

Laser Audio Receiver

Operator's Manual



Model Number:
IF-513

INDUSTRIAL FIBER OPTICS

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INTRODUCTION

This manual provides operating information for Industrial Fiber Optics' Laser Audio Receiver, IF-513. This receiver is used to demodulate the audio signal (generated by a microphone or other audio source) from the beam of a Helium Neon (HeNe) laser, IF-HN08M, or a Semiconductor Diode laser, IF-RL08-635. The manual contains all the information you need to complete this project safely and knowledgeably, even if you are a novice to this technology. Please read the manual carefully while completing the activity.

As soon as you receive the Laser Audio Receiver, inspect it and the shipping container for damage. If any damage is found, immediately refer to the section of this manual entitled "Shipment Damage Claims".

Industrial Fiber Optics makes every effort to incorporate state-of-the-art technology, highest quality and dependability in its products. We constantly explore new ideas and products to best serve the rapidly expanding needs of industry and education. We encourage comments that you may have about our products, and we welcome the opportunity to discuss new ideas that may better serve your needs. For more information about our company and products refer to <http://www.i-fiberoptics.com> on the Worldwide Web.

Thank you for selecting this Industrial Fiber Optics product. We hope it meets your expectations and provides many hours of productive activity.

Sincerely,

The Industrial Fiber Optics Team

LASER CLASSIFICATIONS

All manufacturers of lasers used in the United States, must conform to regulations administered by the Center for Devices and Radiological Health (CDRH), a branch of the U.S. Department of Health and Human Services. CDRH categorizes lasers as follows:

Class	Description
I	A laser or laser system, which does not present a hazard to skin or eyes for any wavelength or exposure time. Exposure varies with wavelength. For ultraviolet, 2 to 4 μm exposures is less than from 8 nW to 8 μW . Visible light exposure varies from 4 μW to 200 μW , and for near-IR, the exposure is < 200 μW . Consult CDRH regulations for specific information.
II	Any visible laser with an output less than 1 mW of power. Warning label requirements – yellow caution label stating maximum output of 1 mW. Generally used as classroom lab lasers, supermarket scanners and laser pointers
IIIa	Any visible laser with an output over 1 mW of power with a maximum output of 5 mW of power. Warning label requirements – red danger label stating maximum output of 5 mW. Also used as classroom lab lasers, in holography, laser pointers, leveling instruments, measuring devices and alignment equipment.
IIIb	Any laser with an output over 5 mW of power with a maximum output of 500 mW of power and all invisible lasers with an output up to 400 mW. Warning label requirements – red danger label stating maximum output. These lasers also require a key switch for operation and a 3.5-second delay when the laser is turned on. Used in many of the same applications as the Class IIIa when more power is required.
IV	Any laser with an output over 500 mW of power. Warning label requirements – red danger label stating maximum output. These lasers are primarily used in industrial applications such as tooling, machining, cutting and welding. Most medical laser applications also require these high-powered lasers.

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LASER AUDIO RECEIVER PROCEDURE

Equipment Needed:

Modulated HeNe or Diode Laser *

Microphone or other Audio Source *

Laser Audio Receiver

* Not included in the IF-513

Procedure:

1. Choose a flat, level surface about 60 x 120 cm (2 x 4 feet) in size.
2. Collect all the items listed in the Equipment Needed section above.
3. Review the “Rules for Laser Safety” listed on the back cover of this booklet.
4. For detailed information regarding the operation of the helium neon or diode laser refer to its operating manual.
5. Position the laser and the receiver as shown in Figure 1.
6. Push the laser’s shutter to its closed position.
7. Make sure the laser’s ON/OFF switch is in its OFF position.



Figure 1. Side view of the laser and audio receiver.

8. Plug the laser line cord or VAC-to-DC laser power adapter into an AC electrical outlet. Refer to the laser’s operating manual if necessary.
9. Plug the VAC-to-DC audio receiver power adapter into an AC electrical outlet.
10. Plug the cord from the power adapter into the power jack located on the front of the audio receiver.
11. Plug the microphone or the patch cord from the audio source into the 3.5 mm audio jack on the back of the laser.
12. Turn on the laser. The pilot light on the laser should now be lit, showing that it is on.

13. Open the laser shutter.
14. Dim the room lights to help you observe the laser beam. Position the receiver in line with the laser so the beam strikes the audio receiver close to the photodetector access hole. Manually align the beam with the optical input (photo diode) of the audio receiver.
15. Turn on the microphone or audio source.
16. Turn the ON/OFF volume knob on the audio receiver to the 12 o'clock position. The pilot light (yellow LED) on the audio receiver should now be lit, showing that it is on.
17. Speak into the microphone or turn on the audio source and listen for the audio to come out of the receiver. If you do not hear any sound on the first attempt, continue to speak into the microphone or play the audio source while turning up the volume control clockwise on the audio receiver. If you are using an audio source that has a volume knob, you may need to increase this volume.
18. If you reach the maximum volume setting on the audio receiver and still do not hear any sound, realign the laser beam with the photo diode in the aperture. When you have the audio receiver and the laser properly aligned you should easily hear the audio from the receiver.
19. If you continue to have problems at this point refer to the "TROUBLE-SHOOTING" section in the back of the manual. If you have successfully established an audio link using the laser continue with your experiment.
20. Upon completing the experiment close the laser beam shutter.
21. Turn the volume knob on the audio receiver to the OFF position.
22. Turn off the microphone or audio source.
23. Unplug the power adapters or line cords from the electrical outlets, the laser and the audio receiver.
24. Remove all equipment from the table and store in their proper locations.



TROUBLESHOOTING

No Pilot Light or Light Output from Laser

- Check the troubleshooting steps in the laser manual.

No Sound from Laser Audio Receiver

- Is the 110 (220) VAC-to-VDC power adapter plugged into the laser audio receiver and an appropriate wall outlet or extension cord?
- Is the receiver's power indicator light on?
- Is the laser beam positioned so it hits the receiver detector properly?
- Are input signals to the laser of sufficient amplitude? (Speak louder into the microphone.)
- For Diode Laser Only: If the laser has a Gain Control knob, increase the gains of the amplifier by turning the knob clockwise (refer to the Laser Diode Instruction Manual for information about the operation of the Gain Control knob).
- Check for damaged or open electrical circuit in the microphone cord.

Do not attempt to troubleshoot the laser or laser receiver beyond the steps listed above. If all your connections are correct, and you are confident that power is being supplied to the laser and any input devices, please return the laser for appropriate inspection/servicing to Industrial Fiber Optics, as described in the section entitled SERVICE AND MAINTENANCE.

SERVICE AND MAINTENANCE

Periodic operation, maintenance and service of this equipment is not required. The warranty will be voided if entry has been made, and/or any screws have been removed. In the unlikely event this equipment malfunctions and you wish to have it repaired, please do the following:

- In writing, describe the problem, person to contact, phone number, and return address.
- Carefully pack the item, its power adapter, manual, and written description in a strong box with sufficient packing material to prevent damage in shipment.
- Ship the package to:

INDUSTRIAL FIBER OPTICS

1725 WEST 1ST STREET
TEMPE, AZ 85281-7622
USA

WARRANTY

Industrial Fiber Optics products are warranted against defects in materials and workmanship. The warranty for the product, excluding laser, is for one (1) year. The warranty for the individual laser is dependent upon model. Refer to the manual which was included with the laser for the proper warranty period. The warranty will be voided if internal or external components have been damaged, mishandled, or altered by the buyer.

Warranty liability is limited to repair or replacement of any defective unit at the company's facilities, and does not include attendant or consequential damages. Repair or replacement can be made only after failure analysis at the factory. Authorized warranty repairs are made at no charge, and are guaranteed for the balance of the original warranty.

Industrial Fiber Optics will pay the return freight and insurance charges for warranty repair within the continental United States, by United Parcel Service or Parcel Post. Any other delivery means must be paid for by the customer.

If an item is not under warranty, repairs will not be undertaken until the cost of such repairs have been prepaid by the customer. Typical repair costs range from \$50 - \$75, and completion times from two to three weeks.

When returning items for analysis and possible repair, please do the following:

- In a letter, describe the problem, person whom we should contact, phone number and return address.
- Pack the unit and your letter carefully in a strong box with adequate packing material, to prevent damage in shipment.
- Ship the package to:

INDUSTRIAL FIBER OPTICS

1725 WEST 1ST STREET
TEMPE, AZ 85281-7622
USA

SHIPMENT DAMAGE CLAIMS

If damage to an Industrial Fiber Optics product should occur during shipping, it is imperative that it be reported immediately, both to the carrier and the distributor or salesperson from whom the item was purchased. **DO NOT CONTACT INDUSTRIAL FIBER OPTICS.**

Time is of the essence because damage claims submitted more than five days after delivery may not be honored. If shipping damage has occurred during shipment, please do the following:

- Make a note of the carrier company, the name of the carrier employee, the date and the time of the delivery.
- Keep all packing material.
- In writing, describe the nature of damage to the product.
- In cases of severe damage, do not attempt to use the product (including attaching it to a power source).
- Notify the carrier immediately of any damaged product.
- Notify the distributor from whom the purchase was made.

Table 1. Common abbreviations used when working with lasers.

Abbr	Long version	Scientific Notation
mW	milliwatts	1×10^{-3} watts
μ W	microwatts	1×10^{-6} watts
nW	nanowatts	1×10^{-9} watts
mm	millimeters	1×10^{-3} meters
μ m	micrometers	1×10^{-6} meters
nm	nanometers	1×10^{-9} meters

Notes:

Notes:

Rules for Laser Safety

- Lasers produce a very intense beam of light. Treat them with respect. Most educational lasers have an output of less than 3 milliwatts, and will not harm the skin.
- Never look into the laser aperture while the laser is turned on! PERMANENT EYE DAMAGE COULD RESULT.
- Never stare into the oncoming beam. Never use magnifiers (such as binoculars or telescopes) to look at the beam as it travels – or when it strikes a surface.
- Never point a laser at anyone's eyes or face, no matter how far away they are.
- When using a laser in the classroom or laboratory, always use a beam stop, or project the beam to areas, which people won't enter or pass through.
- Never leave a laser unattended while it is turned on – and always unplug it when it's not actually being used.
- Remove all shiny objects from the area in which you will be working. This includes rings, watches, metal bands, tools, and glass. Reflections from the beam can be nearly as intense as the beam itself.
- Never disassemble or try to adjust the laser's internal components. Electric shock could result.