



# AEA R84 Ribbon Microphone User's Manual

The AEA R84 is a neoclassic design that shares the Large Ribbon Geometry (LRG) of the acclaimed AEA R44 series. The R84 has been designed for accent and solo use in the contemporary studio. LRG format mics, such as the RCA 44, have been making great recordings now for over 65 years. Buying an AEA R84 demonstrates your interest in continuing this tradition of quality sound. Your R84 is supplied as a complete system that includes an integral cushion mount / stand adapter, an attached three-meter "star-quad" mic cable, and a custom softcase.

We'll assume you are familiar with the basics of using a microphone and want to start recording right away. To help you get the most out of your new R84 this short-form manual covers:

1. Cautions
2. How it sounds
3. Unique Characteristics
4. Technical Specifications
5. The Back Story
6. Additional Reading

*Because you want to begin using your R84 right away, we start with the three fundamental cautions for ribbon microphone users and owners:*

***DON'T BLOW INTO IT !!***

***PHANTOM POWER IS DANGEROUS !***

***KEEP IT COVERED WHEN NOT IN USE.***

Your mic thanks you for learning these three cautions.

Now it wants you to have some fun!

What will you record together today?

## GRIST FOR THE MILL

**Why do we begin with warnings?** There are reasons for these three cautions, and they have to do with the physical construction of your newest prized possession. An R84's active element is a very thin strip of aluminum only .00007 inch thick. Yes, that is seven / one-hundred-thousandths of an inch, or two microns (.000002 M) thick. Folded in accordion style pleats and loosely suspended in a strong magnetic field, it dances very well to music.

**Breath and other Blasts of Wind** These pleated ribbon corrugations factor into Caution #1. Blowing into a mic may have worked for your junior high principal on a PA mic: "Is this mic working?" On a studio ribbon mic, strong breath blasts can stretch some of those pleats and change the tensioning of the ribbon. This will change the sound, so try to avoid blasts of air. Joe Chiccarelli recommends putting your hand where the mic will be, to feel if there are air blasts there from the guitar / bass cabinet, vocalist, or whatever you are recording. If you spot a problem, move the mic or use a "popper stopper" to block the blasts. In a typical Marshall stack setup with your ribbon mic one to two feet in front of a speaker and the volume turned up full, just forgetting to turn the amp down before plugging or unplugging an instrument can be distressing. Ribbons are tough, the LA Philharmonic even uses them outside at the Hollywood Bowl, but care is needed as blasts of wind are a ribbon's worst enemy.

**Phantom Power** If you connect a ribbon mic to phantom power using a defective mic cable (i.e., shorted between Pin-2 or Pin-3 to ground), the ribbon element will snap instantly. When plugged into a defective cable or out-of-balance phantom power supply, the 48-volt phantom pulse causes the ribbon to leap out of its magnetic gap and break cleanly in the middle. We don't cover this under warranty. Luckily, ribbon mics ignore phantom power when mic cables and electronics are operating properly. If you have the choice, however, it is wise to play it safe and turn off phantom power. Do this a few minutes before you plug in a ribbon mic, because the phantom power capacitors need time to discharge to zero voltage. (A few mic preamps are optimized for ribbon mics; these minimalist designs don't need or use phantom power, or they have blocking capacitors ahead of the transformerless mic preamp circuitry. Transformer coupled mic preamps do not need these protective DC blocking capacitors.)

**Cover it when not in use and keep it vertical** The R84 is a sturdy high-performance microphone that is delivered in a handsome, vertically oriented, soft case. We urge you to keep it in that case when not using it. We would even recommend keeping the mic in a plastic bag also, as added protection while not in use. An "Ounce of Prevention," insurance, protection, call it what you will — but people who take care of their tools often are happier. The R84 is a LRG (Large Ribbon Geometry) microphone and our case encourages you to store the mic vertically so as to maximize ribbon life. Because these ribbons are over two inches long, they will sag over time if stored horizontally rather than vertically. Our soft case is also useful for protecting the mic while on a stand, in the mic locker, while transporting it to your next session and when sending it back to us for a checkup. An LRG microphone can go for many years between checkups. Your ears are always the best judge of whether it sounds 'right.'

**If you lose your case** Just keeping your R84 covered with a plastic food-storage bag will pay big dividends. It protects the ribbon from random air movement, such as when stage curtains close or the cartage company has all the doors open to bring in a Hammond B3. A bag also keeps the mic from ingesting minute "tramp iron" particles from surfaces it's laid upon. The R84 is designed to minimize such unscheduled trash pick-ups, but older classics such as the RCA 44 and the Coles 4038 are quite good at attracting ferrous junk or even each other. If too many of these tiny pieces of iron get through the protective screens and into the ribbon gap, they will obstruct the ribbon's movement. The sound of a ribbon hitting

such obstacles is not pleasant. Fixing it requires disassembling the mic and trying to clean out the gap. Sometimes a new ribbon is required and this is not covered under warranty.

## WHAT DOES IT SOUND LIKE?

“Nothing else sounds like a large ribbon on strings, horns and voices,” observes Wes Dooley. “AEA’s classic R44 series and our neoclassic R84 offer a truly opulent sound.” It is uncanny how closely what you hear in the studio, while you are placing the mic, matches the control room playback. The versatile R84 sounds great on a wide range of instruments, including brass, strings, percussion, electric guitar and bass. Whether used on vocals or instruments, its performance is intimate, warm and detailed, yet never harsh. AEA’s first ribbon mic, the classic high-output R44 series, continues to gain converts with its natural sound, articulate midrange and forgiving nature. Your R84 enjoys similar sonic qualities, but is optimized for close-up solo and accent chores.

The R84 is an LRG mic with an aluminum diaphragm that is over two inches long, but only 185 thousandths of an inch wide and 70 millionths of an inch thick. This supple, low-tension element dances exceptionally well to the music, which results in:

1. Quick and accurate transients
2. A smooth high end that extends out to 20kHz
3. Solid bass response down to 20 Hz.
4. A consistent figure-eight directional pattern

## UNIQUE CHARACTERISTICS

**Large sweet spots both front and rear** The R84 maintains accurate tonality for off-axis instruments and room tone and has wider sweet spots front and rear than large-diaphragm condenser mics. Because of its geometry, the R84’s high-frequency response is more extended horizontally off-axis than directly on-axis. As sound sources move laterally around the mic towards the null plane, their output level goes down as expected but the mic’s high-frequency response actually increases. The on-axis response goes out to 20 kHz, and at 30-35 degrees off-axis it goes even higher.

**Variable high-frequency EQ as you change the vertical angle** The physics of the long ribbon in the R84 means that its high-frequency response decreases as you tip it either up or down off the main axis. This is in addition to the normal change in level as you move off axis. If you’re interested in a darker sound, while maintaining midrange presence, experiment and move the R84’s aiming point up or down from where you’d normally aim it.

**Highs on ribbons** An R84 has an extended, detailed and smooth high end without the additional “zip” or “tizz” characteristic of large-diaphragm condenser mics. The contrast in sound quality between the smoothness of a ribbon and the aggressiveness of a condenser has to do with how their diaphragms are tensioned. A ribbon is clamped at each end and tensioned lightly, usually with a resonance of 50 Hz or below. The ribbon’s low mass is quite well damped by the air itself which results in well-controlled transients with minimal overshoot.

**Tizz.** Condenser mic diaphragms are tensioned and clamped around their perimeter which typically

results in the addition of a series of high-Q resonances in the 8 to 12 KHz range, which some mastering engineers call *Tizz*. In contrast, a good studio ribbon mic offers the smoothest, most accurate HF transient response you're likely to hear. This difference in resonance structure might explain why studio musicians universally describe the sound from our LRG mics as: "Exactly what my ears hear when I play. It doesn't sound like a recording." Mark Linett observes: "What I like best about AEA mics is their ability to handle EQ. They allow me to be creative in adding almost any HF EQ I can imagine."

**How close can you go?** An R84 can be used very close up without sounding obnoxious. The smoothness of its treble response and its ability to handle destructive levels of 165 dB SPL at  $\geq 1$  kHz make this possible. An LRG mic's combination of low distortion at high SPL and smooth HF response is unique. LRG mics also handle higher SPLs at lower frequencies than their shorter brethren.

**Proximity** The R84's proximity bass rise is less pronounced than with the AEA R44, because the R84 is designed for closer mic'ing. The R44's sometimes overwhelming bass boost begins at six feet (1.8 M). The original RCA 44 was developed during a time when studios were larger and mics were rarely used really close up. The contemporary R84 has a more moderate proximity effect that is well suited for close up use.

**Figure-eight?** The R84 maintains an effective figure-eight polar pattern from down in the basement at 20 Hz and on up. In the studio or on stage, such wide-band native figure-eight performance can be useful. A figure-eight has the same directivity index as a cardioid and with the null area being a plane at 90 degrees to the main axis, you have access to a whole new set of tricks.

**Blumlein and More** Two R84s set vertically coincident and at 90 degrees to each other creates Blumlein's famous stereo configuration. This setup is also a useful studio technique if you want face-to-face interaction but with console control of each musician's levels. You place the musicians at right angles to each other and directly facing the front or rear pickup axis of the mics. The isolation is excellent as the principal axis of one mic is the null plane for the other. Such right angle orientations also are used to isolate guitar and bass amps. Variations with spaced pairs can isolate entire sections, such as the saxes from the horns.

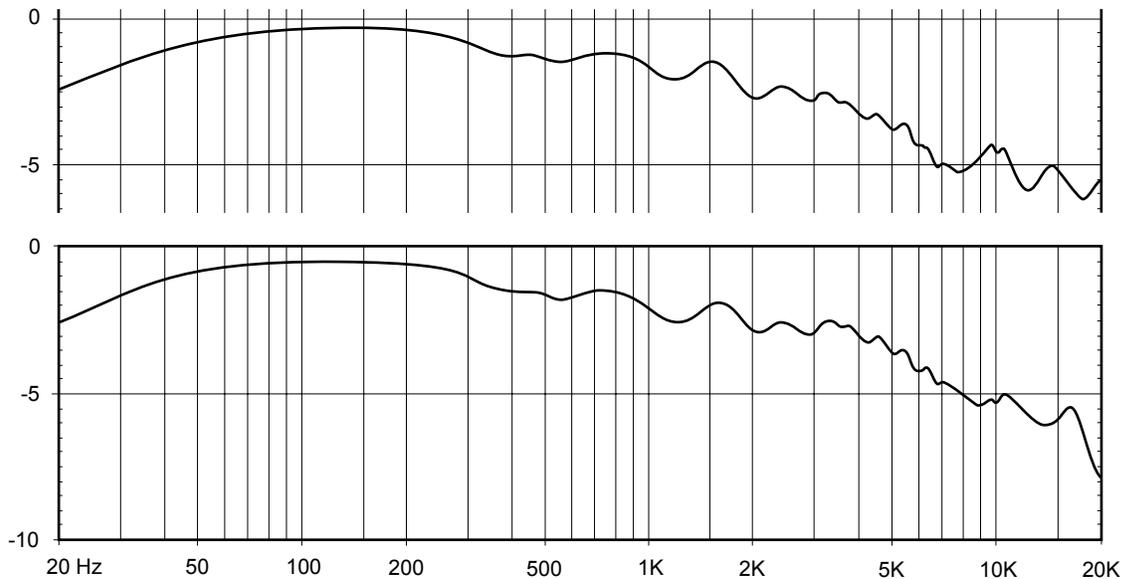
**"This Side" and "That Side"** The sound of your new AEA R84 is slightly different between the front and the back — subtle, but sufficient to offer two "flavors." In addition to polarity, this is caused by using two wraps of grill cloth on the back and only one on the front. So, don't think in terms of front and rear, think "This Side" and "That Side." If your pre-amp or console has the option, try using the phase (polarity) switch when on the back side of the R84. Voices and horns put more energy into the positive than the negative half of each wave, so it is useful to be able to switch polarity.

**Polarity** The figure-eight polar pattern is engraved on the top cap of the R84 and is marked + (**positive**) and - (**negative**) to indicate the absolute polarity of the microphone. (Positive pressure on the + side of the ribbon produces a positive voltage on Pin-2, with respect to Pin-3, of the XLR connector.) Although not everyone can identify polarity inversion (example: the bass drum hit sucks the woofer in rather than kicking it out) all the time, some people can, so it is worthwhile to experiment and be aware of it.

There are many more things that could be told, but it really comes down to this: The R84 is a really forgiving microphone. Listen to it on everything. Move it around and listen to the changes. Find what works for you in your recording environment. There are good reasons why this type of microphone has been in constant use for more than six decades. The R84 will show you why it'll be around for a long time to come. Now go have fun and record something.

## SOME TECHNICAL DETAILS

**R44 vs. R84** Compared to the AEA R44, the R84 is physically lighter at 1.75 vs. 7.5 lbs. (.8 vs. 3.4 Kilos) and more compact at 3.0 vs. 4.6 inches across and 11.5 vs. 13.25 inches high (7.6 vs. 11.76 cm across, 29.2 vs. 33.7 cms high). Your R84 has 3 dB more sensitivity (output) than an original RCA 44B or BX (-52 vs. -55 dBV/Pa). It is 4 dB less sensitive than its big brother, the AEA R44C or CNE (-52 vs. -48 dBV/Pa) and 9 dB less sensitive than our hot rod R44'X' mics. Luckily in ribbon mic design less output sensitivity can be traded for more bandwidth, so the R84 goes out nicely to 20 kHz rather than the R44's 15 kHz. Both mics are Large Ribbon Geometry (LRG) and use a big, 2.35 by 0.185 inches by 2 m (4.7 by 59.7 mm by 2 m), pure aluminum low-tension ribbon which produces solid bass down to 20 Hz. 0 dBV/Pa is 1 VAC (Volt AC) at One Pascal (94 dB Sound Pressure Level.)



**R84 frequency response curves: Upper curve is front, Lower curve is rear, 0 dB = -50 dBV**

## THE BACK STORY

AEA has long been a resource for ribbon microphone aficionados seeking repair or replacement of their treasured classics. We consider the 44 to be RCA's best sounding studio microphone. As collectors began to buy up the supply of RCA 44s through the 1990s, the availability of this wonderful ribbon mic to the studio was greatly endangered. We embarked on a quest lasting several years for the know-how and expertise necessary to recreate ALL the parts for this much sought after microphone.

We were exceptionally fortunate to be advised by Jon Sank during this endeavor. Jon was the engineer who supervised RCA microphone production from 1960 until the division closed in 1976. He

continued to be involved with microphones and acoustics as a consultant, and never lost his love for RCA microphones. He taught Wes Dooley in 1981 how to re-ribbon the RCA 44 with no premonition that 15 years later we'd collaborate on returning the 44 to production and widespread studio use. Jon Sank died but a few weeks before his favorite mic, the 44, was reborn at the 1998 AES Convention.

The AEA R44, manufactured by hand at our facility in California, faithfully reproduces the 1936 original's every strength. "Our ribbon mics evolved from our creation of accurate replacement parts for the classic RCA studio ribbons," explains Dooley. "In the process we brought a legend back to life." AEA's first ribbon mic, the now classic high-output R44, continues gaining converts with its natural sound, articulate midrange and forgiving nature. Our 20 years of experience with various versions of the RCA/AEA 44s and England's Coles 4038, was the apprenticeship we served before the development of the R84.

This sensibly priced high-performance LRG microphone is a significant breakthrough for performance and value. The R84 is a versatile performer, with a ribbon element 100 percent larger than other manufacturers, which delivers exceptional headroom while maintaining an intimate performance quality with smooth highs and extended lows. Protect it from puffs of air, phantom power, and "tramp iron" and the R84 is nearly invulnerable. Treat it well and it'll outlive you.

AEA's client list is a who's who of the professional audio industry, including Eddie Van Halen, John Rzeznik, Bruce Swedien, Steve Turre, Walter Sear, Bob Rock, 20th Century Fox Scoring, Richard Green, Sony Music, Skywalker Scoring, Chris Stone, Air Studio, Kevin Bacon, Shawn Murphy, Sony Pictures Scoring, Sheryl Crow, Sunset Sound, Larabee Studios and Abbey Road Studios.

We've been working with high-performance ribbon mics for over 20 years and also manufacture accessories for stereo and surround recording. Our custom products include high-end studio booms, stands, specialized mounting adaptors and hardware, Decca trees, stereo microphone positioners, MS stereo decoders and solid-state stereo phase monitors. Visit our site, [www.wesdooley.com](http://www.wesdooley.com) for more information.

### **Specifications:**

Operating Principle: Velocity microphone

Frequency Response: 20 Hz to above 20 kHz

Maximum SPL: 165 + dB SPL above 1 kHz for 1% third harmonic

Output Sensitivity: -52 dBv/Pa

Output Impedance: 270 ohms nominal

Recommended Load: 1.2 K ohm or greater

Powering: Not required or recommended

Polarity: Pin 2 high for positive pressure on front of microphone.

Connector: XLR-3M wired to a 3 meter captive cable

Off Axis Response: (level changes with angle, frequency response is consistent)

Polar Pattern: Native bi-directional pattern

Horizontal: -35 dB null at 90 / 270 degrees

Vertical: Reduced HF response above and below 0 / 180 degree axis, null at 90 / 270 degrees

Transducer element

Ribbon Thickness: 1.8 microns ( .0000018 meter ) of pure aluminum  
Ribbon Width: 4.7 mm  
Ribbon Length: 59.7 mm

### References and Recommended Reading:

BASIC STEREO MICROPHONE PERSPECTIVES - A REVIEW, first published in the AES Journal, vol. 33, no. 7/8, pp. 548-586, 1985 July/August; republished in the STEREOPHONIC TECHNIQUES ANTHOLOGY, pp. 297-305

THE BIDIRECTIONAL MICROPHONE: A FORGOTTEN PATRIARCH, was first presented at the 113th AES Convention in Los Angeles, 2002 October, Preprint no. 5646; it is scheduled for publication in the AES Journal in the 2003 April issue (vol. 51, no. 4)

THE NEW STEREO SOUNDBOOK, third edition, by Ron Streicher and F. Alton Everest, published by Audio Engineering Associates, 1998; [www.stereosoundbook.com](http://www.stereosoundbook.com).

RIBBON MICROPHONE ESSAYS by Wes Dooley, Ron Streicher and Philip Merrill published by Audio Engineering Associates, June 2003; [www.wesdooley.com](http://www.wesdooley.com).

## **Other Products by Audio Engineering Associates:**

### **TRP - The Ribbon Pre**

AEA/Fred Forsell collaboration preamp with no phantom power and 83dB of clean gain

RCA Working Reproduction Microphones and replacement parts

**AEA R44C and CNE Microphone** - Tribute to the classic RCA 44B using NOS ribbons

**AEA R44CX Microphone** - 6db more output for critical digital recordings

**RCA44 and RCA77 microphones** - Spare parts and prop shells

AEA Ribbon Microphones

**AEA R92 Microphone** - Large-ribbon optimized for guitar and other close-micing situations

**AEA R88 Microphone** - Large-ribbon coincident pair in a sleek black "stealth" package

**AEA R84 Microphone** - That big ribbon sound in a smaller more affordable package

Modular Microphone Positioners

**SMT** - Stereo Microphone Template for Blumlein and ORTF spacing

**SMP-17, 1M and 1.25M** - Stereo bars in three lengths for the ultimate in positioning flexibility

**Decca and Mini-Decca Trees** - For microphone arrays including recording for multichannel

Modular Studio Microphone Stands and Booms

**Flightweight Stands**

**Medium-Duty Vertical Stands and Booms**

**Heavy-Duty Stands and Booms**

**Crank-up Stands**

Since 1983 we've been the US agent for Coles Electroacoustics, manufacturers of the 4038 studio ribbon microphone and the 4104B, "lip" mic for voice-over work in high noise environments. We sell and service Coles microphones and genuine Coles parts.

In North America we represent CB Electronics, a leading worldwide supplier of machine control equipment to the sound-for-picture industry. Their products specialize in professional control of and translation between bi-phase, 9-pin serial and time code machines. Their SR line provides low cost multiple machine remote controls for RS-422, Sony, and Tascam DA88 protocol machines. The new P2DVD Interface may be a RS422 controlled Master with most RS422 synchronisers and Console automation systems.

Our Audio Test Department buys, sells, trades, and rents new and used audio test gear. Audio Precision, B&K, Hewlett Packard, Galaxy, Goldline, Neutrik, and Amber are among the lines we maintain in stock for audio measurements of Level, Polarity, Phase, THD and IMD, W&F, SPL, and Real-Time Analyzers.

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