Introduction

In this assignment the task of identifying the most preferable microphone and pre-amp combination was undertaken with a classically trained singer performing a Regina Spektor track called ‘Laughing With‘ in the crossover style.

To create an appropriate backing track myself and a peer learnt the song and recorded it in EFS1 after which the vocalist came to Vestry 2 for the testing. The session started at 10am, though the singer was instructed to arrive at 12am in order to avoid any unnecessary waiting time during set up.

The pre-amps used were the Focusrite ISA820, the TF Pro P4 and the Amek Neve DMCL in the control room of Vestry 2. The microphones used were a Neumann TLM 193, an sE2200T and an sE4400a; of which the sE 2200t and Amek Neve were selected for the final recording.

The microphones were chosen to test various design characteristics; the TLM and sE4400a are both transformer-less designs which contrasts with the sE2200T; a tube variant of sE’s popular large diaphragm condenser - the sE2200a - and contains the same capsule as the sE4400a.[1]

For the record I had never previously used any of these microphones but had brand experience with alternative models and knew their relative specifications before deciding to use them for the session.

Preparation

A major consideration was how many takes the vocalist would have to preform given that she would be testing pre-amps with both myself and a peer. To cut down the amount of takes needed a Klark Technic DN1248 splitter was utilised which is capable of splitting signal three ways; this unit has two transformer balanced outputs and an electronically balanced out, which isolates each signal. The main advantage of this unit over the passive splitter already in the Vestry booth is that the impedance of one signal would not interfere with another to cause mismatches and made for more accurate testing.

Another consideration was the possibility of the vocalist tiring of the setup and so the splitter, routing and microphones were all connected and configured in advance of her arrival.

Prediction & Recording

After two hours setting up the vocalist arrived to start the tracking. Given that we had rehearsed the track before I had a decent idea of what her voice sounded like and although I had not tried any of the microphones, I predicted that the TLM 193 paired with the Amek would be the most suitable combination.

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[1] White, P. (2009) - *SE Electronics SE4400a, Multi-pattern Condensor Microphone* - [Available http://www.soundonsound.com/sos/apr09/articles/se4400a.htm]

In essence the vocal style was a predominantly classical approach - mostly based around technique - and so the Amek/TLM seemed like an ideal combination; a transformer-less design is supposed to have a more natural low frequency response[2], while the Amek - to my ears - has always imparted an exceptionally flattering quality on any signal that passes through it.

As Williams[3] discuses; a headphone mix can cause a dislocation from the performance resulting in a less than optimal take. I believe this may have been a factor in the recording given that the vocalist had never used headphones before and an amount of experimentation was needed to find the ideal solution; in the end this was a carefully balanced mix with the headphones on both ears.

The monitoring mix provided to her consisted of drums and guitar at quite a low level, with piano and vocals in the forefront; this was at the request of the vocalist as she had previously trained with a piano accompaniment and this balance made it easier for her to intonate with. Aside form this the vocalist was used to singing in reflective spaces (such as a church) and in order help simulate a familiar environment a reverb unit was set up, again helping the vocalist intonate through sensory feedback.

Every time the microphones were switched the gain had to be reset requiring the vocals to be readjusted in the headphone mix on each take. In this instance the splitter was a saving grace as only three takes were needed to cover the nine combinations of mic/pre-amp, saving the vocalist a considerable amount of time and effort on each change over.

Finally the vocalist was asked to remain at the same distance to the microphone throughout the recording (measured by distance to the pop shield). This was taken perhaps a little too literally, and so we had a short discussion on the topic of microphone technique; this came quite naturally to her and while no expert she learnt the basics quick enough to seriously benefit the recording.

Microphones

Given the assignments nature of subjective evaluation and experimentation I wanted to broaden my experience through the use of previously unknown microphones. While all the microphones chosen were quoted as suitable for vocals and of decent quality, I also decided to test various electrical designs at the same time. To make for fair comparison between the microphones it was ensured they all had the same directional pattern; in this case cardioid.

The sE4400a was chosen because its technical specifications provide a good middle ground for comparisons against both the TLM and sE2200T. It is transformer-less and has an impedance of 50Ω (like the TLM), while it also contains the same capsules as housed in the sE2200T. This simply eliminated a lot of variables when trying to isolate the important aspects of each microphones design.

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[2] DPA (2008-2011) - *Transformer Vs. Transformerless Output* - [Available http://www.dpamicrophones.com/en/Mic-University/Technology-Guide/Transformer.aspx]

[3] Williams, A. (2011) *I'm Not Hearing What you're Hearing* - Unpublished course reading, p6.

The Neumann TLM193 was booked due to its lineage (previous positive experience with the TLM103) as well as to compare the capsules frequency response and resonances against the transducers housed in the sE4400a (comparing it with the sE2200a would have been unfair given the completely different design). Sharing identical impedances of 50Ω and a transformer-less design made for an ideal capsule comparison between the two microphones.[4] [5]

The sE2200T was chosen because of its slightly different design in comparison with the 4400a and radically different design to the TLM. Given that the sE microphones both shared the same capsule, its fair to assume the difference must have been the output stage; the 2200T was a valve design which consequentially required a transformer also having the knock on effect of a higher output impedance rated 200Ω.[6]

The 4400a and TLMs output impedance of 50Ω is typically regarded as low while the 2200T's of 200Ω is higher but still considered the same. According to Bartlett a microphones output impedance should be paired with a load 7-10 times greater to ensure maximum voltage transference between the microphone and preamp and avoid high frequency roll off.[7]

The TLM193s frequency response dips by 2dB with a wide Q around 4kHz and as such it was not surprisingly a slightly dark microphone for vocals, however with a little corrective equalisation the TLM sounded better than the 4400a which seemed to have a stronger midrange (contributing to a slightly claustrophobic and boxy quality) also sounding a little brighter. Paul White quotes the sE2200T as having "a robust tone without being obviously coloured sounding" but this is a statement with which I personally disagree.[8] The microphone certainly has a decent body around the midrange but the high end seems saturated with harmonics, though this was actually ideal when auditioned in context with the backing track. However the preceding sentence "For general vocal use, the extended high end of this mic helps to produce a detailed sound, but it does so without seeming in any way aggressive; the tube preamp and output transformer succeed in keeping the top end sounding smooth, but not dull" seems a lot more accurate in my opinion.

Its note worthy that transformer-less designs often reproduce the bass frequencies better due to increased accuracy in the phase response because they lack on output transformer.[9] This was certainly noticeable on the recordings, but considering the source was vocals it bore little relevance to the recording session.

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[4] Neumann (unknown) - *TLM 193 Technical Data* - [Available: http://www.neumann.com/?lang=en&id=current_microphones&cid=tlm193_data]

[5] Neumann (unknown) - *TLM 193 Technical Data* - [Available: http://www.neumann.com/?lang=en&id=current_microphones&cid=tlm193_data]

[6] sE Electronics (unknown) - *sE Electronics sE2200T Tube Cardioid Condenser Microphone* - [Available: http://www.seelectronics.com/se2200t-tube-mic]

[7] Bartlett (2009) - *Practical Recording Techniques p535* - Focal Press, Elsevier Inc. UK

[8] White, P. (2009) - *SE Electronics SE2200T* - [Available: http://www.soundonsound.com/sos/aug09/articles/se2200t.htm]

[9] DPA (2008-2011) - *Transformer Vs. Transformerless Output* - [Available http://www.dpamicrophones.com/en/Mic-University/Technology-Guide/Transformer.aspx]

Pre-Amps
As Vestry 2 contained some of the nicest pre-amps in the university it was chosen for tracking the vocals.

The Amek Neve has in past been a favorite pre-amp of mine, while the Focusrite ISA is quite flexible with its variable impedance (although this was left fixed in the 'medium' setting for testing purposes). I had never used the TF Pro but have been recommended it several times and given the designers connection to the well know Joe Meek range it seemed like a good option. One really nice advantage to recording in Vestry 2 is that there are enough outboard pre-amps to completely bypass the C24 as I have always found Avid/ Digidesign pre-amps quite two dimensional and 'cheap' sounding (although they are certainly useable).

Given that the microphones were all of relatively low output impedance it was still important to consider the pre-amplifiers input load; the Amek was 5kΩ, the TF Pro was 1k1Ω and the ISA828 had four settings: 600Ω, 1k4Ω, 2k4Ω and 6k8Ω. Looking at this data we can see that the sE2200T could have had some issues if paired with the ISA on its lower impedance settings or when used with the TF Pro P4.

Describing the characteristics of each pre-amp is quite a bit harder than doing the same for the microphones but there were certainly qualitative differences between them. The ISA828 had a pronounced low end that seemed to mask the midrange to an extent while it also had a quite brittle high end; the transient response seemed quite quick and might account for its seemingly brittle high end.

The TF Pro had a strong body to it but a lacked a defined high end, this was more pronounced on the sE2200T due to the impedance mismatch which was quite minimal (300Ω). Regardless it actually sounded very good, especially in low frequencies and pays testament to Ted Fletchers ethos of keeping a smooth phase response over the entire frequency range.[10]

The Amek Neve worked beautifully on everything; it had a solid low end with pleasant upper harmonics, it sounded in no way brittle like the ISA probably because any high end boost sounded slightly higher in frequency (in the presence range). Neve is also famous for his design philosophy of using an extended frequency range (over 100kHz) which is likely to keep high frequency phase distortion to a minimum.[11]

Analysis
Although I predicted the TLM through the Neve would be the tracking combination; I was pleasantly surprised to find that the sE2200T sounded better especially considering that it cost a fifth of the price.

The vocalist initially preferred the sE2200T through the TF Pro because it sounded more like the voice she heard in her head, but upon playing the recording in context with the track she decided that the Neve suited the track better. This was mainly due to the

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[10] Fletcher, T. (unknown) - *P10 Handbook* - p4 [Available: http://www.tfpro.com/assets/files/handbooks/P10-handbook.pdf]

[11] Amek (2002) - *Purepath DMCL User Guide* - [Available: http://www.amek.com/products/purepath/DMCL%20User%20Guide%20V2.0%20English.pdf]

presence which helped cut through the rest of the instruments while improving the vocals audibility. It was interesting to hear that the self perception of the singers voice was a consideration that was trumped by context; perhaps on another track in the future the TF Pro might suit better. This is a nice belief given that such a unit costs a fraction of the Neves price and certainly speaks volumes about the usability of inexpensive equipment!

Conclusion

The final microphone/pre-amp choice was a joint decision and we recorded the demo with the mutually agreed upon 2200T/Neve combination. Such an exersise in critical listening was beneficial to the recording and the tests were a good exersise in understanding another perspective (by which I refer to the vocalists). Aside from this it was defiantly a good idea to compare the different designs as its a skill that can be transferred to another session.

Word Count: 1923

Session Forms

Advanced Recording Techniques

Assignment 1 Pre-Session Form (Engineer Producer Copy)

Name of Vocalist:	Camille Hendrickx
Contact details:	Camille.Hendrickx@Gmail.com
Description of Voice:	Classical
Genre of music:	Pop/Classical Crossover
Headphone Preference:	Both ears
Pop Shield Preference:	About 1ft in front of mic
Vocal Booth:	Vestry Drum Booth
Smoker or Non-Smoker:	Non-Smoker
Classically Trained:	Yes
Self-Trained:	No
Years of Experience:	4 Years
Prior recording experience:	None

Advanced Recording Techniques

Assignment 1 Pre-Session Form

	Microphone Choice	Pre-Amplifier Choice	Predicted to yield best result (tick) ✓
1	Neumann TLM 193	Amek Neve	✓
2	sE4400a	Amek Neve	
3	sE2200T	Amek Neve	
4	Neumann TLM 193	Focusrite ISA828	
5	sE4400a	Focusrite ISA828	
6	sE2200T	Focusrite ISA828	
7	Neumann TLM 193	TF Pro P1	
8	sE4400a	TF Pro P1	
9	sE2200T	TF Pro P1	

Rationale for predicted choice:

The Amek Neve has always lived up to its name in the past, the TF Pro P1 costs considerably less and the Focusrite ISA828 has never seemed particularly great on previous tests.

None of the microphones have been previously used but given my previous experience with the Neumann TLM 103 which has a very smooth characteristic, I would assume the TLM 193 to sound the best.

The sE microphones also seem of reasonable reasonable quality - especially the 2200T which is of valve design - but given the TLM193s lineage and considerably higher pricing it is likely to sound the best.

Advanced Recording Techniques

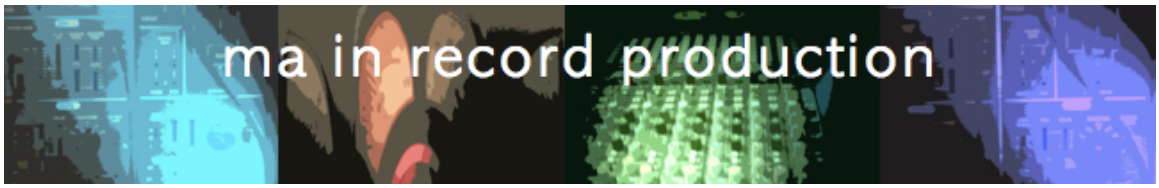
Assignment 1 Post-Session Form

	Microphone Choice	Pre-Amplifier Choice	What did you like or dislike about the combination and which yielded the best result (tick) ✓
1	**Neumann TLM 192**	**Amek Neve**	☒ Why: Smooth frequency response but slightly dull mic
2	**sE 2200t**	**Amek Neve**	✓ Why: Best combination. Nice high end harmonics
3	**sE 4400a**	**Amek Neve**	☒ Why: Boxy microphone but useable
4	**Neumann TLM 192**	**Focusrite ISA 828**	☒ Why: Brittle pre-amp but smoothened out by the TLM
5	**sE 2200t**	**Focusrite ISA 828**	☒ Why: Far too bright a combination. No balance between the pre-amp and microphone
6	**sE 4400a**	**Focusrite ISA 828**	☒ Why: Worst combination; boxy mic and brittle pre-amp
7	**Neumann TLM 192**	**TF Pro P1**	☒ Why: Seemingly the best pre-amp for the TLM but too dull overall.
8	**sE 2200t**	**TF Pro P1**	☒ Why: This was a good combination; presumably the impedance mismatch caused some high end loss though.
9	**sE 4400a**	**TF Pro P1**	☒ Why: Not a great microphone but solid pre-amp

Advanced Recording Techniques

Assignment 1 Post-Session Form

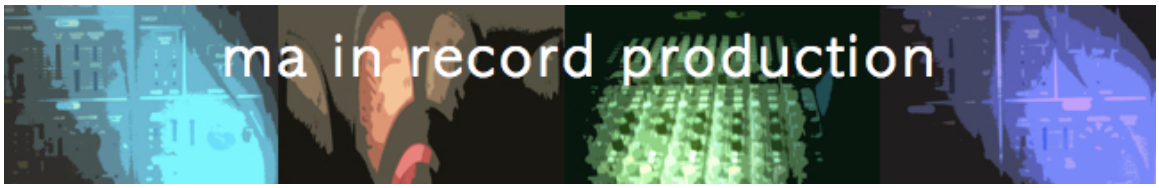
Q1	Was the chosen combination your predicted one?	No
Q2	Was the chosen combination the singers predicted one?	No
Q3	Did you both agree on the same combination?	Yes
Q4	If you did not, how did you reach a decision?	NA
Q5	If you did, why do you think this is?	It had the best fitting harmonic profile
Q6	Was a backing track used?	Yes
Q7a	What was used on the singers monitor mix?	Drums, Guitar, Piano, Vocals
Q7b	Was this used for all combinations?	Yes
Q8	What time did the session start and end	10am Start 6pm Finish



Advanced Recording Techniques

Assignment 1 Recording Session Assessment Form

Q1	What time did the session start and end?	12am to 6pm
Q2	Were you relaxed and comfortable in the session? If not, what would have helped to improve either of these factors?	I had never recorded with headphones before but was relatively comfortable with them, some more experience would have helped.
Q3	Did the session run smoothly? If not, what would have improved the situation for you?	Other than a few technical problems that were dealt with the session ran well.
Q4	Was your vocal sound at its best for the session? If not, what would have improved the situation for you?	I had just recovered from a cold but was otherwise alright for the recording.
Q5	Do you feel you gave a good performance in all takes? If not, which were the better or worse performances and what was good or bad about them?	I warmed up beforehand but the later takes were slightly better
Q6	Was this useful for you? Why?	Yes, I gained experience in the studio which taught me about a different performance environment.
Q7	Were there any problems with the backing track or the headphones mix? Please give details where appropriate.	I didn't have a lot to compare by but it seemed acceptable.



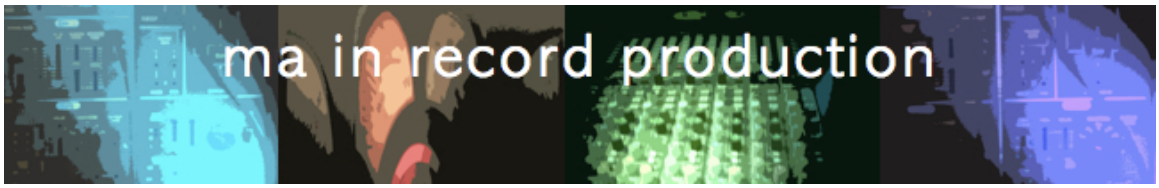
Advanced Recording Techniques

Assignment 1 Any other comments on how useful, enlightening, desirable or otherwise this exercise was for you. Any other comments on factors that affected your performance or the sound of your voice.

It was an interesting experience to hear the difference in the various recordings. As mentioned already I had just recovered from a cold so I needed a slightly longer warm up but other than that I was fine.

Notes and comments by the engineer / producer on the points raised above by the vocalist:

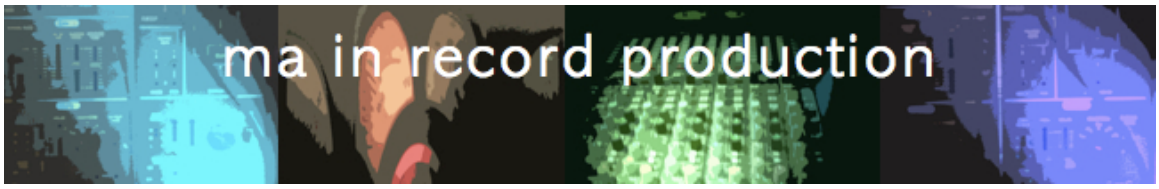
Time was allocated for the vocalist to warm up in and once she considered herself ready we started tracking. The session coinciding with the end of a cold was unfortunate but I trusted Camille's judgement that she was be well enough to preform (which she was, but in my opinion she was closer to 90% optimal health than 100%).



Advanced Recording Techniques

Assignment 1 Post-Session Form

	Microphone Choice	Pre-Amplifier Choice	What did you like or dislike about the combination and which yielded the best result (tick) ✓
1	Neumann TLM 192	Focusrite ISA 828	☒ Why: Smoothest microphone but a brittle preamp
2	Neumann TLM 192	TF Pro P1	☒ Why: Clearest preamp for this microphone
3	Neumann TLM 192	Amek Neve	☒ Why: Smoothest combination available but not suitable for the track
4	sE 4400a	Focusrite ISA 828	☒ Why: Boxy microphone but the preamp was brittle
5	sE 4400a	TF Pro P1	☒ Why: Clearest preamp again but no good with the microphone
6	sE 4400a	Amek Neve	☒ Why: Narrowest preamp, less full sounding microphone than the Neumann
7	sE 2200t	Focusrite ISA 828	☒ Why: Very bright combination, sharp
8	sE 2200t	TF Pro P1	☒ Why: Good body with a less defined high end, liked but not as intimate as the Neve. Very nice.
9	sE 2200t	Amek Neve	✓ Why: The vocals sound clear and defined with the track. Used for the demo.



Advanced Recording Techniques

Assignment 1 Post-Session Form

Q1	Was the chosen combination your predicted one?	Had no prediction
Q2	Was the chosen combination the engineer/ producers predicted one?	Unknown
Q3	Was the finally agreed upon combination chosen by you, the engineer/producer or a joint decision?	Joint decision
Q4	Did you both agree on the same combination?	Initially no, in the end yes.
Q5	If you did not, how did you reach a decision?	It sounded the best alongside the backing track
Q6	If you did, why do you think this is?	----
Q7	Was a backing track helpful?	Yes, it put things in context
Q8a	Did you find the monitor mix helpful?	Yes
Q8b	Was this used for all combinations?	Yes
Q9	What time did the session start and end	12am to 6pm

Advanced Recording Techniques

Assignment 1 Post-Session Form

It was a nice learning experience for the first time in the studio.
I underestimated the impact a microphone could have on the final recording but felt the pre-amps made less of a difference.

Research Folder

Research notes

Sound on sound - SE Electronics SE2200T Review
This article influenced my decision to use the 2200T for the testing as the microphone receives a positive review. It also sheds light on various specifications about the 2200T.

Sound on sound - SE Electronics SE4400a Review
This article explains that the 4400a contains two of the same capsules as the 2200a (same as the 2200T) and some of the microphones other features. It mentioned that the 4400a has a transformer-less output and so it seemed like a good microphone for comparison against the TLM193 (initials standing for Transformer-Less Microphone).

Alan Williams - I'm not hearing what your hearing
This was required reading for the module and discusses the various aspects of how a foldback mix can influence a performance. Of particular interest is the section discussing the feeling of dislocation a vocalist might endure while recording with headphones.

Bartlett and Bartlett - Practical Recording Techniques (Fifth Edition)
This book explains about impedance and how it effects us in a practical sense, something I became interested in after hearing the difference the ISA828s variable impedance button had on the audio.

Neumann Website - http://www.neumann.com/
This provided a lot of relevant information regarding the TLM193; namely the spec sheets and frequency response of the microphone.

sE Website - http://www.seelectronics.com/
This provided information regarding the frequency response of the sE2200T and sE4400a along with their spec sheets.

SE Electronics SE220(

Valve Condenser Microphone

Buy PDF

Published in SOS August 2009

Printer-friendly version

Reviews : Microphone

SE tweak their successful design to create what's probably the most affordable serious tube mic around.

Paul White

SE Electronics SE2200T £360

pros

Tonally similar to the well-respected SE2200A, but with a little more vocal weight and a smoother high end.

Sensibly priced.

Comes in a case with a good shockmount, the PSU and the seven-pin XLR cable.

cons

Seven-pin XLR needs to be handled more carefully than the more robust three-pin type.

summary

The SE2200T is everything you'd expect from a tube version of the SE2200A — with a touch more tonal weight and high-end polish, to give a classic tube mic sound at a project studio price. Don't expect the mic to sound very different from an SE2200A, though, because the tonal character imparted by the tube and transformer is quite subtle, just as it should be.

information

£360 including VAT.

Sonic Distribution +44 (0)845 500 2500.

Click here to email

www.sonic-distribution.com

www.seelectronics.com

The capsule used in SE's original SE2200 cardioid-pattern capacitor microphone has proved to be something of a winner for the company, and already the designers have updated the basic mic to the SE2200A by improving the electronics, as well as launching a USB version that plugs straight in to your computer. Now the SE2200T, a valve (or 'tube', hence the 'T' in this mic's name) option has been added to the range.

Model 'T'

This SE2200T has its own distinctive tonal character, which is imparted by its dual-triode tube preamp circuit and output transformer. As with the solid-state SE2200A, there's a 10dB pad and a bass roll-off filter, each of which is engaged using horizontally mounted mini toggle-switches just below the basket. Outwardly, the mic looks quite similar to its solid-state counterpart, with is cylindrical brass body and simple lines, although it also includes a separate power supply to drive the high-voltage tube circuitry.

With all the electronics and capsules manufactured in SE's own Shanghai factory, the overall build quality of the fixed-cardioid pattern 2200T looks reassuringly solid and well finished, with an attractive, satin-finish plating over solidly machined metalwork. The outer casework for the lower half of the mic can be removed by unscrewing the heavy, machined locking ring at the base of the mic body, to reveal a neat main circuit board housing the necessary resistors and capacitors, with an ECC83 (12AX7) dual-triode tube, mounted in a porcelain base on its own small circuit board, laying alongside.

An output transformer occupies the lower section of the mic body. It is enclosed in a metal shield that also forms part of the seven-pin XLR output-connector housing (the pins need to carry the power supply to the tube as well as the signal from the mic). The signal output exits the PSU on a conventionally wired, three-pin XLR. All the metalwork, other than a grey band below the basket, is electro-plated, and a simple, printed, red SE logo indicates the 'live' side of the microphone. Everything comes in a foam-lined aluminium case that holds the mic, the included metal-frame shockmount, the power supply and the seven-pin XLR cable.

As this is a tube mic, phantom power isn't required, but the mic won't complain if it is connected to an input that has phantom power applied. However, as the XLR has seven pins (rather than the usual three), which are rather thin, you need to take care when mating the connectors: rough handling could bend them.

The quoted 20Hz20kHz frequency response alone doesn't tell you much about the shape of this mic's frequency curve, although the graph of the capsule's response shows a broad, gentle, high-end rise, which gives the sound a nice open quality that goes well with the tube's gentle warmth. With a well-designed tube mic such as this, the influence of the tube is fairly subtle, and it flatters without making the sound seem obviously coloured or unnatural. Conversely, mics that are designed to produce very obvious amounts of tube distortion often end up sounding dull or unfocused — and thankfully SE have not fallen into that trap.

The SE2200T has a sensitivity of -33dB (+1dB) where 0dB=1v/Pa at 1kHz, and it is pretty quiet for a tube mic. Its equivalent input noise level (EIN) is specified as 16dB A-weighted, making it one dB quieter than the solid-sate version, which is unusual (tube mics tend to be noisier than FET mics, all else being equal). The maximum SPL measured at 0.5 percent THD at 1kHz is 130dB without the pad switched in, which, again, is some 5dB higher than for the SE2200A, and is presumably due to the greater headroom of the tube circuitry.

Studio Tests

For general vocal use, the extended high end of this mic helps to produce a detailed sound, but it does so without seeming in any way aggressive; the tube preamp and output transformer succeed in keeping the top end sounding smooth, but not dull. The tube circuitry contributes to a subtle warmth, which yields a robust tone without being obviously coloured-sounding, and there's that familiar tube-like sense of compression about the sound, particularly at the lower end of the male vocal range. Overall the effect is gently flattering but still quite natural-sounding. This mic also works well on acoustic guitar, once you've taken the time to find the sweet spot, balancing the complex string harmonics with the body resonances. If you experiment to find the best mic position, it also works fine on electric guitar amplifiers, delivering a smooth mid-range with just the right amount of edge but no unwanted grittiness.

In direct comparison with the SE2200A, the SE2200T sounds very similar and, subjectively at least, its sensitivity is almost identical. On voice, the highs come over as slightly smoother sounding and the 'chest' frequencies of male vocals gain weight from that slightly compressed tube character, but the difference, while noticeable, is not excessive. The practical outcome is that vocals seem more solid, and slightly more polished at the high end, but by the same token, the comparison also serves as a reminder as to how well the solid-state version performs, given how affordable it is.

SE Electronics SE4400a

Multi-pattern Condenser Microphone

Buy PDF

Reviews : Microphone

Published in SOS April 2009
Printer-friendly version

SE Electronics SE4400a
£512

pros

Very versatile. Subjectively natural sound, balancing warmth with detail. Excellent shockmount.

cons

No obvious cons, although if you only need a cardioid-pattern mic you may be better off buying an SE2200a.

summary

SE have designed a good studio all-rounder at a price point that should make it attractive to serious enthusiasts and professionals alike.

information

SE4400a single mic £511.75, matched pair £1069.50. Prices include VAT.

Sonic Distribution +44 (0)845 500 2500.

Click here to email

www.sonicdistribution.com

Small size and a choice of polar patterns make this mid-priced, large-diaphragm mic a very versatile performer.

Paul White

You can find any number of Chinese-built microphones at the budget end of the market, but SE are one of the very few companies to own a microphone factory in China — rather than having their mics made for them in one of the huge factories in Shanghai or Bejing that specialise in building mics or capsules for third-parties. Certainly, this has helped SE to build a strong reputation for value at the affordable end of the market, but they also make more up-market microphones, many with innovative design features, such as the Titan's titanium diaphragm or the Gemini's dual-tube, transformerless circuitry.

Overview

The mic reviewed here is designed to meet professional needs, but priced within reach of the serious home-studio owner, and despite cosmetic similarities to a well-known Austrian studio classic — which also has a pair of fours in its name — the SE4400a is far from being a copy or clone. In fact, the mic's multiple patterns are achieved using a pair of back-to-back, large-diameter (one inch), centre-electrode capsules that are mechanically similar to those used in the company's SE2200a model. Indeed, that's my guess on how the name was arrived at: 2200a x 2 = 4400a. The two capsules are supported on a shockmount inside a slim, flat-profile body, and the overall cosmetic theme is matt black (to comply with film, theatre and TV low-visibility requirements). FET circuitry with a transformerless balanced output stage delivers the signal to the outside world on a conventional XLR connector, and standard 48V phantom power is required for operation.

A row of four miniature toggle-switches along one side of the body allows you to switch in a -10dB or -20dB pad when working with high SPLs, to engage the high-pass filter (60 or 120Hz, and off), set the pickup pattern to omni, cardioid or figure-of-eight, and to change between normal and hypercardioid mode when cardioid is selected — so you have four pattern choices in all. The main body of the mic is finished in a tactile, rubbery coating (possibly Nextel), and the steel grille is also finished in black. Overall, the quality of finish and styling is excellent, and the same can be said of the included shockmount, which grips the base of the mic in a plastic sleeve tightened by a thumb-screw. The mic can either be mounted to sit snugly inside the shockmount or outside it (inverted), enabling it to fit into tighter spaces than the more common shockmount designs. Similarly, the three-quarter-inch-thick profile of the mic makes it easy to position in awkward places, such as around a snare drum. The usual swivel mount attaches the shockmount to the threaded mic-stand adaptor, and I'm happy to say that the swivel locks really securely, even when the thumbscrew is just lightly finger-tight.

A frequency response of 20Hz-20KHz is quoted. On its own, this means relatively little, but the frequency plot is somewhat more revealing and shows a nominally flat response, but with a gentle presence peak at around 10kHz. This type of response tends to produce a largely natural sound, but with an extra sense of clarity at the high end, making it suitable for a wide range of acoustic instruments from piano and acoustic guitars to drum overheads. The sensitivity of 14.1mV/pa-34 (±1dB) puts the mic's output in the same ball-park as most other similar studio mics, and although its equivalent noise level of 17dB (A-weighted) isn't outstandingly low, it is again pretty typical for this type of microphone, and certainly quiet enough for most studio tasks. A maximum SPL for 0.5 percent THD at 1kHz is quoted as 130dB, but I suspect that this is extended when the pads are switched in.

Matched pairs are available as an option for a slightly increased cost, but these come in a camera-style case, with a sturdy metal mounting-bar so that you can use the mics as a spaced stereo pair.

Performance

The SE4400a is clearly designed as a general-purpose mic, so I wasn't surprised to find that it had no overbearing tonal characteristics. Its presence peak gives it a slightly flattering, larger-than-life vibe, but in a pretty subtle way that doesn't make things sound too harsh, and the low end gains useful support from a little added warmth. The general tonality also remained reasonably consistent between patterns — taking the proximity effect out of the equation, of course.

As you'd expect, the large-diaphragm design makes the SE4400 very good as a vocal microphone, and it should be quite flexible in this role, as long as you don't need to hype up the vocal sound too much. I even managed to make some good violin recordings, in which the top end of the instrument sounded very close to how I heard it in the room. Normally, I'd generally go for a mic with a more rounded-sounding top end for recording violin, but I was putting this mic through its paces, after all, and the result I got responded very well to some gentle top-cut EQ.

I found that acoustic guitar was handled without problems by the mic, which delivered both the depth and woodiness of the body sound, and the transient detail of the strings. I also managed to coax a very sweet, woody sound out of a mandolin when the mic was positioned about 12 inches from the sound hole. The SE4400a sounds good on hand percussion too, including bodhran, so it should work as a drum overhead or general percussion mic too. Because the response is pretty flat, with plenty

of low-end extension, there's no reason not to expect a stereo pair to turn in good results on piano, although I didn't have the chance to try this during the review.

Given that the mic is, as I mentioned, based on a derivation of two back-to-back SE2200a capsules, I also compared it directly with that mic (with the SE4400a in cardioid mode), and wasn't surprised to discover that they sound very similar. So if you only need a cardioid mic, the SE2200a is clearly going to save you a lot of money. Being hyper-critical, I'd have to say that, as with large-diaphragm mics more generally, it doesn't sound quite as focused as a small-diaphragm model when used on some acoustic instruments, and its 'omni' mode isn't quite as true an omni as you'd get from a single, small-diameter capsule. But, on the other hand, I couldn't find anything that it couldn't cope with, and its ease of positioning for a large-diaphragm model was a big plus.

Conclusion

If you need a large-diaphragm, multi-pattern capacitor mic that's almost as easy to position as a small-diaphragm pencil mic, the SE4400A, with its elegant shockmount, is a very practical choice in the mid-priced section of the microphone market.

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methodologies can yield fascinating research data, as experience and practice allow the researcher the opportunity to analyze one's own thought processes as a means to formulate and test a theoretical postulate. Later in the chapter, I will examine an incident involving myself as a session musician that illustrates one form of conflict resulting from headphone use.[3]

The Dislocated Sound – Headphones and the Musician/Instrument Divide

> "When you're in the [open] air, you're not just hearing the music, you're also hearing like… some sort of mystical overtones that are flying through the air… Headphones put this box on your head." – Peter [4]

Headphones often become the locus of a musician's discomfort in the studio, and the first instance of dissatisfaction concerns the sound of their instrument as mediated by technology and technician, compared to the sound of their instrument in the room, a tale of two audioscapes.

Simon Zagorski-Thomas 4/11/10 12:12
Comment: An audioscape and a soundscape? It spoils the literary reference but is perhaps confusing and this distinction seems crucial to your argument.

Vocalists appear to suffer the most from the dislocation of sound that headphones engender. Because sound is produced in their bodies, resonating in the chest cavity and sinuses, a singer's audioscape is both heard and felt. As with many musical instruments, certain areas of the frequency spectrum emanate from various parts of the body – lower frequencies in the chest, middle frequencies in the upper palette, upper frequencies in the

Simon Zagorski-Thomas 4/11/10 12:13
Comment: Soundscape – or am I misunderstanding the distinction?

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[3] During these sessions, taking field notes was impossible. Instead, I kept "headnotes" that I wrote in a journal after coming home from the session. Dialog presented in full quotation marks (") is taken directly from field notes written during the session in progress. Dialog presented in single quotation marks (') is a paraphrase or re-creation of conversation recalled after the session. Additionally, I have supplemented this research with interviews, some of which I quote in the body of the chapter, using pseudonyms in attribution in order to protect their professional careers.

[4] Author interview, conducted Sept. 2004.

front of the mouth. The full picture cannot be apprehended without some space for the various frequencies to combine.

The sound of the voice in the room is vital to the singer's ability to control the parameters of their sound – pitch and amplitude. Headphones interrupt this constant interaction, often emphasizing the lower frequencies because the headphone speakers are coupled with the skull further resonating the fundamental at the expense of overtone perception, mystical or not. The timbre of the voice as it exists in the headphone audioscape is greatly modified by the accuracy and placement of the microphone, and any subsequent processing applied in the control room. Equalization can alter the frequency spectrum of the sound. The amplitude of the signal may be electronically modulated by using dynamics signal processing such as compression and limiting.

One might consider that the electronic mediation is responsible for the disbelief with which the recording novice vocalist responds to the sound of the recorded voice – 'That's not how my voice sounds.' While this reaction is partially symptomatic of Schafer's "schizophonia," the disembodied voice of the recording, it is also a response related to the isolation of one component of the vocalist's sound from another. Vocalists' conception of their sound, their vocal self, is a product of bone conduction coupled with room resonance. Because a microphone does not capture the internal vibrations caused by the act of singing, it only replicates part of the equation. Therefore, to the ears of the vocalist, recorded playback produces the sound of someone else – 'That's not my voice.' But the singer's colleagues in the studio have no trouble identifying the source of the recorded voice because, like a microphone, they have not experienced the bone conduction of the voice – 'What do you mean? It sounds just like you.' Headphones

complicate matters because they substitute the sound of the singer's own voice as interpreted by the microphone for the familiar sound of their voice resonating in the room, upsetting the balance between direct conduction and reflected sonic energy. Rather than a case of exchanging one audioscape for another, headphones present vocalists with the simultaneous experience of the divided self.

Simon Zagorski-Thomas 4/11/10 12:15
Comment: A soundscape for an audioscape?

The inability of a singer to reconcile the disparity between the mediated and unmediated audioscape can lead to performance problems. It is not unusual for singers to sing slightly below pitch when using headphones. A commonly employed solution involves removing one headphone speaker from the ear, so that the vocalist can attenuate their sound based on the familiar interaction with voice and room reflected sound, while simultaneously monitoring the mediated audioscape (and thus all other sound as well) through the headphone speaker still in place on the opposite ear.[5] Musicians who work this way with headphones exert a degree of agency, rejecting an either/or choice of audioscape for a combination of unmediated and mediated, creating a third audioscape which can be further modified by adjusting the proximity of headphone speaker to the ear.

Simon Zagorski-Thomas 4/11/10 13:52
Comment: Mediated audioscape and unmediated soundscape?

Simon Zagorski-Thomas 4/11/10 13:54
Comment: Again – the unmediated is presumably by definition not an audioscape. Is the third an audioscape or an audioscape / soundscape blend?

A few professional singers I know attempt to correct the vocal problems associated with headphone use by establishing a comfort level with the simultaneous experience of mediated and unmediated audioscapes through repeated practice. They have set up a microphone, mixer, and headphone system in their domestic music making spaces and

Simon Zagorski-Thomas 4/11/10 13:57
Comment: This seems more colloquial and out of step with the tone of the rest of the writing.

Simon Zagorski-Thomas 4/11/10 13:55
Comment: ditto

[5] John Lennon, finding the unused speaker awkwardly placed behind or in front of his ear, requested a headphone set with a single ear piece for this reason. Lewisohn, Mark. 1988. *The Beatles Recording Sessions*. New York: Harmony Books.: 147.

rarely practice vocalizing *without* wearing headphones. In time, mediated dissociation becomes naturalized, and their conception of the sonic self is more in accordance with the audioscape they experience when singing under headphones in recording studio conditions.[6]

Other instrumentalists experience similar dislocation, though perhaps to a lesser degree. A distinction can be observed between those instruments whose sound is produced acoustically and those whose sound is mediated by electronic amplification. In the latter instance, the musician's experience of their sound is *always* dislocated, and it is these musicians who are most at ease wearing headphones. The degree of dislocation present in the normal use of an amplified instrument is simply extended by headphone use.

Simon Zagorski-Thomas 4/11/10 12:22
Comment: Too sweeping? What about your singer who practices in headphones versus the guitarists and bassists who hate them?

This is not to say that these musicians are not subject to a measure of discomfort at this extended dislocation. Many electric guitarists are frustrated with the lack of amplitude their instrument is afforded relative to the other instruments in their headphone mix, or with the level of overall volume the headphones can generate before distortion. Electric bassists often find that the headphones themselves are incapable of reproducing the lower frequency spectrum that their instruments produce. In such situations, these instrumentalists are more than willing to accept a further physical dislocation from their amplified sound in exchange for their presence in the control room during recording,

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[6] This situation has become more commonplace on the concert stage as a number of professional musicians have adopted in-ear headphone monitoring during live performance.

Appendix C

Impedance

Impedance is one of audio's more confusing concepts. To clarify this topic, I'll present a few questions and answers about impedance.

WHAT IS IMPEDANCE?

Impedance (Z) is the resistance of a circuit to alternating current, such as an audio signal. Technically, impedance is the total opposition (including resistance and reactance) that a circuit has to passing alternating current.

A high-impedance circuit tends to have high voltage and low current. A low-impedance circuit tends to have relatively low voltage and high current.

I'M CONNECTING TWO AUDIO DEVICES. IS IT IMPORTANT TO MATCH THEIR IMPEDANCES? WHAT IF I DON'T?

First some definitions. When you connect two devices, one is the source and one is the load. The source is the device that puts out a signal. The load is the device you are feeding the signal into. The source has a certain output impedance, and the load has a certain input impedance.

A few decades ago in the vacuum-tube era, it was important to match the output impedance of the source to the input impedance of the load. Usually the source and load impedances were both 600 ohms. If the source impedance equals the load impedance, this is called "matching" impedances. It results in maximum power transfer from the source to the load.

In contrast, suppose the source is low Z and the load is high Z. If the load impedance is 10 times or more the source impedance, it is called a "bridging" impedance. Bridging results in maximum voltage transfer from the source to the load. Today, nearly all devices are connected bridging—low-Z out to high-Z in—because we want the most voltage transferred between components.

For best sound quality and highest voltage transfer, the input impedance of the connector you're plugging into should be at least 7 to 10 times higher than the output impedance of the source (such as an electric guitar or microphone).

For example, if a mic's impedance is 200 ohms, the input impedance of a mic input (that you plug the mic into) should be 7 to 10 times higher, or 1400 to 2000 ohms. If you look at the input impedance spec for mixer mic inputs, it's typically around 1500 ohms.

Similarly, the impedance of an electric-guitar pickup is typically 20 to 40 K ohms (20,000 to 40,000) ohms. So the ideal input impedance of a guitar amp (or direct box input, or instrument input) is at least 7 to 10 times higher, or at least 280 to 400 K ohms.

If you connect a low-Z source to a high-Z load, there is no distortion or frequency-response change caused by this connection. But if you connect a high-Z source to a low-Z load, you might get distortion or altered response. For example, suppose you connect an electric bass guitar (a high-Z device) into an XLR-type mic input (a low-Z load). The low frequencies in the signal will roll off, so the bass will sound thin. And the highs might roll off, making the sound dull.

We want the bass guitar to be loaded by a high impedance, and we want the mic input to be fed by a low-impedance signal. A direct box or impedance-matching adapter does this (Figure C.1). Such an adapter is available from Radio Shack, part no. 274-017.

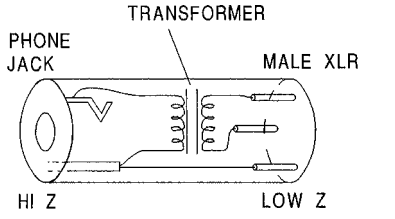
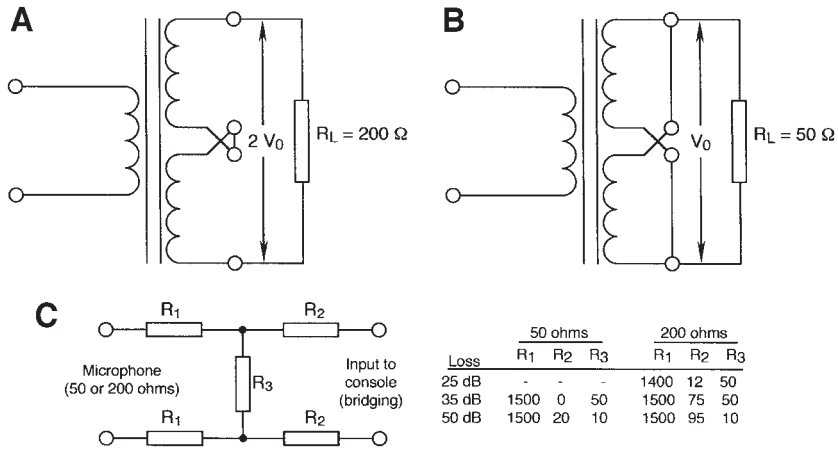


FIGURE C.1
High-to-low impedance matching adapter.



	50 ohms			200 ohms		
Loss	R_1	R_2	R_3	R_1	R_2	R_3
25 dB	-	-	-	1400	12	50
35 dB	1500	0	50	1500	75	50
50 dB	1500	20	10	1500	95	10

FIGURE 8–10

Transformer strapping for 200 ohms (A) and 50 ohms output impedance (B); H-pad values for balanced attenuation for microphone impedances of 50 and 200 ohms (C).

CONSOLE INPUT SECTION

In the very early days of broadcasting and recording, the dynamic microphones of the period had relatively low outputs and normally operated into matching input impedances. Typically, a microphone with a 600-ohm source impedance looked into a 600-ohm load, following the matched impedance concept. Impedance matching was a holdover from early telephone practice and found its way into broadcasting, and from there into recording. Today, the *bridging* concept is well established. In a bridging system, all output impedances are relatively low and all input impedances are relatively high throughout the audio chain. Here, the ratio of high to low impedance is normally in the range of 10-to-1 or greater.

Figure 8–11 shows a simplified transformerless console input section showing switchable line-microphone operation. At one time transformers were felt to be indispensable in the design of microphone input circuitry. Their chief advantages are a high degree of electrical balance and consequent high common-mode signal rejection. (A common-mode signal is one that is identical at both inputs; typically, induced noise signals are common mode.) In the era of vacuum tubes the input transformer was of course essential. Today's best solid state balanced input circuitry does not mandate the use of transformers, and there are considerable economic advantages to pass on to the user. Only under conditions of high electrical interference might their use be required.

Today, most microphones have an output impedance in the range of 50 to 200 ohms. Most consoles have an input bridging impedance in the range of 1500 to 3000 ohms.

IMPROPER MICROPHONE LOADING

A typical 250-ohm ribbon microphone may have an impedance modulus as shown in Figure 8–12A. As long as the microphone looks into a high

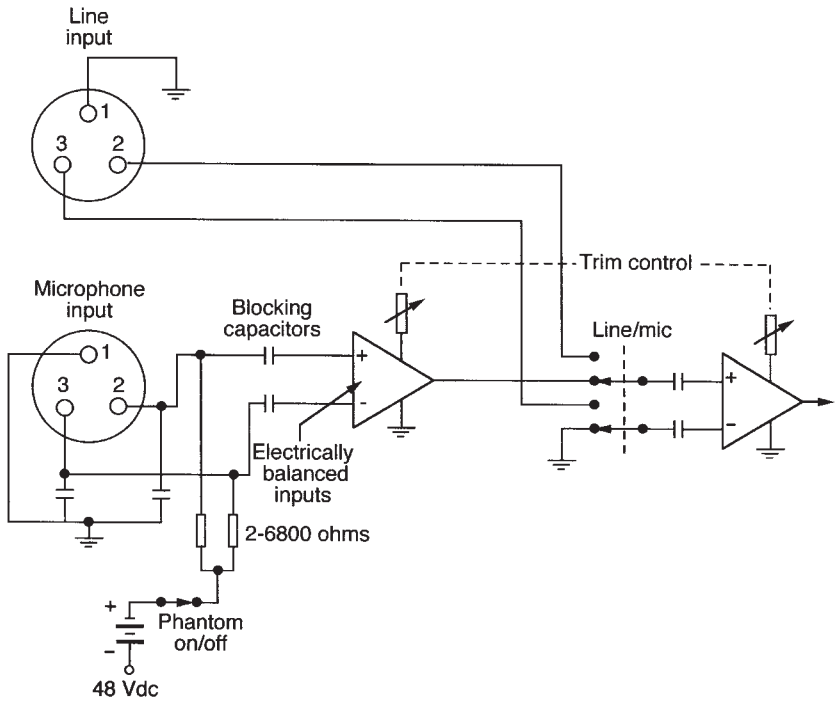


FIGURE 8–11

Simplified circuit for a transformerless console microphone/line input section.

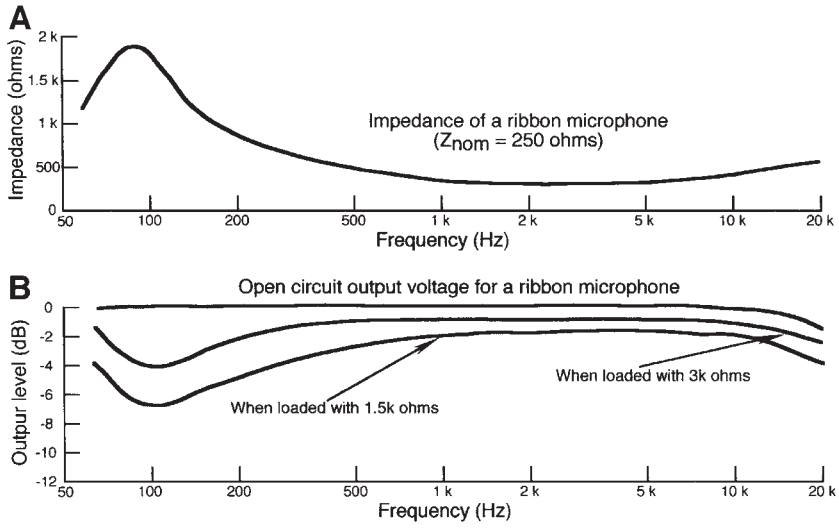


FIGURE 8–12

Effect of loading on ribbon microphone response.

impedance load, its response will be fairly flat. When used with a modern console having 1500- or 3000-ohm input impedances, the frequency response will be altered as shown at B. This is a response problem routinely encountered today and frequently goes unchallenged.

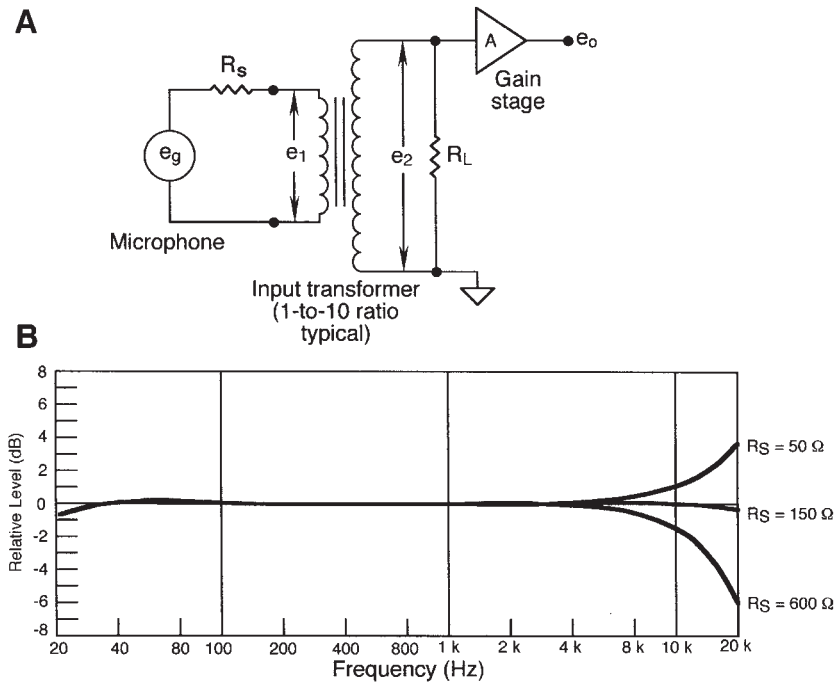


FIGURE 8–13

Response of transformer input circuit to varying values of microphone source impedance.

Another problem with improper loading is shown in Figure 8–13. Here, a capacitor microphone is loaded by a console input transformer that has a non-optimal termination on its secondary side. This can produce response variations similar to those shown in the figure as a function of the microphone's output impedance. Note that as the input impedance is reduced, the response develops a rise in the 10 kHz range. This comes as a result of an undamped resonance involving the stray capacitance between the primary and secondary windings of the transformer (Perkins, 1994).

UNBALANCED MICROPHONE INPUTS

Only in the lowest cost paging systems is one likely to come across an unbalanced microphone input. For fairly short cable runs from microphone to amplifier, there may be no problems. For longer runs, where there is greater likelihood for interference, the difference between balanced and unbalanced operation is as shown in Figure 8–14. For balanced operation, shown at A, induced noise will be equal and in-phase in both signal leads; it will be effectively canceled by the high common mode rejection of the input circuitry. For unbalanced operation, shown at B, the induced signal currents will be different between shield and conductor, and the noise will be significant.