JOSEPHSON

e22S

CARDIOID CONDENSER MICROPHONE

The e22S microphone was developed in the Josephson Engineering custom lab in response to the needs of Steve Albini. Steve's studio, **electrical audio** in Chicago, is known for innovative recording of a wide range of musical styles. His requirement was for a mic that sounded like some specific models of out-of-production European condenser microphones, but which also was more rugged (to withstand drumstick hits) and lower profile (preferably side-address). We went through several iterations of the design before he was happy, but now the mic is the "one mic in the studio that gets used on every session."

We asked Steve to write down some thoughts about using the e22S mic. These are his comments.

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Microphone Warranty

Josephson microphones are warranted to be free of defects for five years from the date of original purchase. If purchase documents are not available, the warranty period begins when the microphone was shipped from the factory. Josephson Engineering will, at its option, repair or replace any microphone that fails, providing that it is returned to the factory prepaid and has not been abused or altered.

There are no user-serviceable parts inside Josephson Engineering microphones. Disassembling a Josephson microphone will void its warranty.

For service information please contact Josephson at 831-420-0888. Repair shipments may be sent to the factory at the address below.

EU Regulatory Compliance

Josephson Engineering, Inc. certifies that e22S microphones bearing the "CE" mark conform to the applicable requirements of the European Union directives as follows:

Machinery 93/68/EEC	Exempt – passive sensor
Low Voltage 93/68/EEC	Exempt – passive sensor
EMC 93/68/EEC	Exempt – passive sensor
RoHS 2002/95/EEC	Compliant for Hg, Cd, Cr6, PBB, PBDE and Pb

David Josephson, CEO
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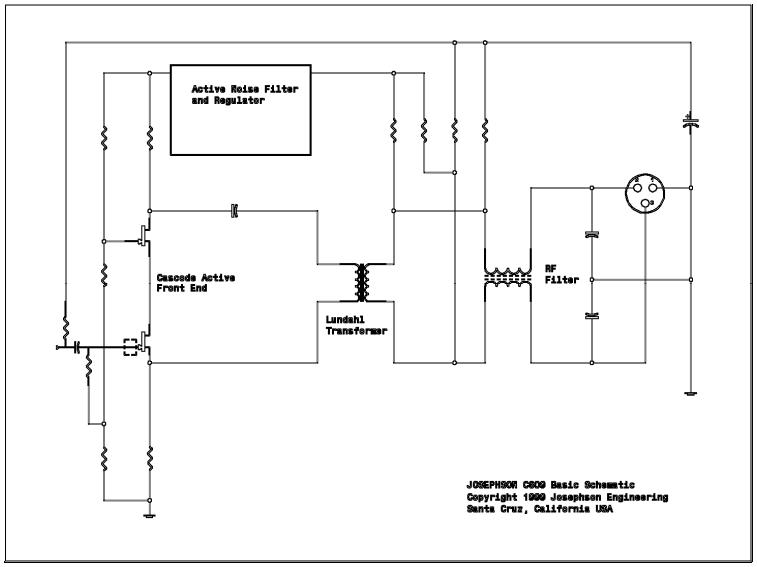
Notes from Josephson on the e22S design

The e22S is derived from the C609 microphone body from the Josephson Engineering “Series Six” custom line of interchangeable capsule microphones, together with the KA22S capsule which is unique to this microphone. The capsule diaphragm is polyester with pure evaporated gold metallization. The housing is made of machined brass with matte black chrome plated finish.

The electronics are as simple as can be built for a condenser microphone — unfortunately simpler is not always easier. The front end circuit is Josephson’s proprietary Class-A discrete FET cascode design. Signal from the FET is coupled through film capacitors to an output transformer developed for this microphone by Per Lundahl at Lundahl Transformers in Sweden. It uses an amorphous glass-nickel alloy core and pure copper wire for minimum coloration. No DC-DC converters or other switching power supply topologies are used, so the microphone requires full 48 volt phantom powering per IEC 61938 for proper operation.

Please don’t connect microphones through normaling patch bays, this is often a source of problems.



Drums

The e22S was inspired by the need for a rugged, high quality condenser mic with a low profile for use as a close mic on drum kits. I often use them in top-and-bottom pairs, but they are also useful on the top side only. The side-address design allows the microphone capsule to be optimally oriented without the body of the microphone interfering with drum stick movement, cymbals or other hardware. Instead of having to work around the drummer's layout, you can pick a spot you'd like for the capsule and stick it there.

e22S on a snare (and where another mic might have been)

On snare drum, the mic's burly housing is a godsend, as it can withstand glancing or direct blows from a drum stick, and the flat profile allows the mic to get in over the drum even on tight layouts with an imposing high-hat position. A capsule location closer to the rim of the drum will pick up more shell ring and head overtones, while placing it closer to the contact area will

provide more attack and a deeper tone. Pay attention to the angle of the capsule as well: with the diaphragm parallel to the head, the tone is darker with a more definite pitch, while an oblique angle facing the stick/head contact area tends to emphasize the attack.

An e22S near the rim of a floor tom, with an outline of where another mic might otherwise be used (and not clear the cymbal).

Using the mics in top-and-bottom pairs on tom-toms is a good technique for capturing the resonance of the drum, but requires a little more care in set-up. Start by positioning the top mic so it gets a clear view of the stick contact point on the head. This will provide good attack and stroke definition. If using the top mic only, you should experiment with the capsule angle: with the mic diaphragm more parallel to the drum head, you will get less attack and more resonance, and the e22S design permits a perfectly flat orientation.

develops slightly farther away from the instrument than it does with a flat-top.

For banjo, tamboura and other skinned string instruments, the skin head tends to resonate and project more tone than the strings or bridge do. The microphone can be placed with the diaphragm facing the head, at a distance that allows comfortable playing. A little proximity boost is helpful to avoid a brittle sound.

For mandolin and ukulele, two instruments that can sound brittle, the e22S is a good choice, and can be used fairly close to the picking (or strumming) hand, generally favoring the area near the middle of the body. For ukulele, the precaution about getting too close to the sound hole (from the acoustic guitar notes) can be ignored, as this instrument generates very little low-frequency information.

For bowed instruments (violin, viola, ‘cello, bass) the recording distance should be greater, as the bow itself needs room to move, and the sound of the instrument develops some at distance away from the body. I would recommend starting 24 - 36 inches away for bass or cello, farther yet for violin and viola (probably overhead, as the playing posture dictates), with the microphone capsule facing the bow/string contact area. For string bass played pizzicato, played with fingers jazz style or slapped doghouse style, the mic should be nearer the plucking hand, and can be supplemented with a mic close to the body, as these styles don't offer the sustain or projection of bowed playing.

Good Luck
-steve albini

Amplifiers

The e22S is one of the few condenser mics that sounds good on just about any amplified instrument. For most purposes, it's a good idea to start with the capsule a few inches away from the speaker, centered on the voice coil.
If the mic is closer than 6 inches, proximity boost becomes quite noticeable. Proximity effect may be useful as a way of making small amplifiers sound bigger, but it can also lead to muddiness and the over-emphasis of a specific frequency. Additionally, surface reflections and edge-effect radiation become more noticeable the closer the mic is to the loudspeaker.

Don't hesitate to audition this mic on any electric instrument. It has proven useful on electric bass, electric guitar, electric violin, pedal steel, tonewheel organ, electronic organ, mellotron, electric piano, clavinet, electric double-bass and other instruments.

Acoustic instruments

The e22S is a fine choice for any plectrum instrument. The side-address design allows for unobtrusive positioning, while the clean electronics and wide bandwidth make for excellent flexibility.

Most flat-top guitars sound best if the mic is positioned near the playing (rather than fretting) hand, with the capsule *not* aimed directly at the sound hole. The sound hole tends to project bass frequencies (especially the resonant frequency of the body) which can overwhelm the higher partials.

I have had good luck with a pair of e22S's, one on the bass (top) side and one on the treble side, each facing the player's picking hand from a distance of 12 - 18 inches. Arch-top guitars can be treated like a cello, as the sound generally

The bottom mic is hearing the resonant head only, so be conscious of two things: The center of the head will move the farthest and have the most proportion of fundamental note. While harmonic modes develop all over the head, you will find a large number of nodes for different harmonics around the perimeter of the head – by that I mean that

e22S's, top and bottom

the overtones will be more varied and localized when the mic is radially farther away from the center of the head. This can sound good or not, but if you're primarily interested in the fundamental note of the drum, then the mic should probably stay on-axis with the center of the drum head.

One of these two mics will need to have its polarity flipped, as the two mics are acoustically out of phase – they are looking at opposite phases of a vibrating drum. Which one you flip depends on how the polarity change affects the sound of the drum kit as a whole, which the mics can also hear somewhat.

To find the level where the bottom head is contributing the most to the overall tone of the drum, monitor the combination of the two mics, with the bottom one off and both channels in normal (not reversed) polarity. Gradually raise the bottom head mic level until you find a null in the sound (where the acoustic phase difference is canceling the most sound). With the mic at that level, reverse the polarity of one of the mics. You will hear the tone of the drum (that part of the drum sound that is common to both drum heads) emphasized – raising or lowering the bottom head will not increase the level of this component, but it will change the tonal and harmonic balance. This is a good place to start.

I normally assign both mics to a single tape track for each drum, with the bottom one polarity-reversed to start with. Once I've got the rest of the kit rigged, I audition both options of polarity. If you reverse the polarity of the summed track, you have effectively flipped the polarity of both mics simultaneously, so it's easy to audition both options on playback or monitoring.

For single-headed toms, you may find a use for a bottom mic to pick up the shell tone and internal acoustics of the drum. The polarity note still applies.

A subtle but sometimes crucial benefit of using two mics on the drum is that the mics behave as a differential system at low frequencies, and can attenuate some distant low frequency bleed, say from a bass amplifier, while leaving the local low frequency content (that of the drum itself) unaffected.

A nice feature of the e22S is the relatively smooth off-axis response – cymbal bleed into the tom mics sounds quite natural, and often compliments the overhead mics, and the resonances of the kit as a whole are faithfully captured.

e22S's with Josephson C42 on snare (foreground)