Sportsound 1000 series

Installation and Operation Manual

ED-15605   *Rev 2 – 05 March 2006*

DAKTRONICS

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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 the Sportsound telephone numbers listed on the cover page of this manual. 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 8 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.
- **Appendix A** lists the drawings referenced within this manual.
- **Appendix B** lists the reference manuals that will be included for non-Daktronics components.

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-15605.**

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.

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 **Appendix A.**

Figure 1: *Daktronics drawing label*

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.
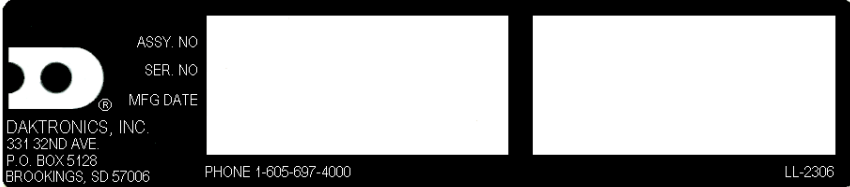
Figure 2: System identification label

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

Options:
1. One (1) Handheld wireless microphone system
2. One (1) Wireless referee/headset microphone system
3. One (1) Wireless in-ear monitor system for on-field talent
4. One (1) FM radio system

2.1   Speakers

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

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

2.2   Amplifier Rack Components

Reference Drawing:
1000 Series Amp Rack, Wiring Diagram.................... **Drawing B-260889**

Figure 6: *Amplifier rack*

Amplifier

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 amplifier rack in these system houses four audio power amplifiers.

Height: 3.5" (89 mm)
Width: 19" (483 mm)
Depth: 14" (356 mm)
Weight: 21 lbs (9.5 kg)

Figure 7: *Part #: A-1988 (back)*

Drawing B-260889 shows the proper standby power and signal connections from each source to and between each amplifier.

Channel Settings

To properly set the channels on the amplifier, turn the knob for CH1 and CH2 to 0, as shown in **Figure 8**.

Figure 8: *Channel setting*

Dip Switch Settings

The dip switches are located on the rear of the Amplifier. They should be set to parallel mode to function correctly, as indicated in **Figure 9**. All switches should be set to the right (On) except switch seven.

Figure 9: *Dip switch settings*

Processor

Located above the amplifiers is the digital signal processor (DSP) featuring two inputs, two outputs and 24-bit multifunctional DSP. It provides all the processing needed between the mixing console and the audio power amplifier in a sound system.

Height: 1.75" (45 mm)
Width: 19" (483 mm)
Depth: 8.5" (216 mm)
Power: 16 W

Figure 10: Part #: A-1999 processor

For more information, refer to the manufacturer's manual in **Appendix B**.

2.3   Portable Announcer's Rack Enclosure Case Components

Each Sportsound 1000 series includes a portable announcer's control rack. **Figure 7 and 8**, below, illustrate how the components fit into the rack (H 22"xW 22"xD 22").
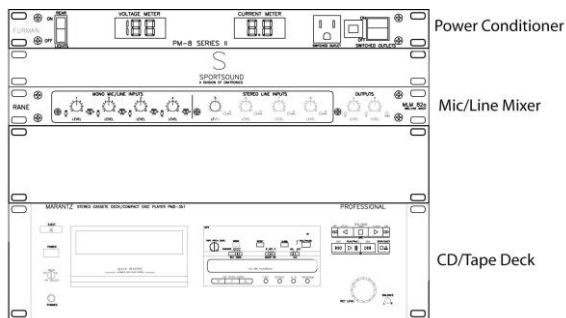
Figure 11: Portable announcer's rack OA-1340-0018

Figure 12: Portable announcer's rack

CD player/cassette deck

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

Height: 5.3" (133 mm)
Width: 19" (480 mm)
Depth: 11" (280 mm)
Weight: 13 lbs (6.1 kg)

The CD/cassette deck in the portable announcer's rack will look like either **Figure 13** or **Figure 14**. For more information on the player in **Figure 13**, refer to **ED-15654**. For more information on the player in **Figure 14**, refer to **ED-16003**.

Figure 13: Part #: A-1958 CD player/cassette deck

Figure 14: 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: 18 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 15: Part #: A-1960 Microphone/line mixer, front and back view

For more information, refer to the manufacturer's manual in **Appendix B**.

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)
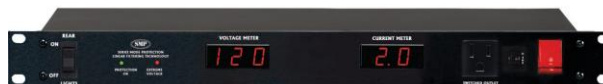
Figure 16: Part #: A-1959 15A power conditioner

For more information, refer to the manufacturer's manual in **Appendix B**.

2.4   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 announcer's rack that receives information from the wireless microphone/transmitter. Refer to the manufacturer's manual in **Appendix B** 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. The receiver is mounted and wired in the portable announcer's rack that receives information from the body pack transmitter. With a large frequency response, this option allows for announcements to be made from great ranges.

Wireless in-ear field 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 announcer's rack.

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 **Appendix B**.

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 manufacturer's manual in **Appendix B**.

Section 3: Mechanical Installation

Daktronics is not responsible for installations of structural integrity of support structures done by others. It is the customer's responsibility to ensure that a qualified structural engineer approves the structure and any additional hardware.

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: 1100 lb (499 kg)

3.2 Lifting the System

Reference Drawing:
Shop Drawing, Standard 1000 Series .... **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° 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. Eight ½" studs are connected to the bottom of the Sportsound 1000 cabinet. To mount the system in place, drop the studs through the holes in the ½" steel plate on the mounting frame and tighten with ½" washers and nuts. Refer to **Drawing B-246571** for mounting requirements.

Figure 17: Cabinet and mounting bolts

Section 4:   Electrical Installation

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.

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.

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

Reference Drawings:

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

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.

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Section 5: Maintenance and Troubleshooting

5.1 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. **DO NOT USE A POWER WASHER.**

5.2 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 manufacturer's manuals located in **Appendix B**. If the problem persists, please contact Sportsound 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 announcer's rack is not powered up	Power up portable announcer's rack
No sound from cabinet	Portable announcer's rack is not plugged into the signal jack	Plug portable announcer's 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 announcer's rack	Plug in announcer microphone into appropriate input in the back of the portable announcer's 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

Section 6:   Replacement Parts

6.1   Cabinet parts

1. A-1999 digital signal processor
2. A-1989 audio amplifiers
3. A-1988 audio amplifiers
4. A-1902 10" speakers
5. A-1903 15" speakers
6. A-1901 high frequency driver

6.2   Portable announcer's rack parts

1. A-1958 combination CD player /cassette deck
2. A-1960 microphone/line mixer
3. A-1959 power conditioner

6.3   Sportsound 1000 series options replacement parts

1. A-2024 A-Band UHF Wireless Microphone System
2. A-2023 A-Band UHF Wireless Microphone System
3. A-1985 B-Band UHF Wireless Microphone System
4. A-1984 B-Band UHF Wireless Microphone System
   a. A-1972 Head worn Microphone
5. A-1951 Wireless In-Ear Monitor System
6. A-2016 Stationary Transmitter and Receiver
7. A-1908 single ear bud

6.4   This is how to reach us:

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

Phone: Daktronics Help Desk: 877-605-1115 (toll free)
or 605-697-4034

Fax: 605-697-4444

Appendix A: 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

TYP.

0.25" TYP. BOTH ENDS

3/16
3/16   TYP.

DETAIL: A
(8 X SCALE)

1/3 TYP.

1/3 OVERALL DISTANCE

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

COLUMNS
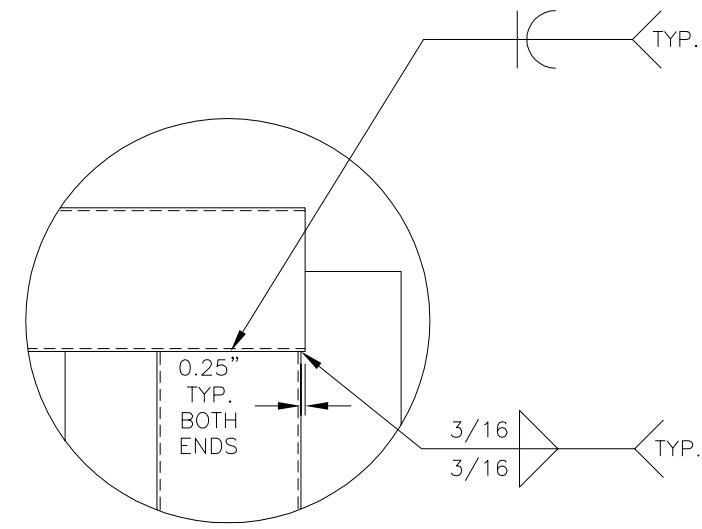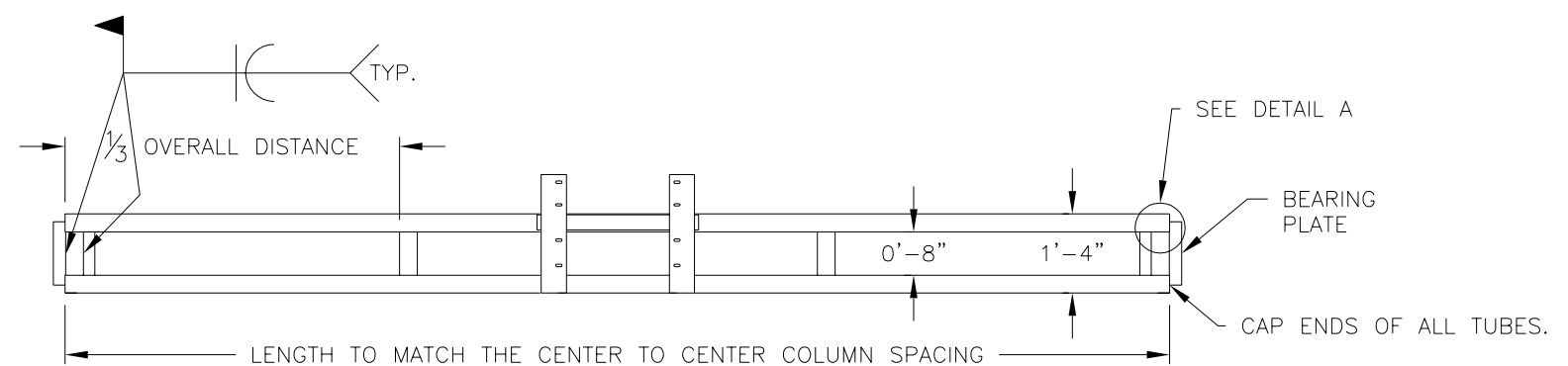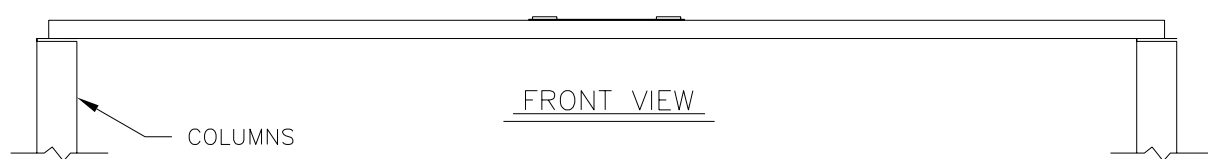
FRONT VIEW

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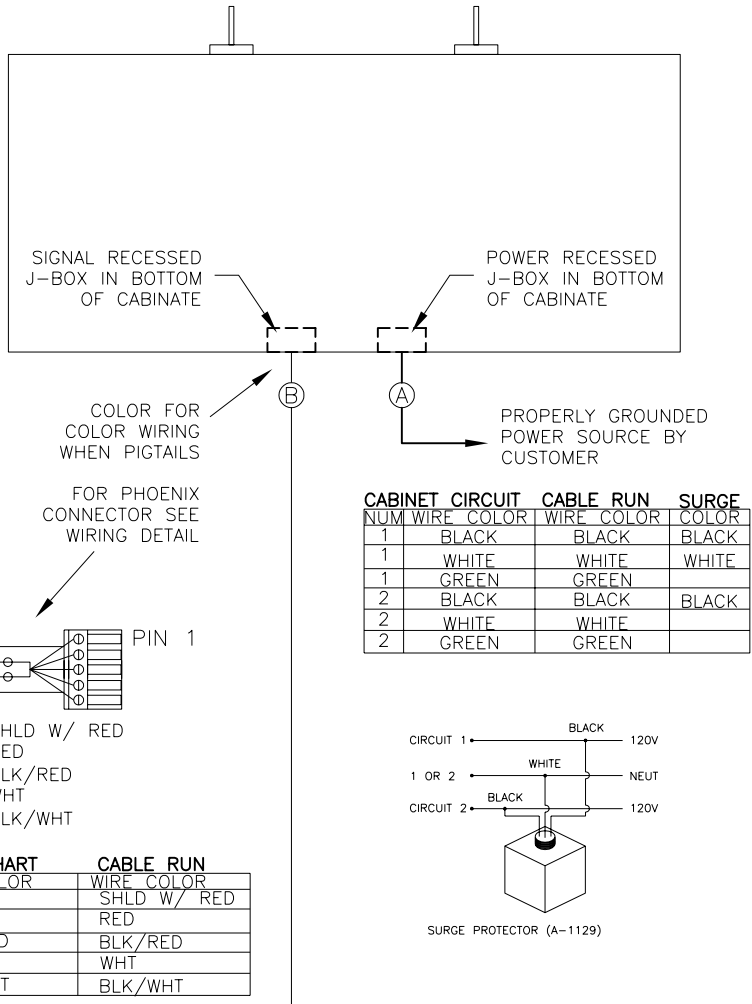
THE CONTRACTUAL AGREEMENT WILL DETERMINE THE PARTY OR PARTIES RESPONSIBLE FOR ITEMS LISTED AS FIELD INSTALLED. THIS DRAWING IS NOT INTENDED TO DETERMINE RESPONSIBILITIES AND SHOULD BE USED FOR REFERENCES ONLY.

———— EXTERNALLY MOUNTED HARDWARE
– – – – INTERNALLY MOUNTED HARDWARE

SIGNAL RECESSED J-BOX IN BOTTOM OF CABINATE

POWER RECESSED J-BOX IN BOTTOM OF CABINATE

(B)   (A)

COLOR FOR COLOR WIRING WHEN PIGTAILS

PROPERLY GROUNDED POWER SOURCE BY CUSTOMER

FOR PHOENIX CONNECTOR SEE WIRING DETAIL

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	

(B)   PIN 1

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

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

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

SURGE PROTECTOR (A-1129)

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.

REAR VIEW

W-1586
10FT CABLE
BY DAKTRONICS

ANNOUNCERS RACK CASE INCLUDES FRONT AND REAR REMOVABLE COVERS

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	

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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

8'-0 1/8"

A

SPEAKER CABINET @ 1150 LBS.

B

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

FRONT VIEW

MAX COLUMN SPACING = 19' C-C

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

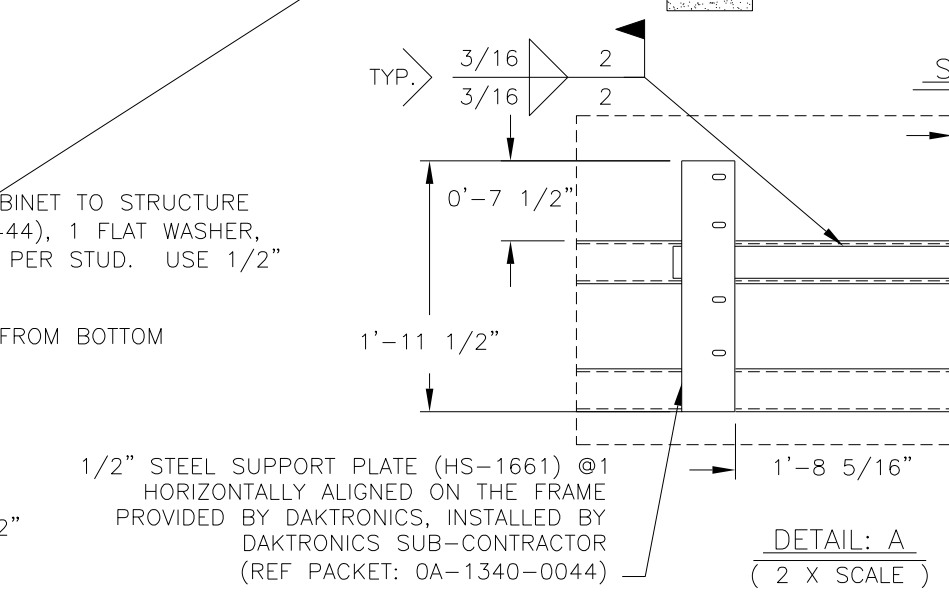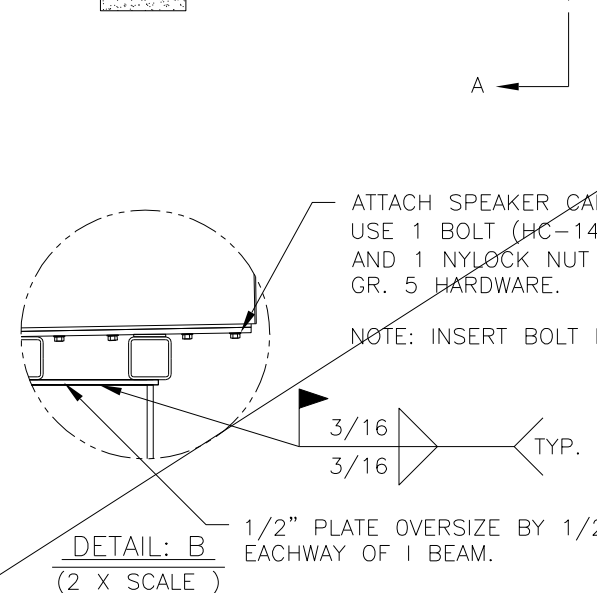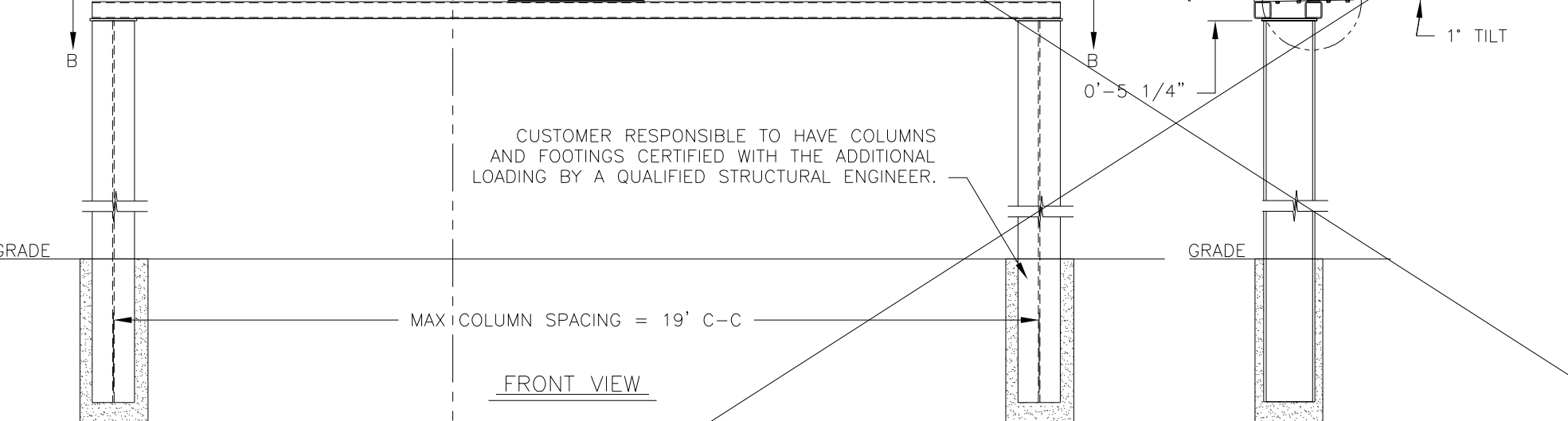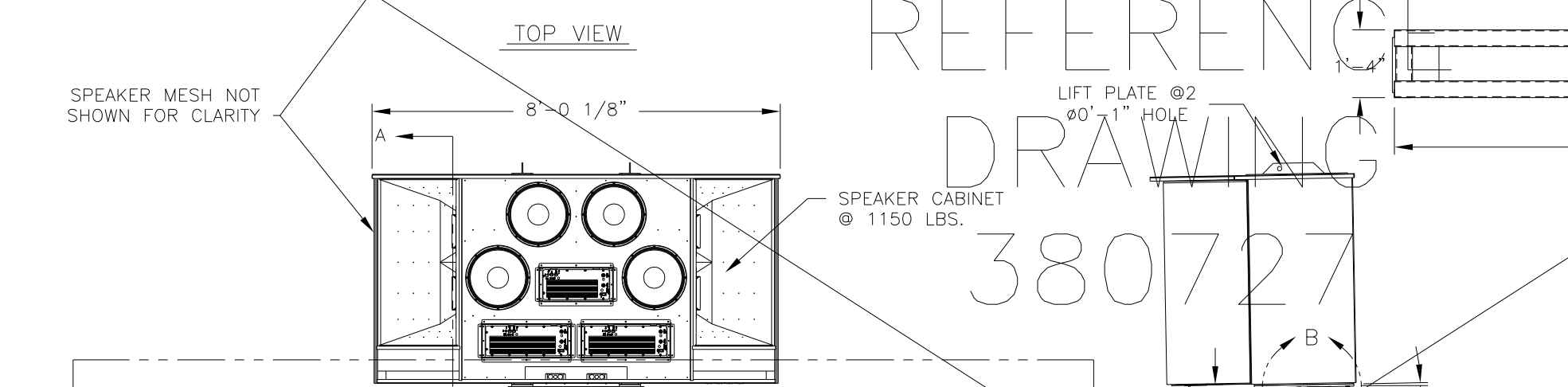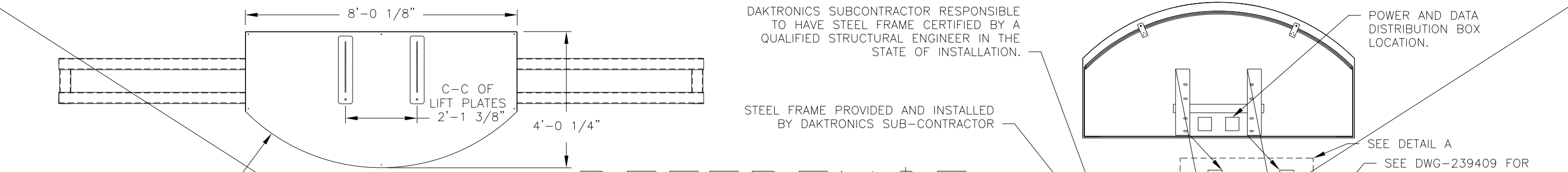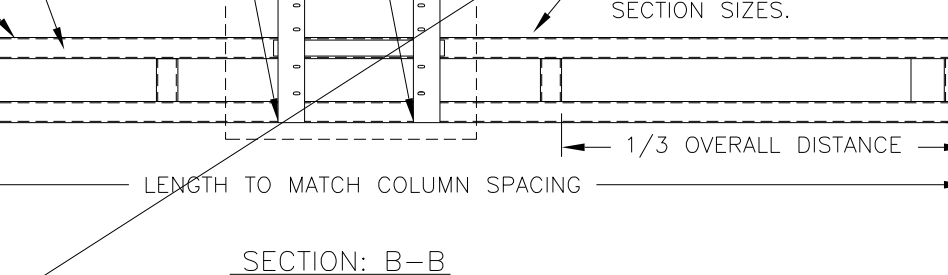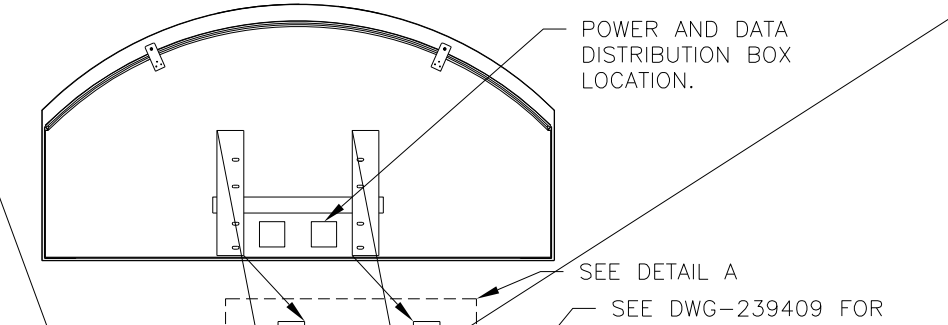SEE DWG-239409 FOR SECTION SIZES.

1/3 OVERALL DISTANCE

LENGTH TO MATCH COLUMN SPACING

SECTION: B-B

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.

TYP. 3/16 3/16 2 2

SECTION: A-A

0'-5"

0'-7 1/2"

3/16 3/16 TYP.

1'-11 1/2"

1'-8 5/16"

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: B
(2 X SCALE)

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)

DAKTRONICS, INC. BROOKINGS, SD 57006

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	

PROJ: SPORT SOUND SYSTEMS- 1000 SERIES
TITLE: SHOP DWG: STANDARD 1000 SERIES CABINET
DES. BY: DTREML DRAWN BY: JREDICK DATE: 1 JULY 05
REVISION APPR. BY:
03 SCALE: 3/8"=1'
1340-E10B-246571

JENSEN DIN-2LI

1. RED
2. BLK W/RED
3. SHIELD
4. RED
5. BLK
6. SHIELD

DELTROL 24VAC RELAY

6

9

RED

BLK

power input

ce

master   slave

RS-485

8 4 2 1
addr select

REMOTE PRESET

REMOTE VOLUME | OUTPUT | INPUT

CH1

CH2

322

CH1 INPUT   A1 L

A1 R

CH2 INPUT

CH1 INPUT   A2 L

A2 R

CH2 INPUT

CH1 INPUT   A3 L

A3 R

CH2 INPUT

CH1 INPUT   A4 L

A4 R

CH2 INPUT

DAKTRONICS, INC.   BROOKINGS, SD 57006

PROJ: SPORTSOUND SYSTEMS

TITLE: 1000 SERIES AMP RACK, WIRING DIAGRAM

DES. BY: KBIERBA   DRAWN BY: KBIERBA   DATE: 30 DEC 05

REVISION 00

APPR. BY:

SCALE: NONE

REV. | DATE | DESCRIPTION | BY | APPR.

1340-R10B-260889

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.

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

GRADE

MAX COLUMN SPACING = 19' C-C

FRONT VIEW

8'-0 1/4"

4'-1 3/16"

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

GRADE

REAR VIEW

LIFT PLATE @2 Ø0'-1" HOLE

4'-1 1/4"

0'-5 1/8"

2' TILT

GRADE

SECTION: A-A

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

STEEL FRAME PROVIDED AND INSTALLED BY DAKTRONICS SUB-CONTRACTOR

POWER AND SIGNAL CONDUIT ENTRANCE LOCATION

INDICATOR LIGHT FOR TROUBLE SHOOTING

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)

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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:
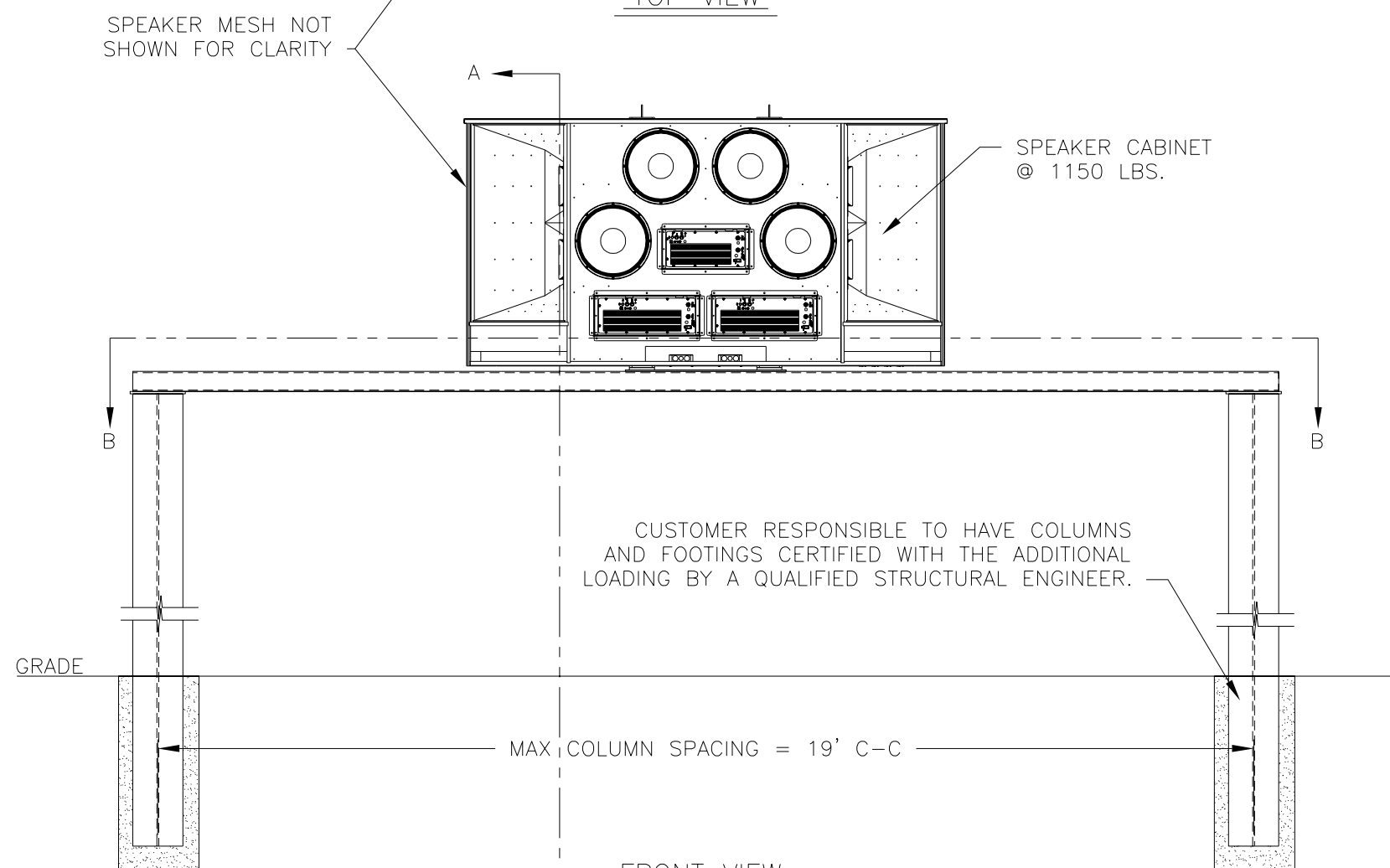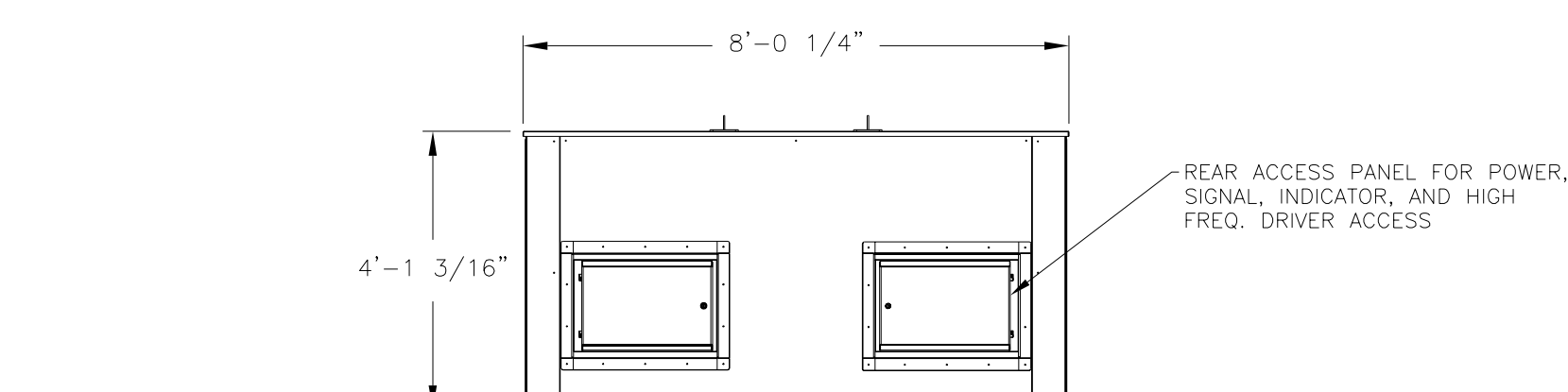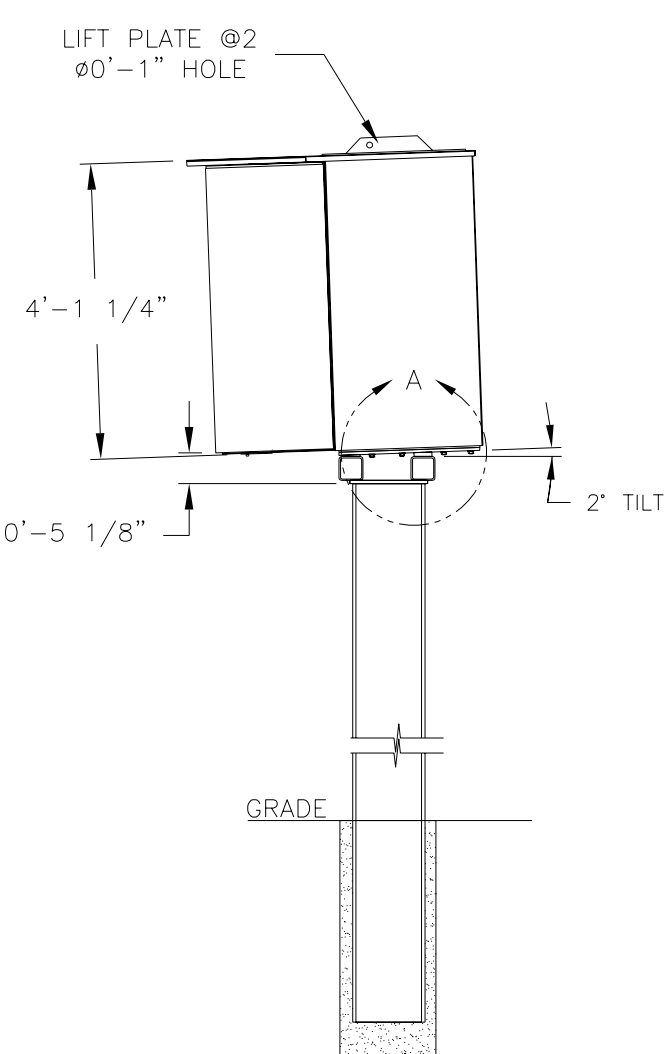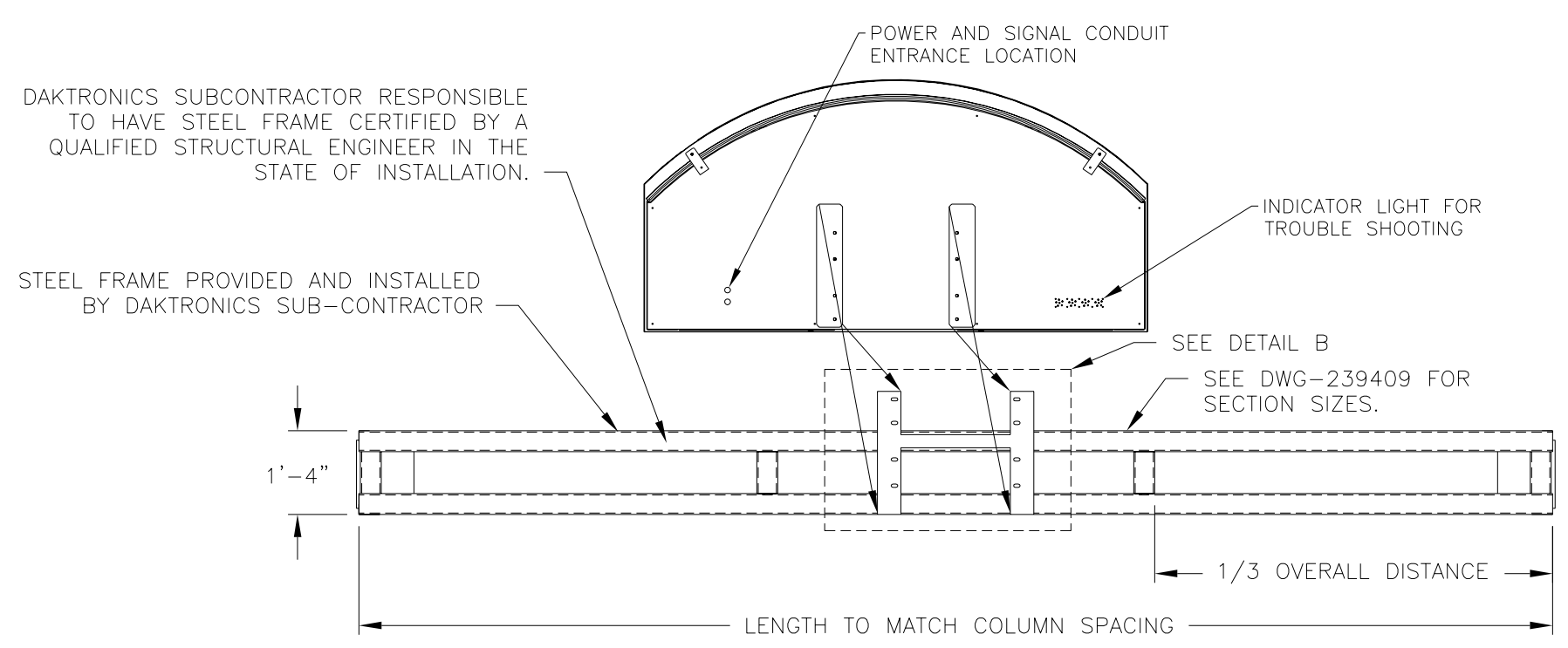01   APPR. BY:
SCALE: 3/8"=1'   1340-E10C-380727

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

Appendix B: Reference Manuals

PROFESSIONAL

Model PMD350 User Guide

Combination Stereo Cassette Deck/CD Player

marantz ®
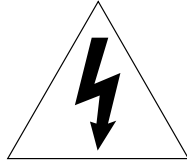
CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK)
NO USER-SERVICEABLE PARTS INSIDE
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL
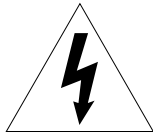
The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK,
DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CAUTION: TO PREVENT ELECTRIC SHOCK, MATCH WIDE
BLADE OF PLUG TO WIDE SLOT, FULLY INSERT.

ATTENTION: POUR ÉVITER LES CHOCS ÉLECTRIQUES,
INTRODUIRE LA LAME LA PLUS LARGE DE LA
FICHE DANS LA BORNE CORRESPONDANTE DE LA
PRISE ET POUSSER JUSQU'AU FOND.

LASER SAFETY

This unit employs a laser, Only a qualified service person should remove the cover or attempt to service this device, due to possible eye injury.

"CAUTION - USE OF CONTROLS OR ADJUSTMENTS
OR PERFORMANCE OF PROCEDURE
OTHER THAN THOSE SPECIFIED HEREIN
MAY RESULT IN HAZARDOUS RADIA-
TION EXPOSURE.

1

SAFETY
INSTRUCTIONS

READ BEFORE OPERATING EQUIPMENT

This product was designed and manufactured to meet strict quality and safety standards. There are, however, some installation and operation precautions which you should be particularly aware of.

1. Read Instructions — All the safety and operating instructions should be read before the appliance is operated.

2. Retain Instructions — The safety and operating instructions should be retained for future reference.

3. Heed Warnings — All warnings on the appliance and in the operating instructions should be adhered to.

4. Follow Instructions — All operating and use instructions should be followed.

5. Water and Moisture — The appliance should not be used near water-for example, near a bathtub, wash-bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.

6. Carts and Stands — The appliance should be used only with a cart or stand that is recommended by the manufacturer.

7. An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

8. Wall or Ceiling Mounting — The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.

9. Ventilation — The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

10. Heat — The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.

11. Power Sources — The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.
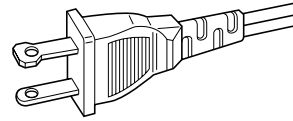
12. Grounding or Polarization — Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

AC POLARIZED PLUG

13. Power-Cord Protection — Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

14. Cleaning — The appliance should be cleaned only as recommended by the manufacturer.

15. Power Lines — An outdoor antenna should be located away from power lines.

16. Outdoor Antenna Grounding — If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built up static charges.
Section 810 of the National Electrical Code, ANSI/NFPA No. 70 — 1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See Fig. 1.

17. Nonuse Periods — The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

18. Object and Liquid Entry — Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

19. Damage Requiring Service — The appliance should be serviced by qualified service personnel when:
   A. The power-supply cord or the plug has been damaged; or
   B. Objects have fallen, or liquid has spilled into the appliance; or
   C. The appliance has been exposed to rain; or
   D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
   E. The appliance has been dropped, or the enclosure damaged.

20. Servicing — The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

2

FIGURE 1

EXAMPLE OF ANTENNA GROUNDING ACCORDING TO
NATIONAL ELECTRICAL CODE INSTRUCYIONS
CONTAINED IN ARTICLE 810 -"RADIO AND TELEVISION EQUIPMENT"

ANTENNA LEAD
IN WIRE

GROUND CLAMP

ANTENNA
DISCHARGE UNIT
(NEC SECTION 810-20)

ELECTRIC
SERVICE
EQUIPMENT

GROUNDING CONDUCTORS
(NEC SECTION 810-21)

GROUND CLAMPS

POWER SERVICE GROUNDING
ELECTRODE SYSTEM
(NEC ART 250, PART H)
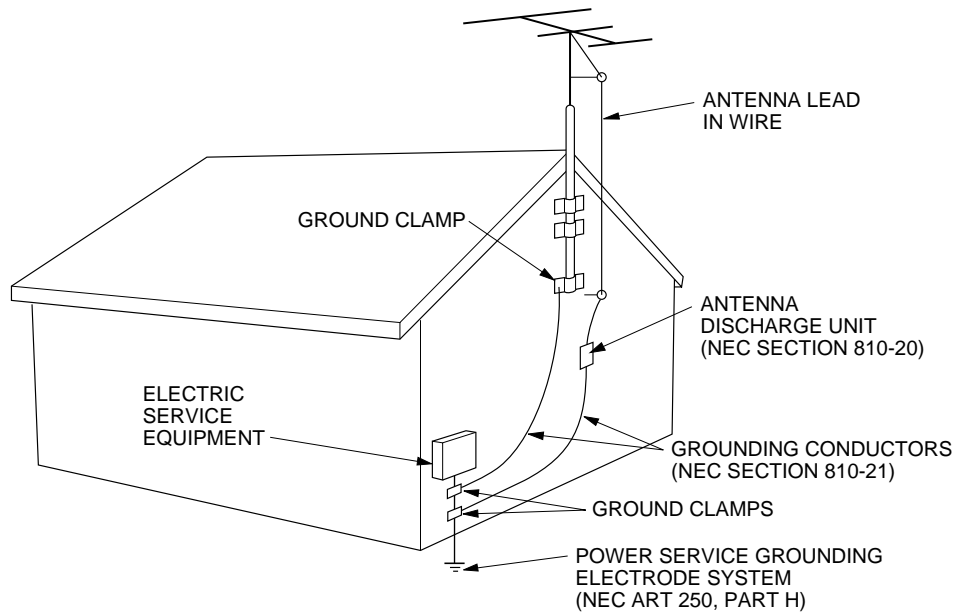
NEC - NATIONAL ELECTRICAL CODE

NOTE TO CATV SYSTEM INSTALLER:

This reminder is provided to call the CATV (Cable-TV) system installer's attention to Article 820-40 of the NEC, which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

NOTE:

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 in-stalled 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 recep-tion, 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 techni-cian for help.

NOTE:Changes or modifications may cause this unit to fail to comply with part 15 of the FCC Rules and may void the user's authority to operate the equipment.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

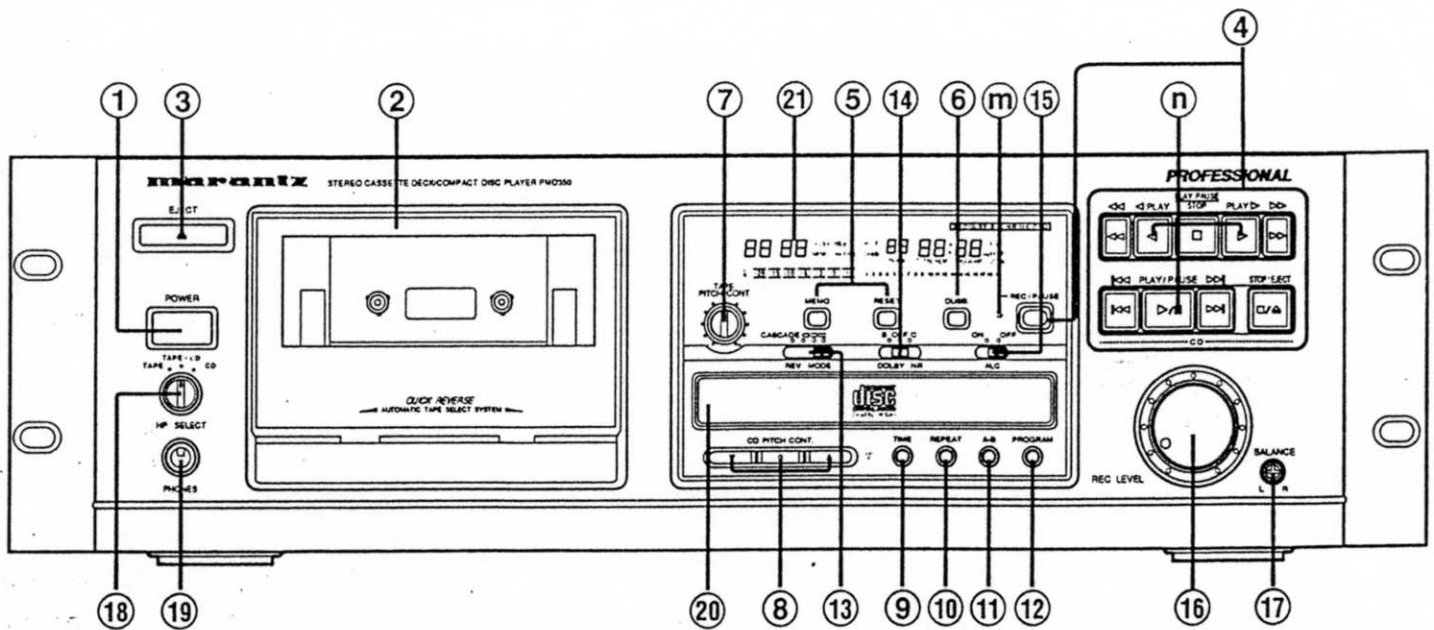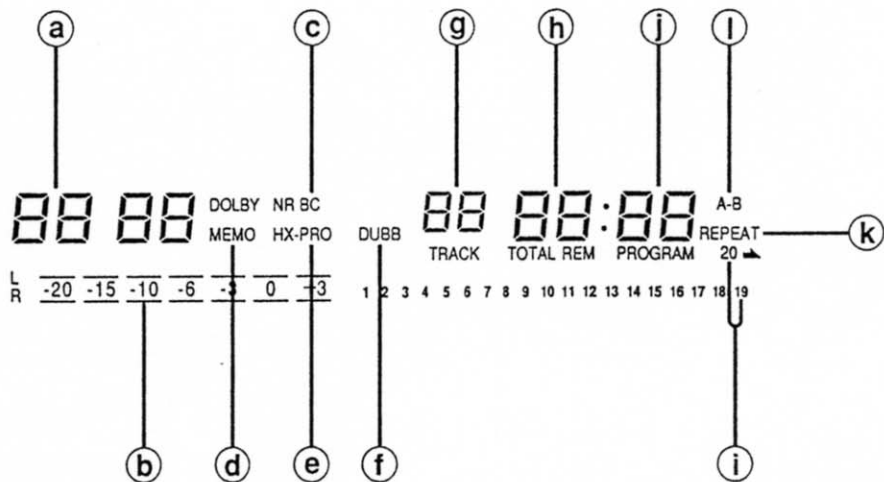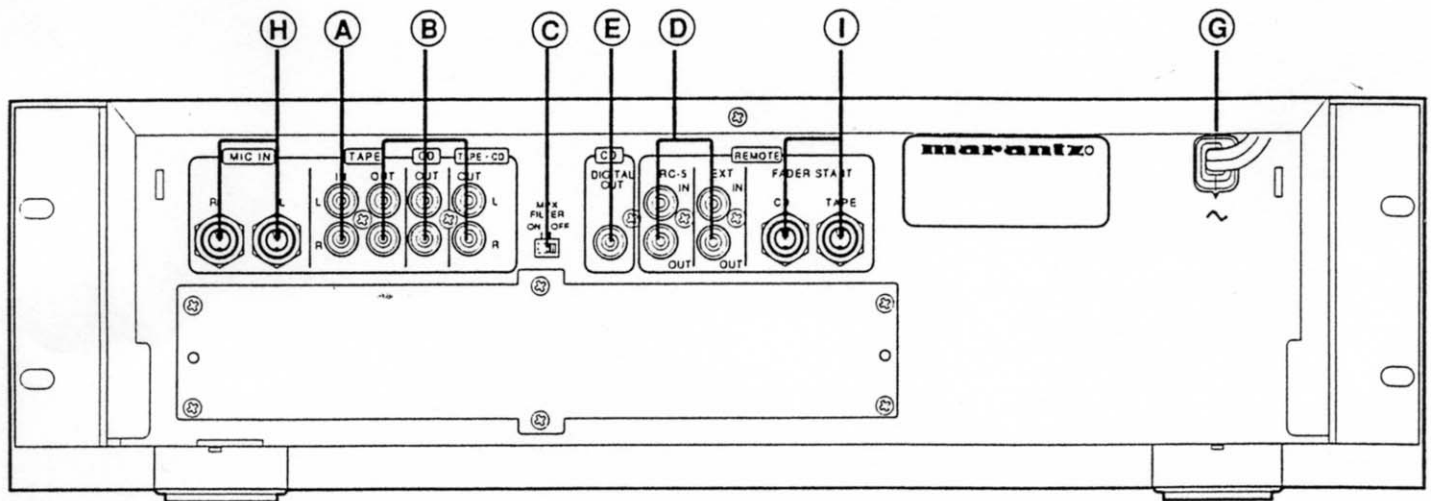Cet appareil numérique de la Classe B respecte toutes les exigences du Règlement sur le matérier brouilleur duCanada.

3

Figure 1

CONTENTS

INTRODUCTION

Thank you for selecting the Marantz PMD350 combination Stereo Cassette Deck/CD Player. Please read these operating instructions carefully. We recommend that you read the entire user guide prior to connecting and operating the unit. It is also recommended that all connections be made prior to operating the unit.

Please refer to this manual to identify controls and connections for operation of the unit.

PRECAUTIONS

The following precautions should be taken when operating the equipment.

GENERAL PRECAUTIONS

When setting the equipment ensure that:
- Air is allowed to circulate freely around the equipment.
- The equipment is on a vibration free surface.
- The equipment will not be exposed to interference from an external source.
- The equipment will not be exposed to excessive heat , cold, moisture or dust.
- The equipment will not be exposed to direct sunlight.
• In addition, never place heavy objects on the equipment.
• Never place heavy objects on the equipment.
• Should the unit become exposed to moisture do not operate the unit until it has been thoroughly inspected by a electrically competent technician.
• Do not break the connection to the AC main power by pulling the power cord. Remove from the outlet by pulling on the plug only.

FEATURES

QUICK OPTICAL AUTOREVERSE

In addition to the normal tension reversing circuitry the PMD350 tape transport also employs optically sensed quick autoreverse circuitry. This circuitry reacts to the clear areas of the tape, usually the leader tape, and, when detected will reverse the
direction of the tape transport. This process minimizes the lose of signal being recorded or played back. This reverse process applies to all tape playback and recording modes , including autoreverse and continuous mode.

TAPE AND CD PITCH CONTROL

The PMD350 tape player and CD player both allow for adjustment of the playback pitch from -12% to +12%.The feature is particularly usefully for adjusting the unit playback pitch to allow you to tune the PMD350 to accompanying instruments and choirs.

RC-5 REMOTE CONTROL COMPATIBILITY

The PMD350 comes equipped with an RC-5 remote in and out port. Through the use of various remote control options
Marantz has available the major functions of the unit can be operated via wired or wireless remote control.

ONE TOUCH DUBBING

The PMD350 allows for the dubbing of the CD to the tape with one button start control. This feature allows you to manually or automatically select the recording level you desire.

DUAL CD MEMO POINTS

The PMD350 allows you to select two points within the CD playback mode and repeat the audio playback within these points until a stop command is issued.

LOCKABLE REM TRACK TIME MODE

The CD time display can be toggled between the various modes of display. In addition to this, when a display mode is set the unit will remain in the selected mode until you change it.
This is particularly useful for DJ's monitoring the audio during performances and programs.

ONE TRACK PLAY AND STOP MODE

The PMD350 can be set to allow for the CD player to play the selected track and return to the stop mode rather than continue on to the next track on the CD.

AUDIO QUE CD PLAY

The CD player on the PMD350 contains the Audio Que feature. This feature allows the CD player to advance to the beginning of the audio within the track rather than start from the track start
flag. This feature helps to minimize the silence at the beginning of a CD track playback.

DOLBY NR SYSTEMS

The Dolby Noise Reduction systems compress and amplify the tape during recording in order to raise the signal-to-noise ratio on the tape. During playback, these signals are expanded and
attenuated by the same amount in order to regain the original dynamic range of music. An additional result of this expansion and attenuation is that the noise floor of the recording is reduced significantly. Dolby B typically reduces noise by 10dB.
Dolby C typically reduces noise by 20 dB.

DOLBY HX PRO HEADROOM EXTENSION

The Dolby HX PRO system monitors the total amount of effective bias during recording and instantaneously compensates for any excess bias by reducing the deck's bias signal level accordingly. The system operates independently on
each channel. HX Pro is unlike a noise reduction system because it functions only during recording and no decoding is required. Therefore a tape recorded with the HX Pro system
can be played back on any other cassette deck while retaining the benefits of HX Pro.

REAR PANEL CONNECTIONS

(A) LINE INPUT
These jacks should be connected to the LINE OUTPUT of your source.

(B) LINE OUTPUT(Tape,CD,Mix)
These jacks should be connected to the appropriate INPUT of your PA or monitoring system.

(C) MPX FILTER SWITCH
When recording FM broadcast with Dolby NR, set this switch to the ON position.

(D) RC-5 REMOTE CONTROL JACKS
These jacks are used with the Marantz infrared or wired remote accessories to provide remote control operation of the PMD350. These jacks can be serially linked to provide serial remote control operation of multiple RC-5 equipped products as well.

(E) DIGITAL OUTPUT JACKS(IEC958 type II)
This connector outputs the digital signal of the CD Player. Connect this jack to other IEC958 type II digital inputs such as a D/A Converter, digital sound processor or amplifier with IEC958 type II digital inputs such as the Marantz Compact Disc Recorder.

(F) REMOTE EXT(extension) JACKS
Connection with other Marantz components equipped with the REMOTE EXT. jacks will allow for extended cascade operation of several units.

(G) POWER CORD
120VAC input power connector.

(H) MIC(MICROPHONE) INPUT JACKS
For use with microphones as the input source into the tape deck. When microphones are installed into these jacks, the line inputs are automatically switched off and only the microphone signal is input into the unit. For mono recording insert the microphone into the L (Left) jack .

(I) FADER START JACKS
Upon receiving a dry switch contact closure on the jack connections, the CD Player can be switched in and out of play and play/pause mode. The Tape deck can be switched in and out of play and stop or the record and stop mode.

FRONT PANEL FEATURES

(1) POWER SWITCH BUTTON
Push the POWER switch in to turn power to the unit on and off. When power is turned off, all past setting are removed from memory and the unit returns to its default setting upon the next power up.

(2) CASSETTE TAPE HOLDER
This section holds the cassette tape for tape Play and Record functionality. Tapes that have the record protect knock-out removed will not enter into the record mode.

(3) EJECT BUTTON
Press the eject button to open the cassette tape holder.

(4) TAPE DECK AND CD PLAYER CONTROL
TAPE DECK CONTROL BUTTONS
■ : STOP BUTTON
Press the stop button to cancel all current operations of the tape deck.

► : FORWARD PLAY BUTTON
Press the forward play button to engage the tape deck into the forward play function.

◄ : REVERSE PLAY BUTTON
Press the reverse play button to engage the tape deck into the reverse play function.

◄◄ : REWIND BUTTON
Press the rewind button to engage the tape transport into fast rewind mode from the right(take-up) to the left(supply) reels.

►► : FAST FORWARD BUTTON
Press the fast forward button to engage the tape transport into the fast forward wind mode from the left(supply) to the right(take-up) reels.

● : REC/PAUSE BUTTON
Press the rec / pause button to engage the tape transport into the record pause mode. In this mode the tape deck is armed to begin recording. The tape record mode can be engaged by pressing the forward play ► or reverse play ◄ buttons.

CD PLAYER CONTROL BUTTONS
■ ▲ STOP/EJECT BUTTON
Press the Stop/Eject button to stop the CD Player while in the play mode. Press the Stop/ Eject button while in the Stop mode to open the door and eject the disk. During the program mode the Stop/Eject button will cancel the current program as long as the CD player is in the Stop mode.

► II PLAY/PAUSE BUTTON
Press the PLAY/PAUSE button the change the CD player mode from CD play to CD pause or from CD pause to CD play.

I◄◄ PREVIOUS BUTTON
When the CD player is in the play or pause mode, pressing the PREVIOUS button will skip back one track for every time the button is pushed.
During the program mode this function is used along with the next button to select the desired tracks to be played.
Press and hold during playback to fast reverse the CD play.

►►I NEXT BUTTON
When the CD player is in the play or pause mode, pressing the NEXT button will skip forward one track for every time the button is pushed. During the program mode this function is used along with the previous button to select the desired tracks to be played.
Press and hold during playback to fast forward the CD play.

(5) TAPE COUNTER BUTTON
MEMO BUTTON
Press the MEMO button to store a memory point into the counter memory. Once this point is set, the tape deck will rewind or fast forward until it reaches this point in the tape and will stop. To cancel the memory control press the MEMO button again.

RESET BUTTON
Press the RESET button to reset the current tape counter reading from its existing point to "0000".

6 DUBB BUTTON

Press the DUBB button to engage the tape transport into the dubbing mode from the CD player. Once the DUBB button is pressed, the CD player will copy directly to the tape deck.

7 TAPE PITCH BUTTON

Rotate the tape deck pitch control to adjust the tape deck playback pitch from -12% to +12%.
While the control is in the center detent position, the tape deck is at normal(0% pitch variance) speed. This control has no effect on the tape pitch during the record mode.

8 CD PITCH CONTROL BUTTON

By pressing the CD player pitch control buttons you can adjust the CD player playback pitch from -12% to +12% in .1% increments. You can return the CD player to the normal speed position by pressing the center "0" control.
Holding the pitch + or - controls for 2 or more seconds will cause the pitch to adjust in .5% increments.

CAUTION: When the CD pitch control is used, digital lock may not occur with some D/A converters.

9 TIME BUTTON

By pressing the TIME button you can adjust the CD player time displayed from the following formats. NORMAL- Displays the time elapsed within the current track being played. REM- Displays the remaining time left of the current track being played. TOTAL REM- Displays the total time remaining on the current disk being played. This control can be toggled between the various displays by pressing the TIME button multiple times.

0 REPEAT BUTTON

By pressing the REPEAT button you can program the CD player to repeat all tracks of the current disk. When there is a CD play program that is currently active, this function will repeat the current program selections. To clear this function, press the repeat control button again.

q A-B BUTTON

The A-B BUTTON allows you to repeat a specific section in the current CD track that is being played. When this control is pressed the first time, the A-B indicator flashes and this position on the track is noted as the start or A point.
When this control is pressed again, the A-B indicator lights continuously, and this position on the track is noted as the end or B point. After setting the end point the CD player returns to the start point (A), and plays until it reaches the end point (B). The CD player will repeat this function until the stop or A-B button is press again.

w PROGRAM BUTTON

The PROGRAM button will place the CD player into the program entry mode or the single track play mode. When the PROGRAM button is pressed once, the CD player enters the program entry mode and the program indicator will begin to flash. Pressing the PROGRAM button again will place the CD player in the single track play mode, and the track indicator will begin to flash. Pressing the PROGRAM button again will return the CD player to the normal play mode.

e REVERSE MODE SWITCH

The Reverse Mode switch allows you to set the automatic tape direction operation of the tape transport during playback, normal recording or dubbing. The 4 positions of this switch are as follows;

⇄ : One-way mode.
In this position the tape will play or record one side of the tape and stop.

⊃ : Two-way mode.
In this position the tape will play or record both sides of the tape and stop.

⊃ : Continuous mode
In this position the tape will play the tape in a continuous loop until the stop command is given. In the record mode the tape will record both sides of the tape and stop.

CASCADE MODE:
In this position multiple Marantz tape decks that are equipped with the "EXT" cascade connector can be looped together to allow for extended cascade playback or recording. In this mode the tape will play or record both sides of the tape and at the end of the tape on the first deck a command will be issued causing the next deck in line to begin cascade play or record. This will continue until the end of the last tape on the last deck of the loop is reached.

r DOLBY NOISE REDUCTION SWITCH

The Dolby Noise Reduction switch allows for the encoding or decoding of Dolby B or C Noise Reduction. When recording with Dolby Noise Reduction on, select the type(B or C) of noise reduction desired and place the switch in the appropriate position. When playing a tape with Dolby Noise Reduction encoded onto it, place this switch in the same position(B or C) as it was record in.

t AUTOMATIC RECORD LEVEL SWITCH (ALC)

The ALC switch allows for automatic control of the source level during recording. When this switch is set to the OFF position, the level of recording is controlled by the manual record level adjustment. When this control is set to the ON position, the record level is set automatically. In this position the manual record level adjustment has no effect on the recording.

y MANUAL RECORD LEVEL CONTROL

The manual record level control allows you to adjust the record level up or down during recording.

u RECORD BALANCE RECORD

The recessed balance control allows for the adjustment of the record level between the left and right channels. By using a phillips type screwdriver, you can adjust this balance control between Left(Counter-clockwise) and Right(Clockwise).

i HEADPHONE SLECTOR SWITCH

Used to switch the headphone output.

o HEAPHONES JACK

The headphones jack is used to allow monitoring of the Tape, CD or Tape/CD Mix through headphones. This jack requires that a 1/4" headphone jack connection be made and the desired source can be selected by the HP SELECT switch located diectly above theheadphone input jack.

p COMPACT DISC TRAY

The Compact Disc tray is used to hold the desired CD for playback.

DISPLAY INDICATORS

Tape counter display indicates the amount of tape that has been transported across the head in digits.

Level indicators display the record or playback signal levels of the tape deck.

Dolby NR B C indicators display the type of Dolby noise reduction that has been selected.

¶ MEMO indicator is Displayed when the tape deck memory function is turned on.

HX PRO indicator is displayed showing HX PRO is activated.

DUBB indicator is displayed when dubbing from the CD player to the tape deck.

TRACK number indicator displays the track number that the CD has identified in play or pause mode. In the stop mode, the number of tracks on the entire CD or the numbers of the tracks programmed to play are displayed. When the TRACK number indicator is flashing it indicates that the CD player is in the single track play mode. When in this mode the CD player will play the selected track and go to the stop mode.

TRACK time indicator displays the playing time of the CD in 4 digits representing minutes and seconds. This display typically represents elapsed time of the track being played. When the REM indicator is displayed, the time shown represents the remaining time of the track being played. When the TOTAL REM indicator is displayed, this represents the total remaining time of the CD or of the program currently being played. In the stop mode the total playing time of the CD is displayed. The flashing colon, " : " indicates that the CD pitch control is in use.

TRACK number indicator(1 through 20), displays the track numbers on the CD. When in the program mode the tracks programmed are displayed . Upon completion of playing a track, the number will disappear. When playing a CD with more than 20 tracks on it, the "=>" indicator is displayed.

D PROGRAM indicator is displayed to indicate that the CD player is in the program mode. The indicator flashes during the program play entry mode. This indicator can be turned on and off by pressing the program button.

REPEAT indicator is displayed when the CD player is in the repeat mode.

A-B indicator is displayed when the tape deck is in the A-B repeat mode. When the A-B indicator is flashing, this indicates standby for the setting of point B.

m REC indicator is displayed when the tape deck is in the Record mode. When the REC indicator is flashing, this indicates the tape deck is in the Record Pause mode.

£ TAPE DECK PLAY indicator(located inside of the tape play button) displays the direction and mode of the tape transport, Play or Pause.When the indicator is flashing this indicates the transport is in the pause mode and the direction the transport is assigned. When the indicator is constantly on, this indicates that the transport is in the play or record mode and the direction that the transport is assigned. This indicator will not light if there is not a tape in the transport.

CD PLAYER PLAY indicator(located inside of the CD play button) displays a constant indicator when the CD Player is in the Play mode and a flashing indicator when the CD Player is in the Pause mode.

Operations

The following operating procedures are based on the assumption that the power switch is set to the ON position and that all input and output connections have already been made. For examples of input and output connections, please refer to the section in this manual marked "Connections".

CASSETTE DECK OPERATION
CASSETTE TAPE PLAYBACK

1. Open the cassette holder by pressing the eject button. Load a cassette tape into the cassette holder and close. The 5 indicator on the play control button will begin to flash.

2. Set the Dolby Noise Reduction control switch to the same position as the tape was originally recorded in(i.e. tapes recorded with Dolby B noise reduction need to have this switch in the Dolby B position, tapes recorded with Dolby C noise reduction need to have this switch in the Dolby C position, and tapes recorded without Dolby Noise Reduction need to have this control set to the Off position).

3. Set the reverse mode control switch to the desired position.

4. Press the 5 play control button to begin playback in the forward direction. Press the 4 play control button to begin playback in the reverse play direction. When the tape enters into the playback mode the indicator on the play control button will change from the flashing mode to a constant on mode to indicate playback is operating.

5. Pressing the stop control button will stop the tape transport during playback.

CASSETTE TAPE REWIND/FAST FORWARD

Regardless of the direction that the tape transport is currently in, pressing the 2 (Fast Forward) control button will place the tape transport in the high speed fast forward mode and the tape will advance quickly from left to right. Pressing the 1 (Rewind) control button will place the tape transport in the high speed rewind mode and the tape will retract quickly from right to left.

In either the fast forward or the rewind mode, the tape transport will continue to fast forward or rewind until the stop control button is pressed or the end of the tape is reached.

CASSETTE TAPE RECORD

1. Open the cassette holder by pressing the eject button. Load a recordable cassette tape into the cassette holder and close. The 5 indicator on the play control button will begin to flash. (If you wish to change the tape direction, press the 4 play control button and then press the stop control button).

2. Set the Dolby Noise Reduction control switch to the position that you want to record the tapes noise reduction in(i.e. tapes to be recorded with Dolby B noise reduction need to have this switch in the Dolby B position, tapes to be recorded with Dolby C noise reduction need to have this switch in the Dolby C position, and tapes to be recorded without Dolby Noise Reduction need to have this control set to the Off position). When recording FM broadcast with Dolby Noise reduction on, set the MPX switch to the On position.

3. Set the reverse mode control switch to the desired position.

4. Set the ALC control mode switch to the ndesired position, on or off.

5. Press the rec/pause control button. The REC indicator will begin to flash indicating the tape transport is in the record pause mode.

6. If the ALC control button is in the Off position, using the manual record level control adjust the input signal to the desired recording level.

7. Press the 5 play control button to begin recording in the forward direction. Press the 4 play control button to begin recording in the reverse direction. When the tape enters into the playback mode the REC indicator and the play control button indicator will change from the flashing mode to the constant on mode. This indicates the tape transport is in the record mode.

8. To pause the tape transport during recording press the rec/pause control button. Press the play control button to resume recording.

9. Pressing the stop control button will stop the tape transport during recording. Pressing the 1 rewind in the 5 play/record direction or the
   2 FAST FORWARD in the 4 play/record direction will cause the unit to return to the position the recording began at.

COMPACT DISC PLAYER OPERATION
COMPACT DISC PLAYBACK

1. Open the compact disc tray by pressing the STOP/EJECT button. Load a compact disc onto the compact disc tray and close the tray by gently pushing the front of the compact disc tray or by pressing the STOP/EJECT button. The CD player display will show the general data of the current CD.

2. To begin playback of the compact disc press the CD play/pause control button. The 5 indicator in the CD PLAY/PAUSE button will illuminate, the display will show the data for the first track and the track will begin to play.

3. To pause the CD during playback, press the CD PLAY/PAUSE button. The display will remain in the current position and the 5 indicator in the CD PLAY/PAUSE button will begin to flash. Pressing the CD PLAY/PAUSE button will resume normal playback from the point that the CD player was paused.

4. Upon completion of playback of the last track in the disc the CD Player will return to the stop mode. You can also stop the CD playback by pressing the STOP/EJECT button once.
   Pressing the STOP/EJECT button again will cause the CD tray to open.

SELECTING THE TRACK FOR PLAYBACK

1. By pressing the CD 7 NEXT or the CD 6 PREVIOUS buttons you can select the track to be played. Each press of the CD 7 button will advance the CD player to the beginning of the next track and enter into the play pause mode.
   Each press of the CD 6 button will cause the CD player to skip to the beginning of the previous track and enter into the play pause mode. Pressing the CD PLAY/PAUSE button will resume playback at the beginning of the selected track.

PROGRAMMING PLAYBACK TRACKS
(PROGRAM PLAY MODE)

This procedure allows you to program selected tracks for playback in the order you desire.

1. By pressing the PROGRAM button once you will place the CD player into the programming mode for playback. Once the PROGRAM button is pressed the PROGRAM indicator in the CD display will begin to flash. This indicates the CD player is in the program entry mode.

2. By pressing the CD 7 NEXT or the CD 6 PREVIOUS buttons you can select the track to be programmed. Each press of the CD 7 button will advance the CD player to the beginning of the next track. Each press of the CD 6 button will cause the CD player to skip to the beginning of the previous track. When the desired track number has been selected, leave the CD player untouched for approximately 1.5 seconds and the selected track will be stored in the playback program. Continue this procedure until all desired tracks(20 tracks maximum) have been programmed.

3. By pressing the PLAY/PAUSE button the CD player will exit the program entry mode and enter the program play mode. The PROGRAM indicator in the CD display will go to constant on and the CD player will begin to play in the order selected during the programming.

4. By pressing the STOP/EJECT button the CD player will stop playing but will remain in the program play mode. The program will remain in memory.

5. When the STOP/EJECT button is pressed while the CD player is in the stop mode and while the program is still engaged, the memorized program will be cleared.

CD TO TAPE DUBBING

The CD source can be dubbed directly on to the tape deck by two means, manual recording or automatic level control(ALC On). During manual record dubbing the level desired is adjusted by manually adjusting the record level control. After the desired level is adjusted, you then release the tape deck to record. During ALC dubbing the record level is adjusted automatically based on the peak levels of the source and the tape deck enters the dubbing mode automatically.

MANUAL LEVEL TAPE DUBBING

1. By pressing the CD STOP/EJECT button and the tape eject button you can load the CD to be dubbed onto the CD tray and a recordable tape into the tape transport. Gently press the front of each of the mechanism to close them. The CD display will register the general CD data and the tape play indicator located inside of the tape PLAY button will begin to flash.

2. Prepare the tape for dubbing by rewinding it to the beginning of the first side that the tape is to be recorded onto.

3. Set the ALC switch to the OFF position.

4. Press the DUBB button once. The REC indicator will begin to flash, the DUBB indicator will light and the CD player will enter play mode. At this point you can adjust the record level control to achieve the desired record level.

5. After adjusting the record level, press the DUBB button again. The CD player will return to the stop mode, and the tape transport will enter into the record mode. After approximately 5 seconds the CD player will enter the playback mode and begin to play the first track, dubbing it onto the tape.

6. When either the CD transport or the tape transport have reached the end and stopped, the other transport will also stop.

7. To end the dubbing during a session, press the STOP on the tape transport or the STOP/EJECT button on the CD player.

AUTOMATIC RECORD LEVEL TAPE DUBBING

1. By pressing the CD STOP/EJECT button and the tape eject button you can load the CD to be dubbed onto the CD tray and a recordable tape into the tape transport. Gently press the front of each of the mechanism to close them. The CD display will register the general CD data and the tape play indicator located inside of the Tape PLAY button will begin to flash.

2. Prepare the tape for dubbing by rewinding it to the beginning of the first side that the tape is to be recorded onto.

3. Set the ALC switch to the ON position.

4. Press the DUBB button once. The REC indicator will begin to flash, the DUBB indicator will light and the CD player will enter play mode. The CD will automatically begin to search the source for the peak level. This procedure could take as long as 5 minutes tocomplete. Once the peak level has been determined, the record level for dubbing will be set automatically.

5. After the record level has been set, the tape transport will enter into the record mode. After approximately 5 seconds the CD player will enter the playback mode and begin to play the first track, dubbing it onto the tape.

6. When either the CD transport or the tape transport have reached the end and stopped, the other transport will also stop.

7. To end the dubbing during a session, press the STOP on the tape transport or the STOP/EJECT button on the CD player.

Notes:
    When dubbing is started with a program of CD tracks, the tracks are dubbed in the order that the original playback was programmed for. For assistance in programming playback, see the section marked "Program Playback".

During dubbing, a blank space of approximately 4 seconds is automatically inserted between CD tracks. This may hinder some dubbing such as live recordings on CD.

The CD peak level that is detected during ALC level dubbing may vary from one recording to another, however the effect will be minimal.

When recording with the reverse mode control set to the two way or the continuous mode there may be an interruption in recording of approximately 1 second during the optical reversing of the tape transport.

EXTENDED CASCADE OPERATION

By using the cascade feature on the PMD350 with other PMD350's or other Marantz products offering the cascade feature, several units can be connected to supply long playback or recording functionality.

EXTENDED CASCADE PLAYBACK

1. Refer to the user guide of the other components to assure that all connections and switch settings are set correctly.

2. Assure that the "EXT" jack on the rear of all units are connected. Starting with the first unit to operate, connect the "EXT" out jack to the "EXT input on the second unit to operate. Continue this set-up procedure until all units that are to operate in the cascade mode have the "EXT" control jacks serially linked together.

3. Set the PMD350 reverse mode control switch to the cascade position.

4. Begin the playback of the first source by pressing the play control button. The unit will enter playback mode. After the first source has completed playback, the next component in the cascade will begin playback. This will continue until the last unit linked in the cascade chain has completed playback and entered the stop mode.

5. To exit out of the cascade playback mode, press the stop control button of the source machine currently in playback mode.

EXTENDED CASCADE RECORDING

1. Refer to the user guide of the other components to assure that all connections and switch settings are set correctly.

2. Assure that the "EXT" jack on the rear of all units are connected. Starting with the first unit to operate connect the "EXT" out jack to the "EXT input on the second unit to operate. Continue this set-up procedure until all units that are to operate in the cascade mode have the "EXT" control jacks serially linked together.

3. Set the PMD350 reverse mode control switch to the cascade position.

4. Place all components that are linked together in the cascade mode into the record pause mode.

5. Begin the recording of the first source by pressing the play control button. The unit will enter record mode. After the first source has completed recording, the next component in the cascade will begin recording. This will continue until the last unit linked in the cascade chain has completed recording and entered the Stop mode.

6. To exit out of the cascade record mode, press the stop control button of the source machine currently in record mode.

NOTES:
    If all components have not be set up correctly, tape or CD loaded, record pause armed, etc., the cascade function will stop upon reaching this source machine.

If the cascade function is started with the tape first the PMD350 will go to CD playback next and then to the next component. If the playback is started with the CD first the PMD350 will play the CD then go to the next component.

Before beginning the cascade record function hand wind the tape leaders so that no leader is showing. This will minimize interruptions in your recordings.

SYNCHRONIZED RECORDING CONTROL

The PMD350 is capable of connecting with other Marantz RC-5 based products to allow for synchronized start of the product recording through the starting of the play function of the CD player or the tape transport of the PMD350.

By connecting the RC-5 output jack to the RC-5 input jack of another Marantz recorder, the PMD350 will issue a command for the recording to start as soon as the play control button is pressed on the PMD350. Pressing the stop or the stop/eject control button on the PMD source deck will place the attached component into the record pause mode.

During the cascade recording mode, the PMD350 can be attached to other Marantz RC-5 based decks for the purpose of small scale duplication of the dubbing source. This is accomplished by linking the RC-5 output connector to the RC-5 input of the recording deck and placing the PMD350 reverse mode control switch into the cascade position.

REMARKS

CAUTION

- If you must stop playback or recording in the middle of a tape, be sure to press the **STOP** button first, then turn the power off. If the power is turned off in the middle of an operation, the cassette tape remains loaded, and it may be impossible to eject. In such a case, turn the power on, enter PLAY mode, then press STOP, and the eject the tape.
- The same caution as above applies in case of power failure. To prevent damage, never attempt to force the removal of a cassette while the power is off.

ERASURE OF TAPE

When a program source is recorded onto a tape, the previously recorded sound is erased automatically, and replaced with the new recording. If you wish to erase a tape without recording, set the REC LEVEL control to the minimum(0) position and let the tape travel in the Record mode.

AUTO TAPE SELECTOR

This unit is equipped with an auto tape selector whitch automatically sets the bias and equalizer level using the detection holes porovided in the cassette shell. The bias and equalizer levels are automatically set according to the type of cassette as follows. (See Figure 3)

- Normal tapes   EQ;   120μS,   Bias; Low
- HIGH/Position tapes   EQ;   70μS,   Bias; High
- Metal tapes   EQ;   70μS,   Bias; Metal

TO PROTECT VALUABLE RECORDINGS

In the record mode, information previously recorded on the tape will automatically be erased. To prevent this from happening, use a small screwdriver to break out one or both safety tabs (See Figure 4).

It is possible to restore the recording capability of either side of the cassette by covering the opening with clear adhesive tape (See Figure 5).

CARE AND MAINTENANCE

This section describes the care and maintenance tasks that must be performed to optimize the operation of your Marantz equipment.

MAINTENANCE FOR TAPE

Head Cleaning

If the heads are not cleaned for a long period, dirt or dust may be deposited on the heads and capstans, causing degraded high-frequency characteristics, volume drop, or degraded recording and erasure performances.

To prevent this, clean the heads, etc., periodically as follows.

1. Turn the power off.
2. Open the cassette holder by pressing the EJECT button.
3. As shown in Figure 2, clean the parts which come in contact with tape, including the heads, capstans, tape guides, pinch wheels, etc., with a cotton swab soaked in head cleaning solution.

Head Demagnetization

When a magnetized metallic objects (such as a screwdriver tip, etc.) comes in contact with a head or capstan, or when the deck has been used for a long period of time, the head may be magnetized and noise may be generated. If the head is extremely magnetized, the high frequencies in recorded tapes could even be erased.

To prevent this, demagnetize the heads and capstans periodically (every 20 hours of use) using a commercially-available head demagnetizer. (For the operation, please refer to the instruction manual supplied with your head demagnetizer.)

Caution: Be sure to turn the power of the cassette deck off before using a head demagnetizer.

CLEANING OF EQUIPMENAL SURFACES

The exterior finish of your unit will last indefinitely with proper care and cleaning. Never use scouring pads, steel wool, scouring powders or harsh chemical agents (e.g., lye solution), alcohol, thinners, benzine, insecticide or other volatile substances, as these will mar the finish of the equipment. Likewise, never use cloths containing chemical substances. If the equipment gets dirty, wipe the external surfaces with a soft, lint -free cloth.

If the equipment becomes heavily soiled:

- dilute some liquid soap in water, in a ratio of one part detergent to six parts water
- dip a soft, lint free cloth in the solution and wring the cloth out until it is damp
- wipe the equipment with the damp cloth
- dry the equipment by wiping it with a dry cloth.

REPAIRS

Only the most competent and qualified technicians should be allowed to service your unit. Marantz and its factory trained warranty station personnel have the knowledge and special equipment needed for repair and calibration of this precision instrument.

In the event of difficulty, call the toll-free telephone number listed on the face of the warranty to obtain the name address of the Marantz Authorized Service Center nearest you. In many cases, the dealer where you purchased your Marantz unit may be equipped to provide service. Please include the model and serial number of your unit together with a copy of your purchase receipt and a full

description of what you feel is abnormal in its behavior.

TROUBLESHOOTING

Should faults occur it is in many cases not necessary to consult your dealer or technical service department. On the basis of the following checks you will be able to rectify a number of conditions yourself without difficulty.

If the condition cannot be remedied after the following check, please consult your dealer or nearest Marantz service agent.

TAPE DECK

The tape does not travel.
1. Check that the power cord is plugged properly.
2. Check that the POWER switch is set to ON.
3. Check that the tape is rewound.

The tape travels, but no sound is output.
1. Check that the cassette tape is recorded.
2. Check that the mixer, amplifiers and speakers are connected and functioning properly.

Tape will not record.
1. Check that the protection tabs of cassette tape are not broken.
2. Check that the recording level is set properly.

Sound is distored.
1. Check that the recording level is not too high.
2. Check that the head is not dirty.

Sound is unstable.
1. Check that the head is not dirty.
2. Check that the pinch wheels and capstans are not dirty.
3. Check that the tape is wound regularly.

Noise is noticeble.
1. Check that the head is not dirty.
2. Check that the head is not magnetized.
3. Check that the DOLBY NR switch is set properly according to the tape.

Hum interferes with the sound.
1. Check that cords are connected properly.
2. Check that there is not any source of magnetism (TV, motor, transformer, etc.) placed near the unit.
3. When this unit and amplifier are stacked, hum noise is sometimes generated depending on the amplifier model. In such a case, place the components in positions where interference does not occur.

CD PLAYER

The disc fails to rotate.
1. Check that the power cord is plugged in properly.
2. Check that the POWER switch is set to ON.
3. Check that the disc is placed in the correct position on disc tray.
4. Check that the disc is placed properly with the label side facing up.
5. Check that the disc is not dirty.
6. Check that the disc is not scratched.
7. Check that the disc is not warped.
8. Check that the transport screws have been removed.

The disc is rotating but no sound is heard.
1. Check that the amplifier and speakers are connected properly.
2. Check that the amplifier is turned ON.
3. Check that the amplifier's volume control is not set at the minimum level.
4. Check that the amplifier's input selector switch is set to the correct input ("CD" or "AUX" whichever corresponds to the input jacks the CD player is connected to).

The disc stops in mid-operation.
1. Check that the disc is not dirty.
2. Check that the disc is not scratched.
3. Check that the disc is not warped.

The sound drops out or noise is heard.
1. Check that the disc is not dirty.

2. Check that the disc is not scratched.
3. Check that the disc is not warped.

CLEANING OF EXTERIOR SURFACES

With proper care and cleaning, the exterior finish of your equipment will last indefinitely. Never use scouring pads, steel wool, scouring powders or harsh chemical agents (e.g. lye solution), alcohol, thinners,benzine, insecticide or other volatile substances, as these will mar the finish of the cabinet. Likewise, never use cloths containing chemical substances. If the equipment becomes dirty, wipe the external surfaces with a soft, lint-free cloth.

If the cabinet becomes heavily soiled:

– dilute some washing-up liquid in water, in a ratio of one part detergent to six parts water;
– dip a soft, lint-free cloth in the solution and wring the cloth out until it is damp;
– wipe the equipment with the damp cloth;
– dry the equipment by wiping it with a dry cloth.

NOTICE
- Quick reverse operation will only occur after the transport has been moving for 15 seconds. Before that time it take approximatery 4 seconds to reverse.
- One second of audio is lost during quick reverse.
- Automatic search operations can only operate on one well at a time.
- Eject buttons will not function unless the deck is in the stop mode. Thus, if the power is turned off without hitting the **STOP** button, the door may not open.
- The tape counters are only approximate measurements of minutes and seconds and are not intended for timing-critical applications. They are most accurate with 60 minute tapes.
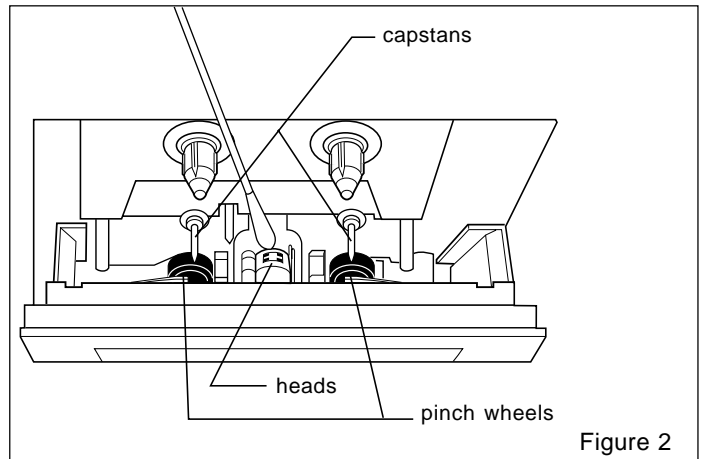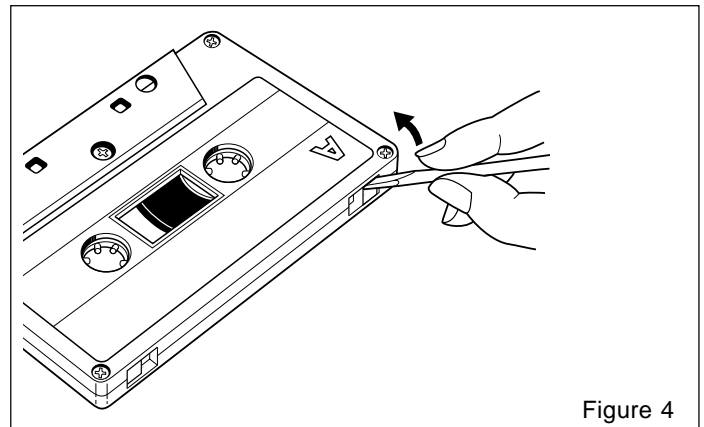
COMPACT DISCS

The glossy side shining like a rainbow is the front side of the disc, and the side on which the label is printed is the back.
Unlike conventional turntables for playing analog discs, Compact Disc Player reads the information recorded on the disc from underneath without contacting it using a beam of laser light. Therefore, the performance of a compact disc will not degrade like conventional analog records.

Handle discs carefully so as not to damage or scratch the front side.

To protect the disc, avoid placing it in the following locations:
– In direct sunlight or near a source of heat like a heater.
– In a place which is damp or dirty.
– In a place which could be exposed to rain, such as near a window.

Always keep the disc surface clean.
Up to six billion data units are recorded on the front side of the disc. When cleaning the disc surface, always be sure to use a special compact disc cleaner and wipe as shown below.

Wipe in a radial direction.   Do not wipe in circumferential direction.
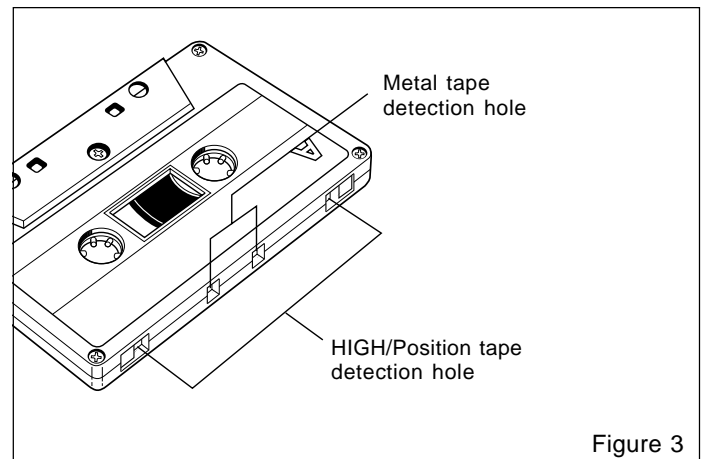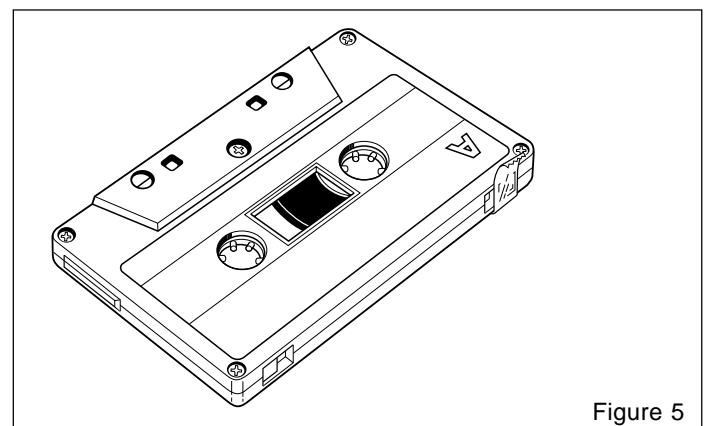
- Do not use conventional record cleaner for analog records, as this will adversely affect the disc surface.
Store discs properly by placing them in their disc cases.

14

capstans
heads
pinch wheels
Figure 2

Figure 4

Metal tape detection hole
HIGH/Position tape detection hole
Figure 3

Figure 5

marantz® is a registered trademark.
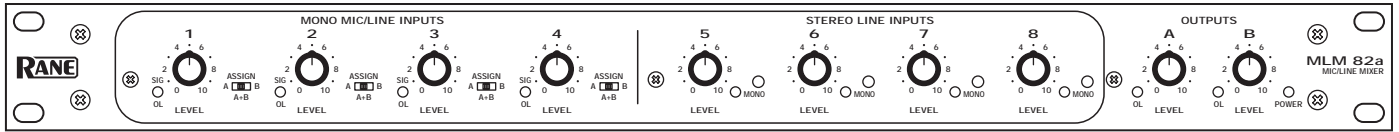
QUICK START

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 microphone jack on an existing sound system, choose MIC level. For unbalanced OUTPUT connections *do not* tie pin 3 (i.e. "–") to ground.
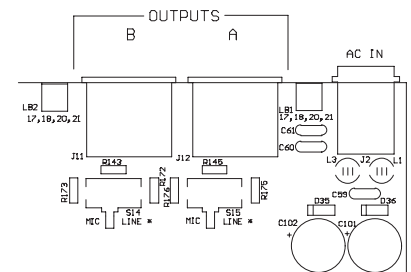
WEAR PARTS: This product contains no wear parts.

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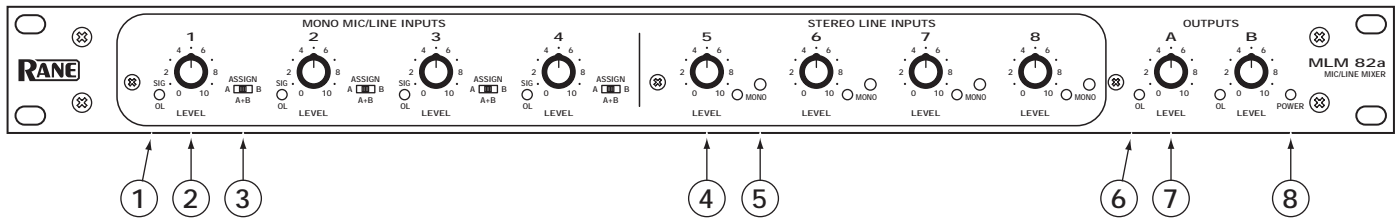
① **SIGnal present/OverLoad LED.** This bi-color LED lights green for a -30 dBu signal, and turns red when the Input is within 3 dB of clipping.

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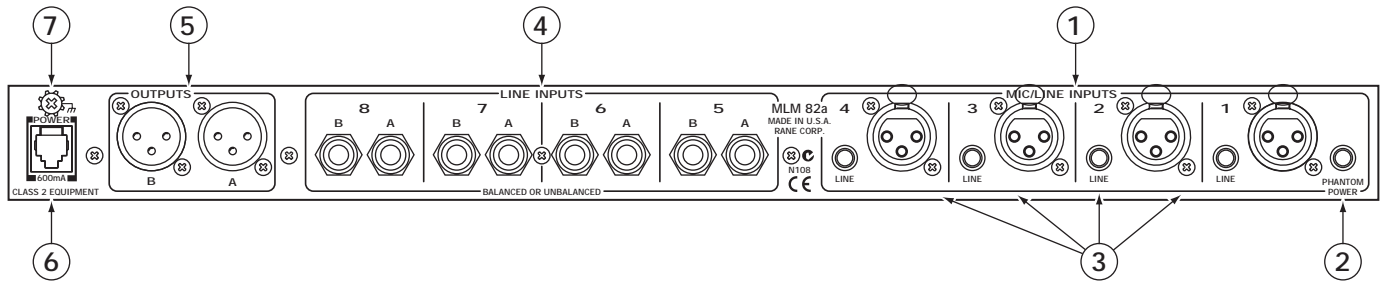
① **MIC/LINE INPUTS 1 through 4.** These XLRs connect either balanced Microphone or Line signals, depending on the LINE switch setting (see ③). Rane adheres to the international and U.S. standard for balanced pin configurations: Pin 1 is chassis ground (neutral), pin 2 is positive (+), and pin 3 is negative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

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.

Symetrix

322 DSP Engine

CONTROL PROTOCOL

322 DSP Engine
Command Protocol
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Printed in the United States of America

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Contents

Introduction

About this document

The purpose of this document is to provide a technical understanding of the Symetrix 322 DSP Engine Command Protocol. It will define and illustrate the data string structure used to communicate with the 322 via a serial RS-232 or RS-485.

Conventions used in this document

A dollar sign "$" preceding a set of two alphanumeric characters denotes a hex value. All other number values should be considered decimal values. Ex., "$A0" represents the decimal value of "160".

Getting Started

Data string format

We can say, for purposes of illustration, that the data string is made up of three parts; the address header, the MSB and LSB byte count. The address header consists of the address escape byte, <$FB>, and the number of the addressed unit, <$ADDR>. The <$FB> signals the beginning of a data string as well as an escape for the end of one. Anywhere a <$FB> byte is present in the outgoing data stream, it must be escaped with another <$FB> byte to indicate that the byte is to be treated as a data value and not the address mark. This additional escape byte is not factored into the checksum. The <$ADDR> is the unit ID number ($01−$FA or 1-250; an address of $00 or 0 is used for global or "broadcast" type commands). The MSB and LSB byte count indicate the number of bytes to follow (not including any <$FB> escape bytes). The MSB and LSB together are treated as a 16 bit unsigned quantity, the MSB being the upper byte and the LSB the lower. The MSB will always be zero unless the command stream is more than 255 bytes long.

Here is another way to look at it:

PART	LENGTH	DESCRIPTION
Address Header	2 bytes	byte 1: Escape byte <$FB>
		byte 2: Device Address <$ADDR> ($01−$FA or 1-250; 0 = global)
Data String Size	2 bytes	byte 1: MSB = normally zero (see above paragraph)
		byte 2: LSB = Command (1 byte) + Parameters (nn bytes) + Checksum (1 byte)
Command &	1 byte	For example, $A0 **(Send Parameter Data)**
Parameters	nn bytes	Format and size varies by command type (See Parameter Indexes, pages 18-23)
Checksum	1 byte	See **Checksum** on page 6

Data string construction

An example command string: Set Ch. 1 input gain to maximum level using $A0 **Send Parameter Data**.

$FB, $02, $00, $05, $A0, $00, $C1, $BB, $E0

| Start Byte | Device ID | MSB | LSB | Command | MSB Parameter Index | LSB Parameter Index | Value | Checksum |

Address Header — Data String Size — Command & Parameters — Checksum
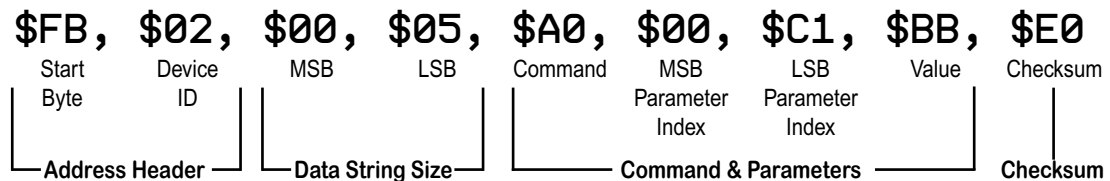
An example return status string: No error.

$02, $32, $38, $00, $02, $00, $FE

| Device ID | Device Type | Manufacturers' Code | MSB | LSB | Returned Status | Checksum |

Returned codes

Returned status codes (PA-422 ANNEX A defined):
- **$00**: no error
- **$01**: invalid data
- **$02**: invalid command code
- **$03**: device locked
- **$04**: device not locked
- **$05**: channel(s) muted
- **$06**: channel(s) not muted

322 specific status codes:
- **$07**: checksum error
- **$10**: EEPROM write error
- **$12**: invalid password
- **$13**: command failed
- **$14**: password required
- **$15**: insufficient dsp resources to add a new module

Device type codes:
- **$32**: 322 2X2 DSP Engine

Manufacture's code
- **$38**: Symetrix

Checksum

The checksum is the 2's complement of the LSB byte of the (32 bit internal) checksum. To compute the checksum, ignore the initial <$FB> and <$ADDR> bytes of the string so you are left with the MSB, LSB, command, and parameter data. Add the remaining bytes. Here is a simple formula:

sum = sum AND $FF   :make sure the sum is less than $100 (256 in decimal)
checksum = $100 - sum   :take the two's complement of sum

Example:
Data String with out checksum: **$FB, $01, $00, $04, $A0, $04, $BB** (251, 1, 0, 4, 160, 4, 187 in decimal)
Remove FB and address bytes: **$00, $04, $A0, $04, $BB** (0, 4, 160, 4, 187 in decimal)
Add remaining bytes: **$163** (355 in decimal)
Ignore all but the bottom byte: **$63** (99 in decimal)
Two's compliment: **$9D** (157 in decimal)
Data String with checksum: **$FB, $01, $00, $04, $A0, $04, $BB, $9D** (251, 1, 0, 4, 160, 4, 187, 157 in decimal)

General Notes

Unit addressing

The rear dip switch defines the unit number by multiplying by two (i.e. switch setting 1 = unit number <$02>). In the case of a 322EX, if a slave 322 is connected, as defined by the connectors chosen when connecting the Cat-5 cable between the units, it adds 1 to the unit number defined by the dip switch. Thus a two unit pair with both dip switch unit numbers set to 2, the master will be addressed by commands to unit <$04> and the slave will be addressed by commands sent to unit <$05>.

Timing

Because all other host processing is suspended during communication it is necesssary to pace the repetitive commands like the **Real Time Data** command to allow some processing between the data strings to take place. Typically, requesting a real time update every 100mS is plenty fast for a GUI update and leaves the 322 sufficient time for internal processing. This is only important when the 322 is operating near 100% load.

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Commands

$82 Load Program - Loads a program into the edit buffer
Example: Load program 1
`<$FB, $02, $00, $03, $82, $01, $7A>`

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$82		command
$nn		memory number (1- 4)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$83 Set Program Pointer - deferred load program
Note: Receiving a global load program command (address mark + unit address of 0) will load the program number set in this command if it is nonzero. See Command: **Global Load Program** on page 17.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$83		command
$nn		program pointer (0 = off, 1-8 = program memory)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$85 Lock device

Lock states are controlled by setting bits in the lock word that is 16 bits long (for future expandibility). A set bit enables the appropriate lock.

For the remote interface and rear panel inputs

BIT	Function
0	Disables program stores
1	Changes to the edit buffer are disabled except for output level control
2	Changes to the edit buffer output level parameters are disabled
3	Program loads from RS232/RS485 are disabled

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$19		(LSB) including command and checksum
$85		command
$nn		password (16 bytes, 0 filled)
...		(If no password was stored in the device, this field is ignored)
$nn		rear/remote lock level bit map
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all sent bytes)

$86 Unlock Device

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$22		(LSB) including command and checksum
$86		command
$nn		password (16 bytes, 0 filled)
...		(If no password was stored in the device, this field is ignored)
$78		checksum (of all sent bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

Symetrix

$87 Mute output(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$87		command
$nn		bit mapped to output channel (Bit 0 set = Channel 1 muted, Bit 1 set = Channel 2 muted)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$88 Unmute output(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$88		command
$nn		bit mapped to output channel (Bit 0 set = Channel 1 unmuted, Bit 1 set = Channel 2 unmuted)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$89 Mute all outputs

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$89		command
$75		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$8A Unmute all outputs

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$8A		command
$8C		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$93 Save program
Note: Two consecutive saves of program 255 will initialize all programs and global parameters.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$03		(LSB) including command and checksum
$93		command
$nn		program number to save to
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$94 Set System Data
Note: any field filled with zeros uses the current value

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$50		(LSB) bytes to follow
$94		command
$nn		16 character old password
. . .		
$nn		16 character new password
. . .		If 16 null's, then password not altered
$nn		16 character device name
. . .		If 16 null's, then name not altered
$nn		program to run on powerup. (0 = last program, 1-4 = presets 1-4)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$96 Bypass Relay Control
If bit 0 is set in the control byte then the first bypass relay will be energized. Similarly, if bit 1 is set, the second bypass relay will be energized. Note that the actual signal being bypassed is dependent on internally set jumpers. An energized relay causes signal to be taken from the DAC.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) including status and checksum
$96		command
$nn		bypass relay control byte
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$97 Set Rear Baud Rate
This command changes the baud rate after the checksum has been sent. The command only affects the rear control port, the front remains always at 38400 Baud. The data value refers to one of five different baud settings:

    0 = 9600
    1 = 19200
    2 = 38400
    3 = 57600
    4 = 115200

Any value outside this range has no effect. The baud is set to 38400 after a factory initialization.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) including status and checksum
$97		command
$nn		baud rate index (see above)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$9B Set the Min/Max Range for Analog Control(s)

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$06		(LSB) bytes to follow
$9B		command
$nn		ADC 1 minimum (0-255)
$nn		ADC 1 maximum (0-255)
$nn		ADC 2 minimum (0-255)
$nn		ADC 2 maximum (0-255)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$9C Toggle RS-485 Master/Slave Status On/Off
Note: State is not maintained over power cycles and must be reestablished at each new connection. If there is another controller on the RS-485 network then it must be disabled for the duration of the front panel connection. Also, this command is only executable from the front panel connection. The purpose of this command is to allow a 322 to become, in effect, an RS-232 to RS-485 converter and drive an isolated bus connecting multiple 322's through their rear RS-485 connections.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$03		(LSB) bytes to follow
$9C		command
$nn		master/slave status (0 = slave, 1 = master)
$nn		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum

$A0 Send Parameter Data
Example: Sets Channel 1's input gain to maximum level.
`<$FB, $02, $00, $05, $A0, $00, $C1, $BB, $E0>`

Note: If the parameter index number is 254 then the command will receive all of the GUI storage space data as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$nn		(MSB) number of bytes to follow
$nn		(LSB) including command, data and checksum
$A0		command
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		parameter data starting with
...		given index
$nn		last parameter byte
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$A1 Send Parameter Data to Preset Storage
Note: If the parameter index number is 254 then the command will receive all of the GUI storage space data as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$nn		(MSB) number of bytes to follow
$nn		(LSB) including command, data and checksum
$A1		command
$nn		program buffer to send to (1-4)
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		parameter data starting with
...		given index, from **Parameter Indexes** on page 18
$nn		last parameter byte
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

Symetrix

$00 Get Operational Status

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$00		command
$FE		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$05	(LSB) including status and checksum
	$nn	current program pointer (0 = not active)
	$nn	modified status (1 = edit buffer modified)
	$nn	last error status (0 if none)
	$nn	returned status
	$nn	checksum (of all returned bytes)

$02 Get Device Type and Device ID Codes
Note: This command is typically used for discovery purposes.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$02		command
$FC		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$02	(LSB) including status and checksum
	$nn	returned status
	$nn	checksum (of all returned bytes)

$12 Get Software Statistics

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$12		command: return software status
$EC		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$41	(LSB) including status and checksum
	$nn	16 byte password
	. . .	
	$nn	16 byte device name
	. . .	
	$nn	revision number *100, MSB
	$nn	revision number, LSB
	$nn	day
	$nn	month
	$nn	year (20<nn>)
	$nn	rear/remote lock level
	$nn	power-up program (0 = last operating state, 1-4 = presets 1-4, $FF = don't change)
	$nn	return status
	$nn	checksum (of all returned bytes)

$20 Receive Parameter Data
Note: executing this command resets the 'EBCHANGED_LOCAL' (bit1) flag in the realtime status command. If the parameter index number is 254 then the command will send all of the GUI storage space as a block.

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$07		(LSB) including command and checksum
$20		command
$nn		buffer to read from (0 = edit, 1-4 = programs)
$nn		(MSB) starting parameter index number
$nn		(LSB) starting parameter index number
$nn		(MSB) number of parameters to read
$nn		(LSB) number of parameters to read
...		parameters up to the last available
$nn		checksum
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$nn	(MSB) number of bytes to follow
	$nn	(LSB) including status and checksum
	$nn	data, ordered according to the table on page 18
	...	
	$nn	returned status
	$nn	checksum (of all returned bytes)

$21 Read Analog Control Data

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) bytes to follow
$02		(LSB) including command and checksum
$21		command
$DD		checksum (of all received bytes after addressing)
	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow
	$06	(LSB) including status and checksum
	$nn	ADC 1 minimum (0-255)
	$nn	ADC 1 maximum (0-255)
	$nn	ADC 2 minimum (0-255)
	$nn	ADC 2 maximum (0-255)
	$nn	returned status
	$nn	checksum

$22 Get Real-Time Status

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$ADDR		unit address (1-250)
$00		(MSB) number of bytes to follow
$02		(LSB) including command and checksum
$22		command: get realtime data
$DC		checksum

<Continued>

	$ADDR	unit address (1-250)
	$DT	device type
	$ID	manufacturer's code
	$00	(MSB) number of bytes to follow,
	$34	(LSB) including status and checksum
	$nn	master/slave status (0 = master, 1 = slave)
	$nn	DSP load (0-200 in 0.5% steps)

Note: Level values are 0.5dB/step below 0dBFS. Compression attenuation is 0.5dB/step below 0dBFS. I.E., a level of -10dBFS would return a value of 20 or <$14>.

	$nn	gain monitor 1 output
	$nn	gain monitor 2 output
	$nn	gain monitor 3 output
	$nn	gain monitor 4 output
	$nn	ch 1 input level
	$nn	ch 2 input level
	$nn	ch 3 input level
	$nn	ch 4 input level
	$nn	ch 1 output level
	$nn	ch 2 output level
	$nn	ch 3 output level
	$nn	ch 4 output level

Note: Compression metrics are offset by 48dB. A returned value of 0 indicates 48dB of gain, a returned value of 96 indicates 0dB.

	$nn	compressor 1, 1st section/lowpass gain reduction
	$nn	compressor 1, 2nd section/hipass gain reduction
	$nn	compressor 2, 1st section/lowpass gain reduction
	$nn	compressor 2, 2nd section/hipass gain reduction
	$nn	raw analog control input 1 (range of external pot = 0-255 or <$00 - $FF>)
	$nn	raw analog control input 2 (range of external pot = 0-255 or <$00 - $FF>)

Map of overload status bits. The bit is set if in overload, cleared after 3 seconds of inactivity.

	BIT	MODULE
$nn	0	parametric 1
	1	parametric 2
	2	parametric 3
	3	parametric 4
	4	parametric 5
	5	parametric 6
	6	parametric 7
	7	parametric 8
$nn	0	parametric 9
	1	parametric 10
	2	parametric 11
	3	parametric 12
	4	parametric 13
	5	parametric 14
	6	parametric 15
	7	parametric 16
$nn	0	compressor 1 1st section
	1	compressor 1 2nd section
	2	compressor 2 1st section
	3	compressor 2 2nd section
	4	shelf 1
	5	shelf 2
	6	shelf 3
	7	shelf 4

<Continued>

SEND	RECEIVE		DESCRIPTION
	$nn	0	summer 1
		1	summer 2
		2	low pass 1
		3	low pass 2
		4	hi pass 1
		5	hi pass 2
		6	crossover
		7	anti feedback 1
	$nn	0	anti feedback 2
		1	input 1
		2	input 2
		3	input 3
		4	input 4
		5	output 1
		6	output 2
		7	output 3
	$nn	0	output 4
		1	small speaker eq 1
		2	small speaker eq 2
		4	Gate 1 closed
		5	Gate 2 closed
		6	ARM1 signal is above threshold
		7	ARM2 signal is above threshold
	$nn		current program

Note: The "Changed Flag" bit will be reset upon the next execution of the command **$20 Read Program Paramter Data**, see page 15.

SEND	RECEIVE	DESCRIPTION
	$nn	Edit buffer changed flag
		Bit 0 set = Edit buffer changed since last status read
	$nn	System settings changed flag
		Bit 0 set = changed since last **$12 Get Software Statistics** command
	$nn	Bypass/mute status
		Bit 0 set indicates channel 1 is bypassed
		Bit 1 set indicates channel 2 is bypassed
		Bit 2 set indicates channel 1 is muted
		Bit 3 set indicates channel 2 is muted

Gate attenuation is 0.5dB/step below 0dBFS

SEND	RECEIVE	DESCRIPTION
	$nn	Gate 1 gain reduction
	$nn	Gate 2 gain reduction
	$nn	return status
	$nn	checksum (of all returned bytes)

Global Load Program

SEND	RECEIVE	DESCRIPTION
$FB		address mark
$00		broadcast address 0 (load program pointed to by program pointer)

Parameter Definitions

Parameter Indexes
Note: Each module takes up no DSP processing time until the signal source is set to a value other than 'Null Input' <$00>. A module should be removed from a signal path by setting its signal source to null, thus removing its dsp load as well.

Parametric EQ: 16 Instances

Index	Function	Mapping table	Notes
$00	Parametric 1 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$01	Parametric 1 frequency	Freq1	
$02	Parametric 1 band width	Bw1	
$03	Parametric 1 gain	Gain2	
$04	Parametric 2 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$05	Parametric 2 frequency	Freq1	
$06	Parametric 2 band width	Bw1	
$07	Parametric 2 gain	Gain2	
$08	Parametric 3 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$09	Parametric 3 frequency	Freq1	
$0A	Parametric 3 band width	Bw1	
$0B	Parametric 3 gain	Gain2	
$0C	Parametric 4 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$0D	Parametric 4 frequency	Freq1	
$0E	Parametric 4 band width	Bw1	
$0F	Parametric 4 gain	Gain2	
$10	Parametric 5 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$11	Parametric 5 frequency	Freq1	
$12	Parametric 5 band width	Bw1	
$13	Parametric 5 gain	Gain2	
$14	Parametric 6 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$15	Parametric 6 frequency	Freq1	
$16	Parametric 6 band width	Bw1	
$17	Parametric 6 gain	Gain2	
$18	Parametric 7 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$19	Parametric 7 frequency	Freq1	
$1A	Parametric 7 band width	Bw1	
$1B	Parametric 7 gain	Gain2	
$1C	Parametric 8 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$1D	Parametric 8 frequency	Freq1	
$1E	Parametric 8 band width	Bw1	
$1F	Parametric 8 gain	Gain2	
$20	Parametric 9 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$21	Parametric 9 frequency	Freq1	
$22	Parametric 9 band width	Bw1	
$23	Parametric 9 gain	Gain2	
$24	Parametric 10 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$25	Parametric 10 frequency	Freq1	
$26	Parametric 10 band width	Bw1	
$27	Parametric 10 gain	Gain2	

<Continued>

Index	Function	Mapping table	Notes
$28	Parametric 11 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$29	Parametric 11 frequency	Freq1	
$2A	Parametric 11 band width	Bw1	
$2B	Parametric 11 gain	Gain2	
$2C	Parametric 12 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$2D	Parametric 12 frequency	Freq1	
$2E	Parametric 12 band width	Bw1	
$2F	Parametric 12 gain	Gain2	
$30	Parametric 13 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$31	Parametric 13 frequency	Freq1	
$32	Parametric 13 band width	Bw1	
$33	Parametric 13 gain	Gain2	
$34	Parametric 14 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$35	Parametric 14 frequency	Freq1	
$36	Parametric 14 band width	Bw1	
$37	Parametric 14 gain	Gain28	
$38	Parametric 15 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$39	Parametric 15 frequency	Freq1	
$3A	Parametric 15 band width	Bw1	
$3B	Parametric 15 gain	Gain2	
$3C	Parametric 16 signal source	Sigsrc1	Setting bit 7 = bypass mode; setting bit 6 = mute
$3D	Parametric 16 frequency	Freq1	
$3E	Parametric 16 band width	Bw1	
$3F	Parametric 16 gain	Gain2	

Low Pass Filters: 2 Instances

Index	Function	Mapping table	Notes
$40	Low Pass 1 signal source	Sigsrc1	Setting bit 7 puts the lowpass into bypass mode
$41	Low Pass 1 gain trim	Gain5	
$42	Low Pass 1 frequency	Freq1	
$43	Low Pass 1 slope	Slope1	
$44	Low Pass 2 signal source	Sigsrc1	Setting bit 7 puts the lowpass into bypass mode
$45	Low Pass 2 gain trim	Gain5	
$46	Low Pass 2 frequency	Freq1	
$47	Low Pass 2 slope	Slope1	

High Pass Filters: 2 Instances

Index	Function	Mapping table	Notes
$48	Hi Pass 1 signal source	Sigsrc1	Setting bit 7 puts the hipass into bypass mode
$49	Hi Pass 1 gain trim	Gain5	
$4A	Hi Pass 1 frequency	Freq1	
$4B	Hi Pass 1 slope	Slope1	
$4C	Hi Pass 2 signal source	Sigsrc1	Setting bit 7 puts the hipass into bypass mode
$4D	Hi Pass 2 gain trim	Gain5	
$4E	Hi Pass 2 frequency	Freq1	
$4F	Hi Pass 2 slope	Slope1	

Delay: 2 Instances

Note: Delay is updated 100mS after any delay length parameter is written. Maximum delay is 16384 samples (0x4000, 0.372 seconds)

Index	Function	Mapping table	Notes
$50	Delay 1 signal source	Sigsrc1	Setting bit 7 puts the delay into bypass mode
$51	Delay 1 delay msb		
$52	Delay 1 delay mid		
$53	Delay 1 delay lsb		
$54	Delay 2 signal source	Sigsrc1	Setting bit 7 puts the delay into bypass mode
$55	Delay 2 delay msb		
$56	Delay 2 delay mid		
$57	Delay 2 delay lsb		

Gate/Expander: 2 Instances

Note: The Gate module is stereo. If used in a mono, mode set the unused input to null source <$00>. Setting bit 7 in the signal source parameter forces bypass mode. It is possible to monitor the effect of the sidechain filters by using the gate sidechain output monitors, Sigsrc1 offsets <$2D> through <$30>.

Index	Function	Mapping table	Notes
$58	Gate 1 signal source A	Sigsrc1	Setting bit 7 forces gate bypass mode
$59	Gate 1 signal source B	Sigsrc1	Setting bit 7 forces gate bypass mode
$5A	Gate 1 threshold	Thresh1	
$5B	Gate 1 depth	Thresh1	
$5C	Gate 1 attack	TcTable3	
$5D	Gate 1 release	TcTable3	
$5E	Gate 1 sidechain lowpass freq	Freq1	
$5F	Gate 1 sidechain hipass freq	Freq1	
$60	Gate 2 signal source A	Sigsrc1	Setting bit 7 forces gate bypass mode
$61	Gate 2 signal source B	Sigsrc1	Setting bit 7 forces gate bypass mode
$62	Gate 2 threshold	Thresh1	
$63	Gate 2 depth	Thresh1	
$64	Gate 2 attack	TcTable3	
$65	Gate 2 release	TcTable3	
$66	Gate 2 sidechain lowpass freq	Freq1	
$67	Gate 2 sidechain hipass freq	Freq1	

Compressor: 2 Instances

Notes:
1. Each compressor is a stereo module. If the module is used in a monophonic mode set the unused input to the null Sigsrc1 index <$00>.
2. There are three operating modes for the module. This is set in the opmode parameter:
> 0 = Dual band. Each of the compressors inside the module act on different parts of the spectrum, set by the crossover frequency parameter. This parameter is ignored if the compressor isn't operating in mode 0.
> 1 = Single fullband. Only the first section is operational.
> 2 = Series fullband. Both sections of the compressor operate in series.

3. The sidechain mode parameter affects the first compressor in series mode or the only compressor in single mode. It allows converting the first section into either an AGC or an expander. In the AGC mode, the makeup gain parameter is automatically controlled, and the threshold control becomes the target level parameter.

Index	Function	Mapping table	Notes
$68	Compressor 1 signal source A	Sigsrc1	Setting bit 7 bypasses entire compressor
$69	Compressor 1 signal source B	Sigsrc1	
$6A	Compressor 1 signal delay	<$00-$84>	0 - 3mS, in 22.68uS sample increments
$6B	Compressor 1 crossover freq	Freq1	only active in dual band mode
$6C	Compressor 1 threshold	Thresh1	low pass/first section goal level in ARM mode
$6D	Compressor 1 knee	Knee1	low pass/first section
$6E	Compressor 1 ratio	Ratio1	low pass/first section
$6F	Compressor 1 attack time	TcTable1	low pass/first section
$70	Compressor 1 hold time	TcTable2	low pass/first section
$71	Compressor 1 release time	TcTable2	low pass/first section
$72	Compressor 1 makeup gain	Gain2	low pass/first section, +24dB added to table value
$73	Compressor 1 threshold	Thresh1	hi pass/second section
$74	Compressor 1 knee	Knee1	hi pass/second section
$75	Compressor 1 ratio	Ratio1	hi pass/second section
$76	Compressor 1 attack time	TcTable1	hi pass/second section
$77	Compressor 1 hold time	TcTable2	hi pass/second section
$78	Compressor 1 release time	TcTable2	hi pass/second section
$79	Compressor 1 makeup gain	Gain2	hi pass/second section, +24dB added to table
$7A	Compressor 1 operating mode		0: dual band, 1: single band, 2: series

Note: setting bit 7 in the 'sidechain mode' parameter enables a series high pass filter in the first compressor section's sidechain, setting bit 6 enables a high pass in the second section's sidechain

$7B	Compressor 1 sidechain mode		0: normal, 1: AGC ARM enabled, 2: expander mode
$7C	Compressor 1 ARM threshold	Thresh1	'autosense' level
$7D	Compressor 2 signal source A	Sigsrc1	
$7E	Compressor 2 signal soruce B	Sigsrc1	
$7F	Compressor 2 signal delay	<$00-$84>	0-3mS in 22.68uS sample increments
$80	Compressor 2 crossover freq	Freq1	only active in dual band mode
$81	Compressor 2 threshold	Thresh1	low pass/first section goal level in ARM mode
$82	Compressor 2 knee	Knee1	low pass/first section
$83	Compressor 2 ratio	Ratio1	low pass/first section
$84	Compressor 2 attack time	TcTable1	low pass/first section
$85	Compressor 2 hold time	TcTable2	low pass/first section
$86	Compressor 2 release time	TcTable2	low pass/first section
$87	Compressor 2 makeup gain	Gain2	low pass/first section, +24dB added to table value
$88	Compressor 2 threshold	Thresh1	hi pass/second section
$89	Compressor 2 knee	Knee1	hi pass/second section
$8A	Compressor 2 ratio	Ratio1	hi pass/second section
$8B	Compressor 2 attack time	TcTable1	hi pass/second section
$8C	Compressor 2 hold time	TcTable2	hi pass/second section
$8D	Compressor 2 release time	TcTable2	hi pass/second section
$8E	Compressor 2 makeup gain	Gain2	hi pass/second section, +24dB added to table
$8F	Compressor 2 operating mode		0: dual band, 1: single band, 2: series

Note: setting bit 7 in the 'sidechain mode' parameter enables a series high pass filter in the first compressor section's sidechain, setting bit 6 enables a high pass in the second section's sidechain

$90	Compressor 2 sidechain mode		0: normal, 1: AGC ARM enabled, 2: expander mode
$91	Compressor 2 ARM threshold	Thresh1	'autosense' level

Summer/Mixer: 2 Instances

Index	Function	Mapping table	Notes
$92	Signal Source 1	Sigsrc1	
$93	Signal Source 1 Gain	Gain3	
$94	Signal Source 2	Sigsrc1	
$95	Signal Source 2 Gain	Gain3	
$96	Signal Source 1	Sigsrc1	
$97	Signal Source 1 Gain	Gain3	
$98	Signal Source 2	Sigsrc1	
$99	Signal Source 2 Gain	Gain3	

Shelving Filter: 4 Instances

Index	Function	Mapping table	Notes
$9A	Shelf 1 signal source	Sigsrc1	Setting bit 7 bypasses filter
$9B	Shelf 1 input gain trim	Gain5	
$9C	Shelf 1 mode		0: Low Shelf, 1: High Shelf
$9D	Shelf 1 freq	Freq1	
$9E	Shelf 1 gain	Gain5	
$9F	Shelf 2 signal source	Sigsrc1	Setting bit 7 bypasses filter
$A0	Shelf 2 input gain trim	Gain5	
$A1	Shelf 2 mode		0: Low Shelf, 1: High Shelf
$A2	Shelf 2 freq	Freq1	
$A3	Shelf 2 gain	Gain5	
$A4	Shelf 3 signal source	Sigsrc1	Setting bit 7 bypasses filter
$A5	Shelf 3 input gain trim	Gain5	
$A6	Shelf 3 mode		0: Low Shelf, 1: High Shelf
$A7	Shelf 3 freq	Freq1	
$A8	Shelf 3 gain	Gain5	
$A9	Shelf 4 signal source	Sigsrc1	Setting bit 7 bypasses filter
$AA	Shelf 4 input gain trim	Gain5	
$AB	Shelf 4 mode		0: Low Shelf, 1: High Shelf
$AC	Shelf 4 freq	Freq1	
$AD	Shelf 4 gain	Gain5	

Crossover: 1 Instance

Index	Function	Mapping table	Notes
$AE	Crossover 1 signal source	Sigsrc1	
$AF	Crossover 1 lo pass frequency	Freq1	Linkwitz/Riley mode links Low and High Pass Filters
$B0	Crossover 1 hi pass frequency	Freq1	
$B1	Crossover 1 low pass delay	<$00-$84>	0-3mS, in 22.68uS sample increments
$B2	Crossover 1 low pass phase		0: Normal, 1: Inverted
$B3	Crossover 1 low pass gain trim	Gain5	
$B4	Crossover 1 hi pass delay	<$00-$84>	0-3mS, in 22.68uS sample increments

Note: setting the top bit in this phase parameter enables the compensating horn EQ.

$B5	Crossover 1 hi pass phase		0: Normal, 1: Inverted
$B6	Crossover 1 hi pass gain trim	Gain5	

<Continued>

Note: The top 4 bits specify filter type (0000 = Butterworth, 0001 = Linkwitz/Riley, 0010 = Bessel, 0011 = Elliptic). For the Linkwitz/Riley case, only 24 and 48 dB/octave slopes are allowed. If an illegal slope is given for the L-R case the slope command will be ignored.

Index	Function	Mapping table	Notes
$B7	Crossover 1 low pass slope	Slope2	
$B8	Crossover 1 high pass slope	Slope2	

Input Gain

Index	Function	Mapping table	Notes
$C1	Input 1 gain	Gain3	
$C2	Input 2 gain	Gain3	

Output Source and Gain

Index	Function	Mapping table	Notes
$C3	Output 1 signal source	Sigsrc1	
$C4	Output 1 gain	Gain3	
$C5	Output 2 signal source	Sigsrc1	
$C6	Output 2 gain	Gain3	

Rear ADC Control Inputs

Note: Destination parameter is the index of a parameter in the following table. Parameters controlling signal source are ignored. To control one of the delay modules, use the LSB parameter <$53> or <$57>. The value sent will be left shifted 6 bits to generate the final delay value. Minimum and maximum index values vary according to the table used by the controlled parameter. The 322 will handle mapping the range of the input voltage to the table range in real time. A value of 255 or <$FF> in the destination field disables that control.

Index	Function	Mapping table	Notes
$CB	Rear Control 1 destination 1		
$CC	Rear Control 1 minimum index 1		
$CD	Rear Control 1 maximum index 1		
$CE	Rear Control 1 destination 2		
$CF	Rear Control 1 minimum index 2		
$D0	Rear Control 1 maximum index 2		
$D1	Rear Control 1 destination 3		
$D2	Rear Control 1 minimum index 3		
$D3	Rear Control 1 maximum index 3		
$D4	Rear Control 1 destination 4		
$D5	Rear Control 1 minimum index 4		
$D6	Rear Control 1 maximum index 4		
$D7	Rear Control 2 destination 1		
$D8	Rear Control 2 minimum index 1		
$D9	Rear Control 2 maximum index 1		
$DA	Rear Control 2 destination 2		
$DB	Rear Control 2 minimum index 2		
$DC	Rear Control 2 maximum index 2		
$DD	Rear Control 2 destination 3		
$DE	Rear Control 2 minimum index 3		
$DF	Rear Control 2 maximum index 3		
$E0	Rear Control 2 destination 4		
$E1	Rear Control 2 minimum index 4		
$E2	Rear Control 2 maximum index 4		

Test Signals

Note: These are always running, and only need to have a module pointed to their outputs

Index	Function	Mapping table	Notes
$E3	Pink Noise	Thresh1	

Parameter Encoding Tables

TcTable1: Compressor attack time; 0.5ms to 2350ms

$00	0.05ms	$14	11.0ms	$28	31.0ms	$3C	60.0ms	$50	350.0ms
$01	0.1ms	$15	12.0ms	$29	32.0ms	$3D	70.0ms	$51	450.0ms
$02	0.2ms	$16	13.0ms	$2A	33.0ms	$3E	80.0ms	$52	550.0ms
$03	0.3ms	$17	14.0ms	$2B	34.0ms	$3F	90.0ms	$53	650.0ms
$04	0.4ms	$18	15.0ms	$2C	35.0ms	$40	100.0ms	$54	750.0ms
$05	0.5ms	$19	16.0ms	$2D	36.0ms	$41	110.0ms	$55	850.0ms
$06	0.6ms	$1A	17.0ms	$2E	37.0ms	$42	120.0ms	$56	950.0ms
$07	0.7ms	$1B	18.0ms	$2F	38.0ms	$43	130.0ms	$57	1050.0ms
$08	0.8ms	$1C	19.0ms	$30	39.0ms	$44	140.0ms	$58	1150.0ms
$09	0.9ms	$1D	20.0ms	$31	40.0ms	$45	150.0ms	$59	1250.0ms
$0A	1.0ms	$1E	21.0ms	$32	41.0ms	$46	160.0ms	$5A	1350.0ms
$0B	2.0ms	$1F	22.0ms	$33	42.0ms	$47	170.0ms	$5B	1450.0ms
$0C	3.0ms	$20	23.0ms	$34	43.0ms	$48	180.0ms	$5C	1550.0ms
$0D	4.0ms	$21	24.0ms	$35	44.0ms	$49	190.0ms	$5D	1650.0ms
$0E	5.0ms	$22	25.0ms	$36	45.0ms	$4A	200.0ms	$5E	1750.0ms
$0F	6.0ms	$23	26.0ms	$37	46.0ms	$4B	210.0ms	$5F	1850.0ms
$10	7.0ms	$24	27.0ms	$38	47.0ms	$4C	220.0ms	$60	1950.0ms
$11	8.0ms	$25	28.0ms	$39	48.0ms	$4D	230.0ms	$61	2050.0ms
$12	9.0ms	$26	29.0ms	$3A	49.0ms	$4E	240.0ms	$62	2150.0ms
$13	10.0ms	$27	30.0ms	$3B	50.0ms	$4F	250.0ms	$63	2250.0ms
								$64	2350.0ms

TcTable2: Compressor hold/release time; 1ms to 5800ms

$00	1.0ms	$13	20.0ms	$26	39.0ms	$39	130.0ms	$4C	1050.0ms
$01	2.0ms	$14	21.0ms	$27	40.0ms	$3A	140.0ms	$4D	1300.0ms
$02	3.0ms	$15	22.0ms	$28	41.0ms	$3B	150.0ms	$4E	1550.0ms
$03	4.0ms	$16	23.0ms	$29	42.0ms	$3C	170.0ms	$4F	1800.0ms
$04	5.0ms	$17	24.0ms	$2A	43.0ms	$3D	180.0ms	$50	2050.0ms
$05	6.0ms	$18	25.0ms	$2B	44.0ms	$3E	190.0ms	$51	2300.0ms
$06	7.0ms	$19	26.0ms	$2C	45.0ms	$3F	200.0ms	$52	2550.0ms
$07	8.0ms	$1A	27.0ms	$2D	46.0ms	$40	210.0ms	$53	2800.0ms
$08	9.0ms	$1B	28.0ms	$2E	47.0ms	$41	220.0ms	$54	3050.0ms
$09	10.0ms	$1C	29.0ms	$2F	48.0ms	$42	230.0ms	$55	3300.0ms
$0A	11.0ms	$1D	30.0ms	$30	49.0ms	$43	240.0ms	$56	3550.0ms
$0B	12.0ms	$1E	31.0ms	$31	50.0ms	$44	250.0ms	$57	3800.0ms
$0C	13.0ms	$1F	32.0ms	$32	60.0ms	$45	350.0ms	$58	4050.0ms
$0D	14.0ms	$20	33.0ms	$33	70.0ms	$46	450.0ms	$59	4300.0ms
$0E	15.0ms	$21	34.0ms	$34	80.0ms	$47	550.0ms	$5A	4550.0ms
$0F	16.0ms	$22	35.0ms	$35	90.0ms	$48	650.0ms	$5B	4800.0ms
$10	17.0ms	$23	36.0ms	$36	100.0ms	$49	750.0ms	$5C	5050.0ms
$11	18.0ms	$24	37.0ms	$37	110.0ms	$4A	850.0ms	$5D	5300.0ms
$12	19.0ms	$25	38.0ms	$38	120.0ms	$4B	950.0ms	$5E	5550.0ms
								$5F	5800.0ms

TcTable3: Gate rate in dB per ms; 0.1dB/ms to 100dB/ms

$00	0.1ms	$0D	4.0ms	$1A	17.0ms	$27	30.0ms	$34	43.0ms
$01	0.2ms	$0E	5.0ms	$1B	18.0ms	$28	31.0ms	$35	44.0ms
$02	0.3ms	$0F	6.0ms	$1C	19.0ms	$29	32.0ms	$36	45.0ms
$03	0.4ms	$10	7.0ms	$1D	20.0ms	$2A	33.0ms	$37	46.0ms
$04	0.5ms	$11	8.0ms	$1E	21.0ms	$2B	34.0ms	$38	47.0ms
$05	0.6ms	$12	9.0ms	$1F	22.0ms	$2C	35.0ms	$39	48.0ms
$06	0.7ms	$13	10.0ms	$20	23.0ms	$2D	36.0ms	$3A	49.0ms
$07	0.8ms	$14	11.0ms	$21	24.0ms	$2E	37.0ms	$3B	50.0ms
$08	0.9ms	$15	12.0ms	$22	25.0ms	$2F	38.0ms	$3C	60.0ms
$09	1.0ms	$16	13.0ms	$23	26.0ms	$30	39.0ms	$3D	70.0ms
$0A	1.0ms	$17	14.0ms	$24	27.0ms	$31	40.0ms	$3E	80.0ms
$0B	2.0ms	$18	15.0ms	$25	28.0ms	$32	41.0ms	$3F	90.0ms
$0C	3.0ms	$19	16.0ms	$26	29.0ms	$33	42.0ms	$40	100.0ms

Thresh1: -100dB to 0dBFS in 0.5dB steps. Encoded from 0 to 200, where 0 = -100dB.

$00	OFF	$28	−80.5dB	$50	−60.5dB	$78	−40.5dB	$A0	−19.5dB
$01	−100.0dB	$29	−80.0dB	$51	−60.0dB	$79	−40.0dB	$A1	−19.0dB
$02	−99.5dB	$2A	−79.5dB	$52	−59.5dB	$7A	−39.5dB	$A2	−18.5dB
$03	−99.0dB	$2B	−79.0dB	$53	−59.0dB	$7B	−39.0dB	$A3	−18.0dB
$04	−98.5dB	$2C	−78.5dB	$54	−58.5dB	$7C	−38.5dB	$A4	−17.5dB
$05	−98.0dB	$2D	−78.0dB	$55	−58.0dB	$7D	−38.0dB	$A5	−17.0dB
$06	−97.5dB	$2E	−77.5dB	$56	−57.5dB	$7E	−37.5dB	$A6	−16.5dB
$07	−97.0dB	$2F	−77.0dB	$57	−57.0dB	$7F	−37.0dB	$A7	−16.0dB
$08	−96.5dB	$30	−76.5dB	$58	−56.5dB	$80	−36.5dB	$A8	−15.5dB
$09	−96.0dB	$31	−76.0dB	$59	−56.0dB	$81	−36.0dB	$A9	−15.0dB
$0A	−95.5dB	$32	−75.5dB	$5A	−55.5dB	$82	−35.5dB	$AA	−14.5dB
$0B	−95.0dB	$33	−75.0dB	$5B	−55.0dB	$83	−35.0dB	$AB	−14.0dB
$0C	−94.5dB	$34	−74.5dB	$5C	−54.5dB	$84	−34.5dB	$AC	−13.5dB
$0D	−94.0dB	$35	−74.0dB	$5D	−54.0dB	$85	−34.0dB	$AD	−13.0dB
$0E	−93.5dB	$36	−73.5dB	$5E	−53.5dB	$86	−33.5dB	$AE	−12.5dB
$0F	−93.0dB	$37	−73.0dB	$5F	−53.0dB	$87	−33.0dB	$AF	−12.0dB
$10	−92.5dB	$38	−72.5dB	$60	−52.5dB	$88	−32.5dB	$B0	−11.5dB
$11	−92.0dB	$39	−72.0dB	$61	−52.0dB	$89	−32.0dB	$B1	−11.0dB
$12	−91.5dB	$3A	−71.5dB	$62	−51.5dB	$8A	−31.5dB	$B2	−10.5dB
$13	−91.0dB	$3B	−71.0dB	$63	−51.0dB	$8B	−31.0dB	$B3	−10.0dB
$14	−90.5dB	$3C	−70.5dB	$64	−50.5dB	$8C	−30.5dB	$B4	− 9.5dB
$15	−90.0dB	$3D	−70.0dB	$65	−50.0dB	$8D	−30.0dB	$B5	− 9.0dB
$16	−89.5dB	$3E	−69.5dB	$66	−49.5dB	$8E	−29.5dB	$B6	− 8.5dB
$17	−89.0dB	$3F	−69.0dB	$67	−49.0dB	$8F	−29.0dB	$B7	− 8.0dB
$18	−88.5dB	$40	−68.5dB	$68	−48.5dB	$90	−28.5dB	$B8	− 7.5dB
$19	−88.0dB	$41	−68.0dB	$69	−48.0dB	$91	−28.0dB	$B9	− 7.0dB
$1A	−87.5dB	$42	−67.5dB	$6A	−47.5dB	$92	−26.5dB	$BA	− 6.5dB
$1B	−87.0dB	$43	−67.0dB	$6B	−47.0dB	$93	−27.0dB	$BB	− 6.0dB
$1C	−86.5dB	$44	−66.5dB	$6C	−46.5dB	$94	−27.5dB	$BC	− 5.5dB
$1D	−86.0dB	$45	−66.0dB	$6D	−46.0dB	$95	−26.0dB	$BD	− 5.0dB
$1E	−85.5dB	$46	−65.5dB	$6E	−45.5dB	$96	−25.5dB	$BE	− 4.5dB
$1F	−85.0dB	$47	−65.0dB	$6F	−45.0dB	$97	−25.0dB	$BF	− 4.0dB
$20	−84.5dB	$48	−64.5dB	$70	−44.5dB	$98	−24.5dB	$C0	− 3.5dB
$21	−84.0dB	$49	−64.0dB	$71	−44.0dB	$99	−24.0dB	$C1	− 3.0dB
$22	−83.5dB	$4A	−63.5dB	$72	−43.5dB	$9A	−23.5dB	$C2	− 2.5dB
$23	−83.0dB	$4B	−63.0dB	$73	−43.0dB	$9B	−23.0dB	$C3	− 2.0dB
$24	−82.5dB	$4C	−62.5dB	$74	−42.5dB	$9C	−22.5dB	$C4	− 1.5dB
$25	−82.0dB	$4D	−62.0dB	$75	−42.0dB	$9D	−22.0dB	$C5	− 1.0dB
$26	−81.5dB	$4E	−61.5dB	$76	−41.5dB	$9E	−20.5dB	$C6	− 0.5dB
$27	−81.0dB	$4F	−61.0dB	$77	−41.0dB	$9F	−20.0dB	$C7	0.0dB

Ratio1: 1.0 to 6.0 in 0.2 steps. 6.0 to 20.0 in 1.0 steps. Encoded from 0 to 39, where 0 = 1.0 and 39 = 20.0.

$00	1.0	$08	2.6	$10	4.2	$18	5.8	$20	13.0
$01	1.2	$09	2.8	$11	4.4	$19	6.0	$21	14.0
$02	1.4	$0A	3.0	$12	4.6	$1A	7.0	$22	15.0
$03	1.6	$0B	3.2	$13	4.8	$1B	8.0	$23	16.0
$04	1.8	$0C	3.4	$14	5.0	$1C	9.0	$24	17.0
$05	2.0	$0D	3.6	$15	5.2	$1D	10.0	$25	18.0
$06	2.2	$0E	3.8	$16	5.4	$1E	11.0	$26	19.0
$07	2.4	$0F	4.0	$17	5.6	$1F	12.0	$27	20.0

Knee1

$00	24dB (Soft)	$01	12dB (Medium)	$02	0dB (Hard)

Freq1: 16Hz to 19.6kHz in 1/20 octave steps. Encoded from 0 to 205, where 0 = 16Hz and 205 = 19.6kHz.

$00	16.176Hz	$2A	69.348Hz	$54	297.302Hz	$7E	1.274kHz	$A8	5.464kHz
$01	16.746Hz	$2B	71.794Hz	$55	307.786Hz	$7F	1.319kHz	$A9	5.656kHz
$02	17.337Hz	$2C	74.325Hz	$56	318.640Hz	$80	1.366kHz	$AA	5.856kHz
$03	17.948Hz	$2D	76.947Hz	$57	329.877Hz	$81	1.414kHz	$AB	6.062kHz
$04	18.581Hz	$2E	79.660Hz	$58	341.510Hz	$82	1.464kHz	$AC	6.276kHz
$05	19.237Hz	$2F	82.469Hz	$59	353.553Hz	$83	1.515kHz	$AD	6.498kHz
$06	19.915Hz	$30	85.378Hz	$5A	366.021Hz	$84	1.569kHz	$AE	6.727kHz
$07	20.617Hz	$31	88.388Hz	$5B	378.929Hz	$85	1.624kHz	$AF	6.964kHz
$08	21.344Hz	$32	91.505Hz	$5C	392.292Hz	$86	1.681kHz	$B0	7.210kHz
$09	22.097Hz	$33	94.732Hz	$5D	406.126Hz	$87	1.741kHz	$B1	7.464kHz
$0A	22.876Hz	$34	98.073Hz	$5E	420.448Hz	$88	1.802kHz	$B2	7.727kHz
$0B	23.683Hz	$35	101.532Hz	$5F	435.275Hz	$89	1.866kHz	$B3	8.000kHz
$0C	24.518Hz	$36	105.112Hz	$60	450.625Hz	$8A	1.931kHz	$B4	8.282kHz
$0D	25.383Hz	$37	108.819Hz	$61	466.517Hz	$8B	2.000kHz	$B5	8.574kHz
$0E	26.278Hz	$38	112.656Hz	$62	482.968Hz	$8C	2.070kHz	$B6	8.876kHz
$0F	27.205Hz	$39	116.629Hz	$63	500.000Hz	$8D	2.143kHz	$B7	9.189kHz
$10	28.164Hz	$3A	120.742Hz	$64	517.632Hz	$8E	2.219kHz	$B8	9.513kHz
$11	29.157Hz	$3B	125.000Hz	$65	535.887Hz	$8F	2.297kHz	$B9	9.849kHz
$12	30.186Hz	$3C	129.408Hz	$66	554.785Hz	$90	2.378kHz	$BA	10.196kHz
$13	31.250Hz	$3D	133.972Hz	$67	574.349Hz	$91	2.462kHz	$BB	10.556kHz
$14	32.352Hz	$3E	138.696Hz	$68	594.604Hz	$92	2.549kHz	$BC	10.928kHz
$15	33.493Hz	$3F	143.587Hz	$69	615.572Hz	$93	2.639kHz	$BD	11.313kHz
$16	34.674Hz	$40	148.651Hz	$6A	637.280Hz	$94	2.732kHz	$BE	11.712kHz
$17	35.897Hz	$41	153.893Hz	$6B	659.754Hz	$95	2.828kHz	$BF	12.125kHz
$18	37.163Hz	$42	159.320Hz	$6C	683.020Hz	$96	2.928kHz	$C0	12.553kHz
$19	38.473Hz	$43	164.938Hz	$6D	707.107Hz	$97	3.031kHz	$C1	12.996kHz
$1A	39.830Hz	$44	170.755Hz	$6E	732.043Hz	$98	3.138kHz	$C2	13.454kHz
$1B	41.235Hz	$45	176.777Hz	$6F	757.858Hz	$99	3.249kHz	$C3	13.928kHz
$1C	42.689Hz	$46	183.001Hz	$70	784.584Hz	$9A	3.363kHz	$C4	14.420kHz
$1D	44.194Hz	$47	189.465Hz	$71	812.252Hz	$9B	3.482kHz	$C5	14.928kHz
$1E	45.753Hz	$48	196.146Hz	$72	840.896Hz	$9C	3.605kHz	$C6	15.454kHz
$1F	47.366Hz	$49	203.063Hz	$73	870.551Hz	$9D	3.732kHz	$C7	16.000kHz
$20	49.037Hz	$4A	210.224Hz	$74	901.250Hz	$9E	3.863kHz	$C8	16.564kHz
$21	50.766Hz	$4B	217.638Hz	$75	933.033Hz	$9F	4.000kHz	$C9	17.148kHz
$22	52.566Hz	$4C	225.313Hz	$76	965.936Hz	$A0	4.141kHz	$CA	17.753kHz
$23	54.409Hz	$4D	233.258Hz	$77	1.000kHz	$A1	4.287kHz	$CB	18.379kHz
$24	56.328Hz	$4E	241.484Hz	$78	1.035kHz	$A2	4.438kHz	$CC	19.027kHz
$25	58.315Hz	$4F	250.000Hz	$79	1.071kHz	$A3	4.594kHz	$CD	19.698kHz
$26	60.371Hz	$50	258.816Hz	$7A	1.109kHz	$A4	4.756kHz		
$27	62.500Hz	$51	267.943Hz	$7B	1.148kHz	$A5	4.924kHz		
$28	64.704Hz	$52	277.392Hz	$7C	1.189kHz	$A6	5.098kHz		
$29	66.986Hz	$53	287.175Hz	$7D	1.231kHz	$A7	5.278kHz		

Bw1: 0.050 to 0.095 in 0.005 octave steps, 0.10 to 3.0 in 0.1 octave steps and 3.0 to 7.0 in 0.2 octave steps.

$00	0.050	$0A	0.10	$14	1.1	$1E	2.1	$28	3.2	$32	5.2
$01	0.055	$0B	0.20	$15	1.2	$1F	2.2	$29	3.4	$33	5.4
$02	0.060	$0C	0.30	$16	1.3	$20	2.3	$2A	3.6	$34	5.6
$03	0.065	$0D	0.40	$17	1.4	$21	2.4	$2B	3.8	$35	5.8
$04	0.070	$0E	0.50	$18	1.5	$22	2.5	$2C	4.0	$36	6.0
$05	0.075	$0F	0.60	$19	1.6	$23	2.6	$2D	4.2	$37	6.2
$06	0.080	$10	0.70	$1A	1.7	$24	2.7	$2E	4.4	$38	6.4
$07	0.085	$11	0.80	$1B	1.8	$25	2.8	$2F	4.6	$39	6.6
$08	0.090	$12	0.90	$1C	1.9	$26	2.9	$30	4.8	$3A	6.8
$09	0.095	$13	1.00	$1D	2.0	$27	3.0	$31	5.0	$3B	7.0

Slope1

$00	12dB/octave (Soft)
$01	24dB/octave (Medium)

Slope2

$00	6dB/octave	$04	30dB/octave
$01	12dB/octave	$05	36dB/octave
$02	18dB/octave	$06	42dB/octave
$03	24dB/octave	$07	48dB/octave

Sigsrc1: Remote Inputs only present in LVDS enabled units with cable attached.

$00	Null Input	$19	Delay 1 output
$01	Channel 1 signal input	$1A	Delay 2 output
$02	Channel 2 signal input	$1B	Gate 1 Ch 1 output
$03	Channel 3 signal input (remote 322 left)	$1C	Gate 1 Ch 2 output
$04	Channel 4 signal input (remote 322 right)	$1D	Gate 2 Ch 1 output
$05	Parametric 1 output	$1E	Gate 2 Ch 2 output
$06	Parametric 2 output	$1F	Compressor 1 Ch 1 Output
$07	Parametric 3 output	$20	Compressor 1 Ch 2 Output
$08	Parametric 4 output	$21	Compressor 2 Ch 1 Output
$09	Parametric 5 output	$22	Compressor 2 ch 2 Output
$0A	Parametric 6 output	$23	Summer 1 Output
$0B	Parametric 7 output	$24	Summer 2 Output
$0C	Parametric 8 output	$25	Shelf 1 Output
$0D	Parametric 9 output	$26	Shelf 2 Output
$0E	Parametric 10 output	$27	Shelf 3 Output
$0F	Parametric 11 output	$28	Shelf 4 Output
$10	Parametric 12 output	$29	Crossover 1 Low Output
$11	Parametric 13 output	$2A	Crossover 1 High Output
$12	Parametric 14 output	$2B	Pink Noise
$13	Parametric 15 output	$2C	Null Input
$14	Parametric 16 output	$2D	Gate 1 Ch 1 Sidechain output
$15	LowPass 1 output	$2E	Gate 1 Ch 2 Sidechain output
$16	LowPass 2 output	$2F	Gate 2 Ch 1 Sidechain output
$17	HiPass 1 output	$30	Gate 2 Ch 2 Sidechain output
$18	HiPass 1 output	$31	Small Speaker EQ 1 output
		$32	Small Speaker EQ 2 output

Gain1: +/- 12dB in 0.5dB steps, encoded from 0 to 48, where 0 = -12.0dB, 24 = 0dB and 48 = +12.0dB.

$00	−12.0dB	$0A	− 7.0dB	$14	− 2.0dB	$1E	+ 3.0dB	$28	+ 8.0dB
$01	−11.5dB	$0B	− 6.5dB	$15	− 1.5dB	$1F	+ 3.5dB	$29	+ 8.5dB
$02	−11.0dB	$0C	− 6.0dB	$16	− 1.0dB	$20	+ 4.0dB	$2A	+ 9.0dB
$03	−10.5dB	$0D	− 5.5dB	$17	− 0.5dB	$21	+ 4.5dB	$2B	+ 9.5dB
$04	−10.0dB	$0E	− 5.0dB	$18	0.0dB	$22	+ 5.0dB	$2C	+10.0dB
$05	− 9.5dB	$0F	− 4.5dB	$19	+ 0.5dB	$23	+ 5.5dB	$2D	+10.5dB
$06	− 9.0dB	$10	− 4.0dB	$1A	+ 1.0dB	$24	+ 6.0dB	$2E	+11.0dB
$07	− 8.5dB	$11	− 3.5dB	$1B	+ 1.5dB	$25	+ 6.5dB	$2F	+11.5dB
$08	− 8.0dB	$12	− 3.0dB	$1C	+ 2.0dB	$26	+ 7.0dB	$30	+12.0dB
$09	− 7.5dB	$13	− 2.5dB	$1D	+ 2.5dB	$27	+ 7.5dB		

Gain2: -36dB to +12dB in 0.5dB steps, encoded from 0-96, where 0 = -36.0dB, 72 = 0dB and 96 = +12.0dB.

$00	-36.0dB	$14	-26.0dB	$28	-16.0dB	$3C	- 6.0dB	$50	+ 4.0dB
$01	-35.5dB	$15	-25.5dB	$29	-15.5dB	$3D	- 5.5dB	$51	+ 4.5dB
$02	-35.0dB	$16	-25.0dB	$2A	-15.0dB	$3E	- 5.0dB	$52	+ 5.0dB
$03	-34.5dB	$17	-24.5dB	$2B	-14.5dB	$3F	- 4.5dB	$53	+ 5.5dB
$04	-34.0dB	$18	-24.0dB	$2C	-14.0dB	$40	- 4.0dB	$54	+ 6.0dB
$05	-33.5dB	$19	-23.5dB	$2D	-13.5dB	$41	- 3.5dB	$55	+ 6.5dB
$06	-33.0dB	$1A	-23.0dB	$2E	-13.0dB	$42	- 3.0dB	$56	+ 7.0dB
$07	-32.5dB	$1B	-22.5dB	$2F	-12.5dB	$43	- 2.5dB	$57	+ 7.5dB
$08	-32.0dB	$1C	-22.0dB	$30	-12.0dB	$44	- 2.0dB	$58	+ 8.0dB
$09	-31.5dB	$1D	-21.5dB	$31	-11.5dB	$45	- 1.5dB	$59	+ 8.5dB
$0A	-31.0dB	$1E	-21.0dB	$32	-11.0dB	$46	- 1.0dB	$5A	+ 9.0dB
$0B	-30.5dB	$1F	-20.5dB	$33	-10.5dB	$47	- 0.5dB	$5B	+ 9.5dB
$0C	-30.0dB	$20	-20.0dB	$34	-10.0dB	$48	0.0dB	$5C	+10.0dB
$0D	-29.5dB	$21	-19.5dB	$35	- 9.5dB	$49	+ 0.5dB	$5D	+10.5dB
$0E	-29.0dB	$22	-19.0dB	$36	- 9.0dB	$4A	+ 1.0dB	$5E	+11.0dB
$0F	-28.5dB	$23	-18.5dB	$37	- 8.5dB	$4B	+ 1.5dB	$5F	+11.5dB
$10	-28.0dB	$24	-18.0dB	$38	- 8.0dB	$4C	+ 2.0dB	$60	+12.0dB
$11	-27.5dB	$25	-17.5dB	$39	- 7.5dB	$4D	+ 2.5dB		
$12	-27.0dB	$26	-17.0dB	$3A	- 7.0dB	$4E	+ 3.0dB		
$13	-26.5dB	$27	-16.5dB	$3B	- 6.5dB	$4F	+ 3.5dB		

Gain3: OFF to -90dB to -60dB in 1dB steps. -60dB to +18dB in 0.5dB steps. Encoded from 0 to 187, where 0 = OFF.

$00	OFF	$26	−56.5dB	$4C	−37.5dB	$72	−18.5dB	$98	+ 0.5dB
$01	−90.0dB	$27	−56.0dB	$4D	−37.0dB	$73	−18.0dB	$99	+ 1.0dB
$02	−89.0dB	$28	−55.5dB	$4E	−36.5dB	$74	−17.5dB	$9A	+ 1.5dB
$03	−88.0dB	$29	−55.0dB	$4F	−36.0dB	$75	−17.0dB	$9B	+ 2.0dB
$04	−87.0dB	$2A	−54.5dB	$50	−35.5dB	$76	−16.5dB	$9C	+ 2.5dB
$05	−86.0dB	$2B	−54.0dB	$51	−35.0dB	$77	−16.0dB	$9D	+ 3.0dB
$06	−85.0dB	$2C	−53.5dB	$52	−34.5dB	$78	−15.5dB	$9E	+ 3.5dB
$07	−84.0dB	$2D	−53.0dB	$53	−34.0dB	$79	−15.0dB	$9F	+ 4.0dB
$08	−83.0dB	$2E	−52.5dB	$54	−33.5dB	$7A	−14.5dB	$A0	+ 4.5dB
$09	−82.0dB	$2F	−52.0dB	$55	−33.0dB	$7B	−14.0dB	$A1	+ 5.0dB
$0A	−81.0dB	$30	−51.5dB	$56	−32.5dB	$7C	−13.5dB	$A2	+ 5.5dB
$0B	−80.0dB	$31	−51.0dB	$57	−32.0dB	$7D	−13.0dB	$A3	+ 6.0dB
$0C	−79.0dB	$32	−50.5dB	$58	−31.5dB	$7E	−12.5dB	$A4	+ 6.5dB
$0D	−78.0dB	$33	−50.0dB	$59	−31.0dB	$7F	−12.0dB	$A5	+ 7.0dB
$0E	−77.0dB	$34	−49.5dB	$5A	−30.5dB	$80	−11.5dB	$A6	+ 7.5dB
$0F	−76.0dB	$35	−49.0dB	$5B	−30.0dB	$81	−11.0dB	$A7	+ 8.0dB
$10	−75.0dB	$36	−48.5dB	$5C	−29.5dB	$82	−10.5dB	$A8	+ 8.5dB
$11	−74.0dB	$37	−48.0dB	$5D	−29.0dB	$83	−10.0dB	$A9	+ 9.0dB
$12	−73.0dB	$38	−47.5dB	$5E	−28.5dB	$84	− 9.5dB	$AA	+ 9.5dB
$13	−72.0dB	$39	−47.0dB	$5F	−28.0dB	$85	− 9.0dB	$AB	+10.0dB
$14	−71.0dB	$3A	−46.5dB	$60	−27.5dB	$86	− 8.5dB	$AC	+10.5dB
$15	−70.0dB	$3B	−46.0dB	$61	−27.0dB	$87	− 8.0dB	$AD	+11.0dB
$16	−69.0dB	$3C	−45.5dB	$62	−26.5dB	$88	− 7.5dB	$AE	+11.5dB
$17	−68.0dB	$3D	−45.0dB	$63	−26.0dB	$89	− 7.0dB	$AF	+12.0dB
$18	−67.0dB	$3E	−44.5dB	$64	−25.5dB	$8A	− 6.5dB	$B0	+12.5dB
$19	−66.0dB	$3F	−44.0dB	$65	−25.0dB	$8B	− 6.0dB	$B1	+13.0dB
$1A	−65.0dB	$40	−43.5dB	$66	−24.5dB	$8C	− 5.5dB	$B2	+13.5dB
$1B	−64.0dB	$41	−43.0dB	$67	−24.0dB	$8D	− 5.0dB	$B3	+14.0dB
$1C	−63.0dB	$42	−42.5dB	$68	−23.5dB	$8E	− 4.5dB	$B4	+14.5dB
$1D	−62.0dB	$43	−42.0dB	$69	−23.0dB	$8F	− 4.0dB	$B5	+15.0dB
$1E	−61.0dB	$44	−41.5dB	$6A	−22.5dB	$90	− 3.5dB	$B6	+15.5dB
$1F	−60.0dB	$45	−41.0dB	$6B	−22.0dB	$91	− 3.0dB	$B7	+16.0dB
$20	−59.5dB	$46	−40.5dB	$6C	−21.5dB	$92	− 2.5dB	$B8	+16.5dB
$21	−59.0dB	$47	−40.0dB	$6D	−21.0dB	$93	− 2.0dB	$B9	+17.0dB
$22	−58.5dB	$48	−39.5dB	$6E	−20.5dB	$94	− 1.5dB	$BA	+17.5dB
$23	−58.0dB	$49	−39.0dB	$6F	−20.0dB	$95	− 1.0dB	$BB	+18.0dB
$24	−57.5dB	$4A	−38.5dB	$70	−19.5dB	$96	− 0.5dB		
$25	−57.0dB	$4B	−38.0dB	$71	−19.0dB	$97	0.0dB		

Gain5: -12dB to +12dB in 0.1dB steps.

$00 −12.0dB	$30 − 7.2dB	$60 − 2.4dB	$90 + 2.4dB	$C0 + 7.2dB
$01 −11.9dB	$31 − 7.1dB	$61 − 2.3dB	$91 + 2.5dB	$C1 + 7.3dB
$02 −11.8dB	$32 − 7.0dB	$62 − 2.2dB	$92 + 2.6dB	$C2 + 7.4dB
$03 −11.7dB	$33 − 6.9dB	$63 − 2.1dB	$93 + 2.7dB	$C3 + 7.5dB
$04 −11.6dB	$34 − 6.8dB	$64 − 2.0dB	$94 + 2.8dB	$C4 + 7.6dB
$05 −11.5dB	$35 − 6.7dB	$65 − 1.9dB	$95 + 2.9dB	$C5 + 7.7dB
$06 −11.4dB	$36 − 6.6dB	$66 − 1.8dB	$96 + 3.0dB	$C6 + 7.8dB
$07 −11.3dB	$37 − 6.5dB	$67 − 1.7dB	$97 + 3.1dB	$C7 + 7.9dB
$08 −11.2dB	$38 − 6.4dB	$68 − 1.6dB	$98 + 3.2dB	$C8 + 8.0dB
$09 −11.1dB	$39 − 6.3dB	$69 − 1.5dB	$99 + 3.3dB	$C9 + 8.1dB
$0A −11.0dB	$3A − 6.2dB	$6A − 1.4dB	$9A + 3.4dB	$CA + 8.2dB
$0B −10.9dB	$3B − 6.1dB	$6B − 1.3dB	$9B + 3.5dB	$CB + 8.3dB
$0C −10.8dB	$3C − 6.0dB	$6C − 1.2dB	$9C + 3.6dB	$CC + 8.4dB
$0D −10.7dB	$3D − 5.9dB	$6D − 1.1dB	$9D + 3.7dB	$CD + 8.5dB
$0E −10.6dB	$3E − 5.8dB	$6E − 1.0dB	$9E + 3.8dB	$CE + 8.6dB
$0F −10.5dB	$3F − 5.7dB	$6F − 0.9dB	$9F + 3.9dB	$CF + 8.7dB
$10 −10.4dB	$40 − 5.6dB	$70 − 0.8dB	$A0 + 4.0dB	$D0 + 8.8dB
$11 −10.3dB	$41 − 5.5dB	$71 − 0.7dB	$A1 + 4.2dB	$D1 + 8.9dB
$12 −10.2dB	$42 − 5.4dB	$72 − 0.6dB	$A2 + 4.2dB	$D2 + 9.0dB
$13 −10.1dB	$43 − 5.3dB	$73 − 0.5dB	$A3 + 4.3dB	$D3 + 9.1dB
$14 −10.0dB	$44 − 5.2dB	$74 − 0.4dB	$A4 + 4.4dB	$D4 + 9.2dB
$15 − 9.9dB	$45 − 5.1dB	$75 − 0.3dB	$A5 + 4.5dB	$D5 + 9.3dB
$16 − 9.8dB	$46 − 5.0dB	$76 − 0.2dB	$A6 + 4.6dB	$D6 + 9.4dB
$17 − 9.7dB	$47 − 4.9dB	$77 − 0.1dB	$A7 + 4.7dB	$D7 + 9.5dB
$18 − 9.6dB	$48 − 4.8dB	$78 0.0dB	$A8 + 4.8dB	$D8 + 9.6dB
$19 − 9.5dB	$49 − 4.7dB	$79 + 0.1dB	$A9 + 4.9dB	$D9 + 9.7dB
$1A − 9.4dB	$4A − 4.6dB	$7A + 0.2dB	$AA + 5.0dB	$DA + 9.8dB
$1B − 9.3dB	$4B − 4.5dB	$7B + 0.3dB	$AB + 5.1dB	$DB + 9.9dB
$1C − 9.2dB	$4C − 4.4dB	$7C + 0.4dB	$AC + 5.2dB	$DC +10.0dB
$1D − 9.1dB	$4D − 4.3dB	$7D + 0.5dB	$AD + 5.3dB	$DD +10.1dB
$1E − 9.0dB	$4E − 4.2dB	$7E + 0.6dB	$AE + 5.4dB	$DE +10.2dB
$1F − 8.9dB	$4F − 4.1dB	$7F + 0.7dB	$AF + 5.5dB	$DF +10.3dB
$20 − 8.8dB	$50 − 4.0dB	$80 + 0.8dB	$B0 + 5.6dB	$E0 +10.4dB
$21 − 8.7dB	$51 − 3.9dB	$81 + 0.9dB	$B1 + 5.7dB	$E1 +10.5dB
$22 − 8.6dB	$52 − 3.8dB	$82 + 1.0dB	$B2 + 5.8dB	$E2 +10.6dB
$23 − 8.5dB	$53 − 3.7dB	$83 + 1.1dB	$B3 + 5.9dB	$E3 +10.7dB
$24 − 8.4dB	$54 − 3.6dB	$84 + 1.2dB	$B4 + 6.0dB	$E4 +10.8dB
$25 − 8.3dB	$55 − 3.5dB	$85 + 1.3dB	$B5 + 6.1dB	$E5 +10.9dB
$26 − 8.2dB	$56 − 3.4dB	$86 + 1.4dB	$B6 + 6.2dB	$E6 +11.0dB
$27 − 8.1dB	$57 − 3.3dB	$87 + 1.5dB	$B7 + 6.3dB	$E7 +11.1dB
$28 − 8.0dB	$58 − 3.2dB	$88 + 1.6dB	$B8 + 6.4dB	$E8 +11.2dB
$29 − 7.9dB	$59 − 3.1dB	$89 + 1.7dB	$B9 + 6.5dB	$E9 +11.3dB
$2A − 7.8dB	$5A − 3.0dB	$8A + 1.8dB	$BA + 6.6dB	$EA +11.4dB
$2B − 7.7dB	$5B − 2.9dB	$8B + 1.9dB	$BB + 6.7dB	$EB +11.5dB
$2C − 7.6dB	$5C − 2.8dB	$8C + 2.0dB	$BC + 6.8dB	$EC +11.6dB
$2D − 7.5dB	$5D − 2.7dB	$8D + 2.1dB	$BD + 6.9dB	$ED +11.7dB
$2E − 7.4dB	$5E − 2.6dB	$8E + 2.2dB	$BE + 7.0dB	$EE +11.8dB
$2F − 7.3dB	$5F − 2.5dB	$8F + 2.3dB	$BF + 7.1dB	$EF +11.9dB
				$F0 +12.0dB

End of Document

the 15 amp

series II

power conditioners

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

Owner's Manual

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 F E A T U R E S

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
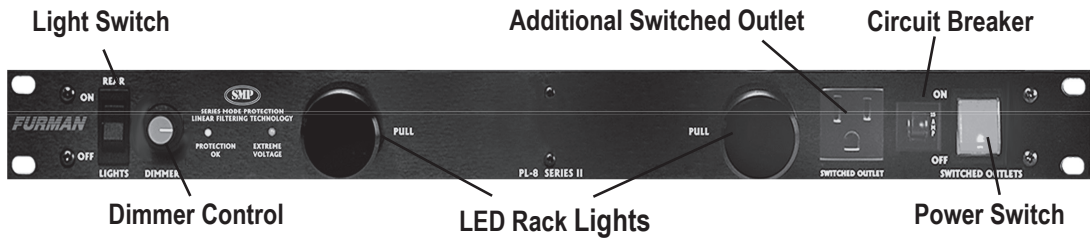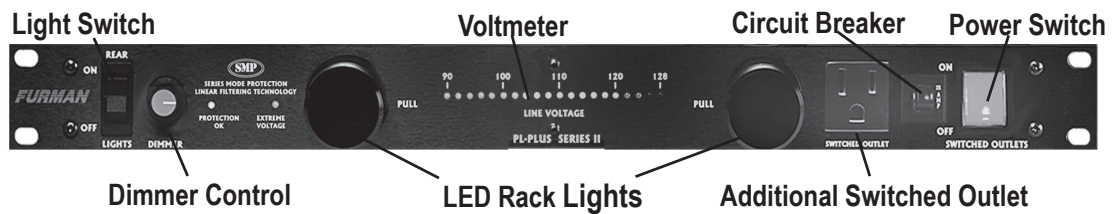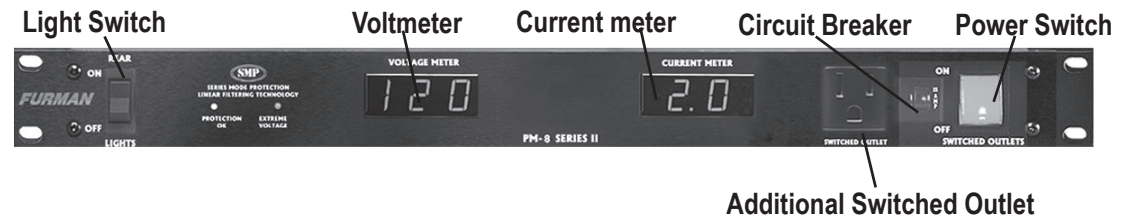
Light Switch — Additional Switched Outlet — Circuit Breaker

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

FURMAN

111804-C

PSM®600

Wireless Personal Stereo Monitor System
User Guide

⚠

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.
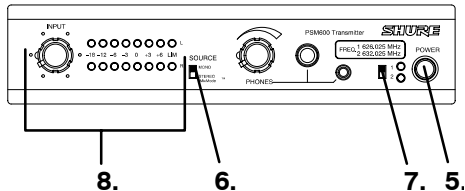
P6T Transmitter Setup

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.
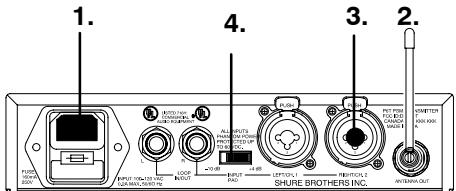
    NOTE: All inputs are phantom power protected up to 60 VDC.

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.
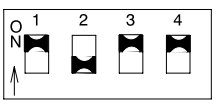
    #1: UP − Frequency #1
    #2: DOWN − Stereo control
    #3: UP − High frequency boost
    #4: UP − Limiter on

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.
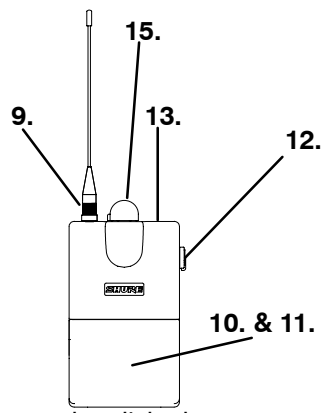
Now you know the basic setup for your new PSM600 Personal Stereo Monitor System. If any troubles occur, please refer to the *Troubleshooting* section of this manual. The rest of the manual goes into greater detail on features and applications — including MixMode™ control, which enables you to customize 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

PA715 ANTENNA

E3 EARPHONES

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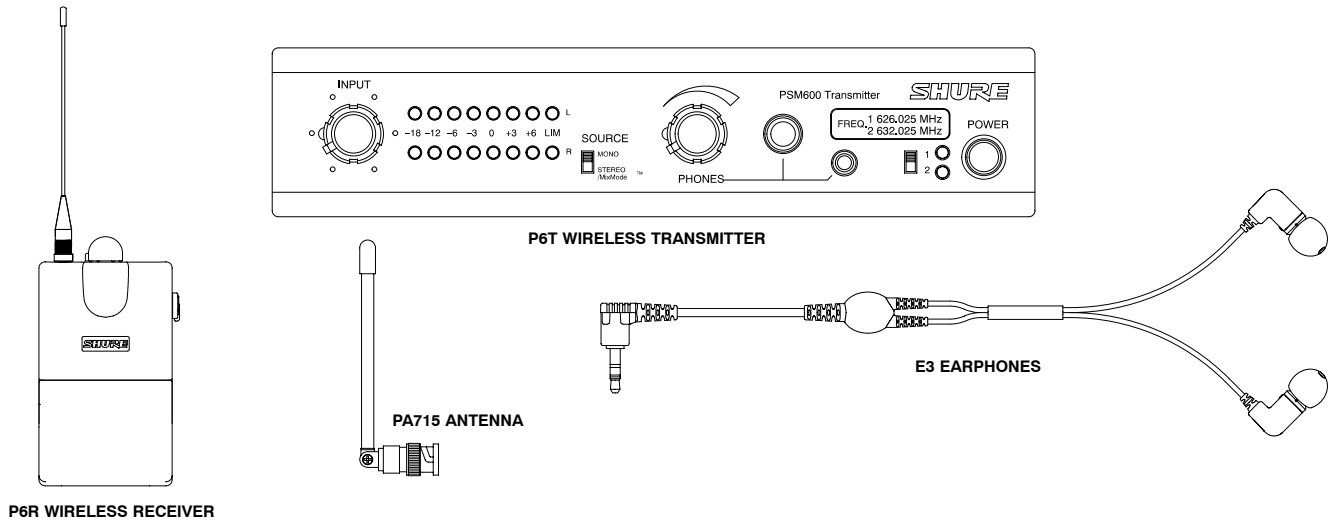
P6T Wireless Transmitter with rack-mounting hardware and one antenna
P6R Wireless Body-Pack Receiver with antenna
E3 Earphones with soft gray flex sleeves

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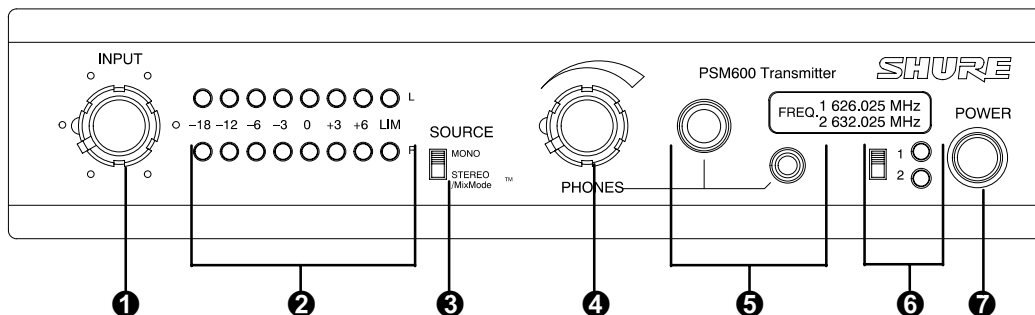
❶ INPUT Dial. This controls the signal level to the transmitter modulator. For optimum sound, the input level should be set in the −3 dB to +3 dB range.

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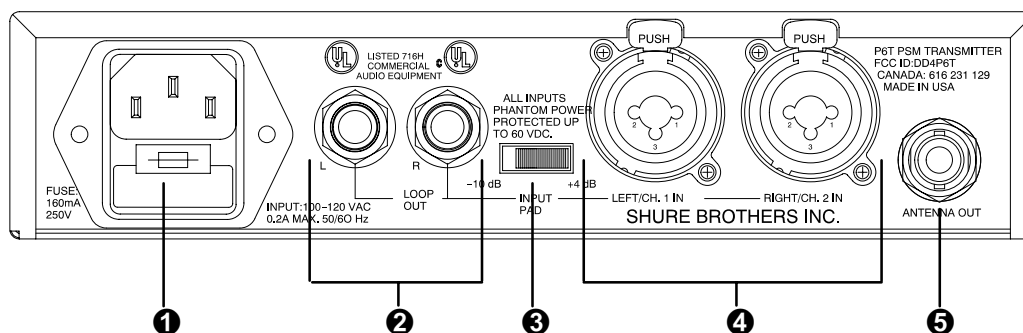
❶ Power Connector with Integral Fuse. Connects to a power supply. The fuse is located in the bottom drawer.

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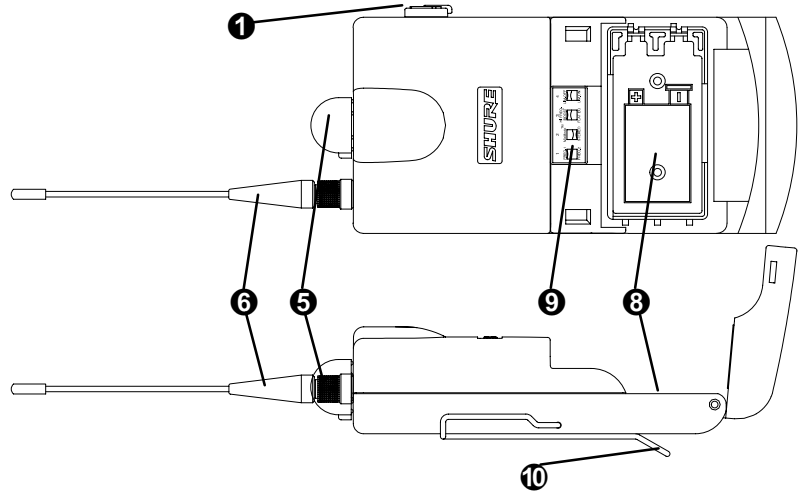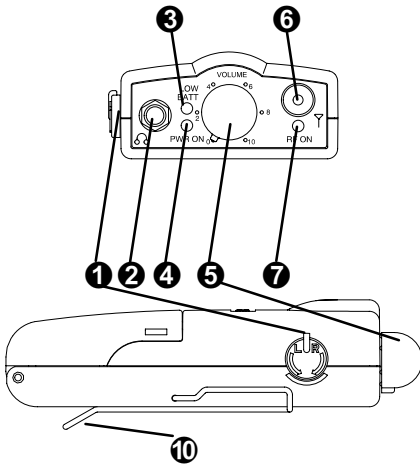
❶ **Balance Dial.** In stereo mixes, this controls the left/right balance. In MixMode™, this controls the mix level of two transmitter inputs.

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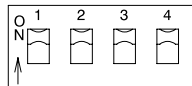
DIP SWITCH	FUNCTION	UP	DOWN
1	Frequency Select	Frequency 1	Frequency 2
2	Stereo/MixMode Select	MixMode control	stereo control
3	Equalization (Flat/High Boost)	Gives a 6 dB boost at 10 kHz for a better high-end response	normal response
4	Limiter defeat	Limiter on	Limiter off

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.
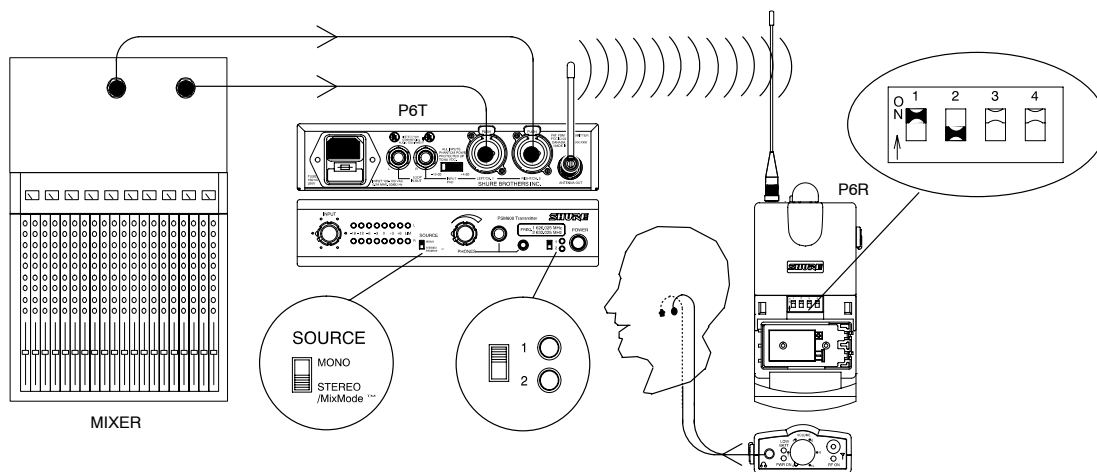
1. Connect the stereo mixer outputs to the L/CH1. and R/CH2. INPUTs on the P6T Transmitter
2. Set the SOURCE switch on the P6T front panel to STEREO.
3. Set DIP switch 2 of the P6R Receiver to STEREO.
4. Set DIP switch 1 on the P6R and the FREQ. switch on the P6T to the same frequency.
5. Use the balance 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.
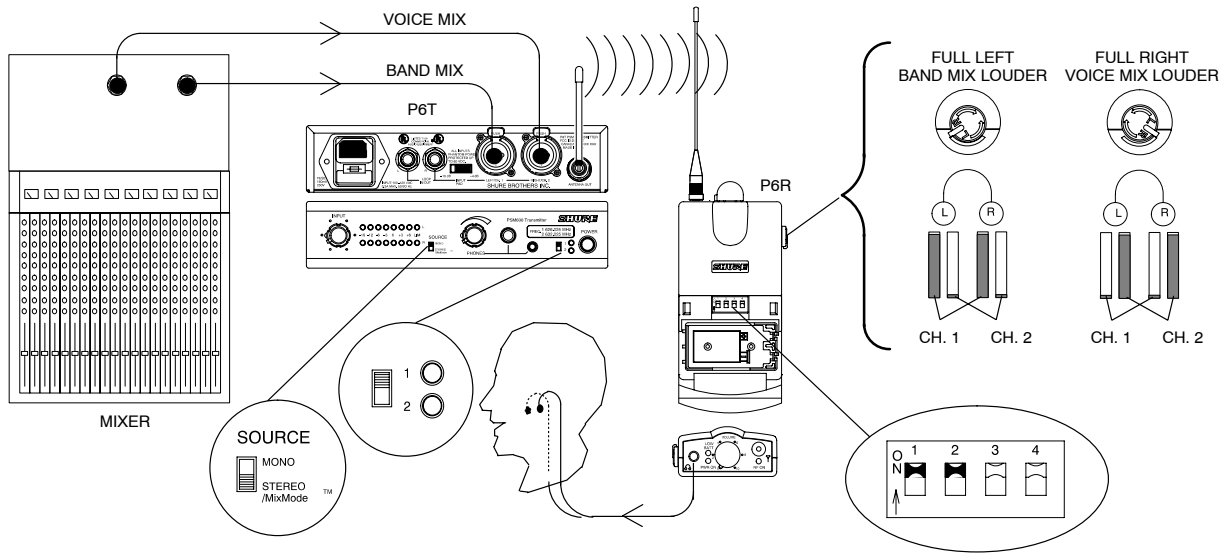
1. Connect the monitor mix 1 and monitor mix 2 mixer outputs of the mixer to the L/CH. 1 and R/CH. 2 audio inputs of the P6T Transmitter.
2. Set the SOURCE switch on the P6T Transmitter to STEREO.
3. Set DIP switch 2 on the P6R Receiver to MixMode ™.
4. Set DIP switch 1 on the P6R and the FREQ. switch 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.
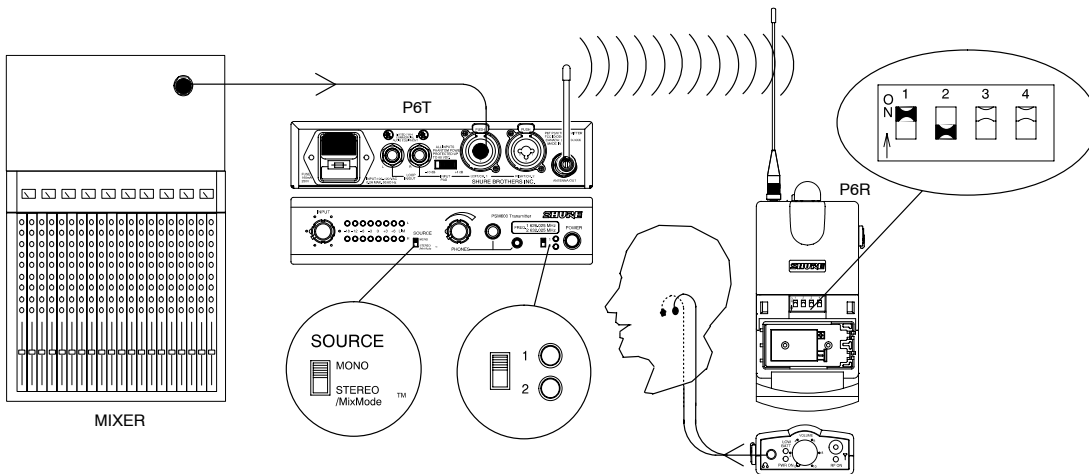
1. Connect the mono monitor output of the mixer to either the Left or Right audio inputs of the P6T.
2. Flip the SOURCE switch on the front panel to MONO.
3. Flip DIP switch 2 of the P6R to STEREO.
4. Set DIP switch 1 on the P6R and the FREQ. switch on the P6T to the same frequency.

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.

MIXER
P6T #1
P6T #2
P6T #3
P6R #1
P6R #2
P6R #3
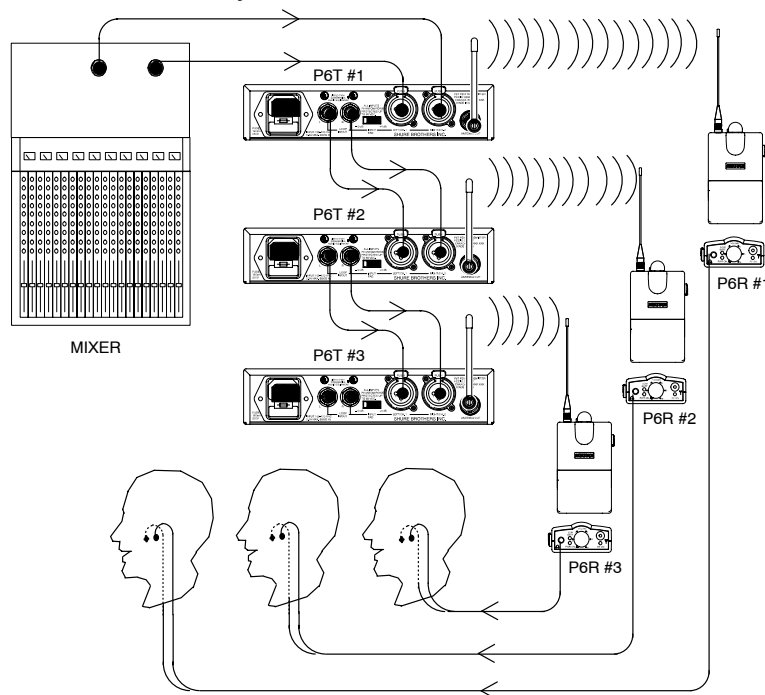
Running Floor Monitors Through a P6T Transmitter

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.


P6T
P6R
FLOOR MONITOR
AMPLIFIER
MIXER
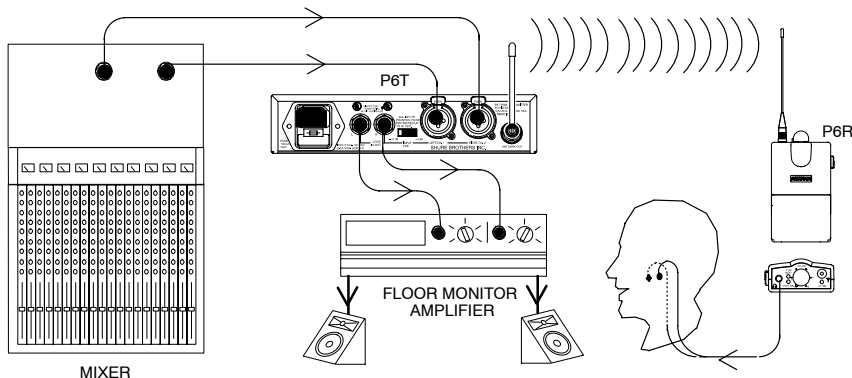
Running Multiple PSM Wireless Systems Under MixMode Control

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.
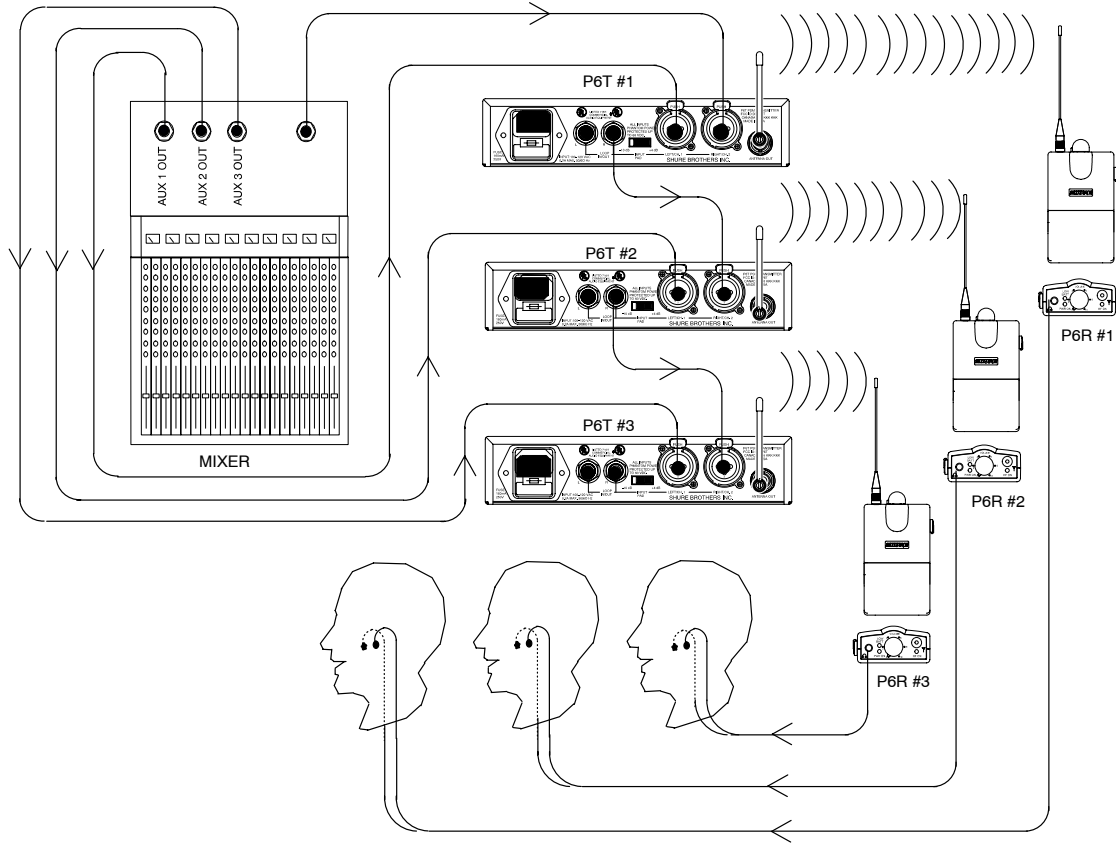
Running a Recording Device Through a P6T Transmitter

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.
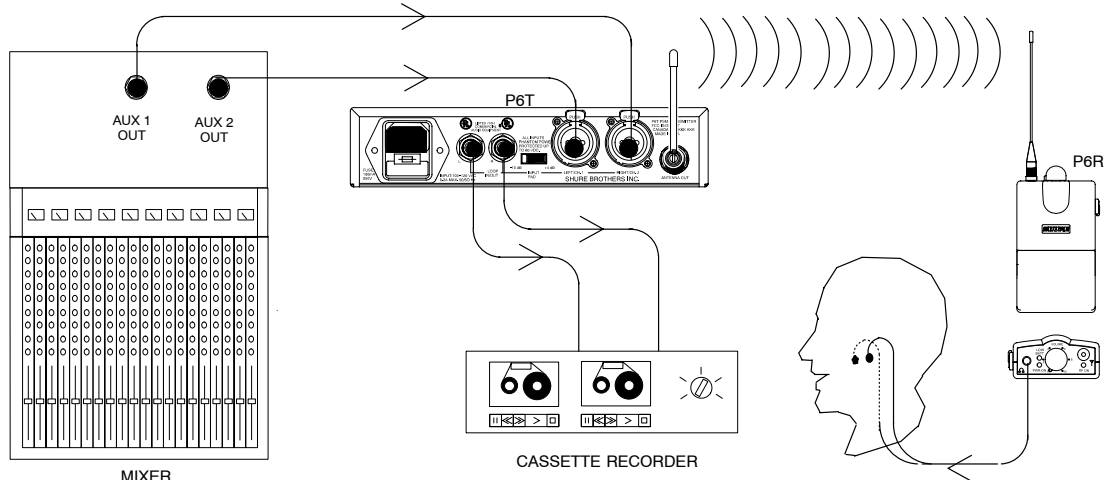
ACCESSORIES

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
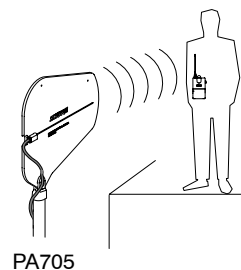
PA760 Antenna Combiner

PA760

MULTIPLE P6Ts
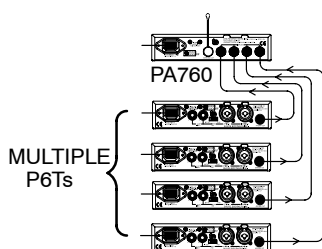
The PA760 is a breakthrough new product specifically designed to improve the performance of multiple wireless monitor systems. First, it combines up to four P6T Transmitters into a single antenna with no signal loss, thus reducing stage clutter without losing wireless range. The PA760 significantly reduces 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
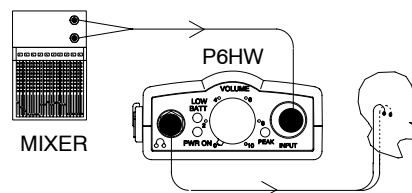
E-Series Earphones

E3
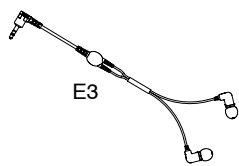
Shure offers a variety of earphones to fit your needs. Designed exclusively for PSM systems, they deliver superior sound quality. For the added comfort of a precise fit, custom earmolds are also available for E3 model earphones. For more information, see *Custom Earpieces* under *Appendix A. Technical 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 ⓧ. 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.
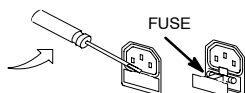
Current
115 mAac maximum at 120 Vac
55 mAac maximum at 230 Vac

Fuse
P6T: 120 Vac, 160 mA/250 V time delay
EP6T: 230 Vac, 80 mA/250 V time delay

FUSE

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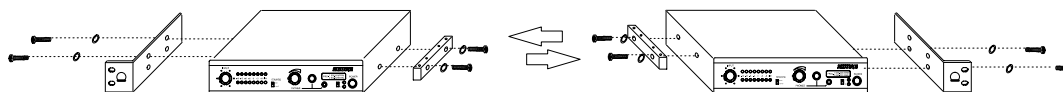
> **WARNING:** Do not torque the screws too tightly, or the chassis may be damaged.

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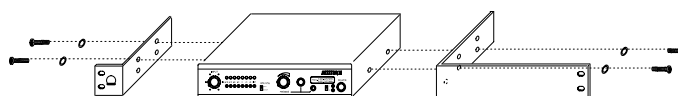
1. Remove the screws and washers from each side of the unit.
2. Align the supplied rackmount brackets over the holes.
3. Using the screws and washers from step 1, fasten the rack-mount brackets.

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.
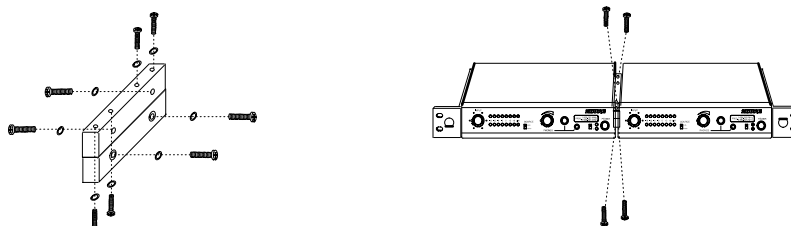
NOTE: The link bars are designed with recesses in the side holes where the screw head and washer fit in. Once the link bars are screwed on properly, the vertical holes will align. Each link bar has two threaded holes and two unthreaded holes. In order to ensure proper fit, stack the link bars so that 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
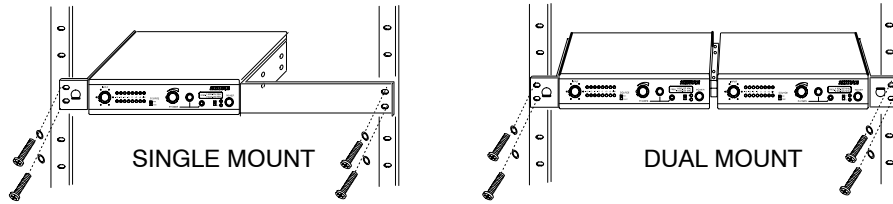
1. Insert the unit(s) into a 19-inch equipment rack.
2. Fasten the unit(s) to the rack using all four of the supplied screws.

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.
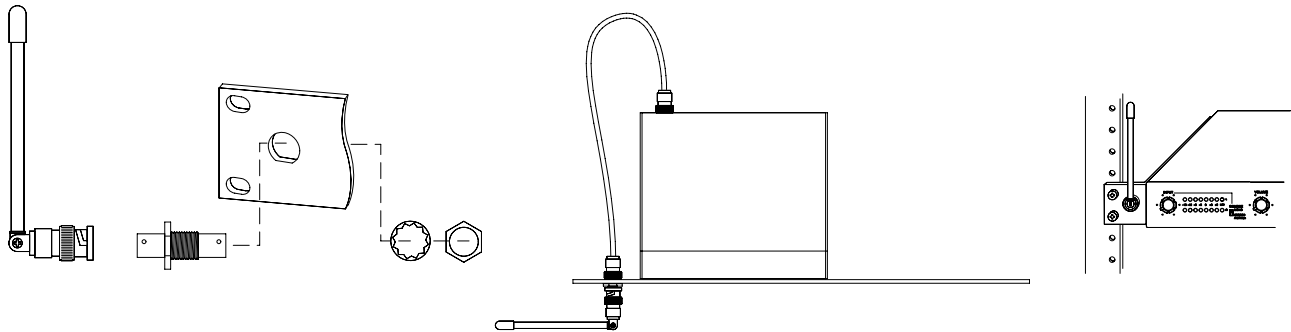
NOTE: The PA715 antenna, which comes supplied with the P6T; cannot be remote mounted. Use a PA705 antenna for remote mounting.

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.
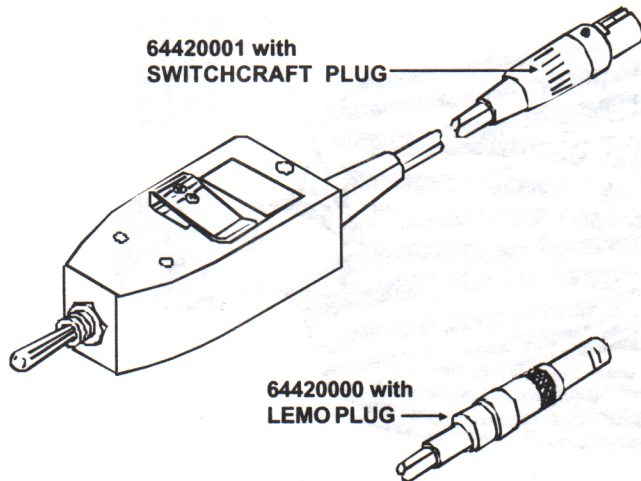
12000 Portland Ave. South, Burnsville, MN 55337

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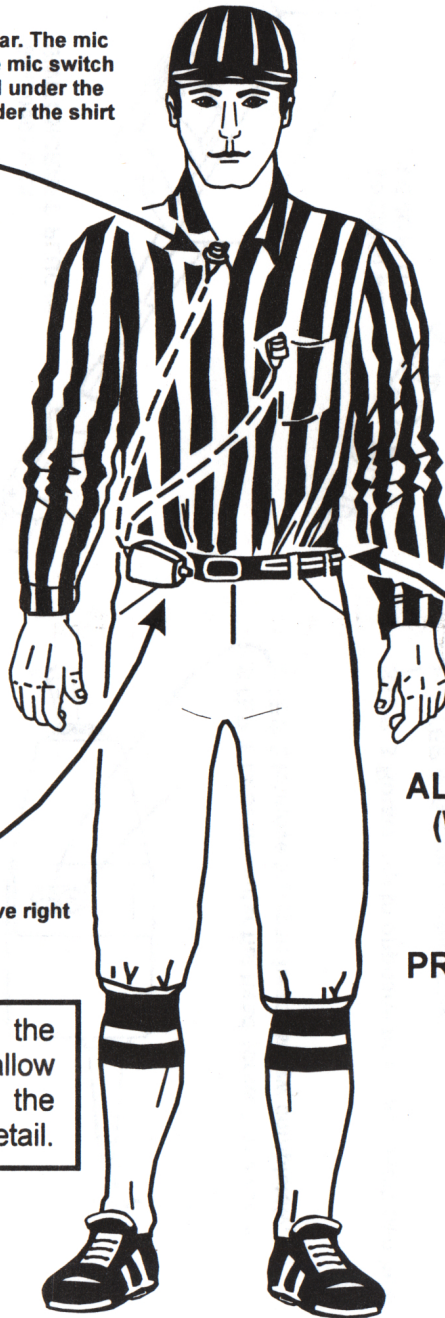
Refer to the illustration on the back of this sheet for placement of the Referee Switch Box and belt transmitter for best optimum performance.
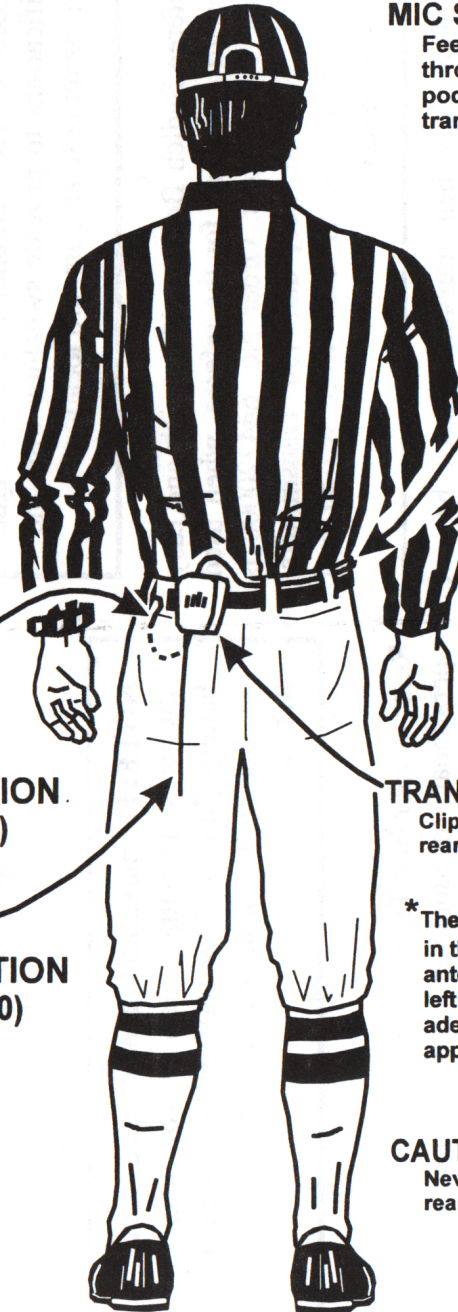
MIC WIRING FOR REFEREES

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.

MIC SWITCH
Clip the switch unit on belt above right front pocket.

*ANTENNA ALTERNATE POSITION
(WT-50, 55, 100, 200)

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^{TM} 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

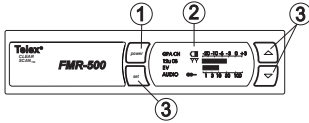## FMR-500 Receiver Controls, Connectors, and Indicators

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
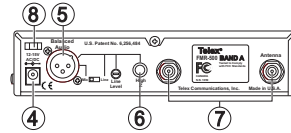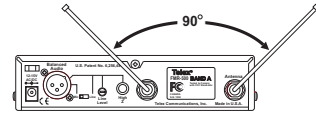
7. TNC Antenna Input Connectors

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.
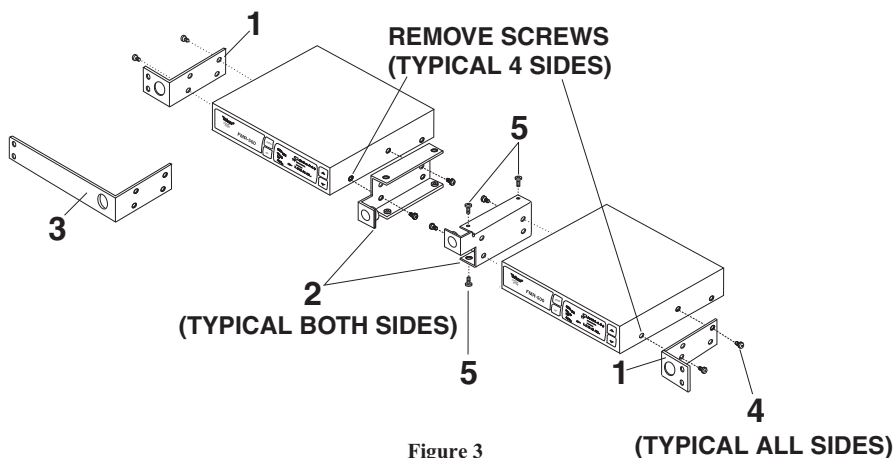

Figure 3
Rack Mount Installation

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.
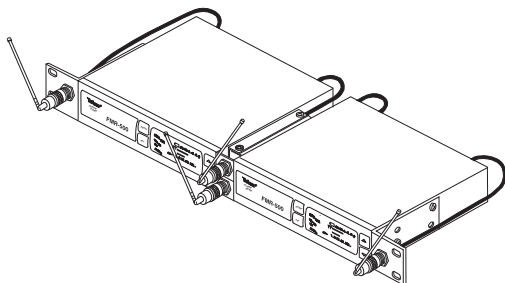

Figure 4
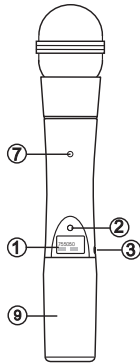**Front Mounting Antennas**

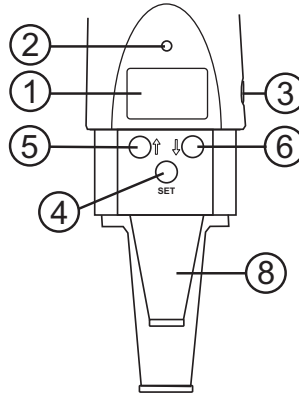## Handheld Transmitter HT-500

Figure 5
Handheld Transmitter

HT-500 Controls, Connectors, and Indicators

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

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**.**

Figure 6
Transmitter

5. Channel/Frequency Up Switch

6. Channel/Frequency Down Switch

7. Microphone Gain

8. 9V Battery Holder

9. Battery Cover - Screw type

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.
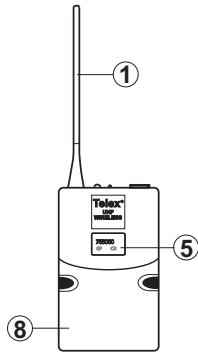

Figure 8
Control View

Bodypack Transmitter - WT-500

Figure 7
Bodypack Transmitter
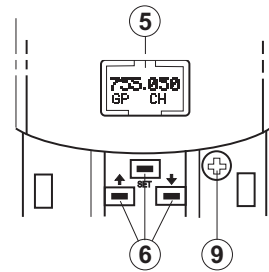
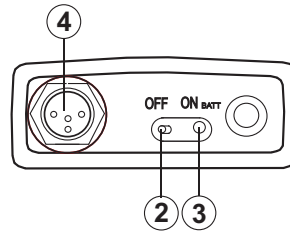**Figure 9**
Top View

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.

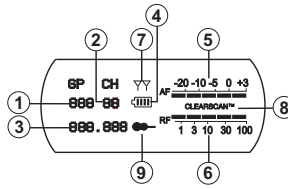# Section 4 - Receiver Display Screens and Functions

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
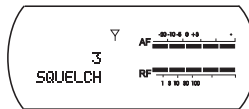
Squelch Adjustment Screen

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
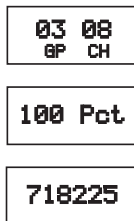
Transmitter Display and Controls

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
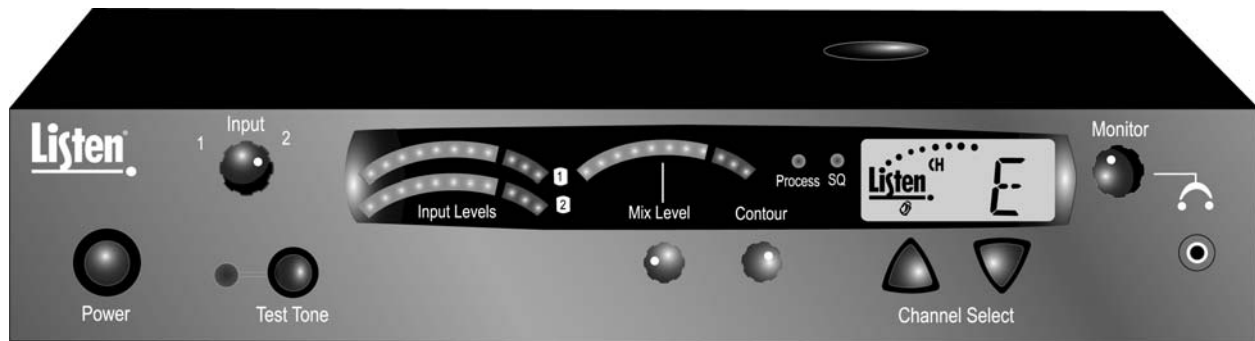
Don't miss a single sound. Listen.

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
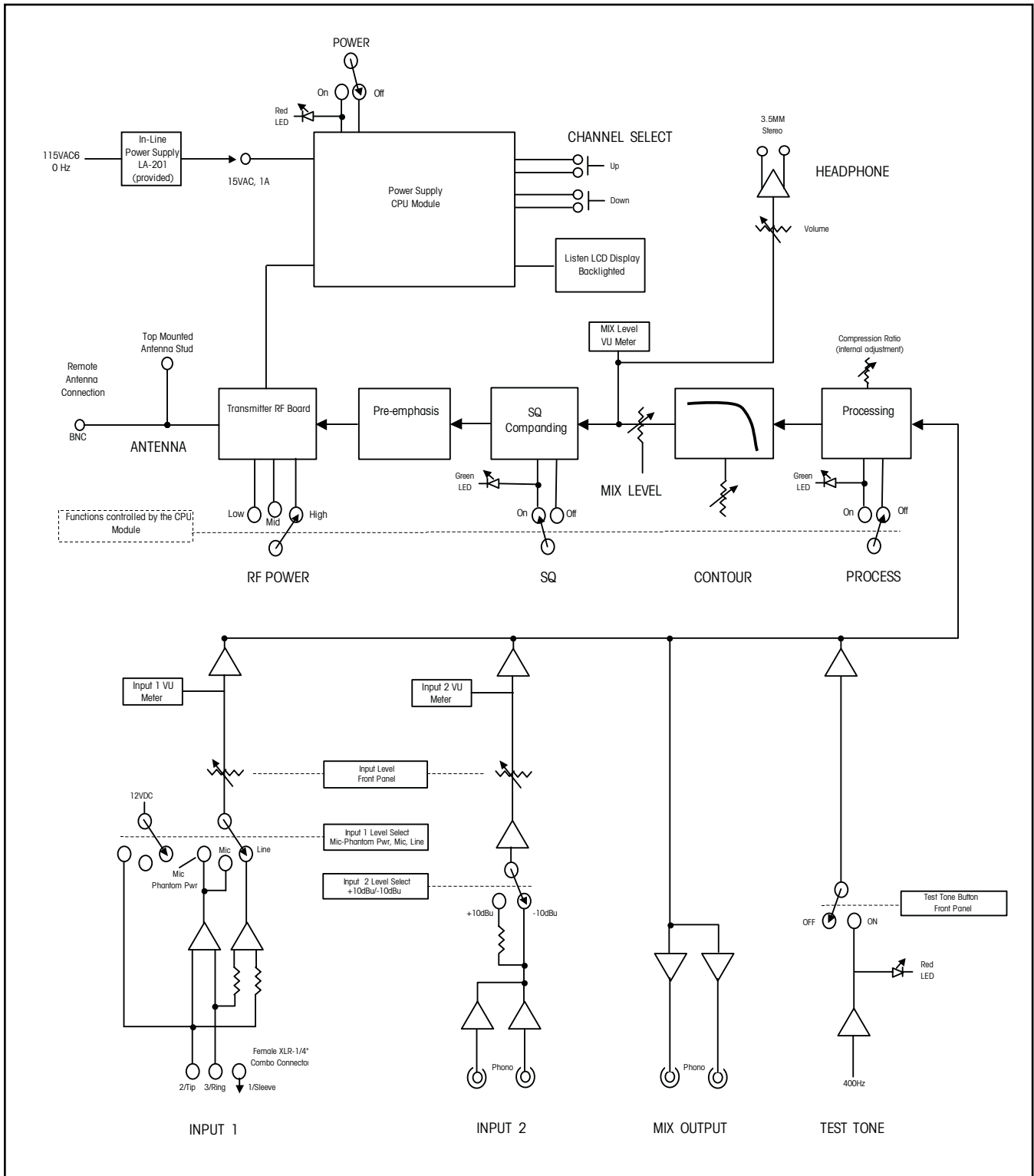
## Quick Reference
LT-800 Front Panel: Controls & Displays

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

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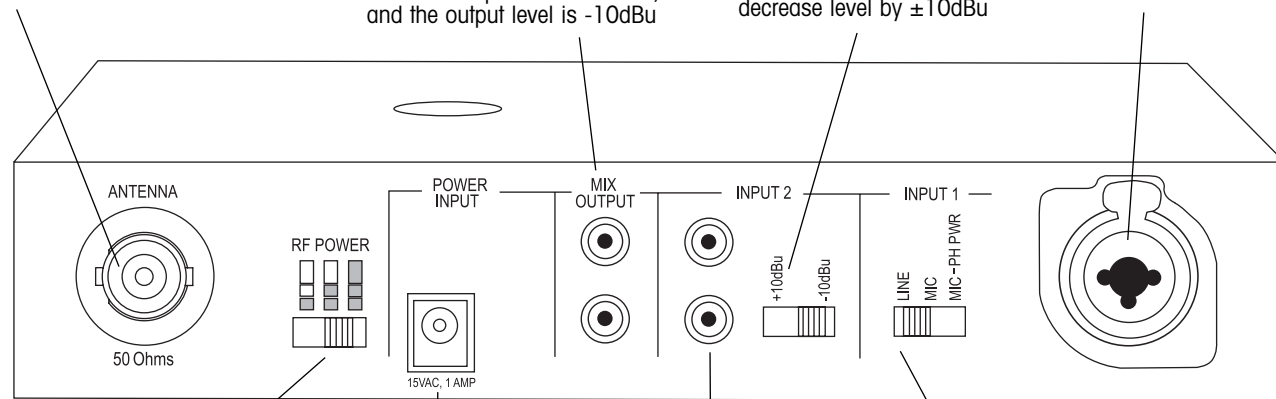
Set RF Power level here (¼, ½ and Full). See page 6 for guidelines on setting power levels

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.
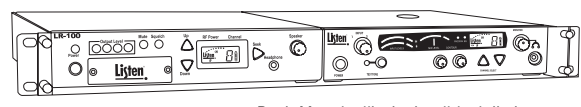
Rack Mount with dual unit installed
Shown with LR-100 and LT-800
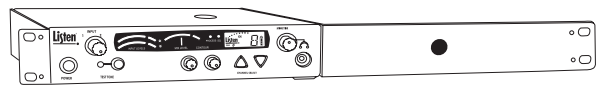
Rack Mount with single unit installed
Shown with LT-800

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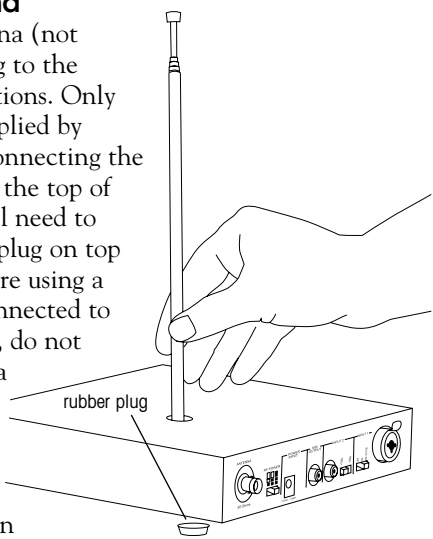
LT-800 shown with top mount antenna connected through top of unit
(part numbers LA-101,
LA-106 (72 MHz) or
LA-102 (216 MHz)
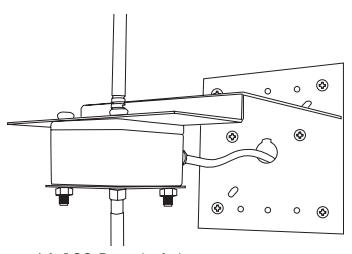
LA-122 Remote Antenna
See RF Reception Maximization Strategies and Coaxial Cable on page 10.
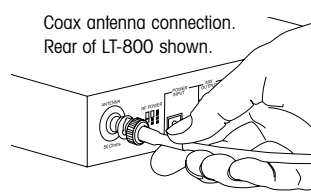
Coax antenna connection.
Rear of LT-800 shown.

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).
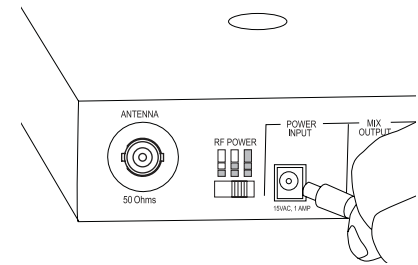

5 Select Phonak Compatibility (if necessary)

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.
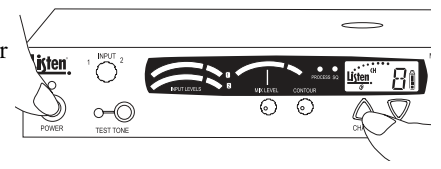

6 Select Channel Mode (if necessary)

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.
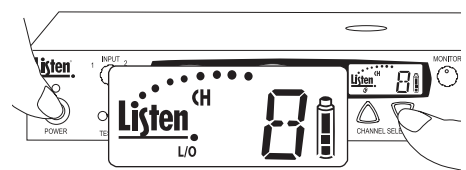
# LT-800 Setup Instructions continued

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
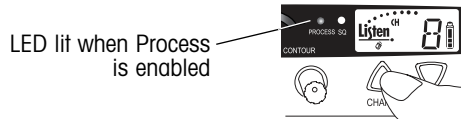
between SQ On and Off.
If the green LED is

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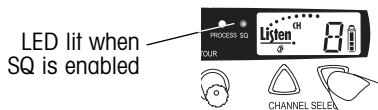
displayed on the front panel, that feature is enabled. Once you have enabled or disabled the features as desired, let the transmitter exit the program mode by waiting 5 seconds.

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
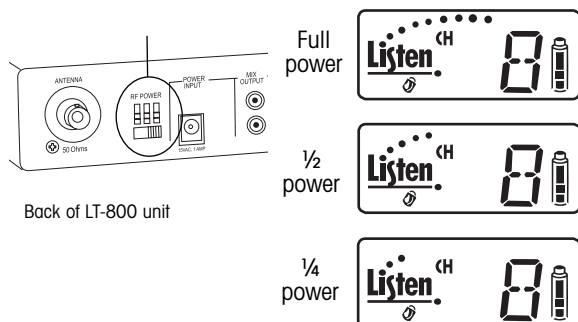
9 Connect Audio Inputs

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.
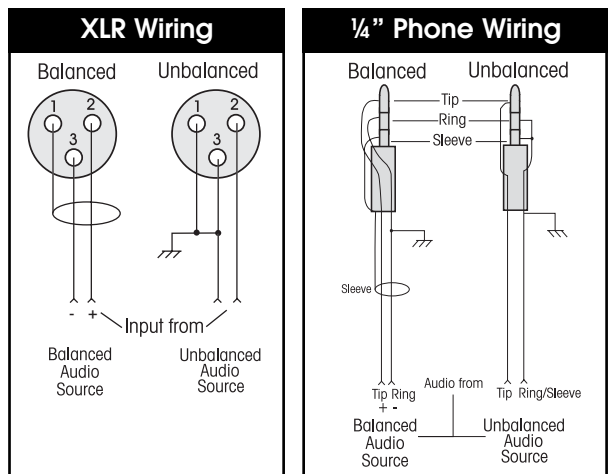
Input 1

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

Mic

Mic with Phantom Power

Back of LT-800 with XLR connected to Input 1
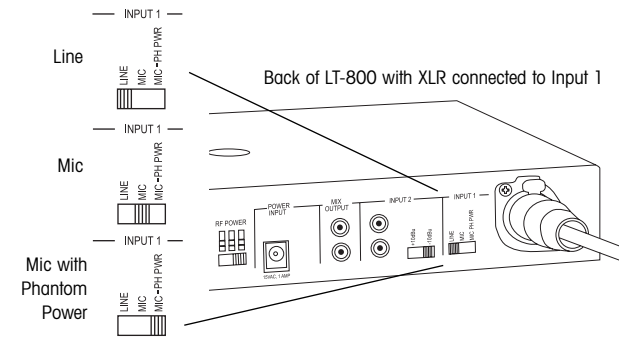
Plug your microphone into Input 1 and move the input select switch to Mic (for dynamic microphones) or Mic + PH Power (for condenser microphones).

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

XLR Wiring	¼" Phone Wiring
Balanced Unbalanced	Balanced Unbalanced

Input from
Balanced Audio Source   Unbalanced Audio Source

Tip
Ring
Sleeve

Sleeve

Audio from
Tip Ring   Tip Ring/Sleeve
+ -
Balanced Audio Source   Unbalanced Audio Source

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.
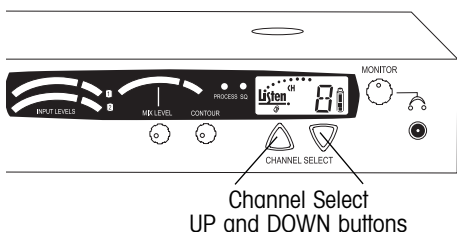
6
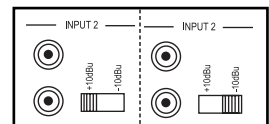
LT-800 Operating Instructions

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.
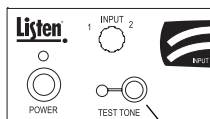
Press Test Tone
button here

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.
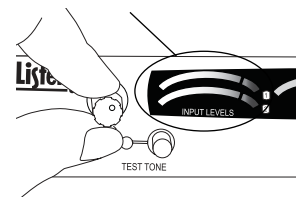

2 Adjust Contour
Adjust the Contour knob counterclockwise if your audio source is mostly voice. Adjust the knob clockwise if your audio source is mostly music. The Contour knob adjusts the relative equalization of the unit. This equalization boosts or cuts frequencies above 5 kHz.
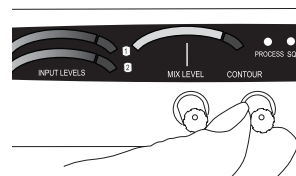
3 Adjust Mix Level
Adjust the mix level until the right VU meter occasionally illuminates the red LED. This is the level adjustment for the combined output from Input 1 and Input 2.

7
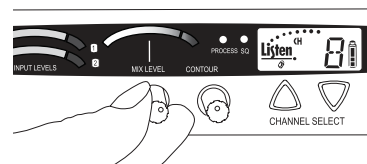
LT-800 Compatibility with Other Manufacturers

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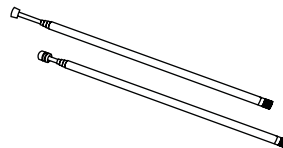
Telescoping
(Top Mount)
LA-106 for 72 MHz or
LA-102 for 216 MHz

**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.
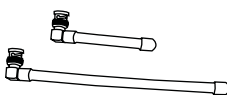
90 Degree Helical
(Rear Mount)
LA-123 for 72 MHz or
LA-124 for 216 MHz
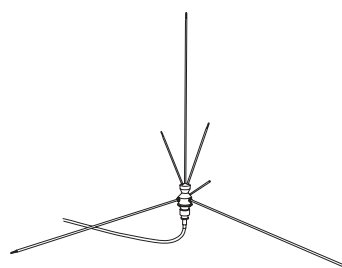
216 MHz Ground Plane
(Remote Mount, outdoor)
LA-107 for 216 MHz

Rack Mount Options
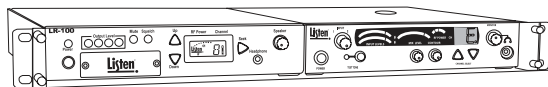
LA-326 Rack Mounting Kit

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.
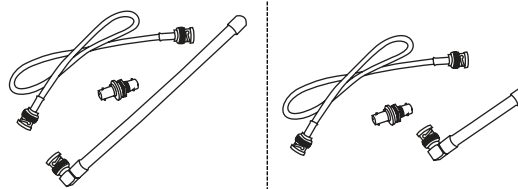
**Antenna Kit for the
LA-326 Rack Mount Kit**
LA-125 for 72 MHz and LA-126 for 216 MHz
(LA-326 also required)

Optional Accessories continued

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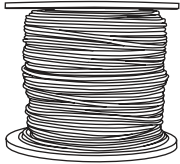
RG-58 Coaxial Cable
LA-112

RG-8 Coaxial Cable
LA-113

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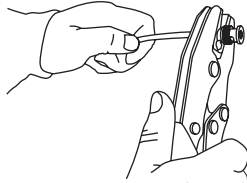
Installation of BNC Connectors
LA-114
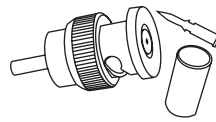
BNC Connector for RG-58
LA-127

BNC Connector for RG-8
LA-128

Microphone Options
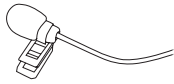
Lapel
LA-261

Over-the-Head
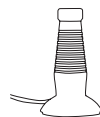LA-262

Over-the-Ear
LA-268

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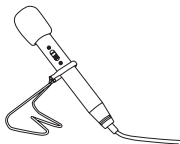
Hand Held
LA-274
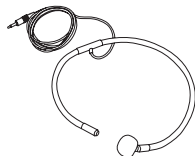
Collar
LA-276

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®

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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
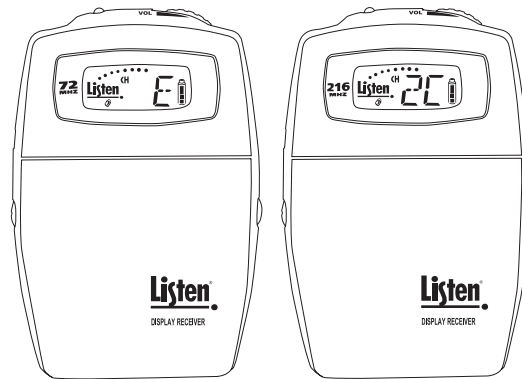
Listen

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Toll Free (North America): 1.800.330.0891
Fax: +1.801.233.8995
E-mail: info@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.
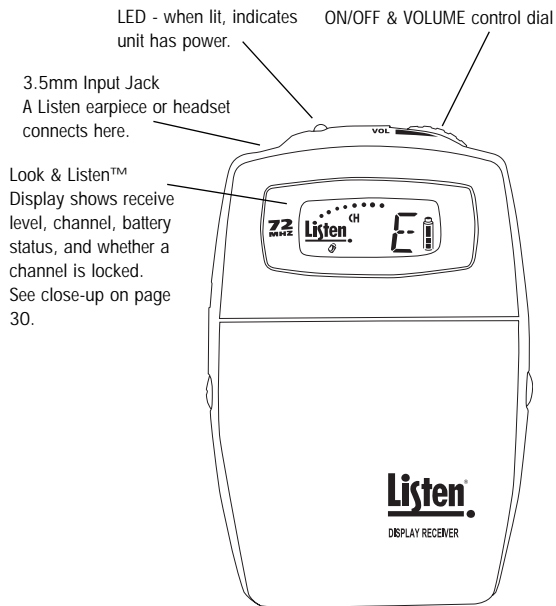
Specifications

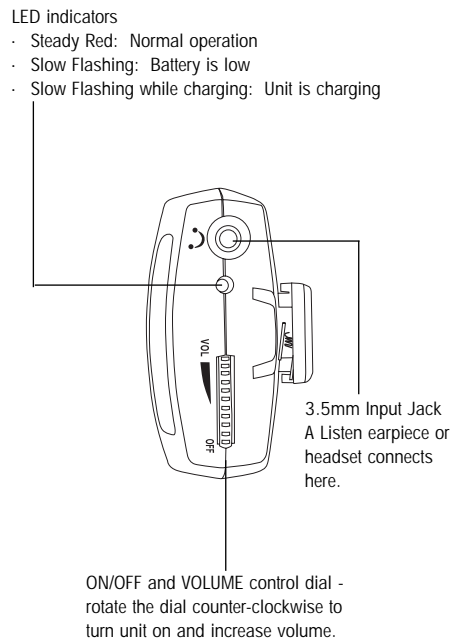|	Specification	LR-400-072	LR-400-216
RF	RF Frequency Range	72.025 - 75.950 MHz	216.025 - 216.975 MHz
	Number of Channels	57 (17 wide, 40 narrow)	57 (19 wide, 38 narrow)
	Sensitivity	.6uV typical, 1 uV maximum for 12dB SINAD	
	Frequency Accuracy	± .005% stability 0° to 50°C (32° to 122° F)	
	Antenna	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	

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LR-400 Specifications continued

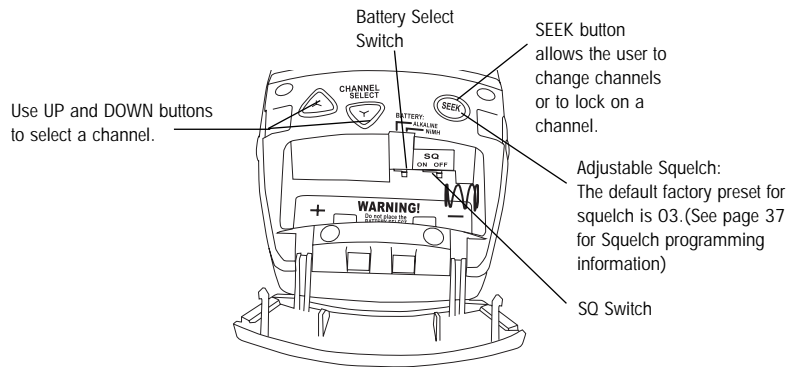|	Specification	LR-400-072	LR-400-216
Controls	Set Up Controls	Alkaline/NiMH batteries and SQ enable/disable and programmable squelch setting.	
	User Controls	Volume, channel UP/DOWN, SEEK (All controls except volume are electronically lockable, and are behind the door)	
	Programming	Squelch can be adjusted 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

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.

LR-400 Top of Unit

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.

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.
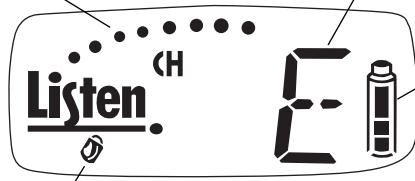
SQ Switch: shipped in the ON position, use a screwdriver or pen to slide to the OFF position if needed. You should turn SQ off if any of your receivers do not have SQ.

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).

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
for assistance. See page 69 for contact information.

2

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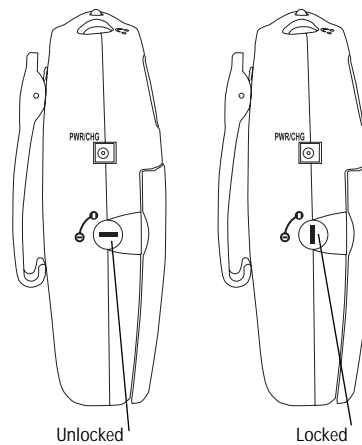
> **WARNING:** Do not place the BATTERY switch in the NiMH position if you are
> not using Nickel Metal Hydride Batteries. The NiMH position will attempt to
> charge the batteries. Charging non-Nickel Metal Hydride batteries may
> result in physical harm, destruction of property and/or fire.

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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).
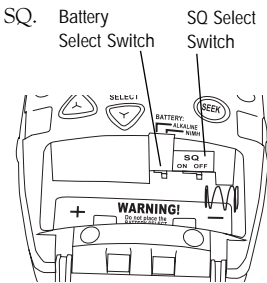
6 **Connect an Earphone or Headset**
Your headset or earphone will connect to the jack on the top of the unit. Either mono or
stereo connectors may be used with a Listen receiver. Make certain you push the plug all the
way into the jack.

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LR-400 Setup Instructions continued
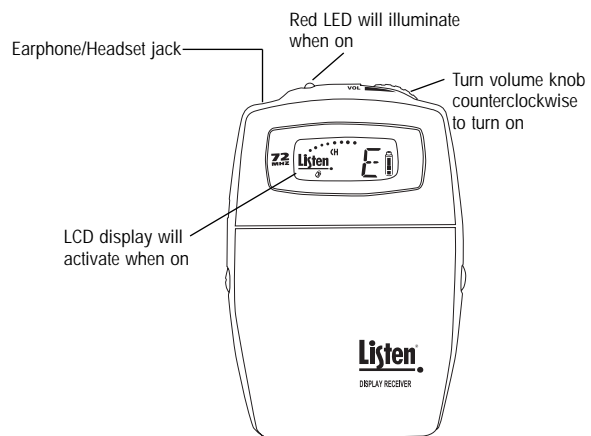
7 **Turn the Unit On**
Receivers are turned on by rotating the volume dial counterclockwise. The red LED on top of the unit should activate and the LCD display should illuminate. If they do not, make sure you have installed the batteries correctly and that you are using fully charged batteries.

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.

Red LED will illuminate when on

Earphone/Headset jack

Turn volume knob counterclockwise to turn on

LCD display will activate when on

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.
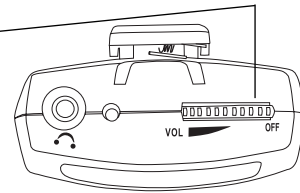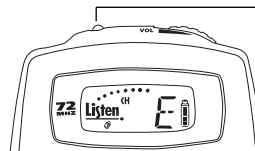
Is the Channel Locked on My Receiver?

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.
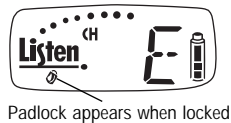
Padlock appears when locked

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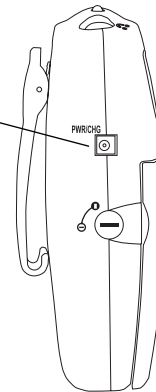
IMPORTANT: DO NOT ATTEMPT TO CHARGE ANY TYPE OF BATTERY OTHER THAN NiMH (NICKEL METAL HYDRIDE) with your Listen equipment. Alkaline batteries may explode when connected to a charger. Other risks of charging non-NiMH batteries include destruction of property or fire.

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.
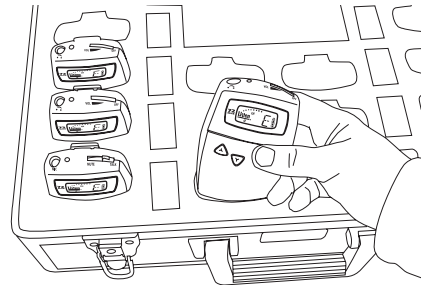
LA-311 - 16-unit Drop In Charging Case shown

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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.