User's Guide

Instructions for Installation and Operation

900 MHz Monaural Audio Transmitter
Model PAT900

900 MHz Monaural Audio Receiver
Model PAR900M

APPLIED WIRELESS©

Long Range Wireless Applications

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Pro Audio Transmitter
Model PAT900

Pro Audio Dual Diversity Receiver
Model PAR900M

Introduction / Product Descriptions

Model PAT900 from Applied Wireless Inc. is a high quality transmitter designed to broadcast excellent quality low noise audio from any monaural line level source, to the Applied Wireless model PAR900M receiver. The PAT900 transmitter is compatible with line level audio sources such as mixers, CD and DVD players, commercial radio (AM or FM) receivers, satellite radio receivers, MP3 players, and PCs. It also has a Mic input as well. These products are for use with amplified speakers or speakers with separate amplifiers. Model PAT900 conforms to FCC Part 15 requirements for unlicensed use, and will transmit over distances up to 450-950 feet*. The range may be increased substantially through the use of a directional antenna (such as a flat panel or Yagi) at the receiver.

* Unobstructed, straight line-of-sight range. See Table 2 on Antenna Range Performance.

The PAT900 transmitter and the PAR900M receiver provide twenty-four user-selectable channels of operation within the 902 – 928 MHz band to enable simultaneous operation of multiple transmitters in a common area. Excellent frequency stability is assured through the use of crystal references. The products incorporate precise FM modulation and sophisticated filters to provide stable, interference-free high-fidelity audio reception.

The transmitter and receiver are housed in rugged aluminum extrusion enclosures. AC power converters (9-VDC) are supplied, along with RCA phono-type audio cables. By FCC regulation, the transmitter's quarter-wave antenna is permanently attached (substituting a different antenna, or mounting the antenna remotely are not permitted). The antennas supplied with the receiver are a removable quarter-wave ground plane (sometimes

referred to as a half-wave) antenna. The receiver's antennas attach with a BNC connector, enabling the use of alternative antennas, (such as a directional flat panel or Yagi) to increase operating range (please contact Applied Wireless for a selection of available antennas).

The PAT900 transmitter and the PAR900M receiver are well-suited for many diverse applications, including distribution of audio entertainment content throughout a building, DJ audio, event audio, commercial and industrial surveillance, monitoring, security, etc.

Installation Instructions

Before Beginning the Installation
Plan your installation carefully. The physical location and orientation of the transmitter and receiver antennas (relative to each other and their surroundings) will have a significant influence on reception quality at the receiver. The following guidelines will generally yield the best results:

- The transmitter antenna should be positioned vertically (pointing either up or down). The receiver antennas should be canted off vertical at up to a 45-degree angle.
- Antennas should be positioned high enough to enable people to move about below them without creating obstructions between the antennas.
- Although the RF signal from the transmitter will pass through most non-metallic building materials (wood, brick, etc.), its strength is reduced with every wall through which it must pass. Therefore, *maximum stated reception range is based on unobstructed line of sight conditions.*
- The transmitter and receiver are both rated for indoor use only. If either unit must be located outdoors, it must be protected from the elements (using, for example, a non-metallic NEMA4 enclosure).

Connecting Audio to the PAT900 Transmitter
Line Input
Connect a balanced or unbalanced line level audio source (outputs from a mixer or CD player, for example) to the corresponding XLR OR PHONO

line-level input jacks on the transmitter's front panel (refer to Figure 1). Some audio devices, such as MP3 players, portable

Figure 1- Transmitter Inputs and Adjustments

CD players, and PC sound cards have a single miniature (3.5mm) stereo phone jack (as opposed to separate RCA phono-type jacks). To connect any of these to the transmitter, use the supplied adaptor in conjunction with a phono cable to make the connection. Left and right stereo inputs may be connected to the red and white phono inputs. The output from the receiver will be monaural however.

Mic Input
A microphone input may be used as well. Connect using either the balanced XLR or 3.5mm connectors.

Mic Ducking Switch (rear panel)
ON: By switching the ducking switch to ON, the line input audio will be muted when the microphone is used. When microphone input is no longer detected, the line audio will resume.

OFF: Mic audio will be mixed with line audio.

Mic ALC Switch
ON: Prevents over-modulation distortion due to excessive mic level.

Connecting the PAR900M Receiver Audio Outputs
Connect the receivers appropriate balanced or unbalanced outputs to the appropriate inputs on the device that is to amplify the received audio signals (refer to Figure 2).

Figure 2- Receiver Back Panel

Connecting Power to the Transmitter and Receiver
The PAT900 and the PAR900M each require an external power source of between 7.5 and 18 volts DC. A plug-in 120VAC-to-9VDC power converter is supplied with each unit. Insert the power converter's 2.1mm plug into the DC INPUT jack on the unit's rear panel (refer to Figures 1 and 2). Plug each converter into a live 120VAC outlet. The transmitter's red POWER indicator LED (on the front panel) should illuminate. On the receiver, power on is indicated by the illumination of the 2 digit CHANNEL display.

User Settings and Adjustments

Selecting the Channel of Operation (Transmitter)

Referring to Figure 3 and Table 1, select the channel on which the transmitter will operate. Available channels are numbered 01 through 24. To select a channel, use a small flat-blade screwdriver to rotate the selector on the **left** to the "tens digit" of the desired channel, then rotate the selector on the **right** to the "ones digit" of the desired channel. As an example, to select channel 16 rotate the selector on the left to "1," and rotate the selector on the right to "6." Be sure to line up the selector's triangle-shaped pointer (*NOT* the screwdriver slot) to the desired number. Please note that setting the channel to "00" is the same as channel "01." Similarly, setting the channel to any number from "25" to "99" is the same as channel "24."

Figure 3-Transmitter

If several PAT900 transmitters are to be used simultaneously in a common area (so as to broadcast multiple audio programs), each transmitter must be set to its own unique channel.

Selecting the Channel of Operation (Receiver)

Figure 4-PAR900M Front Panel

The PAR900M provides 24 user-selectable channels. Referring to Figure 4 and Table 1, use the DOWN and UP buttons on the unit's front panel to select the desired channel. Momentarily pressing either button will raise or lower the displayed channel by one; holding either button continuously will rapidly cycle the channels up or down as appropriate. If multiple PAT900 transmitters are operating in a common area to broadcast multiple audio programs, the PAR900M receiver can receive any of the desired programs simply by selecting the corresponding channel.

If you encounter sporadic noises, dropouts, fading, etc., it may be due to interference from another 900MHz device (such as an older cordless phone or baby monitor) operating nearby. To alleviate the problem, try selecting a different channel for the transmitter and receiver – ideally one that is at least 9MHz above or below the originally selected channel (see Table 1).

Please note: Wireless devices that operate outside of the 902 – 928MHz frequency band, such as modern cordless phones and computer networks operating at 2.4 or 5.8GHz, will not generally interfere with, or be affected by, the PAT900 transmitter and/or the PAR900M receiver.

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
01	915.0	09	914.2	17	919.6
02	916.2	10	915.4	18	921.0
03	923.6	11	917.0	19	921.8
04	917.4	12	917.8	20	923.0
05	918.4	13	919.0	21	910.0
06	910.6	14	920.6	22	911.2
07	911.8	15	921.4	23	912.4
08	913.4	16	922.6	24	913.8

Table 1 – Channel / Frequency Allocations

NOTE 1: Setting the transmitter to channel "00" is the same as channel 1. Similarly, setting the transmitter's channel to any number from "25" to "99" (inclusive) is the same as channel 24.
NOTE 2: If the PAT900 and PAR900M will be used along with an Applied Wireless video transmitter and receiver (models VT900-3 and VR900-3), the channel for the audio units must be at least 9MHz above or below the channel of the video units, to prevent interference between the RF signals. For example, if the video units are set to channel 1 (907MHz), set the audio units to channel 20.

Table 2- Antenna Range Guide

Range Performance (when used with PAT900 or AT900-24DZ Transmitters)

Receiver Antenna Type	Threshold	Recommended Max.
Standard Omni-Directional Antennas	900 Ft	450 Ft
Flat Panel Antenna (FP915-5)	1300 Ft	650 Ft
Yagi, 10-dB (Y915-10)	1900 Ft	950 Ft

Distances are "Line-of-Sight". Non Line-of-Sight applications will experience reduced range, the amount of reduction based upon the nature of the obstruction(s).
The "Recommended Max" in the table above, allows for a 6-dB signal margin for your application.
Data in table is based on actual unobstructed field measurements.

Setting the Transmitter's Audio Modulation Level
With an active audio source connected to the transmitter's AUDIO INPUTS, adjust the AUDIO LEVEL control on the front panel such that the green MODULATION LEVEL OK indicator is illuminated whenever audio is present, and the red PEAK indicator flashes only on the loudest audio transients. To prevent distorted audio at the receiver, the red PEAK indicator should not be illuminated continuously.

IMPORTANT!

Properly setting the transmitter's modulation level is *CRITICAL* to satisfactory operation of the transmitter and receiver. If the level is set too low, the receiver will likely be plagued with objectionable background noise (hiss). If the level is set too high, distorted audio and/or interference on adjacent channels is likely to result.

Note: The audio source device may have a volume control that adjusts the level of the audio signal(s) being fed to the transmitter's inputs. If your source device (e.g. MP3 player, portable CD player, or PC sound card) is so equipped, initially set that device's volume control to its approximate midpoint. Then, adjust the transmitter's AUDIO LEVEL control as described above. Use the following guidelines to "fine tune" the settings:

- If the audio output at the receiver suffers from excessive background noise, the source device's volume level is probably set too low. Increase the source device's volume control a bit, and readjust the transmitter's AUDIO LEVEL control accordingly.
- If the audio output at the receiver is distorted, and/or if the transmitted audio program can be heard on (or interferes with) either or both of the channels adjacent to the selected channel of operation, the source device's volume level is probably set too high. Reduce the source device's volume control a bit, and readjust the transmitter's AUDIO LEVEL control accordingly.

Mic Modulation Level Adjustment
With no audio on the audio line input, set the mic level adjust for the appropriate LED indication on the Peak lamp as above. The ALC switch may be either on or off, however it is recommended that it normally be used in the ON position to prevent over-modulation distortion.

Adjusting Headphone Volume (Receiver)
If desired, stereo headphones or earbuds equipped with a standard 3.5mm mini-phone plug may be used with the PAR900M. Insert the plug into the HEADPHONE jack on the rear panel. The output level at this jack may be adjusted using the VOLUME control on the front panel.

Note: The receiver's VOLUME control only affects the volume at the headphone jack. It does not affect the volume at the receiver's line level audio output phono jacks.

Internal Settings

PAR900M Receiver:
Noise Gate: The receiver will mute the audio output when the transmitter is turned off or is out of range. This prevents the hiss associated with reception of noise. There is some hiss also present with low input levels, like quiet passages in classical music or dead air especially with the volume turned up. The Noise Gate provides an additional muting option. When *enabled* as described below, low input levels or no input will mute the audio.

Noise Gate Enable: To enable the noise gate feature (will mute at very low levels), change jumper setting per the following instructions:

1) Gain access to the circuit board by remove the Output Panel on the receiver, the volume control knobs, and the grounding screw on the bottom.
2) The receiver's Noise Gate Enable/Disable Jumper is near the board number, 400426. A Shorting Jumper straddles two of the three pins soldered to C131 (factory default position). It can be moved to the two pins closest to the edge of the board to ENABLE the noise gate.

Changing any other internal settings can negatively affect the systems performance.

PAT900 Transmitter:
Transmitter Headphone Monitor Output Level (R30).

The transmitter only has an adjustment for the transmitter headphone monitor output level (R30). This is set at the factory and should require no further adjustments.

Remove the Input Panel on the transmitter to access the circuit board.

Changing any other internal settings will negatively affect the systems performance.

CAUTION!

The PAT900 transmitter and the PAR900M receiver both contain sensitive electronic components on their respective circuit boards. These devices can be permanently damaged by static discharge if adequate anti-static procedures are not observed. Such damage is not covered by the Applied Wireless, Inc. Limited Warranty. Before attempting to modify any of the internal settings, discharge any static that may have accumulated on your body by touching a metal object or surface that is earth grounded, such as a cold water pipe. In addition, your work area should be as static-free as possible (for example, do not work in an area in which the floor is covered by nylon carpeting).

Technical Specifications

PAT900 Transmitter

Operating Frequency (24 Channels)	902 – 928 MHz
Operating Voltage Range	7.5 to 18VDC
Operating Current	120 mA
Audio Signal-to-Noise Ratio*	78 dB
Audio Frequency Response (+/-2dB)*	30 - 20,000 Hz
Audio Distortion (@ 1kHzm +/-25KHz deviation)*	0.3%
RF Output Power	1 mW (0 dBm)
Frequency Stability (over operating temp.range)	+/-30 ppm
FM Deviation	+/-40 KHz
Harmonic Suppression	-45 dBc
Operating Temperature Range	-20°C to +70°C
Storage Temperature Range	-50°C to +150°C

*Audio performance specifications are "end-to-end" characteristics, when used with Model PAR900M receiver.

PAR900M Receiver

Operating Frequency (24 Channels)	902 – 928 MHz
Operating Voltage Range	7.5 to 18VDC
Operating Current	180 mA
Audio Frequency Response (+/-2dB,)*	30 - 20,000 Hz
Output Level, Typical, XLR	+4 dBu ($1.25V_{RMS}$ unloaded)
Output Level, Typical, RCA	-6 dBm (.48 V_{RMS} 1k load)
Audio Signal-to-Noise Ratio*	50 dB
Audio Distortion (@ 1kHzm +/-25KHz deviation)*	0.3%
RF Input Sensitivity (30 dB SNR)	-106 dBm
IF Bandwidth	180 KHz
Antenna Input Impedance	50 Ohms
Frequency Stability (over operating temp. range)	+/-30 ppm
Operating Temperature Range	-20°C to +70°C
Storage Temperature Range	-50°C to +150°C

*Audio performance specifications are "end-to-end" characteristics, when used with Model PAT900 transmitter.

The following sections pertain exclusively to the Audio Transmitter, Model PAT900, AT900-24DY and AT900-24DZ:

This product incorporates transmitter module FCC ID: QY4265
This device complies with Part 15 of the FCC Rules. 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 interference that may cause undesired operation.

INSTRUCTION TO THE USER (required by the FCC)

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 Rules. In order to maintain compliance with FCC 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.

ONE YEAR LIMITED WARRANTY (USA)

Products manufactured by APPLIED WIRELESS, INC. (AW) and sold to purchasers in the USA are warranted by AW according to the following terms and conditions. You should read this Warranty thoroughly.

- **WHAT IS COVERED, AND DURATION OF COVERAGE:**

AW warrants the product to be free from defects in materials and workmanship for one (1) year from the date of purchase by the original end user purchaser.

- **WHAT IS NOT COVERED:**

This warranty does not apply to the following:

1. Damage caused by accident, physical or electrical misuse or abuse, improper installation, failure to follow instructions contained in the User's Guide, any use contrary to the product's intended function, unauthorized service or alteration (i.e. service or alteration by anyone other than AW).
2. Damage occurring during shipment.
3. Damage caused by acts of God, including without limitation: earthquake, fire, flood, storms, or other acts of nature.
4. Damage or malfunction caused by the intrusion of moisture or other contamination within the product.
5. Batteries supplied by AW in or for the product.
6. Cosmetic deterioration of chassis, cases, or pushbuttons resulting from wear and tear typical of normal use.
7. Any cost or expense related to trouble-shooting to determine whether a malfunction is due to a defect in the product itself, in the installation, or any combination thereof.
8. Any cost or expense related to repairing or correcting the installation of an AW product.
9. Any cost or expense related to the removal or reinstallation of the product.
10. Any product whose serial number or date code is altered, defaced, obliterated, destroyed, or removed.

This warranty is extended to the original purchaser of the product(s) only, and is not transferable to any subsequent owner or owners of the product(s). AW reserves the right to make changes or improvements in its products without incurring any obligation to similarly alter products previously purchased.

- **EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES:**

AW expressly disclaims liability for incidental and consequential damages caused (or allegedly caused) by the product. The term "incidental or consequential damages" refers (but is not limited) to:

1. Expenses of transporting the product to AW to obtain service.
2. Loss of use of the product.
3. Loss of the original purchaser's time.

- **LIMITATION OF IMPLIED WARRANTIES:**

This warranty limits AW's liability to the repair or replacement of the product. AW makes no express warranty of merchantability or fitness for use. Any implied warranties, including fitness for use and merchantability, are limited in duration to the period of the one (1) year express limited warranty set forth herein. The remedies provided under this warranty are exclusive and in lieu of all others. AW neither assumes nor authorizes any person or organization to make any warranties or assume any liability in connection with the sale, installation, or use of this product.

Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of liability for incidental or consequential damages so the limitations or exclusions stated herein may not apply to you. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

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ONE YEAR LIMITED WARRANTY (USA), cont.

- **HOW TO OBTAIN WARRANTY SERVICE:**

If a product covered by this warranty and sold in the USA by AW proves to be defective during the warranty period AW will, at its sole option, repair it or replace it with a comparable new or reconditioned product without charge for parts and labor, when said product is returned in compliance with the following requirements:

1. You must first contact AW at the following address/phone for assistance:

APPLIED WIRELESS, INC.
1250 Avenida Acaso, Suite F
Camarillo, CA 93012
Phone: (805) 383-9600

If you are instructed to return your product directly to the factory, a Return Merchandise Authorization number (RMA) will be issued to you.

2. You must package the product carefully and ship it insured and prepaid. The RMA number must be clearly indicated on the outside of the shipping container. *Any product returned without an RMA number will be refused delivery.*

3. In order for AW to perform service under warranty, you must include the following:

(a) Your name, return shipping address (not a PO Box), and daytime telephone number.
(b) Proof of purchase showing the date of purchase.
(c) A detailed description of the defect or problem.

Upon completion of service, AW will ship the product to the specified return shipping address. The method of shipping shall be at AW's sole discretion. The cost of return shipping (within USA) shall be borne by AW.

Applied Wireless products are designed and manufactured with pride in the United States of America

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