Desktop Optical Fiber Amplifier
AMP-FL8612-OB
Operating Manual

2-1-15, Ohara, Fujimino, Saitama, 356-8502, Japan
Tel: +81-49-278-7829, Fax: +81-49-263-9328
E-mail: info@fiberlabs.co.jp
URL: https://www.fiberlabs.com

Table of Contents

1. Safety Precautions

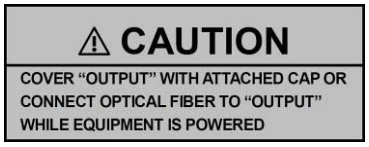
Read carefully about warnings and cautions in this manual and understand before using this instrument. Always follow those directions to use this instrument safely.

1.1. Symbols used in this manual

⚠ WARNING	Incorrect operation or failure to observe the warning may result in death or serious injury

⚠ CAUTION	Incorrect operation or failure to observe the caution may result in injury or damage to the instrument

1.2. Example of labels attached on our products

	Cover the output port with the attached cap or connect a fiber patch cable before turning on this instrument.
	Do not open the enclosure. There are an invisible laser radiation and dangerous voltages in this instrument.
	Be careful of a laser radiation.
	Our products are compliant to IEC 60825-1. Descriptions of the label depend on its laser class. The laser class, emission wavelength, and maximum output power of this instrument are described in the attached specifications.

2. Preparations before Use

2.1. Included items

The standard included items are described in the attached specification sheet. If any items are missed or damaged, please contact us immediately. It is recommended that the carton box and packaging materials should be kept with care to avoid damages in case of reuse for transfer to an another location.

2.2. Acceptance inspection

(1) Appearance & mechanical inspection

Before turn on this instrument, please check the appearance of the enclosure and movement of switches and make sure there are not any damages or troubles in transit.

(2) Performance & functional inspection

If there is no trouble in the appearance and mechanical movement, check functions and performance followed by instructions of the operating manual.

(3) Upon finding damage or troubles

If any damages or troubles are found in inspections, please contact us immediately with details of the trouble.

2.3. For your own safety

- This instrument emits an invisible IR light. Never stare into the output port regardless of its power on/off state. This could cause serious disorders to human bodies. Make sure that no light is emitted from the optical connector end face before the observation by a microscope or other methods.
- Thoroughly read this operation manual before using this instrument. Controlling or adjusting in procedures not specified in this manual may cause a dangerous exposure of a laser radiation.
- Do not insert or drop a foreign object such as a metallic piece into this instrument through the openings, otherwise this may cause an electric shock, fire or malfunction.
- Do not disassemble or alter this instrument. If the housing of the instrument is opened during operations, operators may be exposed to an dangerous laser radiation. And this may cause an electric shock, fire or malfunction

WARNING Do not turn on this instrument without covering the output port with the cap or connecting a fiber patch cable.

WARNING Never stare into the other end of the output patch cable directly, or view it with an optical instruments during operations.

CAUTION Do not connect or disconnect a fiber patch cable during operations. It may cause severe damages to this instrument and/or connected equipment.

2.4. For stable use

- Avoid using this instrument in a dusty location.
- Avoid using in a location that difficult to turn off this instruments.
- For connection with this instrument, use fiber patch cables without any scratches or dusts on the end face. Before connecting cables, clean the end face of them with alcohol. And it is recommended to check that there are no scratches or dusts adhering on the end faces by a microscope and so on.
- When this instrument is not in use, protect the optical ports from dust and dirt by putting the connector protection cap on. When the instrument is not used for a long period of time, it is recommended to disconnect a main power cable for safety reasons.
- The standard optical properties and the settings are listed in the attached inspection report. Please note that these values may vary for the operating environment and aging deteriorations.
- Please note that the warranty will expire in case of failures and malfunctions caused by inappropriate handlings not specified in this manual.

CAUTION Separate the back panel more than 5 cm from walls to avoid overheating.

3. Power Requirements

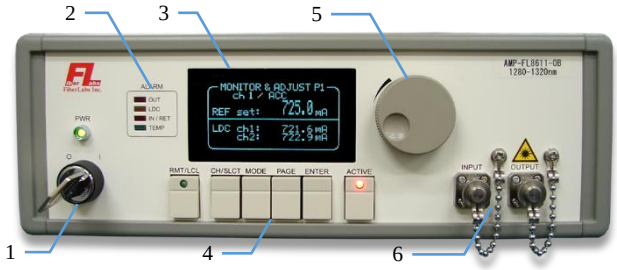
This instrument has a wide input voltage range to accommodate different voltage standards. Please refer to the input voltage / frequency range in the specification and make sure that the output of your power supply is within the range.

Use the three-pronged AC power cable that is provided with this instrument. This cable connects the instrument enclosure to an earth ground when connected to an appropriate AC outlet.

WARNING Failure to provide an earth ground can cause severe damages to persons. Only use a three-pronged AC power cable.

4. Panel Layouts

The front and rear panel of this instrument are shown below. Table 4-1 shows names and functions of each parts. * The size and layout may differ depending on the models.



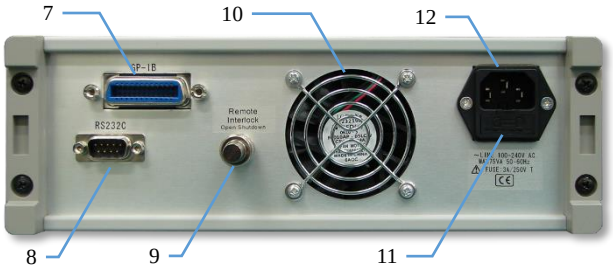


Table 4-1. Names and functions of the parts

No.	Name		Functions
(1)	Power Switch + LED		Switch the main power supply on (|) / off (○)
(2)	Alarm LEDs	OUT (red)	Light up with the output signal level alarm
		LDC (yellow)	Light up with the pump-LD drive current alarm.
		IN/RET(orange)	Light up with the input signal level / back-reflection alarm
		TEMP (green)	Light up with the case / pump-LD temperature alarm
(3)	Display		Indicate information of this instrument
(4)	Control Buttons	REMOTE / LOCAL	Switch and indicates the remote /local mode It can also be used as the hold function to prevent accidental operations.
		CH / SELECT	Shift pump-LD channel / Select an item
		MODE	Shift the display modes
		PAGE	Shift the display pages
		ENTER	Save the editing value
		ACTIVE (+LED)	Activate the pump-LD driving and indicate the status
(5)	Adjust Dial		Adjust & edit the selected value.
(6)	Optical Ports		Input / output ports
(7)	GPIB Port		Use for GPIB (IEEE488) control.
(8)	RS-232C Port		Use for RS232C control.
(9)	Remote Interlock		Shut down the optical output with an external signal
(10)	Fan		Cooling fan
(11)	Fuse Box		Fuse and a spare are stored
(12)	AC Power Inlet		AC power input

5. Operation Procedures

The following are basic operations for this instrument.

5.1. Startup procedures

(1) Make sure that the power switch is off before connecting a power cable.

(2) Connect fiber patch cables to the input / output port. Use the patch cables that meet the connector / fiber type of this instrument described in the attached specifications.

(3) Connect the other end of the patch cables to the other equipment to avoid light exposure.

(4) Input an appropriate optical signal.

(5) Connect a power cable.

(6) Turn the power switch on, and check that the power LED lights up. The system startup screen will appear in the display.

(7) Press the ACTIVE button to start the optical output. ACTIVE LED lights up when the pump-LDs drive starts. Wait about 1 minute until the temperature of the pump-LDs become stable.

⚠ WARNING	When the instrument is turned on in the state that the APR function is off, the ASE light is emitted from the output port regardless of whether an input signal provided or not. Exercise due care for your own safety.

⚠ WARNING	Some models have some light emission from the output port regardless of the setting of pump-LDs when the instrument is turned on. Exercise due care for your own safety

⚠ CAUTION	Never input the optical signal while the pump-LDs are driven. Otherwise unexpected optical surge might cause **SERIOS BREAKDOWNS** to inside / outside of the instrument.

5.2. Adjust optical output level

An adjustment the output level of the optical fiber amplifier is done by changing pump-LDs drive settings. The output adjustment and monitoring are possible from front control panel / remote control ports.

(1) Input the optical signal. If the instrument is the model with the input signal level monitor, it is possible to check the input signal level.

(2) Check the pump-LD drive mode settings. For details of ‘ACC’ / ’ALC’ / ’AGC’ (*only models with AGC function), please refer to **6. Pump-LD Drive Mode.**

(3) Set the pump-LD drive mode and output value (at ACC: pump-LD drive current / at ALC: output signal

level, etc.).

(4) Check the monitoring values.

(5) The pump-LD drive current and the output signal level has a safety limit. It is not possible to set it beyond these limit values. Please note that ALC/AGC might not work normally when the pump-LD drive current is near the limit value.

5.3. Stopping procedures

(1) Press the ACTIVE button to stop the optical output. Make sure that the ACTIVE LED is turned off.

(2) Turn the power switch off before disconnecting the fiber patch cables from the optical ports.

(3) Check the power LED turns off, and disconnect the power cable from AC inlets.

> ⚠ WARNING Make sure disconnect the power cable from AC inlets to turn off the instrument.

(4) Disconnect the fiber patch cable from the optical ports.

(5) Cover the optical ports with the cap. Make sure to cover the output port to avoid light exposure caused by turning on the instrument by mistake.

> ⚠ WARNING Do not disconnect the fiber patch cable or remove the cap from the output port before turning off the instrument.

6. Pump-LD Drive Mode

In this instruments, Users can select the pump-LD drive mode from ACC (Auto Current Control : constant pump-LD current), ALC (Auto Light Control : constant output level), and AGC (Auto Gain Control : constant amplification gain) (*only models with AGC function). The detail of each mode is shown below.

6.1. ACC (Auto Current Control : Constant pump-LD drive current mode)

At ACC mode, the pump-LD drive current is controlled to a constant level. It is relatively easy to adjust the output signal level. Therefore it is useful if users need to adjust frequently to optimize channel settings. On the other hand, the output signal level may fluctuate with the variation of the input signal level, wavelength, or the operating temperature.

6.2. ALC (Auto Light Control : Constant optical output level mode)

At ALC mode, the output signal level is controlled to a constant level. The output signal level does not fluctuate even if the input signal level, wavelength, and operating temperature vary. Therefore it is suitable for system operation.

6.3. AGC (Auto Gain Control : Constant amplification gain mode) *Only models with AGC function

At AGC mode, the amplification gain is controlled to a constant level. The amplification gain does not fluctuate even if the input signal level, wavelength, and operating temperature vary. Therefore it is suitable for system operation.

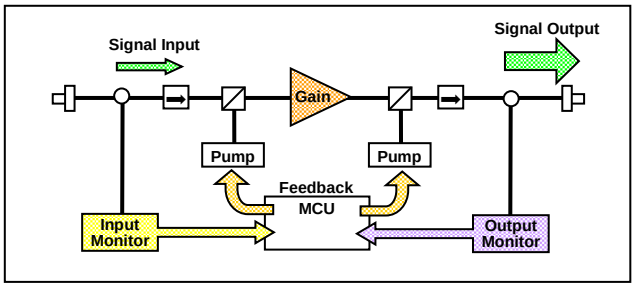


Fig.6-1. Image of Feedback Operation

7. Front Control Panel

7.1. Page transition

The display pages transition is shown below. Press the MODE button to move to the next mode, press the PAGE button to move to the next page.

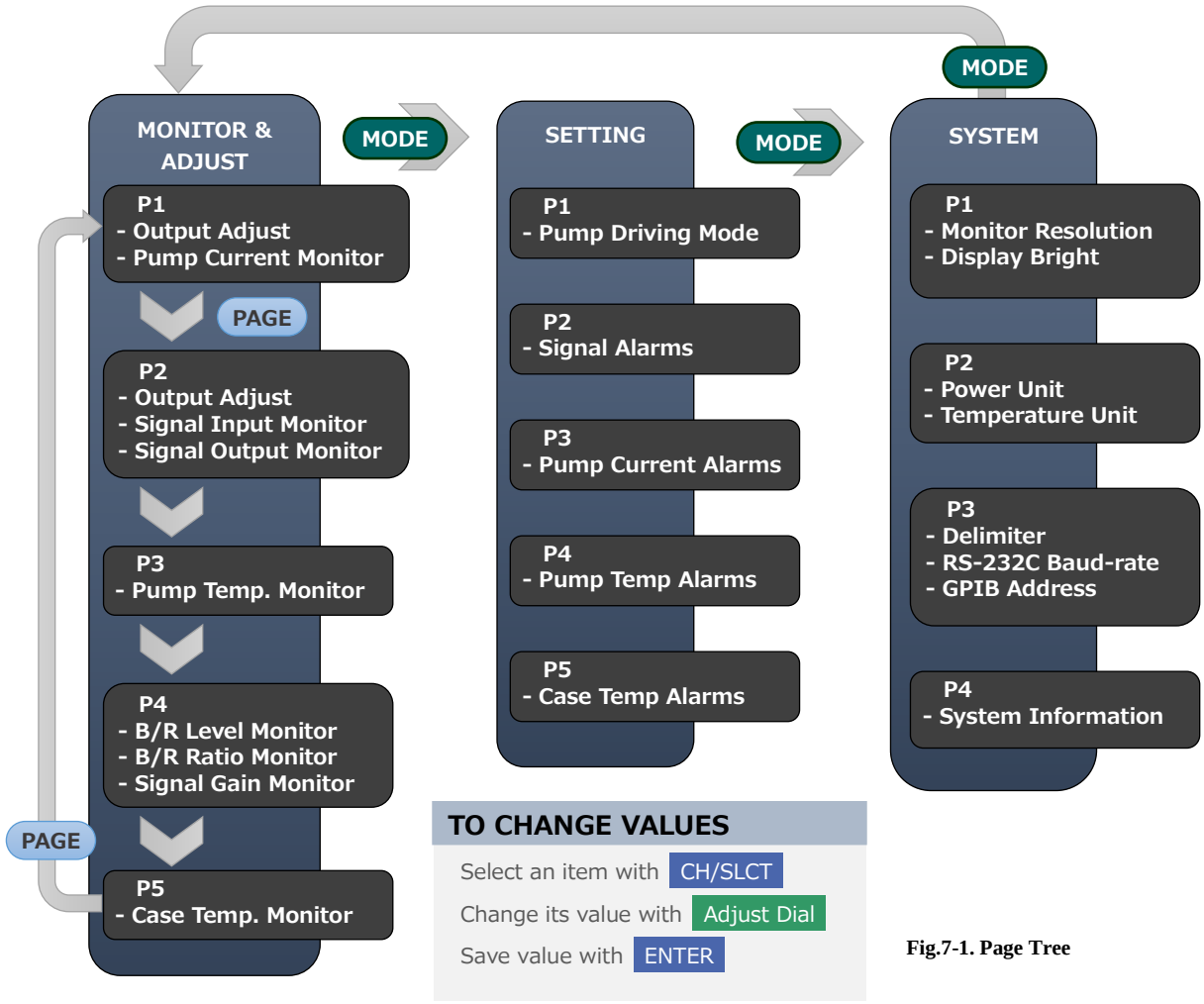


Fig.7-1. Page Tree

7.2. MONITOR & ADJUST mode

This mode is to adjust the output level and monitor parameters.

7.2.1. Page 1: Adjust output and pump-LDs current monitor

- (1) : Channel of pump device
- (2) : Current setting of pump driving mode
- REF set : Output target setting

  The setting of the pump-LD drive current (at ACC) / output signal level (at ALC) / gain (at AGC) is displayed.
- LDC ch x : Pump-LDs driving current monitors

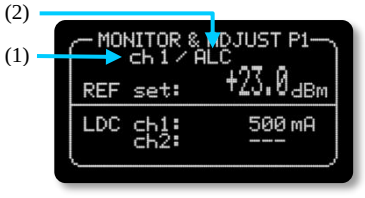


Fig.7-2 MONITOR & ADJUST P1

7.2.2. Page 2: Adjust output and signal monitor

- OUT #x : Signal output level monitors
- IN #x : Signal input level monitors

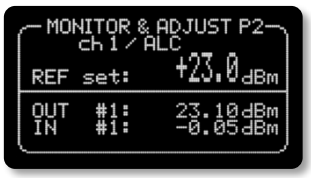


Fig.7-3 MONITOR & ADJUST P2

7.2.3. Page 3: Auxiliary monitor #1

- LDT ch x : Pump-LD temperature monitors

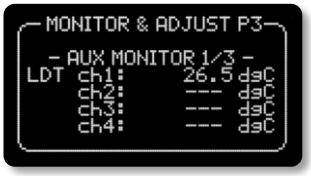


Fig.7-4 MONITOR & ADJUST P3

7.2.4. Page 4: Auxiliary monitor #2

- BR level : Monitor of back-reflection level from output port
- BR ratio : Back-reflection ratio monitor
  The value is calculated from output level and b/r level
- Sig Gain : Signal gain monitor
  The value is calculated from input and output level

Fig.7-5 MONITOR & ADJUST P4

7.2.5. Page 5: Auxiliary monitor #3

- CaseTmp : Case temperature monitor

Fig.7-6 MONITOR & ADJUST P5

7.3. SETTING mode

This mode is to set the driving mode and alarm settings.

7.3.1. Page1: Pump-LD driving mode setting

- Mode set : Select the driving mode

Fig.7-7 SETTING P1

7.3.2. Page2: Signal alarm setting

- Thrshld : Alarm threshold value
- Alm : Alarm detection valid / invalid

  When this item is set to OFF, the alarm is not raised even if the problem occurred.
- In : Input signal level alarm

  This alarm is raised when the input signal level drops to its threshold value or lower.

Fig.7-8 SETTING P2 (e.g.)

- Out : Output signal level alarm

  This alarm is raised when the output signal level drops to its threshold value or lower.
- BR : Back-reflection alarm

  This alarm is raised when the return-loss (output signal level – back-reflection level) at the output port drops to its threshold value or lower.

- Power Reduction : Auto-Power-Reduction with Input/BR alarm

  When this item is set to YES, Auto-Power-Reduction (APR) with input / br alarm is enable. Refer to **8.2. Auto-Power-Reduction with Input / BR Alarm** for more information. Note that the APR does not work if the input / br alarm detection is set to OFF.

7.3.3. Page3: Pump-LD current alarm setting

This alarm is raised when the pump-LD driving current rises to its threshold value or above.

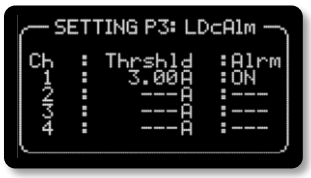


Fig.7-9 SETTING P3 (e.g.)

- CH : Pump-LD channel number
- Thrshld : Alarm threshold value
- Alm : Alarm detection valid / invalid

When this item is set to OFF, the alarm is not raised even if the problem occurred.

7.3.4. Page4: Pump-LD temperature alarm setting

This alarm is raised when the pump-LD temperature rises to its threshold value or above.

Fig.7-10 SETTING P4 (e.g.)

- CH : Pump-LD channel number
- Thrshld : Alarm threshold value
- Alm : Alarm detection valid / invalid

When this item is set to OFF, the alarm is not raised even if the problem occurred.

7.3.5. Page4: Miscellaneous alarm setting

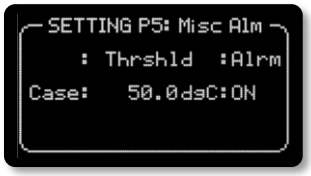


Fig.7-11 SETTING P5 (e.g.)

- Thrshld : Alarm threshold value
- Alm : Alarm detection valid / invalid
- Case : Case temperature alarm

  This alarm is raised when the case temperature rises to its threshold value or above.

7.4. SYSTEM mode

This mode is to set system-related parameters.

7.4.1. Display setting

The settings for the display are displayed.

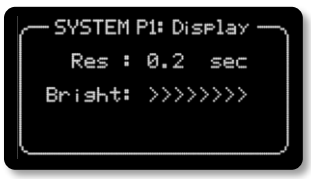


Fig.7-12 SYSTEM P1 (e.g.)

- Res : Monitor Renewal Interval
- Bright : Display brightness

7.4.2. Unit setting

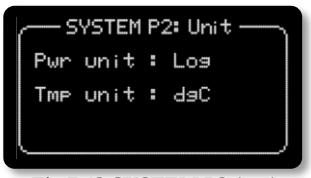


Fig.7-13 SYSTEM P2 (e.g.)

- Pwr unit : Optical level unit

  Select from 'Lin' (mW / uW / %) or 'Log' (dBm / dB).
- Tmp unit : Tempetrature Unit

  Select from deg.C or deg.F.

7.4.3. Remote interface setting

- Delimiter : Select delimiter from CR / LF / CR+LF.
- RS232C BR : Baud-rate for RS232C
- GPIB Add : Address for GPIB

Fig.7-14 SYSTEM P3 (e.g.)

7.4.4. System Information

This page shows the system information.

- H/W rev. : Hardware revision
- F/W rev. : Firmware revision
- Pump LD : Number of pump LDs
- Opt Path : Number of signal paths

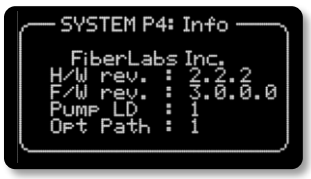


Fig.7-15 SYSTEM P3 (e.g.)

8. Alarm / Interlock Function

8.1. Alarm function

This instrument is equipped with the following alarm items. Each alarm is non-holding, it is reset automatically when the monitor values return to their normal level.

(1) OUT : Output signal level drop alarm

It is raised when the output signal level drops to its threshold value or lower, and OUT LED lights up.

(2) LDC : Pump-LD drive current excess alarm

It is raised when any of the pump-LD drive current rises to its threshold value or above and LDC LED lights up.

(3) IN/RET : Input signal level drop / Back-reflection excess alarm (*only models with each monitor)

It is raised when the input signal level / back-reflection (outout – reflection level) at the output port drops to its threshold value or lower, and IN/RET LED lights up. The back-reflection alarm works only when the output signal level and the return light level are above a certain level.

(4) TEMP : Case / Pump-LD temperature excess alarm

It is raised when the temperature inside the case or any of pump-LD temperature rise to its threshold value or above, and TEMP LED lights up.

8.2. Auto-Power-Reduction with Input / BR Alarm (* only models with each monitor functions)

The APR is a function halts the pump-LD / limits output power when the input signal level / back-reflection alarm are raised. This function is to protect users from accidental exposure to beam and protect this instrument and connected equipment from the trouble caused by drastic fluctuation of the signal level.

(1) How to validate the APR function

Set the setting of the APR and the input level / back-reflection alarm detection to on. The pump-LD output will halt when the input signal level alarm is raised. The output signal level is limited to laser class 1 or less when the back-reflection alarm is raised. ACTIVE LED will blink while the APR is working

(2) If you do not use the interlock function

Set the setting of the APR to off. The pump-LD output is held as it is even if the alarms are raised.

8.3. Emergency remote interlock

The optical output of this instrument can be stopped with an external signals through the interlock port on the rear panel. When the circuit between terminals is opened, the optical output will shut down. To restart, short the terminals and press ACTIVE button again.

8.4. Recovery operation from APR / remote interlock

The APR and remote interlock will not be released automatically even if the monitor values and external signal return to their normal level. Users have to press ACTIVE button or activate by remote command each time.

9. Optical Connections and Connector Cleaning

Please check the attached spec sheets and use the cables that match the optical connector / fiber type of this instrument. Do not use an index matching gel. In many cases, not only does not improve the coupling of connectors, it causes a degradation of the performance for contamination of connectors.

Before connecting fiber patch cables to the instrument, inspect the connector end faces of the cable and make sure that they are clean. Any dirt or imperfections on the ferrule must be removed. Connecting polluted cables might cause a degradation of the performance and internal troubles. The following are procedures for connecting a patch cable to the input/output port.

(1) Blow off loose dirt or dusts on the connector end face of cables with compressed air by using hand blower or the like.

(2) Gently wipe the connector end face by using a cotton swab soaked with an isopropyl alcohol or a ferrule cleaner, etc.

(3) Once again, blow off remaining dirt and alcohol with a compressed air.

(4) Inspect all connector end faces and make sure that they are clean. Repeat procedures again if there are still any contaminations. If you cannot remove contaminations, replace the cable.

(5) Connect to the optical ports of the instrument.

10. Maintenance & Service / Fuse Replacement

This chapter provides instructions and guidelines for replacing a fuse. The fuse replacement is only maintenance allowed for users. Do not open the case or disassemble this instrument. It may cause unexpected problems and injuries.

> ⚠ WARNING
>
> There are dangerous voltages and light-emitting devises in this instrument may cause injury. Do not open or disassemble the case of this instrument to avoid danger.

Fuses are in the fuse box located at the bottom of the AC inlet. Follow these instructions and guidelines for replacing fuses to prevent accidents.

(1) Turn off the instrument, and disconnect the main power cable.

(2) Insert a minus screwdriver at an angle into the hole at the top of the fuse box

(3) Pull out the fuse box from the AC inlet.

(4) Remove the blown fuse from the fuse box and replace with a spare one.

(5) Push the fuse box into the inlet until it clicks in place.

(6) Turn on the instrument, and make sure the power LED lights up.

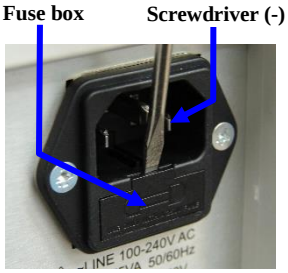


Fig. 10-1

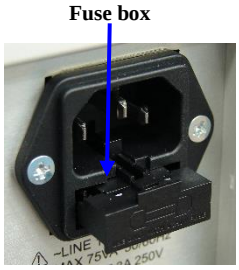


Fig. 10-2

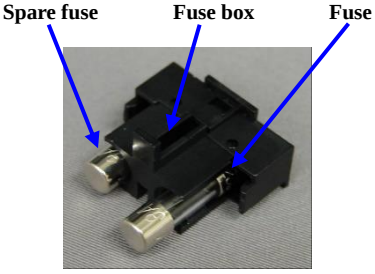


Fig. 10-3

> ⚠ CAUTION
>
> Use the specified type of fuse.
> Fuse Type : 250 V / 3A / T (φ 5.2 × 20 mm)

11. Troubleshooting

11.1. Things to do before troubleshooting

This chapter describes the items to be checked before troubleshooting when the instrument does not work as intended.

(1) The power LED does not light up.

- Check the power cable and the range of supplied voltage.
- Check the continuity of fuse.
- Check the emergency stop button if the instrument has it.

(2) The optical output level is low, or unstable.

- Check the APR function is not working.
- Check the remote interlock is not working.
- Check the installation of the fiber patch cables.
- Check that the type of connected patch cables is compatible with the connector / fiber of this instrument.
- Check all connector ferrules of connected patch cables and make sure that they are clean. If any contaminations are observed, ferrules of optical ports of the instrument may be contaminated. If the problem is not resolved by replacing the appropriate patch cables, please contact us.
- Check the connected patch cables does not have the increase of the insertion loss by the damage.
- Check the input signal level, wavelength, and stability.

11.2. Alarms in steady operation

Users can guess the cause of trouble from the alarm type and combination. The following are the causes of trouble guessed from each alarms.

(1) 'LDC' alarm is raised.

At ACC : It is shown that a setting value simply exceeds its threshold.

At ALC/AGC : Check the input signal level, wavelength, and stability and the condition of the input patch cable. If there are no problems in them, the amplification efficiency might drop caused by the degradation of the internal optical components. It does not affect the operation for now, but there is a possibility that the degradation progresses if ignored.

(2) 'OUT' alarm is raised.

Check the input signal level, wavelength, and stability and condition of the input patch cable. If there are no problems in them, the instrument might be unable to keep the output level because the above (1) state progresses further. It is necessary to investigate and repair by the manufacturer, please contact us.

(3) 'IN/RET' alarm is raised.

Check the input signal level, wavelength, and stability and the condition of the input/output patch cables.

(4) 'TEMP' alarm is raised.

Check the fan on the rear panel is operating properly and the air holes are not blocked. And the pump-LD temperature might not be controlled caused by the internal trouble. In this case, it is necessary to investigate

and repair by the manufacturer, please contact us.

11.3. Required Information for Service and Support

These reference information is useful for the efficient support service.

- Product number and serial number
- Details of problem
- Operational environment (input signal level, wavelength, signal standard, system uptime, etc.)
- Drive mode of Pump-LDs (ACC / ALC / AGC)
- Setting values of Pump-LDs (forward current (at ACC), output level (at ACC), gain (at AGC))
- Internal monitor values (input signal level, output signal level, pump-LD current, temperature, etc.)
- Threshold values and status (pass or fail) of each alarms
- Setting of APR function (ON or OFF)

11.4. System Messages

Users can get the system messages from its error queue by remote command ‘SYStem:ERRor?’. It is compatible with the standard SCPI system. Refer to the programing manual for details.

12. Warranty

This instrument is thoroughly inspected and tested mechanically and electrically throughout the manufacturing and before the shipment from the factory, and warranted to operate properly. Should any failure arise from defect in the manufacturing or any failure arise from accidents in transit, immediately contact us informing the details of the failure. In case we cannot deal with the trouble if the instrument is shipped back to us without a prior notice, contact us in advance in such cases as above.

The instrument is guaranteed for a period of one year from the date of delivery. Those defects that occur within a period of one year after the delivery shall be repaired at no charge. However, free of charge repairing service does not apply in the case of the defect resulting from improper operation use, or to the failure or damage caused by natural disasters even if within the above warranty period. Also, please carefully note that in case the instrument is altered or modified by customers including opening of the housing, the whole warranty shall be invalidated.

FiberLabs Inc.
2-1-15, Ohara, Fujimino, Saitama, 356-8502, Japan
Tel: +81-49-278-7829
Fax: +81-49-263-9328
E-mail: info@fiberlabs.co.jp
URL: https://www.fiberlabs.com

END