

Royer Labs

Model R-12

Active Mono Ribbon Microphone

Operation Instructions Manual
& User Guide

Designed and Assembled in the U.S.A.

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Introduction

Thank you for choosing a Royer Labs model R-12 ribbon microphone. The R-12 is a handcrafted precision instrument capable of delivering superior sound quality and exceptional performance for many applications.

The Royer R-12 is an all-new design incorporating the best elements of our classic models while adding new technological features. As with our classics, the R-12 is a bi-directional ribbon (figure-8) microphone. The R-12 incorporates Royer's patented direct-corrugated, offset-ribbon element, a feature that allows for high SPL handling and is standard in all R-series microphones.

The R-12 is an active microphone powered by standard 48-volt phantom power. The electronic circuitry has been upgraded utilizing the latest SMT circuit technology.

With our unique built-in triple-element windscreen, a switchable -15 dB pad and a 100 Hz high-pass filter, the R-12 is well suited for vocals as well as the traditional ribbon mic applications such as amplified guitar, brass and percussion. Royer's active circuitry and specially designed impedance-matching transformer combine to deliver superior headroom and ultra-low distortion even at high SPL's. The microphone's body has an extremely durable finish that is not only environmentally considerate but resists stains and scratches while minimizing reflected light.

Description

The R-12 is a phantom powered bi-directional (figure-eight) velocity type ribbon microphone designed for professional applications. The figure-eight pick-up pattern allows the R-12 to be addressed from either side with equal sensitivity. The in-phase signal is achieved when the microphone is addressed from the front, indicated by the "ROYER" logo.

The R-12 and R-10 are our most tolerant models to shock and vibration, and performance is unaffected by changes in temperature or humidity. However, ribbon microphones are somewhat more sensitive to direct blasts of air, and the R-12 is no exception to this rule. Discretionary use of a windscreen or pop screen, such as the Royer PS-101 or equivalent, is highly recommended for close-miking vocalists or certain types of percussion and wind instruments.

Applications

The Royer Labs R-12 is a versatile microphone, ideally suited for many critical applications both in the studio and on live stages. Royer's proprietary 3-layer windscreen system and shock mounted transducer assembly greatly increase the R-12's ability to handle plosives and rough handling. Combining this with Royer's patented offset-ribbon technology and a custom-designed matching transformer, the R-12 can handle SPLs of 160 dB (at 1 kHz) with no overload or distortion. This allows for comfortable use on instruments like electric guitars, vocals, horns, drum overheads and Leslie speakers, while also being an excellent choice for violin, acoustic guitar, piano and other

acoustic instruments. Its naturally smooth frequency response characteristics are a perfect match for cymbals, stringed and reed instruments, and other instruments that commonly exhibit harshness.

Special Features

The R-12 is an active microphone requiring standard 48-volt phantom power to operate. It draws a mere 4-milliamperes of current. In addition to its robust mechanical design, the R-12 has a switchable -15 dB pad designed to minimize overload when handling very loud source material. In addition, a switchable high-pass filter (placed at 100 Hz, 6dB per octave) reduces low frequencies that result from proximity effect or ultra-low-frequency sound sources.

Ribbons in the Digital World

Digital recordings benefit greatly from the properties inherent in ribbon microphones. Since A/D converters cannot distinguish between the sound source being recorded and the complex distortion components often associated with condenser microphones, they sometimes have difficulty tracking the signal accurately, resulting in ringing and edgy-sounding tracks. With ribbon microphones, ringing is virtually nonexistent due to the ribbon's lack of harmonic artifacts and high frequency peaks. A/D converters have less difficulty tracking the ribbon-generated signal, resulting in very smooth digital recordings free of microphone-related edginess.

User Guide

Using the R-12 Ribbon Microphone

There are a few important facts about ribbon microphones that are key in understanding how to use them intelligently.

1. The R-12 is a *side address*, bi-directional microphone and its rejection in the dead areas is very strong. Due to this directionality, the R-12 should be placed at 1.3 times the distance normally used with omni-directional microphones, or about the same distance used for cardioid microphones. This method is used to achieve the same ratio of direct to reflected sound.

2. In the horizontal plane, the R-12 does not discriminate against the highs off axis; nor does it boost highs on axis. Therefore, several instruments or vocalists can be placed in front of the microphone without favoring the performer in the center of the group.

   Several performers can be grouped at both the front and back of the microphone, with one proviso: since the outputs are out of phase at the front and back of the microphone, cancellation can result if, for example, two tenors are placed at opposite sides at equal distances and they are singing in unison, so listen to the feed before committing to it.

3. When using the R-12 to record loud signal sources, placing the microphone slightly off axis to the signal source (either horizontally or vertically) lowers direct pressure on the ribbon element, possibly leading to longer ribbon life.

4. The R-12 is an active microphone and requires standard 48-volt phantom power to operate. It will not work in the absence of a phantom power source.
5. It is not recommended to attempt to test the R-12 with an Ohm meter; damage to the electronic circuit could result and would not be covered by the manufacturer's warranty.

6. Although the R-12 is a robust microphone, do provide it adequate protection. If the microphone is to remain set up on a stand when not in use, place the supplied mic sock over it until it is to be used. When carrying the microphone around, wrap your hand (or the supplied mic sock) around the ribbon end to minimize any potential of wind getting to the ribbon element. These practices help the ribbon element last longer before needing replacement.

7. Do not allow the microphone to be dropped on hard surfaces such as floors or tables - depending on how the mic falls, you could stretch the ribbon. The microphone would likely continue to operate, but performance could be compromised and re-ribboning the microphone would be necessary to restore normal operation.

Amplification Considerations

Unlike passive ribbon microphones and many moving coil dynamic microphones, the R-12 is far less dependent on preamplifier characteristics for good performance. Passive microphones require preamplifiers that offer a proper impedance match and higher gain characteristics for proper operation. The R-12 will deliver excellent performance with even the most moderate of preamplifiers. The R-12 will even work well when plugged directly into a computer interface that has a built-in preamp stage and phantom power capability.

So which preamp should I consider?
Try to find the best preamplifier you can afford that has good noise and gain characteristics. Most preamplifiers today offer fairly high impedance inputs and should work well with the R-12 and most passive microphones as well.

Equalization & Ribbon Microphones

One of the great strengths of ribbon microphones is how well they take EQ. Even with substantial amounts of equalization, ribbons retain their natural, real quality. For example, when a lead vocal is being captured on an R-12, you can actually boost upper-end frequencies to the point where the R-12 emulates the performance curve of a condenser mic with excellent results. This is not to say that a ribbon microphone can substitute for a quality condenser mic in all cases, but the EQ friendliness inherent in ribbon microphones does allow for an enormous amount of flexibility.

Ribbon mics take EQ so well because of their 1) inherent low self-noise, 2) unusually smooth frequency response characteristics and, 3) freedom from off-axis coloration. Dialing in high amounts of equalization on condenser or dynamic microphones also brings up equal amounts of the microphone's harmonic distortion products and noise, contributes to an unnatural, unpleasant sound. Because distortion and self-noise are very low in ribbon microphones, high levels of EQ can be used without adding harshness or excessive noise.

Hum, Noise & Mic Orientation

All dynamic microphones, including ribbons, are electromagnetic devices and are, to some degree, susceptible to picking up stray alternating magnetic fields. Power transformers (such as those found in guitar amplifiers) and alternating current motors are the most likely sources of radiated noise. Building wiring and electrical utility transformers are other likely sources. A well-designed microphone provides shielding to minimize the effects of stray magnetic radiation, but complete isolation is impossible, and the result can be hum or buzz. Ribbon microphones can potentially manifest this condition to a greater degree because of their higher gain requirements. Vintage ribbon microphones often have poor shielding, and the problem can be worse. The cure for this problem is to identify the source of the noise and move the microphone away from it. Another trick is to alter the orientation of the microphone in such a way that the noise is cancelled out. If you ever experience this situation while in the studio, try rotating the microphone to identify the "null" point, then reposition the mic and the sound source. This is much like having a guitar player with single coil pickups reposition the instrument until amplifier hum disappears.

The Sweet Spot

Finding and Working with the Sweet Spot

Good engineers know the benefits of finding and working with the "sweet spot." The sweet spot will be defined as the optimum placement (working distance and angular position) of any microphone relative to the sound source.

Each microphone has its own sweet spot whether it is a ribbon, dynamic or condenser type. The sweet spot will vary with the type of sound source and its volume intensity, the polar pattern of the microphone and how consistent it is with frequency, and the acoustic environment.

Being in the sweet spot means the microphone and the sound source are in a state of harmony; the acoustic information is exciting the microphone in a way that the resulting reproduction is very desirable, usually without the need of additional equalization or electronic manipulation.

There are only general rules as to where the sweet spot may be found for any given microphone, and usually experimentation reveals it. The sweet spot can be extremely variable since it depends on the quirks of a given microphone and a given room. Once the sweet spot is discovered, this placement can become a rule of thumb starting point for future microphone placement with similar sound sources. Remember this: If it sounds good, it's probably right. If it doesn't, move the microphone. It's often more effective to reposition the microphone than to start fiddling with knobs. Knob twisting can affect headroom and phase coherency and add unwanted noise.

The following is a list of variables that account for "sweet spot" effect:

1. Frequency response variations due to proximity effect.

2. Frequency response variations due to treble losses as a result of absorption and "narrowing" of the pattern at high frequencies, causing weakening of highs as the microphone is moved away from the sound source.

3. Variation in ratio of direct to reverberant sound.

4. Tendency of a microphone to favor the nearest sound source due to a combination of these items, plus the influence of inverse square law. Inverse square law states that for each halving of source-to-microphone distance, the sound pressure level *quadruples.*

Other Types of Microphones

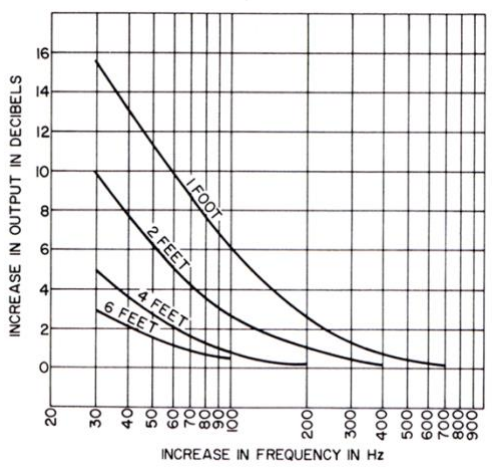
For the same ratio of direct to reverberant sound, omni-directional microphones must be closer to the sound source than cardioid or bi-directional microphones. Microphones should generally face the sound source head-on or treble losses due to phase cancellation can result. The exception here is for large diaphragm condenser microphones, which often give the flattest response at an angle of about 10-20 degrees (off axis), where phase loss and diffraction effect offset each other somewhat.

Proximity Effect and Working Distance

The Sound That Is "More Real than Real"

Ribbon microphones have long been renowned for rich bass. This effect is largely due to the fact that ribbon microphones generally have excellent bass response to begin with, and at the same time exhibit an effect known as *proximity effect* or *bass tip-up*.

As illustrated in the following graph, a typical bi-directional ribbon microphone will have a flat frequency response at a distance of about six feet from the microphone, but at shorter distances the bass response is boosted; the effect becomes increasingly pronounced as the distance between the microphone and the sound source is reduced.



Typical relationship of microphone distance to frequency response for ribbon-velocity bidirectional microphone.

This bass-boosting characteristic can become quite intense and, if desired, can be corrected by equalization (reducing low end). However, for a multiple microphone setup, the pronounced bass boosting (due to proximity effect) can be turned to an advantage. If an instrument, such as a trumpet, is extremely close-miked and the bass is cut to restore flat response, unwanted low-frequency sounds are cut back by upwards of 20dB compared to an un-equalized microphone with a flat response. This discrimination is *independent* of the microphone's polar response.

Another area where proximity effect can be turned to an advantage is to make things sound "more real than real." For example, many voices and certain musical instruments produce fundamental frequencies within the bass range (below 150Hz or so) but the fundamentals are weak. If a microphone which has no proximity effect and a rising high frequency response is used on an upright piano, or on a person with a thin or quiet voice, the recorded sound is likely to sound even thinner than it was in real life. In contrast, using a microphone with strong proximity effect on such sound sources can deliver a "better than real" sound since the boosted bass response will compensate for the weak fundamentals in the sound source. Since the fundamentals are present, but weak, using proximity effect to boost them by several dB will sound natural, even though the sound has been sweetened.

Radio and television announcers have long relied on proximity effect to give a full, rich, authoritative quality to their voices. By knowing how to work with the proximity effect, the engineer can get several useful effects without resorting to a box.

Microphone Techniques

General Tips for Using the Royer R-12

The following are good basic starting places for recording with the R-12. These positions are known to produce good results, but experimentation is the key to getting the most out of your recordings. Photographs of many of the following techniques can be found at www.royerlabs.com.

Amplified Instruments can be miked from a distance of 2 to 8 inches or more. The smooth, undistorted response is extremely useful for natural reproduction of electric guitars.

Electric Guitar amplifier speakers are often beamy, so experiment with mic placement to find your favorite spot. Placing the mic at greater distances from the speaker cabinet adds more room ambience to the mix. You will find the R-12 adds no undesirable elements to the sound. Basically, what you hear at the amp is what you get in the control room, in your recordings, and in FOH systems.

Brass Instruments and R-12s go together extremely well. Mic the instrument from a distance of 18 inches to start and increase the working distance a little if several instruments are being used. You can move closer in or further away depending on the sound desired.

Reed Instruments sound full and never edgy when captured with an R-12. Normal working distances are about a foot or two from the instrument.

String Instruments sound very sweet and clean when recorded with R-12's. Place the microphone anywhere from two to several feet from the instrument. For larger string sections, try placing the microphone slightly above the instrumentalists and angled down; a distance of three or four feet will do the trick nicely.

Pianos sound excellent when recorded with R-12's and are free of phase-related comb filtering. The bass is full and rich while the top remains clean with no clatter. Mic the piano at a distance of one foot to several feet, depending on taste. A more direct, up-front sound will be achieved when the microphone is placed closer to the soundboard.

For capturing a piano in stereo, place a pair of R-12's apart, one over the bass strings and the other over the high strings. The farther the mics are from each other, the wider the stereo spread. For a more direct stereo effect, the microphones may be placed in an X-Y pattern just outside the open piano lid.

Choirs and Orchestras can be picked up well with two R-12's. Place the microphones at a height of ten feet or so and a few feet behind the conductor. The microphones should be spaced apart approximately one foot and angled, one toward the left and one toward the right.

Drums and Percussion Instruments sound full-bodied and natural when recorded with a pair of R-12's. For a drum set, placing the microphone(s) at a distance of four to six feet above the kit works very well. A touch of high end EQ will make the cymbals cut more if needed.

Kick drums can be miked closely (10 to 18 inches), *with the microphone leaned forward at a 45-degree angle* to protect the ribbon element from excessive plosive forces *(See Example 3)*. This microphone position also provides good kick drum isolation due to the top of the microphone, which does not pick up sound, being aimed at the rest of the kit.

Another useful method is to mic the kick drum at 18 inches. If the front head has a hole cut in it, position the microphone away from the hole to avoid excessive air blasts. An R-12 used as a mono room mic, four to six feet in front of the kit and compressed, will yield a surprisingly large, full drum sound.

Recording Loud or Plosive Sounds

Wind blasts can stretch the ribbon element in all ribbon microphones. This includes the R-12, although it's 3-layer wind screen system cuts down wind at the ribbon element considerably. Kick drums, de-tuned electric guitar amps, and bass amplifiers can generate considerable close up wind blasts. One way to determine if the air pressure is excessive is to place your hand in front of the sound source (kick drum, guitar cab, etc.). If you feel air movement, do not put your ribbon microphone there.

A simple technique to protect against overstressing the ribbon is to slightly angle the microphone so the percussive wave is not directed at the front of the mic "head on." A slight angular tilt (either vertically or horizontally) is all that is required to reduce stress on the ribbon element. (See Example 1)

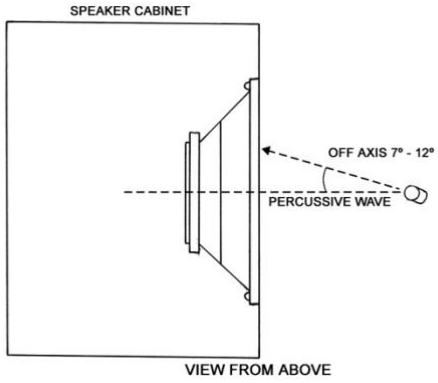
1. Example of Vertical Positioning Technique



Slight off-axis positioning minimizes stressing the ribbon on loud sound sources.

2. Example of Horizontal Positioning Technique

Angling the microphone slightly minimizes stressing the ribbon. Due to the microphone's pickup pattern, sound will not be affected.



3. Side View of Kick Drum Miking Technique

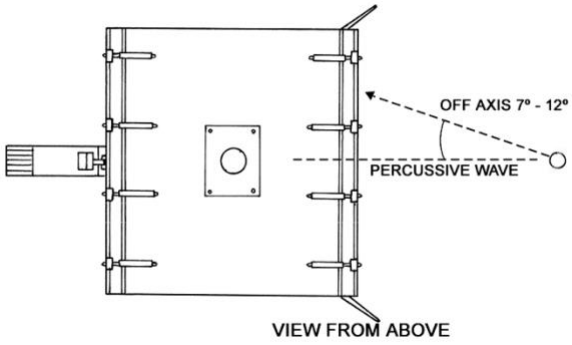
A) Close miking —angle mic so the sound pressure wave is off-axis



B) *Standard miking position*

4. Horizontal Positioning Technique

Applied to kick drum—similar to that utilized for other loud or percussive instruments



Stereophonic Microphone Techniques

Classic Blumlein Technique

For many years, several coincidence microphone setups have been widely used for recording in stereo as naturally as possible.

The "Blumlein" technique, named for A.D. Blumlein of England, involves the use of two figure-eight microphones positioned as in the sketch *(see Figure 1)*, so that one faces left and the other right, at an angle of 90 degrees (i.e. each displaced 45 degrees from center).

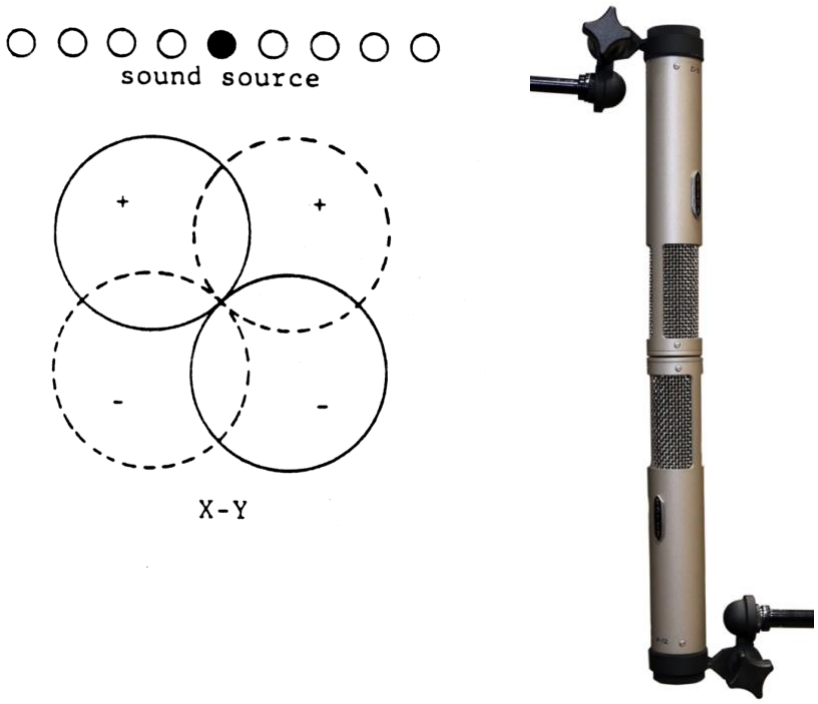


Figure 1
Classic Blumlein or coincident miking technique

Each microphone ultimately feeds one speaker in a stereo system, and due to the directionality of the microphones, the result is a very well-defined stereo effect on playback. For classical music, particularly, the reproduction can be very satisfying.

Mid-Side (M-S) Technique

In the early days of stereo radio broadcasting, the mid-side recording technique was developed to allow for 1) simultaneous stereo and mono feeds from the same mic array and 2) electronic manipulation of the width of the stereo image.

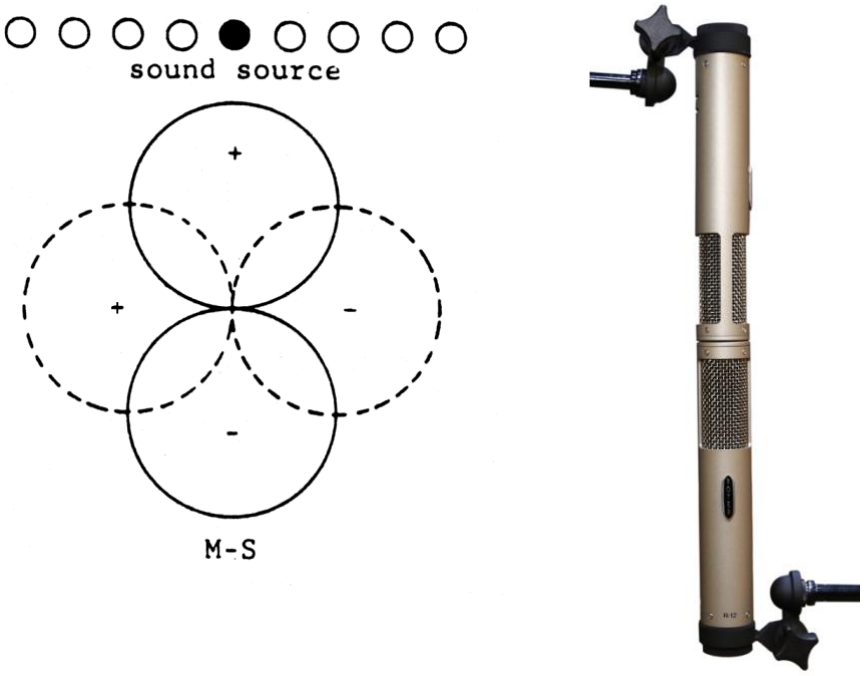


Figure 2 - Typical M-S Miking Technique

In M-S recording, one mic faces sideways, one faces forward as shown in *Figure 2*, and they are connected as shown in *Figure 3*. If the outputs of the two microphones are equal (or made equal using gain controls), the stereo pickup will be similar to that of two microphones placed as a Blumlein X-Y pair, delivering a wide stereo image.

As you reduce the level of the "side" microphone, the width of the stereo image will narrow until, with the side microphone turned all the way down, you have just the "mid" mic panned center for a mono pickup.

If the outputs of the "mid" and "side" microphones are recorded on separate tracks, the electrical connections shown in *Figure 3* can be made at the mixer outputs and the adjustment of the stereo separation can be done during mixdown, rather than during the actual recording.

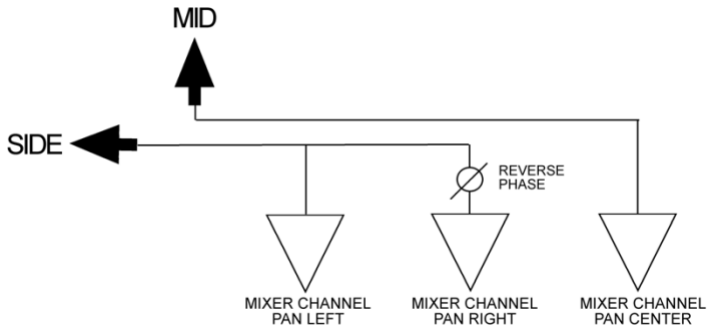


Figure 3
Typical M-S connection set-up

Care & Maintenance

The R-12 is a hand-built precision instrument. All that is required to ensure proper operation of this microphone is to follow some common-sense rules.

1. Avoid ribbon element damage by not exposing the microphone to severe shock or vibration. If the microphone is accidentally dropped but it sounds and performs normally, it's okay. However, low output or a dull sound would indicate a damaged ribbon which will need to be replaced.

2. *Do not expose the microphone to excessive direct blasts of air or strong air currents!* Use a windscreen or suitable blast filter when close miking a vocalist or wind-producing instruments. P-popping does not necessarily damage the ribbon element, but it may introduce unacceptable thuds to the vocal track or produce preamplifier overload.

3. Do not expose the microphone to liquids or caustic smoke.

4. To avoid hum, do not expose the microphone to strong alternating electromagnetic fields, such as the power transformers in amplifiers.

5. Use a soft cloth to clean the microphone body. A small amount of denatured alcohol can be used to remove fingerprints and other stains.

6. Do not expose the microphone to metal filings. Fine metal filings can slip through the R-12's windscreen and make their way to the transducer's strong magnets, at which point they will rub against the ribbon element and the microphone will have to be re-ribboned.

7. When not in use, store the microphone in its protective case.

8. Leave disassembly of the microphone to a trained technician. Disassembling the microphone voids the warranty. There are no user-serviceable parts inside.

Caution!

Keep recorded tapes, spring-wound watches and personal credit cards using magnetic coding away from the microphone. The transducer's powerful magnets can easily erase tapes and credit cards, or bend delicate metal parts in fine watches.

Features

- Very high overload characteristics – maximum SPL rating of 160 dB @ 1 kHz.
- R-12's active electronics will not overload or produce distortion up to maximum SPL rating
- Requires standard 48-volt phantom power supply (4-mil current draw)
- Switchable high-pass filter cuts low frequencies at 100 Hz, 6dB per octave
- Switchable -15dB pad for recording high SPL sound sources
- 3-layer windscreen system protects against wind exposure and lowers proximity effect when close-miking
- Shock mounted ribbon transducer provides extra protection to ribbon element
- Swivel microphone mount allows flexible microphone placement.
- Extremely low residual noise
- Ribbon element is unaffected by heat or humidity
- Absence of high frequency phase distortion
- Excellent phase linearity – even off axis
- Equal sensitivity from front or back of element
- Consistent frequency response regardless of distance
- Compact size

R-12 Technical Specifications

Acoustic Operating Principle:	Electro-dynamic pressure gradient with active electronics
Polar Pattern:	Figure-8
Generating Element:	2.5 micron aluminum ribbon
Frequency Range:	30Hz – 15,000Hz +/-3dB
Sensitivity:	-36 dB (ref 1V/pa)
Switchable Pad:	-15 dB
Switchable Bass Cut:	100 Hz (6dB per octave)
Output Impedance:	200Ω (nominal) balanced
Rated Load Impedance:	1000Ω or greater
Maximum SPL:	>160dB @ 1KHZ, > 135dB @ 30HZ
Output Connector:	Male XLR 3-pin (Pin 2 Hot)
Power Requirements:	48-volt Phantom Power
Supply Current:	4 mA

All Royer monaural microphones are available in matched pairs at additional charge.

Mechanical Specifications

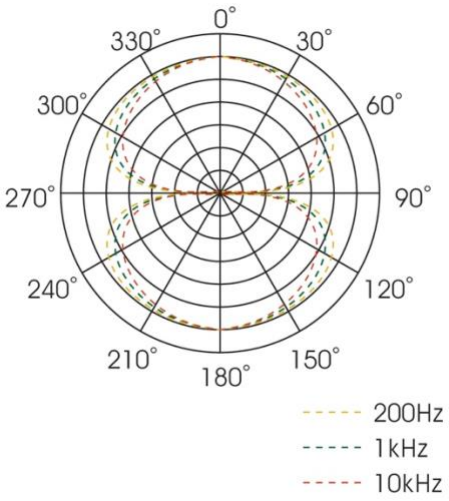
High grade Neodymium magnet assembly in Royer's patented Flux-Frame transducer
1.5" x 3/16" x 2.5-micron ribbon assembly

Multi-layer Stainless steel and synthetic screen with internal baffle and dampener

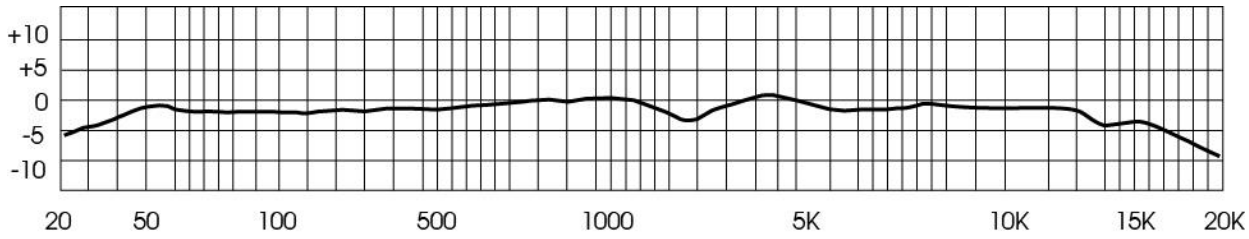
Weight	16.3 ounces (462 grams)
Microphone Dimensions:	Length including mounting base: 8 ¼" (209.5mm)-inches Width: 1 3/8" (35mm)
Finish:	High-tech, non-reflective matt epoxy
Accessories:	Swivel microphone holder, carrying case, protective mic sock
Optional Accessories:	Pop-screen (Royer PS-101)

To learn more about Royer products and their usage, visit our website at www.royerlabs.com.

Polar Pattern



Frequency Response



Warranty

The Royer R-12 is warranted for a period of ten years from the date of purchase. This warranty covers material and workmanship The first re-ribboning is free within one year of purchase. Customer pays all shipping charges

Extended Ribbon Element Policy: First re-ribbon free within five years of purchase if the microphone is registered by the original owner within one year of purchase. Microphones must be registered within one year of purchase for extended ribbon element warranty.

PLEASE RETAIN YOUR ORIGINAL BILL OF SALE AS YOU WILL NEED TO PRESENT IT SHOULD YOU REQUIRE SERVICE UNDER THIS WARRANTY.

TO VALIDATE THIS WARRANTY, THE REGISTRATION CARD AND A PHOTOCOPY OF THE SALES RECEIPT FROM AN AUTHORIZED ROYER DEALER MUST BE ON FILE WITH ROYER LABS.

EXCLUSIONS:
This warranty does not cover the following:

1. Defects or damage caused by accident, fire, flood, lightning or other acts of nature.
2. Defects or damage caused by abuse, misuse, negligence or failure to observe the instructions contained in the owner's manual.
3. Damage caused during shipping or handling.
4. Products that have had their serial numbers altered or removed.
5. Products purchased in "AS-IS" (used) condition.
6. Products that have been altered or repaired by anyone other than a factory authorized service station.

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