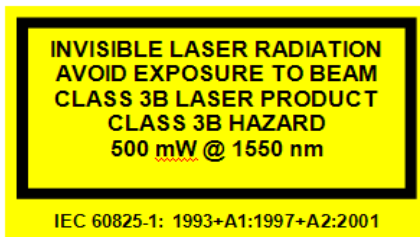


HOA 7000 Series Optical Amplifier Product Manual

**Part No: 700-0005044
Revision F March 2001**



HOA 7020 H Only



When you work with this equipment, take the following precautions:

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- Never look at an optical fiber using a direct magnification fiber scope without verifying that all lightwave sources on the fiber are turned off.
- Never look directly into an optical connector.
- Install protective covers or caps over connectors when they are not being used.
- Always assume that exposed optical connectors and cables are energized.
- Always make an optical power measurement of the fiber or connector before cleaning or before visual inspection, to ensure that the fiber is not energized.

Lorsque vous travaillez avec ce matériel, prenez les précautions suivantes:

- L'utilisation de commandes ou de réglages ou l'utilisation de procédures autres que celles décrites dans ce manuel d'utilisation peut générer une exposition à des radiations dangereuses.
- Ne jamais regarder une fibre optique directement avec un outil d'inspection de fibres sans vérifier que toutes les sources lumineuses dans la fibres sont éteintes.
- Ne jamais regarder directement à un connecteur de fibre optique.
- Installer les bouchons protecteurs sur les connecteurs qui ne sont pas utilisés.
- Toujours supposer qu'un connecteur exposé ou une fibre optique émettent de l'énergie lumineuse.
- Toujours mesurer la puissance optique d'une fibre optique ou d'un connecteur avant de le nettoyer une inspection visuelle pour s'assurer que la fibre n'émet pas d'énergie lumineuse.

Beim Arbeiten mit diesem Gerät, beachten Sie die folgenden Vorsichtsmaßnahmen:

- Die Verwendung von Reglern oder Einstellungen sowie die Durchführung von Verfahren die hier nicht beschrieben sind kann dazu führen das Sie gefährlicher Strahlung ausgesetzt werden.
- Blicken Sie nie mit einem Lichtwellenleiter Microscope in einen Lichtwellenleiter, ohne zu prüfen, dass alle Laserquellen auf dem Lichtwellenleiter deaktiviert sind.
- Blicken Sie nie direkt in einen optischen Anschluss.
- Installieren Sie Schutzabdeckungen oder Kappen über Lichtwellenleiteranschlüssen, wenn sie nicht verwendet werden.
- Gehen Sie immer davon aus, dass optische Anschlüsse und Kabel aktiv sind.
- Führen Sie immer eine optische Messung am Lichtwellenleiter oder Stecker durch bevor Sie einen optischen Anschluss reinigen oder inspizieren, um sicherzustellen, dass er nicht aktiv ist.

All Other HOA Covered By This Manual



Complies with 21 CFR 1040.10 and 1040 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Laser Warning (Class 1M)

**WARNING: CLASS 1M LASER PRODUCT; INVISIBLE LASER RADIATION;
DO NOT VIEW DIRECTLY WITH MAGNIFIER.**

Viewing the laser output with optical instruments (e.g. magnifier, microscopes) within a distance of 100mm may pose an eye hazard.

**ATTENTION: PRODUIT LASER CLASSE 1M; RADIATION LASER INVISIBLE;
NE PAS OBSERVER A LA LOUPE DIRECTEMENT.**


L'observation des effets laser a l'aide d'un appareil optique (comme loupe, microscope...) a une distance jusqu'a 100mm peut poser un danger a l'oeil.



**WARNUNG: KLASSE 1M LASER PRODUKT; UNSICHTBARE LASERSTRAHLUNG; NICHT
DIREKT MIT LUPE BETRACHTEN.**

Das betrachten des Laser Ausgangs mit optischen Instrumenten (z.B. Vergrößerungsglas, Mikroskop) innerhalb eines Abstandes von 100mm kann eine Augenverletzungs-Gefahr darstellen.

ATTENTION AVERTISSEMENT ACHTUNG

Pursuant to the pertinent sections of Title 21, (United States) Code of Federal Regulations (CFR), Chapter I, Subchapter J, and administered by the Center for Devices and Radiological Health (CDRH), operation under the Food and Drug Administration (FDA), this product, which produces or receives an optical signal, composed of Laser Radiation, complies with 21 CFR Chapter I, Subchapter J, as applicable to Class I Laser Products with a Class 3B Hazard.

	<p>Note</p> <p>This laser warning is included in all Harmonic manuals. The intended use of all Harmonic products, including those products that do not contain lasers, are in systems that contain lasers. Therefore this warning is important for the safety of all persons operating or maintaining the equipment.</p>
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INTENDED MEANING SIGIFICATION BEDEUTUNG	INTERNATIONAL SYMBOL SYMBOLE INTERNATIONALE INTERNATIONALES SYMBOL
<p>DANGER: Invisible Laser Radiation, when open or when operating with fiber disconnected. AVOID DIRECT EXPOSURE TO THE BEAM. Never operate unit with a broken fiber or with a fiber connector disconnected.</p> <p>DANGER: Les rayons laser sont invisibles à l'oeil. NE PAS S'EXPOSER DIRECTEMENT AU FAISCEAU. Ne jamais utiliser l'appareil lorsque la fibre est interrompue ou un connecteur endommagé ou déconnecté.</p> <p>VORSICHT: Unsichtbare Laserstrahlung, wenn Abdeckung geöffnet oder Glasfaserkabel entfernt. DIREKTEN KONTAKT MIT DEM STRAGL VERMEDIDEN. Das Gerät nicht einschalten, wenn das Glasfaserkabel beschädigt oder nicht angeschlossen ist.</p>	
<p>CAUTION: There are no user serviceable parts inside. Refer all servicing to qualified service personnel. Other than those specific measurements, adjustments and tests specified in the manual, make NO attempt to modify or alter any circuit or assembly in any manner.</p> <p>ATTENTION: Toute intervention sur cet équipement est formellement déconseillée par le fabricant. En dehors de réglages décrits dans le manuel, l'utilisateur doit contacter une personne qualifiée par le fabricant pour toute modification ou réparation.</p> <p>VORSICHT: Es sind keine zu wartenden Teile im Gerät, alle Wartungsarbeiten nur von qualifiziertem Personal ausführen lassen. Ex dürfen nur die im Handbuch spezifisch aufgeführten Messungen, Justierungen und Tests vom Benutzer vorgenommen werden. Unter keinen Umständen, dürfen Modifikationen oder Änderungen jeglicher Art am Gerät unternommen werden.</p>	

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Chapter 1

Overview

1.1 About this Manual

This instruction manual is a complete guide to installing and operating the single width HOA 7000 Optical Amplifier single width module. Please read the entire manual before beginning installation.

- Chapter 1 gives General Information about the HOA 7000 Series Optical Amplifiers.
- Chapter 2 describes the Installation of the HOA 7000 Series Optical Amplifiers.
- Chapter 3 follows through the Power up of the HOA 7000 Series.
- Chapter 4 describes the Setup of the HOA 7000 Series.
- Chapter 5 describes Maintenance.
- Appendix A gives Technical Specifications.
- Appendix B covers Assistance and Sales Offices.

1.2 Product Manual Applicability

This manual applies to all HOA7000 Series Optical Amplifiers with an optical output of +20dBm. Models currently included in this manual are the 7014E,7017E,7014I-GF,7017I-GF,7019IL-GF,7020I-GF,7017H-GF,7020H-GF. Appendix A, Table A-2, includes specific output power information for each of these models. Separate manuals are provided for the HOA 7000 series Optical Amplifiers with output power greater than +20 dBm.

1.3 Product Description

The HOA 7000 Series Optical Amplifiers are erbium-doped fiber amplifier (EDFA) modules. They include:

- The HOA 7000E series for high-performance supertrunking applications.
- The HOA 7000-GF series for DWDM applications.
- The capability of producing over 100 mW of optical power in the 1535 to 1565 nm range.
- Microprocessor controlled.
- Local control of operating parameters and display of the HLP 4200 Platform.

- Remote control and monitoring by means of the NETWatch Element Management System.

1.4 Product Application

The HOA7000 Series Optical Amplifiers are part of Harmonic's MAXLink and METROLink Product Lines. These product lines are designed to meet the economic and technical requirements of Broadband service providers. The HOA 7000 series optical amplifiers are plug-in modules intended for use in Harmonic's HLP4200 equipment platforms.

Typical applications include:

- Medium and long haul applications beyond the reach of 1310 nm transmitters.
- Fiber dense architectures.
- Redundant rings.
- Broadcast layer transmission.
- Hub interconnects.
- DWDM architectures.

The modular design of the MAXLink and METROLink product lines offer the user a number of advantages:

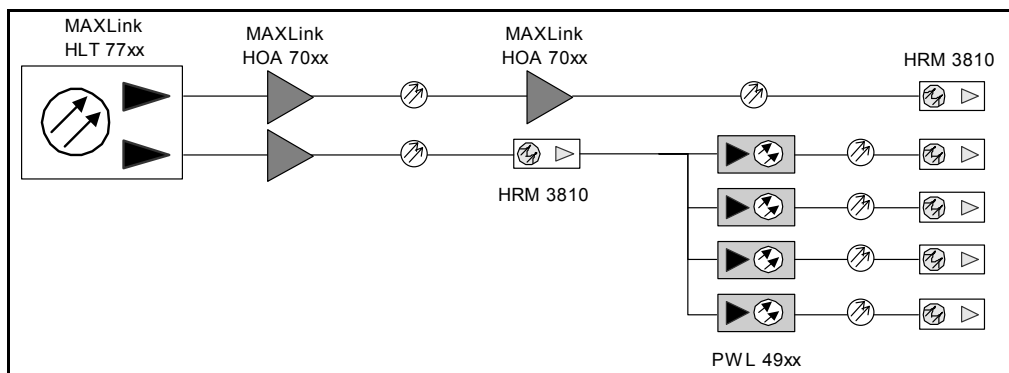
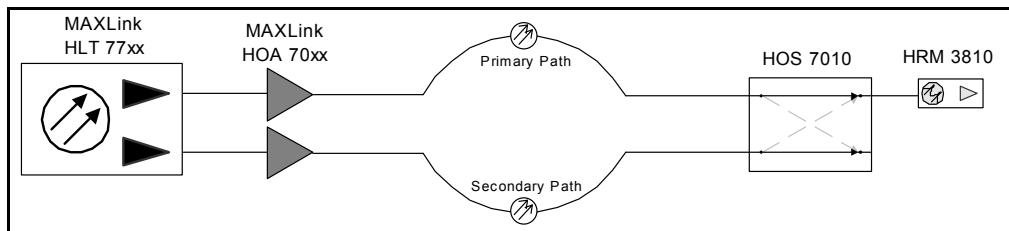
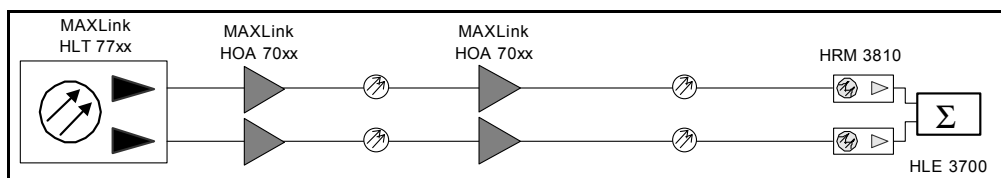
- The flexibility to add other plug-in modules as industry requirements change without the need to replace equipment shelves, power supplies or status monitoring equipment.
- The economic advantage of sparing plug-in modules rather than entire subsystems.
- The ability to decrease the life-cycle cost of the equipment by means of an increased numerical count of spare plug-in modules.
- Reduced service outages based on the ease of plug-in module replacements in contrast to “all in one” type systems.

Typical deployments of the Optical Transmitter are shown in Figure1- 1.

The HOA 7000-GF Optical Amplifier Signal Flow Diagram is shown in Figure1- 2.

The HOA 7000-E Optical Amplifier Signal Flow Diagram is shown in Figure1- 3.

The front and rear panel features of the HOA 7000 Optical Amplifier are shown in Figure1- 4 and Figure1- 5.

Point-to-Point Interconnect (Long Haul)

Redundant Ring

Repeater Solution with HLE 3000 Link Extender

Figure 1-1 Typical Deployment of the Optical Amplifier

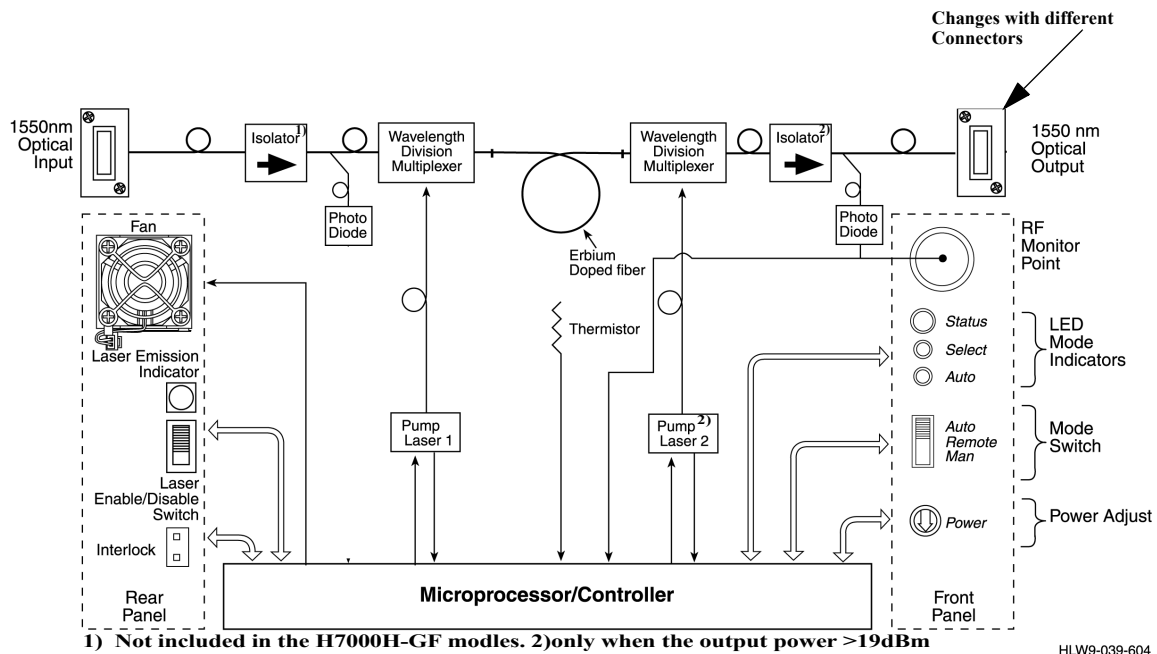


Figure 1-2 HOA 7000-GF Optical Amplifier Signal Flow Diagram

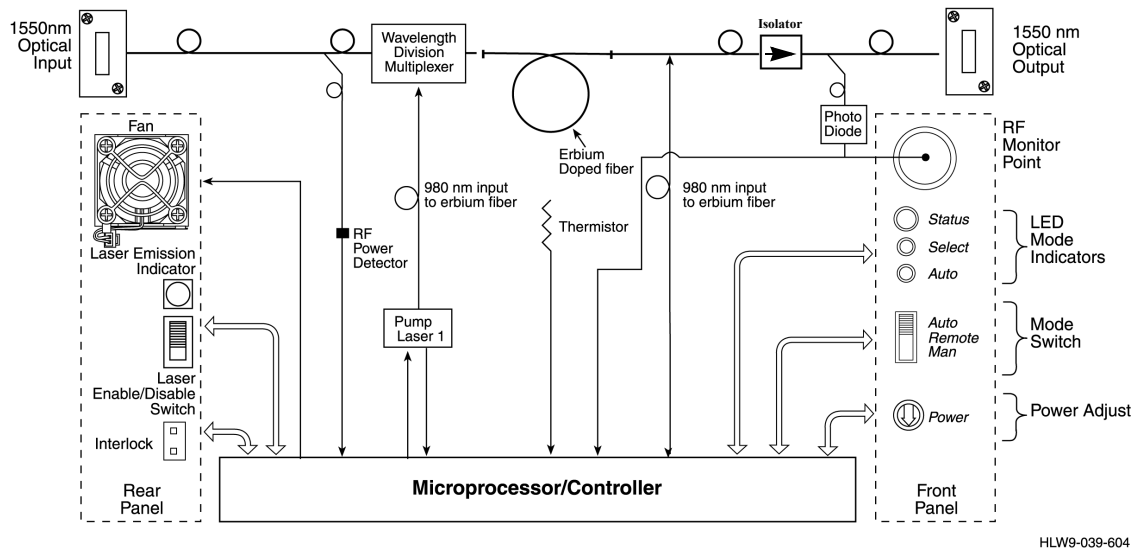


Figure 1-3 HOA 7000E Optical Amplifier Signal Flow Diagram

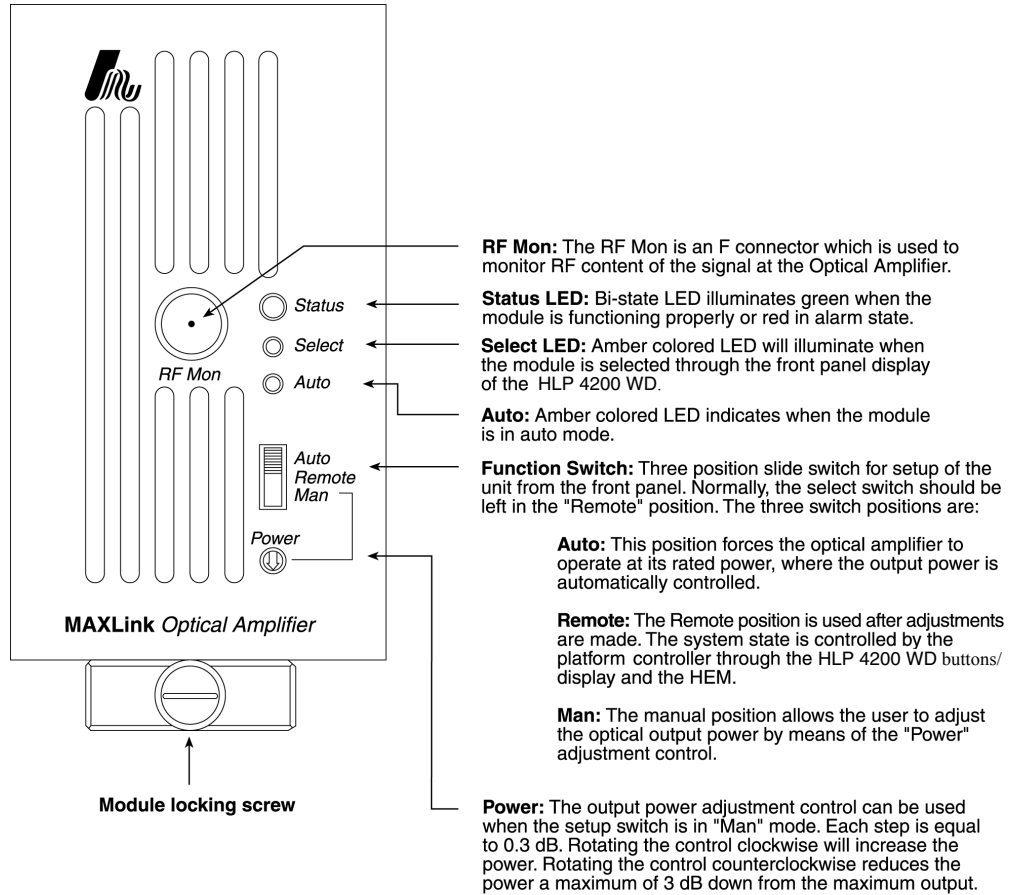
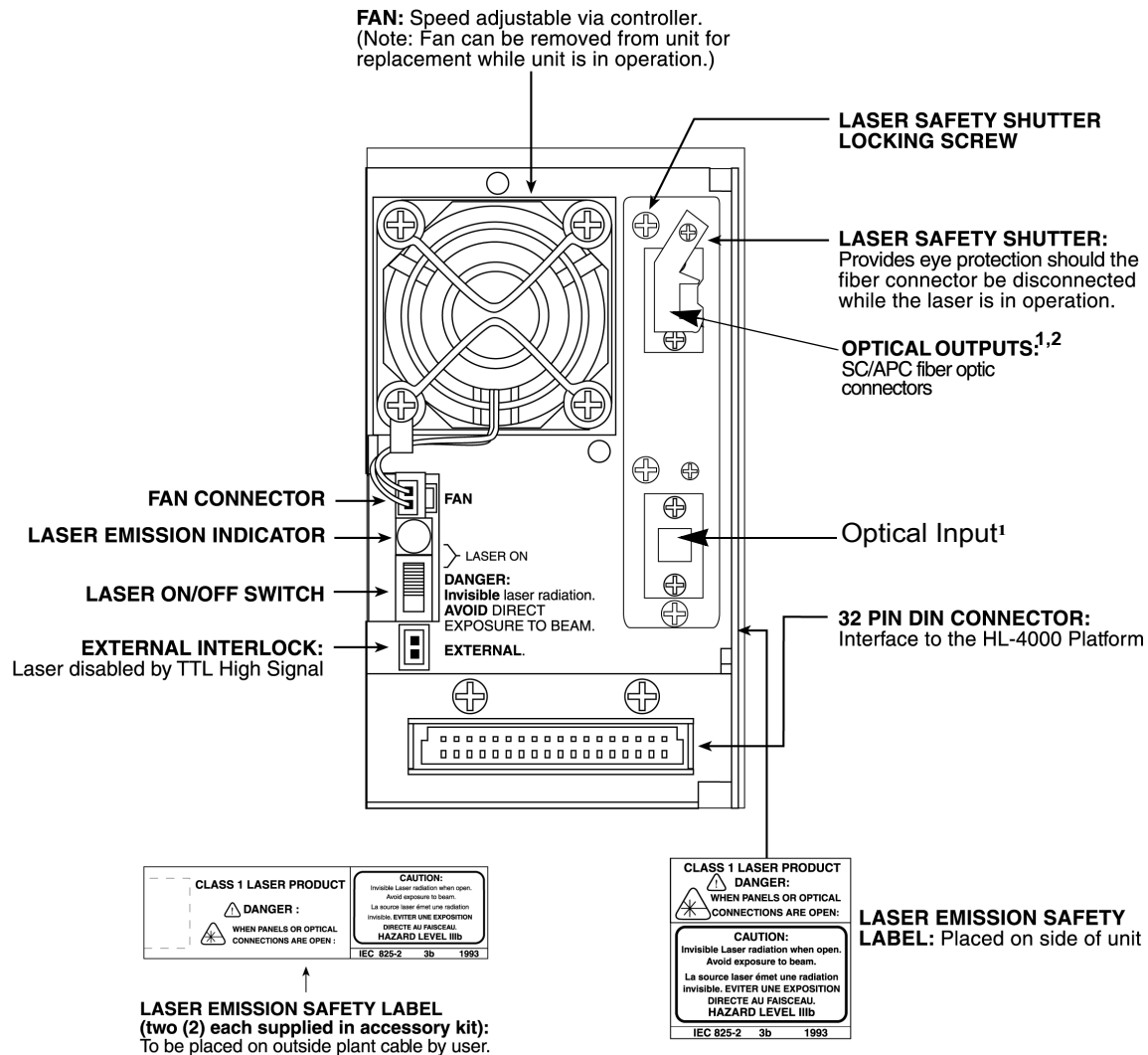


Figure 1-4 HOA 7000 Optical Amplifier Front Panel Features

Some models may have more than 1 output



1)Optical input and output shown here with SC/APC connectors
2)Some models may have more than one output

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Figure 1-5 HOA 7000 Optical Amplifier Rear Panel Features

Chapter 2

Installation of the HOA 7000 Series

This chapter describes how to:

- Receiving and Inspection.
- Installing the Unit in the HLP 4200 Platform.
- Connecting the fiber cable.

2.1 Receiving and Inspection

When unpacking the unit, inspect the shipping container and equipment for damage. Save the shipping material for future use.

If the container or the equipment is damaged, notify both the freight carrier and Harmonic Inc. To protect the operator from potential injury and to protect the equipment from future damage, do not perform any operational tests.



Warning

Do not perform any operation test if the equipment appears to be damaged.


The HOA 7000 series is provided with the following accessories:


1. Product Manual.
2. Male GSK to Female F-Adapter.
3. Fiber cleaning kit.
4. Extra safety labels supplied for user cable(s).

2.2 Installing the HOA 7000 Series into the HLP 4200 Platform

The HOA7000 Series Optical Amplifiers are designed for use in the HLP4200 Platform and can be inserted into any available HLP4200 slot. The HLP4200 Platform is available in two configurations, with a display (HLP4200 WD) or without the display (HLP4200 ND). If the unit is to be installed in a HLP4200 WD Platform, the display/control panel must be lowered prior to inserting the unit. If a HLP4200 ND Platform is being used, there is no display/control panel to be lowered. Once the unit is seated in the platform, lock the unit into position by tightening the knurled lock screw, as shown in Figure 1-4.


2.3 Connecting the Fiber Cable

Danger!	
	Invisible Laser Radiation when open or fiber disconnected. AVOID DIRECT EXPOSURE TO THE LASER BEAM. Direct viewing of the beam can cause serious eye damage and possible loss of vision.

Note!	
	Never operate unit with a broken fiber or with a fiber connector disconnected.

- Direct viewing of the beam may cause serious eye damage and possible vision loss.
- Never operate system with fiber disconnected, an aperture open or a broken fiber.
- Do not view fiber ends or apertures directly with optical instruments (such as a magnifying glass or an eye loupe).
- This Product is a Class I Laser with a Level 3B Hazard. The product is rated to 200 mW at 1550 nm \pm 15nm.

2.3.1 Cleaning Fiber Optic Connectors

Danger!	
	The fiber cable carries invisible laser radiation. AVOID EXPOSURE TO BEAM. Never operate a unit that has a broken fiber or a disconnected fiber connector.

Dirty optical connectors are the leading source of poor performance in a broadband optical fiber network. Dirty optical connectors lead to optical signal loss and reflections, that in turn can result in serious carrier-to-noise (CNR) performance degradation and in some cases distortion performance degradation.

Harmonic recommends that all mating fiber connections be cleaned before making a connection to an optical transmitter. If it is suspected that the optical connector of a HOA module may have been exposed to contamination then properly clean the HOA optical connectors before connecting optical fiber.

Caution!



Improper cleaning of an optical connector can do more harm than good. Never use a clean air product to spray air onto the surface of an optical connector. Spraying air onto an optical connector can cause condensation on the connector surface, leaving water spots and trapping dust.

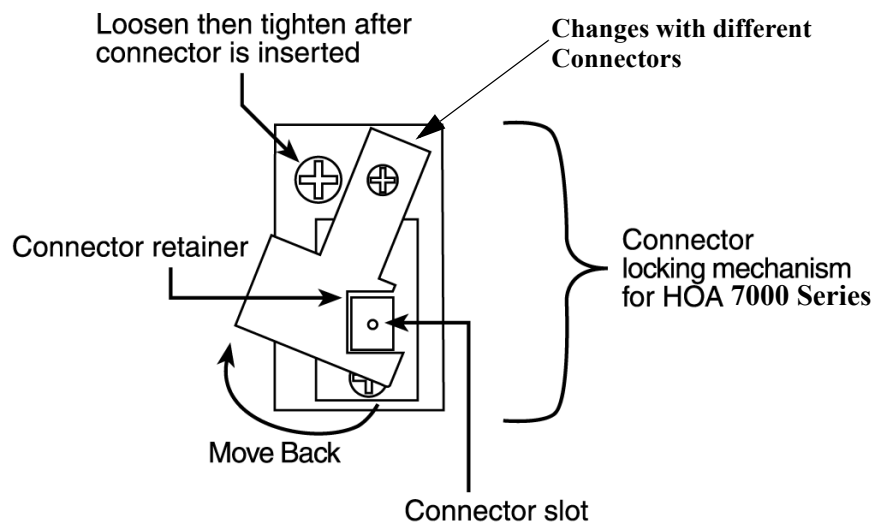
Caution!



Failing to wipe a connector with a dry lens paper immediately after wiping with paper wet with Isopropyl alcohol can also lead to condensation on the connector. Using low grade cleaning paper or other cloth to wipe an optical connector can leave microscopic fibers on the optical connector surface.

Each Optical Amplifier is supplied with an accessory kit that includes an SC/APC fiber jumper. For optical installation, follow the steps below:

1. Make sure the laser disable switch is in the off/down position. The laser emission indicator (Amber LED) is OFF.
2. Remove the plastic dust cover from the SC/APC connectors and store them in a clean plastic bag for future use. Remove protectors from connectors.
3. Loosen the lock screw and move the safety shutter. See Figure 2- 1.

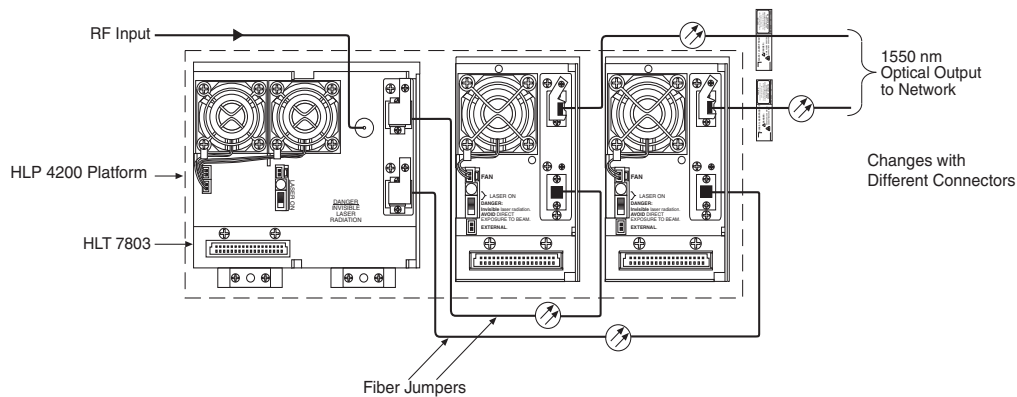


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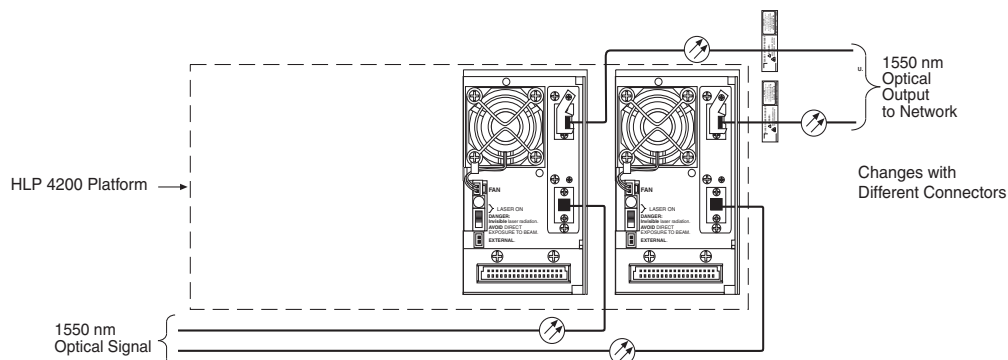
Figure 2-1 Safety Shutter

4. Carefully insert the plug into the optical connector at the rear panel of the Optical Amplifier. Push the plug until you hear a click.

5. Move the safety shutter back so that the shutter locks the connector in place. Tighten the lock screw.
6. Whenever a connector is opened, the plastic dust covers must be placed on both ends. See Figure 2- 1. Typical fiber connections are shown in Figure 2- 2.



(A) Two HOA 7000 Amplifiers used with HLT 7803 Transmitter



(B) HOA 7000 Amplifier used as repeater or inline amplifier in a 1550 nm network

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Figure 2-2 Typical Fiber Cable Connections HOA 7000 Series

2.4 NETWatch Site Controller

Harmonic's NETWatch Site Controller element management system can be used to monitor and control the HOA 7000 series optical amplifiers, either remotely or locally. For information on configuring and using this system consult the NETWatch Site Controller Instruction Manual.

Chapter 3

Power Up

This chapter covers:

- Power Up.
- HLP 4200 Platform Main Menu Display.

3.1 Power Up



DANGER!

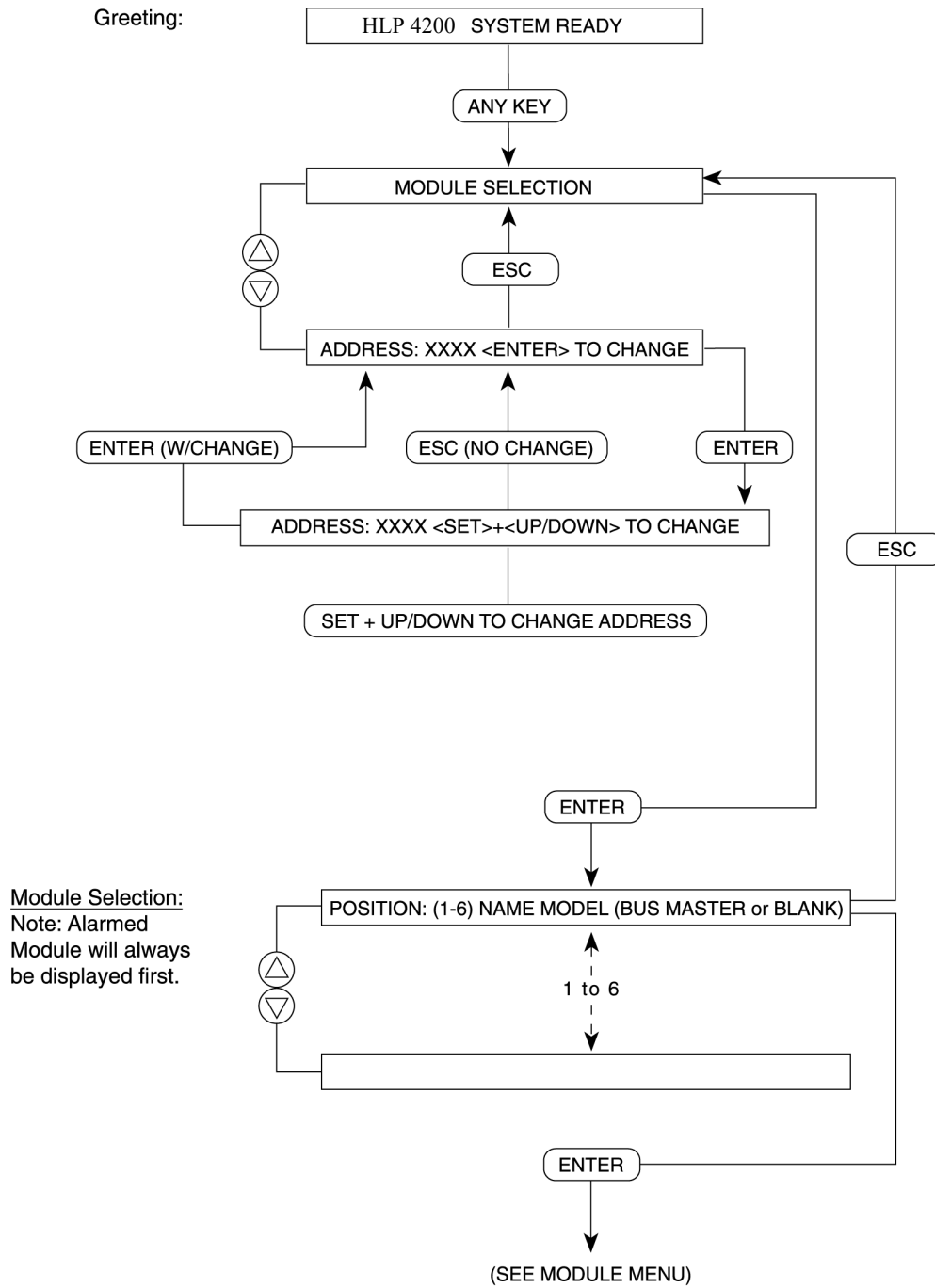
Avoid direct exposure to the Laser Beam. Direct viewing of the beam can cause serious eye damage and possible loss of vision. Invisible laser radiation present when fiber is open or fiber disconnected.

1. Depress the power button on the power supply. (Normally, this would be a CPS 4000 Series power supply in the HLP 4200 platform).
2. If the unit is operating normally, the status LED on the front panel should illuminate green.

If your system has an HLP 4200 ND option, all controls and parameters can be monitored and controlled locally or remotely. See the NETWatch Element Management System Manual.

If your system has an HLP 4200 WD option, the display will greet the operator with <HLP 4200 SYSTEM READY> message as shown in Figure 3- 1. The operator can then walk through the Optical Amplifier menus by following the steps described below:

1. Depressing any key on the front panel will show a module selection message on the front panel, which reads <MODULE SELECTION>.
2. Pressing <ENTER> when the above message is shown leads the operator to a menu displaying a list of connected modules by using <UP> and <DOWN> keys from the keyboard. The module messages show the module position as the first field in the message, the left most being the number 1. The select LED of the currently selected module is illuminated.
3. Once the Optical Amplifier under installation is the focus of the front panel display, pressing <ENTER> will lead the operator to the Optical Amplifier menus. See Figure 3- 1.
4. Refer to Figure 4-2 in Chapter 4, to see how to traverse the Optical Amplifier menus.



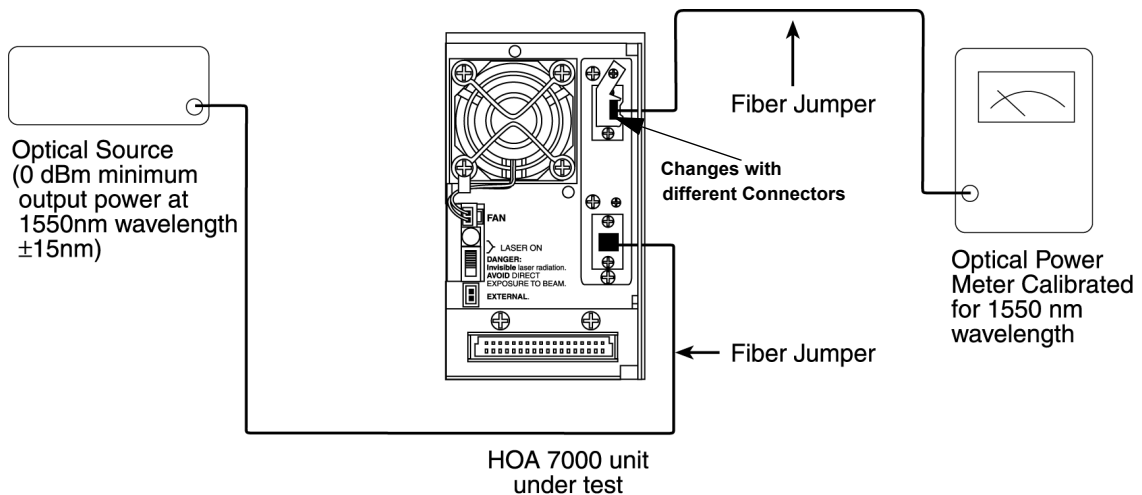
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Figure 3-1 HLP 4200 Platform Main Menu Display

To verify the Optical Amplifier is operating at maximum specified output. Perform an optical output power test as follows:

Required instruments/accessories –

1. Optical Source – (0 dBm output min @ 1550 nm \pm 15 nm).
2. Optical Power Meter – (200 mW input capability @ 1550 nm).
3. (2) Fiber jumpers with suitable connectors.
4. Make sure that the Optical Amplifier is turned off before making any measurements or connecting any cables.
5. Connect an optical source to the input of the Optical Amplifier by means of a fiber jumper. The optical source must be set for a minimum of -10 dB output at 1550 nm \pm 15 nm. Refer to Figure 3- 2.
6. Connect an optical power meter capable of measuring 200 mW/23 dBm power levels to the output of the Optical Amplifier using a fiber jumper. The power meter should be calibrated for 1550 nm operation. Refer to Figure 3- 2.



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Figure 3-2 Optical Power Measurement HOA 7000 Series

7. Make sure the slide switch on the front panel of the Optical Amplifier is in <Auto> mode. Turn the HLP 4200 on.
8. The optical power meter should indicate an output level of no less than 17 dBm for the HOA 7017, 14 dBm for the HOA 7014, 20 dBm for HOA 7020. See Table A-2 in Appendix A.

Chapter 4

Setting Up the HOA 7000 Series

The amplifier provides three options for User Interface. The availability of different options is dependent upon the type of system configuration the customer has acquired. This chapter covers:

- Setup of the Optical Amplifier with Front Panel Controls.
- Setup with HLP 4200 WD Display.
- The NETWatch Element Management System.

4.1 Setup with the HOA 7000 Front Panel Controls

The Interface on the front panel of the amplifier is limited to the capability of setting up the amplifier with a three position switch in conjunction with a power adjustment.

**Note!**

For initial setup of the amplifier, Harmonic recommends using the HLP 4200 WD platform's push buttons and display, if available. If you are using the HLP 4200 ND platform, NETWatch can be used for the amplifier setup.

4.1.1 Switch Setup

The three position slide switch for setup of the unit from the front panel. The three switch positions are: Auto, Remote and Manual.

- Auto mode – In auto mode, these units will operate at maximum rated output. The optical output level is detected and fed back to the level drive control. This provides an auto output leveling loop.
- Remote mode – When the slide switch is in this position, adjustments can be made to the module by means of the HLP 4200 WD or the NETWatch Element Management Software. The module normally would be left in the Remote mode.
- Manual mode – The manual position allows the user to adjust the optical output by means of the “Power” adjustment control. The output power adjustment control can be used when the setup switch is in “Man” mode. Each step is equal to 0.3 dB. Rotating the control clockwise will increase the power. Rotating the control counter clockwise reduces the power a maximum of 3 dB down from the maximum output.

Set the amplifier module front panel switch to the Manual position.

4.1.2 Switch Power Adjust

Adjust the output power control with its attenuation adjustment range of 3 dBm in 0.3dB increments from maximum output level as follows:

- Each step of rotation is equal to 0.3 db.
- Rotate the control clockwise to increase the power.
- Rotate the control counter clockwise to reduce the power.

The greatest reduction allowed is 3 dB less than maximum output.

Front Panel LEDs

The front panel also supports three LEDs.

- Status LED Green = No Alarm
 Red = Alarm
- Select LED Yellow = Module selected via the Front Panel
- Auto LED Yellow = Unit in Auto Mode

4.2 Setup with the HLP 4200 WD Display

The following subsections describe how to use the HLP 4200 WD Platform's push buttons and display to adjust the output power level of the HOA 7000 Optical Amplifier series or reset the amplifier to the factory default settings.

The HOA 7000 Optical Amplifier series are preset at the factory to provide maximum optical power in the 1535 to 1565 nm range. If a lower power setting is needed, follow the instructions in the Power Adjust Switch section. To reset the amplifier to factory defaults use the Factory Optimized Settings section.

4.2.1 Original Setup

To setup the amplifier, follow these steps:

1. Make sure the Setup slide switch on the front panel of the Optical Amplifier is set in the Remote position.
2. Press <Esc> until the HLP 4200WD platform display reads: MODULE SELECTION. Press <Enter>.
3. Press ▲ or ▼ until the display indicates the HOA 7000 series module to setup, then press <Enter>.
4. Press ▲ or ▼ until the display reads: ADJUSTMENTS. Press <Enter>.
5. Press ▲ or ▼ until the display reads: ADJUST OPTICAL. Press <Enter>.
6. Press ▲ or ▼ until the display reads: MANUAL. Press <Enter>. The current power setting is displayed.
7. Hold down the <Set> key, press ▲ or ▼ until the value wanted is displayed. Press <Enter>.

4.2.2 Resetting To Factory Optimized Settings

Harmonic's factory optimizes the performance of each HOA 7000 Series Optical Amplifier prior to shipment. The settings are written into its memory. If at any time the amplifier's settings are changed, the amplifier can always be reset to the original factory settings through the HLP 4200 WD display interface.

To return the HOA 7000 series optical amplifier to factory settings:

1. Press <Esc> until the HLP 4200 WD platform display reads MODULE SELECTION, then press <Enter>.
2. Press ▲ or ▼ until the display indicates the HOA module you wish to reset, then press <Enter>.
3. Press ▲ or ▼ until the display reads ADJUSTMENTS, then press <Enter>. The current power level setting is displayed.
4. Press ▲ or ▼ until the display reads <SET+UP> SWITCH TO FACTORY SETTINGS. Hold down the <Set> button and press ▲.
5. A message appears, asking to confirm the factory settings. Press <Enter>. A message appears, confirming that the factory settings have been restored.

4.3 NETWatch Element Management System

Harmonic provides a complete Element Management System. All controls and parameters can be monitored and controlled locally or remotely. See the NETWatch Element Management System manual.

Chapter 5

Maintenance

This chapter describes:

- Cleaning the Fiber Optic Connector.
- Fan Replacement.
- What to do in case of Problems.
- Warranty Summary.

5.1 Cleaning the Fiber Optic Connector

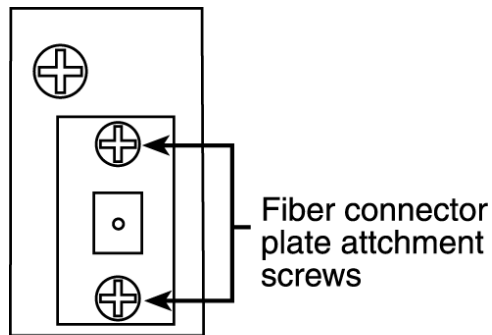


DANGER!

Invisible laser radiation when open or fiber disconnected. **Avoid direct exposure to the Laser Beam.** Direct viewing of the beam can cause serious eye damage and possible loss of vision.

- Never operate system with fiber disconnected, an aperture open or a broken fiber. Do not view fiber ends or apertures directly with optical instruments (such as a magnifying glass or an eye loupe).
- This Product is a Class I Laser with a Level 3B Hazard. The product is rated to 100 mW at 1550 nm. +/- 15nm.
- As a rule, you should clean the mating connector before you connect it to the optical amplifier. You should also clean the optical amplifier connector. The cleaning procedure of the optical amplifier is explained in the following steps.

1. Remove the optical connector plate (including the shutter) by unscrewing the two screws.



HLW9-128-602

Figure 5-1 Optical Connector Plate

2. Pull the plate away (2" max to prevent breakage of the fiber). Pull and release the optical connector from the adaptor.
3. Fold a piece of dry lens cleaning paper in half twice (for a 4-ply thickness).
4. Lay the connector on the lens cleaning paper with the tip touching the paper. Pull the connector across the paper to wipe the tip.
5. If necessary, use one drop of Isopropyl Alcohol to wet part of the paper. Drag the connector across the wet area to reduce residue on the connector surface. Then drag the connector tip across the dry area.
6. Assemble the connector back to the adaptor plate. Assemble the plate back to the transmitter back panel. The mating optical connector has to be cleaned as explained in steps 3 through 6.

WARNING!

Never use a clean air product to spray air into the optical adaptor or on the connector surface. The air causes dust to condense on top of the optics wave guide which is very difficult to remove. Never clean a connector when laser light is passed through it.

5.2 Fan Replacement

Should a fan failure occur, disconnect the power cable and remove the four (4) phillips head screws securing the fan to the module housing. Replace the failed fan unit with a new fan unit. Secure the new unit with the four (4) phillips head screws and reconnect the power cable.

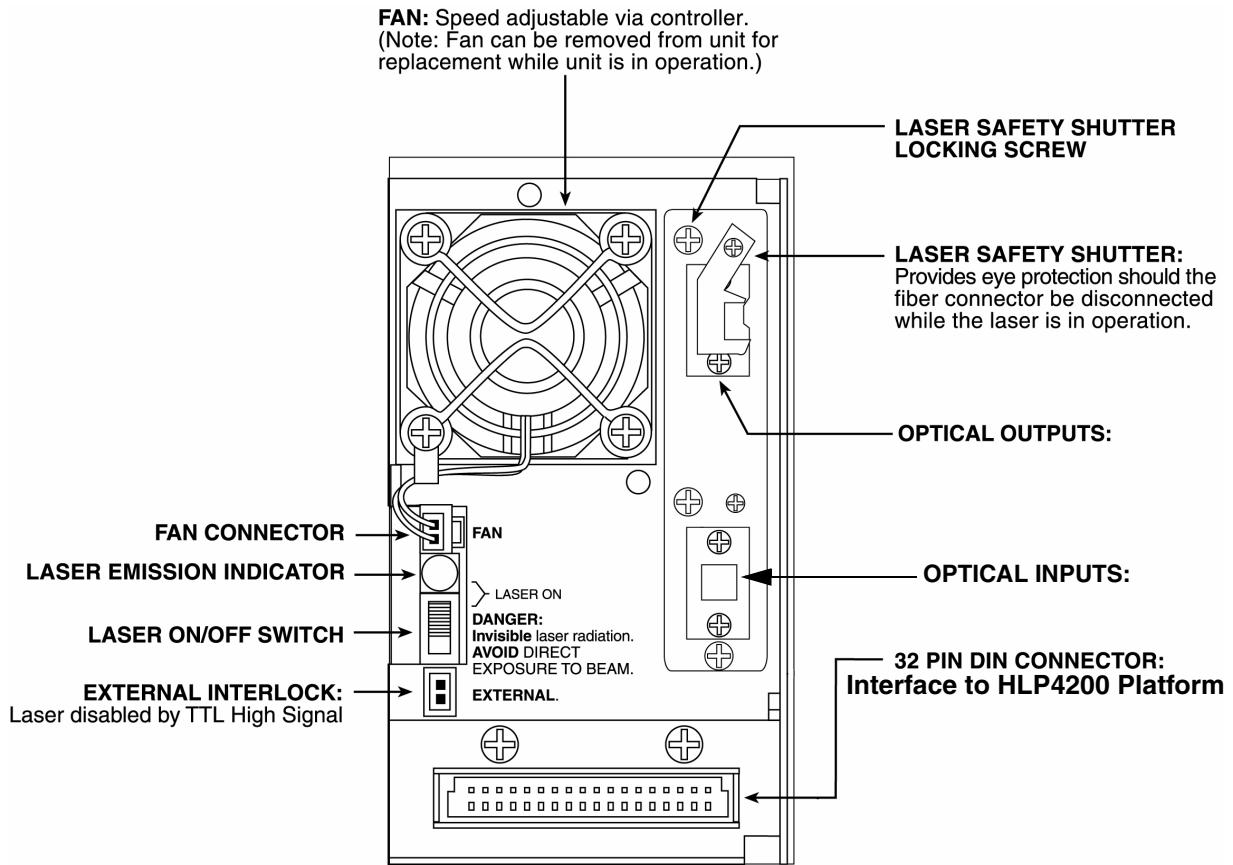


Figure 5-2 HOA 7000 Optical Amplifier Rear Panel Features

5.3 In Case of Problems

Should a problem occur, contact the Harmonic Customer Service Department at 800-730-4099. A service technician will assist you in determining whether or not a fault exists with the unit. A Return Material Authorization (RMA) Number will be issued for any faulty unit that needs to be returned. Note this number on the shipping container and all correspondence.

The return address is:

Harmonic Inc.
549 Baltic Way
Sunnyvale Ca. 95054
Attention Customer Service
RMA no. _____

5.4 Warranty Summary

This Harmonic Inc. hardware product is warranted against defects in material and workmanship for thirty-six (36) months from the date of shipment. Harmonic Inc. will, at its option, either repair or replace products that prove to be defective.

We shall have no liability or responsibility to the customer or any other person with respect to any loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read instructions carefully. No liability will be assumed for any damage caused by improper installation.

The information in this document is subject to change without notification. The content of this document is protected by copyright. No part of this document may be reproduced or copied by any means without the permission of Harmonic Inc.

For warranty or repair, return this product to a service facility designated by Harmonic Inc. The Buyer shall prepay shipping charges to Harmonic Inc., and Harmonic Inc. shall pay shipping to return the product to the buyer. However, buyer shall pay all shipping charges, duties and taxes for products returned to Harmonic Inc. from another country.

Harmonic Inc. warrants that its software, as well as firmware designated by Harmonic Inc. for use with the product, will execute its programming instructions when installed properly.

Harmonic Inc. does not warrant that the operation of the product or software or firmware will be uninterrupted or error free.

5.5 Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from abuse, neglect by the Buyer, improper installation or application by the Buyer, the Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site penetration or maintenance.

NOTE: No other warranty is expressed or implied. Harmonic Inc. specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

5.6 Exclusive Remedies

The remedies provided herein are the Buyer's sole and exclusive remedies. Harmonic Inc. shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based upon contract, tort or any other legal theory.

Technical Specifications

A.1 Link Performance

Composite second order (CSO): -80 dBc

Composite triple beat (CTB): -80 dBc

A.2 Optical Output

Output Power:

TABLE A-1. Noise Performance

Model	7014E	7017E	7014I-GF	7017I-GF	7019IL-GF	7020I-GF	7017H-GF	7020H-GF
Noise Figure (dB) ^a	3.7	3.7	4.5	4.5	5.0	5.0	4.5	5.0

a) With 0 dBm optical input power

TABLE 2. Output Power

Model	Output Power		1549 - 1561 nm		1535 - 1546 nm		1535 - 1561 nm	
	Total Optical Output Power (dBm)	Total Optical Output Power (mW)	Input Power (dBm) ²	Gain Tilt (dB)	Input Power (dBm) ²	Gain Tilt (dB)	Input Power (dBm) ²	Gain Tilt (dB)
7014E	14	25	-10 to +10	N/A	-10 to +10	N/A	N/A	N/A
7017E	17	50	-10 to +10	N/A	-10 to +10	N/A	N/A	N/A
7014I-GF	14	25	-1 to +10	< 2dB	+3 to +10	< 2dB	N/A	N/A
7017I-GF	17	50	-1 to +10	< 2dB	+3 to +11	< 2dB	N/A	N/A
7019IL-GF	19	80	-1 to +10	< 2dB	+1 to +10	< 2 dB	+4 to +11	< 2 dB
7020I-GF	20	100	-1 to +6	< 2 dB	-1 to +6	< 3 dB	N/A	N/A
7017H-GF	17	50	+11 to +14	< 2 dB	+11 to +14	< 2 dB	N/A	N/A
7020H-GF	20	100	+11 to +14	< 2dB	+11 to +14	< 2.5 dB	N/A	N/A

Optical power adjustment range: 3 dB down from max in 0.3 dB increments.
Optical Output Power Stability: +/- 0.1 dBm down from max in 0.3 dB increments.
Optical return loss: <-50 dB
Input range: >-20 dBm to +10 dBm
Polarization sensitivity: 0.1 dB
Polarization mode dispersion (PMD): <2 psec
Connector type: SC/APC (FC/APC optional)
Wavelength: 1550 nm \pm 15 nm
Laser shutdown: DISABLE/ENABLE switch
Protective Housing: Safety shutter or locks fiber connector in place

A.3 User Interface

Front panel
Bi-state status LED: Normal=Green, Alarm=Red
Module selection indicator: Yellow LED
Auto LED: Auto=Yellow
Alarms (See manual for list of alarms).
Function slide switch
Auto, Remote, Manual

A.4 RF Monitor point

Level: +4 dBmV per channel (typical 80 analog channels)
Flatness: +/- 1 dB
Return Loss: <-16 dB
Connector type: Male GSK (female F-type adapter included)
Rear panel
Laser disabled: Yellow LED

A.5 Harmonic NETWatch Element Management System

Optical Power Alarm - Monitor
Optical Power - Monitor
Mute Status - Monitor

A.6 Power Requirements

Nominal: 24 VDC – supplied by HLP 4200 power bus
Maximum: 26 VDC
Consumption: 22 Watts maximum

A.7 Physical

Dimensions: 2.616”W x 4.37”H x 10.7”D
Weight: 4 lbs
Mounting: HLP 4200 platform

Appendix B

Harmonic Inc. - Offices

B.1 Assistance:

For technical support and customer service, call toll free: 800.730.4099.
Harmonic's Web address is www.harmonicinc.com.

B.2 Sales Offices

Harmonic Inc. (U.S.A)

Corporate Headquarters
549 Baltic Way
Sunnyvale, CA 94089
Tel: 1.408.542.2500
Tel: 1.800.788.1330
Fax: 1.408.542.2510

Harmonic Inc. (U.S.A)

U.S. Technical Support
Tel: 1.800.730.4099
Fax: 1.408.542.2521

Harmonic Inc. (U.S.A)

U.S. Return Materials
Authorization
Tel: 1.408.542.2621

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Harmonic - Latin America

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Miami, Florida 33131
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