User's Manual

AQ7420
High-Resolution Reflectometer

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ7420-01EN
2nd Edition

Thank you for purchasing the AQ7420 High-Resolution Reflectometer. This instrument enables the measurement of optical return loss, burnout detection, and optical insertion loss of optical fiber cables and optical devices.
This user's manual explains the features, operating procedures, and handling precautions of the instrument. To ensure correct use, please read this manual thoroughly before beginning operation. Keep this manual in a safe place for quick reference.
The manuals for this instrument are listed on the next page. Please read all manuals.

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 improvements to the product's performance and functionality. Refer to our website to view our latest manuals.
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Revisions

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Manuals

The following manuals, including this one, are provided as manuals for this instrument. Please read all manuals.

Manuals included with the product

Manual Title	Manual No.	Description
AQ7420 High-Resolution Reflectometer Getting Started Guide	IM AQ7420-02EN	Explains the handling precautions, installation procedure, and specifications of this instrument.
AQ7420 Request to Download Manuals	IM AQ7420-73Z2	Describes the manuals provided on the website.
AQ7420 High-Resolution Reflectometer	IM AQ7420-92Z1	Document for China
720921 AC Adapter User's Manual	IM 720921-01EN	Describes the handling precautions of the AC adapter.
Safety Instruction Manual	IM 00C01C01-01Z1	Safety manual (European languages)

Manuals provided on the website

Download the following manuals from our website.

Manual Title	Manual No.	Description
AQ7420 High-Resolution Reflectometer User's Manual	IM AQ7420-01EN	This document. Explains how to operate this instrument.

For details on downloading manuals, see Request to Download AQ7420 Manuals (IM AQ7420-73Z2).

The "EN," "Z1," and "Z2" in the manual numbers are the language codes.

Conventions used in this manual

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

k:	Denotes 1000.	Example: 12 kg, 100 kHz
K:	Denotes 1024.	Example: 720 KB (file size)

Displayed characters

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

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

WARNING Provides precautions to avoid the risk of fatal or serious injury to the user if the product is mishandled.

CAUTION Provides precautions to avoid the risk of minor injury to the user or damage to property if the product is mishandled.

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.

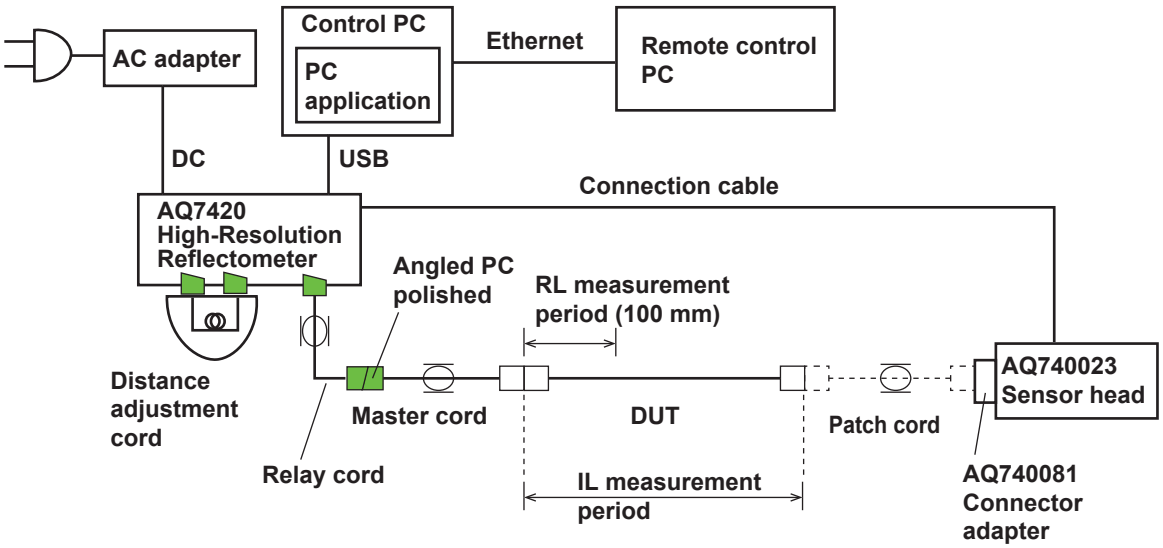
ATTENTION Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

Note Provides important information for handling this instrument.

Contents

1.1 Overview

System configuration



The instrument can measure and analyze optical return loss (RL), burnout detection, and optical insertion loss (IL) of optical fiber cables and optical devices. You can set the pass/fail judgment conditions for each measurement item during setup before measurement, and the instrument will automatically display the judgment result based on the judgment conditions at the end of the measurement.

For RL measurement and burnout detection measurements, the AQ7420 can (1) detect scratches and breaks inside the fiber under test and reflected light from optical components by measuring the return loss of the optical signal output from the AQ7420's optical port and (2) display the position and intensity of RL incidents in the DUT on a graph. In addition, analysis can be performed using the marker feature.

For IL measurements, the AQ7420 can measure and display the insertion loss of the fiber under test connected between the tested end of the AQ7420 master cord and the AQ740023 optical input port.

The AQ7420 is used by installing a dedicated PC application on the control PC. The AQ7420 can also be controlled remotely by sending and receiving communication commands via TCP-IP. You can view the measurement results using a PC application installed on the control PC.

PC application window

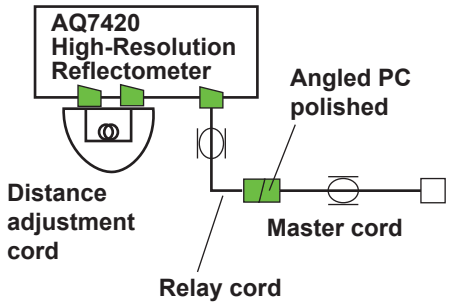
1.2 Optical Return Loss (RL) Measurement

Optical return loss is determined by measuring the optical return loss distribution based on the principle of Time Domain Optical Coherence Tomography (TD-OCT) using a Michelson interferometer inside the instrument.

The optical return loss can be measured at optical connector connection points, internal scratches, and connection points of the individual components that make up the interior of the DUT. The optical return loss at the near-end point (0 mm point) can be measured as an RL value. Measurement is achieved by performing the reference measurement and RL measurement described next.

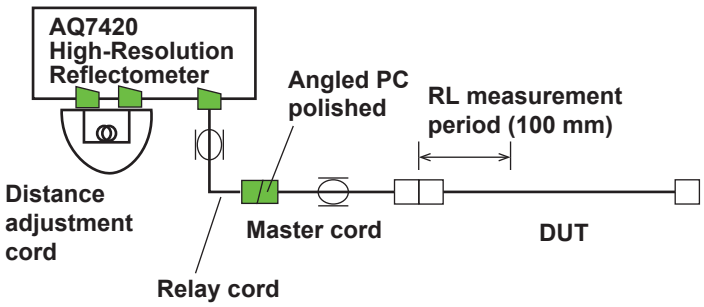
Reference measurement

The instrument measures the intensity of the reflected light caused by the open end of the master cord connected to the AQ7420 by measuring the return loss of the light signal output from the AQ7420's built-in light source. This measurement serves as a reference for the distance measurement of the target device to be measured later and is a reference measurement with the open end of the master cord as the starting point (0 mm). The master cord supplied with the instrument is used.



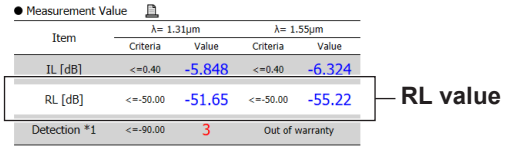
RL measurement

Following the above reference measurement, the return light of the DUT is measured. For the measurement, the DUT is connected to the open end of the master cord.



Measurement result

The result is displayed as RL value on the main window (see section 4.1).

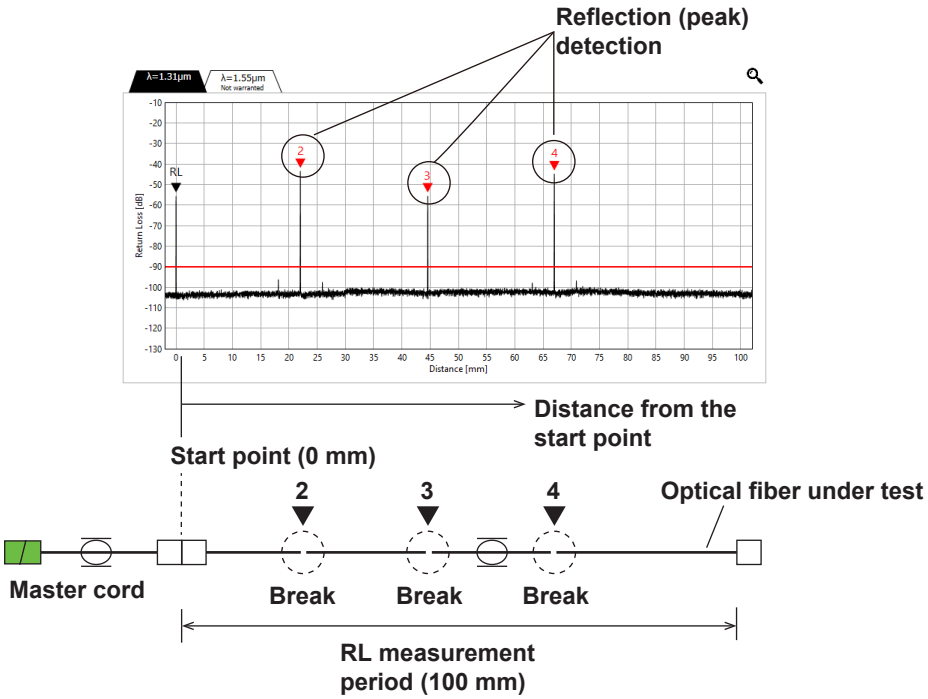


1.3 Burnout Detection (Detection)

Burnout detection is carried out by measuring the optical return loss distribution based on the principle of Time Domain Optical Coherence Tomography (TD-OCT) using a Michelson interferometer inside the instrument. The optical return loss can be measured at optical connector connection points and connection points of the individual components that make up the interior of optical components. The optical return loss distribution is measured over the entire RL measurement period.
Measurement is achieved by performing a reference measurement and detection measurement. The reference measurement and detection measurement methods are the same as those of the optical return loss (RL) measurement. For details, see section 1.2.

Measurement result

The optical return loss distribution is displayed as a graph in the main window (see section 4.1). A reflection (peak) can be detected at the break point of the target device. Here is an example of a fiber under test.



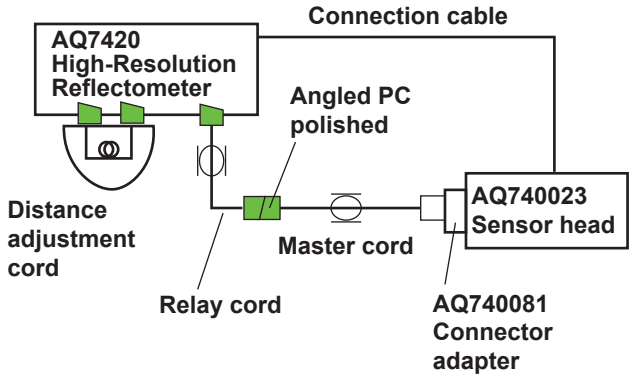
1.4 Optical Insertion Loss (IL) Measurement

For optical insertion loss measurement, the difference is measured between the intensity of the light received directly by the light detector of the AQ740023 sensor head from the connection end of the measured side of the AQ7420 master cord and the intensity of the light received when the DUT is connected between the connection end of the measured side of the master cord and the light detector of the AQ740023 sensor head. This difference is measured as the optical insertion loss. Measurement is achieved by performing the reference measurement and IL measurement described next.

Reference measurement

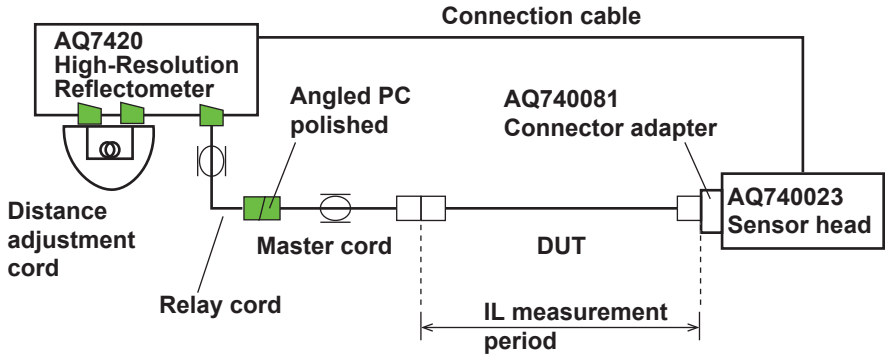
The light signal output from the AQ7420's built-in light source is directly input to the light detector of the AQ740023 to measure light intensity. This measurement is a reference measurement as it serves as a reference for comparison with the transmitted light of the DUT to be measured later. There are two types of reference measurements: RL/Detection and IL. Here, we measure the IL reference.

The optical fiber cable connecting the AQ7420 to the AQ740023 requires high measurement accuracy, so the master cord supplied with the instrument is used.



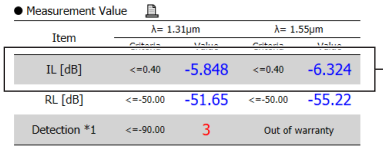
IL measurement

Following the above reference measurement, the transmitted light of the DUT is measured. For the measurement, the target device is connected between the master cord and the AQ740023.



Measurement result

The result is displayed as IL value on the main window (see section 4.1).



1.5 Analysis

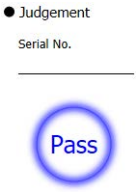
Pass/fail judgment

Pass/fail judgment is performed automatically at the end of measurement based on the specified judgment reference values (thresholds) of return loss (RL), burnout detection (Detection), and optical insertion loss (IL). Judgment results are indicated by color (blue and red). For setting the threshold values, see section 3.3.

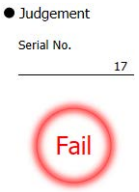
Total judgment result

Pass/fail judgment is performed by taking the logical product of all return loss (RL), burnout detection (Detection), and optical insertion loss (IL) judgment results.

Pass: The result is displayed in blue to indicate Pass because all measurement results are within the threshold values.



Fail: If any one of the measurement results exceeds the threshold value among all measurement results, the result is displayed in red to indicate Fail.



Measurement result (numeric)

The judgment results for each of the return loss (RL), burnout detection (Detection) and optical insertion loss (IL) values are indicated by different colors.

If the value of each measurement result is within the threshold value, the value is displayed in blue to indicate Pass.

If the value of each measurement result exceeds the threshold value, a Fail judgment is made and the number of peaks exceeding the threshold value is displayed in red.

● Measurement Value

Item	λ= 1.31μm		λ= 1.55μm	
	Criteria	Value	Criteria	Value
IL [dB]	<=0.40	-5.848	<=0.40	-6.324
RL [dB]	<=-50.00	-51.65	<=-50.00	-55.22
Detection *1	<=-90.00	3	Out of warranty	

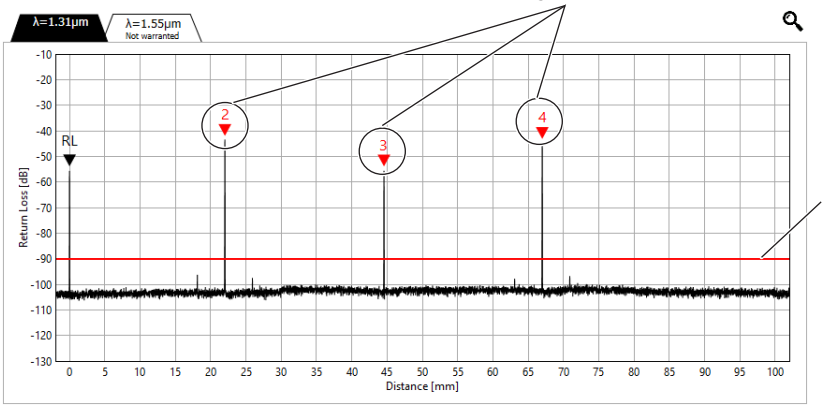
*1:Failure Point Pass : Blue Fail : Red

Judgment result indicated by the color of the value

Measurement result (waveform)

If the value of the return loss of each peak in the burnout detection (Detection) exceeds the threshold value, a marker is displayed on the waveform (peak) on the graphical display.

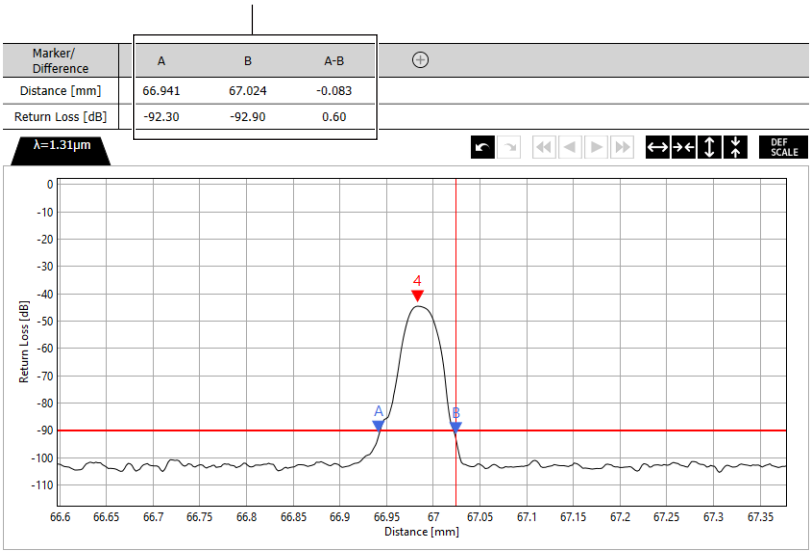
Markers are displayed at the peaks that exceed the threshold.



Markers and cursor

In addition to markers on the waveform on the graph display, new markers can be set by moving the cursor to the position you want to analyze. You can check the distance of the marker position from the starting point and the value of the return loss. The distance between newly placed markers (A-B) and the difference in return loss can be displayed. The difference in distance and return loss between markers on the waveform and newly placed markers (e.g., 4-B) can also be displayed.

Value of the distance from the start point of the marker position, value of the reflection attenuation at the marker position, and each value between markers



1.6 Saving and Printing Data

Saving and loading

Measurement data (PS)

The following items are measured and saved in a CSV file.

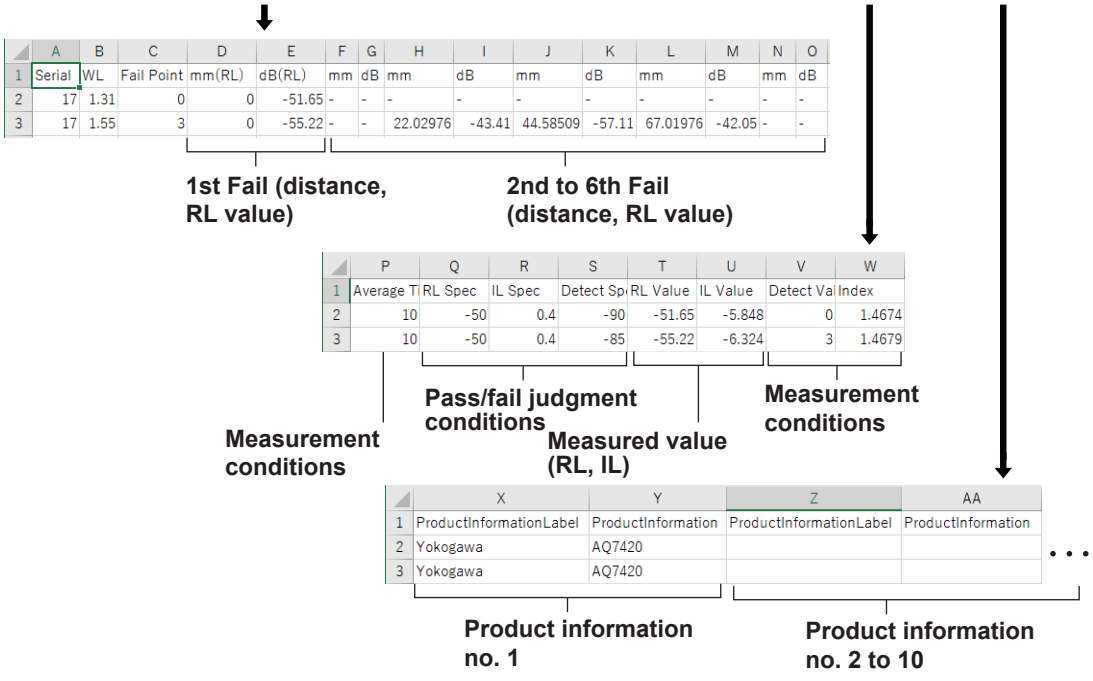
If the suffix code is -13NN, measured values for wavelength 1.31 µm are saved.

If the suffix code is -1315, two wavelengths, 1.31 µm and 1.55 µm, can be measured. If 1.55 µm is enabled as a sub wavelength, two wavelengths can be measured simultaneously and the data of both wavelengths are saved in a single file.

- Pass/fail judgment
- Number of fail judgments
- Positions (mm) of peaks judged as fail
- Return losses (RL) of peaks judged as fail

PS format (example for suffix code -1315)

Measured values of wavelength 1.31 µm (up to six Fail detections recorded)	**Pass/fail judgment and measurement conditions**	**Product information**
Measured values of wavelength 1.55 µm (up to six Fail detections recorded)	**Pass/fail judgment and measurement conditions**	**Product information**



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Serial	WL	Fail Point	mm(RL)	dB(RL)	mm	dB	mm	dB	mm	dB	mm	dB	mm	dB
2	17	1.31	0	0	-51.65	-	-	-	-	-	-	-	-	-	-
3	17	1.55	3	0	-55.22	-	-	22.02976	-43.41	44.58509	-57.11	67.01976	-42.05	-	-

	P	Q	R	S	T	U	V	W
1	Average Ti	RL Spec	IL Spec	Detect Sp	RL Value	IL Value	Detect Val	Index
2	10	-50	0.4	-90	-51.65	-5.848	0	1.4674
3	10	-50	0.4	-85	-55.22	-6.324	3	1.4679

	X	Y	Z	AA
1	ProductInformationLabel	ProductInformation	ProductInformationLabel	ProductInformation
2	Yokogawa	AQ7420		
3	Yokogawa	AQ7420		

Waveform data (PW)

The measure data (PS) on the previous page and waveform data are saved in a single file.
You can set the file type to CSV, jpg, or bmp. If you select jpg or bmp, the image data of the analysis window is saved.
CSV files are saved in the following format.
If the suffix code is -13NN, measured values for wavelength 1.31 µm are saved.
If the suffix code is -1315, two wavelengths, 1.31 µm and 1.55 µm, can be measured. If 1.55 µm is enabled as a sub wavelength, two wavelengths can be measured simultaneously and the data of both wavelengths are saved in a single file.

- Measurement data (PS)
- Wavelength 1.31 µm distances mm (column A) → Displays the distances at the specified resolution in row 8 and later
- Wavelength 1.31 µm RL value dB (column B) → Displays the RL measurements at the above positions
- Wavelength 1.55 µm distances mm (column C) → Same as above
- Wavelength 1.55 µm RL values dB (column D) → Save as above

PW format (example for suffix code -1315)

Lines 1 to 3 (measured data (PS))

Measured values of wavelength 1.31 µm (up to six Fail detections recorded)	**Pass/fail judgment and measurement conditions**	**Product information**
Measured values of wavelength 1.55 µm (up to six Fail detections recorded)	**Pass/fail judgment and measurement conditions**	**Product information**

See PS format.

Lines 5 and 6

Measurement range (span), measurement range setting

Lines 8 and later (waveform data)

Measured value of wavelength 1.31 µm		**Measured value of wavelength 1.55 µm**	
Distance mm	**Relative value dB**	**Distance mm**	**Relative value dB**
Distance mm	**Relative value dB**	**Distance mm**	**Relative value dB**
⋮		⋮	

Recorded at specified resolution intervals

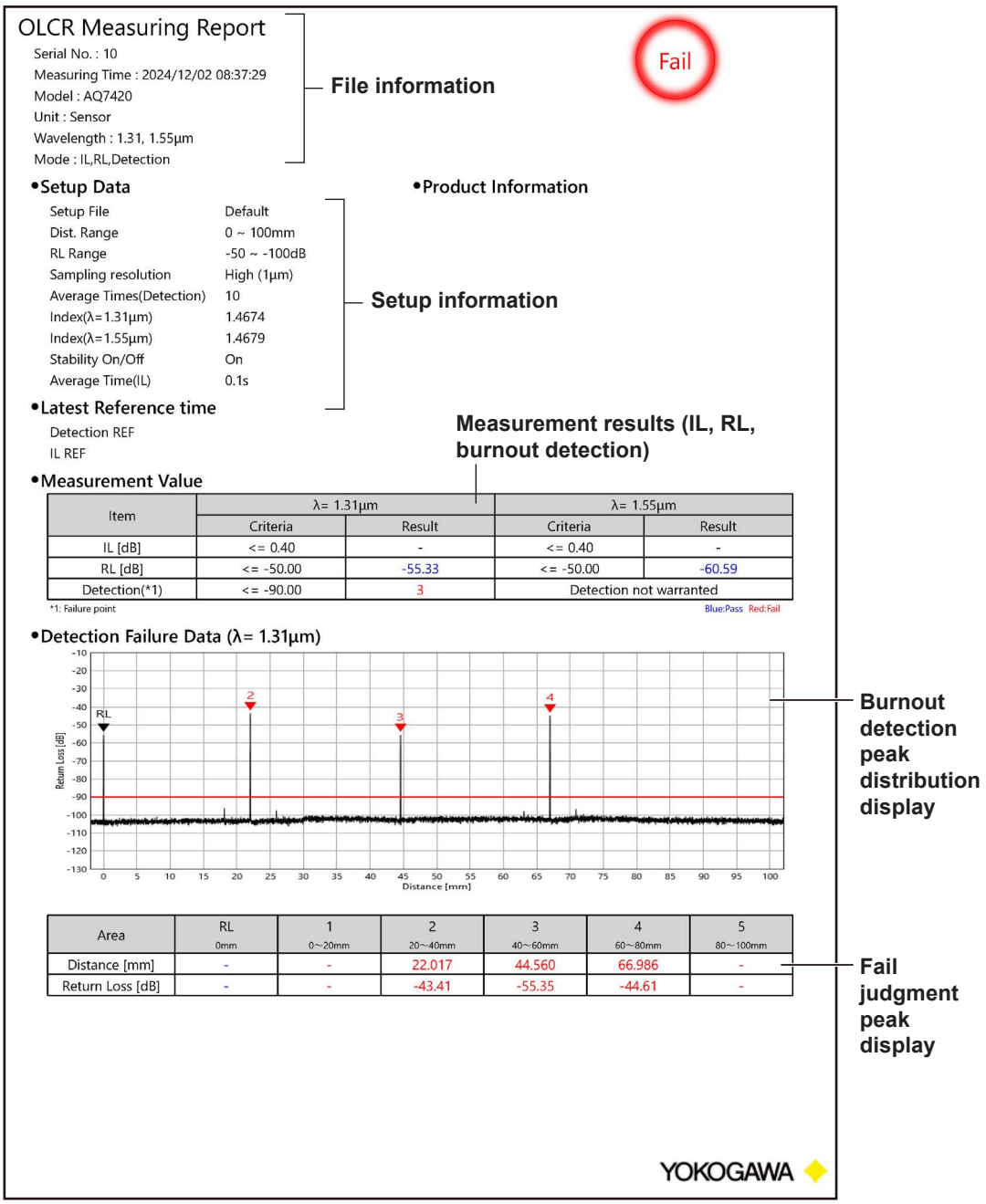
	A	B	C	D
8	1.31		1.55	
9	mm	dB	mm	dB
10	-7.678954	-130	-7.676325	-130
11	-7.670776	-110.66	-7.66815	-110.66
12	-7.662599	-108.93	-7.659975	-108.93
13	-7.654421	-101.38	-7.6518	-101.38
14	-7.646243	-99.67	-7.643625	-99.67
15	-7.638065	-99.01	-7.63545	-99.01
16	-7.629887	-103.06	-7.627275	-103.06
17	-7.62171	-98.3	-7.6191	-98.3
18	-7.613532	-105.07	-7.610925	-105.07
19	-7.605354	-111.79	-7.60275	-111.79
20	-7.597176	-112.81	-7.594575	-112.81

Relative value dB

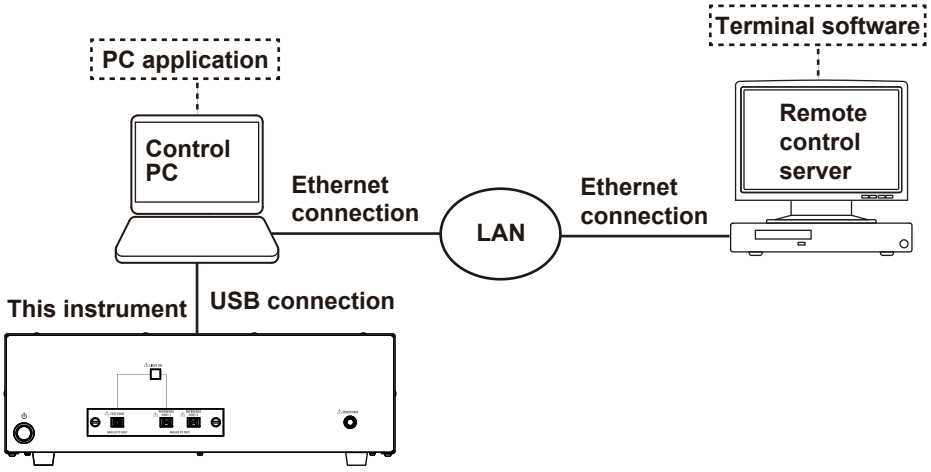
Distance mm

Printing data

Measurement results and waveform data on the graph display on the main window of the PC application and can be printed as a summarized one-page report. If you change the print destination from a printer name to PDF, you can generate a PDF file.



1.7 Remote Control



In addition to operating the instrument using a control PC with a PC application installed, the instrument can also be controlled remotely by sending control commands from an external remote control server via a LAN. The PC application must also be running for remote control.
Users are responsible for preparing their own servers and terminal software for remote control.
Contact your network administrator for details on the LAN to connect to for remote control.

Login feature

A login command is sent from a remote control server using a terminal software program. There are two ways to log in: administrator and user. If you log in with administrator privileges, you can edit your password and user privileges. For details on how to use the commands, see chapter 7.

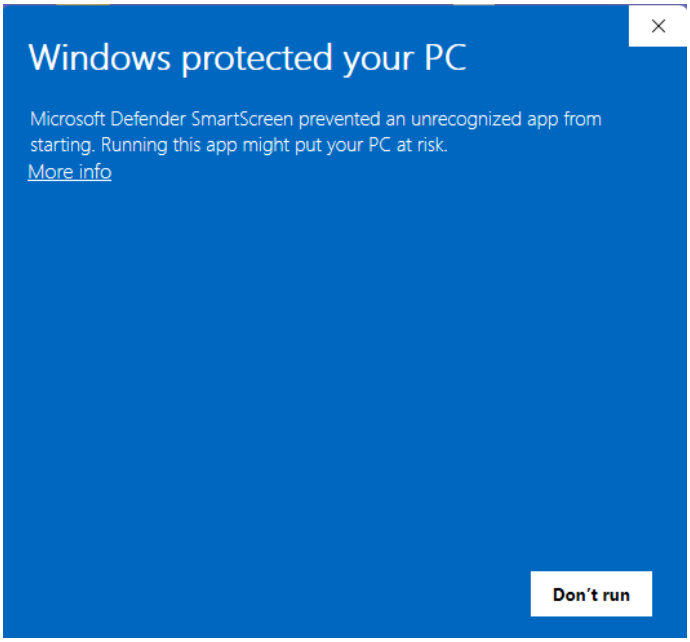
Local control during remote control

If you need local control while using remote control, you need to disconnect the remote connection. Use a logout command to log out. Alternatively, enable the local button in the remote condition settings on the Setup window to show a local button on the control PC during remote connection. Click it to disconnect. For setting remote conditions, see section 3.5.

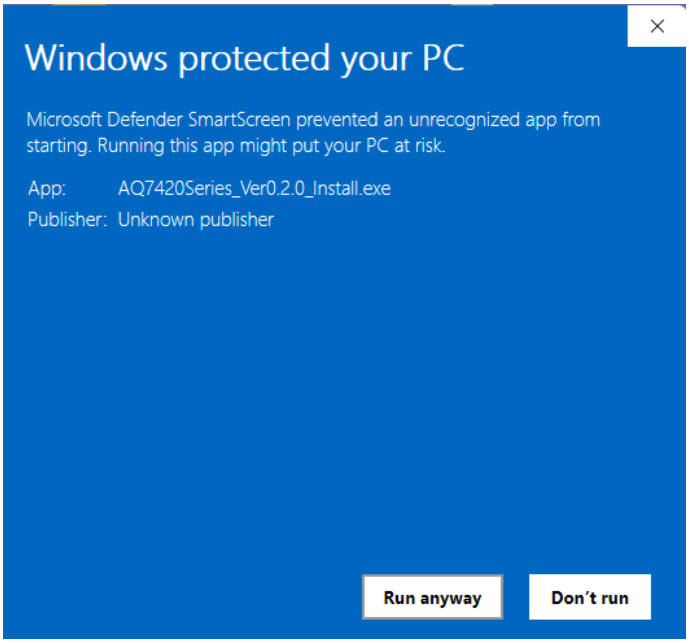
2.1 Installation

Procedure

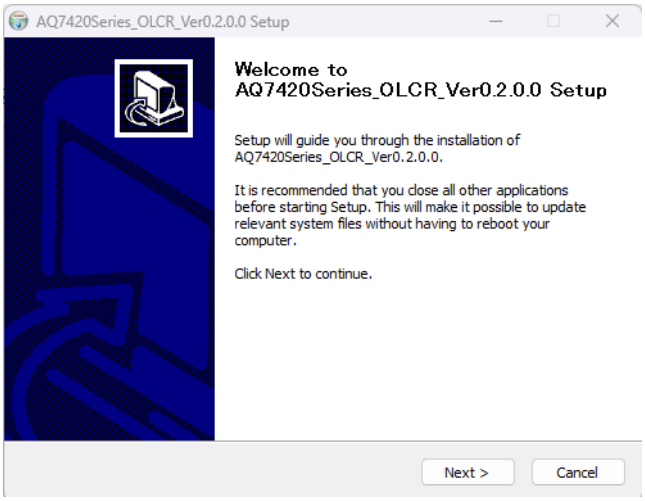
1. Turn on your PC, and start Windows. If AQ7420Series is already installed, uninstall it.
2. Place the PC application CD supplied with the product in the CD-ROM drive.
   Installation begins automatically.
3. If the following Windows message appears, click **More info**. A window appears showing more information.



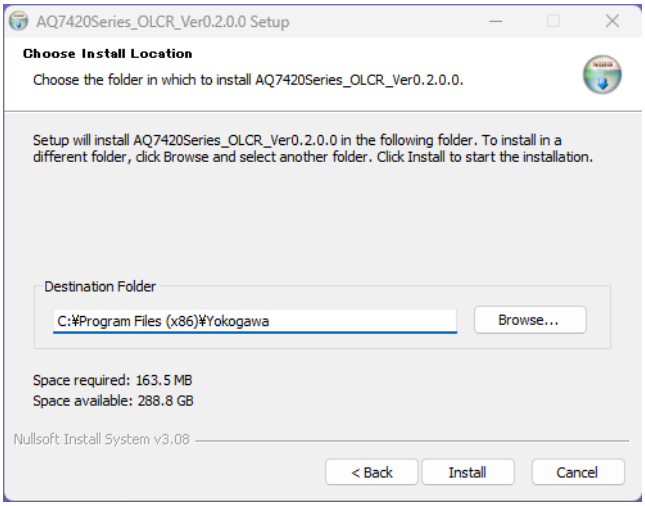
4. Click Run anyway. The installer runs.



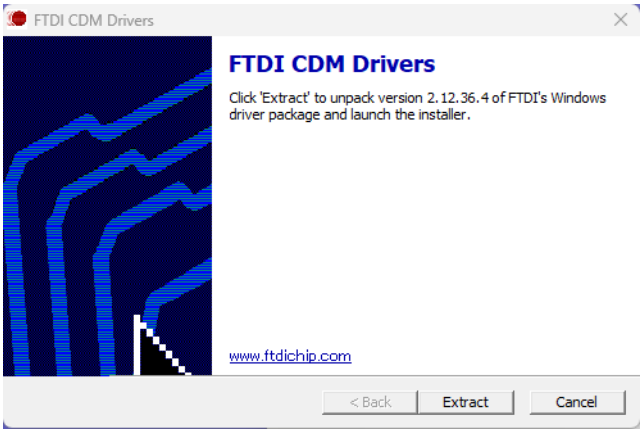
5. Click **Next**. A Choose Install Location window appears.



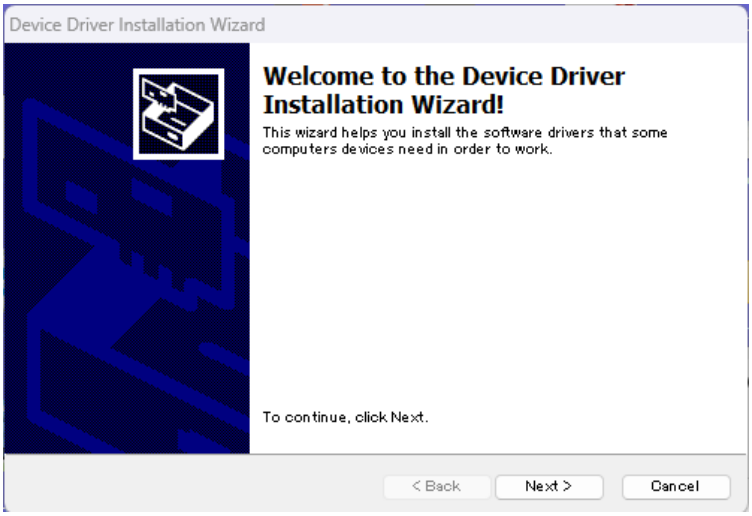
6. Select the installation drive and folder, and click **Install**. The PC application installation begins. The default install location is C:\Program Files(x86)\Yokogawa\. When the installation is complete, a driver installation window appears.



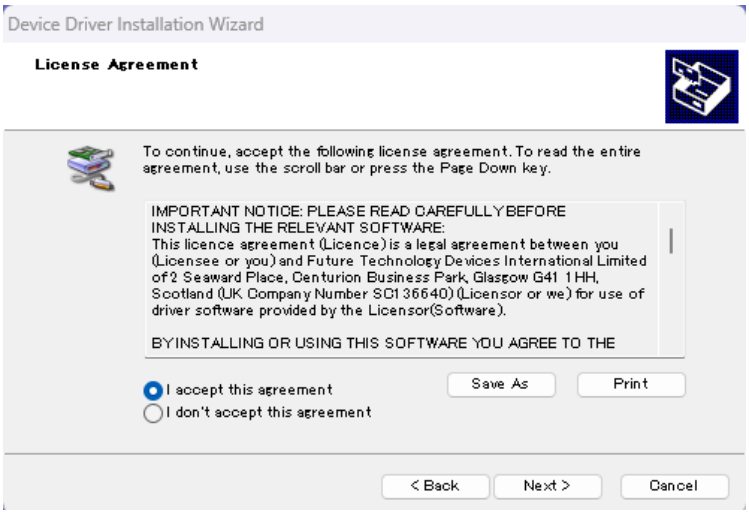
7. Click **Extract**.



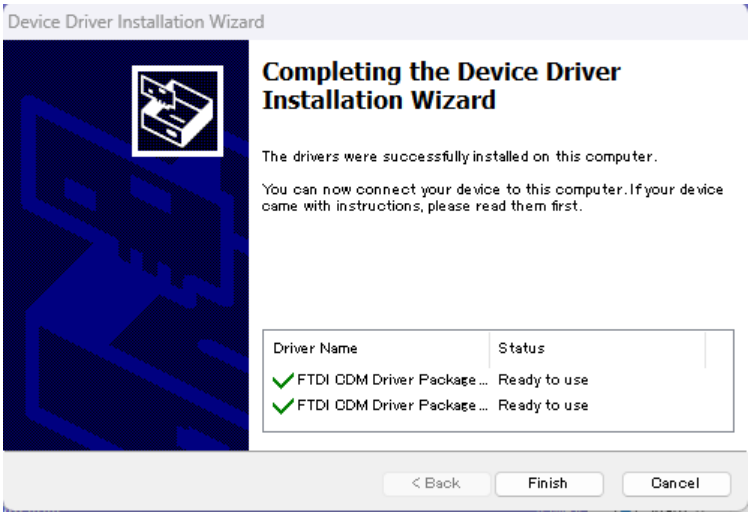
8. Click **Next**.



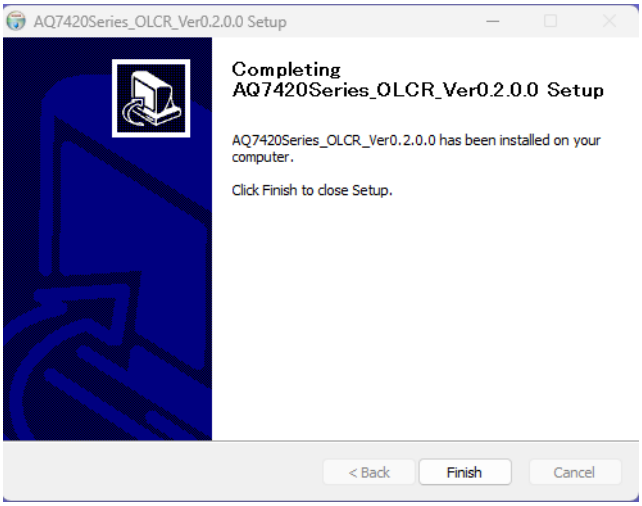
9. Read the license agreement thoroughly. If you agree, click **I agree** and then click **Next**.



10. Click **Done**.



10. Click **Finish** to complete the installation. Yokogawa>OSA Viewer is added to the Windows Start > Programs menu, and a shortcut icon “AQ7420Series_OLCR” is created on the desktop.



Uninstalling the software

This section explains how to uninstall the software on Windows 11.

1. On the Windows Start menu, click **Settings**.
2. Click **Apps** in the Settings window.
3. Select **Installed apps**.
4. Click the ··· icon on the AQ7420Series_OLCR menu, and click Uninstall.
   A uninstallation confirmation window appears.
5. Click **Yes**.
   The software is uninstalled.

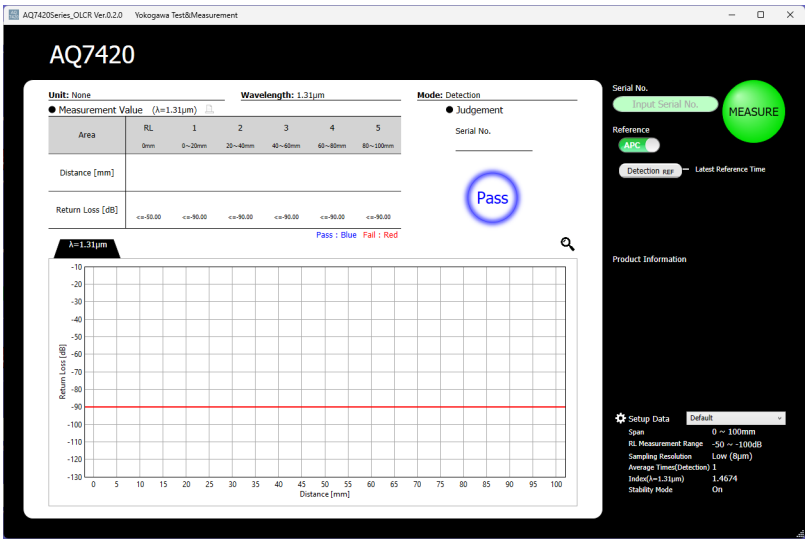
2.2 Running and Closing the Application

On the Windows start menu, click **Programs** > **AQ7420Series_OLCR** > **AQ7420Series_OLCR**, or double-click the AQ7420Series_OLCR shortcut icon on the desktop.

When the software starts, the main window appears. Immediately after you start the software, the window that was shown immediately before the software was closed the last time appears.

Start window

Main window

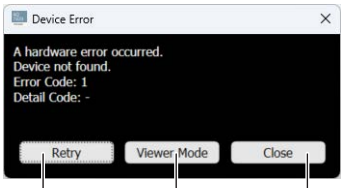


Exiting from the software

Click x in the upper right of the window.

Connection error or viewer mode

- **Connection error**
  If the software fails to connect to the AQ7420 at startup, the Device Error window will appear. Make sure that the connection between the AQ7420 and the PC is correct, and then click Retry. For the connection and operation procedures, see section 2.6 in the Getting Started Guide (IM AQ7420-02EN).



Closes the window

Starts the software in viewer mode without connecting to the AQ7420.

Retries to connect to the AQ7420.

- **Viewer mode**
  You can operate the software on a PC alone, without connecting to the AQ7420.
  You can create and save setup conditions on the software, check waveform data of measurement results, and print reports.

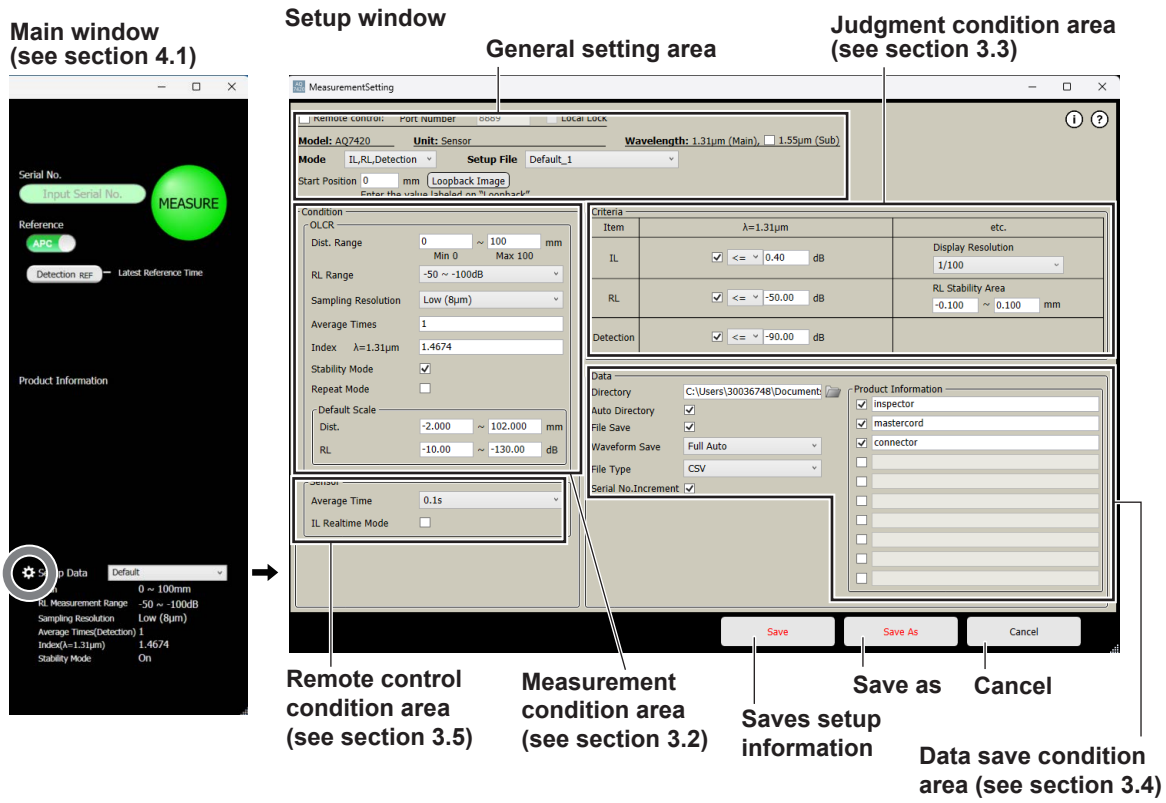
3.1 Description of the Setup Window

Procedure

Opening the setup window

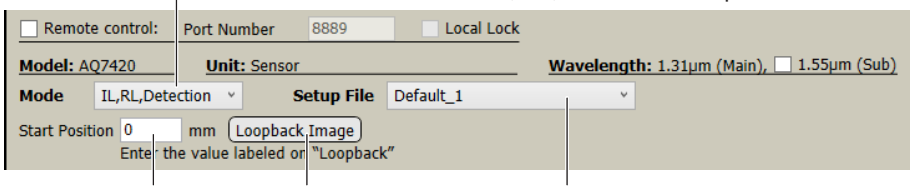
Set the measurement conditions and judgment conditions (analysis) of the instrument.

1. On the main window, tap the Setup Data icon . A setup window appears.



General setting area

Select the operation mode.
Select from the three combinations of IL, RL, and Detection operation modes.



Start position
(See page 3-2.)

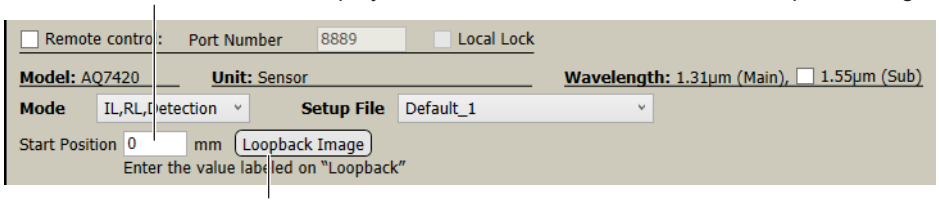
Loopback image
(See page 3-2.)

Select a setup file.
Select a setup file stored in the PC.

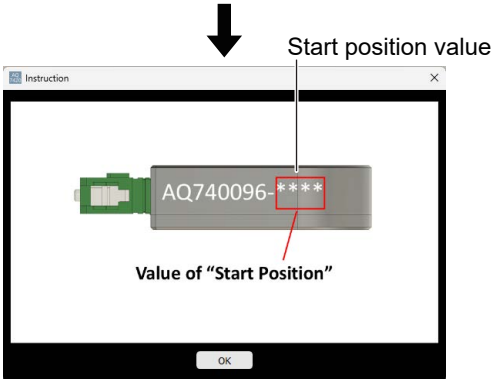
- **Setting the Start Position**

2. Click **Loopback Image** on the setup window. The Instruction window appears.
3. Set the start position to the value displayed on the Instruction window.

Start position
Used for distance adjustment cords of any length.
Enter the value displayed on the Instruction window of the loopback image.



Loopback image
The length of the distance adjustment cord connected to the reference port of this instrument is automatically detected, and the start position value is displayed.



Explanation

General setting area

Selecting the operation mode

The following three operation modes are available.

- **IL, RL, Detection**
  Three items, IL, RL, and burnout detection, are measured in a single measurement.
- **Detection**
  Two items, RL and burnout detection, are measured in a single measurement.
- **IL**
  Only IL is measured in a single measurement.

Selecting a setup file

You can select a previously saved setup file saved with the Save as button.
When you select a setup file, the display changes according to the saved settings.

Start position

Used for distance adjustment cords of any length. Distance adjustment cords of any length are options that can be used to inspect positions farther than 100 mm. The horizontal scale (distance) on the graph display shown on the main window of the PC application is shifted by the specified value.

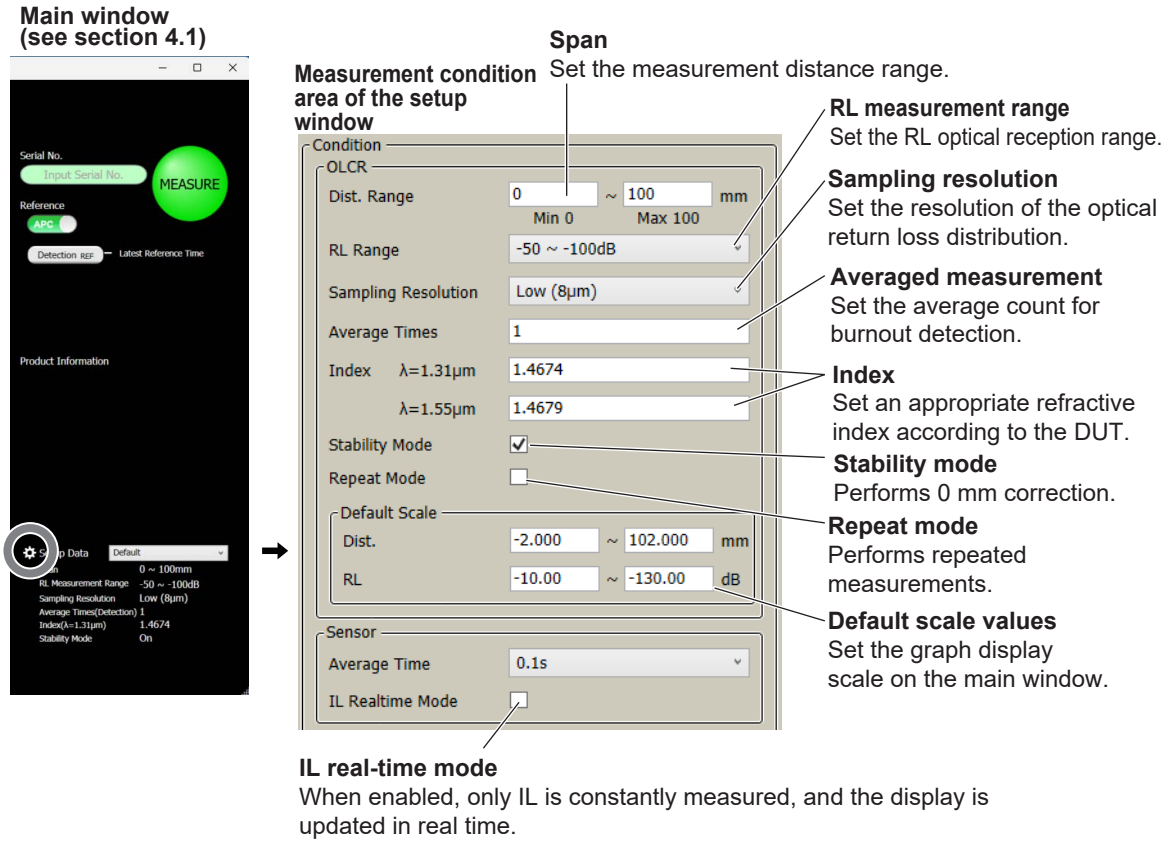
3.2 Measurement Conditions

Procedure

Opening the setup window (measurement condition area)

Set the measurement conditions of the instrument.

1. On the main window, tap the Setup Data icon . A setup window appears.



Note

- When a value outside the setting range is entered or a required value is not entered, the value box color changes to pink. Check the setting, and enter an appropriate value.
- See section 3.1 for a description of the setup window.

Explanation

Measurement condition area

Span

Set the distance range for measuring the IL, RL, and burnout detection. The measurement time varies depending on the distance range. Range: 0 to 100 mm

RL Measurement Range

If you set the optical reception range to –14.7 to –85 dB and a large reflection (approx. –50 dB or more) is present in the range, measurement will take a long time.

Range: –14.7 to –85 dB
–50 to –100 dB

Sampling Resolution

Three distance resolution options are available for optical return loss distribution measurement.

Range: High (1 µm)
Middle (4 µm)
Low (8 µm)

Average Times (Detection)

Burnout detection measurements are taken the specified number of times and averaged.

Range: 1 to 16

Index

Set an appropriate refractive index according to the DUT. The closer to the exact figure, the closer the measurement is to the actual length.

Stability Mode

If the distance of the end face of the master cord to be measured changes during measurement, such as due to temperature changes, the change is corrected to 0 mm.

Repeat Mode

When a measurement is started, the measurement is executed repeatedly under the set measurement conditions.

Average duration (IL)

The average duration for IL measurement can be set in three ways.

Setting range: 0.1 s
0.8 s
6.5 s

IL real-time mode

Normally, the measurement operation is executed only once using the Measure button on the main window, but if this setting is enabled, the IL measurement can be repeated and the measurement can be continued while updating the measurement results on the main window.

Enabled: Continuous measurement is performed with the IL measurement sensitivity held constant.
However, measurement accuracy will be poor for DUTs with large IL of 20 dB or more. In such cases, disable IL real-time mode.

Disabled: Measurement is performed while automatically switching the IL measurement sensitivity.
When the DUT is removed from the instrument, the IL measurement sensitivity is changed automatically to high sensitivity. When the next DUT is connected to the instrument, it will take a certain amount of time as the sensitivity will be automatically changed again.

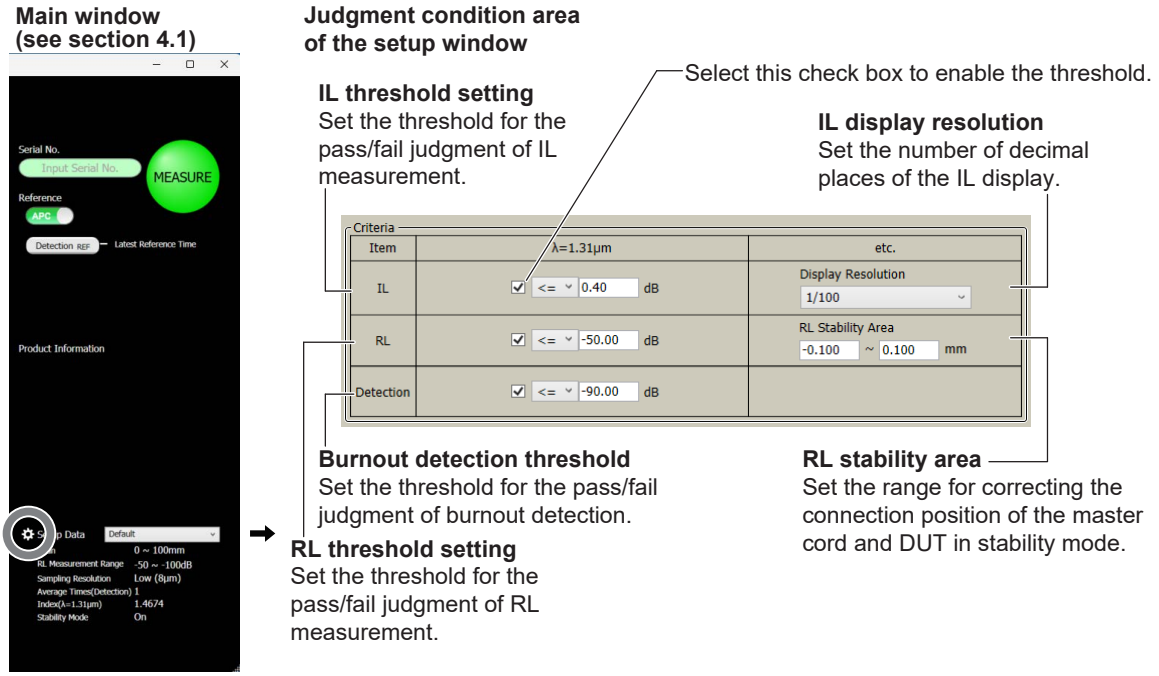
3.3 Judgment Conditions (Analysis)

Procedure

Opening the setup window (judgment condition area)

Set the judgment conditions of the instrument.

1. On the main window, tap the Setup Data icon . A setup window appears.



Note

- When a value outside the setting range is entered or a required value is not entered, the value box color changes to pink. Check the setting, and enter an appropriate value.
- The figure above shows the settings for when the operation mode is set to IL, RL, Detection. The settings are different for other modes.
- See section 3.1 for a description of the setup window.

Explanation

Judgment condition area

IL threshold

Set the threshold for the pass/fail judgment of IL measurement. If a value exceeding the threshold occurs, the result will be FAIL. Range: 0 to 40 dB

RL threshold

Set the threshold for the pass/fail judgment of IL measurement. If a value exceeding the threshold occurs, the result will be FAIL. Range: –120 to -10 dB

Burnout detection threshold

Set the threshold for the pass/fail judgment of burnout detection. If a value exceeding the threshold occurs, the result will be FAIL. Range: –120 to -10 dB

IL display resolution

Set the number of decimal places of the IL display.

Range: 1/10, 1/100, 1/1000, 1/10000

RL stability area

Set the range within which the connection position is corrected in stability mode.

Range: –10 to 110 mm

3.4 Data Save Conditions

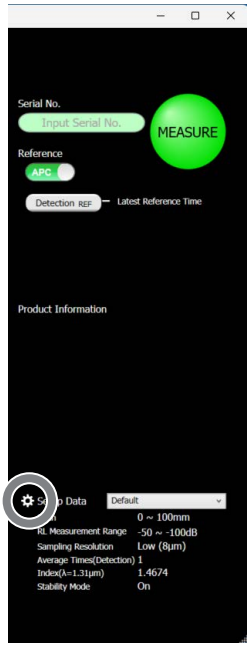
Procedure

Opening the setup window (data save condition area)

Set the data save conditions of the instrument.

1. On the main window, tap the Setup Data icon . A setup window appears.

Main window (see section 4.1)

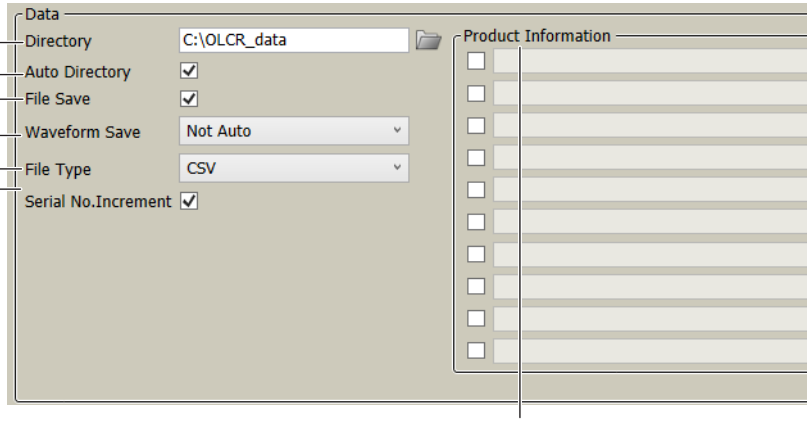


Judgment condition area of the setup window

File Save
When enabled, numeric data of measurements are saved in a file per day.

Auto Directory
When enabled, a directory is created automatically for saving data.

Directory
Set the directory where the data will be stored.



Serial number increment
The serial number is incremented for each measurement.

File type
Set the file format for saving waveforms.

Waveform Save
Specify how to record waveform data.

Product information items
When enabled, you can enter the product information area on the main window.

Note

- See section 3.1 for a description of the setup window.

Explanation

Data save condition area

Directory

Set the directory where the data will be stored.

Waveform Save

Not Auto: Waveforms are not recorded.

Only NG Auto: Waveforms are recorded only when the threshold is exceeded.

Show Retry Dialog: Opens a dialog box for selecting the next action when the threshold is exceed.

Full Auto: All measured waveforms are recorded.

File Type

Select the file format for saving the waveforms from CSV, BMP and Jpeg.

Product Information

You can enter the product information on the main window.

Up to 17 characters are displayed in the report window.

The entered characters are output in report format.

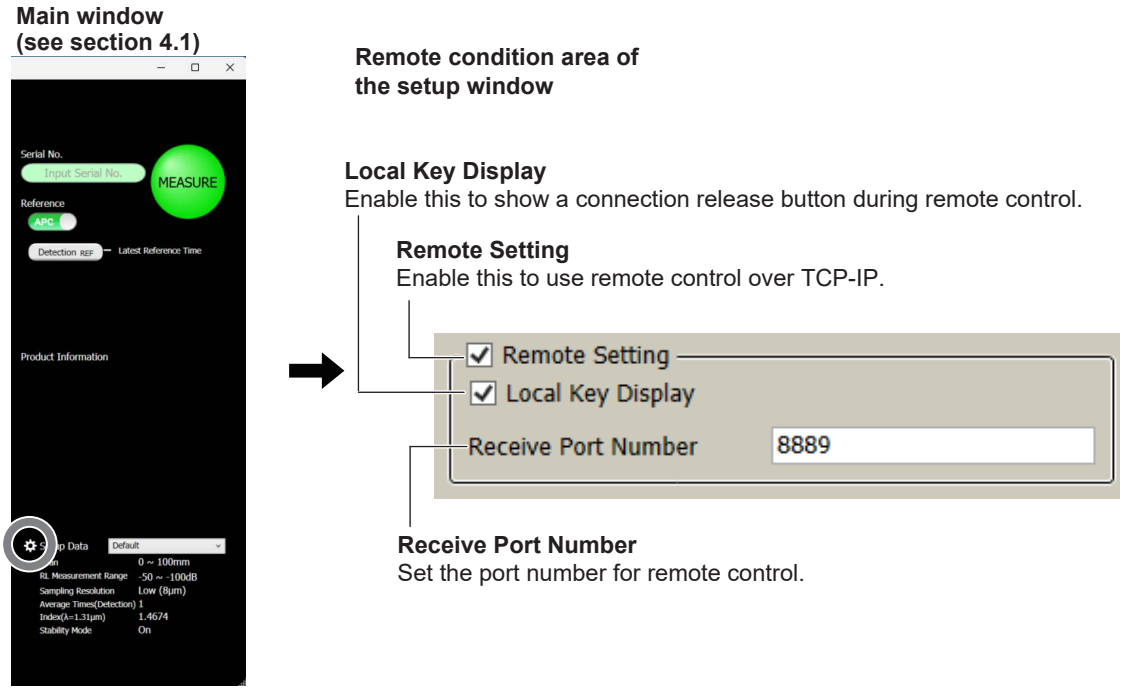
3.5 Remote Conditions

Procedure

Opening the setup window (remote control condition area)

Set the remote control conditions of the instrument.

1. On the main window, tap the Setup Data icon . A setup window appears.



Note

- See section 3.1 for a description of the setup window.

Explanation

Remote condition area

Remote Setting

Enable this to use remote control over TCP-IP.

Local Key Display

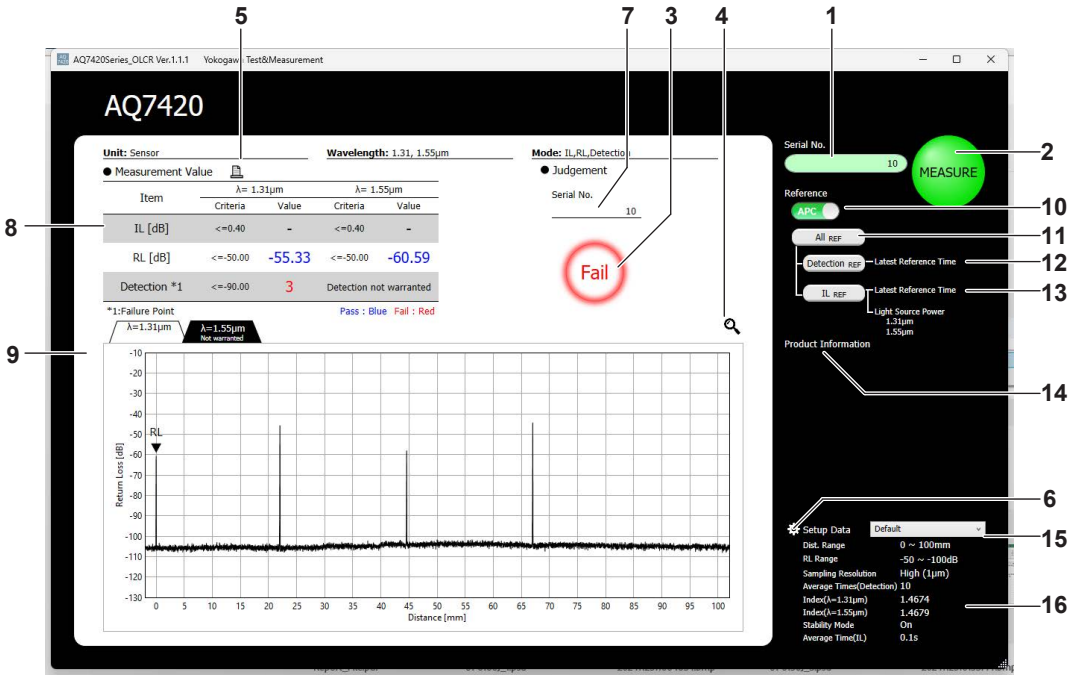
Enable this to show a connection release button on the window during remote control.

Receive Port Number

Set the port number for remote control.

4.1 Description of the Main Window

Main window



No	Name	Description
1	Serial number	You can enter the serial number of the DUT. If the auto increment function is turned on and a string with a number at the end is entered, the number is incremented every measurement. If the entered string does not end with a number, a number is automatically entered on the second measurement, and the number is incremented every subsequent measurements.
2	MEASURE button	Starts a measurement.
3	Judgment display	Shows judgment results. • When all measurement items are Pass, the judgment is shown as Pass in blue. • If any item is Fail, the judgment is shown as Fail in red.
4	Analysis mode button	Show an analysis window for analyzing waveform data.
5	Report button	Creates measurement results in a report form. The report can be output to a printer or PDF file.
6	Setup button	Shows a setup window for setting measurement and judgment conditions.
7	Serial number display	Shows the serial number entered in the serial number box.
8	Measurement result display area	Shows measurement results (numeric data). The color of the numerical display changes to blue or red depending on the judgment result based on the threshold of the judgment condition. Blue indicates Pass. Red indicates Fail. “—” indicates not judged.
9	Graph display area	Shows a waveform of the burnout detection measurement result. If two wavelengths are measured, you can switch between the two graph displays of the measurement results using the tab at the upper left of the display area.
10	Target connector selection button	Selects the connector under measurement.
11	All REF button	Performs all IL, RL, and Detection reference measurements. The date and time the reference measurement was last performed is displayed on the right. This function is not available in Detection mode or IL mode.

No	Name	Description
12	Detection REF button	Performs RL and Detection reference measurements. The date and time the reference measurement was last performed is displayed on the right. This function is not available in IL mode.
13	IL REF button	Performs IL reference measurements. The date and time the reference measurement was last performed and the optical power are displayed on the right. This function is not available in Detection mode.
14	Product Information	You can enter product information. Up to 10 items can be registered. You can enter them on the SETUP window.
15	Setup file name	Shows the name of the selected setup file. You can change the setup file here.
16	Measurement condition display	Shows the measurement conditions entered on the setup window.

4.2 Measurement Precautions

Warm-up

This instrument requires warming up after turning on the power and starting up.
Execute a one-hour measurement with the repeat mode turned on, and then calibrate the measurement system by performing a reference measurement. For details on repeat mode, see the setup window in section 3.2.
Measurement accuracy may not be achieved without a proper warm-up.

To make accurate measurements

- Warm-up.
- Turning on the stability mode reduces the effect of ambient temperature changes on measurement results. For details on stability mode, see section 3.2.
- Use this instrument and optical fiber cables in an environment where ambient temperature fluctuations are minimal.
  IL measurements should be performed in an air-conditioned room with an ambient temperature variation of ±1 °C or less. Also, install the instrument in such a way that air from the air conditioning system does not directly hit the instrument or optical fiber cables.
- Fix the optical fiber cables to maintain their layout condition.
- When measuring IL, attach the connector adapter properly to the sensor head. If the coupling is poor during attachment, correct values will not be measured.

Measurement distance fluctuation due to ambient temperature

As the length of the master cord changes due to changes in ambient temperature, the position of the light reflection point will fluctuate slightly. Changes in master cord length can be automatically corrected by turning stability mode on.
However, the optical fiber cable under measurement also varies in length due to changes in ambient temperature, so the position of the optical reflection point will fluctuate. Fluctuations in the DUT cannot be corrected with stability mode.

Noise level

The noise level of the burnout detection distribution waveform may vary depending on the DUT. The noise level increases when the sum of the light reflections of the DUT is large. Terminating one end of the DUT lowers the noise level, making it easier to measure small reflections.
When RL Measurement Range is set to “–50 to –100 dB” on the setup window, measuring reflections larger than –50 dB may cause spurious noise to be measured before or after the DUT’s peak.

Measurement at wavelength 1.55 µm

SM fiber (1.31 µm zero dispersion) measurements at a wavelength of 1.55 µm are affected by the wavelength dispersion of the optical fiber cable. The light reflection at the 0 mm distance point is unaffected, but as the distance increases, the level of reflected light measured decreases.
DSF fiber (1.55 µm zero dispersion) measurements at a wavelength of 1.55 µm are not affected by the wavelength dispersion of the optical fiber cable, but measurements at a different wavelength of 1.31 µm are affected.

4.3 Reference Measurement

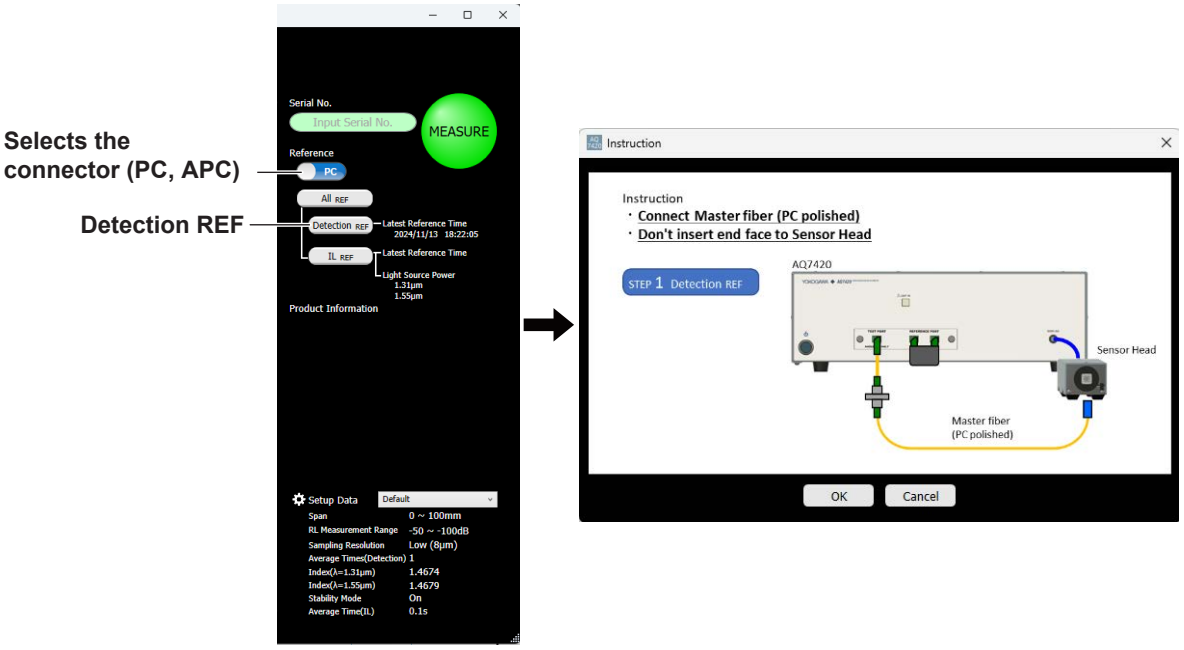
A reference measurement is required before measuring IL, RL, or burnout detection with this instrument. Use the dedicated master cord for this instrument. The master cord is a standard accessory. The master cord can also be purchased separately.

Procedure

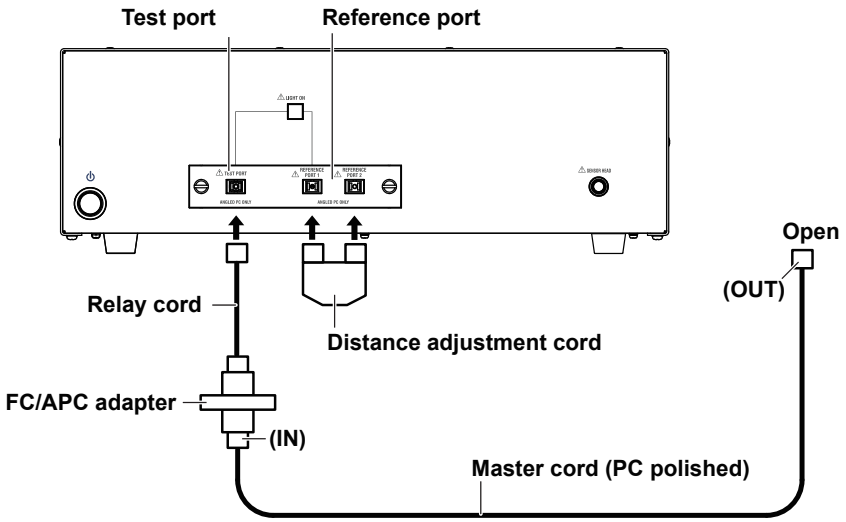
RL/Detection (burnout detection) measurement reference of PC polished DUT (Detection REF)

1. On the main window, set the target connector selection button to **PC**.
2. Click **Detection REF** on the main window. An Detection REF instruction window appears.

Main window (see section 4.1)



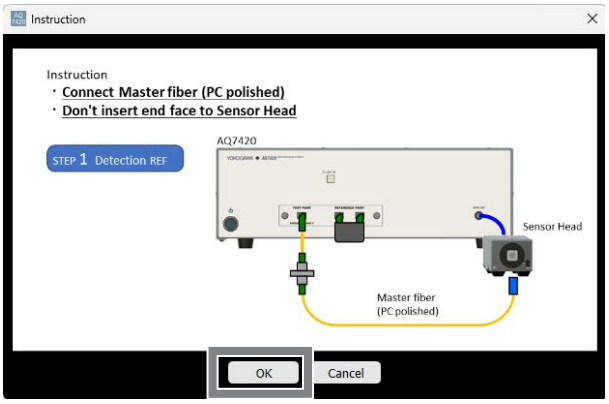
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC adapter.
6. Connect the other end of the FC adapter to the IN end of the master cord (PC polished).



Note

- Do not move the optical fiber cables during reference measurement.
- Do not point the open end of the master cord at people.
- Keep a space of at least 100 mm beyond the end face position (OUT) of the master cord, and do not place reflective objects.
- If there is a large splice loss due to dirt on the connector end face, the message “Under Range” will appear.
- If the “Under Range” message appears, clean the connector end faces of the various cords and the FC/APC adapter. For the cleaning procedure, see section 2.5.
- If the message continues to appear even after cleaning the end-face, the end-face may be scratched. Inspect the end face with a fiber connector inspection probe or the like.
- Perform a reference measurement when you make any of the following changes.
  - After a warm-up
  - FC/APC adapter replacement
  - Master cord replacement
  - Distance adjustment cord replacement
  - When Start Position is changed on the setup window (when a distance adjustment cord is connected)

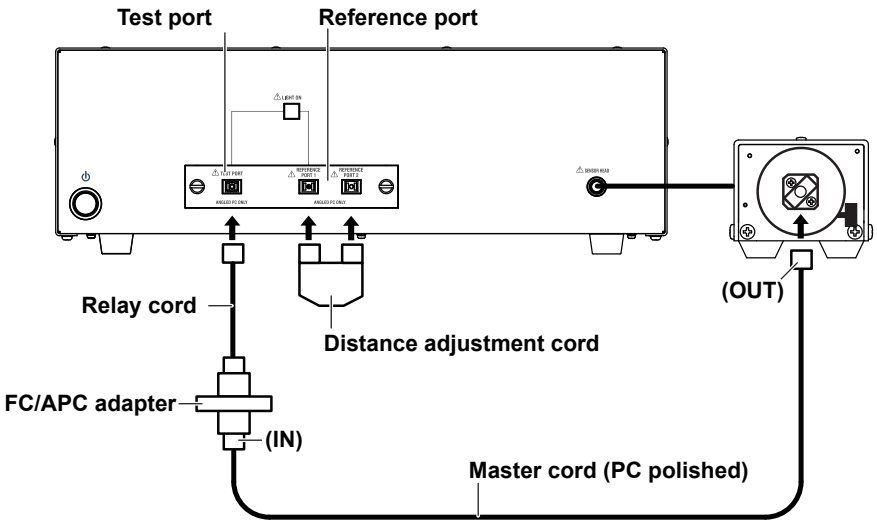
7. Click **OK**. A reference measurement (step 1) is executed. The instruction window will automatically close when the reference measurement is finished.



IL measurement reference of PC polished DUT (IL REF)

1. On the main window, set the target connector selection button to **PC**.
2. Click **IL REF** on the main window. An IL reference instruction window appears.

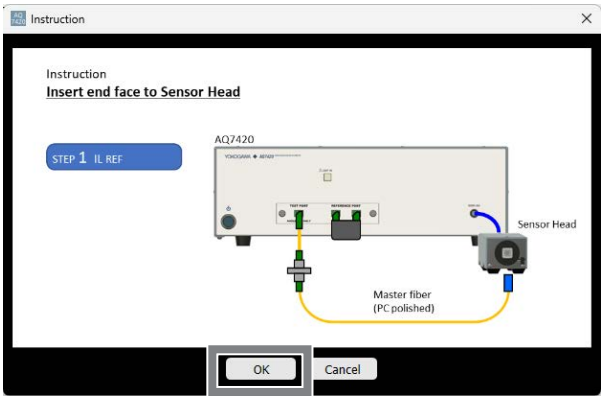
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC/APC adapter.
6. Connect the other end of the FC/APC adapter to IN end of the master cord.
7. Connect the OUT end of the master cord to the optical input port of the sensor head.



Note

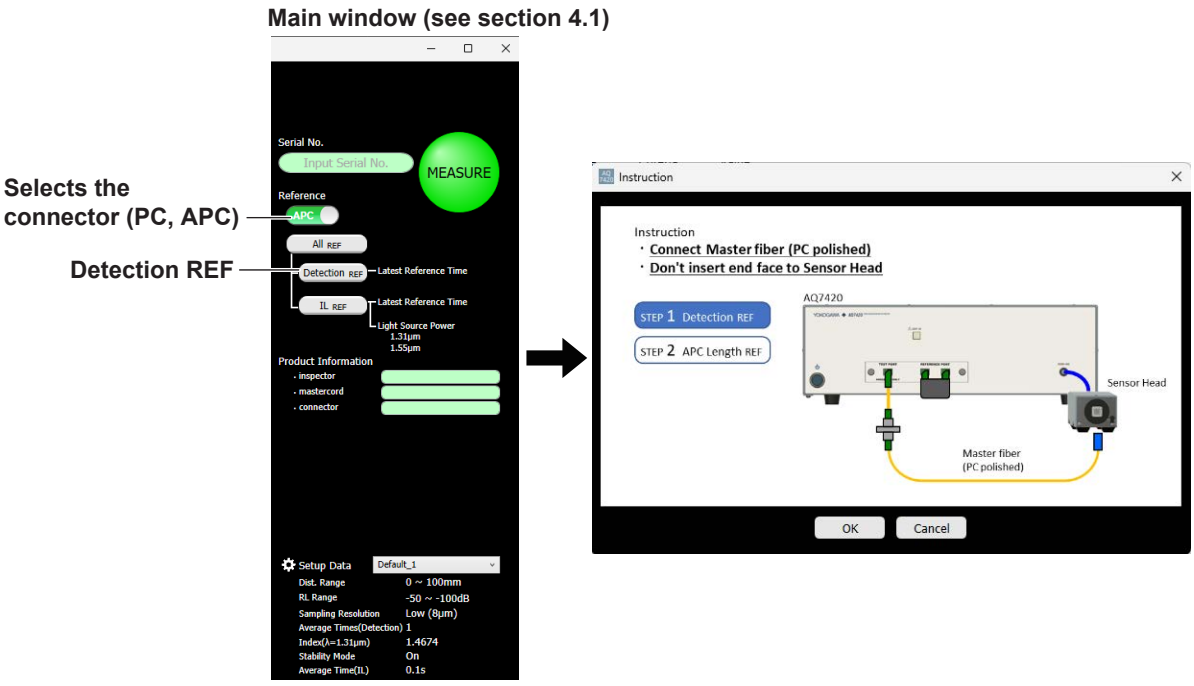
- Do not move the optical fiber cables during reference measurement.
- If there is a large splice loss due to dirt on the connector end face, the message “Under Range” will appear.
- If the “Under Range” message appears, clean the connector end faces of the various cords and the FC/APC adapter. For the cleaning procedure, see section 2.5.
- If the message continues to appear even after cleaning the end-face, the end-face may be scratched. Inspect the end face with a fiber connector inspection probe or the like.
- Perform a reference measurement when you make any of the following changes.
  - After a warm-up
  - FC/APC adapter replacement
  - Master cord replacement
  - Distance adjustment cord replacement
  - When Start Position is changed on the setup window (when a distance adjustment cord is connected)

8. Click **OK**. A reference measurement (step 1) is executed. The instruction window will automatically close when the reference measurement is finished.

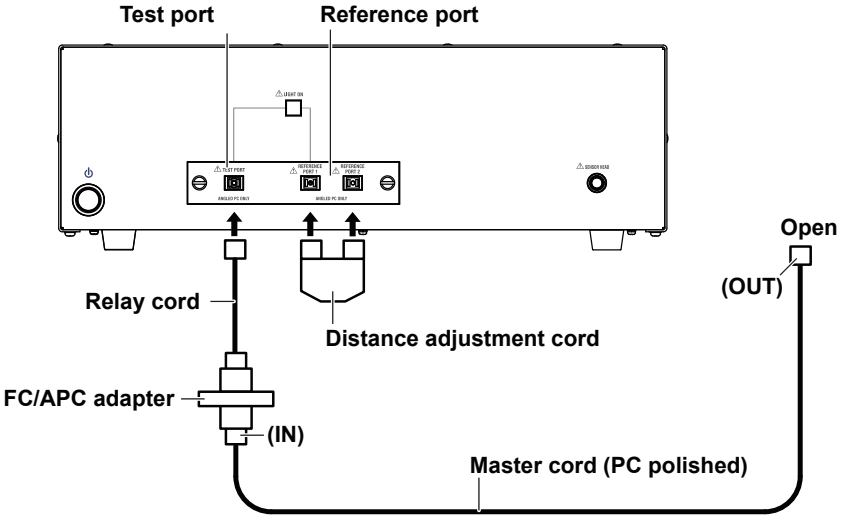


RL/Detection (burnout detection) measurement reference of APC polished DUT (Detection REF)

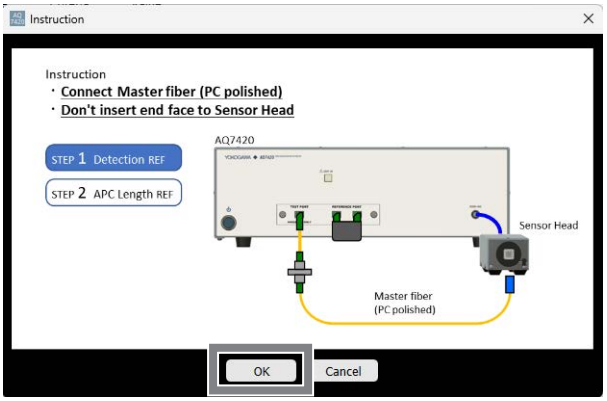
1. On the main window, set the target connector selection button to **APC**.
2. Click **Detection REF** on the main window. An Detection REF instruction window appears.



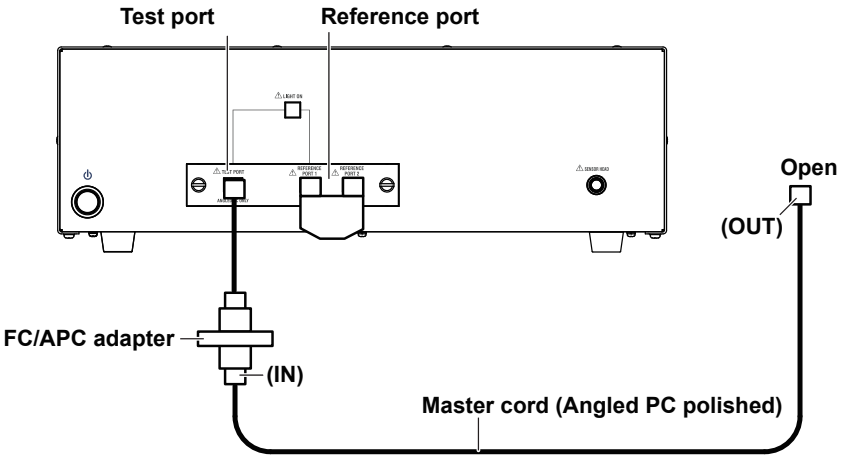
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC adapter.
6. Connect the other end of the FC adapter to the IN end of the master cord (PC polished).



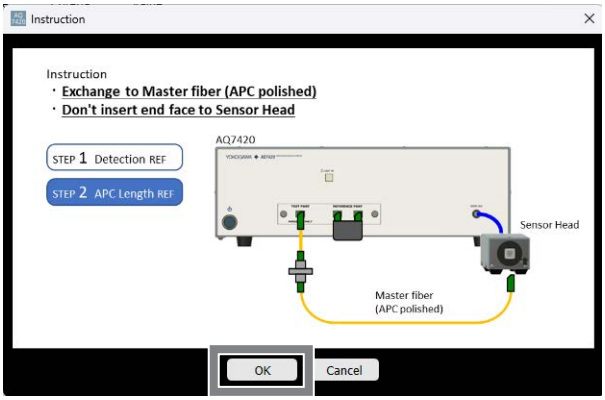
7. Click **OK**. A reference measurement (step 1) is executed.



8. Remove the master cord (PC polished) from the FC/APC adapter, replace it with a master cord (Angled PC polished), and reconnect.



9. Click **OK** of the displayed operation guide (STEP2). The second reference measurement is executed.



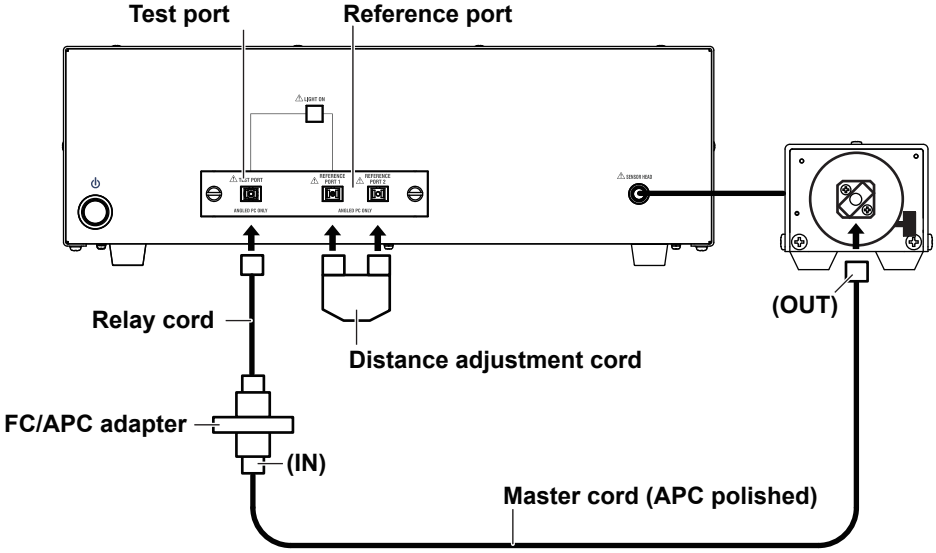
Note

- Do not move the optical fiber cables during reference measurement.
- Do not point the open end of the master cord at people.
- Keep a space of at least 100 mm beyond the end face position (OUT) of the master cord, and do not place reflective objects.
- If there is a large splice loss due to dirt on the connector end face, the message “Under Range” will appear.
- If the “Under Range” message appears, clean the connector end faces of the various cords and the FC/APC adapter. For the cleaning procedure, see section 2.5.
- If the message continues to appear even after cleaning the end-face, the end-face may be scratched. Inspect the end face with a fiber connector inspection probe or the like.
- Perform a reference measurement when you make any of the following changes.
  - After a warm-up
  - FC/APC adapter replacement
  - Master cord replacement
  - Distance adjustment cord replacement
  - When Start Position is changed on the setup window (when a distance adjustment cord is connected)

IL measurement reference of APC polished DUT (IL REF)

1. On the main window, set the target connector selection button to **APC**.
2. Click **IL REF** on the main window. An IL reference instruction window appears.

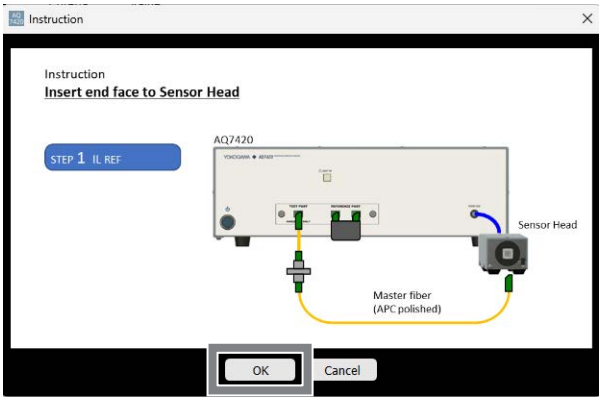
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC/APC adapter.
6. Connect the other end of the FC/APC adapter to IN end of the master cord.
7. Connect the OUT end of the master cord to the optical input port of the sensor head.



Note

- Do not move the optical fiber cables during reference measurement.
- If there is a large splice loss due to dirt on the connector end face, the message “Under Range” will appear.
- If the “Under Range” message appears, clean the connector end faces of the various cords and the FC/APC adapter. For the cleaning procedure, see section 2.5.
- If the message continues to appear even after cleaning the end-face, the end-face may be scratched. Inspect the end face with a fiber connector inspection probe or the like.
- Perform a reference measurement when you make any of the following changes.
  - After a warm-up
  - FC/APC adapter replacement
  - Master cord replacement
  - Distance adjustment cord replacement
  - When Start Position is changed on the setup window (when a distance adjustment cord is connected)

8. Click **OK**. A reference measurement (step 1) is executed. The instruction window will automatically close when the reference measurement is finished.



Explanation

This instrument has two types of reference measurement functions: IL measurement and RL measurement/burnout detection measurement.

IL REF function

IL REF (reference measurement for IL measurement) measures the optical output level of the master cord as a reference value.
The level difference between the light reception level value when the DUT is connected and the reference measurement value (reference value) is calculated as the IL measurement value.
Perform a reference measurement when making consecutive measurements or when there is a gap between the end of a measurement and the next measurement. Longer intervals between reference measurements may affect measurement accuracy.

Detection REF function

RL measurement/burnout detection measurement measures the reference value by assuming the master cord end face position (OUT) to be 0 mm and the optical return loss to be –14.7 dB (Fresnel reflection).
When using the Angled PC polishing master cord, the –14.7 dB value reference is not applicable, so after performing the first reference measurement with the PC polished master cord, replace with an Angled PC polished master cord, and perform the second reference measurement.

ALL REF function

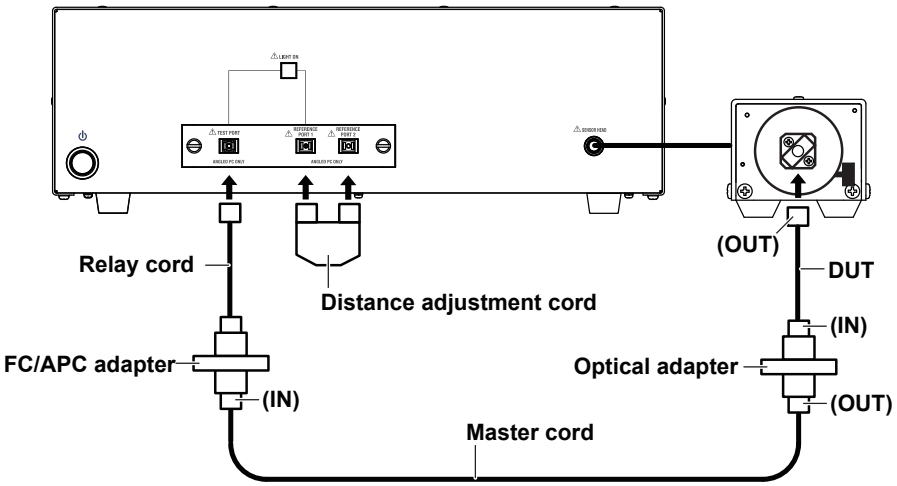
IL REF and Detection REF are executed simultaneously.

4.4 DUT Measurement

Procedure

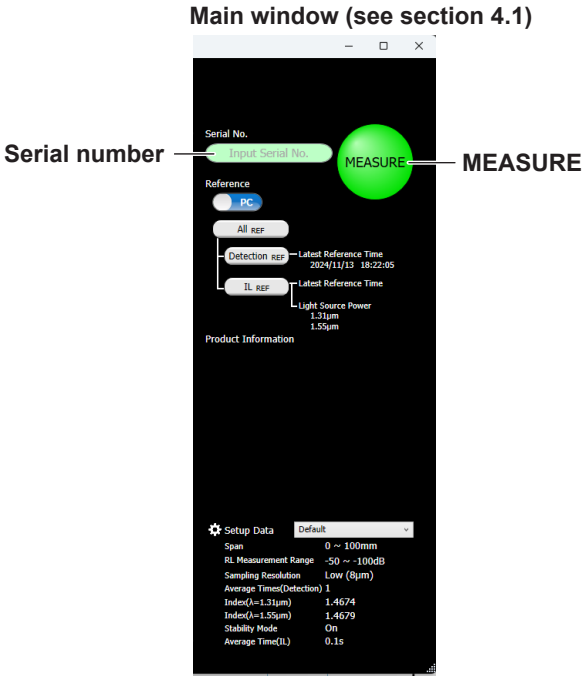
IL measurement

1. Connect the OUT end of the master cord to one end of another FC adapter you prepared.
2. Connect the IN end of the DUT to the other end of the FC adapter.
3. Connect the OUT end of the DUT to the optical input port of the sensor head.



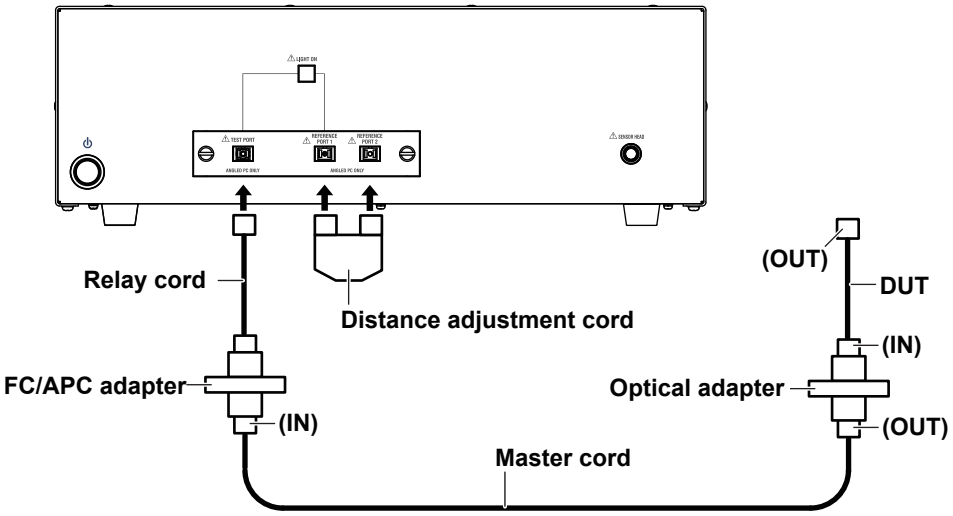
4. If necessary, enter the DUT's serial number in the **Serial No.** box on the main window.
5. Click **MEASURE** on the main window. A measurement will begin. When the measurement is complete, the result is displayed in the measurement result display area.

Main window (see section 4.1)



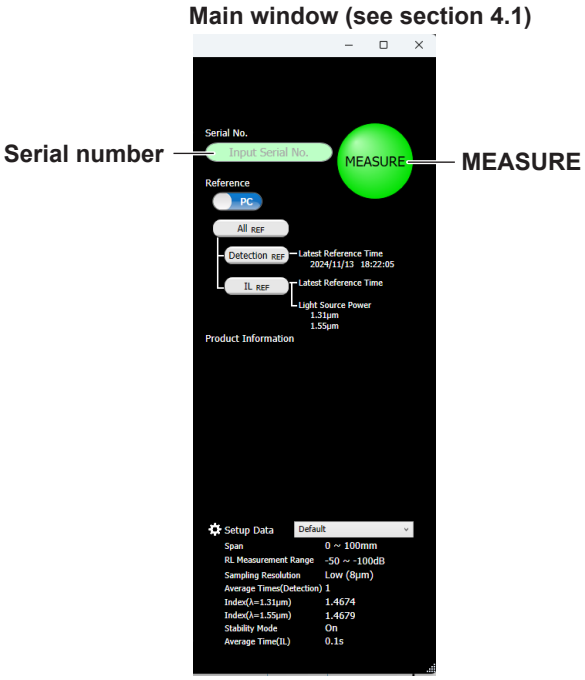
RL, burnout detection measurement

1. Connect the OUT end of the master cord to one end of another Optical adapter you prepared.
2. Connect the IN end of the DUT to the other end of the Optical adapter.



3. If necessary, enter the DUT's serial number in the **Serial No.** box on the main window.
4. Click **MEASURE** on the main window. A measurement will begin. When the measurement is complete, the result is displayed in the measurement result display area.

Main window (see section 4.1)

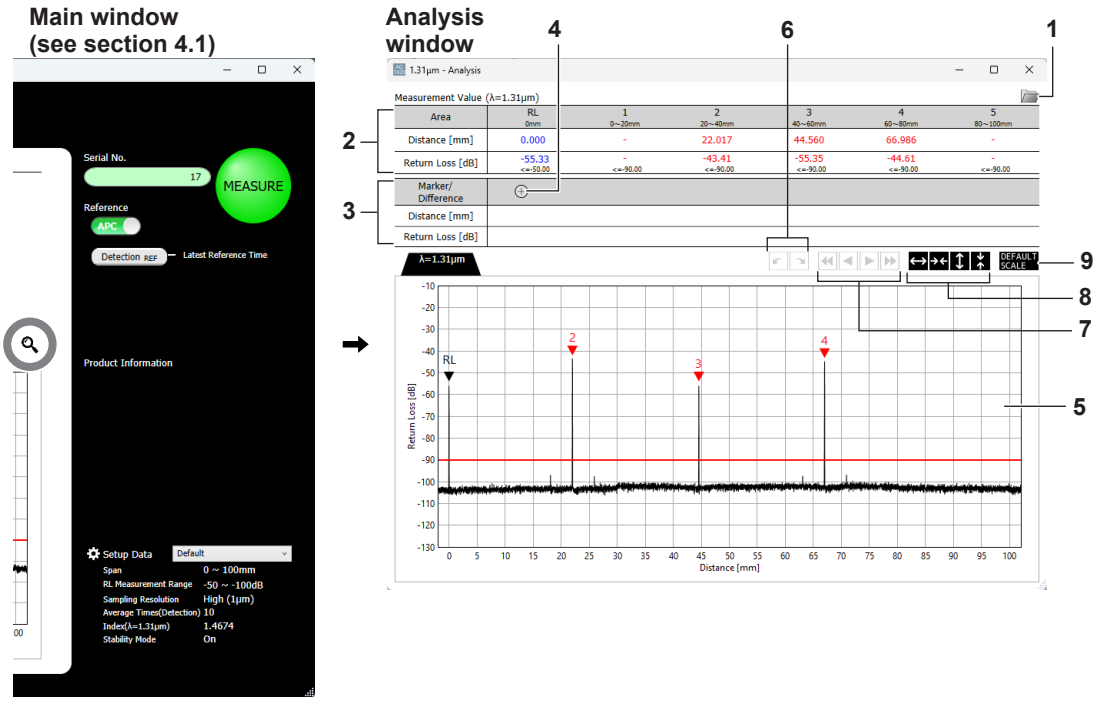


5.1 Description of the Analysis Window

Procedure

Opening the analysis window

1. Click the icon on the main window. The Analysis window appears.



No	Name	Description
1	SAVE/RECALL button	Saves/Loads waveform data.
2	Reflection result display area	Shows the reflections of the connection, positions of the detected reflections, and RL for up to 6 points.
3	Marker/Difference display area	Shows judgment results. • When all measurement items are Pass, the judgment is shown as Pass in green. • If any item is Fail, the judgment is shown as Fail in red.
4	Marker/Difference add button	Shows the specified marker position, the RL at the position, the distance between markers, and the RL difference.
5	Graph display area	Shows a graph of the burnout detection measurement result. You can drag the graph. You can zoom the dragged area by right-clicking or by using the mouse wheel.
6	Undo and redo buttons	Undoes or redoes graph movement and zoom.
7	Marker move buttons	Moves a selected marker.
8	Zoom buttons	Zooms in or out of the displayed waveform.
9	DEFAULT SCALE button	Resets the graph display to the default value specified in SETUP.

Explanation

The distribution of burnout detection measured by the instrument is displayed in a graph, and the graph of detected burnouts (peaks) can be analyzed as a waveform. By using the cursor in the graph window and placing markers on the waveform, you can check the distance between the markers (Distance) and the value of the return loss (Return Loss).

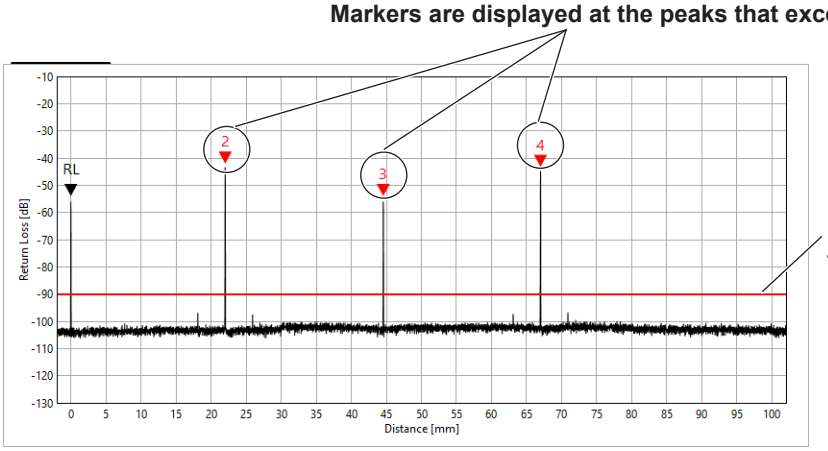
Reflection result display and graph display areas

The RL value and the distance from the start point are displayed for the peaks exceeding the threshold.

Measurement Value (λ=1.31µm)

Area	RL 0mm	1 0~20mm	2 20~40mm	3 40~60mm	4 60~80mm	5 80~100mm
Distance [mm]	0.000	-	22.016	44.560	66.983	-
Return Loss [dB]	-51.65 <=-50.00	- <=-90.00	-43.89 <=-90.00	-55.11 <=-90.00	-44.58 <=-90.00	- <=-90.00

Markers are displayed at the peaks that exceed the threshold.



Burnout detection threshold
Example: –90 dB

5.2 Marker and Cursor Operations

Procedure

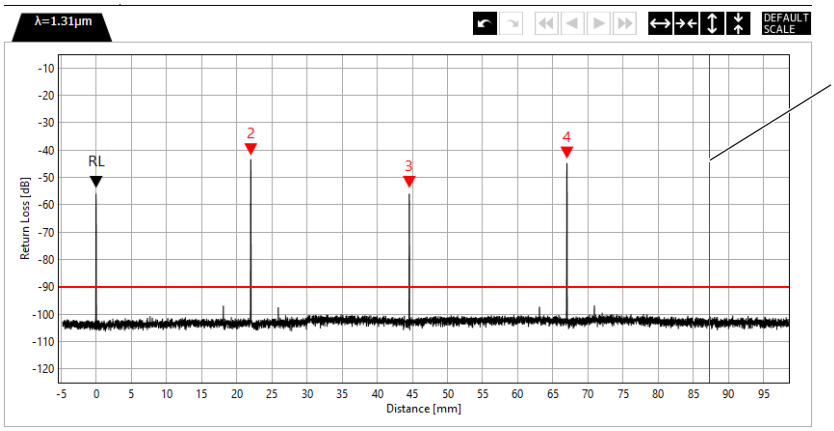
Opening the analysis window

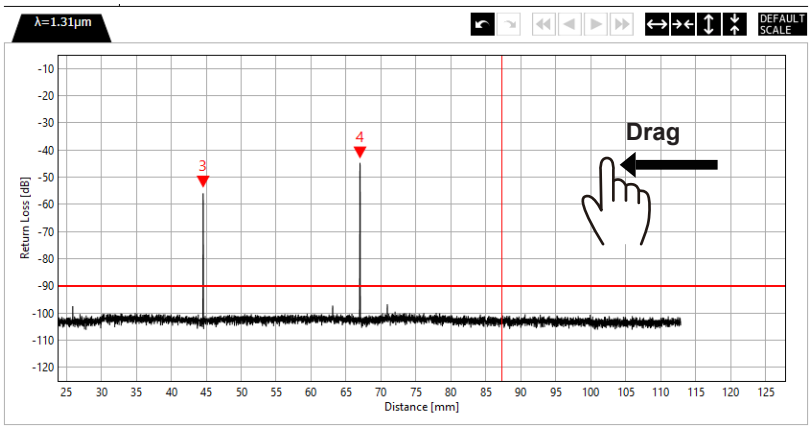
1. Click the icon on the main window. The Analysis window appears.

Cursor operation

Displaying and moving the cursor

2. Click the graph display area. A vertical cursor appears at the clicked position.
3. Click on the destination of the cursor. The cursor moves to that position.

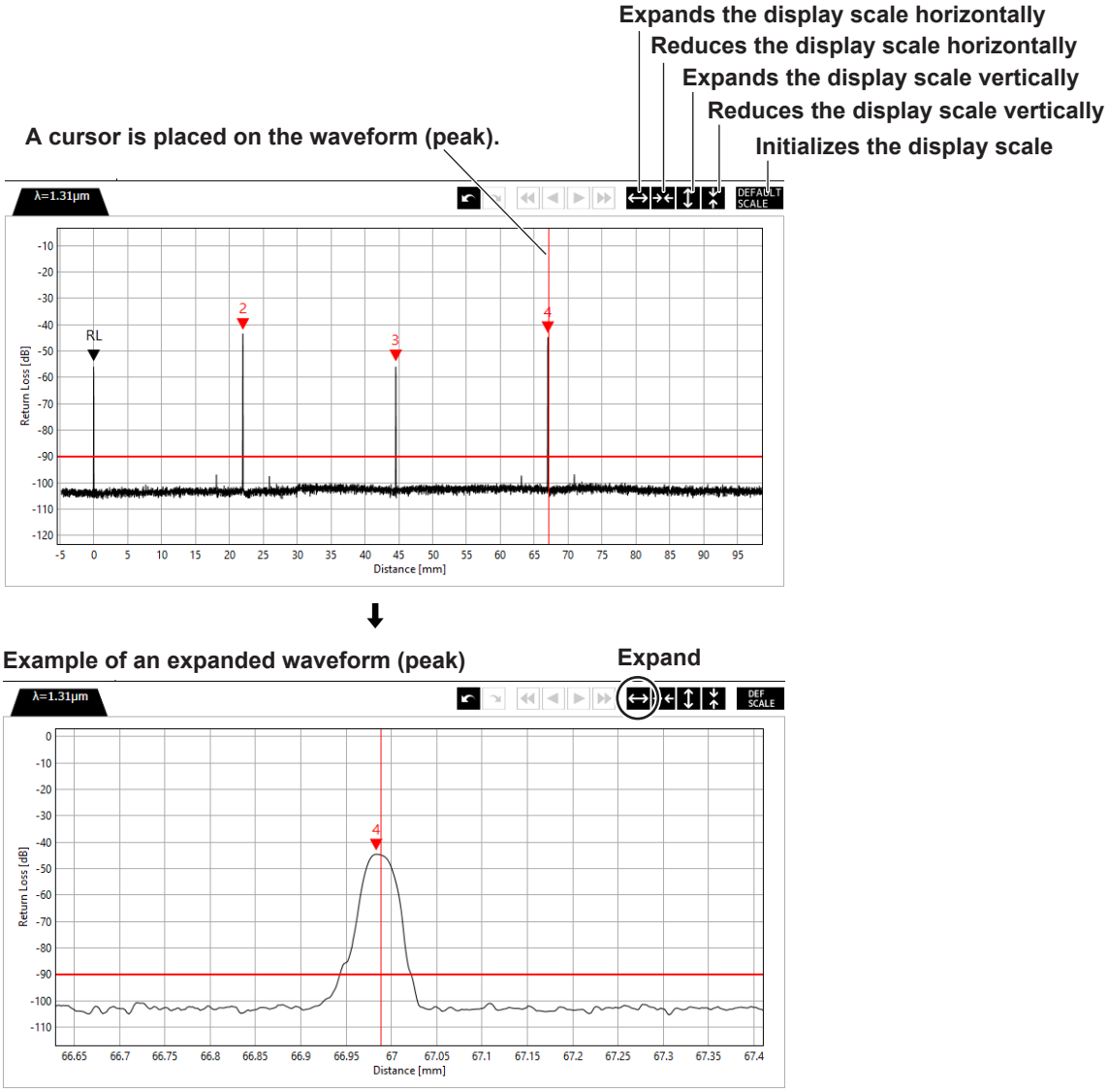




Drag within the graph display area to move the graph display.

Zooming the graph display

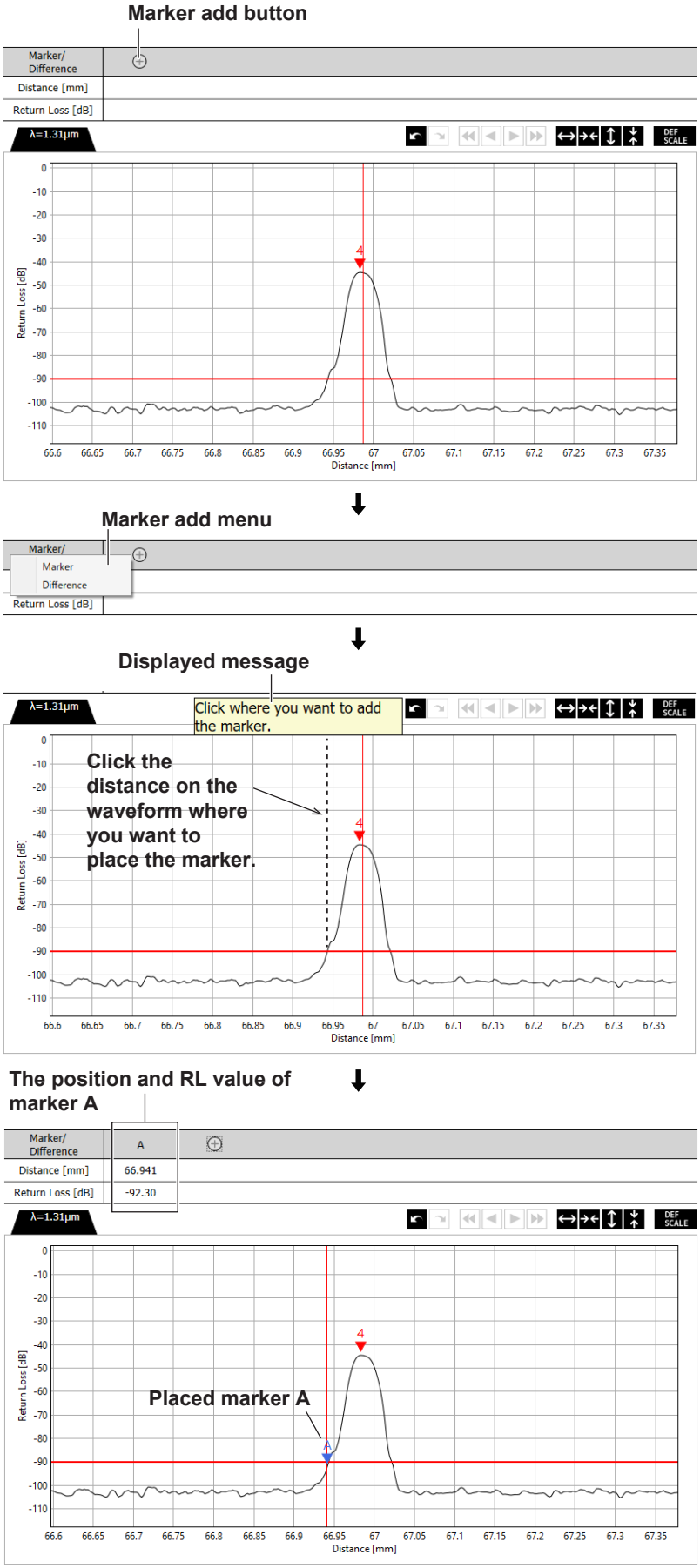
4. Click the area you want to zoom. A cursor appears.
5. Use the zoom buttons to adjust the area to display.



Marker operation

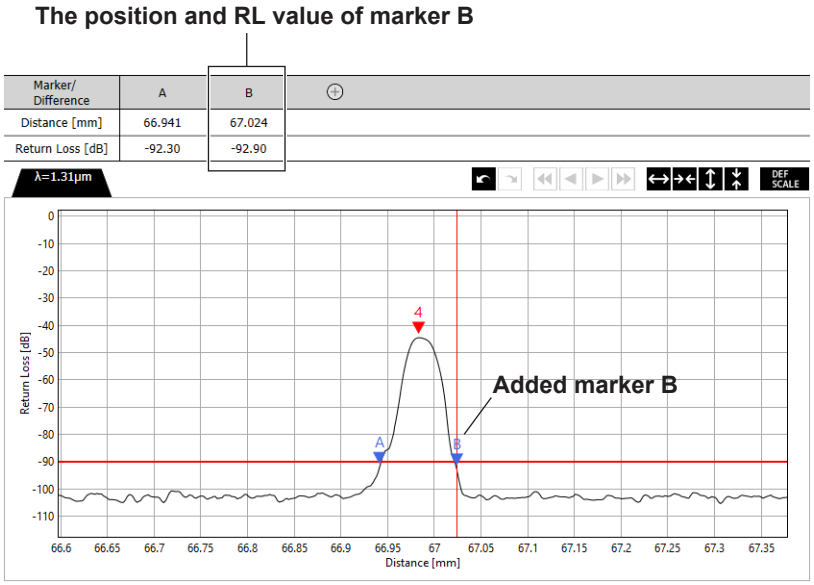
Placing a marker

2. Click the marker add button. A marker add menu appears.
3. On the menu, click **Marker**. A message appears.
4. Click the distance position where you want to place the marker. A marker is placed at the corresponding distance position on the waveform.


Marker add button
Marker/
Difference
Distance [mm]
Return Loss [dB]
λ=1.31μm
DEF SCALE
Return Loss [dB]
Distance [mm]
Marker add menu
Marker
Difference
Displayed message
Click where you want to add the marker.
Click the distance on the waveform where you want to place the marker.
The position and RL value of marker A
A
66.941
-92.30
Placed marker A

Adding a marker

Repeat steps 2 to 4 on page 4-4.

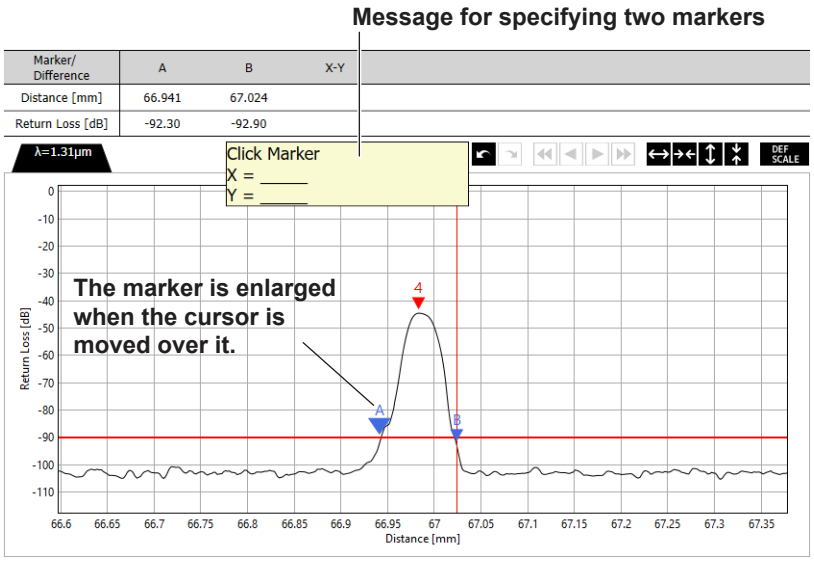


Displaying the marker measurement values between two points

5. Click the marker add button. A marker add menu appears.

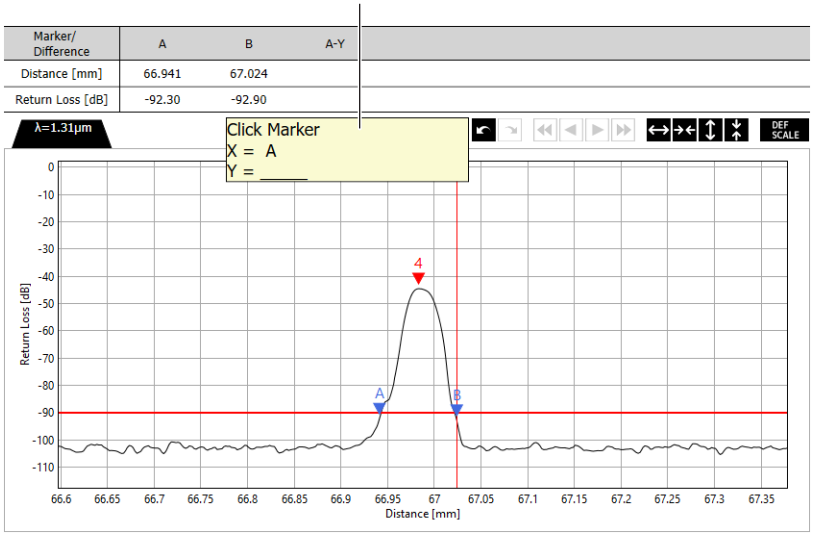
6. On the menu, click **Difference**. A message appears for specifying the two markers.

7. Move the mouse over the first marker. The marker is enlarged.



8. Click the marker. This marker is used to find the X value.

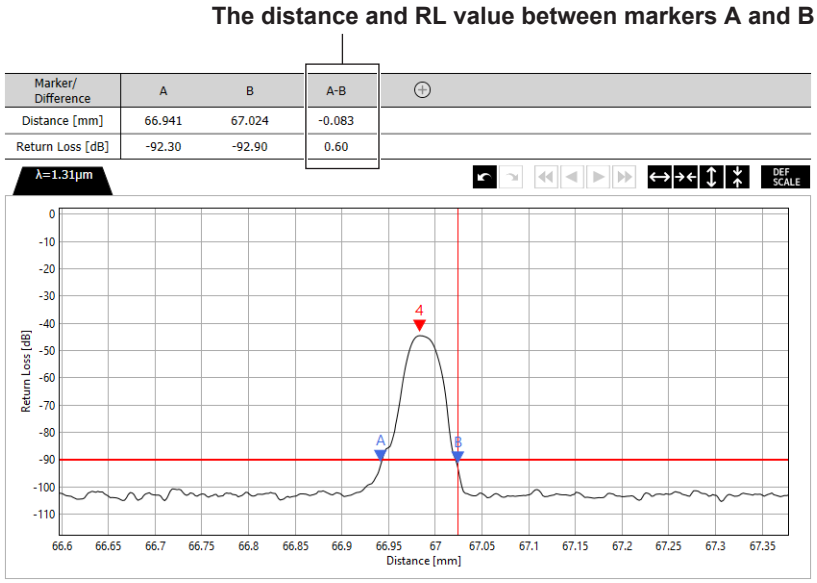
Marker A is used to find the X value.



9. Move the mouse over the second marker. The marker is enlarged.

10. Click the marker. This marker is used to find the Y value.

The distance and RL value between markers A and B

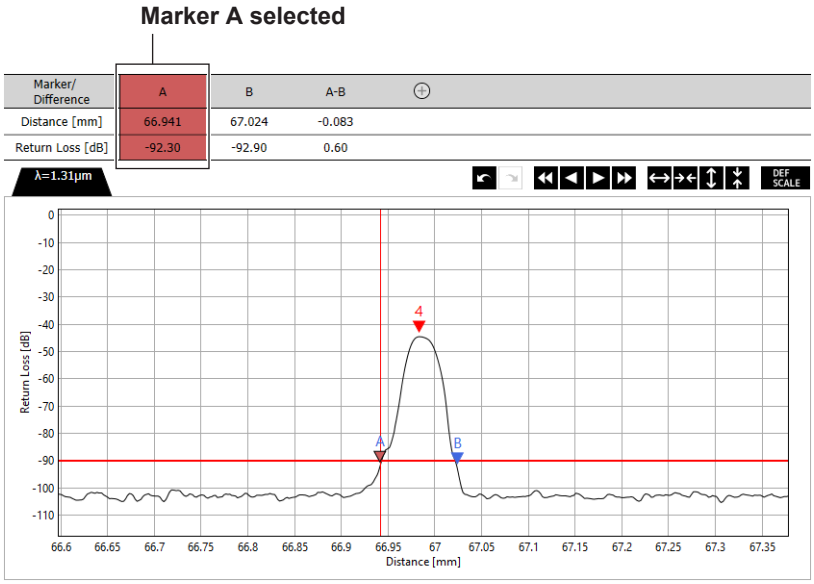


Note

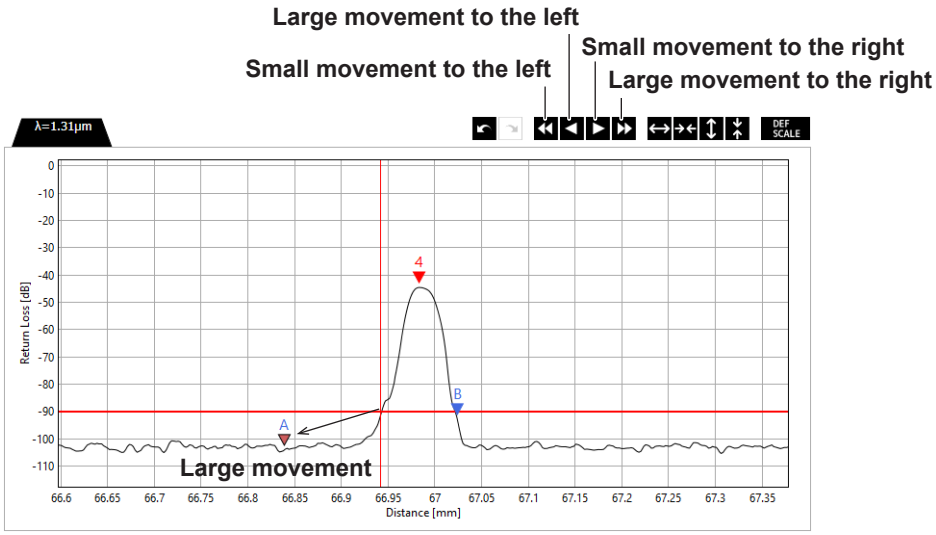
The distance and RL value between a marker and the waveform (peak) can also be displayed.

Moving a marker

5. Move the mouse over the marker you want to move. The marker is enlarged.
6. Click the marker. The selected marker color changes.

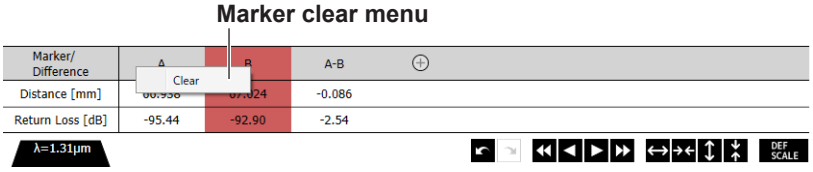


7. Click a marker move button. The marker moves in the specified direction.



Clearing a marker

5. In the marker/difference display area, right-click the marker information you want to clear. A marker clear menu appears.
6. On the menu, click Clear. The marker on the waveform and the marker information in the marker difference display area are cleared.



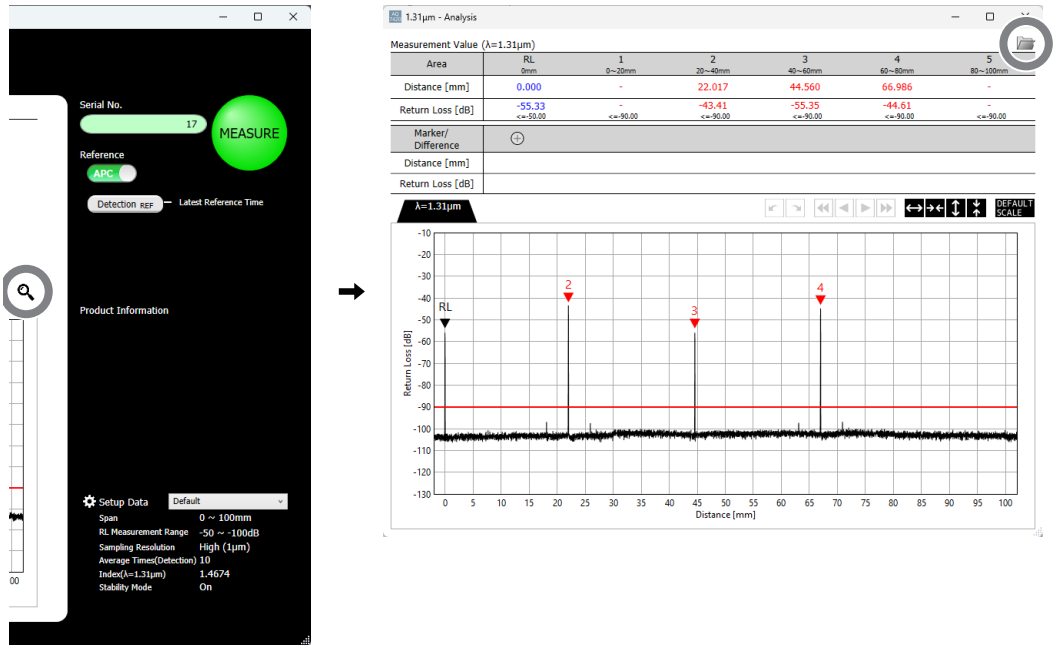
6.1 Saving and Loading Waveform Data

Procedure

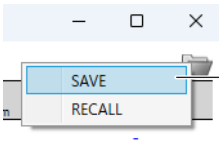
Manually saving a waveform (r Not Auto)

1. Click the icon on the main window. The Analysis window appears.
2. Click the icon on the analysis window. A menu appears for saving and loading.

Main window (see section 4.1) **Analysis window**



3. Click **SAVE**. A file is saved in the folder specified on the setup window.



SAVE button

Automatically saving waveforms (Only NG Auto and Full Auto)

After measurement, waveforms are automatically saved, so you do not need to perform any waveform saving operation.

Note

When Only NG Auto is selected, waveforms are saved only when the judgment results of the measured data are Fail.

Loading a waveform

1. Click the icon on the main window. The Analysis window appears.
2. Click the icon on the analysis window. A menu appears for saving and loading.
3. Click **RECALL**. A file selection window appears.

4. Select the waveform file (csv format).

Explanation

File name

Measurement data

The string “PS” is added to the beginning of the file name, followed by the date information.

Example: PS20241115.csv

→ Date: November 15, 2024

Waveform data

The string “PW” is added to the beginning of the file name, followed by the date, time, and serial number information. You can choose one of three file types: csv/jpg/bmp.

Example: PW20241115_103040_AAA1.csv
PW20241115_103040_AAA1.jpg
PW20241115_103040_AAA1.bmp

→ Date and time: 10:30:40 on November 15, 2024

→ Serial number: AAA1

Directory name

If you enable Auto Directory in the Data area of the setup window, date directories will be created in the specified directory.

A month (e.g., 11) directory will be created in the year (e.g., 2024) directory, and a day (e.g., 15) directory will be created in the month directory.

Format of measurement data (PS) and waveform data (PS)

See section 1.6.

6.2 Printing Reports

Procedure

Printer printing

1. Click the report icon  on the main window. A Windows print setup window appears.
2. Select the printer you want to use from the Printer drop-down menu.
3. Click Print. Measurement data is printed in report format on a single page of paper.

PDF generation

1. Click the report icon  on the main window. A Windows print setup window appears.
2. Select the application for generating the PDF from the Printer drop-down menu.
3. Click Print. Measurement data is printed in report format on a single page and saved to a PDF file.

Explanation

When generating a PDF file, specify a file name.

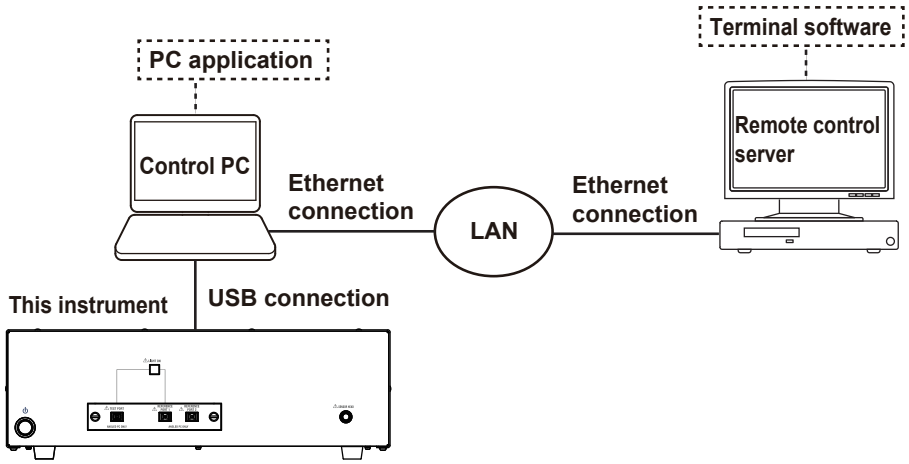
See section 1.6 for a description of the report format.

7.1 Remote Control

Procedure

Remote control preparation

1. Connect a server or other device for remote operation via a LAN to the PC that will control the instrument.



2. Run the PC application, and set the remote conditions. For editing the remote conditions, see section 3.5.

Remote control

3. Set the **IP address** of the control PC and the **port number** of the PC application in the terminal software. The port number should be set to the same value as the port number of the PC application set in step 2. The protocol is TCP/IP. For details about the network that you intend to connect the instrument to, consult your network administrator.

Logging in

4. Enter the login command in the command input screen of the terminal software.

```
:LOGIn<wsp>reflectometer,reflectometer
```

If the command is correctly recognized, “OK” is returned. If the login is successful, the string “Remote” is displayed on the screen of the control PC.

Logging out

5. Enter the logout command in the command input screen of the terminal software.

```
:LOGOut
```

If the command is correctly recognized, “OK” is returned.

Note

- If the command is not correctly recognized, “Invalid Command” is returned.
- For the command syntax, see section 7.3.
- All commands should be in plain text (unencrypted strings).

Changing the Login (administrator privileges) ID and password

6. Run the terminal software with administrator privileges.

7. Enter the login command in the command input screen of the terminal software.

```
:LOGIn<wsp>reflectometer,reflectometer
```

If the command is correctly recognized, “OK” is returned. If the login is successful, the string “Remote” is displayed on the screen of the control PC.

8. Enter the administrator ID change command in the command input screen of the terminal software.

```
:IDWrite:ADMin<wsp>yokogawa,123456789
```

If the command is correctly recognized, “OK” is returned. In the input example of the data above, the ID is “yokogawa” and the password is “123456789.”

Note

The default ID and password are as follows:
ID: reflectometer
Password: reflectometer

Creating or changing the Login (user privileges) ID and password

9. Run the terminal software.

10. Enter the login command in the command input screen of the terminal software.

```
:LOGIn<wsp>,yokogawa,123456789
```

If the command is correctly recognized, “OK” is returned. If the login is successful, the string “Remote” is displayed on the screen of the control PC.

11. Enter the user ID change command in the command input screen of the terminal software.

```
:IDWrite<wsp>,user1,abcdefg
```

If the command is correctly recognized, “OK” is returned. In the input example of the data above, the ID is “user1” and the password is “abcdefg.”

Note

Up to five users can log in. When several users are logged in simultaneously, the commands from each user are executed in the order they are received.

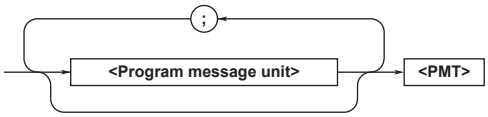
7.2 Programming Overview

Messages and queries

Messages are used to exchange information between the terminal software and PC application. A message that is sent from the terminal software to the PC application is called a program message. A program message requesting a response from the PC application to the terminal software is called a query.
A message received by the terminal software from the PC application is called a response message. If a program message contains a query, the PC application returns a response message upon receiving the program message. The instrument returns a single response message in response to a single program message.

Program messages

The program message format is shown below.



<Program message unit>
A program message consists of one or more program message units. Each program message unit corresponds to one command. Separate each program message unit with a semicolon.

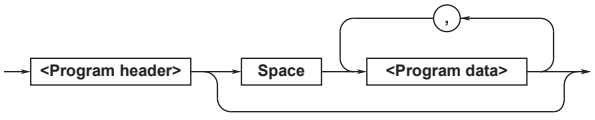
```
:SETUp:MEASure:STARt 20;:SETUp:FILE:LIST?
```

Unit Unit

<PMT>
This is a program message terminator. Use CR, LF or CRLF in ASCII code.

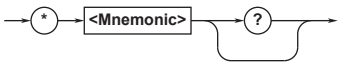
Program message unit syntax

The program message unit syntax is shown below.



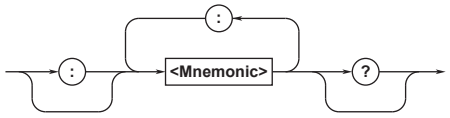
<Program header>
The program header indicates the command type.

- **Common command header**
  Commands that are defined in IEEE 488.2-1992 are called common commands. The header format of a common command is shown below. Be sure to include an asterisk (*) at the beginning of a common command.



Common command example `*CLS`

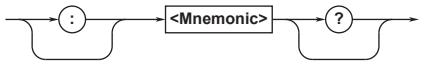
- **Compound header**
  Other commands that are specific to the instrument are classified and arranged in a hierarchy according to their functions. The compound header syntax is shown below. Be sure to use a colon to specify a lower hierarchical level.



Compound header example

`:SETUp:MEASure:STARt`

- **Simple header**
  These commands are functionally independent and are not contained within a hierarchy. The simple header syntax is shown below.



Compound header example `:LOGin`

Note

A <mnemonic> is an alphanumeric character string.

Header interpretation rules

The PC application interprets the header that it receives according to the rules below.

- Mnemonics are not case sensitive.
  Example "`SETUp`" can also be written as "`setup`" or "`setUP`."
- The lower-case characters can be omitted.
  Example "`IDWrite`" can also be written as "`IDWR`" or "`IDW`."
- The question mark at the end of a header indicates that it is a query. You cannot omit the question mark.
  Example The shortest abbreviation for "`:SETUp:MEASure:STARt?`" is "`:SETU:MEAS:STAR?`."

Response messages

When the terminal software sends a query with a question mark, the PC application returns only data as the response message to the query.

Data

Data contains conditions and values that are written after the header. A space separates the data from the header.

- Use <wsp> to indicate a space.
  Example `:SETUp:MEASure:STARt 20` -> `:SETUp:MEASure:STARt<wsp>20`
- When one option is to be selected from multiple character strings (mnemonics), a | is written to separate each option. The data interpretation rules are the same as those described in “Header interpretation rules.”
  Example `:SETUp:MEASure:SAResolution<wsp>0.1s|0.8s|6.5s`
  (0.1s, 0.8s or 6.5s)
- User-defined data is grouped as follows:

Data	Description
<value>	Numeric data The following three data types are available. • Integer (example: 0, 10) • Sign (example: <, ≤) • Decimal (example: 1.31, 1.55) • Floating-point number (example: -5.00000000E+001)
<”string”>	User-defined string (variable) (example: yokogawa, user)

The unit of distance is mm, and the unit of RL is dB.

7.3 List of Commands

Command	Function	Page
IDWrite Group		
:IDWrite	Sets the login user ID and password.	7-8
:IDWrite:ADMin	Sets the login administrator ID and password.	7-8
LOGIn Group		
:LOGIn	Performs a login.	7-9
LOGOut Group		
:LOGOut	Performs a logout.	7-10
MAIN Group		
:MAIN:SERIal	Sets or queries the measurement source serial number.	7-11
:MAIN:MEASure	Starts or stops measurement.	7-11
:MAIN:STOP	Stops the instrument's internal processing.	7-11
:MAIN:REF:ILREf	Executes or queries the IL (insertion loss) reference measurement.	7-11
:MAIN:REF:DETEction	Executes or queries the Detection (burnout detection) reference measurement.	7-11
:MAIN:REF:APC	Executes or queries the APC (Angled-PC) reference measurement.	7-11
:MAIN:INFO1|2|3|4|5|6|7|8|9|10	Sets or queries the product information.	7-11
:MAIN:RESUlt:REPOrt	Prints a measurement result report.	7-11
:MAIN:RESUlt:JUDGe?	Queries the judgment result.	7-11
:MAIN:RESUlt1|2:ILVAlue?	Queries the IL (insertion loss) value.	7-11
:MAIN:RESUlt1|2:RLVAlue?	Queries the RL (return loss) value.	7-11
:MAIN:RESUlt1|2:DETEct?	Queries the Detection (burnout detection) value.	7-12
:MAIN:RESUlt1|2:MAIN?	Queries the detailed data of Detection (burnout detection).	7-12
SETUp Group		
:SETUp:MODE	Sets or queries the operation mode.	7-13
:SETUp:FILE:LIST?	Queries a list of setup files stored in the PC.	7-13
:SETUp:FILE:RECAll	Loads a setup file stored in the PC.	7-13
:SETUp:FILE:SAVE	Saves the current settings to the PC.	7-13
:SETUp:MEASure:STARt	Sets or queries the measurement range start position.	7-13
:SETUp:MEASure:STOP	Sets or queries the measurement range end position.	7-13
:SETUp:MEASure:RLRAnge	Sets or queries the RL (return loss) measurement range.	7-13
:SETUp:MEASure:SAREsolution	Sets or queries the distance measurement sample resolution.	7-13
:SETUp:MEASure:AVETimes	Sets or queries the average count for Detection (burnout detection) measurement.	7-13
:SETUp:MEASure:ILAVetime	Sets or queries the average count for IL (insertion loss) measurement.	7-13
:SETUp:MEASure:INDEx	Sets or queries the refractive index of the optical fiber cable.	7-13
:SETUp:MEASure:WLENgth	Sets or queries the wavelength to be measured.	7-13
:SETUp:MEASure:REPEat	Sets or queries whether repeated measurements will be performed.	7-14
:SETUp:MEASure:STABility	Sets or queries whether stability measurements will be performed.	7-14
:SETUp:MEASure:IRTM	Sets or queries whether real-time measurements (IL) will be performed.	7-14
:SETUp:CRITeria:ILENable1|2	Sets or queries whether IL (insertion loss) pass/fail judgment will be performed.	7-14
:SETUp:CRITeria:ILCOndition1|2	Sets or queries the IL (insertion loss) judgment conditions.	7-14
:SETUp:CRITeria:ILVAlue1|2	Sets or queries the threshold for the IL (insertion loss) judgment conditions.	7-14
:SETUp:CRITeria:ILREsolution	Sets or queries the number of digits displayed for IL (insertion loss) measurements.	7-14
:SETUp:CRITeria:RLENable1|2	Sets or queries whether RL (return loss) pass/fail judgment will be performed.	7-14
:SETUp:CRITeria:RLCOndition1|2	Sets or queries the RL (return loss) judgment conditions.	7-14
:SETUp:CRITeria:RLVAlue1|2	Sets or queries the threshold for the RL (return loss) judgment conditions.	7-15
:SETUp:CRITeria:RSTArt	Sets or queries the start position of the RL (return loss) judgment range.	7-15
:SETUp:CRITeria:RSTOp	Sets or queries the end position of the RL (return loss) judgment range.	7-15

Command	Function	Page
:SETUp:CRITeria:DEENable1|2	Sets or queries whether Detection (burnout detection) pass/fail judgment will be performed.	7-15
:SETUp:CRITeria:DECOndition1|2	Sets or queries the Detection (burnout detection) judgment conditions.	7-15
:SETUp:CRITeria:DEVAlue1|2	Sets or queries the threshold for the Detection (burnout detection) judgment conditions.	7-15
:SETUp:DATA:DIREctory	Sets or queries the save location of measured data.	7-15
:SETUp:DATA:AUTO	Sets or queries whether the directory for saving measured data will be created automatically.	7-15
:SETUp:DATA:FILEsave	Sets or queries whether measured data (values) will be saved automatically.	7-15
:SETUp:DATA:WAVEform	Sets or queries whether measured data (waveforms) will be saved automatically.	7-16
:SETUp:DATA:TYPE	Sets or queries the data format for saving measured data (waveforms).	7-16
:SETUp:DATA:INCRement	Sets or queries whether the serial number will be incremented automatically.	7-16
:SETUp:DATA:IN FO1|2|3|4|5|6|7|8|9|10 ENABle	Sets or queries whether the product information will be edited.	7-16
:SETUp:DATA:IN FO1|2|3|4|5|6|7|8|9| 10:TiTLe	Sets or queries the product information.	7-16
:SETUp:MISC:REMOte:ENABle	Sets or queries whether remote connection will be made.	7-16
:SETUp:MISC:REMOte:LOCAl	Sets or queries whether the Local button will be shown on the PC application window.	7-16
:SETUp:MISC:REMOte:PORT	Sets or queries the TCP/IP communication port number for remote connection.	7-16

Common Command Group

*CLS(CLear Status)	Clears all the event registers in the status byte register that are reflected by the summary, and the queues (excluding the output queue).	7-17
*ESR?(standard Event Status Register)	Queries and clears the standard event status register.	7-17
*IDN?(IDeNtify)	Queries the instrument model.	7-17
*OPT?(OPTion)	Queries the installed options.	7-17
*OPC?(OPeration Complete)	Returns ASCII code 1 if the wait for execution has ended.	7-17
*RST(ReSeT)	Initializes the settings. All ongoing processes are stopped. Clears the *OPC? command.	7-17
*WAI(WAIt)	Holds the execution of the subsequent command until all waiting states are completed.	7-17

7.4 IDWrite Group

:IDWrite

Function Sets the login user ID and password.

Syntax `:IDWrite<wsp><”string”>,<”string”>`
First <”string”>: user ID
Next <”string”>: password

Example `:IDW user1,abcdefg`

Description This command is valid when logged in with administrative privileges.

:IDWrite:ADMin

Function Sets the login administrator ID and password.

Syntax `:IDWrite:ADMin<wsp><”string”>,<”string”>`
First <”string”>: administrator ID
Next <”string”>: password

Example `:IDW yokogawa,1234567890`

Description This command is valid when logged in with administrative privileges.

7.5 LOGIn Group

:LOGIn

Function Performs a login.

Syntax `:LOGIn<wsp><”string”>,<”string”>`
First <”string”>: administrator ID or user ID
Next <”string”>: password

Example `:LOGI user1,abcdefg`

Description If you log in with an administrator ID, you can execute commands that are enabled with administrator privileges.

7.6 LOGOut Group

:LOGOut

Function Performs a logout.

Syntax `:LOGOut`

Example `:LOGO`

7.7 MAIN Group

:MAIN:SERIal

Function Sets or queries the measurement source serial number.

Syntax
```
:MAIN:SERIal<wsp><"string">
:MAIN:SERIal?
```
<"string">: measurement source serial number

Example
```
:MAIN:SERI 12345
:MAIN:SERI? -> 12345
```

Description You can also specify double-byte characters.

:MAIN:MEASure

Function Starts or stops measurement.

Syntax
```
:MAIN:MEASure
```

Example
```
:MAIN:MEAS
```

Description When the instrument is in standby mode, the instrument starts a measurement.
When the instrument is in the middle of a measurement, the instrument stops the measurement.

:MAIN:STOP

Function Stops the instrument's internal processing.

Syntax
```
:MAIN:STOP
```

Example
```
:MAIN:STOP
```

:MAIN:REF:ILREf

Function Executes or queries the IL (insertion loss) reference measurement.

Syntax
```
:MAIN:REF:ILREf
:MAIN:REF:ILREf?
```

Example
```
:MAIN:REF:ILRE
:MAIN:REF:ILRE? -> 20241001120000
```

Description If a query is made, the year, month, day, and time of the previous reference measurement are returned.

:MAIN:REF:DETEction

Function Executes or queries the Detection (burnout detection) reference measurement.

Syntax
```
:MAIN:REF:DETEction
:MAIN:REF:DETEction?
```

Example
```
:MAIN:REF:DETE
:MAIN:REF:DETE? -> 20241001120000
```

Description If a query is made, the year, month, day, and time of the previous reference measurement are returned.

:MAIN:REF:APC

Function Executes or queries the APC (Angled-PC) reference measurement.

Syntax
```
:MAIN:REF:APC
:MAIN:REF:APC?
```

Example
```
:MAIN:REF:APC
:MAIN:REF:APC? -> 20241001120000
```

Description If a query is made, the year, month, day, and time of the previous reference measurement are returned.

:MAIN:INFO1|2|3|4|5|6|7|8|9|10

Function Sets or queries the product information.

Syntax
```
:MAIN:INFO1|2|3|4|5|6|7|8|9|10<wsp>
<"string">
:MAIN:INFO1|2|3|4|5|6|7|8|9|10?
```
<"string">: product information string

Example
```
:MAIN:INFO1 yokogawa
:MAIN:INFO? -> yokogawa
```

Description You can set up to 10 items for the product information.
Setting and querying are possible when the product information editing feature is enabled with the :SETUp:DATA:INFO:ENABle command.

:MAIN:RESUlt:REPOrt

Function Prints a measurement result report.

Syntax
```
:MAIN:RESUlt:REPOrt
```

Example
```
:MAIN:RESUl:REPO
```

:MAIN:RESUlt:JUDGe?

Function Queries the judgment result.

Syntax
```
:MAIN:RESUlt:JUDGe?
```
The judgment result is returned as an integer.
0: FAIL
1: PASS

Example
```
:MAIN:RESUl:JUDG? -> 1
```

:MAIN:RESUlt1|2:ILVAlue?

Function Queries the IL (insertion loss) value.

Syntax
```
:MAIN:RESUlt1|2:ILVAlue?
```
1: 1.31
2: 1.55

Example
```
:MAIN:RESUl1|:ILVAl? ->
-5.00000000E+001
```

:MAIN:RESUlt1|2:RLVAlue?

Function Queries the RL (return loss) value.

Syntax
```
:MAIN:RESUlt1|2:RLVAlue?
```
1: 1.31
2: 1.55

Example
```
:MAIN:RESUl1|2:RLVAl? ->
-5.00000000E+001
```

:MAIN:RESUlt1|2:DETEct?

Function Queries the Detection (burnout detection) value.

Syntax `:MAIN:RESUlt1|2:DETEct?`

1: 1.31

2: 1.55

Example `:MAIN:RESUl1|2:RLVAl? ->`
`-5.00000000E+001`

:MAIN:RESUlt1|2:MAIN?

Function Queries the detailed data of Detection (burnout detection).

Syntax `:MAIN:RESUlt1|2:MAIN?`

1: wavelength 1.31 µm

2: wavelength 1.55 µm

Example `:MAIN:RESUlt1|2:RLVAlue? ->`
`-5.00000000E+001`

7.8 SETUp Group

:SETUp:MODE
Function Sets or queries the operation mode.
Syntax :SETUp:MODE<wsp>0|1|2
:SETUp:MODE?
0: IL RL Detection
1: RL Detection
2: IL
Example :SETU:MODE 0
:SETU:MODE? -> 0

:SETUp:FILE:LIST?
Function Queries a list of setup files stored in the PC.
Syntax :SETUp:FILE:LIST?
:SETUp:MODE?

:SETUp:FILE:RECAll
Function Loads a setup file stored in the PC.
Syntax :SETUp:FILE:RECAll
Example :SETU:FILE:RECAll

:SETUp:FILE:SAVE
Function Saves the current settings to the PC.
Syntax :SETUp:FILE:SAVE<wsp><"string">
Example :SETU:FILE:SAVE RLtest

:SETUp:MEASure:STARt
Function Sets or queries the measurement range start position.
Syntax :SETUp:MEASure:STARt<wsp>20
:SETUp:MEASure:STARt?
Example :SETU:MEAS:STAR 20
:SETU:MEAS:STAR -> +2.00000000E+001
Description The measurement range is 0 to 100 mm.

:SETUp:MEASure:STOP
Function Sets or queries the measurement range end position.
Syntax :SETUp:MEASure:STOP<wsp>80
:SETUp:MEASure:STOP?
Example :SETU:MEAS:STOP 80
:SETU:MEAS:STOP -> +8.00000000E+001
Description The measurement range is 0 to 100 mm.

:SETUp:MEASure:RLRAnge
Function Sets or queries the RL (return loss) measurement range.
Syntax :SETUp:MEASure:RLRAnge<wsp>0|1
:SETUp:MEASure:RLRAnge?
0: –14.7 to –85 dB
1: –50 to –100 dB
Example :SETU:MEAS:RLRA 1
:SETU:MEAS:RLRA? -> 1

:SETUp:MEASure:SAREsolution
Function Sets or queries the distance measurement sample resolution.
Syntax :SETUp:MEASure:SAREsolution<wsp>0|1|2
:SETUp:MEASure:SAREsolution?
0: High (1 µm)
1: Middle (4 µm)
2: Low (8 µm)
Example :SETU:MEAS:SARE 1
:SETU:MEAS:SARE? -> 1

:SETUp:MEASure:AVETimes
Function Sets or queries the average count for Detection (burnout detection) measurement.
Syntax :SETUp:MEASure:AVETimes<wsp><value>
:SETUp:MEASure:AVETimes?
<value>: 1 to 16
Example :SETU:MEAS:SARE 1
:SETU:MEAS:SARE? -> 1

:SETUp:MEASure:ILAVetime
Function Sets or queries the average count for IL (insertion loss) measurement.
Syntax :SETUp:MEASure:ILAVetime<wsp>0|1|2
:SETUp:MEASure:ILAVetime?
0: 0.1 s
1: 0.8 s
2: 6.5 s
Example :SETU:MEAS:ILAV 1
:SETU:MEAS:ILAV? -> 1

:SETUp:MEASure:INDEx
Function Sets or queries the refractive index of the optical fiber cable.
Syntax :SETUp:MEASure:INDEx<wsp><value>
:SETUp:MEASure:INDEx?
<value>: 1.0000 to 2.0000
Example :SETU:MEAS:INDE 1.4674
:SETU:MEAS:INDE? -> +1.46740000E+000

:SETUp:MEASure:WLENgth
Function Sets or queries the wavelength to be measured.
Syntax :SETUp:MEASure:WLENgth<wsp>0|1|2
:SETUp:MEASure:WLENgth?
0: main wavelength
1: sub wavelength
2: main wavelength and sub wavelength
Example :SETU:MEAS:WLEN 0
:SETU:MEAS:WLEN? -> 0

:SETUp:MEASure:REPEat

Function Sets or queries whether repeated measurements will be performed.

Syntax `:SETUp:MEASure:REPEat<wsp>0|1`
`:SETUp:MEASure:REPEat?`
0: Measurement will not be repeated.
1: Measurement will be repeated.

Example `:SETU:MEAS:REPE 1`
`:SETU:MEAS:REPE? -> 1`

:SETUp:MEASure:STABility

Function Sets or queries whether stability measurements will be performed.

Syntax `:SETUp:MEASure:STABility<wsp>0|1`
`:SETUp:MEASure:STABility?`
0: Stability measurements will not be performed.
1: Stability measurements will be performed.

Example `:SETU:MEAS:STAB 1`
`:SETU:MEAS:STAB? -> 1`

:SETUp:MEASure:IRTM

Function Sets or queries whether real-time measurements (IL) will be performed.

Syntax `:SETUp:MEASure:IRTM<wsp>0|1`
`:SETUp:MEASure:IRTM?`
0: Real-time measurements will not be performed.
1: Real-time measurements will be performed.

Example `:SETU:MEAS:IRTM 1`
`:SETU:MEAS:IRTM? -> 1`

:SETUp:CRITeria:ILENable1|2

Function Sets or queries whether IL (insertion loss) pass/fail judgment will be performed.

Syntax `:SETUp:CRITeria:ILENable1|2<wsp>0|1`
`:SETUp:CRITeria:ILENable1|2?`
ILENable1: wavelength 1.31 µm
ILENable2: wavelength 1.55 µm
0: Pass/fail judgment will not be performed.
1: Pass/fail judgment will be performed.

Example `:SETU:CRIT:ILEN1 1`
`:SETU:CRIT:ILEN1? -> 1`

:SETUp:CRITeria:ILCOndition1|2

Function Sets or queries the IL (insertion loss) judgment conditions.

Syntax `:SETUp:CRITeria:ILCOndition1|2<wsp>0|1`
`:SETUp:CRITeria:ILCOndition1|2?`
ILCOndition1: wavelength 1.31 µm
ILCOndition2: wavelength 1.55 µm
0: < (greater than)
1: ≤ (greater than or equal to)

Example `:SETU:CRIT:ILCO1 1`
`:SETU:CRIT:ILCO1? -> 1`

:SETUp:CRITeria:ILVAlue1|2

Function Sets or queries the threshold for the IL (insertion loss) judgment conditions.

Syntax `:SETUp:CRITeria:ILVAlue1|2<wsp>`
`<value>`
`:SETUp:CRITeria:ILVAlue1|2?`
1: wavelength 1.31 µm
2: wavelength 1.55 µm
<value>: 0 to 40 dB

Example `:SETU:CRIT:ILVA11 40`
`:SETU:CRIT:ILVA11? -> +4.00000000E+001`

:SETUp:CRITeria:ILREsolution

Function Sets or queries the number of digits displayed for IL (insertion loss) measurements.

Syntax `:SETUp:CRITeria:ILREsolution<wsp>`
`0|1|2|3`
`:SETUp:CRITeria:ILREsolution?`
0: 1/10000
1: 1/1000
2: 1/100
3: 1/10

Example `:SETU:CRIT:ILRE 0`
`:SETU:CRIT:ILRE? -> 0`

:SETUp:CRITeria:RLENable1|2

Function Sets or queries whether RL (return loss) pass/fail judgment will be performed.

Syntax `:SETUp:CRITeria:RLENable1|2<wsp>0|1`
`:SETUp:CRITeria:RLENable1|2?`
RLENable1: wavelength 1.31 µm
RLENable2: wavelength 1.55 µm
0: Pass/fail judgment will not be performed.
1: Pass/fail judgment will be performed.

Example `:SETU:CRIT:RLEN1 1`
`:SETU:CRIT:RLEN1? -> 1`

:SETUp:CRITeria:RLCOndition1|2

Function Sets or queries the RL (return loss) judgment conditions.

Syntax `:SETUp:CRITeria:RLCOndition1|2<wsp>`
`0|1`
`:SETUp:CRITeria:RLCOndition1|2?`
RLCOndition1: wavelength 1.31 µm
RLCOndition2: wavelength 1.55 µm
0: < (greater than)
1: ≤ (greater than or equal to)

Example `:SETU:CRIT:ILCO1 1`
`:SETU:CRIT:ILCO1? -> 1`

:SETUp:CRITeria:RLVAlue1|2

Function Sets or queries the threshold for the RL (return loss) judgment conditions.

Syntax
```
:SETUp:CRITeria:RLVAlue1|2<wsp>
<value>
:SETUp:CRITeria:RLVAlue1|2?
```
1: wavelength 1.31 µm
2: wavelength 1.55 µm
<value>: -120 to -10 dB

Example
```
:SETU:CRIT:RLVA1 -50
:SETU:CRIT:RLVA1? -> -5.00000000E+001
```

:SETUp:CRITeria:RSTArt

Function Sets or queries the start position of the RL (return loss) judgment range.

Syntax
```
:SETUp:CRITeria:RSTArt<wsp><value>
:SETUp:CRITeria:RSTArt?
```
<value>: –10 to 110 mm

Example
```
:SETU:CRIT:RSTA -10
:SETU:CRIT:RSTA? -> -1.00000000E+001
```

Description The judgment range is –10 to 110 mm.

:SETUp:CRITeria:RSTOp

Function Sets or queries the end position of the RL (return loss) judgment range.

Syntax
```
:SETUp:CRITeria:RSTOp<wsp><value>
:SETUp:CRITeria:RSTOp?
```
<value>: –10 to 110 mm

Example
```
:SETU:CRIT:RSTO 110
:SETU:CRIT:RSTO? -> +1.10000000E+002
```

Description The judgment range is –10 to 110 mm.

:SETUp:CRITeria:DEENable1|2

Function Sets or queries whether Detection (burnout detection) pass/fail judgment will be performed.

Syntax
```
:SETUp:CRITeria:DEENable1|2<wsp>0|1
:SETUp:CRITeria:DEENable1|2?
```
DEENable1: wavelength 1.31 µm
DEENable2: wavelength 1.55 µm
0: Pass/fail judgment will not be performed.
1: Pass/fail judgment will be performed.

Example
```
:SETU:CRIT:DEEN 1
:SETU:CRIT:DEEN? -> 1
```

:SETUp:CRITeria:DECOndition1|2

Function Sets or queries the Detection (burnout detection) judgment conditions.

Syntax
```
:SETUp:CRITeria:DECOndition1|2<wsp>
0|1
:SETUp:CRITeria:DECOndition1|2?
```
DECOndition1: wavelength 1.31 µm
DECOndition2: wavelength 1.55 µm
0: < (greater than)
1: ≤ (greater than or equal to)

Example
```
:SETU:CRIT:DECO1 1
:SETU:CRIT:DECO1? -> 1
```

:SETUp:CRITeria:DEVAlue1|2

Function Sets or queries the threshold for the Detection (burnout detection) judgment conditions.

Syntax
```
:SETUp:CRITeria:DEVAlue1|2<wsp>
<value>
:SETUp:CRITeria:DEVAlue1|2?
```
1: wavelength 1.31 µm
2: wavelength 1.55 µm
<value>: -120 to -10 dB

Example
```
:SETU:CRIT:DEVA1 -50
:SETU:CRIT:DEVA1? -> -5.00000000E+001
```

:SETUp:DATA:DIREctory

Function Sets or queries the save location of measured data.

Syntax
```
:SETUp:DATA:DIREctory<wsp><"string">
:SETUp:DATA:DIREctory?
```
<"string">: path and file name

Example
```
:SETU:DATA:DIRE /USB0/Data/Test.csv
:SETU:DATA:DIRE? -> /USB0/Data/Test.
csv
```

:SETUp:DATA:AUTO

Function Sets or queries whether the directory for saving measured data will be created automatically.

Syntax
```
:SETUp:DATA:AUTO<wsp>0|1
:SETUp:DATA:AUTO?
```
0: not created automatically
1: created automatically

Example
```
:SETUp:DATA:AUTO 1
:SETUp:DATA:AUTO? -> 1
```

Description The directory name is generated based on the year, month, and day.
Example: 20241001

:SETUp:DATA:FILEsave

Function Sets or queries whether measured data (values) will be saved automatically.

Syntax
```
:SETUp:DATA:FILEsave<wsp>0|1
:SETUp:DATA:FILEsave?
```
0: not saved automatically
1: saved automatically

Example
```
:SETU:DATA:FILE 1
:SETU:DATA:FILE? -> 1
```

Description Measured data (values) will be saved automatically to the specified directory.

:SETUp:DATA:WAVEform

Function Sets or queries whether measured data (waveforms) will be saved automatically.

Syntax
```
:SETUp:DATA:WAVEform<wsp>0|1
:SETUp:DATA:WAVEform?
```
0: not saved automatically
1: saved automatically

Example
```
:SETU:DATA:WAVE 1
:SETU:DATA:WAVE? -> 1
```

Description Measured data (waveforms of the graph display) will be saved automatically to the specified directory.

:SETUp:DATA:TYPE

Function Sets or queries the data format for saving measured data (waveforms).

Syntax
```
:SETUp:DATA:TYPE<wsp>0|1|2
:SETUp:DATA:TYPE?
```
0: CSV
1: JPG
2: BMP

Example
```
:SETU:DATA:TYPE 2
:SETU:DATA:TYPE? -> 2
```

:SETUp:DATA:INCRement

Function Sets or queries whether the serial number will be incremented automatically.

Syntax
```
:SETUp:DATA:INCRement<wsp>0|1
:SETUp:DATA:INCRement?
```
0: not incremented
1: incremented

Example
```
:SETU:DATA:INCR 1
:SETU:DATA:INCR? -> 1
```

Description The serial number is incremented each time a measurement is made.

:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10 ENABle

Function Sets or queries whether the product information will be edited.

Syntax
```
:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10
ENABle<wsp>0|1
:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10
ENABle?
```
0: not edited
1: edited

Example
```
:SETU:DATA:INFO1ENAB yokogawa
:SETU:DATA:INFO1ENAB? -> yokogawa
```

:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10:TiTLe

Function Sets or queries the product information.

Syntax
```
:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10
<wsp><”string”>
:SETUp:DATA:INFO1|2|3|4|5|6|7|8|9|10?
```
<”string”>: product information string

Example
```
:SETUp:DATA:INFO1 yokogawa
:SETUp:DATA:INFO1? -> yokogawa
```

Description You can set up to 10 items for the product information.
Setting and querying are possible when the product information editing feature is enabled with the :SETUp:DATA:INFO:ENABle command.

:SETUp:MISC:REMOte:ENABle

Function Sets or queries whether remote connection will be made.

Syntax
```
:SETUp:MISC:REMOte:ENABle<wsp>0|1
:SETUp:MISC:REMOte:ENABle?
```
0: Remote connection will not be made.
1: Remote connection will be made.

Example
```
:SETU:MISC:REMO:ENAB 1
:SETU:MISC:REMO:ENAB? -> 1
```

Description The serial number is incremented each time a measurement is made.

:SETUp:MISC:REMOte:LOCAl

Function Sets or queries whether the Local button will be shown on the PC application window.

Syntax
```
:SETUp:MISC:REMOte:LOCAl<wsp>0|1
:SETUp:MISC:REMOte:ENABle?
```
0: hidden
1: shown

Example
```
:SETU:MISC:REMO:LOCA 1
:SETU:MISC:REMO:LOCA? -> 1
```

Description Remote connection can be released from the PC application window if the Local button is shown.

:SETUp:MISC:REMOte:PORT

Function Sets or queries the TCP/IP communication port number for remote connection.

Syntax
```
:SETUp:MISC:REMOte:PORT<wsp><value>
:SETUp:MISC:REMOte:PORT?
```
<value>: 1 to 65535

Example
```
:SETUp:MISC:REMOte:PORT 8889
:SETUp:MISC:REMOte:PORT? -> 8889
```

Description For the port number, consult your network administrator.

7.9 Common Command Group

*CLS(CLear Status)

Function Clears all the event registers in the status byte register that are reflected by the summary, and the queues (excluding the output queue).

Syntax `*CLS`

Example `*CLS`

Description This command clears:

- Error queue
- Standard event status register
- Status byte register (excluding the 4th bit).

*ESR?(standard Event Status Register)

Function Queries and clears the standard event status register.

Syntax `*ESR?`

Example `*ESR? -> 255`

Description The command returns the value of the standard event status register as an integer. The value that is returned is the sum of the decimal numbers that correspond to the enabled bits of the standard event status register.

Bit	Name	Description
128	PON	Power on
64	URQ	(Empty. Outputs 0)
32	CME	Command error
16	EXE	Execution error
8	DDE	(Empty. Outputs 0)
4	QYE	Query alarm
2	RQL	(Empty. Outputs 0)
1	OPC	Command execution complete

*IDN?(IDeNtify)

Function Queries the instrument model.

Syntax `*IDN?`

Example `*IDN? ->`
`YOKOGAWA,AQ23811A,000000001,01.01`

Description The instrument model information is returned in the following format:
<manufacturer>, <model>, <serial number>, <firmware version>

*OPT?(OPTion)

Function Queries the installed options.

Syntax `*OPT?`

Example `*OPT? -> OPM_UNIT,"0"`

Description The option information is returned in the following format:
`OPM_UNIT,"0|1"`
OPM_UNIT: AQ740023
0: no connection
1: connected

*OPC?(OPeration Complete)

Function Returns ASCII code 1 if the wait for execution has ended.

Syntax `*OPC?`

Example `*OPC? -> 1`

*RST(ReSeT)

Function Initializes the settings. All ongoing processes are stopped. Clears the *OPC? command.

Syntax `*RST`

Example `*RST`

*WAI(WAIt)

Function Holds the execution of the subsequent command until all waiting states are completed.

Syntax `*WAI`

Example `*WAI`

Appendix 1 Using Open Source Software

Using Open Source Software

This product includes open source software.
For the license of each open source software, please refer to OLCR_Attribution.txt in the installation folder of the AQ7420 control software that is included with the product.
For the installation folder, see section 2.1.