

---

**User's  
Manual**

**AQ7420  
High-Resolution Reflectometer**

---

---

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.

<b>Document No.</b>	<b>Description</b>
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.
- The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of YOKOGAWA is strictly prohibited.

## Trademarks

- Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are either registered trademarks or trademarks of Adobe Systems Incorporated.
- In this manual, the ® and TM symbols do not accompany their respective registered trademark or trademark names.
- Other company and product names are registered trademarks or trademarks of their respective holders.

## Revisions

- 1st Edition: December 2024

# Terms and Conditions of the Software License

Yokogawa Test & Measurement Corporation, a Japanese corporation (hereinafter called "Yokogawa"), grants permission to use this Yokogawa Software Program (hereinafter called the "Licensed Software") to the Licensee on the conditions that the Licensee agrees to the terms and conditions stipulated in Article 1 hereof.

You, as the Licensee (hereinafter called "Licensee"), shall agree to the following terms and conditions for the software license (hereinafter called the "Agreement") based on the use intended for the Licensed Software.

Please note that Yokogawa grants the Licensee permission to use the Licensed Software under the terms and conditions herein and in no event shall Yokogawa intend to sell or transfer the Licensed Software to the Licensee.

Licensed Software Name: Control software for AQ7420  
Number of Client License: Unlimited

## Article 1 (Scope Covered by these Terms and Conditions)

- 1.1 The terms and conditions stipulated herein shall be applied to any Licensee who purchases the Licensed Software on the condition that the Licensee consents to agree to the terms and conditions stipulated herein.
- 1.2 The "Licensed Software" herein shall mean and include all applicable programs and documentation, without limitation, all proprietary technology, algorithms, and know-how such as a factor, invariant or process contained therein.

## Article 2 (Grant of License)

- 2.1 Yokogawa grants the Licensee, for the purpose of single use, non-exclusive and non-transferable license of the Licensed Software with the license fee separately agreed upon by both parties. Yokogawa allows the Licensee to use only one instance of the software for use on one device, whether that device is physical or virtual. If the Licensee want to use the software on more than one virtual device, the Licensee must obtain a separate Licensed Software for each instance.
- 2.2 The Licensee is, unless otherwise agreed in writing by Yokogawa, not entitled to copy, change, sell, distribute, transfer, or sublicense the Licensed Software.
- 2.3 The Licensed Software shall not be copied in whole or in part except for keeping one (1) copy for back-up purposes. The Licensee shall secure or supervise the copy of the Licensed Software by the Licensee itself with great, strict, and due care.
- 2.4 In no event shall the Licensee dump, reverse assemble, reverse compile, or reverse engineer the Licensed Software so that the Licensee may translate the Licensed Software into other programs or change it into a man-readable form from the source code of the Licensed Software. Unless otherwise separately agreed by Yokogawa, Yokogawa shall not provide the Licensee the source code for the Licensed Software.
- 2.5 The Licensed Software and its related documentation shall be the proprietary property or trade secret of Yokogawa or a third party which grants Yokogawa the rights. In no event shall the Licensee be transferred, leased, sublicensed, or assigned any rights relating to the Licensed Software.
- 2.6 Yokogawa may use or add copy protection in or onto the Licensed Software. In no event shall the Licensee remove or attempt to remove such copy protection.
- 2.7 The Licensed Software may include a software program licensed for re-use by a third party (hereinafter called "Third Party Software", which may include any software program from affiliates of Yokogawa made or coded by themselves.) In the case that Yokogawa is granted permission to sublicense to third parties by any licensors (sub-licensor) of the Third Party Software pursuant to different terms and conditions than those stipulated in this Agreement, the Licensee shall observe such terms and conditions of which Yokogawa notifies the Licensee in writing separately.
- 2.8 Yokogawa software products may contain open source software (hereafter referred to as OSS). For the OSS, terms and conditions provided separately apply with higher precedence than those of this agreement.

## Article 3 (Restriction of Specific Use)

- 3.1 The Licensed Software shall not be intended specifically to be designed, developed, constructed, manufactured, distributed or maintained for the purpose of the following events:
  - a) Operation of any aviation, vessel, or support of those operations from the ground;;
  - b) Operation of nuclear products and/or facilities;;
  - c) Operation of nuclear weapons and/or chemical weapons and/or biological weapons; or
  - d) Operation of medical instrumentation directly utilized for humankind or the human body.
- 3.2 Even if the Licensee uses the Licensed Software for the purposes in the preceding Paragraph 3.1, Yokogawa has no liability to or responsibility for any demand or damage arising out of the use or operations of the Licensed Software, and the Licensee agrees, on its own responsibility, to solve and settle the claims and damages and to defend, indemnify or hold Yokogawa totally harmless, from or against any liabilities, losses, damages and expenses (including fees for recalling the Products and reasonable attorney's fees and court costs), or claims arising out of and related to the above-said claims and damages.

## Article 4 (Warranty)

- 4.1 The Licensee shall agree that the Licensed Software shall be provided to the Licensee on an "as is" basis when delivered. If defect(s), such as damage to the medium of the Licensed Software, attributable to Yokogawa is found, Yokogawa agrees to replace, free of charge, any Licensed Software on condition that the defective Licensed Software shall be returned to Yokogawa's specified authorized service facility within seven (7) days after opening the Package at the Licensee's expense. As the Licensed Software is provided to the Licensee on an "as is" basis when delivered, in no event shall Yokogawa warrant that any information on or in the Licensed Software, including without limitation, data on computer programs and program listings, be completely accurate, correct, reliable, or the most updated.
- 4.2 Notwithstanding the preceding Paragraph 4.1, when third party software is included in the Licensed Software, the warranty period and terms and conditions that apply shall be those established by the provider of the third party software.
- 4.3 When Yokogawa decides in its own judgement that it is necessary, Yokogawa may from time to time provide the Licensee with Revision upgrades and Version upgrades separately specified by Yokogawa (hereinafter called "Updates").
- 4.4 Notwithstanding the preceding Paragraph 4.3, in no event shall Yokogawa provide Updates where the Licensee or any third party conducted renovation or improvement of the Licensed Software.
- 4.5 THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WRITTEN, ORAL, OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY YOKOGAWA AND ALL THIRD PARTIES LICENSING THIRD PARTY SOFTWARE TO YOKOGAWA.
- 4.6 Correction of nonconformity in the manner and for the period of time provided above shall be the Licensee's sole and exclusive remedy for any failure of Yokogawa to comply with its obligations and shall constitute fulfillment of all liabilities of Yokogawa and any third party licensing the Third Party Software to Yokogawa (including any liability for direct, indirect, special, incidental or consequential damages) whether in warranty, contract, tort (including negligence but excluding willful conduct or gross negligence by Yokogawa) or otherwise with respect to or arising out of the use of the Licensed Software.

## Article 5 (Infringement)

- 5.1 If and when any third party should demand injunction, initiate a law suit, or demand compensation for damages against the Licensee under patent right (including utility model right, design patent, and trade mark), copy right, and any other rights relating to any of the Licensed Software, the Licensee shall notify Yokogawa in writing to that effect without delay.
- 5.2 In the case of the preceding Paragraph 5.1, the Licensee shall assign to Yokogawa all of the rights to defend the Licensee and to negotiate with the claiming party. Furthermore, the Licensee shall provide Yokogawa with necessary information or any other assistance for Yokogawa's defense and negotiation. If and when such a claim should be attributable to Yokogawa, subject to the written notice to Yokogawa stated in the preceding Paragraph 5.1, Yokogawa shall defend the Licensee and negotiate with the claiming party at Yokogawa's cost and expense and be responsible for the final settlement or judgment granted to the claiming party in the preceding Paragraph 5.1.
- 5.3 When any assertion or allegation of the infringement of the third party's rights defined in Paragraph 5.1 is made, or when at Yokogawa's judgment there is possibility of such assertion or allegation, Yokogawa will, at its own discretion, take any of the following countermeasures at Yokogawa's cost and expense.
  - a) To acquire the necessary right from a third party which has lawful ownership of the right so that the Licensee will be able to continue to use the Licensed Software;
  - b) To replace the Licensed Software with an alternative one which avoids the infringement; or
  - c) To remodel the Licensed Software so that the Licensed Software can avoid the infringement of such third party's right.
- 5.4 If and when Yokogawa fails to take either of the countermeasures as set forth in the preceding subparagraphs of Paragraph 5.3, Yokogawa shall indemnify the Licensee only by paying back the price amount of the Licensed Software which Yokogawa has received from the Licensee. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF YOKOGAWA AND ANY THIRD PARTY LICENSING THIRD PARTY SOFTWARE TO YOKOGAWA WITH RESPECT TO INFRINGEMENT OF THE INTELLECTUAL PROPERTY RIGHTS INCLUDING BUT NOT LIMITED TO, PATENT AND COPYRIGHT.
- 5.5 Regardless of this article, the terms and conditions provided separately apply to demands for compensation or the like arising from the use of the Third-Party Software or OSS.

### Article 6 (Liabilities)

- 6.1 If and when the Licensee should incur any damage relating to or arising out of the Licensed Software or service that Yokogawa has provided to the Licensee under the conditions herein due to a reason attributable to Yokogawa, Yokogawa shall take actions in accordance with this Agreement. However, in no event shall Yokogawa be liable or responsible for any special, incidental, consequential and/or indirect damage, whether in contract, warranty, tort, negligence, strict liability, or otherwise, including, without limitation, loss of operational profit or revenue, loss of use of the Licensed Software, or any associated products or equipment, cost of capital, loss or cost of interruption of the Licensee's business, substitute equipment, facilities or services, downtime costs, delays, and loss of business information, or claims of customers of Licensee or other third parties for such or other damages. Even if Yokogawa is liable or responsible for the damages attributable to Yokogawa and to the extent of this Article 6, Yokogawa's liability for the Licensee's damage shall not exceed the price amount of the Licensed Software or service fee which Yokogawa has received. Please note that Yokogawa shall be released or discharged from part or all of the liability under this Agreement if the Licensee modifies, remodels, combines with other software or products, or causes any deviation from the basic specifications or functional specifications, without Yokogawa's prior written consent.
- 6.2 All causes of action against Yokogawa arising out of or relating to this Agreement or the performance or breach hereof shall expire unless Yokogawa is notified of the claim within one (1) year of its occurrence.
- 6.3 In no event, regardless of cause, shall Yokogawa assume responsibility for or be liable for penalties or penalty clauses in any contracts between the Licensee and its customers.

### Article 7 (Limit of Export)

Unless otherwise agreed by Yokogawa, the Licensee shall not directly or indirectly export or transfer the Licensed Software to any countries other than those where Yokogawa permits export in advance.

### Article 8 (Term)

This Agreement shall become effective on the date when the Licensee receives the Licensed Software and continues in effect unless or until terminated as provided herein, or the Licensee ceases using the Licensed Software by itself or with Yokogawa's thirty (30) days prior written notice to the Licensee.

### Article 9 (Injunction for Use)

During the term of this Agreement, Yokogawa may, at its own discretion, demand injunction against the Licensee in case that Yokogawa deems that the Licensed Software is used improperly or under severer environments other than those where Yokogawa has first approved, or any other condition which Yokogawa may not permit.

### Article 10 (Termination)

Yokogawa, at its sole discretion, may terminate this Agreement without any notice or reminder to the Licensee if the Licensee violates or fails to perform this Agreement. However, Articles 5, 6, and 11 shall survive even after the termination.

### Article 11 (Jurisdiction)

Any dispute, controversies, or differences between the parties hereto as to interpretation or execution of this Agreement shall be resolved amicably through negotiation between the parties upon the basis of mutual trust. Should the parties fail to agree within ninety (90) days after notice from one of the parties to the other, both parties hereby irrevocably submit to the exclusive jurisdiction of the Tokyo District Court (main office) in Japan for settlement of the dispute.

### Article 12 (Governing Law)

This Agreement shall be governed by and construed in accordance with the laws of Japan. The Licensee expressly agrees to waive absolutely and irrevocably and to the fullest extent permissible under applicable law any rights against the laws of Japan which it may have pursuant to the Licensee's local law.

### Article 13 (Severability)

In the event that any provision hereof is declared or found to be illegal by any court or tribunal of competent jurisdiction, such provision shall be null and void with respect to the jurisdiction of that court or tribunal and all the remaining provisions hereof shall remain in full force and effect.

### Article 14 (Change in Agreement)

The contents of this contract, contents of this product, specifications of the licensed software, related support and other related services can be changed at Yokogawa's discretion.

# 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

Terms and Conditions of the Software License.....	ii
Manuals .....	iv
Conventions used in this manual.....	v

## Chapter 1 Features

1.1 Overview .....	1-1
1.2 Optical Return Loss (RL) Measurement.....	1-3
1.3 Burnout Detection (Detection).....	1-5
1.4 Optical Insertion Loss (IL) Measurement .....	1-6
1.5 Analysis.....	1-8
1.6 Saving and Printing Data .....	1-10
1.7 Remote Control .....	1-13

## Chapter 2 Installing the PC application

2.1 Installation .....	2-1
2.2 Running and Closing the Application .....	2-5

## Chapter 3 Setup

3.1 Description of the Setup Window .....	3-1
3.2 Measurement Conditions .....	3-3
3.3 Judgment Conditions (Analysis).....	3-6
3.4 Data Save Conditions .....	3-8
3.5 Remote Conditions.....	3-10

## Chapter 4 Performing Measurements

4.1 Description of the Main Window.....	4-1
4.2 Measurement Precautions .....	4-3
4.3 Reference Measurement.....	4-4
4.4 DUT Measurement.....	4-14

## Chapter 5 Analysis

5.1 Description of the Analysis Window .....	5-1
5.2 Marker and Cursor Operations.....	5-3

## Chapter 6 Saving and Printing Data

6.1 Saving and Loading Waveform Data.....	6-1
6.2 Printing Reports .....	6-3

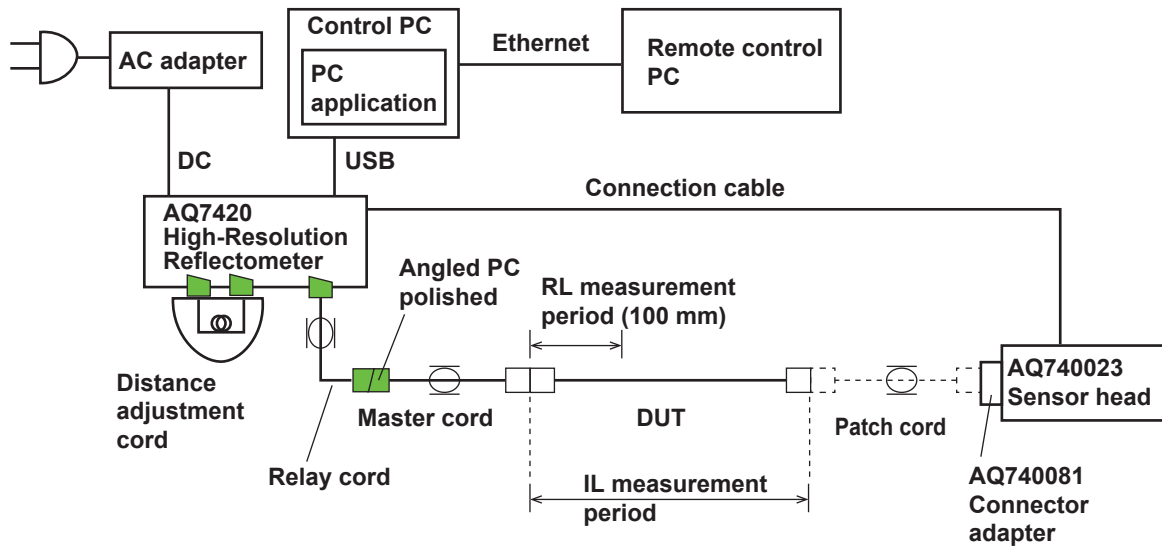
<b>Chapter 7</b>	<b>Remote Control</b>	
7.1	Remote Control.....	7-1
7.2	Programming Overview.....	7-3
7.3	List of Commands .....	7-6
7.4	IDWrite Group .....	7-8
7.5	LOGIn Group.....	7-9
7.6	LOGOut Group.....	7-10
7.7	MAIN Group .....	7-11
7.8	SETUp Group.....	7-13
7.9	Common Command Group.....	7-17
<b>Appendix</b>		
Appendix 1	Using Open Source Software.....	App-1





# 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.

# 1.1 Overview

## PC application window

**Judgment result**

**AQ7420**

Unit: Sessor      Wavelength: 1.31, 1.55µm      Mode: IL, RL, Detection

Item	Criteria	Value	Criteria	Value
IL [dB]	<=0.40	-	<=0.40	-
RL [dB]	<= -50.00	-55.33	<= -50.00	-60.59
Detection #1	<= -90.00	3	Detection not warranted	

\*1: Failure Point      Pass : Blue    Fail : Red

Serial No. 10

**Fail**

Return Loss (dB)

Distance (mm)

MEASURE

Reference

All ref

Detection ref

IL ref

Light Source Power

Product Information

Setup Data

Dist. Range 0 ~ 100mm

RL Range -50 ~ -100dB

Sampling Resolution High (1µm)

Average Times(Detection) 10

Index(=1.31µm) 1.467%

Index(=1.55µm) 1.452%

Stability Mode On

Average Time(DL) 0.1s

**Measurement results displayed numerically**

**Graph of waveform data**

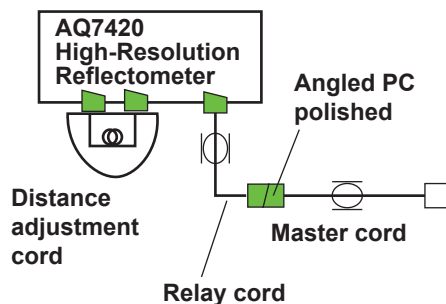
## 1.2 Optical Return Loss (RL) Measurement

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.

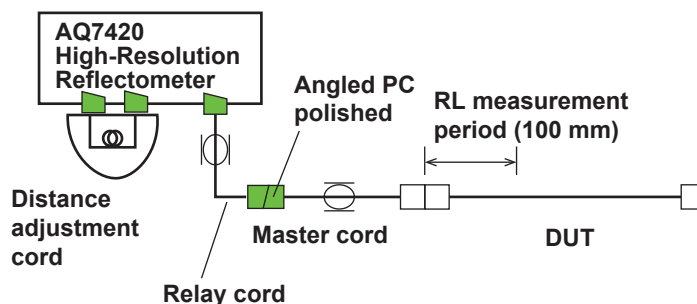
### Reference measurement

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.




## 1.2 Optical Return Loss (RL) Measurement

---

### Measurement result

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

● 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	

— RL value

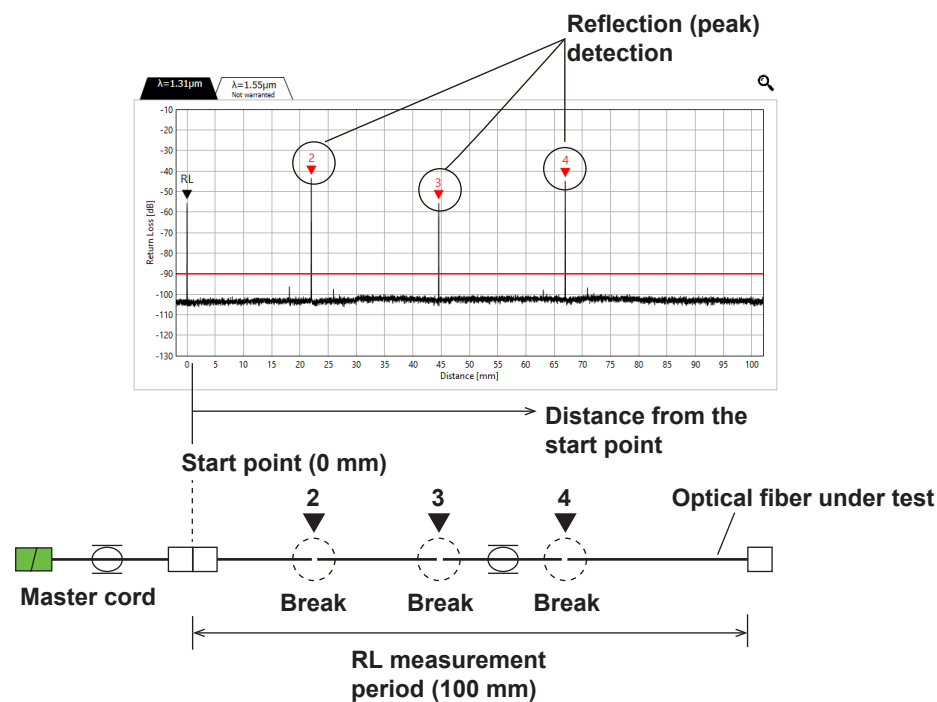
## 1.3 Burnout Detection (Detection)

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.



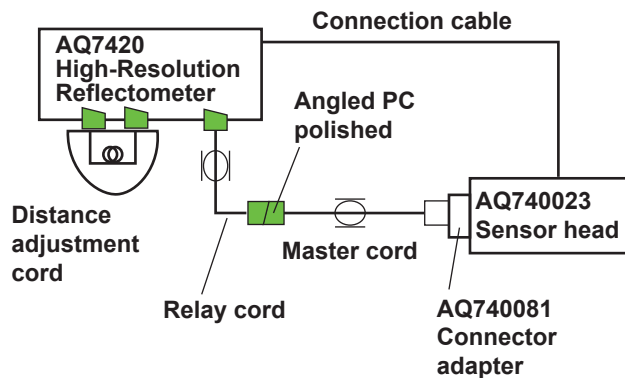
## 1.4 Optical Insertion Loss (IL) Measurement

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

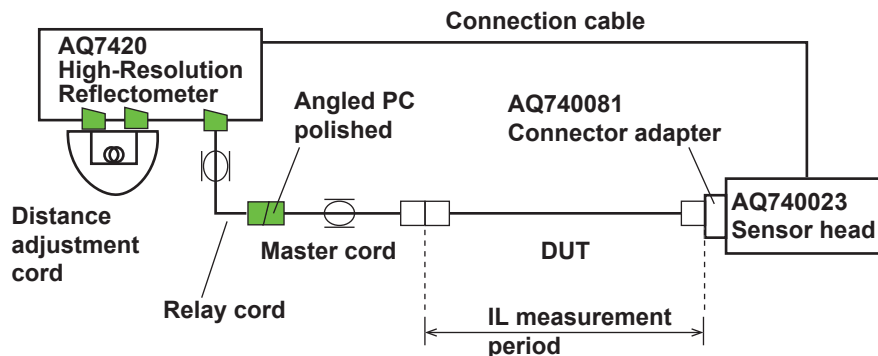
The light signal output from the AQ7420's built-in light source is directly input to the light detector of the AQ740023 to measure light intensity. This measurement is a reference measurement as it serves as a reference for comparison with the transmitted light of the DUT to be measured later. There 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).

● Measurement Value 

Item	$\lambda = 1.31\mu\text{m}$		$\lambda = 1.55\mu\text{m}$	
	Criteria	Value	Criteria	Value
IL [dB]	$\leq 0.40$	-5.848	$\leq 0.40$	-6.324
RL [dB]	$\leq -50.00$	-51.65	$\leq -50.00$	-55.22
Detection *1	$\leq -90.00$	3	Out of warranty	

IL value

## 1.5 Analysis

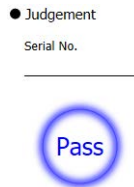
### Pass/fail judgment

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	$\lambda = 1.31\mu\text{m}$		$\lambda = 1.55\mu\text{m}$	
	Criteria	Value	Criteria	Value
IL [dB]	$\leq 0.40$	-5.848	$\leq 0.40$	-6.324
RL [dB]	$\leq -50.00$	-51.65	$\leq -50.00$	-55.22
Detection *1	$\leq -90.00$	3	Out of warranty	

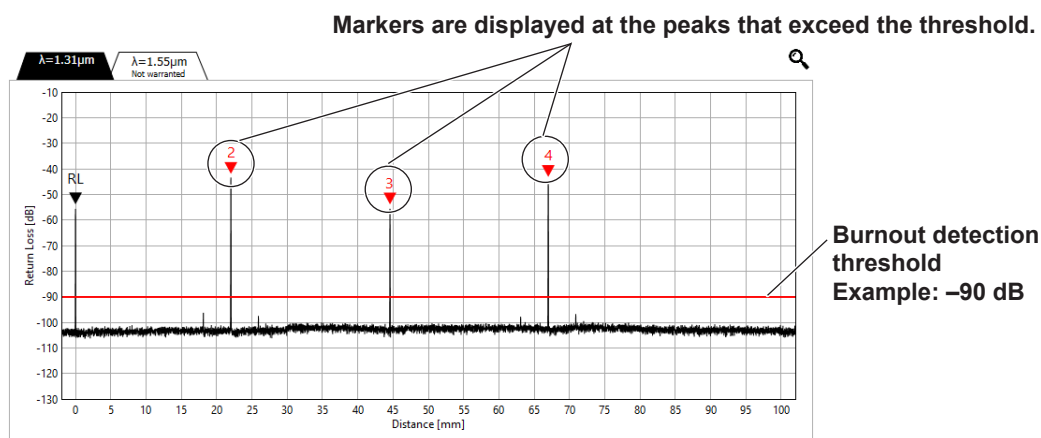
\*1: Failure Point Pass : Blue Fail : Red

**Judgment result indicated  
by the color of the value**



### Measurement result (waveform)

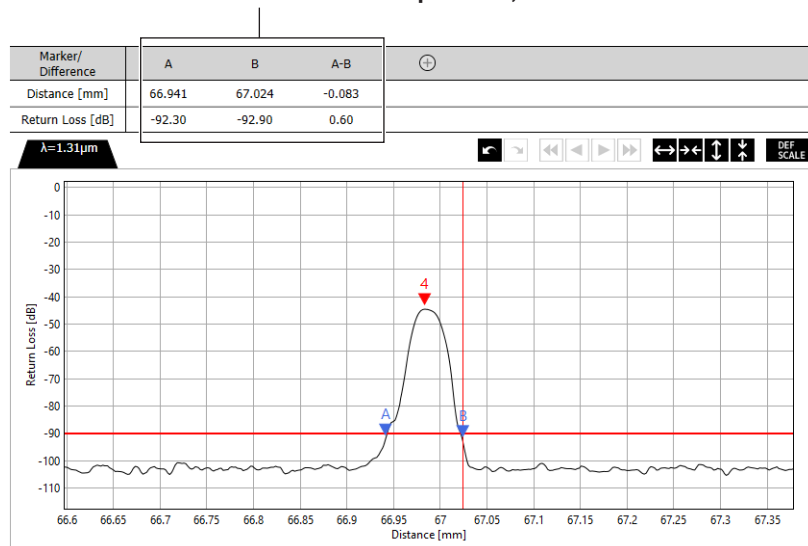
If the value of the return loss of each peak in the burnout detection (Detection) exceeds the threshold value, a marker is displayed on the waveform (peak) on the graphical display.



### Markers 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.

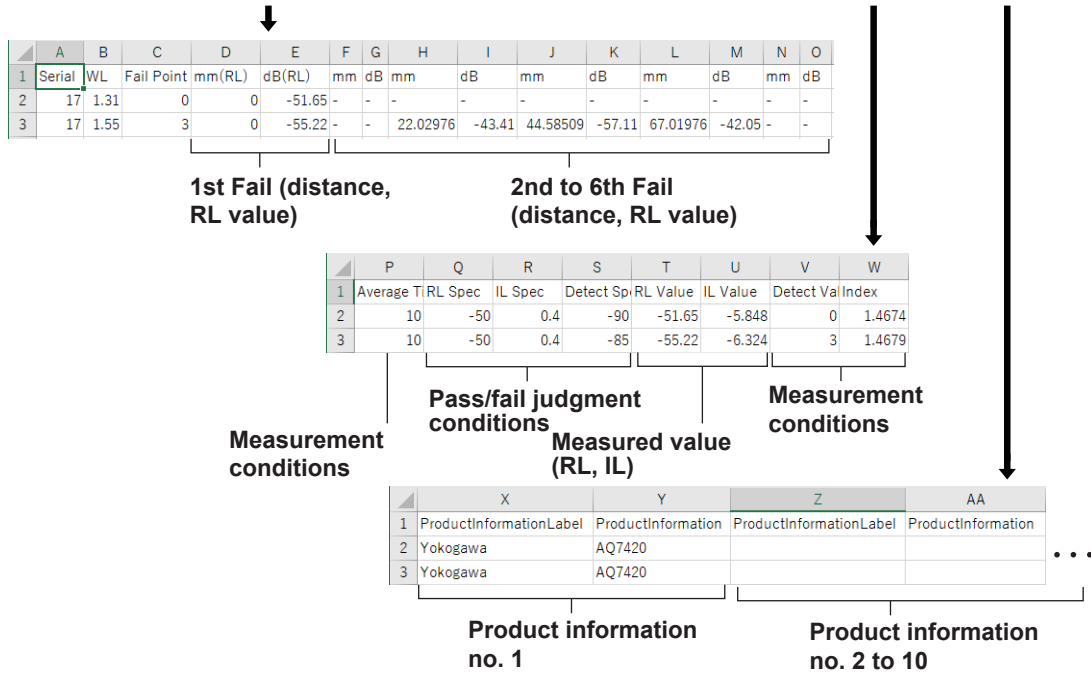
If the suffix code is -13NN, measured values for wavelength 1.31 μm are saved.

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



**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



Lines 5 and 6

See PS format.

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.

**OLCR Measuring Report**

Serial No. : 10  
 Measuring Time : 2024/12/02 08:37:29  
 Model : AQ7420  
 Unit : Sensor  
 Wavelength : 1.31, 1.55μm  
 Mode : IL,RL,Detection

**•Setup Data**

Setup File	Default
Dist. Range	0 ~ 100mm
RL Range	-50 ~ -100dB
Sampling resolution	High (1μm)
Average Times(Detection)	10
Index(λ=1.31μm)	1.4674
Index(λ=1.55μm)	1.4679
Stability On/Off	On
Average Time(IL)	0.1s

**•Latest Reference time**

Detection REF  
IL REF

**•Measurement Value**

Item	λ= 1.31μm		λ= 1.55μm	
	Criteria	Result	Criteria	Result
IL [dB]	<= 0.40	-	<= 0.40	-
RL [dB]	<= -50.00	-55.33	<= -50.00	-60.59
Detection(*1)	<= -90.00	3	Detection not warranted	

\*1: Failure point

Fail

**File information**

**•Product Information**

**Setup information**

**Measurement results (IL, RL, burnout detection)**

**•Detection Failure Data (λ= 1.31μm)**

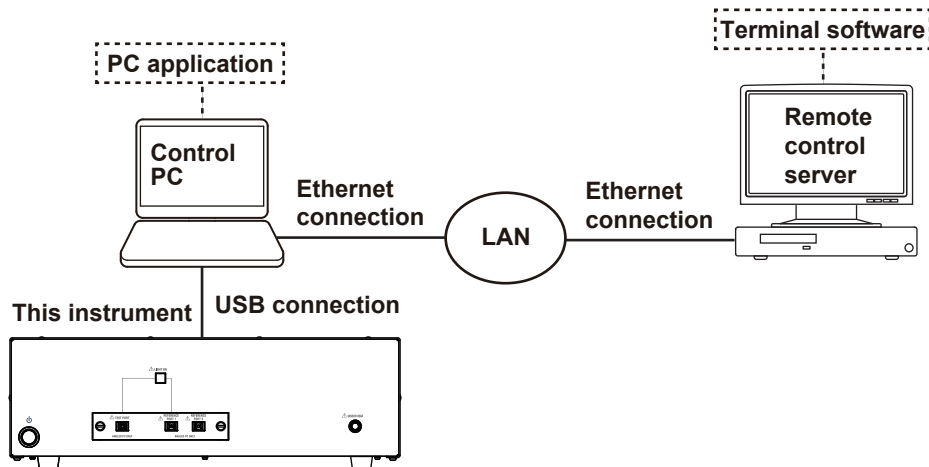
Area	RL	1	2	3	4	5
	0mm	0~20mm	20~40mm	40~60mm	60~80mm	80~100mm
Distance [mm]	-	-	22.017	44.560	66.986	-
Return Loss [dB]	-	-	-43.41	-55.35	-44.61	-

**YOKOGAWA** ◆

Burnout detection peak distribution display

Fail judgment peak display

## 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.

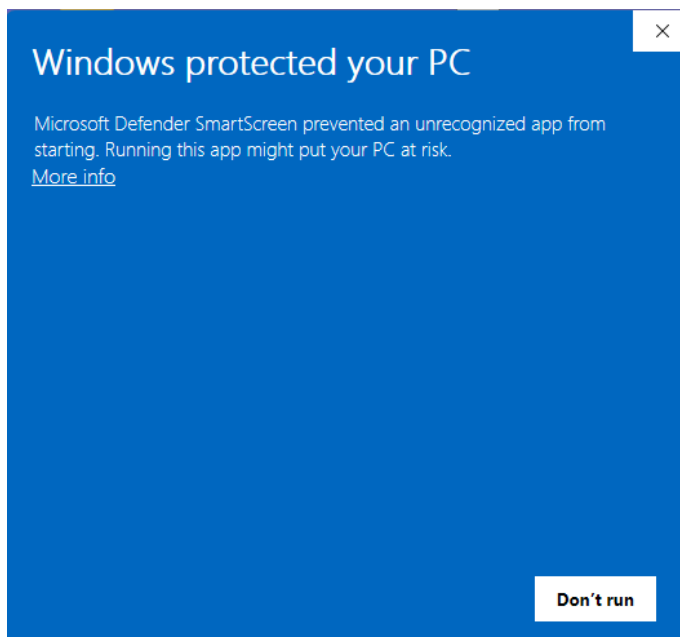
### Local control during remote control

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.

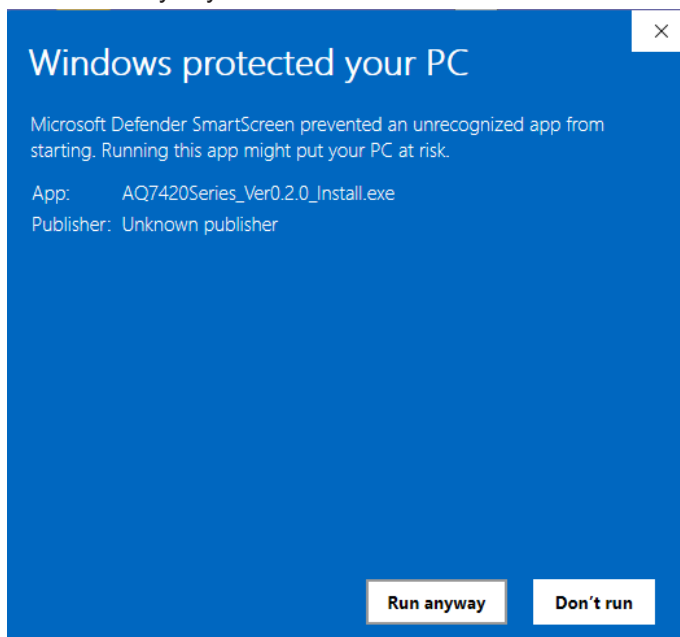
## 2.1 Installation

### 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.

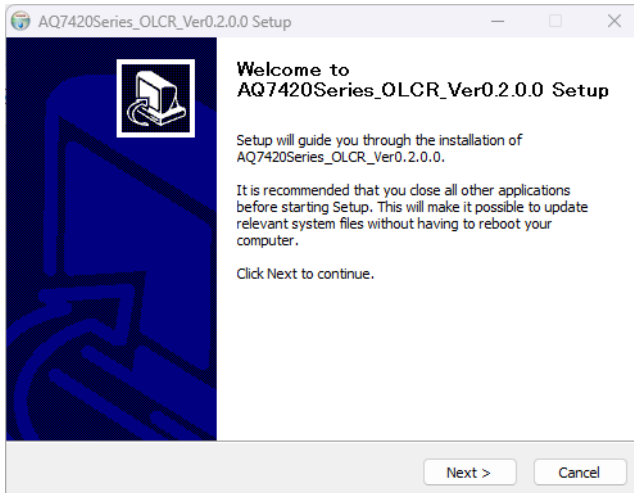


4. Click Run anyway. The installer runs.

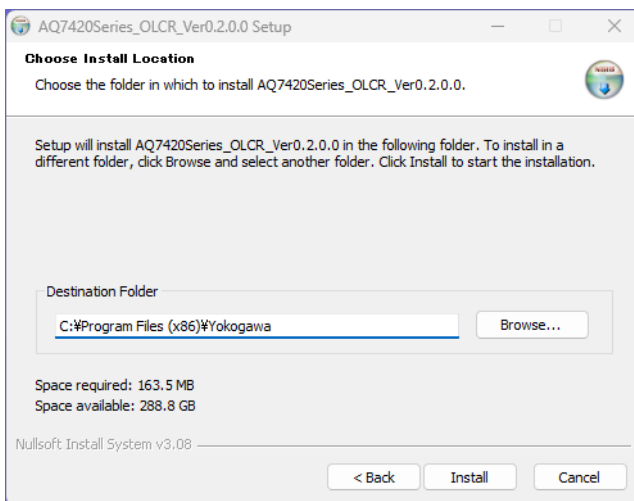


## 2.1 Installation

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

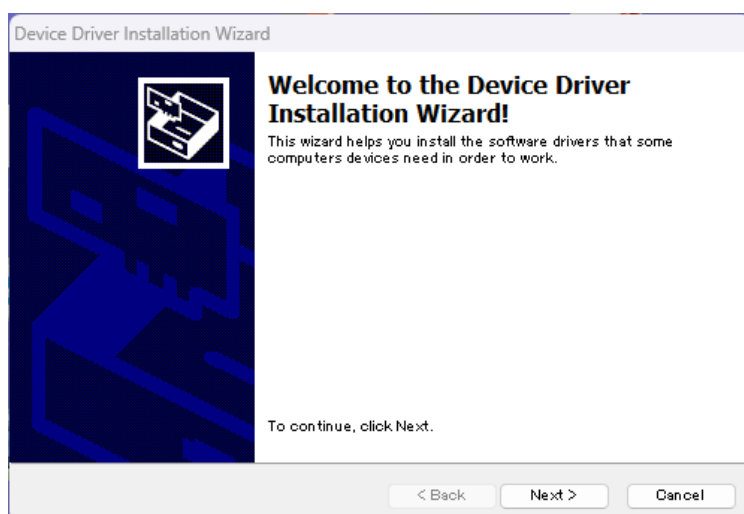
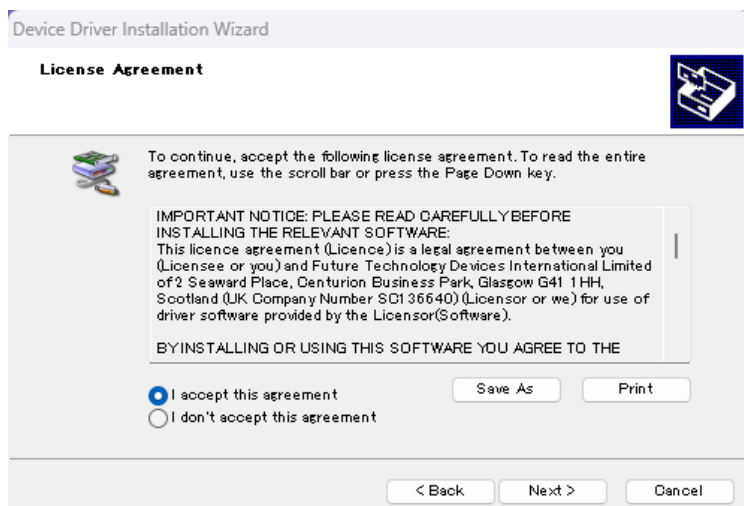
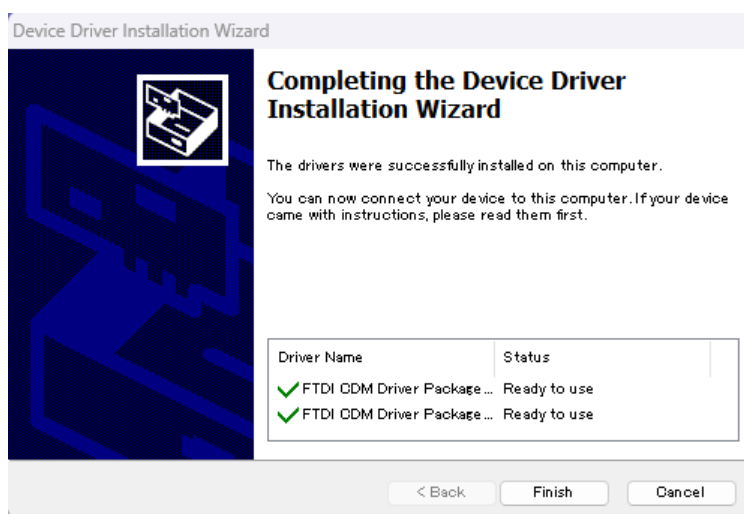


6. Select the installation drive and folder, and click **Install**. The PC application installation begins. The default install location is C:\Program Files(x86)\Yokogawa\. When the installation is complete, a driver installation window appears.



7. Click **Extract**.



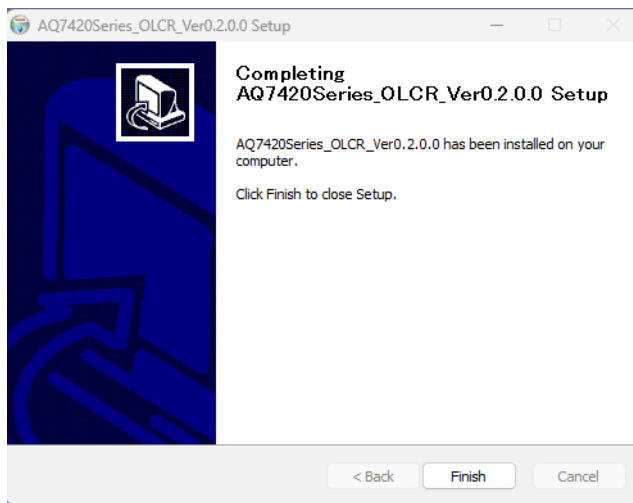
8. Click **Next**.9. Read the license agreement thoroughly. If you agree, click **I agree** and then click **Next**.10. Click **Done**.



## 2.1 Installation

---

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

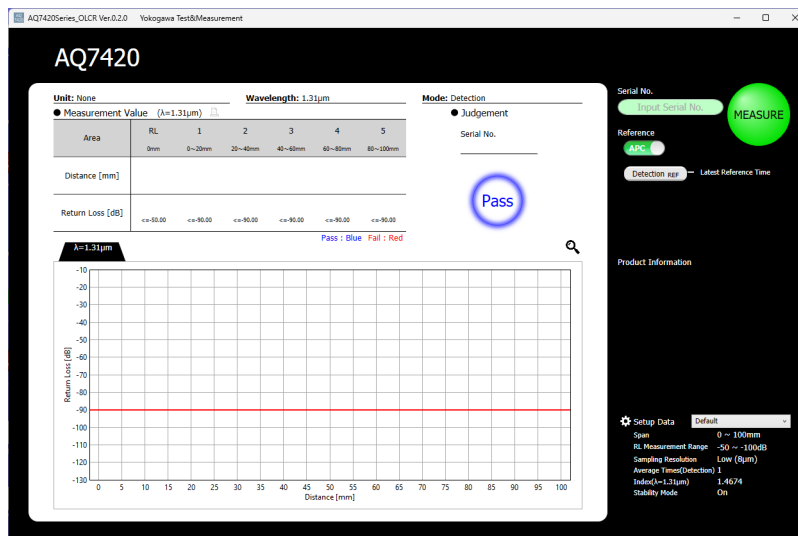
On the Windows start menu, click **Programs > AQ7420Series\_OLCR > AQ7420Series\_OLCR**, or double-click the AQ7420Series\_OLCR shortcut icon on the desktop.

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.

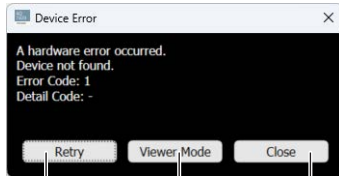
## 2.2 Running and Closing the Application

---

### 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

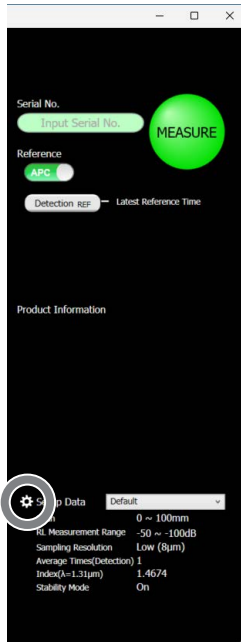
## Procedure

### Opening the setup window

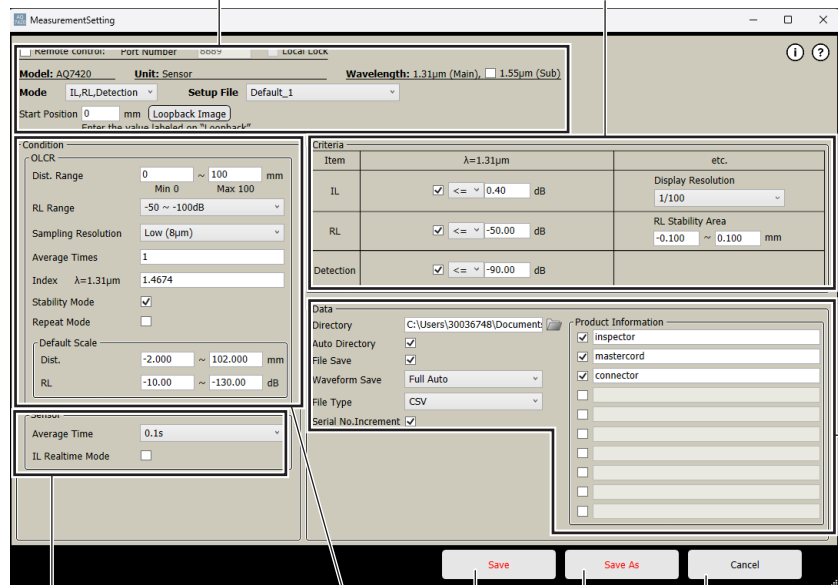
Set the measurement conditions and judgment conditions (analysis) of the instrument.

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

Main window (see section 4.1)



Setup window



Remote control condition area (see section 3.5)

Measurement condition area (see section 3.2)

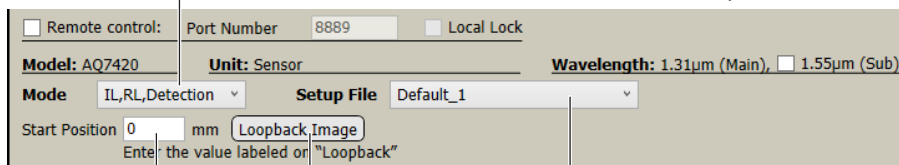
Saves setup information

Save as Cancel Data save condition area (see section 3.4)

### 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.

### 3.1 Description of the Setup Window

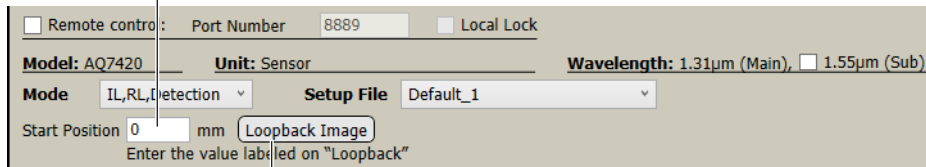
- **Setting the Start Position**

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.

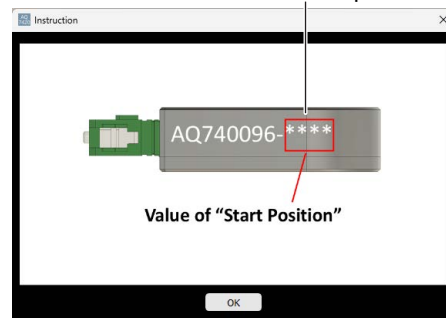


#### Loopback image

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.



Start position value



## 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.

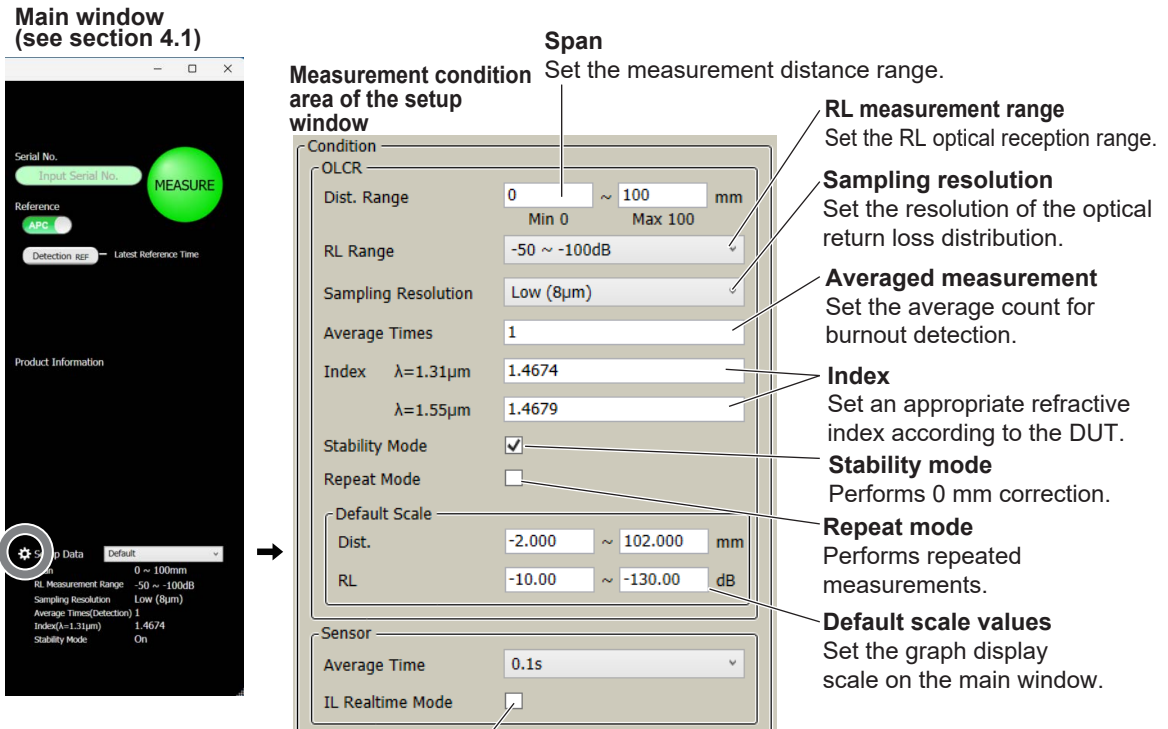
## 3.2 Measurement Conditions

### 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.



**Main window (see section 4.1)**

**Measurement condition area of the setup window**

**Span** Set the measurement distance range.

**RL measurement range** Set the RL optical reception range.

**Sampling resolution** Set the resolution of the optical return loss distribution.

**Averaged measurement** Set the average count for burnout detection.

**Index** Set an appropriate refractive index according to the DUT.

**Stability mode** Performs 0 mm correction.

**Repeat mode** Performs repeated measurements.

**Default scale values** Set the graph display scale on the main window.

**IL real-time mode**  
When enabled, only IL is constantly measured, and the display is updated in real time.

**Condition**

OLCR

Dist. Range 0 ~ 100 mm  
Min 0 Max 100

RL Range -50 ~ -100dB

Sampling Resolution Low (8 $\mu$ m)

Average Times 1

Index  $\lambda=1.31\mu$ m 1.4674  
 $\lambda=1.55\mu$ m 1.4679

Stability Mode

Repeat Mode

Default Scale

Dist. -2.000 ~ 102.000 mm

RL -10.00 ~ -130.00 dB

Sensor

Average Time 0.1s

IL Realtime Mode

#### 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 ( $1\ \mu\text{m}$ )  
Middle ( $4\ \mu\text{m}$ )  
Low ( $8\ \mu\text{m}$ )

##### 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)

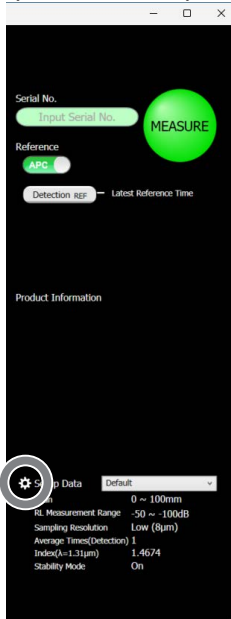
### Procedure

#### 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.

Main window  
(see section 4.1)



Judgment condition area  
of the setup window

#### IL threshold setting

Set the threshold for the pass/fail judgment of IL measurement.

Select this check box to enable the threshold.

#### IL display resolution

Set the number of decimal places of the IL display.

Criteria		$\lambda=1.31\mu\text{m}$	etc.
IL	<input checked="" type="checkbox"/> $\leq$	0.40 dB	Display Resolution 1/100
RL	<input checked="" type="checkbox"/> $\leq$	-50.00 dB	RL Stability Area -0.100 ~ 0.100 mm
Detection	<input checked="" type="checkbox"/> $\leq$	-90.00 dB	

#### Burnout detection threshold

Set the threshold for the pass/fail judgment of burnout detection.

#### RL stability area

Set the range for correcting the connection position of the master cord and DUT in stability mode.

#### RL threshold setting

Set the threshold for the pass/fail judgment of RL measurement.

### 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

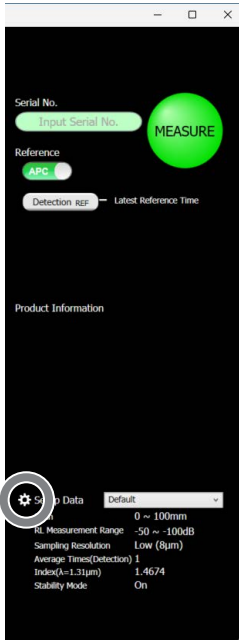
### Procedure

#### 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

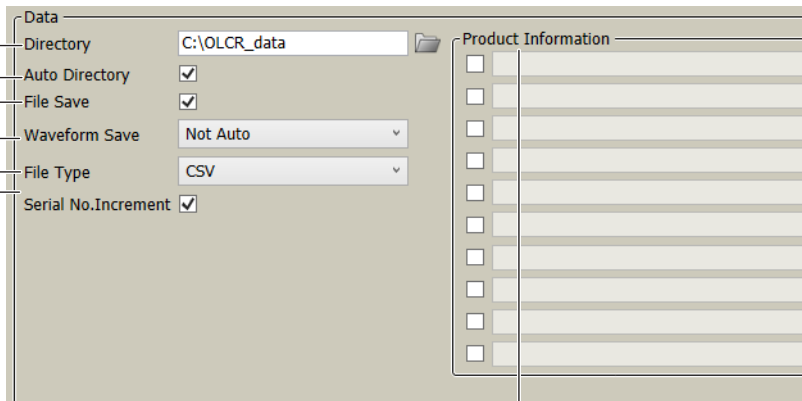
When enabled, numeric data of measurements are saved in a file per day.

#### 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

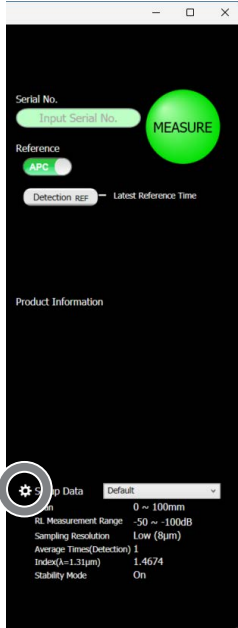
### Procedure

#### 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.

Main window  
(see section 4.1)



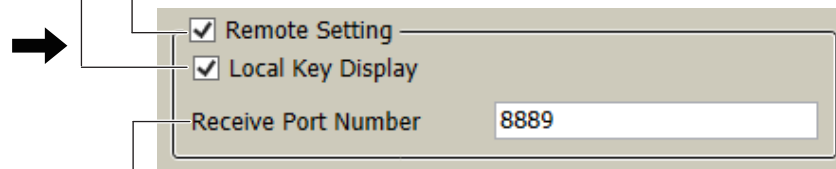
Remote condition area of  
the setup window

#### Local Key Display

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

#### Remote Setting

Enable this to use remote control over TCP-IP.



#### Receive Port Number

Set the port number for remote control.

### 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

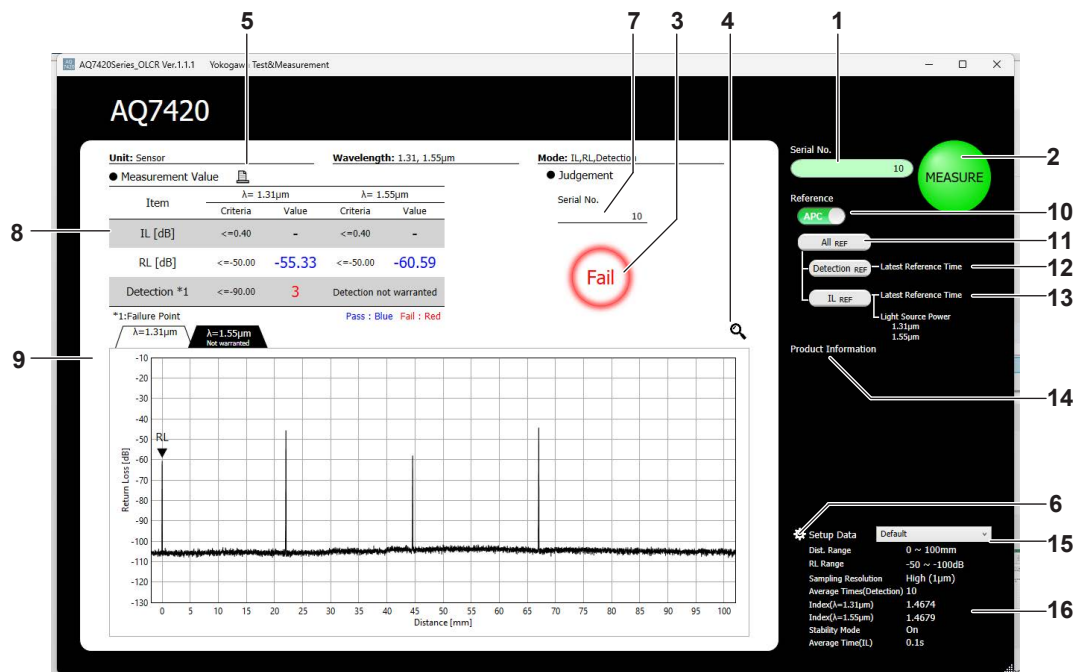
Enable this to show a connection release button on the window during remote control.

##### 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.

#### 4.1 Description of the Main Window

---

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  $\pm 1$  °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 $\mu\text{m}$

SM fiber (1.31  $\mu\text{m}$  zero dispersion) measurements at a wavelength of 1.55  $\mu\text{m}$  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  $\mu\text{m}$  zero dispersion) measurements at a wavelength of 1.55  $\mu\text{m}$  are not affected by the wavelength dispersion of the optical fiber cable, but measurements at a different wavelength of 1.31  $\mu\text{m}$  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.

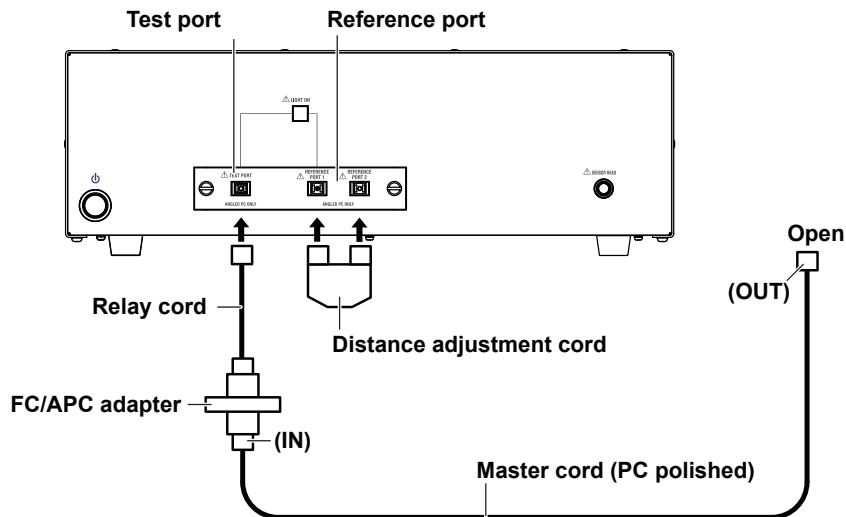
### Procedure

**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.



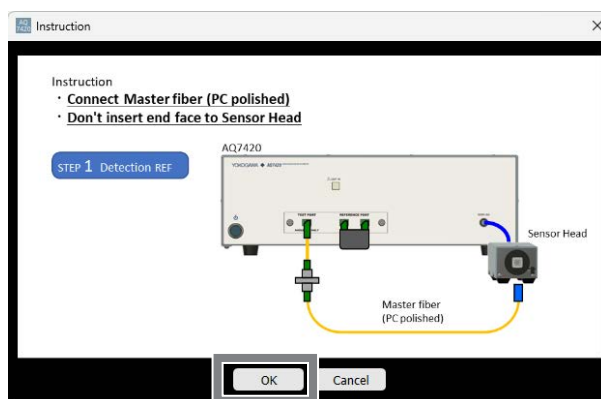
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC adapter.
6. Connect the other end of the FC adapter to the IN end of the master cord (PC polished).



### 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.



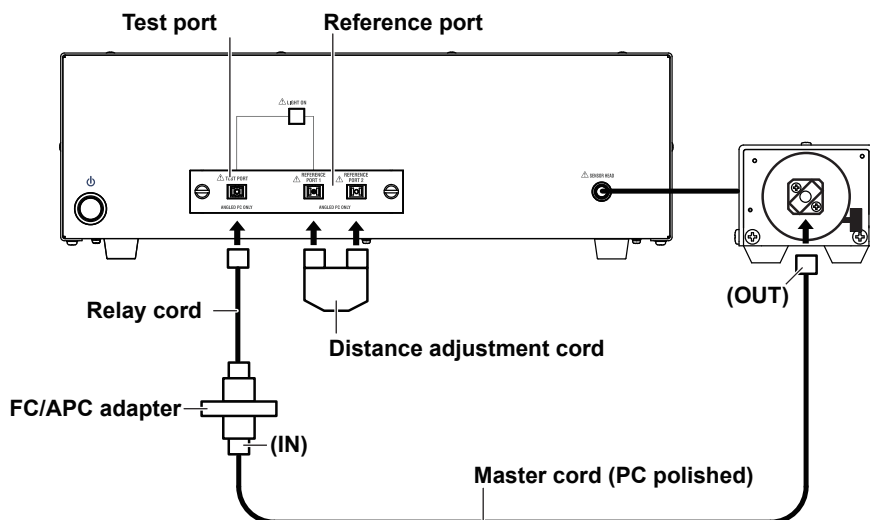
### 4.3 Reference Measurement

#### 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.



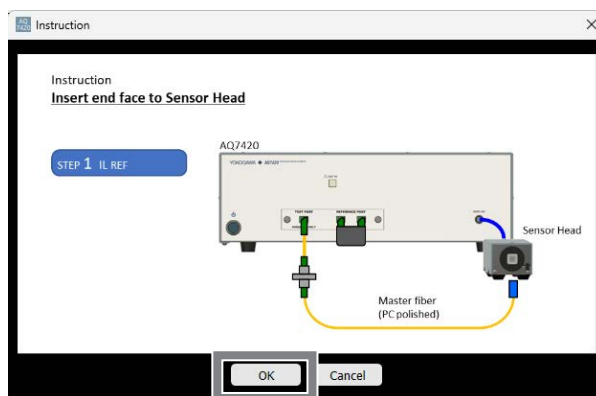
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC/APC adapter.
6. Connect the other end of the FC/APC adapter to IN end of the master cord.
7.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

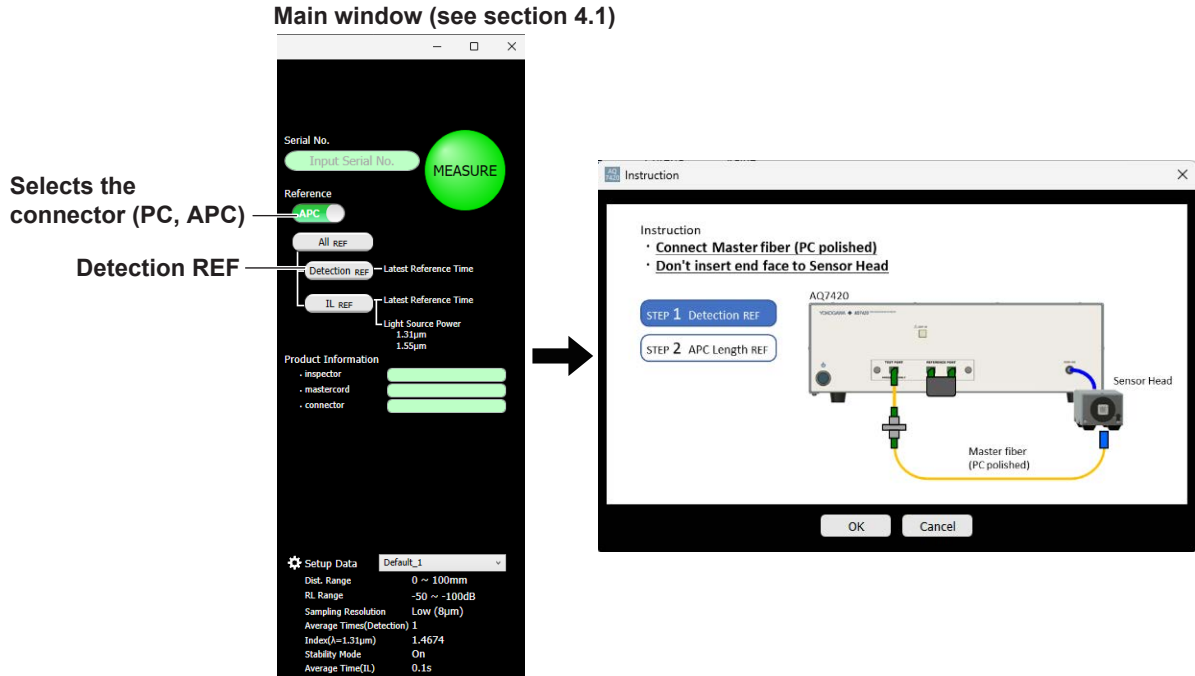
8. Click **OK**. A reference measurement (step 1) is executed. The instruction window will automatically close when the reference measurement is finished.



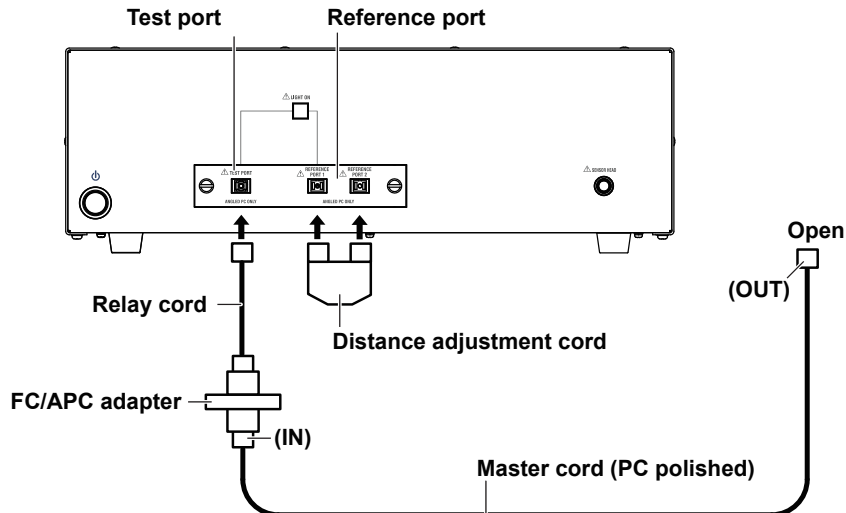
### 4.3 Reference Measurement

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

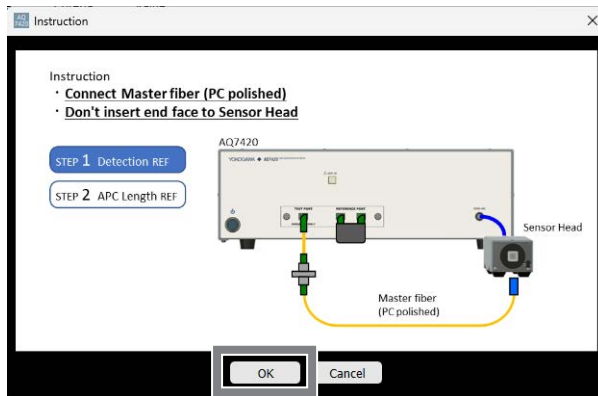
1. On the main window, set the target connector selection button to **APC**.
2. Click **Detection REF** on the main window. An Detection REF instruction window appears.



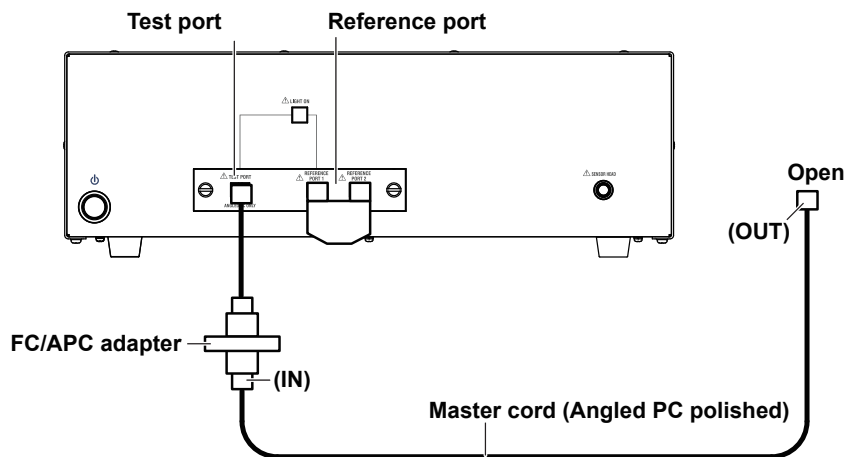
3. Connect the distance adjustment cord to the instrument's reference port.
4. Connect one end of the relay cord to the instrument's test port.
5. Connect the other end of the relay cord to one end of the FC adapter.
6. Connect the other end of the FC adapter to the IN end of the master cord (PC polished).



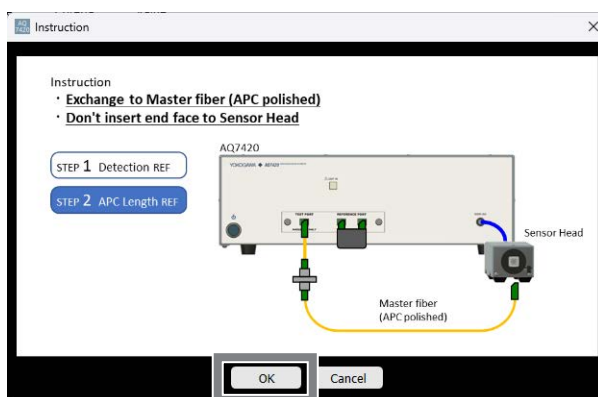
7. Click **OK**. A reference measurement (step 1) is executed.



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.



### 4.3 Reference Measurement

---

#### **Note**

---

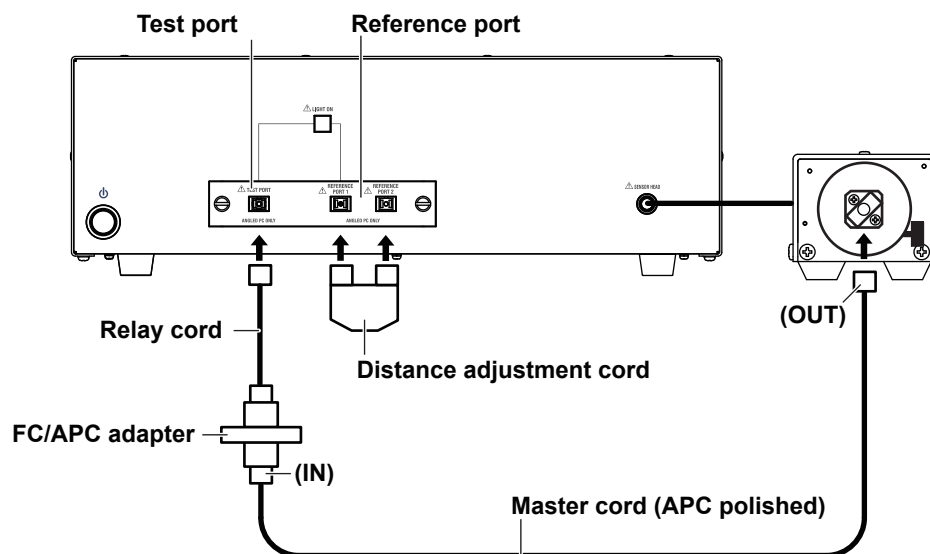
- Do not move the optical fiber cables during reference measurement.
  - Do not point the open end of the master cord at people.
  - Keep a space of at least 100 mm beyond the end face position (OUT) of the master cord, and do not place reflective objects.
  - If there is a large splice loss due to dirt 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.



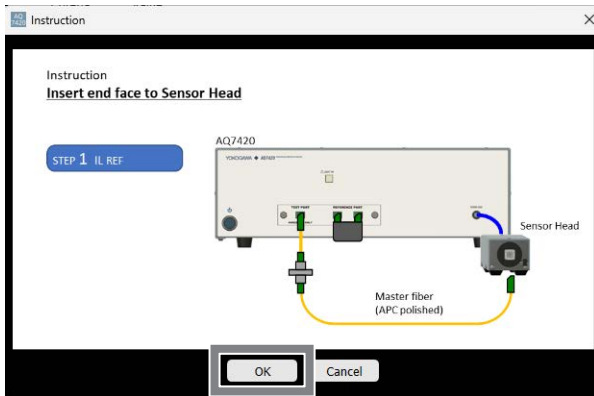


### 4.3 Reference Measurement

#### 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

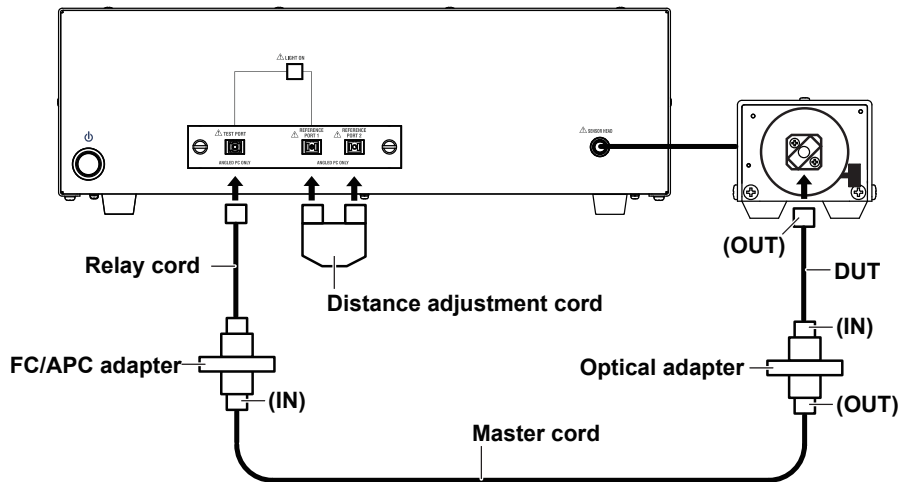
IL REF and Detection REF are executed simultaneously.

## 4.4 DUT Measurement

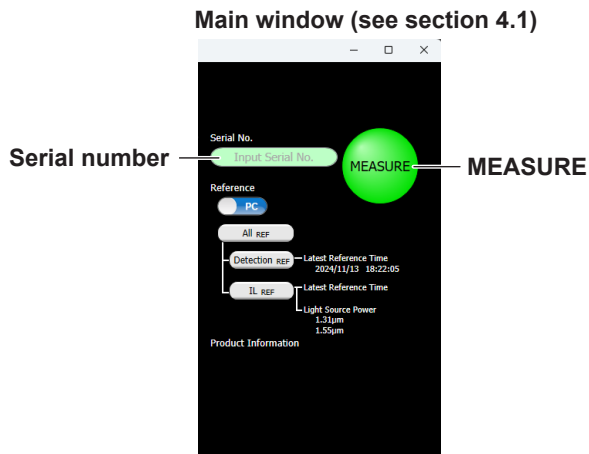
### Procedure

#### 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.



#### RL, burnout detection measurement

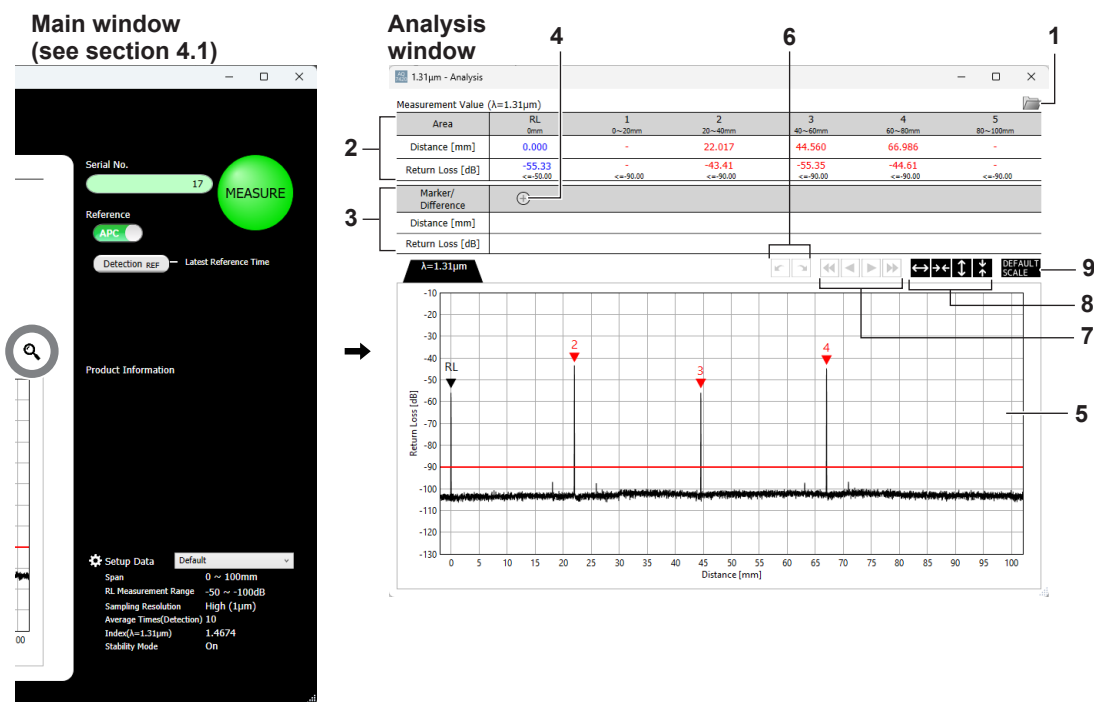
1. Connect the OUT end of the master cord to one end of another FC adapter you prepared.

# 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. <ul style="list-style-type: none"> <li>• When all measurement items are Pass, the judgment is shown as Pass in green.</li> <li>• If any item is Fail, the judgment is shown as Fail in red.</li> </ul>
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.

## 5.1 Description of the Analysis Window

### Explanation

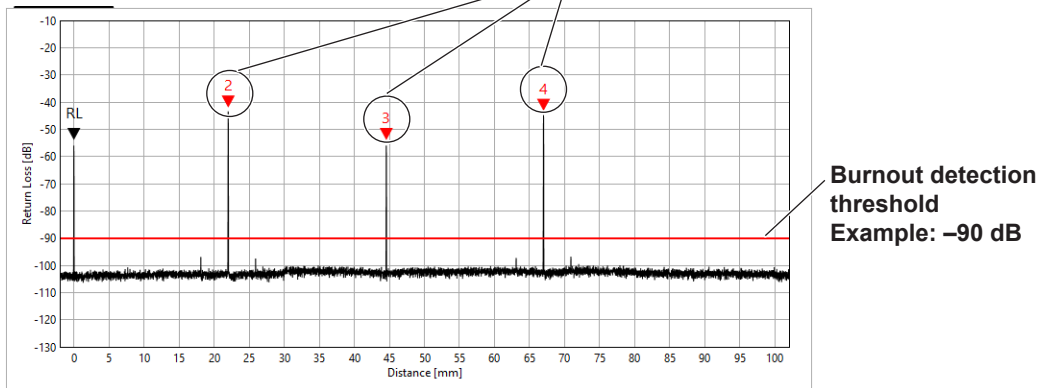
The distribution of burnout detection measured by the instrument is displayed in a graph, and the graph of detected burnouts (peaks) can be analyzed as a waveform. By using the cursor in the graph window and placing markers on the waveform, you can check the distance between the markers (Distance) and 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 ( $\lambda=1.31\mu\text{m}$ )						
Area	RL	1	2	3	4	5
	0mm	0~20mm	20~40mm	40~60mm	60~80mm	80~100mm
Distance [mm]	0.000	-	22.016	44.560	66.983	-
Return Loss [dB]	-51.65 $\leq -50.00$	- $\leq -90.00$	-43.89 $\leq -90.00$	-55.11 $\leq -90.00$	-44.58 $\leq -90.00$	- $\leq -90.00$

Markers are displayed at the peaks that exceed the threshold.



## 5.2 Marker and Cursor Operations

### Procedure

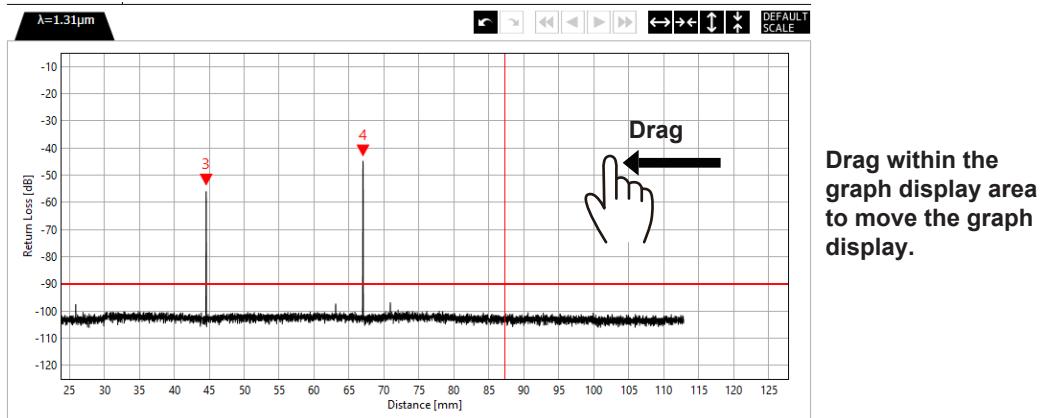
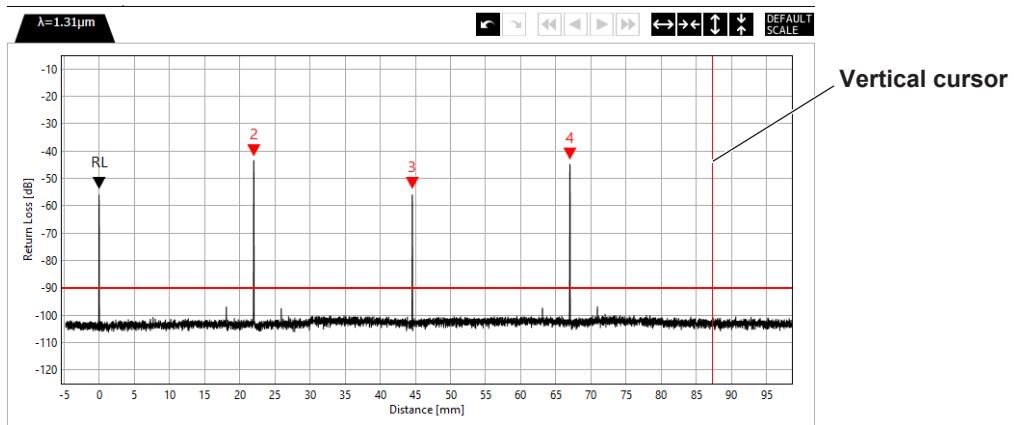
#### Opening the analysis window

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

#### Cursor operation

##### Displaying and moving the cursor

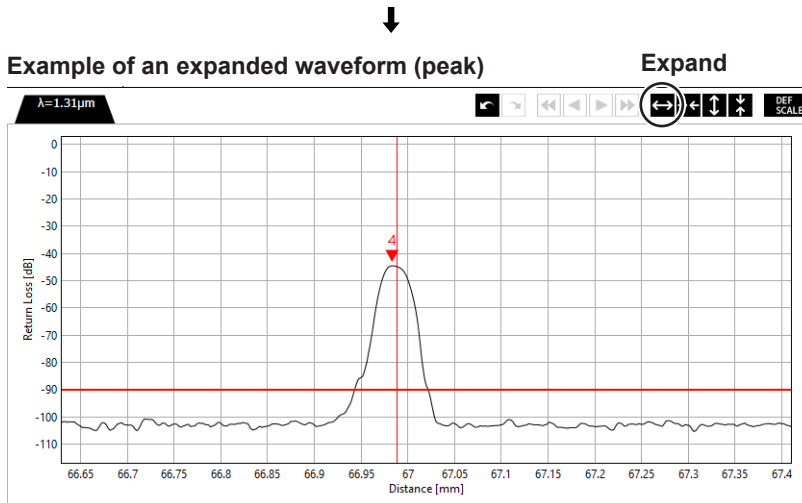
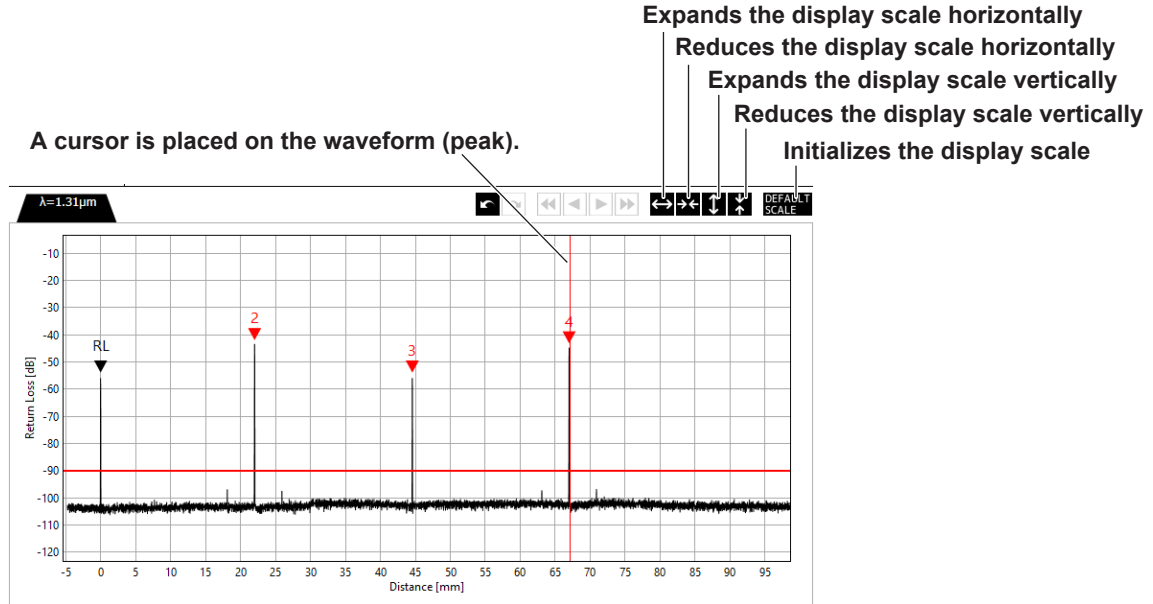
2. Click the graph display area. A vertical cursor appears at the clicked position.
3. Click on the destination of the cursor. The cursor moves to that position.



## 5.2 Marker and Cursor Operations

### 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.

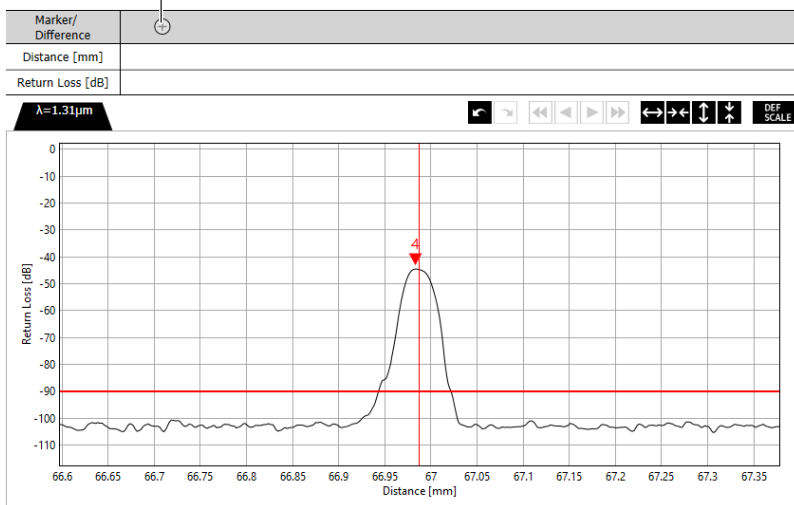


## Marker operation

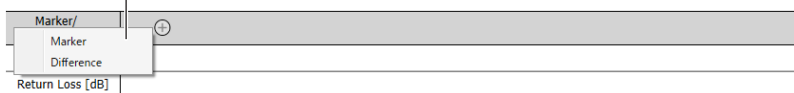
### Placing a marker

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.

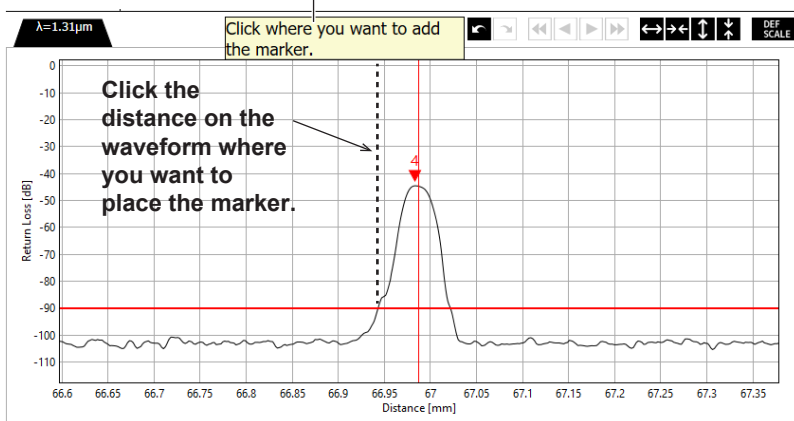
Marker add button



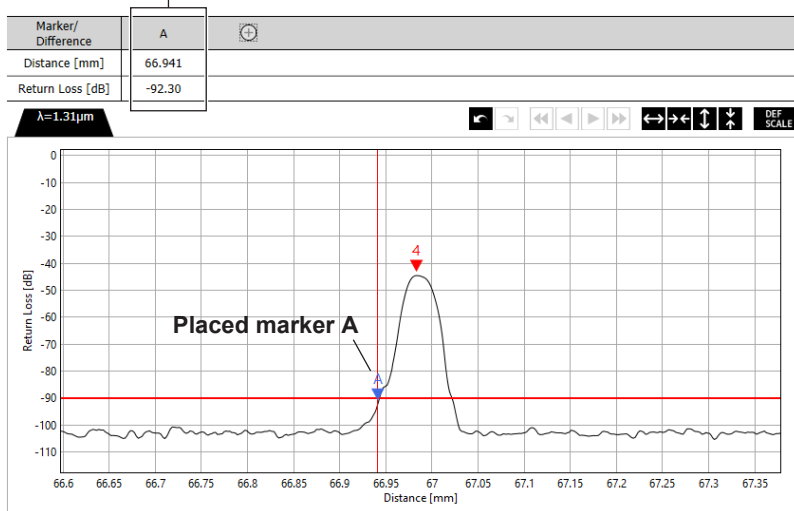
Marker add menu



Displayed message



The position and RL value of marker A



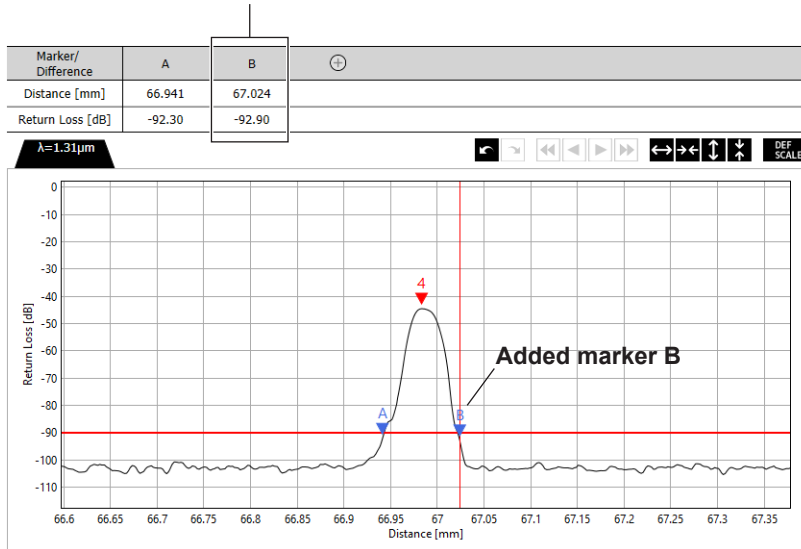


## 5.2 Marker and Cursor Operations

### Adding a marker

Repeat steps 2 to 4 on page 4-4.

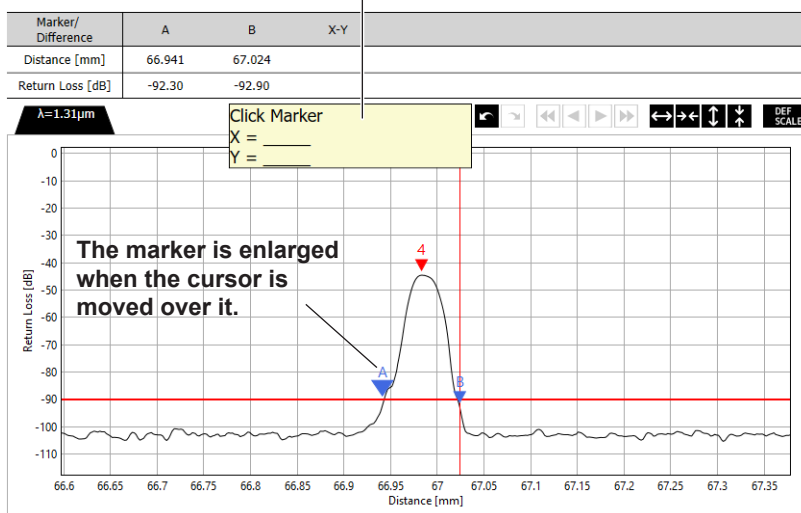
#### The position and RL value of marker B



### Displaying the marker measurement values between two points

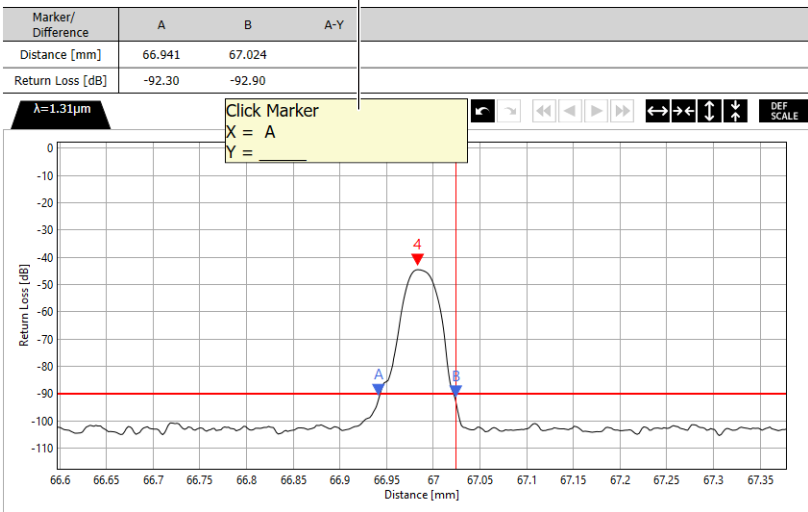
5. Click the marker add button. A marker add menu appears.
6. On the menu, click **Difference**. A message appears for specifying the two markers.
7. Move the mouse over the first marker. The marker is enlarged.

#### Message for specifying two markers



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

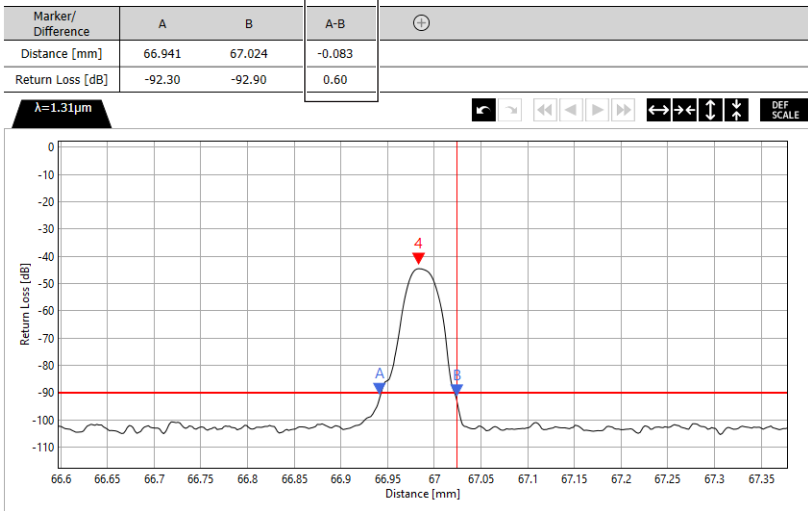
Marker A is used to find the X value.



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

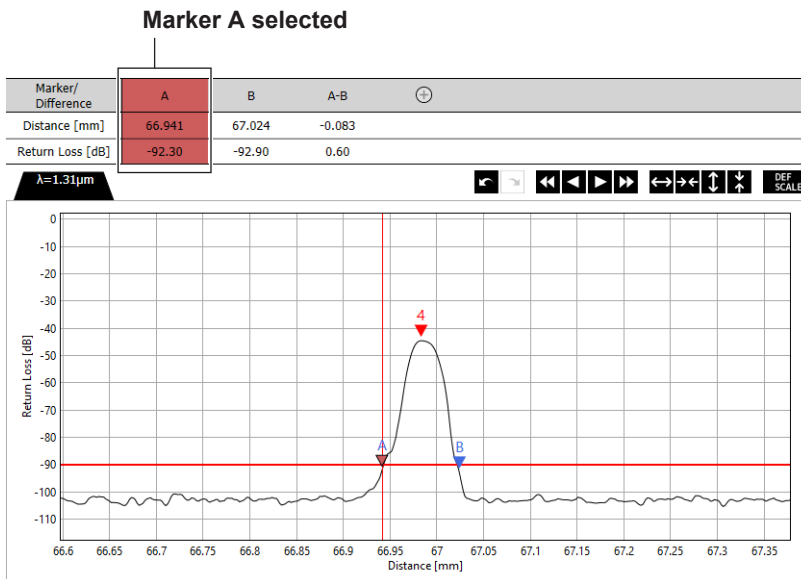


**Note** The distance and RL value between a marker and the waveform (peak) can also be displayed.

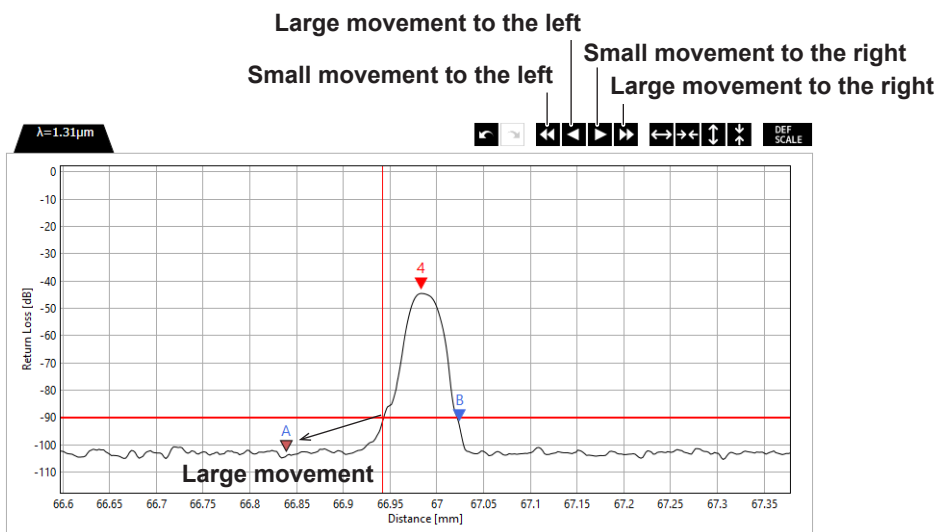
## 5.2 Marker and Cursor Operations

### 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.

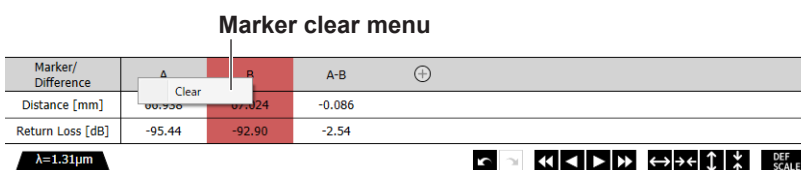


7. Click a marker move button. The marker moves in the specified direction.



### 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.



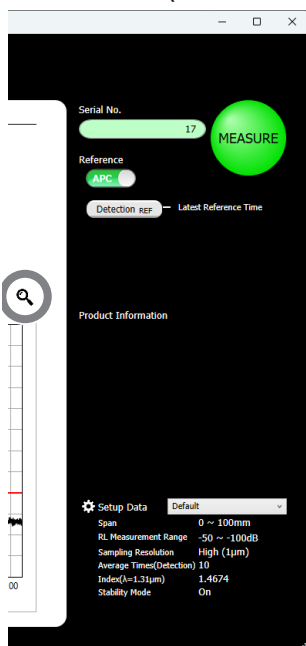
# 6.1 Saving and Loading Waveform Data

## Procedure

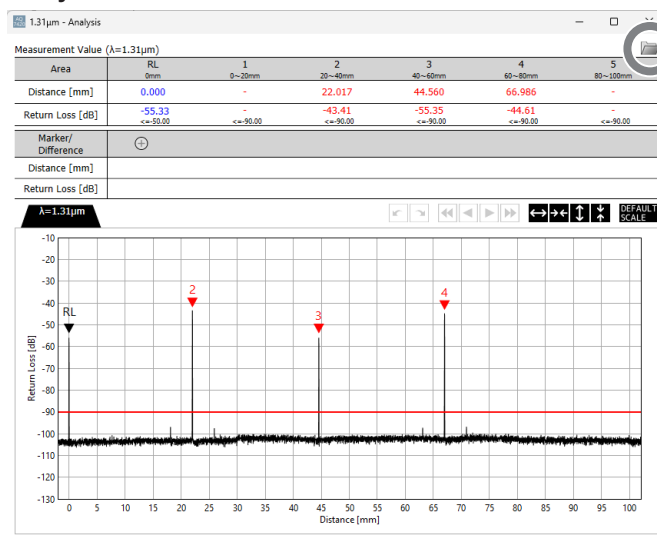
### Manually saving a waveform (r Not Auto)

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.



### 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

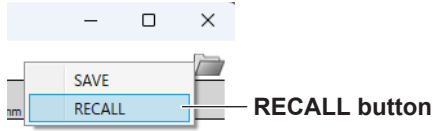
When Only NG Auto is selected, waveforms are saved only when the judgment results of the measured data are Fail.

## 6.1 Saving and Loading Waveform Data

---

### 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

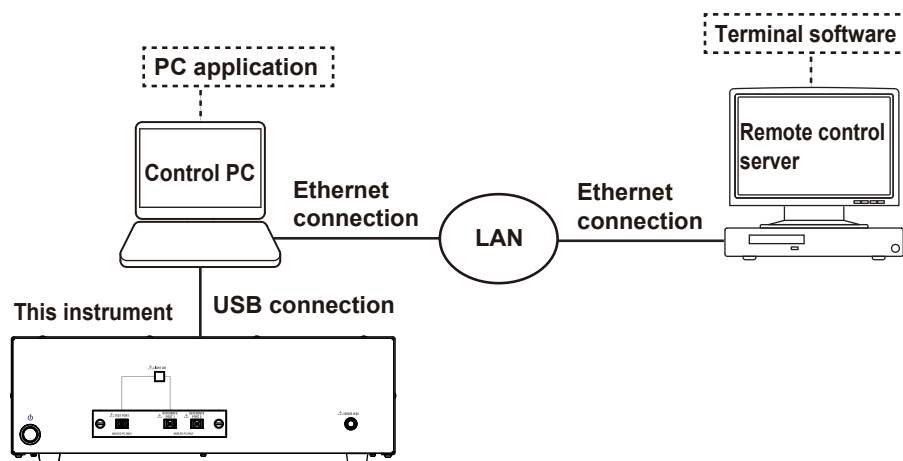
When generating a PDF file, specify a file name.  
See section 1.6 for a description of the report format.

## 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

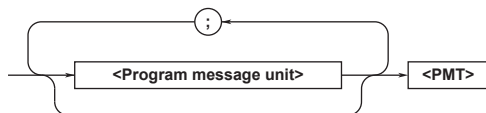
### Messages and queries

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.

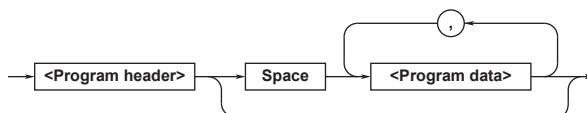
```
:SETUp:MEASure:STArT 20; :SETUp:FILE:LIST?  
      Unit                Unit
```

#### <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.

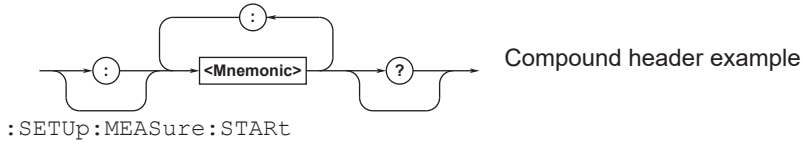


## 7.2 Programming Overview

---

- **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.



- **Simple header**

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



---

**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. <ul style="list-style-type: none"> <li>• Integer (example: 0, 10)</li> <li>• Sign (example: &lt;, ≤)</li> <li>• Decimal (example: 1.31, 1.55)</li> <li>• Floating-point number (example: -5.00000000E+001)</li> </ul>
<"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
<b>IDWrite Group</b>		
:IDWrite	Sets the login user ID and password.	7-8
:IDWrite:Admin	Sets the login administrator ID and password.	7-8
<b>LOGIn Group</b>		
:LOGIn	Performs a login.	7-9
<b>LOGOut Group</b>		
:LOGOut	Performs a logout.	7-10
<b>MAIN Group</b>		
: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
<b>SETUp Group</b>		
: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:RLNable1 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

### 7.3 List of Commands

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 (WAI)t	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:RESUlt: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:RESUlt:JUDGE? -> 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:RESUlt1|: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:RESUlt1|2:RLVAl? ->  
-5.00000000E+001

## 7.7 MAIN Group

---

### **:MAIN:RESUlt1|2:DETEct?**

Function Queries the Detection (burnout detection) value.

Syntax :MAIN:RESUlt1|2:DETEct?

1: 1.31

2: 1.55

Example :MAIN:RESUlt1|2:RLVA1? ->

-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  $\mu\text{m}$

2: wavelength 1.55  $\mu\text{m}$

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  $\mu$ m)  
1: Middle (4  $\mu$ m)  
2: Low (8  $\mu$ m)

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

## 7.8 SETUP Group

### **: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  $\mu\text{m}$   
ILENable2: wavelength 1.55  $\mu\text{m}$   
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  $\mu\text{m}$   
ILCOndition2: wavelength 1.55  $\mu\text{m}$   
0: < (greater than)  
1:  $\leq$  (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  $\mu\text{m}$   
2: wavelength 1.55  $\mu\text{m}$

<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  $\mu\text{m}$

RLENable2: wavelength 1.55  $\mu\text{m}$

0: Pass/fail judgment will not be performed.

1: Pass/fail judgment will be performed.

Example :SETU:CRIT:RLN1 1  
:SETU:CRIT:RLN1? -> 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  $\mu\text{m}$

RLCOndition2: wavelength 1.55  $\mu\text{m}$

0: < (greater than)

1:  $\leq$  (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  $\mu\text{m}$   
2: wavelength 1.55  $\mu\text{m}$   
<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  $\mu\text{m}$   
DEENable2: wavelength 1.55  $\mu\text{m}$   
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  $\mu\text{m}$   
DECOndition2: wavelength 1.55  $\mu\text{m}$   
0: < (greater than)  
1:  $\leq$  (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  $\mu\text{m}$   
2: wavelength 1.55  $\mu\text{m}$   
<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.

## 7.8 SETUp Group

### **: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.