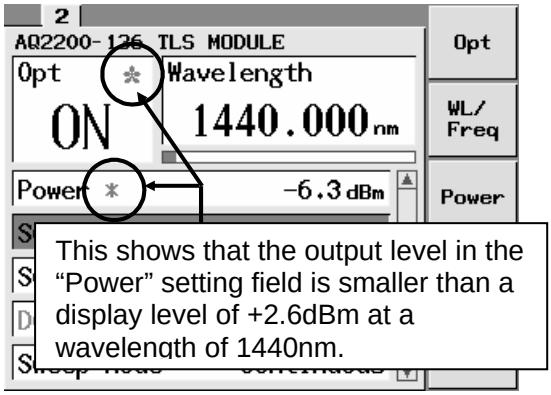
The AQ2200-136 has a laser output level range you can set a different value for each wavelength.

Note

- The laser output value has individual setting range for each AQ2200-136.
- The set interval of the laser output value is 0.1dB.
- The laser output value range you can input does not meet the actual laser output setting range.
- Each wavelength has an individual range, in which you can change the laser output value variably.
- If the laser output value exceeds the range of each wavelength, in which you can change the laser output value variably, the "*" indication is shown in the “Power” display field. If the "*" indication is shown, the display value does not meet the output value. The output value becomes smaller than the display value.
- The connector connection status, environment, and/or secular change may affect the laser output value displayed in the “Power” display field. Therefore, the Power display does not guarantee the set value. The value in the “Power” display field is used as reference value.

* Non-achievement of Laser Output Level

In the AQ2200-136, each laser output variable change range of each module to the laser maximum output level and wavelength is different. For wavelength around the short wavelength (from 1440nm), since the laser output level does not satisfy the minimum value of the Power set value range, the laser output non-achievement indication "*" is always shown. However, the specifications stated in the catalog are satisfied.



"*" indication in the "Opt" field is the logical AND of non-achievement of the level and non-execution of the calibration.

Note

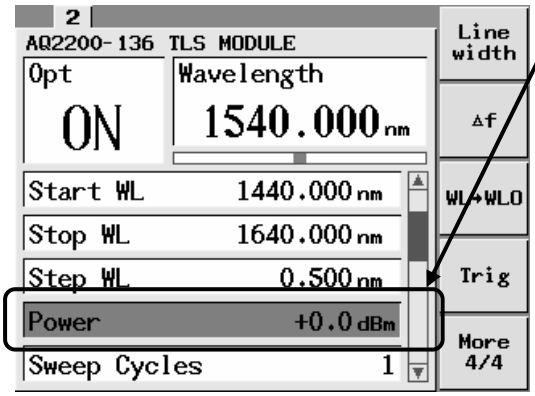
- When the laser output non-achievement indication "*" is displayed, this shows that the display level does not achieve the display level.
- Even though the laser output non-achievement indication is shown, the laser output level stated in the catalog specification is not satisfied.

8.2 Setting through Auto Detection of the Maximum Value at the Fixed Wavelength

The maximum level, which can be output at the currently set fixed wavelength, can be detected automatically. This section describes how to make the setting through the auto detection.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

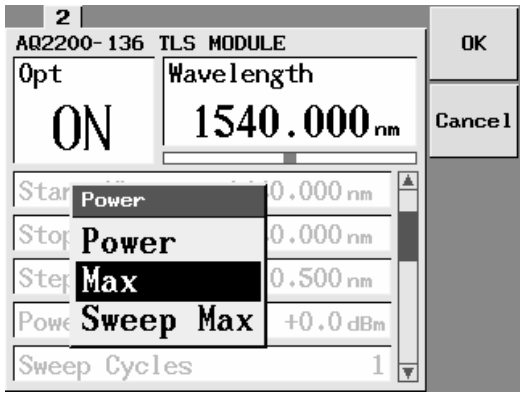
[Operation 1] Select the "Power" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Power", and then press the [ENTER] key.

Press the [ENTER] key.

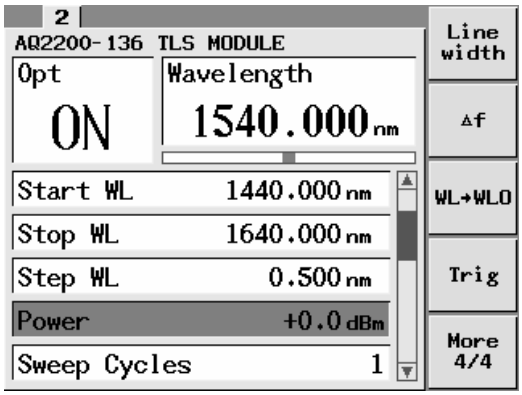
[Operation 2] Select a desired output setup method.



The "Power" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Max", and then press the [ENTER] key.

Press the [ENTER] key.

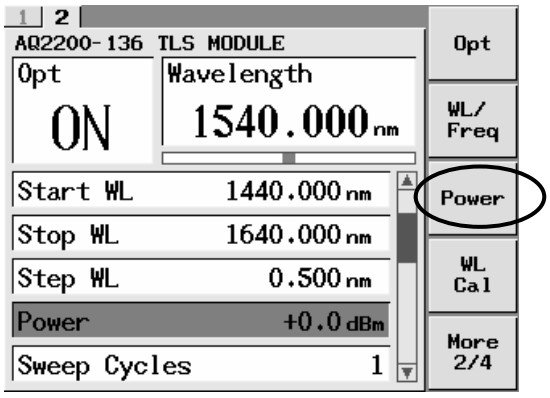
[Completion of Operation]



The maximum Power set in the "Wavelength" field is detected automatically, and then it is shown in the "Power" field.

Operating Procedures Operation with the Function Key and Cursor Key

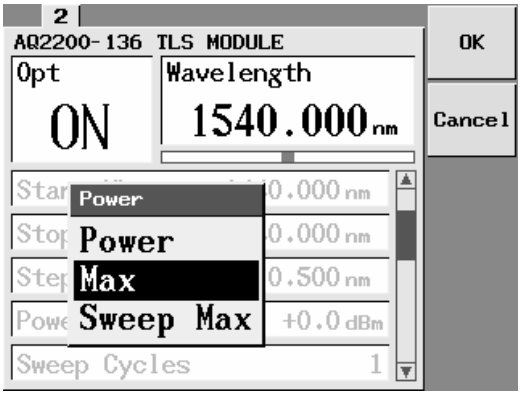
[Operation 1] Select the "Power" item.



Press <Power>. The "Power" popup screen will appear.

Press <Power>.

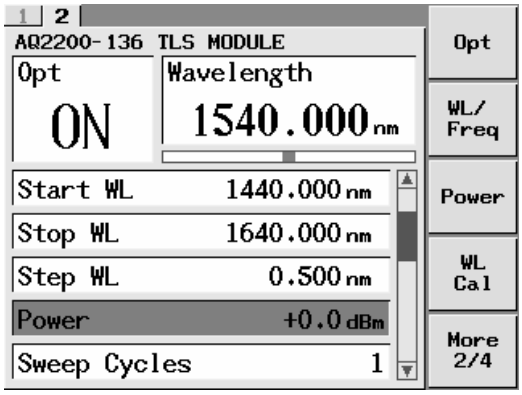
[Operation 2] Select a desired output setup method.



The "Power" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Max", and then press <OK>.

Press <OK>.

[Completion of Operation]



The maximum Power set in the "Wavelength" field is detected automatically, and then it is shown in the "Power" field.

Note

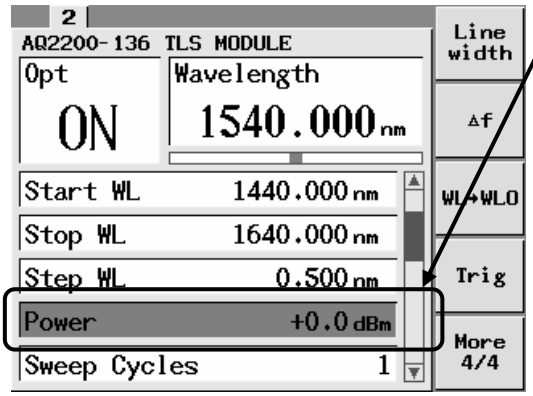
- If the level is not achieved even within the variable change range of the output level when the value is displayed in the "Power" field through the auto detection, the maximum level value to be output within this variable change range is displayed and the warning mark is also shown.

8.3 Setting through Auto Detection of the Optimal Value during Sweep

The maximum level, which can be output within the wavelength range, in which the sweep is performed, can be detected automatically. This section describes how to make the setting through the auto detection during sweep.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

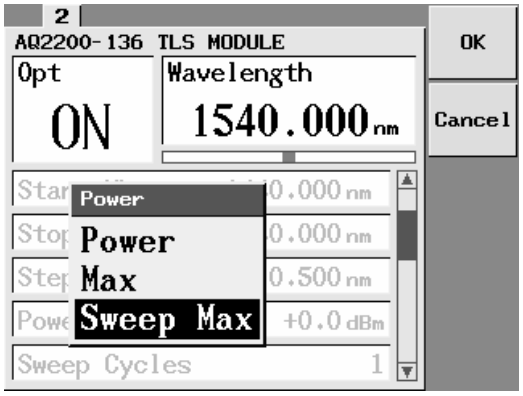
[Operation 1] Select the "Power" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Power", and then press the [ENTER] key.

Press the [ENTER] key.

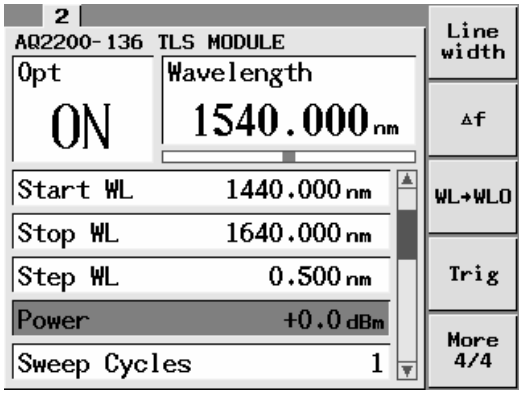
[Operation 2] Select a desired output setup method.



The "Power" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Max", and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



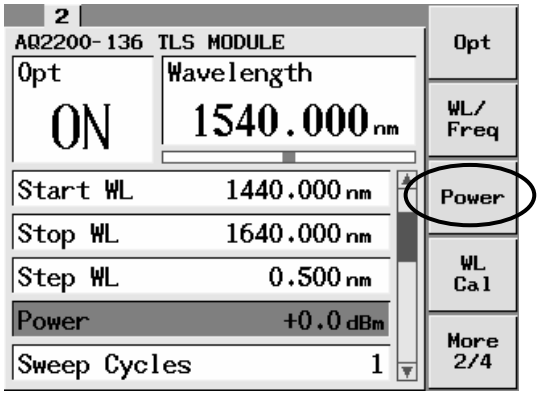
The Power is detected automatically in the wavelength range set for the sweep, and then it is set.

Explanation

"Sweep Max" automatically detects an optimal value used to obtain the maximum flatness within the specified wavelength range. For details, see “Setting the Power” in section 4.3.

Operating Procedures Operation with the Function Key and Cursor Key

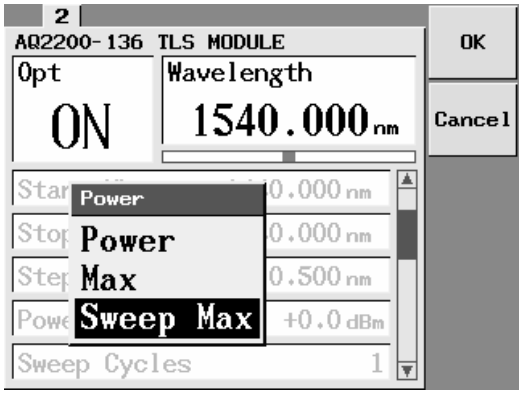
[Operation 1] Select the "Power" item.



Press <Power>. The "Power" popup screen will appear.

Press <Power>.

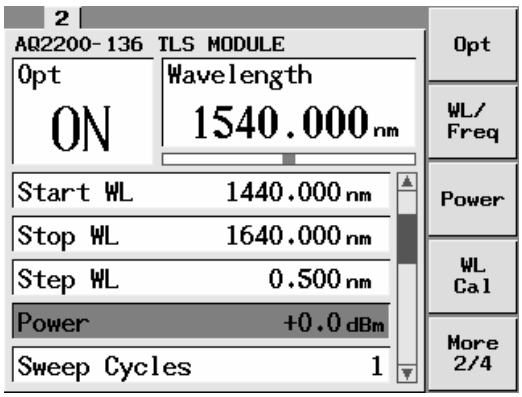
[Operation 2] Select a desired output setup method.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Max", and then press <OK>.

Press <OK>.

[Completion of Operation]



The Power is detected automatically in the wavelength range set for the sweep, and then it is set.

Note

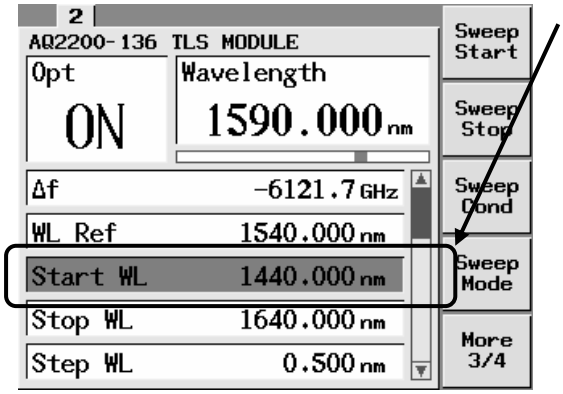
- The range of Power to be set may vary depending on each AQ2200-136.
- To set the maximum output at all wavelength levels, you can input the maximum value of the allowable output setting using the manual Power setup.

9.1 Setting the Sweep Start Wavelength

To perform the sweep, it is absolutely necessary to set each sweep wavelength range. The conditions you must set are **"Start wavelength", "Stop wavelength", "Sweep step", "Sweep cycles", "Sweep interval", "Dwell time", and "Sweep speed".** This section describes how to set the Start wavelength.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

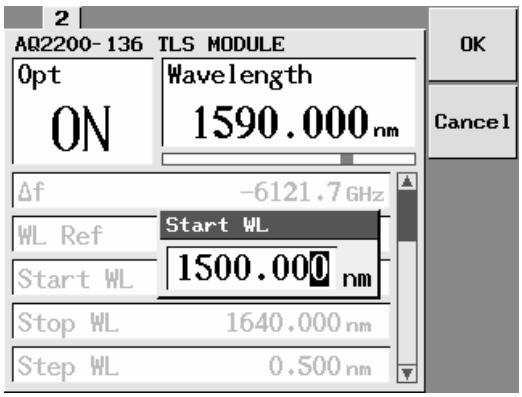
[Operation 1] Select the "Start WL" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Start WL", and then press the [ENTER] key.

Press the [ENTER] key.

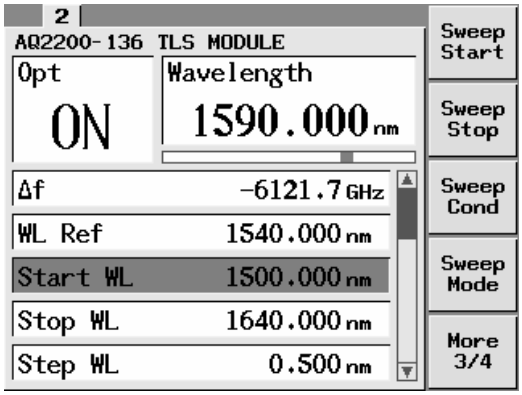
[Operation 2] Set a desired start wavelength value.



The "Start WL" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

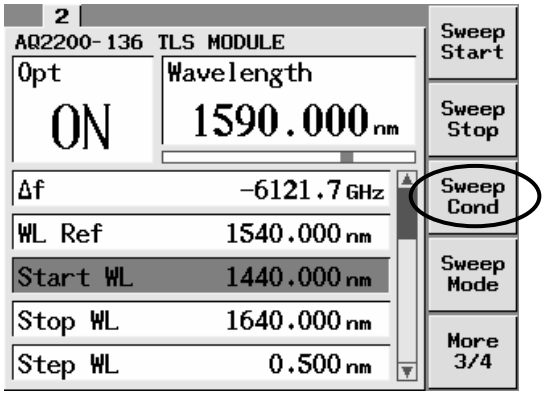
[Completion of Operation]



The numeric value you have set is shown in the "Start WL" field.

Operating Procedures Operation with the Function Key and Cursor Key

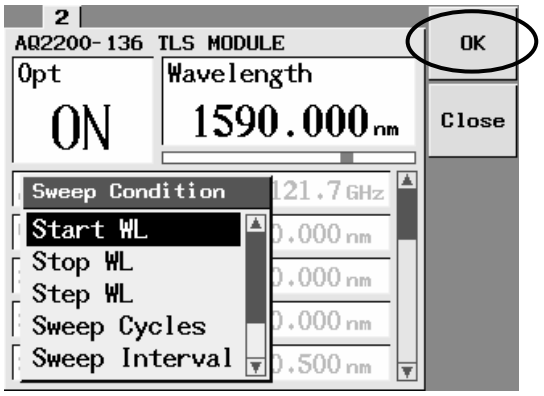
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

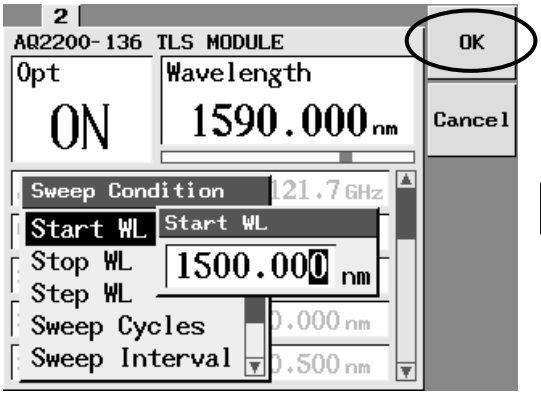
[Operation 2] Select the “Start WL” item.



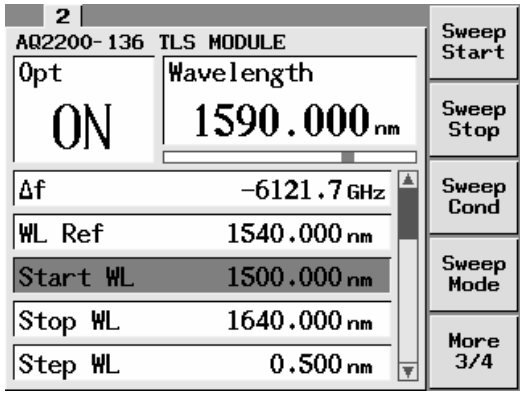
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Start WL”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired start wavelength value.



[Completion of Operation]



The "Start WL" popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Note

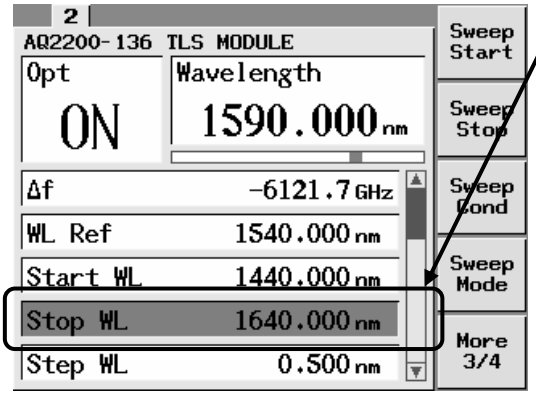
- The wavelength setting range is “1440” to “1640nm”. If a value, which is 1440 or less, is set, "1440" is shown. On the contrary, if a value, which is 1640 or more, is set, "1640" is shown.
- The minimum significant digit you can set is “0.001nm”.

9.2 Setting the Sweep Stop Wavelength

This section describes how to set the Stop wavelength.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

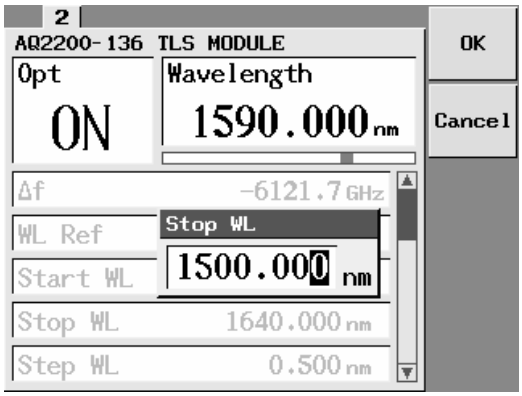
[Operation 1] Select the "Stop WL" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Stop WL", and then press the [ENTER] key.

Press the [ENTER] key.

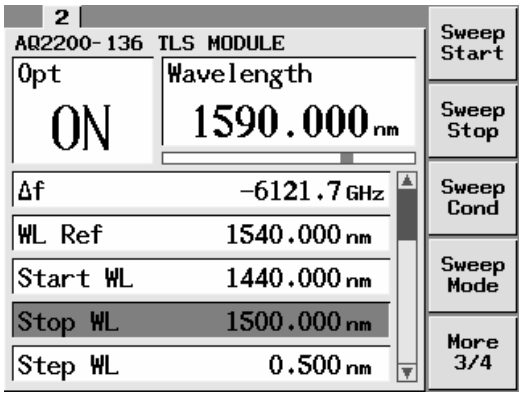
[Operation 2] Set a desired stop wavelength value.



The "Stop WL" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



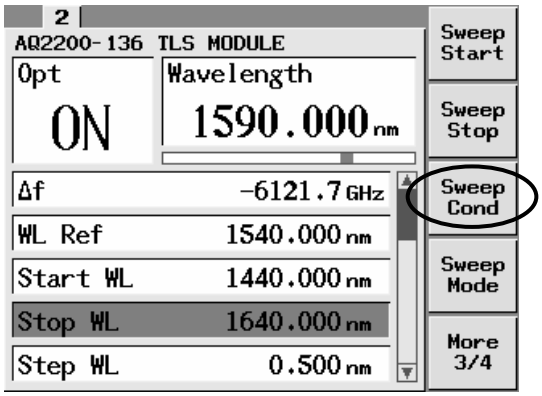
The numeric value you have set is shown in the "Stop WL" field.

Note

- The wavelength setting range is “1440” to “1640nm”. If a value, which is 1440 or less, is set, "1440" is shown. On the contrary, if a value, which is 1640 or more, is set, "1640" is shown.
- The minimum significant digit you can set is “0.001nm”.

Operating Procedures Operation with the Function Key and Cursor Key

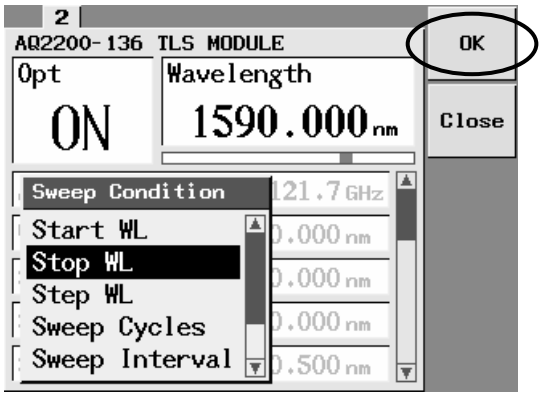
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

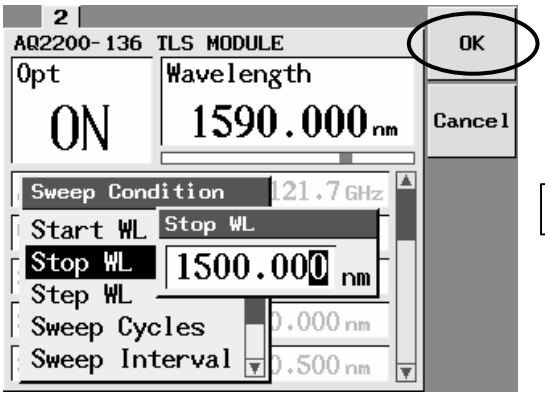
[Operation 2] Select the “Stop WL” item.



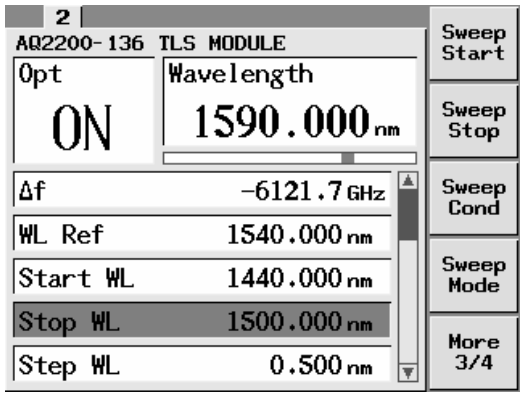
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Stop WL”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired stop wavelength value.



[Completion of Operation]



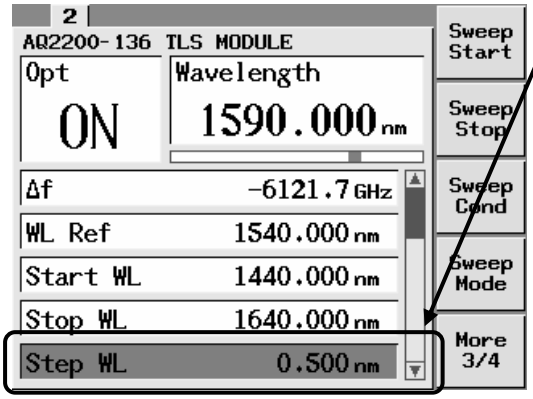
The "Stop WL" popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

9.3 Setting the Sweep Step Wavelength

This section describes how to set the sweep step.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

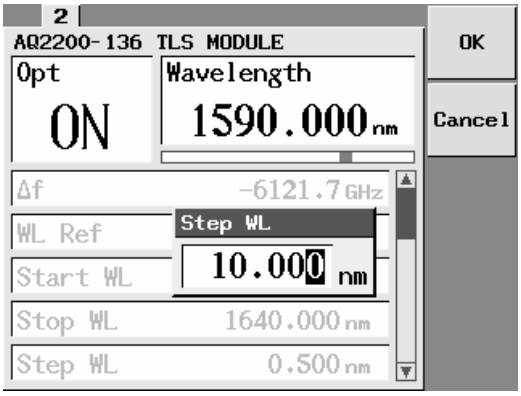
[Operation 1] Select the "Step WL" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Step WL", and then press the [ENTER] key.

Press the [ENTER] key.

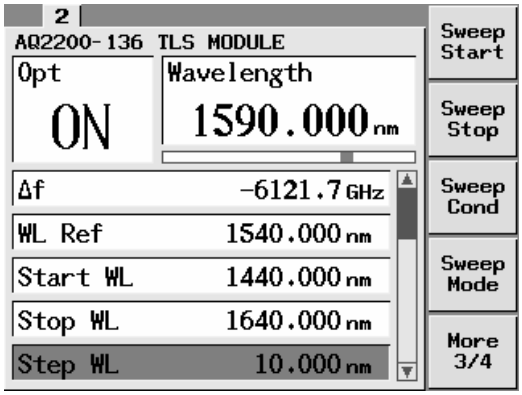
[Operation 2] Set a desired sweep step value.



The "Step WL" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]



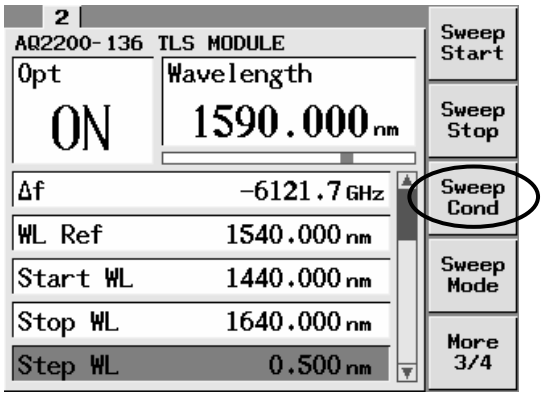
The numeric value you have set is shown in the "Step WL" field.

Note

- The wavelength setting range is “0.001” to “100.000nm”.
- The minimum significant digit you can set is “0.001nm”.

Operating Procedures Operation with the Function Key and Cursor Key

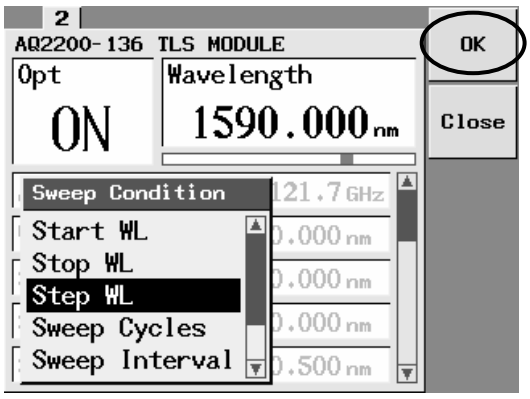
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

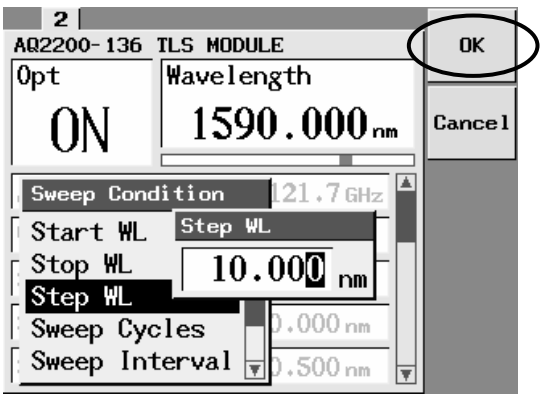
[Operation 2] Select the “Step WL” item.



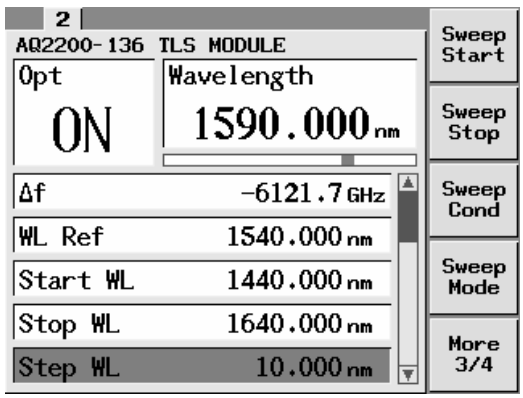
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Step WL”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired sweep step value.



[Completion of Operation]



The "Step WL" popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

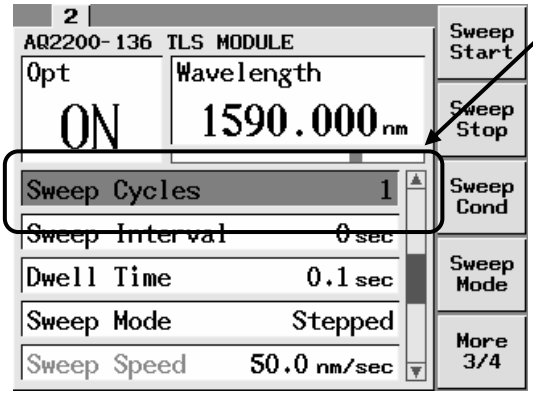
9.4 Setting the Sweep Cycles

This section describes how to set the sweep cycles. The number of repetition measurement cycles with the same parameters can be set for the sweep cycles. The following Table shows the Sweep Modes, in which the “Sweep Cycles” setting becomes valid.

Sweep Mode	Valid	Invalid
Stepped	○	
Manual		○
Continuous	○	

Operating Procedures Operation with the [ENTER] Key and Cursor Key

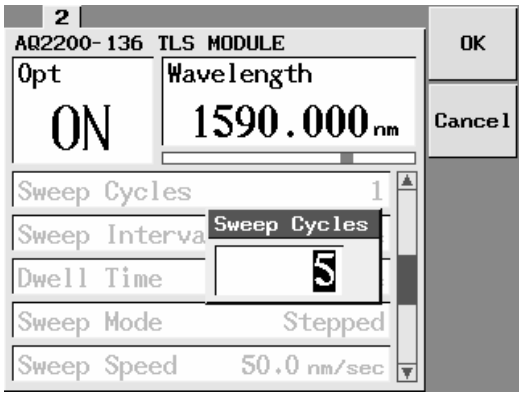
[Operation 1] Select the "Sweep Cycles" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Cycles", and then press the [ENTER] key.

Press the [ENTER] key.

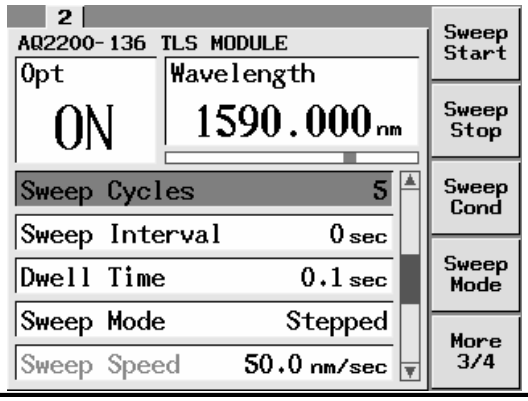
[Operation 2] Set the number of sweep cycles.



The "Sweep Cycles" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

[Completion of Operation]

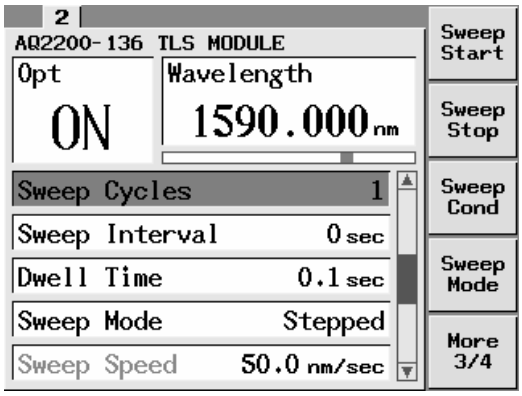
Press the [ENTER] key.



The numeric value you have set is shown in the "Sweep Cycles" field.

Operating Procedures Operation with the Function Key and Cursor Key

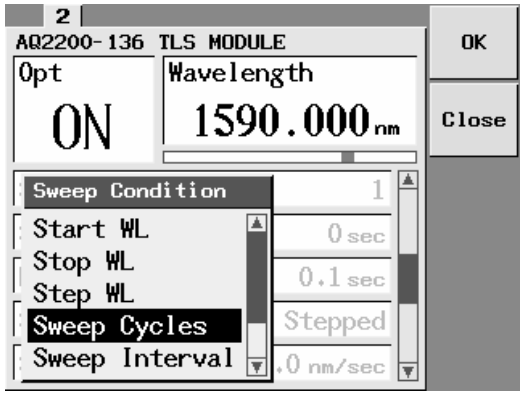
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

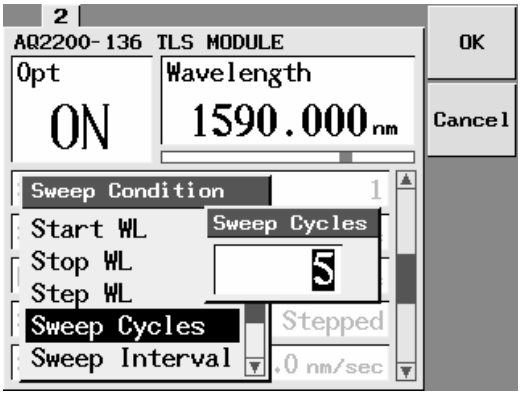
[Operation 2] Select the “Sweep Cycles” item.



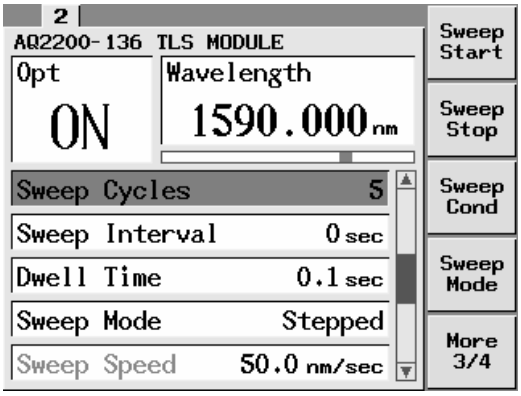
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Sweep Cycles”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired value for “Sweep Cycles”.



[Completion of Operation]



The “Sweep Cycles” popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Note

- It is possible to combine the Sweep Cycles setting with the Sweep Interval setting.
- For example, when performing the measurement for 9 hrs. at measurement intervals of 1 hr., this combination setting is valid.
- The allowable setting range is 0 to 99999 cycles.
- When the “Sweep Cycles” setting is set at “0”, the measurement is repeated infinitely.

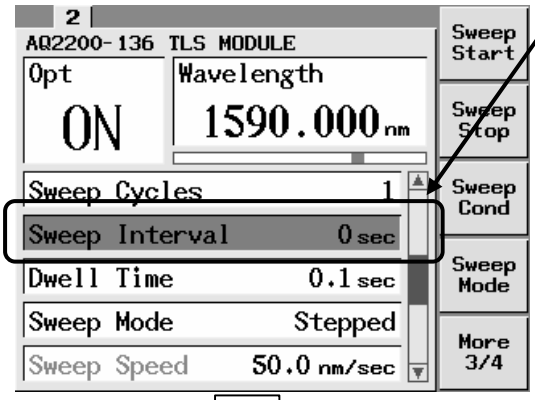
9.5 Setting the Sweep Interval

This section describes how to set the sweep interval. A period of interval time between completion of the previous measurement and start of the next time during continuous measurement can be set for the sweep interval. The following Table shows the Sweep Modes, in which the “Sweep Interval” setting becomes valid.

Sweep Mode	Valid	Invalid
Stepped	○	
Manual		○
Continuous	○	

Operating Procedures Operation with the [ENTER] Key and Cursor Key

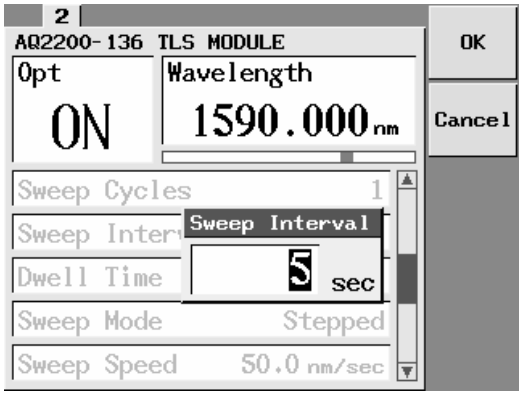
[Operation 1] Select the “Sweep Interval” item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Interval", and then press the [ENTER] key.

Press the [ENTER] key.

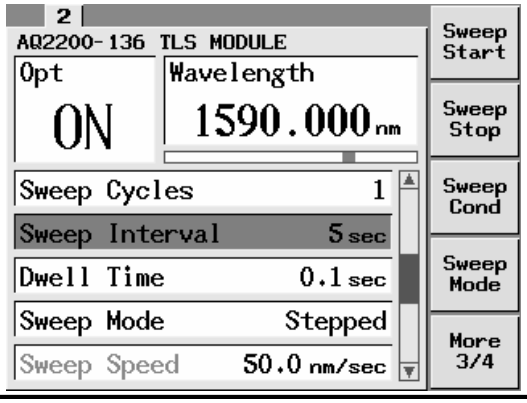
[Operation 2] Set the value of sweep interval.



The "Sweep Interval" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

[Completion of Operation]

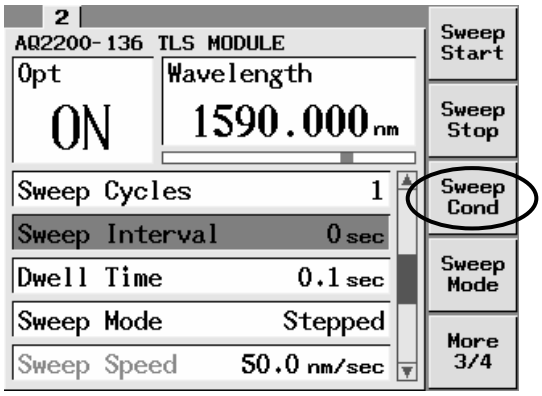
Press the [ENTER] key.



The numeric value you have set is shown in the "Sweep Interval" field.

Operating Procedures Operation with the Function Key and Cursor Key

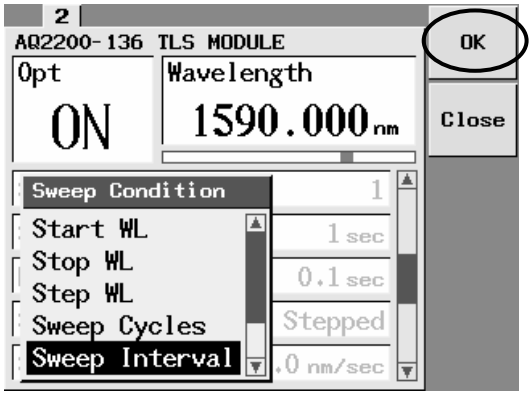
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

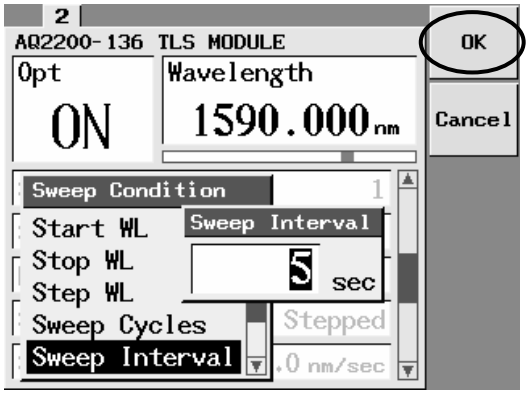
[Operation 2] Select the “Sweep Interval” item.



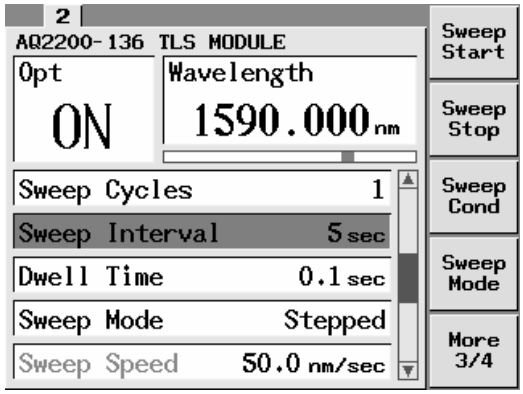
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Sweep Interval”, and then press <OK>.

Press <OK>.

[Operation 3] Set the value of sweep interval.



[Completion of Operation]

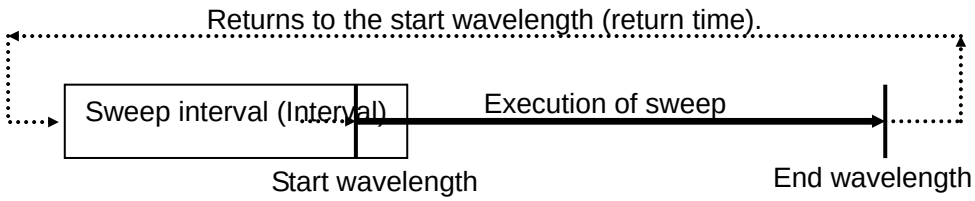


The “Sweep Interval” popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Explanation

The sweep interval counts a period of time from standby at the start wavelength.

The sweep interval does not include a period of time necessary to return from the end wavelength to the start wavelength.



Note

- It is possible to combine the “Sweep Interval” setting with the “Sweep Cycles” setting.
- The allowable setting range is 0 to 99999 sec.
- According to the wavelength sweeping range, the return time to the start wavelength is added to the sweep interval. Therefore, the measurement interval is different from the sweep interval.

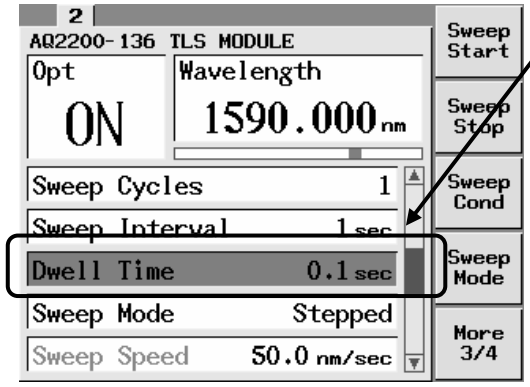
9.6 Setting the Dwell Time (Lock Time per Wavelength)

This section describes how to set the dwell time (lock time per wavelength). For the dwell time, a period of time to lock the wavelength is set. The following Table shows the Sweep Modes, in which the "Dwell Time" setting becomes valid.

Sweep Mode	Valid	Invalid
Stepped	○	
Manual		○
Continuous		○

Operating Procedures Operation with the [ENTER] Key and Cursor Key

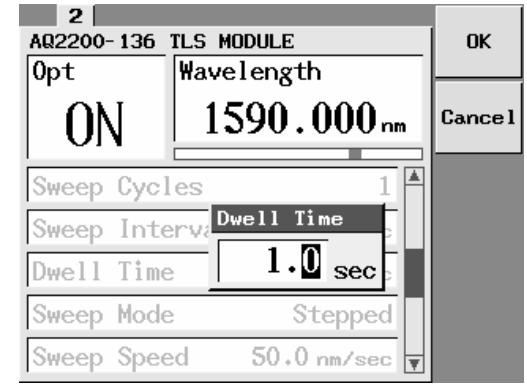
[Operation 1] Select the "Dwell Time" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Dwell Time", and then press the [ENTER] key.

Press the [ENTER] key.

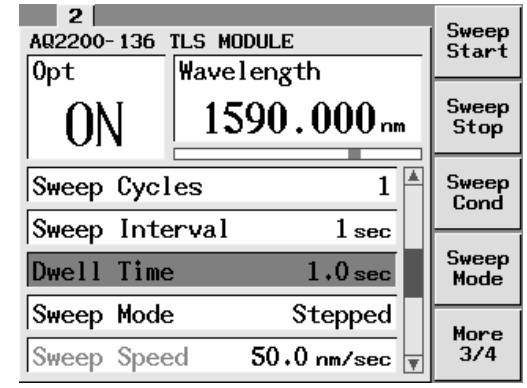
[Operation 2] Set a desired dwell time value.



The "Dwell Time" popup screen will appear. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press the [ENTER] key.

Press the [ENTER] key.

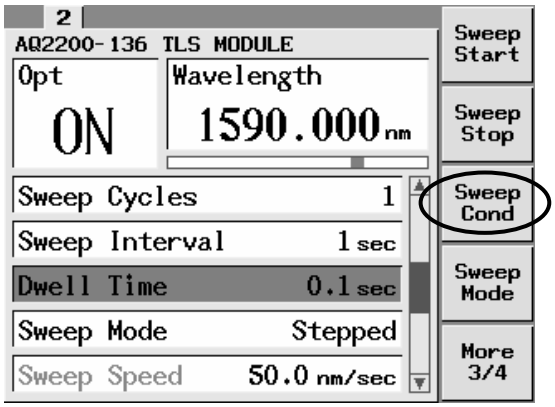
[Completion of Operation]



The numeric value you have set is shown in the "Dwell Time" field.

Operating Procedures Operation with the Function Key and Cursor Key

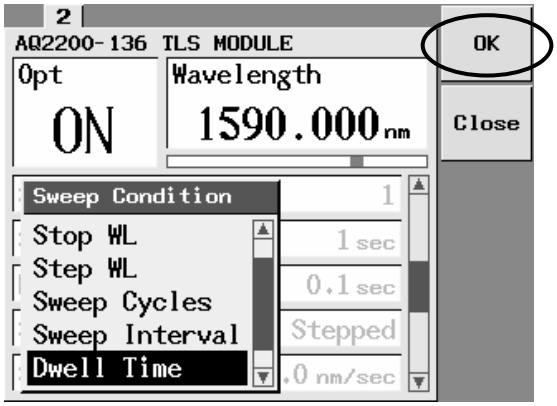
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

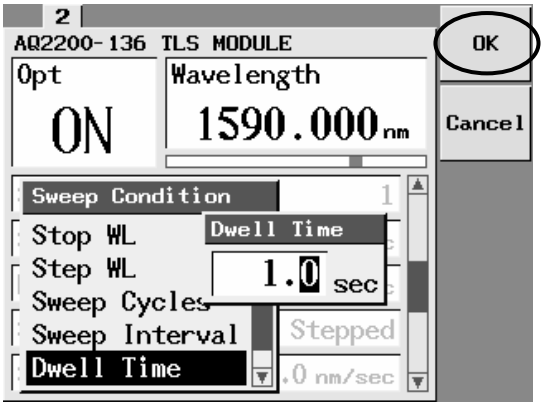
[Operation 2] Select the “Dwell Time” item.



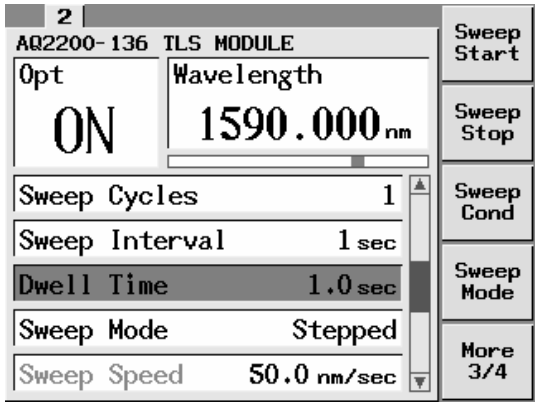
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Dwell Time”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired dwell time value.



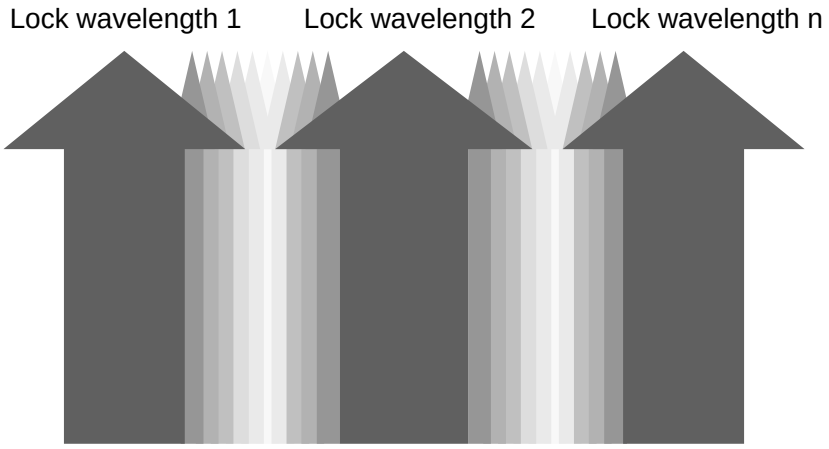
[Completion of Operation]



The “Dwell Time” popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Explanation

The dwell time shows a period of time from locking of the wavelength at the set level to starting of the movement to the next wavelength. The dwell time does not include the movement time to the next wavelength.



Note

- The allowable setting range is 0.1 to 999.9 sec.

9.7 Setting the Sweep Speed in the Continuous Sweep Mode

This section describes how to set the sweep speed. The sweep speed setup provides the following functions.

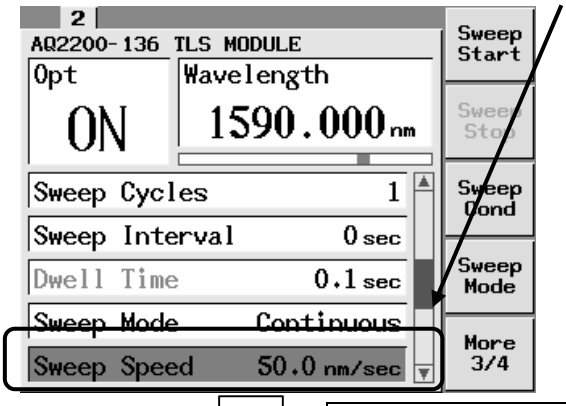
Manual setup: A sweep speed ranging from the maximum speed calculated from the Step wavelength to “0.2nm/s” can be set.

Auto setup: The sweep speed setting is automatically detected from the input Step wavelength.

● Manual Setup

Operating Procedures Operation with the [ENTER] Key and Cursor Key

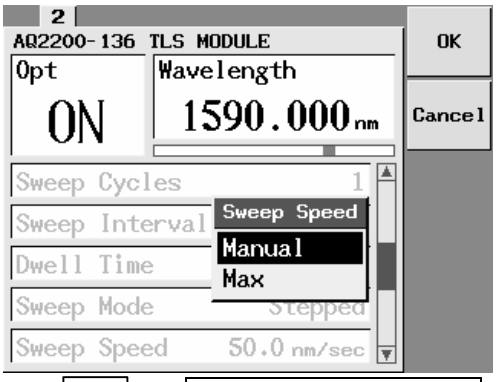
[Operation 1] Select the “Sweep Speed” item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to “Sweep Speed”, and then press the [ENTER] key.

Press the [ENTER] key.

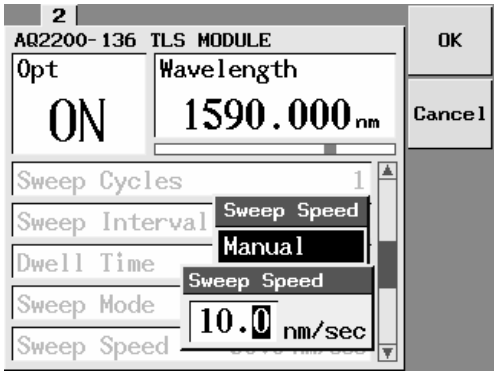
[Operation 2] Select the “Manual” item.



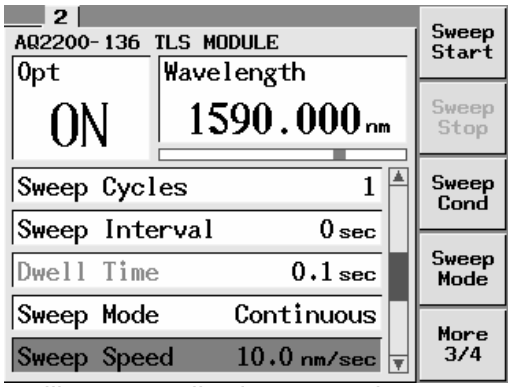
The “Sweep Speed” popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Manual", and then press the [ENTER] key.

Press the [ENTER] key.

[Operation 3] Set a desired speed value.



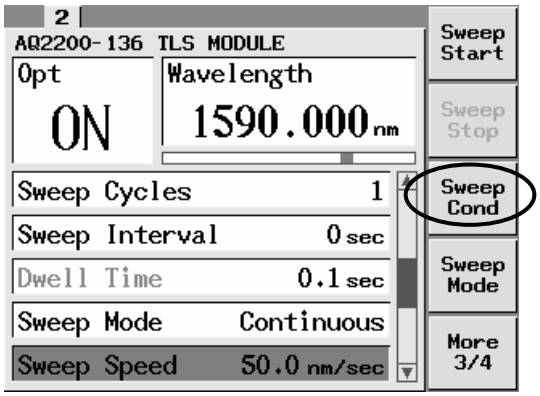
[Completion of Operation]



The “Sweep Speed” popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

Operating Procedures Operation with the Function Key and Cursor Key

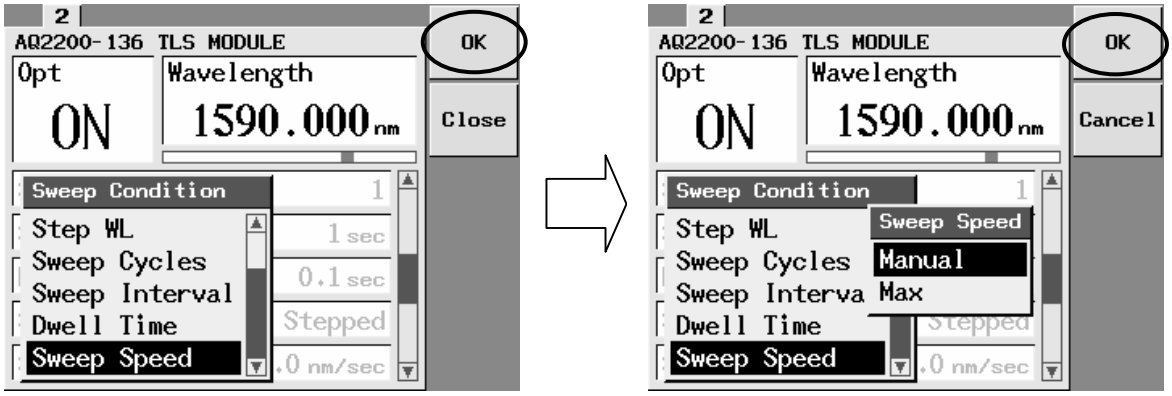
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

[Operation 2] Select the “Manual” item.

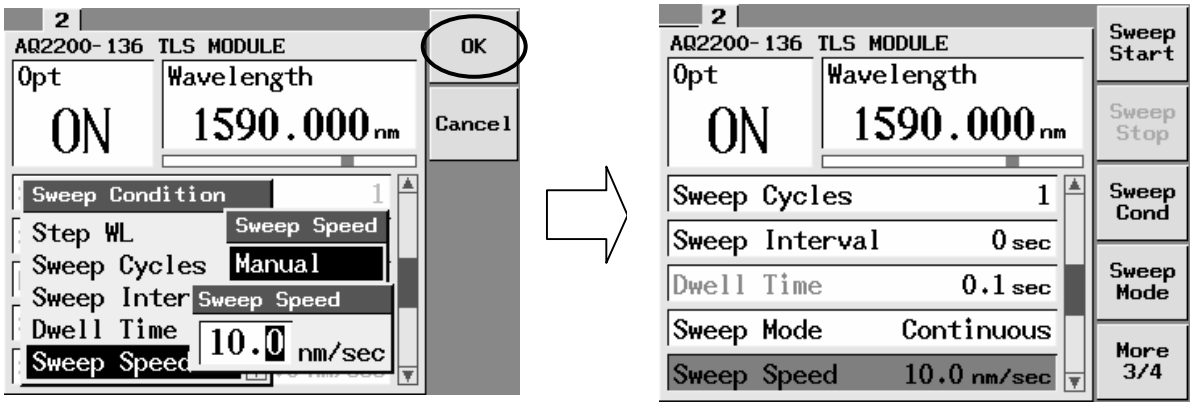


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Speed", and then press <OK>. The “Sweep Speed” popup screen will appear. Move the cursor to "Manual" and press <OK>.

Press <OK>.

[Operation 3] Set a desired speed value.

[Completion of Operation]

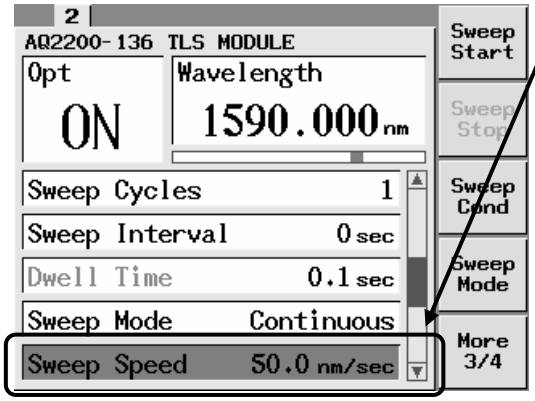


The “Sweep Speed” popup screen will appear, allowing you to input a numeric value. On the popup screen, input a desired numeric value through the ten-key pad or with the [▲] or [▼] key, and then press <OK>.

● Auto Setup

Operating Procedures Operation with the [ENTER] Key and Cursor Key

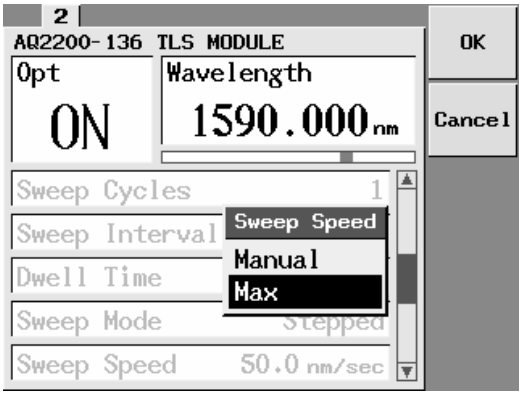
[Operation 1] Select the “Sweep Speed” item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to “Sweep Speed”, and then press the [ENTER] key.

Press the [ENTER] key.

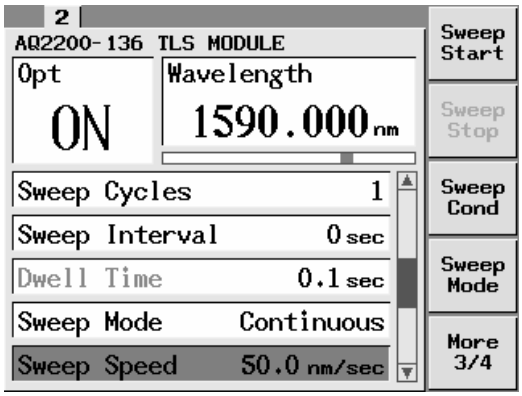
[Operation 2] Select the “Max (auto setup)” item.



The “Sweep Speed” popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Max", and then press the [ENTER] key.

Press the [ENTER] key.

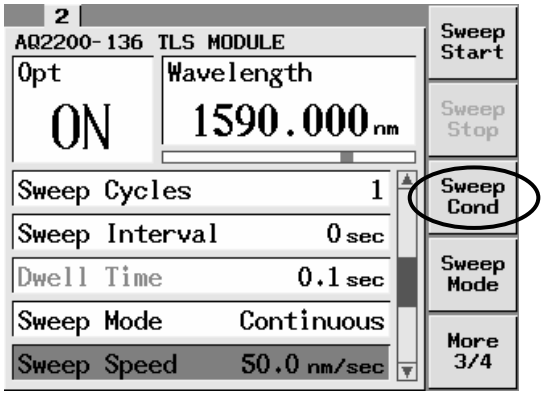
[Completion of Operation]



The automatically set value is then shown in the "Sweep Speed" field.

Operating Procedures Operation with the Function Key and Cursor Key

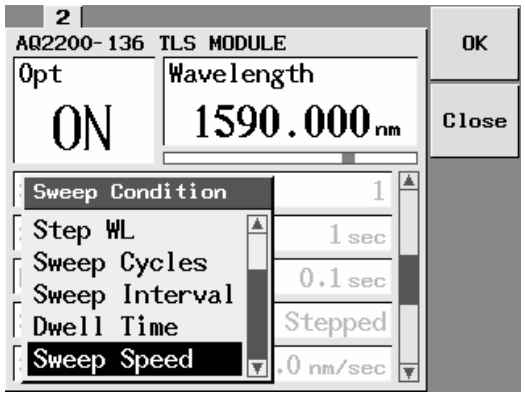
[Operation 1] Select the "Sweep Cond" item.



Press <Sweep Cond>. The "Sweep Condition" popup screen will appear.

Press <Sweep Cond>.

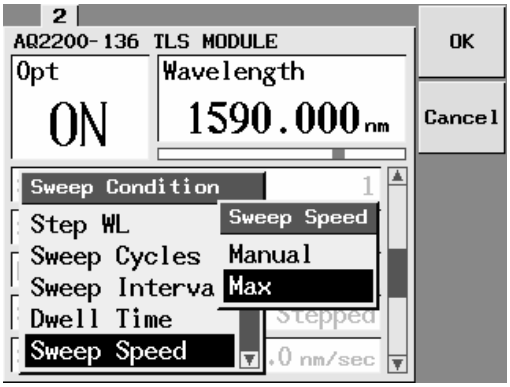
[Operation 2] Select the "Sweep Speed" item.



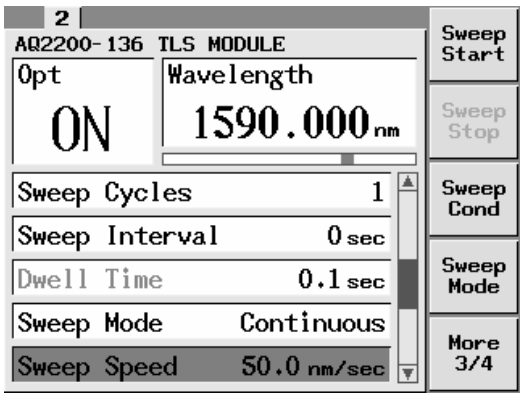
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Speed", and then press <OK>.

Press <OK>.

[Operation 3] Select the "Max (auto setup)" item.



[Completion of Operation]



The "Sweep Speed" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Max", and then press <OK>.

Explanation

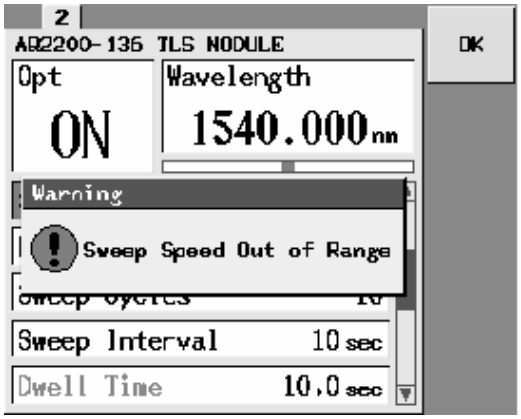
A sweep speed per unit time is set for the sweep speed.

Normally, the sweep speed is set at 50nm/s, that is, the fastest mode.

The sweep speed may depend on the “Step WL” setting.

A sweep speed of “50nm/s” cannot be set for all “Step WL” settings.

The upper limit of each sweep speed is determined from the “Step WL” setting. Therefore, if the sweep speed exceeds the upper limit, the following Warning message will appear.



If the Step wavelength is changed after the sweep speed has been detected automatically, the automatically detected value becomes invalid.

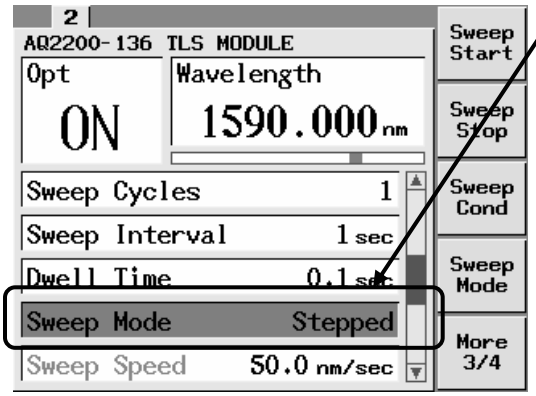
10.1 Starting the Manual Sweep

This manual sweep function moves the wavelength to the next wavelength step with the button operation. This function is convenient to individually evaluate the details at relevant wavelength. First, the operation mode is set to the manual mode (step 1), and then the sweep is performed with the button operation (step 2).

● Step 1 Setting the Operation Mode to “Manual”

Operating Procedures Operation with the [ENTER] Key and Cursor Key

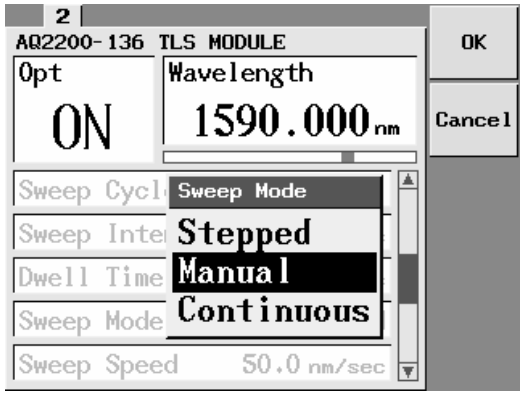
[Operation 1] Select the "Sweep Mode" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Mode", and then press the [ENTER] key.

Press the [ENTER] key.

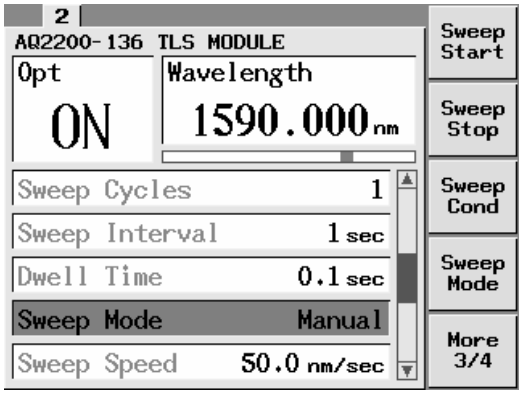
[Operation 2] Select the “Manual” mode.



The "Sweep Mode" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Manual", and then press the [ENTER] key.

Press the [ENTER] key.

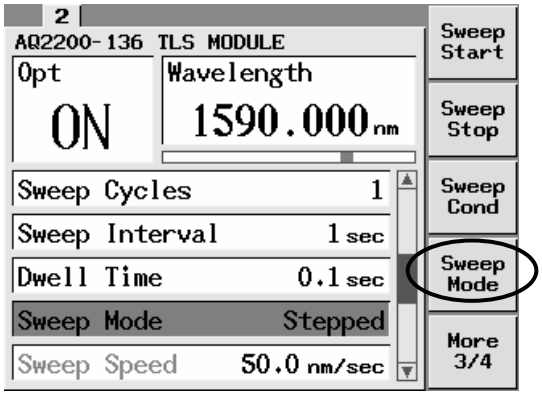
[Completion of Operation]



"Manual" is shown in the "Sweep Mode" field.

Operating Procedures Operation with the Function Key and Cursor Key

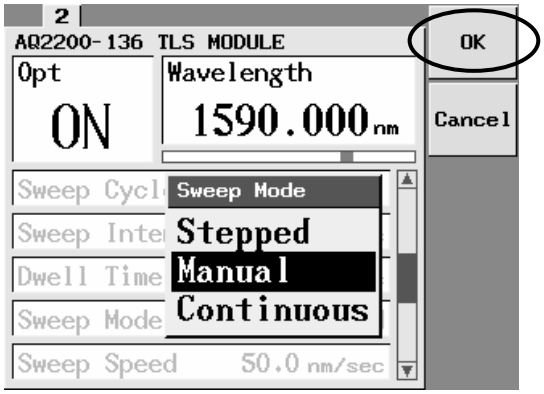
[Operation 1] Select the "Sweep Mode" item.



Press <Sweep Mode>. The "Sweep Mode" popup screen will appear.

Press <Sweep Mode>.

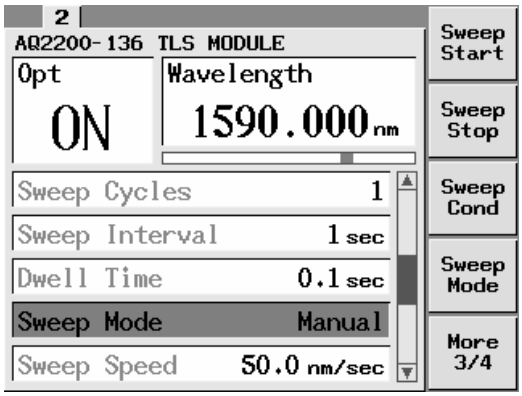
[Operation 2] Select the “Manual” mode.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Manual”, and then press <OK>.

Press <OK>.

[Completion of Operation]

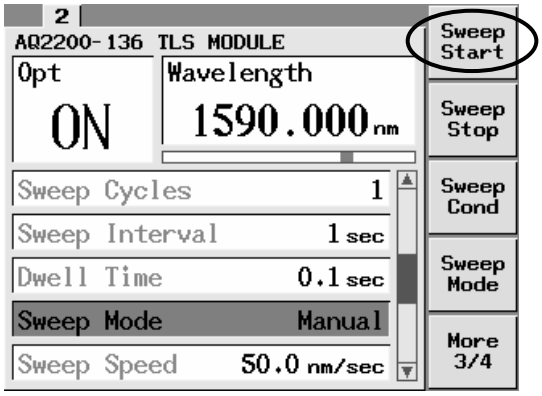


"Manual" is shown in the "Sweep Mode" field.

● Step 2 Starting the Sweep with the Button Operation

Operating Procedures

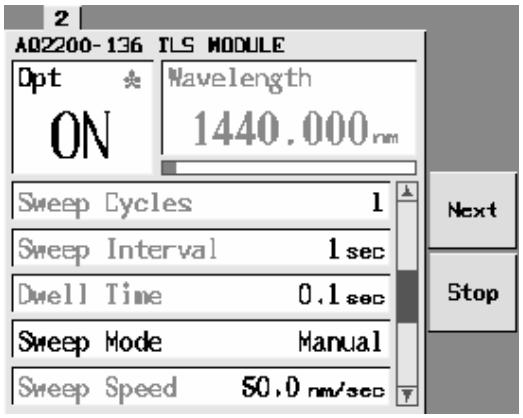
[Operation 1] Start the sweep.



When pressing <Sweep Start>, the sweep is started.

Press <Sweep Start>.

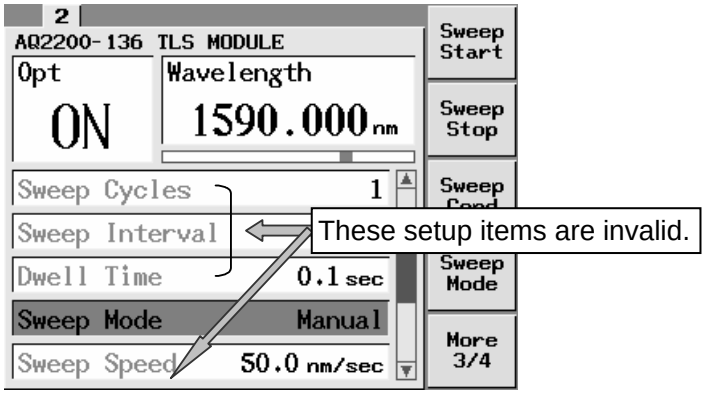
[Operation 2] Output the next wavelength.



When pressing <Next>, the movement to the next wavelength is started. Pressing <Stop> will exit the sweep.

Explanation

The setup items other than valid setup items are dimmed.



10.2 Starting the Step Sweep

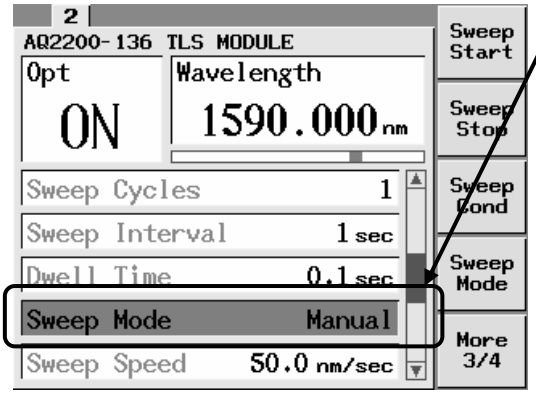
This step sweep function automatically moves the wavelength to the next wavelength after each wavelength has been output for a certain period of time.

First, the operation mode is set to the step mode (step 1), and then the sweep is performed (step 2).

● Step 1 Setting the Operation Mode to “Manual”

Operating Procedures Operation with the [ENTER] Key and Cursor Key

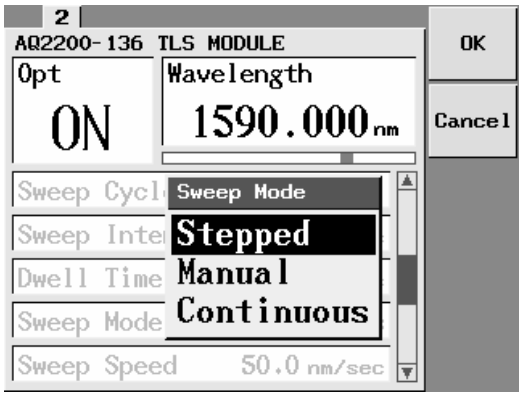
[Operation 1] Select the "Sweep Mode" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Mode", and then press the [ENTER] key.

Press the [ENTER] key.

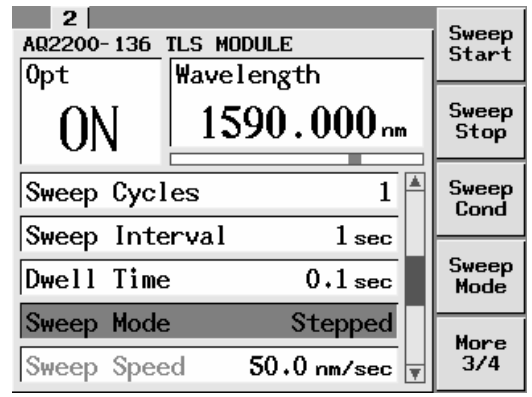
[Operation 2] Select the “Stepped” mode.



The "Sweep Mode" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Stepped”, and then press the [ENTER] key.

Press the [ENTER] key.

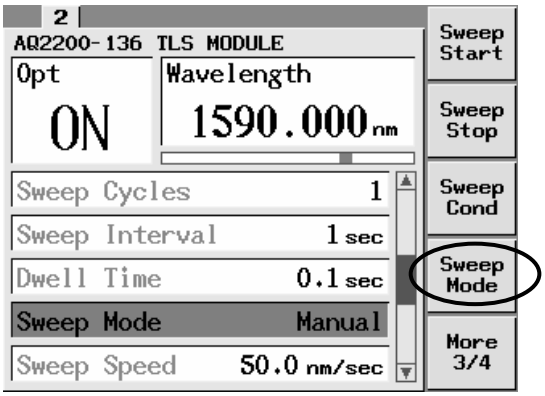
[Completion of Operation]



“Stepped” is shown in the "Sweep Mode" field.

Operating Procedures Operation with the Function Key and Cursor Key

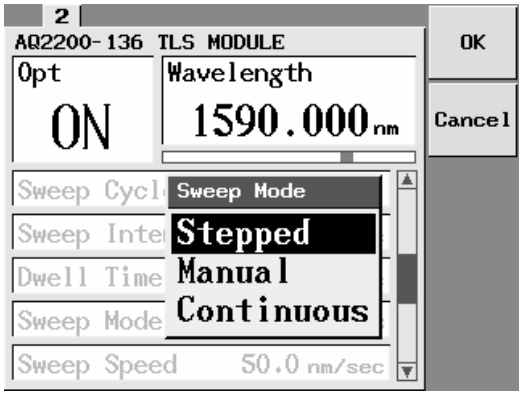
[Operation 1] Select the "Sweep Mode" item.



Press <Sweep Mode>. The "Sweep Mode" popup screen will appear.

Press <Sweep Mode>.

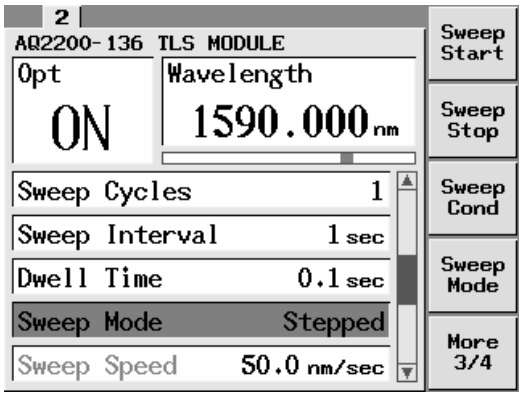
[Operation 2] Select the “Stepped” mode.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Stepped”, and then press <OK>.

Press <OK>.

[Completion of Operation]

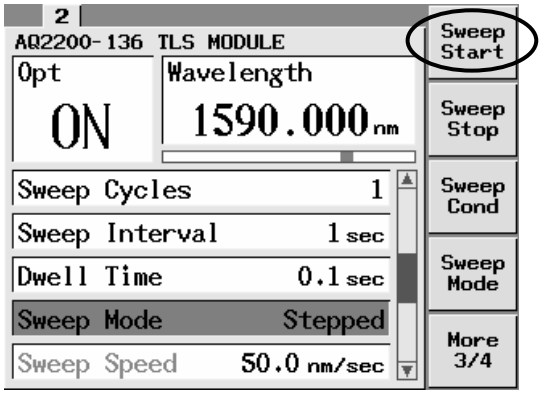


“Stepped” is shown in the "Sweep Mode" field.

● Step 2 Starting the Sweep with the Button Operation

Operating Procedures

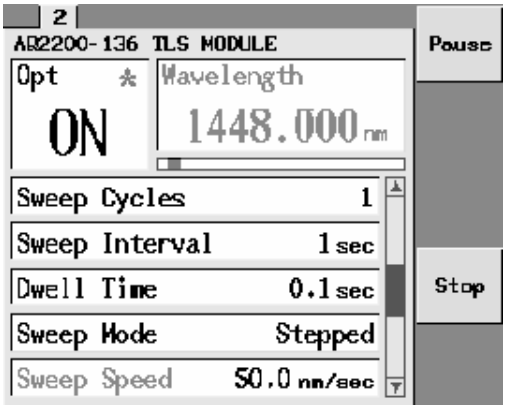
[Operation 1] Start the sweep.



When pressing <Sweep Start>, the sweep is started.

Press <Sweep Start>.

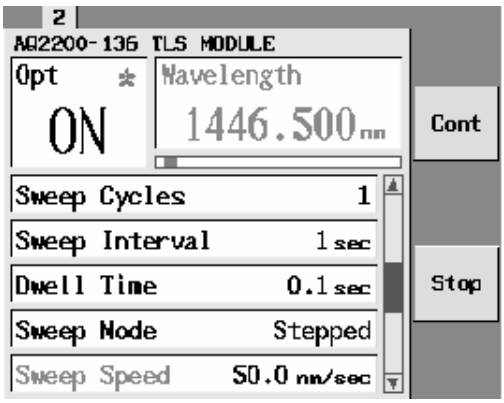
[Operation 2] Stop the sweep temporarily.



When pressing <Pause>, the sweep is stopped temporarily. Pressing <Stop> will exit the sweep.

Press <Pause>...

[Operation 3] Cancel the temporary step of the sweep.



When pressing <Cont>, the temporary stop of the sweep is cancelled. Pressing <Stop> will exit the sweep.

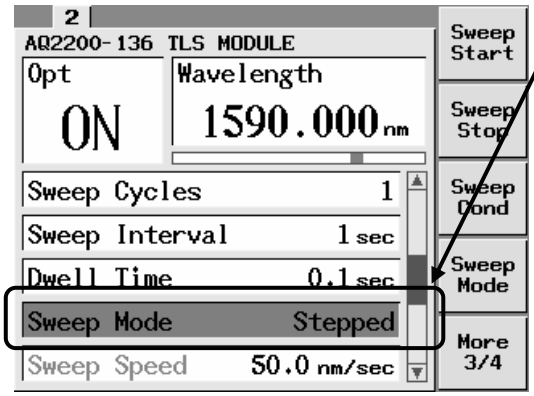
10.3 Starting the Continuous Sweep

This continuous sweep function variably changes the wavelength within the sweep range to continuously output it.

● Step 1 Setting the Operation Mode to “Continuous”

Operating Procedures Operation with the [ENTER] Key and Cursor Key

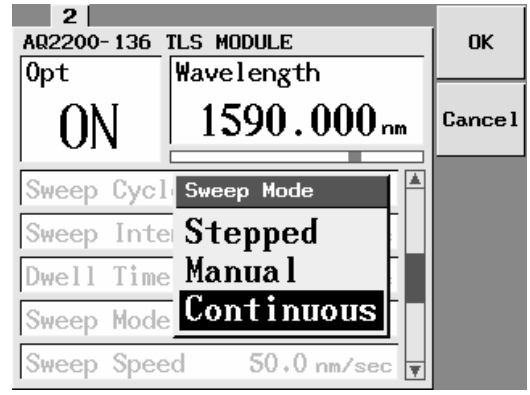
[Operation 1] Select the "Sweep Mode" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Mode", and then press the [ENTER] key.

Press the [ENTER] key.

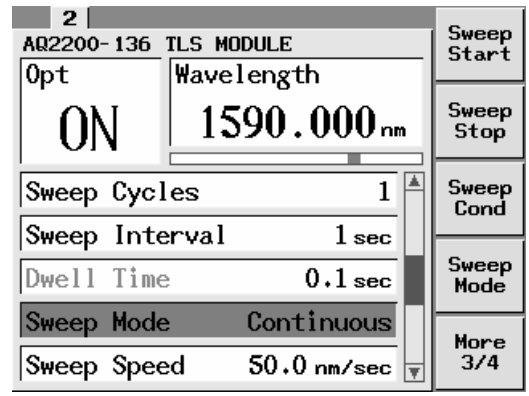
[Operation 2] Select the “Continuous” mode.



The "Sweep Mode" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Continuous”, and then press the [ENTER] key.

Press the [ENTER] key.

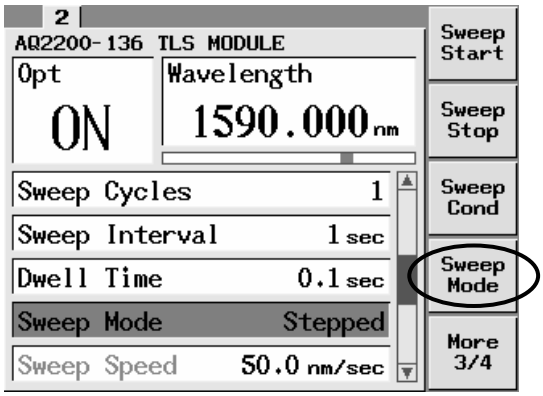
[Completion of Operation]



“Continuous” is shown in the "Sweep Mode" field.

Operating Procedures Operation with the Function Key and Cursor Key

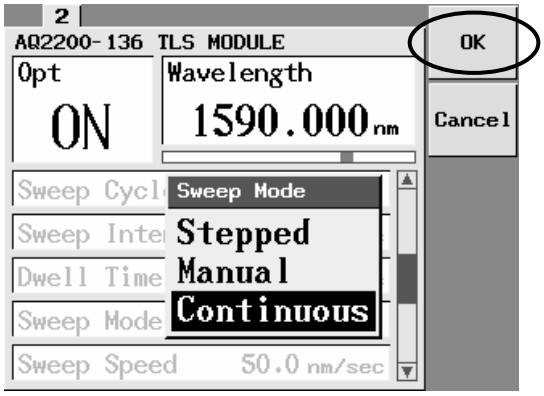
[Operation 1] Select the "Sweep Mode" item.



Press <Sweep Mode>. The "Sweep Mode" popup screen will appear.

Press <Sweep Mode>.

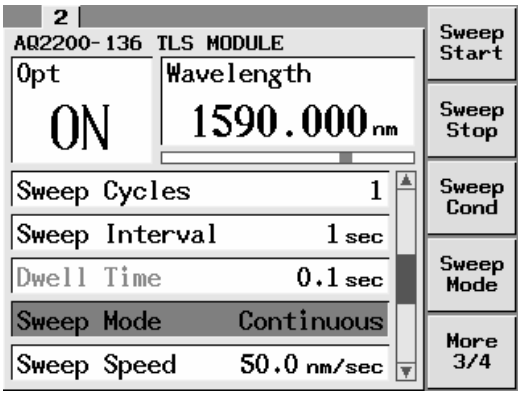
[Operation 2] Select the “Continuous” mode.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Continuous”, and then press <OK>.

Press <OK>.

[Completion of Operation]

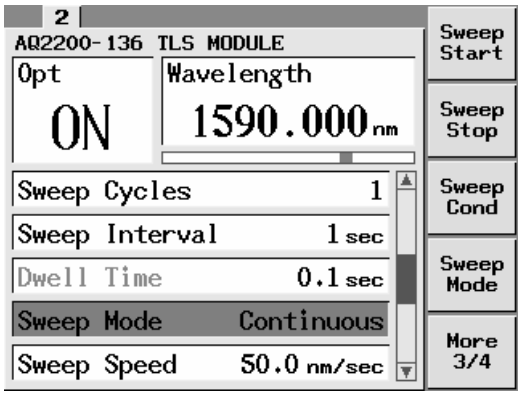


“Continuous” is shown in the "Sweep Mode" field.

● Step 2 Starting the Sweep with the Button Operation

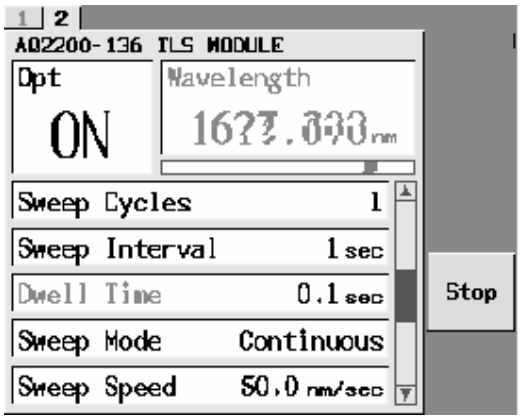
Operating Procedures

[Operation 1] Start the sweep.



When pressing <Sweep Start>, the sweep is started.

Press <Sweep Start>.



Pressing <Stop> will exit the sweep.

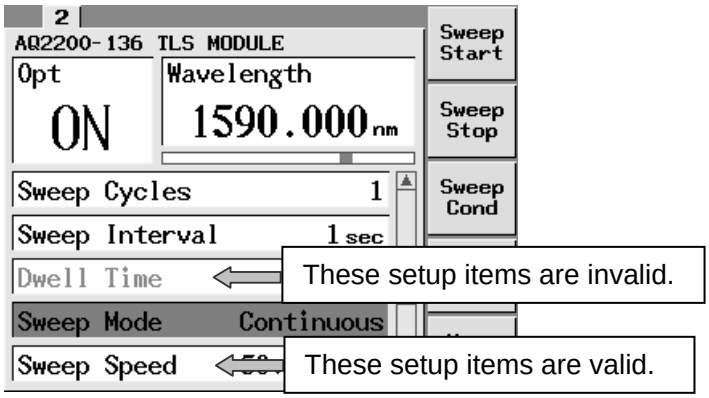
Explanation

The following Table shows the valid setup items in each Sweep Mode.

○: Valid, ×: Invalid

	Manual Sweep	Stepped Sweep	Continuous Sweep
Start WL	○	○	○
Stop WL	○	○	○
Step WL	○	○	○
Sweep Cycle	×	○	○
Sweep Interval	×	○	○
Dwell Time	×	○	×
Sweep Speed	×	×	○

The setup items other than valid setup items are dimmed.



10.4 Starting the Trigger Sweep

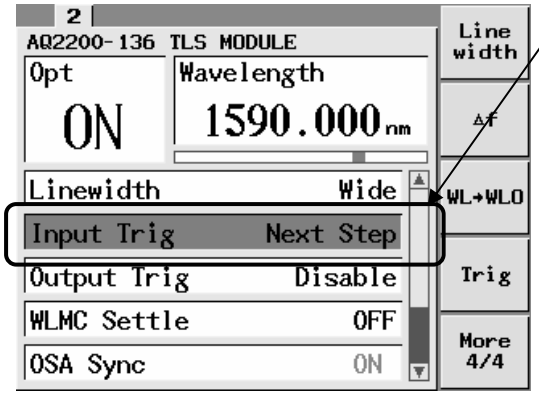
Three kinds of trigger modes are provided and an optimal trigger mode can be selected. The operation described in section 3.2 uses the internal trigger (mode, in which the input trigger is not used). If it is necessary to establish the synchronization with the external unit, the trigger, which is input externally, is used.

- Mode without use of input trigger
- Mode, in which the sweep is started with the input trigger
- Mode, in which the step sweep is started with the input trigger

● Mode without Use of Input Trigger

Operating Procedures Operation with the [ENTER] Key and Cursor Key

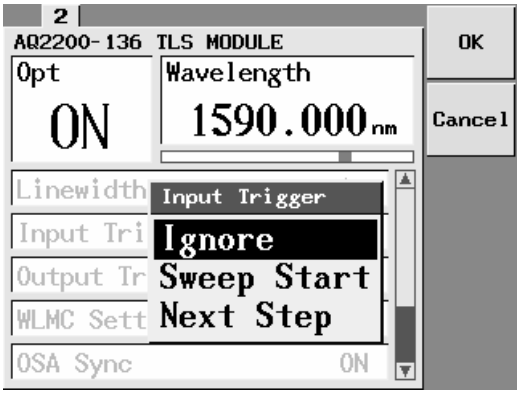
[Operation 1] Select the "Input Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Input Trig", and then press the [ENTER] key.

Press the [ENTER] key.

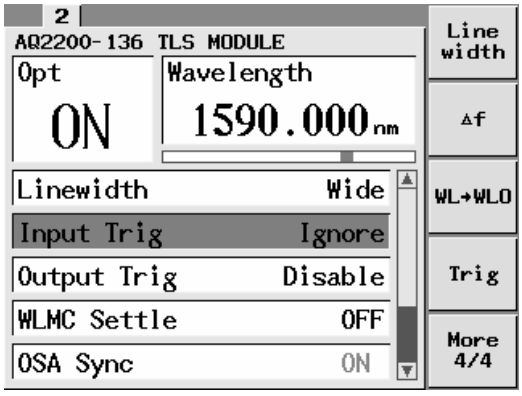
[Operation 2] Select a desired trigger operation.



The "Input Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Ignore", and then press the [ENTER] key.

Press the [ENTER] key.

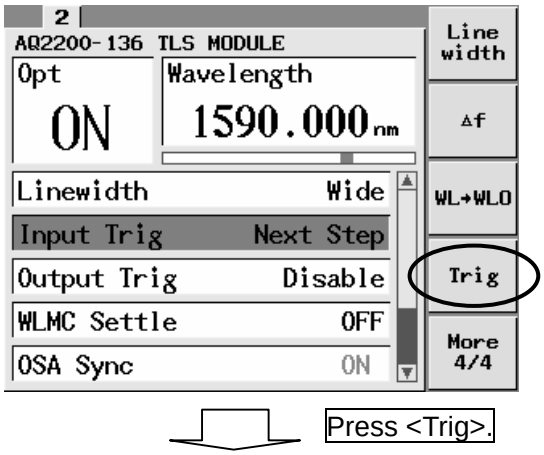
[Completion of Operation]



"Ignore" is shown in the "Input Trig" field.

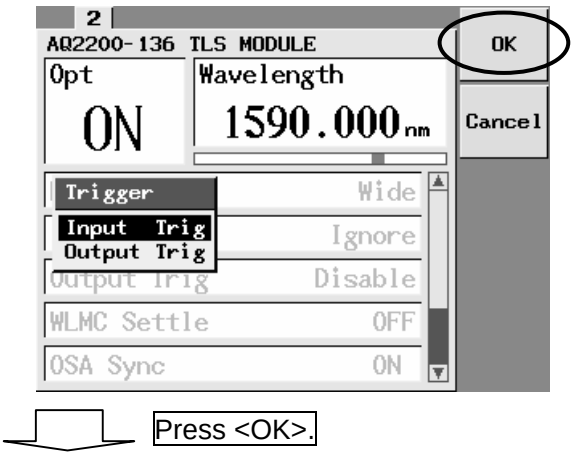
Operating Procedures Operation with the Function Key and Cursor Key

[Operation 1] Select the "Trig" item.



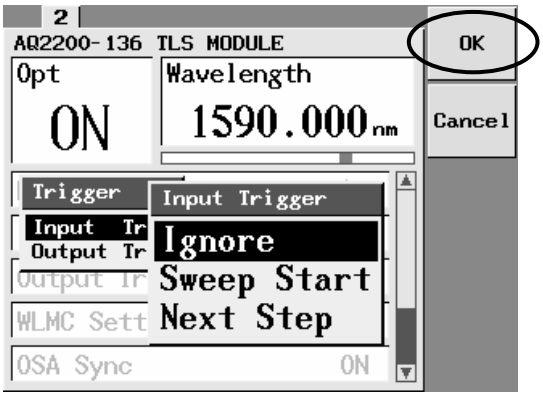
Press <Trig>. The "Trig" popup screen will appear.

[Operation 2] Select the “Input Trig” item.

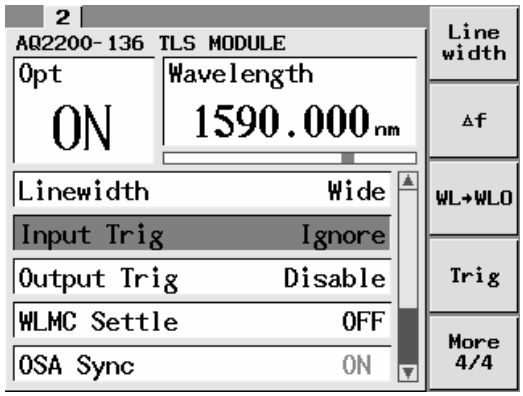


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Input Trig”, and then press <OK>.

[Operation 3] Set “Input Trigger Ignore”.



[Completion of Operation]

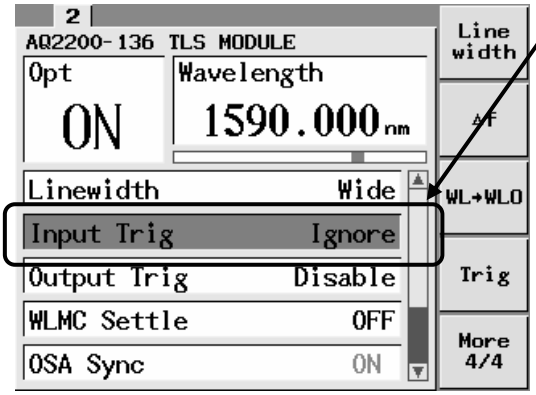


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Ignore”, and then press <OK>. "Ignore", which you have set, is shown in the "Input Trig" field.

● Mode, in which the Sweep Is Started with the Input Trigger

Operating Procedures Operation with the [ENTER] Key and Cursor Key

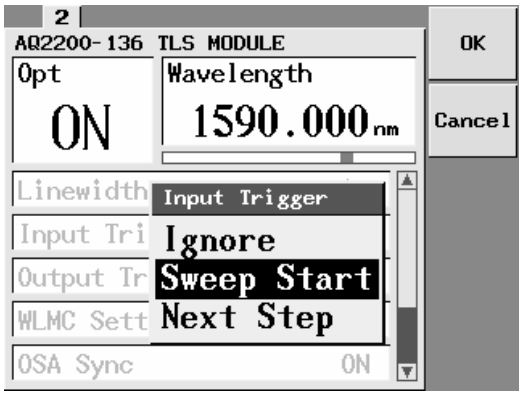
[Operation 1] Select the "Input Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Input Trig", and then press the [ENTER] key.

Press the [ENTER] key.

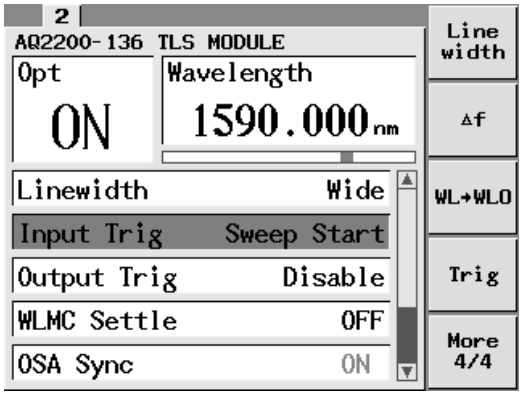
[Operation 2] Select a desired trigger operation.



The "Input Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Start", and then press the [ENTER] key.

Press the [ENTER] key.

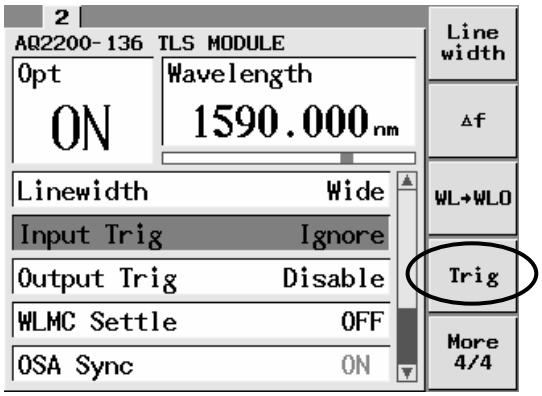
[Completion of Operation]



"Sweep Start", which you have set, is shown in the "Input Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

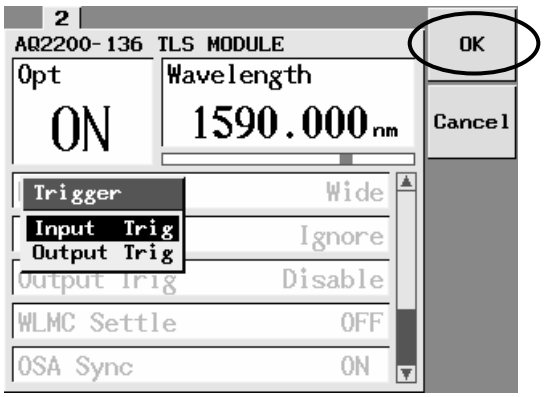
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

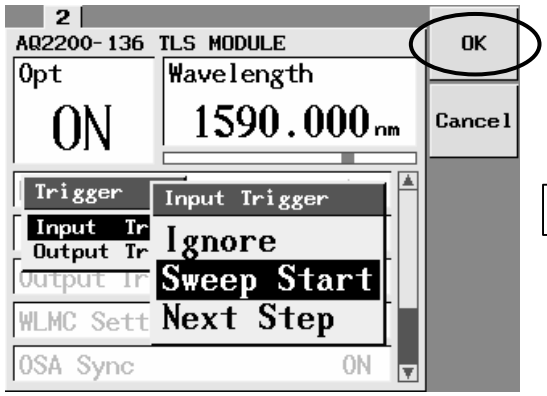
[Operation 2] Select the “Input Trig” item.



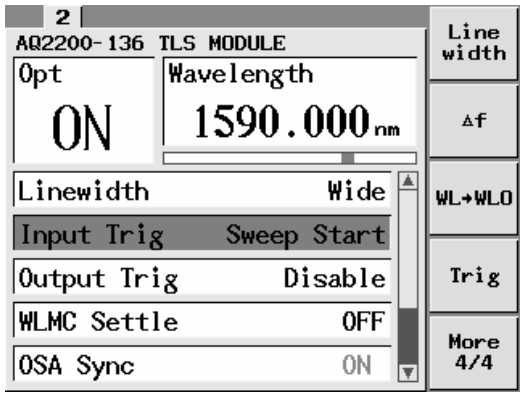
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Input Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired trigger operation.



[Completion of Operation]

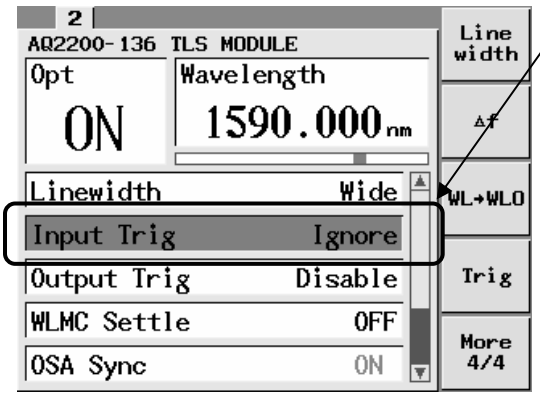


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Sweep Start”, and then press <OK>. “Sweep Start”, which you have set, is shown in the "Input Trig" field.

● Mode, in which the Step Sweep Is Started with the Input Trigger

Operating Procedures Operation with the [ENTER] Key and Cursor Key

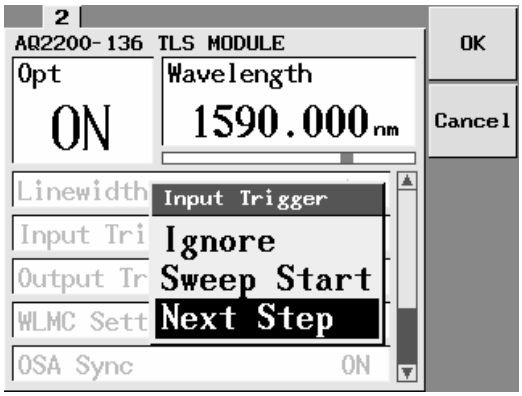
[Operation 1] Select the "Input Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Input Trig", and then press the [ENTER] key.

Press the [ENTER] key.

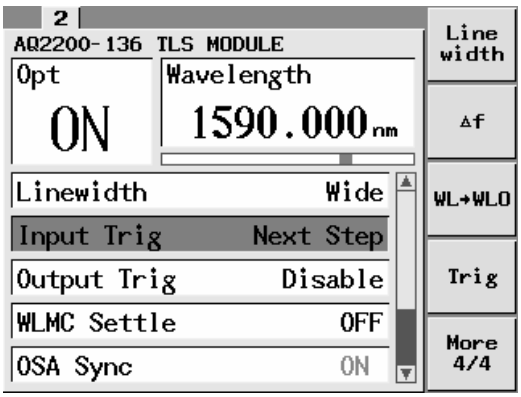
[Operation 2] Select a desired trigger operation.



The "Input Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Next Step", and then press the [ENTER] key.

Press the [ENTER] key.

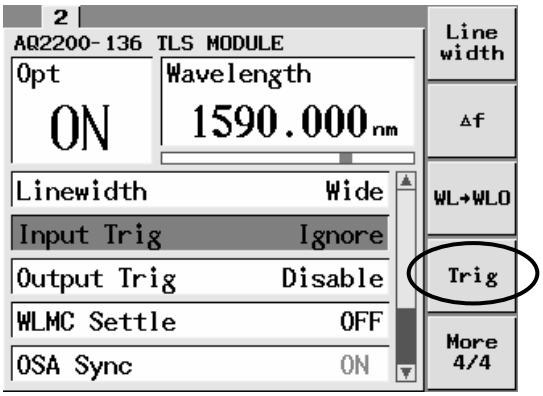
[Completion of Operation]



"Next Step", which you have set, is shown in the "Input Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

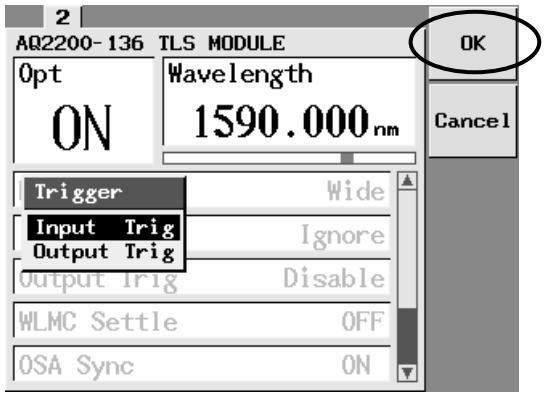
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

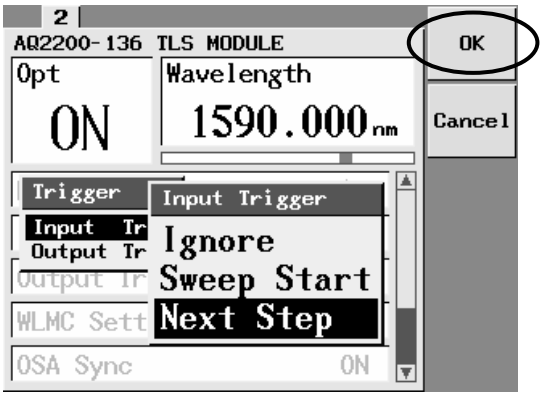
[Operation 2] Select the “Input Trig” item.



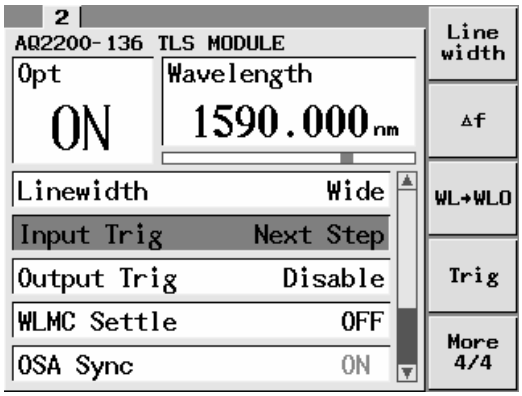
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Input Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Set a desired trigger operation.



[Completion of Operation]



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Next Step”, and then press <OK>. “Next Step”, which you have set, is shown in the "Input Trig" field.

Explanation

Valid Input Trigger Modes During Sweep Measurement

	Manual Sweep	Stepped Sweep	Continuous Sweep
Ignore	○	○	○
Sweep Start	○	○	○
Next Step	○	○	* Note 1

Note 1: Next step is ignored when setting the mode from other sweep mode to the Continuous Sweep mode.

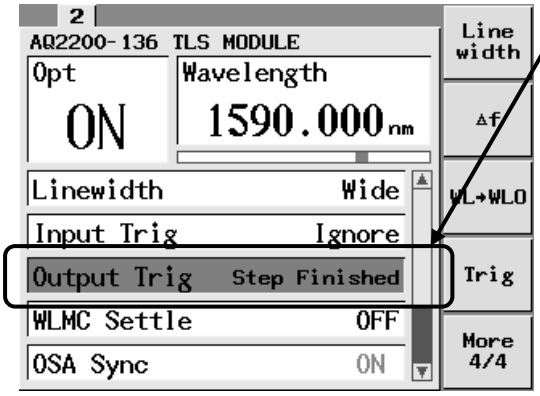
11.1 Making the Trigger Output Disabled

The trigger can be output to the outside every time the sweep conditions, which have been specified, are executed. There are four conditions shown below.

"**Making the trigger output disabled**", "**Outputting the trigger at measurement intervals**", "**Outputting the trigger after completion of the sweep**", "**Outputting the trigger after starting of the sweep**". This section describes how to make the setting so that the trigger output is disabled.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

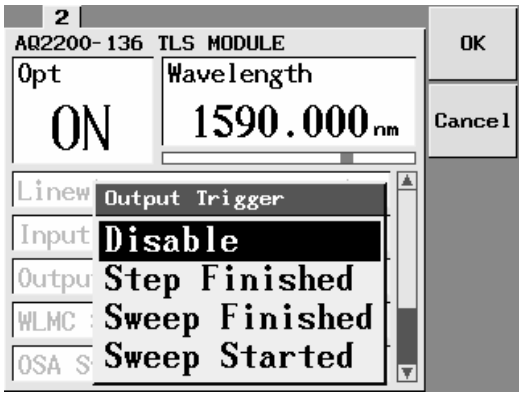
[Operation 1] Select the "Output Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Output Trig", and then press the [ENTER] key.

Press the [ENTER] key.

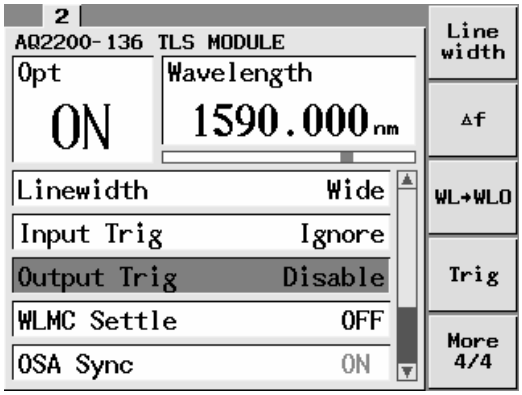
[Operation 2] Select a desired trigger output operation.



The "Output Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Disable", and then press the [ENTER] key.

Press the [ENTER] key.

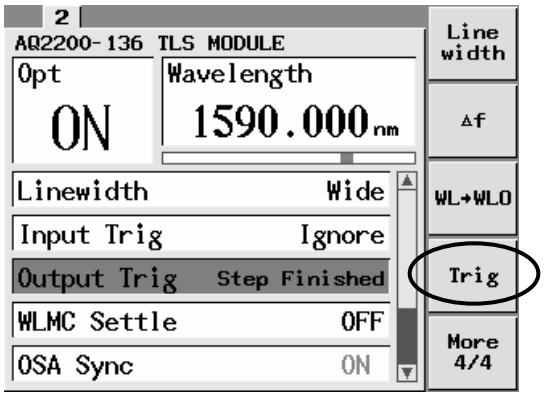
[Completion of Operation]



"Ignore" is shown in the "Output Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

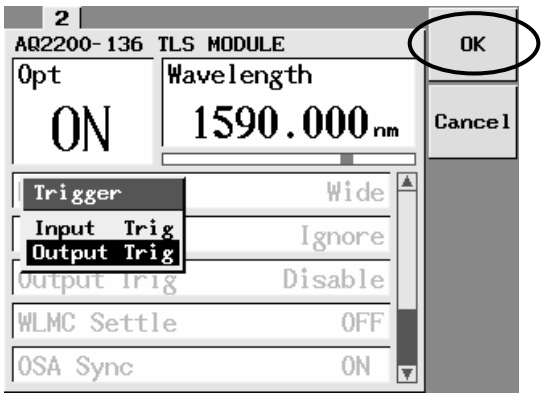
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

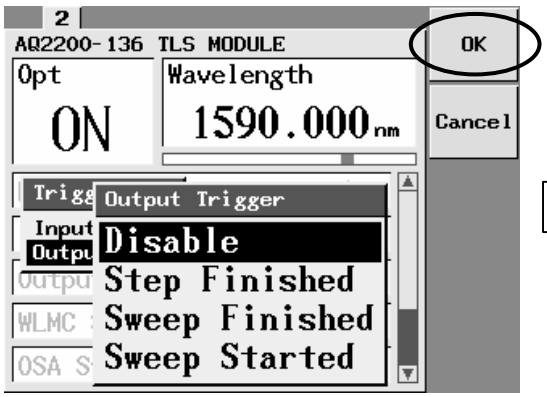
[Operation 2] Select the “Output Trig” item.



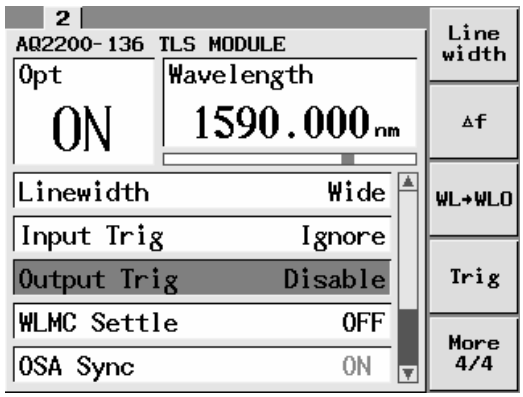
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Output Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Set “Output Trigger Disable”.



[Completion of Operation]



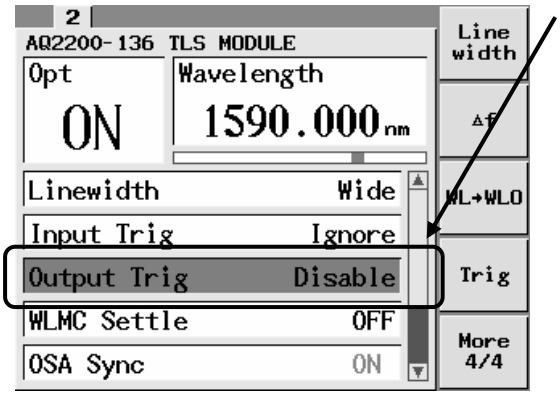
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Disable", and then press <OK>. "Disable", which you have set, is shown in the "Output Trig" field.

11.2 Outputting the Trigger at Measurement Intervals

This section describes how to set the measurement interval (step).

Operating Procedures Operation with the [ENTER] Key and Cursor Key

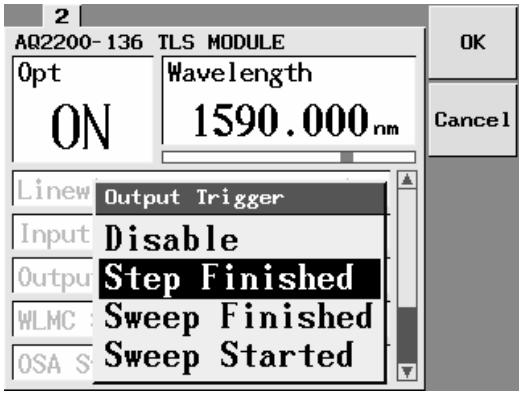
[Operation 1] Select the "Output Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Output Trig", and then press the [ENTER] key.

Press the [ENTER] key.

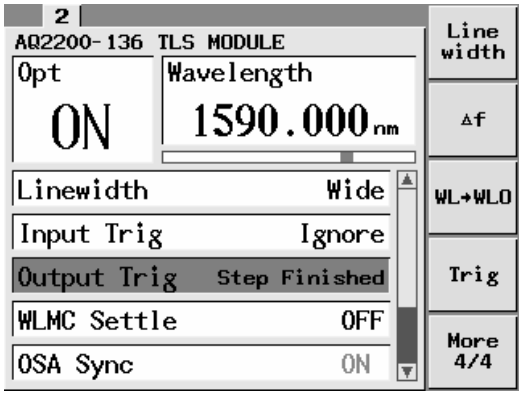
[Operation 2] Select a desired trigger output operation.



The "Output Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Step Finished", and then press the [ENTER] key.

Press the [ENTER] key.

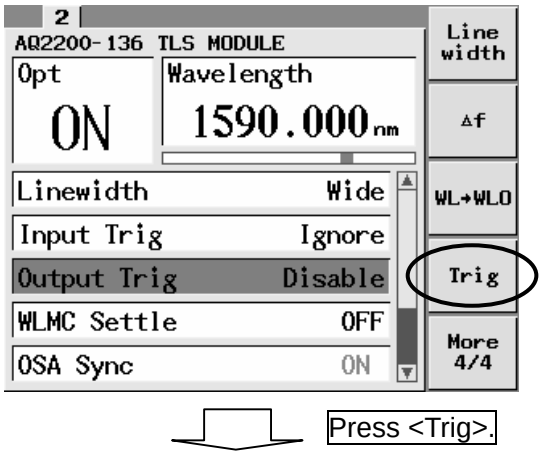
[Completion of Operation]



"Step Finished" is shown in the "Output Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

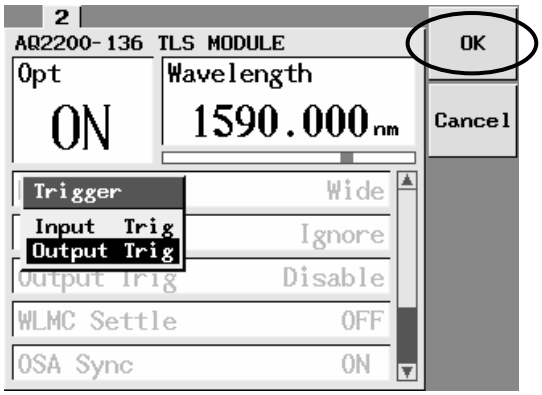
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

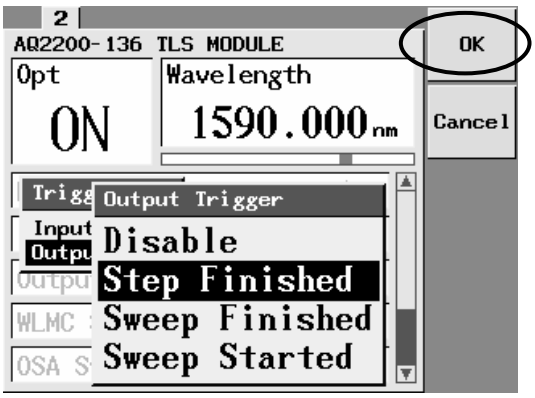
[Operation 2] Select the “Output Trig” item.



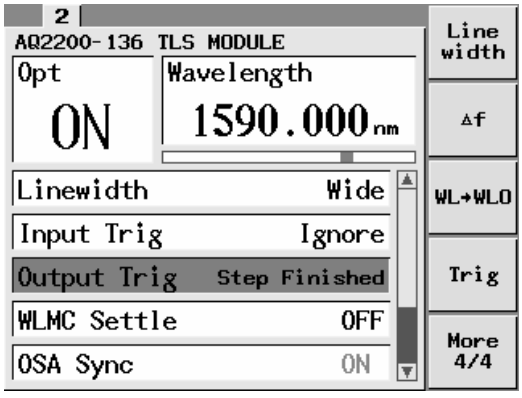
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Output Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Set the output at measurement intervals.



[Completion of Operation]



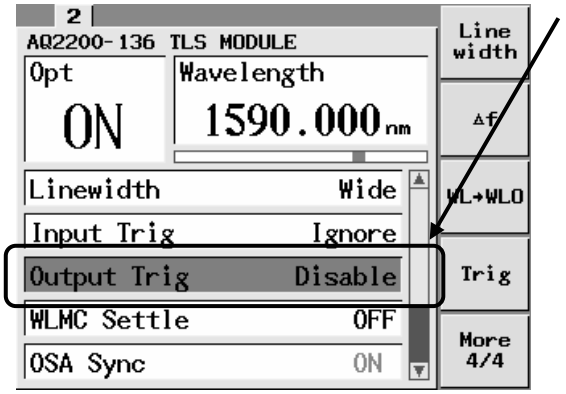
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Step Finished", and then press <OK>. "Step Finished", which you have set, is shown in the "Output Trig" field.

11.3 Outputting the Trigger after Completion of the Sweep

This section describes how to make the setting so that the trigger is output after completion of the sweep.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

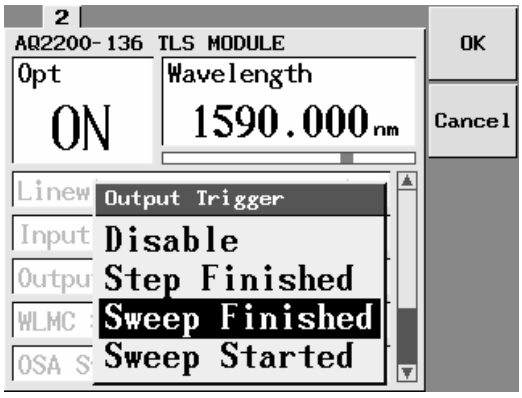
[Operation 1] Select the "Output Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Output Trig", and then press the [ENTER] key.

Press the [ENTER] key.

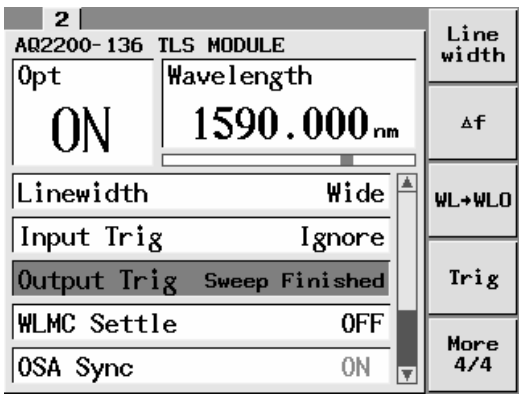
[Operation 2] Select a desired trigger output operation.



The "Output Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Finished", and then press the [ENTER] key.

Press the [ENTER] key.

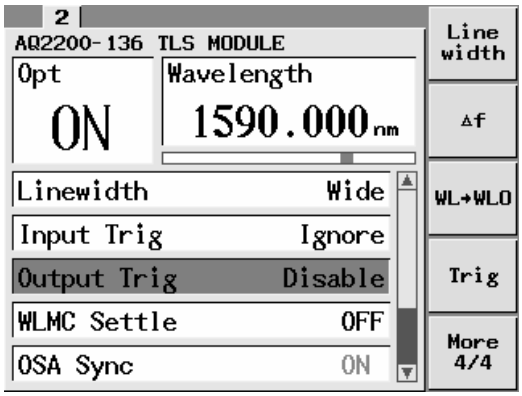
[Completion of Operation]



"Sweep Finished" is shown in the "Output Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

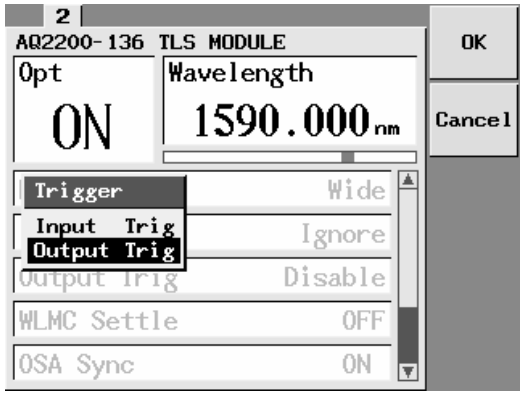
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

[Operation 2] Select the “Output Trig” item.

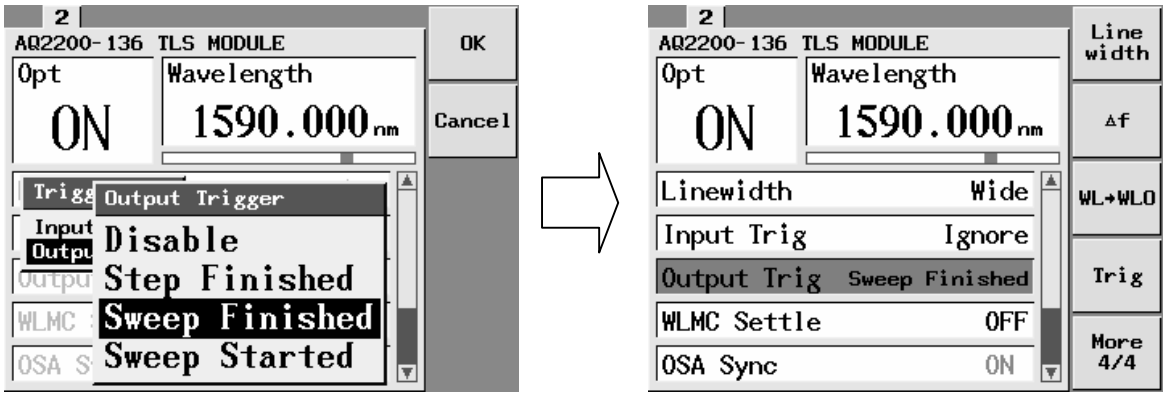


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Output Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Make the setting to output the trigger after completion of the sweep.

[Completion of Operation]



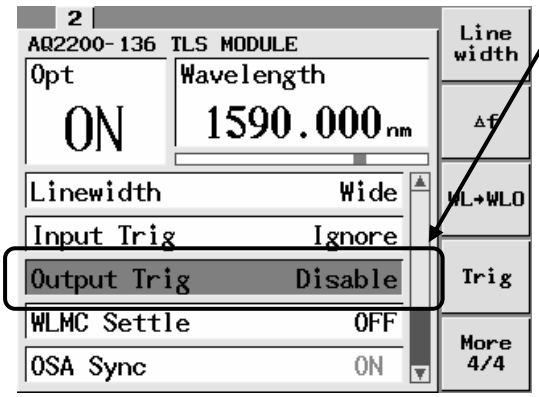
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Finished", and then press <OK>. "Sweep Finished", which you have set, is shown in the "Output Trig" field.

11.4 Outputting the Trigger after Starting of the Sweep

This section describes how to make the setting so that the trigger is output after starting of the sweep.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

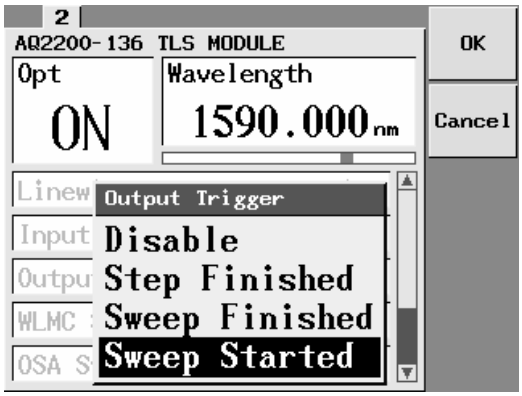
[Operation 1] Select the "Output Trig" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "Output Trig", and then press the [ENTER] key.

Press the [ENTER] key.

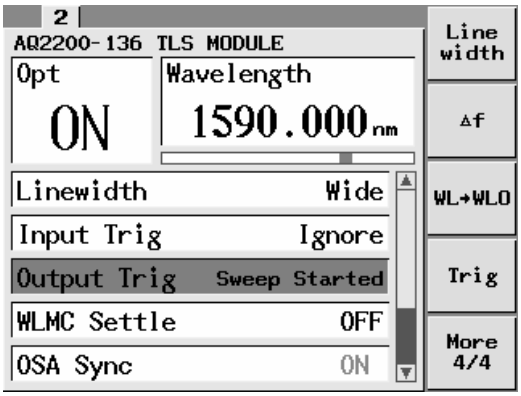
[Operation 2] Select a desired trigger output operation.



The "Output Trigger" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Started", and then press the [ENTER] key.

Press the [ENTER] key.

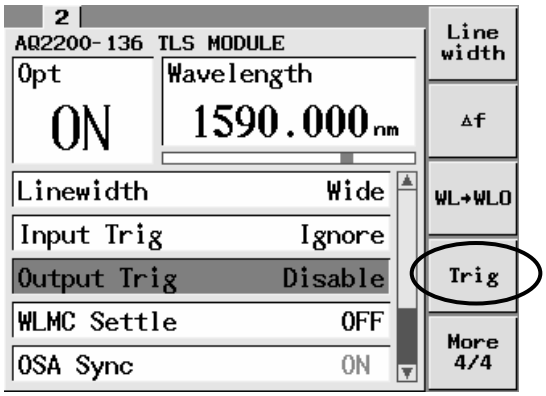
[Completion of Operation]



"Sweep Started" is shown in the "Output Trig" field.

Operating Procedures Operation with the Function Key and Cursor Key

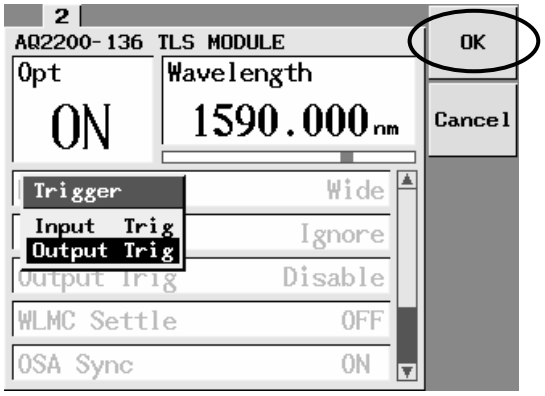
[Operation 1] Select the "Trig" item.



Press <Trig>. The "Trigger" popup screen will appear.

Press <Trig>.

[Operation 2] Select the “Output Trig” item.

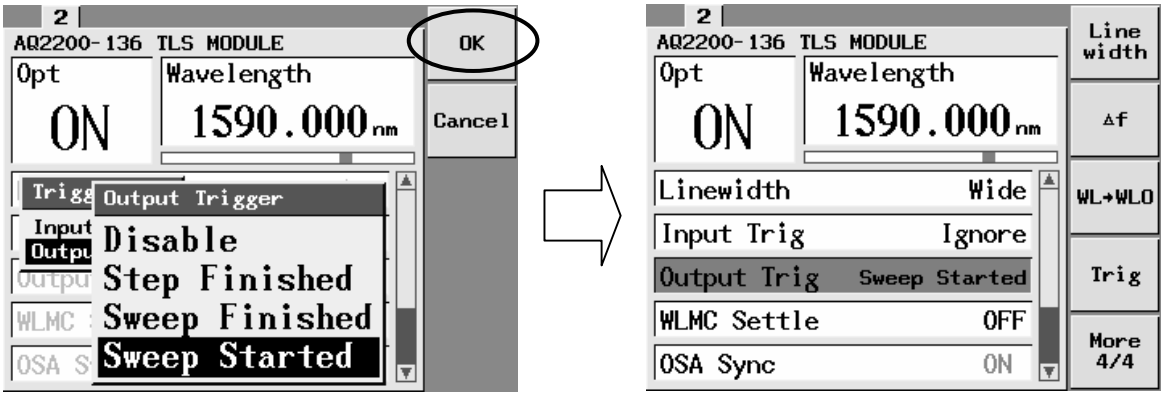


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Output Trig”, and then press <OK>.

Press <OK>.

[Operation 3] Make the setting to output the trigger after starting of the sweep.

[Completion of Operation]



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "Sweep Started", and then press <OK>. "Sweep Started", which you have set, is shown in the "Output Trig" field.

Explanation

- Disable

  Making the trigger output disabled (Default setting)

- Step-Finished

  Outputting the trigger at measurement intervals

- Sweep-Finished

  Outputting the trigger after completion of the sweep

- Sweep-Started

  Outputting the trigger after starting of the sweep

Valid output trigger modes during sweep measurement

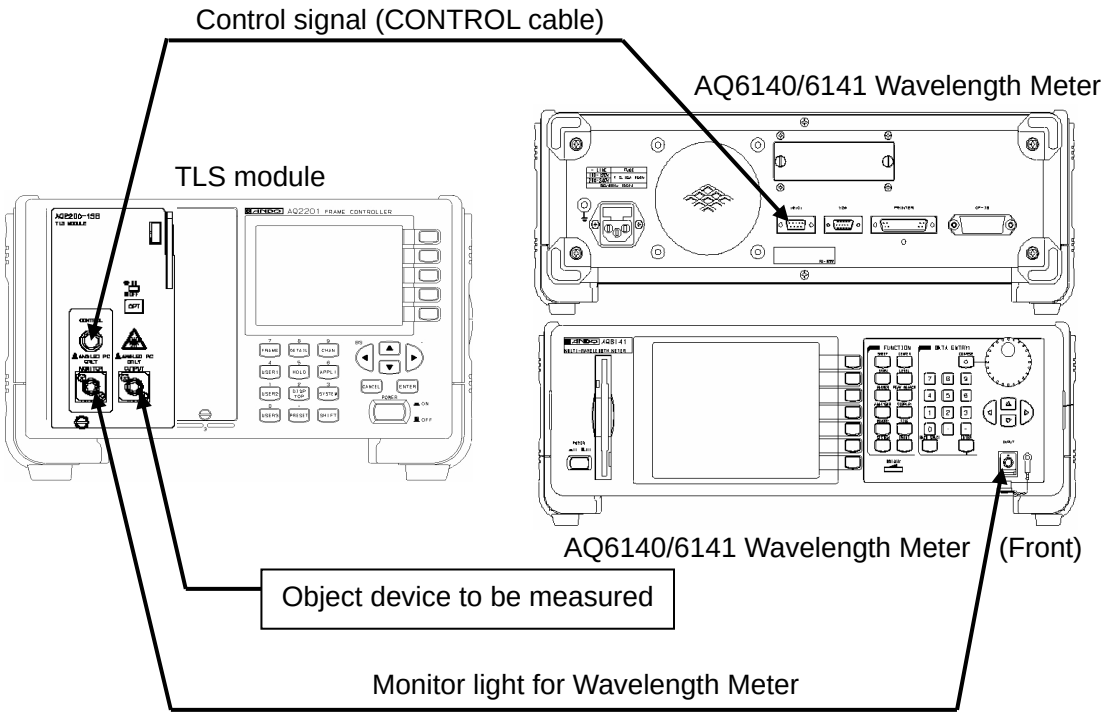
	Manual Sweep	Stepped Sweep	Continuous Sweep
Disable	○	○	○
Step Finished	○	○	○
Sweep Finished	○	○	○
Sweep Started	○	○	○

12.1 Increasing the Wavelength Accuracy by Combining with the AQ6140/6141 Wavelength Meter

This section describes how to make the setting when this unit is connected to the Wavelength Meter.

- Required Units and Devices
  - AQ6140/6141 Wavelength Meter
  - Special cable for remote control (accessory of this unit)
  - Optical fiber for monitor output (Angled PC-FC)

- Connections with the AQ6140/6141



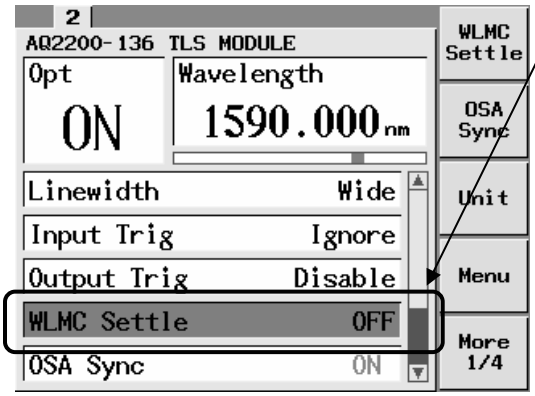
The above Fig. shows the connections.

Control signal (CONTROL cable): Remote control cable is connected to the AQ2200-136 and AQ6140/6141.

Monitor light for Wavelength Meter: Monitor output optical fiber is connected to the AQ2200-136 and AQ6140/6141.

Operating Procedures Operation with the [ENTER] Key and Cursor Key

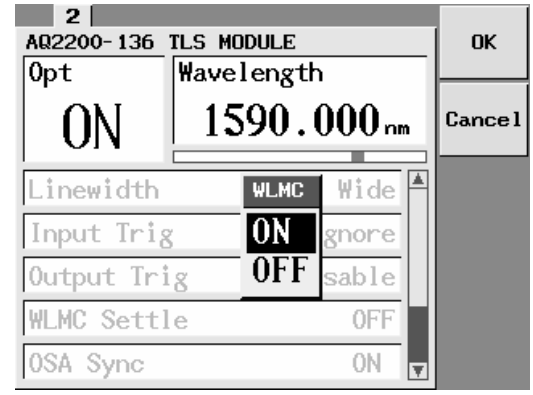
[Operation 1] Select the "WLMC Settle" item.



Scroll the screen display with the [▲] or [▼] cursor key to move the cursor to "WLMC Settle", and then press the [ENTER] key.

Press the [ENTER] key.

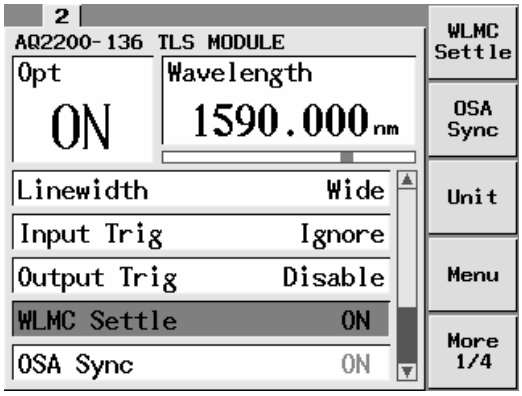
[Operation 2] Set to ON.



The "WLMC" popup screen will appear. Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press the [ENTER] key.

Press the [ENTER] key.

[Completion of Operation]

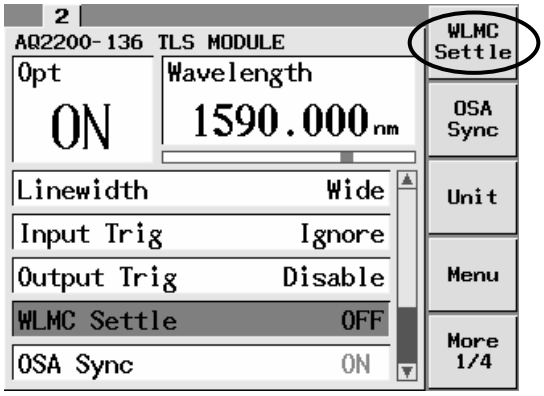


"ON" is shown in the "WLMC Settle" field.

When setting the wavelength after completion of the above operation, the wavelength convergence function becomes valid.

Operating Procedures Operation with the Function Key and Cursor Key

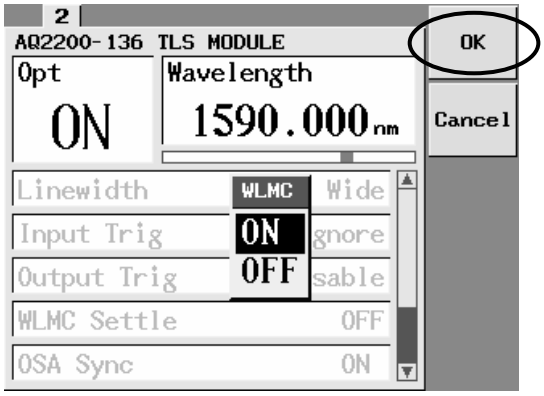
[Operation 1] Select the "WLMC Settle" item.



Press <WLMC Settle>. The "WLMC Settle" popup screen will appear.

Press <WLMC Settle>.

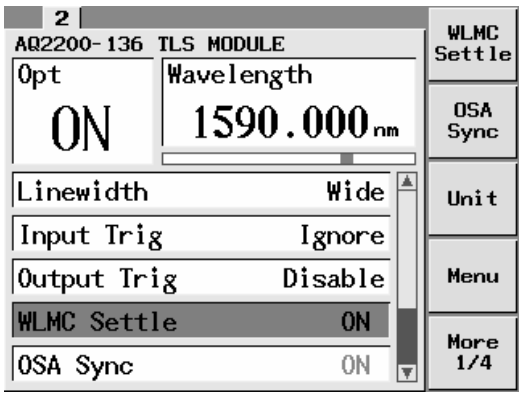
[Operation 2] Set to ON.



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "ON", and then press <OK>.

Press <OK>.

[Completion of Operation]



"ON" is shown in the "WLMC Settle" field.

Explanation

The settling wavelength function calibrates the wavelength with high wavelength accuracy by monitoring the wavelength of the AQ2200-136 with the AQ6140/6141 Wavelength Meter. Additionally, since connectors for the special monitor output to the Wavelength Meter and Wavelength Meter control are provided on the front panel, the variable change wavelength light source having high wavelength accuracy is constructed only with this unit and AQ6140/AQ6141, and without use of external personal computer.

Note

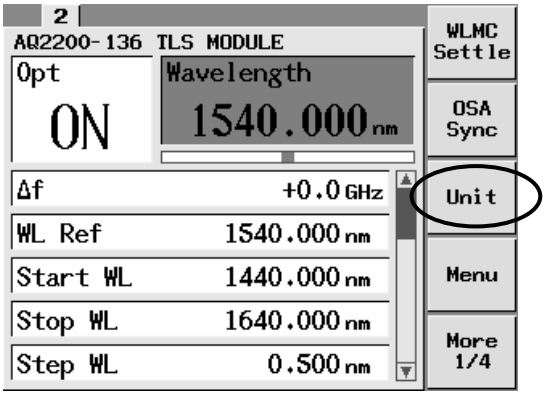
- The wavelength accuracy may depend on the accuracy of the Wavelength Meter to be used.
- The Continuous-Sweep function cannot be executed while the wavelength convergence function is running.
- Only the AQ6140/AQ6141 can be used for the Wavelength Meter when using this function.
- The settling time of one wavelength is approximately 4 to 5s.
- When the wavelength cannot be converged within 20 cycles, relevant error is shown and the settling function is aborted.
- If the "WLMC Settle" was turned ON once, the Wavelength Meter stays under remote control even if you turn OFF the "WLMC Settle". To cancel this remote-controlled status, it is necessary to operate the Wavelength Meter. For details, see the User's Manual of the Wavelength Meter.

13.1 Changing the Wavelength Display Unit

Either "Wavelength" [nm] or "Frequency" [THz] can be selected for the display unit. This section describes how to change the display unit from "Wavelength" (wavelength) to "Frequency" (frequency).

Operating Procedures

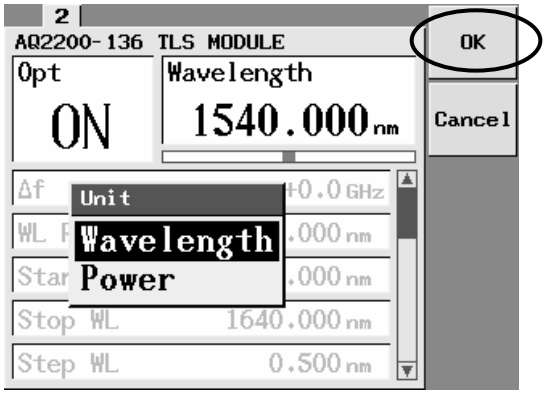
[Operation 1] Select the "Unit" item.



Press <Unit>. The "Unit" popup screen will appear.

Press <Unit>.

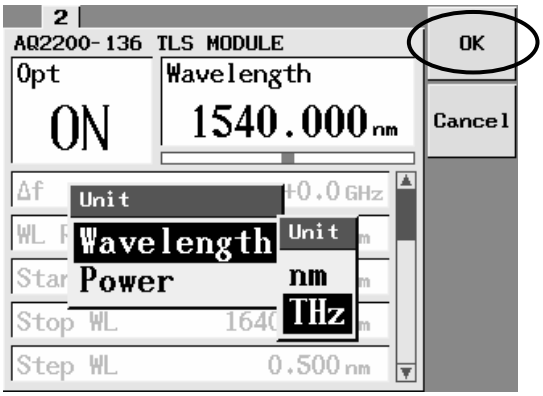
[Operation 2] Select the “Wavelength” display item.



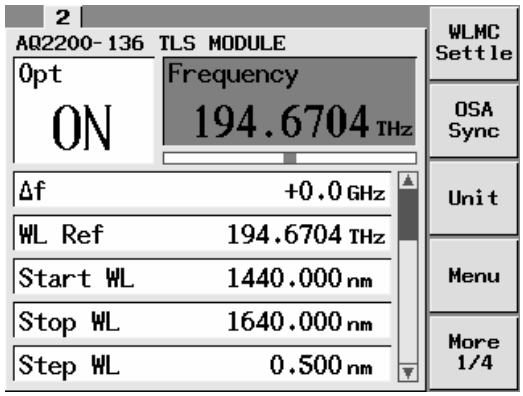
Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Wavelength”, and then press the <OK> or [ENTER] key. The "Unit" popup screen will appear.

Press the [ENTER] key, or press <OK>.

[Operation 3] Select a desired unit.



[Completion of operation]



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "nm" or "THz", and then press the <OK> or [ENTER] key. The "Wavelength" display will change to "Frequency".

Explanation

It is possible to switch the display between the wavelength display and frequency display.

The wavelength and frequency are calculated from the following formula.

$\lambda display\ (nm) \times 10^{-9} = C / (fdisplay\ (THz) \times 10^{12})$

$\lambda display$: Display wavelength (nm)

fdisplay: Display frequency (THz)

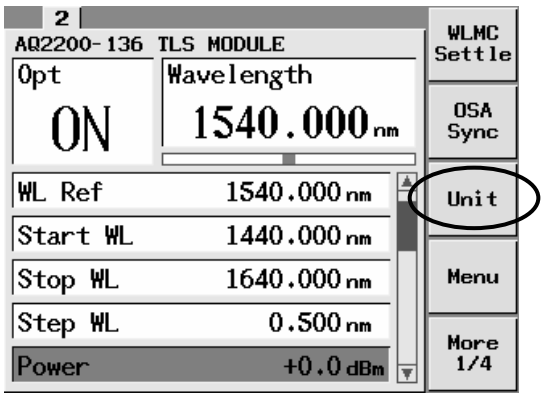
C: Light velocity in vacuum (2.99792458×10^{8} m/s)

13.2 Changing the Power Display Unit

Either [dBm] or [W] can be selected for the wavelength display unit of "Power". This section describes how to change the power display unit.

Operating Procedures

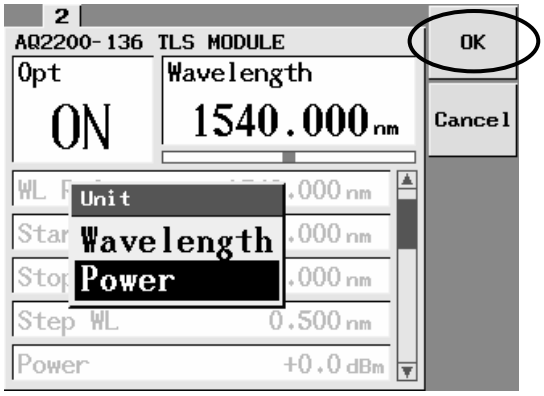
[Operation 1] Select the "Unit" item.



Press <Unit>. The "Unit" popup screen will appear.

Press <Unit>.

[Operation 2] Select the “Power” display item.

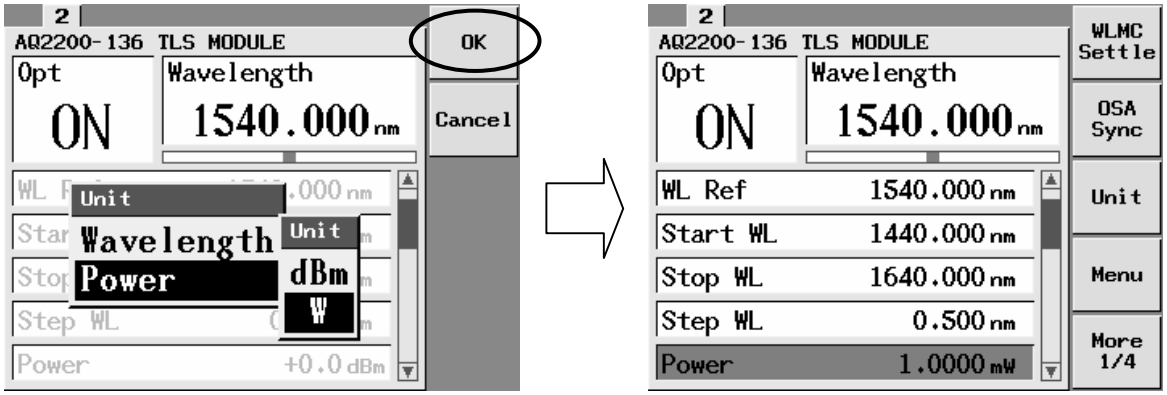


Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to “Power”, and then press the <OK> or [ENTER] key. The "Unit" popup screen will appear.

Press the [ENTER] key, or press <OK>.

[Operation 3] Select a desired unit.

[Completion of operation]



Scroll the popup screen display with the [▲] or [▼] cursor key to move the cursor to "dBm" or "W", and then press the <OK> or [ENTER] key. The unit for "Power" display will change.

Explanation

It is possible to switch the display between the dBm display and W display.
The wavelength and frequency are calculated from the following formula.

PdBm = 10logPw

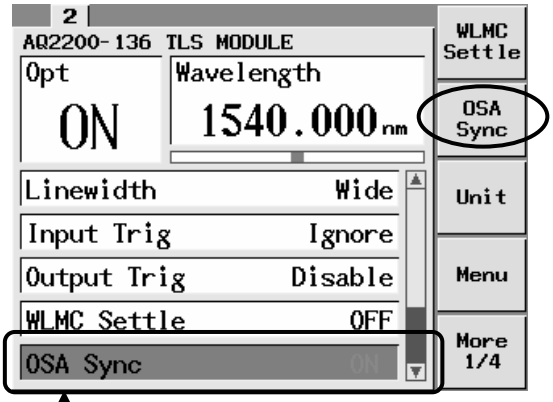
Pw: Optical power (mW)

PdBm: Optical power (dBm)

13.3 Synchronous Sweep with AQ6317B/C Optical Spectrum Analyzer

By combining this unit with the AQ6317B/C Optical Spectrum Analyzer, the synchronous sweep measurement can be performed. This section describes how to set the synchronous sweep measurement. The wavelength for the synchronous sweep of this unit and optical spectrum analyzer is 1440 to 1640nm. In this measurement system, points where cannot be measured correctly due to effects of the humidity exist close to the short wavelength (1440 to 1510nm) of the allowable sweep range.
The cause of this trouble is that the atmospheric moisture content existing on the optical path inside the optical spectrum analyzer absorbs the light to be measured. The measurement value is changed by the atmospheric status and/or wavelength reproducibility of the measurement system every time the measurement is performed. Additionally, since the optical path of the optical spectrum analyzer is longer than that of the optical power meter due to its measuring principle, the humidity may adversely affect the optical spectrum analyzer easily.
To improve this effect, it is necessary to control the humidity around the optical spectrum analyzer.

Operating Procedures



When mounting this unit on the AQ2201 Frame Controller, the characters are dimmed and the setup is not needed.

When mounting this unit on the AQ2201 Frame Controller, this item is fixed at “ON”.

Explanation

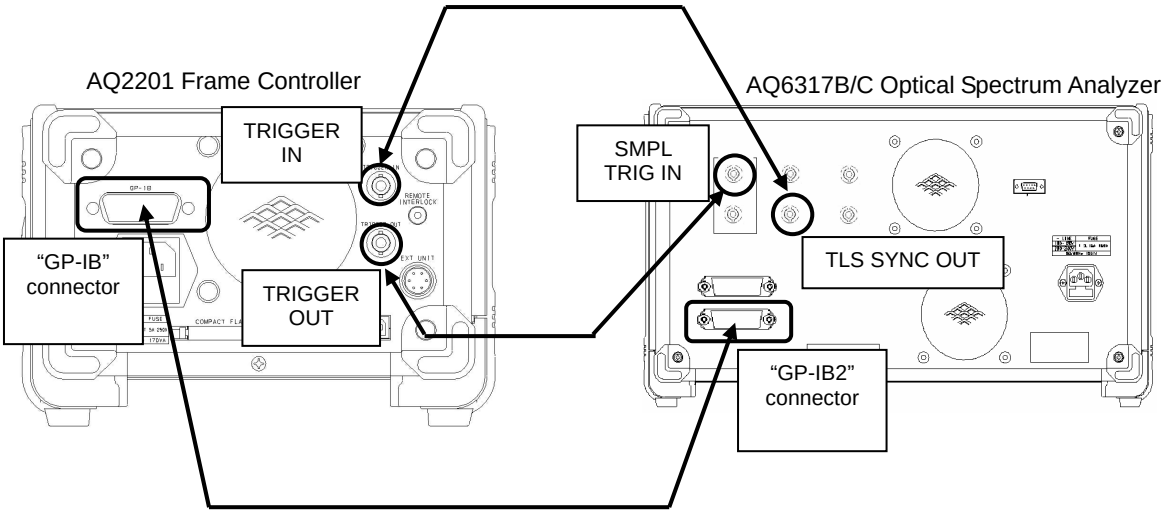
Follow the steps below to connect this unit and AQ6317B/C.

(1) Connect the “GP-IB” connector on the rear of the AQ2201 Frame Controller and the “GP-IB2” connector on the AQ6317B/C with the GP-IB cable.
(2) Connect “TRIGGER OUT” on the rear of the AQ2201 Frame Controller and “TRG MODE SMPL TRG IN” on the AQ6317B/C with the coaxial cable.
(3) Connect “TRIGGER IN” on the rear of the AQ2201 Frame Controller and “TLS SYNC OUT” on the AQ6317B/C with the coaxial cable.

When measuring an object device to be measured, first start the sweep with this unit connected to the AQ6317B/C using the short fiber to perform the reference measurement. Additionally, it is absolutely necessary that the difference in wavelength between this unit and AQ6317B/C is smaller than the resolution set on the AQ6317B/C. To satisfy this condition, the resolution of the AQ6317B/C is set to “2.0nm”.

For details about how to set the resolution, see the User’s Manual for AQ6317B/C.

The setup items you must set on the TLS module are WL Cal (wavelength calibration), Linewidth (line width), and Power (optical output level).



Connection Diagram for Synchronous Sweep of This Unit and AQ6317B/C

- Operating the AQ6317B/C

[Step 1] Setting the GP-IB address

Set the GP-IB address of the AQ2201 with the <MORE 1/3> and <TLS ADRS> keys of the "SYSTEM" switch, rotary knob, step key, or ten-key pad.

The GP-IB address of the AQ2201 has been set at "20" before shipment from the factory.

Additionally, set an address of the GP-IB2 port with the <MORE 3/3> and <GP-IB2 ADRS> keys of the "SYSTEM" switch so that it is not overlapped with the address of the AQ2201. Furthermore, make sure that the <SYSTEM CONTROLLER> key of the soft key menu is highlighted.

[Step 2] Setting the sweep mode.

From the soft key menu of the "SET UP" switch, press <MORE 2/2> and <TLS SYNCSWEEP> keys to highlight the selected mode.

[Step 3] Specifying a measurement range.

HOLD, AUTO, MID, or HIGH1 can be set. Presently, **HIGH2 and 3 are not applicable**.

[Step 4] Starting the sweep.

When starting the sweep of the AQ6317B/C with the <REPEAT> and <SINGLE> keys or the <SEGMENT MEASURE> key of "SWEEP", the wavelength of this unit mounted on the AQ2201 is synchronized with the sweep.

[Step 5] Completing the sweep.

Press the <TLS SYNC SWEEP> key again to cancel the highlight display. The synchronous sweep of this unit cannot be started.

Note

- Before starting the measurement, always calibrate the wavelength of the AQ6317B/C and this unit. If the wavelength calibration is not performed, the sync-loss may occur. Additionally, perform the alignment of the AQ6317B/C.
- Do not set <RESOLN> of the AQ6317B/C to "2.0nm" or less. Doing so may cause the sync-loss to occur.

14.1 General Description of Commands

The following shows the list of commands. For details about command syntax description rules, see the Remote Command Reference for AQ2200 Multi-application Test System.

Command	Description
:power:state	Setting or reading the optical output ON/OFF
:wavelength:correction:zero	Starting or reading the wavelength calibration
:wavelength	Setting or reading the wavelength
:frequency	Setting or reading the frequency
:wavelength:frequency	Setting or reading the Δf (offset)
:wavelength:reference	Setting WL $\rightarrow$ WL0 (offset)
:linewidth	Setting or reading the line width
:power:level:immediate:amplitude	Setting or reading the optical output level
:wavelength:sweep:pmax	Reading the optimal value (auto detection) during sweep
:wavelength:sweep:start	Setting or reading the sweep start wavelength
:wavelength:sweep:stop	Setting or reading the sweep end wavelength
:wavelength:sweep:step:width	Setting or reading the sweep step wavelength
:wavelength:sweep:cycles	Setting or reading the sweep cycles
:wavelength:sweep:interval	Setting or reading the sweep interval
:wavelength:sweep:dwell	Setting or reading the dwell time
:wavelength:sweep:speed	Setting or reading the sweep speed
:wa velength:sweep:mode	Setting or reading the sweep mode
:wavelength:sweep:state	Setting or reading the sweep start (end)
:wavelength:sweep:step:next	Setting the wavelength to the next wavelength
:trigger:input	Setting or reading the input trigger
:trigger:output	Setting or reading the output trigger
:wlmc:mode	Setting or reading the wavelength convergence function ON/OFF
:wavelength:unit	Setting or reading the wavelength display unit
:power:unit	Setting or reading the power display unit
:osasync	Setting or reading the OSA synchronous sweep function ON/OFF

14.2 Commands for Calibrating of the Wavelength

- Setting the Optical Output ON/OFF

syntax:	[:FRAME[F]][:SOURce[M]][:CHANnel[D]]:POWer:STATe<wsp>OFF|ON|0|1	
parameter:	OFF or 0:	Sets the optical output to “OFF”.
	ON or 1:	Sets the optical output to “ON”.
example:	:frame0:source1:channel1:power:state on	
example of abbr.:	:pow:stat on	

- Reading the Optical Output ON/OFF Setting Status

syntax:	[:FRAME[F]] [:SOURce[M]][:CHANnel[D]]:POWer:STATe?	
parameter:	None	
response:	0:	Optical output OFF status
	1:	Optical output ON status
example:	:frame0:source1:channel1:power:state? → 1	
example of abbr.:	:pow:stat?	

- Starting (Stopping) the Wavelength Calibration

syntax:	[:FRAME[F]] [:SOURce[M]][:CHANnel[D]]:WAVelength:CORRection:ZERO [<wsp>ON|OFF]	
parameter:	ON:	Starts the wavelength calibration.
	OFF:	Stops the wavelength calibration.
example:	:frame0:source1:channel1:wavelength:correction:zero on	
example of abbr.:	:wav:corr:zero on	

- Reading the Wavelength Calibration Status

syntax:	[:FRAME[F]] [:SOURce[M]][:CHANnel[D]]:WAVelength:CORRection:ZERO?	
parameter:	None	
response:	+0:	Completed.
	+1:	Calibration in progress
	+2:	Error (Error is saved into the queue.)
example:	:frame0:source1:channel1:wavelength:correction:zero? → +0	
example of abbr.:	:wav:corr:zero?	

14.3 Commands for Setting of the Wavelength

- Setting the Wavelength

syntax:	[:FRAME[F]] [:SOURce[M]][:CHANnel[D]]:WAVelength[:CW[/]|:FIXed[/]] <wsp><value>[PM|NM|UM|MM|M]|MIN|MAX|DEF
parameter:	<value>PM or NM or UM or MM or M: Sets the wavelength in [m].
	MIN: Sets the minimum wavelength.
	MAX: Sets the maximum wavelength.
	DEF: Sets the default wavelength value.
example:	:frame0:source1:channel1:wavelength:fixed1 1500nm
example of abbr.:	:wav 1500nm

- Reading the Wavelength

syntax:	[:FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength[:CW[/]|:FIXed[/]]? [<wsp>MIN|MAX|DEF]
parameter:	MIN: Returns the minimum wavelength.
	MAX: Returns the maximum wavelength.
	DEF: Returns the default value.
response:	<value>: Returns the float-type wavelength set value in [m].
	Example) "1500nm"→ +1.50000000E-006
example:	:frame0:source1:channel1:wavelength:fixed1? → +1.50000000E-006
example of abbr. 1:	:wav? → +1.50000000E-006
example of abbr. 2:	:wav? Min → +1.44000000E-006

- Setting the Frequency

syntax:	[:FRAME[F]][:SOURce[M]][:CHANnel[D]]:FREQuency[/] <wsp><value>[THZ|GHZ]
parameter:	<value>[THZ|GHZ]: Sets the frequency in [Hz].
	Setting range: Frequency conversion value ranging from "minimum wavelength" to "maximum wavelength" (in steps of 0.0001THz). Example "193.4145THz" (1550nm)
	MIN: Sets the minimum wavelength.
	MAX: Sets the maximum wavelength.
	DEF: Sets the default wavelength value.
example1:	:frame0:source1:channel1:frequency1 193.4145thz
example2:	:frame0:source1:channel1:frequency1 1550nm
example of abbr.:	:freq 193.4145thz

- Reading the Frequency

syntax: [:FRAME[F]][:SOURce[M]][:CHANnel[D]]:FREQuency[/]?
[<wsp>MIN|MAX|DEF]
parameter: MIN: Returns the minimum wavelength.
MAX: Returns the maximum wavelength.
DEF: Returns the default value.
response: <value>: Returns the float-type frequency set value in [Hz].
Example) “193.4145THz”→ +1.93414500E+014
example: :frame0:source1:channel1:frequency1? → +1.93414500E+014
example of abbr. 1: :freq? → +1.93414500E+014
example of abbr. 2: :freq? Min → +1.50004500E+014

- Setting the Δf (Offset Setup)

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:FREQuency[/]
<wsp><value>[THZ|GHZ]
parameter: <value>[THZ|GHZ]: Sets the Δf.
Setting range: In accordance with the minimum and maximum wavelength levels (in steps of 0.1GHz)
Example) -1.2GHZ
example: :frame0:source1:channel1:wavelength:frequency1 -1.2ghz
example of abbr.: :wav:freq -1.2ghz

- Reading the Δf Value (Offset Setup)

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:FREQuency[/]?
parameter: None
response: <value>: Returns the float-type Δf set value in [Hz].
Example) “-1.2GHz”→ -1.20000000E+009
example: :frame0:source1:channel1:wavelength:frequency1? →-1.20000000E+009
example of abbr.: :wav:freq? →-1.20000000E+009

- Reading the WL Ref Value (Offset Setup)

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:REFerence[/]?
parameter: None
response: <value>: Returns the float-type WL Ref set value in [m].
Example) “1550.123nm”→ +1.55012300E-006
example: :frame0:source1:channel1:wavelength:reference?→ +1.55012300E-006
example of abbr.: :wav:ref? → +1.55012300E-006

- Setting "WL→WL0" (Offset Setup)

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:REFerence:DISPlay
parameter: None
example: :frame0:source1:channel1:wavelength:reference:display
example of abbr.: :wav:ref:disp

14.4 Commands for Setting of the Line Width

- Setting the Line Width

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:LINewidth <wsp>NARRow|0|WIDE|1	
parameter:	NARRow or 0:	Sets the spectrum line width to “Narrow”.
	WIDE or 1:	Sets the spectrum line width to “Wide”.
example:	:frame0:source1:channel1:linewidth narrow	
example of abbr.:	:lin narr	

- Reading the Line Width

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:LINewidth?		
parameter:	None		
response:	+0:	Spectrum line width is set at “Narrow”.	
	+1:	Spectrum line width is set at “Wide”.	
example:	:frame0:source1:channel1:linewidth?	→	+0
example of abbr.:	:lin?	→	+0

14.5 Commands for Setting of the Power

- Setting the Optical Output Level

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:POWer[:LEVel][:IMMediate]
[:AMPLitude[/]]<wsp><value>
[DBM|PW|NW|UW|MW|Watt]|MIN|MAX|DEF
parameter: <value>DBM[PW|NW|UW|MW|Watt] :
Sets the power.
Setting range: Response of “SLOT:IDN?” in steps of 0.1dB.
Example) “3DBM”
example: :frame0:source1:channel1:power:level:immediate:amplitude1 3dbm
example of abbr.: :pow 3dbm

- Reading the Optical Output Level

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:POWer[:LEVel][:IMMediate]
[:AMPLitude[/]]?[<wsp>MIN|MAX|DEF]
parameter: MIN: Returns the minimum power level.
MAX: Returns the maximum power level.
DEF: Returns the minimum power level.
response: <value>: Returns the float-type power level in [dBm] or [W].
Example) “3DBM”→ +3.00000000E+000
Example) “1.995mW”→+1.99500000E-003
* The unit of the response may vary depending on the current power unit setting.
example: :frame0:source1:channel1:power:level:immediate:amplitude1? min
→ +3.00000000E+000
example of abbr.: :pow? min → +3.00000000E+000

Note) The read power levels are the maximum and minimum values in the range of all waveforms supported by this module. Additionally, the maximum and minimum power levels and the corresponding waveform values differ according to each module.

- Reading the Optimal Value (Auto Detection) during Sweep

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:PMAX?
<wsp><start wav>,<stop wav>
parameter: <start wav>: Sets the start wavelength in [nm].
Example) 1550NM
<stop wav>: Sets the end wavelength in [nm].
Example) 1640NM
response: <value>: Returns the float-type power level within the specified wavelength range.
Example) "1.234mW" → "+1.23400000-003"
The unit is fixed at “W”.
example: :frame0:source1:channel1:wavelength:sweep:pmax? 1550nm,1640nm
→ +1.23400000-003
example of abbr.: :wav:swe:pmax? 1550nm,1640nm → +1.23400000-003

14.6 Commands for Setting of the Sweep

- Setting the Sweep Start Wavelength

  syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STARt <wsp><value>[PM|NM|UM|MM|M]
  parameter: <value>[PM|NM|UM|MM|M]: Sets the sweep start wavelength in [m]. Example) "1500NM"
  Setting range: Minimum wavelength to maximum wavelength of "SLOT:IDN?" (in steps of 0.001nm)
  example: :frame0:source1:channel1:wavelength:sweep:start 1500nm
  example of abbr.: :wav:swe:star 1500nm

- Reading the Sweep Start Wavelength

  syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STARt?
  response: <value>: Returns the float-type sweep start wavelength set value in [m]. Example) “1500nm”→ +1.50000000E-006
  example: :frame0:source1:channel1:wavelength:sweep:start? min → +1.50000000E-006
  example of abbr.: :wav:swe:star? min → +1.50000000E-006

- Setting the Sweep End Wavelength

  syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STOP <wsp><value>[PM|NM|UM|MM|M]
  parameter: <value>[PM|NM|UM|MM|M]: Sets the sweep end wavelength in [m]. Example) "1640NM"
  Setting range: Minimum wavelength to maximum wavelength of "SLOT:IDN?" (in steps of 0.001nm)
  example: :frame0:source1:channel1:wavelength:sweep:stop 1640nm
  example of abbr.: :wav:swe:stop 1640nm

- Reading the Sweep End Wavelength

  syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STOP?
  response: <value>: Returns the float-type sweep end wavelength set value in [m]. Example) “1640nm”→ +1.64000000E-006
  example: :frame0:source1:channel1:wavelength:sweep:stop? min → +1.64000000E-006
  example of abbr.: :wav:swe:stop? min → +1.64000000E-006

- Setting the Sweep Step Wavelength

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STEP[:WIDTh]
<wsp><value>[PM|NM|UM|MM|M]
parameter: <value>[PM|NM|UM|MM|M]: Sets the sweep step wavelength in [m].
Example) "0.5NM"
Setting range: 0.001 to 100.000nm, in steps of 0.001nm
example: :frame0:source1:channel1:wavelength:sweep:step:width 0.5nm
example of abbr.: :wav:swe:step 0.5nm

- Reading the Sweep Step Wavelength

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STEP?
[<wsp>MIN|MAX]
parameter: MIN: Returns the minimum sweep step wavelength.
MAX: Returns the maximum sweep step wavelength.
response: <value>: Returns the float-type sweep step wavelength set value in [m].
Example) “0.5nm”→ +5.00000000E-010
example: :frame0:source1:channel1:wavelength:sweep:step? min
→ +5.00000000E-010
example of abbr.: :wav:swe:step? Min → +5.00000000E-010

- Setting the Number of Sweep Cycles

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:CYCLes
<wsp><value>|MIN|MAX|DEF|0
parameter: <value>: Set the number of sweep cycles in a range of "0 to 99999 (in steps of “1”)".
MIN: Sets the minimum number of sweep cycles (1).
MAX: Sets the maximum number of sweep cycles (99999).
DEF: Sets the default number of sweep cycles (1).
0: Continuous sweep
example: :frame0:source1:channel1:wavelength:sweep:cycles 100
example of abbr.: :wav:swe:cycl 100

- Reading the Number of Sweep Cycles

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:CYCLes?[
<wsp>MIN|MAX|DEF]
parameter: MIN: Returns the minimum number of sweep cycles.
MAX: Returns the maximum number of sweep cycles.
DEF: Returns the default number of sweep cycles.
response: <value>: Returns the signed integer value showing the number of sweep cycles.
Example) 10 cycles → +10
+0: Continuous sweep
example: :frame0:source1:channel1:wavelength:sweep:cycles? min
→ +10
example of abbr.: :wav:swe:cycl? min → +10

● Setting the Sweep Interval

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:INTerval <wsp><value>[S]|MIN|MAX|DEF

parameter: <value>[S]: Sets the sweep interval time in [sec].
Setting range: 0 to 99999 sec, in steps of “1 sec”.
MIN: Sets the minimum sweep interval time (0 sec).
MAX: Sets the maximum sweep interval time (99999 sec).
DEF: Sets the default sweep interval time (0 sec).

example: :frame0:source1:channel1:wavelength:sweep:interval 100s

example of abbr.: :wav:swe:int 100s

● Reading the Sweep Interval

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:INTerval? [<wsp>MIN|MAX|DEF]

parameter: MIN: Returns the minimum sweep interval time.
MAX: Returns the maximum sweep interval time.
DEF: Returns the default sweep interval time.

response: <value>: Returns the signed integer value showing the sweep interval time (in [sec]).
Example) 10sec→ +10

example: :frame0:source1:channel1:wavelength:sweep:interval?
→ +10

example of abbr. 1: :wav:swe:int? → +10

example of abbr. 2: :wav:swe:int? min → +0

● Setting the Dwell Time

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:DWELl <wsp><value>[S|MS|MIN|MAX|DEF]

parameter: <value>[S|MS]: Sets the dwell time in [sec].
Setting range: 0.1 to 999.9 sec, in steps of “0.1 sec”.
MIN: Sets the minimum dwell time (0.1 sec).
MAX: Sets the maximum dwell time (999.9 sec).
DEF: Sets the default dwell time (0.1 sec).

example: :frame0:source1:channel1:wavelength:sweep:dwell 10s

example of abbr.: :wav:swe:dwel 10s

- Reading the Dwell Time

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:DWELl?
[<wsp>MIN|MAX|DEF]
parameter: MIN: Returns the minimum dwell time.
MAX: Returns the maximum dwell time.
DEF: Returns the default dwell time.
response: <value>: Returns the float-type dwell time set value in [sec].
Example) “0.5sec”→ +5.00000000E-001
example: :frame0:source1:channel1:wavelength:sweep:dwell? min
→ +5.00000000E-001
example of abbr.: :wav:swe:dwel? min → +5.00000000E-001

- Setting the Sweep Speed

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:SPEed
<wsp><value>[NM/S|UM/S]
parameter: <value>[NM/S|UM/S]: Sets the sweep speed in [m/s].
Example) "3NM/S"
Setting range: 0.2 to 50.0nm/s, in steps of “0.1nm/s”
example: :frame0:source1:channel1:wavelength:sweep:speed 3nm/s
example of abbr.: :wav:swe:spe 3nm/s

- Reading the Sweep Speed

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:SPEed?
[<wsp>MIN|MAX]
parameter: MIN: Returns the minimum sweep speed.
MAX: Returns the maximum sweep speed.
response: <value>: Returns the float-type sweep speed set value in [m/s].
Example) “3nm/s”→ +3.00000000E-009
example: :frame0:source1:channel1:wavelength:sweep:speed? min
→ +3.00000000E-009
example of abbr.: :wav:swe:spe? min → +3.00000000E-009

14.7 Commands for Starting of the Sweep

- Setting the Sweep Mode

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:MODE <wsp><mode>
parameter:	STEPped: Sets the step sweep mode. MANual: Sets the manual sweep mode. CONTinuous: Sets the continuous sweep mode.
example:	:frame0:source1:channel1:wavelength:sweep:mode stepped
example of abbr.:	:wav:swe:mode step

- Reading the Sweep Mode

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:MODE?
parameter:	None
response:	STEP: Step sweep mode MAN: Manual sweep mode CONT: Continuous sweep mode
example:	:frame0:source1:channel1:wavelength:sweep:mode? → STEP
example of abbr.:	:wav:swe:mode? → STEP

- Starting (Stopping) the Sweep

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep[:STATe] <wsp>STOP|0|STARt|1|PAUSe|2|CONTinue|3
parameter:	STOP or 0: Stops the sweep. STARt or 1: Starts the sweep. PAUSe or 2: Pauses the sweep (when the sweep mode is set at "Stepped"). CONTinue or 3: Restarts the paused sweep (when the sweep mode is set at "Stepped").
example:	:frame0:source1:channel1:wavelength:sweep:state start
example of abbr.:	:wav:swe star

- Reading the Sweep Status

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep[:STATe]?
parameter:	None
response:	+0: Completion of sweep. +1: Sweep in progress.
example:	:frame0:source1:channel1:wavelength:sweep:state? → +0
example of abbr.:	:wav:swe? → +0

- Setting the Next Sweep Wavelength

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:SWEep:STEP:NEXT
parameter:	None
example:	:frame0:source1:channel1:wavelength:sweep:step:next
example of abbr.:	:wav:swe:step:next

- Setting the Input Trigger

syntax:	:TRIGger[M] [:CHANnel[D]]:INPut<wsp><parameter>	
parameter:	IGNore:	Ignores the trigger input.
	NEXTstep:	Moves the wavelength to the next wavelength by the trigger input.
	SWStart:	Starts the sweep by the trigger input.
example:	:trigger1:channel1:input nextstep	
example of abbr.:	:trig:inp next	

- Reading the Input Trigger Setting

syntax:	:TRIGger[M] [:CHANnel[D]]:INPut?	
response:	IGN:	Ignores the trigger input.
	NEXT:	Moves the wavelength to the next wavelength by the trigger input.
	SWS:	Starts the sweep by the trigger input.
example:	:trigger1:channel1:input? → NEXT	
example of abbr.:	:trig:inp? → NEXT	

14.8 Commands for Outputting of the Trigger

- Setting the Output Trigger

syntax:	:TRIGger[M] [:CHANnel[D]]:OUTPut<wsp><parameter>	
parameter:	DISable:	Makes the trigger output disabled.
	STFinished:	Outputs the trigger when the wavelength step movement is completed.
	SWFinished:	Outputs the trigger when the movement to the sweep end wavelength is completed.
	SWSTarted:	Outputs the trigger when the movement to the sweep start wavelength is completed.
example:	:trigger1:channel1:output stfinished	
example of abbr.:	:trig:outp stf	

- Reading the Trigger Output Setting

syntax:	:TRIGger[M] [:CHANnel[D]]:OUTPut?	
parameter:	None	
response:	DIS:	Makes the trigger output disabled.
	STF:	Outputs the trigger when the wavelength step movement is completed.
	SWF:	Outputs the trigger when the movement to the sweep end wavelength is completed.
	SWST:	Outputs the trigger when the movement to the sweep start wavelength is completed.
example:	:trigger1:channel1:output? → STF	
example of abbr.:	:trig:outp? → STF	

14.9 Commands for Settling Wavelength Function

- Setting the Settling Wavelength Function ON/OFF

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WLMC:MODE<wsp>OFF|ON|0|1	
parameter:	OFF or 0:	Sets the settling wavelength function to “OFF”.
	ON or 1:	Sets the settling wavelength function to “ON”.
example:	:frame0:source1:channel1:wlmc:mode on	
example of abbr.:	:wlmc:mode on	

- Reading the ON/OFF Setting of the Settling Wavelength Function

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WLMC:MODE?		
parameter:	None		
response:	0:	Settling Wavelength function is OFF.	
	1:	Settling Wavelength function is ON.	
example:	:frame0:source1:channel1:wlmc:mode?	→	1
example of abbr.:	:wlmc:mode?	→	1

14.10 Commands for Other Operations

- Setting the Wavelength Display Unit

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:UNIT <wsp>NM|0|THZ|1
parameter:	NM or 0: Sets the wavelength display unit to “nm”.
	THZ or 1: Sets the wavelength display unit to “THz”.
example:	:frame0:source1:channel1:wavelength:unit nm
example of abbr.:	:wav:unit nm

- Reading the Wavelength Display Unit

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:WAVelength:UNIT?
parameter:	None
response:	+0: Wavelength display unit is “nm”.
	+1: Wavelength display unit is “THz”.
example:	:frame0:source1:channel1:wavelength:unit? → +1
example of abbr.:	:wav:unit? → +1

- Setting the Power Display Unit

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:POWer:UNIT<wsp>DBM|0|Watt|1
parameter:	DBM or 0: Sets the power unit to “dBm”.
	W or 1: Sets the power unit to “mW”.
example:	:frame0:source1:channel1:power:unit dbm
example of abbr.:	:pow:unit dbm

- Reading the Power Display Unit

syntax:	[FRAME[F]][:SOURce[M]][:CHANnel[D]]:POWer:UNIT?
parameter:	None
response:	+0: Power unit is “dBm”.
	+1: Power unit is “W”.
example:	:frame0:source1:channel1:power:unit? → +0
example of abbr.:	:pow:unit? → +0

- Setting the OSA Synchronous Sweep Function ON/OFF

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:OSASync<wsp>OFF|ON|0|1
parameter: OFF or 0: Sets the OSA synchronous function to “OFF”.
ON or 1: Sets the OSA synchronous function to ”ON”.
example: :frame0:source1:channel1:osasync on
example of abbr.: :osas on

Note) When this module is mounted on the AQ2201 Frame Controller, this function is fixed at ON. You cannot set it to OFF.

Explanation

- When the OSA synchronous function of other TLS module is set at ON, the newly selected TLS module is turned ON and the previously selected module is turned OFF.
- The command from the OSA is sent to the TLS module with the OSA synchronous function set at ON.

- Reading the ON/OFF Status of the OSA Synchronous Sweep Function

syntax: [FRAME[F]][:SOURce[M]][:CHANnel[D]]:OSASync?
parameter: None
response: 0: OSA synchronous function is OFF.
1: OSA synchronous function is ON.
example: :frame0:source1:channel1:osasync? → 1
example of abbr.: :osas? → 1

- Initializing the Module Setting

syntax: :SLOT[M]:PRESet
parameter: None
example: :slot1:preset
example of abbr.: :slot:pres

Explanation

Module Initialization Items

Item	Initial Value
Opt	OFF
Wavelength	1501.743
Δf	+0.0GHz
WL Ref	1501.743
Start WL	1440.000
Stop WL	1640.000
Step WL	0.500nm
Power	Since the minimum output level value within the setting range is displayed, each module has a different initial value.
Sweep Cycles	1
Sweep Interval	0sec
Dwell Time	0.1sec
Sweep Mode	Continuous
Sweep Speed	50.0nm/sec
Linewidth	Narrow
Input Trig	Ignore
Output Trig	Disable
WLMC Settle	OFF
OSA Sync	ON
Unit (Wavelength)	nm
Unit (Power)	dBm

15.1 Notes on Storage

● Notes Before Storage

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

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 -10 to 50°C (+10 to 35°C during measurement)
- Humidity 80%RH or less (No condensation allowed)
- 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.

15.2 Notes on Transport

- 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.

- Remove the modules currently mounted on the frame controller.
- Place cushioning material on projecting parts on the front and rear panels of the instrument to protect them.
- Wrap the instrument with a thick vinyl sheet to prevent entry of dust.
- 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, top/bottom/right/left panels) and the sides of the box.
- 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 on the instrument is 50G or less in the event of the box being dropped.
- 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

Before transport, pack the frame controller as described above. During transport, make sure that vibration is avoided and the storage conditions recommended in 15.1, "Notes on Storage" are satisfied.

15.3 Cleaning the Module

- Clean the panel and exterior of the main unit, and the panel of the module with a cloth rag soaked in lukewarm water to remove the dirt, and then wipe them off with a dry cloth rag.
- With a dry cloth rag, clean the parts other than the panel surface of the module and electric interface.
- To clean the electric interface, blow the air to the electric interface using a spray gun to remove dust, and cover it with a cap.

Note

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

15.4 Cleaning the Optical Interface

● Necessity to Clean the Optical Interface

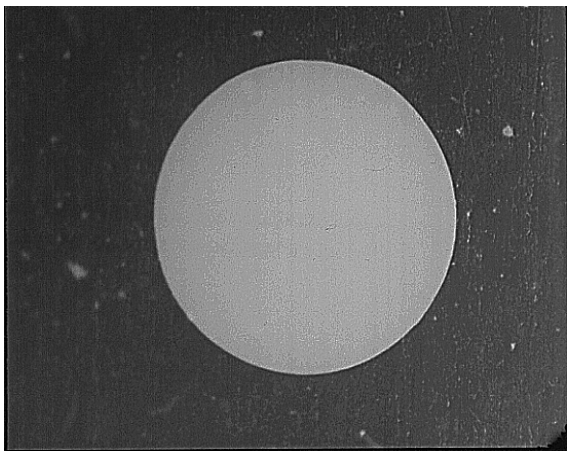
The optical connector is only an optical component, the optical transmission of which is exposed to the outside. Even a scratch on the end face, which cannot be checked visually, greatly affects its optical performance. Therefore, if the optical connector is connected improperly, if it is connected without removal of dust or dirt, or if it is cleaned improperly, this may cause the end face of the optical connector to be scratched. Additionally, to connect the optical connector, it is absolutely required to properly joint the ferrule cores of both optical connectors. An optical adaptor is used for the connection. However, if the connection is made with dust sticking to the ferrule side face or ferrule guide of the optical adaptor, the cores cannot be jointed correctly. In this status, the loss of the optical power, disturbance of the transmission mode, and/or optical reflection at the connection point may become large, causing the measurement not to be performed correctly.

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

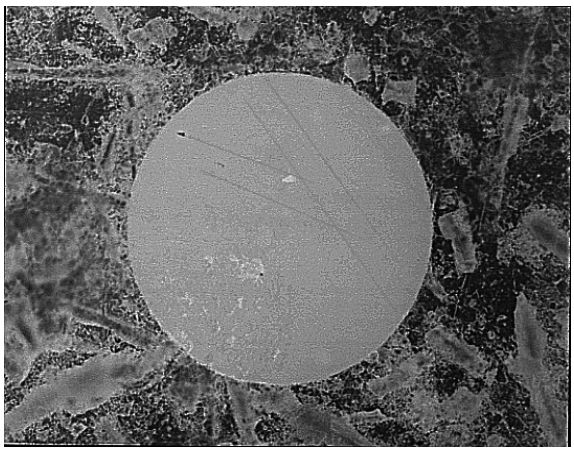
When using this unit, clean the ferrule every time it is connected and the precision sleeve every time it is connected 30 times.

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

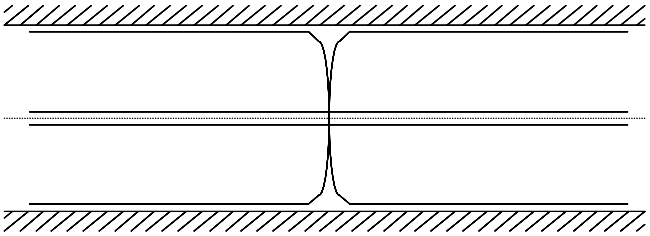
- Optical connector to be connected after other metallic sleeve has been inserted.
  - → In particular, metallic sleeve worn-out particles may easily stick to the ferrule side face or end face.
- Optical connector made of ferule material to be easily worn-out, such as metallic ferrule or crystallized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



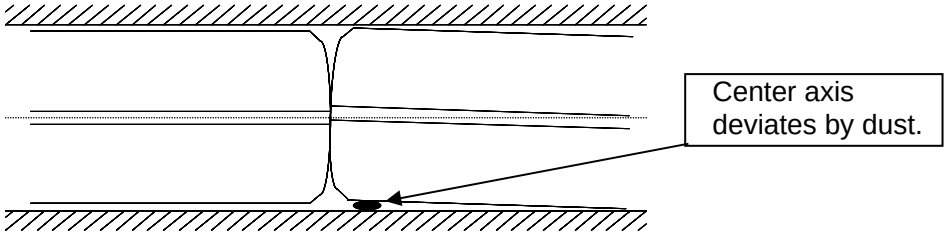
Enlarged Photo of Correct Optical Connector Connection Part



Enlarged Photo of Scratched Optical Connector Connection Part



Optical Connector in Correct Joint Status



Optical Connector in Axis Deviation Status by Dust

- 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.

● Cleaning the Optical Connector

- Soak the cleaning paper in the isopropyl alcohol, hold the optical ferrule end face by this cleaning paper, and clean the end face properly.
- Soak another cleaning paper in the isopropyl alcohol and clean the ferrule end face with this cleaning paper by rubbing it.
- Furthermore, wipe off the moisture content with another cleaning paper. After that, blow out dust sticking to the end face with an air spray.
- 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

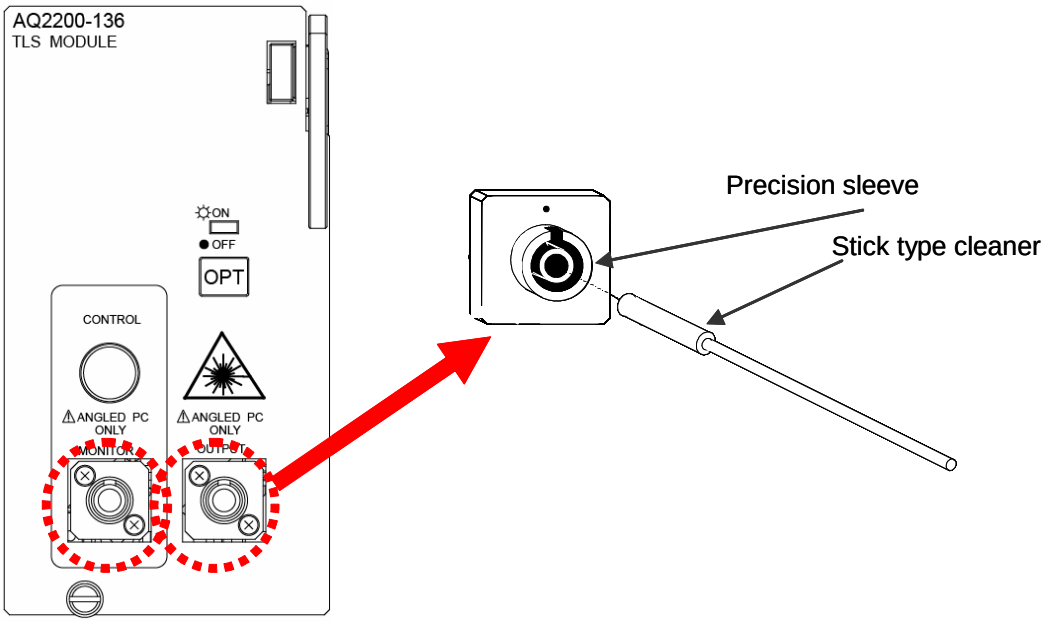
If any contaminated cleaning paper is used, this may cause the end face to be scratched.

To prevent such trouble, always use new cleaning paper.

● Cleaning the Optical Output

■ 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.

■ With another stick type cleaner, wipe off the moisture content completely. After that, blow out dust sticking to the end face with an air spray.



15.5 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.

16.1 Major Leading Particulars

Item		Specifications	Remarks
Wavelength variable change width		1440nm to 1640nm	
Wavelength setting resolution		1pm	
Absolute wavelength accuracy		≤±100pm	*1,*2
Relative wavelength accuracy		≤±50pm	*1,*2
Wavelength stability (when compared to the time)		±5pm/h	*4,*8,*10
Spectrum line width	NARROW	≤1MHz	*3,*7,*13
	WIDE	≥50MHz	*2,*3,*15
Optical output	Maximum output wavelength	≥+7dBm	*2,*12,*15
	1520 to 1610nm	≥+5dBm	
	1475 to 1625nm	≥+1dBm	
	Full-wavelength range	≥-8dBm	
Optical output stability	5 min.	≤±0.01dB	*2,*5,*8,*9,*15
	1 hr.	≤±0.05dB	
	24 hrs.	≤±0.1dB	
Reproducibility of optical output (when compared to the wavelength)		≤±0.04dB	*2,*5,*8,*9,*15
Variable change width of optical output		≥4dB	*4,*6,*15
MONITOR output	Maximum optical output	≤+5dBm	*14
	Minimum optical output	≥-25dBm	
Wavelength sweep speed		50nm/sec (Max. speed)	
Applicable optical fiber		SM(ITU-T G.652)	
Applicable optical connector		FC/Angled PC	*11
Dimensions		62(W)×130(H)×339(D)mm	
Weight		Approx. 2kg	
Operating temperature range		+10 to +35°C	*10
Storage temperature range		-10 to +50°C	
Humidity conditions		≤80% (No condensation allowed.)	

Unless otherwise specified particularly, the specification values are obtained at 2m-SMF output point after the calibration has been completed 1 hr. after OPT ON under reference operating conditions (*).

* Reference operating conditions: Ambient temperature: 23±2°C, Temperature change ratio: 1°C/10min. and 3°C/hr., Humidity: 50±5%

*1 ±2σ, line width: NARROW
*2 At maximum optical output
*3 Wavelength: 1590nm
*4 Wavelength: 1560nm to 1610nm
*5 Line width: WIDE
*6 0.1dB-step
*7 Line width: NARROW
*8 Constant temperature
*9 Wavelength: 1460nm to 1620nm
*10 Ambient temperature of frame controller. When mounting the frame controller on the main unit, the operating temperature range of the frame controller is narrowed.
*11 Angled/PC manufactured by Seiko Giken or its equivalent (step type)
*12 Maximum output + 17dBm or less
*13 At minimum optical output
*14 MONITOR connector is used.
*15 OUTPUT connector is used.

16.2 Standard Accessory

Accessory Name	Q'ty
Wavelength Meter control cable	1
Dust-proof cap (large)	1
Dust-proof cap (small)	2

16.3 List of Error Codes

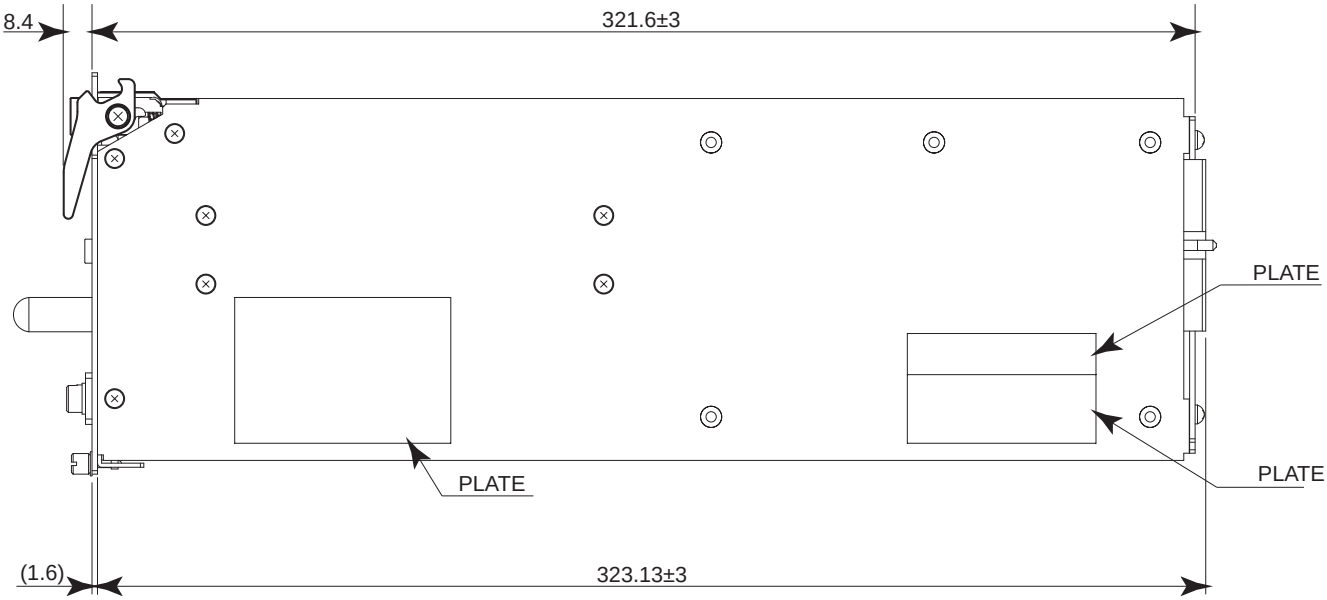
Screen	Error Message	Description
1130	Temperature Error	Internal temperature error
1133	TEC Temperature Error	TEC temperature error
1136	LD Over Current Error	LD over-current error
1137	TLS EL Error	TLS end limit error
1138	TLS Initialization Error	TLS initialization error
1139	TLS WL Calibration Error	TLS wavelength calibration error
1154	External Serial Communication Error	External serial communication error
1155	Wavelength Meter Type Error	Illegal Wavelength Meter model error
1156	Convergence Error	Correction (Convergence) cycle-over error
1157	Wavelength Over Error	Wavelength error
1158	Query Dare Error	Wavelength Meter command query error
1159	LD is inactive	Inactive optical output
1160	Temperature Limit Error	Internal temperature error
1162	Opt Lock Error	Optical output ON command is sent in the Lock status.
1163	Sweep Parameter Error1	Start WL setting is larger than Stop WL.
1164	Sweep Parameter Error2	The number of sweep steps is 2001 or more in the Swept application.
1165	Sweep Parameter Error3	Sweep speed is set, at which the sweep cannot be performed.
1166	Sweep Parameter Error4	WLMC Mode is set at ON in the Continuous mode.

16.4 List of Default Values

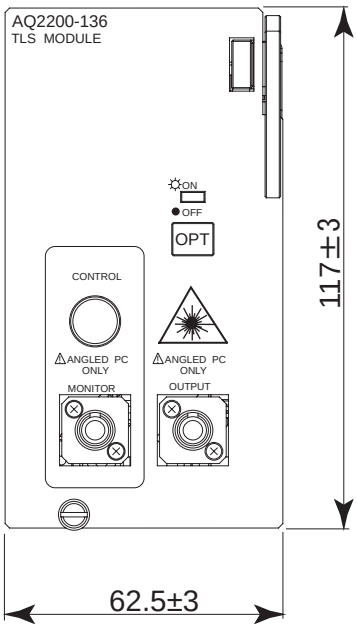
Item	Initial Value
Opt	OFF
Wavelength	1501.743
Δf	+0.0GHz
WL Ref	1501.743
Start WL	1440.000
Stop WL	1640.000
Step WL	0.500nm
Power	Since the minimum output level value within the setting range is displayed, each module has a different initial value.
Sweep Cycles	1
Sweep Interval	0sec
Dwell Time	0.1sec
Sweep Mode	Continuous
Sweep Speed	50.0nm/sec
Linewidth	Narrow
Input Trig	Ignore
Output Trig	Disable
MWL Settle	OFF
OSA Sync	ON
Unit (Wavelength)	nm
Unit (Power)	dBm

16.5 External Dimensions

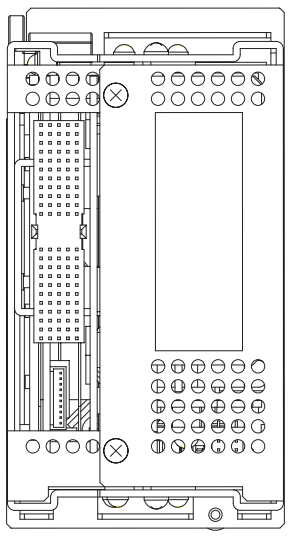
Unit : mm



SIDE VIEW



FRONT VIEW



REAR VIEW