

# **Infrared Listening System 500**

## **Operating Manual**



Sound Associates, Inc.  
424 West 45th Street  
New York, NY 10036

Phone (212) 757-5679  
Fax (212) 265-1250

September 24, 1992

**Table of Contents**

INTRODUCTION ..... 1

I. INFRARED LISTENING SYSTEM 500 FEATURES ..... 1

II. THEORY OF OPERATION ..... 3

    Installation Design ..... 3

    Emitter Positioning ..... 4

III. INSTALLATION ..... 5

    System Set-up ..... 5

        1. Mixer to Transmitter Inputs ..... 5

        2. Transmitter Output Modules ..... 5

        3. Transmitter to Emitter ..... 6

    Optional Setup ..... 6

    Painting the Emitters ..... 6

    Mounting of Emitters ..... 7

IV. OPERATING THE SYSTEM ..... 7

    Operation of the Transmitter ..... 7

    Operation of the Receiver ..... 8

    Charging the Receiver Battery ..... 8

V. DISTRIBUTION OF HEADSETS / RECEIVERS ..... 9

VI. TROUBLE SHOOTING ..... 9

VII. TECHNICAL SPECIFICATIONS ..... 11

    Transmitter ..... 11

    Emitter Panel ..... 12

    Receiver ..... 12

## INTRODUCTION

The Sound Associates Infrared Listening System 500 is a wireless assistive listening device which may be used as an aid for the hearing impaired or to perform simultaneous translations. It is considered by the Americans with Disabilities Act (ADA) as an "appropriate" listening system for the hearing impaired. The System 500 consists of three major components: the transmitter, the emitter, and the receiver.

The transmitter modulates an audio signal that is converted into infrared light by the emitters. This light carries the audio signal on its back, fills the room and is converted back into audio by the receiver. The infrared light is amplitude modulated with a 95 kHz frequency-modulated sub-carrier. Ninety-five kHz is the industry standard; other manufacturers' receivers can be used with our system, and our receiver used with other home or large area systems.

Please read the following installation instructions completely before attempting any steps. If, after reading the instructions, you are unable to install the system please call Sound Associates' infrared installation unit weekdays at (212) 757-5679 between 10:00 AM and 5:30 PM Eastern Time.

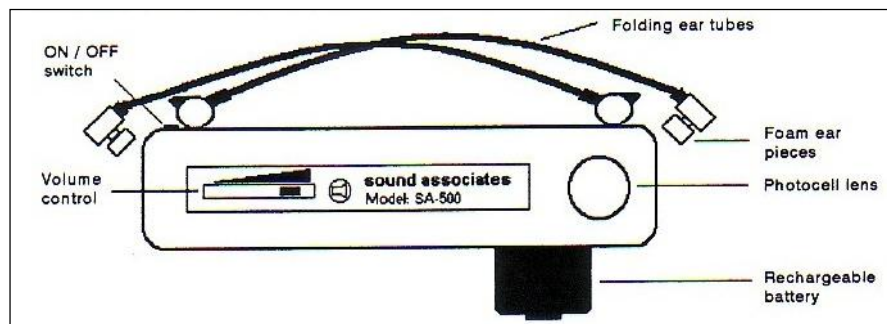
### I. INFRARED LISTENING SYSTEM 500 FEATURES

FEATURE	ADVANTAGE INFRARED TECHNOLOGY
Wireless Headsets	No pre-registered seating. No "Deaf Section". Easy distribution.
Infrared light is the carrier of the audio signal	Is contained within its environment. Little to no interference. High sound quality reproduction.
The audio sign is frequency modulated at 95 kHz	Industry standard. Headsets are interchangeable with other home and large area systems.

<b>Transmitter SA-501 (Figure 1)</b>	
FEATURE	ADVANTAGE INFRARED TECHNOLOGY
Modular inputs on the transmitter (TOA 900 series module)	A variety of TOA modules are available. Inputs can be added and subtracted as needed. Allows for a custom design with each unit.
Up to 3 inputs can be utilized	Allows the transmitter to be used as a mixer. Gives more versatility to the user.



<b>Receivers SA-500H (Figure 3)</b>	
<b>FEATURE</b>	<b>ADVANTAGE INFRARED TECHNOLOGY</b>
Removable foam ear tips	Very comfortable. Easy to clean.
“On/Off” switch of the receiver is located under the right ear tubs	Limits misuse because the receiver is “on” when worn and “off” when folded. Extends battery life.



**Figure 3.** SA-500H Headset/receiver with ear tubes folded.

<b>Accessories</b>	
<b>FEATURE</b>	<b>ADVANTAGE INFRARED TECHNOLOGY</b>
Emitter cable is 2-wire shielded cable	Standard microphone cable. Inexpensive.
Optional headset distribution cabinet	Easy, efficient storage and distribution.
Optional 25 and 50 position battery chargers	All the batteries recharge at once. Easy handling for quick distribution. Easy storage.
Optional neck induction loop	More severely impaired patrons may use their hearing aids in conjunction with the infrared system.

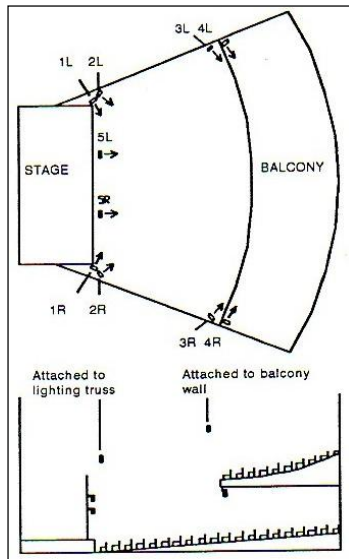
## II. THEORY OF OPERATION

### Installation Design

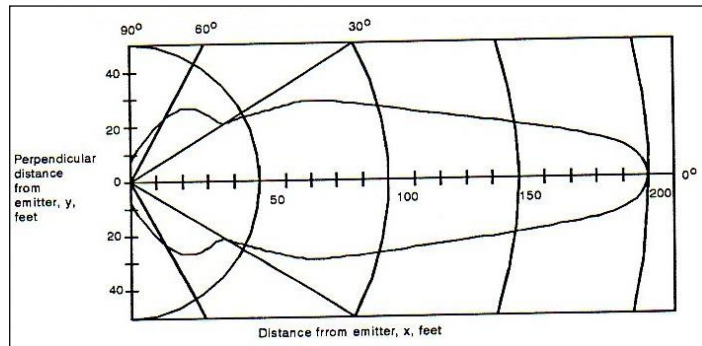
The most important part of the installation is the emitter layout. The emitters produce the infrared light on which the audio signal is carried and must be in direct view of all seats in the house. The carrier behaves like visible light. A blocked emitter will cause a shadowing effect on the audience, allowing only the non-shadowed areas to receive the audio signal. The installation design must take into consideration the seating rake, any balconies or overhangs, columns, or any projections that may obstruct the infrared light.

## Emitter Positioning

**Figure 4** shows the emitter layout for a large theater with one overhang. Emitters 1R + 1L and 2R + 2L cover the front and rear of orchestra, emitters 3R + 3L cover the balcony, and emitters 4R + 4L cover under the balcony. Usually emitters 5L + 5R can be omitted from the design, but in this case they were installed to ensure that the front of the balcony received the signal.



**Figure 4.** Positioning of emitters in a ten emitter system.



**Figure 5.** Radiating pattern of infrared emitter panel (SA-511).

Although the SA-511 emitter covers approximately 6000 sq. ft. and the emitter pattern is fairly wide (see **Figure 5**), it is always better to over design with a line of sight system.

Also, in **Figure 4** you will notice the criss-crossing pattern of the emitters. Criss-crossing the signals usually covers the most area per emitter while overlapping infrared signals. This allows the same seat to be covered by two or more emitters so a temporary obstruction, such as a person or scenery (between the receiver and the emitter), will not alter the reception.

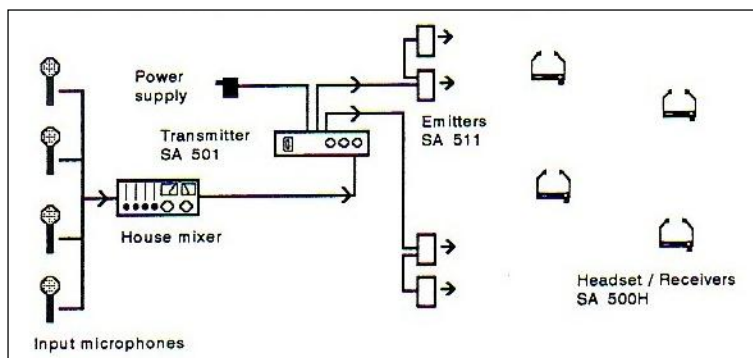
*NOTE: EACH INSTALLATION DESIGN IS UNIQUE; THESE ARE ONLY SUGGESTIONS FOR TYPICAL INSTALLATIONS. THE DESIGN AND EMITTER POSITIONING SHOULD TAKE INTO CONSIDERATION THE ROOMS INDIVIDUAL SIZE, SHAPE, AND COLOR. IF ANY QUESTIONS SHOULD ARISE PLEASE CONTACT OUR OFFICE FOR ASSISTANCE.*

### III. INSTALLATION

#### System Set-Up

##### 1. Mixer to Transmitter Inputs

The most common set-up of an infrared system is one in which an auxiliary send out of the house mixer is fed into the transmitter (**Figure 6**). A high level audio signal out of the mixer (300 mVrms maximum) must be connected to a TOA L-OI (SA-515) line level input module, via a shielded cable terminated in a standard male XLR connector. Low level audio (microphone) must be connected to a TOA M-OI (SA-516) microphone input module, via a shielded cable terminated in a standard male XLR connector.

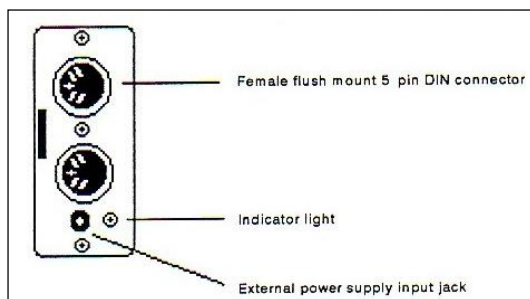


**Figure 6.** Line drawing of a common ILS installation.

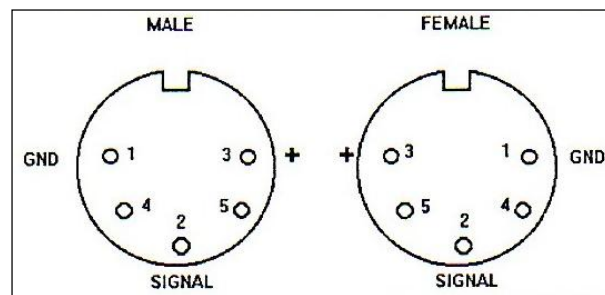
##### 2. Transmitter Output Modules

Each output module in the transmitter powers up to four emitters. (See **Figure 7**.) The 2 female connectors on the output module allows 2 home-runs for each module. Additional emitters may be "daisy-chained" together. The external power supply powers the modules and a maximum of four emitters.

**WARNING: DO NOT PLUG OR UNPLUG THE POWER SUPPLY WHILE THE UNIT IS "ON". POWER SHOULD BE SHUT "OFF" AT THE UNIT AND AT THE SOURCE WHILE ALL THE CONNECTIONS ARE MADE, ESPECIALLY THE CONNECTIONS BETWEEN THE EXTERNAL POWER SUPPLY AND THE OUTPUT MODULE.**



**Figure 7.** SA-502 output module for SA-501 transmitter.



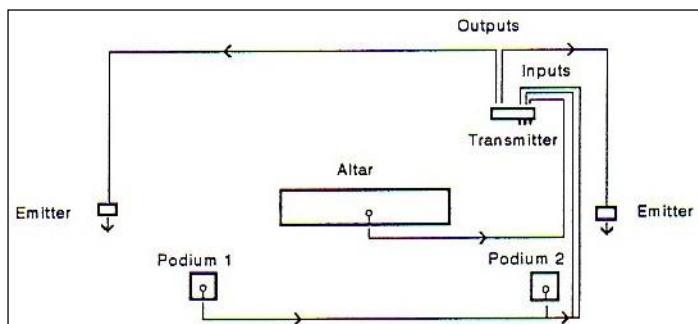
**Figure 8.** Pin configuration of a 5-pin DIN connector (front view).

### 3. Transmitter to Emitter

The transmitter provides DC voltage and the modified audio signal to each emitter. The cable connecting the transmitter to the emitters is standard 2-wire shielded microphone cable ending with 5-pin DIN connectors. **Figure 8** shows the pin configuration of the connectors. We recommend a cable with two 18 gauge conductors and a 18 gauge shield, such as the Alpha 2421C.

## Optional Set-Up

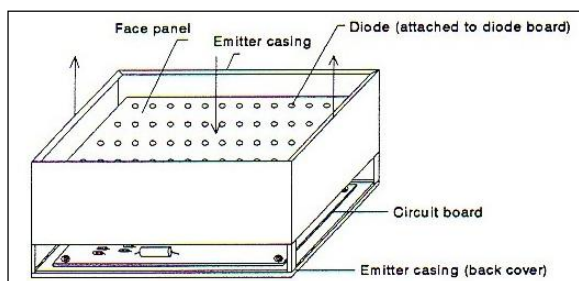
The Infrared Listening System 500 was designed to be versatile, easy to install, and user friendly. Therefore, we designed the transmitter with 3 inputs so that it may be used as its own small mixer. For example, in a small church situation with a small sound system or no sound system, the Infrared Listening System 500 may still be installed without the purchase of an additional mixer (see **Figure 9**). If the altar and the two podiums are the primary speaking areas, the three locations may be equipped with microphones and the output level for the infrared controlled at the transmitter. Some situations may call for a house feed plus an additional feed from a paging system. Our multiple inputs make this possible.



**Figure 9.** Line drawing of an ILS installation where the transmitter is used as a mixer.

## Painting the Emitters

The emitters are white in color but may be painted to match their surroundings. The emitters must be dismantled before painting begins. To dismantle the unit push on the emitter face panel (not on the diodes) and pull off the front cover (see **Figure 10**). The diode panel can then be separated from the rest of the unit by unplugging it from the circuit board. The circuit board can be unscrewed and the diode board pushed out of the face panel. After all circuitry is dismantled, the casing and face plate may be painted. We suggest the use of flat Krylon spray paint due to its ability to adhere to smooth plastic surfaces.



**Figure 10.** Dismantling the emitter for painting.

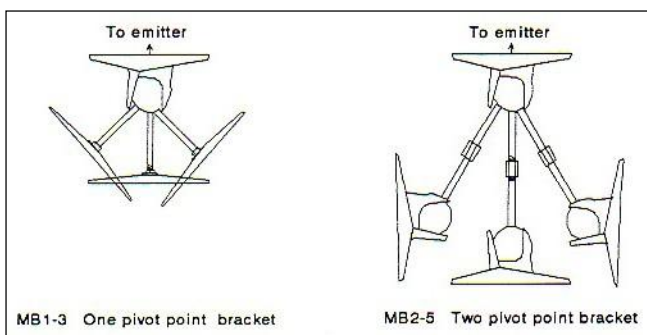
**WARNING: DO NOT PAINT THE LEDS. PAINT COVERING THE DIODES WILL LIMIT THEIR LIGHT EMISSION.**

## Mounting the Emitters

The emitters can be mounted to walls, ceilings, pipes, I-beams, or microphone stands. The wall and ceiling mounts can consist of either a one pivot-point mount (MB1-3) or a two pivot-point mount (MB2-5). The pipe mount (MB1-C) and microphone mount (MB1-MA) consist of only one pivot-point. The one pivot-point mount has a limited rotation of approximately 90 degrees off center (**Figure 11**). The two pivot point mount has much more mobility, including three dimensional positioning. This mount can rotate a full 180 degrees.

After deciding on the location of the emitters, (see INSTALLATION DESIGN), fix the mounting plate of the MBI-3 or MB2-5 bracket to a secure flat surface with two screws or bolts with a maximum diameter 1/4 inch. The opposite end of the mount attaches to the back of the emitter with two 8/32 x 1/2 inch machine screws. If you use the mounting bracket with the clamp, be sure to tighten the wing nut as much as possible without damaging the threads, and use safety wires where necessary.

*NOTE: THE MOUNT FOR THE SA-511 EMITTER IS A STANDARD INDUSTRIAL MOUNT WITH A VARIETY OF ATTACHMENTS. IF ONE OF THESE MOUNTS DOES NOT FIT YOUR NEEDS PLEASE CONTACT SOUND ASSOCIATES AT (212) 757-5679 FOR A CUSTOM DESIGNED MOUNT.*



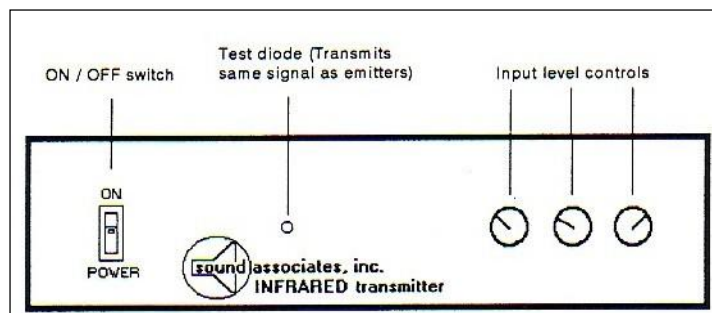
**Figure 11.** Position diagram of the one- and two-pivot point ceiling or wall mount brackets.

## IV. OPERATING THE SYSTEM

### Operation of the Transmitter

*NOTE: ALL CONNECTIONS, ESPECIALLY THE CONNECTION BETWEEN THE OUTPUT MODULE AND THE EXTERNAL POWER SUPPLY, MUST BE MADE BEFORE THE UNIT IS TURNED "ON".*

After the system is completely "set-up" and all the connections secure, the unit may be turned "on". The input audio level can be adjusted by the corresponding volume control on the front of the transmitter and monitored by the signal emitted by the test diode located on the front panel (see **Figure 12**). The input audio level should be raised until distortion can be heard in the headset, then backed down slightly so the gain is at an optimum level with no distortion. In operation the system should be checked on a regular basis to detect distortion due to overloading.

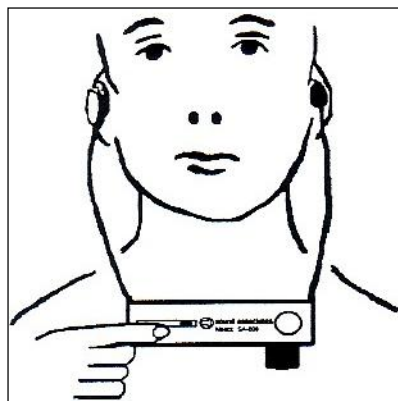


**Figure 12.** Front view of the transmitter.

## Operation of the Receiver

The receiver/headset is worn stethoscope style, under the user's chin with the photo-cell lens facing away from the body (see **Figure 13**). The rechargeable battery must be inserted firmly into the bottom of the receiver for use. The battery can be plugged in either direction. The receiver's on/off switch is located under the unit's right ear tube; therefore, the headset is "on" when worn and shuts "off" when folded. The volume can be adjusted by the slide control located on the units face.

*NOTE: THE DETECTOR LENS MUST NOT BE BLOCKED OR COVERED DURING OPERATION, AS THIS WOULD INTERRUPT SOUND REPRODUCTION. ALSO, THE FOAM EAR PIECES SHOULD BE REMOVED AND WASHED FOR SANITATION AFTER EACH USE.*



**Figure 13.** Diagram of the SA-500H headset/receiver in use.

## Charging the Receiver Battery

The SA-500H receiver comes with a 2.4 volt rechargeable battery that can be charged in a standard 110 volt outlet. The battery's operating time is approximately 6 hours with a recharging time of approximately 12 to 18 hours. Internal circuitry prevents the batteries from being overcharged, so they may be allowed to recharge for extended periods of time without worry. For best results, the batteries should be drained completely every six months and then recharged to full capacity.

## V. DISTRIBUTION OF HEADSETS / RECEIVERS

Distribution is most efficient when done from a cabinet with numbered slots which correspond to numbered headsets. The headsets should be prepared with newly charged batteries and sanitized foam ear tips and tested before distribution begins.

To ensure the safe return of a headset, an ID with a printed name and address should be placed into the headset slot and returned to the patron when the headset is returned. Although a driver's license is preferred, other forms of identification may be accepted such as: a passport, a voided check, or a credit card with an address printed on it. A cash deposit (such as \$100) for each headset can be taken in lieu of an ID. We suggest no more than 2 headsets be given on any ID. In multiples of 3 or more, one may want to get a signature for the number of sets taken.

Should a headset be lost in house, all information should be taken from the ID before returning it to the patron. The patron should be responsible for lost headset replacement.

The foam ear tips should be removed after every use and be replaced with freshly-cleaned ones. Soiled foams should be placed in a mesh laundry bag and washed whenever there is an accumulation. They can be put into a dryer (on low heat) or hung to dry overnight.

Batteries must plug into a 110 V outlet to be recharged and should be left overnight. The batteries cannot be over-charged so extended charging is recommended. Also, batteries should be rotated so ones used last have a longer recharging time.

## VI. TROUBLE SHOOTING

SYMPTOM	CAUSE/REMEDY
Only static heard in the headset	Headset is not receiving the infrared transmission.  Make sure ... <ul style="list-style-type: none"> <li>· .. transmitter is powered. (There is an indicator light on the front of the transmitter and on each output module.)</li> <li>· .. emitters are powered. (There are indicator lights on the bottom of the emitters.)</li> <li>· .. the photo cell on the headset is in direct view of the emitter panel.</li> <li>· .. direct sunlight does not shine on the photo cell. (Sunlight carries infrared light which could interfere with the transmission.)</li> </ul>

SYMPTOM	CAUSE/REMEDY
<p>No static and no audio in the headset</p>	<p>The headset is not powered or the infrared light is being received but with no audio signal "on its back."</p> <p>Make sure ...</p> <ul style="list-style-type: none"> <li>· .. battery is charged and secured firmly in place.</li> <li>· .. the volume on the headset is turned up.</li> <li>· .. the input is plugged into the transmitter.</li> <li>· .. the level on the transmitter and the level from the mixer is up</li> </ul>
<p>Signal is received but with some static in the headset.</p>	<p>The infrared signal is too weak or high levels of infrared light are interfering with the transmission.</p> <p>Make sure ...</p> <ul style="list-style-type: none"> <li>· .. all emitters are connected and being powered.</li> <li>· .. emitters are in sight.</li> <li>· .. intense light is not shining on the photo cell on the receiver.</li> <li>· .. headset battery is fully charged.</li> </ul>
<p>Audio signal is distorted</p>	<p>The input level is too high or there is too much current draw on the power supply.</p> <p>Make sure ...</p> <ul style="list-style-type: none"> <li>· .. a line level output out of the mixer is not connected to a microphone level input module on the transmitter.</li> <li>· .. level on the transmitter is not too high.</li> <li>· .. headset battery is fully charged.</li> <li>· .. more than 4 emitters are not connected to one module.</li> </ul>
<p>Unit will not turn "on"</p>	<p>Make sure ...</p> <ul style="list-style-type: none"> <li>· .. the first output module is powered by an external power supply.</li> <li>· .. the power supply is generating 24V AC. If not the internal fuse is blown and the power supply must be replaced.</li> </ul>
<p>Indicator light on the output module is not "on"</p>	<p>Make sure ...</p> <ul style="list-style-type: none"> <li>· .. the power supply is plugged into the output module.</li> <li>· .. the fuse on the output card is not blown.</li> <li>· .. that the first module is powered.</li> </ul>

SYMPTOM	CAUSE/REMEDY
Indicator light on the emitter panel is not "on".	Power is not being supplied to the emitter.  Make sure ... . . . emitter is connected to the transmitter directly or through another emitter . . . . unit is powered.

## VII. TECHNICAL SPECIFICATIONS

### Transmitter

Transmitting frequency	95 kHz
Type of Modulation	Pulsed amplitude modulation
Modulation Nominal Swing	15 kHz
Fuse	2A Slow
Dimensions	19" x 3 1/2" x 7" deep
Weight	4 lb.

#### INPUT LINE LEVEL

Connector	Female XLR
Sensitivity for rated output (100 mY) Input impedance	125m V
Load impedance	Balanced 600 ohms
Frequency response	10k ohms
Max input level	20-20,000 Hz + 1 dB
	20 dBm (7.75 V)

#### INPUT FOR DYNAMIC MICROPHONE

Connector	Female XLR
Sensitivity for rated output (100 mY)	Nominal: 40 dB
	Adjustable: 52-32 dB
Input impedance	Balanced 200 ohms
Load impedance	10k ohms
Frequency Response	25-20,000 Hz + 1 dB
Controls	1 low cut, 1 high cut, 1 gain
Phantom power	On or off, DC 20 V

**OUTPUTS**

Connector	Female 5 pin DIN
Number of Outputs	2 to 8
RF Output Voltage	Approx. 5 V rms
Supply Voltage	24 V AC
Indicator	Recessed LED

**Emitter Panel**

Operating Frequency	95 kHz
Number of Operating Diodes	50
Average Radiating Power	6.8W
Input/Output Connectors	5 pin DIN; (male / female)
Supply Voltage	24 - 35 V DC
Current Drain During Operation	Approx. 300 mA
Cable	20 gauge 3 conductor
Indicator	Recessed LED
Area Covered by one Emitter	6,000 sq. ft.
Dimensions	8 1/4" x 5" x 3"
Weight	18.5 oz.

**Receiver**

AF Frequency Response	50 Hz to 12 kHz
Receiving Frequency	95 kHz
Power Supply	2.4 V rechargeable Nicad battery
Operating Time	Approx. 6 hours
Battery Recharging Time	Approx. 18 hours
Output	112 db SPL @ 1 kHz
Dimensions Folded	6 3/4" x 2 1/2" x 5/8" deep
Dimensions Open	6 3/4" x 6 5/8" x 5/8" deep
Weight	2 oz.

Sound Associates, Inc. reserves the right to install modifications where necessary, especially in the interest of technical progress, without prior notice.