



## User's Manual

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# R84 & A840 Ribbon Microphones

The passive R84 and active A840 are neoclassic designs in the tradition of the acclaimed R44 and A440 Big Ribbon™ microphones. They are designed for main, accent and solo use in contemporary studios. Mics in this tradition, such as the RCA 44, have been making great recordings for over 75 years. Buying an AEA R84 or A840 demonstrates your interest in continuing this tradition of quality sound.

The frequency response of the R84 and A840 is the same. They use different transformers so there are some sonic differences. The R series transformer was developed by Ken Reichenbach at Cinemag to match the sound of our reference RCA studio ribbons. The A series transformer is a very high-ratio transformer developed by Per Lundahl at Lundahl in Sweden without reference to the RCA tradition.

These sonic differences are subtle when using AEA mics with our TRP and RPQ *No Load*™ mic preamps. A Big Ribbon™ resonance is very low, 16.5 Hz rather than a more usual 40-60 Hz. Ribbon mics, like woofers, have a substantial impedance peak at resonance. Using unbuffered ribbons with lower impedance preamps increases noise and dramatically reduces bass. One advantage unbuffered ribbons have over buffered ribbons is that their SPL limits are entirely mechanical. AEA R series handle very high SPLs, above 1 k Hz they handle over 165 dB SPL. The 2 micron thin ribbon's mass well matches its air load, so even when used close-up as a spot mic it adds no extra high frequency 'tizz'.

An A840's mic line and preamp is buffered by a phantom-powered discrete-JFET circuit from the ribbon motor and high-ratio transformer. The result is a quiet microphone with excellent headroom and sensitivity. It matches any P48 spec preamp and drives long mic lines easily. Output impedance varies little with frequency, so there is less sonic interaction between the mic, the mic line and the preamp.

Your microphone 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 case. The R84 is delivered in a compact custom softcase. The A840 is delivered in a smaller version of the R44/A440 cloth covered armoured case. A bright brass grill and thumbnuts identify the A840 from a distance. A red label at the XLR and engraving on the logo band identifies it as requiring 7 mA of P48 phantom power.

This manual covers:

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



## *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.***

**Why do we begin with warnings?** The reasons for these three cautions have to do with the moving element in your newest prized possession. The ribbon 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:** Blowing into a mic worked for your junior high principal “Is this mic working?” However strong breath or wind blasts can permanently stretch a ribbon’s pleats, and change its’ sound. Ribbons are tough, the LA Philharmonic uses them outside at the Hollywood Bowl, but blasts of wind are a ribbon’s worst enemy.

Joe Chiccarelli recommends using your hand to feel if there are air blasts where the mic will be. If you feel a problem, move the mic or use a “popper stopper” to block the blasts. Turn amps down before plugging or unplugging an instrument. Imagine your ribbon a few inches in front of a Marshall stack with the volume turned up full. It gives new meaning to the term “pop” music.

**Phantom Power:** *The A840 needs 7 mA of P48 power. The R84 is a passive ribbon* and does not want or need phantom power. Passive ribbon mics and phantom power co-exist when everything is perfect. But if either Pin-2 or Pin-3 is shorted to ground with phantom power applied, the ribbon tries to jump out of its magnetic gap and it often stretches or snaps. Such damage is not covered under warranty.

Play it safe and turn off phantom power a few minutes before you plug in a ribbon mic. Most phantom powered preamps have DC blocking capacitors which need time to discharge to zero voltage. Or use AEA’s DC-coupled ribbon mic preamps such as the TRP and RPQ and avoid such problems.

**Protect it when not in use:** Keeping your ribbon mic covered when not in use pays big dividends. It protects the ribbon from unexpected air movement, such as when stage curtains close or the cartage company opens the doors. It also keeps the mic from ingesting minute “tramp iron” particles from surfaces it’s laid upon. The R84 and A840 are designed to minimize such unscheduled trash pick-ups, but older classics such as the RCA 44 and the Coles 4038 are very good at attracting ferrous junk or even each other.

When a tiny piece of iron gets through the protective screens and into the ribbon gap, it obstructs a ribbon’s movement. This sound is interesting but not pleasant. Cleaning the gap is not always successful. Sometimes a new ribbon is needed. This work is not covered under warranty.

We make both soft and armoured cases for your mic. The soft case has the advantage that it is more compact and handy for transport, and will protect your mic from accidental mic stand tumbles. The armoured case is larger and heavier, while still being cordura covered and of a reasonable weight.

**Storage and Service:** *Big-Ribbon<sup>™</sup>* mics can be used horizontally in a studio with no problems. The ribbons are sturdy and we’ve had them last over 30 years. But they are over two inches long so, even if it might not be absolutely necessary, we recommend storing your AEA mics vertically.

Ribbon mics don’t need regular checkups. If it sounds ‘right’, then it is. They also don’t demagnetize except over centuries. But if your mic doesn’t sound right, send it in and we’ll check it out.

## WHAT DOES IT SOUND LIKE?

“Nothing else sounds like a *Big-Ribbon™* mic on acoustic instruments,” observes Wes Dooley. “AEA’s classic R44 series and our neoclassic R84 / A840 mics offer a truly opulent sound.” It is uncanny how closely playback matches your studio listening experience. Eddie Van Halen recorded Alex’s drums at 5150 and said that his *Big-Ribbon™* mics were the only ones where playback sounded like being there.

The versatile R84 / A840 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 mics, the R44 series, continue to gain converts with their natural sound, articulate midrange and forgiving nature. Your R84 / A840 has similar sonic qualities, but is optimized for closer-up solo and accent chores.

AEA *Big-Ribbon™* mics all share 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 past 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 and A840 maintain accurate tonality for off-axis instruments and room tone and have wider sweet spots front and rear than large-diaphragm condenser mics. Because of its geometry, the R84’s high-frequency response is more consistent horizontally than most mics. As a sound source moves laterally around the mic towards the null plane, the output level goes down as expected but the mic’s high-frequency response is remarkably consistent and goes out well past 20 kHz. Using the Curve-Shaper on the AEA RPQ preamp, response past 30 k Hz is easy to attain.

**Variable high-frequency EQ as you change the vertical angle** The physics of this long ribbon 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 aiming point up or down from where you’d normally aim it.

**Highs on ribbons** AEA *Big-Ribbon™* mics have 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 in the 40 to 65 Hz range. AEA ribbons are tensioned at 16.5 Hz which provides their 20 Hz capability. 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 tightly and then clamped around their perimeter as are drum heads. This tension creates high-Q resonances, in the 8 to 12 k Hz range for large capsule mics.

Engineers refer to this extra sound as *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 Big Ribbon™ 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 and add almost any HF EQ I can imagine."

**How close can you get?** Quite close. These mics have a smooth extended treble response that never sounds harsh up close. High SPL is not a big problem either. The R84 handles 165 dB SPL  $\geq 1$  kHz and the A840 clips above 141 dB SPL. AEA Big Ribbons™ handle higher SPLs at lower frequencies than their shorter brethren.

**Proximity Bass Boost:** All figure-8 mics have a proximity bass rise as the sound source gets closer. All of us automatically pay attention to proximity effect when we first audition a mic. We talk into it and listen for where the bass and treble balance: with lips touching the mic, out nine inches or so, or at a distance. Compared to the R44 and A440, the R84 and A840 are balanced for closer use. The R44's proximity effect begins at six feet (1.8 M) and can become huge. The RCA 44 was developed when studios were larger and mics were rarely used close up. The R84 / A840 have a more moderate proximity effect, better suited for closer use in contemporary studios. Different AEA mics are balanced for close (92), medium (84 & 840), and distant (44 & 840) work.

**Figure-eight?** These Big Ribbon™ mics maintains an effective figure-eight polar pattern down to 20 Hz. On stage or in the studio, such a well controlled polar pattern is very 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 rather than a point at 180 degrees, you now have access to a new bag of tricks.

**Blumlein and More:** This purist stereo technique is also useful for studio tracking. Blumlein stereo is a pair of figure-8 mics set vertically coincident at 90 degrees to each other. Solo and ensemble micing use the 90 degree arc between the front left axis and front right axis.

When musicians want to play face to face and track isolation is needed, this technique is a lifesaver. Place the musicians at right angles to each other with their instruments facing the front of one mic or the other. Track isolation between instruments is excellent as the principal axis of one mic is the null plane for the other. Individual instruments such as guitar and bass amps can be isolated and variations such as spaced pairs can be used to isolate entire sections, such as the saxes from the horns.

Rigging a R84 or A840 pair for Blumlein requires a boom arm and a pair of right angle mic clamps. The Konig & Meyer model 238 clamps on a K&M 211/1 adjustable boom work well. The telescopic boom makes it easy to adjust the distance between the R84 end caps until they are almost touching. A small foam rubber pad can be used between the top end caps if a desired. Setting up a Blumlein pair of R84s does take time, which is why we offer the AEA R88 Blumlein ribbon mic.

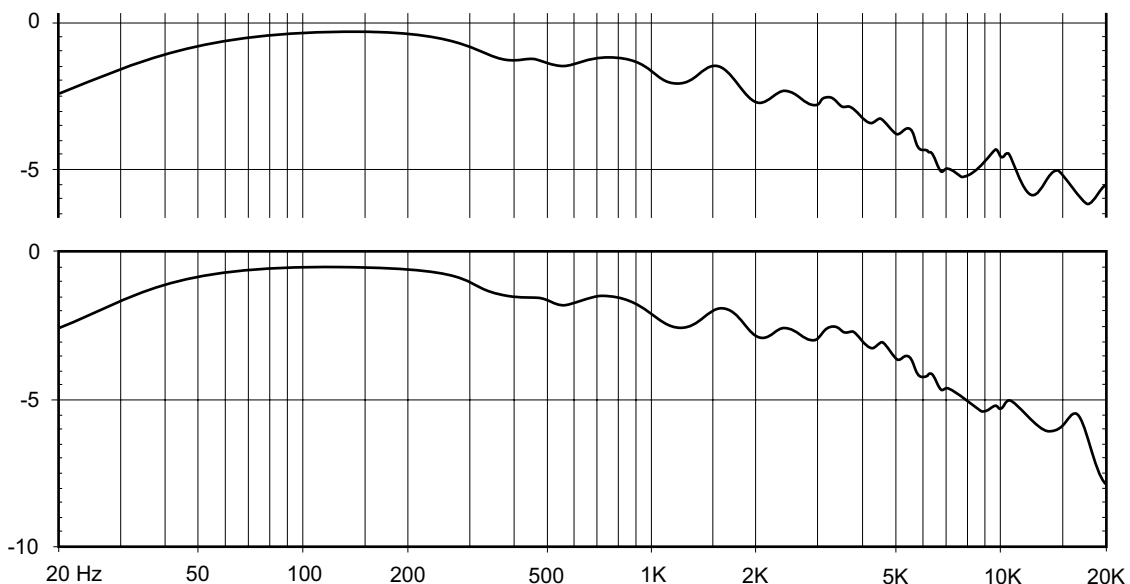
**"This Side" and "That Side"** The sound of your R84 / A840 is slightly different between the front and the back — subtle, but sufficient to offer two "flavors." In addition to polarity, this is caused by using two wraps of grill cloth on the back and only one on the front. So, don't think in terms 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.

We could spend an entire day talking about *Big-Ribbon™* mics, but listening to them is much more fun. These are really easy to use microphones. If your ears like the sound you are hearing, then you will probably like a *Big-Ribbon™* recording. Try them on everything. Move it around and listen to how positioning changes the sound. Discover what works best for you in your recording environment. *Big-Ribbon™* microphones have been in constant use making hits now for more than seven decades. Working with one will let you discover why they will be around for a long time to come. Have fun, experiment, and let us know about your adventures.

## TECHNICAL DETAILS

**R44 / A440 vs. R84 / A840** Compared to the 44 series, the 84 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). The passive R84 has about the same sensitivity (output) than an original RCA 44B or BX (-56 vs. -55 dBV/Pa). Ribbon mic design lets one trade less output sensitivity for more bandwidth. Thus the R84 goes out nicely past 20 kHz rather than the R44's 15 kHz. Both are *Big-Ribbon™* designs that share a pure aluminum low-tension ribbon which is 2.35 by 0.185 inches by 2 m (4.7 by 59.7 mm by 2 m) and delivers bass down to 20 Hz.



**R84 frequency response curves: Upper curve is front, Lower curve is rear, 0 dB = -55 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 endangered. AEA 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 using and servicing various versions of the RCA mics such as the 44 and England's BBC/STC/Coles 4038 and 4104B, was the apprenticeship we served before the development of the R84.

The R84 and A840 are sensibly priced *Big-Ribbon™* microphones which deliver high performance and value. They are versatile performers, with a ribbon element 100 percent larger than other manufacturers. This *Big-Ribbon™* 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 it 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 30 years and also manufacture accessories for stereo and surround recording. Our custom products include high-end studio booms and stands; specialized mounting adaptors and hardware; and Decca trees and stereo microphone positioners. Visit our site, [www.ribbonmics.com](http://www.ribbonmics.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: -56 dBv/Pa  
Output Impedance: 270 ohms nominal  
Recommended Load: 1.2 K ohm or greater  
Phantom Powering:  
    R84: Not required or recommended  
    A840: 7 mA of P48 specification phantom power required  
Polarity: Pin 2 high for positive pressure on front of microphone.  
Connector: XLR-3M wired to a 3 meter captive cable

Polar Pattern: Native bi-directional pattern

Off Axis Response:

Horizontal: -35 dB null at 90 / 270 degrees  
                  Level changes with angle, frequency response is consistent  
Vertical: Null at 90 / 270 degrees  
                  Reduced HF response above and below 0 / 180 degree axis,

Transducer element: Pure Aluminum

Ribbon Thickness: 1.8 microns ( .0000018 meter ) 0.000070 inches

Ribbon Width: 4.7 mm 0.185 inches

Ribbon Length: 59.7 mm 2.35 inches

## 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.ribbonmics.com](http://www.ribbonmics.com).
- THE DESIGN OF A RIBBON TYPE PRESURE-GRADIENT MICROPHONE FOR BROADCAST TRANSMISSION: BBC Monograph #4 by D.E.L. Shorter and H.D. Harwood published by the BBC, December 1955; [http://downloads.bbc.co.uk/rd/pubs/archive/pdf/monographs/bbc\\_monograph\\_04.pdf](http://downloads.bbc.co.uk/rd/pubs/archive/pdf/monographs/bbc_monograph_04.pdf)
- THE DESIGN OF A HIGH-QUALITY COMMENTATOR'S MICROPHONE INSENSITIVE TO AMBIENT NOISE: BBC Monograph # 7 by H.D. Harwood published by the BBC, June 1956; [http://downloads.bbc.co.uk/rd/pubs/archive/pdf/monographs/bbc\\_monograph\\_08.pdf](http://downloads.bbc.co.uk/rd/pubs/archive/pdf/monographs/bbc_monograph_08.pdf)

## Other Products by Audio Engineering Associates:

AEA Microphone Preamps

**TRP The Ribbon Pre**

*No-Load<sup>™</sup>* DC coupled preamp with 83dB of gain optimized for ribbons and tube mics

**RP<sub>48</sub> Q For Ribbon and Condenser Mics**

80dB gain, AC & DC inputs, instant-compare curve-shaping proximity-tuning and air-lift

RCA Working Reproduction Microphones and replacement parts

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

**AEA R44 X motor option** - 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 close-micing guitars and vocals

**AEA R88 Microphone** - Large-ribbon Blumlein / MS coincident pair

**AEA A440 Microphone** - The quietest ribbon ever. Noise floor options to 6 dB (A)

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 servicing 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 supply replacement parts for both STC and Coles microphones.

AEA represents CB Electronics, a leading worldwide supplier of machine control equipment to the sound-for-picture industry. Their products speed up Mix to Pix postproduction cycle in Hollywood and around the world. From old school bi-phase to 9-pin serial and time code gearboxes, they provide the digital glue for modern facilities.

CB's SR line handles multiple machine control and synchronization for RS-422 protocol devices. Their PD-1 PEC - Direct speciality control surface for ProTools HD is now a Hollywood standard. The inexpensive USB-422 interface from USB to RS422 send and receive is sturdy and easy to setup.

## Audio Engineering Associates

1029 N. Allen Ave., Pasadena, CA 91104, USA

Phone: (626) 798-9128 Fax: (626) 798-2378

Visit us on the web at [www.ribbonmics.com](http://www.ribbonmics.com)