

Thank you for purchasing the AQ7277B Remote OTDR.

This product is an OTDR module, designed to be integrated into a remote fiber test system.

This user's manual explains the handling precautions, specifications, and connection procedures of the AQ7277B Remote OTDR for users that are involved in remote fiber test.

For correct operation, please read this manual thoroughly before use.

The AQ7277B comes with the following manuals. Please keep them in a safe place.

Manual Title	Manual No.	Description
AQ7277B Remote OTDR User's Manual	IM AQ7277B-01EN	This manual.
AQ7277B Remote OTDR User's Manual	IM AQ7277B-92Z1	A manual for China.

\* The "-EN" in the manual number is the language code.

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

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

The following manual is a related manual that is downloaded with the remote controller for the AQ7277B available at the YOKOGAWA website.

Manual Title	Manual No.	Description
Remote Controller for the AQ7277B Remote OTDR Configuring Network Settings and Updating the Firmware	IM AQ7277B-61EN	This manual explains how to use the remote controller for configuring the AQ7277B.
AQ7277B OTDR Communication Interface User's Manual	IM AQ7277B-17EN	Explains the features related to using communication commands to control the AQ7277B..

You can download the remote controller for the AQ7277B (Yokogawa OTDR Remote Controller) and the manual from the following webpage.

<https://tmi.yokogawa.com/library/>

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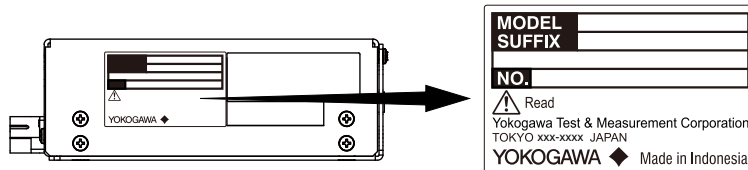
## Revisions

- 1st Edition: September 2016
- 2nd Edition: November 2016
- 3rd Edition: October 2017
- 4th Edition: March 2018

## Checking the Package Contents

### AQ7277B

Check that the product that you received is what you ordered by referring to the model name and suffix code given on the name plate affixed to the product.



Model	Suffix Code	Description
AQ7277B		Remote OTDR
Suffix code	-B01	1650 nm wavelength (with filter)
	-B02	1550 nm wavelength

### No. (Instrument number)

When contacting the dealer from which you purchased the instrument, please tell them the instrument number.

### Standard Accessories

The instrument is shipped with the following accessories. Make sure that all accessories are present and undamaged.

Name	Model or Part No.	Quantity	Specifications and Notes
User's manual	IM AQ7277B-01EN	1	This manual
	IM AQ7277B-92Z1	1	A manual for China
Inquiries	PIM113-01Z2	1	List of worldwide contacts

## Remote Controller for the AQ7277B Remote OTDR

A free software for configuring the Remote OTDR.

You can download the remote controller for the AQ7277B (Yokogawa OTDR Remote Controller) from the following webpage.

<https://tmi.yokogawa.com/library/>

## Conventions Used in This Manual

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**

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

### **CAUTION**

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

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Une manipulation ou une utilisation incorrectes risquent de blesser l'utilisateur ou d'endommager l'instrument. Ce symbole apparaît sur l'instrument pour indiquer à l'utilisateur qu'il doit se reporter au manuel de l'utilisateur afin d'y lire les instructions spécifiques correspondantes. Ce même symbole apparaît à la section correspondante du manuel de l'utilisateur pour signaler lesdites instructions. Dans le manuel de l'utilisateur, ce symbole est accompagné des termes AVERTISSEMENT et ATTENTION.

### **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.

## **Safety Precautions**

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

### **The following Symbols Are Used on This Instrument.**



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



Hazard, radiation of laser apparatus.

### **Failure to comply with the precautions below could lead to injury or death.**

## **WARNING**

### **Use the Instrument Only for Its Intended Purpose**

This optical measuring instrument with light source is designed to measure the optical characteristics of light sources and evaluate their performance. Do not use this instrument for anything other than as an optical measuring instrument.

### **Check the Physical Appearance**

Do not use the instrument if there is a problem with its physical appearance.

### **Use the Correct Power Supply**

- Make sure that the power supply voltage matches the AQ7277B's rated supply voltage and that it does not exceed the maximum voltage range specified for the power cord.
- Use an insulated secondary power supply (LPS or equivalent).
- Use an AC adapter that meets the AQ7277B ratings.
- Use an AC adapter with a power cord that meets the appropriate standards of the area that you are using it in.

### **Check the Power Supply Capacity**

Make sure that the power supply capacity sufficiently meets the AQ7277B's maximum power consumption (or current capacity) before you connect the power cord.

### **Do Not Look at the Laser Beam**

Do not look directly or indirectly into the laser beam or at a specular reflection of the beam without protective equipment. The laser beam may cause blindness or damage to your eyes.

### **Do Not Operate in an Environment with Flammable or Explosive Gasses, Steam, or Dust**

Do not operate the instrument in an environment with flammable or explosive gases, steam, or dust (dangerous places). Operation in such an environment constitutes a safety hazard.

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**Do Not Remove the Case or Disassemble or Alter the Instrument**

Only qualified YOKOGAWA personnel may remove the case and disassemble or alter the instrument.

**Remove Connections When Carrying or Moving the Instrument**

When carrying or moving the instrument, remove all cords (including the power cord) and cables.

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**CAUTION**

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**When Using the Same Wavelength That Is Used in Real Communication to Make Measurements**

If communication light is present in the optical fiber that you want to measure, the communication may be affected. Take appropriate precautions to avoid communication interference.

In addition, to make accurate measurements with the AQ7277B, take the measurement environment (such as the presence of communication light) into consideration.

**When Using a Wavelength (1650 nm) Different from That Used in Real Communication to Make Measurements**

When there is communication light in the fiber under measurement, use a light beam with a different wavelength to make measurements.

If the device connected to the system under measurement does not have a filter for blocking 1650 nm laser beams or depending on the lightfastness power rating or the attenuation characteristics of the blocking filter, the light pulses that the AQ7277B emits may damage the device. Be sure to install an appropriate blocking filter and check that the device's ratings are adequate before making measurements.

**Operating Environment Limitations**

This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.

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**AVERTISSEMENT****Utiliser l'instrument aux seules fins prévues**

- Cet instrument de mesure optique est prévu pour mesurer les caractéristiques optiques des sources lumineuses et évaluer leur performance. Ne pas utiliser cet instrument à d'autres fins que celles de mesure optique.
- Utilisez une alimentation électrique secondaire isolée (LPS ou équivalent).
- Utilisez un adaptateur secteur qui répond aux puissances AQ7277B.
- Utilisez un adaptateur de courant alternatif avec une corde de pouvoir qui rencontre les normes appropriées de la région dans laquelle vous l'utilisez.

**Inspecter l'apparence physique**

Ne pas utiliser l'instrument si son intégrité physique semble être compromise.

**Vérifier l'alimentation**

Avant de brancher le cordon d'alimentation, vérifier que la tension source correspond à la tension d'alimentation nominale du AQ7277B et qu'elle est compatible avec la tension nominale maximale du cordon d'alimentation.

**Faisceau laser**

Ne pas fixer directement ou indirectement le faisceau laser, ni la réflexion spéculaire du faisceau en l'absence d'équipement de protection. Ne pas orienter le faisceau laser en direction des yeux. Le faisceau laser peut entraîner la cécité ou causer des lésions oculaires.

**Ne pas utiliser dans un environnement explosif**

Ne pas utiliser l'instrument en présence de gaz ou de vapeurs inflammables. Cela pourrait être extrêmement dangereux.

### Ne pas retirer le capot, ni démonter ou modifier l'instrument

Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier l'instrument. Certains composants à l'intérieur de l'instrument sont à haute tension et par conséquent, représentent un danger.

### Retirer les connexions lors du transport ou de déplacer l'instrument

Pour transporter ou de déplacer l'instrument, supprimer tous les enregistrements (y compris le cordon d'alimentation) et les câbles.

## ATTENTION

### Lors de l'utilisation de la même longueur d'onde qui a été utilisée dans la communication réelle pour effectuer des mesures

Si le signal de communication est présent dans la fibre optique que vous voulez mesurer, la communication peut être affectée. Prendre les précautions nécessaires pour éviter des interférences de communication.

En outre, pour effectuer des mesures précises avec l'AQ7277B, prendre l'environnement de mesure (tels que la présence du signal de communication) en considération.

### Lors de l'utilisation d'une longueur d'onde (1650 nm) différente de celle utilisée dans la communication réel pour effectuer des mesures

Lorsque le signal de communication est présent dans la fibre en cours de mesure, utiliser un faisceau lumineux d'une longueur d'onde différente pour effectuer les mesures.

Si l'appareil est connecté au système en cours de mesure ne dispose pas de filtre pour bloquer 1650 nm de faisceaux laser ou en fonction de la puissance nominale de la lumière ou des caractéristiques d'atténuation du filtre de blocage, les impulsions lumineuses que l'AQ7277B émet peuvent endommager l'appareil. S'assurer d'installer un filtre de blocage approprié et vérifier que les notes de l'appareil sont adéquates avant de prendre des mesures.

### Limitations relatives à l'environnement opérationnel

Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

## Safety Precautions for Laser Products

This instrument uses a laser light source. This instrument is a Class 1M laser product as defined by IEC/EN 60825-1:2007 Safety of Laser Products—Part1: Equipment Classification and Requirements. In addition, this instrument complies with 21 CFR 1040.10, 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

<b>INVISIBLE LASER RADIATION</b> 不可见激光辐射 <b>DO NOT VIEW DIRECTLY WITH</b> 勿通过光学仪器直接观看光束 <b>OPTICAL INSTRUMENTS</b> 1M类激光产品 <b>CLASS 1M LASER PRODUCT</b> (IEC/EN60825-1:2007, GB7247.1-2012)	Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007 2-9-32 Nakacho, Musashino-shi, Tokyo 180-8750, Japan
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## Laser Specifications

Model	Class	Center Wavelength	Maximum Output Power <sup>1</sup>	Mode Field Diameter	Beam Divergence
AQ7277B-B01	1M	1650 nm	CW: 50 mW@ 1650 nm PULSE: 200 mW@1650 nm PULSE width: 20 μs@1650 nm, Duty: ≤ 3.0%	9 μm	11.5°
AQ7277B-B02	1M	1550 nm	CW: 50 mW@1550 nm PULSE: 200 mW@1550 nm PULSE width: 20 μs@1550 nm, Duty: ≤ 3.0%	9 μm	11.5°

1: Under single fault conditions.

## Authorized Representative in the EEA

Europe B. V. is Authorized Representative of Yokogawa Test & Measurement Corporation in the EEA for this Product. To contact Yokogawa Europe B. V., see the separate list of worldwide contacts, PIM 113-01Z2.

## Specifications

### Interface

	Item	Specification
External control I/F	USB port	USB2.0 TYPE B(mini)×1
	LAN port	Ethernet (10BASE-T/100BASE-TX)
External I/F	DC power supply input port	For +12 VDC supply LGP6531-1500FC (or equivalent)
	LED connector	For driving LEDs (power supply, light emission, alarm)

### OTDR Features

Item	Specification	
Model	AQ7277B-B01	AQ7277B-B02
Wavelength	1650 nm ± 5 nm <sup>*1</sup> 1650 nm ± 10 nm <sup>*2</sup>	1550 nm ± 25 nm
Pulse light output	+15 dBm or less	-
Event dead zone <sup>*3</sup>	0.7 m (0.6 m typ)	
Attenuation dead zone <sup>*4</sup>	4 m (typ)	
Dynamic range <sup>*5</sup>	37 dB (40 dB typ)	44 dB (50 dB typ)
Distance range	0.2, 0.5, 1, 2, 5, 10, 20, 30, 50, 100, 200, 300, 400, 512 km	
Pulse width <sup>*6</sup>	3, 10, 20, 30, 50, 100, 200, 300, 500, 1000, 2000, 5000, 10000, 20000 ns	
Distance measurement accuracy	±0.75 m + measured distance × 2 × 10 <sup>-5</sup> ± the sampling resolution	
Loss measurement accuracy	±0.03 dB/dB	
Sampling resolution	2 cm min.	
Reading resolution	Horizontal axis: 1 cm min. Vertical axis: 0.001 dB min.	
Sample data points	256,000 points max.	
Index of reflection	1.30000 to 1.79999 (in 0.00001 steps)	
Distance unit	km	
Measurement functions	Distance, loss, return loss	
Compliant fiber	SM (ITU-T G.652)	
Optical connector	SC (fixed type)	
Laser class	1M	

\*1 At the -20 dB point from the pulse output peak

\*2 At the -60 dB point from the pulse output peak

\*3 At the -1.5 dB point from the unsaturated peak value with the pulse width at 3 ns and return loss greater than or equal to 55 dB. IOR=1.50

\*4 At the point where the back scattering light level is within ±0.5 of the steady-state value with the pulse width at 10 ns and return loss greater than or equal to 55 dB. IOR=1.50

\*5 SNR = 1, 20 μs pulse width, 200 km distance range, 8 m sampling resolution, 3 minute measurement time.

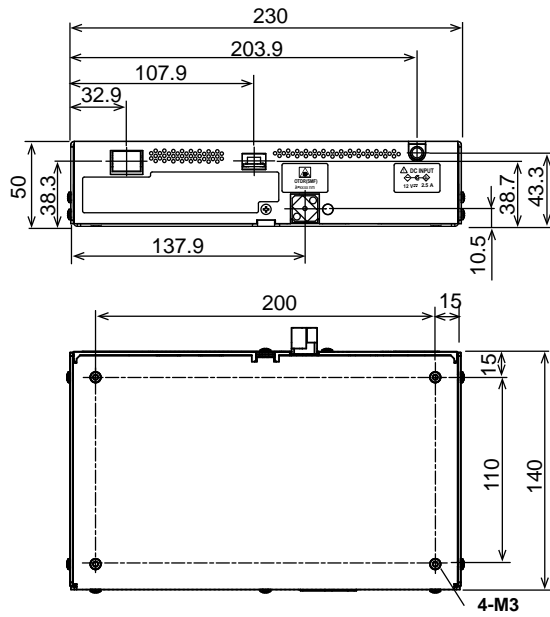
\*6 The range depends on the distance range.

At 23 °C ± 2 °C unless otherwise specified.

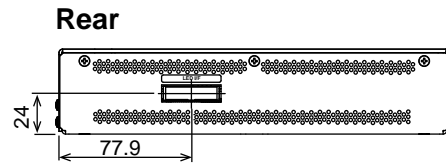
### General Specifications

	Item	Specification
Operating environment	Ambient temperature	-10 to 50 °C
	Ambient humidity	0 to 90% RH (no condensation)
	Elevation	4000 m or less
Storage environment	Ambient temperature	-20 to 60 °C
	Ambient humidity	0 to 90% RH (no condensation)
	Elevation	4000 m or less
DC power supply	Rated supply voltage	12 VDC 2.5 A or less
	Permitted supply voltage range	12 VDC ±10%
Warm-up time		At least 30 minutes
Dimensions and weight	Dimensions	230 mm (W) × 50 mm (H) × 140 mm (D), excluding protrusions
	Weight	Approx. 1 kg
Laser safety standard		Compliant standards: IEC/EN 60825-2007 Class 1M, GB 7247.1-2-2012, FDA 21 CFR1040.10 and 1040.11
EMC standards		Compliant standards EN 61326-1 Class A EN 55011 Class A, Group1 EMC Regulatory Arrangement in Australia and New Zealand EN 55011 Class A, Group1 Korea Electromagnetic Conformity Standard ( 한국 전자파적합성기준 ) This product is a Class A (for industrial environments) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.
Environmental Standard		EN 50581 monitoring and control Instruments including those for industrial use

## External Dimensions

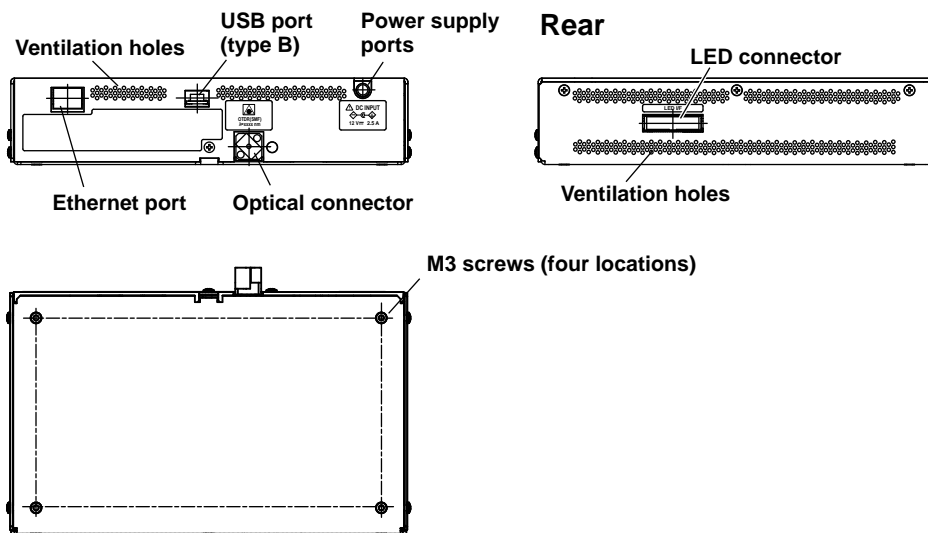


Unit: mm



Unless otherwise specified, tolerances are  $\pm 3\%$  (however, tolerances are  $\pm 0.3$  mm when below 10 mm).

## Component Names



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## Installation

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### WARNING

- This instrument is designed to be used indoors. Do not install or use it outdoors.
  - Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.
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### CAUTION

Do not block the ventilation holes.  
If you block the ventilation holes on the front and rear panels of the AQ7277B, the AQ7277B will become hot and may break down.

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### AVERTISSEMENT

- L'instrument est prévu pour une utilisation en intérieur. Ne pas l'installer, ni l'utiliser à l'extérieur.
  - Installer l'instrument de manière à pouvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.
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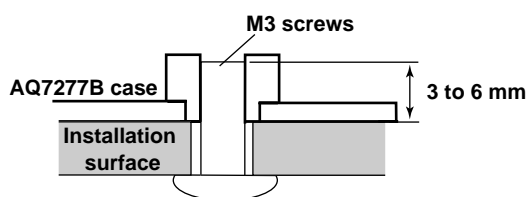
### ATTENTION

Ne pas obstruer les orifices de ventilation.  
Si vous obstruez les orifices de ventilation sur les panneaux avant et arrière de l'AQ7277B, l'AQ7277B se chauffera peut tomber en panne.

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Fix the AQ7277B in place using the six M3 screws (screw tightening torque: 0.6 to 0.7 N•m).  
Adjust each screw so that the portion of the screw that is inserted into the AQ7277B case is 3 mm to 6 mm in length.



### Do Not Install the Instrument in the Following Places

- Outdoors
- In direct sunlight, or near sources of heat
- In an environment with excessive amounts of soot, steam, dust, or corrosive gases
- Near sources of strong magnetic fields
- Near high-voltage equipment or power lines
- In an environment that is subject to large levels of mechanical vibration
- On an unstable surface
- Where the instrument is exposed to water or other liquids.



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## Connecting Optical Fiber Cables

### Cleaning the Connector End Faces of Optical Fiber Cables

Clean the connector end face of the optical fiber cable under measurement before connecting it to the instrument. If dust is adhered to the connector end face, it may damage the instrument's optical connector. If this happens, the instrument will not be able to make correct measurements.

### Connecting a Optical Cable to the AQ7277B

Connect the optical cable to the optical connector of the AQ7277B.

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#### **CAUTION**

Insert the optical fiber cable connector slowly and straight into the optical port. If you shake the connector to the left and right or force it into the port, the optical connector may be damaged. Some optical connectors on the market do not meet the specifications. Use optical connectors that are approved or used by national or local telecom carriers and providers in your area.

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#### **ATTENTION**

Insérer les connecteurs de câbles à fibre optique délicatement et sans les incliner dans les ports optiques. Éviter de faire pression sur le connecteur ou de forcer pour l'insérer dans le port, car cela pourrait endommager le connecteur optique ou le port optique. Certains connecteurs optiques sur le marché ne répondent pas aux spécifications. Utiliser des connecteurs optiques homologués ou utilisés par les entreprises et les fournisseurs de services de télécommunications de votre région.

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## Connecting to the Power Supply

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### WARNING

- Use an insulated secondary power supply (LPS or equivalent).
  - Make sure to follow the warnings below when connecting the power cord. Failure to do so may cause electric shock or damage to the instrument.
    - Check that power is not being supplied to the power cord before connecting it to the AQ7277B.
    - Be sure to use a power cord that matches the power supply terminal of this instrument.
    - Check that the power supply meets the AQ7277B's rated supply voltage and the permitted supply voltage range.
    - Do not place objects on top of the power cord, and keep it away from heat sources.
  - Use an AC adapter that meets the AQ7277B ratings.
  - Use an AC adapter with a power cord that meets the appropriate standards of the area that you are using it in
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### AVERTISSEMENT

- Utilisez une alimentation électrique secondaire isolée (LPS ou équivalent).
  - S'assurer de suivre les avertissements ci-dessous lors de la connexion du câble d'alimentation. Ne pas le faire peut provoquer un choc électrique ou endommager l'appareil.
    - Vérifier que le câble d'alimentation n'est pas sous tension avant de le connecter à l'AQ7277B.
    - Veiller à utiliser un câble d'alimentation qui correspond à la borne d'alimentation de cet appareil.
    - Vérifier que l'alimentation correspond à la tension nominale d'alimentation de l'AQ7277B et à la plage de tension d'alimentation autorisée.
    - Ne pas déposer des objets sur le câble d'alimentation, et le tenir éloigné des sources de chaleur.
  - Utilisez un adaptateur secteur qui répond aux puissances AQ7277B.
  - Utilisez un adaptateur de courant alternatif avec une corde de pouvoir qui rencontre les normes appropriées de la région dans laquelle vous l'utilisez.
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Connect the power cord to the power supply ports.

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## Power-on Operation

If you are using the OTDR Remote Controller (available at the YOKOGAWA website) and the AQ7277B starts normally, the top menu will appear in the control window of the Remote Controller that is displayed in the PC monitor window.

Control window of the OTDR Remote Controller that is displayed in the PC monitor window



For instructions on how to install the Remote Controller and how to connect the AQ7277B to a PC, see the User's Manual IMAQ7277B-61EN (Remote Controller for the AQ7277B Remote OTDR: Configuring Network Settings and Updating the Firmware).

### Note

You can download the remote controller for the AQ7277B (Yokogawa OTDR Remote Controller) from the YOKOGAWA website.

<https://tmi.yokogawa.com/library/>

## If the AQ7277B Does Not Start Normally When the Power Is Turned On

Check the following items.

- Check that power is being supplied through the power cord.
- Check that the power cord is connected properly.

If the AQ7277B still does not start normally after checking these items, contact your nearest YOKOGAWA dealer for repairs.

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## Connecting the USB Interface or Ethernet Interface

Connect the USB or Ethernet interface depending on the network you are using.

### USB Interface Specifications

Electrical and mechanical specifications: USB 2.0  
Connector: Type B mini (receptacle)  
Number of ports: 1

#### **Note**

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To use the USB interface, you need to obtain the USB driver and communication library.  
Download them from the YOKOGAWA Web page.  
<https://tmi.yokogawa.com/library/>

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### Ethernet Interface Specifications

Number of ports: 1  
Electrical and mechanical specifications: IEEE802.3  
Transmission system: Ethernet (10BASE-T/100BASE-TX)  
Data rate: 10 Mbps/100 Mbps  
Communication protocol: TCP/IP  
Connector: RJ45  
Port number: 10001/tcp

#### **Note**

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- To use the Ethernet interface, you need obtain the communication library.  
Download it from the YOKOGAWA Web page.
  - To use the Ethernet interface, you need to configure the TCP/IP settings in advance.  
Configure them using the dedicated software, Yokogawa OTDR Remote Controller. You can download the software from the YOKOGAWA Web page.  
<https://tmi.yokogawa.com/library/>
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