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Find the *Yokogawa / Ando AQ8201-31* at our website: ***Click HERE***

AQ8204
FRAME CONTROLLER

Instruction Manual

AQ8204 Software version	4.0X

* This document applies to the above and later software versions.

ANDO ELECTRIC CO., LTD.

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AS-62559-4 Rev.1.0

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Thank you very much for purchasing our product.

WARRANTY

ANDO ELECTRIC warrants with its quality assurance system that the subject equipment sold by it to be free from defects in material or workmanship. However, should the subject equipment fail due to improper workmanship or transportation, contact our service agency of your convenience including the Sales Department at headquarters, branch office and ANDO EELECTRIC TECHNICAL SERVICE Co., Ltd.

ANDO ELECTRIC's obligation under the warranty shall continue for twelve (12) months from date of the shipment thereof to buyer. ANDO will be responsible to offer free-of-charge repair or replacement should the equipment fail during the said period. In spite of the foregoing, however, ANDO shall not be liable for troubles or damages arising from natural disasters or the equipment retrofitted or improperly used by the equipment.

The free-of-charge repair warranted in this document is applicable to the domestic users alone.

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INTRODUCTION

A part of this manual describes explanation for all units (AQ8202 EXPANDER FRAME, AQ8202-01 SYSTEM CONTROLLER, AQ8203 HALFSIZE FRAME and AQ8204 FRAME CONTROLLER). But the explanation about unit other than this unit is not related to the operation of this unit.

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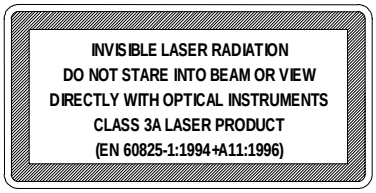
For using the laser products safely

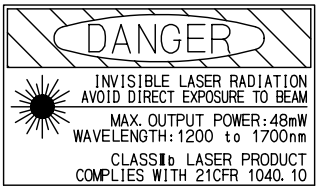
The specification of laser products is as follows.

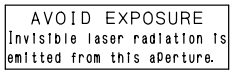
	AQ8201-110	AQ8201-12/-12A
Laser Type	DFB-Laser	ASE
Laser Class According to EN60825-1:1994+A11:1996 According to 21CFR 1040.10	 3A IIIb	 3A IIIb
Maximum Output Power	+48dBm	+48dBm
Beam Diameter	9μm	9μm
Numerical Aperture	0.1	0.1
Wavelength	1524.110 to 1620.500nm	1550 ± 20nm

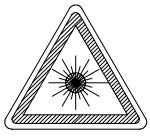
	AQ8201-13/-13A	AQ8201-13B/-13D
Laser Type	ECL	ECL
Laser Class According to EN60825-1:1994+A11:1996 According to 21CFR 1040.10	 3A IIIb	 3A IIIb
Maximum Output Power	+48dBm	+48dBm
Beam Diameter	9μm	9μm
Numerical Aperture	0.1	0.1
Wavelength	1460 to 1580nm	1500 to 1620nm

The following laser safety warning labels are stuck on the side and the optical output port of laser products.









And, the seal of the laser safety warning label written in the local language is included to the laser product. Please stick the label of language suitable for customers on the position by which everyone who uses a laser product is seen clearly.

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WARNING

Use of controls or adjustments of performance or procedures other than this manual specified for the laser source may result in hazardous radiation exposure.

WARNING

The invisible laser light is emitted from the optical output port. The optical output port is located on the front panel of the laser product.

A green LED on the front panel of the laser product is turned on while a laser light is emitted.

The OPT switch can control an emission of a laser light by pushing. The OPT switch is located near the optical output port of the front panel.

WARNING

The invisible laser light is not visible to the human eye, but it may seriously damage your eyesight when a laser light came into your eyes.

Do not emit a laser light, when the optical fiber is not connected to the optical output port. And, please detach the optical fiber after stopping a laser light emits when you detach the optical fiber from the optical output port.

Under no circumstances look into the optical output port and the end of the optical fiber connected to the optical output port while a laser light is emitted.

WARNING

A laser light of high power may be emitted from an optical output port when the inside of a laser product is decomposed and remodeled carelessly. Only the approved person with the qualification of our company can repair the laser product.

You must return a laser product to our company when you need repair of the laser product. In this case, please require to serviceman of our company.

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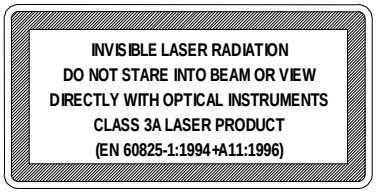
Für die sichere Anwendung unserer Laserstrahl-Produkte

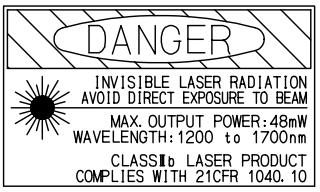
Unsere Laserstrahl-Produkte besitzen die folgenden technischen Daten:

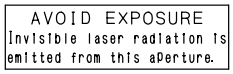
	AQ8201-110	AQ8201-12/-12A
Laserstrahl-Typ	DFB-Laser	ASE
Laserstrahl-Klasse Entsprechend EN60825-1:1994+A11:1996 Entsprechend 21CFR 1040.10	 3A IIIb	 3A IIIb
Max. Ausgangsleistung	+48dBm	+48dBm
Strahldurchmesser	9µm	9µm
Numerische Blendenöffnung	0.1	0.1
Wellenlänge	1524.110 bis 1620.500nm	1550 ± 20nm

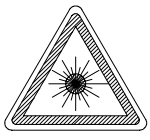
	AQ8201-13/-13A	AQ8201-13B/-13D
Laserstrahl-Typ	ECL	ECL
Laserstrahl-Klasse Entsprechend EN60825-1:1994+A11:1996 Entsprechend 21CFR 1040.10	 3A IIIb	 3A IIIb
Max. Ausgangsleistung	+48dBm	+48dBm
Strahldurchmesser	9µm	9µm
Numerische Blendenöffnung	0.1	0.1
Wellenlänge	1460 bis 1580nm	1500 bis 1620nm

Auf der Seite und im Strahl-Austrittsbereich unserer Laserstrahl-Produkte sind Aufkleber mit den folgenden Sicherheitshinweisen angebracht.









Außerdem werden unseren Laser-Geräten in den Sprachen der jeweiligen Region gedruckte Aufkleber mit Sicherheitshinweisen beigelegt. Bringen Sie den Aufkleber in Ihrer Sprache auf der Außenfläche des Rahmens des Laser-Geräts an, so dass dieser von jedem Benutzer des Geräts deutlich erkannt werden kann.

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WARNUNG

Jegliche Bedienung und Einstellungen, die nicht ausdrücklich in dieser Bedienungsanleitung festgelegt wurden, bergen das Risiko, sich der gefährlichen Laserstrahlung auszusetzen.

WARNUNG

Durch den Austrittsbereich des Laserstrahls werden unsichtbare Laserstrahlen ausgestrahlt. Der Austrittsbereich des Laserstrahls befindet sich auf der Gerätevorderseite.

Während dem Aussenden von Laserstrahlen leuchtet die grüne Leuchtdiode auf der Gerätevorderseite ununterbrochen auf.

Durch Betätigen des Schalters "OPT" kann der Laserstrahl ein- und ausgeschaltet werden. Der "OPT"-Schalter befindet sich in der Nähe des Austrittsbereichs des Laserstrahls auf der Vorderseite des Geräts.

WARNUNG

Obwohl unsichtbare Laserstrahlen für das menschliche Auge nicht sichtbar sind, können die Augen geschädigt oder die Sehschärfe stark beeinträchtigt werden, wenn Laserstrahlen in das Auge gelangen.

Senden Sie keine Laserstrahlen aus, solange die Glasfaser nicht an den Austrittsbereich des Laserstrahls angeschlossen wurde. Schalten Sie den Laser außerdem stets vorher ab, bevor Sie die Glasfaser vom Austrittsbereich des Laserstrahls trennen.

Schauen Sie während dem Aussenden von Laserstrahlen niemals in die Laser-Austrittsöffnung oder in das äußerste Ende der an den Austrittsbereich des Laserstrahls angeschlossenen Glasfaser.

WARNUNG

Wenn Änderungen am Inneren des Laserstrahl-Geräts vorgenommen werden oder das Produkt zerlegt wird, können Laserstrahlen hoher Intensität ausgestrahlt werden.

Reparaturen an unseren Laser-Produkten dürfen ausschließlich durch ausgebildetes und zugelassenes Fachpersonal unseres Unternehmens vorgenommen werden.

Zu diesem Zweck muss das Laserstrahl-Gerät, falls eine Reparatur erforderlich werden sollte, an unser Unternehmen zurückgesendet werden. Benachrichtigen Sie unser Kundendienstpersonal, wenn eine Reparatur erforderlich wird.

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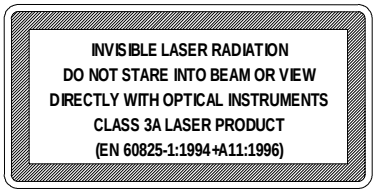
Consignes de sécurité pour utiliser nos appareils à laser

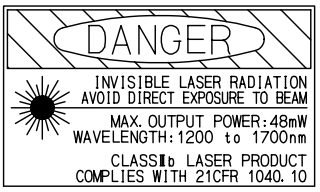
Caractéristiques de nos appareils à laser :

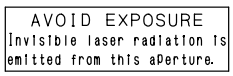
	AQ8201-110	AQ8201-12/-12A
Type de laser	DFB-Laser	ASE
Classe de laser Conforme au STD EN60825-1:1994+A11:1996 Conforme au STD 21CFR 1040.10	 3A IIIb	 3A IIIb
Puissance de sortie max.	+48dBm	+48dBm
Diam. du faisceau	9µm	9µm
Ouverture Numérique	0.1	0.1
Longueur d'onde	1524.110 à 1620.500nm	1550 ± 20nm

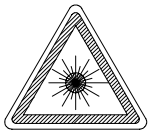
	AQ8201-13/-13A	AQ8201-13B/-13D
Type de laser	ECL	ECL
Classe de laser Conforme au STD EN60825-1:1994+A11:1996 Conforme au STD 1040.10	 3A IIIb	 3A IIIb
Puissance de sortie max.	+48dBm	+48dBm
Diam. du faisceau	9µm	9µm
Ouverture Numérique	0.1	0.1
Longueur d'onde	1460 à 1580nm	1500 à 1620nm

Les étiquettes des consignes de sécurité ci-dessous sont collées sur le devant et sur la sortie de faisceau de nos appareils à laser.









De plus, les étiquettes des consignes de sécurité imprimées dans les langues des pays concernés sont fournies avec nos appareils à laser. Collez l'étiquette imprimée dans votre langue sur la surface externe du cadre de l'appareil à laser, là où toute personne amenée à manipuler l'appareil pourra la voir clairement.

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AVERTISSEMENT

Tout contrôle ou réglage réalisé d'après toute procédure autre que celle stipulée expressément dans le Mode d'emploi est susceptible d'exposer aux dangereuses radiations du faisceau laser.

AVERTISSEMENT

D'invisibles faisceaux laser irradient à travers la section de sortie du faisceau laser. La section de sortie du faisceau laser se situe sur le panneau avant.

Lors de l'émission du faisceau laser, la diode verte située sur le panneau avant est allumée en permanence.

L'émission du faisceau laser peut être activée (On) ou désactivée (Off) par l'interrupteur " OPT ". L'interrupteur " OPT " se situe à côté de la sortie du faisceau laser, sur le panneau avant.

AVERTISSEMENT

Bien que les faisceaux laser ne soient pas visibles à l'œil nu, ils peuvent endommager les yeux ou atteindre gravement l'acuité visuelle s'ils sont envoyés dans les yeux.

N'activez pas le laser tant que la fibre optique n'est pas raccordée à la sortie du faisceau. De plus, lorsque vous débranchez la fibre optique raccordée à la sortie du faisceau, assurez-vous de toujours éteindre le laser avant de débrancher.

Lorsque le laser est activé, ne regardez jamais directement dans la sortie du faisceau ni dans la fibre optique qui est connectée à la sortie du faisceau.

AVERTISSEMENT

Lors du démontage ou de la réparation des appareils à laser, un important taux d'irradiation peut être émis.

Seul le personnel qualifié et agréé par notre société est autorisé à effectuer des réparations sur nos appareils à laser.

Par conséquent, pour toute réparation d'un de nos produits laser, vous devez retourner l'appareil à notre société. Contactez notre service après-vente pour toute réparation.

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Symbols and Signal Words

Following describes the meanings, definitions and usage of the symbols and signal words employed in this document.

1. **DANGER**, **WARNING**, **CAUTION** and **NOTE**

1) Importance of Safety Alert Symbols

From the definitions provided in paragraph (2) below, the most important critical information is contained in **DANGER** being following by **WARNING**, **CAUTION** and **NOTE**, in this order.

2) Meanings

DANGER	Indicates an immediate risk that will result in serious injury or death if the warning is unheeded.
WARNING	Indicates hazards or hazardous procedures that could result in serious or non-serious injury, death or property damage if the warning is not observed.
CAUTION	Indicates hazards or hazardous procedures that could result in injury or property damage if the caution is not observed.
NOTE	Provides supplementary explanations on “exemptions”, “corrections” or “restrictions” on the main unit.

※ Serious injury as defined in this document:

Serious injury refers to lost sight, burn (high or low temperature), electric shock, fracture or toxicity that leaves an aftereffect and/or requires hospitalization or doctor's attention for a long period.

※ Non-serious injury as defined in this document:

It denotes personal injuries such as bodily damage, burn or electric shock that does not require hospitalization or long term attention by doctor.

2. Reference for Readers

A page to be reference will be indication as shown below.

Example: (→2-1) indicates that relevant information is contained in page 2-1.

3. Representations of Operation Keys and Screen Displays

They are respectively indicated as shown below (except in the table).

[ ] : Display on the front or rear panel.
▲ ▼ ◀ ▶ : Cursor key
[ ] : Key names

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- Read this instruction manual and the following “Safety Precautions” before starting the system.
- Maintain this document in a place easy to reach after reading it.

Safety Precautions

This document employs the following safety alert symbols and signal words in order to ensure correct use of the system and prevent personal injuries or property damages. Respective symbols are assigned with the following meanings.

Read this section well before proceeding to the text of this document.

◎ Following safety alert symbols and signal words indicate basic safety rules or precautions to be observed.



This symbol represents safety precautions or rules (including DANGER or WARNING notices) that require user’s attention. (A symbol to represent an actual precaution or rule will be placed inside this triangle.)



This symbol represents safety precautions or rules users must strictly observe. (A symbol to represent an actual precaution or rule will be placed inside this circle.)



This symbol represents banned user actions.

◎ Examples of Safety Alert Symbols

 **WARNING**	Identifies hazards that could result in serious personal injury or death if the warning is unheeded and the system is improperly operated.

 **CAUTION**	Identifies hazards that could result in personal injury or property damage if the caution is unheeded and the system is operated improperly

	Identifies fuming or fire hazard that could result from improper handling.
	Identifies electric shock that could result from improper handling.
	Identifies personal injury that could result from improper handling.

	Instructs to disconnect the power cable from the receptacle to ensure work safety.
	Identifies general safety rules to be observed by users.

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1. Restrictions on Operating Environment

	Take care so that water may not enter into the system or the system may not be exposed to water. → Otherwise, fire hazard, electric shock or system failure can result.
	Make sure to connect the system to the ground potential before starting it up. → Otherwise, electric shock or system damage can result. However, when connecting the attached power cord (3-pole plug with grounding pin) to the grounded 3-pole power receptacle, above grounding is not necessary.

2. Restrictions on Operating Conditions

	Don't operate the system at any voltage other than the predetermined supply voltage. → Otherwise, fire hazard, electric shock or accident can result.
	Whenever connecting the system to supply mains, be sure to plug it to the dedicated receptacle.
	Don't try to use an extension cord since it can cause overheat and thus fire hazard.

3. Setup and Installation Work

3.1 Precautions to be observed by Setup and Installation Personnel

	Avoid disorderly and complex wiring from the power supply. → Otherwise, cable overheating or fire hazard can result.
	Make sure that the power plug is positively connected to the receptacle. → Otherwise, fire hazard or electric shock can result if a metal piece touches the power plug.
	Don't try to stack 3 or more units. → Otherwise, personal injury can result from fallen units.

3.2 Restrictions or Bans on Installation Environment and Conditions

	Don't install the system in a highly humid or dusty place. → Otherwise, electric shock or system failure can result.
	Don't install the system on an unstable bench or inclined location. → Otherwise, personal injury can result if it falls or tumbles down.
	Don't install the system in an environment exposed to severe vibrations or impacts. → Otherwise, personal injury can result if it falls off.

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	Be sure not to insert or inadvertently drop a metal bar or metallic pieces into the system through its opening. → Otherwise, fire hazard, electric shock or accident can result.
	Keep the power cord away from heating units. → Otherwise, fire hazard or electric shock can result from the damaged coating.
	Hold the plug portion when disconnecting the power plug from the receptacle. → Otherwise, fire hazard or electric shock can result from the damaged cord.
	Don't try to connect or disconnect the power plug with wet hands. → Otherwise, electric shock can result.
	Don't place the system in a high temperature environment including a place exposed to direct sunlight and inside a vehicle. → Otherwise, system failure can result due to internal overheating.

3.3 Actions Prohibited in System Installation

	Make sure whenever moving the system that the power plug is disconnected pulled out the receptacle and external connection cables are disconnected. → Otherwise, fire hazard or electric shock can result from the damaged cord.
	Don't bloc the system ventilation hole. → Otherwise, fire hazard can result from the heat built up inside the system.
	Don't damage or rework the power cord. → Otherwise, fire hazard or electric shock can result from the cord being damaged by excessive weight, heat or stresses applied to it.

4. Note before Using the System

Read the instruction manual well.

5. Usage

Be sure to operate the system in accordance with the procedures provided in the instruction manual.

When a safety alert symbol (CAUTION, WARNING or DANGER) is indicated, make sure that your action is in compliance with the rules stipulated in the instruction manual.

	Make sure that the system installation is free from water filled container or metal pieces. → Otherwise, fire hazard, electric shock or system failure can result if water or a piece of metal is inadvertently dropped inside the system.
	Don't try to rework, or forcibly bend, twist or pull the power cord. → Otherwise, fire hazard or electric shock can result.

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	Don't try to disassemble or retrofit the system. → Otherwise, fire hazard, electric shock or system failure can result.
	Remove the power plug from the receptacle when you are not going to use the system for a long period of time. → Otherwise, fire hazard, electric shock or system failure can result from lightning.
	Use care when opening or closing the doors on the system so that your fingers may not be caught.
	Be sure the power plug is disconnected from the receptacle, whenever replacing a fuse. → Otherwise, electric shock or the system damage due to shorting can result.
	Make sure that the fuse used has the specified rating and performance. → Using a short bar can aggravate an accident and also cause electric shock.
	Don't try to change the battery by you. (The lithium battery is used for the system. If you need to change the exhausted battery, please contact to our company.) → Otherwise, fire hazard or system failure can result if battery is not changed properly.

6. Maintenance

It is recommended to carry out the system maintenance on a regular basis. If you have any question the maintenance, contact us at the addresses listed at the end of the instruction manual.

	Dusts or dirt being left not cleaned inside the system can cause fire hazard or the system failure.
	When you wipe dirt of the system, please wipe out dirt with the soft dry cloth etc. If it is very dirty, wipe out with the cloth which was wrung strongly after soaking in water. Please use neither benzine nor thinner, etc.

7. Actions Required for System Failure

	If damages are found on the power, contact us for the replacement. → Using such damaged cord can result in fire hazard or electric shock.
	Should a foreign substance is dropped inside the system, turn off the system power switch first, and then remove the power plug from the receptacle and contact us. → Otherwise, fire hazard, electric shock or system failure can result.
	Should an abnormal state (such as fume or offensive odor) is detected on the system; stop the system operation. Otherwise, fire hazard or electric shock can result. As soon as above trouble is found, turn off the system power switch immediately and then remove the power plug from the receptacle. After making sure that fuming is stopped, contact us for the repair. Don't try to fix the trouble by yourself. It is an extremely risky attempt.

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	Should the system is dropped or damaged, turn off the system power switch, and then disconnect the power plug from the receptacle and contact us. → Using the system in such condition can result in fire hazard, electric shock or system failure.
	Whenever a system failure is suspected, contact us for the check instead of trying to fix it by you. → Otherwise, electric shock or other personal injury can result. Our warranty is not applicable to the system trouble being fixed by the user without previous notice to us.

8. Precautions on Disposal

	Don't try to dispose the system by incineration. → Otherwise, fire hazard or personal injury can result from explosion.

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Chapter 1 General Description

This document describes how to operate AQ8202 EXPANDER FRAME, AQ8202-01 SYSTEM CONTROLLER, AQ8203 HALFSIZE FRAME, AQ8204 FRAME CONTROLLER (hereinafter called “main-unit”) and various modules.

1.1 System Overview

This system is consisted of the main-unit and the various modules. The former can be used on desktop or incorporated into the rack and the latter can be incorporated into the module housing on the plug-in method.

The modules connectable to the module housing are AQ8201 series optical measurement modules including the light source, optical power meter, optical attenuator, optical switch and optical return-loss meter. The main-unit[*1] function as the general-purpose controller in regulating operations of these modules.

You can construct measuring systems of various types by incorporating two or more the main-unit into the 19-inch EIA-complied rack and controlling their operations externally via GP-IB.

1.2 Configuration

The standard configuration of the system includes the following modules to be connected to the module housing, and accessories. Following lists target modules of the control.

AQ8201-110	WDM DFB-LD MODULE
AQ8201-12	ASE MODULE
AQ8201-12A	ASE MODULE (high power)
AQ8201-13	ECL MODULE
AQ8201-13A	ECL MODULE (PMF)
AQ8201-13B	ECL MODULE (L-band)
AQ8201-13D	ECL MODULE (L-band, PMF)
AQ8201-21	OPM MODULE
AQ8201-22	DUAL OPM MODULE
AQ8201-32	ATTN MODULE
AQ8201-32A	ATTN MODULE (L-band)
AQ8201-33	ATTN MODULE (L-band, high resolution)
AQ8201-33M	ATTN MODULE (L-band, high resolution, with monitor port)
AQ8201-412	DUAL 1x2 OSW MODULE
AQ8201-422	DUAL 2x2 OSW MODULE
AQ8201-414	1x4 OSW MODULE
AQ8201-418	1x8 OSW MODULE
AQ8201-43	1x12 OSW MODULE
AQ8201-44	1x16 OSW MODULE
AQ8201-71	RLM MODULE

[*1] Excluding AQ8202

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1.3 Specifications

1.3.1 EXPANDER FRAME (AQ8202)

(1) Overview

AQ8202 EXPANDER FRAME (hereinafter called “this device”) is an EXPANDER FRAME equipped with the 10-slot interface specially prepared for AQ8201 optical measurement module.

Although the general-purpose module controller is not provided on this device, it enables setup of the mounted external control via GP-IB interface modules when any of AQ8201-01 SYSTEM CONTROLLER,AQ8203 HALFSIZE FRAME or AQ8204 FRAME CONTROLLER is connected.

Although this device is a desktop type, using special treatment device allows you to incorporate it into the 19-inch EIA-complied rack. You can construct measuring systems of various types by incorporating two or more this device and general-purpose controller into the 19-inch EIA-complied rack and controlling their operations externally via GP-IB.

(2) Specification

Table.1-1 shows specification of this device.

Table.1-1 Specification of AQ8202

Number of slots to accommodate modules	10
Serial interface	For connection of AQ8202-01, AQ8203 and AQ8204
Power requirement	100 to 120 VAC/200 to 240 VAC [*1], 50/60 Hz and 600 VA or less.
Environmental conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 425 (W) × 132.6 (H) × 500 (D) mm. [*2] Approx. 10 kg.

(3) Accessories

Table.1-2 shows accessories list attached to the device.

Table.1-2 List of AQ8202 Accessories

No	Accessory name	Qty	Description
1	Instruction manual	1	AS-62559-5
2	Power cord	1	3-pole
3	Connection cable	1	
4	Dust cover for expansion connector	2	Mounted on the rear panel
5	Dust cover for high-speed expansion connector	2	Mounted on the rear panel

[*1] Setting of input voltage is automatically switched.
[*2] Except protrusions on the device.

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1.3.2 SYSTEM CONTROLLER (AQ8202-01)

(1) Overview

AQ8202-01 SYSTEM CONTROLLER (hereinafter called “this device”) is the display with built-in controller specially prepared for AQ8202 EXPANDER FRAME.

This device connects up to four AQ8202 units to control up to 40 AQ8201 optical measurement modules. The device allows remote control via GP-IB.

Although this device is a desktop type, using special treatment device allows you to install it on the front or rear side of AQ8202 and then to incorporate it into the 19-inch EIA-complied rack. You can construct measuring systems of various types by incorporating two or more the AQ8202 units and this device into the 19-inch EIA-complied rack and controlling their operations externally via GP-IB.

(2) Specification

Table.1-3 shows specification of this device.

Table.1-3 Specification of AQ8202-01

Display	6.5-inch TFT color LCD
Serial interface	For connection of AQ8202 (up to four units are connectable)
GP-IB interface	Conformed to IEEE-488.2
PCMCIA interface	Used for version update alone (Flash ATA card is used)
Power requirement	100 to 120 VAC/200 to 240 VAC [*1], 50/60 Hz and 30 VA or less
Environmental conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 425 (W) × 132.5 (H) × 110 (D) mm. [*2] Approx. 4 kg.

(3) Accessories

Table.1-4 shows accessories list attached to the device.

Table.1-4 List of AQ8202-01 Accessories

No	Accessory name	Qty	Description
1	Instruction manual	1	AS-62559-6
2	Power cord	1	3-pole
3	Remote interlock connection plug	1	Red
4	Remote interlock short-circuit plug	1	Black
5	Dust cover for VGA connector	1	Mounted on the rear panel
6	Dust cover for GP-IB connector	1	Mounted on the rear panel
7	Dust cover for expansion connector	4	Mounted on the rear panel

[*1] Setting of input voltage is automatically switched.
[*2] Except protrusions on the device.

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1.3.3 HALFSIZE FRAME (AQ8203)

(1) Overview

AQ8203 HALFSIZE FRAME (hereinafter called "this device") is the united STN color LCD and controller equipped with the 3-slot interface specially prepared for AQ8201 optical measurement modules.

This device functions as a general-purpose controller of these modules. It allows external control of the mounted modules via GP-IB interface.

Although this device is a desktop type, using special treatment device allows you to incorporate it into the 19-inch EIA-complied rack. You can construct measuring systems of various types by incorporating two or more this device into the 19-inch EIA-complied rack and controlling their operations externally via GP-IB.

This device connects up to four AQ8202 EXPANDER FRAMEs.

(2) Specification

Table.1-5 shows specification of this device.

Table.1-5 Specification of AQ8203

Number of slots to accommodate modules	3
Display	STN color LCD
GP-IB interface	Complied to IEEE488.2
Serial interface	For AQ8202 alone
PCMCIA interface	For version update alone (Flash ATA card is used)
Power requirement	100 to 120 VAC/200 to 240 VAC[*1], 50/60 Hz and 190 VA or less.
Environmental conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 212 (W) × 132.5 (H) × 400 (D) mm.[*2] Approx. 5.4 kg.
Option	Rack mount kits (for single-unit and two-unit connection)

(3) Accessories

Table.1-6 shows accessories list attached to AQ8203.

Table.1-6 List of AQ8203 Accessories

No	Accessory name	Qty	Description
1	Instruction manual	1	AS-62559-2
2	Power cord	1	3-pole
3	Optical output control key	2	
4	Remote interlock connection plug	1	Red
5	Remote interlock short-circuit plug	1	Black
6	Dust cover for GP-IB connector	1	Mounted on the rear panel
7	Dust cover for expansion connector	1	Mounted on the rear panel
8	Blank panel	2	Mounted on the front panel

[*1] Setting of input voltage is automatically switched.
[*2] Except protrusions on the device.

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1.3.4 FRAME CONTROLLER (AQ8204)

(1) Overview

AQ8204 FRAME CONTROLLER (hereinafter called "this device") is the united STN color LCD and controller equipped with the 8-slot interface specially prepared for AQ8201 optical measurement modules.

This device functions as a general-purpose controller of these modules. It allows external control of the mounted modules via GP-IB interface.

Although this device is a desktop type, using special treatment device allows you to incorporate it into the 19-inch EIA-complied rack. You can construct measuring systems of various types by incorporating two or more this device into the 19-inch EIA-complied rack and controlling their operations externally via GP-IB.

This device connects up to four AQ8202 EXPANDER FRAMEs.

(2) Specification

Table.1-7 shows specification of the device.

Table.1-7 Specification of AQ8204

Numbers of slots to accommodate modules	8
Display	STN color LCD
GP-IB interface	Complied to IEEE488.2
Serial interface	For AQ8202 alone
PCMCIA interface	For version update alone (Flash ATA card is used)
Power requirement	100 to 120 VAC/200 to 240 VAC [*1], 50/60 Hz and 600 VA or less.
Environmental conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 425 (W) × 132.5 (H) × 500 (D) mm. [*2] Approx. 10 kg.

(3) Accessories

Table.1-8 shows accessories list attached to AQ8204.

Table.1-8 List of AQ8204 Accessories

No	Accessory name	Qty	Description
1	Instruction manual	1	AS-62559-4
2	Power cord	1	3-pole
3	Optical output control key	2	
4	Remote interlock connection plug	1	Red
5	Remote interlock short-circuit plug	1	Black
6	Dust cover for GP-IB connector	1	Mounted on the rear panel
7	Dust cover for expansion connector	1	Mounted on the rear panel

[*1] Setting of input voltage is automatically switched.
[*2] Except protrusions on the device.

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1.3.5 WDM DFB-LD MODULE (AQ8201-110)

(1) Overview

AQ8201-110 WDM DFB-LD MODULE (hereinafter called “this module”) is the light source equipped with DFB-LD to support WDM channel wavelength.

Depending on your purpose, you can optionally get the model designed for high output power (Option 01), the model for PMF (Option 02), the model for sine wave-form external modulation (Option 03) or CHOP external modulation (Option 04). *1

(2) Specification

Table.1-9 Table 1-9 shows specification of this module. Table.1-10 shows specification of each option.

Table.1-9 Specification of AQ8201-110

Available wavelength range		1524.110 nm to 1620.500 nm *2
Wavelength accuracy		0.01 nm (typ.) *3
Wavelength setting resolution		0.001 nm
Spectrum line width	NARROW	5 MHz or less
	WIDE	50 MHz (typ.)
Optical output		+10 dB or more *4 *5
SMSR		45 dB (typ.) *6
Output level stability	15 minutes	Within ±0.005 dB *5
	24 hours	Within ±0.03 dB *5
Wavelength stability	15 minutes	Within ±0.005 nm *3
	24 hours	Within ±0.01 nm *3
Wavelength range		1.6 nm or more *3
Optical attenuation range		10 dB (0.01 step)
Optical isolation		55 dB (typ.)
RIN		–145 dB/Hz (typ.)
Internal modulation		100 Hz to 300 kHz (CHOP)
Applicable fiber		SM (9/125 μm)
Optical connector		FC/Angled PC *7
Laser product class		IEC60825-1: class 3A 21CFR 1040.10: class Ⅲb
Environmental conditions		Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass		Approx. 39.5 (W) × 130 (H) × 339 (D) mm, Approx. 0.7 kg.

★ Specifications assured at fixed temperature within 25±3°C.

★ Specifications assured after warm-up for one hour.

*1 Cannot specify Option03 and Option04 simultaneously.

*2 Select desirable wavelength from the list of specified wavelength range (Table.1-11).

*3 CW light, attenuation 0.0dB, center wavelength, at fiber end (FC/Angled PC - FC/SPC, 2m, SMF), spectrum line width “NARROW"

*4 Ambient temperature: constant in 25±3°C, CW light, attenuation 0.0dB, center wavelength, at fiber end (FC/Angled PC - FC/SPC, 2m, SMF), spectrum line width “WIDE"

*5 Using master cord

*6 Attenuation 0.0dB, center wavelength

*7 Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).

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Table.1-10 List of AQ8201-110 Optional Modules

● Option 01 (For larger output power)

Optical output	+13 dB or more *1

● Option 02 (For PMF)

Applicable fiber	PM (9/125 μm)
Polarization extinction ratio	20 dB or more *2

● Option 03 (For externally modulated sine waveform)

Externally modulated frequency	100 Hz to 300 kHz
Input connector	SMA

● Option 04 (For externally modulated CHOP)

Externally modulated frequency	100 Hz to 300 kHz
Input connector	SMA *3
Optical pulse delay time	1 μsec (typical) *4 *5
Optical pulse rise time	1 μsec or less *4 *6
Optical pulse fall time	1 μsec (typical) *4 *6

★ Performance guarantee temperature: constant in 25±3°C.

★ Specifications assured after warm-up for one hour.

(3) Polarization Maintaining Fiber (PMF)

Following figure illustrates structure of PMF.

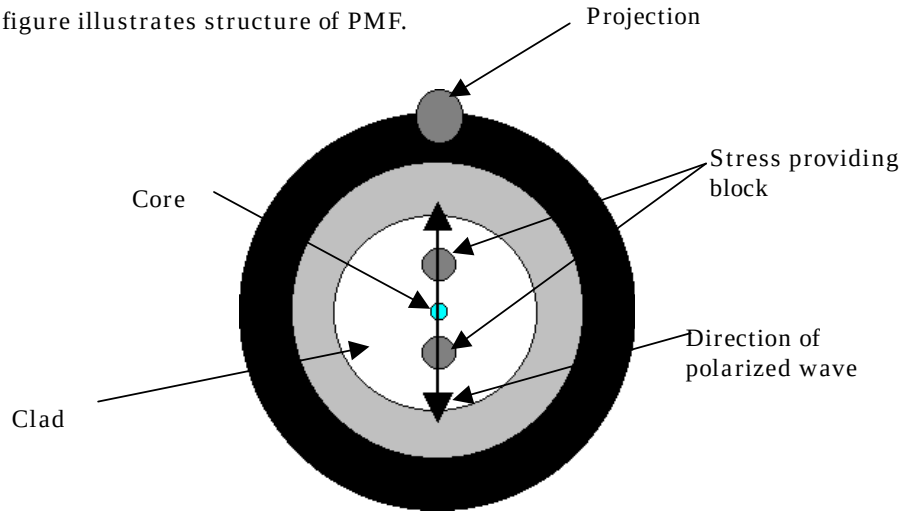


Figure.1-1 Polarization Maintaining Fiber

*1 Ambient temperature: constant in 25±3°C, CW light, attenuation 0.0dB, center wavelength, at fiber end (FC/Angled PC - FC/SPC, 2m, SMF), spectrum line width “WIDE", using master cord

*2 CW light, attenuation 0.0dB, spectrum line width “NARROW", with end of the optical connector mounted on the panel

*3 Please use the 50Ω of coaxial cable (less than 3m) for cable to connect to external modulation input connector.ulation input connector.

*4 Modulation signal 100Hz, attenuation 0.0dB, spectrum line width “NARROW"

*5 The delay time of modulated optical output to the input modulation signal.

*6 Time of 10% to 90% of rise/fall down of the optical output signal.

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Table.1-11(1) Specified wavelength range

(Optical frequency: THz. Wavelength: nm)

Optical frequency	Wave length	Optical frequency	Wave length	Optical frequency	Wave length
185.000	1620.500	187.000	1603.168	189.000	1586.203
185.050	1620.062	187.050	1602.740	189.050	1585.784
185.100	1619.624	187.100	1602.311	189.100	1585.365
185.150	1619.187	187.150	1601.883	189.150	1584.946
185.200	1618.750	187.200	1601.455	189.200	1584.527
185.250	1618.313	187.250	1601.028	189.250	1584.108
185.300	1617.876	187.300	1600.600	189.300	1583.690
185.350	1617.440	187.350	1600.173	189.350	1583.271
185.400	1617.004	187.400	1599.746	189.400	1582.854
185.450	1616.568	187.450	1599.320	189.450	1582.436
185.500	1616.132	187.500	1598.893	189.500	1582.018
185.550	1615.696	187.550	1598.467	189.550	1581.601
185.600	1615.261	187.600	1598.041	189.600	1581.184
185.650	1614.826	187.650	1597.615	189.650	1580.767
185.700	1614.391	187.700	1597.189	189.700	1580.350
185.750	1613.957	187.750	1596.764	189.750	1579.934
185.800	1613.522	187.800	1596.339	189.800	1579.518
185.850	1613.088	187.850	1595.914	189.850	1579.102
185.900	1612.654	187.900	1595.489	189.900	1578.686
185.950	1612.221	187.950	1595.065	189.950	1578.270
186.000	1611.787	188.000	1594.641	190.000	1577.855
186.050	1611.354	188.050	1594.217	190.050	1577.440
186.100	1610.921	188.100	1593.793	190.100	1577.025
186.150	1610.489	188.150	1593.369	190.150	1576.610
186.200	1610.056	188.200	1592.946	190.200	1576.196
186.250	1609.624	188.250	1592.523	190.250	1575.782
186.300	1609.192	188.300	1592.100	190.300	1575.368
186.350	1608.760	188.350	1591.678	190.350	1574.954
186.400	1608.329	188.400	1591.255	190.400	1574.540
186.450	1607.897	188.450	1590.833	190.450	1574.127
186.500	1607.466	188.500	1590.411	190.500	1573.714
186.550	1607.035	188.550	1589.989	190.550	1573.301
186.600	1606.605	188.600	1589.568	190.600	1572.888
186.650	1606.174	188.650	1589.146	190.650	1572.476
186.700	1605.744	188.700	1588.725	190.700	1572.063
186.750	1605.314	188.750	1588.304	190.750	1571.651
186.800	1604.885	188.800	1587.884	190.800	1571.239
186.850	1604.455	188.850	1587.463	190.850	1570.828
186.900	1604.026	188.900	1587.043	190.900	1570.416
186.950	1603.597	188.950	1586.623		

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Table.1-11(2) Specified wavelength range

(Optical frequency: THz. Wavelength: nm)

Optical frequency	Wave length	Optical frequency	Wave length	Optical frequency	Wave length
190.950	1570.005	192.900	1554.134	194.850	1538.581
191.000	1569.594	192.950	1553.731	194.900	1538.186
191.050	1569.183	193.000	1553.329	194.950	1537.792
191.100	1568.773	193.050	1552.926	195.000	1537.397
191.150	1568.362	193.100	1552.524	195.050	1537.003
191.200	1567.952	193.150	1552.122	195.100	1536.609
191.250	1567.542	193.200	1551.721	195.150	1536.216
191.300	1567.133	193.250	1551.319	195.200	1535.822
191.350	1566.723	193.300	1550.918	195.250	1535.429
191.400	1566.314	193.350	1550.517	195.300	1535.036
191.450	1565.905	193.400	1550.116	195.350	1534.643
191.500	1565.496	193.450	1549.715	195.400	1534.250
191.550	1565.087	193.500	1549.315	195.450	1533.858
191.600	1564.679	193.550	1548.915	195.500	1533.465
191.650	1564.271	193.600	1548.515	195.550	1533.073
191.700	1563.863	193.650	1548.115	195.600	1532.681
191.750	1563.455	193.700	1547.715	195.650	1532.290
191.800	1563.047	193.750	1547.316	195.700	1531.898
191.850	1562.640	193.800	1546.917	195.750	1531.507
191.900	1562.233	193.850	1546.518	195.800	1531.116
191.950	1561.826	193.900	1546.119	195.850	1530.725
192.000	1561.419	193.950	1545.720	195.900	1530.334
192.050	1561.013	194.000	1545.322	195.950	1529.944
192.100	1560.606	194.050	1544.924	196.000	1529.553
192.150	1560.200	194.100	1544.526	196.050	1529.163
192.200	1559.794	194.150	1544.128	196.100	1528.773
192.250	1559.389	194.200	1543.730	196.150	1528.384
192.300	1558.983	194.250	1543.333	196.200	1527.994
192.350	1558.578	194.300	1542.936	196.250	1527.605
192.400	1558.173	194.350	1542.539	196.300	1527.216
192.450	1557.768	194.400	1542.142	196.350	1526.827
192.500	1557.363	194.450	1541.746	196.400	1526.438
192.550	1556.959	194.500	1541.349	196.450	1526.050
192.600	1556.555	194.550	1540.953	196.500	1525.661
192.650	1556.151	194.600	1540.557	196.550	1525.273
192.700	1555.747	194.650	1540.162	196.600	1524.885
192.750	1555.343	194.700	1539.766	196.650	1524.498
192.800	1554.940	194.750	1539.371	196.700	1524.110
192.850	1554.537	194.800	1538.976		

(4) Accessories

Table.1-12 shows accessories list attached to this module.

Table.1-12 List of AQ8201-110 Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	1	Mounted on the optical output connector.
2	SMA connector cap *1	1	Mounted on the external modulation input connector.

*1 This cap is attached only when Option 03 or 04 is specified.

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1.3.6 ASE MODULE (AQ8201-12/12A)

(1) Overview

AQ8201-12/12A ASE MODULE (hereinafter called "this module") is a stable ASE light source equipped with the built-in optical isolator. It utilizes ASE generated by EDF to realize higher output power and broader band.

(2) Specification

Table.1-13 shows specification of this module.

Table.1-13 Specification of AQ8201-12/12A

		-12	-12A
Spectrum density (–13 dBm/nm)		1525 nm to 1570 nm (typ.) *1	
		1530 nm to 1565 nm *1	
Total output power		+10 dBm or more *1 *2	+15 dBm or more *1 *2
Output level stability	5 minutes	±0.005 dB (typ.) *1 *3	
	1 hour	Within ±0.05 dB *1 *4	
Optical modulation mode		CW	
Polarization extinction ratio		0.1 dB (typ.)	
Optical attenuation range		6 dB (0.1 dB step)	
Applicable fiber		SM (9/125 μm)	
Optical connector		Universal adapter: Option *5	
Laser product class		IEC60825-1: class 3A 21CFR 1040.10: class Ⅲb	
Environmental conditions		Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)	
Dimensions and mass		Approx. 79.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.3 kg.	

★ Specifications assured after warm-up for one hour.

(3) Accessories

Table.1-14 shows accessories list attached to this module.

Table.1-14 List of AQ8201-12/12A Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	1	Mounted on the Optical output connector.

*1 CW light, attenuation 0.0dB, at fiber end (FC/PC - FC/PC, 2m, SMF)
*2 Using master cord
*3 5 minutes (at constant temperature in 20 to 30°C)
*4 1 hour (±1°C in 0 to 40°C)
*5 AQ9441 (FC), AQ9441 (SC) and AQ9441 (ST) are available.

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1.3.7 ECL MODULE (AQ8201-13/13A/13B/13D)

(1) Overview

AQ8201-13/13A/13B/13D ECL MODULE (hereinafter called "this module") is an external cavity laser diode of the single longitudinal mode with tunable wavelength. This module, as an alternate of AQ8201-110, can be used on WDM communication device or components as a testing light source.

AQ8201-13A is designed for use at PMF. AQ8201-13B is designed for use at L-band. AQ8201-13D is designed for use at L-band and PMF.

(2) Specification

Table.1-15 and Table.1-16 shows specification of this module.

Table.1-15 Specification of AQ8201-13/13A

		-13	-13A
Available wavelength range		1460 nm to 1580 nm	
Wavelength setting resolution		10 pm	
Wavelength accuracy		Within ±0.2 nm *1 *2 *3 *4	
Wavelength repeatability		±50 pm (typ.) *1 *2 *4	
Wavelength setting time		3 sec (typ.) *5	
Spectrum line width	NARROW	5 MHz (typ.) *1 *2	
	WIDE	100 MHz (typ.) *1 *2	
Optical output level	1460 to 1580 nm	+6 dB or more *1 *2 *6 *7	+5 dB or more *1 *2 *6
	1490 to 1580 nm	+8 dB or more *1 *2 *6 *7	+7 dB or more *1 *2 *6
	1520 to 1580 nm	+10 dB or more *1 *2 *6 *7	+9 dB (typ.) *1 *2 *6
SMSR		45 dB or more *1 *2 *8	
Output level stability	15 minutes	Within ±0.005 dB *1 *2 *4 *6	
	1 hour	Within ±0.01 dB *1 *2 *4 *6	
Wavelength stability	15 minutes	Within ±0.005 nm *1 *2 *4	
	24 hours	Within ±0.01 nm (typ.) *1 *2 *4	
Optical attenuation range		10 dB (0.01dB step) *1 *8	
RIN		–145 dB/Hz (typ.) *1 *2	
Internal modulation		100 Hz to 300 kHz (CHOP) *9	
External modulation		100 Hz to 300 kHz (Sine Wave)	

*1 Temperature fixed at 23°C, CW light, 2m fiber output, single vertical mode
*2 Optical attenuation: 0.0dB
*3 After wavelength calibration
*4 C-band 1520 to 1570 nm
*5 Full span (120 nm)
*6 Spectrum line width: WIDE
*7 Using master cord
*8 Wavelength: 1550 nm
*9 Setting resolution: 0.1kHz, accuracy: ±2%.

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Applicable fiber	SM (9/125 μm)	PM (9/125 μm)
Optical connector	FC/Angled PC [*1]	
Laser product class	IEC60825-1: class 3A 21CFR 1040.10: class Ⅲb	
Environmental conditions	Operating temperature: 23±5°C [*2] Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)	
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.2 kg.	

Table.1-16 Specification of AQ8201-13B/13D

		-13B	-13D
Available wavelength range		1500 nm to 1620 nm	
Wavelength setting resolution		10 pm	
Wavelength accuracy		Within±0.2 nm [*3 *4 *5 *6]	
Wavelength repeatability		±50 pm (typ.) [*3 *4 *6]	
Wavelength setting time		3 sec (typ.) [*7]	
Spectrum line width	NARROW	5 MHz (typ.) [*3 *4]	
	WIDE	100 MHz (typ.) [*3 *4]	
Optical output level	1500 to 1620 nm	+6 dB or more [*3 *4 *8 *9]	+5 dB (typ.) [*3 *4 *8]
	1530 to 1620 nm	+8 dB or more [*3 *4 *8 *9]	+7 dB (typ.) [*3 *4 *8]
	1560 to 1620 nm	+10 dB or more [*3 *4 *8 *9]	+9 dB (typ.) [*3 *4 *8]
SMSR		45 dB or more [*3 *4 *10]	
Output level stability	15 minutes	Within ±0.005 dB [*3 *4 *6 *8]	
	1 hour	Within ±0.01 dB [*3 *4 *6 *8]	
Wavelength stability	15 minutes	Within ±0.005 nm [*3 *4 *6]	
	24 hours	Within ±0.01 nm (typ.) [*3 *4 *6]	
Optical attenuation range		10 dB (0.01dB step) [*3 *10]	
RIN		−145 dB/Hz (typ.) [*3 *4]	
Internal modulation		100 Hz to 300 kHz (CHOP) [*11]	
External modulation		100 Hz to 300 kHz (Sine Wave)	
Applicable fiber		SM (9/125 μm)	PM (9/125 μm)

*1 Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).
*2 Ambient temperature of the mainframe.
*3 Temperature fixed at 23°C, CW light, 2m fiber output, single vertical mode
*4 Optical attenuation: 0.0dB
*5 After wavelength calibration
*6 C-band 1560 to 1610 nm
*7 Full span (120 nm)
*8 Spectrum line width: WIDE
*9 Using master cord
*10 Wavelength: 1580 nm
*11 Setting resolution: 0.1kHz, accuracy: ±2%.

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Optical connector	FC/Angled PC [*1]
Laser product class	IEC60825-1: class 3A 21CFR 1040.10: class Ⅲb
Environmental conditions	Operating temperature: 23±5°C [*2] Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.2 kg.

(3) PMF (Polarization Maintaining Fiber)

Please refer 1.3.5(3) Polarization Maintaining Fiber (PMF) (→1-7)

(4) Accessories

Table.1-17 shows accessories list attached to this module.

Table.1-17 List AQ8201-13/13A/13B/13D Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	1	Mounted on the optical output connector
2	SMA connector cap	1	Mounted on the external modulation input connector.

[*1] Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).
[*2] Ambient temperature of the mainframe.

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1.3.8 OPM MODULE (AQ8201-21/22)

(1) Overview

AQ8201-21 OPM MODULE and AQ8201-22 DUAL OPM MODULE (hereinafter called "this module") optical power meter succeeded in realizing broad band, high certainty and low polarization dependency of 0.02 dB_{p-p} or less.

This module is not only capable of covering a broad wavelength band but also capable of high accuracy measuring optical power with magnitude of the error being reduced only to ±2.5% under the reference conditions.

(2) Specification

Table.1-18 and Table.1-19 shows specification of this module.

Table.1-18 Specification of AQ8201-21

Wavelength range		700 nm to 1700 nm
Photodetector		Cooled InGaAs
Applications		Small-diameter silica fiber emission *1
Optical connector		AQ9389B (FC) Connector adapter (standard) *2
Polarization dependent loss		0.02 dBp-p (typ.) *3
Power range	CW light	–80 dBm to +27 dBm *4
	Chopped light	–80 dBm to +24 dBm *4
Inaccuracy under reference condition		±2.5% *5 *6
Total accuracy		±5% (1000 nm to 1650 nm) *7
Linearity		±0.05 dB (1000 nm to 1650 nm,–40 dBm to +27 dBm) *8
Noise	CW light	–73 dBm or less *9
	Chopped light	
Environment conditions		Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass		Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 0.8 kg.

★ Specifications assured at fixed temperature within 23±5°C.

★ Specifications assured after warm-up for one hour.

---

*1 Applicable fiber ≦ 62.5/125 µm(GI) NA ≦ 0.275

*2 ST and SC connector are also available.

*3 At 1550nm wavelength, SM fiber

*4 At 1310nm wavelength

*5 At 1310 nm calibration point

*6 Reference conditions:
① Power level: –20 dBm (10 µW), CW light
② SM fiber, master FC connector
③ Ambient temperature: 23 ± 5°C
④ Calibration with AQ9389B (FC) connector adapter
(If you disconnect connector adapter, the accuracy of specifications may be lost. When you change connector, we recommend you to have recalibration.)

*7 Operation conditions:
① Power level: –20 dBm (10 µW), CW light
② ≦ 50 µm optical fiber, NA ≦ 0.2
③ Ambient temperature: 23 ± 5°C
④ With AQ9289B (FC) connector adapter

*8 Linearity at a wavelength within wavelength specified in total accuracy (CW light, ambient temperature: 23 ± 5°C)

*9 ① Averaging 1sec (averaging executed 10 times)
② In wavelength 1200 to 1600 nm
③ CW, Chopped light (270 Hz)

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Table.1-19 Specification of AQ8201-22

Wavelength range	1280 nm to 1700 nm
Photodetector	Cooled InGaAs
Applications	Small-diameter silica fiber emission *1
Optical connector	AQ9389B (FC) Connector adapter (standard) *2
Polarization dependent loss	0.02 dBp-p (typ.) *3
Power range	-80 dBm to +10 dBm
Inaccuracy under reference condition	±2.5% *4 *5
Total accuracy	±5% (1470nm to 1610nm) *6
Linearity	±0.05dB±50pW (1470nm to 1610nm,−73 dBm to +10 dBm) *7
Noise	−73 dBm or less *8
Environment conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 0.8 kg.

★ Specifications assured at fixed temperature within 25±1°C.

★ Specifications assured after warm-up for one hour.

(3) Accessories

Table.1-20 and Table.1-21 shows accessories list attached to this module.

Table.1-20 List of AQ8201-21 Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	1	Mounted on the optical input connector
2	Plug for analog output	1	

Table.1-21 List of AQ8201-22 Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	2	Mounted on the optical input connector

*1 Applicable fiber ≦ 9/125 μm(SM) NA ≦ 0.1
*2 ST and SC connector are also available.
*3 At 1550 nm wavelength, SM fiber
*4 At 1550 nm calibration point
*5 Reference conditions:
① Power level: 0 dBm (10 μW), CW light
② SM fiber, master FC connector
③ Calibration with AQ9389B (FC) connector adapter
(If you disconnect connector adapter, the accuracy of specifications may be lost. When you change connector, we recommend you to have recalibration.)
*6 Operation conditions
① Power level: 0 dBm, CW light
② SM fiber NA≦0.1
③ With AQ9289B (FC) connector adapter
*7 Linearity at a wavelength within wavelength specified in total accuracy (CW light)
*8 ① averaging 1 sec (averaging management ten times)
② At 1470nm to 1610nm
③ CW light

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1.3.9 ATTN MODULE (AQ8201-32/32A/33/33M)

(1) Overview

AQ8201-32/32A/33/33M ATTN MODULE (hereinafter called "this module") are programmable high performance tunable optical attenuators capable of performing non-cutoff switching of attenuation level in 0.01 dB step (in 0.001 dB step with AQ8201-33/33M) in the range of 0 dB to 60 dB.

Thanks to high light fastness (+23 dBm) and high return loss of these modules, they can also be used for light volume adjustment on WDM systems and fiber amplifiers.

Besides AQ8201-33M equip a monitor port and it can monitor power level of output optical.

(2) Specification

Table.1-22 and Table.1-23 show specifications of AQ8201-32/32A and 33/33M, respectively.

Table.1-22 Specification of AQ8201-32/32A

	AQ8201-32	AQ8201-32A
Wavelength range	1200 nm to 1600 nm	1480nm to 1650nm
Insertion loss	2.5 dB or less (1310/1550 nm) *1 *2	2.5dB or less (1550nm) *1.*2
Maximum attenuation level	60 dB	
Attenuation accuracy	Within ±0.1 dB (1310/1550 nm) *1 *2 *3	Within ±0.1 dB (1520 to 1620 nm) *1*2*3
Repeatability	Within±0.02 dB *1	±0.01 dB (typ) *1
Minimum attenuation step	0.01 dB	
Optical return loss	60 dB or more (1310/1550 nm) *1 *2 *4	60 dB or more (1550 nm) *1 *2*4
Polarization dependent loss	0.05 dBp-p (typ) (1550 nm) *1	
Maximum input power	+23 dBm	
Shutter isolation	100 dB or more	
Applicable fiber	SM (9/125 μm)	
Optical connector	FC/Angled PC *5	
Environment conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)	
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.0 kg.	

★ Specifications assured at fixed temperature within 25±3°C.

★ Specifications assured after warm-up for one hour.

*1 At constant temperature
*2 Using master cord
*3 Expect PDL
*4 With FC/Angled PC connector (return loss: 63dB or more)
*5 Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).

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Table.1-23 Specification of AQ8201-33/33M

	-33	-33M
Wavelength range	1480 nm to 1650 nm	
Insertion loss	2.5 dB or less (1550 nm) *1 *2	4.0 dB or less (1550 nm) *1 *2
Maximum attenuation level	60 dB	
Attenuation accuracy	Within ±0.1 dB (1520 nm to 1620 nm) *1 *2 *3	
Repeatability	±0.005 dB (typ.)	±0.01 dB (typ.)
Minimum attenuation step	0.001 dB	
Optical return loss	60 dB or more (1550 nm) *1 *2 *4	50 dB or more (1550 nm) *1 *2 *4
Polarization dependent loss	0.05 dBp-p (typ.) (1550 nm) *1	0.1 dBp-p (typ.) (1550 nm) *1
Maximum input power	+23 dBm	
Monitor output		10 dB (typ.) *5
Shutter isolation	100 dB or more	
Applicable fiber	SM (9/125 μm)	
Optical connector	FC/Angled PC *6	
Environment conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)	
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.0 kg.	

★ Specifications assured at fixed temperature within 25°C.

★ Specifications assured after warm-up for one hour.

(3) Accessories

Table.1-24 and Table.1-25 shows accessories list attached to this module.

Table.1-24 List of AQ8201-32/32A/33 Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	2	Mounted on the optical input/output connector.

Table.1-25 List of AQ8201-33M Accessories

No	Accessory name	Qty	Description
1	Optical connector cap	3	Mounted on the optical input/output connector and monitor port connector.

*1 At constant temperature
*2 Using master cord
*3 Expect PDL
*4 With FC/Angled PC connector (return loss: 63dB or more)
*5 At output port
*6 Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).

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1.3.10 OSW MODULE (AQ8201-412/422/414/418/43/44)

(1) Overview

AQ8201-412/422 DUAL OSW MODULE and AQ8201-414/418/43/44 OSW MODULE (hereinafter called “this module”) are equipped with the optical switch to switch optical path of optical signals.

Two optical switches are installed in -412 and -422 and an optical switch is installed in -414, -418, -43 and -44.

Using a single or two or more optical switches enables to connect diverse optical signals.

(2) Specification

Table.1-26 shows specification of this module.

Table.1-26 Specification of AQ8201-4X series

	DUAL OSW		OSW			
	-412	-422	-414	-418	-43	-44
Wavelength range	1480 nm to 1620 nm					
Insertion loss	1.7 dB or less *1		1.5 dB or less *1			
Return loss	50 dB or more *1		55 dB or more *1			
Isolation	60 dB or more *1		70 dB or more *1			
Polarization dependent loss	0.05 dBp-p (typ.) *1					
Repeatability	±0.02 dB (typ.) *1 *2					
Applicable fiber	SM (9/125 μm)					
Optical connector	FC/Angled PC *3					
Environment conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)					
Dimensions and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm.				Approx. 79.5 × 130 × 339 mm	
	Approx. 0.6 kg	Approx. 0.7 kg	Approx. 0.6 kg	Approx. 0.7 kg	Approx. 1.0 kg	Approx. 1.2 kg

★ Specifications assured at fixed temperature within 25±3°C.

(3) Accessories

Table.1-27 shows accessories list attached to this module.

Table.1-27 List of AQ8201-4X Series Accessories

No	Accessory name	Model	Qty	Description
1	Optical connector cap	-412	6	Mounted on the optical input/output connector.
		-422	8	
		-414	5	
		-418	9	
		-43	13	
		-44	17	

*1 At constant temperature, using connector content mastering cord, at 1550nm wavelength

*2 After warm-up for one hour

*3 Angled PC is manufactured by SEIKOH GIKEN Co., or equivalent (step-type).

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1.3.11 RLM MODULE (AQ8201-71)

(1) Overview

AQ8201-71 RLM MODULE (hereinafter called "this module") is the optical return loss meter with dynamic range of 65 dB or more. This module is capable of high accuracy measuring optical return loss - its relative measurement accuracy is ±0.4 dB or less in the range of 0 dB to 50 dB and ±0.7 dB or less in the range of 50 dB to 60 dB.

(2) Specification

Table.1-28 shows specification of this module.

Table.1-28 Specification of AQ8201-71

Wavelength range	1280 nm to 1620 nm
Dynamic range	65 dB or more *1
Relative measurement accuracy	Within ±0.4 dB (0 dB to 50 dB) *2
	Within ±0.7 dB (50 dB to 60 dB) *2
Measuring stability	Within ±0.02 dB *3
Applicable fiber	SM (9/125 μm)
Input connector (from light source)	FC/PC
Output connector (to DUT)	SC/Angled PC *4 *5
Environment conditions	Operating temperature: 5 to 40°C Storage temperature: 0 to 50°C Humidity: 85% RH or less (no condensation)
Dimension and mass	Approx. 39.5 (W) × 130 (H) × 339 (D) mm. Approx. 1.2 kg.

★ Specifications assured after warm-up for one hour.

★ Use AQ8201-71 master code

General conditions otherwise specified:

- Optical input level: –5 dB to 0 dB and CHOP (270 Hz).
- Wavelength: 1550nm
- Reference: Fresnel reflection (using master cord for AQ8201-71).
- Ambient temperature: 23 ± 1°C

(3) Accessories

Table.1-29 shows accessories list attached to this module.

Table.1-29 List of AQ8201-71 Accessories

No	Accessory name	Qty	Description
1	Optical connector cap (for FC)	1	Mounted on the optical input connector.
2	Optical connector cap (for SC)	1	Mounted on the optical input/output connector.

*1 Varies depending on master cord

*2 Depends on stability of light source to be used, linearity of photo receiver and isolation of optical directional coupler.

*3 Display stability with Fresnel reflection measurement: 5 minutes

*4 Angled PC is manufactured by from SEIKOH GIKEN Co., or equivalent (step-type).

*5 Do not connect other master cord than one specified by ANDO to output connector.

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(4) Master cord

You need AQ8201-71 master cord (option) when you use this module.

TYPE	Connect	Return loss	Note
AQ8201-71 master cord (FC)	SC/Angled PC – FC/PC master connector	50dB or more	Cord length 1m
AQ8201-71 master cord (SC)	SC/Angled PC – SC/PC master connector	50dB or more	Cord length 1m
AQ8201-71 master cord (OPEN)	SC/Angled PC – open *1		Cord length 2m

*1 The customer needs to terminate the open end of the master connector by soldering.
To measure the reflection attenuation of a connector whose Fresnel reflection cannot be measured (due to the skew polishing or others), prepare two AQ8201-71 open master cords.
Solder one of them and use it as the master cord, and use the other one for the Fresnel reflection reference measurement.

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Chapter 2 Before Starting Up the System

This chapter describes the product packing/unpacking and acceptance inspection method as well as general precautions.

In order to ensure correct use of the main-unit and the various modules used on the system, users are requested to read this chapter well before starting the system.

2.1 Unpacking and Acceptance Inspection

ANDO ELECTRIC warrants the intended performance of the delivered main-unit and modules through the predetermined mechanical and electrical inspections. In spite of the foregoing, however, users are requested to check the delivered main-unit and modules soon for damages that can result during the transportation.

After unpacking, it is recommended to maintain the wooden box, cushioning materials and interior cardboard boxes for the future use though consumable packing materials such as steel straps and packing papers may not be recyclable.

2.1.1 Inspection of Mechanical Operation

Check the appearance and operations of the switches and knobs of the main-unit and the various modules for damages that can result during the transportation. Check types and quantity of the accessories and spare parts against the packing list.

2.1.2 Performance Check

If the main-unit and the various modules are free from mechanical problems, proceed to the performance check.

2.2 When Damages or Troubles are Found

If your acceptance inspection finds damages or specification-based troubles on the system or modules, contact our headquarters, branch office or sales office immediately.

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2.3 Re-packing

When re-packing the system to transfer it to another location, it is recommended to recycle the packing materials being used for its delivery. When such materials are lost or damaged and unusable, observe the following packing procedure.

(1) Pack the system and modules with solid papers or vinyl sheets. Protect protrusions on the system or modules from damage by applying appropriate cushioning materials on them.

(2) Place the packed system and modules in cardboard or wooden boxes. The box used must have a clearance of 5 to 10 centimeters between the accommodated product on every side.

(3) Fill up the clearance between the system or module and the box with cushioning materials such as polyurethane foam. Insufficient cushioning materials will not be able to protect the product from vibrations during the transportation and thus can be a cause of damage.

(4) When using a wooden box, be sure to seal it with steel straps after attaching the lid. When using a cardboard box, close the lid and then seal the box firmly with adhesive tapes.

(5) Indicate the following information on an easy-to-see position of the box.

- Product name
- Destination
- Name of the dispatcher

CAUTION

A transportation panel must be attached to the frame to be transported.

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2.4 Power Supply-Related Safety Measures

The main-unit operates with 100 to 120 VAC or 200 to 240 VAC, 50/60 Hz power supply. Before connecting AC power, however, you must make sure that measures for preventing following accidents are prepared:

- Personal injury due to electric shock.
- Equipment damage due to abnormal voltage.
- Troubles due to earth current.

In order to prevent above troubles, users must observe the following rules.

2.4.1 Polarity of Power Cord

The 3-pole (2-pole for the ground connection type) power receptacle having the grounding E pin is connected to L (live line), N (neutral line) and protective ground line (earth) as shown in Figure.2-1. Thus, you can just plug the attached 3-core power cord into the 3-pole receptacle to have correct matching of the polarity.

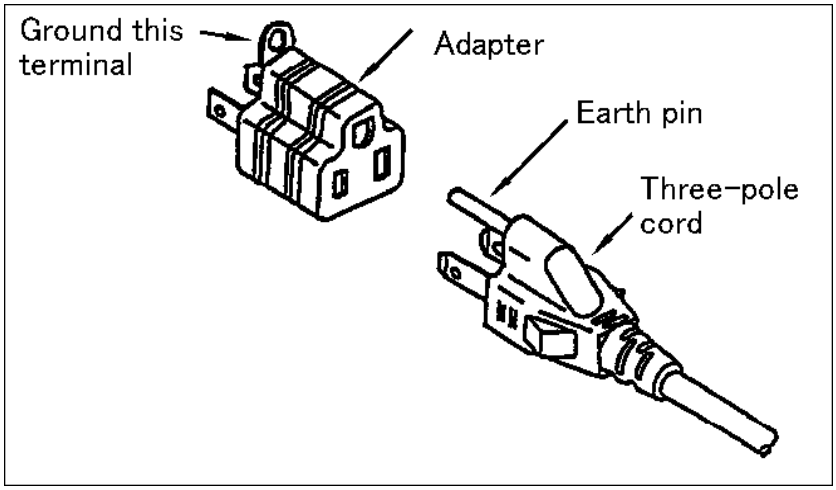


Figure.2-1 3-Core Power Cord Plug

2.4.2 Protective Ground

(1) Grounding via 3-pole power receptacle

Polarity of the 3-core power cord's plug matches that of the power supply. Thus, when a 3-pole receptacle is available, connecting the power cord to the receptacle automatically connects the system cabinet to ground potential.

(2) Grounding via conversion adapter (for Japan)

When a 3-pole power receptacle is not available, connect the adapter's grounding terminal to ground potential by use of the attached 3-pole to 2-pole conversion adapter.

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2.4.3 Fuse Replacement

The power fuse is installed in the AC LINE connector module on the rear side panel of respective modules. Table.2-1 shows the fuses used and Figure.2-2 shows the power fuse replacement procedure.

Table.2-1 Power Fuse

Unit name	Supply voltage	Power fuse	Remarks
AQ8202	100 to 120 VAC	F6.3 250V	Ceramics tube type fuse ($\phi 5 \times 20$ mm) Fast acting type
	200 to 240 VAC		
AQ8202-01	100 to 120 VAC	T0.63 250V	Glass tube type fuse ($\phi 5 \times 20$ mm) Time lag type
	200 to 240 VAC		
AQ8203	100 to 120 VAC	F3.15 250V	Ceramics tube type fuse ($\phi 5 \times 20$ mm) Fast acting type
	200 to 240 VAC		
AQ8204	100 to 120 VAC	F6.3 250V	Ceramics tube type fuse ($\phi 5 \times 20$ mm) Fast acting type
	200 to 240 VAC		

AC LINE connector module is provided on the rear side panel of above modules. See Figure.2-2. The power fuse is installed on the fuse holder situated inside the AC LINE connector module. Whenever replacing the power fuse, following procedure must be employed.

(1) Turn the power switch off and then disconnect the power cord.

(2) Pull out the fuse holder.

(3) Remove both of the two fuses installed and then install new ones. Be sure to remove both fuses even if another one is not blown. When one fuse is melted, you might as suspect the other is damaged, too.

(4) Place the fuse holder back into the original position and then connect the power cord.

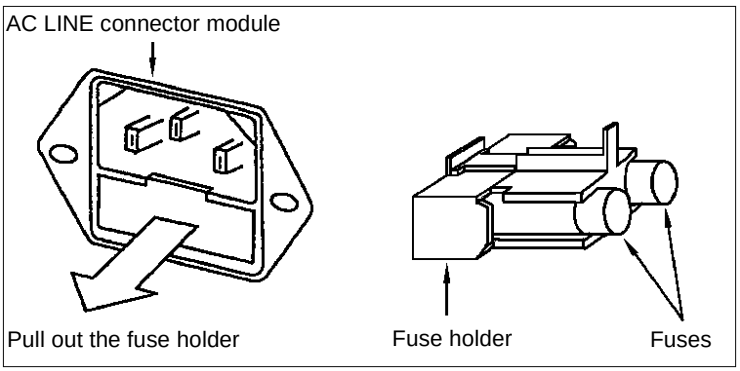


Figure.2-2 Power Fuse Replacement Procedure

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CAUTION

Before replacing the fuse, make sure to turn the power switch off and disconnect the power plug from the receptacle. If you try to replace the fuse with power being connected, electric shock can injure you.

After replacing the fuse and before turning the power switch on again, make sure that the system is grounded and the selected AC supply voltage level is appropriate. If you try to turn power on without providing appropriate grounding, electric shock may injure you. If the selected AC supply voltage level is inappropriate, the abnormal voltage may damage the equipment.

2.5 Optical Output Control Key

Optical output control key (OPTICAL OUTPUT ENABLE) is installed in the rear panel of main-unit as the safeguard. (See Chapter4)

It becomes OPT LOCK state when the optical output control key is turned OFF. In this state, light source (LD, ASE, ECL) module cannot output the light.

You can be pulled out the optical output control key when it is OFF state.

The optical output control key is not installed in AQ8202-01 SYSTEM CONTOROLLER.

NOTE

In the state of OFF, It is displayed on OPT parameter as "LOCK".

2.5.1 Optical Output Control for AQ8202-01

AQ8202-01 SYSTEM CONTROLLER doesn't have the optical output control key.

For the AQ8202-01, optical output is controlled by the password. For details, please refer to “Chapter 5 System Operation” of "AQ8202-01 SYSTEM CONTROLLER Instruction manual".

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2.6 Remote Interlock

Remote interlock connector is installed in the rear panel of main-unit as the safeguard. (See Chapter4)

It becomes OPT LOCK state when the remote inter lock connector is open state (not connect). In this state, light source (LD, ASE, ECL) module cannot output the light.

NOTE

In the open state, It is displayed on OPT parameter as "LOCK".

2.6.1 Usage

Connect the remote interlock connection plug (red) and a switch. This switch is installed so that opening and closing of a door or window etc. may be interlocked with. Design the switch to turn off/on, if a door or window etc. open/close.

If preparation is completed, connect the remote interlock connection plug (red) to the main-unit.

NOTE

The code that connects the remote interlock connecting plug (red) and the switch should not exceed 30m. Moreover, the wiring should not let the outdoors pass.

2.6.2 Usage without Remote Interlock Function

Connect the remote interlock short-circuit plug (black) and use it.

CAUTION

Before connecting the each plug to remote interlock connector, make sure to turn the power switch off. If you try to connect a plug to the main-unit having turned on the power, electric shock can injure you.

Don't connect a thing except the attached plug to the remote interlock connector. Otherwise, fire hazard, electric shock or failure can result.

NOTE

Please keep carefully the remote interlock plug that removed by exchange etc.

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Chapter 3 System Operation Notes

This chapter describes precautions on use of the frame and the various modules.

3.1 Precautions on Use

3.1.1 EXPANDER FRAME (AQ8202)

(1) Since AQ8202 EXPANDER FRAME (hereinafter called "this device") is a Class A (IEC61326) product, it can cause electromagnetic interference when used in residential environment. When using this device in such environment, the user must provide appropriate means for avoiding the trouble.

(2) Be sure to protect this device from excessive impacts.

(3) Don't try to maintain this device in high temperature or highly humid environment for a long time.

(4) This device-operating environment must be free from equipment that irradiates strong radio wave or magnetic field. Otherwise, this device malfunctioning can result.

(5) Don't try to connect any not specified module to the module-housing block of this device. Such attempt may lead to this device failure.

(6) Before mounting or dismounting a module from this device, be sure to turn power off or to make this device the standby state. Otherwise, this device and/or the module can be damaged.

(7) 25 millimeters or more space must be provided on the top and bottom of this device.
If you operate this device with its ventilating hole being blocked, abnormal temperature-rise can result damaging this device and/or the modules.

(8) This device equips with the fuse to protect it from over current. If the fuse is blown, disconnect the power cord and then replace the fuse installed in the AC voltage input receptacle.

(9) Service personnel alone are allowed to remove the cover of this device. No other person should try to remove it.

(10) As long as this device is operated in the rack, be sure to maintain the temperature inside the rack at 40°C or less.

(11) Don't try to stack this device in three or more layers. Personal injury can result from the fallen devices.

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3.1.2 SYSTEM CONTROLLER (AQ8202-01)

(1) Since AQ8202-01 SYSTEM CONTROLLER (hereinafter called “this device”) is a Class A (IEC61326) product, it can cause electromagnetic interference when used in residential environment. When using this device in such environment, the user must provide appropriate means for avoiding the trouble.

(2) Be sure to protect this device from excessive impacts.

(3) Don't try to maintain this device in high temperature or highly humid environment for a long time.

(4) This device-operating environment must be free from equipment that irradiates strong radio wave or magnetic field. Otherwise, this device malfunctioning can result.

(5) 25 millimeters or more space must be provided on the top and bottom of this device.
If you operate this device with its ventilating hole being blocked, abnormal temperature-rise can result damaging this device and/or the modules.

(6) This device equips with the fuse to protect it from over current. If the fuse is blown, disconnect the power cord and then replace the fuse installed in the AC voltage input receptacle.

(7) Service personnel alone are allowed to remove the cover of this device. No other person should try to remove it.

(8) As long as this device is operated in the rack, be sure to maintain the temperature inside the rack at 40°C or less.

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3.1.3 HALFSIZE FRAME (AQ8203)

(1) Since AQ8203 HALFSIZE FRAME (hereinafter called “this device”) is a Class A (IEC61326) product, it can cause electromagnetic interference when used in residential environment. When using this device in such environment, the user must provide appropriate means for avoiding the trouble.

(2) Be sure to protect this device from excessive impacts.

(3) Don’t try to maintain this device in high temperature or highly humid environment for a long time.

(4) This device-operating environment must be free from equipment that irradiates strong radio wave or magnetic field. Otherwise, this device malfunctioning can result.

(5) Don’t try to connect any not specified module to the module-housing block of this device. Such attempt may lead to this device failure.

(6) Before mounting or dismounting a module from this device, be sure to turn power off. Otherwise, this device and/or the module can be damaged.

(7) 25 millimeters or more space must be provided on the rear of this device.
If you operate this device with its ventilating hole being blocked, abnormal temperature-rise can result damaging this device and/or the modules.

(8) This device equips with the fuse to protect it from over current. If the fuse is blown, disconnect the power cord and then replace the fuse installed in the AC voltage input receptacle.

(9) Service personnel alone are allowed to remove the cover of this device. No other person should try to remove it.

(10) As long as this device is operated in the rack, be sure to maintain the temperature inside the rack at 40°C or less.

(11) Don’t try to stack this device in three or more layers. Personal injury can result from the fallen devices.

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3.1.4 FRAME CONTROLLER (AQ8204)

(1) Since AQ8204 FRAME CONTROLLER (hereinafter call “this device”) is a Class A (IEC61326) product, it can cause electromagnetic interference when used in residential environment. When using this device in such environment, the user must provide appropriate means for avoiding the trouble.

(2) Be sure to protect this device from excessive impacts.

(3) Don’t try to maintain this device in high temperature or highly humid environment for a long time.

(4) This device-operating environment must be free from equipment that irradiates strong radio wave or magnetic field. Otherwise, this device malfunctioning can result.

(5) Don’t try to connect any not specified module to the module-housing block of this device. Such attempt may lead to this device failure.

(6) Before mounting or dismounting a module from this device, be sure to turn power off. Otherwise, this device and/or the module can be damaged.

(7) 25 millimeters or more space must be provided on the top and bottom of this device.
If you operate this device with its ventilating hole being blocked, abnormal temperature-rise can result damaging this device and/or the modules.

(8) This device equips with the fuse to protect it from over current. If the fuse is blown, disconnect the power cord and then replace the fuse installed in the AC voltage input receptacle.

(9) Service personnel alone are allowed to remove the cover of this device. No other person should try to remove it.

(10) As long as this device is operated in the rack, be sure to maintain the temperature inside the rack at 40°C or less.

(11) Don’t try to stack this device in three or more layers. Personal injury can result from the fallen devices.

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3.1.5 Various Modules

(1) Be sure to protect the modules from excessive impacts.

(2) Don't try to maintain the modules in high temperature or highly humid environment for a long time.

(3) Operating environment of the modules must be free from equipment that irradiates strong radio wave or magnetic field. Otherwise, malfunctioning can result.

(4) Before connecting a module to a device, make sure that the module is intended for the target device. Otherwise, the module and/or frame can be damaged.

(5) Before mounting or dismounting a module from this device, be sure to turn power off. Otherwise, the module and/or frame can be damaged.

(6) The environment where the modules are maintained or operated must be free from static electricity. Otherwise, the module can be damaged.

(7) Don't try to touch the metallic pins of the module connector. Otherwise, the module can be damaged static electricity.

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3.2 Precaution on Use of Optical Parts

3.2.1 WDM DFB-LD MODULE (AQ8201-110)

If the optical connector on AQ8201-110 WDM DFB-LD module (hereinafter called "this module") is damaged, its stability can be adversely affected. Thus, you must observe the following precautions on use to avoid such trouble.

(1) Don't try to use the module in dusty environment.

(2) Before connecting an optical fiber to this module, make sure that its end face is free from damages.

(3) Before connecting an optical fiber to this module, be sure to clean its end face with alcohol or equivalent.

(4) Before connecting an optical fiber to this module, make sure that its end face is free from scratches or dusts by use of microscope. (When inspecting the end face with a microscope, make sure that light is not emitted from the optical fiber.)

(5) It is prohibited to use a bare fiber adapter when connecting an optical fiber to this module.

(6) When the module is not used, apply the protective cap to protect the optical output port from dusts.

(7) FC/Angled PC connector is used on this module. Using FC/PC connector can damage the module. For the fiber connected, FC/Angled PC connector must be used.

DANGER

The light to be output from this module is infrared and thus invisible to you. Exposing your eyes directly to the output light can damage functions of your eyes. Reasonable care, therefore, is required in using the module.

Note that similar injury can be caused by another optical equipment connected to this module. Thus, the same level of care must be exercised in handling such equipment, too.

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3.2.2 ASE MODLE (AQ8201-12/12A)

If the optical connector on AQ8201-12/12A ASE MODULE (hereinafter called "this module") is damaged, its stability can be adversely affected. Thus, you must observe the following precautions on use to avoid such trouble.

(1) Don't try to use the module in dusty environment.

(2) Before connecting an optical fiber to this module, make sure that its end face is free from damages.

(3) Before connecting an optical fiber to this module, be sure to clean its end face with alcohol or equivalent.

(4) Before connecting an optical fiber to this module, make sure that its end face is free from scratches or dusts by use of microscope. (When inspecting the end face with a microscope, make sure that light is not emitted from the optical fiber.)

(5) It is prohibited to use a bare fiber adapter when connecting an optical fiber to this module.

(6) When the module is not used, apply the protective cap to protect the optical output port from dusts.

DANGER

The light to be output from this module is infrared and thus invisible to you. Exposing your eyes directly to the output light can damage functions of your eyes. Reasonable care, therefore, is required in using the module.

Note that similar injury can be caused by another optical equipment connected to this module. Thus, the same level of care must be exercised in handling such equipment, too.

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3.2.3 ECL MODULE (AQ8201-13/13A/13B/13D)

If the optical connector on AQ8201-13/13A/13B/13D ECL MODULE (hereinafter called "this module") is damaged, its stability can be adversely affected. Thus, you must observe the following precautions on use to avoid such trouble.

(1) Don't try to use the module in dusty environment.

(2) Before connecting an optical fiber to this module, make sure that its end face is free from damages.

(3) Before connecting an optical fiber to this module, be sure to clean its end face with alcohol or equivalent.

(4) Before connecting an optical fiber to this module, make sure that its end face is free from scratches or dusts by use of microscope. (When inspecting the end face with a microscope, make sure that light is not emitted from the optical fiber.)

(5) It is prohibited to use a bare fiber adapter when connecting an optical fiber to this module.

(6) When the module is not used, apply the protective cap to protect the optical output port from dusts.

(7) FC/Angled PC connector is used on this module. Using FC/PC connector can damage the module. For the fiber connected, FC/Angled PC connector must be used.

DANGER

The light to be output from this module is infrared and thus invisible to you. Exposing your eyes directly to the output light can damage functions of your eyes. Reasonable care, therefore, is required in using the module.

Note that similar injury can be caused by another optical equipment connected to this module. Thus, the same level of care must be exercised in handling such equipment, too.

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3.2.4 OPM MODULE (AQ8201-21/22)

Ultra-precision optical parts are used on AQ8201-21 OPM MODULE and AQ8201-22 DUAL OPM MODULE (hereinafter called "this module"). They play critical role in warranting the module performance. You must, therefore, handle them carefully referencing the following precautions.

(1) This module must not be exposed to incident light in excess of the specified optical output measurement range. Otherwise, the photo-detector can be damages.

(2) Make sure that the photo-detector's detecting surface and the optical connector are free from damages or settled dusts. Otherwise, the intended performance of the module may become unavailable.

(3) When conducting incident light directly to the photo-detector, care must be exercised so that its detecting surface may not be damaged.

NOTE

If the detecting surface or the connector adapter is stained with dusts or dirt, clean them using absolute alcohol or equivalent.

3.2.5 ATTN Module (AQ8201-32/32A/33/33M)

Ultra-precision optical parts are used on AQ8201-32/32A/33/33M ATTN MODULE (hereinafter called "this module"). They play critical role in warranting the module performance. You must, therefore, handle them carefully referencing the following precautions.

(1) This module must not be exposed to incident light in excess of the specified or less input power. Otherwise, the photo-detector can be damages.

(2) Make sure that the photo-detector's detecting surface and the optical connector are free from damages or settled dusts. Otherwise, the intended performance of the module may become unavailable.

(3) FC/Angled PC connector is used on this module. Using FC/PC connector can damage the module. For the fiber connected, FC/Angled PC connector must be used.

NOTE

If the detecting surface or the connector adapter is stained with dusts or dirt, clean them using absolute alcohol or equivalent.

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3.2.6 OSW MODULE (AQ8201-412/422/414/418/43/44)

Ultra-precision optical parts are used on AQ8201-412/422/414/418/43/44 OSW MODULE (hereinafter called "this module"). They play critical role in warranting the module performance. You must, therefore, handle them carefully referencing the following precautions.

(1) Make sure that the photo-detector's detecting surface and the optical connector are free from damages or settled dusts. Otherwise, the intended performance of the module may become unavailable.

NOTE

If the detecting surface or the connector adapter is stained with dusts or dirt, clean them using absolute alcohol or equivalent.

3.2.7 RLM MODULE (AQ8201-71)

Ultra-precision optical parts are used on AQ8201-71 RLM MODULE (hereinafter called "this module"). They play critical role in warranting the module performance. You must, therefore, handle them carefully referencing the following precautions.

(1) You must not connect a master cord not designated by our company to the master cord connection. Otherwise, the ferrule can be damaged.

(2) Make sure that the photo-detector's detecting surface and the optical connector are free from damages or settled dusts. Otherwise, the intended performance of the module may become unavailable.

NOTE

If the detecting surface or the connector adapter is stained with dusts or dirt, clean them using absolute alcohol or equivalent.

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Chapter 4 System Functions

This chapter describes functions of the frame and module components as well as that of the display.

4.1 EXPANDER FRAME (AQ8202)

4.1.1 Description of Components

Figure.4-1 shows the configuration of AQ8202 (hereinafter called “this device”). Component names and functions corresponding to the numbers in the figure are described in Table.4-1.

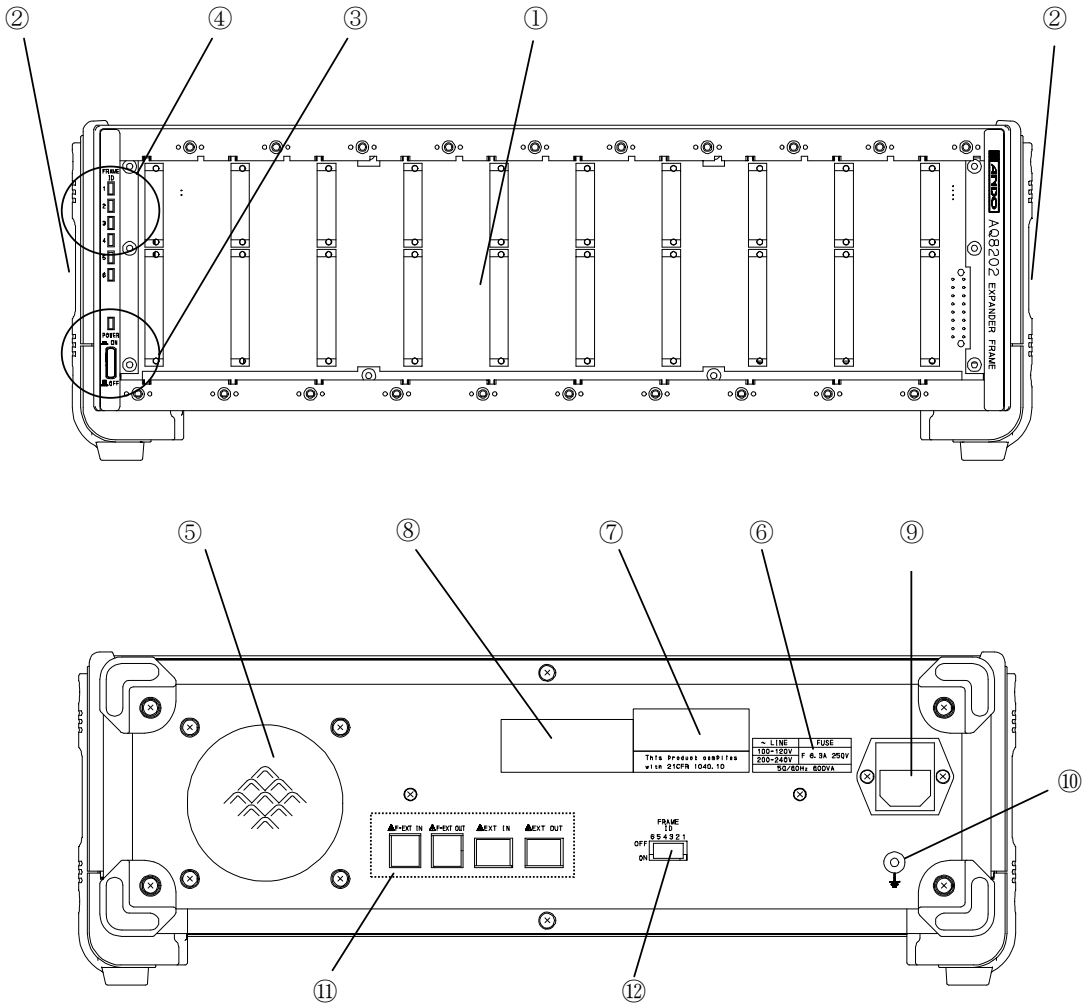


Figure.4-1 Configuration of AQ8202

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Table.4-1 Names and Functions of AQ8202 Components

No.	Name	Display	Functions
①	Module housing		It is used to accommodate modules. Power must be turned off before connecting or disconnecting a module.
②	Handle		It is used to move this device to another location.
③	Power switch	・ ON ・ OFF	It is used to turn on or off power.
④	Frame ID LED	FRAME ID 1 2 3 4 5 6	It shows the frame ID of this device.
⑤	Fan		It is used to radiate heat.
⑥	Power supply rating label		It is used to indicate ratings of the power supply as well as types of fuses used.
⑦	Nameplate		It is used to indicate the serial number.
⑧	Warning label		It shows the note to prevent shock hazard from leakage current.
⑨	Power plug connector		It is the receptacle for the power plug. A fuse is incorporated in it.
⑩	Safety ground terminal		It is used to connect this device to ground potential.
⑪	External expansion connector	⚠ EXT UNIT	It is used to connect external equipment. Note that only the equipment specially designed for this device is connectable.
⑫	Frame ID switch		It is used to select a frame ID in the range of 1 to 4.

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4.2 SYSTEM CONTROLLER (AQ8202-01)

4.2.1 Description of Components

Figure.4-2 shows the configuration of AQ8202-01 (hereinafter called “this device”). Component names and functions corresponding to the numbers in the figure are described in Table.4-2.

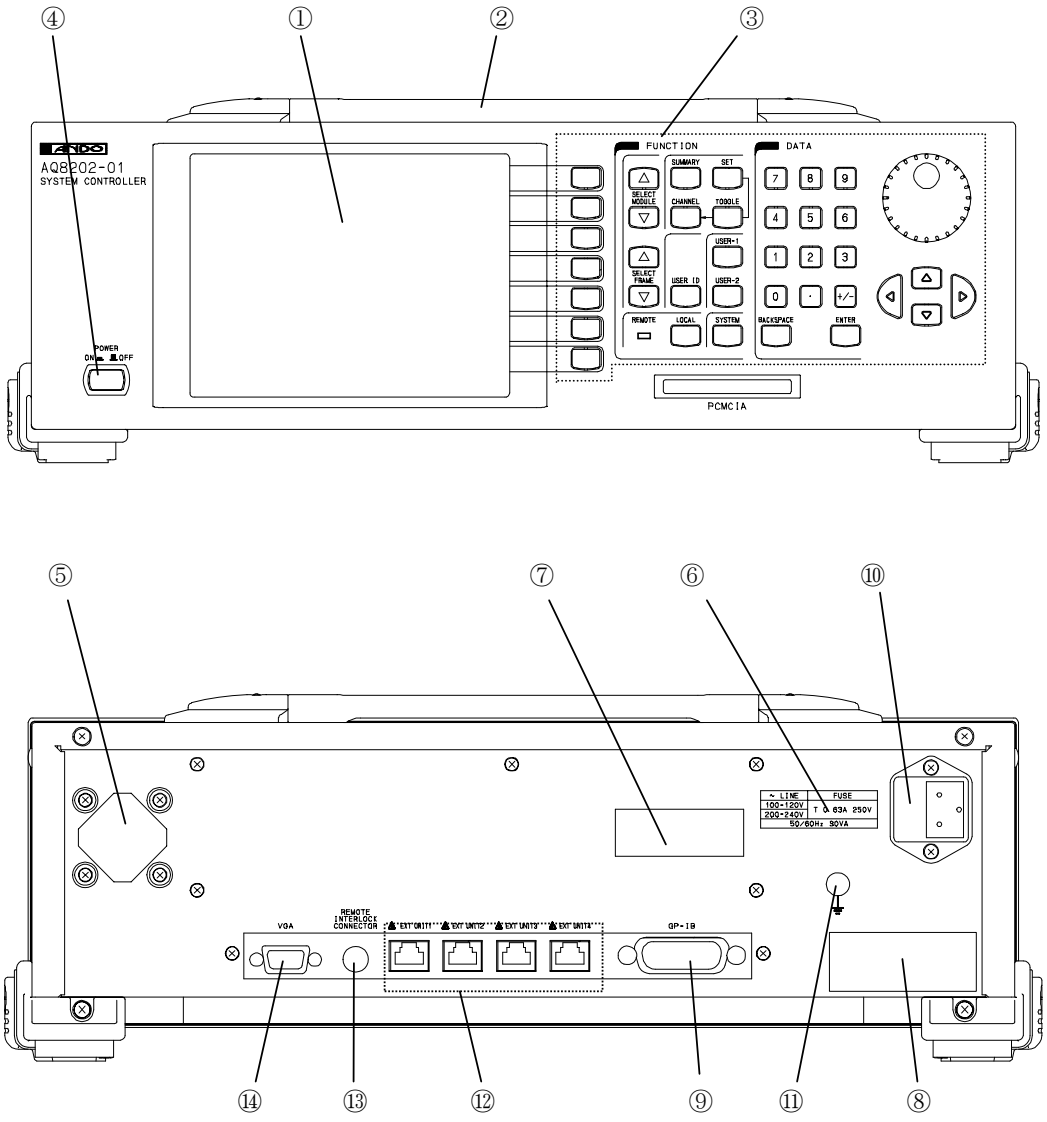


Figure.4-2 Configuration of AQ8202-01

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Table.4-2 Names and Functions of AQ8202-01 Components

No.	Name	Display	Functions
①	Display		It is used to display measurements and settings.
②	Handle		It is used to move this device to another location.
③	Key switch		It is used to control the device.
④	Power switch	・ ON ・ OFF	It is used to turn power on or off.
⑤	Fan		It is used radiate heat.
⑥	Power supply rating label		It is used to indicate ratings of the power supply as well as types of fuses used.
⑦	Nameplate		It is used to indicate the serial number.
⑧	Warning label		It shows the note to prevent shock hazard from leakage current.
⑨	GP-IB connector	GP-IB	It is a 24-pin connector for GP-IB interface.
⑩	Power plug connector		It is the receptacle for the power plug. A fuse is incorporated in it.
⑪	Safety ground terminal		It is used to connect this device to ground potential.
⑫	External expansion connector	⚠ EXT UNIT	It is used to connect external equipment. Note that only the equipment specially designed for this device is connectable.
⑬	Remote interlock	REMOTE INTERLOCK CONNECTOR	Light is not output as long as it is set to the Open position.
⑭	VGA output	VGA	It is used to output the screen display to the external monitor.

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4.3 HALFSIZE FRAME (AQ8203)

4.3.1 Description of Components

Figure.4-3 shows the configuration of AQ8203 (hereinafter called "this device"). Component names and functions corresponding to the numbers in the figure are described in Table.4-3.

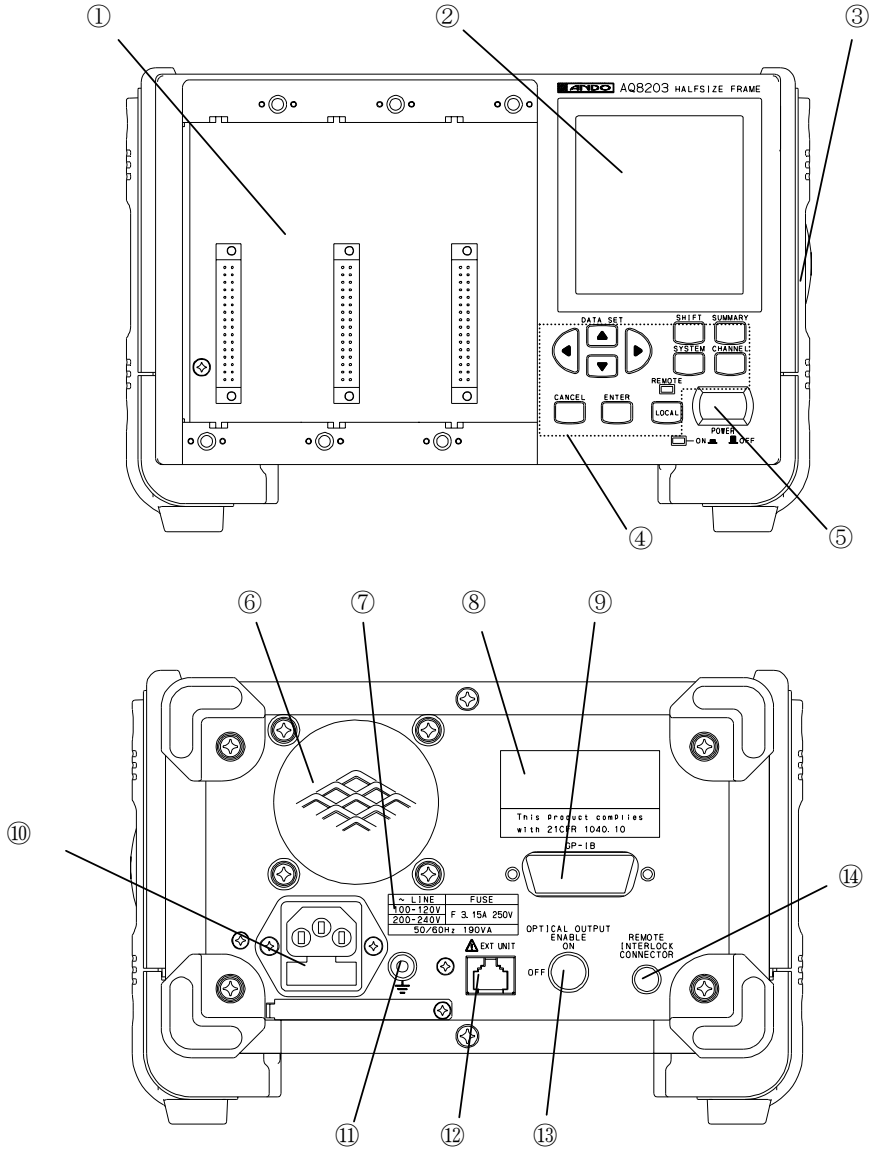


Figure.4-3 Configuration of AQ8203

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Table.4-3 Names and Functions of AQ8203 Components

No.	Name	Display	Functions
①	Module housing		It is used to accommodate modules. Power must be turned off before connecting or disconnecting a module.
②	Display		It is used to display measurements and settings.
③	Handle		It is used to move this device to another location.
④	Key switch		It is used to control this device.
⑤	Power switch	・ ON ・ OFF	It is used to turn on or off power.
⑥	Fan		It is used to radiate heat.
⑦	Power supply rating label		It is used to indicate ratings of the power supply as well as types of fuses used.
⑧	Nameplate		It is used to indicate the serial number.
⑨	GP-IB connector	GP-IB	It is a 24-pin connector for GP-IB interface.
⑩	Power plug connector		It is the receptacle for the power plug. A fuse is incorporated in it.
⑪	Safety ground terminal		It is used to connect this device to ground potential.
⑫	External expansion connector	⚠ EXT UNIT	It is used to connect external equipment. Note that only the equipment specially designed for this device is connectable.
⑬	Optical output control key	OPTICAL OUTPUT ENABLE	Light is not output as long as the key is turned off.
⑭	Remote interlock	REMOTE INTERLOCK CONNECTOR	Light is not output as long as it is set to the Open position.

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4.4 FRAME CONTROLLER (AQ8204)

4.4.1 Description of Components

Figure.4-4 shows the configuration of AQ8204 (hereinafter called “this device”). Component names and functions corresponding to the numbers in the figure are described in Table.4-4.

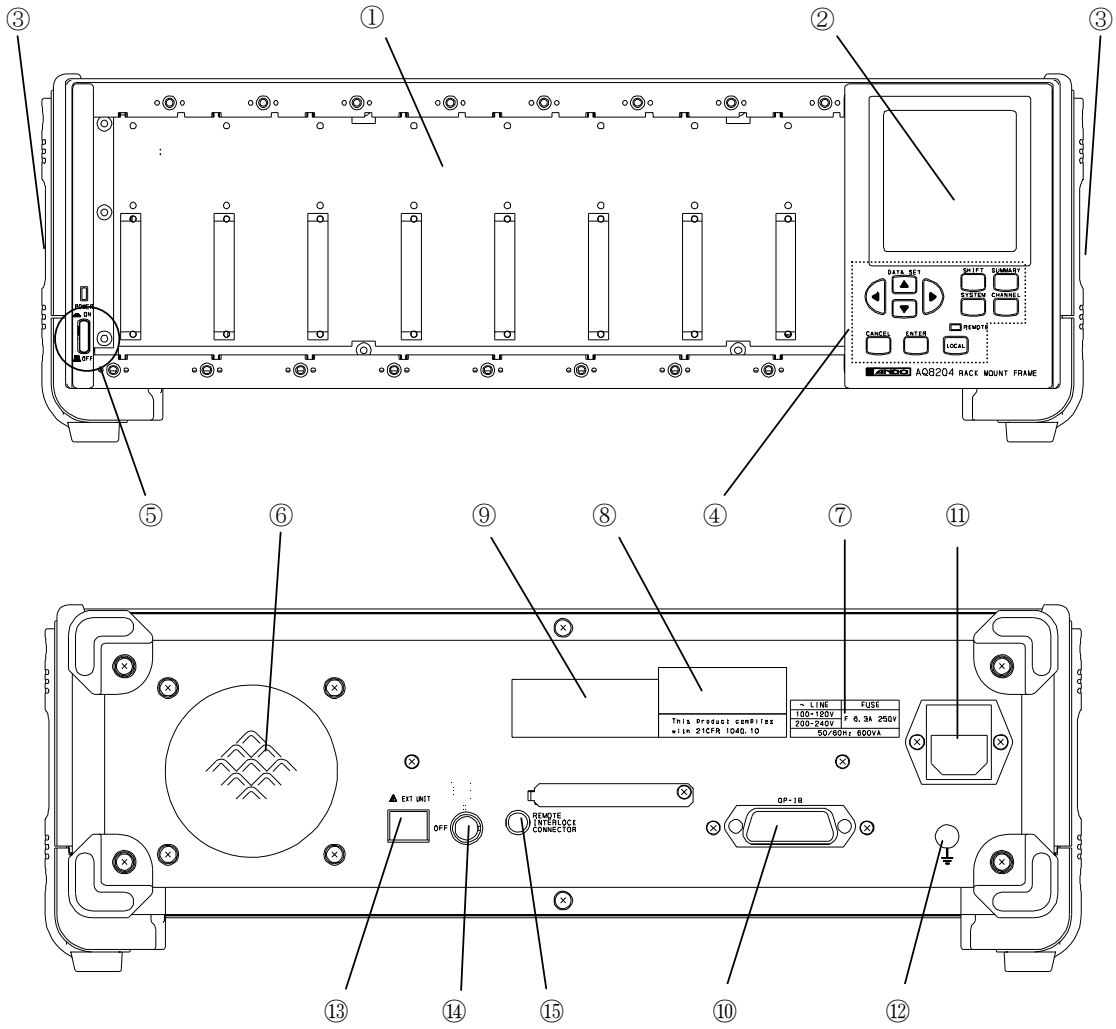


Figure.4-4 Configuration of AQ8204

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Table.4-4 Names and Functions of AQ8204 Components

No.	Name	Display	Functions
①	Module housing		It is used to accommodate modules. Power must be turned off before connecting or disconnecting a module.
②	Display		It is used to display measurements and settings.
③	Handle		It is used to move this device to another location.
④	Key switch		It is used to control this device.
⑤	Power switch	・ ON ・ OFF	It is used to turn on or off power.
⑥	Fan		It is used to radiate heat.
⑦	Power supply rating label		It is used to indicate ratings of the power supply as well as types of fuses used.
⑧	Nameplate		It is used to indicate the serial number.
⑨	Warning label		It shows the note to prevent shock hazard from leakage current.
⑩	GP-IB connector	GP-IB	It is a 24-pin connector for GP-IB interface.
⑪	Power plug connector		It is the receptacle for the power plug. A fuse is incorporated in it.
⑫	Safety ground terminal		It is used to connect this device to ground potential.
⑬	External expansion connector	⚠ EXT UNIT	It is used to connect external equipment. Note that only the equipment specially designed for this device is connectable.
⑭	Optical output control key	OPTICAL OUTPUT ENABLE	Light is not output as long as the key is turned off.
⑮	Remote interlock	REMOTE INTERLOCK CONNECTOR	Light is not output as long as it is set to the Open position.

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4.5 WDM DFB-LD MODULE (AQ8201-110)

4.5.1 Description of Components

Figure.4-5 shows the configuration of AQ8201-110 (hereinafter called "this module"). Component names and functions corresponding to the numbers in the figure are described in Table.4-5.

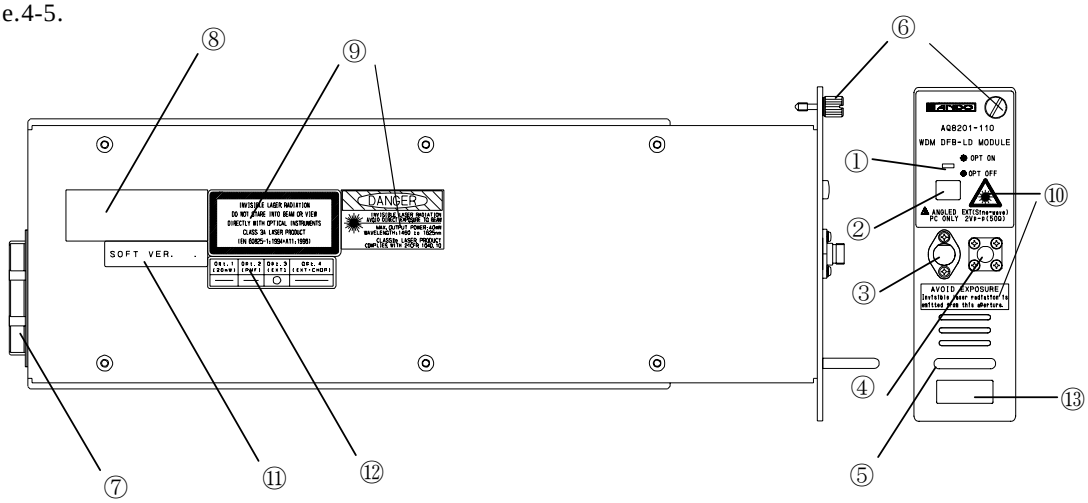


Figure.4-5 Configuration of AQ8201-110

Table.4-5 Names and Functions of AQ8201-110 Components

No.	Name	Display	Functions
①	OPT indicator lamp	○ OPT ON ● OPT OFF	It remains turned on as long as optical output is maintained.
②	OPT switch		It is used to turn on or off optical output.
③	Optical output port	⚠ ANGLED PC ONLY *1	It is used to connect FC/ Angled PC connector.
④	External modulation input connector *2	*3	It is used to receive external modulation signals.
⑤	Pull-out lever		It is used to unmount the module from the module housing. Pull the lever out to your side.
⑥	Mounting screw		It is used to fix the module to the main-unit.
⑦	Main unit connector		It is used to connect the module to the main-unit.
⑧	Nameplate		It is used to indicate the serial number.
⑨	Laser safety instruction		It is used to offer precautions on handling laser.
⑩	Warning label		Warning label
⑪	Software version label		It is used to indicate the software version.
⑫	Option indication label		Names of the options added are indicated with ○ mark.
⑬	Wavelength/ frequency label		It is used to indicate the wavelength and frequency selected when this module is shipped.

*1 When Option 01 is added, "+13 dBm" is displayed. When Option 02 is added, the word "PMF" as well as "PMF" marking is displayed.

*2 It exists only when Option 03 or Option 04 is selected.

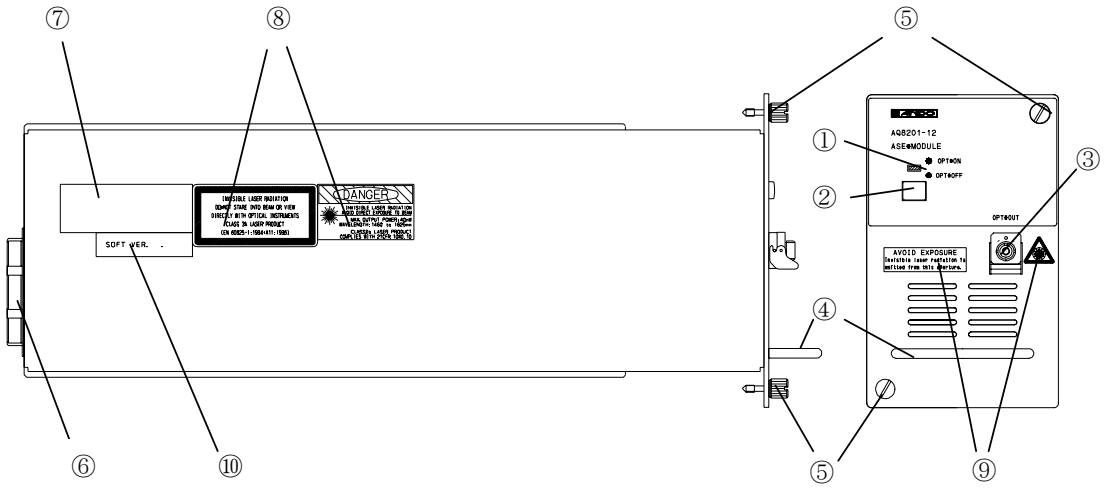
*3 When Option 03 is added, "EXT (Sine-wave) 2 Vp-p (50 Ω)" is indicated. When you added Option 04, "EXT-CHOP (TTL)" is displayed.

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4.6 ASE MODULE (AQ8201-12/12A)

4.6.1 Description of Components

Figure.4-6 shows configuration of AQ8201-12/12A (hereinafter called “this module”). Component names and functions corresponding to the numbers in the figure are described in Table.4-6.



* Component layout on AQ8201-12A slightly differs from above illustration.

Figure.4-6 Configuration of AQ8201-12/12A

Table.4-6 Names and Functions of AQ8201-12/12A Components

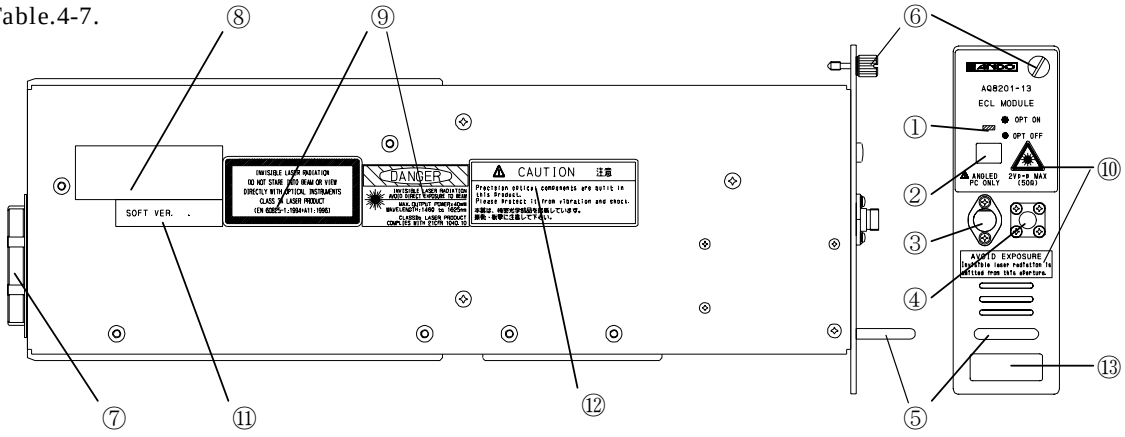
No.	Name	Unit display	Functions
①	OPT indicator lamp	○ OPT ON ● OPT OFF	It remains turned on as long as optical output is maintained.
②	OPT switch		It is used to turn on or off optical output.
③	Optical output port	OPT OUT	It is used to connect FC/PC connector. Using connector adapter is enabled to connect ST/PC or SC/PC.
④	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
⑤	Mounting screw		It is used to fix the module to the main-unit.
⑥	Main unit connector		It is used to connect the module to the main-unit.
⑦	Nameplate		It is used to indicate the serial number.
⑧	Laser safety instruction		It is used to offer precautions on handling laser.
⑨	Warning label		Warning label
⑩	Software version label		It is used to indicate the software version.

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4.7 ECL MODULE (AQ8201-13/13A/13B/13D)

4.7.1 Description of Components

Figure.4-7 shows configuration of AQ8201-13/13A/13B/13D (hereinafter called “this module”). Component names and functions corresponding to the numbers in the figure are described in Table.4-7.



* Component layout on AQ8201-13A/13B/13D slightly differs from above illustration.

Figure.4-7 Configuration of AQ8201-13/13A/13B/13D

Table.4-7 Names and Functions of AQ8201-13/13A/13B/13D Components

No.	Name	Unit display	Functions
①	OPT indicator lamp	○ OPT ON ● OPT OFF	It remains turned on as long as optical output is maintained.
②	OPT switch		It is used to turn on or off optical output.
③	Optical output port	⚠ ANGLED PC ONLY *1	It is used to connect FC/Angled PC connector.
④	External modulation input connector	2Vp-p MAX (50 Ω)	It is used to input external modulation signals.
⑤	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
⑥	Mounting screw		It is used to fix the module to the main-unit.
⑦	Main unit connector		It is used to connect the module to the main-unit.
⑧	Nameplate		It is used to indicate the serial number.
⑨	Laser safety instruction		It is used to offer precautions on handling laser.
⑩	Warning label		Warning label
⑪	Software version label		It is used to indicate the software version.
⑫	Warning label		It is used to offer precautions on handling main unit
⑬	Wavelength seal		It shows setting range of wavelength

*1 The word “PMF” and “PMF” marking is displayed for -13A and -13D.

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4.8 OPM Module (AQ8201-21/22)

4.8.1 Description of Components

Figure.4-8 and Figure.4-9 shows configuration of AQ8201-21/22 (hereinafter called “this module”). Component names and functions corresponding to the numbers in the figure are described in Table.4-8.

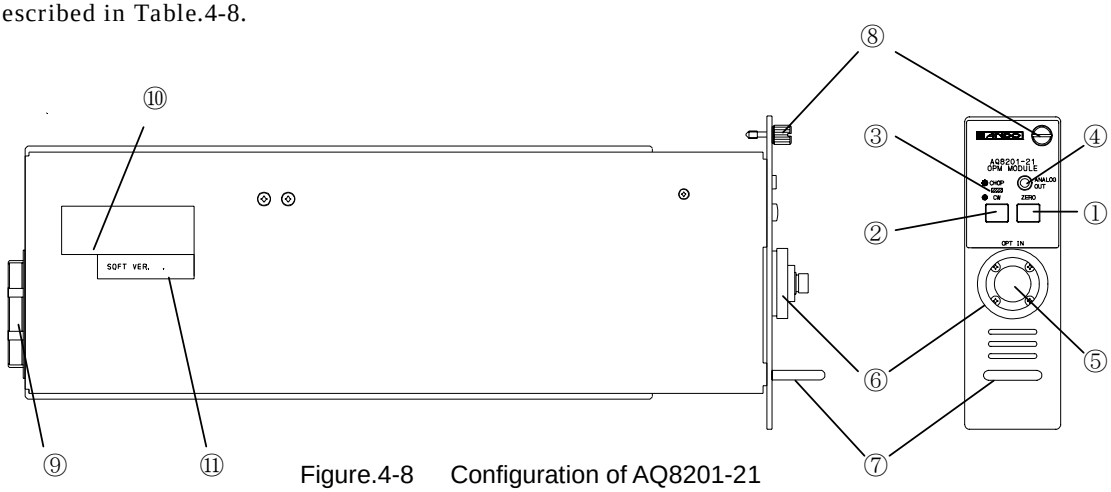


Figure.4-8 Configuration of AQ8201-21

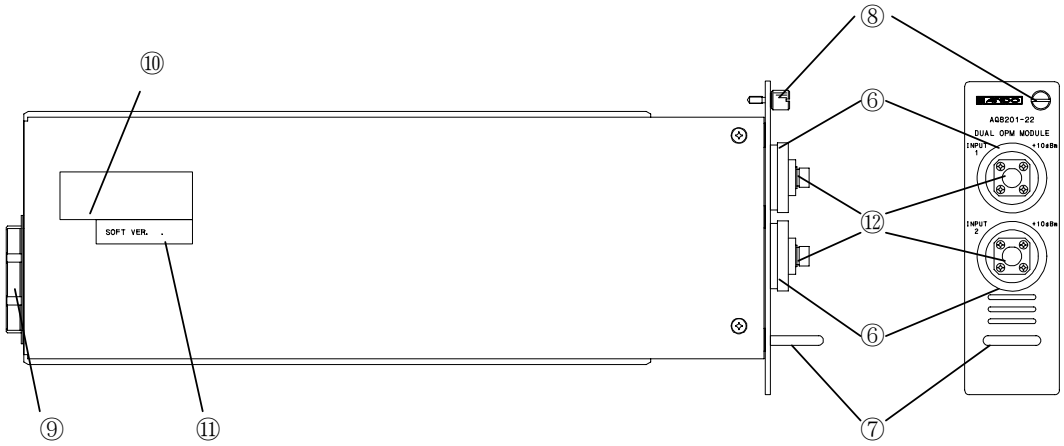


Figure.4-9 Configuration of AQ8201-22

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Table.4-8 Names and Functions of AQ8201-21/22 Components

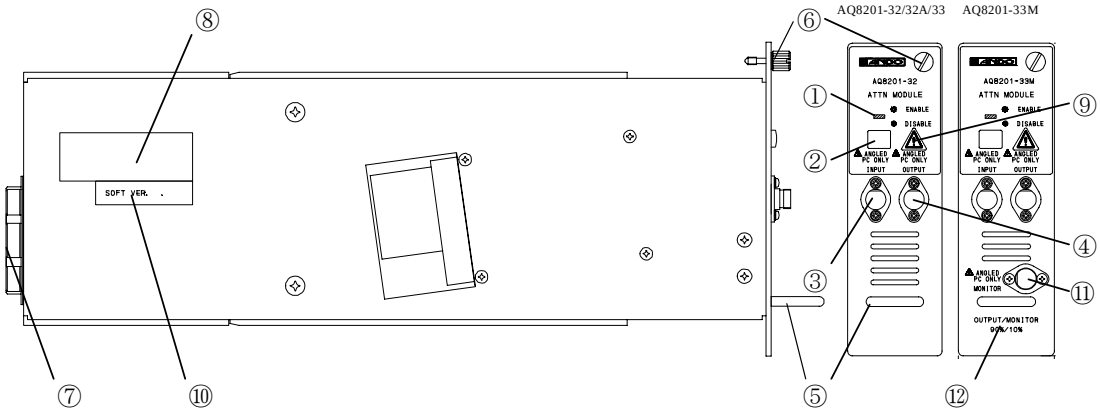
No.	Name	Unit display	Functions
①	ZERO SET switch	ZERO	It is used to implement ZERO SET.
②	CW/CHOP switch		It is used to select the optical modulation mode (CHOP frequency is specified from the frame).
③	CW/CHOP indicator lamp	○ CHOP ● CW	It comes on as CHOP light is selected.
④	Analog output pin	ANALOG OUT	It is used to output linear values within a single range in the corresponding voltage values.
⑤	Optical sensor	OPT IN	It is used to detect light. It allows connecting various types of connector adapters.
⑥	Connector adapter		It is used to connect fiber cords attached with various types of connectors. Normally, it is used for FC connector.
⑦	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
⑧	Mounting screw		It is used to fix the module to the main-unit.
⑨	Main unit connector		It is used to connect the module to the main-unit.
⑩	Nameplate		It is used to indicate the serial number.
⑪	Software version label		It is used to indicate the software version.
⑫	Optical sensor	Input 1 +10dBm Input 2 +10dBm	It is used to detect light. It allows connecting various types of connector adapters.

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4.9 ATTN Module (AQ8201-32/32A/33/33M)

4.9.1 Description of Components

Figure.4-10 shows configuration of AQ8201-32/32A/33/33M (hereinafter called "this module"). Component names and functions corresponding to the numbers in the figure are described in Table.4-9.



* Component layout on AQ8201-32A/33/33M slightly differ from above illustration.

Figure.4-10 Configuration of AQ8201-32/32A/33/33M

Table.4-9 Names and Functions of AQ8201-32/32A/33/33M Components

No.	Name	Unit display	Functions
①	Shutter LED	○ ENABLE ● DISABLE	It comes on when the shutter is open.
②	Shutter switch		It is used to open or close the shutter.
③	Optical fiber connector	INPUT	It is used to input light. It connects FC/Angled PC connector.
④	Optical fiber connector	OUTPUT	It is used to output light. It connects FC/Angled PC connector.
⑤	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
⑥	Mounting screw		It is used to fix the module to the main-unit.
⑦	Main unit connector		It is used to connect the module to the main-unit.
⑧	Nameplate		It is used to indicate the serial number.
⑨	Warning label		Warning label
⑩	Software version label		It is used to indicate the software version.
⑪	Optical fiber connect	⚠ ANGLED PC ONLY MONITOR	It is monitor output connector. It can connect FC/Angled PC connector
⑫	Monitor branch ratio	OUTPUT/MONITOR	It shows a turning comparison of optical output and monitor output.

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4.10 OSW Module (AQ8201-412/422/414/418/43/44)

4.10.1 Description of Components

Figure.4-11 shows configuration of AQ8201-412/422/414/418/43/44 (hereinafter called “this module”). Component names and functions corresponding to the numbers in the figure are described in Table.4-10.

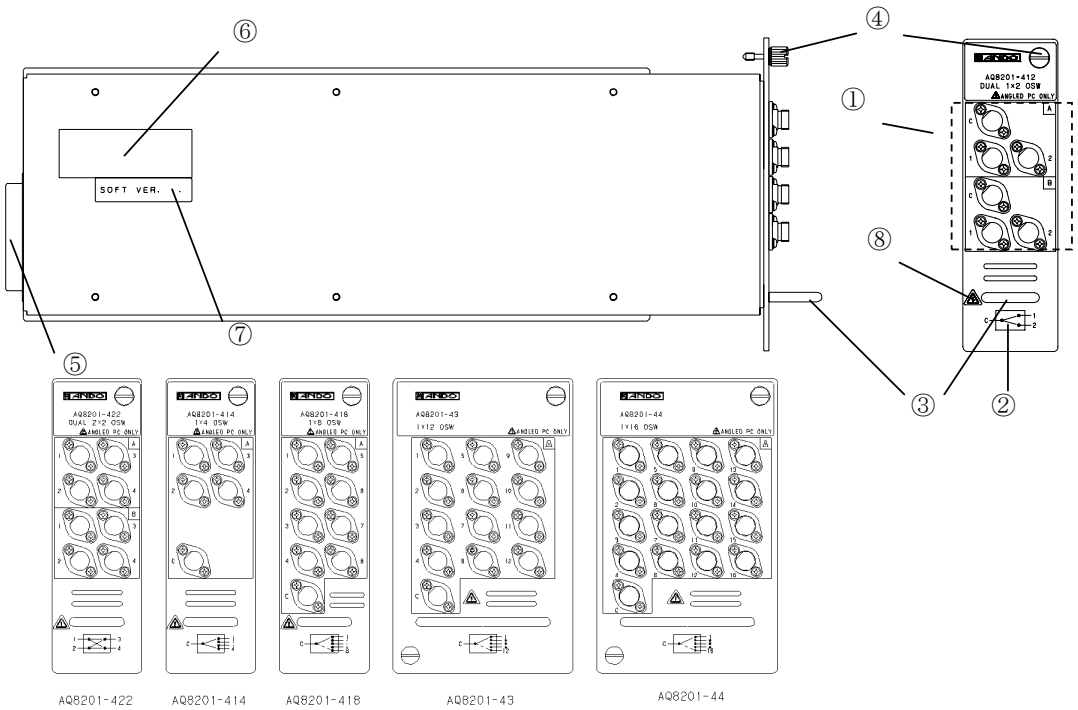


Figure.4-11 Configuration of AQ8201-412/422/414/418/43/44

Table.4-10 Names and Functions of AQ8201-412/422/414/418/43/44 Components

No.	Name	Unit display	Functions
①	Optical fiber connector	C,1,2,…	It is used to input or output light. It connects FC/Angled PC connector.
②	Connection indication label		It is used to indicate connection of the optical fiber connector and the built-in switch.
③	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
④	Mounting screw		It is used to fix the module to the main-unit.
⑤	Main unit connector		It is used to connect the module to the main-unit.
⑥	Nameplate		It is used to indicate the serial number.
⑦	Software version label		It is used to indicate the software version.
⑧	Warning label		Warning label

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4.11 RLM Module (AQ8201-71)

4.11.1 Description of Components

Figure.4-12 shows configuration of AQ8201-71 (hereinafter called “this module”). Component names and functions corresponding to the numbers in the figure are described in.Table.4-11.

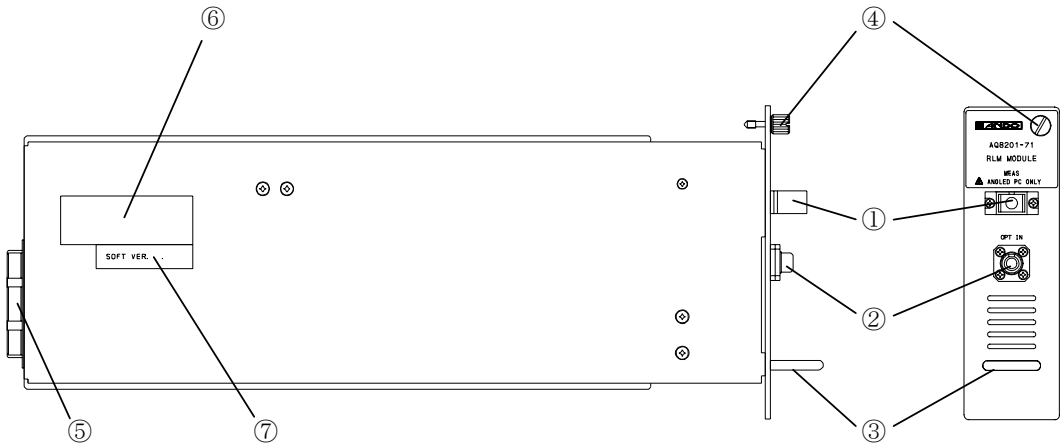


Figure.4-12 Configuration of AQ8201-71

Table.4-11 Names and Functions of AQ8201-71 Components

No.	Name	Unit display	Functions
①	Master cord connector	MEAS	It is used to connect the master cord designated by us.
②	Optical input port	OPT IN	It is used to input light. It allows to connect the SM fiber attached with FC connector.
③	Pull-out lever		It is used to move the module out of the module housing. Pull the lever out to your side.
④	Mounting screw		It is used to fix the module to the main-unit.
⑤	Main unit connector		It is used to connect the module to the main-unit.
⑥	Nameplate		It is used to indicate the serial number.
⑦	Software version label		It is used to indicate the software version.

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Chapter 5 System Operation

This chapter describes how to operate AQ8204 (hereinafter called "this device") and various modules used with the device.

5.1 Preparations

- Make sure that the device POWER switch is shifted to the [OFF] position.
- Make sure that the fuse installed in the device power plug receptacle is rated at the predetermined capacity.
- Make sure that the supply voltage is matching to the input voltage.
- Place a desired module in the module housing.

CAUTION

Before mounting or unmounting a module, shift the device POWER switch to the [OFF] position. If you try to mount or unmount a module while the POWER switch is positioned at [ON], the module can be damaged.

It is prohibited to connect an unauthorized module to this device. Otherwise, the device and/or the module can be damaged.

- Connect the attached power cord to this device and the predetermined supply mains. When a 2-pole receptacle is used for the supply mains, connect the grounding pin to ground potential using the attached conversion adapter. (For Japan)
- Make sure that the installation environment is suitable for the device. The device must not be used in a dusty place.
- The device must be installed in a flat and stable location. Make sure that the ventilating hole in the installation is not closed.
- Make sure that the module used is positively connected to the device.

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5.1.1 Cleaning at the time of Connecting Optical Connector

Before connecting an optical fiber cord or another optical connector to a module, be sure to clean the optical connector to be connected and the connector connection of the module. Other wise, dusts and dirt may damage the connector to be connected and optical parts inside the module.

(1) Cleaning of Module

We recommend you to use "CLETOP Stick Type" produced by NTT International for cleaning the connector connection of the module. (In case of AQ8201-12 with universal adapter, remove the universal adapter and clean it with absolute alcohol.)

Figure.5-1 shows the cleaning method of the optical connector connection.

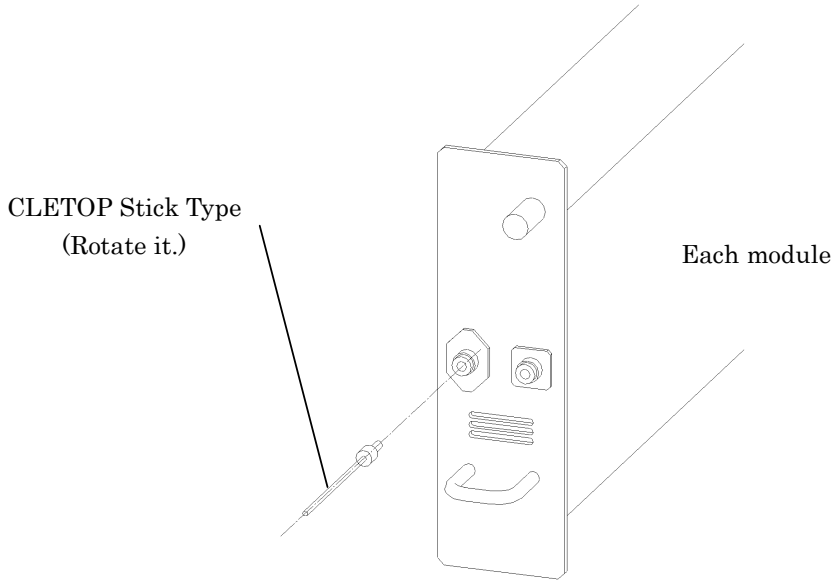


Figure.5-1 Cleaning Method of Optical Connector Connection

(2) Cleaning of Optical Connector to be Connected

Moisten a wiping sheet with a bit of absolute alcohol and wipe stains from the ferrule and end faces of the optical fiber connector. (Be sure to use a new wiping sheet all the time.)

NOTE

After being cleaned with absolute alcohol, the optical connector may still be stained depending on the wiping method. So, we recommend you to check stain on the end faces of the optical connector through a microscope.

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5.1.2 Mounting and Unmounting of Blank Panel (Option)

The blank panel is used to protect the module housing of the device. Be sure to mount this panel on it when no module is stored in the housing.

Figure.5-2 shows the mounting and unmounting methods of the blank panel.

CAUTION

This device may get out of order if a metal piece enters the module housing.

(1) Mounting Method

Bring the mounting screws on the blank panel to the upper and lower screw holes on the module of this device and fix the upper and lower portions of the blank panel to this device as shown in Figure.5-2.

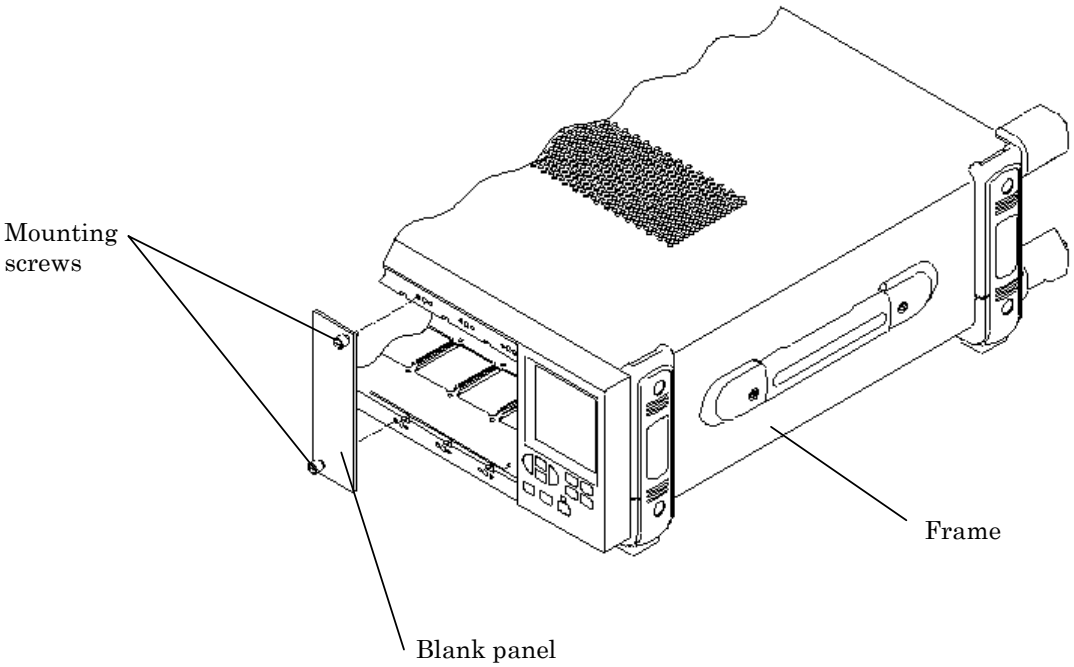


Figure.5-2 Blank Panel Mounting Method

(2) Unmounting Method

Turn the mounting screws of the mounted blank panel counterclockwise and unmount the blank panel.

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5.1.3 Mounting and Unmounting Methods of Module to and from the Frame

Before mounting or unmounting the module, make sure that this device power is set to [▙ OFF].

(1) Mounting Module

Bring a module to a rail in the module housing of the frame portion, insert it in the housing and tighten the mounting screw on the upper part of the module to fix it.

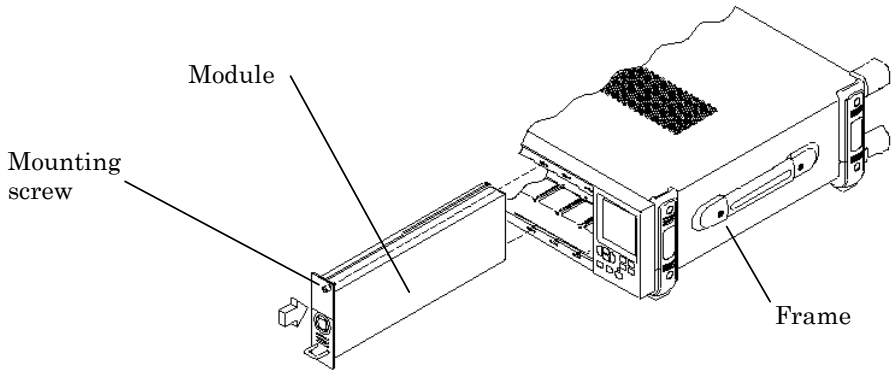


Figure.5-3 Module Mounting Method

(2) Unmounting Method

Remove the mounting screw from the upper part of the module and pull the pullout lever to unmount the module.

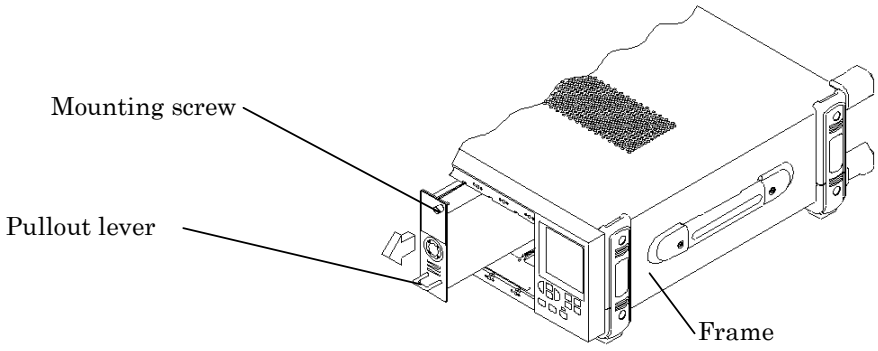


Figure.5-4 Module Unmounting Method

CAUTION

Before mounting or unmounting a module to or from the frame portion, be sure to turn off the power of the frame portion. When it is mounted or unmounted while the power remains ON, the module and the frame portion will be damaged.

The pullout lever on the module is only for mounting and unmounting the module to and from the frame portion. Never use the lever for carrying the module. Otherwise, the lever may be broken and drop.

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5.1.4 Mounting and Unmounting Methods of Universal Adapter (AQ8201-12/12A)

When various connector adapters are attached to the optical connector portion, the ASE module allows connecting various optical connectors.

(1) Mounting Method

① Combine a universal adapter and the optical connector so that the guide pin of the universal adapter engages with the guide hole of the plinth.

② Lower the detaching lever until it clicks.

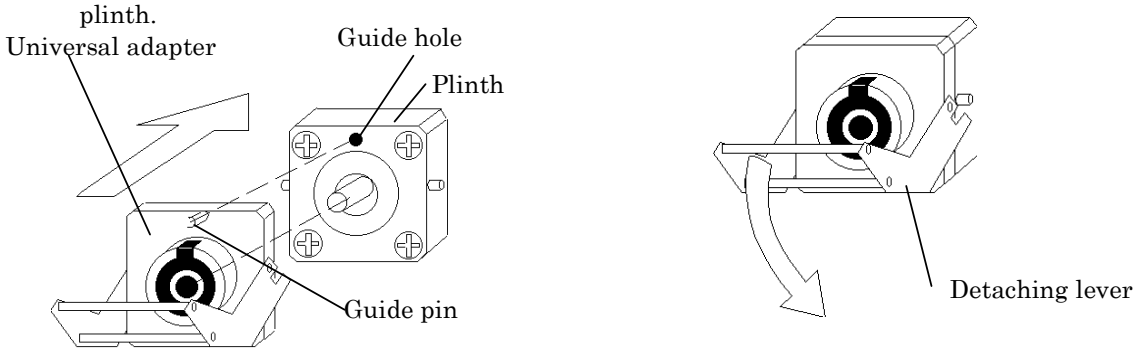


Figure.5-5 Universal Adapter Mounting Method

(2) Unmounting Method

① Pull up the detaching lever of the universal adapter and unlock the lever.

② After unlocking the lever, draw the detaching lever toward you to pull it out of the plinth.

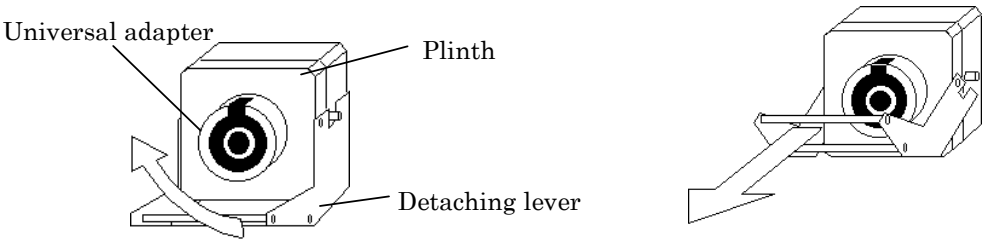


Figure.5-6 Universal Adapter Unmounting Method

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5.2 Basic Operations

Four screen modes are available. You can call any screen with the panel key to set parameters and to monitor operations.

5.2.1 Front Panel

(1) Description of the Front Panel

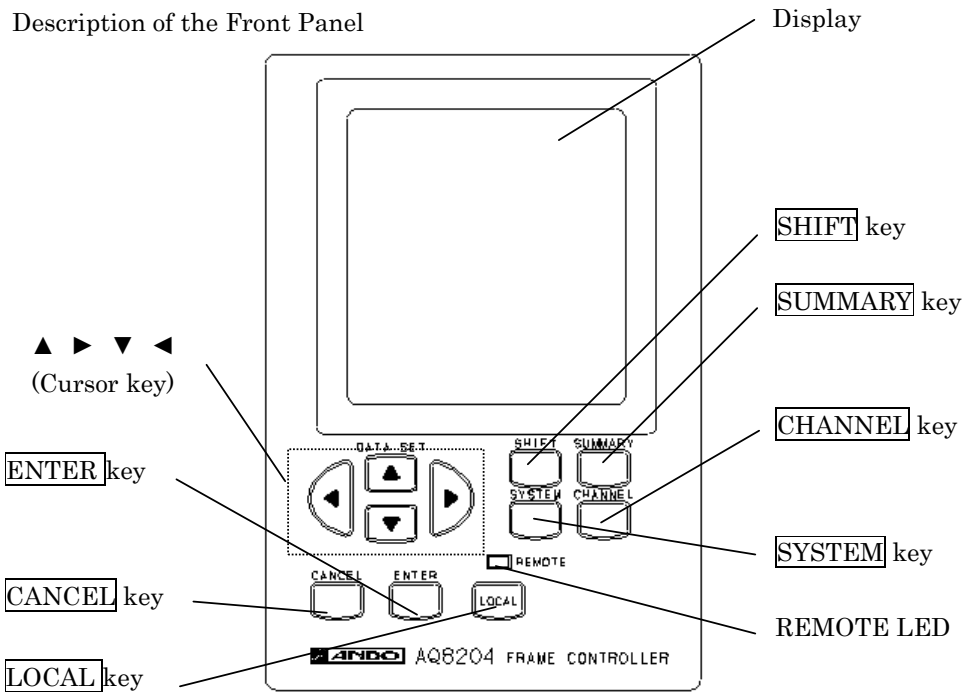


Figure.5-7 AQ8204 Operation and Display Panel

Display : Present measured values and present states are displayed here.

▲ ► ▼ ◄ (Cursor key) : ▲ and ▼ are used to change numerical values or menu options. ◄ and ► are used to change a device for controlled and digit position of numerical values entered.

CANCEL key : is used to cancel the current operation such as parameter setup.

ENTER key : is used to validate a menu option or setting value selected with the cursor key.

SYSTEM key : is used to display the system screen.

CHANNEL key : is used to display the single screen or to change modules to be controlled.

SUMMARY key : is used to display the Summary screen.

SHIFT key : It is used along with other keys when implementing various operations.

LOCAL key : is used to cancel GP-IB controlled remote mode. As long as the remote mode is turned on, all keys except the LOCAL key and POWER switch are disabled.

REMOTE LED : lights in the remote state.

☆ A short beep is sounded as you press these keys.

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5.2.2 Kind of Screen Display

(1) Initialize Screen
After the power is turned on, the initialization will start. When any error occurs during the initialization, the error content will be displayed on the screen.

(2) Summary Screen (Default)
The list of states of the module housing slots is displayed on the screen. When modules have been inserted, the kinds and the states of the modules are displayed.

(3) System Screen
This screen display the version screen, and change the brightness of the backlight, contrust, buzzer volume, and GP-IB address on the screen.

(4) Version Screen
This screen displays software version of AQ8204 and the module used.

(5) Single Screen
This screen allows you to display state of the module installed as well as to check and modify the parameters.

5.2.3 Screen Transition

Figure.5-8 shows the screen transition process of the device.
As system power is turned on, initialization process takes place. Then the Summary screen appears.

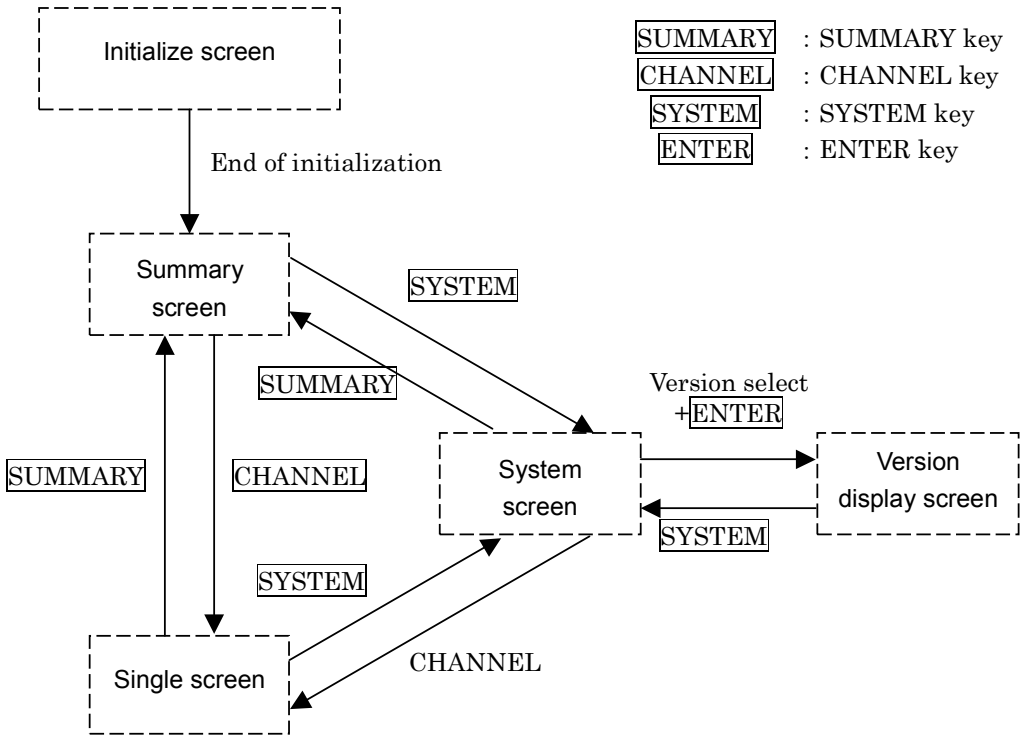


Figure.5-8 Screen Transition

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5.2.4 Initialize Screen

When the power is turned on, the initialize screen will appear, and the initialization will start.

If any error occurs during the initialization, a buzzer will sound and the error content will be displayed for 10 sec.

Figure.5-9 shows the Initialize screen [*1].

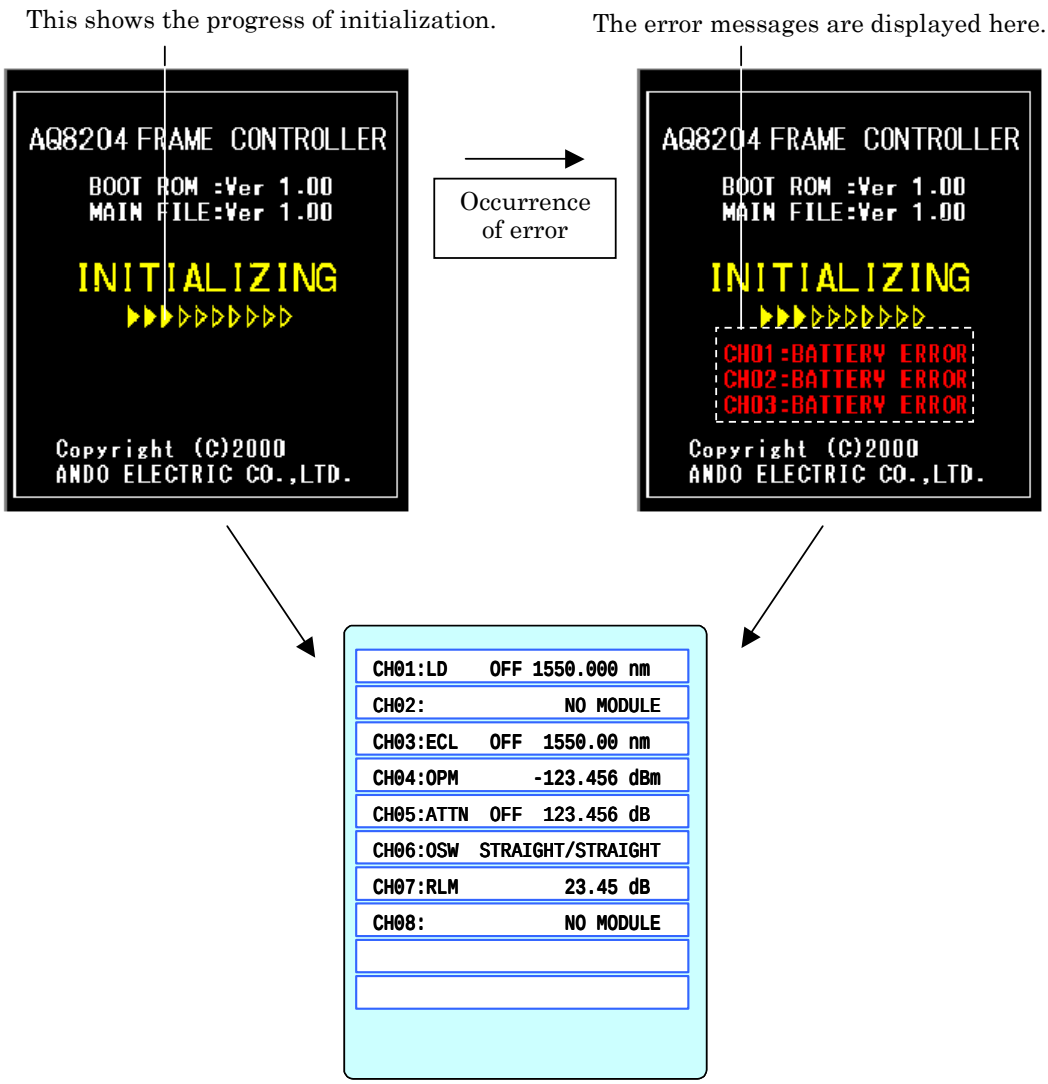


Figure.5-9 Initialize Screen

[*1] The screen sometimes slightly differs from the actual screen display.

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5.2.5 Summary Screen

The state of the module-housing slot is summarized on the screen. When any module has been inserted, the kind and the state of the module are displayed on the screen. (When EXPANDER FRAME is connected, they will be displayed when the proper frame is selected.)

You can call up this screen by pressing the SUMMARY key from the System or Single screen.

(1) Screen Display

Figure.5-10 shows the Summary screen [*1].

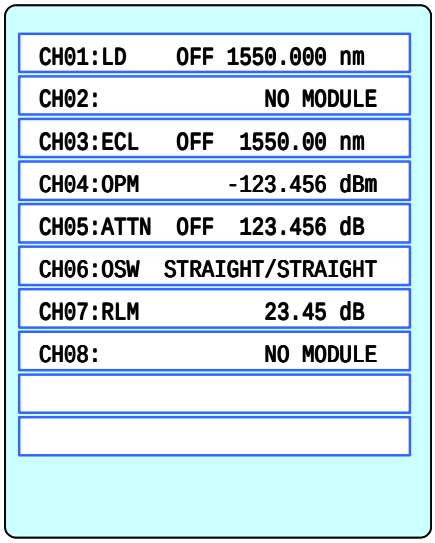


Figure.5-10 Summary Screen

(2) Operation

◄► : Used to select the parameter to be displayed.
▲▼ : Used to select the target module of control.
ENTER : It allows modifying attenuation level of ATTN module alone.
CHANNEL : It is used to display the Single screen for the target module of control.
SYSTEM : It is used to display the System screen.

[*1] The screen sometimes slightly differs from the actual screen display.

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5.2.6 System Screen

This screen display the version screen, and change the brightness of the backlight, contrust, buzzer volume, and GP-IB address on the screen.

You can call up this screen by pressing the SYSTEM key from the Summary or Single screen.

(1) Screen Display

Figure.5-11 shows the System screen [*1]. A menu option you select will be highlighted on the screen.

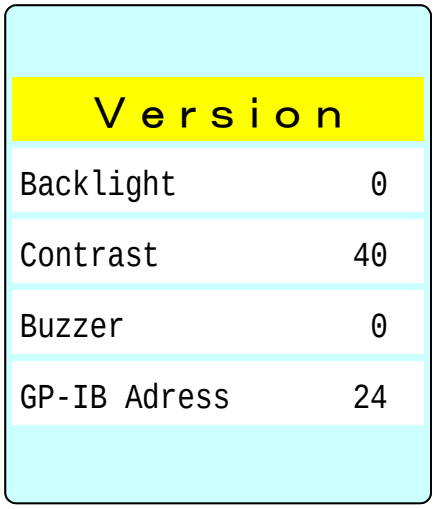


Figure.5-11 System Screen

(2) Operation

Select a desired menu option using ▲▼, then press the ENTER key. Following menu options are available.

Version : It turns on the Version Display screen.
Backlight : It allows you to adjust brightness of the backlight.
Contrast : It allows you to adjust contrast.
Buzzer : It allows you to adjust buzzer sounds.
GP-IB Address : It allows you to change GP-IB address.

☆ The value you specified for each menu option is maintained even if system power is turned off.

① Adjustment of backlight brightness

Select the "Backlight" and then press the ENTER key. The corresponding currently set value will be highlighted enabling you to specify a desired value.

▲▼ : Allows you to specify the value in the range of 0 to 99.
0 and 99 select the darkest and brightest level, respectively.
◄► : Allows you to change a value to be entered.
ENTER : Used to validate the specified value.
CANCEL : Used to cancel the setup operation. In this case, the currently selected value remains valid without being modified.

[*1] The screen sometimes slightly differs from the actual screen display.

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② Contrast adjustment

Select the "Contrast" and then press the ENTER key. The corresponding currently set value will be highlighted enabling you to specify a desired value.

▲▼ : Allows you to specify a value in the range of 0 to 99.
0 and 99 select the lowest and highest contrast, respectively.
◄► : Allows you to change the value to be entered.
ENTER : Used to validate the specified value.
CANCEL : Used to cancel the setup operation. In this case, the currently selected value remains valid without being modified.

③ Adjustment of buzzer sound level

Select the "Buzzer" and then press the ENTER key. The corresponding currently set value will be highlighted enabling you to specify a desired value.

▲▼ : Allows you to specify a value in the range of 0 to 9.
0 turns the sound off. 1 and 9 select the lowest and highest sound, respectively.
ENTER : Used to validate the specified value.
CANCEL : Used to cancel the setup operation. In this case, the currently selected value remains valid without being modified.

④ Change of GP-IB address

Select the "GP-IB Address" and then press the ENTER key. The corresponding currently set value will be highlighted enabling you to specify a desired value.

▲▼ : Allows you to specify a value in the range of 0 to 30.
Specify 24 when you want to selects the default value.
▲▼ : Allows you to change the value to be entered.
ENTER : Used to validate the specified value.
CANCEL : Used to cancel the setup operation. In this case, the currently selected value remains valid without being modified.

NOTE

The value you specified for each menu option is maintained even if system power is turned off.

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5.2.7 Version Screen

This screen allows you to display software version of the main unit and modules installed.

You can call up this screen by selecting “Version” from the System screen and then pressing the ENTER key.

(1) Screen Display

Figure.5-12 shows the Version Display screen [*1].

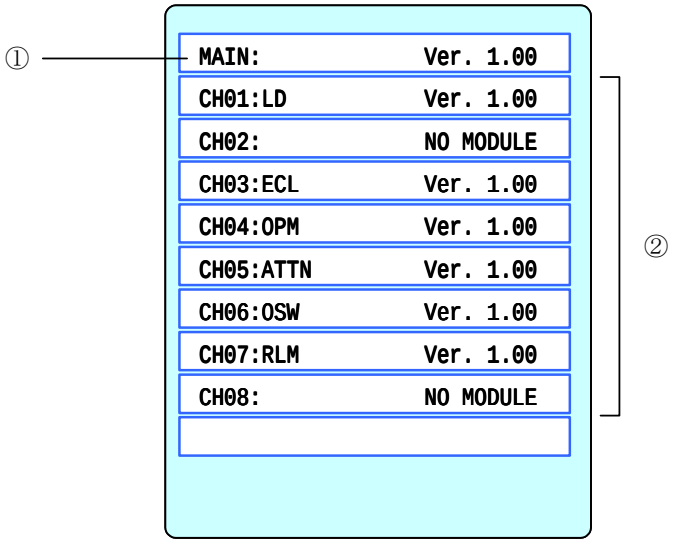


Figure.5-12 Version Screen

① MAIN

It is used to display software version of this device.

② CH

They display software version of modules mounted in each channels.

(2) Operation

SYSTEM : It restores the System screen.

[*1] The screen sometimes slightly differs from the actual screen display.

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5.2.8 Single Screen

The Single screen allows you to display the parameters or specify the parameter values on the individual module basis. You can call up this screen by pressing the CHANNEL key from the Summary screen.

(1) Screen Display

Figure.5-13 shows the Single screen. For description of respective parameters, refer to the following.

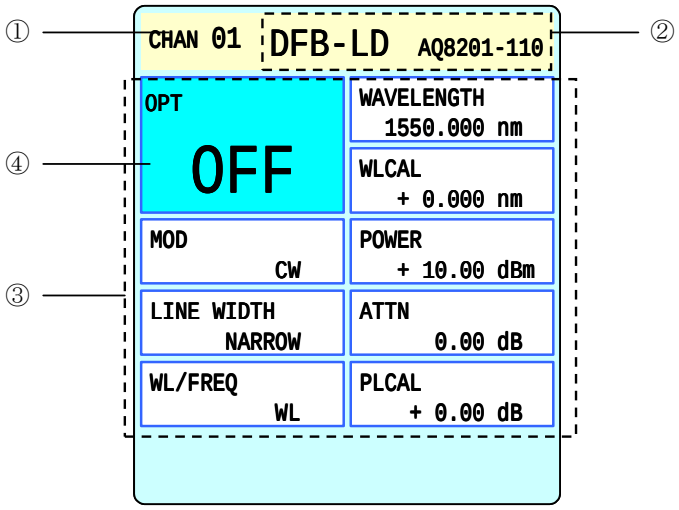


Figure.5-13 Single Screen (When AQ8201-110 is the target module of control)

① CHAN

It used to display the slot number in which the module is mounted.

② Module name

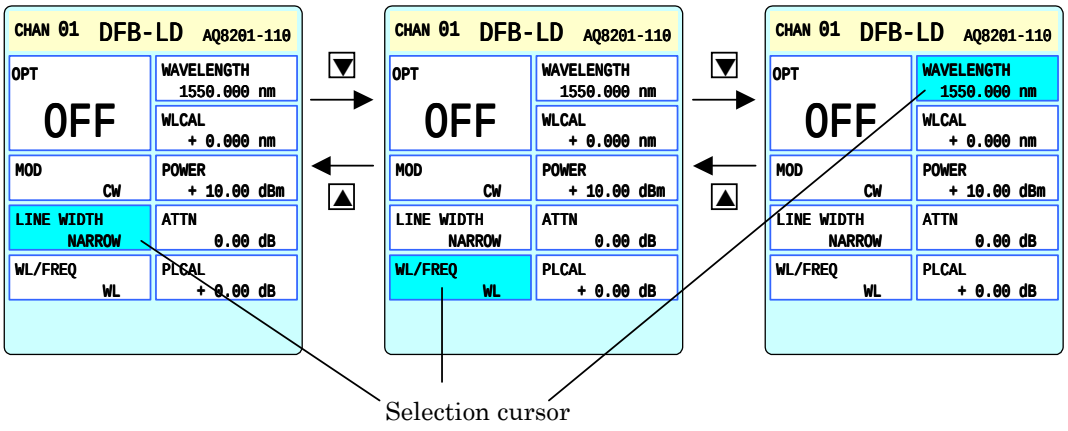
It used to display the type and model name of the module.

③ Parameter

It used to display parameters of the module to be controlled.

④ Selection cursor

This indicates the currently selected parameter. You can move to another parameter using ▲or▼ key. You can change a parameter value only when the parameter concerned is selected. Note that you can't select a parameter this is not modifiable.

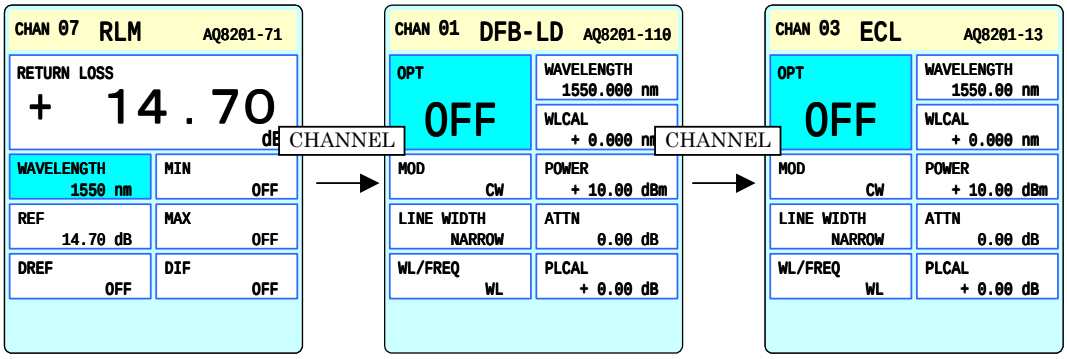


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(2) How to Select Module to be Controlled

CHANNEL key is pressed in order to change the module to be controlled. The module to be controlled changes and the single screen of the module is displayed.

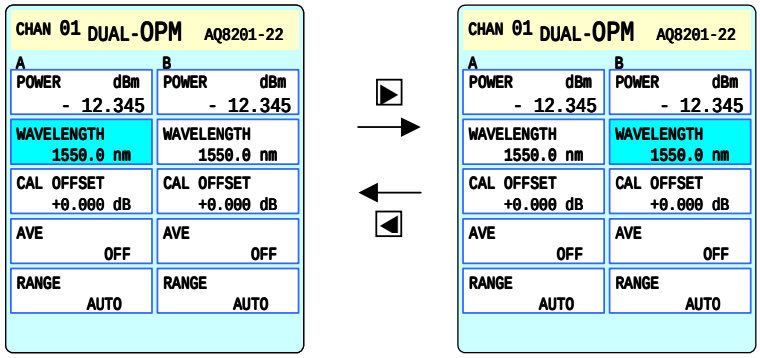
Before modifying parameters of the module, you must select it as the target of control.



(3) How to Select Device to be Controlled

There are some which have two or more devices by some module.

◄ and ► keys are pressed in order to change the module to be controlled.

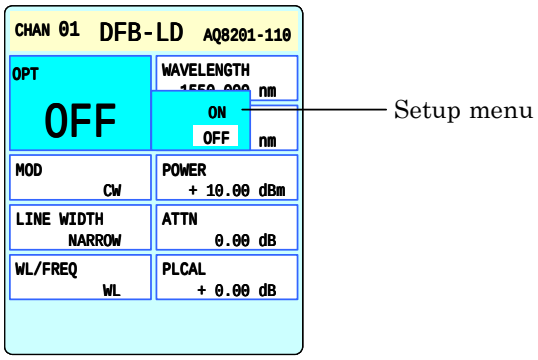


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(4) Parameter Change Procedure

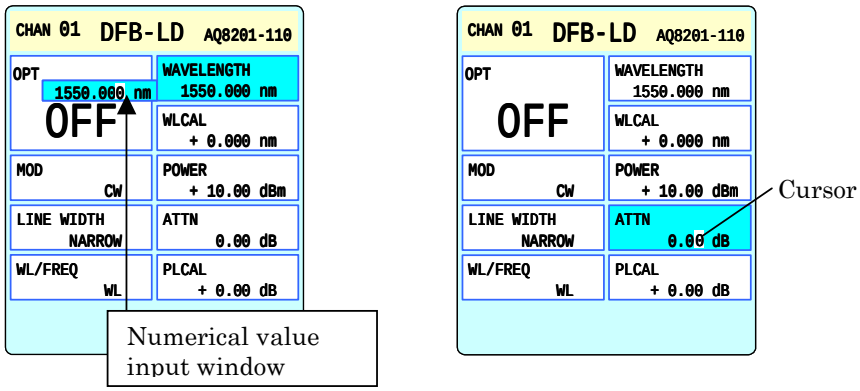
When changing a parameter value, select the parameter using ▲ or▼ key and then press the ENTER key. This will bring up the setup menu.

When the setup menu is displayed through the above operations, select a desired setting from the menu using ▲ or▼ key and then validate you selection using the ENTER key.

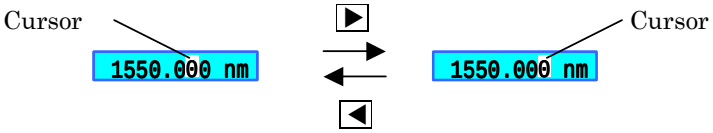


When the numerical value input window is displayed, specify a desired value using ▲ or▼ key and then validate it using the ENTER key.

ATTN parameter, however, is validated upon modification is done on the value with ▲ or▼ key.



◄ and ► keys are used to specify a digit where the value is modified.



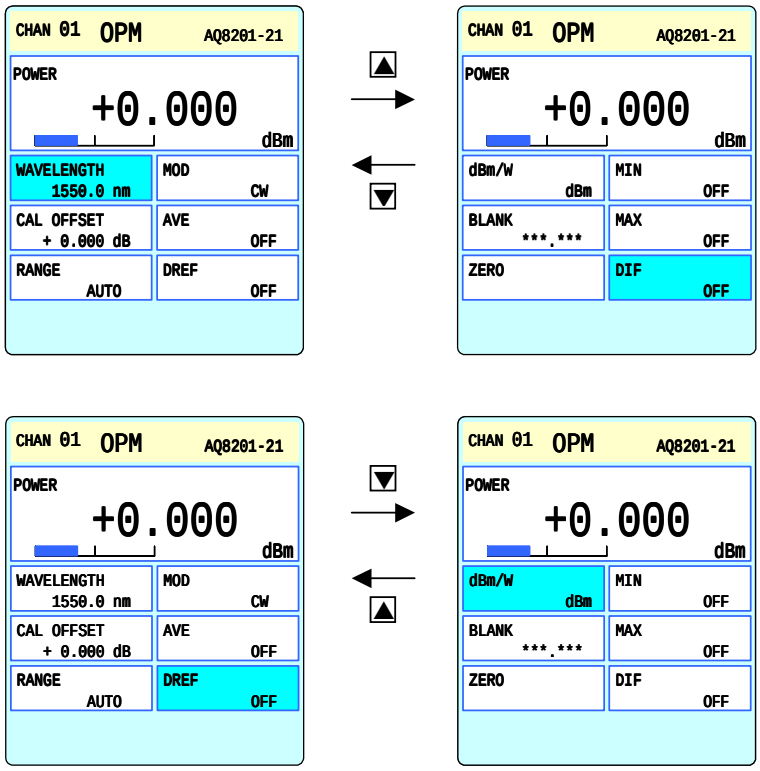
Use the CANCEL key to cancel your setup operation. In this case, the currently selected parameter remains unchanged and the original screen is restored. However, since ATTN parameter value is validated at the moment you specified one using ▲ or▼ key, it can't be cancelled by the CANCEL key.

For parameters of respective modules, refer to 5.3 (→5-17).

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(5) Switching the Screen

Parameters of some modules cannot be displayed in a single screen. In such case, you can switch the screen to view them all or modify some of them using ▲ and ▼ keys are as shown below.



(6) Displaying the Summary Screen

Press the SUMMARY key to display the Summary screen.

For the description of the Summary screen, refer to 5.2.5 (→5-9).

(7) Displaying the System Screen

Press the SYSTEM to display the System screen.

For the description of the System screen, refer to 5.2.6 (→5-10).

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5.3 Operating the Modules (Single Screen)

Following describes the screen displays and operating procedures of respective modules installed on the main unit (the screen sometimes slightly differs from the actual screen display).

5.3.1 WDM DFB-LD MODULE (AQ8201-110)

Following describes the screen display and operating procedures when WDM DFB-LD MODULE is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-14 shows the screen displayed when AQ8201-110 is selected as the target of control. Description of each parameter is provided in the below.

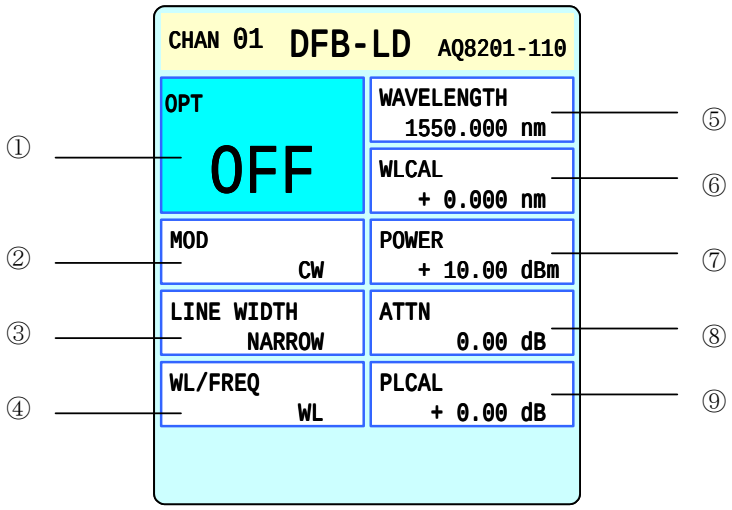


Figure.5-14 Screen Display when AQ8201-110 is Target of Control

① OPT
Indicates whether optical output is turned on or off.

② MOD
Indicates the currently turned on modulation mode.

③ LINE WIDTH
Indicates the currently selected state of spectral bandwidth of output light.

④ WL/FREQ
Indicates which of the wavelength and frequency is selected to represent output wavelength.

⑤ WAVELENGTH (FREQUENCY)
Indicates output wavelength. It can be indicated either in frequency or wavelength from your selection in ④ (WL/FREQ).

⑥ WL CAL
Indicates a correction value (offset) for the output wavelength displayed.

⑦ POWER
Indicates power level of output light.

⑧ ATTN
Indicates level of optical attenuation.

⑨ PL CAL
Indicates a correction value (offset) for the output power level displayed.

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(2) Optical Output On/Off Procedure

You can display the setup menu by selecting the OPT parameter and then pressing the ENTER key.

If you select “ON”, light will be output and “ON” will be indicated for the OPT.

If you select “OFF”, light output will be turned off and “OFF” will be indicated for the OPT.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

(3) Output Light Modulation Procedure

If you select the MOD parameter and press the ENTER key, selectable modulation modes When using internal modulation, you can select either one of “0.27 kHz”, “1.0 kHz” or “2.0 kHz” to modulate output light at the selected frequency. When other frequency is required, select “CHOP-F” and the frequency setup window will appear allowing you to specify a desired frequency.

When using the external modulation [*1], select “EXT”.

External modulation of frequency is available in the range of 0.1 kHz to 300 kHz.

Note that you cannot specify the internal and external modulation at the same time.

The default has been set to "CW".

For the setup procedure, see 5.2.8(4) (→5-15).

CAUTION

When Option 03 or 04 is installed, externally modulated signal must not exceed 2Vp-p. Entering excessive amplitude can damage the module.

NOTE

If you select high modulation frequency (approximately 20 kHz) in the internal modulation (CHOP-F), resulting actual modulation frequency may not be exactly the same as the specified one.

(4) Procedure for Suppressing Interference of Light

You can display the setup menu by selecting the LINE WIDTH parameter and then pressing the ENTER key.

If you select “WIDE” from the menu, broadening spectral bandwidth of output light.

If you select “NARROW”, restoring the normal spectral bandwidth.

The default has been set to "NARROW".

For the setup procedure, see 5.2.8(4) (→5-15).

[*1] It is not available when the external modulation is not supported (Option 03 or 04 must be installed).

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NOTE

The WIDE mode helps suppressing interference inside the optical parts, thereby enabling their stable measurement.

(5) Wavelength Display Format Switching Procedure

Display the setup menu by selecting the WL/FREQ parameter and then hitting the ENTER key.

If you select "WL" from the menu, the parameter name of output wavelength (see ⑤ in Figure.5-14) will be changed to WAVELENGTH and output wavelength will be indicated in wavelength [nm].

Likewise, selecting "FREQ" will change the parameter name (see ⑤ in Figure.5-14) of output wavelength to FREQUENCY and output wavelength will be indicated in frequency [THz].

The default has been set to "WL".

For the setup procedure, see 5.2.8(4) (→5-15).

(6) Output Wavelength Fine Adjustment Procedure

Display the wavelength setup window (or the frequency setup window when the frequency display is selected) by selecting WAVELENGTH (or FREQUENCY for the frequency display) and then hitting the ENTER key.

You can fine adjust the currently selected wavelength of output light from this window.

Specify desired wavelength, using ▲, ▼, ◄ or ► key and then press the ENTER key.

The center wavelength has been set as the default.

Available adjusting range depends on the type of the module used.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

It will take 1 to 2 minutes until the selected wavelength is stabilized.

When output light is modulated or WIDE is selected for LINE WIDTH, wavelength measurements obtained from a wave meter can contain some errors.

Such errors can be magnified if you switch the display format while the maximum or minimum value is being selected.

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(7) Displayed Output Wavelength Correcting Procedure

Bring up the wavelength setup window by selecting the WL CAL parameter and then pressing the ENTER key.

If you specify a correction value from this window, that will be added to the current value for WAVELENTH (FREQUENCY for the frequency display) and the resulting sum will be displayed. Wavelength of actually output light, however, remains the same.

Specify a desired wavelength using ▲, ▼, ◄ or ► key and then press the ENTER key.

The default has been set to 0.000 nm.

The setting range is from –10.000 to +10.000 nm.

For the setup procedure, see 5.2.8(4) (→5-15).

(8) Power Level Adjusting Procedure

Selecting the ATTN parameter and pressing the ENTER key will display the cursor within the parameter space allowing you to specify the attenuation level by using it. Output power level is changed according to the attenuation level specified.

Use ▲, ▼, ◄ and ► keys to specify a desired attenuation. You can delete the cursor by pressing the ENTER or CANCEL key.

The default has been set to 0.00 dB.

The setting range is from 0.00 to 10.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

After the setup, 1 to 2 minutes will be required until the power level is stabilized.

Changing an attenuation level reflects the modified on the module as is. In this case, you can't restore the original value using the CANCEL key.

(9) Displayed Power Level Displayed Correcting Procedure

Selecting the PL CAL parameter and pressing the ENTER key will display the power level setup window. You can modify the power level displayed from this window.

When the modification is made, the POWER space displays the level after adding this correction value. Power level of actually output light, however, remains the same even after the modification.

Specify a correction value using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 0.00 dB.

The setting range is from –80.00 to +80.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

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5.3.2 ASE MODULE (AQ8201-12/12A)

Following describes the screen displays and operating procedures when ASE MODULE is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-15 shows the screen displayed when AQ8201-12 is selected as the target of control. Description of each parameter is provided in the below.

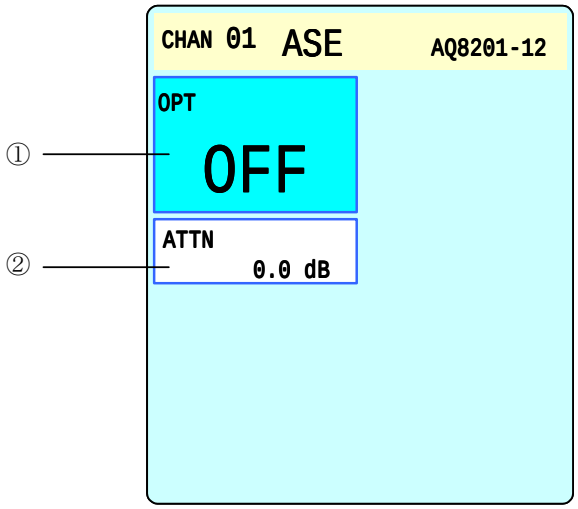


Figure.5-15 Screen Display when AQ8201-12 is Target of Control

① OPT
Used to indicate whether optical output is turned on or off.

② ATTN
Used to indicate the optical attenuation level.

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(2) Optical Output On/Off Procedure

Selecting the OPT parameter and pressing the ENTER key will display the setup menu.

Select “ON” to turn on the optical output. The OPT parameter space will indicate “ON”.

Selecting “OFF” turns off the optical output, and “OFF” will displayed in the OPT parameter space.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

(3) Power Level Adjusting Procedure

Selecting the ATTN parameter and pressing the ENTER key will display the cursor within the parameter space allowing you to specify an attenuation level by using it. Output power level is changed according to the attenuation level specified.

Use ▲, ▼, ◄ and ► keys to specify a desired attenuation. You can delete the cursor by pressing the ENTER or CANCEL key.

The default has been set to 0.0 dB.

The setting range is from 0.0 to 6.0 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

After the setup, 1 to 2 minutes will be required until the power level is stabilized.

Changing an attenuation level reflects the modified on the module as is. In this case, you can’t restore the original value using the CANCEL key.

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5.3.3 ECL MODULE (AQ8201-13/13A/13B/13D)

Following describes the screen displays and operating procedures when ECL MODULE is selected as the target of control.

(1) Screen Displays and Parameters

Figure.5-16 shows the screen displayed when AQ8201-13 is selected as the target of control. Description of each parameter is provided in the below.

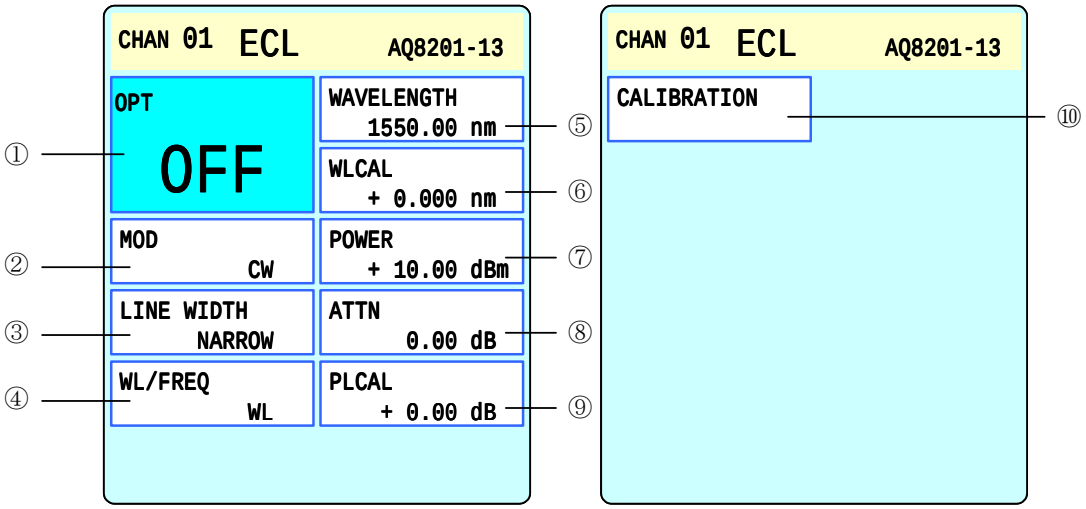


Figure.5-16 Screen Display when AQ8201-13 is Target of Control.

① OPT
Indicates whether optical output is turned on or off.

② MOD
Indicates the currently turned on modulation mode.

③ LINE WIDTH
Indicates the currently selected state of spectral bandwidth of output light.

④ WL/FREQ
Indicates which of the wavelength and frequency is selected to represent output wavelength.

⑤ WAVELENGTH (FREQUENCY)
Indicates output wavelength.
It can be indicated either in frequency or wavelength from your selection in ④ (WL/FREQ).

⑥ WL CAL
Indicates a correction value (offset) for the output wavelength displayed.

⑦ POWER
Indicates power level of output light.

⑧ ATTN
Indicates level of optical attenuation.

⑨ PL CAL
Indicates a correction value (offset) for the output power level displayed.

⑩ CALIBRATION
It is used to calibrate output wavelength.

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(2) Optical Output On/Off Procedure

You can display the setup menu by selecting the OPT parameter and then pressing the ENTER key.

If you select “ON”, light will be output and “ON” will be indicated for the OPT.

If you select “OFF”, light output will be turned off and “OFF” will be indicated for the OPT.

This setting is defaulted to “OFF”.

For the setup procedure, see 5.2.8(4) (→5-15).

(3) Output Light Modulation Procedure

If you select the MOD parameter and press the ENTER key, selectable modulation modes When using internal modulation, you can select either one of “0.27 kHz”, “1.0 kHz” or “2.0 kHz” to modulate output light at the selected frequency. When other frequency is required, select “CHOP-F” and the frequency setup window will appear allowing you to specify a desired frequency.

When using the external modulation, select “EXT”.

External modulation of frequency is available in the range of 0.1 kHz to 300 kHz.

Note that you cannot specify the internal and external modulation at the same time.

The default has been set to "CW".

For the setup procedure, see 5.2.8(4) (→5-15).

CAUTION

Externally modulated signal must not exceed 2Vp-p. Entering excessive amplitude can damage the module.

NOTE

If you select high modulation frequency (approximately 20 kHz) in the internal modulation (CHOP-F), resulting actual modulation frequency may not be exactly the same as the specified one.

(4) Procedure for Suppressing Interference of Light

You can display the setup menu by selecting the LINE WIDTH parameter and then pressing the ENTER key.

If you select “WIDE” from the menu, broadening spectral bandwidth of output light.

If you select “NARROW”, restoring the normal spectral bandwidth.

The default has been set to "NARROW".

For the setup procedure, see 5.2.8(4) (→5-15).

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NOTE

The WIDE mode helps suppressing interference inside the optical parts, thereby enabling their stable measurement.

(5) Wavelength Display Format Switching Procedure

Display the setup menu by selecting the WL/FREQ parameter and then hitting the ENTER key.

If you select "WL" from the menu, the parameter name of output wavelength (see ⑤ in Figure.5-16) will be changed to WAVELENGTH and output wavelength will be indicated in wavelength [nm].

Likewise, selecting "FREQ" will change the parameter name (see ⑤ in Figure.5-16) of output wavelength to FREQUENCY and output wavelength will be indicated in frequency [THz].

The default has been set to "WL".

For the setup procedure, see 5.2.8(4) (→5-15).

(6) Output Wavelength Adjustment Procedure

Display the wavelength setup window (or the frequency setup window when the frequency display is selected) by selecting WAVELENGTH (or FREQUENCY for the frequency display) and then hitting the ENTER key.

You can fine adjust the currently selected wavelength of output light from this window.

Specify desired wavelength, using ▲, ▼, ◄ or ► key and then press the ENTER key.

The default varies with module.

The setting ranges are from 1460 to 1580 nm for −13/13A and from 1500 to 1620 nm for −13B/13D.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

It will take 1 to 2 minutes until the selected wavelength is stabilized.

When output light is modulated or WIDE is selected for LINE WIDTH, wavelength measurements obtained from a wave meter can contain some errors.

Such errors can be magnified if you switch the display format while the maximum or minimum value is being selected.

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(7) Displayed Output Wavelength Correcting Procedure

Bring up the wavelength setup window by selecting the WL CAL parameter and then pressing the ENTER key.

If you specify a correction value from this window, that will be added to the current value for WAVELENTH (FREQUENCY for the frequency display) and the resulting sum will be displayed. Wavelength of actually output light, however, remains the same.

Specify a desired wavelength using ▲, ▼, ◄ or ► key and then press the ENTER key.

The default has been set to 0.000 nm.

The setting range is from –10.000 to +10.000 nm.

For the setup procedure, see 5.2.8(4) (→5-15).

(8) Power Level Adjusting Procedure

Selecting the ATTN parameter and pressing the ENTER key will display the cursor within the parameter space allowing you to specify the attenuation level by using it. Output power level is changed according to the attenuation level specified.

Use ▲, ▼, ◄ and ► keys to specify a desired attenuation. You can delete the cursor by pressing the ENTER or CANCEL key.

The default has been set to 0.00 dB.

The setting range is from 0.00 to 10.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

After the setup, 1 to 2 minutes will be required until the power level is stabilized.

Changing an attenuation level reflects the modified on the module as is. In this case, you can't restore the original value using the CANCEL key.

(9) Displayed Power Level Displayed Correcting Procedure

Selecting the PL CAL parameter and pressing the ENTER key will display the power level setup window. You can modify the power level displayed from this window.

When the modification is made, the POWER space displays the level after adding this correction value. Power level of actually output light, however, remains the same even after the modification.

Specify a correction value using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 0.00 dB.

The setting range is from –80.00 to +80.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

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(10) Wavelength Calibration Procedure

Following describes how to calibrate the output wavelength.

① Measuring system

Figure.5-17 shows the measuring system employed for the wavelength calibration.

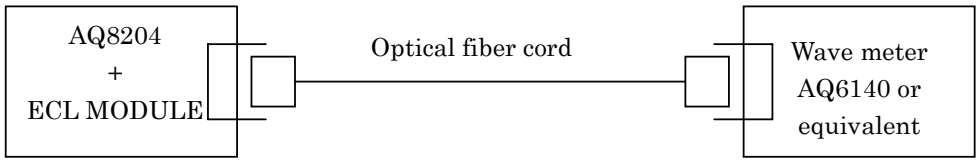


Figure.5-17 Measuring System Employed for Wavelength Calibration

② Calibration procedure

Following describes the calibration procedure.

1. Select CALIBRATION and then press the ENTER key.
2. A menu will appear. Select "GO" from the menu and press the ENTER key.
3. Select CAL POINT A, press the ENTER key and then enter the value displayed on the wave meter. Likewise, select CAL POINT B, press the ENTER key and then enter the value displayed on the wave meter.
4. After entering wavelength for each point, select WRITE and then press the ENTER key.
5. Select "SET" and then press the ENTER key to start the calibration. You can restore the original value being set at the shipment by selecting "RESET" and pressing the ENTER key.
6. Press the CANCEL key to return to the Single screen.

NOTE

Communication is cut off as long as CALIBRATION is continued, disabling to use other installed modules. They become operable when CALIBRATION is complete.

Don't try to turn power off while CALIBRATION is turned on.

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5.3.4 OPM MODULE (AQ8201-21)

Following describes the screen displays and operating procedures when OPM module is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-18 shows the screen displayed when AQ8201-21 is selected as the target of control. Description of each parameter is provided in the below.

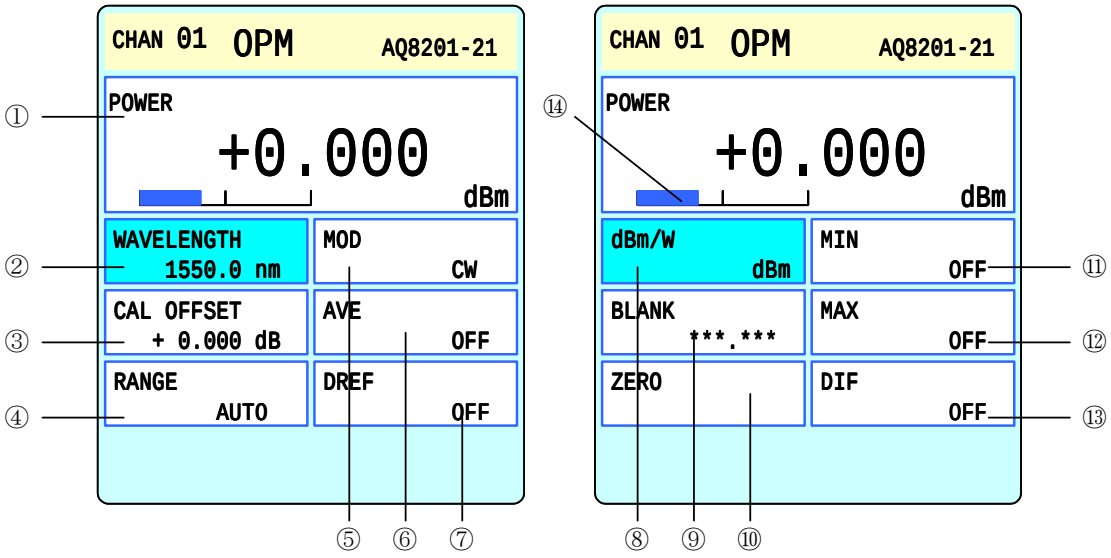


Figure.5-18 Screen Display when AQ8201-21 is Target of Control

① POWER
Indicates the input power level. When the input power range is within the range, it will be highlighted in blue. When out of the range, it will be highlighted in red.

② WAVELENGTH
Displays the calibration wavelength.

③ CAL OFFSET
Displays an offset of the input power level.

④ RANGE
Displays the range specified.

⑤ MOD
Indicates the modulation mode.

⑥ AVE
Indicates the averaging count.

⑦ DREF
Displays the reference employed in the relative measurement.

⑧ dBm/W
Indicates the display format of the input power level.

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⑨ BLANK
Indicates numbers of digits employed to represent the input power level.

⑩ ZERO
Used to implement the zero set.

⑪ MIN (MIN/MAX)
Displays the maximum and minimum values measured. Normally, the minimum value is displayed. When this option is selected, the measuring state (ON/OFF/STOP) is also indicated.

⑫ MAX
Displays the maximum value determined in the maximum/minimum value measurement.

⑬ DIF
Displays the difference between the maximum and minimum value obtained from the maximum/minimum value measurement. If the difference is greater than "99.9999", it will be indicated as "**.****" (in the W display mode).

⑭ Analog bar
The divisions on the bar indicate measurable scope of the range. The blue bar indicates position within the range of an input power. As long as the bar is positioned beyond the divisions, your measurement is disabled. In this case, you must change the "RANGE". When the "AUTO" is specified for the "RANGE", however, the range will be automatically modified.
You can turn on or off display of the analog bar using the SHIFT+CHANNEL keys. By default, it is turned off.

(2) Calibration Wavelength Setup Procedure
Match the calibration wavelength to that of the target light of the measurement.
Selecting the WAVELENGTH parameter and pressing the ENTER key will display the wavelength setup window. Specify a desired value from this window.
Specify the wavelength using ▲, ▼, ◄ and ► keys and then press the ENTER key.
The default has been set to 1310.0nm.
The setting range is from 700.0 to 1700.0nm.
For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If wavelength of input light is not identical with the one you specified, accurate measurement may not be obtainable.

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(3) Displayed Power Level Correction Procedure

Display the power level setup window by selecting the CAL OFFSET parameter and pressing the ENTER key. You can modify the power level displayed from this window. When the modification is made, the POWER space displays the level after adding this correction value.

Specify a correction value using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 0.00 dB.

The setting range is from –80.00 to +80.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

(4) Measurement Range Setup Procedure

Selecting the RANGE parameter and then pressing the ENTER key will display the setup menu.

If you select "AUTO", the range will be automatically switched according to the input power level.

If you select a range between "+30 dBm" and "–60 dBm", the range will be fixed to the selected value.

If you select "HOLD" and press the ENTER key while the "AUTO" mode is turned on, the range will be fixed to the value currently selected, disabling the automatic range switching function.

The default has been set to "AUTO".

For the setup procedure, see 5.2.8(4) (→5-15).

(5) Modulation Mode Setup Procedure

If you select the MOD parameter and press the ENTER key, selectable modulation modes will be displayed. Select the mode matching to that the light measured.

Thus, when the modulation mode of the target light is CW, you must select "CW".

When input light is internally modulated, select either one of "0.27 kHz", "1.0 kHz" or "2.0 kHz". It must be identical with frequency of the target light of measurement. If the target light is modulated at any frequency other than above, you must select "EXT".

"EXT" must also be specified when the input light is externally modulated.

The default has been set to "CW".

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If the modulation mode of the input light is not identical with the one you specified, accurate measurement may not be obtainable.

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(6) Averaging Process Setup Procedure

You can display the averaging count by selecting the AVE parameter and pressing the ENTER key.

If you select “OFF”, your operation will be ended without proceeding to the averaging.

Specifying any number in the range of “2” and “200” turns on the averaging measurement. This operation is continued until the specified count is reached.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

(7) Relative Value Measurement Setup Procedure (Display reference)

Select the DREF parameter and then press the ENTER key to display the setup menu.

Selecting “ON” turns on the relative value measurement. In this case, the currently specified value will be displayed in the DREF space as the reference value and the relative value from the reference will be indicated in the POWER space.

Selecting “OFF” turns on the absolute value measurement.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If a value cannot be accommodated within display area, the value will be highlighted in red. It will be displayed in blue only after its digits have been adjusted for the normal display.

Independent of the display format employed, a measurement value is indicated in percentage of the reference value.

(8) Procedure for Switching the Displayed Power Level

Select the dBm/W parameter and then press the ENTER key to display the setup menu.

Selecting “dBm” turns on the dBm display employing “dBm” as the unit of POWER.

If you select “W”, “W” is selected as the unit of POWER. As long as the W display mode is selected, a prefix varies among “G, M, m, μ, n, p, f and a” according to the input power level.

The default has been set to “dBm”.

For the setup procedure, see 5.2.8(4) (→5-15).

(9) Procedure for Modifying the Power Level Display Digits

Select the BLANK parameter and then press the ENTER key to display the setup menu.

From the menu, specify numbers of digits in the decimal part that are to be used in representing the input power level. The digit after the last is rounded.

The default has been set to “***.***” .

For the setup procedure, see 5.2.8(4) (→5-15).

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(10) ZERO SET Procedure

Select the ZERO parameter and then press the ENTER key to display the setup menu. Then press the ENTER key, and this module executes ZERO SET.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

Before executing the zero set, make sure to block the light to the optical sensor using the attached optical connector cap. If the block is insufficient, errors can be magnified.

Electric offset value [*1] can vary according to ambient temperature or duration of conductance. Thus, you must wait ambient temperature to stabilize before turning on the zero set.

Whenever measurement modulated light, be sure to specify the modulation mode and modulation frequency before starting the zero set.

(11) Maximum and Minimum Value Measuring Procedure

Select the MIN parameter (parameter name will be changed to MIN/MAX) and then press the ENTER key to display the setup menu.

Selecting “ON” initiates the maximum/minimum value measurement. Spaces of the MIN parameter, MAX parameter and DIF parameter respectively display the minimum value, maximum value and difference between the maximum and minimum value.

Selecting “OFF” terminates the maximum/minimum value measurement. In this case, the measured difference between the maximum and minimum values is deleted.

If you select “STOP”, the maximum/minimum measurement is paused. The maximum and minimum values determined up to this moment are held even after the measurement is paused.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

[*1] This value is noted in the specification as the noise level.

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5.3.5 DUAL OPM MODULE (AQ8201-22)

Following describes the screen displays and operating procedures when DUAL OPM module is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-19 shows the screen displayed when AQ8201-22 is selected as the target of control. Description of each parameter is provided in the below.

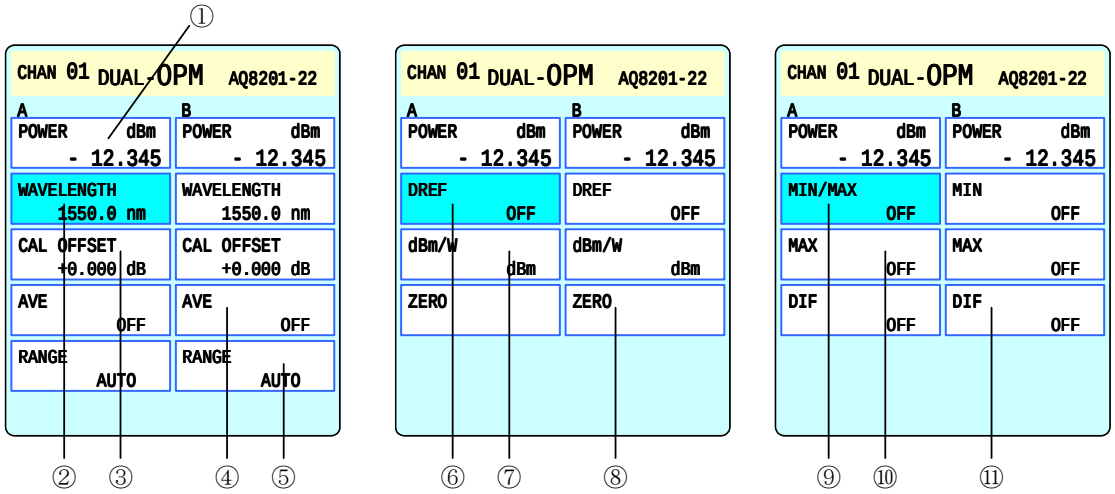


Figure.5-19 Screen Display when AQ8201-22 is Target of Control

① POWER
Indicates the input power level. When the input power range is within the range, it will be highlighted in blue. When out of the range, it will be highlighted in red.

② WAVELENGTH
Displays the calibration wavelength.

③ CAL OFFSET
Displays an offset of the input power level.

④ AVE
Indicates the averaging count.

⑤ RANGE
Displays the range specified.

⑥ DREF
Displays the reference employed in the relative measurement.

⑦ dBm/W
Indicates the display format of the input power level.

⑧ ZERO
Used to implement the zero set.

⑨ MIN (MIN/MAX)
Displays the maximum and minimum values measured. Normally, the minimum value is displayed. When this option is selected, the measuring state (ON/OFF/STOP) is also indicated.

⑩ MAX
Displays the maximum value determined in the maximum/minimum value measurement.

⑪ DIF
Displays the difference between the maximum and minimum value obtained from the maximum/ minimum value measurement. If the difference is greater than "99.9999", it will be indicated as "**.****" (in the W display mode).

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NOTE

This module cannot measure the modulation light.
When inputting the modulation light to this module, the displayed value is not a correct value.

(2) Calibration Wavelength Setup Procedure

Match the calibration wavelength to that of the target light of the measurement.

Selecting the WAVELENGTH parameter and pressing the ENTER key will display the wavelength setup window. Specify a desired value from this window.

Specify the wavelength using ▲, ▼, ◄ and ► keys and then press the ENTER key.

The default has been set to 1550.0nm.

The setting range is from 1280.0 to 1700.0nm.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If wavelength of input light is not identical with the one you specified, accurate measurement may not be obtainable.

(3) Displayed Power Level Correction Procedure

Display the power level setup window by selecting the CAL OFFSET parameter and pressing the ENTER key. You can modify the power level displayed from this window. When the modification is made, the POWER space displays the level after adding this correction value.

Specify a correction value using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 0.00 dB.

The setting range is from –80.00 to +80.00 dB.

For the setup procedure, see 5.2.8(4) (→5-15).

(4) Averaging Process Setup Procedure

You can display the averaging count by selecting the AVE parameter and pressing the ENTER key.

If you select “OFF”, your operation will be ended without proceeding to the averaging.

Specifying any number in the range of “2” and “200” turns on the averaging measurement. This operation is continued until the specified count is reached.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

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(5) Measurement Range Setup Procedure

Selecting the RANGE parameter and then pressing the ENTER key will display the setup menu.

If you select “AUTO”, the range will be automatically switched according to the input power level.

If you select a range between “+10 dBm” and “–60 dBm”, the range will be fixed to the selected value.

If you select “HOLD” and press the ENTER key while the “AUTO” mode is turned on, the range will be fixed to the value currently selected, disabling the automatic range switching function.

The default has been set to "AUTO".

For the setup procedure, see 5.2.8(4) (→5-15).

(6) Relative Value Measurement Setup Procedure (Display reference)

Select the DREF parameter and then press the ENTER key to display the setup menu.

Selecting “ON” turns on the relative value measurement. In this case, the currently specified value will be displayed in the DREF space as the reference value and the relative value from the reference will be indicated in the POWER space.

Selecting “OFF” turns on the absolute value measurement.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If a value cannot be accommodated within display area, the value will be highlighted in red. It will be displayed in blue only after its digits have been adjusted for the normal display.

Independent of the display format employed, a measurement value is indicated in percentage of the reference value.

(7) Procedure for Switching the Displayed Power Level

Select the dBm/W parameter and then press the ENTER key to display the setup menu.

Selecting “dBm” turns on the dBm display employing “dBm” as the unit of POWER.

If you select “W”, “W” is selected as the unit of POWER. As long as the W display mode is selected, a prefix varies among “G, M, m, μ, n, p, f and a” according to the input power level.

The default has been set to “dBm”.

For the setup procedure, see 5.2.8(4) (→5-15).

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(8) ZERO SET Procedure

Select the ZERO parameter and then press the ENTER key to display the setup menu. Then press the ENTER key, and this module executes ZERO SET.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

Before executing the zero set, make sure to block the light to the optical sensor using the attached optical connector cap. If the block is insufficient, errors can be magnified.

Electric offset value [*1] can vary according to ambient temperature or duration of conductance. Thus, you must wait ambient temperature to stabilize before turning on the zero set.

(9) Maximum and Minimum Value Measuring Procedure

Select the MIN parameter (parameter name will be changed to MIN/MAX) and then press the ENTER key to display the setup menu.

Selecting "ON" initiates the maximum/minimum value measurement. Spaces of the MIN parameter, MAX parameter and DIF parameter respectively display the minimum value, maximum value and difference between the maximum and minimum value.

Selecting "OFF" terminates the maximum/minimum value measurement. In this case, the measured difference between the maximum and minimum values is deleted.

If you select "STOP", the maximum/minimum measurement is paused. The maximum and minimum values determined up to this moment are held even after the measurement is paused.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

[*1] This value is noted in the specification as the noise level.

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5.3.6 ATTN MODULE (AQ8201-32/32A/33/33M)

Following describes the screen displays and operating procedure when ATTN MODULE is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-20 shows the screen displayed when AQ8201-33 is selected as the target of control. Description of each parameter is provided in the below.

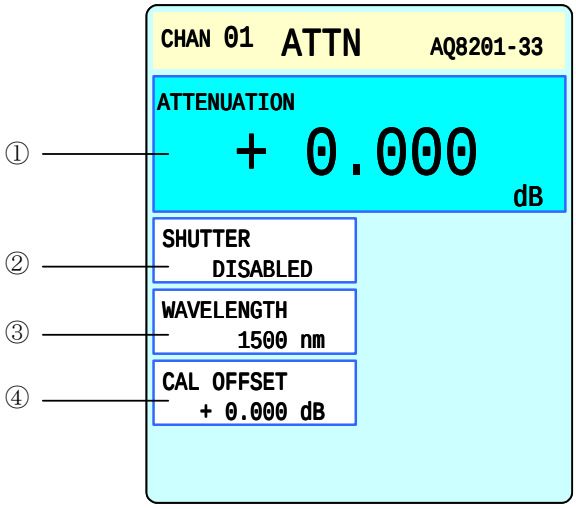


Figure.5-20 Screen Display when AQ8201-33 is Target of Control

① ATTENUATION
Indicates the level of optical attenuation.

② SHUTTER
Indicates state of the shutter.

③ WAVELENGTH
Displays attenuation wavelength.

④ CAL OFFSET
Indicates an offset value of the displayed optical attenuation.

(2) Optical Attenuation Level Setup Procedure

Selecting the ATTENUATION parameter and pressing the ENTER key will display the cursor within the parameter space allowing you to specify the attenuation level by using it. You can specify a desired level by modifying the currently displayed value.

Use ▲, ▼, ◄ and ► keys to specify a desired attenuation. You can delete the cursor by pressing the ENTER or CANCEL key.

The default has been set to 0.00 dB for −32 and −32A and to 0.000 dB for −33 and −33M.

The setting ranges are from 0.00 to 60.00 dB for −32 and −32A and from 0.000 to 60.000 dB for −33 and −33M.

For the setup procedure, see 5.2.8(4) (→5-15).

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NOTE

An ATTN value is reflected on the module at the moment it is modified. After modification, therefore, you can't restore the original value with the CANCEL key.

(3) Shutter Open/Close Procedure

Select the SHUTTER parameter and then press the ENTER key to display the setup menu.

Selecting "ENABLED" opens the shutter outputting attenuated input light.

If you select "DISABLED", output of light will be disabled irrespective of presence or absence of input light.

The default has been set to "DISABLED".

For the setup procedure, see 5.2.8(4) (→5-15).

(4) Procedure for Setting Damped Wavelength

The damped wavelength is set to the wavelength of a damping light.

Select the WAVELENGTH parameter and then press the ENTER key to display window for setting wavelength. Change this value, and you can set the damped wavelngth.

Specify a wavelength using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 1550.0 nm.

The setting ranges are from 1200 to 1600 nm for −32 and from 1480 to 1650 nm for −32A, −33 and −33M.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If wavelength of the input light is not identical with that you specified, intended attenuation won't be obtainable.

(5) Procedure for Correcting the Displayed Optical Attenuation Level

Display the attenuation level setup window by selecting the CAL OFFSET parameter and then pressing the ENTER key. You can modify the power level displayed from this window. When the modification is made, the ATTENUATION space displays the level after adding this correction value.

Specify a correction value using ▲, ▼, ◄ and ► keys and then validate it pressing the ENTER key.

The default has been set to 0.00 dB.

The setting ranges are from –80.00 to +80.00 dB for −32 and from –80.000 to +80.000 dB for −32A, −33 and −33M.

For the setup procedure, see 5.2.8(4) (→5-15).

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5.3.7 DUAL 1x2/ 2x2 OSW (AQ8201-412/422)

Following describes the screen displays and operating procedure when DUAL 1x2/ 2x2 OSW is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-21 shows the screen displayed when AQ8201-412/422 are selected as the target of control. Description of each parameter is provided in the below.

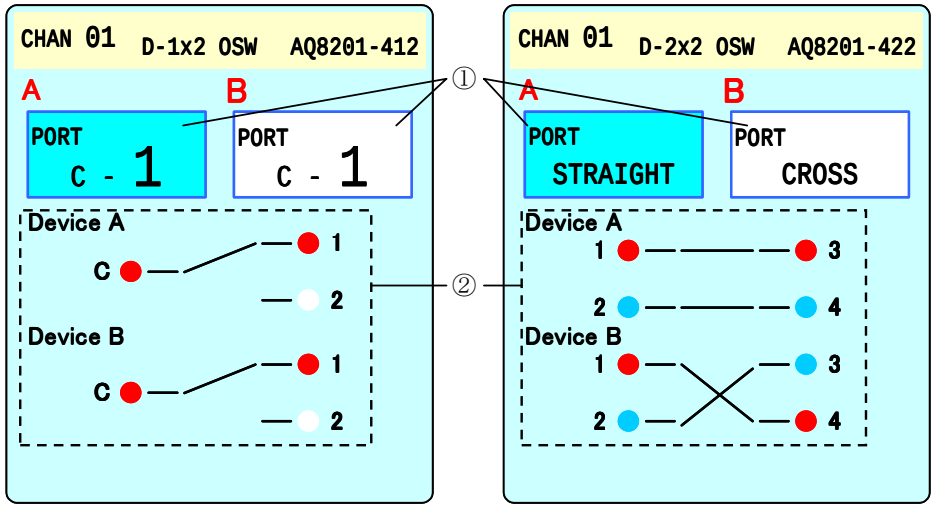


Figure.5-21 Screen Display when AQ8201-412/422 are Target of Control

① PORT

Displays ports connected to respective devices.

② C—*, *—*

Indicates connection between devices.

(2) Procedure for Switching a Connecting Port

Select the PORT parameter and then press the ENTER key to display the setup menu. You can switch a connecting port by selecting a desired port from this menu.

As for -412, select the number of the port to be connected to C-port.

If you select “STRAIGHT” when -422 is installed, Port 1 and Port 3 as well as Port 2 and Port 4 are connected. When “CROSS” is selected, Port 1 and Port 4 as well as Port 2 and Port 3 are connected.

The default has been set to "1" for −412 and to "STRAIGHT" for −422.

For the setup procedure, see 5.2.8(4) (→5-15).

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5.3.8 1x4/ 1x8/ 1x12/ 1x16 OSW (AQ8201-414/418/43/44)

Following describes the display screens and operating procedure when 1x4/ 1x8/ 1x12/ 1x16 OSW is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-22 shows the screen displayed when AQ8201-414 is selected as the target of control. For description of the parameters, refer to the below.

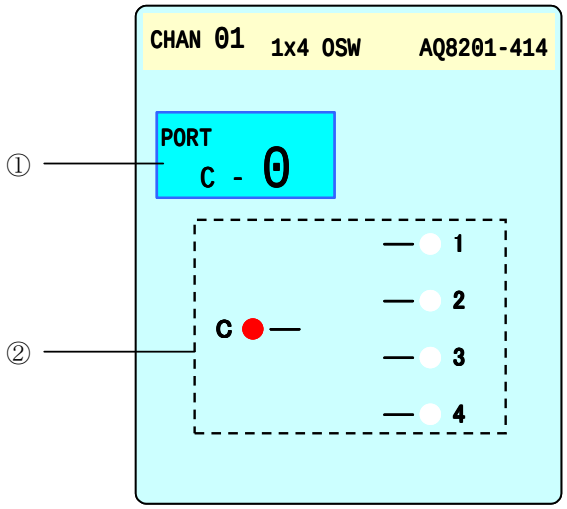


Figure.5-22 Screen Display when AQ8201-414 is Target of Control

① PORT
Indicate the port connected.

② C—∗
Procedure for Switching a Connecting Port

(2) Procedure for Switching a Connecting Port

Select the PORT parameter and then press the ENTER key to display the setup menu. You can switch a port connected to C-port by selecting a desired port number from this menu. If you select "0", C-port won't connect to any port and the optical path will be cut off.

The default has been set to "1".

Setting range is 0 to 4 for -414, 0 to 8 for -418, 0 to 12 for -43 and 0 to 16 for -44.

For the setup procedure, see 5.2.8(4) (→5-15).

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5.3.9 RLM MODULE (AQ8201-71)

Following describes the display screens and operating procedure when RLM MODULE is selected as the target of control.

(1) Screen Display and Parameters

Figure.5-23 shows the screen displayed when AQ8201-71 is selected as the target of control. Description of each parameter is provided in the below.

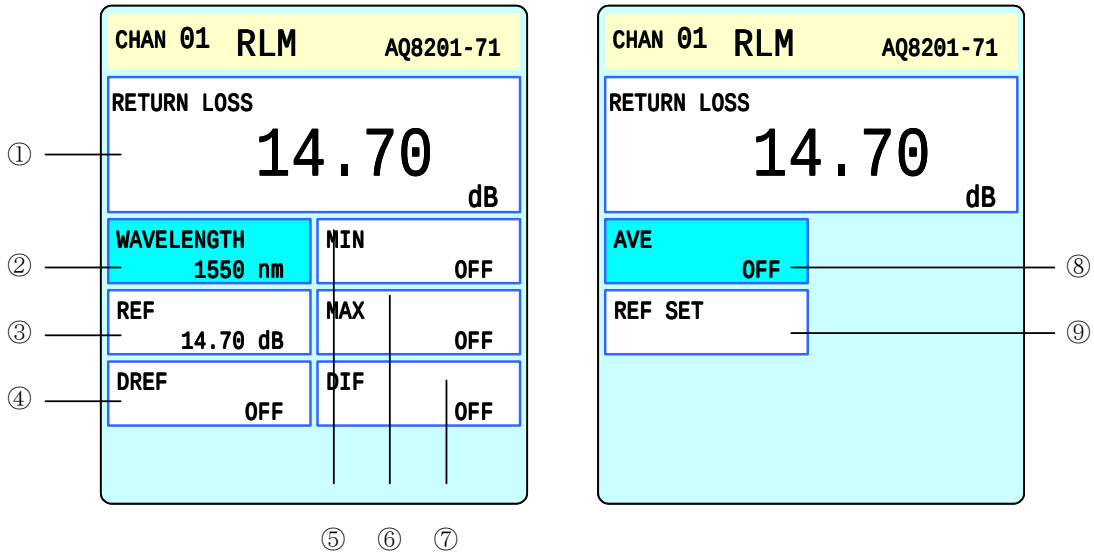


Figure.5-23 Screen Display when AQ8201-71 is Target of Control

① RETURN LOSS
Displays the return loss.

② WAVELENGTH
Displays the calibration wavelength.

③ REF
Displays the reflection standard value.

④ DREF
Displays the reference value in the relative measurement.

⑤ MIN (MIN/MAX)
Displays the result of the maximum/minimum value measurement. Normally, the minimum value is displayed. When this parameter is selected, measuring state (ON/OFF/STOP) is also indicated in the space.

⑥ MAX
Displays the maximum value determined in the maximum/minimum value measurement.

⑦ DIF
Displays the difference (MAX - MIN) in the maximum/minimum value measurement. If the result is greater than "99.9999", it will be indicated as "**.****" (in the W display mode).

⑧ AVE
Displays the averaging count.

⑨ REF SET
Executes the reflection standard measurement.

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(2) Calibration Wavelength Setup Procedure

Match the calibration wavelength to that of the target light of the measurement.

Selecting the WAVELENGTH parameter and pressing the ENTER key will display the wavelength setup window. You can set a desired value by modifying the displayed wavelength.

Specify the wavelength using ▲, ▼, ◄ and ► keys and then press the ENTER key.

The default has been set to 1550.0 nm.

The setting ranges are from 1280 to 1620 nm.

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

If wavelength of input light is not identical with the one you specified, accurate measurement may not be obtainable.

(3) Reflection Standard Value Setup Procedure

Display the setup menu by selecting the REF parameter and then pressing the ENTER key.

If you specify “0.20 dB”, total reflection (0.20 dB) is selected for as the reflection standard.

When “14.70 dB” is specified, Fresnel reflection (14.70 dB) is selected for the reflection standard.

The default has been set to "14.70 dB" (Fresnel reflection reference).

For the setup procedure, see 5.2.8(4) (→5-15).

(4) Relative Value Measurement Setup Procedure (Display reference)

Select the DREF parameter and then press the ENTER key to display the setup menu.

Selecting “ON” turns on the relative value measurement. In this case, the currently specified value will be displayed in the DREF space as the reference value and the relative value from the reference will be indicated in the POWER space.

Selecting “OFF” turns on the absolute value measurement.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

Independent of the input power display format, measurements are indicated in percentage of the standard value.

The relative value measurement is enabled on when the return loss measurement is turned on.

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(5) Maximum and Minimum Value Measuring Procedure

Select the MIN parameter (parameter name will be changed to MIN/MAX) and then press the ENTER key to display the setup menu.

Selecting "ON" initiates the maximum/minimum value measurement. Spaces of the MIN parameter, MAX parameter and DIF parameter respectively display the minimum value, maximum value and difference between the maximum and minimum value.

Selecting "OFF" terminates the maximum/minimum value measurement. In this case, the measured difference between the maximum and minimum values is deleted.

If you select "STOP", the maximum/minimum measurement is paused. The maximum and minimum values determined up to this moment are held even after the measurement is paused.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

NOTE

The maximum/minimum value measurement is enabled only when the return loss measurement is turned on.

(6) Averaging Process Setup Procedure

You can display the averaging count by selecting the AVE parameter and pressing the ENTER key.

If you select "OFF", your operation will be ended without proceeding to the averaging.

Specifying any number in the range of "2" and "200" turns on the averaging measurement. This operation is continued until the specified count is reached.

The default has been set to "OFF".

For the setup procedure, see 5.2.8(4) (→5-15).

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(7) Reflection Standard Measurement Procedure

After setting up the reflection standard measuring system as shown below, display the setup menu by selecting the REF SET parameter and then pressing the ENTER key. Select "SET" from the menu and then press the ENTER key.

① Standard Fresnel reflection

Make sure that the Ando specified master cord (equipped with the same master connector as that of the master cord under the test) is connected to the AQ8201-71 master cord connector.

The ferrule on the master cord end must be cleaned with alcohol. It must be blocked against incident light, too.

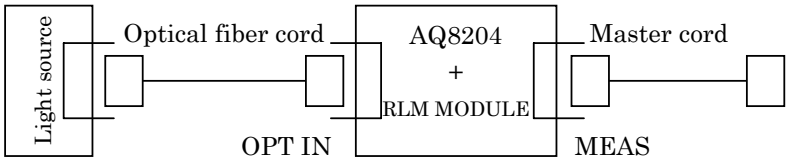


Figure.5-24 Standard Fresnel Reflection Measuring System

② Total reflection standard

Make sure that the Ando specified master cord is connected to the AQ8201-71 master cord connector and the total reflection master cord is connected to the master cord side via the adapter.

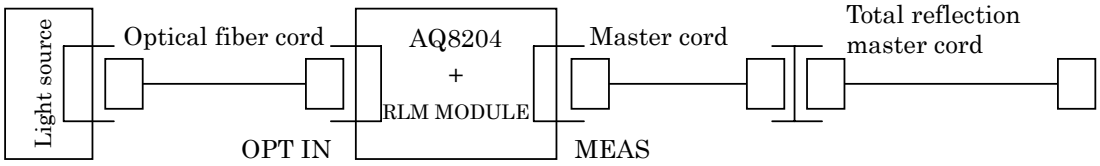


Figure.5-25 Standard Total Reflection Measuring System

NOTE

If the error of reflection standard measurement remains greater than ±0.02 dB after repeated trial, you should suspect unstableness of LD light source as well as stains on the optical fiber connector or inside the connector. Make sure that the LD light source used is AQ4211 or equivalent, and then clean the input port of this module and the connector of the optical fiber and master cord with alcohol. If the requirement of ±0.02 dB is not still met, contact our Sales Department at Headquarters, branch office, sales office or Ando Electric Technical Service Co.

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(8) Return Loss Measurement Procedure

After making sure that the reflection standard measurement is complete, connect the connector master under test to the master cord. As the connection is complete, the return loss will be displayed.

① Standard Fresnel reflection

As shown Figure.5-26, using the adapter, connect the connector under test to the master connector side of the Ando designated master cord that is connected to the AQ8201-71 connector port. Make sure that the other end of the connector under test is processed non-reflective.

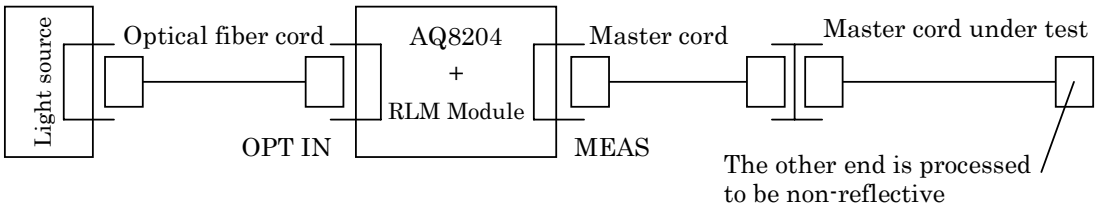


Figure.5-26 Return Loss Measuring System (Standard Fresnel reflection)

② Standard total reflection

Remove the Ando designated master cord and the total reflection master cord from the master cord connector port on AQ8201-71 (when the connector under test and the master connector of the master cord are the same type, remove only the total reflection cord). Then reconnect them as shown in Figure.5-25.

NOTE

Output level of the light source used in the measurement must be 0 to –5 dBm. When AQ8201-110 is used, the output must be reduced with an attenuator.

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5.4 Control via GP-IB (Complied with IEEE488.2)

AQ8204 (hereinafter called "this device") equips with GP-IB as standard enabling setup and modifications of parameters as well as data communication via GP-IB bus.

The connector used on the system conforms to the receptacle type connector as specified in IEEE-488 standard.

CAUTION

Connecting or disconnecting of the GP-IB cord must be done after shifting the POWER switch to the [▉OFF] position.

NOTE

After powering on, the system won't accept the GP-IB program code for approximately 1 minute maximum.

5.4.1 Interface Section

Table.5-1 GP-IB Interface Section

Function	Description on available function
SH1	Full source handshaking functions
AH1	Full acceptor handshaking function
T6	Basic talker function, serial pole function and talker cancel function with MLA
L4	Basic listener function and listener cancel function with MTA instruction
SR1	Full service request functions
RL1	Full remote/local functions
PP0	No parallel port function
DC1	Device-clear function
DT0	No device trigger function
C0	No controller function
E1	Open collector driver

5.4.2 GP-IB Address

You can change GP-IB address of the system from the System screen (→5-11).

A new GP-IB address becomes valid at the moment you specified it.

Specified GP-IB address is held by EEPROM [*1]. If backup data is deleted, the default value (the one set at the system shipment) will be restored. Default value for the address is "24".

[*1] EEPROM allows 100,000 times of rewriting.

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5.4.3 Description on Remote/Local Function (R/L function)

The RL function allows the devices to choose the remote function in which operations are performed based on interface information or the local function in which operations are performed based on the front panel information.

(1) Conditions Required for Turning on the Remote Mode
The remote mode is turned on when the listener address is received while REN is being set. As the remote mode is turned on, REMOTE LED comes on.

NOTE

In this state, local control is disabled except from the LOCAL key.

(2) Conditions Required for Turning on the Local Mode
The local mode can be turned on only when any of the following four incidences is detected. Other commands such as IFC (interface clear), SDC (selected device clear) and DCL (device clear) can't turn on the local mode. As the local mode is turned on, REMOTE LED goes off.

① When REN (remote enable) is identified as "FALSE".

② When GTL (go to local) is received.

③ When the panel LOCAL key is pressed. Except, however, when LLO (local lockout) is selected.

④ When power is interrupted.

5.4.4 Interface Messages

(1) LLO
The system is put in LLO state as this universal command "LLO" is received in the remote mode. In this state, all function keys (including the local switch) are disabled. You can cancel this state by releasing REN (remote enable) or turning system power on again.

(2) DCL
Data in the input buffer and output queue is cleared as this command is received.

(3) SDC
Data in the input buffer and output queue is cleared as this command is received while the system in the listener mode.

(4) GTL
The system returns to the local mode as this command is received while the system in the listener mode.

CAUTION

Depending on type of given controller, handshaking on it may be stopped if you try to execute a command or program code immediately after receiving this DCL command.

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5.4.5 Common Commands

(1) ∗CLS: (Clear Status Command)
It clears all event registers and queue (except output queue) summarized in status byte.
It also puts the system in OCIS (Operation complete Command Idle State) and OQIS (Operation complete Query Idle State).

(2) ∗ESE***NRf***: (Standard Event Status Enable Command)
It is used to set a specified ***NRf*** type numerical data on ESE (standard Event Status Enable register). (0 to 255)

(3) ∗ESE? : (Standard Event Status Enable Query)
It modifies the data currently set on ESE to ***NRf*** type numerical data and then sets it on the output queue.

(4) ∗ESR? : (Standard Event Status Register Query)
It modifies the data currently set on ESR to ***NRf*** type numerical data and then sets it on the output queue. This operation clears contents of ESR.

(5) ∗IDN? : (Identification Query)
Ex.
ANDO-ELECTRIC, AQ8204, 12345678, 03.00F



(6) LCK? : (OPT LOCK Event Status Query)
It modifies the data currently set on OPT LOCK Event Status Register to ***NRf*** type numerical data and then sets it on the output queue.

(7) LCKE : (OPT LOCK Event Status Enable Command)
It is used to set a specified ***NRf*** type numerical data on OPT LOCK Event Status Register. (0 to 255)

(8) LCKE? : (OPT LOCK Event Status Enable Query)
It modifies the data currently set on OPT LOCK Event Status Register to ***NRf*** type numerical data and then sets it on the output queue.

(9) ∗OPC : (Operation Complete Command)
When a deferred operation is complete, it sets “1” on OPC bit (BIT0) of ESR and causes the system into OCIS.

(10) ∗OPC? : (Operation Complete Query)
When a deferred operation is complete, it sets “1” (31H) on the output queue and causes the system into OQIS.

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(11) *RST : (Reset Command)

It resets current settings on the system to the default values and also causes the system into OCIS and OQIS. This command, however, does not affect the following.

① State of GP-IB interface

② GP-IB address

③ Output queue

④ State of Service Request Enable Register

⑤ State of Standard Event Status Enable Register

(12) *SRE***NRf**: (Service Request Enable Command)

It is used to set a specified ***NRf*** type numerical data on Service Request Enable Register. (0 to 255)

(13) *SRE? : (Service Request Enable Query)

It modifies the data currently set on Service Request Enable Register to ***NRf*** type numerical data and then sets it on the output queue.

(14) *STB? : (Read Status Byte Query)

It is used to move the data currently set on Status Byte and MSS (Master Summary Status Bit) to the ***NRf*** type numerical data output queue.

(15) *TST? : (Self-test query)

It tests GP-IB interface and then sets ***NRf*** type numerical data "1" on the output queue.

(16) *WAI : (Wait to continuity command)

Execution of commands succeeding to *WAI are stopped from the time when this command is recognized up until the no-operation pending flag goes TRUE.

This command, however, will be disabled when DCL or SDC is received, an error is detected or power is turned on again.

Target Commands of Deferred Operation

*RST	:	When the reset operation is completed.
LW,LUCWL#	:	When wavelength setup is completed on AQ8201-13/13A/13B/13D.
LUDSET	:	When setup of calibration wavelength is completed on AQ8201-13/13A/13B/13D.
LUDRST	:	When the default value is selected as the calibration wavelength of AQ8201-13/13A/13B/13D.
LUCAL#	:	When the setting mode is completed on AQ8201-13/13A/13B/13D.
PZ	:	When ZEROSET is completed on AQ8201-21/22.
AAV#	:	When attenuation level setup is completed on AQ8201-32/32A/33/33M.
SA#SB%	:	When the port setup is completed on AQ8201-4X.
RREF	:	When reference measurement is completed on AQ8201-71.
#,%	:	Set value

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5.4.6 Control by Program Code

(1) Program Code

Following lists the program codes used on this system and the modules. ∗ mark suffixed to the program code is to be replaced with a numerical value or characters that represent a setting or state.

Table.5-2 Program Codes for AQ8204

Program Codes	Setting Contents	Operations	Request Code / Data Format
BATT?		Checks the battery on this device. 0: LOW 1: OK	 BATT∗
CDSPCH∗	1 to 8 11 to 50	Calls up the single display screen. 1 to 8: Each channel number of this device. 11 to 50: EXPANDER FRAME channel numbers	CDSP? CDSPCH∗∗
CDSPMLT∗	1 to 5	Calls up the Summary screen. 1: This device 2 to 5: EXPANDER FRAME 1 to 4	CDSP? CDSPMLT∗
CDSPSYS		Calls up the System screen.	CDSP? CDSPSYS
CDSPVER∗	1 to 5	Calls up the Version screen. 1: This device and modules installed on CH1 to 8. 2 to 5: Modules installed on the EXPANDER FRAME 1 to 4.	CDSP? CDSPVER∗
CLGTNRf	0 to 99	Adjusts the back light brightness. 0 (darkest) to 99 (brightest)	CLGT? CLGTNRf
CCNTNRf	0 to 99	Adjusts the contrast. 0 (lowest) to 99 (highest)	CCNT? CCNTNRf
CBZR∗	0 to 9	Adjusts the buzzer sound. 0 (lowest) to 9 (highest)	CBZR? CBZR∗
FR∗ *1	0 to 4	Selects one of the frames as target of control. 0: This device 1 to 4: EXPANDER FRAME 1 to 4.	FR? FR∗
FRALL		Selects all connected frames as target of control.	FR? FRALL
C∗∗ *2 *3	1 to 8 11 to 50	Selects one of the modules installed on the frame as target of control.	C? C∗∗
CALL *4		Selects all modules installed on the frame as target of control.	C? CALL
D∗ *5 *6	Depending on module	It selects one device as the target of control on the module that is already selected as target of the control. *7	D? D∗

*1 When a frame which is not connected is selected, an error occurs.
*2 An error will be warned if you specify a channel not accommodating a module.
*3 The default value can be restored with FR∗ or FRALL.
*4 Some modules do not support thus function.
*5 An error will be warned if you specify a non-existent device.
*6 The default value can be restored with FR∗, FRALL, C∗∗ or CALL.
*7 For the detail, refer to the program codes prepared for each module.

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CLD		Selects all LD MODULE and ECL MODULE mounted on the frame (FR∗ or FRALL) for control.	C? CLD
CASE		Selects all ASE MODULE mounted on the frame (FR∗ or FRALL) for control.	C? CASE
COPM		Selects all OPM MODULE mounted on the frame (FR∗ or FRALL) for control.	C? COPM
COPM2		Selects all DUAL OPM MODULE mounted on the frame (FR∗ or FRALL) for control.	C? COPM2
CATTN		Selects all ATTN MODULE mounted on the frame (FR∗ or FRALL) for control.	C? CATTN
CATTN2		Selects all AQ8201-32 mounted on the frame (FR∗ or FRALL) for control.	C? CATTN2
CATTN3		Selects all AQ8201-33 mounted on the frame (FR∗ or FRALL) for control.	C? CATTN3
COSW		Selects all OSW modules mounted on the frame (FR∗ or FRALL) for control.	C? CRLM
CRLM		Selects all RLM modules mounted on the frame (FR∗ or FRALL) for control.	C? CRLM
CMD/DELIM∗	0, 1	Sets delimiter of this device. 0: CR+LF+EOI 1: EOI	CMD/DELIM? CMD/DELIM∗
ERR?		Outputs error information of the main-unit.	 See 7.12 (→7-9)
HED∗	0, 1	Sets header of result code. 0: With header 1: Without header	HED? HED∗
MOD?		Displays modules mounted at the present.	 See 5.4.6 (3) (→5-63)

Table.5-3 Program Codes Common to Modules

Program code	Setting contents	System operation	Request code Data format
MBATT?		Checks the battery of modules. 0: LOW 1: OK	 MBATT∗
MODEL?		Outputs module information.	 See 5.4.6 (3) (→5-63)
RESET		Resets settings on the modules to the default values. Causes the zero-point return. The initialization takes about 20 seconds.	
RMT∗	0, 1	Locks out the module local key. 0: Release 1: Lockout	 See 5.4.6 (3) (→5-63)

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Table.5-4 Program Codes for LD MODULE

Program code	Setting contents	System operation	Request code / Data format
LOPT∗	0, 1	Set ON/OFF of optical output. 0: OFF 1: ON 2: LOCK (query only)	LOPT? LOPT∗
LATL**.**	00.00 to 10.00	Sets attenuation (in dB).	LATL? LATL**.**
LATLC		Set the attenuation to 0 dB.	
LEMO∗	0, 1	Sets ON/OFF of the external modulation. 0: OFF 1: ON	LEMO? LEMO∗
LIMO∗	0 to 3	Set the internal modulation modes. 0: CW (Continuous light) 1: 270Hz (Rectangular wave) 2: 1.0kHz (Rectangular wave) 3: 2.0kHz (Rectangular wave)	LIMO? LIMO∗
LIMOD***.*	0.1 to 300.0	Sets the internal modulation frequency (in kHz).	LIMO? LIMOD***.*
LW****.*** *1	LWMIN to LWMAX	Sets the output wavelength (in nm).	LW? LW****.***
LF***.*** *1	LFMIN to LFMAX	Sets the output wavelength (in THz).	LF? LF***.***
LCOHR∗	0, 1	Sets the spectrum line width of output light. 0: NARROW 1: WIDE	LCOHR? LCOHR∗
LWMAX? *2 LWMIN? *2		Outputs the maximum value/minimum values (in nm) of wavelengths settable by LW.	 LWMAX****.*** LWMIN****.***
LFMAX? *2 LFMIN? *2		Outputs the maximum value/minimum values (in THz) of wavelengths settable by LF.	 LFMAX***.*** LFMIN***.***
LWC? *2		Outputs the center wavelength (in nm).	 LWC****.***
LFC? *2		Outputs the center wavelength (in THz).	 LFC***.***
LUS∗	0, 1	Sets the unit of output wavelength. 0: nm (Wavelength) 1: THz (Frequency)	LUS? LUS∗
LD?		Outputs module information.	 See 5.4.6 (3) (→5-63)

*1 Set values and output values include values set by LWLCAL. The setting range varies with values of LWLCAL.
*2 Output values include those set by LWLCAL.

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LWLCAL***.***	-10.000 to 10.000	Adds the offset value set for wavelength display and displays it (in nm).	LWLCAL?
			LWLCAL***.***
LPLCAL***.**	-80.00 to 80.00	Adds the offset value set for output power level display and display it (in dB).	LPLCAL?
			LPLCAL***.**
LPL**.** *1		Sets the output power level (in dBm).	LPL?
			LPL**.**

NOTE

Setting ranges specified by LW and LF correspond to LWMIN - LWMAX and LFMIN - LFMAX, respectively. Setting range of LD MODULE is 1.6 nm or more, including the user-specified wavelength.

Table.5-5 Program Codes for ASE MODULE

Program code	Setting contents	System operation	Request code
			Data format
EOPT*	0, 1	Sets ON/OFF of the optical output. 0: OFF 1: ON 2: LOCK (query only)	EOPT?
			EOPT*
EATL*.*	0.0 to 6.0	Sets attenuations (in dB).	EATL?
			EATL*.*
EATLC		Sets the attenuation to 0 dB.	
ED?		Outputs ASE information.	
			See 5.4.6 (3) (→5-63)

*1 Set values and output values include those set by LPLCAL. And the setting range varies with values of LPLCAL.

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Table.5-6 Program Codes for ECL MODULE

Program code	Setting contents	System operation	Request code / Data format
LOPT∗	0, 1	Sets ON/OFF of the optical output. 0: OFF 1: ON 2: LOCK (query only)	LOPT? LOPT∗
LATL**.** *1	0.00 to 10.00	Sets attenuations (in dB).	LATE? LATL**.**
LATLC *1		Sets the attenuation to 0 dB.	
LEMO∗ *1	0, 1	Sets ON/OFF of the external modulation. 0: OFF 1: ON	LEMO? LEMO∗
LIMO∗ *1	0 to 3	Sets the internal modulation modes 0: CW 1: 270 Hz (Rectangular wave) 2: 1.0 kHz (Rectangular wave) 3: 2.0 kHz (Rectangular wave)	LIMO? LIMO∗
LIMOD***.* *1	0.1 to 300.0	Sets the internal modulation frequency (in kHz).	LIMO? LIMOD***.*
LW****.** *1 *2	LWMIN to LWMAX	Sets the output wavelength (in nm).	LW? LW****.**
LF***.** *1 *2	LFMIN to LFMAX	Sets the output wavelength (in THz).	LF? LF***.**
LCOHR∗ *1	0, 1	Sets the spectrum line width of output light. 0: NARROW 1: WIDE	LCOHR? LCOHR∗
LWMAX? *1 *3 LWMIN? *1 *3		Outputs the maximum value/minimum value (in nm) of wavelengths settable by LW.	 LWMAX****.** LWMIN****.**
LFMAX? *1 *3 LFMIN? *1 *3		Outputs the maximum value/minimum value (in THz) of wavelengths settable by LF.	 LFMAX***.** LFMIN***.** LFC***.**
LUS∗ *1	0, 1	Sets units of output wavelength. 0: nm (Wavelength) 1: THz (Frequency)	LUS? LUS∗
LD? *1		Outputs module information.	 See 5.4.6 (3) (→5-63)
LWLCAL***.** *1	-10.00 to +10.00	Adds offset values set for the wavelength display and displays them (in nm).	LWLCAL? LWLCAL***.**
LPLCAL***.** *1	-80.00 to +80.00	Adds offset values set for the output power level display and displays them (in dB).	LPLCAL? LPLCAL***.**

*1 This code is valid only when the wavelength calibration mode is OFF.
*2 Set values and output values include those set by LWLCAL. And the setting range varies with values of LWLCAL.
*3 Output values include those set by LWLCAL.

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LMSTAT?		Inquires for the end of module operation. 0: Stop 1: During operation	 LMSTAT*
LPL**.** *1 *2		Sets the output power level (in dBm).	LPL? LPL**.**
LUCAL*	0, 1	Sets ON/OFF of the wavelength calibration mode. 0: OFF 1: ON	LUCAL? LUCAL*
LUCWL* *3	0, 1	Outputs wavelengths at calibration points. 0: CAL POINT A 1: CAL POINT B	LUCWL? LUCWL*
LUCALD/****.** */ . *3		Registers the measured wavelength at each point. ****.***: Measured wavelength at CAL POINT A. . : Measured wavelength at CAL POINT B.	LUCALD? LUCALD/****.** */ .
LUMAX? *3 LUMIN? *3		Displays the maximum value/minimum values (in nm) of wavelengths settable by LUCALD.	
LUDEST *3		Execute calibration according to the measured wavelength at each point.	
LUCRST *3		Change the wavelength calibration data to the state at the time of shipment.	
LUWTBP****.**/ *3		Draws up user wavelength tables. ****.** : Wavelength correction value : Pulse count (0000 to 24500/250)	LUWTBP? LUWTBP****.**/

NOTE

Setting ranges specified by LW and LF correspond to LWMIN - LWMAX and LFMIN - LFMAX, respectively.

*1 Set values and output values include those set by LPLCAL. And the setting range varies with values of LPLCAL.
*2 It is enabled only when the wavelength calibration mode is turned off.
*3 It is enabled only when the wavelength calibration mode is turned on.

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Table.5-7 Program Codes for OPM MODULE

Program Codes	Setting Contents	Operations	Request Code Data Format
D∗ (-22 only)	1, 2	Selects a device in the module under control for control. 1: Device A 2: Device B	D?
			D∗
PW∗∗∗∗.∗∗ (-21)	700.0 to 1700.0	Sets calibration wavelengths (in nm).	PW?
			PW∗∗∗∗.∗∗
PW∗∗∗∗.∗∗ (-22)	1280.0 to 1700.0	Sets calibration wavelengths (in nm).	PW?
			PW∗∗∗∗.∗∗
PR∗	A, C to L, Z	Set the ranges. A: AUTO C: +30 dBm (-21 only) D: +20 dBm (-21 only) E: +10 dBm F: 0 dBm G: −10 dBm H: −20 dBm I : −30 dBm J : −40 dBm K: −50 dBm L : −60 dBm Z: HOLD	PR?
			PR∗
PMO∗ (-21 only)	0 to 4	Sets modulation modes. 0: CW 1: 0.27 Hz 2: 1.0 kHz 3: 2.0 kHz 4: External modulation (Extension CHOP)	PMO?
			PMO∗
PDR∗	0, 1	Sets ON/OFF of the relative value measurement. 0: Absolute value measurement 1: Relative value measurement (POWER value at that time is applied as a reference value.)	PDR?
			PDR∗
PH∗	0 to 4	Sets maximum value/minimum value measurement. 0: OFF 1: MAX measurement 2: MIN measurement 3: DIF measurement 4: STOP	PH?
			PH∗
PA∗	A to H	Sets the averaging processing count. A : 1 (OFF) B : 2 C : 5 D : 10 E : 20 F : 50 G : 100 H : 200	PA?
			PA∗
PZ		Executes ZERO SET.	
PF∗	A, B	Changes the display formats. A : W display B : dBm display	PF?
			PF∗

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POD? *1		Outputs measured values.	See 5.4.6 (3) (→5-63)
PFR? *1		Outputs the reference value at the time of measuring relative value.	See 5.4.6 (3) (→5-63)
PHD/MAX? *1 PHD/MIN? *1 PHD/DIF? *1		Outputs the maximum value/minimum value/ difference value at the time of measuring the maximum value/minimum value.	See 5.4.6 (3) (→5-63)
PCAL***.***	-80.000 to +80.000	Adds offset values (in dB) set for the display of measured values.	PCAL? PCAL***.***

Table.5-8 Program Codes for ATTN MODULE

Program Codes	Setting Contents	Operations	Request Code / Data Format
AAV**.** *2 (-32, -32A)	0.00 to 60.00	Sets the attenuations (in dB).	AAV? AAV**.**
AAV**.*** *2 (-33, -33M)	0.000 to 60.000	Sets the attenuations (in dB).	AAV? AAV**.***
AW**** (-32)	1200 to 1600	Sets the wavelengths (in nm).	AW? AW****
AW**** (-32A, -33, -33M)	1480 to 1650	Sets the wavelengths (in nm).	AW? AW****
AWMAX? AWMIN?		Outputs the maximum value/minimum value of settable wavelengths (in nm).	 AW****
ASHTR*	0, 1	Opens and closes the shutter. 0: DISABLED (Close) 1: ENABLED (Open)	ASHTR? ASHRT*
AMSTAT?		Outputs the motor state. 0: Stop 1: During operation	 AMSTAT*
AD?		Outputs ATTN information.	See 5.4.6 (3) (→5-63)
ACAL***.** (-32, -32A)	–80.00 to 80.00	Adds offset value set for the attenuation display (in dB).	ACAL? ACAL***.**
ACAL***.*** (-33, -33M)	–80.000 to 80.000	Adds offset value set for the attenuation display (in dB).	ACAL? ACAL***.***

NOTE

The setting range of AW is from AWMAX to AWMIN.

*1 Output values include value set by PCAL.

*2 Set values and output values include those set by ACAL. And the setting range varies with values of ACAL.

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Table.5-9 Program Codes for OSW

Program Codes		Setting Contents	Operations	Request Code Data Format
D∗ (-412, -422 only)		1, 2	Selects a device in the module under control for control. 1: Device A 2: Device B	D? D∗
SA◊SB□	-412	◊: 1 □: 1, 2	Sets the connection port. ◊ 1: Port C [*1] 2: Port 2 □ 0: Shading 1 to n: Each port number [*2]	SASB? other than -422: SA◊SB□ -422: SSTRAIGHT or SCROSS
	-422	◊: 1, 2 □: 1, 2		
	-414	◊: 1 □: 0 to 4		
	-418	◊: 1 □: 0 to 8		
	-43	◊: 1 □: 0 to 12		
	-44	◊: 1 □: 0 to 16		
SSTRAIGHT (-422 only)			Set the connection ports. Ports 1 and 3 and Ports 2 and 4 are connected.	SASB? SSTRAIGHT
SCROSS (-422 only)			Set the connection ports. Ports 1 and 4 and Ports 2 and 3 are connected.	SASB? SCROSS
SAMAX?			Outputs the largest port number out of Side A ports [*3].	 SAMAX∗
SAMIN?			Outputs the smallest port number out of Side A ports.	 SAMIN∗
SBMAX?			Outputs the largest port number out of Side B ports [*4].	 SBMAX∗
SBMIN?			Outputs the smallest port number out of Side B ports.	 SBMIN∗
SMSTAT?			Outputs the state of channel change. 0: End of operation 1: During operation	 DUAL OSW: SMASTAT∗/∗ OSW: SMASTAT∗

[*1] Port 1 for -422.
[*2] In case of -422, 1: Port 3, 2: Port 4.
[*3] Ports designated to ◊ by Command SA◊SB□.
[*4] Ports designated to □ by Command SA◊SB□.

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Table.5-10 Program Codes for RLM MODULE

Program Codes	Setting Contents	Operations	Request Code / Data Format
RW****	1280 to 1620	Sets calibration wavelengths (in nm).	RW?
			RW****
RDR*	0, 1	Sets ON/OFF of relative value measurement. 0: Absolute value measurement 1: Relative value measurement (POWER value at that time is applied as a reference value.)	RDR?
			RDR*
RH*	0 to 4	Sets the maximum value/minimum value. 0: OFF 1: MAX measurement 2: MIN measurement 3: DIF measurement 4: STOP	RH?
			RH*
RA*	A to H	Sets the averaging processing counts. A : 1 (OFF) B : 2 C : 5 D : 10 E : 20 F : 50 G : 100 H : 200	RA?
			RA*
RFL*	A, B	Set reflection references. A: Fresnel reflection reference (14.70dB) B: Total reflection reference (0.20dB)	RFL?
			RFL*
RREF		Executes measurement of reference reflection.	
RREF?		Outputs the state of reference reflection measurement. 0: Before measurement 1: After measurement 2: During measurement	
			RREF*
RD?		Outputs measured values.	
			See 5.4.6 (3) (→5-63)
RHD/MAX? RHD/MIN? RHD/DIF?		Outputs the maximum value/minimum value/ difference value at the time of measuring the maximum value/minimum value.	
			See 5.4.6 (3) (→5-63)

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(2) Default Values when Control via GP-IB is turned on

Following shows the default values of the system and modules.

Default values are restored with "*RST" or "RESET" command, or when power is turned on again.

Table.5-11 Default Values of AQ8204

Program code	Default value
*ESE	0 (Full mask)
*SRE	0 (Full mask)
LCKE	0 (Full mask)
CMD/DELIM	0 (CR+LF+EOI)
FR	0 (Frame of this device is seceted.)
C	ALL (All channels are selected.)
D	1
CDSP	MLT1

Values specified with ESE or SRE are backed up inside the system. Thus, powering on again does not restore the corresponding default values.

Table.5-12 Default Values of LD MODULE

Program code	Default value
LOPT	0 (OFF)
LATL	0 (0.00 dB)
LEMO	0 (OFF)
LIMO	0 (CW)
LW, LF	Value of LWC or LFC
LCOHR	0 (OFF)
LUS	0 (WL)
LWLCAL	0 (0.000 nm)
LPLCAL	0 (0.00 dB)

Values specified the program codes (except that with LOPT) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

Table.5-13 Default Values of ASE MODULE

Program code	Default value
EOPT	0 (OFF)
EATL	0 (0.0 dB)

Values specified the program codes (except that with EOPT) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

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Table.5-14 Default Values of ECL MODULE

Program code	Default value
LOPT	0 (OFF)
LATL	0 (0.00dB)
LEMO	0 (OFF)
LIMO	0 (CW)
LW, LF	Value of LWC or LFC
LCOHR	0 (OFF)
LUS	0 (WL)
LWLCAL	0 (0.00nm)
LPLCAL	0 (0.00dB)
LUCAL	0 (OFF)

Values specified the program codes (except that with LOPT) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

LUCWL	0 (A point)
LUCALD	-13/13A : 1520.000/1570.000 -13B/13D : 1560.000/1610.000

Don't try to turn power off while the calibration is taking place.

Table.5-15 Default Values of OPM MODULE

Program code	Default value
PW	-21: 1310 (1310.0nm) -22: 1550 (1550.0nm)
PR	A (AUTO)
PMO (-21 only)	0 (CW)
PDR	0 (OFF)
PH	0 (OFF)
PA	A (OFF)
PCAL	0 (0.000dB)

Values specified the program codes (except that with PDR and PH) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

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Table.5-16 Default Values of ATTN MODULE

Program code	Default value
AAV	0 (0.00dB)
AW	1550 (1550nm)
ASHTR	0 (DISABLED)
ACAL	0 (0.00dB)

Values specified the program codes (except that with ASHTR) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

Table.5-17 Default Value of OSW

Program code	Default value
SA◊SB□	SA1SB1

Table.5-18 Default Values of RLM MODULE

Program code	Default value
RW	1550 (1550nm)
RDR	0 (OFF)
RH	0 (OFF)
RA	A (OFF)
RFL	A (14.70dB)
RREF	0 (None)

Values specified the program codes (except that with RDR, RH and RREF) are backed up inside the module. Thus, powering on does not restore the corresponding default value.

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(3) Data Format

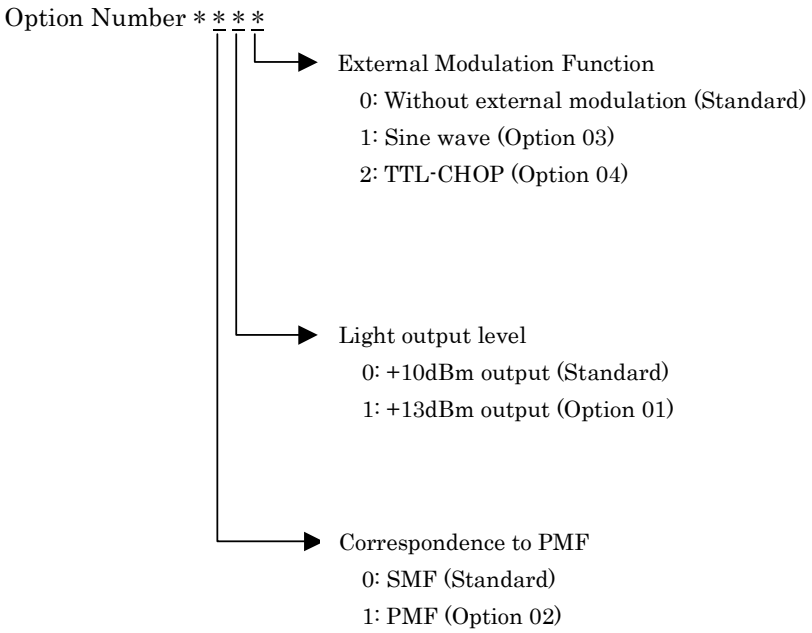
Table.5-19 shows the data format.

Table.5-19(1) Data Format

Command	Output data format
*IDN?	ANDO-ELECTRIC, AQ8204, Serial No., Software version
MODEL?	AQ8201-***/Module serial No./Module software version/Module option No.
MOD?	AQ8201-***, AQ8201-***, …
SVER?	ROM**.**, MAIN**.**
LD?	LD**◊00.00□□□□.□□ **: Channel No. (1 to 8, 11 to 50) ◊: Status (0: LD OFF, 1: LD ON, 2: LOCK) 00.00: Set optical attenuation □□□□.□□: Set wavelength (Output values include values set by LWLCAL.)
ED?	ED**◊00.0 **: Channel No. (1 to 7, 11 to 49) ◊: Status (0: LD OFF, 1: LD ON, 2: LOCK) 00.0: Set optical attenuation

① Module Option Number Format (AQ8201-110)

The module option umbers output by "MODEL?" are as follows:



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Table.5-19(2) Data Format

Command	Output data format
POD? PFR? PHD/MAX? PHD/MIN? PHD/DIF?	@@@**◊△○@□□□□□□□□ @@@: Header changes depending on command. **: Channel No. (1 to 8, 11 to 50) ◊: Status Z: During zero setting I : In the range (Normal) U: Under the range O: Over the range R: During range selection A: During averaging △: Function information 1: Measurement data, 3: Maximum value, 4: Minimum value, 5: DIF value A: Display difference value, C: Reference value ○: Unit L: GW, M: MW, N: KW, O: W, P: mW, Q: μW, R: nW, S: pW, T: fW, Z: aW, U: dBm, V: dB, W: No unit @: Range information (Corresponds to program codes for OPM module.) C to L: +30 to -60 dBm (-21) E to L: +10 to -60 dBm (-22) □□□□□□□□: Data(Decimal number with 8-digit code) (Output values include values set by PCAL.)
AD?	AD**◊○□□□□△△.△△ **: Channel No. (1 to 8, 11 to 50) ◊: Status (0: Motor in a stop, 1: Motor in operation) ○: Shutter state (0: OFF, 1: ON) □□□□: Set wavelength △△.△△△: Set attenuation (Output values include values set by ACAL.)
RD? RHD/MAX? RHD/MIN? RHD/DIF?	@@@**◊○△□□□□□□□ @@@: Header changes depending on command. **: Channel No. (1 to 8, 11 to 50) ◊: Status F: During measurement of reference reflection R: During measurement of return loss A: During averaging N: Before measure ○: Function information 1: Measurement data, 3: Maximum value, 4: Minimum value, 5: DIF value △: Reflection Reference 1: Fresnel reflection reference, 2: Total reflection reference □□□□□□□□: Data (Decimal number with 8-digit code)

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NOTE

Response of query command is set into the output queue. When this device receives a new query command, it will clear data left in the output queue and write the latest information. So, read data in the output queue before executing a next command.

When plural modules had been controllable by CALL, CLD, COPM, CATTN etc. and a query command was sent to this device, responses of maximum of 48 modules are separated by comma and are returned.

For example, if "CALL, AAV?" are sent when the ATTN MODULE is mounted to CH01, CH03 of this device and CH3-1, CH3-4 of EXPANDER FRAME, the data format returned is as follows:

"AAV10.00, ,AAV10.00, ,AAV10.00, , ,AAV10.00, , , , ,"

(4) Delimiter
Delimiter is CR+LF+EOI or EOI.

(5) Maximum Receivable Numbers of Program Code Characters
You can send two or more program codes concatenating them with a comma (,).
The maximum receivable numbers of program code characters is 512 (including delimiter). If the numbers of characters exceed 512, all program codes received are disabled and an error will be output.

NOTE

Blanks can be inserted to any place since they are neglected.

(6) Maximun of Number of Transmission Characters
The maximum of number of transmission characters (including delimiters) is 512.

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5.4.7 Register

The register of event processing is classified into three groups at function. The standard Event Status Register (ESR), the Status Byte Register (SBR) and the OPT LOCK event status register are used to record specific events which occurred during operating this device. These registers are based on IEEE-488.2-1987.

(1) Standard Event Status Register

ESR records 8 types of event which occurred during operating this device.

The contents of this register can be read by the query command "∗ESR?". Moreover this can be cleared by "∗CLS" or "∗RST".

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

Table.5-20 Functions of ESR Bits

Bit	Outline of Operations for set a bit
BIT7	PON (Power ON) This bit is set when the power of this device is turned on.
BIT6	URQ (User request) Not used
BIT5	CME (Command error) This bit is set when the received command is committing a syntax error or violating the system's receiving format as well as when an individual command not prepared for the specified module is receive.
BIT4	EXE (Execution error) This bit is set when a specified data is outside the predetermined range or when an error is warned because a given setting or query is violating the restrictions being set during the module operation.
BIT3	DDE (Device error) This bit is set when a command is unacceptable due to hardware trouble on the module.
BIT2	QYE (Query error) This bit is set when this device is requested to read an output queue in which data is not present or not processed yet as well as when data in the output queue is lost.
BIT1	RQC (Request control) Not used
BIT0	OPC (Operation complete) This bit is set when a deferred operation is complete. Its operation is corresponded to "∗OPC" command. ※ When "∗OPC" is used against two or more modules, OPC will be output at the end of operation of respective target modules.

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(2) Status Byte Register

Each bit of SBR records the preparation situation of the data to output queue, the service request situation of this device, the event record situation to ESR, etc.

You can read contents of SBR using the serial poll or "*STB?". When "*STB?" is used, the contents are written to the output queue. Moreover this can be cleared by "*RST".

If you use the serial poll for the read, BIT6 become RQS bit.

When "*STB?" is used for the read, BIT6 become MSS bit.

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
×	RQS MSS	ESB	MAV	×	×	×	OLK

Table.5-21 Functions of SBR Bits

Bit	Operational overview of bit set
BIT7	Not used
BIT6	RQS (ReQuest Service) This bit means that this device is requesting service to the GP-IB controller. This bit can be read by serial poll.
	MSS (Master Status Summary) If any bit of MAV, ESB, or OLK of SBR is set and the bit is in "enable" state by SRE, this bit is set. This bit can be read by query "*STB?".
BIT5	ESB (Event Status Bit) If any bit of ESR is set and the bit is in "enable" state by ESE, this bit is set.
BIT4	MAV (Message AVailable) This bit means that data is prepared in the output queue.
BIT3	Not used
BIT2	Not used
BIT1	Not used
BIT0	OLK (Optical output LocK bit) If OPT LOCK bit of OPT LOCK Event Status Register is set and the bit is in "enable" state by OPT LOCK Event Status Enable Register, this bit is set.

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(3) OPT LOCK Event Status Register

OPT LOCK event status register is set when the interlock contact is open (remote interlock short plug is not connected) or the optical output control key is turned off.

The contents of this register can be read by the query command "LCK?". Moreover this can be cleared by "∗CLS" or "∗RST".

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
×	×	×	×	×	×	×	OPT LOCK

Table.5-22 Functions of OPT LOCK Event Status Register Bits

Bit	Operational overview of bit set
BIT7	Not used
BIT6	Not used
BIT5	Not used
BIT4	Not used
BIT3	Not used
BIT2	Not used
BIT1	Not used
BIT0	OPT LOCK (OPTical output LOCK bit) This bit is set when LD emission is locked.

(4) Register Clearing Condition

Respective registers are cleared when the following condition is met.

Table.5-23 Register Clearing Condition

Register type	Clearing condition
Standard Event Status Register (ESR)	• When power is turned off. • When "∗RST" is executed. • When "∗CLS" is executed. • When status data is written to the output queue by "∗ESR".
Standard Event Status Enable Register (ESE)	• When power is turned off.
Status Byte Register	• When power is turned off. • When "∗RST" is executed.
Service Request Enable Register	• When power is turned off.
OPT LOCK Event Status Register	• When power is turned off. • When "∗RST" is executed. • When "∗CLS" is executed. • When status data is written to the output queue by "LCK?"
OPT LOCK Event Status Enable Register	• When power is turned off. • When "∗RST" is executed.

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(5) Event Processing Sequence

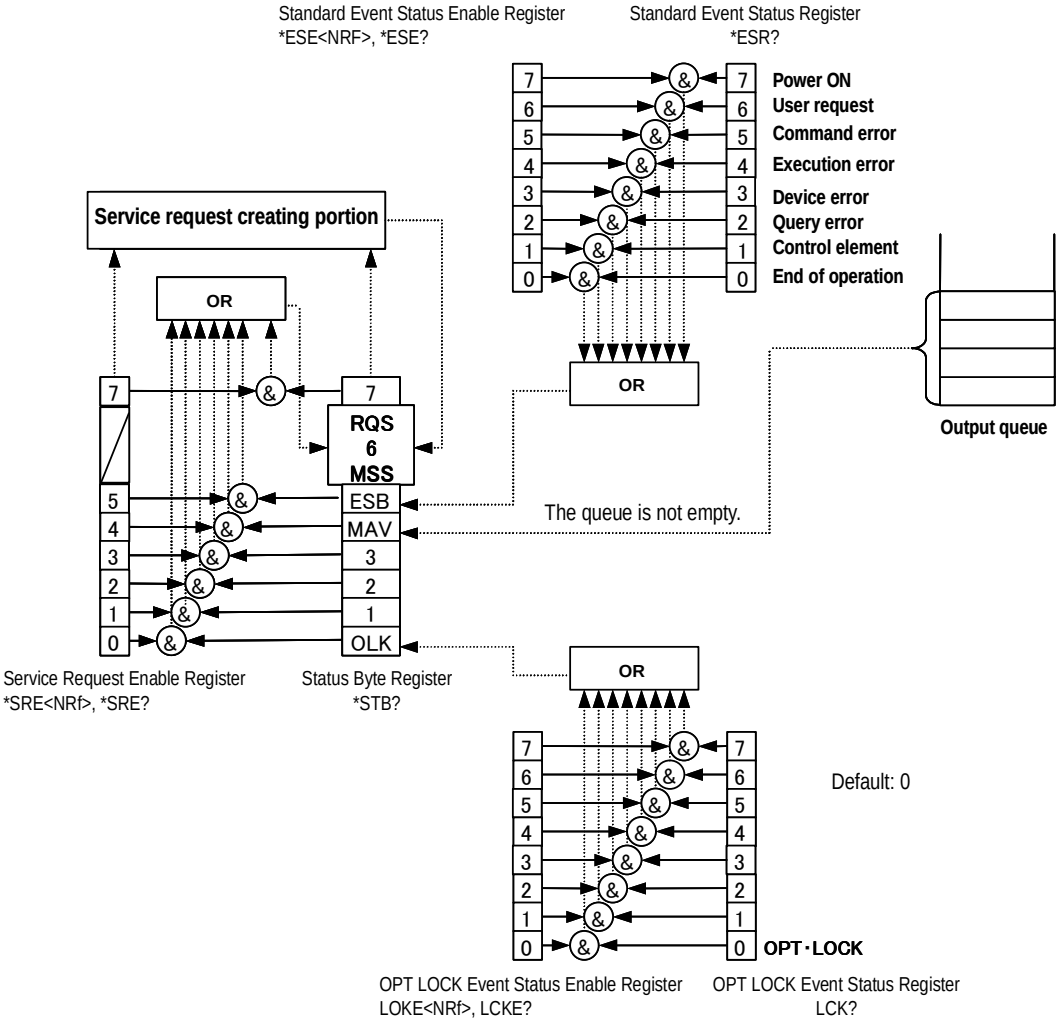


Figure.5-27 Event Processing Sequence

NOTE

When you use ESB bit or OPT LOCK bit of Status Byte Register, be sure to clear ESB bit (and ESR) or OPT LOCK bit (and OPT LOCK Event Status Register) by "*ESR?" or "LCK?".

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Chapter 6 Circuits and Structures

This chapter describes basic configuration of the system and various module circuits as well as outline of the structures.

6.1 EXPANDER FRAME (AQ8202)

6.1.1 Circuit

(1) Functional Block Diagram

Figure.6-1 shows functional block diagram of AQ8202 (hereinafter called “this device”).

This device feeds power to the housed modules. When a controller such as AQ8202-01, AQ8203 or AQ8204 is connected, it can send key operations or GP-IB commands to the controllable module.

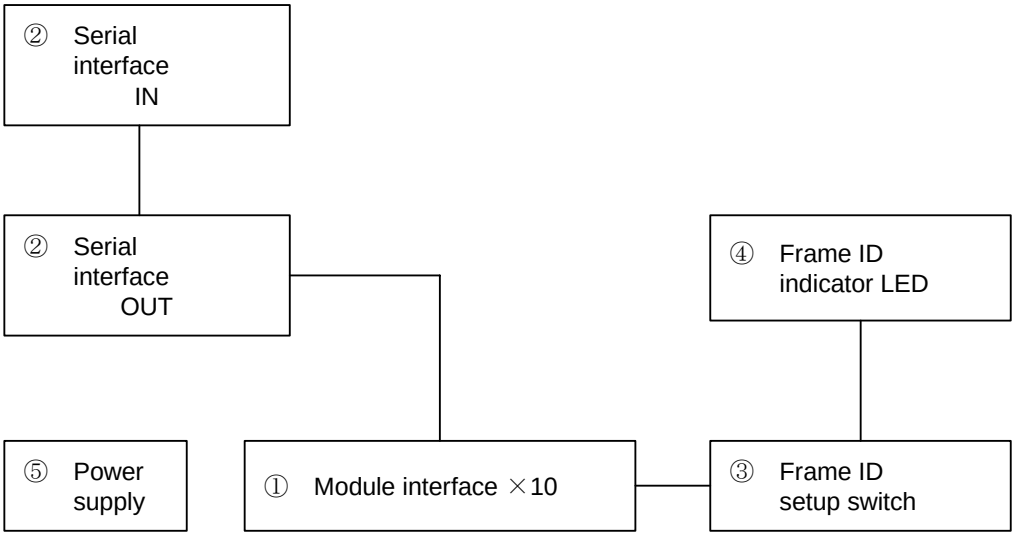


Figure.6-1 AQ8202 Functional Block Diagram

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(2) Description of Components

① Module interface
Each of these interfaces is used connect the specified module.

② Serial interface
They are used for external expansion. Two types are prepared one for IN and the other for OUT.

③ Frame ID setup switch
It is used to specify a Frame ID in the range of 1 to 4.

④ Frame ID indicator LED
This LED indicates the currently selected Frame ID.

⑤ Power supply
Power is turned on or off from the AC power switch.

6.1.2 Structure

ASD-62559-5 shows outside view of this device.

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6.2 SYSTEM CONTROLLER (AQ8202-01)

6.2.1 Circuit

(1) Functional Block Diagram

Figure.6-2 shows functional block diagram of AQ8202-01 (hereinafter called "this device").

This device is used to control the modules that are housed in AQ8202.

It is also used to operate on data from modules and then send requested data to the display connected to LCD or VGA terminal.

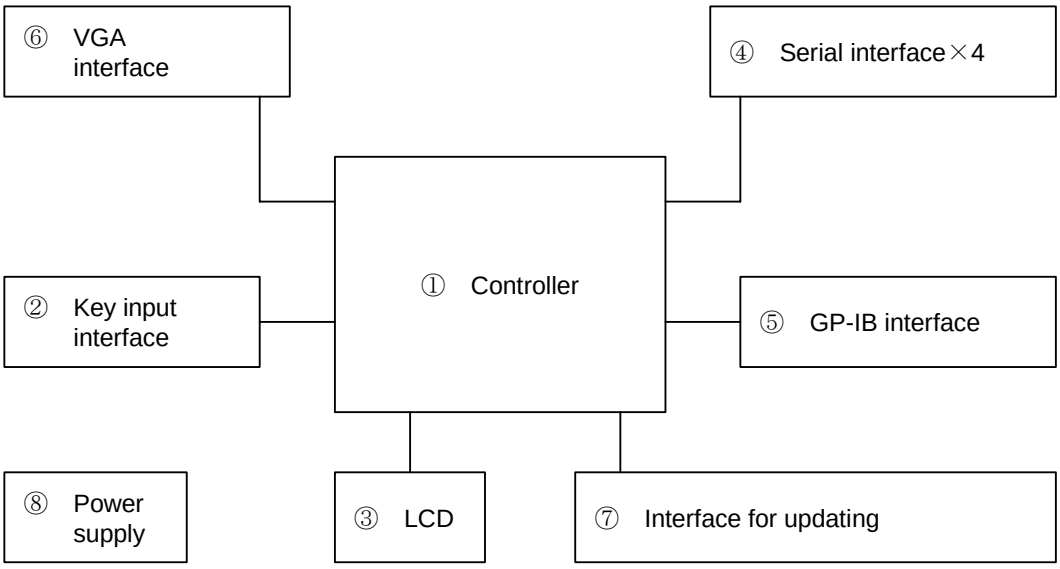


Figure.6-2 Functional Diagram of AQ8202-01

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(2) Description of Components

① Controller

It provides instructions to and collects information from all modules in order to be controlled.

② Key input interface

It is a user interface prepared for the manual operation of modules.

③ LCD

It displays parameters of the modules and the main unit as well as the current data.

④ Serial interface

These interfaces are used for external expansion. They can be used to connect AQ8202.

⑤ GP-IB interface

It is used to send and receive signals via GP-IB.

⑥ VGA interface

It outputs data to VGA terminal for external monitor.

⑦ Interface for updating

It enables updating by use of flash ATA card (prepared for update purpose only).

⑧ Power supply

Power is turned on or off from the AC power switch.

6.2.2 Structure

ASD-62559-6 shows outside view of this device.

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6.3 HALFSIZE FRAME (AQ8203)

6.3.1 Circuit

(1) Functional Block Diagram

Figure.6-3 shows functional block diagram of AQ8203 (hereinafter called “this device”).

This device is used to send the key operations and GP-IB commands to the controllable module as well as to operate on digital data from the module to send results of the operation to the display.

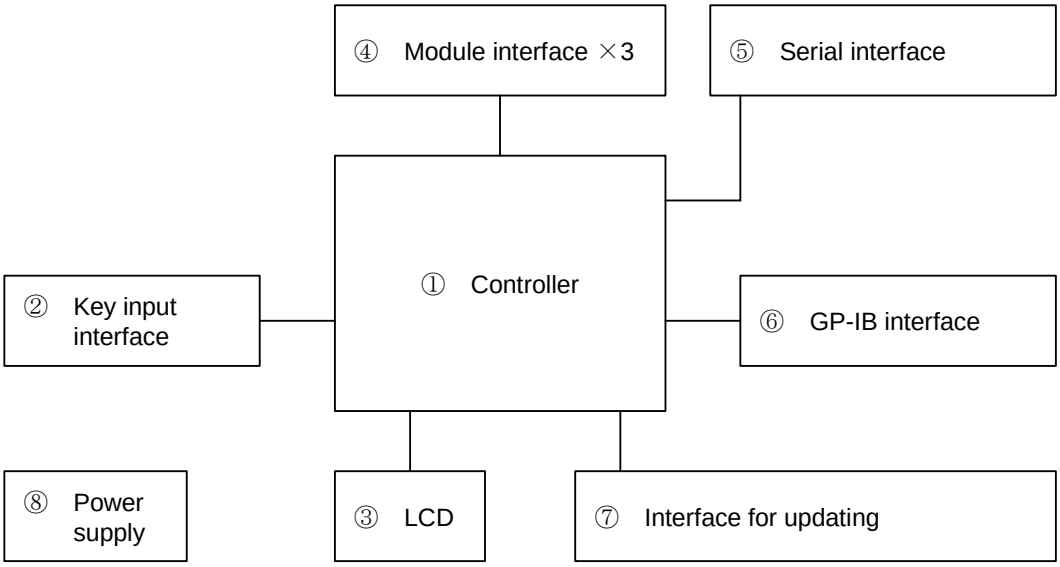


Figure.6-3 Block Diagram of AQ8203

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(2) Description of Components

① Controller
It provides instructions to and collects information from all modules in order to be controlled.

② Key input interface
It is a user interface prepared for the manual operation of modules.

③ LCD
It displays parameters of the modules and the main unit as well as the current data.

④ Module interface
These interfaces are used to connect the modules.

⑤ Serial interface
These interfaces are used for external expansion. They can be used to connect AQ8202.

⑥ GP-IB interface
It is used to send and receive signals via GP-IB.

⑦ Interface for updating
It enables updating by use of flash ATA card (prepared for update purpose only).

⑧ Power supply
Power is turned on or off from the AC power switch.

6.3.2 Structure

ASD-62559-2 shows outside view of this device.

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6.4 FRAME CONTROLLER (AQ8204)

6.4.1 Circuit

(1) Functional Block Diagram

Figure.6-4 shows functional block diagram of AQ8204 (hereinafter called “this device”).

This device is used to send the key operations and GP-IB commands to the controllable module as well as to operate on digital data from the module to send results of the operation to the display.

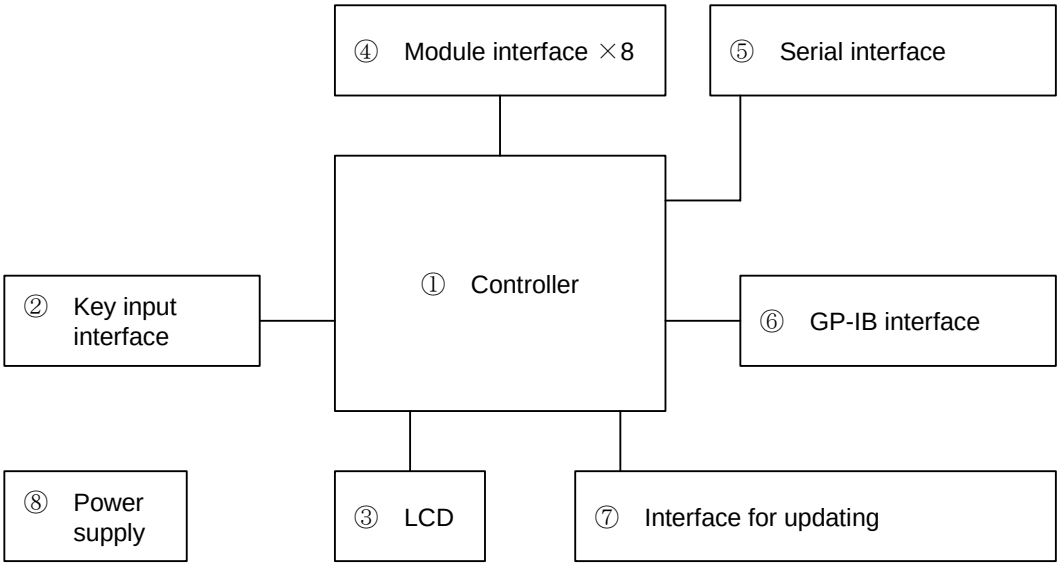


Figure.6-4 Block Diagram of AQ8204

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(2) Description of Components

① Controller

It provides instructions to and collects information from all modules in order to be controlled.

② Key input interface

It is a user interface prepared for the manual operation of modules.

③ LCD

It displays parameters of the modules and the main unit as well as the current data.

④ Module interface

These interfaces are used to connect the modules.

⑤ Serial interface

These interfaces are used for external expansion. They can be used to connect AQ8202.

⑥ GP-IB interface

It is used to send and receive signals via GP-IB.

⑦ Interface for updating

It enables updating by use of flash ATA card (prepared for update purpose only).

⑧ Power supply

Power is turned on or off from the AC power switch.

6.4.2 Structure

ASD-62559-4 shows outside view of this device.

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6.5 WDM DFB-LD MODULE (AQ8201-110)

6.5.1 Circuit

(1) Functional Block Diagram

Figure.6-5 shows the block diagram of AQ8201-110 (hereinafter called “this module”). Key operations as well as commands from the main-unit operate this module.

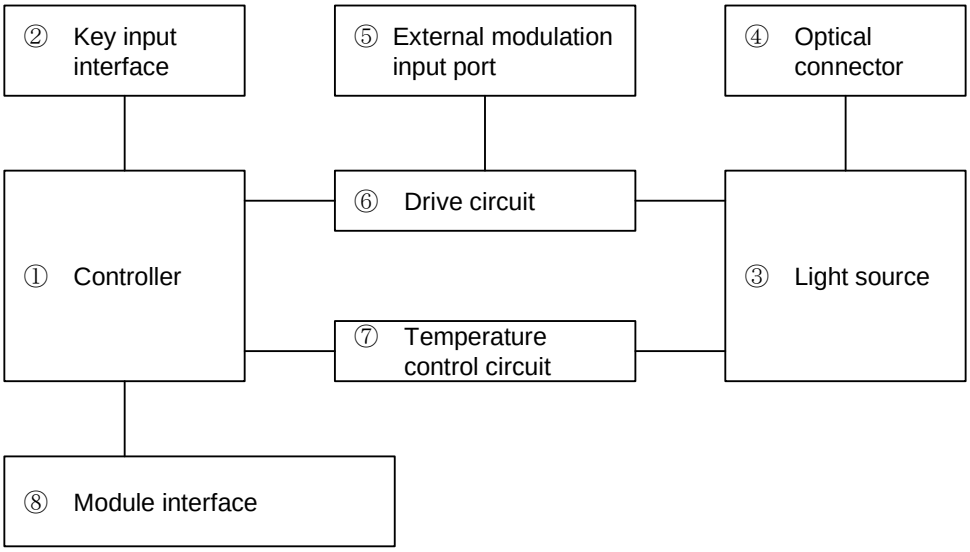


Figure.6-5 Functional Diagram of AQ8201-110

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(2) Description of Components

① Controller
It controls the blocks using signals from the Key input interface and main-unit.

② Key input interface
It is the switch used to turn on or off the light source.

③ Light source
It is the light source of DFB-LD.

④ Optical connector
This connector is used to output light.

⑤ External modulation input port
It is the SMA connector used to input external modulation signals (it is provided for Option 03 and 04 alone).

⑥ Drive circuit
It is used to drive the light source module.

⑦ Temperature control circuit
This circuit controls the light source temperature.

⑧ Module interface
It is used to exchange data with the main-unit.

6.5.2 Structure

ASD-62631-001 to ASD-62631-012 show outside view of this module.

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6.6 ASE MODULE (AQ8201-12/12A)

6.6.1 Circuit

(1) Functional Block Diagram

Figure.6-6 shows functional block diagram of AQ8201-12/12A (hereinafter called "this module").

Key operations as well as commands from the main-unit operate this module.

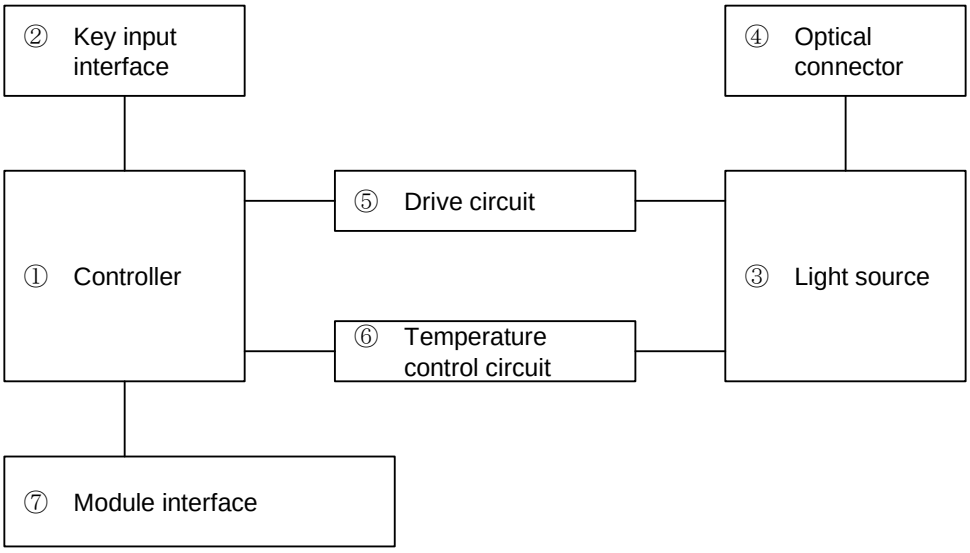


Figure.6-6 Functional Diagram of AQ8201-12/12A

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(2) Description of Components

① Controller
It controls the blocks using signals from the Key input interface and main-unit.

② Key input interface
It is the switch used to turn on or off the light source.

③ Light source
It is the light source of ASE.

④ Optical connector
This connector is used to output light.

⑤ Drive circuit
It controls optical output by modulating drive current in response to signals from the controller.

⑥ Temperature control circuit
This circuit controls the light source temperature.

⑦ Module interface
It is used to exchange data with the main-unit.

6.6.2 Structure

ASD-62521-12/121 show outside view of this module.

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6.7 ECL MODULE (AQ8201-13/13A/13B/13D)

6.7.1 Circuit

(1) Functional Block Diagram

Figure.6-7 shows functional block diagram of AQ8201-13/13A/13B13D (hereinafter called "this module").

Key operations as well as commands from the main-unit operate this module.

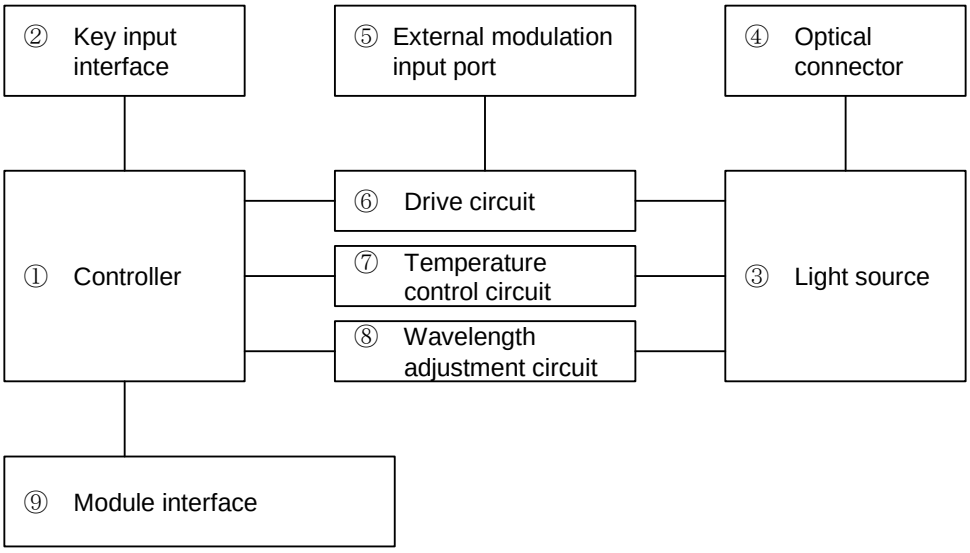


Figure.6-7 Functional Diagram of AQ8201-13/13A/13B/13D

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(2) Description of Components

① Controller
It controls the blocks using signals from the Key input interface and main-unit.

② Key input interface
It is the switch used to turn on or off the light source.

③ Light source
It is the light source of ECL.

④ Optical connector
This connector is used to output light.

⑤ External modulation input port
It is the SMA connector used to input external modulation signals.

⑥ Drive circuit
It is used to drive the light source module.

⑦ Temperature control circuit
This circuit controls the light source temperature.

⑧ Wavelength control circuit
It is used to adjust the output wavelength.

⑨ Module interface
It is used to exchange data with the main-unit.

6.7.2 Structure

ASD-62621-131/132/133/135 show outside view of this module.

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6.8 OPM MODULE (AQ8201-21/22)

6.8.1 Circuit

(1) Functional Block Diagram

Figure.6-8 shows functional block diagram of AQ8201-21/22 (hereinafter called "this module").

Key operations as well as commands from the main-unit operate AQ8201-21.

Commands from the main-unit operate AQ8201-22.

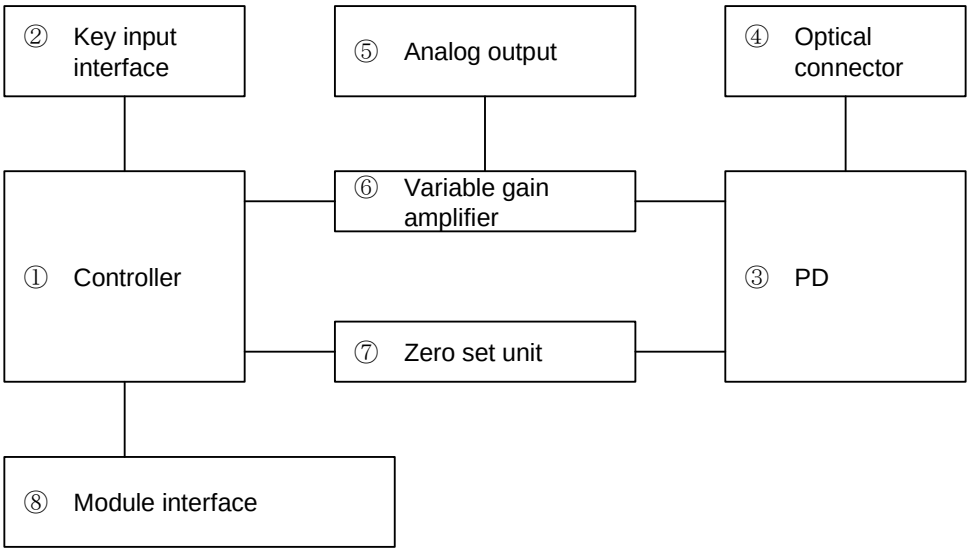


Figure.6-8 Functional Block Diagram of AQ8201-21

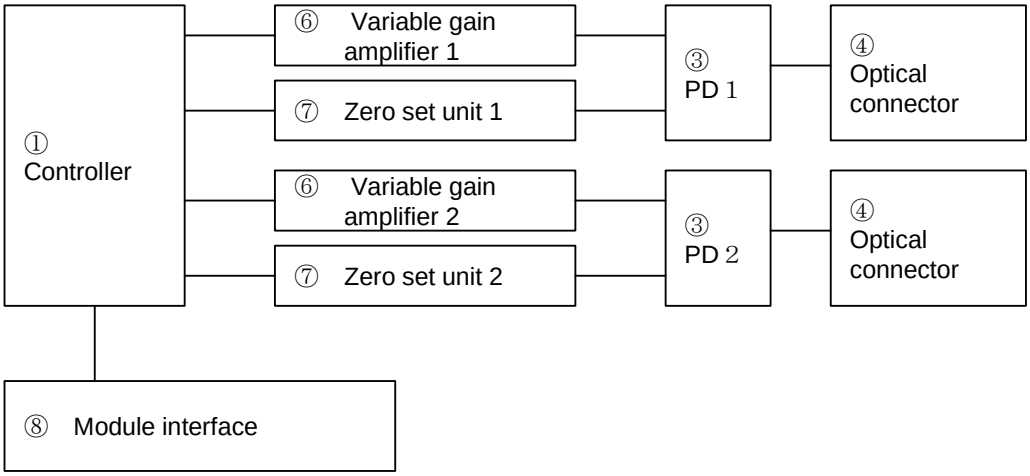


Figure.6-9 Functional Block Diagram of AQ8201-22

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(2) Description of Components

① Controller

Signals amplified on the variable gain amplifier are then converted to digital signals on the AD conversion circuit. The signals are then processed (logarithmic conversion and corrections) on the CPU circuit. It is also used to send measurements to the main-unit via the serial I/O.

② Key input interface

It is composed of a switch used to execute zero set and a switch used to select the input light between CHOP and CW.

③ PD

It is InGaAs photodiode. It outputs electric signals proportional to intensity of incident light. For AQ8201-21, it contains Peltier and thermistor in order to maintain the photodiode at a constant temperature.

④ Optical connector

It is the connector used to input target light of measurement.

⑤ Analog output

It outputs linear values within a single range by the voltage.

⑥ Variable gain amplifier

It switches gain level according to intensity of incident light.

⑦ Zero set circuit

It is used to negate electric offset within the circuit by use of output from the DA conversion circuit. Output value from the DA conversion circuit is validated as you execute ZERO SET, and that value is maintained until you execute ZERO SET again.

⑧ Module interface

It is used to exchange data with the main-unit.

6.8.2 Structure

ASD-62521-21/22 show outside view of this module.

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6.9 ATTN MODULE (AQ8201-32/32A/33/33M)

6.9.1 Circuit

(1) Functional Block Diagram

Figure.6-10 shows functional block diagram of AQ8201-32/32A/33/33M (hereinafter called "this module").

Key operations as well as commands from the main-unit operate this module.

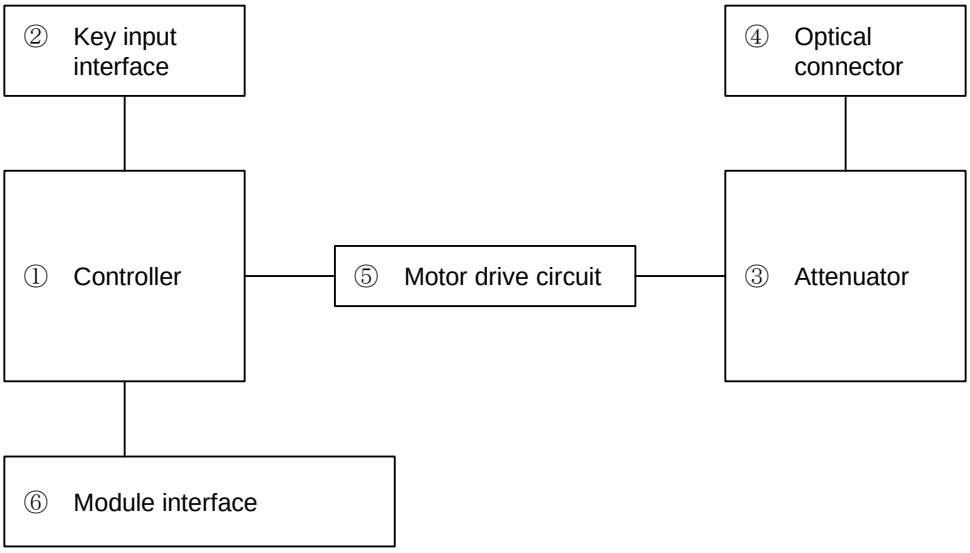


Figure.6-10 Functional Block Diagram of AQ8201-32/32A/33/33M

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(2) Description of Components

① Controller

It controls blocks according to signals from the Key input interface and main-unit.

② Key input interface

It is the switch used to turn on or off the shutter.

③ Attenuator

It is the light-attenuating filter connected to the motor.

④ Optical connector

It is used to input/output light.

⑤ Motor drive circuit

It drives the motor on the attenuator according to signals from the controller.

⑥ Module interface

It is used to exchange data with the main-unit.

6.9.2 Structure

ASD-62521-32/321/34/341 show outside view of this module.

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6.10 OSW MODULE (AQ8201-412/422/414/418/43/44)

6.10.1 Circuit

(1) Functional Block Diagram

Figure.6-11 and Figure.6-12 show functional block diagram of AQ8201-412/422/414/418/43/44 (hereinafter called "this module").

Commands from the main-unit operate this module.

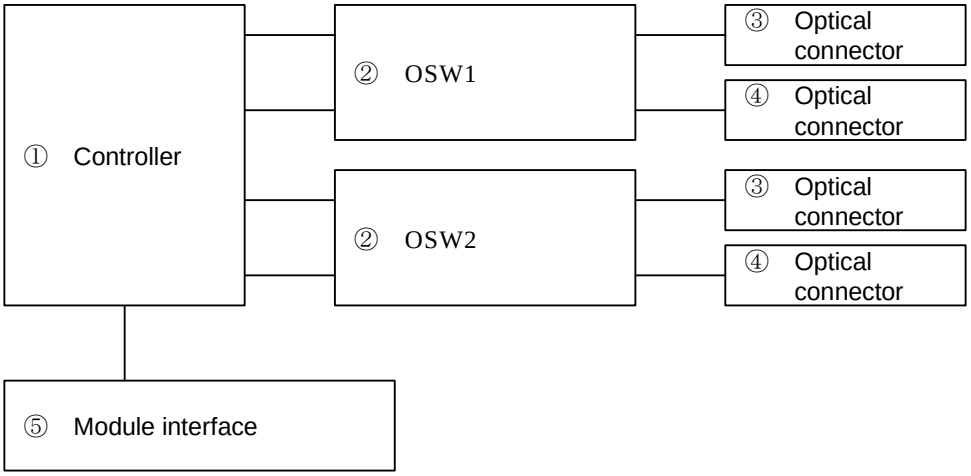


Figure.6-11 Functional Block Diagram of AQ8201-412/422

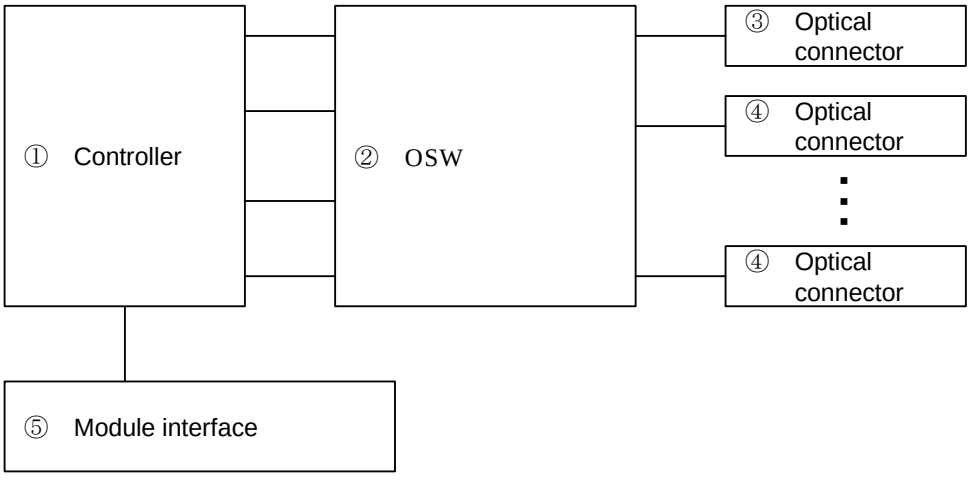


Figure.6-12 Functional Block Diagram of AQ8201-414/418/43/44

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(2) Description of Components

① Controller
It controls blocks according to signals from the main-unit.

② OSW
It switches connection between C-port (1-port and 2-ports with -422) and other ports (3-port and 4-ports with -422).

③ Optical connector (C port)
It is connected to one of the ports from OSW. Connection to 1-port and 2-port on -422 is not available, though.

④ Optical connector
One of the ports is connected to C-port from OSW. One of 1-port and 2-ports on -422 is connectable to C-port.

⑤ Module interface
It is used to exchange data with the main-unit.

6.10.2 Structure

ASD-62521-412/422/414/418/43/44 show outside view of this module.

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6.11 RLM MODULE (AQ8201-71)

6.11.1 Circuit

(1) Functional Block Diagram

Figure.6-13 shows functional block diagram of AQ8201-71 (hereinafter called "this module").

Commands from the main-unit operate this module.

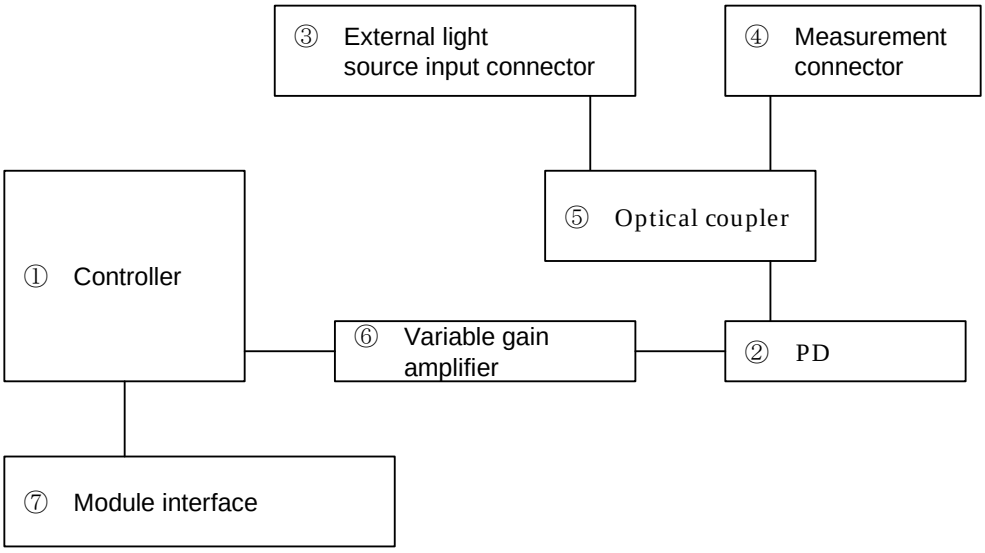


Figure.6-13 Functional Block Diagram of AQ8201-71

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(2) Description of Components

① Controller

Signals amplified on the variable gain controller are then converted to digital signals on the AD conversion circuit. The signals are then processed (logarithmic conversion and corrections) on the CPU circuit. It is also used to send measurements to the main-unit via the serial I/O.

② PD

It is InGaAs photodiode. It outputs electric signals proportional to intensity of incident light.

③ External light source input connector

This connector is used to input the reference light.

④ Measurement connector

It is the interface used to measure return loss of the equipment under test.

⑤ Optical coupler

It is used to output the light entered via the external light source input connector through the measurement connector as well as to send the light reflected by the equipment under test to PD.

⑥ Variable gain amplifier

This unit comprises an operational amplifier, active LPF, active BPF and detection circuit. It switches gain level according to intensity of incident light.

⑦ Module interface

It is used to exchange data with the main-unit.

6.11.2 Structure

ASD-62521-71 shows outside view of this module.

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Chapter 7 Troubleshooting Guide

This chapter describes the points to be checked when you can't operate the system as intended.

7.1 EXPANDER FRAME (AQ8202)

(1) It does not start up as power is turned on.

- Check the fuse provided inside the power plug receptacle.

(2) The power LED light up in orange.

- It is in standby state. Check the connection between AQ8202 and the controller. And Make sure that power switch of the controller is turned on.

7.2 SYSTEM CONTROLLER (AQ8202-01)

(1) It does not start up as power is turned on.

- Check the fuse provided inside the power plug receptacle.

(2) LCD does not display images.

- Check the connection between AQ8202-01 and AQ8202.

(3) It does not recognize the modules.

- Check the connection between the modules and AQ8202.
- The power of AQ8202-01 must be turned on after the power of AQ8202 is turned on.

(4) Screen displays an error.

- Refer to the Error Code Table (Table.7-1) (→7-9).

Contents of an error will be indicated at the bottom of the screen in the following format.

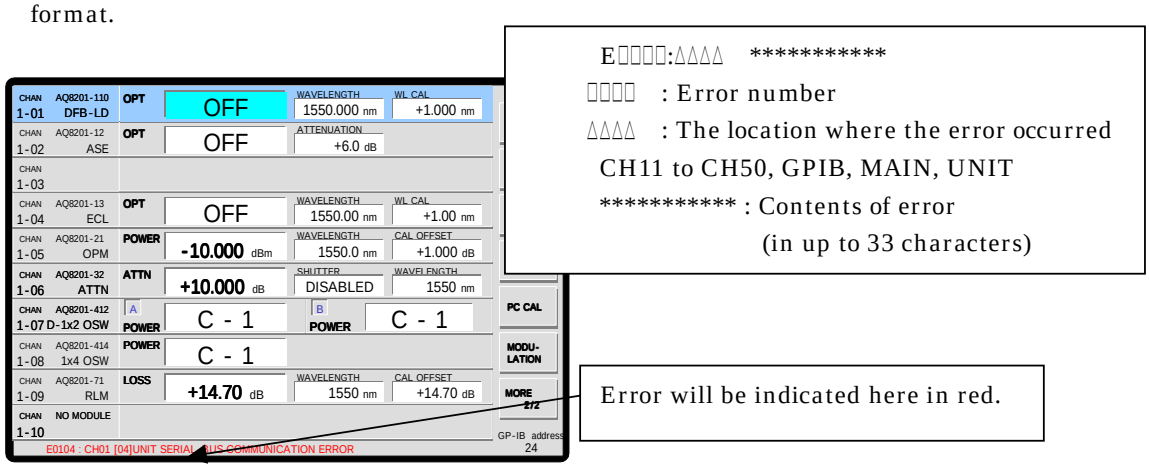


Figure.7-1 Error Indication (AQ8202-01)

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7.3 HALFSIZE FRAME (AQ8203)

(1) It does not start up as power is turned on.

- Check the fuse provided inside the power plug receptacle.

(2) It does not recognize the modules.

- Check the connection between the modules and AQ8203.
- When AQ8202 is used, the power of AQ8203 must be turned on after the power of AQ8202 is turned on.

(3) Screen displays an error.

- Refer to the Error Code Table (Table.7-1) (→7-9).

Contents of an error will be indicated at the bottom of the screen in the following format.

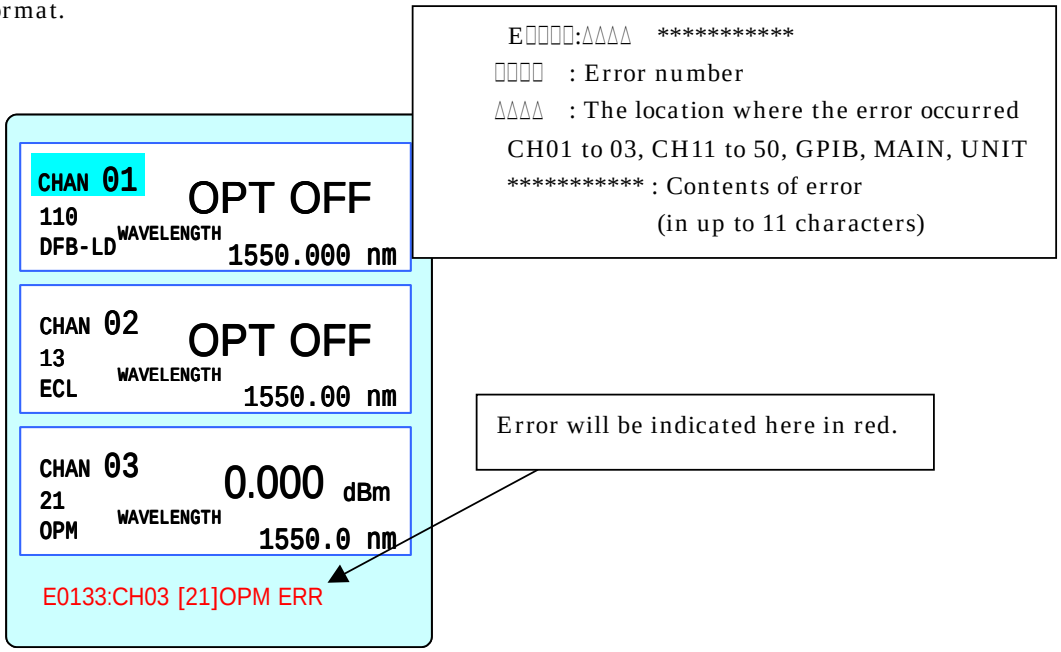


Figure.7-2 Error Indication (AQ8203)

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7.4 FRAME CONTROLLER (AQ8204)

(1) It does not start up as power is turned on.

- Check the fuse provided inside the power plug receptacle.

(2) It does not recognize the modules.

- Check the connection between the modules and AQ8204.
- When AQ8202 is used, the power of AQ8204 must be turned on after the power of AQ8202 is turned on.

(3) Screen displays an error.

- Refer to the Error Code Table (Table.7-1) (→7-9).

Contents of an error will be indicated at the bottom of the screen in the following format.

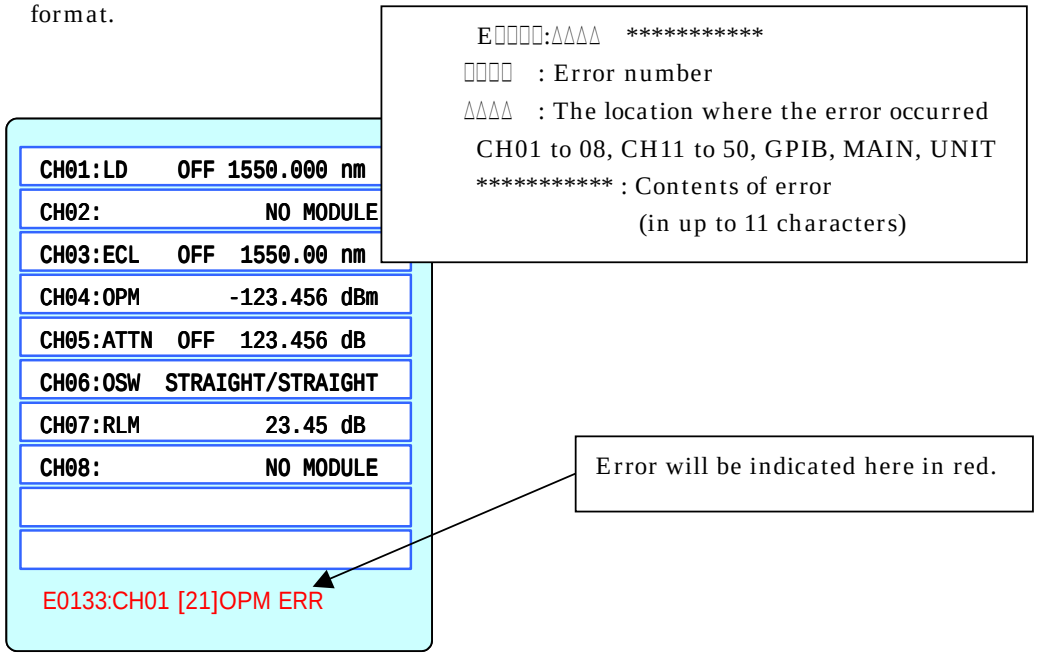


Figure.7-3 Error Indication (AQ8204)

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7.5 WDM DFB-LD MODULE (AQ8201-110)

(1) It does not generate optical output.

- Make sure that the OPT switch is turned on.
- Make sure that the optical fiber is connected.
- Make sure that the optical output control key is turned on. When controller is AQ8202-01, you must input the correct password in authentication screen.
- Make sure that the remote interlock connector is not open state.

(2) Optical output level is lower than the specified level.

- Check the optical output port of module and end face of the connected optical fiber for stains or settled dusts. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that the CW output is selected.
- Make sure that 0.00 dB is selected for the attenuation level.
- Make sure that the optical fiber is connected correctly.
- Check the optical fiber for disconnection or other troubles.

(3) Optical output level is unstable.

- Using a microscope, check the optical connector of module and end face of the connected optical fiber for damages or stains. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that an appropriate type of optical connector is connected.

(4) Turning on or off of optical output is unavailable.

- Make sure that the main-unit is released from the remote mode (GP-IB controlled state).

(5) Wavelength outputted is not matching the set-up wavelength.

- Check the offset value.
- Select CW and spectrum line width “NARROW” for the output light and then measure the wavelength again. If the output light is modulated or spectrum line width is set to “WIDE”, the wave meter can fail to measure its wavelength accurately.

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7.6 ASE MODULE (AQ8201-12/12A)

(1) It does not generate optical output.

- Make sure that the OPT switch is turned on.
- Make sure that the optical fiber is connected.
- Make sure that the optical output control key is turned on. When controller is AQ8202-01, you must input the correct password in authentication screen.
- Make sure that the remote interlock connector is not open state.

(2) Optical output level is lower than the specified level.

- Check the optical output port of module and end face of the connected optical fiber for stains or settled dusts. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that 0.0 dB is selected for the attenuation level.
- Make sure that the optical fiber is connected correctly.
- Check the optical fiber for disconnection or other troubles.

(3) Optical output level is unstable.

- Using a microscope, check the optical connector of module and end face of the connected optical fiber for damages or stains. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that an appropriate type of optical connector is connected.

(4) Turning on or off of optical output is unavailable.

- Make sure that the main-unit is released from the remote mode (GP-IB controlled state).

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7.7 ECL MODULE (AQ8201-13/13A/13B/13D)

(1) It does not generate optical output.

- Make sure that the OPT switch is turned on.
- Make sure that the optical fiber is connected.
- Make sure that the optical output control key is turned on. When controller is AQ8202-01, you must input the correct password in authentication screen.
- Make sure that the remote interlock connector is not open state.

(2) Optical output level is lower than the specified level.

- Check the optical output port of module and end face of the connected optical fiber for stains or settled dusts. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that the CW output is selected.
- Make sure that 0.00 dB is selected for the attenuation level.
- Make sure that the optical fiber is connected correctly.
- Check the optical fiber for disconnection or other troubles.

(3) Optical output level is unstable.

- Using a microscope, check the optical connector of module and end face of the connected optical fiber for damages or stains. (Before starting the checkup, you must turn the main-unit power off and make sure that light is not being output.)
- Make sure that an appropriate type of optical connector is connected.

(4) Turning on or off of optical output is unavailable.

- Make sure that the main-unit is released from the remote mode (GP-IB controlled state).

(5) Wavelength outputted is not matching the set-up wavelength.

- Check the offset value.
- Select CW and coherence control is turned OFF for the output light and then measure the wavelength again. If the output light is modulated or coherence control is turned on, the wave meter can fail to measure its wavelength accurately.
- Since this module has the wavelength proofreading function, please perform wavelength proofreading according to procedure. (CALIBRATION)

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7.8 OPM MODULE (AQ8201-21/22)

(1) Absolute value is incorrect.

- Check the calibration wavelength.
- Check the correction value.
- Check the optical modulation mode turned on the light source and this module.
- Check the connector adapter for proper connection.
- Clean end face of the connected optical fiber.

(2) Zero set is not available.

- Make sure that light to the optical sensor is appropriately blocked.
- Make sure that the main-unit is released from the remote mode (GP-IB controlled state).

(3) Switching of the optical modulation mode is not available.

- Make sure that the main-unit is released from the remote mode (GP-IB controlled state).

7.9 ATTN MODULE (AQ8201-32/32A/33/33M)

(1) Optical attenuation level is not matching the set-up level.

- Make sure that wavelength of input light is matching the attenuation wavelength.
- Clean end face of the connected optical fiber.

(2) Insertion loss is large.

- Clean the input/output plug and the connected fiber.
- Make sure that the fiber connected is FC/Angled PC.

(3) Return loss is large.

- Clean the input/output plug and the connected fiber.
- Make sure that the fiber connected is FC/Angled PC.

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7.10 OSW MODULE (AQ8201-412/422/414/418/43/44)

(1) Insertion loss is large.

- Clean the input/output plug and the connected fiber.
- Make sure that the fiber connected is FC/Angled PC.

(2) Return loss is large.

- Clean the input/output plug and the connected fiber.
- Make sure that the fiber connected is FC/Angled PC.

7.11 RLM MODULE (AQ8201-71)

(1) Measurements taken on the target are unstable.

- Check the module's optical connector and end face of the connected optical fiber for stains or settled dusts.
- Make sure that an appropriate type of optical fiber is connected.
- Check the optical fiber for disconnection or other troubles.

(2) Values obtained from the standard reflection measurement are unstable.

- When AQ4211 or equivalent is used as the LD light source and the fluctuation of the measured values is within ±0.02 dB, there is no problem with RLM module.
  Above unstableness are due to fluctuations in the light reflected by the equipment under test.
- If a fluctuation greater than ±0.02 dB results from the standard reflection measurement when AQ4211 or equivalent is used as the LD light source, you should suspect stains on the master cord connector port, optical input port or connector of the connected optical fiber. Clean the connectors on the optical fiber and master cord as well as the master cord connector port and optical input port with alcohol.
  If the trouble recurs, failure on RLM module can be suspected. In this case, contact the head office, nearby branch and sale office or ANDO ELECTRIC TECHNICAL SERVICE.

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7.12 Error Codes

(1) ERR?

Output format E□□□□

□□□□ represent the error code (shown in the table below) written to the output queue.

Table.7-1 Error Code Table for AQ8203/AQ8204

Error code	Contents
E0003	MAIN TYPE ERR Data from an unintended module is received.
E0006	FAN ERR Fan failed. Turn power off immediately.
E0041	CH△△ NO MODULE Module is not mounted on the target channel.
E0043	FR△ NO FRAME The target frame is not connected.
E0050	GPIB SYNTAX ERR GP-IB: Command is written in illegal format.
E0051	GPIB EXECUTE ERR GP-IB: Command execution ended unsuccessfully.
E0052	GPIB QUERY ERR GP-IB: No data exist in output queue, or data is lost.
E0053	GPIB BUF OVER GP-IB: Receiving buffer is filled up.
E0058	GPIB I-QUE OVER GP-IB: Input queue is filled up.
E0059	GPIB O-QUE OVER GP-IB: Output queue is filled up.
E0060	GPIB LD-ROCK ERR GP-IB: LD emission is unavailable because LD is locked or key is turned off.
E0061	GPIB COM MOD ERR GP-IB: This command is invalid in the current operation mode.
E0101	CH△△ [01]COM ERR A wrong command is issued (an error commonly applicable to all modules).

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E0102	CH△△ [02]DAT ERR Data specified is outside the allowable input range (an error commonly applicable to all modules).
E0103	CH△△ [03]RAM ERR Data write to RAM ended unsuccessfully (an error commonly applicable to all modules).
E0104	CH△△ [04]SER ERR Attempt to turn on serial communication ended unsuccessfully (an error commonly applicable to all modules).
E0117	CH△△ [11]LIM ERR Optical output limiter is activated (an error applicable to all light source modules).
E0118	CH△△ [12]MT INIT ERR Motor failed to return to starting position (an error applicable to all light source modules).
E0119	CH△△ [15]COM MOD ERR This command is invalid in the current operation mode (an error peculiar to ECL module).
E0133	CH△△ [21]OPM ERR Operation is disabled (an error peculiar to OPM module).
E0135	CH△△ [23]ZER ERR Execution of ZERO SET ended unsuccessfully (an error peculiar to OPM module).
E0136	CH△△ [24]CHP ERR Frequency actually entered is not identical with the specified CHOP frequency (an error peculiar to AQ8201-21).
E0141	CH△△ [41]OSW ERR Operation is disabled (an error peculiar to OSW module).
E0142	CH△△ [42]INIT ERR Motor failed to return to starting position (an error peculiar OSW module).
E0149	CH△△ [31]ATT ERR Operation is disabled (an error peculiar to ATTN module).
E0213	CH△△ [71]RLM ERR Operation is disabled (an error peculiar to RLM module).
E0216	CH△△ [74]MOD ERR Entered frequency is not 270 Hz (an error peculiar to RLM module).
E0217	CH△△ [75]REF ERR Execution of REF SET ended unsuccessfully (an error peculiar to RLM module).

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Table.7-2 Error Code Table for AQ8202-01

Error code	Contents
E0003	MODULE TYPE MISS MATCH ERROR Data from an unintended module is received.
E0006	FAN ALARM Fan failed. Turn power off immediately.
E0007	BACK UP BATTERY ALARM Battery for the backup is depletion or abnormal condition.
E0041	CH△△ NO MODULE Module is not mounted on the target channel.
E0042	PASSWORD MISS MATCH Password is incorrect.
E0043	FR△ NO FRAME The target frame is not connected.
E0050	GP-IB COMMAND SYNTAX ERROR GP-IB: Command is written in illegal format.
E0051	GP-IB COMMAND EXECUTE ERROR GP-IB: Command execution ended unsuccessfully.
E0052	GP-IB QUERY ERROR GP-IB: No data exist in output queue, or data is lost.
E0053	GP-IB BUFFER OVERFLOW GP-IB: Receiving buffer is filled up.
E0060	GP-IB LD LOCK ERROR GP-IB: LD emission is unavailable because LD is locked or key is turned off.
E0101	CH△△ [01]UNIT SEND COMMAND ERROR A wrong command is issued (an error commonly applicable to all modules).
E0102	CH△△ [02]UNIT DATA OVER ERROR Data specified is outside the allowable input range (an error commonly applicable to all modules).
E0103	CH△△ [03]UNIT RAM WRITE ERROR Data write to RAM ended unsuccessfully (an error commonly applicable to all modules).
E0104	CH△△ [04]UNIT SERIAL-BUS COMMUNICATION ERROR Attempt to turn on serial communication ended unsuccessfully (an error commonly applicable to all modules).

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E0117	CH△△ [11]UNIT LIGHT OUTPUT LIMIT OPERATION Optical output limiter is activated (an error applicable to all light source modules).
E0118	CH△△ [12]MT ORG ERROR Motor failed to return to starting position (an error applicable to all light source modules).
E0119	CH△△ [15]ECL CALIBRATION MODE ERROR This command is invalid in the current operation mode (an error peculiar to ECL module).
E0133	CH△△ [21]OPM ERROR Operation is disabled (an error peculiar to OPM module).
E0135	CH△△ [23]OPM ZERO SET ERROR Execution of ZERO SET ended unsuccessfully (an error peculiar to OPM module).
E0136	CH△△ [24]MODULATION CHOP ERROR Frequency actually entered is not identical with the specified CHOP frequency (an error peculiar to AQ8201-21).
E0149	CH△△ [31]ATTN ERROR Operation is disabled (an error peculiar to ATTN module).
E0150	CH△△ [32]ATTN ORG ERROR Motor failed to return to starting position (an error a peculiar to ATTN module).
E0165	CH△△ [41]OSW ERROR Operation is disabled (an error peculiar to OSW module).
E0166	CH△△ [42]OSW ORG ERROR Motor failed to return to starting position (an error peculiar to OSW module).
E0213	CH△△ [71]RLM ERROR Operation is disabled (an error peculiar to RLM module).
E0216	CH△△ [74]RLM MODE ERROR Entered frequency is not 270 Hz (an error peculiar to RLM module).
E0217	CH△△ [75]RLM RREF ERROR Execution of REF SET ended unsuccessfully (an error peculiar to RLM module).

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Chapter 8 Maintenance

This chapter describes the Main-unit and various modules maintenance and servicing procedures.

8.1 EXPANDER FRAME (AQ8202)

AQ8202 is the frame used to control AQ8201 series optical measurement module via controllers such as AQ8202-01. Thus, it does not require separate maintenance. For maintenance of modules, refer to page 8-2 and after. Each module requires different maintenance procedure.

8.2 SYSTEM CONTROLLER (AQ8202-01)

AQ8202-01 is a controller prepared for AQ8201 series optical measurement module. Thus, it also does not require separate maintenance. For maintenance of modules, refer to page 8-2 and after. Each module requires different maintenance procedure.

8.3 HALFSIZE FRAME (AQ8203)

AQ8203 is a controller prepared for AQ8201 series optical measurement module. Thus, it also does not require separate maintenance. For maintenance of modules, refer to page 8-2 and after. Each module requires different maintenance procedure.

8.4 FRAME CONTROLLER (AQ8204)

AQ8204 is a controller prepared for AQ8201 series optical measurement module. Thus, it also does not require separate maintenance. For maintenance of modules, refer to page 8-2 and after. Each module requires different maintenance procedure.

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8.5 WDM DFB-LD MODULE (AQ8201-110)

8.5.1 Tester Units Required

Table.8-1 shows the tester units required for the maintenance.

Table.8-1 Tester Units Required for LD MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter (AQ2140+AQ2735)	Power measurement range: –80 to +27 dBm Wavelength range: 700 to 1700 nm
Optical spectrum analyzer or wave meter (AQ6315/AQ6317)	Wavelength range: 0.35 to 1.75 µm Resolution: 0.05 nm
Optical fiber cord	Single mode optical fiber cord (short) FC/Angled PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.5.2 Periodic Inspection

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly. Following shows the checkpoints.

(1) Center Wavelength and Stability

Select CW for the module optical modulation mode and then measure the center wavelength and spectral bandwidth using an optical spectrum analyzer or wave meter.

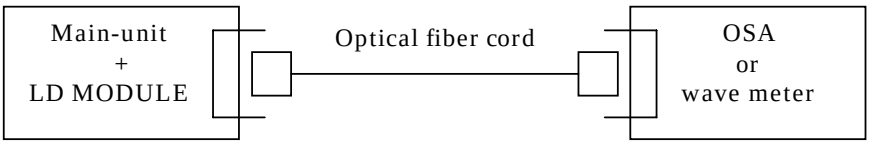


Figure.8-1 Center Wavelength and Stability Measuring System

(2) Optical Output Level and Stability

Select CW for output waveform of each module, connect them to the optical power meter (OPM) via a short fiber (2 m) and then measure the optical output level.

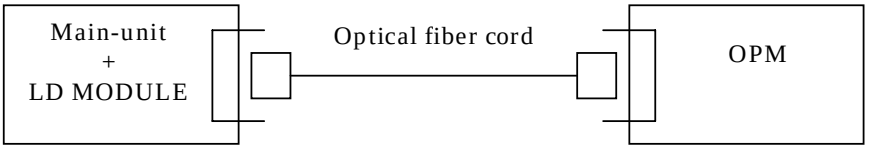


Figure.8-2 Optical Output Level and Stability Measuring System

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8.5.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.6 ASE MODULE (AQ8201-12/12A)

8.6.1 Tester Units Required

Table.8-2 shows the tester units required for the maintenance.

Table.8-2 Tester Units Required for ASE MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter (AQ2140+AQ2735)	Power measurement range: –80 to +27 dBm Wavelength range: 700 to 1700 nm
Optical spectrum analyzer or wave meter (AQ6315/AQ6317)	Wavelength range: 0.35 to 1.75 µm Resolution: 0.05 nm
Optical fiber cord	Single mode optical fiber cord (short) FC/PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.6.2 Periodic Inspection

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly. Following shows the checkpoints.

(1) Center Wavelength and Stability

Select CW for the module optical modulation mode and then measure the center wavelength and spectral bandwidth using an optical spectrum analyzer or wave meter.

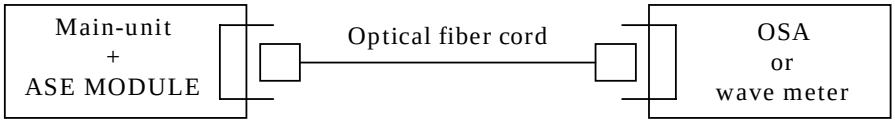


Figure.8-3 Center Wavelength and Stability Measuring System

(2) Optical Output Level and Stability

Select CW for output waveform of each module, connect them to the optical power meter (OPM) via a short fiber (2 m) and then measure the optical output level.

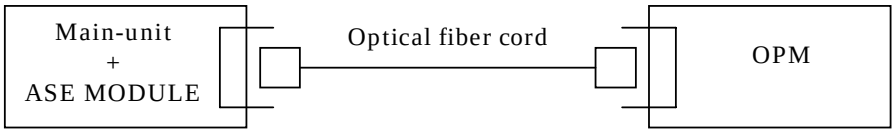


Figure.8-4 Optical Output Level and Stability Measuring System

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8.6.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.7 ECL MODULE (AQ8201-13/13A/13B/13D)

8.7.1 Tester Units Required

Table.8-3 shows the tester units required for the maintenance.

Table.8-3 Tester Units Required for ECL MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter (AQ2140+AQ2735)	Power measurement range: –80 to +27 dBm Wavelength range: 700 to 1700 nm
Optical spectrum analyzer or wave meter (AQ6315/AQ6317)	Wavelength range: 0.35 to 1.75 µm Resolution: 0.05 nm
Optical fiber cord	Single mode optical fiber cord (short) Polarization maintaining fiber cord(short) FC/Angled PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.7.2 Periodic Inspection

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly. Following shows the checkpoints.

(1) Center Wavelength and Stability

Select CW for the module optical modulation mode and then measure the center wavelength and spectral bandwidth using an optical spectrum analyzer or wave meter.

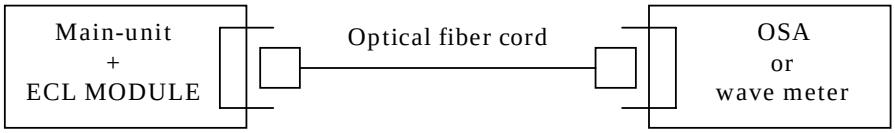


Figure.8-5 Center Wavelength and Stability Measuring System

(2) Optical Output Level and Stability

Select CW for output waveform of each module, connect them to the optical power meter (OPM) via a short fiber (2 m) and then measure the optical output level.

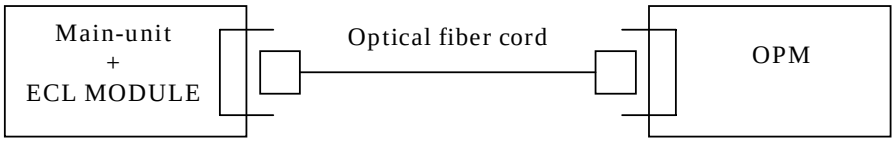


Figure.8-6 Optical Output Level and Stability Measuring System

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8.7.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.8 OPM MODULE (AQ8201-21/22)

8.8.1 Tester Units Required

Table.8-4 shows tester units required for the maintenance.

Table.8-4 Tester Units Required for OPM MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter	Power measurement range: –90 to +13 dBm Wavelength range: 700 to 1700 nm Measuring certainty / resolution: within ±2% / 0.01 dB
Variable optical attenuator (AQ3150)	Attenuation level: 0 to ∞ dB
Light source (AQ2140+AQ4213)	Emission wavelength: 1310 nm ± 20 nm (-21) : 1550 nm ± 20 nm (-22) Output level: –3 dBm or more
Optical fiber cord	Single mode optical fiber cord (short) FC/PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.8.2 Periodic Inspection

Periodic inspection is an effective means for maintaining the normal system performance over a long period as well as for detecting the system failure at an earlier stage.
Its frequency or interval should be decided taking into account how the system equipment is maintained and how frequently it is used.

Periodic inspection comprises mechanical inspections, performance test, adjustments and calibrations.

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly.

(1) Mechanical Inspection

Mechanical inspection checks appearance and mechanical operations of the module externally. Appearance of the module is visually checked for damages or deformations. Also, assembled parts are checked for looseness, and switches and stoppers are checked smooth action.

(2) Basic Performance Test

Performance test compares the module performance against its specification. Performance test is conducted in the incoming inspection, periodic inspection and checkups after repair.

Following shows the procedure to be employed for testing the basic module performance.

① Connect this module to the frame and then turn power on. If any failure is present, the indicator on the frame will notify contents of the error. For meaning of the error message, refer to Chapter 5 of this instruction manual.

② Connect the module as shown in Figure.8-7, and then make sure that its display varies reflecting move of the variable optical attenuator.

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(3) Performance Test

① Connect this module and calibrated optical power meter, as shown in Figure.8-7, and then compare the measurements obtained from each of them.

② You can check performance of this module by varying power level and wavelength of incident light.

(4) Calibration

This module does not equip with knobs for calibration. If the absolute value is not correct at the reference wavelength, contact ANDO ELECTRIC for the calibration.

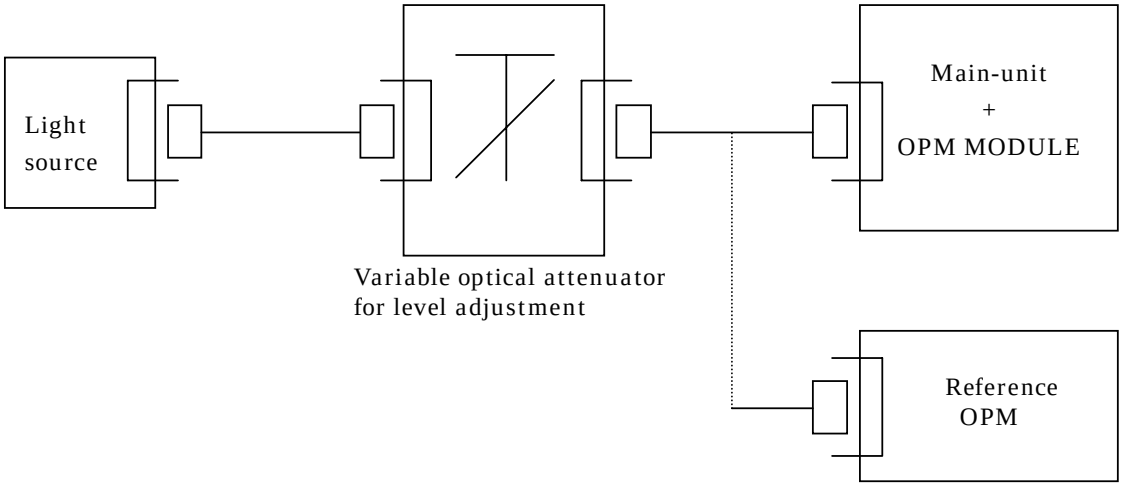


Figure.8-7 OPM Performance Test

8.8.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.9 ATTN MODULE (AQ8201-32/32A/33/33M)

8.9.1 Tester Units Required

Table.8-5 shows tester units required for the maintenance.

Table.8-5 Tester Units Required for ATTN MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter	Power measurement range: –110 to +10 dBm Wavelength range: 700 to 1700 nm Display resolution: 0.001 dB
Light source (AQ2140+AQ4213)	Emission wavelength: 1310 nm ± 20 nm : 1550 nm ± 20 nm Output level: –3 dBm ± 1 dBm Stability: within ±0.005 dB
Optical fiber cord	Single mode optical fiber cord (short) FC/Angled PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.9.2 Periodic Inspection

Periodic inspection is an effective means for maintaining the normal system performance over a long period as well as for detecting the system failure at an earlier stage.
Its frequency or interval should be decided taking into account how the system equipment is maintained and how frequently it is used.

Periodic inspection comprises mechanical inspections, performance test, adjustments and calibrations.

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly.

(1) Mechanical Inspection

Mechanical inspection checks appearance and mechanical operations of the module externally. Appearance of the module is visually checked for damages or deformations. Also, assembled parts are checked for looseness, and switches and stoppers are checked smooth action.

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(2) Insertion Loss

Figure.8-8 and Figure.8-9 show the insertion loss measuring systems.

① Select 0 dB for the module attenuation level and then open the shutter.

② Connect the module as shown in Figure.8-8 and then reference the optical power at A (0 dB).

③ Connect the module as shown in Figure.8-9 and then measure the optical output at B. The value obtained from this measurement indicates the insertion loss.

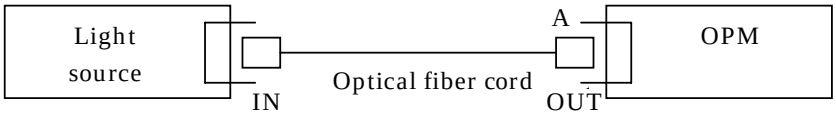


Figure.8-8 Insertion Loss Measuring System 1

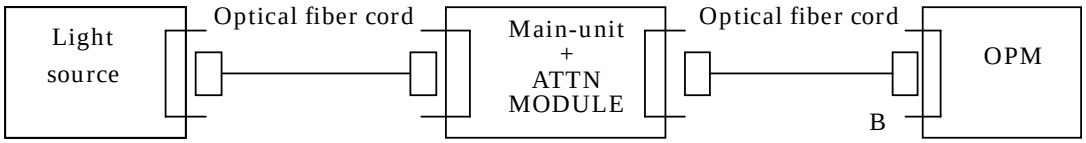


Figure.8-9 Insertion Loss Measuring System 2

8.9.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.10 OSW (AQ8201-412/422/414/418/43/44)

8.10.1 Tester Units Required

Table.8-6 shows tester units required for the maintenance.

Table.8-6 Tester Units Required for OSW

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Optical power meter (AQ2140 + AQ2733)	Power measurement range: –110 to +10 dBm Wavelength range: 700 to 1700 nm Display resolution: 0.001 dB
Light source (AQ2140+AQ4213)	Emission wavelength: 1550 nm ± 20nm Output level: –3 dBm ± 1 dBm Stability: within ±0.005 dB
Optical fiber cord	Single mode optical fiber cord (short) FC/Angled PC – FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.10.2 Periodic Inspection

Periodic inspection is an effective means for maintaining the normal system performance over a long period as well as for detecting the system failure at an earlier stage.
Its frequency or interval should be decided taking into account how the system equipment is maintained and how frequently it is used.

Periodic inspection comprises mechanical inspections, performance test, adjustments and calibrations.

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly.

(1) Mechanical Inspection

Mechanical inspection checks appearance and mechanical operations of the module externally. Appearance of the module is visually checked for damages or deformations. Also, assembled parts are checked for looseness, and switches and stoppers are checked smooth action.

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(2) Insertion Loss

Figure.8-10 and Figure.8-11 show the insertion loss measuring systems.

① Select 0 dB for the module attenuation level and then open the shutter.

② Connect the module as shown in Figure.8-10 and then reference the optical power at A (0 dB).

③ Connect the module as shown in Figure.8-11 and then measure the optical output at B. The value obtained from this measurement indicates the insertion loss.

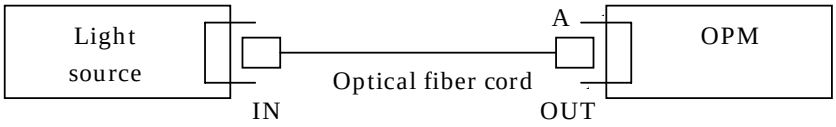


Figure.8-10 Insertion Loss Measuring System 1

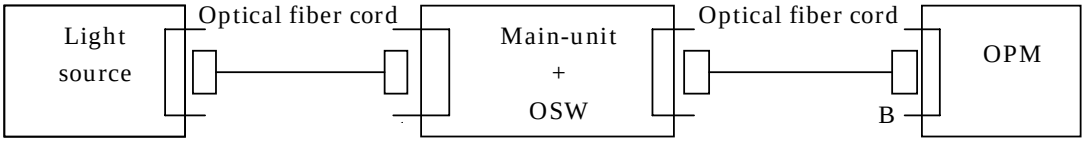


Figure.8-11 Insertion Loss Measuring System 2

8.10.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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8.11 RLM MODULE (AQ8201-71)

8.11.1 Tester Units Required

Table.8-7 shows tester units required for the maintenance.

Table.8-7 Tester Units Required for RLM MODULE

Equipment	Major performance
Main-unit (AQ8202-01 + AQ8202/ AQ8203/ AQ8204)	
Light source (AQ2140+AQ4213)	Emission wavelength: 1310 nm ± 20 nm Output level: -3 to ±1dBm Stability: within ±0.005 dB
Optical fiber cord	Single mode optical fiber cord (short) FC/PC – FC/PC
Matched termination	Return loss: 65 dB or more
Master cord	SC/Angled PC - FC/PC

Equipment in parentheses denotes applicable ANDO ELECTRIC products.

8.11.2 Periodic Inspection

Periodic inspection is an effective means for maintaining the normal system performance over a long period as well as for detecting the system failure at an earlier stage.
Its frequency or interval should be decided taking into account how the system equipment is maintained and how frequently it is used.

Periodic inspection comprises mechanical inspections, performance test, adjustments and calibrations.

Design of this module ensures high stability and reliability. It is, therefore, recommended to inspect the module once every half-yearly.

(1) Check of Dynamic Range

Connect the module as shown in Figure.8-12 and measure the reference reflection. Then, disconnect the cord and connect the reflection-less terminator instead. Make sure that 65 dB minimum is indicated.

(2) Check of Stability of Indicated Value

Connect the module as shown in Figure.8-12. With this arrangement, make sure that fluctuations in the displayed values do not exceed ±0.02 dB during five minutes of reference reflection measurement (optical output from the light source maintained in the range of 0 to 5 dBm).

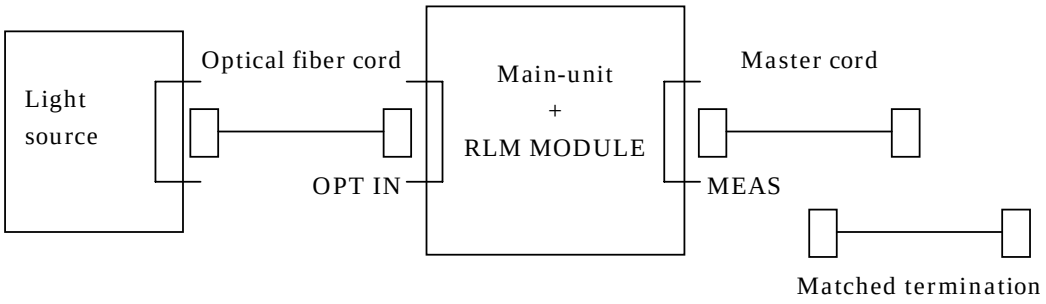


Figure.8-12 RLM Performance Test

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8.11.3 Cleaning

Dusts or dirt settled on the optical output connector of the module could degrade optical output level as well as its stability. You must clean an optical fiber before it is connected to the connector.

For cleaning of the module optical output port, CLETOP Stick Type (from NTT International) is recommended.

CAUTION

Don't try to touch inside the module.

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