User's Manual

AQ6150/AQ6151
Optical Wavelength Meter

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ6150-01EN
6th Edition

Thank you for purchasing the AQ6150/AQ6151 Optical Wavelength Meter. The AQ6150/AQ6151 is a high-speed wavelength measuring instrument for LD and LED light sources. This user's manual explains the features, operating procedures, and handling precautions of the AQ6150/AQ6151.
To ensure correct use, please read this manual thoroughly before beginning operation. Keep this manual in a safe place for quick reference in the event that a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the AQ6150/AQ6151. Please read all manuals.

Manual Title	Manual No.	Description
AQ6150/AQ6151 Optical Wavelength Meter User's Manual	IM AQ6150-01EN	This manual. The manual explains all the AQ6150/AQ6151 features other than the remote control features.
AQ6150/AQ6151 Optical Wavelength Meter Getting Started Guide	IM AQ6150-02EN	Provided as a printed manual. This guide explains the handling precautions, basic operations, and specifications of the AQ6150/AQ6151.
AQ6150/AQ6151 Optical Wavelength Meter Remote Control User's Manual	IM AQ6150-17EN	The manual explains the AQ6150/AQ6151 communication interface features and how to use them.

The "EN" in the manual number is the language code.
PDF files of all the manuals above are included in the accompanying manual CD.

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

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

Notes

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

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Revisions

- 1st Edition: December 2012
- 2nd Edition: September 2014
- 3rd Edition: January 2016
- 4th Edition: October 2016
- 5th Edition: November 2016
- 6th Edition: October 2017

Safety Precautions

This instrument is an IEC safety class I instrument (provided with a terminal for protective earth grounding).
The general safety precautions described herein must be observed during all phases of operation. If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.

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

Alternating current

ON (power)

OFF (power)

French

Avertissement : À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.

Courant alternatif

Marche (alimentation)

Arrêt (alimentation)

Conventions Used in This Manual

Notes

The notes and cautions in this manual are categorized using the following symbols.

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 user's manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

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

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

French

AVERTISSEMENT Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

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

Notations Used in the Procedural Explanations

The contents of the procedural explanations are indicated using the following symbols, notations, and terminology.

Procedure Carry out the procedure according to the step numbers. All procedures are written under the assumption that you are starting operation at the beginning of the procedure, so you may not need to carry out all the steps in a procedure when you are changing the settings.

Explanation This section describes the setup items and the limitations regarding the procedures.

Characters and Terminology Used in Procedural Explanations

Panel Keys and Soft Keys

Bold alphanumeric characters in procedural explanations indicate panel keys that are used in the procedure and soft keys and menu items that appear on the screen.

Unit

k	Denotes 1000. Example: 12 kg, 100 kHz
K	Denotes 1024. Example: 459 KB (file size)

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Chapter 7 Other Features

Chapter 8 Maintenance, Inspection, and Storage

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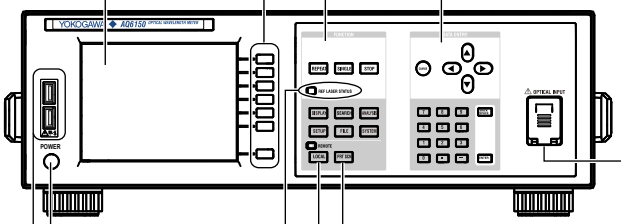
1.1 Front Panel



Display
Displays measured waveforms, measurement conditions, measured values, etc.

Soft key section
Control the functions that are assigned to soft keys, which appear on the right of the LCD display.

FUNCTION section
Set all features including measurement, setup, and display.

DATA ENTRY section
Enter measurement condition parameters and labels.

OPTICAL INPUT
Connect the optical input signal here.

PRT SCN key
Saves a screen capture

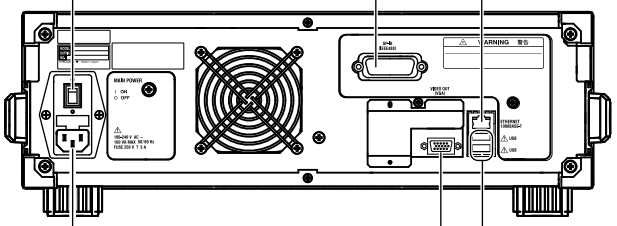
LOCAL key
Clears remote mode

REF LASER STATUS LED
Indicates the internal reference light source status

POWER switch
A switch for starting and stopping the AQ6150/AQ6151

USB port
Connect a USB storage medium, USB mouse, or USB keyboard.

1.2 Rear Panel



GP-IB connector
Use this connector to control the AQ6150/AQ6151 from a PC.

MAIN Power switch
Used to turn the main power ON/OFF.

ETHERNET port
Use this port to connect the AQ6150/AQ6151 to a network. (10/100/1000BASE-TX)

Power inlet
Connect the power cord.

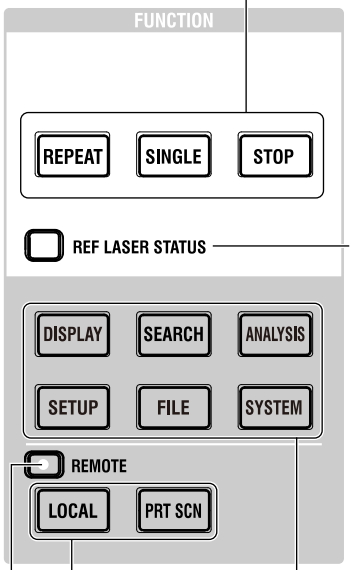
USB port
Connect a USB storage medium, USB mouse, or USB keyboard.

VIDEO OUT
Video signal (VGA) terminal
Use this terminal to view the AQ6150/AQ6151 screen on an external display.

1.3 Keys

FUNCTION Section

The FUNCTION section consists of three measurement control keys, six function keys, and two auxiliary keys. Pressing a function key shows the setup menu for the corresponding function on the right side of the screen.



Measurement control keys
Starts or stops measurement.

REPEAT	Starts repeat measurements. The key illuminates while the measurement is in progress. Measurement is repeated until you press STOP.
SINGLE	Starts a single measurement. The key illuminates while the measurement is in progress. Measurement automatically stops after one measurement.
STOP	Stops the measurement.

Internal reference light source status display
Indicates the operating status of the internal He-Ne laser.

Off	The laser is not being output. Measurement is not possible.
Blinking orange	Laser output is in preparation. This indicates the status until the laser output stabilizes. Measurement is not possible while the message “REF LASER STARTING” is displayed. If this status lasts approximately 5 minutes, the AQ6150/AQ6151 assumes that a malfunction has occurred and turns the LED red. When the AQ6150/AQ6151 is ready to measure, the message disappears. It takes approximately 1 minute for the laser output to stabilize. To make accurate measurements, wait for the laser output to stabilize.
Green	Normal status (stable laser output). Measurement is possible.
Orange	When the light source approaches its service life, the message “It is about time to plan for REF LASER replacement" appears. The operating time of the laser output has reached the replacement reference time (30000 hours). Measurement is possible, but replace the light source quickly.
Red	If a malfunction occurs, the message “REF LASER or interferometer is out of order. Please contact our sales representatives” appears. Measurement is not possible. For information on replacing the light source, contact your nearest YOKOGAWA dealer.

Function keys
Set measurement conditions, data saving and loading, etc.

DISPLAY	Displays a setup menu for selecting measurement screens and setting waveform display scales.
SEARCH	Displays a setup menu for searching measured peaks.
ANALYSIS	Displays a menu for performing drift measurements, FP-LD analysis, and data logging.
SETUP	Displays a setup menu for setting measurement conditions (type of light, detection threshold, unit, etc.)
FILE	Displays a setup menu for saving and loading measured data and settings from a USB storage device or internal memory.
SYSTEM	Displays a setup menu for setting network parameters, showing system information, setting the clock, and so on.

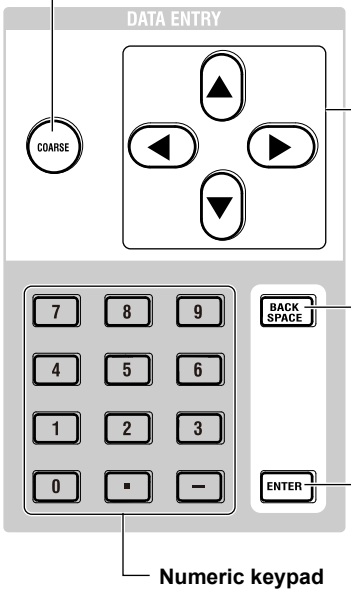
Auxiliary key
See section 1.1.

Remote control indicator
Illuminates in remote control mode.
See section 1.2 in the Remote Control User’s Manual, IM AQ6150-17EN.

DATA ENTRY Section

You can enter various measurement parameters from the DATA ENTRY section.

You can enter parameters using the arrow keys or numeric keypad.



COARSE key

Turn this key on to select the next higher digit or increases the step by which the value changes.
Each time you press the key, the setting toggles between on and off.
When set to on, the key illuminates.

Arrow keys

Increase or decrease values, move the cursor (up and down) in file lists, move the cursor (up, down, left, and right) in the character selection area of character input screens, enter numeric keypad values (left and right), and so on.

To increase a value: ▲ or ► key
To decrease a value: ▼ or ◄ key

BACK SPACE key

Press this key to erase the key before the cursor.
The last entered number (at the right end) is erased, and you can enter the correct number.
If you press BACK SPACE repeatedly and the numeric keypad input area becomes empty, the numeric keypad input area disappears.

ENTER key

Confirms the value that you have entered with the numeric keypad, in the parameter input window, or character input screen.

Numeric keypad

You can use the numeric keypad to enter values directly in parameter input windows.
If you press a soft key that has a parameter, the current value appears in a parameter value display area. If you press a key on the numeric keypad in this condition, the number that you selected appears in the area.
If the value that you enter with the numeric keypad is outside the allowed range, it is reset to the closest value within the range.

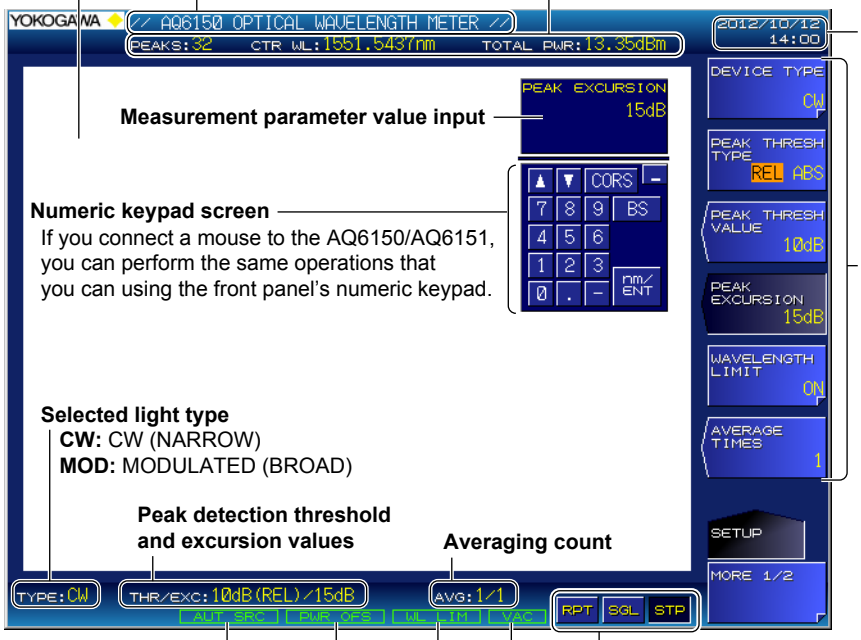
1.4 Screens

Main Screen

Measurement result display
Displays the peak window, peak list window, and spectrum window.
The display varies depending on the VIEW mode. Details are given later.

Label
You can display text of your choice using up to 52 characters.

Measurement summary
Displays the number of detected peaks (PEAKS), center wavelength (CTR WL), and total power (TOTAL PWR)



Date and time

Measurement parameter value input

Numeric keypad screen
If you connect a mouse to the AQ6150/AQ6151, you can perform the same operations that you can using the front panel's numeric keypad.

Setup menu

Selected light type
CW: CW (NARROW)
MOD: MODULATED (BROAD)

Peak detection threshold and excursion values

Averaging count

Illuminates when the auto peak search feature is on

Illuminates when the power offset is not zero
See section 2.6 in the Getting Started Guide, IM AQ6150-02EN.

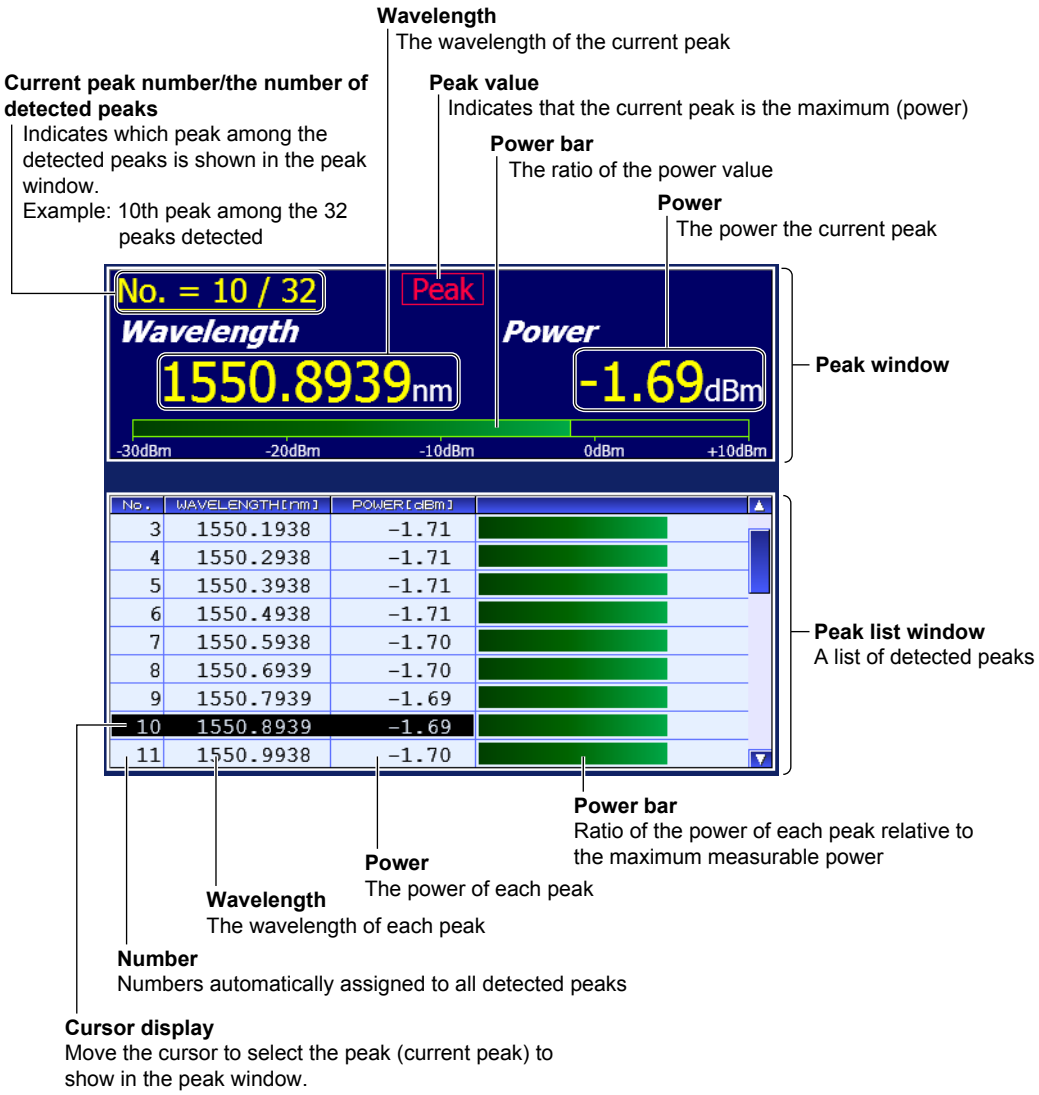
Measurement control keys
Indicates the state of the measurement control keys. If you connect a mouse to the AQ6150/AQ6151, you can click these keys to perform the same operations that you can using the front panel's measurement control keys.
RPT: Repeat measurement
SGL: Single measurement
STP: Stop measurement

Selected medium
VAC: Vacuum
AIR: Standard air

Illuminates when measurement wavelength range limit is on
See section 3.5.

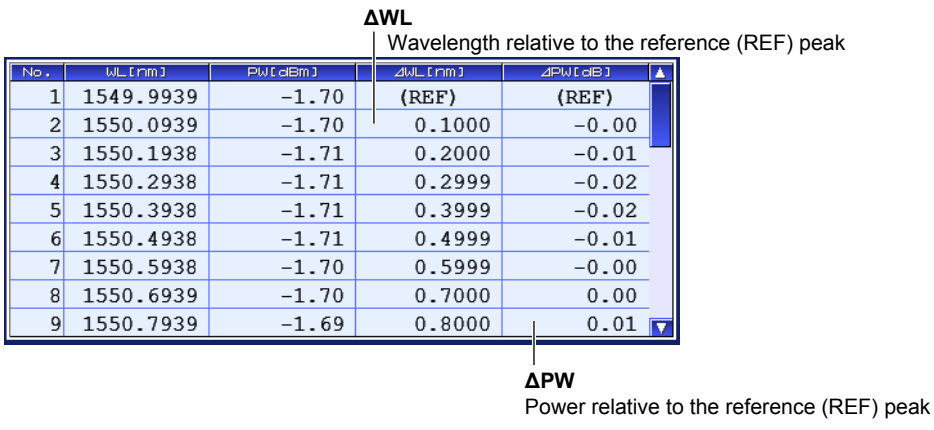
Multi Peak Screen for Absolute Values

For the procedure, see section 4.2.



Multi Peak Screen for Relative Values

The peak window is the same as with the multi peak screen for absolute values, shown above. For the procedure, see section 4.3.

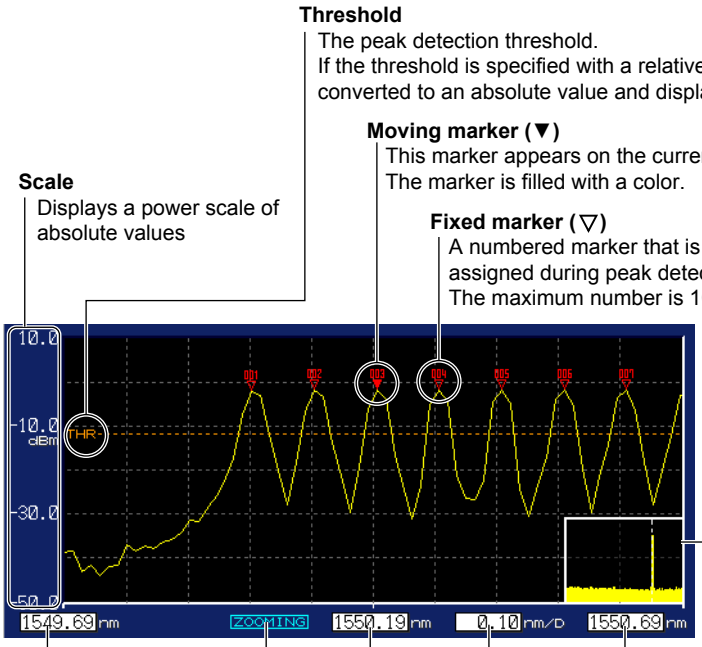


Single Peak Screen

A screen that shows only the peak window. The displayed contents and features are the same as those of the multi peak screens. For the procedure, see section 4.1.

Spectrum Window

For the procedure, see section 4.4.



Threshold
The peak detection threshold.
If the threshold is specified with a relative value, it is converted to an absolute value and displayed.

Moving marker (▼)
This marker appears on the current peak.
The marker is filled with a color.

Fixed marker (▽)
A numbered marker that is automatically assigned during peak detection
The maximum number is 1024.

Scale
Displays a power scale of absolute values

Overview window
The entire spectrum waveform

Start wavelength of the scale
The start wavelength of the display range

Stop wavelength of the scale
The stop wavelength of the display range

Wavelength per division

Center wavelength of the scale
The center wavelength of the display range

Zoom
Appears when the spectrum is being zoomed in on

2.1 Setting the Peak Detection Threshold and Excursion Values

Set the parameters for detecting wavelengths.

- Peak Threshold
- Peak Excursion

Procedure

Peak Thresh Type

Set whether to use an absolute value or relative value to specify the threshold.

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **PEAK THRESH TYPE** soft key.
   Each time you press the soft key, the setting toggles between REL and ABS.

Threshold definition mode (REL, ABS)

Set the threshold.

Set peak excursion.

Peak Thresh Value

Set the threshold as a value.

3. Press the **PEAK THRESH VALUE** soft key.
   A screen for setting the threshold level appears.
4. Enter the threshold using the arrow keys or numeric keypad.
5. Press **ENTER**.
   The specified threshold appears on the soft key.

Enter the value.
You do not have to enter a unit.

Note

The unit changes automatically according to the mode setting.
In REL mode, the unit is dB. In ABS mode, the unit is dBm.

Peak Excursion

Set the amount of power change from the peak value (the difference between the peak and valley) as a value. The peak power is automatically measured.

2. Press the **PEAK EXCURSION** soft key.
   A screen for setting the power difference appears.
3. Enter the value using the arrow keys or numeric keypad.

Enter the value.
You do not have to enter a unit.

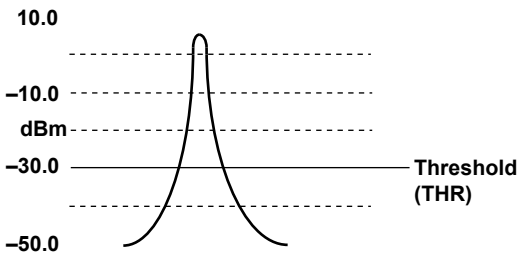
4. Press **ENTER**.
   The power difference that you enter appears on the soft key.

Explanation

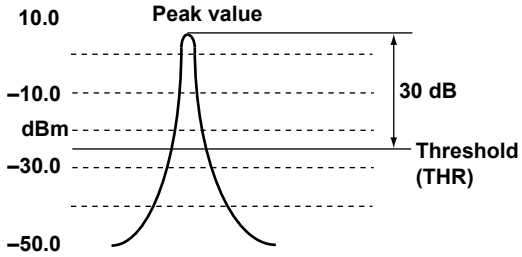
Peak Threshold

Set the power threshold for detecting wavelengths. Set the threshold using a relative value from the power peak (when PEAK THRESH TYPE is REL) or an absolute power value (when PEAK THRESH TYPE is ABS). If you specify –30 dB using a relative value, the threshold is set to a value that is 30 dB less than the peak value. Wavelengths that exceed this threshold power are measured.
The range of threshold values that you can specify are shown below. If you specify a value greater than the upper limit, the threshold is set to the upper limit. If you specify a value less than the lower limit, the threshold is set to the lower limit.

- ABS (absolute value): –40.0 dBm to 10.0 dBm
- REL (relative value): 0 dB to 40.0 dB



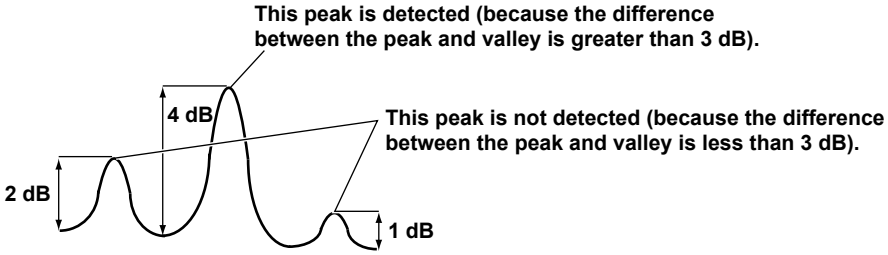
THR = –30 dBm in ABS mode



THR = 30 dB in REL mode

Peak Excursion

Peaks whose amount of power changes from the peak value (the difference between the peak and valley) is greater than the specified value are measured.

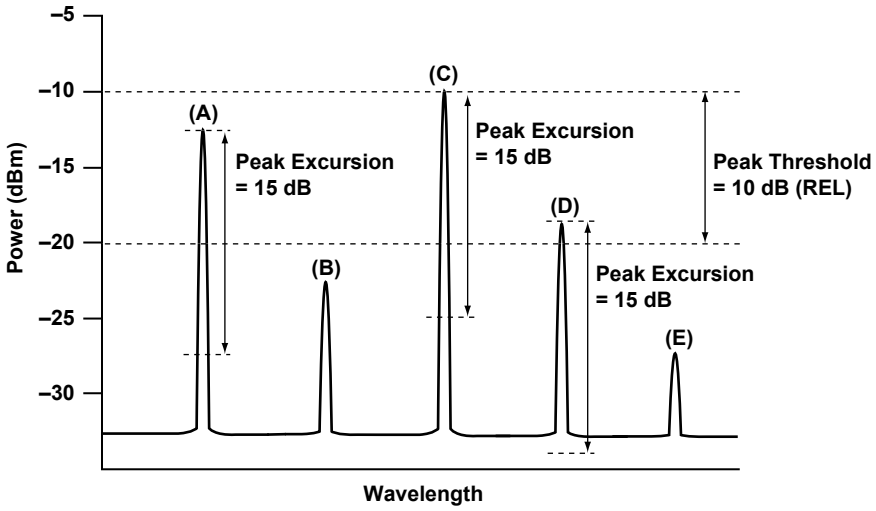


Example: When peak excursion is set to 3 dB

Example of Setting Peak Detection Parameters

Peak Thresh = 10 dB (Relative mode)

Peak Excursion = 15 dB



In the above example, only (A) and (C) are detected as peaks.

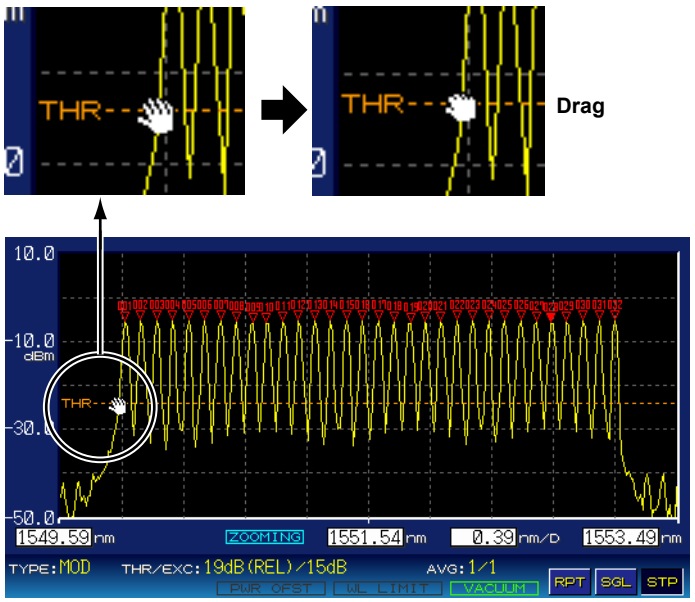
Explanation

- (A) and (C) are detected as peaks because their peak powers are within the Peak Threshold range and the differences between the peak and valley are greater than the Peak Excursion value.
- (B) and (E) are not detected as peaks because their peak powers are outside the Peak Threshold range.
- (D) is not detected as a peak because even though its peak power is within the Peak Threshold range, the difference between the peak and valley is less than the Peak Excursion value.

Mouse Operation for Setting the Peak Threshold

If you connect a mouse to the AQ6150/AQ6151, you can drag the cursor from the top of the spectrum window to set the threshold.

When the cursor changes to a hand cursor, you can drag.



For details on connecting a mouse, see section 2.5 in the Getting Started Guide, IM AQ6150-02EN.

For details on how to use the spectrum window, see section 4.3.

2.2 Setting the Medium (Vacuum or Standard Air) That Light Travels Through

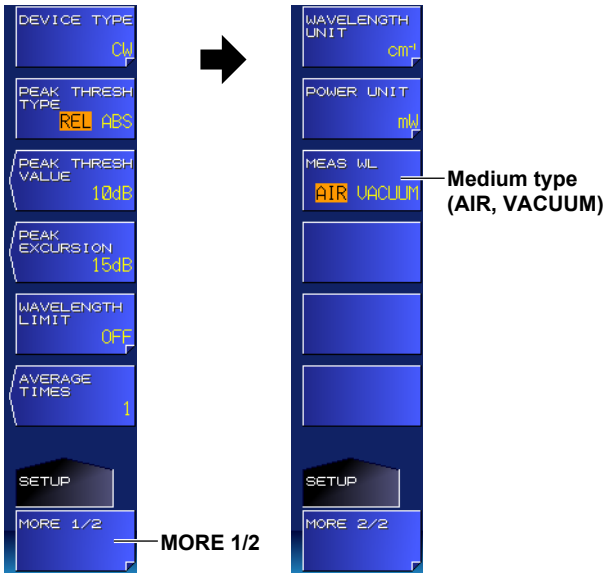
Set the actual medium in which the light under measurement will be used.

Procedure

Setting the Medium

Set the medium to vacuum or standard air.

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **MEAS WL** soft key.
   Each time you press the soft key, the setting toggles between AIR and VACUUM.



Explanation

The wavelength of light varies depending on the medium that it travels through.
To accurately measure the wavelength, set the actual medium in which the light will be used.
If you specify AIR (standard air), measured results will be converted for the following conditions.

- Air pressure 760 torr
- Temperature 15°C
- Humidity 0%

Even if the actual ambient temperature is 25°C, the AQ6150/AQ6151 converts the measured results for 15°C.

2.3 Setting the Wavelength and Power Units

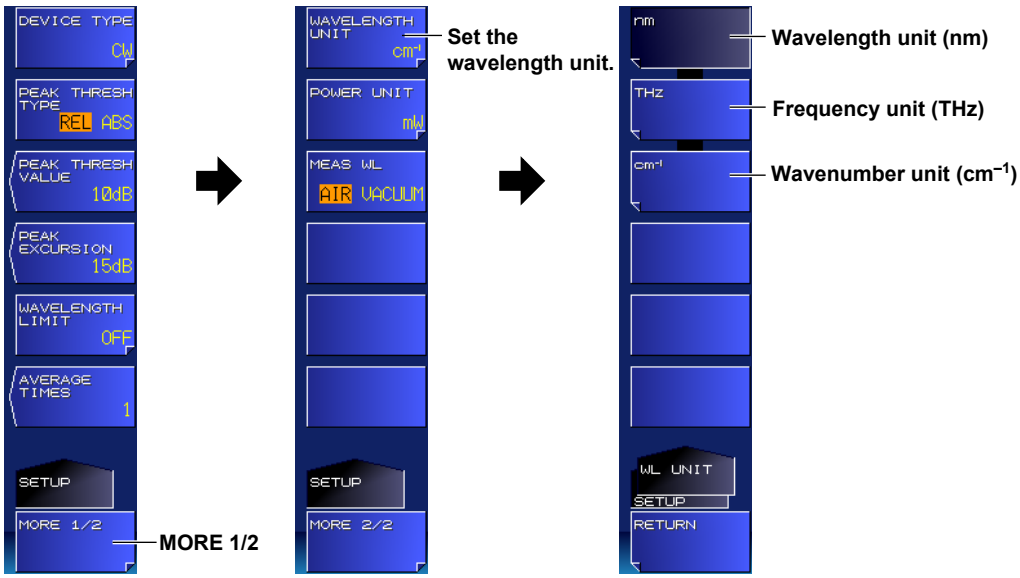
Set the unit to display in the peak window, spectrum window, and list on the AQ6150/AQ6151 display.

Procedure

Wavelength Unit

Specify wavelength, frequency, or wavenumber.

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **WAVELENGTH UNIT** soft key.
   A wavelength unit setup menu appears.



Wavelength Unit

4. Press the **nm** soft key.
   The setup menu returns to the previous display, and “nm” appears on the soft key.

Frequency Unit

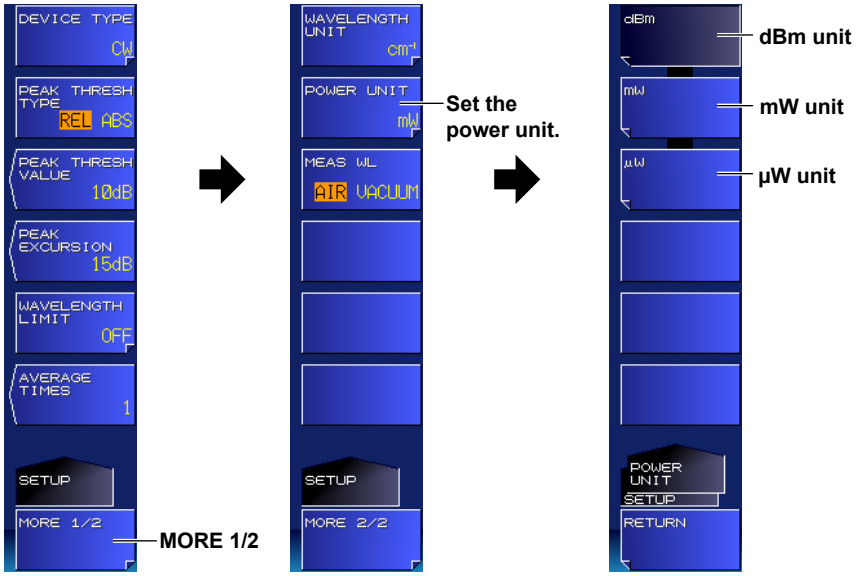
4. Press the **THz** soft key.
   The setup menu returns to the previous display, and “THz” appears on the soft key.

Wavenumber Unit

4. Press the **cm^{-1}** soft key.
   The setup menu returns to the previous display, and “cm^{-1}” appears on the soft key.

Power Unit

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **POWER UNIT** soft key.
   A power unit setup menu appears.



4. Press the **dBm**, **mW**, or **µW** soft key.
   The setup menu returns to the previous display, and the specified unit appears on the soft key.

Explanation

Wavenumber

Wavenumber is a unit that expresses how many waves (peaks) are in a centimeter.
It is the reciprocal of the wavelength divided by 100.
Example: 1/1550 nm ÷ 100 ≈ 6452 cm^{-1}

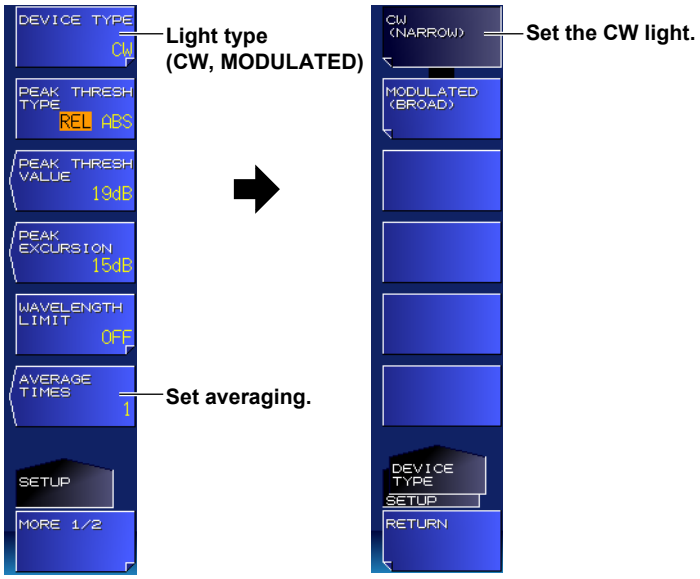
2.4 Configuring the CW Light (DFB-LD and FP-LD) Measurement

Select the light type for measuring an LD light source.

Procedure

Light Type

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **DEVICE TYPE** soft key.
   A light type setup menu appears.
3. Press the **CW (NARROW)** soft key.
   The setup menu returns to the previous display, and "CW" appears on the soft key.



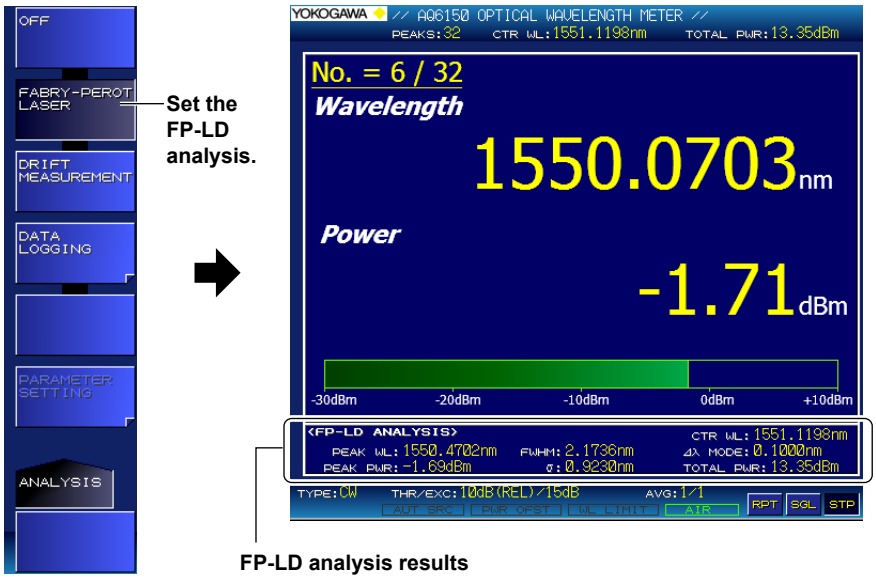
Note

- If the output of the light source under measurement is not stable, set averaging as necessary. For details on averaging, see section 3.3.
- To measure the peak under measurement separately from the side modes that appear near it, set a limit on the range of measured wavelength. For details, see section 3.5.

FP-LD Analysis

The AQ6150/AQ6151 can automatically perform FP-LD (Fabry-Perot) analysis for each measurement and display the results.

1. Press the **ANALYSIS** key.
   An analysis setup menu appears.
2. Press the **FABRY-PEROT LASER** soft key.
   A screen for displaying FP-LD analysis results appears.



Explanation

FP-LD Analysis

In FP-LD analysis, the following items are computed, and their results are displayed.

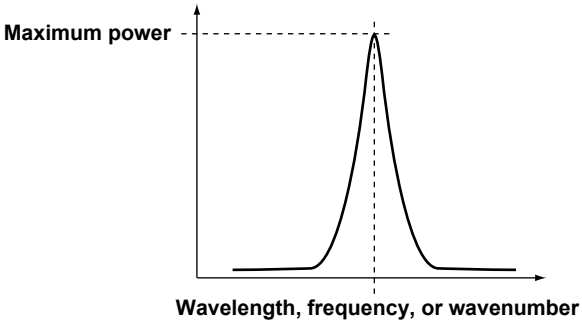
- Peak Power (maximum peak value): PEAK PWR
- Peak Wavelength (wavelength at maximum peak): PEAK WL
- Total Power (total peak): TOTAL PWR
- Mode Spacing (peak spacing): Δλ MODE
- Center Wavelength (mean wavelength): CTR WL
- Full Width at Half Maximum (FWHM): FWHM
- Sigma (Σ): σ

For detailed equations, see appendix 2.

Wavelength and Power Measurement of a Peak in a CW Light (Narrow)

The value on the horizontal scale where the peak optical power is maximum is assumed to be the peak's wavelength, frequency, or wavenumber.

The value on the vertical scale where the peak optical power is maximum is assumed to be the peak's power.



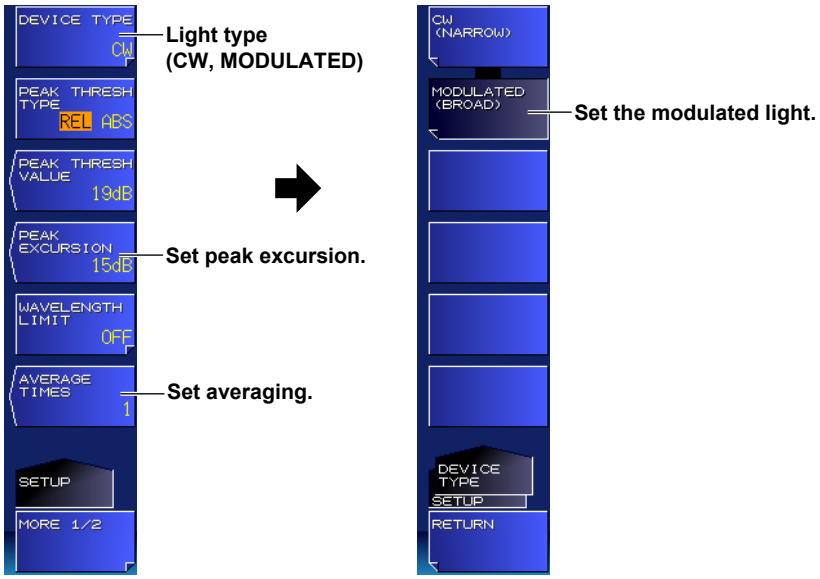
2.5 Configuring the Modulated Light (10G or 40G modulation, LED) Measurement

Select the light type for measuring a modulated light or LED.

Procedure

Light Type

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **DEVICE TYPE** soft key.
   A light type setup menu appears.
3. Press the **MODULATED (BROAD)** soft key.
   The setup menu returns to the previous display, and "MODULATED" appears on the soft key.

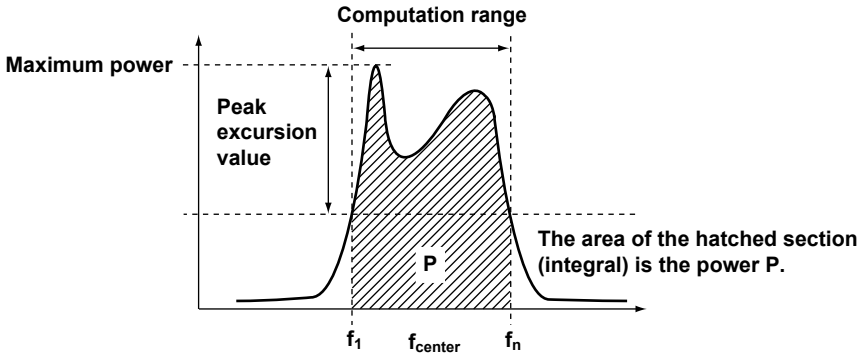


Peak Excursion

The wavelength and power of a modulated light are determined by the power difference from the peak value. Peak Excursion is also used to detect peaks. For the procedure, see section 2.1.
For details on the measured values of optical wavelength and power, see the explanation.

Explanation

Wavelength and Power Measurement of a Peak in a Modulated Light (Broad)



Wavelength, Frequency, or Wavenumber

The center-of-gravity value of the horizontal bandwidth defined by the value where the peak optical power is maximum to the value where the power is peak excursion value (dB) less than the maximum power is assumed to be the peak's wavelength, frequency, or wavenumber.
The center-of-gravity value (f_{center}) is computed with the following equation.

$$f_{center} = \frac{\sum_{i=1}^{n} (Pi \times fi)}{\sum_{i=1}^{n} Pi}$$

Pi = Power at each measurement point within the computation range
fi = Frequency at each measurement point within the computation range

Power

The integral value calculated over the horizontal bandwidth (f_1 to f_n), which is defined by the value where the peak optical power is maximum to the value where the power is peak excursion value (dB) less than the maximum power, is assumed to be the peak's power.

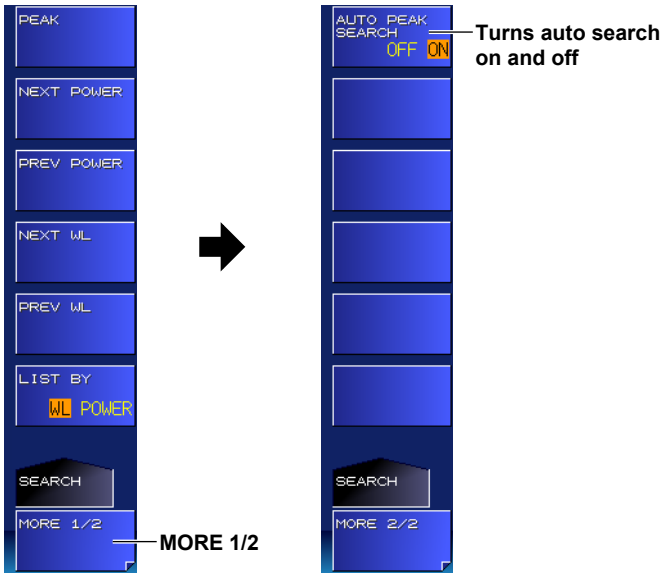
2.6 Turning Auto Wavelength or Power Searching On and Off

During single or repeat measurement, the auto wavelength or power search feature automatically searches for the peak with the maximum power and displays the peak on the screen. To search the peak manually, see section 5.1.

Procedure

Turning Auto Search On or Off

1. Press the **SEARCH** key.
   A search condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **AUTO PEAK SEARCH** soft key.
   Each time you press the soft key, the setting toggles between OFF and ON.



Explanation

Auto Search

Auto Search always searches for the peak with the maximum power.

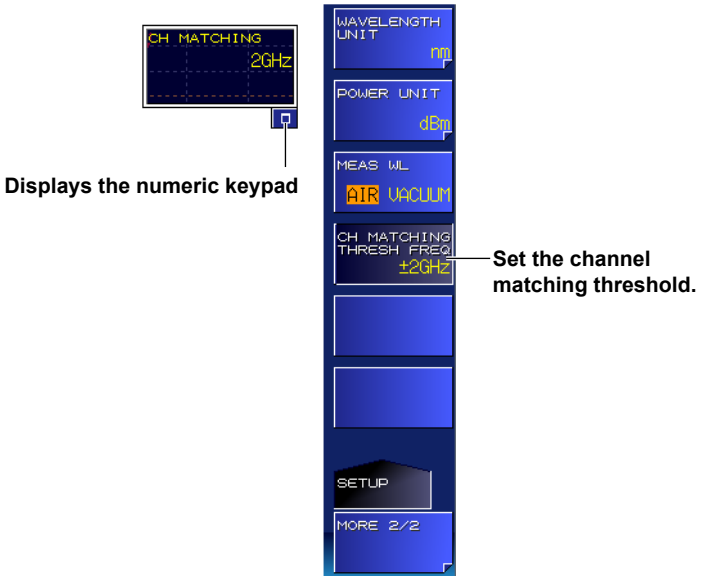
2.7 Setting the Frequency Tolerance (Channel Matching)

When measuring repeatedly, you can specify the frequency variation threshold for identifying identical peaks.

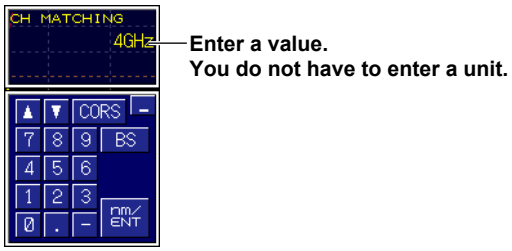
Procedure

Channel Matching Threshold

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **CH MATCHING THRESH FREQ** soft key.
   A screen for setting the channel matching threshold appears.



4. Enter the threshold using the arrow keys or numeric keypad.



5. Press **ENTER**.
   The specified threshold appears on the soft key.

Explanation

When measuring repeatedly, specifying a threshold will enable the AQ6150/AQ6151 to determine the closest peaks between the peak detected in this measurement and the peaks that have been already detected (channel matching) and identify the closest peaks as identical peaks when their frequency difference is less than or equal to the threshold.
This value is valid in following conditions.

- During averaged measurement
- During drift measurement
- When the logging item is set to PEAK in the analysis data logging function

3.1 Single Measurement

Under the conditions specified in chapter 2, the AQ6150/AQ6151 measures once and displays the results on the screen.

CAUTION

- Do not apply light that is +18 dBm or greater to the optical connector of the AQ6150/AQ6151. Doing so may damage the optical components in the AQ6150/AQ6151.
- If you want to use a light that is +18 dBm or greater, use an optical attenuator to adjust the light to less than +18 dBm.

French

ATTENTION

- Ne pas appliquer un signal de +18 dBm ou plus au connecteur optique de l'AQ6150/AQ6151. Cela pourrait endommager les composants optiques qui sont utilisés à l'intérieur de l'AQ6150/AQ6151.
- Si vous souhaitez utiliser un signal de +18 dBm ou plus, utilisez un atténuateur optique pour ajuster le signal à moins de +18 dBm.

Procedure

1. Press the **SINGLE** key.

The SINGLE key illuminates to indicate that a measurement has started. When the measurement is complete, the SINGLE key turns off.

Note

- If the AQ6150/AQ6151 detects an optical input power that exceeds the allowable limit, the message "Input power too high" appears on the screen, and the measurement stops. For details on messages, see section 8.1.
- If you change the power offset, redo the measurement.
- If averaging is enabled, the AQ6150/AQ6151 measures for the specified number of times and completes the single measurement. For details on how to set averaging, see section 3.3.

Explanation

Measurement Range

In a single measurement, the AQ6150/AQ6151 sweeps the measurement range of 1270 nm to 1650 nm once. You cannot stop the measurement while sweeping is in progress. If you press STOP, the measurement will stop after the current sweeping is finished.
To change the measurement range, see section 3.5.

Peak Detection

When peaks that exceed the threshold power are present in the measurement range, the AQ6150/AQ6151 measures their wavelengths and power values and displays the results on the screen. The AQ6150/AQ6151 can display up to 1024 peaks.
If the AQ6150/AQ6151 detects no peaks, the "No Signal" message appears on the screen.
In such cases, check the threshold and peak excursion values (see section 2.1).

Spurious Noise

Spurious noise may be measured depending on the measurement conditions. For details, see appendix 3.

3.2 Repeat Measurement

Under the conditions specified in chapter 2, the AQ6150/AQ6151 makes repeated measurements and updates the measurement results on the screen.

CAUTION

- Do not apply light that is +18 dBm or greater to the optical connector of the AQ6150/AQ6151. Doing so may damage the optical components in the AQ6150/AQ6151.
- If you want to use a light that is +18 dBm or greater, use an optical attenuator to adjust the light to less than +18 dBm.

French

ATTENTION

- Ne pas appliquer un signal de +18 dBm ou plus au connecteur optique de l'AQ6150/AQ6151. Cela pourrait endommager les composants optiques qui sont utilisés à l'intérieur de l'AQ6150/AQ6151.
- Si vous souhaitez utiliser un signal de +18 dBm ou plus, utilisez un atténuateur optique pour ajuster le signal à moins de +18 dBm.

Procedure

1. Press the **REPEAT** key.
The REPEAT key illuminates to indicate that a measurement has started. Measurement is repeated until you press STOP.

Note

- If the AQ6150/AQ6151 detects an optical input power that exceeds the allowable limit, the message "Input power too high" appears on the screen, and the measurement stops. For details on messages, see section 8.1.
- If you change the power offset after a measurement, redo the measurement.
- If averaging is enabled, the AQ6150/AQ6151 measures for the specified number of times and updates the measured results. For details on how to set averaging, see section 3.3.

Explanation

Measurement Range

In a repeat measurement, the AQ6150/AQ6151 sweeps the measurement range of 1270 nm to 1650 nm repeatedly. You cannot stop the measurement while sweeping is in progress. If you press STOP, the measurement will stop after the current sweeping is finished.
To change the measurement range, see section 3.5.

Peak Detection

When peaks that exceed the threshold power are present in the measurement range, the AQ6150/AQ6151 measures their wavelengths and power values and updates the results on the screen. The AQ6150/AQ6151 can display up to 1024 peaks.
If the AQ6150/AQ6151 detects no peaks, the "No Signal" message appears on the screen.
In such cases, check the threshold and peak excursion values (see section 2.1).

Spurious Noise

Spurious noise may be measured depending on the measurement conditions. For details, see appendix 3.

3.3 Averaged Measurement

Under the conditions specified in section 3.1 or 3.2, the AQ6150/AQ6151 averages the measured data of multiple sweeps and displays the measured results.

Procedure

Setting Averaging

The AQ6150/AQ6151 measures for the specified number of times, averages the measured values, and displays the results. The following procedure is for setting the measurement count (Average Times).

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **AVERAGE TIMES** soft key.
   A screen for setting the measurement count appears.
3. Enter the measurement count using the arrow keys or numeric keypad.

Enter the value.

4. Press **ENTER**.
   The specified measurement count appears on the soft key.

Note

- Simply changing the average setting will not change the results that have already been measured according to the procedure in section 3.1 or 3.2.
  Redo the measurements explained in section 3.1 or 3.2.
- If you press STOP while a measurement explained in section 3.1 or 3.2 is in progress, the measurement will stop even if the specified measurement count has not been reached.
- If the AQ6150/AQ6151 detects an optical input power that exceeds the allowable limit while a measurement explained in section 3.1 or 3.2 is in progress, the measurement will stop even if the specified measurement count has not been reached.
- If you switch between single measurement and repeat measurement or change measurement conditions during averaged measurement, the averaged data up to that point is discarded, and measurement is performed again for the specified number of times.
- For details on setting the frequency tolerance (channel matching) for identifying identical peaks, see section 2.7.

Explanation

Averaging

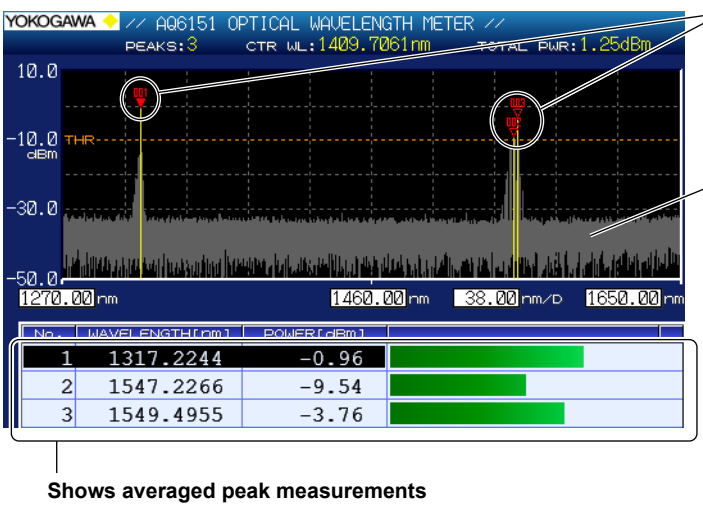
If the measurement count (Average Times) is set to 2 or higher, the AQ6150/AQ6151 computes the average wavelength and power of the measured results.
In a single measurement, the AQ6150/AQ6151 measures for the specified number of times, computes and displays the average values, and then stops the measurement.
In a repeat measurement, the AQ6150/AQ6151 computes the moving averages with the most recent measurement and the specified number of measurements and updates the values on the screen.
Averaging can be performed over 2 to 100 times. If the measurement count is set to 1, averaging is not performed.

Averaging for single and repeat measurements are based on the peaks that are detected in the first sweep. If the peaks that are detected in subsequent sweeps differ from those of the first sweep, averaging is processed in the following manner.

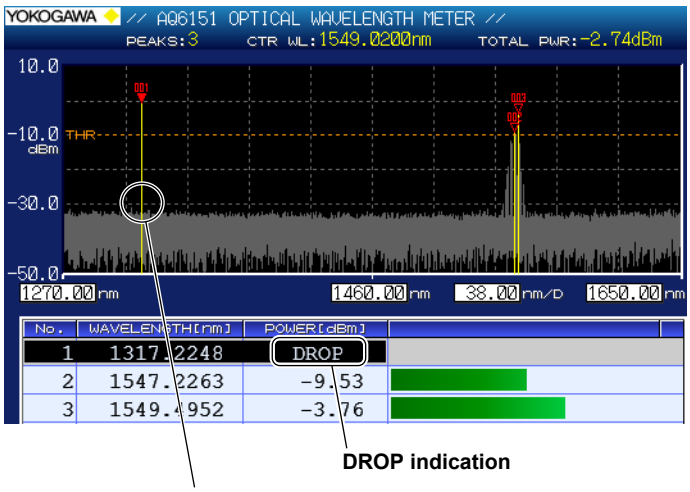
- Additional peaks (peaks that are not detected in the first sweep) are not averaged.
- Dropped peaks (peaks that are detected in the first sweep but are not in subsequent sweeps) are not averaged. For such peaks, “DROP” appears on the screen.

For details on single measurement, see section 3.1.
For details on repeat measurement, see section 3.2.

Display during Averaged Measurement



Display When a Peak Is No Longer Detected during Averaged Measurement



The No. 1 peak is lost.
If a peak is lost from the most recent measured data (gray), averaged measurement on the peak is aborted.
The peak (averaged measurement result) before it was lost remains on the screen, but averaging is not performed after it is lost. If this happens, “DROP” is displayed for the power value in the measured results.

Note

For details on setting the frequency tolerance (channel matching) for identifying identical peaks, see section 2.7.

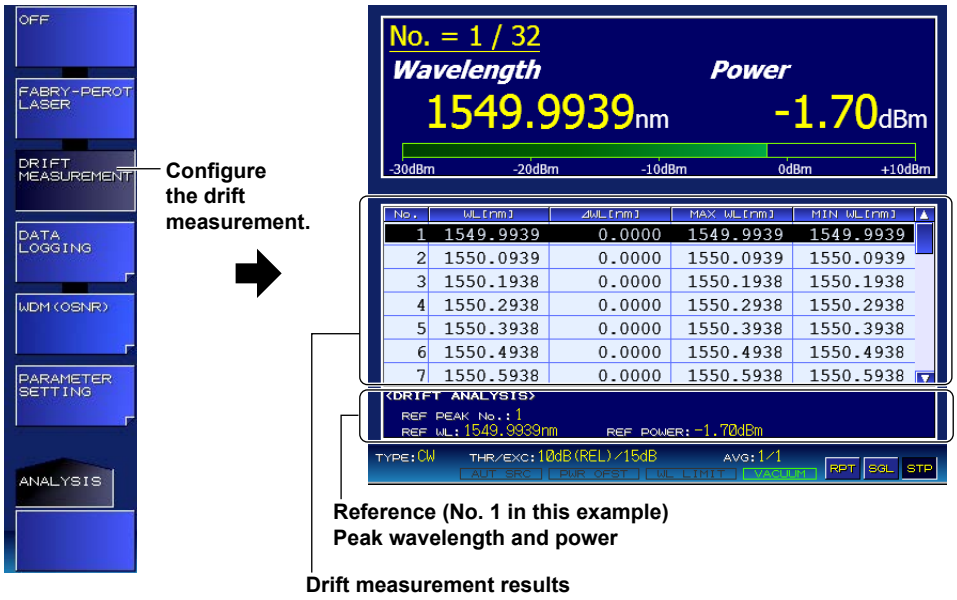
3.4 Drift Measurement

Under the conditions specified in section 3.1 or 3.2, the AQ6150/AQ6151 measures the amount of change in the peaks' wavelength and power values.

Procedure

Turning Drift Measurement On or Off

1. Press the **ANALYSIS** key.
   An analysis setup menu appears.
2. Press the **DRIFT MEASUREMENT** soft key.
   A drift measurement parameter setup menu and a result screen appear.



The reference area shows the values for the peak that the cursor is on in the drift measurement result display (list display).
You can select what to display for the drift measurement results by following the procedure on the next page. The example above shows the screen when wavelength (difference from the reference, maximum, and minimum) is specified. The display contents can be changed even after a measurement is finished.

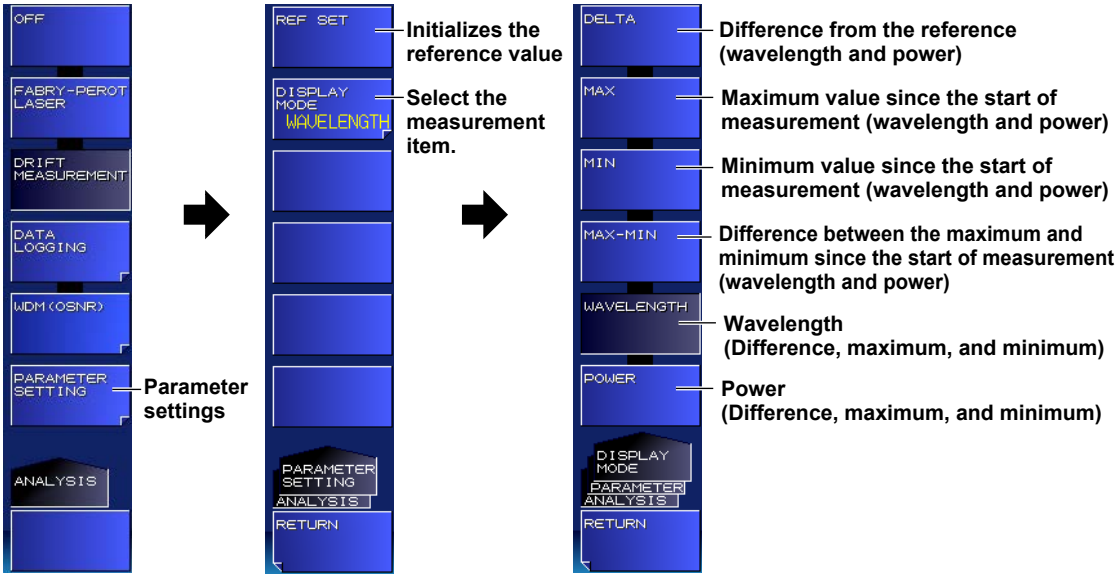
Note

- Averaged measurement cannot be performed during drift measurement. If you enable drift measurement, the measurement count for averaging (AVERAGE TIMES) will be set to 1.
- For details on setting the frequency tolerance (channel matching) for identifying identical peaks, see section 2.7.

Selecting the Measurement Item

Select the item that you want to show for the drift measurement results.

3. Press the **PARAMETER SETTING** soft key.
   A DISPLAY MODE setup menu appears.
4. Press the **DISPLAY MODE** soft key.
   A display item setup menu appears.



Initializing the Reference Value

You can initialize (clear) the peak reference values (wavelength and power values).

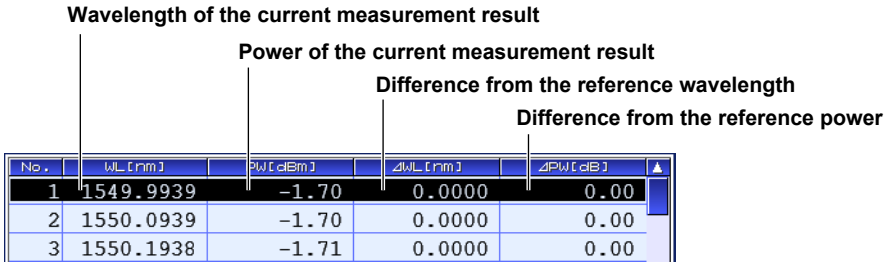
4. Press the **REF SET** soft key.
   All peak reference values are cleared.

Explanation

Selecting the Measurement Item

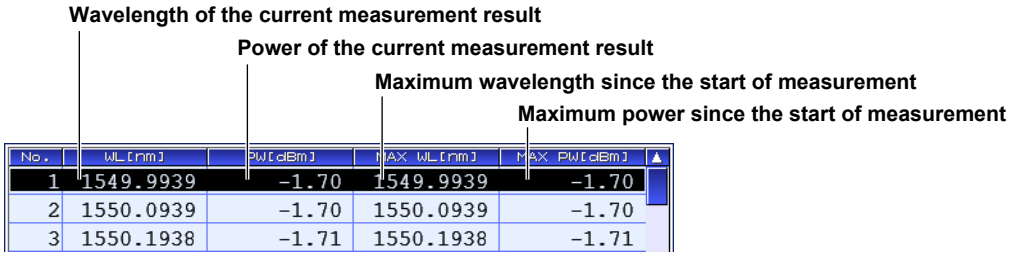
DELTA

The differences between the current measurement peak and the reference peak are displayed. The wavelength and power values are displayed. The units of wavelength, frequency, or wavenumber and power are displayed according to the settings.



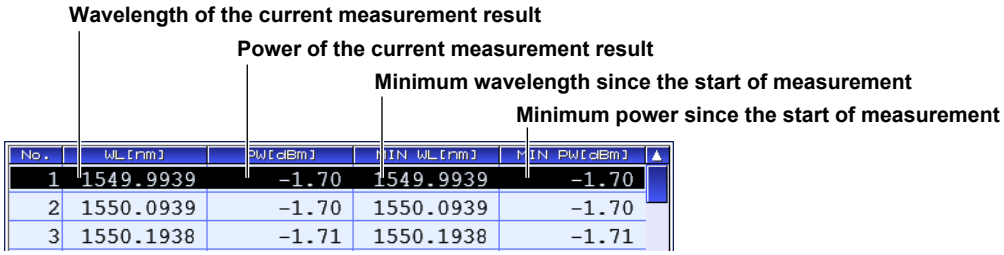
MAX

The maximum values since the start of measurement are displayed. The wavelength and power values are displayed. The units of wavelength, frequency, or wavenumber and power are displayed according to the settings.



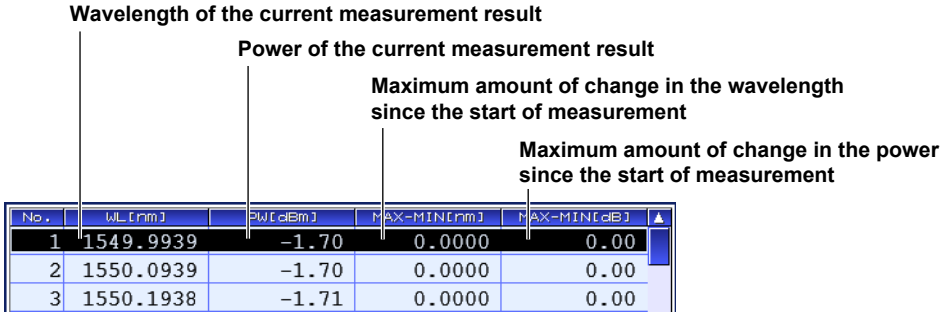
MIN

The minimum values since the start of measurement are displayed. The wavelength and power values are displayed. The units of wavelength, frequency, or wavenumber and power are displayed according to the settings.



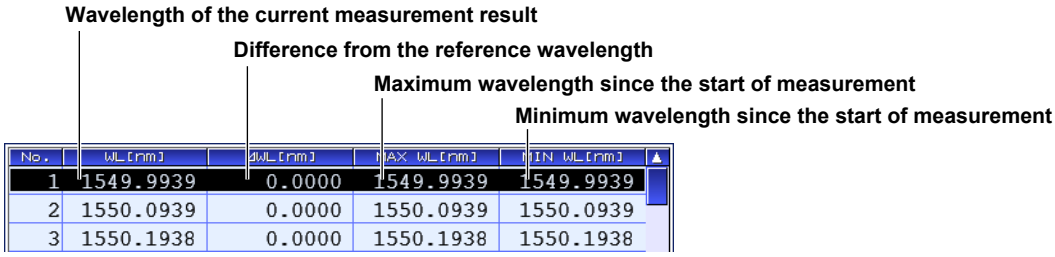
MAX-MIN

The differences between the maximum and minimum since the start of measurement are displayed. The wavelength and power values are displayed. The units of wavelength, frequency, or wavenumber and power are displayed according to the settings.



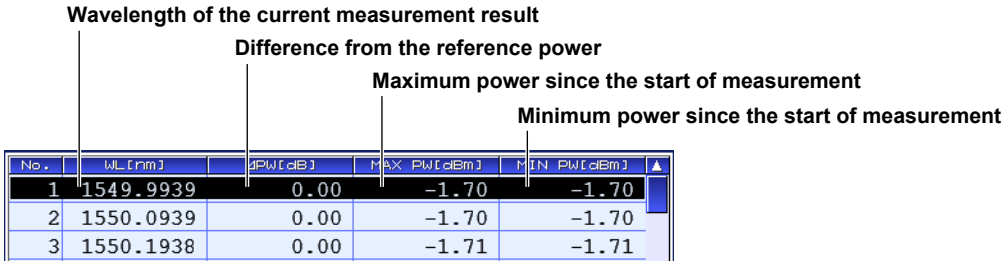
WAVELENGTH

Only the measured wavelengths, frequencies, or wavenumbers are displayed. The measured values of DELTA, MAX, and MIN are displayed.
The wavelength, frequency, or wavenumber is displayed automatically according to the settings.



POWER

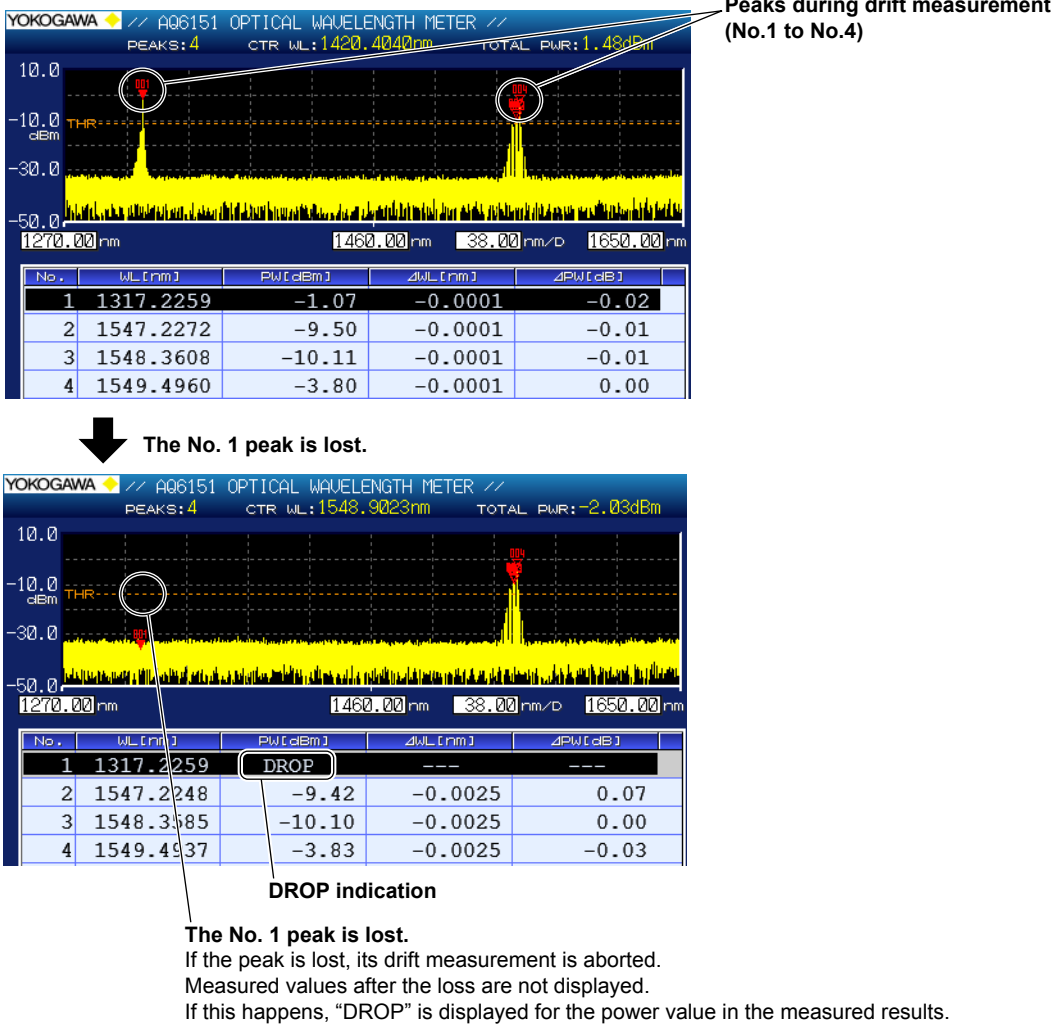
Only the measured power values are displayed. The DELTA, MAX, and MIN values of power are displayed.
The unit of power is displayed according to the settings.



Indication When Peaks Are No Longer Detected during Measurement (DROP)

If a peak is lost during drift measurement, the drift measurement of that peak is aborted.

Display during drift measurement



The No. 1 peak is lost.
If the peak is lost, its drift measurement is aborted.
Measured values after the loss are not displayed.
If this happens, “DROP” is displayed for the power value in the measured results.

Note

For details on setting the frequency tolerance (channel matching) for identifying identical peaks, see section 2.7.

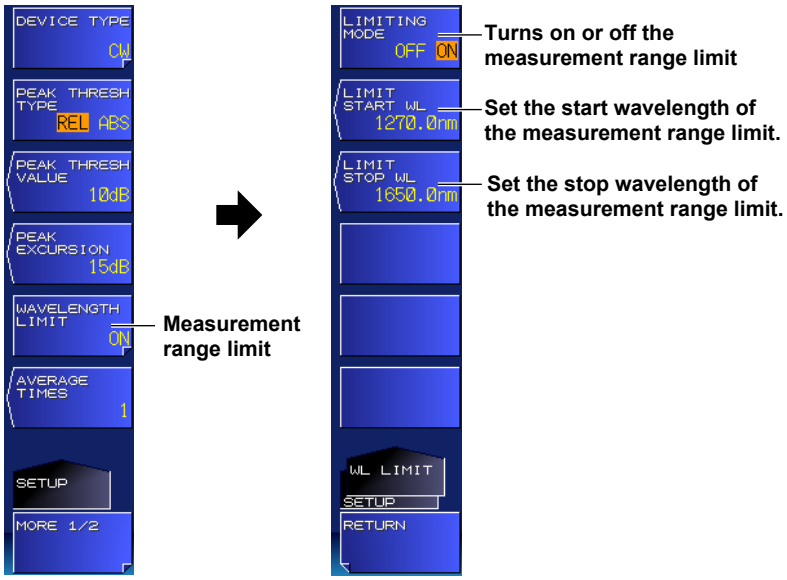
3.5 Measuring Only a Specific Wavelength

When making measurements under the conditions specified in section 3.1 or 3.2, you can limit the measurement range in which to detect peaks.

Procedure

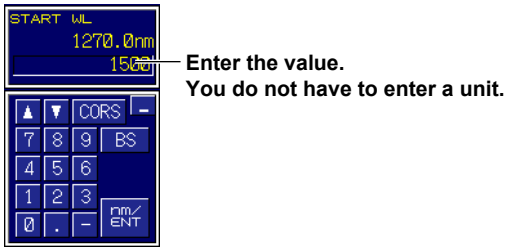
Turning On or Off the Measurement Range Limit

1. Press **SETUP**.
   A measurement condition setup menu appears.
2. Press the **WAVELENGTH LIMIT** soft key.
   A measurement range limit setup menu appears.
3. Press the **LIMITING MODE** soft key.
   Each time you press the soft key, the setting toggles between ON and OFF. When set to ON, the measurement range can be limited.



Setting the Limit Start Wavelength

4. Press the **LIMIT START WL** soft key.
   A screen for setting the start wavelength appears.



5. Enter the start wavelength using the arrow keys or numeric keypad.
6. Press **ENTER**.
   The specified start wavelength appears on the soft key.

Setting the Limit Stop Wavelength

4. Press the **LIMIT STOP WL** soft key.
   A screen for setting the stop wavelength appears.

Enter the value.
You do not have to enter a unit.

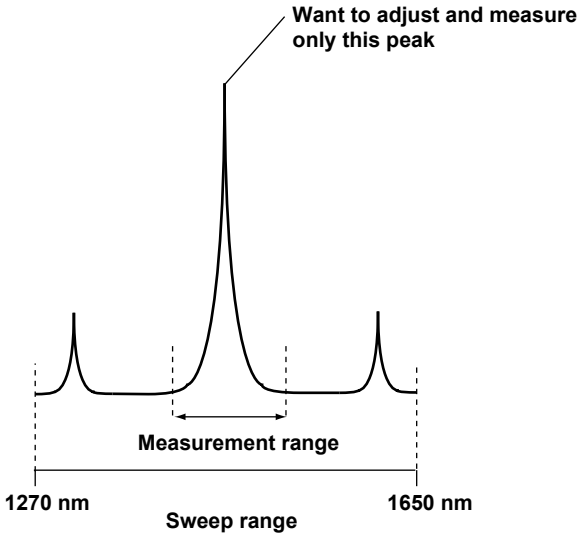
5. Enter the stop wavelength using the arrow keys or numeric keypad.
6. Press **ENTER**.
   The specified stop wavelength appears on the soft key.

Note

The soft key name and value are displayed according to the wavelength (vacuum), frequency, or wavenumber settings.

Explanation

In a single sweep of a normal measurement, the AQ6150/AQ6151 measures over the range of 1270 nm to 1650 nm to detect peaks and compute the total power. If you place a measurement range limit, the sweep range does not change, but the range over which peaks are detected and total power is computed is limited.
By limiting the measurement range when there are superimposed peaks in the light under measurement or when side modes are detected, you can measure only the desired peak. This makes it easy to adjust the wavelength and check the total power.

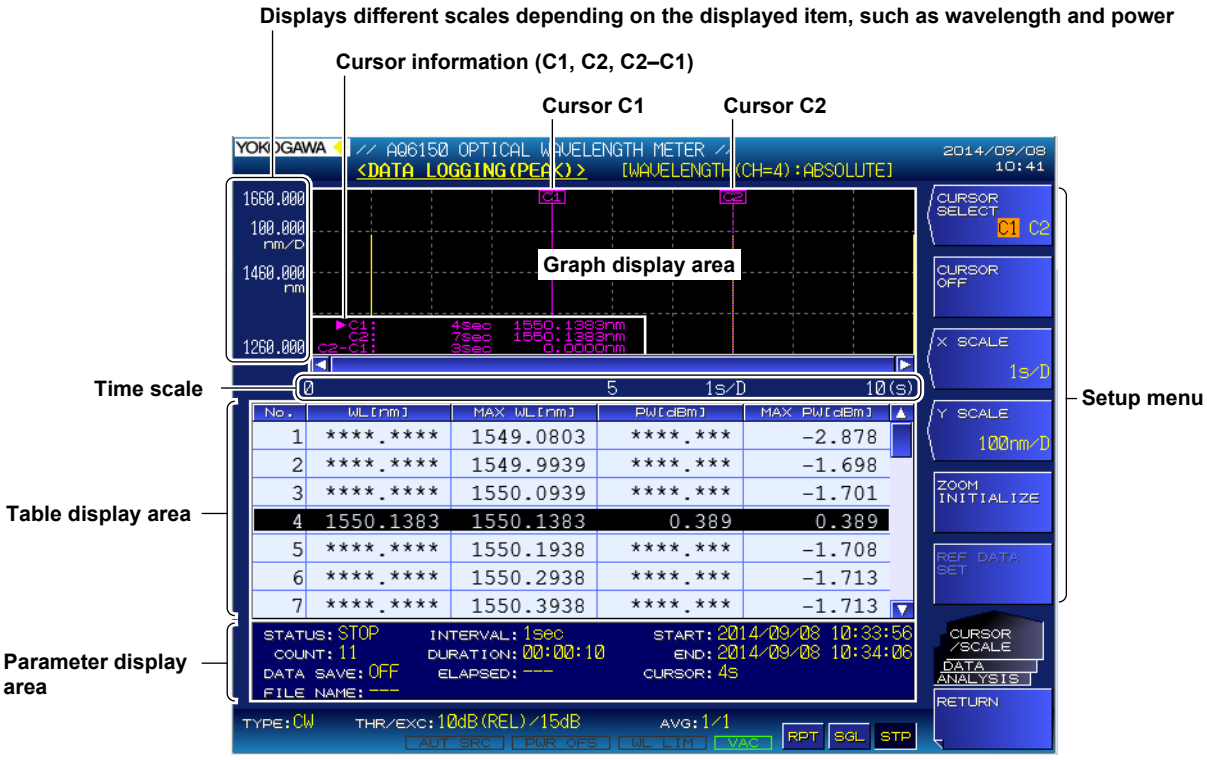


Peaks outside the measurement range will not be detected. The spectrum waveform will consist only the peaks within the limit range (measurement range). In this situation, scaling is also limited within the range.
For details on scaling, see section 4.4.

3.6 Analysis Data Logging

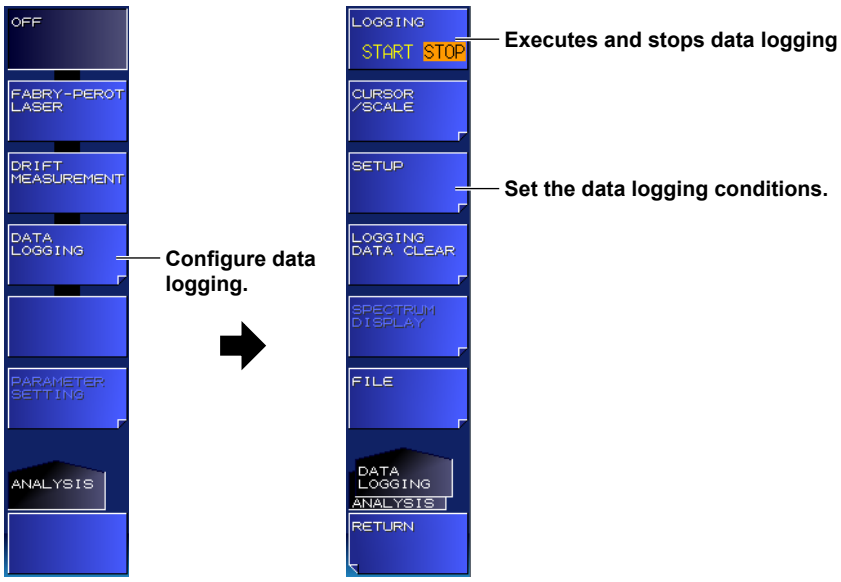
The analysis data logging function measures and records FB-LD analysis, and peak data at regular intervals and displays the data in tables and graphs on the screen. The contents in the table can be saved to files.

Logging Screen



Procedure

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.

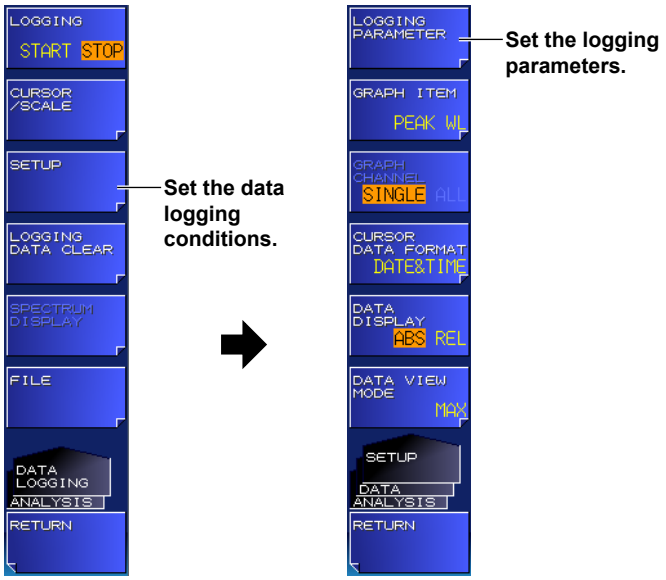


Setting the Data Logging Conditions

Setting the Logging Parameters

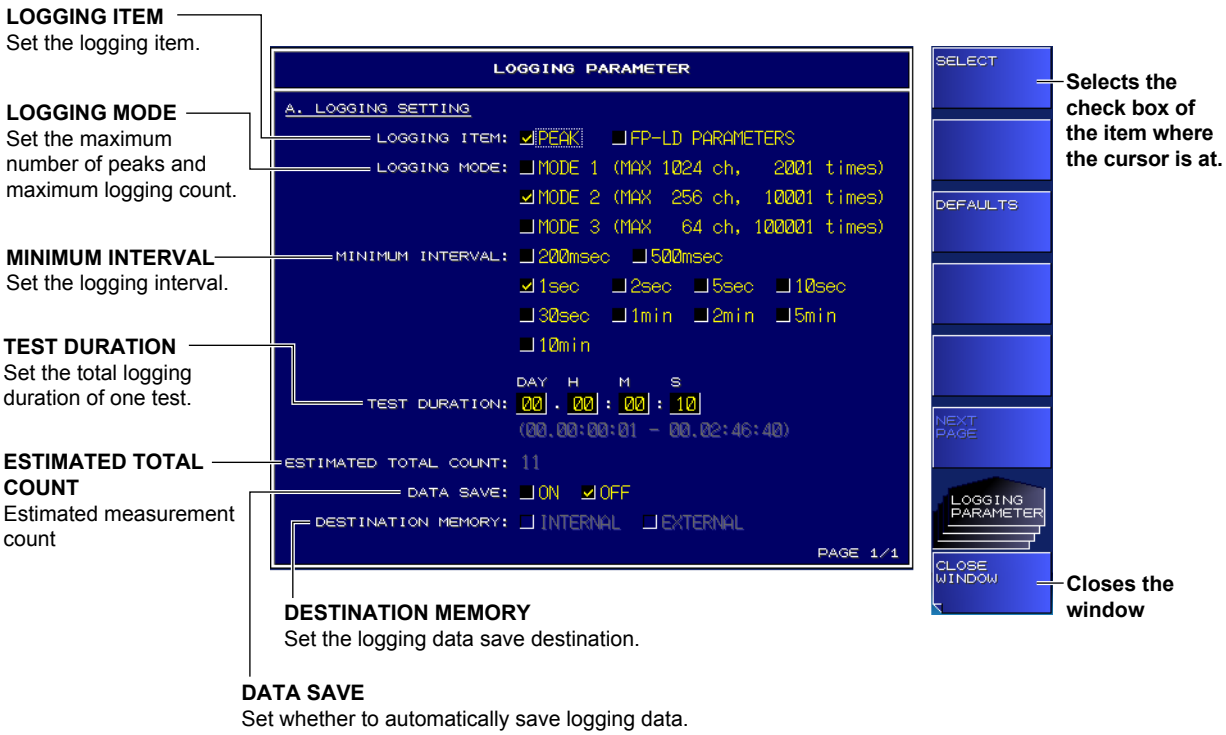
2. Press the **SETUP** soft key.

A menu for setting the data logging conditions appears.



3. Press the **LOGGING PARAMETER** soft key.

A screen for setting the logging parameters appears.



4. Move the cursor using the arrow keys, and enter the value using the numeric keypad.

To select a check box, align the cursor, and then press the **SELECT** soft key.

5. Press the **CLOSE WINDOW** soft key.

The logging parameter setup screen closes, and the setup menu returns to the previous level.

Note

- The LOGGING PARAMETER soft key cannot be used while data logging is in progress.
- Averaged measurement cannot be performed while data logging is in progress. When you press the DATA LOGGING soft key, the measurement count for averaging (AVERAGE TIMES) will be set to 1.
- For details on setting the frequency tolerance (channel matching) for identifying identical peaks, see section 2.7.

Executing and Stopping Data Logging

2. Press the **LOGGING** soft key.

   A confirmation message for deleting the existing logging data and the EXECUTE and CANCEL soft keys appear.

   * If there is no existing logging data, the confirmation message for deleting the data will not appear, and data logging will begin immediately.

3. Press the **EXECUTE** soft key.

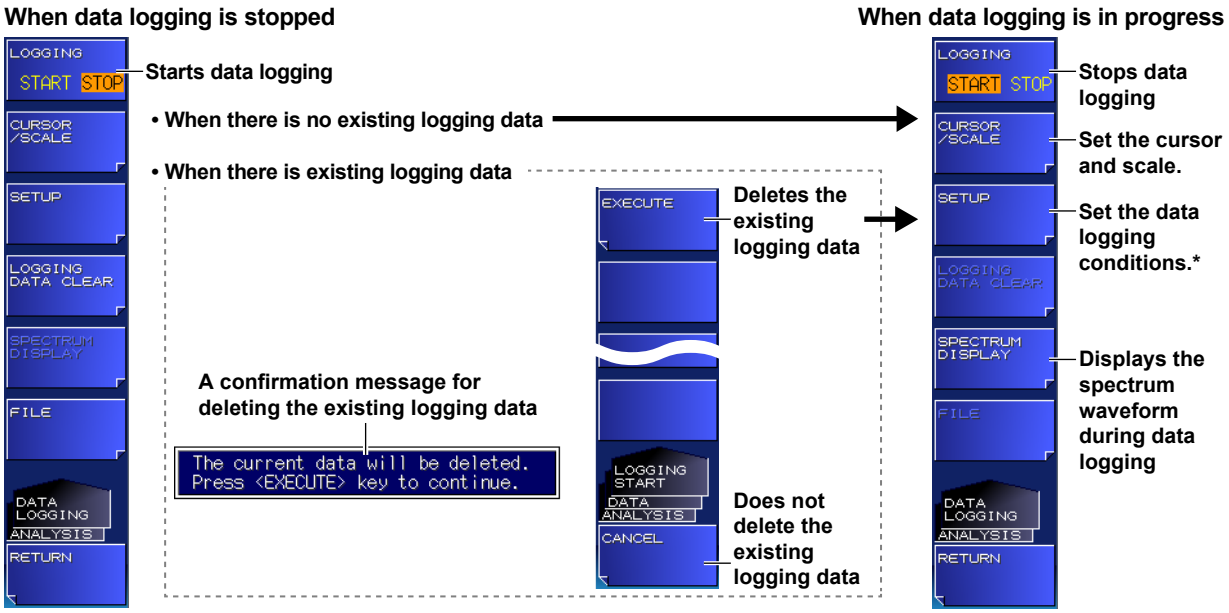
   The existing logging data is deleted, and a new data logging session begins.

   When the specified number of measurements is reached, data logging automatically stops.

   If you do not want to delete the existing logging data, press the **CANCEL** soft key.

   The previous setup menu will return.

4. If you press the **LOGGING** soft key while data logging is in progress, data logging will be stopped.



* The LOGGING PARAMETER soft key cannot be used while data logging is in progress.

Note

- When performing operations such as marker operation and display switching during data logging, the measurement interval may be slightly longer.
- When DATA SAVE is ON, the AQ6150/AQ6151 checks the amount of free space in the data storage space before starting to log. If there is insufficient free memory space, a warning will appear.

  WARNING 47: Disk space is not enough for logging

  If this warning appears, reduce the logging time to decrease the data size.
- While data logging is in progress, you can only perform operations related to data logging (see the above figure).

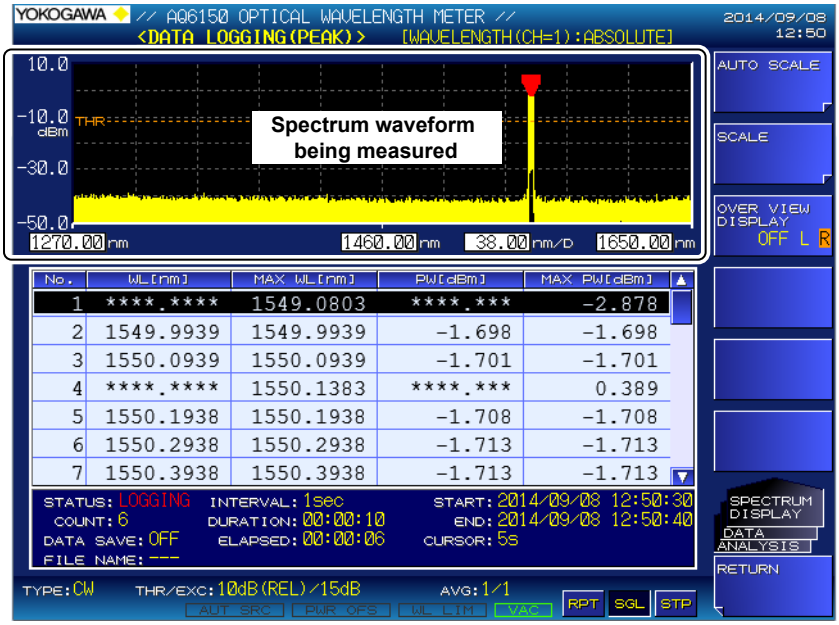
  If you try to perform an operation that is not related to data logging, a confirmation message for stopping the data logging will appear. If you do not want to stop data logging, press the NO soft key.

Displaying the Spectrum Waveform during Data Logging

If necessary, you can view the measured spectrum waveform while data logging is in progress.

4. Press the **SPECTRUM DISPLAY** soft key.

The waveform of the data being logged appears on the screen (normal spectrum waveform display).



Note

You cannot use the SPECTRUM DISPLAY soft key when data logging is stopped.

Returning to the Previous Display

5. Press the **RETURN** soft key.

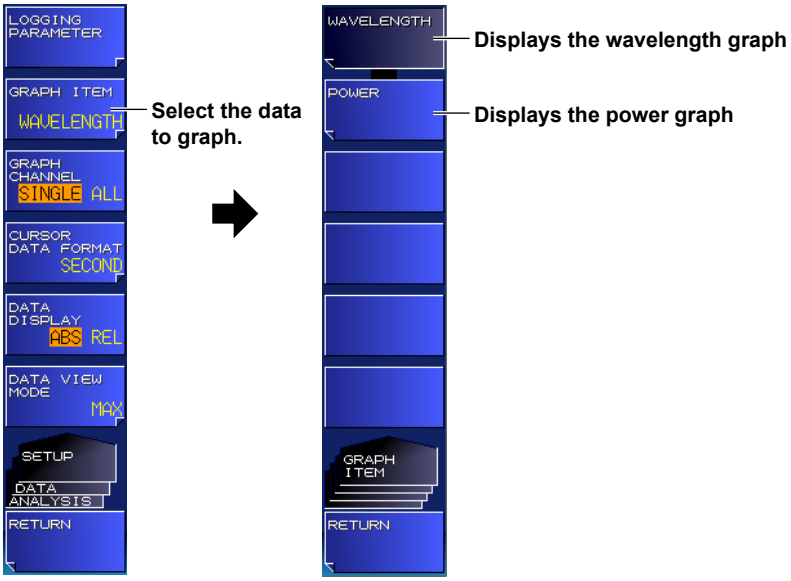
The setup menu returns to the previous display.

Selecting the Data to Graph

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
2. Press the **SETUP** soft key.
   A menu for setting the data logging conditions appears.
3. Press the **GRAPH ITEM** soft key.
   The displayed menu varies depending on what is being logged.

When the Logging Item Is PEAK

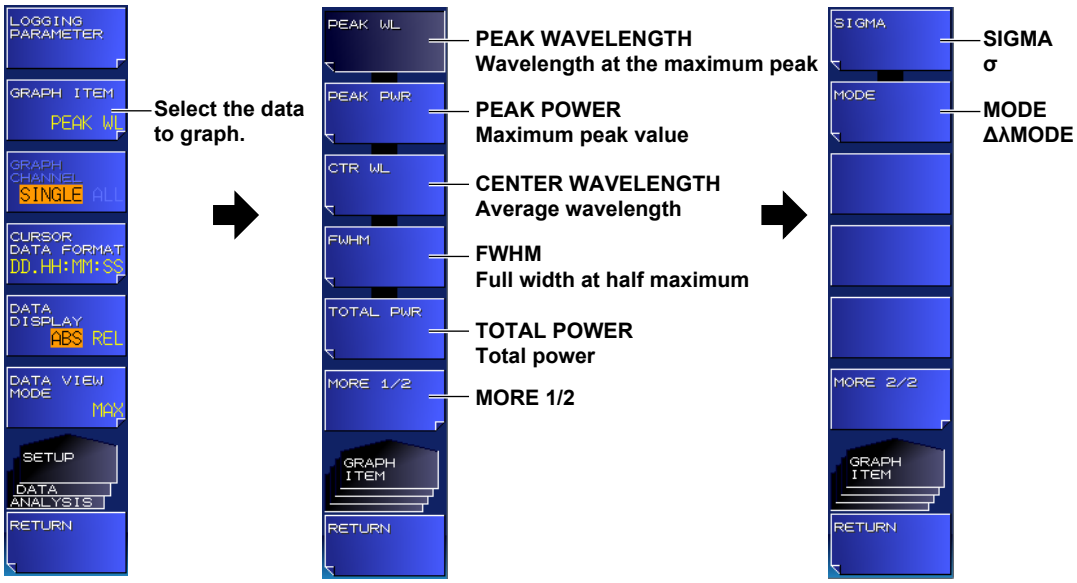
4. To display the wavelength graph, press the **WAVELENGTH** soft key. To display the power graph, press the **POWER** soft key.



When the Logging Item Is FP-LD PARAMETERS

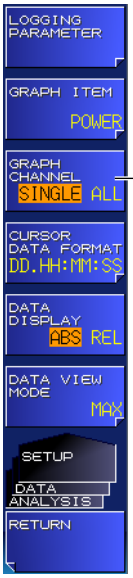
4. To display the graph of FP-LD analysis items, press the soft keys below.

- To display the peak wavelength graph **PEAK WL**
- To display the peak power graph **PEAK PWR**
- To display the center wavelength graph **CTR WL**
- To display the full-width-at-half-maximum graph **FWHM**
- To display the total power graph **TOTAL PWR**
- To display the spectral width (σ) graph of the center wavelength based on the RMS parameter
  Press **MORE 1/2** and then **SIGMA**
- To display the MODE graph
  Press **MORE 1/2** and then **MODE**



Selecting the Number of Peaks to Graph

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
2. Press the **SETUP** soft key.
   A menu for setting the data logging conditions appears.
3. Press the **GRAPH CHANNEL** soft key.
   The mode changes to SINGLE or ALL. If you specify SINGLE, select the peak to display from the table.



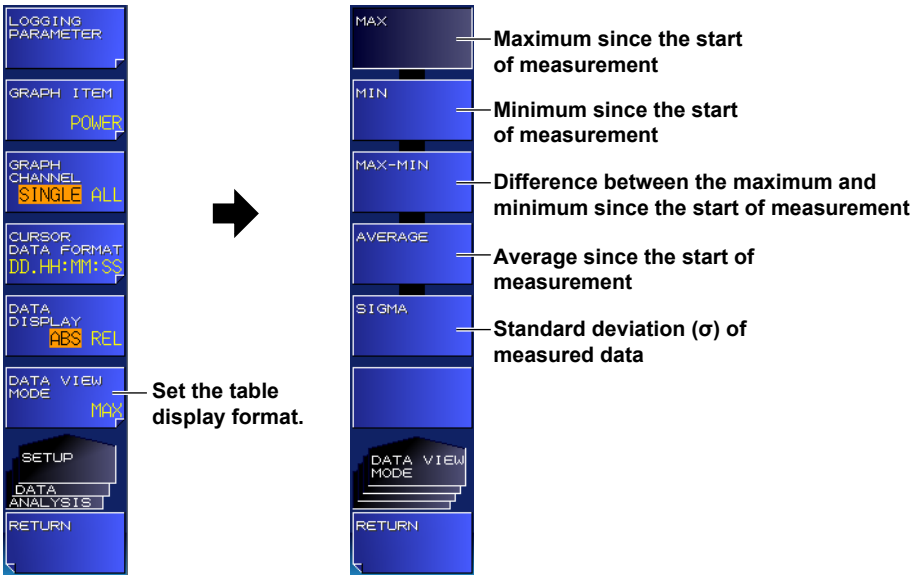
Selects the number of peaks to graph (SINGLE, ALL)

Note

- If the LOGGING ITEM logging parameter is set to FP-LD PARAMETERS, the GRAPH CHANNEL soft key cannot be used.
- If the MINIMUM INTERVAL logging parameter is set to 200msec or 500msec, GRAPH CHANNEL will be set to SINGLE at the start of data logging. In addition, the GRAPH CHANNEL soft key cannot be used while data logging is in progress.
- If GRAPH CHANNEL is set to ALL, screen processing may take longer depending on the logging count and peak count conditions. While data logging is in progress, if the measurement time becomes longer than the logging interval of a single measurement, a warning will appear (except when MINIMUM INTERVAL is set to 200msec) and GRAPH CHANNEL will be set to SINGLE.
  WARNING 25: Sweep time exceeds the set interval
  If this warning appears, we recommend changing the logging settings as follows.
  - Make the logging interval longer.
  - Set GRAPH CHANNEL to SINGLE.
  - If you are auto saving (DATA SAVE set to ON) during data logging and the data save destination is set to USB storage medium (DESTINATION MEMORY set to EXTERNAL), change the destination to INTERNAL or set DATA SAVE to OFF.

Setting the Table Display Format

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
2. Press the **SETUP** soft key.
   A menu for setting the data logging conditions appears.
3. Press the **DATA VIEW MODE** soft key.
   A table display format setup menu appears.
4. Press the **MAX**, **MIN**, **MAX-MIN**, **AVERAGE**, or **SIGMA** soft key.
   The table display format will change.

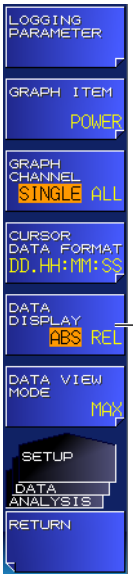


Note

SIGMA appears as "*****.***" while data logging is in progress.

Setting the Table Value Display Mode

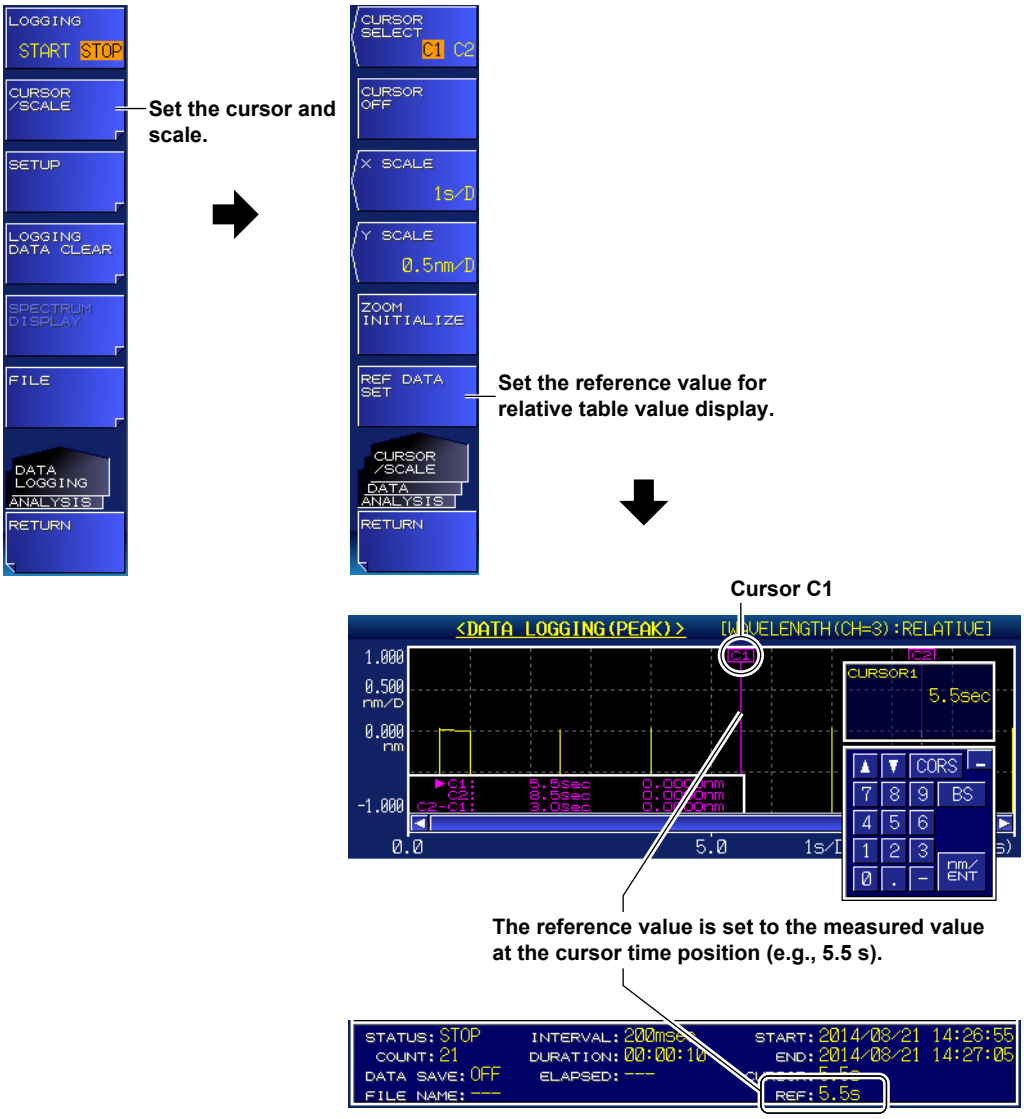
1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
2. Press the **SETUP** soft key.
   A menu for setting the data logging conditions appears.
3. Press the **DATA DISPLAY** soft key.
   The value display mode changes to ABS (absolute value) or REL (relative value).



Set the table value display mode (ABS, REL).

Setting the Reference Value for Relative Table Value Display

1. Move cursor C1 or C2 to the graph value (time) that you want to make the reference value.
   For instructions on how to move the cursors, see “Displaying Graph Values Using Cursors” on the next page.
2. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
3. Press the **CURSOR/SCALE** soft key.
   A cursor/scale operation setup menu appears.
4. Press the **REF DATA SET** soft key.
   The reference value is set to the measured value at the cursor time position.

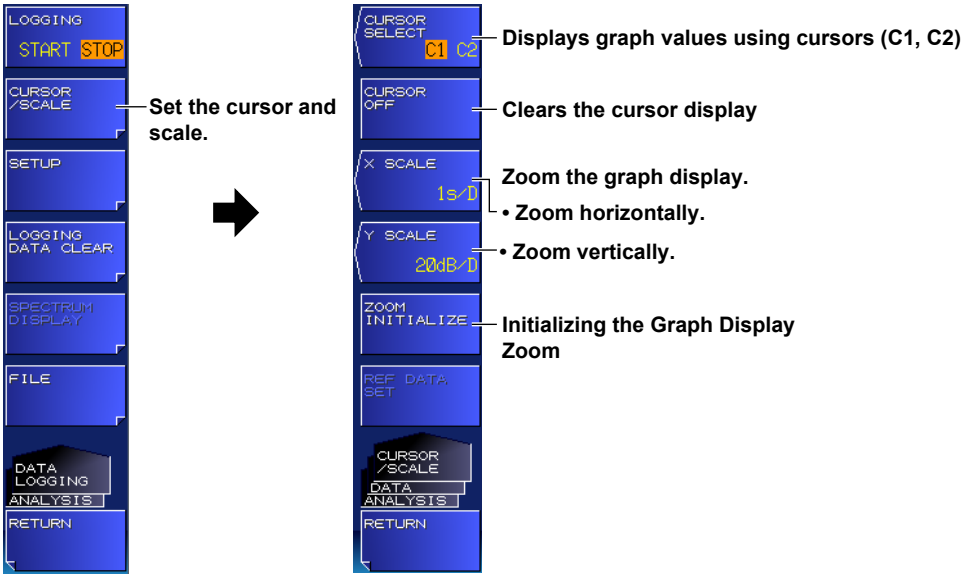


Note

You cannot use the REF DATA SET soft key if data logging has not been executed and no data exists.

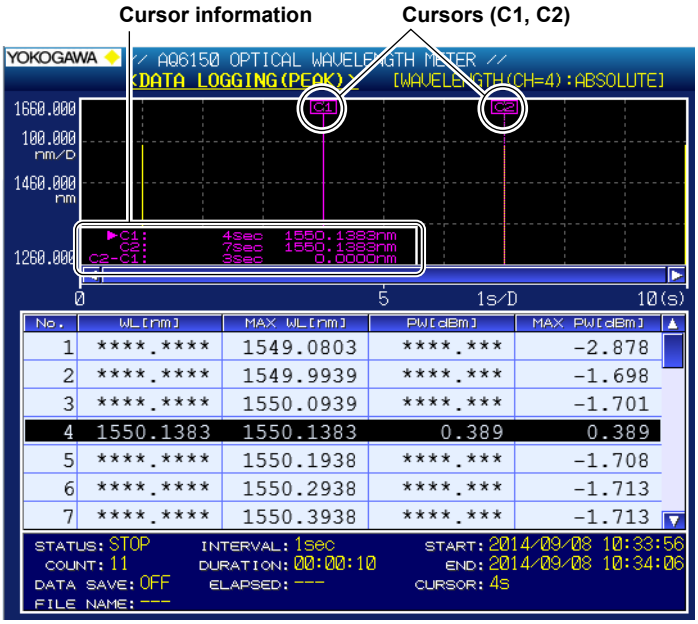
Operating the Data Logging Screen

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
2. Press the **CURSOR/SCALE** soft key.
   A cursor/scale operation setup menu appears.



Displaying Graph Values Using Cursors

3. Press the **CURSOR SELECT** soft key.
   Cursors C1 and C2 appear in the graph display area, and the cursor values are displayed in the lower left of the graph area.
   Each time you press the CURSOR SELECT soft key, the current cursor toggles between cursor C1 and C2.



4. Move the cursor using the arrow keys.
   Use the left and right arrow keys to move between target channels and the up and down arrow keys to move between the target items on the table.

Note

The difference between the two cursor values (C2 – C1) is displayed below the cursor values.
The horizontal axis shows the logging time.
The vertical axis shows the value of the graph data (GRAPH ITEM).
You cannot move the cursors to an area where there is no logging data.

Clearing the Cursor Display

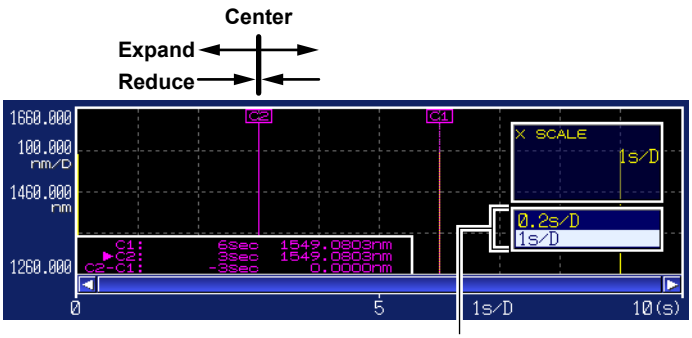
5. Press the **CURSOR OFF** soft key.
Both cursors, C1 and C2, are cleared.

Zooming the Graph Display

- **Zooming Horizontally**

3. Press the **X SCALE** soft key.
A screen for setting the horizontal scale appears.

4. From the drop-down list, select the horizontal scale.
The horizontal scale is expanded or reduced to the specified value at the current cursor (cursor C1 or C2) position.

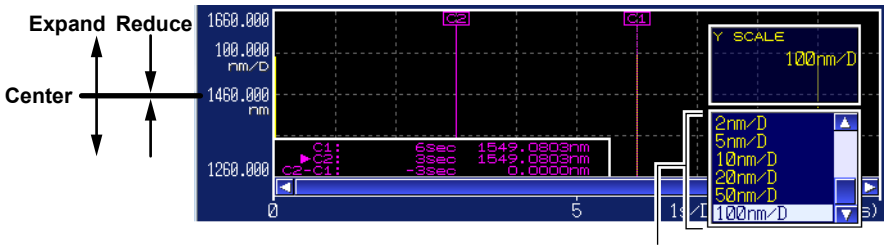


Horizontal scale drop-down list box
The scale is displayed in 1-2-5 steps.

- **Zooming Vertically**

3. Press the **Y SCALE** soft key.
A screen for setting the vertical scale appears.

4. From the drop-down list, select the vertical scale.
The vertical scale is expanded or reduced to the specified value at the current cursor (cursor C1 or C2) position.



Vertical scale drop-down list box
The scale is displayed in 1-2-5 steps.

Initializing the Graph Display Zoom

3. Press the **ZOOM INITIALIZE** soft key.
The graph display zoom will be initialized.

Note

Horizontal and vertical zooming will be initialized if you perform any of the following operations.

- If you clear the logging data
- If you start a new data logging session
- If you initialize the data (section 7.5)

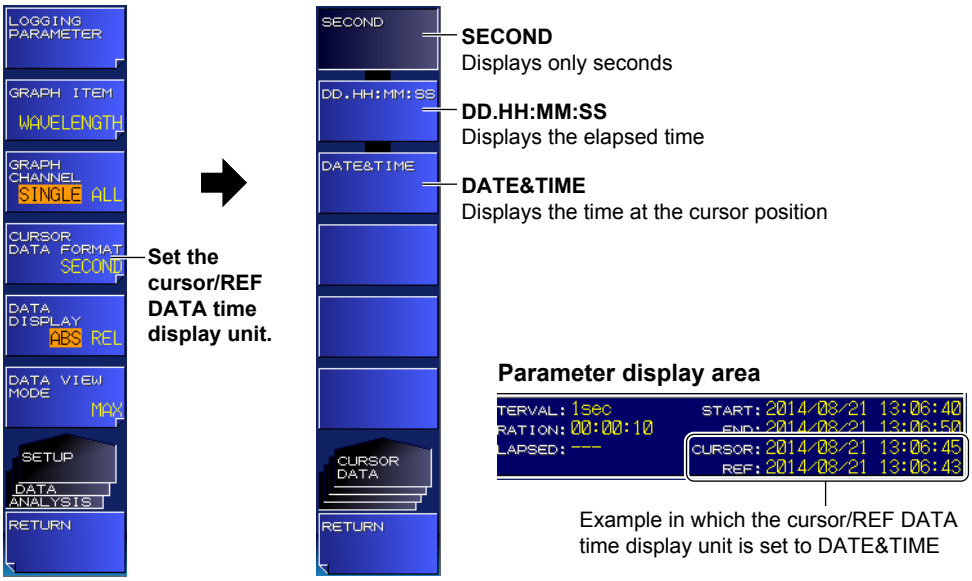
Setting the Cursor/REF DATA Time Display Unit

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
A data logging setup menu appears.

2. Press the **SETUP** soft key.
A menu for setting the data logging conditions appears.

3. Press the **CURSOR DATA FORMAT** soft key.
A menu for setting the cursor and the REF DATA time display unit appears.

4. Press the **SECOND**, **DD.HH:MM:SS**, or **DATE&TIME** soft key.
The cursor time and REF DATA time* in the parameter display area will be displayed in the specified unit.
* REF DATA time appears only when the table value display mode (DATA DISPLAY) is set to REL (relative value).



Saving and Loading Data Logging Results

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.
   A data logging setup menu appears.
   You can also save and load data logging results from the menu that appears by pressing **FILE**. For details, see section 6.5.
2. Press the **FILE** soft key.
   A setup menu for saving and loading data logging results appears.

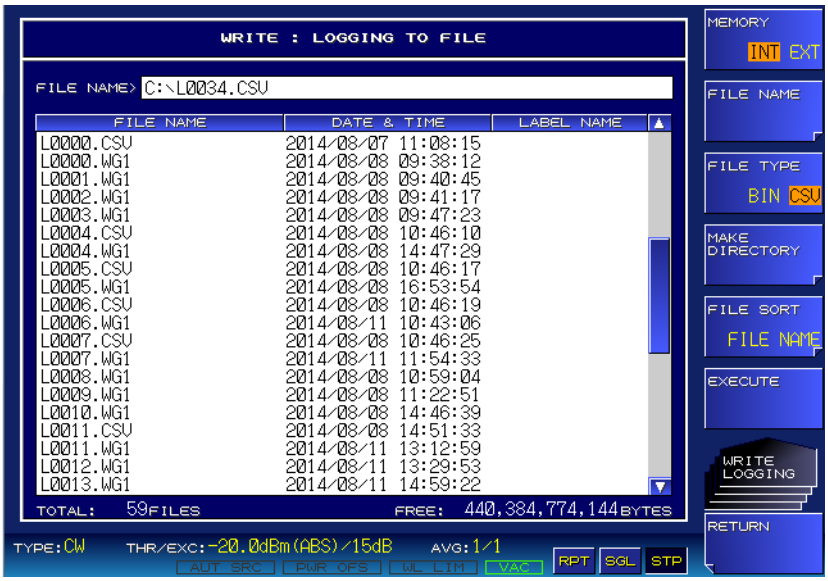
Save data logging results.

Load data logging results.

Removes the USB storage medium ► section 6.1

Saving Data Logging Results

3. Press the **WRITE** soft key.
   A data save setup menu and file list appear.
   For the operating procedure, see step 4 and subsequent steps in section 6.5.

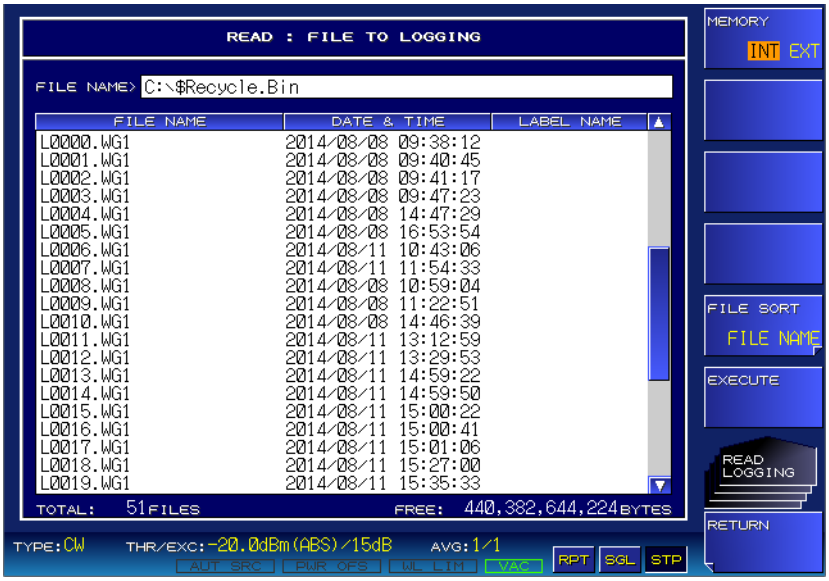


Loading Data Logging Results

3. Press the **READ** soft key.

A data load setup menu and file list appear.

For the operating procedure, see “Loading Measured Results” in section 6.2.



Deleting Logging Data

1. Press **ANALYSIS** and then the **DATA LOGGING** soft key.

A data logging setup menu appears.

2. Press the **LOGGING DATA CLEAR** soft key.

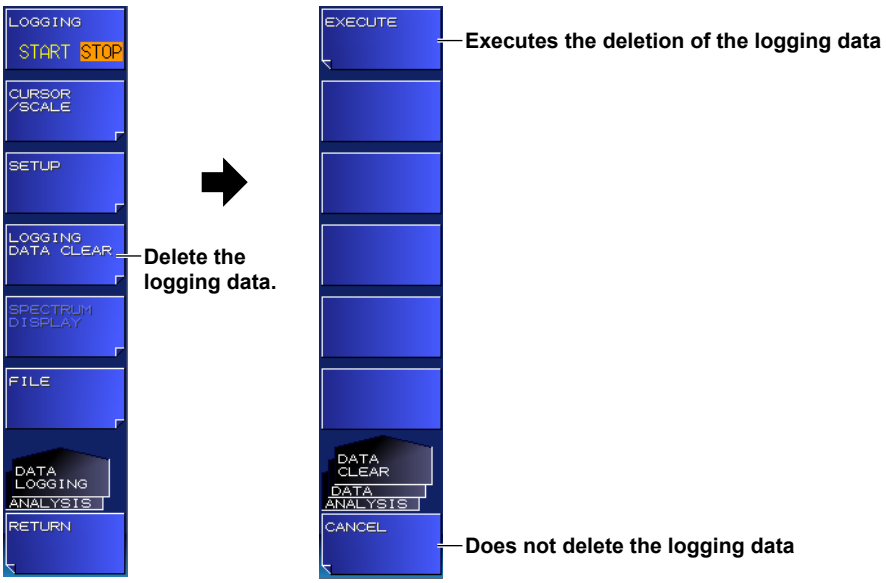
The EXECUTE and CANCEL soft keys appear.

3. Press the **EXECUTE** soft key.

The logging data is deleted.

If you do not want to delete the logging data, press the **CANCEL** soft key.

The previous setup menu will return.



Note

This function is the same as the deletion performed for the data deletion confirmation message that appears when data logging is executed.

Explanation

Parameter Display

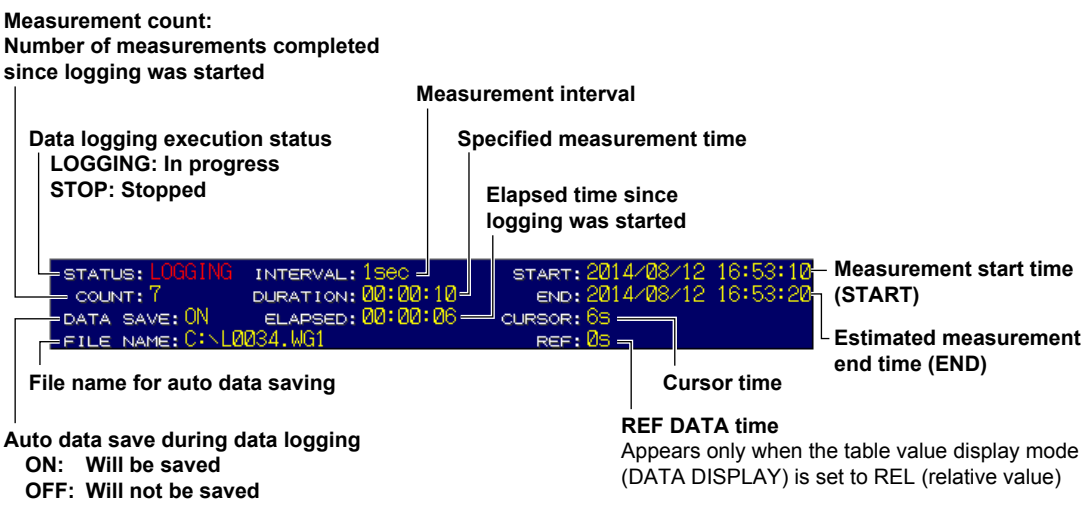


Table Display

Displays the current analysis data and the analysis data of MAX, MIN, MAX-MIN, AVERAGE, and SIGMA values from the start of data logging to the current. Only one of the analysis items can be displayed.

When the Logging Item Is PEAK

- **ABS (absolute value) display**

Wavelength (unit that was used for logging)
Power (log display only)

No.	WL[nm]	MAX-MIN[nm]	PW[dBm]	MAX-MIN[dB]
1	1555.1234	1555.1234	1555.1234	1555.1234
2	1555.1234	1555.1234	1555.1234	1555.1234
3	1555.1234	1555.1234	1555.1234	1555.1234
4	1555.1234	1555.1234	1555.1234	1555.1234
5	1555.1234	1555.1234	1555.1234	1555.1234
6	1555.1234	1555.1234	1555.1234	1555.1234
7	1555.1234	1555.1234	1555.1234	1555.1234

Display format selected with DATA VIEW MODE (MAX, MIN, MAX-MIN, AVERAGE, SIGMA*)

- **REL (relative value) display**

REF data selected with GRAPH ITEM
DELTA data selected with GRAPH ITEM
Display format selected with DATA VIEW MODE (MAX, MIN, MAX-MIN, AVERAGE, SIGMA*)

No.	REF WL[nm]	ΔWL[nm]	MAX-MIN[nm]
1	1555.1234	1555.1234	1555.1234
2	1555.1234	1555.1234	1555.1234
3	1555.1234	1555.1234	1555.1234
4	1555.1234	1555.1234	1555.1234
5	1555.1234	1555.1234	1555.1234
6	1555.1234	1555.1234	1555.1234
7	1555.1234	1555.1234	1555.1234

* If the display format is set to SIGMA, "****.***" is displayed while data logging is in progress.

When the Logging Item Is FP-LD PARAMETERS

- **ABS (absolute value) display**

FP-LD analysis items **Data at the cursor position** **Display format selected with DATA VIEW MODE (MAX, MIN, MAX-MIN, AVERAGE, SIGMA*)**

ITEM	CURRENT DATA	MAX-MIN
PEAK WL[nm]	1555.1234	1555.1234
PEAK POWER[dBm]	1555.1234	1555.1234
FWHM[nm]	1555.1234	1555.1234
SIGMA[nm]	1555.1234	1555.1234
MODE[nm]	1555.1234	1555.1234
CENTER WL[nm]	1555.1234	1555.1234
TOTAL POWER[dBm]	1555.1234	1555.1234

- **REL (relative value) display**

FP-LD analysis items **REF data** **DELTA data** **Display format selected with DATA VIEW MODE (MAX, MIN, MAX-MIN, AVERAGE, SIGMA*)**

ITEM	REF DATA	DELTA	MAX-MIN
PEAK WL[nm]	1555.1234	1555.1234	1555.1234
PEAK POWER[dBm]	1555.1234	1555.1234	1555.1234
FWHM[nm]	1555.1234	1555.1234	1555.1234
SIGMA[nm]	1555.1234	1555.1234	1555.1234
MODE[nm]	1555.1234	1555.1234	1555.1234
CENTER WL[nm]	1555.1234	1555.1234	1555.1234
TOTAL POWER[dBm]	1555.1234	1555.1234	1555.1234

* If the display format is set to SIGMA, "****.***" is displayed while data logging is in progress.

Logging Parameters

LOGGING ITEM

Selects the logging item.

- PEAK: Records the wavelength and power values of each peak.
- FP-LD PARAMETERS: Records all the FP-LD analysis items listed in appendix 2.

LOGGING MODE

If you want to log many peaks, use MODE1.
If you want to log many iterations, use MODE2 or MODE3.
The AQ6150/AQ6151 automatically detects the number of peaks.

- MODE1: The maximum logging count is 2001. The maximum number of peaks that can be logged is 1024.
- MODE2: The maximum logging count is 10001. The maximum number of peaks that can be logged is 256.
- MODE3: The maximum logging count is 100001. The maximum number of peaks that can be logged is 64.

MINIMUM INTERVAL

Sets the logging interval (the approximate time duration from the start of a measurement to the start of the next measurement).
Selectable range: 200msec, 500msec, 1sec, 2sec, 5sec, 10sec, 30sec, 1min, 2min, 5min, 10min

Note

The logging interval may be set longer than the specified interval depending on the stability and logging conditions of the light under measurement. While data logging is in progress, if the measurement time becomes longer than the logging interval of a single measurement, a warning will appear (except when MINIMUM INTERVAL is set to 200msec) and GRAPH CHANNEL will be set to SINGLE.

WARNING 25: Sweep time exceeds the set interval

If this warning appears, we recommend changing the logging settings as follows.

- Make the logging interval longer.
- Set GRAPH CHANNEL to SINGLE.
- If you are auto saving (DATA SAVE set to ON) during data logging and the data save destination is set to USB storage medium (DESTINATION MEMORY set to EXTERNAL), change the destination to INTERNAL or set DATA SAVE to OFF.

TEST DURATION

Sets the total logging duration of one test.
The setting range depends on the LOGGING MODE setting (maximum logging count) and logging interval. The minimum logging duration is the logging interval. If the logging interval is less than 1 second, it is set to 1 second.

ESTIMATED TOTAL COUNT

Displays the estimated measurement count during logging.

DATA SAVE

Sets whether to automatically save logging data during data logging.
This is fixed to OFF when the logging interval is set to 200msec or 500msec.

- ON: Data is saved automatically during data logging.
- OFF: Data is not saved automatically during data logging.

DESTINATION MEMORY

Selects the data save destination when saving data automatically during data logging. Logging data will be saved in the root directory of the selected save destination.

- INTERNAL: Internal memory
- EXTERNAL: USB storage medium

If the size of logging data will be large, use the USB storage medium.

Note

- If you also want to save data automatically when data logging is in progress (DATA SAVE set to ON), the storage area must have sufficient free space for saving the data of all logging measurements.
  If there is insufficient free memory space at the start of logging, a warning will appear.
  WARNING 47: Disk space is not enough for logging
  If this warning appears, reduce the logging time to decrease the data size.
- If you set the data save destination to USB storage medium, depending on the access speed of the medium that you are using, the processing time may be longer than the logging interval. If this is the case, a warning will appear, and GRAPH CHANNEL will be set to SINGLE (except when MINIMUM INTERVAL is set to 200msec).
  WARNING 25: Sweep time exceeds the set interval
  If this warning appears, we recommend changing the logging settings as follows.
  - Make the logging interval longer.
  - Set GRAPH CHANNEL to SINGLE.
  - If you are auto saving (DATA SAVE set to ON) during data logging and the data save destination is set to USB storage medium (DESTINATION MEMORY set to EXTERNAL), change the destination to INTERNAL or set DATA SAVE to OFF.

File Name

The following file name will automatically be assigned.
L****.WG1
where **** is a number between 0000 and 9999 that not used at the save destination. If all numbers are already used, the file with the number 9999 will be overwritten.

Cursors

If you show the cursors, cursor values will appear in the lower left of the graph area.
Cursor C1 and C2 will appear simultaneously. The value of C2 – C1 will appear below the cursor values.

Scales

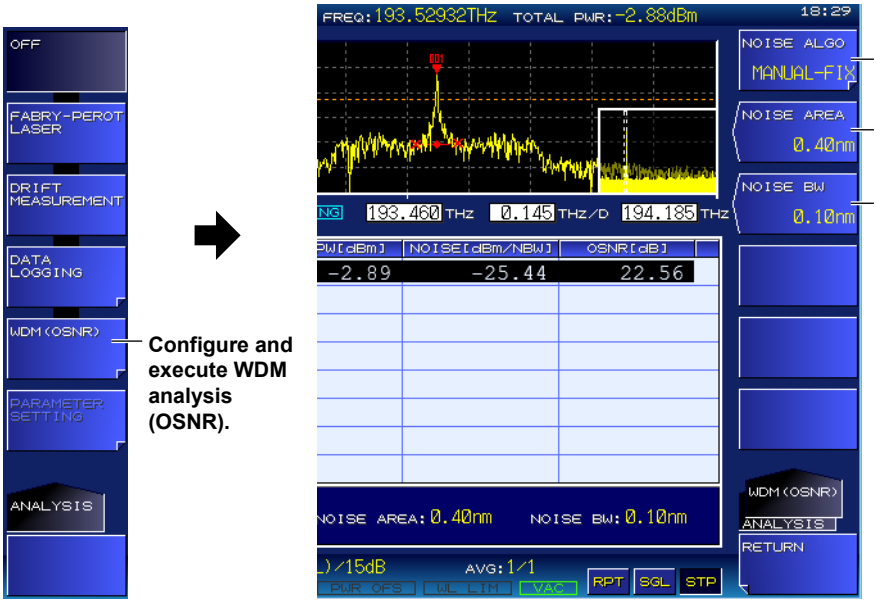
The horizontal and vertical scales are automatically set according to the logging parameter conditions and logging data values.
Zooming is performed in 1-2-5 steps.
Examples: The horizontal scale settings change like this: 5 s/div, 2 s/div, 1 s/div
The vertical scale settings change like this: 500 nm/div, 200 nm/div, 100 nm/div

3.7 WDM Analysis (OSNR)

The WDM analysis function measures signal power and noise power for all detected peaks and calculates the optical signal-to-noise ratio (OSNR).

Procedure

1. Press the **ANALYSIS** key.
   An analysis setup menu appears.
2. Press the **WDM (OSNR)** soft key.
   WDM analysis is executed, and the WDM analysis setup menu and analysis results are displayed.



Selecting the Noise Detection Method

3. Press the **NOISE ALGO** soft key.
   A menu for selecting the noise detection method appears.
4. Press the **AUTO-CTR** or **MANUAL-FIX** soft key.

Setting the Noise Measurement Point (NOISE AREA) (if MANUAL-FIX was selected in step 4)

5. Press the **NOISE AREA** soft key.
   A screen for setting the measurement point appears.
6. Enter the measurement point as a difference from the target peak wavelength using the arrow keys or numeric keypad.
7. Press **ENTER**.
   The specified measurement point appears on the soft key.

Setting the Noise Bandwidth (NOISE BW)

8. Press the **NOISE BW** soft key.
   A screen for setting the bandwidth appears.
9. Enter the noise bandwidth using the arrow keys or numeric keypad.
10. Press **ENTER**.
    The specified bandwidth appears on the soft key.

Explanation

How OSNR Is Determined

The OSNR of the ith peak is calculated using the following equation.

OSNRi = 10 × Log(Si) – 10 × Log(LNNi)

Si: Signal power of ith peak

Si = Pi – Ni

Pi: Peak power of ith peak [mW]

Ni: Noise power of ith peak [mW]

LNNi: Noise power normalized by the noise bandwidth (NOISE BW) of ith peak

LNNi = Ni × (NBW/RBW)

Ni: Noise power of ith peak [mW]

NBW: Noise bandwidth (NOISE BW)

RBW: Resolution bandwidth (constant) of the FFT spectrum

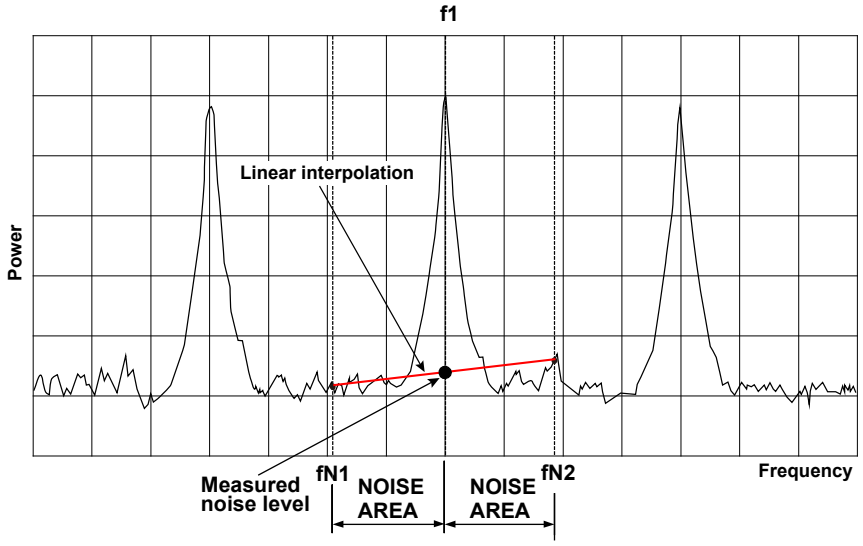
Note

For modulated light measurement, OSNR is calculated using the integrated power.

Noise Power

The noise power is measured in the following manner.

1. Peak is detected, and the peak frequency (f1) is determined.
2. Two noise measurement points (fN1, fN2), one to the left and one to the right of f1, are determined.
3. The two points (fN1, fN2) are linearly interpolated, and the noise power (N1) at f1 is determined.



NOISE AREA can be set automatically or manually according to the NOISE ALGO setting.

NOISE ALGO

Select whether to set the measurement points (NOISE AREA) of noise power automatically or manually.

AUTO-CTR

The measurement points of noise power are set automatically.
If there is another peak within ±200 GHz of the target peak frequency, the measurement points of noise power are set to the points offset by one-half the difference between the target peak frequency and the closest peak frequency from the target peak frequency.
If there is no other peak, the measurement points of noise power are set to the points offset by ±100 GHz from the target peak frequency.

MANUAL-FIX

The measurement points of noise power are set manually.
The measurement points of noise power are set to the points offset by the wavelength set with NOISE AREA from the target peak wavelength.

NOISE AREA

Set the noise measurement point for when MANUAL-FIX is selected.
The noise measurement points are those determined by
Target peak wavelength ± NOISE AREA setting

NOISE BW

Set the noise bandwidth used when determining noise power as explained in “How OSNR Is Determined.”

Averaged Measurement of WDM Analysis

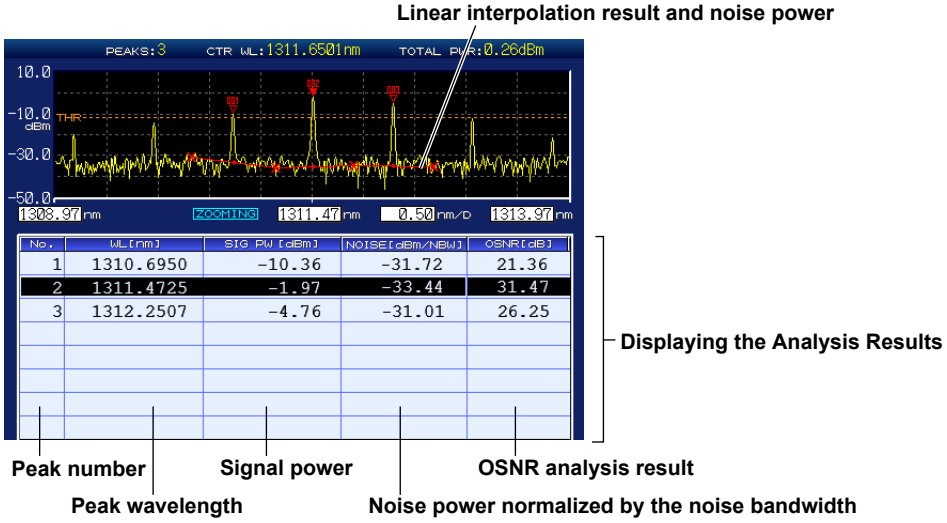
When average times (Average Time) is 2 or higher, averaged wavelength, power, and noise power are used to calculate OSNR.
In averaged measurement, lower noise power can be measured than when average times is set to 1.
For details on averaged measurement, see section 3.3.

Executing Analysis

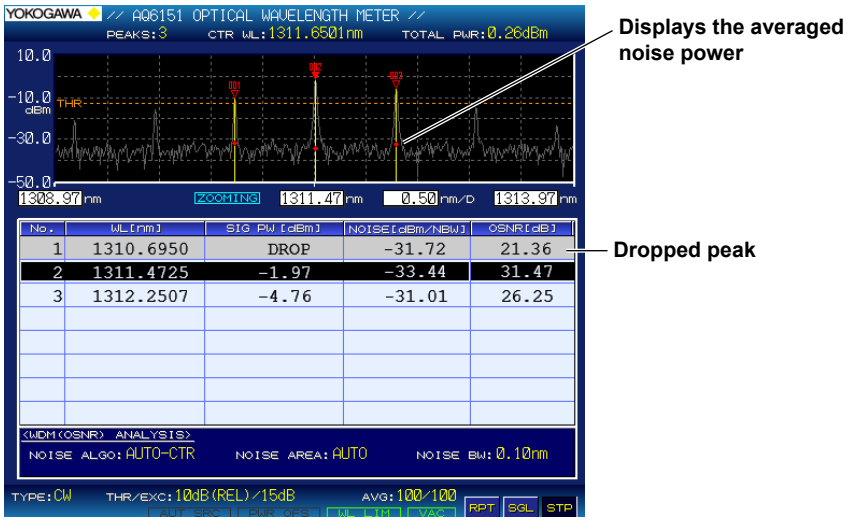
Analysis is executed when the **WDM (OSNR)** soft key on the ANALYSIS screen is pressed or when measurement is performed.

Displaying the Analysis Results

When average times is 1



When average times is 2 or higher



Saving Measured Results

You can save the measured results in CSV format. For details, see section 6.2, “Saving Measured Results.”

File Example

```
AQ6150 DATA        R01.06.02          ← Header (measured data) and firmware version
S/N                                   ← Serial number
// AQ6150 OPTICAL WAVELENGTH METER //  ← Label
2016/1/7  19:37:03                    ← Date and time

DATA TYPE          OSNR               ← Data type (“OSNR” for OSNR analysis data)
DEVICE TYPE        NARROWBAND         ← Light type (NARROWBAND: CW, BROADBAND: MODULATED)
PEAK THREL         REL    14dB        ← Threshold definition mode and the definition
PEAK EXCURSION     15dB               ← Difference between peak and valley
AVG                OFF                ← Average times*
MEDIUM             VACUUM             ← Medium that light travels through
X UNIT             WL                 ← Wavelength unit
Y UNIT             dBm                ← Power unit
POWER OFFSET       0.0dB              ← Power offset
NOISE MEAS ALGO    MANUAL-FIX         ← Noise detection method
NOISE AREA         0.40nm             ← Noise measurement position
NOISE BW           0.10nm             ← Noise bandwidth

PEAKS              32                 ← Number of peaks
AVERAGE WL[nm]     1551.54366         ← Average wavelength
TOTAL PWR[dBm]     13.35              ← Total power

NO.  WL[nm]       SIG PWR[dBm]  NOISE[dBm/NBW]  OSNR[dB]
1    1549.99387   -1.71         -14.98          13.27
2    1550.09385   -1.76         -10.03          8.28
|    |            |             |               |
     Wavelength   Signal power   Noise power     OSNR
Peak number
```

*: **Set to OFF when average times is 1.**
Set to measurement count or set count when average time is 2 or higher.

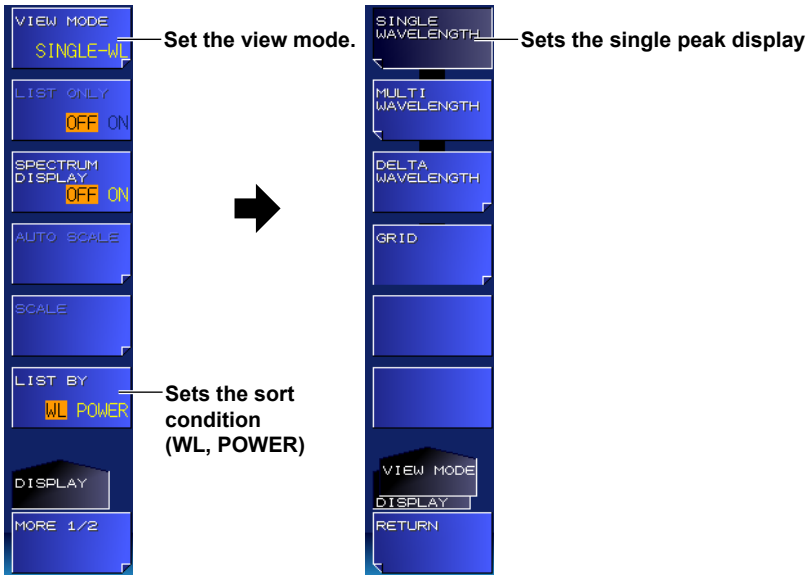
4.1 Displaying Only One Pair of Values

You can select to display only one pair (wavelength and power) of peak measurement results. For details on the screen, see “Single Peak Screen” in section 1.4.

Procedure

Setting the View Mode

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **VIEW MODE** soft key.
   A view mode setup menu appears.
3. Press the **SINGLE WAVELENGTH** soft key.
   The setup menu returns to the previous display, and “SINGLE-WL” appears on the soft key.



Setting the Sort Condition

2. Press the **LIST BY** soft key.
   Each time you press the soft key, the setting toggles between WL and POWER.

Explanation

View Mode

When the AQ6150/AQ6151 detects multiple peaks during measurement, it retains data for up to 1024 peaks. The view mode specifies how to display these peaks. This section explains how to display one pair of measurement results for the current peak. To display multiple measurement results, see section 4.2.

Sort Condition

You can sort the measured results in the AQ6150/AQ6151 in descending order by wavelength or power. Peak and peak power searching is performed in accordance with this sort order. For details on how to search for peaks or peak power, see chapter 5.

WL: Peaks are displayed in ascending order by wavelength (frequency or wavenumber)
POWER: Peaks are displayed in descending order by power.

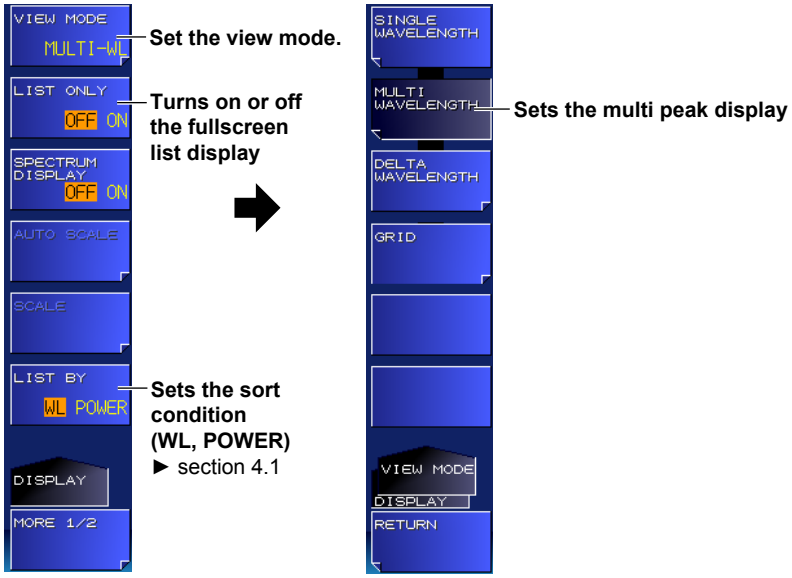
4.2 Displaying Values in a List

You can display peak measurement results in a list. For details on the screen, see “Multi Peak Screen for Absolute Values” in section 1.4.

Procedure

Setting the View Mode

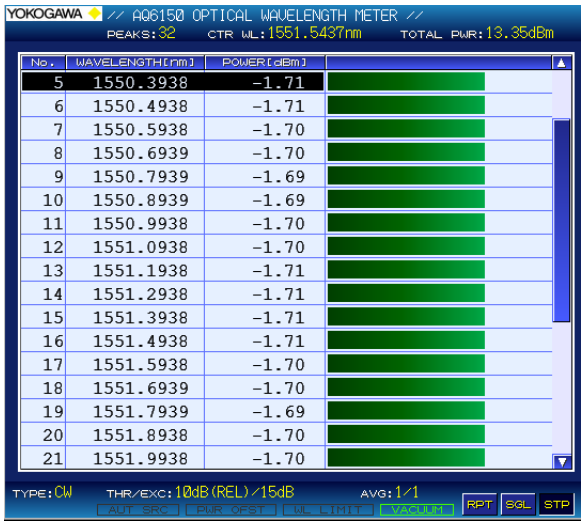
1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **VIEW MODE** soft key.
   A view mode setup menu appears.
3. Press the **MULTI WAVELENGTH** soft key.
   The setup menu returns to the previous display, and “MULTI-WL” appears on the soft key.



Fullscreen List Display

You can select to display only the list by clearing the peak window display.

4. Press the **LIST ONLY** soft key.
   Each time you press the soft key, the setting toggles between ON and OFF. When set to ON, the list is displayed in fullscreen.



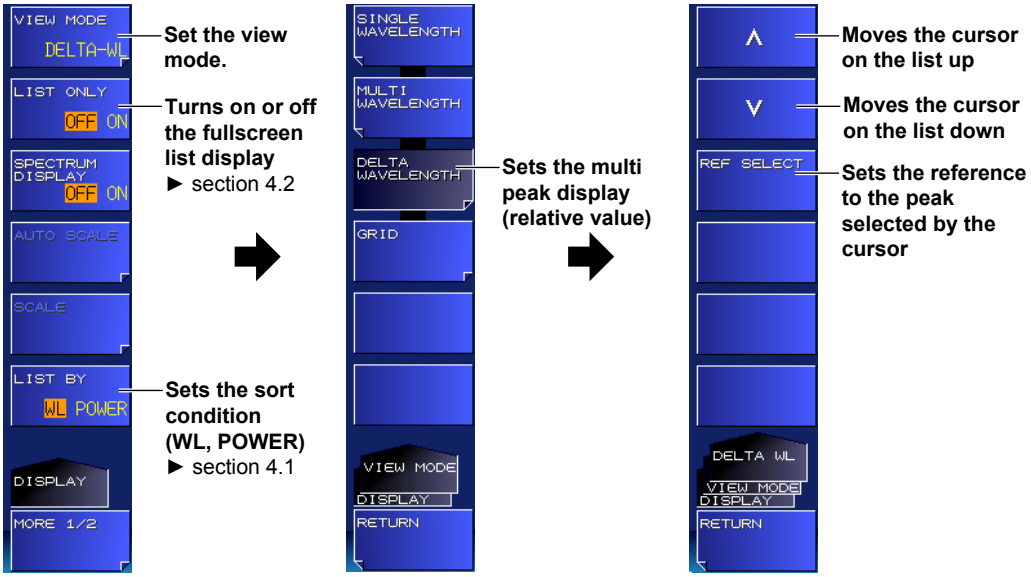
4.3 Displaying Reference and Relative Values in a List

You can list the measured results of values relative to the reference peak. For details on the screen, see “Multi Peak Screen for Relative Values” in section 1.4.

Procedure

Setting the View Mode

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **VIEW MODE** soft key.
   A view mode setup menu appears.
3. Press the **DELTA WAVELENGTH** soft key.
   A reference peak setup menu appears.

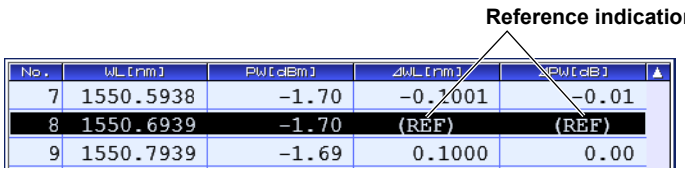


- **When Not Setting the Reference**

4. Press the **RETURN** soft key.
   The setup menu returns to the previous display, and “DELTA-WL” appears on the soft key.

Setting the Reference Peak

4. Move the cursor in the list to the peak you want to set as the reference using the up and down arrow soft keys.
5. Press the **REF SELECT** soft key.
   The character string “REF” appears in the relative value columns in the list.



Explanation

Relative Value Computation

Relative values ΔWL and ΔPW are computed as follows:

- **ΔWL**
  (wavelength of the current peak) – (wavelength of the reference peak)

- **ΔPW**
  (power of the current peak) – (power of the reference peak)

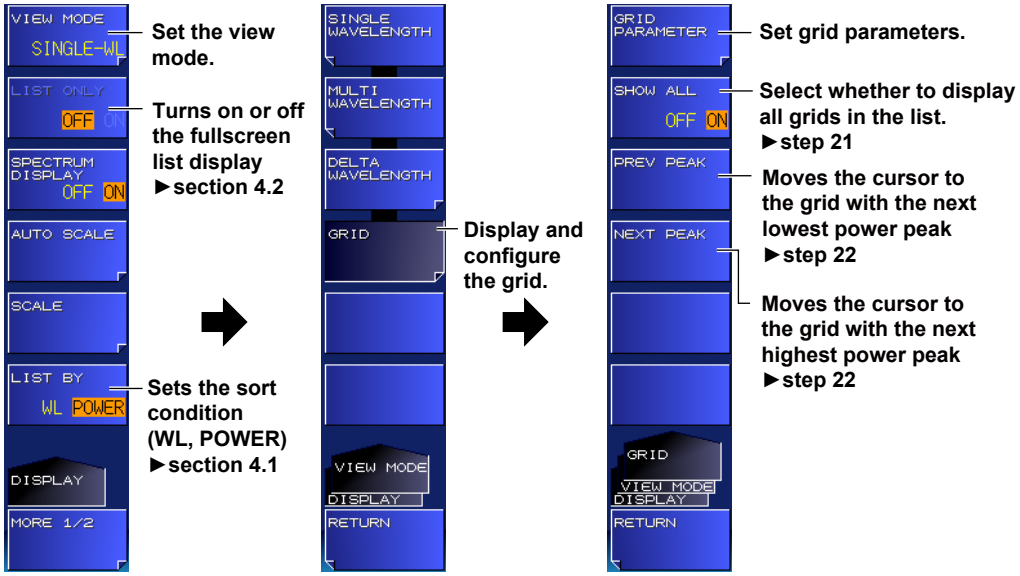
4.4 Displaying the Grid

It is possible to set a grid and measure and display how far peaks within a specified area are away from the grid center.

Procedure

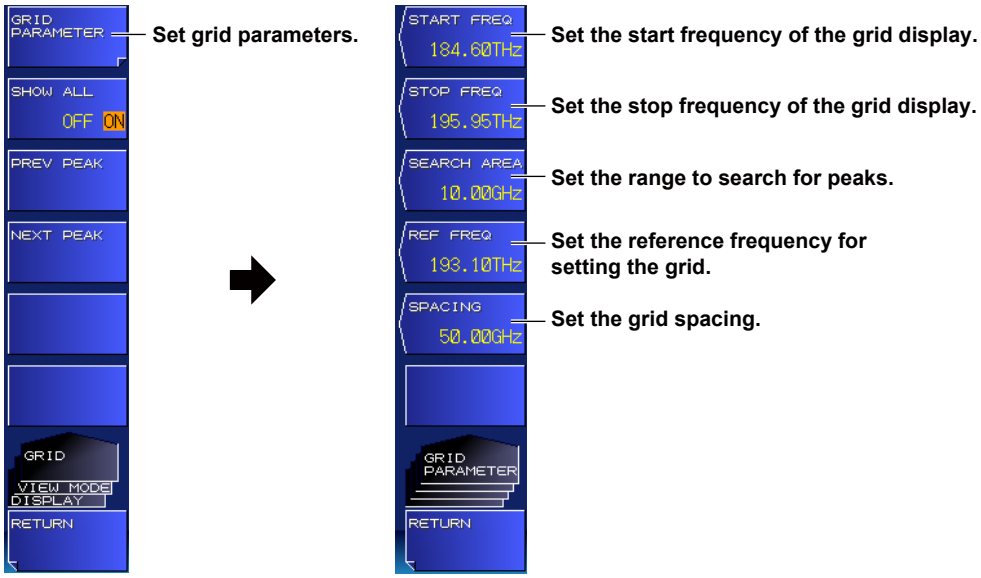
Setting the View Mode (VIEW mode)

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **VIEW MODE** soft key.
   A view mode setup menu appears.
3. Press the **GRID** soft key.
   The screen changes to a grid display, and a grid display menu appears.



Setting Grid Parameters

4. Press the **GRID PARAMETER** soft key.
   A grid parameter setup menu appears.



Setting the Start Frequency

5. Press the **START FREQ** soft key.
   A screen for setting the start frequency of the grid display appears.
6. Enter the grid's start frequency using the arrow keys or numeric keypad.
7. Press **ENTER**.
   The specified value appears on the soft key.

Setting the Stop Frequency

8. Press the **STOP FREQ** soft key.
   A screen for setting the stop frequency of the grid display appears.
9. Enter the grid's stop frequency using the arrow keys or numeric keypad.
10. Press **ENTER**.
    The specified value appears on the soft key.

Setting the Search Area

11. Press the **SEARCH AREA** soft key.
    A window for setting the peak search area appears.
12. Enter the area using the arrow keys or numeric keypad.
    The area is set to ±(set value/2) relative to the grid.
    The value greater than the grid spacing can not be set.
13. Press **ENTER**.
    The specified value appears on the soft key.

Setting the Reference Frequency

14. Press the **REF FREQ** soft key.
    A screen for setting the reference frequency appears.
15. Enter the reference frequency using the arrow keys or numeric keypad.
16. Press **ENTER**.
    The specified value appears on the soft key.

Setting the Grid Spacing

17. Press the **SPACING** soft key.
    A screen for setting the grid spacing appears.
18. Enter the grid spacing using the arrow keys or numeric keypad.
19. Press **ENTER**.
    The specified value appears on the soft key.
20. When you finish setting the parameters, press the **RETURN** soft key. The setup menu returns to the screen that appears immediately after step 3.

Note

- START FREQ and STOP FREQ can be set using wavelength (START WL, STOP WL) or wavenumber (START WNUM, STOP WNUM) depending on the wavelength unit setting.
- The maximum number of grids that can be set is 9999.

Configuring the List Display

21. Press the **SHOW ALL** soft key to select whether to display all grids (ON) or only grids that have peaks (OFF).

Moving the Cursor

22. To change the grid selected by the cursor, press the **PREV PEAK** or **NEXT PEAK** soft key.

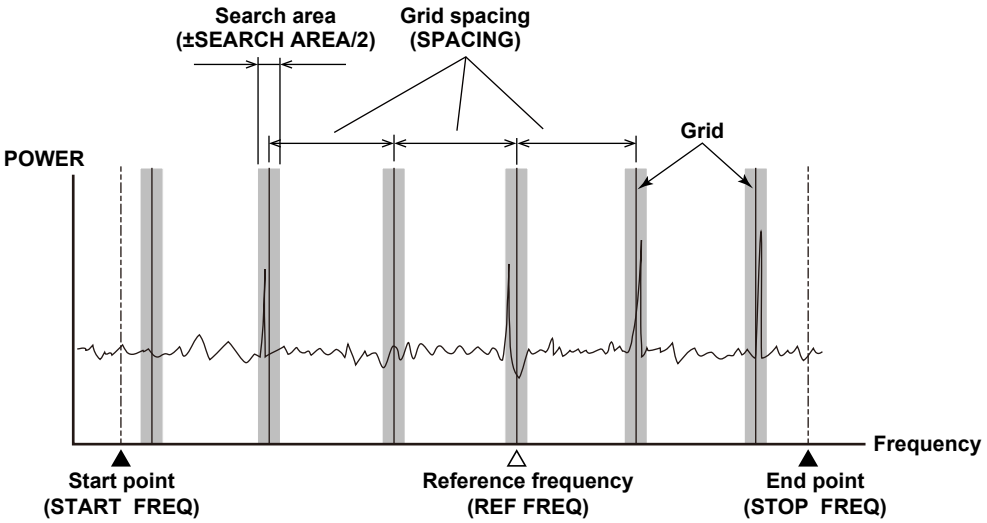
PREV PEAK: The cursor moves to the grid with the previous peak in the list.

NEXT PEAK: The cursor moves to the grid with the next peak in the list.

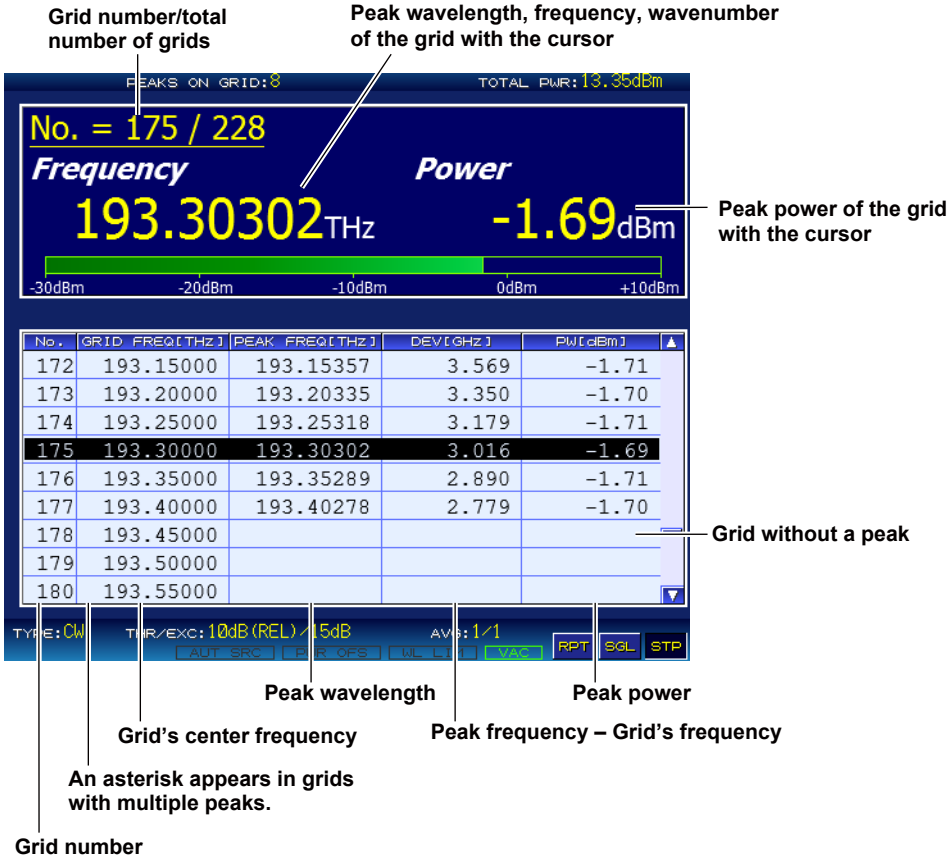
Explanation

Setting the Grid

Grids are created at equal spacing between START FREQ and STOP FREQ. Each grid is created at the grid spacing from the reference frequency. Peaks are searched within a range of ±SEARCH AREA/2 from the specified grids.



Displaying Measured Results



The list displays grid numbers, grid frequencies (wavelength, wavenumber), peak frequency (wavelength, wavenumber), frequency deviation (wavelength difference, wavenumber difference) of the grids and peaks, and peak power.
If SHOW ALL is ON and there is no peak within the search area, PEAK FREQ, DEV, and PW become blank.
Grid numbers are assigned in ascending order by frequency of each grid starting with 1. Grid numbers do not change even if the display unit is changed.

Searching Power

If power is searched for using the search function when grids are displayed, the cursor moves as follows.

PEAK:	The cursor moves to the grid with the highest power peak.
NEXT POWER:	The cursor moves to the grid with the next highest power peak.
	The cursor does not move if the cursor is in a grid without a peak.
PREV POWER:	The cursor moves to the grid with the next lowest power peak.
	The cursor does not move if the cursor is in a grid without a peak.

Saving Measured Results

You can save the measured results in CSV format.

```
AQ6150 DATA      R01.06.02 ———— Header (measured data) and firmware version
S/N ———————————————————— Serial number
// AQ6150 OPTICAL WAVELENGTH METER // —— Label
2016/1/7  19:37:03 ———————— Date and time

DATA TYPE        GRID CHECK ——— Data type ("GRID CHECK" for grid display data)
DEVICE TYPE      NARROWBAND —— Light type (NARROWBAND: CW, BROADBAND: MODULATED)
PEAK TH          REL    10dB ——— Threshold definition mode and the definition
PEAK EXCURSION          15dB ——— Difference between peak and valley
AVG  OFF ———————————————— Average times*
MEDIUM           VACUUM ———— Medium that light travels through
X UNIT           FREQ ————— Wavelength unit
Y UNIT           dBm ————— Power unit
POWER OFFSET     0.0dB ————— Power offset
GRID START       193.00THz ———— Grid's start frequency
GRID STOP        193.05THz ———— Grid's stop frequency
REF FREQ         193.10THz ———— Grid's reference frequency
GRID SPACING     10.00GHz ———— Grid spacing
SEARCH AREA      10.00GHz ———— Grid width
SHOW ALL GRID    TRUE ————— Whether to display all grids

GRID NUM         6 ————————— Number of grids
PEAKS            3 ————————— Number of peaks in the grid area
```

No.	GRID [THz]	GRID MIN[THz]	GRID MAX[THz]	STATUS	FREQ[THz]	PWR[dBm]	DEV[GHz]
1	193.000000	192.995000	193.005000	0			
2	193.010000	193.005000	193.015000	0			
3	193.020000	193.015000	193.025000	0			
4	193.030000	193.025000	193.035000	1	193.029205	-1.72	-0.7953
5	193.040000	193.035000	193.045000	1	193.041630	-1.71	1.6295
6	193.050000	193.045000	193.055000	1	193.054059	-1.70	4.0594

Grid number

Grid's center frequency

Grid's minimum frequency

Grid's maximum frequency

Peak presence
0: Not present
1: Present
2: Multiple peaks present

Peak frequency

Peak power

Difference between the grid' s center frequency and peak frequency

***: Outputs the value and measurement count when average times is 2 or higher**

If SHOW ALL is ON, the measured data of all grids are saved. If it is OFF, only the measured data of grids that have peaks are saved.

For the save procedure, see section 6.2, "Saving Measured Results."

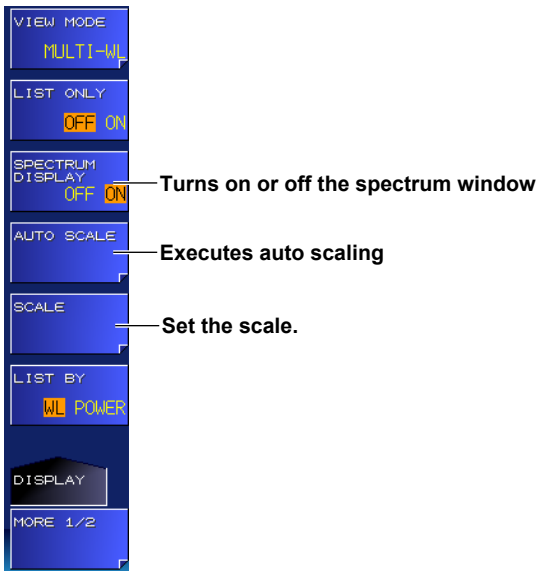
4.5 Displaying Waveforms

The AQ6150/AQ6151 displays peak measurement results as spectrum waveforms. For details on the screen, see “Spectrum Window” in section 1.4.

Procedure

Displaying the Spectrum Window

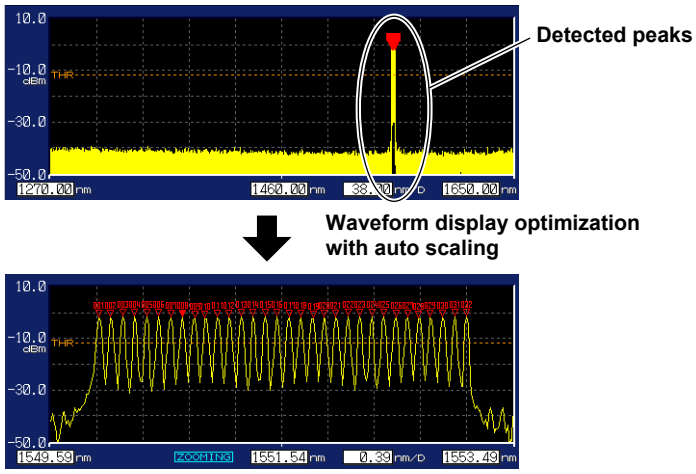
1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **SPECTRUM DISPLAY** soft key.
   Each time you press the soft key, the setting toggles between ON and OFF. When set to ON, the spectrum window is displayed.



Adjusting (Scaling) the Waveform Display

Executing Auto Scaling

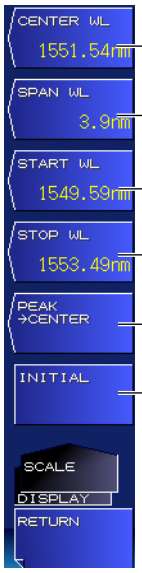
3. Press the **AUTO SCALE** soft key.
   The spectrum waveform display is automatically optimized. When you execute auto scaling, a scale display condition setup menu will appear. For details, see “Setting the Scale.”



Setting the Scale

The procedure is explained using an example in which the unit is set to wavelength (nm). If you change the unit (frequency or wavenumber), the scale display will change automatically.

3. Press the **SCALE** soft key.
A scale display condition setup menu appears.



Set the scale's center wavelength.
Set the wavelength span.
Set the scale start wavelength.
Set the scale stop wavelength.
Displays the maximum peak in the center of the scale
Initializes the scale settings

- **Setting the Center Wavelength**

4. Press the **CENTER WL** soft key.
A screen for setting the center wavelength appears.

5. Enter the value using the arrow keys or numeric keypad.

Enter the value.
You do not have to enter a unit.

6. Press **ENTER**.
The specified center wavelength appears on the soft key.

- **Setting the Wavelength Span**

4. Press the **SPAN WL** soft key.
A screen for setting the wavelength span appears.

5. Enter the value using the arrow keys or numeric keypad.

Enter the value.
You do not have to enter a unit.

6. Press **ENTER**.
The specified wavelength span appears on the soft key.

- **Setting the Start Wavelength**

4. Press the **START WL** soft key.
   A screen for setting the start wavelength appears.
5. Enter the value using the arrow keys or numeric keypad.

Enter the value.
You do not have to enter a unit.

6. Press **ENTER**.
   The specified start wavelength appears on the soft key.

- **Setting the Stop Wavelength**

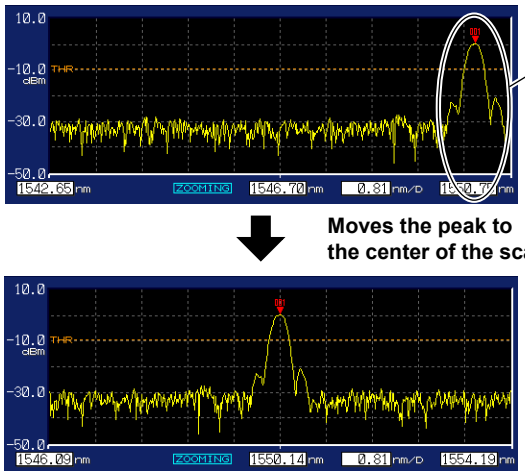
4. Press the **STOP WL** soft key.
   A screen for setting the stop wavelength appears.
5. Enter the value using the arrow keys or numeric keypad.

Enter the value.
You do not have to enter a unit.

6. Press **ENTER**.
   The specified stop wavelength appears on the soft key.

- **Displaying the Maximum Peak in the Center of the Scale**

4. Press the **PEAK -> CENTER** soft key.
   The peak with the maximum power moves to the center of the scale.



Detected peak

Moves the peak to the center of the scale

- **Initializing the Scale Settings**

4. Press the **INITIAL** soft key.
   The scale settings are initialized.

Note

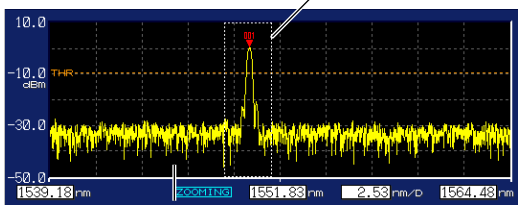
Scale settings are automatically changed if you execute auto scaling or display the maximum peak in the center of the scale.

Expanding the Wavelength Display Using a Mouse

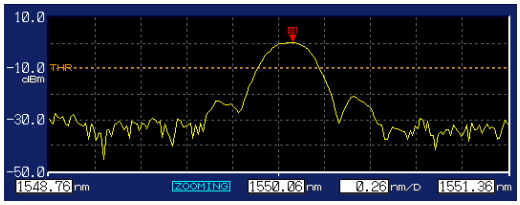
If you connect a USB mouse, you can specify the range to expand by dragging the cursor.

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **SPECTRUM DISPLAY** soft key.
   Each time you press the soft key, the setting toggles between ON and OFF. When set to ON, the spectrum window is displayed.
3. Drag the range on the spectrum waveform that you want to expand.
   The waveform will be displayed expanded.

Drag the range you want to expand (broken-line frame).



The waveform is expanded so that the left edge of the broken-line frame is the start wavelength and the right edge is the stop wavelength.



Displaying the Overview Window

Even if you change the scale settings by expanding the waveform display, executing auto scaling, and so on, you can display the waveform over the entire sweep range (1270 nm to 1650 nm) in a small window.

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **SPECTRUM DISPLAY** soft key.
   Each time you press the soft key, the setting toggles between ON and OFF. When set to ON, the spectrum window is displayed.
3. Press the **MORE 1/2** soft key.
4. Press the **OVER VIEW DISPLAY** soft key.
   Each time you press the soft key, the setting changes between OFF, L (displayed on the left), and R (displayed on the right).

Note

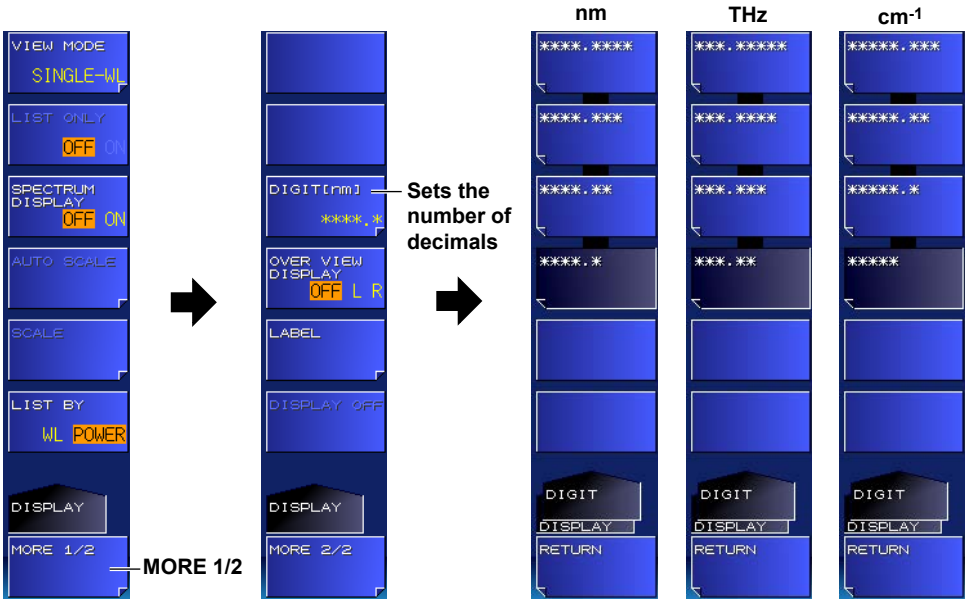
For an example of the overview window, see “Spectrum Window” in section 1.4.

4.6 Setting the Number of Decimal Places

Procedure

Set the number of decimal places for the measured values to be displayed.

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **DIGIT [nm]** soft key.
   A setup menu appears. The number of decimal places varies depending on the wavelength unit.
4. Press the soft key corresponding to the number of decimal places you want to use.



Explanation

Set the number of decimal places for the measured values to be displayed on the screen.
This does not affect saved data or response data for remote commands.
The number of decimal places depending on the wavelength unit is as follows.

Wavelength [nm]	Frequency [THz]	Wavenumber [cm^{-1}]
****.****	***.*****	*****.***
****.***	***.****	*****.**
****.**	***.***	*****.*
****.*	***.**	*****

If you change the wavelength unit, the number of decimal places for frequency and wavenumber is also changed automatically to those shown in the same line.

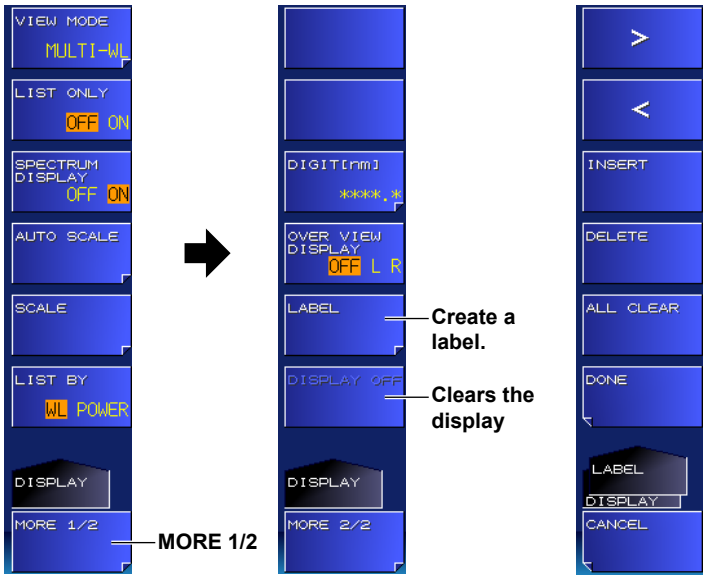
4.7 Creating Labels

Procedure

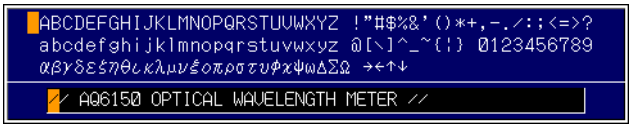
Creating a Label

It is convenient to write information, such as what has been measured and measurement conditions, on a label when you save measured results.

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **LABEL** soft key.
   A setup menu and a character input screen for entering characters appear.



Character input screen



Note

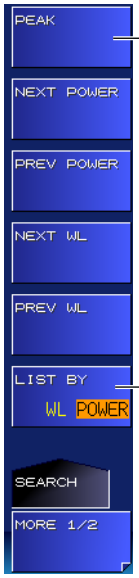
- For instructions on how to enter text, see section 3.3 in the Getting Started Guide, IM AQ6150-02EN.
- For the label display position, see “Main Screen” in section 1.4.

5.1 Searching for Peaks and Power

You can search measured data for the peak with the maximum power.

Procedure

1. Press the **SEARCH** key.
   A search condition setup menu appears.
2. Press the **PEAK** soft key.
   The peak with the maximum power is displayed on the screen.

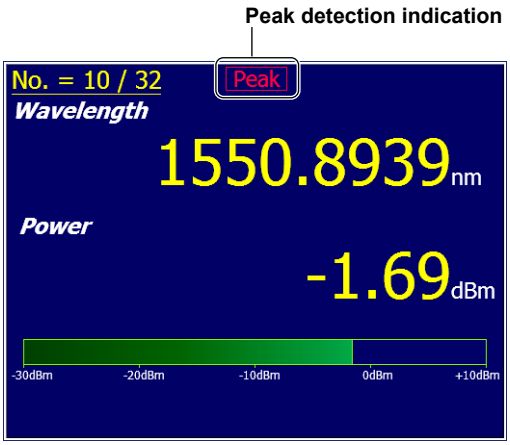


Executes the detection of the peak with the maximum power

Sets the sort condition (WL, POWER)
► section 4.1

Explanation

You can search the measured peaks for the peak with the maximum power. The wavelength (standard air or vacuum), frequency, or wavenumber display changes automatically depending on the unit setting.

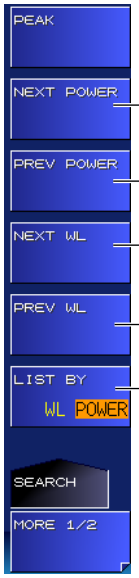


5.2 Searching for Peaks with the Next Highest or Lowest Wavelength or Power Values

You can search measure data for peaks with the next highest or lowest wavelength or power values.

Procedure

1. Press the **SEARCH** key.
   A search condition setup menu appears.



Searches for the peak with the next lowest power value after that of the current peak

Searches for the peak with the next highest power value after that of the current peak

Searches for the peak with the next longest wavelength after that of the current peak

Searches for the peak with the next shortest wavelength after that of the current peak

Sets the sort condition (WL, POWER)
► section 4.1

Explanation

The next and previous searches for the wavelength, frequency, or wavenumber and power are convenient if you set the appropriate sort condition on the multi peak screen. For details on the multi peak screen, see section 4.2.
The PREV and NEXT soft keys' wavelength, frequency, or wavenumber indication changes automatically depending on the unit setting.

When the Sort Condition Is Set to WL

No.	WAVELENGTH[nm]	POWER[dBm]
1	1549.9939	-1.70
2	1550.0939	-1.70
3	1550.1938	-1.71
4	1550.2938	-1.71
5	1550.3938	-1.71
6	1550.4938	-1.71
7	1550.5938	-1.70
8	1550.6939	-1.70
9	1550.7939	-1.69

PREV WL(FREQ/WNUM)
Current peak
NEXT WL(FREQ/WNUM)

When the Sort Condition Is Set to POWER

No.	WAVELENGTH[nm]	POWER[dBm]
1	1550.8939	-1.69
2	1550.7939	-1.69
3	1551.7939	-1.69
4	1552.6939	-1.69
5	1551.8938	-1.70
6	1550.9938	-1.70
7	1550.6939	-1.70
8	1551.6939	-1.70
9	1552.5939	-1.70

PREV POWER
Current peak
NEXT POWER

6.1 USB Storage Media

Compatible USB Storage Media

The AQ6150/AQ6151 supports USB memory media and USB hard drives compliant with USB 1.1 or USB 2.0.

For more details, contact your nearest YOKOGAWA dealer.

Removing a USB Storage Medium

Be sure to follow the procedure below to remove a USB storage medium.

1. Press **FILE**.

   A file menu appears.

   Check whether the **REMOVE USB STORAGE** soft key is unavailable (dimmed).

   If it is, the USB storage medium can be removed.

2. If not (the **REMOVE USB STORAGE** soft key is available), press it.

   The REMOVE USB STORAGE soft key becomes unavailable (dimmed), and the USB storage medium can be removed.

Removes the USB storage medium

Note

- If there are multiple connected USB storage devices, the AQ6150/AQ6151 detects only the one connected first. If there is a USB storage device already connected and you connect another, the AQ6150/AQ6151 will not detect it. If you remove the USB storage device that was connected first, the AQ6150/AQ6151 will not automatically detect the other one. If you want the AQ6150/AQ6151 to detect the other device, disconnect it once and reconnect it.
- For other notes, see the instruction manual supplied with the USB memory device.

6.2 Saving and Loading Measured Results

You can save measured peak data to a USB storage medium and load data from it.

Procedure

CAUTION

Do not remove the USB storage medium or turn off the power when the USB storage media access indicator is blinking. Doing so may damage the USB storage medium or corrupt its data.
Before you remove a USB storage medium, be sure to follow the procedure in section 6.1 to make the USB storage medium ready to be removed.

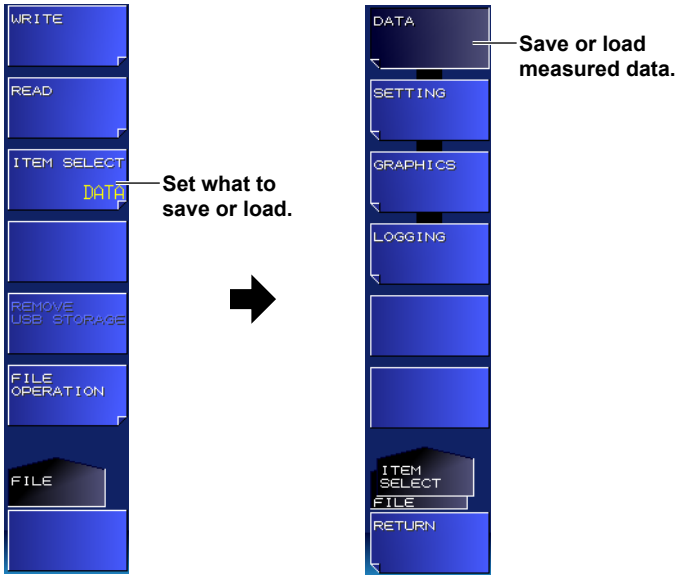
French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'indicateur d'accès au support de stockage USB clignote. Cela pourrait endommager le support de stockage USB ou corrompre ses données.
Avant de retirer un support de stockage USB, veuillez à suivre la procédure décrite dans la section 6.1 pour rendre le support de stockage USB prêt à être retiré.

Setting the File Type to DATA (Measured Data)

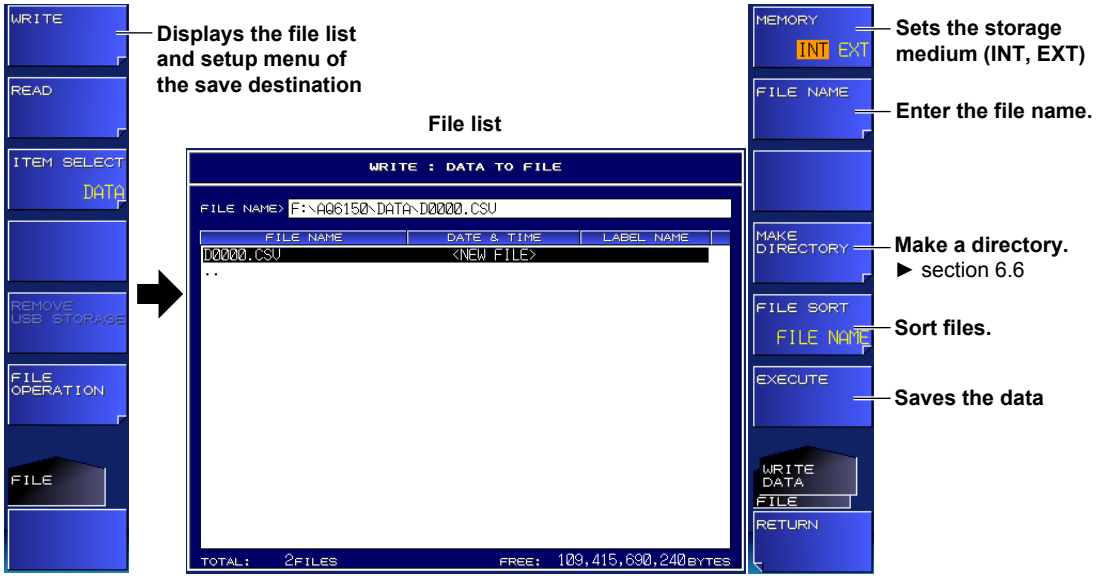
1. Press **FILE**.
2. Press the **ITEM SELECT** soft key.
   The setup menu changes.
3. Press the **DATA** soft key.
   DATA is selected, and the menu returns to the previous level.



Saving Measured Results

4. Press the **WRITE** soft key.
A file list appears.

5. Press the **MEMORY** soft key.
Each time you press the soft key, the setting toggles between INT (internal memory) and EXT (USB storage media). The file list of the selected medium appears. The internal memory is the E drive; the USB storage medium is the F drive.



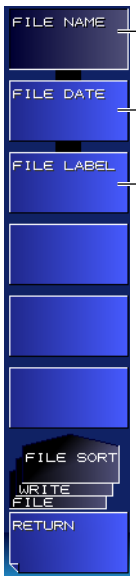
Character input screen

Sorting the File List

If necessary, change the sort order of the file list.

6. Press the **FILE SORT** soft key.
A sort condition setup menu appears.

7. Press the appropriate sort condition soft key.
The files are sorted accordingly.



Entering the Name of a File to Save

6. Press the **FILE NAME** soft key.
A setup menu and a character input screen for entering characters appear.

Note

- For instructions on how to enter text, see section 3.3 in the Getting Started Guide, IM AQ6150-02EN.
- If you do not enter a file name, the file name will automatically take on a serial number as describe below.
  If there is a file with the same serial number in the same directory, a different number will be assigned.
  Example: If 0000, 0001, and 0002 are available, 0003 will be assigned.
  If 0000, 0002, and 0003 are available, 0001 will be assigned.
  Measured data: D0000.CSV, D0001.CSV. . .
  Setup data: S0000.WS1, S0001.WS1. . .
  Screen capture data: G0000.BMP, G0001.BMP. . .
  Logging data: L0000.WG1, L0001.WG1. . .

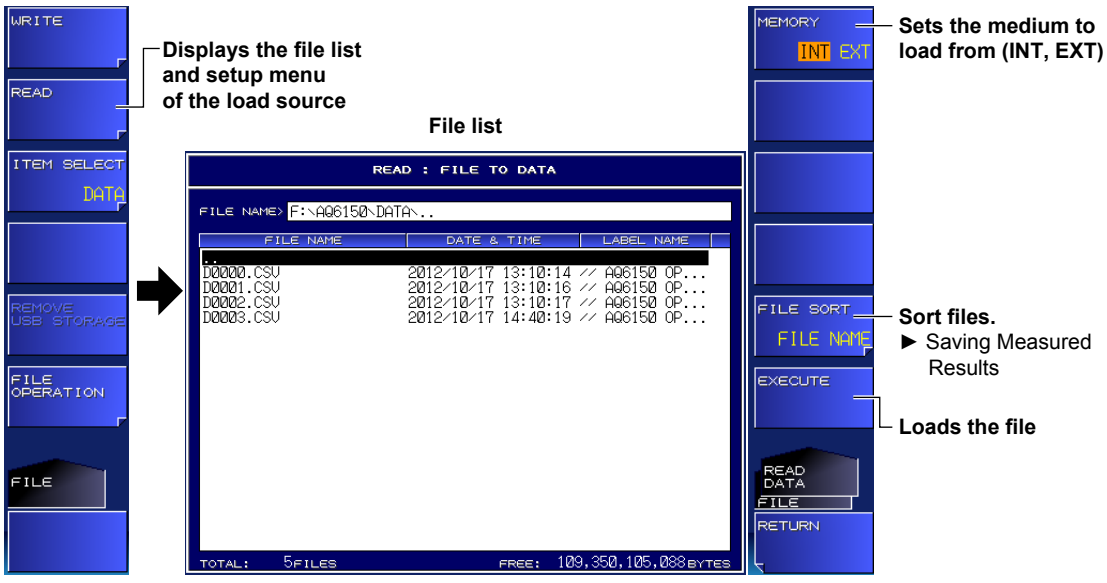
Saving the File

7. Press the **EXECUTE** soft key.
The file is saved.

Loading Measured Results

4. Press the **READ** soft key.
A file list appears.

5. Press the **MEMORY** soft key.
Each time you press the soft key, the setting toggles between INT (internal memory) and EXT (USB storage media).
The file list of the selected medium appears.



Loading the File

6. Press the **EXECUTE** soft key.
The file is loaded, and the measured results appear on the screen.

Explanation

Extension

The extension for measured data is .CSV.

File Name

You can save files by having their names assigned automatically or with specific names.
Automatic file names range from D0000 to D9999.
To specify the name, use characters that are allowed by MS-DOS. The maximum number of characters that you can use for file names is 52 (excluding the extension).
The following characters can be used.

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789
!! " # $ % & ' ( ) * + , – . / : ; < = > ? @ [\ ] ^ _ ~ { | }

File Size

The file size varies depending on the data that you are saving. Check that there is sufficient space on the storage medium before saving the data.

Sorting Files

You can sort the file list by file name, date and time, and label.

Data Format

```
AQ6150 DATA       R01.06.02                    Header (measured data) and firmware version
S/N               0123456789                   Serial number
// AQ6150 OPTICAL WAVELENGTH METER //          Label
2012/10/17        14:40:19                     Date and time

DATA TYPE         MULTI WAVELENGTH
DEVICE TYPE       BROADBAND
PEAK TH ABS       -20.0dBm
PEAK EXCURSION    15dB
AVG       1       10
MEDIUM    AIR
X UNIT    WL
Y UNIT    dBm
POWER OFFSET      0.0dB                        Measurement setup details

FP-LD ANALYSIS
PEAK WL[nm]       1549.5698
MEAN WL[nm]       1551.1188
MODE SPACING [nm]       0.1
FWHM [nm]         2.1727
PEAK PWR[dBm]     1.44
TOTAL PWR[dBm]    16.44
SIGMA [nm]        0.9226                       FP-LD analysis results
                                               (displayed only when executed)

PEAKS     32
AVERAGE WL[nm]    1551.1188
TOTAL PWR[dBm]    16.44

NO.       WL[nm]          PWR[dBm]
1         1549.5698       1.44
2         1550.4698       1.44
3         1551.4694       1.43
4         1550.5696       1.43
5         1552.3691       1.43                 Peak measurement results
```

WDM Analysis (OSNR)

AQ6150 DATA R01.06.02 — Header (measured data) and firmware version
S/N — Serial number
// AQ6150 OPTICAL WAVELENGTH METER // — Label
2016/1/7 19:37:03 — Date and time

DATA TYPE	OSNR
DEVICE TYPE	NARROWBAND
PEAK THREL	14dB
PEAK EXCURSION	15dB
AVG	OFF
MEDIUM	VACUUM
X UNIT	WL
Y UNIT	dBm
POWER OFFSET	0.0dB
NOISE MEAS ALGO	MANUAL-FIX
NOISE AREA	0.37nm
NOISE BW	0.10nm

Measurement setup details

PEAKS	32
AVERAGE WL[nm]	1551.54366
TOTAL PWR[dBm]	13.35

NO.	WL[nm]	SIG PWR[dBm]	NOISE[dBm/NBW]	OSNR[dB]
1	1549.99387	-1.71	-14.98	13.27
2	1550.09385	-1.76	-10.03	8.28
3	1550.19384	-1.8	-7.61	5.81
4	1550.29382	-1.86	-5.92	4.06
5	1550.39381	-2.02	-2.61	0.58
6	1550.49381	-2	-2.82	0.82
7	1550.59382	-1.96	-3.4	1.44

Analysis results

Grid Measurement

AQ6150 DATA R01.06.02 — Header (measured data) and firmware version
S/N — Serial number
// AQ6150 OPTICAL WAVELENGTH METER // — Label
2016/1/7 19:37:03 — Date and time

DATA TYPE	GRID CHECK
DEVICE TYPE	NARROWBAND
PEAK TH	REL 10dB
PEAK EXCURSION	15dB
AVG	OFF
MEDIUM	VACUUM
X UNIT	FREQ
Y UNIT	dBm
POWER OFFSET	0.0dB
GRID START	193.00THz
GRID STOP	193.05THz
REF FREQ	193.10THz
GRID SPACING	10.00GHz
SEARCH AREA	10.00GHz
SHOW ALL GRID	TRUE

Measurement setup details

GRID NUM	6
PEAKS	3

No.	GRID [THz]	GRID MIN[THz]	GRID MAX[THz]	STATUS	FREQ[THz]	PWR[dBm]	DEV[GHz]
1	193.000000	192.995000	193.005000	0			
2	193.010000	193.005000	193.015000	0			
3	193.020000	193.015000	193.025000	0			
4	193.030000	193.025000	193.035000	1	193.029205	-1.72	-0.7953
5	193.040000	193.035000	193.045000	1	193.041630	-1.71	1.6295
6	193.050000	193.045000	193.055000	1	193.054059	-1.7	4.0594

Measurement results

6.3 Saving and Loading Setup Data

You can save the AQ6150/AQ6151 measurement conditions and soft key states to a file in binary format.

Procedure

CAUTION

Do not remove the USB storage medium or turn off the power when the USB storage media access indicator is blinking. Doing so may damage the USB storage medium or corrupt its data.
Before you remove a USB storage medium, be sure to follow the procedure in section 6.1 to make the USB storage medium ready to be removed.

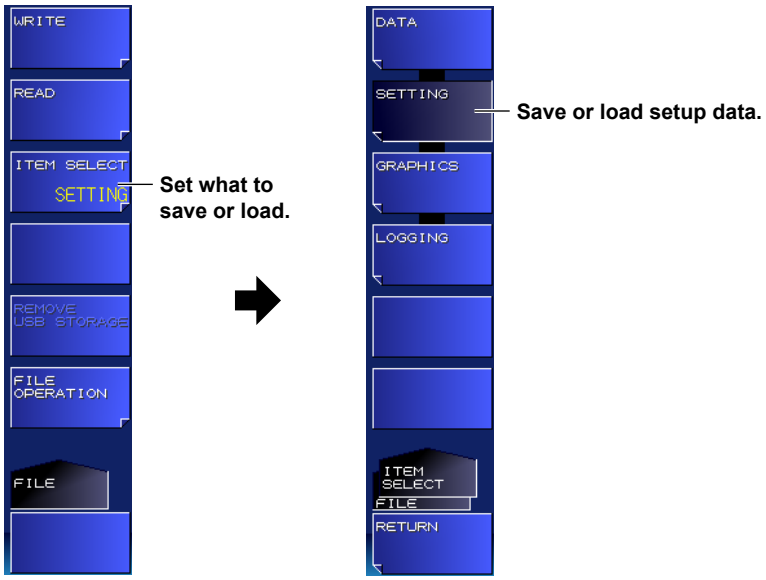
French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'indicateur d'accès au support de stockage USB clignote. Cela pourrait endommager le support de stockage USB ou corrompre ses données.
Avant de retirer un support de stockage USB, veuillez à suivre la procédure décrite dans la section 6.1 pour rendre le support de stockage USB prêt à être retiré.

Setting the File Type to SETTING (Setup Data)

1. Press **FILE**.
2. Press the **ITEM SELECT** soft key.
   The setup menu changes.
3. Press the **SETTING** soft key.
   SETTING is selected, and the menu returns to the previous level.



Saving Setup Data

For the procedure, see “Saving Measured Results” in section 6.2.

Loading Setup Data

For the procedure, see “Loading Measured Results” in section 6.2.

Explanation

Extension

The extension for setup data is .WS1.

File Name

You can save files by having their names assigned automatically or with specific names.
Automatic file names range from S0000 to S9999.
To specify the name, use characters that are allowed by MS-DOS. The maximum number of characters that you can use for file names is 52 (excluding the extension).
The following characters can be used.

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789
!! “ # $ % & ‘ ( ) * + , – . / : ; < = > ? @ [\ ] ^ _ ~ { | }

File Size

The file size varies depending on the data that you are saving. Check that there is sufficient space on the storage medium before saving the data.

Sorting Files

You can sort the file list by file name, date and time, and label.

6.4 Saving Screen Capture Data

You can capture the screen and save it as a file.

Procedure

CAUTION

Do not remove the USB storage medium or turn off the power when the USB storage media access indicator is blinking. Doing so may damage the USB storage medium or corrupt its data.
Before you remove a USB storage medium, be sure to follow the procedure in section 6.1 to make the USB storage medium ready to be removed.

French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'indicateur d'accès au support de stockage USB clignote. Cela pourrait endommager le support de stockage USB ou corrompre ses données.
Avant de retirer un support de stockage USB, veuillez à suivre la procédure décrite dans la section 6.1 pour rendre le support de stockage USB prêt à être retiré.

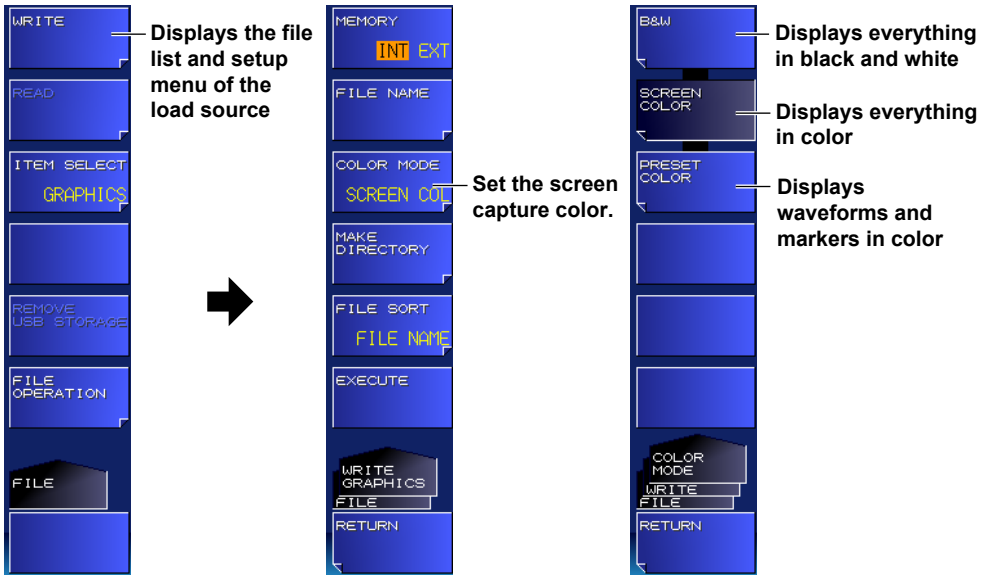
Setting the File Type to GRAPHICS (Screen Capture Data)

1. Press **FILE**.
2. Press the **ITEM SELECT** soft key.
   The setup menu changes.
3. Press the **GRAPHICS** soft key.
   GRAPHICS is selected, and the menu returns to the previous level.

Setting the Screen Capture Data Color

Set the color for saving screen captures.

4. Press the **WRITE** soft key.
   A file list appears.
5. Press the **COLOR MODE** soft key.
   A color setup menu appears.
6. Press the appropriate color condition soft key.
   The color condition is selected, and the menu returns to the previous level.



Note

For details on the color setting of the AQ6150/AQ6151 display, see section 7.2.

Saving Screen Capture Data

For the procedure, see “Saving Measured Results” in section 6.2.

Explanation

Extension

The extension for screen capture data is .BMP.

File Name

You can save files by assigning their names automatically or with specific names.

Automatic file names range from G0000 to G9999.

To specify the name, use characters that are allowed by MS-DOS. The maximum number of characters that you can use for file names is 48 (excluding the extension).

The following characters can be used.

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

0123456789

!! “ # $ % & ‘ ( ) * + , – . / : ; < = > ? @ [\ ] ^ _ ~ { | }

File Size

The file size varies depending on the data that you are saving. Check that there is sufficient space on the storage medium before saving the data.

Sorting Files

You can sort the file list by file name, date and time, and label.

6.5 Saving and Loading Logging Data

You can save and load logging data and the corresponding trace waveforms.

Procedure

CAUTION

Do not remove the USB storage medium or turn off the power when the USB storage media access indicator is blinking.
Doing so may damage the USB storage medium or corrupt its data.
Before you remove a USB storage medium, be sure to follow the procedure in section 6.1 to make the USB storage medium ready to be removed.

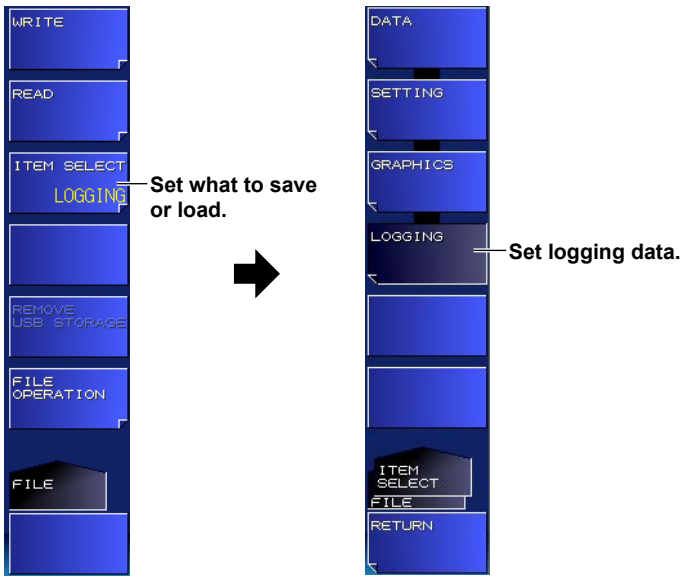
French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'indicateur d'accès au support de stockage USB clignote. Cela pourrait endommager le support de stockage USB ou corrompre ses données.
Avant de retirer un support de stockage USB, veuillez à suivre la procédure décrite dans la section 6.1 pour rendre le support de stockage USB prêt à être retiré.

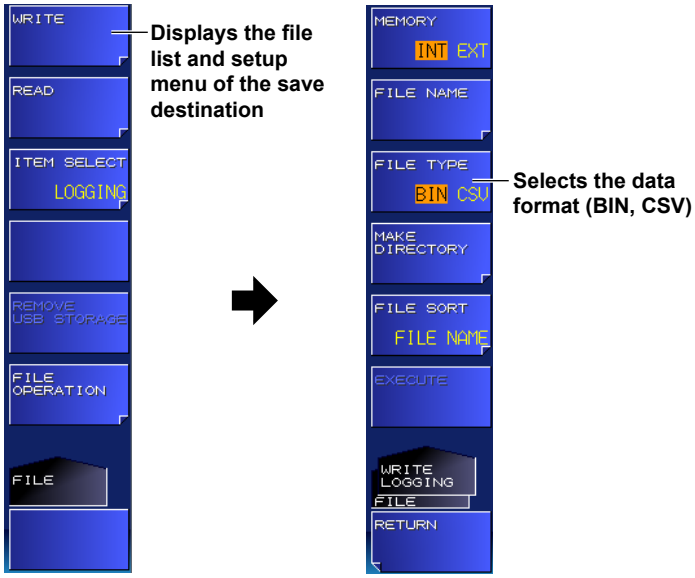
Setting the File Type to LOGGING (Logging Data)

1. Press **FILE**.
2. Press the **ITEM SELECT** soft key.
   The setup menu changes.
3. Press the **LOGGING** soft key.
   LOGGING is selected, and the menu returns to the previous level.



Selecting the Data Format

4. Press the **WRITE** soft key.
   A file list appears.
5. Press the **FILE TYPE** soft key.
   Each time you press the soft key, the setting toggles between BIN (binary format) and CSV (ASCII format). The file name extension will change.



Saving Logging Data

For the procedure, see “Saving Measured Results” in section 6.2.

Loading Logging Data

For the procedure, see “Loading Measured Results” in section 6.2.

Explanation

You can save logging data to the internal memory or USB storage media and also load logging data saved previously.

Extension

The file name extensions for saving logging data are shown below.
BIN (binary format): .WG1
CSV (ASCII format): .CSV

File Name

You can save files by assigning their names automatically or with specific names.
Automatic file names range from L0000 to L9999.
To specify the file name, use characters that are allowed by MS-DOS. The maximum number of characters that you can use for file names is 52 (excluding the extension).
The following characters can be used.

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789
!! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ~ { | }

Data Format

You can save in the following two data formats.

BIN

Data is saved in binary format.
It is a single file consisting of all information including various settings and logging data. The file size will be smaller than that of ASCII format.

CSV

Data is saved in comma-separated (CSV) ASCII format.
It is a file consisting of a portion of the logging data in CSV format. Included are setup parameters and log data (wavelength, power, etc.). The file size will be larger than that of binary format.
Logging data saved to CSV format cannot be loaded into the AQ6150/AQ6151.

File Size

The file size varies depending on the data that you are saving.
Check that there is sufficient free space at the storage destination before saving the data.

The approximate file size when waveform data is saved along with logging data is shown below. It will vary depending on conditions such as the changes in the number of peaks during data logging.

When the Logging Item Is PEAK

Data size (bytes) = (72 + 24 × the number of peaks) × logging measurement count + 8000

When the Logging Item Is FP-LD PARAMETERS

Data size (Bytes) = 136 × logging measurement count + 8000

Sorting Files

You can sort the displayed file list by file name, date and time, and label.

CSV Data Format

CSV data is saved in the following format.

Header

AQ6150 LOG		File header
// AQ6150 OPTICAL WAVELENGTH METER //		Label (57 characters)
S/N	*********	Instrument number
Software Version	Rxx.xx	Firmware version

Waveform Condition Parameters

The waveform condition format is the same as that of measured data.

See “Saving and Loading Measured Results” in section 6.2.

Data Logging Condition Parameters

INTERVAL	1sec	Measurement interval
DURATION	00:00:10	Measurement duration
COUNT	11	Measurement count
START TIME	2014 /9/1 13:20:36	Measurement start time
END TIME	2014 /9/1 13:20:46	Measurement end time
REF NUM	1	Position of the reference value for the relative value display

Measured Data

- **PEAK Analysis**

NUM	Time(sec)	CH	WL[nm]	POWER[dBm]
1	0.0	1	1577.8481	-56.466

- **FP-LD Analysis**

NUM	Time(sec)	PEAK WL [nm]	PEAK PWR [dBm]	CTR WL [nm]	FWHM [nm]	TOTAL PWR [dBm]	SIGMA [nm]	MODE SPACING [nm]
1	0.0	1530.3322	-12.649	1530.3322	1.8956	-9.652	0.0139	1.1723

6.6 File Operation

You can perform file operations such as renaming and copying files.

Procedure

CAUTION

Do not remove the USB storage medium or turn off the power when the USB storage media access indicator is blinking. Doing so may damage the USB storage medium or corrupt its data.
Before you remove a USB storage medium, be sure to follow the procedure in section 6.1 to make the USB storage medium ready to be removed.

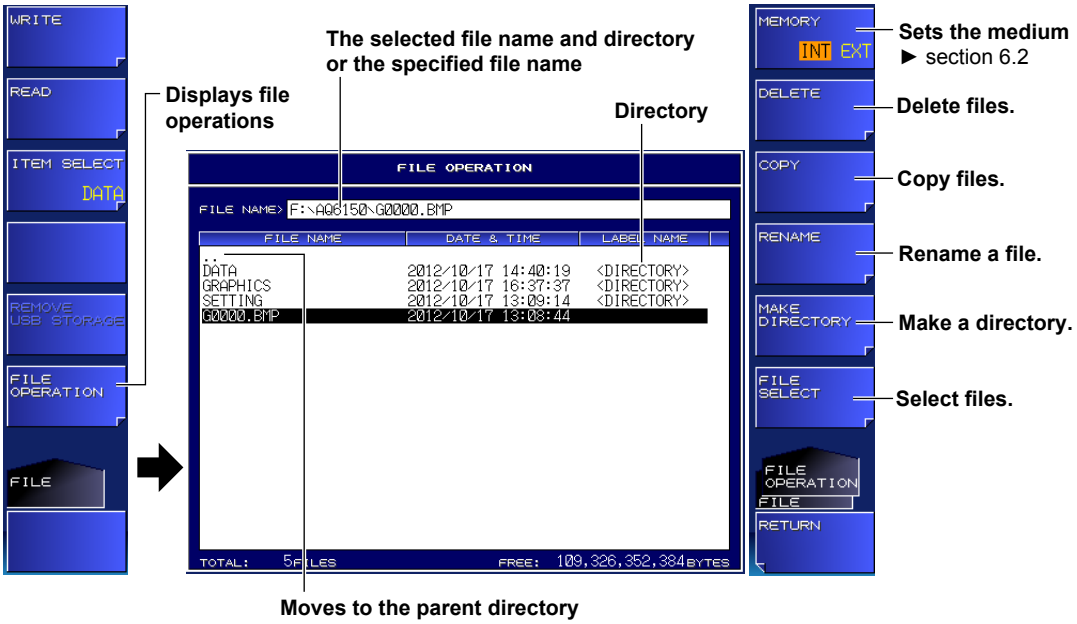
French

ATTENTION

Ne retirez pas le support de stockage USB et ne mettez pas l'alimentation hors tension lorsque l'indicateur d'accès au support de stockage USB clignote. Cela pourrait endommager le support de stockage USB ou corrompre ses données.
Avant de retirer un support de stockage USB, veuillez à suivre la procédure décrite dans la section 6.1 pour rendre le support de stockage USB prêt à être retiré.

Displaying the File Operation Screen

1. Press **FILE**.
2. Press the **FILE OPERATION** soft key.
   A file operation setup menu and file list appear.



Selecting a File or Directory

3. Select files or directories using the arrow keys.

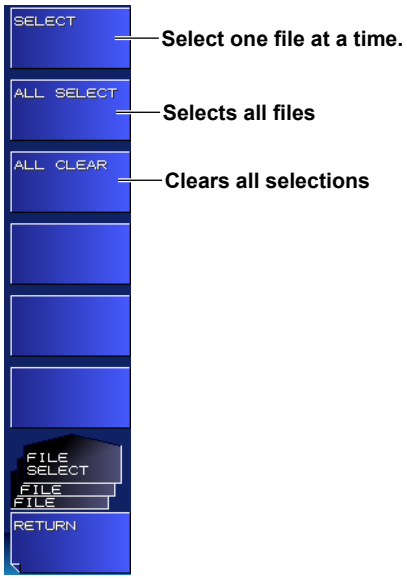
   To move to a child directory, select the directory, and press **ENTER**.

   To move to the parent directory, select ".." and press **ENTER**.

Selecting Multiple Files

4. Press the **FILE SELECT** soft key.

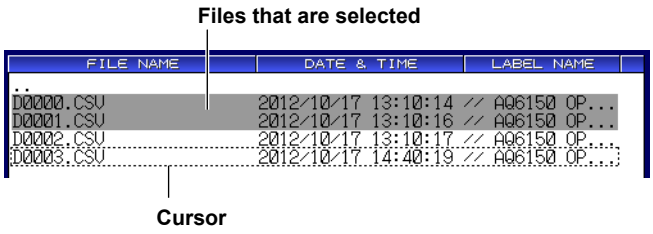
   A file selection menu appears.



Selecting Files One at a Time

5. Move the cursor to the file that you want to select using the arrow keys. Then, press the **SELECT** soft key.

   The background of the file name where the cursor is at turns gray to show that it is selected. To select additional files, repeat this procedure.



Selecting All Files

5. Press the **ALL SELECT** soft key.

   All files are selected.

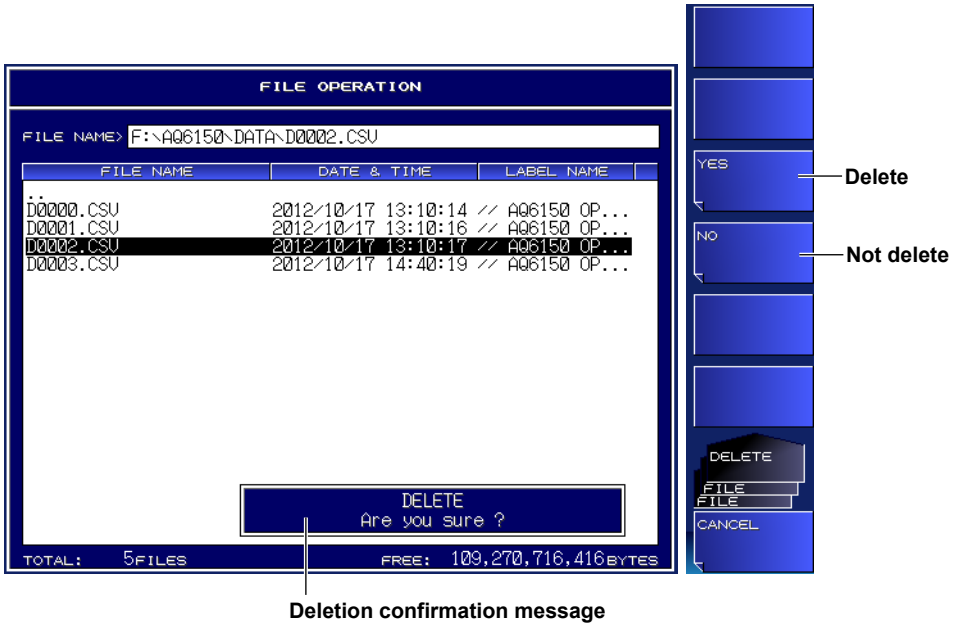
Unselecting All Files

6. Press the **ALL CLEAR** soft key.

   The file selection is cleared.

Deleting Files and Directories

6. Select the files and directories that you want to delete according to steps 3, 4 and 5.
7. Press the **DELETE** soft key.
   A deletion confirmation setup menu appears.
8. Press the **YES** soft key.
   The selected files and directories are deleted. If you press the NO soft key, the files and folders are not deleted, and the setup menu returns to the previous display.



Copying Files and Directories

6. Select the files and directories that you want to copy according to steps 3, 4 and 5.
7. Press the **COPY** soft key.

   A copy operation setup menu and file list appear. If the copy destination medium is different from the copy source medium, press the MEMORY soft key to select the medium (see section 6.2).
8. To paste with the same name, press the **EXECUTE** soft key.

   The selected files and directories are pasted.

   To paste with a different name, press the **NEW FILE NAME** soft key.

   A setup menu and a character input screen for entering characters appear.

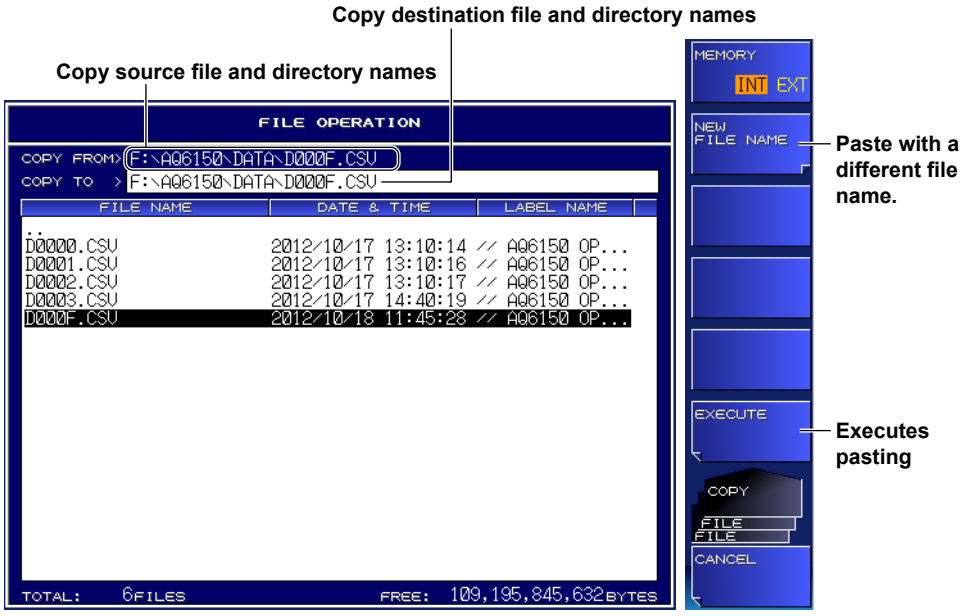
Note

- For instructions on how to enter text, see section 3.3 in the Getting Started Guide, IM AQ6150-02EN.
- When you copy multiple files and directories, you cannot change their names.

9. Press the **DONE** soft key.

   The file or folder name is confirmed, and the setup menu returns to the previous display.
10. Press the **EXECUTE** soft key.

    The file or directory is pasted with the specified name.



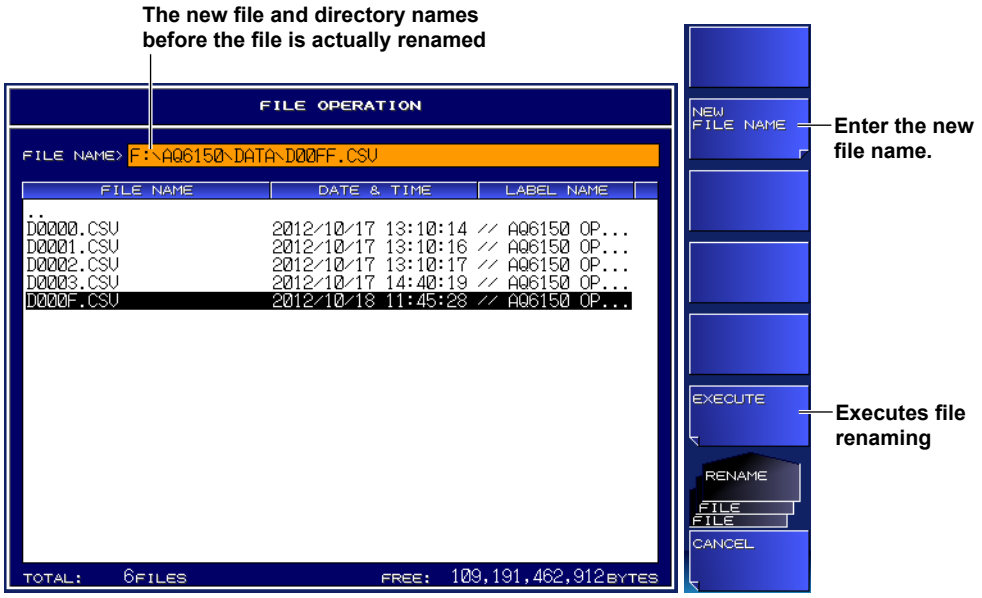
Renaming a File or Directory

3. Select a file or directory using the arrow keys.
4. Press the **RENAME** soft key.
   A setup menu for entering characters appear.
5. Press the **NEW FILE NAME** soft key.
   A character input screen appears.

Note

- For instructions on how to enter text, see section 3.3 in the Getting Started Guide, IM AQ6150-02EN.
- If you select a file or directory with the FILE SELECT soft key, you cannot rename it.

6. Press the **EXECUTE** soft key.
   The file or directory is renamed.



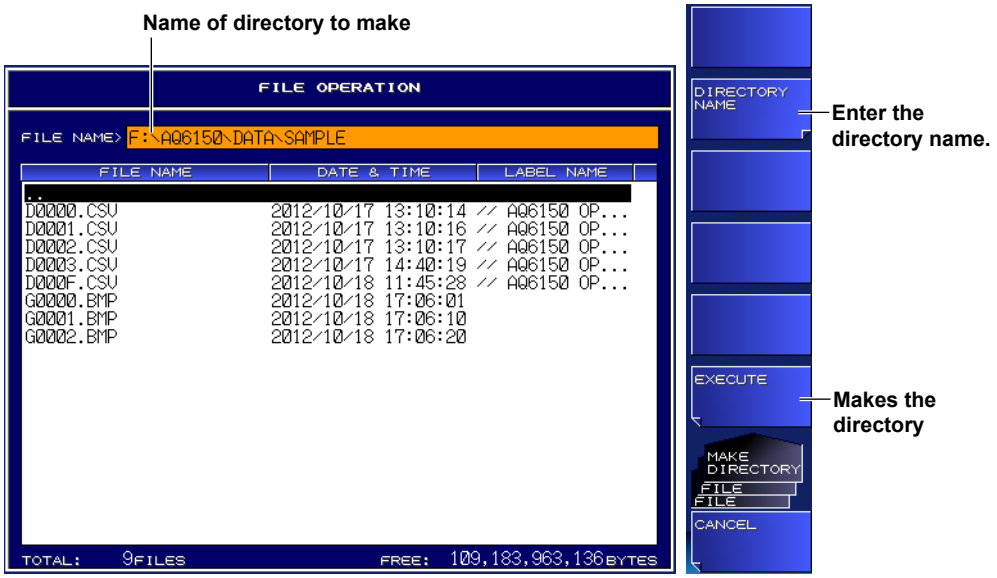
Making a Directory

3. Press the **MAKE DIRECTORY** soft key.
   A setup menu for creating directories appears.
4. Press the **DIRECTORY NAME** soft key.
   A character input screen appears.

Note

For instructions on how to enter text, see section 3.3 in the Getting Started Guide, IM AQ6150-02EN.

5. Press the **EXECUTE** soft key.
   A new directory is created.



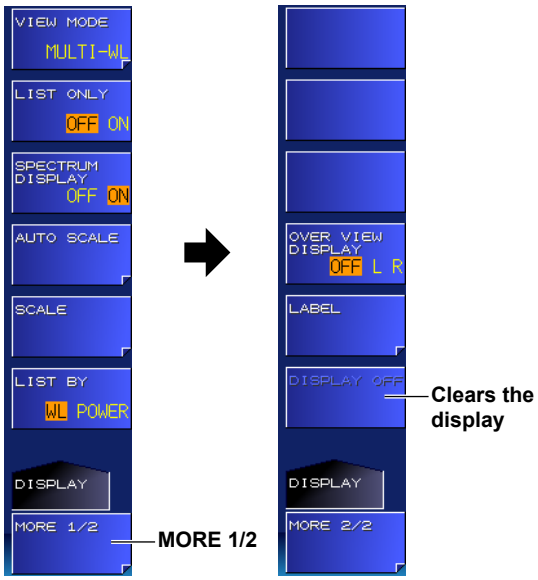
7.1 Turning the Display and Buzzer On and Off

Procedure

Turning Off the Display

You can temporarily turn off the display. Use this function when you are using the instrument in a dark room or similar environment in which the light from the screen has an effect on the work.

1. Press **DISPLAY**.
   A screen display condition setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **DISPLAY OFF** soft key.
   The AQ6150/AQ6151 display turns off. Use any of the AQ6150/AQ6151 panel controls or mouse to turn the display back on.



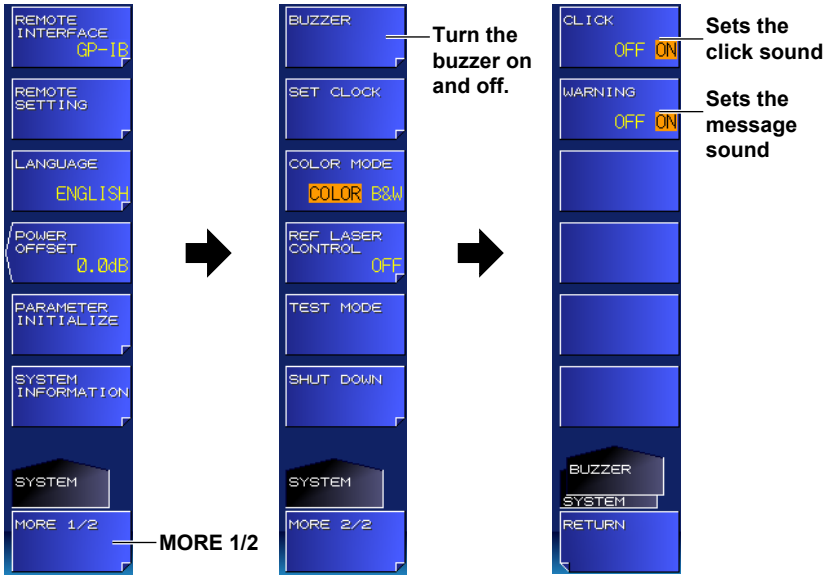
Note

If the DISPLAY OFF remote command has been executed, even if you use a panel key or mouse to turn the display on, the message “Display turn off” will be displayed for approximately 5 seconds, and the display will turn off again. To keep the display turned on, execute the DISPLAY ON remote command, or press LOCAL to switch the instrument from remote to local mode.

Turning On or Off the Buzzer

You can enable the click sound that is generated when you operate the AQ6150/AQ6151 or other sound that is generated when a message is displayed.

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **BUZZER** soft key.
   A setup menu for turning on and off the click sound and message sound appears.
4. Press the **CLICK** or **WARNING** soft key.
   Each time you press the soft key, the setting toggles between OFF and ON. When set to ON, the sound is enabled.



7.2 Display Color

You can set the display color.

Procedure

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **COLOR MODE** soft key.
   Each time you press the soft key, the setting toggles between COLOR and B&W.

Explanation

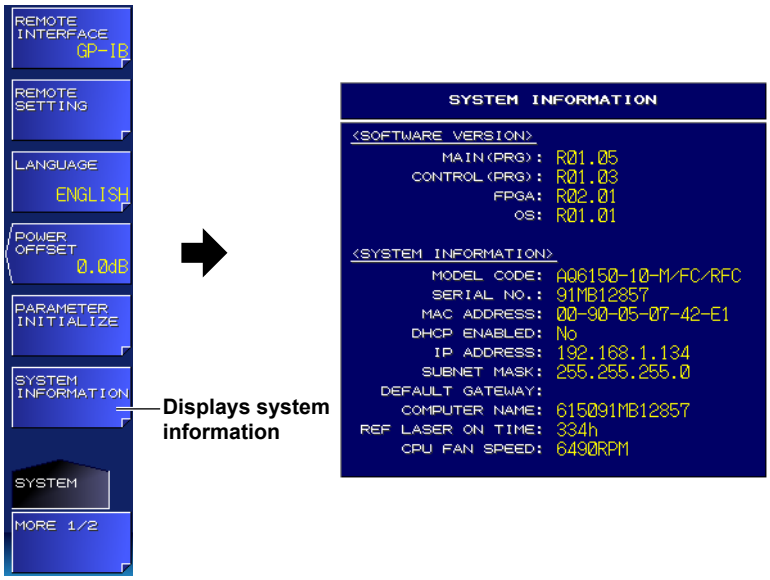
The procedure in this section sets the colors on the display. To set the colors for saving screen captures, see section 6.4. Even if you set the display color to B&W, if the screen capture data color is set to SCREEN COLOR, screen captures will be saved in color.

7.3 System Information

You can display system information, such as the AQ6150/AQ6151 instrument number and firmware version.

Procedure

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **SYSTEM INFORMATION** soft key.
   The system information appears.



Explanation

Display Details

Software Version	
MAIN (PRG)	Firmware version
CONTROL (PRG)	Device driver version
FPGA	FPGA data version
OS	Operating system version
System Information	
MODEL CODE	Model
SERIAL NO.	Instrument number
MAC ADDRESS	Ethernet port's MAC address
DHCP ENABLED	TCP/IP settings
IP ADDRESS	
SUBNET MASK	
DEFAULT GATEWAY	
REF LASER ON TIME	Total running time of the internal reference light source
CPU FAN SPEED	Rotational speed of the CPU fan

7.4 Turning the Internal Reference Light Source (He-Ne Laser) On and Off

You can turn off the internal reference light source (He-Ne laser), such as when you are going to suspend measurement for a long period of time.
When the light source is off, the power consumption is reduced by about 20%.

CAUTION

Repetitively turning the internal reference light source on and off at short intervals reduces its service life. After you turn off the light source, wait as long as possible before turning it back on. Turn off the laser when you are going to suspend measurements for a long period of time (6 hours or more).

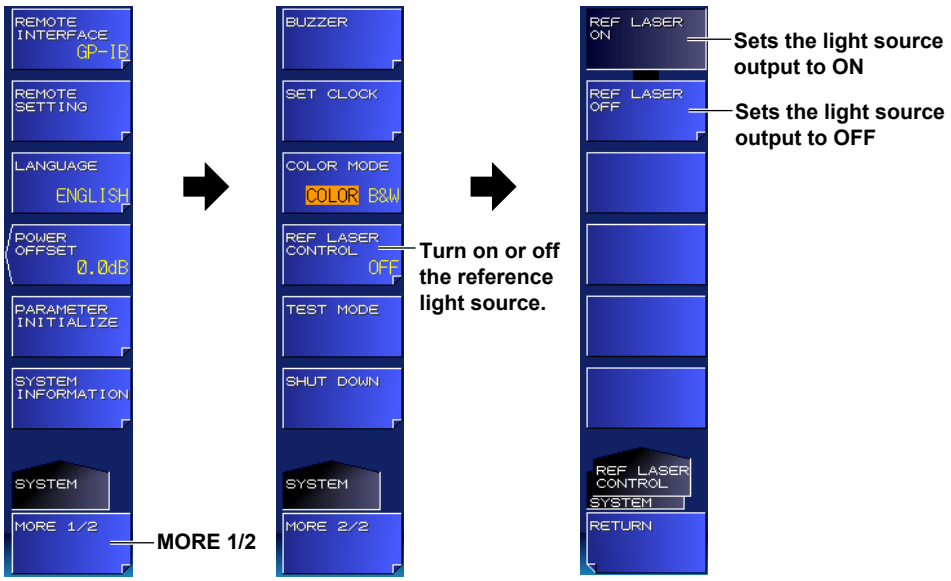
French

ATTENTION

Allumer et éteindre de façon répétée la source interne de lumière de référence à de courts intervalles réduit sa durée de vie. Après avoir éteint la source de lumière, attendez aussi longtemps que possible avant de la rallumer.
Éteignez le laser lorsque vous allez suspendre les mesures pour une longue durée (6 heures ou plus).

Procedure

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **MORE 1/2** soft key.
3. Press the **REF LASER CONTROL** soft key.
   A setup menu for turning the internal reference light source on and off appears.

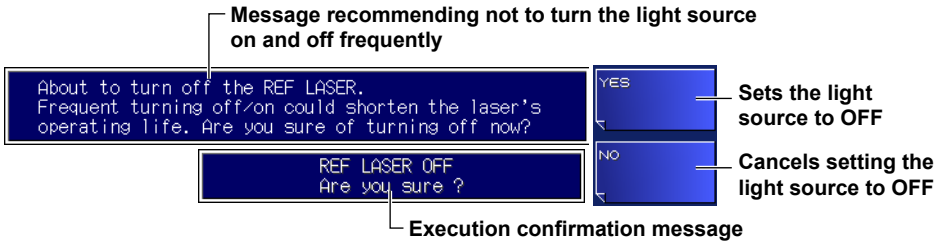


4. Press the **REF LASER ON** or **REF LASER OFF** soft key.
   - Pressing the REF LASER ON soft key turns on the light source.
   - Pressing the REF LASER OFF soft key displays a setup menu for confirming the operation and a message recommending that you provide as much time as possible before turning it back on.

If You Press the OFF Soft Key

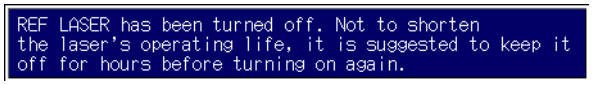
5. Press the **YES** soft key.

The light source turns off. If you press the NO soft key, the light source is not turned off, and the setup menu returns to the previous display.



Note

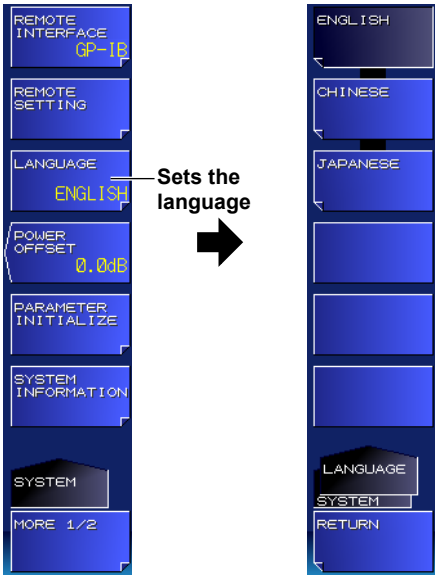
When the light source turns off, a message recommending that you provide as much time as possible before turning it back on appears (see below).



7.5 Setting the Language

Procedure

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **LANGUAGE** soft key.
   A language setup menu appears.
3. Press the soft key corresponding to the language you want to select.



Explanation

You can set the language to use for soft keys, messages such as warnings, and the titles of setup windows to English, Japanese, or Chinese.
The language for other components and that for this language setting soft key are in English.
The factory default setting is ENGLISH.

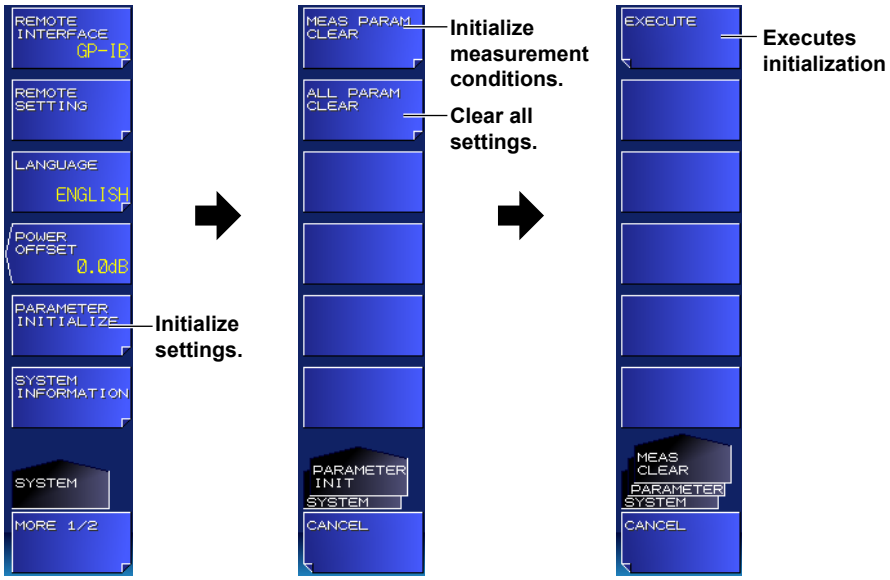
7.6 Initializing the Settings

You can initialize the measurement conditions and system settings to their factory defaults.

Procedure

Initializing Measurement Conditions

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **PARAMETER INITIALIZE** soft key.
   A setup menu for setting the range to initialize appears.
3. Press the **MEAS PARAM CLEAR** soft key.
   A setup menu for initializing the measurement conditions appears.
4. Press the **EXECUTE** soft key.
   The measurement conditions are initialized.



Initializing All Settings (Measurement Conditions and System Settings)

3. Press the **ALL PARAM CLEAR** soft key.
   A setup menu for initializing all settings appears.
4. Press the **EXECUTE** soft key.
   All settings are initialized.

Explanation

The range of settings that is initialized is as follows.

- Measurement condition initialization: Conditions that have been set with the DISPLAY, SEARCH, ANALYSIS, and SETUP keys.
- Initialization of all settings: All conditions except for the internal memory contents and the running time information of the internal reference light source

8.1 Messages

Messages may appear on the screen while you are using this instrument. This section describes the error messages and their causes. If a message that indicates an error or malfunction warning appears, turn the power off and then turn it back on. If the same message appears after you restart the AQ6150/AQ6151, contact your nearest YOKOGAWA dealer.

No.	Message	Cause
No.1 to 19 Messages that appear when a function is executed		
1	Peak number limit exceeded	The number of detected peaks exceeded the measurable limit. The upper limit is 1024.
2	<AVERAGE TIMES> set to 1	An execution of drift measurement was selected when the averaging measurement count was set to 2 or higher. The count has been set to 1.
No. 20 to 69 Messages that indicate the reasons for not being able to execute a function		
20	Input power too high	Measurement is not possible because the optical input power is too high.
21	Invalid port number	The port number for remote control cannot be set to 20001.
22	Invalid character	A character that cannot be used for the computer name was entered.
23	Invalid address	A value that cannot be used as part of the IP address was specified.
24	Network configuration failure	Network configuration failed.
25	Sweep time exceeds the set interval	Unable to log at the specified interval because the sweep time is longer than the interval (displayed only the first time after logging is started).
30	USB Storage not inserted	A USB storage device is not inserted.
31	USB Storage not initialized	The USB storage device is not initialized.
32	USB Storage write-protected	The USB storage device is write protected.
33	File not found	The specified load file does not exist.
34	Invalid directory name	Unable to make the directory because the directory name is invalid.
35	Invalid file name	Unable to save the file because the file name is invalid.
36	Directory already exists	Unable to make the directory because a directory with the same name already exists.
37	Copy failed	Unable to copy because a directory or file with the same name already exists.
38	File write-protected	Unable to overwrite or delete the file because the file attribute is set to read only.
39	Storage full	Unable to save the file because there is not enough free space on the USB storage device.
40	Directory full	Unable to create the file because the number of files in the directory has reached the upper limit.
41	No data	There is no data to save.
42	File is not data file	Unable to load the file because it is not a DATA file (CSV format).
43	File is not setting file	Unable to load the file because it is not a SETTING file (.WS1 extension).
45	File already exists	Unable to rename the file because a file with the same name already exists.
46	System data not saved properly	Failed to save the file containing setup parameters and instrument information.
47	Disk space is not enough for logging	Logging cannot be started because there is not enough space for saving files with the logging function.
48	File is not a logging file	The file cannot be loaded because it is not a logging file.
50	Incompatible firmware version	Unable to install because the firmware is not compatible.
51	Update file read error	Failed to read the update file. • The file may be corrupt. • There are multiple files. • There are no files.
No. 70 to 79 Messages that indicate errors in measurement processing		
70	Hardware error(motor timeout)	The internal motor is not operating normally.
71	Measurement error(setup)	Hardware setup failed.
72	Measurement error(data sampling)	Hardware data sampling failed.
73	Measurement error(amp ranging)	The internal amplifier range cannot be set properly.
74	Measurement error(sequence)	Measurement processing did not complete within the proper time.
No. 80 to 99 Warnings that indicate hardware malfunction		
80	Fan1 motor stopped!	The CPU cooling fan has stopped. The AQ6150/AQ6151 will shut down in 10 seconds.
81	Fan2 motor stopped!	The cooling fan has stopped. The AQ6150/AQ6151 will shut down in 10 seconds.
82	Calibration data failed!	Calibration data is abnormal.
83	Internal Temparature warning!	The internal interferometer temperature is high (exceeds 40°C).
84	Internal temparature too high	The internal interferometer temperature is high (exceeds 45°C). The AQ6150/AQ6151 will shut down in 10 seconds.
85	Hardware error (Ref Laser timeout)	The internal reference light source (He-Ne laser) failed to start.

8.1 Messages

No.	Message	Cause
90	Hardware error(PCI device)	Failed to initialize the PCI device at startup.
91	Hardware error(motor Initialize)	Failed to initialize the internal motor at startup.
No. 100 and higher	**Message that indicate remote control errors**	
113	Undefined header	Undefined command. Check the command type.
200	Execution error	Failed to execute the command. Check the setup conditions.
220	Parameter error	Check the parameter because it is incorrect.
222	Data out of range	The parameter range has been exceeded. Check the ranges of the settings.
223	Too much data	The response data is too large for the command. Execute a query command that will return response data within the appropriate size.
350	Queue overflow	The amount of data in the queue has reached its upper limit. Query error information with the :SYST:ERR? command to reduce the amount of error in the error queue.
400	Query error	Unable to respond to the query.
410	Query INTERRUPTED	The response to the query has been overwritten by a response to another query.
440	Query UNTERMINATED	There was no response to the query.

8.2 Updating the Firmware

When there is a firmware update, such as when new functions are added, you can update the firmware in the AQ6150/AQ6151. Download the update firmware from the YOKOGAWA website.

http://www.yokogawa.com/ymi/

CAUTION

- When the firmware is being updated, do not turn off the power. If you do, you may not be able to start the AQ6150/AQ6151.
- If there are multiple update firmware files in the USB memory device, the AQ6150/AQ6151 will not update.

French

ATTENTION

- Lorsque la mise à jour du micrologiciel est en cours, n'éteignez pas l'instrument. Si vous le faites, vous pourriez ne pas être en mesure de démarrer l'AQ6150/AQ6151.
- S'il existe plusieurs fichiers de mise à jour du micrologiciel dans le dispositif de mémoire USB, l'AQ6150/AQ6151 ne sera pas mis à jour.

Preparing to Update the Firmware

The AQ6150/AQ6151 can read the update firmware (.UPD extension) in one of two ways. Prepare the update firmware according to your environment.

Reading the Firmware from a USB Memory Device

Create a directory named "UPDATE" in the USB memory device, and save the update firmware in that directory.

Check that the AQ6150/AQ6151 is not connected to a network. If it is, you will not be able to update.

Reading the Firmware from a PC

Save the update firmware in a PC, and connect the PC to the AQ6150/AQ6151 over a network.

Procedure

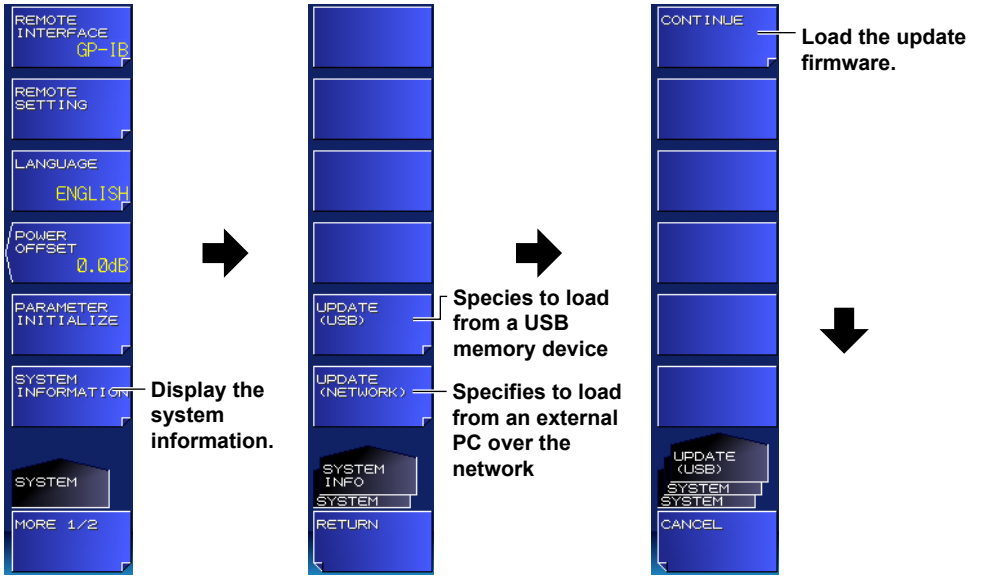
Reading the Firmware from a USB Memory Device

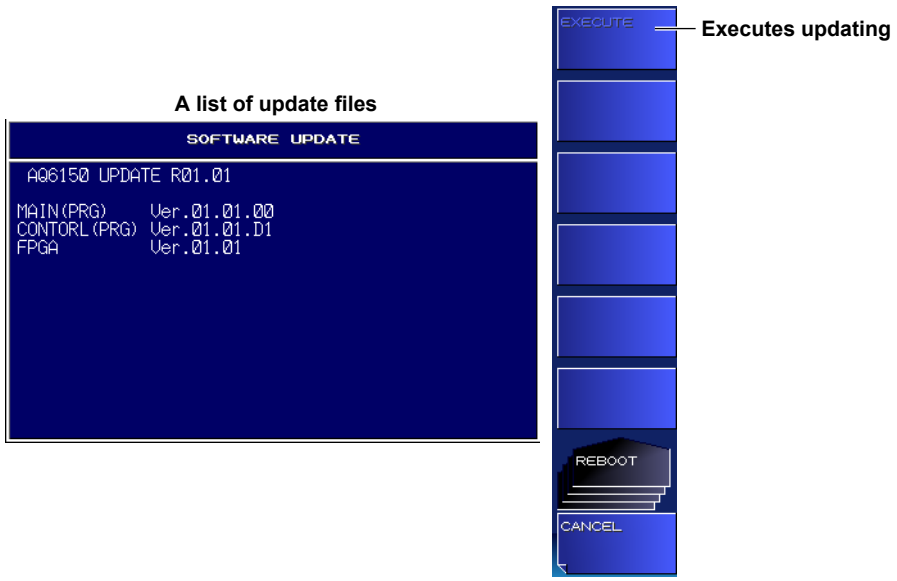
1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **SYSTEM INFORMATION** soft key.
   A setup menu for version information and updating appears. For details on version information, see section 7.3.
3. Press the **UPDATE(USB)** soft key.
   The "Insert Update Files" message appears.
4. Connect a USB memory device containing the update firmware to the AQ6150/AQ6151.

5. Press the **CONTINUE** soft key.
   A list of update firmware files and an update execution setup menu appear. The message “Please remove USB storage device” appears.
6. Remove the USB memory device. If the AQ6150/AQ6151 is connected to a network, disconnect the network cable from the AQ6150/AQ6151.
   The soft key for executing the update operation becomes available.

Note

Do not reconnect the network cable that you removed from the AQ6150/AQ6151 ETHERNET port until the updating is complete.

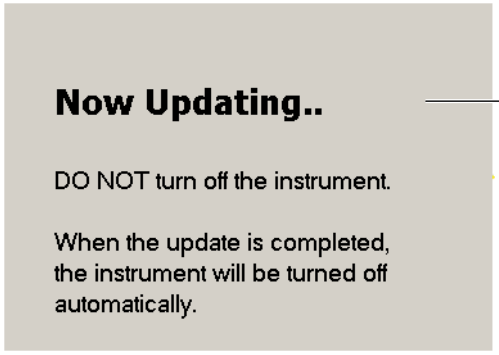




7. Press the **EXECUTE** soft key.
   The AQ6150/AQ6151 automatically restarts and starts updating. During updating, the screen shows that updating is in progress. When updating is complete, the AQ6150/AQ6151 automatically shuts down. This completes the update procedure. Turn the power on, and the AQ6150/AQ6151 will start normally.

Note

Once updating starts, you cannot abort the process until it is complete. You can cancel using the CANCEL soft key or another key in any of the steps before step 6.



Screen displayed during updating

Reading the Firmware from a PC

1. Press **SYSTEM**.
   A system setup menu appears.
2. Press the **SYSTEM INFORMATION** soft key.
   A setup menu for version information and updating appears.
3. Press the **UPDATE(NETWORK)** soft key.
   The “Insert Update Files (NETWORK)” message appears.
4. Connect the PC containing the update firmware to the AQ6150/AQ6151 over a network.
5. Use a file management software on the PC to copy the update software in the UPDATE directory of the AQ6150/AQ6151 internal memory.
6. For the remaining of the procedure, follow the steps from step 5 in “Reading the Firmware from a USB Memory Device.”

Note

When you update the firmware, the setup data will be initialized.
If necessary, save the setup data. For the procedure, see section 6.3.

8.3 Routine Maintenance

To use this instrument for as long as possible and to prevent problems or malfunctions, routine maintenance is necessary.

CAUTION

- Turn the instrument off before starting maintenance. Otherwise, you may damage the instrument.
- Do not use chemicals such as thinner, benzene, or alcohol. Doing so may cause discoloration and deformation.
- Using dirty cleaners can damage the optical input.
- Using dirty cotton swabs can damage the optical input.
- When you attach or detach the connector adapter, be sure not to damage the ferrule end face or the connector adapter.

French

ATTENTION

- Mettre l'instrument hors tension avant la maintenance. Sinon, vous risquez de l'endommager.
- Ne pas utiliser de produits chimiques (par exemple, diluants, benzène ou alcool) pour éviter toute décoloration ou déformation.
- L'utilisation de nettoyants sales pourrait endommager l'entrée optique.
- L'utilisation des tampons de coton sales pourrait endommager l'entrée optique.
- Lorsque vous attachez ou détachez l'adaptateur du connecteur, veillez à ne pas endommager l'extrémité de la virole ou l'adaptateur du connecteur.

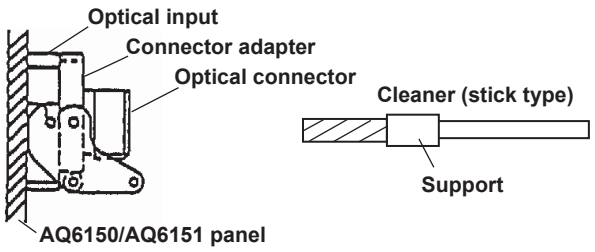
Cleaning the Instrument Exterior

When you clean the case or the operation panel, first remove the power cord from the outlet, and then wipe with a dry, soft, clean cloth.

Cleaning the Optical Connector of the Connector Adapter

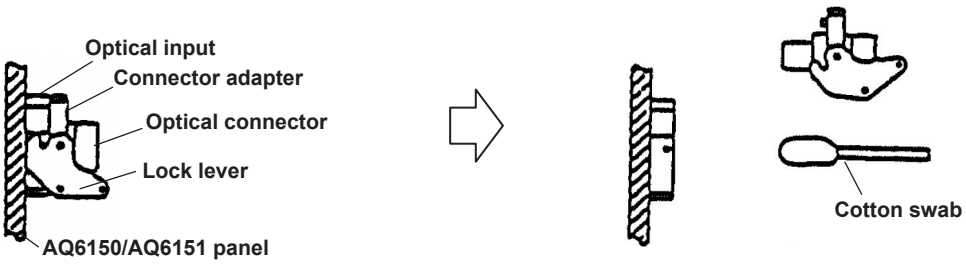
We recommend that you use a stick-type cleaner to clean the optical connector of the connector adapter.

1. Open the optical connector cover, which is on the front panel of the AQ6150/AQ6151.
2. Clean the optical connector with a cleaner.
   Insert the cleaner straight into the optical connector and turn it to clean.
   When you do this, hold the support area of the cleaner as much as possible.



Cleaning the Ferrule End Face of the Optical Input

1. Turn off the power. Then, remove the connector adapter from the AQ6150/AQ6151.
   For the removal procedure, see section 2.4 in the Getting Started Guide, IM AQ6150-02EN.
2. Clean the ferrule end face using a cotton swab moistened with a small amount of absolute alcohol.
   Always use a new cotton swab.
3. When you finish cleaning, attach the connector adapter to the AQ6150/AQ6151.



8.4 Storage Precautions

This section contains precautions for storing the AQ6150/AQ6151 for an extended period of time.

Before Storage

Clean the AQ6150/AQ6151 before storage. For details on cleaning, see section 8.3.

Storage Conditions

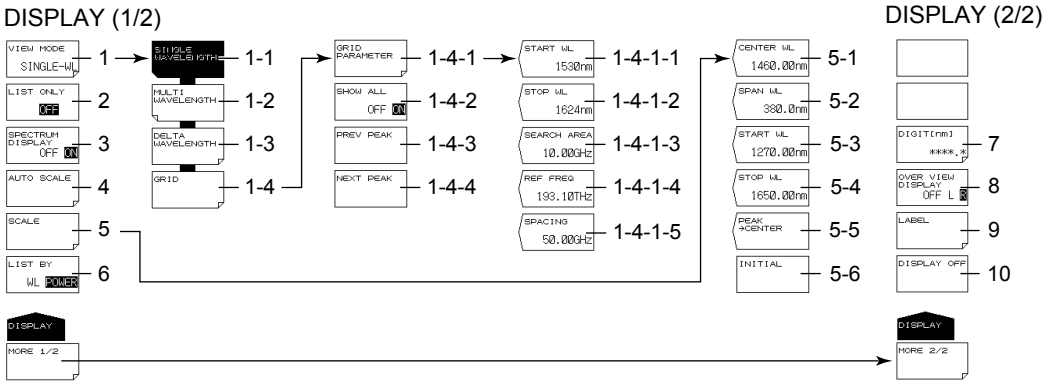
Do not store the instrument in the following locations.

- In direct sunlight or in a place with an abundance of dust
- In a place that is subject to water drops or a place that has a high humidity that may cause water drops to form
- In a place with active gases or a place in which the device may rust
- In a place where the temperature and humidity change greatly over a day
- In a place whose temperature and humidity are as indicated below
  - A temperature greater than 50°C
  - A temperature less than –10°C
  - Humidity greater than 85%
  - Humidity less than 20%

Appendix 1 Soft Key Tree Diagram

The menu structure of the AQ6150/AQ6151 is illustrated below. Some menus have been omitted.

DISPLAY



1 Set the display mode for measured values.
- 1-1 Sets the display mode to single peak (section 4.1)
- 1-2 Sets the display mode to multi peak (absolute values) (section 4.2)
- 1-3 Sets the display mode to multi peak (relative values) (section 4.3)
- 1-4 Sets to grid display (section 4.4)
  - 1-4-1 Set grid parameters (section 4.4).
    - 1-4-1-1 Set the start wavelength (section 4.4).
    - 1-4-1-2 Set the stop wavelength (section 4.4).
    - 1-4-1-3 Set the search area (section 4.4).
    - 1-4-1-4 Set the reference frequency (section 4.4).
    - 1-4-1-5 Set the grid spacing (section 4.4).
  - 1-4-2 Set whether to display grids without peaks in the list (section 4.4).
  - 1-4-3 Move the cursor to the grid with the previous peak (section 4.4).
  - 1-4-4 Move the cursor to the grid with the next peak (section 4.4).

2 Turns on or off the list display (section 4.2)

3 Turns on or off the spectrum window (section 4.5)

4 Automatically sets the display scale to a setting suitable for the current measured values (section 4.5)

5 Set the display scale (section 4.5).
- 5-1 Set the display center wavelength (section 4.5).
- 5-2 Set the display span (section 4.5).
- 5-3 Set the display start wavelength (section 4.5).
- 5-4 Set the display stop wavelength (section 4.5).
- 5-5 Sets the peak with the maximum power to the center of the display (section 4.5)
- 5-6 Initializes the display scale and displays the entire measurement range (section 4.5)

6 Sets the sort order of the peak display (section 4.1)

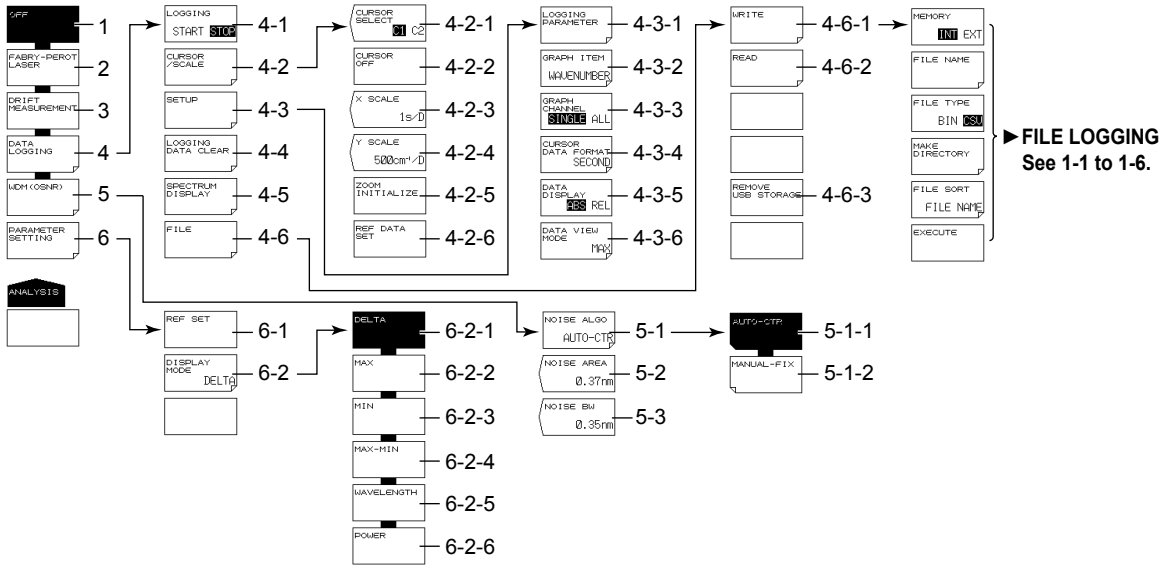
7 Select the number of decimal places (section 4.6).

8 Turns on or off the overview window (when the spectrum window is on) (section 4.5)

9 Set label information (section 4.7).

10 Turns off the display temporarily (section 7.1)

ANALYSIS

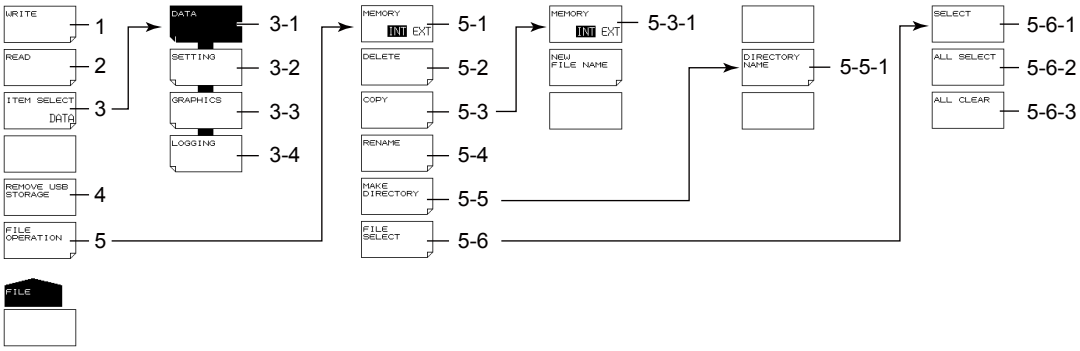


1 Turns off the FP-LD analysis and drift measurement (sections 2.4 and 3.4)
2 Turns on the FP-LD analysis (section 2.4)
3 Turns on the drift measurement (section 3.4)
4 Configure data logging (section 3.6).
- 4-1 Executes and stops data logging (section 3.6)
- 4-2 Display cursors and scales (section 3.6).
  - 4-2-1 Selects the cursor display (section 3.6)
  - 4-2-2 Turns off the cursor display (section 3.6)
  - 4-2-3 Select the horizontal scale (section 3.6)
  - 4-2-4 Select the vertical scale (section 3.6)
  - 4-2-5 Initializes the display scale (section 3.6)
  - 4-2-6 Set the reference value for relative table value display (section 3.6).
- 4-3 Set the data logging conditions (section 3.6).
  - 4-3-1 Set the logging parameters (section 3.6).
  - 4-3-2 Select the data to graph (section 3.6).
  - 4-3-3 Selects the number of peaks to graph (section 3.6)
  - 4-3-4 Set the cursor/REF DATA time display unit (section 3.6).
  - 4-3-5 Sets the table data value display mode (section 3.6)
  - 4-3-6 Set the table display format (section 3.6).
- 4-4 Deletes logging data (section 3.6)
- 4-5 Displays the spectrum waveform during data logging (section 3.6)
- 4-6 Save and load logging data (sections 3.6 and 6.5).
  - 4-6-1 Save logging data (sections 3.6 and 6.5).
  - 4-6-2 Load logging data (sections 3.6 and 6.5).
  - 4-6-3 Removes the USB storage medium (sections 3.6 and 6.1)

5 Configure WDM (OSNR) analysis (section 3.7).
- 5-1 Set the noise detection method (section 3.7).
  - 5-1-1 Set to AUTO-CTR (section 3.7).
  - 5-1-2 Set to MANUAL-FIX (section 3.7).
- 5-2 Set the noise measurement point for when MANUAL-FIX is selected (section 3.7).
- 5-3 Noise bandwidth (section 3.7)

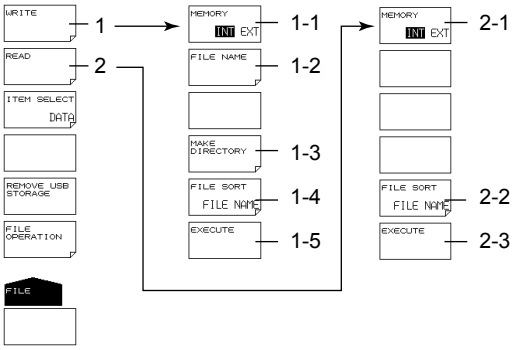
6 Set parameters (when drift measurement is on) (section 3.4).
  6-1 Initializes the reference (section 3.4)
  6-2 Set the drift measurement display format (section 3.4).
    6-2-1 Displays the difference between the reference values and current values (section 3.4)
    6-2-2 Displays the maximum values since the start of measurement (section 3.4)
    6-2-3 Displays the minimum values since the start of measurement (section 3.4)
    6-2-4 Displays the maximum amount of change since the start of measurement (maximum – minimum) (section 3.4)
    6-2-5 Displays the amount of change in wavelength values (maximum, minimum, and maximum amount of change) (section 3.4)
    6-2-6 Displays the amount of change in power values (maximum, minimum, and maximum amount of change) (section 3.4)

FILE



1 Save a file (see item 1 in DATA, SETTING, GRAPHICS, and LOGGING described later).
2 Load a file (see item 2 in DATA, SETTING, and LOGGING described later).
3 Set what file to load or save (sections 6.2 to 6.5).
  3-1 Set the file type to DATA (measured data) (section 6.2).
  3-2 Set the file type to SETTING (setup data) (section 6.3).
  3-3 Set the file type to GRAPHICS (screen capture data) (section 6.4).
  3-4 Set the file type to LOGGING (logging data) (section 6.5).
4 Removes the USB storage medium (section 6.1)
5 File operation (section 6.6)
  5-1 Sets the medium (drive) (section 6.2)
  5-2 Delete files (section 6.6).
  5-3 Copy files (section 6.6).
    5-3-1 Sets the medium (drive) (section 6.2)
  5-4 Rename a file (section 6.6).
  5-5 Make a directory (section 6.6).
    5-5-1 Enter a directory name (section 6.6).
  5-6 Select files (section 6.6).
    5-6-1 Select files one at a time (section 6.6).
    5-6-2 Selects all files (6.6)
    5-6-3 Unselects all files (6.6)

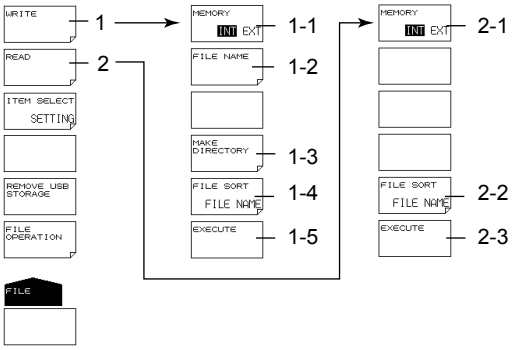
DATA



1 Save a file (section 6.2).
- 1-1 Sets the medium (drive) (section 6.2)
- 1-2 Enter the file name (section 6.2).
- 1-3 Make a directory (section 6.6).
- 1-4 Sort files (section 6.2).
- 1-5 Saves the file (section 6.2)

2 Load a file (section 6.2).
- 2-1 Sets the medium (drive) (section 6.2)
- 2-2 Sort files (section 6.2).
- 2-3 Loads the file (section 6.2)

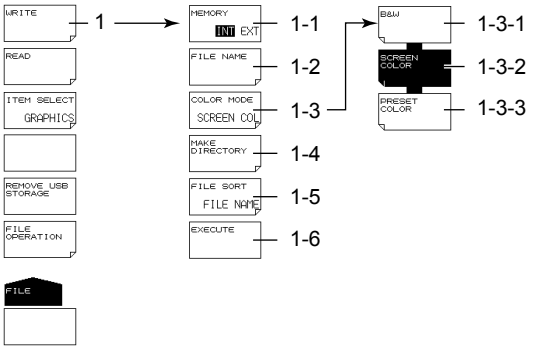
SETTING



1 Save a file (section 6.2).
- 1-1 Sets the medium (drive) (section 6.2)
- 1-2 Enter the file name (section 6.2).
- 1-3 Make a directory (section 6.6).
- 1-4 Sort files (section 6.2).
- 1-5 Saves the file (section 6.2)

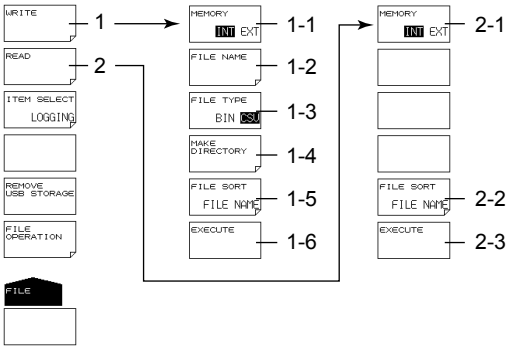
2 Load a file (section 6.2).
- 2-1 Sets the medium (drive) (section 6.2)
- 2-2 Sort files (section 6.2).
- 2-3 Loads the file (section 6.2)

GRAPHICS



1 Save a file (section 6.2).
- 1-1 Sets the medium (drive) (section 6.2)
- 1-2 Enter the file name (section 6.2).
- 1-3 Set the screen capture color (section 6.4).
  - 1-3-1 Displays everything in black and white (section 6.4).
  - 1-3-2 Displays everything in color (section 6.4).
  - 1-3-3 Displays waveforms and markers in color (section 6.4).
- 1-4 Make a directory (section 6.6).
- 1-5 Sort files (section 6.2).
- 1-6 Saves the file (section 6.2)

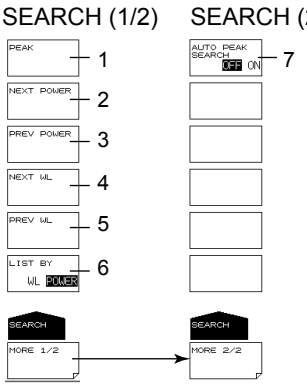
LOGGING



1 Save a file (section 6.2).
- 1-1 Sets the medium (drive) (section 6.2)
- 1-2 Enter the file name (section 6.2).
- 1-3 Select the data format (section 6.5).
- 1-4 Make a directory (section 6.6).
- 1-5 Sort files (section 6.2).
- 1-6 Saves the file (section 6.2)

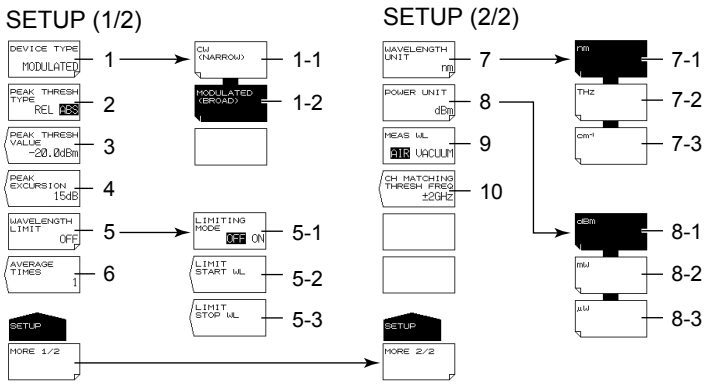
2 Load a file (section 6.2).
- 2-1 Sets the medium (drive) (section 6.2)
- 2-2 Sort files (section 6.2).
- 2-3 Loads the file (section 6.2)

SEARCH



1 Executes the detection of the peak with the maximum power (section 5.1)
2 Searches for the peak with the next lowest power value after the current power (section 5.2)
3 Searches for the peak with the next highest power value after the current power (section 5.2)
4 Searches for the peak with the next longest wavelength after the current wavelength (section 5.2)
5 Searches for the peak with the next shortest wavelength after the current wavelength (section 5.2)
6 Sets the sort order of the peak display (section 4.1)
7 Turns auto searching on and off (section 2.6)

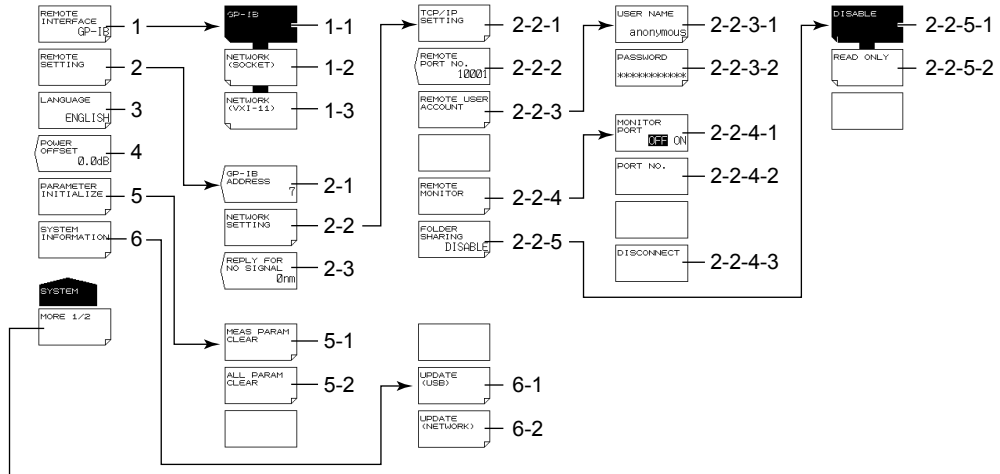
SETUP



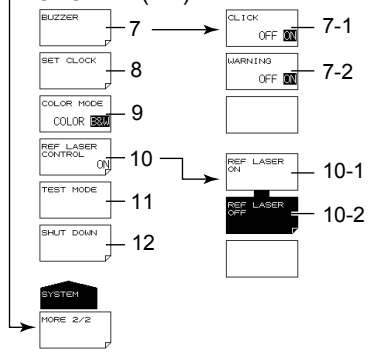
1 Set the light type (sections 2.4 and 2.5)
  1-1 Specifies the CW light (NARROW) (section 2.4)
  1-2 Specifies the modulated light (BROAD) (section 2.5)
2 Sets the threshold definition mode (section 2.1)
3 Enter the threshold (section 2.1).
4 Set peak excursion (section 2.1).
5 Limit the measurement range (section 3.5).
  5-1 Turns on or off the measurement range limit (section 3.5)
  5-2 Set the start wavelength of the measurement range limit (section 3.5).
  5-3 Set the stop wavelength of the measurement range limit (section 3.5).
6 Set averaging (sections 2.4 and 3.3).
7 Set the wavelength unit (section 2.3).
  7-1 Specifies the wavelength unit (nm) (section 2.3)
  7-2 Specifies the frequency unit (THz) (section 2.3)
  7-3 Specifies the wavenumber unit (cm^{-1}) (section 2.3)
8 Set the power unit (section 2.3).
  8-1 Sets the power unit to dBm (section 2.3)
  8-2 Sets the power unit to mW (section 2.3)
  8-3 Sets the power unit to µW (section 2.3)
9 Sets the medium (standard air or vacuum) (section 2.2)
10 Set the frequency tolerance (channel matching) (section 2.7).

SYSTEM

SYSTEM (1/2)



SYSTEM (2/2)



1 Configure the remote interface (sections 2.4 and 3.2 in IM AQ6150-17EN).
- 1-1 Set the remote interface type to GP-IB (section 2.4 in IM AQ6150-17EN).
- 1-2 Set the remote interface type to Ethernet (SOCKET) (section 3.3 in IM AQ6150-17EN).
- 1-3 Set the remote interface type to Ethernet (VXI-11) (section 3.3 in IM AQ6150-17EN).

2 Configure remote mode (sections 2.4 and 3.2 in IM AQ6150-17EN).
- 2-1 Set the GP-IB address (section 2.4 in IM AQ6150-17EN).
- 2-2 Configure the network settings (section 3.3 in IM AQ6150-17EN).
  - 2-2-1 Configure TCP/IP settings (section 3.3 in IM AQ6150-17EN).
  - 2-2-2 Set the remote port number (section 3.3 in IM AQ6150-17EN).
  - 2-2-3 Set the user name and password (section 3.3 in IM AQ6150-17EN).
    - 2-2-3-1 Set the user name (section 3.3 in IM AQ6150-17EN).
    - 2-2-3-2 Set the password (section 3.3 in IM AQ6150-17EN).
  - 2-2-4 Set the remote monitor function (section 3.3 in IM AQ6150-17EN).
    - 2-2-4-1 Sets the remote monitor on and off (section 3.3 in IM AQ6150-17EN)
    - 2-2-4-2 Set the port number (section 3.3 in IM AQ6150-17EN).
    - 2-2-4-3 Disconnects the monitor connection (section 3.3 in IM AQ6150-17EN)
  - 2-2-5 Set directory sharing (section 3.3 in IM AQ6150-17EN).
    - 2-2-5-1 Disable directory sharing (section 3.3 in IM AQ6150-17EN).
    - 2-2-5-2 Enable directory sharing (read only) (section 3.3 in IM AQ6150-17EN).
- 2-3 Set the response value when a signal is not detected (section 1.4 in IM AQ6150-17EN).

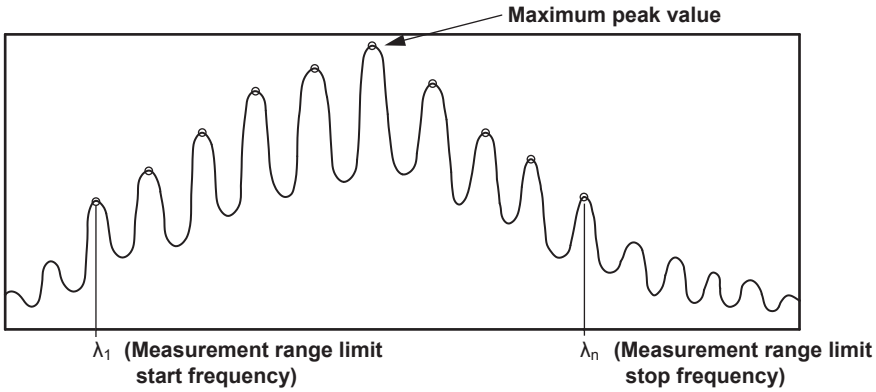
3 Set the language (section 7.5).

4 Set the power offset (section 2.6 in IM AQ6150-02EN).

5 Initialize the settings (section 7.6).
  5-1 Initializes measurement conditions (section 7.6)
  5-2 Initializes all settings (section 7.6)
6 Displays system information (section 7.3)
  6-1 Updates the firmware (USB memory) (section 7.3)
  6-2 Updates the firmware (via network) (section 7.3)
7 Turn the buzzers on and off (section 7.1).
  7-1 Turns the click sound on and off (section 7.1)
  7-2 Turns the message sound on and off (section 7.1)
8 Set the clock (section 2.7 in IM AQ6150-02EN).
9 Sets the display color (section 7.2)
10 Turn the internal reference light source (He-Ne laser) on and off (section 7.4)
11 Manufacturer adjustment
12 Shuts down (section 2.3 in IM AQ6150-02EN)

Appendix 2 FP-LD Analysis

The FP-LD analysis algorithm equations are shown below. The peak that are analyzed are those that are detected within the measurement range limits (λ_1 to λ_n). For the procedure to limit the measurement range, see section 3.5.



Peak Power (maximum peak value): PEAK PWR

The maximum peak value detected in the measurement range

Peak Wavelength (wavelength at the maximum peak): PEAK WL

The wavelength of the maximum peak

Total Power (total peak): TOTAL PWR

$$\text{TOTAL PWR} = \sum_{i=1}^{n} Pi$$

n: The number of peak detected in the measurement range
P: Peak power (in mW)

Mode Spacing (peak spacing): Δλ MODE

$$\Delta\lambda\ \text{MODE} = \frac{\lambda_n - \lambda_1}{n-1}$$

λ_n: Wavelength of the nth peak
The equation example is for the wavelength. The AQ6150/AQ6151 displays analysis results for the specified unit (wavelength, frequency, or wavenumber).

Center Wavelength: CTR WL

$$\text{CTR WL} = \frac{\sum_{i=1}^{n} (Pi \times \lambda i)}{\sum_{i=1}^{n} Pi}$$

Sigma (spectrum width): σ

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n} Pi \times (\lambda i - \text{CTR WL})^2}{\sum_{i=1}^{n} Pi}}$$

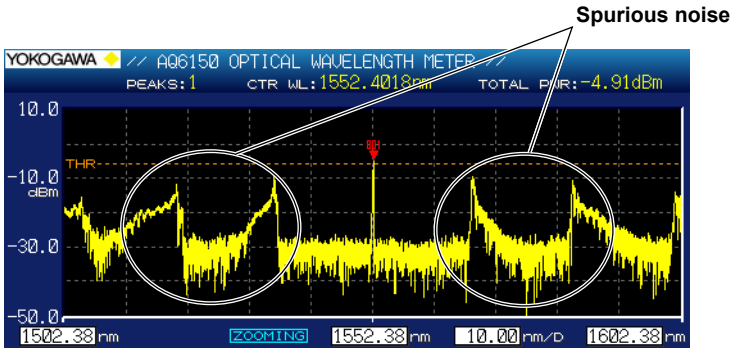
Full Width at Half Maximum:FWHM

FWHM = 2.355 × σ

Appendix 3 Spurious Noise

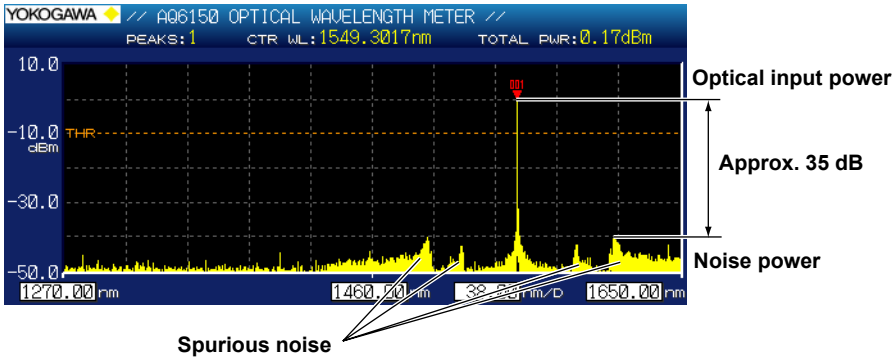
When Measuring Modulated Light

The AQ6150/AQ6151 cannot accurately measure the wavelength of modulated light whose repetition period is long. For example, if you measure a modulated light that is a few hundred kilohertz or less, spurious noise will clearly appear on both side of the measured peak. This is not a malfunction.



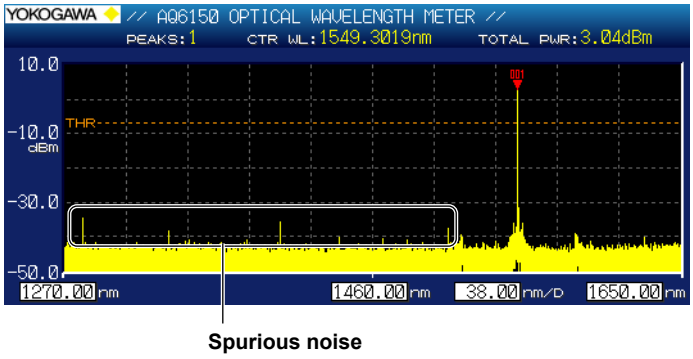
During Warm-up and Changes in Ambient Temperature

Due to the characteristics of the AQ6150/AQ6151, spurious noise may appear on both sides of the measured peak during warm-up or when the ambient temperature fluctuates. The spurious noise intensity will be suppressed by approximately 35 dB of the optical input power. If the optical input power is small, the spurious noise intensity will also be small. When making measurements, reduce the peak detection threshold appropriately (see section 2.1) to prevent erroneous detection of spurious noise.



When Optical Power Input Is –10 dBm or Higher

Due to the characteristics of the AQ6150/AQ6151, spurious noise may appear if you apply optical power that is approximately –10 dBm or higher. The spurious noise intensity will be suppressed by approximately 35 dB of the optical input power. If the optical input power is small, the spurious noise intensity will also be small. When making measurements, reduce the peak detection threshold appropriately (see section 2.1) to prevent erroneous detection of spurious noise.



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