Sportsound 1000 series
2nd Generation

Installation and Operation Manual

ED-18519   *Rev 0 – 16 November 2007*

DAKTRONICS

DAKTRONICS, INC.

Table of Contents

Section 1: Introduction

This manual explains the operation, installation, maintenance and troubleshooting of the Sportsound® 1000 series sound systems. For questions regarding the safety, installation, operation, or service of this system, please refer to **Section 8: Daktronics Exchange and Repair and Return Program**. The Sportsound 1000 series system is composed of several manufacturers' components. Operation documentation for these products is included in Appendix B.

This manual is divided into eight sections listed below:

- **Introduction** covers the basic information needed to make the most of the rest of this manual – take time to read the entire introduction as it defines terms and explains concepts used throughout the manual.
- **Equipment List** shows what is included in the Sportsound 1000 system.
- **Operation** section gives an overview of how to run the system.
- **Mechanical Installation** provides general guidance on mounting.
- **Electrical Installation** gives general guidance on terminating power and signal cables at the system.
- **Maintenance and Troubleshooting** addresses situations that may occur, probable solutions and performing general maintenance.
- The drawings referenced within this manual are listed in the **Reference Drawings** section on page 25.
- The reference manuals that will be included for non-Daktronics components are listed in the **Reference Manuals** section on page 27.

Daktronics identifies manuals by an ED number located on the cover page of the manual. For example, this manual would be referred to as **ED-18519.**

Listed below are a number of drawing types commonly used by Daktronics, along with the information each is likely to provide.

- **System riser diagrams:** overall system layout from control location to system.
- **Electrical** and **mechanical speciation drawings:** mounting information, system dimensions; power and signal entrance points, and access method (front or rear).
- **Schematics:** power wiring, signal wiring, panel board or power termination panel assignments, signal termination panel assignments, and transformer assignments.

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DAKTRONICS, INC.   BROOKINGS, SD 57006
PROJ: SPORT SOUND SYSTEMS, 1000 SERIES
TITLE: SHOP DWG; STANDARD 1000 SERIES CABINET
DES BY: DTREML   DRAWN BY: JREDICK   1 JULY 05
REVISION 00   APPR. BY: SCALE: 3/16"=1'   1340-E10B-246571

Figure 1: *Daktronics drawing label*

Figure 1, illustrates the Daktronics drawing label. The drawing number is located in the lower-right corner of each drawing. Listing the last set of digits and the letter preceding them identifies drawings in the manual. In the example below, the drawing would be referred to as **Drawing B-246571**. Reference drawings are inserted in alphanumeric order in the **Reference Drawings** section on page 25**.**

All references to drawing numbers, appendices, figures, or other manuals are presented in **bold** typeface, as shown below.

"Refer to **Drawing-B-246571** for the system dimensions."

Additionally, drawings referenced within a particular section are listed at the beginning of that section as shown in the following example:

Reference Drawing:
Shop DWG, Standard 1000 Series Cabinet....................................**Drawing B-246571**

The model numbers of a Daktronics system can be found on the ID label on the system. The label will be similar to the one shown in **Figure 2**. When calling Daktronics Customer Service, please have this information available to ensure that your request is serviced as quickly as possible.
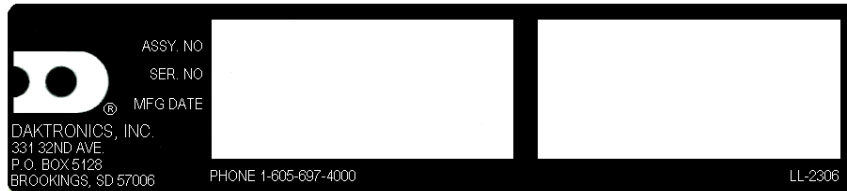
Figure 2: System identification label

Section 2:   Equipment List

Note: All products purchased in this system are individually tested for product safety approval.

The Sportsound 1000 series sound systems come complete with all of the following elements:

1. All necessary design, fabrication, processing and amplification equipment, acoustic devices, and installation for a complete sound system
2. Speaker system
3. Speaker cabinet with applied vinyl graphics and printed mesh grille
4. Eight channel microphone/line audio mixer
5. Professional cassette/CD playback deck
6. Portable announcer's control rack
7. One (1) wired microphone with on/off switch
8. Power conditioner and surge suppression
9. 1000' signal cable

Options:
1. One (1) Handheld wireless microphone system
2. One (1) Wireless referee microphone system with headset and lapel microphone
3. One (1) Wireless in-ear monitor system for on-field talent
4. One (1) ADA compliant hearing assistance system
5. One (1) Antenna extension/mounting kit
6. One (1) Low frequency cut-off switch

2.1   Speakers

There are three different types of speakers that are used in this system including:
- Daktronics part **# A-1901**: 2" high frequency drivers (Figure 3)
  - Serviceable at Daktronics Brookings Customer Service center
- Daktronics part **# A-1902**: 10" mid-range speakers (Figure 4)
- Daktronics part # A-1903: 15" low frequency speakers (Figure 5)

Figure 3: *Part #: A-1901*   **Figure 4:** *Part #: A-1902*   **Figure 5:** *Part #: A-1903*

Amplifier Components

Reference Drawing:

Amplifiers

In sound systems, the amplifier is the last component before the speakers. It receives a signal from the mixer and supplies power to drive the speakers. The series 1000 utilizes three power amplifiers with build in DSP (Digital Signal Processing).

The series 1000 utilizes three power amplifiers with built in DSP (Digital Signal Processing), which manage equalization, limiting, compression and crossover functions. The DSP program is set at the factory and is not user accessible.

Figure 6: Amplifier

2.2 Portable Announcer's Rack Enclosure Case Components

Each Sportsound 1000 series includes a portable announcers control rack. **Figure 8 and 9**, below, illustrate how the components fit into the rack (H 20"xW 22"xD 21.5").
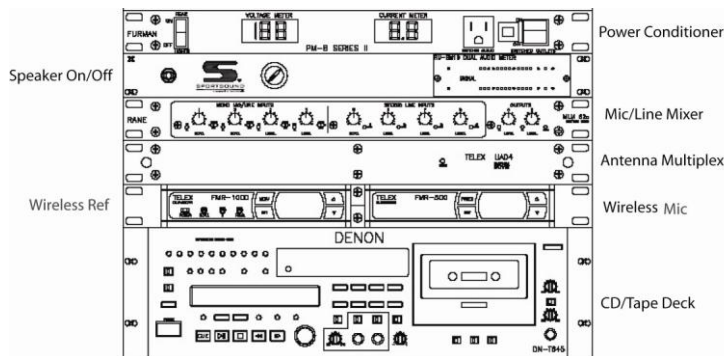

Figure 7: Portable announcer's rack OA-1340-0127

Figure 8: Portable announcer's rack

CD player/cassette deck

Overall technical specifications:
Power requirements: 120VAC, 60 Hz
Power consumption: 29 W

Height: 5.3" (135 mm)
Width: 19" (483 mm)

Depth: 11" (279 mm)
Weight: 13 lbs (6 kg)

The CD/cassette deck in the portable announcer's rack will look like **Figure 10**. For more information on the player in **Figure 10**, refer to **ED-16003**.

Figure 9: Part# A-1958 CD player/cassette deck

Microphone/line mixer

In a sound system a mixer is an electronic device that combines the electrical sound signals from microphones, tapes, CDs, instruments, etc. With a mixer, volume adjustment, and tonal quality of each input source can be adjusted to achieve a harmonious mix of sound. The Sportsound 1000 includes a microphone/line mixer that features four balanced, studio grade, mono microphone/line inputs with XLR jacks and 15VDC phantom power.

Power requirement: 120 VAC
Power consumption: 72 W

Height: 1.75" (45 mm)
Width: 19" (483 mm)
Depth: 5.3" (135 mm)
Weight: 4 lbs (1.8 kg)

Figure 10: Part #: A-1960 Microphone/line mixer, front and back view

For more information, refer to the manufacturers manual in the **Manuals Section** on page 27.

Power conditioner

In sound systems, the power conditioner is a filtering device that cleans the power to the system and protects from adverse power events such as brownouts, spikes, over voltage and electronic noise.

Power consumption: 12 W
Height: 1.75" (45 mm)
Width: 19" (483 mm)
Depth: 10.5" (267 mm)
Weight: 11 lbs (5 kg)

Figure 11: Part #: A-1959 15A power conditioner

For more information, refer to the manufacturers manual in the **Manuals Section** on **page 27**.

2.3   Sportsound 1000 Series Options

Wireless handheld microphone system

This wireless microphone system option for small and medium sized installs contains a receiver and a handheld transmitter. The receiver is mounted and wired in the portable announcers rack that receives information from the wireless microphone/transmitter. Refer to the manufacturer's manual in the **Reference Manuals** section on page 27 for more information.

Referee microphone system

This wireless microphone system option contains a receiver, a body pack transmitter and a weatherproof headset for referee announcements and a lapel microphone, wind screen and accessories. The receiver is mounted and wired in the portable announcers rack that receives information from the body pack transmitter.

Wireless in-ear talent, personal monitor system

Full system

The in-ear field monitor is for on-field talent such as singers and presenters. With no time delay, performers stay in tune and in time. The full system is complete with a transmitter that is mounted in the portable announcers rack and one receiver.

Optional

If more receivers are required and the transmitter is already installed, additional receiver packs and headphones are available to purchase.

For more information, refer to the manufacturer's manual in the **Reference Manuals** section on **page 27**.

Hearing assist system

This system is ADA compliant for the hard of hearing and includes a transmitter and four receivers, antenna, and earpieces. For more information, refer to the manufacturers manual from the **Reference Manuals** section on **page 27**..

Section 3: Mechanical Installation

Note: Daktronics is not responsible for an installation of structural integrity and support structures done by others. The cabinet must be installed by a qualified technician.
It is the customer's responsibility to ensure that a qualified structural engineer approves the structure and any additional hardware. The cabinet must be installed no further than 40 yards behind the goal post to provide coverage for seating from the 15 yard line to the 15 yard-line (**Figure 13**).
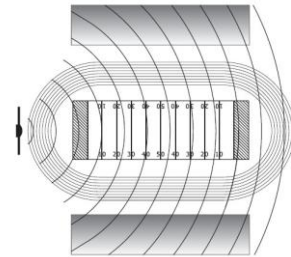
Figure 12: Overhead football coverage

3.1   Mechanical Installation Overview

Reference Drawing:
Sportsound System Structural Mount .... **Drawing A-239409**

Mechanical installation consists of lifting and mounting the cabinet on to an existing frame. Refer to **Drawing A-239409** for mounting instructions.

Cabinet specifications
Height: 48" (1219 mm)
Width: 96" (2438 mm)
Depth: 48" (1219 mm)
Weight: 1150 lb (522 kg)

3.2   Lifting the System

Reference Drawing:
Shop Drawing, Standard 1000 Series Cabinet....................................... **Drawing B-246571**

The Sportsound 1000 series systems are shipped with two lift plates attached to the top of the cabinet. Each lift plate contains a 1" hole. Use a spreader bar or a bridle when lifting the cabinet into place. If a bridle is used, it must have an angle of 45 degrees or greater from the horizon cable system. Refer to **Drawing B-246571** for a detailed drawing of the cabinet.

Note: Daktronics assumes no liability for system damage or injury resulting from incorrect setup or incorrect lifting methods.

3.3   Mounting the System

The speaker cabinet will be mounted atop a frame that must be certified by a structural engineer. To mount the system in place, set the bottom plates on the speaker cabinet on top of the ½" steel plate (provided by Daktronics). Align the holes and secure down with eight ½″ grade five bolts with ½" flat and lock washers. Refer to **Drawing B-246571** for mounting requirements.

Figure 13: Cabinet

Section 4:   Electrical Installation

Note: Only qualified individuals should perform power routing and termination to the system. It is the responsibility of the electrical contractor to ensure that all electrical work meets or exceeds local and national codes. Failure to follow installation guidelines will result in audible noise on the sound system.

4.1   Preparing for Power/Signal Connection

Reference Drawing:
> System Riser Diagram; 1000 Series Sportsound................................... **Drawing A-246801**

Power/signal
Drawing A-246801 details power and signal wire hookup of the Sportsound 1000 series.

Power
The system requires two 20A circuits at 120 VAC for incoming power. Power is recessed at the externally mounted J-box located at the bottom of the sound cabinet. The power source must be properly grounded by the customer. **Figure 15** details the proper wiring of the surge suppressor.
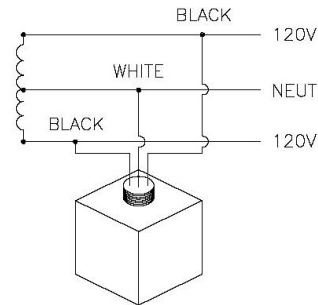
Figure 14: *Single-Phase three-wire 120/240VAC*

Signal
One 2-pair sound signal cable must be in a dedicated conduit running from the control room to the system. Signal is recessed at the externally mounted J-box located at the bottom of the sound cabinet. If a dedicated conduit is not possible, all other data cables, excluding sound, must be fiber optic. Any cable running in conduit with audio cable must be approved by a Daktronics electrical engineer.

Connection from J-box

J-Box		Cable Run
Pin	**Wire Color**	**Wire Color**
1	GREEN	SHIELD W/ RED
2	RED	RED
3	BLACK/RED	BLACK/RED
4	WHITE	WHITE
5	BLACK/WHITE	BLACK/WHITE

Grounding

Systems **must** be grounded according to the provisions outlined in Article 250 and 600 of the National Electrical Code and according to the specifications in this manual. Daktronics requires a resistance-to-ground of 10 ohms or less.

The contractor performing the electrical installation can verify ground resistance. Technicians from Daktronics Sales and Service offices can also provide this service.

The system **must** be connected to an earth electrode installed at the system. Proper grounding is necessary for reliable equipment operation. It also protects the equipment from damaging electrical disturbances and lightning. The system **must be** properly grounded, or the warranty will be void. Refer to **Drawing A-246801**, for information on where to connect the grounding wire.

The material for an earth-ground electrode differs from region to region and may vary according to conditions present at the site. Consult the National Electrical Code and any local electrical codes that may apply. The support structure of the system cannot be used as an earth-ground electrode. The support is generally embedded in concrete. If it is in earth, the steel is usually primed or it will corrode, making it poor ground.

4.2   Lightning Protection

The use of a disconnect near the system to completely cut all current-carrying lines significantly protects the circuits against lightning damage. The National Electrical Code also requires it. In order for this device to provide protection, the power **must** be disconnected when the system is not in use.

Section 5:   Sound Operation

The Sportsound 1000 system is multifaceted. Some components are briefly discussed here. For complete instructions on these and other components, refer to the manufacturer's manual from the **Reference Manuals** section on page 27.

5.1   Connections and Preparation

Connections

1.   Connect announcers rack with system with the 5 pin XLR cable provided.

2.   Plug in any microphones to the XLR input panel on the announcers rack with XLR cables.

3.   Plug in any auxiliary equipment (video, mp3 player, etc.) using the Video (XLR) or Aux (RCA) jacks provided on the rear input panel.

Preparation

1.   Ensure that you have a fresh supply of 9V batteries for the wireless microphones. Daktronics advises placing a new battery in each microphone before the beginning of each game.

2.   Install the microphone on the Referee, and lock the refs belt to **[ON]**, so that the Referee cannot accidentally bump the system off.
    a.   Transmitter On/Off Lock out for Referee's Microphone.
         Cycling the power switch 3 times in under 3 seconds and On-Lock will be displayed for a second and then return to normal operation. The power switch alone will no longer turn the unit off. To turn the unit off, put the power switch in the [**OFF**] position, open the batter door and press [**MENU**], [**SET**], [**Up**] or [**DOWN**] and the unit will power down. The next time the unit is powered on, the power switch will operation normally.

For more information, refer to **ED-15660** from the **Reference Manuals** section on page 27.

5.2 Power-Up

The power switch turns the speaker cabinet ON as shown in **Figure 16**.

Note: Power does not need to be turned on in the announcers rack for this to work. Always turn off and unplug the 5-Pin XLR from the back of the Announcers Rack when not in use.

Figure 15: Power switch

1. Turn the power to the speaker cabinet from the sign's power panel to **[ON]**.

   Note: Two green lights on the bottom of the Sportsound 1000 cabinet will verify if the power is on.

2. Verify sound system switch is turned **[OFF]** and the RANE mixer is turned down.

3. Plug in announcer rack and turn on the Furman smart power strip located at the top of the rack. This will provide power to the announcer's rack.

   Note: Red switch will glow in the **[ON]** position.

For more information, refer to **ED-15655** and **ED-15658** from the **Reference Manuals** section on page 27.

5.3 Turning the System On

The Sportsound 1000 system consists of two main parts, the speaker cabinet (incorporated into the scoreboard structure) and the control equipment (announcer's rack) in the control location.

1. Flip sound system switch to the **[ON]** position. This will turn the speaker cabinet on.

   Note: An amber light will appear on the bottom of the Sportsound 1000 to verify connection and that the speaker cabinet has turned on.

2. Insert a CD into the CD player.

3. Turn the CD input up to 6 or 7.

4. Start turning up the A output until desired sound levels are met. This will be around 6 for normal games but may vary depending on the venue. The audio meter should average about OdB. For game level, point where the meter averages in the yellow colored section. This indicates audio is leaving the announcers rack and a red pulsing LED on the bottom of the Sportsound 1000 will indicate audio is entering the speaker cabinet.

5. Send a signal from a connected device (mp3 player, video, etc) and turn up corresponding knobs to desired volume levels.

6. Speak into the microphone and turn up their corresponding knobs to desired volume level.

5.4   Perform a Clear Scan

The Sportsound 1000 control system may include wireless microphones. This microphone consists of a microphone interfaced to a battery-powered transmitter. The transmitter is housed in the body of the handheld microphone. Perform a ClearScan on all of the wireless units before the game.

Depending on the area, a search may need to be done for clear frequencies for the wireless microphones. Cell phones, TV and radio transmitter all compete for wireless frequencies. To minimize interferences, consult the Telex Quickstart Guide and run the clear scan functionality.

In highly saturated areas (close to a TV or radio tower), there may only be a select number of frequencies to choose from. In this situation, consult Telex for support.

1. Turn the microphone and/or beltpacks to **[ON]**.

2. Verify the group and channel numbers match.

3. Check the receiver display for the battery strength. Replace batteries if needed.

4. Speak into microphone and turn up to the desired level.

5. If experiencing intermittent sound, perform a Clear Scan.

For more information, refer to **ED-15660** from the **Reference Manuals** section on page 27.

5.5   Operation

1. Adjust input device levels as needed. CD's will vary from disk to disk and need to be adjusted accordingly.

2. If announcers microphone is too quiet verify the talker is talking into the microphone and not at a distance from his/her face before turning the sound up. Microphones should be used within a few inches of the mouth.

3. Auxiliary 8 input devices will also vary in signal strength.

5.6 Powering Down

1. Turn the sound system knob to **[OFF]**.

2. Turn the power conditioner to **[OFF]**.

3. Unplug the 5 pin XLR and power connections to the announcers rack.

4. When the scoreboard is powered off at the breaker panel, power off the breaker that controls the cabinet.

Section 6: Maintenance and Troubleshooting

6.1 Maintenance

Grille maintenance and cleaning

To allow maximum acoustic transparency, the front of the cabinet contains a PVC mesh grille. Do not apply anything to the surface, which may obstruct the holes in the material. To maintain the brightness of the colors and prolong the life of the grille, periodic cleaning is necessary to remove build-up. Failure to clean periodically may result in permanent discoloration or staining. When cleaning, use a mildly soapy solution (Dove®, Ivory®, etc.) and a very soft brush. To protect the printed surface of the grille a circular motion is recommended. Rinse with clean water with a normal faucet pressure.

Note: Do not use a power washer.

Troubleshooting

This section lists potential problems with the system, indicates possible causes, and suggests corrective action. This list does not include every possible problem, but it does represent some of the more common situations that may occur. If individual components fail to work, refer to troubleshooting sections in the manufacturers manuals located in the **Reference Manuals** section on page 27. If the problem persists, please contact Daktronics for assistance.

Note: The standard level used to test Sportsound equipment is Level 5, or knobs turned to the 12 o'clock position.

Symptom/ Condition	Possible Cause	Potential Solution
No sound from cabinet	Portable announcers rack is not powered up	Power up portable announcers rack
No sound from cabinet	Portable announcers rack is not plugged into the signal jack	Plug portable announcers rack into signal jack
No sound from cabinet	Individual components are not powered up	Power up individual components
No sound from cabinet	Master volume control on the mixer are not turned up to standard level	Turn volume up to standard level
No sound from cabinet	Individual component volume controls on the mixer are not turned up to standard level	Turn individual volume controls up to standard level

No sound from cabinet	Announcer microphone is not plugged into appropriate input on the back of the portable announcers rack	Plug in announcer microphone into appropriate input in the back of the portable announcers rack
No sound from cabinet	The in-line announcers handheld press to talk microphone switch is not being pressed	Press the press to talk switch before speaking into the microphone
No sound from cabinet	The main switch or breaker is not in the on position at the speaker cabinet location	Turn the main switch or breaker to the on position at the speaker cabinet location
For Wireless		
No sound from cabinet	The battery is not installed properly in the transmitter	Reinstall the battery properly
No sound from cabinet	The battery is not providing full power	Charge or replace battery
No sound from cabinet	The transmitter is not switched to the on position	Switch the transmitter to the on position
No sound from cabinet	The transmitter and receiver are set to different channels	Set to same channel

Indicator Lights

Speaker Cabinet

Each of the indicator lights signifies a specific operation as shown in **Figure 18**.

Color	Indication
Green	Power circuit #1 is on
Amber	Announcers rack is turned on (sound system ON/OFF switch)
Red	Audio signal is present at the cabinet (Red LEDs will flash with the music)
Green	Power circuit #2 is on

Figure 16: Speaker cabinet indicator lights

Announcers Rack

This is a critical point in the trouble shooting process because it confirms that audio is leaving the mixer. Current models are equipped with a peak signal indicator shown in **Figure 19**, with red indicating that the signal leaving the rack is clipped or clipping is eminent.

Figure 17*: Peak signal indicator*

Section 7:   Replacement Parts

7.1   Cabinet parts

1. A-2165 power amplifiers SP-2
2. A-2166 power amplifiers SP-3
3. A-1903 15" speakers
4. A-1901 high frequency driver
5. A-1902 10" midrange speakers
6. A-2151 diaphragm kit
7. 0A-1340-0103 indicator light
8. A-1129 surge suppressor

7.2   Portable announcer's rack parts

1. A-1958 combination CD player /cassette deck
2. A-1960 microphone/line mixer
3. A-1959 power conditioner
4. 0A-1340-0126 rack indicator and switch plate assembly

7.3   Sportsound 1000 series options replacement parts

1. A-2024 Telex 500 HD **A-Band** UHF Wireless Microphone System
   A-2056 receiver (base, in rack)
   A-2146 microphone (handheld)
2. A-2023 Telex 1000 REF **A-Band** UHF Wireless Microphone System
   A-2056 receiver (base, in rack)
   A-2052 microphone (belt pack)
   A-2141 Telex, lapel mic
   A-1211 switch box
   A-2140 antenna for transmitter
   A-1972 Special Project mic
3. A-1985 Telex 500 HD **B-Band** UHF Wireless Microphone System
   A-2057 receiver (base, in rack)
   A-2147 microphone (handheld)
4. A-1984 Telex 1000 REF **B-Band** UHF Wireless Microphone System
   A-2054 receiver (base, in rack)

A-2051 microphone (belt pack)
A-2141 Telex, Lapel mic
A-1211 switch box
A-2140 antenna for transmitter
A-1972 Special Projects mic
5. A-1972 Head worn Microphone
6. A-1951 Wireless In-ear Talent Personal Monitor System
7. A-2016 ADA hearing assist kit
A-1908 in-ear speaker
A-2049 transmitter
A-2050 receiver
A-1907 universal antenna kit
8. A-1908 single ear bud
9. A-1987 Telex UAD4 antenna splitter
10. A-1987 antenna splitter
11. A-2026 Telex wall mount antenna
12. A-2000 Telex ¼ wave antenna

Section 8: Daktronics Exchange and Repair & Return Programs

To serve customers' repair and maintenance needs, Daktronics offers both an Exchange Program and a Repair & Return Program.

Exchange Program

Daktronics unique Exchange Program is a quick service for replacing key parts in need of repair. If a part requires repair or replacement, Daktronics sends the customer a replacement, and the customer sends the defective part to Daktronics. This decreases display downtime.

Before Contacting Daktronics

Write important part numbers:

Display Serial Number: _____

Display Model Number: _____

Contract Number: _____

Date Installed: _____

Location of Sign (Mile Marker Number): _____

Daktronics Customer ID Number: _____

To participate in the Exchange Program, follow these steps.

1. **Call Daktronics Customer Service:**

Market Description	Customer Service Call Number
Schools - primary through community/junior colleges, Religious organizations, Municipal clubs and community centers	877-605-1115
Universities and professional sporting events, Live events for auditoriums and arenas	866-343-6018
Financial institutions, Petroleum, Sign companies, Gaming, Wholesale/Retail establishments	866-343-3122
Department of Transportation, Mass Transits, Airports, Parking Facilities	800-833-3157

2. **When the new exchange part is received, mail the old part to Daktronics.**
If the replacement part fixes the problem, send in the problem part, which is being replaced.
   a. Package the old part in the same shipping materials in which the replacement part arrived.
   b. Fill out and attach the enclosed UPS shipping document.
   c. Ship the part to Daktronics.

3. **A charge will be made for the replacement part immediately, unless a qualifying service agreement is in place.**
In most circumstances, the replacement part will be invoiced at the time it is shipped.

4. **If the replacement part does not solve the problem, return the part within 30 working days or the full purchase price will be charged.**
If, after the exchange is made the equipment is still defective, please contact Customer Service immediately. Daktronics expects *immediate return* of an exchange part if it does not solve the problem. The company also reserves the right to refuse parts that have been damaged due to acts of nature or causes other than normal wear and tear.

Repair & Return Program

For items not subject to exchange, Daktronics offers a Repair & Return Program. To send a part for repair, follow these steps

1. **Call or Fax Daktronics Customer Service:**
Refer to the appropriate market number in the chart listed on the previous page.
Fax: 605-697-4444

2. **Receive a Return Materials Authorization (RMA) number before shipping.**
This expedites repair of the part.

2. **Package and pad the item carefully to prevent damage during shipment.**
Electronic components, such as printed circuit boards, should be placed in an antistatic bag before boxing. Daktronics does not recommend Styrofoam peanuts in packaging.

3. **Enclose:**
   - your name
   - address
   - phone number
   - the RMA number
   - a clear description of symptoms

Shipping address

Mail: Customer Service, Daktronics
PO Box 5128
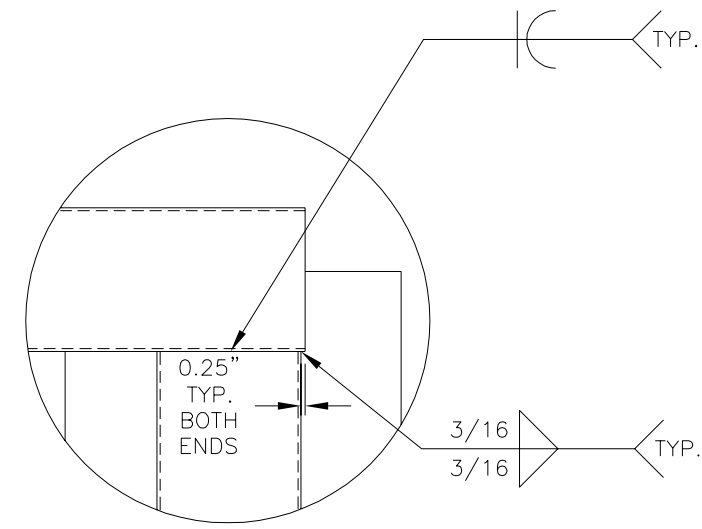331 32nd Ave
Brookings, SD 57006

Reference Drawings

Drawings in this manual are referenced by their last set of digits and the letter preceding them. Drawings in this appendix are listed in alphanumeric order.
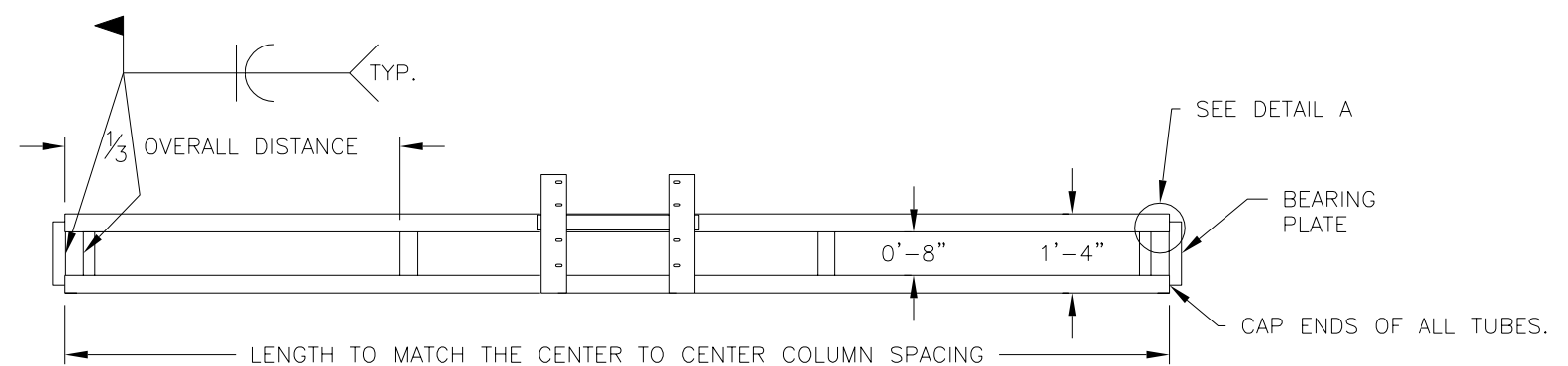
SPORTSOUND STRUCTURAL MOUNT

HORIZONTAL C-C COLUMN SPACING (FT) A	MAX ELEVATION TO TOP OF DISPLAY (FT)	DESIGN WIND VELOCITY (MPH)		
		70	80	100
8	40	HSS 3x3x3/16	HSS 3x3x3/16	HSS 3x3x3/16
9	40	HSS 3x3x3/16	HSS 3x3x3/16	HSS 3x3x3/16
10	40	HSS 3x3x3/16	HSS 3x3x3/16	HSS 4x4x3/16
11	40	HSS 3x3x3/16	HSS 3x3x3/16	HSS 4x4x3/16
12	40	HSS 3x3x3/16	HSS 3x3x3/16	HSS 4x4x3/16
13	40	HSS 4x4x3/16	HSS 4x4x3/16	HSS 4x4x3/16
14	40	HSS 4x4x3/16	HSS 4x4x3/16	HSS 4x4x3/16
15	40	HSS 4x4x3/16	HSS 4x4x3/16	HSS 4x4x3/16
16	40	HSS 4x4x3/16	HSS 4x4x3/16	HSS 4x4x3/16

HSS 3x3x3/16 ← RECOMMENDED SPEAKER HORIZONTAL SIZE

0.25" TYP. BOTH ENDS

3/16
3/16 TYP.

TYP.

DETAIL: A
(8 X SCALE)

⅓ OVERALL DISTANCE

TYP.

SEE DETAIL A

BEARING PLATE

0'-8"   1'-4"

CAP ENDS OF ALL TUBES.

LENGTH TO MATCH THE CENTER TO CENTER COLUMN SPACING

TOP VIEW

FRONT VIEW

COLUMNS

INFORMATION GIVEN IS FOR ESTIMATING PURPOSES ONLY. ALL TUBING MUST BE DESIGNED BY A STATE LICENCED ENGINEER. DAKTRONICS DOES NOT ASSUME ANY LIABILITY FOR ANY INSTALLATIONS DERIVED FROM THIS INFORMATION OR DESIGNED AND INSTALLED BY OTHERS.

DAKTRONICS, INC.   BROOKINGS, SD 57006

PROJ: SPORTSOUND SYSTEM
TITLE: SPORTSOUND SYSTEM STRUCTURAL MOUNT

DES. BY: JBRIGGS   DRAWN BY: JBRIGGS   DATE: 20APRIL05

01	20 FEB 06	ADDED DETAIL A, UPDATED FRAME DESIGN AND CHANGED TO B SIZE DRAWING.	JKU	
REV.	DATE	DESCRIPTION	BY	APPR.

REVISION 01   APPR. BY: SCALE: 1/8"=1'

1340-E10B-239409

REAR VIEW

(A) TWO, 20AMP BRANCH CIRCUITS (2WIRES + GND FOR EACH), IN CONDUIT. CONDUCTORS AND CONDUIT TO BE SIZED, PROVIDED AND INSTALLED BY CUSTOMER. TERMINATION IN J-BOX TYPICALLY BY CUSTOMER.

(B) ONE, 2PAIR SIGNAL CABLE (WEST PENN 430, W-1614) IN DEDICATED CONDUIT. **NOTE: ANY CABLE RUNNING IN CONDUIT WITH AUDIO CABLE NEEDS TO BE APPROVED BY A DAKTRONICS ELECTRICAL ENGINEER.** CONDUIT BY CUSTOMER. CABLE TYPICALLY BY DAKTRONICS. TERMINATION TYPICALLY BY CUSTOMER.

NOTES:

THIS IS NOT A SCALED DRAWING AND SHOULD BE USED FOR POWER AND SIGNAL REQUIREMENTS ONLY.

IT IS THE RESPONSIBILITY OF THE ELECTRICAL INSTALLATION CONTRACTOR TO ENSURE THAT ALL ELECTRICAL WORK PERFORMED ON SITE MEETS OR EXCEEDS ALL LOCAL AND NATIONAL ELECTRICAL CODES.

ALL SIGNAL CABLE RUNS SHOULD BE LABELED WITH THEIR ORIGIN AND DESTINATION ON EACH END.

ANY CABLE RUNNING IN CONDUIT WITH AUDIO CABLE NEEDS TO BE APPROVED BY A DAKTRONICS ELECTRICAL ENGINEER.

ALL DISPLAYS MUST BE GROUNDED PER ARTICLE 250 AND 600 OF THE NATIONAL ELECTRICAL CODE WITH NO MORE THAN 10 OHMS GROUND RESISTANCE.
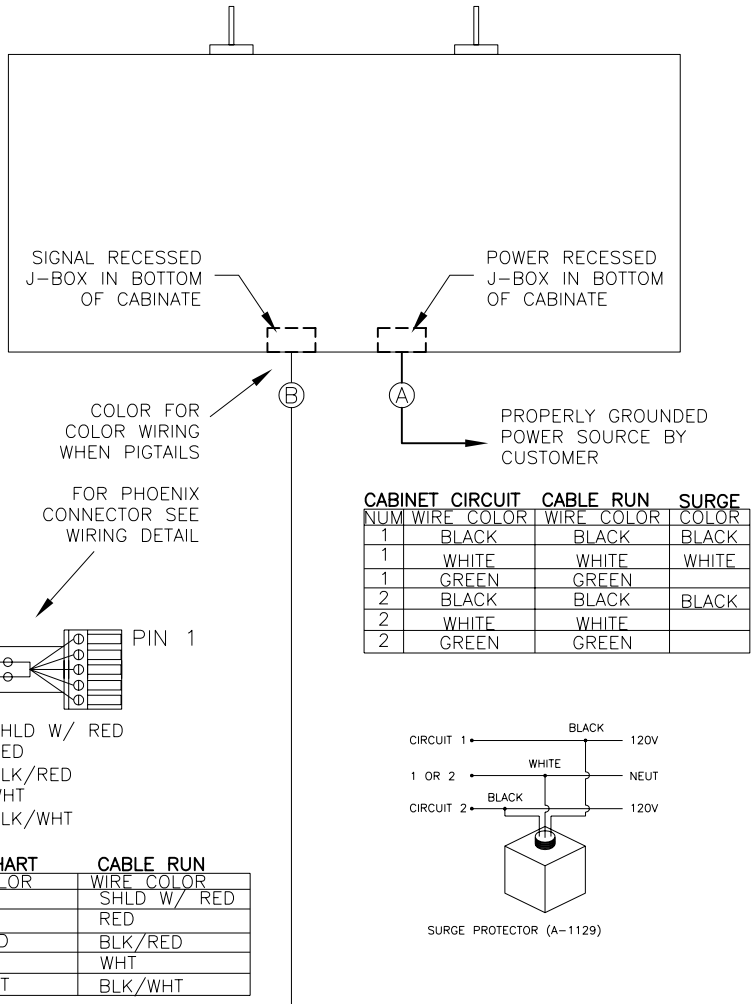
DAKTRONICS IS NOT RESPONSIBLE FOR THE QUALITY OF THE POWER DELIVERY SYSTEM TO THE DISPLAY SYSTEM.

POWER AND SIGNAL REQUIREMENTS ARE SPECIFIED TO THE EQUIPMENT AND SETUP SHOWN. ANY CHANGES MADE TO EQUIPMENT OR THEIR SETUP SHOULD BE DISCUSSED WITH DAKTRONICS DESIGN PERSONNEL AND WILL REQUIRE AN UPDATED RISER DIAGRAM DRAWING.

THE CONTRACTUAL AGREEMENT WILL DETERMINE THE PARTY OR PARTIES RESPONSIBLE FOR ITEMS LISTED AS FIELD INSTALLED. THIS DRAWING IS NOT INTENDED TO DETERMINE RESPONSIBILITIES AND SHOULD BE USED FOR REFERENCES ONLY.

———— EXTERNALLY MOUNTED HARDWARE
- - - - INTERNALLY MOUNTED HARDWARE

SIGNAL RECESSED J-BOX IN BOTTOM OF CABINATE

POWER RECESSED J-BOX IN BOTTOM OF CABINATE

COLOR FOR COLOR WIRING WHEN PIGTAILS

FOR PHOENIX CONNECTOR SEE WIRING DETAIL

PROPERLY GROUNDED POWER SOURCE BY CUSTOMER

PIN 1

PIN1: SHLD W/ RED
PIN2: RED
PIN3: BLK/RED
PIN4: WHT
PIN5: BLK/WHT

CABINET CIRCUIT		CABLE RUN	SURGE
NUM	WIRE COLOR	WIRE COLOR	COLOR
1	BLACK	BLACK	BLACK
1	WHITE	WHITE	WHITE
1	GREEN	GREEN	
2	BLACK	BLACK	BLACK
2	WHITE	WHITE	
2	GREEN	GREEN	

CIRCUIT 1 — BLACK — 120V
1 OR 2 — WHITE — NEUT
CIRCUIT 2 — BLACK — 120V

SURGE PROTECTOR (A-1129)

J-BOX CHART — CABLE RUN

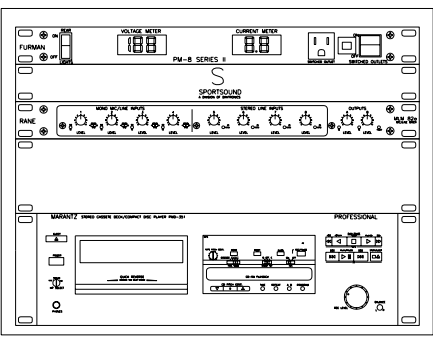| PIN	WIRE COLOR	WIRE COLOR
1	GREEN	SHLD W/ RED
2	RED	RED
3	BLK/RED	BLK/RED
4	WHT	WHT
5	BLK/WHT	BLK/WHT

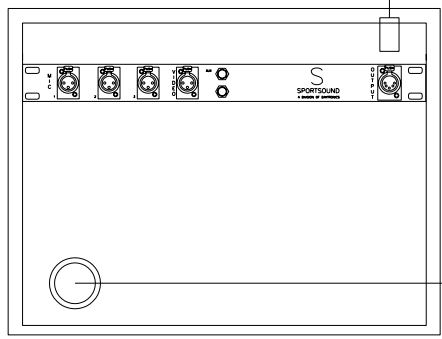INSTALLATION AND OPERATIONS MANUAL
ED-15605

0A-1340-0035
5PIN XLR J-BOX

FRONT VIEW

1000 SERIES, SPORTSOUND ANNOUNCER'S CASE. 20" X 22" X 21.5" DIMENSIONS.

ANNOUNCERS RACK CASE INCLUDES FRONT AND REAR REMOVABLE COVERS

REAR VIEW

W-1586
10FT CABLE
BY DAKTRONICS

STANDARD 3 PRONG POWER CORD WITH ANNOUNCERS ENCLOSURE. DEDICATED 15AMP, GROUNDED 3 PRONG OUTLET REQUIRED.

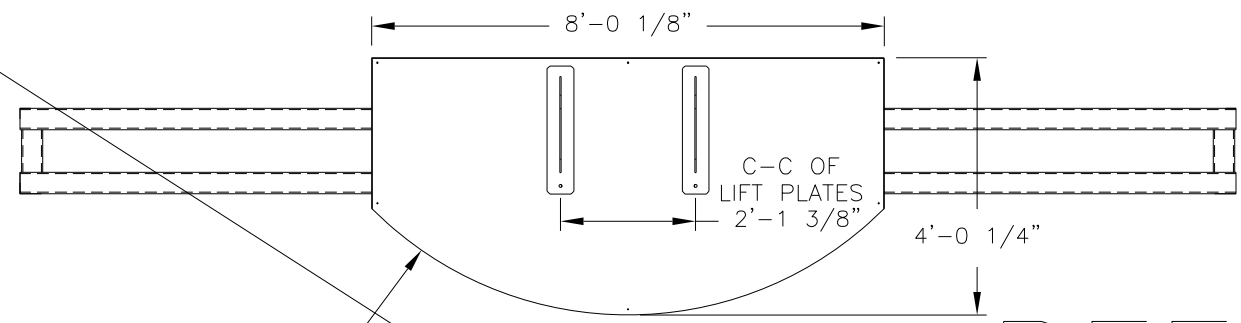| REV.	DATE	DESCRIPTION	BY	APPR.
04	04 OCT 07	ADDED CIRCUIT WIRING CHART CHANGED DIMENSIONS OF ANNOUNCERS CASE	AFL	
03	26 APR 07	ADDED DIAGRAM FOR WIRING USING A TERMINAL BLOCK	AFL	
02	1 NOV 05	CHG PR # TO W REVISE JOB WIRE COLORS	KZB	
01	13 JUL 05	UPDATED SYSTEM RISER, CHANGED W-1583 CABLE TO W-1586. UPDATED J-BOX WIRING.	MWM	

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: SPORTSOUND SYSTEMS
TITLE: SYSTEM RISER DIAGRAM; 1000 SERIES SPORTSOUND
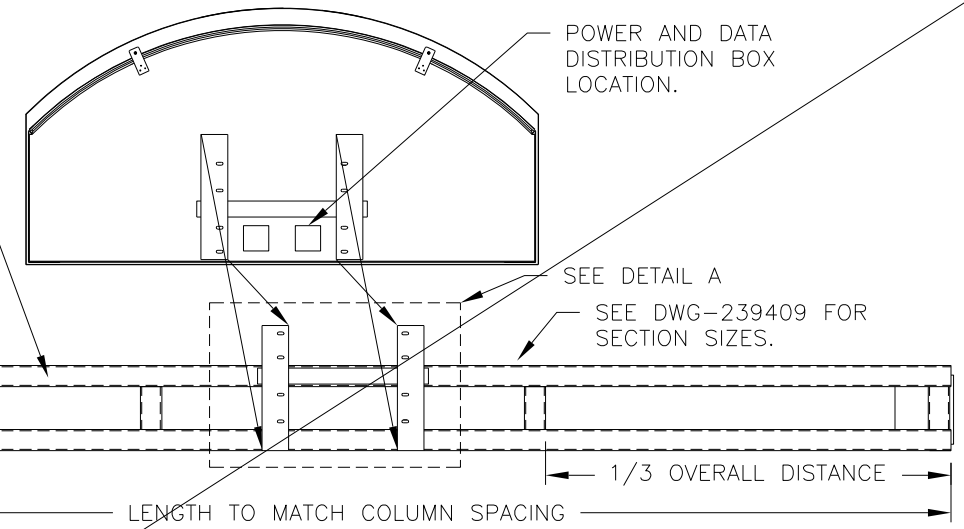DES. BY: MMILLER   DRAWN BY: MMILLER   DATE: 06 JUL 05
REVISION 04   APPR. BY:
SCALE: NONE
1340-R01A-246801

REFERENCE DRAWING 380727

TOP VIEW

8'-0 1/8"

C-C OF LIFT PLATES 2'-1 3/8"

4'-0 1/4"

SPEAKER MESH NOT SHOWN FOR CLARITY

DAKTRONICS SUBCONTRACTOR RESPONSIBLE TO HAVE STEEL FRAME CERTIFIED BY A QUALIFIED STRUCTURAL ENGINEER IN THE STATE OF INSTALLATION.
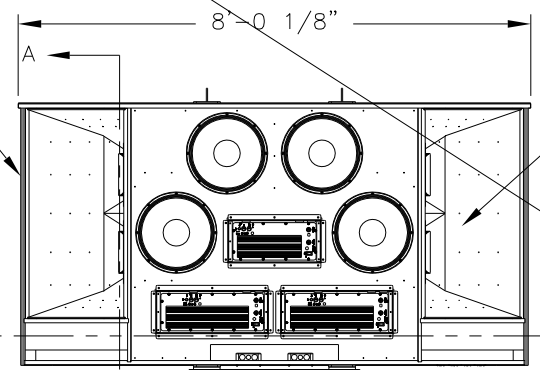
POWER AND DATA DISTRIBUTION BOX LOCATION.

STEEL FRAME PROVIDED AND INSTALLED BY DAKTRONICS SUB-CONTRACTOR

SEE DETAIL A

SEE DWG-239409 FOR SECTION SIZES.

1/3 OVERALL DISTANCE

LENGTH TO MATCH COLUMN SPACING

SECTION: B-B

FRONT VIEW

8'-0 1/8"

SPEAKER CABINET @ 1150 LBS.

LIFT PLATE @2 Ø0'-1" HOLE

1" TILT

0'-5 1/4"

CUSTOMER RESPONSIBLE TO HAVE COLUMNS AND FOOTINGS CERTIFIED WITH THE ADDITIONAL LOADING BY A QUALIFIED STRUCTURAL ENGINEER.
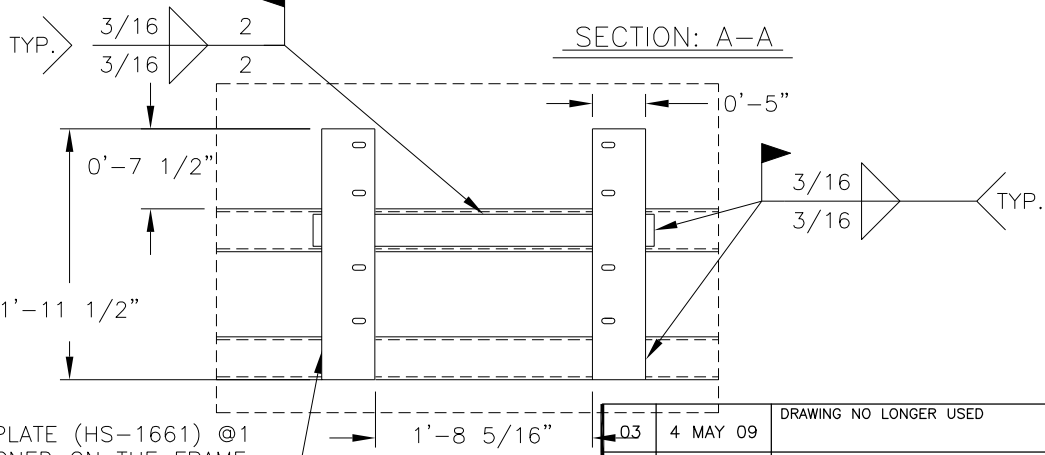
GRADE

GRADE

MAX COLUMN SPACING = 19' C-C

ATTACH SPEAKER CABINET TO STRUCTURE USE 1 BOLT (HC-1444), 1 FLAT WASHER, AND 1 NYLOCK NUT PER STUD. USE 1/2" GR. 5 HARDWARE.

NOTE: INSERT BOLT FROM BOTTOM

DETAIL: B
(2 X SCALE)

1/2" PLATE OVERSIZE BY 1/2" EACHWAY OF I BEAM.

3/16
3/16 TYP.

TYP. 3/16
3/16 2
2

SECTION: A-A

0'-7 1/2"

0'-5"

1'-11 1/2"

3/16
3/16 TYP.

1'-8 5/16"

1/2" STEEL SUPPORT PLATE (HS-1661) @1 HORIZONTALLY ALIGNED ON THE FRAME PROVIDED BY DAKTRONICS, INSTALLED BY DAKTRONICS SUB-CONTRACTOR (REF PACKET: 0A-1340-0044)
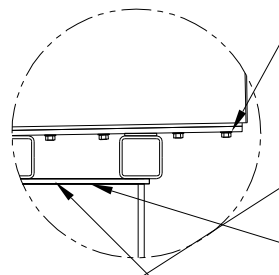
DETAIL: A
(2 X SCALE)

NOTES:

1.0 REFERENCE
1.1 REFER TO DAKTRONICS RISER DIAGRAM 1340-R10B-244827 FOR ALL ELECTRICAL POWER AND DATA SPECIFICATIONS.
1.2 REFER TO DAKTRONICS DRAWING 239409 FOR STRUCTURE CONSTRUCTION DETAILS.
1.3 THE SHOWN INSTALLATION MUST BE APPROVED BY THE CUSTOMER AND CERTIFIED IN THE STATE IN WHICH IT IS INSTALLED BY A QUALIFIED STRUCTURAL ENGINEER BEFORE IT CAN BE USED FOR FABRICATION OR ERECTION.

2.0 GENERAL NOTES
2.1 ALL DIMENSIONS ARE IN FEET AND INCHES.
2.2 REFER TO INSTALLATION AND MAINTENANCE MANUAL FOR COMPLETE INSTALLATION INSTRUCTIONS.

3.0 SOUND CABINET NOTES
3.1 DAKTRONICS SOUND CABINET IS A MARINE GRADE PLYWOOD CONSTRUCTION AND PROTECTED WITH AN ALUMINUM SHEETING.
3.2 LIFT PLATES ARE PROVIDED BY DAKTRONICS. WHEN LIFTING USE 45° OR GREATER, FROM THE HORIZON, CABLE SYSTEM.

4.0 STRUCTURAL NOTES
4.1 ALL STRUCTURAL STEEL SHALL BE ASTM A36, EXCEPT: TUBING SHALL BE A500-B, WIDE FLANGE SHAPES SHALL BE A992-B.
4.2 BEFORE PAINTING OR PRIMING, ALL STRUCTURAL STEEL MUST BE PREPARED TO MEET CUSTOMERS SPECIFICATIONS BY THE FABRICATION SUBCONTRACTOR. THIS MAY INCLUDE SANDBLASTING, SOLVENTS, AND GRIDING. ALL STEEL MUST BE COATED AND PROTECTED BY RED OXIDE OR GALVANIZED TO MEET CUSTOMERS SPECIFICATIONS, AND THEN FINISHED PER COLOR INDICATED BY THE CUSTOMER BY THE FABRICATION SUBCONTRACTOR.
4.3 PAINT MUST BE TOUCHED UP AFTER ERECTION BY THE INSTALLATION SUBCONTRACTOR.
4.4 FABRICATION AND ERECTION SHALL CONFORM TO THE LATEST EDITION OF AISC SPECIFCATIONS.
4.5 ALL WELDING (SHOP AND FIELD) SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1 LATEST EDITION SPECIFICATIONS BY A CERTIFIED WELDER USING E70XX ELECTRODES.
4.6 ALL HOLLOW STEEL SECTIONS MUST BE CAPPED AND WELDED ALL AROUND TO PREVENT WATER FROM ENTERING THE SECTION.
4.7 DAKTRONICS DESIGNED STRUCTURAL HARDWARE DOES NOT INCLUDE ANY TENSION CONTROL HARDWARE. TORQUE ON BOLTS TO FOLLOW THE "TURN OF THE NUT METHOD" OF TIGHTENING, UNLESS OTHERWISE NOTED.

5.0 PROJECT RESPONSIBILITY
5.1 DAKTRONICS' AND CUSTOMER SUBCONTRACTORS SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO INSTALLATION.
5.2 ALL SUBCONTRACTORS SHALL PERFORM WORK IN ACCORDANCE WITH OSHA REQUIREMENTS AND ANY LOCAL CODES THAT APPLY.
5.3 EACH SUBCONTRACTOR IS SOLELY RESPONSIBLE FOR JOBSITE SAFETY.
5.4 ERECTION SUBCONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGNING AND PROVIDING TEMPORARY BRACING.
5.5 EACH SUBCONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF WASTE MATERIALS ON THE JOBSITE.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: SPORT SOUND SYSTEMS- 1000 SERIES
TITLE: SHOP DWG: STANDARD 1000 SERIES CABINET
DES. BY: DTREML   DRAWN BY: JREDICK   DATE: 1 JULY 05

REV.	DATE	DESCRIPTION	BY	APPR.
03	4 MAY 09	DRAWING NO LONGER USED	KCS	
02	02 AUG 07	UPDATED CONNECTION OF CABINET TO PLATE ASSY. AND ADDED UPDATED VIEWS OF CABINET	BJH	
01	20 FEB 06	UPDATED THE STEEL SUPPORT PLATE AND SQUARED THE ENDS OF THE FRAME.	JKU	

REVISION 03   APPR. BY: SCALE: 3/8"=1'

1340-E10B-246571

DETAIL A

REAR VIEW

A2

A3

A1

A2 PIN 5 ← ← ⊞ ───────── TO S01 BLK
A2 PIN 6 ← ← ⊞ ───────── TO S01 RED
A2 PIN 4 ← ← ⊞ ───────── TO S04 RED
A2 PIN 1 ← ← ⊞ ───────── TO S04 BLK
A2 PIN 3 ← ← ⊞ ───────── TO S08 BLK
A2 PIN 2 ← ← ⊞ ───────── TO S08 RED

A3 PIN 6 ← ← ⊞ ───────── TO S02 RED
A3 PIN 5 ← ← ⊞ ───────── TO S02 BLK
A3 PIN 1 ← ← ⊞ ───────── TO S06 BLK
A3 PIN 4 ← ← ⊞ ───────── TO S06 RED
A3 PIN 2 ← ← ⊞ ───────── TO S10 RED
A3 PIN 3 ← ← ⊞ ───────── TO S10 BLK

A1 PIN 1 ← ← ⊞ ───────── TO S11 BLK
A1 PIN 4 ← ← ⊞ ───────── TO S11 RED
A1 PIN 2 ← ← ⊞ ───────── TO S12 RED
A1 PIN 3 ← ← ⊞ ───────── TO S12 BLK

DETAIL B

OVERALL VIEW

DETAIL F

DETAIL E

DETAIL D

DETAIL C

REAR VIEW

SIDE VIEW

RED + ○ ○ − BLK

NOTE: TO CONNECT SPEAKER WIRES, LOOSEN SCREW TERMINAL THEN SLIDE IN
WIRE THROUGH HOLES AND TIGHTEN SCREW AGAIN.
WHITE WIRE TO RED TERMINAL, BLACK WIRE TO BLACK TERMINAL.
WHT/RED = +
BLK   = −
WHEN WIRING DOUBLE CHECK WIRES, POSITIVE TO RED AND NEGATIVE TO BLK.
EVERY SPEAKER NEEDS A PAIR OF BLK AND RED. NEVER SWAP POLARITY.

REAR VIEW

DETAIL D

A-1901
1 HIGH FREQ. DRIVER
SEE DETAIL 'C' FOR WIRING

S05   S02   S06

S09   S10

S05,S06,S09,S10
A-1902
10" MIDRANGE SPEAKER
SEE DETAIL 'C' FOR CONNECTIONS

REAR VIEW

DETAIL E

S11   S12

S13   S14

TO A1

S11−S14
A-1903
15" SUBWOOFER
SEE DETAIL 'C' FOR CONNECTIONS

TO A3

TO A2

REAR VIEW

DETAIL F

A-1901
1 HIGH FREQ. DRIVER
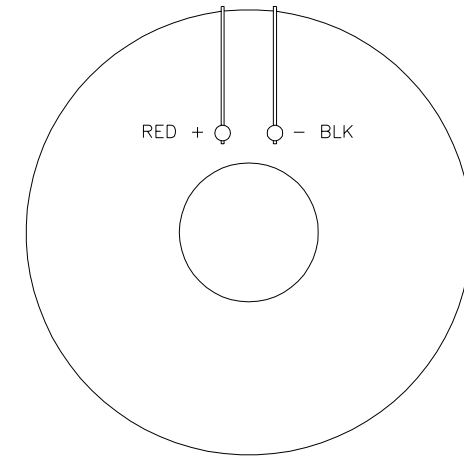SEE DETAIL 'C' FOR WIRING

S03,S04,S07,S08
A-1902
10" MIDRANGE SPEAKER
SEE DETAIL 'C' FOR CONNECTIONS

S04   S01   S03

S08   S07

0A-1340-0093
HARNESS; 1000 SERIES, SPEAKER

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: SPORTSOUND SYSTEMS		
TITLE: 1000 SERIES, SPEAKER CABINET WIRING		
DES. BY: JCARLSO	DRAWN BY: JCARLSO	DATE: 14 FEB 07

REVISION	APPR. BY: MMILLER	
00	SCALE: NONE	1340-R10B-297102

REV.	DATE	DESCRIPTION	BY	APPR.

S01 (A-1901)

S02 (A-1901)

S05 (A-1902)

S06 (A-1902)

S09 (A-1902)

S10 (A-1902)

S03 (A-1902)

S04 (A-1902)

S07 (A-1902)

S08 (A-1902)

S13 (A-1903)

S11 (A-1903)

S14 (A-1903)

S12 (A-1903)

I01

INDICATOR CIRCUIT
J1 SIG-IN   J2 SIG-OUT
TB1 24VIN   TB2 MUTE
J3 120V   J4 120V

0A-1340-0103

SIG_IN
RELAY_IN

SIG_OUT
MUTE_OUT

0A-1340-0096

A03

3 CHANNEL AMPLIFIER
SIG IN   OP3
SIG OUT
STANDBY   OP2
PWR OUT
PWR IN   OP1

SP3-1000-1000-500
A-2166

A3_SIG_IN
A3_SIG_OUT

A03_PIN_5&6
A03_PIN_1&4
A03_PIN_2&3

0A-1340-0043

A02

3 CHANNEL AMPLIFIER
SIG IN   OP3
SIG OUT
STANDBY   OP2
PWR IN
PWR OUT   OP1

SP3-1000-1000-500
A-2166

A2_SIG_IN
A2_SIG_OUT

A02_PIN_5&6
A02_PIN_1&4
A02_PIN_2&3

0A-1340-0043

A01

2 CHANNEL AMPLIFIER
SIG IN   OP1
SIG OUT
STANDBY   OP2
PWR IN
PWR OUT

SP2-1000-1000
A-2165

A1_SIG_IN

A01_PIN_1&4
A01_PIN_2&3

SIG BRACKET

TO ANNOUNCER'S RACK CONTACT SWITCH
AUDIO FROM ANNOUNCER'S RACK

POWER BY CUSTOMER

PWR J-BOX

SURGE
SUPRES

CIRCUIT 2: 10.4 AMPS

CIRCUIT 1: 15.6 AMPS

DWG-297102
SPEAKER WIRING DETAILS

ADD-3925
WIRE LABLES

TOP VIEW

8'-0 1/8"

C-C OF LIFT PLATES 2'-1 3/8"

4'-0 1/4"

SPEAKER MESH NOT SHOWN FOR CLARITY

SPEAKER CABINET @ 1150 LBS.

A

B — B

A

FRONT VIEW

CUSTOMER RESPONSIBLE TO HAVE COLUMNS AND FOOTINGS CERTIFIED WITH THE ADDITIONAL LOADING BY A QUALIFIED STRUCTURAL ENGINEER.

GRADE

MAX COLUMN SPACING = 19' C-C

8'-0 1/4"

4'-1 3/16"

REAR ACCESS PANEL FOR POWER, SIGNAL, INDICATOR, AND HIGH FREQ. DRIVER ACCESS

GRADE

REAR VIEW

SECTION: A-A

LIFT PLATE @2 ∅0'-1" HOLE

4'-1 1/4"

A

0'-5 1/8"

2' TILT

A

GRADE

DAKTRONICS SUBCONTRACTOR RESPONSIBLE TO HAVE STEEL FRAME CERTIFIED BY A QUALIFIED STRUCTURAL ENGINEER IN THE STATE OF INSTALLATION.

POWER AND SIGNAL CONDUIT ENTRANCE LOCATION

INDICATOR LIGHT FOR TROUBLE SHOOTING

STEEL FRAME PROVIDED AND INSTALLED BY DAKTRONICS SUB-CONTRACTOR

SEE DETAIL B

SEE DWG-239409 FOR SECTION SIZES.

1'-4"

1/3 OVERALL DISTANCE

LENGTH TO MATCH COLUMN SPACING

SECTION: B-B

ATTACH SPEAKER CABINET TO STRUCTURE USE 1 BOLT (HC-1444), 1 FLAT WASHER, AND 1 NYLOCK NUT PER STUD. USE 1/2" GR. 5 HARDWARE.

NOTE: INSERT BOLT FROM BOTTOM

3/16
3/16
TYP.

1/2" PLATE OVERSIZE BY 1/2" EACHWAY OF I BEAM.

DETAIL: A
(2 X SCALE)

0'-4 1/2"

0'-7 1/2"

1'-11 1/2"

3/16
3/16
TYP.

1'-8 7/8"

1/2" STEEL SUPPORT PLATE (HS-1661) @1 HORIZONTALLY ALIGNED ON THE FRAME PROVIDED BY DAKTRONICS, INSTALLED BY DAKTRONICS SUB-CONTRACTOR (REF PACKET: 0A-1340-0044)

DETAIL: B
(2 X SCALE)

NOTES:

1.0 REFERENCE
1.1 REFER TO DAKTRONICS RISER DIAGRAM 1340-R10B-244827 FOR ALL ELECTRICAL POWER AND DATA SPECIFICATIONS.
1.2 REFER TO DAKTRONICS DRAWING 239409 FOR STRUCTURE CONSTRUCTION DETAILS.
1.3 THE SHOWN INSTALLATION MUST BE APPROVED BY THE CUSTOMER AND CERTIFIED IN THE STATE IN WHICH IT IS INSTALLED BY A QUALIFIED STRUCTURAL ENGINEER BEFORE IT CAN BE USED FOR FABRICATION OR ERECTION.

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2.2 REFER TO INSTALLATION AND MAINTENANCE MANUAL FOR COMPLETE INSTALLATION INSTRUCTIONS.

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3.1 DAKTRONICS SOUND CABINET IS A MARINE GRADE PLYWOOD CONSTRUCTION AND PROTECTED WITH AN ALUMINUM SHEETING.
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4.3 PAINT MUST BE TOUCHED UP AFTER ERECTION BY THE INSTALLATION SUBCONTRACTOR.
4.4 FABRICATION AND ERECTION SHALL CONFORM TO THE LATEST EDITION OF AISC SPECIFCATIONS.
4.5 ALL WELDING (SHOP AND FIELD) SHALL BE PERFORMED IN ACCORDANCE WITH AWS D1.1-LATEST EDITION SPECIFICATIONS BY A CERTIFIED WELDER USING E70XX ELECTRODES.
4.6 ALL HOLLOW STEEL SECTIONS MUST BE CAPPED AND WELDED ALL AROUND TO PREVENT WATER FROM ENTERING THE SECTION.
4.7 DAKTRONICS DESIGNED STRUCTURAL HARDWARE DOES NOT INCLUDE ANY TENSION CONTROL HARDWARE. TORQUE ON BOLTS TO FOLLOW THE "TURN OF THE NUT METHOD" OF TIGHTENING, UNLESS OTHERWISE NOTED.

5.0 PROJECT RESPONSIBILITY
5.1 DAKTRONICS' AND CUSTOMER SUBCONTRACTORS SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO INSTALLATION.
5.2 ALL SUBCONTRACTORS SHALL PERFORM WORK IN ACCORDANCE WITH OSHA REQUIREMENTS AND ANY LOCAL CODES THAT APPLY.
5.3 EACH SUBCONTRACTOR IS SOLELY RESPONSIBLE FOR JOBSITE SAFETY.
5.4 ERECTION SUBCONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGNING AND PROVIDING TEMPORARY BRACING.
5.5 EACH SUBCONTRACTOR IS RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF WASTE MATERIALS ON THE JOBSITE.

DAKTRONICS, INC. BROOKINGS, SD 57006

PROJ: SPORTSOUND SYSTEMS; 1000 SERIES
TITLE: SHOP DWG; STANDARD 1000 SERIES W/REAR ACCESS
DES. BY: KSCHNAB   DRAWN BY: KSCHNAB   DATE: 27 MAR 08
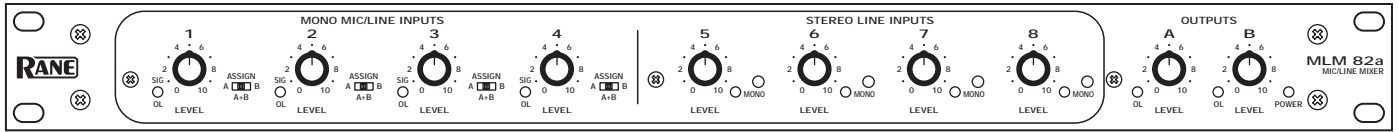REVISION APPR. BY:
01   SCALE: 3/8"=1'   1340-E10C-380727

| 01 | 12 MAY 08 | UPDATED DRAWING TO REFLECT CHANGES TO MOUNTING PLATE INCREASED ANGLE FROM 1 TO 2 DEGREES | KCS | |
| REV. | DATE | DESCRIPTION | BY | APPR. |

Reference Manuals

QUICK START

This section is provided as a convenience for those in a rush. If you are experienced with this unit or other Rane products, these few words will refresh your memory.

INPUTS 1 through **4** may be microphone or line level. The choice between the two is made by setting the **LINE** push buttons on the REAR of the unit next to the **MIC/LINE INPUT JACKS**. Each microphone input may be assigned to **A**, **B** or **A+B** outputs using the front panel **ASSIGN** switches.

INPUTS 5 through **8** are stereo line inputs which may be set to mono using the recessed **MONO** switches located on the front panel.

Internal switches allow setting output signal levels for **MIC** or **LINE.** The factory default setting is **LINE**. If the MLM 82a is connected directly to a power amplifier, equalizer or recorder input, choose **LINE** level. If the MLM 82a is connected to a microphone jack of an existing sound system, choose **MIC** level.

Once Inputs, Outputs, and power are properly connected, with the **OUTPUT LEVELS** counterclockwise (*off*), set the Input **LEVELS** as high as possible without causing the **SIG/OL** indicators to blink red except during extreme signal peaks. Now slowly raise the **OUTPUT LEVELS** as desired.

Never connect anything except an approved Rane power supply to the red thing that looks like a telephone jack on the rear of the MLM 82a. This is an AC input and requires special attention if you do not have a power supply *exactly* like the one that was originally packed with your unit. See the full explanation of the power supply requirements on page Manual-3.

MLM 82a CONNECTION

When connecting the MLM 82a to other components in your system for the first time, leave the power supply for last. This gives you a chance to make mistakes and correct them without damage to your fragile speakers, ears and nerves.
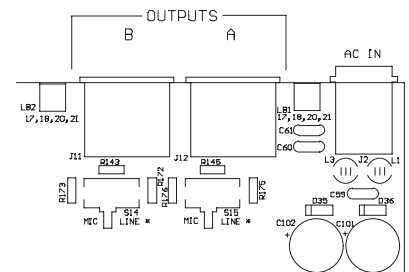
MIC/LINE INPUTS 1-4

The four XLR jacks provided on the MLM 82a are balanced MIC/LINE inputs. They will also accept unbalanced connectors. Use only shielded cable for inputs. For best noise rejection use two-conductor-plus-shielded wire, even for unbalanced operation. Connect the shield at both ends to help insure proper grounding. See the Sound System Interconnection RaneNote included with this manual for all cable adaptations. Rane follows the AES recommended practice of pin 2 positive, pin 3 negative, and pin 1 to shield. Switch any input connected to a microphone to the MIC position (*out*) using the associated switches on the rear panel. When connecting line level signals, switch the input to the LINE position (in). A single phantom power switch is provided for the four MIC inputs. *If LINE is selected, Phantom Power is disabled for that input.*

STEREO LINE INPUTS 5-8

The ¼" connectors are line-level balanced/unbalanced Inputs. If the MLM 82a is to be used with unbalanced sources, consult the Sound System Interconnection RaneNote included with this manual for proper wiring. Stereo Inputs use both A and B jacks at each INPUT. INPUTS 5 through 8 also serve as mono Inputs when the front panel MONO switch is engaged.

OUTPUTS

The MLM 82a's OUTPUTS are balanced. The same wiring conventions as the XLR Inputs apply. The type of device following the MLM 82a must be considered when setting the internal Output Level switch. Choose between LINE (0 dB) or MIC (-40 dB) output, the factory setting is LINE. If the MLM 82a is connected directly to a power amplifier input, choose LINE level. If the MLM 82a is connected to a micro-phone jack on an existing sound system, choose MIC level. For unbalanced OUTPUT connections *do not* tie pin 3 (i.e. "–") to ground.

WEAR PARTS: This product contains no wear parts.

FRONT PANEL DESCRIPTION
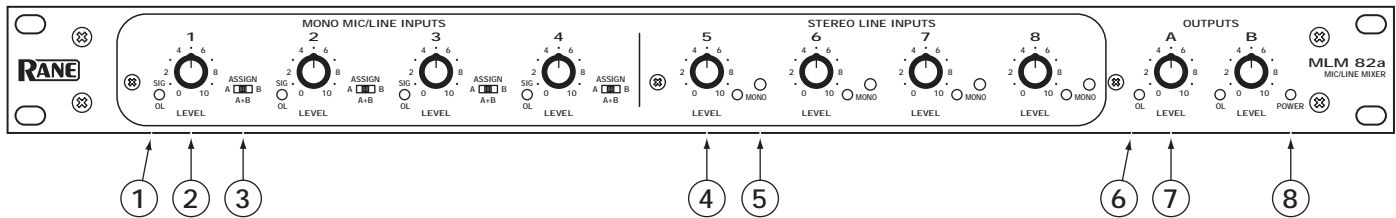
① **SIGnal present/OverLoad LED.** This bi-color LED lights green for a -30 dBu signal, and turns red when the Input is within 3 dB of clipping.

② **MONO MIC/LINE INPUT LEVEL controls 1-4** determine the MIC/LINE preamp gain and mix level to be assigned to the A, A+B, B Outputs.

③ **ASSIGN switches** determine between the **A, A+B** or **B** Outputs for each MIC/LINE input.

④ **STEREO LINE INPUT LEVEL controls 5-8** determine the amount of stereo or mono line Input routed to the Outputs.

⑤ **MONO switch** mixes the A and B sides of each STEREO LINE input together. When active, the associated LED lights, and the A and B Inputs for that channel have exactly the same level.

⑥ **OUTPUT OverLoad LED** illuminates within 3 dB of an approaching overload condition. To avoid this, the associated OUTPUT LEVEL control may be decreased, or the problem-causing individual Input Level may be lowered.

⑦ **A and B OUTPUT LEVEL controls** set the Output Level for A and B outputs.

⑧ **POWER LED** is lit whenever adequate power is applied to the unit.
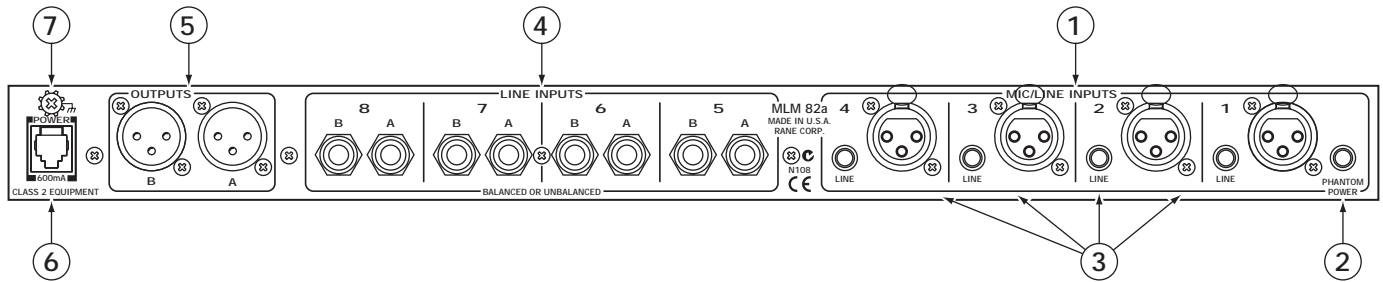
① **MIC/LINE INPUTS 1 through 4.** These XLRs connect either balanced Microphone or Line signals, depending on the LINE switch setting (see ③). Rane adheres to the international and U.S. standard for balanced pin configurations: Pin 1 is chassis ground (neutral), pin 2 is positive (+), and pin 3 is negative (–)**.**

② **PHANTOM POWER switch** applies 15 V Phantom Power to any Inputs 1-4 that are set for MIC Input.

③ **LINE Input selectors** switch the sensitivity and input impedance for either a microphone or line level input. If LINE is chosen, Phantom Power is deactivated for that Input.

④ **¼" LINE INPUTS.** These stereo pairs of balanced inputs accommodate stereo line-level signals. These TRS (Tip-Ring-Sleeve) ¼" jacks handle either balanced or unbalanced signals. In most cases an unbalanced signal may use a mono ¼" plug (Tip-Sleeve). See the Sound System Interconnection RaneNote included with this manual for proper connection.

⑤ **A and B OUTPUT jacks.** These balanced XLR's provide the A and B mixed output. INTERNAL OUTPUT LEVEL switches allow setting the output level for MIC or LINE level. Pin connections are the same as above in ①.

⑥ **POWER supply input.** *This is not a telephone jack.* The MLM 82a is supplied from the factory with an RS 1 remote power supply suitable for connection to this input jack. The power requirements call for an 18 volt AC center-tapped transformer only. Call the Rane factory for RS 1 replacement or substitution.

⑦ **Chassis ground point.** A #6-32 screw is provided for chassis grounding purposes. See the note below for details.

CHASSIS GROUNDING

   The MLM 82a is supplied with an external power supply (the RS 1). **This power supply does not ground the unit.** On the rear chassis a #6-32 screw is provided to allow for attachment of the grounding wire. This chassis ground point must be connected to earth ground either through another product which utilizes a three-prong grounded AC power cord or by attaching the wire to a known earth ground, (the screw on a grounded AC outlet.)

   If after hooking up your system it exhibits excessive hum or buzzing, there is an incompatibility in the grounding configuration between units somewhere. Your mission, should you accept it, is to discover how your particular system wants to be grounded. Here are some things to try:
 1. Try combinations of lifting grounds on units that are supplied with ground lift switches or links.
 2. If your equipment is in a rack, verify that all chassis are tied to a good earth ground, either through the line cord grounding pin or the rack screws to another grounded chassis.
 3. Try moving the device away from high magnetic field sources, such as large transformers used in power amplifiers.
    Please refer to the RaneNote "Sound System Interconection" for further information on system grounding.

OPERATING INSTRUCTIONS

MONO MICROPHONE/LINE LEVEL INPUTS 1-4

The microphone pre-amps in the MLM 82a have a combination gain trim, Level control. The LEVEL control adjusts both the input dynamic range and mix level. There is no need for the typical independent gain trim control found on most mixers. The PHANTOM POWER switch activates 15 volt Phantom Power for all Inputs selected for microphone use. With LINE selected, Phantom Power is defeated only in that Input. 15 volts is sufficient power for all but the most esoteric condenser microphones. If in doubt, check the manufacturer's microphone specs.

SIGNAL PRESENT/OVERLOAD INDICATORS

The MLM 82a has four bi-color indicators for Signal Present/Overload (green/red). Green indication occurs when there is a signal present above -30 dBu. This lamp should be glowing green when signal is present. If this lamp is *off*, check these possibilities:
A. The Input may not be connected.
B. There is little or no signal present at the moment.
C. There is a Mic connected to a channel switched to LINE.
D. The Mic needs Phantom Power (See Rear Panel, ②).
E. The LEVEL control needs to be increased (clockwise).
F. The cable is not wired properly (See the Sound System Interconnection RaneNote).

A red glowing LED indicates that the levels are so high that distortion due to clipping is occurring or imminent.
Check these conditions:
A. The LEVEL control may be turned too high.
B. The Output of the preceding device may need to be reduced.
C. The Input may be switched to MIC with a line-level source. Switch the Input to LINE.

STEREO LINE INPUTS 5 through 8 do not have overload indicators. Because 12 dB of gain is added after the STEREO LINE INPUT LEVEL controls, it is possible to overload a line input without an overload indication. The A and B OUTPUT OL indicators can overload from the Line Inputs if the OUTPUT LEVEL controls are set to 10. Although a single Input may be at unity gain, multiple active Inputs mixed together can cause an overload. If the OL indicators illuminate, just turn down the OUTPUT LEVELS until the overload stops—mix ratios will not change.

STEREO LINE LEVEL INPUTS 5-8

The STEREO LINE INPUT LEVEL controls adjust both A and B Inputs equally. Use the OUTPUT LEVEL controls together for overall output adjustment, or separately to control balance.

A single mono input may be used for the A and/or B inputs. Any mono source connected to A will go to the A output. Any mono source connected to the B input will go to the B output. If you wish one or two mono sources to go to both A and B outputs, press the MONO switch. If you wish to mono a single stereo source and have it present in A and B outputs, press the mono switch. STEREO LINE INPUTS 5-8 may each be independently set for mono operation.

HOLE PLUGS

To protect the setting of any rotary control, remove the knob by simply pulling it off, and snap in one of the hole plugs included with your unit.

To protect the entire front panel, use a Rane SC 1.7 Security cover.

FURMAN
PURIFY YOUR POWER

Owner's Manual

the 15 amp
series II
power conditioners

PL-8 II
PM-8 II
PL-PLUS II
PL-PLUS D

Furman Series II Features

- SMP+ with extreme voltage shutdown
- LiFT (Linear Filtering Technology) with zero ground contamination
- Eight rear panel outlets and one front panel outlet
- 15 amp rating, with circuit breaker
- Three year limited warranty

PL-8 Series II Additional Features

- Two retractable, long-life, low-heat LED light fixtures with dimmer control for rack illumination
- BNC connector on the rear panel allows you to attach any standard (12VAC 0.5 amp) gooseneck lamp to illuminate the rear of your rack

PL-PLUS Series II Additional Features

- Two retractable, long-life, low-heat LED light fixtures with dimmer control for rack illumination
- BNC connector on the rear panel allows you to attach any standard (12VAC 0.5 amp) gooseneck lamp to illuminate the rear of your rack
- Front panel meter to display incoming line voltage ranging from 90 to 128 volts (D version has a digital meter instead of LED's)

PL-PLUS D Series II Additional Features

- Two retractable, long-life, low-heat LED light fixtures with dimmer control for rack illumination
- BNC connector on the rear panel allows you to attach any standard (12VAC 0.5 amp) gooseneck lamp to illuminate the rear of your rack
- Laboratory precision Digital Voltmeter displays incoming line voltage (+/- 1 VAC)

PM-8 Series II Additional Features

- Laboratory precision Digital Voltmeter displays incoming line voltage (+/- 1 VAC)
- True RMS Current Meter displays power draw (+/- 0.5 amp)
- BNC connector on the rear panel allows you to attach any standard (12VAC 0.5 amp) gooseneck lamp to illuminate the rear of your rack

INTRODUCTION

Thank you for purchasing a Furman Series II Power Conditioner, and congratulations on your choice. The Series II power conditioners feature Furman's revolutionary Series Mode Protection Plus (SMP+) circuit, as well as our exclusive Linear Filtering Technology (LiFT). Together, these technologies comprise what is, without question, the world's most advanced and comprehensive transient voltage surge suppressor / conditioner.

SMP+ (Series Mode Protection Plus)

Furman's SMP+ surge suppression virtually eliminates service calls. Traditional surge suppression circuits "sacrifice" themselves when exposed to multiple transient voltage spikes, requiring the dismantling of your system, and repair of your surge suppressor. Not so with SMP+. With Furman's SMP+, damaging transient voltages are safely absorbed, clamped, and dissipated.

Unique to Furman's SMP+ is its unparalleled clamping voltage. While other designs offer clamping voltages that are well above 330 Vpk, Furman's SMP+ clamps at 188 Vpk, (133 VAC RMS) even when tested with multiple 6000 Vpk - 3000 amp surges! This unprecedented level of protection is only available with Furman's SMP+ technology. Additionally, Furman's trusted over-voltage circuitry protects against all too frequent accidental connections to 208 or 240 VAC, by shutting off the incoming power until the over voltage condition is corrected. *[For E versions: Furman's SMP clamps at 376 VpK, (266 VAC RMS.)]*

LiFT (Linear Filtering Technology)

Unfortunately, traditional AC filter - conditioners have been designed for unrealistic laboratory conditions. Prior technologies, whether multiple pole filter or conventional series mode, could actually harm audio and video performance more than they help, due to the resonant peaking of their antiquated, non-linear designs. Under certain conditions, these designs can actually add more than 10 dB of noise to the incoming AC line! Worse still, lost digital data, the need to re-boot digital pre-sets, or destroyed digital converters are frequently caused by excessive voltage spikes and AC noise contaminating the equipment ground. Furman's SMP with LiFT takes another approach, ensuring optimal performance through linear filtering and no leakage to ground.

SAFETY INFORMATION

To obtain best results from your Furman Series II Power Conditioner, please read this manual carefully before using.

WA R N I N G

To reduce the risk of electrical shock, do not expose this equipment to rain or moisture. Dangerous high voltages are present inside the enclosure. Do not remove the covers. Refer servicing to qualified personnel only. The lightning flash with an arrowhead symbol is intended to alert the user to the presence of un-insulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

IMPORTANT SAFETY INSTRUCTIONS
(Please read prior to installation)

1. Please read and observe all safety and operating instructions before installing your Series II unit. Retain these instructions for future reference.

2. Your Series II unit should not be used near water – for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, near a swimming pool, etc.

3. Do not place your Series II unit near heat sources such as radiators, heat registers, stoves, or other appliances that produce heat.

4. The PL-8 II, PL-Plus II, PL-Plus D II, and PM-8 II should only be connected to a 120 VAC, 60Hz, 15 amp grounded electrical outlet. Do not defeat the ground or change polarization of the power plug. *(E- versions 220 – 240 VAC 50 Hz. / J- versions 100 – 120 VAC 50 Hz.)*

5. Route the power cord and other cables so that they are not likely to be walked on, tripped over, or stressed. Pay particular attention to the condition of the cords and cables at the plugs, and the point where they exit your Series II unit. To prevent risk of fire or injury, damaged cords and cables should be replaced immediately.

6. Clean your Series II unit with a damp cloth only. Do not use solvents or abrasive cleaners. Never pour liquid on or into the unit.

7. Your Series II unit should be serviced by qualified service personnel when:

• The power supply cord or the plug has been frayed, kinked, or cut.
• Objects have fallen or liquid has spilled into the unit.
• The unit has been exposed to rain or other moisture.
• The unit does not appear to operate normally.
• The "Protection OK" indicator is not lit.
• The unit has been dropped, or the enclosure has been damaged.
• The retractable LED lights have failed. *(not applicable to the PM-8 II)*

8. Your Series II unit requires that a safety ground be present for proper operation. Any attempt to operate the unit without a safety ground is considered improper operation and could invalidate the warranty.

9. Do not attempt to service your Series II unit beyond what is described in this manual. All other servicing should be referred to qualified service personnel.

ADDITIONAL FEATURES

PL-8 SERIES II
The PL-8 II features LED rack lights which produce virtually no heat and provide an

extremely long life span. A dimmer control for the rack lights allows the user to adjust the level of illumination or simply switch the lights off. Additionally, a rear mounted BNC jack accepts any standard (12VAC 0.5 amp) gooseneck lamp for rear rack illumination. The PL-8 II has a master switch for all outlets that glows red when the power is on. The front-panel circuit breaker can be quickly and easily reset should the unit be overloaded. The PL-8 II also features a 10 foot, 14 gauge heavy-duty power cable.

PL-PLUS SERIES II

The PL-Plus II features LED rack lights which produce virtually no heat and provide an extremely long life span. A dimmer control for the rack lights allows the user to adjust the level of illumination or simply switch the lights off. A rear mounted BNC jack accepts any standard (12VAC 0.5 amp) gooseneck lamp for rear rack illumination.

Additionally, the PL-Plus II offers a 20 segment LED bar-graph meter that displays incoming voltage between 90 and 128 volts in 2-volt steps. The normal range voltages are indicated in green, with moderately and extremely high or low voltages in yellow and red respectively. The voltmeter's accuracy is ±2 volts. It can easily be re-calibrated, if necessary. *(E- versions 180 – 256 VAC in 4 volt steps   /   J-versions 80 - 118 VAC in 2 volt steps)*

The PL-Plus II has a master switch for all outlets that glows red when the power is on. The front-panel circuit breaker can be quickly and easily reset should the unit be overloaded. The PL-Plus II also features a 10 foot, 14

gauge heavy-duty power cable.

PL-PLUS D SERIES II

The PL-Plus D II features LED rack lights which produce virtually no heat and provide an extremely long life span. A dimmer control for the rack lights allows the user to adjust the level of illumination or simply switch the lights off. A rear mounted BNC jack accepts any standard (12VAC 0.5 amp) gooseneck lamp for rear rack illumination.

Additionally, the PL-Plus D II offers a laboratory precision digital meter that displays incoming voltage in 1-volt steps. The voltmeter's accuracy is ±1.5 volt.

The PL-Plus D II has a master switch for all outlets that glows red when the power is on. The front-panel circuit breaker can be quickly and easily reset should the unit be overloaded. The PL-Plus D II also features a 10 foot, 14 gauge heavy-duty power cable.

PM-8 SERIES II

The PM-8 II features two laboratory precision digital meters that display both incoming voltage in 1-volt steps, and a true R.M.S. current meter that measures the AC power draw within 0.5 amp. A rear mounted BNC jack accepts any standard (12VAC 0.5 amp) gooseneck lamp for rear rack illumination.

The PM-8 II has a master switch for the rear outlets that glows red when the power is on. The front-panel circuit breaker can be quickly and easily reset should the unit be overloaded. The PM-8 II also features a 10 foot, 14 gauge heavy-duty power cable.

OPERATION

Retractable Rack Lights, Rear Panel Lamp and Dimmer Control:
The PL-8 II, PL-Plus, and PL-Plus D II utilize a dimmer control for the two retractable front panel light tubes. The dimmer knob controls the brightness of both light fixtures. Turn it clockwise to increase brightness; turn it counterclockwise to decrease brightness. When the lights are not in use, we recommend turning the dimmer fully counterclockwise to maximize the life of the LED's, however, this is not absolutely necessary. Whether the light tubes are retracted or flush with the front panel, there will be no appreciable heat regardless of dimmer setting due to the efficiency of our full light spectrum LED's.

All Series II units feature a rear rack BNC socket which will accept any 12 VAC (0.5A) gooseneck lamp assembly, (such as the Furman GN-LED or GN-I). Simply slide the BNC plug over the socket and rotate clockwise until the connector snaps into the locked position. **The rear rack lamp can be powered on or off with the rear light power switch located on the far left of the front panel.** The Series II's front panel

LED lamps must be replaced by qualified Furman service personnel.

Multi-Segment LED voltmeter:
(PL-Plus II only)
This three-color, 20-LED bargraph is an accurate, self checking AC voltmeter that continually measures normal voltages. The meter reads from 90 to 128 volts in 2 volt increments (PL-PLUS E II: 180 to 256 volts, in 4 volt increments). The normal range voltages are indicated in green, with moderate and extremely high or low voltages in yellow and red respectively. The voltmeter provides three special flashing patterns to indicate abnormal conditions.

(1) If only the single leftmost (beneath the 90V mark – *180V for E version*) LED flashes, the input voltage is marginally low.

(2) If all of the LED's on the voltmeter flash, the input voltage is marginally high. Power to the PL-Plus's outlets will remain unless the incoming voltage rises above the Extreme Voltage Shutdown cutoff voltage (135 - 140 volts, 2*60 – 265 volts E version, 120 - 125 volts J version*).

Mains Vltg.	Voltage Status	Voltmeter Reading	Outlets
80-90	Low Marginal	The LED beneath the 90V mark flashes	ON
90-104	Low	Meter Reads in Low Red	ON
106-108	Medium Low	Meter Reads in Low Yellow	ON
110-120	Normal	Meter Reads in Green	ON
122-124	Medium High	Meter Reads in High Yellow	ON
126-128	High	Meter Reads in High Red	ON
130-140	High Marginal	All Meter LEDs Flash	ON
Above 140	Extreme (Shutdown)	Meter off—Extreme Voltage LED illuminates	OFF

(3) If none of the LED's on the voltmeter are lit, and the Extreme Voltages LED indicator is illuminated, then the PL-Plus II has shut down power to its outlets because the input voltage is in a range considered extreme (in excess of 135 volts - *260 volts E version, 120 volts J version*).

Digital Voltmeter:
(PL-Plus D II and PM-8 II only)
Furman's laboratory precision AC digital voltmeter continually measures incoming voltages, within a typical tolerance of +/- 1.5VAC. It should be noted that the voltage reading is incoming. No adjustment should be necessary on these units.

Digital Current Meter: **(PM-8 II only)**
Furman's laboratory precision AC digital current meter continually measures the total circuit AC load, within a typical tolerance of +/- 0.5 amp. Because these meters feature true R.M.S. technology, the current readings are accurate regardless of load conditions (capacitive, inductive or resistive).

NOTE: The PL-8 II, PL-Plus II, PL-Plus D II, and PM-8 II do not compensate for high or low line voltage. If you frequently move your rack to different locations, derive power from generators, use long extension cords, travel internationally, or are in an area prone to brownouts, you may benefit from the use of one of Furman's AC Line Voltage Regulators.

On/Off Rocker Switch:
This 15 amp capacity power switch is specifically designed to stand up to the enormous high inrush current demands of many Power Amplifiers. Additionally, the semi-transparent rocker lights when switched to the "ON" position. *(E-versions feature 10 amp capacity)*

Extreme Voltage Shutdown Indicator:
This LED is normally off. It monitors a hazard common in the entertainment industry: wiring faults – for example, accidental connection to 220VAC where 120VAC is expected, or an open neutral from a 208 or 240VAC feed. The Series II SMP+ circuit senses voltages that are so high that operation would be impossible and shuts the power down before damage can occur. Upon initially applying power to these units, the Extreme Voltage indicator LED will light if the input voltage is above the extreme voltage cutoff, and power will not be applied to the unit's outlets. If the unit has been operating with an acceptable input voltage and subsequently that voltage exceeds 135V, it will shut off power to the outlet and the Extreme Voltage LED will light.
E version: over voltage shut down is 260 VAC
J version: over voltage shut down is 125 VAC
Guards against open neutral and accidental connection to 300+ VAC

Protection OK Indicator:
Although the Furman SMP circuit assures virtually free protection from transient voltage spikes and surges, nature has a way of occasionally creating electrical forces that are beyond the capabilities of *any* TVSS device to absorb without some degree of damage. In the rare instance that this occurs, the green "Protection OK" LED indicator located on your front panel will dim. If this happens, some level of protection from voltage surges will remain, but the Furman's clamping voltage rating will be compromised. The unit must be returned to Furman Sound, or an authorized Furman Service center for repair.

NOTE: If the mains power is above the high cutoff voltage and has caused the unit to remove power from its outlets, it cannot restore power without the operator manually turning the unit off, then on again. Avoid turning the unit back on, without first checking the source of the problem, and perhaps changing the AC source.

TROUBLE SHOOTING GUIDE

1.) Symptom: No power to the AC outlets.

Possible Cause: Circuit breaker has tripped due to excessive load.

Action Needed: Remove one piece of equipment from the Series II unit, and push the square re-set tab into the Circuit breaker bezel.

2.) Symptom: No power to the AC outlets, "Protection OK" indicator is not lit.

Possible Cause: Either the AC outlet to which your Series II device is connected has no AC voltage present, or the unit has been subjected to a *sustained* voltage in excess of 400 Volts.

Action Needed: Plug the Series II unit into an AC receptacle where AC voltage is present. If the problem persists, the protection circuit may be damaged, and require factory service.

3.) Symptom: Extreme Voltage indicator lit.

Possible Cause: Input voltage is above 135- 140 volts *(260 – 265 volts E version, 120 - 125 volts J version),* causing power to the unit's outlets to be shut down. Additionally, if the voltage

is below 85 - 90 volts at turn on, the unit will not allow AC voltage to reach the outlets.

Action Needed: Correct the line voltage, then turn the unit on. Consider installing a Furman voltage regulator.

DEFINITIONS

SPIKE: This is a pulse of energy on the power line. Spikes can have voltages as high as 6000 volts. Though they are usually of very short duration, the energy they contain can be considerable, enough to damage sensitive solid-state components in audio and computer equipment. Spikes can also foul switch contacts and degrade wiring insulation. They are an unavoidable component of electric power. They are caused unpredictably by electric motors switching on or off (on the premises or outside), utility company maintenance operations, lightning strikes and other factors. Spikes (also called surges or transients) are absorbed by special components in the PL-8 and PL-PLUS to provide safe voltage levels to protect your equipment.

RFI/EMI INTERFERENCE: Noise from RFI (Radio Frequency Interference) or EMI (Electro Magnetic Interference) involves lower voltages and less energy than is found in spikes, but it is continuous rather than transient in nature. It is not likely to cause damage, but it can certainly be annoying, producing static in audio circuits, "snow" on video screens, or garbled data in computers. Noise can be introduced into AC lines by nearby radio transmitters, certain kinds of lighting, electric motors, and other sources. Because noise occurs at higher

frequencies than the 50 or 60 Hz AC line, it can be effectively reduced through use of low-pass filtering.

Make sure to pick up one of Furman's goosneck lights - the perfect accessory for your Series II unit.

GN-LED

GN-I

SPECIFICATIONS

Current rating:
    15 amps ("E" versions 10 amps)

Operating Voltage:
    90 to 140 VAC ("E" versions 180 to 260 VAC)

Over Voltage Shutdown:
    140 VAC typically ("E" versions 260 VAC typically, "J" versions 125 VAC typically)

Voltmeter Accuracy:
    PL-PLUS II only: ±2 VAC, calibrated with internal trimpot adjustments
    PL-PLUSD & PM-8: ±1.5 VAC,
    Current meter: ±0.5A

Spike Protection Modes:
    Line to neutral, zero ground leakage

Spike Clamping Voltage:
    188 Vpk @ 3,000 amps, (133 VAC RMS)
    ("E" Version: 376 Vpk (266 VAC RMS)

Response time:
    1 nanosecond

Maximum surge current:
    6,500 amps

Noise attenuation:
    10 dB @ 10 kHz
    40 dB @ 100 kHz
    100 dB @ 10 MHz
    Linear attenuation curve from 0.05 - 100 ohms line impedance

Mechanical:
    Dimensions: 1.75" H x 19" W x 10.5" D.
    Weight: 11 lbs (5 kg).
    Construction: Steel chassis, .125" brushed and black anodized aluminum front panel; glass epoxy printed circuit boards

Power Consumption:
    PL-8 II, 6 watts
    PL-PLUS II, 12 watts
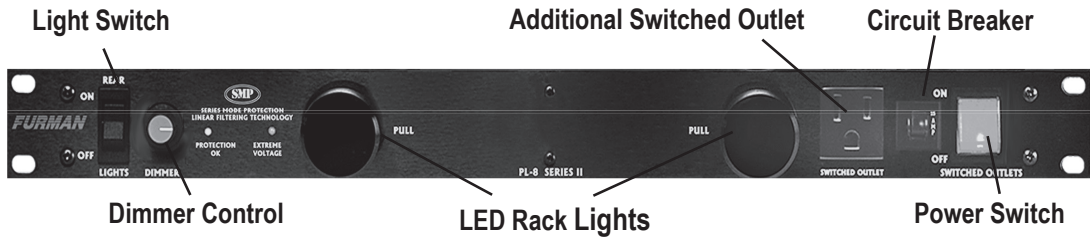   PL-PLUS D II, 12 watts
    PM-8 II, 12 watts

Safety Agency Listings:
    CE, NRTL-C

SERIES II 15 AMP POWER CONDITIONERS

PL-8 Series II
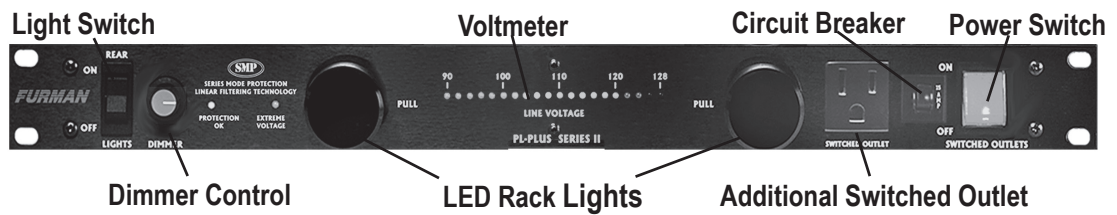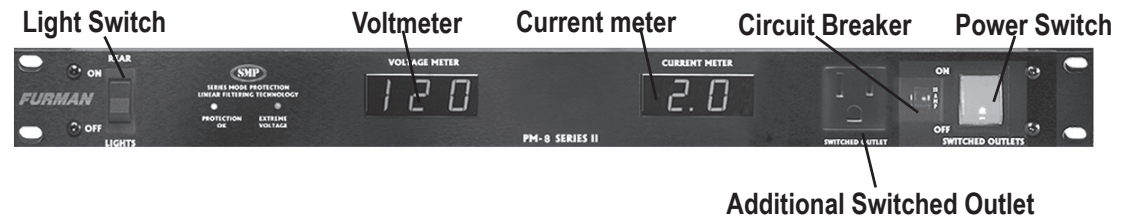
Light Switch   Additional Switched Outlet   Circuit Breaker

Dimmer Control   LED Rack Lights   Power Switch

PL-PLUS Series II

Light Switch   Voltmeter   Circuit Breaker   Power Switch

Dimmer Control   LED Rack Lights   Additional Switched Outlet

PL-PLUS D Series II

Light Switch   Voltmeter   Circuit Breaker   Power Switch

Dimmer Control   LED Rack Lights   Additional Switched Outlet

PM-8 Series II

Light Switch   Voltmeter   Current meter   Circuit Breaker   Power Switch

Additional Switched Outlet

Rear of all

8 Switched Outlets   BNC Connector for Goosneck Light

10

FURMAN

111804-C

PSM®600

Wireless Personal Stereo Monitor System
User Guide

Printed in U.S.A.

⚠️

WARNING!

USE OF THIS SYSTEM AT AN EXCESSIVE VOLUME MAY RESULT IN PERMANENT HEARING DAMAGE. OPERATE AT THE LOWEST POSSIBLE VOLUME.

In order to use this system safely, avoid prolonged listening at excessive sound pressure levels. Please refer to the following guidelines established by the Occupational Safety Health Administration (OSHA) on maximum time exposure to sound pressure levels before hearing damage occurs.

90 dB SPL at 8 hours
95 dB SPL at 4 hours
100 dB SPL at 2 hours
105 dB SPL at 1 hour
110 dB SPL at $1/2$ hour
115 dB SPL at 15 minutes

120 dB SPL — avoid or damage may occur

It is difficult to measure the exact Sound Pressure Levels (SPL) present at the eardrum in live applications. In addition to the volume setting on the PSM, the SPL in the ear is affected by ambient sound from floor wedges or other devices. The isolation provided by the fit of quality earpieces is also an important factor in determining the SPL in the ear.

Here are some general tips to follow in the use of this product to protect your ears from damage:

1. Turn up the volume control only far enough to hear properly.

2. Ringing in the ears may indicate excessive gain levels. Try lowering the gain levels.

3. Have your ears checked regularly by an audiologist. If you suffer wax buildup, stop using the system and consult an audiologist.

4. Wipe the ear molds with an antiseptic before and after use to avoid infections. Stop using the ear molds if they are causing great discomfort or infection.

FCC Statement. The P6R Receiver complies with part 15 of the FCC Fules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including inerference that may cause undesired operation.

Licensing Statement. Changes or modifications not expressly approved by Shure Brothers Inc. could void your authority to operate the equipment. Licensing of Shure wireless microphone equipment is the user's responsibility, and licensability depends on the user's classification and application. Shure strongly urges the user to contact the appropriate authority concerning proper licensing.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

TABLE OF CONTENTS

GETTING STARTED WITH THE PSM600 SYSTEM

Thank you for purchasing the PSM600 Personal Stereo Monitor System. The PSM600 is a revolutionary new product family designed to meet the diverse audio monitoring needs of musicians, engineers, and stage performers.

This section outlines step-by-step instructions to quickly show you how to connect your PSM system to an audio source while introducing you to some of its features.
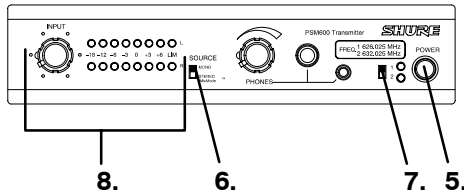
P6T Transmitter Setup

1. Plug the power cord to the power connector. Connect the other end to a power supply.
2. Attach the antenna to the ANTENNA OUT BNC connector.
3. Plug the cable(s) from the audio source (mixer, audio output, CD player) into the LEFT/RIGHT audio inputs. For a stereo send, use both inputs. For mono send, use either the LEFT or RIGHT input.
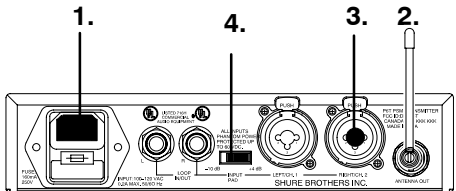
   NOTE: All inputs are phantom power protected up to 60 VDC.

4. Put the PAD switch in the +4 dB if the input signal is +4 dB, or the −10 dB position, if the input signal is −10 dB.
5. Turn on the P6T Transmitter.
6. Set the SOURCE switch to match the audio send (stereo/mono).
7. Set the FREQuency switch in the UP position to frequency #1.

   IMPORTANT: Never set more than ONE transmitter to the same operating frequency.

8. Power on the audio source and adjust the level control so the LEDs are in the −3 dB to +3 dB range.

P6R Receiver Setup

9. Attach the bodypack antenna (PA710) to the ANTENNA connector by aligning the red dot and threading the shell until it is tight.
10. Open the battery door and insert a 9V alkaline battery.
11. Set the DIP switches according to the illustration.
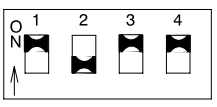
    #1: UP − Frequency #1
    #2: DOWN − Stereo control
    #3: UP − High frequency boost
    #4: UP − Limiter on

12. Set the balance control to the center detent position.
13. Insert the plug of the earpieces into the headphone connector on the top panel.
14. Insert the earpieces into your ears.
15. Turn on the receiver by rotating the volume knob clockwise past the click, then slowly raise the volume to a comfortable listening level.
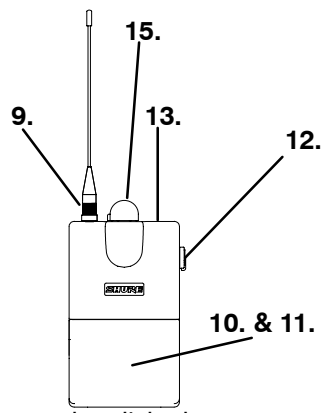
Now you know the basic setup for your new PSM600 Personal Stereo Monitor System. If any troubles occur, please refer to the *Troubleshooting* section of this manual. The rest of the manual goes into greater detail on features and applications — including MixMode™ control, which enables you to customize your own mixes. Please read the rest of the manual to help you make the most of your PSM600 System.

INTRODUCTION

Description

The Shure PSM600 Personal Stereo Monitor System is a UHF wireless, two-channel stereo, monitor system designed for onstage applications. The PSM has several advantages over onstage loudspeaker monitors: it is less visible, has better sound, allows freedom of movement, and reduces the chances of feedback. It is a versatile system, designed for use in many different sound reinforcement applications: public address, live music, theater, and electronic news gathering (ENG). The wireless system is frequency compatible with other Shure UHF and VHF wireless systems.
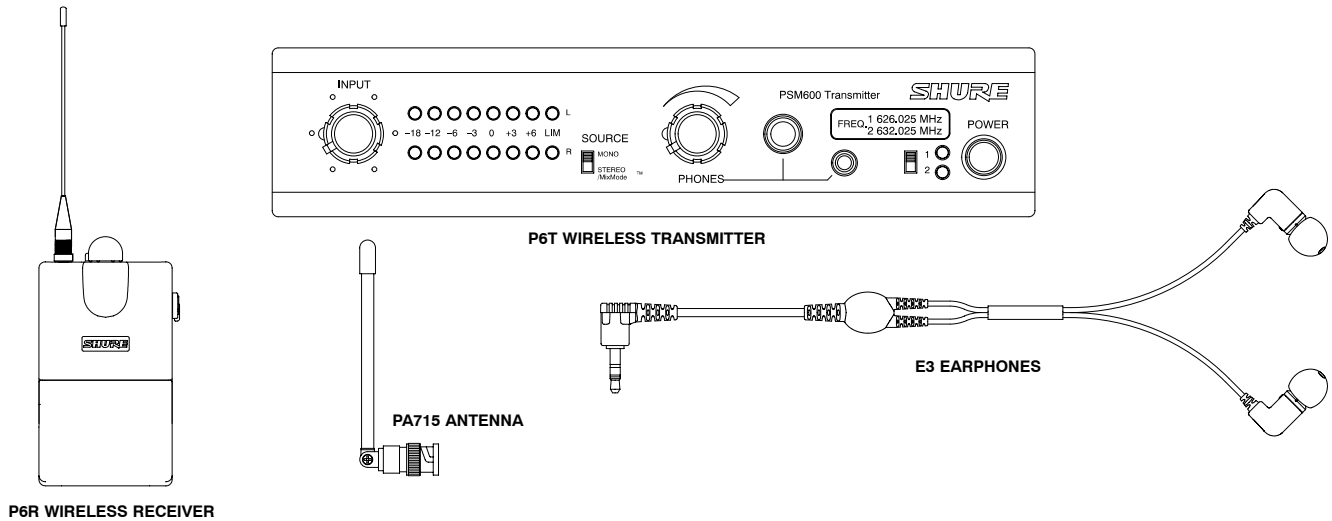
Components

P6T WIRELESS TRANSMITTER

E3 EARPHONES

PA715 ANTENNA

P6R WIRELESS RECEIVER

P6T Wireless Transmitter with rack-mounting hardware and one antenna
P6R Wireless Body-Pack Receiver with antenna
E3 Earphones with soft gray flex sleeves

Features

- UHF operation.

- Stereo or MixMode™ control for custom monitor mixes.

- 2 user-selectable frequencies per system.

- Up to10 compatible frequencies for 10 separate mixes.

- Frequency compatible with all Shure Wireless systems (country dependent).

- MPX Stereo audio transmission.

- Switchable high-frequency boost on P6R.

- +4 dBu/−10 dBV input level select switch on P6T.

- Electronically balanced, combined 1/4-in./XLR connectors on P6T can be used with balanced or unbalanced connections.

- Volume and Balance dials on the P6R Receiver for easy user access.

- Internal linear power supply on P6T, switchable between 120 VAC and 230 VAC.

- Peak transmitter modulation limiter with fixed threshold and modulation limit indicators.

- Loop out connectors on P6T for multiple mix setups and easy installation.

- Tone-Key squelch.

- Half-rack chassis on P6T complete with mounting hardware.

- All metal construction on P6T and P6R

- Headphone monitor on P6T for local listening.

OVERVIEW

P6T Transmitter

Front Panel
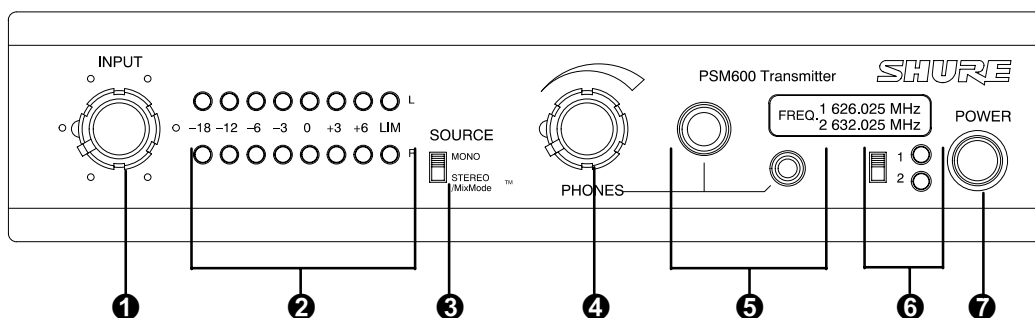
❶ INPUT Dial. This controls the signal level to the transmitter modulator. For optimum sound, the input level should be set in the −3 dB to +3 dB range.

❷ Stereo INPUT Meters. Each channel has an eight LED meter which indicates the modulation level of the radio signal. Important: When the LIM (limit) LEDs illuminate, the system is overdriven. Reduce the input knob to keep the input level LEDs at around −3 dB to +3 dB.

❸ SOURCE Switch. Set to MONO when only one input is needed. Set to STEREO/MixMode when both inputs are needed.

❹ PHONES Volume Dial. This dial controls the signal level to the headphone output, without affecting the input level.

**❺ Headphone Connectors — $1/4$-in. phone and 3.5 mm ($1/8$-in) mini.** Each connector is configured as left=tip, right=ring, ground=sleeve. Please note that only one of these outputs can be used at a time.

❻ Frequency Switch and Indicators. This switch determines the frequency the P6T transmits. The frequencies your particular unit operates at are indicated just above this switch. The LEDs indicate which frequency the unit is transmitting: RED = frequency 1, GREEN = frequency 2. These LEDs also act as power-on indicators.

❼ Power Switch. Press this button to turn the unit on.

Rear Panel
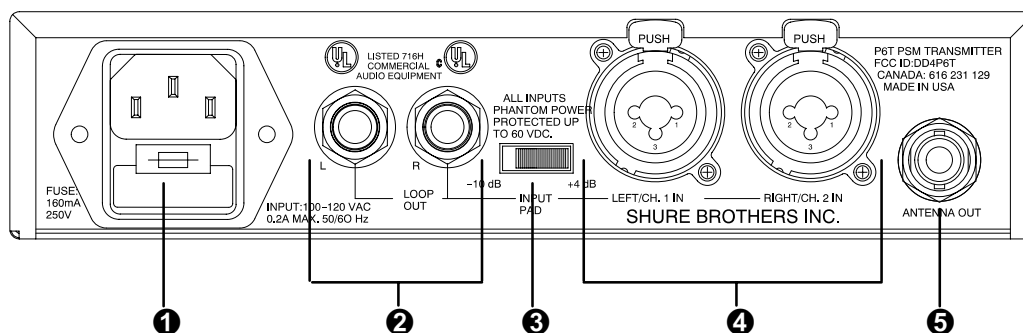
❶ Power Connector with Integral Fuse. Connects to a power supply. The fuse is located in the bottom drawer.

❷ LOOP OUT Connectors — $1/4$-in. phone, balanced. Additional connectors internally wired to the respective LEFT/RIGHT input connectors.

❸ INPUT PAD Switch. Selects the input level for −10 dBV or +4 dBu operation.

❹ LEFT/CH. 1 and RIGHT/CH. 2 Input Connectors — Combined $1/4$-in. phone and XLR (female), balanced. Electronically balanced inputs can be used with either balanced or unbalanced outputs. Either connector can be used for mono control.

❺ Antenna Connector — 50 Ω, BNC type. This connects to the antenna to transmit UHF signals to the receiver.

5

P6R Receiver

Controls and Connectors
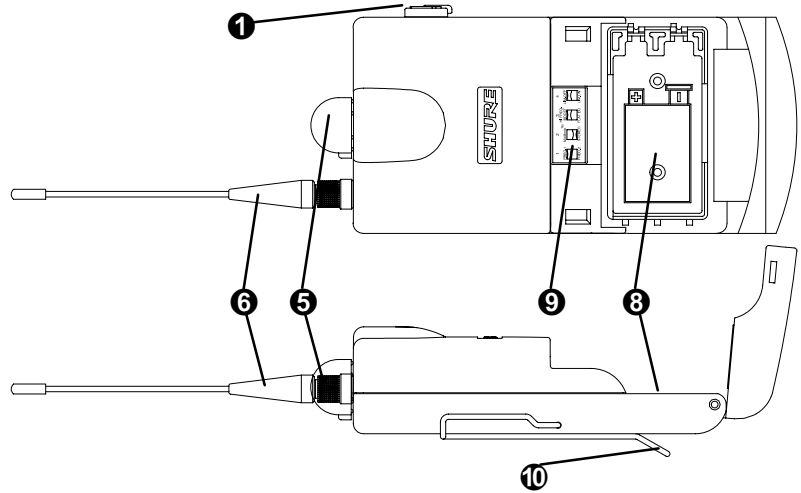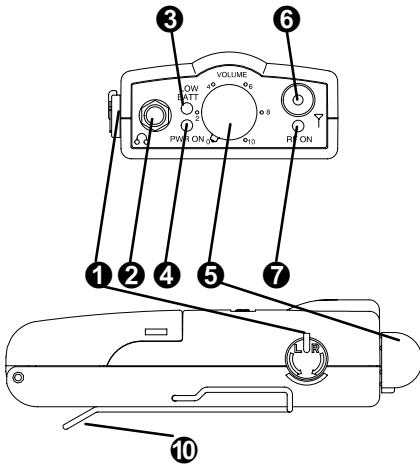
❶ **Balance Dial.** In stereo mixes, this controls the left/right balance. In MixMode™, this controls the mix level of two transmitter inputs.

❷ **Headphone Connector.** 3.5 mm ($^1/_8$-in.) jack connects to the earphones. Left=tip, right=ring, ground=sleeve.

❸ **LOW BATT Indicator.** This red LED illuminates when the battery has approximately 45 minutes of operating time remaining, depending on the volume.

❹ **Power LED.** This green LED illuminates when the power is ON and the battery is good.

❺ **ON/OFF and Volume Dial.** Full counter-clockwise turns the P6R OFF. Turn the dial clockwise past the click to turn the P6R ON. Once ON, turn the dial clockwise to raise the volume, and counter-clockwise to lower the volume in the earpieces.

❻ **Antenna and Connector.** An easily removable antenna connects to the P6R to receive RF signals from the P6T Transmitter.

❼ **RF LED.** Illuminates when the P6R is receiving a signal from the transmitter.

❽ **Battery Compartment.** Accepts one 9-volt battery (Duracell recommended). Open the door by pressing the latches on both sides and pulling.

❾ **DIP Switches.** Using the DIP Switches, you can customize the operation of the receiver. See *DIP Switches* (below).

❿ **Belt Clip.** Secures the P6R to a belt, pocket, or to other clothing.

DIP Switches
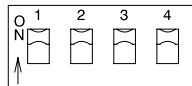
DIP SWITCH	FUNCTION	UP	DOWN
1	Frequency Select	Frequency 1	Frequency 2
2	Stereo/MixMode Select	MixMode control	stereo control
3	Equalization (Flat/High Boost)	Gives a 6 dB boost at 10 kHz for a better high-end response	normal response
4	Limiter defeat	Limiter on	Limiter off

IMPORTANT: The Limiter is designed to respond to and limit the loudness of unexpectedly high signals. It is not designed to prevent long term exposure to high SPL levels. ***It is designed for use with Shure earphones, so the maximum limited SPL may be different with other earpieces.*** We recommend that you always use the built-in limiter provided with this system. However, a limiter defeat switch has been provided for those who would prefer to use an external limiter product.

INSTALLATION AND APPLICATIONS

The flexible design of the PSM600 Personal Stereo Monitor System makes configuring a monitor mix very simple. In addition, the unique MixMode circuitry enables you to customize your own individual mix in a multiple mix environment. To help you install the PSM600 into your sound system, the tables and diagrams in this section describe three distinct modes of operating or controlling the system. Although the examples show only single system setups, you can configure multiple wireless systems in a setup. Some multiple mix setups are detailed in the *LOOP Applications* section of this chapter.

Operating Modes

Stereo Control	Used for conventional Stereo monitor mixes.
	Transmitter Stereo/MixMode setting *Receiver* Stereo setting *Balance Dial* Varies stereo left/right image
MixMode Control	Used for creating an individual mix between two distinct monitor sends.
	Transmitter Stereo/MixMode setting *Receiver* MixMode setting *Balance Dial* Varies levels between mixes
Mono Control	Used when only one (mono) monitor mix is available.
	Transmitter Mono setting *Receiver* Stereo setting *Balance Dial* Varies the right/left volume control

NOTE: For consistency throughout the following diagrams, a mixing console is shown as the source supplying the audio signal to the P6T Transmitter. However, any balanced or unbalanced send that outputs a line level should drive the P6T Transmitter adequately. Some devices that would work are a CD player, DAT machine, direct out box, signal processing equipment, and microphone preamps.

Stereo Control

This diagram shows how to connect the PSM600 system with a stereo monitor mix.
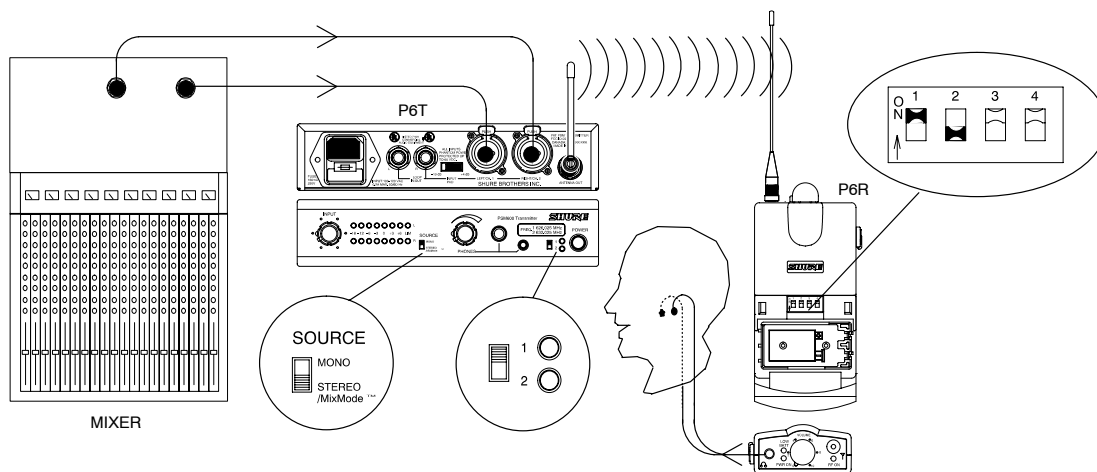
1. Connect the stereo mixer outputs to the L/CH1. and R/CH2. INPUTs on the P6T Transmitter
2. Set the SOURCE switch on the P6T front panel to STEREO.
3. Set DIP switch 2 of the P6R Receiver to STEREO.
4. Set DIP switch 1 on the P6R and the FREQ. switch on the P6T to the same frequency.
5. Use the balance dial on the P6R Receiver to adjust the balance of the Right and Left channel volume.

MixMode Control

This diagram shows how to connect the PSM600 system with two monitor mixes combined at the receiver. This allows you to vary the level between the two mixes to create a custom mix.
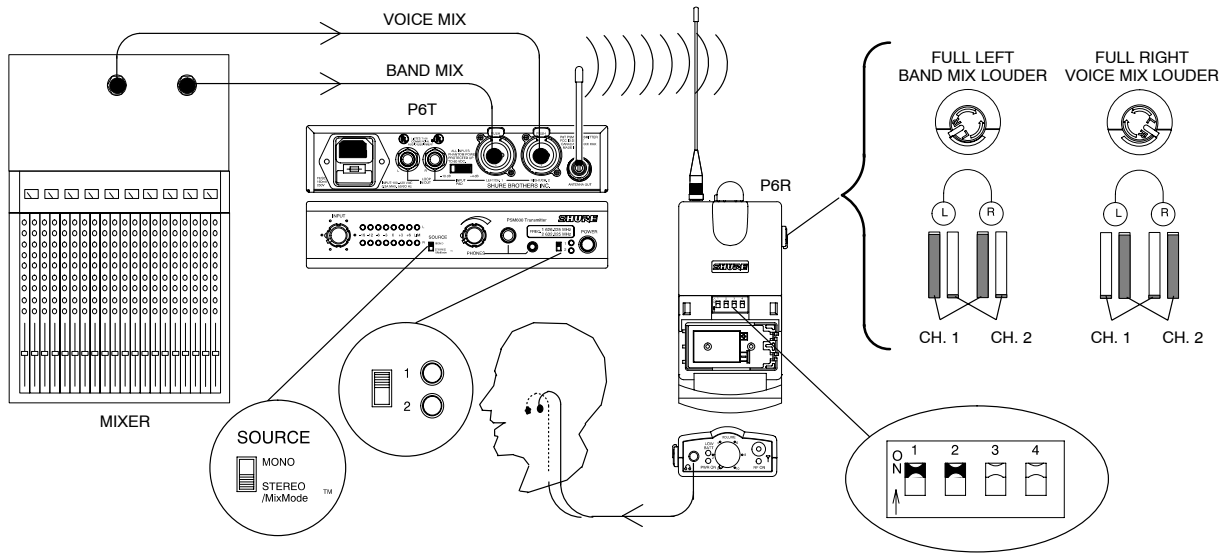
1. Connect the monitor mix 1 and monitor mix 2 mixer outputs of the mixer to the L/CH. 1 and R/CH. 2 audio inputs of the P6T Transmitter.
2. Set the SOURCE switch on the P6T Transmitter to STEREO.
3. Set DIP switch 2 on the P6R Receiver to MixMode ™.
4. Set DIP switch 1 on the P6R and the FREQ. switch on the P6T to the same frequency.
5. Use the balance dial on the P6R to adjust the relative levels between the two monitor mixes.

Mono Control

This diagram shows how to connect the PSM600 system with a mono monitor mix.
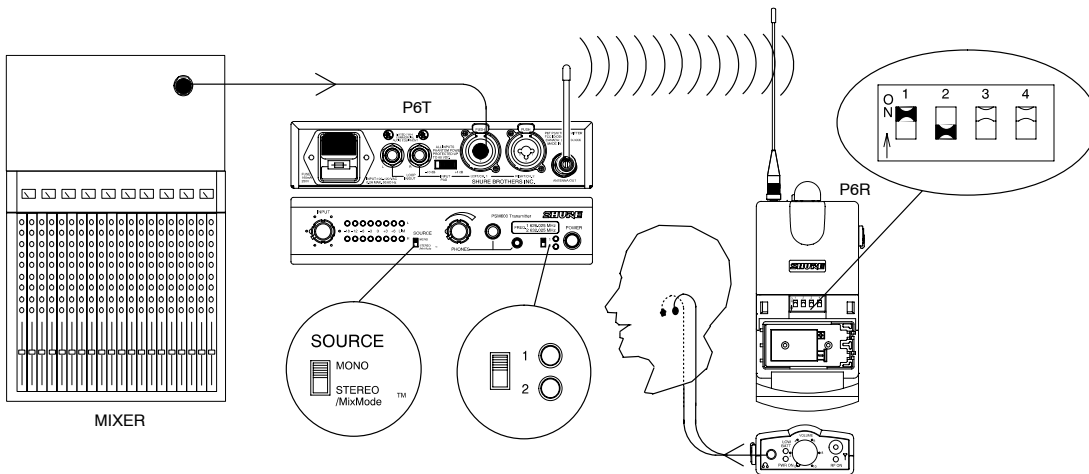
1. Connect the mono monitor output of the mixer to either the Left or Right audio inputs of the P6T.
2. Flip the SOURCE switch on the front panel to MONO.
3. Flip DIP switch 2 of the P6R to STEREO.
4. Set DIP switch 1 on the P6R and the FREQ. switch on the P6T to the same frequency.

LOOP Applications

The LOOP OUT L (left) and R (right) outputs allow the signal going through the P6T to be run to other devices. The LOOP feature of the P6T can be used for any number of applications. Shown here are only a few examples of how it can be used.

> **NOTE**: The LOOP connectors act as either inputs or outputs. They can be used as outputs when the LEFT and RIGHT INPUT connectors are used for input. However, LOOP connectors can also act as inputs when connected directly to the outputs of a mixer. When the LOOP connectors are used as inputs, the LEFT and RIGHT INPUT connectors act as outputs. These diagrams show the LOOP connectors being used as outputs. Also, the input pad does not affect the level of the LOOP signals.

Running Multiple PSM Wireless Systems Under Stereo Control

The LOOP INPUT connectors can be used to send the same monitor stereo signals to multiple P6T wireless transmitters. This will free up busses on the mixing console, allowing you more freedom with your audio system. Simply connect a P6T to the mixing console as described in *Stereo Control*, then run $^1/_4$-in to $^1/_4$-in from the L/R LOOP connectors of the first unit to the LEFT/RIGHT Input connectors of the next unit. Connect subsequent unit in the same way.
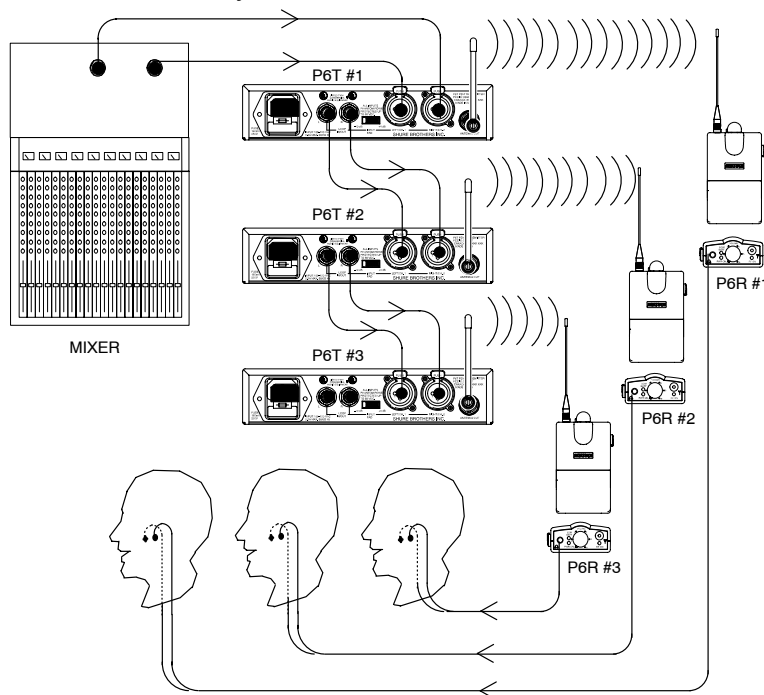
Running Floor Monitors Through a P6T Transmitter

The monitor audio signal can be sent through the LOOP connectors to another amplifier, such as an amplifier for an onstage monitor system. When setup this way, the P6R and the onstage monitors will have the same audio.

9
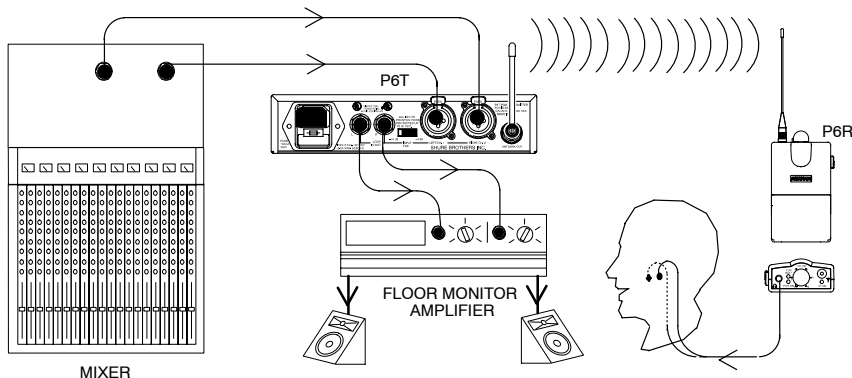
Running Multiple PSM Wireless Systems Under MixMode Control

A main mono monitor mix can be sent to multiple P6T transmitters, then independent monitor mixes can be sent to the second channel of each. This will allow an entire band to hear the same monitor mix, while giving each individual player a separate mix of their own. Each player can then use the balance knob to adjust the levels between their own mix and the main mono monitor mix.
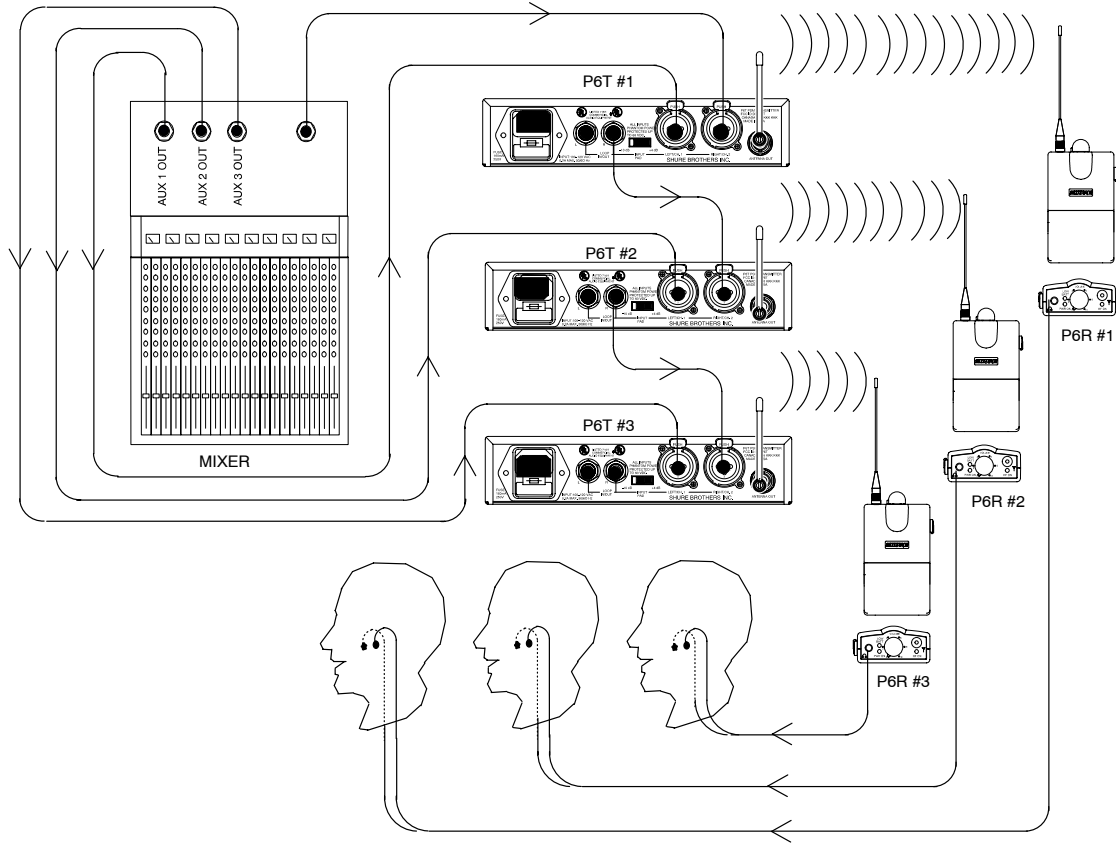
Running a Recording Device Through a P6T Transmitter

If you would like to make a recording of a performance, the LOOP outputs can be connected to the inputs of a tape deck, DAT, or other recording device.

ENGLISH
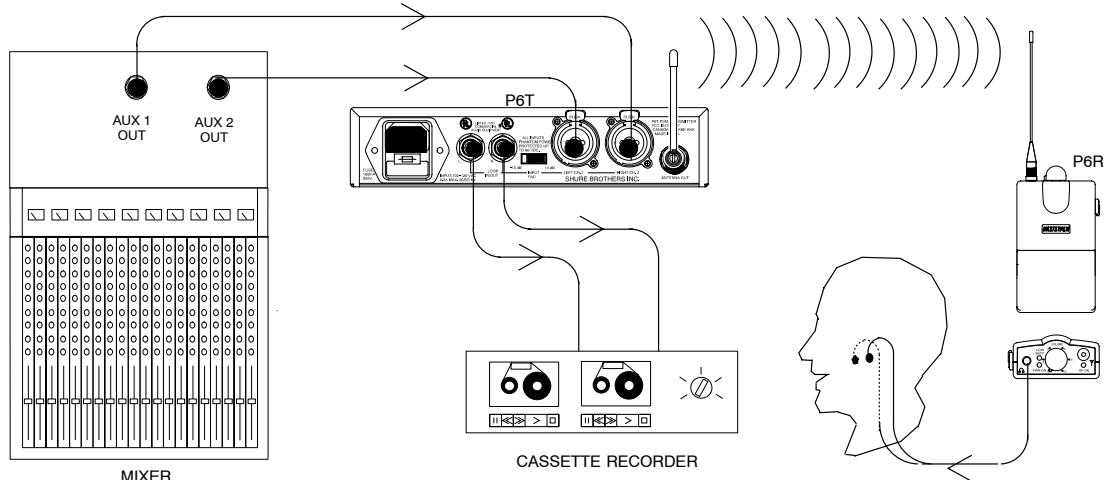
ACCESSORIES

Several additional products have been developed as part of the PSM product family. These products can enhance the operation of your system, and must be purchased separately.

PA705 Unidirectional Antenna

The PA705 is a unidirectional, remote-mountable, wideband transmitting antenna designed to provide wireless coverage in a cardioid pattern. You can use the PA705 to secure a line-of-sight transmission path from the transmitter to the receiver when the actual transmitters are obscured. Also, since the PA705 has some gain (due to its directivity), it is also useful when covering very long distances with your wireless system.

PA705
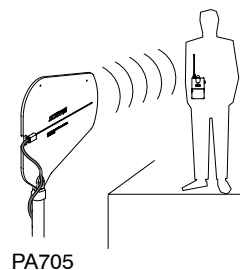
PA760 Antenna Combiner

PA760

MULTIPLE P6Ts
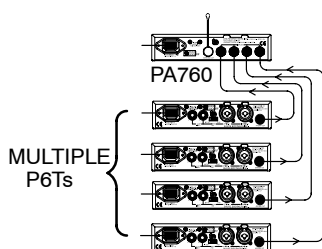
The PA760 is a breakthrough new product specifically designed to improve the performance of multiple wireless monitor systems. First, it combines up to four P6T Transmitters into a single antenna with no signal loss, thus reducing stage clutter without losing wireless range. The PA760 significantly reduces interference by lowering the Intermodulation Distortion (IMD) levels between the four transmitters. The PA760 is an internally-powered, half-rack unit — transportation and setup are easy. Please note that the PA760 cannot be cascaded to other PA760's.

P6HW Hardwired Body Pack

The P6HW is a hardwired version of the Personal Stereo Monitor for users who do not need the mobility of wireless systems, such as drummers or keyboard players. The P6HW has the same features as the wireless version (Stereo control, MixMode control, limiter, etc.) at a lower price. The P6HW also includes an input pad for increased dynamic range, as well as an input peak indicator to alert the user when levels are too high.

P6HW

MIXER
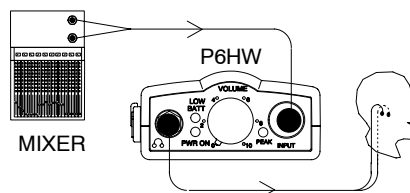
E-Series Earphones

E3
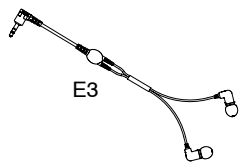
Shure offers a variety of earphones to fit your needs. Designed exclusively for PSM systems, they deliver superior sound quality. For the added comfort of a precise fit, custom earmolds are also available for E3 model earphones. For more information, see *Custom Earpieces* under *Appendix A. Technical Specifications*.

TROUBLESHOOTING

PROBLEM	SOLUTION
No sound at the Receiver	☞ Check the power cord on the Transmitter and make sure it is powered on. ☞ Make sure both the transmitter and the receiver are set to the same frequency. ☞ Make sure the earpiece is plugged into the receiver. ☞ Make sure receiver is on and the battery is good. ☞ Make sure both antennas are correctly attached. ☞ Listen to the headphone monitor on the transmitter to check audio feed.
Low Receiver Range	☞ Make sure all antennas are fully inserted and secured onto jacks. ☞ Try to maintain line-of-sight between transmitter and receiver. ☞ Try the other frequency in case interference is limiting the range. ☞ Check for television channel interference. ☞ Make sure the PA715 antenna is not remote mounted.
Receiver sounds fuzzy or distorted	☞ Make sure no other transmitters are operating on your frequency. ☞ Make sure transmitter input level is 0 dB ±3 dB for optimum performance. ☞ Listen to the headphone monitor on the transmitter to check audio feed. ☞ Try and maintain a minimum of 10 ft. between transmitter antennas and receiver when using multiple transmitters.
Low audio output at the receiver headphones	☞ Make sure transmitter input level is 0 dB ±3 dB for optimum performance. ☞ Switch the transmitter pad to −10 dBV position if the input is too low.

APPENDIX A. TECHNICAL SPECIFICATIONS

SYSTEM

RF Carrier Frequency Range
626 to 862 MHz (country dependent)

Audio Frequency Response
50 to 15k Hz (+0, −3 dB re 1KHz); earpiece dependent

Operating Range
300 ft. (environment dependent)

Modulation
FM ±35 kHz Deviation (Nominal), MPX Stereo

Channel Separation
35 dB typical

Total Harmonic Distortion
0.8% typical (Ref. ±35 KHz deviation)

Signal-to-Noise Ratio
80 dB typical (A-weighted)

Operating Temperature
−7° C to +49° C (20° F to 120° F)

Polarity
P6T audio inputs to P6R audio outputs: Non-inverting
XLR: pin 2 positive with respect to pin 3
1/4-in. TRS: Tip positive with respect to ring

Certification
P6T: Certified to FCC Part 74 (FCC ID No. DD4P6T). Certified in Canada by IC under RSS−123. UL and cUL Listed to UL 813 and CSA C22.2 No. 1.

EP6T: Meets essential requirements of European R&TTE Directive 99/5/EC, eligible to carry the CE mark: CE O682 Φ. Type approved to EN 300 422 Parts 1 and 2. Meets requirements of EMC Standard EN 301 489 Parts 1 and 9. VDE GS Certified to EN 60065.

P6R: Approved under the Notification provision of FCC Part 15. Certified by IC in Canada under RSS−123. Meets the essential requirements of European R&TTE Directive 99/5/EC, eligible to carry the CE mark. Meets requirements of EMC standard EN 301 489 Parts 1 and 9.

IMPORTANT!:

THIS RADIO EQUIPMENT IS INTENDED FOR USE IN MUSICAL PROFESSIONAL ENTERTAINMENT AND SIMILAR APPLICATIONS.

NOTE: THIS RADIO APPARATUS MAY BE CAPABLE OF OPERATING ON SOME FREQUENCIES NOT AUTHORIZED IN YOUR REGION. PLEASE CONTACT YOUR NATIONAL AUTHORITY TO OBTAIN INFORMATION ON AUTHORIZED FREQUENCIES FOR WIRELESS MICROPHONE PRODUCTS IN YOUR REGION

Licensing: A ministerial license to operate this equipment may be required in certain areas. Consult your national authority for possible requirements.

P6T TRANSMITTER

Shure Transmitter Model P6T may be used in the countries and frequency ranges listed in Table 1 on page i.

RF Output Power
100 mW (+20 dBm) typical conducted (country dependent)

Modulation Limiter
Internal peak limiter (>10:1 compression)

Antenna
External whip, 50 Ω BNC connector

Power Requirements
P6T: 100 to 120 Vac, 50/60 Hz
EP6T: 220 to 240 Vac, 50/60 Hz
NOTE: This product is not disconnected from the mains power supply when the power switch is in the OFF position.

Current
115 mAac maximum at 120 Vac
55 mAac maximum at 230 Vac

Fuse
P6T: 120 Vac, 160 mA/250 V time delay
EP6T: 230 Vac, 80 mA/250 V time delay
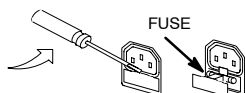
Dimensions
44.5 mm X 197.4 mm X 238.1 mm (1 $^3/_4$ in. X 7 $^3/_4$ in. X 9 $^3/_8$ in.)

Net Weight
1.62 kg (3 lbs., 9 oz.)

P6R RECEIVER

RF Sensitivity
1.2 μV typical

Image Rejection
70 dB typical

Spurious Rejection
60 dB typical

Squelch Threshold
4 μV typical

Antenna Input Impedance
50 Ω typical

Antenna
External, threaded connector

Power Requirements
9 V battery

Battery Life
4–6 hours, volume dependent

Audio Output Connector
3.5 mm Stereo (Left = tip, Right = ring, Ground = sleeve)

Minimum Load Impedance
16 Ω

Net Weight
0.52 lbs.

Overall Dimensions
27.18 mm X 64.52 mm X 85.09 mm
(1.070 in. X 2.540 in. X 3.350 in.)

CONNECTORS

P6T Audio Inputs (LEFT/CH.1 and RIGHT/CH.2)

Connector: (XLR and 1/4-inch combined)	XLR (female)	$^1/_4$-inch phone jack (female)
Configuration:	electronically balanced	electronically balanced
Actual Impedance:	20 kΩ	20 kΩ
Nominal Input Level:	+4 dBu (+4 input level) / −10 dBV (−10 input level)	+4 dBu (+4 input level) / −10 dBV (−10 input level)
Maximum Input Level:	+25 dBu (+4 input level) / +13 dBu (−10 input level)	+25 dBu (+4 input level) / +13 dBu (−10 input level)
Pin Assignments:	Pin 1 = ground / Pin 2 = hot / Pin 3 = cold	Tip = hot / ring = cold / sleeve = ground
Phantom Power Protection?	Yes Up to 60 VDC	Yes Up to 60 VDC

P6T L/R LOOP Outputs (IN and OUT)

Connector: (XLR and 1/4-inch combined)	$^1/_4$-inch jack (female)
Configuration:	electronically balanced
Actual Impedance:	20 kΩ
Nominal Input Level:	+4 dBu (+4 input level) / −10 dBV (−10 input level)
Maximum Input Level:	+25 dBu (+4 input level) / +13 dBu (−10 input level)

Pin Assignments:	Tip = hot ring = cold sleeve = ground
Phantom Power Protection?	Yes Up to 60 VDC

FURNISHED ACCESSORIES

Body-Pack Antenna PA710
Transmitter Antenna PA715
Rack Mount Kit PA745
60 cm (2 ft) Coaxial Cable (RG-58/U) UA802
E3/E5 sleeve assortment with cleaning tool . . 90XC1371

OPTIONAL ACCESSORIES

Antenna Combiner . . . . PA760 (120 VAC)
PA760E (240 VAC)
Unidirectional Antenna PA705
10 ft Coaxial Antenna Cable (BNC connector) . . . PA725
Bag of 20 Foam Ear Inserts PA750
Triple-Flange Ear Inserts (2) PA755

CUSTOM EARPIECES

For information regarding a complete line of custom made musicians' earpieces, contact:

Ultimate Ears Inc.
2657 Windmill Pkwy. #391
Henderson, NV 89014
(702) 263–7805
(702) 896–8856 (fax)
www.ultimateears.com

Firehouse Productions, Inc.
12 Boice Road
Hyde Park, NY 12538
(914) 229–2055
(914) 229–0844 (fax)

Sensaphonics
660 N. Milwaukee
Chicago, IL 60622
(312) 660–1714
(312) 432–1783 (fax)

Voltage Selection

The P6T Transmitter can be internally modified to operate from 230 Vac, 50/60 Hz power.

> **WARNING**
> Voltages in this equipment are hazardous to life. No user-serviceable parts inside. Refer all servicing to qualified service personnel. The safety certifications of the P6T do not apply when the operating voltage is changed from the factory setting.

To change the operating voltage, follow these steps.

1. Disconnect the P6T from the ac power source.

2. Remove the eight Phillips head screws securing the top cover.

3. Locate Voltage Selector switch SW4 adjacent to power transformer T1 and, using a screwdriver, turn the center rotor to the 230 V position.

4. Locate fuse and remove it. Replace it with a 80 mA, 250 V, time delay fuse for 230-volt operation (160 mA, 250 V, time delay fuse for 115-volt operation).

Fuse part numbers are:

Fuse Type	Shure Part No.	Part No.
80 mA, 250 V time delay	80H380	Schurter .034.3106
160 mA, 250 V time delay	80K258	Littelfuse 218.160

5. Replace the power cord with a cord rated for for 230 V operation, i.e., an IEC appliance connector on the equipment end and a CEE 7/7 ("Schuko") mains connector on the other.* (Shure part #95A8247.)

Similarly, the EP6T can be internally modified to operate from 115 Vac, 50/60 Hz power.

To change the operating voltage, follow these steps.

1. Disconnect the EP6T from the ac power source.

2. Remove the eight Phillips head screws securing the top cover.

3. Locate Voltage Selector switch SW4 adjacent to power transformer T1 and, using a screwdriver, turn the center rotor to the 115 V position.

4. Locate fuse and remove it. Replace it with a 160 mA, 250 V, time delay fuse for 115-volt operation (80 mA, 250 V, time delay fuse for 230-volt operation).

Fuse part numbers are:

Fuse Type	Shure Part No.	Part No.
160 mA, 250 V time delay	80K258	Littelfuse 218.160
80 mA, 250 V time delay	80H380	Schurter .034.3106

5. Replace the power cord with a cord rated for for 115 V operation, i.e., an IEC appliance connector on the equipment end and a mains connector suitable for 115 V operation on the other.* (Shure part #95A8389.)

---

*For systems requiring other mains connectors, obtain a power cord with an IEC 320 type mating connector for connection to the P6T, and an appropriate plug on the other end for connection to the mains. The supplied cord uses Harmonized IEC Cordage with color coding as follows: Brown = Line, Blue = Neutral, Green/Yellow = Ground.

APPENDIX B. RACK MOUNTING OPTIONS

Rack Mounting the P6T Transmitter

NOTE: Dual mounting with other Shure products. The P6T can also be dual mounted with a Shure SC or LX half-rack wireless receiver. These same instructions apply, but the front panels will not align evenly. The SC and LX receivers must use the SC and LX rack ears. They cannot be mounted with P6T rack ears. However, the link bars are universal and can be used to connect the P6T with an LX or SC receiver.

> **WARNING:** Do not torque the screws too tightly, or the chassis may be damaged.

Single Unit
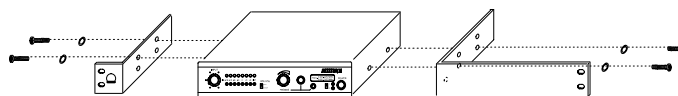
1. Remove the screws and washers from each side of the unit.
2. Align the supplied rackmount brackets over the holes.
3. Using the screws and washers from step 1, fasten the rack-mount brackets.

Dual-Mounted Units
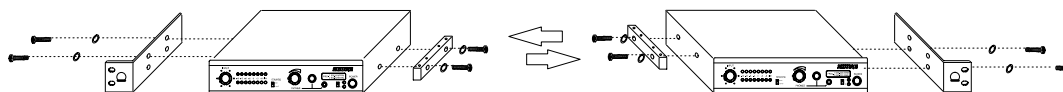
1. Remove the screws and washers on each side of both units.
2. Placing the two units side-by-side, screw the link bars to the inside panels of each unit. The units are designed so that the link bar on the right unit will fit directly on top of the link bar of the left unit (facing front). Use two of the screws and washers from step 1 per link bar to fasten the link bars.
3. Align the rackmount brackets on the outside panels of the units and fasten using four of the screws and washers from step 1.
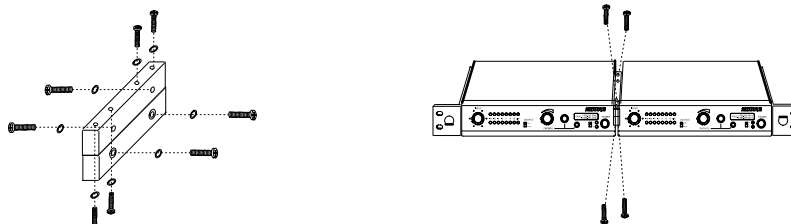
NOTE: The link bars are designed with recesses in the side holes where the screw head and washer fit in. Once the link bars are screwed on properly, the vertical holes will align. Each link bar has two threaded holes and two unthreaded holes. In order to ensure proper fit, stack the link bars so that the unthreaded holes on one bar align with the threaded holes on the other bar. Then, each pair of screws fits in the opposite direction of the other pair, ensuring the stability of the link.

4. Place the two units next to each other so the link bars overlap and the screw holes on the two align.
5. Fasten the link bars together using 4 supplied screws and washers.

Mounting in an Equipment Rack

SINGLE MOUNT   DUAL MOUNT
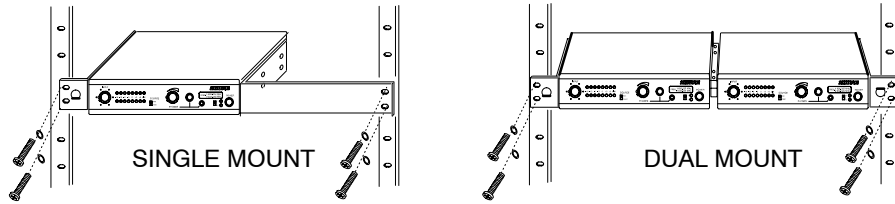
1. Insert the unit(s) into a 19-inch equipment rack.
2. Fasten the unit(s) to the rack using all four of the supplied screws.

Front Mounting the Antenna

When rack mounting units, use the supplied cable and bulkhead adapter to front mount the antenna. This prevents other cables from becoming entangled in the antenna and can greatly reduce RF interference.
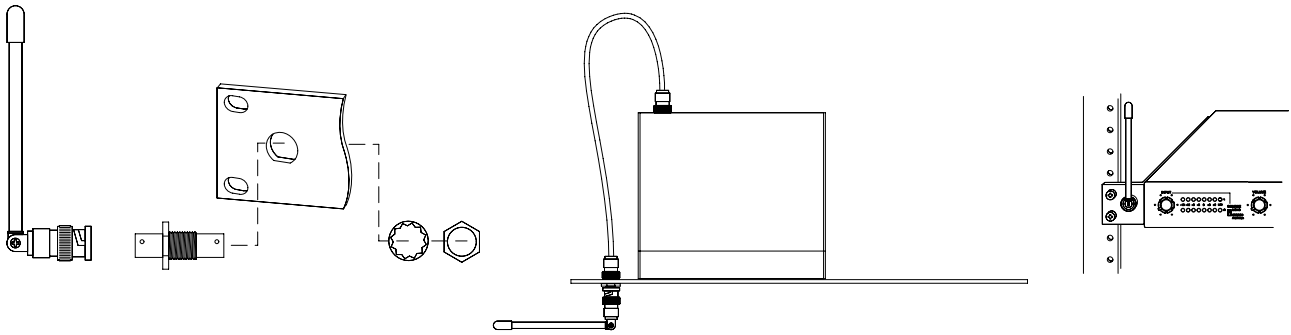
NOTE: The PA715 antenna, which comes supplied with the P6T; cannot be remote mounted. Use a PA705 antenna for remote mounting.

TABLE 1   TABLEAU 1   TABELLE 1   TABLA 1   TABELLA 1

Country Code Code de Pays Lander–Kurzel Código de país Codice del Paese	FREQ CODE	FREQ1 (MHZ)	FREQ2 (MHZ)
USA	HA	626.475 (TV 40)	632.550 (TV 41)
	HB	629.975 (TV 40)	634.775 (TV 41)
	HC	642.275 (TV 42)	646.500 (TV 43)
	HD	647.525 (TV 43)	653.375 (TV 44)
	HE	655.250 (TV 44)	656.500 (TV 45)
A, B, CH, D, E, F, GR, I, L, NL, P	MF*	801,100	802,550
	MG*	805,050	810,550
	MH*	808,600	813,300
	MJ*	811,600	813,800
	MK*	823,475	827,700
S	MF*	801,100	802,550
	MG*	805,050	810,550
	MH*	808,600	813,300
	MJ*	811,600	813,800
DK, FIN, N	MH*	808,600	813,300
	MJ*	811,600	813,800
	ML*	801,100	801,900
	MM*	817,100	819,700
GB, IRL	**GROUP 1**		
	KB*	854,900	856,175
	KC*	856,950	860,400
	GROUP 2		
	KB*	854,900	856,175
	KD*	859,375	860,900
All Other Countries Tous les autres pays Alle anderen Länder Demás países Tutti gli altri Paesi	*	*	*

*Please contact your national authority for information on available legal frequencies for your area and legal use of the equipment

*Se mettre en rapport avec les autorités compétentes pour obtenir les informations sur les fréquences autorisées disponibles localement et sur l'utilisation autorisée du matériel.

*Für Informationen bezüglich der für Ihr Gebiet verfügbaren gesetzlich zugelassenen Frequenzen und der gesetzlichen Bestimmungen für den Einsatz der Geräte setzen Sie sich bitte mit der zuständigen örtlichen Behörde in Verbindung.

* Comuníquese con la autoridad nacional para obtener información en cuanto a las frecuencias legales disponibles y usos legales del equipo en su área.

*Rivolgersi alle autorità competenti per ottenere informazioni relative alle frequenze autorizzate nella propria regione e alle norme che regolano l'uso di questo apparecchio.

EU DECLARATION OF CONFORMITY

We, Shure Incorporated
of 5800 Touhy Ave
Niles, Illinois, 60714-4608 U.S.A
(847) 600-2000

Declare under our sole responsibility that the following product

Model: P6R Description: Personal Stereo Monitor Receiver

to which this Declaration relates
are in conformity to European Low Voltage Directive 73/23/EEC
are in conformity to European EMC Directive 89/336/EEC
are in conformity to European CE Marking Directive 93/68/EEC
The product complies with the following product family, harmonized or national standards:
P4R: EN 301 489 Part 1 and 9, ETSI 300 422-1 and ETSI 300 422-2

Manufacturer: Shure Incorporated

Signed _____ Date November 12, 2003
Name, Title Craig Kozokar
EMC Project Engineer, Corporate Quality, Shure Incorporated
European Contact: Shure Europe GmbH
Wannenacker Str. 28, 74078 Heilbronn, Germany
Phone: 49-7131-7214-0, Fax: 49-7131-7214-14

EU DECLARATION OF CONFORMITY

We, Shure Incorporated
of 5800 Touhy Ave
Niles, Illinois, 60714-4608 U.S.A
(847) 600-2000

Declare under our sole responsibility that the following product

Model: P6T Description: Personal Stereo Transmitter

to which this Declaration relates
are in conformity to European Low Voltage Directive 73/23/EEC
are in conformity to European EMC Directive 89/336/EEC
are in conformity to European R&TTE Directive 1999/5/EC
are in conformity to European CE Marking Directive 93/68/EEC
The product complies with the following product family, harmonized or national standards:
P6T: EN 301 489 Part 1 and 9, ETSI 300 422-1 and ETSI 300 422-2, and
EN 60065, EN61000-3-2, EN 61000-3-3
Manufacturer: Shure Incorporated

Signed _____ Date November 12, 2003
Name, Title Craig Kozokar
EMC Project Engineer, Corporate Quality, Shure Incorporated
European Contact: Shure Europe GmbH
Wannenacker Str. 28, 74078 Heilbronn, Germany
Phone: 49-7131-7214-0, Fax: 49-7131-7214-14

Telex®

Operating Instructions

FMR-500
User Guide

TELEX®

TELEX®
TELEX COMMUNICATIONS, INC.
12000 Portland Ave. South, Burnsville, MN 55337

REFEREE SWITCH BOX
ORDER NO. 64420000
ORDER NO. 64420001

PN 802396-1

INSTRUCTION SHEET

64420001 with SWITCHCRAFT PLUG

64420000 with LEMO PLUG
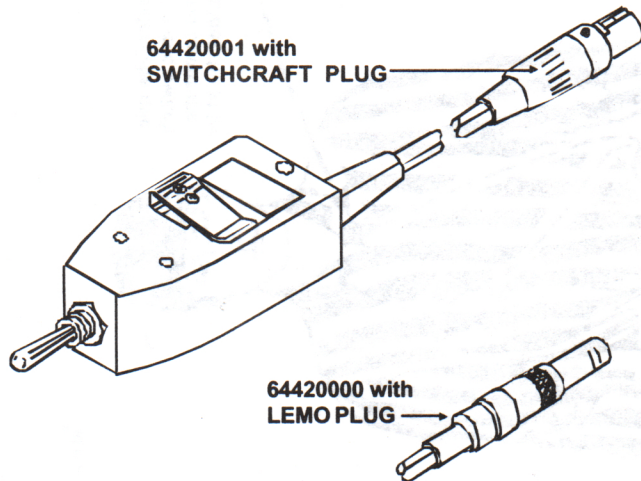
Overall View of Referee Switch Box

STEP 1 Loosen center flat head screw 1 or 2 turns.
STEP 2 Remove top (pan head) screw completely.

STEP 3 Rotate clip to opposite position, install pan head.

STEP 4 Tighten center screw.

Clip Reversing Detail

General

> The TELEX Referee Switch Box was designed to meet National Football League specifications to provide switching from the belt transmitter to an outboard location.

The Referee Switch Box provides quick and easy audio on/off operation for the referee, when used with Belt Transmitters. Order No. 644220000 is used with WT-100, 200, and 450 Transmitters. Order No. 64420001 is used with WT-50 and WT-55 Transmitters.

> **NOTE:** Your belt transmitter must be modified by an Authorized Service Facility in order for the Referee Switch Box to operate.

Operation and Placement

Insert your lapel microphone plug into the Mic Jack of the Referee Switch Box. Plug the connector from the switch box into the Mic Jack of your belt transmitter.

> **NOTE:** For maximum uninterrupted service, always start with a new 9 volt alkaline battery (Mallory MN 1604 or equivalent) or an 8.4 volt Nicad battery in your belt transmitter.

Refer to your Belt Transmitter Owner's Manual for operational procedures and Setting Gain Levels.

Refer to the illustration on the back of this sheet for placement of the Referee Switch Box and belt transmitter for best optimum performance.

MIC WIRING FOR REFEREES

MIC
Clip the mic to pocket or collar. The mic cord should loop out of the mic switch unit and enter the waist band under the right arm. Dress the cord under the shirt for user's comfort.
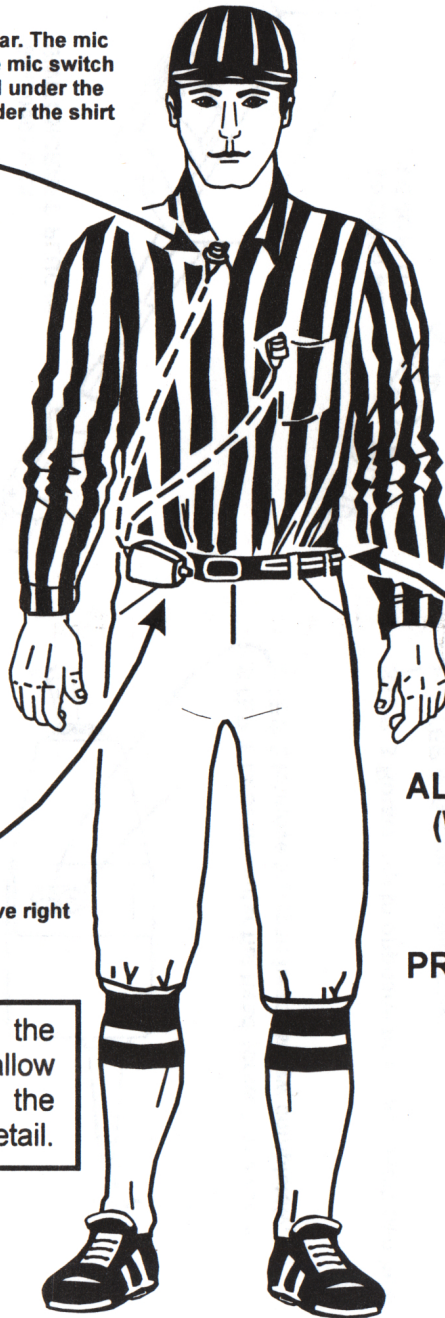
MIC SWITCH CORD UNIT
Feed the cord from the mic switch through belt loops above right rear pocket and loop the cord into the transmitter.

*ANTENNA ALTERNATE POSITION (WT-50, 55, 100, 200)
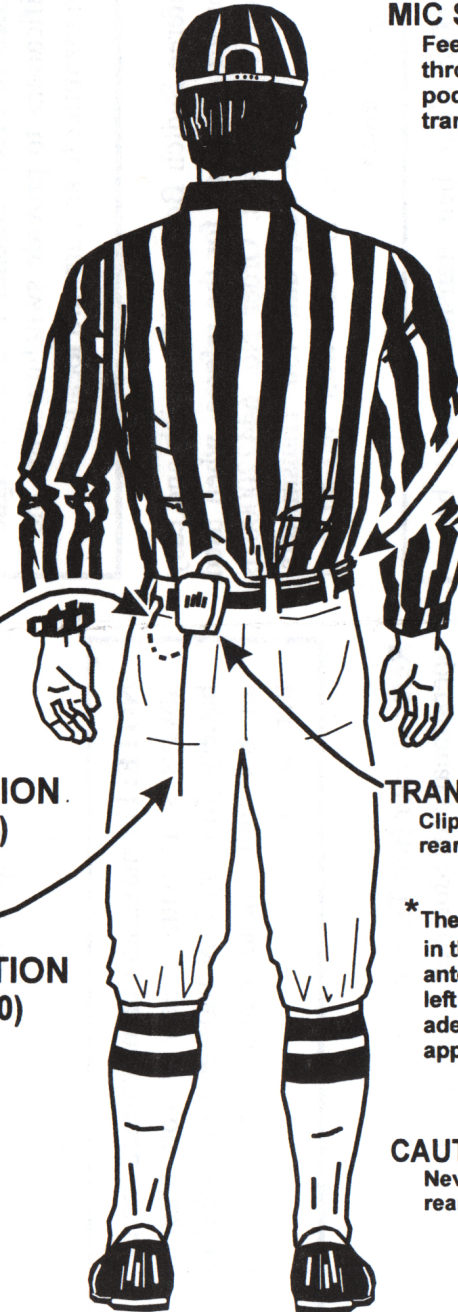
MIC SWITCH
Clip the switch unit on belt above right front pocket.

ANTENNA PREFERRED POSITION (WT-50, 55, 100, 200)

TRANSMITTER
Clip the transmitter on belt above left rear pocket.

*The trailing wire antenna works best in the preferred position. Feeding the antenna through the belt loops on the left side and clipping it in place will give adequate performance for most applications.

CAUTION!
Never coil the antenna and place it in rear pocket.

NOTE: The belt clip on the switch may be reversed to allow wear on the left side of the body. See clip reversing detail.

Section 1 - Quick Set-Up

Quick Set-up: Receiver

1. Do not connect the receiver to any other equipment yet!

2. Connect the two antennas to the receiver.

3. Plug the power supply into the back of the receiver and into an outlet.

4. Press the POWER switch. Display will light up.

5. Press and hold the SET button until ClearScan™ shows and starts flashing on the right side of the screen.

6. When ClearScan stops flashing, the receiver will automatically set itself and display the clearest group and channel.

7. If you are using a guitar, turn off the receiver. Press and hold SET while you turn the receiver on. A guitar symbol will appear in the display to indicate instrument mode.

8. Turn the receiver off and connect the mixer or other audio system to the receiver XLR Connector or the ¼ inch Line Level Jack.

9. Set the audio mixer or other system input level to minimum.

10. Press the Power switch button in again.

    Receiver "Quick Set-up" is complete.

Quick set-up: Transmitter

1. With the Power Switch on the transmitter OFF, install a fresh alkaline battery into the transmitter.

2. Place the transmitter Power Switch to the ON position.

3. The Red Battery Low Light near the display will flash on and then off. The display will also come on and display a group and channel.

4. Press the SET button once and the Group number will flash.

5. Use the up and down arrows to change the Group number to match the Group number displayed on the receiver. Press SET and the Channel Number will flash.

6. Use the up and down arrow buttons to change the Channel to match the receiver. Press Set and nothing will be flashing. The channel is now set.

7. If you are using a bodypack transmitter, plug the microphone into the transmitter connector. If using a guitar, turn the transmitter off and wait until display is blank. Hold SET down and turn the transmitter on. A guitar symbol should appear on the display. Plug the cord into the transmitter and guitar.

    Transmitter "Quick Set-up" is complete.

Quick set-up: System Operation

1. With the transmitter and receiver on, monitor the display screen. Note that the RF (1-100) Bar graph should indicate near the 100 mark. The AF Bar should show very little, if any, indication until you talk or sing into the microphone. While talking or singing in the loudest voice used in performance, adjust the transmitter gain control *if necessary* to cause the AF Bar Graph to peak near -6 to -3 but not over +3 for best performance.

2. Set the mixer/amp gain.

3. Talk or sing into the microphone or play the guitar at a normal volume. You should hear audio coming out of the system.

4. If using the unbalanced 1/4" output, you may have to adjust the gain (via the control next to the connector on the back panel) to match the level found when singing or playing with a wired connection.

    "Quick Set-up" is now complete.

    Please enjoy your FMR-500 system.

Section 2 - System Description

The FMR-500 Wireless Microphone system combines frequency agility and ease of use like no other. The transmitters and receivers operate over a 24 MHz bandwidth in the UHF portion of the Radio Frequency spectrum.

System Features Include:

- Advanced ClearScan technology for selecting the clearest available channels in intermodulation free groups

- Completely programmable in 25 kHz steps for over 950 possible frequencies

- LCD Displays for ease of viewing-Group, Channel, Frequency, Battery Status, Diversity Activity, Audio Meter and RF Meter

- Patented Phase Diversity System

- Adjustable Unbalanced Line Level 1/4 inch output jack

- Balanced XLR output jack for fixed Microphone Level or adjustable Line Level

The high quality audio circuitry and advanced Radio Frequency (RF) signal processing offer broadcast quality signal-to-noise and audio clarity.

- Front Panel Power ON/OFF Switch

- Front Panel Software Control of Squelch settings

- Double Squelch (Amplitude and Tone) system prevents false squelch

- Lockout feature to prevent accidental channel changes

- "Smart" battery feature in the transmitter means there is no wrong orientation

- Power Lock On feature prevents accidental turn off

- Battery level displayed at the receiver

Section 3 - Detailed Components Description

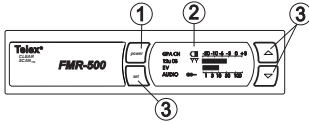## FMR-500 Receiver Controls, Connectors, and Indicators
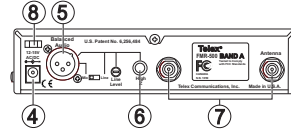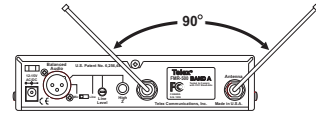

Figure 1 - FMR-500 Front Panel

Figure 2 - FMR-500 Back Panel

Proper Antenna Orientation

1. Power ON/OFF

2. Graphical Display
  a. Channel Display
  b. Frequency
  c. Battery Strength Indicator
  d. Diversity Indicator
  e. RF Strength of Signal Indicator
  f. Audio Level Indicator
  g. Guitar Mode Indicator

3. Display Control Buttons (Set/Up/Down)

4. Power Connector

5. XLR BalancedMic/Line Level Audio Output Line Level Adjustable

6. Unbalanced Line Level Audio Output Connector with Level Adjustment

7. TNC Antenna Input Connectors

8. Power Cord Retainer

Receiver Setup and Operation

1. Place the receiver and antennas where there is a clear line of sight to the area where the transmitter will be used. Rotate the antennas to separate them by 90 degrees.

2. **Connect the power supply** cord to the receiver. Plug the power supply into an AC outlet. Turn the receiver on and confirm that it is ON by checking the main display screen.

Caution: Please make sure the AC power supply is the correct voltage for your local requirements before it is plugged into the wall.

3. **Manual Channel Change.** Press the SET button and the Group number will start to flash. The Up and DOWN buttons allow you to scroll through the factory set group. When the group you desire is displayed, press SET to select that group and the Channel Number will start flashing. Scroll to the desired channel and press SET to select. The numbers will stop flashing and the new group and channel are installed.

4. **Frequency Assignment (Outside of preset Groups and Channels),** press SET and UP at the same time and the group and channel will go blank and the Frequency will start flashing. Use UP/DOWN to scroll in 25 KHz steps to the desired frequency. Press SET and the frequency will be selected and stop flashing. Press Set and UP at the same time to return to group and channel operation. Hint: holding in the Up or Down key will increase the speed of the scroll. Just release and press again for fine control.

5. **Advanced ClearScan:** This feature automates the process of finding a clear group of inter-modulation free channels and the clearest channels within those groups.

a. **ClearScan for Groups**: From the main display screen, push SET once and the Group Number will flash. While Group is flashing, press and hold SET until ClearScan appears, release the set key. When the scan is completed, the display will show the group with the most clear channels and the Channel number will indicate how many clear channels are in that group. Use the UP/DOWN keys and to view other groups and press SET to select a group. The Group will be set and the Channel will start to flash. Select a channel manually or use ClearScan for Channels.

b. **ClearScan for Channels:** To scan for the clearest channel in a group, press and hold set while the Channel is flashing until ClearScan appears, release the SET button. When the scan is complete, the display will show the clearest available channel. Use UP/DOWN to scroll through the other available channels rank from clearest to least clear (but still available for use, ClearScan will not display any channel that can't be used). Press SET to select the channel.

c. **Auto ClearScan:** This function will find the clearest group and channel with the press of just one button. With nothing flashing, press and hold the SET button until ClearScan appears on the right side of the screen. When the scan is complete, the receiver will be set to the clearest channel in the clearest group.

d. **ClearScan Band:** While in the Frequency Mode, this function will scan the entire band looking for the clearest frequency, regardless of groups and channels. In Frequency Mode, press Set once and the frequency will flash, press and hold set until ClearScan appears on the right side of the display. The scan will continue until you press Set again so you can scan a location overnight, 24 hrs, a week, or a few seconds. When you press Set again, the scan will stop and the clearest frequency will be displayed. You can scroll through the 8 clearest frequencies using the Up and Down buttons. Press Set to accept the frequency displayed.

NOTE: Groups 9 and above are set up to work with the other US frequency band (A and B). If you are using a mix of Band A and Band B, scroll down to these groups and use the clearest group.

6. **Change Lock-Out**: By pressing and holding the UP and DOWN arrow keys together for 3 seconds, the SET key is disabled.To reactivate the SET key, simply press and hold the UP and DOWN keys again for 3 seconds. This feature can be useful when the receiver is in a location where unauthorized personnel have access to the receiver.

7. For set up, make sure the mixer or amplifier input used for the FMR-500 is muted or turned down to a minimum level.

8. Plug an audio cable (not supplied) into the 3 pin XLR or 1/4 inch output of the FMR-500.

   a. **NOTE:** The XLR connector is the preferred connection since the output is balanced and will be more immune to noise for longer runs of cable although either can be used with good results. If the 1/4 inch connector is used, adjust the output level on the back panel to 12 o'clock (midway in the range) to start and adjust later if necessary.

Now refer ahead to transmitter setup and return to step 9 when that is completed.

9. With the transmitter on, speak into the microphone or play the guitar. Turn up the level on the mixer or amplifier until you are able to hear the desired signal. If no audio is present, repeat setup and refer to the troubleshooting section.

   NOTE: If the 1/4 inch output is used, it may be necessary to adjust the receiver output until the volume level from the wireless system approximates the level of an equivalent wired microphone/instrument.

10. **Squelch Adjustment** - The squelch setting can be used to maximize range or immunity to noise. Press and hold Up for 3 seconds. The current squelch setting will be displayed. Adjust the squelch using the UP/DOWN keys. Maximum squelch (9) maximizes noise immunity but limits the range. Minimum squelch (1) will maximize the range but allow more noise to break through the squelch. Press SET to save the new squelch setting.

Receiver Push-Button Reference Sheet

Display	Status Button	Function Activated	Edit	Accept
Nothing Flashing	Press and hold SET	Auto ClearScan	n/a	n/a
Nothing Flashing	SET	Edit Group -Group will flash	▲▼	SET
Group Flashing	Press and hold SET	ClearScan Group - list clear groups in order	▲▼	SET
Group Flashing	SET	Edit Channel - Channel will flash	▲▼	SET
Channel Flashing	Press and hold SET	ClearScan Channel - list clear channels in order	▲▼	SET
Nothing Flashing	Press and hold Up	Edit Squelch Setting	▲▼	SET
Nothing Flashing	Press and hold Up & Down	Edit Lock - Secure will appear	n/a	n/a
Edit Lock On	Press and hold Up & Down	Return to Access Mode	n/a	n/a
Power Off	Press and hold SET	Toggle between Guitar and Voice mode	n/a	n/a
Nothing Flashing	Press SET and Up	Toggle to Frequency Mode - Freq will flash	▲▼	SET
Frequency Flashing	Press and hold SET	ClearScan Band - Clear Scan will flash	n/a	SET
ClearScan Band Running	Press SET	End ClearScan Band after next full scan	n/a	n/a
ClearScan Band Results	n/a	Clearest frequencies listed	▲▼	SET
Frequency Mode	Press SET and Up	Return to Group and Channel Mode	n/a	n/a
Nothing Flashing	Press and hold Down	Display Software Revision	n/a	n/a

Rack Mount Installation

The FMR-500 is supplied with rack mounts for single and double mounting in a standard EIA 19"/483mm equipment rack (see Figure 3). For rack mounting a single unit, a long (#3) and short (#1) "ear" are used. For dual side-by-side mounting, use the short (#1) "ears" and the mid brackets (#2) from two FMR-500's as shown.

To assemble the rack mount adapters to the FMR-500 proceed as follows:

1. Remove the front Phillips head screws from each side of each unit.

2. Align the correct rack ear or bracket with the holes on the side of the unit. Install the previously removed screws. Insert an additional screw (#2, provided in the parts pack) into the remaining hole. Repeat this step for the opposite side of the unit. Be sure to tighten all screws securely.

Four double mounting of two FMR-500's proceed as follows:

1. Align the mid brackets (#2) with the holes on the adjacent sides of each unit.

2. Install the previously removed screws. Insert an additional screw (#4, provided in the parts pack) into the remaining holes. Tighten all screws securely.

3. Place the two assemblies side-by-side with the mid brackets together. (The left bracket should fit above the right so that the countersinks are visible). Install 4 flat head screws (#5, provided in the parts pack) and tighten them securely.

REMOVE SCREWS (TYPICAL 4 SIDES)

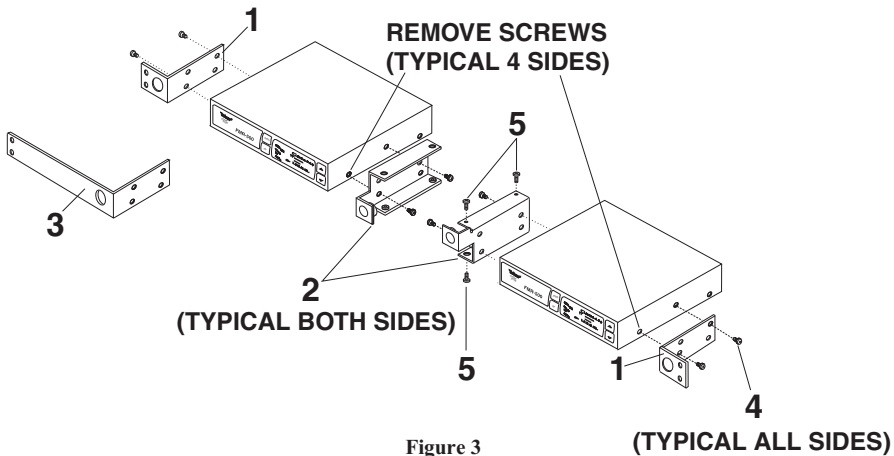**(TYPICAL BOTH SIDES)**

(TYPICAL ALL SIDES)

Figure 3
Rack Mount Installation

Front Mounting Antennas

1. Remove hole plugs from brackets.

2. Attach the antenna connectors to the brackets.

3. Attach the supplied extension cables from the rack connectors to the antenna connections on the back of the receiver. See Figure 4.
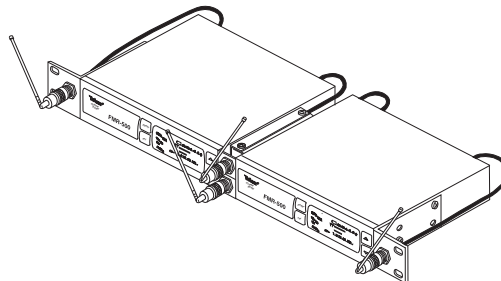
Figure 4
Front Mounting Antennas

Handheld Transmitter HT-500
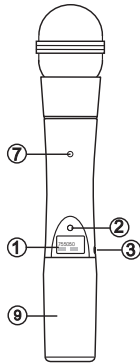
Figure 5
Handheld Transmitter
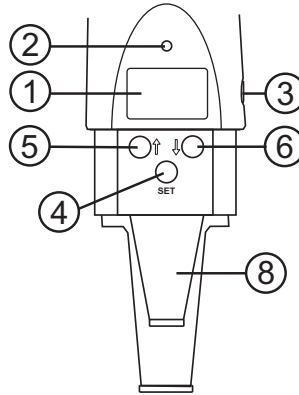
HT-500 Controls, Connectors, and Indicators

Figure 6
Transmitter

1. Main Display - LCD
   (Channel, Frequency or Battery Level Indication)

2. Battery Low LED - Lights when battery is low

3. Power On/Off Switch

4. Set Switch

5. Channel/Frequency Up Switch

6. Channel/Frequency Down Switch

7. Microphone Gain

8. 9V Battery Holder

9. Battery Cover - Screw type

Handheld Transmitter Setup and Operation

1. **Insert Battery.** Remove the battery compartment cover by unscrewing it completely. Insert a 9V battery, terminal end first into the battery compartment.

   NOTE: The HT-500 unique design allows the battery to be inserted and used regardless of the positive and negative terminal position.

2. **With battery compartment still open,** turn the unit so you can see the display and the control panel. Turn the unit on by sliding the power switch forward to the on position. The battery low LED will light for a second and the display will show the Group and Channel numbers.

3. **Change the group and channel numbers** to match those displayed on the receiver by pressing SET. The Group number will flash and can be changed with the UP/DOWN keys. Once the desired group number is showing, press SET to select and the Channel number will flash. Select the Channel and press SET again. The flashing will stop and the channel is now set.

4. **Other Screens:** Press SET and DOWN at the same time to display the battery level. Press SET and DOWN again to display frequency. Press them one more time to return to Group and Channel**.**

5. **Frequency Edit Mode -** Press SET from the frequency display screen to enter frequency edit mode. Press the Up and Down to adjust frequency in 25 kHz increments. Holding the Up or Down buttons down will auto step the frequency; slowly at first, then quickly. You can also enter frequency edit mode by pressing SET and UP at the same time from either the Group and Channel or Battery status display screens. Pressing SET and UP at the same time from the Frequency display screen will enter Group and Channel edit mode.

6. **Power Lock Out -** Press SET, UP, and DOWN at the same time and hold 3 seconds to lock the power switch on. To turn the unit off, place the power switch in the OFF position and push SET, UP, or DOWN. To remove the lock, press SET, UP, and DOWN again at the same time and hold 3 seconds. A one-time only ON-LOCK mode can also be entered by quickly cycling the power switch three times.

7. **Set Key Lock-Out**, by pressing and holding the UP and DOWN arrow keys together for 3 seconds, the SET key is disabled. To reactivate the SET key simply press and hold the UP and DOWN keys again for 3 seconds.

8. **Verify reception.** With the transmitter and receiver on and matching Group and Channel, the main receiver display should be indicating a RF signal on the bar graph. Speak into the microphone and the Audio Meter bar graph should indicate audio signal presence. If the level meters do not show reception, make sure the channels are matching and refer to the trouble shooting section.

9. **Adjustment of the transmitter audio gain - If necessary** The transmitter audio gain is factory set at the middle of the range, which should be suitable for most applications. For loud or soft speakers/singers, a gain adjustment may be necessary. Have the speaker or singer use the microphone in a normal performance level voice. The Audio Meter in the main receiver display screen should show peaks around the -3dB level. If the meter peaks all the way to the right or well below the -3dB level, adjust the transmitter audio gain.

To adjust the transmitter gain, gently insert the provided screwdriver (or other 3/32 - 2.5 mm screwdriver) into the adjustment hole above the display screen. Turn lightly until the screwdriver tip goes into the adjustment level control Gently turn counterclockwise until the control stops (the microphone output is at minimum but not off). Slowly turn the gain control up (clockwise) while speaking/singing into the microphone and audiometer shows peaks around -3 dB.

NOTE: Operating with the transmitter audio gain set as high as possible (without distortion or peaks all the way to the right end of the meter) will result in the best performance and highest signal to noise ratio.

10. Test Performance. Go back to Section 3. Receiver Setup and Operation - Step 9 to complete system set up and test.

Bodypack Transmitter - WT-500
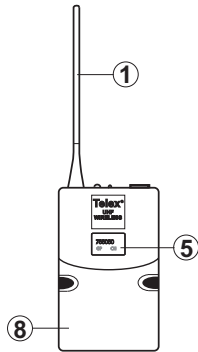
Figure 7
Bodypack Transmitter
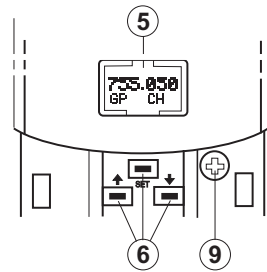
Figure 8
Control View

Figure 9
Top View

WT-500 Controls, Connectors, and Indicators

1. Antenna - flexible 1/4 wave antenna

2. Power On/Off Switch

3. Battery Low LED Indicator

4. TA4 Audio Connector

5. LCD Display (Channel, Frequency or Battery Level Indication)

6. Display Control Buttons (Set/Up/Down)

7. Belt Clip (Removable, not shown)

8. 9V Battery Compartment

9. Audio Gain Adjustment

Bodypack Transmitter Setup and Operation

1. **Insert Battery.** Pinch the battery door tabs inward and pull the door open. Insert a 9V battery as indicated by the +/- in the holder.

2. With battery compartment still open, turn the unit on with Power switch on the top panel. The battery low LED will light for a second and the display will show the Group and Channel numbers.

3. **Change the group and channel numbers** to match those displayed on the receiver by pressing SET. The Group number will flash and can be changed with the UP/DOWN keys. Once the desired Group number is showing, press SET to select and the Channel number will flash. Select the Channel and press SET again, the flashing will stop and the channel is now set.

4. **Set Key Lock-Out**. By pressing and holding the UP and DOWN arrow keys together for 3 seconds, the SET key is disabled. To reactivate the SET key, simply press and hold the UP and DOWN keys again for 3 seconds.

5. **Verify reception.** With the transmitter and receiver on and matching Group and Channel, the main receiver display should be indicating a RF signal on the bar graph. If the level meter does not show reception, make sure the channels are matching and refer to the trouble shooting section.

6. **Attach the Microphone or Guitar.**

   Microphone: Plug the microphone cable into the top panel of the WT-500. Speak into the microphone and the Audio Meter bar graph should indicate audio signal presence.

   Guitar: Turn off the bodypack, press and hold SET while you turn the bodypack on. A guitar symbol will appear in the display to indicate instrument mode. Repeat the process holding SET on the receiver as it is powered up. Plug in the MAC-G3 guitar cable. Strum the guitar and the Audio Meter bar graph on the receiver should indicate audio signal presence.

7. **Adjustment of the Transmitter Audio Gain - (if necessary).** The transmitter audio gain is factory set at the middle of the range, which should be suitable for most applications. For loud or soft speakers/singers, a gain adjustment may be necessary.

Have the speaker or singer use the microphone in a normal performance level voice. The Audio Meter in the main receiver display screen should show peaks around the -3 dB level. If the meter peaks all the way to the right or well below the -3 dB level, adjust the transmitter audio gain.

To adjust the transmitter gain, gently insert the provided screwdriver (or other screwdriver) into the adjustment potentiometer. Gently turn counterclockwise until the control stops (the microphone output is at minimum but not off). Slowly turn the gain control up (clockwise) while speaking/singing into the microphone or strumming the guitar and the audiometer shows peaks around -3 dB.

NOTE: Operating with the transmitter audio gain set as high as possible (without distortion or peaks all the way to the right end of the meter) will result in the best performance and highest signal to noise ratio.

Other Screens: Press SET and DOWN at the same time to display the battery level. Press SET and DOWN again to display frequency. Press them one more time to return to Group and Channel.

8. **Frequency Edit Mode -** Press SET from the frequency display screen to enter frequency edit mode. Press the Up and Down to adjust frequency in 25 kHz increments. Holding the Up or Down buttons down will auto step the frequency; slowly at first, then quickly. You can also enter frequency edit mode by pressing SET and UP at the same time from either the Group and Channel or Battery status display screens. Pressing SET and UP at the same time from the Frequency display screen will enter Group and Channel edit mode.

9. **Power Lock Out** - Press and hold SET, UP, and DOWN at the same time and hold for 3 seconds to lock the power switch on. To turn the unit off, place the power switch in the OFF position and push SET, UP, or DOWN. To remove the lock, press SET, UP, and DOWN again at the same time and hold for 3 seconds. A one-time only ON-Lock mode can also be entered by quickly cycling the power switch three times.

10. **Test Performance** - Go back to Section 3 - Receiver Setup & Operation, Step 9 to complete system set up and test.
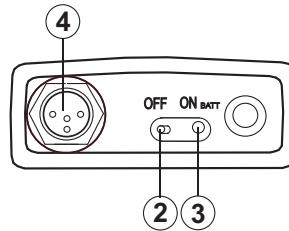

APPROVAL INFORMATION

The Electro-Voice/Telex Transmitters are Type Accepted under United States Federal Communications Commission CFR 47, Part 74 and Industry Canada RSS123.

The Electro-Voice/Telex Receiver is approved under United States Federal Communications Commission CFR 47, Part 15 and Industry Canada RSS210.

Licensing of Electro-Voice/Telex equipment is the users responsibility and Licensability depends upon the users classification, users application and frequency selected. Electro-Voice/Telex strongly urges the user to contact the appropriate telecommunications authority for any desired clarification.

CAUTION: Any changes or modifications made to the above equipment could void the users authority to operate the equipment.

Section 4 - Receiver Display Screens and Functions

Main Operating Screen
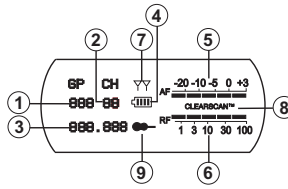
Figure 10
Main Operating Screen

Display:

1. Group Number · · · · · · · · · · · · · · 10 (factory set)
2. Channel Number · · · · · · · · · · · · · · · · · · 01 to 10
3. Frequency · · · · · · · · · · · Displayed in MegaHertz
4. Battery Status · · · · · · · · · · · · · · · 100 to 0 Pct in 25 Pct steps/Flash if low
5. Audio VU Meter · · · · · · · · · · -30 VU to + 3 VU
6. RF Signal Strength · · · · · · · · · · · 1 µV to 100 µV
7. Antenna Diversity Status · · · left or right antenna
8. ClearScan · · · · · · · · Indicates Scan is in progress
9. Guitar Symbol · · · · · · Indicates Instrument Mode

Controls:

1. Press and hold SET for 3 seconds starts Auto-ClearScan™
2. Press SET once, Group starts flashing, adjust with UP and DOWN
2.a With Group flashing, press and hold SET for 3 seconds to start Group Scan
3. Press SET twice, Channel starts flashing, adjust with UP and DOWN
3.a With Channel flashing, press and hold SET for 3 seconds to start Channel Scan
4. Press SET and UP at the same time to enter Frequency Mode
5. Press and hold UP for 3 seconds to adjust Squelch
6. Press and hold SET during power up to enter Instrument Mode
7. [UP] + [DOWN] for 3 seconds Sets/Resets Edit Lockout

Squelch Adjustment Screen

Figure 11
Squelch Adjustment Screen
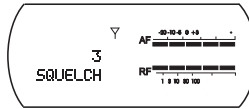
Display:

1. Squelch Level · · · · · · · · · · · · · · · · 1-10

Controls:

1. [UP] + [DOWN] adjust the squelch level
2. SET saves the squelch level shown and returns you to the main screen

Transmitter Display and Controls
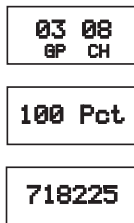
Figure 12
Transmitter Display and Controls

Display:

1. Group and Channel
2. Battery Level in Percentage
3. Frequency

Controls:

1. Press SET once, GP will flash, use UP and DOWN to adjust
2. Press SET again to accept GP, CH will flash, adjust with UP/DOWN
3. Press SET again to accept CH and channel will be installed
4. Press SET and DOWN at the same time to change display mode
5. Press SET and UP to enter Frequency Set Mode
6. Press SET and DOWN to return to the Group/Channel Mode
7. Press and hold UP and DOWN for 3 seconds to lock out SET
8. Press and hold UP and DOWN again to activate SET
9. Press and hold UP, DOWN, and SET to lock power (see Section 4)
10. Press and hold UP, DOWN, and SET to unlock power

Transmitter On/Off Lock-Out

There are two On/Off lockout modes available, One Time and Everytime.

One Time: Cycle the power switch 3 times in under 3 seconds and On-Loc will be displayed for a second and then return to normal operation. The power switch alone will no longer turn the unit off. To turn the unit off, put the power switch in the off position (On-Loc will be displayed) open the battery door and press [Set], [Up], or [Down] and the unit will power down. The next time the unit is powered on, the power switch will operate normally.

Everytime Use: With the unit on and operating in the normal mode, press and hold [Set], [Up], and [Down] for 3 seconds. On-Loc will be displayed and the power switch alone will no longer turn the unit off. To turn the unit off, put the power switch in the off position, (On-Loc will be displayed), open the battery door and press [Set], [Up], or [Down] and the unit will power down. The next time the unit is powered on, the On-loc function will still be on. To enable the power switch, press and hold [Set], [Up], and [Down] for 3 seconds (On-Off will be displayed).

Guidelines and Recommendations for Best Performance

Compatibility

The transmitter and receiver must be of the same frequency band and set to the same group and channel in order to work together. The FMR-500 is available in two frequency bands, A and B. The band information is available in the Group/Channel edit screen on the receiver, the bottom label on the handheld transmitter, and on the back panel label on the bodypack.

Using Multiple Wireless Systems

If two or more FMR-500 systems and/or other UHF/VHF wireless systems are being used in the same location, proper frequency coordination is necessary to avoid interference. All channels in the FMR-500 factory set groups are designed to work together, so if channels from just one group are used no further coordination is required. Contact your dealer or Telex for assistance if you are planning more systems or using the FMR-500 with other wireless equipment.

IMPORTANT NOTE: Always use the smallest preset group that meets your needs. For instance, if you want to set up 6 units, use one of the groups of 8 frequencies. The smaller the preset group, the more compatible the frequencies are.

Multiple Systems and Advanced ClearScan

Because all of the channels in the factory set groups are compatible, Advanced ClearScan can be used to set up multiple systems quickly and with confidence. When setting up more than one system, set up the first system using the Auto-ClearScan™ function.

Once the working Group has been established, leave the first transmitter on, set the next receiver Group to the working Group and run ClearScan for Channels. This will provide the next clearest channel in that group. Set the transmitter to match, leave it on and repeat until all the systems are set up. If you run out of clear channels in one group but need to set up more systems, contact your dealer or Telex for assistance in choosing additional frequencies.

Potential Sources of Interference

There are many potential sources of interference for your wireless system. Any electronic product that contains digital circuitry including digital signal processors (reverb/multi-effects units), electronic keyboards, digital lighting controllers, CD and DVD players, and computers, all emit RF energy that can adversely affect the performance of your wireless system. It is always best to place the receiver as far away as possible from these devices to minimize potential problems.

Analog and Digital Television stations can also interfere with your wireless system. The FMR-500 is designed to operate over 28 MHz of RF bandwidth, which covers six TV channels. The factory presets on the FMR-500 are optimized for conditions where one, two, or possibly three of the six stations are covered in your area. If four or more of the six stations are used in your area, it will severely limit the number of systems that will operate together and you should be using a different band.

Battery Recommendations

Fresh 9-volt alkaline batteries form a quality manufacturer will yield the best performance from your transmitters. Rechargeable 8.4-volt Ni-Cad batteries can be used but will result in much shorter operation time.

When the transmitters are turned on, the red battery LED will flash once if the battery is good. If the light does not light or stays lit continuously, the battery is weak or dead. If the light comes on during use, the battery is weakening and should be replaced as soon as possible. If sound quality degrades during use, it may be the result of a weakening battery.

Caution: The battery level indicators, on the transmitters and receiver displays, are based on the use of alkaline batteries. Use of other battery types will result in false readings on these indicators although the battery low LED on the transmitters will operate normally.

Receiver and Antenna Placement

Do not place the receiver near a large metal object or surface. Locate the receiver as close as possible to the area where the transmitter will be used. Ideally, position the receiver/antennas within sight of the transmitter. When using multiple systems, do not allow antennas to cross or touch each other. For best results with multiple receivers, use a UAD-2 antenna splitter. (See Section 7).

Section 5 - Trouble Shooting Guide

Problem	Possible Causes	Solutions
No audio and no display on the receiver	Receiver is off	Make sure that the power supply is properly connected and the on/off button is in the on position
No audio and no RF signal indicator on the receiver display	Transmitter is off	Turn on transmitter power switch
	Transmitter is on a different channel	Match the transmitter group and channel to the one displayed on the receiver
	No (or dead) battery in transmitter	Insert fresh battery in transmitter
	Faulty battery contacts	Clean and or bend contact
No Audio with good RF signal indicator but no (or low) Audio indicator on the receiver display	Microphone not connected	Check the TA4F connector on the bodypack or the detachable microphone element connection on the handheld
	Low gain setting on the transmitter	Increase the transmitter gain
No (or low) Audio with good RF signal and Audio indicators on receiver display	Receiver audio output cable is damaged or disconnected	Connect, repair or replace cable
	Gain not sufficient on mixer/preamp/amp input or it is muted	Increase gain on mixer or un-mute the input
	Receiver output too low (1/4" output)	Increase the audio output setting
Distorted audio signal	Transmitter audio gain too high	Decrease the transmitter gain setting
	Receiver output too high (1/4" output)	Decrease the receiver output setting
	Battery level low in transmitter	Insert fresh battery in transmitter
Interference	Another FMR-500 system in the installation is on the same channel or the signals are mixing	Make sure all the channels in use are from the same group. Use ClearScan to select the clearest group. If more channels are needed call Telex at 800-392-3497 for coordination help
	Another wireless product in the area is on the same frequency or the signals are mixing	Use ClearScan to change the operating frequency. If problems persist, call Telex at 800-392-3497 for coordination help

Trouble Shooting Guide (continued)

Problem	Possible Causes	Solutions
Interference (continued)	Receiver is too close to digital signal processor or similar device	Move the receiver to a different location
	Strong electromagnetic field from stage lighting or other source near the transmitter or receiver, which may be producing RF noise at or near the operating frequency	Use ClearScan to change the operating frequency. Repair or remove the source of interference. Move the receiver to a different location
Short range or drop-outs	RF reflective metal obstacles between the transmitter and receiver	Move the obstacles, or reposition the receiver/antennas
	Poorly oriented beltpack antenna	Check the antenna connection and re-orient the bodypack so the antenna is vertical (up and down) and facing the receiver, if possible
	Faulty receiving antenna system	Check all antenna connections and reposition to be in line-of-sight with the transmitter
Can't change settings on receiver or transmitter	Lock-out feature is enabled	Disable lock out (see pages 3 and 9)
Bodypack or Handheld transmitter will not turn off, display says On-Loc	On/Off lock-out is engaged	Put the on/off switch in the off position and press one of the programming buttons (see page 9)

Section 6 - Technical Specifications

FMR-500 Receiver

Specifications

Overall

Receiver Type . . . . Synthesized PLL

Frequency Range (RF) . . . . A Band 648 - 676 MHz (TV Channels 43 - 48)
B Band 696 - 724 MHz (TV Channels 54 - 56)

Number of Channels . . . . >1122 possible frequencies
Programmable in 25 kHz steps

Modulation . . . . +/- 40 kHz

Diversity . . . . Digital Posi -Phase^{TM} True Diversity

RF Sensitivity . . . . <1.0 μV for 12 dB SINAD

Image Rejection . . . . >60 dB

Squelch . . . . Tone Code plus Amplitude

Ultimate Quieting. . . . . >100 dB

FCC Certification . . . . Approved under Part 15

Power Requirements. . . . . 12-15V AC/DC, 300mA

Operating Temperature. . . . . -7° to 49° C (20° to 120° F)

Receiver Dimensions . . . . 1.72 in. H x 7.50 in. W x 5.9 in. D
43.69 mm H x 190.50 mm W x 150 mm D

Audio Parameters

Frequency Response . . . . 50 - 15 kHz +/- 2dB

Balanced Output (typical) . . . . (max @ 40 kHz deviation)
330mV RMS 100K OHM Load, Mic Position
10mV to 2V RMS 100K OHM Load, Line Position

Unbalanced Output . . . . adjustable 10 mV to 1V RMS, 100K OHM Load

Distortion. . . . . <1.0%, 0.5% typical (ref 1kHz, 40kHz deviation)

Signal-to-Noise Ratio. . . . . >100 dB A Weighted

Dynamic Range . . . . >100 dB

Transmitters WT-500 and HT-500

Radiated Output . . . . 30 mW Typical

Microphone Head ElectroVoice 767a . . . . N/D 767a supercardioid N/DYM dynamic

Microphone Head ElectroVoice RE410 . . . . RE410 cardioid condenser

Standard Lavalier Microphone. . . . . ELM-22 Omni-Dierctional Condenser

TA4F Connector Wiring. . . . . Pin 1: Ground; Pin 2 Mic Input;
Pin 3: +5V bias; Pin 4: +5V bias
through a 3k   resistor

Audio Gain Adjustment Range . . . . 40 dB WT-500
26 dB HT-500

Power Requirements. . . . . 9 Volt Alkaline Battery

Battery Life (Typical) . . . . >8 hours with 9-Volt Alkaline Typical

Bodypack Antenna . . . . Flexible external 1/4 wave

Handheld Antenna . . . . Internal 1/2 wave

Dimensions (Handheld) . . . . 24.0 cm (9.4 in.) Long

Dimensions (bodypack) . . . . 3.8 in. H x 2.38 in. W x 0.92 in. D
96.5 mm H x 60.5 mm W x 23.4 mm D

Section 7 - Accessories and Parts

	MODEL No.	Order No.
Omnidirectional Lapel Microphone	WLM-50	64277000
Unidirectional Lapel Microphone	UML21	ULM21
Premium Omnidirectional Lapel Microphone	ELM-22	70925006
Premium Lapel/Instrument Unidirectional Microphone	ELM-33	70926001
Presenter's Headworn Microphone	HM2	HM2
Singer's Headworn Microphone	HM7	HM7
Hard Shell, Foam lined Road Case	RC-RE2	7185800
Foam Windscreen for Handheld	379-1	3792031
Handheld Transmitter Color Kit	HHCK	7185700
Bodypack Pouch	WP-1000	879553
Guitar Cord	MAC-G3	879706
Single Receiver Rack Mount Kit	RMS	71081001
Single Rack Mount Kit with front mount antenna cables	RMS-TNC	71081004
Double Rack Mount Kit	RM-D	71081002
Front Mount Antenna Cables (4)	FMC-K	878978
1/4 Wave Rx Antenna 600-746 MHz (A/B Bands)	ANU-14	879010
1/2 Wave Rx Antenna (680-870 MHz)	FA-500	860031
1/2 Wave Antenna Mounting Bracket with 10' of Coax	AB-2	71138000
Antenna/Pwr Distribution (600-780 MHz) (A/B Bands)	UAD-2	71253000
Termination Plug for UAD-2	TP-2	650095
Directional Rx Antenna (450-900 MHz) (A/B Bands)	ALP-450	71147000
Low Loss Coaxial Antenna Cable (25, 50, 75, 100 ft. with TNC Connectors)	CXU-25 CXU-50 CXU-75 CXU-100	71151025 71151050 71151075 71151100

User's Manual
LT-800 Stationary Transmitter
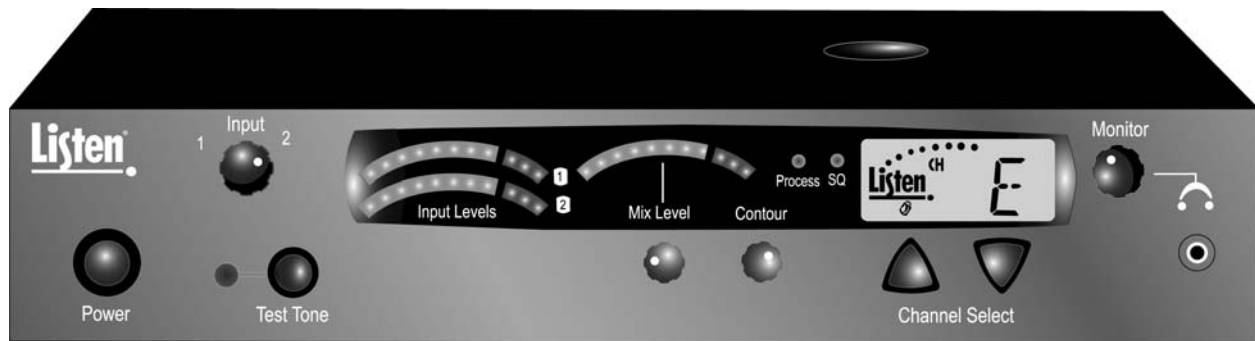
Don't miss a single sound. Listen.

Dear Valued Customer,

Thank you for choosing Listen! All of us at Listen are dedicated to providing you the highest quality products and prompt, efficient customer care. Our products are manufactured in an ISO-9000 factory that has been independently certified to the highest quality standards. We stand ready to answer any questions you might have during installation or in the operation of our products. Should there be any problems with your Listen products, we are ready to help you in any way we can. We appreciate any comments you may have on how we might improve our products or our service. Here's how to reach us:

Telephone: 1.801.233.8992
Fax: 1.801.233.8995
Toll Free (North America): 1.800.330.0891
E-Mail: support@ListenTech.com
Web: www.ListenTech.com

Thank you... and enjoy your listening experience!

Best regards,

The Listen Team

Russell Gentner, President

LT-800 Package Contents

· LT-800 Stationary Transmitter (72 MHz or 216 MHz)
· LA-201 120 VAC Power Supply
· LA-121 BNC Adapter (72 MHz model only)
· User Manual
· Quick Reference Sticker

Listen Part Number

72 MHz: LT-800-072
216 MHz: LT-800-216

Optional Accessories

See pages 19-20

Table of Contents
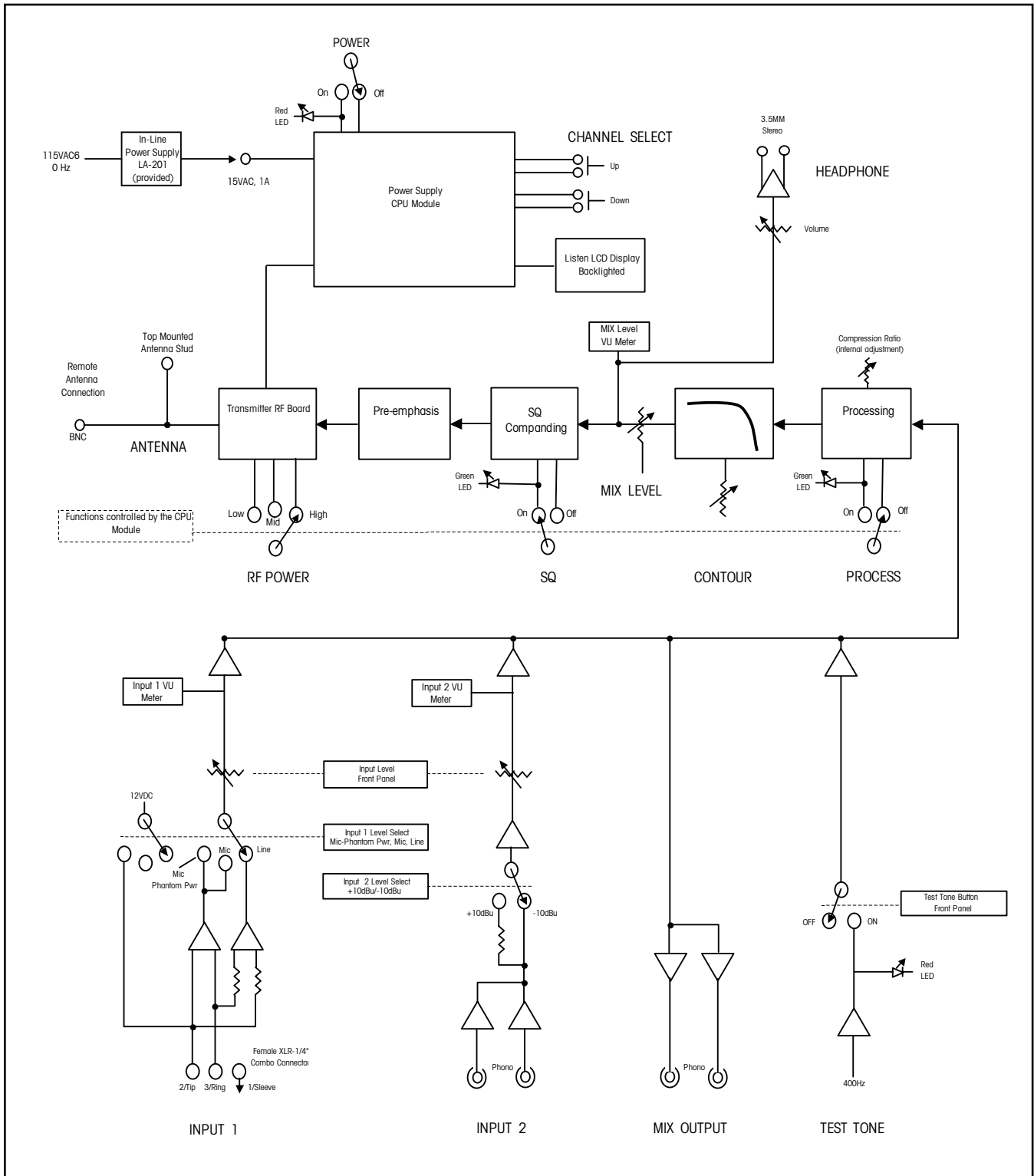
Specifications

Architectural Specifications

The stationary FM transmitter shall be capable of broadcasting on 57 channels. The transmitter shall have a SNR of 80dB or greater. The output power shall be adjustable to quarter, half or full. Channel tuning shall be capable of being locked. The device shall broadcast on both wide and narrow band channels. The device shall have an audio frequency response of 63 Hz to 15k Hz, ± 3dB at 72 MHz, or of 63 Hz to 10k Hz, ± 3dB at 216 MHz. It shall have two mixing audio inputs. The device shall have the following audio controls: input level, mix level and an adjustable low pass filter. The device shall have an audio processor that is capable of automatic gain control and limiting. The Listen LT-800 is specified.
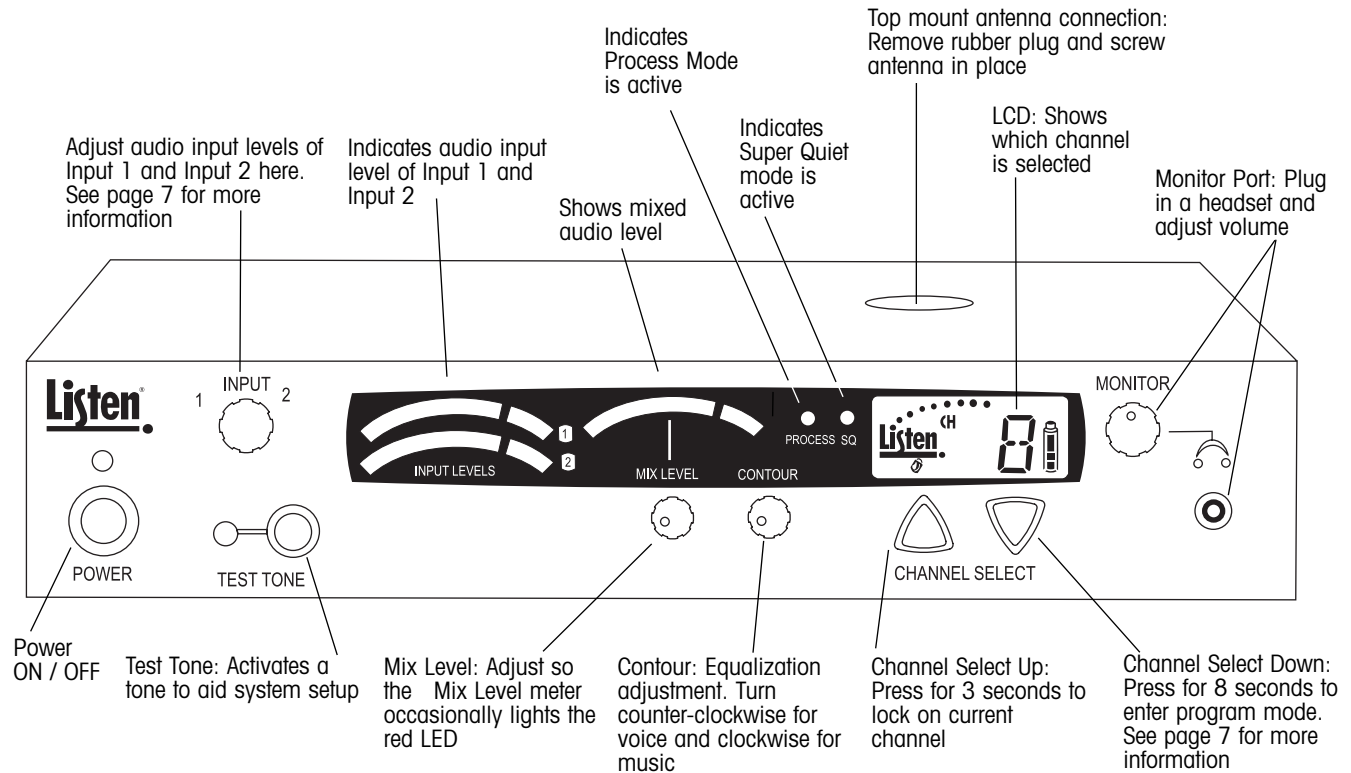
Specifications

	Specification	LT-800-072	LT-800-216
RF	RF Frequency Range	72.025 - 75.975 MHz	216.025 - 216.975 MHz
	Number of Channels	57 (17 wide, 40 narrow)	57 (19 wide, 38 narrow)
	Frequency Accuracy	+/- .005% stability 0 to 50C	
	Transmitter Stability	50 PPM	
	Output Power	8,000uV at 3m	100mW (Max allowed by FCC)
	Antenna	Several available. See www.ListenTech.com for details	
	Antenna Connector	BNC	BNC
	Compliance	FCC Part 15, Industry Canada	
Audio		** All system specifications are wireless end-to-end	
	System Frequency Response	63Hz - 15kHz (±3dB)	63Hz - 10kHz (± 3dB)
	System Signal to Noise Ratio (A-weighted)	SQ enabled: 80dB; SQ disabled 60dB	SQ enabled: 80dB; SQ disabled 50dB
	System Distortion	<2% total harmonic distortion (THD) at 80% deviation	<2% total harmonic distortion (THD) at 80% deviation
	Audio Input 1	Rear panel. Female-XLR and 1/4 in combo connector, balanced, 0/-55dBu (line/mic) nominal input level adjustable, -30/+21dBu (mic/line) maximum input level, impedance 20k/1k ohms (line/mic), phantom power +12VDC	
	Audio Input 2	Rear panel. (2) Phono connectors, unbalanced, -10/+10dBu nominal input level adjustable, +30dBu maximum, impedance 100k ohms	
	Combined Audio Output (Mix)	Rear panel. (2) Phono connectors, unbalanced, 0dBu nominal output level, +19dBu maximum, impedance 10 ohms.	
	Headphone Output	Front panel. (1) 3.5mm connector, unbalanced, adjustable output level, +14dBu maximum, impedance 10 ohms. 350mW, 32 ohms, 3.5mm stereo.	
Controls	Front Panel	Power, Test Tone on/off, Channel up/down, Input Level, Mix Level, Contour, Headset Level	
	Rear Panel	Input 1 Level (Line, Mic, Mic-Phantom Power), Input 2 Level (-10/+10 dBu), RF Power (low, mid, high)	
	Internal Adjustments	Compression ratio for audio processor	
	Programming	SQ on/off, Processing on/off	
Indicators	Input 1 and Input 2, Mix VU Meters	8 Green, 2 Red	
	SQ and Processing	Indicated by a green LED when on	
	RF Power	Indicated on the LCD Display	
	Power	Red LED illuminates when the unit is powered up	
	LCD Display	Channel designation, lock status, RF Power Level	
	Test Tone	Red LED illuminates when test tone enabled	
Power	Power Supply Type	In-line power supply, Listen part number LA-201	
	Power Supply Input	120VAC, 60 Hz, 19 watts	
	Power Supply Output	15VAC, 1000mA	
	Power Supply Connector	.02 in (5.0mm) OD x .01 in (2.5mm) ID, barrel type	
	Compliance	UL Listed	
Physical	Dimensions	8.0 in (20.3cm) W x 8.0 in (20.cm) D x 1.75 in (4.45cm) H	
	Unit Weight	3.0 lbs (1.4kg)	
	Unit Weight with LA-201 Power Supply	4.4 lbs (2.0kg)	
	Shipping Weight	5.0 lbs (2. kg)	
	Rack Mounting	1 rack unit, optional rack mount not included. Order Listen part number LA-326.	
Environmental	Temperature - Operation	-10 C (14 F) to +40° (104 F)	
	Temperature - Storage	-20 C (-4 F) to +50° (122 F)	
	Humidity	0 to 95% relative humidity, non-condensing	

LT-800 Block Diagram

Quick Reference
LT-800 Front Panel: Controls & Displays

Indicates Process Mode is active

Top mount antenna connection: Remove rubber plug and screw antenna in place

Indicates Super Quiet mode is active

LCD: Shows which channel is selected

Adjust audio input levels of Input 1 and Input 2 here. See page 7 for more information

Indicates audio input level of Input 1 and Input 2

Shows mixed audio level

Monitor Port: Plug in a headset and adjust volume

Listen

INPUT 1 2

INPUT LEVELS

MIX LEVEL

CONTOUR

PROCESS SQ

Listen CH

MONITOR

POWER

TEST TONE

CHANNEL SELECT

Power ON / OFF

Test Tone: Activates a tone to aid system setup

Mix Level: Adjust so the Mix Level meter occasionally lights the red LED

Contour: Equalization adjustment. Turn counter-clockwise for voice and clockwise for music

Channel Select Up: Press for 3 seconds to lock on current channel

Channel Select Down: Press for 8 seconds to enter program mode. See page 7 for more information
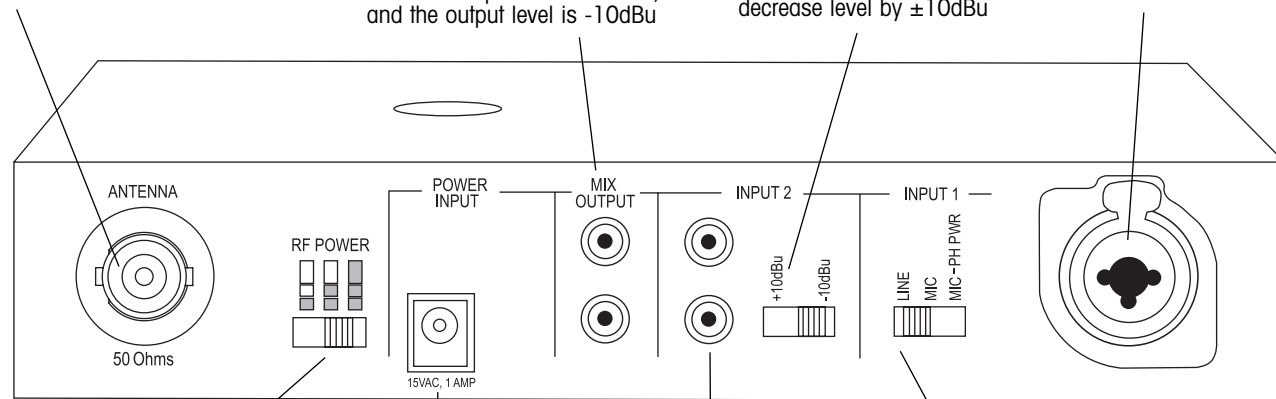
LT-800 Back Panel: Connections & Settings

Remote Antenna Connection: See page 19 or the Listen website for details on antennas that can be attached here

Mix Output: These connectors contain a mix of Input 1 and Input 2. They are unbalanced phono connectors; and the output level is -10dBu

Input 2: Set switch to match the level of your Input 2 audio source, not used to increase or decrease level by ±10dBu

Input 1: Used for balanced connection of a microphone or line level input. This combination connector accepts either XLR or ¼" phono plugs

ANTENNA

RF POWER

POWER INPUT

MIX OUTPUT

INPUT 2

INPUT 1

+10dBu   -10dBu

LINE   MIC   MIC+PH PWR

50 Ohms

15VAC, 1 AMP

Set RF Power level here (¼, ½ and Full). See page 6 for guidelines on setting power levels

The Listen LA-201 power supply connects here

Input 2: Connect unbalanced audio to these phono connectors, input level -10dBu or +10dBu

Select Line, Mic or Mic+Phantom Power. Line is balanced 0 dBu input level, Mic is -55dBu, +12VDC supplied in PH Power position. If not using input 1, leave in line position.

4

LT-800 Setup Instructions

1 Unpack the Product

Remove outer packaging and plastic cover. Inspect for physical damage.

2 Mount in Rack (if necessary)

If rack mounting the unit, install the optional rack mount kit (part LA-326) according to the instructions included with the kit, then install the LT-800 in the rack.

NOTE: If rack mounting, you will need to use a rear connection antenna.
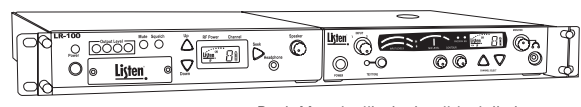
Rack Mount with dual unit installed
Shown with LR-100 and LT-800
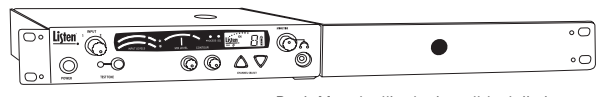
Rack Mount with single unit installed
Shown with LT-800

3 Connect Antenna

Connect the antenna (not included) according to the installation instructions. Only use an antenna supplied by Listen. If you are connecting the antenna directly to the top of the LT-800, you will need to remove the rubber plug on top of the unit. If you are using a remote antenna connected to the rear of the unit, do not connect an antenna to the top connector. See page 19 for antenna options, or refer to the Listen website for remote antenna options.

rubber plug
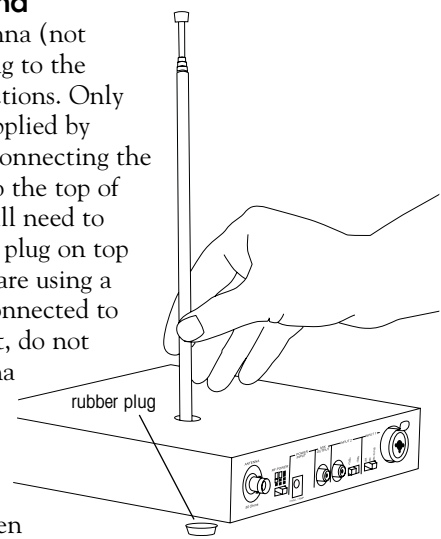
LT-800 shown with top mount antenna connected through top of unit
(part numbers LA-101, LA-106 (72 MHz) or LA-102 (216 MHz)
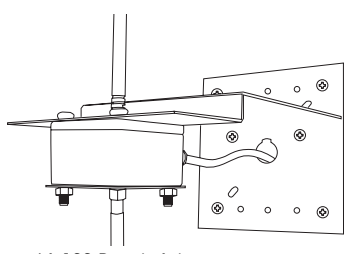
LA-122 Remote Antenna
See RF Reception Maximization Strategies and Coaxial Cable on page 10.
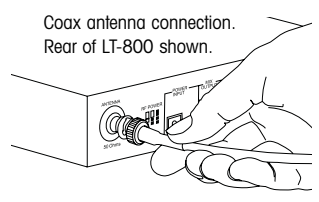
Coax antenna connection. Rear of LT-800 shown.

4 Connect Power

Plug the power supply into the power connector on the back panel, then plug the power supply into an outlet.

Only use a Listen approved power supply (The LA-201, an in-line transformer, is the approved power supply for this unit).
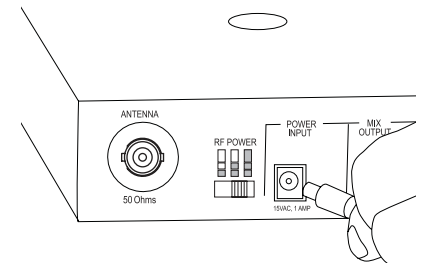
5 Select Phonak Compatibility (if necessary)

If you will be using Phonak receivers with your LT-800 (216 MHz only), the transmitter can become completely compatible through software control. When switched to this mode, the LT-800 transmitter will display the Phonak channels. By integrating Phonak channels and compatibility into the LT-800-216, it is more convenient to use Phonak receivers with Listen transmitters. (www.phonak.com)

To Select Phonak Mode:

Press and hold down the channel select "up" button while powering on the unit. The LCD will display a "P" momentarily upon power up indicating that the transmitter is in the Phonak Channel Mode. The channels displayed will now match Phonak channels. To return to the Listen channel designations, repeat this process. The LCD will display an "L" momentarily upon power up indicating that you are in the Listen Channel Mode.
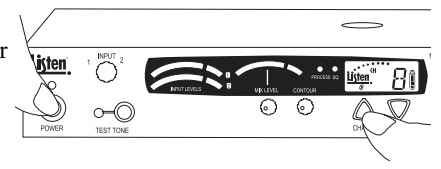
6 Select Channel Mode (if necessary)

Your transmitter has been shipped to you with only a limited number of channels available (Basic Mode). If all channels (Expanded Mode) are required, use the following procedure.

To Select Expanded Mode:

To enable or disable the Expanded Mode, press and hold the channel select "down" button while powering on the unit. When the Basic Mode is enabled, "L/O" (lockout) will be displayed on the LCD display as shown below. This indicator is extinguished when in the Expanded Mode.

5
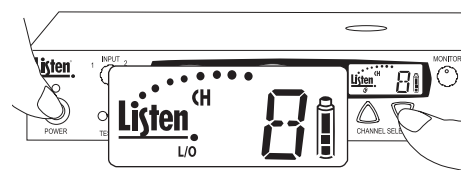
LT-800 Setup Instructions continued

**7** **Set SQ (Super Quiet) and Process Features**
Your transmitter is shipped to you with SQ (super quiet) enabled and Process disabled. For a detailed description of these features and when to use them, please refer to page 9.

To Disable or Enable SQ and Process Features:
With the unit on press and hold the channel select "Down" button for 8 seconds. The program (PGM) icon will appear on the LCD.

Once in the program mode,
Program icon

the SQ and Process features can be turned on and off by pressing the channel select buttons.

· Press the channel select "Up" button to toggle between Process On and Off.
· Press the channel select "Down" button to toggle

LED lit when Process is enabled
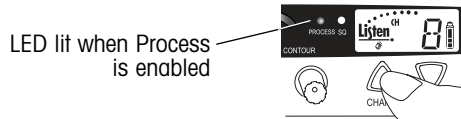
between SQ On and Off.
If the green LED is

LED lit when SQ is enabled
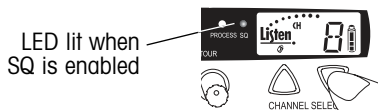
displayed on the front panel, that feature is enabled. Once you have enabled or disabled the features as desired, let the transmitter exit the program mode by waiting 5 seconds.

8 **Set RF Power**
Set the RF POWER switch on the back of the unit to Full, ½ or ¼ (Level is indicated on the LCD display). The amount of transmitted RF power that you will need depends on your application. If you are operating multiple transmitters in the same environment, it is best to set the transmitter's output power to its lowest level to reduce the possibility of interference.

Full power

½ power

¼ power

Back of LT-800 unit
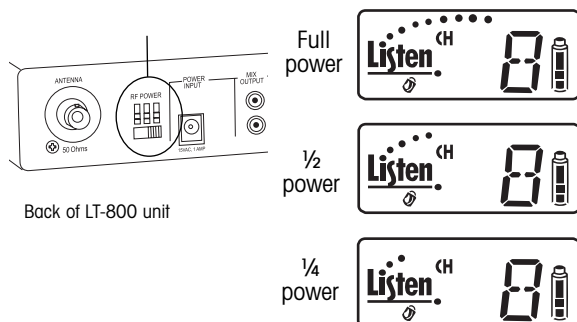
9 **Connect Audio Inputs**
The LT-800 has two audio input options: Input 1 and Input 2. Input 1 is a balanced connection using either an XLR or ¼" phono connector. Input 2 has two unbalanced mixing phono connectors. Use Input 1 if you are using a microphone or if you have a balanced connection such as from a professional audio mixer (you can also use Input 1 for unbalanced connections). Use Input 2 to connect to an unbalanced audio source.

Input 1
Connect the audio source(s) to one or both audio input connections. Input 1 offers a choice of balanced XLR or ¼" phono connector.

Line

Back of LT-800 with XLR connected to Input 1

Mic

Mic with Phantom Power
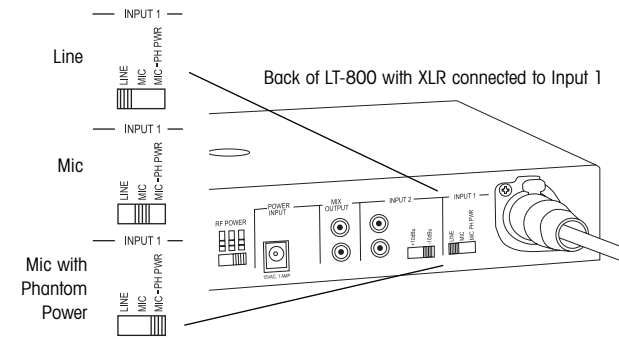
Plug your microphone into Input 1 and move the input select switch to Mic (for dynamic microphones) or Mic + PH Power (for condenser microphones).

Plug your balanced or unbalanced audio source into Input 1. Use the following diagram.

XLR Wiring	¼" Phone Wiring
Balanced Unbalanced	Balanced Unbalanced
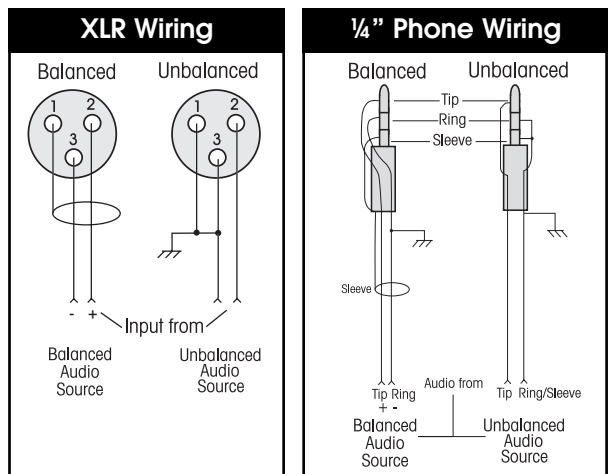
Input 2
Plug your unbalanced audio source into Input 2 and select the audio level switch for -10dBu or +10dBu, to match the audio level coming from your equipment.
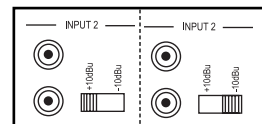
LT-800 Operating Instructions

1 **Power Unit On**
Turn power on by pressing the power button.

2 **Select a Channel**
Select the transmit channel by pressing the channel select UP and DOWN buttons. See Channel Selection on page 11 for more information.

Channel Select
UP and DOWN buttons

NOTE: The LT-800 is shipped with only limited channels (Basic Mode). To select from all channels (Expanded Mode) refer to page 5. (for a more detailed description of Basic and Expanded Mode refer to page 9)

3 **Lock on Channel**
Once you determine your transmit channel, you can lock the transmitter on that channel. To lock a channel hold the Channel Select "Up" button for 3 seconds until the padlock icon appears on the display. To unlock, repeat this process and the padlock icon will disappear.

4 **Test Tone (if necessary)**
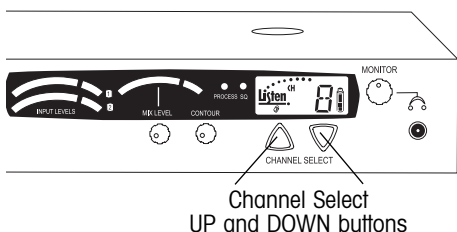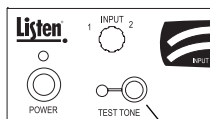To broadcast a test tone, press the test tone button. This helps to test receivers when no audio source is available.

Press Test Tone
button here

LT-800 Audio Control

1 **Adjust Audio Input Level**
Adjust the input knob counterclockwise to add gain to Input 1. This will decrease gain to Input 2. Adjust input knob clockwise to add gain to Input 2. This will decrease gain to Input 1. If you have two audio sources connected to both Input 1 and 2, adjust the level of one input using the VU meter, then adjust the output level of the other audio source. Adjust the input level until the left VU meter(s) occasionally illuminate the red LEDs. Illumination of the red LEDs indicates the unit is in limiting. Limiting is required so that the unit does not over-modulate the transmitter. If you don't want any audio limiting to occur, make sure the red LEDs never illuminate. If you want a highly limited signal, turn the audio gain up so the red LEDs illuminate often.
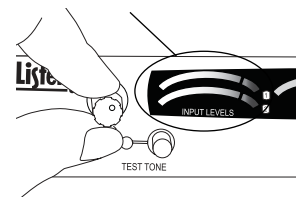
2 **Adjust Contour**
Adjust the Contour knob counterclockwise if your audio source is mostly voice. Adjust the knob clockwise if your audio source is mostly music. The Contour knob adjusts the relative equalization of the unit. This equalization boosts or cuts frequencies above 5 kHz.
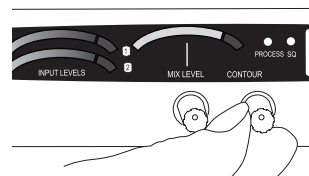
3 **Adjust Mix Level**
Adjust the mix level until the right VU meter occasionally illuminates the red LED. This is the level adjustment for the combined output from Input 1 and Input 2.
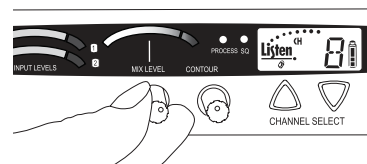
LT-800 Compatibility with Other Manufacturers

If you are using another manufacturers' receivers with the LT-800, determine the frequency of their receivers then refer to Listen's Frequency Compatibility Tables (pages 12-14) to find the LT-800 channel that corresponds with the receiver's frequency. We recommend verifying corresponding channel designations on these tables to ensure compatibility and provide the best possible reception.

The LT-800 is Phonak compatible and can be set to display Phonak specific channels. See page 5 to set Channel Mode and page 14 for specific channel designations.

Listen SQ™ (Super Quiet) - Improving Your Listening Experience

People are accustomed to listening to low noise, high fidelity audio (delivered via CD, DVD, etc.). FM radio systems, such as those made by Listen, have more inherent noise compared to most sound systems. To minimize noise, Listen uses a noise reduction technology called ListenSQ™. Both the transmitter and receiver must have the SQ feature enabled to achieve the desired results. SQ is available on new Listen systems, including the system you received in this shipment. If you are planning to use this product with older Listen systems that do not have Listen SQ, or equipment not manufactured by Listen, you must disable Listen SQ.

Your Listen LT-800 has been shipped to you with the SQ feature enabled. You may need to disable the SQ function for one or more of the following reasons:

1. You are using your new Listen LT-800 with older version Listen receivers that do not have the SQ function.

2. You are using your new Listen LT-800 with equipment supplied by other manufacturers (Listen is the only manufacturer using SQ Technology).

3. You expect that end users will bring and use their own receivers that don't have the SQ function.

NOTE: See page 6 to enable or disable SQ (Super Quiet).

SQ Summary
· SQ is NOT squelch
· SQ improves noise performance by at least 20dB
· SQ is NOT compatible with older version Listen products
· SQ is NOT compatible with other manufacturers' products
· To work properly, SQ must be enabled for both the transmitter and receivers
· SQ can be disabled to permit operation with older Listen products or other manufacturers' products

Process Mode

Process mode is used for Audio Gain Control (AGC). With the process mode enabled, the LT-800 will automatically adjust for inconsistent signal input levels by raising or lowering the signal level accordingly to provide a consistent sound output level. This feature should be used in applications where a consistent sound level is important and the input levels vary substantially. Typically you would not want to engage the Process Mode when a speaker's emphasis is critical to the message they are conveying.

Basic and Expanded Mode

In the default Listen channel mode, only the most commonly used channels are available. This is called "Basic Mode". When the LT-800 is in Basic Mode, "L/O" (lock-out) will be displayed on the LCD, meaning some transmission channels are unavailable. If the channel needed is not available in Basic Mode, access to all transmission channels is achieved in "Expanded Mode". To access Expanded Mode press and hold the channel select "down" button while powering on the unit. To return to Basic Mode, repeat the same process of powering on the unit while holding the "down" button.

RF Reception Maximization Strategies

For proper and dependable operation, Listen receivers need to receive a strong and consistent signal from the originating transmitter. Note that on portable receivers the headset wire is the receiving antenna. The following strategies should be used maximize this signal:

1. When designing and installing your system, keep in mind that the location of both the transmitting and receiving antennas is critical to maximize broadcast range.

2. Eliminate or minimize obstructions between the transmitting and receiving antenna.

3. Minimize the distance between the transmitting and receiving antennas.

4. Move transmitting and receiving antennas away from metal or conductive objects.

5. Place the transmitting antenna as high as possible.

6. Orient both transmitting and receiving antennas vertically.

7. Position the RF Power switch on the back of the LT-800 to full RF Power, unless lower power is necessary (see page 6).

8. Keep coaxial cable from transmitter to antenna as short as possible.

CAUTION: When installing antennas, ensure the antenna is clear of power lines.

Coaxial cable, connectors, and optional antenna mounting kits are available from Listen. See page 19, visit www.ListenTech.com or ask your dealer for details.

Coaxial Cable

The antenna for the LT-800 can be mounted directly on the unit if desired. However, you may find that the unit will provide better performance when the antenna is located elsewhere. If you plan to mount the antenna in a different location other than the top of the unit, you must use cable and connectors rated at 50 ohms. Although cable used for cable TV installations looks similar to this cable, it will not work with your Listen system.

If you need to run cable over a length greater than 50 feet for 216 MHz applications or greater than 100 feet for 72 MHz applications or to maximize broadcast range, Listen recommends that you use RG-8 cable rather than RG-58. RG-8 is a lower loss cable, meaning that more of your signal will reach the antenna.

Long cable runs can result in signal degradation due to the "loss" characteristics of the cable. When using RG-58 with a 72 MHz transmitter, there is an average* loss of 4 dB per 100 feet of cable and at 216 MHz using RG-58 an average* loss of 8 dB per 100 feet of cable. (A 3dB loss means half of your power has been lost.) However, it is better to suffer coaxial power loss than to try to shoot your signal through obstacles! Obstacles, especially metal, can create drop-outs or reflections of your signal that will result in poor listening conditions.

*NOTE: There are many varieties of 50 ohm, RG-58 and RG-8 cables. You may purchase a cable that is better or worse than this value. Please check with the cable vendor or manufacturer for exact specifications.

Channel Selection

It is important to choose channels that are free from interference to achieve proper operation of your Listen equipment. This process is trial and error. Before turning on the transmitter, listen to the wide band channels on the receivers (lettered channels at 72 MHz and channels that start with a "2" for 216 MHz when using a Listen receiver). Listen to the audio through the headphone or via the speaker and choose a channel with the least amount of interference. Unless you are interfacing with an existing narrowband transmission system, always use a wide band channel.

If you are using multiple channels follow this process:
1. **Same Space** If you are using multiple transmitters in the same space, the highest number of channels that will work simultaneously is six at 72 MHz and three at 216 MHz. With all of the transmitters off, listen for interference on all the wide band channels with a Listen receiver. Using the frequency compatibility tables on pages 12-13, eliminate any channels that have noticeable interference. Now choose the channels with the widest channel spacing. It is recommended that adjacent channels be spaced at least 300k Hz apart. If there is no interference the following channels are recommended. For a 72 MHz system, use channels A, C, E, I, J and H. For a 216 MHz system, use channels 2A, 2K and 2V.

2. **Distributed Spacing** If you are using transmitters that are distributed over a large area, you can achieve more simultaneous broadcast channels. However, it is critical that your receiver(s) be located as close to its transmitter as possible. You can use adjacent channels (see frequency compatibility tables on pages 12-13) in this case as long as the adjacent channel transmitter is at least 50% further away from the receiver than the original transmitter. Example: The transmitter for the receiver on channel E is 100 feet from the receiver. The adjacent channel transmitter on channel D should be at least 150 feet away.

It is highly recommended that after channel selection has been achieved, you lock the channel so that it cannot be changed by the user. To accomplish LOCK on the LT-800, press the "UP" button for 3 seconds. Repeat the process to unlock.

Notes in regard to using 72 MHz and 216 MHz systems:
1. 72 MHz is a secondary frequency band. This means that other transmitters are licensed to use these frequencies. Thus, you may experience interference from paging transmitters and other types of transmissions. You will need to find a clear channel by listening to all the wide band channels.

2. 216 MHz is a primary frequency band and no other types of transmissions are authorized to use it. Thus, you will find the highest probability of clear channels in this band. However, you may experience intermodulation of the TV Channel 13 aural carrier if there is a channel 13 transmitter in your area and you are close to the transmitter. If you cannot find a clear channel in 216 MHz band due to channel 13, it is recommended that you switch to a 72 MHz system.

Wide Band Recommendation
Listen recommends that you always use a wide band channel unless you need to be compatible with existing narrow band receivers from other manufacturers. Wide band channels have lower noise than their narrow band counterparts.

At 72MHz
The LT-800 at 72 MHz operates on 17 wide band channels and 40 narrow band channels.

· Letters= Wide Band Channels (Example: E)
· Numbers= Narrow Band Channels (Example: 32)

At 216MHz
The LT-800 at 216 MHz operates on 19 wide band channels and 38 narrow band channels.

· "2" as left digit= Wide Band Channel (Example: 2C)
· "1" and "3" as left digits= Narrow Band Channels (Examples: 1A; 3R)

72 MHz Compatibility Chart

Frequency MHz	Listen	Phonic Ear	Comtek	Phonak	Williams*	Gentner	Telex	Drake
72.0250	1	1	1	A1	(11, 1)			
72.0500					(2)	1		
72.0750	2	2	2	A2	(12, 3)			
72.1000	A	A	A	A	A, (13, 4)	2	A	72.1
72.1250	3	3	3	A3	(14, 5)			
72.1500					(6)	3		
72.1750	4	4	4	A4	(15, 7)			
72.2000	K	K	K	K	K, (8)	4	B	72.2
72.2250	5	5	5	K5	(16, 9)			
72.2500					(10)	5		
72.2750	6	6	6	K6	(17, 11)			
72.3000	B	B	B	B	B, (18, 12)	6	C	72.3
72.3250	7	7	7	B7	(19, 13)			
72.3500					(14)	7		
72.3750	8	8	8	B8	(20, 15)			
72.4000	N	N	N	N	N, (16)	8	D	72.4
72.4250	9	9	9	N9	(21, 17)			
72.4500					(18)	9		
72.4750	10	10	10	N0	(22, 19)			
72.5000	C	C	C	C	C, (23, 20)	10	E	72.5
72.5250	11	11	11	C1	(24, 21)			
72.5500					(22)	11		
72.5750	12	12	12	C2	(25, 33)			
72.6000	O	O	O	O	O, (24)	12	F	72.6
72.6250	13	13	13	O2	(26, 25)			
72.6500					(26)	13		
72.6750	14	14	14	4	(27)			
72.7000	D	D	D	D	D, (28)	14	G	72.7
72.7250	15	15	15	D5	(29)			
72.7500					(30)	15		
72.7750	16	16	16	D6	(30, 31)			
72.8000	P	P	P	P	P, (32)	16	H	72.8
72.8250	17	17	17	P7	(31, 33)			
72.8500					(34)	17		
72.8750	18	18	18	P8	(32, 35)			
72.9000	E	E	E	E	E, (33, 36)	18	I	72.9
72.9250	19	19	19	E9	(34, 37)			
72.9500					(38)	19		
72.9750	20	20	20	E0	(35, 39)			
74.6250	33	33	33	E3	(36, 40)			
74.6500					(41)	20		
74.6750	34	34	34	E4	(37, 42)			
74.7000	I	I	I	I	I, (38, 43)	21	O	
74.7250	35	35	35	I5	(39, 44)			
74.7500					(45)	22		
74.7750	36	36	36	I6	(40, 46)			
75.2250	37	37	37	I7	(41, 47)			
75.2500					(48)	23		
75.2750	38	38	38	I8	(42, 49)			
75.3000	J	J	J	J	J, (43, 50)	24	P	
75.3250	39	39	39	J9	(55, 51)			
75.3500					(52)	25		
75.3750	40	40	40	J0	(45, 53)			
75.4000	R	R	R	R	R, (54)	26	Q	
75.4250	21	21	21	R1	(46, 55)			
75.4500					(56)	27		
75.4750	22	22	22	R2	(47, 57)			
75.5000	F	F	F	F	F, (48, 58)	28	J	75.5
75.5250	23	23	23	F3	(49, 59)			
75.5500					(60)	29		
75.5750	24	24	24	F4	(50, 61)			
75.6000	S	S	S	S	S, (62)	30	K	75.6
75.6250	25	25	25	S5	(51, 63)			
75.6500					(64)	31		
75.6750	26	26	26	S6	(52, 65)			
75.7000	G	G	G	G	G, (53, 66)	32	L	75.7
75.7250	27	27	27	G7	(54, 67)			
75.7500					(68)	33		
75.7750	28	28	28	G8	(55, 69)			
75.8000	T	T	T	T	T, (70)	34	M	75.8
75.8250	29	29	29	T9	(56, 71)			
75.8500					(72)	35		
75.8750	30	30	30	T0	(57, 73)			
75.9000	H	H	H	H	H, (58, 74)	36	N	75.9
75.9250	31	31	31	H1	(59, 75)			
75.9500					(76)	37		
75.9750	32	32	32	H2	(60, 77)			

Wideband frequencies are indicated in highlighted rows. The highlighted channels also indicated those channels available in the "basic" mode (default). All channels can be accessed when in the "expanded" channel mode (see page 9 for more information).

*Parenthesis indicate T35 and T20 narrowband.

216 MHz Compatibility Chart

Frequency MHz	Listen	Phonic Ear	Comtek	Phonak	Williams	Gentner	CSI	AVR	Light Speed
216.0125	1A		1	1				C01	N01
216.0250	2A	41	41	41		1	1		
216.0375	3A		2	2					
216.0625	1B		3	21					
216.0750	2B	42	42	42		2	10		
216.0875	3B		4	4					
216.1125	1C		5	5				C05	
216.1250	2C	43	43	43	A	3	6		
216.1375	3C		6	22					
216.1625	1D		7	23					
216.1750	2D	44	44	44	B	4	14		
216.1875	3D		8	8					
216.2125	1E		9	9				C09	N09
216.2250	2E	45	45	45	C	5	2		
216.2375	3E		10	24					
216.2625	1F		11	25					
216.2750	2F	46	46	46	D	6	11		
216.2875	3F		12	12				C12	N12
216.3125	1G		13	13					
216.3250	2G	47	47	47	E	7	7		
216.3375	3G		14	26					
216.3625	1H		15	27					
216.3750	2H	48	48	48	F	8	15		
216.3875	3H		16	16				C18	N18
216.4125	1J		17	17				C21	
216.4250	2J	49	49	49	G	9	18		
216.4375	3J		18	18					
216.5125	1K		21	61					
216.5250	2K	51	51	29	H	10	3		
216.5375	3K		22	62					
216.5625	1L		23	28					
216.5750	2L	52	52	52	I	11	12		
216.5875	3L		24	64				C24	N64
216.6125	1M		25	65				C25	
216.6250	2M	53	53	53	J	12	8		
216.6375	3M		26	81					
216.6625	1N		27	82					
216.6750	2N	54	54	54	K	13	16		
216.6875	3N		28	68					
216.7125	1P		29	69				C29	
216.7250	2P	55	55	55	L	14	19		
216.7375	3P		30	83					
216.7625	1R		31	84					
216.7750	2R	56	56	56		15	4		
216.7875	3R		32	72				C32	N72
216.8125	1S		33	73				C33	
216.8250	2S	57	57	57			13		
216.8375	3S		34	76					
216.8625	1T		35	85					
216.8750	2T	58	58	58			9		
216.8875	3T		36	86					
216.9125	1U		37	77				C37	N77
216.9250	2U	59	59	59			17		
216.9375	3U		38	88					
216.9625	1V		39	79				C39	
216.9750	2V	60	60	60			5		
216.9875	3V		40	80				C40	N80

Wideband frequencies are indicated in highlighted rows. The highlighted channels also indicated those channels available in the "basic" mode (default). All channels can be accessed when in the "expanded" channel mode (see page 9 for more information).

Phonak Frequency Chart

Frequency MHz	Listen	Phonak
216.0125	1A	1
216.0250	2A	41
216.0375	3A	2
216.0625	1B	21
216.0750	2B	42
216.0875	3B	4
216.1125	1C	5
216.1250	2C	43
216.1375	3C	22
216.1625	1D	23
216.1750	2D	44
216.1875	3D	8
216.2125	1E	9
216.2250	2E	45
216.2375	3E	24
216.2625	1F	25
216.2750	2F	46
216.2875	3F	12
216.3125	1G	13
216.3250	2G	47
216.3375	3G	26
216.3625	1H	27
216.3750	2H	48
216.3875	3H	16
216.4125	1J	17
216.4250	2J	49
216.4375	3J	18
216.5125	1K	61
216.5250	2K	29
216.5375	3K	62
216.5625	1L	28
216.5750	2L	52
216.5875	3L	64
216.6125	1M	65
216.6250	2M	53
216.6375	3M	81
216.6625	1N	82
216.6750	2N	54
216.6875	3N	68
216.7125	1P	69
216.7250	2P	55
216.7375	3P	83
216.7625	1R	84
216.7750	2R	56
216.7875	3R	72
216.8125	1S	73
216.8250	2S	57
216.8375	3S	76
216.8625	1T	85
216.8750	2T	58
216.8875	3T	86
216.9125	1U	77
216.9250	2U	59
216.9375	3U	88
216.9625	1V	79
216.9750	2V	60
216.9875	3V	80

Wideband frequencies are indicated in highlighted rows. The highlighted channels also indicated those channels available in the "basic" mode (default). All channels can be accessed when in the "expanded" channel mode (see page 9 for more information).

LT-800 Troubleshooting

The LT-800 has no power
Make sure the LA-201 power transformer is connected to a power source and is connected to the jack marked "Power Input". Make sure the POWER button is pressed in.

There is no audio or the audio level is too low
Make sure that your audio source is properly connected to Input 1 and/or Input 2. The Input 1 or Input 2 switches must be in the correct position for the appropriate input level. For example: if you are using the output of a mixer on Input 2, the switch should be in the -10dBu position. If it were to be in the +10dBu position, the level would be too low. Also, check the Input knob to ensure it is properly adjusted. You should be able to see the VU meter deflect on Input 1 or Input 2 corresponding with the input level of the audio source. You can listen to the audio source by connecting a headset to the front panel jack and adjusting the Monitor volume control.

If the level of audio into the transmitter is low and can't be corrected using the level input switches, the audio processor can be turned on to boost the signal (see page 6 to set, page 9 for description of Process Mode).

The audio is distorted
Check to make sure you have the input level select switches in the proper position. You may be providing too much audio level for the input stage to handle. Make sure the SQ mode is set correctly on both the LT-800 and the receivers you are using. If your receivers do not have SQ, make sure the SQ mode is turned off (see page 6).

There is hum in the audio
Make sure you have properly grounded the audio source to the LT-800. Check the connections from the audio source to the LT-800. If you can, try to use a balanced audio source - this will reduce the chance of creating hum. Connect a ground wire from the LT-800 to ground and/or to the ground of the source audio.

There is a tone
The Test Tone button has been pressed (its LED light is on). Push the Test Tone button to turn off the tone.

The Audio Input 1 sounds "tinny"
If you are using an unbalanced audio source, make sure Pin 3 on the XLR or the ring on the ¼" plug is grounded (see page 6).

I cannot pick up the signal on the receiver
Check to make sure the receiver and the transmitter are using the same frequency band (i.e. 72 MHz or 216 MHz) and that they are on the same channel. Make sure the LT-800 has an antenna connected. Ensure that the receiver has an antenna (for portable products the headset is the receiving antenna).

I can pick up the signal on the receiver, but it sounds like it's not tuned in
Check to make sure the transmitter and receiver are on exactly the same channel. It's a good idea to lock the channels once they have been set. To lock the LT-800, press the UP button for a 3 seconds (see page 7).

LT-800 Troubleshooting

I'm using another brand of receiver - how do I tell which channel to use

Refer to Listen's Frequency Compatibility Tables (pages 12-13). Adjust Listen's transmitter to the same frequency as the other major brand. Since Listen products can access 57 channels, they will most likely receive on the same fixed channel or channels of other major brands. If you are using another brand of receiver, make sure you have turned off the SQ feature on the Listen product(s).

There is not sufficient range

First make sure that the receivers you are using are operating properly, then make sure that you have an antenna connected either to the top of the LT-800 transmitter or connected to the back of the unit (but not both!). The antenna should be as high as possible and free of obstacles. In addition make sure you are using the correct antenna type for your unit. You might want to use a remote antenna (provided by Listen) that can be mounted on a mast or wall. Try using different frequencies to find one with less interference.

There is interference in my transmission

Ensure that the transmitter and receivers are on the same channel. Verify that there are no other transmitters on the same channel or a close channel to the one exhibiting interference. Try different channels until you find a clear channel. If this does not work, try a different frequency band (i.e. if you are using 72 MHz, try 216 MHz or vice versa). Please contact Listen support for assistance and a return authorization (RMA) number to exchange product for alternate frequency equipment.

End users are adjusting the unit

First, lock the channel by pressing and holding the channel select UP button for 3 seconds. Consider removing the Input, Mix Level and Contour knobs. You can order a rack mount kit from Listen which offers a security cover that will limit access to the unit.

I am using other manufacturers' receivers and the sound is distorted

The receiver is probably not designed to handle the +25 kHz deviation of the Listen transmitter. This can be corrected by turning the Mix Level knob down. Another possibility is that you have enabled the SQ function of the LT-800, and this feature is not available in other companies' products. You will need to disable SQ in this event (see page 6).

If you are using Phonak receivers, the transmitter is capable of operating in the Phonak mode (please refer to page 5).

Several transmitters are operating in the same environment

For this, you'll need to choose your transmitting frequencies carefully. See page 11 for more details.

Can I have two antennae connected to my transmitter

No. The LT-800 transmitter can use only one antenna connection at a time. You may connect either a top mount antenna through the top antenna port, or a remote antenna connected to the BNC connection on the rear of the unit. If multiple antennae are simultaneously connected to both ports the transmitter will have extremely poor broadcast performance and range.

Compliance Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) These devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesirable operation.

Listen's LT-800 Transmitter (216 MHz only)
Listen's LT-800 transmitter is authorized by rule under the Low Power Radio Service (47 C.F.R. Part 95) and must not cause harmful interference to TV reception or United States Navy SPASUR installations. You do not need an FCC license to operate these transmitters. These transmitters may only be used to provide: auditory assistance to persons with disabilities, persons who require language translation, or persons in educational settings; health care services to the ill; law enforcement tracking services under agreement with a law enforcement agency; or automated maritime telecommunications system (AMTS) network control communications. Two-way voice communications and all other types of uses not mentioned above are expressly prohibited.

This device must be installed by a trained audio professional or certified dealer of Listen. The user can't make any modifications to the unit without expressed written consent of Listen Technologies Corporation. Any modifications made will void the FCC compliance, Listen warranty and the user's authority to operate Listen's equipment.

FCC Statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

· Reorient or relocate the receiving antenna.
· Increase the separation between the equipment and receiver.
· Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
· Consult the dealer or an experienced radio/TV technician for help.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to FCC and IC Rules. In order to maintain compliance with FCC and IC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.
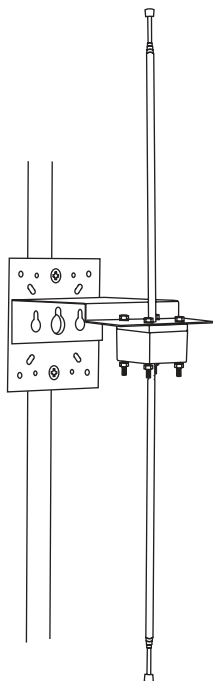
Contacting Listen

If technical service is needed, please contact Listen. Pre-authorization is required before returning Listen products. If products were damaged in shipment, please contact the carrier, then contact Listen for replacement or repair requirements payable by the carrier.

Listen's corporate headquarters are located in Sandy, Utah U.S.A. and are open Monday through Friday, 8am to 5pm Mountain Time.

Address: 8535 South 700 West
Suite A
Sandy, UT 84070-2515
U.S.A.

Web Site: www.ListenTech.com

Email: techsupport@ListenTech.com

Phone: 1.801.233.8992
1.800.330.0891 (North America)

Fax: 1.801.233.8995

Optional Accessories

Antenna Options

72 MHz Helical
(Top Mount)
LA-101 for 72 MHz
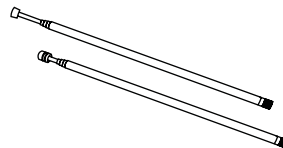
Telescoping
(Top Mount)
LA-106 for 72 MHz or
LA-102 for 216 MHz

**LA-122 Universal
Antenna Kit**

The single solution for all of your indoor
remote antenna needs. Includes: 72 and 216
MHz components; flexible and rigid dipoles
and monopole radials; hardware for multiple
mounting configurations; and 25 feet (7.6m)
of RG-58 coax cable.
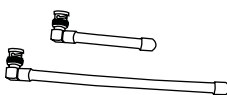
90 Degree Helical
(Rear Mount)
LA-123 for 72 MHz or
LA-124 for 216 MHz
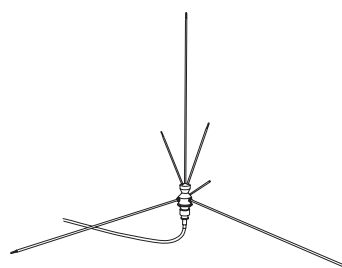
216 MHz Ground Plane
(Remote Mount, outdoor)
LA-107 for 216 MHz

Rack Mount Options
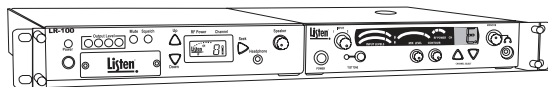
LA-326 Rack Mounting Kit

Includes components for single and dual rack
configuration and a security cover

NOTE: Rack mounted units cannot use the LA-106,
LA-102 or LA-101 top mounted antenna.
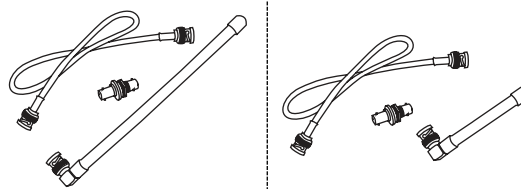
**Antenna Kit for the
LA-326 Rack Mount Kit**
LA-125 for 72 MHz and LA-126 for 216 MHz
(LA-326 also required)

Optional Accessories continued

Cable & Connectors Options
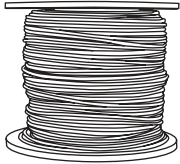
RG-58 Coaxial Cable
LA-112

RG-8 Coaxial Cable
LA-113

available by the foot
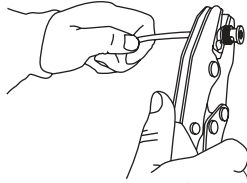
Installation of BNC Connectors
LA-114
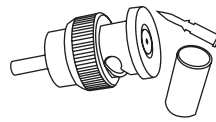
BNC Connector for RG-58
LA-127

BNC Connector for RG-8
LA-128

Microphone Options
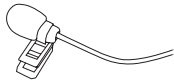
Lapel
LA-261

Over-the-Head
LA-262

Over-the-Ear
LA-268

Noise Cancelling
LA-270
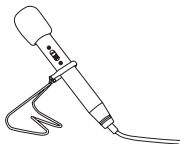
Hand Held
LA-274
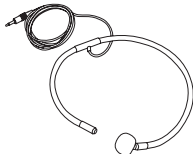
Collar
LA-276
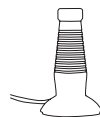
Conference
LA-277

Behind-the-head
LA-278

Phono Converter
LA-280

NOTE: To use Listen microphones you must use a converter (LA-280) to adapt the 3.5 mm connection to a ¼" phono connection.

Listen®

www.ListenTech.com

Listen Technologies Corporation
8535 South 700 West, Suite A
Sandy, Utah 84070-2515 U.S.A.
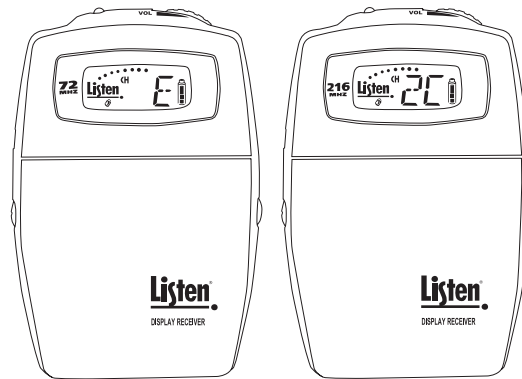Telephone: 1.801.233.8992
Toll Free (North America): 1.800.330.0891
Fax: 1.801.233.8995
E-mail: info@ListenTech.com

User's Manual

LR-400 Display Receiver

Listen.

www.ListenTech.com

Don't miss a single sound. Listen.

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LR-400 Package Contents

· LR-400 (72MHz or 216MHz)
· Warranty Card
· Receiver User Manual

Listen Part Number

72 MHz: LR-400-072
216 MHz: LR-400-216

Optional Accessories

See pages 70-71.

LR-400 Table of Contents

LR-400 Specifications

Architectural Specifications

The FM receiver shall be capable of receiving on 57 wide and narrow band channels with a SNR of 80dB or greater. The receiver shall be capable of seeking channels. The device shall have an adjustable squelch. The device shall have an audio frequency response of 63Hz to 15KHz, ± 3dB at 72MHz, or of 63Hz to 10kHz, ± 3dB at 216MHz. The device will incorporate a stereo headset jack that allows the user to plug in either a mono or stereo headset and listen to the audio normally. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, RF signal strength and channel lock status. The receiver shall incorporate automatic battery charging circuitry for recharging of NiMH batteries. The Listen LR-400 is specified.
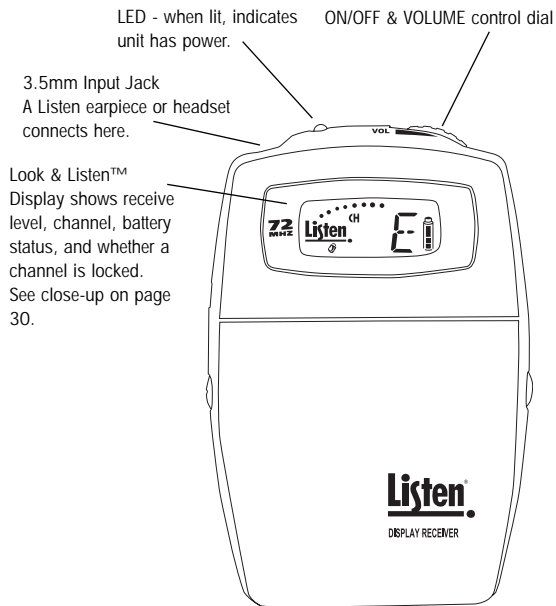
Specifications

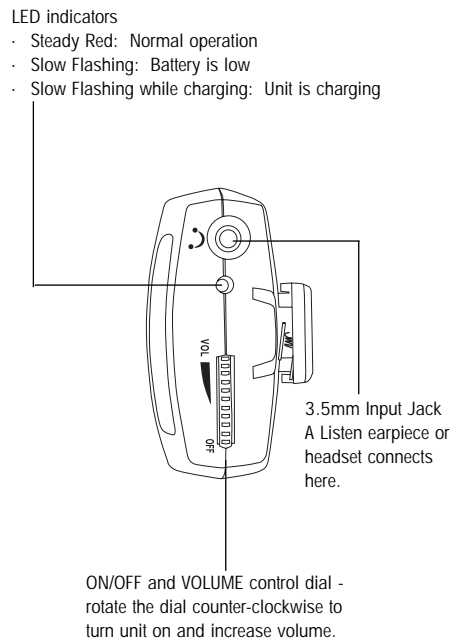|	Specification	LR-400-072	LR-400-216
RF	RF Frequency Range	72.025 - 75.950 MHz	216.025 - 216.975 MHz
	Number of Channels	57 (17 wide, 40 narrow)	57 (19 wide, 38 narrow)
	Sensitivity	.6uV typical, 1 uV maximum for 12dB SINAD	
	Frequency Accuracy	± .005% stability 0° to 50°C (32° to 122° F)	
	Antenna	Uses earphone cable	
	Antenna Connector	3.5mm connector	
	Squelch	Programmable in 20 steps	
	Compliance	FCC Part 15, Industry Canada	
Audio	** All system specifications are wireless end-to-end		
	System Frequency Response	63Hz - 15kHz (±3dB)	63Hz - 10kHz (±3dB)
	System Signal to Noise Ratio (A-weighted)	SQ enabled: 80dB; SQ disabled 60dB	SQ enabled: 80dB; SQ disabled 50dB
	System Distortion	<2% total harmonic distortion (THD) at 80% deviation	
	Output	3.5mm connectors, unbalanced, 0dBu nominal output level, 16mW maximum, impedance 32 Ohms	

LR-400 Specifications continued

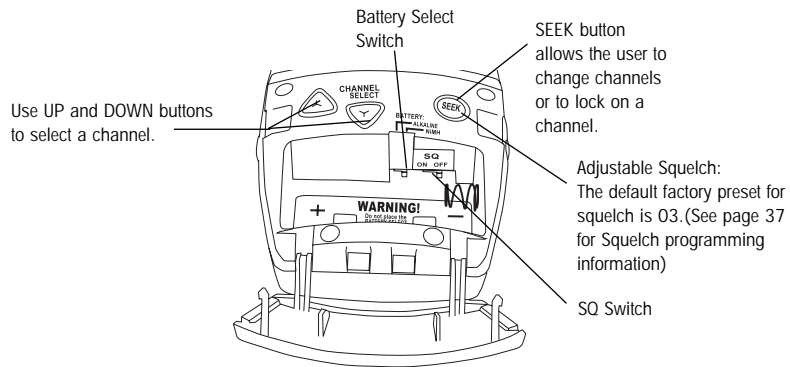|	Specification	LR-400-072	LR-400-216
Controls	Set Up Controls	Alkaline/NiMH batteries and SQ enable/disable and programmable squelch setting.	
	User Controls	Volume, channel UP/DOWN, SEEK (All controls except volume are electronically lockable, and are behind the door)	
	Programming	Squelch can be adjusted for sensitivity and signal capture control. Channel selection can be locked by holding the SEEK button for 5 seconds. Unit cannot be programmed, however, it is capable of entering squelch mode.	
Indicators	LCD Display	Indicates channel, RF signal strength, lock status, and squelch setting.	
	LED	Red, illuminates when unit is on. Flashes when batteries are low. Flashes when charging. Flashes when locked and user attempts to seek to another channel.	
Power	Battery Type	Two AA batteries, alkaline or NiMH	
	Battery Life (Listen batteries)	30 hours alkaline (LA-361), 15 hours NiMH rechargeable (LA-362)	
	Battery Charging (NiMH only)	Fully automatic, 14 hours	
	Power Supply Connector	2.3mm OD by 0.7mm ID, barrel type connector. 7.5VDC, center positive <250mA. Drop in contact points for use with Listen charging/carrying cases.	
	Compliance	UL Listed	
Physical	Dimensions	3.0 in x 1.0 in x 5 in WxDxH (7.6cm x 2.5cm x 13.cm)	
	Unit Weight	3.9oz (111g)	
	Unit Weight with batteries	5.8 oz (164.4g)	
	Shipping Weight	1.0 lbs (453.6kg)	
	Door	Manually lockable. UP, DOWN and SEEK protected by door.	
Environmental	Temperature - Operation	-10° to 40°C (14° to 104° F)	
	Temperature - Storage	-20° to 50°C (-4° to 122° F)	
	Humidity	0 to 95% relative humidity, non-condensing	

Quick Reference
LR-400 Front

LR-400 Top of Unit

LED - when lit, indicates unit has power.

ON/OFF & VOLUME control dial

3.5mm Input Jack
A Listen earpiece or headset connects here.

Look & Listen™
Display shows receive level, channel, battery status, and whether a channel is locked.
See close-up on page 30.

LED indicators
· Steady Red: Normal operation
· Slow Flashing: Battery is low
· Slow Flashing while charging: Unit is charging

3.5mm Input Jack
A Listen earpiece or headset connects here.

ON/OFF and VOLUME control dial - rotate the dial counter-clockwise to turn unit on and increase volume.

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Quick Reference
LR-400 Inside Access Door

Battery Select Switch

SEEK button allows the user to change channels or to lock on a channel.

Use UP and DOWN buttons to select a channel.

CHANNEL SELECT

SEEK

BATTERY:
ALKALINE
NIMH

SQ
ON OFF

+ WARNING!
Do not place the
batteries on the —

Adjustable Squelch: The default factory preset for squelch is 03.(See page 37 for Squelch programming information)

SQ Switch

Battery Select Switch - place in NiMH position ONLY if you are using Nickel Metal Hydride batteries, otherwise, leave it in the Alkaline position.
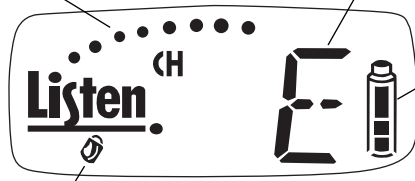
SQ Switch: shipped in the ON position, use a screwdriver or pen to slide to the OFF position if needed. You should turn SQ off if any of your receivers do not have SQ.

Quick Reference
LR-400 Look & Listen™ Display

Dots indicate the relative RF signal strength. When there is a full signal the unit will display all 8 dots.

Indicates the currently tuned channel

Battery level indicator. The indicator flashes, along with the red LED on top of the unit, to alert you when the battery is low and needs to be charged or changed.

When the padlock is visible, the channel is locked. Press and hold SEEK for 5 seconds to unlock or lock.

LR-400 Battery Indicator

All three segments showing: The batteries are at 50% or greater capacity.

Two segments showing: The batteries are at 25-49% capacity.

One segment showing: Your batteries less than 25% capacity. When this segment begins flashing along with the LED on top of the unit, you should immediately change your batteries or recharge them (if using NiMH batteries).

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LR-400 Setup Instructions

1 **Remove the product**
Remove outer packaging and plastic cover. Inspect for physical damage. If damage is aparent, please contact Listen Technologies Corporation technical support
**2** for assistance. See page 69 for contact information.

Open the front access door
If locked, use a pocketknife or small screwdriver to unlock the door locks on both sides of the unit. To unlock the door, rotate the lock ¼ turn counterclockwise.

Grip the two tabs with your thumb and index finger and pull the door downward. Do NOT place batteries in the unit yet.

3 **Select Battery Type**
See diagram on page 29. You have two choices: NiMH and Alkaline. The unit is shipped with the switch in the Alkaline position. Use a pen or small screwdriver to select the battery type.

CAUTION: If you are using any battery type other than rechargeable Nickel Metal Hydride (NiMH) batteries, make sure the BATTERY selection switch is in the alkaline position.

Unlocked   Locked
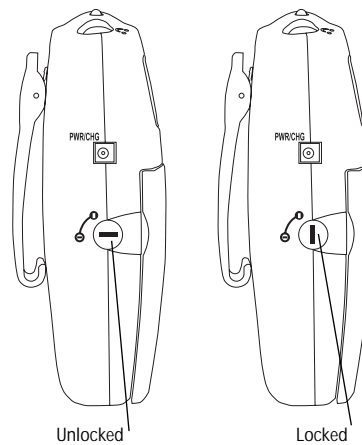
WARNING: Do not place the BATTERY switch in the NiMH position if you are not using Nickel Metal Hydride Batteries. The NiMH position will attempt to charge the batteries. Charging non-Nickel Metal Hydride batteries may result in physical harm, destruction of property and/or fire.

## LR-400 Setup Instructions **continued**

4 **Set SQ switch**
The SQ switch is inside the battery compartment next to the Battery Select switch. The unit
is shipped with SQ in the ON position. To turn it off, use a small screwdriver or pen to slide
the switch to the OFF position (to the right). See page 58 for more information on SQ.

Battery
Select Switch

SQ Select
Switch

5 **Place Batteries in Unit**
Place two AA batteries in the compartment, making note of the battery polarity
shown in the battery compartment, and again verifying that the BATTERY
SELECT switch is in the correct position for the batteries you are using. (ALK
should be selected for all battery types other than NiMH).

NOTE: Listen uses 1800mAh (milli-Amp-hour) constant current NiMH
(Nickel Metal Hydride) batteries. These may be purchased from your Listen
dealer (ask for part number LA-362).
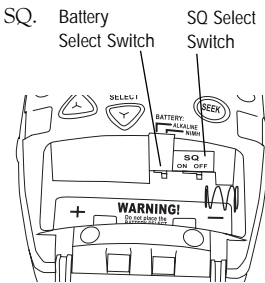
6 **Connect an Earphone or Headset**
Your headset or earphone will connect to the jack on the top of the unit. Either mono or
stereo connectors may be used with a Listen receiver. Make certain you push the plug all the
way into the jack.

LR-400 Setup Instructions continued
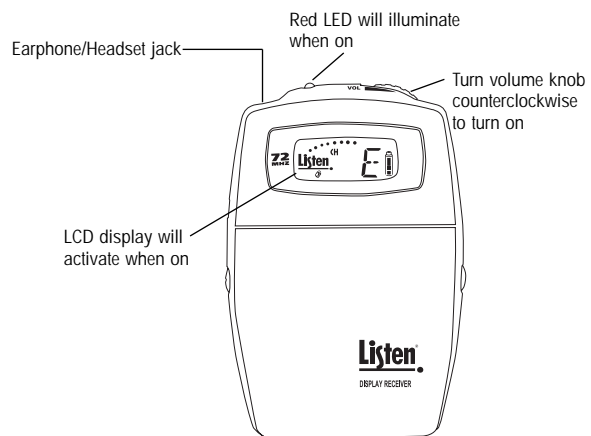
7 **Turn the Unit On**

Receivers are turned on by rotating the volume dial counterclockwise. The red LED on top of the unit should activate and the LCD display should illuminate. If they do not, make sure you have installed the batteries correctly and that you are using fully charged batteries.

8 **Select Channel(s)**

See page 56 for complete channel selection information.

9 **Set Squelch**

See pages 36 and 37 for squelch and programming information.

Earphone/Headset jack

Red LED will illuminate when on

Turn volume knob counterclockwise to turn on

LCD display will activate when on

Listen.

DISPLAY RECEIVER

33

LR-400 Operation Instructions

1 **Make Sure the Unit is On**

Rotate the volume knob counterclockwise with an earphone or headset connected to the unit. Listen receivers use the cable of the earphone or headset as a receiving antenna.

Be careful when turning the unit on - if you turn the knob too far you might get too much volume in your earphone!

2 **Select a Channel**

Select the channel to match the transmission channel by pressing the UP and DOWN buttons on the receiver.

At 72MHz:

72MHz receivers operate on 17 wide band channels and 40 narrow band channels. Channels represented by letters on the display (i.e. A) are wideband channels ; channels represented by numbers are narrowband channels.

At 216MHz:

216MHz receiversoperate on 19 wide band channels and 38 narrow band channels. Channel numbers starting with a "2" are wide band; channels beginning with a "1" or "3" are narrow band channels.

Refer to the Frequency Compatibility Tables (pages 60-63) for specific frequencies and compatibility with other manufacturers.

3 **Test the audio**

If a transmitter is broadcasting on that channel, you will be able to hear the audio. If the signal is too weak, the audio will be muted (squelched).

LR-400 Operation Instructions continued

4 Find an audio transmission using SEEK

Another way to find a channel on the LR-400 is to use the SEEK button. When you do this, the Listen receiver looks for the next active channel. Sometimes the unit will mistake interference for a real broadcast signal. If you get interference, press the SEEK button again. The unit may stop on a channel that is close to the actual broadcast channel, in which case the channel will sound noisy or distorted. Simply press SEEK again until you find the clearest operating channel.

5 Adjust the volume control

Use the control dial on the top of the unit to adjust the volume to a comfortable level.

6 To Lock into Only One Channel

Press and hold the SEEK button for 5 seconds to lock a receiver onto the currently tuned channel. Press and hold the button again to unlock. When locked the LED on top of the unit will flash when you press the SEEK button.
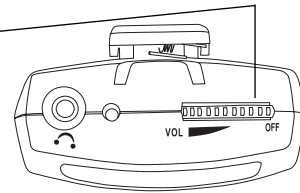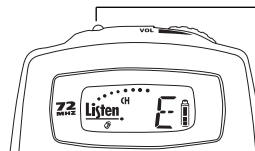
Is the Channel Locked on My Receiver?

On the LR-400, when the channel is locked, the padlock icon will appear on the display. If the unit is locked, the red LED on the top of the unit will flash when you press the SEEK button.
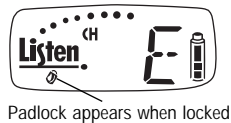
Padlock appears when locked

If locked, LED flashes on all portable receivers when SEEK button is pressed.

LR-400 Squelch

Squelch

The purpose of squelch is to mute the audio output of your receiver when the signal from the transmitter is turned off or is too weak to be received. Without squelch you would hear radio noise in your earphone. The squelch on your receiver can be adjusted so that it will mute the audio on different RF signal strengths. This is useful as follows:

· To ensure that users don't hear transmissions from other transmitters, set the squelch setting to the highest level that doesn't squelch the receiver.
· If the receiver is going to be close to the transmitter (i.e. in a classroom), setting the squelch setting high so that when the transmitter is turned off it immediately squelches and ignores transmitters in other rooms.
· If you are in an area that has a lot of inference, you may want to set the squelch setting to a high setting to ensure the interference is not picked by the receiver.
· If you need the maximum amount of range, you may want to consider setting the squelch setting to a low level (0, 1 or 2). CAUTION: when setting the squelch level low the reliability of squelch function is comprised. This will cause radio noise to be heard in the earphone and there is a possibility of hearing damage.

Squelch Programming Instructions

Squelch Programming

To enter Squelch programming mode
· Turn the unit off
· Press and hold the seek button; while still holding seek turn the ON/OFF dial to turn the unit on.
· Release the seek button when the Listen name disappears and a two digit display is seen.

To adjust the Squelch level
· Use the Channel UP and DOWN buttons to raise or lower the squelch sensitivity settings.
· Lower numbers mean that a less powerful and possibly noisy signal will be heard, but you can have a longer range.
· Higher numbers mean that a more powerful signal with no noise will be heard, but you may have a shorter range.

To save and exit the squelch programming mode press the seek button.

Squelch setting 00 is no squelch; this effectively disables Squelching capabilities of the receiver. Squelch setting 20 is maximum squelch sensitivity; you must have a very strong and stable RF signal for the unit to not engage the squelch feature.)

Adjusting the squelch setting will keep your LR-400 receiver from picking up noise when the transmitter is not sending audio, or when you lose the signal by being out of range or if encountering interference.

Note: For squelch settings 1-3, the squelch function is slow which allows for maximum transmission range. For squelch settings 4-20 the squelch function is fast to ensure little radio noise is heard during the squelch function.

(The Listen SQ feature is not squelch, please refer to page 58 for information on Listen SQ).

LR-400 Charging Batteries

The LR-400 and all Listen receivers are unique because they have SmartCharge™ chargers built in. When any of these units are connected to an LA-202 wall transformer or dropped into a Listen charging case, NiMH batteries will be charged.

To charge the batteries using the LA-202 wall transformer, plug the transformer into the jack marked "PWR/CHG" on the side of the unit. The unit can be operated while the batteries are charging.

To charge the batteries using a drop-in charger, simply place the unit into a slot in the charger and connect the charger to power. Make sure the unit is fully seated in its slot.

One of several charging cases available from Listen. Check the Listen website for more details.

SmartCharge™ uses a pulse charging, which greatly extends the life of Nickel Metal Hydride (NiMH) batteries. The entire charging process takes 13 hours. Listen recommends that you allow the charger to complete its full cycle every time for maximum battery life.

Connect LA-202 here and plug it into an AC wall outlet.

PWR/CHG
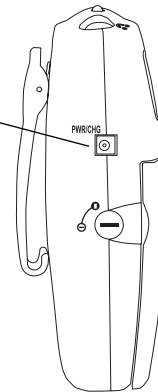
IMPORTANT: DO NOT ATTEMPT TO CHARGE ANY TYPE OF BATTERY OTHER THAN NiMH (NICKEL METAL HYDRIDE) with your Listen equipment. Alkaline batteries may explode when connected to a charger. Other risks of charging non-NiMH batteries include destruction of property or fire.

IMPORTANT: In order to charge NiMH batteries, the BATTERY SELECT switch in your Listen product must be set to the NiMH setting. Use a pen or small screwdriver to move the switch (located in the battery compartment) to the proper position.

LR-400 Charging Batteries continued

During the charge cycle, the red LED on top of the Listen product will flash slowly. When charging is completed, the LED will turn off. It is not necessary to unplug the charger; however, if you unplug the unit from the charger and then plug it back in, it will begin the 13-hour charge cycle over again.

When not using the LR-400, it is recommended to leave the unit on the charger. The charger provides a "maintenance" charge that keeps the battery at 100%. If the unit is not on the charger, the battery will lose up to 20% of its charge per month.

NOTE: Listen uses 1800mAh (milli-Amp-hour) constant current NiMH (Nickel Metal Hydride) batteries. These may be purchased from your Listen dealer (ask for part number LA-362).

One of several charging cases available from Listen. See the www.ListenTech.com for more options.
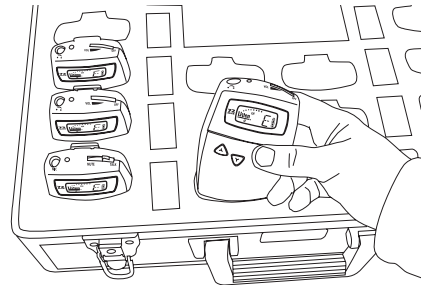
LA-311 - 16-unit Drop In Charging Case shown

LR-400 Wall Transformer Operation

The LR-400 will operate normally when connected to a wall transformer. Use Listen part number LA-202, available from any Listen dealer. Connect the wall transformer to the jack on the side of the LR-400 marked "PWR/CHG" and plug the wall transformer into a grounded AC outlet.

You do not need to have batteries installed in the LR-400 to operate it with a wall transformer.

NOTE: If batteries are in the unit ensure that the battery selection switch is set properly as shown on page 29. Please review the information on page 38 for important information regarding battery type and charging.

The LA-202 wall transformer plugs into the side of your portable transmitter or receiver.