

User's Manual

Model 735020 to 735030

AQ7270 OTDR

Before Use

Thank you for purchasing the AQ7270 OTDR. To ensure correct use, please read this manual thoroughly before beginning operation. For details on the functions and performance, see the AQ7270 OTDR User's Manual (CD-ROM). The latest editions of manuals are available to registered customers for download from our Web site. You can register from the following web page.
<http://www.yokogawa.com/tm/>

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IM 735020-04E
 1st Edition

Checking the Contents of the Package

If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

MODEL	Suffix Code	Description
735020		SMF-1550 nm, 32 dB
735021		SMF-1650 nm, 30 dB
735022		SMF-1310/1550 nm, 34/32 dB
735023		SMF-1310/1550 nm, 40/38 dB
735024		SMF-1550/1625 nm, 38/35 dB
735025		SMF-1310/1490/1550 nm, 34/30/32 dB
735026		SMF-1310/1550/1625 nm, 34/32/28 dB
735027		SMF-1310/1550/1650 nm, 34/32/30 dB
735028		SMF-1310/1550/1625 nm, 40/38/35 dB
735029		MMF-850/1300 nm, 22.5/24 dB
735030		MMF-850/1300, 22.5/24 dB
		SMF-1310/1550 nm, 34/32 dB
Optical connector	-SCC	SC connector (fixed)
	-FCC	FC Connector (fixed)
	-NON	No universal adapter (requires a separate connector purchase)
	-USC	SC universal adapter
	-UFC	FC universal adapter
Language	-HE	English
	-HC	Chinese/English
	-HK	Korean/English
	-HR	Russian/English
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard (CC compatible)
Options	/PM	Optical power monitor function (not supported by the MMF of the 735021, 735029, and 735030)
	/LS	Light source function (not supported by the MMF of the 735029 and 735030)
	/PL	Internal printer and LAN
	/DF	Dummy fiber (SMF) (not supported by 735029 and 735030)
	/SB	Shoulder belt

• Standard Accessories

Name	Part Number	Qty.	Note
AQ7270 OTDR User's Manual	B8070TH	1	
AC adapter	B8070TN	1	
Battery pack	B8070TL	1	
Printer roll paper	A9010ZP	1	Included with the /PL option
Universal connector (SC)	A1022PJ	1	Included with the -USC model
Universal connector (FC)	A1023PJ	1	Included with the -UFC model
Shoulder belt	B8070CY	1	Included with the /SB option
Hand belt	B8070CX	1	
Power cord (UL/CSA standard)	A1068WD	1	
(VDE standard)	A1071WD	1	
(AS standard)	A1070WD	1	
(BS standard)	A1069WD	1	
(GB standard CC compatible)	A1076WD	1	

Conventions Used in 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.

--- Direct current



Recycle

| ON (power)



Equipment protected throughout by double insulation or reinforced insulation

○ OFF (power)



Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

Handling Precautions

To use the instrument safely and effectively, be sure to observe the precautions given in the user's manual.

Laser Safety

• This instrument uses a laser light source. This instrument is a Class 1M laser product as defined by IEC60825-1 Safety of Laser Products-Part 1: Equipment Classification, Requirements and user's Guide. In addition, the AQ7270 complies with 21CFR1040.10 except for the items that deviate from the standard as a result of complying with Laser Notice No.50 dated on July 26, 2001.

INVISIBLE LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 1M LASER PRODUCT

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MODEL	Class	Center Wavelength	Output Power
735020	1M	1550 nm	CW: ≤ 5 mW@1550 nm PULSE: ≤ 200 mW@1550 nm PULSE width: ≤ 20 us@1550 nm (duty cycle: ≤ 2.5%)
735021	1M	1650 nm	CW: ≤ 5 mW@1650 nm PULSE: ≤ 32 mW@1650 nm PULSE width: ≤ 20 us@1650 nm (duty cycle: ≤ 2.5%)
735022	1M	1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)
735023	1M	1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)
735024	1M	1550/1625 nm	CW: ≤ 5 mW@1550/1625 nm PULSE: ≤ 200 mW@1550/1625 nm PULSE width: ≤ 20 us@1550/1625 nm (duty cycle: ≤ 2.5%)
735025	1M	1310/1490/1550 nm	CW: ≤ 5 mW@1310/1490/1550 nm PULSE: ≤ 200 mW@1310/1490/1550 nm PULSE width: ≤ 20 us@1310/1490/1550 nm (duty cycle: ≤ 2.5%)
735026	1M	1310/1550/1625 nm	CW: ≤ 5 mW@1310/1550/1625 nm PULSE: ≤ 200 mW@1310/1550/1625 nm PULSE width: ≤ 20 us@1310/1550/1625 nm (duty cycle: ≤ 2.5%)
735027	1M	1310/1550/1650 nm	CW: ≤ 5 mW@1310/1550/1650 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE: ≤ 32 mW@1650 nm PULSE width: ≤ 20 us@1310/1550/1650 nm (duty cycle: ≤ 2.5%)
735028	1M	1310/1550/1625 nm	CW: ≤ 5 mW@1310/1550/1625 nm PULSE: ≤ 200 mW@1310/1550/1625 nm PULSE width: ≤ 20 us@1310/1550/1625 nm (duty cycle: ≤ 2.5%)
735029	1M	850/1300 nm	PULSE: ≤ 50 mW@850 nm, PULSE: ≤ 100 mW@1300 nm PULSE width: ≤ 1 us@850 nm (duty cycle: ≤ 5%) ≤ 5 us@1300 nm (duty cycle: ≤ 0.6%)
735030	1M	850/1300 nm	PULSE: ≤ 50 mW@850 nm, PULSE: ≤ 100 mW@1300 nm PULSE width: ≤ 1 us@850 nm (duty cycle: ≤ 5%) ≤ 5 us@1300 nm (duty cycle: ≤ 0.6%)
		1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)

If the instrument is used in a manner not specified in this manual or the manual on the CD-ROM, the protection provided by the instrument may be impaired. Yokogawa Electric Corporation assumes no liability for the customer's failure to comply with these requirements.



WARNING

- **Use the Correct Power Supply**
 Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the AC adapter and that it is within the maximum rated voltage of the provided power cord.
- **Use Only the Designated Power Cord or AC Adapter**
 Use only the power cord or AC adapter that comes with the instrument. Do not use it for other devices.
- **Use Only the Designated Battery**
 Use only the battery specified for the instrument. Do not use it for other devices.
 Use only this instrument or a charger specified by YOKOGAWA to charge the battery. If the charging of the battery does not complete within a specified time, stop charging the battery immediately.
 Because the electrolyte solution inside the battery is alkaline, harm can be done to the clothes or skin, if the battery leaks or explodes and the solution comes in contact. If the electrolyte solution enters the eye, it can cause blindness. In such cases, do not rub the eye. Rinse thoroughly with water and immediately consult your eye doctor.
 To prevent the possibility of electric shock and accidents, always turn OFF the power switch and remove the AC adapter power supply from the instrument when replacing the Ni-MH battery.
 Do not throw the battery into fire or apply heat to it. This can cause dangerous explosions or spraying of the electrolytes.
- **Do Not Look at the Laser Light**
 Do not look at the laser's direct light, reflected light from a mirror, or indirect light without proper protective eyewear. In addition, avoid being exposed to the laser light. It can cause blindness or damage to the eye. Place a cover over unused optical connectors.
- **Do Not Operate in an Explosive Atmosphere**
 Do not use the thermocouple in a location where any flammable or explosive gas/vapor is present. Operation in such an environment constitutes a safety hazard.

Handling of the CD-ROM

The AQ7270 OTDR user's Manual CD-ROM contains the PDF files of the following:

Language	IM	Manual Name
Japanese	IM 735020-01	AQ7270 OTDR User's Manual
	IM 735020-17	AQ7270 OTDR Communication Interface User's Manual
English	IM 735020-01E	AQ7270 OTDR User's Manual
	IM 735020-17E	AQ7270 OTDR Communication Interface User's Manual

Adobe Reader by Adobe Systems is required to open PDF files. You can download Adobe Reader from the following page.

<http://www.adobe.co.jp/products/acrobat/readstep2.html>

Notes

- The contents of CD-ROM are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of the CD-ROM 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 the CD-ROM without YOKOGAWA's permission is strictly prohibited.

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- For purposes of this manual, the TM and © symbols do not accompany their respective trademark names or registered trademark names.

Specifications

The specifications given below are typical values and are not warranted. The values below are those obtained after warming up the instrument for at least 30 minutes.

Optical Specifications

MODEL: 735020		
Center wavelength	1550 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	8 m (typ.)	
Dynamic range (min.) ⁴	32 dB	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735021		
Center wavelength	1650 nm ± 5 nm ^{*1} , ±10 nm ^{*2}	
Measuring pulse optical output	≤15 dBm (max.)	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	12 m (typ.)	
Dynamic range (min.) ^{4,10}	30 dB	
Light source (optical output)	-5 dBm or more (/LS option)	

MODEL: 735022		
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm	
Dynamic range (min.) ⁴	34 dB@1310 nm, 32 dB@1550 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy)*2	±0.5 dB or less (/PM option)	

MODEL: 735023		
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm	
Dynamic range (min.) ⁴	40 dB@1310 nm, 38 dB@1550 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735024		
Center wavelength	1550 nm ± 25 nm, 1625 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	8 m (typ.)@1550 nm, 12 m (typ.)@1625 nm	
Dynamic range (min.) ⁴	38 dB@1550 nm, 35 dB@1625 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735025		
Center wavelength	1310 nm ± 25 nm, 1490 nm ± 25 nm, 1550 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1490 nm, 8 m (typ.)@1550 nm	
Dynamic range (min.) ⁴	34 dB@1310 nm, 30 dB@1490 nm, 32 dB@1550 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735026		
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1625 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ.)@1625 nm	
Dynamic range (min.) ⁴	34 dB@1310 nm, 32 dB@1550 nm, 28 dB@1625 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735027		
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1650 nm ± 5 nm ^{*1} , ±10 nm ^{*2}	
Measuring pulse optical output	≤15 dBm (max.)@1650 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ.)@1650 nm	
Dynamic range (min.) ^{4,10}	34 dB@1310 nm, 32 dB@1550 nm, 30 dB@1650 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735028		
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1625 nm ± 25 nm	
Event dead zone ⁵	0.8 m (max.)	
Attenuation dead zone ⁶	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ.)@1625 nm	
Dynamic range (min.) ⁴	40 dB@1310 nm, 38 dB@1550 nm, 35 dB@1625 nm	
Light source (optical output)	-5 dBm or more (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less (/PM option)	

MODEL: 735029		
Center wavelength	850 nm ± 30 nm, 1300 nm ± 30 nm	
Event dead zone ⁵	2 m (typ.)	
Attenuation dead zone ⁶	7 m (typ.)@850 nm, 10 m (typ.)@1300 nm	
Dynamic range (min.) ⁴	22.5 dB@850 nm, 24 dB@1300 nm	

MODEL: 735030		
Center wavelength	850 nm ± 30 nm, 1300 nm ± 30 nm, 1310 nm ± 25 nm, 1550 nm ± 25 nm	
Event dead zone ⁵	2 m (typ.)@850/1300 nm, 0.8 m@1310/1550 nm	
Attenuation dead zone ⁶	7 m (typ.)@850 nm, 10 m (typ.)@1300 nm, 7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm	
Dynamic range (min.) ⁴	22.5 dB@850 nm, 24 dB@1300 nm, 34 dB@1310 nm, 32 dB@1550 nm	
Light source (optical output)	-5 dBm or less@1310/1550 nm (/LS option)	
Optical power monitor (input level)	-50 dBm to -5 dBm@1310/1550 nm (/PM option)	
Optical power monitor (accuracy) ³	±0.5 dB or less@1310/1550 nm (/PM option)	

*1 ±5 nm: -20 dB point from the peak value of the pulse optical output.
 *2 ±10 nm: -60 dB point from the peak value of the pulse optical output.
 *3 When applying input with λ = 1310 nm at -10 dBm.
 *4 Pulse width of 20 μs, distance range of 200 km, sampling resolution of 32 m, averaging duration of 3 min.
 *5 Pulse width 3 ns, return loss 45 dB or more, 1.5 dB point below the peak value at unsaturated condition.
 *6 Pulse width 10 ns, return loss 45 dB or more, at a point where the backscattering light level is within 0.5 dB of the steady-state value.
 *8 Pulse width of 500 ns (850 nm)/1 μs (1300 nm), averaging duration of 3 min, sampling resolution of 4 m.
 *9 Pulse width of 10 ns, return loss 45 dB or more, at a point where the backscattering light level is within 1.5 dB of the steady-state value.
 *10 1.65 μs: With background light (1550 nm ± 75 nm, -19 dBm, CW light).

General Specifications

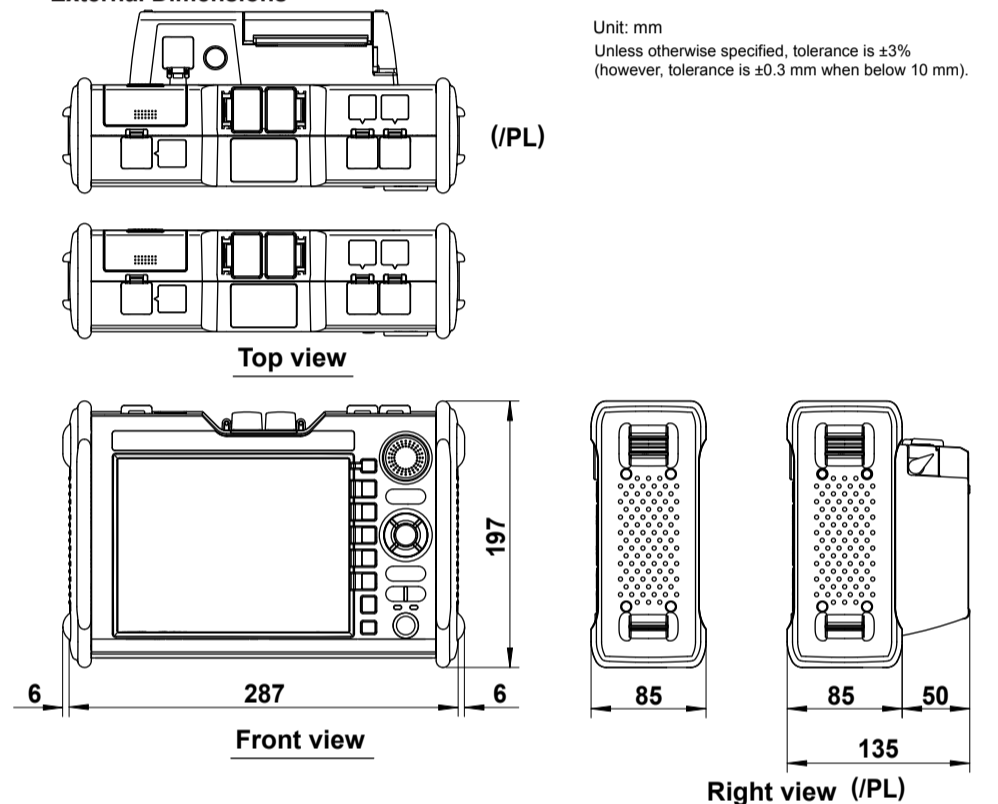
Display	8.4-inch color TFT (640 × 480 dots)	
Distance range	500 m, 1 km, 2 km, 5 km, 10 km, 20 km, 50 km, 100 km, 200 km, 300 km, and 400 km	
Reading resolution	1 cm min.	
Sampling resolution	5 cm, 10 cm, 20 cm, 50 cm, 1 m, 2 m, 4 m, 8 m, 16 m, and 32 m	
Number of data samples	Up to 50000 points	
Group index	1.30000 to 1.79999 (0.00001 steps)	
Distance unit	km mile and kf for English display	
Pulse width	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs, 2 μs, 5 μs, 10 μs, and 20 μs *1 5 μs for 850 nm (MM) *2 Exclude 3 ns for 850/1300 nm (MM)	
Distance measurement accuracy	±1 + measured distance × 2 × 10 ⁻⁵ ± sampling resolution	
Internal memory	Saves up to 1000 waveforms	
USB (1.1)	Type A (printer and external memory) Type B (remote and storage)	
LAN (option)	10/100BASE-T	
Internal printer (option)	576-dot/line thermal printer, chart paper width: 80 mm	
AC power supply	100 to 240 VAC 50/60 Hz	
Battery	Duration: 6 hours (under specified operating conditions) charge time: within 5 hours	

Dimensions and Weight

Weight (options excluded)	Approx. 2.8 kg	
Dimensions (projections excluded)	287 (W) × 197 (H) × 85 (D) 287 (W) × 197 (H) × 135 (D) with the /PL option	

- Typical value represents a typical or average value. It is not strictly warranted.
- The ampersand after the values in the optical specifications indicate that the value correspond to the wavelength after the ampersand.

External Dimensions



Environmental Specifications

Temperature range	During use:	0°C to 45°C
	During storage	-20°C to 60°C
	When using the printer	0°C to 35°C (80%RH or less)
	When charging the battery pack	0°C to 35°C
Maximum relative humidity	85%RH or less (without condensation)	

Laser Safety

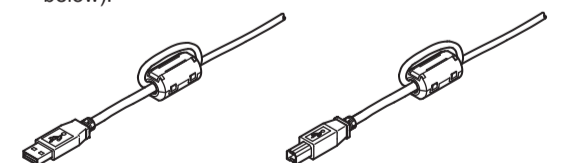
- The laser light source is classified to IEC60825-1; Class 1M.
- It complies with 21CFR1040.10 except for the items that deviate from the standard as a result of complying with Laser Notice No.50 dated on July 26, 2001.

Emission

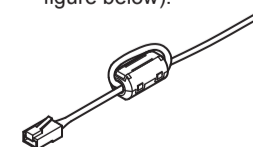
Complying standards	EN61326 Class A, (C-Tick AS/NZS CISPR11) EN61000-3-2 EN61000-3-3 This instrument is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.
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Cable conditions

- USB
Use a shielded cable.
Use cables of length 3 m or less. Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA part number: A1190MN) with two windings at the AQ7270 end (see the figure below).



- Ethernet interface connector
Use LAN cables of length 30 m or less. Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA part number: A1190MN) with two windings at the AQ7270 end (see the figure below).



Immunity

Complying standard	EN61326 industrial environment
Cable conditions	Same as the cable conditions for emission.