



# **220 Series Professional VHF Wireless Systems**

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**ATW-221**      UniPak™ System

**ATW-222**      Handheld Microphone System

***Installation and Operation***

# Professional VHF Wireless Systems

## *Installation and Operation*

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

This device complies with INDUSTRY CANADA R.S.S. 210, en conformité avec IC: RSS-210/CNR210. Operation is subject to the following conditions: 1) This device may not cause harmful interference and 2) this device must accept any interference received, including interference which may cause undesired operation.

**CAUTION!** Electrical shock can result from removal of the receiver cover. Refer servicing to qualified service personnel. No user-serviceable parts inside. Do not expose to rain or moisture.

The circuits inside the receiver and transmitter have been precisely adjusted for optimum performance and compliance with federal regulations. Do not attempt to open the receiver or transmitter. To do so will void the warranty, and may cause improper operation.

**Notice to individuals *with implanted cardiac pacemakers or AICD devices:***

Any source of RF (radio frequency) energy *may* interfere with normal functioning of the implanted device. All wireless microphones have low-power transmitters (less than 0.05 watts output) which are unlikely to cause difficulty, especially if they are at least a few inches away. However, since a "body-pack" mic transmitter typically is placed against the body, we suggest attaching it at the belt, rather than in a shirt pocket where it may be immediately adjacent to the medical device. Note also that *any medical-device disruption will cease when the RF transmitting source is turned off.* Please contact your physician or medical-device provider if you have any questions, or experience any problems with the use of this or any other RF equipment.

### **Introduction**

Thank you for choosing an Audio-Technica professional wireless system. You have joined thousands of other satisfied customers who have chosen our products because of their quality, performance and reliability. This wireless microphone system is the successful result of years of design and manufacturing experience.

This professional wireless system includes a receiver and either a body-pack or a handheld transmitter on a specific crystal-controlled frequency.

The receiver features true diversity reception. Two antennas feed two completely independent RF sections on the same frequency; automatic logic circuitry continuously compares and selects the superior received signal, providing better sound quality and reducing the possibility of interference and dropouts. The receiver is half-width for a standard 19" (1U) rack mount.

Please note that in multiple-system applications there must be a transmitter-receiver combination on a **separate** frequency for each input desired (only one transmitter for each receiver). Operating frequency information will be found on page 6.

The versatile ATW-T201 UniPak body-pack transmitter has both a high-impedance input for instruments, and a low-impedance input with bias connection for use with dynamic and electret condenser microphones. The ATW-T202 handheld transmitter features a unidirectional dynamic microphone element.

Both the body-pack and handheld transmitters use internal 9-volt batteries and have Off/Standby/On switches, input Trim (level) adjustments and battery-save switches.

## Receiver Installation

### Location

For best operation the receiver should be at least 3' (1 m) above the ground and at least 3' (1 m) away from a wall or metal surface to minimize reflections. Keep the receiver antennas away from noise sources such as digital equipment, motors, automobiles and neon lights, as well as away from large metal objects. In multi-channel systems, position receivers at least 3' (1 m) apart and keep operating transmitters at least 6' (2 m) from the receivers to help assure maximum RF performance.

### Output Connection

There are two audio outputs on the back of the receiver: balanced (160 mV) and unbalanced (280 mV). Use shielded audio cable for the connection between the receiver and the mixer. If the input of the mixer is a 1/4" jack, connect a cable from the 1/4" unbalanced audio output on the back of the receiver to the mixer. If the input of the mixer is an XLR-type input, connect a cable from the balanced XLR-type audio output on the back of the receiver to the mixer.

The two isolated audio outputs permit simultaneous feeds to both unbalanced and balanced inputs. For example, both a guitar amp and a mixer can be driven by the receiver.

### Power Connection

Connect the included [need number] adapter to the DC power input on the back of the receiver. Then plug the adapter into a standard 120 volt 60 Hz AC power outlet.

### Antennas

Attach the antennas to the antenna input jacks.

## Receiver Controls and Functions

### Front Panel Controls and Functions (Fig. A)

1. POWER SWITCH: Press power switch in to turn on
2. POWER INDICATOR: Lights when power is supplied to the receiver.
3. TUNER OPERATION INDICATOR: Indicates which tuner has the better reception and is in operation.
4. AF PEAK INDICATOR: Only lights when audio distortion is present at maximum modulation. Not affected by position of AF Level Control.
5. TUNER OPERATION INDICATOR: Indicates which tuner has the better reception and is in operation.
6. AF LEVEL CONTROL: Adjusts the level at both audio output jacks.

### Rear Panel Controls and Functions (Fig. B)

7. ANTENNA INPUT JACK: BNC-type antenna connector for Tuner "A." Attach the antenna directly, or extend it with a low-loss antenna cable.
8. SQUELCH CONTROL: Adjusts level of noise-muting circuit (Preset at factory but can be adjusted as circumstances warrant.)
9. BALANCED AUDIO OUTPUT JACK: XLRM-type connector. A standard 2-conductor shielded cable can be used to connect the receiver output to a balanced aux-level input on a mixer.
10. GROUND LIFT SWITCH: Disconnects the ground pin of the balanced output (9) from ground. Normally, the switch should be to the left (ground connected). If hum caused by a ground loop occurs, slide switch to the right.
11. UNBALANCED AUDIO OUTPUT JACK: 1/4" phone jack. Can be connected to an unbalanced aux-level input of a mixer or tape recorder.
12. DC POWER INPUT: For the provided [NEED NUMBER] adapter, or other 12-18V DC source. (Receiver requires 500 mA.) [CORRECT?]
13. ANTENNA INPUT JACK: BNC-type antenna connector for Tuner "B." Attach the antenna directly, or extend it with a low-loss antenna cable.

### Battery Selection and Installation

An alkaline 9-volt battery is recommended. ***Make certain the transmitter power switch is Off before installing or changing batteries.***

When inserting the battery, ***observe correct polarity as marked inside the battery compartment.*** The transmitter housings are designed to prevent incorrect installation of the battery; ***do not force the battery in.*** Reversed batteries may cause damage to the transmitter.

### UniPak™ Transmitter Battery Installation

1. Slide off the battery cover as shown in Figure C.
2. Carefully insert a fresh 9V alkaline battery, observing polarity markings.
3. Replace the battery cover (Fig. D).

### Handheld Transmitter Battery Installation

1. While holding the upper part of the transmitter body just below the ball-screen, unscrew the lower body cover and slide it downward to expose the battery compartment (Fig. E). ***Do not attempt to pull the lower body farther down, or to gain access to the electronics.***
2. Lift the white "battery keeper" arm until it sticks straight out from the mic body (no higher). Then carefully insert a fresh 9V alkaline battery, observing polarity markings.
3. Screw the body back together. ***Do not overtighten.***

### Battery Condition Indicator

The red battery condition indicator (Fig. G/H) should light strongly with a fresh battery. As the battery weakens, the indicator will grow dimmer. When the indicator becomes very dim or goes out, there is little life left in the battery. Replace it at once for continued operation of the transmitter.

All transmitters feature battery-save switches (Fig. C/E). As supplied, the switch is set in the High position for maximum range. Switching to the Low position increases battery life by reducing power. (Note: Effective range decreases when the switch is set in Low position.)

### UniPak™ Transmitter Input Connection

Connect an audio input device (microphone or guitar cable) to the input connector on the bottom of the transmitter. The cable connector latches automatically when inserted into the transmitter jack. To unlatch and remove the connector, simply pull up on the connector's knurled metal collar.

A number of Audio-Technica professional microphones and cables are available separately, pre-terminated with a UniPak input connector (see "Optional System Accessories" on page 7).

### Transmitting Antenna

The UniPak transmitter includes a permanently attached flexible antenna. For best results, allow the antenna to hang freely and full length from the bottom of the transmitter. If the received signal is marginal, experiment with different transmitter positions on your body or instrument; or try repositioning the receiver. ***Do not attempt to remove, replace or change the length of the transmitting antenna.***

## System Operation

Turn down the receiver AF level control and the mixer/amplifier level before starting up the wireless system. Do *not* switch on the transmitter yet.

### Receiver on...

Press the power switch. The green Power indicator on the front panel will light.

### Transmitter on...

When the transmitter is switched on, the receiver's yellow RF signal indicator will light. The transmitters have a 3-position power switch. When the switch is set to "Standby" (ST or ST.BY), the transmitter produces RF with no audio signal. When the switch is "On," the transmitter produces both RF and audio. Excessive audio input to the transmitter will cause the receiver's red AF Peak indicator to light.

### Receiver Volume

Under typical operating conditions, the receiver's volume control should be turned all the way up, with overall system audio gain adjusted at the mixer or amplifier.

### Receiver Squelch

The squelch control on the rear panel of the receiver is preset at the factory, but can be adjusted if you must use the system in a high RF interference area. If there is audio output from the receiver when your transmitter is off, adjust the squelch control so the system will receive the signal from your transmitter but "squelch" or eliminate the unwanted background RF noise. This adjustment can cause a reduction in useable range of the wireless transmitter, so set the control to the lowest position which reliably mutes the unwanted RF signals.

### Input Level Adjustment

Input trimmer controls in the transmitters enable you to maximize performance for a particular microphone or guitar sensitivity, or to adjust for different acoustic input levels.

### Adjusting Input Level - UniPak Transmitter

Slide the battery cover off the top part of transmitter and remove the screwdriver from its clip (Fig. C). Gently turn both the "MT" (Mic Trimmer) and "GT" (Guitar Trimmer) controls to their full counterclockwise positions (toward "LO").

### • Microphone: Adjusting input level

Gently turn only the "MT" (Mic Trimmer) control all the way *up* (clockwise, toward "Hi"). Check for excessive gain by speaking/singing into the microphone at typically-loud levels while watching the receiver's AF Peak indicator. If the AF Peak indicator does light, turn the MT control slightly counterclockwise until the AF Peak indicator no longer lights with maximum audio input to the transmitter.

### • Guitar/Instrument: Adjusting input level

Gently turn only the "GT" (Guitar Trimmer) control all the way *up* (clockwise, toward "Hi"). Check for excessive gain by playing at typically-loud levels while watching the receiver's AF Peak indicator. If the AF Peak indicator does light, turn the GT control slightly counterclockwise until the AF Peak indicator no longer lights with maximum instrument input to the transmitter.

After adjusting input level, return the screwdriver to its clip and reinstall the battery cover. No further transmitter gain adjustments should be needed, as long as the input device and the acoustic input level are not changed.

### Adjusting Input Level - Handheld Transmitter

Unscrew the lower body cover and slide it downward, exposing the screwdriver and Gain Trimmer control (Fig. F). Remove the screwdriver from its clip. Gently turn the control to its full clockwise position (toward the side marked "H"), the factory setting. Check for excessive gain by speaking/singing into the microphone at typically-loud levels while watching the receiver's AF Peak indicator. If the AF Peak indicator does light, turn the Gain Trimmer control slightly counterclockwise until the AF Peak indicator no longer lights with maximum audio input to the mic/transmitter.

Return the screwdriver to its clip and close and secure the lower body. No further transmitter gain adjustments should be needed, as long as the acoustic input does not change significantly.

**CAUTION!** *The small trimmer controls are delicate; use only the supplied screwdriver. Do not force the trimmers beyond their normal 190° range of rotation.*

*Return the screwdriver to its storage clip when not in use.*

## Ten Tips To Obtain The Best Results

1. Use only fresh alkaline batteries. Do not use "general purpose" (carbon-zinc) batteries.
2. Position the receiver so that it has the fewest possible obstructions between it and the normal location of the transmitter. Line-of-sight is best.
3. The transmitter and the receiver should be as close together as conveniently possible, but not less than 6' (2 m).
4. Do not place the receiver antennas within 3' (1 m) of another receiver or antenna.
5. The receiver antennas should be kept away from any metal.
6. A receiver cannot receive signals from two transmitters at the same time.
7. In the UniPak transmitter, the "MT" or "GT" input control *not* in use should be set to *minimum*.
8. If the receiver output is set too low, the overall signal-to-noise ratio of the system may be reduced. Conversely, if the volume control of the receiver is set too high, it may over-drive the input of the mixer/amplifier, causing distortion. Adjust the output level of the receiver so the highest sound pressure level going into the microphone (or the loudest instrument playing level) causes no input overload in the mixer, and yet permits the mixer level controls to operate in their "normal" range (not set too high or too low). This provides the optimum signal-to-noise for the entire system.
9. Turn the transmitter off when not in use. Remove the battery if the transmitter is not to be used for a period of time.
10. Unplug the receiver from the AC outlet when the system is not in use.

## System Operating Frequencies

### Frequency Selection

Each transmitter/receiver system operates on a single factory-aligned, crystal-controlled frequency. Available frequencies are shown in the chart below.

Operating frequency is specified by a two character code, such as "T2," in addition to the actual frequency in MHz. The frequency of each transmitter appears on a label on the outside of the unit. The frequency of each receiver appears on a label on the bottom of the unit and the frequency of each system appears on the outer carton. For future reference, please record them in the space provided below.

### RF Interference

If you encounter receiving interference (from other than an operating TV station), often it can be eliminated by adjusting the receiver's squelch control, as described on page 5.

Please note that wireless frequencies are shared with other radio services. According to Federal Communications Commission regulations, "Wireless microphone operations are unprotected from interference from other licensed operations within the band. If any interference is received by any Government or non-Government operation, the wireless microphone must cease operation..."

If you need assistance with operation or frequency selection, please contact your dealer or the A-T professional division.

Extensive wireless information also is available on the A-T Web site at [www.audio-technica.com](http://www.audio-technica.com).

Application	Freq. Code	Freq. (MHz)
<ul style="list-style-type: none"> <li>• Traveling frequencies: (Normally work anywhere in the U.S.A. and Canada.)</li> </ul>	T2	169.505
	T3	170.245
	T8	171.905
Systems on these frequencies may be combined for up to three simultaneous operating channels.		

For future reference, please record your system information here (the serial numbers appear near the screwdriver clip in each transmitter, and on the bottom of each receiver):

#### Operating Frequency

Freq. Code    \_\_\_  \_\_\_

Frequency    \_\_\_  \_\_\_  •  \_\_\_  \_\_\_  MHz

#### Receiver

Model ATW-R220

Serial Number    \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_

#### Transmitter

Model ATW-T20  \_\_\_  
                  1/2

Serial Number    \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_  \_\_\_

## Specifications<sup>†</sup>

### OVERALL SYSTEM

Operating Frequency	VHF high band, 169 MHz to 172 MHz
Frequency Stability	±0.005%
Modulation Mode	FM
Maximum Deviation	±15 kHz
Operating Range	200' minimum
Operating Temperature Range	40° F (4° C) to 110° F (43° C)
Frequency Response	80 Hz to 13 kHz

### RECEIVER

Receiving System	Dual independent receivers, automatic-switching diversity reception
Image Rejection	50 dB minimum
Signal-to-noise Ratio	80 dB at 10 kHz deviation (IEC-weighted), maximum modulation 15 kHz
Total Harmonic Distortion	≤1% (10 kHz deviation at 1 kHz)
Sensitivity	20 dBμV for 60 dB S/N (IEC-weighted)
Audio Output	350 mV (1 kHz modulation, 10 kHz deviation, 100k ohm load)
Output Connector	1/4" TS ("mono") phone jack
Power Supply	120V AC 60 Hz, 6 VA; or 12V DC, 200 mA, center positive, with external DC supply
Dimensions	8.27" (210.0 mm) W x 1.72" (43.5 mm) H x 4.73" (120.0 mm) D
Net Weight	18.9 oz (536 grams); without AC adapter, 11.9 oz (336 grams)
Accessories Included	AD1202A 120V docking AC adapter; 120V AC IEC cordset

### UNIPAK™ TRANSMITTER

RF Power Output	10 mW High position, 2 mW Low position, typical
Spurious Emissions	Under federal regulations
Dynamic Range	≥90 dB, A-weighted
Input Connections	High impedance, low impedance, bias
Battery	9V (NEDA type 1604) alkaline, not included
Current Consumption	30 mA typical
Battery Life	Approximately 15 hours in High position Approximately 20 hours in Low position
Dimensions	2.56" (65.0 mm) W x 4.33" (110.0 mm) H x 1.00" (25.4 mm) D
Net Weight (without battery)	2.8 oz (78 grams)

### HANDHELD TRANSMITTER

RF Power Output	10 mW High position, 2 mW Low position, typical
Spurious Emissions	Under federal regulations
Dynamic Range	≥90 dB, A-weighted
Microphone Element	Dynamic unidirectional
Battery	9V (NEDA type 1604) alkaline, not included
Current Consumption	30 mA typical
Battery Life	Approximately 15 hours in High position Approximately 20 hours in Low position
Dimensions	9.50" (241.3 mm) long, 2.10" (53.3 mm) diameter
Net Weight (without battery)	12.7 oz (360 grams)
Accessory Included	AT8456a stand clamp

<sup>†</sup> In the interest of standards development, A.T.U.S. offers full details on its test methods to other industry professionals on request.

## Optional System Accessories

### WIRELESS ESSENTIALS™ MICROPHONES AND CABLES

All Wireless Essentials accessories are terminated for use with ATW-T201 and other UniPak™ transmitters.

AT829cW	Miniature cardioid condenser lavalier microphone. Includes clothing clip and windscreen.
MT830cW	Subminiature omnidirectional condenser lavalier microphone. Includes clothing clip and windscreen.
MT830cW-TH	"Theater" model, same as MT830cW except beige color mic and cable for concealment.
AT831cW	Miniature cardioid condenser lavalier microphone. Includes clothing clip and windscreen.
AT851cW	Surface-mount wide-range hemi-cardioid condenser microphone.
AT857AMLcW	19" gooseneck cardioid microphone. Mounts to 5/8"-27 thread. Includes windscreen.
AT889cW	Headworn noise-canceling condenser microphone. Includes windscreen and cable clip.
AT898cW	Subminiature cardioid condenser lavalier microphone. Includes clothing clip base, viper clip base, magnet clip base, three single mic holders, two double mic holders and two windscreens.
AT899cW	Subminiature omnidirectional condenser lavalier microphone. Includes AT899AK accessory kit.
AT899cW-TH	"Theater" model, same as AT899cW except beige color mic and cable for concealment. Includes AT899AK-TH accessory kit.

ATM35cW	Cardioid condenser instrument microphone. Includes AT8418 clip-on instrument mount.
ATM73cW	Headworn cardioid condenser microphone. Includes windscreen.
ATM75cW	Headworn cardioid condenser microphone. Includes windscreen.
PRO 8HEcW	Headworn hypercardioid dynamic microphone. Includes windscreen and cable clip.
PRO 35xcW	Cardioid condenser instrument microphone. Includes AT8418 clip-on instrument mount.
AT-GCW	Hi-Z instrument/guitar cable with 1/4" phone plug.
XLRW	Connecting cable for UniPak transmitter with an XLRF-type input connector, for Lo-Z microphones with XLRM-type output terminations.

### OTHER ACCESSORIES

AT8114	Foam windscreen for handheld transmitter.
AT8141	Water-resistant pouch for UniPak transmitter.
AT8390	Shielded audio cable with 1/4" to 1/4" phone plugs. Available in a variety of lengths. (Also available with one straight and one 90° phone plug as the AT8316.)
AT8456a	Stand clamp for handheld transmitter, 5/8"-27 threads.
ATW-VP10	Vinyl pouch with belt clip to hold UniPak transmitter.

## Receiver Controls and Functions

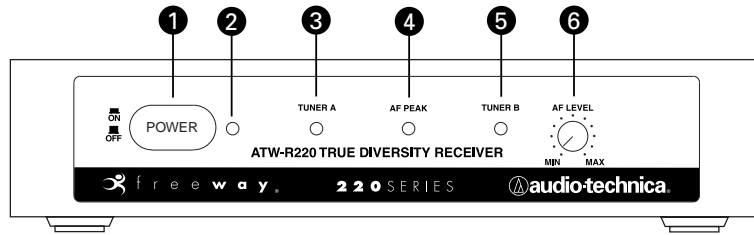


Figure A (p. 3)

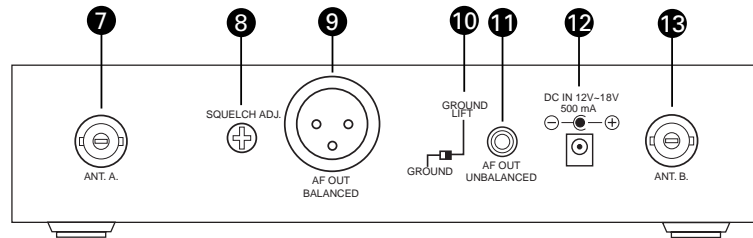
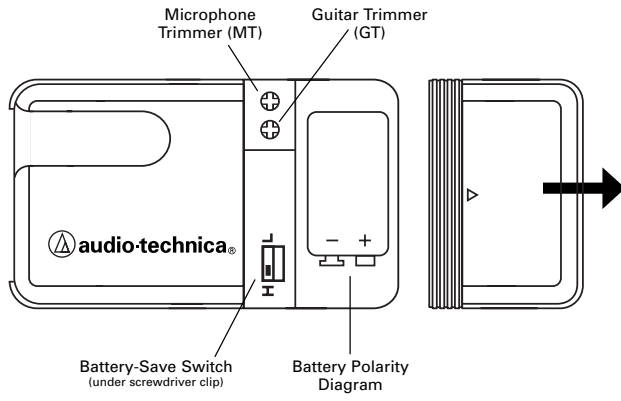


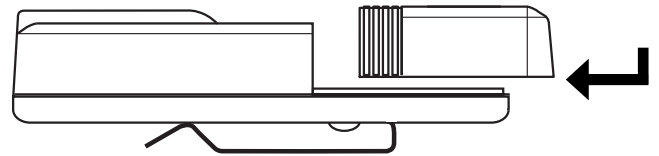
Figure B (p. 3)



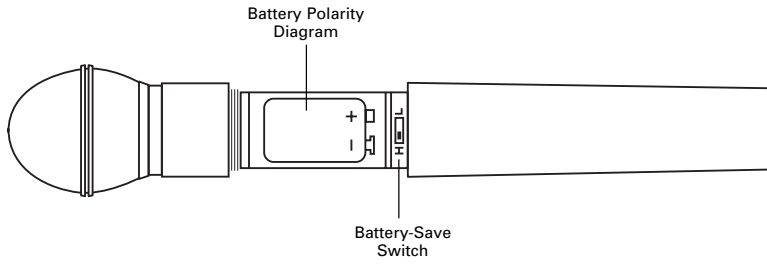
## Transmitter Controls and Functions



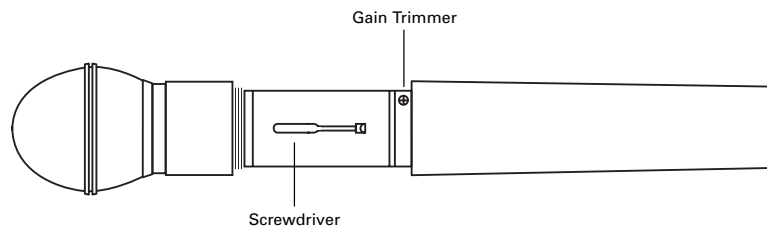
**Figure C** (p. 4)



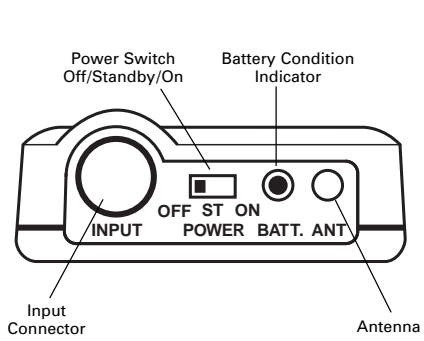
**Figure D** (p. 4)



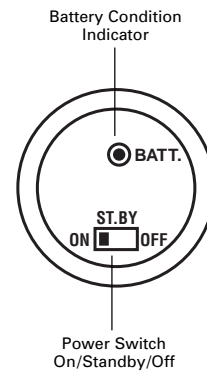
**Figure E** (p. 4)



**Figure F** (p. 5)



**Figure G** (p. 4)



**Figure H** (p. 4)

### **One-Year Limited Warranty**

Audio-Technica professional wireless systems purchased in the U.S.A. are warranted for one year from date of purchase by Audio-Technica U.S., Inc. (A.T.U.S.) to be free of defects in materials and workmanship. In event of such defect, product will be repaired promptly without charge or, at our option, replaced with a new product of equal or superior value if delivered to A.T.U.S. or an Authorized Service Center, prepaid, together with the sales slip or other proof of purchase date. **Prior approval from A.T.U.S. is required for return.** This warranty excludes defects due to normal wear, abuse, shipping damage, or failure to use product in accordance with the instructions. This warranty is void in the event of unauthorized repair or modification, or removal or defacing of the product labeling.

**For return approval and shipping information,** contact the Service Dept., Audio-Technica U.S., Inc., 1221 Commerce Drive, Stow, Ohio 44224.

Except to the extent precluded by applicable state law, **A.T.U.S. will have no liability for any consequential, incidental, or special damages; any warranty of merchantability or fitness for particular purpose expires when this warranty expires.**

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

Outside the U.S.A., please contact your local dealer for warranty details.

***Visit our Web Site!***  
***www.audio-technica.com***



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