



# Installation Guide & User Manual

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**PERSONAL PA<sup>®</sup> Pro Wide-band System 250**  
Wireless FM Listening System

Transmitter Model T4  
Receiver Models R7, R7-4

 **Williams Sound<sup>®</sup>**  
Helping People Hear



# PRO WIDE-BAND SYSTEM, MODEL PPA 250

## INSTALLATION GUIDE & USER MANUAL

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## FAST SETUP PROCEDURE

### Step 1 Choose a Location for the Transmitter

It's usually most convenient to locate the T4 next to the public address equipment. The location must have the audio feed and 120 VAC power available. Place the transmitter on a level surface where there are no substantial metal or other electrically conductive objects between the antenna and the listening area.

After initial adjustments, there should be no need to access the unit.

### Step 2 Choose a Location and Install the Antenna

The T4 is equipped with a with a short flexible antenna (ANT 021). The ANT 021 threads onto a stud recessed in a hole on the top of the transmitter. Do not use excessive force to tighten the antenna; it need only be finger tight.

The T4 Transmitter can also be purchased with a with a coaxial antenna (ANT 005) or Wall Mount Dipole Antenna (ANT 024).

See *Remote Antenna Location Tips* on page 11 for more detail.

### Step 3 Choose a Channel

Both the T4 Transmitter and R7 Receivers are set to 72.9 MHz at the factory, unless otherwise specified. However, you may easily set the T4 to any of the 10 available channels using the FM Channel/FM Power Switch. You may wish to use a different channel if there is already another hearing assistance system or operations by some other authorized radio service operating on 72.9 MHz in your area.

Receivers must also be set to the same frequency. See page 20 for receiver tuning instructions.

### Step 4 Choose and Connect an Audio Source

Plug the T4's audio cable into either Line Out, Record Out, Tape Out or Auxiliary Out jack on your system amplifier. If these outputs are already in use, a simple Y-cord can be used to make the connection. Plug the other end of the audio cable into the T4's Audio Input Jack on the rear panel. If all line level outputs are in use, the T4's line out jack on the transmitter's rear panel can be used to feed other devices.

**IMPORTANT: If you choose to connect to 70 Volt Speaker line, be certain to set the Audio Config switch correctly. Severe damage will occur if you do not.**

## Step 5

### Set the Audio Select DIP Switches

Set the Audio Select switch for the type of source you're using.

**If you have used the audio cable provided with the PPA 250, there is no need to change the factory set configuration.**

If you have used a different type of cable, see the T4's top panel and pages 10 and 13 for the appropriate switch configurations and plug wiring diagrams. See page 15 for Compress vs. Limit adjustments.

## Step 6

### Connect the Power Supply

Plug the T4's transformer into a standard 120 VAC outlet and connect the attached cable to the transmitter. The cable connector has a retaining catch which must be installed toward the top of the transmitter as illustrated on the T4's back panel. The T4 will not operate if you install the cable upside down, though no damage will result.

Neither the T4, nor its power supply, are equipped with a power switch. Because there is no "wear out" mechanism and power consumption is minimal, continuous operation is not a problem.

## Step 7

### Adjust the Audio Input Control

Play a compact disc or other good audio source through the complete sound system at a level that is typical of normal operation.

Adjust the Audio Input control so that the Level Indicator *0 dB* LED generally lights and the *+6 dB* LED lights occasionally.

## Step 8

### Listen with the Receiver

Install the batteries, plug in the earphone, and walk around the listening area. The signal should be clear and quite loud when the volume is turned up. See page 17 for performance checks.

For more detailed installation procedures, see page 11. For more detailed system description, see page 8.

## SYSTEM OVERVIEW

The PPA 250 is a Wide-band FM Listening System which operates in the 72–76 MHz frequency band.

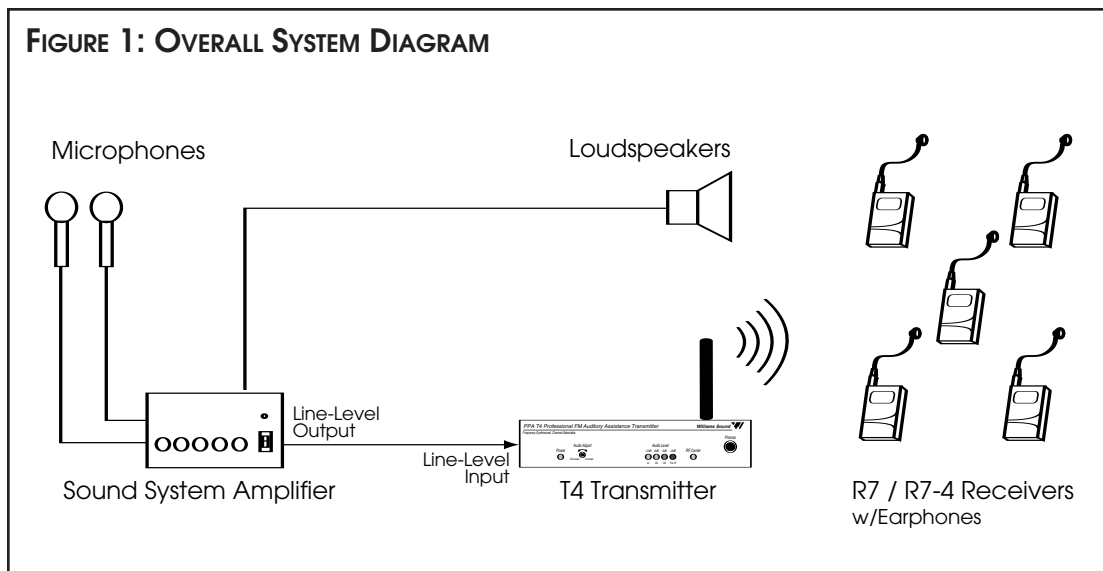
Developed for hearing assistance in places of public access, the PPA 250 is designed for those who need help overcoming background noise, reverberation, or distance from the sound source. It includes a complete audio processor optimized for the needs of hearing impaired persons and is easily integrated with your existing sound system. The PPA 250 can also be used with a microphone as a stand-alone system.

Your PPA 250 has two principal parts: the T4 Transmitter and the R7 Receivers. Much like a miniature radio station, the transmitter and microphone pick up the sounds you want to hear and broadcast them over an FM radio signal. The receivers pick up the broadcast up to 500 feet away.

Listeners may sit anywhere and can make the audio signal as loud as they wish without causing PA system feedback or disturbing others.

To avoid difficulties, read through this manual as you begin to use the system. Then save it for questions that arise as you continue to use your PPA system.

If you have any problems with this Williams Sound product, don't hesitate to call us toll-free at 1-800-843-3544.



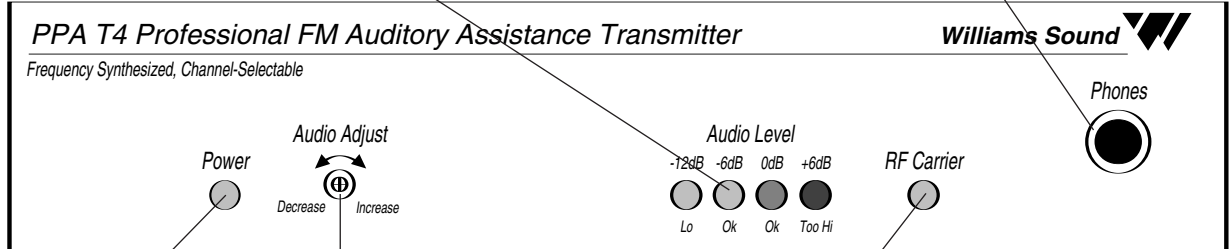
**FIGURE 2: T4 TRANSMITTER CONTROLS & FEATURES**

**Audio Level Indicators**

Four-LED array shows audio level in 6 dB steps. Optimum level is reached when the amber 0 light usually blinks and the red +6 light blinks occasionally.

**Phones Jack**

1/4" jack, 220 Ω source impedance. Drives mono or stereo headphone. Monitors exactly what is being transmitted.



**Power Indicator**  
Green LED

**Audio Level Control**  
Rotary pot, screwdriver adjust, used with audio indicator lights

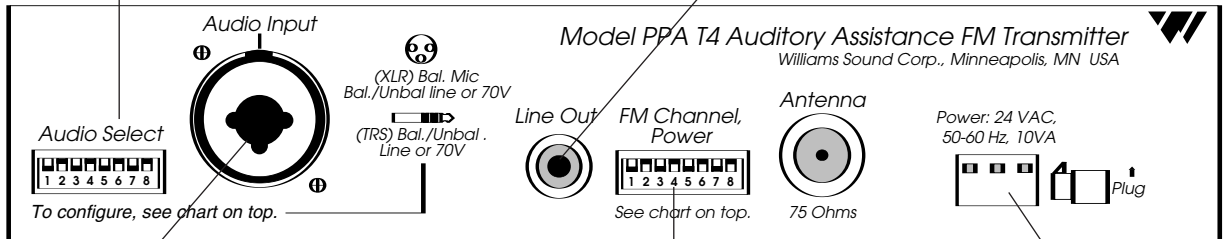
**RF Indicator**  
Green LED indicates transmitter RF is on

**Audio Select Switches**

DIP switch, sets input characteristics, audio processing mode, and input filter cutoff frequency. (See top panel chart or Figure 3)

**Line Out**

Line level output of the fully processed, as transmitted, audio. Can be used for monitoring, recording, or as a feed for other equipment.



**Balanced/Unbalanced Audio Input**  
Combination 3-pin female XLR/1/4" stereo jack, accepts balanced or unbalanced microphone and line level inputs, 25 V or 70 V audio input

**FM Channel/FM Power Switches**  
DIP switch for setting channel frequency and RF output power level. See chart on top of unit for switch configurations.

**Power Connection**  
3-pin, Molex connector for TFP 016 power supply

**IMPORTANT: If you choose to connect to 70 Volt Speaker line, be certain to set the Audio Config switch correctly. Severe damage will occur if you do not.**

# CONTROLS AND CONNECTORS

## FRONT PANEL

### POWER INDICATOR

Indicates that the transmitter has power available and that the unit is on.

### AUDIO ADJUST CONTROL

Controls level of audio signal and is connected between the input amplifier and the audio level processing circuit.

### AUDIO LEVEL INDICATOR

A four-LED array shows audio level in 6 dB steps. Indicator is average responding and is calibrated so that optimum level is reached when the amber 0 light usually blinks and the red +6 light blinks occasionally.

### RF CARRIER INDICATOR

The RF Carrier On Indicator shows when the transmitter is actually transmitting.

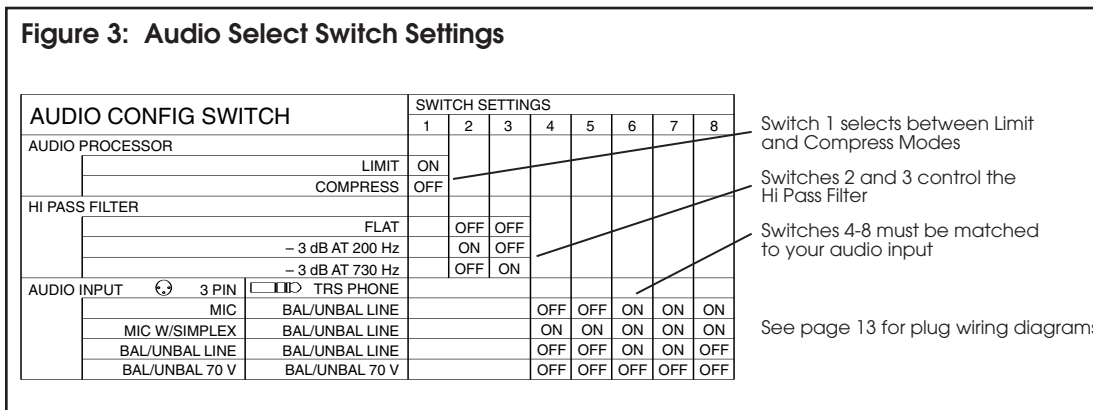
### PHONES JACK

The Phones Jack monitors the processed, “as transmitted” audio. It accommodates standard professional headphones with a 1/4" inch Tip-Ring-Sleeve (Stereo) plug. It can accept any other type of headphone or earphone including those with Tip-Sleeve (Mono) plugs. Earphones with 3.5 mm plugs can be used with a suitable adapter (i.e., Radio Shack Part #274-367). Listening to this signal gives an accurate indication of the audio actually heard by users.

## REAR PANEL

### AUDIO SELECT SWITCH

Input characteristics, audio processing mode, and input filter cutoff frequency are set by this DIP switch. A chart of settings is shown in Figure 3 and on the top of the unit. “On” and “Off” are labeled on the body of the DIP switches.



## INPUT

The input can be configured to accept three types of signal sources: Balanced or Unbalanced Microphone, Balanced or Unbalanced Line, and 70 V speaker line. The input is configured to accept various combinations of these inputs by means of the Audio Select switch. (See Figure 3.)

### PROFESSIONAL MICROPHONE

Most dynamic, ribbon, or condenser microphones equipped with a balanced output and a 3-pin XLR connector can be used. Power can be supplied for condenser microphones according to DIN 45596. It can be turned off for dynamic and ribbon mics, though this is not usually required. Microphones are connected in the normal industry standard pin arrangement. The “in phase” signal conductor is connected to pin 2, the “out of phase” signal conductor is connected to pin 3, and the shield is connected to pin 1 of the XLR connector. Optimum performance is attained with 200  $\Omega$  microphones.

### LOW COST MICROPHONE

Most low cost dynamic or condenser (with an internal battery) microphones equipped with a two conductor 1/4" plug can be connected if an appropriate adapter is used. A suitable adapter is Radio Shack® part number 274-017.

### BALANCED LINE

Any balanced line level source can be connected to the 1/4" jack or the 3-pin XLR input. The Audio Select switch must be set properly. The “in phase” signal conductor is connected to the Tip of the 1/4" jack or to pin 2 of the XLR connector. The “out of phase” signal conductor is connected to the Ring of the 1/4" jack or to pin 3 of the XLR connector. The shield is connected to the sleeve of the 1/4" jack or to pin 1 of the XLR connector. The input impedance is approximately 20 K $\Omega$  and performance is improved with a low source impedance. With most professional audio equipment, connecting the input directly to a line level output is best.

### UNBALANCED LINE

Any unbalanced line level source can be connected to the 1/4" jack or the 3-pin XLR input. The Audio Select switch must be set properly. The “hot” conductor is connected to the Tip of the 1/4" jack or to pin 2 of the XLR connector. The shield is connected to the sleeve of the 1/4" jack or to pins 1 and 3 of the XLR connector. If a Tip-Ring-Sleeve 1/4" jack is used, the Ring must be connected to the Sleeve. Input impedance is approximately 20 K $\Omega$ . Performance is improved with a low source impedance. With most professional audio equipment, connecting the input directly to a line level output is best.

### 2 TO 16 $\Omega$ OR 70 V SPEAKER LINE

The T4 input can also be connected directly to 2 to 16  $\Omega$  or 70 Volt speaker lines.

**IMPORTANT: If you choose to connect to 70 Volt Speaker line, be certain to set the Audio Select switch correctly. Severe damage will occur if you do not.**

When making such connections, it's very important to avoid creating ground loops. Pin 1 of the 3-pin connector and the sleeve of the 1/4" jack are connected directly to the chassis. Normally, one of these would be connected to the common output terminal of the power amplifier connected to the speaker line. But in most installations, there cannot be an external connection from the common terminal of a power amplifier to ground. To avoid this



unacceptable situation, use a connection scheme like those described in the section *Avoiding Ground Loops*.

Set the Audio Select Switch for Line input when connecting to 2-16 Ω speakers. Set the Audio Select Switch for 70 V when connecting to 25 V or 70 V speaker lines.

Speaker lines are most often equalized, making them an inferior signal source. Source signals should not be equalized.

#### TAPE OUTPUT

A line level output of the fully processed, “as transmitted” audio is provided through this jack. Use it for monitoring audio quality, providing a processed signal for recording, or for other uses.

#### FM CHANNEL/FM POWER SWITCH

The channel frequency and RF output power level are set according to a chart shown in Figure 4 as well as on the top of the unit. “On” and “Off” are labeled on the body of the DIP switches. 10 wide band FM frequencies are available.

Once the FM Channel/FM Power Switch is set, no further adjustment is required. RF output can be reduced to alleviate problems caused by inadequate immunity to RF in some audio equipment. Williams Sound offers a document (*Technical Bulletin: Buzz Or Hum In The Sound System, FRM 531*) giving suggestions for improving RF immunity in existing audio equipment.

**Figure 4: FM Channel Switch Settings**

RF CONFIG SWITCH		SWITCH SETTINGS							
		1	2	3	4	5	6	7	8
FREQUENCY	72.100 MHz	ON	ON	ON	ON	OFF			
	72.300 MHz	ON	ON	OFF	ON	OFF			
	72.500 MHz	ON	OFF	ON	ON	OFF			
	72.700 MHz	ON	OFF	OFF	ON	OFF			
	72.900 MHz	OFF	ON	ON	ON	OFF			
	74.700 MHz	OFF	ON	OFF	OFF	ON			
	75.300 MHz	ON	ON	ON	OFF	OFF			
	75.500 MHz	ON	ON	OFF	OFF	OFF			
	75.700 MHz	ON	OFF	ON	OFF	OFF			
	75.900 MHz	ON	OFF	OFF	OFF	OFF			
RF OUTPUT POWER	FULL						OFF	OFF	
	HALF						OFF	ON	
	QUARTER						ON	OFF	
	OFF						ON	ON	

Switches 1-5 toggles control frequency settings

Switch 6 is not used

Switches 7 and 8 control RF output power. The factory setting is FULL, and can be adjusted if conditions warrant. See Troubleshooting Guide.

Remember: If you change the transmitter frequency, you must also change receiver frequencies.

#### POWER IN

21 VAC to 26 VAC only, 50 or 60 Hz (TFP 016 Power Supply included with system). Current consumption is approximately 200 mA. One side of power input is connected directly to circuit common (Chassis).

## DETAILED SETUP PROCEDURE

### STEP 1: CHOOSE A LOCATION AND INSTALL THE TRANSMITTER

It's usually most convenient to locate the T4 next to the public address equipment because your transmitter location must have the audio feed and 120 VAC power available.

#### FOR SIMPLE INSTALLATIONS

Place the transmitter on a level surface where there are no substantial metal or other electrically conductive objects between the antenna and the listening area. After initial adjustments, there will be no need to access the unit.

#### FOR ENGINEERED INSTALLATIONS

The transmitter can be mounted in an equipment rack. Use a Williams Sound rack mount kit (RPK 005 or RPK 006). Make sure there is good electrical contact between the transmitter chassis and the rack cabinet.

Ambient temperature of the transmitter location must not exceed 125° F.

### STEP 2: CHOOSE A LOCATION AND INSTALL THE ANTENNA

The T4 is equipped with a with a short flexible antenna (ANT 021). The ANT 021 threads onto a stud recessed in a hole on the top of the transmitter. Do not use excessive force to tighten the antenna; it need only be finger tight.

The T4 can also be purchased with a coaxial antenna (ANT 005) or Wall Mount Dipole Antenna (ANT 024).

#### REMOTE ANTENNA LOCATION TIPS

- ▶ Install the ANT 005 or ANT 024 with its elements vertical. It should be near or within the listening area and somewhat above the seats. However, do not install the antenna directly overhead. There is a null in the coverage area off the ends of the antenna.
- ▶ The antenna is best installed on a wall 10 to 15 feet above the floor. It may be located in the next room from the listening area if the separating wall does not contain metal lath, steel studs, or significant ductwork. Do not install the antenna in an organ chamber. The numerous pipes of an organ significantly deflect and absorb the radio signal.
- ▶ The ANT 005 and ANT 024 feedline is classified under the National Electrical Code as Class II wiring and may be installed in conduit with other Class II wiring. It **SHOULD NOT** be installed with Class I (power) wiring.
- ▶ Even though regulations allow the feedline to be installed with other audio system wiring, you might still choose not to do this. Because all coaxial cable leaks to some degree, other improperly shielded audio equipment might be interfered with. In these cases, either avoid such installation or take steps as outlined in Williams Sound's *Technical Bulletin: Buzz Or Hum In The Sound System* (FRM 531). Other audio equipment will not disturb the transmitter or its antenna.
- ▶ Do not connect the coaxial cable to the building or electrical ground in any way.

### AVOIDING UNDESIRABLE ANTENNA INSTALLATIONS

Transmission (range, directional properties) can be severely impaired by improper installation of the antenna.

- ▶ DO NOT install the antenna within any metal enclosure.
- ▶ DO NOT install the antenna where it is within about 4 feet of any metal object that is more than about 2 feet long.
- ▶ DO NOT install the antenna where it is separated from the listening area by any substantial metal object, such as heating ducts, structural steel, foil backed insulation, steel studs or metal lath.
- ▶ DO NOT install the antenna with its elements horizontal. It is a technical advantage to use vertical polarization as well as an FCC requirement.

### STEP 3:

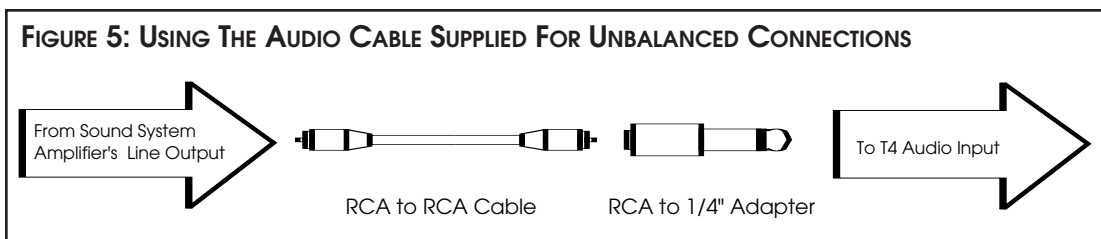
#### CHOOSE A CHANNEL

Normally, the T4's factory-set channel (72.9 MHz) requires no change. However, it may prove necessary to use an alternate channel if another hearing assistance system or authorized radio service is operating on 72.9 MHz in your area.

In this case, you may easily set the T4 Transmitter to any of the 10 available channels using the FM Channel/Power Switch. Remember, receivers must also be set to the same frequency. See page 20 for receiver tuning instructions.

**IMPORTANT:** Some cities have other radio services licensed on hearing assistance channels, and under FCC rules governing hearing assistance, you must yield to them. A list is included with the transmitter of cities where other radio services are known to exist. Do not use frequencies that are known to be used by licensed radio services in your city, either if they are on the list or if you discover one.

**NOTE:** If you seem to be having interference problems, the best course of action is to first work through the Trouble Shooting Guide—in case the problem is *not* caused by interference. Try retuning if the problem remains.



## STEP 4:

### CHOOSE AND CONNECT AN AUDIO SOURCE

Your choice of audio source can greatly affect the usefulness of your hearing assistance system.

#### SIMPLE INSTALLATIONS

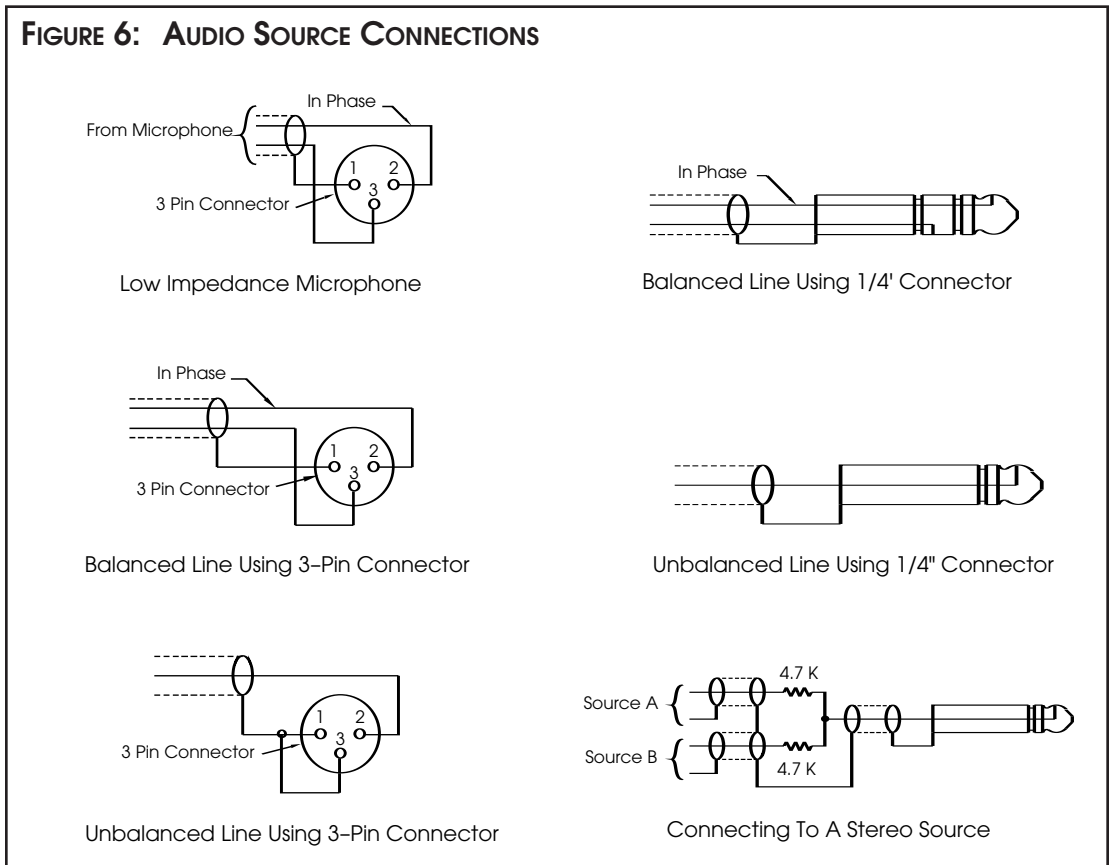
In simple sound systems, the best audio source is usually a Tape or Auxiliary output jack on the system's amplifier. Set the Audio Select switch for the type of source you have (See Figure 6.) and plug in a suitable audio cable. If those jacks are already in use, a simple "Y cord" can easily make the connection. See Figure 5 for use of the PPA 250's audio cable.

#### ENGINEERED INSTALLATIONS

In an engineered audio system, use good wiring practice to properly connect the audio feed as you would connect any other piece of high quality audio equipment. See the section *Avoiding Ground Loops* and *Choosing A Good Audio Source*.

#### MULTI-CHANNEL SOURCES

By constructing a simple resistive mixer, stereo (or 3 channel) sources can be connected to the T4. Additional channels can be accommodated by adding a resistor for each source. Necessary resistors can be obtained from Williams Sound (Part Number RFC 472) or from any local electronics parts supplier. See Figure 6.



## 2 TO 16 $\Omega$ OR 70 V SPEAKER LINE

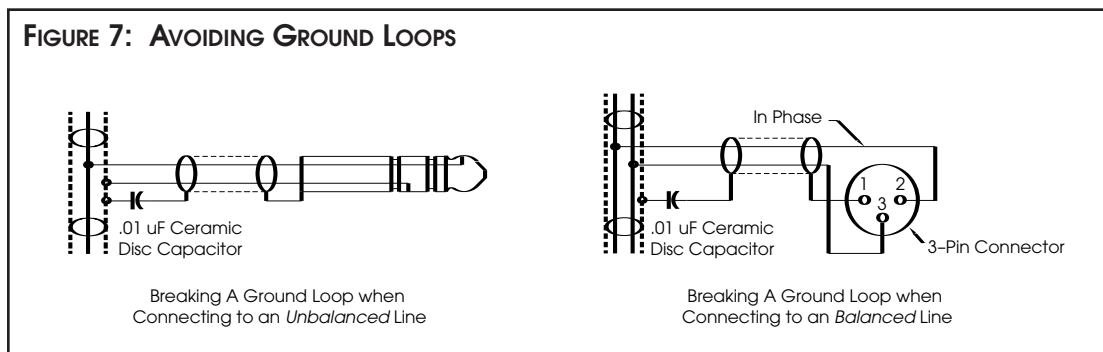
The T4 input can also be connected directly to 2 to 16  $\Omega$  or 70 Volt speaker lines. **If you choose to connect to 70 Volt Speaker line, be certain to set the Audio Select switch correctly. Severe damage will occur if you do not.** When making such connections, it's very important to avoid creating ground loops. Pin 1 of the 3-pin connector and the sleeve of the 1/4" jack are connected directly to the chassis. Normally, one of these would be connected to the common output terminal of the power amplifier connected to the speaker line. But in most installations, there cannot be an external connection from the common terminal of a power amplifier to ground. To avoid this unacceptable situation, use a connection scheme like those described in the section *Avoiding Ground Loops*.

Set the Audio Select Switch for Line input when connecting to 2-16  $\Omega$  speakers. Set the Audio Select Switch for 70 V when connecting to 25 V or 70 V speaker lines.

Speaker lines are most often equalized, making them an inferior signal source. Source signals should not be equalized.

### AVOIDING GROUND LOOPS

Sometimes the normal way of connecting a T4 transmitter to other audio equipment creates a "ground loop". If other ground conditions are favorable, ground loops can often be eliminated by using the T4's balanced input amplifier (even on unbalanced sources), and connecting a capacitor in series with the audio line shield to the transmitter's ground. This method also maintains good RF shielding. Determining the effectiveness of this method for your installation usually requires experimentation. (See Figure 7.)



### CHOOSING A GOOD AUDIO SOURCE FOR THE HEARING IMPAIRED

In engineered sound systems, the designer can specifically provide an advantageous mix for the hearing impaired. Here is a list of attributes that improve the installation's usefulness:

- ▶ The audio should be "dry," with minimal reverberation, either natural or artificially generated.
- ▶ The signal should be "flat," with no equalization as might be found in the feed for house speaker amplifiers. Connect the transmitter's input ahead of any equalizers. However, equalization provided by the parametric equalizers on each input channel of a console can be helpful.
- ▶ The audio should not be subject to a compressor, limiter, or other signal processing equipment. The transmitter has an effective audio processor. Additional compression is

not helpful to the hearing impaired and can contribute to excessive noise in the receiver outputs. See the section below, *Deciding Between Compress Or Limit Settings*.

- ▶ If an audio delay is available for use in large auditoriums, it's usually best to use it. Because radio signals travel faster than sound, delaying the transmitted audio so that an average listener (in the middle of the listening area) hears the transmitted audio a few milliseconds after audio from the main sound reinforcement system speaker is helpful. This will also help audience members who lip read.
- ▶ The FM hearing assistance system transmits audio with very good fidelity, using the same technical standards as commercial FM broadcast radio. Its quality is usually limited by the audio source and by the earphones used with the receivers. Therefore, the audio source signal should be of the highest quality possible.

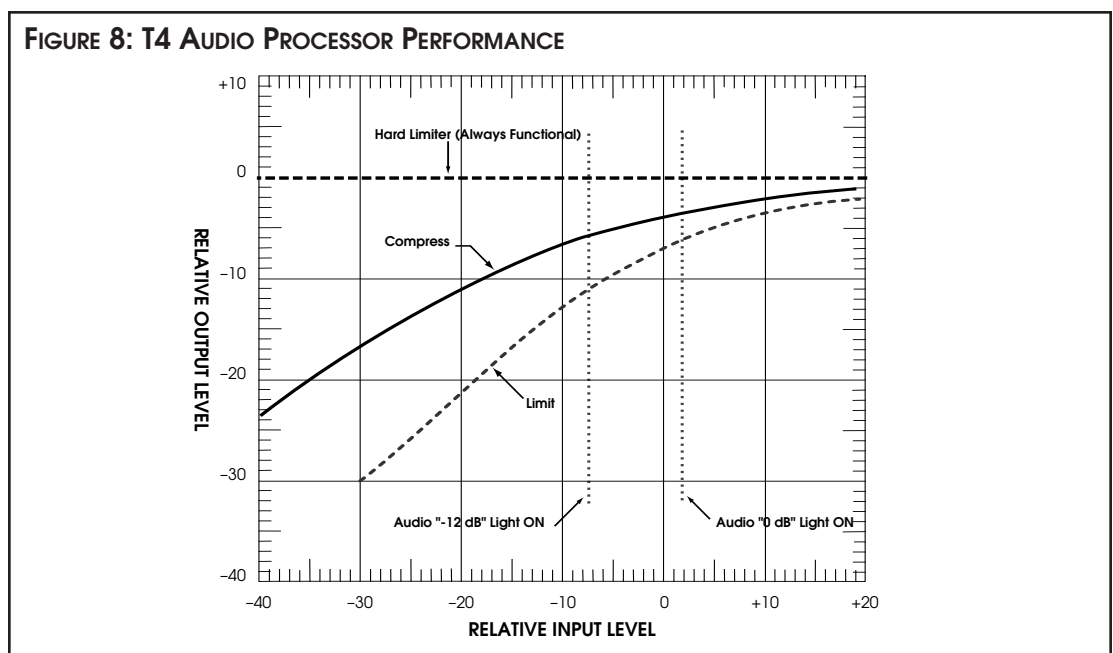
#### DECIDING BETWEEN COMPRESS OR LIMIT SETTINGS

It's easy to select Compress or Limit using one position of the Audio Select Switch. When choosing which mode to use, the system operator should consider the expected audience and program material. Figure 8 shows response curves for the compressor/limiter circuitry.

A hearing impaired person's perception of what is "too loud" is usually similar to a normal hearing person's. However, they often don't hear soft sounds as well. In other words, their dynamic range is reduced. To compensate, the T4's Audio Processor can compress the audio signal, reducing the dynamic range and making it more useful to the hearing impaired.

Some hearing impaired people cannot tolerate as loud a sound as those with normal hearing. When accompanied with hearing loss, their dynamic range is significantly reduced, both for soft and for loud sounds. Compression is especially useful for these individuals.

In some situations, however, such as concerts, compression is annoying to listeners—especially musical purists. Limiting provides control of the modulation level and is optimized to cause a minimum of disturbance to the sound. It's acceptable to the most discerning listeners, but not as helpful to hearing impaired people as compression.





**STEP 5: CONNECT THE POWER SUPPLY**

The T4 transmitter is powered by a wall mounted transformer supplying 24 VAC. Plug the transformer into a suitable 120 VAC outlet and connect the attached cable to the transmitter. The cable connector has a retaining catch which must be installed toward the top of the transmitter as shown on the T4's back panel. Though no damage will result, the T4 will not operate if you install the cable upside down.

Neither the T4, nor its power supply, are equipped with a power switch. Because there is no "wear out" mechanism and power consumption is minimal, continuous operation is not a problem. If you want to control power to the transmitter, connect the power transformer to a switched 120 VAC supply or a master switched outlet for the entire sound system.

**STEP 6: ADJUST THE AUDIO INPUT CONTROL**

Play a compact disc or other quality audio source through the complete sound system at a level that is typical of normal operation. Adjust the Audio Input control so that the Level Indicator *0 dB* LED generally lights and the *+6 dB* LED lights occasionally.



## ASSURING EXCELLENT PERFORMANCE

The PPA 250 consists of a transmitter and several receivers used to deliver an audio signal to listeners who are hard of hearing. The audio signal is usually provided by equipment manufactured and installed by others. The PPA 250 provides excellent audio performance under most conditions. However, Williams Sound equipment does not correct faults in incoming audio. This section is intended to help installers and users recognize proper operation and correct faults whenever possible.

The following tests can be done without instruments to assure that a system is working properly.

### HOW TO RECOGNIZE PROPER OPERATION

Step 1: Play a compact disc through the complete sound system at a level that is typical of normal operation.

Listen to the hearing assistance system using a receiver with a factory-supplied earphone. Set the volume on the receiver at about 3. Comfortable listening is usually achieved with a setting of 2, or even lower. If you have normal hearing, a volume control setting of 3 will likely be too loud for comfortable listening. There should be no audible distortion, hum or noise.

Williams Sound wide band FM systems transmit audio using the same technical standards as FM Broadcast radio. Therefore, the received sound should be of high quality. Using a suitable adapter (Radio Shack Part #274-361), you can connect a professional headphone to a receiver for a critical evaluation.

Step 2: Pause or stop the CD.

There should be no significant increase in noise or hum immediately after the sound is stopped.

Step 3: Play the CD again.

Listen to the system using a receiver. Check for coverage in the listening area. Walk through and around the entire audience area. The sound in the receiver should remain clear and noise-free within the audience area.

Some small spots in the listening area will seem to “dropout”, getting no signal. This is normal and is caused by RF signal reflections from relatively large electrically conductive objects. In most installations, the areas of reduced reception are less than one foot wide and few in number. Moving the receiver only a few inches usually restores reception.



# RECEIVER USE INSTRUCTIONS

## RECEIVER MODEL PPA R7

Receiver Model PPA R7 has a single, wheel-type volume control and an earphone output jack.

### BATTERY INSTALLATION

Open the battery compartment using a coin in the slot in the bottom of the receiver. Press the battery into place, **observing proper battery** polarity. Incorrect insertion of the battery is difficult, and may cause both mechanical and electrical damage to the receiver not covered by the 5 year warranty. The receiver will not work with the battery incorrectly installed.

### CONNECTING EARPHONES

Plug an earphone into the jack near the thumb wheel volume control. Only monophonic earphones will operate properly. If stereo headphones are used, sound will be heard only in one side. A suitable adapter (Radio Shack Part #274-368), can be used so that stereo earphones operate on both sides. Williams Sound extensively evaluates the earphones and headphones included with the PPA 250. We can only assure optimum performance when Williams sound earphones and headphones are used.

### OPERATING THE RECEIVER

Turn the receiver on by rotating the volume control in the direction of the arrow on top of the case. The “On” indicator will light.

Turning the knob in the direction of the arrow will increase the volume. Turning the knob against the arrow will decrease the volume. To avoid depleting the battery, make sure the receiver is turned off when not in use.

If you’re using the PPA 250 with an existing sound system, make sure the sound system is turned on. Have someone speak into a sound system microphone while you listen with the receiver and earphone. You should be able to hear their voice through the receiver.

If you’re using the PPA 250 with a microphone—and not a complete sound system—have someone speak into the microphone while you listen with the receiver and earphone. You should be able to hear their voice through the receiver.

Note: The earphone cord is the receiving antenna. Do not bunch up the cord or wrap it around the receiver.


## ADDITIONAL RECEIVER INSTRUCTIONS

### MODELS PPA R7-4 AND PPA R7-6

The R7-4 and R7-6 receivers feature a channel selector knob on top of the receiver. Turn the selector knob until you hear the desired program.

### MODEL PFM R16:

The R16 Receiver features an environmental microphone input and dual volume controls. The taller knob turns the receiver on and off and controls the transmitted signal level. The



shorter knob controls the microphone signal level. By adjusting the two volume controls, you can hear a mixture of the transmitted signal and nearby sounds.

Note: Some users may not be helped by this system. Severe hearing loss may require using the system with a telecoil coupler (i.e., Neckloop) and personal hearing aid.

## **USING A RECEIVER WITH A HEARING AID**

Williams Sound PPA Receivers can be used with hearing aids using three different methods:

### **NECKLOOP TELECOIL COUPLER**

Neckloops are cords which hang around the neck and couple magnetically with T-Coil equipped hearing aids.

### **SILHOUETTE TELECOIL COUPLER**

These telecoil couplers are worn behind the ear, right next to telecoil-equipped hearing aids.

### **DIRECT AUDIO INPUT (DAI) CORD**

Direct Audio Input cords can be used with compatible hearing aids as well as with Cochlear Implant Processors.

## BATTERY INFORMATION

### DISPOSABLE BATTERIES

In normal use, a heavy-duty 9 Volt battery such as the Eveready 216 will last about 10 hours. Alkaline batteries such as the Eveready 522 will provide about 32 hours of use. If the sound becomes weak or distorted, replace the battery. The indicator light may still be on, even with a battery that is weak. Do not leave dead batteries in the receivers. Battery corrosion is not covered by the Williams Sound five year warranty.

### RECHARGEABLE BATTERIES

The R7 can also use 6 or 7 cell nickel cadmium rechargeable batteries. Optimal battery life is achieved with 7 cell batteries, such as the Williams Sound BAT 003. 6 cell batteries are usually marked “7.2 V”; 7 cell batteries are marked “8.4 V”. A fully charged 7 cell battery such as the BAT 003 will provide about 6 hours of operation per charge. Damage from improper charging is not covered by the Williams Sound five year warranty.

The battery installed in the receiver may be recharged in the receiver **only if it is a Nickel Cadmium battery, and only if the correct Williams Sound charger is used.**

Recharge batteries only with a Williams Sound BAT 005 Single Charger or a Williams Sound CHG 1269A Multiple Charger. The charger is connected to the receiver through the EAR jack. Make sure the receiver is turned off during charging. A complete recharge cycle takes about 14 hours. Receivers should not be left charging continuously when not in use.

### **!! IMPORTANT WARNINGS !!**

**DO NOT ATTEMPT TO RECHARGE ZINC CARBON (“HEAVY DUTY”), ALKALINE, OR LITHIUM BATTERIES!**

**DO NOT ATTEMPT TO RECHARGE DISPOSABLE BATTERIES!** These batteries may heat up and explode, causing possible injury and damage to the equipment.

Avoid shorting the plus and minus battery terminals together with metal objects. Battery damage and burns can result!

Use only Williams Sound Supplied chargers and batteries!

# FREQUENCY CHANGE INSTRUCTIONS

Normally, the PPA 250's factory-set channel (usually 72.9 MHz) requires no change. However, if another hearing assistance system or authorized radio service is operating on 72.9 MHz in your area, it may prove necessary to use an alternate channel

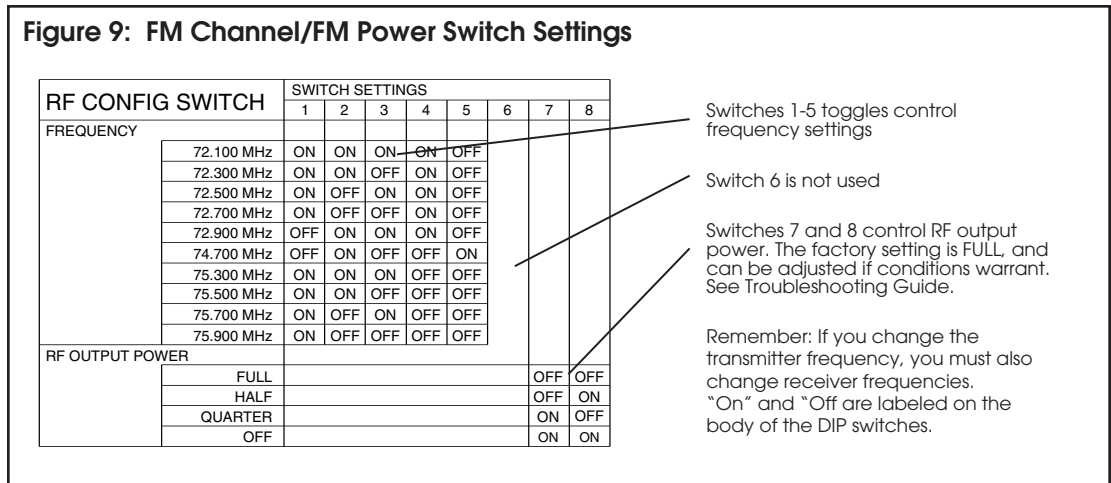
In this event, the PPA System 250's operating frequency can easily be changed to an alternate channel to avoid interference.

See the following sections for instructions on changing frequencies.

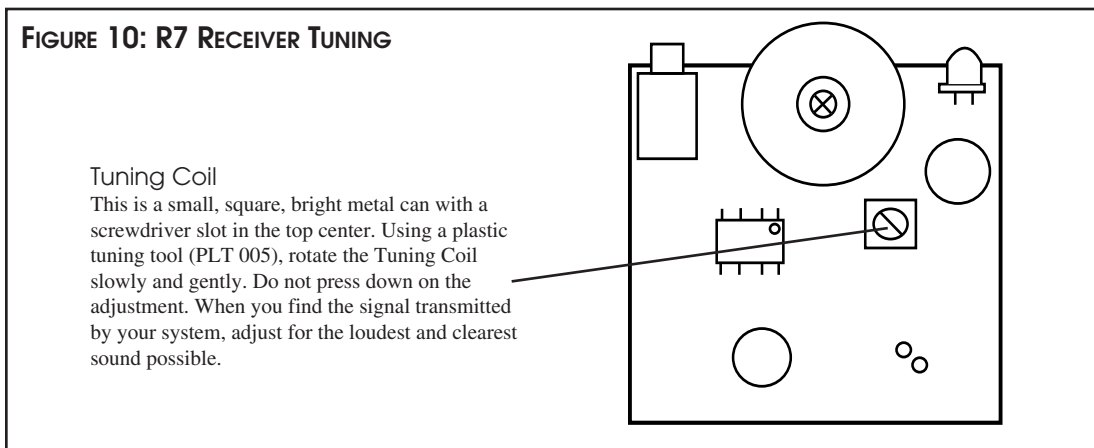
## TRANSMITTER FREQUENCY CHANGE PROCEDURE:

Set the T4 Transmitter to any of the 10 available channels using the FM Channel/FM Power Switch. See figure 9.

**IMPORTANT:** Some cities have other radio services licensed on hearing assistance channels. Under FCC rules governing hearing assistance, you must yield to them. A list of cities where other radio services are known to exist is included with the transmitter. Do not use frequencies that are known to be used by licensed radio services in your city, either if they are on the list or if you discover one.



## RECEIVER FREQUENCY CHANGE INSTRUCTIONS



Tuning for the R7 and R-16 Receivers is determined by a single tuning coil. (See Figure 10.) A plastic tuning wrench (PLT 005) is needed to adjust the receiver tuning coil.

Most Williams Sound receivers, including R7's, are set at the factory to 72.9 MHz. (Yours may have been set to another channel when they were ordered.) To change the frequency of R7 receivers:

- Step 1: The receiver must be tuned under moderate or weak signal conditions. Set the T4 Transmitter's RF Output Power to QUARTER. (See Figure 9.) Play a CD or cassette through the sound system, or have someone speak into a microphone.
- Step 2: Make sure the transmitter is set for the channel to which you want to tune the receiver, then move 50-75 feet away from the transmitting antenna.
- Step 3: Open the battery compartment, then lift up on the battery flap to open the back of the receiver. This will expose the circuit board.
- Step 4: Locate the tuning coil. (See Figure 10.) The only adjustable item in the unit, the tuning coil is a small, square, bright metal can with a screwdriver slot in the top center.
- Step 5: Use the earphone supplied with the receiver to listen for the transmitted signal. Slowly and gently rotate the tuning coil with a plastic tuning tool (PLT 005), Do not press down on the coil. When you find the signal transmitted by your system, adjust for the loudest and clearest sound possible.
- Step 6: Re-tune all the receivers, marking the new frequency inside each's case for future reference.



## SUGGESTIONS FOR RECEIVER MANAGEMENT

Different types of facilities use varying approaches to receiver management and earphone sanitation. Below are some options that customers have used successfully.

1. Regular users purchase or are given their own receiver and take care of their own batteries and earphones.
2. The facility labels a receiver and earphone for each regular user. The facility maintains the units.
3. Ushers issue receivers to people who request them.  
  
Earphones are sanitized after use. Foam ear cushions can be replaced or washed with a mild detergent, rinsed thoroughly and air-dried. The EAR 022 Surround Earphone can be sanitized with an alcohol pad.  
  
The receivers can be stored in a multiple compartment storage case with a credit card or driver's license left as collateral for the receiver.
4. Regular users purchase their own earphone or headphone and bring them to use with receivers at the facility.

# TROUBLE SHOOTING GUIDE

## NO TRANSMITTER OPERATION

### POWER LIGHT NOT ON

- ▶ Most likely, there is no power. Make sure the power outlet is working and that the PPA 250's power supply (TFP 016) is connected correctly.

## AUDIO DIFFICULTIES (AS HEARD IN PHONES JACK ON TRANSMITTER)

### NO AUDIO HEARD IN PHONES JACK

- ▶ Check to see if there is a signal coming from your audio source. Check and correct your audio source if necessary.
- ▶ Check to see if the Audio Level control has been turned all the way down. If so, adjust it.
- ▶ Check to see if there is an incorrect or defective connection from your audio source. See page 13-14 for detailed connection instructions.

### NOISE IN AUDIO

- ▶ Check to see if there is noise in source audio. To find out, disconnect the audio cable. If the noise disappears you noise problem is in the source. Correct or repair your audio source.
- ▶ Check to see if your source level is too low. If so, readjust your source audio level or reset Audio Select switch to match the existing source level.

### BUZZ OR HUM IN AUDIO

- ▶ Check to see if the buzz or hum is in the source. If so, correct or repair your audio source.
- ▶ Check to see if there is an incorrect or defective connection from source. If so, correct your connections. See page 13-14 for detailed instructions.

### DISTORTED AUDIO

- ▶ Check to see if the source audio is distorted. If so, correct or repair your audio source.
- ▶ Perhaps the Audio Select switch is not set to match your audio source. If this is the case, reset the Audio Select switch to match and/or readjust the source.
- ▶ Check to see if the Audio Level control is set too high. If the +6 level indicator is on all the time, adjust the Level control counter-clockwise.
- ▶ If the Audio Level control is set near fully counter-clockwise, the Audio Select switch is set incorrectly. Set Audio Select switch to match your audio source and/or readjust the source.

#### **NOISE IN AUDIO “GROWS” WHEN PROGRAM IS SILENT**

- ▶ The Audio Level control is set too high. You’re probably also seeing the +6 level indicator lighting all the time. To correct, adjust the Audio Level control.
- ▶ It could be that the T4’s Audio Processor is set for Compress when Limit might be more appropriate for the type of program being transmitted. Reset the Audio Select switch for Limit. See page 15.

### **RECEPTION (AT RECEIVER) DIFFICULTIES**

Check *Audio Difficulties (as heard in phones jack on transmitter)* before checking reception.

#### **NO RECEPTION**

- ▶ If the the T4’s RF Indicator LED is not on, it’s possible that an invalid channel is set on the FM Channel/FM Power Switch. Reset this switch to a valid channel.
- ▶ Check to see if the antenna has been disconnected. If so, attach the antenna correctly.
- ▶ Check to see if the output power is set to “OFF”. If so, reset the FM Channel/FM Power Switch for FULL, HALF, or QUARTER RF output.

#### **INSUFFICIENT RANGE, GOOD RECEPTION NEAR TRANSMITTER, POOR AT A DISTANCE**

- ▶ Check to see if the transmitting antenna was installed incorrectly. If so, correct or replace the antenna. The signal should be clearly audible at a 300 foot distance with the ANT 021 and a 500 foot distance with the ANT 005.
- ▶ Make sure the transmitting antenna is not in an unsuitable location. Perhaps the transmitting antenna was installed inside a metal enclosure or is separated from the reception area by electrically conducting objects. (i.e., steel stud walls, heating ducts, substantial structural steel, or 2x2 or 2x4 ceiling grid.) In either case, reinstall the antenna according to installation instructions, locating it outside metal enclosures and away from electrically conducting objects.
- ▶ Perhaps there is a strong interfering signal. If so, make sure the transmitter and antenna are correctly installed. Set the transmitter to FULL power output. If this does not solve the problem, change the PPA 250’s frequency by setting the FM Channel/FM Power Switch according to the instructions on page 24.0


#### **DROPOUTS: AREAS OF NO RECEPTION WITHIN NORMAL RECEPTION AREA**

- ▶ If dropout areas are few and less than 2 feet across, there is no problem. This is part of normal operation.
- ▶ If dropouts are many and large, see the section on insufficient range above.

#### **POPS OR SIMILAR LARGE DEFECTS IN RECEIVED AUDIO**

- ▶ Check to see if there is defective audio at the transmitter. If so, See the *Audio Difficulties* section.
- ▶ Check to see if the receivers are incorrectly tuned. If so, adjust receiver according to instructions on page 20.



- 
- ▶ Check to see if there is a strong interfering signal by listening to the receiver with the transmitter turned off. If an interfering signal is causing overload in the receivers, see the section on insufficient range above. If changing channels does not remedy the problem, use other technology, such as Williams Sound Narrow Band FM or Williams Sound Infrared.

**USERS MUST TURN RECEIVER VOLUME CONTROLS WAY UP (TO 4 OR 5) TO GET ENOUGH VOLUME**

- ▶ Perhaps there is insufficient audio level. If so, the audio level indicator will read too low because the audio level is set incorrectly on the transmitter. Correct the Audio Level control setting.
- ▶ It could be that the input is not configured for the audio source used. If not, correct the setting of the Audio Select switch.
- ▶ Some users may not be helped by this system. Severe hearing loss may require using the system with a telecoil coupler (i.e., Neckloop) and personal hearing aid.

**USERS COMPLAIN OF NOT HEARING LOW LEVEL SOUNDS**

- ▶ Check to see if the Audio Level is set too low. If so, adjust the Audio Level, carefully noting the Level Indicator. The +6 LED should light occasionally.
- ▶ Check to see if the transmitter is set for Limit when the program material would benefit from Compress mode. If so, set the Audio Select switch for Compress.

**USERS COMPLAIN OF TOO MUCH NOISE DURING SOFT AUDIO. DYNAMIC RANGE OF MUSIC REDUCED TOO GREATLY.**


- ▶ Check to see if the Audio Level control is set too high. This problem is more likely to occur in Compress Mode, but can also occur in Limit Mode. To reduce this noise, adjust the Audio Level, carefully noting the Level Indicator. The +6 LED should light occasionally.
- ▶ Perhaps the transmitter is set for Compress when Limit Mode would be more suitable, given the program material. If so, set the Audio Select switch for Limit.

**BUZZ IN OTHER EQUIPMENT WHEN TRANSMITTER IS ON OR OFF**

- ▶ This is not an RF problem. Instead, it is likely caused by incorrect audio connections, a ground loop, or defective equipment. To remedy, use proper audio wiring practice to make connections described on page 14.

**BUZZ OR OTHER NOISE IN EQUIPMENT ONLY WHEN TRANSMITTER IS ON**

- ▶ This is likely an RF-induced disturbance in the other equipment. To remedy, try these steps in order until the buzz is eliminated:
  1. Make certain the transmitter chassis is connected to the equipment cabinet rails.
  2. Make sure antenna connections are secure.
  3. Set the T4 Transmitter to HALF or QUARTER power output using the FM Channel/FM Power Switch.
  4. Install transmitter at a distance from sensitive equipment.
  5. Use a remote antenna. (ANT 005 or ANT 024)
  6. Make sensitive equipment more immune to RFI/EMI. The manufacturers of your



audio equipment may offer application notes for this purpose. Williams Sound offers a document giving suggestions for improving RF immunity in existing audio equipment. (*Technical Bulletin: Buzz Or Hum In The Sound System, FRM 531*)

## WARRANTY

The Williams Sound T4 Transmitter and R7, R7-4, R7-6, and R16 Receivers are warranted against defects in workmanship and materials for FIVE YEARS.

Microphones, earphones, cables, carry cases, rechargeable batteries and chargers are warranted against defects in workmanship and materials for NINETY DAYS.

This warranty does not extend to intentional or accidental physical damage. This warranty applies only to products returned to Williams Sound for service.

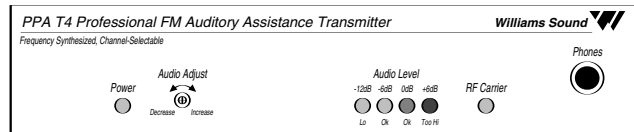
To return a product for service, call 1-800-843-3544 and request a Return Authorization (RA) number.

# Pro Wide-band System, Model PPA 250 SPECIFICATIONS

## PERSONAL PA Transmitter Model T4

Dimensions, Weight:	8.45" (21.5 cm) W x 8.18" (20.8 cm) D x 1.72" (4.4 cm) H, 3lbs. (1.5 kg)	Frequency Accuracy:	±.005% stability, 0-50° C
Color:	Black epoxy paint with white legends	Deviation:	± 75 kHz maximum
Rack Mount:	One EIA rack space high, 1/2 space wide 1-2 units can be mounted in a single rack space with optional RPK 005 (single) or RPK 006 (double) Rack Mount Kits	Pre-Emphasis:	75 µsec
Power:	21 VAC minimum; 26 VAC maximum, 50 or 60 Hz 4.8 VA nominal; 10 VA maximum; Wall mount transformer for 105 to 130 VAC included	RF Field Strength:	Does not exceed 8 mV/m at 3 m
FCC ID:	CNMT4	Nominal Range:	300-500 ft. (90-150 m)
Operating Freqs:	72.1-75.9 MHz * 10 wide-band channels, selectable	Audio Proc. Functions:	Soft Knee Limit or Compress Compression 10 dB add'l gain when input is -20 dB 20 dB add'l gain when input is -40 dB > 10 dB add'l gain when input is -45 dB
		Soft Limiting	
		Frequency Response:	30 - 16000 Hz, +1, -3 dB
		Signal to Noise Ratio:	More than 70 dB below 75 kHz deviation in Limit mode
		Note:	Maximum transmitter range is achieved using the ANT 005 coaxial antenna

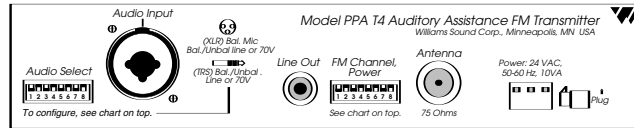
### T4 Transmitter Front Panel



Power Indicator:	Green LED
Audio Level Control:	Rotary pot, screwdriver adjust, used with audio level indicator lights

Audio Level Indicators:	4 LED array, reads -12, -6, 0, and +6 dB
RF Carrier On Indicator:	Green LED indicates transmitter RF is on
Phones Jack:	1/4" TRS (Stereo) jack

### T4 Transmitter Rear Panel



Audio Select Switch:	Eight-section DIP switch
Audio Input:	Combination 3-pin XLR, 1/4" TRS jack
Line Output:	RCA jack, 0.6 V output impedance 1000 Ω
FM Channel Switch:	Eight-section DIP switch (Seven used)
Antenna Outputs:	Hard-wired 75 Ω Coaxial Antenna (ANT 005) uses RG-59 cable, 400 ft. (122 m) max. cable length

Power Connections:	3-pin Molex® connector		
Input Levels	<u>Minimum</u>	<u>Nominal</u>	<u>Maximum</u>
Microphone	100 µV	1 mV	100 mV
Bal or Unbal Line	10 mV	100 mV	10 V
Bal or Unbal or 70 V speaker line	2.3 V	23 V	230 V

**IMPORTANT:** If you choose to connect to 70 Volt Speaker line, be certain to set the Audio Config switch correctly. Severe damage will occur if you do not.

## PERSONAL PA Receiver, Model PPA R7

Dimensions & Weight:	3-5/8" L x 2-3/8" W x 7/8" H (92.1 mm x 60.3 mm x 22.2 mm) 3.2 oz (90 g) with battery
Color:	Gray
Battery Type:	9 Volt, Eveready 216 Carbon Zinc, Eveready 522 Alkaline, or BAT 003 Ni-Cad
Battery Drain:	14 mA, nominal
Battery Life:	10 hours with Eveready 216 32 hours with Eveready 522 6 hours/charge with BAT 003
FCC ID:	CNM R7Y
Operating Freq.:	Pre-Tuned, Adjustable, 72 MHz - 76 MHz *
Intermediate Freq.:	70 kHz
FM Deviation:	75 kHz
De-Emphasis:	75 µS

AFC Range:	± 300 kHz
Sensitivity:	2 µV at 12 dB Sinad with squelch defeated
Squelch:	Squelches at 10 µV for min. 50 dB S/N ratio
Input Overload:	20 mV
Frequency Response:	100 - 10 kHz, ± 3 dB
Signal-to-Noise Ratio:	50 dB at 10 µV
Receive Antenna:	Integral with earphone/headphone cord
Audio Output:	250 mW, max. at 16 Ohms
Output Connector:	3.5 mm mini phone jack, also serves as a charging jack for rechargeable battery
Earphone:	Earbud-type with foam cushion, 3.5 mm plug, 32 Ω
Note:	The R7 Receiver can be field tuned to any of 10 wideband channels using the PLT 005 Tuning Tool.

\* Note: FCC Rules limit the use of the 72-79 MHz band to hearing assistance for the handicapped only.

Your Authorized Williams Sound Dealer Is:

**Williams Sound Corp.**  
10399 West 70th St., Eden Prairie, MN 55344-3459  
U.S.A. 800-328-6190 / 952-943-2252 / FAX: 952-943-2174  
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