Mic Memo

Welcome! This CD holds 22 years of *Mic Memo* issues — a tremendous database of applications and information on Crown microphones — within a searchable Adobe® Acrobat® pdf file format. Whatever your question, needs, or application, you should be able to find useful tips on this CD.

PZM® pioneer Ken Wahrenbrock was the first editor of the *PZM Memo*, which later became the Crown *Mic Memo* as Crown developed a full line of microphones. Ken has since passed on. We deeply appreciate his enthusiasm for PZM mics, his willingness to share his knowledge, and his warm spirit.

The *Mic Memo* issues on this CD are arranged in chronological order. To search for a particular topic in this document, use Acrobat Reader's FIND function. Select the binoculars icon and enter the word or words you are searching for. Turn OFF "Match Case".

Want to know more about stereo applications? Do a search for "stereo". Click the binoculars "Find again" icon until you find all the places that the word "stereo" was mentioned. Are you interested in applications for the GLM-100? Search for "GLM" or "GLM-100". All the app notes for this microphone will appear, one at a time.

Most of the illustrations in this document were scanned from the published newsletters. They will appear sharper in printouts than they do on screen.

I hope you find this compilation an invaluable tool.

Bruce Bartlett
Mic Memo Editor
Layout: Marie Turnock

USING “22 Years of the Crown Mic Memo”

Included Software: This CD contains installation software for the latest versions of Adobe Acrobat Reader for Windows and Mac operating systems. Adobe Acrobat Reader is required to access the Mic Memo archive file (in .pdf format) included on this CD.

CD Requirements: This CD has been optimized to run in a Windows 32-bit or Mac operating environment with Adobe Acrobat Reader 3.0+ software installed on the local system.

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First issue, circa summer 1978
Syn-Aud-Con Newsletter

DEVELOPMENT OF THE PZM

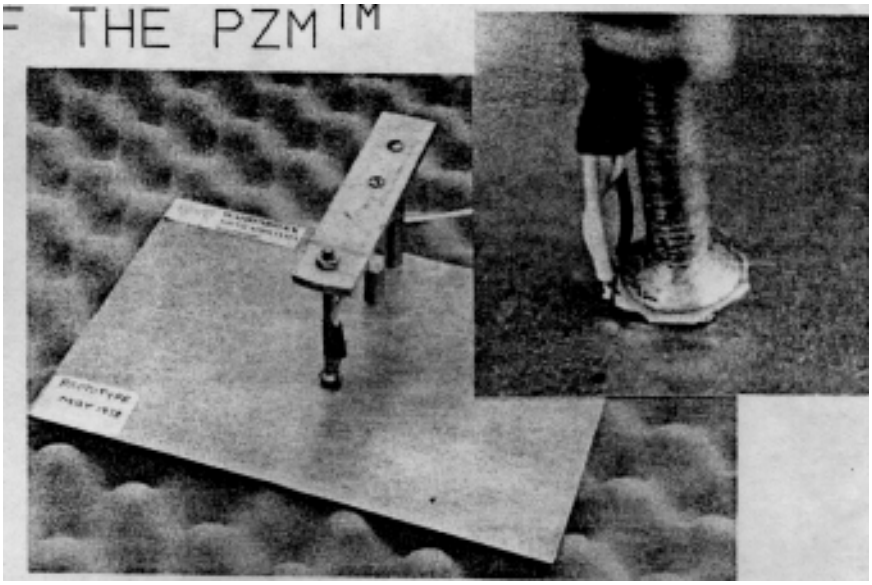


Fig. 1. Prototype built in May 1978 showing a close-up of the capsule mounting

Ken Wahrenbrock, a Syn-Aud-Con graduate and a very alert audio investigator, conceived of and built a prototype of the Pressure Zone Microphone, PZM. He used as his model the drawing shown in Tech Topic Vol 5, # 7, and a sub-miniature electret in a configuration that combined complete acoustic integrity with a rugged, practical mounting that allowed extremely versatile placement of the units.

During the past year PZM systems have achieved a remarkable acceptance among leading professional audio engineers and members of the entertainment industry. When a microphone receives a rave review by a serious music critic you can be sure it is different.

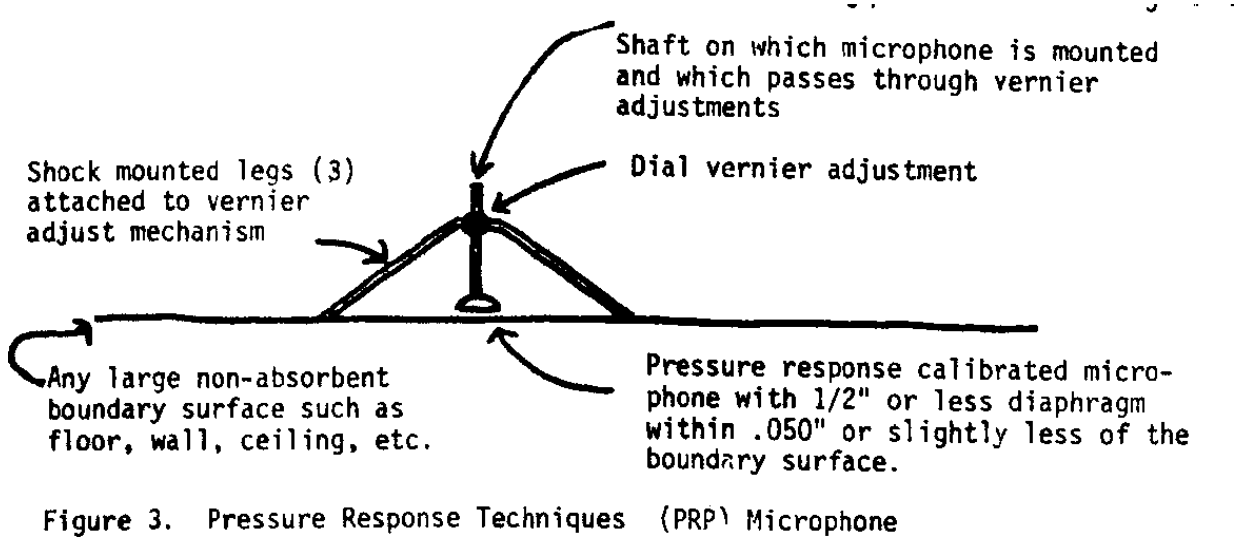


Fig. 2. Pressure Response technique (PRP) Microphone. Drawing from the Syn-Aud-Con Tech Topic

The model built by Syn-Aud-Con used an expensive dial vernier adjustment. Wahrenbrock's prototype used an inexpensive screw. At that time we didn't know what spacing of the diaphragm from the surface would be ideal.

WHY NOT USE FLUSH MOUNTING OF THE MICPOPHONE?

A pressure calibrated microphone when flush mounted has its on-axis response essentially in a free field. A sound is said to be in a free field if it is uniform, away from boundaries, and is undisturbed by other sources of sound.

A pressure calibrated microphone in a free field has a pronounced rise in its amplitude response at high frequencies because of the undamped resonance of its diaphragm.

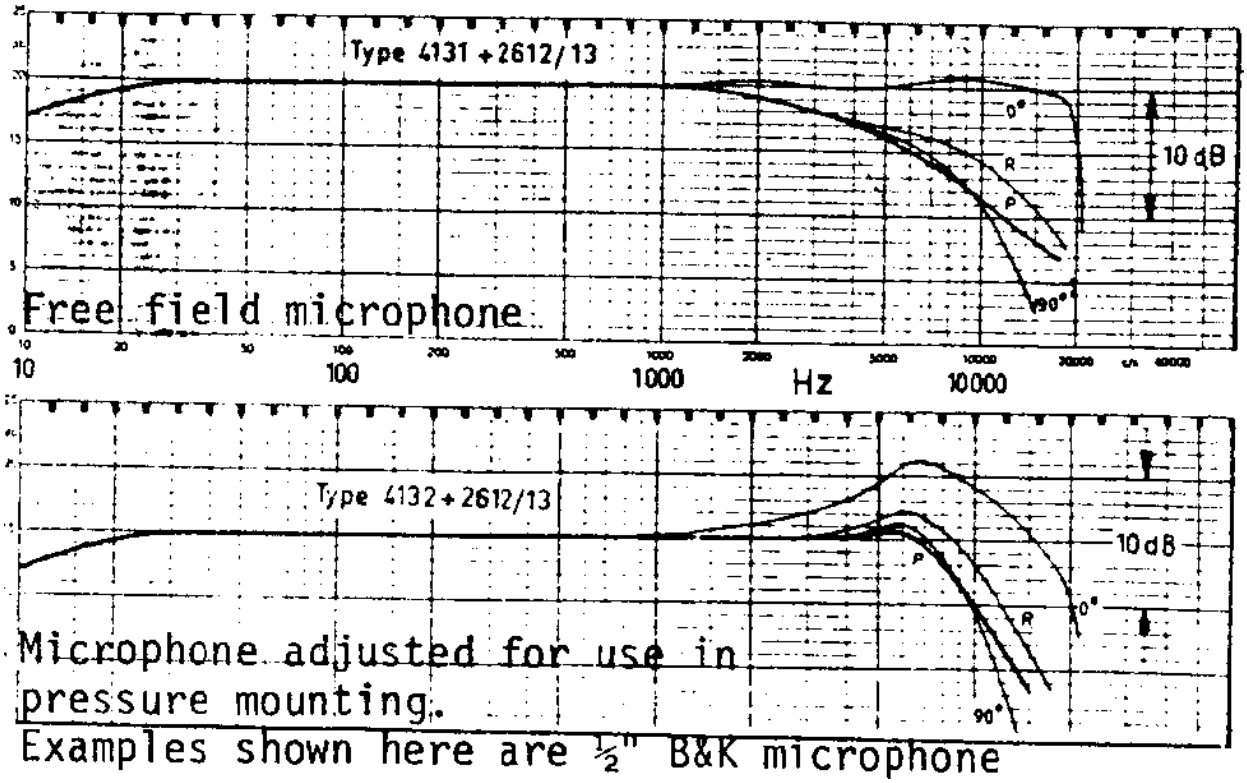


Fig. 3. Top: Free-field mic response. Bottom: Pressure-response mic response.

When placed in a cavity, for example, (a cavity is a pressure sound field) the response becomes uniform with frequency. If a pressure calibrated microphone is flush mounted, then its on-axis response will not exhibit the high frequency peak noted here.

In the PZM system no signal can ever arrive on-axis but can only enter at the sides of the opening between the microphone's diaphragm and the metal plate. This means that not only does the PZM maintain a "flat" response but that it does so for all angles of incidence in the hemisphere surrounding it.

HOW CAN A MICROPHONE SO INEXPENSIVE SOUND SO MUCH CLEANER THAN MICROPHONES LITERALLY 10 TIMES ITS COST?

Because all conventional microphones, no matter how skillfully made, no matter how esoteric the materials they are made from, contain a severe acoustic handicap. They receive both direct and reflected sound [actually, they receive direct and reflected sounds at different times.]

The PZM always sees the pressure field at the surface of the boundary which is totally free of the anomolies caused by the phase cancellation of direct with reflected sound.

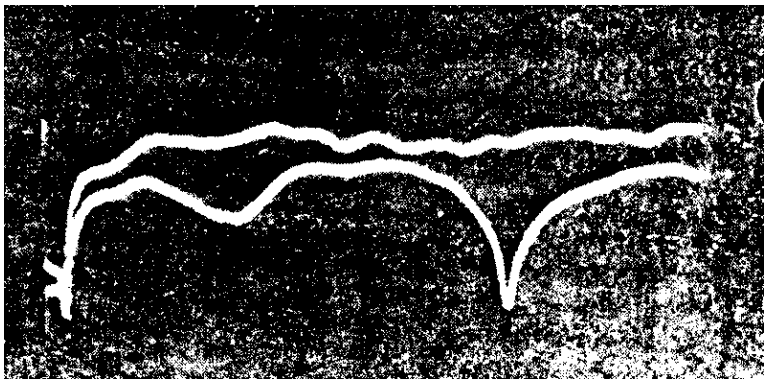


Fig. 4. Top: PZM response on a surface. Bottom: Conventional mic response near a surface.

PZM: A FUNDAMENTAL ADVANCE IN THE SCIENCE AND ART OF MICROPHONY

The 1980s will witness the widespread use of the first really fundamental advance in microphony in fifty years. The tremendous innovations of Wente, Thuras, Olsen, Bauer and others in the late Twenties and early Thirties are the basis of every conventional microphone on the market today. Veneklausen's concept of the "flush-mounted" microphone for stage use, circa the late Sixties, led to a proliferation of useful mounting devices by Shure, EV, and others.

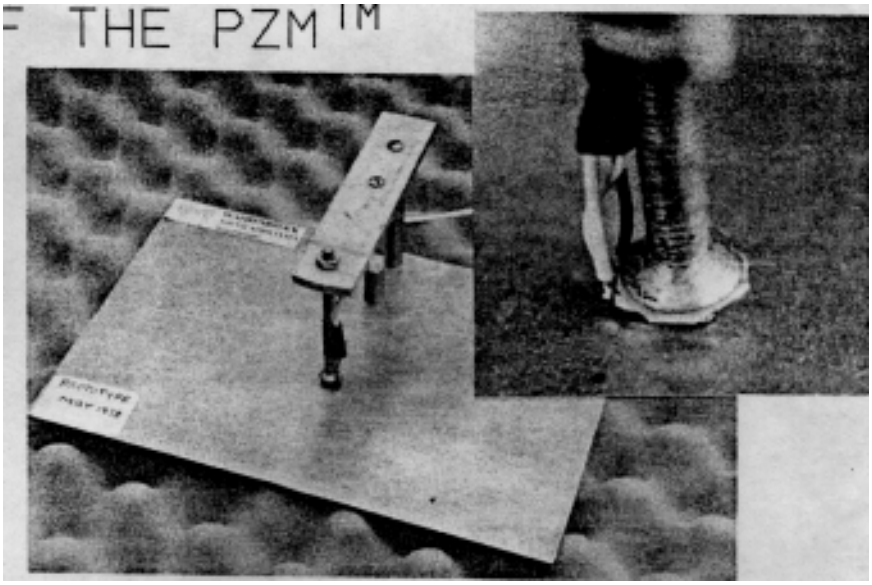


Fig. 5. Early PZM model by Ken Wahrenbrock.

THE PRP BREAKTHROUGH

Ed Long and Ron Wickersham, in studying the behavior of flush-mounted microphones, uncovered a basic error in our thinking. Within a few millimeters of a large surface, sound levels from a pair of equal level signals add coherently because, in close proximity to the surface, the particles are still in phase as they accelerate after being brought to a stop by the boundary. This creates what is called a pressure field right at the surface of the boundary.

"A pressure field is one in which the instantaneous pressure is everywhere uniform. There is no

direction of propagation." GenRad Microphones and Accessories Instruction Manual, 1977.

Long and Wickersham utilized this insight by mounting a ½" B&K pressure-calibrated measuring microphone perpendicularly above a formica surface with only a few hundredths of an inch spacing between the microphone's diaphragm and the formica surface. They named this procedure and its method of utilization, Pressure Recording Process, PRP.

Don Davis of Syn-Aud-Con suggested that a proprietary electret capsule available to Syn-Aud-Con graduates would be a suitable choice for such systems inasmuch as it was pressure calibrated and much less than 1/8" in size. (*Syn-Aud-Con Newsletter* Vol 5, # 3 and *Tech Topic* Vol 5, # 7. April 1978)

Pressure Zone Microphony, PZM, is an application of the Pressure Recording Process, licensed from E.M. Long Assoc. PZM is a trademark of Synergetic Audio Concepts [now a trademark of Crown International]. PRP is a trademark of E.M. Long Associates.

Pressure Zone Microphones are manufacturered by WahrenbrockSound Associates, Ltd. [now mfg. by Crown International].

WHY DON'T ALL MICROPHONE MANUFACTURERS ADOPT THIS IDEA?

Like all fundamental departures from the ordinary, a complex of influences motivate those who first encounter the PZM products and techniques. First, it is a patented product and a majority of the legitimate manufacturers of conventional microphones do not violate the sanctity of a patented idea. Secondly, evaluation of a competitive product by many engineers quickly run into the NIH factor (NIH stands for "not invented here").

A third, and perhaps dominate problem is "How do you measure a PZM?".

HOW TO MEASURE A PZM

The PZM obviously can't be measured in an anechoic chamber [not true - BB]. Only the most advanced engineering thinking has been sufficiently alert to become involved with TEF measurements (Trademarked by Syn-Aud-Con). Time-Energy-Frequency measurements based on Richard C. Heyser's TDS (time delay spectrometry) patent, and its more advanced manifestations such as ETC (energy time curves) and TFC (time frequency curves), are the only measuring tools capable of evalating properly the actual "in situ" performance of the Pressure Zone Microphones [sorry, not true - BB].

The first 600+ users of PZM have employed that most sophisticated analyzer available today, the human ears and brain. Their ears informed them of the sonic superiority of the PZM. The early users have made substantial contributions to their artistic employment. We then measure the objective reasons that always stand behind an inspired artistic intuitive insight.

DOES MICROPHONE PLACEMENT TECHNIQUE HAVE TO BE RE-LEARNED?

To be blunt but honest, YES! What you have learned in the past was how to make the best of a fundamentally bad situation. Some engineers have demonstrated remarkable insights into the problems and taken measures to minimize them. Observe any large complex microphone boom, for example.

There now exists 50 years of experience with how to minimize the "barrel" sound of conventional microphones. When you are suddenly freed of this gross distortion everything sounds good from almost any placement. Now you have the opportunity to choose not just a good sound, but a superlative sound that really lets you record the subtle interface between the artist and the acoustic environment in a degree not experienced before. That's where the real excitement lies.

ADDITIONAL PZM ADVANTAGES

One of the exciting facets about any new breakthrough is the, as yet, unexplored serendipities awaiting the experimenter.

One area worthy of such experimentation is the ease with which the directional discrimination characteristics of the PZM can be modified. A conventional microphone can often exhibit radical changes in frequency response [acoustic comb filtering) near any object (including the artist). The PZM does not [if the object is within a few thousands of an inch of the PZM mic capsule - BB]. Therefore, it is possible to use simple shields to alter the strength of the acoustic signal actually appearing at the surface where the microphone is located without detrimental effeots on its response. [Actually, these shields or boundaries do alter the frequency response of the PZM mic due to diffraction - BB].

For example, a piece of carpet can be laid over the top and rear of a PZM (leaving the front area open). It is easy to obtain a 20 dB front-to-back ratio [at high frequencies - BB]. An extremely effective windscreen for the PZM can be built using a little creativity. One method, though not ideal, is to use a darning hoop that has the foot of a ladies stocking pulled tighly over it and clamped by the outer ring of the hoop. This gives you an exceptional two-stage windscreen that will quiet a literal gale while not affecting the response in any way. These windscreens are more effective than the commercially available foam types.

The pickup of live stage shows, choirs, etc., all can benefit from the directional control of the PZM.

The Pressure Zone Nicrophone works well when mounted in the center of a 4’x4' plexiglass panel over a large orchestra or choir. The large panel serves as a very effective block to the sound from behind the panel.

By its very nature a PZM normally has a Q of 2.

We encourage you to explore various baffling arrangements both for directional control and tonal coloration. keeping in mind that, on occasion, the performer may be able to use extreme coloration as an asset.

We suggest you order a pair of Pressure Zone Microphones. After experience with these units your ears will be equipped to evaluate our written description with greater acuity, making your choice of alternatives and alterations in the systems easier.

# # #

PZM MEMO

March 1979

Ken Wahrenbrock, Editor

PZM Memo is a nonlinear media of information and questions about PRP and PZM microphones, uses, data, suggestions, pricing, modifications, etc.

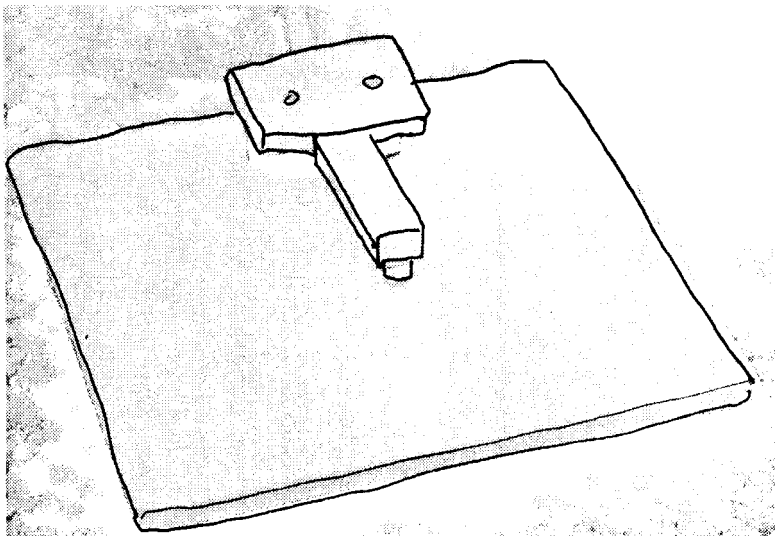


Fig. 1. Early Wahrenbrock PZM prototype.

PZM MICROPHONE SPACING

The spacing between the capsule front and the boundary plate may vary up to .014 without change in response, as testing with TDS has shown.

MICROPHONICS

The small size of the diaphragm of the cartridge reduces the inertia so that there is much less problem with microphonics (mechanical vibration pickup) than with standard size dynamic microphones.

MICROPHONE STAND MOUNTING

Best use of the PZM is to place it on a large boundary of the room, floor, wall, ceiling, gobo or 3' x 3' (or larger) piece of 1/8" plastic or masonite. However, if you wish to mount the mike on a stand, a cutoff Switchcraft 2501F and a 5/8" 6-32 machine screw will mount on the back of the plate and a short Atlas flexible section will allow positioning as you wish. One studio took excess mike holders with the mike socket broken and bolted two of them together for an adjustable mounting.

COMPARISON TO CARDIOIDS

Testing with TDS indicates that the PZM fwill not develop the comb filters as the sound sources move, as a cardioid does. Shifting sources are reproduced faithfully. Multiple sources can be cleanly reproduced without cancellations and comb filters.

REPORTED USES OF PZMs

PZMs have been taped to the underside of the piano lid and used for sound reinforcement with the lid down and covered with a quilt to reduce leakage from other instruments. Some testing is necessary to find optimum placement.

Tests have brought excited response from mixers with much experience in recording orchestra in studios.

Las Vegas Recording used one PZM for the brass section mounted on the back of the gobo, two for reeds, and each section had a better mix and could hear others in the section better.

When confronted with a Model C [discontinued] on a stand, the soloist said, “That can’t be a mike! I can’t sing into that!” They placed a U-87 next to the PZM, recorded 2 channels and let her choose. She liked the PZM sound better.

Recent tests have been made with the LA Philharmonic with PZMs and two other stereo systems.

At another session, the LA Philharmonic was recorded in a studio with 2 PZMs spaced 20' apart on the ceiling, 24' above the director and about 8' behind him.

Lavalier and model D versions [discontinued] have been used in film and TV production.

A recording with a PZM and 1" of foam screen for a close solo microphone provided a recording that, heard on Time-Aligned speakers, located the soloist right in one’s ears.

Several studios have recorded PZMs on 4’x4' panels, gobos or isolation panels. Excellent piano pickup is obtained with the microphone on a panel 6' away and parallel to lid on high stick.

One studio has used 2 PZMs for drum pickup in a drum booth with outstanding results.

In a band with a large percussion section, the percussionist strapped a PZM to his chest and carried his mike from kettle drums to chimes to cymbals, etc.

PZM microphones were used for the piano pickup on the 1979 American Music Awards and Grammy Awards shows. They were also used for the Academy Awards.

# # #

PZM MEMO

August 1979
Ken Wahrenbrock, Editor

MICROPHONE PATTERNS

The PZM pickup pattern should properly be termed hemispherical (when the mic is on a boundary).

A cardioid pickup pattern can be created by using carpet. A 20 dB attenuation toward the rear at high frequencies is measured using TDS. Use a double layer of carpet folded over.

WORDS WE LIKE TO HEAR

Reynold Weidenaar, Free-lance musician, New York City: “Thanks for the PZMemo and thanks for the best mics in my collection!”

From the *L.A. Times*, July 9, 1979 Music Review, on the all-Mozart evening Robert Shaw conducted in the Hollywood Bowl on Friday night, July 6th:

“The star of the evening, then, turned out to be the discreet and newly generalized microphoning on the Bowl stage. With apparent naturalness and unobtrusively, it delivered the music to the outdoor auditors without distortion. That is, of course, saying a lot.”

Ron Streicher, Pacific Audio-Visual Enterprises, Monrovia, CA, on use of PZM for the Metropolitan Opera at the Robin-hood Dell in Philadelphia: “Critics, audience, staff, and — of course — sound crew were all very pleased with the results of these mics. And their performance has prompted interest in other stage applications, as well.”

Martin Towne, Spellbound Sound, Ft. Myers, Florida: “I might expect that the next few years may show us that the PZM may be one of the most important developments in the audio field in this decade.”

A. Bruce Jacobs, Fargo, N.D.: “First of all, I like the microphone! What a piano sound! I think you should offer an option for altar-top usage that would provide the aluminum back plate with big arrows and letters saying, ‘THIS IS A MICROPHONE.’ (I love it.)”

Richard Jamieson, Jamieson & Associates, Minneapolis: “We are extremely happy with the Model A PZM microphones.”

PZMs FOR OPERA

We’re pleased to have had several good, constructive critiques of the PZM mikes from various users across the country. Here are some gleanings from these reports and our responses.

From Ron Streicher on its use at the Metropolitan Opera performances at the Robinhood Dell, Philadelphia:

Faced with the problem of micing the Metropolitan Opera without the mics being seen by the audience, I decided to try the (new) technique of pressure-zone micing, using the PZM microphones of Ken Wahrenbrock’s design. Having previously tried various types of mics and not really being satisfied with any of the results, I had reservations about this unusual’ technique. The results were more than gratifying.

The three mics I ordered from Ken arrived only a few days prior to the first performance. When they were tested with the sound system at the Dell, all seemed ok so to see what they would sound like, I used one on the stage in front of the regular soloist’s stand (bearing an AKO D-224) for a graduation ceremony which Temple University’s Law School was holding at the Dell. As often happens, the soprano came out and stood some fifteen feet away from her stage mark. The AKG, of course, being useless, up came the PZM. Up came the soprano! I was amazed.

There was not time for rehearsal before the Metropolitan Opera’s performance, which is a nightmare for the sound department. No chance to set levels or balances, with 10,000-plus people in the audience (including not always friendly critics) all waiting to hear Luciano Pavorotti. Having set an approximate balance, I was in the bleacher area in the back and my assistant was at the console when the curtain went up and the music started. Only a few minor adjustments were needed and all was well. Again, I was amazed.

I heard clarity and articulation I had not heard previously with ‘conventional’ techniques. No barrel-midrange; the singers could move around the stage with no loss of clarity or definition; no ‘phasing’ could be heard as they moved and no obtrusive footsteps, either. Clarity, presence, balance — these were what I heard.

Setup for coverage was simple: two PZM mics, one on either side of center stage, ten feet off-center (twenty feet apart). The prompter’s box center stage precluded my original intention of placing three mics across the stage but I did set two D-224’s in ‘mice’ at the extremes of the stage — for a little ‘insurance’ — but they were not needed, even though the working area of the show was over fifty feet wide.

I had another surprise, too. Being told that the pair of D-224’s behind the conductor were in the way, I taped my third PZM to the wall of the orchestra pit, directly behind the conductor’s head, out of sight and out of the way. The pickup from this mic was excellent and blended smoothly and cleanly into the overall house mix (which is mono). No problems.

As the Dell is an outdoor facility, there is a problem with wind noise. I solved this by taping a single sheet of ElectroVoice Acoustifoam, cut to size, over the PZM. It worked perfectly.

Also, by placing a piece of heavy, black shag carpeting, doubled over, behind (down-stage) the mics, cancellation of the orchestra into the stage mics was increased. (This technigue was demonstrated in the April SYN-AUD-CON San Diego class with the TDS system; it showed some 10 dB of cancellation, with no appreciable effect on the high frequency response due to phasing aberrations.)

PLATE VIBRATION

Steve Durr, Nashville, TN, reports that at high dB-SPL when mounted on a stand, the 6 x 9" plate may vibrate. If so, tape down more, or tape another piece of metal to plate with gaffer's tape. No problem, if the mike is on a large boundary.

PZMs ON PIANO

A. Bruce Jacobs, Fargo, ND, says:

It is the first time I have encountered a 'non-resonancy' close-miked piano sound. The first time we used it was probably also the first time Peter Scheklie had been miked with one. At least, he looked at it strangely. We were able to reassure him and also impressed his skeptical stage manager.

It would be nice to have a model with an electrostatic to-the-piano-cover hold system like the HP plotters. (Never mind the catastrophe if the thing got unplugged during the performance.)

Thank you for making a new development available to us for such a reasonable amount of money. Usually, some big company grabs stuff like this, gets a patent, and sells it for $500, since it is revolutionary.

From Martin Towne, Spellbound Sound, Ft. Myers, Florida: We have had terrific success using the PZM for pickup of the piano. According to the placement technique used, we are able to get a multitude of natural piano sounds which are agreeable to (and preferred by) any listener without the need for any equalization whatsoever. The degree of success in obtaining the desired sound (spectrum) is directly proportional to the number of different placements tried.

PZMs AS MEASUREMENT MICS

We have been using the PZM as a measurement microphone and have become aware of its use in solving acoustical problems. As an example, a particular church sanctuary had a measured RT60 of approximately 4.0 sec. Placement of the PZM against the rear wall (using the PZM as the measuring microphone) yielded an RT60 of 2.2 sec. It was deduced that the rear wall was adding 1.8 sec. of RT60 to the room.

Calculations showed that if the rear wall had been 100% absorptive, the RT60 would have been, indeed, 2.2 sec. I believe that the PZM was not 'seeing' the reflection of the sound from this wall in this test. I believe this point may be far reaching and will aid us in identifying and quantifying problem surfaces, more precise alignment of loudspeakers, etc.

PZMs ON INSTRUMENTS

We are studying the effects of mounting the PZM directly to surfaces of various types of musical instruments (guitars, drums, wind and brass instruments) and will let you know the results as we experiment.

PZMs ON ORGAN, STAGE PLAYS

Robert E. Brown, J.F.A. Electronics, Troy, NY reports that he has used the microphones successfully to record a large Austin pipe organ in a local cathedral and also to mic a stage play for a local high school.

Reports on the New York Metropolitan at Wolf-trap with PZM's brought much the same response from the sound crew as that at the Robinhood Dell.

Washington, D.C. music critics made no mention of the sound system in their reviews of the performances this past June (usually panned it before). One critic, when approached by a sound crewman, stated, "....best sound I've ever heard at Wolf-trap..."

At Wolftrap, the mike was used on a piano ith lid removed. Mike was placed vertically for concealment (see sketch below).

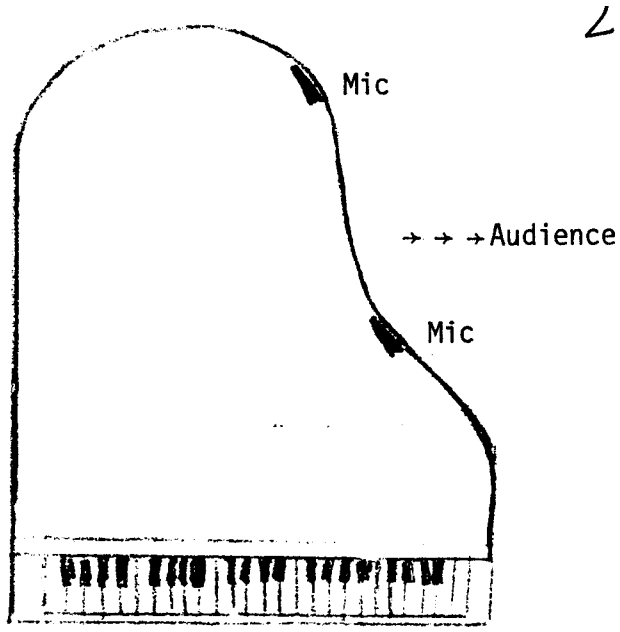


Fig. 1. PZMs miking a piano.

Also, one PZM was placed on the proscenium for audience pickup and ambience. It replaces shotgun mikes with 300% quality improvement.

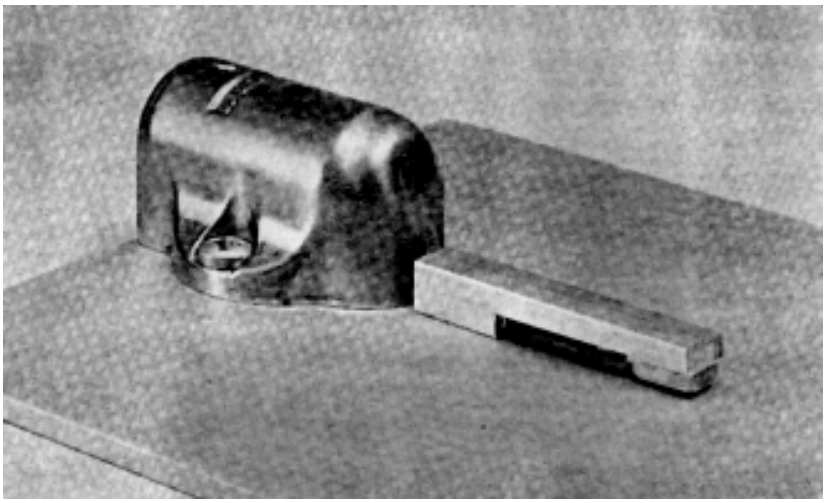
PZM ON STRING BASS

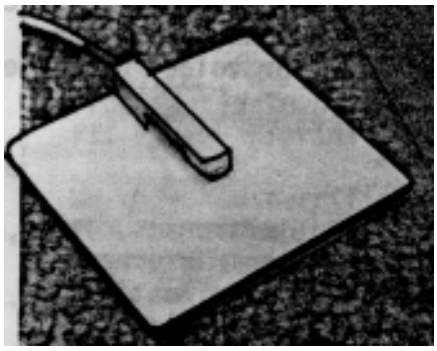
Radio Station KLON's "Big Band Broadcast" using PZM mikes tested a PZM-150 lavalier [discontinued] clipped inside the F hole on a string bass with low tones like the engineer had never heard before.

Our first PZM-150 lavalier will go to Tim McSwinney in Australia, who is a string bass player for recording sessions all over the world.

PZM USAGE BECOMING WORLD-WIDE

PZM's have been shipped to Japan, Sweden, Netherlands, Australia, Hong Kong and Canada.





Figs. 2 and 3. Early models of Wahrenbrock PZMs.

# # #

PZM MEMO
December, 1979
Ken Wahrenbrock, Editor

CROWN TO MANUFACTURE PZMs

As of January 1,1980, a new manufacturer [Crown International] will produce PZM microphones for WSA (Wahrenbrock Sound Associates). The same models will still be available. Shipment will come from WSA.

Some cosmetic revisions are being tooled. Around April 1st, the new manufacturer will ship through its dealers. WSA will become a dealer for PZM, and continue with the development of some new PZM ideas. Ken will continue to edit the *PZMemo* to provide interchange of information about PZM to all users.

Keep your ears open at the Winter CES show.

MORE USES FOR PZMs

ABC-TV used PZMS on piano for “All American Women.”

From BRADFORD WILLIAMS, Cerritos College:

“Several problems presented themselves from the beginning in the sound design of ‘Let’s Call the Whole Thing Gershwin,’ a musical review now at the Westwood Playhouse. First of all, the playhouse is not exactly acoustically perfect. It has a low reflective ceiling, brick walls, and a concave curved back wall in front of the balcony. Secondly, the director wanted no handheld or wireless mics on stage and particularly wanted to avoid the filtered sound so many floor miked shows have due to comb filter effects.

Having used PZMs in college shows with success, I knew they would be the answer for this show. The immediate problem was to make the downstage mics directional without offending the set designer’s sensibilities with hunks of carpet. Sonex foam cut into strips and set over the PZMs with the element just extending out the front seemed to work just fine with the side benefit of hiding the mic from the audience as well. (See picture below)

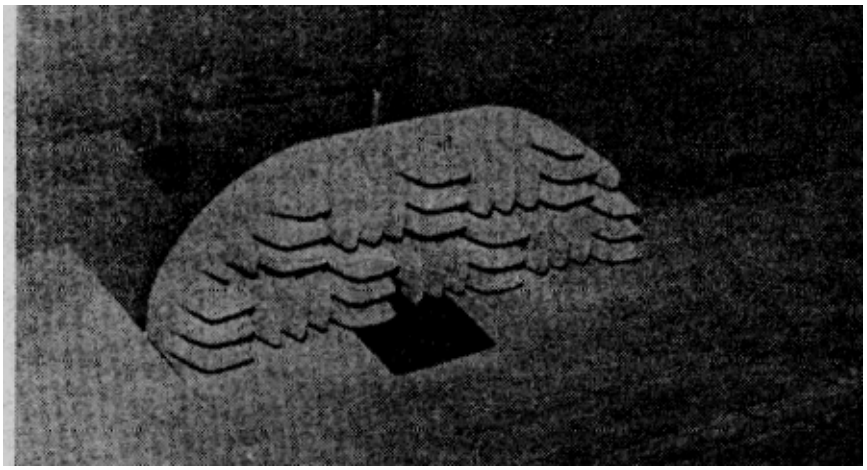


Fig. 1. Sonex foam behind PZM on stage makes the mic directional at mid-to-high frequencies.

Upstage mic placement took a little more thought. The cast dances just about everywhere on the set, the upstage platforms move, so it was finally decided to contact-cement two PZMs to the inside rail of the center stairway, which turns out to be great for sound pickup and yet stays out of everyone’s way.

During the show usually just one PZM at a time is used, depending on the location of the performer. This keeps the sound clean and minimizes floor rumble from the dancers (however, I’ve found PZMs

to be quite immune to shock and floor rumble). The mics are used only when necessary and then just enough to keep the singers above the band. Most people are unaware that the show is being reinforced. The sound is just bigger.

As for the room's acoustic problems, 1/3 octave EQs with pink noise were used to shape the room's response and then a 4 band parametric was used to control feedback."

SUGGESTION FOR MOUNTING PZMs

Polycarbonate sheet will not crack or shatter. It is twice as expensive, $110.00 for 4'x4'xl/8". 1/4" is not quite double that. It can be drilled, filed or sawn with standard tools.

2'x2'xl/8" works well and can be mounted on a light boom on an MS-25 stand.

4'x4'xl/8" can be suspended but single mounting of 4'x4' would require 1/4" and a heavy stand.

How about somebody testing these on a TV boom in place of shotgun mikes and then give us a report?

See illustration below.

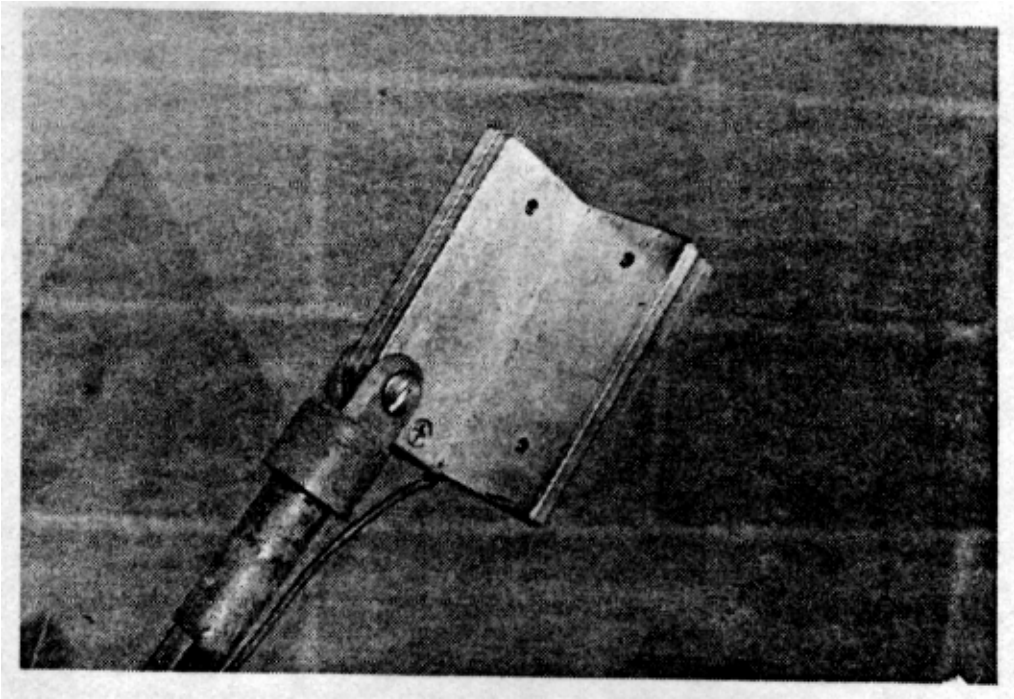


Fig. 2. Mounting plastic sheet to a boom.

WE NEED DATA

From many of you, we hear, "PZM's are really great. We use them all the time."

We would like to know on what records or shows they are being used. Future *PZMemos* will list them, if you give us the information.

CORNER PZM

Reproduced below is an article in the Fall 1979 *Syn-Aud-Con* Newsletter:

In the Anaheim class in September, FARREL BECKER, working with KEN WAHRENBROCK, proposed a new version of the PZM. Farrel's proposal was for a corner PZM.

The PZM3 [discontinued] can be used in theatre, church or auditorium. The mikes may be made using the natural boundaries of the lecterns or pulpits. Invisible boundaries could be developed by

using polycarbonate panels in several configurations. The side and back panels also provide attenuation to give a cardioid pattern to the microphone.

Farrel's reasoning was that "the PZM is not affected by the reflections from the surface it is mounted on. Therefore, if it is essentially mounted against three surfaces, as in a trihedral corner, it will not be affected by three of the six surfaces in normally shaped rooms."

The first illustration compares the level increase at the input of the mixer from a trihedral PZM as compared to a regular single surface PZM. The TDS measurement is from 200 Hz to 10,000. The upper trace is the PZM3 and the lower trace of the regular PZM. Note approximately 10 dB of gain.

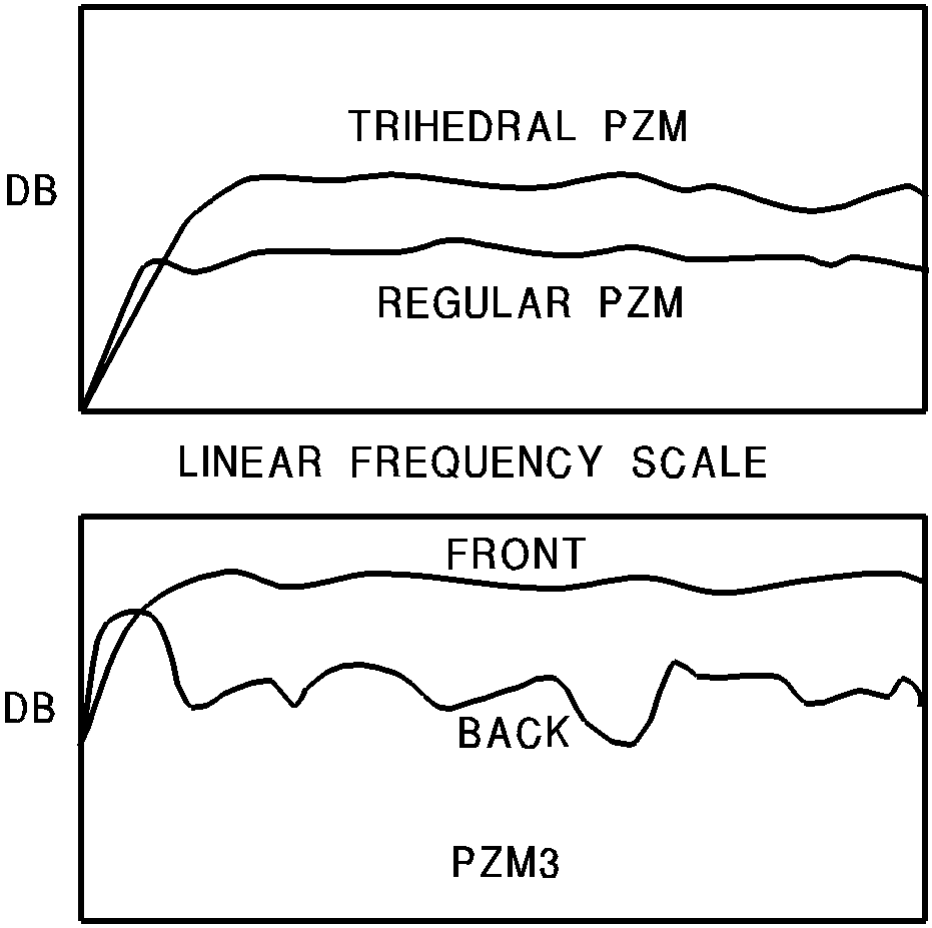


Fig. 3. TDS response curves.

The second illustration is of the front-to-back ratio of the PZM3, at least 20 dB. The curves were made by turning the back of the PZM3 toward the speaker.

Even more impressive than these measurements is the listening quality. Gain jumps up and room influences lower dramatically. Placement of the microphone element is critical and without TDS-EFC measurements extremely difficult to do properly.

As a system for recording conferences in small to medium sized rooms, PZM3 is without peer. Use of the PZM3 away from large supporting surfaces merely acts as a highpass filter below the one-quarter frequency associated with the wavelength of the plates used to form the corner mounting.

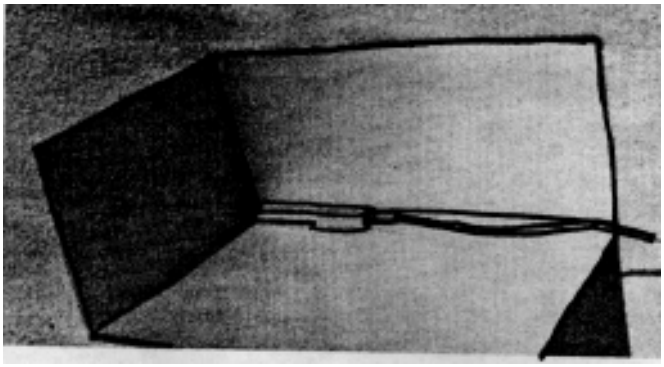


Fig. 4. PZM3.

The PZM-150 lavalier [discontinued] clipped in the string bass of the Glen Miller Orchestra picked up so well, the vibration could be felt in the 4x4's porch roofs around the outside pavillion at which they were performing. (Illustration below)

Fig. 5. PZM clipped to F-hole.

PZMs ON ORCHESTRA

"Rarely does the solution to a first priority problem deal successfully with a second priority headache. Here the PZM microphones of Wahrenbrock have not only given the best orchestral pick-up that we have ever experienced but at the same time have provided an uncluttered visual perspective supporting the illusion of natural sound."

PZMs ON ORCHESTRA, PIANO, HORNS, THEATER

Los Angeles Times reviews:

"...In both instances, the orchestra tended to play roughly, responding to the visiting maestro's sometimes vague instructions with faulty entrances, ruffled textures and curious imbalances. The renovated amplification system projected all this with a primitive clarity that actually may have accentuated the negative."

“The 1979 sound system also brought revelations to this event. The new system - to be reported on in detail later this month - would seem to be the removal of area microphones from crucial spots on the stage and their replacement with general miking over the orchestra. The idea is so simple, few have considered it.

“Tuesday, the results were pleasant - at least from the box seats below the promenade - and, you should excuse the expression, natural. One heard the solo piano in Grieg’s A-minor Concerto without echo or tubbiness, in aural perspective with the orchestra, and apparently without offensive electronic boosting.”

From MICHAEL LEADER, Vancouver, B. C.:

“Tried PZM on the grand piano and sound was fantastic. Just as great on French horn and trombone. The mic was on the control room window, 15' away from horns and sounded almost 3-D. The air from the trombone sounded like it was coming from behind the bell.”

TOM HAYES, Krannert Center for the Performing Arts, Urbana, IL, used PZMs and a $1800 stereo mike for 4-track “AB” of microphone pickup. A demo cassette shows transparent pickup with PZMs and the other mike sounds like somebody partly closed the door to the performers.

PETER FRAMPTON RECORDS WITH PZMs

Modern Recording magazine interview with Tim Boyle re Peter Frampton recording of “Where Should I Be”:

“Peter Frampton began work on (his most recent release) ‘Where Should I Be’ early in 1979 at Cherokee Studios located in Hollywood. After several months of recording with interruptions and ‘various engineers... sort of falling through’ Frampton re-teamed with (his) long-time chief engineer Chris Kimesy and the two moved the project to Filmways/Heider (also in Hollywood) for completion.

Tim Boyle, who seconded for Kimsey, comments on the “Where Should I Be” setup and the Frampton/Kimsey production philosophy.

MR: How are the pianos miked?

TB: We did some interesting things. Chris took one of my suggestions, which was a nice thing. He used two C414s for the piano - high and low end - miked close up to where the dampers are, up towards the front of the piano, and he used a PZM (Pressure Zone Mic) plate mic, a Wahrenbrock (Wahrenbrock Assoc., 9609 Cheddar St., Downey, CA 90242), which is a square plate pick-up mic. It’s the first pickup mic I’ve ever heard that actually works. We used it on a couple of tunes, closing the top of the piano, during the basic tracks especially, and covering it. So what you have is the two mics and the plate mic taped to the lid of the piano, which is then closed.

They’re even buying a couple of those PZM mics for the road. They’re good and they’re cheap too. I think in a couple of years people will find out about them.

So, we’ve got three tracks of piano, the plate mic and then stereo. Also, on some piano overdubs that we did, we used the same approach. The C414s and the lid open and a distance mic, which was a U47.

PZM CHOIR MIKING

From SOUND INVESTMENTS, Indianapolis, IN:

“Our first concern in using a PZM for a choir mike was to find a transparent material to mount the element on so we would not have the problem of a large, ugly plate hanging from the ceiling in the chancel area.

We found that plexiglass less than 3/4" in thickness flexed too much, and tempered safety glass shatters when it is drilled. Then we found that untempered safety glass can be drilled and has the rigidity we were looking for. The PZM-130 Model D element [discontinued] was removed from its plate and mounted on a 12x14" plate of 1/4" safety glass. The plates were then hung with small gauge brass chain from the ceiling approximately 15' from the floor, 5' on each side of center, and two feet in front of the choir rail. (We could not use the Haas distance due to a large CFM delivery from the air

system in the choir area.) The transformers were installed in the junction box underneath the baptistry and lines then run through the multi-cable to an equipment rack.

We found that the feedback suppressor was not needed. The signal is sent to one channel of the main mixer for overall balance control by the operator. Only these two microphones were used to reinforce a 90 voice choir.

In summary, we were amazed by the PZM performance as a choir reinforcement mike for:

1. Tremendous gain before feedback

2. An amazing lack of an 'amplified sound' of the reinforced choir typical of all other systems we've heard or used

3. Pickup patterns which allow larger coverage areas with fewer feedback problems

4. The clean architectural lines we were able to obtain in the chancel area by not using the typical 'overhead choir mike' setup (the most important to our client).

In the same installation we used two PZM-130 Model D [now PZM-6D] microphones on the underside of the piano lid for piano reinforcement.

All in all, both our client and ourselves are tremendously pleased with the performance of the PZM microphones and we look forward to further use of your product."

PZMs AT WOLF TRAP

FARREL BECKER, Wolf Trap Farm, VA reports that PZM microphones were first used at Wolf Trap at a pre-season show called "Fairfax Family Night," May 30, 1979. Here is a condensation of his report.

This is an annual show featuring local talent. The Fairfax Symphony (a local semi-professional orchestra) was featured for the first act. With Wolf Trap's orchestra shell, no sound reinforcement is required for the house but it is always necessary for the lawn seating area. Our usual procedure consists of a single bi-directional microphone on stage directly in front of the conductor. This mic is mixed along with two shotgun mics located on the balcony rail (with appropriate delay for each mic location). In addition to our normal setup, we placed two PZMs on the stage floor about 10' downstage of the first chairs of the orchestra and about 20' apart.

There was no rehearsal for this show, so we started with the PZMs and proceeded carefully. The results were hard to believe. Our artistic director, not knowing anything was being done differently, very excitedly told the sound operator on the lawn, "It sounds like it is coming directly from the stage." He was referring to the quality of the sound vs the direction it seemed to be coming from.

With digital delay, we have been creating the illusion that the sound on the lawn was coming from the stage (from a directional point of view) for many years. The PZMs brought the clarity and naturalness to the lawn that had been missing. The shotgun pickup always sounded "muddy" and was overly reverberant. More experimentation with the PZMS was needed, but this was an incredible improvement.

Next, we used the PZMs for a week's run of the Metropolitan Opera. There we used the PZMs as foot mics with excellent results. Since the Met sets up a prompters' box center and the prompters speak somewhat loudly, instead of 5 mics with one centered, we spaced 4 PZMs evenly along the apron. A piece of carpet, backing side up and painted black, was placed over each mic and the entire setup disappeared into the Met's ground cloth.

These mics were set up about 1 1/4 hours before each performance and we were careful to mark them appropriately so the singers could see them (also told them to beware).

The PZMs proved to be perfect for reinforcing the sound from the stage without anybody being aware of it. No rehearsals are held with the Met either, so as the first performance began, a small amount of high frequency rolloff was added to reduce sibilance and that was that.

With conventional mics, it was a constant battle to keep the equalization on the board adjusted for a close to natural sound. With the PZMs, the equalization was set at the top of the first performance and never touched again for the entire week. The sound was extremely natural and clear, with a

minimum of effort. The PZMs freed the operator to give his full concentration to the action on stage and he had only to worry about levels. Valuable time was no longer wasted on determining how to set the equalization for a natural sound.

The shows all went very smoothly and everyone was pleased. Even the people with the Met, who normally listen each night, stopped listening after the first night. For the first time in six years of the Met performing at Wolf Trap, there was no mention of sound, good or bad, in any of the reviews. This is just what we strive for: No one should be aware that sound reinforcement is being used.

NEW MODEL

F Model [now the PZM-20R]. Flush mounting with integral phantom power interface. These are being specified for courtroom use in several places. At the New York AES, a recording studio expressed interest in mounting two of them in each studio for stereo pickup, talk-back or ambience. The knobs are to reduce the chances of using the mikes for a paper clip.

HANDHELD PZM BEING TESTED

Ten prototypes of a handheld version are being fabricated and will be distributed to several users who have indicated their willingness to test prototypes as they are conceived.

Pearl Bailey used the first prototype at a recent benefit concert and the reinforcement clarity was exceptional. The contrast was apparent when she dislodged the mike connector in the stage floor and a hurried replacement with a typical cardioid was made. The usual muddiness was noticeable as in typical dynamic mikes.

PZMS USED ON THE LONG BEACH SYMPHONY

The Long Beach Symphony has an outdoor summer concert series. In July they had a PZM first, an all-PZM-reinforced concert. They used three PZM-130s on stage front, left and right, spaced 15' apart with one PZM" sweetener at center for reeds and harps, one PZM-150 for string bass sweetener and one PZM left for the emcee and conductor. [Those mics are now the PZM-6D and PZM-30D].

Source: STEVE BARKE, sound engineer for the Long Beach Symphony Association.

PZMs FOR CONFERENCE MIKING

Some interesting new uses of PZMs are surfacing. A telephone company is establishing conference rooms with speakers, mikes and hybrids to remove feedback. These are used for all kinds of service to reduce travel costs for planning, policy discussions, etc. Previous installations required several dynamic mikes in the ceiling to eliminate microphones on the conference tables. One PZM-D or a PZM3 corner mike [both discontinued] will replace three dynamics with 300% improvement in articulation and great reduction in pickup of room reverberation and noise.

There will be continued experimentation for best placement of speakers and microphones for different sizes of rooms and conference table configurations. More to be reported in the next *PZMemo*.

# # #

PZM MEMO
April, 1980
Ken Wahrenbrock, Editor

"The great end of education is to discipline rather than furnish the mind; to train it to use its powers, rather than fill it with the accumulation of others."

Tyron Edwards

The basic purpose of the *PZMemo* is to:

Train PZM users to discover the optimum uses of the PRP.

Develop exploratory mind set for what PZM might do.

Provide information on what others are finding which is helpful for a problem.

Provide examples or data on new products or products PZMs have helped produce. Serve as a forum for ideas, questions or chuckles about PZMs and their uses.

PZMemo is a nonlinear media of the above for PRP and PZM microphones.

PRP is trademarked by E.M. Long Associates. PZM is a practical adaptation of that process and is trademarked by Synergetic Audio Concepts.

PRESS CONFERENCE CONSUMER ELECTRONICS SHOW

Las Vegas, Nevada, January 5-7, 1980

A special press conference was held at CES on Saturday, January 5, 1980 where Max Scholfield, President of CROWN International of Elkhart, Indiana informed the press that CROWN International had become the newly licensed manufacturer of PZM microphones.

CROWN will assume manufacture of PZMs for Wahrenbrock Sound Associates who will continue to distribute the microphones until CROWN has established its dealer franchises and manufactured sufficient microphones to provide dealers with stock.

Ken Wahrenbrock is being retained by CROWN to continue research and development of PZMs. He also will serve as editor of the PZMemo.

CROWN is initiating its manufacture of PZM with four models in black and in gold. Model B 5x6", Model D 3x3", Model F (flush mounted) and the lavalier or tie clip version [current models are the PZM-6D and PZM-30D].

Two power supplies or interfaces will be available:

1. A combination battery and phantom power with a transformer, and

2. An active device which converts the impedance and works on phantom power.

The target date for CROWN to have its dealers supplied is this spring (May-June).

Until that date, microphones will be available from Wahrenbrock Sound Associates.

PZM — BLUMLEIN

Three models of back-to-back PZM’s on plates, 2x2',18x24' and 1’x1' have been tested with very interesting results. First attempts were made by using just the mikes, then reversing polarity on one mike. The results were confused sound with lack of definition in the center. Steve Barker connected the mikes using a sum and difference encoder at the mike and then a high level decoder for left and right channels at the mixer with exceptional results.

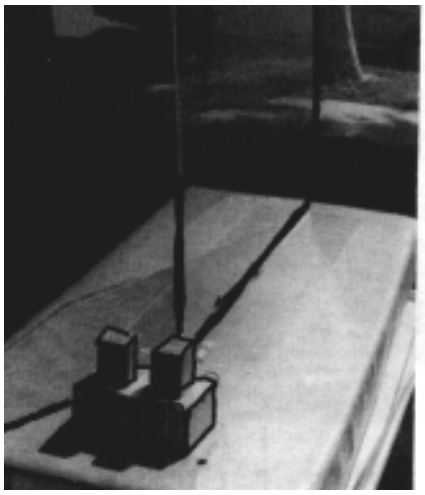


Fig. 1. 2x2' matrix plate with footing for floor mounting with M-S send box.

The set is being used on KLON, Long Beach City College's Big Band Broadcast every week with some remarkable clarity, separation and no hole in the middle section. Investigation and testing is continuing in a number of situations. At a recent Syn-Aud-Con seminar, the mike would pick up inaudible whispering from 10 feet on one side while conversations were being heard right at the mike. A recording has been made using the 2x2' set on the floor in front of a brass quintet. There was excellent imaging and separation with a perfect center image as well.

Further details of the setup and interconnections will be available in the future.

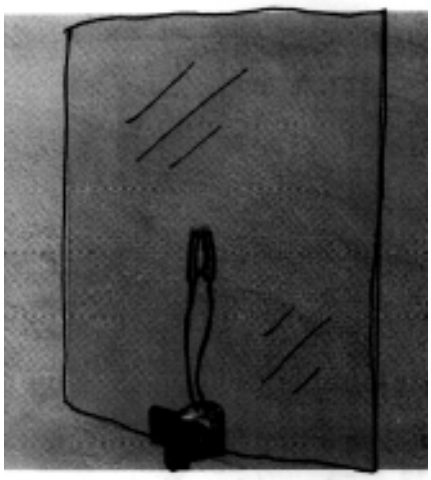


Fig. 2. PZM on 12" square matrix for stand use.

PZMs ON PANELS

PZMs have been made with aluminum 6x9x4" high, 6x9x1" high, 6x6x3" high of smoked acrylic and 6x6x4" high clear acrylic.

These really provide a lot of reach on a lectern or stage position.

It would be interesting to hear what they would do on an interview situation on radio and TV.

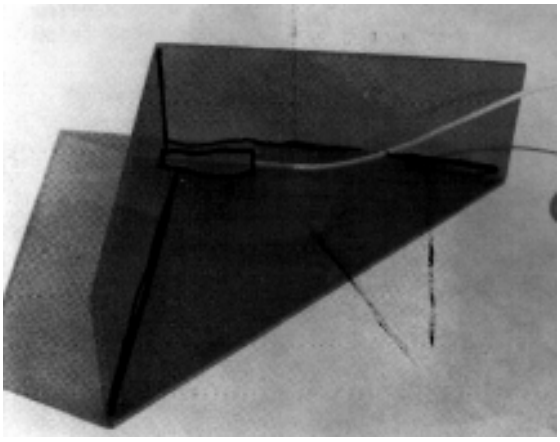


Fig. 3. PZM3 of smoked Plexiglas.

A Model D PZM [now theSound Grabber II] on a short cable with a mercury battery holder on the cable like that provided by Coherent Communications becomes an excellent microphone for a cassette recorder. Our lawyer is using one as he makes depositions and his secretary continually blesses him for the clarity of the cassettes as compared to ones recorded with the mikes he previously used. A Model 0 plate can just be placed on the coffee table and the total conversation is recorded clearly.

A Model 0 with the bar painted white on a clear plexiglas plate for use on altars, etc. is a possibility. If such a model would be helpful for your system designs, give us some feedback.

A number of possibilities for use with natural low end roll-off can be tested with PZMs on the clear plastic plate for stand mounting.

Guitar pickup plus vocals ought to be clearly picked up with such a mike. Quartet pickup should be a natural. Since there will be some difference between this and the usual quartet pickup with an omni or cardioid, the technique of using the PZMs will have to be tested and learned.

Models have been prepared for test with 12" and 6" plastic circles.

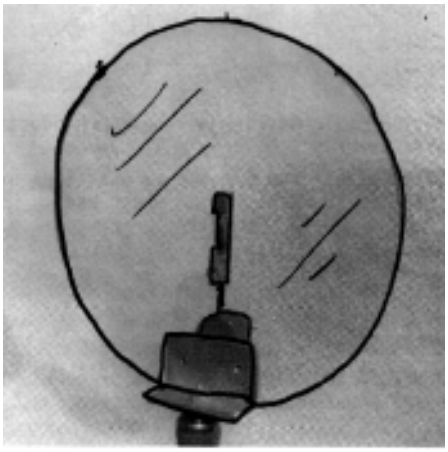


Fig. 4. PZM with 6" plastic circle.

For more information on the PRP recording method and the use of PZM, read the article by Ed Long in db magazine for January, 1980, p 31.

PZMs IN A CATHEDRAL

Robert E. Brown, JFA Electronics, Inc., Troy, NY, writes:

Last year, after a Don Davis pep talk, we ordered a set of PZMs with BT power supply [discontinued]

for installation in a local cathedral.

The microphones are placed in the nave, about 30 feet from the organ and choir stalls, separated by about 30 feet from each other. As a matter of convenience, the BT supply is installed at the organ console, necessitating microphone cables of approximately 200 ft (per microphone). Despite this high-Z run, the only problems experienced to date involve RFI from a local radio station on isolated occasions.

Mikes are installed with excellent results in St. Paul's Episcopal Church, Troy, NY and Cathedral of All Saints, Albany, NY.

PZM ON ACOUSTIC GUITAR

PZM user, Dale Kauffman, writes:

I experimented using the Model 130 Low Profile PZM [discontinued] as a pick-up on an acoustic guitar. After trying several different locations on the guitar, I found the best location to be directly under the strings, between the bridge and the sound hole. The Low Profile PZM was thin enough to insert between the strings and the guitar body, yet left enough clearance so as not to interfere with the strings or the performer.

Fig. 5. PZM on acoustic guitar.

The Low Profile PZM was mounted using thin double-sided foam tape. This gave isolation from the guitar body yet made for easy removal. The tonal quality was exceptional and extremely clean with very good overall response and balance.

PZM ON HORN AND PERCUSSION

Robert W. Spangler, Jr., Susquehanna Sound, Northumberland, Pennsylvania:

We've used the mike on several horn and percussion sessions and we love it!

PZMs IN STUDIO DESIGN

We were very pleased to receive the following (with cartoons) from Ake Eldsator, Stage & Studio, Kungalv, Sweden:

We have done some testing with a remote-controlled hi-Z preamp (not VCA) on the studio floor and found that undistorted peak-level could be higher compared with transformer operated units.

My own comment about the mikes is that they sound very natural and "open" but a bit overbright. They are very sensitive to resonance and ugly reflections in the studio. The small diaphragm is very fast, so transients sound fantastic and light-meters are always in the red area. As a studio-designer I have used the PZM with great success to trace acoustic faults in existing studios and I look forward to

refining my own designs so that PZMs can be used without phasing on every track. In “hi-direct to reflected energy” studios there are often sharp slaps from hard surfaces (not too well diffused) and they are easily heard by PZMs.

SOUND-ABSORBING JACKET

If you’re very close to the mike you can hear reflections from your own body. Perhaps one can wear a special glass-fiber jacket and cap?

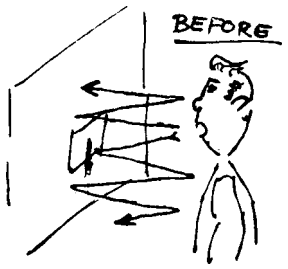


Fig. 6. Sound reflections between wall and body.

Fig. 7. Sound-absorbing jacket.

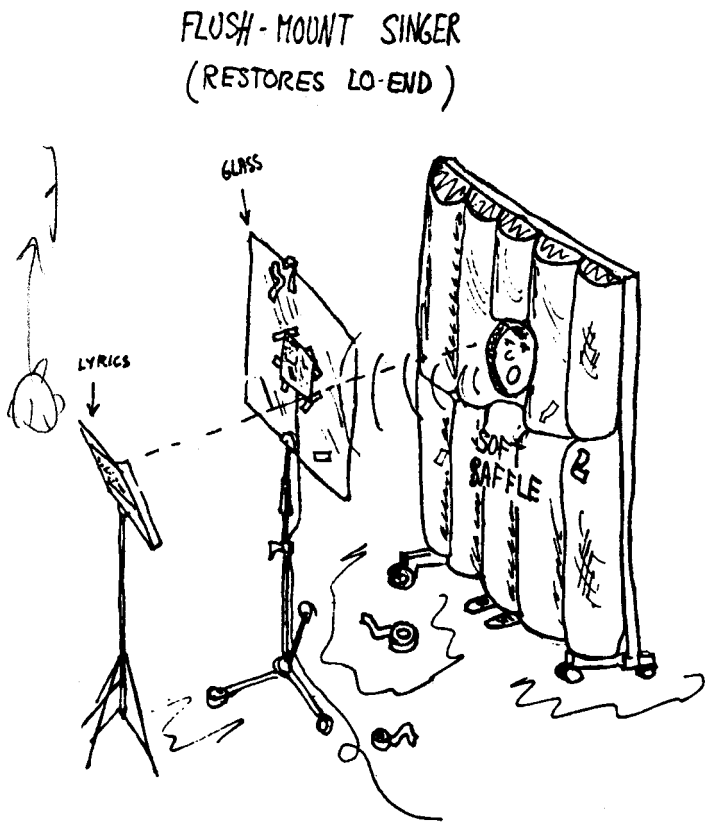


Fig. 8. Flush-mounting the singer.

VARIOUS PZM APPLICATIONS

From Russ Berger, Highgrove House, Inc., Dallas:

I was very disappointed - disappointed with myself. For several years I have known of the PZMs and read ecstatic owners' reports of wonder and satisfaction, but never before found it in myself to move off dead center and try them. The PZMs were put up against the finest mics Germany, America, and Japan have to offer including Neumann's latest and greatest, the U89.

The PZMs are clearly better.

Never before has the sound in the studio been reproduced so accurately in the control room. Now I'm spoiled - spoiled like the other PZM owners.

One of my clients, Six Flags Over Texas, is trying a pair for their live "Gunfight Show." They had been using ElectroVoice 664's with terrible results. After auditioning the PZMs over a pair of UREI 813's, they were amazed.

Tim Guhl, Cultural Resources Council, Syracuse, NY, says:

You were right, the PT power supply is quieter than the PXT and we're very pleased with the PT's. All in all, we're pleased with the PZM systems. We've been using the systems to record the Syracuse Symphony Orchestra and the Opera Theatre of Syracuse for the past five months and we've never gotten such excellent recordings. Testimony to the superiority of the new systems is born in comparison to the other miking technique that we used. Formerly, we used a Neumann SM 69 FET in a 'mid-side" setup. With this we employed a woodwind sweetener mike, this to cover the swimmy image right at the center of the mid-side configuration. We were quite pleased with the mike setup and had spent some three years developing the technique. We even recorded a disc for New World Records and

another for Peters International with this system. Then we ordered the PZMs. The rest is history.

We first set up the PZMs to directly 'A-B" with the mid-side system. I have never heard such a radical change for the better! The entire acoustic of the sound changed, the mid-side setup sounded as though we were listening to the orchestra in a small room with baffles behind our ears, the PZM systems sounded as though we were sitting in the concert hall. The image tightened and spatial localization was more accurate. The entire sound became highly detailed where it was fuzzy before and with our very first placement there was this much improvement!

Mind you this is not just my reaction. My producer (Don Dolloff of WCNY-FM, local NPR) brought in Christopher Keene, the Artistic Director of SSO, several of the Symphony's musicians and the general manager of the Symphony. I called my immediate superior, Dan Wooley, and he called the Executive Director of our organization, Dr. Joseph Golden. We purposefully did not solicit comments from these people to get their candid responses. The responses were all similar to my initial response. There you have it, unqualified exaltation for the PZMs.

The PZM systems were particularly easy to use on our hall because of its acoustical equipment. The CrouseHinds Concert Theater was acoustically designed by Russell Johnson of Consultants Collaborative and the hall features an acoustical reflector (the eyebrow) measuring 18 feet by 60 feet, suspended approximately 32 feet above the stage floor. The eyebrow extends partially over the audience and so it was natural to stick the PZMs to the eyebrow.

We have experimented with various placements of the PZM systems and they are currently located near the audience-most edge, spaced 18 feet apart. There seems to be an optimum pick-up angle.

As we tilted the plates toward the string sections, they became more clear and defined. As for the glockenspiel and tambourine, I have never heard more faithfully reproduced percussion. It became apparent through the PZMs how comb filter effect, even in close miking, can ruin the sound of microphones with good transient response. Our orchestra here moves its position on stage a great deal and where the stereo mike needed constant readjustment, the PZMs require none. This speaks well of observations regarding Haas effect and binural pickup, allowing the listener to integrate the sound with his own ears. Moving to the PZMs was a giant step for us on the road toward faithfully reproduced sound.

Thank you ever so much ... for putting PZM together; as you know Thomas Edison merely put the right materials together to create the light bulb.

PZM PRINCIPLES

Bruce Jacobs (A. Bruce Jacobs, Audio Systems Consultant, Fargo, North Dakota) raises some excellent points and questions on PZM principles.

1. The PRP articles by Ed Long carefully discuss the concept that placing the PZM on a boundary eliminates the frequency spectrum aberrations due to interaction between the direct sound and the major first order reflections. Why, then, put the microphone anywhere but on a major boundary? In mid-air you will still get the first order reflections.

Let's have some reactions.

2. Why a handheld PZM? What possible benefit in place of a conventional high quality mike?

Let's have some reactions.

3. Eric Rudd (with Bruce), "Why shouldn't we have the same concerns as to the placement of our capsule in relation to plate edges as the loudspeaker designer does in placing the tweeter on a rectangular surface? The loudspeaker designer seldom puts a dome tweeter equidistant from the edges of the cabinet much less mount it on a square surface. If he does, the comb-filter effects due to the air impedance transition at the edge of the surface would fall on the same set of frequencies for all four directions from the tweeter and thus would be all the more noticeable."

Let's have some reactions.

Further from Bruce: "In the Fall Syn-Aud-Con Newsletter, Farrel Becker says, 'Use of the PZM3 away from large supporting surfaces merely acts as a high-pass filter... below the one-quarter frequency

associated with the wavelengths of the plates used to form the corner mounting.' I disagree. As Eric Rudd helped to point out, at a low frequency where the size of the plate is small compared to a wavelength, the plate no longer serves to increase the pressure for the capsule. Instead, it lets the capsule record the pressure as if the plate were not there. With the standard PZM, this pressure difference is double or 6 dB.

So let's give the PZM more credit. As the frequency drops, we reach a transition whose frequency depends on the plate dimensions - at which point the response drops to a level that is 6 dB below the high frequency level. Theory and measurement have not agreed for me yet as to the exact frequency and shape of transition in relation to plate geometry."

Let's have some reactions.

REDUCING GLARE FROM PZM PANELS

What do you do when the PZM mounted on a 2x2' plate catches the lights when you are overhead on a choir?

Brad Williams tilted and tilted, cleaned the plate, and moved the plate left and right. Still, light spill. He finally painted the edge black and the spill disappeared. Is that lateral thinking?

PZMs ON COMMERCIAL RECORDINGS

Lenng Dreau

Direct-Disk Labs Nashville, Tennessee

All acoustical guitar miking is PZM.

Reflections of Dad RME1OO4

Russ Morgan Enterprises Las Vegas, Nevada

2 PZMs on drums

1 PZM on brass

1 PZM on reeds

1 PZM on piano

1 PZM on bass

The just released Beach Boys album, "Keepin' the Summer Alive" has PZM's on vocals and some of the instruments.

George Burns, "Wish I was 18 Again," PZM on strings.

New album, not yet released, Willie Nelson, PZM on piano.

Debbie Boone's newest album, PZM on strings.

Bill Gaither Trio "Live" album at Grand Old Opry - PZM on drums.

PZMs FOR MUSICALS AND CHOIRS

CERRITOS COMMUNITY COLLEGE (Norwalk, CA) recently presented the complete Leonard Bernstein's Mass for six sold-out nights. The sound designer was Brad Williams, who has used PZMs before for "Fiddler on the Roof" and "Let's Call the Whole Thing Gershwin" (PZMemo Vol. I, No. 4, p 2).

The set for Mass is staged to represent two different environments, the temporal and the spiritual. The spiritual is upstage, consisting of pews for a choir backed by a rose window and a cross on a platform. The temporal part of the set was basically bare stage encompassing the downstage portion all the way to the stairs and house aisles. To the sides and above the pews were musicians in addition to those in the pit.

To reinforce the choral ensemble in the pews, Brad "flew" 4 PZM's on 2'x2'x 1/4" plexiglas with the

edges painted black to reduce glare. (He found 1/8" plexiglas sagged too much in the center.) Under normal circumstances, the choir could have been covered with 2 mikes, but the proximity of the elevated musicians on each side caused too much leakage. Four PZM's with the two outside ones tilted to place the backside of the plate toward the orchestra provided enough pickup for solo instruments and allowed the choir miking to be at low enough level to reduce leakage to an acceptable level. The four mikes provided excellent balance for the choir.

The street area was miked basically with 2 PZM's at the edge of the stage with double thicknesses of 4" Sonex to provide isolation from the orchestra in the pit. Many of the street chorus were blocked in, to be in front of these mikes for their solos. Others moving in many areas were able to use PZMs on wireless mikes. There were a large number of voices who had to pass a handheld wireless with cardioid capsule.

The difference in quality was very evident. Several of the cast who were using the wireless PZMs were amazed that they could not determine when the mike was on, since the reproduction was so clear.

The sound system for the auditorium has a central cluster over the proscenium.

Two PZMs were also used on 4x4' masonite plates at the rear of the house for stereo reference recordings. The director of the show was so taken with the quality of the recordings that there are plans to edit the tapes into a cast reference album.

PZMs ON INSTRUMENTS

ANDREWS AUDIO CONSULTANTS, New York City, has used a number of PZMs for sound reinforcement and recording for vocals as well as instrumental pickup as follows:

With FLORA PURIM AIRTO, 150 handhelds on the vocals, 150 handhelds on bass drum, snare and high hat, overhead drum set; 150-B on other percussion, 130-C on guitar amp and 130-C on trumpet synthesizer amp comb [all since discontinued.]

With ROBERT KRAFT and IVORY COAST: 150 handheld on vocals, 130's on piano; drums same as above and 150 lavalier on violin.

Jesse with Dave Andrews has tested a 150 with 5x6 plate in free air on a stand for congos with as much bass as an AKG 414, better high end, total sound was tighter and cleaner than traditional mikes.

Dave Andrews reports that two PZMs sent to Lake Placid for the Olympics this winter stopped working; cable or capsule froze. Has anyone else had this or similar experience?

Elsewhere in this issue of PZMemo, we have published a portion of a letter and a couple of cartoons from Ake Eldsator, Stage & Studio, Kungalv, Sweden. Ake has generously sent us his talented sketches of a variety of PZM models and we'd like to share them with you. Here's one of our favorites:

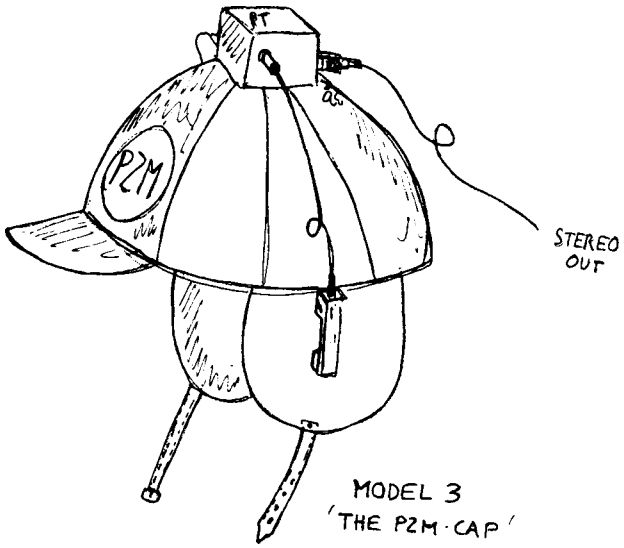


Fig. 9. The PZM Cap.

PZMs IN CHURCH

GARDEN GROVE UNITED METHODIST CHURCH, Garden Grove, California, has found that PZMs really provide the pickup they desire for most of the worship services, weddings and other programs. They are now using two lavaliers for the minister at the pulpit and altar, a PZM3 at the lectern, a PZM handheld for other uses in the Chancel area [both mics discontinued] and a PZM on a 2x2' plate for choir and organ pickup for their cassette ministry.

PAPERS ON PRP AND PZM AT MAY AES CONVENTION

ED LONG of E.M. Long Associates, Oakland, CA and DAVID ANDREWS of Andrews Audio Consultants, New York City will deliver papers on the development and applications of PRP and PZM in recording and sound reinforcement.

New developments in PZM's will be reviewed and results will be reported. Their papers will be given at the Transducers Applications session on the afternoon of Thursday, May 8.

These are but two of the many important and interesting papers that will be presented at a jampacked convention.

PZMs ON FLUTE, GUITAR, DRUMS, STAGE SHOWS

From Russ Berger, Highgrove House, Inc., Dallas, Texas:

The PZMs are wonderful and have solved several problems I have encountered in recording.

The PZM is the first mic that has totally captured the flute. I have tried an enormous variety of mics and placement techniques only to find a compromise in the "essence" of the reproduced flute. The PZM mounted approximately 1½ feet overhead on a low part of the ceiling captured the airy, icy edge and the fluid sonority of the instrument.

The PZM works wonderfully on close miked acoustic guitar. Because of the distance-of-mic to size-of-the-instrument relationship, standard cardioid or omni mics receive the multitude of complex wave forms resonating off the body, sides, neck and strings of the guitar mostly off axis, producing a coloration of the sound. There is also a sizeable amount of reflected energy returned from the floor, walls, ceiling, and off the body of the musician. This coloration determines the "personality" of the mic and is expressed as "warm," "smooth," "consonant," "rich," "zingy," etc.. "all them good adjectives."

But all these descriptions are out the window with the PZM. It simply sounds like the guitar in the room at the mic location.

So far, my favorite PZM position is mounted on the back of the hard reflective side of a 3x4' gobo at “guitar level The gobo is approximately 2x3' away from the guitar. The sound quality is a clear, even and accurate reproduction of the event in the studio. This same gobo works well placed some 10' to 20' (Haas distance) away from a guitar amp to achieve an open non hollow-ambient signal to be mixed with the close mic or panned to create a delay panned effect.

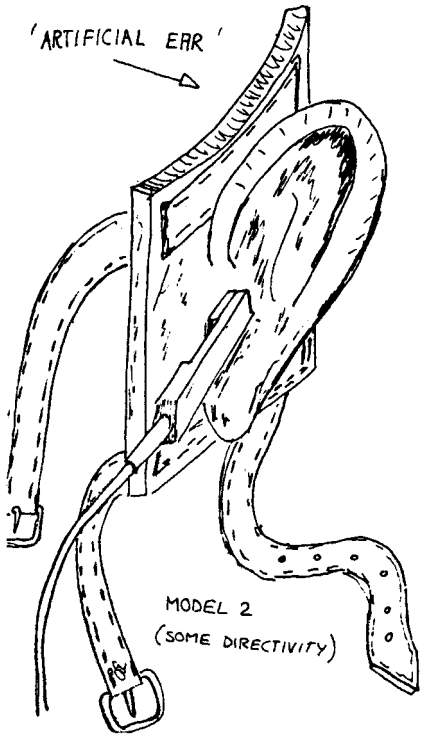
The PZMs are excellent as “under heads” on a drum kit. A common problem in “over heads” is the large proportion of cymbals compared with the toms, especially with drummers who like to “nail” the cymbals or have them positioned exceptionally high over the rest of the kit. The PZMs placed on the floor pick up plenty of the cymbals along with some beautiful leakage off the toms, snare and kick. The separation and location of individual drums in the stereo spread is breathtaking. I also close-mic the snare, toms, and kick to accentuate drop on the toms, pop in the kick and wood in the snare. This is done after achieving a balance with the PZMs.

The PZM is being used at Six Flags Over Texas, an amusement park located in the Dallas/Ft. Worth area.

They had a problem picking up dialogue between some 5 to 6 people staging a gun fight show. The set is outside, located on the porch of a store front and frequently the actors move away from the porch, out into the street. The problems are obvious, they have sought many expensive solutions to no avail.

Two PZMs were placed on the posts of the porch and now the dialogue is plainly heard from all over the porch and within a radius of some10' away to the front and sides. They cured the feedback and articulation problem. These worked so well, the park has specified PZMs for several other critical problem areas.

Ken, hopefully, someone will find this information useful as a starting place. The PZMs really do have to be thoughtfully used. The old standard standby mic technique does not apply. I love it. It rekindles my sense of adventure.



Cartoon courtesy of Ake Eldsator

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Cartoon courtesy of Ake Eldsator

PZMs AT ACADEMY AWARDS

Look for PZMs on the lecterns at the Academy Awards telecast April 14th. (we hope you can't see them!)

PZM DEMOS

CROWN will exhibit and demonstrate PZMs at:

The Midwest Acoustic Conference Chicago, Illinois - May 3, 1980

Audio Engineering Society Convention Los Angeles, California - May 6-9, 1980

Consumer Electronics Show (CES) Chicago, Illinois - June 14-18, 1980.

PZM MEMOS FOR DEALERS

If you desire additional copies of the PZM Bulletin and/or PZMemo, please request them.

We will send single copies of each with all orders we fill. If you want more copies with your multiple orders, please so indicate.

PZMs ON STAGE

Dick Knoppow, on listening to a recording of a high school band made with PZMs, suggested that the microphones should have been made with a velocity capsule at the plate rather than a pressure capsule. [The music was so bad, it would be better if it were not even picked up. A velocity capsule does not respond to pressure.]

One of the local network TV stations tested the 12" square plate on a boom in place of a 916. The inertia, concern for light reflections, the different pickup pattern and greater sensitivity which picked up more sound than the boom operator desired (like off-set noise) made the PZM seem too complicated for boom use.

Some smaller models and more experimentation without great time and cost to the rehearsal operation might help discover what contribution PZM could make to TV sound.

Beverly Hills High School presented “The Music Man” and the front of the stage was covered with 2 PZM-2s while the two side areas for Marian’s Porch and Hotel Front were covered with Model C’s [both discontinued.]

The sound system was stereo and coverage was excellent when the action was upstage or downstage. The solos were amplified with a sense of presence as though the characters were close on mike. The most pleasant aspect was the apparent lack of microphones present.

In New York, the Metropolitan Opera is using some PZM’s on some tests to determine their feasibility in comparison to the usual mikes and miking.

Six PZM handhelds are being tested for live concert sound reinforcement for voice and instruments at the present time.

MORE PZM USES

From Nick Armstrong, Spectangle Productions in Hobart, Tasmania, Australia, comes the following:

I purchased two PZM model A 6"x 9" (PZM130) microphones [discontinued]. Needless to say they were the first ones in Australia and, of course, I cannot speak too highly of them. We now do not use any other microphones for acoustic piano. We also find them “very interesting” for acoustic guitar, particularly in the area of upper harmonics. Two PZMs leave a crossed pair of Neumann KM84i’s “for dead” for choir work. The presence and clarity at twenty feet from a choir is amazing to say the least.

We are considering purchasing one (or two) Model L (Lavalier) PZMs [discontinued] for use inside acoustic guitars for studiorecording purposes. We have been using a Sony omni-directional (ECM-50P5) Electret Condenser mic hung inside the acoustic guitars with some success. The main advantage over conventional close front ‘miking’ is a high rejection from spill from other close high level acoustic instruments, such as a drum kit....

# # #

PZM MEMO

SPECIAL EDITION
1980

The following quotations are the result of a recent survey from PZM users.

“A mic capable of recording an entire choir or symphony orchestra. All my students - I’m a drumset instructor - asked me what the object Neil Peart had taped to his chest was in a recent Rush video. It turned out to be the PZM used on the Vital Signs out of their recent album Moving Pictures. Spectacular drum sound.”

Russet Scarborough

Norfolk, Virginia

“They are really far-out. I really dig the way they pick up all these mat sounds. (just kidding) I think they are outstanding microphones. I have seen a lot of these microphones being used in all type of applications. Keep up the good work.”

William Dike Goldenrod

Florida

“Recently I recorded my drums in my amateur studio. I tried using a PZM mike for an overall drum track. I was using a 4-track recorder and, with limited time, was trying to get a full sound with one take on one track. I found the PZM to give a complete sound with a rich ambient sound which was exactly what I was looking for.”

Mark W Meana, Jenison, Michigan

“They work where conventional mics don’t - the pickup range is greater without use of special tricks.”

Bob Andrews, Tempe, Arizona

“It’s appearance FLAT - brings to mind a description: F for fine - like a musical instrument. L = Live - in its performance, and 1:1 reproduction of sound. A = affordable, when you consider the high price of pro mics; this one can do the job of many multi-mic systems. T = Timely: a perfect mic for digital recording, and its demands for a microphone which can withstand high SPL. It can only stand to reason it will testify to its versatility for time to come.”

Timothy J. Wurgo, Fort Worth, Texas

“The performance of the PZM never ceases to amaze me. In my 41 years of experience in the sound and communication industry I have not seen a microphone that has impressed me as much as the PZM.”

Wayne C. Stephan, Opr. Mgr Ohio Valley Communications, Inc., Evansville, Indiana

“I engineer in a small studio where we have to take advantage of all the ambience we can. PZMs always work. They are everything from beautiful on a piano to awesome on a drum kit. Whether I’m using a PZM as a close mic or a room mic I know I can count on it for sounds that my clients are looking for.”

Karen Hing, Arvada, Colorado

“PZM microphones maintain greater fidelity in their pick-up than do conventional microphones. This is due to phasing at the point-of-pickup of the microphone. Because of close tolerances between a reflective plane and the pick-up point, secondary signals arrive in time very close to the prime signal, which allows the phase amongst the signals to be much closer. This results in a much ‘cleaner’ sound to the listener.”

Marc H. Danforth, Orlando, Florida

“Wonderful in stereo pairs, in close and at distance on: Acoustic Piano, Rhodes Piano, Drums full kit and with one in kick, Acoustic guitar, Electric guitar for space. Recently used exclusively on regional promo for an ad agency, again a stereo pair for flute, flugelhorn, drum overhead, no EQ, client was EXTREMELY pleased, as were musicians, for the effortless, airy, natural sound. Still continuing to experiment - oh, almost forgot, again excellent for stereo percussion. Essentially we set them up as a sound field, and have the musician play in the space between them. Very convincing! Expect another entry from us for the PZM contest this year.”

Alfred B. Brunwell, Calf Audio Inc., Ithaca, New York

“Excellent for many speech applications because of the accuracy and high articulation. I’ve compared the PZM with $2000 Neumanns, Sony ECM 50’s, and other professional microphones. Compared to the PZM, they appear to have the talker with his hand in front of his mouth while he’s speaking.”

Mario V Maltese, Williston Park, New York

“PZMs are the answer to many formerly ‘gray’ areas for miking applications, instead of having to compromise your application with some mic really intended for some other use. I have used PZMs for everything from picking up a choir in a church, to hidden applications for consumer comments on filmed marketing research application. Thank you Crown.”

Dan F. Mccurdy, Garland, Texas

“We have mounted a PZM-6LP [now the PZM-6D] on a piece of plexi and it works just great when the students use it for their dramatic assignments. The hemispheric pickup pattern of these mics are just great allowing for no audible gain change as the talent moves from stage right to left. We have done several dramatic plots that have used PZMs and the audiences have been shocked. Extremely even pick up even at 25 ft.! Unlike my SM-57 which exhibit very uni-directional properties.”

“I have used the PZMs since they were introduced, and I always find it fun to tell students that ‘this small mic is positively a milestone in theater reinforcement and recording.’ They don’t believe me till they play with them and you should see the expressions!! I use our PZM-3OGP [now the PZM-30D] for an orchestra pit when we do musicals - use a little type II DBX resurrection and bingo! Perfect repro.

Robert Steven Yablans, Denver, Colorado

“A PZM has a hemispherical pickup pattern and unbelievable sensitivity. The PZM has opened up a world of new miking techniques. In order to believe in the PZM you have to use it.”

Tim Tison, Evansville, Indiana

“We own several PZM-30G’s [now the PZM-30D] in our rental department. Recently, our mobile 24-track truck was contracted by CBS Television to provide the mics for the 1982 Grammy Awards Presentations. Our position of the show was the ‘Willle Nelson’ insertion, originated live from his concert that evening in Huntsville, Texas. We used a single 3OGPB, mounted to the front lighting tower for audience reaction. The PZM’s work very well for crowd noise, due to their pattern, and because of their very ‘open’ and ‘airy’ sound. Also, I have noticed that the PZM series is very forgiving around ‘dirty’ power and ‘buzzing’ lighting equipment. Of all the microphones we used for the event, only the PZM was completely free of noise and hum.”

Mike Simpson, MIDCOM, Inc., Arlington, Texas

“Excellent mic. The PZM is the most natural clear microphone out today. Applying it to use on plays produces an amazing clarity and depth. I think one needs to use less gain for this mic. The sound may be deceiving. Even though there may be less SPLs coming from the speaker, intelligibility comes through loud and clear.”

David L. Ediger, Tigard, Oregon

“PZM eliminates commonly found phase cancellations inherent to conventional microphone designs by creating a pressure zone in the small gap between the microphone element and its mounting plate. This pressure zone minimizes the direct to reverberant waves differential and results in smoother more natural reproduction. This is accomplished by a pickup pattern of 180 degrees hemispherical and results in very even off-axis frequency response. I recommend these mics highly for many but not all applications.”

Michael H. Webb, Huntington, W. Virginia

“PZM microphones are simply amazing! I have used a pair of PZMs mounted on 2' x 2' acrylic sheets for area miking. I used this miking arrangement on tall stands to mike a swing choir outdoors. Even though it was an exceptionally windy day, the PZMs performed very well and did not pick up any noticeable wind noise. They are just incredible.”

Brian Haynie, Portland, Oregon

“I find the PZM to be a very useful tool. On a grand piano, it causes the quality of tone and clarity to come alive. I have had excellent results in this application. Placing a PZM on a music stand in front of trombones or trumpets creates a very solid and excellent sound.”

John D. Alexander, Anchorage, Alaska

“Fox Music, Charleston, S.C. loaned us one to mike the orchestra of a local opera production. It was sensational. We used one mic on a plexiglas sheet mounted on a music stand and it (the PZM) did the job of at least 3 other low impedance mics we would have used. I also used it for a video freelance news story later broadcast.”

William B. Reed II, Charleston, South Carolina

“They do not introduce axial variations in sound level. These mics also are terrific for large sound level areas since the sensing element can handle large SPL levels (150 dB). These mikes are extremely sensitive even up to 30 - 50 feet from them. PZM mics react in much the same manner as our ears do; making placement in the sound area less complicated. It’s great for ‘true to life’ live recording.”

Robert L. Gilbert, Wichita, Kansas

“I have used your Crown Pressure Zone Microphone (PZM) on various miking techniques. The PZM sounds exceptionally bright on pianos and brass instruments. The sensitivity and directivity still astound me even though I use it a lot.”

Lisa Orti, Denver, Colorado

“I bought the PZM-2LV for our church. It is used for sound reinforcement and recording. Its main use is a lavalier mic. But I have also used it to mike our choir by placing the PZM on a solid wood railing in front of the choir. It has also been used to mike our grand pianQ. This PZM does a very good job for all three uses. I chose this mic for its size, the natural sound it reproduced and because it can be used with phantom power. (No batteries to replace.)”

Donald C. Nieherh, Denver, Colorado

“Being a newcomer to the PZM mics, I am not too accurate on how to explain the PZMs. But having used a PZM mic set-up to record a friend’s band with my own home equipment which consists of a Crown PL2, a Crown SL2, Revox B77 MK II, and borrowing some mixing boards, I was overwhelmed after the mix-down at the fantastic sound of the PZM, considering I am no expert at mic placement. Keep up the great work.”

Charles W. Patterson, Dundalk, Maryland

“Record Production: Used for environmental sounds on pop record - unusual imaging realism. Used to record woodwind instruments without the usual ‘hot spot’ effect found on saxes and clarinets when close miking. Live Sound Mixing: (Harry Belafonte) excellent inside miking of acoustic piano with lid closed without experiencing sound-board ringing.”

Bob Burnham, Boulder, Colorado

“I find the PZM very useful mounted on a large boundary, facing the group for general ensemble recording.”

Tony Kralik, Omaha, Nebraska

“I’ve used the PZM microphones in churches (on pianos) and the full sound I get is amazing and so inconspicuous. I’ve interfaced the LV Series with some Con-Tek wireless gear and the results keep amazing me. The PZM microphone fits in so many situations instead of a conventional type mic with increased fidelity. Don’t stop making them.”

Ken M. Blecher, Total Design Communication, Boca Raton, Florida

“Possibly the best innovation in microphone design yet. The PZM works when many other quality mics just won’t do the job. Many people are skeptical when they see the mic but after hearing what it can do they are always impressed.”

Peter Franks, Omaha, Nebrasha

“I tried miking my piano by using a single PZM on the floor directly underneath and used carpet around the sides of the piano for isolation and got the best sounding recording of my piano that I ever heard!”

Benjamin J. Castle, Atlanta, Georgia

“I am in a local band and once when we were in the studio and couldn’t get a good sound out of our Marshalls, we used a PZM. This worked out great. Keep up the good work.”

Doug Grant, Billy’s Band Aid, Lubbock, Texas

“Fantastic for use with pianos.

Paul 0. Abbott, Charles Christopher, Spokane, Washington Winter Park, Florida

“Recordings done with PZM far better than those done with other mics.”

Linda Westbrook, Lewisville, Texas

“Very nice for most about anything in the studio. Drums, vocal, piano, you name it! I’ve also had good luck using them for sound reinforcement for dramatic productions. They seem to have a realistic, natural sound on almost any instrument.”

Paul Thompson, Kettering, Ohio

“I play in a R & R band in Wichita and we record every gig. I use the Crown PZM-3OGPB by itself to record with. With proper mic placement, this is the only way to go. Great recordings every time. Keep up the good work.”

Cortis R. Payne, Wichita, Kansas

“Super mics that will do the job when others won’t. Sensitivity is excellent.”

Jack Thucler, Grand Rapids, Michigan

“The PZM microphone is mounted on a flat surface acting as a pressure zone, or sounding board, for the mic, making it very sensitive to low frequencies as well as high frequency sounds. Therefore, it sets off the good acoustic designs of some music halls, and exposes the poor acoustic designs of others. The mic works well as either an ambience or direct mic, and has a sensitive hemispherical pick-up. The PZM is an unobtrusive mic and can be easily hidden. It is a durable microphone, resisting many casing shocks during performances. Also, it will transmit sounds up to 150 dB with no distortion. which is remarkable. On top of all this, it has an excellent reach of thirty feet. All in all, the PZM is a technologically advanced microphone that will surely attain great popularity.”

Michael S. Reese, Dallas, Texas

“Recording vocal groups (church, etc.) is achieved easier with PZM than conventional mics.”

Jim Bell, Springdale, Arizona

“Excellent stereo imaging when used in wind ensemble/symphony application. Impressive results on all percussion instruments. Amazing headroom - absolutely noiseless.”

David K. Castell, Westbrook Audio, Inc., Dallas, Texas

“They make good choir microphones.”

Jim Pearce, Wichitaw, Kansas

“I have had great success using the PZM for difficult-to-record instruments such as the usual un-DBX or Dolbyable problem children. Most recently the PZM functioned very satisfactorily on an ornamental candle stand that was part of an old pump organ. This, coupled with a ceiling ambience AKG224, gave very good reproduction and great rejection of the pump-pedal noise. The use of the PZM as a center ambient mic behind (+ 3 feet above floor level) vibraphone solved a 3 year problem.”

T. Hartley Severns, Cambridge, Massachusetts

“The PZM has a calibrated electret capsule which is mounted to a parallel acoustic boundary plate. This allows the incident and reflected waves to be in phase when reaching the transducer. Within the pressure zone, there is no comb filter effect, which can be caused from out-of-phase sine waves. I’ve used the PZM as an overhead on the drum kit and also on bass amps and guitar amps and have had very good response!”

“We have been using PZM microphones for almost 2 years now, and each time, I am still amazed and in fact excited by the quality of the sound. We use ours for sound reinforcement and it has made our jobs a lot easier and in fact has made us sound better than ever before possible. Thanks for a real problem solver. The PZM is a true piece of professional equipment.”

William H. Stewart, Richfield Properties, Richfield, Ohio

“Gives me all the headroom I need on piano miking without feedback.”

Blanca Soler, Portland, Oregon

“I have strapped a PZM-3OGP [now the PZM-30D] with rubberbands to the air holes of a standup bass so that the plate is just slightly off axis of the string (just above the bridge). It was a very non-colored sound but the bowing action was seemingly accented. As long as the rubberbands didn’t pop off during a live performance it worked just fine. Mounting them on plexiglas for a large surface for choirs and drama usually works well. If you need a lot of gain, an equalizer is helpful especially for the extended bass response that the larger plate creates. But it does remain quite natural sounding as

compared to other condensers. (A-B test with SM81 and C451) It sounds acoustically louder, rather than electronically louder; as if the room was getting more live, not the system getting louder. Quite nice.

J.B. Merrell, Thisa, Oklahoma

“Our company has installed PZMs in churches, conference rooms and small studios. When using the right PZM and proper installation, we’ve received nothing but praise. We have experienced no service problems and no failures. For the money, there’s nothing better.”

Gary L. Russell, Service Mgr. Pamgon Music Center, Tampa, Florida

“The PZM has proved to be most effective stage miking for theatre. The PZM is a proven winner for choir miking and ambience recording.”

David Schultz, Tulsa, Oklahoma

“PZM microphones are based on the pressure zone principle of microphone pick-up (a tiny transducer mounted to a reflective plate to pick up reflected sound waves). For this reason, any hard reflective surface on which the PZM is placed becomes a pressure zone. This has several advantages: increased pick-up coverage, increased gain, unlimited mounting possibilities, virtually eliminated phase cancellation experienced with normal microphones. The PZM also has a hemispherical pickup pattern, which makes it ideal for applications where suspended microphone mounting is preferred (choirs, plays, orchestras, recording, etc.) The PZM’s even response and clarity make it an ideal microphone for general purpose applications. It reduces muddiness and increases intelligibility in all voice applications.”

Dave G. Arrington, Cuyahoga Falls, Ohio

“I know from past experience that no one microphone can do it all, including the PZM. What I do know is that the PZM, opened up a whole new era in relation to its unique design, and quite frankly I’m impressed:”

Pat Lopez, Laredo, Texas

“PZMs changed a lot of engineers’ minds about recording by opening a new door in the usage of microphones and mic placement. PZM also solved a few of the many difficult problems in live reinforcement in the area of choirs especially. I just think they’re great.”

Michelle Moriarty, Robert Kosloskie

Golden, Colorado, Billy’s Band Aid, Lubbock, Texas

“Crown PZM microphones consistently give us astounding results as ‘footlight’ mics, altar mics, pulpit mics, ambience mics, lavalier ... but I thought everyone knew that! One church bought a PZM mic for their pulpit even though it cost more than the rest of their sound system because it enabled them to understand the ‘spoken word’, What more can I say???”

Philip B. Clark, Diversified Concepts, Inc., Marcellus, New York

“In my 11 years experience in the fields of sound reinforcement and recording, the Crown PZM microphone has been a mic of many firsts: The first fundamentally new design concept. The first mic to do a good job covering a stage. The first time I’ve recorded a piano that sounded like a piano. In short, while the PZM microphone by Crown cannot do every job, there are now some jobs that nothing else will do.”

Jim Carlon, Des Moines, Iowa

“In recording of traditional music, which usually takes place in the environment of the performer (kitchen, parlor, etc.) the PZM adds authenticity to the recordings by accurately capturing the ambience the music was, and is, heard in the most.”

Gregg Lamping, Fort Lauderdale, Florida

“This particular Crown PZM microphone works very well as a drum set overhead. Drum and cymbal miking has only recently gotten much technical attention. The development of this type of broad range microphone is the type of breakthrough that is really needed to pick up the overall sound of such a large acoustic instrument. Thanks to the people at Crown, keep up the good work.”

Joseph E. Kane, Honolulu, Hawaii

“One thing that works well for me when miking acoustic piano with PZMs placed on the under-side of the open top: hanging fairly loose-weave cloth from the top to cover the opening down the long side. If it’s blade cloth it doesn’t look bad for a live gig, and it doesn’t cut down on sound projection from the piano. But it sure reduces extraneous noise from making it to the PZMs. Hope it works for you.”

Everett W. Armstrong, Ann Arbor, Michigan

“Applications in the studio - great for close miking vocals and pianos. I’ve also used them for ambient-miking Marshall stacks in concrete rooms.”

Andrew D. Canulette III, Newberg, Oregon

“It doesn’t lie. If ‘it’ sounds good (or bad) with a PZM, odds are that ‘it’ sounds good (or bad) to begin with.”

Bruce Coffman, Houston, Texas

“They are unsurpassed for miking choirs, theater dramas, etc. They have excellent pick-up characteristics, even from a good distance, without loss of tone. They can be mounted on a flat surface, such as plexiglas, for even greater sensitivity. I choose the PZMs simply because it worked better than any other microphone for my purposes.”

Jim Atchison, Fort Smith, Arkansas

“They have been excellent for stage pickup microphones, which has been a problem we have been running into for years.”

Marc C. VanderLinden, Audio Com, Inc., Des Moines, Iowa

“The PZM picks up the sound closer to what the ear hears than any other microphone. The Crown PZM is good for recording the ambient sound in a room when recording sound effects, or small acoustic musical groups, is also very useful in the theatre when a sensitive slim line mic is required.”

John Cooper, Masque Sound, New York, New York

“I own a small sound company in the Denver-Metro area. Since the acquisition of my first PZM, a 3OGPB, I’ve had opportunities to use it in many of the applications mentioned in the owner’s manual. It works beautifully for conference reinforcement and recording, piano reinforcement and recording, etc. It is used most often for overhead drum miking in rock and jazz sound reinforcement. I use a sheet of 4' x 4' plexiglas suspended directly above the drum kit, the front being slightly lower than the back. It is impractical ‘cosmetically’ to use even a 2' x 2' boundary in front of the drums, and the lower toms do not sound natural when the PZM is suspended on a boom by itself.”

“The PZM, excluding the price, would make the perfect dictaphone recorder for the executive who likes to walk around his office as he thinks out loud. Mounted inconspicuously in the same executive’s desk, it could be used for taping in the office meetings, etc. I have also used it for ‘surveillance’ in my home.”

Ronald A. Botsho, President, Evenstar Productions, Inc., Lakewood, Colorado

[Editor’s Note: Now we have the PZM Sound Grabber just for that reason.]

“Pressure Zone Microphone. Reach and clarity are improved. One or two PZM mics can do the job of six to eight conventional mics. PZM mics sound very natural.”

Scott T. Smith, Odessa, Florida

“I find the Crown PZM microphone to be an outstanding tool for sound reinforcement in a theatre. We’ve found it extremely effective when hung on a stage border at picking up all sounds upstage, which has always been a problem. The PZM has made it easy for me to satisfy any customer regardless of how difficult a situation they are in.

Joseph R. Bosnack, Jr., Central Islip, New York

“They work all the time. For stage and theater simply adhere to plastic and fly above stage. It’s goof proof.”

Lance M. Fisher, Fayetteville, New York

“In doing classical pipe organ recordings, often the frequencies above 8 kHz are lost or dimished by the time they reach the microphone. This is especially apparent in dry or dead rooms. By using the PZM-3OGP [now the PZM-30D] at medium distances (30-50 feet from the sound source), high frequencies are restored due to its high-end boost. This also eliminates the need for spot reinforcement mics close to the sound source, giving greater presence and a less confused stereo image in the mix due to the use of fewer mics.”

Frederick M. Mobman, Pro Organo Radio Series, Morris, New York

“PZM microphones eliminate many problems, but they do not introduce new ones; the perfect combination of properties. Thanks for that!”

W. Bulthuis, Ensehede, Holland

“I started using PZMs about 3 years ago. At first we had a lot of resistance from musicians accompanying us to use the PZM because most of our shows are festivals with no rehearsals. Once a group has used the PZM, there’s no turning back. We have found it SUPER for both recording and sound reinforcement.”

Greg Morrison, Dan Furney, Dallas Texas Toledo, Ohio

# # #

PZM MEMO

Sept. 1980
Ken Wahrenbrock, Senior Editor

PZM MODELS NOW AVAILABLE FROM CROWN

The PZM microphones have now been re-engineered at Crown for quantity production, and in the process have undergone quite a face lift. They are handsome looking products!

Two models, in a choice of black or gold, are now available; and two more are moving towards an early release date.

Crown Model 3OGP [now PZM-30D] is designed as a general purpose PZM with a 5 x6 inch plate and an XLR connector.

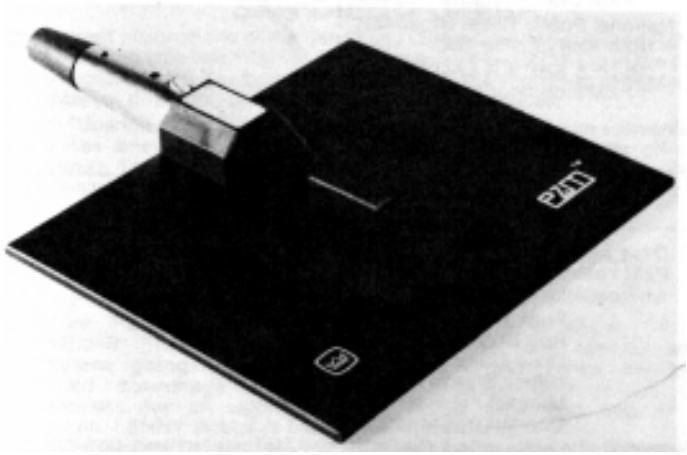

Fig. 1. Crown PZM-30GP

Crown Model 6LP [now the PZM-6D] is a smaller PZM with a 2 x 3 inch plate and an XLR connector at the end of a cable. The 6LP is suitable for all applications but is most useful where minimum size may be required for aesthetic or practical reasons.

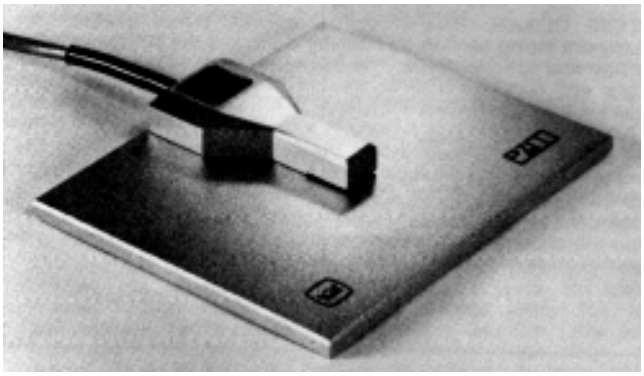

Fig. 2. Crown PZM-6LP

Crown Model 2LV [discontinued] is a lavalier or clip-on PZM and will be available from production about January 1, 1981.

Crown Model 2ORM [now the PZM-20RG] is intended for recessed mounting, with the XLR connector beneath the plate. Small stubs surround the cantilever to prevent sheets of paper from slipping underneath the transducer. This model is now in R&D and will be handled on a special order basis. This special order policy will continue until demand for the model increases. Also available from Crown are two power supplies for the PZM system, an active (PA-18), and a transformer (PX-18) version [discontinued]. Both versions can be used in phantom or battery modes.

CROWN TO MANUFACTURE AND MARKET PZMs

Wahrenbrock as Consultant

In order to be able to devote more of his energies to new product development and to assure the production of high quality PZMicrophones at a rate needed to satisfy demand, Ken Wahrenbrock, the developer of the PZM, has assigned manufacturing and marketing of the microphones to Crown International, Inc., the world-renowned manufacturer of quality audio components for professional and home use.

Wahrenbrock will work closely with the Crown R&D department on new product development and with marketing in suggesting solutions for user problems encountered in the proper use of PZM microphones.

As part of this total effort on Crown's part, the preparation and publication of the PZMemo will become the responsibility of the Crown marketing department, working under Ken Wahrenbrock's direction as Senior Editor.

Franchises for the distribution of PZM microphones are now being assigned by Crown to professional audio dealers around the world. A list of those dealers will appear in an early issue of PZMemo.

Fig. 3. Ken Wahrenbrock, Max Schofield, R. David McLaughlin

VIRGIL FOX AT WOLF TRAP

The huge Allen organ that Virgil Fox uses has more than 160 speakers distributed around the stage. As the sound reached the grass area, it was reinforced by time delay fed by two PZMs on the proscenium. Each rank stood out with great clarity as it was used. One could move from grass to balcony or under the balcony and move from one sound field to another smoothly without noticeable change. The boundary was only discernible if one listened very critically.

As a closing, a soloist from Riverside Church in New York City sang "The Star Spangled Banner" into a 2" square plate on a low stand without any briefing and was quite unsure of how she was being miked. No problem with pickup or clarity.

"MUSIC MAN" AND PZM

The Downey (California) Civic Light Opera presented fifteen performances of "Music Man" in June and all microphones were PZM. The director, musical director, cast and technical crew were amazed at the improvement over past sound coverage of their productions.

Consistently good reports were received during the run from visitors from other areas who are involved in their own productions. Enthusiastic approval for the clarity of dialogue and solos was ex-

pressed by many involved in theater in other areas who visited the production. A drama teacher who expressed concern about the production before hearing the performance, brought her entire class 150 miles to see the second performance.

Several new models of PZM were tested on this production. The 2-1/2 and the pyramid models, using 1/4" Plexiglas were able to provide reach for dialogue and solos 15' to 20' upstage. The pyramid was flown behind a border further upstage and covered the upstage action with great clarity.

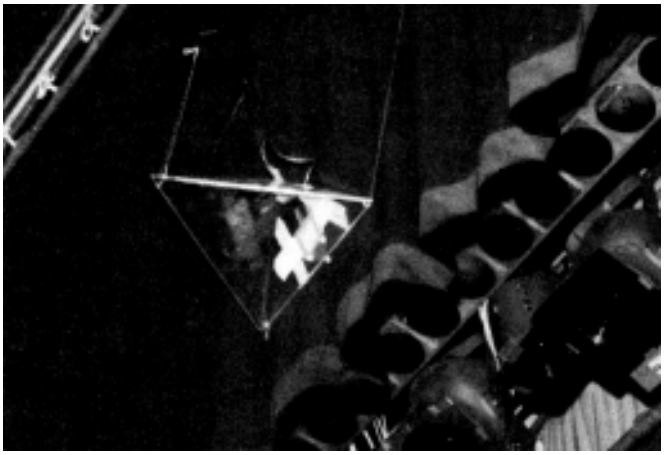

Fig. 4. PZM pyramid hung over the stage.

Two PZM3, two PZM2, four PZM 2-1/2, one pyramid and one L model were used. The wireless mike was used for Marian's dialogue upstage. Coverage included two side stages as well as the main stage. Five PZMs covered the stage-front to avoid loss as cast moved about the stage for dialogue and solos.

"YOU CAN HEAR THE DIFFERENCE"

FARREL BECKER was idly watching TV not long ago and caught Victor Borge on NBC. The red LED went on, "That piano sounds different!" He connected his hi-fl to the TV set and listened and confirmed his impression. As he examined the piano carefully, he could see the PZM on the lid. He and I firmly believe that when you listen to PZMs, DICK HEYSER'S Catastrophe Effect takes place and you can hear the difference. I have heard the same on several records but haven't been able to get the confirmation from the record producer yet.

PZMs ON COMMERCIAL RECORDINGS

"RIGHT TRACK"/Dale Ashby and Father

Gryphon Label G918

Artist is Cy Coleman Trio

PZM on piano and studio ambience

Gryphon Label

Artist is Mel Torme

PZM used for audience response

"THEY ALL LAUGHED"

Country Western movie now in production

PZM used for audience pickup and reaction

National Public Radio Broadcast from Avery Fisher Hall

“BLUES SHE’S A LADY”
PZMs on floor for program pickup

PZMs IN NEW YORK

Dave Andrews, “the world’s greatest PZM salesman,” has been using PZM hand-helds in a number of recording and reinforcement applications. Among them are:

Funk Rock

Roy Buchanan

Dixie Dregs of Atlanta, Georgia

Nancy Wilson in Avery Fisher Hall

Michael Franks-Town Hall, NYC

Concert in Carnegie Hall

RKO Radio in New York City is using PZM for interviews, picking up the interviewer and the interviewee on the same mike.

CBS, New York City, now has sixteen PZMs for a wide variety of applications.

PZM AND TONY ORLANDO

STEVE OLIKER, Tony’s sound engineer, tested PZM-L’s on the orchestra string section by clipping the L’s (lavaliers) to the strings between the bridge and the tail piece. The sound was magnificent, according to Tony and Steve, with little trouble from stage monitors. However, musicians seem to have little concern for care of microphones and the L’s will have to be more rugged to withstand the less careful handling. A Model D was taped inside the body of the harp to amplify the instrument without feedback from monitors and reduce the finger and strumming sound. Again, the response was enthusiastic.

A Model L was clipped to the percussionist so he could carry his mike from vibraharp to bells, to drums, etc. It needs more boundary to do the job but more experimentation is planned.

NBC SPORTS are ordering PZMs for their presentations this fall.

HOW TO USE PZMs?

Most of the questions that are raised about the varied uses of PZMs are the result of many experiences with traditional microphones and the sometimes difficulty in re-orienting to a new pattern of thinking about microphone techniques and placements. There has developed a rich bibliography of microphone techniques and many engineers have discovered particular placements and methods that provide the exact sound they desire. It may be that a different and perhaps new mindset is important when considering the uses and methodology of PZMicrophony.

An excellent resource for your consideration is “The Pressure Recording Process” by Edward Long and Ron Wickersham. Available from Ed Long, E. M. Long & Associates, 4107 Oakmore Road, Oakland, California 94602.

PZMs HORIZONTAL OR VERTICAL??

Dennis Badke of CROWN raises questions about points covered earlier on the position of the plate.

If the plate is placed so the source is 90 degrees from the plate, the pressure zone will be stronger; however, it will also be affected by any reflected sounds from floor or walls that reach it, so as to create comb filters. If the plate is placed on a horizontal boundary and the source is closer to 0 degrees, so that pressure zone is developed all along the boundary from the source to the microphone,

the pressure zone may be less; but the effect of reflected sound will be less also, and thus the resultant signal from the microphone will be a more faithful reproduction.

When using the PZM2, PZM2-1/2, and PZM3, one must remember that unless the areas of each boundary are equal there will be a different frequency response for each boundary and thesummation of the zones will provide a roll-off or accentuation of frequencies.

If a PZM3 is placed in one corner of a room with walls of a fair order of smoothness, frequency response will be excellent and the ambience reflections of the three walls will be canceled from the pickup of the microphone.

Experience of placing PZMs downstage in front of symphony orchestras reveals that the sound pressure of the woodwind sections is sufficient to provide excellent pickup for either recording or reinforcement, even though they are 20' upstage.

FLUSH MOUNTING RAISES OUTPUT

ALAN H. LUBELL explains why flush mounting of microphones raises the output by 6dB rather than 3dB:

“Pressure doubles at a hard boundary and particle velocity doubles at a soft boundary. Both of these effects are standard results in boundary value problems in acoustics due to the coherent addition of incident and reflected waves right at the boundary.”

STAND-MOUNTED 4’X4' PLATES

LEROY SHYNE of Shyne Sound, San Rafael, CA, mounted some 4’x4' sheets of Plexiglas on 15' stands for overhead PZM pickup of orchestra and choral groups with exceptionally clear reception.

He also used one of the plates with PZMs on both sides of the plate for vocal overdubs in the studio. He mounted the plates on the ceiling of his studio with PZMs for vocals and some extra special conga drum tracks. In one sound reinforcement gig, he mounted a PZM inside the piano on the vertical side of the piano for excellent piano reproduction.

THE KNOPPOW SUGGESTION

If you missed the point of using a velocity capsule for the high school band recording (April ’80 *PZMemo*), a PZM with a velocity capsule should be an interesting device when pressure is high, velocity is zero, etc. Dick didn’t elaborate about the phase shift, but we got the point.

BACK-TO-BACK PZMs ON A PANEL

CLAY BARCLAY has used back-to-back PZM’s on several sized plates for stereo recording without using any matrix; and in carefully controlled playback, he feels there is no loss of the center image.

In several emergencies when making recordings at the last moment, he has separated the PZM’s as much as 60' and made recordings that are crisp and exciting to listen to.

The PZM’s should be in polarity and back-to-back.

PZM WEDGE FOR STEREO RECORDING

EVAN WILLIAMS at Golden West College has been checking such stereo recording and feels that to separate the PZM’s about 7" by placing them on two plates in a V with the apex toward the source will provide a fuller center image. Such an arrangement should be spaced so that the capsules are at the junction of the vertical and horizontal boundary or high enough to avoid comb filters from direct sound and reflections from the floor.

PZM LAVALIER USES

Excellent clarity is achieved with a PZM Lavalier-tie clip even when placed under the tie or clothing. Other uses suggesting themselves are: PZMs on movable scenery when close miking is important; close miking for groups when there is no place for cables. [The current model is the GLM-100.]

NEW MODEL PZM2-1/2 AND PYRAMID FOR THEATERS

BRAD WILLIAMS of Cerritos College, California, with some of his crew, were brainstorming to solve sound pickup problems for their theatrical efforts. They had tested PZM and PZM2, so deduced that something in between might provide some excellent coverage yet some more discrimination from orchestra pickup. They decided to test 135 degrees angled panels and made up several prototypes of PZM 2.5's [now replaced by the PCC-160]. In test, they do an excellent job.

Several weeks later, the same team also sought to improve on the 2' square plate for overhead miking of drama for state or closed circuit TV and calculated the angles required to make a pyramid. Three or four prototypes have been assembled and used in several applications. Some of each of these will be provided for testing by the prototype team this summer.

A new model semi-parabola 12" in diameter has been assembled. If will be tested at a Syn-Aud-Con seminar; and if a workable coverage pattern is measured, additional test models will be sent to the prototype test group.

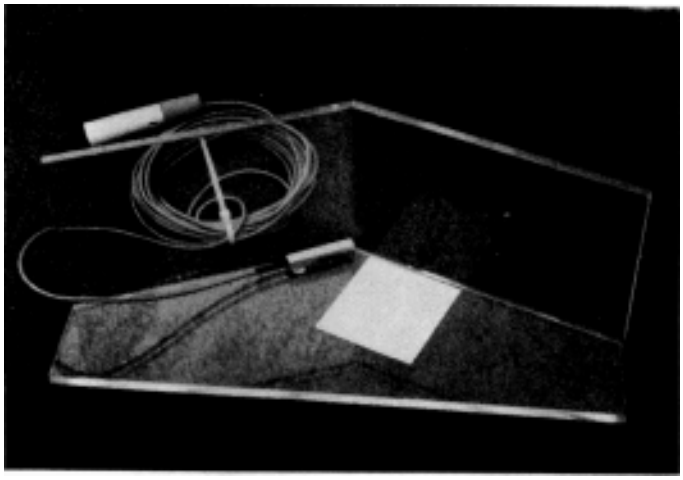

Fig. 5. PZM 2.5

CONFERENCE TABLE USE OF PZM, PRESSURE ZONE SPEAKER AND SBA

Several experimental models of pressure zone speakers with pressure zone microphones mounted above in the sound-canceling focus with the speakers powered by signal biasing amplifiers are being tested for a much simplified module for conference tables in many different applications. Such a system with automatic mixers and signal-biasing amplification equipment will require very little rack space for electronics and provide a pleasing and efficient module for the table in a wide variety of uses.

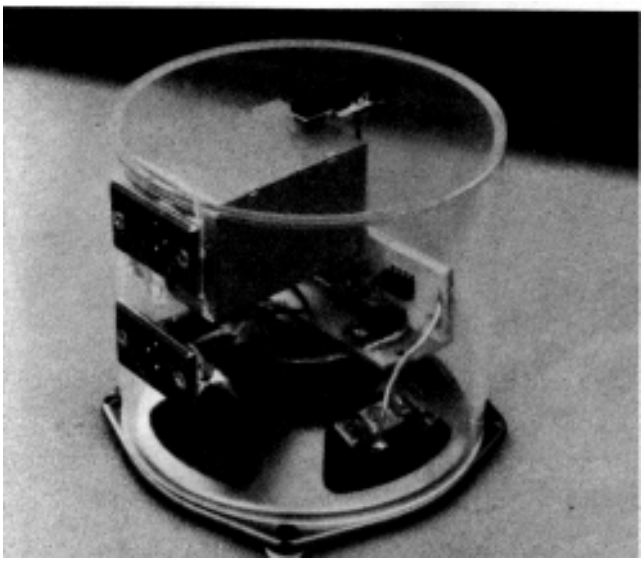

Fig. 6. Pressure Zone speaker and SBA

PZM3

DEWARD and KALE TIMOTHY of Poll Sound, Salt Lake City designed a different version of the PZM3 for use on pulpits and lecterns. The acoustic response is good and the physical dimensions satisfy the aesthetic.

TO THINK ABOUT

Several reports have popped up that interesting things begin to happen when touring groups arrive at a theater and the house soundman suggests using PZM. More and more traveling soundmen have heard of them, not yet had a chance to try them and are really interested in seeing what they will do.

PAPERS ON PZM AT AES, NYC

DAVE ANDREWS and KEN WAHRENBROCK are going to present papers on the use of Pressure Zone Microphones in two sessions at the upcoming Audio Engineering Society convention in New York City. In Hans Schmidt's session on Broadcast Audio Update, the paper will be "Pressure Zone Microphone Techniques for Broadcast and Television" "The Use of Pressure Zone Microphones in Theater Sound Reinforcement and Recording" will be presented in Cecil Cable's session on Sound Reinforcement and Acoustics.

The AES Convention in New York will be held October 31 through November 3,1980.

PZM AS ALTAR TABLE MIC

JOHN MURRAY, Audio Systems Engineering, Klopf Audio/Video Company, reports: "Used a PZM as an altar table mic in a Catholic church. Sanctuary was rather live. Large multihorn cluster was above and behind the altar with horns aimed directly down over the altar area. The PZM provided better gain and highs before feedback than the existing cardioid condensor. The off-axis pickup of the PZM was exceptional."

PZM IN CORNER PICKS UP DISCUSSION

KERMIT ANDERSON, Sonoma State University, used a PZM in the upper corner of the room to record a round-table discussion and a grievance hearing. A cassette recorder was used on auto-level

with excellent results. Set-up was easier and quicker than previous method with multiple mikes and the barrel effect of too-many microphones.

A TITANIC USE FOR PZM

In the movie, “Raising the Titanic,” some of the moving scenes require close voice pickup while the camera is being dollied. The soundman put a PZM on the front of the dolly and had his sound close, staying with the action.

PROGRAM ON PZM AT CHICAGO ACOUSTIC AND AUDIO GROUP

KEN WAHRENBROCK presented a program covering the use of PZM in radio, television, theater, classical reinforcement and recording. After September 10,1980, an edited version of the paper will be available from Crown.

WOLF TRAP AND PZM

FARREL BECKER and the sound team at Wolf Trap Farm have reworked the main speaker system this past spring. The design with its coverage is exceptional from the main seating area, through the balconies to the open grass area outside. It was interesting to observe the clarity of the reinforcement.

When the National Symphony Orchestra is playing, there is no need for reinforcement in the house. Two PZMs are placed over the center of the proscenium to feed the outside system on digital signal delay. It is possible to move from the main room to the grass without noticing a shift in sound quality. A recent performance with Yahuidi Menhuin fora violin concerto, using a PZM on a 2' square plate on a low stand, moved the audience in the balcony and on the lawn right up front for listening. The richness of the tone was all there.

An earlier performance by a jazz group, which decided to use all of their own microphones, was even more noticeable for the complete lack of realistic sound provided for the speaker system. The only instrument that sounded like it was real was the drum set. Piano, trumpet, sax, flute, Soloist and bass all sounded like they were coming out of “run over by a truck” earphones.

Earlier in the summer at the “opening gala,” PZM was used by Liza Minelli and Rod McKuen with great interest and appreciation.

SAN DIEGO OPERA

Recent productions of the San Diego Opera Company utilized PZM for recording with two PZM2-1/2 for the stage and two PZM-C’s in the pit for the orchestra. The balance and clarity of the recording delighted the musical directors, conductors and opera executives.

In “Joan of Arc” several sound effects were miked with conventional mikes since they did not have sufficient PZMs to use for off-stage choirs. The contrast was significant. Future presentations of the Opera Company will be completely miked with PZMs.

“FORTY-SECOND STREET” AT KENNEDY CENTER

Five PZM’s are being used in the new show, “Forty-second Street,” at the Kennedy Center for several weeks before going to Broadway in New York. Three are being used downstage for tap dance pickup. One is on HME wireless for an upstage raised acting area and one on the piano. LENNY WILLS is soundman with RICHIE FITZGERALD as sound designer with Sound Associates of New York City.

PZM AT ACADEMY AWARDS

The testing of PZM for the lecterns did not work out since they picked up too much on-and-off-stage noises and preparations for the next scene, which intruded on the sound for the TV program. They were used for audience participation for the TV broadcast.

SHOWBOAT COULD HAVE USED PZM

A recent visit to the National Theater in Washington, D.C. caught the last performance of “Showboat.” The show is excellent but the touring company sought to save money at the wrong place in neglecting the sound coverage and microphone pickup. Much of the music and significant dialogue were missed for lack of clarity.

In discussion with the sound engineer traveling with the troupe, his comment was, “They didn’t want to spend the money. The show closed two weeks early for lack of attendance. With such an excellent vehicle, it’s too bad one had difficulty in hearing. I wonder how many persons would have encouraged others to attend if they had been able to hear the show?

RICHARD TODD at Busch Gardens, Williamsburg, VA, was setting up a traveling group and suggested PZM on the piano. The group demanded the Heppensteil that was in their contract, so he placed both it and the PZM on the piano and had the music director of the group do an A-B. The choice was PZM. Add another convert.

PZMs USED FOR MUSICAL

Orange Coast College in Southern California is presenting its summer musical, “Company,” with an interesting multi-level stage. Three PZM21/2’S cover the main Stage action with great clarity. Six PZM-D’s give close coverage for the smaller elevated stages. PZM3 is placed under the bridge to cover the upstage floor action.

INTRODUCING THE CROWN PZM: THE SECOND MAJOR ADVANCE IN MICROPHONES IN 100 YEARS.

In 1876, Bell invented the first microphone.

Crown now announces the second microphone - the PZM.

During the last century, microphones have been much improved, but they still employ Bell’s basic concept: a movable diaphragm connected to a transducer, the whole assembly intended to be stuck out in the air somewhere near the sound source. Comb filtering can be a side effect of that design. Every Bell-design microphone demonstrates frequency response anomalies when used near a reflective surface because of an inability to satisfactorily combine direct and reflected signals. Phase-induced amplitude cancellation and reinforcement are the inevitable result.

Crown PZM microphones eliminate comb filtering from the primary boundary because they detect sound according to a new principle, the Pressure Recording Process. As a sound wave approaches a boundary (wall, table, floor) a pressure field four or five millimeters deep forms at the boundary, within which the direct signal and its reflection from the boundary add coherently and remain in phase.

The Crown PZM places a small pressure transducer into the primary boundary pressure zone, eliminating the possibility of phase-induced interference. The PZM concept thus provides a significant improvement in signal quality. Its small profile also improves microphone aesthetics. The PZM pickkup pattern is hemispherical, with no off-axis position.

Singers and speakers can move more freely around the PZM. Gain related to distance will change, but not tonal quality. The PZM responds accurately to SPL up to 150dB. You can put it right inside a drum, a bass fiddle, or a piano. The PZM hears whispered conversations in an ordinary room at thirty feet. In certain situations where undesired ambient noise can’t be eliminated, or in halls with poor acoustics, the PZM probably should not be used-it will pick up everything. Singers, orchestra conductors, pianists, percussionists, broadcasters have all tried - and praised - the PZM.

Recording engineers find that the PZM suggests new miking techniques. For small groups it now seems that the best place for a PZM is on the floor! Recording and reinforcement may well require fewer PZM mikes.

Several PZM models are now available, including a clip-on and recessed model for permanent installation.

The PZM is changing ideas about how a microphone ought to sound, look and be used. Find out for yourself how it might improve your own recording or reinforcement systems.

PZM, PZMicrophone and Pressure Zone Microphone are trademarks of Crown International.

# # #

PZM MEMO

March, 1981
Ken Wahrenbrock, Senior Editor

PZM SEMINAR IN ELKHART

November 17 1980, Crown sales representatives gathered at the Ramada Inn in Elkhart for a one day training seminar on Pressure Zone Microphones, conducted by Ken Wahrenbrock and Dave Andrews. Dave Andrews, New York sound contractor who is most recently known for his work on the New York Hilton sound system, worked for several hours with the representatives, helping them to understand how the PZMicrophones can best be demorstrated and used. Included were details on places where Wahrenbrock and Andrews have found that the PZM should not be used.

Fig. 1. Dave Andrews (right).

The seminar included a tour of the Crown factory, especially those parts of the facility now devoted to assembling and testing the PZMicrophones.

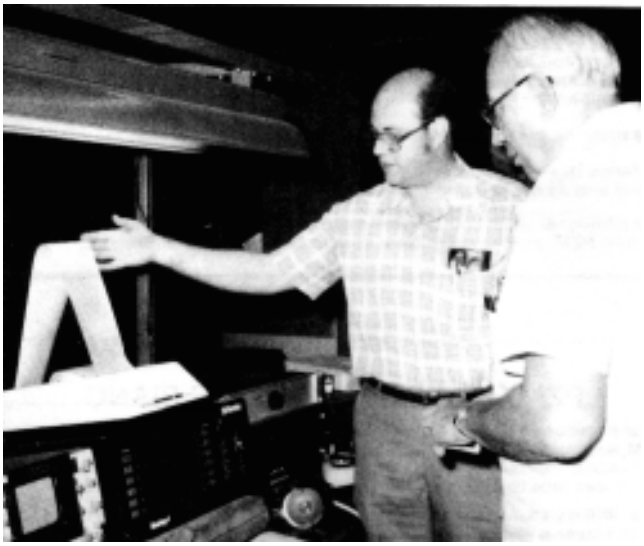

Fig. 2. Don Eger (left), Crown PZM Project Manager, and Ken Wahrenbrock check out the PZM test facility prior to the tour by the representatives.

PZM EXTENDED BASS MODEL ADDED

Crown has added the PZM 31S [now the PZM-30D] to its line, offering a somewhat ditterent frequency response curve to users. The new mike offers deeper bass response, as well as a warmer high end (in contrast to the 3OGP and 6LP, which have a bright, crisp high end). Suggested applications include piano and kick drum miking, as well as close miking situations.

The 31S is now in production, and is available in a silver and black color scheme. The plate ot the 315 is 15cm x 13cm (6x5in.).

NOTE: Some of the news items in this issue may have reference to experimental models of the PZM microphone which have not yet been completely engineered for production. We do encourage your consideration and evaluation of these developmental models, but not all of them may result in production models available for general sale. Watch these columns for notice of new PZM models available from Crown.

BAKER'S KEYBOARD LOUNGE GOES PZM FOR PIANO

The oldest jazz club in the USA was the scene of an interesting demo by T.S. Taylor. The pianist was using a three mike setup which provided adequate sound. He insisted that the lid of his Steinway be left off.

T.S. crawled under the piano, used some duct tape for mechanical isolation on one of the horizontal support members and mounted a PZM about 2½ inches away from the sounding board. He wanted to test the location.

The piano tuner came in, saw no microphones and proceeded to tune the piano. He was unaware that the PZM was feeding the monitor system, but not the house system at the moment T.S. was chatting with him and smiled at his comment that "old Betsey" was sounding especially good that day. The humidifier and all were finally matched.

T.S. went back and clicked off the PZM. It created a "howl to awake hibernating bears." Richard, the tuner, yelled, "T.S. what are you doing to me?" He forgot all about the Steinway for 45 minutes while T.S. took him step by step through PZM technology and applications. After the education, Richard's response was, "Turn it back on; I'll never be able to get it tuned without it now."

The tuner now wants a rental arrangement for another PZM.

Clarence Baker, the owner, returned and expressed amazement at the piano sound and its microphone placement.

One additional comment. The piano player for that next weekend arrived with his own PZM, purchased in New York to take with him on the road.

CANNONBALL ADDERLY JAZZ FESTIVAL

On October 1-6,I was given the distinct pleasure of being chief engineer tor the 1st Cannonball Adderly Jazz Festival.

Southern Sound of Tallahassee set three different types of rooms ranging from small, dead rooms to a large, live gym.

The piano was a 9' Steinway. The local Crown dealer, Stereo Sales, Willie Marasco, loaned a 3OGP PZM [now the PZM-30D]. I taped the mike to the inside of the lid just over and slightly forward of the crossing of the bass strings and the midrange strings. The presence of a crossbrace on the lid prevented me from moving the pickup further forward and out.

The Nat Adderly rhythmn section, Larry Willis on piano, Walter Booker on bass, Timmy Cobb on drums, backed up most of the solo “name” artists. Because of the intimacy of the music and setup, the piano (lid always open) was within 3’of the ride cymbal. This caused proximity problems on the high end of the PZM. Slight attenuation on the board solved the problem but compromised the piano sound. As sound engineer, I was probably the only one who was aware of that problem.

The sound of the piano in all the rooms was so nice and clear, responsive and lust plain real, I had to write.

Even performers such as Larry Willis, Dr, Billy Taylor, Mary Lou Williams and especially Ramsey Lewis were totally pleased with their sound thru the monitors (no feedback at all) through the house system. Already a Crown power amp person, I would like to thank Ken Wahrenbrock and Crown for this product. My job just became easier and more pleasurable.

Bruce Johnson, Tallahassee, Florida

BUCKNELL JAZZ & ROCK ENSEMBLE
PZM ON WILLIE NELSON’S PIANO

After exposure to PZM’s on the piano in Las Vegas, thanks to Chips Davis, a PZM was purchased for Willie Nelson’s show at the Universal Ampitheater in Hollywood. Some WSA staff attended to check out the sound and reported that it was nice to have a crisp piano rather than a jumble of sound, Pete, Willie’s sound man, stated that they were the best mics he’s heard. The piano player is Willie’s sister, Bobbie; she is featured quite a bit.

We found very favorable results miking the grand piano during a studio session with the 20-piece Bucknell Jazz & Rock Ensemble. The piano was miked with 1 PZM model A taped to the lid which was closed. With the horn section no more than 5 feet away, the isolation was superb. Also, the sound was so natural and non-resonant that we were able to cut the piano track with no EQ. Not only did the PZM capture the desirable frequency response and isolation we wanted, but when the piano was panned to the center during the final mix-down, it gave the apparent feeling that the piano was very wide and did not sound like a single source microphone was used. We and the group were very pleased with the final results. The album on the Tunisia label is scheduled to be released October, 1980. JUDGE FOR YOURSELF.

Scott Gelnett, Susquehanna Sound, Northumberland, PA

WHAT'S NEW WITH PZM/PIANO?

In a sound reinforcement pick-up of the Cedar Rapids Symphony outdoors, I had great success with a PZM on an upright piano. I taped it on the outside, to one of the large upright supports facing the sounding board. By positioning in the upper corner the capsule was surrounded by sounding board, reflecting plate and 2 supports but was not completely enclosed. This gave excellent isolation. with the clarity we've come to expect from PZMicrophones. Actually the piano sounded better than it had any right to!

Thought you'd enjoy hearing yet another war story!

Bruce A. Thayer, Division Manager, WMT Music & Sound

PZM ON UPRIGHT PIANO

An additional placement for PZM's on an upright piano is to place one or two PZM's on the inside of the cover just above the pedals.

Wade Bray of Kimball International tried such an arrangement and a Baldwin sounded just like a Steinway.

DIFFERENT BASSES: DIFFERENT PZM PLACES

There doesn't seem to be a standard place for PZM on string basses. Can you help? There is considerable difference in the sound of basses using the PZM. The quality of the bass will determine the sound developed for the microphone. It may also require a different mike placement depending upon the quality of the bass. Inexpensive basses are quite different in sound and placement from the best made German bass instruments.

PZMs HAVE TOO-DEEP BASS FOR SOME APPLICATIONS

Paul Morrow from Acoustic Design Associates, who designed some special flush mountings, found that with one of the capsules there was more bass than the automatic mixers could handle. The air conditioning noise would trigger the mixer.

Their solution was to replace the 2 uF input capacitor in the power supply with a .047 uF and thus roll-off the bass.

Others may find this solution helpful.

PZM GOES TO A PARADE

Robert Houser, Audio Engineer, KTLA-TV, Channel 50, S. California, used 2 PZM-GLP's [now the PZM-6D] on 2'x2' pieces of stiff cardboard taped to street lightpoles 15' above the ground. That was the pickup for the Anaheim Halloween parade on Nov. 1 presented live on Channel 50. It was taped and replayed on Nov. 2.

KTLA, Channel 5, bought the show and replayed it the following weekend.

The pickup was for the band and float sounds and provided exceptional clarity as compared to the free field mikes usually used. At one point the mixer compared the difference on the show.

PZMs ON PIANO

Jim Hudson, who provides entertainment for the guests at the Milwaukee Hyatt-Regency's Atrium cocktail lounge, came to us with a request to solve the problems with the dull, weak sound his piano player was getting. The piano is on a carpeted floor in the Atrium, which is the Hyatt trademark, This space provided just one reflective surface for the piano; since most of the sound we hear is reflected, the five missing surfaces were quite evident. The PZMicrophones' unique clarity and transparency gave the audience psychoacoustic suggestion of a much more "present" piano; measurements indi-

cated no high frequency lift, but rather a low frequency lift and the average volume of the piano remained unchanged - to the management's delight since the piano was more audible but didn't cause problems with guest rooms opening onto the Atrium.

Peter Neupertz, Flanner's Pro Audio, Milwaukee, WI

PZM IN KICK FOR FAT LOWS

Recently we've been experimenting with the PZM in a studio situation. For years I've been experimenting with drum sounds, trying to get a fat low end sound without slop. The PZM has come through with the sound we have wanted. We simply throw a PZM in the kick drum on top of the towels and the sound is there. All we can say is look out Neumann!

Phil Langdon, Baumann Music, Arlington Heights, IL

OVERHEAD DRUM MIKING WITH PZMs

"In the beginning there was sound. Now there is the "PZM." These mikes are truly a representative of the '80's.

We are using two for stereo overheads on drums and close miking the double kicks with SM-57's on a 12-piece drum set in an open aircage. The natural L to R pan in the control room puts you in the drummer's seat.

Acoustic 6 or 12 string guitar through a Leslie with stereo L & R 130's is devastating. The mikes make your imagination cringe with the countless possibilities."

Alan R. Cahen, Infinity Recording, Tulsa, OK

PZM GOES TO THE MOVIES

I have used two PZM's for SFX Recordings in stereo for an upcoming picture "Uforia"; also for Neil Young's new picture, "Human Hiway." The best FX mike ever devised. Works well on the floor as a dialogue mike for wide shots when the other alternative would be a boom mike from above especially in boomy, tubby rooms. You should make some with clear Lexan plates; they would be less conspicuous.

Kirk Francis Beverly Hills, CA

PZM GOES TO THE THEATER

The sound engineer for a theater came in and rented 6 PZM-3OGP's [now the PZM-30D] and 10 AKG 451's for the show. After one rehearsal he brought back the 10 451's. When queried about the reason for returning the mikes and checking to see if they were defective, the answer was, "I don't need them, the PZM's cover the show perfectly."

Phil Clark, Diversified Concepts, Marcellus, NY

PZM GOES TO CHURCH

John Murray of KLOPF Audio-Video Co. placed a PZM on the altar of a Catholic church which was very live. A large multi-horn speaker cluster was above and behind the altar with horns aimed directly down over the altar area.

The PZM provided better highs and gain before feedback than the existing cardiod condenser on a stand. Off-axis pickup with the PZM was exceptional.

PZM GOES TO CHURCH - AGAIN

Carl Derr in Emoryville, CA, installed a church sound system and in providing microphones suggested a PZM lavalier. The minister emphatically rejected any lavalier as noisy, poor sound and worthless. Carl suggested just one service and left it for the next Sunday. On Monday the response was: “This is my microphone, you cannot have it back!

PZM ON SYRACUSE ORCHESTRA AND CHORUS

I must report on our fantastic success in using PZM’s for reinforcing the sound ofthe Syracuse Symphony Orchestra and Chorus during their Fay’s Christmas Concert at the Onondaga County War Memorial Auditorium in Syracuse, New York, on December 7,1980.

The orchestra was located in the center of the 2 million cubic foot auditorium where they were surrounded by more than 7,000 listeners. Since an orchestra shell could not be used with this configuration, the temporary loudspeaker cluster, which was hung about 40 feet over the center of the orchestra, was required to cover the full circle of listeners plus act as stage monitor for the orchestra.

Six 3OGP type PZM’s [now the PZM-30D] were used to pick up various sections of the orchestra and a 6LP type, attached to an 18x24 plexiglass plate, was mounted about 15 feet over the conductor’s podium to pick up the general ambience of the orchestra. The mix was 1/3 octave equalized and fed to the cluster of 13 Mantaray horns covering the listening area.

The results were astounding. The conductor was pleased because he could hear the entire orchestra even better than with the orchestra shell. The stage manager asked if it was turned on because he couldn’t “hear” the sound system, although he could hear the orchestra very well. The critics were apparently pleased because all they wrote about was the “clear rendition” of the various portions of the program. And many listeners took the time to compliment us on the quality of the sound. Needless to say, we were pleased with the results. But, of course, that’s why we used the PZM’s.

STUDIO USE

The last *PZMemo* reported on Leroy Shyne’s building of the 4’x4' plates and the great stands he mounts them on. Since then he has used the plates for dual vocal overdubs in a studio and on a different recording for vocals and conga drums.

He has also used the simple 3OGP’s [now the PZM-30D] for piano reinforcement for concerts with the mikes mounted on the inside of the piano with the lid removed with excellent results.

Leroy Shyne, Shyne Sound, San Rafael, CA

I have been using 2 of the PZM’s in our studio (PZM 3OGPG) [now the PZM-30D] with incredible results. So far the PZM’s were used on drums, piano, acoustic guitar and, vocals.

We are currently working on an album called “Homespun” featuring all local talent and the PZM mikes.

Charles Solak, Recording Studio, ASC Music Publishing, Binghamton, NY

PZMs USED AT AES NEW YORK

The prototype lavalier PZMs were used at most of the technical sessions for fhe New York Convention of the Audio Engineering Society. When more then one microphone type was used, the greater clarity and gain of the PZM was quite evident.

The paper’s chairman, Glen Ballou, in expressing thanks, said “I will be returning the microphone to you shortly. Darn it.”

PZMs ON THE EAST COAST

Recent word comes that NBC New York is also using about 18 PZMs. I do location recording as well

as engineering and production at numerous studios around Boston. I haven't used the mikes very much yet but am excited about experimenting with them.

I am really excited about this concept, especially because it represents to me a really fundamental shift or transformation beginning to take place in some engineers' approach to technology. The willingness to experiment, to try seemingly outrageous ideas and techniques to get results rather than staying enmeshed in preconceived ideas about "the right way to do it" really opens up an entire new panorama of possibilities for our ears and minds to explore.

David Litman, Other End Production, Carlisle, MA

EXPERIMENTAL MODELS

NOTE: Some of the news items in this issue may have reference to experimental models of the PZM microphone which have not yet been completely engineered for production, We do encourage your consideration and evaluation of these developmental models, but not all of them may result in production models available for general sale. Watch these columns for notice of new PZM models available from Crown.

# # #

PZM MEMO

November 1981
Ken Wahrenbrock, Senior Editor

PZMICROPHONE HONORED

We have often remarked on the durability of the PZMicrophone design and its ability to stand up to rough usage without damage.

Much of that ruggedness is due to a new reinforced plastic called "FIBERFIL" which Crown's design engineers selected for the capsule housing.

The manufacturer of FIBERFIL, Division of Dart Industries, recently invited a number of people to Chicago for the presentation of a series of awards to companies whose products illustrated creative uses of their plastic. One of the products singled out for this honor was PZMicrophone.

Don Eger and Verne Searer, members of Crown's engineering staff, attended the meeting and accepted the award on behalf of all the smart people at Crown.

PZM AND GUITAR

A couple of ideas on guitar pickup come to us from Chips Davis of Las Vegas Recording. A handheld prototype he has been evaluating for us proved to work quite well on a flex holder 12" from the front of the quitar. He has also used a PZM-30GP [now the PZM-30D] on a short stand. K.W. thinks that an even better idea would be a 6LP [now the PZM-6D] on a piece of plexiglass 18" square, mounted on a low stand and tilted to provide good separation from the monitors.

PZM ARTICLES

db, the sound engineering magazine, used a beautiful color photo of PZM on its front cover for the June issue. Inside the magazine was a major article on the theory and practice of PZM, authored by our own Clay Barclay.

Recording Engineer/Producer for June includes a lengthy article on the sound system developed by A-1 Audio for Barry Manilow's tours for 1980 and 81. The article includes significant mentions of how Manilow used PZMikes, especially for his piano.

PZMs IN THE STUDIO

Robert Margouleff, an independent recording engineer, has used PZMikes for congas. One overhead and one below. Ed Bannon of Las Vegas Recording has found a PZM/piano system that works very well for rock music. One PZM is mounted on the underside of the lid, centered. The lid is placed on the short stick and a second PZM is fastened to the stick facing the high end strings.

Chips Davis (also Las Vegas Recording) puts a PZM-30GP [now the PZM-30D] on a boom stand over and in front of trumpets for excellent pickup on multichannel miking.

Chips has also installed two 30GP's in a V-shape above the drum set. He also finds it helps to use a PZM mounted on the wall in front of the kick.

PZM DROWNS; WE'RE ALL AT SEA

Charles Bilello of West Hempstead, NY, writes concerning the use of a hand-held PZM with a small windscreen for vocals. After three hours, the mike began frying, was muffled and went dead. Gap between capsule and boundary was filled with moisture. After drying out, it worked perfectly. Have tried a U87 windscreen, but it cuts oft highs too much on PZM. Charles needs help. Does anyone know of a windscreen that is moisture proof that won't muffle the sound? Write us and we'll forward the information to Charles. Chips Davis, of Las Vegas Recording, has been tying a prototype PZM handheld with a double windscreen for recording vocals and reports that it works quite well. He hasn't mentioned - so far -any problems with moisture.

NEW HOPE FOR FLYING PZMs

We have come across a nifty new product that might be helpful to those of you who are flying PZMicrophones on overhead panels. It's called Pyramount, and it's a fixture that mounts to the ceiling (it could be attached to a boom, too). It makes it easy to position your PZM panel at any angle you want.

PROTECTING THE PZM NAME

We obviously think that the PZMicrophone is a valuable contribution to the art of microphony. Valuable enough that we would like everyone to recognize the fact that the original PzMicrophone is manufactured by Crown, and only by Crown. Crown, in fact, is the only manufacturer authorized by the inventor of the Pressure Recording Process to use the words PZM, PZMicrophone, or Pressure Zone Microphone to describe the product.

But we have to work hard to maintain that kind of identity. It is important for us to do that, since it is inevitable that someone, someday will be manufacturing microphones which may look and act like PZMicrophones. Unless we have licensed them to do so they cannot be referred to as the PZM.

So, would you help us by reminding your friends in the publishing business, who may have occasion to write about PZMicrophones; to find some way to acknowledge the fact that these names are trademarks, that they belong to Crown and can only be used if they are so identified. It's not necessary to identify PZM as a Crown trademark everytime if a short footnote or parenthetical statement is utilized, i.e., "PZM is a trademark for microphones manufactured by Crown International, Elkhart, IN." Thanks. We appreciate your help.

K.W.

Pressure Recording Process (PRP) is a trademark owned by E M. Long Associates and used by permission.

PZM ON STAGE

Our auditorium has an incredible problem with acoustics. I was amazed with the performance of the PZMicrophones I used for a musical (PZM 2-1/2) [now replaced by the PCC-160]. They responded with the best sound reinforcement I have heard in our auditorium and I have experimented with a great number of microphones in the last five years. PZM's are the best thing to come along in stage theatrical sound reinforcment.

David H. Dunbrack, Auditorium Manager, Huntington Beach High School, CA

MORE ON PZM PYRAMID

Carl Haye of Micar Audio, Independence, MO, has made a 4 sided pyramid using a 30GP [now the PZM-30D] but is going to change it to a 6LP [now the PZM-6D] bar and capsule. He measured with a real time analyzer and estimated more than 12dB gain over the PZM placed on the stage floor. He laid the pyramid at the stage front and had good gain to 20' upstage.

If you need to use us as a referral for the Crown microphones, please feel free to do so. They have been an added asset.

Sincerely,

Michael L. Medley, Northland Cathedral Assembly of God, Kansas City, MO

MORE HELP WANTED

I want to know how far apart two, or three 30GP [now the PZM-30D] PZMikes can be placed and still maintain phasing foran organ recording that will be made into a record. I want the mikes to be flat on the floor, on 4'x4' plywood over a carpet. I have read Application Note #12 suggesting a wedge with the mics 7" apart.

What new "liberties" are there for phasing with the PZM process that conventional mikes do not allow?

James E. Brackett, Shangri-La Cottage, Epworth Heights, Ludington, Ml 49431

A Response From Ken Wahrenbrock:

PZM technology has not changed the problem of spaced microphones when recording for disc. In such a situation, where the engineer needs to sum and difference the two microphones, the L-R mix (which is the vertical excursion of cutter or stylus) will create intense cancellations and a 3 dB addition for high amplitude signals which may arrive at the mikes at different times. It was to solve this problem that the "coincident crossed pair" configuration was developed. Placing PzMicrophones on either side of a plate or wedge is the PZM equivalent of the "CCP."

As to the second question, there are no particular phasing liberties available only with PZMikes. If you are doing multiple miking with spaced PZMikes for sound reinforcement you do not get as much "dropin/dropout" process, but it does not reduce the recording-for-disc problems.

I have recorded organ with spaced PZMikes, when the final materials were tape or cassettes, with exceptionally good results; but were I to be recording for disc, I would use a PZM on either side of a plate or wedge to get a stereo image without phase cancellation problems.

PZM & PIANO - UPRIGHT VARIETY

We have heard about another possibility for placement of the PZMicrophone with an upright piano. Put the mike on a wall in back of the piano and adjust the distance from wall to sounding board for best sound. The piano can also be moved sideways for best bass/treble balance. Our thanks to Don Eger of Crown's marketing staff for this one, as an answer to an inquiry from C. W. Lytle of Fairbury, Nebraska, who wrote us with a concern about excessive buildup of bass notes.

PZM GOES TO THE OPERA

A letter to Murray Young from Chris Wood, sound engineer from the San Francisco Opera, dated 4/20/81:

..... We have three Wahrenbrock PZM's that we are very happy with. Two live during the season on the upstage wall of the orchestra pit. The orchestra sound from these is put into a 70V system for onstage (behind the set) choruses and bands (musicians). The third lives on the balcony rail where it picks up orchestra with singers for our video archive system. We are hoping to expand our PZM use into the more traditional reinforcement-type areas. The lack of coloration in the PZM is a prime factor when mixing real and amplified sound."

A LETTER FROM SUPERIOR SOUND, KANSAS CITY, MO:

The Crown microphones we purchased have been superb. The added pickup... is really unbelievable. Also.. have given us a much better mix of the choir voices.

CONCERT RECORDING WITH PZMs

TO: Bert Spangler, Audio Coordinator, Media Development Center, University of Wisconsin - Eau Claire

FROM:Larry Glenn

DATE: December 22, 1980

SUBJECT: Evaluation of Crown PZM Microphones

I have used the Crown PZM microphones along with microphones which we have normally used for recording several concerts and recitals this fall. I have found them to be quite useful in some situations and would recommend their purchase.

As I normally do only recording of music, I have not had opportunities to evaluate their performance for speech. I did make one test for this purpose. I mounted the PZM on the ceiling in a classroom and made a recording while I walked around the classroom and talked. I repeated the test with a dynamic cardiod microphone mounted in the same location. I found the sound of the PZM was clearer and less clouded by room reverberation.

For music recording I have used the PZM's one at a time as highlight microphones, as a pair for basic stereo image pick-up, and at stage edge for vocal pick-up during an opera performance. I found them suitable for some instruments as a close highlight microphone, but not for all instruments. They worked well with piano and with wind ensembles. I placed one directly under the piano in the first case, and 10 to 15 feet away in the second case.

I also used one on the floor about 6 feet in front of a performer playing the oboe. The sound was definitely clear, but the performer had too "raw" a sound, compared to an overhead microphone. (Editor's Note: The performer principally hears the oboe from reflected sound. The PZM was exposed to direct or "raw" sound, which would sound unusual to the performer. - K. W.) As a basic stereo pair for choral pickup at 15 to 20 feet away, I found them too bright, accentuating the sibilance problem we have in the concert hall. When I mounted them on ceiling beams in the arena at 30 to 50 feet from the performers, they performed very well, giving a good balance between a large chorus and orchestra.

For each of the above applications I was able to compare the PZM's to other microphones. I also used them at the edge of the concert hall stage for vocal pick-up during an opera. I did not use other microphones on the floor to compare them to. I used them to mix in with the main stereo pick-up I was using to increase the clarity of voices as the performers moved around the stage. They were somewhat bright but were acceptable for this use. Their low profile made them a good choice for floor placement and I did not find objectionable noise from footsteps.

If purchased, I am sure we will find them a useful addition to our present selection of microphones.

NY JAZZ FESTIVAL

The Los Angeles Times (and other papers for all we know) carried a story on July 8, 1981, reviewing what used to be called the Newport Jazz Festival. The article as we saw it included a large photo of Diny Gillespie blowing his horn, in front of a highly visible PZMicrophone, at Carnegie Hall.

Unfortunately, the reviewer was too involved with the music to pay any attention to the mike; so we don't know what he thought of it.

K.W.

PZMs FOR CLASSROOM, VOICEOVERS, INTERVIEWS

DATE; January 23,1981

TO: Burton Spangler, Audio Coordinator, University of Wisconsin-Eau Claire

FROM: Lawrence Cheng, Audio Recording Specialist

SUBJECT: Crown PZM Microphones

The Crown PZM -30GPB (now the PZM-30D) microphone was used in three experimental situations. Its performance characteristics were found to be quite different from that of a "typical" dynamic microphone.

(1) In a classroom

The PZM was mounted on a rigid board (2'x4') on the ceiling above the first row. A dynamic microphone with an omni pattern was mounted a few inches beside the PZM. A moving sound source was picked up by these two mics and recorded onto separate tracks. The tape was analyzed later. It was found that the PZM channel had a better sound. The highs were "crisper"; speech appeared more intelligible. A more important aspect was that the PZM channel sounded "closer' regardless of the position of the sound source in the room. Interestingly, EQ alone was unable to bring the perspective of the dynamic channel as "close" as that of the PZM channel.

(2) In a recording booth

The table top was padded. It was discovered that placing the PZM on a sheet of metal (2'x4') improved the quality of sound noticeably. Despite the fact that the PZM sounded a bit "nasal," it performed satisfactorily. However, in an AB test, the Neumann U87i was preferred.

(3) In Department of Allied Health Interview Rooms

Findings were similar to those found in the classroom. Room sound was more evident in the PZM channel.

In general, if both the capacity as well as the limitations of the PZM were clearly understood, it can be a valuable tool for any recording engineer.

PZM ON THE AIR

Mark Heller, Chief Engineer for WVON/WGCI in Chicago, writes:

WGCI in Chicago uses its PZM to record all public affairs programs.

In our studio, we found that by adding a rumble filter after the mic and then using an equalizer we increased the lost bass due to the studio picking up the air conditioner overhead.

WVON uses it for the nightly talk show from 10 PM - 12 midnight - Hotline. The new mic allows better freedom and less formality than the Sony electret lavaliers we had been using.

We are very happy and have suggested that our TV station inDenver consider it for their newscast operation at "NINE ALIVES ACTION NEWSCENTER."

Thank you, Mark.

PZM & ENG

“ENG” as most of you already know stands for electronic news-gathering. Remote trucks equipped with mini-cameras scurry all over the landscape to tape the latest news or even transmit a live remote back to the studio so the news staff can bring the viewers the news as it happens.

It seems to us that this might be a great place for a microphone with the capabilities of the PZM, but we haven’t yet heard about anyone who has tried it out for that. Anyone care to let us know of their experience with PZM & ENG?

K.W.

PZMs: OPERA IN ISRAEL

Now I would like to relate to you two instances in which we have used the PZM with unprecedented, fantastic success in Israeli terms, and I believe in any terms.

A classical music festival was held in one of Israel’s leading concert halls. There was a need to amplify music played inside the hall to a park outside where 2000 people, who could not get tickets, were assembled.

We put up two Bose 802 speakers on high stands outside the hall and the PZM 31S [now the PZM-30D] at the front of the stage inside the hall, where the actual concert was taking place.

The program consisted of small classical groups, choirs singing songs from the Renaissance and an opera.

The audience in the park outside was surprised by the high quality of the sound; and the director of the festival, Mr. Noam Sherif, asked us if it was a master tape he was hearing.

He could not believe that what he was hearing was really coming from inside the hall and at such high quality. His surprise grew when he went inside and could not detect any microphones.

The reviews were outstanding; and when we compared the microphones with others, there was a great difference in the volume and clarity of the sound.

Another most complicated project was amplifying the sound of the opera “II Troubadour” played by the Genova Opera of Italy, in Jerusalum.

This is an open air venue with a great view of Jerusalem. The place can hold at least 10,000 people, so you can imagine its size.

The managers of the opera who were not accustomed to appearing with microphones were quite worried. The company consists of a symphonic orchestra, a choir and soloists, all together numbering 220 people.

The stage was covered by an acoustic shell; the speakers were hung in a center cluster and consisted of a 5-way system, made up entirely of JBL speakers. The cluster was flown 17 meters above the audience, and tilted a bit forward towards the audience, so as to prevent returning echoes from the boulders that surrounded the area.

At first we had problems of feedback, and the sound engineers had to alter the sound system by changing the low bass and the “mid” speakers into full range. We also taped some foam rubber onto the back of the mikes used for the orchestra and for the mike at the stage front.

We placed one PZM-31S [now the PZM-30D] at the front of the stage on the floor; and we flew two PZM-31S’s about 4 meters in the air on both sides of the stage, on a plate of 4’x4' plexiglass as you had suggested. We had to fly the mikes a bit higher because the movements of the props during the show kept us from lowering them.

Above the choir, which was in the back part of the stage, we flew another PZM on a 4’x4' plexiglass plate and placed another one (for the orchestra) on the conductor’s podium.

We had to add two condenser mikes for the bass and timpani because of the difficult conditions in which we had to work. In short, there was a lot of anxiety; the fact that our experience with the PZM was quite brief was not comforting. To tell the truth, even we could not believe that these virtually

invisible mikes would be sufficient in that situation. All the professional material you sent us could not convince us either.

The minute the dress rehearsal began, our fears subsided. The people from the opera could not believe their ears. They could not decide whether they were hearing the singer or amplified voice. Even 100 meters from the stage, everything sounded crystal clear.

One of the interesting things is that there was a strong wind blowing during the show and all the overhanging mikes were swaying widely. Yet the wind could not be heard at all through the PZMikes while the two condensers were noisy, even though they were shielded by windscreens.

The critics could not and would not believe that there was any amplification. They could not understand how every detail was heard, and yet there were no visible mikes.

I think this is a great compliment for the mikes. As a result of this success we became the first professional equipment hiring company in Israel to be invited abroad to prepare the sound design for the International Ballet Festival in Alervi, Italy, a festival which is now taking place.

We hope to send the reviews as soon as our crews return from Italy.

Asher Bitansky, Mor Productions, Tel Aviv, Israel

THE AMBIENT NOISE PROBLEM

Pro Sound News, in a recent issue, provided some sound advice to studio owners contemplating conversion for video production. The author, Peter S. Neupert comments about the PZM:

“The acoustic environment in television studios is terrible. They are too live and too noisy. We have been taking Crown PZMicrophones around to television and video production houses where its unique properties make it a fantastic problem solver when you encounter amateur talent, mike-shy people, reach problems, sightlines problems, etc. But if the studio is too noisy, it will not work at all.”

The sense of what Peter is saying is not that the PZMike won’t work, but that it works too well. As we have mentioned on many occasions, the reach of the PZM configuration does make it unsuitable for use in a noisy environment. Other manufacturers, please take note - PZM can’t do everything!

EXPERIMENTING WITH PZM

Thank you for sending me a pair of Crown PZM’s for test and evaluation . . . I really enjoyed working with the PZM’s.

I got the opportunity to use the PZM’s along with some other mikes (Sony’s ECM-50PS, AKG’s C-451 +CK-1, and Aitec’s 654) to record a small bluegrass/rock group.

Since we were recording in a rather large room, I tried an experiment in multi-mike technique that worked quite nicely. I used the ECM-50’s for acoustic guitar pickups, the 654’s for vocal pick-up, and the PZM’s mounted back-to-back on a 4-foot-square sheet of plexiglas for stereo room pick-up. The perfect stereo omni! The PZM’s served as the main source, with the other four mics mixed-in as needed for presence and localization. The reverb we were able to pick up from the room in this manner was much better than what we were used to hearing from other mics used from room pick-up, and an order of magnitude better than using spring reverbs to enhance the sound.

I am looking forward to using some PZM’s on my next job.

Sincerely yours,

Mike Sullivan, Hoover-Keith Associates, Inc., Houston, Texas

PZM INFO FROM SYN-AUD-CON

The Winter ’81 edition of Don Davis’ SYN-AUD-CON newsletter contained the following comment:

“Glen Ballou reports making a helicopter noise tape (he works for Sikorsky Aircraft) of a takeoff, fly-by and landing using a Crown PZM. He states that the recording was done in 20 degree weather with 20

knot winds. Even when the helicopter flew directly overhead at 50' altitude, the wind noise was minimal. He concludes ‘Another good use of PZM’s.’ Have you tried Crown’s PZM’s with their phenomenal freedom from vibration pickup, wind noise and shock? You’ll be pleasantly surprised when you do.”

PZM HIGH IN THE ROCKIES

Rocky Mountain High Note, published in the Denver area by Front Range Publishing, included an article in a recent issue by Marc Farley, editor, on a PZM seminar given by Barath Acoustics of Denver. Farley reports that he was duly impressed with the “funny looking gizmo,” and detailed a lengthy interview with Ken Wahrenbrock, who represented Crown at the seminar.

# # #

PZM MEMO

February 1982
Ken Wahrenbrock, Senior Editor

PZM SCORES IN RADIO

We purchased the PZMicrophones after a most impressive demonstration of some prototypes by Barny Cole of Calf Audio in Ithaca. As we record the Binghamton Symphony... we felt the PZMwould be beneficial... we have used the PZMicrophone in primarily a coincident stereo pair and spaced omni configuration. We rely primarily on AKG 421’s and CGI’s for highlighting. We also sometimes use the SM81. We do a large number of concert recordings of various size groups performing different music. Oflen there is no rehearsal and no blocking is available. The PZMs are very useful in these situations. Their flexibility is astounding and they are also remarkably forgiving.

PZM LAVALIER DEBUTS IN NEWS BROADCAST

We have already tried out the first two PZM redundant lavalier mikes [discontinued] at a major broadcast studio in Los Angeles.

The mike was pressed into use when the first-string anchor man had to do a news spot from L.A for national broadcast. Within 48 hours, the New York headquarters was after us to supply more of the mikes.

Hang in there. everybody, they’re coming soon is the word from Crown.

KW

Tom Hill, FM Production Coordinator, WSKC/FM,4V, Endwell. NY

MORE ON PIANO SOUNDS

Rudy Bauskes suggests mounting a PZM mike on the underside of the lid of a grand piano, surrounded by a donut of SONEX acoustic insulating material, with an 8" hole and outside diameter as desired. The donut damps out reverberant sound when the lid is closed and sharpens the attack for more accurate reproduction of percussive action.

PZM SOLVES A TOUGH, SMALL PROBLEM

We were recentiy faced with a different type of application that we solved with PZM.

A local music club, open 24 hours a day, occupies three floors, It offers programmed music via jukebox four days a week and live music for some of the other three days (mostly rock, country, R&B). We were asked to install a relay system which would mute the jukebox and bring up the live program without turning off the jukebox (allowing the program to play out while the band was performing). The

problem was further complicated by the fact that the club does not have a house mixer.

A direct line from the band mixer band area was so small that most mixes were vocal only, and in remote areas of the club you could not hear the instruments.

Our solution was to mount a PZM over the stage, with the power supply shorted into the relay. When the jukebox is muted by switch, the mixer feed comes up, the PZM kicks in, and the band - vocals and instruments - are heard throughout the club.

Chris Brown, Sound City., New Orleans, LA

FAT ELECTRIC-GUITAR SOUND

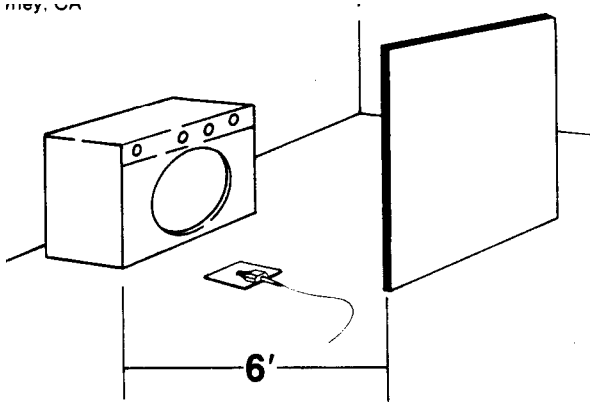

Fig. 1. PZM miking technique.

To fatten an electric guitar sound on a demo recording, we placed a PZM on the floor 3 feet away from and facing the speaker cabinet. Since the PZM is sensitive enough to pick up the initial sound from the speaker and the reflected sound of the mirror, a thickened sound is recorded, By experimenting with the distance between the speaker, PZM and hard reflective surface, an ambient sound can be obtained without adding a second mike as is the practice with other types of mikes.

Vince Motel

Downey, CA

PZM HIDES IN CHURCH

Tom Hayes, a faculty member at the University of Illinois, has built a PZM mike into an altar cross for the ultimate in concealment.

NAGRA DEALER LOVES PZM

A NAGRA dealer friend of ours in Southern California has asked for the loan of a PZM. claiming it is the only mike he can find that really allows him to demonstrate the fine sonic quality of the NAGRA recorder.

— Ken Wahrenbrock

PZM & UNDERSTANDING JONESTOWN

We recently did a 90 minute radio documentary on Jim Jones and the Jonestown, Guyana, community tragedy. Using actual recordings made by the People’s Temple of Jim Jones and his followers The FBI had confiscated these tapes and released them after a Freedom of Information Act reques. They were all very dry, P.A.-feed tapes recorded on inexpensive cassette machines, usually mono and A.G.C. operated.

To provide a “feel” of what it really sounded like in the pavilion at Jonestown, we ran the tapes (after much processing to improve fidelity and intelligibility) through a studio monitor speaker and used 2 PZM’s on either side ot the studio to pick up the room sound in stereo, which was then mixed back in with the dry audio coming off the original tape. This greatly enhanced the quality and realism of the program, without further compromising the already poor quality material with the conventional mike’s “off-mike” sound. The show is entitled “Father Cares: The Last of Jonestown” and has since won several national awards.

Skip Pizzi, National Public Radio, Washington D.C.

EXPERIMENTAL MODELS

NOTE: Some of the news items in this issue may have reference to experimental models of the PZM microphone which have not yet been completely engineered for production. We do encourage your consideration and evaluation of these developmental models, but not all of them may result in production models available for general sale. Watch these columns for notice of new PZM models available from Crown.

A COUPLE OF PZM PROBLEMS WITH VOCALS

While I am very pleased with the PZM on all acoustic instruments, recording the voice is still a problem. Your new model with boosted low end is really needed here. The main problem is a hollow or doubled sound on close miked vocals. The problem may arise from early reflections from ceiling, walls and performer in a small vocal booth. I have used the following setup to minimize the problem:

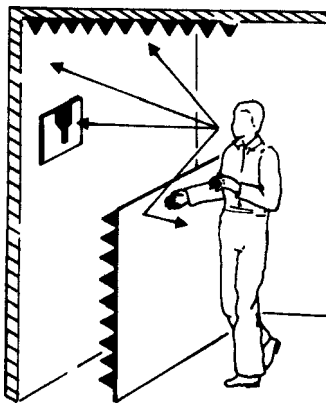

Fig. 2. Using wall absorption when recording PZM vocals.

I would also like to know if other PZM users have had any experience with (orcan offer solutions for) the following problems:

a. Breath and arm movement sound on acoustic guitar.

b. Low output level. On miking an acoustic guitar, my preamp gain and fade are full open.

c. Pedal and damper noises on acoustic piano with PZM on lid.

Peter D’Antonio

KW replies to Peter:

a. No solution with PZM. It will pick up all the sounds a guitarist makes.

b. Try using a PZM mounted in a large boundary (3x3' or 4x4' panel).

c. See PZM Application Note on Piano (No.5), where we suggest PZM mounted on a panel parallel to the open lid (long stick), six to eight feet from the piano.

ANOTHER STAGE SUCCESS FOR PZM

We in Leisure Village have had many problems with sound. Whenever we put on a play, variety show or speeches, it was necessary to hang mikes all over the stage. And even then the sound was uneven, sometimes even fading out. We have good speakers and they are judiciously placed. If an actor spoke with his back to the audience, it was a disaster. Choral groups, worse.

That all came to an end when we purchased two PZMs. After a little experimenting we found the answer to all our sound problems, We found that by placing one on each side of the center stage on 2'x4' plywood hung just behind and level with the teaser we could pick up great sound even when an actor spoke with his back to the audience. Even with the curtain closed and the mikes behind the curtain, we had good sound.

I can't recommend them too highly.

Arthur D. Kaufmann, Technical Director

Drama Workshop and Variety Shows

Leisure Village

Camarillo, CA

PZMs IN THE STUDIO

A recent letter from Ralph Hodges, an audio editor of our acquaintance, contained the following paragraph:

"Two recording engineer friends wanted to try the PZM's in a multi-mike studio session; and as might be expected, they worked out less favorably under those conditions. In particular, they found that the PZM's directional characteristics were not helpful in suppressing "coloration" from the recording environment. In other words, they got the instrument plus room. instead of just the instrument. Stands to reason. To sum up, I'd say that the PZMs are good to ideal for my sort of recording but not an appropriate choice for general-purpose studio work."

KW replies:

Au contraire, Ralph, PZM has been found by many recording engineers to be an ideal choice for multimike recording in the studio. In addition, a number of studios have two or three PZM microphones permanently mounted for overall stereo miking and for back-up tracks.

In multi-channel recording, PZMe can frequently take a whole section with less leakage than individual instrument mikes. One of the reasons we publish PZMemo is to help users understand that conventional miking techniques may not work well with PZMs, and that its principles of operation can simplify miking in many cases. We continue to suggest that new users of PZMs should try the PZM by itself until the user feels that he or she understands the microphone both as to its virtues and its faults (it is not, we agree, the solution for every recording or reinforcement situation), and then begin to use it in combination with other microphones.

The testimony to date of the many recording engineers who have used the mike in this manner is that it does solve many different problems for studio recordings, many of which have been described in these pages and in PZM Application Notes.

STARLIGHT THEATER AN OLDTIMER WITH PZM PLAYS

The Starlight Theater, Balboa Park, San Diego, concentrates on the old family musical for its summer season presentations of outdoor theater. It is also one of the earliest users of PZM microphones, having installed them in its sound system for the 1979 season.

Bill Lewis, sound engineer for the theater, remembers the early Wahrenbrock 6x9 flat plates with which they opened in July of 1979, and how much easier it was to mix the sound, since the earlier condenser mikes had to be EO'd differently as the actors moved up and down stage. "The PZM not

only had better clarity," Lewis recalls, "but it also eliminated the need to EQ differently to compensate for actor movement. It also enormously improved the range of pickup, allowing me to follow the action by only varying the gain.

Late in the 1980 season, Starlight tried out the PZM 2's [now the PCC-160] made by Ken W. and now rely on it as their standard mike.

During a performance of SHOWBOAT in the 1981 season, Lewis had to figure out a way to mike Joe, the lead, as he started "Old Man River" on a three-foot platform all the way backstage. 25' from the mikes. moving down and across the stage as the song proceeded. Lewis solved the problem by using a PZM pyramid, engineered by Ken. positioned at the front of the stage. It picked up everything beautifully. Several listeners commented that it sounded as if he was using a hand-held.

"About the only problem I have ever had with the PZM mikes. of whatever variety," Lewis said, "was the ambient noises at the extreme reaches. I have had no probtem picking up actors at 35 to 40 feet but you have so much gain by then, that the ambient noise can be a problem. Everybody walks on little cat feet when we're trying to do that."

PZM MAKES STAGE INTRODUCTION IN CANADA

The National Film Board of Canada publishes "PERFORATIONS," an equipment review for the performing arts. In the 1981 May-June issue, Michael Drolet, a member of NFB's Engineering Division, writes a lengthy article about the first use of PZMs for sound reinforcement in stage productions, The event was the production of "Guys and Dolls" by an amateur group in Montreal.

Drolet and his associates found that the full-stage action required 2½'s (Drolet built his own reflectors) across the front of the stage and suspended a pyramid (which they also built) twenty-five feet up at the back of the stage.

Drolet says: "We are very pleased with the performance of the Pressure Zone Microphones which really picked up the high frequencies even at quite a distance. This is what made the words so intelligible,. At the same time, they seemed almost immune from foot noise in the dance numbers . . . The show was a great success!"

Thanks for your information, Michael. We're sure next year's production will be even better.

KW

SHAKESPEARE FESTIVAL

National Public Radio station KSOR each year broadcasts the Shakespeare Festival held in Ashland, Oregon. The 1981 broadcast employed PZM mikes for the first time. John Patton, technical director. and John Baxter. program director for KSOR, had sampled PZM and borrowed some mikes from KW to do this broadcast.

The production takes place on a three-level stage, with balconies in the rear third of the stage. Action happens on all levels, with the audience close to the stage and no amplification. The unit director asked for 30GP's [now PZM-30D] at center front stage, which provided audience reaction.

Both Patton and Baxter praised the tremendous dynamic range of the mike, which allowed the actors and actresses to be picked up regardless of their distance from the mikes. No microphonics were experienced from all of the stomping around which characterizes so much of Shakespearean drama. The PZMs were rated much better for this purpose than conventional mikes. which had created problems in the past for KSOR because of their high visibility and difficulty in shock mounting.

A final word of praise came from other NPR stations which picked up the plays for broadcast to their own audiences. expressing enthusiasm for the sound quality of the performances.

KW

PYRAMID TO THE RESCUE

If possible, I would appreciate plans for the “pyramid” that has been pictured in some of the memos. I’m presently using two 2’x2' plates with a 6LP [now PZM-6D] on each. These are flown 8' high and spaced about 15' apart and are about 4' in front of a church choir section. The sound is clear but I had hoped for a higher level through the single speaker cluster at the apex of the “A” frame ceiling.

Part of the problem is that the speaker cluster is almost directly above the PZM plates but there is a separation of about 20 ft, With the plates tilted into the choir I thought that the front to back rejection would be ample enough to be able to reinforce the choir sound. Recordings sound good, but I need a better center fill, especially to pick up the men, This is the reason that I asked about the pyramid. Please advise any solutions.

Thank you.

Daniel L. Minnich San Bernardino, CA

PZM TEST DATA

From John Bachman, Crown PZM Product Engineer

1. I have compiled some test data in regard to your questions of 2LV behavior after being exposed to cold and moisture.

2. Frequency response curve of PZM after 2 hours at 10 degrees F. shows no significant change from standard response curve.

3. Frequency response of same mike after being allowed to warm to room temperature shows no significant change from standard response curve.

4. Frequency response curve of same mike after being immersed in water for 60 seconds shows significant distortion and a large drop in output level. We conclude that PZM is not an underwater mike without external protection.

5. Frequency response curve of same mike after being dried by a high heat dryer for 5 minutes shows no significant change from the standard response curve. We conclude that the PZM is not permanently damaged by water immersion.

I am confident this answers our question of temperature and moisture stability of the 2LV. Our reports of both extremes that we have received from users have always been positive in this respect.

TELECONFERENCING AUDIO REMAINS IN ITS INFANCY

(PRO SOUND NEWS, Nov. 1, 1981)

The article, authored by Alan Gable, reviews the state of the art in teleconferencing facilities in hotels and corporations in the U.S., with special attention devoted to the generally low quality of sound transmission provided by most of the hotel systems. Corporations seem to be more concerned with sound quality and claim to be installing systems which satisfy the most critical listeners.

One paragraph is worth reprinting in its entirety:

“One item that has been proven effective enough for widespread acceptance is the Crown line of patented Pressure Zone Microphones (PZM). Marv Welkowitz ot Pro Sound Labs claims that ‘two (PZM) microphones - one on each end of the table - would pick up 20 people talking, very easily. It’s probably the best microphone you could use for teleconferencing purposes. Because of the PZM’s compact size... the plate-type microphone is easily recessible into any tabletop.”

Our own recommendation for this application would be one PZM for each four to six people, depending on the size of the table.

FIXTURES FILL SANCTUARY WITH LIGHT AND SOUND

I enjoy very much the Application Notes, new product news, and general information exchange that are coming my way via the PZMemo.

I recently installed a pair of 3OGP [now the PZM-30D] microphones for recording and reinforcement of a church choir. The microphones were fastened to the choir side of existing five-sided light fixtures. The dimension of the surface is approximately 9" width by 36" height. The microphones are about 20 feet above the choir and 24 feet into the sanctuary. Results have been outstanding. The music director, pastor, system operator, and members of the congregation are expressing total satisfaction. This is the third pair of microphones that have been installed in the last 10-12 years, and it is the first time that everyone is satisfied. The church is the East Congregational Church in Grand Rapids, Michigan

Keep up the good work.

Mel Wierenga, Presiden, ASCOM, Inc., Wyoming, Michigan

PZM GETS INTERVIEWED

Radio Station KZLA, Los Angeles, reports excellent pickup and clarity of sound with two to five people in interview and public forum programs with the 30GP [now the PZM-30D] mounted on a mike stand. Although they expressed concern about the price, ‘they discovered that the PZM could replace miking each person individually and solve their cost problem.

Vince/KW

PZM IN THE MAGAZINES

Just a few items that caught our eye:

An interview with Tim Boyle, recording engineer for Peter Frampton, included an interesting bit on piano miking, using two C414’s on the high and low end inside the piano, with a PZM taped to the lid, with the piano closed and covered. Tim seemed impressed with the PZM performance and is quoted as saying, “They’re good and they’re cheap, too. I think in a couple of years people will find out about them.” (MODERN RECORDING AND USIC, Oct. 1979) (We’ve got to get caught up with our reading-KW).

Joe Tarzia, recording engineer for Teddy Pendergrass, is quoted in an article appearing in the September issue of MODERN RECORDING AND MUSIC (September, 1981), as saying about his mounting two PZM microphones on the angled glass of the studio windows: “There’s an unexplainable openness to the PZMs. On occasion, I’ve taped PZM mikes to the corner of two walls. which added a bottom that was lacking in other positions.”

David Morgan, soundman for the Barry Manilow tour in the fall of 1980, writes in the June, 1981, issue of RECORDING ENGINEER/PRODUCER in great detail about the sound system used for the tour. For the Manilow piano, Morgan selected a PZM, mounted on Ozite carpet under the lid, and an AKG 451 mounted on one of the cross braces inside the piano. Morgan says: “This combination turned out to be exactly what we were looking for, It sounded exactly like a grand piano. I rolled off most of the high end on the PZM, yet retained enough to keep that pleasing percussion quality on the low strings. The 451 was rolled off all the way up to 700Hz, and I used it for brightness only.”

Morgan also found that by changing the phase relationships between the two mikes. he could produce the sounds of almost any kind of piano needed. The whole article is great reading, if you can still find a copy.

STUDIO SOUND (Canada) in reporting on the Los Angeles AES of 1981 (issue of August, 1981) says of PZM: “(They) are becoming quite popular and are generating a spectrum of reactions.” The editor goes on to describe the use of PZM in a stereo recording situation using a wedge mounting method, similar to the ideas we have discussed from time to time in these pages.

The February, 1981, issue of MILLIMETER reviews the PZM mike as“exciting tools that will revolution-

ize sound . . . PZM is useful for recreating normal sounds in normal environments because it preserves the natural sound, or room ambience, while retaining a realistic quality which is perfect for reproducing sounds as true to life as possible."

PZM EFFECTS BETTER SOUND

A few months ago I was asked to record some effects for a short film. One of those effects was of a person cleaning a blackboard. I knew right there that the only way to get the right sound is to use a PZM. So I rented one from David Andrews, and the results were very good. I have to note here that I tried to use another mike (RE-15) and it didn't sound right.

Daniel I. Matalon, Burbank, CA

THERMOPLASTIC MIC REDUCES STATIC AND SOUND DISTORTION

Carbon-fiber filled thermoplastic is the key material in Crown International Inc.'s new Pressure Zone Microphone.

Designers of the device claim it is the most significant innovation in microphone design in 45 years, because its materials solve the problems of sound distortion and static interference.

The mike operates on this principle: Near the reflective surface closest to a sound source, there is a zone in which direct and reflected sound waves are in phase. The mic capsule is placed there.

The PZM is recommended for use in recording studios and on conference tables.

Material selected for the mike is nylon 6/6 with 30% carbon fill, which Crown says helps reduce static electricity.

Further, the reinforced material offers thin-wall construction while maintaining necessary strength. It has a modulus of elasticity of 35x10^5 psi, and compressive strength of 29,000 psi. Crown claims the strength is especially important in instances where the mike is set on a floor — of a stage for instance — and might be stepped on.

PZM WINS PRIZES

The Crown PZM microphone has been the recipient of two major awards in the field of design engineering during 1981, for excellence in the use of materials.

MATERIALS ENGINEERING. a publication devoted to the discussion of significant new uses of materials in engineered products, has identified the PZM microphone and its engineering staff, headed by Don Eger and Wayne Royer, as the recipients of its Top Twenty award for imaginative and excellent use of materials, in this case, of carbon-fiber-filled thermoplastic.

DESIGN ENGINEERING, a publication circulated to over 100,000 design engineers, included the PZM for special mention in an article devoted to the use of reinforced plastics which are prized for their high strength-to-weight ratios and their special electrical properties.

Reprinted with permission from MATERIALS ENGINEERING, Nov.1981.

PZM UNDER THE DOME IS SUCCESSFUL

Bill Lewis, in a recent conversation with the editor. reminisced about a choral recording job he and Dave Johnson (of San Diego Symphony fame) did.

As Bill remembers it, the choir numbered somewhere near 150 voices, accompanied by a small chamber orchestra, which was unusual in being duplicated right to left. As the music from the choir emphasized the right side, only the right orchestra would accompany the singers, and the same effect held to the left. It was an exciting audio effect.

The miking was further complicated by the fact that the recording was done in a cathedral with a tall domed ceiling, with the choir positioned directly under the dome.

Bill and Dave miked the group with two PZM microphones, mounted on 2’x2' Plexiglas panels, fifteen feet high and twenty feet apart. Mike output went to power supply and directly into the tape recorder (no mixer). The mikes were positioned about 25' back from the choir with the orchestra directly in front of the singers.

Bill: “We were simply amazed at the fantastic imagery, the clarity of the sound and the extraordinary balance between choir and orchestra. It was an experience hard to forget, especially when you think what we may have had to go through if we had not had PZM mikes to do the job.”

“PZMs ARE GREAT MIKES”

I recently released a recording with footstomps called “It Hurts To Be In Love.” I wanted that Four Seasons sort of sounding clap/stomps with a little army boots thrown in. We stomped on plywood and I put two PZMs on adjacent plywood baffles. Sounded great!

Just engineered and produced the Plasmatics. I used PZMs to recreate more room drum and bass sound at my studio, the SCHOOLHOUSE (with a 20 x 26 x 14 room). PZM worked fine on the studio tracks and was exceptional on beefing up two live tracks for the EQ. The PZMs added a real lower mid and bottom which is heard on the disc.

We’re currently producing Average White Band, using PZM for Hamish Stuart’s lead vocal sound. It brings out all the best of his vocal style!

Great mike!

Dan Hartman, SCHOOLHOUSE, New York, NY

STAGE REINFORCEMENT

Jim Brown, BRIDGEWATER CUSTOM SOUND, Chicago, says he found it valuable to mount PZMs on 3x3 or 3x4 sheets of plastic or plywood and place them on the floor in front of the performer, tilted up sfightly towards the performer. In a live situation, this does not interfere with audience listening but picks up a strong, clear signal to feed to the mixer. Jim uses this technique for multi-channel recording for groups or orchestras and has found it particularly valuable for brass or vibraphones. The improved sound quality also lets him reduce the level of the performer monitors, since the clearer sound makes it easier for the performers to hear themselves.

PZM REPLACES CHURCH MIXER

I recently received a call from Bob Hurd, a director for several choirs in Southern California. He was in a recording studio when I was demonstrating some PZM-6S’s [now the PZM-6D] to the owner and was impressed. He wanted to know if there was a PZM which he could use with his church choir, They have 15 voices, guitars, piano, violin and flute in the group. They had previously been using five mikes to cover everything and without much success.

I mounted a PZM on a 2’x2' plastic panel and placed it on a mike stand, in front of the choir at chest level. Pick-up of all instruments and voices was excellent. Not only did they buy the mike, but they sold the Tapco 6100 mixer they had been using and now just plug the PZM directly into the church’s main system.

Bob Hurd also told a priest at Loyola Marymount University and they have just bought the same configuration for their choir.

Vince Motel, Downey, CA

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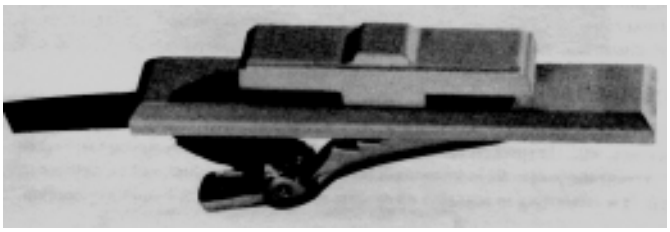
PZM MEMO

August, 1982
Ken Wahrenbrock, Senior Editor

NEW CROWN CLIP-ON MICS



PZM-3LVR

Two new PZM mikes have been added to the Crown line, both clip-on versions.

The 3LVR [now replaced by the CM-10], a redundant mike, has been designed by Crown to be used particularly in broadcasting situations. The 3LVR includes two separate PZM microphones mounted on a clip-on bar, 5.0cm long by 1.0cm wide. The mike is available in either black or champagne and includes separate cabling for each mike, carried in a common sleeve.

The power supply for the 3LVR is also new and includes two separate active supplies with separate in and out connections for each mike.

THE EDITOR'S CORNER: PZM ANNIVERSARY

A discussion of the Pressure Recording Process by Ed Long and Ron Wickersham at a Syn-Aud-Con Seminar in the San Francisco area in January, 1978, tnggered the development of PZM's.

The prototype PZM first saw the light of day in May, 1978, so with this issue of the PZMemo we celebrate a 4th anniversay. From a very primitive beginning with the models roughly assembled, the acceptance has been phenomenal. The universal enthusiasm and reaction to something quite different by recording engineers in reinforcement, radio and television has been delightful to observe.

When we realize that there has been more than fifty years of exploration, use and study of free field microphony with much literature including textbooks on the basics of microphone construction and use even with particular instruments, we realize there are many interesting and exciting research and writing projects ahead.

Who will explore the best way to mike particular instruments with PZM's? Who will research the most realistic symphony or opera recording methods with PZM's? Who will test and report objectively on the difference between free field M-S classical recording and PZM M-S recordings?

Who will find the breakthrough to use the clarity of PZM's with parabolic reflectors for distance recording for sports? The youngster is forty-eight months old and still developing. Can anyone prognosticate where it will be in another year? Help it grow by sharing what you have learned.

The 3LVR, as with all PZM microphones, is based on all the principles of the Pressure Recording Process developed by Long and Wickersham. In this configuration, a small precision calibrated pressure capsule is mounted facing a boundary plate. The invention practically eliminates problems caused by comb filtering and results in remarkably increased sensitivity and reach. The design also provides a hemispherical pickup pattern, based on the boundary, with no off-axis decrease in sensitivity.

The 3LV, a companion introduction to the 3LVR. is a single-mike version of the 3LVR and is an efficient investment for voice reinforcement in situations where the redundancy of the 3LVR may not be necessary. The 3LV is also available in black or champagne and can be used with existing PZM "L" type power supplies. active or passive. or with optional L" adapter into any Crown PZM supply.

Both the 3LVR and the 3LV includes built-in clip which fastens to fabric or any other thin support. Neckties or lapels are ideal mounting surfaces. Because of pressure-zone properties and sensitivities of the PZM design, either mike can be mounted under neckties or other parts of clothing with little loss of signal quality or clarity.

The PZM-3LV [now the CM-10] is now available from Crown inventory, and demo units have been sent to dealers. The 3LVR is expected to go into production in August, with literature for both units available at about the same time.

PZM CHALLENGE 1982

We are pleased to devote much of this issue of *PZMemo* to reporting on the 1982 PZM Challenge contest which was developed by Crown as another way (in addition to *PZMemo*) of sharing PZM technology.

The beginning

On February 1,1982. Crown mailed to all names on the *PZMemo* mailing list, to all PZM dealers, and to editors of professional audio magazines a notice of the PZM Challenge, which was actually two contests. The “Open” Contest could be entered by anyone except Crown employees and their families. The other was a Crown “Dealer” contest, open only to Crown dealers and their employees.

Entrants were asked to submit excerpts from original stereo recordings made using two or more PZM microphones as the principal pickups.

The categories

Three categories were established in each contest: classical, popular and environmental sounds. Unfortunately, no entries were received in the environmental category: we can only speculate that PZM users have been having too much fun recording musical events to pay attention to sound effects.

Prizes were established for each category in each contest, with a grand prize to be selected in each contest. Provision was also made for honorable mentions to be awarded to those entries which, in the opinion of the judges, were of more than average interest.

39 entries

The contest closed on May 1, 1982. with a total of thirty-nine entries received. Each entrant received a T-shirt decorated with a PZM Challenge emblem. The entries were well distributed among dealer and open, popular and classical.

The judging

Judging took place on May 6, 1982, in a room especially equipped for accurate playback, with the speakers carefully positioned and equalized. Special care was taken to prevent the judges from knowing whether entries were submittted on cassette or reels. It is interesting to note that no cassette entry won prizes or honorable mention.

The judges were:

Greg Bogantz, Engineer, RCA Records, Indianapolis. IN. Greg is in charge of disc mastering technology for RCA and has spent many years of careful listening and engineering in the recording field. He is a graduate of Purdue University.

Michael Stoll, President, Reproductions Technology, Inc., Elkhart, IN. Mike is the founder of RTI, a manufacturer of industrial reel-to-reel tape recorders, and a recording engineer with several discs to his credit.

Robert J. Pickrell, Manager, Elkhart County Symphony Association, Elkhart, IN. Bob has been involved with the production of musical events for most of his adult life and is currently in his 13th year as manager ofthe Elkhart County Symphony Association. He is a graduate of Chicago-Conservatory College. Chicago, Illinois.

The criteria

The basic criterion for judging was the perception by the judges of the fidelity of the recording process. Given the musical production and the aims of the recording engineer, did the recording provide a faithful rendition of what was actually going on during the performance? Music content and the quality

of the performer's skill were specifically ruled out at criteria for judging.

The judges listened for such qualities as balance, closeness or distance of various performers, mix, bandwidth, clarity and ambience.

A second major criterion for judging was the degree of creativity shown in the use of the PZM microphones. Entrants were asked to submit miking diagrams along with their tapes: after listening to each entry, the judges were shown these diagrams.

The scoring was on a scale of 1 to 10 (high), individually by each judge, with scores totaled independently by Crown's advertising and public relations agency.

The winners

Grand prize and open popular category: David C. Jensen, Sparks, Nevada, for a recording of BUZZARD'S ROOST at the Hilton Opera House Stage, Reno, Nevada.

Open classical category: Larry Glenn, Eau Claire, Wisconsin, for a recording of the Christmas Concert at University Arena, Eau Claire, Wisconsin.

Grand prize and dealer classical category: Chet Hall, Canal Winchester, Ohio, for a recording of the Columbus Symphony Pops Concert, Batelle Hall, Columbus, Ohio.

Dealer popular category: Alfred B. Grunwell, Ithaca, N.Y., for a recording of the Covenant Love Community Chorus and Orchestra. "Before His Majesty The King: at Calf Audio, Inc., Ithaca, N.Y.

Honorable mention: Tres Virgos Studio (Gerald E. Jabobs, owner) on behalf of Tamarin Productions, San Rafael, CA, for the instrumental tracks of an A-V presentation prepared for Bank of America.

Honorable mention: Michael E. Lamm, Houston, Tesas, for a recording of the Texas Chamber Orchestra at Galveston Opera House, Galveston, Texas.

Honorable mention: Joe Bidwell of Autograph, Incorporated. Tucson, Arizona, for a recording of "I Smile (But You Know It Ain't Easy)" at Autograph Studio, Tucson, Arizona.

Our heartiest congratulations to each and every winner, and our deepest thanks to all who entered the contest.

BUZZARD'S ROOST (Grand Prize, Open)

The group plays good bluegrass. As this session, the performers were:

Steve Carlson Dobro

Joe Craven III Mandolin

Steve Davis Banjo

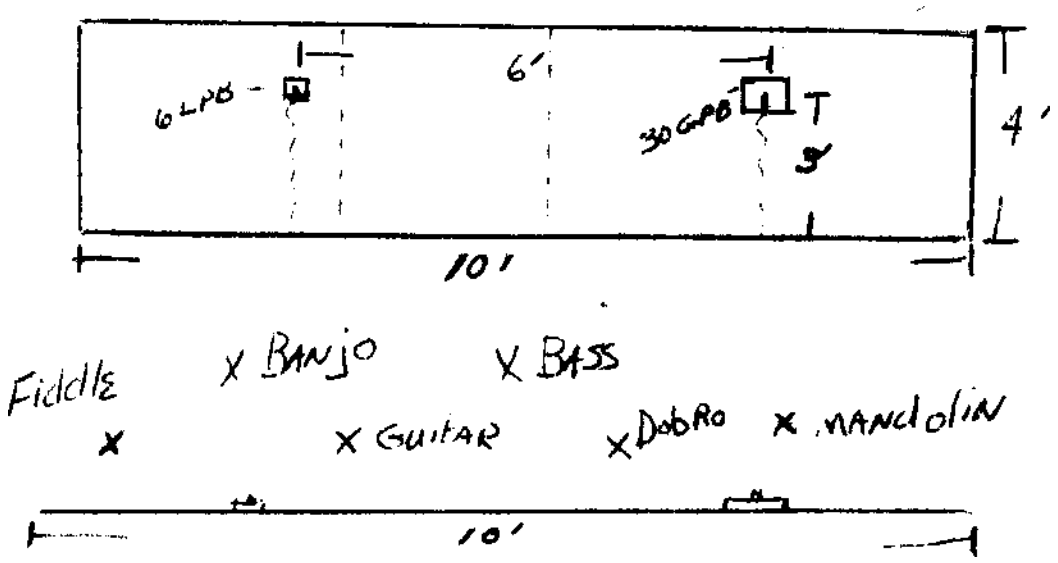
Charlie Edsall Guitar

Bob Erlich Fiddle

Julie Smyers Upright Bass

The recording was made on the stage of the Hilton Opera House in Rena, Nevada, on February 21, 1982. Dave Jensen, the recording engineer, had set up plexiglass sheets to form a boundary four feet high and ten feet long. Two PZM mikes (a 3OGP and a 6LP) [now the PZM-30D and PZM-6D] were attached to the boundary six feet apart and three feet above the floor. This mike "stand" was then placed ussstage center (the stage is sixty feet wide by fifty-five feet deep).

The performers then faced the boundary and the back of the stage. A typical placement is shown below:



Buzzard's Roost mic setup

The PZM mikes were phantom powered from a Yamaha PM-1000 mixer, panned hard left and right, flat channel EQ, no effects, into a TEAC 35-2 half-track recorder, 15 ips, dBX encoded. The entry tape was a copy from thc master.

As the readers of PZMemo can appreciate, this is an unusual set-up. Jensen also decided on one additional trick that really made this an outstanding recording. The mix during the performance was physical; that is, the performers moved forward and back to develop the needed emphasis. The mixer, once set for a performance, was not changed in any way. The judges recognized this creative use of the PZM mikes and the top-notch quality of the recording. We're glad he decided to share it with us.

COLUMBUS SYMPHONY (Grand Prize, Dealer)

On the evening of March 27, 1982, Mitch Miller conducted the Columbus Symphony Pops Orchestra in a performance which included the Dance of the Comedians by Smetana. The place was Batelle Hall, Ohio Center, in Columbus. The large auditorium (250 feet by 150 feet with a 40-foot ceiling) is in a multi-purpose structure and is capable of seating over 3,000 people.

Chet Hall, the recording engineer, obtained permission to reeord the concert with the aid of PZM mikes. He used two PZM6LP's [now the PZM-6D] mounted on 24' x 30' plexiglass plates, 1/4" thick. The plates were strung on aircraft cable, twenty feet apart and fifteen feet up over the conductor.

The mic signal went to a Tascam board/D-out to Tascam 35-2B 1/2-track recorder, Ampex 456 tape at 15 ips.

Again the judges were impressed with the realism of this recording and particularly with the good balance and ambience resulting from the mike placement, which fairly represents an ideal for PZM miking of orchestras. All of the Symphony's eighty pieces were clearly heard and accurately positioned.

A CHRISTMAS CONCERT

(Category Winner, Open Classical)

The Department of Music of the University of Wisconsin at Eau Claire presented a Christmas Concert at University Arena in Eau Claire on December 6 and 7.1980. Larry Glenn was asked to do a recording for the record and elected to use two PZM 3OGP's [now the PZM-30D] as a selected pair mounted on the underside of a steel beam near the ceiling. The mikes were approximately 25 feet above the performers and positioned 12-feet to either side of the conductor. Principal works performed were THE STAR OF BETHLEHEM by Josef Rheinberger and NEW YEAR'S SONG by Robert Schumann.

Of particular interest on this recording was the excellent separation of soloists. orchestra and choir. Balance and distance information provided an accurate spatial picture of the performance, ranking this as one of the best of the entries.

BEFORE HIS MAJESTY THE KING

(Category Winner. Dealer Popular)

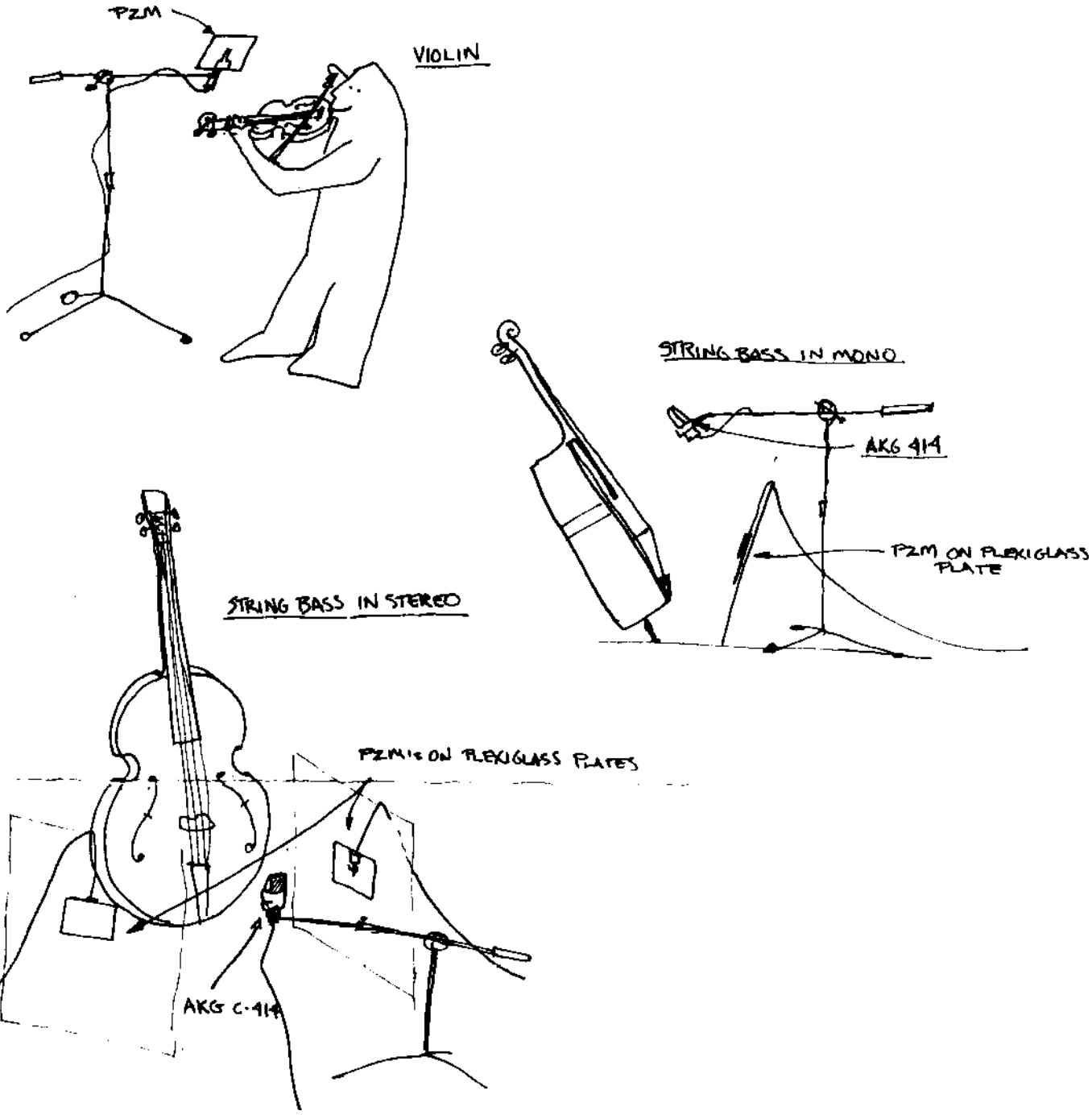
Alfred B. Grunwell works for Calf Audio, Inc., in Ithaca, New York. The tape submitted to the PZM Challenge was a copy of recordings by the Covenant Love Community (producers: Lynn Nichols and Peter Hopper) for an album planned for release this summer.

The balance of this report is made up of quotes from Grunwell's notes accompanying his entry, plus some delightful sketches he made to show us how he used PZM as the principle mike for this recording.

Covenant Love Community (Notes on the Recording)

"Recording was done in as large chunks as possible: i.e., drums, bass, acoustic piano, and rhythm guitar were recorded simultaneously when possible.

"All choruses and instruments were recorded in stereo whenever possible. The project wanted to be as 'big' and 'spacious' as possible.



"Before His Majesty The King" mic setup

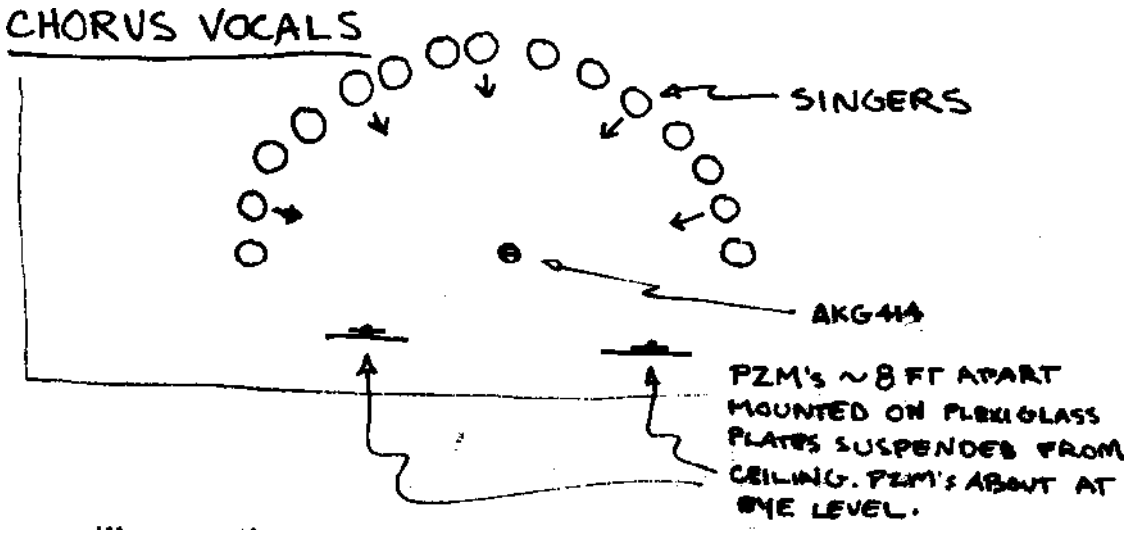
"Most effects were added during the mix, including but not limited to compression. phasing, flanging, doubling, echo, reverb, etc. A dramatic sound was sought but not at the expense of the music or the message.

"PZM's were chosen and used whenever possible because of their open, airy sound, Ours is a small studio by big-boy standards and this helped overcome the problem.

“Baffles, goboes and separate rooms were NOT used in this recording. Hence there is a ‘bleed’ from the drums onto the piano track, for example, but this was not felt to detract from the feeling. And since with the PZM’s the pianist could play with the rest of the group at the same time, a more musical performance was achieved.

“For the ‘Distance’ PZM, it was stuck up an elevator shaft we have, to increase the space on certain instruments.

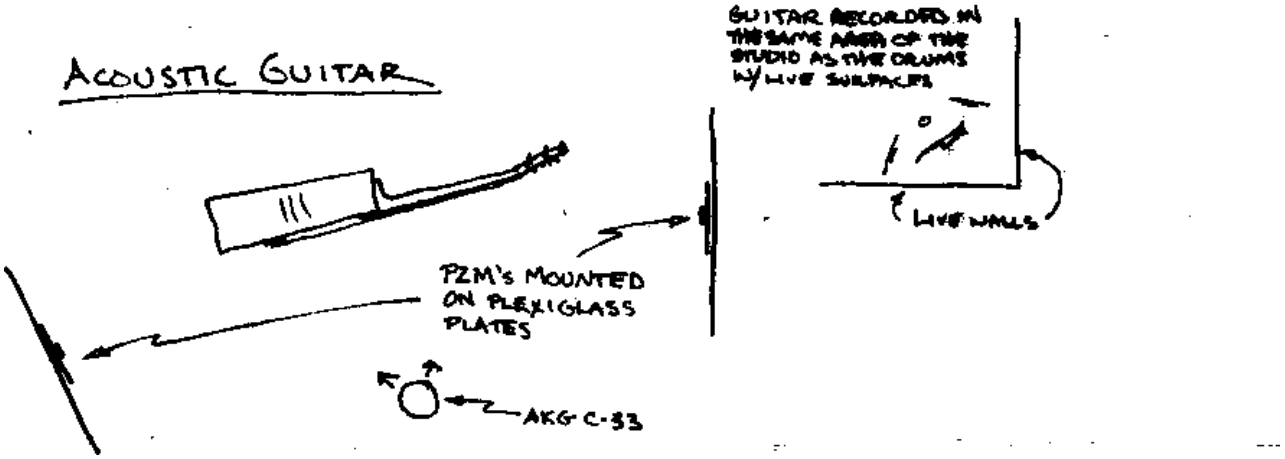
“Equipment Used: Board: ADM 3216. Machines: Ampex MMIOOO, ElectroSound ES505. The machines run at 30 ips, Ampex 456 Grand Master, EL +9 level, NO NOISE REDUCTION. The clients loved the combination of PZM’s, UREI 811 time aligned monitors, 30 ips and no noise reduction. The master mix is very open and spacious sounding.



“His Majesty” mic setup.

“Other ancillary equipment: Inovonics Dynex, Orban Stereo Synthesizers, Orban Controller, Orban Parametric EQ, Orban Stereo Limiter, UREI 1176 Limiter, dBX 160 series Compressor, IRPS DDL, Lexicon PCM 41’s, UREI Little Dipper, AKG BXIO, etc.

“Our mikes included two Wahrenbrock Original Prototype PZM’s (048, 049) and a Crown 6LPB. We borrowed a Couple of other 6LPB’s for this project. We also used a number of conventional mikes as indicated on the sketches.”



“His Majesty” mic setup.

Recording Engineers: Alfred B. Grunwell, J. Todd Hutchinson. Mixing Engineers: ABG, JTH with producers Peter Hopper and Lynn Nichols.

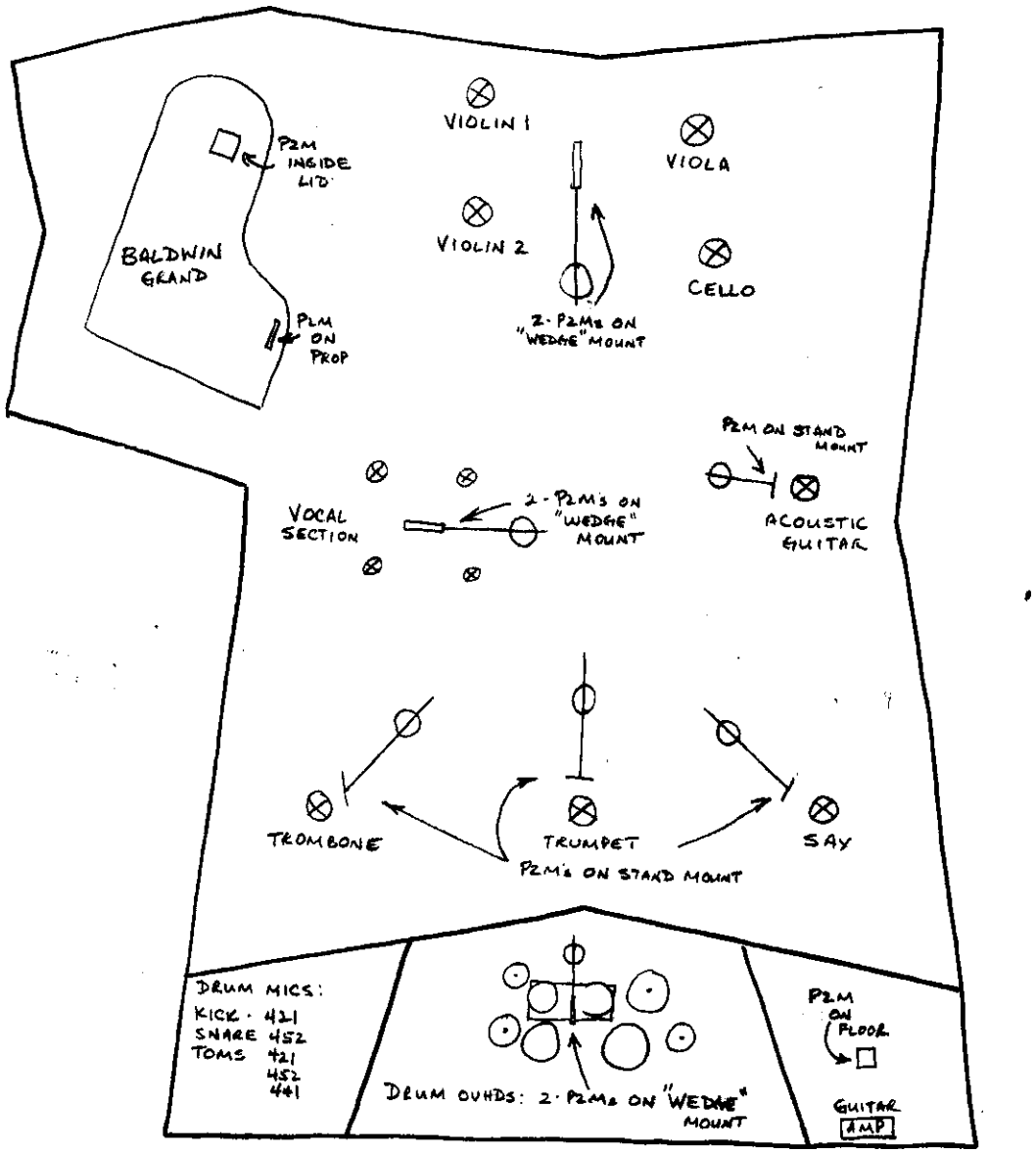
Recorded and mixed at Calf Audio, Inc., Ithaca, N.Y. 14850.

TRES VIRGOS

(Honorable Mention)

The entry submitted by Tres Virgos was recorded as the instrumental track for an audio-visual presentation prepared for the Bank of America.

Jerry Jacob. owner of Tres Virgos. prepared the entry forms which accompanied the tape and included the sketch which says all we need to know about the methods used to achieve the quality sound coming from Tres Virgos. Note especially the piano concept. in which a PZM is mounted on the stick, facing into the treble strings. as well as another PZM inside the lid above the far end of the bass.



Tres Virgos mic setup.

All PZM mikes were 3OGP [now the PZM=30D], and the inputs were mixed on an MCI 528B console which had been modified with Aphex VCA's and custom interface circuitry and were recorded for this performance on an MCI JH-24 16/24 Master Recorder which also had some custom interface circuitry added. Engineers (record and mix) were Ed Bannon and Robin Yeager, assisted by Robert Missbach. Producers for Tamatin Productions were Tom Donald and Jerry Jacob.

"I SMILE (BUT YOU KNOW IT AIN'T EASY)"

(Honorable Mention)

This song. written by Ky Fleming and Dennis Morgan, was recorded exclusively with PZM mikes (except for the drum kit) in early 1981 for BIRC records and remixed br the PZM Challenge in February, 1982.

Joe Bidwell, the engineer, added a comment to his outline: "The disc made from this recording (BIRC 0490) received substantial play on Tucson station KIKX. While the mix was done with AM broadcast in mind. the record seemed to have more 'presence' than other records at the station. I attribute this, at least partially. to the extensive use of PZM's."

The performers and mic techniques are as follows:

Lead Vocalist: Erin Brooks

A PZM 2LV (61138) was affixed to a 2'x2', 1/8" plexiglass plate mounted on a mic stand. Erin worked about 12" from the mic. (This is a recent overdub. The original 3-81 recording used a 6LP in the same configuration.)

Drums: Dennis Fridkin

A PZM 3OGP [now the PZM-30D] was placed inside the bass drum, face-up on a pillow damper. Other mikes were conventional.

Bass: Johnny Lange (Autograph Salesman) A Music Man instrument

direct-in.

Piano: Duncan Stitt

A 31S [now the PZM-30D] was mounted on a 2'x2' plexiglass surface and used 2' from the back of the soundboard of a Baldwin Hamilton.

Guitar: Don Shipley

A 6LP [now the PZM-6D], on a 2'x2' plexiglass plate, was used 12" from the Gibson "Country Western" (circa 1963).

Strings: Don Demer Quartet

A 31S [now the PZM-30D], mounted to a 2 x 2 plate. was suspended ahove the section on a mike boom and adjusted for balance. The players sat in a 6' circle: the mic was placed at a 7' height.

Steel Guitar: Rich Brennion

A 31S [now the PZM-30D] was placed on the floor, 12 inches in front of a vintage Gibson amplifier (circa 1938) with the original field-coil speaker. Rich played a Z-B instrument.

"I Smile" vocal mic technique.

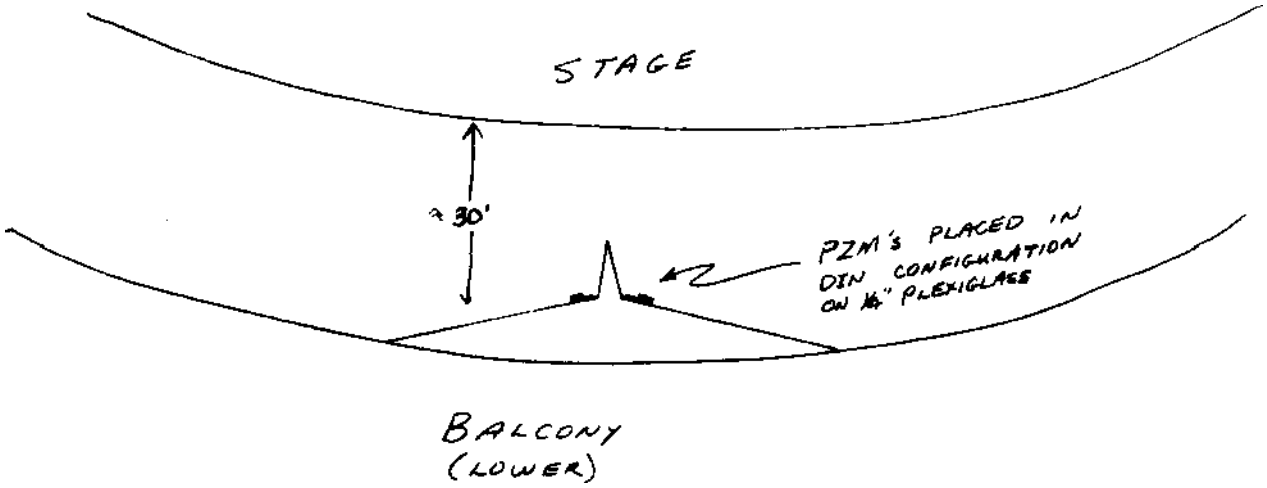
Backing Vocals: Connie Warren, Lucy Billings, Erin Btrooks.

A 6LP [now the PZM-6D] on 2'x2' plate was used as shown in the above photo. Notice that the music was placed behind the plexiglass.

TEXAS CHAMBER ORCHESTRA

(Honorable Mention)

On the 28th of March, 1982, the Texas Chamber Orchestra played a program of classical music including Handel's CONCERTO GROSSO, J.S. Bach's Concerto in A Minor for violin, Beethoven's KONZERT SATZ FOR VIOLIN AND ORCHESTRA, and Mozart's Eine Kleine Nachtmusik. The Galveston Opera House, where the performance took place, has a lower balcony whose face is approximately thirty feet from the front of the stage. Michael E. Lamm, recording engineer, was asked to make a tape for the record and placed two PZM-150's [now the PZM-6D] on plexiglass plates on the face of the balcony in what Lamm characterizes as a DIN configuration (see sketch).



Texas Chamber Orchestra mic technique.

The judges noted an exceptional stereo balance and clarity but also a somewhat higher level of audience noise.

# # #

PZM MEMO

November, 1982
Ken Wahrenbrock, Senior Editor

PZM AS A LAVALIER

Last month, producer Elliot Redpearl and engineer Chris Cassone hit upon a really novel and unusual way to use the PZM.

During the "Rocky" recording session for Rumpelstiltskin Productions, Cassone and Redpearl decided that the U-47 they were using on Rocky's vocals was not demonstrating enough of Rocky's dynamic vocal presence. They tried placing the PZM in several different positions, when Cassone finally suggested taping the PZM to Rocky's chest.

Redpearl and Cassone walked into the studio where Rocky was waiting for instructions. Without warning, Cassone started to take off Rocky's t-shirt. As Cassone ran gaffers tape around his chest, Rocky said, "I don't believe you're doing this."

"I don't believe you're letting me," was all Chris could say.

After a take or two, we found that the PZM was not breathing with Rocky; Cassone then borrowed a

pair of suspenders and taped the PZM to them (photo enclosed). The sound we finally recorded was rich, deep, and full of life.

The PZM, when used this way (in conjunction with conventional miking procedures), yields more presence and vocal nuance than any other method we've ever tried or heard of.

We'd be glad to hear your comments. Either Elliot Redpearl or I may be reached at the address below.

Sincerely,

Judy Katz

Director, A&R

Rumpelstiltskin

New York, NY

CHOOSING A MICROPHONE

An excerpt from an article In THEATRE DESIGN & TECHNOLOGY, Winter, 1981, by Rollins Brook.

"Our last acoustical type is the Pressure Zone Microphone or PZM. The PZM is a new concept only three years old. It is probably the first really new microphone principle since the discovery of the acoustical cardioid in 1936. The PZM doesn't even look like a microphone. It is a small metal plate upon which is mounted a small block with an XLR connector in one end. The microphone element (a condenser) is less than ¼" in diameter and is mounted facing the metal plate with only a few thousandths of an inch space between them. With the element so mounted, there is no such thing as on-axis; all the sounds reaching the rnicrophone will come in scooting along the mounting plate in what is known as the boundary pressure zone. (For those who would like to know more about the technical whys and wherefores, Crown, the manufacturer of PZM, will gladly send a stack of literature.)

"For our purposes now, let us consider the product of this new technique. First, the PZM is rarely mounted on a mic stand. It goes on the floor or on the ceiling or on a set wall or attached to the piano lid or some other large flat surface. Its pickup pattern is hemispherical - one half of an omni. Most importantly, it has no off-axis coloration.

"The PZM is still too new for us to know all its capabilities and its shortcomings. We still must develop proper techniques of use to realize all its advantages. But at this point, three years after its introduction with over 4,000 units in use around the world, it appears that we have a major addition to the world of microphones."

ASHLAND, OREGON, SHAKESPEARE FESTIVAL USES PZMS FOR SECOND YEAR

(See article in February, 1982 *PZMemo*.)

KSOR National Public Radio Station at Southern Oregon State College in Ashland has been broadcasting the opening night performance of the annual Shakespeare Festival live since 1977. They were taping the show for later broadcast many years before that. They also make the broadcast available on satellite for other NPR stations all over the country.

Through the years they have constantly improved their pickup of the Festival so that the listeners can sense the realism and the crowd ambience. They have also added features like "Stump the Experts" and introductory music to add to the interest and enjoyment of the radio audience.

last year in an attempt to fill in some of the holes in past years miking and wishing to improve the pickup for radio audiences all over the country, they tested PZMs. Since the Festival is in an Elizabethan outdoor unreinforced theater, the microphones had to be invisible. PZM-30GPs [now the PZM-30D] were used for the stage floor front and 6LPs [now the PZM-6D] were used in several spots. The reaction of staff and audience was very positive. The articulation pickup of the cast had improved several orders of magnitude. Reports from other stations carrying the broadcast were highly complimentary.

This year, as they prepared to cover the Festival, they sought to build on last year. They used 6S cantilevers which were concealed behind posts and scenery to give the added reach of PZM-2 and PZM-3 formats [discontinued], plus some 2-1/2's and 2LVs for announcers and music. A special 4-way was used for the panel presentation.

KSOR is also expanding their studios and will be using PZMs for a weekly children's program which they produce and distribute over the 2nd largest satellite translator network in the nation. Many of the translators are solar powered. Gina Ing is the Director of Resource Development and John Baxter is Program Director.

KW

PZM TESTED BY AMERICAN RADIO THEATRE

David Krebs, president of the ART, served as recording engineer for a series of tests of the PZM microphone and as author of the test report. The tests were run to determine "applicability and feasibility of. . . PZM microphones in the recording of human voices and sound effects for stereo radio dramas."

In the tests, which were conducted from December of 1981 through March of 1982, PZM-2-1/2s [now PCC-160] were used adjacent to each other (developing a pickup pattern analogous to the coincident crossed pair configuration used with conventional mikes). In several of the tests the angle of separation of the two mikes was varied (see sketches).

Krebs reported: "The PZMs seemed to perform quite well. It was noted that the stereo field made the listener much more aware of the room ambience and size, and that it would be necessary to investigate ways of improving off-mic effects. WKYU-FM recently purchased two PZM microphones. In getting to know them we have tried a number of configurations for studio and remote use.

In monaural, off-mic is achieved by simply turning one's head into the dead area of the microphone being used. With bidirectional ribbon mics or cardioids, this is a simple matter. With PZMs it is necessary to combine physical distance with a motion into the dead area to realize the same illusion of character motions in a radio play."

Copies of the complete report will be sent free of charge to station engineers who request it on their letterhead.

PZMs on PLATES

WKYU-FM recently purchased two PZMs. In getting to know them we have tried a nuber of configurations for studio and remote use.

Recently we decided on 20-inch diameter plexiglass discs on which the PZMs would be mounted for remote band and ensemble pick-ups. Since we also use the PZMs in other configurations we needed a quick and safe way to mount the mikes on the plexiglass.

After consideration of a number of alternatives - drilling and threading, double-face tape, etc. - we tried contact cementing Velcro strips to the back of the PZM plate and the face of the plexiglass disc. Two five-inch long strips have been cemented to each plate with corresponding strips cemented to each disc.

The Velcro is holding the mikes firmly, is not bad looking, and makes mounting the mikes a quick and simple process. The whole process cost about $1.50.

David T. Wilkinson, WKYU-FM, Western Kentucky University

AETNA TELECONFERENCES WITH PZM

COMMUNICATONS NEWS carried a story in its May issue on a new teleconferencing system being developed by Aetna Life and Casualty, Hartford, Connecticut. Although the system will eventually be national in scope, its beginning links are between Hartford headquarters and a data processing build-

ing eight miles away. Four rooms, two at each site, are currently in operation, saving the company a great deal of travel time and expense.

Each room is designed for six people, with a PZM microphone installed on the central wedge-shaped table for each seat and a seventh mounted on the back wall. The publication notes: “The Aetna system appears to be a success.”

Richard Jackson, manager of teleconferencing and technical communications for Aetna, is quoted in the article as saying, in part: “If you do decide on teleconferencing in any of its forms... treat the audio correctly and make your first use a suceessful one. Don’t short-change yourself so your company’s first move into this technology is a bad experience... do it right the first time.”To which we can only add, “Amen.”

The Aetna system was also described and pictured in the July, 1982, issue of MANAGEMENT REVIEW, as part of a major article reviewing teleconferencing. The article suggests that designers of teleconferencing systems need to work closely with corporate managers to make sure the systems match corporate needs. MANAGEMENT REVIEW also points out that not all conferencing will be adaptable to electronic interfaces; but where properly designed and used, it can contribute significantly to more efficient communications.

The Aetna teleconferencing rooms have been awarded an “Excellence in Sound” award from Altec Lansing. Although the PZM microphones are clearly visible in the photos included in the printed brochure prepared by AL, no mention is made of them in the equipment list. Naturally. But M & S Sound Company, who was contractor for the installation, wrote us a nice letter in which they said: “Through extensive research we came to the conclusion that PZM was the only way to go in the Aetna.”

Thank you, M&S.

AN ITALIAN VIEW OF PZM SOUND QUALITY

FARE MUSICA, an Italian magazine, recently carried an article on PZM microphones by Darin Massari. The author reviews the history and development of the microphone in some detail and includes in the last section of his article several ideas on how to use the PZM. Some excerpts:

“The PZM is one of the purest and finest things you ever saw... “Let us now look at the best use one may make of it.

“Voice: at a distance of 30cm (11.8”), the voice is perfect, requiring no adjustment to meet the natural timbre; it also carried dynamic forti without yielding in the least.

“Piano: a PZM at 5cm (2”) from the strings gives a beautiful sound indeed, natural, very limpid.

“Guitar: excellent also at 30cm in front of the body, with a very good, natural equilibrium of timbres and optimum crispness in the highs.

“Good with an electric guitar, placed 30cm away on the floor or farther away with an amplifier.

“Drums: outstanding performance . . . at 30cm in front on the floor . . . optimum presence and an enviable ‘punch.’

“Cymbals: one of the most natural and subtle you may have ever heard; delicate but cutting, fine and bright, very well defined.

“And finally, also very good with bongos . . . one of the few to succeed comfortably in rendering this very percussive sound.”

PZM SOLVES TV RECORDING PROBLEMS FOR HOSPITAL

The Butterworth Hospital in Grand Rapids, Michigan, produces six times a year a TV teaching film called “Nursing Grand Rounds.” The film is taped in a 327-seat auditorium and involves a panel of nurses discussing a particular patient whose course of treatment is followed in some detail to help other members of the hospital staff understand a surgical procedure or course of treatment for a specific disease. Following the panel discussion, the panel answers questions from the audience.

Richard Buist, biomedical communications coordinator for the hospital, reports that before PZM, the panel had problems sliding mikes up and down the table, or tripping over too many cords, or losing the sound as they went to a blackboard to diagram an answer to a question. Audience questions were also very difficult to obtain on the tape with the usual difficulties involved in passing hand-helds around, etc.

PZM has solved all of those problems for Butterworth. One PZM mike on the table picked up all of the presentation and was even successful in handling audience questions. Dick has found, however, that the audience can he picked up more easily from a separate PZM mounted on a light pole some distance above the heads of the audience, and aimed out at them.

Dick asked us to extend our thanks to Audio Distributors in Grand Rapids for putting him in touch with PZM, which we are happy to do. Thanks, A.D.!

SOUNDING OUT PZM MICS IN THE THEATRE

We purchased three PZM microphones in November, 1981 for our production of The Sound of Music. They worked much better than any other mic arrangement.

The only real problem we encountered, and one that should be remembered, is that the amplification system was not good enough to use these to their full potential. Our theatre is large (1,364 seats) so to use them the gain had to be quite high, which leads to problems with feedback. I feel that given a good amplification system with anti-feedback control, these mics will become the theatre microphones of the near future. Their placement in a production setting is covered fully in the free Crown literature, and these methods do work. Purchase of the mics includes a subscription to the *PZMemo* — a useful publication permitting dialog between Crown and users of their equipment.

Though they will not solve every miking problem, the advantages of the PZM's appearance, ease of setup, resistance to physical damage - far outweigh the disadvantages.

Peter Haentzschel, Technical Director, Wayland Baptist University, Plainview, Texas

Reprinted from the THEATRE CRAFTS Magazine, May, 1982.

PZM PYRAMID FOR THEATER USE

In response to Daniel Minnich's question on the use of the PZM Pyramid (PZMemo, February, 1982), I have employed several methods in order to obtain fantastic stage reinforcement for musicals. Our production company just finished a run of the musical, "Grease." I used three pyramids, two spaced 28 feet apart, the other upside down as a center fill. PZM-6LPs [now the PZM-6D] were used and the mix was great.

An upside down pyramid placed twenty feet high should provide excellent reinforcement for center channel fills. We have made several excellent recordings using this method. I would also suggest that moving the speaker clusters may reduce any ambient interference. Good luck!

Robert S. Yablans, Technical Director, University of Denver Miracle Theatre Company, Denver, Colorado

MORE ON THE PYRAMID

Here from the Editor are dimensions for some of the experimental versions of the PZM microphone that we have been trying out. We would appreciate hearing if anyone has tried different dimensions or angles with improved results (or worse! even knowing what not to do with PZM could be helpful.)

The pyramid is made of three equilateral triangles (remember those from your high-school geometry? Same dimension on all three sides). The simplest way to build them is to have three pieces of acrylic plastic cut to size and glue them with an acrylic cement along the three sides; the bottom (or top, depending on where you're standing) will be open. Remove the cantilever of a 6LP [PZM-6D] and mount it at the apex of the pyramid, opposite the open end, with the capsule end of the cantilever pointing into the apex. The cord will come out the open end and can be taped to the outside of the pyramid to avoid stressing the connection with the cantilever.

I have used both 12" triangles and 18". My own experience has been that the 18" pyramid has better response and a tighter pickup.

I am currently experimenting with some 36" triangles for recording organ music. Will let you all know how they work later.

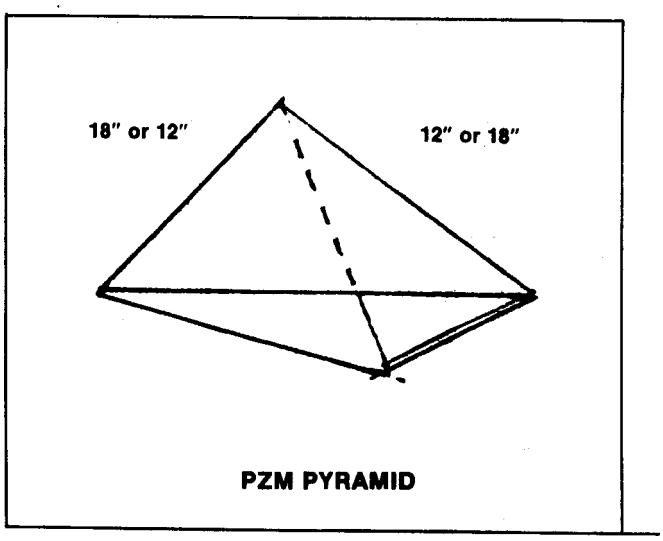


Fig. 1. PZM Pyramid.

PZM-3

My preferred configuration for this is shown in the sketch. Again, the simplest material for construction is acrylic sheet, but almost any sheet material will do. Note that the cantilever is mounted with the capsule nestled into the angle.

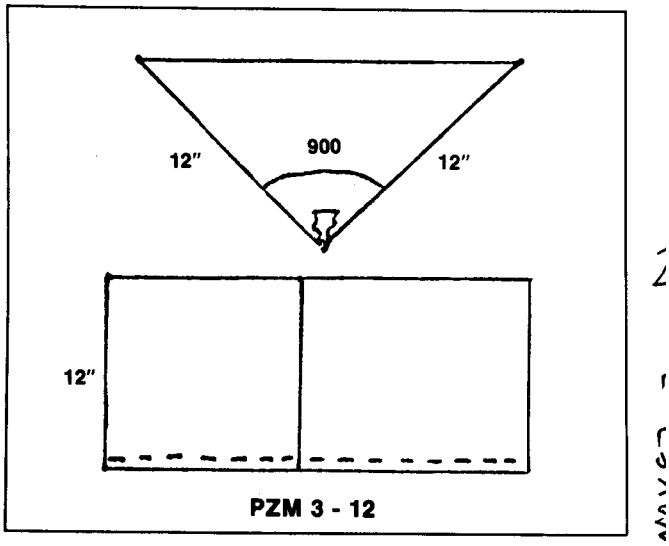


Fig. 2. PZM-3-12.

PZM 2-1/2 [now replaced by the PCC-160]

I have used both 12" and an 8" version of this style of PZM, which differs from the PZM-3 [discontin-

ued] only in the angle of back plates. Either of these two can be used for stereo pickup such as is detniled in the report from American Radio Theatre (see elsewhere in this issue).

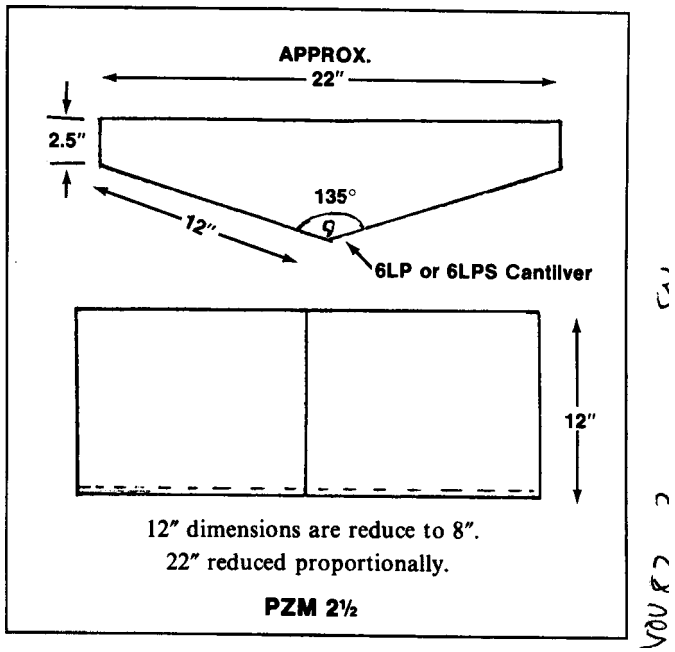


Fig. 3. PZM-2-1/2.

The 2-1/2 is especially becoming an accepted configuration for front of stage pickup for dramatic or musical events, since it is directional and does screen out audience noise. Work is continuing with our staff in California and at Crown headquarters in Elkhart to determine the best configuration for this and to determine the operating characteristics of the 2-1/2. We will, of course, publish the data as soon as it is available.

MORE ON DRUM KITS

In a recent recording session at the “Rock Shop,” David Moore and I were experimenting to find an open, punchy snare sound.

We found a great sound by taping a PZM-6LP [now the PZM-6D] to a “Maxi-Pad” and attaching the pad to the kick drum beater head. This gave us a great kick and snare balance with good tone for both. We added 3dB at 125Hz. With a reflective wall behind the drum kit, the entire set was surprisingly balanced.

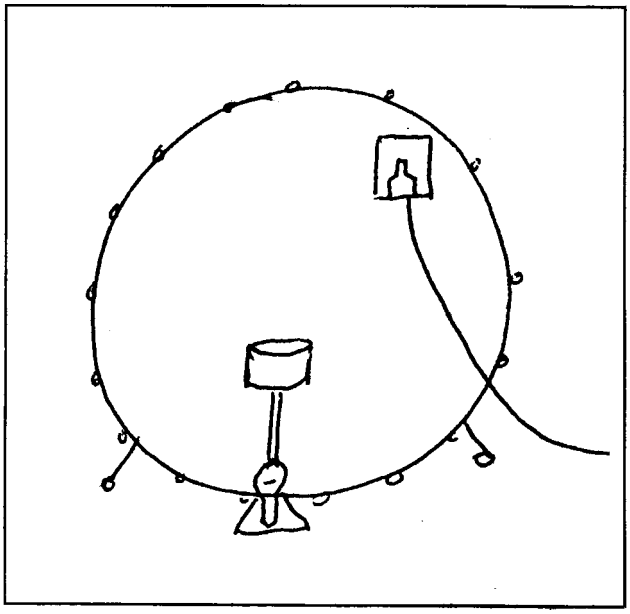


Fig. 4. PZM kick-drum miking.

J.Paul Hancock, AUDIO I/O, Norman, Okalahoma

A QUESTION OF VIBRAHARPS

Sirs:

... I have invented and am promoting this new instrument called Silver Harp which has no metal resonator tubes but employs a wooden acoustic body in the same way as a piano or guitar...! Have been wondering how the PZM microphone works if one or two are placed permanently inside the instrument. The main problem with using a regular condenser mike has been that the attacking sound of the mallet is so overbearing that this idea was not practical at all, but PZM microphone inside the body of the Silver Harp might solve many problems

Seiji Oshima, Newton, Mass

K.W.:

We are including this letter for two reasons. One, because it is an interesting problem in PZM microphony but also because it clarifies an important - and frustrating -problem in customer relations. We would certainly like to be able to send trial PZM microphones to everyone in the world of music who wants to try them out for one reason or another, but we are sure that our readers understand how big a problem this would he for us. So our message to Seiji, and to others like him, is to go to the nearest PZM dealer (we have already sent Seiji his list) and see if you can work out a trial with the dealer. Our dealers understand that you frequently must try out PZM to be sure it will work for you, and they may be willing to work out a trial purchase plan that supplies you with the mike you need without risk to you or the dealer.

Another possibility is for another reader in Seiji's neighborhood who may already own a PZM microphone to contact him and offer to let him use your mike for his testing. Helping members of the music industry to learn and prosper together is one of the reasons we publish *PZMemo*.

PZM USE IN TV

In most PZM applications, the biggest disadvantage has been the noise from lighting scopes, air conditioning, cameras and people moving off screen. The hemispherical pick up pattern hears everything. So the use of PZMs makes studio discipline to its uttermost a must, especially for the partici-

pants who will have to pay extra attention to paper rattling, finger tapping and what have you. On the other hand, the phase problems with two or more microphones is eliminated in a fine way. Also, it seems as if the difference in level of voices evens out in a fine way. Although the PZM picks up noise from the studio it is a big question whether this noise is more acceptable than the noise generated from a multitude of Sony ECM-50's.

When it comes to music productions not much in the TV situation differs from the recording studio situation as far as ways to use the PZM - almost. But the tight schedules don't give us too much time for experimentation. And it is hard to get people to try something new when it is Neumanns and Schoeps they're use to. But I'll push on to make them try.

The greatest use of PZM in television I'm certain of is their use on special occasions. Because of its physical shape it can easily fit into a decoration. And because of its polar pattern it's ideal for use when a sentence is said back-to-the camera too far away for the boom to pick up or the camera shoots too wide for the boom not to be in the picture or making shadows on the walls.

Roald Thomesen, Bjornekollen 7, I 344 Haslum, Norway

HOW DO I MAKE MY PZM CARDIOID?

My field is film and TV sound recording . . . commercials, documentaries, news, and on oceasion, feature films.

My particular problem is this: Every once in a while, I am called upon to record, on VTR, a Broadway show... where absolutely no changes are made in the performance. We record an actual matinee performance, and I have to get the sound the best way I can with out disturbing the audience . . . or the performers!

Up to the time I bought the PZMs, I used condenser mics. putting them on short risers so that they projected about 3" above the stage in front of the actors. Everything was either black, or taped black so that they were not noticeable. Then I got the PZMs! Problem is that I want to phase the mikes so that they pick up the performance, and attenuate the noise from the audience.

So my question is. .. how can this be done? I want to make the PZM cardioid and reduce the hemispherical pick up to the front.ONLY!

I have used the mike on commercials where they have performed beautifully in a heavy wind ambience... and where I had to pick up both sides of an interview, where the announcer sat on one side of a picnic table and the people, on the other... the low profile and the pick-up ability of the PZM is just what I needed... plus it was windy tbat day, and not a bit of wind noise came through, although it was obvious because the hair of the women was blowing about, on camera.

Bob Rogow, BOB ROGOW SOUND, Massapequa, New York

Bob - Put clear plexiglass boundaries behind the mic capsule, with the "nose" of the capsule holder touching the boundaries. Or use a Crown PCC-160, which is a supercardioid boundary mic.

PZMs ON PANELS PICK UP CHURCH CHOIR LOUD AND CLEAR

Sirs:

Please add my name to your list of satisfied users of PZM mikes. As the sound engineer of Christ Covenant Church (Greensboro, N.C.), I face many difficult problems. Our pastor is a professional singer and demands quality sound. We are a small church, and every dollar spent must have maximum return.

I use PZM mikes for sound reinforcement, plus using the mix to make recordings. "B.P." (before PZM), we used five Shure SM 58s and one 5M57. Two of the 58s were for the front row of the choir, two for the second (6" platform), and the last 58 and the 57 for the tenor and bass sections on the last tier.

While it did work OK at times, it often caused great headaches. Many times, since the choir members are not used to working with microphones, they would stand just far enough behind the mikes to be

out of the response pattern. Sometimes whole sections of the choir dropped out. We could also never get enough gain without feedback and the choir lacked that natural ambience or “mix” that is so important.

After reading about PZMs in MODERN RECORDING AND MUSIC, and picking apart every piece of literature I could find on PZM, I stuck my neck out and declared that PZM would solve most if not all of our problems.

After ordering our microphones from Audio Unlimited (they are good dealers for Crown and have been helpful in every way), we purchased a new mixing board. Trying to sort out a new board and two new mikes is a story in itself; but after a little practice, good results were easy to obtain.

The PZM mikes are mounted, one on a 4x4 foot Plexiglas panel flown above the choir and slanted to favor the back rows, plus one on a 3x3 panel on a mic stand for the first row.

Wow! what results. Monitor gain can be run to the point of pain, pick-up is just short of phenomenal, and blend and ambience are very good. Another pleasant surprise is that our 25-voice choir sounds like a “cast of thousands.”

The only problem I have had so far is that during a live performance I don’t have enough time to get my recording mix set properly. During our last performance (the annual Easter program) the PZM mikes performed so well that I wanted Crown and all their staff to take a welideserved bow. Thank you for a quality product.

Bill Wood, Sound Engineer/Christ Covenant Church, Greensboro, N.C.

PZM ON HARPSICHORD

Don’t know of anyone in this area with comparable equiment. We have three PZM mikes, using them principally on harpsichord and voice.

PZM is particularly good on harpsichord, which has a terrific peak as the string is struck. This usually overloads any other microphone and results in a very scratchy tonality. PZM has a higher tolerance, and therefore produces a clearer recording.

F.Gardon Morrill, MORRILL RECORDING, Plorence, Italy

# # #

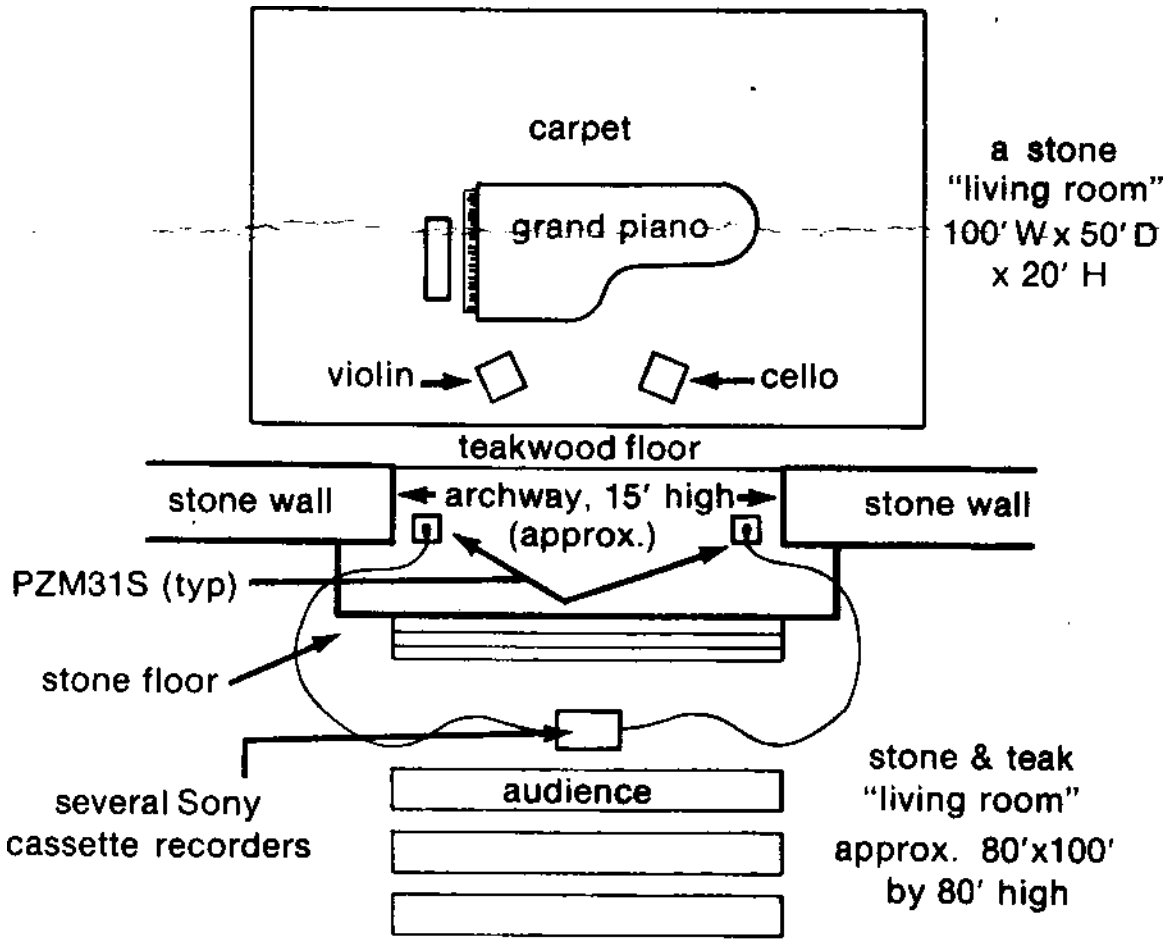
PZM MEMO

April, 1983
Ken Wahrenbrock, Senior Editor

RECORDING A SMALL CLASSICAL ENSEMBLE WITH PZMs

by Jon R. Sank

(Reprinted with permission from *Audio* Magazine, March 1983, p. 52.)



Sketch of recent PZM use at "GLEN CAIRN", Bryn Athyn, PA by Lachln Pitcairn. Musicians from Curtis Institute, formerly of Curtiss String Quartet.

My first hands-on tryout of the PZM in an on-site recording occurred during the Christmas season of 1981 at "Glencairn," the home of the late Mr. and Mrs. Raymond Pitcairn in Bryn Athyn, PA.

Each year since the residence was completed in 1939, a "Christmas Sing" is held in the Great Rail. This is a large room with an 80 foot-high ceiling. and up to 800 townspeople attend. Members of the Philadelphia Orchestra's brass section play in a smaller room which is joined to the Great Hall by a large stone archway. The building has handcut stone walls, with teak floors and woodwork.

The PZMs were placed about 8 feet apart on the stone floor of the archway. They did not sound as good when taped to the (very rough) stone walls of the arch. For comparison, RCA KB-2A "Paintbrush" velocity microphones were "flown" about 20 feet above the PZMs. Each set of mikes were then connected to identical Tandberg cassette recorders.

Lachlan Pitcairn, son of Raymond Pitcairn and an accomplished amateur musician, supervised the recordings. He had previously selected the conventional microphone type and placement. For this “Sing,” however, the contrast in setup labor was great: The PZMs were taped to the floor, with power supplies hidden in a niche and short cable running along the floor to the recorder. The “flown” mikes required some human acrobatics, plus long cable runs and balancing transformers at the Tandbergs to eliminate noise and r.f.i.

The PZM and conventional recordings sounded almost identical in the low and midrange frequencies, including the same mix of direct and reverberant sound. The PZMs sounded brighter in the highs, but the velocity mikes had falling response above 5kHz. I found it surprising that the microphones placed on the floor could sound similar to those overhead.

1983 PZM CHALLENGE CLOSES MAY 1 WITH MANY ENTRIES RECEIVED

The 1983 PZM Challenge is now entering the judging phase, with May 1 as the last postmark date for entries.

According to Gerry Barclay, Crown promotions manager, a number of entries have already been received, with judging scheduled for mid-May. Results of the contest wiil be announced in early June.

The 1983 Challenge is being conducted in a similiar fashion to the 1982 competition, with entries allowed in two separate contests: one for Crown dealers and their employees, and one for all other PZM users. Barclay emphasized that “this seemed the only fair way to provide some separation between PZM-experienced dealers and their customers.”

Entrants were asked to submit tape excerpts from original stereo recordings which were made using at least two PZM microphones as the main pickups. The tapes are being judged on fidelity of the recording process, overall sound quality and creativity in PZM use.

In addition to the tapes, entrants are asked to submit miking diagrams and other suitable sketches or photographs. These enable the judges to evaluate more closely such variables as mike-to-performer distance, ambience, mixing and balance. In the judging process, these plans and sketches are evaluated after the judges have first listened to the tapes and recorded an initial score.

Entries will be judged as either classical, popular or environmental with a prize in each category and a grand prize in each contest.

Category prizes will be a pair of PZM microphones, with the model to be selected from the expanding line of new PZM mikes introduced in 1982-83.

Grand prize winners will also receive a Crown home audio system consisting of an FM2 tuner, SL2 preamp and PL2 power amp, all in a handsome walnut cabinet.

The judges may also elect to award honorable mention prizes of $50.00 to entries deemed worthy.

STUDIO PZM USE

Well over 100 recording studios in the U.S. are now using PZM microphones.

PZM SHOWS OFF FOR RINGLING AND ICE FOLLIES

As reported in PRO SOUND NEWS, April and SOUND AND COMMUNICATIONS, April:

Future Sounds, Inc., of Weston, Connecticut won contracts to supply sound systems for Ice Follies, and for Ringling Brothers Circus for their 1982 seasons. In both systems PZM mikes were used to pick up live music.

Doug Donahue, president of Future Sound, said of the Ringling system, which includes 14 PZM mikes which streamlines the orchestra setup, “The greatest show on earth now has the greatest sound on earth.”

Donahue reports to us by phone that the Ringling bandmaster had been experiencing some difficulty in obtaining consistent sound as the circus traveled from city to city. Mike setups always seemed to be difficult to duplicate, with noticeable differences in sound.

Donahue solved the problem by drilling small holes in the PZM plates and fastening them to the band's music stands. Donahue says the bandmaster is delighted, the sound is consistent, "and the band plays on."

PZM ON DRUMS

"The seemingly non-restricted or non-confined frequency spectrum that the PZM has gives it the versatility that I have longed for in a microphone. The brights of the PZM make it the perfect overhead mike for a drum kit, while the rugged bottom end gives the user a perfect drum kick mike. With the time difference between the direct and reflected sound waves being so minute, this in-phase perfection seems to have no degree of distortion. I have never been more pleased with a microphone."

Christpher W. Eagan, Freehold, NJ

CANBY ON BACH - AND PZM

"There's always something new for me at the Oregon Bach Festival, where I've been taking myself each year after the long Eastern winters. In 1981, you may recall, I discovered an interesting array of PZM microphones.

"This year, somewhat to my surprise, the PZMs occupied different positions; the main miking was standard.

"The smaller pair of PZMs took on the hanging job; at half stage, facing backwards to pick up the chorus which sang on risers directly behind the orchestra. These mikes cope beautifully with the severe transients generated by loud choral forces; the wrong-side, non-response of the half-omni pattern cuts down audience noise and the flat response out to wide angles gives a sharp, clear definition in stereo. I suspect there is no better microphone anywhere for chorus.

"I discovered the larger pair of PZM squares in a brand-new location, hung far apart a few feet out from the rear boundary. So — PZMs for ambience? Good idea. Very wide angle, low distortion at the ambient sides and, again, minimum audience pickup from the rear. In one concert I got to sit about 10 feet behind one of these and found myself viewing the entire concert straight through the mike, like a large edgeless plate glass window."

Edward Tatnall Canby, Reprinted with permission from *Audio,* November 1982.

PZM REVIEW

Our thanks to Jon Sank for a detailed and thoughtful review of PZM microphones in the March 1983 issue of Audio magazine (see excerpt elsewhere in this issue on the "Glencairu" recording). Well worth tracking down and reading.

MORE ON DRUM MIKING WITH PZMs

"I use a PZM for the overhead on the drum kit. But I don't use it just for cymbals, I use it for high hat, all rack toms and the cymbals. I now use just three mikes in the kit. A 421 for kick, a 57 for snare and a PZM. Also very cost effective because it replaced four mikes I had been using. The PZM is mounted on a 1-ft x 1-ft plexiglass plate positioned just to the right of the drummer's head. This also makes sure I hear what the drummer hears. Even though I use the PZM with a five piece rock & roll band, leakage is not a problem because the leakage is not off-axis coloration. What leakage there is doesn't sound bad.

P.S. Drums sound great too!", Rande Ferguson, SECO LABS INC., Omaha, NE

PZMs FOR SOUND EFFECTS

“I am using the PZM-31 [now the PZM-30D] for recording sound effects for use in film and television sound tracks. I use it on everything from church ambience to car crushers. I have had good results so far and look forward to using it more.”

Fred Brennan, Sound Editor, MASTER’s WORKSHOP CORP.

NPR USING PZMs

We have just received a copy of the press kit distributed to NPR stations across the country from KSOR-FM, detailing the events of the OREGON SHAKESPEAREAN FESTIVAL, which is produced at Southern Oregon State College, Ashland, Oregon.

All of the releases mention KSOR’s use of PZM microphones for broadcast pickup, in a new sound system designed by Ken Wahrenbrock. Reports from participating stations indicate the sound was the best ever.

We hope to have photos and more details from KSOR to explain exactly what they did, in a later issue of PZMemo.

STILL MORE ON PZM DRUM MIKING

“On a recent album project we found the ‘standard’ bass-drum technique didn’t work. So, in conjunction with a Sennheiscr MD-421, we added a PZM mounted to 3’x4' Plexiglass plate angled out at the top slightly. Between the 2 mikes (50% each) we received the kick impact we were looking for.”

“Thanks! They’re great on most everything and perfect for many uses auditoriums, overall drums, etc.”

Rodger A. Bliss, RIVER CITY STUDIOS, LTD., Grand Rapids, MI

PZM FOR HARPSICHORD

“I have recently purchased one of your PZM-6LP microphones [now the PZM-6D] for use in sound-reinforcement situations where the normal volume of my harpsichord is insufficient to cover the acoustical environment in which I am playing. I also own Sennheiser and AKG microphones (dynamic and condenser), and I find that I get much better results with PZMs.

“In most situations I play harpsichord while my wife plays Baroque flute. She does not enjoy playing into anything of fixed position (like a microphone on a boom stand), and so I have experimented with my PZM-6LP mounting it to a strap around her neck in such a way that the electret capsule rests approximately six inches under her chin. We seem to get pretty good results doing this, although we have yet to test it in the concert situation. The little booklets sent with the PZM-6LP refer to PZMs of contrasting colors and mounts, and I am hoping you might send me a copy of any illustrated brochure you may have available. One of the things we are considering is mounting a gold or silver capsule in a necklace of some sort that would largely conceal the microphone and wire. I would like to know if this is a viable solution to reinforcing the Baroque flute (box wood), and I would also be interested in learning of any alternate solutions you would care to propose.

“Also, I wonder if you feel the results obtained in the recording situation with the PZM are on a par quality-wise with results using a Neumann U-87 or AKG C414EB with these particular instruments. Perhaps even the careful mixing or blending of the two different types of microphones would produce pleasant results. I am interested in your views if you have any to share.”

Gilbert L. Blount, Director, USC EARLY MUSIC ENSEMBLE

AUDIENCE MIKING WITH PZMs

“While mixing a live performance on radio station KWJS in Dallas, I realized that the incredibly small room we had to work in was going to sound tight and squashed. I quickly reached into my trusty bag of tricks and pulled out a couple of PZMs, taped one to the ceiling and one to the control room glass, and ran both through a digital delay and a touch of echo. The 12 people in the audience sounded like a hundred and the performance of recording artists Tom Autry never sounded better. I left the PZM mikes on throughout the performance. The radio station staff said it, was the best live broadcast in their history, thanks to PZM.”

Randy Adams, SIERRA RECORDING, Fort Worth, TX

RECORDINGS DONE WITH PZMs

“Not A One” Vinnie Golia, Alex Cline NW0I07

Woodwinds, drums

“Slice Of Life” Vinnie Golia Trio

Alex Cline - drums

Roberta Miranda - bass

Vinnie Golia - woodwinds NW0I08

“Gift of Fury” Vinnie Golia Quintet same as above w/

Wayne Peet - piano

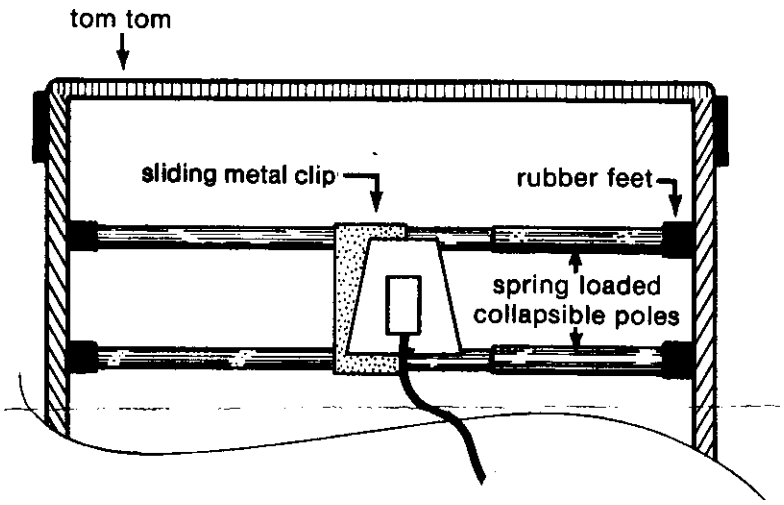
John Rapson - trombone NW0I09

“Down-In/ness” Wayne Peet - piano NW0III

All records are on the Nine Winds Label with Bruce Bidlack as engineer and Nels Cline as producer.

Source: Vince Motel

MIKING INSIDE A TOM TOM WITH A PZM-2LV



Holding fixture for PZM-2LV

Richard Stevens of Nashville, Tennessee tells me of an accessory he used to mount a PZM 2LV [now the GLM-100] inside a tom tom (see diagram). Because of the PZM’s ability to handle up to 150 dB-SPL, the mike can be mounted right inside the drum and moved from side to side to find the “Sweet Spot.” Richard is interested in showing his device in the PZMemo.

J. P. Bachman, Crown Project Engineer

PZMs NOT SENSITIVE TO MAGNETIC FIELDS

John Bachman, Crown PZM Project Engineer, notes that the PZM is particularly valuable if you are contending with strong ambient magnetic fields (especially found in broadcasting applications).

Since PZM mikes do not have coils, they are unaffected by most magnetic fields.

PZM PYRAMID DIMENSIONS

“We need help. Some of the ideas written in the *PZMemo* are hard to visualize. I need pictures or drawings of the pyramids. If you have plans for the pyramid setup can you forward a copy of me?

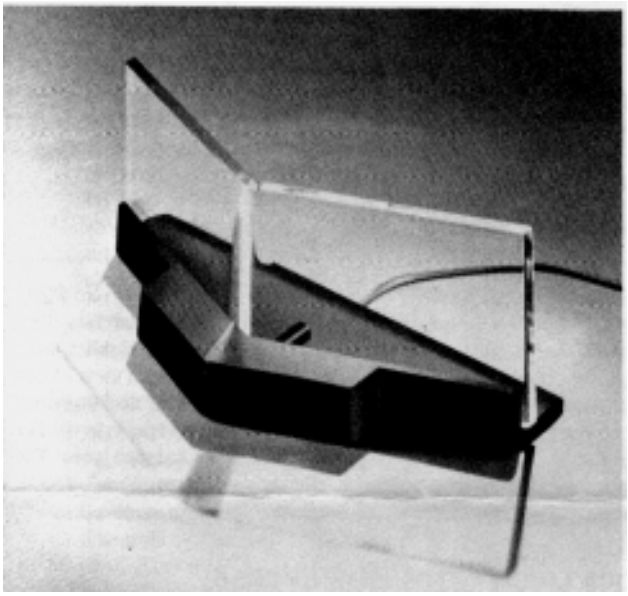
“PZMs work well with band and high school students but little kids are a problem. We push gain as much as possible but we get feedback. Where should you place stage monitors when using PZMs at front of stage? Is there a particularly effective way to use PZMs for 1) Plays , 2) Choral groups, 3) Band (horns) and 4) School Board meetings. I’ve tried them for all those situations and have mixed results. I want to find what I’m doing right/wrong.”

Enrique K. Ochart Jr., Auditorium Director, SAHUARITA SCHOOLS, Sahuarita, AZ 85629

(The enclosed set of questions are excellent and much of the requested information can be found in past issues of *PZMemos.* Refrrences and additional information is provided here.)

A. A picture of a PZM pyramid is in the *Crown Boundary Microphone Application Guide.* The larger the size the better the directivity at low frequencies, and the more rejection toward the back of the microphone.

In addition, here’s a photo of the new Crown PZM-2.5 [now replaced by the PCC-160].



PZM 2.5 directional PZM microphone.

B. The large plate mikes using panels of sizes 2’xl’, 3’x3' and 4’x4' work very well when flown either by stand or from overhead. I use 1/8" plexiglass or polycarbonate for the 2’x2' and 1/4" material for the larger ones. Mount the microphone plate 4" off-center for a smooth response. Orient the plate so that the hemispherical pattern picks up the group, solo, orchestra or ambience you desire. Remember that the back side of the microphone has very high rejection especially at high frequencies and placement may be made to reject audience, air conditioning, room ambience, other instruments or speakers.

C. When using 2.5s on the stage there will be excellent rejection of monitors, if large enough plates are used, and monitors are placed behind the plane of the microphones.

1. The Boundary Mic App Guide mentions the use of PZMs for theater. I suggest 2.5 x 8" or 12" for

the stage front. I use 3 to 5 of them depending upon width of stage and age of cast. I use 1 or 2 pyramids upstage flown in the borders if they are needed. Many times the reach of the downstage 2.5s will cover, since they reach 25' if the cast projects at all.

2. Choral groups may be miked several ways:

a. 2.5s on the floor. 2.5s on short stands between the choral group in the rear and orchestra in front.

b. Flown large plates in several different configurations. The size of the plates depends upon size of group, available space for mikes, types of stands available or facility for hanging mikes.

c. Pyramids have been used for each section of a choral group so that some sections could be assisted more than others when stereo is needed.

d. Choral groups for stereo broadcast have been grouped around two PZMs back-to-back on a 2x2' plate. Soloists merely moved in closer to a mike and then backed out to the group as required.

3. Band, orchestra and/or sections will find 2.5s, plates and simple standard PZMs all helpful depending upon need. The San Diego Symphony brass section was reinforced by a single 2.5 x 12".

4. School board meetings: If you are merely recording the meeting for a record and secretarial assistance, then one or two 6LPs, 6Ss, 30GPs, or 31Ss will cover large boardroom tables [now the PZM-30D and PZM-6D]. If there is a need to amplify the discussion for large open-board meetings, then 2.5s [now the PCC-170, PCC-130 or MB series] will assist you to increase gain and reduce feedback.

I reaffirm that a basic experimental stance is the fundamental requirement to learn PZM microphone technique. Thank you for the good questions.

Ken Wahrenbrock

# # #

PZM MEMO

October, 1983
Ken Wahrenbrock, Senior Editor

PZM CHALLENGE, 1983

by Bruce Bartlett

Forty people accepted the PZM Challenge. It was the second annual contest comparing original stereo recordings that used PZMs as the main microphones. The Challenge is divided into an “open” contest, which can be entered by anyone except Crown employees and their families; and a “dealer” contest, for Crown dealers and their employees.

Three categories are established in each contest: classical, popular, and environmental. Category winners receive their choice of a pair of PZMicrophones. Grand prize winners also receive a Crown home audio system consisting of an FM-2 Tuner, an SL-2 Preamplifier and a PL-2 Power Amplifier, all in a walnut cabinet. Honorable mentions - entries of more-than-average interest - receive a fifty-dollar certificate applicable towards the purchase of a PZMicrophone.

Judging took place on May 6, 1983. The judges had long experience in critical listening. They were:

Dr. Clay Barclay, New Product Manager, Crown International. Clay is also a former high-end audio retailer and recording engineer.

Charles Brown, free-lance recording engineer, Philadelphia, PA. Charles has recorded, among other clients, the Philadelphia Orchestra and the Delaware Symphony.

Bruce Bartlett, Microphone Design Engineer, Crown International. Bruce has also worked as a recording engineer, musician, and audio journalist.

A judge's viewpoint

After patching in all the various types of playback equipment (thanks to Dennis Badke of Crown), we settled in for a full day of listening to forty-five recordings. Listening was done over a pair of UREI 813-A time aligned studio monitor speakers.

On separate forms, we scored each entry on a scale from 1 to 10, both for the overall sound quality and for creativity in the use of PZMs. We didn't know who had recorded each entry.

It quickly became apparent that the recordings spanned a wide range of quality. Some entries were easily ruled out because of noise, distortion, audible compression, or poor frequency response. Note that these are defects of the recording equipment, not the PZMs.

Most entries were good. They had no serious faults, but often were not exciting as demo material. On the other hand, a few entries (such as a rock recording by George Pappas) were very impressive for their clarity, frequency range, naturalness, ambience, balance, and so on. They lost only by default to the top entries.

The judges' scores were entered into a computer, which averaged the results and indicated the winners.

One observation became clear: HOW you use the microphones and recording equipment) is just as important as what microphones you use.

As a judge, there are a few hints I think would be helpful to anyone contemplating entering the Challenge next year:

Find material that is exciting, with extreme highs and lows and a wide dynamic range so that it demonstrates the full capabilities of PZMs.

Get the finest reproduction on tape by using good equipment. Noise and distortion should be inaudible and no overall compression should be used.

Avoid cassettes if possible. They give lower overall quality. Find a venue with good acoustics.

Use PZMs in unusual ways, and remember to include specifics about placement, etc. with your entry. Otherwise, judges assign an average score for creativity.

The winners:

Grand Prize in the Open Challenge, Popular Category:

Robert Missbach, Tres Virgos Studios, San Rafael, California;

for a recording of a "multi-image soundtrack" for Westamerica Banks, performed by the Tamarin Session Players.

Winner in the Open Environmental Category:

David J. Harrington, Casper, Wyoming; for a recording of a basketball game in the Casper Events Center.

Winner in the Open Classical Category:

RBH Audio Inc., Brooklyn, New York; for a recording of the National Chorale Soloists in St. Peter's Church, Citicorp Center, New York.

Honorable Mention, Open Classical Category:

Andrzej Lipinski, Hollywood, California; for a recording of the Radio and TV Chamber Orchestra of Poznan, Poland, performing in Poznan University Hall.

Dealer Challenge

Grand Prize in the Dealer Challenge, Popular Category:

Alfred B. Grunwell and Todd Hutchinson of Calf Audio, Inc., Ithaca, New York; for a recording of Don Hale and Dazz (featuring Lesly Giscombe).

Winner in the Dealer Classical Category:

Richard Menasco, Tallahassee, Florida; for a recording of Manuel Ponce's Concerto for Guitar, performed in the Tallahassee Civic Center.

There were no entries in the Dealer Challenge environmental sounds category.

Thanks to everyone who took up the challenge, and congratulations to all the winners. Let's discuss each winning entry in detail:

Multi-image Soundtrack for Westamerica Banks Grand Prize, Open Popular:

A variety of instruments contributed to this unique, highly impressive recording of the Tamarin Session Players, directed by Peter Adams.

The production was created in April, 1983, at Tres Virgos Studios, a state-of-the-art facility in San Rafael, California. Mixdown engineer Robert Missbach supplied us with studio layout sheets for the session:

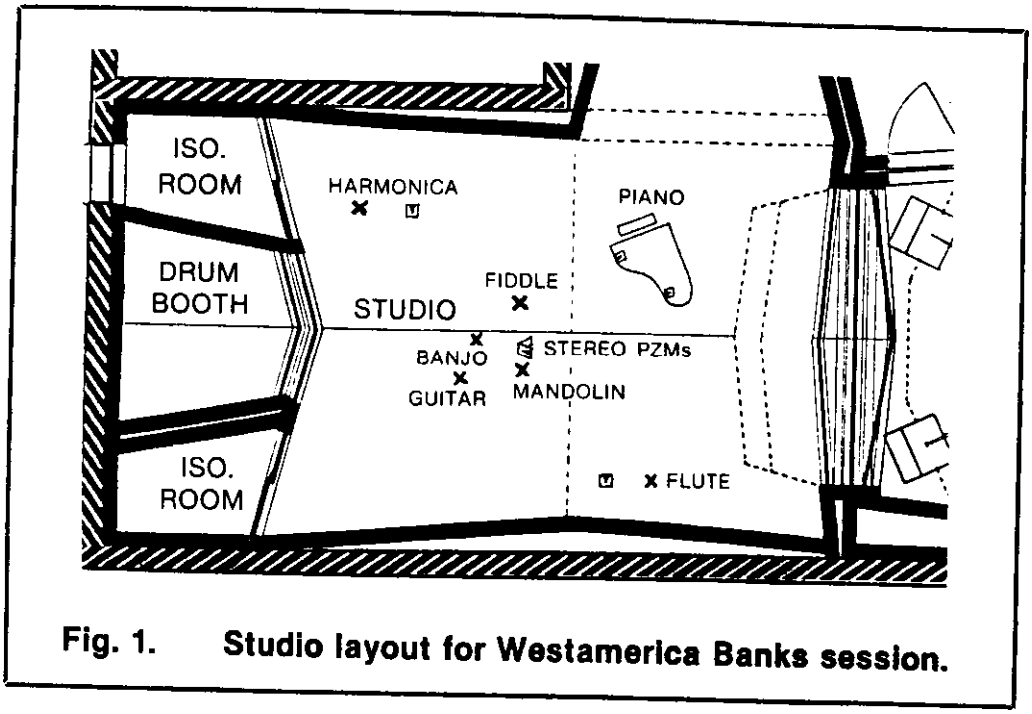


Fig. 1. Studio layout for Westamerica Banks session.

The recording is a montage of pieces of folk and popular music. Gordon Lyon recorded about 30 seconds each of different musical material, such as bluegrass, jug band, and bagpipes. In the mixdown, Robert crossfaded from one musical segment to another. The effect is a continuous change of aural perspectives.

The microphone setup was unusual. Two Crown PZM-3OGPs [now the PZM-30D] were taped together along one edge of their plates, forming a "V." This was used as a near-coincident stereo pair. The two microphones were on mike stands about 5 feet high and were angled 20 degrees apart. The musicians were grouped around this stereo array. To control the balance between the instruments, the musicians stood at various distances from the microphones. Thus, a true stereo recording of the ensemble was made onto two tracks of the 2-track recorder. This setup was used for each of the different musical ensembles contributing to the sound track.

During the 24-track mixdown, Robert segued the 2-track stereo recordings as the mix progressed, crossfading from one musical "ambience" to another. Although 30 seconds of each musical piece was

recorded, only about 5 seconds of each was played during mixdown. Robert says that no automation was used - only “ten-finger digital.” It was a difficult mix, but tastefully done.

Some other instruments were covered individually. The staff normally picks up grand piano with a PZM-3OGP near the short stick and a PZM-31S [now the PZM-30D] on the underside of the lid. Flute and harmonica were covered with a 3OGP on a stand.

The judges were impressed with the natural stereo perspectives, the clear and spacious sound, and the imaginative production.

Basketball Game: Winner Open Environmental

This recording transported us right into a CBA basketball game at the Casper Events Center in Casper, Wyoming, February 6, 1983. Engineer David J. Harrington provided us with the following information:

The PZM pair was mounted on either side of a 4' by 8' sheet of masonite pegboard. The microphones were mounted at the top of the pegboard by using a C-clamp to hold them to the masonite. The whole assembly was suspended over center court, 29 feet above the floor, such that the 8' length divided the court along a line between the two baskets (see diagram).

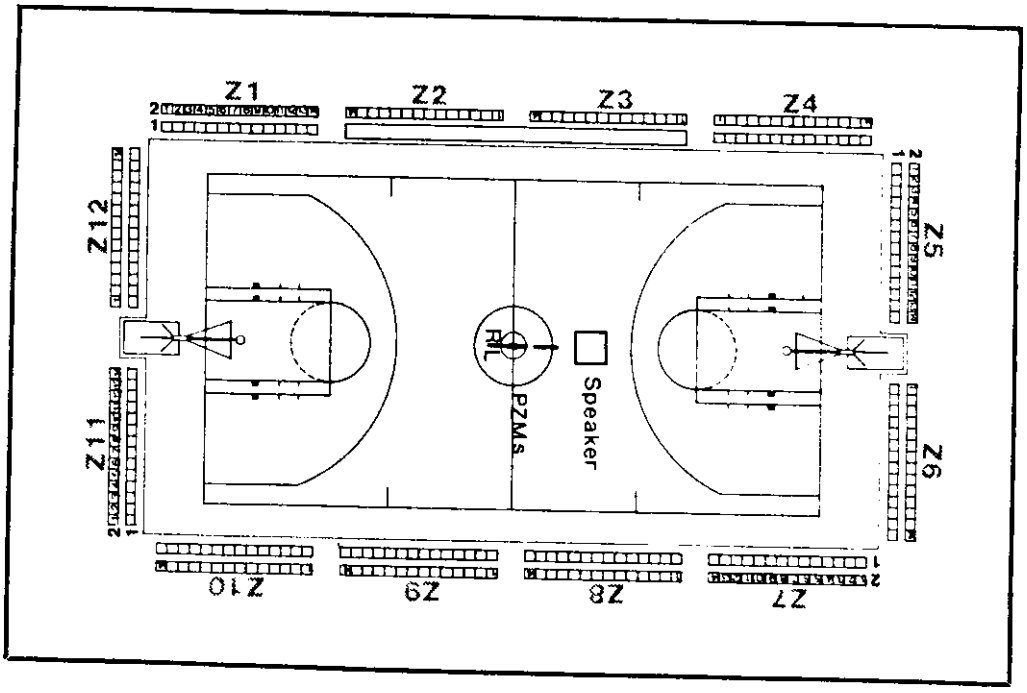


Fig. 2. Basketball game miking.

This arrangement permitted the stereo channels to be summed for mono broadcast. It provided maximum stereo separation for the audience sounds but little separation for the players. The house sound cluster was centered on the same axis as the microphone setup, so the announcements through the house system were heard in mono.

The judges clearly heard the ball dribbling and shoes squeaking. The recording had a great sense of stereo ambience, with opposing audience members yelling on both sides.

The National Chorale Soloists

Winner, Open Classical

This polished ensemble, directed by Martin Josman, was recorded February 16, 1983, in St. Peter’s Church, Citicorp Center, New York. Engineers from RBH Audio mounted two PZM-6LPs [now the PZM-6D] on 30" by 32" acrylic panels, arranged at a 110-degree angle and rigged 20' above the fourth

row of seats, angled at the performers. No other microphones were used.

The ingenuity of this setup earned it high scores. The stereo imaging and tonal balance were natural; the recorded ambience was spacious.

Radio & TV Chamber Orchestra of Poznan

Honorable Mention, Open Classical

This is a beautiful, near-flawless recording, made in Poznan University Hall in Poland by Andrzej Lipinski in 1981. It was recorded for Polish radio and TV in Warsaw.

Two PZM-3OGPs [now the PZM-30D] were placed in a spaced-pair configuration, and ambience microphones and spot microphones were added.

The judges were impressed by the spacious hall acoustics, the appropriate perspective, the clarity, and the sharp center imaging.

Don Hale and Dazz

Dealer Grand Prize, Popular

Recorded at Calf Audio Inc., Ithaca, New York, in 1981 through 1983, this entry was tops in creative use of PZMs as well as sound quality. It was made by Alfred B. Grunwell with Todd Hutchinson assisting. The PZM usage was as follows:

[Note: Current PZM models are PZM-6D and PZM-30D.]

Kick drum - PZM-6LP

Grand piano - Two Wahrenbrock prototype PZMs on the underside of the closed lid.

Electric guitar - PZM-31S for room ambience.

Acoustic guitar - Stereo pair of PZM-31s taped to a wooden door.

Vocals - PZM-315 a few feet away (for “air”) in combination with standard microphones.

Horns - PZM-31S at a distance for blend, in combination with standard microphones up close.

French Horn and flute - PZM-31S at a distance, in combinationwith standard microphones up close.

Don Hale, the writer, arranger, producer, keyboardist, and band leader, was “extremely pleased with the PZM performance, because it allowed him to hear his arrangements very articulately.” The judges thought the recording was sleekly produced; very clean, clear, and natural.

Manuel Ponce’s Concerto for Guitar

Winner, Dealer Classical

Richard W. Menasco made this skillfully multi-miked recording at the Tallahassee Civic Center on April 4, 1983. It was mastered on a Technics digital audio cassette recorder. The setup, which earned high points for creativity, is shown below:

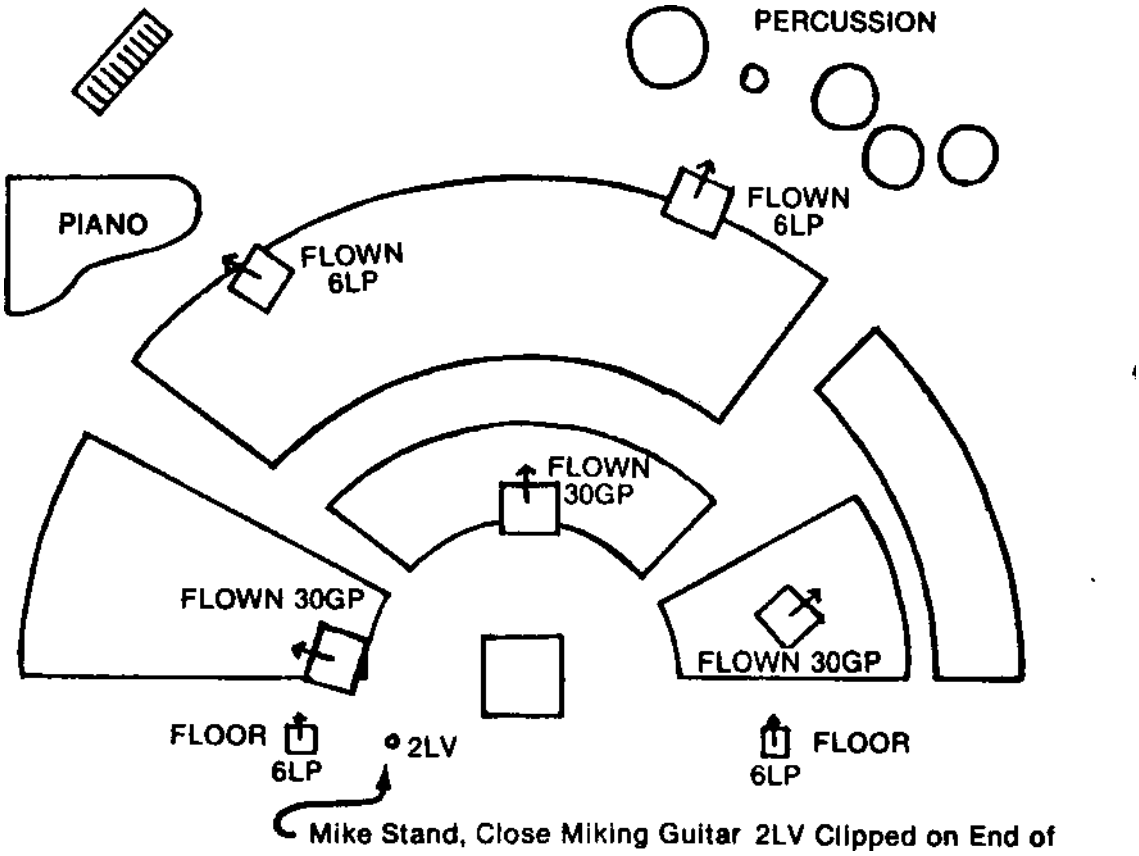


Fig. 3. Microphone setup for Manuel Ponce's "Concerto for Guitar"

Although the recording lacked hall reverberation, the balance of the multi-miked orchestral sections was well done. To my ears, the solo acoustic guitar sounded a little too close, out of perspective with the rest of the orchestra. But that may have been an unavoidable side effect of achieving adequate isolation on the guitar microphone. Altogether a fine job.

We appreciate the efforts of everyone who accepted this year's PZM Challenge.

ZAPPA PRODUCES BALLET ALBUM WITH LONDON SYMPHONY

Like to solve problems? Consider these. Arrive in London to record a music project that has been developing since 1975. The leased hall for the recording with the London Symphony (107 musicians) is too small. An immovable motion picture screen about eight feet from the rear wall (which the leasing agent forgot to mention) makes the room even smaller. It is also too noisy, and all the other major concert halls are booked.

Frank Zappa faced this as he arrived last January in London to record the ballet music he had been composing for the last eight years. He finally found space in Twickenham Studios, using a sound stage where the "007" movies had been shot. It was rather dead, which made it difficult for the orchestra but provided dry tracks for better mixdown and fmal editing. The music was also presented at a live concert at the Barbicon. The recording effort included enough music for a second record that will be mastered some time in the future.

Frank has used PZMs for a number of years. He has experimented with them for instrument and vocal pickup from serious music to just having fun with their unique qualities. As he prepared for this project, Frank had Thom Ehle, one of his engineers, contact Vince Motel of Wahrenbrock Sound to check out

some new prototype PZMs. Vince took several models to The Utility Muffin Research Kitchen, their recording studio. Frank and Mark Pinske, his recording engineer, tested them and wanted to explore PZMicrophony more. I visited the studio with Vince and we talked about microphone placement and instrumental pickup. They then proposed the PZM complement they wanted to take with them to England. The details were then worked out with Crown and the plastics fabricators to assemble the quantity desired.

Frank chose to take many of the traditional microphones with him also and had arranged for the remote recording van to have many of them available, including a Calrec Soundfield mike. As they prepared for the recording session, Mark had 90 minutes to place the microphones after the stage crew placed the stands and chairs. He set up the microphones as they had planned with PZMs for strings and some percussion, and regular mikes for many of the instruments were set up in the usual way. As the rehearsal started and he checked each mike on the “solo buss,” he found such vast differences in pickup quality that at each break he was scrambling to replace as many other mikes as he could with PZMs.

Due to the nature of the acoustics in the new venue and the size of the orchestra, PZMs became the overwhelming choice for this job. Because there were not quite enough PZMs available to use them exclusively, a few AKG 451s and an RCA ribbon mike were left in the setup. The hall, the musicians, the timing, all demanded a quality of microphone pickup that would lay down tracks for extensive editing work with little loss of quality and minimum noise and leakage. According to Zappa, this record could not have been made without PZMs, the Sony PCM 24-track digital recorder and the Lexicon programmable reverb unit. The recording studio in London turned out to be very dry and the Lexicon unit added the needed richness. And the thousands of edits for the final mix were humanly possible, Zappa says, only because of the outstanding features of the Sony recorder.

Here are some details on the miking.

STRINGS: These were miked with several different PZMs. The violins and violas were miked with 12" dishes on boom stands overhead, one dish for each two instruments. The cellos were miked with 2.5-8" between two instruments at the base of their music stands on the floor. This was just right; the 2.5-12" picked up too much floor noise and emphasized the box sound. The string basses were miked with 2.5-12" for each two at the base of their music stand. These picked up the lowest strings with clarity.

BRASS: The eight French horns were miked first with U47s, but had too much leakage even with the mikes in the cardioid position, so a change was made to a plate PZM on a barrier behind them. The French horn players don’t like a boundary behind them because it gives them bad reflections. If you get underneath them they don’t sound right either, because the players don’t hear themselves that way. The French horns really sound best with an indirect pickup. Pinske finally put the 31S on the back barrier and a dish overhead and combined the two. It was an indirect plus an attack sound that was the best French-horn sound ever.

TROMBONES: Final pickup was two flat-plate 31S’s [now the PZM-30D] on stands facing the “bones,” but far enough away to get some distance, placed lower than the direct line out of the bell. The direct sound gave too much attack, too-abrasive a sound, too much initial horn-bell sound. A microphone hears like your ear. If you put your ear right in front of a trombone, it’s too bright. You want to put the PZM at a spot where you would want to hear the “bones.” The indirect sound is more pleasing. When you move off-axis, the hot spot of the bells blows past the PZMs. If you lower the PZMs, they work great. If you raise them, you begin to get cymbals, etc.

WOODWINDS: A dish overhead picked up the flutes and clarinets very well. For bassoon they used a wooden boundary with a 6S placed behind the instrumentalist. They would also use a 2.5-12" in front on the floor if there were enough channels. The solo clarinet was miked with the same dish that was used for the harp at other times.

HARP: The dish was mounted on a low stand and angled downward toward the sounding board when the harp was tilted back into its normal playing position. The dish can be moved back and forth a mere 4" and change the pickup of the harp and sometimes lose the low register. Placement is very critical. Pinske says, “I found a spot that was so beautiful!”

PERCUSSION: With the tympani Mark started with a regular mike. As he soloed that mike he could hear the whole orchestra, so he exchanged it for a plate PZM on 4' x 4' plexiglass and set it up between the tympani and the other drummers. His comment:

“The amount of rejection as compared to the other was phenomenal. I got mainly tympani, and, when he wasn’t playing, I got very little leakage.” One of the five percussion sections was picked up with a 2.5-12". Gong sounds were very live. Bells were right there in the control room. Two PZMs were finally used over the drums, and the stick sounds on the snares and toms were exceptional. PZMs also worked well for handheld percussion instruments like gourds, maracas, whistles, shakers, scrapers, etc. Pinske used clip-on PZMs for several small items like castanets. For solo percussion instruments like vibes, marimba, glockenspeil and xylophones, since they were all together, Frank finally used two 31S models [now the PZM-30D] on overhead booms oriented down for stereo pickup. They really picked up the mallet work.

Problems and Benefits of PZMs

Both Frank Zappa and Mark Pinske shared reactions to the use of PZMs in a project such as this.

Zappa believes that there are some real problems in using PZMs. When musicians walk in and see the plastic dishes, they laugh, since they think plastic mikes will sound plastic. They are used to large heavy metal microphones. If they can see through the microphone, they don’t take it seriously. They also don’t look out for them when they are on the floor, since they can barely see them. The small cable also reduces the rugged image and stability of the microphone. PZMs thus create problems for the producer since he has to spend time in interpretation and extra motivation for the orchestra to do its best in spite of its original humorous image of the microphones. Pinske emphasized that the use of PZMs requires some explanation to the musicians since many of them had never seen PZMs before. When they understood it was a new type of microphone and that it had some very distinguishing characteristics, they kidded about it, but were cooperative and interested.

Another problem is the PZM’s extraordinary sensitivity and the musicians’ awareness of them. Every time they breathe, move their feet or diddle with their instruments, the sound gets on the tape. A reed player sucking his reed to keep it moist during breaks can be heard.

Zappa told me that they learned a great deal about plate PZMs on flat boundaries and what they would do, finding that they are more forgiving than many traditional mikes. The more they tested them the more they realized that PZMs do react much like the human ear. For instance Pinske would just walk around until he found a spot where an instrument sounded right, put a PZM there and nine times out of ten, the sound in the control room was just like it was out there next to the instrument.

They found that when they recorded with PZMs, they needed very little EQ. They might have to cut one or two spots, but they could lay tracks and then EQ for effects on mixdown as they desired. They also could make the recording dry enough so that reverberation could be added in the mixdown.

Pinske found to his delight that “In an out-of-phase condition the PZM is the best microphone I’ve found on this planet to maintain the stereo image. It is unbelievable on low frequencies.” Pinske put them back-to-back on bass drums and found them to be less than 15 degrees out of phase. Traditional microphones would be at least 90 degrees out of phase at 3340 Hz. Pinske believes that PZM mikes keep a better stereo image and pass it on to the lacquers.

Frank Zappa’s reaction to the PZMs he used was very positive. He said, “My goal is to get as much of what actually happens, soundwise, onto a record as I can . . . in spite of the laws of physics and manufacturing. In a project this expensive, to put your entire trust in one specific kind of technology and have it pay off is extremely gratifying. We could have played it a lot safer and done it a different way, but I don’t think that I could have gotten the same results. There is no way we could have gotten the sounds on these tapes without PZMs.”

PZM Dish prototypes

The new prototype called the “dish” has exceptional qualities that Mark Pinske utilized to get the close-miked pickup he needed and to provide the isolation that was also necessary. By tilting it a few

degrees one way or another, he could discriminate against nearby instruments, and by moving it into a proper location for that particular instrument or group of instruments he could lay down the sound he wanted on its dedicated track. The side rejection changes when the mike is tilted just a small amount. The response of the dish at the low end is excellent. For additional isolation, Mark suggested a deeper version and these have been made and are being tested.

For those who have not seen one, the “dish” is a circle of 1/8 or 3/16 plexiglass 12" in diameter with a 1/2" flat flange around the edge. The center is raised up 3 inches. The 2LV [now the GLM-100] bar is mounted inside the dish so the boundary curves away from it and tightens up the pickup pattern. A stand mount is fastened to the dish so that it can be mounted on a stand or a boom. A short goose-neck provides for flexibility for setting angle and direction. (A photographic toggle is being used to provide flexibility on some newer versions.)

The PZM-2.5-12" is made with a 12" x 24" section of plexiglass heated and bent in the center to form a 135 degree angle. This is fastened to a plexiglass base. The bar is removed from a 6S and fastened to the plexiglass base. This provides 10 dB of gain in the forward direction and up to 40 dB of rejection off the back.

The PZM-2.5-8" is just like the 2.5-12" but is made with an 8" x 16" boundary.

Editor’s Reaction

I was very pleasantly surprised when Vince Motel and I visited the Utility Muffin Research Kitchen and explored PZMicrophony with Frank Zappa and his recording engineer Mark Pinske. Frank had purchased PZMs (Crown 3OGP) quite early in their history and enjoyed using them in many ways. He had made a video tape in his studio with a plate fastened to his forehead with an elastic band as he interviewed people.

After checking several new prototypes Vince had taken, Frank and Mark wanted to really explore uses of PZMs. For two hours they put us on the hot-seat seeking information that would help them use PZMs for miking the symphony orchestra in London. If a question required a “Sorry, it won’t work that way” answer, there was always a “Well then, what if” question that built upon that information to seek a solution to the anticipated need. Such an exploratory stance is extremely important in developing skill in using PZMs.

That interest and enthusiasm has continued since the recording and editing of that tape. New uses are being developed in re-editing former masters or other music Frank has in his vault.

We need to recognize that this recording has been in the composing and planning stages for years, and Crown appreciates Frank’s willingness to test our technology. It is such a good recording. We pay tribute to his courage as he learned to use PZMs in so many ways.

I have been privileged to listen to the tapes in his studio, and the realism and presence of the instruments are something I have not heard in other studios unless they also use PZMs. There is an additional factor in this music also. The separation that Mark obtained with close miking places you in a listening position right behind the conductor. The demonstration records sound, on a good system with “time aligned” speakers, as though you had the instruments in your listening room. If you have not heard PZMs like this, get this recording and listen. It is produced by Barking Pumpkin Records. Find it in your favorite record store or tell them to order it.

There is an interesting article on this record in the December issue of the RECORDING ENGINEER PRODUCER magazine. It is an interview by Vince Motel. Look for it.

NEW PROTOTYPES BEING TESTED

After the recording sessions in London, Mark Pinske, Frank Zappa’s recording engineer, suggested that a deeper dish would provide better isolation and tighter focusing for closer pickup of the instruments. The dishes were made 3" deep rather than 2", and he has found that they accomplish what he sought. He is using two of them tilted down away from each other over the drum kit, as they redo tracks on some of Zappa’s other recordings.

A 7260 version of the 1560 was made and tested as a stereo mike with a boundary installed inside the 60 degree fold at the center and a bar placed on each side. This was tested as a stereo marimba pickup. It worked well but needed a larger boundary. It is being used as a stereo ambient mike in the live portion of The Utility Muffin Research Kitchen, Frank's recording studio. A larger two-piece version with 24" x 36" folded plexiglass and a boundary installed on one end is being tested. These are equipped to mount on stands at whatever height the engineer desires. These are being used for vocals with ambience as well.

A 4060 version of the 1560 has been tested for the lectern of a Christian Science Church. A single microphone can reinforce both readers. If one of the readers has a considerably different volume level than the other, the bar and capsule can be mounted off-center to compensate for the difference.

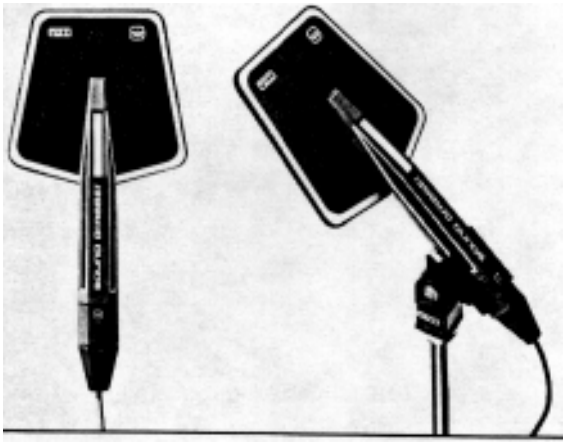
Pierre Michelov, the sound engineer for the Long Beach Municipal Band, has ordered some 2.5-18" units to use behind his French horns. These are also being tested with the San Diego Symphony and will be evaluated in the next issue.

Some folding 48" pyramids are under construction using the special plastic material "TUFFAK TWINWALL" for lightness. A theater organ concert will be used to test them in November and reports will follow.

ARTICLE TO READ

Find a copy of August RECORDING ENGINEER PRODUCER and read the article "Realistic Stereo Miking for Classical Recordings," by Michael Lamm and John Lehman.

SOUND GRABBER: THE FIRST CONSUMER PZM



Sound Grabber

The Sound Grabber, the first consumer version of the professional PZM, has now been introduced to offer home and business recordists the opportunity for vast improvement in the quality of their recordings. Introduced at the Summer Consumer Electronics Show, the Sound Grabber is designed for use with video and audio cassette recorders, and is equipped with a ten-foot cord with a 1/8" mike plug.

The new microphone provides an isolated output signal that will record easily on standard cassette recorders and will effectively eliminate motor noise, muffled sounds and reduce room reverberations that are often a problem with built-in mikes. Because the Sound Grabber promotes high quality sound with a clarity not before available, and is capable of establishing room ambience, video taping with the new microphone reflects the feeling of actually "being there."

Crown suggests using the new microphone for recording one-to-one interviews, group discussions, conferences, family gatherings, amateur vocal and instrumental performances, and speeches. "In operation, users will actually experience an improvement in the performance of their regular recording

equipment," Clay Barclay, product development manager, commented. The Sound Grabber is especially suited for home use, since its rugged construction will survive many years of rough handling.

PZM 180: A MID-PRICED MUSIC PZM

Also available to the advanced amateur or beginning professional is the PZM 180 [now the PZM-185]. The PZM 180 microphone offers a wider dynamic range than the Sound Grabber, making it more suitable as a music mike. Conferences, interviews, group discussions, home video productions, broadcast news and sports are other possible applications.

The PZM-180 is a balanced output model that has a self-contained "N cell" power source, as well as internal electronics for phantpm powering adaptation. The microphone's frequency response is extended and smooth, and the hemispherical polar pattern allows wide pickup.

PROFESSIONAL MODEL 12SP

Crown's new 12SP [now the PZM-30D] model offers studio quality in recording, sound reinforcement, broadcasting and electronic news gathering for the experienced professional.

The 12SP is designed for phantom powering by a supply providing 12 to 48 volts. It features a transformer balanced, low-impedance output and an integral XLR connector; wide, smooth frequency response with high-frequency emphasis for brilliance; low noise and high output level; a hemispherical pickup pattern; high sensitivity and excellent reach for clear pickup of distant sounds.

In operation, the ruggedly constructed 12SP can be placed on a surface such as a floor, table, or lectern; used as a hand-held microphone; or affixed to a surface near a sound source such as the underside of a raised grand piano lid.

MODEL 2.5: CROWN'S HIGHLY DIRECTIONAL PZM

The PZM-2.5 [replaced by the PCC-160] is designed to improve directional pickup. The new low-profile, minimum visibility microphone combines a precision-calibrated pressure capsule with a nearly invisible corner boundary to achieve improved directionality of coverage. It effectively captures and emphasizes sounds approaching from its front while rejecting sounds from behind.

The PZM-2.5 is recommended for applications such as theater productions, conferences and public speaking. The microphone effectively eliminates audience noise pickup while providing excellent coverage for the user.

In operation, the microphone can be placed on a surface such as a floor, table or lectern and aimed at the desired sound source. The corner boundary design increases the microphone's sensitivity and actually improves speech articulation through its specially tailored frequency response.

And, the PZM-2.5 is convenient to use. The microphone plugs directly into a 12 to 48 volt phantom power supply, includes a transformer-balanced, low-impedance output and a permanently attached 15-foot cable. These microphones all feature a black base; the B4C has a 4" clear boundary, the B8C has an 8" clear boundary, and the B4D has a 4" dark boundary.

BOUNDARY EFFECTS

I've been using PZMs for a variety of reinforcement applications in client churches over the past two or three years. Recent experiments - and experience - have prompted a couple of questions/ observations:

1. How critical is the distance from the capsule to the nearest boundary (e.g., on a 2.5 or pyramid)? Put another way: how much leeway is there in placing the capsule; at what point do you lose the benefit of the additional surfaces; can you get the capsule too close?

2. I've noticed what appears to be a buildup or increase in midrange response on 2s and 2.5s. Has anyone else reported something similar?

3. Recently I encountered a bit of distortion - seemed to be upper mid-range - when using a 2 with 65 degrees between the two surfaces. Any ideas?

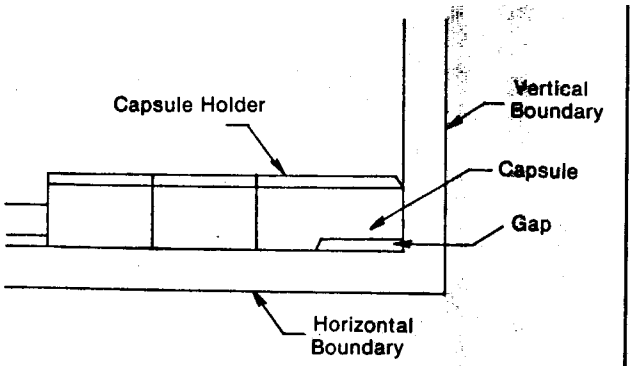
Thanks a lot - keep up the good work with the PZMemo.

Warren Ediger, Omaha, NE

Reply:

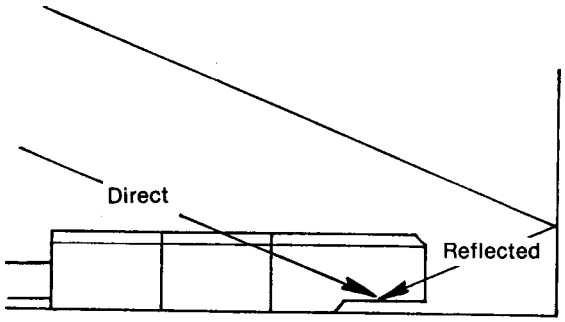
1. Regarding the effects of capsule spacing from nearby boundaries: I'm assuming the microphone capsule is mounted a fixed distance (about .020 to .050 inch) from the honzontal boundary, due to the built-in gap in the capsule holder. This spacing between the capsule and the boundary it faces should be maintained for flattest high-frequency response.

Now suppose you add a vertical boundary, such as in the 2.5. The capsule should be placed as close as possible to the vertical boundary for flattest high-frequency response. That is, the "nose" of the capsule holder should touch the vertical boundary.



Correct PZM placement near boundaries.

As the capsule is moved away from the vertical boundary, sharp dips in the high-frequency response occur. These are due to phase cancellations between the direct sound reaching the capsule and the reflected sound off the vertical boundary.



Incorrect PZM placement near boundaries.

To demonstrate this effect, talk into a PZM 2.5 while varying the horizontal spacing between the capsule and the vertical boundary. Repeat a phrase with a lot of high-frequency content, such as "Sally's sister is a thespian." You'll hear the high frequencies diminish first as the capsule is pulled away from the vertical boundary. With enough spacing (say, 3 inches), the phase cancellations will extend into the mid-frequencies, reducing the microphone's sensitivity at those frequencies.

If for some reason you can't mount the capsule holder so that it touches the vertical boundaries, do the following: Make recordings of the microphone's output for various capsule spacings. See how far you can move the capsule away from the boundary before the sound quality becomes unacceptable for your particular application.

The lowest frequency that cancels is f = C/4S, where C = the speed ofsound (13560 i.p.s.) and S = the capsule-to-boundary spacing in inches. For example, a 1/2-inch spacing should cause a cancella-

tion at 6780 Hz, noticeably reducing the clarity of “S” sounds.

2. There is an apparent mid-range boost with the 2 and the 2.5 boundaries. That’s because the vertical boundaries are too small to reinforce the low frequencies, but they do reinforce the mid-to-high frequencies.

The low-frequency response shelves down about 6 dB at a frequency f = C/6D, where C = the speed of sound and D = the boundary dimension.

In addition, the vertical boundaries reinforce frequencies whose wavelength is approximately the same as the boundary dimensions (a phenomenon called diffraction). For example, a one-foot-square vertical boundary best reinforces frequencies having a one-foot wavelength (about 1 kHz). The frequency of major reinforcement is f = .88 C/D, where C = the speed of sound and D = the boundary dimension.

In the Crown PZM-2.5, the vertical boundaries are carefully sized to aid clarity and articulation by gently boosting the upper-mid frequencies.

3. Mounting a PZM between two boundaries angled 65 degrees apart should not cause harmonic distortion. The THD of the microphone is 1% for 148 dB SPL at the mic capsule. If two boundaries each boost the SPL at the microphone 6 dB, that puts the l percent distortion point at 148-12 or 136 dB SPL, which is still greater than the output of most sound sources.

Perhaps the boundaries’ mid-range boost is overloading your mixer or recorder input. Try a pad or resistive attenuator.

Bruce Bartlett, Microphone Design Engineer

PZM VIBRATION PICKUP

Can I use 2 PZM-2ORMG [now the PZM-20R] in a stereo radio station on the desk table without any noise problem from people hitting the table?

Denis Aubin, D.A. Productions & Consulting, Sherbrooke, Quebec Canada

Reply:

Although the PZM is insensitive to mechanical vibrations (such as table thumps), it still can pick up the sound of desk knocks acoustically, like any other microphone. You may want to pad parts of the desk to avoid generating sounds from people hitting the table.

If possible, borrow some PZM’s (3OGP, 31S, 6LP or 6S) and lay them on the desk top to test for thump pickup. If the noise is acceptably low with these PZMs, it also will be okay with the built-in PZM-2ORMGs.

Bruce Bartlett, Microphone Design Engineer

PZM NOISE

We have two PZM3OGPB microphones with PA-18 transformer-less power supplies. We have had these mikes about two years and I am quite pleased with their sound except for one thing. They seem to have very low output and when I get sufficient gain from them, the noise is objectionable. In fact, it is bad enough that I have practically quit using them at all over the last few months. My favorite application for them is acoustic guitar, but it sounds like he is playing next to a waterfall.

Here are the details. I used them with phantom power. I have tried a battery but that doesn’t seem to make any difference. They are feeding our MCI JH-428B console, via Neumann microphone cables. By the way, the phantom power supply is a Neumann 48v supply. In order to get the gain up to an appropriate level, I have to run the mike preamp gain control on the console at wide open. By way of comparison, a Neumann U-87 with the same source would only need to have the mike gain control about 1/2 to 3/4 open to achieve the same level and at the same time the noise level would be considerably lower. I borrowed one of the new tubular transformer-type supplies from a friend to see if that would help. The gain problem persisted, and the noise problem was only marginally better.

I like the sound of the mikes. However, the noise is apparent even in final mixdowns, so I have had to stop using them for everything that I was using them for before.

Do you have any suggestions?

David M. Boothe, Rainbow Sound, Inc., Dallas, TX

Reply:

The open-circuit sensitivity of a PZM on a large surface is -70.0 dB re 1 V per microbar. For comparison, the sensitivity of a typical dynamic microphone is -75.0 dB (5 dB less sensitive). The sensitivity of a Neumann U-87 is -65.0 dB. So the PZM is 5 dB less sensitive than the U-87, and that's why you have to crank up the fader for the PZM. The same would happen with any microphone of the PZM's sensitivity. [The sensitivity of current PZM models is -65 dBV/microbar.]

One solution is to increase the sound pressure level at the microphone, if possible. To do this, (1) mount the PZM on a large surface, such as a wall, or (2) mount the PZM cartridge holder in the corner between two or three boundaries (walls and floor), or (3) put the sound source closer to the microphone.

Another solution is to modify the PA-l 8 electronics. Locate R8 and R9, the two matched 619 ohm, lt'o resistors between the two transistors. The smaller these resistors are, the greater the gain. For 8 dB more gain, change them to 100 ohms. [or use a current PZM.]

If you suspect your mikes are defective, send them to Crown's service department.

Bruce Bartlett, Microphone Design Engineer

PZMs IN FILM SCORING

I was at Wally Heider recording when Mr. Wahrenbrock first demonstrated his PZM mic and from that day on they were considered essential on every session we did. For the film scoring division we suspended 3 mic's for left center right about 20' above the floor. The sessions were still set up with gobos and close miking. The PZM's provided the majority of the audio in the mix while the close mikes provided balance and desired coloration. The application of the PZM is only limited by your imagination.

James W. Hearn, Ryder Sound Services Inc., Hollywood, CA

PZMs ON DRUMS, LESLIE ORGAN SPEAKER, AND SOUND EFFECTS

We suspended two 4 x 5 PZM's from the ceiling of our drum cage on monofilament line in an overhead stereo configuration approximately 3-1/2 ft. above the drum kit. Board EQ stays flat and a natural sound can be adjusted in the mix if necessary. The natural pan of tom tom rolls and cymbals is aesthetically superb. The monofilament virtually eliminates vibration and stand noise as well as clears the area for more freedom to the drummer.

The 2" x 2" Wahrenbrock PZM's fit well inside the rotary horn section of Leslie cabinets and with an auto-panner give brilliant and exciting results. Because of the high acceptable level of SPL, the PZM is valued to us for use in recording clear special effects (live reverb amp explosion, gunshots, etc.) with clarity and no excess coloration.

Alan R. Cahen, Infinity Recording Studios, Tulsa, OK

PZMs ON ORCHESTRA

Greetings from western Australia! We have just started using your PZM's on our orchestra (West Australian Symphony Orchestra) and are extremely impressed with their performance. I would appreciate any microphone lay-outs you have for orchestral work. Also like to be put on your PZMemo list. Keep yourselves nice.

Karl Akers, Australian Broadcasting Commission, Perth, W. Australia

PZM STAGE MIKING

For a recent high school production of Li'l Abner we supplied four PZM's for sound reinforcement. Three 2.5's were spread across the front of the stage and a PZM pyramid was hung on a light bar above a six foot high platform toward the rear of the stage.

It wasn't until opening night that we found out that the mayor of Dogpatch was going to stand on that platform, raise his hand, and fire a starter's pistol to start the Sadie Hawkin's Day race. His hand was directly under the pyramid, about four feet below it. After three performances (and gun shots) the PZM is still perforning!

Michael E. Lamm, Dove & Note Recording Co., Houston, TX

RECORDING ORCHESTRAS WITH PZMs

As the final semester of my Music Engineering Technology degree from the University of Miami, Fla., I was fortunate to get a unique opportunity to work here in Norway with Norsk Rikskringkasting (NRK). For the last four months I have been learning the ropes of European Broadcasting and music recording for radio and TV.

One of the main projects that I have worked on has been the recording of the Bergen Symphony Orchestra in the great-sounding Grieg Hall. The hall's layout and the NRK's facilities allow for a lot of experimentation with miking techniques so when I read about the PZM challenge in a trade magazine I thought that trying some PZMs in the hall might be worthwhile. My supervisor, Tore Skille, was also interested in experimenting with PZMs.

At that time, our section didn't have any PZMs so we borrowed 2 or 3 from the Grieg Hall's audio department. We tried them on the ceiling, on the floor, on the walls, EVERYWHERE. Each positioning gave us a different perspective, but we finally settled on flying the mikes, back to back, on a circular 10-1/2" metal plate above the conductor's head. Our remote controlled flying rig allows a broad range of mike placements to compensate for group size and musical selection, but usually we end up positioning the mikes 1-2 meters above the conductor.

The clarity and definition the PZMs give is fantastic. We use conventional Schoeps (omni) for side fills and ambiance, but the pair of PZMs provide the main signal. By using the PZMs and omni mikes we minimize phasing problems and have virtually no off axis coloration. This makes things a lot easier because most of our recordings are made for radio broadcast.

Our department now has its own pair of PZMs and they have already earned their position in the Grieg Hall. My stay here is almost over, but I think the PZMs stay has just begun. Thanks for being included in this special opportunity in audio education.

Mark Drews, Milford, MI

ATTACHING PLATE TO MIC STAND

We've found a great way to attach a plexi boundary plate to a mic-stand! Drill and tap holes in an Atlas SW-1 for flathead machine screws and countersink them into plexi! Mount PZM with Velcro.

Steven Hirsch, The Mixingboard, Burlington, VT

ENVIRONMENTAL SOUNDS

I was absolutely amazed to read that no environmental sounds were entered in the PZM contest. I have made some incredibly striking recordings in this area - pigs grunting at feeding time -the interior of a chicken coop - and most amazing, the sound of traffic beneath the Brooklyn Bridge, which resembles a massive hive of monster bees! They were all made with a stereo pair of PZMs on a Nagra IV-S at 15 ips.

I meant to enter the contest, but just never got around to it. It's a pity, because I have now read the rules in detail, and see that the prizes were really worth competing for.

Also, I really expected you would get many responses in the environmental category. I suppose it would not be fair or feasible to extend the contest in this category. I do hope, however, that you will run the contest again in a year or two, and that you will not delete the environmental category. I promise I will enter!

Reynold Weidenaar, New York, NY

Reynold - Rest assured there will be a PZM Challenge in 1984. As a recipient of *PZMemo*, you'll be notified. Editor.

PZM TURNS UPRIGHT PIANO INTO A GRAND

I have a new recording studio with an upright piano. I was worried about getting the right sound with an upright. The PZM calmed my worries. I had people ask if I had a grand piano. The PZM gets rid of that mid-range "mud" and boosts the high and low end for an incredible sound. The PZM saved me a $10,000.00 investment in a grand piano.

Tim Greene, Mountain Top Recording, Boone, NC

# # #

PZM MEMO

February, 1984
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

ANNOUNCING THE 1984 PZM CHALLENGE

Have you made a PZM recording that's especially impressive? Do you plan to make one soon? If so, enter it in the PZM Challenge 1984, the yearly contest to determine the best original stereo recording using PZMs as the main microphones.

The Challenge is divided into an "open" contest, which can be entered by anyone except Crown employees and their families; and a "dealer" contest, open only to Crown dealers and their employees.

Three categories are established in each contest: classical, popular, and environmental. Category winners receive their choice ofa pair of PZMicrophones. Grand prize winners also receive a Crown home audio system consisting of an FM-2 Tuner, an SL-2 Preamplifier and a PL-2 Power Amplifier, all in a walnut cabinet. Honorable mentions- entries of more-than-average interest - receive a fifty-dollar certificate applicable towards the purchase of a PZMicrophone.

Forty people entered the contest in 1983, so you have a good chance of winning. To increase your chances, we recommend the following:

I. Use high-quality recording equipment. Noise, distortion, and compression should be inaudible.

2. Record in a venue with good acoustics.

3. Record exciting music that demonstrates the full frequency range of the PZM.

4. Use PZMs in unusual ways, and carefully describe your miking setup. Otherwise the judges just assign an average score for creativity.

We're looking forward to receiving some excellent recordings. Good luck!

NEW PZM LITERATURE

Since the inception of the Pressure Zone Microphone, we've all learned a lot about PZM acoustics. This knowledge is available in a new booklet from Crown called the "PZM Theory and Application Guide." Based on Ken Wahrenbrock's application notes, the new guide is the clearest explanation yet of PZM operating principles and techniques. [The current version is called *The Crown Boundary*

Microphone Application Guide.]

The contents cover such topics as Pressure Zone theory, controlling the PZM's low-frequency response, shaping the polar pattern, microphone techniques, and phantom powering.

The PZM Theory and Application Guide is available free for the asking from Crown, and is included with each new PZM.

Articles on the PZM appeared in the January issues of *Modern Recording & Music* and *Tape Deck* magazine. The December issue of *Recording Engineer/Producer* featured a rebuttal to Stephen Temmer's criticism of PZMs.

TWO-TIME PZM CHALLENGE WINNER

Alfred Grunwell, right, has won the PZM Challenge two years running.

Winning the PZM Challenge is a real achievement in itself, but Alfred Grunwell won the contest two years in a row! He's the co-owner of Calf Audio, a recording studio in Ithica, New York.

Alfred said that the award "is gratifying to us because it means that Crown doesn't simply look at the return address and toss everything that's not from California or New York City. And the award shows that experience and the way it sounds actually still do count for something, which is pleasant to hear."

Alfred uses PZMs extensively because he says they sound "bright, crisp, and articulate," compared to many traditional microphones which sound "smeared and blurry" when they pick up sound reflections from nearby surfaces.

In his recordings, he uses both conventional microphones and PZMs. They complement each other, each microphone reproducing sound more effectively in different applications.

For example, Alfred prefers conventional microphones for lead vocals, but finds PZMs usable on any instrument. PZMs provide a strong attack on drums and are equally effective for recording piano, acoustic guitar, and violin. "They sound exceptionally good on vocal choruses," Grunwell adds, "because they give you a high degree of articulation and they have a great deal of reach, so people don't have to be right near the microphone."

Alfred recently promoted the PZM in the October 12, 1983 issue of *The Times Monitor*, Central New York's College newspaper. Thanks for the mention, Alfred, and congratulations again.

CLEARING UP PZM MISCONCEPTIONS

Many people are confused about PZM operating principles. Here are some explanations of various phenomena in PZM acoustics to help the sound engineer use PZMs more effectively.

I. The PZM does not eliminate sound reflections from the surface it's mounted on. It uses them. Sound reflections add effectively in-phase with the direct sound from the source, over the audible range. This increases the sound pressure at the mike capsule by 6dB, which boosts the sensitivity 6 dB and

increases the signal-to-noise ratio by 6 dB.

What the PZM eliminates is the audible effect of sound reflections. If a conventional microphone is placed near a sound-reflecting surface, the reflection arrives at the mike after the direct sound. This causes phase interference, comb filtering, a degraded frequency response. But with the PZM, the reflection arrives at the mike diaphragm simultaneously with the direct sound, which allows a flatter frequency response.

2. The PZM plate is not a transducer; it does not convert sound into electricity. Instead, it serves as a predictable, hard surface to reflect sound into the mike capsule.

3. If you use a PZM on a large surface such as a wall, table, or floor, the frequency response is wide and smooth. Ifyou use the PZM as is on a microphone stand, you lose bass and add upper-midrange, due to the size of the plate. Many sound engineers like the effect and use it in their recordings.

If you mount the PZM on a large panel, the low-frequency response shelves down about 6 dB at and below the frequency F = C/6D, where C = the speed of sound and D = the panel dimension. This low-frequency shelf does not occur at grazing incidence (sound-wave motion parallel to the panel). As you closely approach the panel (less than a panel dimension away), the full bass response returns.

PZM IN BILLBOARD SURVEY

Billboard Magazine annually surveys recording studios around the country to determine how many microphones of each brand are used. PZMs were on the list for the first time this year. They were used by 37.7 percent of the studios surveyed. Not bad for a microphone manufactured by Crown for only three years! That is rapid acceptance for such a new product. The first Wahrenbrock prototypes were available in September 1978.

CROWN ANNOUNCES A STAND-MOUNTED BOUNDARY FOR PZMs

A PZM, having a hemisperical polar pattern, is sensitive to every sound around it. As a result, in some applications it may pick up too much unwanted sound; such as audience noise, muddy room acoustics, or squealing feedback. Crown has introduced a new “boundary” or panel that solves these problems by making the PZM directional: sensitive to sound from one direction.

The Crown A240 Boundary [discontinued] is a transparent plexiglass panel, two feet square by 1/4" thick, to which a stand-mounted PZM can be attached. The boundary extends the low-frequency response, increases gain-before-feedback, and reduces pickup of leakage, audience noise, and room acoustics.

If you mount a PZM on a microphone stand, it may sound thin in the bass because the plate provided with the microphone is too small to reinforce low frequencies. But by mounting the PZM on the A240 Boundary, the low-frequency response is greatly extended, providing a fuller bass sound.

The boundary also makes the microphone sensitive to sounds approaching from the front of the panel, while rejecting sounds from the rear. That is, it makes the PZM directional — helping it reject audience noises, room acoustics, and leakage (off-mike sounds from other instruments). And, thanks to the boundary, the PZM can be turned up louder in sound-reinforcement systems before feedback oecurs.

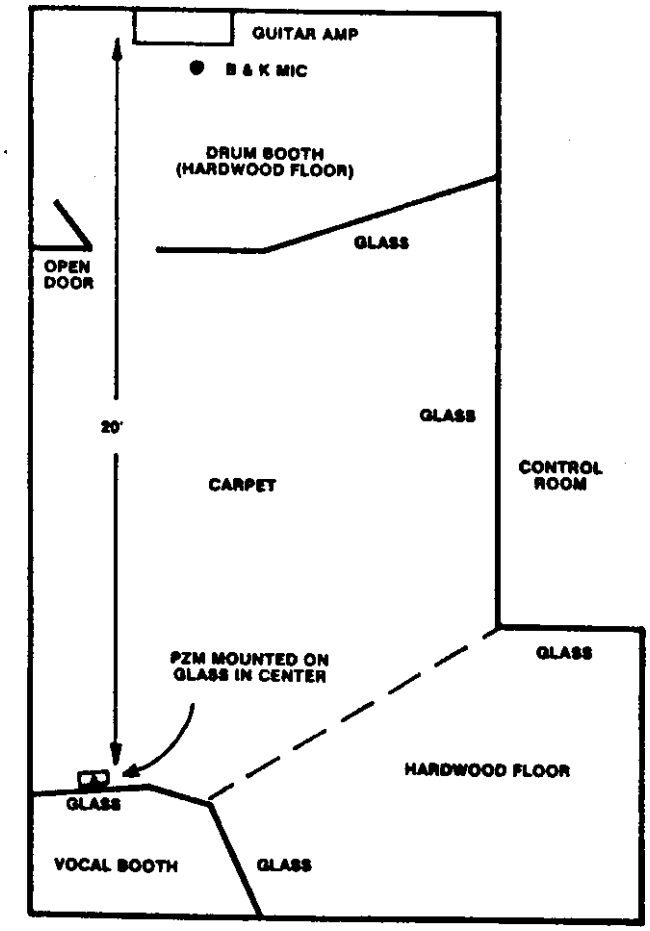
The A240 includes a sturdy, adjustable stand adapter to mount the panel to any standard microphone stand. Holes in the panel let you suspend or “fly” the microphone panel on nylon lines. Two microphone mounting clips are attached to opposite sides of the panel for stereo recording.

LETTERS ABOUT PZM APPLICATIONS

PZM for ambience

Dann F. Haworth, an engineer at Chapman Recording Studios in Kansas City, sent us the following diagram of his PZM application.

A PZM is mounted on the center of the glass-walled vocal isolation booth. It picks up room ambience for electric-guitar tracks. The PZM's signal is mixed with that of a close-up B&K microphone.



PZM placement in studio.

Recording small groups with PZMs

I found a way to accurately record less than four sources. I placed two PZM-6LP [now the PZM-6D] on a concrete wall, 10 feet apart and 4 feet up. The room should be as dead as possible. I used an AKAI GX-747 with Dolby A or C.

The recording was played back through a Perreaux PMF 2150B power amp through KEF or ADS L2030 speakers, with the tweeter and midrange positions matching those of the original mikes.

The tape was proeessed through Carver's Sonic Holograph circuit with the original channels reversed,

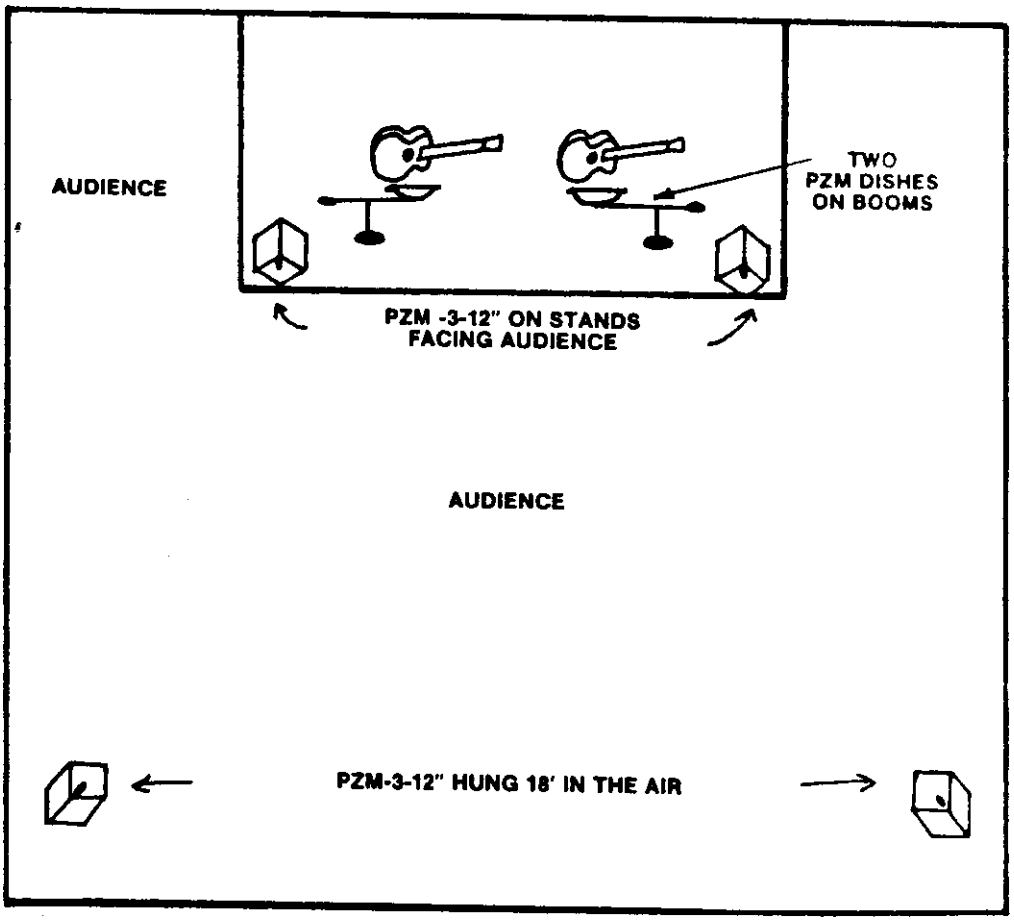
Derek Richardson, DBS Recordist, Chicago, Bollingbrook, Illinois

Miking guitar and audience with PZMs

On August 13, 1983, I was involved in a recording session featuring Tommy Tedesco, a guitarist. Tommy has been involved in the studio scene so long that he is known to other guitarists as "The Godfather." The session was for a sampler disc for CBS records. It was digitallv recorded.

The recording was done at HOP SINGH's in Marina Del Rav California. PZM 3-12" were used around the club to pick up the room sound.

Tommy and Jimmy Bruno both played nylon-string acoustic guitars. The only other instrument miked was a mandolin, which Jimmy used on two numbers. To record these instruments, we used two protoype PZM Dishes. They were 12" in diameter and had a 3-1/2" rise in the middle, with the micro-phone capsule/holder mounted a! the center inside. The dishes were placed about 6" in front of the guitars' sound holes.



Tommy Tedesco's session.

Keep in mind that Tommy has been recorded virtually every day for the past twenty years. He has played the themes from M*A*S*H and Bonanza, worked on the "50 Guitars" albums from the early 60's, and worked for acts like the Beach Boys and Frank Zappa. He has worked on so many comercials and theme songs for shows, that you have undoubtedly heard his artistry.

Take this into account when you read the following: After listening to the playback, Tommy said "This is the best recording I have ever heard of my guitar. It sounds just like I hear it live."

Since that recording date, I have received a call from him wanting to know more about PZMs. Since he is planning some future products, you will probably be hearing more of Tommy Tedesco recorded with PZMs. We'll keep you posted.

Vince Motel, Audio Stuff, Downey, CA

Orchestra pickup with PZMs

We provided sound reinforcement for the Tallahassee Symphony Orchestra for the last three of their performances last year, all held in the Tallahassee Civic Center. We were contracted to provide sound reinforcement because the house sound system was designed for voice, and was not full-range in frequency nor set up to pick up the music.

We wouldn’t have been able to do as well as we did without Crown equipment and advice. The overall arrangement was suggested by David Johnson, Studio West Recording Studio, *The PZM Memo*, and Ken Wahrenbrock.

Crown PZM Microphones were used to pick up the overall orchestra sound. We used two Crown-PZM 3OGP and three PZM-6LP on 2' X 2' sheets of plexiglass (to extend the low-frequency response) suspended overhead [now the PZM-30D and PZM-6D]. But we probably should have used 4' X 4' sheets instead.

Additional pickup was provided to the bass section and special areas such as solo-guitar artists and piano solos.

We used a Tapco 7416 mixer to mix the house sound and to feed audio to the television crew. The show was aired on WFSU Channel II (Public Television Station) and WFSU FM 91.5 (Public Radio station).

The house sound system was engineered to provide frequency response from 20 Hz to 40 kHz. All this was made possible by using Crown EQ-2, SA-2 (2), MX4 (2), DC-300A1 1(6), D150-AII (2), PL-2 (2), D-75 (2), and numerous other components.

We used a Technics SV-PI00 Digital Audio Cassette Recorder to record the final concert, and submitted a copy of this tape to Crown for the PZM Challenge (and won).

We enjoyed this project and learned a lot from doing it.

Willie T. Menasco, Stereo Sales, Tallahassee, FL

Miking a Leslie cabinet with PZMs

I’ve used PZMs for kick drums since first reading about them. I have just used a PZM for a new experiment, and am delighted with the results.

The keyboard player I work with uses a Leslie 147 cabinet with a JBL 2220 B for low end. I was using a Shure 5M57 microphone with a windscreen, but the larger the room, the more volume needed - hence, the more rumble.

With a minor modiflcation of the cabinet, a PZM was mounted by drilling four small holes in the plate, and attaching the plate to the lower left inside wall of the cabinet. The results were great.

Mark Perrin, Fat Sound, Rensselaer, NY

Recording a jazz trio with PZMs

On August 9th, 1983, we recorded the Shelly Manne Trio at HOP SINGH’s in Marina Del Ray, California. The Trio consisted of Sheily Manne on drums, Frank Collette on piano, and Monty Budwig on acoustic bass. This was for a sampler disc for CBS records to be released on compact disc. PZMs were the only mikes used. The date was recorded in Sensurround with PZMs as the room mikes

.We used three PZMs to record the drums. Two were dishes for overhead. These dishes were 12" in diameter and had a 3-1/2" rise in the middle. The kick-drum mike was a 2.5 model with a 12" back plate. The separation in this setup was remarkable. We got no piano or bass on the drum tracks.

Shelly Manne remarked that that bass-drum sound was the best he ever heard. He also thanked us for capturing all the subtleties and nuances of his playing (he generally plays quietly, using brushes a lot).

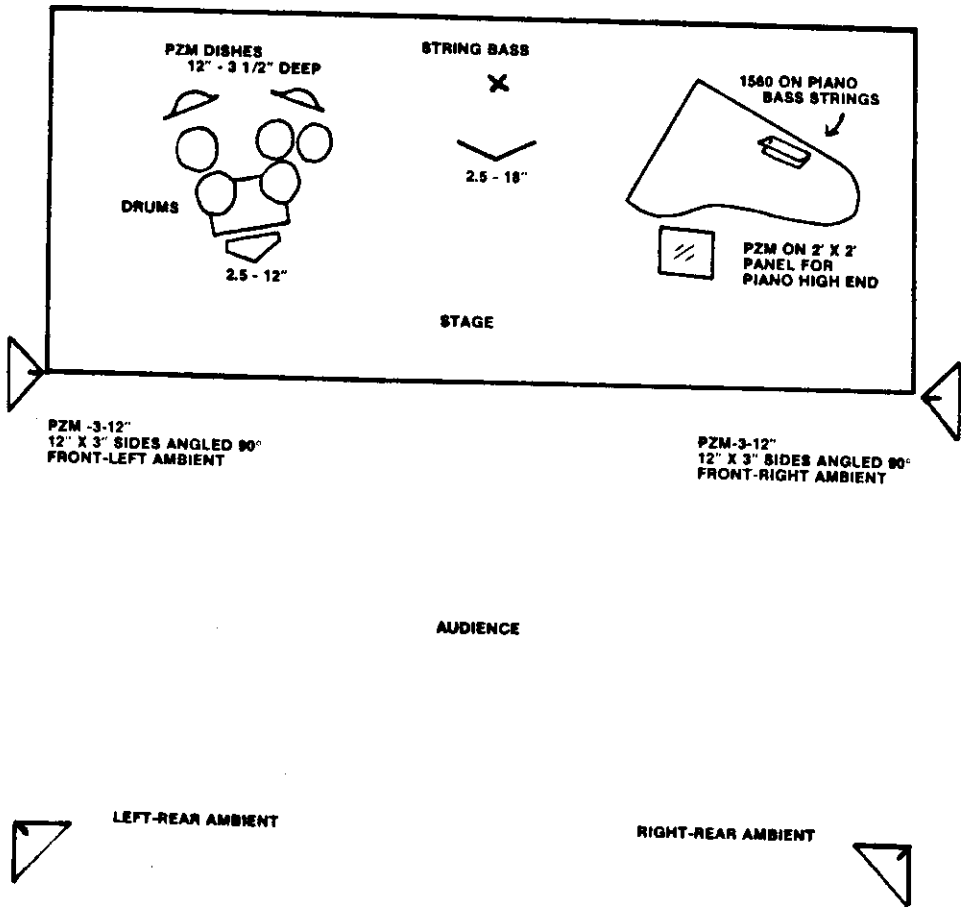
The piano was miked with a PZM mounted on a 2' X 2' plate aimed at the high end, and a 1560 boundary accessory over the bass strings. At times, Frank plays the piano by reaching inside and plucking the strings. This is a very quiet sound, and texturally is like a guitar. The PZMs picked this up very well.

The bass was miked with a PZM-2.5 model taken to extremes. The back plate was 18" tall and 3 1/2 feet wide. This captured an incredible low end.

The room mikes were PZMs mounted in 90-degree plastic corners. Two were at the edge of the stage, with the off-axis side pointing towards the audience and the group (see illustration). The rear room mikes were in the same configuration but about 18 feet in the air.

We converted a lounge in the club into a control booth with Sonex acoustical foam. The ambient mikes were encoded into a quad spread with the CBS Labs Encoder.

Vince Motel, Audio Stuff, Downey, CA



Shelly Manne Trio recording session

Recording fireworks with PZMs

On July 4th, I got a great sound recording fireworks with PZMs taped to the glass window panes of my house - three miles from the fireworks site.

I also recorded another fireworks display (as an assignment) on-site with a van. One PZM was taped to the windshield. The windshield wiper was inadvertantly turned on, and ran over the mike 15 times before being shut off (didn't damage the mike). Another mike was on top of the van. I got a wonderful sound to use as an effect on a record called "Bomb Boys" being worked on in my studio.

I also use my kitchen as an echo chamber. Bright-sounding echoes are picked up with two PZMs back-to-back on plexiglass.

Alfred B. Grunwell, Calf Audio Inc., Ithica, NY

PZMs in studio, theater

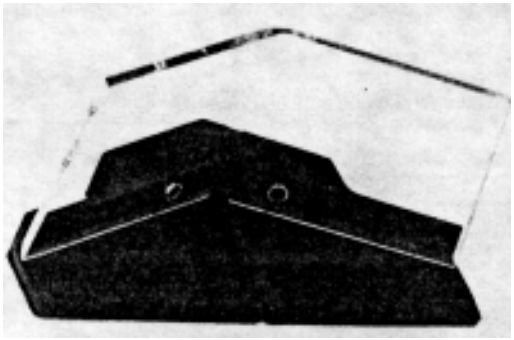
My first experience with PZMs was as an audio technician at a radio station in Southern California in 1980. The piano in the studio did not appear to be miked, yet the reproduced piano sounded like the instrument was in the control room with us! Only later did I figure out that the gentleman so solicitous of the piano sound was Ken Wahrenbrock.

Since then I've used PZMs in recording (perfect ambience mike, not my favorite for drums); live (great for piano and brass if the pattern can be shaped so as not to pick up other sounds); and theater (four mikes placed all-the-way downstage, on plexiglass, aiming away from the audience - this approaches miraculous performance for monitoring and foldback purposes).

Farrell Winter Sueslosky, Independent Productions, Long Beach, CA

TWO NEW PZMICROPHONES FROM CROWN

PZM-2.5 [since replaced by the PCC160]

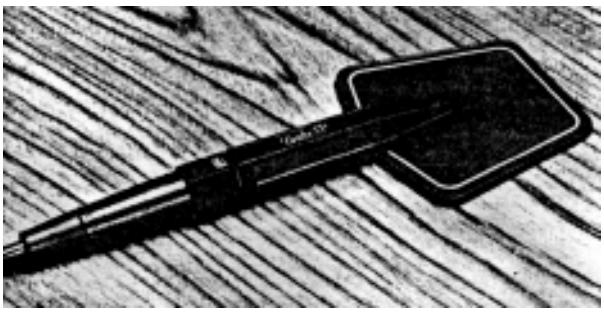


PZM-2.5

This is Crown's first directional PZM, highly recommended for stage-floor pickup of drama, musicals, and opera. The mike capsule is mounted in the corner of three reflective surfaces that shape the polar pattern. Stage dialog is emphasized while audience noise and orchestra sounds are rejected. The 2.5 provides 10dB of forward gain for outstanding "reach." It greatly reduces pickup of room acoustics and feedback. Self-noise is virtually inaudible.

Electronics in the base adapt the unit for phantom powering. The output is balanced, low impedance. The clear plexiglass boundaries are nearly invisible from a distance, and are carefully sized to enhance speech articulation.

PZM-12SP [now the PZM-30D]



PZM-12SP

The PZM-12SP has a bright, crisp sound like the PZM-30GP, but is designed for somewhat different applications. Since it weighs very little, the 12SP can be safely attached to ceilings or suspended panels. And it includes a handle for easy stand mounting - say, over drums.

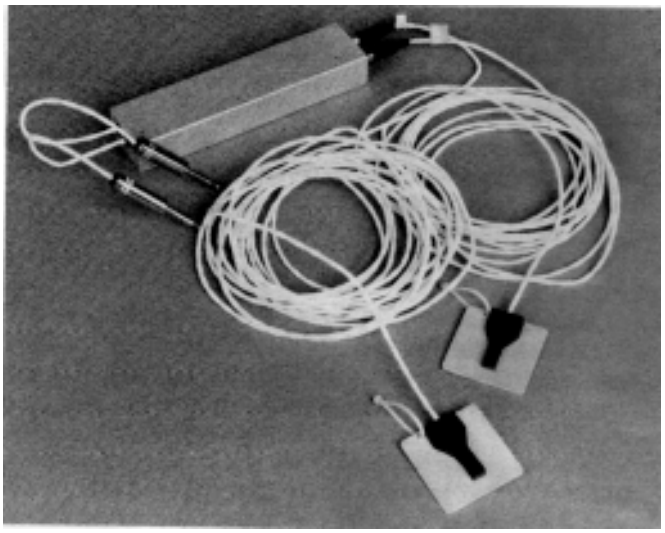
The housing and plate are made of conductive carbon-filled nylon, which provides better RF shielding than other lightweight alternatives. Being non-resonant, this material doesn't "ring" when subjected to shock. The integral handle permits the microphone to be hand-held, stand-mounted, or simply laid on any hard surface. Built-in electronics adapt the unit for phantom powering.

# # #

PZM MEMO

July, 1984
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

CROWN PZMs USED IN NASA SPACE SHUTTLE!



PZMs used in space shuttle flight.

Crown PZMs are not only used around the world; they have orbited around the world. During the April 6, 1984 flight of the NASA space shuttle (Flight 11), PZMs provided the sound track for a 70-mm film showing life aboard the space craft.

The project was sponsored by Imax Corporation, a Canadian film company. Their film will be shown next summer on an enormous screen for tourists at Cape Canaveral, and at the National Aeronautics & Space Museum at the Smithsonian Institution.A PZM is an ideal microphone for this application because the space shuttle has so many reflecting surfaces. The Crown PZMs were appreciated for their small size, light weight, and clear, natural audio.

The microphones were PZM-6S models [now the PZM-6D], modified by Crown microphone engineering to meet the rigors of space flight. We designed a new battery power supply that weighed less than the standard PX18 interface, and selected two mic capsules with a sufficient “barometric leak” to withstand sudden changes in air pressure.

The mics were carefully assembled with special Teflon-insulated mic cable supplied by NASA. The assembly was potted in place to prevent damage from vibration.

We acoustically “tuned” the two units for the desired frequency response and to match the two mics in tone quality. The chosen response was midway between that of the 6S (flat) and 6LP (presence peak), providing an articulate yet natural sound.During the space flight, the microphone plates were attached with Velcro to the walls of the shuttle to prevent the mics from floating away. The PZMs plugged into a Sony cassette recorder to record speech aboard the space craft. According to Imax, they worked fine.

Shuttle flights 14 and 17 will also include PZMs for more sound track recordings. We’re proud that Crown was selected to help document these historical missions.

PZMs PROVIDE REFERENCE-QUALITY SIGNALS

PZMs are being used to generate clean signals for critical listening tests. The Swiss section of the Audio Engineering Society met last summer to examine digital recording. PZMicrophones were used to pick up an orchestra playing in another part of the building, and the signal was brought to a mixing console which fed a digital Studer A808 prototype PCM transport. Program material was monitored both before and after tape to determine the audible effects of digital recording.

It's gratifying that the Swiss section judged the PZMs to be clean enough to provide a reliable signal source - one that does not mask small differences farther down the audio chain.

STEREO-TV TECHNIQUE

Here's a stereo-TV application for PZMs. Gary Pillon, of General Television Network of Michigan, suggests the following boundary system: On top of a portable TV camera, mount a "V" or wedge made of two pieces of plexiglass one-foot square. Screw a PZM-6LP [PZM-6D] to each panel, aiming left-front and right-front for stereo pickup.Place the panels in front of the camera, as far as possible, so that acoustic noise from the camera is rejected.

To cut wind noise in outdoor shots, mount some stretched nylon stockings or open-cell foam over the microphones. Best wind rejection occurs when the screening is spaced far from the microphones.

Gary also has a tip for PZM users who want to raise heavy PZM boundaries on mike stands. Try a "Mole High-Riser," a lighting support used to hold 5000-watt lights 15 feet high. They are available at many video rental houses.

CROWN PZM VS. RADIO SHACK PZM

Many of you are aware that Radio Shack is selling a low-cost PZM. Crown licensed the right to manufacture PZMs to Radio Shack.Although the Radio Shack model is good for its price, you get what you pay for.

The Crown PZM most competitive in price with the Radio Shack model is the Crown Sound Grabber. Here are some advantages of the Sound Grabber that justify its higher price:

*Self-contained. No in-line battery box.

*The battery lasts much longer, so no on-off switch is needed.

*Can be hand-held or stand-mounted as well as used on a surface.

*Lighter weight allows easier mounting on walls and ceilings.

*Unit-to-unit consistency is better, because the microphone capsules must fall within rigid performance limits.

*Much more sensitive (15 dB).

*Made in U.S.A. by Crown, which also builds highly regarded studio microphones.

*If the user wants to upgrade to higher-quality PZMs, or needs a special-purpose PZM, Crown manufactures an entire line of PZMs for varied applications.

THE DEVELOPMENT OF THE MULTI-BOUNDARY PRESSURE ZONE MICROPHONE

by Ken Wahrenbrock

EDITOR'S NOTE: This is a comprehensive history of the use of multiple boundaries with PZMs. In general, the more boundaries that are used, and the bigger the boundaries, the more directional is the pickup pattern. And the more directional the pickup pattern is, the less is the pickup of ambience, leakage, and unwanted noise. We thank Ken Wahrenbrock for his pioneering work with multiple boundaries, and for this interesting history. The models mentioned in this article are not commercially

available, but are easy to build.

In early 1979, during one of the Syn-Aud-Con seminars, Farrell Becker suggested using more than one boundary for PZMs. So we taped three pieces of base-plate together with gaffer's tape, and loosely mounted a PZM cantilever and capsule in the corner (Figure 1).

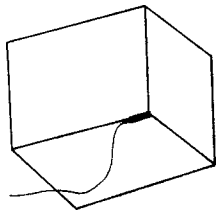


Fig. 1: 1979 - The first experimental multiboundary PZM put together with gaffer's tape. The increased gain and directionality were immediately apparent. It was similar to a PZM-3*.*

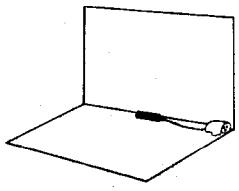


Fig. 2: Early sample of a PZM-2. When a PZM-2 or PZM-3 is placed at the junction of two or three room boundaries, recorded room ambience is dramatically reduced*.*

We monitored the microphone with headphones. The gain and directionally were greatly increased, and the reduction in reverberation pickup was startling - even when the talkers were 30 feet or more from the microphone.

Some of these early models were made from aluminum plates. The PZM-2, as it was called, had a second plate wedged on to make an "L" (Figure 2). The height of the backplate was 5". Some PZM-3 microphones (Figure 1) were also made by adding a third boundary welded to one end. The cantilever and capsule were mounted in the closed corner.

The early testing was done by placing the PZM-2 and PZM-3 at the junctions of walls. With the PZM-2, the pickup pattern was reduced from a hemisphere to 'A of a sphere. The PZM-3 further reduced that pickup by half.

We found that positioning the microphone on one boundary eliminated the audible effect of reflections or ambience from that boundary. Placing the PZM at the junction of an additional boundary further reduced the reflections and ambience. Placing the PZM at the junction of three boundaries increased the articulation and reduced the ambience still more, because one-half of the room reflections were audibly eliminated.

These PZM-2s and PZM-3s were shortly tested by Brad Williams in the theatre workshop at Cerritos College in Southern California. PZMs placed across the front of the stage added 6 dB of gain from the second boundary. This greatly improved the pickup while reducing audience noise, compared to the flat PZMs with carpet added for rear attenuation.

The stage pickup was excellent with the PZM-2, although the mic did not discriminate sufficiently against the orchestra and the audience. The PZM-3, on the other hand, had too-narrow a pickup pattern and left downstage areas uncovered.

PZM-2.5

Brad sought to solve that problem by splitting the difference - he built some PZM 2.5's. The enclosed angle was 135 degrees (Figure 3). These early models were made of dark plastic since aluminum was expensive. The first prototypes were made in three pieces, with careful angle calculations on the table saw. The height of the vertical boundaries was reduced to 4" to avoid blocking sighflines for the front seats in the theater.

During 1980, the vertical-boundary sizes were increased. Constructing the boundaries of clear plastic

made them invisible. An 8" boundary gave a considerable improvement over a 4" boundary, increasing the reach upstage and providing much better rear discrimination. It also lowered the frequency at which the 6 dB shelving loss takes place.

These 8-inch tall 2.5's have been used for solo mikes and group mikes when mounted on stands because of their excellent reach and rear rejection. Several choral groups have used these for reinforcement pickup to balance the choral level with the orchestra level.

Later in 1980 we increased the boundaries to 12" and heard another order of improvement. TDS measurements indicated 40 dB of discrimination in the midrange and above when the microphone is placed on a large boundary like a stage floor. Many stages have used these to pick up musicals, with the soloists standing 25 to 30 feet away from the microphones.

Many more 12" models are being used for high-school and college theaters, because youthful voices have less strength and require more assistance. Where school auditoriums are not carefully engineered, PZMs have provided a margin which enabled the drama and music instructors to present their classes in the best manner possible.

A larger version of the 2.5 - 18" high and over 36" long -is now being used in several ways. One of these has been used by the San Diego Symphony for pickup of the French horns, and another for the entire brass section. Again, the pickup with that size boundary is exceptional, and the discrimination from the back is increased by an order of magnitude.

An additional version of the 2.5 is now being fabricated. The vertical boundary will be a 24" x 36" piece of plastic, heated and folded to 135 degrees at the center of the short dimension. It will stand 36" high, and will be placed near the music stand for two string basses. This will provide much better pickup of the total sound because the sounds from the F hole can be more clearly received.

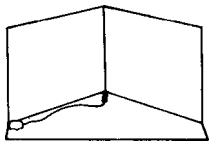


Fig. 3: PZM-2.5 with an enclosed angle of 135 degrees.

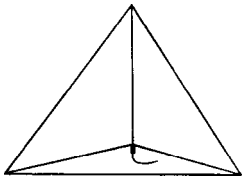


Fig. 4: A PZM triangle pyramid. A model with 18" short sides was suspended overhead for stage pickup. Another model with 4' short sides and 5-1/2' long sides was used to record an organ with reduced leakage*.*

Later versions of the 2.5 were made with the vertical boundary of one piece heated and bent in the center. Mounting this on the base increased the strength. The latest version is made with additional support on the base that allows the vertical boundary and the base to be screwed together. This construction allows easier storage and shipping.

PZM pyramids

Back when the first 2.5 units were being tested, we also built some plastic boundaries shaped like pyramids. The PZM capsule was mounted in the inner corner (Figure 4). The first ones were constructed 12" on the short sides of the triangles. Later models were increased to 18" and worked much better.

Pyramids were suspended over stages in the borders for upstage pickup. Since the pickup pattern was the extension of the planes of the three boundaries, the pyramid could be directed to cover particular areas. The assembly reduced offstage pickup and eliminated noise from overhead.

These pyramids delighted sound crews and directors. In several theaters, the designing architect was more pleased with his acoustical and sound-system design when PZMs were used.The pyramids'

application in theater sound reinforcement was spreading. Several touring theater companies, when introduced to PZMs, found their show engineers purchasing PZMs on their own when the show sound companies would not make the purchase. The reinforcement was so much improved that the sound engineer would not go back to traditional shotgun microphones.

Some narrower versions of the pyramid have been fabricated with an angle of 60 degrees rather than the usual 90 degrees. This reduces the pickup angle. There is a bit of high-end comb filtering, but the decreased pickup of room ambience and tighter pickup pattern provide greater reach.

Next we made two pyramids that were 48" on the short sides of the triangles, made with Tuffak Twinwall. They were used for some theater organ recordings to reduce leakage from other instruments. They were suspended from the spotlight bridge in front of the divided organ chambers.

L-squared array

A very flexible version of multiple-boundary PZMs is the L-squared arrayby Mike Lamm (Figure 5). Several articles have described his array and the variety of pickup patterns he has developed. The recordings made with the L-squared are excellent and exciting.

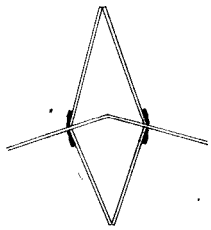


Fig. 5: *The L-squared array.*

PZM Dish

A different type of boundary is a blown bubble boundary which we call the “dish.” The earliest versions were a mere 6" in diameter with a depth of about 1". The cantilever/capsule was mounted on the concave surface near the center (Figure 6). These dishes did not provide much more than the standard plates mounted on stands, so nothing more was done with them for a while.

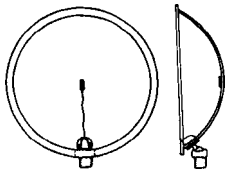


Fig. 6: The PZM Dish, designed by Mike Lamm of Houston, Texas.

In 1981, I built ten dishes 12" in diameter and 2" deep. Dave Johnson used these with the San Diego Symphony. He considered the results a great improvement over the traditional free-field microphones he had been using.

Frank Zappa also used them in his classical recording. The engineers felt that they could be improved by deepening them, so some were made 3.5" deep. These were startingly better, with a tightening of the pickup pattern and better isolation from nearby instruments. They were used for solo instruments in concertos, as well as instrumental sections for sound reinforcement of the orchestra.

Some of these were also produced with a diameter of 28". The reach is exceptional, but no practical use has surfaced for these as yet. In foothall games they clearly pick up the quarterback calls, but also reach across the field.

PZM Cones

A different form of dish termed the “cone” has been used. It is heat-formed of 1/8" plastic over a form with an included 60-degree angle (Figure 7). It provides a much tighter pickup pattern than the dish. It has been used as a “follow” microphone for a roving TV camera to provide an audio perspective matching that of the video shot.

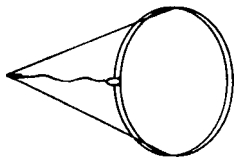


Fig. 7: PZM Cone. It has been used as a "follow" mike for a roving TV camera by Keith Warrn of Southern California Edison. It provides the same audio perspective as the video shot.

1560-type boundaries

Crown is making an "L"-shaped boundary accessory called the 1560 [now discontinued]. It is 15" long by 5" high, and has an enclosed angle of 60 degrees. Several 2260s and 2860s have been made to fit particular pulpits and lecterns (Figure 8). One version has been built that is 40" long. A single PZM mic mounted in it can pick up two persons using it at the same time. If one has a stronger voice than the other, the bar can be offset to compensate.

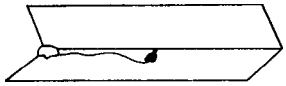


Fig. 8: A PZM 2260 - 22" long with an acute angle of 60 degrees.

Several of these have been built even larger. One was made 72" long by 6" wide to pick up the marimba in stereo. A boundary was placed in the center and two bars installed as close to the center as possible.

Two additional models have been tested with the boundaries made of plastic 24" x 36", heated and folded to an internal angle of 60 degrees to make a microphone 36" long. End plates were installed for directionality. Two of these have been used by Frank Zappa for stereo background vocals, ambience pickup, and stereo marimba.

A special version of the 1560 was constructed for use in an auditorium where a teacher had to read at a desk for long periods of time. Additional gain was required, since the reader wanted to lean back away from the mike. Two side boundaries were added at 45 degrees on each side to provide additional side discrimination from the loudspeaker cluster (Figure 9).

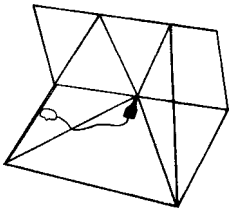


Fig. 9: A PZM 1560 modified with two side boundaries at 45 degrees on each side. It provides additional side discrimination from the loudspeaker cluster at Ambassador Auditorium.

Conclusion

This rather quick review of the development of multi-boundary PZMs has undoubtedly missed readers' developments that may be important and unique. Forward them to Crown. Include pictures or drawings to illustrate the idea and the technique utilized.

There are still many yet-to-be discovered ways that these PZMs can be used; many configurations of multi-boundary PZMs yet to be developed. The one principle I'm sure of is that PZMs can provide some microphone pickups that no other microphone can yet accomplish.

LETTERS FROM PZM USERS

PZMs improve conference miking

At a J.C. Penney corporate headquarters meeting room, I saw an odd-looking round device on a table. It was a conference microphone made by another manufacturer. We suggested they try a PZM for comparison. They did, and will buy two PZMs! They loved them.

Two years ago, a German magazine research company set up an office in New Jersey. I suggested they use the PZM, but they thought they couldn't afford it, and bought two conference microphones of another manufacturer. Later the research company called to say that the microphones were terrible and wanted to try the PZM. I gave him one for three days. They reported that his German business associates heard them and were delighted! He ordered three more PZMs!

The head of the audio-visual department at J. Walter Thompson wanted to try a PZM taped to a l2-foot-high ceiling. I told him he should get the prize for unusual usage of PZMs. He said "I knew they were good but this blew me away!" He bought it.

Sam Helms, Metrorep, 57 South St, Freehold, N.J.

PZMs great for drum reinforcement

I play in a Top-40 band, and recently started using PZMs in live sound reinforcement. I'm using two inside a large plexiglass barrier for my drums. I place them low and in the corners facing out I also use one conventional unidirectional microphone overhead in the center, and one on top of the snare drum.With this setup, I get incredible low end from the toms and bass drums, great highs from my cymbals and Rototoms, and I only use four channels on the main board. The barrier also cuts down my stage volume.

Mark L. Wright, Las Cruces, N.M.

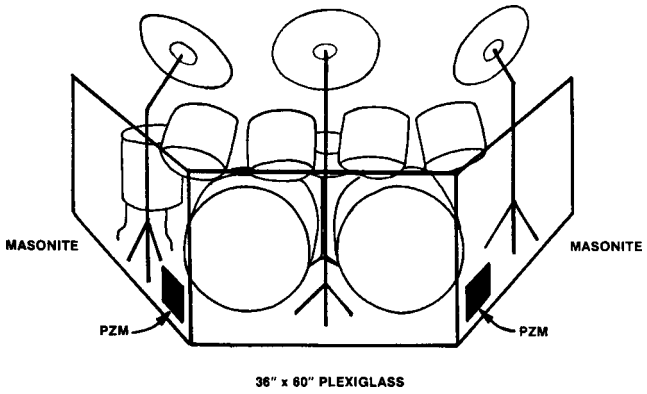


Fig. 10: PZM drum miking.

Reply:

Thanks for your notes on PZM techniques for drums. We're glad you were able to simplify your drum miking. Some other techniques worth trying are:

*A PZM-30GP [now the PZM-30D] on your chest to pick up the kit.

*Two 30GP [PZM-30D] overhead, back-to-back, for cymbals.

*A GLM-100 clipped onto the snare-drum rim.

# # #

PZM MEMO

October 1984
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

CROWN PZMs ENHANCE BUDDY RICH RECORDING

Tate-Reber Productions, headed by Gary Reber, recently recorded the Buddy Rich Big Band with extensive use of PZMs. Digital recording equipment was supplied by Abbey Road Studios. The recording will be released in Beta Hi Fi, VHS Hi Fi, analog disc, and Compact-Disc formats.

For overall quad pickup of the band and audience, Gary devised an eleven-foot-wide PZM boundary array made of 4’x 4' plexiglass panels. The front mics of the array picked up the ensemble, while the rear mics picked up audience reaction.

In addition, Gary used two PZM Dishes [discontinued] over the drumset, a PZM-2.5 [discontinued] in front of the kick drum, and a pair of PZM-6S [now the PZM-6D] units underneath the lid of the piano. In all, eleven PZM-6S and four PZM-2LV were employed. Bass was taken direct and miked off the amp.

The mix was processed through a Tate quadraphonic encoder/decoder system, which permits panning of tracks anywhere around the listener.

Gary will describe the setup in full detail in future issues of STUDIO SOUND and MIX, and in the next issue of PZM Memo [Mic Memo]. Watch for this outstanding recording later this year.

PZMs RECORD HOUSTON SYMPHONY

Dove & Note Recording Company, Houston, Texas, recently completed a recording session with the Houston Symphony Orchestra. Dove & Note suggested PZM applications, supervised the overall project, did the recording engineering and performed the live stereo mix.

The album material was large-scale classical works performed by the 97-piece Houston Symphony and the 225-voice Sanctuary Choir of Second Baptist Church, Houston. They were conducted by Gary Moore, Minister of Music of the church.

Digital Entertainment Corporation, Nashville, supplied a 32-track Mitsubishi X-800 Digital Studio Recorder; Digital Services, Inc., Houston, provided the remote studio facilities; Crescendo Corporation, Dallas, underwrote the project, and Sparrow Records, Los Angeles, will distribute the recording. Album release is expected in September.

PZM ON PANEL

I’ve been a sound recording engineer since 1945 (PRE-TAPE). First with AFRTS from 1946-56 and sicne 1956 to the present with theMotion Picture/TV Dept. at Rockwell International-NAAO (nee NorthAmerican Aviation.

I’m sure that you’ve had as many ideas for the use of the PZM as there are audio people who write you. About a year ago, I put together a plexiglass boundary plate for use with our mic stands. We took some pictures and I am enclosing a set for your interest. Since that time I see you now have one on the market [discontinued.] I’m sure I was not the only user to come up with the idea.

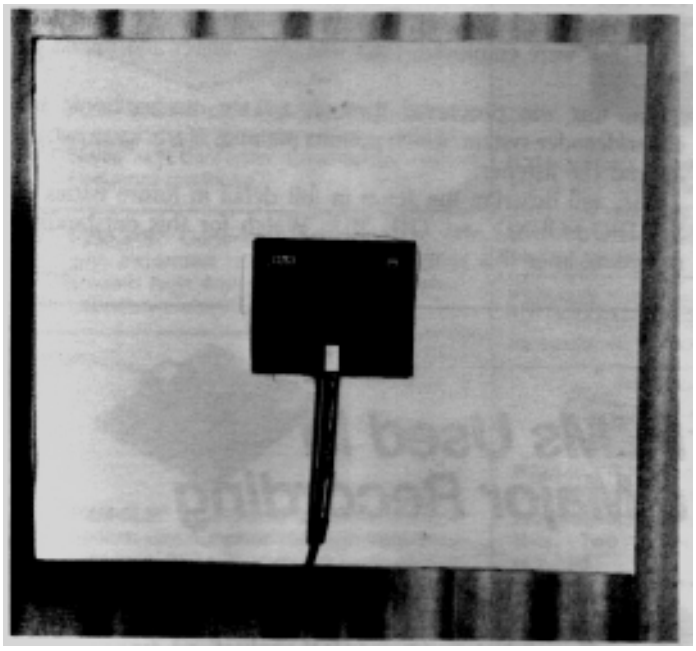


Fig. 1: PZM-30GP and PX-T on paper-covered plexiglass boundary.

Not long ago I was on location for a Rockwell project to record sound for one of our company films at an Air Force base. Much of my time there was spent about 200 feet from the main runway. I mounted a PZM on the side of an Air Force van which was parked parallel to the runway (see photo), to see what would happen as the various jet aircraft took off and landed on that runway.

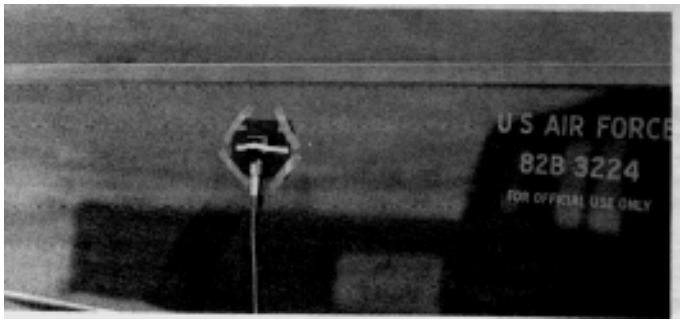


Fig. 2: PZM-30GP taped to side of van.

The results were amazing. I used a Nagra III with a multi-step attenuation pad in the mic line. The only distortion was the natural distortion associated with a jet engine operating at the dB level. The sounds were recorded mono. I only wish I had a Nagra IVS. While the sound will not transfer to 16mm optical with that purity, I at least know that the original recording is good.

It would seem that the uses for the PZM are limited only by the imagination. It's nice to hear "clean" noise.

Martin Halperin

Audiovisual Program Coordinator

Motion Picture/TV Department

North American Aircraft Operations

Rockwell International Corporation

Los Angeles, California

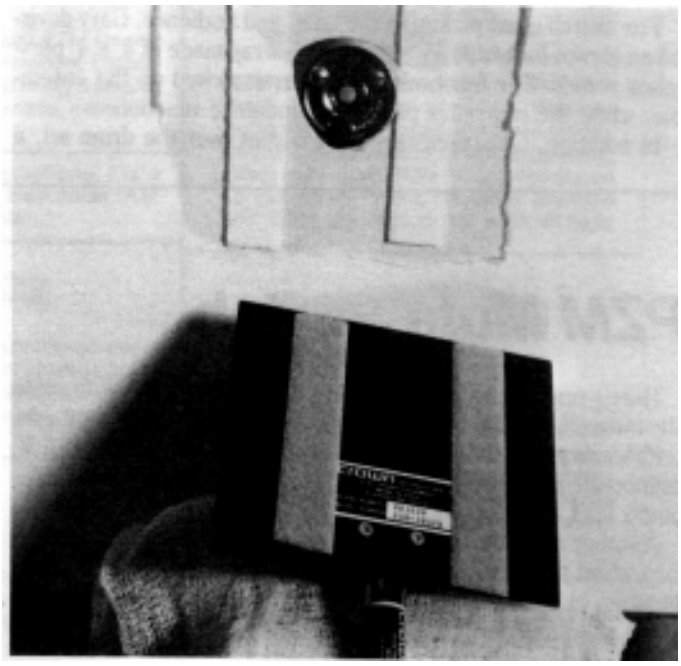


Fig. 3: Velcro strips hold PZM to panel. Atlas AD-11 flange is screwed to panel. It accepts a tube that fits into a microphone stand adapter*.*

PZM ON DISK FOR MIKING CHOIRS AND ORCHESTRAS

Here's the best way I've found to mike a choir/orchestra to achieve maximum gain or reject nearby sound sources.

1. Cut out a 24"-diameter disk of 1/4" acrylic plastic and polish the edges (see figure).
2. Mount a flange on top of the disk in the center.
3. Screw a gooseneck into the flange. The gooseneck allows leveling of the disk.
4. Mount a 6LP [now the PZM-6D] to the bottom of the disk.
5. Splice the mic cable inside the gooseneck with grey Belden 8451.

I have suspended lengths up to 45 feet without problems.

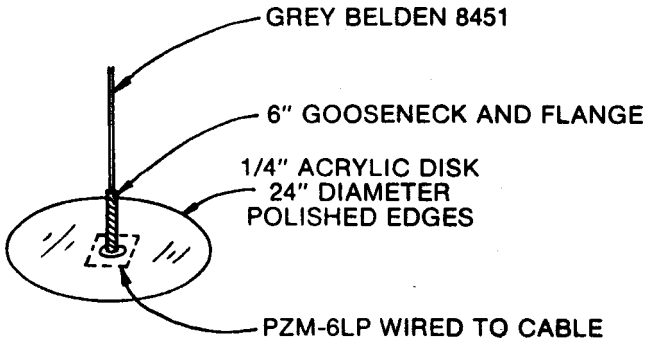


Fig. 4: PZM on suspended acrylic disk.

RESULTS:

1. More available gain than actually needed! Previously this was unheard-of for a choir.
2. I'm able to reinforce the choir sound back to the choir via an overhead monitor with success. In other words, the choir can actually hear themselves via the monitor - also previously impossible.
3. We achieve excellent rejection of "above plate" sound sources; pipe organs immediately above the

choir are not additionally amplified.

4. We get the usual PZM benefits. Since there's a greater area of blending, we can use fewer PZMs than we would need using cardioid condensers. There's better spectral pickup of off-axis voices; therefore better, more natural reinforcement. Choir directors love them.

5. You can hang them via the mic cable without tie lines, fishing line, etc.

I don't care what [theory] says; placement of the element near the center of the disk produces no audible problems for sound-reinforcement uses. [Editor's comment: The response problems caused by that placement occur only for sources on-axis in a "dead" environment.]

Glen C. Collins, P.E. Allied Sound, Inc.

Nashville, Tennessee

PZM PULPIT MIKING

I need some help concerning monitors, using a PZM as a pulpit microphone. I never have enough gain before feedback.

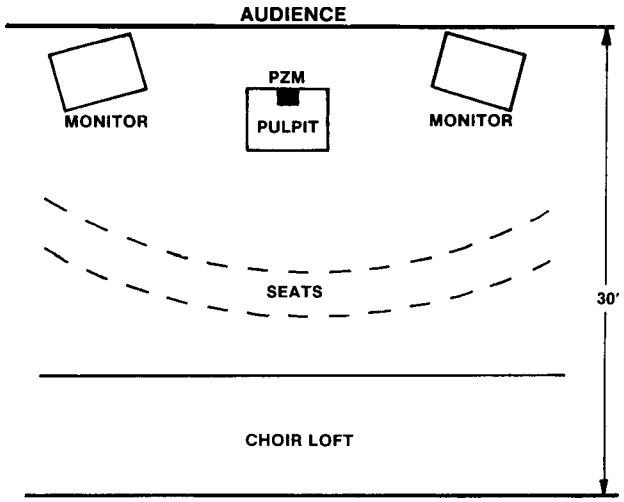


Fig. 5: Customer's PA setup.

The sketch will give you an idea of the pulpit area. We currently use a Neumann KM84, but would like to eliminate the gooseneck, etc., associated with the Neumann. Please respond with any helpful information.

Also, can I make the PZM wireless? I have an HME wireless system.

Dale Bettany, Sound Technician, Bethesda Temple, 21960 Fern, Oak Park, Michigan 48237

Reply:
Feedback is sometimes a problem with PZMs because placing them on a surface also places them far from the sound source. The farther the microphone, the less the gain-before-feedback. The same problem occurs with any microphone placed far from its source.

Here are some suggestions:
*Raise or build-up the pulpit surface so it's closer to the talker.

*Try wiring the two monitor loudspeakers in opposite polarity, and place them exactly equidistant from the PZM. This arrangement partially cancels the monitors' sound at the microphone, letting you increase the gain-before-feedback.

*Using a graphk equalizer in the monitor channel, cut frequencies that feed back.

*Try mounting the PZM capsule/holder on an angled boundary. This is an L-shaped, 60-degree angle, clear acrylic plastic corner reflector that makes the PZM directional. It's designed for use with the

PZM-6LP and PZM-6S [now the PZM-6D] microphones.

*With the angled boundary, the best monitor location might be behind the microphone (the audience side of the pulpit), if you can place the monitors there.

*You can make your own corner boundary out of wood or plastic. The bigger the boundary, the better it works. Big boundaries have more bass and better rear rejection than small boundaries. So make the biggest boundary that is not visually conspicuous.

*Try a Crown PCC-130W, which is a small supercardioid boundary mic.

MULTI-BOUNDARY PZM FOR THEATER

“Brighton Beach Memoirs” just played the Fisher Theatre with PZMs in the footlights, mounted in a homemade Isoflector-like shield - but with the mic mounted backwards (see below).

[Editor’s comment: This arrangement can be improved by mounting the capsule holder so that the “nose” or front of the capsule holder touches the vertical boundary. This avoids phase cancellations and improves rear rejection.]

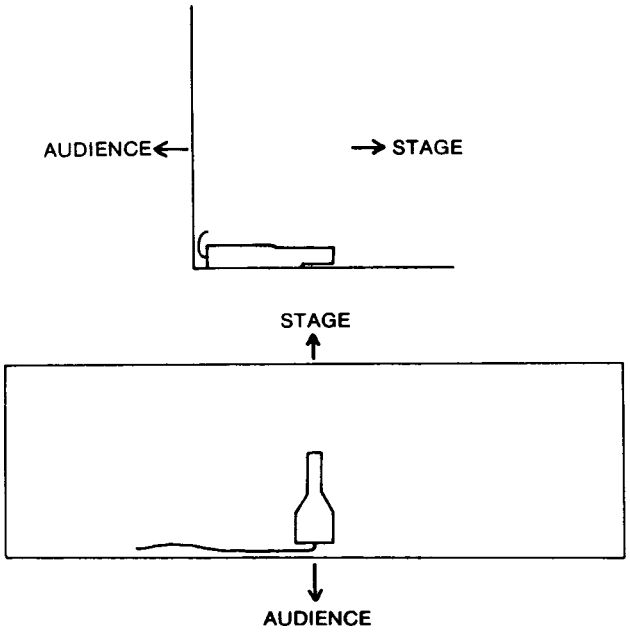


Fig. 6: Incorrect placement of capsule holder in angled boundary.

ORCHESTRA RECORDING WITH PZMS ON A PANEL

Since this summer’s purchase of two Crown PZM mics we have been in a state of recording bliss! The difference between these two little mics and any combination of traditional mics we’ve used is truly remarkable.

Among several concerts so far recorded with PZMs, we had excellent results recording Bach’s Cantata 106 and A. Honneger’s oratorio “King David.” Both performances included orchestra, organ, and full choir with soloists (instrumental and vocal).

We mounted the PZMs back-to-back on a 18" square plexiglass plate, placed several feet above and behind the conductor’s head. We obtained a balance and clarity unmatched - even with complex microphone placements and mixings of the past. So, besides being excellent microphones, they considerably reduce the time to prepare for a major recording project.

We do have a couple of problems, however. They don’t work with every recorder or mixer I have. Is it possible to add a line transformer to boost the signal so it will work with my Yamaha K-960 or Nakamichi BX-2, for instance? Since (alas) I must still haul my equipment all over the place, I prefer to

use cassette decks over the large open-reel machines (when top quality is not of greatest concern).

Also, since we record a good bit of choral music, we have had some complaints of over-emphasized "essing." Is there such a thing as an "ess-filter?"

Stephen Heller, Department of Music, Moravian College, Bethlehem, PA

Reply:
You can add a line transformer to boost the signal. The transformer must be connected between the phantom power-supply output and your recorder input.

There is a signal processor called a 'De-esser" (a form of compressor) which reduces sibilance without affecting tone quality. Ask your sound dealer. Unfortunately, it requires line-level signals and is expensive.

Some PZMs (30G, 6LP) [now the PZM-30D and PZM-6D] have an emphasized high-frequency response for brilliance. If you have either of these models, they may be causing your sibilance problem. Try a PZM-31S or PZM-6S [now the PZM-30D and PZM-6D] which have a flatter high-frequency response.

PZMs CAPTURE STOCKHOLDER'S MEETING

Industrial Communications of Detroit used seven PZMs in Isoflectors for the dias on GM stockholders' meeting. We felt it was a stunning improvement over last year's setup.

Lester J. Hamilton, Fisher Theatre Sound Dept., Union Lake, Michigan

YOU TURKEY!

I recorded a Thanksgiving dinner using two PZMs taped to the turkey. The carving was particularly dramatic. You can actually hear the difference between light and dark meat!

Christopher S. Johnson, CBS Educational and Professional Publishing, New York, New York

[Editor's comment: No comment]

PZMs IN BAFFLES AID PICKUP OF A MEETING

Recently we were contracted by the local Alcoholics Anonymous Club to help with their meeting room. They were using a powered lectern that everyone could hear. But when members of the audience near the front responded to the moderator, no one in the rear could hear them, since they were facing the front. Adding to this problem was a large electrostatic smoke precipitator (hung from the ceiling) which emitted a rumble in the rear of the room.

SOLUTION: We built four plexiglass right-angle baffles (see figure), mounting 6S elements snug into the corners of the baffles. We located the PZMs for maximum coverage of the front two-thirds of the audience.

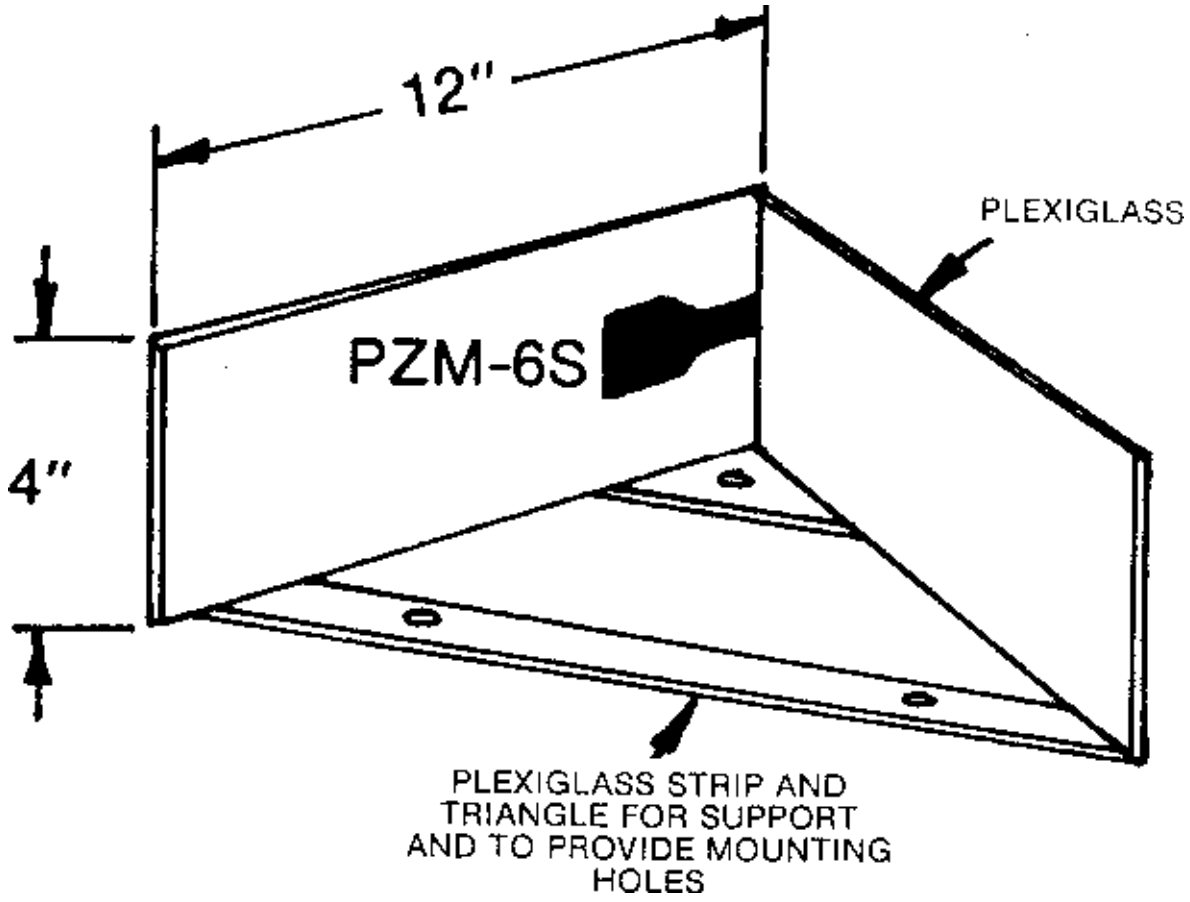


Fig. 7: PZM mounting in angled baffle.

We also located the ceiling speakers toward the rear, and hooked them in series-parallel to present 8 ohms to each channel of the Hafler DH-220 amp.

The other components used in this chain were a Ramko P4 mixer, a Crown PH4 [now PH-4B] Phantom Power Supply, and a Range GE-27 ½-octave equalizer.

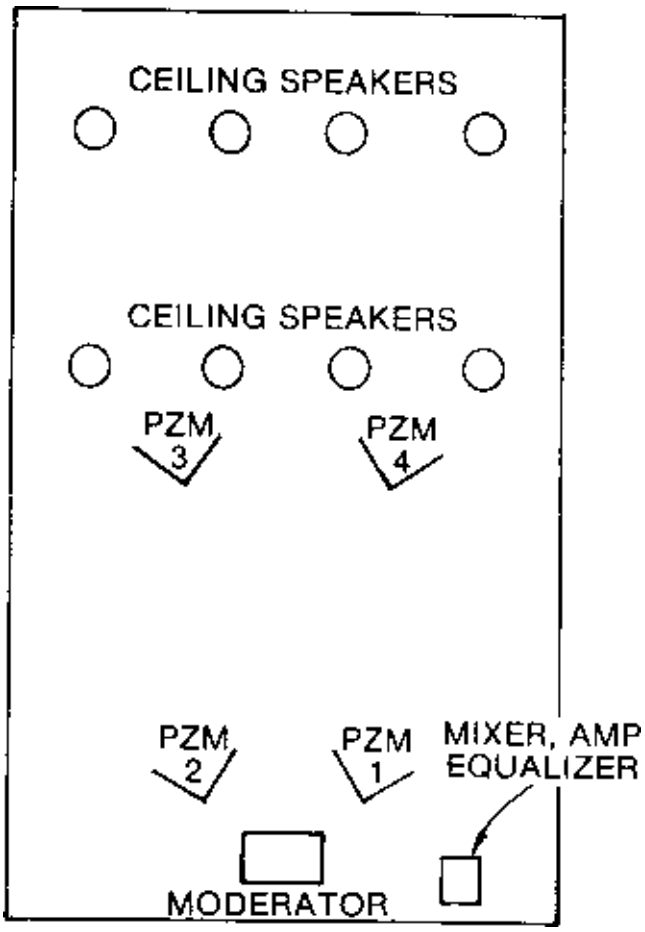


Fig. 8: Mic and speaker layout at meeting.

The results were terrific.. .no feedback with the EQ set, and plenty of volume in the rear of the room - even with the smoke precipitator running. The club is so delighted that we were contracted to do three other meeting rooms in the Atlanta area.

Thomas M. Hayward/Rick Rogers, National Sound Engineering, Atlanta (Lilburn), Georgia.

# # #

PZM MEMO SUPPLEMENT

October, 1984
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

1984 PZM CHALLENGE WINNERS

Judging has been completed for this year's PZM Challenge. It was the third annual contest to determine the best original recordings made with Crown PZMs as the main microphones.

The PZM Challenge is divided into two categories. The "Dealer" contest is open only to Crown PZM dealers, their employees, and immediate families. The "Open" contest can be entered by anyone except Crown dealers. Ineligible entrants are Crown employees, sales reps, and advertising or public-relations agents.

Based on the recordings' sound quality and creativity in the use of PZMs, winners are determined in each of three categories:classical, popular, and environmental. The winners from each category receive their choice of a pair of PZMicrophones. A Grand Prize winner is then selected for each contest from the category winners. Each of the two Grand Prize winners receives a choice of two pair of PZMicrophones and a PZM accessory. Runners-up from each category receive one pair of PZM model 180 microphones.

Judging took place on June24, 1984. The judges had long experience in critical listening. They were:

Dr. Clay Barclay, New Product Manager, Crown International. Clay is also a former high-end audio dealer and recording engineer.

Bruce Bartlett, Microphone Design Engineer and Technical Writer, Crown International. Bruce is also editor of the *PZM Memo*, a contributing editor to *Modern Recording & Music*, and a recording engineer and musician.

Tom Lininger, Microphone Department Manager, Crown International.

This year's entries numbered twenty-six. They were uniformly high in quality; we regret not being able to award more entries. On separate forms, we scored each entry on a scale from 1 to 10. both for the overall sound quality and for creativity in the use of PZMs. The scores were entered into a computer, which averaged the results and indicated the winners.

THE WINNERS

Dealer Challenge

Grand Prize In the Dealer Challenge, Popular Category:

ALFRED GRUNWELL and TODD HUTCHINSON. Calf Audio, Ithica, New York; for a recording of folk singer Mark Rust.

Winner in the Dealer Classical Category:

RICHARD MENASCO, Tallahassee, Florida; for a recording of "St. Nicholas."

Winner in the Dealer Environmental Category:

JACK FLANINGAN, Triad Audio Systems. Inc.. Fort Wayne, Indiana; for a recording of a steam train.

Runner Up in the Dealer Popular Category:

DAVID MENASCO, Tallahassee, Florida; for a recording of "When I'm 64."

Runner Up in the Dealer Classical Category:

RICHARD MENASCO, DAVID MENASCO. and MICHAEL

LOWHORN, Tallahassee, Florida; for a recording of "The Messiah."

Runner Up In the Dealer Environmental Category:

DAVID MENASCO, Tallahassee, Florida; for a recording of rain and birds.

Open Challenge

Grand Prize In the Open Classical Category:

GARY PILLON, Detroit, Michigan: for a recording of "Christ the King Chorale."

Winner, Open Popular Category:

JIM WILKE, Seattle, Washington: for a solo piano recording of Adam Makowitz.

Winner, Open Environmental Category:

HERB CHALLIS, Ormond Beach. Florida: for a recording of a space-shuttle liftoff.

Runner Up, Open Popular Category:

LEROY SHYNE, Shyne Sound, San Rafael, California; for a recording of three gospel groups.

Runner Up, Open Classical Category:

ANDRJEZ LIPINSKI, Glen Echo. Maryland: for a recording of Vivaldi's "Four Seasons."

Runner Up, Open Environmental Category:

FRANK SERAFINE. Serafine FX Inc.. West Los Angeles. California; for a recording of jets at the Denver airport.

Thanks to everyone who took up the challenge. and congratulations to all the winners. Let's discuss each winning entry in detail.

Mark Rust - "Our Families Came to Sing"

World Records, Toronto

Grand Prize, Dealer Popular Category

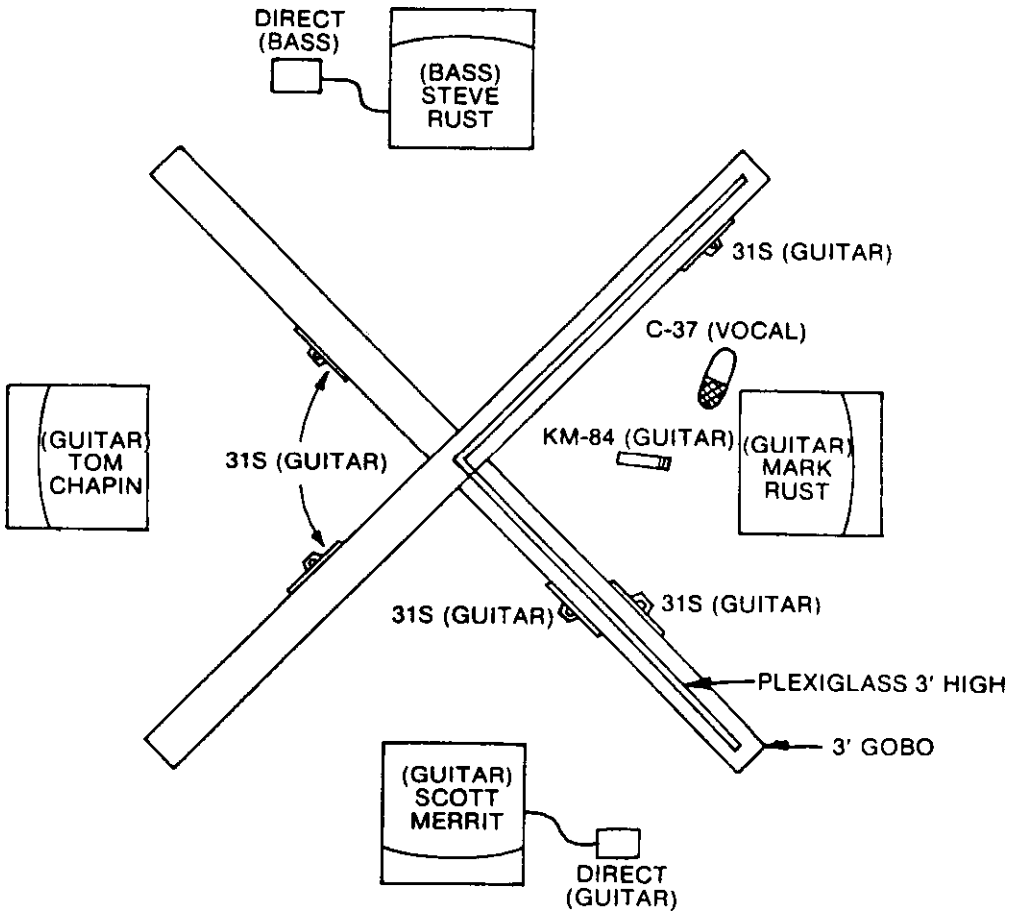
Engineered by Alfred Grunwell and Todd Hutchinson

Calf Audio, Ithica, New York, 1983

Produced by Bill Usher

This record of folk music sounded open, airy, clean, and well defined. It was well balanced tonally and very well mixed. The creative recording techniques used in this recording are described below by engineer Alfred Grunwell, a three-time PZM Challenge winner:

"Philosophically, we (and the producer) like to record all instruments simultaneously for both musical and economic reasons. (Most of the instruments] were cut live, with the musicians separated by goboes (baffles] that were sound-absorbent on the bottom, and reflective plexiglass on top. We have them set up in an "X", all very close together, good eye contact, playing very softly. With normal mics this is hopeless, because generally you need to push the mics in very tight to get enough gain. All we did was tape a pair of PZMs to the tops of each gobo in each artist's station and roll!



Mark Rust session setup.

On one tune the musicians were so soft that we had the PZMs all the way open - no pads - and the faders on the board pushed all the way up. It was great - a nice, bright, airy sound, no sweat. No EQ was used on recording or mixdown.

All instruments on this record were recorded in stereo - usually a pair of PZMs."

More of Grunwell's techniques will be covered next issue.

"Harold Schiffernan's St. Nicholas"

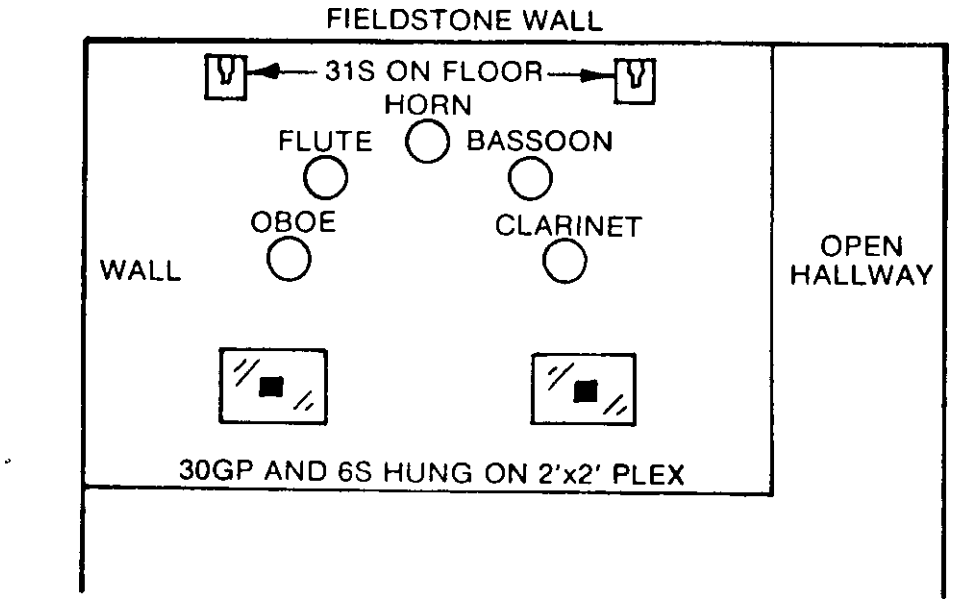
Performed by a woodwind quintet.

Winner, Dealer Classical Category

Engineers: Richard Menasco and David Menasco, Tallahassee, Florida

A very natural, realistic recording of a woodwind quintet, with pleasant ambience and stereo.

The setup, shown below, included two PZM-31S [now the PZM-30D] on the floor near a fieldstone wall behind the ensemble; and a PZM-3OGP and 6LP [now the PZM-6D] hung on 2' x 2' plexiglass in front of the ensemble.



St. Nicholas session setup.

765 Steam Train

Winner, Dealer Environmental Category

Engineered by Jack Flaningan, Triad Audio Systems, Inc., Fort Wayne, Indiana

A clean, realistic recording of a steam train, with full stereo motion well-captured by the PZM array.

The recording was made one-quarter mile from any roads, along a wooded stretch of an old Norfolk & Western track outside New Haven, Indiana. Two PZM-3OGPs [now the PZM-30D] were located ten feet from the rails in a coincident-pair arrangement.

Lennon & McCartney's "When I'm 64"

Runner Up, Dealer Popular Category

Engineered and performed by David Menasco, Tallahasse, Florida

This is an amazing re-creation of the Beatles' tune, made by multiple digital overdubs. Water glasses are cleverly substituted for chimes. Each instrument sounds natural. The mix is clean and well balanced, with good use of stereo. The lack of hiss after 12 generations speaks well for the digital recording process!

The tape contains recordings of thirteen individual performances. Along with each performance, a tape of the preceding performances was played, and the sum of these signals was recorded on a stereo recorder. Thus, the tape has a 13th-generation copy of the bass part, and a 12th-generation copy of the snare drum part.

Noise buildup was avoided by recording on a Technics SV-P100 digital audio cassette recorder and a Technics SV-100 digital processor with a Toshiba VCR. The only effect used was the three-band EQ on the Tapco C-12 mixer, used sparingly.

[Here are the old Crown mic models mentioned below and their current equivalent models:

2LV = GLM-100

6LP = PZM-6D

30GP or 31S = PZM-30D]

The microphone setup was as follows:

BASS: Direct to mixer.

SNARE DRUM AND BACKING VOCAL: 2LV clipped to shirt, 6LP out front on stand, panned left and right for stereo.

GUITAR AND BACKING VOCAL: 2LV on stand for vocal: 6 LP on wall for guitar amp.

UPRIGHT PIANO: 6LP on stand for bass strings; 2LV on stand for treble strings, panned left and right for true stereo.

THREE BACKING VOCAL TRACKS: 2LV on mic stand, panned for stereo.

CYMBALS: 2LV on stand over hi-hat; 2LV on stand over cymbal.

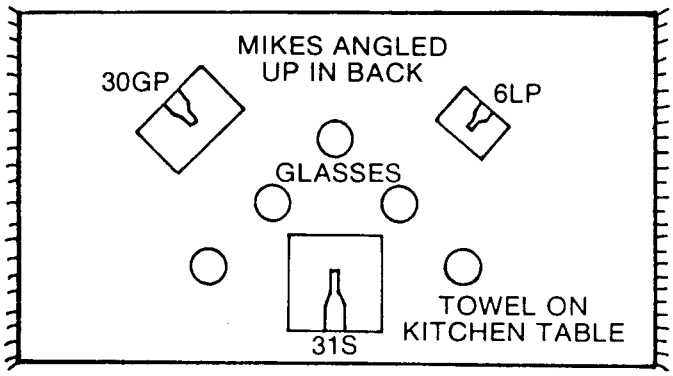
BASS CLARINET, FIRST CLARINET, SECOND CLARINET:

6LP and 2LV on stands, left and right, with 31S in center for bass clarinet only.

To achieve the effect of a three-piece combo, David placed the mics for stereo pickup, then positioned the bass clarinet near the right side, the second clarinet near the left side. and the first clarinet near the center.

WATER GLASSES: See figure below.

LEAD VOCAL: (and first clarinet on first four and last four measures): David sang about a foot away from the wall into the same array used on David Menasco's recording of birds and rain (described later).



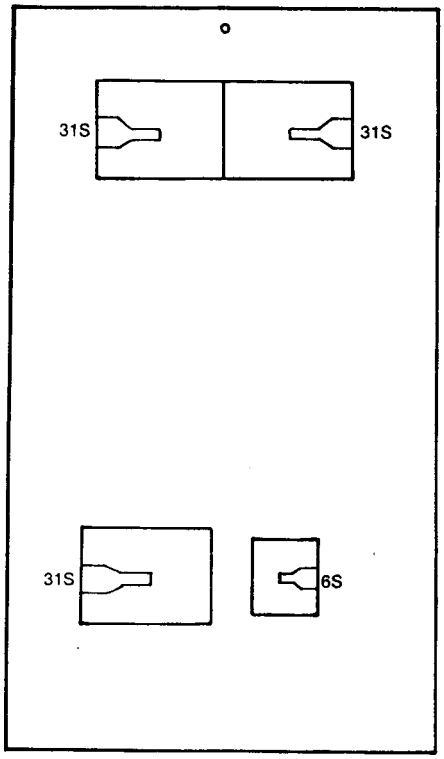
"When I'm 64" session setup.

"Birds and Rain in My Backyard"

Runner Up, Dealer Environmental Category

Engineered by David Menasco

This is a natural stereo recording containing a low-frequency rumble characteristic of the city environment. The microphone array shown below was hung by nails on the back wall of David's house.



"Birds and Rain" mic setup.

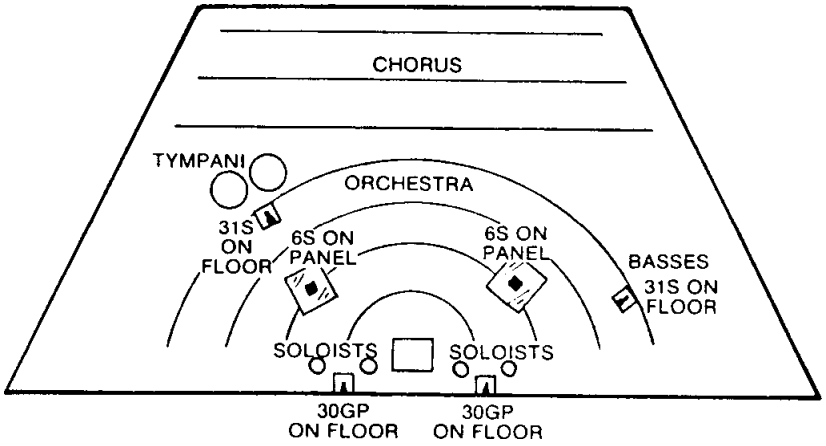
Handel's "Messiah," an Oratorio in Three Parts

performed by the Tallahassee Symphony at the Ruby Diamond Auditorium Tallahassee, Florida

Runner Up, Dealer Classical Category

Engineered by Richard W. Menasco, David Menasco, and Michael Lowhorn

This is a subtly multi-miked recording of a large classical ensemble. We heard a smooth, full-bodied recording with a competent mix of all the instruments and voices. The setup is shown below:



"Messiah" microphone placement.

"Christ the King Chorale concert"

Recorded at Christ the King Church, Detroit, MI

Grand Prize Winner, Open Classical Category

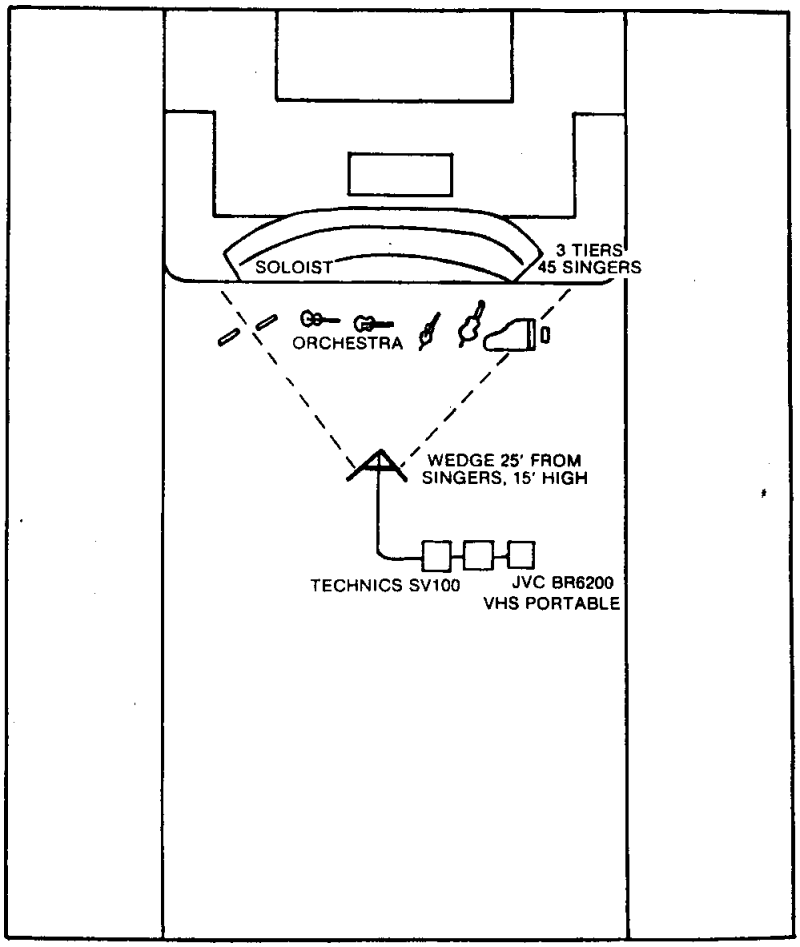
Engineered by Gary J. Pillon

The recording was clean and clear, with a well-balanced blend of the orchestra, soloist, chorus, and ambience. Although the soloist was picked up at a distance, she was reproduced with amazing presence and immediacy.

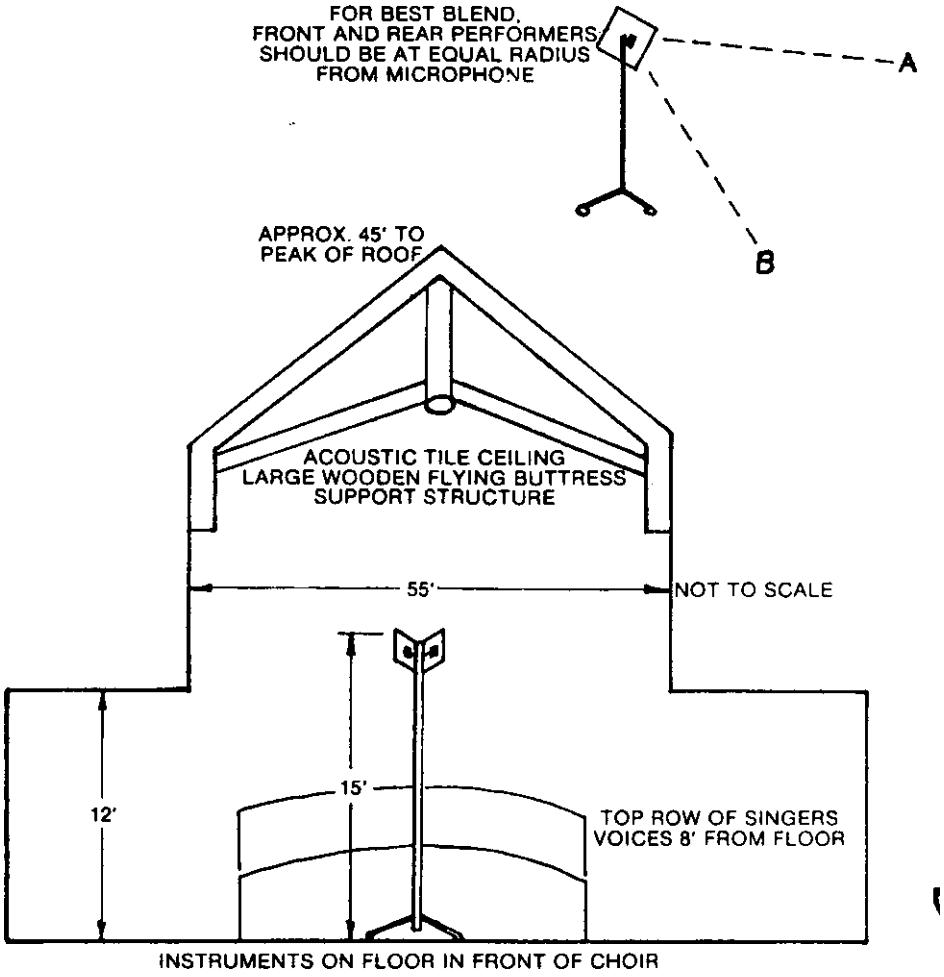
Engineer Gary Pillon describes the recording technique:

“For two months beforehand, I was busy pulling all the pieces together for this singular event. General Television Network supervisor, Chris Allen, was very supportive. He authorized the use of a JVC BR6200 VHS portable deck, Earthtone location mixer, and other support equipment. One of our VTR operators, Paul Feinberg, donated his pair of PZM 6LPs [now the PZM-6D] along with a plexiglass wedge measuring 2' x 2', angled to give a capsule spacing of approximately 9 inches. Interestingly enough, a piece of video hardware supplied a solid base for the microphones. A Mole-Richardson Hi-Riser, normally used to support 5000-watt lights, enabled the wedge to fly almost 15 feet above the audience.

The church has fairly good acoustics, so the microphone placement was a matter of finding the one “sweet spot” at the nearfield boundary. In this manner an acoustic balance was struck between the choir and orchestra musicians, letting the wedge capture the event, rather than individual sources.



“Christ the King Chorale concert” mic setup, top view.



"Christ the King Chorale concert" mic setup, audience view.

Once I placed the microphones at their critical distance in the church, I joined the bass section of the choir, and engineer Loren Mathers took over. We had set up our Technics SV-100 Digital Encoder, supplied by Hy James Inc., for maximum headroom.

At this point, Alexander Broude Inc. graciously consented to clear the music for the PZM Challenge, and an analog transfer from the digital elements was supervised by Ed Wolfrum of Audio Graphics in Royal Oak. The Otari MTR 10/dbx-1 analog copy is virtually identical to the Technics master, and provides "best seat" perspective to an excellent performance.

I would like to thank everyone concerned for their hard work, and to offer this entry in the spirit of cooperation that helped create it."

"Adam Makowitz, Solo Piano Concert"

Performed at the Seaffle Concert Theatre, Seattle, Washington

Winner, Open Popular Category

Engineered by Jim Wilke, Seattle, Washington

This is a solo piano recorded closeup in stereo - a suitable perspective for pop music - with natural reproduction of piano timbre and dynamics.

Jim attached two PZM-3OGPs [now the PZM-30D] to the underside of the piano lid. No other mics were used. The recording was broadcast on non-commercial radio.

“Three Gospel Groups”
Recorded at Dominican College in San Rafael, CA

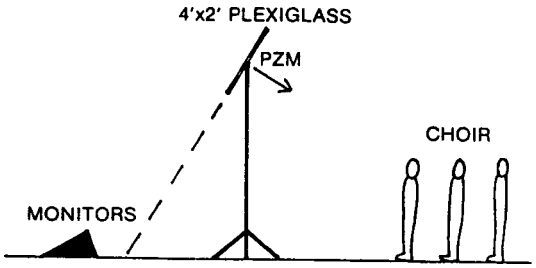
Runner Up, Open Popular Category

Engineered by Leroy Shyne, Shyne Sound, San Rafael, California

Here’s a well-balanced mix with clear cymbals and well-controlled ambience.

The concert was recorded at the sound-reinforcement mix position (in an outdoor ampitheatre) with two 31S mics. The choir microphones were two Wahrenbrock PZM-150s mounted on 4'

x 2' pieces of plexiglass, angled to reject the monitors behind the boundary plane (see figure below). The piano microphone,a 6LP [now the PZM-6D], was mounted on the closed lid. Drums were covered by a Wahrenbrock PZM-150 on a mic stand overhead.



“Three Gospel Groups” mic placement.

“Vivaldi’s Four Seasons - Autumn”

Flute Version - Performed by the Polish Radio & TV Chamber Orchestra

Jadwiga Kotnowska, Flute; Agnieszka Duczmal, Director

Baroque Catholic Church in Pozanan, Poland

Runner Up, Open Classical Category

Engineered by Anchjez Lipinski, Glen Echo, Maryland

This delightful recording had a warm, smooth tonal balance; an appropriate perspective, and well-balanced stereo. The beautiful, lively hall acoustics gave the recording a ‘commercial” sound.

Engineer Lipinski won an honorable mention last year. He describes the recording as follows:

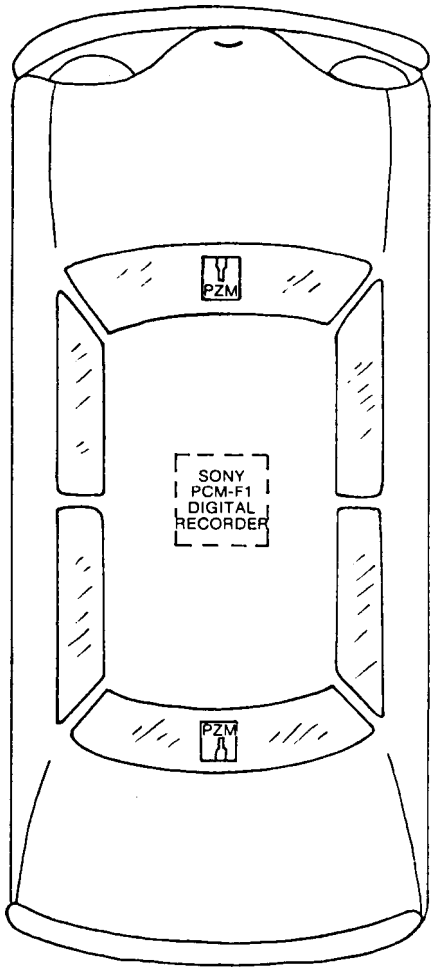
“The place of the recording was a balcony of the Baroque Catholic Church in Pozanan, Poland. I accepted as the best possible place for two PZM-3OGPs [now the PZM-30D], 5 to 6 feet apart on a wide handrail of the balcony. Then I asked the soloist to move behind the orchestra. Finally I added one coincident stereo mic as a spot for the soloist. and recorded it on separate tracks before mixdown.”

“Jets at the Denver Airport”
Recorded at the Stapleton Airport in Denver

Runner Up, Open Environmental Category

Engineered by Frank Serafine, Serafine FX Inc.

This recording earned high points for creative usage of PZMs as well as sound quality. As shown in the figure below, Frank Serafine placed PZMs on the front and rear windshields of his ’79 Olds Cutlass for stereo pickup. He recorded their signals with a Sony PCM-F1 Digital Recorder.



“Jets at the Denver Aiport” mic placement on car windshields.

A jet flying low over the microphones was heard as an enormous scream from speaker to speaker - practically blowing out the tweeters. Yet the recording was undistorted.

Another environmental recording that almost tied with the “Jets” tape deserves mention. Reynold Weidenaar recorded pigs at a feeding trough with a pair of PZMs set on concrete pavement 8 feet apart, directly in front of the feeding trough. Disgustingly real!

The PZM Challenge was a lot of fun to judge this year. The overall quality of the recordings was quite high. so we found it difficult to rank them. Many lost only by default to the top entries.

Thanks to all the entrants for your efforts. The winning entries will be played at the Crown booth at the October AES Show in New York. Many thanks to all who participated.

# # #

PZM MEMO

January 1985
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

CROWN INTRODUCES PCC-160 PHASE COHERENT CARDIOID

PCC-160

Soon to be available from Crown is a new, unidirectional microphone meant to be used on boundaries like the PZM.

The Crown PCC-160 (Phase Coherent Cardioid) is a surface-mounted supercardioid microphone intended for professional applications on stage floors, lecterns, conference tables, and news desks. When used as a “footlight” microphone for drama. musicals, or opera, the PCC provides louder, clearer sound pickup than previous microphones.

Technically, the PCC-160 is NOT a PZM. The diaphragm of a PZM is parallel to the boundary (a patented feature): the diaphragm of the PCC-160 is perpendicular to the boundary.

We mention the PCC in the PZMemo because it gains much of the same benefits from surface-mounting as does the PZM. Also. those PZM users who need a directional model but would prefer not to work with plexiglass boundaries have another option.

The PCC is not a replacement for the PZM. PZMs are preferred in applications where you need a uniform hemispherical pickup, a shapeable polar pattern, corner mounting, 150 dB SPL capability, or a flat response down to 20 Hz.

Like the PZM, the PCC is designed to be used on a relatively large boundary surface. Unlike the PZM, the Phase Coherent Cardioid uses a sub-miniature, professional quality supercardioid mic capsule. The unidirectional polar pattern increases gain before feedback, reduces unwanted room noise and off-axis pickup.

Since the microphone capsule is placed on a boundary, direct and reflected sounds arrive at the diaphragm coherently, or in-phase. The benefits are a wide, smooth frequency response free of phase interference, excellent clarity and reach, and a “half supercardioid” pattern (based on the hemisphere created by the large boundary plane).

Self-contained electronics eliminate the need for an in-line preamp box. The PCC-160 may be phantom powered directly from the console or other remote power source providing 12 to 48 volts. A “bass tilt” switch allows the user to tailor the low-end response for particular applications.

Thanks to its low profile and charcoal grey finish, the microphone becomes almost invisible in use. The heavy-gauge all-steel body protects the unit from accidental abuse. Capable of withstanding up to 120 dB SPL without distorting, the PCC will never overload in practical use. Its electret condenser capsule provides a frequency response from 50 Hz to 18 kHz. Sensitivity is very high (-53 dB re 1 volt/microbar) and self-noise is low (less than 22 dBA).

Production units are expected to be available in January 1985 at a suggested list price of $249. For more information, contact Customer Services Dept., Crown International, 1718 W. Mishawaka Rd., Elkhart, IN 46517.

In a few months, Crown will also introduce the PZM-2.5-FM [discontinued], which uses 18-inch-high plexiglass boundaries to achieve directionality. How does the 2.5 compare to the PCC? The 2.5 has lower self-noise and better rear rejection of high frequencies. The PCC has better rejection of low-to-mid frequencies, requires no plexiglass boundaries, and has a three-position bass-tilt switch.

WHERE'S THE MICROPHONE?

The following is a true story from Bill Raventos, Microphone Product Manager at Crown.

A woman reported that her school's PZMs were stolen. She showed up at Crown carrying three PZM carrying cases, saying 'This is all that's left of them."

Bill opened the cases. In each one was a PZM-30GP and a power-supply interface.

"What was stolen?" Bill asked.

"The microphones," she replied.

Bill took out the 30GP and explained, "This is a microphone."

"Oh... Never mind."

PZM-180s SIMPLIFY MICROPHONE TECHNIQUES

Brian Coviello of Hoffman's Music in Spokane. Washington appreciates the simplicity of using PZMs in stereo live recordings.

He used two PZM-180s [now the PZM-185] back-to-back to record a live concert in Calvary Chapel. The mics were hung over the center of the balcony.

The concert blended live vocals with a pre-recorded instrumental track. PZMs also contributed to the instrumental track, with 3OGPs [now the PZM-30D] used for percussion and for string ambience (taped to the control-room window). Mixdown engineers at Whitefield Studio in southern California were impressed with the PZMs' sound.

Brian's live recording was released on MRC records. a label featuring contemporary Christian music.

LETTERS FROM PZM USERS

PZM studio techniques

The following is an excerpt from a letter by Alfred Grunwell of Calf Audio, a grand prize winner in the 1984 PZM Challenge:

One of the great benefits of PZMs is that they greatly expedite the setup procedure. For those used to taking a lot of time in setting up, it's astounding. Placement does make a difference, but it is dramatically less critical than with normal mics...

One comment we hear from time to time, and must collectively dispel, is that PZMs tend to sound harsh on acoustic instruments. In my opinion, there's some other problem, and not the mic. For example, if you're recording an Ovation acoustic guitar (the kind with the plastic back, popular for live playing) with PZMs, then the sound will be bright to the point of thin and/or harsh. But in this case, it's the instrument, which is generally acknowledged as great for live work but inappropriate for recording because of this reason.

On all our vocal work, we use whichever standard mic sounds best on that particular voice, have the talent sing toward the control-room window (which has a PZM-6LP [now the PZM-6D] on it), and mix a little delayed PZM sound in on the track. It really opens up the vocal sound by giving it both air and brightness, precious commodities in contemporary recording. And because it's a PZM and used in small proportion, there's no ugly comb filtering... All multiple-person sections are always done with a stereo pair of PZMs.

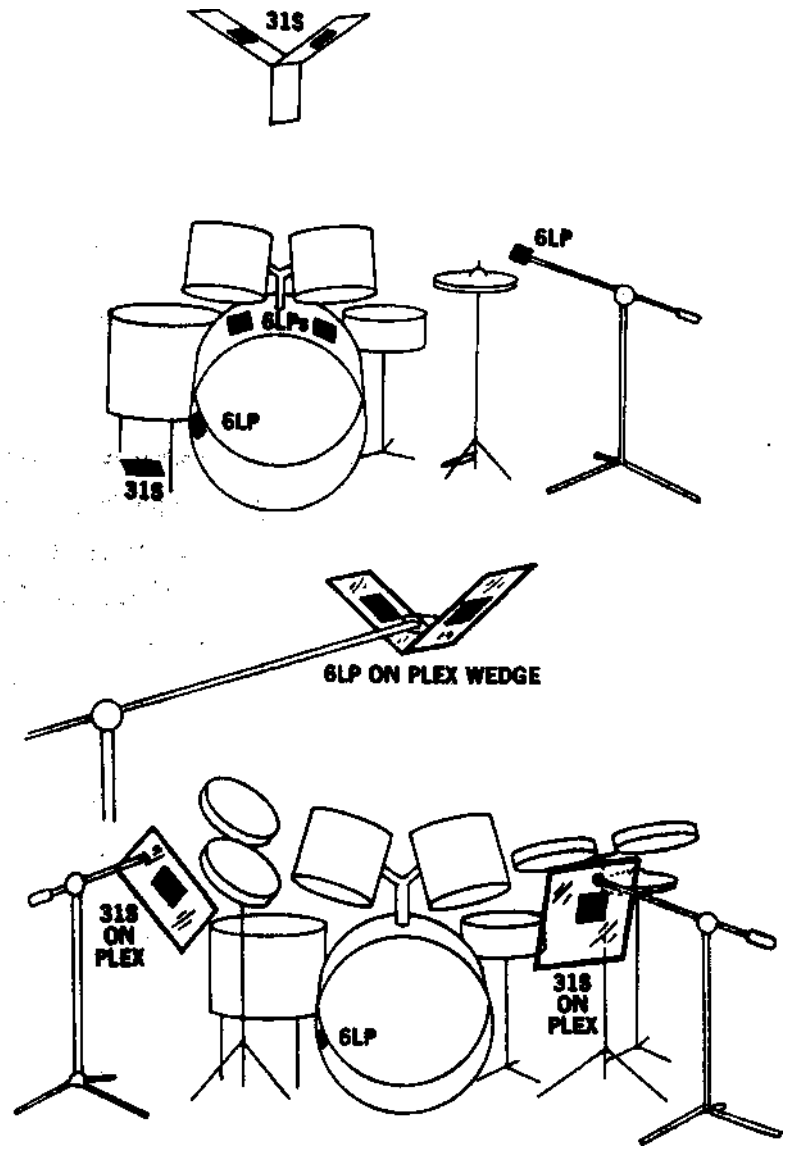


Fig. 2: Grunwell's drum-miking technique.

On the drums we're developing more techniques and trying to make them totally PZM while maintaining the standard low, deep studio sound. So we've come up with this: We have a "flying V" plexiglass unit that we use for stereo overheads with PZM-6LPs. We usually use a 6LP [now the PZM-6D] in the kick and on the high-hat. Our newest breakthrough is to tape the PZMs onto the top of the kick, directly under the mounted toms. And voila: more great sound, bright but deep, lots of attack and plenty of air.

Alfred Grunwell, Calf Audio Inc., Ithica, New York

More on Grunwell's techniques next issue.

PZMs help record "Pilot" LP

We used the PZMs for drum ambience (two-wedge configuration), vocal ambience, and sound effects on the first LP released through Rain Records, entitled "Pilot."

Band:Pilot, Rain Recording, Mt. View, Hawaii

PZMs for conference and audience

I work in a Media Services center at a college. We've purchased a PZM-3OGP, 6LP, and 2LV [current models are the PZM-30D and PZM-6D].

Our primary use is in our TV studio (which is rather small and not totally soundproofed), and during the video and audio tapings of small-to-large groups attending conferences on this campus.Here are some situations where we could use help:

1. How do we get rid of the slight "echo" effect in the studio when using the 30GP or 6LP? [now the PZM-30D and PZM-6D.]

2. What's the best way to use PZMs when trying to get audience questions in auditoriums seating 250 and 600 people? (By the way, these people will seldom use aisle microphones set up for this specific purpose,)

3. How do we avoid sometimes getting radio stations over the audio we are trying to tape?

Any other information from users of PZMs in similar situations would be more than appreciated.

Mikel-Jon Carter, AV Coordinator, Media Services, Bentley College, Waltham, MA 02254

Reply:

To reduce "echo" or reverberation, you can (1) sit closer to the microphones, (2) place the microphones closer to the participants, (3) deaden the studio acoustics with carpet on the floor and thick curtains spaced from the walls, or (4) use a Crown PCC-160, a supercardioid boundary microphone. The PCC-160 is unsuitable if the participants surround the microphone, since it rejects sound from the rear.

To pick up audience questions, (1) try mounting a PZM-6LP [now the PZM-6D] on a 2' x 2' plexiglass panel several feet above the front row of the audience, just in front of the front row. Aim the microphone side of the panel at the back of the audience. (2) Try one or more 6LPs on the ceiling over the audience.

To reduce RFI, ground the mic cable shield directly to the mixer chassis. Also, you can install capacitors in the microphone line to shunt radio frequencies to ground. In the mixer mic connector (or in the interface output connector), solder a .01 mF, 100V capacitor between pin 2 and 1, and solder another matched capacitor between pin 3 and 1. Alternatively, solder a 470 pico farad, 25V capacitor between pin 3 and pin 1 in the PZM cable connector (or in the cantilever). Use whatever solution works best.

I hope these suggestions solve your audio problems.

Rock recording with PZMs

With the advent of "new wave" and garage-band rock styles, the recording environments have become diverse and odd.

No longer are these bands satisfied recording one track at a time. Their emphasis is at least 90% live in the studio, or wherever. Recording such bands requires innovative ideas (especially in small rooms or clubs). PZM mikes can be very useful in recording rock instruments such as bass guitar. electric guitar, and the full drum set.

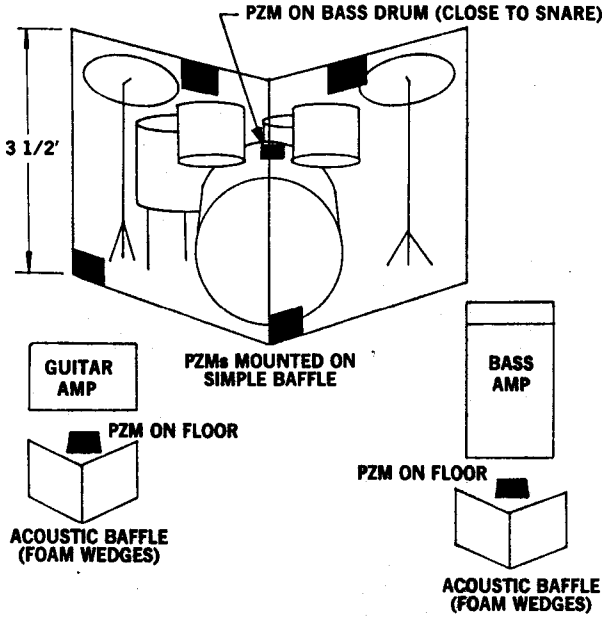


Fig. 3: Mic setup for rock recording.

I know the microphone setup looks odd, but they work with minimal leakage and almost no phasing. Both direct boxes and PZMs were used in combination with some Shure and Sennheiser mies. The PZMs give a great full sound enhancement.

I would like to hear more on recording rock hands in small areas and small clubs. Thanks.

The Gang at Squantum, Squantum Sound, Perth Amboy. NJ

PZM for equalization

Used in conjunction with a White 140 Spectrum Analyzer, the PZM-30GP [now the PZM-30D] does a great job in equalization for masking systems. (A masking system is a speaker system playing pink noise to make conversations more private).

The noise spectrum was equalized to an NC-40 curve, which slopes downward between 63 Hz and 2 kHz. The PZM is flat in that range. I used the PZM in an open office area on a 2' panel at ear height (4' off the floor). The PZM gives a much broader area of sampling and works much better than conventional instrumentation microphones in this application.

R.G. Heiser, Industrial Communication Co., Columbus, Ohio

Mics for film/video

I have several clients in the film and video sound business, and they have appliations for which PZMs could be used.

I would like to see info from people with successful applications of PZMs for location recording of film/video sound.

Kurt Albershardt, Paragon Sound, Universal City, CA

Reply:

For film/video applications, Crown mics are typically used as follows:

*CM-10 lavalier into a wireless transmitter.

*PZM-6D's small plate mics) hidden on the set on tables, on props, on walls, behind flower pots, under thin tablecloths, or on the floor.

*Form a “V” out of two sheets of clear plexiglass, 1 foot square by 1/4" thick. Place the “V” on top of the video camera with the point of the V aiming at the sound source. Tape PZMs to opposite sides of the “V” for stereo pickup. (This suggestion courtesy of Gary Pillon of General Television Network.)

Miking interviews with PZMs
I use my PZM-6LP for interviews. My business is making audio tapes for family histories. I put the PZM on my large teak dining table, and we conduct the interview looking out on a fantastic view of San Francisco. The PZM-6LP [now the PZM-6D] makes it easy for interviewees to relax and free-associate.

Overall, the quality of the tape is very good. I have to be sure no extraneous noises will occur during the two-hour session. I still have to experiment a bit on placement of the mic for a more even response.

David Angress of Sound Genesis suggested the PZM after he became self-conscious during an interview using a traditional unidirectional mic.

I love receiving the newsletter, although I wish somebody was using PZMs for speech so I could compare notes.

Adah Bakalinsky, Legacy Unlimited, San Francisco, CA

Violin miking
My idea concerns modifying a chin-rest clamp to hold a GLM vertically along the top edge of a violin. This would produce (I think) a second boundary to add directionality to the pattern. I thought of this as a way to use a GLM on stage with an Irish folk group. Any response would be greatly appreciated.

John Halliburton, Carbondale, IL

Reply:
Here are some suggestions on miking a violin with a GLM:

*Clip a GLM to the bridge.

*Put a strip of foam rubber in the clip teeth, and clip the GLM to the short strings behind the bridge.

*Clip the supplied GLM-UM Universal Mount to the tailpiece, and clip the other end to the GLM flex relief. Position the GLM over an F-hole.

*Place a GLM inside an F-hole and EQ the signal to make it sound more natural.

*Try a GLM vertically mounted as you suggested.

You may want to record yourself with these different microphone placements, then play back the tape over a hi-fi system to determine which placement sounds best. Also check each technique to see which gives the most gain before feedback. Good luck!

# # #

MIC MEMO

April, 1985
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

PZM MEMO BECOMES MIC MEMO

Why the name change? We’ve broadened our emphasis in microphone design here at Crown. Having just introduced the PCC-16O, and with other surprises yet in store, we’ve changed the name of this newsletter to the Mic Memo to reflect Crown’s broader approach to making interesting, technically innovative transducers.

Look to these pages in future issues for more information on PZMs, and ALL of Crown’s new microphone products. As always, reader input is welcome!

HELP!

We need suggestions from PZM users on effective audio-pickup methods for location film or video. This is a neglected area of PZM application. Send us a description of your techniques, and we II he happy to publish the tips in the Memo.

Here's one tip: Try a PCC-160 on the floor or on a table near the action. Its half-supercardioid pattern should help reject background noises and room acoustics.

PZMS COVER OUTDOOR BAND TOURNAMENT

KPHO TV, Phoenix, has developed a unique application for PZMs: pickup of the Fiesta Bowl National Pageant of Bands. The show and setup are described below by Mark Voorhees, a maintenance specialist and project engineer at KPHO.

In 1983, KPHO began producing this program for national distribution by Broadcast Communications, Inc. The event is an invitational marching band competition in conjunction with the FIESTA BOWL football game, with bands traveling from around the country to perform in the 3½ hour live show at Sun Devil Stadium, Arizona State University, Tempe, Arizona.

KPHO TV, a division of the Meredith Corporation Broadcasting Group, was contracted by the Fiesta Bowl National Pageant of Bands to produce the television special, hosted by NBC "Today Show" personality Willard Scott. The telecast is a one-hour edited version of the live show, including one performance by each participant band.

The engineering challenge involved devising the best audio pickup possible, capable of maximum quality and versatility. The stadium is outdoors, and, to make matters worse, on the approach pattern of a major airport. The fact that many stadium seating areas were to be kept empty added to the audio difficulties.

Our approach was to use the large-plate PZMs (Model 3OGP) [now the PZM-30D] for field pickup of the bands, as well as audience reaction. We determined that our area coverage required twelve PZMs for the stadium field, and two for crowd sound.

Since we wanted the most directional control, each PZM was mounted on a 3/8" thick, two-foot-square clear Lexan panel which was mounted (adjustably) to the top of a ten-foot pole, which we could then mount temporarily on a fence post at the edge of the field. Additionally, the crowd mics were mounted on the back of two of the center-field mics. (The custom mounts were developed by KPHO Mechanical Engineer Vernon Prue). The use of the Lexan made the installations almost invisible. See Figures 1 and 2.

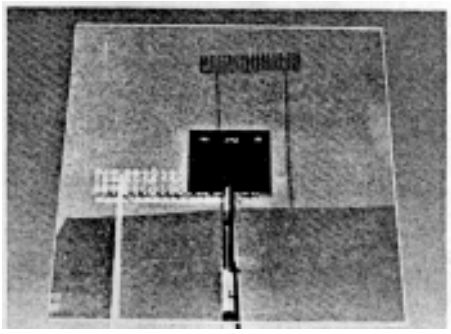


Fig. 1: A single-panel PZM mount. Ten of the mic positions were ouffitted with ths mount.

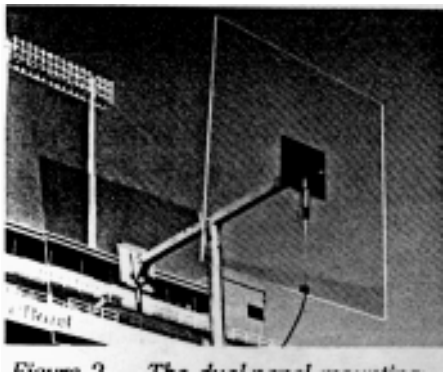


Fig. 2: The dual-panel mounting placed at north a south 40-yard lines.

We chose to aim the PZMs to the working field area, and adjusted position and tilt accordingly. Fixed percussion instruments were picked up using cardioid dynamic mics, so that coverage could be limited. See Figure 3 for mic placement and aiming.

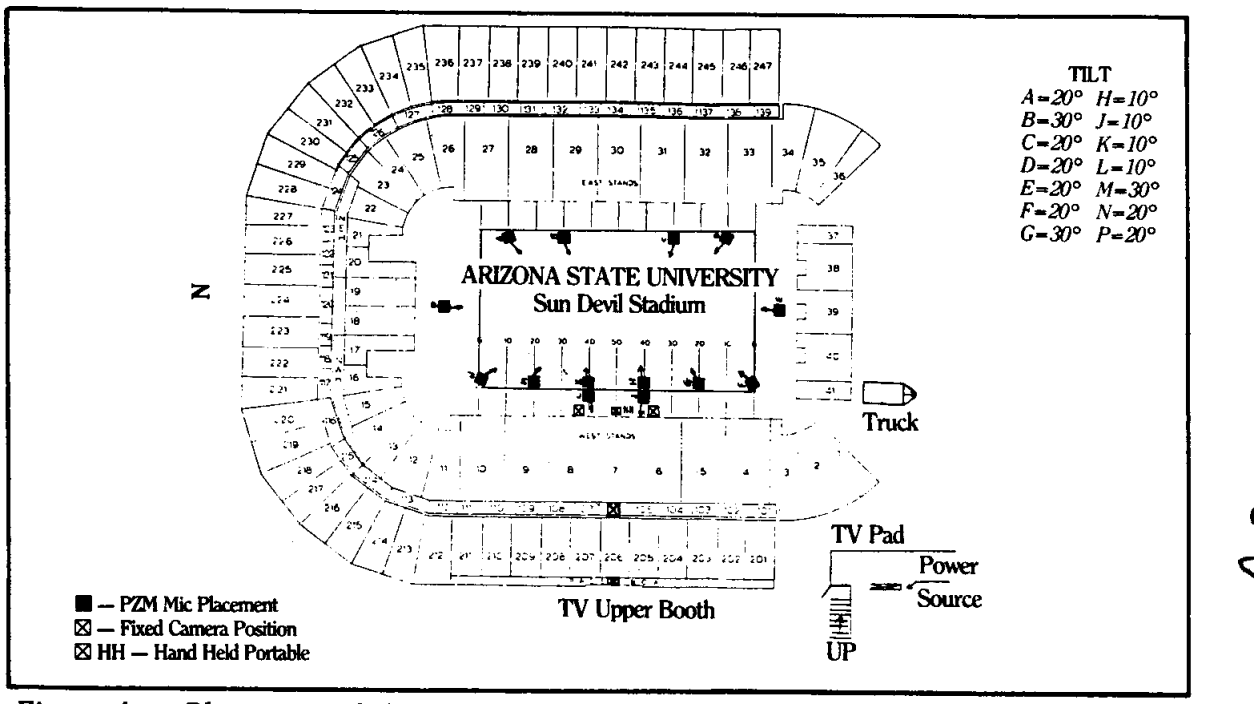


Fig. 3: Placement of the PZMs on the stadium field. Aiming direction and elevations are indicated.

This arrangement created a “sound dome” over the field area, providing good overall coverage and good left-right separation. The PZMs rejected background noises and aircraft quite well.

The bands played to the main spectator stands at the west side of thestadium. We wanted less pickup at the east side so that, when the band turned away from the audience, the level dropped. This provided an audible cue that the band was aiming away. The object was to convey the motion and dynamics of the bands, rather than a constant-level coverage.

This year’s efforts were an expansion of our first use of these mics last year. We learned from that show that our original placements (for 8 mics) and mounts had to be changed. “Holes” in coverage plagued our first use of this method, but overall quality was good.

We were very pleased with the PZM performance during taping this year. Although this year’s show was released in monophonic sound, the entire production was recorded in field-mixed stereo, with

appropriate placement of the panning controls on the Audiotronics console. As expected, the noises and dead echoes were virtually eliminated; the performances were crisp and clear with outstanding pickup of solo elements within the bands.

Band directors who screened the final shows from 1983 and this year have complimented us on the unmatched quality of the audio pickups. We look forward to using the PZMs on this and other projects in the future.

FOR KPHO TV:

Engineering Supervisor: Walter Beatty

Engineering Audio Supervisor: Mark Voorhees

Engineering Audio Mixer: Robert Carter

Engineering Audio Mixer: Richard Kohler

Remote van provided by TCS Communications, New Kensington, PA.

LAS VEGAS HILTON SHOW BAND USES PZMS

by Ken Wahrenbrock

Hilton Music Director Dick Lane and Sound Engineer Steve Rypka were so pleased with their first tests of PZMs that the request was “purchase them.” Two PZM-D-3s are used for the trumpets and two more for the woodwinds. The woodwinds include two players with flutes, clarinets, and saxes. Piano is miked with a PZM-6S [now the PZM-6D].

The drum kit is screened with plexiglass on three sides. A PZM-6S is placed in front of the bass drum on the plexiglass. A PZM 2LV [now the GLM-100] is being tested for close pickup on the toms and snare if needed.

The percussionist is wearing a PZM-2LV for 95% of his pickup. An additional mic is stand-mounted over a tom. Since his instruments are surrounding him about 270 degrees, he provides the proper-direction pickup as he turns to play that particular set of equipment. One sound effect using a boat whistle did not sound right the first time. He realized that the mic was now below his mouth on his chest, so he turned the whistle over to radiate downwards.

Steve Rypka is exploring other uses of PZMs with the band and expects to utilize some other PZM versions in the future. In testing the PZMs, Dick and Steve sought clarity and accuracy. The PZMs delivered.

PZM ORCHESTRAL RECORDING SOUNDS WONDERFUL

Gary Pillon, a sound mixer for General Television Network just sent in a very impressive PZM recording which was up for a local Emmy nomination. It is a live mix of “The Messiah,” performed by the Fort Street Chorale and Orchestra on December 8, 1984. The recording venue was a cinderblock-and-wood church dating back to the late 1800’s - a marvelous acoustic space.

Performers included 75 choir members, a 2~piece orchestra, and four soloists. The original mono audio fed a 5-camera video remote truck hired by WTVS, the local public TV station. Channel 56 was taping the event as the capstone of a 1/2-hour documentary about the choir.

Gary used two stereo pairs of PZM-6S’s [now the PZM-6D]. A 60-degree wedge was placed about 8 feet behind the conductor, even with the overhead chandeliers, out of camera view except for an extreme wide shot.

In addition, a stereo 2.5 (designed by Mike Lamm of Dove and Note Recording in Texas) was placed on “apple boxes” and sandbags just behind the conductor. It picked up the sound coming directly from the orchestra and augmented the soloists, who stood on each side of the Maestro, facing the 800 people who packed the two levels of the church.

Gary also sent a June ’84 recording of The Christ the King Chorale, augmented by a 22-piece cham-

ber orchestra. He used a bipolar PZM (two PZMs back-to-back on a 2-foot boundary) about 17 feet over the conductor's head. Equipment included a dbx 700 Digital Processor and a Beta Hi-fl video deck.

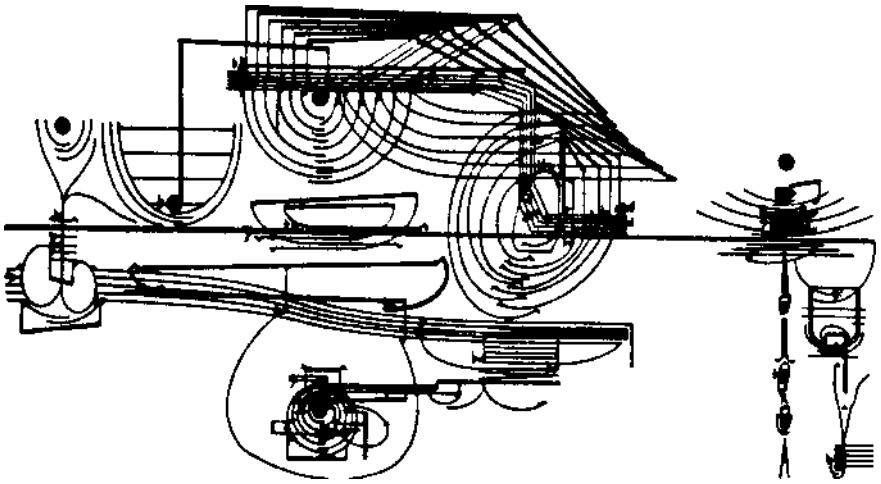
To our ears, the recordings sounded spacious, with a full stereo spread, good localization, and a mid-audience perspective. The acoustics suited the music well. Tonal quality was full and smooth, and the balances among the orchestra, choir, and soloists were just right. This recording could have been a PZM Challenge winner.

According to Gary, "PZMs really do the job and have a sound that is all their own - the sound of real life."

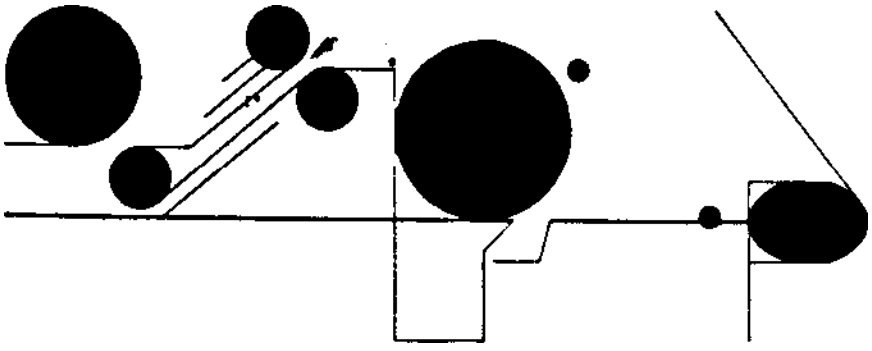
PZMs CAPTURE AUDIENCE AS PERFORMERS

Another intriguing recording was sent in by Ron Streicher, a well-known recording engineer with Pacific Audio Visual Enterprises. Ron has presented several practical papers on recording techniques at A.E.S. conventions.

His tape was a recording of "Treatise" by Cornelius Cardew, performed by the AUDIENCE of the Monday Evening Concert at the Bing Auditorium of the Los Angeles County Museum of Art, on January 7, 1985. Audience members played toy instruments while interpreting the slide-projected score (examples shown below).

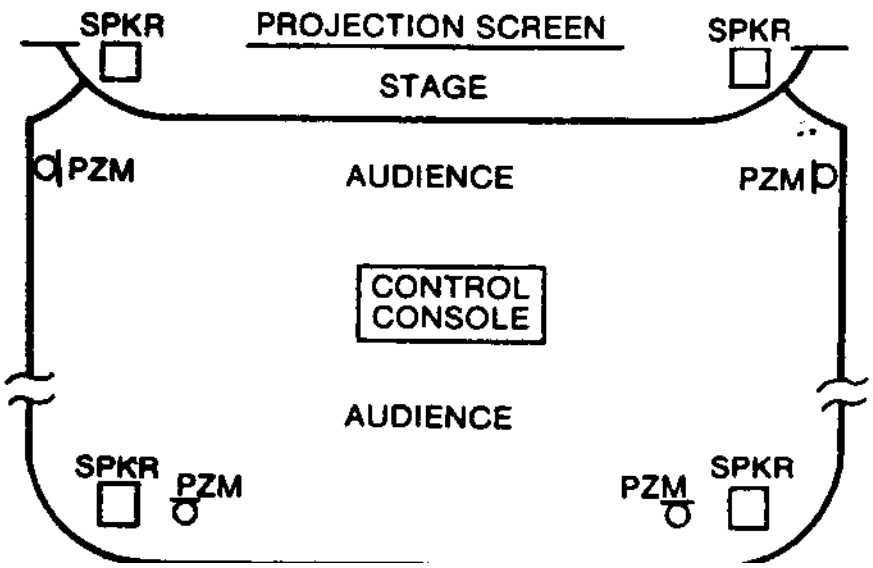


Sample of projected score for music recorded by Ron Streicher.



Another sample of the score.

The recording mics were PZM-150-Ds (made for Ron by Ken Wahrenbrock in 1978), which were placed on the walls in the four "corners" of the auditorium (front left and right, back left and right) to surround the audience. Immediately adjacent to each microphone was a loudspeaker system; these were used to play the recording back to the audience immediately after its performance.



Speaker/microphone layout for Ron Streicher's recording.

Ron reports: "This performance recording gave me, finally, the opportunity to do something I have wanted to try for a long time.. to record an environmental "happening" and then to immediately play it back in the same environment, from the same perspective as it was recorded. Since I was situated in the middle of the audience (where I was operating the recording/playback system for the concert), I was in a good position to evaluate the correspondence of the recording to that of the original performance.

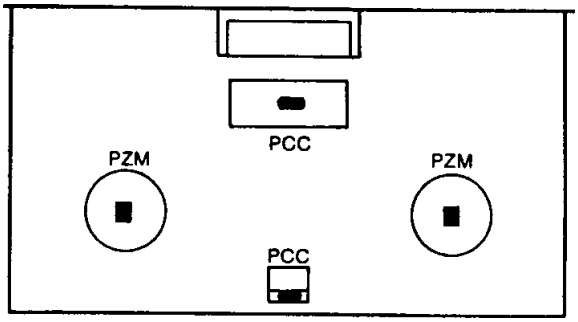
It was a remarkable experience! As I had expected, the sounds recorded seemed to be reproduced with an uncanny relationship to their original locations in the hall. I cannot tell whether this was true for all participants in all locations, but it was so for me."

The sound we heard was indeed quite natural, and we could sense the mirth of the performers as they concocted their own responses to the graphic images of the score.

USING PCCs FOR STAGE LECTURES

The figure below shows a stage arrangement for public group discussions. At the rear of the stage is a sofa and coffee table; on either side of the stage are two round tables, and at center stage is a lectern.

A Crown PCC-160 (supercardioid boundary microphone) is placed on the coffee table to pick up the participants on the couch; another is used on the lectern shelf top. If the participants at each round table surround the microphone, a PZM can be used. Otherwise a PCC is preferred for more gain-before-feedback.



PCC/PZM placement for stage lectures.

LETTERS FROM PZM USERS

PZMs great for piano, kick drum

In July we purchased a new Tokai piano. We had been using Shure SM-57s to mike it, however, I wanted to experiment with PZMs. I finally settled on placing the 3OGP [now the PZM-30D] flat on a piece of foam on the stand that holds the short and long stick. The piano lid reflects the sound down into the PZM, and combined with the direct sound Wow! Clear, clean, natural, crisp - with NO added coloration.

A PZM-31S [now the PZM-30D] is great in a kick drum. Again, natural sound with no coloration, and ability to withstand the high SPL.

I have learned not to be alraid to experiment with PZMs. You are only limited by your mind - not the mic!

Bill Wood, Christ Covenant Church, Greensboro, NC

PZMs for studio drums

I'm a drummer in a local studio around Memphis, TN. In my sound-proof box where I record, we recenfly installed PZM microphones. I'm glad to say that it is the best sound I've ever gotten out of a microphone. I'm proud to say that Crown is the best sound you can get when you're "ready for real." Thank you, Crown; you're the best.

Derick Kemp, Dirt Music Co. Clarksdale, MS

Hiding PZMs

I would like to conceal PZMs for use in industrial films, but have been unable to find out how to use them in this situation. Also, have you printed anything about ENGIEFP uses? Have you considered selling a manual based on your *PZMemo*?

Zack Schindler Madison Heights, MI

Reply:

Available at no cost is the *Crown Boundary Microphone Application Guide*, which includes many *PZMemo* applications. You can order one from Crown or your Crown dealer.

Here are some suggestions on concealing PZMs:

1. Clip a PZM-3LV [now the CM-10] lavalier to the shirt under the tie. Boost high frequencies on your mixer to compensate for the tie's high-frequency rolloff (unless this boost makes clothing noise objectionable).

2. Put a PZM-6S or PZM.6LP [now the PZM-6D] on tables, under tablecloths, behind props, or on walls.

For elecfronic news gathering:

1. Use a PZM-12SP [now the PZM-185] as a handheld interview mic, or place it on a desk or table for seated interview.

2. Use a PCC-160 on a desk or table to reduce background noise and off-axis pkkup.
3. For ambient pickup on location, tape a PZM to the side of the news van.

Sound Grabber output pad
I just purchased a pair of Sound Grabbers and am very pleased with their striking clarity and (sensitive) response to very (quiet) sounds. However, because of their high output, they overloaded the mic inputs on my open-reel deck. A simple in-line voltage divider can be made from a couple of I k ohm resistors. This will reduce the output so they won't overload the mic inputs.

I have used these mics with musical material with good results. Thanks for a fine product at an economical price.

Russell C. Campbell, Ferndale, WA

SPECIAL PZM FOR FLUTE

by Ken Wahrenbrock

Charlotte Blount is professor of classical flute and baroque flute at USC, California. Her husband Gilbert is professor of harpsichord there. They have combined talents to present concerts on classical and baroque flute in many places.

Most halls they have encountered require some reinforcement for the flute to balance the harpsichord volume. Charlotte has found that a stand microphone and most lavalier mics are unable to provide faithful reproduction. Gilbert has used a PZM for the harpsichord and enjoyed the PZM's fidelity. He contacted Ken Wahrenbrock to see whether something could be done for the flutes.

A 2LV [now the GLM-100] cantilever with a 15-foot cord was mounted on a small bar 5/16" X 3/4". Velcro was mounted on the flute and on the base of the bar. This arrangement spaced the PZM from the body of the flute to place the sound entry of the PZM even with the raised emboucher of the flute. Careful placement of the PZM is required to find the sweet spot so that the reinforced sound faithfully reproduces the sound heard by the musician's well-trained ears.

This special PZM was compared to several other microphones (including other small electrets). The judgement by careful listeners was "no comparison."

More testing is planned for the wooden baroque flute to find a microphone with the same transparent reinforcement. The PZM for the metal flute does not quite "cut it," even though it is superior to all the other mics tested.

# # #

MIC MEMO

October 1985
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

USING PZMs TO RECORD THE BUDDY RICH BIG BAND

Fig. 1: Buddy Rich Band at King Street Studios.

We're proud that Crown PZMs were selected to preserve a performance of one of the biggest names in jazz: Buddy Rich and his big band. An alltime great drummer with masterful technique and tremendous drive, Buddy currently heads the pre-eminent big band in the country.

Bogue-Reber Productions of Los Angeles, in association with One Pass Productions of San Francisco, produced a Buddy Rich Band concert video special on One Pass's King Street Studios Soundstage, April 2 and 3, 1985. Crown PZMs were used extensively in this major production.

The two-hour specials were titled "Mr. Drums: The 'Channel One' Set and the 'West Side Story' Set."

The programs were licensed to:

Pioneer Artists (a division of Pioneer Video) for worldwide Laserdisc digital-sound videodiscs. Sony Corporation for worldwide Beta Hi-Fi, VHS Hi-Fi videocassettes, and Video-8 with digital sound. Cafe Records by Mobile Fidelity Sound Labs (Original Master Recordings label) for two compact discs, two audio cassettes, and a specially packaged threerecord set.

The project was produced in association with the Bravo Entertainment Network as a pay/cable TV special, and for the Discovery Music Channel.

Gary Reber was Producer. His credits include the SQ/Tate System surround-stereo soundtrack production of David Bowie's "Serious Moonlight" and "Dolly Parton in London" HBO specials. Steve Michelson, President of One Pass, was Executive Producer; and Scott Ross, Vice President of One Pass Operations, was Director. Ken Rasek of Chicago was the Digital Surround Stereo Soundtrack Mixing Engineer.

Conceived by Reber nearly a year ago, the project was meant to define the state of the art in film-style high-tech video production. The 8-camera Ikegami shoot used the revolutionary SQ/Tate surround-stereo system. The event was supported by equipment manufacturers whose reputations for cutting-edge technology are renowned.

In the King Street Studios, the livingroom-size control room was transformed into a Soundex-treated digital-audio recording/mixdown control room. Equipment included a Yamaha 2000 recording console and a 16-channel SQ/Tate System position-encoder console to create the final "live-to-two-channel" encoded surround-stereo mix.

The Tate/SQ position encoder contains 360-degree, fixed-position pan pots which enable the mixing engineer to assign dialog, instrument, music or effects to a specific spatial location (or pan for motion).

To further enhance the signal transparency and transient definition of the Buddy Rich rhythm section, special BBE processing was applied to those input channels just ahead of the Tate/SQ position encoder. No other equalization or processing was applied to the mix, except for slight soundfield reverberation produced by a Lexicon Model 200 Digital Reverberator.

To capture the full dynamic range and transient power of the Buddy Rich Band, Reber chose Crown Pressure Zone Microphones for their accuracy and transparency, and AKG “The Tube” microphones for their warmth.

Fig. 2. Buddy Rich

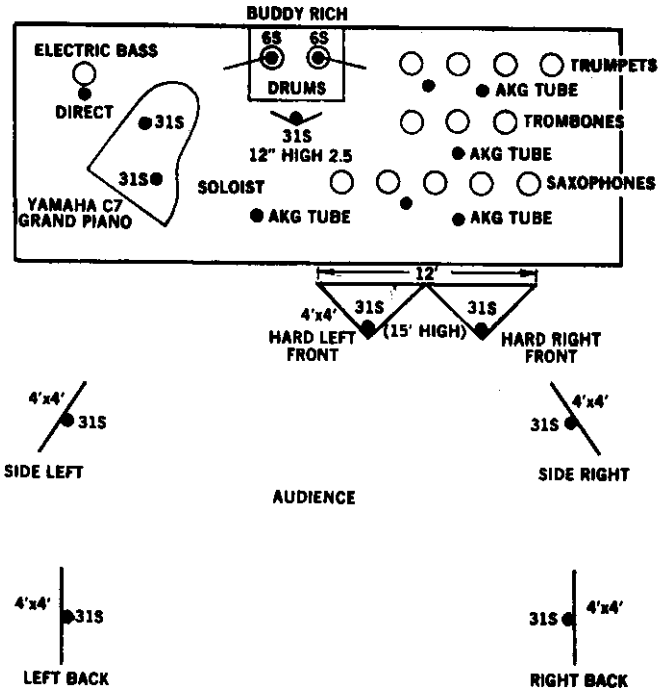


Fig. 3. Microphone layout for Buddy Rich band session.

Four AKG “The Tube” microphones were placed for intimate pickup of trumpet, trombone, and saxophone soloists. Additionally, four Countryman Isomax II Condenser Microphones were clipped to the flutes of the musicians who play saxophones and double occasionally on flute. Buddy’s announce microphone was a Shure 5M87.

The rhythm section, horns, and ambient surround were recorded with twelve Crown PZM microphones (PZM-315 and PZM-65) mounted on specially designed and surface-treated plexiglass boundary arrays. These arrays were configured by Reber and Vince Motel, the project's PZM Application Engineer. Bruce Bartlett, a Microphone Project Engineer at Crown, was consulted about boundary acoustics and array design.

The entire wiring requirements for the soundtrack production were met by Monster Cable Prolink Interconnect Cables and Prolink High-Performance Studio Microphone Cables, assuring pristine signal quality in the transmission from microphones to mixing consoles to recorders.

Storage of the mix was on a combination of state-of-the-art analog tape recorders (by Nagra, Studer, and Ultra Master) and digital audio processors (by Sony and JVC) coupled to Sony BVU U-Matic video tape recorders.

The result: A state-of-the-art, SQ/Tate System surround-stereo soundtrack presentation displaying full dynamic range, wide channel separation, and exceedingly low distortion and noise. The recording had extraordinary transparency and accuracy.

As Reber states, "The objective was to capture the"live" essence of the Buddy Rich Band concert experience for replay on videodiscs, videocassettes, analog records, cassettes, compact discs, and stereo television broadcasts."

"The equipment chosen for this production produced a quality of audio delivery to make sound real and dimensional. When replayed through a Tate Surround-Stereo System consumer decoder through a four-channel audio system, the stereo soundtrack is transformed; and the listener is enveloped within an entire sound field, just like the "live" experience enjoyed by the audience at the concert. That's our purpose: To put you there."

The opinions expressed in this article are those of Tate-Reher Productions and do not necessarily reflect those of Crown International.

PZMs ON RECORD

Heard any PZMs on disc lately? Crown is collecting the names of any compact discs or analog LPs that were recorded with PZMs.

One such recording is "Pan Is Beautiful III," an outstanding yecording of a steel-band contest (covered next issue). Another is Frank Zappa's recording with the London Symphony Orchestra.

The best we've heard yet is a jazz-fusion compact disc, "Tricycle" by FIlm and the BB's, on DMP records. High-impact drums, piano and sax are picked up with PZMs, along with synthesizers and Alembic bass. Terrific demo material.

If you know of any records using PZMs, or if you've made a commercially released record using them, please send the record titles to Bruce Bartlett at Crown.

THE PROBLEM-SOLVING PCC

Crown PCC-160s greatly improved the sound reinforcement in a gymnasium/ auditorium at Bethel College in Mishawaka, Indiana. The microphones picked up a stage production of an original musical, "Joseph."

As shown in the figure below, three PCCs were strategically located on a 20'x 40' stage. The gym was 100' deep by 70' wide, with cement block walls and a hardwood floor.

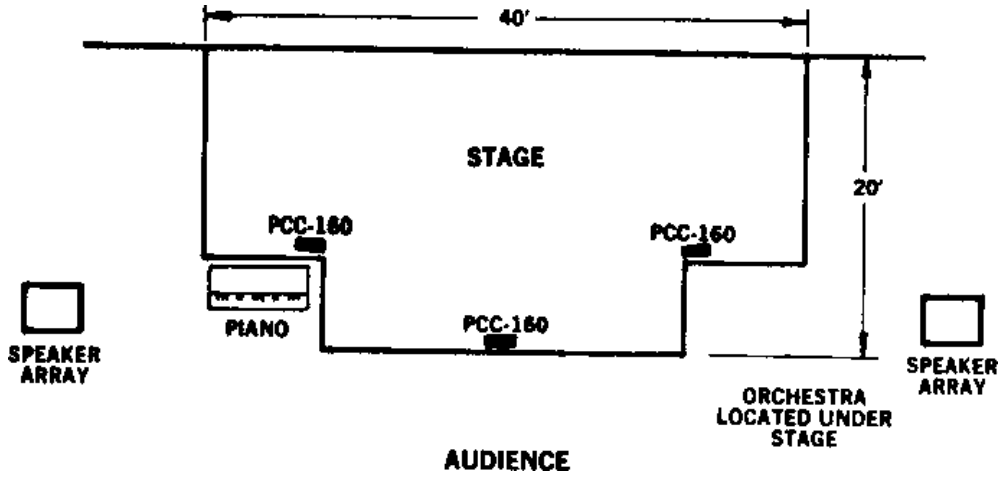


Fig. 5. PCC stage miking.

All three mics were on simultaneously. Although this procedure decreases gain-before-feedback compared to muting unused mics, the gain was sufficient. There was no need to ride the microphone faders.

The PCC-160 has a supercardioid pickup pattern with a small rear lobe, and maximum sound rejection (nulls) at 135 degrees off-axis. The sound engineer used this knowledge to advantage when aiming the mics.

For example, note the piano four feet behind the left-side PCC. When the rear of the microphone was aimed at the piano, the PCC picked it up slightly. But after rotating the mic to “null out” the piano, the piano became inaudible through the reinforcement speakers.

As in any theatre sound system, actors who didn’t project were harder to hear. Additional microphones (PZMs) might be suspended to reinforce rear-stage dialog in future productions.

According to the sound engineer, past setups have always had problems, but the PCCs provided the best sound in years. The reinforced sound was quite intelligible - despite the gym’s cavernous acoustics.

The South Bend Tribune reviewer praised the show’s sound quality: “The production also is enhanced by an excellent sound system which does justice to the music.”

Ken Kuespert, a freelance sound engineer, tried PCCs for a recent stage production of “Brigadoon” at Lakeshore High School in Stevensville, Michigan. Five PCCs were placed as shown in Figure 6: three across the front of the main stage and two on the thrust stage.

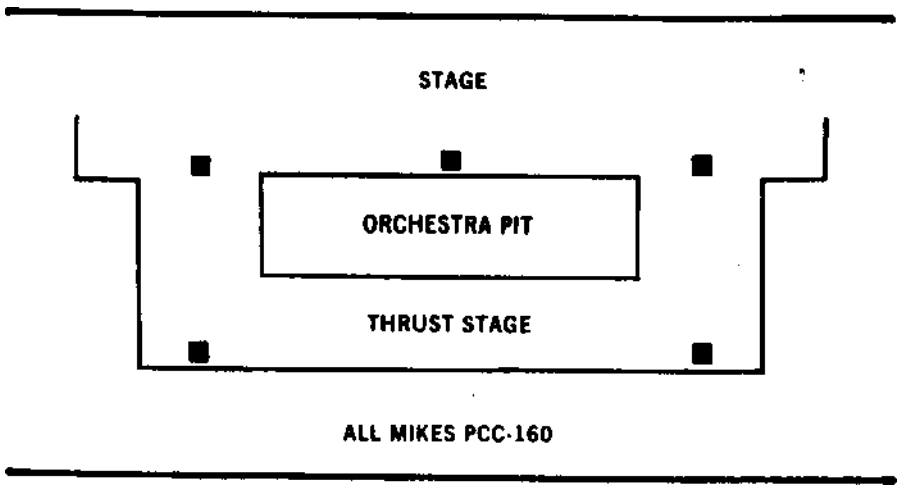


Fig. 6. PCCs on stage.

Ken rode gain on the microphones. He often had GAIN TO SPARE - practically unheard-of in stage miking. The tone quality was natural; the foot noise was minimal.

In another installation, a user reported that he tried a PCC in his marble-floored church, with amazing results: A PCC on the floor provided more gain-before-feedback than the standard lectern mic on a gooseneck!

We don't expect this result too often, and have encountered installations where only a gooseneck mic will work. Success or failure depend on the room acoustics and sound system. Still, it's gratifying that sometimes the PCC can work so well.

The PCC is a good mic for a lecturer or minister who wanders while speaking. With a gooseneck mic, the distance from the talker to the microphone varies greatly as the talker moves, because the gooseneck mic is close to the talker. As a result, the microphone output varies greatly. But a PCC is relatively far from the talker, so its output varies less as the talker moves.

A PCC-160 was used on the TV show "Airwolf," which features a high-tech helicopter. The mic was placed on the 'copter's dashboard to pick up the pilots' dialog. Since the PCC also looked "high-tech," it was left in view for the camera shots!

Wedding recording is another application where the PCC is ideal. Just put it on the floor near the ceremony. It will provide highly intelligible pickup without detracting from the proceedings.

HOW TO USE A PCC WITH A NEWS DESK

Television directors dislike lavalier mics. These clip-on microphones are visible on-camera; they can be inconvenient to attach to clothing (especially females), and the cord is subject to much abuse.

The PCC-160 Phase Coherent Cardioid is a viable alternative to lavalier mics in news-desk applications. It picks up approximately the same amount of background noise and room acoustics as a lavalier mic. Yet, it is invisible on-camera and causes no problems with attachment or cables. A PCC also can be used as a backup microphone if a lavalier mic fails on the air.

One-to-three people can be picked up with a single PCC.

Try to mount the PCC as shown below. Place it two feet or less from the talent to reduce ambient pickup. Mount it on a shelf or ledge several inches above the main desk to reduce pickup of paper shuffling. Many news desks include such a ledge in front to hide the TV monitors.

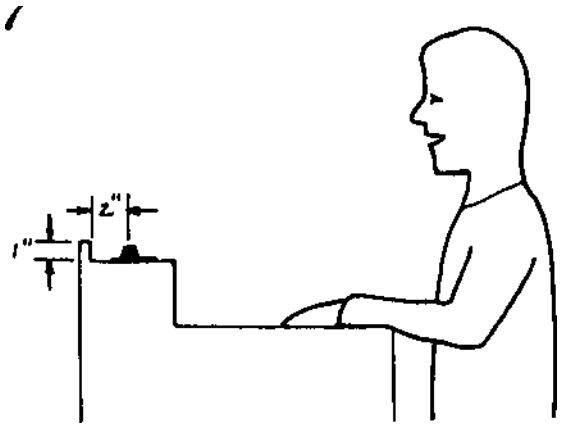


Fig. 7. News desk miking with a PCC-160.

Putting the microphone on a shelf also prevents the talent from laying papers on top of the mic. If papers are placed on the microphone, high frequencies are greatly reduced and the response becomes very rough.

On the camera side of the shelf is a small ledge to hide the PCC. The microphone should be spaced at least twice the ledge height away from the ledge to avoid degrading the polar pattern.

You may want to pad the desk top with 1/8" foam rubber or felt to dampen table taps.

If a raised shelf is unacceptable, place the PCC directly on the news desk and put some thin foam or felt on the table top in front of the microphone (not on the microphone plate) to reduce table taps. The foam does not significantly affect the microphone's frequency response.

Do NOT place foam under the microphone. Foam under a PCC acts as a shock amplifier, not a shock isolator! In addition, raising the mic off the desk top roughens its frequency response.

With these precautions, you should achieve a clean pickup with no microphones in sight.

The PCC also has applications in radio. The figure below shows a PCC on an announcer's table beside the DJ's console. Such an arrangement is an improvement over a gooseneck mic for inexperienced interviewees. One PCC covering two people picks up less room acoustics than two PCCs.

Note the acoustically absorbent material on the wall behind the announcers. It absorbs room reflections to make a "tighter" sound.

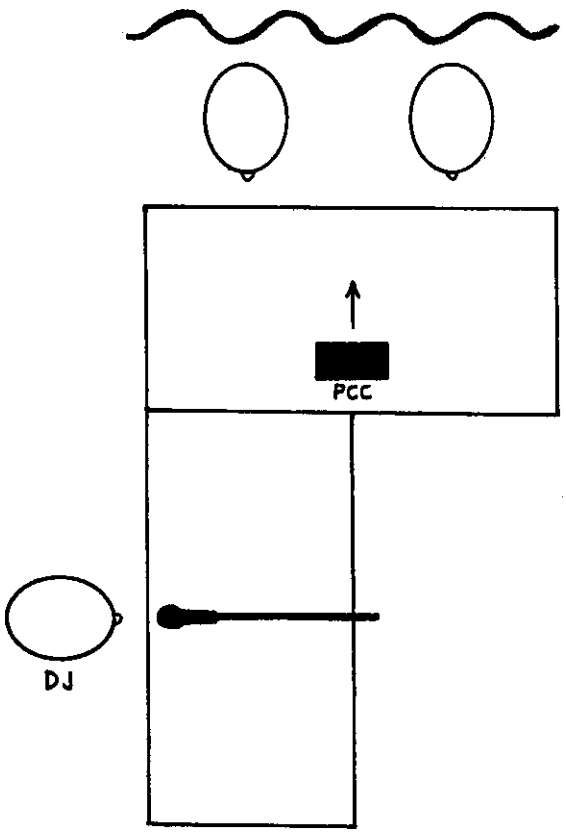


Fig. 8. PCC picking up an interview.

LETTERS FROM PZM USERS

Invisible microphone

As producer of the annual awards banquet for the Academy of Magical Arts, I am always faced with what magic to include which will entertain and fool an audience of some of the world's top magicians.

One of the hits of the last two years was my "Invisible Microphone" at the podium. I pretended to adjust it as I would with a normal podium mic, but I was really using a PZM-6LP. No one could figure out how the sound was being picked up so well - even when there were two or three people at the podium. To make the PZM invisible I covered the back with silver metalized mylar tape.

WARNING: When used on a podium, there is a danger of people laying scripts and plaques OVER the PZM. Position it at the top of the podium to minimize this risk.

Audience miking with PZMs

Writing in reply to the letter from Mikel-Jon-Carter in the Jan.'85 *PZMemo*, dealing with audio situations in his T.V. studio at Bentley College of Waltham, Mass. One of his questions concerned using PZMs to mike an audience.

I do audio for a talk show aired weekly on local cable television. Our program is called "Citizen News on the Air" and is hosted by Stephen Chace-Bass. "CNA" airs every Monday evening on the public-access channel in Long Beach, California.

We've used PZMs available to us over a year. I've learned not to use them for miking talent because they work too well, picking up clothes rustling, construction sounds from the building next door, etc.

Several recent programs have featured an in-studio audience (albeit no more than fifteen people). I placed the audience seats around a low table below camera range, and a PZM on the table. I instructed the audience to ask questions from their seats, and explained that it was not necessary to speak louder or lean towards the table.

As a result, I was able to keep the PZM gain down, avoiding excessive ambient sound and retaining enough headroom for soft-spoken audience members.

Sound Grabber works great

We have purchased two of your Sound Grabbers from DAK Industries in California to record our family therapy sessions for our clients. One mic is usually placed on the floor in the center of the room. It has worked so well that we have failed to consider the possibility that there might be a better placement. The reduction in background noise amazes us.

In addition, we also utilize them to record our vocal octet and our wind ensemble along with other musical functions in the community. Again, they are usually thrown somewhere on the floor out of the way, and give exceptional balance and sound quality. We have discovered they usually provide the best presence if they are within ten feet of a small group and 15 feet of the larger groups.

I find their capacity unbelievable, having spent ten years as the Supervisor of Recording at Interlochen, Michigan with the best condensers available at the time. I am turning out recordings on my home equipment equal to what used to happen with Ampex and Telefunken equipment.

You might be pleased to note that I will be taking your mics and my home machine to Italy with the MSU Alumni Band tour. The quality of my demo tapes has assured us that at least one of our local PBS radio stations will be airing those tapes upon our return.

Gary Wakenhut Lakeview, Michigan

More gain-before-feedback

In a large church auditorium, we want to get more gain before feedback, and less importantly, more feedom of movement for the talkers. The present mikes are AKG 202E5 super-cardioids mounted on a pulpit and a lectern. Thirty feet directly overhead are an Altec multicellular horn and a bass-reflex speaker (crossed-over at 500 Hz).

Would the gain before feedback improve if we replaced the pulpit and lectern mikes with PZM-2.5s, or use a pair of PZM-3LV clip-on's (or have you other suggestions?). I suspect the talkers would prefer clip-ons, but feedback control would be sacrificed due to the mike positions changing as the talkers moved about.

We like the acoustics as they exist; the precedence effect is good and we wouldn't want to lose it by moving the loudspeakers forward. The main room ring modes have been suppressed by LC filters in the speaker line, and the horn has been aimed and cells stuffed for equal-level dispersion.

T. Wickstrom St. Paul, Minn.

Reply:

Try a PCC-160.

Miking percussion with a PZM

I am a percussion player. In exploring your literature and PZMemos, I haven't found any in-depth coverage of PZM use in a live set-up like mine.

I perform in a four-piece band (guitar, bass, keyboards) in lounges, clubs, and our own converted garage/studio.

My set-up includes three congas, a table for handheld percussion (similar in size and height to an ironing board), a rack approximately 50 inches long with stationary bells and blocks, hanging gongs, metal tubes 3 to 5 feet from the floor, a snare drum, and a cymbal stand.

I am essentially caged by my noise toys. It seems that a major problem with PZMs in this situation would be ambient and incidental sounds. I would like to receive any tips and info you or your readers might have. As far as I can tell, you guys have an amazing product.

Charles Lowrey, Self-Generated Productions, Nashville, Tenn.

Reply:

The usual method of miking a large percussion set-up with PZMs is to strap a PZM to the percussionist's chest. The microphone follows the percussionist as he or she moves from one instrument to another. Since only one mic is used there is little ambient pickup.

An alternative is to mount PZMs on several Crown A240 Boundaries. The A240 [no longer available] is a 2'x2' clear plexiglass panel to which a PZM can be attached to make the microphone dfrectional. Included with the A240 is a rugged, adjustable stand adapter for mounting the panel to a mic stand.

Aim the microphone side of the panel at the instruments, and aim the opposite side of the panel at the sound-reinforcement speakers. Use as few panels/mics as possible to cover your set-up.

# # #

MIC MEMO

January 1986
Bruce Bartlett, Senior Editor
Ken Wahrenbrock, Contributing Editor

ANNOUNCING THE CROWN GLMs: GREAT LITTLE MICROPHONES

Fig. 1. GLM-100 microphone.

Crown is proud to present two new additions to the microphone line: The GLM-100 miniature omnidirectional mic, and the GLM-200 miniature hypercardioid mic.

Both GLMs are miniature electret condenser microphones designed for professional recording or sound reinforcement. They offer all the quality of larger studio microphones, yet are nearly invisible in use.

GLMs can be clipped or taped onto an acoustic guitar, sax, or flute to allow the performer freedom of movement They can be attached to drum rims to pick up a drum set without the unsightly clutter of boom stands. Suspended over a choir or orchestra, or hidden on a film set, they disappear in use yet provide excellent sound quality.

Frequency response is wide and smooth: 20 Hz to 20,000 Hz in the omni GLM-10O; 60 Hz to 20,000 Hz in the hypercardioid GLM-200. Other benefits include excellent transient response, minimal off-axis coloration, and very high overload level (150 dB SPL peak).

The GLM output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. The microphone connects directly to a 24-48 volt phantom power supply; no additional interface is required.

The hypercardioid GLM-200 has excellent rejection of off-axis sounds (over 25 dB at the rear nulls); this rejection is uniform with frequency. The hypercardioid pattern increases gain-before-feedback and reduces pickup of room acoustics, background noise, and unwanted sounds behind the microphone.

When used as a lavalier microphone, the GLM-200 rejects background noise and room acoustics compared to a conventional omnidirectional lavalier.

The omnidirectional GLM-1OO is recommended for extended low-frequency response, lower noise, and all-around pickup (say, for drum-kit miking with just two or three microphones.)

Included with the GLM is an all-purpose mic clip for mounting the microphone, a tie bar and belt clip for lavalier use, and a windscreen. Optional accessories allow mounting on various instruments [no longer available]. Several GLM application notes are available from your Crown dealer.

PZMs IN TELEVISON PRODUCTION

Gary Pillon, a sound mixer for General Television Network of Oak Park, Michigan, is a pioneer in television-audio applications for the PZM.

Gary won the 1984 PZM Challenge, worked on the Detroit region ITVA Golden Cassette winner and took home the first local Emmy for field audio (for the syndicated PBS program “Miracle on Fort Street”).

He was invited to the International Film and Television Workshops last June in Rockport, Maine as a teaching assistant, specializing in showing the many uses of PZMs in film and video recording. After reviewing the basics, Gary played his Emmy-winning recording of the “Messiah,” which was very well received.

The class then went into a field test arranged by the teachers, New York sound mixers Mark Dichter and Helene Kaplan. A cover shot of a seated, table-top, three-person role play was set up. They recorded this situation with a Schoeps hypercardioid, a Sennheiser shotgun, three Tram body mikes, one PZM-6S [now the PZM-6D], and the Schoeps set up on a table mount.

When Gary played back the Nagra recording over IMF speakers, the differences became quite apparent. According to the class, the PZM track was the best-balanced and most lifelike of this particular test. The other major contender was the table-mounted Schoeps, which costs over three times as much and cannot be hidden under a tablecloth or prop.

They also recorded on the Rockport dock in an open phone booth. The overhead boom could not get in the right place to record dialog, so Gary put a PZM-6S capsule into the corner of the glass shroud. According to the students, the quality of the pickup was startling, and this test further increased interest in the mics.

This summer Gary also constructed a prototype stereo PZM 2.5. Cutting out pieces of foamcore, he built a device resembling two 2.5 mics joined along their long end (see Figure 2). The assembly could be stand-mounted from the backside or hand-held if necessary.

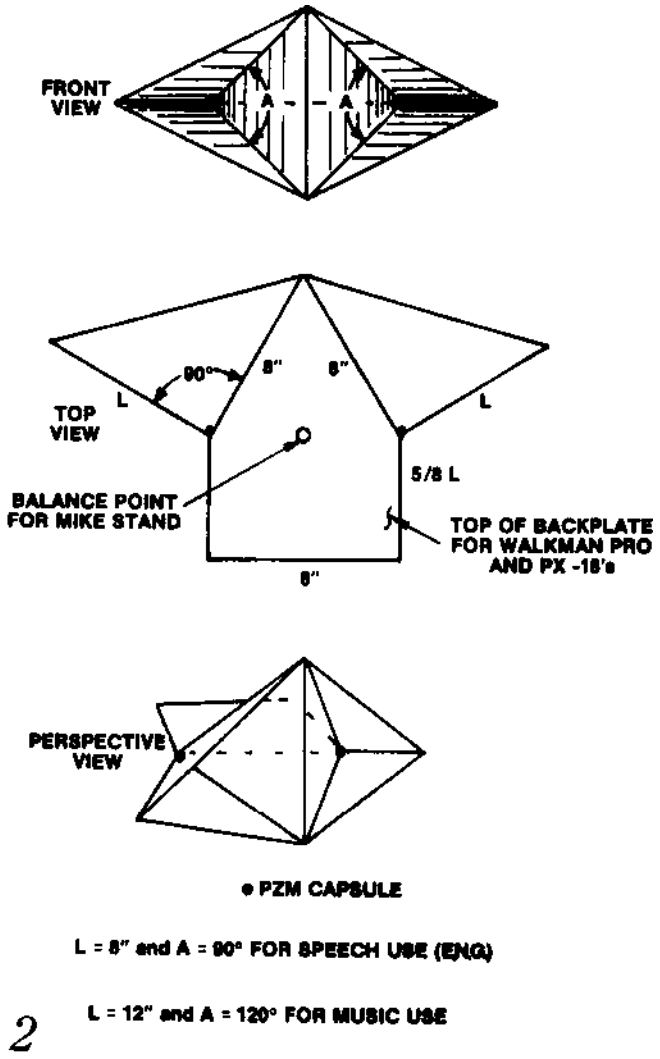


Figure 2

Fig. 2. Pillon stereo PZM.

The stereo image, which is partly a result of the 8" capsule spacing, is designed to be like that produced by a binaural recording, but with more-realistic playback over loudspeakers. Ideally, this device would mount on a Steadicam platform and give an excellent match between audio and video perspective. [The current version of this mic is the Crown SASS-P MKII.]

A different version of the stereo 2.5 has been designed by Mike Lamm and John Lehmann of Dove & Note Recording in Houston, Texas (see Fig. 3). Gary sent us a variety of recordings made with the device since its construction for the Messiah concert. The demos he sent us were made with this “floor model” and a Sony Walkman 6C Pro. As Gary says, “You can take the Lamm and Lehmann floor array, set it down, and just roll. You get a very close approximation of the real event.”

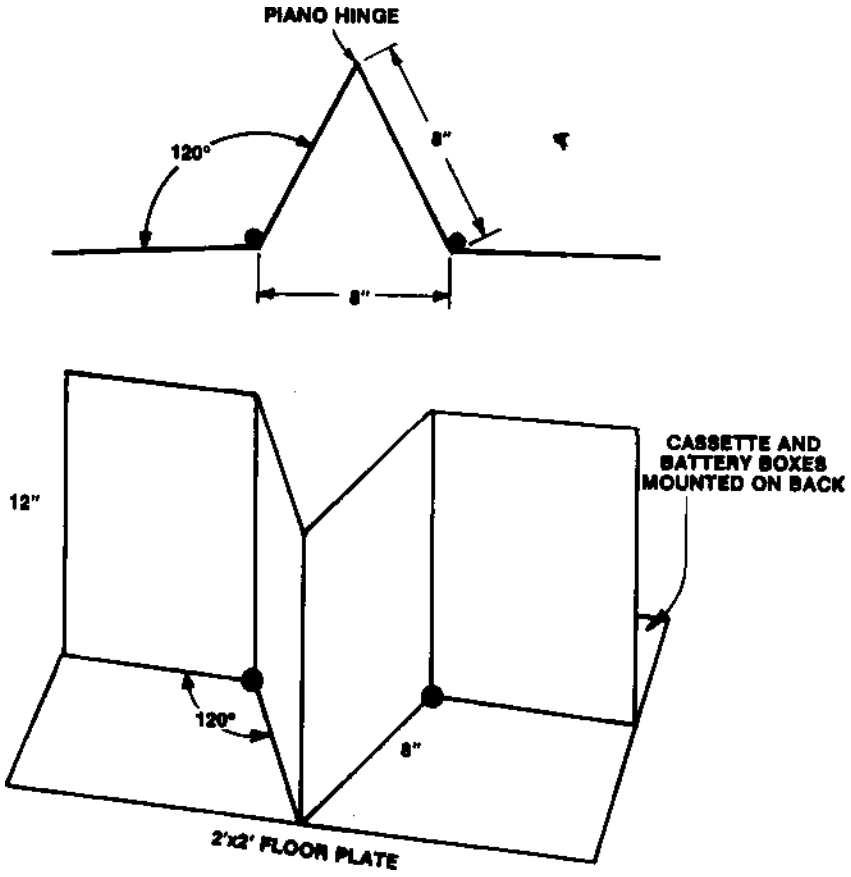


Fig. 3. Lamm and Lehman floor-mount stereo PZM.

One recording was made in a rock club with the stereo 2.5 inverted and hung from the light bar over the band. This was not a “tight,” commercial-sounding record, but rather an accurate recording of how a rock band sounds from the audience - a distant perspective. With the tape playing at full volume over headphones, you really feel part of the audience!

Another recording was made with the Lamm and Lehmann (L^2) array on the floor ofthe band room of a similar group. A comparison of the two recordings confirms what you might expect: the suspended mics had less bass and more highs, while the floor-mounted mics reversed the balance.

A third tape of the Christ the King Chorale used a unique microphone technique for classical-music recording of an orchestra and choir Gary formed a PZM wedge by mounting a pair of PZMs on 2-foot-square panels with edges touching (as in Figure 4). Two bungee cords anchored the wedge from the top of a Mole Richardson Hi-Riser placing it 17 feet high and 10 feet behind the conductor on the edge of the near-field boundary. In addition, Gary placed the L^2 floor array 8 feet behind the conductor (See Figure 3). This setup was first used on the Messiah concert.

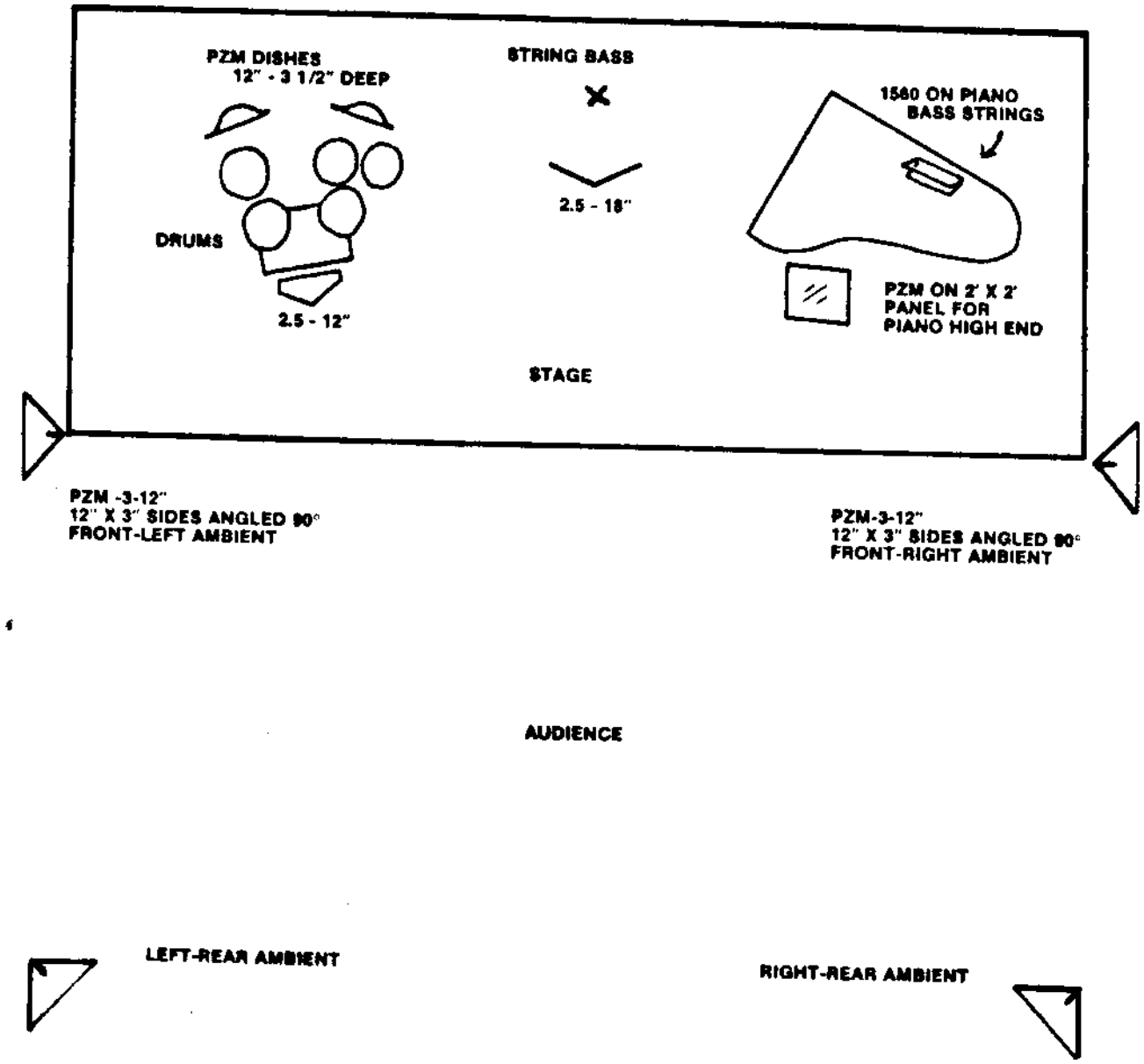


Fig. 4. PZM wedge placement.

Because of rehearsal delays, he had only one minute to obtain a balanced mix before this concert, but it worked. To our ears, individual instruments and voices sounded articulate and clear without being harsh or overbright. Hall ambience was pleasant and full. Stereo images were clearly localized and the stereo spread was natural. Blending of the orchestral and choir sections was excellent.

We congratulate Gary Pillon on his Emmy award and thank him for sharing his PZM techniques with us.

PZMs RECORD STEEL-DRUM FESTIVAL

Hayden A. Hart, director of Electronic Services Limited, sent us an outstanding recording they had done of the “1984 Pan Is Beautiful II” Steelband Music Festival in Trinidad, West Indies.

We heard an open, airy, natural sound; with very wide dynamic range and good imaging. The recording captured the full range of timbres from delicate to piercing. Cymbals sounded smooth, and the low bass was phenomenal.

The goals for the recording were described by Mark Coffey of Texas Pacific Film & Video of Austin, Texas, paraphrased below:

Our theory is that distant miking, rather than close miking, best captures the sound of a steel-drum orchestra. This premise is based on the qualities of the individual pan and the overall sound produced by multiple instruments of the same tonal range.

Pan has an imperfect quality: When a note is struck off-center there is usually a brittle, noise-like tone that contrasts to the roundness of the primary tone. Close miking picks up every off-center hit. Because sharp sounds lose their energy faster with distance than round sounds, distant miking would hear more tone and less attack.

In addition, groups of steel drums never can be perfectly in tune because of the imprecise tuning method. When large orchestras play, the slightly out-of-tune instruments give rise to a whole other sound.

The out-of-tune notes beating against one another create a shimmering effect, which helps give pan its uniqueness. It sounds something like a Leslie organ speaker.

To fully record the shimmering effect, the mics should be placed some distance from the sound source. I come from the school of thought that says air mixes sound better than electronics. The interaction of the instruments playing live can be captured only by using distant miking.

Trying to duplicate this sound by close miking would result in the sound of 100 pans playing together instead of 100 pans playing as one. And it’s this fullness, this power that is the excitement of a steel-drum orchestra and is the sound we want to record.

For the recording of each steel-drum band, Electronic Services Limited used four Crown PZMs: one PZM-30GP two PZM-6S, and one PZM-6LP [now the PZM-30D and PZM-6D.] These mics were placed on a 2' x 2' sheet of plexiglass, except for the 6S’s placed on 4' x 4' sheets. They were positioned to capture the most important sections of the orchestra.

Note that there is no standard placement of steel band instruments for classical performance. As a result, Electronic Services Limited did much preliminary work to determine exactly where the instrument sections were to be located, so that the mics could be properly positioned.

Shown in Figure 5 is a sketch of the microphone placement for the winning band, Amoco Renegades.

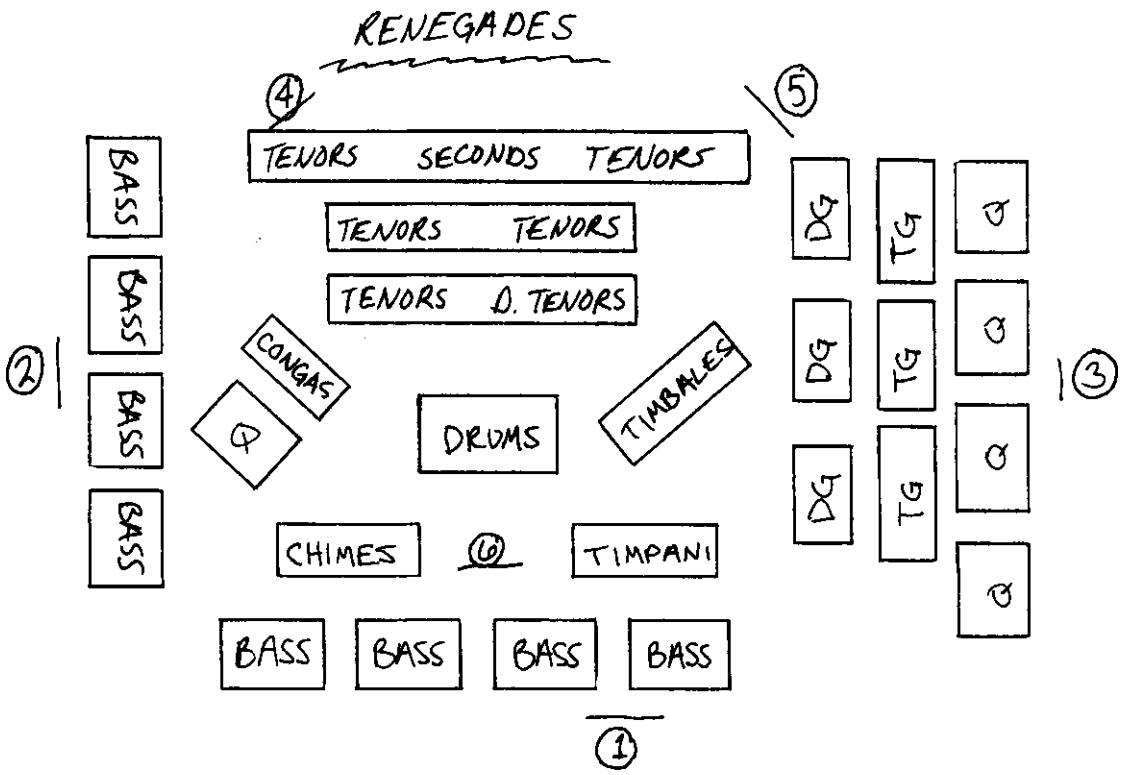


Fig. 5. PZM miking of a steel-drum band.

Mic 1: PZM-31S

Mic 2: PZM-31S

Mic 3: PZM-30GP

Mic 4: PZM-30GP

Mic 5: PZM-30GP

Mic 6: PZM-6LPB

The entire recording was closely monitored on-site and captured on a Thscam 34 eight-track recorder using dbx noise reduction equipment. It was then mixed down to a dbx Model 700 digital processor.

Mark Coffey evaluated the recording as follows:

“Having been present for the recordings at the semi-finals and the finals of the “1984 Pan Is Beautiful” Pan Festival, I am encouraged that the knowledge to record these instruments properly is developing. Although I would like to experiment further with mic placements, Mr Hart’s “surround” technique is based on sound principles.

I think the use of a minimum number of separate tracks is very helpful in gaining a proper balance among the sections. I continue to like the use of PZMs as the main recording microphones but I could see experimenting with a more-directional close-miking technique, say for the bass pans...

These recordings have both presence and depth, power and subtlety. For the Merrytones the bass pans are really standout; giving their calypso punch, definition and power. These are the qualities that must be captured to have a really effective recording...

Overall, I think these recordings are the best I’ve heard thus far.

REDUCING RFI IN THE PCC

The PCC-160 has built-in protection from radio-frequency interference. If you are using the mic in an area with an extremely strong AM-broadcast-band signal, you may want to replace the .002 uF capacitors on the output connector with 0.1 uF capacitors. The audio response at 20 kHz will be down 3 dB, but any AM pickup should be eliminated.

LETTERS FROM PZM USERS

Mounting PZMs on boundaries

I enjoy receiving the *Mic Memo* for the excitement and creativity surrounding the use of PZMs that you bring out each issue.

I use a Radio Shack PZM taped to a piece of plexiglass for recording interviews with Laotian refugees. I glued a piece of foam rubber to the bottom of the plexiglass boundary. The interviewees simply rest the affair in their laps, against their chests. After reading one of your issues, I glued another piece of plexiglass to the foot of the first, gaining better rejection of background noise and slightly higher sound pressure levels.

Though I discovered PZMs through Radio Shack, I'm about to become a true believer and step up to a Crown PZM-30GP!

Kevin Merrell Boise, Idaho

Reply:

Thanks for the idea, Kevin. Before you try a PZM-30GP (now the PZM-30D], note that its cantilever is not detachable from the plate. You may want to try a PZM-6S [now the PZM-6D] which has a removable cantilever.

It's important to place the "nose" of the cantilever against the vertical plexiglass panel to prevent phase cancellations. To achieve this arrangement you might try cutting a notch in the plexiglass to fit the PZM plate.

Combining two PZMs into one input

We are using three PZMs and love them! Two on a large pulpit are super for voice and one on our grand piano, taped to the underside of the lid - super!

I would like to know about combining the two PZMs on the pulpit, used for PA, into one phantom-powered input. Can I do it without loss of sensitivity? We use an Altec preamp model 1690 so we have plenty of power for the mics. Can I just parallel the connections? I have two PZM-6LPs with two PX48 interfaces.

At present, we are using two inputs of the 1690 for this one location. I want to retain both PZMs at their present locations; a single unit reduces gain and flexibility.

Reply:

Paralleling the PX48 outputs will work, but it will reduce each mic's sensitivity by 6dB. (The same is true when any two microphones are paralleled.) With the parallel connection, the load impedance seen by each interface is 150 ohms.

If the interfaces are paralleled, the resulting 150-ohm load may result in distortion with high-SPL sources. To prevent distortion, solder a 270-ohm, 1/8-watt resistor in series with pin 2 and pin 3 in both female connectors in your Y-adapter (a total of four resistors).

With this circuit each interface will see approximately a 1000-ohm load. The sensitivity still will drop 6 dB when the interfaces are connected together.

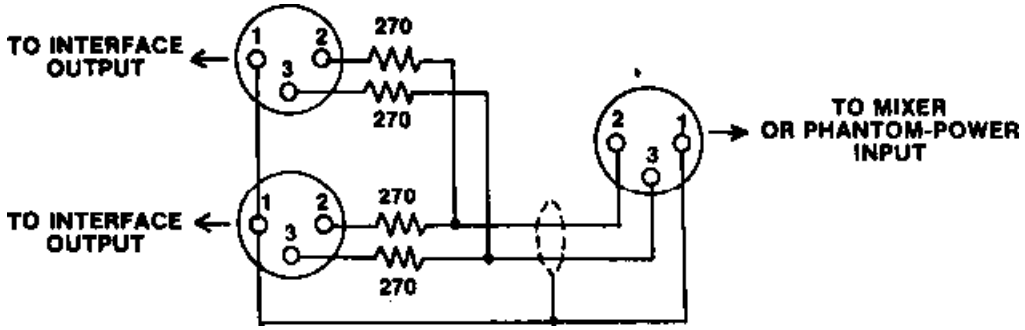


Fig. 6. Mic combiner circuit.

PZM use

I have used the nice PZM-6LP for concerts and for the TV recording studio at the Theater Yaguez and Channel 3-AS. Thanks, Crown International, for the good mics and equipment.

Jaime Ruiz, Supervisor Sound Technician, Theater Yaguez, Mayaguez, Puerto Rico.

PZM theory

In the Dec.'85 issue of *Guitar Player* magazine was an excellent article on personal studios. The article states that PZMs are constructed to pickup only primary [direct] sound waves, and reflect other waves away from the mic capsule. Is this correct? Also, a figure shows a PZM on a mic stand several feet in front of a guitar amp. Is this a proper placement?

Reply:

PZMs pick up both direct and reflected sounds, in phase with each other at all frequencies in the audible band. This provides two benefits: (1) It doubles the microphone sensitivity. (2) It eliminates phase interference between direct sound and sound reflections from the boundary on which the PZM is mounted.

PZMs are meant to be used on large boundaries; otherwise the low-frequency response shelves down 6 dB. Placing a PZM on a mic stand may give the desired sound, but you risk losing low-frequency response and creating phase interference from floor reflections.

# # #

MIC MEMO
August 1986
Bruce Bartlett, Editor

GLM TECHNIQUES FOR RECORDERS (WOODWINDS)

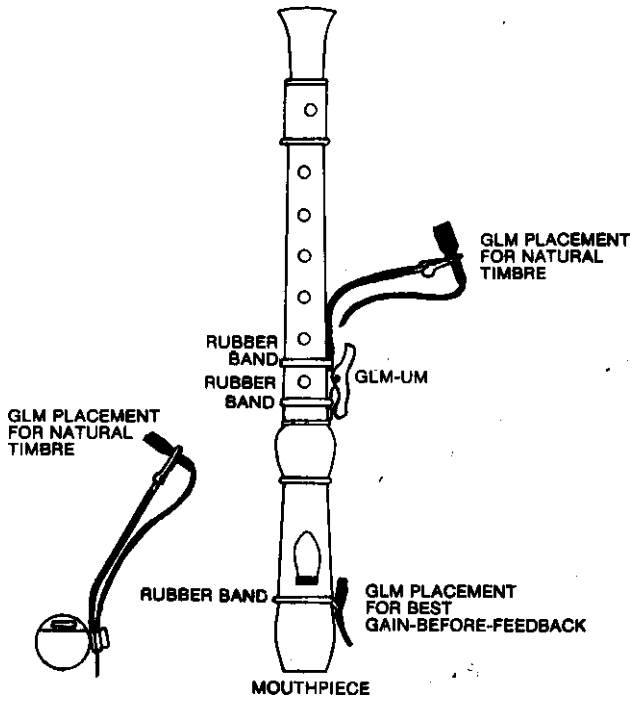


Fig. 1. Suggested GLM placements for a recorder.

Here is a suggested technique for miking a recorder with a Crown GLM-100 mini omnidirectional condenser microphone.

For the most natural tone quality with sound reinforcement, you can mike a recorder with a GLM-1OO as follows (please refer to Fig. 1):

1. Wrap two rubber bands around the recorder on either side of the top-most finger hole.

2. Trap the large clip of the GLM-UM Universal Mount (included with the microphone) under the rubber bands. Place the large clip on the right side of the recorder (player's perspective).

3. Bend the mount-wire 90 degrees so that the small clip is above the center of the finger holes.

4. Clip onto the GLM flex relief; aim the front of the mic at the recorder.

5. Route the GLM cable down the GLM-UM mount and through the large clip.

The following placement provides the most gain before feedback with a sound-reinforcement system. The tone quality is slightly less natural, but the pickup of each note in the scale is uniform:

1 .Wrap a rubber band around the recorder next to the rectangular slot by the mouthpiece, on the player's side of the slot.

2. Trap the GLM-100 under the rubber band and aim the GLM at the slot. Be sure that the GLM is on the player's side of the slot so the GLM is not blown on.

When recording a soloist or group, do the recording in a hall with suitable acoustics - warm ambience or reverberation. Place two GLM—100s 3 feet apart, recorder height about 3 to 10 feet from the instrument(s) to pick up room ambience. Alternatively, place two PZMs on the floor about 3 to 10 feet from the instrument(s), 3 to 6 feet apart.

These suggestions should work well to preserve the beauty of the instrument's timbre.

GLM BANJO MIKING

The following techniques have worked well for miking a banjo with a Crown GLM-100:

1. For the most natural sound, clip the supplied GLM-UM Universal Mount to a banjo tension rod, and clip the other end of the mount to the GLM strain relief. Place the microphone about 1 to 2 inches in from the rim, 1 inch over the drum head, as in Figure 2.

2. For more isolation and more gain-before-feedback, tape the GLM directly to the drum head as follows: Put some double-sided tape on the GLM on the side marked FRONT (as in Fig. 3). Tape the GLM to the banjo head about 1 to 2 inches in from the rim, with the FRONT of the GLM aiming at the head. Tape the GLM to the head with masking tape or drafting tape, taking care not to cover the sound-entry hole (as in Fig. 2).

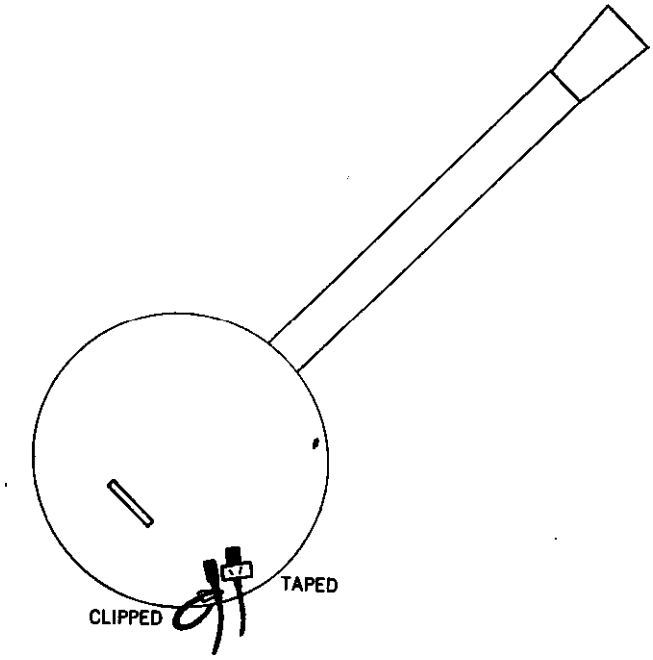


Fig. 2. Miking a banjo with a GLM-100.

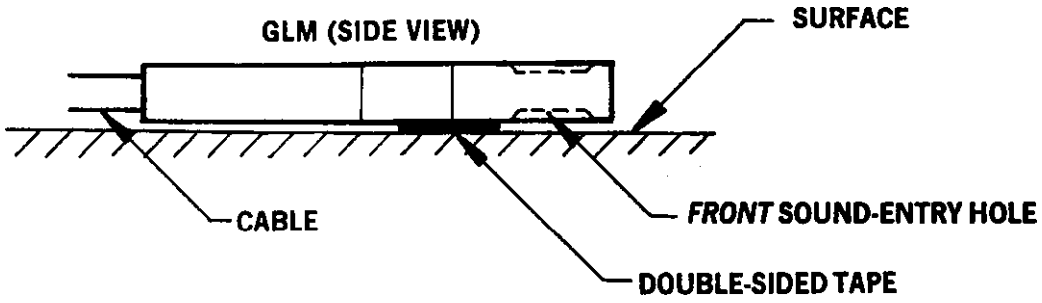


Fig. 3. Use double-sided foam tape to mount a GLM on a banjo head. Also use masking tape (do not cover sound-entry holes).

GLM KICK-DRUM MOUNTING

A handy way to mike a kick drum with a GLM-100 is to feed the mic and its cable through the vent hole in the top of the drum and hang the mic in front of the beater.

If the vent hole on your kick drum is too small for the GLM to fit through, try this:

Hang the GLM by its cable inside the kick drum so it is the same height as the beater. Bend the cable into a “V” near the vent hole, and insert the point of the “V” through the hole. Tie a knot in the cable

just outside the vent hole to keep the cable from falling through.

The GLM can aim in any direction since it is perfectly omnidirectional at low fequencies.

You'll probably want to damp the beater head with a blanket to tighten the beat. Lay a blanket inside the drum pressing against the beater head. Boost the treble on your mixer (ideally, several dB around 2.5 kHz) to increase attack.

UNDERSTANDING MICROPHONE SENSITIVITY

A microphone-sensitivity spec tells how much output (in volts) a microphone produces for a certain input (in SPL). A high-sensitivity microphone puts out a stronger signal (higher voltage) than a low-sensitivity microphone when both are exposed to the same sound pressure level.

Microphone sensitivity is specified in several ways:

dBV per microbar

Millivolts per pascal

dBm per 10 dynes/cm^2

dBm, EIA rating

We'll explain each of these. First note that

10 dynes/cm^2 = 10 microbars 1 pascal = 94dBSPL

1 dyne/cm^2 = 1 microbar = 74 dB SPL

An example of a microphone sensitivity specification is:

Open-circuit voltage -60dB re 1 volt per microbar. That means the mic produces -60 dBV unloaded, when exposed to a sound pressure level of 1 microbar (74 dB SPL). You put 74 dB SPL in; you get -60 dBV out.

A typical sensitivity spec is -65 dBV/ microbar for a condenser microphone and -75 dBV/microbar fbr a dynamic microphone. Another way to express the same sensitivity is: Open-circuit voltage 10 millivolts per pascal. That is, the mic produces 10 millivolts, unloaded, when exposed to a sound pressure level of 1 pascal (94 dB SPL). You put 94 dB SPL in; you get 10 millivolts out.

Here's still another less common way to specify the same sensitivity: Power level -38 dBm per 10 dynes/cm^2. In other words, the mic produces -38 dBm into a matched load, when exposed to an SPL of 10 dynes/cm^2 (94 dB SPL). "Matched load" means that the load impedance equals the microphone impedance. If the mic impedance is 150 ohms, the load impedance of the mic preamp input is also 150 ohms. This is unlikely to occur in practice; usually the load impedance is at least 7 to 10 times the mic impedance.

The EIA rating or Gm rating is useful for calculating the microphone output into a matched load for a given SPL. SPL + dB (Gm) = dBm output into a matched load.

To compare the sensitivities of two microphones specified in different ways, convert them to the same reference using these formulas:

Millivolts per pascal = $10^{(4+dBV/2O)}$ dBV/microbar = 20 log (mV per pascal/1000) -20dB dBm/10 dynes/cm^2 = dBV/microbar + 22.2 dB (if mic impedance equals 150 ohms) dB (Gm) = dBm/10 dynes/cm^2 - 94dB.

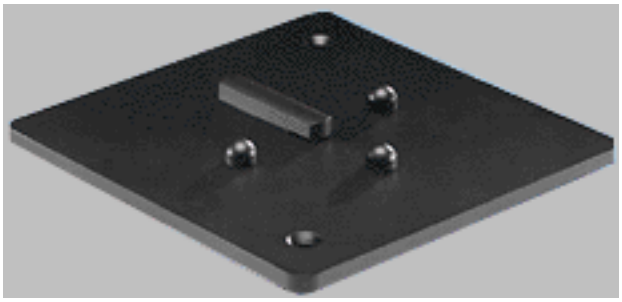
If you put a microphone in a 20 dB louder sound field, it produces 20 dB more signal voltage. For example, if 74 dB SPL in gives you -75 dBV out, then 94 dB SPL in gives you -55 dBV out. 150 dB SPL in gives you +1 dBV out, which is approximately line level! That's why you need so much input padding when you record a kick drum or other loud sources.

# # #

MIC MEMO

October 1986
Bruce Bartlett, Editor

NOVEL CONFERENCE MIKING WITH PZM-20RMGs [now PZM-20R]



PZM-20R

Dave Haneman, the owner/engineer of Advance Video, is an audio/video systems consultant and contractor. He devised an effective and invisible method of miking conferences with PZM-2ORMG microphones.

The conference-room installation was done for Schlesinger Associates, a market research company in Edison, New Jersey. Two PZM-2ORMG mics pick up the conversations of “focus groups,” in which members of the public are interviewed about products. The focus-group rooms have one-way mirrors for viewing and video taping.

The two microphones are mounted in upper opposite corners of the 18' x 25' conference rooms. The rooms seat about 15 people around their tables. Reverberation is well-controlled because the floor is heavily carpeted; the walls are painted drywall, and the ceiling is fiberboard tile. Each 2ORMG is screwed into drywall, with the plate extending about 1" in from the wall and ceiling. Aluminum studding in the walls prevent flush-mounting of the microphones.

Dave reports that results are excellent:

“Most of the group leaders are pleased or impressed with the sound. Intelligibility is very good, yet the microphones are invisible so that interviewees are less self-conscious.”

Theory explains why this method works so well: Mounting the PZM element in a corner boosts its acoustic sensitivity 18 dB (6 dB per boundary). That is, direct sound is boosted 18 dB, while reverberant sound, being incoherent is boosted only 9 dB. Thus there is a 9-dB increase in direct-to-reverb ratio due to corner mounting. This makes voices sound closer and clearer than you’d expect with such distant miking.

In testing the microphone set-up, Dave walked around the conference room counting his steps as he went. Listening to the playback, he heard no indication that he was moving - no dead spots or hot spots.

Through a Rane splitter/mixer, the mics feed two stereo audio recorders and a video recorder Some clients want video recorded on 1/2" tape, but all 1/2" units have AGC, which raises the ambient noise level during pauses. This has not been a serious problem, according to Dave. Air conditioning noise around 1 kHz is partially filtered out with a Rane RE-14 equalizer. All equipment is rack mounted.

Due to budget considerations, no limiter is in the system, so the tape overloads slightly during loud laughter.

Audio and video signals can be patched to various locations throughout the facility, such as a client lounge. Most people listen to copies of the recorded conference over dictation machines.

A final note: Since the focus-group interviewees see no microphones in use, they must be reminded that they are being recorded!

HANGING GLMs

Crown's Don Peterson came up with this nifty way of aiming GLM microphones that are hung from the ceiling:

Cut a 2" piece of coat-hanger wire. Tape or heatshrink it to the GLM cable near the capsule. Bend the wire to the desired angle.

To prevent rotation of the mic, string a length of fishing line between multiple hanging mics.

For clear pickup of a video teleconference, hang a GLM-200 hypercardioid 5 feet over the conference table, aiming down. The microphone hangs out of camera range, and so is invisible. It picks up only 1 dB more reverberation than a PZM in the center of the table.

UPRIGHT PIANO MIKING WITH GLMs

As an experiment, *Mic Memo* editor Bruce Bartlett miked a spinet piano with a spaced pair of GLM-100 microphones in various positions. The back of the piano was facing a wall in a large carpeted living room. The mics were always placed 1/3 in from the left and right sides of the piano. Here are the techniques used and the resulting sound quality compared to the live instrument:

Figure 1

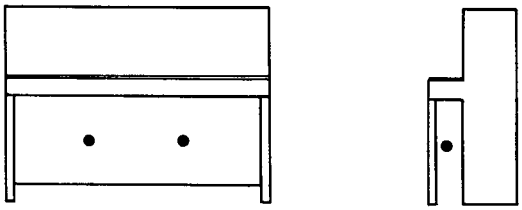


Figure 2

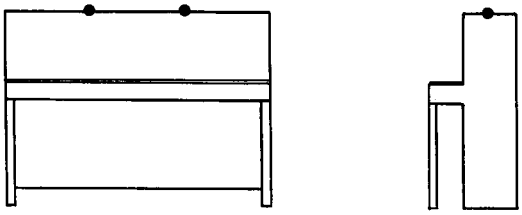


Figure 3

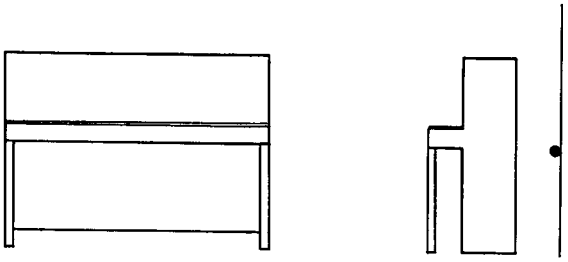


Figure 4

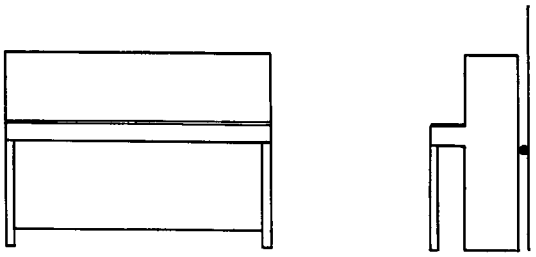


Figure 5

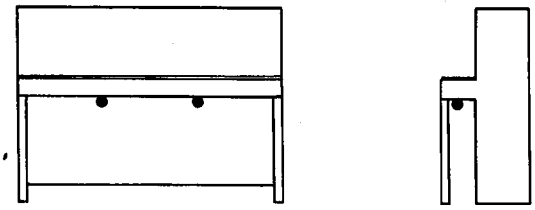


Figure 6

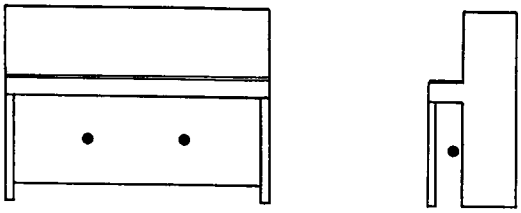
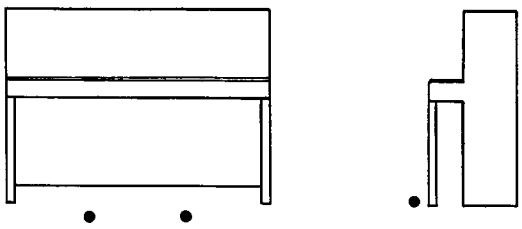


Figure 7



Upright piano miking with GLMs (see text).

Placement 1: Kick panel removed, mics hanging under keyboard 8" from the center of the exposed soundboard (Fig. 1).

Results: Realistic, uncolored, sounds like it's in the room with you. Full bass. Good imaging except for bass notes. Stereo spread is from speaker to speaker. Sounds the most like a grand piano.

Placement 2: Over the open top, a few inches from the strings (Fig. 2).

Results: Colored, thin, constricted, slightly tubby. Good imaging.

Placement 3: On the wall behind the soundboard, PZM-style, soundboard 8" from the wall (Fig. 3).

Results: Mid-rangey. Poor imaging. High SPL, very good isolation.

Placement 4: On the wall behind the soundboard, PZM-style, soundboard 1" from the wall (Fig. 4).

Results: Less colored than placement 3. Pretty good tonal balance, but not very bright. Poor imaging. Very high SPL, low leakage, very good isolation.

Placement 5: Kick panel removed. Mics taped PZM-style to the underside of the keyboard, about 8" from the soundboard (Fig. 5).

Results: Less bass than placement 1, somewhat mid-rangey and constricted.

Placement 6: Kick panel removed, 3" from the soundboard (Fig 6.).

Results: Slightly harsh, woody, or "electric:' Too close.

Placement 7: Kick panel removed, PZM-style on floor about 1 foot from soundboard (Fig. 7).

Results: Natural, fairly similar to placement 1. Slightly more ambient pickup.

PCCs and PZMs SOLVE COUNCIL INTELLIGIBILITY PROBLEM

Vince Taylor, chief engineer of Taylor-Maid Industries (a Palm Desert sound contracting/consulting firm), supplied the following report and photos through Norm Marshank:

The problem:

Palm Desert's City Council Chamber is constructed in the round. The interior is all cement and stone - including the 24-ft.-high dome ceiling. In the center of the chamber, which houses the public seating area, the "trash canning" effect is horrendous. Twelve "gooseneck' mounted E.V RE-11 microphones cluttered the chamber-members' 35-ft. long table, the 6 ft. x 7 ft. support-staff table, and the public podium.

Communication was minimal at best as the city fathers either did not talk into the microphones at all - which provided minimal communication between the members and none to the public - or they over-vocalized into the microphones, "ping-ponging" sound around the chamber to the point of total unintelligibility.

Two column speakers directed toward the public with no speakers directed toward the chamber members added to the impossible situation.

Taylor-Maid Industries was called in to resolve the problem.

The solution:

Three BES-C-12BT-70 hemispherically radiating speakers were ceiling mounted over the council rostrum.

Six Crown PCC-160 microphones, one per council member, were mounted on the chamber desk at a 45-degree angle to the center line of the voice and at 2 or 10 o'clock, depending on availability of desk space.

The PCC-160's were placed to the side and angled, after a test showed the members using the microphones, placed directly in front of them, as a paper support for the reams of paperwork sifted through at each meeting. Small TV monitors permanently mounted between every two members further increased the difficulty of "ideal" microphone placement.

Fig. 8. View from the council members' desk showing PCC-160s.

One PCC-16O mounted on the top shelf of the public lectern solved all the previous problems of communication between the council members and the public. The individual addressing the council no longer has to be constantly admonished to "please speak into the microphone."

Due to the outstanding characteristics of the PCC-16O, gain relative to feedback is excellent. Intelligibility and clarity are nothing short of miraculous, as council members consistently talk off-axis and rock back and forth in their chairs.

One PZM-6FS [now PZM-6D] centered on the support members' table very adequately covers all seated members, usually six, with excellent intelligibility. Once the PZM-6FS has proven itself through several council meetings it will be replaced with a PZM-20RMG.

From the mayor to the attending public, all are delighted.

We are so delighted, three PCC-160's and four PZM's have been spec'd into a local church installation.

RECORDING A ROCK CONCERT WITH TWO MICROPHONES

What happens if you record a rock concert with a classical miking technique - two microphones out front? You get a realistic, "live"-sounding audience perspective of the concert.

It's not the tight, polished sound you hear on records, but rather a "you are there" experience. With this kind of recording, the band can hear how they sound to the audience.

When only two mics are used for overall pickup of an ensemble, the balance between instruments and vocals is controlled by microphone positioning. The vocals (coming through the PA speakers) can be made louder or softer relative to the instruments by moving the mics toward or away from the PA speakers.

I recorded a rock band with two GLM-100 mini omni condenser microphones placed several feet in front of the band, much as you would record an orchestra. The band was set up in a reverberant log cabin to play for a dance. Figure 9 shows the arrangement.

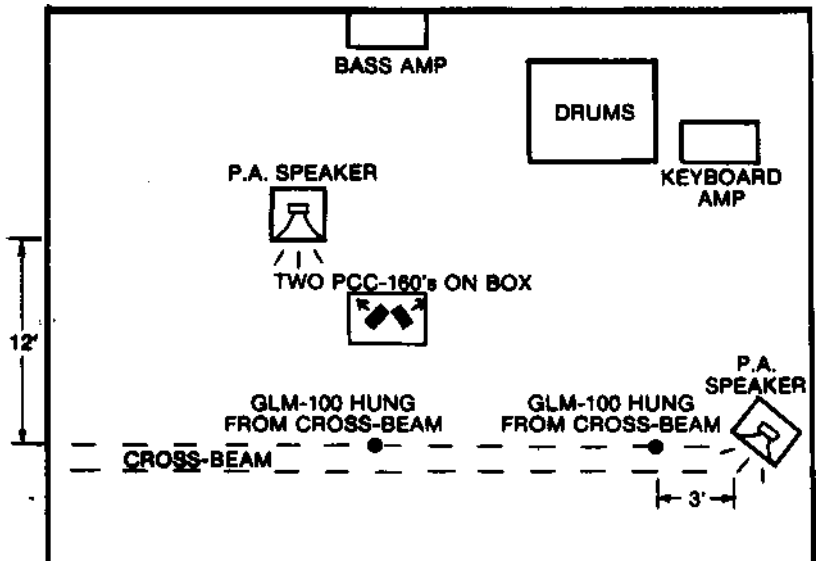


Fig. 9. Setup for experimental two-mic recording of a rock band.

I hung the GLMs just above the reach of the audience. The location of the cabin cross-beams determined the position of the mics, which ended up farther from the band than desired. I should have brought some mic stands to be able to mike closer. Also, once the mics were hung, they couldn't be moved during the concert.

The reproduced sound was wide-range with powerful bass and crisp cymbals. It also was very clean (free of noise and distortion), with clear cymbal transient response. Compared to a record, the sound was distant and the bass was muddy because of the distant miking. It had an audience perspective. There was plenty of audience reaction (almost too much), which added to the "live" feeling.

I also tried a pair of PCC®-160 supercardioid boundary microphones, close together and angled apart 110 degrees. When these microphones were placed on the floor they were too far below the PA. horns to pick up the high frequencies. So I placed the mics on a box near the front edge of the stage. The resulting perspective was much closer and clearer than with the distant GLMs.

The PCCs were only about 10 feet from loud stage amplifiers, drums, and PA. speakers. Again, the sound had a wide frequency range, with sharp cymbal transients.

Since people were dancing in front of the band, the PCCs could not be placed far enough from the band to pick up a good balance. The keyboards were too quiet. So I used the more-distant GLMs for the rest of the performance.

Doing this recording reminded me of several important tips for on-location jobs:

1. If possible, check out the recording site in advance so you can prepare for unusual circumstances.

2. Check all equipment and cables for reliable operation before packing.

3. Don't wrap a 50-foot mic extension cable around your arm to coil it. The resulting coil is likely to tangle. Instead, wrap the cable around a spool or small cardboard box. When you're ready to use the cable, it will unwind kink-free from the spool.

4. In planning the system set-up, draw a block diagram and use it to generate an equipment list. Check off each piece of equipment on the list as you pack.

5. Bring a step ladder, power extension cord with multiple outlets, gaffer's tape, a flashlight, a tool kit and spare headphones.

6. Allow plenty of time for setup and last-minute repairs!

LETTERS FROM PZM USERS

Extending the GLM-200 cable

I want to hang some GLM-200's over a choir but the interface is 8 feet from the mic and becomes visible in a hanging situation. I want to extend the cable. How long a cable can be used between a GLM mic capsule and its interface?

Steve Mills Elkhart, Indiana

Reply:

Twenty-five feet maximum is recommended. Here's how we got that figure:

The impedance of the GLM capsule is 3000 ohms, which is mostly resistive. The capicitance of a 25-foot cable of 40 pF/ft is 1000 pF. These two components form an RC lowpass filter. Let's use the formula for the frequency response of an RC lowpass filter:

$dB = -10 \log(1 + (2piFRC)^2)$ where pi is 3.14, F is frequency in Hz, R is resistance in ohms, and C is capacitance in farads.

At 20 kHz, the response of this filter is down 0.6dB. So, if you want to avoid further rolloff, don't exceed 23 feet of cable length (assuming your cable capacitance is 40 pF/ft between conductor and shield).

Belden 8451 is a thin (.135" O.D), foil-shielded mic cable suitable for hanging mics. Its capacitance is 67 pF/ft. With 25 feet of this cable, the response should be down 1.5 dB at 20 kHz.

Also, the cable attached to the mic capsule is a medium-impedance line, which is more susceptible to hum pickup than a low-impedance line, so the cable length should be kept relatively short.

PZM stage miking

A drama instructor from a local high school comes to you with a problem. The only way that his students can be heard in the auditorium is to drag a hard-wired dynamic mic around with them everywhere they go. He is "TIRED OF IT!" The school board will not spend the money for five-to-eight wireless lavalier systems, and he wants to know what you can do.

Well, if you've never seen a high school teacher grin from ear to ear try this: Sell them four PZM-180's [now PZM-185's] mounted on plexiglass. Hang them out of sight above the stage (approx. 12 feet) and position them as shown (Fig. 4). Add to this three dynamic cardioid mics (which they may already own) positioned across the proscenium lip. Your breath can almost be heard from any position on the stage.

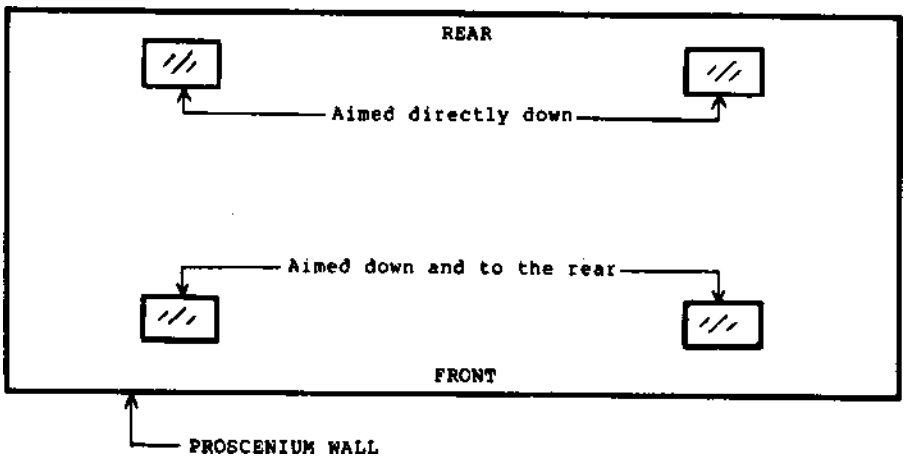


Fig. 10. PZMs on plexiglass boundary.

These mics were installed along with an entirely new sound system from mixer to cluster for under $7000. Believe me when I tell you, a friend was made.

Best wishes,

Micah L. Collins, Dyna-Might Sound & Lighting, SPFD., MO

# # #

MIC MEMO
January 1987
Bruce Bartlett, Editor

NEW PZM ARRAY PROVIDES OUTSTANDING AUDIO FOR STEREO TV

GHOSTBUSTERS! GTN Soundmixer Gary Pillon stands ready to capture sound.

Gary Pillon does it again! A sound-mixer for General Television Network of Detroit, Gary devised a stereo PZM and used it to record exciting stereo sound tracks for video documentaries.

He used two Crown PZM-6S [now PZM-6D] microphones mounted in PZM-2.5 boundaries [discontinued], designed as a single-device stereo shotgun. The mics are 8" apart in an ORTF stereo arrangement, so that the stereo effect works equally well over headphones or loudspeakers. Shown below, the boundaries provide 18 dB of acoustic gain.

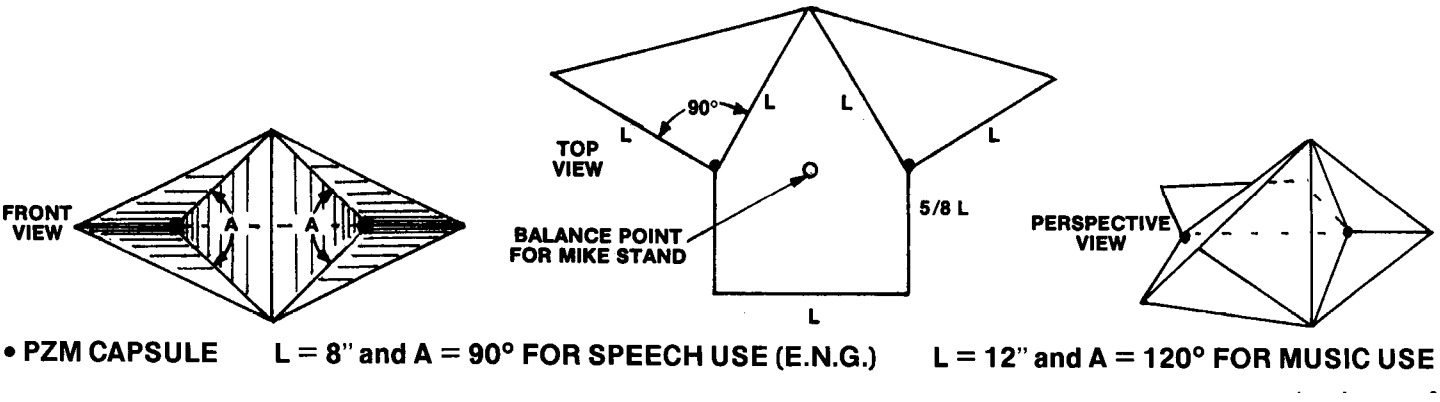


Fig. 1. Pillon's PZM Stereo Shotgun mic.

Gary describes several applications of this unique microphone.

This Fall has been one of the busiest GTN has ever had. Our success has been due in no small part to the use of the PZM Stereo Shotgun. Let me give you a chronology of its application this year, and some of the things we have learned about it.

When I built a large and a small PZM shotgun last December, I hoped to use them as stereo spot mics along with my overhead wedge array for music recording. The PZM Shotguns really lived up to their name, giving a close-up perspective that was too tight to match the openness of the overall

sound field.

I therefore decided to get them into TV productions, and test them in places where a mono shotgun would have been the logical choice.

WDIV-TV Channel 4, the Post-Newsweek station in Detroit, took an early interest in their potential. On April 27th, the station used the large model as the main stereo crowd mic for a Detroit Tigers ball game. They were so happy with the results that they booked both models to cover the launch and detonation areas of the Detroit Freedom Festival Fireworks display on the Detroit River.

However, they had less luck indoors. They tried to use them in their studio while running air conditioning.

Unfortunately, the PZM's blessing is also its curse: the devices heard too much unwanted sound. The low-frequency noise due to the omnidirectional pickup at low frequencies could not be corrected without much equalization. Therefore, conventional mono shotguns were used to reduce sound from the lights and air onditioning.

Another job proved the true merit of the device and its flexibility for TV: a half-hour stereo documentary on the Michigan Muzzleloaders Festival. This three-day conclave occurs every June at Greenfield Village, Michigan. People from around the country come to reenact the past in period costumes, lifestyle, and a black powder shooting contest. The Sound Moves production company wanted us to get as real a feeling as possible, with a natural, "sense of place" viewpoint.

GTN contacted Kirk Gardner, a local Steadicam owner/operator, to shoot the event with one of our Sony Betacam Stereo Camera Recorders.

Burr Huntington, the Sound Moves audio man, recorded all his tracks onto a jammed-sync time-code center-channel stereo Nagra. He matched an AKG CK8 short shotgun with a Beyer ribbon bidirectional, giving him a Mid-Side shotgun that had tremendous reach, while enabling him to match ambience to picture during post production.

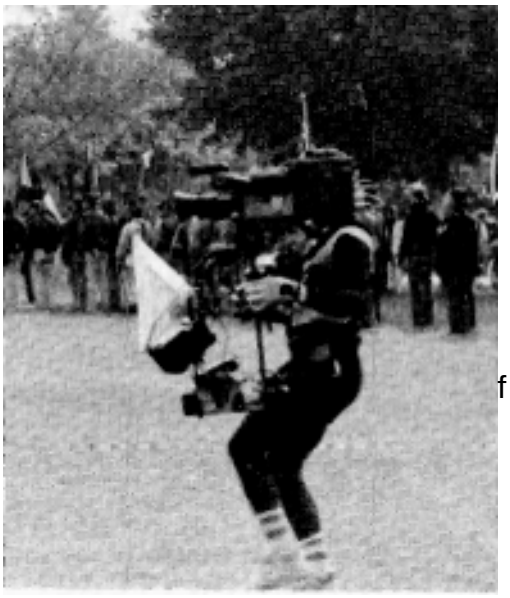
I wanted to replace the camera's mono shotgun with a stereo ambience mic that would make the visual image as real as possible. To do this, I created two new stereo devices called PZM Stereo Shotguns. I placed two Crown PZM-6S [now PZM-6D] cantilevers into each specially constructed Lexan array. Two microphones of each array are spaced 8" apart to mimic human hearing, yet reproduce a very convincing sense of three-dimensional space from two loudspeakers.

My job was to supply stereo audio to the Betacam. I used one of the mics on a television "C" stand, which gave ten-foot-high overviews of the weekend's events. Parades, marching bands, and the gunfire of 80 contestants at a time envelop the listener, even at low levels on inexpensive speakers. This mic also had a pistol grip for handheld use.

The smaller version of the shotgun was mounted as described in the Boundary Booklet, under the lens of a Steadicam, feeding its preamps directly.

The audio perspective was a perfect match to the field of view given by the wide-angle setting of the Sony Betacam zoom lens. While the mic picked up sound from all over Greenfield Village, the central sonic image always matched the picture.

Parade coverage, field events, and the chase after a six-horse gun carriage gave spectacular proof of the value of stereo television. This setup was an outstanding success. Its uncanny knack for matching visual perspective is unrivaled by any other technique. So far as we know, this was the first time that such a recording has ever been done from the Steadicam platform - a world first for the PZM Shotgun. It opened entirely new areas of audio recording.



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PZM stereo shotgun mounted on Steadicam platform.

Dialogue was locked in the center of the image, while a whole sound space was created around it. This effect also worked well when the camera was on sticks, or hand held, as long as Kirk and I worked to get the audio and video to match.

The hand mic also worked very well, and direct comparisons of Mid-Side and PZM were often made. In these cases, we had the added advantage of being able to use the shotgun Mid from the Nagra tracks and match it with the ambience tracks from the PZM Shotgun. As a result, the dry voice-over narrator sounded perfectly at home in the new stereo ambience.

The handheld device also worked well on dialogue. Its subjective reach was as great as a shotgun, and could be augmented by panning the image towards the center without losing a stereo feel. It's important to aim the mic properly in the first place.

In September another documentary created the first commercial use of the Stereo Shotgun as the primary source for stereo audio. Philip Handleman of Handleman Filmworks commissioned GTN to tape the Annual Stearman Fly In, held each September in Galesburg, Illinois. This year, 91 Stearman biplanes, the old WWII training planes, were scheduled to spend a week at the Galesburg Airport. Phil had heard pieces of the Muzzleloaders tracks, and wanted to shoot the whole project, from interviews to ambience, in perspective stereo.

A Vega wireless for his off-camera questions was mixed with the small shotgun through a Shure FP32 mixer; The output was fed to a Sony Betacam. As you can hear from the tape, the results are outstanding. Dialogue can be understood over heavy background noises, and the flying pass-bys are so realistic that you can feel planes going by in three dimensions, even on a stereo pair of inexpensive loudspeakers.

From these stories, I can draw several conclusions:

*The devices work very well if they are properly placed for good standard microphone techniques.

*They blend well with other microphones if you are dissolving between ambience situations. They do not blend well as stereo spot mics, because of their distinct perspective.

*Room conditions may make their use inappropriate.

In short, I believe very strongly that the PZM Stereo Shotgun has a definite future in the field of location recording.

PCCs SOLVE STAGE PICKUP PROBLEM

Nico Valentijn, media specialist for Central High School in Elkhart, Indiana, started using two PCC-160's for stage-floor pickup of drama. They replaced three EV RE-15's in mice.

According to Nico, the PCCs “worked quite well.” In fact, the first time they were tried, the sound was so much louder and clearer that he yelled to others to come listen to the sound. Nico also reports that the coverage was much better, and the “bottom of the barrel” effect was reduced.

The two PCCs were the main floor mics for sound reinforcement. Another PCC was center stage to feed a VCR and the dressing room. A fourth unit was upstage on a second level.

In past years, the orchestra was too loud. The RE-15’s picked up the orchestra, but the PCCs did not as much, so their gain could be brought up. But since the speech was louder, the orchestra started to play louder too! They were asked to play at a normal level.

LETTERS FROM PZM USERS

PZM Stage Miking

I used PZM-6RB [now PZM-6D] mics in a theatre on stage. They were placed on a pole 18-1/2 feet over the stage for monitoring in the cabin. Now we have sound in the cabin in Theatre Yaguez.

Thank you for this Crown microphone. It’s number one on stage.

Sound Technician, Theatre Yaguez, Mayaguez, Puerto Rico

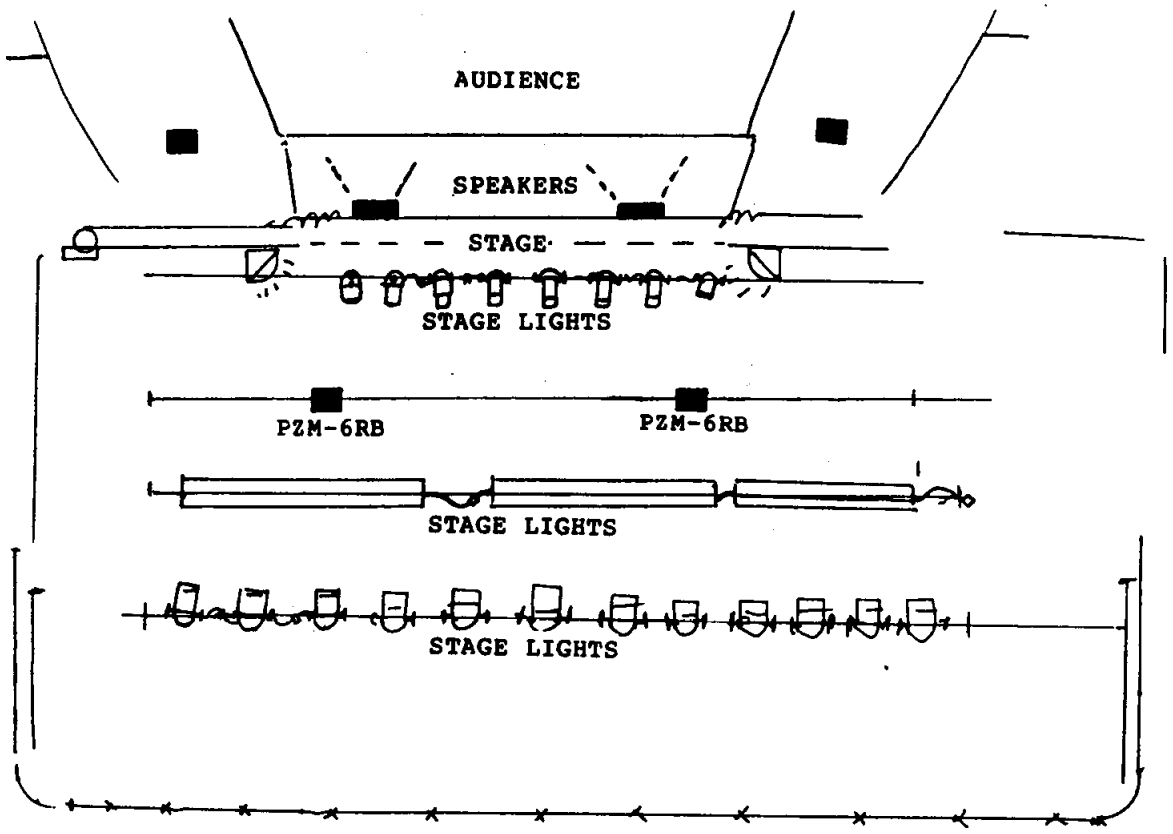

Fig. 2. Stage layout of Theatre Yaguez (drawing by Theatre Yaguez sound technician).

PZM sports pickup, PCC on newscaster

I am involved in a lot of remote television broadcasting, mainly sports. I purchased a pair of PZM mics last summer, and thought I would pass along some of my experience with them.

When the Toronto Blue Jays telecasts went stereo this year, I used the PZMs in a near-coincident arrangement for stereo crowd pickup. I was impressed at how natural the sound was. It almost seemed that you were in the crowd.

I have also used them to good effect on a hockey broadcast. I taped them high onto the glass behind the nets. The skate and board sounds were great but the placement is a bit risky.

When the female talent on our local newscasts decided that they wouldn't wear lavaliers anymore, we experimented with a number of desk mics. We eventually tried and stuck with a PCC-160. The sound quality is best described as "boom like" (the reverberation pickup is similar to that of a boom-mounted shotgun mic). However, we found it to be a little lacking in the bottom end. (Try the "boost" position on the PCC's bass-tilt switch - Ed.)

Paul Patenaude

Toronto, Ontario

# # #

MIC MEMO

April, 1987
Bruce Bartlett, Editor

PCCs PICK UP BOY'S CHOIR

This application note is from Lance Abair of Paragon Music Center, Florida. At the Florida All-State Music Educator Clinic, a boy's choir was accompanied by a piano. Two PCC-160's were placed on top of the piano as shown in Fig. 1. According to Lance, the piano sounded excellent, and there was a very good balance between piano, choir, and soloist.

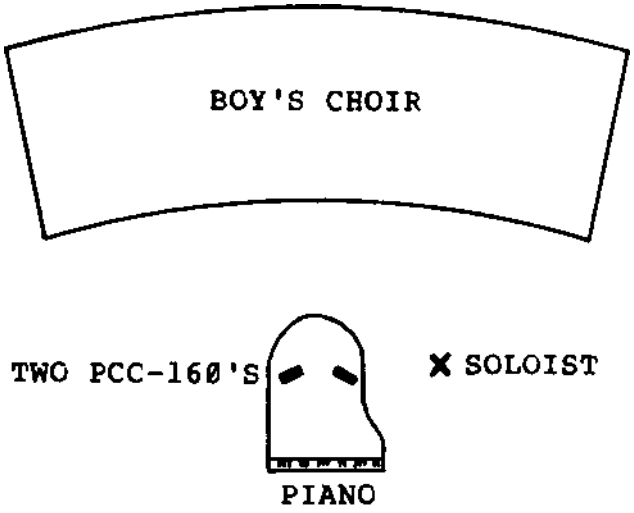

Fig. 1. Miking a boy's choir with two PCC-160s.

RIGOLETTO RECORDED WITH CROWN MICS

Mike Lamm, of Dove & Note Recording in Houston, recorded the Rigoletto opera using Crown microphones exclusively, with great success.

A PZM 'axe" or "wedge" was the primary pickup. An axe consists of two 2-foot-square boundaries joined along one edge to form a "V' The point of the V aims at the sound source.

Four PCC-160s on stage were mixed in to add presence on the singers. In all, six mics were used.

According to Mike, "my totally biased opinion is that the tape sounds great!" We agreed. The recording Mike sent us sounded smooth and natural, with just the right amount of ambience, a fine balance between the singers and the orchestra, and very good imaging.

REINFORCING TRADITIONAL INSTRUMENTS WITH GLMs

At a recent concert in a coffee house, GLMs were used to reinforce and record a wide variety of acoustic stringed instruments. Dan and Jenny Gellert - an oldtime-music duo who are outstanding in their field - taped or clipped GLM-l00s to all their instruments: guitar, banjo, fiddle, dulcimer, and bouzouki.

I did sound reinforcement and live recording for the concert, and had a chance to judge the effectiveness of the GLMs on these acoustic instruments. Figure 2 shows the setup.

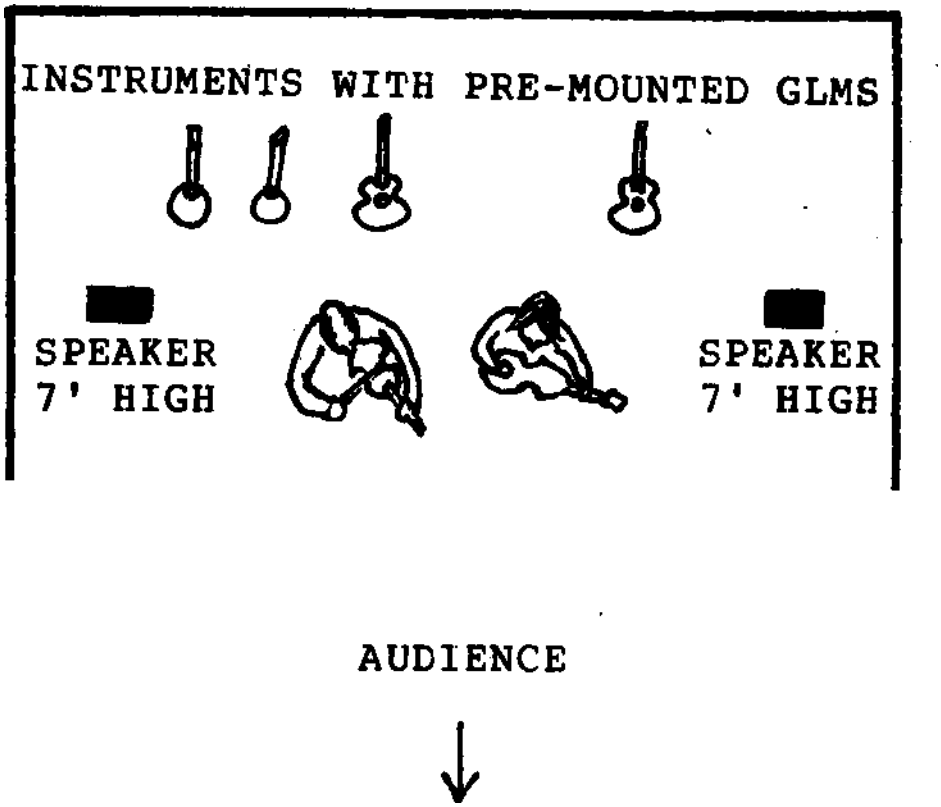

Fig. 2. Stage setup.

Loudspeakers were home bookshelf types, EPI-100s. Although they had to be placed close to the performers, we never ran into feedback. This is partly because traditional acoustic music does not require a high stage volume. Also, I turned down all mics not in use, which is standard practice to reduce potential feedback.

Microphone placement was as follows:

Acoustic guitar: Halfway between the sound hole and the bridge, near the low B string, taped to the guitar PZM-style. This means, the GLM is mounted on the guitar surface, spaced .032" by the included foam spacer, with the FRONT of the mic aiming at the surface.

Dulcimer: Near one of the sound holes, PZM-style. See Fig. 3

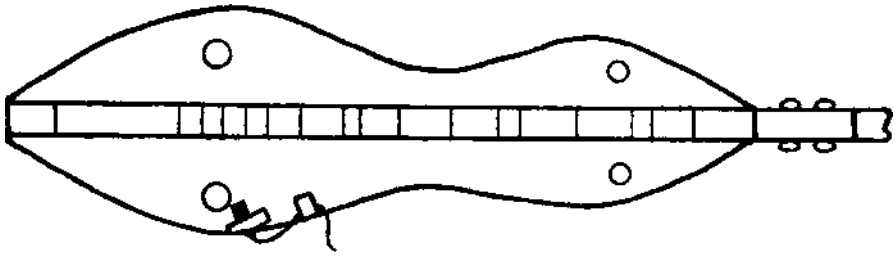

Fig. 3. Dulcimer miking with a GLM.

Bouzouki: Near the sound hole, PZM-style. According to Jenny, a bouzouki is “a mandolin with a hormone problem!” See Fig. 4.

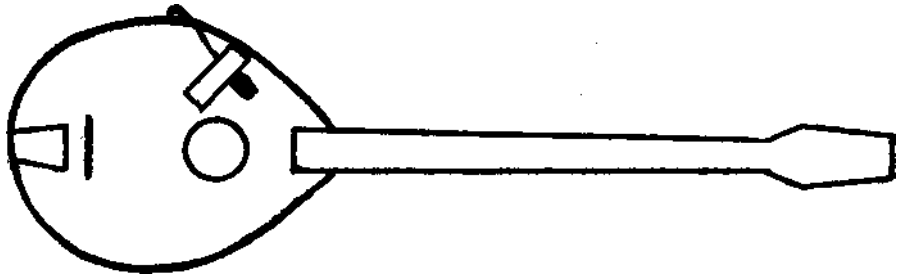

Fig. 4. Bouzouki miking with a GLM.

Banjo: Halfway between the first string and the rim, 1 inch above the head, held by a GLM-UM Universal Mount clipped to the tailpiece.

Fiddle: About 1 inch above an f-hole, held by a GLM-UM Universal Mount clipped to the tailpiece.

I noticed that the GLMs required little or no equalization when mounted in these positions. They accurately reproduced the delicacy of the instruments’ timbres; there was no harsh, electronic sound.

NOTE: When taping a GLM to an instrument PZM-style, it’s important to keep a constant spacing between the mic and instrument. Don’t let the mic pull away from the surface; otherwise, you’ll lose high-frequency response. The Gellerts also recommend taping down the cable a few inches from the mic capsule, allowing some slack between capsule and tape to serve as a strain relief.

As a side note, the power amplifiers in my powered mixer failed fifteen minutes before show time. Fortunately, the previous band had left their powered mixer on stage. I borrowed it, then quickly soldered together a patch cord to connect my mixer output to the band’s powered mixer It saved the day.

Just goes to show: One life-saving experience with a product can greatly increase your respect for it, and one bad experience with another product can devalue your opinion of it.

Jenny emphasizes that “We love using GLMs because not only do they allow freedom of movement on stage, but more important to us, they give the warmest, most natural reproduction of folk instruments. Part of the joy of this music is the unique blend of our vintage Martin guitar with a turn-of-the-century banjo or handmade fiddle. GLMs faithfully capture these musical subtleties.”

GLM-100 FLUTE MIKING EXPERIMENTS

Where is a good place to put a GLM-100 on a flute for recording or sound reinforcement? We tried the following experiment to find out:

For a natural-sounding reference, a GLM-100 was placed 2 1/2 feet in front of, and above, a flute. This mic was plugged into channel 1 of a stereo recorder. Another GLM-100 was mounted on the flute in various positions. The mic was plugged into channel 2 of the recorder. During playback, we switched between the two channels and compared the tonal balance. The results are shown in Fig. 5.

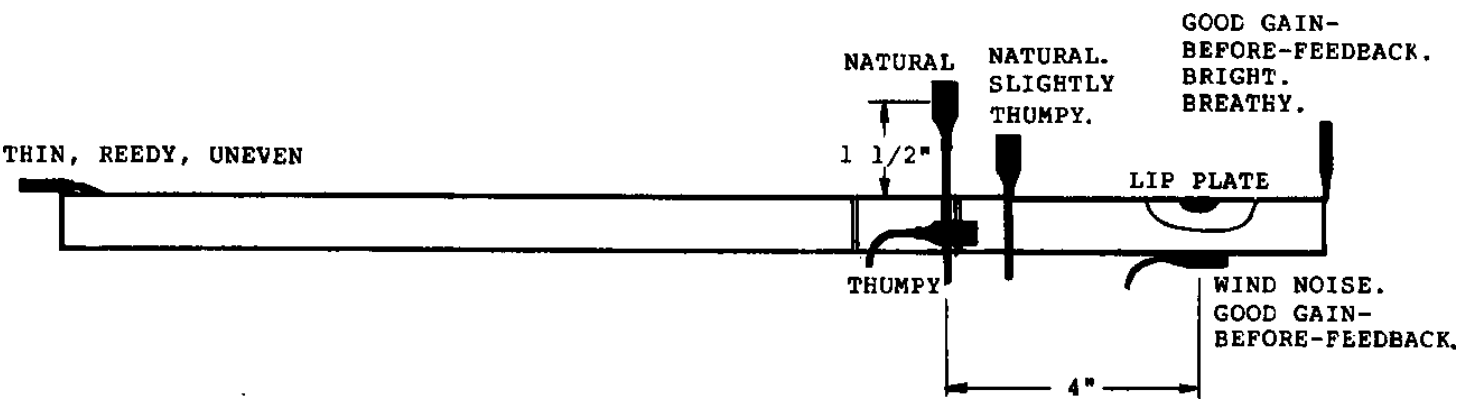

Fig. 5. Tonal effects of various GLM placements on a flute.

The embouchure hole is the loudest part of the flute, so the closer the mic is to the lips, the better the gain-before-feedback. Also, the closer the mic is to the lips, the breathier is the tone. You can reduce breath noise by aiming the mic away from the lips, toward the flutist's right shoulder. Mechanical noise is minimized by keeping the mic capsule away from the body of the flute (say, by taping the cable to the flute, with the mic capsule an inch or two above the flute).

The following positions gave these results:

On the player's right ear: dull, no breath noise, poor gain-before-feedback.

On the player's wristwatch: same as above.

On the player's lapel near the neck: same as above.

2 inches in front of the lip plate: good gain-before-feedback, breathy, and bright.

In general, no windscreen was needed except for outdoor use.

A good starting position for close-up recording is about 4 inches to the left of the lip plate (looking at the flutist), 1-2 inches above the flute. This position gives a natural sound with very little mechanical vibration pickup. A good spot for sound-reinforcement is at the end of the flute near the lip plate (at the crown), with the mic capsule one inch over the flute, and with some treble rolloff at the mixer to restore a natural tonal balance.

GLM-100s USED TO DEMONSTRATE FLUTES

When a flute is played, hard blowing causes a shrill tone quality, loses intonation and reduces dynamics. Softer blowing is better, but then the flute has low volume or poor projection. Fortunately, projection can be increased by careful design of the flute's headjoint, which is the short cylinder containing the lip plate.

Flutemaker David Wimberly makes special head joints that have excellent projection to a concert-hall audience. His problem: How can he demonstrate this projection to a flute player? While two different head joints may sound equally loud to the player, they may project very differently to an audience. How can he demonstrate audience projection to a flutist, who can't hear what the audience hears? His solution is to make a special recording with GLMs.

As shown in Fig. 6, David mounts one GLM-100 very close to the flute to pick it up as the player hears it. He places another GLM in the audience area of an auditorium. The close mic is recorded on channel 1 of a 2-track recorder; the audience mic is recorded on channel 2. So, he records the flute simultaneously with a close mic and a distant mic.

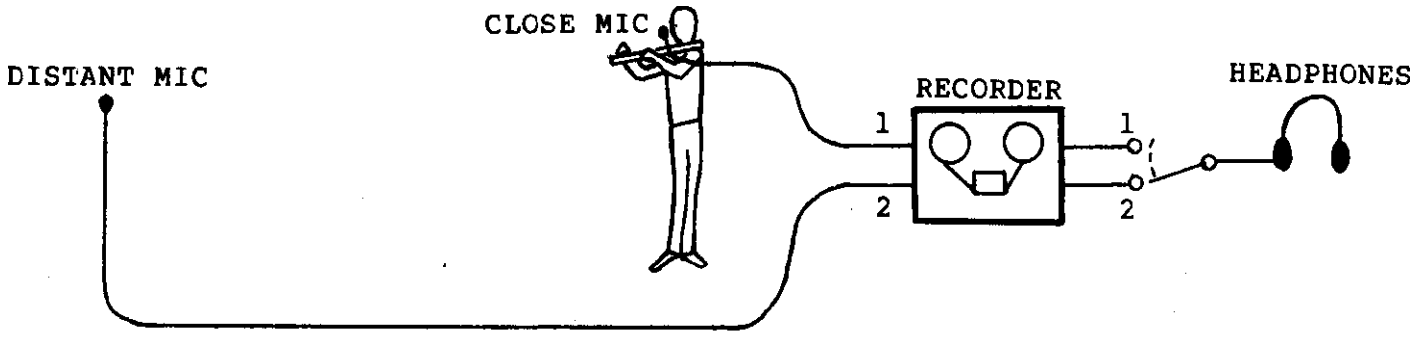

Fig. 6. Close/distant comparison of flute.

This recording is done with the flutist using a competitor's head joint. Then, without touching the record levels, the recording is repeated with the flutist using David's head joint.

While listening to the playback over mono headphones, the flutist switches between channels 1 and 2 to compare the close sound to the distant sound. This is done both for the competitor's head joint and David's head joint. As the recording demonstrates, the two head joints may sound equally loud to the player, but in the audience, David's head joint gives louder projection.

David says that the GLM-100 provides high-fidelity reproduction of the flute's timbre, and is easily portable for on-location demos.

SUPERBOWL PZM

At the January Superbowl, a PZM-6LP was used on the turf to pick up the coin toss at the beginning of the game.

GLM CIRCUIT FOR ACOUSTIC GUITAR

Figure 7 shows a simple circuit you can use with a GLM-100/E to pick up a guitar for sound reinforcement. The 100/E is medium impedance, so your cable to the mixer should be under 20 feet long. Use a 0.22 microfarad capackor or greater for more bass; use a 0.1 microfarad capacitor for less bass. Little or no equalization should be needed.

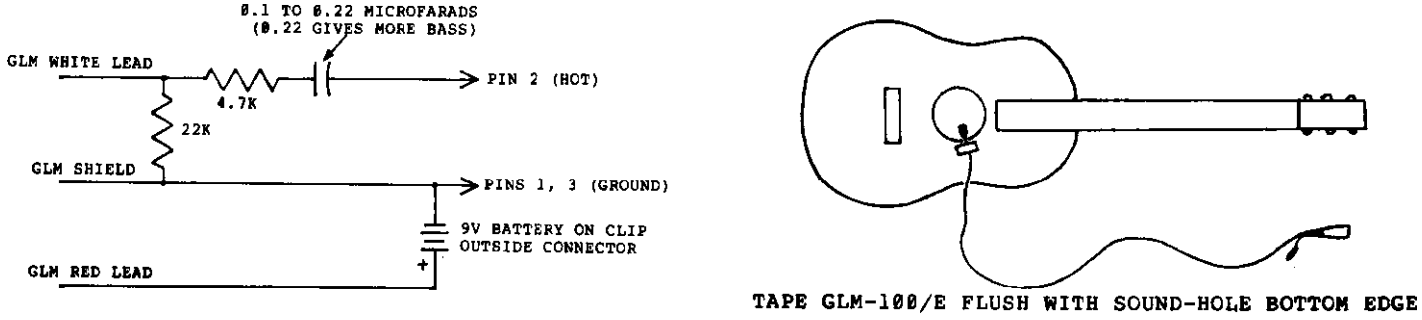

Fig. 7. GLM circuit for acoustic guitar.

Tape the GLM cable to the pick guard, so that the mic is flush with the sound hole near the bottom. The result is a natural-sounding pickup with good gain-before-feedback, and for less than $99.00.

MICROPHONE COMBINING CIRCUIT

Suppose you want to hang two mics over a choir for sound reinforcement, but you don't have enough inputs on your mixer. Here's a simple circuit (Fig. 8) that combines the outputs of two microphones into one without loading down the mics:

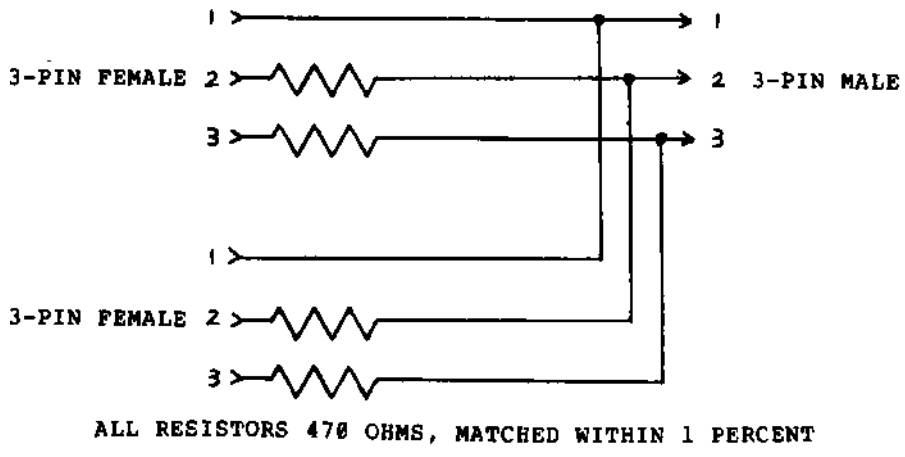

Fig. 8. Microphone combining circuit.

LETTERS FROM PZM USERS

Theater miking

I am a sound technician of the company Theater Yaguez De Mayaguez, Puerto Rico. In exploring your literature and the Mic Memos, I haven't found any in-depth coverage of PZM use in a live setup like mine.

I perform living-theater production on stage for my cabin work. My setup includes PZMs 25 feet high off-stage for live recording on stage, which pick up every instrument on stage, like the last concert of Spader Yadia jazz. It seems that a major problem with PZMs in a situation like this is the excessive pickup of ambience (reverberation). It is up to you on your setup.

I love your PZM product.

Jaime Ruiz Placido, Theatre Yaguez, Mayaguez, Puerto Rico

Reply:

To reduce ambience pickup, place your PZMs closer to the musicians. For starters, try a placement 10 feet in front of the front-row musicians, and 10 to 14 feet above the stage floor as shown in Fig. 9.

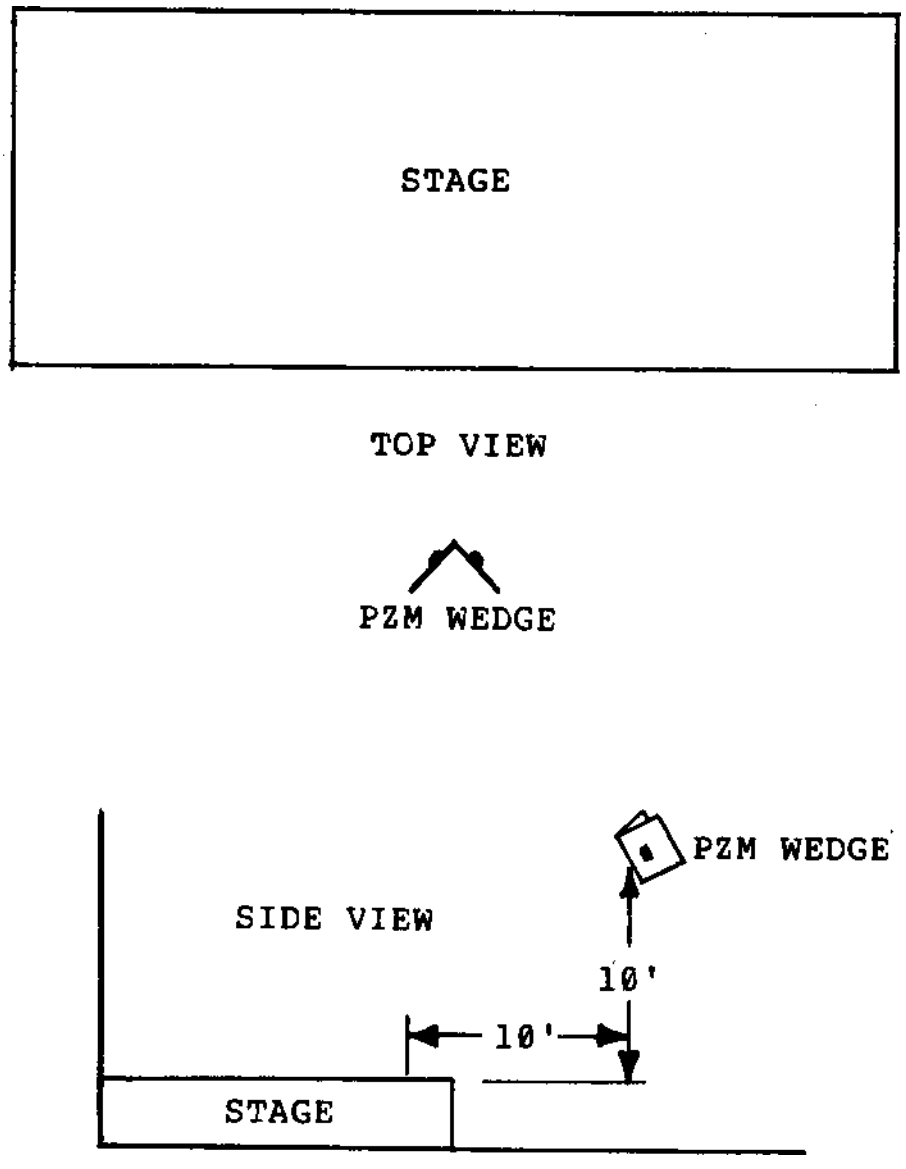

Fig. 9. Stage miking with a PZM wedge.

Try a PZM wedge, which is made of two 2-foot-square panels joined along one edge to form a “V”. Mount a PZM on each panel so that the mics are about 8 inches apart.

You may want to mix in several closeup “spot” microphones on drums and instrumental sections for extra presence.

PCC stage miking

This setup (Fig. 10) gave an incredibly natural pickup of the stage without picking up too much orchestra (obviously because of the supercardioid pickup pattern). Also, there was plenty of gain before feedback.

Mark Bunce

College of Music Recording Services

Bowling Green State University

Bowling Green, Ohio

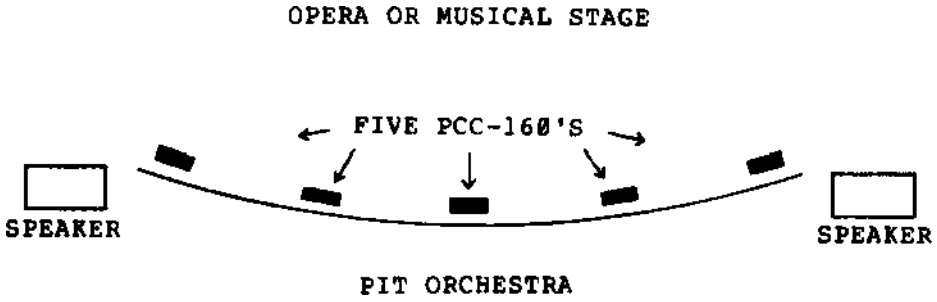

Fig. 10. PCC stage miking.

PZM stage miking

We use two PZM-6LPG’s [now PZM-6D’s] on 2-foot plexiglass panels for plays and assemblies. With young (short) people, I usually mount the mics as shown (in Fig. 11 below). Is this the best way?

Martin Guttenplan, Drama Dept. head

Maclay School

Tallahassee, Florida

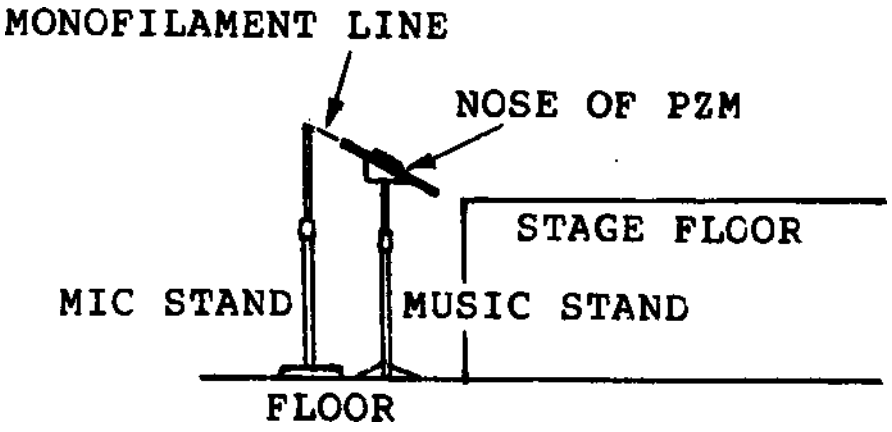

Fig. 11. A PZM stage miking method.

Reply:

The way you showed is good, Martin especially if the pit orchestra is on the back side of the panel. Here’s another way that (1) makes the mics more directionaL (2) makes them reject sound behind them, and (3) increases their sensitivity:

Mount the mics in the junction of the stage floor and a vertical 1-foot plexiglass panel, as shown in Fig. 12. The large plex panel disappears at a distance.

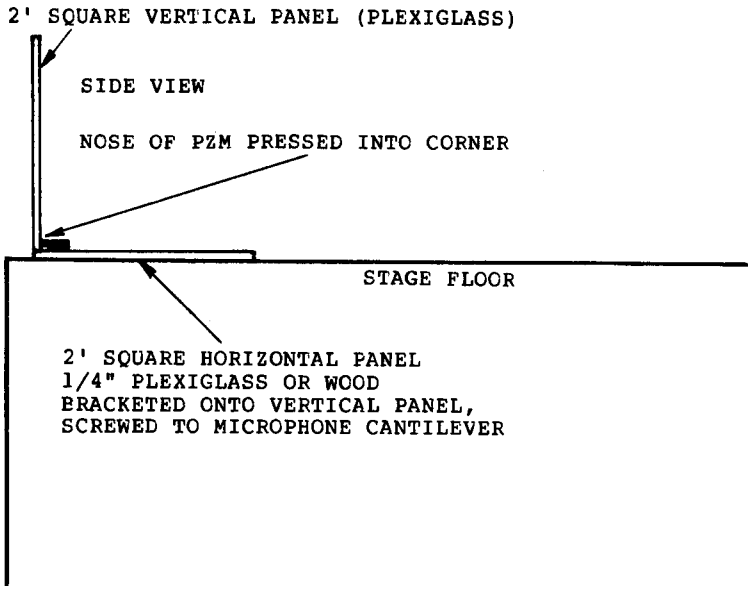

Fig. 12. Making PZM directional with boundaries.

Better yet, try two or three Crown PCC-160 microphones spaced across the front edge of the stage, on the stage floor. These supercardiod boundary microphones have very good rear rejection and excellent gain-before-feedback.

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MIC MEMO

June, 1987
Bruce Bartlett, Editor

CROWN REVEALS THREE INNOVATIVE HAND-HELD MICROPHONES

Three new hand-held microphones designed and built by Crown were shown at the June N.A.M.M. show in Chicago. These are the **CM-100** PZM hand-held omnidirectional [discontinued], the **CM-200** cardioid [now the **CM-200A**], and the **CM-300** Differoid [now the **CM-310A**]. All are electret-condenser types. They provide studio-quality sound, yet are rugged enough to withstand hard professional use in the field.

Their outstanding performance is complemented with handsome styling and a comfortable balance in the performer's hand. In each microphone, a built-in pop filter effectively suppresses explosive breath sounds. Handling noise is extremely low The units can withstand repeated drops and abuse, as well as extremely loud sound pressure levels without distortion. They are balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Each microphone can be phantom powered from the console or other remote power supply. Included with each microphone is a convenient carrying pouch, an adjustable microphone stand adapter for mounting the unit to any microphone stand, and a foam windscreen for outdoor use or additional pop protection.

The Crown **CM-100** [discontinued] is a hand-held omnidirectional condenser microphone for professional stage-vocal use where feedback is not a problem. Frequency range is wider than that of standard vocal microphones (20Hz-20kHz). The CM-100 has the desirable studio sound of the PZM-6R [now the PZM-6D] in a more convenient package. Since it has no proximity effect, it provides a natu-

ral, articulate sound without equalization.

CM-100

The Crown **CM-200** [now the CM-200A] is a cardioid condenser microphone for stage vocal/ instrumental use. The sound of the CM-200 is smooth and non-harsh - yet very articulate - with a wider frequency range than standard vocal microphones (80Hz-15kHz). When used up-close, its proximity effect boosts the bass for a warm, robust sound. An upper-midrange “presence peak” aids intelligibility. The cardioid polar pattern increases gain-before-feedback, rejects unwanted background noise and leakage, and discriminates against sound approaching the rear of the microphone.

CM-200

The Crown **CM-300** Differoid [now the CM-310A] is a close-talking, hand-held differential-type condenser microphone for professional stage-vocal use. Frequency response is 60Hz-18kHz - unheard of for a differential microphone. The noise-canceling capsule provides exceptional gain-before-feedback. It permits extremely loud monitor levels before feedback occurs. This is due to Crown’s new patented methods of improving rear discrimination, far-field rejection, and high-frequency response. The CM-300 also rejects unwanted background noise and leakage, and discriminates against distant sound sources such as monitor loudspeakers or instruments.

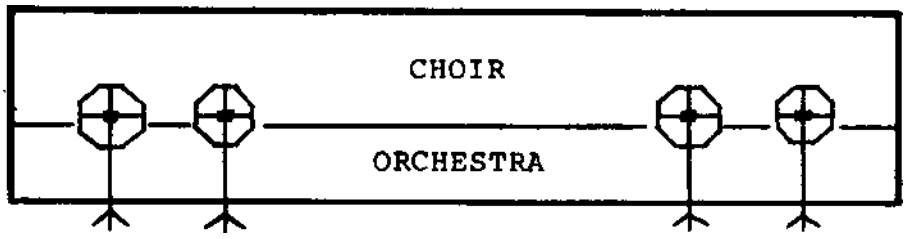
CM-300

PZMs FEATURED PROMINENTLY IN REQUIEM BROADCAST

In a recent PBS broadcast of Verdi’s Requiem Mass in the Spectrum Arena of Philadelphia, four Crown PZMs on plexiglass boundaries were used to pick up the orchestra.

Conducted by Lorin Maazel, the Opera Company of Philadelphia chorus and orchestra accompanied Luciano Pavarotti and the winners of the international voice competition. (This competition was founded in 1980 by Pavarotti and the Opera Company of Philadelphia). John F. Pfieffer was Audio Director for the show, and William King was Audio Supervisor.

As shown in Fig. 1, each PZM was mounted in the center of an octagonal plexiglass panel raised on a mike stand. The panel appeared to be about 4 feet diameter and raised 12 feet high, aiming down at the front row of the orchestra. In addition, there were spot mics on the orchestra, choir, and soloists. The announcer for the broadcast said, “On stage we see the octagonal-shaped Pressure Zone Microphones which help provide a concert-hall-like sound.”



[Fig. 1. PZM placement at Requiem Mass.]

NOTRE DAME JAZZ FESTIVAL USES CROWN MICS EXCLUSIVELY

Once a year in April, big-band jazz groups from colleges around the country come to South Bend, Indiana, to play at the Notre Dame Collegiate Jazz Festival - the oldest such festival in the country. The musical talent displayed at this concert is remarkable.

In past years the event was competitive, but recently the contest aspect has been de-emphasized in favor of promoting a festival feeling. Bands play in a relaxed, friendly atmosphere, while the judges (most of whom are professional musicians) critique talent. Still, there is an “Outstanding Performance” title awarded to the most deserving big bands and combos, as well as an “Outstanding Instrumentalist” certificate for individual performers.

Chicago nightclub owners scout the festival for talent, while judges sometimes recruit promising musicians for their groups.

Many participants have gone on to major success in the recording industry, such as David Sanhorn, Bob James, Al Jarreau, and the Brecker brothers.

Friday evening during the festival, the judges get up on stage and jam, to general amazement. This April the judges’ jam included Frank Wess, saxophone; Red Rodney, trumpet; Kenny Kirkland, piano; Charlie Haden, bass; and Roy Haynes, drums. Judges in past years have included such stellar musicians as Winton and Bradford Marsalis, Lew Tabackin, Alan Dawson, Ron Carter, Tony Williams, David Sanborn, Clark Terry, and John Lewis, to name a few.

Providing quality sound reinforcement for this important event is a major consideration. This year, sound reinforcement was ably handled by Pro Audio, a company based in Grand Rapids, Michigan. Richard Dekker, a house mixer and technician for Pro Audio, provided the following information on the sound system.

All the microphones and amplifiers in use were made by Crown International. The house mixer was a Soundcraft Series 800 B, and the loudspeakers were Pro Audio’s custom designs using components made by JBL and Community Light & Sound.

Figure 2 shows the stage layout and microphone setup. Pro Audio used Crown GLM-200’s for many of the instruments. The GLM-200 is a miniature hypercardioid condenser microphone. It was used on the horn sections, drum overhead, snare drum, percussion, grand piano, electric guitar, and acoustic bass. All GLMs were used as supplied from factory stock with a slightly rising high end. Monitor mixer Tony Francisco reports that feedback was never a problem.

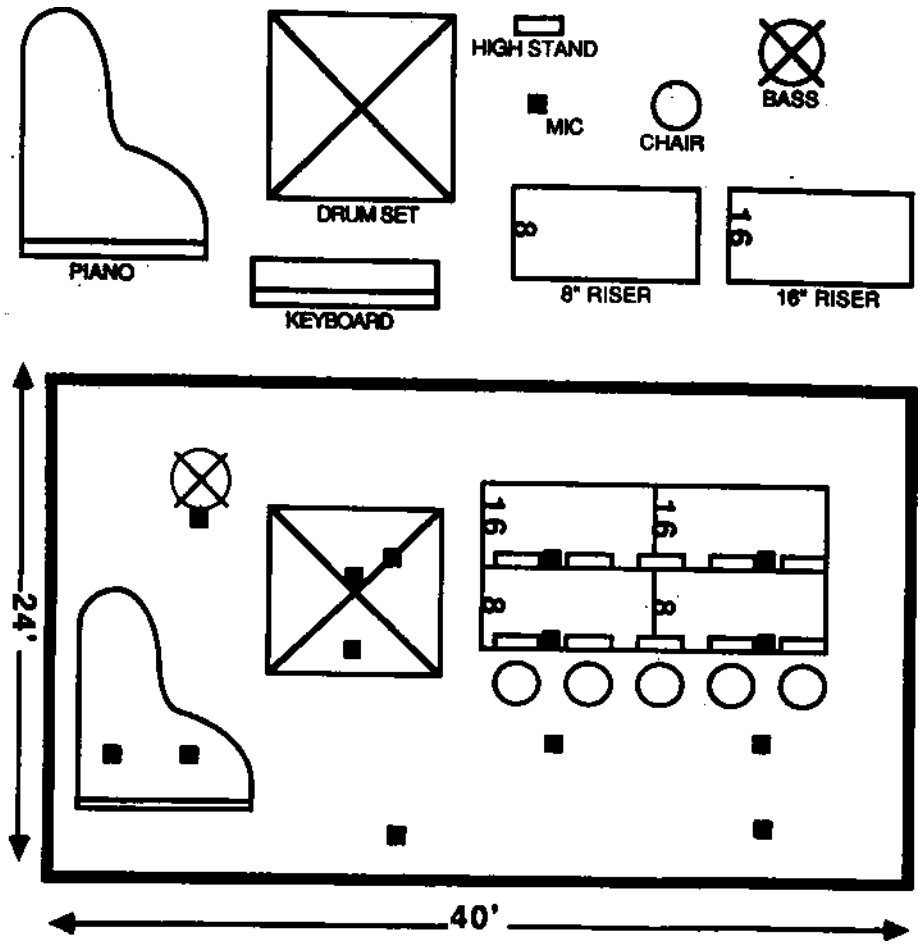


Fig. 2. Typical stage layout.

The GLMs were mounted in GLM-OHM boom arms [discontinued], which use 1/4" diameter black rods. Since the booms are inconspicuous, the stage setup was clean and uncluttered.

A Crown PCC-160 supercardioid boundary microphone was used in the kick drum. Equalization was typical for a kick drum: extreme cut around 400 Hz and boost around 2.5kHz. One drummer whacked a GLM with a stick, but it kept on working.

Two mics were placed in the grand piano with the lid closed to reduce leakage. A PCC-160 was mounted on a foam block on the soundboard, aiming at the treble strings, about 2 1/2 feet from the hammers, The bass strings' were covered by a GLM-200 aiming down at the sound board, attached near a rib by a GLM-HM horn mount, also 2 1/2 feet from the hammers.

Dekker said he was impressed with the clarity of the piano reproduction. Even though the lid was closed, the sound was not muddy. Piano solos cut through the instrumental backup.

The acoustic bass had an unusual miking arrangement. A GLM-200 was clipped to a GLM-HM horn mount, and inserted into an f-hole, about 7" inside the cavity of the instrument. The other end of the horn mount was clipped onto the f-hole. This GLM was mixed with a direct feed from a pickup on the instrument. According to Dekker, this resulted in the best acoustic bass sound he has ever heard.

The new Crown CM-200 [now the CM-200A] cardioid condenser microphone was used for soloists, virtually without equalization. Dekker said the microphone was "super," "phenomenal," with "a nice high-end crispness and airiness:' He said he was "really impressed," and added that "even the judges were talking about the microphones." Dekker wants to try these mics for his home studio.

Solo trumpets and saxes were miked about 8" away with the CM-200.

Crown amplifiers included PSA-2 and Micro-Tech 600 LX units for the house systems, mounted in two roll-around racks near each speaker cluster. The monitor system used Micro-Tech 12OOLX's and D-75's.

To my ears, the overall sound quality at the festival was well-mixed, clear and bright, with a studio "sheen." We're happy that Crown mics and amplifiers contributed to the enjoyment of the festival.

NOVEL GLM SETUP PROVIDES NATURAL RECORDING

'Twas an evenin' of Irish music and poetry at Notre Dame University Library. There I recorded a hammer dulcimer, guitar, bouzouki, pipes, flutes, and bodhran drum with two GLM-100/E microphones on a boundary. The results were delightful.

Figure 3 shows how the two GLMs were mounted. They were placed on a 2-foot-square plexiglass boundary (Crown A240) [discontinued] as a spaced-pair array. The mics were only 14 inches apart, yet provided excellent stereo. Each GLM was mounted facing the boundary, with a gap or spacing of .032 inch.

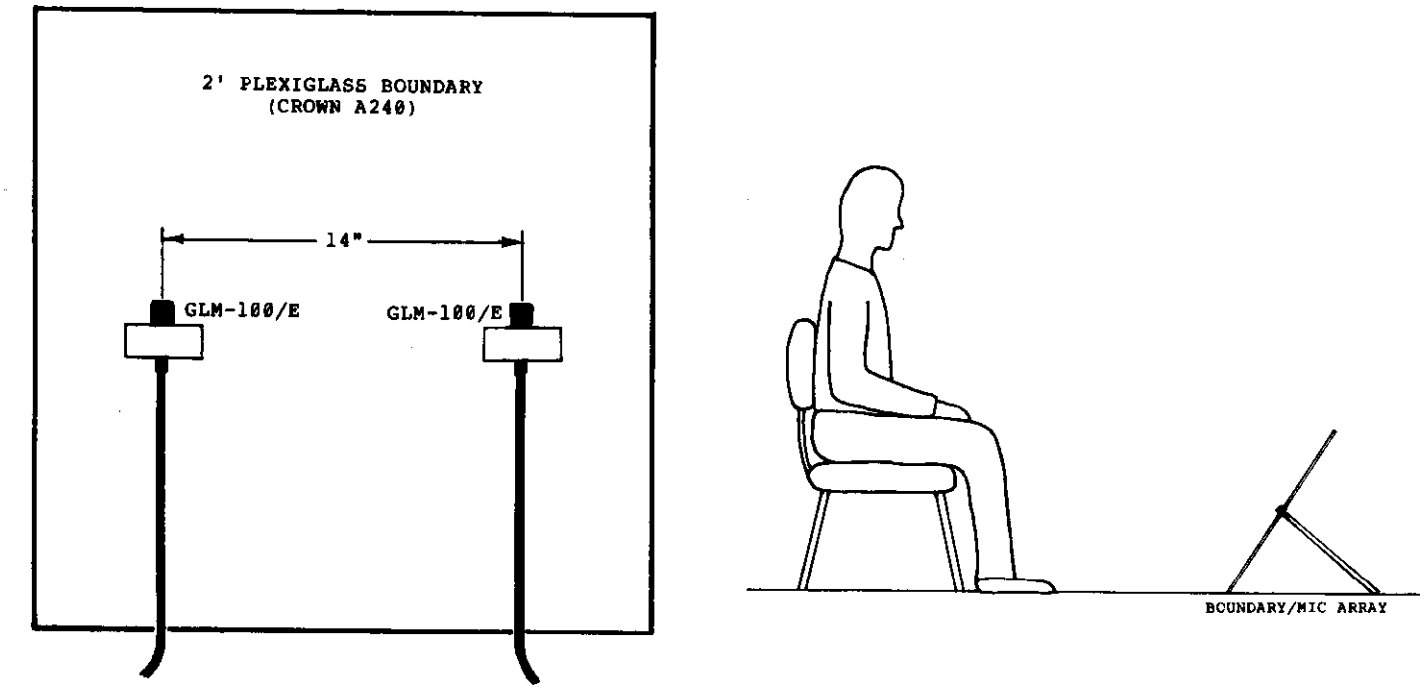


Fig. 3. GLMs on boundary.

The boundary was placed on the carpeted floor, angled up to aim at the performers about 5 feet away. I heard no comb filtering due to floor reflections. In general, the boundary/mic array was placed in the center of the performers (Fig. 4). When only two musicians played, I placed the boundary between them, out front.

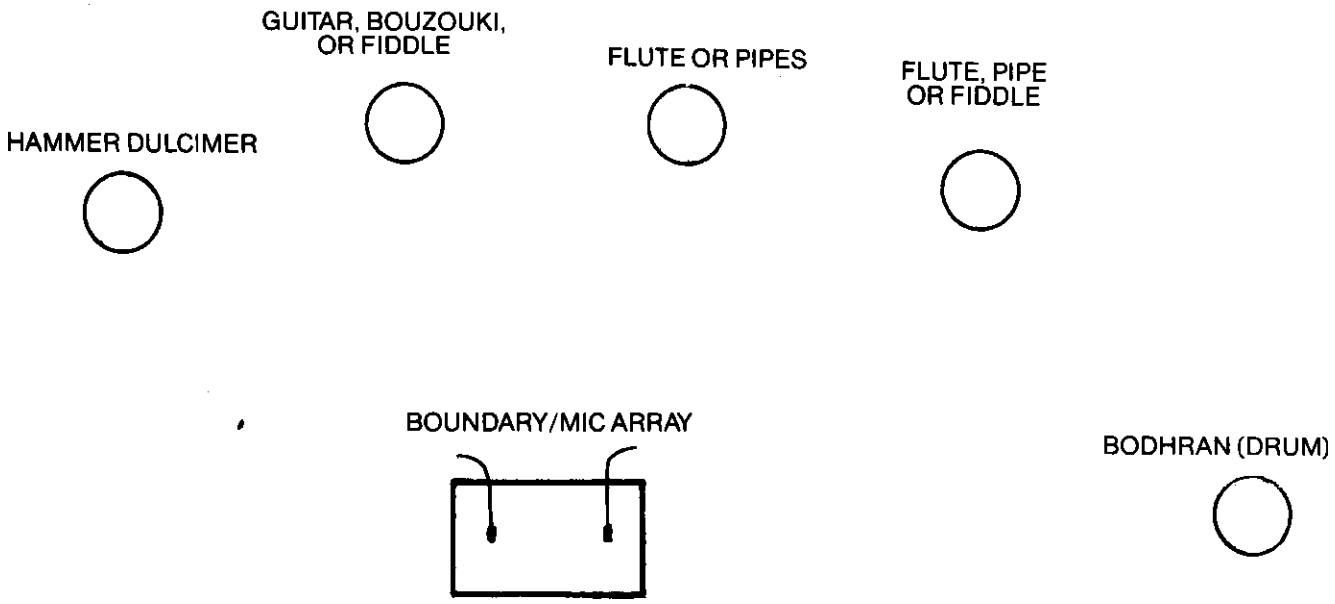


Fig. 4. GLM placement near group.

An alternative stereo technique using a single boundary is to place the mics on either side of the boundary, and aim the edge of the boundary at the performers. This provides a coincident-pair pickup. In the Notre Dame recording, however, the boundary was facing the performers to provide forward directionality. I didn't want to pick up the PA. speakers at either end of the performing ensemble.

Each GLM-100/E was powered from a 9V battery, and ran unbalanced, medium impedance, through a 25-foot mic extension cable to a Sony Walkman Pro. I was impressed at the quality of the recording obtained. No hum, hiss, or high-frequency loss was audible.

The overall sound was clear, natural, spacious, and wide-range, with good imaging. It was simply realistic, giving a "you are there" feeling.

I recommend this setup and equipment to anyone wishing to make purist, true-stereo recordings of small acoustic ensembles. Caution: floor monitor speakers near the microphones may degrade the recordings, so try to position the mics to avoid picking up the monitors.

PCC-160 PAD

In some applications, PCC-160 supercardioid boundary mics are used along with PZMs. The PCC-160 is about 13 dB more sensitive than current PZMs because the PCC is used mainly for distant pickup on stage floors.

If you want to make the output levels of the two mics more equal, try the circuit shown in Fig. 5. It is a 13-dB pad to reduce the sensitivity of a PCC-160 to that of current PZMs. Plug the pad in-line with the PCC's output connector.

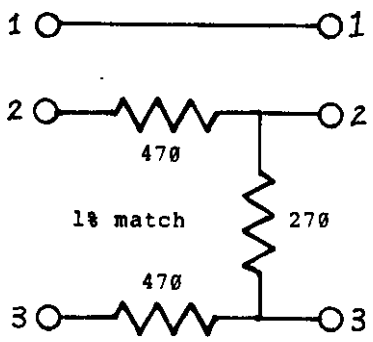


Fig. 5. PCC-160 13 dB pad.

USING A GLM OR A PZM ON A 2-FOOT DISK

If you mount a GLM on a 2-foot-diameter plexiglass disk, how does its response differ from that of a PZM on the same disk? Figure 6 shows the results. Figure 6-A is the frequency response of a GLM-100 mounted PZM-style in the center of a 2-foot diameter disk. Figure 6-B is the same with a PZM-6S [now the PZM-6D]. The bump around 500 Hz and dip at 1kHz are due to sound waves generated at the edge of the boundary interfering with incoming sound waves.

Note the improvement that occurs when the microphone is placed off-center (Figs. 6-C and 6-D). The response is smoother because the distance from the mic to the disk edge is different in every direction. Consequently, phase interference from edge waves is less.

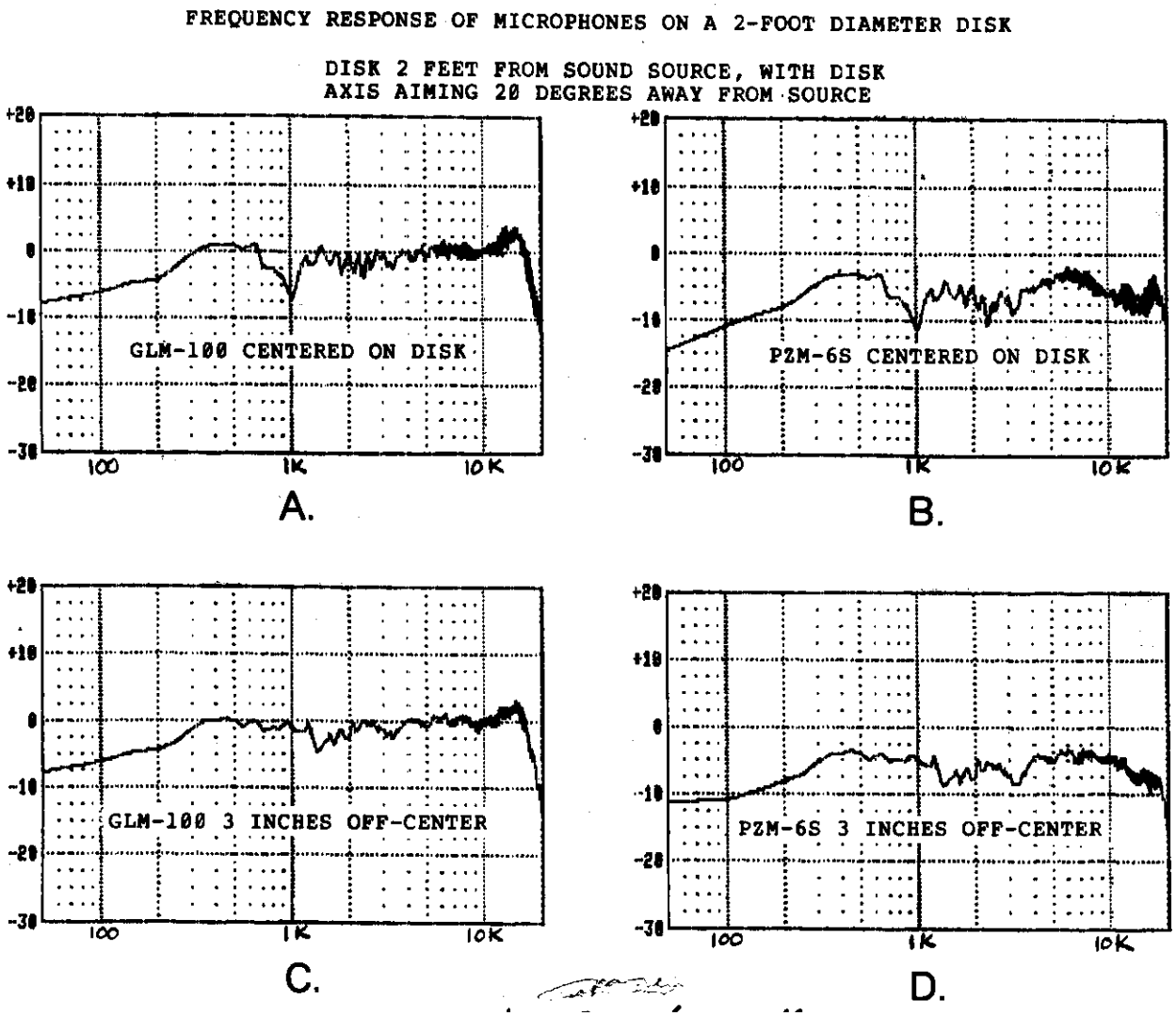


Fig. 6. Frequency response of GLM and PZM on 2-foot disk.

PZMs USED IN AIR SUPPLY CONCERT TOUR

In the recent tour of the pop group Air Supply, house mixer Steve Zelanka used a Crown PZM in the kick drum. He mounted a PZM on a 12" x 10" x 1/2" plexiglass sheet, which was placed inside the drum. The PZM output was gated, compressed, boosted around 8OHz-lOOHz with a Klark-Teknik DN33 third-octave graphic equalizer, and finally went through a dbx model 500 Boom Box.

LETTERS FROM CROWN MICROPHONE USERS

Padding plexiglass boundaries

We use two PZMs on stage for sound reinforcement on high-school musicals. They fit in plexiglass triangle units. Speakers hang behind them facing the audience, creating a slight ring when the gain is pushed to the limit.

I found that by padding the plexiglass (as in Fig. 7), I could help the actors a bit more and eliminate the ring.

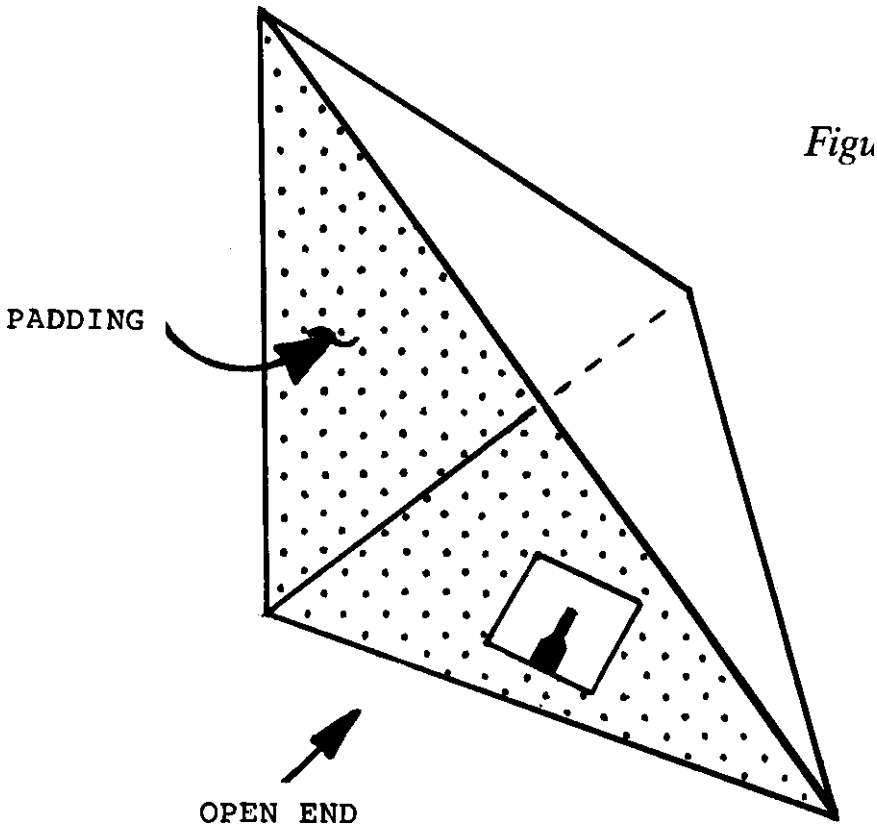


Fig. 7. Padding a plexiglass pyramid.

# # #

MIC MEMO

December, 1987
Bruce Bartlett, Editor

MIKING THE ATLANTA SYMPHONY WITH GLM'S

"All the results are very, very good," says Rex Garrett about reinforcing the Atlanta Symphony with GLM microphones. Rex is with Showorks, a Crown dealer in Marietta, Georgia. He is the monitor mixer and handles close miking of the symphony for concerts. Walt Wynn is the sound contractor, house mixer and does overall miking.

They use Crown GLM-200 miniature hypercardioid microphones on violins and violas. Rex modified the GLM electronics for flat response by changing the plug-in resistor according to Crown GLM Technical Bulletin no.1. For extra bass response, they use GLM-100 miniature omnidirectional microphones on cello and bass.

Overall boom miking is employed if the orchestra plays by itself. For pop concerts with orchestral accompaniment, each instrument has its own microphone. Some recent pop concerts featured such performers as Donna Sommers, Ray Charles, and Lou Rawls.

For violin miking, they tried clipping a GLM-UM Universal Mount to the tailpiece, but it is uncomfortable to the player to have anything in the way. They also tried clipping the GLM-TM Tie Mount onto the bridge, but its weight mutes the instrument slightly. Currently they are experimenting with an elastic Velcro piece that wraps around the bridge and holds the tie-tac mount. Another idea is to clamp onto the ribs of the violin — or the chin rest — and use a bar to hold the GLM over the sound board.

Cellos and bass are miked with a GLM-UM Universal Mount clipped to the tailpiece, holding the mic near the bridge.

There are three trumpet players; each is picked up with a GLM-200 clipped to the top of a music stand. To reduce low-frequency feedback, frequencies below 200 Hz are rolled off. “Hot Spots” are set up close to the horn players’ heads for stage monitoring. According to Rex, the trumpet players are “exceptionally happy’ with this setup.

For piano miking, they plan to use three GLM-200 mics as follows:

*One under the sound board

*One over the sound board near the bass strings

*One over the sound board, near the treble strings, near the keys.

*Alternatively, they will try a coincident-pair setup clipped to the bridge of the piano.

There’s a lot of cabling on stage, which makes quick changes between sets difficult. It helps if the musicians take their mics with them when they go off-stage. Rex and Walt provide a microphone junction box to accommodate every four players.

They are planning to try a 50-input passive mixer stationed off-stage. This mixer would include phantom power, cue buttons, and a mute button for each microphone. The mute buttons are necessary because some string players occasionally move the bow over the microphone. The off-stage mixer would combine the 50 inputs into 10 outputs to be sent to the house mixer.

According to Rex, the reinforced sound is very natural.

CROWN CM-200 MICROPHONES USED EXTENSIVELY IN SPECIAL OLYMPICS

The Crown CM-200 cardioid condenser [now the CM-200a] was the microphone of choice for the 1987 International Summer Special Olympics Games. This was the world’s largest amateur sporting event of 1987. It represented a world-wide effort to recognize the skills and courage of mentally handicapped athletes.

Participating in the event were 4,700 athletes from 72 countries, plus 12,000 volunteers, included hundreds involved with the audio systems at the Games. Audio was supervised by Tom Durell, a leading freelance audio engineer who was sound engineer for last summer’s Liberty Weekend and the 1984 Summer Olympics in Los Angeles.

Held at the campuses of Notre Dame and St. Mary’s college in South Bend, Indiana, the Special Olympics ran from July 31 through August 8.

The Olympics required several elaborate sound systems because much of the program included musical entertainment. In addition to the Opening Ceremonies, small concerts kept the spectators occupied and entertained. In all, there were 314 sound setups used in 8 days!

The sound systems included the following:

Opening Ceremonies (broadcast by ABC)

International Dance System (live dance music for the athletes)

VIP Reception jazz concert

Lunch time entertainment systems (live music)

Athletic-event systems

Awards systems

Olympic Town — a week-long series of concerts, 5 to 6 hours per day.

Nearly all the microphones in use were Crown CM-200 [now the CM-200a] cardioid condenser units. According to Bill Raventos (Crown's Microphone Product Director), Tom Durell was "ecstatic" about the CM-200's. Several sound engineers said that the microphones sounded "great." They were used everywhere, for instruments as well as vocals. The mics were reported to have no breakup, even when used on musical instrument loudspeakers.

CM-200a

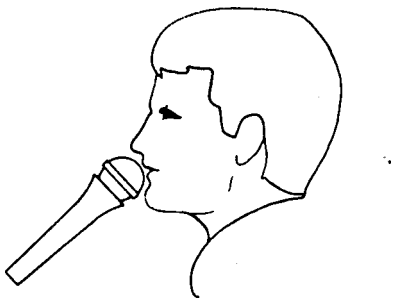
Crown Select Series wooden-handle microphones [discontinued] were custom engraved with the names of the participating celebrities. Oak-handle units were presented to Barbara Mandrell, Oprah Winfrey, Whitney Houston, John Denver, Don Johnson, and Jeff Margolis. Craig Golins received a microphone of ziricote wood, and Lee Miller used one made of laminated birch.

Don Johnson was so impressed by the CM-200 he used that he showed it to Eunice Shriver. Mrs. Shriver later called Crown's Margo Sousley, asking if her daughter, Maria (also a participant in Olympic ceremonies), could have a mic with her name engraved on it.

IN ALL, THE OLYMPICS USED 92 CM-200's, 5 CM-100's, 20 CM- 300's, AND 10 GLM-100's.

We're proud that Crown microphones played a vital part in the success of the 1987 Summer Special Olympics.

HOW TO USE A CM-300 DIFFEROID MICROPHONE [now the CM-310a]



Sing close to the microphone.

The Crown CM-300 Differoid is a differential cardioid microphone that cancels distant sounds. Consequently, it must be used close up — lips touching the grillescreen. In addition, the user should sing directly on-axis, into the front of the microphone. Otherwise the singer's voice will be cancelled or sound thin.

By taking these precautions, the user will experience phenomenal gain-before-feedback: up to 12 dB more than comparable microphones.

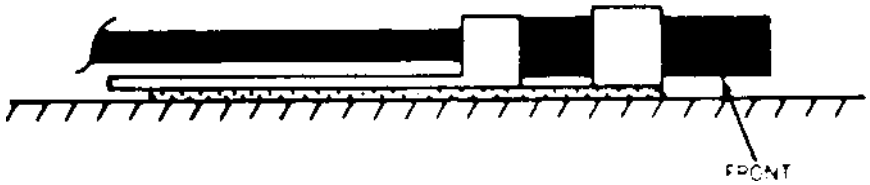
NEW GLM ACCESSORIES

Three useful new accessories for GLM microphones have been just introduced:

***GLM~TM Tie Mount.** This is a clip-on mount for ties and clothing that lets the GLM swivel to any desired position. Unlike the older, fixed Tie Mount, the new mount lets the user place the clip anywhere on the shirt or necktie while still aiming the GLM at the mouth. The new TM will be included with all GLM-100 and GLM-200 microphones.

***GLM-SP Stick Pin Mount.** This mount lets the user fasten a GLM-100 to clothing by pinning the mount to fabric. The SP will be included with all GLM-100's.

***GLM~SM Surface Mount.** This accessory converts a GLM for boundary miking, either on musical instrnments (guiitar, banjo, piano) or on plexiglass boundaries.



GLM-SM Surface Mount

With the GLM-SM, you can mount a GLM-100 omnidirectional microphone face-down nexi to a surface or boundary. This effectively converts the GLM-100 into a Pressure Zone Microphone, eliminating phase cancellations due to delayed sound reflections from the boundary. The polar pattern of the GLM-100 mounted PZM-style is hemispherical.

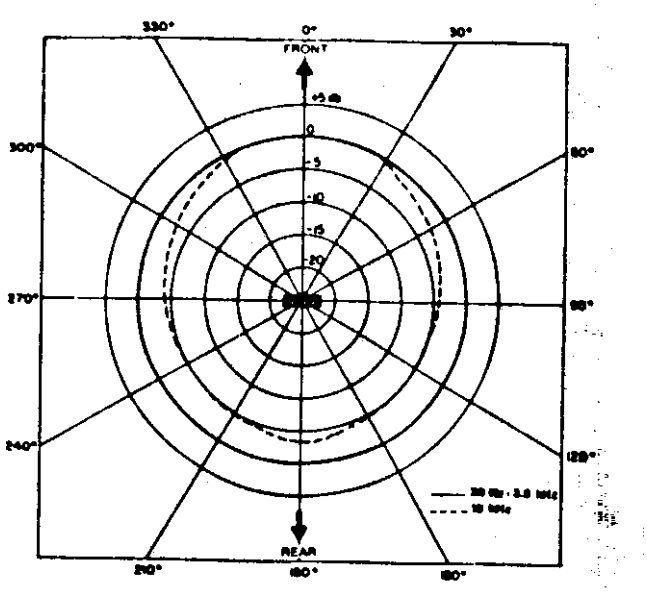
The GLM-SM Surface Mount also lets the user mount a GLM-200 hypercardioid microphone on-edge next to a surface. The axis of the microphone is parallel with the surface. With this mounting, phase cancellations due to surface reflections are moved above the audible range. The polar pattern of the GLM-200 mounted this way is half-hypercardioid.

GLM-SM Surface Mount used to make a hypercardioid boundary mic.

Packed with the GLM-SM are several pieces of double-sided foam tape. Each piece goes between the mount and the body of a musical instrument to prevent rattles when the instrument is played. To attach a GLM-SM to a plexiglass boundary, use ordinary duct tape or drafting tape.

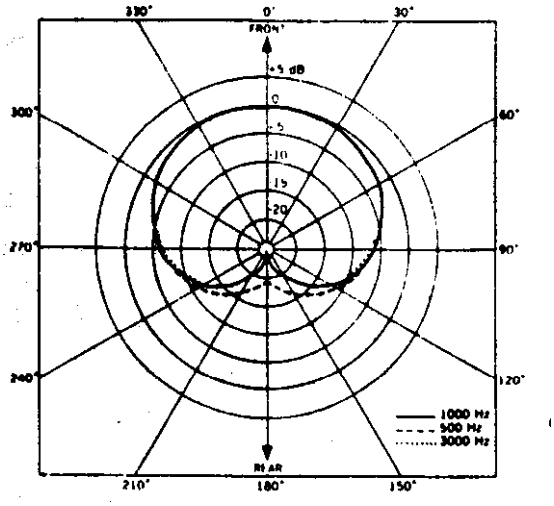
MICROPHONE POLAR PATTERNS

The polar pattern of a mIcrophone is a graph showing how the mic responds to sounds coming from different directions. The graph is a plot of microphone sensitivity in dB vs. angle of sound incidence.



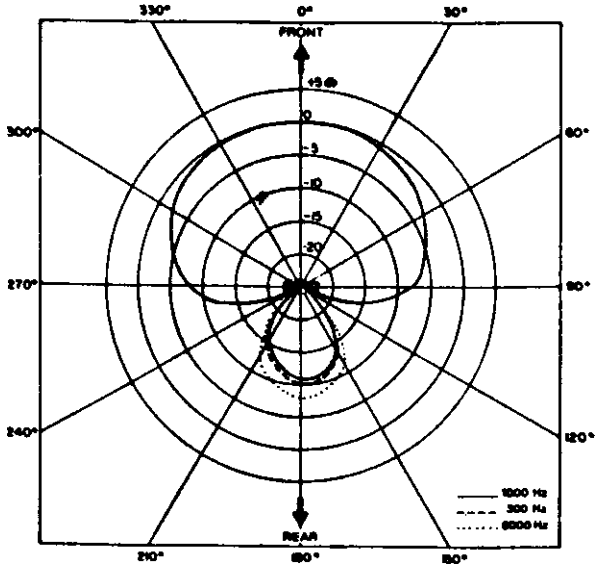
Polar pattern: Omnidirectional.

Omnidirectional microphones are equally sensitive to sounds coming from all directions. Unidirectional microphones are most sensitive to sounds coming from one direction — in front of the microphone.



Polar pattern: Cardioid.

Three types of unidirectional patterns are the cardioid, supercardioid, and hypercardioid pattern. The cardioid pattern has a broad pickup area in front of the microphone. Sounds approaching the side of the mic are rejected by 6 dB; sounds from the rear (180 degrees off- axis) are rejected 20 to 30 dB. The supercardioid rejects side sounds by 8.7 dB, and rejects sound best at two “nulls’ behind the microphone, 125 degrees off-axis.



Polar pattern: Hypercardioid.

The hypercardioid pattern is the tightest pattern of the three (12 dB down at the sides), and rejects sound best at two nulls 110 degrees off-axis. This pattern has the best rejection of room acoustics, and provides the most gain-before-feedback from the main sound reinforcement speakers.

Choose omnidirectional mics when you need:

All-around pickup

Pickup of room acoustics

Extended low-frequency response (in condenser microphones)

Low handling noise

Low wind noise

No up-close bass boost

Choose unidirectional mics when you need:.

Selective pickup

Rejection of sounds behind the microphone

Rejection of room acoustics and leakage

More gain-before feedback

Up-close bass boost (proximity efr fect)

An omnidirectional boundary microphone (such as a PZM) has a half-omni or hemispherical polar pattern. A unidirectional boundary microphone (such as a PCC-160) has a half-supercardioid polar pattern. The boundary mounting increases the directiionality of the microphone, thus reducing pickup of room acoustics.

LETTERS FROM CROWN MICROPHONE USERS

Crown mics in Puerto Rican theater

I am a sound technician for the Teatro Yaguez Municipio of Mayaguez. It is the best theater in the western area of Puerto Rico. The theater was built in 1919 and remodeled in 1976 with federal and municipal funding. We have modern electronic equipment, including many Crown microphones. We are proud of doing our work for the Theater Yaguez. Best wishes to Crown.

Jaime Ruiz Placido, Theater Yaguez, Mayaguez, Puerto Rico

Sound Grabber for camcorder
We recently purchased a Sound Grabber PZM microphone for our video camcorder as an external mic. We were dissatisfied with the camcorder built-in mic's performance, as it picked up motor hum. I place the PZM in my shirt pocket while taping, and get excellent results.

We've tried all kinds of TV appliance stores for mics, and I'm glad we stumbled onto yours. It is a fine piece of equipment which we are proud of. Keep up the good work!

Darwin L. Hjort, Stacy, Minn

Sound Grabber is convenient for interviews
This past year you donated some Sound Grabbers to the Summer Institute of Linguistics-Wycliffe Bible Translators. I received one of these microphones.

I am investigating one of the Indian Languages of Mexico. While sitting at a desk with one of my Indian helpers, I find it convenient not to hold a microphone to her mouth. By just leaving it on the table in front of her, I can record with enough quality to hear the sounds of the words that I need to hear to do my investigations.

And if I need to make comments, I can do so without bringing the microphone to my mouth. I can just make the recording from where I sit at the other end of the desk.

Larry R. Harris

# # #

MIC MEMO

April, 1988
Bruce Bartlett, Editor

"BAD" MICROPHONES

Clair Brothers, the superstar sound-reinforcement company, is using Crown CM-300 Differoid microphones [now the CM-310a] on the current Michael Jackson tour for background vocalists.This tour promotes Jackson's recent album, "Bad."

The singers were having a problem with feedback and lekkage because of high stage-monitor levels. Other microphones were tried, but only the Differoid provided enough isolation and gain-before-feedback.

The Differoid is a differential cardioid condenser microphone for hand-held vocals. It cancels distant sounds and rejects sounds approaching the rear of the mic. This permits very high monitor levels without feedback. By rejecting background noise on stage, the microphone lets the mixer operator "pull the mic out of the mud." That is, a vocal can be brought up clearly in the mix without bringing up everything else along with it.

When the Differoid was first tried, console problems caused the mic to be underpowered, so that it faded out after half an hour. Engineers from Crown and Clair Brothers worked together toward a solution. We determined that the house-console phantom supply needed some re-design to perform closer to DIN standard. Also, since the microphone was paralleled to feed two consoles, one console loaded down the other, causing the phantom voltage to sag to 5 volts! See the article "Phantom-Powering Precautions" in this issue for more detail.

To temporarily solve the problem, the Differoid was powered from both consoles. Gene Clair said that the Differoid sounded "great," had no feedback problems, and projected the vocals clearly. Not bad!

PHANTOM-POWERING PRECAUTIONS

There's a new problem with phantom powering condenser microphones, and it could affect you. It's becoming more common with today's multi-console systems, in which you "Y" or split a microphone signal to feed more than one console in parallel. In this case, the phantom-supply voltage may drop from, say, 48 volts to 5 volts — too low for the microphone to operate properly. You'll hear distortion or level loss.

There are several ways to solve this problem of power-supply sag. But to understand them, we need a brief review of phantom powering itself.

Definition

A phantom-power supply is a circuit that supplies DC powering (12-48V) to condenser mics, using the same conductors as the audio signal. The microphone receives power from, and sends audio to, the console along the same cable conductors. Phantom power operates the microphone circuitry. In an externally biased mic capsule, phantom power also is used to polarize the condenser transducer. (Microphone capsules using the electret or RF principle do not need external polarization, but the mic circuit still needs power.)

If a stand-alone phantom supply is not used, power is applied to each mic connector in the console, and is usually switchable ON or OFF for each input.

Two types of remote powering are phantom and AB. Phantom, the most common, is a positive voltage on pins 2 and 3 with respect to pin 1. The cable shield is the supply return. This is DIN standard 45 596, which is called "multiplex powering." (Apparently the terms "phantom" and "multiplex" are inter-changeable - we welcome letters clarifying this subject). Pin 1 is ground; pin 2 is audio in-phase, and pin 3 is audio return. Although the audio signal has polarity, phantom power has no polarity because both pins 2 and 3 have the same positive DC voltage.

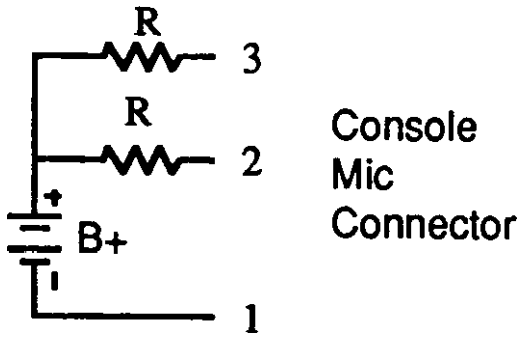


Fig. 1. Phantom voltage applied through two equal resistors.

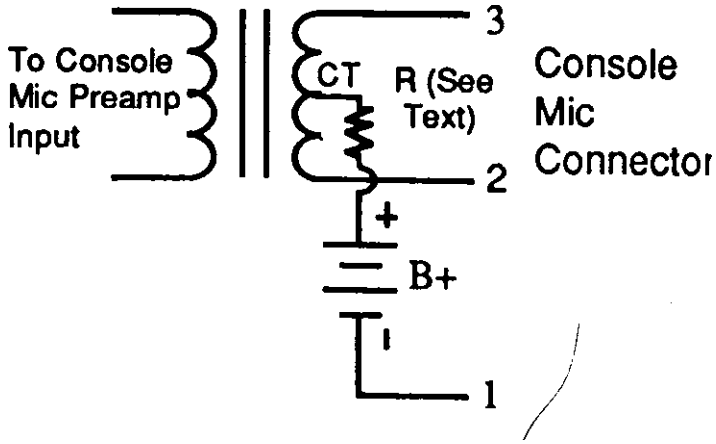


Fig. 2. Phantom voltage appllied through a center-tapped transformer.

The phantom voltage is applied either through two equal resistors to pins 2 and 3 (Fig. 1), or through a resistor to the ungrounded center tap of the microphone input transformer (Fig. 2).

AB remote power (used in some Sennheiser RF condenser shotgun mics) applies positive voltage to pin 2 and negative voltage to pin 3. This is DIN standard 45 595, modulation-lead powering. AB powering is used almost exclusively in the motion-picture industry in the

U.S.A.

Causes of Power Supply Sag

There are at least two causes of power-supply voltage loss that occurs when a mic is plugged in:

1. The phantom supply in the console is improperly designed.

2. If the mic inputs of two consoles are connected in parallel, the mic input of the second console might be loading down the power supply of the firsL That can occur as follows: When the second console's phantom is switched off, a bleeder resistor is switched across the capacitor connected across B+ (Figure 3). This resistor draws excessive current from the other console's supply, dropping its voltage.

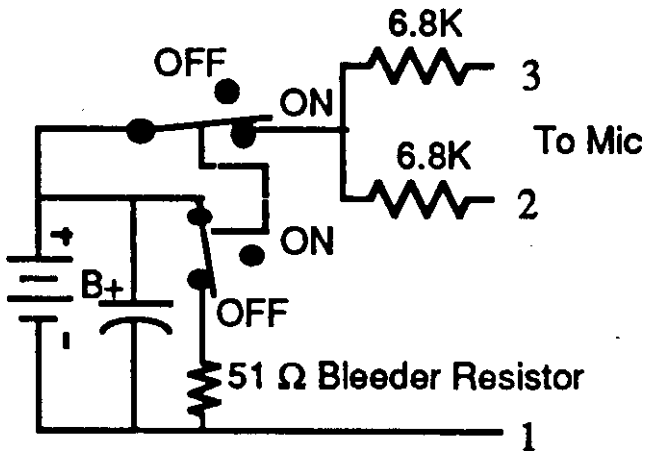


Fig. 3. Phantom supply with bleeder resistor.

Solutions:

1. If there's a resistor between B+ and the two equal resistors that go to mic-connector pins 2 and 3 in the console, remove (short) that resistor. The microphone may pop when it's plugged in, but at least it will work.

2. Supply phantom from both consoles (use caution).

3. Supply phantom from the console that is better regulated (assuming that the consoles don't load down each other), or

4. Use a transformer-isolated mic splitter (expensive but effective).

Phantom Power-Supply Design

If you're adding phantom power to your own customized console, you can use two methods:

1. Apply phantom power through two equal resistors to pins 2 and 3 (Figure 1).

2. Apply phantom power through one resistor to the ungrounded center tap of the input transformer (Figure 2).

What value resistors should you use? The table below answers this question. It's based on DIN specification 45 596.

Many thanks to Gene Clair and Ron

Barthwick of Clair Brothers for their help and suggestions about this problem.

For 12V supply voltage, use 680 ohms for 2-resistor ckt; use 340 ohms for C.T. transformer.

For 24V supply voltage, use 1.2 kilohms for 2-resistor ckt; use 600 ohms for C.T. transformer

For 48V supply voltage,use 6.8 kilohms for 2-resistor ckt; use 3.4 kilohms for C.T. transformer.

GLM-200 CHOIR MIKING

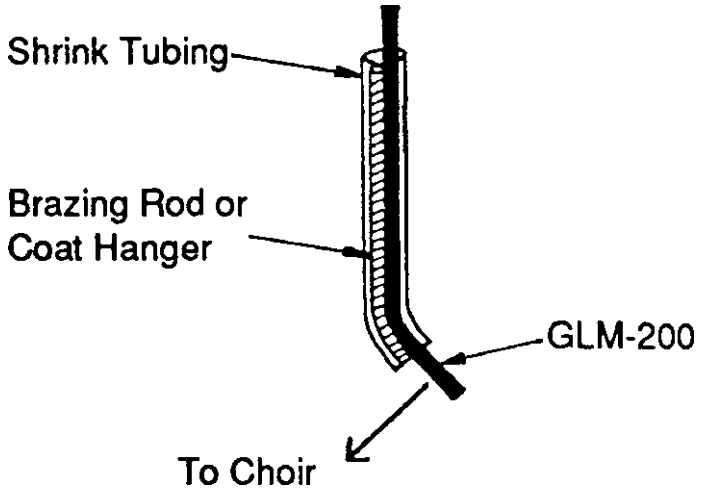
The Crown GLM-200 miniature hypercardioid condenser microphone provides high-fidelity, inconspicuous miking of a choir. The microphone practically disappears in use. Its hypercardioid polar pattern increases gain-before-feedback in sound-reinforcement systems.

Don Peterson, Crown's National Service Manager, provided this suggestion on miking a choir with Crown GLM-200 microphones:

First, you might want to modify the microphone for flat response as described in Crown Technical Bulletin No.1 [discontinued].

You can either hang the microphone from its cable or mount it on a boom mic stand. You might want to experiment with placement using the mic stand, then hang the microphone after finding a suitable position.

If you're hanging the microphone, first tilt it back to pick up the front row and to reduce echo from the wall behind the choir. To do this, bend a brazing rod or a coat hanger as shown in Fig. 4, and attach it to the GLM-200 cable with shrink tubing.



Hanging device for GLM-200.

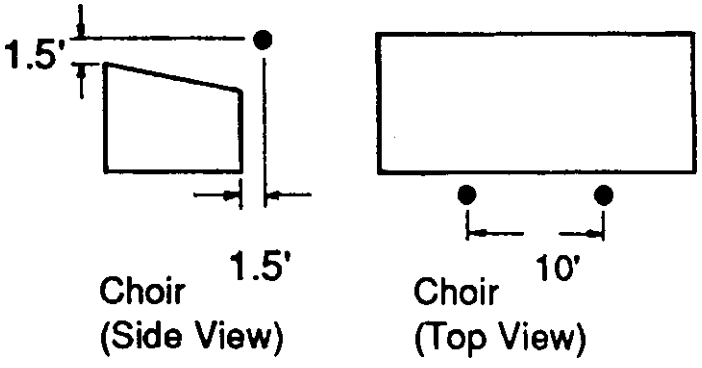


Fig. 5. Choir mic positions.

We recommend the following placement as a starting point (Fig. 5): Using two microphones 10 feet apart, locate them about 1-1/2 feet in front of the front-row musicians, and 1-1/2 feet above the heads of the back-row musicians. If feedback is not a problem, you can place the mics farther from the choir to improve the blend.

You may want to attach a 5-lb. nylon fishing line between the side walls adjacent to the choir, and tie it to both microphones to stabilize their direction. Fasten the line to the side walls slightly below the GLMs to provide a slight downward pull.

GLM-1OO/E microphones with 40' cables are available from Crown on special order. Using this long cable lets you locate the connector/electronics out of sight. [Currently available from Crown are the CM-30 and CM-31 choir mics. They have less self-noise than the GLM-200.]

CLOSE-MIKING A SYMPHONY

When miking a symphony orchestra; most engineers would use a few microphones overhead and out front. But when this method was tried last July on the Atlanta Symphony playing with the Temptations, it didn't work. Leakage of the monitor speakers into the overhead mics caused a hollow reinforced sound. This problem was compounded by sound reflections from the band shell.

William "Billy T" Talarico, sound engineer for the Temptations, had a better idea. He thought of tight-miking the symphony, and suggested that idea to Walt Wynn, who is a sound contractor associated with the Atlanta Symphony. They tried it. According to William, "It was really successful... The orchestra sounded like Vegas strings." The symphony members enjoyed the sound too.

William used all Crown GLM-200 miniature hypercardioid condenser mics. They were set to a bright frequency response for the strings (as supplied from the factory) and to a flat response for everything else. Since the orchestra members did not want anything attached to their instruments, the mics were attached to boom stands with goosenecks.

Although distant miking works well for recording orchestras, tight miking is demanded in unusual circumstances, such as reinforcing an orchestra playing with a pop group.

PCCs COVER PHILADELPHIA'S MUMMER'S DAY PARADE

Here's a tough one: How do you pick up a good balance on an enormous marching band parading down the street? That problem was addressed by KYW-TV 3 in Philadelphia. Ron Little, KYW-TV Production Manager, worked on this project with help from Crown's Microphone Product Director, Bill Raventos.

KYW provided coverage of the Mummer's Day Parade which is held every New Year's Day. This parade is something like Mardis Gras, with vocal performers, string bands, and symphonic bands. It runs from 8 AM to 8 PM with continuous TV coverage.

For the main stereo pickup, Ron used a pair of PCC-160 supercardioid boundary microphones placed back-to-back on a 2-foot-square piece of plexiglass. To reduce wind noise, the plexiglass boundary was wrapped in acoustically transparent fabric. The PCC's bass-tilt switch was set to "flaL"

This arrangement was suspended on cables 32 feet over the street, and 24 feet in front of the performance line of the bands as shown in Figure 6. A similar array was mounted on a boom standing in the middle of the groups' performance area.

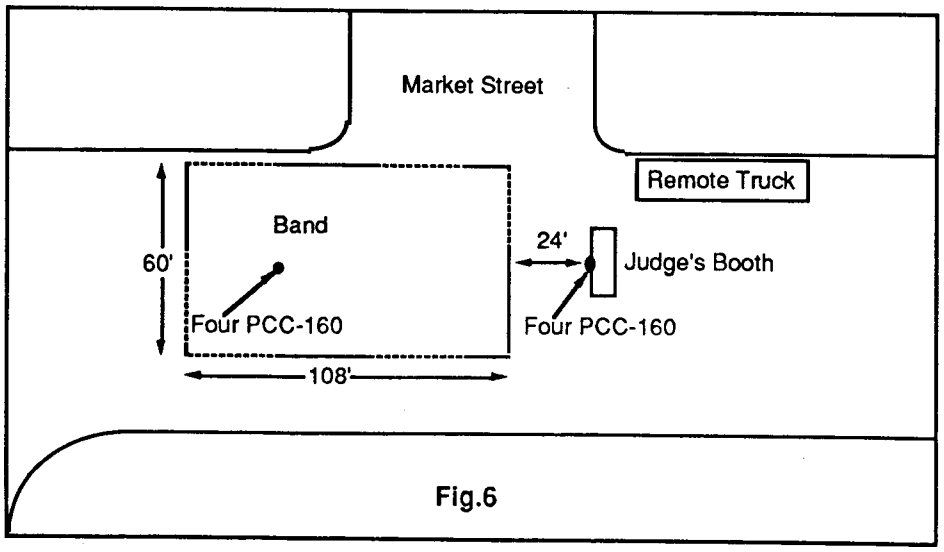


Fig. 6. Parade miking setup.

Two backup mics were also mounted on the same boundaries, making a total of 8 mics used. Backup mics were needed because it would have been impossible to change a mic in the middle of the 14-hour performance. Four microphones contributed to the final mix.

KYW-TV 3 used phantom power from the remote-truck board. Since they didn't want any break or connectors between the mics and the truck, they made two cables which ran from the mics directly back to the truck, so that the lines were unbroken.

According to Ron, "We achieved excellent results. The stereo mix and balance by far surpassed our 1987 parade coverage where we had used conventional mics, shotguns, etc. I do believe we have found the proper answer to the audio situation. KYW-TV is proud of the resulting coverage of this year's parade, and hope that Crown also feels some measure of pride for the part they played."

LETTERS FROM CROWN MICROPHONE USERS

Mic for voice-over

I always enjoy keeping abreast of today's fast-paced advances in audio technology and especially my most important tool of trade — the microphone. I maintain a small audio studio facility in my home, the sole purpose of which is voice-over production. Among other things, I have a Crown PZM and an AKG 414. (also have a couple of RCA 44's and 77's as a reminder of those good old days.)

Browsing through the December issue of *Mic Memo*, my eye was drawn to the piece re: "How to Use a CM-300 Differoid Microphone." In pondering over the interesting details, I couldn't help but wonder what the Crown experts would prescribe from their stable of equipment as the ideal microphone where the prime use is voice-over?

I realize of course that today's recommendation may well be outmoded by tomorrow's advances, but I just had to pop the question. Any response at your convenience will be appreciated; meanwhile I look forward to the next issue of *Mic Memo.*

John J. Strader, JJS Enterprises~Productions, Cincinnati, Ohio.

Reply:

Several Crown microphones can be used for voice-over, depending on your application:

*For a lavalier mic, the CM-10.

*For a boom-mounted cardioid mic, the CM-200a (with its foam pop filter) or the CM-700 (with a hoop-type pop filter).

*For a boundary microphone, the PZM30D.

All these are condenser microphones and require 12-48V phantom power, either from your console, or

from a Crown PH-4B or PH-1A phantom power supply.

The CM-10 lavalier is worn by the user, so it remains a constant distance from the mouth, which aids consistency. There's no problem with breath pops. When using it, angle the script stand away from the user so that the sound does not reflect back into the mic and cause phase interference. Ask the announcer not to move his or her head, if possible, because this can change the tone quality.

Place the CM-200a or CM-700 cardioid mic about 8 inches from the user, with the microphone perpendicular to the script stand. This way, sound reflecting off the stand is rejected by the "dead" back side of the microphone. Position the mic off the axis of the mouth to prevent breath pops. Use a spacer to ensure that the announcer maintains a constant distance to the microphone for every recording.

Tape the PZM-30D to a 2-foot-square script stand. Take care not to make too much paper noise when you turn the script pages. The sound may be a little thin due to the small boundary.

Let us know how these suggestions worked. Good luck!

Padding down a Sound Grabber

When quality is not important, I often use a "boom box" recorder with my Sound Grabbers. However, the automatic level control is really activated by them. What kind of pads could I build that would cut the level about 10 dB?

Gary Wakenhut, Lakeview, MI

Reply:

Try the 10 dB pad shown in Figure 7. For more loss, increase the value of the 2200-ohm resistor, or decrease the value of the 1000-ohm resistor.

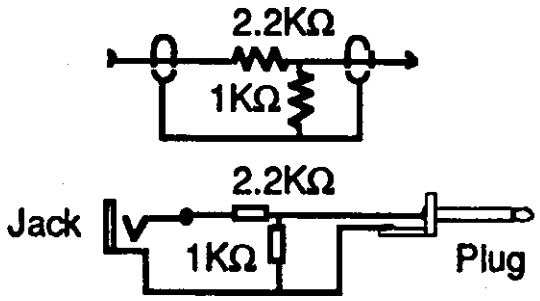


Fig. 7. Sound Grabber 10 dB pad.

Reducing vibration, reducing highs

We have a couple of problems with our Crown microphones.

1. The GLM-200 microphones when used with the GLM-OHM boom assembly have extreme sensitivity to low-frequency vibration, so much so that walking across the stage or studio floor is a problem. Have you any recommendations on attaching the mics to the boom assembly so as to effectively decouple the microphones from the boom-stand-floor?

2. The PZM-20RG microphone has excessive high-frequency response which, rather than contributing to intelligibility, makes the unit extremely prone to feedback even at moderate gains. Have you any recommendations on attenuating the high-frequency peak?

Anthony J. Gnazzo, Department of Music, University of California, Berkely, California

Reply:

1. Tape the GLM cable to the boom arm so that the capsule is held only by its cable, and can vibrate freely. Or isolate the boom stand from the floor by mounting the stand on sponges or foam rubber. The thicker the sponges are, and the smaller their 'foot-prints" are, the better the isolation is.

2. The PZM-20RG was designed for maximum intelligibility for conference recordings, but if feedback

is a problem with sound-reinforcement, try the following solutions:

Cut out a thin rectangle of open-cell foam (such as used in microphone windscreens). Using a sharp knife or razor blade, gently insert the foam fully into the gap under the microphone cantilever. The thicker the foam, the more the high-frequency rolloff If this is not possible, put thick foam around the nose of the cantilever to attenuate the highs.

# # #

MIC MEMO

August, 1988
Bruce Bartlett, Editor

PZMs WIN FOUR EMMYS!

Crown PZM microphones helped their users win four Emmy awards in the last three years. These were:

1. The April 1985 award for a December 1984 music recording by Gary Pillon, General Television Network, Oak Park, Michigan.

2. The May 1987 award for a December 1986 music recording by Bill Samples, WJRT Tv-12, Flint, Michigan.

3. The May 1988 award for a December 1987 music recording by Bill Samples.

4. The May 1988 award for a June 1986 documentary recording by Gary Pillon (tied with Bill Samples).

Bill Samples won two Emmys, one year apart, for the same type of recording: the Saginaw Symphony pops concert held in the Saginaw Heritage Theater. Patterned after the Boston Pops' Christmas concerts, the Saginaw concert added a 125-member choir on the second occasion. Program material ranged from "Go Tell It on the Mountain" to "The Halleluiah Chorus." The show was simulcast over a local PBS radio stafion.

Bill used PZMs because they were aleady in use at the Saginaw Heritage Theater, and the theater's sound engineer recommended them. The first year, Bill used the theatre's two PzMs on a "wedge" or V-shaped plexiglass panel (Fig. 1). The wedge consists of two panels (each 2-feet square), angled 60 degrees apart. The point of the V aims at the sound source. Even though the two PZMs were not the same model and differed in sensitivity, the recording won an Emmy!

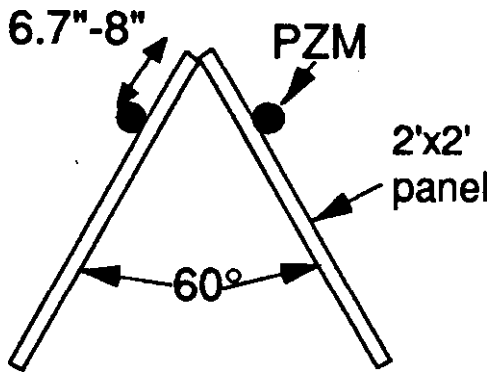


Fig. 1. PZM wedge.

The second year, Bill bought three PZM-6R [now PZM-6D] microphones, the small-plate unit with a rising high-frequency response. In addition to the PZMs on either side of the wedge, he placed a third unit in the middle of the back side to pick up hall reverberation (Fig. 2). This array was suspended 15 to 20 feet over the front row of musicians, even with the curtain line. Bill noted that the band shell focused sound on the PZMs, so that there was less need for spot mics.

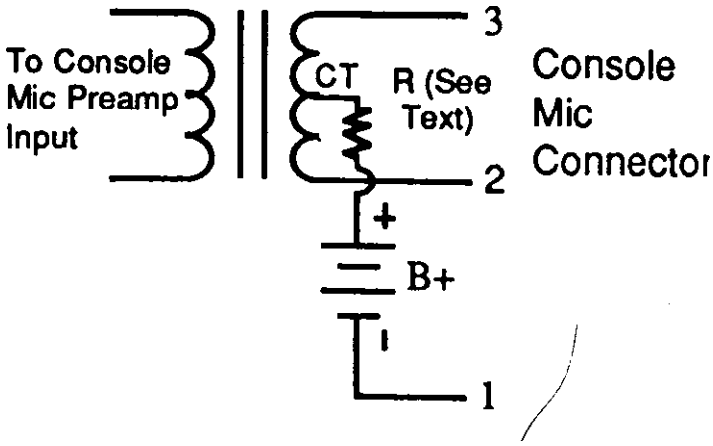


Fig. 2. PZM wedge with rear pickup.

To compensate for the low-frequency shelf of the 2-foot boundaries, he boosted +6 dB at low frequencies. Another PZM was used on the floor to pick up a madrigal group. Bill used spot mics on certain choir members, violins, and percussion.

According to Bill, the PZMs “did an excellent job,” with “super separation” and “unbelievable stereo.”

Gary Pillon used a similar PZM wedge (with two microphones) to record the Fort St. Chorale and Orchestra performing the syndicated PBS program, “Miracle on Fort Street,” which featured Handel’s Messiah. The recording venue, Fort St. Presbyterian Church in Detroit, was a cinderblock-and-wood building dating back to the late 1800’s - a marvelous acoustic space.

Gary used two stereo pairs of PZM-6S [now PZM-6D] (Fig. 3). A 60-degree wedge was placed about 10 feet behind the conductor and 17 feet high. It was anchored by two bungee cords from the top of a Mole Richardson Hi-Riser. This placed the wedge even with the overhead chandeliers, out of camera view except for an extreme wide shot.

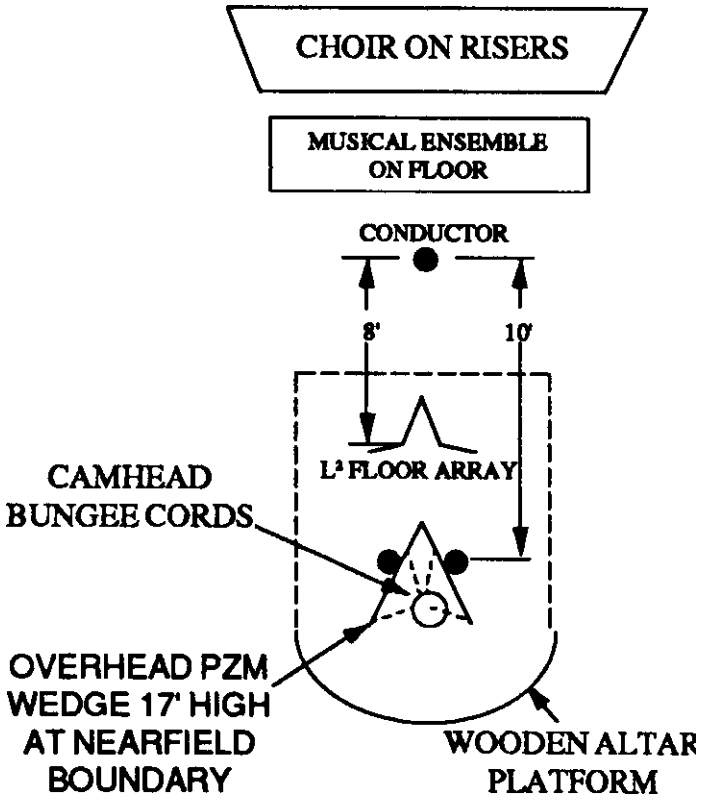


Fig. 3. Mic setup at Fort St. Chorale recording.

In addition, an L^2 array (Fig. 4) designed by Mike Lamm of Dove & Note Recording in Houston was placed on apple boxes and sandbags 8 feet behind the conductor. It picked up the sound coming directly from the orchestra and augmented the soloists, who stood on each side of the Maestro, facing the 800 people who packed the two levels of the church.

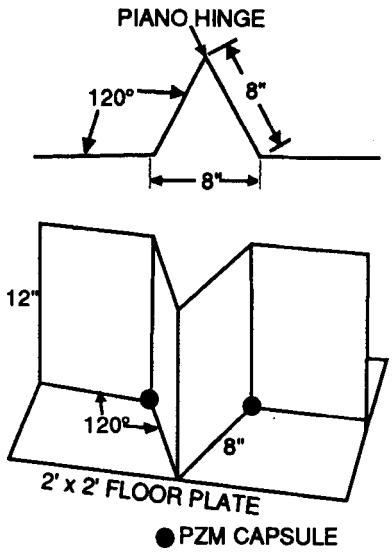


Fig. 4. L^2 array.

To our ears, the recording sounded spacious, with a full stereo spread, good localization, and a mid-audience perspective. The acoustics suited the music well. Tonal quality was full and smooth, and the balances among the orchestra, choir, and soloists were just right.

Gary's second Emmy was for a half-hour documentary on the Michigan Muzzleloader's Festival. This three-day conclave occurs every June at Greenfield Village, Michigan. People from around the country come to re-enact the past in period costumes, lifestyle, and a black powder shooting contest.

Gary devised a stereo PZM shotgun consisting of two PZM-6S [now PZM-6D] cantilevers mounted in a special Lexan array. The two mics are 8 inches apart, and each is fitted in the apex of a pyramid-shaped structure (Fig. 5). Two models were made, small and large, which fed a Sony Betacam.

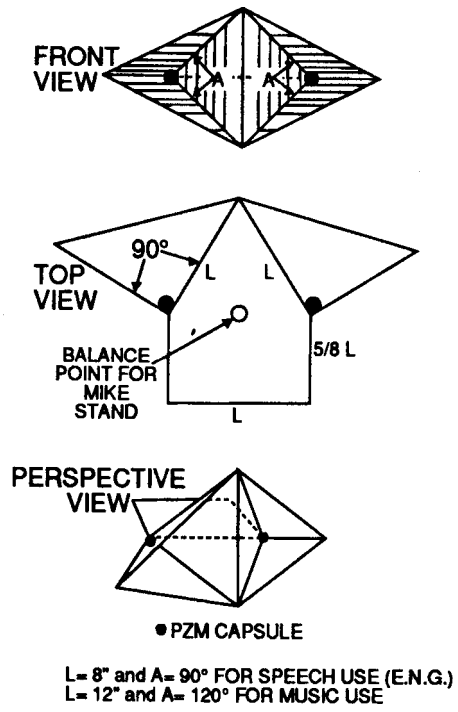


Fig. 5. Pillon PZM stereo shotgun.

The larger unit was used on a televison “C” stand, which gave ten-foot high overviews of the weekend’s events, such as parades, marching bands, and gunfire. This mic also had a pistol grip for handheld use to pick up dialogue.

The smaller version was mounted under the lens of a Sony Betacam on a Steadicam platform (the first application of this type). The audio perspective was a perfect match to the field of view given by the wide-angle setting of the zoom lens. While the mic picked up sound from all over Greenfield Village, the central sonic image always matched the picture. In post production, Gary equalized the PZM stereo shotgun for a flatter response.

Burr Huntington of Sound Moves was Gary’s partner, providing mid-side stereo pickup which was also used in the program.

This sound track was the finest we have ever heard for a television documentary. The dialogue was clear; sound effects were stunning in their realism, and stereo imaging was sharp and effectively used.

We congratulate Bill and Gary for their Emmy awards, and thank them for sharing their PZM techniques with us.

PZM MODIFICATION FOR PURISTS IMPROVES SOUND QUALITY

Here’s a modification for any PZM that makes an audible improvement in sensitivity, frequency response, and clarity. We first suggested it to Pierre Sprey, an audiophile PZM recordist for Maple Shade Studio, Glen Dale, Maryland. He tried it and was delighted with the results.

This modification is for audio purists who are willing to put up with the following disadvantages:

*You need unbalanced mic inputs with an impedance of 10 kilohms or higher.

*The circuit works on 9V batteries rather than phantom power.

*Total cable length should be under 25 feet. Use audiophile-grade cable.

*The handmade circuit may not have the professional look of a manufactured product.

*You might void the microphone warranty.

You also need direct access to the mic capsule leads. In older PZMs that have an in-line interface (interface PA-18, PX-18, or PX-T), the capsule leads go directly to the XLR-type connector in the

microphone cantilever. You can plug a female 3-pin connector into the PZM 3-pin connector to connect to the mic-capsule leads.

In newer PZMs having a built-in interface, you must remove the interface from the microphone or mic connector and unsolder the capsule leads from the printed circuit board. NOTE: This will void the warranty.

Build the circuit shown in Fig. 6. For older PZMs with an external interface, connect the shield to pin 1, the B+ lead to pin 2, and the audio lead to pin 3. For newer PZMs with a built-in interface, connect the shield to the grey lead, the B+ lead to the red lead, and the audio lead to the orange lead.

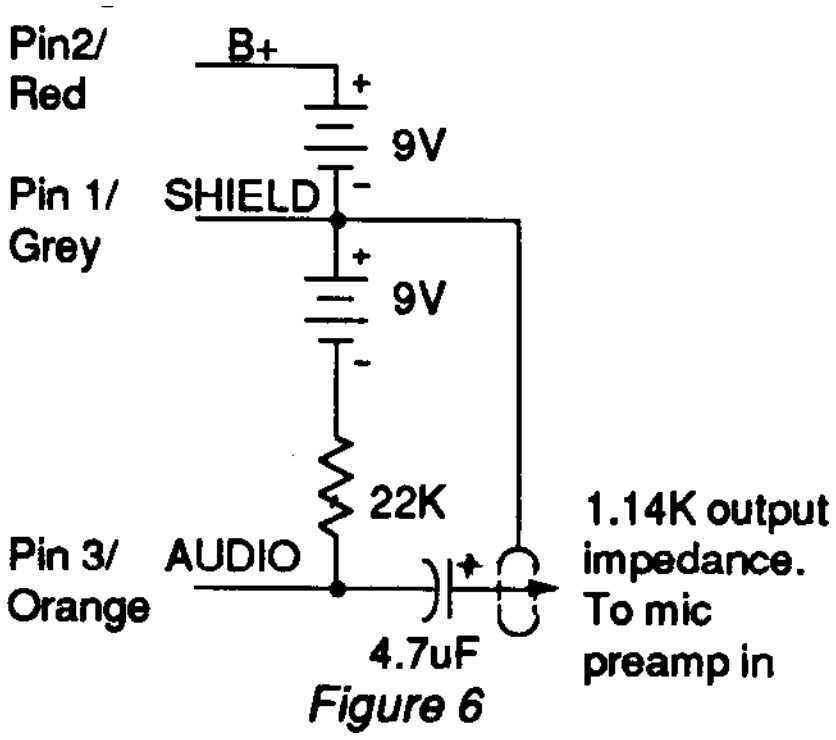


Fig. 6. Schematic for PZM powering system.

The mic capsule is powered by bipolar power (+/- 9v). Since the impedance-matching transformer is missing, the microphone impedance will be 1.14 kilohms, which is still low enough for short cable runs.

According to Pierre, the results are superb. Sensitivity is increased 11 dB; S/N is improved (by overriding mixer noise), the treble is cleaner and sweeter, and the low end is more detailed. Presumably, all these effects are due to omitting the impedance-matching step-down transformer.

Pierre also reports that the Sound Grabber can be powered by two 6V photoflash batteries for greater sensitivity and headroom.

INDY 500 USES CROWN MICROPHONES

Over this Memorial Day weekend, a half-million people watched the Indianapolis 500, the world's fastest auto race. Crown shared its equipment and technology with audio people connected with the race.

The high-level P.A. was provided by three Crown MacroTech 10,000 power amplifiers. Four are installed; one is a standby unit.

All track announcers were heard through CM-300 [now CM-310a] Differoid microphones. A CM-200 [now CM-200a] cardioid microphone was used for Opening Ceremonies and for the interview with

winner Rick Mears. A pair of GLM200/EQR [now GLM-200] microphones were prepared in an X-Y configuration for stereo pickup of some of the pit stops. The evening after the race, the LM-190 [now LM-300] lectern microphone provided audio for the official banquet.

Crown received glowing endorsements from the President of the Indy 500 and the chief track announcer. In addition, the Indy 500 radio network broadcast “Thank you” messages mentioning Crown.

The following is from a letter to Crown from John Royer (with the Indianapolis Motor Speedway Radio Network):

“We greatly appreciate getting to use the Crown microphones. As usual, the PZMs, the CM-200s and the CM-300 all worked great. The LM-190 is truly unbelievable: for the first time at the Victory Banquet you could actually hear the drivers speak.”

Chief track announcer, Don Carnegie, had this to say about the CM-300 [now the CM-310a Differoid.]

“This microphone is the finest I’ve ever used in 43 years of broadcasting on the world’s largest P.A. system. Believe me, this microphone... is compatible with the job that we have to do to inform on qualifying day a crowd of some 250,000, and on race day a crowd in excess of 400,000. In short, I love it. And whoever put it together, let me have one each and every year. That’ll keep me coming back to the track.”

# # #

MIC MEMO

November, 1988
Bruce Bartlett, Editor

AN IMPROVED DIFFEROID MICROPHONE: THE CROWN CM-310 (now the CM-310A)

Crown has improved the CM-300, a differential cardioid handheld microphone that provides outstanding gain-before-feedback and isolation. The replacement model, CM-310, has

*significantly lower noise

*higher SPL capability (151 dB!)

*lower current drain

*a smoother high end, and

*a warmer tonal balance.

The external appearance is identical:

CM-310

All this has been achieved without sacrificing gain-before-feedback. In fact, during a field test of a CM-310, a monitor-mixer engineer for a major tour gradually turned up the CM-310 gain until the monitor-speaker level was more than he could stand. “Stop!” he said, “This microphone does not feed back!”

Of course, the CM-310 can be made to feed back, but at monitor levels that may be hazardous to the speaker drivers. Use with caution.

A technical paper of the development of this microphone will be presented at the November Convention of the Audio Engineering Society.

MILES DAVIS RECORDED WITH CROWN PZMs

How do you mike a trumpeter who won’t stand still? Miles Davis moves around while he plays, which forces engineers to find novel solutions. Clipping a microphone to the bell can yield an unnatural tone quality compared to distant miking.

A solution was found by engineer Steven Strassman and producer Marcus Miller working on Miles’ album, Siesta. They taped Crown PZMs to the walls all around the trumpeter.

According to Miller, “We put them all over the place and worked out the phasing, and that way Miles could go wherever he wanted. We got a really warm sound. The room we worked in was small, so he couldn’t get too far away. When he was playing into the [stand-mounted] mic, it was fine, and when he didn’t feel like playing in the mic we’d just raise the [level of the] PZMs and catch him off the walls. He couldn’t get away from a microphone.

“I used the same mics on the bass clarinet. I’d play to one mic on the wall, and it sounds real interesting. It gets all the air. When I play bass clarinet there’s a little bit of air that escapes out of the corner of my mouth - a problem I never bothered to correct from high school - but it works really well on something like this because it gives it this sizzle at the top.”

PZM CHOIR PICKUP

Leroy Shine of Shine Sound has devised an effective way to reinforce choirs with PZMs. He starts with a plexiglass boundary measuring 1 1/2 feet x 2 1/2 feet. Then he adds an Atlas studio mic stand with a heavy triangular base and a right-angle boom. A flange on the back of the boundary screws onto the boom.

Figure 1 shows the setup. A PZM is mounted near the top of the boundary. This boundary is raised so that its bottom is just above the heads of the front row, 3 to 4 feet in front of them. The boundary is angled to aim at the back row, so that closer voices are more off-axis.

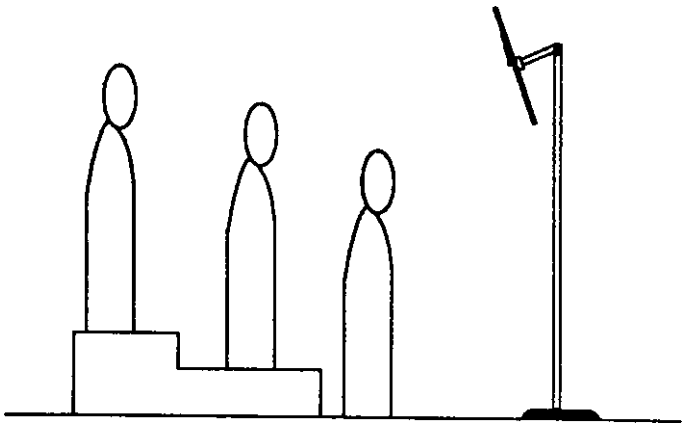


Fig. 1. Leroy Shine’s method of miking a choir with PZMs.

According to Leroy, he gets a balanced, even blend of all three rows on risers, with good gain before

feedback. He employs up to six boundaries for choirs of 750 people.

This arrangement has been used for Rev. James Cleveland's Gospel Music Convention, consisting of many different groups singing about ten minutes each.

Choir members can hear themselves due to reflections off the boundary. Plus, visual reflections reveal any deadpan faces!

PCC LEGISLATURE INSTALLATION

When the chambers of the Alberta, Canada Legislature were being revamped for television, a new microphone system was needed. Don Scheirere and Comtec Associates were called in to design and install the system. They mounted a total of 93 Crown PCC-l60's in members' desks, conference tables, and the Speaker's chair.

In the Omnimedia publication, "Audio Directions" (Aug.'88), Don describes why he chose the PCC-160 for this job:

"We looked at all the big names in microphones. Primarily we needed something that would meet the aesthetic requirements: low profile, something that was non-microphone in appearance, that could be fitted into the architecture of the desks that wouldn't take away from the refurbishing. My prime consideration was something that would give us a good presence from a distance and that could take advantage of the surface. What it basically came down to was that it had to be supercardioid and have a decent response.

"It also had to be something that could take a lot of thumping because the members, as they respond, are banging the desks. The other factor that we had to contend with, and you will anytime there's an assembly or debating situation, is that the darn thing is going to have to handle some dynamic range (115-120 dB SPL) without distortion.

"The PCC-l60 met those requirements. What makes it unique is that you can build it into the architecture without it looking mic-ish. We did the same job for the Saskatchewan Legislature only we used another brand of mic of conventional design. It works fine but the PCC-l60 is better. It gets far better - excellent - presence. That's what everybody comments on. They hear the stuff at home and it sounds like the guy is sitting right there. I wish we had had access to it on the Saskatchewan job.

"We've also used the PCC-160 in the studio and put it into conference rooms with excellent results."

PHANTOM FIGURE CORRECTION

In the April '88 issue of *Mic Memo*, there was an error in Figure 3 in the article "Phantom-Powering Precautions." It should have appeared as shown in Fig. 2 below.

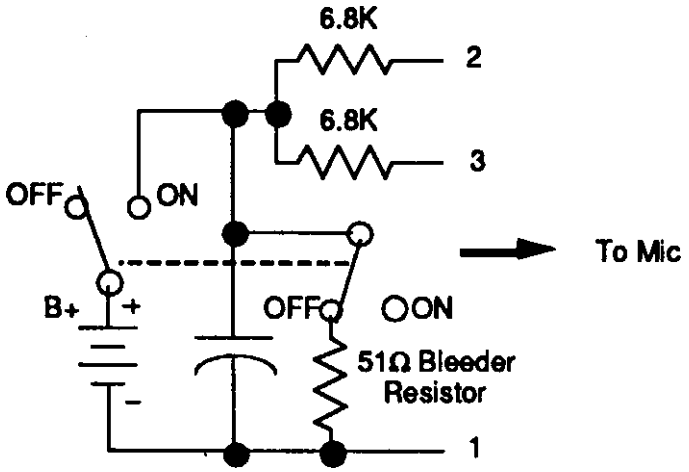


Fig. 2. Correction to phantom-power circuit.

Note that the 51-ohm bleeder resistor is not a good idea. If the mic inputs of two consoles are connected in parallel, the bleeder resistor of the second console can load down the phantom supply of the first console. That resistor should be increased in value or omitted entirely.

PZM/PCC USERS

Crown PZMs and PcCs have been used in a wide variety of applications. Here are just a few of their users:

Miscellaneous

Wayland Baptist University
Aetna Insurance Co. - teleconferencing
Starlight Theater, San Diego
Long Beach Symphony
“42nd St.” show at Kennedy Center
San Diego Opera
Wolf Trap
San Francisco Opera
University of Denver Miracle Theater Co.
LA Philharmonic
Syracuse Symphony
Atlanta Symphony
Opera Theater of Syracuse
Cerritos Community College
Downey Civic Light Opera
Moravian College of Music
Las Vegas Hilton - show band
Christ Covenant Church, Greensboro, NC - piano and kick drum
Palm Desert City Council Chamber
Superbowl (coin toss)
Indy 500 - race track
Imax film on NASA space shuttle
Paragon Music Center, Florida
Dave Andrews Audio
Theater Yaguez, Mayaguez, Puerto Rico
Harrahs Marina Hotel Casino

Recording Studios

Las Vegas Recording
Tres Virgos Studios
Wally Heider Studios
Ryder Sound Services
Dave Andrews Audio Consultants
Dove & Note Recording, Houston

Award Shows

American Music Awards & Grammy Awards (piano)
Academy Awards (audience)

Amusement Parks
Six Flags Over Texas - live gunfight show
Leisure Village, Camarillo, CA
Ringling Bros.
Universal Studio Tours - live gunfight show

Recordings
Pan Is Beautiful III - steel drum contest
Flim & The BB's - "Tricycle"
Beach Boys LP - "Keeping the Summer Alive"
Willie Nelson LP - piano
Debbie Boone LP - strings
Bill Gaither Trio - "Live at Grand Old Opry"LP - drums
Mel Torme - audience reaction
Frank Zappa - London Symphony
Barry Manilow - piano
Shelly Manne - drums
Average White Band - lead vocal
Buddy Rich - "Live at King Street" LP - drums and brass

Radio and TV
WJRT TV-12, Flint, Michigan (Two-time Emmy winner)
KPHO, Phoenix - Fiesta Bowl National Pageant of Bands
KSOR, Oregon
KZLA, Los Angeles
WSKG/FM/TV - symphony recordings
WGCI, Chicago - talk shows
ABC-TV
National Public Radio
America Radio Theatre
KYW-TV 3 Philadelphia (Mummer's Day Parade)
PBS
General Television Network, Detroit (Two-time Emmy winner)

TURN YOUR SOUND GRABBER INTO A STUDIO MIC

Here's a modification for the Crown Sound Grabber that converts it into a studio-quality microphone. We first suggested it to Pierre Sprey, an audiophile PZM recordist for PMS Inc. in Maryland. He tried it and was excited with the results. The Sound Grabber was originally designed for noncritical conference recording, but it can be upgraded for musical applications. This modification is for audio purists who are willing to put up with the following disadvantages:

*You need unbalanced mic inputs with an impedance of 7 kilohms or higher.

*Total cable length should be under 25 feet.

*You will void the microphone warranty.

Referring to Fig. 3, please proceed as follows:

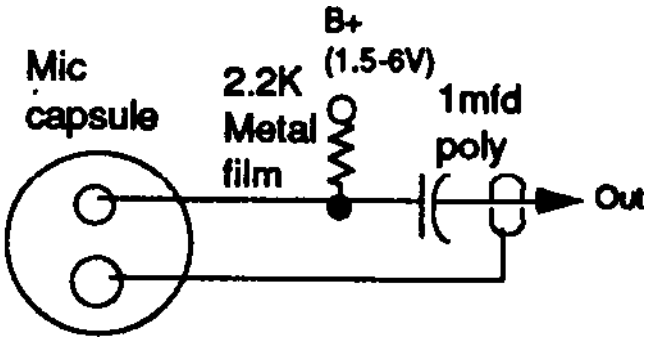


Fig. 3. Sound Grabber enhancement.

I. Open the Sound Grabber and locate the printed circuit board near the cable end. Remove it by cutting away the sealant.

2. The circuit board contains a 2.2 kilohm chip resistor and a chip capacitor. Replace the resistor with a 2.2 kilohm metal film resistor for lower noise.

3. If your mixer input is capacitor coupled, short the chip capacitor. If not, replace it with a 1 microfarad polypropylene capacitor. This extends the bass response to 30 Hz. And, Pierre says, the polypropylene capacitor has less veiling effect on the high end than the chip capacitor. (Poly caps are big and probably won't fit inside the mic.)

Pierre also has glued open-cell foam around the edges of the gap near the capsule to reduce its high-frequency rise. Plus, he has damped the underside of the plate with lead.

Using the Sound Grabber without a boundary, Pierre aims the nose of the microphone at a singer or sax player. This orientation gives a more natural sound (a flatter response) by avoiding the 3 kHz peak due to sound diffraction of the plate built into the microphone.

"It's a first-class microphone for music," he reports. According to Pierre, the modified Sound Grabber has more mid-bass articulation on voice and sax than larger-diaphragm mics (such as the Sony C37 or Neumann U 87i), which tend to smooth over this area. The Sound Grabber's reproduction is more clearly delineated and has a better transient response. Pierre also notes that two Sound Grabbers can be paralleled without problems.

LETTERS FROM CROWN MICROPHONE USERS

Talk-show miking

Here at the Illinois Bell Corporate TV Center, we produce over 200 video programs every year, covering every topic from financial affairs, to corporate safety, to a monthly news magazine for employees.

For years, we have relied on multiple-microphone layouts for our studio programs, but in the last year, we have switched to a new application that not only makes things much more comfortable for our executives and guests, but provides excellent overall signal as well.

Since a good number of our interview programs involve from two to five people, we switched our format from multiple chairs placed in a "Talk Show" style to gathering the principals around a medium-sized table for "round-table" discussions. After wrestling with the multiple-mic proximity problems that this produces, we covered the tabletop with a neutral-color carpet-like set material, cut a flap, drilled a 1" hole through the tabletop, and placed a single PZM-3OGP [now PZM-30D] microphone in the center of the tabletop (as in Fig. 4).

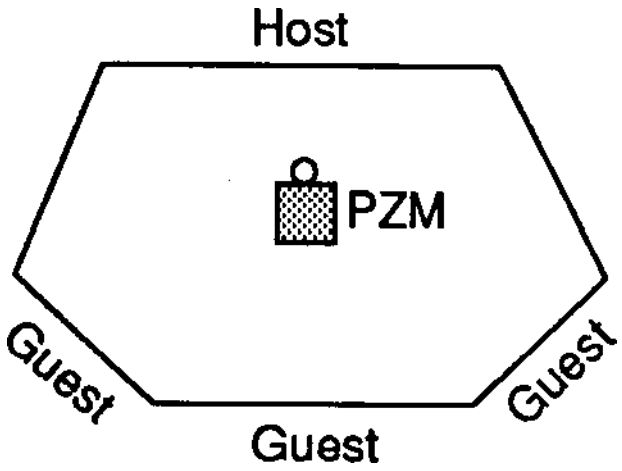


Fig. 4. Talk-show miking with a PZM.

The results have been phenomenal! Not only has the PZM performed with signal clarity and strength equal to a lavalier mic for all subjects around the table, but our guests have been able to just walk in, sit down, and start their discussion without having to fuss about mic placement.

I heartily recommend this procedure for any and all studio interview recordings, both for audio and television.

Jay J. Silvio

Illinois Bell TV Center

Chicago, IL

Harp and dulcimer miking

We just returned from performing at a music festival and the pickup on our Celtic harp and hammered dulcimer left much to be desired. Can you or some of your readers suggest microphones and/or placement which could alleviate our problems? We suspect having our own microphones and doing our own placement would help considerably with inexperienced sound engineers.

Secondly, we have a set of your Sound Grabbers and use them extensively for music recording and sound reinforcement. We have also built some corner plexiglass baffles to be used with the microphones when we are providing sound reinforcement for our local school musicals. Our question is: where and how should the Sound Grabber be placed in a three-walled boundary to maximize the gain?

Gary Wakenhut

Erholengsland Personal Growth Center

Lakeview, MI

Reply:

For the harp, Gary, try one or two Crown GLM-100 miniature omnidirectional condenser microphones, each in a GLM-SM Surface Mount. Tape them to the sound board, either on top or inside. Experiment with position for the most natural tonal balance.

Try the above arrangement with the hammered dulcimer, too. As shown in Fig. 5, mount two GLMs under the strings, on top of the sound board, spaced about 8" apart to pick up each half of the dulcimer equally.

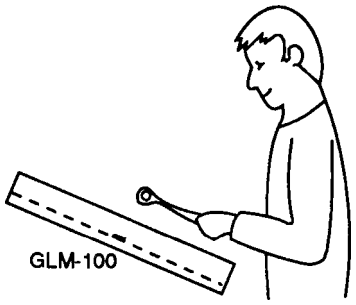


Fig. 5. Dulcimer miking with a GLM-100.

Feedback is a real problem with the hammered dulcimer because it is such a quiet instrument. Miking under the instrument helps gain-before-feedback, but it sounds unnatural. I asked for suggestions from David James, a prominent local hammered-dulcimer player who has won several contests. He told me of a solution devised by Malcolm Dalglish, the fine dulcimer player with Metamora.

Malcolm has used two C-ducer tape pickups mixed with top-mounted microphones. One C-ducer tape goes under the bottom of the bass bridge; the other goes under the bottom of the treble bridge.

These are panned left and right for a pleasant, spacious effect. In addition, two cardioid mics are placed on either side of the top, aiming toward the center, as in Fig. 6. A Crown CM-200 [now CM-200a] cardioid condenser microphone is a good choice for this method.

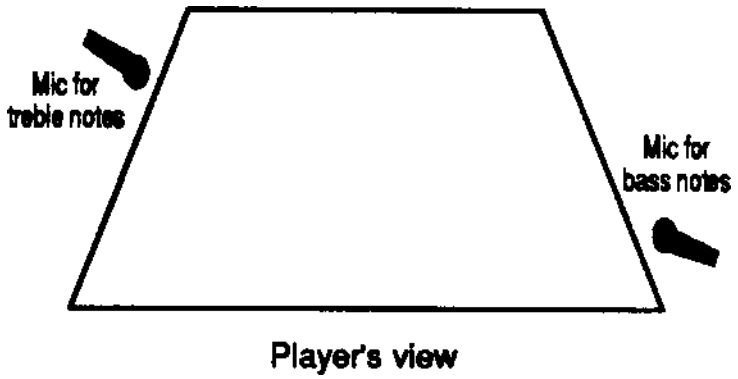


Fig. 6. Stereo dulcimer miking.

For maximum acoustic gain with the Sound Grabber in a three-walled boundary, place the nose of the microphone (containing the mic capsule) in the corner of all three boundaries. To do this, cut a slot in the boundary as shown in Fig. 7 so that the Sound Grabber’s plate will slide under the boundary. If possible, seal the slot to the Sound Grabber with clay or RTV Sealastic.

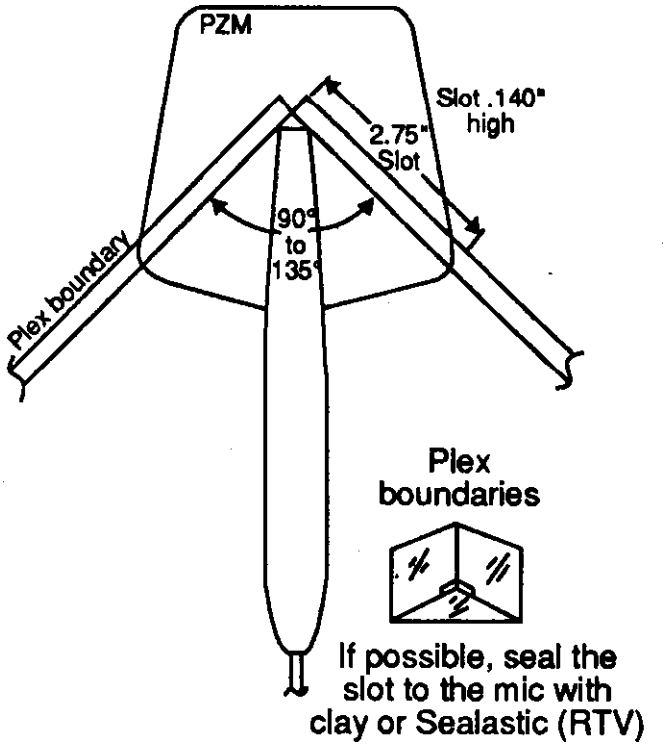


Fig. 7. Positioning a Sound Grabber in a corner boundary.

An angle of 135 degrees between boundaries has worked well. The bigger the boundaries, the more directional is the microphone at low frequencies.

The impedance of the Sound Grabber is medium (1,600 ohms). Consequently, long cable runs (say, over 50 feet) could result in hum pickup or high-frequency loss. You might be able to locate your mixer near the stage to keep the mic extension cables short.

MOUNTING A GLM ON A FLOATING CEILING

Here is a tip from Crown's Don Peterson for recording conversations in rooms with floating acoustic-tile ceilings. Some of these are research labs, interview rooms, teaching hospitals, police interrogation rooms, etc.

1. Mount a GLM-SM Surface Mount on the metal ceiling grid.
2. Attach a GLM-100 microphone to the GLM-SM.
3. Run the cable up behind the tile into the ceiling, and to your mixer or recorder.
4. Using a small paint brush, paint the mic and its cable to match the ceiling. Take care not to paint over the mic grille (the sound opening).

# # #

MIC MEMO

August, 1989
Bruce Bartlett, Editor

RECORDING VOCALS WITH PZMs

In the February '89 issue of *Recording Engineer/Producer*, Dan Torchia interviewed Ed Seay about his recording techniques. For the No.1 record "Cry, Cry, Cry," Seay mounted a Crown PZM on a board placed on a music stand. The female vocalist did overdubs with the PZM.

According to Seay, ‘She was singing into this board and she could not break up the PZM. It took a little EQ to bring back the body of the sound. Because the mic is a hemispherical omni, it rejects sound reflections from the control-room window.”

PZM OVERHEAD DRUM MIKING

In the June 1989 issue of *Mix* were some suggestions on miking drums overhead with PZMs. Gary Platt, Vice President of Engineering at Platinum Recorders, had this to say:

“I like to put a pair of Crown PZMs on top [of the drums] by hanging them from the rafter or putting them on a tall stand. It’s nice for a little high-end zip:

“I’ll take about 16kHz from [the PZM pickup] and roll off the rest. It works incredibly well.”

HOW TO MAKE BETTER STEREO RECORDINGS

The advent of digital audio, stereo television, and stereo film has sparked a renewed interest in true-stereo microphone techniques. These methods use just two or three microphones to pick up a group of sound sources as a whole.

During reproduction of a stereo recording, the listener can locate each instrument or instrumental section between the stereo pair of speakers. The spaciousness of hall ambience is reproduced as well.

A phantom image of each instrument is heard at various positions between the speakers. The position of each image depends on the position of each real instrument around the microphone pair.

Stereo miking has several applications:

*Recording and broadcast of classical-music ensembles and soloists

*Stereo dialog and background ambience for film, video, and Electronic News Gathering (E.N.G.)

*Stereo pickup of piano, drums, and background vocals in pop-music recording

*Stereo sampling

*Television-audience miking

*Sound-effects recording

*Sports broadcasts.

An easy way to record in stereo is to use a stereo microphone. The ideal stereo microphone would have these characteristics:

*Mono compatible. The frequency response is the same in stereo and mono.

*Insensitive to wind noise and mechanical vibrations

*Easy to aim

*Simple to use, without a mid-side (M-S) matrix box

*More portable than a spaced pair of microphones

*Inconspicuous (unlike a dummy head)

*Low cost - current models of M-S stereo mics cost $2,000 to $3,000.

*Compatible for headphones and loudspeakers. Coincident-pair stereo techniques have less stereo spread over headphones than they do over speakers, making it difficult to judge imaging on location.

Further, the ideal stereo microphone would have:

*Sharp and accurate imaging

*An airy, warm, and spacious sense of ambience.

*Low off-axis coloration.

*Wide-range smooth response, low noise, and low distortion.

*Low interchannel phase shift at low frequencies for ease of record-cutting.

Crown has developed a new stereo microphone to meet all these requirements. The Crown SASS-P [now SASS-P MKII] or Stereo Ambient Sampling System (Fig. 1) is a patented, stereo condenser microphone using PZM technology. It was invented by Mike Billingsley, a Vermont recording engineer, and was developed by Crown into a finished product.

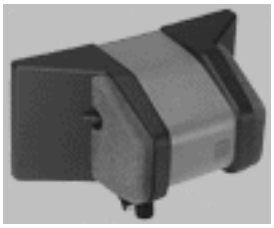


Fig. 1. Crown SASS-P PZM stereo microphone.

The SASS-P uses two premium-quality Pressure Zone Microphones mounted on boundaries to make each microphone directional. The capsules are spaced as far apart as your ears. A foam barrier between the mic capsules reduces acoustic crosstalk which otherwise would cause phase cancellations in mono. Another Crown model, SASS-B [discontinued], is a similarly shaped stereo boundary mount for Bruel & Kjaer 4006/4003 microphones, permitting 10 dB less noise.

For each channel, an omnidirectional microphone capsule is mounted on a boundary approximately 5" square. The two boundaries are angled left and right of center. The sound diffraction of each boundary creates a directional polar pattern. At low frequencies up to about 800 Hz, the polar pattern is omnidirectional, and becomes increasingly directional with frequency. The patterns aim left and right of center, much like a coincident or near-coincident mic array.

The polar patterns of the boundaries and the spacing between capsules have been chosen to provide natural perceived stereo imaging over loudspeakers and headphones. Carefully controlled listening tests have shown that the SASS creates well-focused images, accurately placed and with no hole-in-the-middle.

A foam barrier/baffle between the capsules shapes the pickup angle of each capsule in the front and limits overlap of the two sides at higher frequencies. Although the microphone capsules are spaced apart, there is little phase cancellation when both channels are combined to mono because of the shadowing effect of the baffle. Even though there are phase differences between channels, extreme level differences caused by the baffle reduce phase cancellations in mono.

People who are familiar with PZMs might wonder whether the SASS has a good low-frequency response, since its boundaries are relatively small. The SASS has a flat response down to low frequencies; the usual 6-dB shelf does not occur. Here’s why: Since the capsules are omnidirectional below 500 Hz, their outputs at low frequencies are equal in level. These equal-level outputs are summed in stereo listening, which causes a 3-dB rise in perceived level at low frequencies. This effectively counteracts 3 dB of the low-frequency shelf normally experienced with small boundaries.

In addition, when the microphone is used in a reverberant sound field, the effective low-frequency level is boosted another 3 dB because the pattern is omni directional at low frequencies and unidirectional at high frequencies.

All of the low-frequency shelf is compensated, so the effective frequency response is uniform from 40 Hz to 18 kHz (Fig. 2). This can be proven in an A-B listening test by comparing the tonal balance of the SASS to that of flat-response omnidirectional microphones. They sound tonally the same at low frequencies.

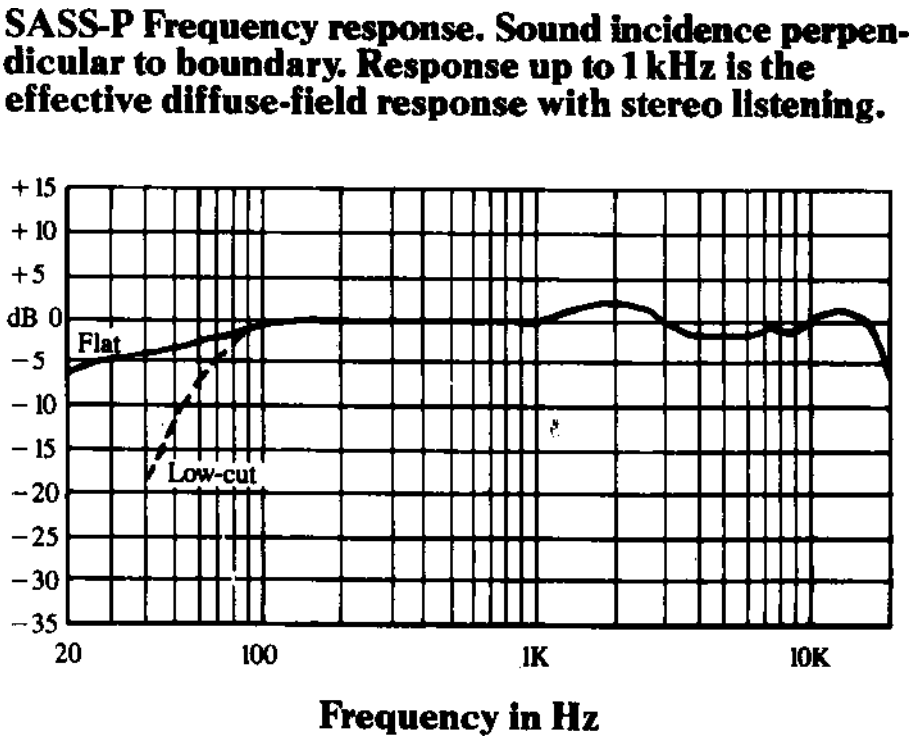


Fig. 2. SASS-P Frequency response. Sound incidence perpendicular to boundary. Response up to 1 kHz is the effective diffuse-field response with stereo listening.

The broad acceptance angle of each side's capsule (125 degrees) picks up ambient sidewall and ceiling reflections from the room, providing an airy perspective well suited to the reproduction of acoustics in good halls and ambient environments. This pattern is consistent to well above and below the microphone.

As a near-coincident array, the SASS forms stereo images by a combination of spacing, isolating, and shaping the directional pattern of otherwise omni capsules to create time and spectral differences between channels. Its stereo localization mechanism varies with frequency as described below:

*At low frequencies below 500 Hz, the SASS produces equal-level outputs from both channels, with direction-dependent delay between channels.

*At frequencies between about 500Hz and 1500Hz, the stereo localization of the SASS is mainly due to time or phase differences between channels.

*At mid frequencies (1.5 kHz to 3kHz), the localization of the SASS is due to a combination of time and intensity differences.

*At high frequencies above 4 kHz, SASS localization is due mainly to intensity differences.

In other words, the localization mechanism of the SASS crosses over from low-frequency arrival-time differences to high-frequency intensity differences in the vicinity of 2000 Hz. This is very close to the mechanism used by the human hearing system, or by a dummy head.

Let's run through the list of claimed advantages and explain how the SASS achieves each one:

*Mono compatible: The foam barrier between capsules prevents acoustic crosstalk which can cause phase cancel lations in mono. As proof, record a person speaking in a normally reverberant room as he or she walks around in front of the SASS. The reproduced tone quality will be the same in stereo or mono.

*Low cost: The price is $799 for the SASS-B (without microphones) and $849 for the SASS-P (with microphones).

*Compatible for headphones and loud speakers: The mic’s similarity to the human head assures accurate headphone reproduction, and the spacing and polar patterns create accurateimaging over loudspeakers as well.

*Insensitive to wind noise and mechanical vibrations: This is due to the highly damped, low-mass diaphragms of the omni capsules.

*Easy to aim: Because of its shape, the SASS is intuitive to aim. And because it has a fixed position when handheld, the SASS provides stable imaging.

*Simple to use, without a matrix box: Outputs are left and right channels. If desired, the user can adjust the stereo spread in post-production with pan pots.

*More portable than a spaced array: It’s a single-point pickup.

*Inconspicuous (unlike a dummy head): The SASS looks mechanical rather than human.

*Sharp and accurate imaging: This claim is based on carefully controlled listening tests described in Audio Engineering Society Preprint 2788 (A-i).

*An airy, warm, and spacious sense of ambience: This is due to the capsule spacing.

*Low off-axis coloration: This is due to the extremely small capsules in the PZM version, and the nose cones in the B&K version which make the microphones more omnidirectional at high frequencies.

*Wide-range smooth response,low noise,and low distortion. The omni condenser capsules have an extended response down to 20 Hz. According to TEF measurements, the response of both models is wide-range and smooth. The measured self-noise of the SASS-P is 20.5 dBA; of the SASS-B is 11.5 dBA. Maximum SPL of the SASS-P is 150 dB SPL; of the SASS-B is 143 dB SPL.

*Low interchannel phase shift at low frequencies for ease of record-cutting: This is because the capsule spacing is only a few inches: a small fraction of a wavelength at low frequencies.

Included with the SASS are these items:

*carrying case

*windscreen

*auxiliary foam wind protectors [now discontinued]

*stand-thread adapter

*hand grip

*swivel mount

*phantom or internal-battery powering (SASS-P only) built-in low-cut switch (SASS-P only).

We hope that the SASS will become a useful new tool for the audio industry -especially for classical recording and stereo ENG.

HOW TO HIDE A GLM IN THE CEILING

Crown’s Don Peterson invented a slick way to camouflage a GLM near a ceiling speaker baffle so that the mic is invisible. Please refer to Fig. 3.

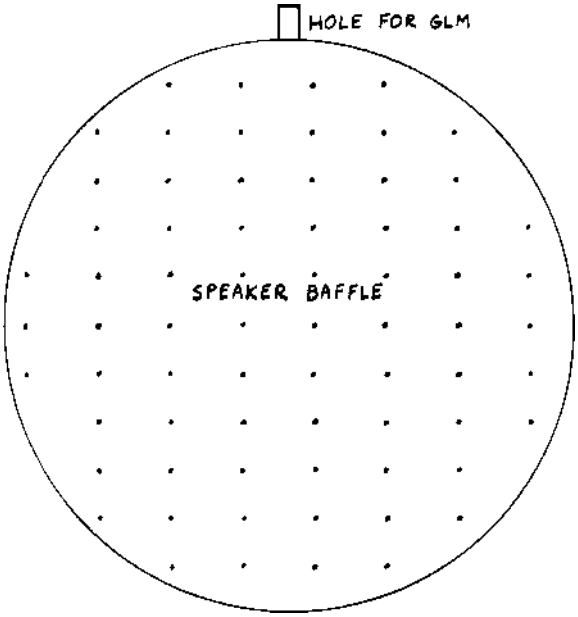


Fig. 3. Hiding a GLM near a speaker baffle.

1. Just outside the area covered by the speaker baffle, in the acoustic tile, cut a groove the same size and depth as a GLM-100.

2. Lay a GLM-100 in the groove so that it is flush with the acoustic-tile ceiling.

3. To disguise the mic, paint it with Testors paint the same color as the tile, being careful not to get any paint into or on the exposed capsule grille.

PLUG INTO YOUR ACOUSTIC GUITAR

Here's a great suggestion from Doug Krehbiel, a musician in North Newton, Kansas. He plugs into his acoustic guitar for convenient sound reinforcement. Figure 4 shows how.

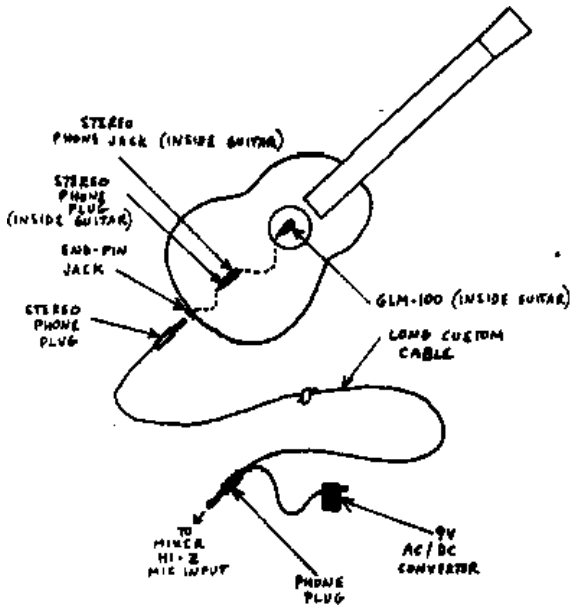


Fig. 4. Connecting a GLM to an acoustic guitar.

Doug mikes his acoustic guitar with a GLM-100 mounted inside on the surface nearest the player, facing the strings. Screwed into the end of his guitar is an end-pin jack. An end pin is a metal cylinder to which you attach a guitar strap, and an end-pin jack is an end pin with a built-in 1/4" phone jack.

Inside the guitar, the GLM-100 plugs into the end-pin jack. When Doug wants to amplify his guitar, he plugs a long custom cable into the end-pin jack, and connects the other end of the cable to a PA. mixer unbalanced mic input.

The custom cable is shown in Fig. 5. One end plugs into the guitar's end-pin jack; the other end plugs into the mixer high-Z mic input. Power for the GLM is also applied at the mixer end from a 9V AC/DC converter.

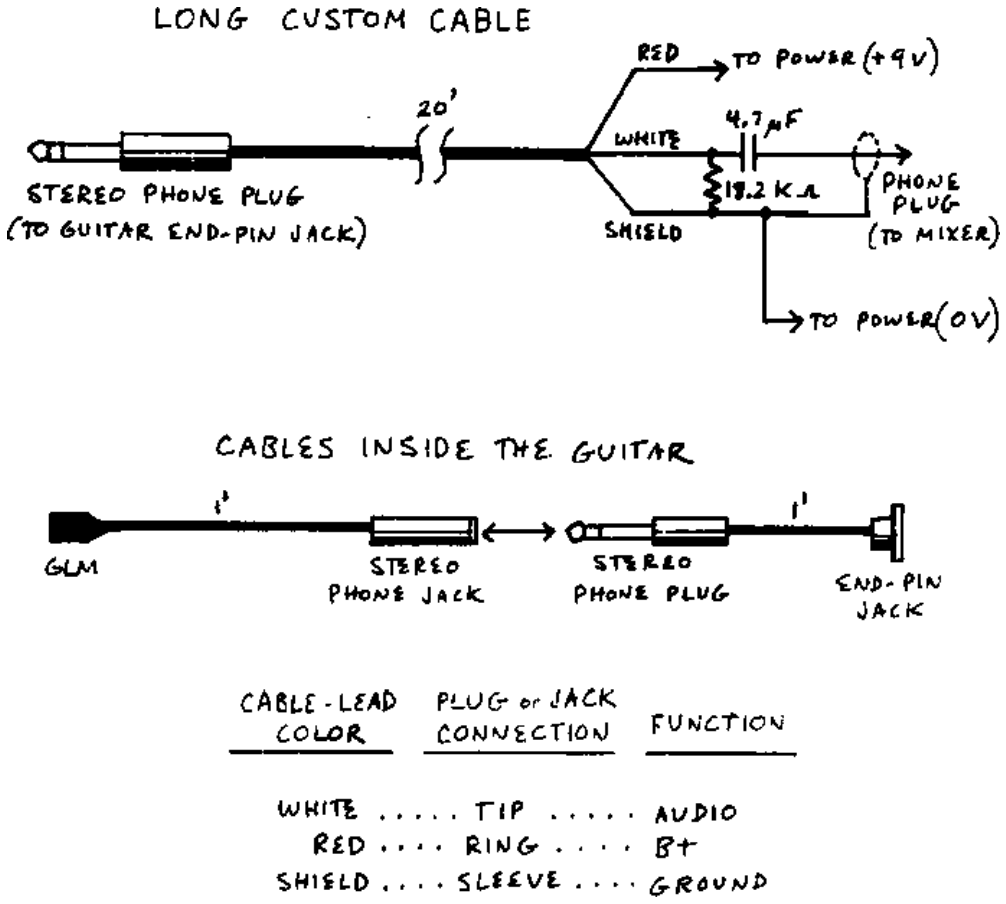


Fig. 5. Custom GLM cable for acoustic guitar.

Inside the guitar is a 1-foot cable (Fig. 5). One end is wired to the end-pin jack; the other end is wired to a stereo phone plug. This plug connects to a stereo phone jack that is wired to the GLM-100.

For P.A., plug the GLM-100 into the end-pin jack and plug the long custom cable into the guitar and PA. mixer. For recording other instruments, unplug the GLM from the end-pin jack, remove the GLM from the guitar, and plug the GLM directly into the long custom cable.

Although the cable from guitar to mixer is long and unbalanced, Doug reports that it picks up no audible hum. This is because the GLM capsule is fairly low impedance (1.1kilohm). Doug also notes that the GLM sounds great and has adequate gain for P.A.

# # #

MIC MEMO

December, 1989
Bruce Bartlett, Editor

SASS TABBED “FAB” AT NAB CONFAB

At the last NAB (National Association of Broadcasters) convention, the Crown SASS [now the SASS-P MKII] was voted one of the top five new audio products out of 3000 products! Source:June 1989 *Video Systems Magazine*.

HOW TO LISTEN TO MUSCLES

Scott Robbins and Don Peterson, customer-service advisors on Crown microphones, described an unusual request. Biomedical researchers at the University of Michigan and with Indiana Brace Co. needed a microphone to pick up the sounds that muscles make.

The microphone was intended to be used by a physically handicapped person as a sensor to activate an artificial hand. When the person wearing the artificial hand moves certain arm muscles, the microphone on the skin picks up the sound the muscles make. The resulting mic signal activates an artificial hand. This microphone pickup eliminates the need for implanted electrodes.

Muscle sounds are in the frequency range of 5 Hz to 25 Hz. So we recommended a microphone with an excellent low-frequency response: the Crown GLM-100/E, which is a miniature omni condenser microphone. By wiring it unbalanced without a transformer (Fig. 1), the user can obtain a response that is flat down to very low frequencies (-3 dB at 20 Hz!). The mic will be encapsulated in silicone rubber to prevent perspiration damage.

Fig. 1 GLM 100/E circuit diagram

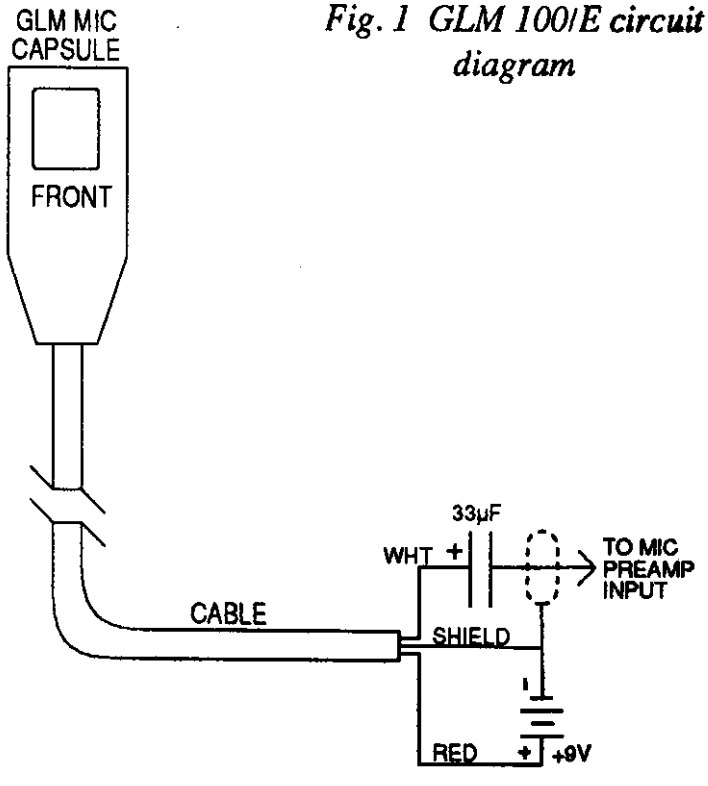


Fig. 1. GLM-100/E circuit diagram.

PZM PIANO MIKING

At a concert in North Africa, *db Magazine* journalist Ed Learned used a Crown PZM along with a Sennheiser 421 for piano miking. He taped a Crown PZM-3lS [now PZM-30D] to the side of the piano near the sound holes and cushioned the PZM with foam to prevent mechanical vibration. The lid was on the short stick. He placed the 421 where the low and mid strings cross, aiming towards the hammers.

Learned reports that, with this method, the gain-before-feedback was adequate and the piano still had "air."

HOW TO REDUCE MIC NOISE

Want to reduce microphone hiss? Place the mic closer to the sound source.

Rex Garrett of SHOWORKS in Atlanta, Georgia, recorded a vocal and dulcimer with a Crown SASS-P [now the SASS-P MKII].

The microphone was about 8 feet away at head height. He reports that the recorded stereo ambience was "incredible." But since the dulcimer is a quiet instrument, Rex had to raise his mixer gain to the point where hiss just became audible.

We recommended that he place the mic closer - 3 to 4 feet - to increase the sound pressure level at the microphone. This louder sound tends to override microphone and mixer noise. In addition, the closer placement helps to reduce pickup of audience noise.

SASS APPLICATION NOTES

The following application suggestions are by the SASS inventor Michael Billingsley, who has used it in the field and in the studio for several years. He also has recorded SASS stereo samples for Synclavier.

The SASS is capable of seamless stereo at all distances beyond three feet. At closer distances, there is some hole-in-the-middle effect (weak center image) because neither capsule can see a centered sound source due to the center baffle.

In live-to-2-track recording, it's best to make the final mic placement decisions while monitoring on loudspeakers for more-accurate imaging.

If the correctly monitored stereo spread is excessive (because of close mic placement), run the SASS signals through a stereo mixer with pan pots, and pan the two channels toward center until the stereo spread is correct. This can be done during recording or post-production.

For a large musical ensemble, place the SASS 4 to 15 feet from the front row of musicians, angle it down to aim at the performers (when raised), and raise it about 15 feet high on a microphone stand. Closer placement sounds more edgy, detailed, and dry; farther placement sounds more distant, blended, and reverberant. Try to find a spot where you hear a pleasing balance between the direct sound from the ensemble and the hall ambience.

Because the SASS is quite sensitive to the sides as well as the front, closer placement will not be as dry as with directional microphones. Hence, the SASS can be placed into an ensemble farther than is ordinarily possible, providing great detail and spread if that is desired, without feeling forced or unnatural. The center of the sound image and the hall reverberation are still retained.

If you are recording a choir that is behind an orchestra, experiment with stand height to find the best balance between the two sources. The strings project upward while the choir projects forward, so you might find a better balance at, say, 9 feet high rather than 15 feet high.

For recording small ensembles, soloists, samples, or sound effects, the microphone need not be raised above ear height.

When you mount the SASS on a moving vehicle, you should devise a shock-mount system to be used under the microphone. Also be sure to use the windscreen, and enable the low-cut switch (or use low-cut filters in your mixer).

Often you can record news commentators without an auxiliary talent microphone. If the ambient noise level makes this impractical, use a mixer to blend a talent microphone (panned to center) with the SASS. The SASS will give a slight but noticeable boost to the appropriate side if the talent moves away from frame center.

If the SASS is camera mounted, use the windscreen to subdue wind noise caused by camera movement.

The SASS can be mounted on fishpoles, floor stands, boom stands and tripods, in addition to the handgrip.

When you record samples or sound effects for keyboard, drum-machine, or disk soundbank reproduction, any recorded ambience will be reproduced as part of the sample. For added future flexibility, you may want to make several samples of one source at different distances to include the range of added reverberance.

Off-center images can be reproduced accurately by sampling the sound source in the desired angular position as perceived from stereo center. Recorded ambience will sharpen the image, but is not necessary.

If angular positioning or ambience is included with the sample, and pitch shifting is anticipated, the direction of the image and the size of the room will be affected by most pitch-changing algorithms. To minimize these undesirable effects, try sampling at intervals of one-third octave or less.

Try to control the room ambience when looping so it is consistent before and after the sample (unless reverbererant decay is desired as part of the sample).

When recording a moving sample or effect, experiment with distance between the microphone and the closest pass of the sound source. The closer the SASS is to the path of the subject, the more rapidly the image will pass the center point (almost hopping from one channel to the other). To achieve a smooth side-to-side movement, you may need to increase the distance.

SASS AMPLIFIES BRASS IN OUTDOOR P.A. SYSTEM

At a summer outdoor concert in Elkhart, Indiana, a Crown SASS-P [now SASS-P MKII] was used to pick up a brass ensemble for sound reinforcement. As the photos show, the SASS was placed a few feet in front and above the ensemble. The microphone picked up an overall acoustical blend of the performers and relayed it accurately to the audience.

Fig. 2. SASS carrying case.

Fig. 3. SASS picking up brass ensemble.

COMPARING LECTERN MICROPHONES

Scott Carpenter of Rainbow Sound, a church sound consultant in Huntsville, Alabama, compared the Crown LM-200 Lectern Microphone [now the LM-201] to the competition. These are his unedited comments:

LM-200

“The Crown LM-200 is the hands-down choice for this application. The most popular mic in use on pulpits is the Audio-Technica AT 857-QM. We have used 857’s for many years with acceptable results. Since the introduction of the LM-200, we have begun to use it exclusively.

“The LM-200 has a solid steel tube and a base as rugged as a Sherman tank. Children can play stick-shift with it all day without weakening the support. The AT gooseneck can become limp which makes it difficult to keep in place. The tube on the LM-200 is longer than the AT’s, which gets the capsule close to the source and improves gain-before-feedback. The supercardioid polar pattern further improves gain-before-feedback compared to the AT’s cardioid pattern.

“The integral pop filter on the LM-200 greatly reduces plosives which severely detract from a service. Even with the foam windscreen installed on the AT, an over-emphasized “p” is reproduced as a small explosion from the speaker cluster.

“The sound quality of the LM-200 has been highly acclaimed by all who have heard it. It has a wide frequency response and an overall sound that is exceptionally faithful to the source. The sound is so natural that soloists in one church preferred to sing through the pulpit mic rather than use the expensive Beyer handhelds they had.

“Probably the best feature of the LM-200 is its excellent isolation. The AT sends pulpit bumps and kicks through the sound system which can be annoying and distracting. The LM-200 has isolation comparable to a studio isobox [stand-mounted shock mount]. This substantially reduces mechanical noises from the pulpit. This feature has made the LM-200 a favorite with pastors as well.

“In applications where the pastor moves or leans left-to-right and requires a wider field of pickup, the Crown PCC-160 or the PCC-200 [discontinued] is optimum. The PCC-200 is simply a gated version of the 160. Both mics are as small as a deck of cards, and exhibit excellent sonic characteristics. Although the isolation and gain-before-feedback are not quite as good as that of the LM-200, they are

superior to other mics we have tested for this application and work quite acceptably. They are also excellent for use as an altar microphone and can be used on the floor to pick up large groups. This is particularly useful for Christian drama."

CHOIR-MIKING TECHNIQUES

Scott Carpenter also offered many tips on miking a choir with the GLM-200:

"The Crown GLM-200 is ideal for this application. It is less than half the size of a postage stamp, which makes a group of them virtually invisible to the congregation. The Audio Technica 853 is the most popular mic for this application. The AKG 460 is one of the most expensive.

"The GLM-200 has a hypercardioid pattern which provides higher gain-before-feedback than the AT. Its wide frequency response and low off-axis coloration are closer to that of the AKG. They cost roughly the same as the AT.

"Perhaps the neatest feature of the GLM-200 is that it can be mounted on a clear plastic stand from the gound up. This eliminates all the scaffolding and overhead wiring as well as all the fishing line and spider webs used to position the mics. Lexan corner molding is used for the stands. It is manufactured by Tri-Guards Inc. and is available at your local Sherwin Williams store. The small 8-foot section sells for under $4.00. The stands can be cut to the desired height and mounted to or near the choir rail (as in Fig. 4). The mic itself can be mounted with hot-melt glue for permanent istallations, or taped to allow removal.

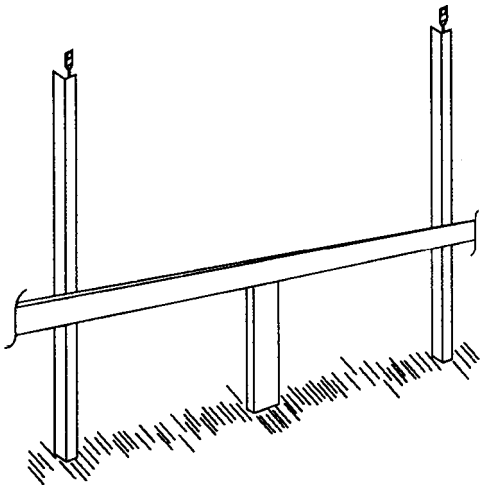


Fig. 4. GLMs on clear plastic stands.

"The GLM-200's can be removed and used in a similar fashion to mike a small orchestra or choir during Christian dramas and special music presentations. This allows the music director to put the choir where desired, and place the choir mics near the choir.

"The 200 can also be hidden in scenery and used for nearfield dialogue pickup. This extra flexibility, which is impossible with fixed hanging mics, coupled with its outstanding performance, makes the GLM-200 a clear winner for choirs.

"If for some reason the mics must be used hanging, such as for an exceptionally large choir, a coil of small stiff wire around the end of the cable and the base of the mic will allow proper orientation and positioning."

MIKING A PIANO WITH A GLM-100

More tips from Scott Carpenter, this time on using a GLM-100 to mike a piano:

"An esteemed colleague in Atalanta told us about the excellent results he had obtained from using an

omnidirectional mic to pick up the piano. Because of feedback concerns, we had never considered the use of an omni mic for live sound reinforcement. We try to be open-minded about innovation, so we tried it and were amazed at the results.

“The Crown GLM-100 was the mic we used. It had much more even pickup of the different tones than the cardioids we had been using. Experimentation with placement quickly yielded optimum placement for the different instruments we tested. The mic works well on uprights, baby grands and grands. The close placement coupled with the high output of a piano prevents problems with gain-before-feedback. Even in applications where the piano was run hot through speaker-cluster monitors, feedback was not a problem.

USING CM MICS FOR HANDHELD VOCALS

Finally, some more comments from Scott on Crown’s handheld microphones:

“The Crown CM-200 [now the CM-200A] is our microphone of choice for handheld vocals. Condenser vocal mics typically exhibit better frequency and transient response than dynamics, as well as better pattern control. The problem is that most condenser mics are cost-prohibitive. There are a few condensers with prices comparable to a good dynamic, available from manufacturers such as E.V., Audio Technica, AKG, and Crown.

CM-200

“Suffice it to say that after playing with all of them, we felt that the Crown CM-200 was best in terms of performance, durability, and price.

“Several churches have reinforced our opinion, since auditions of the CM-200 caused them to replace their exisiting mics with Crowns.

“In extremely high-level applications, the CM-310 Differoid [now the CM-310A] provides the highest level of gain-before-feedback we have heard from any mic anywhere.

HOW THE SASS PROVIDES GREAT STEREO

As we described last issue, the Crown SASS or Stereo Ambient Sampling System is a new stereo microphone that provides very accurate and pinpointed stereo imaging. Figures 5 and 6 show two models, SASS-P [now the SASS-P MKII] and SASS-B [discontinued] respectively. How do they work?

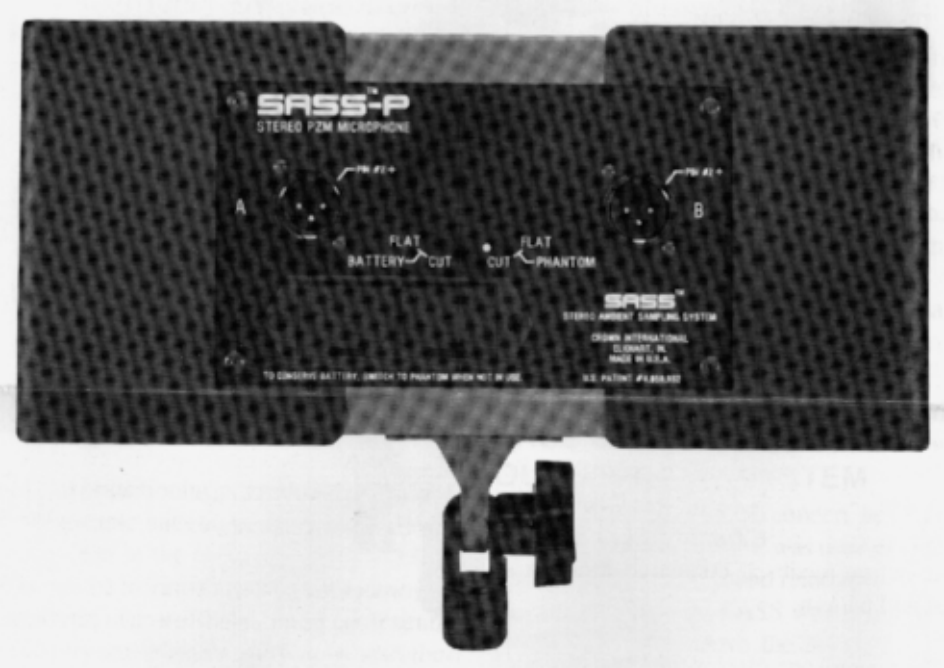


Fig. 5. SASS-P (rear).

Fig. 6. SASS-B (since discontinued).

At low frequencies, the SASS localizes images by arrival-time differences between channels. At high frequencies, it localizes images by amplitude differences between channels. This is very close to the mechanism used by the human hearing system, and for dummy-head recording.

Is there a theoretical basis for such a system? According to Gunther Theile of the I.R.T. (German broadcast organization), the interchannel differences needed for best stereo are head-related. A dummy head or similar system produces interchannel spectral and time differences, which Theile claims are optimum for stereo.

He proposes a new theory of localization: the association model. It suggests that, when listening to two stereo loudspeakers, we ignore our inieraural differences and instead use the speakers' interchannel differences to localize images. (Reference: "On the Stereophonic Imaging of Natural Spatial Perspective Via Loudspeakers:Theory", by Gunther Theile (Institut fur Rundfunktechnik), Perception of Reproduced Sound 1987, ISBN 87-982562-1-1.)

Since the SASS uses interchannel differences similar to those of the human head, it should provide optimal stereo, based on Theile's model of localization. According to listening tests described in Audio Engineering Society preprint 2788 (A-I), the controlled polar patterns and head-sized spacing between capsules create very well focused,natural stereo imaging with no hole-in-the-middle. The reproduction of the sound field is precise and realistic.

# # #

MIC MEMO

March, 1990
Bruce Bartlett, Editor

INVISIBLE MICS SAVE THE DAY

How do you record an old-fashioned wedding with no microphones in sight? Try PZMs on the floor!

I was asked to record a wedding service and wedding music played by acoustic instruments. But this wedding was different: It was an old-fashioned type with early-American music played by traditional acoustic instruments. The bride did not want to see high-tech recording equipment distracting from the old-time setting.

PZMs to the rescue. I was able to record all the wedding music in stereo, and the service itself, with two PZM-30FS [now PZM-30D] microphones on the floor.

Figure 1 shows a typical layout. The musicians — playing hammered dulcimer, whistle, fiddles, accordians, andboudhran — were on a 12' x 12' stage. The PZMs were placed about 3' apart on the floor in front of the musicians.

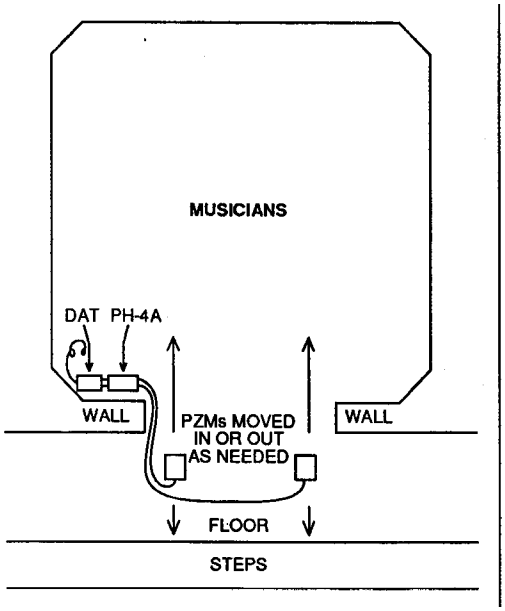


Fig. 1. PZMs recording wedding music.

I had to change mic positions quickly for different musical ensembles, but it was easy to pick up the PZMs and replace them in an intuitively correct spot.

For example, some of the music was performed by a singer who stood far in front of the other musicians. Since the PZMs were behind the singer, she could not be heard clearly in the recording. Before the next number, I put one PZM in front of the musicians, and one in front of the singer. This was a pickup of two mono sources rather than a stereo recording. It greatly improved the balance between the singer and the backup band.

The PZMs also picked up the wedding service clearly. The preacher, bride and groom stood near the PZMs at their feet.

I recorded on a Sony DAT, which came in handy because of its 2-hour nonstop recording time. I could leave the recorder unattended much of the time and join the wedding festivities.

The sound quality was lively and natural. The PZMs picked up just enough crowd noise to convey the feeling of celebration. All the audible spectrum was reproduced with realism, from the low thump of the Irish drum to the delicate tinkle of the hammered dulcimer.

Problems cropped up, of course. Before the wedding I taped the PZMs to the wall in front of the musicians as an alternative pickup. But I heard a buzz in the monitored signal. The culprit was a dimmer that faded the light over the stage. I couldn't locate the dimmer, but I noticed that the hum field was directional. When the mic cables were horizontal, the buzz stopped. So I finally laid the PZMs on the floor.

After the wedding, back at home, I ran the DAT tape through a mixing console to EQ it. In quiet passages, a little buzz remained which I removed with a 4 dB cut at 10 kHz. Several of the songs had no low-frequency content, so I rolled off the low end on these songs to reduce noise. The console signal fed a cassette deck to make cassette copies, which became a prized momento for the bride and groom.

I doubt that I could have done this recording as well - and as inconspicuously - without PZMs.

GLM VIOLIN MIKING

It's very difficult to reinforce a quiet instrument, such as a violin, without feedback. One fiddle player tried mounting a GLM-l00 omni and a GLM-200 hypercardioid next to an f-hole, but she had feedback problems onstage. The solution was to place a GLM-100 inside the violin (through the f-hole). Then there was plenty of gain-before-feedback.

STEREO LOCATION RECORDING WITH THE SASS

by Mike Billingsley (BACKTRACKS Location Recording)

Did you ever question the "real-ness" of soundtrack stereo?

There is a barebones method for lending extraordinary realism to a stereo production without having to string out a half-dozen talent mics,or putting a suitcase full of unidirectional mics in front of every instrument in the orchestra or every kid in the choir.

By adding one high-quality stereo microphone to your setup, with maybe some primary talent mics plus a 4-into-2 or 6-into-2 location portable mixer, a very different (and exciting) stereo soundtrack can be mixed live on location, with very little post-production sweetening required.

I'm not talking about the usual mid-side stereo or "stereo shotgun," which use only interchannel intensity differences to create the right-left image.

Instead, I have fortunately been able to make use of a new microphone which establishes sound location by time delays in addition to intensity differences - by spacing the two mic capsules about the width of a human head while baffling the space between them with acoustic absorbing foam.

The audible effect of this microphone, Crown International's SASS, is quite remarkable.

By itself, in the field, the SASS can record direct to a portable cassette, reel-to-reel, VTR or DAT machine for extraordinarily detailed stereo imaging. The spaced mic capsules allow the mind of the listener to accurately recreate the position of each cricket in a field, individual drops of rain on leaves in a forest, or each of many footsteps or murmurs in a midday crowd.

As a wild-sound recording microphone, or as an ambient mic to catch surrounding and background action, the SASS is unparalleled. I have used it to record hurricane surf, beaver ponds at dawn, traffic, fairs, restaurants, wind in forests, splashing bathers and rattling machinery.

The author collecting wild sounds of chain saws and skidders for the soundtrack of "Patrick's Walk."

In addition (as music recordists might expect) the SASS makes an excellent primary mic for the recording of symphonic concerts, choirs, percussion ensembles and acoustic jazz and folk - not to mention probably the best image of an acoustic piano going.

For scripted drama, sports, audience participation shows, and documentaries, the SASS establishes a true stereo presence around your primary action or characters - the acoustic "ambience" that surrounds the event on screen - which cannot be created any other way. A dozen or more panned mics through a giant console just fake it.

The technique is simple. As the SASS follows the camera angle, either by being panned with the camera by the soundperson or by being mounted on the camera, it gives a detailed, left-to-right image of the acoustic environment pictured.

All that remains is to pan any talent mics (and they may not be necessary) to the position in the stereo perspective that matches where they are heard by the SASS,and then to bring up that mic on the portable mixer until it is just audible enough to lend the needed clarity to speech.

In a pinch, a single talent mic (or even two) can be center-panned even if there is some on-camera movement. The SASS imaging is so precise that, within certain readily apparent limits, it will "pull" a mono-centered mic in the mix toward the side where it "hears" that talent position - giving the benefit of that additional mic without having to do "follow-panning."

This also works in a live concert situation for pop music. In this case, the portable mixer can be used to mix in the mono public-address feed (pre-EQ and post-fader) with the SASS stereo image - putting the SASS abovethe musicians on stage so there's a good spread from left to right. Again,just bring up the mono feed a tad to give the clarity needed for vocals and instrument solos.

All-in-all, the SASS is an incredibly versatile microphone, extremely useful to me in almost all my work. Its other virtues are a phenomenal low-end (extremely useful for sound effects recording), an even frequency response without obnoxious peaks, no proximity effect (the capsules are omnis) and, for its size, extremely light weight (slightly over a pound).

I use the SASS-P [now the SASS-P MKII] with on-board choice of batteries or phantom for all my location work, and the SASS-B [discontinued] (which acts as a frame for a pair of Bruel & Kjaer studio mics) for my remotes and studio work with musicians.

The SASS represents a trouble-free method to introduce breathtakingly real stereo for producers on a tight budget with a small crew, and allows some confidence in productions where, until now, there were usually only headaches.

Mike Billingsley is producer/owner at BACKTRACKS Location Recording in Monipelier, VT... specializing in location and remote recording of digital sound. BACKTRACKS has a digital post-production editing room and releases sound effects, samples, and acoustic music albums, under the Straight Arrow Recordings label.

LETTERS FROM CROWN MICROPHONE USERS

PZM chest mount for drum pickup

I mike my whole set of drums, indoors or out, with great results using only one PZM-30FS [now the PZM-30D].

I cut out a 7"x8" 16-gauge aluminum plate with one hole in each corner for attaching two 12" elastic straps (Fig. 2). One end of each strap is tied to the plate, stretched around the body or neck, and attached to the other side of the plate with a small hook made out of coat-hanger wire.

I duct-tape the PZM around the plate borders to secure it to the “chest mount.” This effectively puts the PZM right in the middle of things.

It clearly picks up all toms, snare, bass drum, and cymbals. In small clubs, or on large outdoor stages, one PZM beats ten regular mics for convenience any day in my book. Thanks!

Chris J. Altizer, Barboursville, West Virginia

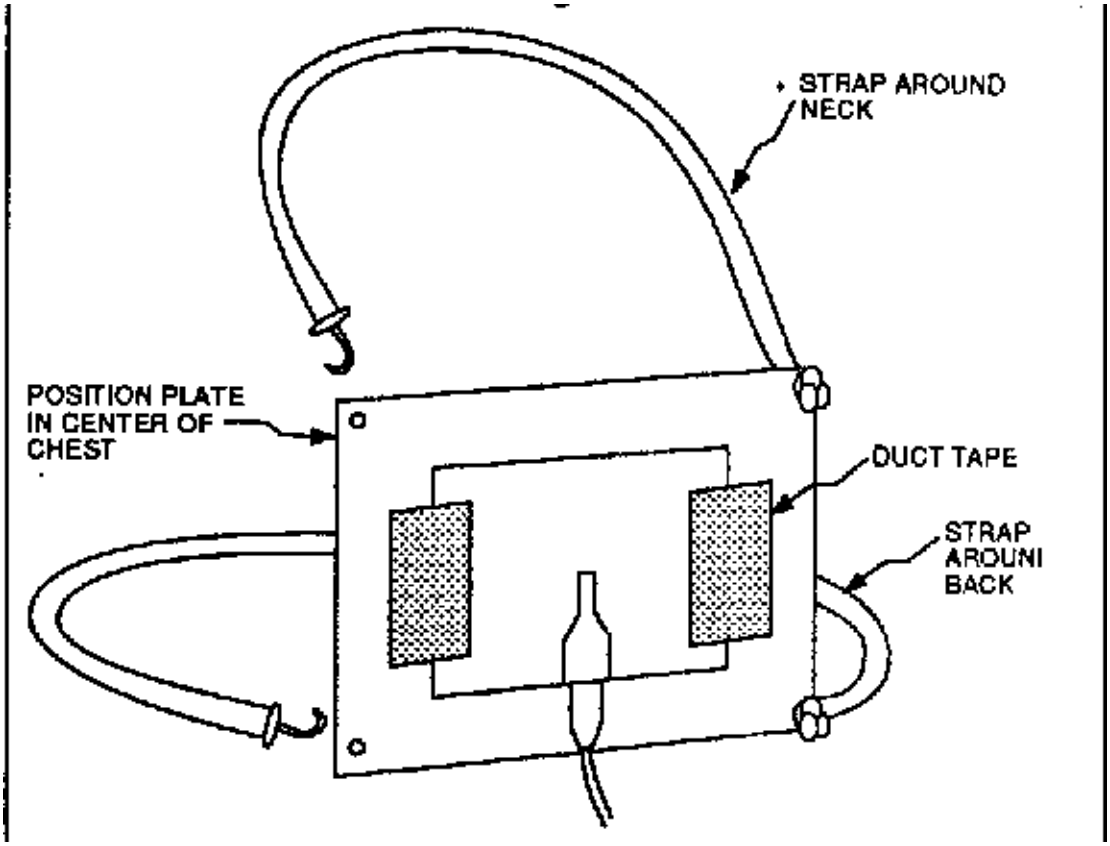


Fig. 2. PZM chest-plate mic.

# # #

MIC MEMO

June, 1990
Bruce Bartlett, Editor

GET A GREAT DRUM SOUND WITH THE SASS

At a recent recording session, the Crown SASS-P PZM stereo microphone helped to create an awesome drum sound.

The artist being recorded was Zoro, the exciting drummer with the Lenny Kravitz group (recently on tour with Tom Petty). Zoro and keyboardist Kenneth Crouch set up in a house near Crown to record segments for an upcoming SASS demo CD.

Zoro

Tom Edmonds, who has done sound for such acts as Meafloaf and Miami Sound Machine, was engineer/producer. Within five minutes, he came up with a sound that, he said, “would have taken hours in the studio to create.”

Zoro’s drums were placed in a brick-lined reverberant room in the home of Clay and Gerry Barclay. In addition to offering the use of their home for the session, they provided a Biamp mixer, Crown Micro-Tech 1200 power amp, and Community monitor speakers.

Edmonds mounted a SASS-P close to the drum set, in front, just above the snare-drum height and below the cymbals. He used an AKG D-112 in the kick. Edmonds also placed two SASS-P microphones about 25 feet out in the room, spread far left and right, for ambience pickup (Fig. 1).

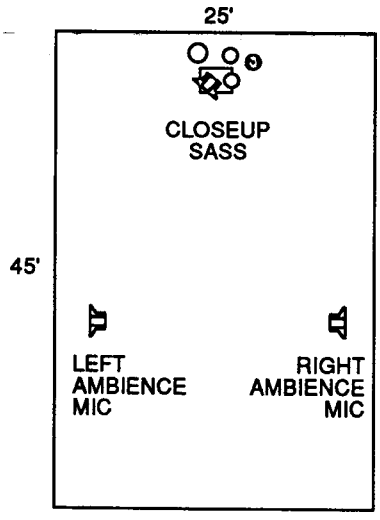


Fig. 1. Drum and ambience miking with SASS mics.

The result was a powerful sound, close but spacious. Stereo imaging and spread were outstanding, and transient attacks were clean. Zoro said that his drum and cymbals sounded more realistic with the SASS than with any recording he had heard before.

It was easy to vary the drum sound by bringing the ambience mics up or down. With just the close-up SASS on, the sound was tight and detailed. With the ambience mics up, the sound was “heavy metal.” All this with NO signal processors in use!

Ken Crouch expertly played a Clavinet and a Korg M-1, which were recorded direct. All the drum mics and keyboards were mixed live to a Sony DAT recorder.

Dan Fye of DAF Studios helped set up the drums and assisted with the session, while Zoro’s wife Andrea Tipon added good vibes.

Edmonds calls the SASS his “secret weapon.” He plans to take it on tour with Zoro and use it for future recording sessions. In fact, the SASS appeared on the Feb.28 Arsenio Hall show, where the Lenny Kravitz band played “Let Love Rule” and “Mr. Cab Driver.”

We suggest you try the SASS too, and see if you aren’t amazed at how easily you can get a clean, larger-than-life drum sound.

Zoro’s drum set miked with the SASS-P.

Zoro’s drum set miked with the SASS-P.

PZMs ON RECORDS

In a recording session with Jason and the Scorchers for A&M Records, engineer Justin Niebank placed a PZM behind the guitar amp cabinet. It was a strange placement, but he liked the sound.

For Siouxsie and the Banshees’ 10th LP, producer Mike Hedges used two PZMs on the ceiling over the drums.

Here’s an unusual miking setup: When recording the Pogues, engineer Chris Dickie tried a PZM on a flight case behind the drum kit, and said it “sounded great.”

Source: Feb. ’89 *Stage and Studio.*

HOW TO RECORD GROUP DISCUSSIONS

Dr. Cynthia Cohen, a researcher with a company called Verdictsuccess, uses a Sound Grabber to record group discussions. She videotapes them with a camera behind a one-way mirror, while the Sound Grabber picks up the conversation.

To ensure that the AA battery for the Sound Grabber will work, she replaces it just before each taping session.

At Crown we experimented with several placements of the Sound Grabber to pick up a person speaking in a small room. This is what you'll hear with the mic in different positions:

*On the floor: relatively bassy and boomy.

*On a table: less bassy.

*On a wall: clearest sound.

Apparently, the wall makes the Sound Grabber like a directional mic aiming at the person. If the Sound Grabber is on the floor, it's directional, but aims up - not at the person speaking. The wall placement gives a higher ratio of direct-to-reverberant sound, which aids clarity.

"S" sounds radiate straight ahead from the mouth, but not so well to the sides or rear. For this reason, it's important to place the mic so that it can "see" everyone's mouth. If the mic is behind a person's head, the voice becomes muffled or weak in "S" sounds.

To connect the microphone to a remote cameorder's mic jack, you need a microphone extension cable. Use oneconductor shielded mic cable with an 1/8" phone jack on one end and an 1/8" phone plug on the other.

How long can this cable be? At Crown we put a 60-foot extension cable on a Sound Grabber and recorded a person speaking. It sounded clean. The microphone impedance is fairly low - 1600 ohms - so you can add at least a 60-foot extension cable to the Sound Grabber without hum pickup or loss of clarity.

REPORT FROM GENERAL TELEVISION NETWORK ON THE SASS

Gary Pillon, a sound engineer at General Television Network, used a SASS-P [now the SASS-P MKII] to record a 45-piece vocal group and a pipe organ. The SASS was run through two Boulder low-noise mic preamps into a DAT. Gary compared the SASS to conventional condenser mics, and to a PZM wedge (2'x2' plex boundaries in a "V").

Pillon says that the SASS reproduction is "phenomenal," "uncanny," "musical-sounding," and "pleasant." He is "very, very impressed."

The SASS, he says, "is its own animal." It sounds neither like the wedge nor the conventional mics, but sounds more like the conventional mics than the wedge. It gives a close perspective but with plenty of room ambience... "Just right there. The wedge has a little more air, but the SASS has a better low end."

According to Pillon, SASS imaging is excellent, and gives the impression of a three-dimensional sound space. He even hears a sense of front/back (sound sources behind the head) when wearing headphones.

He likes the frequency balance. "It has plenty of bottom... it's nice to hear that without resorting to EQ." The noise floor is sufficiently low for his work. Unlike with some other microphones, it was easy to hear an absolute polarity reversal with the SASS.

He also likes how the microphone is lightweight, and noticed no pickup of hand vibration through the hand grip.

Pillon plans to make a CD of this recording.

RECORDING BONES WEST WITH THE SASS

At the recent NAMM show in Anaheim Crown engineers used a SASS-P [now the SASS-P MKII] to record the big band, Bones West. As the photos show, the mic was about 8 feet high and 20 feet back. The result was a realistic recording of the event. The kick-drum reproduction was particulary deep and impressive.

SASS recording Bones West. Mic Dept. manager Tom Lininger monitors the recording.

CONQUERING FEEDBACK WHEN MIKING A CONFERENCE

A Crown microphone user had feedback problems with PZMs when picking up a conference. As Figure2 shows, the conference tables were arranged in a “U” about 28 feet wide. Sixteen PZM-2ORG [now PZM-20R] microphones were mounted in the ceiling every 4 1/2 feet apart over the tables. These mics were amplified through 20 ceiling speakers.

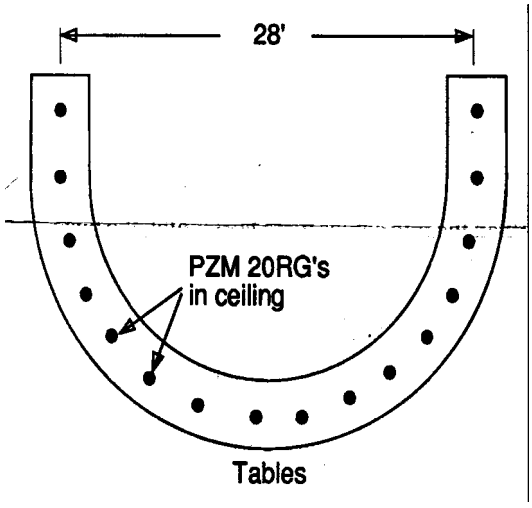


Fig. 2. PZMs over U-shaped table.

Gain-before-feedback was inadequate for several reasons:

*Too many mics were used. The more open mics, the poorer the gain-before-feedback.

*The mics were too far from the talkers. The farther the mics, the poorer the gain-before-feedback.

*The 2ORG is omnidirectional. An omnidirectional mic has poorer gain-before-feedback than a cardioid mic.

*The ceiling speakers were close to the microphones. The closer a speaker is to a mic, the poorer the gain-before-feedback.

So, we recommended that the user follow these suggestions:

*Cut the number of mics in half.

*Use an automatic mixer.

*Put the mics on the table.

*Use directional boundary mics (PCC-160).

We also suggested that the user configure the automatic mixer so that, when a mic gated on, loudspeakers near that mic were made to gate off.

When all these suggestions were followed, the gain-before-feedback improved dramatically.

MEATLOAF'S SOUND ENGINEER ON CROWN MICS

Jim Stanforth, sound engineer on the Meafloaf tour, has this to say about Crown microphones:"CM-100: [discontinued] Excellent handling noise (or lack thereof). Really smooth sounding, although we missed and had to EQ in proximity effect [up-close bass boost] found in cardioids. Monitor levels were a bit of a problem with wedges.

"GLM-100: Marvelous in percussion such as octobans, timbales, single-head toms (from inside). Heard a bit too much reflection from front head on kick drums. Sounded like a PZM-31S placed in the bottom (or anywhere on the shell) of the drum.

"GLM-200: Fantastic!! Great success in kick drum (very smooth and clean). Worked well on the whole drum kit. The least EQ ever used on a kick drum. Produced a solid, clean sound.

See Figure 3 below for Jim's kick-drum miking setup. Although the GLM-200 worked well in this application, readers should note that the GLM-100 has a better low-frequency response and higher overload capability than the GLM-200. Try them both on kick drum -Ed.

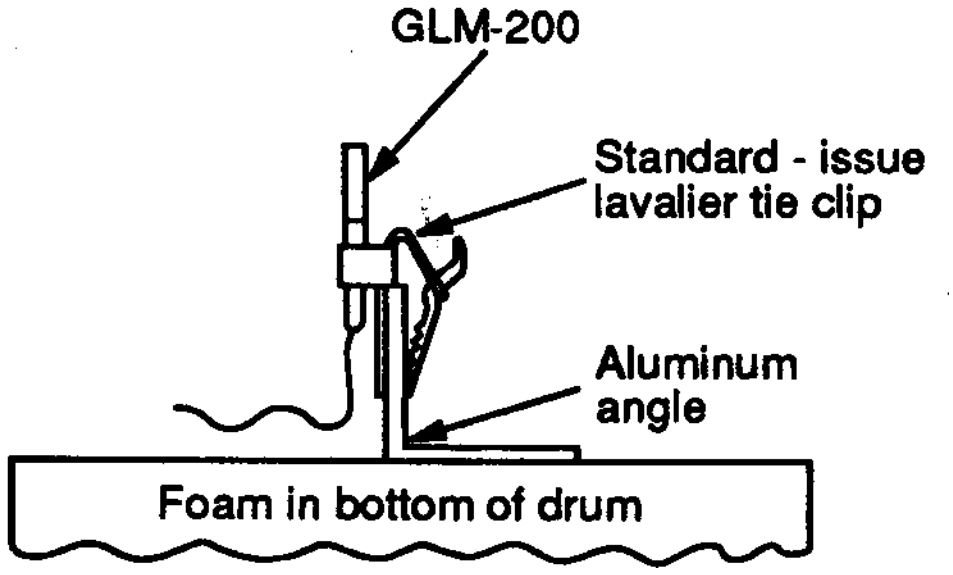


Fig. 3. Mount for GLM-200 miking a kick drum.

PZMs FOR AMBIENCE AND INTERVIEWS

At a taping of a television concert in Sudan, sound engineer Ed Learned placed a Crown PZM on a "flat" or scenic partition behind the Jay Haggard Quintet to pick up ambience.

Learned reports, "After the music was done, we cut a short interview with Jay. I miked the interview with my PZM placed on the floor in front of the seated subjects. It worked fine, with the added advantage of being invisible to the camera. PZMs were new to Sudan; the engineers were quite amazed by their quality and versatility."

Source: Jan/Feb '90 *db Magazine.*

GLMs AT THE GRAMMYS

At the Grammy Awards on November 24, 1989, sax player Clarence Clemens used a GLM-100 in a GLM-HM Horn Mount to pick up his saxophone. He is a member of the band, Living Legends.

AMBIENT MICS INCREASE REALISM

Scott Carpenter, a church sound consultant in Huntsville, Alabama, has this to say about using Crown microphones for ambient miking:

"Recordings and remote feeds of a worship service sound much more realistic when a couple of ambient mics are mixed into them. There are a number of sounds during a service, such as congregational singing, that simply are not picked up through the reinforcement mics.

"Ambient mics give the listener a much better sense of 'being there.' The optimum mics depend on the size and acoustics of the room, but some experimentation with GLM 100s and 200s, PZMs, and the PCC-160 will quickly yield good results."

GLM-200 CHURCH APPLICATIONS

Scott Carpenter has other comments on Crown microphones:

"In our opinion, the GLM-200 is the workhorse of the Crown line. In churches with instruments on stage, it is completely versatile.

*It can be taped facing the head of each drum in a kit, and extended over a kit for cymbals.

*It can be taped to the face of a guitar amplifier with excellent results.

*A pair can be placed on either side of the Leslie rotating speaker in a Hammond B-3. This stereo pickup will produce exhilarating results if the house system is a stereo split cluster type. You can pick up the pedals with a direct box.

*They also work well taped to a stand for acoustic-guitar pickup.

*You can stick one on the wall in the baptistry and pick up not only the words, but also the water splashing.

*They can be easily taped to wind instruments and have the capacity to reproduce their high output without distortion.

"We normally specify extra GLM-200s in our systems, and are pleased to see that they are rarely on the shelf.

"You can place one GLM-100 omni inside an upright piano, close the lid, and pick up all the notes without feedback."

RECORDING A BRASS QUARTET WITH GLMs

Recently a local brass quartet asked to be recorded for an audition tape. I attached a GLM-HM Horn Mount [discontinued] to the bell of each instrument: first trumpet, second trumpet, French horn, and baritone. Onto each Horn Mount was clipped a GLM-100 omni mini mic. Each GLM was placed a little

off-axis of each horn, and as far from the bell as the Horn Mount would allow.

The performers liked this style of miking because they could move around. They didn't have to keep their instruments aimed at a microphone.

The resulting sound from such close miking was a little bright and thin. To compensate, I applied this equalization:

Trumpets: +3 dB at 175 Hz, -3 dB at 3 kHz and 10 kHz.

Baritone: +3 dB at 100 Hz, -3 dB at 10 kHz.

French horn: -12 dB at 10 kHz (to reduce breath noise).

LETTERS FROM CROWN MICROPHONE USERS

Preventing phase cancellations with the SASS

I'm using a SASS-P [now the SASS-P MKII] to pick up a performance of actors on stage. Even though the SASS uses PZMs, I'm hearing phase cancellations from floor reflections. How can I prevent this?

Reply:

Try placing the SASS even with the stage floor, out front, as shown in Fig. 4. In this position, the microphone can "hear" the sound sources, but cannot hear any sound reflections from the stage.

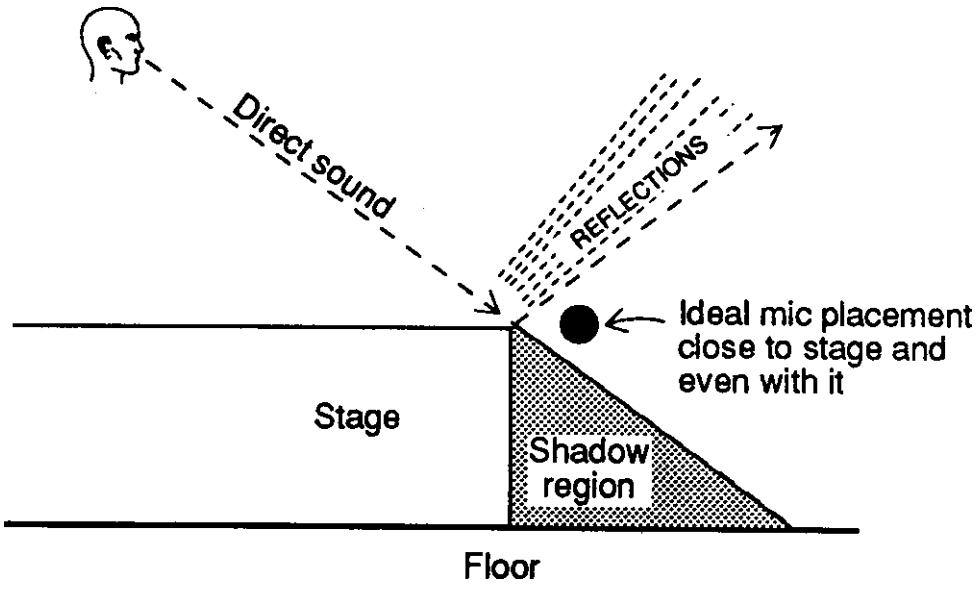


Fig. 4. SASS placement near stage edge.

If the microphone is too low, below the stage floor level, it can't see the actors so the sound may be dull. If the mic is too high, it will pick up floor reflections that can cause phase cancellations.

Any PZM eliminates phase cancellations from the boundary it is nearest to, but not from distant boundaries. If a PZM is raised above a floor, you need to place it carefully to prevent phase interference from the floor reflections.

Ken Wahrenbrock update

Ken Wahrenbrock developed the first commercial PZM and invented several PZM multiple-boundary arrays. This recent letter from Ken shows that he is still actively promotmg the PZM concept:

"I had to do a quickie recording of a theater organ concert for a young blind organist and used my SONY TCD-5 with a stereo PZM like the one Gary Pillon made. [This microphone is made of two small plexiglass pyramids angled apart, with PZM capsules at the apexes, ear spaced. See the *Crown*

Boundary Microphone Application Guide for details, available free from Crown - Ed.] I recorded from about 3/4 back in the auditorium at San Gabriel and got some good cassettes with surprisingly good bass for the small boundaries.

“La Mirada Theater is using Crown PCC-160s [supercardioid boundary mics] across the stage for a play.

“Several junior-high and high schools around this area are using PZM 2-1/2 x 12" units with PZM-6S [now PZM-6D] cantilevers. [A PZM 2-1/2 is a V-shaped plexiglass boundary that sits on the floor. The PZM capsule is mounted in the apex of the 135-degree angle. -Ed.]

“I’m still finding that the 2260s [plexiglass wedge, 22" long, 60-degree angle] are providing pulpit and lectern coverage at churches around here. The staff likes the freedom from having to [speak into] a mic on a gooseneck.

“Next June at the Annual Conference in Redlands, we are going to use two of the new Crown podium mics [LM-200] [now the LM-201] for the lectern and Bishop. The video people want a smaller [microphone] than my redundant PZM hand-held with 2 1/2"-diameter heads. Wish I could use 2260s, but the parameters won’t allow it and give me enough gain-before-feedback in the reverberant house.

“The *Mic Memo* continues to be an excellent update on miking, with the practical input from those who are using them.”

NOW AVAILABLE: CROWN MICROPHONE SLIDE RULE

If there’s any microphone spec that’s confusing, it’s sensitivity. How do you compare two microphones rated in different ways? One spec might be in dBV per microbar; another might be in millivolts per pascal.

There’s help. Crown is offering a low-cost, fiberboard slide rule that lets you easily convert from one microphone-sensitivity specification to another. It also helps you calculate the microphone output voltage for a given input sound pressure level.

All the sensitivity ratings are here: open-circuit sensitivity, power sensitivity, and EIA rating. If you know one sensitivity spec and the microphone impedance, the slide rule calculates the rest.

Attractive and easy to use, the slide rule also includes a polar pattern chart which describes the characteristics of each pattern.

You can order the Crown Microphone Sensitivity Slide Rule for $5.00 (check or money order) directly from Crown Intemational, P.O. Box 1000, Elkhart, IN 46515-1000.

# # #

MIC MEMO

September, 1990
Bruce Bartlett, Editor

GENTLEMEN, START YOUR ENGINES!

Mrs. Hulman starting the race.

Those famous words that began the Indy 500 auto race were heard over TV, radio, and the track P.A. system — thanks to a unique Crown microphone with three mic capsules in one grille. Mrs. Holman, owner of the Indianapolis 500 Motor Speedway, was picked up by this microphone when she started the race.

Crown engineers modified a CM-200 microphone so that three miniature mic capsules fit inside the grille. Each of these capsules fed a separate electronics interface. The three interfaces had isolated outputs, preventing ground loops between the three feeds.

One feed went to ABC Sports for their TV broadcast of the Indianapolis 500 auto race; another feed went to the Indy 500 Motor Speedway radio network, and a third went to the track P.A. system.

CM-230 Tridundant microphone in use.

Why not use three microphones instead? The speedway's technical people wanted a cleaner television shot of Mrs. Holman. Putting three mic capsules in a single microphone was the solution. Three separate capsules, with their electronics, made a highly reliable "tridundant" system. One capsule's signal went to an Altec mixer, then to a distribution amplifier providing feeds for other users.

Crown microphones produced audio for several other applications at the race:

*The track P.A. annoucer used a CM-310 Differoid. He sat in the stands while announcing, and needed a microphone that didn't feed back or pick up leakage from the race track.

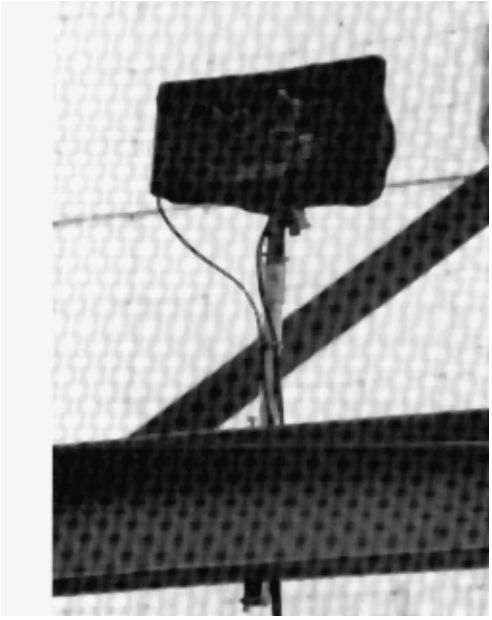
*Two PZMs in plexiglass wedges picked up the Purdue Band playing "Back Home in Indiana."

*A PCC-160 on the pavement picked up the race cars starting and driving away. This mic fed the Motor Speedway radio network.

*A PZM on the track wall picked up the cars for ABC Sports.

*The person who introduced Mrs. Holman used a CM-200 cardioid condenser microphone, as did Jim Nabors and others when they sang.

*ABC Sports hung a SASS-P PZM stereo microphone over the audience to pick up the race in stereo.



SASS clamped to fence.

*The Motor Speedway radio network used a SASS-P for the same purpose. This microphone was mounted on a fence rail using an adapter built by John Royer, head of audio for the race track. His adapter matched the 5/8"-27 thread in the SASS swivel mount to a 3/4" pipe. The pipe was clamped to the fence by two angle irons.

*The radio network hung a SASS-P over the finish line.

Other Crown products contributed to audio at the race. Four Crown Macro-Tech 10,000 amplifiers powered the track P.A. system. This is the biggest P.A. in the world, employing 460 speakers. Since each amplifier carried one-fourth the load, the amplifiers were practically "loafing" while in use.

A Crown IQ-2000 System connected to a MacIntosh computer was used to monitor the MT-10K's and three Comm-Tech CT-400's. The CT-400's provided P.A. in the new Tower Terrace Suites, 1/4 mile away from the computer. The IQ System was used to set input gains, and to monitor output levels and temperature of all the amplifiers.

We're proud that the Indianapolis 500 Motor Speedway relies exclusively on Crown for microphones and amplification. We'll be back the next time those intrepid gentlemen start their engines.

SASS USED IN HUNT FOR RED OCTOBER

Check out the Sept. ’90 of *Mix* magazine for an article on audio for the movie *Hunt for Red October*. A SASS-P up sounds inside the submarine interior which added greatly to the realism of the film. More in the next issue!

PZM WIRING

Many users have PZMs that they want to connect to a wireless transmitter. The table describes how to connect each model.

Old PZMs

30GP, 31FS:

Connect pin 2 or orange to audio in.

Connect pin 3 or red to B+.

Connect pin or grey to ground.

6LP, 6FS:

Connect pin 2 or white to audio in.

Connect pin 3 or red to B+.

Connect pin 1 or black and shield to ground.

New PZMs

First unsolder the leads from the printed circuit board.

30R, 30F:

Connect orange to audio in.

Connect red to B+.

Connect grey to ground.

6R, 6F:

Connect white to audio in.

Connect red to B+.

Connect shield to ground.

[The current PZM models, PZM-30D and PZM-6D, need phantom power so they can’t be connected directly to a transmitter.]

LIST OF SASS USERS EXPANDS

The University of Michigan has purchased a SASS-P PZM Stereo Microphone for making stereo recordings of the Wolverine Marching Band.

Three reviews of the SASS, all highly favorable, can be found in the first issue of EQ magazine, April 1990 Mix, and April 1990 Electronic Musician.

MIKING A FLUTE WITH A GLM-100/E

Monte Stewart, a flutist in Modesto, California, uses a broom clip from a hardware store as a flute clip for a GLM-100/E mini mic. He glues felt inside the broom clip to prevent marring the flute’s finish, and traps the mic cable under the clip.

THUNDERING MICROPHONES, BATMAN!

VROOM! In the movie Days of Thunder starring Tom Cruise, Crown PZM and SASS mics captured sound effects in the racecar scenes.

A SASS-P inside the car picked up ambience in stereo. One PZM-30R was mounted inside the

engine compartment, and another was mounted outside the car to pick up the slipstream and passing cars.

In spite of the high sound pressure levels, the mics provided clean sound with thunderous low frequencies.

NEW PRODUCTS

Newly introduced from Crown is the LM-200a, a lower-noise version of the LM-200 Lectern Microphone. The LM-200a is nearly identical in performance and appearance to the LM-200, yet has several dB less self-noise. Another model, LM-190a, is the same but 3 inches shorter.

LM-200a

The *Crown Microphone Application Guide* and the *Crown Boundary Mic Application Guide* suggest how to choose and use Crown microphones effectively. You'll find suggestions for almost any miking application, from a conference to a full orchestra. The Boundary Guide also explains how boundaries and boundary microphones work. Both guides are available free from Crown.

The SASS-P has been upgraded with new hum-shielded transformers.

The GLM-CH is a choir hanger for GLM microphones. This wire-frame accessory makes it easy to hang a GLM over a choir with correct orientation. You can thread fishline through the tiny pipe or crossbar on the hanger, and attach the line to the sidewalls. This guy wire stabilizes the microphones.

The PZM line has been trimmed: All the PZM models are now available in black only, and come in colorful, contemporary packaging. The list below compares the old and new model numbers:

OLD……..NEW

PZM-30RB, 30RG ……..PZM-30R……..[1998: PZM-30D]

PZM-30FS …… .PZM-30F……..[1998: PZM-30D]

PZM-6RB, 6RG……PZM-6R…….[1998: PZM-6D]

PZM-6FS……..PZM-6F…….[1998: PZM-6D]

INCONSPICUOUS, NATURAL CHOIR MIKING

Need to mike a church choir invisibly? Try the new Crown CM-30. It's a tiny, supercardioid condenser microphone on a 30-foot cable. The CM-30 is precisely designed for inconspicuous overhead miking of

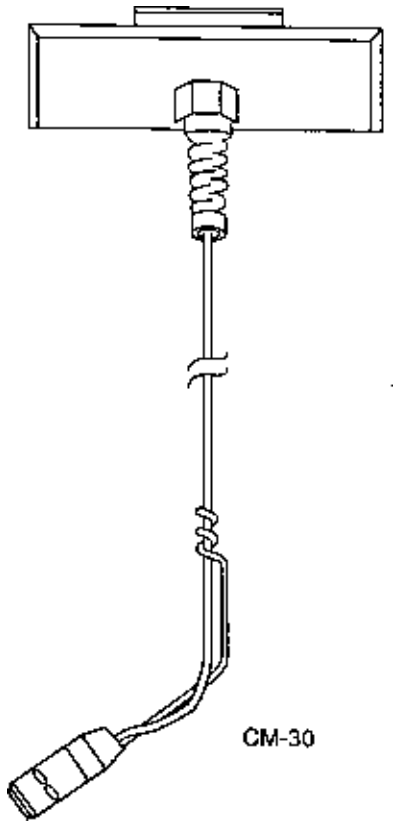
*Choirs

*Conference tables

*Theater stages

*Orchestra sections

*Audience reaction



CM-30

Installation is hassle-free, thanks to a unique ceiling-mounted electronics interface. This is a small circuit board on a plate which mounts in a standard electrical box on the ceiling. The interface has two functions: (1) It converts phantom power to a lower voltage for the microphone capsule, and (2) it converts the medium-impedance unbalanced mic signal to low-Z balanced.

The interface is easy to install, and no connectors are needed. Simply attach the mic cable to the interface by screw terminals, and run another mic cable from the interface output screw terminals to your mixer. Your mixer provides phantom power for the microphone.

Choir miking

You can pick up a choir with no microphones in sight. Field-tested mic placements for choir sound reinforcement are described in the data sheet.

When you place a microphone over a choir, the mic misses the sibilant sounds which project forward. So a mic with a flat response can sound dull when placed overhead. To compensate for this, the CM-30 has an emphasized high-frequency response. The result is a clear, natural sound.

Mic cables can lose their orientation as the mic cable uncoils over time, or the mics can swing back and forth in a breeze. You need a way to hold the mics in position. For this purpose, the CM-30 has a unique built-in hanger which comes with a tiny crossbar or pipe. You thread a fish line or black thread through this pipe and attach the line to the side walls. This guy wire keeps the capsules oriented straight ahead.

The hanger inserts into the mic housing and is held in place by a set screw. There's no bulky, distracting coil of wire around the mic.

Conference table

Suppose you want to pick up a conference-table discussion, but your client doesn't want any microphones on the table. Just hang one or more CM-30s over the table.

Theater stage miking

Use the CM-30 to pick up dialog that the front mics don't get. Hang it overhead by its 30-foot cable. It's so small, it's invisible to the audience, so you can hang it close to the actors. (Just watch out for sets!)

You can hang the CM-30 straight down over the actors' heads, or hang it in front of the actors at an angle to better pick up sibilant sounds.

Orchestra and audience

If you record live concerts, the CM-30 lets you spot-mike sections of the ensemble without distracting from the performance. The microphone also works great for miking audience reaction.

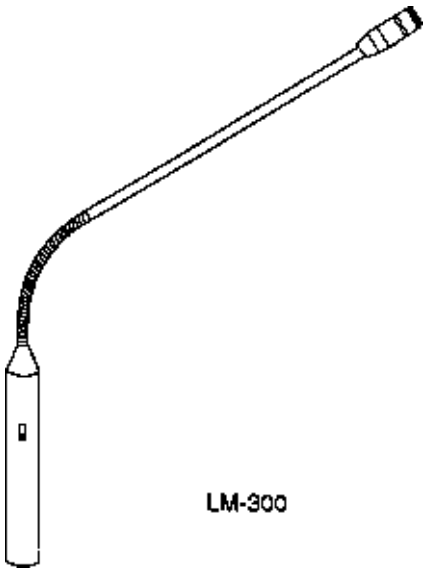
Specs

The CM-30 offers lower self-noise and deeper low-frequency response than the GLM-200 mini hypercardioid microphone. Self-noise in the CM-30 is only 28 dBA, while frequency response is smooth from 40 Hz to 20 kHz. The CM-30's supercardioid polar pattern rejects feedback and background noise.

Altogether, it's a top-performing mic that doesn't get in the way.

ELEGANT LECTERN MIKING

If you need a quiet gooseneck microphone that looks great, the new Crown LM-300 is for you [now the LM-301A.] It's a sleek, black miniature gooseneck mic designed for use on lecterns, pulpits, judicial benches, and witness stands.



LM-300

This streamlined, classy-looking model flexes only near its base. Most of the gooseneck arm is a slender pipe, so the mic retains its elegant shape after repeated adjustments. Electronics are self-contained in a slender cylinder at the end of the gooseneck arm.

Thanks to its supercardioid pickup pattern, the LM-300 greatly reduces feedback, and its flat response assures natural-sounding reproduction of the voice.

We've included a foam pop filter to lessen breath pops. You can purchase an optional metal grille which locks on permanently. Another optional accessory is the LM-300SM lockable shock mount, which reduces table thumps, handling noise, and theft.

The LM-300 is an economical alternative to the Crown LM-200a, which uses a ball-and-socket swivel mount.

PREVENT GLM CLIPPING

A Crown microphone user noted a clipping distortion problem with GLM-100/E microphones when they were used on horns, and powered by a Nady 650 wireless transmitter. Here's one solution:

The GLM-100/E should connect to the high-impedance transmitter input. If the mic is overdriving the transmitter, connect a resistive pad between the mic and transmitter, such as shown in Figure 1.

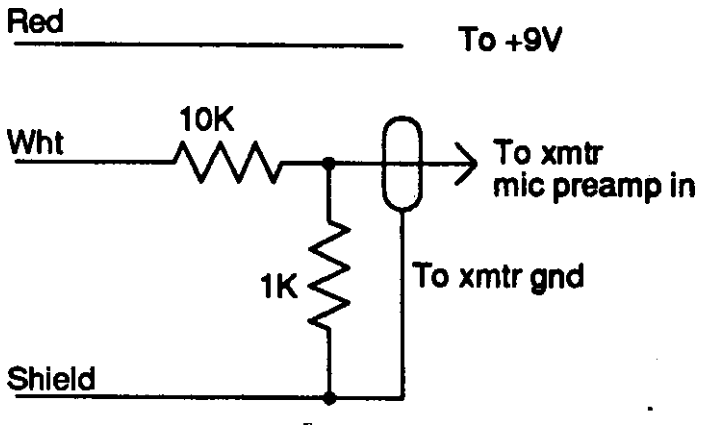


Fig. 1. GLM pad.

According to the GLM-100/E data sheet, the GLM-100/E can handle 120 dB SPL with a unipolar supply such as provided by the Nady transmitter. But according to Crown's measurements, a trumpet can produce up to 154 dB SPL at 6 inches. So it's likely that the trumpet is clipping the GLM.

However, with a bipolar supply, the GLM-100/E can handle 150 dB SPL at 3% THD. If the horn player doesn't play extremely loudly, the GLM-100/E should reproduce the signal without clipping. (In fact, the Mic Memo editor has recorded a brass quartet with GLM-100's attached to the bells of the horns, with no audible distortion.)

If you can tolerate using an outboard box for bipolar powering, you should be able to pick up the horns without distortion. The powering circuit is shown in Figure 2.

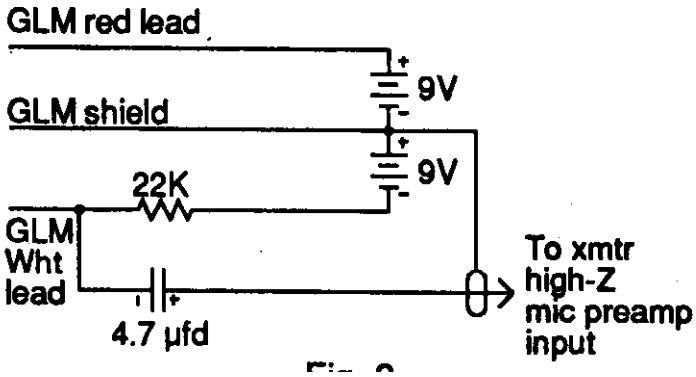


Fig. 2. Bipolar powering for GLM.

LETTERS FROM CROWN MICROPHONE USERS

Miking a discussion group

I have to pick up the sound of a roomful of people. They occupy several desks in an 80'foot square room with two people at each desk. The ceiling is 20' high. Any ideas?

Dan Kahn, Highland Park, IL

Reply:

Try these suggestions, Dan: For maximum clarity, use one PCC-160 per desk into an automatic mic mixer. Or use one PCC-200 per desk into an ordinary mic mixer. The PCC mics are supercardioid

surface-mounted microphones, and provide extraordinary clarity.

If budget is a problem, use four PZM-6R or PZM-30R microphones on the ceiling as shown in Fig. 3. This should provide even coverage of the area. The PZMs at a distance will pick up more room reverberation than the closeup PCCs, but may be quite adequate if the room isn't too live.

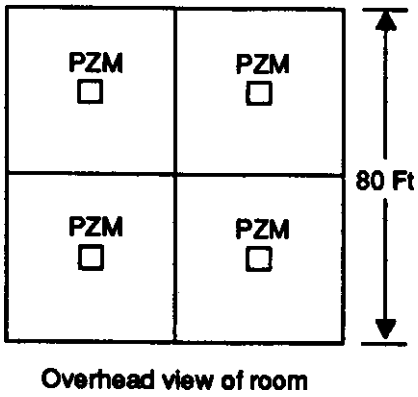


Fig. 3. PZM mics on ceiling.

PZM stage miking

I'm miking a theater stage with three PZMs, but the sound quality and gain are not too good. What do you recommend?

Luella Latozke, Neche, ND

I am interested in using my Crown PZMs for sound reinforcement of amateur musical theatre in a 600 seat proscenium arch theatre.

My problem always seems to be that the "small" voices on stage get lost in the fly tower while the orchestra in the pit in front of the proscenium is loud.

Steve Tinkler, Technical Director, Keyano Theatre, Alberta, Canada

Reply:

PZMs pick up in all directions, and that may be your problem. You need to make them pick up only in front (where the actors are) and reject sound from the rear. This will result in a clearer sound with less feedback.

One solution is to make a corner boundary assembly, first suggested by PZM pioneer Ken Wahrenbrock:

1. For each PZM in use, you need three sheets of clear plexiglass or lucite, 1/4" thick and 18 inches square.

2. Use L-brackets or cyanacrylate adhesive (Super Glue[tm]) to assemble the sheets into a corner form.

3. Remove the PZM cantilever (mic-capsule holder) from its plate, and mount the front or nose of the cantilever tightly into the corner. Maintain the small air gap under the mic capsule.

4. Use as few of these assemblies as possible (one to three). Place them across the front of the stage floor about 1 foot from the edge.

Also, turn up only the microphone nearest the person talking. Every time you double the number of open mics, you decrease gain-before-feedback by 3 dB. The more mics you have on, the more feedback and the less clarity you'll have.

The best solution is to replace each PZM with a Crown PCC-160. This is like a directional PZM but needs no plexiglass panels. It has a special mic capsule that picks up from the front but rejects sounds from the rear.

# # #

MIC MEMO
Winter, 1990
Bruce Bartlett, Editor

UP WITH PEOPLE TROUPE RELIES ON CROWN MICS

Up With People is the world-famed ensemble of young international performers who inspire listeners with hope for humanity. The group performed its 25th anniversary special in the new Denver Convention Center with many dignitaries attending.

Weeks before the performance, Jens Kirkeby, chief sound engineer for Up With People, asked Crown for recommendations on miking the group. He needed to mike two choirs, lead vocalists, and acoustic guitars; and to pick up the audience for a television feed.

Crown and Kirkeby worked out these microphone techniques:

To pick up audience reaction, one SASS stereo mic was hung 30 feet over the audience.

Crown CM-200 cardioid condenser mics (Figure 1) were used for handheld vocals. To prevent breath popping, a foam windscreen was placed on each microphone. Singers held the mics with lips touching the foam windscreen to maximize gain-before-feedback. Kirkeby compressed the lead vocals.

Fig. 1. Crown CM-200

CM-200s were also used for on-air television reports, for audio and video recording and for guest speakers.

To pick up the front rows of each choir, Kirkeby placed two CM-200s on stands on the floor in front. He placed two more on the choir risers to pick up the back rows. Each mic pair was about 10 feet apart (see Figure 2). To compensate for the mic's bass rolloff caused by this distant miking, Kirkeby boosted the bass a few dB on his mixer.

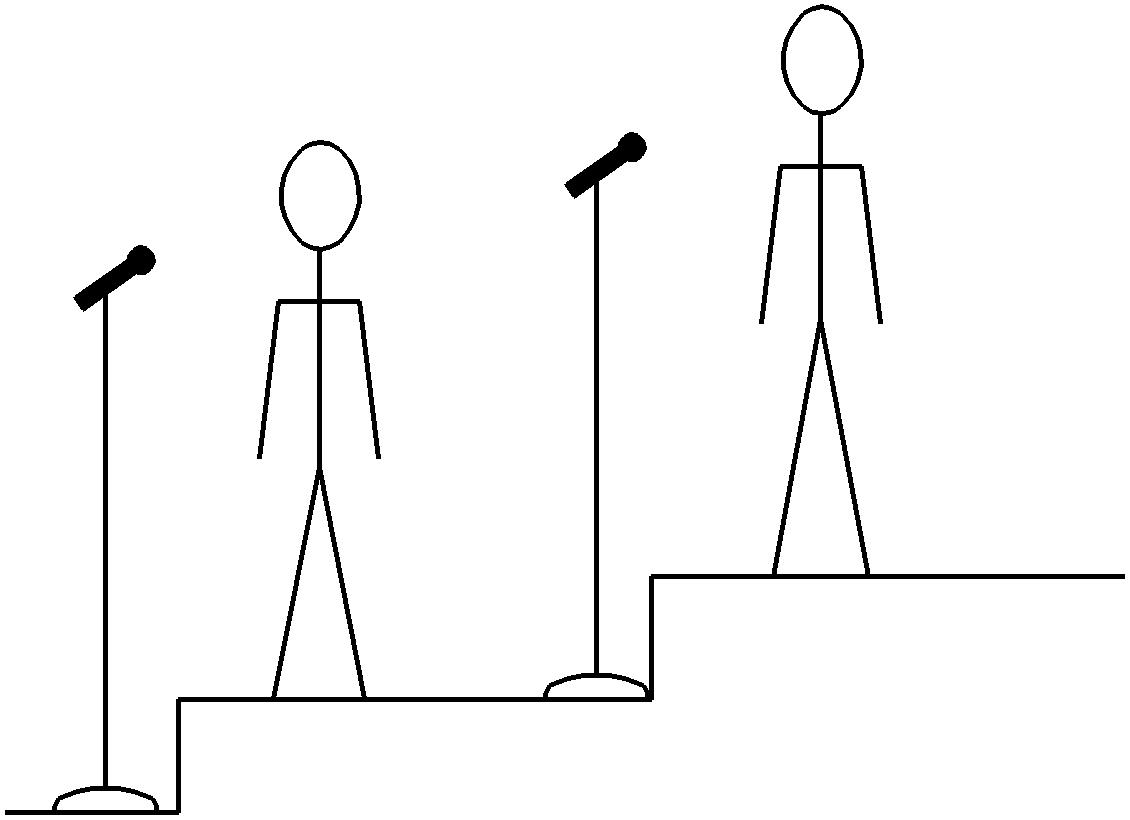


Fig. 2. Choir miking for Up With People.

GLM-100s were mounted on acoustic guitars, while an LM-200 covered guest speakers at the lectern.

After trying the Crown mics at the concerts, Jens had this to say:

"The CM-200 was a very natural and good-sounding microphone both for vocals and instruments. It fit right into our application. The SASS, LM-200 and GLM-100 were great additions to our show and had a big effect on the end results."

THE PZM CHALLENGE REVIVED!

We're bringing back the PZM Challenge, a contest to determine the best recordings made using PZMs and SASS microphones. If you have any great-sounding, creative recordings made with Crown microphones, you could be a prize winner. More on the Challenge in the next issue!

SASS DOCUMENTED IN THE AES JOURNAL

If you'd like to better understand the principles behind the SASS stereo microphone — how it works and how to use it — two papers go into great detail on these subjects. You can find them in the July/August 1990 issue of the *Journal of the Audio Engineering* Society.

The titles are "An Improved Stereo Microphone Array Using Boundary Technology: Theoretical Aspects," and "Practical Field Recording Applications: An Improved Stereo Microphone Array Using Boundary Technology" by Bruce Bartlett and Michael Billingsley.

Author Billingsley presented another paper on SASS applications at the September 1990 Convention of the Audio Engineering Society. It was titled "Application of a New Near-Coincident Stereo Microphone Array for Soundtrack, Special Effects and Ambience Recording on Location."

It can be ordered for a nominal fee from Mike Billingsley, 5 School Avenue, Montpelier, Vermont 05602. Billingsley's paper offers many practical tips on using the SASS for non-musical applications.

UNIQUE ORCHESTRA MIKING

Ken Kuespert, Director of Field Operations with TPC Production Services, came up with a novel way to mike an orchestra.

To pick up the sound of an orchestra outdoors, he placed two PCC-160 supercardioid boundary mics on 2’x3' plexiglass panels on the grass. The mics were 10' back from the ensemble.

Ken reports that the sound quality was surprisingly good.

IMPROVE GAIN-BEFORE-FEEDBACK AT CONFERENCES

Imagine this difficult sound-reinforcement scenario: you want to pick up people speaking at a conference table and amplify their voices through overhead loudspeakers.

The Spring 1990 issue of *Syn Aud Con Newsletter* showed a novel way of coping with this problem. As shown in Figure 3, two loudspeakers are mounted in a V-shaped baffle over the table and are wired in opposite polarity. A PZM is placed on the table exactly between the two speakers.

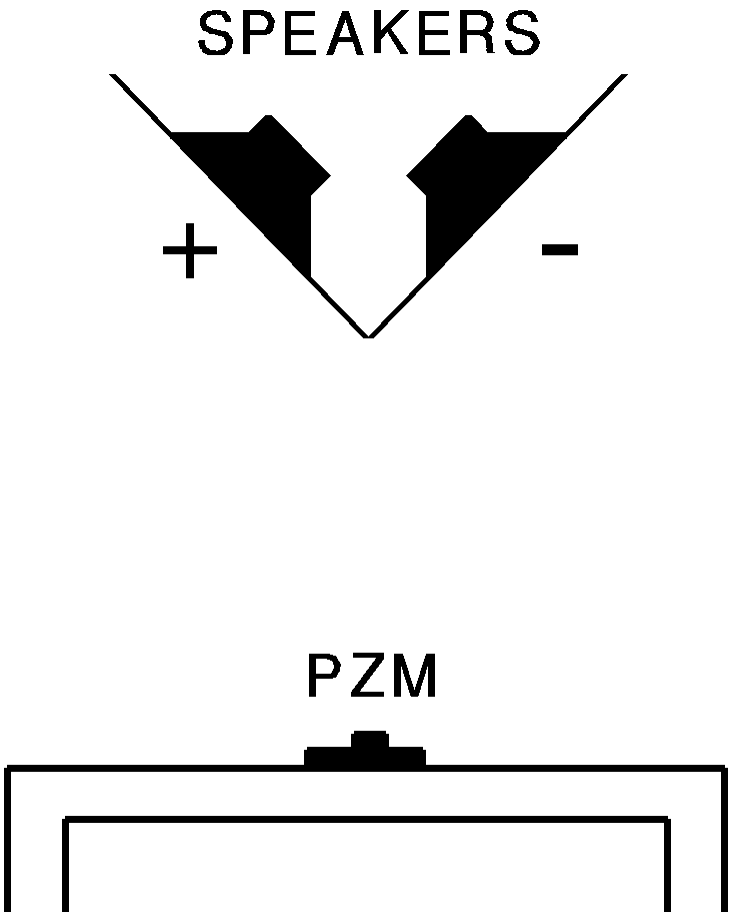


Fig. 3. Conference microphone/speaker setup.

The opposite-polarity acoustic signals from the loudspeakers cancel at the microphone location, so the mic picks up very little loudspeaker signal. Yet each person seated at the table can hear the closest loudspeaker.

Another way to achieve the same effect is to use a single speaker overhead with a bidirectional mic on the table. The null of the mic’s polar pattern aims at the speaker.

DRUM MIKING WITH PZMs

In the June 1990 issue of *Recording Engineer/Producer*, writer Mike Joseph recommended these placements of PZMs for drum miking:

“A pressure-zone-type mic placed slightly in front of the [kick-drum] mouth opening will add a different quality to the sound... Try taping the edge of two pressure zone mics in a 45-degree V or wedge and hanging them above and ahead of the drummer’s head. The sound is natural and balanced, although without a larger boundary plane it is shy below 200 Hz or so.”

PCCs USED IN EMMY-WINNING BROADCAST

The October 1990 issue of *Mix* describes how several Crown PCC-160 microphones were used to pick up sound for La Boheme in the Sydney Opera House.

ABC Radio and the Australian Broadcasting Corporation worked closely to produce this broadcast, which subsequently won an Emmy. Their job was to provide world-class sound, but to conceal all microphones from view and not interfere with onstage activities.

Five PCC-160 unidirectional boundary microphones were placed near the front edge of the stage to pick up lead vocals. The signals from these mics were panned to match the stage layout. In addition, three PZMs provided spot pickup of the woodwinds.

Sound producer Chris Lawrence had this to say about the PCCs:

“The floor-mounted Crown [PCCs] on stage... provided good range, especially in Acts 1 and 4, which took place in a set with a set upstage. Act 2, with busy crowd scenes alternating with pockets of solo action, forced us to combine the [PCCs] with shotgun mics attached to the first tier boxes in the auditorium and aimed at crucial positions onstage.”

HOW TO ISOLATE GROUP DISCUSSIONS

Don Peterson, a technical service advisor on Crown microphones, reported that a customer had an unusal miking problem. In a 30'-square room were four groups of children. Each group was at a table near each wall. The customer wanted Crown to suggest a microphone technique that would isolate the sound of each group.

PZMs could not be placed on each table because the children were playing with toys there. When PZMs were placed on the wall or ceiling near each group, each PZM picked up too much of the other groups; the isolation was poor.

A solution was to hang a GLM-200 face-down over each table. The microphone’s tight hypercardioid pattern isolates the sound of each group, and the mic’s small size makes it inconspicuous. Another useful model for this purpose would be the CM-30 supercardioid mic aiming straight down over each group.

SASS AND PZMs USED IN “HUNT FOR RED OCTOBER”

In creating the sound track for the submarine movie “Hunt for Red October,” sound-effects wizard Frank Serafine came up with some novel uses for PZM and SASS mics.

As described in the Sept./Oct. 1990 issue of *db* magazine, Serafine developed some highly unusual ways to record underwater sounds:

“I took a film can, filled it with 40-weight oil, put a Crown PZM inside it, and sealed it shut with epoxy to make it completely waterproof. We threw it in the water and it floated just underneath the surface. We used it to record all these different kinds of sound effects and movements that we did underwater... Like an underwater sounding board,... it picked up a lot of low-frequency vibrations...”

Another microphone in a film can without oil picked up more of the highs. Serafine recorded in stereo with two different mics to obtain a variety of sound textures. He also mounted a SASS-P on a boom over the surface of a swimming pool to record splashing sounds.

The article (which is fascinating reading) reveals many more ingenious methods used by Serafine to create sound effects.

HOW TO MIKE A CONFERENCE WITH PCCs

This is one of our most frequently asked questions. As shown in Figure 4, use one PCC-160 at arm's length between every two people.

The more mics that are on, the poorer the gain-before-feedback. So use either an automatic mic mixer with PCC-160 mics, or use PCC-200 gated mics with a standard mixer. The gated mics simulate an automatic mixer.

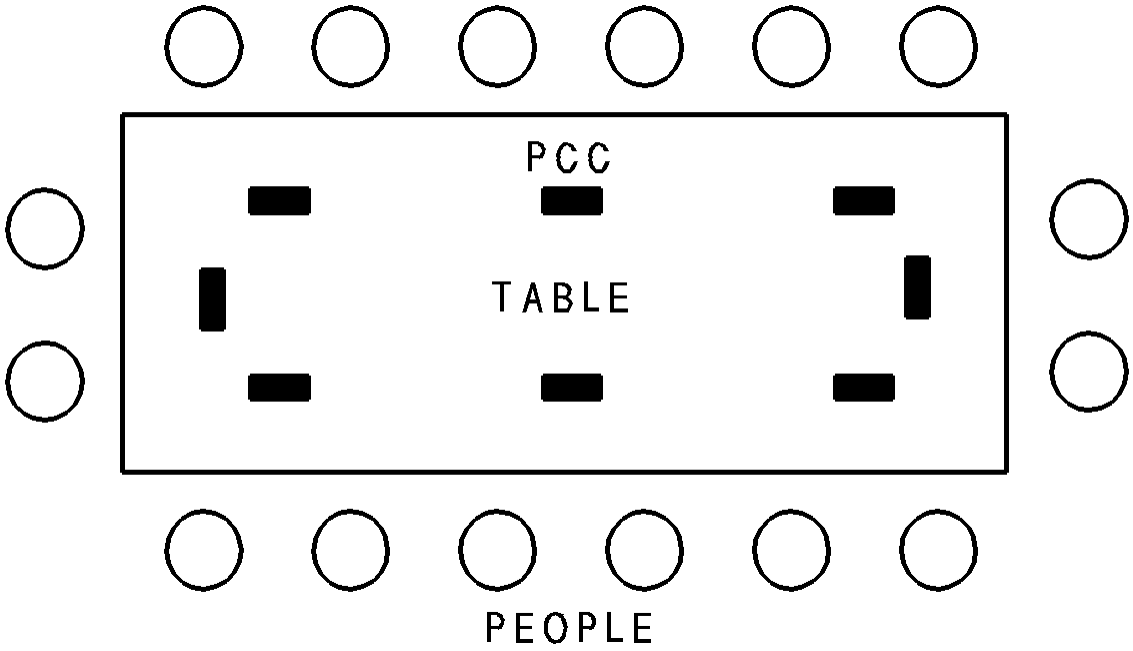


Fig. 4. PCC conference miking.

LETTERS FROM CROWN MICROPHONE USERS

Battery life

What is the battery life of a PZM-180?

Reply: To determine the battery life of any product, you divide the mA/hr rating of the battery by the current drain of the device in mA.

A Mallory N cell used in the PZM-180 is rated at 580 mA/hours. The PZM-180 has a current drain of 0.5 mA. So the battery life is 580/0.5 or 1200 hours.

# # #

MIC MEMO

Spring 1991
Bruce Bartlett, Editor

TAKE THE SASS/PZM CHALLENGE!

Have you made a great-sounding, creative recording with PZMs or a SASS microphone? Send it to Crown, and you may win one of several prizes.

All entries will receive a Challenge T-shirt, while winners will receive their choice of a SASS-P stereo microphone, two PZM-30 or PZM-6 microphones, or any other two Crown mics (they needn't be the same type).

Be sure to tell us when and where you made the recording, and provide sketches of your miking setup. Indicate whether you're an amateur or professional recordist.

Acceptable formats are:

*Half-track open-reel without noise reduction or with dbx I or II

*Cassette with Dolby B or C noise reduction

*DAT

*VHS Hi Fi

*Pro Super-VHS Hi Fi.

Please label your tape accordingly. Sorry, entries cannot be returned. This contest closes June 1, 1991.

We'll judge the recordings separately according to category:

Best PZM recording, amateur

Pop/jazz/folk

Classical

Sound effects

Best PZM recording, professional

Pop/jazz/folk

Classical

Sound effects

Best SASS recording, amateur

Pop/jazz/folk

Classical

Sound effects

Best SASS recording, professional

Pop/jazz/folk

Classical

Sound effects

To improve your chances, make sure your recording is free of noise, distortion, and overall compression. A winning entry should be spectacular. This means a wide dynamic range, beautiful acoustics, intriguing effects, and so on. You can enhance your rating by using original microphone techniques.

Send your entries to

Bruce Bartlett c/o Mic Memo

Crown International

1718 W. Mishawaka Rd.

Elkhart, IN 46517

Good luck! We hope to share your creative recording ideas with other readers of the *Mic Memo*.

PCCs SAVE THE DAY

"I can finally hear the actors!" a listener exclaimed as the PCCs were turned up. Central High School (in Elkhart, Indiana) had just installed PCC-160 directional boundary microphones to reinforce the actors in a stage production of South Pacific.

Audio/video instructor Nico Valentijn placed three PCC-160s on the stage floor 6 feet from the edge,

and 12 feet apart (Figure 1). A fourth PCC was placed on a small platform off-stage. Nico placed the mics 6 feet in from the stage edge, rather than near the edge, in order to get the mics farther behind the house loudspeaker cluster. This reduced the likelihood of feedback.

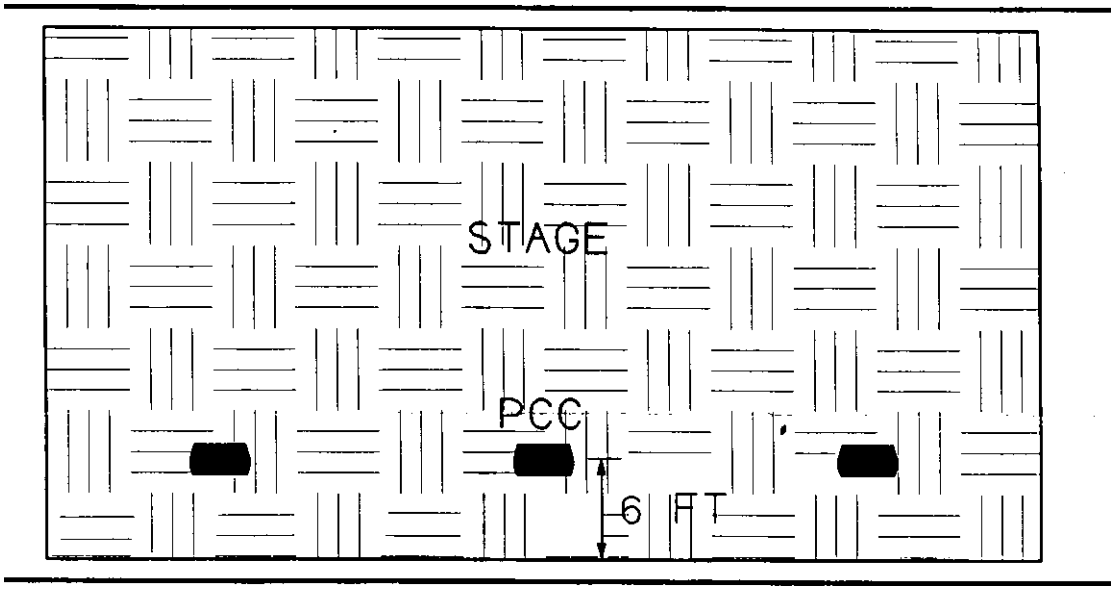


Fig. 1. Stage miking with PCCs.

Nico set the bass-tilt switch on each PCC to "cut" in order to reduce feedback pickup, and set a Rauland-Borg notch-filter to remove feedback frequencies.

To further reduce feedback, the sound mixer for the show followed the action with the mixer faders, turning up only the microphone closest to the person speaking. This also resulted in a clearer, less hollow sound than would be heard with all the mics on.

Before installing the PCCs, the school tried some conventional microphones, each in a mic mouse (foam holder). Nico complained that the resulting sound was dull, and the mics picked up too much of the pit orchestra. But when PCCs were substituted, the sound quality was natural and the orchestra was inaudible over the sound-reinforcement speakers.

ONE WORLD, ONE SASS

A Crown SASS-P contributed to the magnificent recording and broadcast, One World One Voice. This production was a collage of performances by musicians around the world, intended to teach about global issues such as the greenhouse effect, deforestation, pollution and poverty.

According to the Sept. '90 issue of *Recording Engineer/Producer* and the Oct. '90 issue of *Mix*, producer Rupert Hine and engineer Steve Tayler traveled the world in six weeks, recording artists for the show as they went.

Tayler's basic setup was to record with a Crown SASS-P into a DAT. He would group the players around the SASS to balance them.

"I used a variation of this setup to record the samba group *A Vehla Guarda da Portella* in Rio de Janeiro. They played in the street, and everybody was dancing and moving around. Here I used two DATs and two stereo mics. I placed one stereo mic, the SASS-P, in front of the seated musicians. I held the other mic and followed the soloists and the singers as they moved about."

When Tayler recorded the Kodo drummers in a concert hall in Los Angeles, he "felt they were too big and too spectacular to record with just one stereo mic," so he "set up three stereo mics and two mono mics and put them in radically different parts of the hall...It sounded fabulous."

SASS-P NOMINATED FOR MOST INNOVATIVE MICROPHONE AWARD

At the 1991 Music and Sound Awards (sponsored by The Music & Sound Retailer), the Crown SASS-P was nominated as the most innovative microphone of 1991!

TOO MUCH FEEDBACK AND LEAKAGE? TRY A DIFFEROID!

CM-310

Crown makes a microphone that works where no others will: the CM-310 Differoid [Now the CM-310A]. It's a differential cardioid microphone that cancels distant sounds and rejects sounds behind the microphone. As a result, it provides the most gain-before-feedback, and the most isolation from leakage, of any mic you can buy.

But don't take our word for it. Richard Johnson, a sound engineer for HSA/Heather Sound, has this to say about the Differoid:

"When you get into an environment that's hideous — loud stage, loud room, bad room — whether it's rock and roll or Contemporary Christian, the sweet sound of most microphones tends to be washed away in the midst of all these problems. That's where the CM-310 suddenly sounds very, very good.

"It will eliminate a lot of the bleed, and it will be quicker to EQ, both main and monitor. That means you spend less time EQing the monitors by ringing them out [making them feed back]. You tend to be able to EQ by sound quality.

"When you get into the stressful, high-power, high-level type of stages with a lot of things going on, the CM-310 just blows everything else away.

"The closest thing to the 310 in terms of feedback rejection would be the Beyer TGX580 or the Beyer M88. The two Beyer mics are close in performance to a 310, but they're not differential, so they still can't get as much rejection [as the 310].

"Differential microphones, boy, you can just shove all kinds of stuff at 'em, and turn 'em up, and they don't care. In those situations, there isn't anything else that's gonna do better than that — period!"

Jeremiah Hamilton, Staff Technician with Bernhard-Brown, finds that CM-310s are especially valuable when the P.A. speakers aim at the microphone:

"In the summer of '89 we did the Summer Olympic Festival in Norman, Oklahoma, in the major stadium there with about 75,000 people. The problem was proximity feedback because of the volume level on the field where the announcer was. The speakers were facing right at the announcer, and we had to have something that would really do the job.

"[Prominent sound engineer] Tom Durell in LA recommended the Crown CM-310; we had a couple flown in, and it did the job admirably. We've used it several times in announcer situations, and we've had no worries at all about speaker proximity."

UNIQUE ORCHESTRA MIKING

Ken Kuespert, Director of Field Operatons with TPC Production Services, came up with a novel, good-sounding way to mike an orchestra.

To pick up the sound of an orchestra outdoors, he placed two PCC-160 supercardioid boundary mics on 2'x3' plexiglass panels on the grass. The mics were 10' back from the ensemble.

LETTERS FROM CROWN MIC USERS

Camcorder Microphone

I'm planning to go into people's homes with a camcorder in order to videotape parents and children. I need a microphone to pick up their speech clearly. A PZM-30R was recommended to me. Is this a good choice?

Frank Palazzo

Temple University

Reply: The PZM-30R will work well and is rugged, but it may be more than you need. The microphone requires a phantom power supply (Crown PH-4B or PH-1A) which is extra hardware to take with you. Also, the 30R's output is balanced, low-impedance, while a camcorder requires an unbalanced high-impedance microphone.

Most camcorders have a DC voltage at the external mic jack to power condenser mics. Crown makes a microphone that can be powered this way: the GLM-100/E. It's a miniature omni condenser mic without electronics.

As shown in Figure 2, solder the GLM's shield and red lead to the ground terminal of a mini phone plug; solder the white lead to the tip terminal. Connect the mini phone plug to your camcorder, and you're in business.

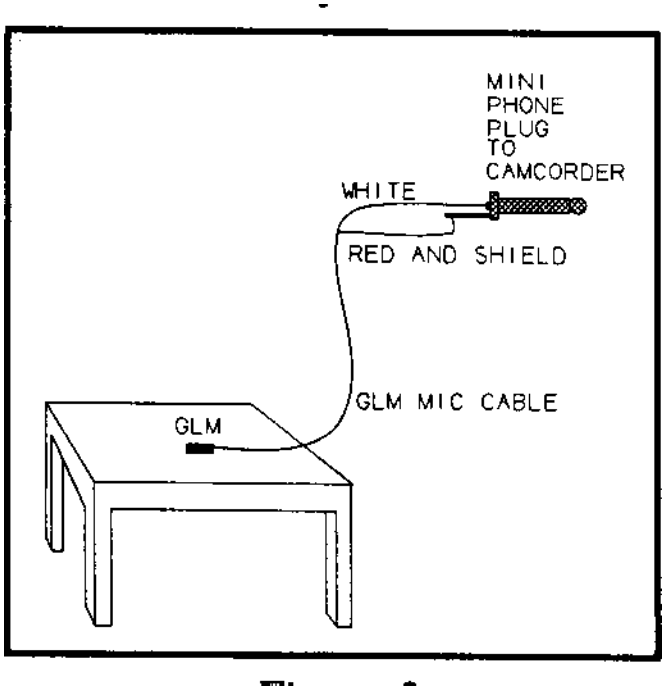


Fig. 2. GLM-100/E miking for camcorder use.

Place the GLM-100/E face-down in a GLM-SM Surface Mount, and tape the mount to a table top near the people speaking. You have an instant PZM, with no external power supply needed, and it costs only about $100.

Miking a wandering lecturer

How do you recommend we mike a person speaking at a lectern, where the person often turns to the right to refer to a projected slide? We don't want to place a mic stand on the floor to one side because it gets in the way of camera shots. Also, we don't want to use a lavalier mic because the cable takes a lot of abuse.

Dale Flora

Bethesda, MD

Reply: For the lectern, we recommend either a PCC-160 or one of the Crown lectern microphones: LM-200a, LM-190a, or LM-300. The LM-200a has a ball-and-socket swivel mount for silent adjustment and is shock-mounted to reduce lectern thumps. The LM-190a is the same but 3 inches shorter. If you need an economical microphone, the LM-300 should fit the bill. It's slim and elegant, and sounds natural.

You also need a microphone placed off to one side, but with no mic stand. We recommend the Crown CM-30 miniature supercardioid mic. You can hang it overhead from its 30-foot cable, aiming toward the lecturer (Figure 3).

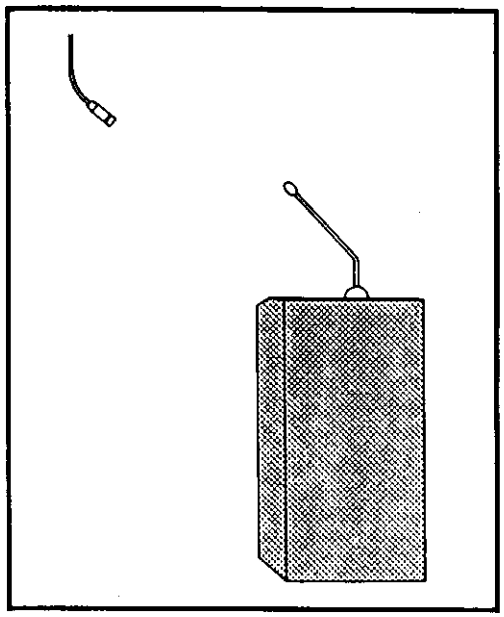


Fig. 3. Dual-microphone method for picking up a lecturer.

Normally you'd expect to hear phase cancellations (a filtered tone quality) when two mics are used on the same sound source. But this shouldn't be a problem because the talker will be close to one microphone or the other, depending on the direction he or she is facing. Thus the 3-to-1 rule will not be violated, and phase cancellations should be minor.

More on wandering lecturer

We're using an LM-200a on our lectern. How far can a person move in front of the microphone and still get picked up? Our minister likes to wander around the side of the mic, and then we can't hear him.

Reply: The LM-200a has a fairly tight polar pattern (supercardioid) to prevent feedback. If the talker is 1 foot from the microphone, he or she can move 1-1/2 feet either side of center and remain at a constant level.

For wandering lecturers, we recommend either a PCC-160 or a lavalier microphone such as the Crown GLM-100 or GLM-100/E. The GLM-100 ($199 list) comes complete with an electronics interface for phantom power. The GLM-100/E ($99 list) is a mic capsule and cable which you solder to a

miniature connector and use with a wireless transmitter. This is a good solution for the person who likes to walk while speaking, but doesn't want to drag a mic cable.

Purr Pickup

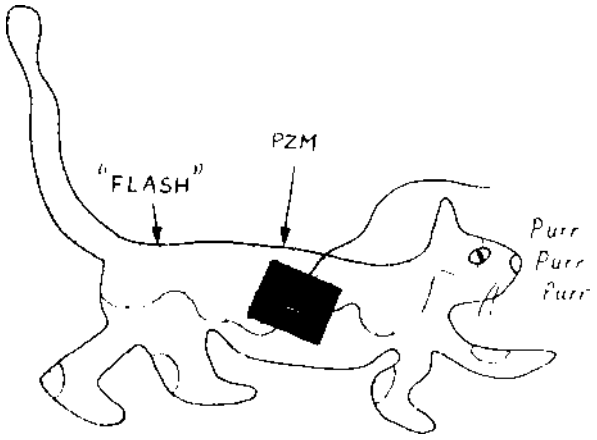
As the owner of an extremely affectionate, large male cat, I have tried to convincingly record his purring. Many microphones out of my collection have been tried, including AKG C12A, Schoeps M221B, RCA BK-5, and many more.

The most realistic recording was made by

1. Inducing the cat to purr (catnip can help).

2. Laying him on his side.

3. Placing a PZM-6 on his chest. A larger cat provides a larger purr and a larger boundary area for improved low-end response.



Purr pickup.

Note: A black microphone must be used. The silver-colored microphones attract too much attention and become toys.

Christopher D. Gately

Chris Gately Audio/Studioteck

Ardmore, PA

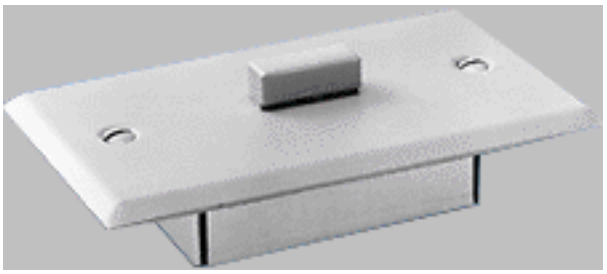
Reply: There may be a problem related to the transition in acoustical impedance from the PZM's metallic boundary plate to the fur of the cat, resulting in a partial regeneration of sound waves at the edge of the boundary. I urge you to purrcede with extreme caution [-Editor].

# # #

MIC MEMO

Summer 1991
Bruce Bartlett, Editor

SUPER SNOOPER MICROPHONE



PZM-11

No, this isn't an ad for DAK. We're talking about the PZM-11 security and surveillance microphone.

It can be mounted in the ceiling or wall in a standard electrical outlet box. The PZM-11 is designed to look like something other than a microphone so as not to draw attention.

Where can you use the PZM-11? Factories, jailhouses, classrooms, subway platforms, military installations. Put it anywhere there's a need to listen for intruders, listen for people in trouble, monitor conversations, or monitor machinery noise.

For easy installation, the microphone connector is a row of screw terminals. The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Powering is via 12 to 48 volts phantom power.

Low frequencies below the voice range are rolled off to reduce pickup of air conditioning rumble, and the highs are boosted to aid clarity and articulation.

YOU CAN WIN THE SASS/PZM CHALLENGE!

Entries have started coming in for the SASS/PZM Challenge, a contest for the best-sounding, most creative recordings made with PZMs or a SASS microphone. We've extended the deadline to July 15, so you still have time to send your entry to the Mic Memo.

Details about the contest were given in the previous issue. Several prizes will be awarded according to category: pop/jazz/folk, classical, and sound effects.

Good luck! We'll share your creative recording ideas with other readers of the *Mic Memo*.

CM-230 TRIDUNDANT CONDENSER MICROPHONE

CM-230

[The CM-230 is no longer being manufactured.]

It's a triple header! The new Crown CM-230 microphone contains three microphone capsules in a single housing, feeding an interface box with three transformer-isolated outputs. This triple-redundant system is more reliable than a single microphone feeding a 3-way splitter.

It's a special-order unit made for broadcast and other applications that require multiple microphones to feed separate mixers. In the case of broadcast, the user often needs separate isolated feeds for the audio pool, in-house P.A., and a backup if the other two feeds fail.

To reduce background noise and feedback, each mic capsule has a supercardioid polar pattern. Frequency response is wide and smooth for natural reproduction of the voice. A built-in windscreen suppresses breath pops.

You can mount the microphone either on a gooseneck attached to the interface or on a separate mic stand. Three-foot and 25-foot multiconductor cables are supplied for connecting the mic to the interface.

The unit has three powering options: phantom power, 12-24 VDC external power supply, or internal 9V batteries. Several switches in the interface let you control and route the signals and system ground.

VROOM!

David Kniper, a sound engineer in Florida, recorded a spot for Mazda at the Daytona raceway. He picked up the race cars in stereo with a SASS-P and recorded direct to DAT. John Maselli was project manager.

According to Kniper, the SASS is a "wonderful piece" with "incredible imaging." He also used a SASS to record an ensemble of four acoustic guitars and a string quartet. This recording was processed through the B.A.S.E. system, which, Kniper says, spreads the sound 12 to 14 feet beyond the speakers.

At the Indianapolis 500 raceway, sound engineer Tom Allebrandi used the SASS-P to record the Dodge Viper pace car for a promotion. Using a portable DAT recorder, he taped exhaust sounds and zoom-bys with a SASS-P on a stand nearby. He even rode the car around the track while recording the engine shifting through the gears. The SASS conveyed an amazing sense of power.

PZMs RECORD BILLY COBHAM'S DRUMS

In the April '91 issue of *EQ* magazine, Dan Daley described a recording session engineered by Craig Bishop. Here's how Bishop miked the drum set of fusion star Billy Cobham:

"For ambient miking of Cobhams' kit, Bishop chose a seemingly parsimonious pair of PZMs taped to the floor three feet in front of the kit and six feet to either side of it. This arrangement is plenty, he says, giving him a combination of low-end resonance and some added brightness as the cymbals reflect off the floor. The PZMs were recorded to a stereo pair of tracks."

CLOSE-MIKING AN ORCHESTRA

How do you reinforce a symphony orchestra? David Scheirman, a concert sound consultant in Julian, California, asked us that question.

Scheirman needed to mike the 85-piece Moscow Symphony which was playing with a loud English rock band. Leakage from the rock band into the strings' microphones was a serious problem.

We offered these suggestions to minimize leakage and increase gain-before-feedback:

*Use a GLM-200 mini hypercardiod mic near each f-hole, aiming across the face of the instrument.

*Roll off the excess bass caused by proximity effect.

*Filter out low frequencies below the fundamental frequency of each instrument.

*Try putting every other GLM in opposite polarity to cancel distant sounds.

*Try two GLM-200's on each instrument, wired in opposite polarity, as close as possible to each other without cancelling the instrument. This arrangement creates a second-order hypercardioid, an extremely tight pickup pattern.

*Put plexiglass barriers around the rock band.

*Gate the orchestra mics.

SASS WINDSCREEN IMPROVED

We've developed a new windscreen for the SASS that dramatically reduces wind noise compared to the original version. Plus, it's one piece — no foam semi-spheres are needed. The new windscreen is a single piece of fabric with imbedded urethane foam.

You can order a SASS windscreen from Crown's Parts Department, part no. D7302J8.

LETTERS FROM CROWN MIC USERS

Easy interviews in the street

I record interviews of people on the street and play them on my radio talk show. Can you recommend any ways to provide hands-free pickup? A handheld mic seems to intimidate most people.

Vic Drescher, WKQX-FM

Reply:

Try placing a PZM-6R in the shirt pocket of the interviewer. The mic picks up both the interviewer and the interviewee.

If the shirt pocket is made of thick fabric, it will filter out the highs, making a dull sound. So try wearing a thin silk shirt because it allows sound to reach the mic unfiltered. Fortunately, the PZM-6R has a rising high end which counteracts the acoustic rolloff of the cloth.

The body of the interviewer acts as a boundary or surface which makes the PZM directional toward the person being interviewed.

Your PZM output could feed either a mini cassette recorder or a cellular-telephone transmitter.

How to mike a walrus

I want to reproduce, over loudspeakers, the sound of walruses in a tank at the Cincinnati Zoo. The tank has a window in it. If I put a PZM on the outside of the window, will it pick up the window vibrations and reproduce the walrus sounds?

Floyd Cosby

Reply:

Probably not — the window glass does not transmit sounds very well, and the PZM is insensitive to mechanical vibrations. Try this instead: put a PZM in a sandwich bag and seal it tightly. Test the bag in a bucket of water to make sure it is watertight. Then attach the mic and bag inside the walrus-tank window. Let us know what they have to say!

CM-30 conference miking

I want to pick up the conversation at a conference table, amplify it, and send it to an adjoining conference room. The client doesn't want any microphones on the table because they might be intimidating. How should I mike the conference table?

Norm Schroff, Consolodated Media, Maitland, Florida

Reply:

For the clearest sound, we'd normally recommend a group of PCC-200 gated supercardioid boundary mics on the table, one microphone for every one or two people. But if table mounting is ruled out, try hanging a CM-30 supercardioid microphone over the table (Fig. 1). Remove the hanger and aim the mic straight down about 3 feet over the heads of the people.

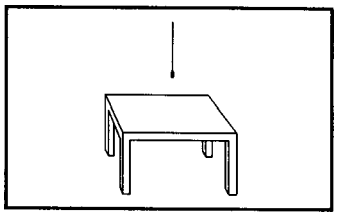


Fig. 1. CM-30 hung over a table.

As an alternative, try a PZM-30R taped to the ceiling over the table. Or you can remove the cantilever from a PZM-6R and mount the nose of the cantilever in an upper corner of the room.

Minister miking

I'm trying to mike a minister for P.A. in an auditorium, but I'm having trouble with feedback. The minister thinks that wireless mics are unreliable and refuses to use one. We tried an omni lavalier but it fed back.

At the altar table, the minister gestures broadly with his arms so we can't put a mic any closer than 3 feet away.

The minister is flanked by two other ministers during his sermon, and maybe they could help by holding microphones. Any ideas?

Reply:

You could have a flanking minister hold an LM-300 gooseneck mic near the minister's mouth. At the altar table, place a PCC-160 supercardioid boundary mic as close to the minister as possible. If feedback is still a problem, try a GLM-200 mini mic instead. Have a flanking minister clip the GLM-200 to the minister's robe a few inches under his chin, taking care to aim the front of the mic at his mouth. The microphone's hypercardioid pattern should help reduce feedback. Good luck!

# # #

MIC MEMO
Fall 1991
Bruce Bartlett, Editor

WINNERS OF THE SASS/PZM CHALLENGE

The results are in for the 1991 SASS/PZM Challenge, a contest to determine the best-sounding and most-creative recordings using Crown SASS microphones and PZMs.

Every single recording was well engineered, with no audible noise, hum, or distortion. Several were sonic knockouts.

The winners received their choice of a SASS-P stereo microphone, two PZM-30 or PZM-6 microphones, or any other two Crown mics. Here are the details on each winning recording:

Best amateur PZM recording, pop/jazz/folk

Anne and Gary Wakenhut, The Collecting Consort, Lakeview, Michigan. "Friendship, A Gift" and "Michigan's Essence."

These recordings are of the Wakenhuts playing Celtic, ethnic, and American folk music, with sounds of nature accompanying many of the selections. The high-quality cassette mastering was done by Solid Sound Studios in Ann Arbor.

The Wakenhuts recorded themselves playing dulcimer and harp in their living room. The harp was miked with a GLM-100 about 4' above the floor and 3' from the sound board. They put a plexiglass boundary behind the mic to block sounds from the dulcimer for better separation.

The dulcimer was placed about 6' in front of the harp. To mike it, they attached a Sound Grabber to a plex boundary about 1-1/2' above the center of the dulcimer (Fig. 1). The dulcimer was panned left and the harp was panned right.

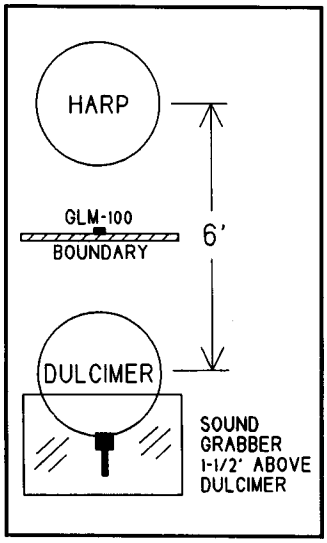


Fig. 1. Miking a dulcimer with a Sound Grabber on a boundary.

Gary reported, “We mix with a Realistic 3-mic 2-line mixer (yuk! Maybe that qualifies me as a non-professional) and record on a borrowed Ampex ATR 700 that is on its last leg in more ways than one.

“The whistle, flute and pan pipe on the “Friendship” tape were recorded in a high-school gym about 6' from a Sound Grabber on a boundary. A second Sound Grabber was taped to the bleachers about 25' away for a little essence [room ambience]. Then these recordings were mixed with nature sounds, and were rerecorded later with Anne playing harp under them.”

One flute was recorded with the dulcimer mic tilted up slightly and about 3' from the flute.

The Wakenhut’s swamp was the scene for other recordings. There recorded a whistle and pan flute along with the frogs. Gary mounted two Sound Grabbers on a V-shaped plex boundary angled about 210 degrees, with the mics ear-spaced. In one instance, the musician stood 20' in front of the mics, in another, 25' behind the mics. To reduce traffic noise, the Wakenhuts placed the boundaries’ back toward the noise and cut the low end. The swamp sounds were mixed with a live mic signal, faded under or brought up as needed.

Another recording took place in a horse-shoe shaped canyon just after a cleansing thunderstorm. The Wakenhuts placed Sound Grabbers vertically on the rocks about 6" apart and at a slight angle to each other for separation. Anne was about 30' below and to the right of one of these, and Gary was above and about 50' to the left. In one part on the tape, Gary played the whistle 200' further around the inside rim of the canyon so the mics were picking up only indirect sound waves off the canyon’s rim.

The Wakenhuts sell their tapes at a store frequented by Indians. The owner says it is spooky to note the emotional and physical responses of the Indians as this canyon piece plays in the background of the store when they are shopping.

In our listening evaluation, we were impressed with the recordings’ lovely, airy effect and clear, warm sonics. Sounds of nature were tastefully blended in. This is such relaxing, healing music!

Best amateur PZM recording, classical

Les Feia, St. Paul, Minnesota. “Act II from Die Fledermaus’” recorded May 2, 1991 at St. Cloud State University, St. Cloud, Minnesota.

To record this opera, Feia placed three PZM-30GP’s across the front edge of the stage, 15' to 20' apart. He also mixed in overall ambience from two PZM-30F microphones on a 90-degree-angled

plexiglass wedge mounted on the balcony railing.

This recording impressed us with its full lows, crisp highs, and spacious stereo. In spite of the ample hall reverb, the voices were clearly articulated and lifelike.

In this same category, an honorable mention goes to R.K. Keiser for his recording of the Haydn "Concerto In C Major for Cello and Orchestra," Penn State University Music Building Recital Hall, September, 1985. Keiser placed two PZMs 6' apart on the front of the stage. The PZMs were removed from their metal boundary plates and were duct-taped to the stage floor. He recorded without EQ into a cassette deck using Dolby B.

This effort showed that you can get a reasonable recording with no microphones in sight. The balance and clarity were not as good as you would get with raised microphones. But often, recordists must compromise mic placement to achieve a clean stage appearance. This on-stage placement of two PZMs resulted in a good, useable recording.

Best professional PZM recording, pop/jazz/folk

Pierre Sprey, Mapleshade Studios, Maryland. "Clifford Jordan Quartet Live at Ethel's" (compact disc MHS 12629A).

Sprey employed a PZM wedge for overall pickup of piano, bass and drums. On the solo sax he used a Sound Grabber taped to the P.A. mic and aimed end-on toward the sax (Fig. 2). Sprey ran the mics unbalanced (to avoid transformers) through custom mic preamps into a Sony TC-880 analog tape deck without noise reduction.

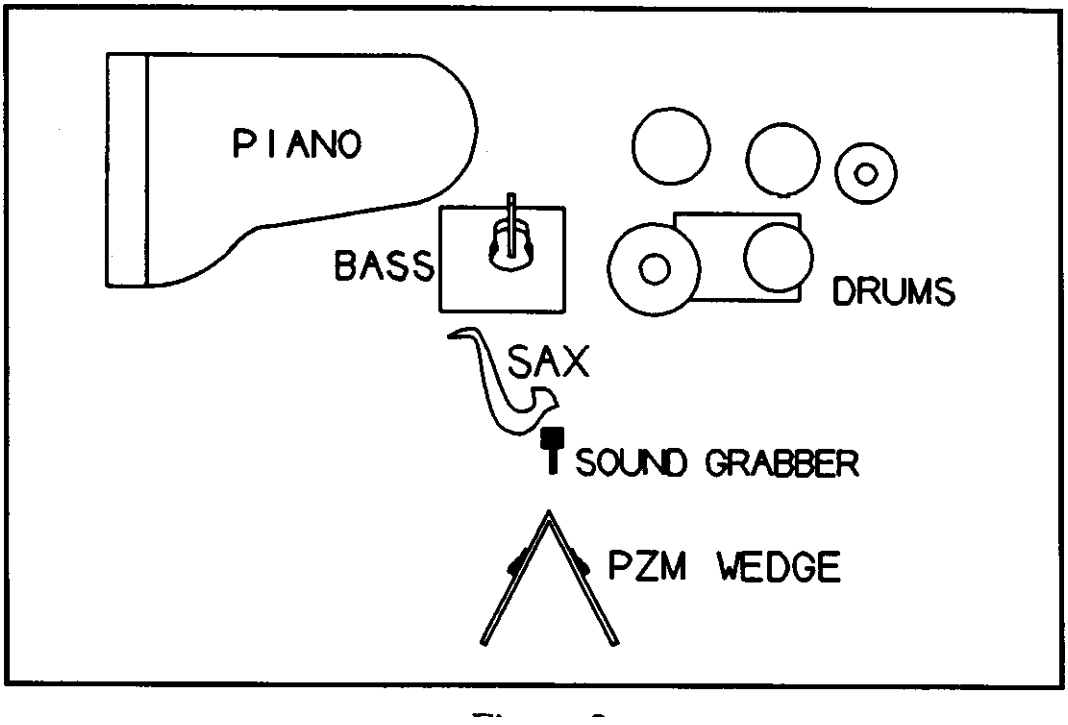


Fig. 2. Sprey's recording method.

We were struck by the incredibly transparent and detailed sax sound. It was as if a veil were ripped off the speakers. Cymbal sounds were sweet and crisp.

In this same categrory, an honorable mention goes to Stephen Roane (Irvington, New York) for his recording of the Dick Weller Band, a jazz/pop group, in the 55 Bar in New York City. After being delayed while driving to the concert, Roane had to set up at the last minute in a standing-room-only crowd. In just 20 minutes, he duct-taped the PZMs into place, got levels, and got a Bass Ale.

Roane describes his miking techniques:
"I used a pair of Crown PZM-30F's, one over the band near the saxophone, on the ceiling; the other on a side inner wall next to the drums. With both mics, Sonex was used to shape the pattern (Fig. 3). The two mics went into a Sansui MX-12 mixer with no EQ and no outboard effects to a Tascam DA-30 DAT recorder."

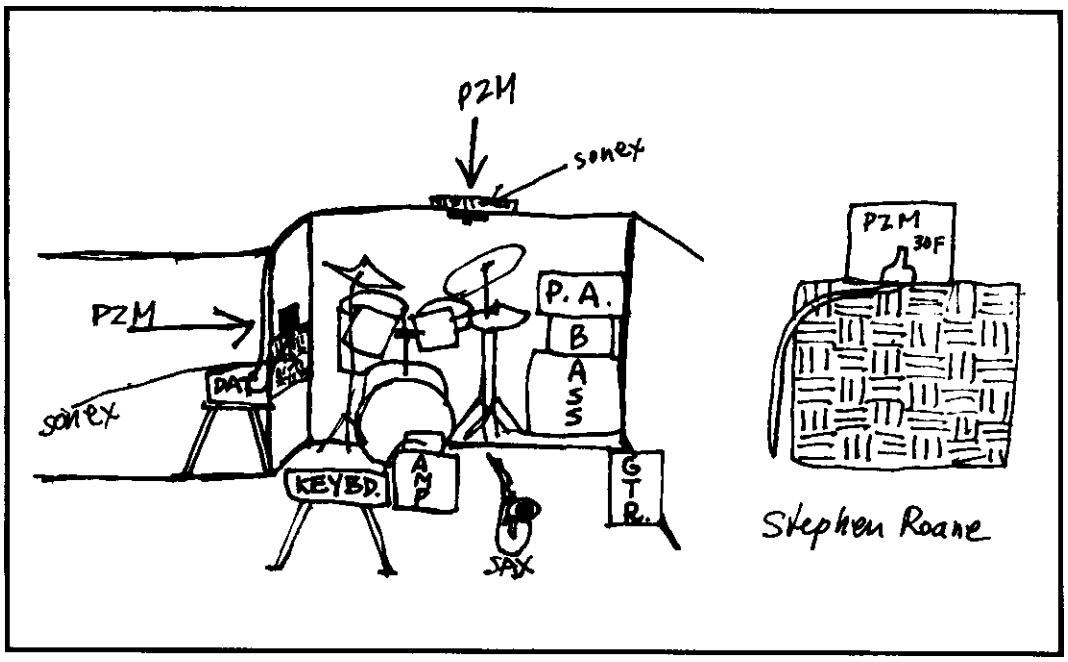


Fig. 3. Roane's miking technique.

In spite of the simple microphone technique, this recording sounded surpisingly well balanced and clear.

Another honorable mention is awarded to Dave Sell, Hatchery Studios, Warren, Michigan, for his recording of Rob Emanuel playing the drums with a sequenced synth track. Emanual is one fantastic drummer!

This recording was the soundtrack for a video demo. The recording was done direct to DAT during a video shoot, and the video was edited to the audio soundtrack.

As shown in Fig. 4, Sell used two PZM wedges to form a "W". A pair of PZMs were mounted in the corners of the "W." He placed these microphones about 15' back in his studio to pick up ambient room sound. Other mics were used close up on the drum set. We thought the drum sound was excellent — full and crisp — while the distant PZMs added dimension and power due to the room reverb.

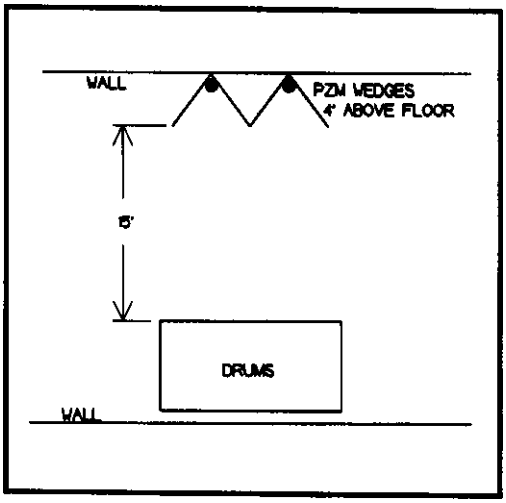


Fig. 4. Sell's miking method.

Best professional PZM recording, classical

Andrew Lipinski, Tonmeister Recordings, Bethesda, Maryland. Unidentified orchestral recording, and a solo piano recording, "Haesun Paik" (compact disc Umkapell 89), Gaston Hall, Georgetown University, Washington D.C.

Lipinski has this to say about recording with PZMs:

"I am a professional recording engineer (M.D. Tonmeister Program) and have been using PZM microphones since the early 80's. Starting every recording session, I check if I can use PZMs and how to use them.

"My microphone technique depends on the room acoustics, size and type of the orchestra, quality of the instruments, etc. I don't use recipes, but I do LISTEN (I was the only professional recording engineer who got a 100% score at the National Bureau of Standards on CBS's DAT anti-copy code test.)

"I do not hesitate to put PZMs on a wooden floor, to hang them on plexiglass panels of different size and shape and equalize the bottom end if necessary. Sometimes I use the PZMs as a main pickup, sometimes as spot microphones. In other cases, I mix them as little as 5% with other types of microphones.

"My favorite model is the PZM-31S (I built my own preamp). My plans are to experiment with the SASS-B and other types of microphones. Thank you for implementing the PZM principle to the real recording life; it works for me perfectly!"

Lipinski's method of orchestral recording is shown in Fig. 5. He reports, "The sound of the PZM wedge or V was mixed in different proportions with different kinds of regular mics. They were XY in the center, A-B or A-B-C, usually much closer and lower than the PZM V panel, and sometimes with spot mics added."

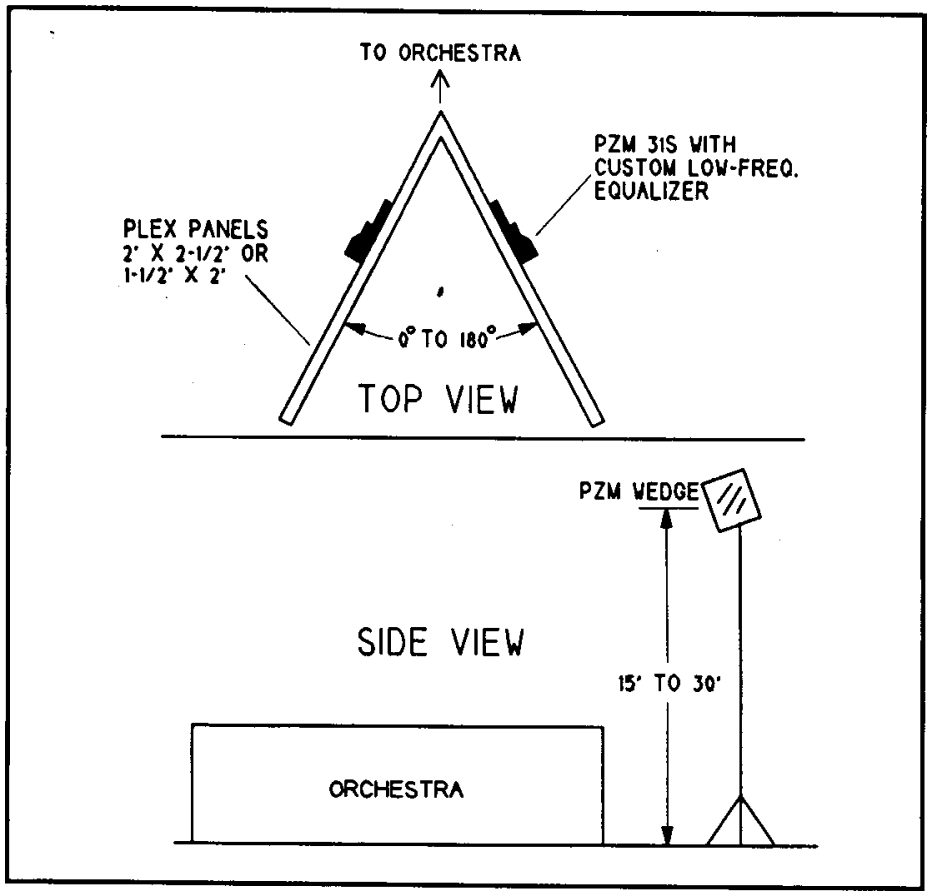


Fig. 5. Lipinski's recording method.

In our listening evaluation of the orchestra pieces, we were startled by the clear, articulate sound with lots of beautiful hall acoustics. Imaging was quite sharp, and the triangle was clean and crisp.

"For my piano recording," said Lipinski, "I placed the PZM V panel above and behind the head of the pianist. Another pair of mics were spaced omnis far away in the hall for ambience."

When we auditioned the solo piano recording, we thought it was miked at just the right distance for an optimum balance between direct sound and hall sound. The piano was clear and natural, enhanced by the warm ambience of the hall.

Lipinski noted, "As a general rule for PZM V panels, I found that the relation betrween height and distance from the sound source to the angle between panels to be very important. Also, the placement of PZMs on each panel should be listened to carefully."

Best professional PZM recording, sound effects

Gary Pillon, General Television Network, Oak Park, Michigan. "Stearman Fly In" and "New Historians" video documentaries.

To record these soundtracks, Pillon devised a stereo PZM made of two plexiglass pyramids, with PZM capsules in the apexes of the pyramids and ear-spaced 8" apart (Fig. 6). He often mounted this assembly to a Steadicam platform.

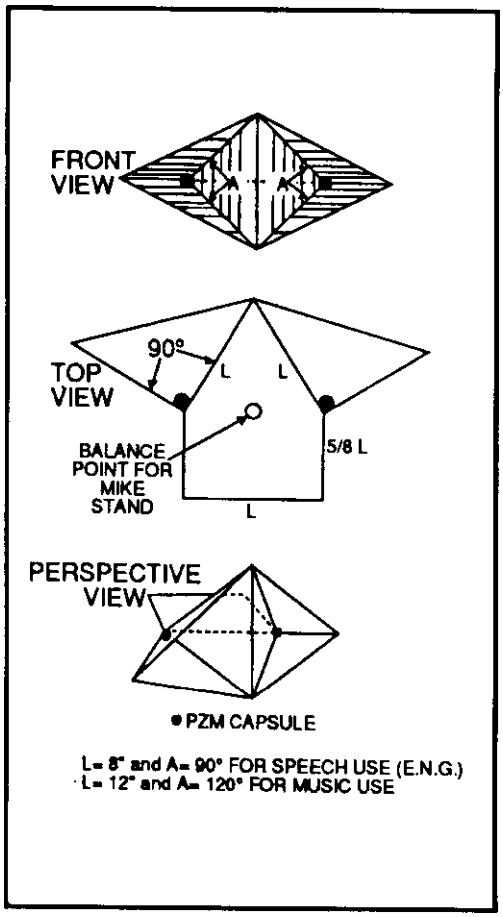


Fig. 6. Pillon's stereo PZM.

Both soundtracks won Emmys, and deservedly so. The detail and presence of the sound tracks made us feel a part of the events. Crossfades were skillfully done, and the stereo added an exciting element of realism.

Best amateur SASS recording, pop/jazz/folk

Tom Haneman, General Television Network, Oak Park, Michigan. "Folk musicians at a festival."

Haneman used a SASS-P and a Sony Walkman Pro to record this group in mid Michigan early last September. The musicians were sitting in a wooded area behind the festival's main stage. They sat close together in a circle (Fig.7).

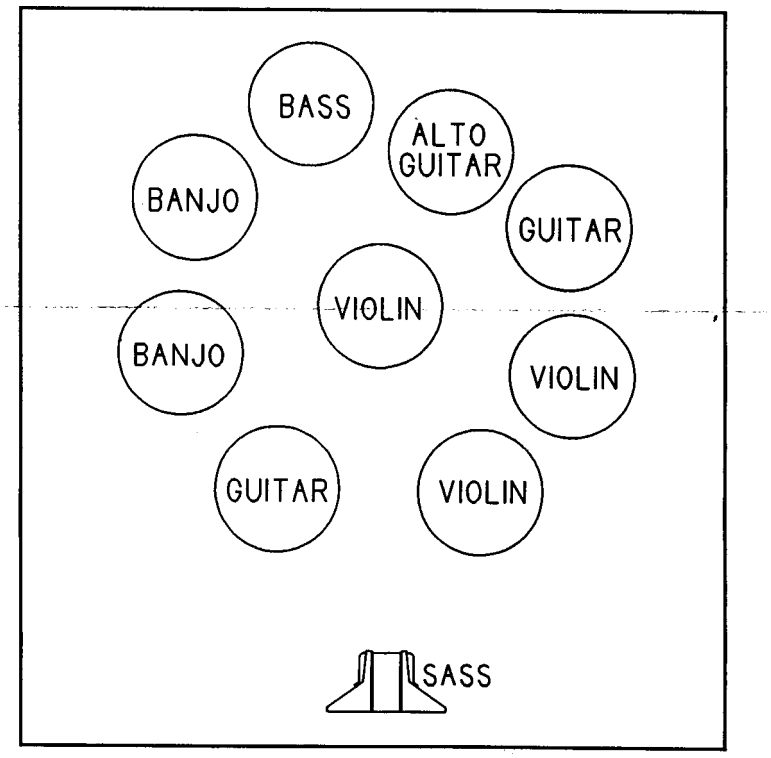


Fig. 7. Haneman's miking technique.

Haneman stood a few feet outside the circle holding the SASS-P six feet high. After consulting with Gary Pillon, they recorded the selected cut into GTN's Lexicon Opus Digital Audio Workstation, equalized to enhance the high end, then recorded to 1/4" tape.

This recording re-created the immediacy of a spontaneous concert in the woods. We could feel the pure joy this music expresses. I was surprised to hear how gentle the highs were, almost muted. Stereo imaging was so precise that we could pick out each individual instrument in the stereo spread.

Best professional SASS recording, classical

Gary Pillon, General Television Network, Oak Park, Michigan. "Fort Street Chorale and Orchestra, Haydn Mass in D, #3."

Pillon recorded this large ensemble with a SASS-P specially modified for improved frequency response. He recorded direct to DAT through a pair of Boulder mic preamps. Pillon mounted the SASS-P about 8' back from the conductor and approximately 15' up on a Matthews light stand.

The sound had a marvelously smooth tone quality with an excellent balance between direct and reflected sound. The balance between choir, orchestra, and soloists was perfect. Stereo imaging was quite sharp. This recording proved that less is more!

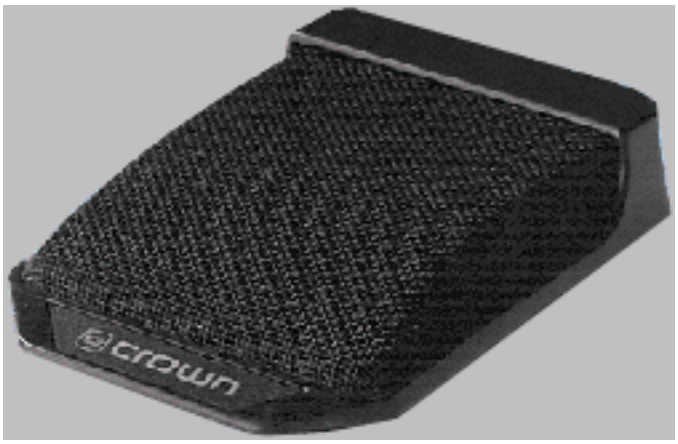
# # #

MIC MEMO

Winter 1992
Bruce Bartlett, Editor

NEW SLEEK MICROPHONE FOR CONFERENCE TABLES: THE PCC-170

The Crown PCC-160 has long been a favorite for stage miking, but its rugged appearance made it less appealing for conference table use. So we designed the PCC-170, whose trim, elegant style looks great on any conference table.



PCC-170

This supercardioid, surface-mounted mic provides clean, clear pickup of speech. The mic's flat frequency response is especially suited for conference use. Two types of connectors are available for the PCC-170: a rear-exit mini XLR, or a bottom-mounted stereo phone plug that connects into a jack in the conference table.

PZM PIONEER KEN WAHRENBROCK VISITS CROWN

Ken Wahrenbrock manufactured the first PZM in 1978. While traveling across the U.S. this summer, he stopped by Crown to see what we're up to and share some stimulating ideas. Good to see you again, Ken!

Ken Wahrenbrock

NEW SASS-P MKII SOUNDS WONDERFUL!

Crown engineers recently developed an upgrade for the SASS-P stereo microphone that greatly improves its tone quality. Several classical-music recording engineers have field-evaluated this change, and all thought it was a substantial improvement.

The enhanced model — SASS-P Mk II — sounds warmer and smoother, and has more air or openness in the high frequencies. All this with no change in self-noise or sensitivity.

1991 PZM/SASS CHALLENGE UPDATE

As we reported last issue, the winner of the best professional PZM recording of classical music was Andrzej Lipinski. We neglected to mention that his recording was of a student orchestra at the National Orchestral Institute at Maryland University.

INTRODUCING THE CM-200A HANDHELD MICROPHONE

CM-200a

Crown is proud to introduce a new handheld condenser cardioid mic, the CM-200a. As the successor to the CM-200, the CM-200a has a warmer, fuller sound.

The CM-200a was used in the Special Olympics at the Closing Ceremonies. Sigmet's Sam Helms, audio-equipment specifier for the Special Olympics, commented on the CM-200a:

"This new version performed unbelievably. The mic had presence; it had warmth, great gain, and low handling noise. The mix engineer could get a high degree of gain-before-feedback and still retain very good intelligibility.

"The mic is great. My sentiments were shared by the guys at [major touring sound company] Eighth Day Sound, as well as Kim Denton, our monitor engineer, who does sound for Steve Lawrence and Eydie Gorme."

GLM-200/E PART OF SUPERB GUITAR-MIKING SYSTEM

At the Walnut Valley Bluegrass Festival in Winfield, Kansas, this September, listeners were treated to some of the best acoustic-guitar sounds they ever heard.

The GLM-200/E was part of a new guitar-pickup system developed by Fishman Transducers and prominent bluegrass guitarist Harvey Reid. A Fishman pickup mounted under the bridge picks up the lows and provides volume and punch. A Crown GLM-200/E mini hypercardioid mic is mounted just inside the sound hole facing in. It provides the treble and the clean acoustic string sound.

The pickup and microphone are mixed in a small 2-input mixer provided as part of the system. The combination of the pickup and microphone provides a loud, punchy, yet natural sound with all the crispness of a real acoustic guitar.

Many stellar performers in the bluegrass field used the new system at the festival. Harvey Reid, John McCutcheon and Dan Crary, among others, were miked with the GLM/pickup hybrid.

A spokesperson for Taylor guitars called this system "the state of the art" in guitar miking. Indeed,

several audience members noticed improved guitar sounds over the year before.

Thanks for this information to Doug Krehbiel, White Pigeon, Michigan.

NEW CM-31 CHOIR MICROPHONE HAS IN-LINE POWER MODULE

Newly available is the Crown CM-31, a miniature supercardioid microphone for overhead miking of choirs and theatre performances.Unlike the CM-30, which has a power module you mount in an electrical box, the CM-31 has a cylindrical in-line power module.

Crown CM-31 choir microphone.

This arrangement allows more flexible placement of the module. You could place it in a hole in the ceiling, hang it from a mic cable for easy access, or mount it to a beam overhead.

PCC-160 IS THE SOUND DESIGNER'S CHOICE

In the Aug/Sept. 1991 issue of *Theatre Crafts*, a survey revealed that, "in the area mic category there was an almost unanimous favorite: the Crown PCC-160. This microphone can be seen along the front of the stage on almost every show on Broadway ... and was the clear favorite of resident theatre designers as well."

GLM-200 USED TO RECORD MOSCOW SYMPHONY

It was a strange but successful combination: the Moscow Symphony and the rock group ELO. They performed together in a concert at the Wembley Arena in London. In this concert, David Scheirman (President of Concert Sound Consultants) used Crown GLM-200 mini mics to amplify the french horns. (Source: Oct. 1991 *R/E/P* magazine.)

In the same issue, another article described the use of PZMs by Obie O'brien, supervising producer/engineer on the live recordings of Bon Jovi's world tour. "I'd tape a PZM to the bottom of [the drummer's] riser and we'd get the direct coupling from its resonance — lots of lows and attacks from kick and snare."

MIKING A GRAND PIANO

What are some effective ways to mike a grand piano at a distance? We learned some great tips on piano miking from Pierre Sprey, owner/operator of Mapleshade Studio in Upper Marlboro, Maryland.

If you just put a mic in front of a piano at an arbitrary spot and it sounds bad, don't blame the microphone. Experiment with placement to get a sound you like.

First, place the mic stand about 3 to 8 feet from the piano. Close placement gives a detailed, percussive sound; distant placement sounds more spacious.

Raise the mic stand high enough so that the microphone is in-line with the raised lid (Fig. 1). This reduces pickup of lid reflections and floor reflections which can cause phase cancellations.

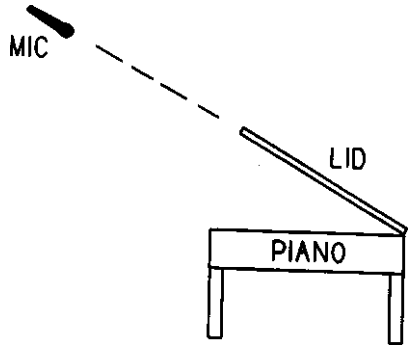


Fig. 1. Miking in-line with the piano lid.

The sound is bassier toward the tail of the piano where the bass strings are attached. So place the mic toward the tail for more bass, or toward the keys for more treble (Fig. 2). Another way to do this is to leave the mic aiming straight ahead, but rotate the piano to change the recorded tonal balance (Fig 3).

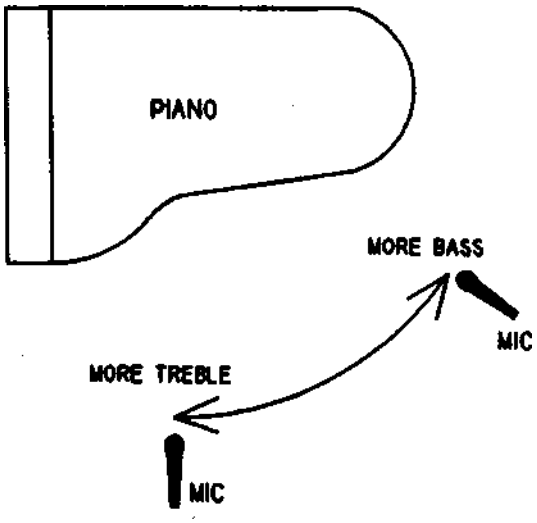


Fig. 2. Mic placement for piano tone control.

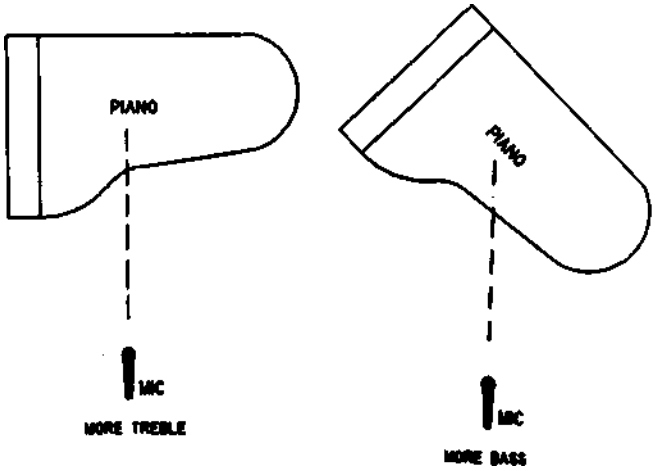


Fig. 3. Piano rotation for tone control.

MIKING A SINGING DRUMMER

Pierre Sprey also had suggestions on this difficult miking problem. He devised an ingenious setup using a PZM on a boundary to pick up a drummer's voice without picking up the drum set.

First, Sprey mounted two mic stands on either side of the drum set. Between these stands he mounted a rod or crossbar which was fitted into a boom holder on each mic stand. He bolted a 2-foot-square piece of plexiglass to the crossbar and taped a PZM in the middle of it (Fig. 4). Sprey placed the PZM about 1 foot from the drummer's mouth and angled the plex panel to reject the snare drum and cymbals (Fig. 5).

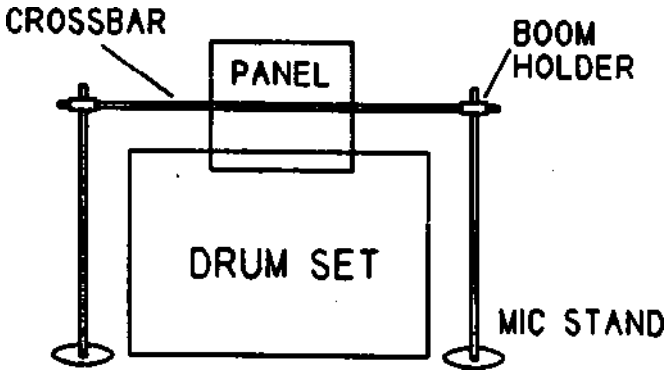


Fig. 4. Miking a singing drummer with a PZM.

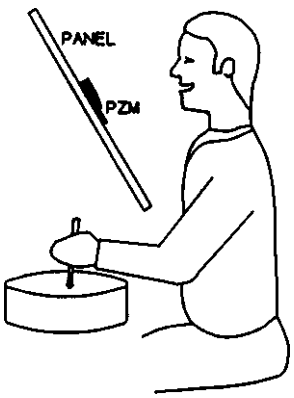


Fig. 5. Miking a singing drummer with a PZM.

With this setup, the drummer could move around with no change in tone quality or level. The vocal mic picked up almost no leakage from the drums. The drummer loved the sound and enjoyed being able to see the band through the panel.

To mike the drum set itself, Sprey placed a PZM wedge (a V made of two plex panels) on a stand in front of the set. This stereo mic array picked up very little of the vocal because the 2-foot plex panel blocked the vocal sound. Quite an innovative and effective mic technique!

PZMS MAY BE MORE SENSITIVE THAN OUR EARS

High up in a mountain range in Wyoming, three recordists were shocked by what they heard when recording there with PZMs. "While at the Cirque of the Towers in the Wind River Mountain Range, Wyoming, we were recording the music from an instrument we had created in the glacial moraine. We had placed PZMs on the face of a rock.

"All of a sudden we heard voices over our headphones, so we stopped to listen. When we removed our headphones, we couldn't hear them any more. But when we put the headphones back on, we could hear climbers talking to each other, saying 'On belay,' 'climbing,' 'off belay.'

"We looked at all the surrounding peaks and finally found the climbers a half mile away and 1000 feet up Pingora's face. The only thing that could have picked up these voices were the PZM microphones we were using to record."

Thanks for this information from James Anderson of Performance Audio in Salt Lake City, who advised the recordists on the use of PZMs.

# # #

MIC MEMO

Spring 1992
Bruce Bartlett, Editor

DIFFEROID ENDS FEEDBACK FOR DAN SEALS

CM-310

Prominent folk artist Dan Seals was hassled by feedback from his stage monitor speakers. Both his guitar and his hat brim reflected sound into his vocal mic, causing feedback.

John Windham of Morningstar Productions tours with Seals. At an October class of Syn Aud Con, John was asked about Dan's feedback problem. He said:

"We no longer have the problem. We are now using the Crown CM-310 Differoid [now the CM-310A]. It has completely solved our feedback problem."

Tim Rathert, sound designer and mixing engineer for Dan Seals, has this to say about the CM-310:

"The 310s are a closer approximation to the tube mics we use in the studio than anything else we've ever used... A critical choosing point was mic performance with an in-the-ear monitoring system. With the Differoid, the fidelity that Dan heard was incredible."

CROWN MICS FEATURED AT OPENING CEREMONIES

Crown microphones delivered the audio at a spectacular event. It was the Opening Ceremonies of the World Gymnastics Championships, held at Market Square Arena in Indianapolis last September.

Stage 2 Productions provided the audio system and engineering, assisted by John Royer, head of sound for the Indianapolis 500 Speedway. Celebrities at the event included Bart Conner, Nadia Commaniche, Sandy Patty and Blackstone the Magician.

How were Crown microphones used at the event?

*Vice President Dan Quayle declared the Games open through a CM-230 tridundant microphone. Each of the two lecterns used a CM-230.

*The children's choir was miked with three PCC-160s on the floor, 3 feet from the ensemble (Fig. 1). According to John Royer, the children sounded close-miked, and leakage was no problem.

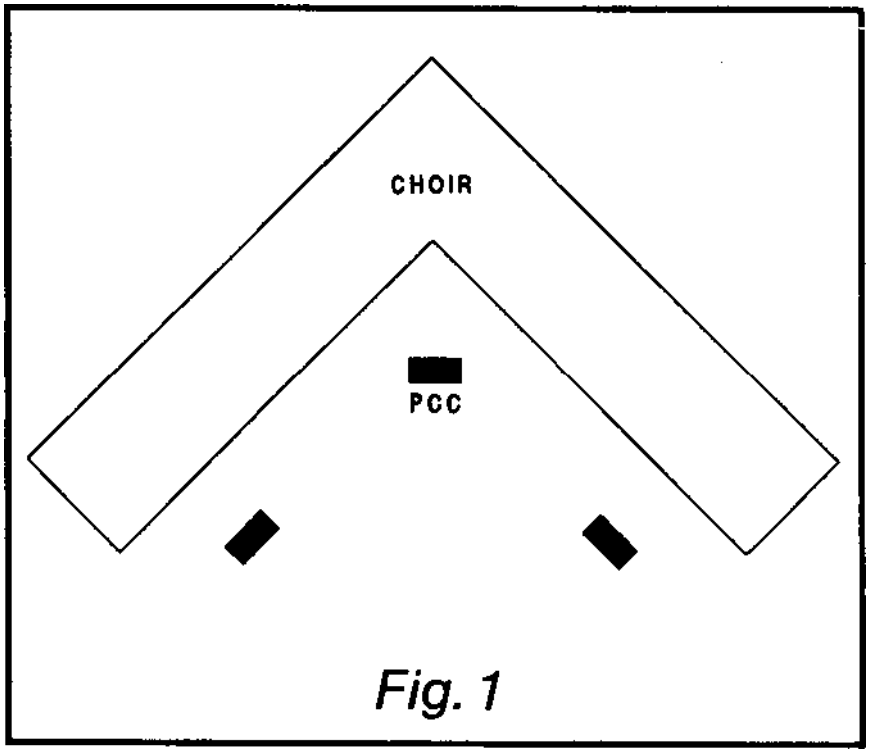


Fig. 1. Miking a children's choir with PCC-160s.

*PZMs on 90-degree plexiglass boundaries picked up the tap dancers effectively.

*Each vocalist sang through a CM-200a handheld microphone.

RECORDING STUDIO RELIES ON GLM-100s EXCLUSIVELY

Musician Doug Krehbiel has put together a recording studio using nothing but GLM-100's for mics. (GLM-100's are miniature omni mics). He especially loves how they sound on acoustic guitar and drums.

Doug built a vocal isolation booth made of two padded screens with a thick blanket roof (Fig. 2).

Inside the booth, he mounted a GLM-100 on a 2' plexiglass panel. Using the double-sided tape supplied with the GLM, Doug taped the mic face down onto the panel. This forms a PZM.

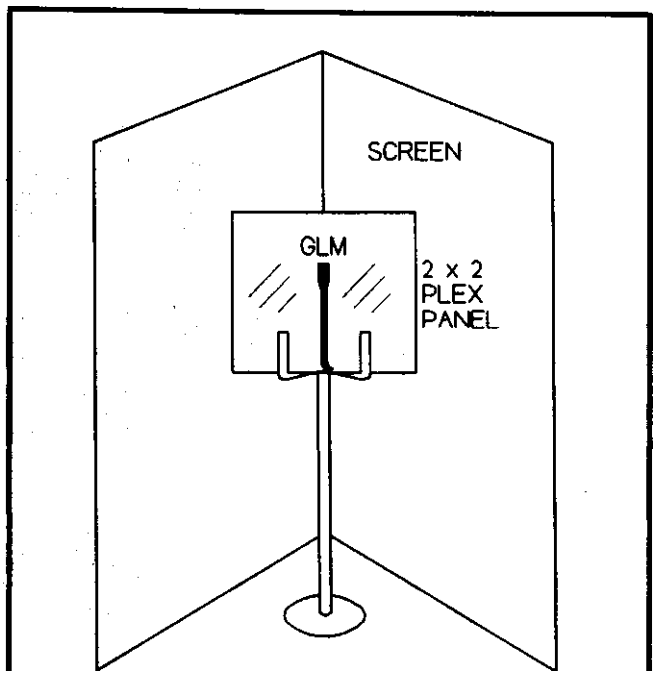


Fig. 2. Vocal isolation booth with GLM-100 on panel.

The plex panel sits on a monitor mount on a mic stand, and rests against the booth walls.

Doug's recording equipment is in the same room as the musicians. Any noise problems with this arrangement? Well, when Doug recorded a singer without the plex panel, the GLM picked up a little "click click" from the rotating tape reels. But the plex panel eliminated that noise. It also rejected room ambience and gave a tight, intimate sound to the vocals.

HELPING A PROJECTIONIST HEAR

In an IMAX movie theater — the type that uses an enormous screen and 70 mm film — the projectionist works in an isolated booth. Acoustically removed from the theater, the projectionist can't hear the sound as the audience hears it.

A solution was devised by Jim Brown, principal consultant for The Audio Systems Group in Chicago. He suggested mounting two PZM-20RG microphones in the balcony face. These pick up the sound in the theater and relay it in stereo to the projectionist.

USING GLMs IN THE THEATER

Here's a man with lots of experience using GLMs in theater applications. He's James R. Cummings, owner of Soundstage 1 recording services, and sound designer for several theatrical troupes that tour nationally (*Sweet Charity*, *Pirates of Penzance*, *Pajama Game*).

By experimenting with GLMs, Cummings has discovered many insights into GLM usage on stage. We're happy to share his ideas here.

The main actors and actresses need wireless lavalier mics. For this application, Cummings prefers the GLM-100 omni lavalier. One reason is that it is tougher than other mics in handling abuse — tugging, sweat, heat, cold, and hairspray. Plus, he says, the GLM is easier to hide, easier to paint, and it sounds great.

Speaking of paint, Cummings found that spray shoe dye holds up the best under sweat.

The usual mic placement at pocket height on the chest doesn't work too well. Most of the time the mic must be nearer the mouth for a more intimate sound.

Typically, Cummings runs the GLM cable through the actor's hair, dead center, and aims the mic over the forehead down toward the mouth (Fig. 3). The mic cable can be run through a wig and out a hole cut in the widow's peak. This placement is especially useful if the actor dances.

Fig. 3. Two effective GLM placements on a theatrical performer.

Another good placement is over the ear, sideways to the head, aimed straight down toward the mouth (Fig. 3), or against the head aimed straight out. Other positions are on an eyeglass frame or a suit lapel.

Often, sweat gets into the mic capsule and clogs it up. The mic is okay if dried overnight. To protect against sweat and hairspray, Cummings wraps the GLM tightly in plastic wrap and secures with a rubber band. There's no change in the mic's frequency response.

Cummings feels that GLMs should be used a lot more on Broadway than they are. "All the theaters know about PCCs, but not GLMs. If they tried them out, they'd be amazed."

OFF-THE-WALL WAYS TO USE PZMs

These tips are adapted from an article by Bruce Bartlett in the June 1990 issue of *EQ* magazine.

Anywhere there's a hard surface, someone will stick a PZM microphone on it and try to record something! Standard PZM techniques have evolved over the years: you can mike a grand piano with two PZMs taped to the underside of the lid, pick up room ambience with PZMs on the walls, or record cymbals with two PZMs over a drum set.

But thanks to ingenious experimenters, many bizarre applications have surfaced. Like these...

***On a drummer's chest**. Chris Altizer devised a chest mount to place a PZM on a drummer's chest (Fig. 4). The PZM picks up the set as the drummer hears it — all the toms, snare, bass drum, and cymbals. Altizer says, "In small clubs, or on large outdoor stages, one PZM beats ten regular mics for convenience any day in my book."

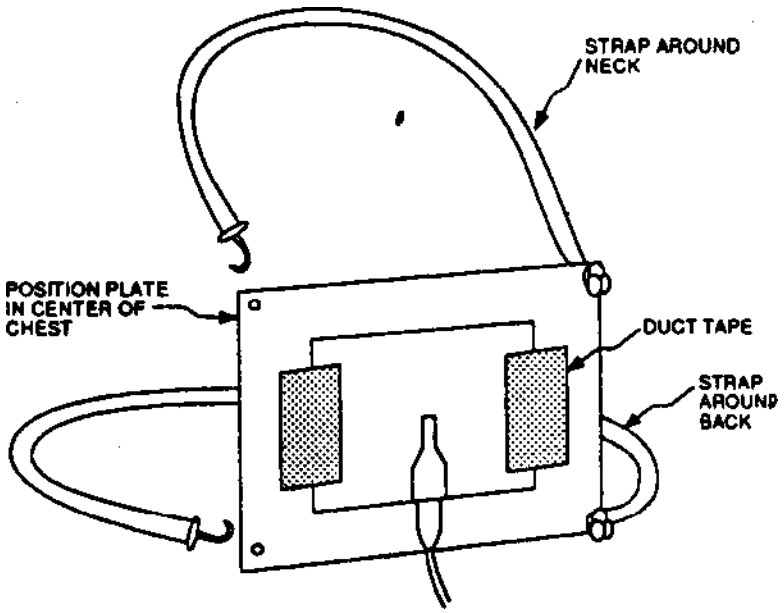


Fig. 4. Chest mount for a PZM.

***On your head**. Binaural recordists such as Frank Zappa have taped a PZM over each ear, then played back the recording over headphones. The result? An amazingly realistic sense of space, for less than the cost of a dummy head.

***On a kick drum head**. J. Paul Hancock of AUDIO I/O taped a PZM to a Maxi-Pad and attached the pad to the kick drum beater head. According to Hancock, "this gave a great kick and snare balance with an open, punchy snare sound."

***In a garbage can**. For a trashy snare sample, nothing beats a PZM in the bottom of a waste container.

***On the floor by a guitar amp**. To fatten the sound of an electric guitar in a demo, Vince Motel laid a PZM on the floor 3 feet from the speaker cabinet. Then he placed a hard panel 6 feet from the cabinet, behind the PZM. Sound reflections from the panel thickened the sound. By changing the distance between speaker, PZM, and panel, Motel got an ambient sound without adding a second room mic.

***On drum baffles**. Mark Wright, who plays in a Top-40 band, used two PZMs inside a large plexiglass barrier surrounding his drums. He placed the mics low and in the corners. He also used one conventional cardioid mic centered overhead and one on top of the snare drum. With this setup, "I got incredible low end from the toms and bass drums, great highs from the cymbals and Rototoms, and used only four channels on the main board. The barrier also cut down my stage volume."

Alfred Grunwell of Calf Audio devised a unique method of drum miking. "We have a flying V plexiglass unit that we use for stereo overheads with PZMs. We usually use a PZM in the kick and on the high-hat. Our newest breakthrough is to tape the PZMs onto the top of the kick, directly under the mounted toms. And voila — more great sound, bright but deep, lots of attack and plenty of air."

***In a plastic dish**. Producer Gary Reber recorded Buddy Rich's drum set overhead with two PZMs, each mounted inside a plastic dish (actually a dome window from a van). A baffled PZM picked up the bass drum. PZM pioneer Ken Wahrenbrock invented these boundaries, plus a slew of other intriguing baffle shapes.

***On a percussionist's chest**. Trying to cover a large array of congas, bells, gongs, and wood blocks? Strap a PZM to the chest of the percussionist. The PZM follows the musician as he or she moves from one instrument to another. Since only one mic is used, there is little ambient pickup.

***In a stereo microphone**. The Crown SASS-P is a stereo PZM microphone. Engineer/Producer

Tom Edmonds used it to record Zoro, the exciting drummer with the Lenny Kravitz band. Edmonds placed the mic under the cymbals, between the rack tom and floor tom, aiming at the snare about 3 feet away (Fig. 5). Then he added two more SASS mics back in the room for ambience. Within five minutes, he came up with a sound that, he said, "would have taken hours in the studio to create."

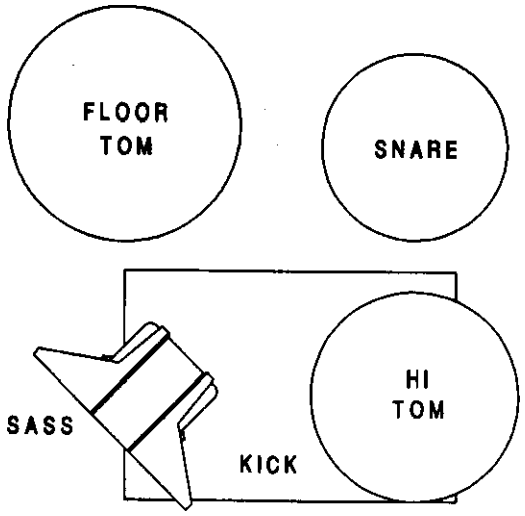


Fig. 5. Miking a drum set with a SASS-P.

PZMs are great fun to experiment with because conventional mic techniques go out the window. In fact, I think I'll go tape some to my house to sample a thunderclap...

LETTERS FROM CROWN MICROPHONE USERS

On the stage in our audiorium, I have five PCC-160s that I can use on the apron. Due to the unusually large depth of the stage [43 feet] I have difficulty in miking the upstage area. Can you suggest a solution? Also, I am interested in a good method of miking a 12' grand piano.

Larry Stroud, Technical Director, East Carolina University

Reply: First, Larry, try three PCCs instead of five to reduce the possibility of feedback. To mic the upstage area, hang one or two CM-30 or CM-31 microphones overhead, about 25 feet from the apron.

If you want to mike the piano for sound reinforcement, or for recording pop music or jazz, try this method: Tape two PZMs or two GLM-100s to the underside of the raised lid. Mount one over the treble strings, one over the bass stings, about 8 inches down from the hammers.

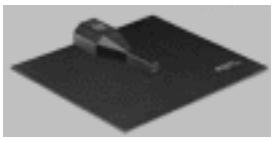
If you want to record a classical-music solo, try our stereo microphone: the SASS-P MK II. Place it about 4 to 8 feet away, in-line with the lid.

# # #

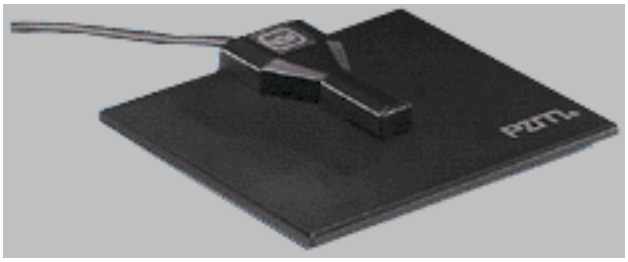
MIC MEMO

Summer 1992
Bruce Bartlett, Editor

NEW PZMs OFFER SWITCHABLE RESPONSE



PZM-30D



PZM-6D

Crown is happy to introduce the PZM-30D and PZM-6D Pressure Zone Microphones, designed for pro recording, sound reinforcement and broadcasting.

In either mic, you can switch the frequency response to either rising or flat. The “rising” position adds brilliance and articulation. The “flat” position gives a smooth, flat response for natural sound (Figure 1). It’s like getting two mics in one!

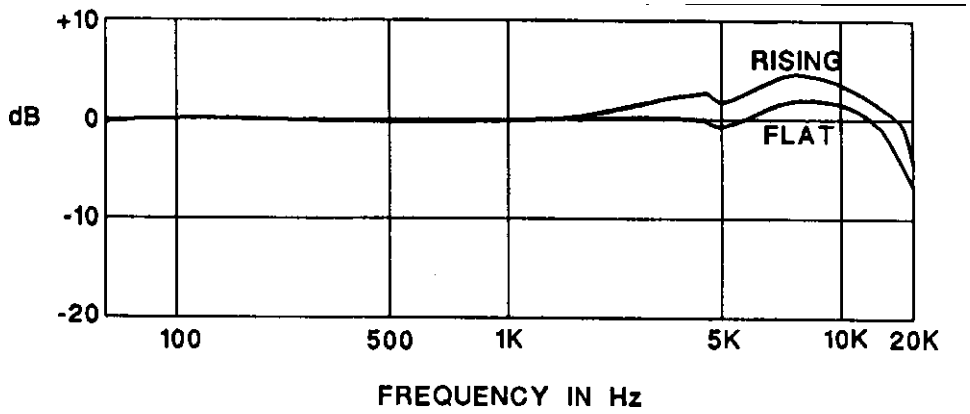


Fig. 1. PZM-30D response.

Intended for studio use, the 30D is especially reliable because it can be used with a rugged detachable cable. The 6D is smaller, and has a thinner attached cable to make the mic inconspicous. It’s well suited for use on conference tables or plexiglass panels.

The PZM-30D replaces the models PZM-30R and PZM-30F. The PZM-6D replaces the models PZM-6R and PZM-6F.

GLM-100s WORK GREAT FOR HARP, DULCIMER

Want to make some beautiful recordings of harp and dulcimer? Take some advice from Anne & Gary Wakenhut, winners of the 1991 PZM/SASS Challenge. They sent us some tips on miking these instruments with GLM-100 mini mics. Please refer to Figure 2.

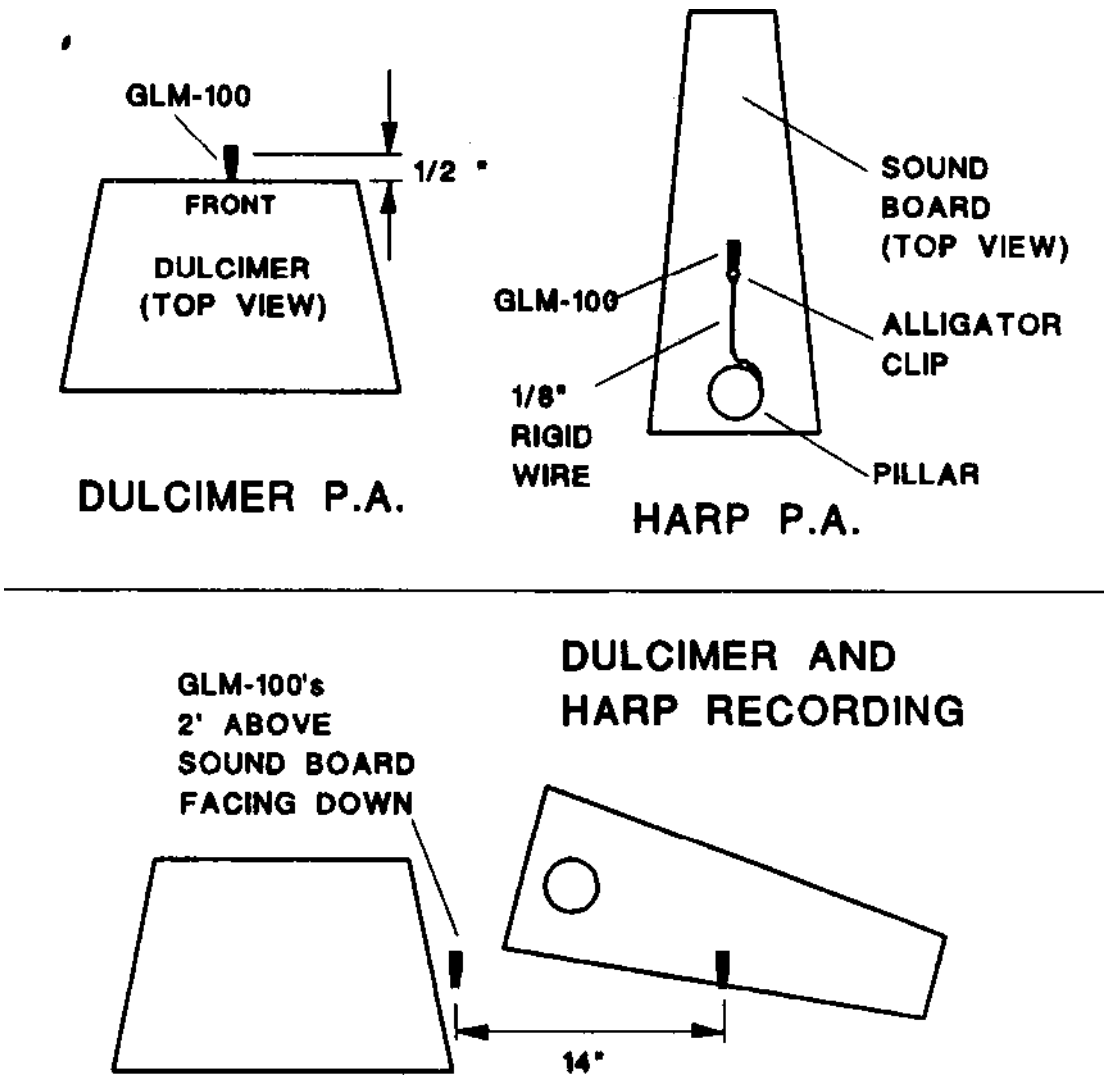


Fig. 2. Miking harp and dulcimer with GLMs.

***Harp sound reinforcement:** "The GLM rides about 1/3 of the way up the harp's sound board. It is held with an alligator clip fastened to a long length of 1/8" rigid wire, which is in turn attached to the pillar and perpendicular to it. This places the mic 1/8" from the sound board. There is no dampening effect which might result if the mic were attached directly to the sound board.

"When feedback is a problem, we rotate the mic so it is not exactly facing the sound board.

***Dulcimer sound reinforcement:** "One GLM is mounted in the center of the top edge, about 1/2" above it and at right angles to the sound board. The GLM looks across the sound board through the strings. It gives an amazingly good and well-balanced pickup of the whole instrument.

***Flute, pan flute and whistle sound reinforcement:** "We attach GLM-100 to the top of a music stand with a rigid wire similarto the harp mount. This makes the mic easily accesible without the clutter of a boom stand.

"We are pleased with the GLM-100s in our sound system, which is almost invisible.

***Harp and dulcimer recording:** "The pillar of the harp is placed as close as possible to the left side of the hammered dulcimer. The two mics are placed on a horizontal boom about 14" apart. Both mics are 2 feet over the soundboards and look down at the floor.

"We get very good presence on both instruments even though the mics are not facing over the ideal sound sources. The placement gives us a very nice stereo spread for each instrument, as both mics

hear both instruments but still provide adequate separation.

“The natural sound which we have been able to gain through Crown mics has been a very important part of our success.”

SASS AND PZMs FEATURED IN VIDEOGRAPHY

The January 1990 issue of *Videography* had the following article about the Crown SASS and PZMs:

“Field Audio Engineer Gary Pillon, a 21-year veteran of General Television Network (GTN), in Oak Park, MI, recently won his second national Crown PZM Challenge, which is sponsored by Crown International Inc. to promote innovative use of the company’s PZM and SASS mics.

“Pillon, who triumphed in two categories, received two GLM-200 mics for his PZM sound-effects work on such videos as *The NewHistorians* and *Stearman Fly-In* . He also won a new SASS-P micfor his music entry for a documentary entitiled *The Fort Street Chorale*.

“Pillon received his first Grand Prize in the 1984 Crown PZM Challenge, and used his four-PZM microphone prize to win his first regional Emmy for the PBS syndicated program, *Miracle on Fort Street*. Pillon is noted for inventing the PZM stereo shotgun that was used in the production of this year’s PZM winners, and is featured in Crown’s how-to Boundary Booklet. Pillon’s most recent innovationuses PZM techniques to create an audio/video simulator for exercise environments.”

NEW BOUNDARY MICS OFFER SWITCHING, GATING

In the last issue of the *Mic Memo*, we introduced the Crown PCC-170: a surface-mounted mic with a supercardioid pattern. This handsomely styled unit is appropriate for use on the most elegant boardroom table or lectern. Other uses include churches, courtrooms, and council chambers.

The previous model, the PCC-160, has a heavy steel housing to withstand abuse on theater stages. In contrast, the PCC-170 is designed for conference tables, where appearance is more important than ruggedness.

Like the PCC-160, the PCC-170 rejects ambient noise and feedback. It’s free of any sonic coloration caused by sound reflections off the table. And the mic reproduces the voice with a clean, clear, and natural sound.

Two new models of the PCC-170 have just been introduced:

PCC-170SW: Used on a conference table, this model has an on/off switch so each person can control their own microphone. The on/off switch is a silent membrane type. By setting a DIP switch, you can configure how the on/off switch works: touch on/off, momentary on, or momentary off. An LED lights when the unit is on.

PCC-170SW

PCC-170GT: [Discontinued.] This has internal gating circuitry. It turns on (gates open) when you speak into it, and turns off (gates shut) during pauses in speech. In multi-mic installations, only the microphone(s) in use will be on. This makes the sound clearer and reduces feedback.

The gating action of the PCC-170GT is smooth and click-free. It turns on quickly with no missed syllables, and gently drops down 12 dB during pauses. When the mic is on, a top-mounted LED flashes. A trim pot lets you adjust the volume level at which the mic turns on.

USING PZMs FOR DRUM MIKING

Want a great drum sound with little fuss? Try these suggestions. In the July, 1991 issue of *Home and Studio Recording* , columnist Paul White wrote about how to mike a drum set on a budget. He recommended a pair of PZMs and a pair of dynamic mics.

First place the PZMs overhead for overall stereo pickup. To do this, tape two PZMs to two mic booms. Place the PZMs 6 or 7 feet above the floor, and 2 feet to each side of the drummer. Angle them to look at the two toms.

Although PZMs have the best bass when mounted on a large surface, they can be used as they are. Their sound will be a little trebley, but when mixed with the other mics, the tonal balance should be right. “The cymbals will sound very bright and natural,” says White.

Put the bass-drum mic on a boom just inside the front head and dampen the drum with a blanket. Equalize it about +6 dB at 80 Hz and cut some around 150 Hz to reduce boxiness. Place the snare mic about 3 inches from the head and 2 inches in from the edge. Aim the mic at the center of the head.

Finally, pan the PZMs hard left and right, and pan the bass and snare to center. You should have a pleasant drum sound with only four mics in use.

EXORCISE PIANO PEDAL THUMPS!

It’s hard to meditate to New Age piano music when the sound is marred by pedal thumps. The following story tells how to exorcise the thump demon from pianos.

I was recording a solo piano album for Michele Schricker, a local musician. To pick up her grand piano, I taped two PZM-30Rs to the underside of the raised lid. The sound was excellent — full, uncolored, and with clear hammer attack. But every time she worked the sustain pedal, the piano thumped.

By instinct, I rolled off the low frequencies. It helped, but the thumps were still there, and the piano sounded thin.

Michele’s husband, George, solved the problem. He wedged some folded paper into the pedal mechanism to limit its travel. A mechanical solution for a mechanical problem. No more thumps!

I’ve learned more good recording tips from musicians than from recording engineers.

HOW TO TAPE A PZM TO A PIANO LID

Don’t use duct tape! It leaves a gooey mess on the piano lid. Instead, use drafting tape, which drafters use to hold paper to their drawing boards. You can find some in an office-supply store.

When used with GLMs, drafting tape prevents marring on any instrument, such as guitar, bass, or violin.

Normally you’d use a GLM-SM Surface Mount to permanently attach a GLM to a guitar or piano lid. But if you don’t need permanent mounting, just use drafting tape instead. Place the mic face-up on the surface and tape the mic in place (Figure 3). Be careful not to cover up the sound-entry window.

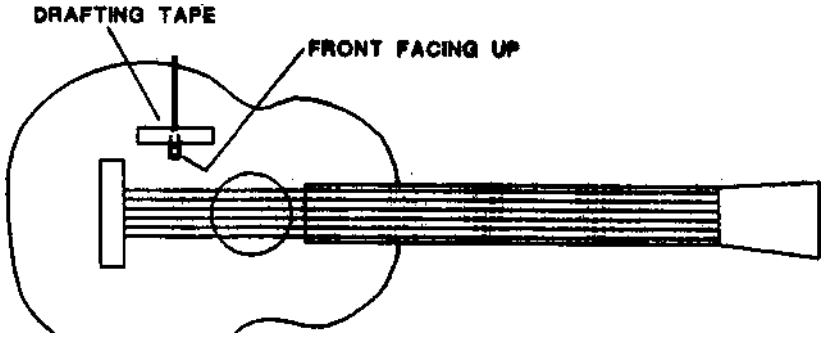


Fig. 3. Miking an acoustic guitar with a GLM-100

GLM MICROPHONE ACCESSORIES

There are a wide variety of accessories for GLM mics. [Some of these have been discontinued]. Here's what they can do for you:

GLM-UM Universal Mount: Supplied with the mic, the Universal Mount lets you attach a GLM to musical instruments.

GLM-TB Tie Bar: Also supplied with the mic, the GLM-TB is a lavalier-type tie clip.

GLM-TT Tie Tac: This is a tie tac that mounts a GLM on a tie.

GLM-SP Stick Pin: The GLM-SP lets you pin the GLM-100 to clothing or other fabric. Either pin it on outside clothing, or inside to hide the microphone.

GLM-BC Belt Clip: Supplied with the mic, the Belt Clip acts as a strain relief. If the cable gets tugged on, the mic stays put.

GLM-OHM: Need an inconpicuous mic stand? The OHM Boom Stand Mount is a slim boom mount for overhead miking of drum sets or choirs. It adjusts easily and securely positions the mic.

GLM-CM Cymbal Mount: Use the Cymbal Mount on a hi hat to position the GLM over the hi-hat cymbals. The mount isolates the GLM from stand vibrations.

GLM-WS2 Windscreen: This is an open-cell foam sphere that reduces wind noise and breath popping. The smaller GLM-WS3 windscreen is less conspicous, but picks up about 7 dB more wind noise than the GLM-WS2.

GLM-CH Choir Hanger: Use this to suspend a GLM over a choir and to aim the mic at the choir.

GLM-DM Drum Mount: This device lets you permanently attach a GLM to a tension rod on a drum. The mount can be folded flat for easy packing.

GLM-HM Horn Mount: Thanks to its soft-rubber clip, the Horn Mount can be attached to a sax or trumpet without marring the finish.

GLM-SM Surface Mount: This lets you mount a GLM mic near a surface or boundary, turning the GLM into a Pressure Zone Microphone. The GLM-SM works with both the GLM-100 omni and the GLM-200 hypercardioid mics.

LETTERS FROM CROWN MICROPHONE USERS

Using GLM-100 with mixer and transmitter

I'd like to use a GLM-100 [mini omni mic] with a mixing console and also with a transmitter. How can I do this?

Reply: You'll probably need two mics: a GLM-100 and a GLM-100/E. The GLM-100 has a balanced low-Z output which plugs into a console mic input. The mic gets phantom power from the console. The GLM-100/E is a mic capsule and cable without electronics. It has an unbalanced, medium-Z output which connects directly to a transmitter.

As an alternative, you can adapt a GLM-100 for transmitter use. Follow this procedure:

1. Plug the GLM-100 into a Crown PH-1B phantom power supply, which is battery powered.

2. Plug the PH-1B balanced output into an adapter to match your transmitter input.

To make this adapter, solder a female XLR to one end of a 2-conductor shielded mic cable. On the other end, solder a connector that mates with your transmitter. Wire pin 2 to hot; wire pins 1 and 3 to ground.

Mic on/off switch

We hung two CM-30 choir mics over our choir. We'd like the organist to turn these mics on and off at the organ. How can this be done?

Reply: A simple way to turn a mic on and off is to wire a SPST switch between pins 2 and 3 of the mic-cable connector. When the switch shorts across pins 2 and 3, the mic turns off.

However, you might hear a click or pop over your speakers when you flip the switch. Any imbalance in the phantom voltage on pins 2 and 3 makes a voltage spike when the switch is flipped.

Here's a popless solution: Amplify the mic-level signal up to line level, then switch the line-level signal. A small mixer with phantom power will do this for not much money. Place the mixer near the organist, and run cables to and from the mixer.

# # #

MIC MEMO

Fall 1992
Bruce Bartlett, Editor

LATEST CM-310 USERS

The CM-310 Differoid [now the CM-310A] is catching on witha variety of musicians. Here are some of the more recent users:

*Jazz artist Grover Washington, Jr. — vocalists on European tour

*Country artist Martina McBride — lead vocal

*Country artist Travis Tritt — lead vocal

*Country artist Hank Williams, Jr. — lead vocal

*Country artist Dan Seals — lead vocal

*Country artist Aaron Tippin — lead vocal

*Rap artist Hammer — nine choir members.

An engineer with Travis Tritt said "It's an excellent microphone — we're very happy with it."

Tim Prince of Starstruck Entertainment works with Aaron Tippin. According to Prince, "We couldn't find a mic that sounded as good with as little feedback as the CM-310. Its unique design allows you to get high monitor volume without feedback. I love that mic. It's a real useful instrument."

Prince said that Tippin tends to have a harsh singing voice, which is well complemented by the flat, smooth sound of the Differoid. He also said that he doesn't have to mute the mic when it's not in use, because it picks up so little leakage. "It acts like it's gated."

The Differoid can be seen on Country Music Television and the Nashville Network in Tippin's video, "There Ain't Nothing Wrong with the Radio."

Hammer's monitor engineer, Harald Danker, said that he needed a mic that rejected noise and feedback. Since 14 mics were open on stage at all times, this was crucial. The mics are used by the chorus or choir of 14 members (now nine). Harald says that he is delighted with the noise and feedback rejection of the CM-310. He notes that the stage is just too noisy for any other microphones because the band and monitors are very loud.

Hammer chorus member using a Crown CM-310 Differoid.

TRIDUNDANT MICS USED IN REPUBLICAN CONVENTION

At the National Republican Convention this August, Burns Audio used sixty CM-230 Tridundant microphones [no longer available] to cover the event. Each mic picked up the speeches at each delegate area.

All the mics were plugged into 20 Crown MPX mixers, which are computer-controlled 6-in, 2-out units. Each mic fed two mixers for redundancy.

A conventional master mixer was used to mix three elements of the program:

1. The combined output of one group of MPX mixers.

2. The combined output of the redundant group of MPX mixers.

3. The lectern microphone.

The person who ran this mixer had to work only two faders at a time.

Another person operated a computer which ran software customized by Crown. With this software, the operator could switch instantly to any state, either by mouse or computer keyboard. When the state was selected, the corresponding mic came on and all other mics were muted. Plus, the name of the state appeared on-screen. A monitor placed at the main lectern showed the person speaking there when the state's mic was on.

According to Burns Audio, the CM-230s sounded great, and the computer-switching made operations much simpler than in the past.

HOW TO MIKE AN ACCORDION

An accordion player asked us how to mike his accordion for sound reinforcement. He had several requirements:

1. He wanted to move around while playing — not stay in front of a mic.

2. The mic should not pick up adjacent instruments or monitor speakers.

3. The mic should not pick up key noises.

First we suggested that he use a CM-200a cardioid or a GLM-200 hypercardioid. However, he couldn't move around when using a CM-200a. And when he attached the GLM-200 to his instrument, the mic picked up too much mechanical vibration (key thumps).

One solution: use a GLM-100 omni, which has very little pickup of vibration. To make it reject the monitors, mount it on a plexiglass panel PZM-style — facing the panel and about .020" from the panel.

Place the GLM-100 in a GLM-SM Surface Mount and attach the mount to the plex panel near the center.

Form the panel into a bracket attached to the accordion by Velcro [tm] (Fig. 1). To avoid standing waves, slightly angle the panel relative to the accordion. Filter out frequencies below 200 Hz on your mixer to reduce thumps and feedback.

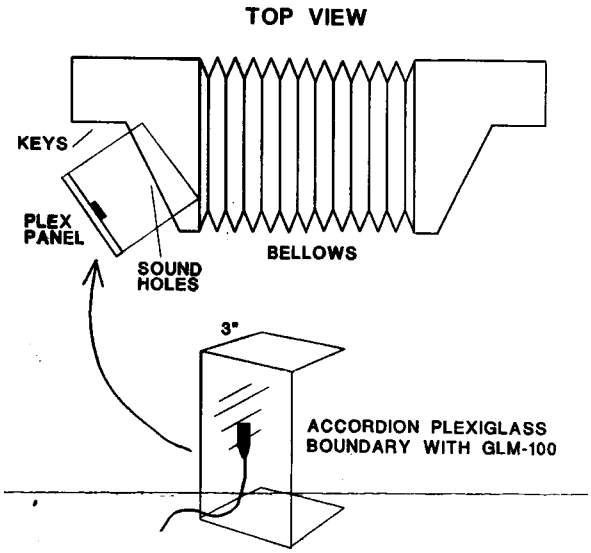


Fig. 1. An accordion miking method.

SASS ON CD

A Crown SASS-B provided the main stereo pickup for the CD, “Musik und Lieder im Kirchenjahr.” This German production (Happy Valley Records 1291) features a brass band and choir.

Along with the SASS, the engineer used a John Hardy M-1 mic preamp into a Tascam DA-30 DAT recorder.

The Mic Memo editor recorded the Hope College choir with a SASS-P MKII. The mic was placed about 12 feet from the choir in a reverberant chapel. Although the recording is not out on CD yet, it was used to make cassettes for the choir members. The choir director loved the sound and plans to make more recordings, possibly for commercial release.

IMPROVING YOUR IMAGE

When you make a stereo recording, it’s important to listen to the quality of the stereo imaging. Is each instrument easy to localize? Is the stage width too narrow or too wide? Is there a ping-pong effect, where most instruments are heard from the left or right speaker?

You can improve the stereo imaging of your recordings by knowing more about stereo mic techniques. Some work better than others.

An easy way to get sharp, accurate imaging is to use a SASS-P MKII stereo mic. It was designed specifically to optimize stereo effects.

Suppose you’re using two mics to record in stereo. There are three basic ways to set them up: coincident pair, spaced pair, and near-coincident pair (Fig. 2).

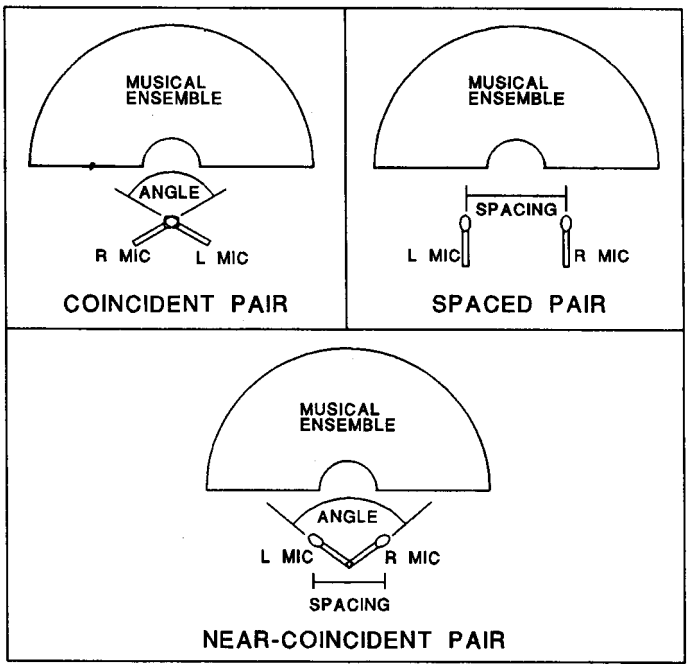


Fig. 2. Three basic stereo-miking methods.

The coincident pair uses two directional mics with their diaphgragms aligned vertically, grilles almost touching, and angled apart. The spaced pair uses two mics of any pattern spaced a few feet apart horizontally and aiming straight ahead. The near-coincident pair uses two directional mics angled apart and spaced a few inches horizontally.

The spaced pair tends to provide diffused, unfocused images for off-center sound sources. Imaging is sharper with coincident and near-coincident methods.

Here's an easy way to check the imaging of your chosen stereo miking arrangement. Record yourself speaking at the left side of the performing ensemble, then move left-center, center, right-center, and right side while speaking. Play back the recording. The left- and right-side speech should come from the left or right speaker. The left-center speech should be heard halfway off center, and so on. Each image should be easy to localize.

If the reproduced ensemble does not extend all the way between your loudspeakers, angle or space the mics a little farther apart. Do the opposite if you hear exaggerated separation — a ping-pong or hole-in-the-middle effect.

DON'T TOUCH THAT MICROPHONE!

You've set up a lectern microphone. The people using it feel that they must lean down and talk into it, causing breath pops and proximity effect. Plus, most users grab the mic boom to adjust its position, causing thumps in the sound system.

To solve these problems, you might want to route this article and Figure 3 to people who use the lectern frequently. The microphone seldom needs to be adjusted for height, since it will pick up people from 5 to 7 feet high within its pickup angle. And you don't need to speak close to the mic — it will pick you up adequately 1 foot away, nearly always without feedback.

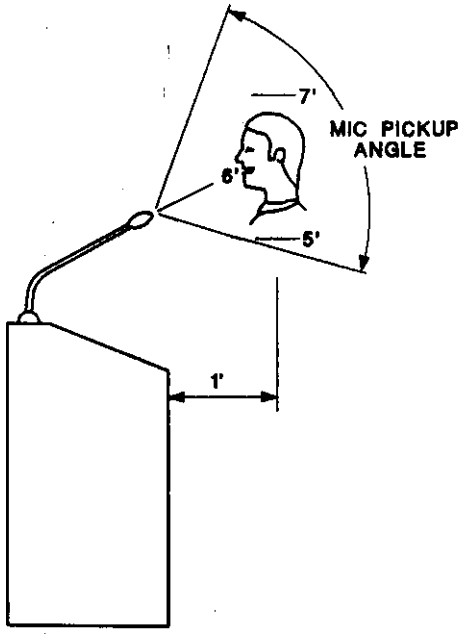


Fig. 3. Suggested lectern mic placement.

Some people put a note on the lectern that reads, “Please don’t touch the mic — talk about 8" away.”

LETTERS FROM CROWN MIC USERS

Super vs. hyper

In the *Crown Microphone Application Guide*, pages 4 and 5 have tables showing that the hypercardioid pattern has more feedback rejection and reverb rejection than the supercardioid. Yet, if you look at the area of rejection of the polars, the super appears to have greater feedback and reverb rejection than the hyper (see Fig. 4). Which is correct?

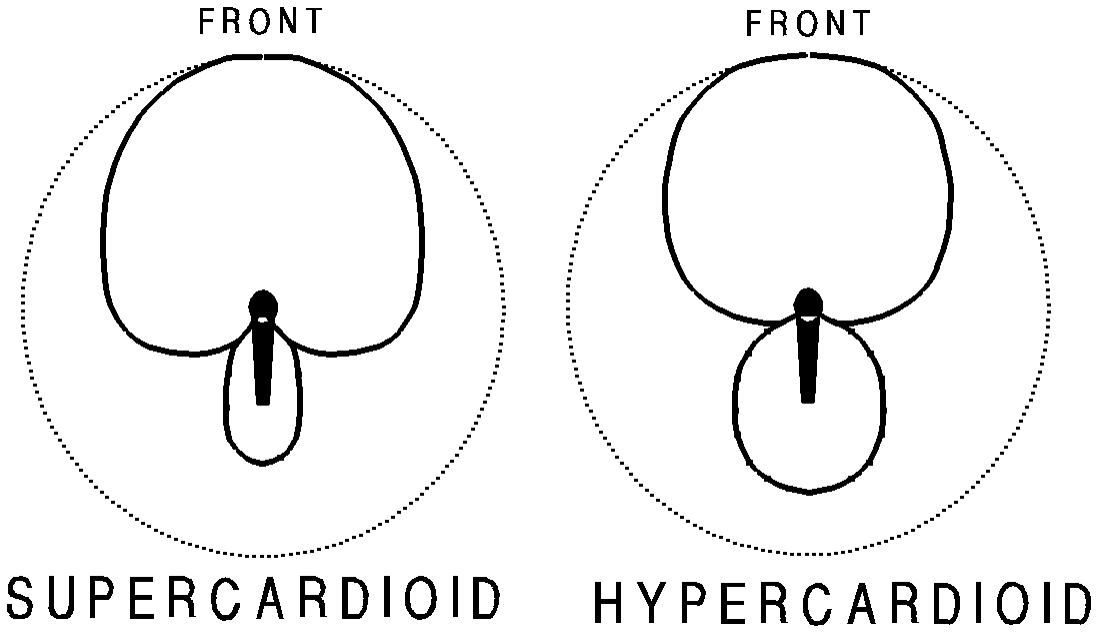


Fig. 4. Supercardioid and hypercardioid polar patterns.

Reply: The supercardioid does have more rear rejection than the hypercardioid. So a super would better reject feedback from a floor monitor, for example.

However, the tables in the application booklet apply to reverberant or diffuse-field sound, which approaches the mic from all directions equally — not just from behind. In this case, the hyper rejects reverberant sound slightly more than the super.

Sound is reverberant when the sound system is indoors and the house speakers are amplifying the microphone. The sound from the house speakers would be mostly reverberant sound at the mic. So the hyper would have a slight advantage indoors in rejecting sound from the house speakers. Also, the null or dead spot of the hyper is likely to aim at the house speakers.

Here's how to determine the reverb rejection of a polar pattern: Using the formula for the polar pattern, you calculate the output of the mic at all angles of incidence and add them up. After doing this, you find that the omni rejects reverb 0 dB, the super rejects reverb 5.7 dB, and the hyper rejects reverb 6.0 dB.

The hyper rejects sounds from the side better than the super. So if you use side-fill monitors, the hyper should more effectively reject feedback from them, all else being equal.

Here's a summary comparing the two patterns:

Best rear rejection: Supercardioid

Best side rejection: Hypercardioid

Best reverberant sound rejection: Hypercardioid

Getting the organ out of the choir

In our church, a pipe organ is directly behind the choir. I want to pick up the choir without picking up the organ. Any suggestions?

Reply: First, mike the choir as close as possible — about 1-1/2 feet in front of the front row, and about 1-1/2 feet above the heads of the back row. If that doesn't help, hang the choir mics overhead and aim them straight down at the choir. The side rejection of the mic will reject some of the organ. Finally, filter out the low frequencies below 100 Hz to avoid picking up deep organ notes in the choir mics.

Duct tape vs. gaffer tape

In regard to your comments about not using duct tape on guitars or piano lids, I must agree completely. Duct tape is made to hold permanently and often does not come off cleanly. What should be used, however, is gaffer tape which looks much like duct tape but is made to hold strongly and temporarily. It is available in theatrical supply shops and pro audio stores, but not in hardware stores which usually sell only duct tape. I have used a top-grade gaffer tape on all sorts of piano lids and never had any residue left as long as I pulled it off sharply.

Drafting tape can be used but is not as strong (being made to hold only paper) and the adhesive has a nasty tendency to turn into unremovable goo if left on for a few days.

Donald Wade, Collegium Sound, Inc., Jackson Heights, NY

PZMs in the ceiling

I'm working on a proposal for a training room, and I plan to specify PZM microphones in the ceiling. The room is 8-1/2 feet high, 30 feet wide, and 50 feet long. How many PZMs do I need? They should cover the entire room uniformly.

Reply: It's best to specify the smallest number of mics that will do the job. The more mics that are on at any one time, the muddier the sound.

Please see Figure 4. Six mics should work fine. The person nearest to each mic is 5 feet away. The person farthest from that mic who is using it is about 9 feet away. So their levels should be reasonably close. We recommend running the mics through an automatic gated mixer to turn off mics not in use.

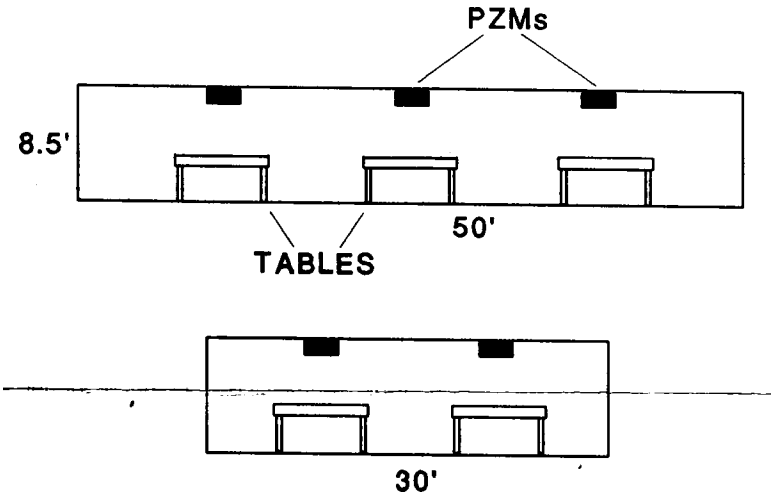


Fig. 4. Miking with PZMs on the ceiling.

# # #

MIC MEMO

Winter 1993
Bruce Bartlett, Editor

GARTH BROOKS' MIC: THE CROWN CM-311 HEADWORN MICROPHONE

CM-311

This is the microphone that country superstar Garth Brooks raves about. It's the new CM-311 headworn microphone [now the CM-311A.] Brooks and his sound engineers extensively field-tested the mic, and have used it on tour. Working closely with Brooks' engineers, Crown engineers designed the microphone to meet the real-world demands of touring sound.

The Crown CM-311 is a rugged headworn microphone for musicians or sportscasters. It sounds like

the best handheld microphones — full, clear, and distortion-free, even with the loudest singers.

“We’re knocked out by it,” says Brooks’ house mixer, Dan Heinz. “It’s got great articulation, no distortion, no leakage problems, no feedback problems.”

The CM-311 is the latest version of the patented Differoid [registered trademark] technology. Its cardioid pickup pattern rejects sounds from the rear, such as floor monitors. And its noise-canceling design rejects sounds at a distance, such as floor monitors, instruments on stage, and crowd noise. In fact, the CM-311 has phenomenal gain-before-feedback and isolation.

Lightweight and comfortable, the mic’s headband and mic boom adjust to fit any singer. An included pop filter greatly reduces breath noise and pops. Because of the boom’s unique behind-the-ear design, it does not cover up the singer’s cheek.

Two models are available: CM-311 and CM-311/E. The CM-311 is a headset and a battery belt pack, which connects to a mixer or any wireless transmitter. The CM-311/E is the headset alone, ready for use with a 9-volt wireless belt transmitter.

The CM-311 can be powered in two ways: the belt pack’s 9V battery or phantom power. The CM-311/E is powered by the 9V battery in the transmitter.

On the belt pack, two output jacks are included: an XLR-type which connects to a mixer, and a 1/8" phone jack which connects to a transmitter.

In situations where the musician plays and sings at the same time, and doesn’t want to be tied to a mic stand, the CM-311 fills the bill. Sports announcers wearing the CM-311 can follow the action without getting off-mic. All this with excellent sound, minimal feedback and leakage, in a comfortable, attractive design.

NIRVANA CHIEF ENGINEER ENDORSES DIFFEROID

CM-310

Craig Montgomery, chief audio engineer for Nirvana, has endorsed Crown CM-310 [now the CM-310A] Differoid microphones, using them for all vocal applications in the red-hot band’s live performance.

Seattle-based Nirvana burst upon the rock/pop scene last year with their trendsetting sound, most commonly described as “grunge metal.” With raw music that’s heavy on guitar distortion, getting the right mix presents a true challenge for Montgomery and his crew, a challenge made easier since he discovered the CM-310.

“Our primary problem was the bleeding of extremely loud guitar amplifier noise into the vocal mix,” Montgomery explains. “It generally runs from three to six dB hotter than our vocals, giving us a very bad situation with stage monitors. We simply had too much guitar bleeding through and couldn’t hear our vocals.”

Enter the CM-310. Offering superb gain-before-feedback, the CM-310 is a differential-type cardioid microphone that provides unmatched suppression of unwanted background noise and rejection of other stage noise. After discovering the mic, Montgomery, working with touring company Proshow USA of Seattle, equipped lead vocalist/guitarist Kurt Cobain, bassist Chris Novoselic and drummer Dave Grohl with CM-310's for all vocals.

"We had tried a variety of the 'typical' mics available for live performance without a lot of success," he says. "But the first time we used the CM-310, the unwanted noise went way down. In fact, it was at least 20 dB quieter than anything we had previously tried."

Montgomery adds that he has also found the CM-310 very effective in cutting out cymbal sound leakage into the vocal mix of drummer Grohl. "And although Chris (bassist) doesn't sing very much, he likes to have an open mic in front of him for interaction with the audience during a show. With the CM-310, we're now able to leave his mic open at all times without worrying about destroying the mix."

Nirvana joins a growing list of top touring acts to employ the CM-310, including Hammer, Grover Washington Jr., Travis Tritt, Michael Jackson, Bryan Adams, Dan Seals and many others.

Thanks to Keith Clark for this report.

GLM-200 HARMONICA MOUNT

Here's a great suggestion is from Bob Devlin of Baltimore, Maryland:

Attention, vocalists who play harmonica. Want to do away with the cumbersome mic stand/mic arrangement? Try making this special shock mount system, which holds a GLM-200 mic in the best position for vocal/harmonica work. It allows you freedom to move. It's ideal for musicians who play non-chromatic harmonica in a rack, Bob Dylan style.

To put this system together, you'll need these materials:

*One 6" harmonica holder rack, available in most music stores.

*Two 1/4" adjustable metal hose clamps (screw type).

*One heavy-gauge metal coathanger.

*One extra firm square of flexible foam, about 1-1/4" square.

*Two elastic hair ties or heavy-duty rubber bands about 2" long.

Please refer to Figure 1 and follow this procedure:

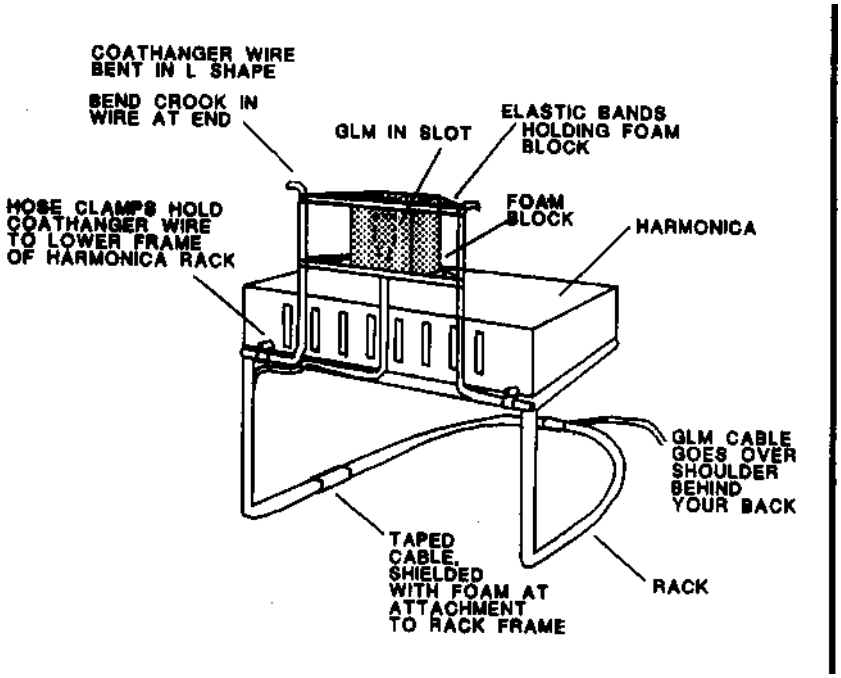


Fig. 1. GLM harmonica mount

1. Cut the coathanger wire into two 3-1/2" pieces. Bend each piece into an “L” shape. Then attach each L to the lower part of the harmonica frame (the part that opens) with the hose clamps.

2. Cut a piece of foam 1-1/4" square. Then with a sharp knife, make a small slit perpendicular to the rear of the foam. Into this slit, you will insert the GLM-200. You put the slit in the rear of the square to have as much foam as possible between the mic and your mouth. This reduces mouth noises and breath pops.

3. Stretch two elastic bands, one top and one bottom, across the two “L” shaped coathanger brackets you have secured to the frame. Be sure that those bands are loose, just tight enough to hold the foam square in place so it won’t fall out. (The looser the bands, the better the shock isolation).

4. Place the foam square, with the GLM-200 inside, between the two elastic bands and adjust the bands.

5. Isolate the mic cable from thumps and taps by carefully taping it to the harmonica rack frame. Run it back over your shoulder. At the points where you tape the cable, you might want to place a small piece of foam around the coathanger wire to reduce cable noise.

To adjust the volume balance between voice and harmonica, vary the height of the GLM within the foam square. Usually the mic is as high as possible since the harmonica is loud.

SOUND GRABBER ON AUDIOPHILE RECORDS

You might not think that the Sound Grabber mic is high enough quality for a recording studio. But here’s a notable exception.

An audiophile recording engineer, Pierre Sprey, likes to use the Sound Grabber in his jazz recordings for vocals and sax solos. Sprey, of Mapleshade Studios in Maryland, has been interviewed in *Down-beat*, *EQ*, and *High Performance Review*. In addition, he was featured in the February 1991 PBS broadcast of the MacNeil Lehrer News Report.

Sprey is a fanatic about sound quality. He takes a purist approach, typically using a single PZM wedge to pick up an entire jazz ensemble. The Sound Grabber is a spot mic for soloists. You can hear the Sound Grabber (and the PZM wedge) in these recordings on the Jazz Heritage label: “Clifford Jordan Quartet Live at Ethell’s” (MHS 512629A) and “Lonely Woman — the Frank Kimbrough Trio” (MHS 512628H).

MIKING A STRING QUARTET WITH GLMs

The Turtle Island String Quartet, who records for Windham Hill Jazz, uses GLM-100 microphones on their instruments for sound reinforcement. Their music is a wonderful, yet sometimes disturbing, combination of classical, jazz, ethnic, and old time. Some of their records include *Skylife* (WH-0125) and *Spider Dreams* (WH-01934, 10141-2).

They shared these GLM miking techniques with us:

Violin: Glue some foam onto the mic capsule strain relief. Insert the mic and the foam through the hole in the bridge. The GLM will “float” between the strings and the top of the violin.

Viola: Use the supplied GLM-UM Universal Mount. Clamp the GLM onto the tailpiece, and put the mic near the side of the bridge.

Cello: Glue some Velcro to cable next to the mic capsule. Glue a mating piece of Velco under the arch of the bridge. Attach the mic there.

Darol Anger, a member of the quartet, likes GLMs because “you get so much detail.” Feedback from the monitors is not a problem. He uses GLM-100 omnis because they have no up-close bass boost, as you would get with the GLM-200 hypercardioid. “We like the Crown mics because they’re built better.”

PCC RECOMMENDATION

In the August 1992 issue of *EQ*, an article on theatrical sound design had this to say about the PCC-160 supercardioid boundary mic:

"For downstage applications, the Crown PCC-160 is the mic of choice. This half-hemispherical PZM, when arrayed along the lip of the stage, captures the bulk of the dialog with quality sound and low susceptibility to feedback."

LETTERS FROM CROWN MIC USERS

Sound Grabber pad

I'm recording loud music with my Sound Grabber. The signal seems to be overloading my cassette recorder input, because the sound is distorted any any recording level. Can you suggest a pad for use with the Sound Grabber?

Reply: See Figure 2. This pad reduces the level by 20 dB, and should prevent your cassette recorder from overloading.

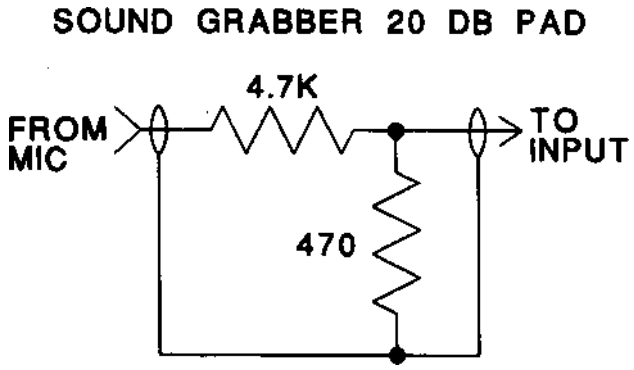


Fig. 2. Sound Grabber pad

Sound Grabber filter

I like to use the Sound Grabber as a free-field mic, away from any boundaries. But then it sounds thin and harsh because of the small boundary plate. Is there a simple filter circuit which will restore a natural sound?

Reply: Try the shelf filter shown in Figure 3. It compensates for the low-frequency shelf of the Sound Grabber's built-in boundary. Reduce the value of capacitor C to raise the low-frequency knee of the shelf. Reduce the value of resistor R to increase high-frequency loss.

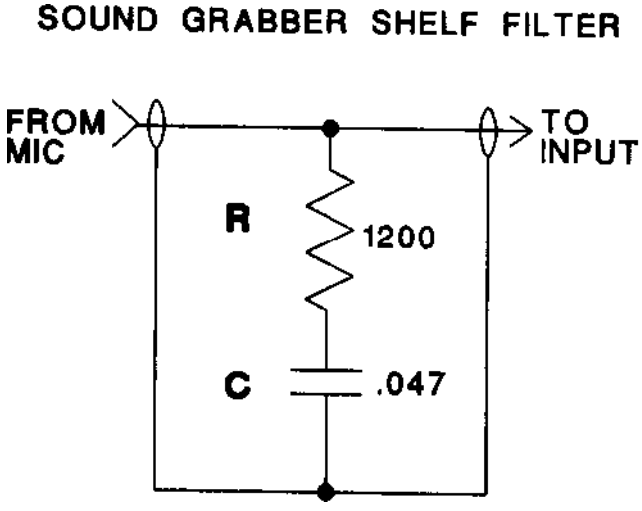


Fig. 3. Sound Grabber shelf filter.

Mic applications

One customer phoned us asking how to use Crown mics for a wide variety of applications. Here are our recommendations:

1. Five people are sitting at a long table on stage at a public meeting. They want to use mics close to their mouths, and they want to turn the mics on and off.

Suggestion: Mount an LM-300 lectern mic near each talker, and mount the mics in 300SM shock mounts. Put foam windscreens on the mics. Make an on-off switch for each mic as shown in Figure. The potentiometer balances the phantom voltage on the two legs of the output cable going to XLR pins 2 and 3. This prevents on/off clicks.

2. At the public meeting, we also want a floor mic.

Suggestion: Use a CM-200a cardioid mic on a mic stand. Add a foam windscreen to prevent breath pops.

3. The zoning board sits around a 4' x 12' table, and we want to record their meeting.

Suggestion: Place two PZM-6D microphones on the table as shown in Figure 4.

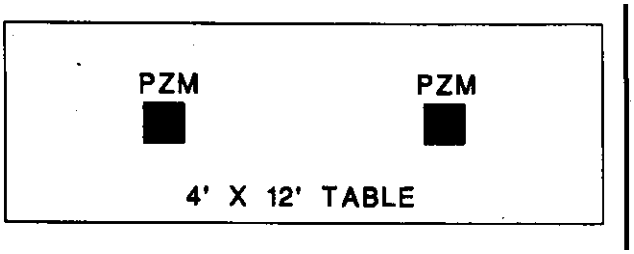


Fig. 4. PZMs on a table.

4. We want to pick up a children's choir for sound reinforcement. The children talk too softly to be picked up with PCC-160s.

Suggestion: Try hanging two CM-31 choir mics just over and just in front of the choir. Also try two CM-200a cardioid mics on floor stands a few feet in front of their mouths.

PZM pad

To pick up a group of people at a meeting, I'm running several PZM-6D boundary mics into a Shure automatic mixer. The output level of the mics is too high for the mixer when the people at the table shout, so the sound distorts. Can you suggest a circuit to cut down the level?

Reply: A 20 pad for a PZM-6D is shown in Figure 5. It should prevent overloading the automatic mixer. For more loss, reduce the 100 ohm resistor. For less loss, increase the 100 ohm resistor or decrease the 470 ohm resistors.

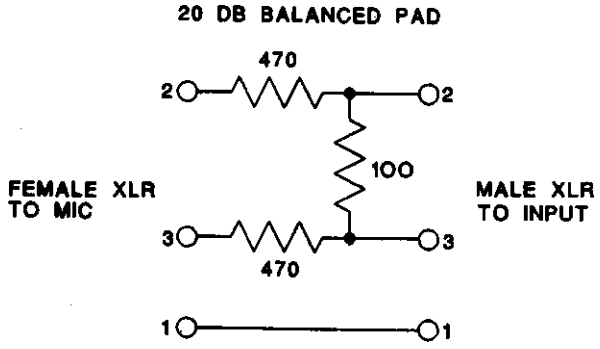


Fig. 5. 20 dB pad.

PZM overhead miking
I want to pick up a group of people sitting around a small conference table. They don't want any mics on the table. The ceiling is 10 feet high, so a PZM on the ceiling might be too far away. Any ideas?

Reply: Try mounting a PZM-6D on a 2-foot square panel of plexiglass. For flattest response, mount the mic a few inches off-center. Suspend the panel a few feet over the table top. Tilt the panel about 5 to 10 degrees to prevent standing waves between the tabletop and panel.

Hearing the congregation
In our church services, members of the congregation stand up and testify. When we broadcast these services, we can't clearly hear the people testifying, even though we hung a PZM wedge over the congregation. How can we pick up these people without handing a wireless mic to them?

Reply: It sounds like the PZM wedge is too far from the congregation for a clear pickup. Try mounting PZMs along the walls near the congregation, and run them through an automatic mixer. Then only the mic closest to the person speaking will come on. The sound should be a lot clearer.

# # #

MIC MEMO
Spring, 1993
Bruce Bartlett, Editor

RECORD MADE EXCLUSIVELY WITH GLM-100 MICS

The Crown GLM-100 was the only model of microphone used in the recording, *The Story Inside*, a cassette album of folk music by George Schricker. The highly reviewed album includes a wide variety of songs ranging from moving ballads to catchy folk-rock.

All vocals and acoustic instruments were recorded with GLM-100 miniature omni mics, as described below:

***Vocals:** hung from a boom with a foam windscreen taped around the mic, 4 inches from the singer's mouth (Fig. 1).

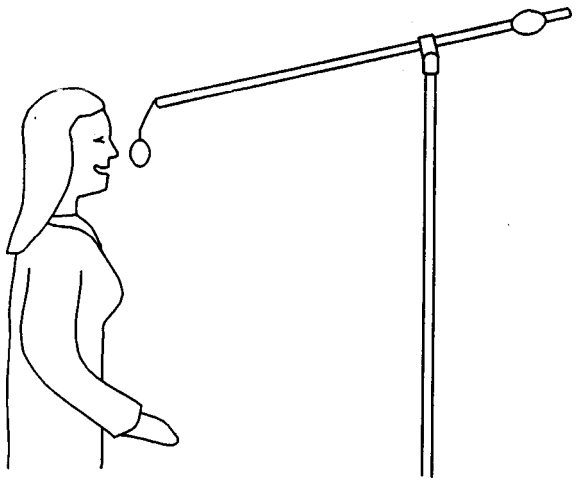


Fig. 1. Miking a lead vocal with a GLM-100.

***Acoustic guitar:** taped to the soundboard face up, halfway between the bridge and the sound hole, near the low E string (Fig. 2).

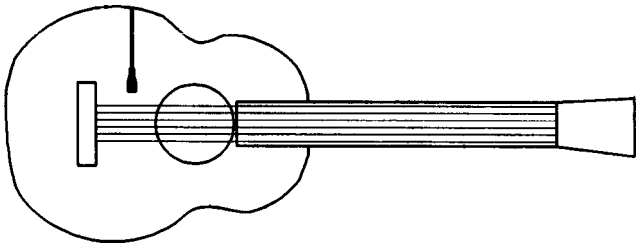


Fig. 2. Miking an acoustic guitar with a GLM-100.

***Fiddle and mandolin:** taped face up near a sound hole.

***Snare drum:** cable taped to the drum rim, with the mic peeking over the top head.

***Cymbal:** hung from a boom 1 foot over the cymbal edge.

Bass guitar and synth were recorded direct.

The instruments needed little or no EQ. Vocals needed a little bass boost for warmth. Normally you get warmth by using a cardioid mic, which has proximity effect. Being an omni, the GLM-100 has no proximity effect, but you can simulate it with EQ. Also, being an omni, the GLM-100 has less coloration and less breath popping than an equivalent cardioid mic.

If you'd like to hear how the GLM-100 sounds on a variety of instruments and vocals, *The Story Inside* cassette is available for $12.00 from:

Heart/Mind Productions

11644 S. Maple

Plymouth, IN 46563

BAFFLES IMPROVE PCC REAR REJECTION

If your PCC-160 picks up too much of the pit orchestra, try putting a small cardboard baffle and a foam pad behind the PCC. Both measures work well to reject sound behind the mic. The baffle absorbs lows; the foam absorbs mids and highs.

Figure 3 shows a baffle made of thin cardboard (a file folder). It measures 12" long by 6" high, and has a 90-degree corner. We put a PCC-170 just in front of this baffle. (A PCC-160 would give similar results). We also put a foam pad just behind the baffle. The foam pad was a 2-foot-square piece of Sonex with 3" wedges.

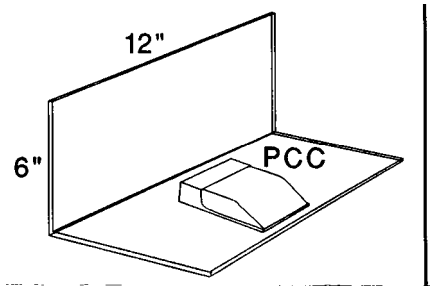


Fig. 3. Rear baffle for PCC-170.

Figure 4, top, shows the PCC-170 frequency response, front and rear, with no baffle or foam pad. The rear response curve was taken with the speaker directly behind the microphone, where an orchestra might be.

Figure 4, bottom, is the same with the baffle and foam pad. The response is rougher with slightly less lows. But there's much better rear rejection.

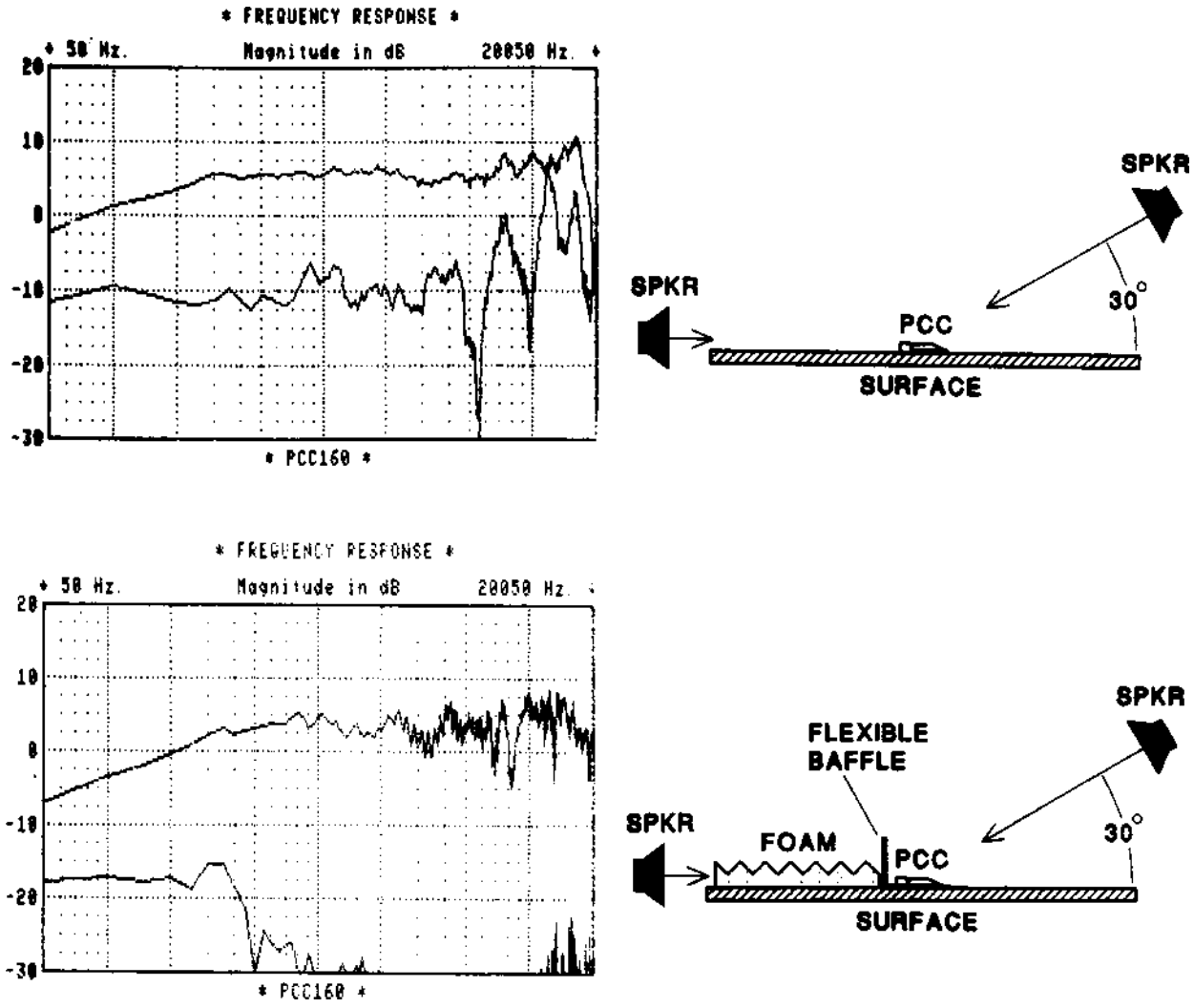


Fig. 4. Effect of cardboard baffle and foam pad on PCC-170 response, rear curve taken directly behind the mic.

Figure 5, top, shows the PCC-170 frequency response, front and rear, with no baffle or foam pad. The rear curve was taken with the speaker 30 degrees above the surface, where a house P.A. speaker might be.

Figure 5, bottom, is the same with the baffle and foam pad. Again, the response is rougher with slightly less lows, and the rear rejection is much better.

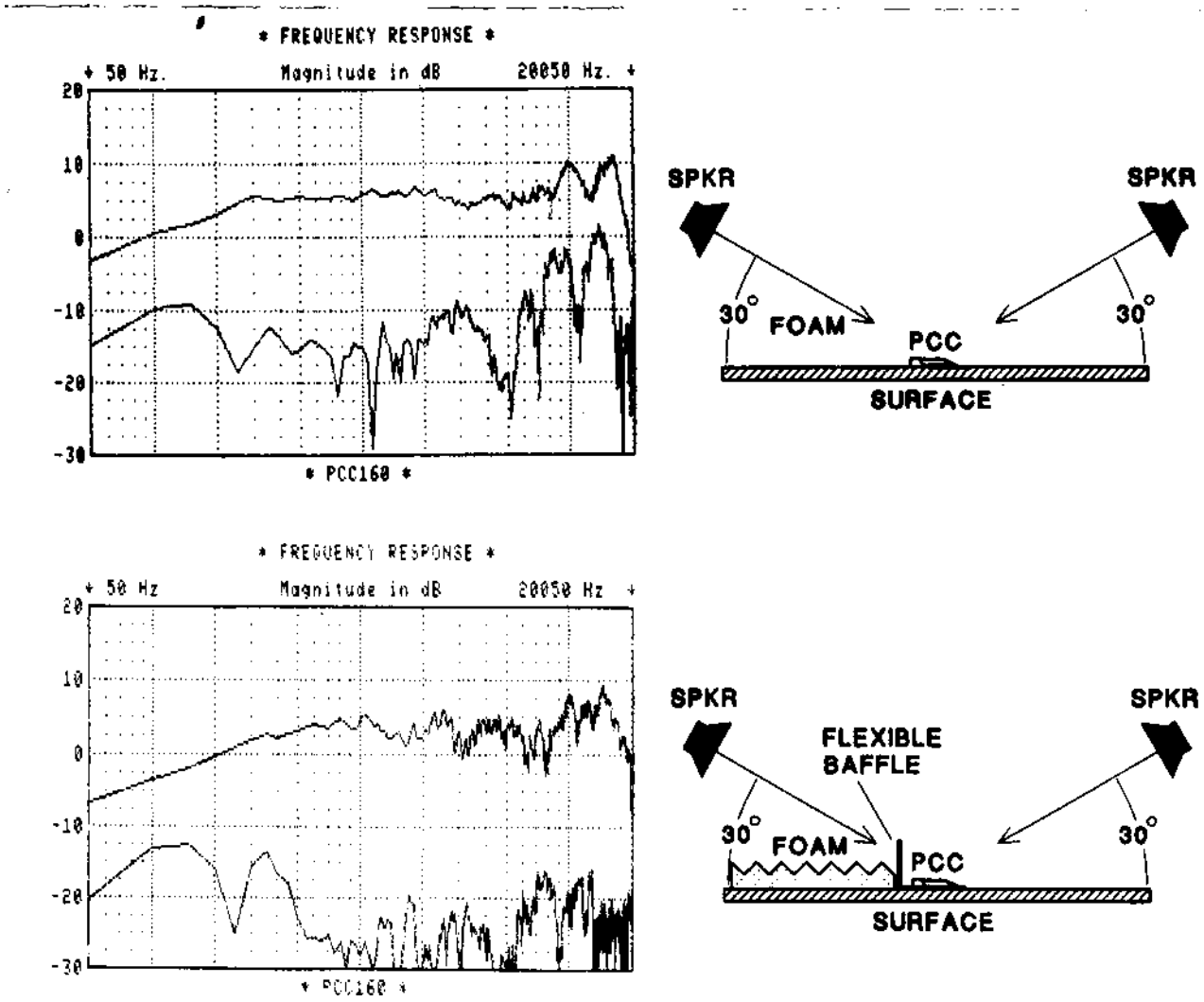


Fig. 5. Effect of cardboard baffle and foam pad on PCC-170 response, rear curve taken with the speaker 30 degrees above the surface.

Not shown are the effects of a 12” x 8” plexiglass baffle with a 70-degree angle. It performed worse than the 12” x 6” cardboard baffle. A 3/4”-thick vertical foam baffle also worked poorly.

The cardboard baffle alone roughens the front frequency response, but it improves rear rejection of the pit orchestra. However, it slightly degrades rejection of the house P.A. speakers.

The foam pad alone does not degrade the frequency response. It improves rear rejection of the pit orchestra.

LETTERS FROM CROWN MIC USERS

Mike or Mic?

[In the *Mic Memo*], the word mic [is] misspelled numerous times while in other areas spelled correctly. The correct abbreviation by all respected authorities of the word microphone is not mike (a person’s name) but mic, the microphone (object).

Garry Matthews, Acoustek Production Services, Vandalia, Ohio

Reply: Thanks for your concern, Garry. I use “mic” for the noun form and “mike” for the past-tense verb and gerund forms. Here’s why: when the letter “c” is followed by a vowel, the c is pronounced soft (like s), rather than hard (like k). According to this rule, the word “micing” rhymes with “slicing.” The word “mic’ing” is correct but clumsy — you stumble over it. I use “miking” and “miked” so that the words are pronounced as intended. Any more reader comments on this?

Miking a guitar for P.A. with a GLM-100

When I mount a GLM-100 [mini omni mic] on my acoustic guitar, on the sound board, it sounds great for recording. But it feeds back easily when I use it as a P.A. mic. Are there any guitar-miking positions that sound good and also work well for P.A.?

Brett Keiling, Mishawaka, IN

Reply:

We tried miking a Martin acoustic guitar with a GLM-100 in various spots. Here are the results:

*On the sound board, halfway between the sound hole and the bridge, near the low E string: Most natural sound but feeds back easily if you face the loudspeaker while playing. However, if the loudspeaker is behind your back, you should get a natural sound and very good gain-before-feedback.

*On the sound board, just outside the sound hole: Weak highs, boomy. Needs -6 dB @ 100 Hz to sound natural. Feeds back easily.

*Flush with the sound hole, just inside the sound hole: Fairly weak highs, boomy. Needs -7.5 dB @ 100 Hz to sound natural. Feeds back easily.

*Flush with the sound hole, centered under the strings: Good highs but boomy. Needs -7 dB @ 100 Hz, -2 dB @ 1kHz to sound natural. Slightly better gain-before-feedback.

*Inside the guitar, on the surface nearest the performer, centered under the sound hole: Good highs but boomy. Needs -12 dB @ 100 Hz, -2.5 dB @ 1kHz to sound natural. There's about 5 dB more gain-before-feedback here than on the sound board.

*Inside the guitar, suspended 2" under the bridge: Dull, bassy. Needs -12 dB @ 60 Hz, +3 dB @ 10 kHz to sound natural. There's about 7 dB more gain-before-feedback here than on the sound board.

What is the best compromise between natural sound and gain-before-feedback? It seems to be with the mic inside the guitar, on the surface nearest the performer, centered under the sound hole. If you can play with the PA speakers behind you (no monitor speakers), then a great-sounding spot is on the soundboard, halfway between the soundhole and the bridge.

If you wish, you can mount a GLM in that spot permanently and wire it to an endpin jack mounted in your guitar. Then you can simply unplug your guitar when you're not playing.

To install the GLM, you'll need a stereo endpin jack, stereo phone plug, pliers, wire strippers, tape, soldering iron and solder. Please refer to Fig. 6 and follow these steps:

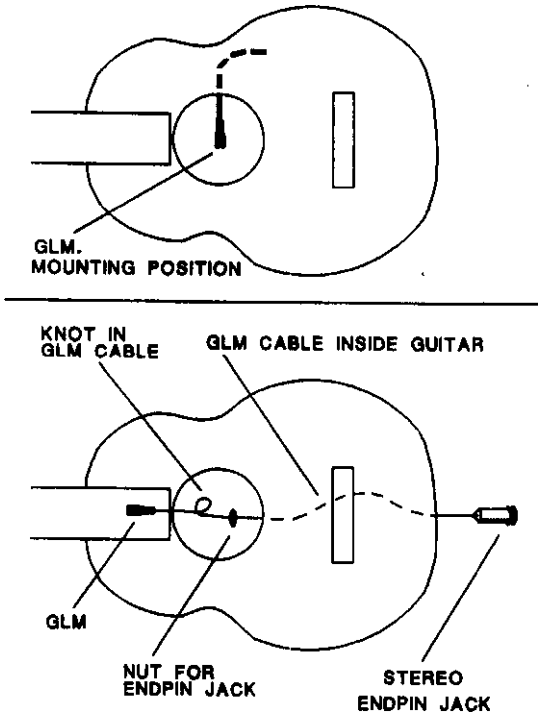


Fig. 6. Installing a GLM-100 in a guitar.

1. Remove the guitar strings and the endpin (if any).

2. If necessary, drill a hole in the tail of the guitar body to fit a stereo endpin jack.

3. Cut the GLM cable about one foot long so it will reach from the sound hole to the endpin jack.

4. Slip one jack nut over the GLM cable. Tie a loose knot in the GLM cable between the mic and the nut so the nut doesn't fall off the cable. Leave one nut and a washer threaded on the endpin jack.

5. Insert a guitar string through the jack hole and out the sound hole.

6. Tape the end of the GLM cable to the guitar string.

7. Pull the GLM cable through the jack hole.

8. Solder the GLM cable to the stereo endpin jack. Short lug - white, midlength lug - red, long lug - shield.

9. Insert the endpin jack into the hole you drilled for it. Hold the guitar neck up so the nut falls down the GLM cable onto the jack threads.

10. Reach inside the sound hole, and tighten the nut onto the endpin jack.

11. Tighten the nut outside the endpin jack.

12. Undo the knot in the GLM cable. Using rubber cement, glue the GLM mic to the inside of the guitar, on the surface nearest the performer, centered under the sound hole. The FRONT of the mic should aim at the strings.

13. Solder a stereo phone plug to the cable that goes to the GLM power module. Short lug - white, midlength lug - red, long lug - shield.

14. At your mixer, set the EQ to -12 dB @ 100 Hz and -2.5 dB @ 1 kHz. These settings are just to get the sound in the ballpark — adjust the EQ to your taste.

If you're handy with electronics, you can EQ the mic permanently by changing a component inside the power module. In the module, take out the screw that holds the XLR connector. Loosen the strain-relief nuts. Pull out the PC board. On the PC board, locate the chip capacitor that is in-line with the green transformer lead. Unsolder it, and replace it with a 0.047 microfarad chip capacitor. This will roll off the bass.

GLM-200 makes a great lectern mic

We do a lot of church work. In every installation we do, we put in GLM-200s at the pulpit and lectern (Fig. 7). Here's how:

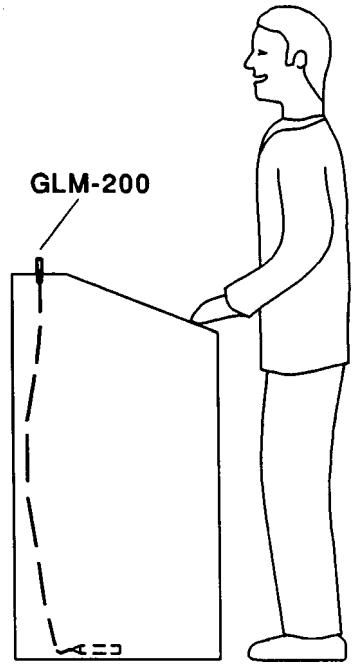


Fig. 7. GLM-200 installation in lectern.

1. Unsolder the plug from the mic.

2. Drill a hole just big enough to accept the flex relief of the mic.

3. Thread the cable through the drilled hole. Make it come out at the bottom of the pulpit/lectern.

4. Re-solder the plug.

Functionally, it's great. Aesthetically, it can't be beat. The only thing that is visible is the 1" foam ball.

Gain-before-feedback is never a problem and the lay reader never has to worry, "Am I too close or too far away?" Never again does the reader have this big gooseneck mass separating them from the congregation.

Joe Chilcote, Chilcote Audio, Stony Run, PA

Reply: Thanks for the idea, Joe! What Joe has done is to create a hypercardioid boundary mic, something like the PCC-160.

# # #

MIC MEMO

Summer 1993
Bruce Bartlett, Editor

IF IT'S TUESDAY, THIS MUST BE BUDAPEST

by Bruce Bartlett

Your mission: Record a 60-voice choir performing in seven cities in Hungary, Slovakia, and the Czech Republic. Capture these one-time concerts for future release on CD. Your equipment must fit in one carry-on bag.

This was my assignment as I accompanied the Hope College Chapel Choir on their two-week tour of Central Europe. Along the way I gathered a lot of tips for on-location recordists and broadcasters.

Equipment

The first step was selecting an easy-to-use stereo mic with sharp and spacious imaging. The Crown SASS-P MK II worked well. To get the cleanest possible sound, I had a custom mic preamp installed inside the SASS to give it a line-level output. This way, I could bypass the minimal mic preamp in the DAT recorder.

On the SASS I mounted a redundant pair of mics: two Crown GLM-100/E mini mics taped to the SASS housing. The two pairs of mics were wired to a single multi-conductor cable, which wrapped around the SASS for easy storage.

My portable DAT recorders were redundant, too: a Sony TCD-D10 and a Denon DTC-80P. The SASS fed the Sony and the GLM's fed the Denon. If a mic or a DAT failed, there was a backup to cover it. Good thing, too, since a DAT battery failed part way into the first concert, and a DAT tape locked up in the second concert. Having a backup gave me great peace of mind!

Powering the equipment was a challenge. European AC power is 220V, 50 Hz, with 2-pin outlets. To avoid using extension cords, I ran everything off batteries. The DAT batteries were recharged each night by a charger plugged into a Radio Shack 240V/120V converter. The mics used 9V batteries.

All this equipment, plus DAT tapes, earphones and cables, fit into the SASS carrying case. I cut extra holes in the case's foam liner to hold everything. Other equipment included a voltmeter, tool kit, and folding mic stand.

Recording technique

I was fortunate to record in some excellent acoustic spaces. In one glorious marble cathedral, the reverb time must have been seven seconds. The choir loved it!

At each venue, I worked out the mic placement during rehearsal. I screwed an extension pipe onto the mic stand to raise the mic 12 feet. With this high placement, the mic picked up less audience noise and less sound reflections from the floor.

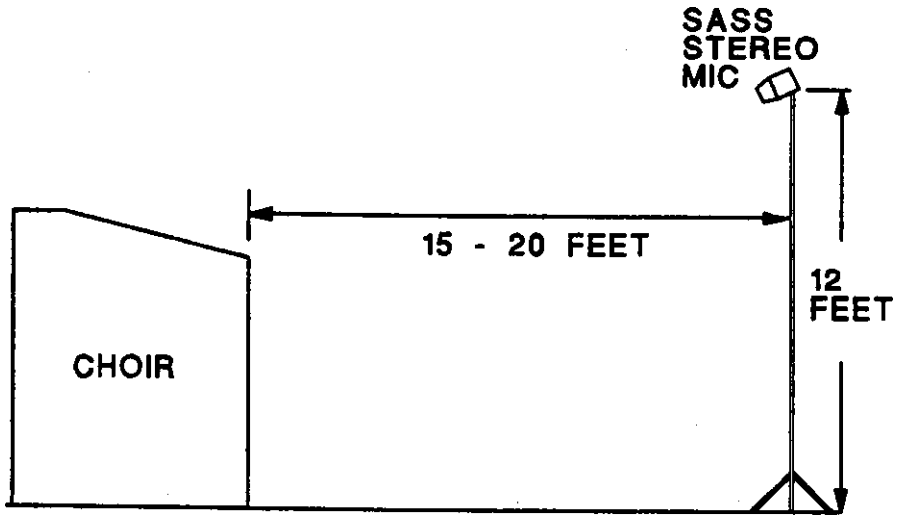


Fig. 1. Choir miking with SASS-P MKII.

I listened to the choir live and tried to find the spot where the sound was best. The goal was a good balance between direct and reflected sound. The conductor wanted a distant, blended sound with lots of reverb, rather than a detailed sound where you can pick out individual voices.

Once I found a good listening distance, I put the mic a little less than half this distance to the choir. For example, if the choir sounded best from 40 to 45 feet away, I put the mic 15 to 20 feet away. That way, the monitored mic signal sounded like the live sound.

A mic must be placed closer to a musical ensemble than the best live listening spot. If you place a mic in the audience area where the sound is good, the recording will sound too reverberant (muddy) when played back over speakers. That's because all the recorded reverb is concentrated into a line between the speaker pair, rather than spread around the listener.

I set up the mic stand, mic and recorders in ten minutes. Then I sat with my DAT machines in the pew next to the mic stand. To keep people from tripping on the mic cable, I taped it down. During rehearsal, I set the record level to -3 dB during the loudest part of the performance. That allowed 3 dB of headroom in case the concert was louder than the rehearsal. I left the level alone, and ran the DAT tape continuously.

Editing

Time to edit the DATs back in the studio. I used a Turtle Beach 56K 2-track digital workstation. Its digital EQ helped to filter out rumble below 80 Hz, and to boost the bass voices in recordings where they were weak. I wanted the basses to be full but not boomy; the sopranos clear but not over-sibilant. I edited out audience noises where I could, faded applause, and "leadered" each song for precise starts and stops.

Some recordings lacked a sense of space because they were made in a "dead" room. To fix this I added artifical reverb to the DAT's analog audio output signal.

Finally, the choral director chose the best performances from all the concerts, and I compiled them into the master DAT tape for release on compact disc. The director and the choir were delighted with the sound. I found the recording system easy to carry, quick to set up, and reliable.

NIRVANA TOURS WITH THE DIFFEROID

In the January 1993 issue of *Mix*, Nirvana's system engineer, Dave Stevens, described how the major rock group started using Crown Differoid microphones:

"Prior to enlisting these new mics for the Nirvana shows, sometimes the guitar tones were being hollowed out by a lot of SPL coming offstage. There was an inordinate amount of leakage on the front

line, in large part because everyone has a vocal mic.

“In trying to solve the problem, [house mixer] Craig Montgomery had read an article touting the virtues of Differoid mics. He asked for some, and we obliged. The first time they were used was at the MTV Music Awards, and they performed admirably.

“During the dates in September, we found that you could trim the microphones at a level that wouldn’t pick up noise from the stage even when you backed away from them. A lot of phase canceling occurs except [for sound directly on axis]. As a result, that ‘whoosh-whoosh’ you typically get with a dynamic cardioid microphone when the vocalist steps away was gone.”

Restless Heart also used Differoids when they performed on the Jay Leno show.

PHANTOM POWER HARMLESS TO DYNAMIC MICS

You can plug a dynamic mic into a phantom power supply without damage and without clicks. Figure 2 shows why.

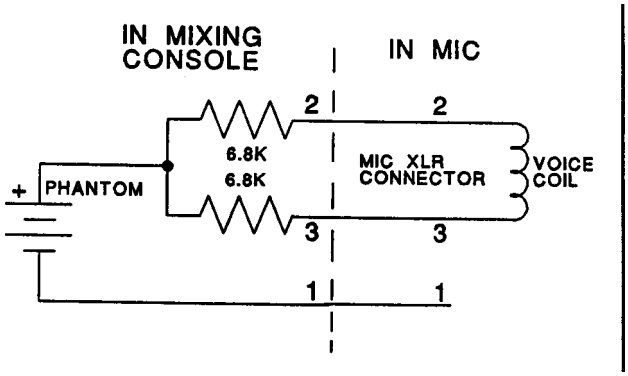


Fig. 2. Circuit of a dynamic mic plugged into phantom power.

Phantom power is a positive voltage applied equally to XLR pins 2 and 3. The negative of the supply is applied to pin 1. In a condenser mic, the phantom-supply current passes from pins 2 and 3, through the mic circuit, and back through pin 1 to the supply negative. But in a dynamic mic, pin 1 is the housing ground, and is not connected electrically to the voice coil. So there is not a complete circuit, and no current can flow through the voice coil.

WHAT’S WRONG WITH THIS PICTURE?

Here’s a little quiz to check your understanding of stereo mic techniques. Figure 3 shows a bird’s-eye view of several miking methods, all using cardioid mics. Those in the left columns are wrong: they result in poor stereo imaging or bad balance. Those in the right columns are correct: they tend to give accurate, sharp imaging.

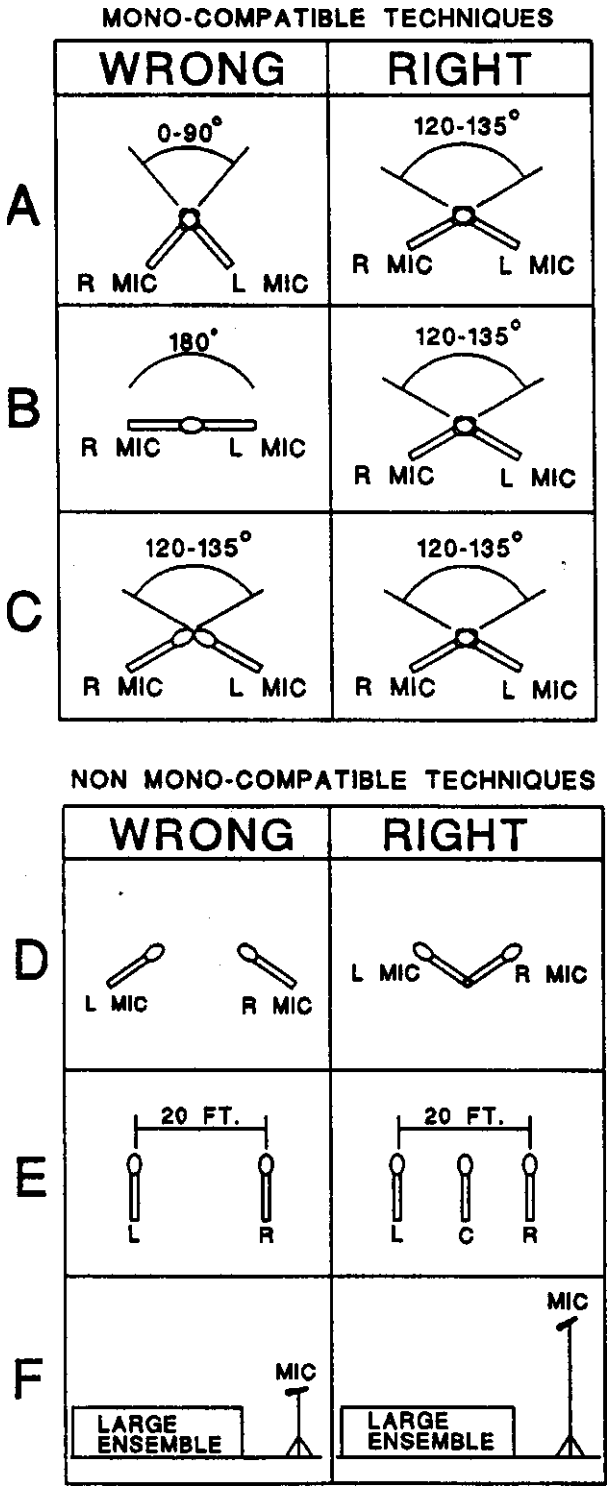


Fig. 3. Wrong and right stereo miking methods.

You might want to guess what the problems are with each lettered technique. The answers are below.

First a disclaimer. These “rights” and “wrongs” are not absolute. There might be situations where doing it “wrong” works best, or is your only option due to visual constraints.

A. Technique “A” is a coincident pair of cardioid mics angled 0 to 90 degrees apart. The mics are not angled apart enough to give a wide stereo spread. You’ll hear a narrow stage width unless the musi-

cal ensemble surrounds the mics in a semi-circle. If you substitute a pair of bidirectional or hypercardioid mics, however, an angle of 90 degrees can work great.

Sometimes you want a stage width that does not extend from speaker to speaker — say, for a string quartet or a piano/vocal recital. In this case, 90-degree angled cardioids can work well. But the room reverb will not sound very spacious.

B. Here, the mics are angled too far apart. You'll hear a hole in the middle. Plus, instruments in the center of the ensemble are picked up 90 degrees off axis to each mic, so they will tend to sound dull or tonally colored.

C. The diaphragms of the mics are not vertically aligned. The slight horizontal spacing between mics will cause the highs to roll off in mono. That is, there will be phase cancellations at high frequencies when both channels are combined to mono.

D. In this method, the mics are spaced apart and angled inward. The left-spaced mic is aiming right; the right-spaced mic is aiming left. This creates conflicting time and amplitude cues. You'll hear vague, inaccurate imaging.

E. The spaced mics are so far apart, you'll hear exaggerated separation. That is, instruments slightly off-center will be reproduced from the left or right loudspeaker. Adding a third mic in the center tends to restore accurate imaging.

I hesitate to call the left pair in E "wrong" because it has a lot going for it. For one thing, it's less conspicuous. Sometimes this is the most important consideration. Also, the spaced pair can work well on a wide sound source, such as a pit orchestra for a musical. And since there's no center mic, you don't need a mixer. You can run the two mics directly into your recorder or mic preamps.

F. Here, the mic is much closer to the front-row musicians than to the back-row musicians. So the front row will sound too loud relative to the back row. The mic is not raised enough to get a good front-to-back balance of the musical ensemble.

The next time you do a stereo remote, listen to what the mic placement is doing to the stereo imaging and to the musical balance. Can you localize each instrument clearly? Is the reproduced stage too wide or too narrow? Does the ensemble have a natural balance? The answers will help you refine your techniques.

LETTERS FROM CROWN MIC USERS

Sound Grabber helps out at spelling bee

Our school district's spelling bee organizers wanted an especially clear voice recording so that they could check back on any disputed spellings. Patching into the house system is difficult, and the levels vary widely because the kids are different ages and sizes.

I used a Sound Grabber taped onto the mic stand just above the adjusting collar, and fed it to the VCR on auto-level. It worked great! The judges even used it as a monitor (the VCR has a built-in CRT and speaker) and could hear much better than they could with the house P.A.

Robert Buchholz, Sunnyside School District, Tucson, AZ

Microphone ground loops

We're using PZM-6D mics in a courtroom. When we plug the mic's power module into a floor jack, we get hum. The jack is tied to grounded conduit.

Kurt Gish, Indianapolis, IN

Reply: It's likely that a ground loop has been set up between the jack ground and mixer ground. This causes hum. Here are some waysto get rid of it. Try one or all of these:

1. At the floor jack, disconnect pin 1 from the jack chassis.

2. Between the mic and the floor jack, add a cable with an XLR on each end, with each shell floating from ground.

3. Ground the mixer to the same point as the conduit ground.

Mounting a PZM in a corner boundary

We are fabricating some acrylic boundaries: the PZM pyramid and PZM-2. What is the recommended distance of the microphone tip from the apex of the pyramid and the corner of the PZM-2 boundary? I have your model PZM-30D microphone.

John Deane, The Laser Workshop, Anaheim, CA

Reply: In general, put the tip of the microphone completely into the corner. This prevents phase cancellations due to delayed sound reflections from the corner. Here's how to install a PZM in a corner boundary:

1. Unscrew the mic from the plate (Fig. 4).

2. Mount the mic so that its tip touches the apex of the pyramid, or the corner of the PZM-2 boundary (Fig. 5).

3. A PZM-6D microphone is preferred for corner mounting over a PZM-30D. The PZM-6D is much easier to mount.

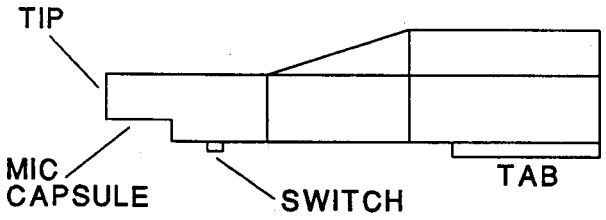


Fig. 4. Unscrew mic from plate.

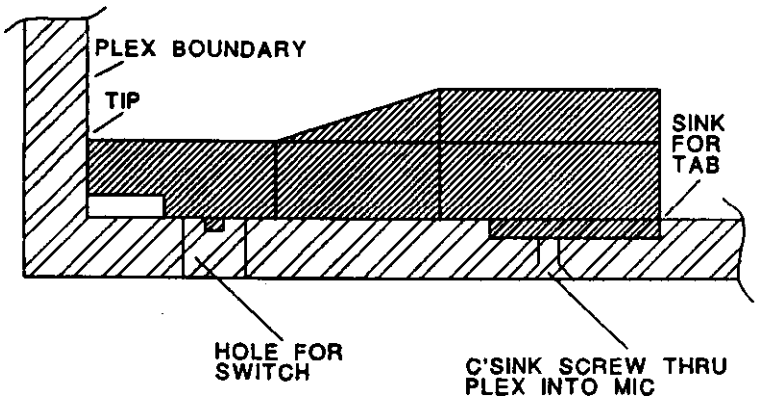


Fig. 5. Mount mic tip in apex of pyramid.

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MIC MEMO

Fall 1993
Bruce Bartlett, Editor

38 SPECIAL LOVES DIFFEROIDS

38 Special

The popular Southern-rock band, 38 Special, is using Crown Differoids (CM-310's) on all their vocals and guitar amps. They say that the 310 sounds natural, and has no feedback or ringing problems. According to group member Rob Wilson, "We enjoyed using the CM 310's on our triple bill with REO Speedwagon, Cheap Trick and .38 Special. We had a consistently superior vocal sound for all shows."

The Differoid is catching on. In fact, Crown Differoid mics were nominated for *EQ* and *Mix* magazines' 1993 Tec Awards. The CM-310 and CM-311 were considered to be "an outstanding technical achievement in microphone technology."

WILL A SASS WORK FOR P.A.?

Yes, if you use it outside. That's the report from Crown's Dr. Clay Barclay, who found that a SASS stereo mic worked well outdoors at the Elkhart Jazz Festival. He used the SASS to mic drums overhead, and to pick up a youth band. There's no feedback, he says, if you're careful with levels and put the speakers well forward of the mics.

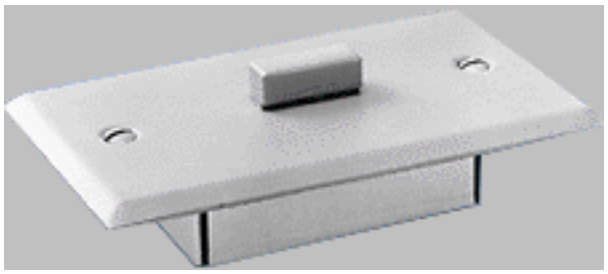
HOW TO REDUCE RFI WHEN HANGING CM-31's

The Crown CM-31 choir microphone has a lot of protection against RFI (radio frequency interference). To shunt RF to ground, there are capacitors at the mic capsule, as well as at the input and output of the power module. Ferrite beads at the module input add more protection.

Still, in some areas close to radio stations, the mic might pick up some inteference — especially if the mic is hung with a long cable. The reason is that the cable attached to the mic is unbalanced, medium impedance. However, the output of the power module is balanced, low-impedance, and is not susceptible to RF pickup.

In extreme cases, you may want to use a very short cable between the mic and its power module — 8 feet or less. Then run a regular mic cable from the power module to the ceiling. This should eliminate any RF problem.

THE NEW PZM-11LL LINE-LEVEL MIC



PZM-11LL

For sound contractors who need an inconspicuous mic for security and surveillance, here's a useful new mic from Crown. The PZM-11LL is a Pressure Zone Microphone. It's intended for security and surveillance uses where 24V AC or DC is available. The PZM-11LL is designed to look like a device, not a microphone, so as not to draw attention.

The PZM-11LL looks and sounds like the PZM-11, but has a line-level output and is powered by 24V AC or DC. It can be easily field-converted to phantom. Since the PZM-11LL has a high output, it can be plugged directly into a VCR line input — no costly mic preamp is needed.

The mic can be mounted in the ceiling or wall in a standard electrical outlet box. It also can be installed without a box because its electronics are shielded inside a removable metal housing.

In the PZM-11LL, low frequencies below the voice range are rolled off to reduce rumble from trucks, machinery, and air conditioning. High frequencies are boosted to help articulation. Because of its tailored response and PZM construction, the PZM-11LL picks up sounds with extra clarity.

The microphone connector is a row of screw terminals for easy installation. The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. The mic can also be wired unbalanced. Powering is by 24V AC, 12-24V DC, or 12-48V phantom.

EQ IMPROVES STAGE-VOCAL SOUND

Suppose you're miking a vocalist with a CM-200A on a stage for recording or P.A. The sound will be bassy due to the mic's proximity effect. If you try to get rid of this by rolling off the lows at 60 Hz, the 500 Hz area will still be emphasized by proximity effect. This gives a "puffy" sound. You might prefer to rolloff at 150 Hz instead, because this EQ knocks out some of the 500 Hz area. A typical rolloff is -6 to -10 dB.

For P.A., however, you might want to leave the EQ flat, or use only a little rolloff. Most performers seem to prefer the extra fullness that the bass boost gives their voice when they perform live.

Be sure to put a foam windscreen on the mic. Breath popping is less with lips touching the windscreen than it is a few inches away.

LATEST SASS USERS

Crown's stereo mic, the Stereo Ambient Sampling System, is finding wide usage:

*Rupert Hine recorded world music in the field for his album, One World, One Voice.

*The BBC has six SASS-B's.

*In a National Geographic Explorer video, the SASS is visible on-screen.

*Fox Network soundman Ron Estes uses a SASS, as well as sound designer Frank Serafine.

*The SASS has recorded stereo samples for Akai, Ensoniq, and E-Mu Proteus keyboards.

*Tom McKenny used the SASS to record Paul Winter and the Gyuto Monks at the Cathedral of St. John the Divine.

*Wylie Statman and John Micelli recorded sound effects with the SASS for the Backdraft attraction at Universal Studios, Hollywood.

*CBS Sports is picking up golf and other sports with numerous SASS-P's.

*ESPN uses SASS mics for baseball; ABC uses them for Monday Night Football.

*Turning from the SASS to the GLM-100, the Turtle Island String Quartet (with Windham Hill) used all GLM-100's on a recent cassette of their live performances.

GLM-100's INVISIBLE IN TV CONCERTS

When a concert is televised, a clean stage appearance is important. Video producers appreciate your finding ways to reduce the clutter on stage.

One way to do this is to put the stage box and snake behind the stage, out of sight. Also, put the floor monitors in front of the stage below the camera view, or off to the sides of the stage.

Another way to reduce clutter is to get rid of mic stands. In their place, use miniature clip-on mics such as Crown GLM-100's. You can clip or tape them to the acoustic guitar, violin, guitar amp, piano lid, drums, and so on. The stage will look much cleaner.

For example, I recently used GLMs while mixing the sound of a jazz quartet for a TV show. No mics or mic stands were visible. On the upright piano, I taped a GLM-100 to the middle strut in front of the sound board. Drums were picked up with a single GLM in the middle of the set, 4" above the snare and under the cymbals. Another GLM went in the kick, hanging through the vent hole. The sax had a GLM clipped to its bell, and bass guitar was picked up direct.

Some people who watched the show wondered how the sound could be so close-up and "tight." Since they saw no mics, they thought the group was picked up with a stereo mic at a distance!

WHICH IS THE BETTER CHOIR MIC: CROWN PZM OR CM-30?

Many people like to mic a choir with a PZM on a plexiglass boundary. It works well, but the boundary is difficult to hang and aim. Crown developed the CM-30 choir mic to work as well or better than a PZM, but without the cumbersome boundary.

How does the CM-30 compare with the PZM? Please refer to the figures.

Figure 1 shows the front and rear frequency response of a PZM-6D on a 2-foot diameter plex boundary. The mic is mounted 4" off-center.

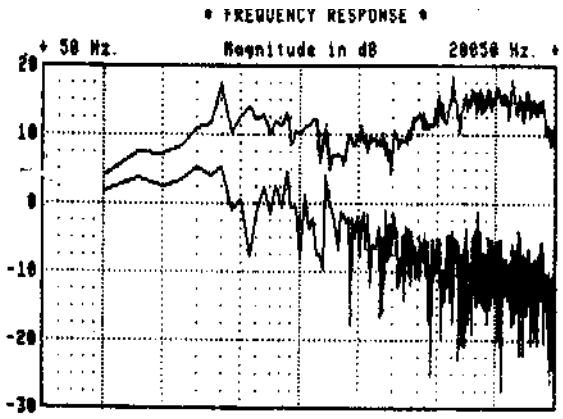


Fig. 1

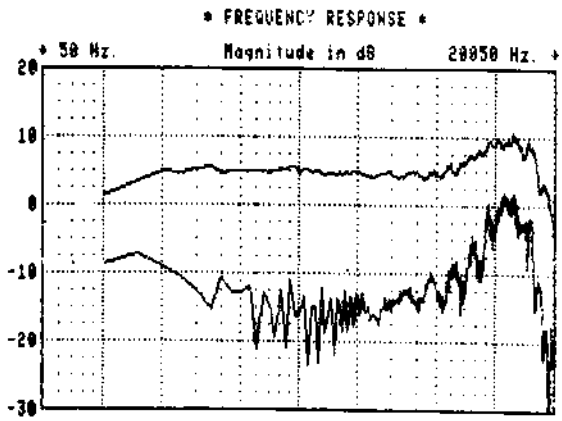


Fig. 2

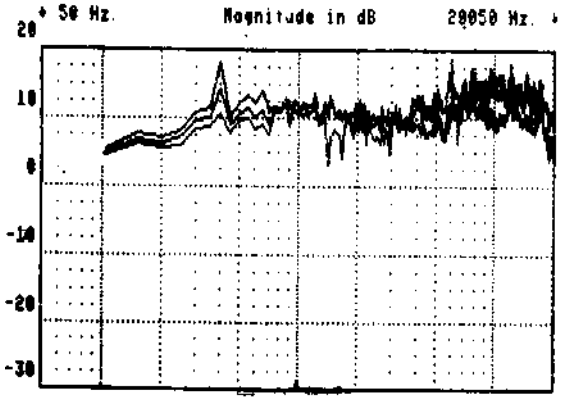


Fig. 3

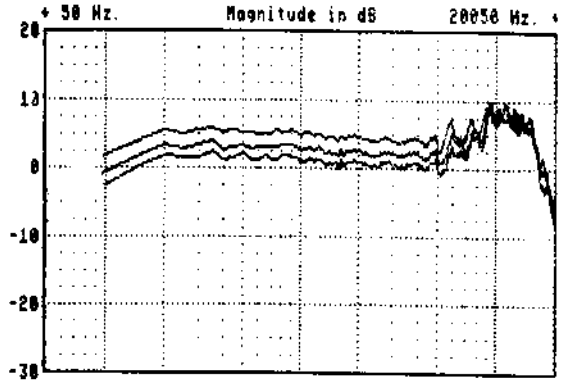


Fig. 4

Left: PZM on boundary. Right: CM-30.

Figure 2 shows the same for a CM-30 microphone. The CM-30 has a smoother response. It also rejects lows and mids better than the PZM. The PZM rejects highs better.

Figure 3 shows the response of the PZM at three different angles: 0 degrees, 45 degrees, and 60 degrees. Because of the PZM's hemispherical pickup pattern, there is almost no off-axis coloration.

Figure 4 shows the same for a CM-30 microphone. The CM-30 also has almost no off-axis coloration.

In a reverberant room, I talked in front of and behind the PZM. The difference in speech level, front to back, was 3.5 to 4 dB. I did the same with a CM-30. The difference in speech level, front to back, was 5 to 8 dB. So the CM-30 has more rear rejection than the PZM in a reverberant room.

I fed the PZM signal through an amplifier and a wide-range speaker, and turned it up just to the point where it started to feed back or ring. I did the same with the CM-30. The PZM and CM-30 had about the same gain-before-feedback. The PZM tended to feed back at low frequencies; the CM-30 tended to feed back at high frequencies. This test might give different results with another sound system or a different room.

To summarize, here are the advantages of each type of mic:

PZM on a boundary: Rejects highs better, feeds back less at high frequencies.

CM-30: Rejects lows and mids better, feeds back less at low to mid frequencies. Smoother response. Smaller, lighter, easier to hang and aim.

Both mics have about the same gain-before-feedback, and both have almost no off-axis coloration.

EQ THE SASS TO THE ENVIRONMENT

The Crown SASS-P MKII stereo microphone has a frequency response that is optimized for indoor use in reverberant concert halls. However, the mic might sound too bright or trebley when used outdoors, or in a room with weak early reflections.

In the latter case, you might want to equalize the SASS signal to get a more natural sound. A suggested EQ setting is -6 to -10 dB at 10 kHz.

LETTERS FROM CROWN MICROPHONE USERS

Plenty of uses for mics

I use the SASS-P for field audio, interviews, music recording and field gathering of sound effects. It's also useful for fill during concert recording, and studio production of multivoiced or chorused talent.

I use the GLM-100 to mic on-camera talent, stage talent at concerts, or public appearance events. I also record stage talent for archiving. The GLM-100 works for eavesdropping on neighbors for prosecution, and/or civil liability complaints.

David Peter Maus, Maus Productions, Chicago, IL

Phantom problem with dynamics?

The *Mic Memo* Newsletter is always informative and outstanding and contains a wealth of tips and information.

You mentioned that phantom power is harmless to dynamic microphones — which is true — but there can be side effects from leaving the phantom power on. Due to the potential difference between the coil and the case, noise can be introduced into the mixer mic input. However, this is usually not a problem except in critical recording situations.

Ken Dickensheets, Dickensheets Design Associates, Austin, TX

Mounting a PZM in a pulpit

Enclosed is a sketch of our church pulpit (Figure 1). The minister does not want any mics visible, so I suggested a PZM. The pulpit is a rather massive oak structure with a surrounding ledge. How should I mount the PZM in the pulpit?

Timothy Warner, Consultant, Asheville, North Carolina

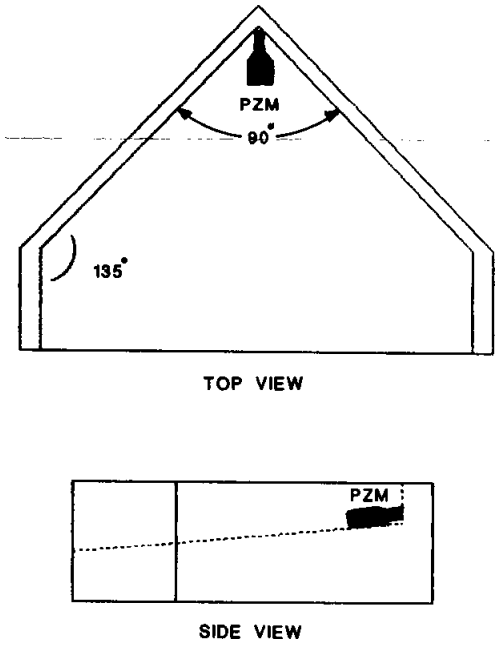


Fig. 1. Church pulpit miking with a PZM 6D.

Reply: I suggest a PZM-6D because it is easy to mount. Aim the PZM away from the minister, and put the nose or tip of the capsule holder tightly into the 90-degree corner of the ledge. This gives two benefits: 1) It prevents phase cancellations due to delayed reflections off the ledge, and 2) it uses the ledge to make the PZM directional.

The ledge will boost the midrange, so use your console EQ to cut some midrange for a more natural sound.

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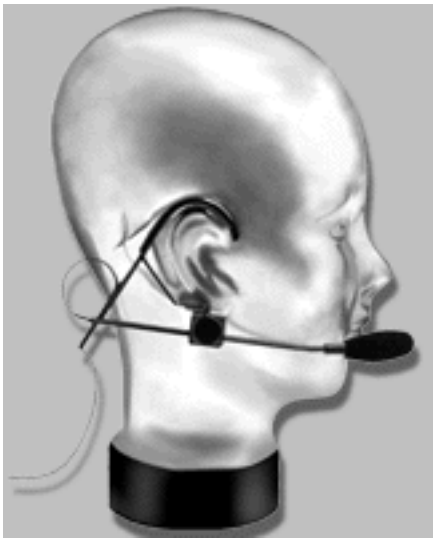
MIC MEMO

Winter 1994
Bruce Bartlett, Editor

NEW CM-312 HEADWORN MIC WEIGHS LESS



CM-312

Crown is happy to introduce the CM-312 microphone [now the CM-312A]. It's a lightweight but rugged headworn mic for aerobics instructors, musicians, sportscasters, and dance callers.

The CM-312 is like the CM-311 headworn mic except that the microphone is to the side of the mouth rather than in front. It is designed for applications that require a lighter, less conspicuous mic. It can be used where gain-before-feedback and leakage are not critical.

The CM-312 sounds like the best handheld microphones — full, clear, and distortion-free, even with the loudest singers. Its hypercardioid pickup pattern reduces feedback and aids isolation.

Lightweight and comfortable, the mic's headband and boom adjust to fit any head. An included pop filter greatly reduces breath noise and pops. Because of the boom's unique behind-the-ear design, it does not cover up the user's face.

Two models are available: CM-312 and CM-312/E. The CM-312 is powered by a 9V battery or phantom power. It has a battery belt pack with a battery on/off switch. The CM-312/E has no connector; you connect it to a 9V-powered wireless transmitter of your choice.

CM-311 HEADWORN MIC IMPROVED

Crown's Differoid headworn mic, the CM-311 [now the CM-311A] has been solving feedback problems for countless performers since its introduction in the winter of 1993. The latest version of the CM-311 is even better. We beefed up the wire frame to stabilize the boom. You'll appreciate the extra ruggedness and lack of "boom bounce." The enhanced models went into production by November 15, 1993.

DRUM MIKING TIP

Here's a unique way to mike a drum set. This technique was suggested by Bob Caracciola, lead audio technician with the Showboat Casino Hotel in Atlantic City.

To isolate the drums, Bob surrounds the set with plexiglass panels on the sides and front. Then he mounts two PCC-160 mics on the inside of the front panel about 1-1/2' up from the floor. Those two mics, he says, are all he needs in most cases to get a great drum sound.

PCCs PICK UP CHILDREN ON TV SHOW

Here's a tough miking problem: A TV station wanted to produce a show in which about 30 children answer questions posed by a moderator. The children sit on low steps while the moderator stands. In the past, the station had used shotgun mics to pick up the kids' comments. But the mics picked up too much studio noise and reverberation.

Jeff Mews, senior producer/director at WSJV-TV in Elkhart, asked us for a solution to this problem.

We suggested that he arrange the children into two groups of 15 on either side of the moderator. Mic them with a PCC-160 supercardioid boundary microphone placed on the floor in front of each group. Pick up the moderator with a lavalier (Fig. 1). Run all the mics into an automatic mixer. In this way, only one mic would be on at a time.

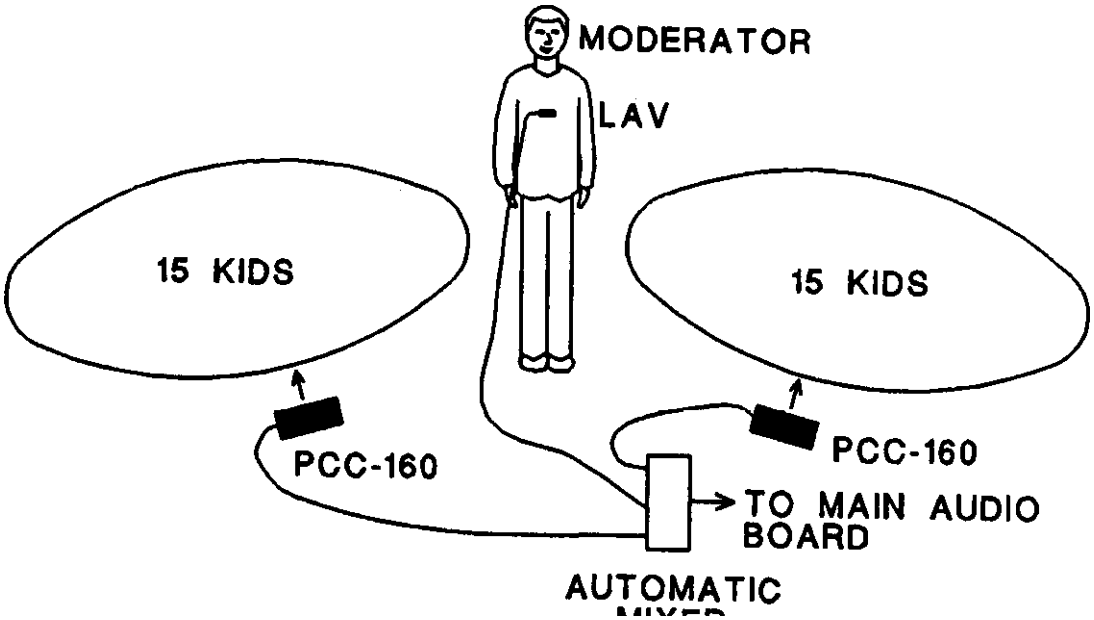


Fig. 1. Miking children with a PCC-160.

Jeff did so, and was pleased at the clear, clean sound. We suggest you try this technique in similar situations.

RESTLESS HEART TOURING WITH CROWN MICS

by Keith Clark

Restless Heart, the popular country-music group recognized for their distinct vocal harmonies, have recently added several Crown CM-311 headworn microphones for vocal applications.

Restless Heart, recently on a major U.S. tour, evaluated a host of headworn microphones before choosing the CM-311's. The mics are used by both of the group's lead vocalists, John Dittrich and Paul Gregg.

Monitor engineer David Baker explains that Dittrich, a drummer, wanted more flexibility than that afforded by stand-mounted mics. In addition, a headworn microphone was also wanted for aesthetic reasons — stand-mount mics interfere with television and video performances.

Baker adds that Gregg, a bass player, wanted to move more freely about the stage. He is using the CM-311E, which connects directly to a wireless transmitter that offers even more freedom of movement.

The CM-311 is designed to meet the most demanding "real world" touring sound applications, exhibiting a pickup pattern similar to the patented Crown CM-310 Differoid handheld microphone. It features superior noise cancelling that provides outstanding gain-before-feedback caused by close proximity of floor monitors, and also offers superb isolation of high-level stage-instrument sound that can bleed into the mix.

The mic is lightweight, rugged and comfortable, with the headband and mic boom adjustable to any vocalist. With its unique behind-the-ear design, the boom does not cover up the face of the vocalist.

"Many of the other headworn mics we tried just weren't very discriminating. They picked up everything," Baker explained. "The CM-311 was the only product that provided the consistent rejection of stage noise without fail."

CM-310 UPGRADED TO CM-310A

Good news for Differoid lovers: the Crown CM-310 Differoid has been improved. For those who haven't heard, the CM-310 is a feedback-killing mic for handheld vocals. The new model, CM-310A, features these enhancements:

1. The sound is clearer, thanks to a slightly reduced midbass.

2. The mic can handle powerful breath pops without cutting out or blocking.

3. The grille is more streamlined and attractive.

All this comes with no loss in performance. The Differoid still has amazing gain before feedback, and still prevents bleedthru from distant sounds on stage.

PCC WORKS GREAT FOR PIANO P.A.

Audio consultant Travis Ludwig sent us some great tips on miking a piano for sound reinforcement. He is the technical director and chief house engineer for "Sunday Nite," a syndicated live radio show.

The show used many acoustic instruments and floor monitors. As a result, there was a lot of random-incident energy or bleed into every mic on the stage.

The radio engineer and Travis had tried many different mic techniques for the grand piano. They settled on either a stereo mic or an XY pair of cardioids over the hammers. However, this technique resulted in enormous amounts of bleed in the piano tracks and limited the gain-before-feedback in the keyboard monitor mix.

The solution for the radio broadcast was to move the stereo mic under the edge of the piano lid, which was on the short stick. Although the mic needed to be equalized, there was less stage noise in the mic.

Travis could not EQ the monitor mixes, and the piano sounded indistinct. So he mounted a PCC-160 on the back side of the piano music stand (Fig. 2). "I located it as far up as visually possible and aimed it down toward the hammers."

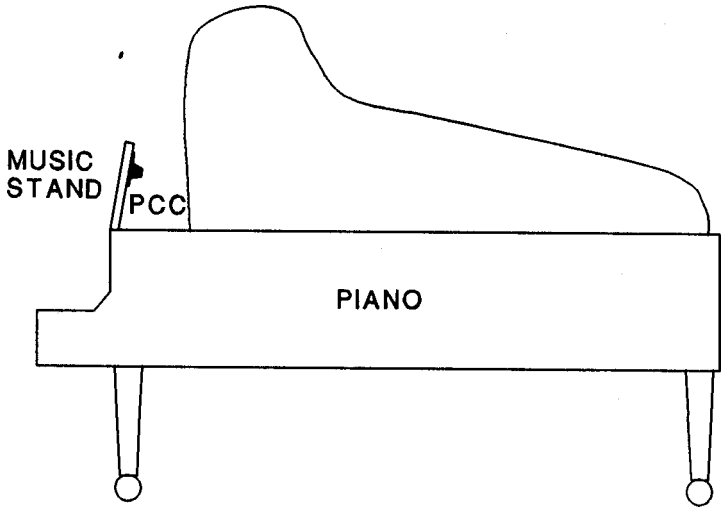


Fig. 2. Piano miking with a PCC-160.

"I listened to the mains and monitors," said Travis. "It sounded great!! No midrange buildup. Not only did it sound terrific, but the rear rejection of the PCC-160 gave us substantially greater gain-before-feedback in both house and monitors, including the keyboard monitor aimed right at the piano. It even improved the random noise bleed."

"I was able to pull the piano out of the mix at will, used NO channel equalization (except a high-pass filter set at roughly 80 Hz), and the band loved the sound of the piano in the monitors. Radio was happy with their stereo rig and I thoroughly enjoyed mixing that evening."

CDs RECORDED WITH GLM-100 MICS

Anne & Gary Wakenhut comprise the group, *The Collecting Consort*. They make beautiful, peaceful music on harp, dulcimer, flute, and synth. Recently, the Wakenhuts released two CDs that were recorded with nothing but GLM-100 mini omni mics.

Gary describes their miking techniques: "The harp and dulcimer were miked with two GLM-100s about 2-1/2 feet apart and about 18" above the instruments. Each mic was rotated away from the opoposite instrument until we got just the amount of separation we were looking for. I built a platform under the harp that gave an incredible increase in bass.

"The whistle and flute pickups were done with me standing 8 to 10 feet behind the dulcimer mic. The pan flute was recorded mostly in a gym, either 75 feet or 6 feet from the mics (Sound Grabbers).

"I ran the synth through two monitor speakers on the floor, aimed up at the mics on each side. Never thought about placing the mics on the floor — I'll give that a try next time."

If you'd like to hear how the GLMs sound on these instruments, you can order the CDs "Spritual Essence" and "The Earth's Essence." They are available from the Wakenhuts at 7363 W. Edgar Rd., Lakeview, MI 48850, phone (517) 352-6996.

LETTERS FROM CROWN MICROPHONE USERS

Mic, Mic., or Mike?

You know, the issue of mic vs. mike is one of life's lesser problems; however, I cannot miss this opportunity to pursue the petty issues.

I have always been a literalist. I believe that life is complicated enough without worrying about strange rules. If you are using mic as an abbreviation, should it not be followed by a period? Otherwise, it would be pronounced like stick. We however use the word as a slang for microphone. In that instance, should it not be spelled the most obvious way to sound like you are shortening the word mic-

rophone — mike?

By the way, who remembers the memorization help for the resistor color codes?

Ken Herr, Supervisor, Audiovisual Services, Air Products & Chemicals, Inc.

Reply: Your suggestions make sense, Ken. I've also seen mic' as an abbreviation. And I've seen (yuck) "He mic'ed the piano with a cardioid condenser."

Literal or not, "mic" is the current usage in most audio trade magazines and on mixer input connectors. Many audio terms are abbreviations that omit the period: reverb, EQ, aux, atten, auto, synth, preamp, sync, demag, omni, amp, tech (for technician), mono (for monophonic), stereo (for stereophonic), and pan pot (for panoramic potentiometer).

The pnemonic phrase for the resistor color code goes something like, "Bad Boys Rob Our Young Girls But Violet Gives Way."

Choir miking

I'm miking a choir of 75 people with 3 cardioids. The mics are 2 feet in front of the front-row singers, and 2 feet above the head height of the back-row singers (Fig. 3). The gain-before-feedback is only fair, and the mics are picking up too much of the orchestra in front of the choir. Would it help to use more mics at a closer working distance?

Irving Wood, Northport, NY

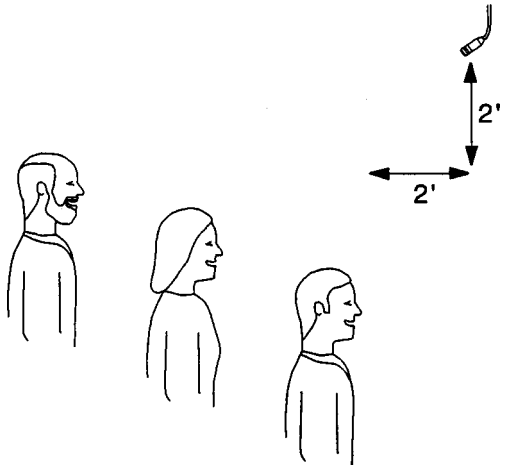


Fig. 3. A choir-miking method.

Reply: First, try switching to a supercardioid mic such as the Crown CM-30 or CM-31. A cardioid is 6 dB down at the side; a supercardioid is 8.7 dB down at the side. So if the side of the mic aims at the orchestra, you'll gain almost 3 dB of isolation from the orchestra.

Your current working distance is about 6 feet to the center row. If you can decrease this to 4 feet, you'll get 3.5 dB more gain before feedback, and 3.5 dB more isolation from the orchestra.

A supercardioid improves gain before feedback by at least 1 dB over a cardioid in a reverberant sound field. The improvement is better if the sound field is more direct than reverberant, and if you can aim the null at the loudspeaker.

In general, twice as many mics at half the distance improves gain before feedback by 3 dB.

Compared to 3 mics at 6 feet from the choir (your current setup),

6 mics at 6 feet reduces gain by 3 dB.

6 mics at 4 feet offers no improvement over 3 mics at 6 feet.

38 mics at 1 foot (one mic per two people) increases gain by 4.7 dB but costs 12.7 times as much!

75 mics at 3 inches (one mic per person) increases gain by 13.6 dB but costs 25 times as much.

To cover three people equally, you would need to mic 5 feet away. So there's no point in trying to cover groups of three people with 25 mics.

Looks like the best solution is to mic a little closer with three supercardioids or hypercardioids.

# # #

MIC MEMO

Spring 1994
Bruce Bartlett, Editor

INTRODUCING THE PCC-170's LITTLE BROTHER: PCC-130

PCC-130

The Crown PCC-130 is a very small, surface-mounted cardioid microphone of professional quality. This handsomely styled unit can be used on the most elegant boardroom table or lectern. Other applications include churches, courtrooms, and council chambers.

The PCC-130 sounds like its bigger brother, the PCC-170. But the PCC-130 has been reduced in size to make it less conspicuous on a conference table. Also, the PCC-130 is cardioid, while the PCC-170 is supercardioid.

Because of its directional pickup pattern, the PCC-130 rejects background noise and feedback. The microphone reproduces the voice with a clean, clear, and natural sound.

Inside the PCC-130, a tiny mic capsule is mounted on a boundary or surface. Because of this arrangement, direct and reflected sound waves arrive at the mic in-phase, and add coherently. This eliminates comb filtering in the audible spectrum and gives a more natural sound. It also enhances sensitivity, clarity, and reach.

All the electronics are built-in, so you don't need an in-line preamp box. Powered by 12-48V phantom power, the PCC-130 has a low-impedance balanced output which permits long cable runs without hum pickup or high-frequency loss. Although the standard connector option is a Switchcraft TB3M, you can order the mic with a 1/4" stereo phone plug on the bottom of the base plate as the PCC-130SPP. Screw holes in the base let you mount the mic permanently.

Capable of handling up to 120 dB SPL without distortion, the PCC-130 will never overload in practical use. Its electret-condenser capsule provides a wide, smooth frequency response from 50 Hz to 18 kHz. RFI suppression is included. Self-noise is low and sensitivity is very high. A bass-tilt switch lets you tailor the low-end response for particular applications.

CROWN DEBUTS STRONGER GOOSENECK MICS

Good news for users of Crown lectern mics: we've upgraded our line of gooseneck microphones — the LM-300, LM-300L, and LM-301. The new models have beefier, extra-rugged goosenecks that continue to stand up under heavy use. Yet the microphones still look slim and elegant. The current models are the LM-300A, LM-300AL, and LM-301A. All include the new, highly effective WS-9 pop filter.

Left: LM-300a, Right: LM-301.

NIRVANA AND SOUNDGARDEN RELY ON CROWN DIFFEROIDS

An article in the Jan/Feb ’94 issue of *Live Sound* described how rock group Nirvana is using Crown CM-310 Differoid mics on tour.

According to Allan Bagley, Nirvana’s front-of-house sound engineer, the most difficult part of his job is getting vocal intelligibility and separation in the mix, without mixing [the vocals] at excessive levels.

“Due to the amount of leakage into the downstage vocal mics and drum vocal mic, a different approach had to be used. Conventional dynamic cardioid mics did not have the off-axis rejection that is required for this show. But the Differoid’s design allows for greater gain before feedback, something very critical in the show. The CM-310 also has outstanding off-axis rejection, keeping bleed to a minimum.

“Bagley and [house mixer] Craig Overbay, as well as longtime Nirvana monitor mixer Ian Beveridge, feel that these [mics] are the key to a good sounding Nirvana show. For over a year, Nirvana has used the Crown CM-310 for all stage vocal mics, carrying at least six at all times, even for network or MTV television tapings.”

Soundgarden is another well-known grunge-rock group currently using Differoids on tour.

SURFACE-MOUNTED GLM RESPONSE SHAPING

When you use a GLM-100 mini mic on a surface, such as an acoustic guitar or a piano lid, you can tailor its frequency response to get a variety of different tone qualities. As Figure 1 shows, there are several ways to mount the GLM next to a surface, each with its own response.

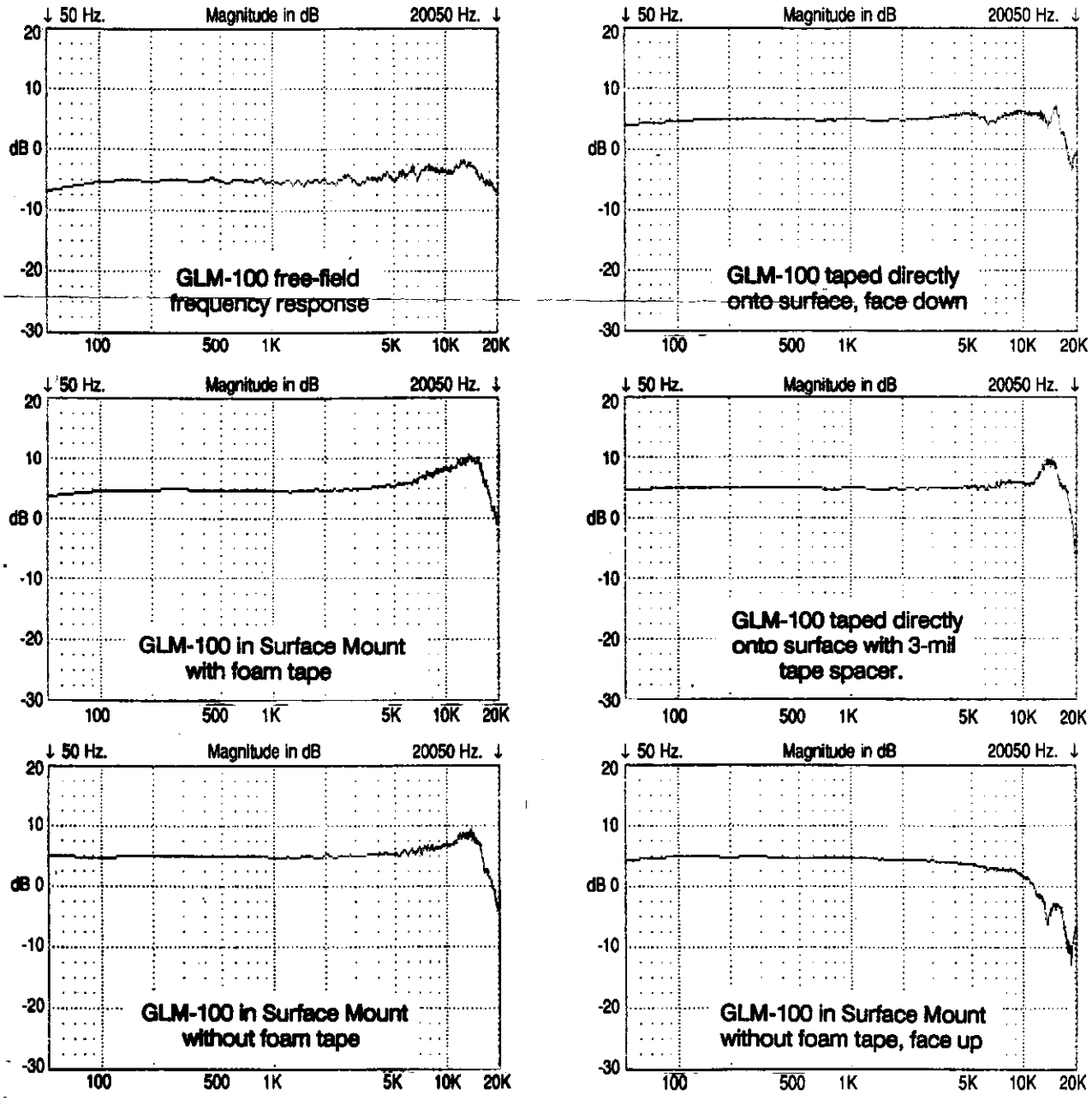


Fig.1. GLM response shaping

For example, suppose you're miking an acoustic guitar with a GLM-100 in a surface mount. The usual placement is near the low E string, halfway between the soundhole and the bridge (Figure 2). If the sound is too bright, or you hear too much string noise, put the mic in the surface mount face up. This orientation will roll off the treble, as shown in the bottom-right response graph.

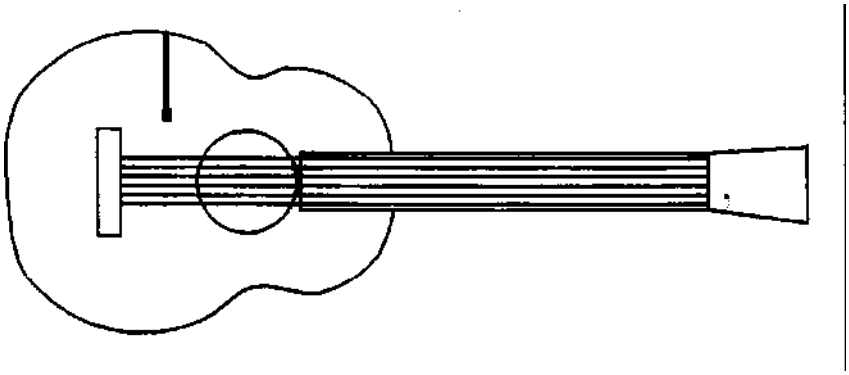


Fig. 2. GLM guitar miking.

HOW TO REDUCE REVERB WITH A PZM WEDGE

A recording engineer phoned Crown to say that he was recording choir and organ in a highly reverberant cathedral with a PZM wedge. A PZM wedge is an assembly of two 2' x 2' pieces of plexiglass. They are mounted with one edge touching to form a wedge or V. Often the edges are joined with a piano hinge. The point of the V aims at the sound source (Figure 3-A).

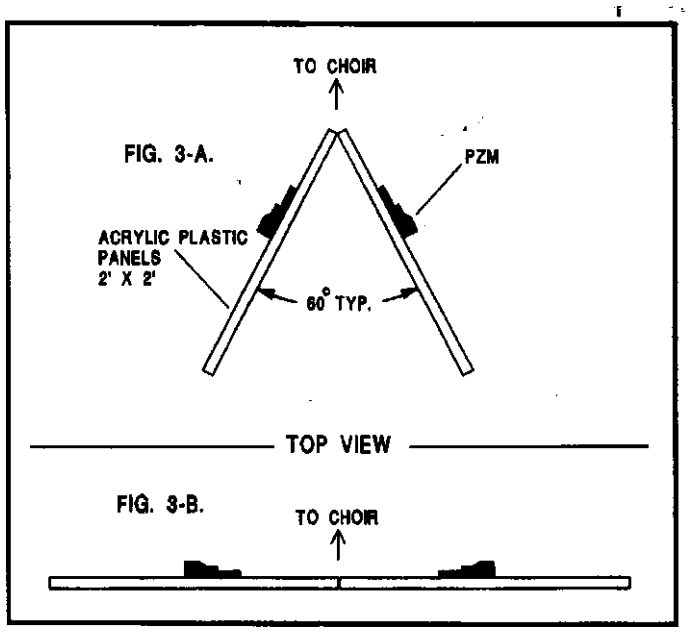


Fig. 3: PZM wedge — angled (top) and folded flat (bottom).

The engineer said that the sound picked up was too live or reverberant. When he moved the mics closer to the choir (3 feet away), the reverb was under control. Unfortunately, at this distance he heard individual voices instead of a blend of all the voices.

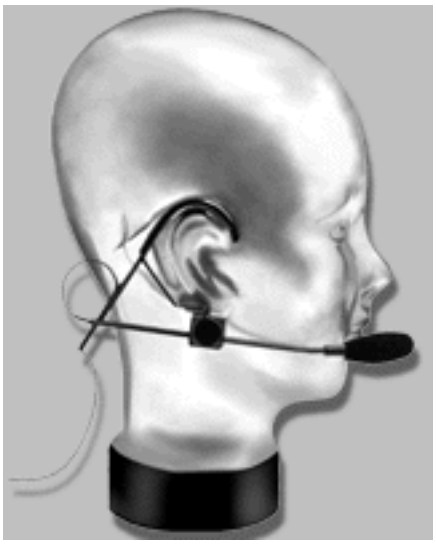
We recommended that he take the V or wedge, and unfold it flat. Then the two PZMs aim directly at the choir (Figure 3-B). This way, the mics pick up more of the choir and less of the room acoustics. That is, they pick up more direct sound and less reflected sound. So the mics can be moved farther away from the choir to get a better blend.

Also, each PZM was mounted on a 2' x 2' boundary, two of which formed the V. If you flatten out the V, you get one large boundary measuring 2' x 4'. The boundary seen by each mic is twice as big, so the boundary rejects lows better.

As a bonus, the stereo array changes from a near-coincident pair to a spaced pair. A near-coincident pair gives sharp imaging, while a spaced pair gives a more blended effect — which the engineer wanted.

LETTERS FROM CROWN MICROPHONE USERS

How to mike a hypnotist



CM-312

My client is a therapeutic hypnotist. During sessions, she wants her voice to be recorded, but without any background noise. Any suggestions?

Mike Peavey, Little Rock, Arkansas

Reply: If the hypnotist doesn't mind wearing a head-worn microphone, a CM-311 will give the ultimate isolation from background noise.However, this mic is worn with lips touching the grille. If that's not acceptable, the next best choice is the CM-312 [now the CM-312A] headworn mic, whichis off to the side of the mouth. Your third choice is a GLM-100 lavalier mic.

GLM and SASS enhance voice-overs

I do a lot of voice-over work in an acoustically tight and very dead room. Occasionally, though, I need a larger, more live and open sound. By positioning my GLM at a boundary, and mixing it in at varying levels, I can get a unique sound that brings to the voice-over a more natural, less canned quality on some projects. Equalization and phasing can create some amusing effects. My SASS-P can be used in the same way to bring depth to stereo projects. The SASS-P is also useful for group voice-overs without the need for EQ or phasing corrections.

CM-310's in country station awards show

CM-310

The country music station of the year, WUSN (US-99) Chicago, bought four CM-310's [now the CM-310A] from Graysonics for the event. Broadcasting live from a remote "studio" in Nashville at the ceremony, chief engineer Bob Larsen was impressed with the quality of the sound of his new mics.

John Grayson, Graysonics, Evanston, IL

No more RFI

An antenna tower within 100 yards of our microphone installation and was causing unwanted radio interference. After we consulted with Yamaha and Peavey, Crown technicians were the only ones who were able to completely eliminate the interference. We used ferrite beads and 250 pF capacitors. Thank you.

Richard Troutman, Troutman Music, St. Joseph, Mo.

Reducing RFI in the Sound Grabber

A number of our court reporters are using Sound Grabber microphones with Marantz tape recorders as an adjunct to the conventional means of capturing verbal court proceedings via Stenograph machines.

We have found the Sound Grabber to be an excellent microphone. The one problem we have experienced in the tendency of the Sound Grabber to also capture a nearby radio station. Is there a retrofit that will eliminate such a problem?

Roger P. Clark, Official Court Reporter, Hennepin County District Court, Minneapolis, MN

Reply: Try soldering a ceramic disk capacitor across the mic-capsule terminals. Tack solder — do not overheat! A good starting value for the capacitor is .0068 microfarad (also called 6.8 nanofarad or 6800 picofarad).

If that doesn't work, you might try soldering a similar capacitor across the mic-jack terminals in the recorder.

CM-200A is unique

CM-200A

We install sound systems in churches. The soloists desire a tapered mic, so they can pick it up and put it back in the stand with one hand. We looked all over for a condenser mic suitable for solo use that had a tapered body. The only option on the market under $600 that has a cardioid pattern and a tapered body in the CM-200A. (Many times a hypercardioid is too narrow for ensemble and duet use.)

Douglas Harrell, Audio Specialists, Yakima, WA

SASS in a spookhouse

I provided sound for a couple of spookhouses this Halloween. Among the canned sound effects at various points in the venues, I dropped in pre-recorded maniacal laughter, narratives, threatening comments and the like.

To tape them I used a DAT and a Crown SASS-P stereo mic in an absolutely dead room. Working about three feet from the mic, the stereo image was deep and wide.

When the Klipsch monitors behind the victim released these sounds, after a generous application of Crown P.A. gain, a delightful wail of terror resulted, and — in at least one case — genuine excremental fright. I've already been invited back next year.

David Peter Maus, Maus Productions, Chicago, IL

# # #

MIC MEMO

Summer 1994
Bruce Bartlett, Editor

MAKING A GREAT MIC SOUND JUST A LITTLE BETTER

by Travis Ludwig

Differential mics have been around for several years. But Crown has managed to refine this application and create an exceptional sounding microphone at the same time. There are, however, a few tips to consider when using these gems.

CM-310A

The CM-310A does an exceptional job reducing bleed. But there's a trade-off. If a vocalist attempts to "work" the microphone, the level drops whenever the vocalist backs away.

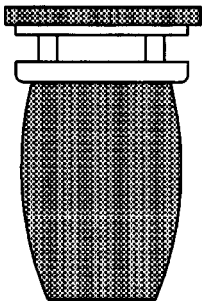
By using a standard compressor you can increase the apparent reach or window of the CM-310A. The compressor must have independent controls for attack, release, threshold, and ratio.

If you set the ratio too high, the threshold too low, or the release time too long, feedback starts to rear its ugly head. After a little experimentation, something wonderful results. The level doesn't drop when the singer backs off the mic. I've used this technique for live radio where as many as eight CM-310A's are in use simultaneously.

If feedback still seems to be a problem, try putting every other vocal mic out-of-phase with the next. Make sure to do an A-B comparision before settling on this approach.

One last tip. To improve the performance of the foam pop filter, hold the tip of the filter and gently pull it away from the ball grille until the bottom edge starts to reveal the grille screen mesh. Now you've created a second air layer between the outer foam and the ball grille. This will greatly increase the effectiveness against p-pop.

NEW WS-9 POP FILTER STOPS BREATH POPS



WS-9 pop filter

The WS-9 foam pop filter fits on our lectern mic models LM-300a, LM-300aL, and LM-301a. It's a major improvement over previous pop filters. Why is it so effective? The WS-9 is a two-stage design. Mounted in front of the usual foam "sock" is a flat foam disk. It works like the flat pop-filter screens you see in recording studios. Lecturers will hear noticeably less breath popping when they use the WS-9.

SASS CONCERT MIKING

In an article in the January, 1994 issue of *Electronic Musician*, Neal Brighton described how he mics an orchestra with the Crown SASS-P MKII stereo microphone:

"My favorite concert miking trick is flying the microphones above the audience (Figure 2). At San Francisco's Community Music Center, I've engineered a number of recordings using a pulley system. A Crown stereo PZM microphone is hoisted approximately fifteen feet above the audience's head and secured with clear fishing line, so that the mic doesn't twist around in mid-air.

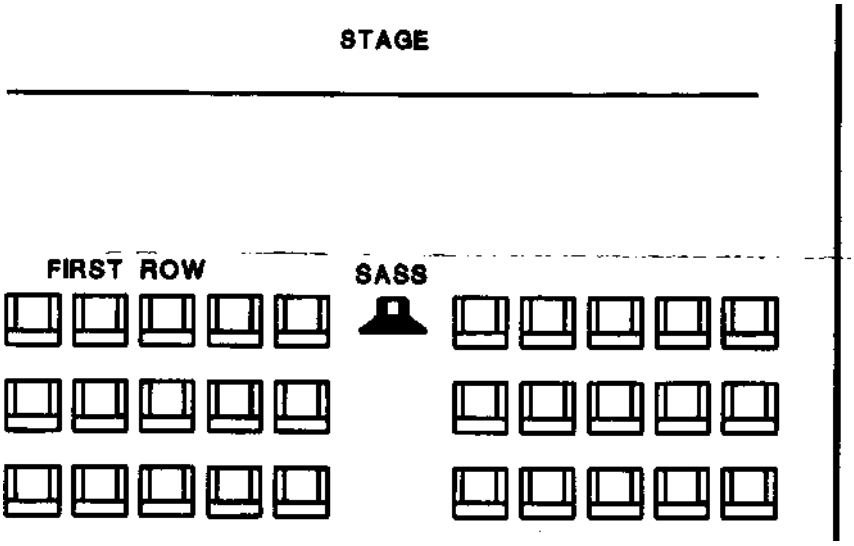


Fig. 2. SASS concert miking.

"Because the Center's medium-size concert hall accommodates intimate gatherings, this miking system produces a clear and vibrant stereo recording. Basically, the PZM mic emulates the sound heard by the audience. I can't think of a better perspective from which to document a classical concert."

GLM: A FAVORED MIC FOR STRINGS

In the March 1994 issue of *Mix* appeared an article titled "The New String Thing." Author Mark Fitzgerald covered miking of live string ensembles.

One prominent group of this type is the Turtle Island String Quartet, who improvise in jazz, bluegrass, and almost any other style. "Their engineer, Brian Walker, works with Turtle Island in the studio and on the road," said Fitzgerald. "Walker uses miniature Crown GLM-100s on all of the instruments..."

RECORDING BIRDS WITH A PZM PYRAMID

The venerable PZM pyramid is a highly directional mic system that you can use to record bird calls. Here's how:

1. First, make a four-sided pyramid using 3/16" plexiglass as shown in Fig. 3. Seal the edges with silicone rubber.

2. Insert a GLM-100 microphone inside so it touches the apex of the pyramid, and glue or tape it in place.

3. Finally, cover the pyramid opening with nylon knit fabric to reduce wind noise.

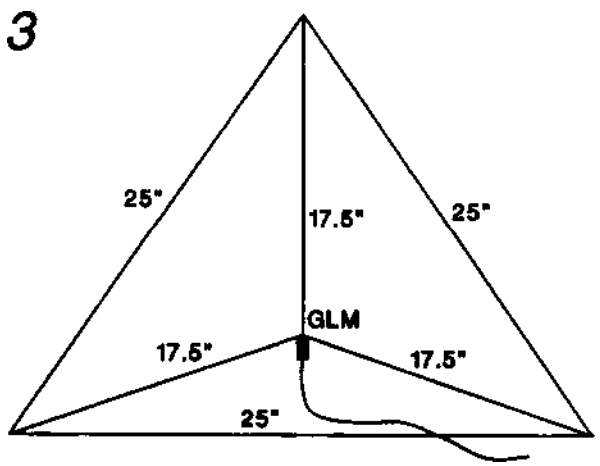


Fig. 3. PZM pyramid.

Bird calls are not very loud, so you might need a more-sensitive microphone. Try a GLM-100/E and wire it as shown in Figure 4. The circuit's output is medium impedance, unbalanced. The sensitivity will be 11 dB higher with this circuit than with the GLM-100.

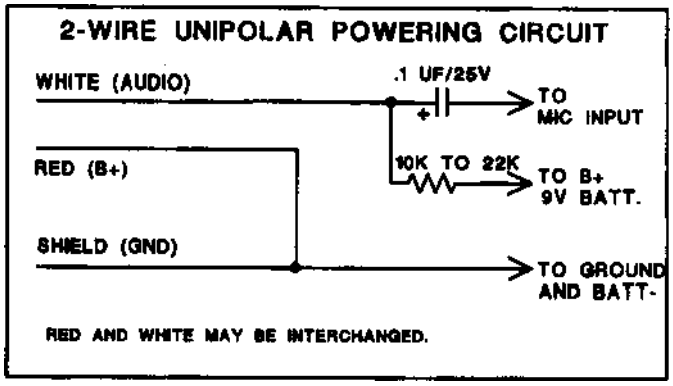


Fig. 4. GLM powering circuit.

WARMER, TIGHTER SOUND WITH PCCs

Bob Myers of Sound Comm was using several PCC-160 supercardioid boundary mics to pick up interviews of the Cleveland Browns at the long conference table. He asked us how to get a warmer, more intimate sound with this setup.

We offered these suggestions:

1. Use the BOOST position on the bass-tilt switch. The conference table might be too small a boundary to provide good bass.

2. Run the mics into a gated mixer so that only one mic is on at a time. This will reduce the pickup of room reverb, giving a more intimate sound.

MIKING HARP AND DULCIMER WITH A SASS

Gary Wakenhut of *The Collecting Consort* records his own albums using a Crown SASS stereo microphone. Formerly Gary was using two GLM-100 microphones. He was happy with them, but was really impressed when he tried a SASS-P MKII.

"The pickup is exquisite. There's more clarity, a more clean and open sound, and a natural stereo spread."

“I mic the harp and dulcimer overhead with the SASS. Placement is 4 inches from an 8-foot-high ceiling. Since the SASS picks up more harp pluck than the GLM, I need to mic farther away. The mic is 3 to 4 feet over the instruments, and picks up a lot of room sound. I reduce the room reverb by hanging a quilt horizontally near the ceiling.

“I built a wooden platform for the harp, which gives a nice, natural boost to its low frequencies.”

PZM: AN EXCELLENT MIC FOR PIANO

In an interview in the March ’94 *EQ* magazine, recording engineer Kooster McAllister had this to say about miking a piano with Crown PZMs:

“A lot of times I have to mic a grand or a baby grand piano in a rock & roll environment, which means that I have to keep the lid closed.

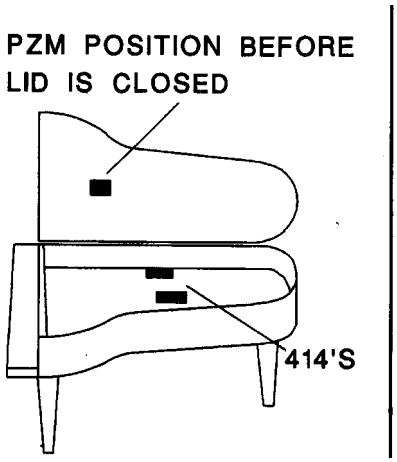


Fig. 5. PZM piano miking.

“I take a PZM up to the hammers of the piano and tape it onto the lid to get the attack. Sometimes you have to screw around a little bit with the phase to get it to where everything is working right, but generally it’s a trick that works for me — a pair of [AKG] 414’s [farther from the hammers] and a PZM, and I’m pretty happy with what I get on the piano.”

RECORDING A CHURCH SERVICE WITH A SASS

As soundman for his church, Jim Riley wanted to record the service so the musicians could hear how they sounded in the audience. That is, he wanted to record the output of the sound-reinforcement speakers.

First Jim placed a SASS near the front row of the audience. But then the mic was off-axis to the horns when placed this close to the stage. The result was a dull sound. What’s more, the ceiling was only 10 feet high. Mic placement near the ceiling gave a boomy or bassy sound.

Next, Jim placed the SASS in the back of the church near his mixing position. He noted that the SASS recording was much more reverberant and bassy than what he heard live in the same spot.

This occurs with any microphone recording. When we hear with two ears, we hear reverberation all around us, but we hear the direct sound up front. So we can ignore the reverb and concentrate on the direct sound. But a microphone can’t discriminate spatially between direct sound and reverb. During playback of a microphone recording, all the reverb is heard up front between the playback speakers, mixed with the direct sound. That’s why the playback sounds more reverberant or muddy than what you hear live.

The solution is to place the mic closer to the sound source than where you are listening — about 2/5 the distance. Then the recording will have the same amount of subjective reverb as what you hear live.

So, we suggested that Jim place the SASS as close as possible to the front where it still picks up the horns clearly — maybe off-center, in front of one speaker. On the mixer, roll off any excess bass caused by too much reverb or ceiling placement.

HOW TO MIC A TABLE OVERHEAD

Suppose you're trying to mic a group of people at a conference table, but no mics can be visible on the table top. Try these suggestions:

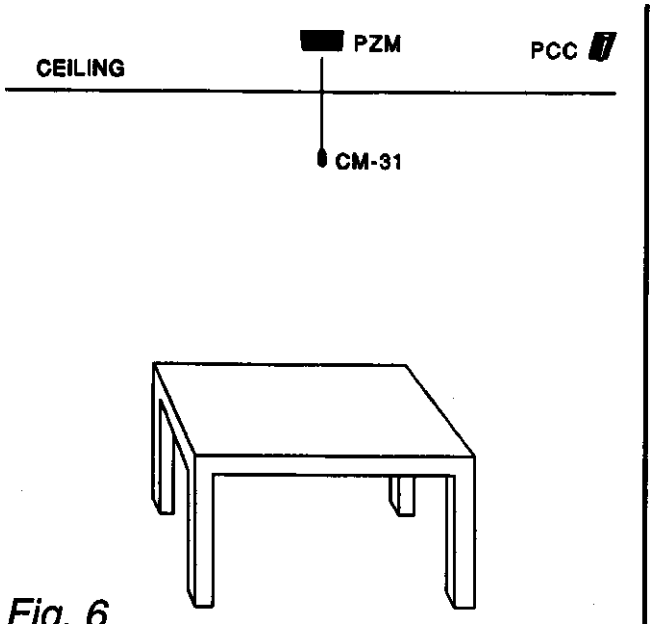


Fig. 6. Table overhead miking.

*Mount a PCC-160 on the ceiling near the table. Put the PCC not directly over the table, but outside it aiming at the table. Then the table will be more on-axis to the mic.

*Mount a PZM-6D directly over the table. Use two mics for long tables.

*Hang a CM-30 or CM-31 supercardioid mic over the table.

LETTERS FROM CROWN MICROPHONE USERS

SASS dynamics and sonic balance

I've been recording with a SASS-P, two PZM-6Rs or 6-Ds, and a DAT. The sound is very good except for two problems:

(1) When I record a symphonic band, the loud percussion hits are too loud.

(2) When I record a piano/vocal recital, the piano is too loud relative to the vocalist.

I don't hear these effects when I listen directly to the musical ensembles. How can I solve these problems?

Reply: To tame the percussive hits, try using a compressor. It will leave the quiet percussive notes alone, but will soften the loud impacts.Plug your SASS into a mic preamp or mic mixer to bring the signal upto line level. Plug the preamp or mixer output into the compressor, and plug the compressor output into your DAT.

On the compressor, try these settings as a beginning: Attack time: very fast (about 1 msec)

Release time: fast (about .1 sec) Threshold: -6 dB. (Set it so the compression starts working at about -6 dB on your DAT meters).

Compression ratio: 1:4.

To control the vocal/piano balance, try placing a mic of your choice about 3 feet from the singer, and mix it with a distant SASS mic. The SASS will pick up mainly piano and ambience. Pan the spot mic to the center, and pan the SASS hard left and right.

Waterproof PZM

I want to pick up the sound of a waterfall in my backyard and reproduce the sound indoors. I plan to use a PZM-30D near the waterfall. How can I make the mic waterproof?

Bruce Garrett

Reply: Wrap the mic in a thin plastic sandwich bag or plastic wrap. The wrap should be limp, rather than stretched tight (Tight wrap degrades the frequency response).

Try to put the mic in a shady spot or cover it with an umbrella to keep off sunlight and rain.

You might want to record the mic's signal during the summer and play it back in the winter.

# # #

MIC MEMO

Fall 1994
Bruce Bartlett, Editor

JANET JACKSON TOURS WITH CROWN CM-311/E HEADWORN MIC

Superstar Janet Jackson sang through a Crown CM-311/E headworn mic on her world tour. The July issues of *Mix* and *Pro Sound News* reported the news. Jackson wore Future Sonics Ear Monitors and a Crown Differoid headset mic, which was run through a wireless transmitter.

CM-311/E

According to Showco's Robert "Cubby" Colby, who mixed the house sound for part of the tour, "Janet was particularly concerned that she's a very soft-spoken person, and was concerned about getting enough vocal headroom above the dance mix, which is fairly big."

"I wanted to come up with something that was really effective for the headset mic, and I chose the Crown CM-311/E Differoid mic. I really like the microphone; it's really robust, darned rugged, and so far it's holding up really well for us."

Showco monitor engineer Randy Bryant said that the headset/in-ear monitor combination works for Jackson “because she has to dance so much and move around. The microphone is good because they designed it so that it’s really tight underneath her chin, so when she does the movement, it doesn’t move either. Other products fit, but they don’t handle the shaking that she gives it with her dance moves.”

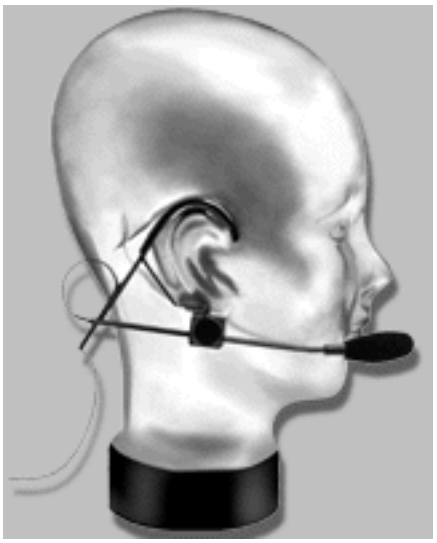
JAZZSET USES PZMs ON PIANO

JazzSet, a weekly hour-long radio program heard on 201 NPR affiliates, features live recordings of top jazz performers in venues around the country. Branford Marsalis is the program’s host.

Tony Caporale of A-1 Audio, Las Vegas, used a Crown PZM on the piano when he recorded a segment for JazzSet at Caesar’s Palace.

CM-312 HEADWORN MIC WORKS FOR PUPPETEERS

How do you mike a puppeteer? A headworn mic seems to be a good choice because it leaves the user’s hands free, and the gain is much better than with a lavalier mic.



CM-312

A group of puppeteers called The Information Theater group (from Kaiser Medical) tried a variety of headworn mics. They wear large puppet heads or masks, and inside the masks they wear headworn mics so they can be heard by large crowds.

The group tried several brands of headworn mics, but they liked the CM-312/E the best [now the CM-312A/E]. “The audio quality was exceptional, and the fit was the best,” said a member of the troupe.

BEAUTIFUL ACOUSTIC RECORDINGS WITH THE SASS-P MKII

If you need to relax, give these new CDs a listen: *A Celtic Portrait* and *All Through the Night* by The Collecting Consort. The group consists of Anne and Gary Wakenhut, who play harp and dulcimer with a gentle touch. Other artists add flute, clarinet, oboe, and harmonium.

The CDs were recorded entirely with a single Crown SASS-P MKII stereo microphone. Gary Wakenhut describes his recording techniques:

“The mic was placed about 3 feet above the instruments facing down. The instruments were separated about 6 feet. Flutes, whistles and clarinet were 15 to 20 feet away. The harmonium was about 25 feet away covered in six sleeping bags.

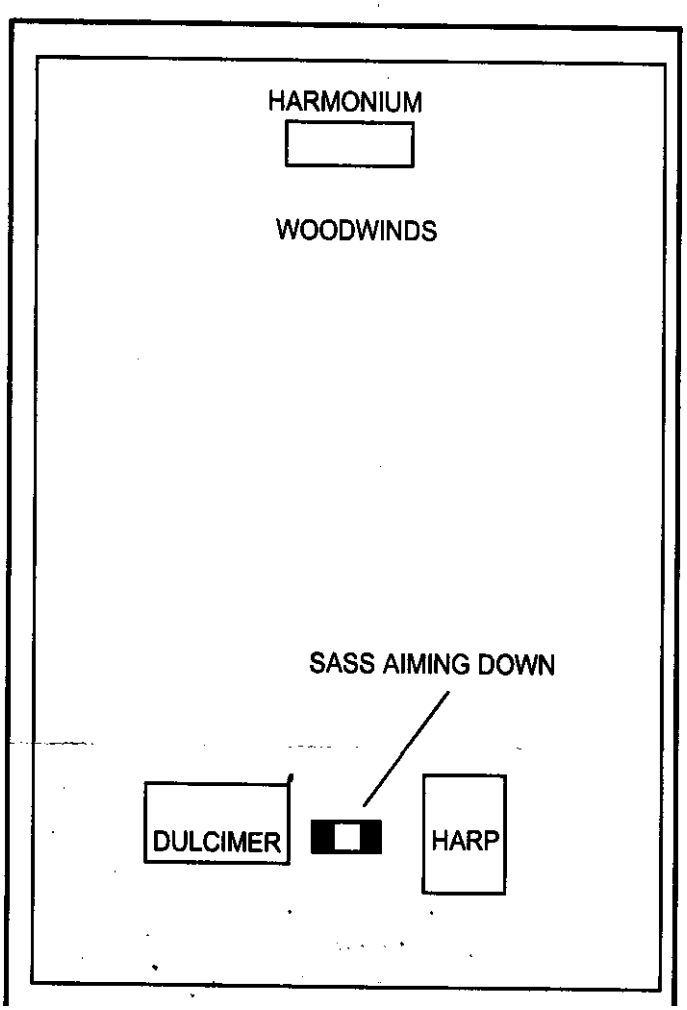


Fig. 1. SASS miking for Celtic Portrait.

“I fastened a quilt to the ceiling directly above the instruments and raised the mic as close to the quilt as possible. [This distant miking helped us] lose most of the percussive edge from the harp and dulcimer. So we could work more with expression and be more aggressive with our instruments.

“WBLV, Blue Lake Fine Arts Radio, came here to tape a live broadcast, and we used my equipment. Steve Albert, the producer, was so amazed by our sound that he immdediately went back to the station to put in a request for the SASS.

“I wouldn’t trade the SASS for all the different models which are available. The SASS gives so much more of a natural sound and better separation. Since it works like the human ear, mic placement is not nearly as critical. So I can work more on my musical sound and not worry about the technical aspects of the pickup.

“The beauty of this mic is its capacity to catch everything. When we add another musician, we just record an initial mic check, listen to a playback and move the musician a few feet. A second check usually affirms our assumptions, and we are ready to record. Then it’s up to the musicians to listen to each other and create their own balance. If the balance is not perfect, the natural essence of the SASS plays that down much more than traditional recording mics.

“In that respect, even a musician unseasoned in mic choice or placement could achieve a good recording with the SASS. All you need are pair of ears which can get the SASS in the general vicinity of a good sound. Also, the SASS would be ideal for live work where there is no chance for a mic placement rehearsal.”

If you’d like to hear the Wakenhuts’ recordings, they are available for $14.16 each ($9.44 for cassette) plus $3.00 postage and handling from The Collecting Consort, 7363 W. Edgar Ed., Lakeview, MI 48850.

MIKING THE TURTLE ISLAND STRING QUARTET

by Darol Anger, a member of the Quartet

The Turtle Island String Quartet has used Crown GLM-100's from its first concerts. [Although they are omni mics, they] work best for us because the mics are mounted so close to the instruments. There's no proximity effect (as there would be with a cardioid pattern), and the mics strongly pick up the box, strings, and air around the instruments in pleasing proportions.

We don't have feedback problems because the mics are so flat in their response and are mounted so tight in. They are between the strings and the top on the violins and cello, and directly behind the bridge on the viola.

Crown mic engineers recently made us a batch of GLM-100's without the high-frequency bump, which sound even better for the violins especially. The cello seems to do well with the normal lavalier EQ, however, because of the cello's lower range.

The problems you get amplifying a cello are similar to guitar problems, and our solutions are similar: a combination of mic and pickup. The cello mic is centered directly under the strings at the top of the underside of the bridge's arch. An L.R. Baggs pickup is in the bridge, and is EQ'd to reproduce frequencies only below 300 Hz. Generally, the pickup is used only when Mark is playing pizzicato bass lines. The mic is on all the time, getting the normal tone of the instrument.

One of the bonuses of the Crown mics is their toughness. The quartet plays all kinds of venues, outdoors, funky clubs, and concert halls of every size. These mics have been nearly trouble-free during the nine years we've been gigging.

SASS-P MKII RECORDS FUSION, ROCK & REGGAE

Ward Kremer, a recording engineer with Hole in the Roof Studios, made good use of the Crown SASS-P MKII stereo mic recently in recording three albums.

He taped Randy Bernsen's fusion band live with just one SASS. At at outdoor concert, the mic was placed in a quiet spot between the floor monitors and the house speakers. Kremer used Ampex tube mic preamps. Although the mic picked up the band at a distance, the recording sounds tight and almost close-miked.

Ward Kremer with his tube mic preamps.

On Cedrick Luces' reggae album, "Ready to Parti," the SASS was mixed with an RCA77DX for lead vocal, Neumann U67 for percussion, and RCA 77 for steel drums. Kremer used the same setup with the doo-wop group, Legacy, on their album "A Life Song."

Kremer reports, “I was very impressed with the overall performance of the SASS, espeically the lifelike stereo. The detail is excellent even when compared to mics like 77’s and U67’s. The musicians loved the sound of it.”

Sometimes Kremer placed the SASS over a drum set for stereo pickup. This same setup was employed with fine results at the Elkhart Jazz Festival this summer.

MIKING POP-MUSIC CONCERTS ON TV

Each year, WNIT-TV in Elkhart, Indiana produces a series of music shows called “Across the Dial.” The series features local musical groups playing jazz, folk, blues, rock and reggae. The instruments and vocals are picked up with Crown microphones, and are mixed live to video tape for later broadcast.

These mic assignments sounded especially good:

Drum set: One GLM-100 mini mic in the center of the set, clipped to the snare drum rim. If the set has extra floor toms, another GLM goes between them. Typical EQ is +6 dB at 80 Hz and 0 to +15 dB at 10 kHz. The louder the music, the more high-frequency boost is needed.

Kick drum: GLM-100 mini mic hanging through the vent hole, near

the center of the drum shell. A pillow damps the beater head.

Typical EQ is -4 dB at 400 Hz to remove the “cardboard” sound,

and +8 dB at 3 kHz for attack.

Vibes: CM-200A about 1 1/2 feet over the top.

String bass: CM-200A 5" from the strings and 3" above the bridge.

Vocals: CM-200A with foam windscreen, lips touching, and EQ’d about -6 dB at 60 Hz to reduce proximity effect and breath pops.

Guitar amp: CM-200A near the center of the speaker cone.

Bass guitar and keyboards: Direct box.

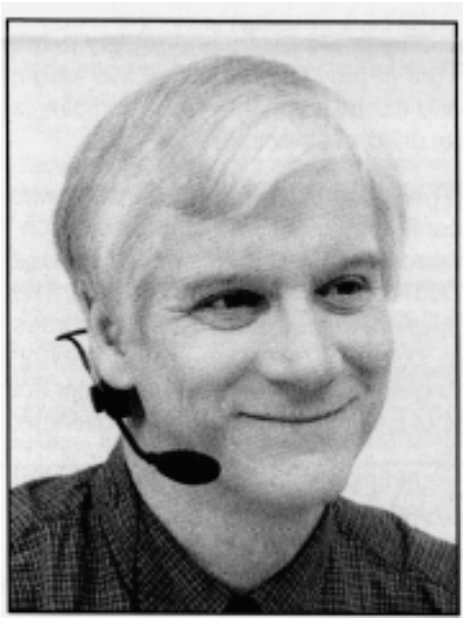
Acoustic guitar: GLM-200 with bass boost disabled, in the sound hole under the strings. This sounds natural and has excellent isolation.

Grand piano: Two GLM-100’s taped to the underside of the piano lid, 1 foot apart and 8 inches from the hammers. Typical EQ is + 6 dB at 10 kHz for extra attack.

# # #

MIC MEMO
Winter 1995
Bruce Bartlett, Editor

CROWN CM-312 VOTED BEST HEADWORN MIC



Mic Memo editor, Bruce Bartlett, wearing a CM-312 microphone.

Angel City Voice, a trade journal for singers, ran a review of several headworn mics in its Nov. ’94 issue. A panel of five listeners ruthlessly tested four major-name mics for sound, comfort, security, and ruggedness. The results:

“The Crown CM-312 had by far the best sound, rivaling good handheld mics. The panel says: Unanimous Winner.” Rating: 5 stars. [The current model is the CM-312A.]

“Sound: very full with great presence and crisp highs. Comfort: secure and comfy on larger heads when adjusted. Quality: very well made. Survived amplifier crush test, then I had to drive my car over it three times to kill it. Panel comments: Joel — Hot mic, clear highs, easy to set up. Jennifer — design doesn’t work well with big hair. Matthew — the obvious choice.”

MIKING AND BIKING

Here’s a novel way to carry mics into the wild to record environmental sounds. Matt Lesco rides to the location on his mountain bike, carrying mics and DAT recorders. When he stops, his bike serves as a tripod stand for the microphones.

Matt is using a Crown SASS-P MKII stereo mic and two PZM-6Ds. The SASS aims to the front while the PZMs aim to the rear. He records each mic pair into a separate DAT for later syncing.

PZM-11 FOR VOICE RECOGNITION

The PZM-11 security and surveillance mic can work well for computer voice recognition. Run one or more PZM-11’s into a mixer. Run the mixer output to a sound card in your computer. Have your computer run a voice-recognition program that analyzes the signal from the sound card.

POLARITY VS. PHASE

In an article by Travis Ludwig in the Summer 1994 *Mic Memo*, the author says, “If feedback seems to be a problem, try putting every other vocal mic out-of-phase with the next.”

Jim Brown of Audio Systems Group wrote in to say, “How much out of phase? At what frequency? Do you mean polarity?”

The answer is: 180 degrees out-of-phase at all frequencies. The term “out-of-phase” has long been used, incorrectly, to mean “opposite polarity.” I believe that was the writer’s intent.

In the same issue, we quote recording engineer Kooster McAllister about miking a piano with Crown PZMs: “Sometimes you have to screw around a little bit with the phase [of the mics] to get it to where everything is working right.” By “phase,” McAllister either meant polarity, or he meant phase shift between mic pairs. He used two pairs of mics to pick up the piano — PZMs and AKG 414s. The spacing between the mic pairs determine the phase shift vs. frequency between their signals.

MIKING AN UPRIGHT PIANO

In the *Crown Microphone Application Guide*, we suggested this method for miking an upright piano: Remove the cover to expose the strings under the keyboard. Hang two GLM-100’s near the strings: one about 8" from the bass strings and one about 8" from the treble strings.

In this position, however, the mics can pick up foot taps and pedal squeaks. You might try miking the upright over the open top with two GLM-100’s. Piano recording expert Richard Shomin suggests this method:

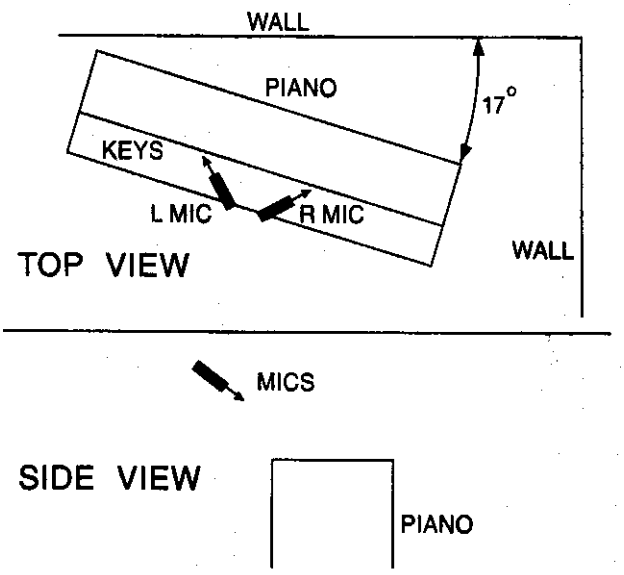


Fig. 1. Miking an upright piano over the top.

“My upright technique begins with the piano at 17 degrees from the wall. While adjusting that angle, I listen for resonances and low-bass balance with respect to the rest of the scale. A piano against the wall] has thin bass and a natural undesirable resonance.

“I remove the top lid and upper panel. The mics are above and slightly to the front of the piano. I adjust mic height and frontal position so that the scale is as uniform as possible.

“I generally use a pseudo-binaural mic configuration. The mic tips are separated from 8" to 16" depending on what I am recording and at what distance. The mics are angled apart 60 to 90 degrees to control the center treble energy. Angling the mics reduces the center hot spot and provides more even coverage.

Sometimes Shomin records off the sound board rear, with the sound board aiming into the room. “No detail is lost in rear locations, and this placement usually results in less mechanical noise, such as hammer action and damping.”

Shomin tries not to pick up room ambience. He feels that room reverb colors the sound and reduces contrast and resolution.

If you use GLM-100’s, you can get a crisper attack by boosting a few dB at 10 kHz.

REDUCING RFI

Are you hearing a radio or TV station on your sound system? The problem is Radio Frequency Interference (RFI). Sometimes, radio and TV signals get into microphones and their cables, then are rectified so that the broadcast audio can be heard.

Here are three ways to reduce RFI:

1. Filter it out with capacitors and ferrite beads.

2. Shield it by grounding the XLR connector shells.

3. Use low-impedance, balanced cables wherever possible.

Most Crown mics have RFI filters built in. If you want to add more filtering in the mic connector, try a 0.01 microfarad ceramic capacitor between pins 2 and 1, and between pins 3 and 1. The larger the capacitor value, the better it filters RFI; but too large a value rolls off the treble in the mic signal. First try these capacitors on either end of the mic cable — mic end or mixer end. If RFI is still a problem, put capacitors on both ends of the mic cable.

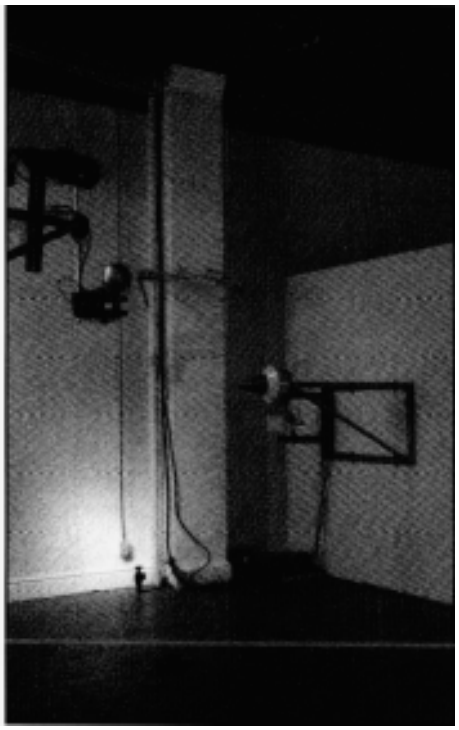
XLR connector shells do not shield against RFI unless they are grounded to pin 1. So connect pin 1 to the ground lug in the 3-pin XLR connector.

The Crown CM-30 and CM-31 mics have long runs of medium-impedance, unbalanced cable coming from the mic. If possible, cut this run as short as possible, connect it to the mic’s power module, then run the low-Z alanced signal from the module back to your mixer.

LETTERS FROM CROWN MIC USERS

PZM-11 is a work of art

Enclosed is a photo of our installation infrastructures that was at the Center of Contempory Art from June 25 to August 13, 1994. The photo shows one of the nine Crown PZM-11 mics highlighted on the back wall.



PZM-11 (highlighted) as part of a work of art.

The following text was included in the catalog for our piece:

"The collaborative team of David Galbraith and Teresa Seemann create a distributed yet collapsed electronic, architectural and acoustical space in their sight-specific piece entitled *infrastructures.* The piece investigates constructed environments through the architecturally embedded exchange of raw unformed AC power for the coded flow of electronic speech and sound.

"Special thanks to... Crown International, Mackie Designs, Symetrix, and Lone Wolf for their unique contributions."

Thank you very much for supporting our art work. The show was very successful and received a number of positive reviews in the local press.

David Galbraith, Teresa Seeman, Lone Wolf Corp.

Recycled paper

I would like to suggest printing the *Mic Memo* newsletter on recycled or at least recyclable paper. I find the newsletter very informative.

Keep up the good work!

Doug Krehbiel, Road Less Traveled, White Pigeon, MI

Reply: Thanks for the idea, Doug. We'll look into it.

GLM shock mounting

I'm using GLM-200's for horns, strings and percussion. However, the horn mount does not isolate the mic very well when used on a sax. You get a lot of thumping from valve action even with a lot of low frequencies EQ'd out. Any solution?

Reply: Try the arrangement shown in Fig. 2. Using the GLM-HM Horn Mount, clamp onto the GLM cable 2 inches from the mic. Put a fishing weight on the GLM cable near the clip, on the mic side of the clip. This arrangement makes the mic floppy so that it's shock-isolated by its cable.

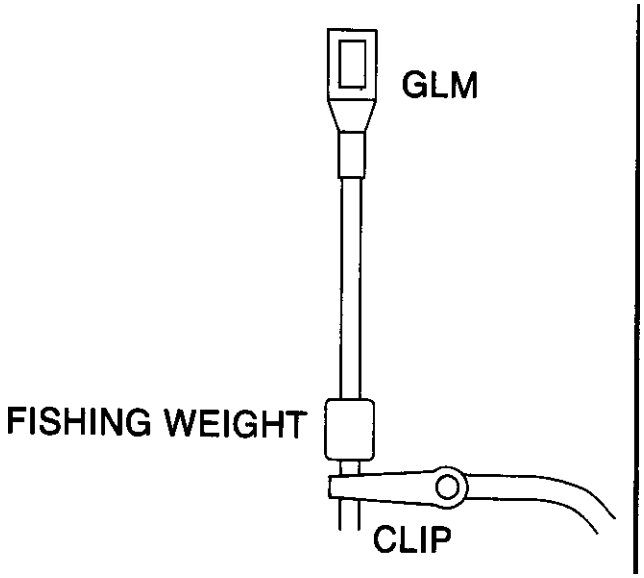


Fig. 2. GLM-200 shock mounting.

PZM for amateur radio

How about offering a PZM for the amateur radio hobby?

S.H. Kundin

Toms Reiver, NJ

Reply: We're looking into modifying the PCC-170 cardioid boundary mic. It would have a button for external switch closure, such as used with an amateur radio rig.

Demo CD

Ever consider a cassette or CD of "What does it sound like if..." It would have information on using Crown mics and would give audible examples of situation changes. An excellent case study is in the Spring '94 issue, "How to reduce reverb with a PZM Wedge."

Also, I'd love to hear examples of SASS sound. Didn't you offer a CD a few years ago? Is it still available?

R.C. Hauf

RCH Productions

Upper Montclair, NJ

Reply: There was a SASS demo CD but it is no longer available – sorry. However, most Crown dealers will do a free loan for trial. A Crown mic demo CD is in the works. [currently available]

Overhead miking not for P.A.

In a recent *Mic Memo* is an article, "How to mic a table overhead." It showed a Crown CM-30 mini supercardioid hanging over a table. I am certain that this technique will work for recording (if the air-conditioning system is quiet). But for sound reinforcement or teleconferencing, this distant placement is unlikely to work (as predicted by the potential acoustic gain equation).

Please tell your readers when a mic technique is only for recording. Mics on the ceiling have virtually no chance of working for sound reinforcement.

Michael Petterson, Shure Brothers Inc.

Book of mic tips

I would like to see all the miking suggestions from past newsletters in book form.

David Exon

Toronto, Ontario, Canada

Reply: Another super idea. A few years ago, we gathered the best tips from the *Mic Memo* and put them in booklets. These mic-technique application guides are available free from Crown or your Crown dealer:

**Crown Microphone Application Guide* (for CM, LM, and GLM mics)

**Boundary* (PZM, PCC and SASS)

**Schools*

**Houses of Worship*

**Video*

**Teleconferencing and Distance Learning*

**Studio*

**Speech Sound Reinforcement*

**Security and Surveillance*

PZM-11LL for observation rooms

Figure 3 shows a way to pick up conversation in a psychiatric observation room. This suggestion is from reader Martin Philip. A Crown PZM-11LL line-level PZM mic sends its audio signal into a separate listening room, where students and their instructor wear receivers.

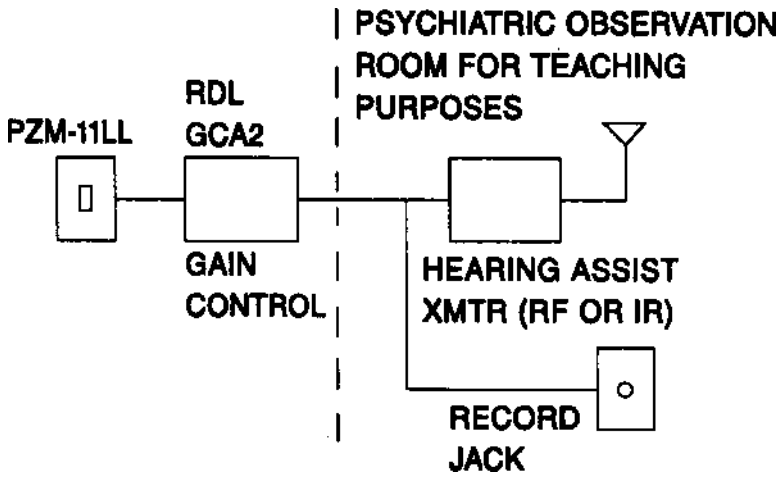


Fig. 3. PZM-11LL listening system.

PZM stereo miking

I have been using PZM-30D's for about six years, mostly recording our large vocal and symphonic groups. I like to mount the mics on a large flat surface above the groups, left and right, then pan the signals to opposite sides for a pseudo-stereo effect. The slight delay fattens up the sound as though you were right where the conductor is standing.

Dan Greuter, E. Peoria, IL

# # #

MIC MEMO

Spring 1995
Bruce Bartlett, Editor

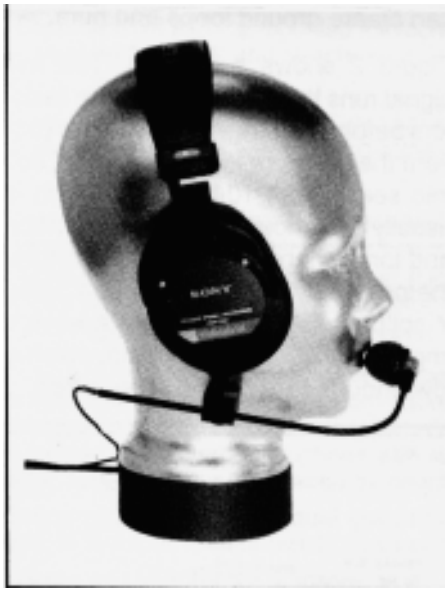
FOUR NEW MICS FROM CROWN

We're happy to introduce four new microphones:

CM-200ASW: Same as the CM-200A handheld cardioid, but with an on-off switch.

CM-310ASW: Same as the CM-310A Differoid, but with an on-off switch and adjustable frequency response.

CM-311HS: Same as the CM-311 Differoid headworn mic, but attaches to a Sony MDR-7506 headphone.



CM-311HS

CM-312HS: Same as the CM-312 hyper-cardioid headworn mic, but attaches to a Sony MDR-7506 headphone.

Let's look more closely at each product.

The Crown **CM-200ASW** is a cardioid condenser mic for provocal/instrumental use. It offers studio-quality sound, yet is rugged enough to withstand hard use in the field. It looks great, sounds great, and has a good balance in the hand. A built-in magnetic reed switch turns the mic on and off. The smooth-acting switch works silently.

The Crown **CM-310ASW** Differoid is a handheld noise-canceling mic for sporting events or other applications with high ambient sound level. It features a magnetic reed switch that turns the mic on and off.

The **CM-310ASW** uses Crown's patented Differoid technology. It is differential or noise cancelling, so it rejects sounds that are not close to the microphone. It has a cardioid polar pattern, so it rejects sounds from the rear.

These features give the CM-310ASW exceptional gain before feedback. It permits extremely loud P.A. levels before feedback occurs. The mic also rejects unwanted background noise. The announcer can sit in the stands with the audience, with the P.A. speakers playing loudly, and not run into feedback.

Inside the mic handle, on the circuit board, is a dip switch that sets the frequency response. It has

two positions: music and announcing. The music position sounds warm and smooth, while the announcing position has less bass and more highs for extra intelligibility.

Designed for broadcasters, the Crown **CM-311HS** is a rugged head-worn microphone that mounts on a Sony MDR-7506 or MDR-V6 headphone. The mic rejects background noise extremely well, so it's well-suited for use in traffic-copters, sporting events, or car races.

The CM-311HS is the latest version of Crown's patented Differoid technology. Its a cardioid, so it rejects noise from behind the mic. And it's noise canceling, so it rejects ambient noise. Lightweight and comfortable, the mic adjusts to fit any user. Supplied with the microphone is a battery/phantom belt pack with a mute button.

The Crown **CM-312HS** is a rugged, lightweight head-worn microphone that mounts on a Sony MDR-7506 or MDR-V6 headphone. Some applications are radio and TV sports broadcasts, and radio studio announcing.

Because the microphone is to the side of the mouth, the mic looks inconspicuous and does not pick up breath pops. The sound of the CM-312HS can be tailored to taste by moving the microphone closer or farther from the corner of the mouth.

The CM-312HS sounds like the best handheld microphones. Its hyper-cardioid pickup pattern reduces feedback and aids isolation. In difficult situations, the Crown CM-311HS head-worn mic is recommended because it picks up even less feedback and leakage than the CM-312HS. The mic adjusts to fit any user. Supplied with the microphone is a battery/phantom belt pack with a mute button.

A SIMPLE MIC SPLITTER

When you record a pop-music concert, three mixers are in use: recording, PA, and monitor. So you need to split each mic's signal three ways to feed the three mixers.

One way is to use a transformer isolated splitter (Fig. 1). Each mic plugs into an XLR that goes to a 1:1 transformer. The splitter has three feeds: one direct and two isolated. Connected directly to the mic, the direct feed goes to the mixer that supplies phantom power.

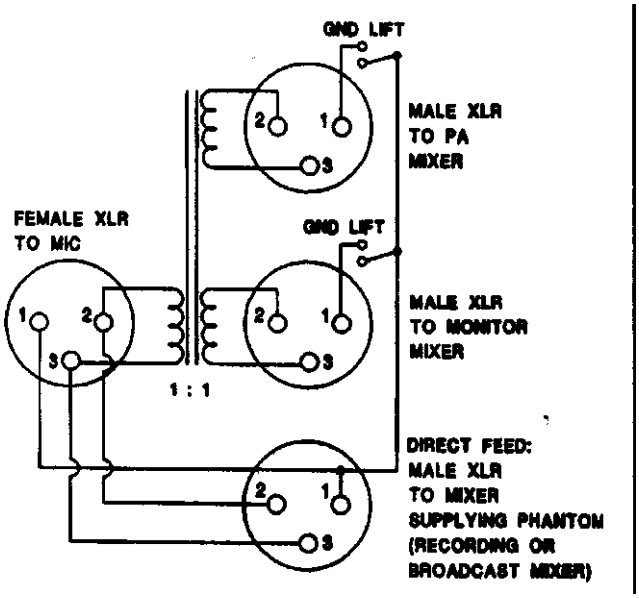


Fig. 1 Transformer-isolated splitter.

The two isolated feeds go to the other mixers. Since the transformer electrically isolates the three mixers, phantom power and RFI from one mixer can't get into the other mixers.

Unfortunately, good transformers cost a lot. You can make a splitter without transformers that works well. Simply Y or parallel the mic output into three mixer inputs. This works, but it creates some problems.

First, the three mixers load down the mic. The mic-input impedance of a typical mixer is 1500 ohms. The paralleled input impedance of three mixers would be only 500 ohms. This is too small a value for many mics. With this load, some condenser mics distort, and dynamics tend to lose some bass.

Another problem is that the Y connects the three mixer grounds together. This can create ground loops and hum.

Figure 2 shows a solution. The mic signal runs through two 270 ohm resistors before splitting. The resistors prevent the mic from loading down. Each mic sees about 1040 ohms, which is usually high enough to prevent distortion and tonal changes. With the resistors, the loss is only 3 dB compared to a 3-way Y splitter. Each mixer sees a source impedance of about 384 ohms, which is low enough to keep the noise down.

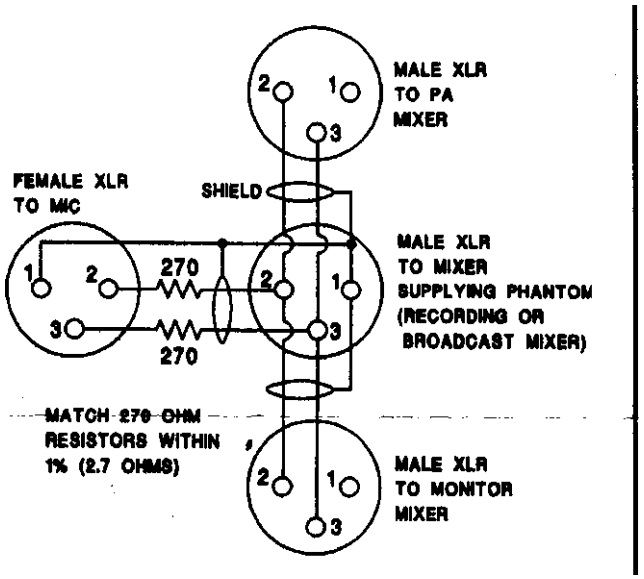


Fig. 2. Resistor-isolated splitter.

To prevent ground loops, only one feed is grounded to the mic-cable shield. This feed goes to the mixer that supplies phantom. The pin-1 ground on the other two mixer feeds is floating. Each mic cable leaving the splitter is grounded at its own mixer to drain away hum interference.

A drawback of the resistors is that they increase the high-frequency loss of the cables due to capacitive loading. But this loss may not be audible.

Don't ground the splitter chassis. Why? If someone plugs in a cable connector that has its shell tied to pin 1, the mic will be grounded through the splitter chassis to more than one mixer. You'll get a ground loop. Instead, use shielded mic cable inside the ungrounded chassis. Connect the shields as shown in Figure 3. Note that the shield is floating at two of the male XLRs to prevent ground loops.

The transformer-isolated splitter in Figure 2 has ground-lift switches that do the same thing. You can add these switches to the passive splitter if you need more flexibility.

Does the transformer isolation prevent the mic from loading down? Nope. Each transformer winding is 1:1, so the reflected impedance that appears at the primary is the input impedance of three mixers in parallel. The mic sees about 500 ohms. You still need to add the 270-ohm resistors to the transformer isolated splitter.

Another way to reduce loading is to use a step-down transformer. Although this loses a few dB of signal level, it raises the impedance seen by the mic.

MIKING A FLUTE WITH A HEADWORN MIC

At the January NAMM show, a flutist was looking for a way to mike his flute. He tried on a Crown CM-311 headworn mic. Then, by bending the wire that was behind his ear, he adjusted the boom to place the mic slightly above and in front of the lip plate (Fig. 3). (Some head sizes will preclude such a boom adjustment.) This flute pickup sounded so good, he bought the mic!

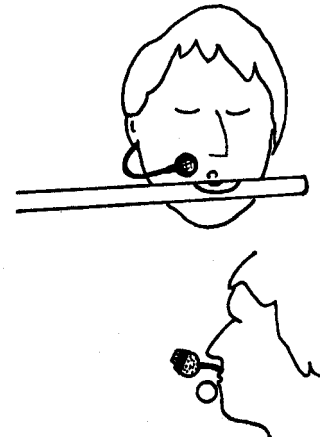


Fig. 3. Flute miking with a CM-311.

MIKING A KIOSK

Sound engineers at Disney World wanted to mount a mic in a videogame kiosk (booth) to pick up the voice of the player. The mic had to be hidden to prevent damage.

We suggested that they mount an LM-300A super-cardioid lectern mic inside a damped enclosure covered with perforated metal. Figure 4 (top) shows the response of the LM-300A in open air at 0 degrees, 90 degrees, and 125 degrees sound incidence. Figure 4 (bottom) is the same with the mic mounted in a 6" x 6" x 4-1/2" deep cardboard enclosure covered with a 1/16" thick perf-metal grille.

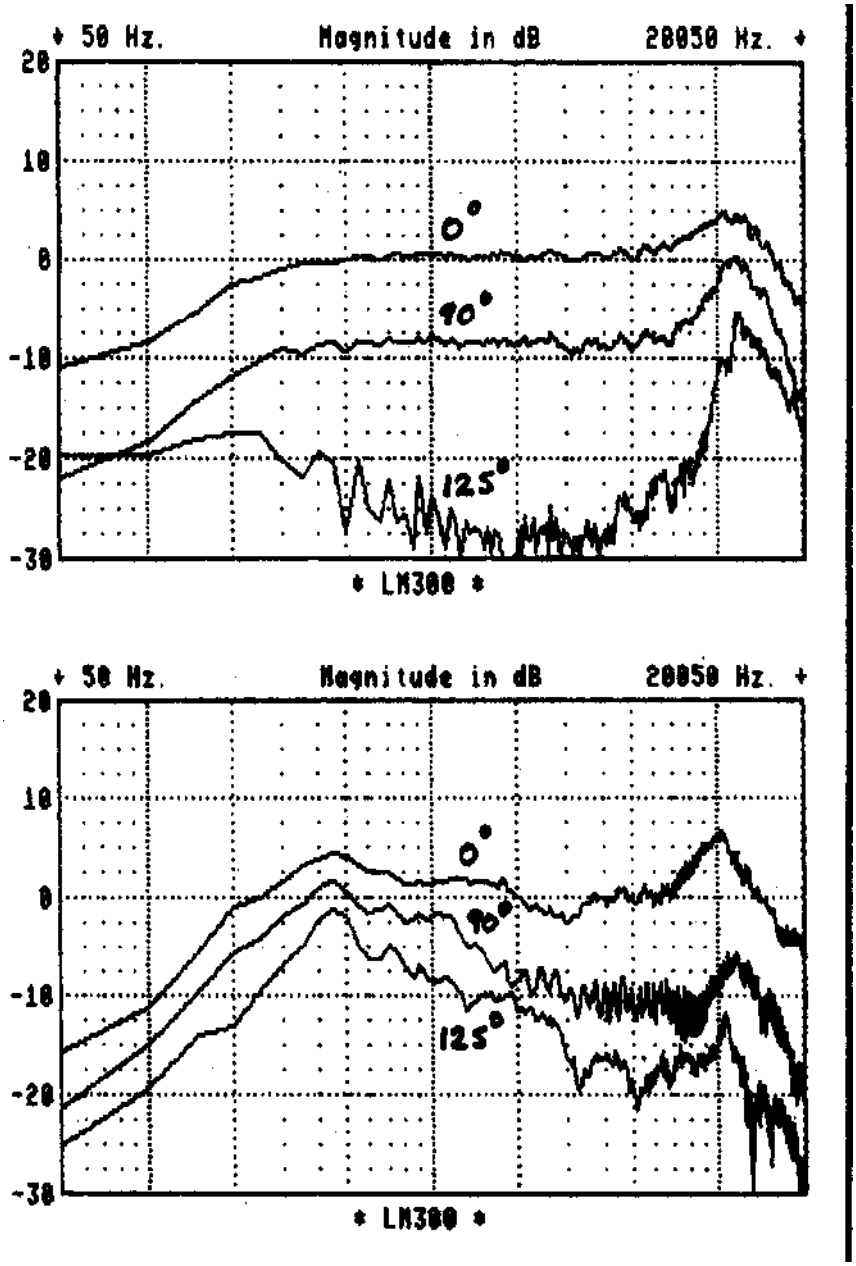


Fig. 4. Top: LM-300A in open space. Bottom: LM-300A in enclosure.

To reduce resonances, the enclosure is covered inside with 2" thick Sonex foam. The mic still retains much of its directionality inside the enclosure. Since the perf metal is at least 40% open, it is transparent to the incoming sound.

NOVEL PCC MIKING WORKS GREAT

Charles Mangano, a sound engineer in Frederick, Maryland, showed us a unique way to mike a theater stage with three PCCs. One mic is at the front edge of the stage in the center. It aims at a couch. On either side of the couch are two PCCs aiming left and right. “It worked like a charm,” said Charles. He reduced floor squeaks by putting a thin foam pad under each mic.

PCC LEVEL VS. ACTOR POSITION

Ever wonder how much the output level of a PCC varies when an actor moves around on stage? Figure 5 shows the mic's calculated output level for various actor positions. The level of an actor 10 feet in front of the mic is called "0 dB." The levels at other positions are referenced to that.

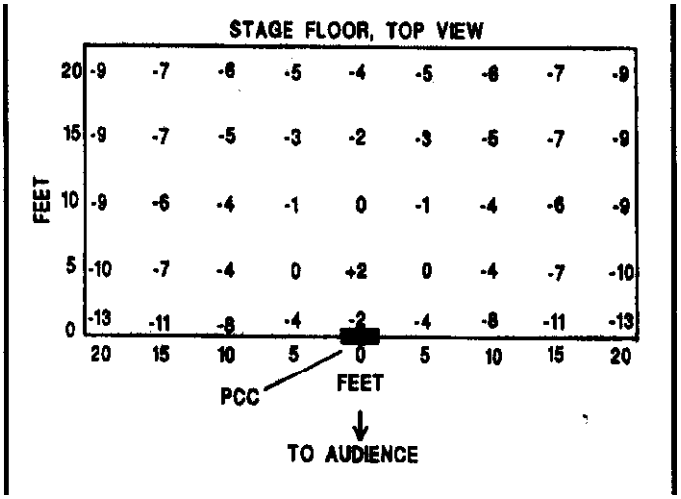


Fig. 5. Actor's level in dB vs. position as reproduced by a PCC-160.

The closer an actor is to the PCC, the higher is its output due to the inverse square law. However, the closer an actor is to the PCC, the more off-axis he or she is to the mic, so the output level tends to drop as the actor gets closer. The two effects partly cancel out, so the PCC's output level is fairly uniform no matter where the actor stands.

One mic can cover a stage 17.4 feet wide, because the level is 3 dB down at the edges of the stage. Two mics 20 feet apart can cover a stage 40 feet wide. If both mics are on, and an actor is midway between them, the actor's level goes up 3 dB.

SASS "AWESOME" ON DRUMS AND JAZZ TRIO

Ward Kremer, a recording engineer in Fort Lauderdale, has been using a SASS-P MKII stereo PZM on drum sets. He puts the SASS about 3 feet in front of the set, 5 1/2 feet high, and tilted down a little. Sometimes he adds a kick-drum mic. He boosts EQ a few dB around 10 kHz to bring out the cymbals.

The results? "I'm getting the best drum sound I've ever gotten," says Kremer. "People who have heard the tapes say, 'Man, what is that? That's the best drums I ever heard.' The left-to-right imaging is supreme. The stereo honesty gives it the 90's sound."

Kremer recorded a jazz-fusion trio in a long, narrow jazz coffeehouse. The SASS was 4 feet off the floor. According to Kremer, the tape needed no changes. "It's got class... an intimate yet mellow live sound."

"The band was very loud — 120 dB average level — but the recordings are so clean. Their dynamics are just awesome."

"Using the SASS is so much easier and better than multi-miking. For one thing, my $20,000 worth of vintage tube mics are not safe to take on location, but the SASS is rugged enough to take in a night club. It's affordable and really simple to operate."

LETTERS FROM CROWN MIC USERS

Violin miking with GLMs

Having just finished the Fall 1994 *Mic Memo*, I would like to offer my support for Darol Anger's recommendation regarding the GLM-100. For the past year I have been miking my strings in this fashion

with excellent results.

My use of the GLM-100 is for violins and violas in a live orchestra which varies from 26 to 30 instruments. As is too often the case, especially in churches, the brass and woodwind sections are much stronger than the string section. On several occasions I have had as few as two violins and one viola.

This orchestra plays in a wonderfully live sanctuary (acoustical consulting provided by my company, of course). The Minister of Music does not like to mike the orchestra at all. His concern (and I agree) is the unnatural localization of the sound when the strings are heard coming from the center cluster above the orchestra.

To overcome this problem, I plug the GLMs directly into an Anchor Audio model MPB-4500 portable speaker system. I locate the speaker at the feet of the first-chair violin player. She has been trained to adjust the volume as directed by the Minister of Music.

Although the GLM-100 is an omni, the body of the violin and viola shield the mic enough to allow sufficient sound pressure level prior to feedback to please the director. The result is a rich, warm sound, sufficient to balance with the brass and woodwinds, while still originating from the correct location within the orchestra.

Bob Adams

Hoover & Keith Inc.

Houston, TX

# # #

MIC MEMO

Summer 1995
Bruce Bartlett, Editor

SASS ON CD GIVES AUDIOPHILE SOUND

Epiphany Records engineer, Jeremy Kipnis, used a custom Crown SASS-P MKII exclusively to record two audiophile CDs. One is a recording of Beethoven works played on a fortepiano; the other is a baroque chamber trio (Fig. 1). Both are 24-bit digital recordings.

Fig. 1. Ephiphany EP-2.

The sound got rave reviews. As Robert Deutsch said in *Stereophile*, Nov. 1994, “This lovely recording features impeccable musicianship and exceptionally natural sound (EP-2, The Instrument of Kings.)”

According to Epiphany’s press release, “Epiphany Recordings brings the listener closer than ever before to the experience of a live concert... Epiphany’s unique recording system uses the most advanced technology available, including a single stereo microphone [Crown SASS-P MKII] created especially for Epiphany Recordings...”

The customized SASS has these special features:

*Mic capsules acoustically tuned for desired timbre.

*Bipolar battery power supply for each capsule.

*Point-to-point internal circuit wiring with silver solder.

*Cardas oxygen-free copper Litz wire.

*A metal film resistor and a hand-wound metal film capacitor are the only circuit components.

*Battery power supply not referenced to mic preamp.

*Independent shielding for each capsule, power supply and ground plane.

*SASS housing treated with vibration-absorbing putty.

*Mic stand filled with #25 lead shot and tuned to 7.48 Hz.

Epiphany describes the CDs:

Epiphany EP-1: *The Young Beethoven*. "Igor Kipnis performs the *Moonlight* and *Pathetique Sonatas* and other Beethoven works on his 1793 Graebner fortepiano, an instrument of the type the composer knew and played during his earlier years. Kipnis's interpretation is as stylistically and historically informed as one can find anywhere today."

Epiphany EP-2: *The Instrument of Kings*.

"Flutist John Solum, using two period instruments, performs baroque and classical sonatas by Handel, Domenico Scarlatti, Vinci, Telemann, C.P.E. and J.C. Bach, and Mozart with harpsichordist and fortepianist Igor Kipnis. Arthur Fiacco, cellist provides continuo [continuo is correct spelling] accompaniments in the baroque works."

We're proud that Jeremy chose the Crown SASS to make recordings for his audiophile label.

HOW TO ATTACH A GLM-200 TO A BOOM

Many mic users want to mount a GLM-200 mini hyper-cardioid mic over a drum set, or in front of a choir. Here's a low-tech method to attach the GLM-200 to a mic-stand boom:

1. Tape a GLM-SM Surface Mount to the end of the boom.

2. Cover the end of the boom with tape so the mic doesn't pick up boom resonances.

3. Insert the mic in the Surface Mount.

GLM VIOLIN MIKING

Fig. 2. GLM violin miking.

Fig. 3. GLM violin miking.

In the Spring ’95 issue of the *Mic Memo*, we told about miking violins with the GLM-100 mini omni mic. Bob Adams used this system for a live orchestra of 26 to 30 players. The amplified GLM signal plays through a speaker at the feet of the first-chair violinist.

Recently we received some photos from Bob that show the mic placement (Figs. 2 and 3). Note the GLM-TB Tie Bar, which clips the mic to the violin bridge.

DON’T GROUND XLR SHELLS

In the Winter ’95 issue of the *Mic Memo*, we printed a misleading statement in an article on reducing RFI:

“XLR connector shells do not shield against RFI unless they are grounded to pin 1. So connect pin 1 to the ground lug in the 3-pin XLR connector.”

This advice applies only to XLR connectors that never touch any external conductors. An example of such a connector is an XLR in a hanging cable (Fig. 4). You might use such a cable to hang a mic over a choir or an orchestra. Grounding the shell in a hanging cable is a last resort against RFI if other measures fail.

Fig. 4. XLR connectors in a hanging cable.

Generally, you should NOT ground the shell to pin 1. If you do, you can set up ground loops if the shell touches outlet boxes, wet grass, metal gridwork, and so on. There might even be a shock hazard.

Thanks to Ron Steinberg of RC Communications and John Landphere of Ancha Electronics for pointing out the error. Steinberg offers this advice:

In a mic cable, tie the shield only to pin 1 in each of its XLR connectors. Ground the mic cable only at its preamp input. Never connect the shell of XLR connectors to shield except within a microphone. Insulate from their mounting plate any connectors which use their shells as conductors for shield (for example, 3-circuit, 1/4" phone jacks and BNC connectors).

Many commercially available mic cables and adapters will need their wiring changed to float pin 1 from the shell.

Steinberg also recommends that PZMs be isolated from conduit ground, since the PZM plate is grounded via the cable shield.

John Lanphere has this to say: If the shell is grounded to pin 1, and you plug it into a mic jack with an isolated ground, you no longer have an isolated ground.

According to Lanphere, Gotham makes a cable with a double braided shield and an insulated ground wire. You tie the shield to pin 1, and tie the XLR connector ground lug to the insulated ground wire. That way the cable shell is grounded to prevent RFI, but it's not tied locally to the pin 1 ground.

Lanphere also says that Benchmark makes a very effective inline RFI filter. You can call Benchmark at 800-262-4675 to get a pamphlet on grounding.

REGIS & KATHIE LEE SHOW RELIES ON SASS STEREO MIC

The Regis & Kathie Lee Show, a popular daily talk show, features lively interaction between the studio audience and hosts Regis Philbin and Kathie Lee Gifford.

To accuately capture the audience response, the show's technical staff tried a number of different microphones and configurations before selecting the Crown SASS-P MKII. They discovered that a single SASS mic flown centrally above the audience in the show's 120-seat studio at WABC-TV, New York does the job — and does it quite well.

Incorporating Crown's PZM technology, the SASS-P MKII supplies excellent stereo imaging with two PZM mics mounted on a head-size boundary. The mic is also mono compatible.

"The SASS-P MKII has been able to provide the consistent levels and sound quality we were looking for," says Bill Beam, WABC-TV chief engineer. "The audience sounds full and bright, and we're able to capture their full reaction."

DIFFEROID HELPS INDY 500 BROADCAST

The radio broadcast of the annual Indianapolis 500 auto race is heard by millions of people throughout the world on more than 1,200 stations.

Four announcers — one at each speedway turn — deliver the latest action as race cars rush by at speeds exceeding 220 mph. Sound quality was always a problem until the announcers began using Crown CM-311 headworn microphones.

Featuring Differoid capsule technology, the CM-311 provides very high gain-before-feedback, and rejects unwanted background noise and leakage. Since the Indy 500 announcers began using Crown CM-311s, overall sound quality and vocal presence are greatly improved, as is noise rejection. Other Crown mics used at the speedway include a CM-310ASW Differoid for the track PA announcer, and a CM-230 tridundant mic.

"The bottom line is that we like the Crown approach to microphone design," says John Royer, chief engineer for the Speedway and radio network. "The company has a number of products that fit the bill for typical uses, while also meeting special needs and applications."

TIPS ON USING CROWN STAGE MICS

We recently posted the following PCC pointers on the Internet:

The PCC-160 floor mic is supercardioid, so it rejects feedback better than the PZM-30D, which is omni.

One PCC can cover a stage 17 feet wide, because the level is 3 dB down at the edges of the stage. Two mics 20 feet apart can cover a stage 40 feet wide. Commonly, three mics are used because much of the action is center stage.

Place the PCCs as close to the actors as possible without getting in their way. This has three benefits:

1. The mics receive a higher SPL, which increases gain before feedback.

2. The mics are farther behind the house speakers, which increases gain before feedback.

3. The mics are farther from the pit orchestra, so they pick up less orchestra.

If you still pick up too much pit orchestra, lay a foam pad on the floor about 1 inch behind the PCC. Try a 2-foot-square piece of foam or Sonex, about 3 inches thick. Do not put a plexiglass boundary behind the PCC because it will degrade the frequency response and polar pattern.

Use a 1/3-octave graphic equalizer to notch out frequencies that feed back. Here's a suggested procedure:

1. Turn up all the mics equally until the sound system just starts to ring or feed back.

2. Find the EQ knob that affects the feedback frequency, and push it down just to the point where feedback stops.

3. Turn up the mics a little more until they start to ring again, usually at a different frequency.

4. Find the EQ knob the affects that frequency, and push it down.

5. Repeat this process until you've notched out about five feedback frequencies, or until the system is loud enough without feedback.

After EQ'ing the system, turn up each fader slowly just to the point where feedback occurs. Mark that point with a piece of tape. Don't push the fader above that point. Also turn up all the faders equally and note the point of fader travel where feedback occurs. Mark that point with a piece of tape, and don't push the faders above that point.

The fewer mics that are on, the better. One mic has less feedback and clearer sound than two or more mics.

To prevent feedback during the performance, try to turn up only one mic at a time. Follow the action with the mixer faders, turning up only the mic closest to the person speaking. When more than one actor is speaking or singing, you may need to turn up two or three mics. It helps to follow a marked script.

If there are some scenes where you still can't hear the actors, you may need to put a mic close to them. Try a PZM on the set near the performer, hang a CM-31 nearby, or clip a wireless lavalier mic on the performer. Keep the mic's fader down until you need to use the mic.

SIMULATING A CAR INTERIOR

Philip Blair suggested this way to simulate a car interior for radio drama: "Tape a spaced pair of PZMs to the studio window. Hang a hard board, empty tape box, or Perspex sheet in front of each of the mics. The board is between the mics and the actors. You'll get a great car interior sound."

"I've also tried PZMs over drum kits. They work really well, and pick up lower frequencies than you'd expect. They are a bit bright and 'fizzy' but that was what I wanted on the day I used them."

COOL WAY TO MOUNT A GLM-100

David James is a hammer-dulcimer player who has won many musical contests. On stage, he plays dulcimer, guitar, mandolin, bouzouki, etc. and mikes them all with a Crown GLM-100 mini omni mic.

Rather than mounting several GLMs on all his instruments, David uses a single mic. He glued a small square of Velcro on the GLM, and another square on the cable to act as a strain relief (Fig. 5). Using double sided tape, he attached mating squares of Velcro to each instrument.

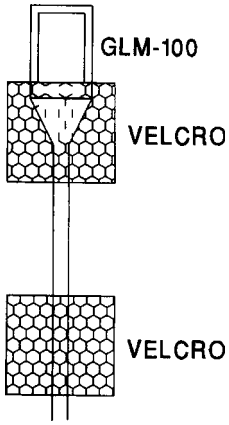


Fig. 5. Velcro squares on GLM-100.

When David plays guitar, he sticks the GLM on his guitar. Then he removes the mic and sticks it on his mandolin, and so on. When the mic is not in use, he attaches it to a music stand.

LETTERS FROM CROWN MIC USERS

PCC handles outdoor abuse

I am the new sound designer at Fort Harrod Drama Productions Inc. [We] have produced the outdoor drama *The Legend of Daniel Boone* for thirty years. Outdoor drama is very hard on mics. Every year they sit all summer through rain or shine on a sand stage in the open weather.

I would like to thank you for designing one of the best mics ever made: the Crown PCC-160. [We] never had the luxury of good sound reinforcement until we bought PCCs two or three years ago. They have excellent range and are, in my opinion, the ultimate boundary mic for the theatre.

Michael Rasbury

Sound Designer/Composer

Fort Harrod Drama Production, Inc.

Harrodsburg, Kentucky

# # #

MIC MEMO
Fall 1995
Bruce Bartlett, Editor

NEW CM-700 STUDIO MIC IS CROWN'S FINEST

CM-700

We're proud to announce our finest studio microphone: the Crown CM-700. It's a cardioid condenser mic for pro or semi-pro recording and sound reinforcement.

Rugged enough for the road, the CM-700 is well suited for acoustic instruments, drum overheads, and studio vocals. It works equally well for popular music (multi-miking) or classical music (stereo and spot miking). Small and inconspicuous, the CM-700 is also a good choice for miking a lectern.

The CM-700 has a very smooth, wide-range frequency response (30 Hz - 20 kHz) which gives it a natural sound. It preserves the delicate timbre of acoustic instruments, yet can reproduce all the power of a pipe organ. The off-axis response is smooth, so any leakage picked up has little colora-tion.

Because of its cardioid pickup pattern, the CM-700 reduces background noise, room reverb, and feedback. The cardioid pattern is uniform with frequency.

Self-noise is very low, permitting clean, noise-free recordings. The mic can handle very loud sounds without distortion. It is protected against static and RFI. The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Powering is by 12-48V phantom power.

Several audiophile touches enhance the mic's pristine sound quality: an ultra-light diaphragm, humbucking transformer, polycarbonate capacitors, and a gold-plated 3-pin connector.

The CM-700 has a bass-tilt switch with three positions: flat, low-cut, and rolloff. An included 3-stage foam pop filter softens breath pops, and a foam windscreen reduces wind noise outdoors.

TRY A PCC ON THE CEILING

To pick up a conference in which no mics are allowed on the table, you might try s PCC-160 on the ceiling. This setup is for recording rather than P.A. The people should be in front of the mic within 30 degrees from the front, as in Figure 1. Aim the “dead” rear of the mic at air-conditioning ducts.

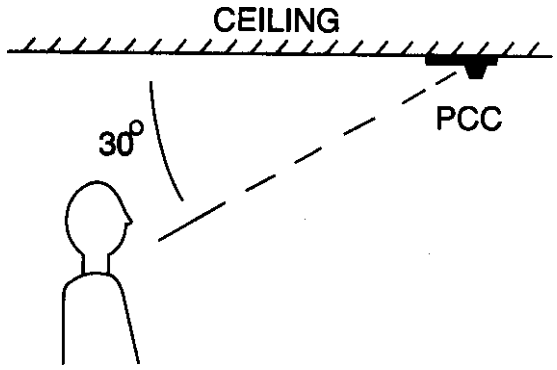


Fig.1. Miking a conference with a PCC-160 on the ceiling.

HOW TO PREVENT PLUG-IN POPS

A drummer told us he was using a Crown CM-311 headworn mic. He wanted to put on the mic in his dressing room, walk onstage wearing the mic, then plug it into a mic cable by his drum set. The mic cable supplied phantom power from the P.A.’s mixer. When the drummer plugged in the mic, there was a loud pop as phantom was applied suddenly. There was no mixer operator to mute the mic.

We suggested, “Build an in-line mute switch. When you walk onstage, close the switch to mute the mic channel, then plug in the mic, then open the switch. You’ll hear very little pop when you plug in the mic.”

How does the circuit work? See Fig. 2. When you close the switch, any pop signal between pins 2 and 3 is shorted out. This greatly reduces the pop. Also, the 0.1 uF capacitors partially short any pop signal that develops between pins 2 and 1, and between pins 3 and 1.

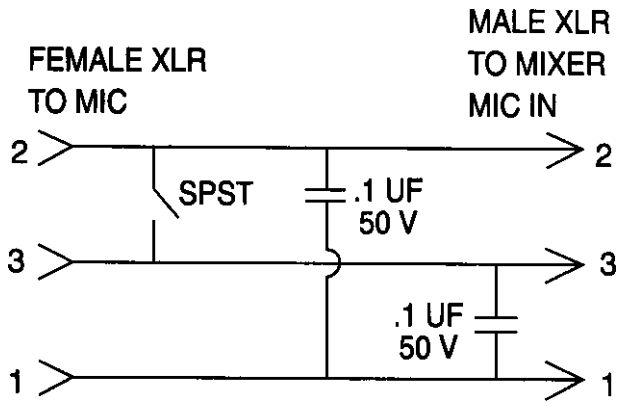


Fig. 2. Microphone mute switch.

PZM WEDGE MAKES BEAUTIFUL RECORDINGS

When National Public Radio (NPR) recently heard some new PZM recordings of choir and orchestra, they were impressed! They didn’t know that Crown mics could sound so good.

The recordings were done by John Coker, a recording engineer from San Antonio, Texas. He stopped by Crown one day to play us his recordings made with a PZM wedge.

They sounded so sweet and clear! You could hear every detail, such as triangle hits in a rapid roll, or snare wires buzzing on a snare drum. Cymbals were crisp yet very smooth. On the low end, the bass drum and tympani were clean. I liked the pinpoint stereo imaging and the wide sound stage.

Figure 3 shows John's typical PZM wedge assembly. He has made seven of these boundaries, each optimized for a different venue.

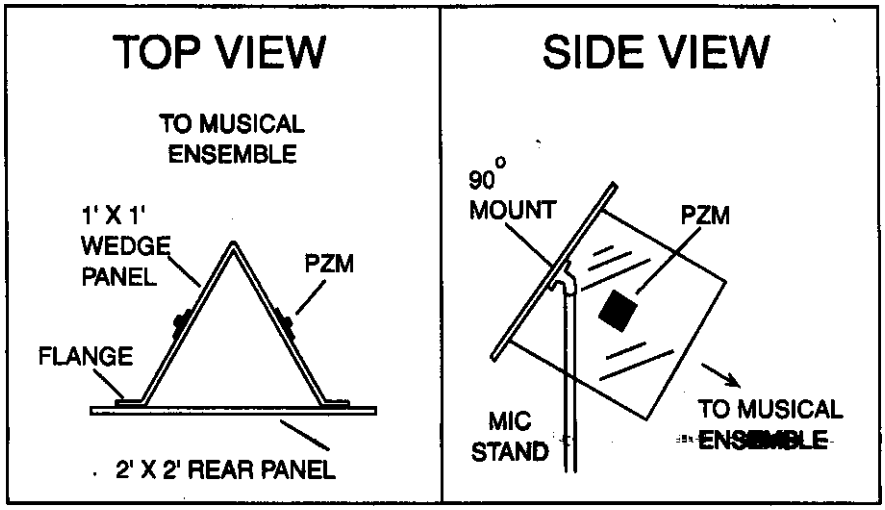


Fig. 3. A PZM wedge.

The V-shaped part is made of two plexiglass panels, each 1-foot square. Actually, they are a 2-foot x 1-foot piece bent to the desired angle. "If the angle between panels is too small," says John, "you hear all the instruments on the left and right, with nothing in the middle. A wedge angle between 58 and 72 degrees is optimum."

John mounts a PZM-6 or PZM-30D in the center of each panel.

At the back ends of the V are flanges that screw to a rear panel, which is 2-feet square. The rear panel blocks sound from the rear of the hall. On the inside of the rear panel is an Atlas 90-degree mount, used to mount the array to a mic stand.

Typically, John places the PZM array about 24 feet from a band or orchestra, 18 feet from a choir, and 11 to 14 feet from a small ensemble. The mics are raised 14 to 25 feet above the stage floor. John tries to place the mics at a spot where the distance to the rear of the ensemble is 1.7 times the distance to the front of the ensemble.

John says, "Often I EQ the PZMs -1 dB at 8K, -2 dB at 16K, and +1.5 dB at 20 to 40 Hz. But if the stage curtains dull the sound of the orchestra, I don't EQ the mic."

John had to convince NPR that his recordings were not multi-miked, and were not digitally enhanced. They had that kind of clarity. Often, just two PZMs are all you need to get presence and detail.

"With multi-miking," says John, "you can't get the blend that occurs naturally in the air. PZMs at a distance let you get that blend, but with the clarity of close miking. A recording made with conventional mics tends to lose ambience. It's 2-dimensional, not 3-dimensional as with PZMs."

NEW CM-10 OMNI LAVALIER IS EASY TO USE

CM-10

Crown has been selling the GLM-100 mini omni as a musical instrument mic, and also as a lavalier mic. When used as a lavalier, the GLM-100 can be tricky to aim because it is side-addressed.

So, we introduced the CM-10: a tiny cylindrical mic that's easy to aim. It's an omni condenser lavalier mic of professional quality. Although the CM-10 costs little, it has a smooth, wide-range frequency response.

The GLM-100 has a flat response for accurate reproduction of music. In contrast, the CM-10 has a response tailored just for lavalier use. The response rises at high frequencies to compensate for the mic being off-axis to the mouth, and rolls off below the voice range to cut out rumble from trucks and air conditioning.

The mic capsule and its cable are field replaceable.

Included with the mic is a rugged tie mount, which clips securely to the tie or shirt. The mount can be worn facing left or right for male or female announcers. When the user clips on the tie mount, the cable can be hidden under clothing. An optional dual clip is available from your dealer for redundant miking.

Two models are available:

CM-10: Supplied with a tubular power module, powered by phantom power.

CM-10/E: Supplied without a connector, for use with a wireless mic transmitter of your choice.

The CM-10 output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. RFI protection is included. The CM-10/E output is unbalanced, medium impedance.

Because of its ruggedness, ease of use and great sound at low cost ($149 list), we feel that the CM-10 represents an excellent value.

MICHIGAN HERITAGE CD DISPLAYS SASS MIC VIRTUES

Anne & Gary Wakenhut — two musicians known as the Collecting Consort — have recorded a new CD using only the Crown SASS-P MKII stereo mic. The CD, "Michigan Heritage'" is a live stereo recording of harp, dulcimer, flute, fiddle, string bass, whistles, and parlour organ.

The sound quality is natural. In my opinion, the overall tonal balance is just right — not too tinkly. Harp is full and deep. At normal listening levels, you hear little or no hiss.

There's a nice airy sense of space, distance and depth, thanks to the natural room reverb that was captured. The recording sounds like musicians in a room instead of a close-miked band with artificial reverb added.

The balances among instruments are carefully done, and the music, as always, is restful and very pleasant.

In setting up to record the CD, Gary Wakenhut applied acoustical foam to the ceiling in an 8' x 8' area over the instruments. Then he placed the SASS about 5 feet in front of the dulcimer and harp (Fig.4). The SASS was about 4 feet high, just below the top of the dulcimer. Higher placement picked up too much hammer sound.

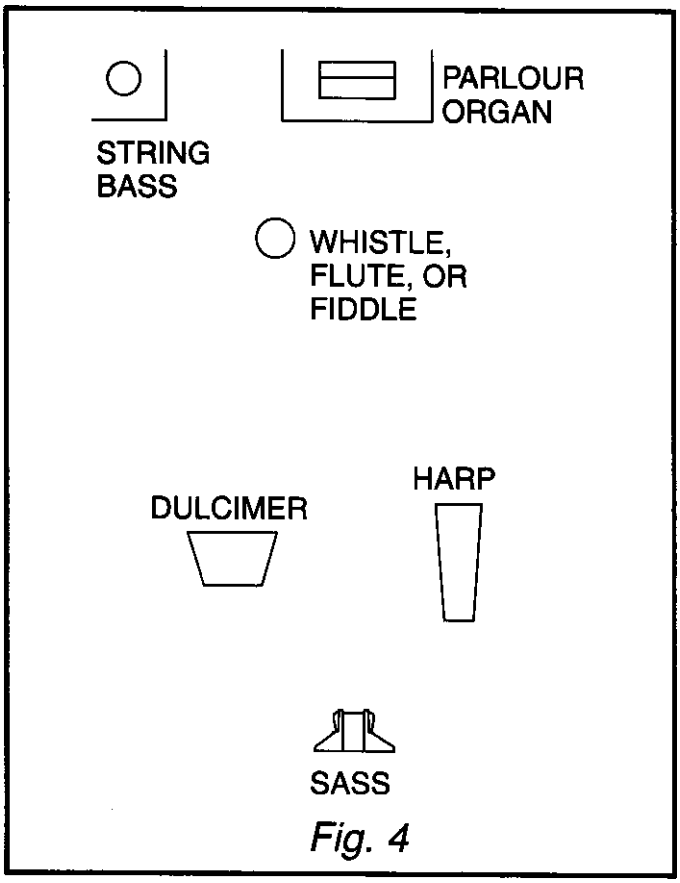


Fig. 4. Harp and dulcimer miking with a SASS.

At first, Anne and Gary pointed the harp directly at the mic. "However," Gary says, "as we walked around the instrument, we liked the sound radiating from the side of the instrument better... a better overall balance of the top and low end of the instrument. But facing the harp at the mic gave a fuller sound, so that's what we used."

"The combination of the [ceiling] foam and the increased miking didstance let us open up our playing. We could be more expressive, using more volume and dynamics. Also, mechanical sounds were less of a problem."

"We placed whistles, flute, and fiddle about 12 to 18 feet away. This gave good presence and helped balance these louder sounds with the quieter harp and dulcimer."

Even though the parlour organ was 20 feet away, it was too loud relative to the harp. "We stuffed all sound-resonating cavities of the beast with fiberglass batting. We surrounded the organ from floor to ceiling with 1" styrofoam insulation board. On top of this, we hung sleeping bags to further absorb the sound."

To isolate the string bass, Gary put it in a far corner, and covered it with styrofoam panels and sleeping bags.

“This recording really surprised our mastering engineer,” says Gary. “He liked the naturalness of the sound, and remarked that it needed far less reverb and EQ to obtain our desired sound than previous recordings.”

If you like slow, peaceful music, you’ll like “Michigan Heritage.” It’s available for $16.04 (CD), or $10.38 (cassette), plus $3.00 shipping from The Collecting Consort, 7363 W. Edgar Rd., Lakeview, MI 48850.

PZM-10 “INVISIBLE” MIC

PZM-10

Here’s a new mic that does a disappearing act. The Crown PZM-10 is a flush-mounted, Pressure Zone Microphone designed for security, surveillance, and conference-table use. Since the mic looks like a light switch, it is inconspicuous.

For many users, the PZM-10 is easier to install than the PZM-11, which mounts in an electrical box and has screw terminal connectors. The PZM-10 mounts in a hole in a ceiling panel or tabletop, and has an XLR-type connector for easy plug-in installation.

In the PZM-10, low frequencies below the voice range are rolled off to reduce pickup of air conditioning rumble. High frequencies are boosted to aid intelligibility. Because of its tailored repsonse and PZM construction, the PZM-10 will pick up conversations or other desired sounds with extra clarity and definition.

The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Powering is by 12 to 48V phantom power.

The mic’s humbucking transformer and steel case prevent hum pickup, even near fluorescent lights. Frequency response is 80 Hz to 20,000 Hz, and the polar pattern is hemispherical.

# # #

MIC MEMO

Winter 1996
Bruce Bartlett, Editor

THE PSYCHOLOGY OF MICROPHONES

Specs and sound are not the only criteria for judging microphones. The psychological effects of weight, size and shape are important, too.

According to Crown Mic Dept. manager Tom Lininger, “Musicians buy microphones by the pound.” That is, a heavy mic is more impressive than a lightweight one, regardless of specs. Light weight in a microphone suggests that it’s a cheap plastic mic.

The size of a microphone also contributes to its perceived value. A big mic connotes big bass. That's why recording engineers prefer to mike the kick drum with a big microphone. In general, large cardioid mics do have deeper bass than small cardioid mics. Surprisingly, though, many mini omni condenser mics — like a GLM-100 — have a flat response down to 20 Hz. The GLM-100 works great in a kick drum. But some people refuse to believe that a tiny mic can have any bass.

GLM-100

Vocalists seem to prefer side-addressed mics rather than end-addressed mics. A probe-shaped mic, which picks up from its end, looks like an accusing finger pointing at the singer. Many singers are not comfortable using such a mic. They prefer to sing into the side of a large microphone. This type of mic looks like it's listening to you. It's all ears! The mic is "accepting" rather than "probing."

Even David Letterman likes the look of a big, side-addressed mic on his desk — even though he's picked up by a lavalier.

Some vocalists like to "eat" the mic that they use on stage. In the studio, it's hard to keep them away from the recording mic. A common trick is to give the singer a dummy handheld mic to sing into. The mic used for the actual recording is placed several inches away.

It's easy to make people think that a mic is highly directional by putting a short shotgun tube on it. Such a mic has a tight pickup pattern only at high frequencies. The tube must be a few feet long to have a tight pattern down to low frequencies.

Before I knew much about mics, I thought that any mic with a ball-shaped grille must be omnidirectional. It's the design of the mic capsule that counts, not the shape of the grille.

Here's a more subtle psychological effect: Some people assume that any costly, name-brand mic should sound accurate without any EQ. But many mics sound bassy when used up close. It's the proximity effect of directional mics. Mic placement affects the sound drastically too. You don't just place a mic near an instrument and settle for what you hear. You fix it with EQ or change the mic placement until you like what you hear. The "sound" of a mic is the sound of its placement, too.

HOW TO COVER A LARGE CONFERENCE ROOM

A customer called Crown asking how to mike conferences for recording in a large library. The room is 30' wide by 50' long by 10' high. People are seated at tables in this room, and no mics are allowed on tables.

We suggested that he install eight Crown PZM-10 mics in the ceiling, 10 feet apart and 10 feet from the walls (Fig. 1). This array gives even coverage of the floor area. Feed the mics into an automatic (gated) mixer so that only one mic is on at a time.

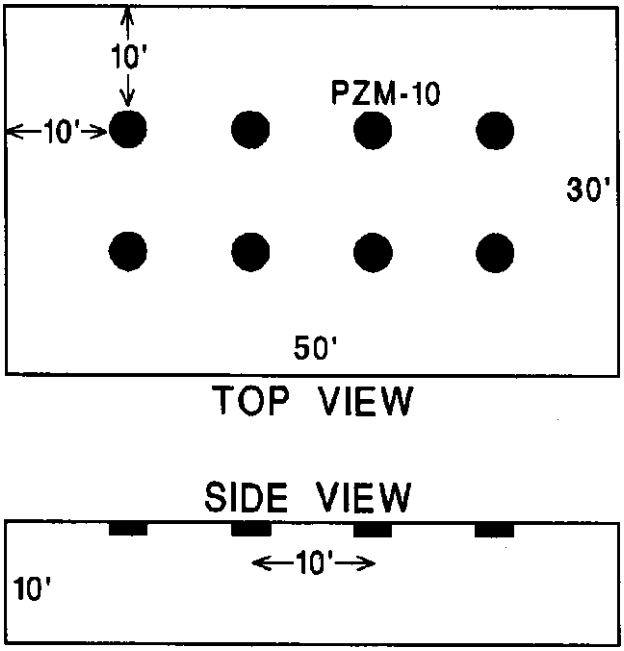


Fig. 1. PZM-10 ceiling miking.

GLM VIOLIN MIKING

You might want to try this miking position for a GLM-100 mini omni: Tape the cable to the tailpiece so that the mic is between the tailpiece and bridge.

This spot on the violin radiates all the frequencies that the violin produces. It sounds wonderfully natural.

CM-310a AS A GUITAR MIC

Sound engineer Randy Glanders reports that the CM-310a Differoid worked great on the acoustic guitar in a bluegrass group. Randy put the mic about 8" from the sound hole.

Randy says, “It sounded natural and had plenty of gain before feedback.”

40 SWITCHABLE MICS INTO ONE INPUT

Design engineer Brad Holman wanted to switch 40 PCC-160 mics on and off, and feed them all into a single mic input in a Bogen PA amplifier. Since only one mic preamp was used, the cost of the system was very little. Holman describes the system:

“We have a convention hall with 40 PCC microphones mounted on 4' x 4' boards suspended from the ceiling. They are spread throughout the hall, and 20 loudspeakers are interspersed among them. We built a switch box that will enable only one microphone at a time, and turn off the speakers (controlled by relays) that would create feedback to the active mic. My part was to design and manufacture the computer circuit that controls it all.”

“We eliminated the pop of switching from one mic to another by having the CPU (Motorola 68HC11) inhibit the input to the Bogen PA amplifier that our switch matrix is feeding.” In other words, the Bogen mic input is muted before the mics are switched, so no switching pops are heard.

Here’s how the switching circuit works. Each mic feeds an inexpensive 1:2 step-up transformer, which increases the signal level feeding the Bogen. A DC voltage (18V) is applied to the center tap of each transformer to supply phantom power to each mic.

The secondaries of all the transformers are wired to a bus connected to the Bogen mic input (Fig. 2). Normally, all but one relay switch is open, so only one mic feeds the Bogen. Although 40 mics are across the bus, they don't load each other down because their in-line relays are open. The computer closes the relay switch for the active mic.

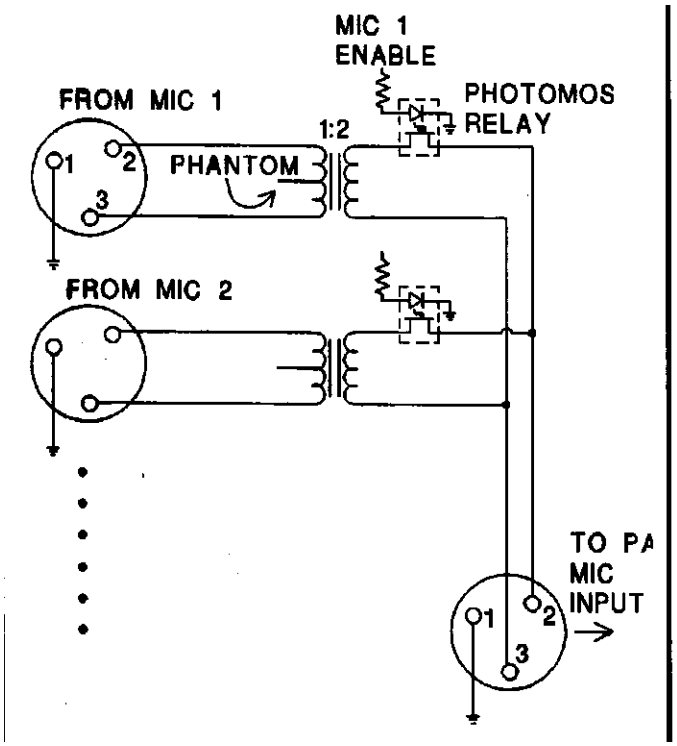


Fig. 2. Mic combining circuit.

Originally, Holman had a 10 kilohm software-controlled pot in series with each mic to control the mic's volume. But these pots added a lot of noise. He removed them. Also, each mic's input transformer was wired 2:1 instead of 1:2. Reversing the transformers boosted the signal level 12 dB.

According to Holman, "The system is operating great. We have virtually no noticeable noise, and excellent S/N ratio."

REDUCING BREATH AND CABLE NOISE IN THE CM-10

Suppose you are miking someone with a Crown CM-10 lavalier mic, and you hear breath pops — even with the supplied windscreen. Try turning the mic upside down in its holder to reduce breath pops. This orientation rolls off the highs slightly: 1 dB at 5 kHz and 1.5 dB at 10 kHz. If feedback is not a problem, you can get the highs back by using EQ. Thanks to Mark Chapman, Crown tech support, for this tip.

What if you hear cable noise whenever the person moves? Tie a fairly tight knot in the mic cable near the mic. The knot's mass will act as a filter to stop cable noise from reaching the mic. Another tip: Tape the cable to clothing so the cable can't slide.

RECORDING A BIG BAND WITH GLMs

The normal use for a Crown GLM-100 mini omni mic is clipped onto a musical instrument. But you can use GLMs for distant miking if the sound source is loud enough to override the mic noise.

Such is the case when you mike a big-band jazz group. Try two or three spaced GLMs about 8 feet in front of the ensemble.

If the band has a singer who uses a handheld mic, you might rubber-band a GLM-100 to the mic grille, and record the GLM's signal. Mix it with the distant GLMs.

NOVEL CHOIR MIKING FOR PA

John Coker of San Antonio, Texas devised some PZM corner boundaries for PA use in a theater (Fig. 3). He hung three of these boundaries upstage and three downstage, 8-1/2' to 10' high.

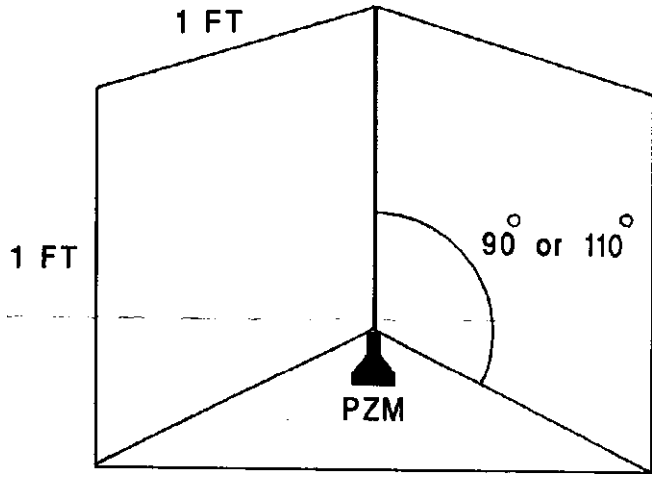


Fig. 3. Coker's choir miking technique.

John says, "Compared to conventional cardioid mics, I get a better blend of the choir on stage." He also gets more gain than with cardioids, but he says that "You still need some good EQ."

"The PZMs seem to have a slower fall-off in level with distance than cardioids do," reports John.

SASS FEATURED IN SONGWRITER CD

The Crown SASS-P MKII stereo mic helped create a beautful, realistic sound on the compact disc, "Love Keep Us Together." The CD is a live concert of some very original singer/songwriters. It was the the Third Annual Singer/Songwriters' Retreat at the Wintertide Coffeehouse in Martha's Vineyard.

Adam Blackburn, a recording engineer for Blackburn Digital, had this to say about the recording:

"The Crown SASS-P MKII was used primarily to provide accurate stereo imaging and three-dimensional depth to the recording, in addition to capturing audience reaction and the ambient house mix. The SASS was attached to a standard short mic boom and hung from lighting pipes, about 7' above and 5' into the house from stage center, above the front row of audience seating. Close mics accounted for about 60% of the stereo mix."

One song was recorded with the SASS alone. "In my opinion," said Blackburn, "this recording is one of the best on the record because of its realism, both in terms of the precise reproduction of the sound stage and re-creation of the heady, intimate, late-night atmosphere."

If you'd like to hear this very entertaining CD, you can order it by phone at 508-693-8830.

SASS RECORDS EFFECTS FOR "CONGO," "TRUE LIES"

Much of the impact of current motion pictures comes from the sound track. And a major part of the sound track is the sound effects. In the recent movie, "Congo," Wylie Statement of Sound Deluxe, Hollywood, used the Crown SASS-P MKII stereo mic to record all the jungle sounds.

And in the Arnold Swarzenegger movie, "True Lies," all the sound effects — gunfire, crashes, jets — were done with the SASS.

Currently, the BBC employs the SASS to pick up tennis matches in stereo.

Thanks to SASS inventor Michael Billingsley for this information.

LETTERS FROM CROWN MICROPHONE USERS

I produce a live dance show on radio at a Chicago night club. We operate in an ambient SPL of 100 dB. Using a CM-310a on a wireless belt pack, the talent can wander the house — amid, beneath, and in front of live speakers with limited feedback problems. Interviewing mic-shy artists and guests is a snap.

D. Peter Maus, Maus Productions, Chicago, IN

# # #

MIC MEMO

Spring 1996
Bruce Bartlett, Editor

PZM ON CHEST MAKES GREAT DRUM DEMOS

Home recordists like to use drum machines because they produce a good sound without much effort. And they don't tie up a lot of tracks. Problem is, drum machines tend to sound stiff and mechanical, so listeners are tiring of them. You don't get the feel you have with acoustic drums.

Pro drummer Rick Shlosser has the perfect solution: Use a real drummer, and record the kit with a PZM on the drummer's chest (Fig. 1). Put another mic in the kick drum.

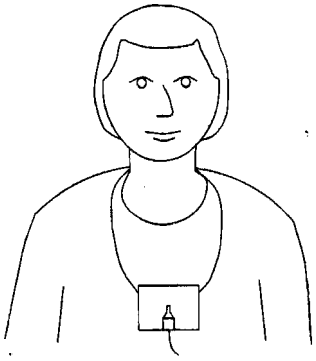


Fig. 1. PZM on chest.

"I was ecstatic when I tried it," says Rick. "The PZM picks up everything: snare, toms, and cymbals."

Rick has played with such luminaries as Rod Stewart, James Taylor, George Benson, Juice Newton, Bonnie Raitt, Linda Ronstadt, Jackson Browne, and many more. He knows what he's talking about when he says "The PZM sounds great."

"Many small studios can't handle the expense and the acoustics of multimiking a drum set," Rick says. "A single PZM provides an easy, low-cost way to get a killer drum sound. Your drums sound best where you're sitting, so it makes sense to put the mic there. If you have a drummer with good dynamics, you don't need an engineer to get a good balance."

Rick is trying to get real drummers back in vogue in the studio. A PZM makes it technically easy to do that.

Because of the limited size of the chest "boundary," the low frequencies are a little weak. You might want to boost the lows on your mixer's EQ about +6 dB around 80 Hz.

Probably the best PZM choice for chest miking would be a PZM-6D. On the back of its plate, you could gaffer-tape a shoelace which you hang around your neck. If it's a permanent setup, you could drill some holes in the plate and tie on the shoelace. Also tie a big loop of elastic onto the plate, and stretch the loop around your chest.

Another mic that sounds super on a drum set is the GLM-100 mini omni mic. You can mount it with the GLM-UM Universal Mount, which is supplied with the GLM. Clip the GLM-UM to the rim of the

snare drum, on the side nearest the center of the set. Put the GLM about 4" above the snare drum (Fig. 2). Another mic goes in the kick. With a little bass and treble boost on the GLM, the sound can be surprisingly good for demos.

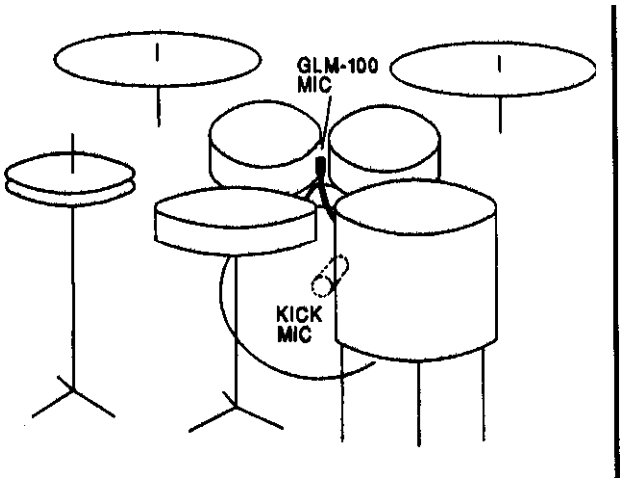


Fig. 2. Miking a drum set with a GLM-100.

Here's a stereo technique that uses two CM-700 cardioid mics. Place one mic about 1 foot to the left of the drummer's left ear. Place the other about 1 foot to the right of the right ear. Aim them at the drum set (Fig. 3). The mics will pick up the set in stereo, very much as the drummer hears it. Boost at little at 60 Hz and 4 kHz to compensate for the Fletcher-Munson effect. Mix these two mics with another one in the kick.

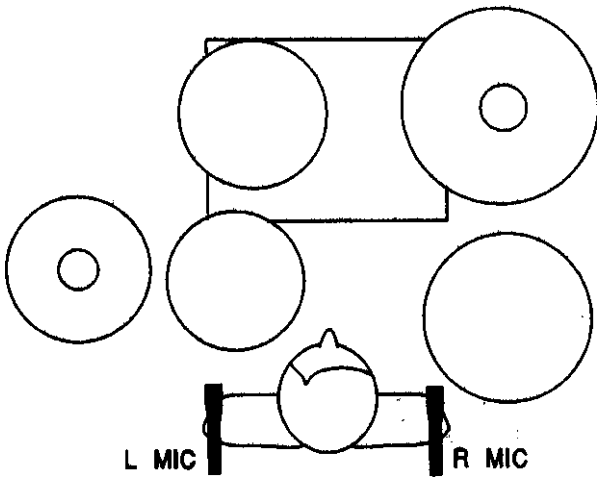


Fig. 3. Miking a drum set with two CM-700's.

WHITE WINDSCREEN FOR CHOIR MICS

Crown recently added a white windscreen for the CM-30W and CM-31W, model WS5W. It is packaged with the product at no additional cost. You can order it separately from your Crown dealer.

CROWN ONLINE

Be sure to check out the new Crown Web site on the Internet. It's full of pictures and info on Crown mics, amps, IQ systems, broadcast systems, and TEF. Point your web browser to http://www.crownintl.com.

Crown is also offering Fax On Demand (Fast Fax system). It's a database of information you can have faxed to you. There are data sheets, price lists, articles on mic techniques, and much more.

To access Crown's Fax On Demand, call 1-800-294-4094. Follow the voice prompts to get a document index, then order the documents you're interested in. Enter your FAX number, and you'll receive the documents instantly.

Have an interesting application for Crown mics? You can send it by email to the Mic Memo editor, Bruce Bartlett. My email address at Crown is bbartlett@crownintl.com. Hope to hear from you!

CEILING MIC PRECAUTIONS

When you mic a group of people from the ceiling, the sound pickup tends to be noisy and muddy. That's because the mics are relatively far from the people talking. As a result, the mics pick up a lot of background noise and room reverberation. If possible, place the mics closer to the talkers, ideally on a table. Also try to deaden the room acoustics with curtains, carpet, and acoustic tile ceiling.

Thanks to Mike Pettersen of Shure Brothers for this tip.

MIKING AUDIENCE REACTION

Cheers, claps, singing, laughs, applause — that's what makes a recording sound "live." So be sure to pick up the audience reaction when you record a concert, game show or church service. Hearing the audience greatly enhances the feeling of being there at the live event.

How do you mike an audience? Basically, you want the mics to pick up only the audience, not the musicians or the PA. So you use directional mics, and aim their "dead" rear at the stage. A good choice is condenser mics with a flat response and low noise.

To cover an audience, it seems reasonable to use PZMs on the ceiling. This is not recommended. The mics will pick up too much noise from ceiling fans, air conditioning, and building vibration. Also, do not put the mics on each side wall. If you do, the stereo spread will be ping-pong, and the mics will pick up the PA speakers.

Probably the best spot for PZMs is on the front face of the stage — the surface that faces the audience (Fig. 4). Tape a pair of PZMs there about 3 feet apart. Since the mics are in the "sound shadow" of the stage, they won't pick up much sound from the musicians or monitor speakers. When mounted on the stage front, the mics become directional with their axes aiming at the audience. Run some mic cables from the mics into your stage box.

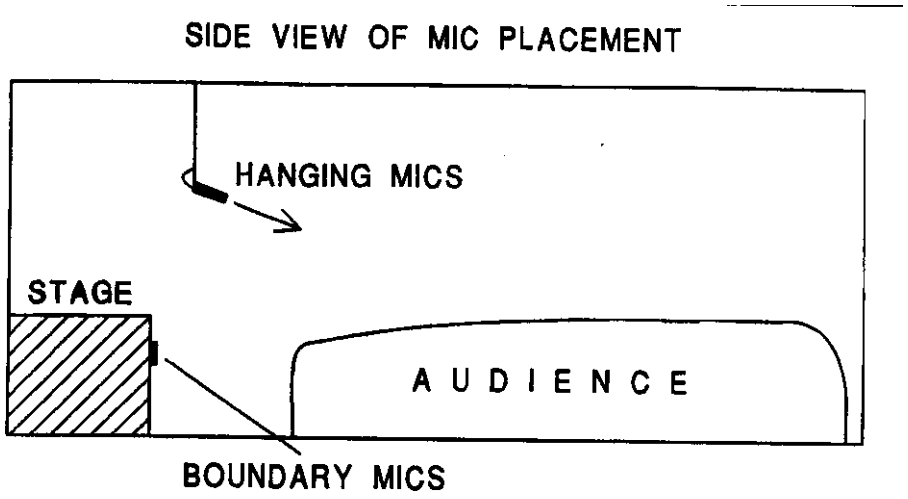


Fig. 4. Audience miking.

Another method uses a SASS stereo mic (or a pair of CM-700 cardioids) on a tall stand, or hung from the ceiling. Place the mics in front of, above, and aiming back toward the faces of the audience (Fig. 4). Voice articulation is best with the mics in front of the people's mouths. If you mic the audience from overhead or behind them, you lose speech clarity. That's because high frequencies radiate in front of the mouth.

Don't put the audience mics far from the stage, because their signal will be delayed by sound's travel time. When you mix in the audience mics, you will hear an echo.

How much delay will there be? Sound travels 1130 feet per second. So if the audience mics are 100 feet from the stage, they will pick up the PA with an 88 msec delay. (Delay = distance/1130). You could delay the stage mix by 88 msec (or whatever) to coincide with the arrival time of sound at the audience mics.

Spaced mics give a desirable spacious feeling to audience reaction because of the random phase between channels. Another advantage of spaced mics: The mic stands are left and right of center, which looks less distracting than a single stand in the middle.

To reduce pickup of air conditioning rumble and bass from the PA, roll off the lows below 100 Hz, or use a 100 Hz highpass filter.

Of course, do not feed the audience mics through the PA speakers or you will get feedback. If the audience mics are run into the PA mixer, be sure to un-assign them from the PA mixer main outputs. Send their signals (by direct-out jacks) only to your recording mixer. Better yet, plug the audience mics directly into your recording mixer.

What if you are recording multitrack, but you do not have enough tracks for the audience mics? Since audience reaction is so important, you must find a way to record it. Here are a few suggestions:

*Send the audience mics to two tracks that are also used for instruments. For example, assign the audience mics to a guitar track and keyboard track. While listening to a well-balanced stereo monitor mix, bring up the audience-mic faders just a little, and only when you need them.

*Record the audience reaction on a separate DAT recorder. During mixdown, sync the DAT roughly by ear with the multitrack. Mix in the DAT's recorded applause only after each song.

*Another method uses a Digital Audio Workstation (DAW). One form of DAW is a computer with a sound card, running a multitrack digital-audio editing program. Use a program that lets you move the tracks in time relative to each other. Record the music mix onto two DAW tracks. Then record the audience (from the DAT recording) onto two more DAW tracks, roughly in sync. Slide the audience tracks in time so they sync exactly with the music tracks.

WIRING A CM-312/E FOR 2-WIRE POWER

The CM-312/E is a headworn mic that you use with a wireless mic transmitter. Normally the mic requires B+, audio and ground inputs on the transmitter. But you can wire the CM-312/E to work with transmitters that have only a hot and ground connection, such as the Sennheiser SK 2012.

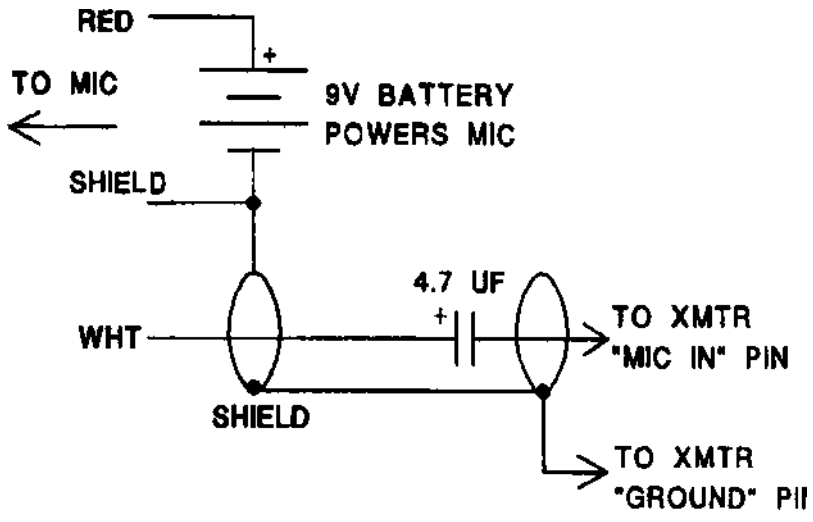


Fig. 5. Wiring schematic.

Figure 5 shows how. Get a 9-volt battery, battery clip and 4.7 microfarad capacitor. Tape them to the outside of the transmitter and wire the mic as shown.

NEW TRANSMITTER WIRING GUIDE

Do you want to connect a Crown mic to a wireless transmitter? Our latest Tech Bulletin #3 tells how. It's titled "Connections for Wireless Microphone Applications."

To tell if you have the latest version, look at the bottom-right area of the cover. The date of the latest version is 12/95. It has updated info on several wireless mic transmitters, including Micron.

A typo crept into this bulletin. The correct TA4F wiring for a Telex WT-55 is Pin 3 red, not Pin 4 red. Also, you can connect the CM-312/E mic to the WT-55 without any modification to the transmitter.

SWEET CM-700 REVIEW

In "Sweet Notes," a newsletter from pro audio dealer Sweetwater Sound, was a brief review of the new Crown CM-700. It's a cardioid condenser mic for stage or studio. Jim Miller had this to say:

"I just received a Crown CM-700 microphone for evaluation and frankly, after trying it out, I couldn't believe that this mic actually carries a list price of just $289! It's a versatile performer that really stands up to the high sound pressure levels produced when close-miking a drum, yet it's still detailed enough for miking acoustic instruments or even vocal work. If you need an extra quality mic in your studio (and who doesn't?), this might be the perfect choice."

NEW LOW-COST SASS

For $625, Crown is offering the SASS-P MKII HC, which is a SASS-P MKII without the carrying case. A windscreen is packed with the mic. The carrying case, hand grip and thread adapter are not included, but can be purchased separately as accessories.

The original SASS-P MKII (with all accessories included) is still available for $950 suggested retail.

LETTERS FROM CROWN MIC USERS

CM-311 tip

I'm a lead vocalist, keyboardist, and live sound engineer all at the same time. My CM-311 makes all this possible — and sounds awesome too! To back off the mic's volume during loud vocal passages, I

push the mic further away, down my chin, with my bottom lip!

Dean Bohana, Acme Music Co., Miller Place, NY

Hello from Ken Wahrenbrock

We received the following letter from Ken Wahrenbrock, who developed the first commercial PZM. He also was the first editor of the *PZM Memo*, which now is the Mic Memo. Good to hear from you, Ken!

We appreciate getting the Mic Memo, and note with interest the many ways mics are used.

The last issue [Winter 1996] brought back some old memories. I pulled out Vol. VI, No. 2, which relates the development of the multiboundary PZM. It has several pictures.

I'm glad there are still some explorers out there in mic technology and use. PZMs can provide a lot of sound.

Ken Wahrenbrock, Downey, CA 90242

# # #

MIC MEMO

Summer 1996

Bruce Bartlett, Editor

RAVE REVIEWS FOR THE CM-700

CM-700

After listening to some tapes made with the Crown CM-700 cardioid condenser mic, recording engineer Richard Shomin had these comments:

“The Crowns [CM-700’s] sound excellent. The 700’s produce a good drum percussive push on headphones, smooth and realistic. All instrument and voice sounds are clean and natural, no exaggerations, low distortion. Excellent fiddle, percussion edges, natural percussive sounds, good balanced bass. Some of the cleanest sounds yet. Those CM-700’s are a good buy!”

Richard Shomin, recording engineer, Cornell, Michigan

“A fine, fine mic for the price. Heck, twice the price!... I’m recommending that my recording school buy four to six CM-700’s because they’re the best mic for the buck right now.”

Christopher Goosman, House Engineer at Solid Sound, Ann Arbor, Michigan

Instructor in Audio Recording Technology at Washtenaw Community College

“I’ve heard several singers and two sax players on the CM-700. The saxes sounded really natural, like you didn’t have a mic in front of ‘em! There were regulars in the audience asking about the mic.”

Ward Kremer, Recording Engineer, Fort Lauderdale, Florida

“Here’s a new contender many engineers may find hard to pass up... The CM-700 is a robust little unit, built with the ruggedness for which Crown is famous...

“We used the CM-700 on the hi-hat. The microphone proved perfectly suited for the task. Its relatively small size made it easy to position, and left plenty of clearance for the cymbal directly above the hats. With the bass-tilt switch set at maximum rolloff, the mic delivered a bright, crisp sound. We are confident that the CM-700 would perform equally well as an overhead drum mic.

“On the cello, the sound was warm and full yet brilliant at the top... We were really pleased with the response and dynamic range of the CM-700 in this setting, and we wouldn’t hesitate to use it on any number of acoustic stringed instruments including guitar and mandolin...

“[In stereo miking a group of Japanese taiko drummers], the CM-700 performed beautifully... Thanks to the excellent rejection characteristics of the CM-700’s cardioid pattern, we had enough gain before feedback to pump it up in the room. The CM-700 would definitely perform well as a choir mic...

“The CM-700 is a superb, extremely versatile mic, sensitive enough for capturing acoustic performances, yet rugged enough to handle the SPLs delivered by a drum kit or powerful vocalist. It is an extremely flat and quiet microphone with very low off-axis coloration...

“The CM-700 would be a wise choice — especially when you consider that many of its competitors will cost you twice the money, if not more.”

Lori Bolender and Mike Cutter, Electronic Musician

CM-10 MIKING ADVICE

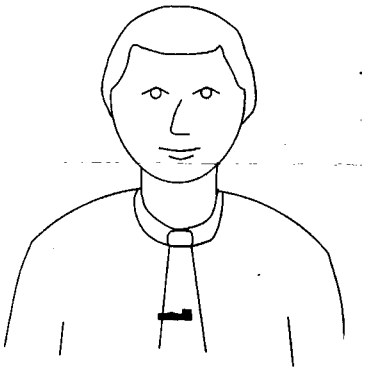


Fig. 1. CM-10 in use.

We've gathered some tips about using the Crown CM-10 lavalier mic in stage, film and video applications.

*To reduce clothing noise, spray the fabric with Static-Guard before putting on the mic.

*Using a vinyl-covered paper clip, build a small cage around the mic so that fabric doesn't rub on the mic.

*Ask the wardrobe department whether they can tailor an actor's costume to hide the mic. To avoid a muffled sound, use clothing made of cotton or fine-weave wool.

*Tape the mic to the chest using Microporous adhesive tape.

*Disguise the mic in a pen cover and put it in the shirt pocket.

*Using bobby pins, put the mic in the hair, poking out under a wig, or just above and behind the ear.

*Hide the mic in the collar.

USER REPORTS ON THE CM-311 HEADWORN MIC

Fig. 2. CM-311

Here are some unsolicited comments from the Internet on our CM-311 headworn mic:

"Take the time to adjust the headband so that the mic capsule is VERY close to the lips. Great rejection of outside sounds. I've used it with some very loud drummers and it works like a charm."

Lee Brenkman, Brenkman Audio Services

"Try the Crown headset mic (the Garth Brooks mic). They sound crystal clear, and a lot better than a 58! Also, they do not become snare/hi hat mics like the AT, or sound like a can like the AKG or Shures."

Mike Cohn, Guerilla Audio

HOW SHOULD I MIKE THIS CHOIR?

We received the following letter from Nelson Cox, a sound engineer for his church:

"We want to install mics for the choir, primarily for recording the service. The choir consists of 35 to 40 people in three rows, grouped mainly on the right because of the protrusion of the baptistry on the left. Pipe organ and loudspeaker system are behind the screen, above the heads of the choir. RFI is a consideration.

“The ceiling is too high to hang the mics. I’d prefer to string a horizontal wire over the choir and hang the mics from that.

“Considering the shape of the choir loft and the placement of the loudspeaker system and organ in relation to the choir, what is the best way to mic the choir?”

Our reply:

Try the Crown CM-31 hanging mics. To prevent picking up the loudspeaker system with the choir mics, I suggest that you mike only the right half of the choir. That way, you can aim the mics away from the loudspeaker. Angle each choir mic to the right slightly so that the loudspeaker is 125 degrees off-axis to each mic (see Fig. 3). That’s the null, or the angle of most rejection, of each supercardioid mic.

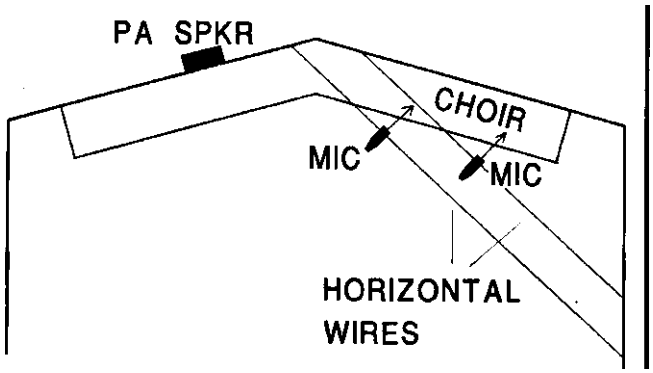


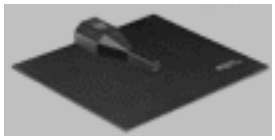
Fig. 3. Choir miking.

Use two mics. Position them so they divide the right half of the choir in thirds. You’ll need two horizontal wires, one for each mic.

Hang the mics about 3 feet above the head height of the back row of singers, and 3 feet in front of the front row of singers. This is closer than mics are normally placed for recording, but you’re trying to reject the loudspeakers. You may want to add artificial reverb to the choir mics. Excellent digital reverbs are available for under $200.

You might want to put a dummy mic on the left half of the choir so they don’t feel left out. :) Or put a Crown CM-200A cardioid mic on a mic stand near the left half for solos. The soloist should stand about 1 foot from the mic. Good luck!

USER TIPS ON PZM-30D, GLM-100



PZM-30D

On the Internet, Bob Berta had this to say about the Crown PZM-30D Pressure Zone mics:

“These are incredible mics that are excellent for [recording sound effects]. I use them for recording pipe organ, orchestras, bands, quartets, and solo musicians. They don’t mount on a mic stand... instead they sit on the floor, taped to a wall, or to a 2’x 2' square sheet of plexiglass...

“I simply put the two PZM mics on the floor at the front of the stage (in a school auditorium) about 2' apart. The imaging and sound are amazing. Plus you don’t have the mics bothering the performers. You can’t get a bad recording with them, it seems.

“You can mount the mics to walls, floors, balcony, etc. They are designed for [distant] miking. For pipe organ, orchestra, etc., they are the way to go. You eliminate much of the ‘in a drum’ sound that you get with any other mics when distant miking.

“You can also take sheets of plexi and mount them in several configurations with two mics to create wonderful stereo pickups or focus their pickup areas. For wild stereo just mount two on opposite sides of the plexi and place it in the middle of a group... then listen with headphones.

“When you use two sheets and stand them up in a V pattern with a 100-degree spread at the back, you provide a somewhat cardioid pattern but with much better imaging than you get with the traditional 2-mic approaches of coincident pairs, etc.

“[The PZMs are] very quiet, 20-20K frequency response, very low noise floor, omnidirectional. They have a switch that allows you to go from dead flat frequency response (really flat) to a slightly rising top end for percussive sounds like drums, piano, guitar, etc.

“These mics are phenomenal! The 30D mics are the most adaptable to a wide variety of uses. If you get them be sure to get the free application booklets from Crown.

“The GLM-100 is a tie-tac size mic that you mount directly onto musical instruments. It is fabulous for direct miking of instruments like flute, strings, horns, accordion, etc. Very inconspicuous. It is omnidirectional, 20-20K aand very low noise floor.

“Both of the Crown mics are equal to ANY studio condensers I have used in sound... very detailed, no bad spots or muddiness. To me they sound much better than a lot of highly rated mics.”

Bob Berta, rkb4@pge.com

CM-700s SHINE ON FOLK RECORDING SESSION

Last April, I recorded a cassette album of folk music featuring Mark and Liza Woolever. We used Crown CM-700 cardioid condensers on all the instruments. The miking went like this:

Fiddle: 1 to 2 feet over the top, aiming at the bridge.

Bodhran (Irish drum) or tambourine: 1 foot from the center.

Lap dulcimer: 1 foot over the middle of the top.

Acoustic guitar: 10 inches from where the fingerboard joins the body, aiming at the sound hole.

Tin whistle and recorder: 8 inches from the middle of the instrument.

Vocals: Crown CM-200A 1 inch from the mouth, with a foam windscreen, EQ’d -6 dB at 100 Hz.

Mark and Liza said that they were really pleased with the clear, natural sound of their instruments.

CORRIDOR CONCERTS BRING LIVE MUSIC TO RADIO

Putting live music on the air is a thrill. At our local public station, WVPE-FM, we produce “Corridor Concerts.” A band comes in and sets up in the corridor or hallway outside the control room. There, I mike and mix them as they play. The mix is sent live over the air.

This was the miking setup for a recent concert of a folk duo named Merriweather:

*Acoustic guitar, mandolin, bouzouki: CM-700 cardioid condenser, a few inches from where the fretboard joins the body, with the bass-tilt switch set to rolloff.

*Hammered dulcimer: CM-700 about 6 inches out from the front edge, 8 inches up.

*Vocals and flute: CM-200A with a foam windscreen, lips touching the windscreen. The mic is angled up to reject the guitar and monitors.

Here are some tips on mixing live. Before the show, write a numbered list of your mixer inputs. Next to each input number, note the instrument or vocal for that input, and the mic you plan to use on each one. Put the list by your snake box and plug in mics accordingly.

You’ll need to mike close to avoid phasing between mics and to reject room acoustics. Close miking can color the sound, so be prepared to use a fair amount of EQ. Most mics will need some bass rolloff to compensate for their proximity effect (up close bass boost).

Fade down mics not in use by about 10 dB. This gives a cleaner sound and reduces phase interference between mics. Do not turn the unused mics all the way off, or you may miss cues.

Technicalities aside, mixing music live to air is on-the-edge radio — fun for both the performers and the listeners.

LETTERS FROM CROWN MIC USERS

Live radio

I produced the St. Jude's Radiothon at Randhurst Mall. It could have been a feedback nightmare, because I used off-air monitoring of the radio station, with heavy processing and 40 dB of compression.

I used three Crown CM-310A's on the dais between the PA/monitor speakers, and a SASS-P for mall ambience. It came off like a breeze. A long breeze, to be sure, but a clean one.

D. Peter Maus, Maus Productions, Chicago, Illinois

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MIC MEMO

Fall 1996
Bruce Bartlett, Editor

SIMPLIFY YOUR MIKING WITH PCCs

Want to keep your miking clean and simple? Often, a single PCC-160, PCC-170 or PCC-130 can replace several other mics, and do a better job.

For example, consider miking a group of panelists on a TV talk show. The usual approach is to clip a lavalier mic on each person, and either ride gain or use an automatic mixer. A simpler method uses a single PCC-170. Seat the people on adjacent sides of a square table. Put the PCC on the opposite corner of the table, aiming at the people (Fig. 1).

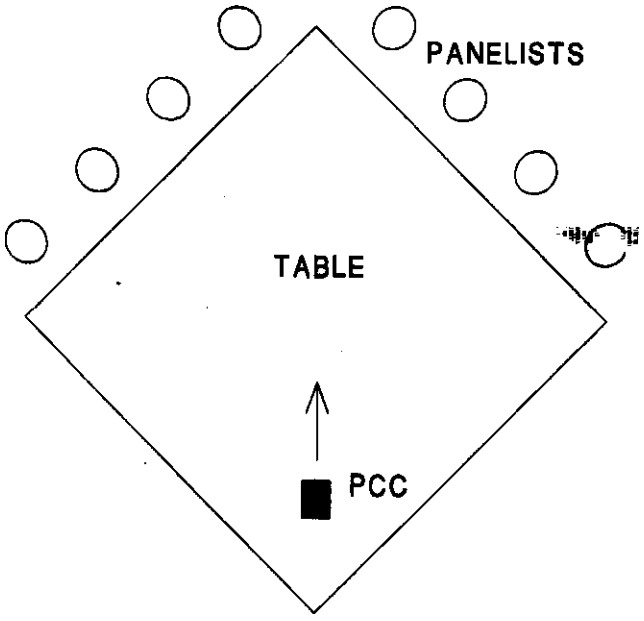


Fig. 1. TV panel miking.

With this technique, there is no phase interference between mics. And surprisingly, the panelists will sound like they are close miked.

Here's an easy way to mike a choir for sound reinforcement. In front of each 12-foot width of singers,

put a PCC-170 on the floor, 8 feet away. You can expect very good gain and an excellent vocal blend. Plus, you eliminate the visual clutter of mic stands.

If you prefer to use a PCC-160 for its extra ruggedness, it may sound too bright. If so, turn down your mixer's EQ a few dB at 10 kHz.

On a theater stage that is 30 feet wide or less, a single PCC-160 often can cover the area as well as three or four PCCs. Put just one PCC a foot or two from the stage edge, in the middle.

If you use several mics instead, you have to ride gain on each mic to follow the action on stage. Not so with the single PCC — just set it and forget it. Also, one mic has more gain before feedback than three mics.

Sometimes you may need to use wireless lavalier mics or spot mics on the set. But often a single PCC can cover most of the stage area quite well.

OVERHEAD PZM SPACING

Suppose you're recording a conference with PZMs on the ceiling. How far apart should the mics be to get uniform coverage?

Use the two-times rule. The spacing between mics should be two times the distance from mouth to ceiling. For example, if the ceiling is 5 feet above the talkers' mouths, the mics should be 10 feet apart. Then the mics will pick up everyone about equally.

In general, use as few mics as possible that will do the job.

If several mics are on at the same time, the recorded sound will be reverberant or muddy. It helps to run all the mics into a gated mixer (automatic mixer), which turns off all mics except the one in use. This keeps the sound clear.

Note that PZMs on the ceiling are NOT a good choice for P.A. The mics are too far from the talkers to get enough gain before feedback.

DRUM MIKING TIPS

The following techniques on miking drums are from Mark Frink, sound reinforcement editor for *Mix* magazine. Mark suggested some novel ideas in the June 1996 issue:

"The most overlooked condensers for miking drums are the smallest. One of my favorites is the Crown GLM-200. Last year, for Tony Bennett's 'Unplugged,' I used a pair of these on Clayton Cameron's 4-piece Ludwig jazz kit — one each just below the hi-hat and the ride cymbals. Using a short piece of coathanger, these were duct-taped to the cymbal stands using a small piece of foam as a shock mount, so that they were facing each other over the snare drum from each side of the kit."

Mark used other mini mics on the snare and kick.

"Panning the [GLM-200] cymbal 'underhead' mics, a wide drum sound is achieved, with the snare and kick mics adding to make it big and fat. This four-mic technique compares favorably to individually miking kits where dynamics and skill, rather than volume, become the focus. The microphones can't be seen. I've had people come up and ask where the mics are, or why the acoustics are so good in the hall."

"Engineers can take advantage of drum sets that are isolated with Plexiglas and use these large, flat surfaces to mount Crown PZM mics to take advantage of boundary effects. Two PZMs, placed correctly and panned, will often eliminate the need for other mics."

CM-30 PROVIDES CLEAR SOUND IN HEART-CATH LAB

Tony Hackett, general manager of Thompson Communications in Nashville, told us how he uses Crown CM-30 hanging mics in a medical application. In the Vanderbilt University Medical Center are several heart catherization labs. Each lab includes a procedure room, where the doctor inserts a catheter into a patient, and a control room, where an operator controls equipment.

CM-30

A CM-30 supercardioid mic picks up the doctor from anywhere in the room. The CM-30 is hung about 1 foot below the ceiling, which is 10 feet high. According to Tony, “It sounds great. The clarity is unbelievable.”

In the control room, a loudspeaker or a headset plays the doctor’s voice to the control-room operator. The operator talks to the doctor over a headworn mic.

Tony has installed ten such systems for a cost under $1200 each.

CHOIR MIC SPACING

Many Crown mic users ask: How far apart should I put my choir mics to pick up everyone equally?

If the choir is 9 feet wide, use one mic 3 feet from the front row.

Choir 20 feet wide: Use two mics 2 feet away, 10 feet apart.

Choir 40 feet wide: Use two mics 2 feet away, 20 feet apart.

Choir 60 feet wide: Use two mics 3 feet away, 30 feet apart.

How did we get those figures? We will call the pickup “uniform” if each singer is picked up at a level within 3 dB of each other. A supercardioid mic (like the CM-30) is down 3 dB at 58 degrees off axis. This corresponds to 4.5 feet off axis if the mic is 3 feet away from the choir. Hence, one mic 3 feet away can pick up a choir 9 feet wide.

What if you use two mics? When both mics pick up a singer midway between them, their signals add, so the level goes up 3 to 6 dB. So the singer can be at the 6 dB down point of the supercardioid pattern. That happens at 78 degrees off axis. This corresponds to 10 feet off axis if the mic is 2 feet away from the choir. Hence, two mics 2 feet away can pick up a choir 40 feet wide.

GLMS AMPLIFY CONTRA DANCE BAND

Each month in Elkhart, Indiana, a contra dance group has a dance with music provided by acoustic musicians. Contra dancing is like square dancing except that it’s done in two long rows and is more energetic. The band plays Irish reels and jigs, and old-time fiddle tunes.

We wanted an inconspicuous way to mike the band with a natural sound. Our current system uses several GLM-100 mini omni mics, one per instrument. These mics are run into a mixer, power amp, and two bookshelf speakers from a home stereo.

The speakers are on chairs against the wall behind the musicians. Although you might suspect feed-

back would be a problem, it's not. The reason is that the GLMs are attached to each instrument, so not much gain is needed. Also, the performers' bodies block sound from the speakers behind them (Fig. 2).

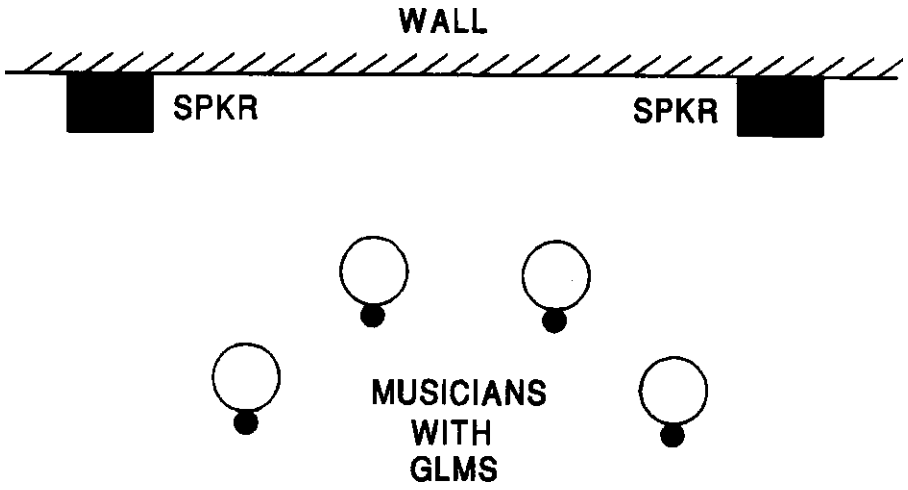


Fig. 2. Contra dance band miking.

Here is a typical miking setup:

*Acoustic guitar: GLM taped to the body of the guitar, halfway between the sound hole and the bridge, near the low E string.

*Banjo: Taped onto the drumhead a few inches in from the rim.

*Mandolin: Taped to the body near an f-hole.

*Fiddle: Positioned over an f-hole using the GLM-UM Universal Mount.

*Hammered dulcimer: Taped to the front edge, several inches over the top.

*Electric bass: Direct.

No mics are visible from the dance floor. The sound is just like the live band, only louder. There's no sense of technology getting between the musicians and dancers.

When the fiddle player needs to announce the name of the tune, she talks into her fiddle microphone.

The dance caller wears a CM-312 headworn mic, which is plugged into a wireless transmitter. She prefers a headworn mic because she often calls while demonstrating dances, and needs both hands free.

PRAISE FOR PZMs ON THE NET

The following question and answer were posted in the Internet newsgroup rec.audio.pro:

Q: "I'm currently looking to buy a pair of matched mics to do some live recording to DAT. I will be recording everything from [pop group] Phish in an ampitheater to unknown folk bands in small clubs. Any recommendation on mics that would fit the bill? I'm hoping to keep it around $1500 for the pair."

A: "I would buy a set of the best Crown PZM microphones. They have a very smooth response, when properly used, compared to stand mics. Crown has application notes on how to use them with plexiglass shields for miking by hanging from the ceiling, or use as is by miking on the floor.

They are extremely versatile, and have a very smooth sound, whereas even the best stand mic will suffer from comb filter effects due to the pickup of direct and reflected sound, which produces variations in the frequency response. The PZM approach does not suffer from these problems. And they will be WELL under your budget" [$738/pair]."

Gary L. Sanders, V.P. Engineering, Sanders Media Adventures, Inc.

MIKING FOR DISTANCE LEARNING

In a typical distance learning system (Fig. 3), there are students in one or more classrooms, and a professor in another location. The professor talks to the students through a clip-on or lavalier microphone. The mic signal is sent by phone lines or satellite to the classrooms. There, a loudspeaker plays the professor's voice to the students. The students can see the professor over a TV monitor, and vice versa.

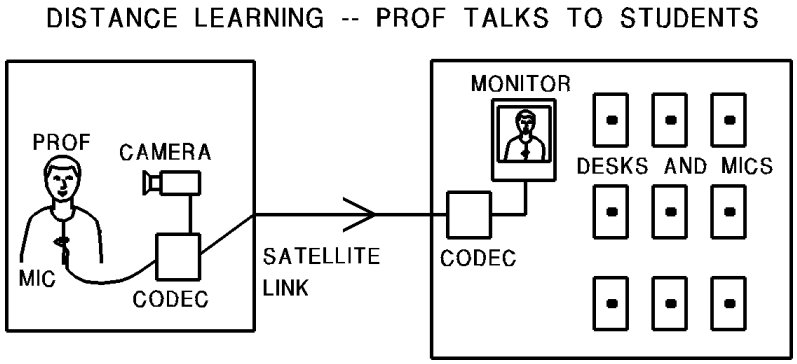


Fig. 3. Distance learning system.

In the classroom, each student or pair of students has a desk mic (Fig. 4). Students can switch on the mic when they want to ask the teacher a question. The mic signals are sent by phone lines or satellite to the teacher. The teacher and student can talk back and forth, almost as if they were in the same room.

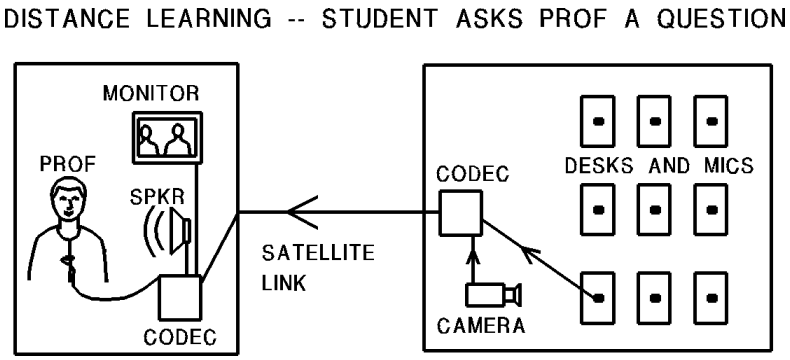


Fig. 4. Distance learning system.

A typical Crown mic in this application is the PCC-170SW desk mic. If you want remote sensing of switch closure, substitute PCC-170SWO mics. These mics can be used with a video camera switcher. When a person turns on his or her mic, the camera aiming at that person is switched on. Then the TV monitor view tracks whoever is speaking.

One designer of a distance learning system is Greg Gogins, Technical Facilities Manager at the U. of Minnesota. He asked us how to mike a student seating area (auditorium) which had ceiling mounted speakers and noisy air conditioning.

Our reply:

We recommend that the mics be close to the students. Use push-to-talk mics on the backs of the rows of chairs, one mic for every two students.

Crown makes a model PCC-170SW microphone for this purpose. It's a surface mounted (boundary-type) mic with a built-in membrane switch to turn the mic on or off. The switch can be configured for momentary on, momentary off, or push-on/push-off.

Normally this mic is placed on a desktop. Are there any desks or writing surfaces in the auditorium? You might make a shelf held up with L-brackets that go on the back of the seats. Mount each mic on top of this horizontal shelf.

An alternative is to use conventional mics on some sort of mic stands, and run all the mics into an automatic (gated) mixer such as made by Shure Brothers. The gated mixer turns on only the mic in use. You might use a lectern (gooseneck) mic, such as the Crown LM-300a, held to the seat back by a metal strap having an omega cross section. That would be a clean installation.

LETTERS FROM CROWN MIC USERS

SASS: the mic of choice

I use the SASS series exclusively as my overhead mic when recording drum tracks in the studio. It creates the best sound possible from the complete kit. The stereo separation is unbeatable. I have also used it to record choirs in large churches, and high school bands. Everyone should own at least two. It is the mic of choice for Digital Glue Studio.

Rick Owens

Digital Glue Studio

Midland, TX

CM-311 isolates drummer's vocal

I've been using a [Brand X] microphone, but as a drummer/lead vocalist the mike was so "hot" that a lot of additional sound came through the lead vocal channel. Your mike [CM-311] is "hot" enough for vocals but not so much as to pick up interference. I used a headset mike a few years back, but it couldn't compare to the quality of this one. Nice job!

Jerry Murphy

Yukon, OK

# # #

Mic Memo

Winter 1997
Bruce Bartlett, Editor

AWARD-WINNING STUDIO USES CROWN MICS

Harrison Digital Audio Recording in Gurdy, Massachusetts, is National Public Radio's producer for southern New England. A few years ago, they won NPR's award for best recording of the year. Owner Jeff Harrison had this to say about the Crown mics he uses:

"We're using the CM-700 condenser cardioid. That's a pretty amazing little piece of equipment. We just used it as a tuba microphone on a recent release and it acquitted itself quite well. It sounded very, very nice.

"People ask us to record live shows. I'm finding GLM-100s useful for stage productions where we hide them here and there on the set.

GLM-100

"The GLM-100s are very handy little devils. They fill the bill anytime we have to mike something in which a microphone cannot be seen. They have a nice flat response and they sound good, and they handle a high sound pressure level.

"We use them anytime we're doing video work or a live stage show. They'll go on the side of something in a drum kit, or on a floor underneath percussion, or inside the lids of pianos — which is the most common use, probably.

"There will be more 700s joining our flock, and probably a few more GLM-100s. Develop some more serious recording microphones and we'll buy them!"

NEW APPLICATION GUIDES

How do you mike a teleconference? What's a good way to mike a grand piano? The answers are in two new Crown mic application guides:

1. CM, LM, and GLM Series. 2. Teleconferencing and Distance Learning

Mic application guide

Other mic application guides in this series are:

Speech Sound Reinforcement

Boundary Microphones

Houses of Worship

Schools

Studio

Security and Surveillance

All these booklets are available free from your Crown dealer, or directly from Crown. Just call the literature room, phone 219-294-8093.

CROWN TEF-05 OMNI MEASUREMENT MIC

TEF-05

The new Crown TEF-05 [Now the CM-150] is a 1/2" diameter, omnidirectional electret condenser microphone. It is intended for free-field TEF measurements, sound-level meter measurements, and pro' recording.

The TEF-05 has a very flat, wide-range frequency response (20 Hz to 20 kHz +/- 1.5 dB). The mic is supplied with a proof-of-performance sheet, which shows frequency response and sensitivity. This information can be used to calibrate the microphone. The mic capsule grille fits into a Bruel & Kjaer 4220 pistonphone.

Because of its pre-aged titanium diaphragm, the TEF-05 is extremely stable over a wide range of environmental conditions.

When used for recording, the TEF-05 sounds natural and accurate. It preserves the delicate timbre of acoustic instruments, yet can reproduce all the power of a pipe organ. The off-axis response is smooth, so any leakage picked up has little coloration.

In close-miking applications, the mic's self-noise is inaudible. The TEF-05 can handle very loud sounds (127 dB SPL) without distortion. It is protected against static and RFI. The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Powering is by 18-48V phantom power.

An included foam windscreen reduces wind noise outdoors.

INTERNET COMMENTS ON THE CM-311

The following Internet message was posted in the newsgroup, rec.audio.pro:

Subject: What is a good headset mic for a drummer?

"I would like to ditto the Crown CM-311. I currently am using one with the Carman RIOT world tour, which is in the round. This mic is fantastic. Has excellent rejection, and sounds great! The 311/E is the best option, the electronics are built into the cord end."

Ed Crippen

ecrippen@sprynet.com

CROWN MIC DEMO CD

CD cover

Want to hear what Crown mics sound like? Order the new Crown Microphone Demo CD. Every cut on this CD is a sonic spectacular. Each selection demonstrates the sound of Crown microphones, using a wide variety of music and sound effects.

Mics featured on the compact disc are the GLM-100, CM-200A, CM-700, SASS-P, SASS-P MKII, PZM-30D, and PCC-160.

Partial contents include:

Sound effects: airplanes, gun shots, earthmovers, stereo imaging, and more.

Classical: Pipe organ, choir, orchestra, solo piano.

Jazz: Dixieland, percussion, quartets, ensembles.

Folk: Folk duos, folk groups, Baltic folk group.

Pop: Rock ‘n’ roll, pop, oldies, barbershop.

The CD is available free from Crown, but we must ask $4.95 for shipping and handling. Send your order to Crown International, 1718 W. Mishawaka Rd., Elkhart, IN 46517.

THE 3-TO-1 RULE

Suppose you’re recording a singer/guitarist. There’s a mic on the singer and a mic on the acoustic guitar.

The voice sounds funny — sort of filtered. What’s happening? The vocal mic is picking up the vocal up close. The guitar mic is picking up the vocal at a distance. So there are two vocal signals in the mix. One is direct and one is delayed.

When you combine a signal with its delayed replica at equal levels, certain frequencies cancel out, depending on the delay. There appears a row of notches in the frequency response where the sounds cancel. This is called a comb filter effect, because the frequency response looks like the teeth of an inverted comb.

In general, if two mics pick up the same sound source at different distances, and their signals are fed to the same channel, this might cause phase cancellations. These are peaks and dips in the frequency response caused by some frequencies combining out of phase. The result is a colored, filtered tone quality. It sounds like mild flanging.

To reduce phase cancellations between two mics, follow the 3 to 1 rule: The distance between mics should be at least three times the mic-to-source distance. For example, if two mics are each 1 foot from their sound sources, the mics should be at least 3 feet apart to prevent phase cancellations (Fig. 1).

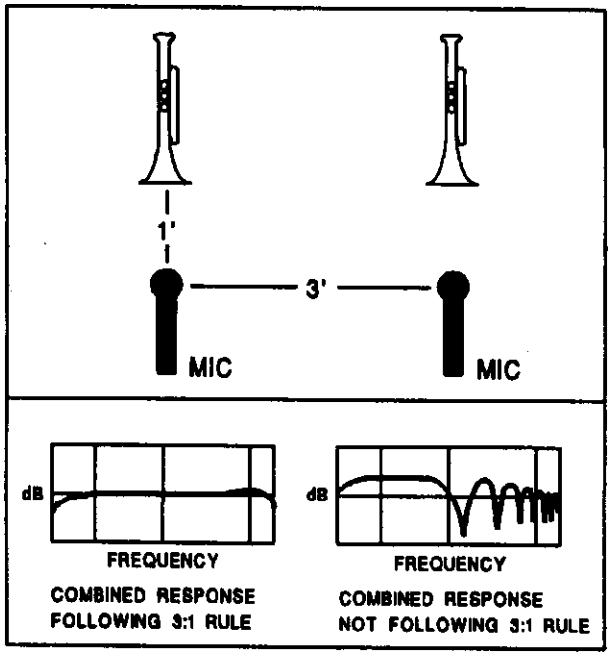


Fig. 1. 3:1 rule.

How was the 3:1 rule determined? Mic engineers Lou Burroughs and Tom Lininger discovered the following fact:

When you add a signal to its delayed replica at equal levels, you get severe comb filtering with deep notches. But when you mix direct and delayed signals at different levels, you get less deep notches.

Specifically, if the delayed signal is 9 dB less than the direct signal, the comb-filter notches are only +/- 1 dB, so for all practical purposes they are inaudible.

How do we make sure that the delayed signal, picked up by a distant mic, is at least 9 dB below the direct signal picked up by the close mic? Put the distant mic at least three times farther from the source than the close mic is. Due to the inverse square law, the level drops about 9.5 dB when the distance to the source is increased three times.

So the 3:1 rule ensures that the level at the distant mic will be down at least 9 dB, so the mixed signals will have comb filtering of +/- 1 dB or less.

A ratio of 4:1 or more is even better. The 3:1 ratio is the minimum to avoid audible comb-filter effects.

Suppose the close mic is picking up a loud piano, and the distant mic is picking up a quiet acoustic guitar. You've placed the mics following the 3:1 rule. But you have to turn up the guitar-mic gain a lot because the guitar is so quiet. If so, you might negate the 9 dB separation. That is, the piano signal in the guitar track might be less than 9 dB below the piano signal in the piano track, because the guitar-mic's gain is so high.

So there's more to it than just the 3:1 placement. The idea is to get at least 9 dB difference between track levels for the same instrument. You want at least 9 dB of separation between tracks.

Here are some ways to increase separation:

*Mike close.

*Spread instruments farther apart.

*Put a gobo between them.

*Use directional mics, and aim the null of each mic's polar pattern at the other mic.

*Record in a deader room. This reduces reflections into the front of each mic, which can degrade separation.

*Use a pickup on the guitar instead of a mic.

If the close and distant mics are two cardioids aiming in opposite directions, the mics can be closer than 3:1 and still get enough separation.

Also, don't use two mics when one will do the job. For example, use just one mic on a lectern. If you must use two mics mixed to the same channel, place them so their grilles touch, one over the other. This will prevent phase cancellations by aligning the mic signals in time.

LETTERS FROM CROWN MIC USERS

PZMs and distant miking

From what I have heard, when you close-mike and distant-mike an instrument, and mix the mic signals, the distant mic should be two feet higher than the close mic.

Would it be true to say that, unlike other mikes, it doesn't matter how high or low you place PZMs when using them as a distant mike since they're not prone to comb filtering? If this is true, is there still any particular reason to keep them above or below the height of the close mike?

Geoff Goacher

Sound Advice Acoustical Consultants

Irvine, California

Reply: Like any other mic, A PZM is prone to comb filtering except from the surface it is mounted on. A PZM mic capsule does not get comb filtering from its boundary plate, because the mic capsule is

very close to the plate. But a PZM raised off the floor will get comb filtering from delayed reflections off the floor. This can be reduced if you raise the mic farther from the floor. Two feet higher is okay, but is not a standard.

3-D guitar sound

Buy a GLM series miniature condenser and clip it inside of an acoustic guitar. Then blend it with piezo electronics in the bridge, and then blend it with a cardioid dynamic that is pointed at the sound hole. Then use a PZM to mike the room. The result is 3-D sound.

Stephen Guild

Portland, CT

Mic technique vs. EQ

I use mics for every step of the recording process. I feel that the science and physics involved in mic placement no longer exists. Just put a $3000 condenser mic in front of the instrument and then tweak the EQ till it's correct. Hah!

Stephen Guild

Portand, CT

Improvised reverb chamber

I had a commercial project that called for reverb. My studio reverb unit was on the bench for repairs.

I found a 12-foot heavy cardboard tube, about 8 inches diameter. I drilled a small hole in the side near one end. Into that end I inserted a GLM-100 and capped off the end with a coffee can.

The other end I capped with a coffee can whose bottom was punched with a 1" hole, 2" off center.

I held the punched end of the tube near my studio mic when I spoke. I sent the far-end GLM to a separate track. I performed the read, and closed the account. It sounded funky, but it worked. The account loved it.

D. Peter Maus, Maus Productions, Chicago, Il

Recording sounds at Great America

I recently produced two days of live radio at Six Flag's Great America in Gurneee, Illinois. Miking an amusement park is a snap with a couple of SASS-P's [stereo mics] with wireless transmitters. Miking the area around the broadcast setup was not difficult at all with a pair of GLM-100s [mini omni's] taped to fence posts between which most of the crowd would be standing. And of course, the talents were on CM-310A's [handheld differential mics].

The trick was the pair of helpers who rode the rides together, wired with GLM-100 lavaliers driving wireless transmitters. The screams from the BATMAN ride and THE DEMON ride were breathtaking and in stereo. Next time, though, I think I'll invest in a profanity delay... Know what I mean?

D. Peter Maus

Maus Productions

Chicago, IL

# # #

MIC MEMO
Spring 1997
Bruce Bartlett, Editor

MIKING AN ORCHESTRA WITH GLM-200s

GLM-200

What's a good way to amplify an orchestra? One method is to use a Crown GLM-200 mini hypercardioid mic on each instrument. That technique works well for Randy Piotroski, a freelance live sound mixer.

Randy says, "We've used the GLMs on several symphony orchestras: Pittsburg with Marvin Hamlisch directing, San Diego with Nick Perito directing, Denver, North Carolina, Arizona, and Puerto Rico.

"Basically I close mike all the strings and blend them together. On each instrument, I clip a GLM-200 onto the strings just behind the bridge, aiming down at the body. That way the mic is not touching the wood of the instrument. I use the tie clip with some heatshrink over the alligator clip.

"We like these Crowns for close miking. They take a lot without overloading.

"I'm using no compression, minimal EQ. I cut a little around 400 Hz and 8 kHz because the mic is so near the body, it tends to sound a little woody.

"Typically our orchestra is 12 first strings, 12 second strings, 6 violas and cellos. On cello we drop the mic down into the f-hole, free hanging about 4 inches in. We mute the cello mics when the song is over to avoid klunks from player movement. As for EQ, we just highpass filter the mic until it sounds fairly smooth. We didn't have enough mics to try on the basses.

"We're putting GLMs to darn good use. As long as I have the same microphones day in and day out, it doesn't matter what the PA is. If I have the same starting base, I can make it work.

"The GLM records well, too, without a lot of processing. I add a touch of reverb just to breathe air back into the sound. I also use an ambient mic over each section: an AKG 414 in a figure-eight pattern.

"Initially, the musicians were reluctant for me to clip a mic onto their instruments. They would say 'What are you doing? I've got an $8000 Stradivarius.' But one by one they realized, 'Hey, I'm not being heard if I don't use this mic.' They all of a sudden wanted to put their mic on."

TURNING ON MICS WITHOUT POPS

Sound Tech's John Sprinkle designed a church sound system with several mics. When the minister turns off his wireless mic, a relay activates phantom power for the choir mics to turn them on automatically. Unfortunately, this makes a loud pop over the PA speakers.

John said, "We have no mixer operator to ride gain. How can the choir mics be turned on without pops?"

Our suggestion was this: Route the minister's mic to group 1 in the mixer, and route the other mics to group 2. Short the output of group 2 with the relay. When the relay kicks open, you will hear the group 2 choir mics.

RAVES FOR TEF-05

TEF-05

Compliments are coming in for the new TEF-05 [now the CM-150] omni condenser mic. Although the mic was designed for acoustic measurements with the TEF-20 sound analyzer, it also is great for pro recording.

Bill Tullis, a sound engineer with Turner Broadcasting, compared the TEF-05 to similar models by B&K and Earthworks. He had this to report about the TEF-05:

“We found the Crown TEF-05 microphone to be equal to the competition and superior where price is concerned. The model is especially good for choir recording and sound effects gathering in controlled locations, as well as ambience and crowd reaction. The flat response is great for recording high strings and reed instruments, especially in classical applications.”

TIPS FOR RECORDING ACOUSTIC GUITAR

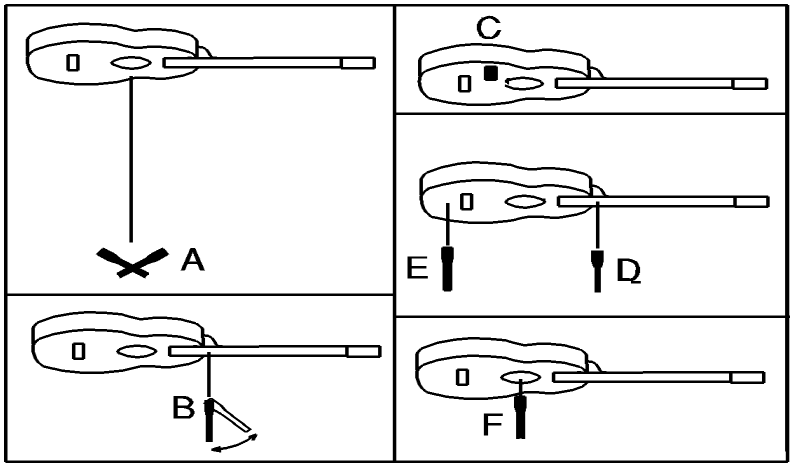


Fig. 1. Some mic techniques for acoustic guitar.

Reviewers have praised the Crown CM-700 cardioid condenser as being especially good for acoustic guitar. Here are some suggestions for mic techniques.

To record a classical guitar solo in a recital hall, mike about 3 to 6 feet away to pick up room reverb. Try a stereo pair (Fig. 1-A), such as XY, ORTF, MS, spaced pair, or a Crown SASS-P MKII stereo mic.

When you record pop, folk or rock music, try a CM-700 about 1 foot from where the fingerboard joins the guitar body — at about the 12th fret (Fig. 1-B). That’s a good starting point for capturing the acoustic guitar accurately. Still, you need to experiment and use your ears. Close to the bridge, the sound is woody and mellow.

Another spot to try: Tape a GLM-100 mini omni mic onto the body, halfway between the sound hole and bridge, about 1/2 inch from the low E string (Fig. 1-C).

The guitar will sound more real if you record in stereo. Try one mic near the 12th fret, and another near the bridge (Fig. 1-D, 1-E). Pan left and right.

Is feedback or leakage a problem? Mike close to the sound hole with a CM-700 (Fig. 1-F). The tone there is very bassy, so set the mic's bass-tilt switch to "Rolloff." Also turn down the low-frequency EQ on your mixer until the sound is natural.

FOX TV SPORTS USES CROWN MICS

One TV network doing innovative audio work at sporting events is the Fox network. Last summer, Fox crews traveled to baseball parks with four Crown PCC-170s (supercardioid boundary mics). They experimented with placing them in various parts of the outfield walls in ballparks. The PCC-170 also has been used as a backboard mic in basketball. (But we would recommend the PCC-160 for its ruggedness and similar sound).

For ice hockey, Fox engineers used PCC-160s taped to the clear plastic shield that protects the audience from the hockey puck. Each mic is up high aiming down at the ice.

TIP FOR MIKING THERAPY SESSIONS

Crown PZMs have been a popular choice for picking up counselors and their clients. A PZM on the wall picks up the sound, which is fed to a loudspeaker in a nearby room. There, students or other counselors can listen in on the session.

Speech picked up this way is fairly intelligible. To make the sound even clearer, use two PZMs and two speakers for stereo. Stereo reproduction helps the listener separate the talkers from the room acoustics. Two PZMs on the wall about 3 feet apart should do the trick.

PRESIDENTS OF THE U.S. RECORD WITH CM-310As

CM-310A

Grunge-pop trio *Presidents of the United States of America* recently put out their second album, recorded at Studio Litho in Seattle. Band member Dave Dederer talked about the mics they used to record the vocals:

"We did most of the vocal takes at Litho with live vocal mics. We didn't use fancy studio mics, just the same ones we used on the road. It was a Crown condenser [CM-310a], and that works for us. It gets a nice, warm, up-front kinda sound, and you don't get psyched out the the pop-screen, four-million-dollar mic that you're totally afraid of."

Vocalist Chris Ballew agrees. “I hate those [big studio mics]! You can’t put your lips on ‘em! How are you supposed to sing without putting your lips on the mic?”

Band members recorded most of the album with their lips touching the grilles of the CM-310a Differoid mics.

SASS STEREO MIC FOR PIANO SAMPLING

In an article in the Nov. 1996 issue of *Electronic Musician*, author Jim Miller talks about his piano sampling techniques:

“[One] approach is to position your mics by the player’s head. I’ve had tremendous success with this technique, particularly when using the Crown SASS-P, which is specially designed to create a strong stereo image. Although this mic position sacrifices a little in the punchiness department, it captures a lush, spacious re-creation of what the pianist acutally hears during a performance.

“The Crown Stereo Ambient Sampling Systemhas become myfavorite piano sample.”

KEN WAHRENBROCK

We’d like to quote this article from the Fall 1996 issue of the *Syn-Aud-Con Newsletter*:

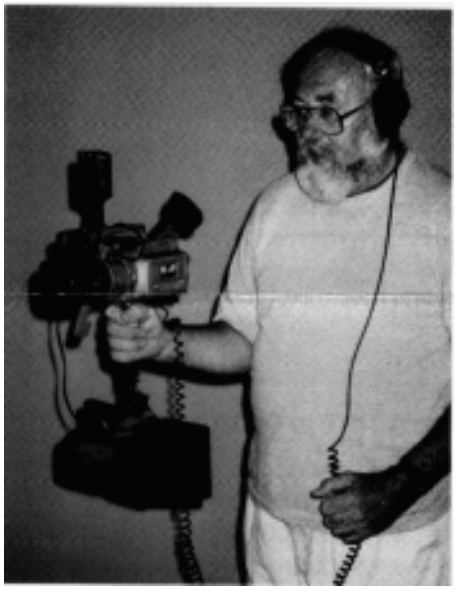
“Ken Wahrenbrock, the developer of the first practical Pressure Zone Microphone (PZM) and the driving force behind its adoption by the audio industry, has been paralyzed from the chest down from a bicycle accident in July.

“Ken traveled with Don and Carolyn [Davis] for several years duing the 1980s and was Don’s indispensable right hand, building innumerable special black boxes for Syn-Aud-Con experiments and demonstrations.

“Ken made many, many audio friends during those years and it is our feeling that a significant number of you will want to be in touch with him.

“Ken is now at home. Ken’s address is: 9609 Cheddar, Downey, CA 90242.” [Ken has since passed away… a great loss. We will miss him.]

TRY A SASS WITH A CAMCORDER



Gary Pillon

Gary Pillon, a soundmixer with General Television Network, has had great success using a Crown SASS stereo mic mounted on a camcorder. As the photo shows, the SASS attaches to the handgrip, and provides easy stereo pickup for the video shot.

Gary says that the SASS also could work mounted on a Steady Tracker or Glide Cam, devices which steady the camcorder shot.

HOW A CARDIOID MIC WORKS

As if by magic, cardioid mics can pick up what they are aimed at, but reject sounds to the side and rear.

For example, talk into a cardioid microphone from all sides while listening to its output. Your reproduced voice will be loudest when you talk into the front of the mic and softest when you talk into the rear.

Because they discriminate against sounds to the sides and rear, cardioids help to reject unwanted sounds such as room acoustics (reverberation), feedback, or leakage. Cardioids are the most popular choice for this reason.

How do they work? In other words, how do you make a mic directional?

Start by making an omnidirectional mic. Take a mic transducer, made of a diaphragm and some hardware that changes diaphgram motion into a signal. Then put this transducer in the end of a sealed can, so that incoming sound contacts the diaphragm only on its front surface.

Sound from the front presses on the front of the diaphgram, and makes a signal. Sound from the side or rear bends around to the front of the mic. This sound also presses on the front of the diaphgram and makes a signal. So the mic responds the same to sounds from all directions. In other words, it has an omnidirectional polar pattern ("omni" means "all.")

Note that the omni mic becomes directional at high frequencies. That's because the mic housing blocks high frequencies that arrive off-axis.

Now suppose we put some holes in the can behind the diaphgram. We carefully size these holes, and add acoustic damping such as felt or foam, to create an acoustic phase-shift network. It's like an RLC circuit, which delays the signal passing through it. The holes, or the "rear ports," let sound into the back of the diaphragm. Also, the ports delay the sound reaching the back of the diaphgram.

How does this arrangement cancel sound from the rear? Suppose a sound wave approaches the mic from the rear. It travels to the diaphgram by two paths: outside the mic, and inside the mic through the ports (Figure 2).

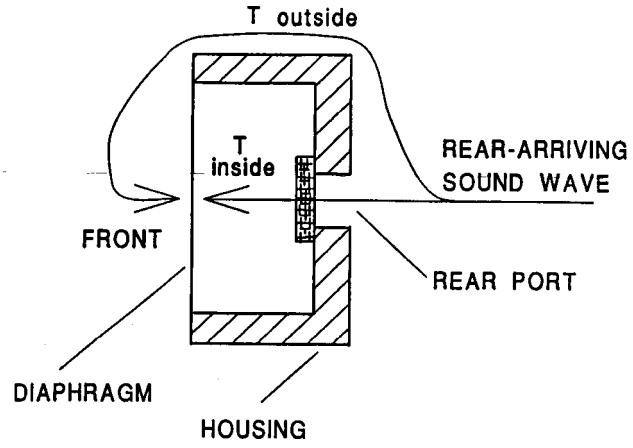


Fig. 2. Sound-wave travel outside and inside a cardioid mic.

Some of the sound wave travels to the front of the diaphragm, outside the mic. The sound travel time — from the rear port location to the front — we will call T.

Some sound also enters the rear ports, and is delayed. If the delay inside the mic is set the same as the delay outside the mic, sounds arrive at the front and rear of the diaphragm at the same time — in phase. Sounds push on opposite sides of the diaphragm, in phase. The diaphragm cannot move, so sounds from the rear make a very weak signal. Rear sounds cancel out. You have created a cardioid polar pattern.

Sounds coming from the front do not cancel out. Why not? Frontal sound waves travel to the rear ports during time T. Inside the mic, the phase-shift network further delays the sound by time T. The total delay is 2T. Since there is a big delay or phase shift between the signals at the diaphragm's front and rear, a frontal sound makes a strong signal.

High frequencies do not reach the rear of the diaphgram because they are filtered out by the rear port's RLC filter. The cardioid mic is directional at high frequencies because its housing blocks high frequencies off-axis.

How about a bidirectional ribbon mic? The ribbon is fully open to sound on its front and rear. Sounds from the front or rear experience a phase shift as they travel around the ribbon, so you get an output signal. But sounds from the side press equally on the front and rear of the ribbon, in phase. The ribbon cannot move, so you get a weak output from side sounds.

By changing the delay of the rear ports, you can get almost any pattern between bidirectional and cardioid, such as supercardioid or hypercardioid. Each of these two patterns has a rear lobe that is in opposite polarity with the front lobe.

# # #

MIC MEMO

Summer 1997
Bruce Bartlett, Editor

REBA McENTIRE TOURS WITH CROWN CM-311/E's

Reba McEntire, the "Queen of Country music," sings through a Crown CM-311/E on tour. The March '97 issue of Mix magazinedescribed the application:

"Headset microphones, worn by Reba, Linda Davis and three background singers are Crown CM-311/E's, with beltpacks by Vega Wireless. An elaborate spare mic system includes ten extra headsets and a pair of handheld Vegas fitted with Crown heads."

Reba wearing CM-311E

CM-700 RECOMMENDED FOR ACOUSTIC GUITAR

In the March '97 issue of *EQ* magazine, engineer Mike Sokol talks about miking the acoustic guitar:

"For live sound, the challenge is to get enough gain before feedback, so close miking is essential. Lately I've been using the Crown CM-700 with excellent results. Position the mic 4-to-6 inches away from the strings, and slightly in front of the sound hole."

CHOIR MIKING WITH PCC's

Miking a choir is not an easy task. But sound engineer Don Brooks worked out a simple solution to this complex problem.

Brooks is Director of Technical Ministries for Central Community Church in Wichita, Kansas. He describes a novel way to mike a choir with PCC-160 supercardioid boundary mics:

"We have 100% converted to PCC-160s for our choir miking. This has been a one-year process as we experimented with mic location, position, angle, etc.

"Our choir size is 85 to 105 on Sunday, with a live orchestra of 20 directly in front. The orchestra is part of the problem, and the reason for the PCC-160's success. The choir sits and/or stands in a choir loft that has five rows with a 2-foot rise each row. The front row seats 36; the back row seats 18.

"We finally pulled the seven hanging AT-853's we were using, and are now using only four PCCs (which may be two more than we need).

"Also, last Christmas we used eight PCC-160s to mike our 38-foot high "singing Christmas tree" with 150 singers, again with great success."

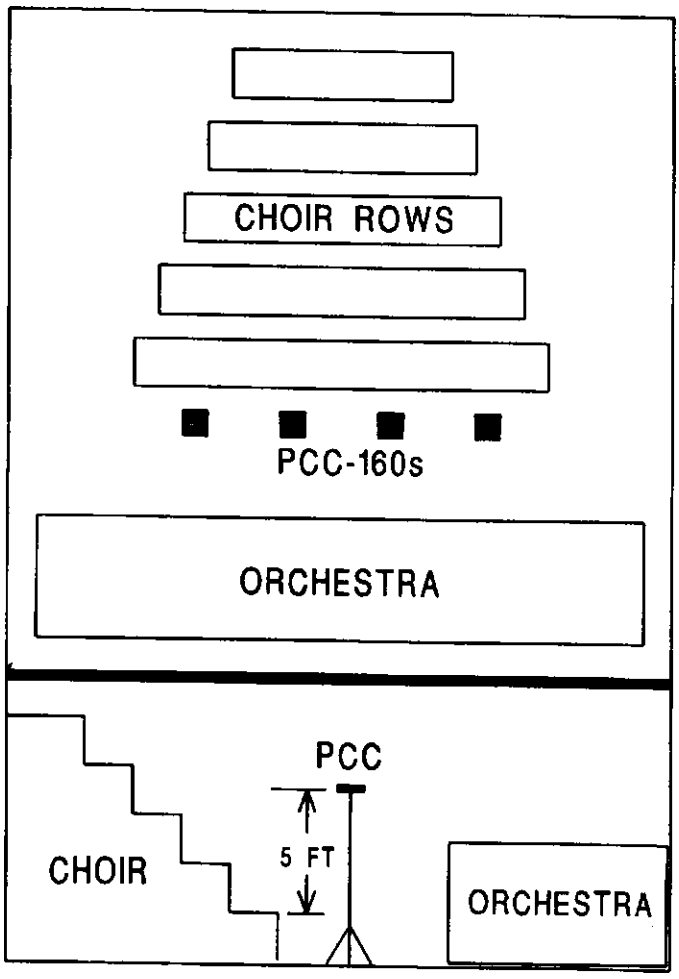


Fig. 1. Miking a choir with PCCs on stands.

DIFFEROID ON TOUR WITH THE DAVE MATTHEWS BAND

The popular acoustic-pop group, The Dave Matthews Band, has recorded two highly successful CDs: Under the Table and last years' multi-Platinum Crash.

Ian Kuhn, monitor mixer for the band, had this to say about the CM-310A Differoid mic used during their recent tour:

"Drummer Carter Beauford sings into a Crown CM-310A Differoid. A CM-310A is also used for Moore's vocal and doubles as his flute mic. The Differoid gives us great rejection and isolates the sound source, and Beauford definitely likes his vocal screaming."

Source: Mark Frink, "A Stage-Eye View of the Dave Matthews Band," Feb. '97 issue of *Mix* magazine.

POPLESS MIC ON/OFF SWITCH

Many microphone users want to insert a mute button in-line with a mic cable. With a dynamic mic, all you have to do is short XLR pins 2 and 3 together to mute the mic. But with a condenser mic, shorting pins 2 and 3 can cause a click or pop.

The cause is phantom-power imbalance. If the phantom DC voltage on pin 2 is higher or lower than on pin 3, you get a pop when you flip the on/off switch.

Bob Stadtherr, of Bob Stadtherr Engineering, kindly supplied us with a circuit to prevent this problem. Stadtherr describes the circuit shown in Figure 2:

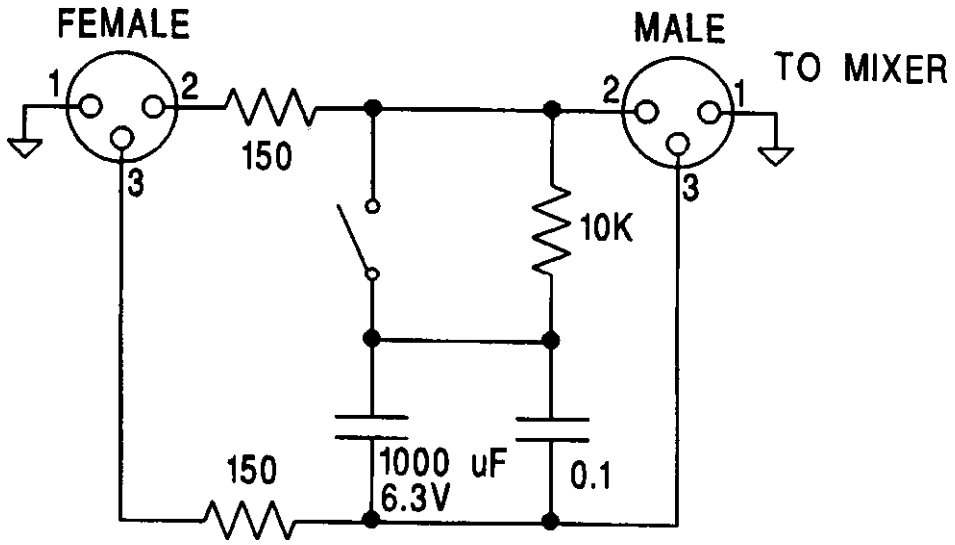


Fig. 2. Microphone on/off switch.

"This is essentially a lowpass filter, with a cutoff frequency down around 1 Hz (assuming a 150 ohm mic impedance). The 10K resistor allows the capacitor to charge to the DC voltage between the lines, so when the switch is closed, no change to the DC levels occurs."

Thanks for your suggestion, Bob!

MIKE OR MIC?

The spelling of the abbreviation for microphone is not standardized. Webster's New World Dictionary says that "mike" is slang for "microphone." However, mixers are marked "MIC" on their microphone inputs.

In the Mic Memo we use the following spelling: MIC for the noun form and MIKE for the verb form. We don't say "micing" because "c" is pronounced soft (like "s") if a vowel follows it. We don't say "mic'ing" — although that is correct — because it's cumbersome. We just say "miking," which is how it sounds. It's like saying "biking" instead of "bicing."

AIR OUT YOUR TRACKS WITH DISTANT MIKING

Close miking is the norm these days, since it gives a tight, punchy sound with lots of presence. Guitar amps and drums are often miked within an inch or two, sax close to the bell. But there's an alternative — distant miking — which is a great way to open up the sound of your tracks.

If you want to capture a natural sound on an acoustic instrument, chances are you'll get it more easily if you move the mic back about a foot or two. The sound opens up and becomes more natural.

Here's why. Musical instruments are designed to sound best at a distance, at least 1 1/2 feet away. The sound of an instrument needs some space to develop. A mic placed a foot or two away tends to pick up a well balanced, natural sound. That is, it picks up a blend of all the parts of the instrument that contribute to its character or timbre.

Think of a musical instrument as a loudspeaker with a woofer, midrange, and tweeter. If you place a mic a few feet away, it will pick up the sound of the loudspeaker accurately. But if you place the mic close to the woofer, the sound will be bassy. Similarly, if you mic close to an instrument, you emphasize the part of the instrument that the microphone is near. The tone quality picked up very close may not reflect the tone quality of the entire instrument.

Suppose you place a mic next to the sound hole of an acoustic guitar. The sound hole resonates around 80 to 100 Hz. A microphone placed there emphasizes this bassy resonance, giving a boomy recorded timbre that does not exist at a greater miking distance.

In the same way, the sax and clarinet project only the highs out of the bell. The tone holes supply the warmth and body of the timbre. If you mic close to the bell, you miss the contribution from the tone holes, and may wind up with a harsh tone quality.

Despite its importance, mic technique seems to be a vanishing art. We can learn from the masters of mic technique, many of whom made gorgeous recordings with distant mics. Judging from session photos taken in the 50's and early 60's, the engineers used to place the mics at least a foot or two from the instruments.

The sound picked up this way was natural, and was often better than what we're recording now. We tend to be addicted to close miking, not realizing there's an alternative.

For an example of how good distant mic placement can sound, check out the Dave Brubeck reissue, *Time Signatures — A Career Retrospective*. Even though the tapes are 30 years old, they sound great. Drums have lots of impact; acoustic bass sounds full; piano and sax are warm rather than thin.

On the Brubeck groups, the engineers used one large-diaphragm condenser mic per instrument, and each mic was at a respectful distance (Figure 3). They usually miked the sax about 1 1/2 feet away from the keys and bell. Piano was miked just outside the raised lid, with the mic about 1 foot below the lid. The entire drum set was picked up with one mic placed 5 feet off the floor and 3 feet in front. String bass was covered by a mic about 1 1/2 feet from the bridge.

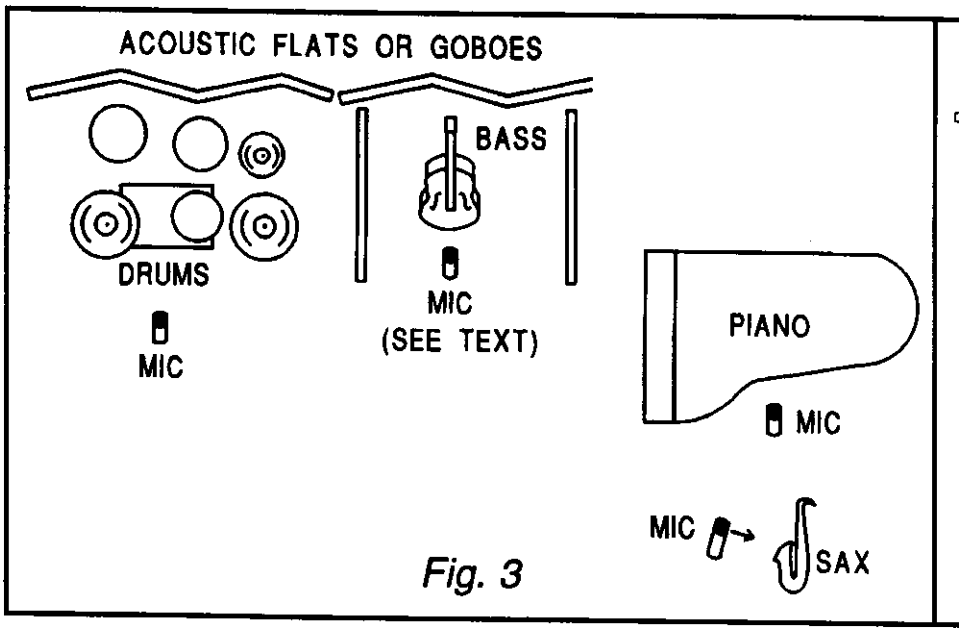


Fig. 3. Miking the Dave Brubeck Quartet.

Listen to any record by Led Zeppelin. John Bonham's bass drum was miked about ten feet away, and it sounds huge. Check out recordings by Elton John. The engineer often miked the piano several feet away, overhead.

How can we use those techniques from the past to record better sound in our productions today? Usually, you can get a natural sound if you place the microphone as far from the instrument as the instrument is big. That way, the mic has equal pickup of all the sound-radiating parts of the instrument. For example, if the body of an acoustic guitar is 18 inches long, place the mic 18 inches away for a natural tonal balance. If this sounds too distant or muddy, move in a little closer.

Similarly, try miking a sax about 1 1/2 feet away, about halfway between the tone holes and the bell. You'll appreciate the warm, musical timbre you hear at that distance. Of course, you might not want a natural sound. If you prefer a bright, edgy tonal balance, mic the sax closer to the bell (Figure 4).

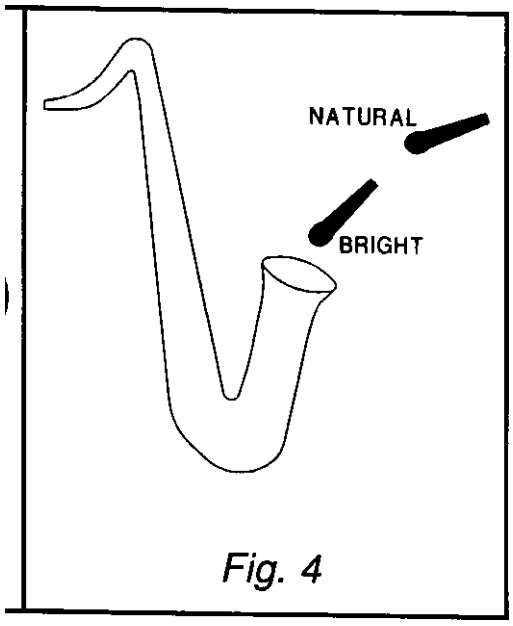


Fig. 4. Sax miking tonal effects.

LETTERS FROM CROWN MIC USERS

Miking a church service with the SASS

1. I want to use a SASS-P MKII stereo mic to record our church service, including the P.A. speakers, as the audience hears it. Where should I place it?

2. Is it okay to add damping to the SASS boundaries? If so, where?

Reply: (1) Try putting the SASS close and up high, near the first row of the congregation, and raised high enough to not be distracting.

(2) The panels on which the SASS mic capsules are mounted tend to vibrate or ring very slightly, especially with loud sound sources. You can dampen this vibration to improve the mic's transient response. Glue some urethane foam or Soundcoat damping compound to the inside of the boundaries. As long as you do not damage the capsule wiring, adding damping does not void the warranty.

Soundcoat's phone number in New York is 516-242-2200, and in California is 714-979-9202.

CM-700 great for live gigs

I went to see the band Motorhead. They were using an AKG D-112 to mike the bass amp, but couldn't get the snap they wanted. The next night they used a Crown CM-700 [cardioid condenser] I lent them. They bought one. We use the CM-700 for live work often, as it works well for kick, bass, overheads, hi-hat, and brass. Great mic. Thanks.

Ed Andrews, Pollen Sound & Lighting, Weirs Beach, NH

Strange sounds in train recording

I was recording a train passby with a Crown SASS-P MKII stereo mic. I heard some "ticking" or "buffeting" sounds, even though the recording level was normal. What is this?

Reply: Most likely, it's wind noise. The train could have caused some turbulence as it passed. Try using the supplied windscreen, especially when you record outdoors.

PCC floor isolation

I need to figure out a good way to provide some isolation against vibrations for PCC and PZM type mics.

Thomas Boisseau, Sound Works, Conyers, GA

Reply: Interesting you should mention that, Thomas, because the PCC and PZM have very little pickup of mechanical vibrations from the floor. The PCC's mic diaphragm is perpendicular to the floor, so vertical vibrations do not make the diaphragm move. The PZM's mic diaphragm has very low mass and is highly damped, so it is not responsive to vibrations.

To prove it to yourself, record someone stomping on the floor. As they are stomping, lift the PCC or PZM off the floor. There is almost no change in the sound. The mics pick up the foot steps acoustically through the air, just as your ears do. But they pick up almost no mechanical vibration through the floor.

If you want to isolate the mics anyway, try four small pieces of foam rubber, one in each corner of the mic. The smaller the surface area of the isolator, the better it isolates. Because the mic will be raised above the floor slightly, the frequency response will be degraded with an upper-midrange dip.

GLM praise

Hey, the polar response of the GLM-100 at all frequencies is great! And the response is flat and smooth. Keep up the good work.

Chris Griffin, Middleton, WI

PZM PIONEER NEEDS YOUR THOUGHTS

Ken Wahrenbrock built the first commercial version of the Pressure Zone Microphone. He also edited the PZM Memo, and was an active participant in Syn-Aud-Con seminars.

Ken had a serious accident which left him disabled. According to Ken, “My active life came to a screeching halt with an accident on my bicycle. Unknown to me, my front wheel was loose, and when I pulled the front fork up as I entered a parking lot, the wheel disconnected. I went over the handle-bars and hit the ground, causing spinal cord hyperflexion at cerbral vertebrae 5, 6 and 7.

“The result was I became a quadriplegic. I have some use of my right arm, but only a little use of the left, which is also weaker. I have no control of the my fingers. The neurosurgeon we consulted for a third opinion agreed that the condition is permanent.

“Important lessons reinforced: You just never know... Enjoy what you can enjoy while you can enjoy it... You don’t get it the way you want it; you get it the way you get it... Take one day at a time... Just put one foot in front of the other... If it makes you cry, don’t think about it... There’s no substitute for a sense of humor... Just do the best you can every day.”

Please include Ken in your thoughts and prayers. He and his family are grateful for the many people around the country who continue to contribute to their well-being.

Please send any donations to the Ken Wahrenbrock Fund, Syn-Aud-Con, 8780 Rufing Rd., Greenville, IN 47124. Check, Visa, or Master Card are welcome. If you’d like to write, Ken is at 9609 Cheddar St., Downey, CA 90242-4928. [Ken has since passed away – a tragic loss.]

# # #

MIC MEMO

Fall 1997
Bruce Bartlett, Editor

A BOUNTY OF NEW HEADWORN MICS

Crown is happy to announce SIX new headworn mics. Compared to our previous models, the new models offer these advantages:

*Carrying case.

*New slim battery pack with easy access to the battery.

*Mic on/off switch programmable for push-on/push-off, push-to-talk, or mute.

*A more-rugged boom mount.

*Boom 1 inch longer to accommodate larger heads.

*New high-performance windscreen with some models.

*Wireless models now work down to 3 volts.

CM-311A

Let's briefly describe each new model:

CM-311A: Headworn Differoid mic with a battery beltpack. The mic is in front of the mouth.

CM-311AHS: Same as CM-311a, but mounts on a Sony MDR-7506 headphone.

CM-311A/E: Wireless version of the CM-311A; runs off 3-9V from a transmitter of your choice.

CM-312A: Headworn hypercardioid mic with a battery beltpack. The tiny mic is to the side of the mouth.

CM-312AHS: Same as CM-312A, but mounts on a Sony MDR-7506 headphone.

CM-312A/E: Wireless version of the CM-312A; runs off 3-9 V from a transmitter of your choice.

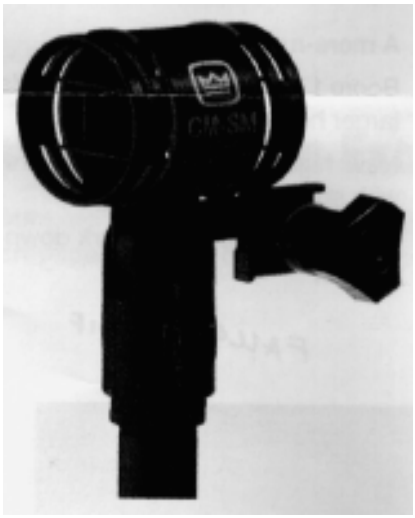
HANG 'EM HIGH

Want to permanently hang a SASS stereo mic? Try running a pipe straight down from the ceiling to the SASS, which you mount upside down. Both ends of the pipe should have a 5/8"-27 thread. One end screws into the SASS swivel mount; the other end screws into an Atlas AD-11 flange that bolts to a ceiling beam.

Being upside down does not affect the SASS's sound. Just be sure that the left and right channels are not audibly reversed.

STOP THUMPS WITH NEW SHOCK MOUNTS

Does your lectern mic go "bong" when someone drums on the lectern surface? Solve the problem with the LM-SM shock mount, which isolates Crown lectern mics from mechanical noises. This flat rubber disk mounts in a lectern, pulpit, or table top. The rubber isolator is more stable than elastic bands, and the mount prevents theft by securely holding the mic in place. Installation is quick and easy.



CM-SM shock mount

Also available is the CM-SM, a mic-stand adapter that isolates a CM-700 microphone from mechanical vibration. It will also work with other 3/4" diameter mics that are similar to the CM-700 in weight and size, such as the Crown TEF-05 [Now the CM-150] omni studio mic.

Because of its elastic suspension, the shock mount reduces stand and floor thumps by at least 22 dB (A-weighted). A thumbwheel on the shock mount lets you clamp the mic cable. This keeps the mic oriented corrently and prevents cable noise from reaching the mic.

NEW MINI-BOUNDARY MICS EASE INSTALLATION, CUT COSTS

Just introduced from Crown is a series of five miniature boundary mics for multi-miking on conference tables. Other uses are teleconferencing, security, distance learning, boardrooms, and courtrooms. The mics are nearly invisible: each is approximately the size of a silver dollar.

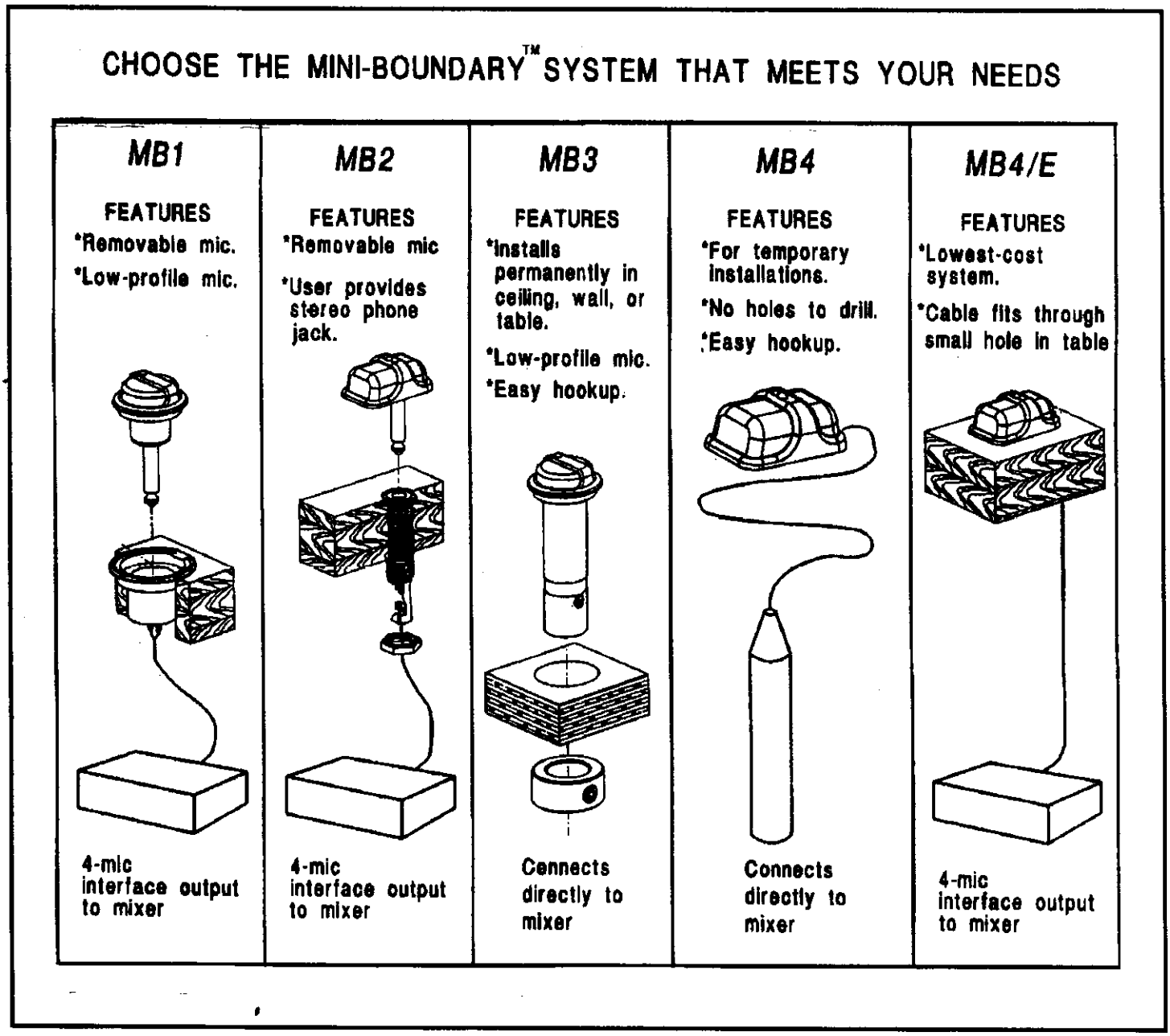


Fig. 1. MB series.

All MB series mics feature a surface-mounted supercardioid capsule for extended reach and a clear, natural sound. With 70 dB attenuation in the off position and low self-noise, quiet is guaranteed even when multiple mics are in use.

Some of the mics (MB-1, MB-2, and MB-4/E) are used with an MB-100 or MB-200 interface, which mounts unobtrusively under the table top. The interface powers up to four mics, and has programmable switching to turn the mic on or off if desired (switches not provided). The MB-200 interface also has remote switch-closure sensing via an optical coupler.

An installation using an MB interface and four MB mics can save up to 30 percent compared to standard individual microphones.

The wide variety of mic styles lets you mix and match as needed for several configurations. Let's look more closely at each mic model.

The **MB-1** plugs into a table-mounted jack. Supplied with the mic is a brass table insert with a phone

jack that accepts the mic. The insert flush-mounts in a hole drilled in the table. After meetings you can remove the mic and cover the insert with the provided brass disk.

A rectangular microphone, the **MB-2** has a bottom-mounted phone plug. It plugs into a stereo phone jack previously installed in the table. The contractor supplies the phone jack, which is a Switchcraft 152B Thick Panel Phone Jack or equivalent.

The **MB-3** circular mic permanently installs into a hole drilled in a table, wall, or ceiling. On the bottom of the mic is a tubular power module with an XLR-type output connector.

Don't want to drill into the conference table? Try the **MB-4**. This rectangular mic has a 15-foot attached cable leading to an XLR-type connector with powering electronics. The **MB-4/E** is the same, but without the electronics/connector. The MB-4/E is used with the Crown MB-100 or MB-200 interface.

HANSON POP GROUP USES CROWN CM-311A

Zac Hanson wearing a CM-311A

The young recording group, Hanson, is something of a pop phenomenon. Aged 11, 14, and 16, they had a top-ten album with Middle of Nowhere. Their single "MMMBop" was No. 1 for three weeks.

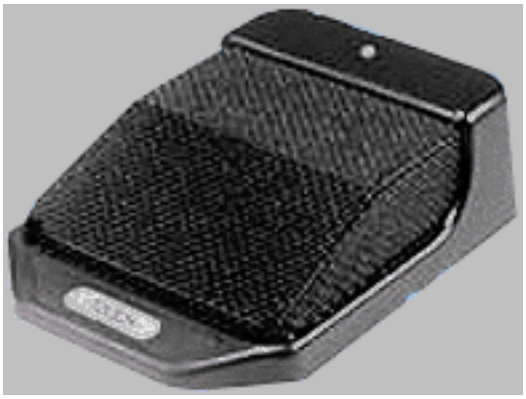
Shown in the photo is drummer Zac Hanson, who uses a Crown CM-311A headworn mic on tour. Source: *People* magazine, 7-7-97.

MIC MEMO NOW ON THE WEB

The *Mic Memo* is also on the Crown Web Page. Our Web site address is **http://www.crownintl.com**.

COMPACT CONFERENCE MIC FEATURES ON/OFF SWITCH

Measuring only 3.5" x 2.5", the Crown PCC-130SW is a surface mounted supercardioid mic of top quality. This handsomely styled unit is appropriate for use on the most elegant boardroom table or lectern. Other applications include distance learning, teleconferencing, courtrooms and council chambers.



PCC-130SW

Thanks to its half-supercardioid polar pattern and surface mounting, the PCC-130SW offers a clear, natural sound with excellent articulation.

On the front of the mic is a silent-operating membrane switch which is normally off. You can program the switch for touch on/off, momentary on or momentary off. The mic is intended for multi-mic use on a conference table where each person wants control of his or her microphone.

RFI suppression is included. Self-noise is low and sensitivity is very high. A bass-tilt switch lets the user tailor the low-end response.

SASS AND CAMCORDER MAKE A PERFECT PAIR

The SASS-P MKII stereo mic is an ideal mate for the new low-cost pro-sumer camcorders. Thanks to the SASS, it's easy to record a stereo soundtrack with superb imaging. Just connect the SASS up-side down to the camcorder.

Who came up with this idea? Gary Pillon, a location soundmixer for General Television Network. He's also a columnist for Michigan VUE, a magazine about video production in Michigan.

In his column, Sound Advice, Gary said, "Why is a location soundmixer excited about a new video format? [Your] projects [can] link the power of a good video camera with the 360-degree soundfield of a stereo microphone. The secret ingredient that makes this idea so successful is mounting the camera and stereo mike on a Steadicam platform. The rig becomes a virtual representative of the operator, seeing and hearing surrounding events in a matched audio-video perspective."

SASS/camera

“[Small, lightweight] consumer cameras... can be mounted on an inverted stereo mike like the Crown SASS-P MKII. New handheld stabilizers, like the Glidecam ©3000 Pro and Steadytracker © Flightstick, offer mounting platforms for any of the new-generation stereo mics, such as the SASS-P MKII.”

PZMS ON A BUDGET

Redesigned for the ’90s, the Sound Grabber II and PZM-185 are low-cost Pressure Zone Microphones. They are designed for general-purpose use such as conferences, group discussions, interviews, home video, lectures, and music recording.

The Sound Grabber II is powered by an internal 1.5V battery. The boundary “paddle” can be removed so the mic will fit in your pocket. Attached to the mic is an 8-foot cable with a mini phone plug. Output is medium-Z unbalanced.

PZM-185

Similar in size and shape to the Sound Grabber II, the PZM-185 also has a removable boundary “paddle.” The mic runs off phantom power or an internal 1.5V battery. Output is low-Z balanced. Both mics offer the same clear sound and freedom from phase interference that makes PZMs so useful.

CROWN MICS: IN THE BEGINNING

The 17-year history of Crown microphones has an intriguing beginning. Someone approached Crown and asked them if they wanted to manufacture a radically new microphone that nobody else was making. It was called the Pressure Zone Microphone, or PZM.

The PZM started as a mic technique, not a product. It all began in 1978. Audio consultant Ed Long, and recording engineer Ron Wickersham, came up with an unsual concept: they mounted a small microphone face down very close to a surface. This gave a very clear, natural sound quality by eliminating phase interference from surface reflections.

Ken Wahrenbrock, a graduate of the Syn Aud Con audio seminar, developed the first PZM prototype. He mounted a miniature hearing-aid mic face down next to a plate. He marketed these mics on a small scale.

In 1980, Ken approached Crown with his invention. We agreed to manufacture and market the PZM. Crown engineers gave the PZM a facelift so that it looked slick and professional. That was the only mic Crown made back then.

When PZMs were first introduced at the Audio Engineering Society, they were controversial and caused a great stir because they were so different. Eventually they caught on, and now almost every other microphone company makes their own version.

Since then, Crown developed several new types of PZMs, PCCs, and all sorts of other microphones. The SASS was the only other microphone that started from an outside inventor; the rest were developed here. But the microphone product line all started with the Crown PZM. It may look funny, but it sounds great.

LETTERS FROM CROWN MIC USERS

Differoid Delights

I do a lot of live sound for broadcast. When the CM-310A came out I bought one right away and put it to work in one of my most challenging venues. It worked well, so I bought three more and made sure I always had one in my case, at least as a backup. But the CM-310A's are such good problem solvers, I have found that my other mics don't see so much daylight anymore.

D. Peter Maus, Maus Productions, Chicago, IL

# # #

MIC MEMO

Winter 1998
Bruce Bartlett, Editor

CM-700 SHOOT-OUT

CM-700

"I was shocked to hear that Crown made anything besides the Garth Brooks headset mic or PZMs. I assumed that the CM-700 at $289 was a cheap mic; it couldn't sound good. But it smoked the much-more expensive mic I tried on acoustic guitar."

So said Randy French, a recording engineer/producer for Randy French Sound Labs in Michigan. He recently compared the Crown CM-700 cardioid condenser mic to an AKG 414-TL2 costing several times as much. The AKG unit is a large-diaphragm microphone with a C-12 mic capsule.

Randy tells the story:

I thought it wasn't a fair comparison, but I decided to do it anyway because a lot of people like to use a 414-TL2 on the acoustic guitar. I plugged the mics into a $2,300 API mic preamp and recorded them

straight to a DAT. I miked the guitar 8 inches away at the 12th fret, but also miked it every crazy way you could think of.

Playback in mono was over a pair of UREI 809's and KRK 7000's. It was a blind test. I started punching back and forth between the two mics. When the first mic came up, I said, "That's my TL2." I recognized it. The second mic sounded a little distant and kinda boxy. Didn't have quite the focus and brightness. I said, "Well, this test is over with; I already know which one is the TL2."

I was listening for transients, top end. I want something with a real breathy, airy top end to it.

At the end of the test I tapped on each mic to identify them. Guess what? I got 'em backwards! I was blown away; I didn't believe it. So I redid the whole test and identified them for sure. The CM-700 on that acoustic guitar smoked the other mic. It was pretty much a slam dunk. A huge difference.

Not that the TL2 sounded bad, but the CM-700 was much clearer, purer, focused, and quicker-sounding. The TL2 had a blurrier, more distant sound.

I checked the CM-700 with drums and cymbals. No breakup. When hung over cymbals, compared to a 414 and a U-87, the 700 sounded so similar that it was just a matter of preference or taste. On the bell of the cymbal, the 700 blew the rest away; it was purer and cleaner. I thought, "There's no way this inexpensive mic could sound this good."

Mics with 1-inch diaphragms, like the TL2, tend to sound bigger but muddier around 300-400 Hz.

On vocals, the CM-700 sounded too bassy up close (I didn't use the built-in bass rolloff switch). But at 1 foot versus a U-87, I was pleasingly surprised. I did not prefer the 700 but it had a very present sound. At 2 feet from the singer, like for a choir or backup vocals, the 700 was right in the ballpark with the other mics.

The only complaint I have is: It makes me mad that I spent as much as I did on some other mics!

CONCERTINA MIKING WITH GLMS

Musician Rich Rys came up with a novel and effective way of miking his concertina.

Using rubber bands, he attached a GLM-100 mini omni mic on the inside of each forearm near the wrist (Fig. 1). Each mic is about 5 inches from the concertina grille holes. Rys put electrical tape over the grille holes nearest the mic to soften them.

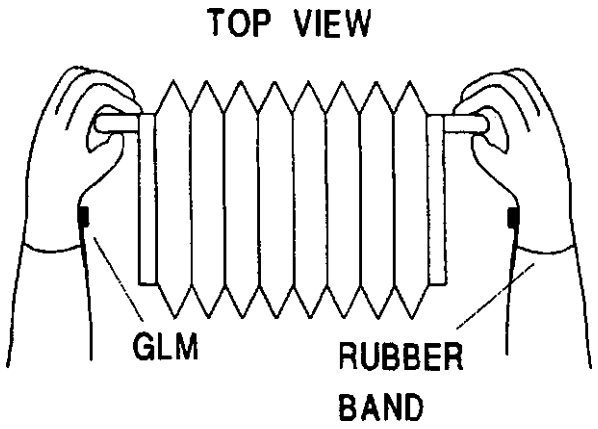


Fig. 1. Concertina miking with GLMs on wrists.

According to Rys, the GLM-100 gives an even pickup and clear sound, but perhaps not enough gain-before-feedback. He substituted the GLM-200 hypercardioid and solved the feedback problem.

PZMS FOR STEREO PIANO

John Hampton is a prominent recording engineer who has worked with such greats as B.B. King, Travis Tritt, Lynyrd Skynyrd, Robert Cray, the Bar Kays, the Gin Blossoms, and many of Nashville's most succesful country artists.

In the November 1997 issue of *Mix* magazine, Hampton described his piano miking techniques:

“A piano was meant to be heard phase-coherently. When you listen to a piano, you’re hearing the piano hammers hitting the strings, and the sound reflecting off the lid and coming to your ear.

“My favorite method is to put two PZMs back to back — just tape them together. I will put them 12 to 15 inches above where the hammers hit the strings. They need to be the kind of PZMs with the high-frequency boost [PZM-6D or PZM-30D]. With those, you never need to EQ the piano.

“[That is one way] that I have recorded piano and consistently experienced the most satisfying results.”

LIVE ROCK RECORDING WITH CM-311As

Recording engineer Mark Darnell played me his tape of a rock band, recorded live to 2-track in the studio. The sound was so tight (free of leakage), I thought it was done with overdubbing. But Darnell had recorded all the instruments and vocals at the same time.

His secret? Use CM-311A Differoid headworn mics on the singers. These mics have so much isolation, there is almost no leakage in their signal. The tone quality of these mics works well with rock production.

Figure 2 shows the studio layout. Three guitar amps were miked with Crown CM-700s, the keyboard was direct, and a PCC-160 captured the kick drum. The keyboardist and drummer sang live through their CM-311A mics. All the musicians monitored each other through headphones.

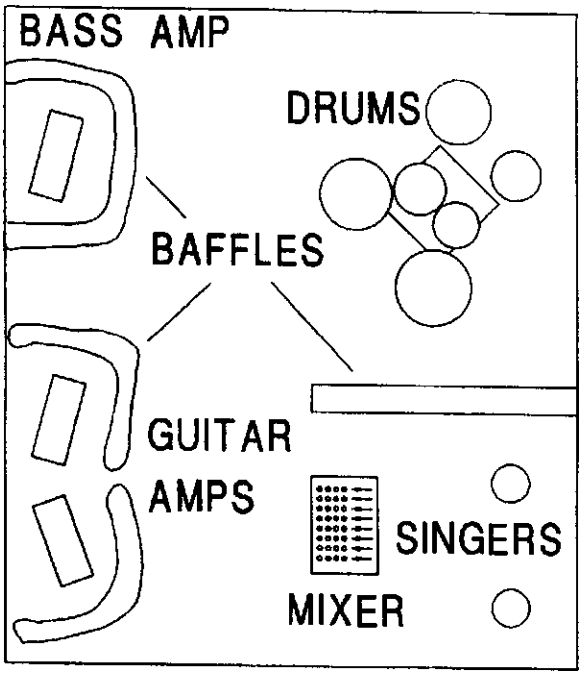


Fig. 2. Studio layout for live recording.

HOW TO AVOID COMB FILTERING

When you’re forced to hang a stereo mic near a ceiling, you might get phase cancellations from ceiling sound reflections. Sound arrives at the mic via two paths: direct from the source, and delayed off the ceiling (Fig. 3). The direct and delayed sounds combine at the mic, causing phase interference and a colored tone quality.

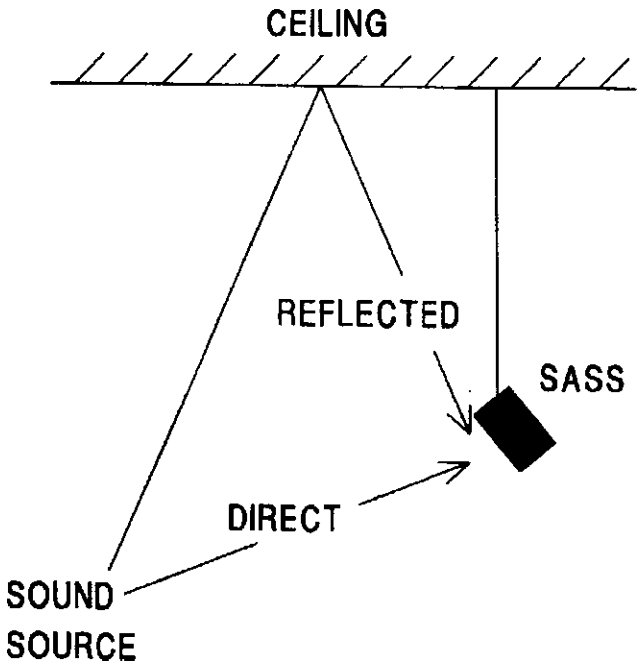


Fig. 3. Ceiling reflections.

Rex Garrett, a sound engineer with Showorks, devised a mic placement near the ceiling that is free of coloration. In one application, he hung a SASS stereo mic 10 feet from the ceiling. The resulting delay from the ceiling reflection is too short to make an echo, but too long to make serious comb filtering. According to Garrett, hanging the mic 10 feet from the ceiling removes the sound of the ceiling.

MIKING A FLUTE RECITAL

Reader Stan Larson wanted to record a recital of a flute and grand piano in a church. His recording machine was a cassette multitracker. Stan said that he wanted to control the relative levels of the two instruments, and asked if we had any miking advice.

One suggested method is to mike the piano and flute up close, and also mike the room for ambience. On the piano, try a PZM-6D taped to the underside of the raised lid. On the flute, use a CM-700 cardioid condenser about 1 foot away, midway between the mouthpiece and tone holes. Aim the "dead" rear of the flute mic at the piano.

Also, place a couple of mics back in the hall to pick up room reverb.

Feed the piano and flute mics to tracks 1 and 2, and feed the room mics to tracks 3 and 4. During mixdown, adjust the balance between the instruments, and mix in the desired amount of hall ambience.

Another method is the usual way of recording classical music: a stereo mic pair several feet out front. Try mounting two CM-700 mics as an ORTF array: angled 110 degrees apart and spaced 7 inches horizontally. Place the mic pair about 4 to 15 feet away — closer for more presence; farther for more hall sound.

That method leaves the balance up to the musicians rather than the recording engineer.

CARRYING CASES FOR CM-311/CM-312 MICS

Crown now offers a storage/travel case for the CM headworn microphones. The new CM-311A and CM-312A models come with the case included. Those who have the older microphones can buy the case from our parts department: Crown Part No. 125127-1, cost $25.00.

INCREASING GLM-100 GAIN-BEFORE-FEEDBACK

David James, an award-winning fiddler and guitarist, came to Crown to explore ways to make his GLM-100 louder through his PA system. (The Crown GLM-100 is a mini omni mic.)

These mic positions worked well:

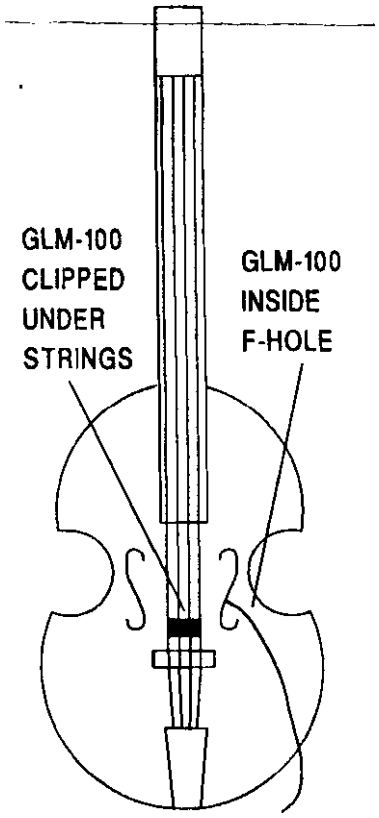


Fig. 4. Fiddle miking with the GLM-100.

Guitar: Attach the lavalier clip to the sound hole. Place the mic under the strings, with the front of the mic looking at the strings. With some bass rolloff, the sound is natural.

Fiddle (natural sound): Attach the lavalier clip to the bridge. Place the mic aiming down at the body about 1/4" away (Fig. 4)

Fiddle (loudest sound): Place the mic inside an f-hole, with the cable wedged into the narrow part of the f-hole (Fig. 4). For cable strain relief, trap the cable under a rubber band stretched around the fiddle. This method needs some EQ to sound natural; try cutting at 100 Hz and 3 kHz.

CM-700 REVIEW

In the Spring 1997 issue of *Tape Op* was this review of the CM-700 cardioid condenser mic:

“I’ve been using this mic for recording the snare during basic tracks and lead-vocal tracks during final overdubs. It’s amazing that one mic could be great on both. It has many other uses too, like for capturing the ugly glory of a death-metal Marshall guitar cabinet, violin overdubs, and Indian hand drums. I find it to be one of the most versatile mics I’ve ever used and sometimes wonder how I recorded without one.”

CLEAR PLASTIC PCCs PROVIDE AUDIO AT OLYMPICS

If you don't see any mics at the Olympic hockey games this winter, they are Crown mics! We were asked to design some "invisible" PCC-type mics that had to withstand being hit by a hockey puck.

Fox TV network had tried Crown PCC-160 supercardioid boundary mics to pick up hockey games. They taped the PCCs to the clear plexiglass barrier that shields the audience from stray hockey pucks. But the mics looked too big. Fox engineers asked Crown to make the mic base of clear Lexan so that the mic would disappear.

Also, Crown added internal braces to strengthen the housing against strikes by hockey pucks.

Phil Adler, a freelance audio mixer, was using clear PCC's for hockey games broadcast by ESPN. This winter in Nagano Japan, Adler will mix the Winter Olympics hockey games using eight of those mics.

"I love these things," says Adler. "On camera all you see is the narrow mic cover; it looks like a black line. You don't even notice it. The mics allow me to get incredible audio. Fox loves them too."

Adler tapes the PCCs to the inside of the hockey-puck barrier with clear shipping tape.

When you watch the Winter Olympics, listen for great sound from mics you can't see.

LETTERS FROM CROWN MIC USERS

SASS-happy

I have been using the Crown SASS-P microphone for several years for live orchestra and for recording. In fact, we are recording the Moller pipe organ in the the fabulous Fox Theatre in Atlanta as I am writing this. The Crown SASS microphone is great.

Jess McCurry, Fox Theatre, Atlanta, GA

Mic vs. Mike

Thank you for your thoughtful and rational discussion of the abbreviation for microphone (Summer 1997 issue). I look forward to other articles relating to standardization and consistency. A key factor in the design of systems and products that meet Human Factors Engineering (Ergonomic) criteria is consistency, and designing to meet the needs, expectations, habits, and performance characteristics of the user.

Andrew D. Keller, CPE, Keller Professional Ergonomics, Longmont, CO

Mic techniques, voice directivity

1. In some future issue, could you show preferred mic locations for instruments? I feel that others, besides myself, would be greatly interested in that subject.

2. Has anyone published a series of patterns showing how a person's voice projects from their mouth at various frequencies? I believe that every audio operator and consultant could do a better job of mic placement if they had such information and could compare it to data on microphones.

Patrick J. Utecht, Satellite Beach, FL

Editor's reply:

1. Crown has published a series of microphone application guides. They are free from Crown or your Crown dealer. Titles include:

*CM, LM and GLM series

*Studio recording

*Boundary mics

*Speech sound reinforcement

*Houses of worship

*Video

*Schools

*Teleconferencing and Distance Learning

2. One source of voice directional patterns is the classic text Acoustics by Leo Beranek. Figure 5 (from that book's Fig. 11.12) shows directivity patterns for the human voice.

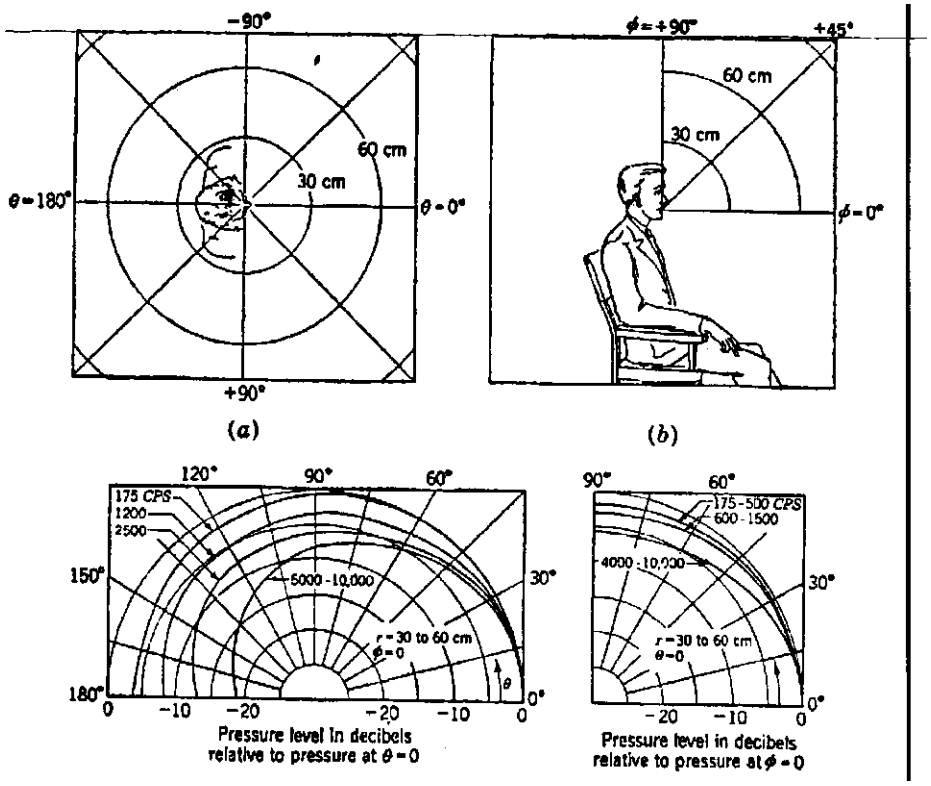


Fig. 5. Voice directivity patterns.

Note that the high frequencies are diminished off-axis to the mouth. So choir mics hung above the mouth should have a rise at high frequencies to compensate. The Crown CM-30 and CM-31 choir mics have such a frequency response.

# # #

MIC MEMO

Spring 1998

Bruce Bartlett, Editor

EASY CHOIR PICKUP WITH MINI BOUNDARY MICS

Crown's tech-support wiz, Mark Chapman, told me about a unique application of the MB-4 Mini Boundary Mic. The MB-4 is a miniature supercardioid mic meant to be used on surfaces.

Here's the application: a church choir had to be situated under a balcony, so the ceiling was low over their heads. There was no place to hang conventional mics without picking up phase interference from ceiling reflections.

The church's sound engineer solved the problem. Using double-sided tape, he attached two MB-4's to the ceiling in front of the choir (Fig. 1). Then he ran the mic cables behind the edging.

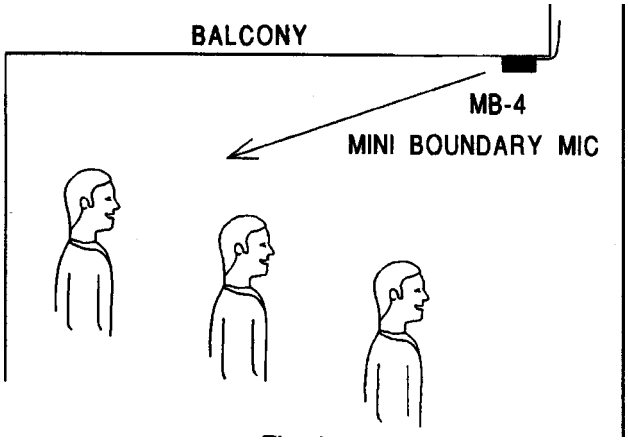


Fig. 1. MB-4 miking a choir under a balcony.

According to the sound engineer, the choir's sound was much louder and more natural than it had been in the past. Plus, the mini boundary mics are invisible in use.

CROWN MICS FEATURED ON GUITAR CD

Will Rogers, a skilled New Age guitarist, used Crown mics exclusively to record his recent CD, *Freeing the Soul*.

To quote his liner notes, "Thanks... for the prototype Crown microphones I beta-tested and could never return — thanks guys for the most impressive mic system for acoustic guitar I have ever recorded — this sound would not have been possible without the stereo GLM-200's and the Crown CM-700 and PZM."

CD album cover

Played with technical virtuosity, Rogers' music is peaceful and meditative. It features acoustic guitar, electric guitar, and percussion.

Rogers sent us the following note with the CD: "The Crown CM-700 and GLM-200 guitar mics (with their EQ disabled) are really terrific. I have been using them exclusively since discovering their intimate tone and clarity. I often use just two GLMs in stereo for the close-mic guitar sound. This album has won an ASCAP award and I feel the Crown mics were definitely a part of that."

The CD, *Freeing the Soul*, # 11-17-1, is available from the labelOversoul Music, phone 213-650-3698 or 213-654-7740.

MAINTAINING YOUR MICS

Chances are you have several great-sounding mics in your collection. You want to keep them in top condition; otherwise their sound can degrade over time. Here are some tips on maintaining your mics so they will always sound like new.

The best maintenance is preventive. If you protect your mics from environmental pollutants, that is the best insurance against loss of performance.

The air is full of contaminants such as dust and cigarette smoke. These can settle on the diaphragm and degrade its frequency response. What's more, breath moisture and humidity can short out the high-impedance parts of condenser mics, causing thin bass or crackles. Let's look at several ways to keep pollutants out of your mics.

Use a pop filter: Although the main use for a foam pop filter is to reduce plosives, the filter also shields the mic diaphragm. Breath moisture and food particles have a hard time making it through the filter.

Caution: pop filters are made of polyurethane foam, which can decay over time. Old windscreens slowly turn to powder which may collect on the diaphragm. Periodically replace old filters with new ones.

Hoop-type pop filters made of nylon fabric also shield vocal mics from mouth particles.

Keep mics covered: If you leave a mic on its stand without a cover, dust settles on the mic capsule and gradually degrades its response. This is easy to prevent. Your mics came with protective pouches or carrying cases. After each session put the mics in their pouches or cases. For long-term storage, put them in a closet or cabinet.

Don't blow on mics: Blowing on a microphone for a mic check is a no-no. Doing so can force particles through the grille screen and onto the diaphragm. In many mics, the diaphragm is made of very thin metal foil. A breath blast can bottom out the diaphragm onto the backplate, causing a spark which can perforate the diaphragm. Ribbon mics are especially sensitive to damage by breath pops. To test a mic, simply talk into it or scratch the grille.

Upgrade older mics: Do you suspect that an older mic does not sound like it used to? Do you have a vintage mic that you want to upgrade? Send it either to the manufacturer, to your mic dealer, or to a person who specializes in vintage-mic upgrades, such as Stephen Paul.

For a nominal fee, the mic manufacturer will run a response curve, check the noise floor, and so on. Then they will replace or clean the mic capsule at their discretion. They will also check the electronics and replace aged components if necessary.

This maintenance takes skill and specialized equipment. Do not attempt to repair the mic yourself, or you may damage it worse than when you started. Usually it is safe to solder on a wire that has broken loose, but other circuit changes are not recommended. Some electronic components might have been selected for tight tolerances or low distortion, so a replacement may not work correctly. Some circuit parts may have been coated to keep out humidity, and soldering them destroys this protective coating.

Mic rentals: If you rent microphones for occasional use, you don't always know what shape they are in. The rental house may have maintained their stock, but perhaps not. Ask.

When do you need service? How do you know whether a microphone no longer has its original frequency response? One way is to compare it to a new mic of the same model number. Set up a talk-test comparison, either live or recorded, and listen for tonal differences between the two mics. Place them the same distance from your mouth and match their levels carefully.

Caution: Two new mics of the same model may sound slightly different due to production tolerances. With most microphones, the response is allowed to vary +/- 2 dB from one unit to the next. But if you hear an extreme difference, it's time to have the microphone repaired.

If you have access to a sound analyzer (such as the Goldline TEF-20), you can measure your mics' frequency response. Test a microphone when it is new and print out a response curve. Then test the

same mic periodically with the same setup to see whether the response has changed. Follow this procedure:

1. If possible, use a coaxial speaker so that all the sound arrives on-axis to the mic.

2. Place the mic on a stand exactly 1 foot from the speaker, on-axis to the tweeter.

3. Place the mic and speaker several feet from the walls, ceiling, floor, and other reflective surfaces.

4. Set the frequency resolution to 300 Hz to keep sound reflections out of the measurement. Then the lowest frequency you can measure accurately is 300 Hz. Ignore data below 300 Hz.

5. Run a frequency sweep and print out the response curve.

NOTE: This curve includes the response of the loudspeaker, as well as the mic. Some software lets you measure the speaker first with a flat omni mic. Then the software subtracts the speaker response from subsequent measurements. This leaves the response of the mic itself.

We looked at some ways to test mics for degraded response, and offered some tips on preventive maintenance. With a little care, your microphones will keep their original performance for a long time.

HISTORY OF THE SASS MICROPHONE

In the summer of ’89, Crown introduced a new kind of stereo microphone that the world had never seen before. It was called the SASS, or Stereo Ambient Sampling System.

SASS-P MKII in use outdoors.

The SASS uses two PZM microphones on small panels, separated by a foam barrier. The two mics are spaced as far apart as our ears, and the foam barrier acts something like a head. So the SASS produces very realistic stereo recordings. If you record an orchestra with the SASS, you can hear exactly where each instrument is located, and you can hear all the ambience and reverb of the concert hall. The SASS also works great for recording sound effects in stereo.

The SASS was invented in 1989 by a recording engineer named Mike Billingsley. He approached Crown about developing and marketing his invention. We worked with Mike to develop the SASS into a professional product.

In the Spring of 1989, a group of microphone people went to the European Convention of the Audio Engineering Society to reveal the news about the SASS mic. We also presented papers on the theory and application of the SASS mic.

To test the SASS, we recorded the London Philharmonic. We also recorded Lenny Kravitz’s drummer, Zoro, and the Indy 500 racecars. Crown put out a demo CD of the SASS.

The current version of the SASS is the SASS-P MKII. It gets a lot of comments at trade shows, not only because it looks unique, but also because it works so well.

EFFECT OF BOUNDARY PLATES ON CONVENTIONAL MICS

Can you improve the rear rejection of a standard microphone by mounting a boundary plate behind the mic capsule? That question was asked by Steven Crispiano, a sound engineer for NBC News. He sent us several types of mics to test, along with some round plexiglass plates ranging from 8" to 10" diameter.

We measured the frequency response and off-axis rejection of each mic before and after adding the plate. Here are the results:

The general effect of the boundary plate on the mics is:

1. Rougher response, especially on axis.

2. More directionality at high frequencies.

3. Less directionality (more omni) at low frequencies.

Here's the effect of the boundary on each mic:

Handheld omni: Much rougher on-axis response due to delayed reflections off the boundary. The boundary is not in the same plane as the mic diaphragm, so delayed reflections off the boundary cause phase interference. The mic becomes more directional from 300 Hz up, especially at high frequencies. It becomes sort of a supercardioid.

Short shotgun: The on-axis response becomes rougher but probably doesn't sound bad because the peaks and dips are so narrow. The 90-degree curve is about the same, but the rear null shifts from 180 degrees to 125 degrees and becomes deeper. The boundary makes the mic a little more directional at the expense of smooth response.

Cardioid dynamic: The on-axis response becomes rougher and the off-axis response becomes worse — more omni. A boundary is not recommended with this mic.

Crown CM-200A cardioid: See Figure 2. The on-axis response becomes rougher. The off-axis response becomes more omni up to 4 kHz, then becomes more directional above 4 kHz (Fig. 2)

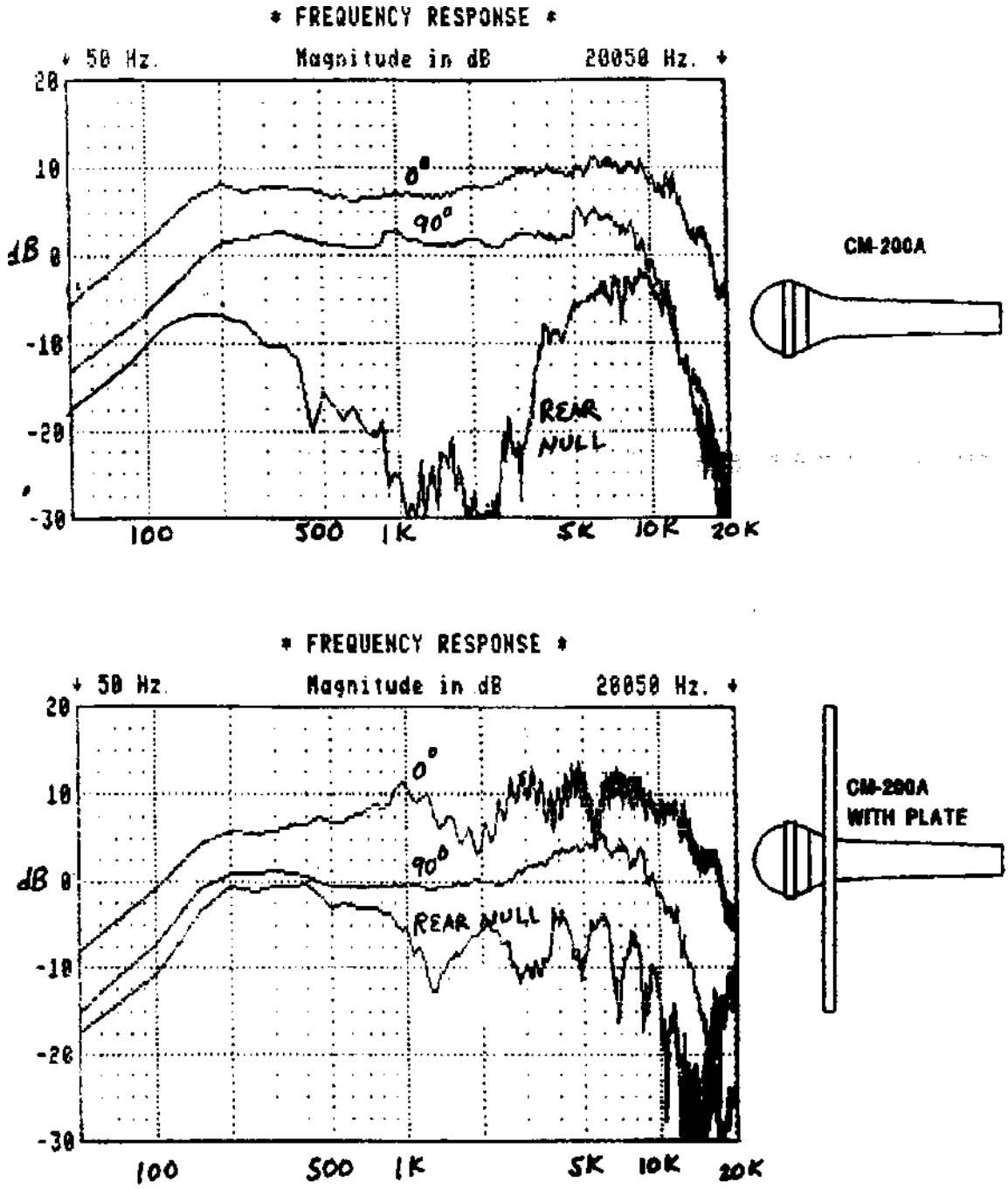


Fig. 2. Crown CM-200A without plate (top) and with plate (bottom).

Summing up, the plate can make an omni mic more directional (for better background noise rejection) at the expense of natural reproduction. The plate makes the shotgun a little more directional, but degrades the performance of the cardioid mics.

LAVALIER MIKING TIPS

A popular way to mike a stage play is with wireless lavaliers and PCC-160 stage mics. Crown's CM-10/E and GLM-100/E lavalier mics are good choices for this application. Here are a few ways to get the best results from them.

CM-10 omni lavalier mic.

*Try to stick with one model of mic for consistency.

*Lavaliers sound much more natural just above the breastbone than at the throat area.

*If the mic is inside a shirt, tape the mic to the shirt to prevent cable noise. Use fresh gaffer's tape or surgical tape.

*Metal-bodied mics can create a shock hazard. The plastic housing of the CM-10 and GLM-100 prevents this problem.

*You can conceal the mic in the knot of a tie. Wrap the mic in toupee tape before hiding it in the tie knot.

*Other places to hide the mic are in a wig, hat, glasses, or in the hair. Be sure to strain-relieve the cable behind the neck.

*To reduce cable noise by several dB, tie a loose knot in the cable a few inches from the mic. Strain-relieve the cable at the collar or belt.

*Ask the actor or actress to help you string the cable through their costume.

*The wardrobe department can make mic belts or pockets to hide wireless transmitters.

*Several layers of clothing can generate noise when they rub against each other. You might ask the wardrobe department to secure the layers temporarily with needle and thread.

*Attend wardrobe pre-production meetings. Tactfully ask whether they can avoid noisy clothing, such as starched, stiff costumes and plastic fabrics.

*Don't store mics with tape on them, because a gooey residue will build up.

*Periodically inspect the connectors and cables. Wiggle them while listening to the mic output.

*Use fresh batteries at each performance. Do not use rechargable batteries because they do not always retain their charge.

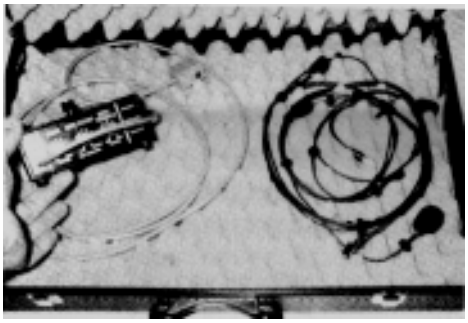
*Low-frequency cut can help reduce breath pops or cable noise. A high-frequency boost compensates for the mic being covered by thick clothing.

# # #

MIC MEMO

Summer 1998
Bruce Bartlett, Editor

CONCERTINA MIKING WITH GLM-100s



Concertina miking system

Rich Rys, a prominent concertina player, shared with us his unique method of miking.

Rys uses five GLM-100 mini omni mics on the instrument. Three mics are on the treble side, two on the bass side. Foam windscreens cover the mics.

Near each mic is a black Delrin plastic rod, 1/2" long and 3/16" diameter. Rys affixes some Velcro there to attach each mic about 1/2" from the concertina grille.

The five mics are fed into a custom mixer with a high-Z input.

According to Rys, the GLMs pick up no key noise and no air-valve noise. The concertina coverage is extremely even and clear, with great dynamic range. Rys reports that the mics are durable. He will purchase a Sabine FBX feedback exterminator to use with the mic array.

SURROUND-SOUND MIC TECHNIQUES

A number of mic techniques have been developed for recording classical music in surround. Let's take a look at some of them.

Delos VR^2 Surround Miking Method

John Eargle, Delos' director of recording, developed their VR^2(Virtual Reality Recording) format. Recordings made with this method offer discrete surround. They also are claimed to sound good in stereo and very good with "steered" analog decoding, such as Dolby Pro Logic.In making these recordings, Eargle uses the mic placement shown in Fig. 2.

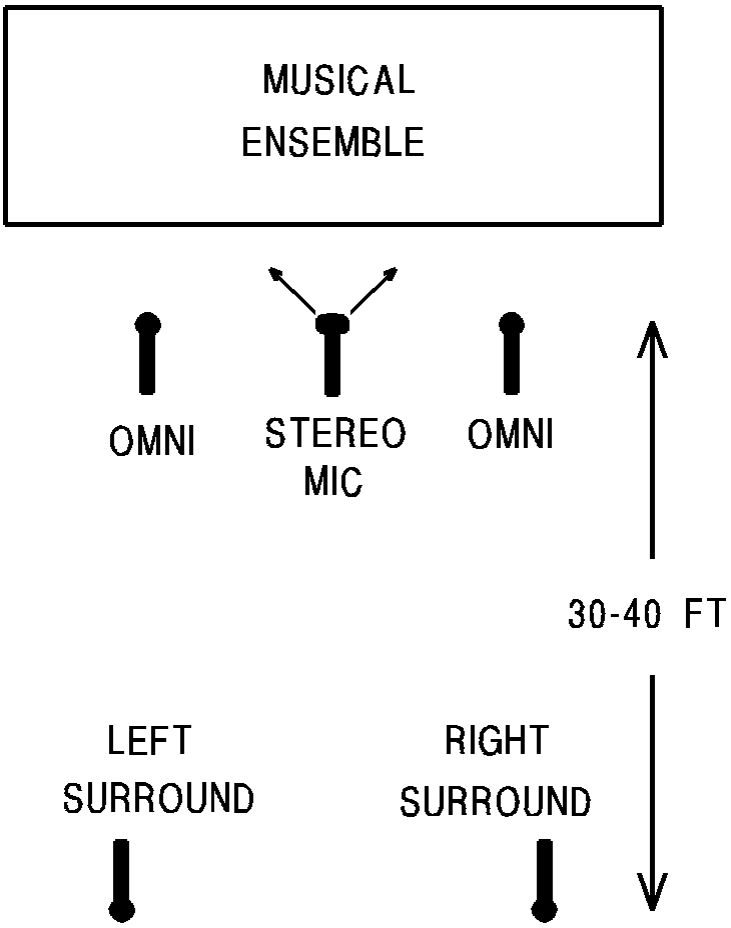


Fig. 2. A Delos surround miking method.

This method employs a coincident-stereo mic in the center, flanked by two spaced omni's typically 4 feet apart. Two house mics (to pick up hall reverb) are placed 30 to 40 feet behind the main pair. (Greater spacing creates an undesirable echo). These house mics are omnis or cardioids aiming at the rear of the hall, spaced about 12 feet apart. There also might be spot mics (accent mics) placed within the orchestra. The mics are assigned to various tracks of a digital 8-track recorder:

1 and 2: A mix of the coincident-pair mics, flanking mics, house mics, and spot mics.

3 and 4: Coincident-pair stereo mic

5 and 6: Flanking mics

7 and 8: House mics (surround mics)

5-Channel Mic Array with Binaural Head

This method was developed by John Klepko of McGill University. It combines an array of three directional mics with a 2-channel dummy head (Fig. 3).

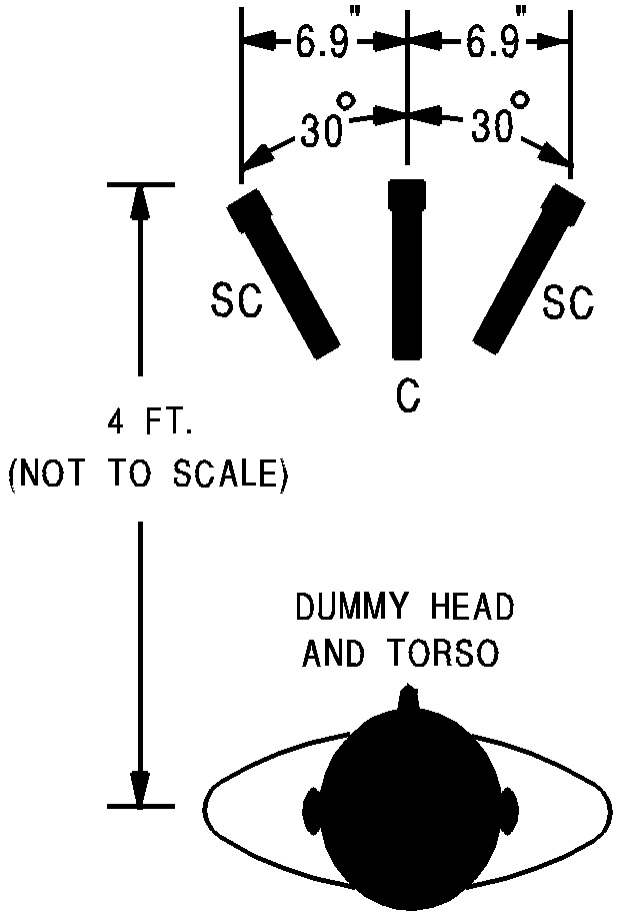


Fig. 3. The Klepko surround miking method.

Front left and right channels: identical supercardioid mics Center channel: cardioid mic Surround channels: dummy head with two pressure-type omni mics fitted into the ear molds. The mics are shock mounted, and have equal sensitivity and equal gains. Supercardioids are used for the front left/right pair to reduce center-channel buildup.

Although the dummy head's diffraction causes peaks and dips in the response, it can be equalized to compensate.

During playback, the listener's head reduces the acoustical crosstalk which would normally occur between the surround speakers.

According to Klepko, "The walkaround tests form an image of a complete circle of points surrounding the listening position. Of particular interest is the imaging betwen +/- 30 degrees and +/- 90 degrees. The array produces continuous, clear images here where other (surround) techniques fail."

"The proposed approach is downward compatible to stereo although there will be no surround effect. However, stereo headphone reproduction will resolve a full surround effect due to the included binaural head-related signals. Downsizing to matrix multichannel (5-2-4 in this case) is feasible except that it will not properly reproduce binaural signals to the rear because of the mono surrounds. As well, some of the spatial detail recorded by the dummy-head microphone would be lost due to the usual bandpass filtering scheme (100Hz-7kHz) of the surround channel in such matrix systems."

DMP Method

DMP engineer Tom Jung has recorded big-band jazz in surround using a Decca Tree stereo array for the band and a rear-aiming coincident stereo mic for the surround ambience (Fig. 4). Spot mics in the band complete the miking. The Decca Tree uses three mics spaced a few feet apart, with the center mic placed slightly closer to the performers. It feeds the center channel in the 5.1 system.

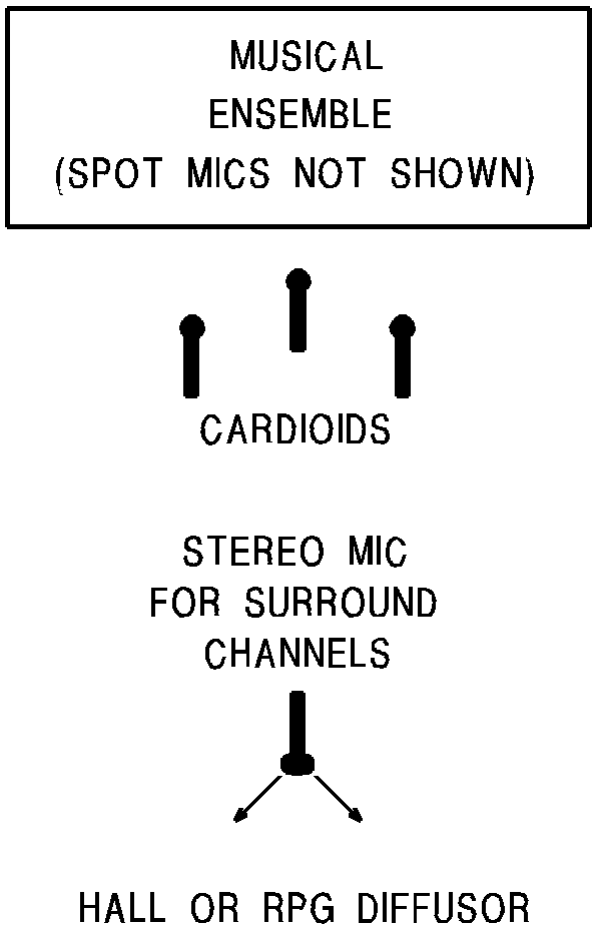


Fig. 4. A DMP surround miking method.

Woszcyk Technique (PZM Wedge Plus Surround Mics)

A recording instructor at McGill University, Wieslaw Woszcyk developed an effective method for recording in surround that also works well in stereo. The orchestra is picked up by a PZM wedge made of two 18"x29" hard baffle boards angled 45 degrees. A mini omni mic is mounted on or flush with each board. At least 20 feet behind the wedge are the surround mics: two coincident cardioids angled 180 degrees apart, aiming left and right, and in opposite polarity (Fig. 5).

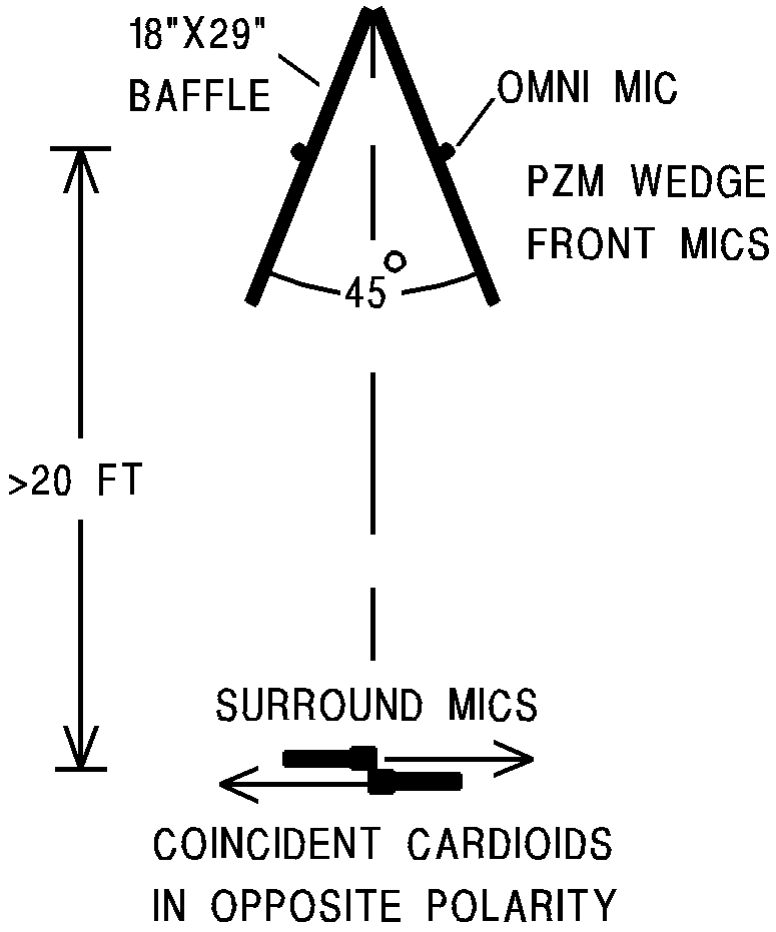


Fig. 5. Woszcyk surround miking method.

According to Woszcyk, his method has several advantages:

*Imaging is very sharp and accurate, and spaciousness is excellent due to strong pickup of lateral reflections.

*The out-of-phase impression of the surround pair disappears when a center coherent signal is added.

*The system is compatible in surround, stereo and mono. In other words, the surround signals do not phase-interfere with the front-pair signals. That is because (1) the surround signals are delayed more than 20 msec, (2) the two mic pairs operate in separate sound fields, and (3) the surround mics form a bidirectional pattern in mono, with its null aiming at the sound source.

If a PZM wedge is not acceptable because of its size and weight, other arrays with wide stereo separation may be substituted. Some Crown mics well suited for orchestra miking in surround are the CM-700 cardioid, CM-150 omni, SASS-P MKII stereo mic, and PZM-6D.

LETTERS FROM CROWN MIC USERS

Clear PCC-160s for hockey game miking

Editor's note: In a recent article we told how PCCs are used to mike hockey games. The mics are taped to the clear plexiglass barrier which protects the crowd from hockey pucks. The PCC base is made of clear Lexan to make the mic less visible.

Clear PCCs: What a great idea! I have also used PCC's when I worked as a freelance mixer for Fox, and would like to expand on your idea. Why not remove the boundary altogether? When you affix the

PCC to the glass, the glass becomes the boundary. Also, color the PCC case/cable a light grey, and you would not see it at all on TV.

Randy Meador, North Phoenix Baptist Church, Phoenix, AZ

Reply:
Thanks for the great idea, Randy. There is a consideration, however. Suppose you remove all of the boundary plate except for the part that holds the mic capsule and circuit boards. Then the mic capsule will be raised about 1/8" from the nearest boundary, which is the plexiglass hockey-puck shield. This spacing will cause some phase cancellation at high frequencies, which will roll off the highs a little. However, this may not be a problem in practice.

Miking audience comments with an overhead PZM [This letter has been paraphrased slightly.]

We recently completed an installation using a Crown PZM-10 surveillance microphone for the council chamber room for the City of Eagle. Eagle is a very nice, upscale town near Boise, Idaho that is currently experiencing an economic boom. The council room already had a sound system consisting of five Crown LM-300 microphones for the council members to use, and one dynamic microphone on a floor stand for the citizens of Eagle to stand and be heard. The mixed signal was fed into the house PA system as well as a recorder used for transcribing the meeting (Fig. 6).

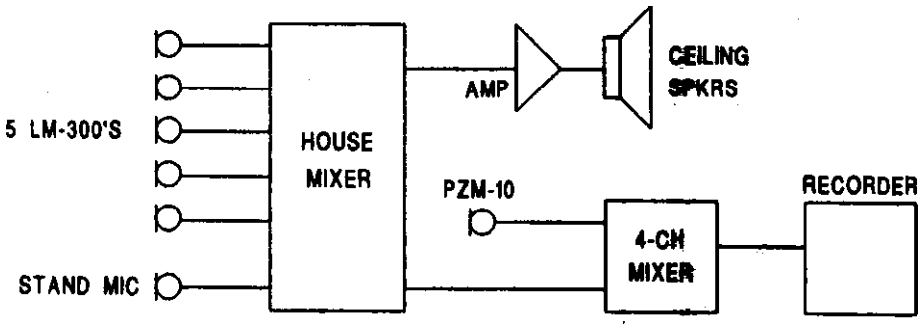


Fig. 6. Council miking system.

However, the mayor and the council members were convinced that a few of the citizens were not comfortable with standing at the microphone and airing their opinions. Some of them had been voicing their opinions from the seating area and not getting their opinions on tape. The City Council wanted to make sure that all opinions were being recorded and taken into consideration.

To accommodate them, we suggested installing two PZM microphones on the ceiling over the seating area. Being concerned with the appearance of the overhead microphones and the use of the citizen's money, they asked if they could get by with just one microphone. We installed one Crown PZM-10 in the center of a 1/4" thick piece of 12" x 12" white acrylic (Fig. 7). Since the ceiling tile in the room is also white and each square measures 12" x 12", the PZM-10 and its acrylic boundary would blend in well.

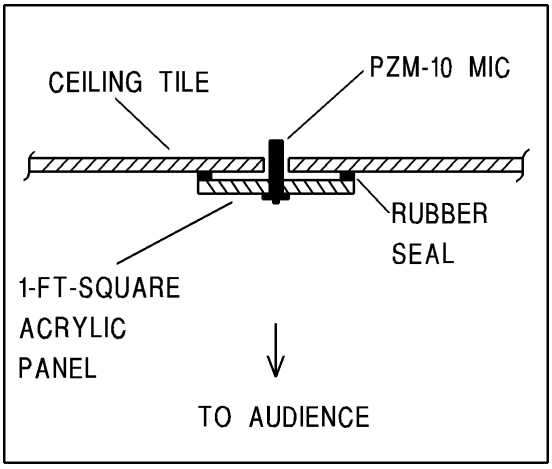


Fig. 7. PZM-10 on a foot-square boundary isolated from the ceiling.

We thought that the PZM might pick up too much sound from the ceiling-mounted speakers, since the microphone now had to be mounted in the center of the ceiling amongst the speakers. To compensate for the lack of coverage, we also felt that we would have to turn up the gain more than we did with two microphones. To avoid those problems and the possibility of feedback, we installed a thin layer of white rubber door seal around the upper edge of the acrylic boundary to insulate it from vibration before mounting it to the ceiling.

As stated before, the house mixer controls all the council mics. We sent the house mixer's aux output to another 4-channel mixer with phantom power. Then on the 4-channel mixer, we mixed in the PZM-l0, and fed this mixer's main output to the recorder (Fig. 6). This way, the PZM-l0 signal was not sent to the house mixer which feeds the ceiling speakers. This worked out well since the city wanted to record only the comments and opinions of the citizens.

The result was a very clear recording of all the citizens from their seats-even those who chose not to speak into the stand-mounted mic in front. The city is very pleased with the performance and the appearance of the installation. So are we. Thanks for making high-quality components and for making it easier for us to please our customers.

Robert S.(Rob) Manwill

QSI Systems, Inc.

# # #

MIC MEMO

Fall 1998
Bruce Bartlett, Editor

CM-700s ENHANCE BASSES IN UTAH SYMPHONY

CM-700

Allen Tucker, recording engineer for the Utah Symphony in Salt Lake City, prefers to use Crown CM-700 cardioid condenser mics on the double basses. "I get very good definition and articulation compared to other mics," says Tucker. "We tried the AKG 391 with a CK-1 capsule, which we were using on strings and woodwinds. I liked the CM-700 much better on the basses."

Tucker notes, "I'm really impressed with the mic, especially considering its price range. I wouldn't mind having a whole truckload of them."

EAR CLIP HOLDS CM-10 LAVALIER MIC FOR THEATER USE

When you run sound for stage plays, you often must wire the actors with wireless mics. The Crown CM-10/E miniature omni is ideal for this purpose. Where can you put the mic so that it is invisible, but picks up well?

Try making the ear-loop clip shown in Figure 1. Find a loop that is used with some earphones. Such earphones might be available from assistive-listening suppliers. Tape the mic cable to the loop, and hook the loop over the ear. The mic becomes hidden in the hair at the temple. Even though the CM-10/E is an omni mic, the gain before feedback and isolation are very good with this mounting.

The mic is invisible because it is hidden in the actor's hair. The cable exits behind the ear, through the hair, down to a belt-pack transmitter.

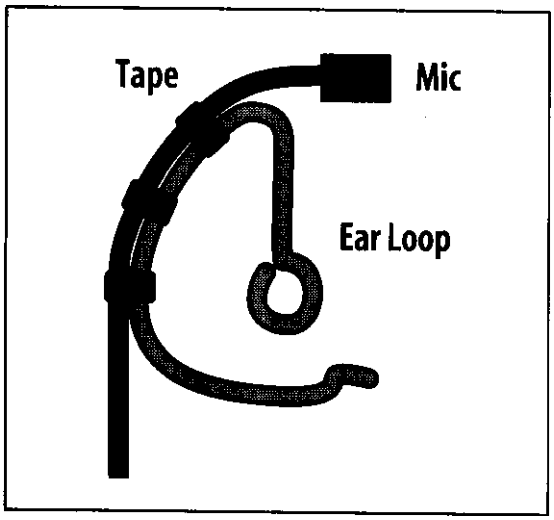


Fig. 1. Ear loop clip for CM-10 mini omni mic.

You may need to boost the highs because of the head's shadowing effect on high frequencies. But watch out for feedback.

To prevent sweat from reaching the microphone along its cable, wrap some sponge material around the cable.

The source of this information was an article in the Alpha Sound & Lighting Co. catalog, supplied by David Glass of Crown.

CUSTOMIZE YOUR PZM-185

Did you know that a piece of foam can act as an acoustic equalizer? You can modify the high-frequency response of a PZM-185 microphone by putting a piece of windscreen foam between the mic capsule and the boundary "paddle."

The PZM-185 normally has a peak in its response around 11 kHz to compensate for being off-axis to the mouth in conference applications (Figure 2, solid line). But if you want the mic to have a flatter response for music recording, you can change it.

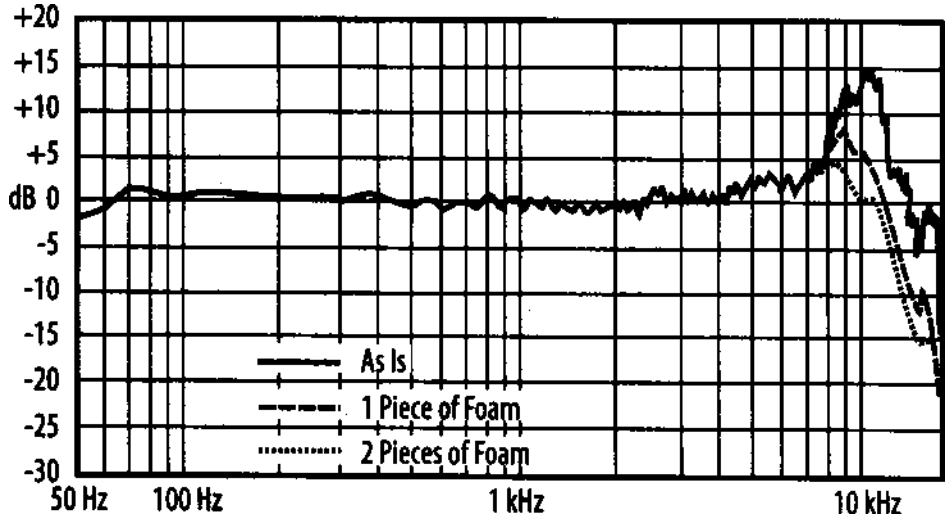


Fig. 2. Effect of adding foam to PZM-185.

Find a foam windscreen, and cut out a piece about 1/8" thick and 3/8" square. Pry the boundary paddle off the PZM. If you hold the PZM upside down, you'll see the mic capsule near the front of the mic. Lay the foam piece on the mic capsule and replace the paddle.

Now the PZM-185 will have a response something like the dashed line in Figure 2. To get the response shown in the dotted line, stack two pieces of foam.

NEW LM-201 LECTERN MIC IGNORES THUMPS

LM-201

Crown is happy to introduce the LM-201 lectern mic with internal shock mounting. The mic capsule "floats" in a soft rubber suspension, which isolates it from mechanical vibrations such as thumps and handling noise.

Featuring a new low-noise mic capsule, the LM-201 is intended for use on lecterns, pulpits, and similar applications. Its unique ball-and-socket swivel lets it be adjusted without any creaking — unlike the old-style goosenecks. Swivel motion is limited to prevent cable damage.

The microphone is easily installed with wood screws or bolts. It is rugged, and is built to withstand daily abuse.

Because of its supercardioid pickup pattern, the LM-201 rejects background noise and reverberation, and improves gain-before-feedback, more than a cardioid mic.

The LM-201 has a smooth, wide-range frequency response for natural reproduction of the voice. Low frequencies are filtered out to reduce pickup of lectern thumps, room rumble and breath pops.

The included wire-screen grille has an internal pop filter to reject explosive breath sounds. An external foam windscreen is supplied for extra pop filtering or for outdoor use.

CM-700 PERFECT FOR PIANO

The following note was posted on the Internet:

"Finally, I saw this on a concert broadcast on PBS and it sounded great. They had two small-diaphragm condensers (Crown CM-700, Neumann KM-84, etc.) in an X-Y patttern clamped in the center of the frame. I have since used this technique a couple times with great results."

-Bob L.

"I agree. I had great results with the jazz group ICU miking the piano with 2 Crown CM-700s. I don't see them on stages too often around here, I guess they're just too inexpensive to make it on a rider... :) "

-Michael Kivett

At the Elkhart Jazz Festival, your Mic Memo editor used two CM-700s on grand piano for P.A. The mics were about 8 inches horizontally from the hammers and 8 inches above the soundboard, angled down to aim at the hammers (Fig. 3). One mic was over the treble strut and one over the bass strut. The lid was on the high stick.

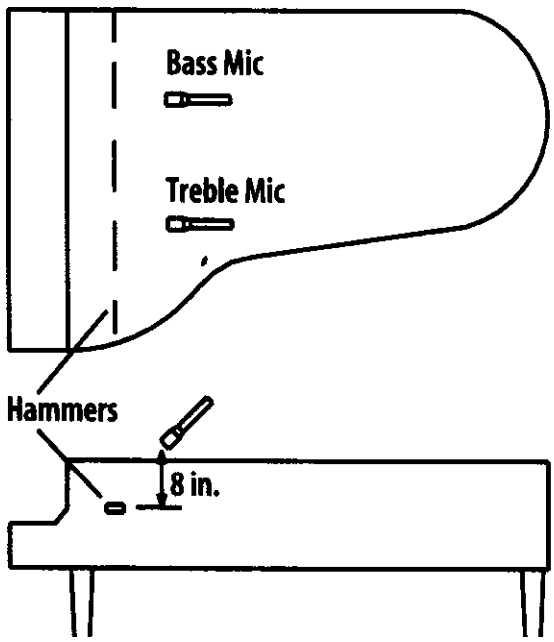


Fig. 3. A piano miking technique.

Isolation from other instruments was good, and the tone quality was natural. A slight EQ cut at 250 Hz reduced the tubbiness from lid reflections.

PZM-10LL LINE LEVEL SECURITY MIC

PZM-10LL

Designed for security and surveillance, the new PZM-10LL features a line-level output. This Pressure Zone Mic resembles a light switch so it disappears in use. Its tubular housing mounts in a hole in a ceiling panel, wall or table.

The microphone has a balanced, line-level output from its “pigtail” 1-foot cable. Powering is by 12 to 24V DC.

In the PZM-10LL, low frequencies below the voice range are rolled off to reduce pickup of air-conditioning rumble. The high-frequency response is boosted to help articulation. Because of its tailored response and PZM construction, the PZM-10LL picks up conversation or other desired sounds with extra clarity and definition.

FOAM WINDSCREENS HAVE LITTLE EFFECT ON RESPONSE

When you put a foam pop filter or windscreen on a microphone, does the mic's frequency response change? Figure 4 shows the answer. In Figure 4 (top), adding a 2-inch diameter foam windscreen to a Bruel & Kjaer lab mic has no effect under 10 kHz. The highs roll off about 1.5 dB at 20 kHz.

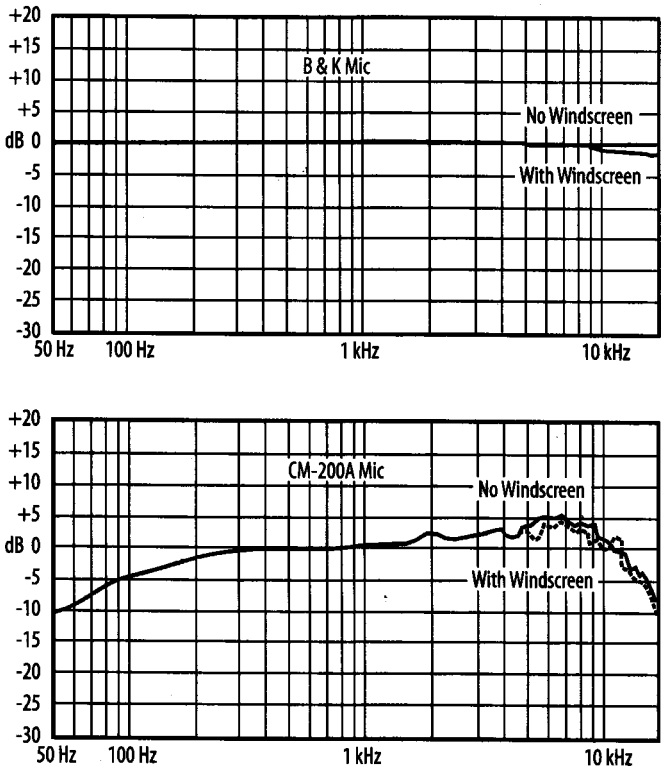


Fig. 4. Effect of foam windscreen on B&K mic (top) and CM-200A (bottom).

Figure 4 (bottom) shows how a foam pop filter affects a Crown CM-200A handheld mic. The response drops 1 dB from 6 kHz to 18 kHz.

So, while foam windscreens tend to attenuate the highs, the effect is not serious.

SILENT SWITCHING OF CM-311HS

Bill Cowgers, an audio engineer who works with remote TV trucks, came up with a clever way to silently switch a CM-311HS to two destinations: to the producer, or to the on-air feed.

Each mic (without electronics) is connected to two CM-311HS circuit modules. To switch the mic from on-air to producer, he mutes one circuit and unmutes the other. No switching pops.

EFFICIENT MIC CHANGES AT FESTIVALS

Mic changeover between acts

Many of you are doing sound reinforcement or recording at music festivals. A major part of these jobs is changing the mic setup between acts. If this is not done right, the changeover can be slow and confusing. One engineer I know ended up with a big ball of tangled mic cables by the end of the gig!

Here are some tips on changing the mic setup efficiently between acts.

If possible, have a production meeting at least a day before the gig. Invite all the mixers, stage crew, and recording personnel. Make it clear who will serve as the head engineer, responsible for the final say. Specify who will provide which equipment, who will handle mic changes, monitors, etc.

Ideally, obtain stage plots for the bands ahead of time. On these plots, write each mic's placement and model number. Give a copy of the plots to FOH, monitor mixer and stagehands.

Some engineers use an overhead projector backstage to project an acetate of the next band's stage plot. Aim a small video camera at the image and send the feed to FOH and the monitor mixer. There, small video monitors show the setup.

Give the stagehands walkie talkies or wireless intercom headsets. At least use standard hand signals so they can communicate with the FOH person. A single wired intercom is an option. But it may not work as well because there is only one person on stage trying to relay the instructions.

Make sure each stagehand is responsible for a particular set of mics, unless you have a crew that is used to working together.

Offstage, have a set array of mics on booms with coiled cables. You can pull them out when needed. Keep some mini omni mics (lavaliers) offstage to use on acoustic guitars or fiddles.

Label each mic-cable connector with a number that corresponds to its input. Put the same number on both ends of the cable. You might number the mics from left to right, and plug them in so the mic on the left of the stage is on the left side of the console.

For mic assignments that won't change from act to act, label the mic stands according to their instruments and/or channels.

Changing drum mics between acts is too time-consuming. Get one good drum kit, set it up properly before the show, and make everyone use it. Drummers often bring their own cymbals and kick-drum pedals, however. You might also have a single bass amp that all the bass players use.

Pre-set the drums and backline amps on a low and sturdy rolling riser or two so that the swap can go faster.

When you can pick up an instrument direct, do so. The sound may not be as good as from a micro-

phone, but the setup is easier and leakage is eliminated. If you're using hand signals to the stage-hands, be sure you have a signal that means "flip the ground lift on the DI."

Decide on the snake and console channel assignments ahead of time. Allow enough room on the console to accommodate the largest group that will play that day (within reason). For example, if one band has two bass inputs and one stereo guitar, and another has one bass and three mono guitars, have enough channels for each without repatching: 2 bass and 3 guitar channels.

For an acoustic folk festival, you might try the following setup: Assign instrument mics to odd-numbered channels, and assign vocal mics to even-numbered channels. Keep the instrument and vocal channels for each person next to each other on the console.

When the first band comes on, if you have no stage plot, ask them what instruments and vocals will need mics. Take notes. Write up a channel-assignment list and place it next to the snake box. Contact the FOH person and read off the list, or write a second list and run it up to FOH. Place mics and plug in cables according to the list.

Here's a sample channel-assignment list:

1. Bass DI
2. Kick Crown PZM-30D
3. Snare Crown CM-200A
4. Rack tom CM-200A
5. Rack tom CM-200A
6. Floor tom CM-200A
7. Drums overhead left Crown CM-700
8. Drums overhead right Crown CM-700
9. Lead guitar CM-200A
10. Rhythm guitar CM-200A
11. Keyboard mix DI
12. Lead vocal CM-200A
13. Bass player vocal Crown CM-311A
14. Keyboard player vocal CM-311A

The FOH mixer should solo each input over headphones to make sure it is working and free of buzzes and crackles.

Ask the band members where they want their monitor speakers to go. Also ask what they want to hear in their monitors, and how many monitor mixes they need. Relay this information to FOH.

To keep the stage uncluttered, put out only as many mics as the band needs. Keep the rest in the wings.

As soon as one act ends, the FOH mixer should turn down or mute the master faders and monitor-send faders. Pull all cables from the snake. Pull each mic/stand/coiled cable to the back or edge of the stage. This keeps the stage clean and keeps the coils untangled. Don't move mics from one instrument to another: this can tangle the cables very quickly.

Some engineers prefer to leave the mic cables plugged into the snake. Between acts, unplug each mic. Pull the mics/stands to the back or edge of the stage. Pull the cables back to the snake and coil them neatly, side-by-side and in numerical order. While the next act is setting up, reset the mics where they are needed and rerun the cables.

If you collect all the mics between each act, this helps you account for all the mics.

To sum up: Plan ahead, maintain communications, and clear the stage between acts.

Many thanks for these tips from the following sound people on the Internet: Glenn, Scott Dorsey, Fletcher, Jon Best, Mark Donnelson, Shiva, Eric Handler, Michael Knowles, Scott Fraser, and Paul Tumolo.

# # #

MIC MEMO

Winter, 1999
Bruce Bartlett, Editor

SOUNDMAN USES 22 CM-700 MICS

CM-700

“They’re great,” said Anthony Andorfer of D&L Communications. He’s a soundman for his local school and church. “We started out with two CM-700s. We couldn’t believe they were so good, so we got twenty more.”

Anthony uses the CM-700 cardioid condenser mics on everything: piano, acoustic guitar, flute, choir, handbells, and so on. “It works really well on grand piano. I use three mics per piano.”

To pick up stage plays in the school gym, Anthony employs ten CM-700s on desk stands. The mics are spread across the 70-foot stage. He sets each mic’s bass-tilt switch to “low-cut,” which filters out rumble.

SASS RECORDS SOUND EFFECTS FOR PLAYSTATION GAME

The Crown SASS-P MKII was used to record realistic sound effects for NBA Shootout 98, a simulation/arcade basketball game for the PlayStation. The audio team’s goal was to create NBA-quality sound to complement this popular title.

The recording process is described by Chuck Carr, a composer/sound designer/audio engineer at 989 Studios in San Diego, Calif. (formerly Sony Interactive Studios America).

“We used a Crown SASS-MKII microphone to record stereo/binaural sound effects... Binaural audio works exceptionally well for ambient environmental sounds and one-shot sound effects.”

“We decided to rerecord the sound effects from SHOOTOUT 97 and add some incredible 3D stereo samples into the mix, such as ambient room basketball bounces and shoe squeaks. We knew what kinds of sounds we were looking to get before we started recording and discovered some great audio nuggets such as shoe stomps, grunts, and springy basketball rims after istening to the finished recording.”

“We rented a local gymanasium for two hours to record our assistant producer and his brother playing basketball.” The SASS recorded the big 3D sounds, like dribbling, shoe squeaks, rim hits, etc.

Source: *Game Developer* magazine, Sept. 1998.

“STOMP” PERCUSSION SHOW RELIES ON PCCs

PCC-160

The Broadway musical “Stomp” is a remarkable musical performance done in pantomine. All the music is played with homemade percussion instruments: trash can lids, hubcaps, garbage bags, plastic tubes, push brooms, and so on. It is a highly entertaining, original production.

To pick up the sound of all these instruments, sound engineer Jimmy Acecedo uses up to 30 mics deployed all over the stage. His main mics are four Crown PCC-160s (supercardioid boundary mics).

Jimmy covers the mics with Saran Wrap to waterproof them from the water-bottle antics on stage.

Figure 1 shows the frequency response of a PCC-160 as is. Figure 2 is with limp Saran Wrap covering the mic. Figure 3 is with tight Saran Wrap.

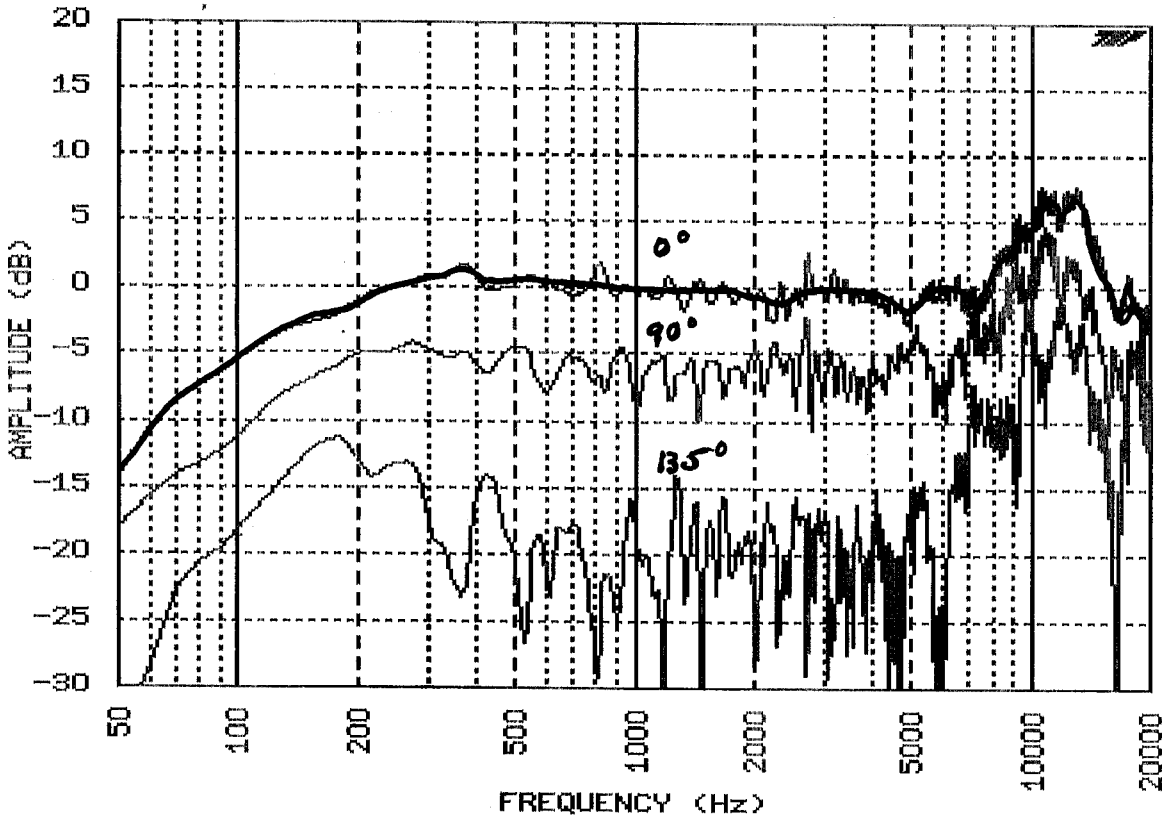


Fig. 1. PCC-160 as is.

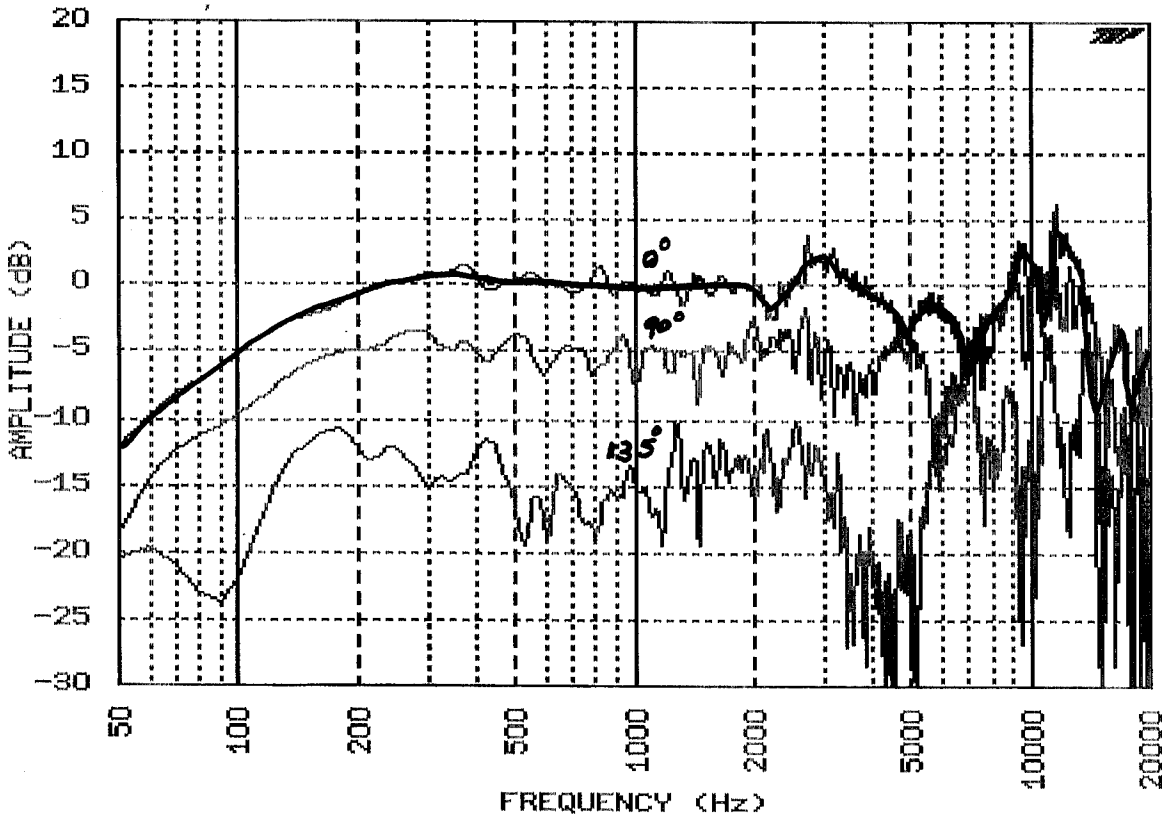


Fig. 2. PCC-160 covered by limp Saran Wrap.

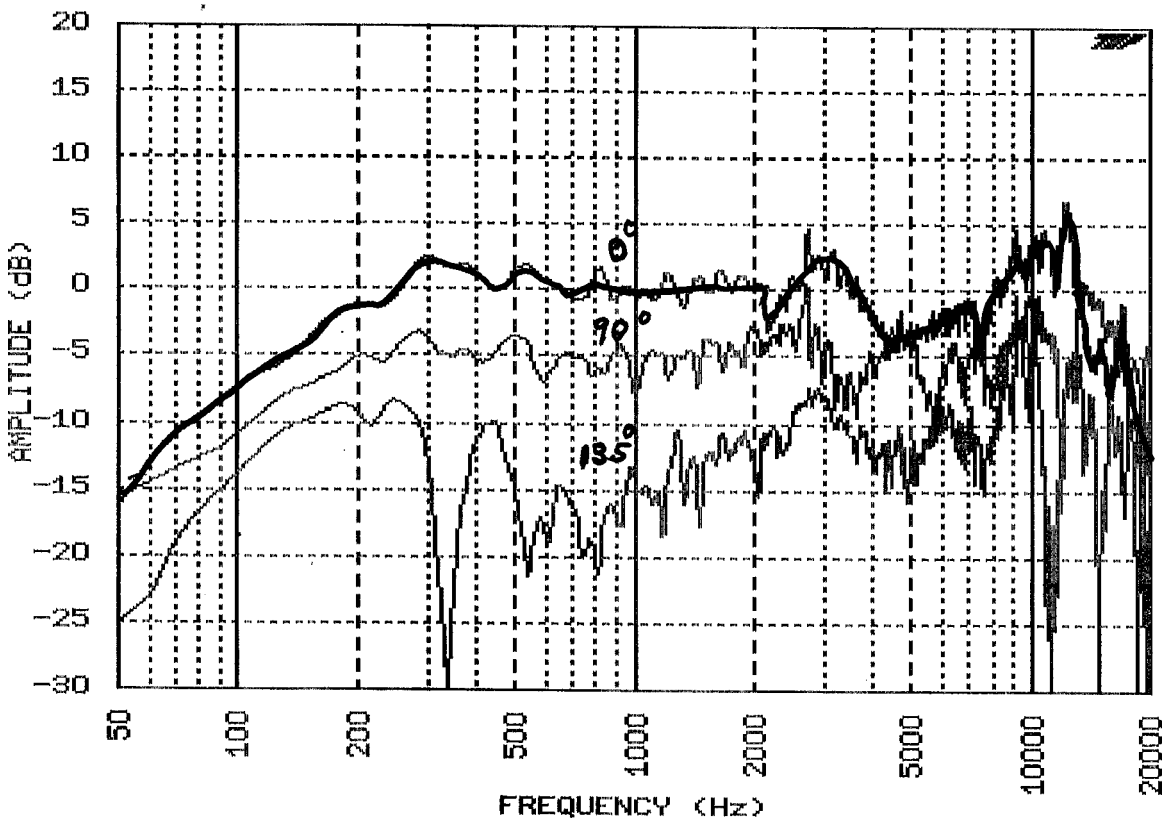


Fig. 3. PCC-160 covered by tight Saran Wrap.

Limp Saran Wrap creates a 3 dB loss in the upper mids, and reduces the rear rejection between 200 Hz and 3 kHz. Tight Saran Wrap also creates a 3 dB loss in the upper mids, reduces the bass by 2 dB at 100 Hz, and gives much less rear rejection from 50 Hz to 6 kHz. Clearly, it's better to leave the Saran Wrap limp rather than stretched. The Wrap is more acoustically transparent when loose.

UNIQUE GLM PIANO-MIKING METHOD

Tom George, a sound engineer for 8th Day Sound, invented an unusual technique for miking grand piano. It uses two GLM mics taped PZM-style to the underside of the raised lid.

Over the treble strings is a GLM-100 mini omni mic. Over the bass strings is a GLM-200 mini hypercardioid mic. The front of each mic faces the piano lid. According to George, the GLM-200 gives a sound with more bass than the GLM-100.

TRY AN MB-4 FOR E.N.G.

MB-4 mini boundary mic

Want an easy way to mike a press conference? Try an MB-4 Mini Boundary Mic. It's a tiny, rectangular, surface-mounted microphone. Just stick it on a table or lectern in front of the person speaking. No messing with mic stands. Plug the mic into a DAT recorder with phantom power, hit record, and there's your news recording.

LETTERS FROM CROWN MIC USERS

SASS on CD

A concert I recorded using the SASS-P MKII has been released by Newport Classics. It is a program of music by the American composer Charles Griffes and includes some premiere recordings.

I lent the recording to a friend. Upon hearing it, he immediately ordered the SASS-P MKII for himself!

Joe Stanko

New York City

# # #

MIC MEMO Spring 1999 Bruce Bartlett, Editor

THIS MIC'S ALL WET

Crown is happy to introduce the PZM-11LLWR: a water-resistant Pressure Zone Microphone with a balanced, line-level output. A plastic membrane inside the microphone protects the mic capsule from water damage. The mic mounts in a standard electrical outlet box.

Applications include fast-food restaurants, outdoor intercoms, toll booths, bridges, state park nature centers, theme park security, home automation, and so on.

The microphone can be plugged directly into a VCR line input -- no costly mic preamp is needed. Output (via screw terminals) can be balanced or unbalanced. Powering is by 24V AC or 12-24V DC. The unit can be factory-set for phantom powering by special order.

In the PZM-11LLWR, frequencies below the voice range are rolled off to reduce traffic rumble. The high-frequency response is boosted to help articulation. Because of its tailored response and PZM construction, the PZM-11LLWR will pick up conversations or other desired sounds with extra clarity.

The unit is "water resistant," which means:
*The microphone will work during and after rainfall.
*The mic's frequency response will change temporarily if the membrane gets wet, but will return to normal when dry.
*If water freezes on the membrane, the mic's frequency response will change, but will return to normal when the ice melts and the membrane dries.
*High-pressure water sprays directly on the membrane (through the louvered wall plate) may damage the membrane.
*The microphone is not designed to be submerged.

Specifications

Transducer type: Electret condenser.
Frequency response (typical): 80 Hz to 10,000 Hz
Polar pattern: Hemispherical.
Equivalent noise level (self-noise): 26 dB SPL typical,
A-weighted.
S/N Ratio: 68 dB at 94 dB SPL.
Maximum SPL: 100 dB SPL produces 3% THD at maximum gain.
Operating temperature range: -10 to +60 deg. C, 14 to 140 deg. F.
The mic still works at -40 deg. C but its sensitivity is reduced.
When the mic is returned to normal operating temperature, its
sensitivity will be within +/- 3 dB of normal.

STEREO GUITAR MIKING SOUNDS SO REAL!

Doug Krehbiel, a recording engineer in Newton, Kansas, offers an effective method for miking an acoustic guitar:

Start with two CM-200A mics (cardioid condensers) and mike the guitar in stereo. Realism is greatly enhanced by stereo miking.

As shown in Figure 1, one CM-200A aims at the bottom of the bridge from 9 inches away. It is angled in about 45 degrees and is about 25 inches from the floor. The second CM-200A is chin height. It aims at the "sweet spot" where the neck joins the body, from 11 inches away. This mic is about 3 feet off the floor and is angled in about 45 degrees.

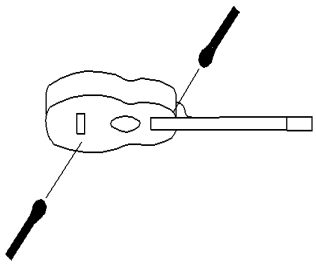


Fig. 1. Suggested method for miking a guitar in stereo.

Doug says, "When I used this technique, the guitarist said, 'It sounds just like Nashville!'"

FISHING WEIGHT STRAIGHTENS CHOIR-MIC CABLE

Crown rep Daniel Casada relayed a dealer tip to us. When hanging a CM-30 or CM-31 choir mic, put a 6-ounce fishing weight on the cable. Attach the weight just behind the microphone.

This extra weight straightens the mic cable when the microphone hangs. It also angles the mic more toward the choir.

Thanks to Crown's Mark Chapman for this information.

JANET JACKSON TOURS WITH CM-311 HEADWORN MIC

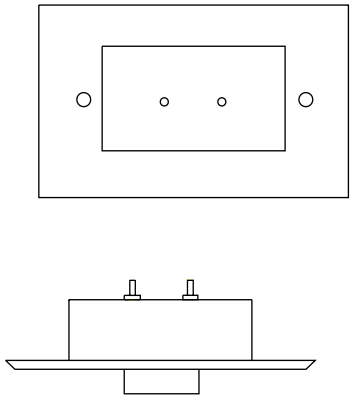
On her 1998 tour, superstar Janet Jackson used a Crown CM-311 headworn mic (now the CM-311A). It was mounted on a custom boom which comes up under Janet's chin.

Since her show included so much dancing, a headworn mic was a must. FOH engineer Robert "Cubby" Colby chose the CM-311 because, in his words, it's "The ONLY headset mic." Special tape was used to hold the mic in place because Janet perspires from dancing.

We're proud that major performers like Janet Jackson and Garth Brooks prefer the Crown CM-311A.

Source: Dec. 1998 Pro Sound News.

PZM-11 WALL MIC IDEAL FOR HOME AUTOMATION



Imagine that you're sitting in your living room, and the room feels cold. You simply say, "Temperature: 70." A mic picks up your voice and sends it to a sound card in your computer. Software recognizes your command. A controller tied to your computer turns on the furnace and sets the thermostat to 70 degrees.

This is an example of a home automation or voice-command system. It includes a microphone in each room, a mic mixer, your computer, and a controller. A typical model is the Home-Voice™ Multi-Room Kit by applied Future Technologies, http://www.appliedfuture.com/MultiRoom.html.

Because the PZM-11 typically costs little and mounts easily in an electrical outlet box, it is ideal for such a system. Other choices are the PZM-11LL (line level), PZM-10 and PZM-10LL.

CROWN SASS-P MKII STEREO MICROPHONE ENHANCES JEWEL'S IN-EAR MONITOR MIX

A Crown SASS-P MkII stereo condenser microphone enhanced the in-ear monitor (IEM) mix for singer-songwriter Jewel during a series of recent concert touring dates.

Eighth Day Sound, a touring company based in Cleveland, supplied the Crown SASS-P to Colm O'Reilly, Jewel's long-time monitor engineer. With a unique, patented design based upon Crown's PZM Technology, the SASS-P provides precise and realistic sound that accurately conveys the ambient environment, creating well-focused natural stereo imaging.

O'Reilly began utilizing the mic during Jewel performances on the Lilith Fair tour, clamping it to the front lighting truss at the halfway point, about 10 feet downstage of her normal stage position. Pointed toward the audience, the SASS-P captured crowd ambience, which was then blended into Jewel's stereo IEM mix.

"The SASS delivered impressive gain and a flat response," O'Reilly notes. "Rarely did we need to apply any equalization, except in extreme acoustic environments, where the top end was rolled off a little bit."

Based upon this successful evaluation period during Lilith Fair, O'Reilly then employed the SASS-P throughout a subsequent three-week tour. He adds that this approach stands in contrast to the typical method employed for capturing crowd ambience, which involves placement of microphones at stage left and right (either flown or on stands). These mics generally pick up only the chatting noise of the people in the extreme nearfield, while at the same time, they tend to produce resonance not consistent with the stage and venue.

"We were able to achieve very good response with this approach, based around the SASS. It sounded just as if she were standing between two PA stacks in a normal concert situation, without the isolation of in-ear monitors," O'Reilly explains. "Jewel just loved the sound and mix we were able to create."

Thanks to Crown's Bob Lichty for this information.

POOR MAN'S BASS TRAP

If you play an amplified bass guitar through a speaker in a room, and do a bass run up the scale, you may hear some notes that boom out in the room. The room is resonating at those frequencies. These resonant frequencies, which are strongest below 300 Hz, are called room modes or normal modes. They occur in patterns called standing waves. Room modes can give a tubby or boomy coloration to musical instruments and voices recorded in that room.

Mic techniques can help. Here's how. Standing waves are patterns of sound-pressure buildup in the room. At certain points in the studio, the resonances are strong; at other points, there are nulls: areas where the resonances are weak. You can use this fact to your advantage. When recording a vocal, move the mic around to find a null spot where the sound is not boomy. Record the vocal there.

PHANTOM POWER AND BIAS VOLTAGE: IS THERE A DIFFERENCE?

The following article was submitted by Mike Petterson from Shure Brothers. Thanks, Mike!

Many users of professional audio equipment believe there is no difference between phantom power and bias voltage. Not true! Phantom and bias are not interchangeable. This article explains the differences between phantom and bias, and addresses common misconceptions.

Phantom power (Figure 2) is a dc voltage (11-48 volts) which powers the preamplifier of a condenser microphone. Phantom power is normally supplied by the microphone mixer, but may also be supplied by a separate phantom power supply. Phantom requires a balanced circuit in which XLR pins 2 and 3 carry the same dc voltage relative to pin 1. So if a mixer supplies 48 volts of phantom, XLR pins 2 and 3 of the microphone cable each carry 48 volts dc relative to pin 1. Of course,the mic cable carries the audio signal as well as the phantom voltage.

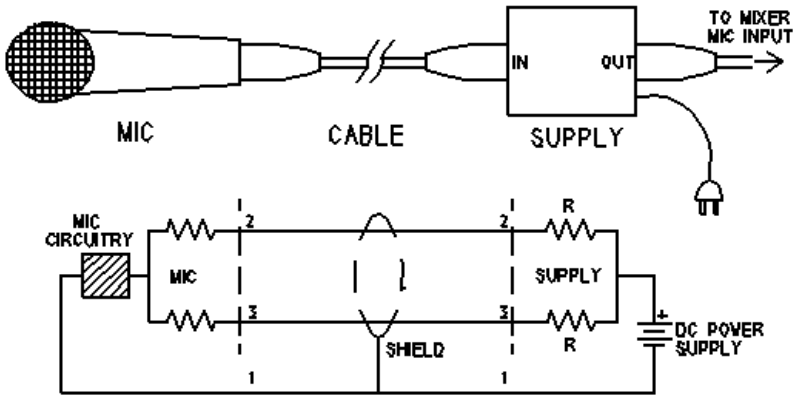


Figure 2. Phantom power.

Mixers that supply phantom power contain current-limiting resistors which act as control valves. If the microphone or cable is improperly wired, these resistors limit the flow of current to the microphone and thereby prevent damage to the phantom-supply circuit.

A balanced dynamic microphone is not affected by phantom power. However, an unbalanced dynamic microphone will be affected. Although the microphone will probably not be damaged, it will not work properly.

Bias (Figure 3) is a dc voltage (1.5-9 volts typically) that is provided on a single conductor. Unlike phantom power, bias does not require a balanced circuit. Bias supplies power to a Junction Field Effect Transistor (JFET) connected to the output of an electret condenser mic element. The JFET acts as an impedance converter which is a necessity in any microphone design that uses a condenser element. A condenser element has a high output impedance (>1,000,000 ohms). The JFET input loads the output of the condenser element with an even higher impedance (>10,000,000 ohms) to minimize loss of signal level. Also, the JFET output provides a low source impedance (<1,000 ohms) to feed the microphone preamplifier.

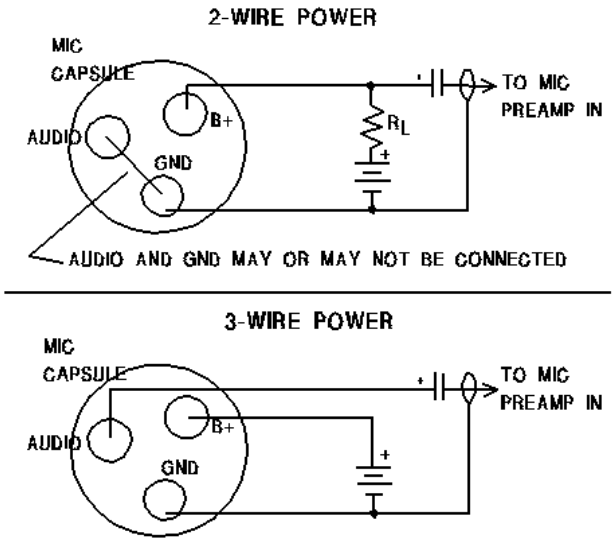


Figure 3. Bias applied to a microphone capsule.

In some condenser microphones, the bias voltage must be supplied on the same conductor as the audio. Condenser elements with a built in JFET use this configuration and employ a single-conductor shielded cable. Other condenser microphones utilize separate conductors for bias and for audio. Consult the manufacturer's data sheet to find out the exact wiring configuration.

A dynamic microphone should not be connected to an input that supplies bias voltage (such as a wireless transmitter) because the audio and the bias voltage will travel down the same conductor. If this occurs, the frequency response of the microphone may be altered or the audio signal distorted. If a dynamic microphone must to be connected to an input with bias voltage, a blocking capacitor must be used. The blocking capacitor is placed in series with the hot conductor of the microphone. The capacitor passes the audio that is present on the hot conductor while blocking the dc bias voltage. The capacitor must have enough capacitance to pass the audio signal without degradation. The exact value depends upon the electronic characteristics of the microphone circuit and must be calculated for each situation.

Remember, in a typical electret condenser microphone, it is the JFET that requires unbalanced bias and the preamplifier that requires balanced phantom power. Therefore, a condenser microphone that requires phantom power will not work with an input that only supplies bias, e.g. a wireless transmitter.

Once again....phantom and bias are not interchangeable!

# # #

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Summer 1999

The Perfect Mic For Mobile DJ's: CM-311A

When you're the hottest mobile entertainer act in the country, you don't settle for less than the best when it comes to the sound of your performance.

That's why Los Angeles based and three-time Female Entertainer of the Year, Lisa Capitaneli, won't trust her shows to anyone but Crown. We quote Lisa from her web page, http://www.dothedance.com/crownad.jpg:

"The CM-311 is by far the best headset microphone around. I'm able to move around the dance floor and in front of the speakers with no fear of feedback. In my opinion, it is one of the best contributions a manufacturer has ever given to the DJ industry."

Lisa has won the American Disc Jockey Awards Female Entertainer of the Year, 1996, '97, '98; and is creator of the hot new dances "Do the Dance" and "Joy."

Riverdance Relies On SASS Stereo Mic

In the blockbuster musical/dance show, Riverdance, the Crown SASS-P MKII stereo mic was used to pick up a wide array of percussion instruments.

According to an article by soundmixer Chris Kathman in July '98 Pro Sound News, "The percussion setup should be in a sculpture museum; it has gigantic, dramatically sweeping cage elements, with only a few mics: an SM57, and SM81, a 421 and an unorthodox Crown SASS-P stereo overhead. There are other lavs for instruments and Samson foot mics for the dancers."

Pro Audio/Video Recording On A Budget

Gary Pillon using a SASS-PMKII stereo mic with a camcorder.

Gary Pillon, GTN's 29-year veteran location soundmixer, loves to share his enthusiasm for exciting new audio products in the columns he writes for *Michigan VUE* magazine. Here are some of his comments from the Jan/Feb '99 issue:

"Speaking of ambience, the Crown SASS-P MKII is still the best microphone under $1000 for getting "panoramic

Continued on page 2

Featured Inside

Continued from page 1

audio vistas." If your production needs more focused dialog pick-up, then the mid-side Shure VP88 is the microphone of choice in that price range.

"Mount the Shure on a Mighty Wondercam Rover with a quick release plate, put the SASS-P on the sled base of a GLIDECAM V-8, and the Canon XL1 will let you record both perspectives for thousands less than the price of a comparable Sanken, Neumann, Schoeps, or Soundfield system... Neither the Shure or Crown microphones suffered unduly from wind or handling noise... I've been going to the State Fair since I was five years old, and I've got to tell you, these recordings (four different perspectives using the shure and SASS models) sounded right. Each microphone offered a valid, useful and compelling point-of-view.

"I decided to tape the Renaissance Festival at Canon's higher quality two-channel audio settings. I mounted the

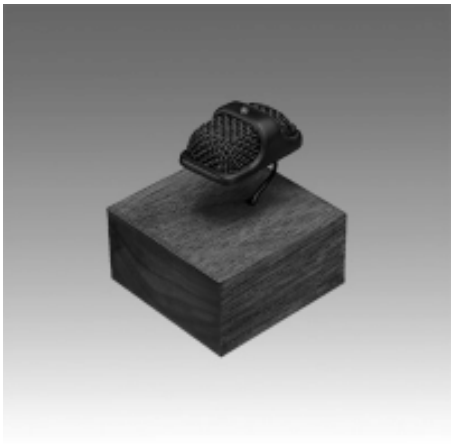
Gary Pillon (left) and Bryan Varga (right) capturing sounds at the Renaissance Festival.

SASS as a counterbalance on the bottom of the Steady TRACKER hand-held platform, and used the VP88 as a audio-only feed to a TASCAM DA-P1 DAT recorder. The Crown tracks were a perfect match to the XL1's field of view..."

From the Mar/Apr 1999 issue of *Michigan VUE*:

"I've been making Crown PZM stereo recordings from these camera platforms for close to 15 years. In the last two years, full bandwidth, stereo surround, ambience extraction devices from Lexicon, Circle Surround, and Meridian have made it possible to print the signal as 5.1 'discrete' electrical channels of information. In its new form, it can be released on DVD or broadcast on DTV as a 5.1-channel mix without needing a separate ambience decoder box in each viewer's home." The Dolby Digital or DTS decoder already used for playing your disc collection will be able to handle these extracted/encoded tracks.

Try An MB-4 Mic For Voice Recognition



Seeking a good mic for computer voice recognition, sound consultant Mark Curry tried a variety of mics. Some were headworn, others were boundary mics. Curry had a disabled client who issued voice commands from his wheelchair and needed his computer to respond.

To Curry's surprise, a PCC-170SW worked with 100% accuracy on voice recognition from across the room! Even with music playing in the background, the client could speak commands several feet from the PCC-170SW (on the computer desk), and the computer would understand the commands.

Curry asked us if there were a less expensive alternative to the PCC-170SW. We recommended the MB-4E, which is a supercardioid boundary mic like the PCC-170SW. But the MB-4 costs only $109 (suggested list), and is much smaller than the PCC-170SW.

Either mic picks up speech reliably at a distance. By using them, you may not need a headworn mic to talk to your computer!

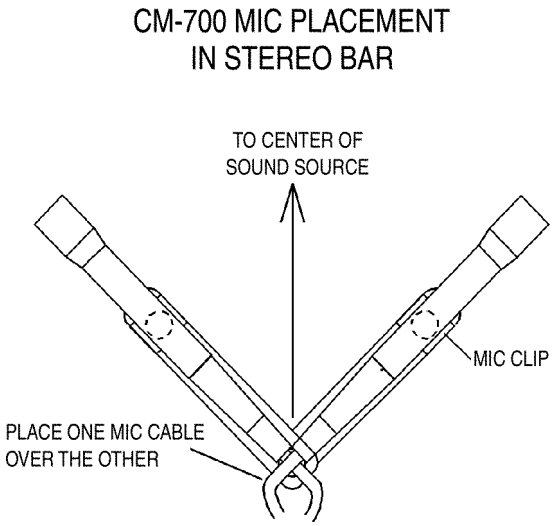
Differoid Mic Featured On Jackson's Album Cover

On the cover of superstar Janet Jackson's new album, "The Velvet Rope Tour Live in Concert," Janet is wearing the Crown CM-311A Differoid headworn mic. The microphone has become part of her look on stage.

In the cover photo, the rear of the mic is shielded with a foam windscreen.

Jackson's album is a spectacular concert filmed live at Madison Square Garden, New York. It was released on DVD, VHS and Laserdisc.

Crown Announces Matched Stereo Mic Pairs



Crown will be offering pro recording microphones in stereo matched pairs. One pair, CM-700MP, is two CM-700 cardioid condenser mics. Another pair, CM-150MP, is two CM-150 omni condenser mics. The microphones will be matched in sensitivity and frequency response within 1.5 dB.

Pairs of the CM-700 or CM-150 work great for stereo recording a classical music ensemble, folk group, drum set, piano, vocals, percussion, and so on.

Because of its pre-aged titanium diaphragm, the CM-150 omni is extremely stable over a wide range of environmental conditions.

Several audiophile touches enhance the CM-700's pristine sound quality: an ultralight diaphragm, humbucking transformer, polycarbonate capacitors, and a gold-plated 3-pin connector.

Both models have a very smooth, wide-range frequency response which gives them a natural sound. They preserve the delicate timbre of acoustic instruments, yet can reproduce all the power of a pipe organ. The off-axis response is also smooth.

Self-noise is very low, permitting clean, noise-free recordings. The mics can handle very loud sounds without distortion. Protection against static and RFI is included. The output is balanced, low impedance, which allows long cable runs without hum pickup or high-frequency loss. Powering is by 12-48V phantom power.

CM-700 frequency response is 30 Hz to 18 kHz (50 Hz to 16 kHz +/- 2.5 dB); self-noise is 21 dBA. CM-150 frequency response is 20 Hz to 20 kHz +/- 1.5 dB; self-noise is 19 dBA.

In the data sheet for the CM-700 cardioid matched pair, we offer the following advice about stereo mic techniques:

Coincident pair (XY): This technique is mono-compatible. Angle the mics inward so their grilles are aligned vertically, and angle them 90 degrees to 135 degrees apart. An angle of 90 degrees gives a narrow stereo spread unless the musical ensemble surrounds the mics in a semicircle. An angle of 135 degrees gives a wider stereo spread, but may have some off-axis coloration.

Near-coincident pair: Angle the mics outward and space their grilles a few inches apart horizontally. In the O.R.T.F. stereo mic technique, the mics are angled 110 degrees apart (55 degrees either side of center) and are spaced 17 cm (7 inches) apart. This technique tends to provide accurate localization and sharp imaging. Another technique is the N.O.S. method: angle the mics 90 degrees apart and space the grilles 1 foot apart. This method has less off-axis coloration than the O.R.T.F. method but less-sharp imaging.

Angle the mics down slightly so they will aim at the musical ensemble when raised. Raise the mic pair on a boom stand (typically about 14 feet high for an orchestra). Place the mic stand about 5 to 20 feet from the front row of musicians. Find a miking distance where you monitor the desired amount of hall ambience. Close miking sounds close; distant miking sounds distant.

A suggested equalization is +3 dB at 80 Hz, - 2 dB at 5 kHz and +2 dB at 12 kHz. This EQ compensates for distant miking and off-axis placement.

In the data sheet for the CM-150 omni matched pair, this advice is given about stereo miking:

Place each CM-150 on a separate mic stand, or place both mics on a stereo mic mount of your choice that allows up to 1 meter of spacing.

The wider the spacing betwen microphones, the wider the stereo spread. A spacing that tends to give accurate localization is about 2 feet. Smaller spacings tend to have a narrow stereo spread; wider spacings tend to have exaggerated separation of off-center instruments. If you hear excessive movement of a centrally placed soloist, place the mics closer together. A spacing of 12 feet tends to pick up a good balance of a symphonic band or orchestra. Mixing in a third CM-150 placed between the outer pair will improve the localization.

Angle the mics down slightly so they will aim at the musical ensemble when raised. Raise the mic pair on a boom stand (typically about 14 feet high for an orchestra). Place the mic stand(s) about 4 to 15 feet from the front row of musicians. Find a miking distance where you monitor the desired amount of hall ambience. Close miking sounds close; distant miking sounds distant.

Wiring Crown Mics To Wireless Mic Transmitters

Below is a list of some popular transmitter models, followed by the connector to use with each one, and its wiring to various Crown mics.

In this list, the **Hirose 4-pin** connector is the **Hirose HR10-7P-6S**.

CM-10/E

Audio-Technica Hirose 4-pin 1 & 2: shield & black, 3: yellow, 4: 4.7K to pin 3

Electro-Voice Switchcraft TA4F 1: 2.2K to pin 3, 3: yellow, 4: shield and black

Nady Switchcraft TA3F 1: shield and black, 2: 2.2K to pin 3, 3: yellow

Samson most models Hirose 4-pin 1: 2.2K to pin 2, 2: yellow, 6: shield & black

Samson ST-2 Hard-wired. 1 & 2: shield & black, 3: 2.2K to pin 4, 4: yellow

Samson CT-3 Hard-wired. 1: 2.2K to pin 2, 2: yellow, 3 & 4: shield and black

Shure Switchcraft TA4F 1: shield and black, 2: 2.2K to pin 3, 3: yellow, 4: jumper to pin 3

Telex Switchcraft TA4F or Lemo 4-pin 1: shield and black, 2: yellow, 4: 2.2K to pin 2

GLM-100/E

Audio-Technica Hirose 4-pin 1 & 2: shield, 3: white, 4: red

Electro-Voice Switchcraft TA4F 1: red, 3: white, 4: shield

Nady Switchcraft TA3F 1: shield, 2: red, 3: white

Samson most models Hirose 4-pin 1: red, 2: white, 6: shield

Samson ST-2 Hard-wired. 1 & 2: shield, 3: red, 4: white

Samson CT-3 Hard-wired. 1: red, 2: white, 3 & 4: shield

Shure Switchcraft TA4F 1: shield, 2: red, 3 & 4: white

Telex Switchcraft TA4F or Lemo 4-pin 1: shield, 2: white, 4: red

CM-311A/E and CM-312A/E

Audio-Technica Hirose 4-pin 1 & 2: shield, 3: white, 4: red

Electro-Voice Switchcraft TA4F 1: red, 3: white, 4: shield. 470 pF cap. bet. pins 3 and 4

Nady Switchcraft TA3F 1: shield, 2: red, 3: white

Samson most models Hirose 4-pin 1: red, 4: white, 6: shield

Samson UT-5 Hirose 4-pin 1: red, 2: white, 6: shield

Shure Switchcraft TA4F 1: shield, 2: red, 3: white, 4: jumper to pin 3

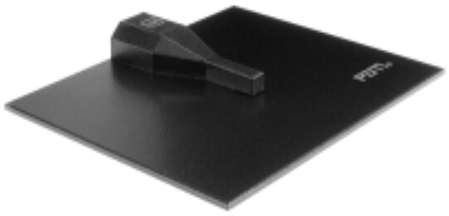
Telex Switchcraft TA4F or Lemo 4-pin 1: shield, 2: white, 4: red

How To Hang A SASS Mic

David Stas of CES Corp. told us a clever way to hang a Crown SASS stereo mic over a musical ensemble. Hang the mic from two mic cables, each with a right-angle XLR connector plugged into the SASS. Attach the other end of the cables to a grid or other stucture near the ceiling.

Before hanging the mic, first you need to determine a good mic position. Put the SASS on a tall mic stand and make test recordings. Once you find the sweet spot, hang the SASS there.

Crown PZMs Make Huge Drum Sound



In recording the third album for British "gothic trip hop" duo Switchblade Symphony, engineer Gregory Butler found a great use for PZMs. The album was recorded in an large unfinished room in a house by the ocean in Malibu, California.

"For the drums... we knew that trying to mic it like a normal drum kit would be usless in that room. So we thought, 'Let's make a really huge drum sound then.' We hung Crown PZMs from the ceiling and put mics five feet off, ten feet off, behind the kit... just to try and get the room. And the drums ended up sounding bigger than Led Zeppelin."

Source: "Tracking in the Wild" by Alan Di Perna, Feb. '99 *EQ*.

Mic Memo

crown

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Fall 1999

How To Blow Up Speakers

Community Loudspeakers puts out a document called "Recommended CD's for Demo Use." It is a list of CD's that they "successfully used for demos which will bring out the best qualities of good loudspeaker systems (or point out the faults in poor quality speakers)."

One such CD is the Crown SASS Demo Disc:
Track 37 Fireworks
Track 40 Harley-Davidson Motorcyle
Track 42 Jets Takeoff

Community says, "Play these three tracks of sound effects real loud and you'll blow up almost any competitive loudspeaker system. Of course, Community loudspeakers have the PowerSense[tm] protection circuitry in the crossovers, so they will survive the ordeal."

The SASS demo CD has been discontinued, but the fireworks and motorcycle tracks can be found on the Crown Microphone Demo CD, which is currently available. If you'd like a copy please send $4.95 for shipping and handling to Literature Dept., Crown International, 1718 W. Mishawaka Rd., Elkhart, IN 46517.

Crown Headworn Mic Enhances Sarah Brightman Concert


Sarah Brightman From http://www.sarah-brightman.com/video01.html

Sarah Brightman, a skilled and compelling soprano, performed an exciting concert named "One Night in Eden," broadcast on PBS June 13. According to PBS, the concert "takes viewers to musical paradise, exploring a diverse range of musical styles, from *Titanic* and the Bee Gees to Puccini..."

During the concert, Sarah sang through a Crown CM-311A Differoid headworn mic. It was mounted a few inches in front of her mouth, rather than touching her lips. This made the CM-311A act like a conventional stand-mounted mic, with a more natural sound free of breath pops. It also kept the mic out of the singer's face. Feedback was not a problem in this application, so the distant placement worked well.

Sarah starred in the Andrew Lloyd Webber musicals *Cats, Requiem, and Phantom of the Opera*; and recorded several top-selling hits such as "Who Wants to Live Forever" and "Time to Say Goodbye."

Featured Inside

Serafine Says SASS Is Fine

SASS-P MKII

Hollywood film-sound designer Frank Serafine had some good things to say about his recent use of the Crown SASS-P stereo microphone. We spoke with him recently about his work.

We heard you're using the SASS-P for motion picture work?

Oh yes, I am. I use it for recording ambiences. The mics are very sensitive and pick up sounds for miles. The ambiences they pick up are really nice.

Both indoors and outdoors?

Yeah, anything I want super high resolution to. It's an overall really good mic for out in the field, or for big dynamic sounds.

Are you using the original SASS-P?

Yeah, I've had it for about 15 years.

What are some typical ambiences you might record?

Oh, frogs in Florida, trains, crickets, playgrounds, school ambience... lots of things like that.

Are you running into any hiss or noise problems with it?

No, not really.

Do you have to EQ the signal?

No, I don't do much of that either. I try to get the best sound I can on the spot. The positioning or the way I mike things has a lot to do with the way the sound is used.

We appreciate your time, Frank.

No problem!

CM-700 Rave Review

CM-700

Here are some email quotes from Rip Rowan, Editor of the on-line recording magazine, *ProRec*: Pro and Home Recording Resources on the Internet:

"[The CM-700's] sound so great... My choice for overhead and acoustic guitar was SM-81s. I couldn't believe my ears... I'm blown away... I'm shocked... I'm floored... I'm amazed... Excellent mic... Way underpriced. I'm sold."

"Did more tracking today with them. I may get a Neumann KM184 for a day just to compare. These sound better than any small diaphragm condenser I've ever used. Wonderful! Fantastic! Clear highs, never brittle, nice rise about 6K, smooth, not metallic. Better hands down than an SM81, which is a compliment."

Rowan published the following review of the CM-700 on ProRec (reprinted with permission). The web site is at http://www.prorec.com.

I was fortunate to receive a matched pair of Crown CM-700s for review almost two months ago. I have spent the better part of those months making extensive use of these microphones, and I am happy to report that we have a serious more-for-less contender in these mics.

Crown has produced the CM-700 for some time now, but only recently began shipping these as matched pairs. The matched set includes a stereo mic mount for X-Y applications. Retail for the pair is about $580, and can be found on the street for less than $450.

Rip Rowan

Just the Facts

The Crown CM-700 is a single pattern cardioid condenser microphone. The operative word in any description of this mic is flexibility. Crown has designed the CM-700 to serve virtually any application where a cardioid microphone would be suggested.

Two bass rolloffs are provided: a low-cut setting provides a gentle slope below 110 Hz, while a rolloff setting gives more bass-reduction with a steep cut below 110 Hz. I thought these were misnamed. The cut provides a gentle rolloff, and the rolloff provides a sharp cut. [Both switch positions have a gentle rolloff, but the "rolloff" setting starts at a higher frequency — Ed.]

Specifications suggest a fairly middle-of-the-road mic. Self-noise (21 dB SPL, A-weighted) and signal-to-noise ratio (73 dB) put these mics generally below audiophile mics from Neumann, Schoeps and Earthworks. The mics also display [relatively] low-level sensitivity at -52 dB re 1 mW/Pa. These specs would suggest that this is not going to be the mic of choice for very quiet applications such as quiet acoustic guitar picking or other sensitive field recording applications. On the other hand, the mic can sustain 151 dB, unpadded, so it is easy to envision that this mic will be very useful for many rock, jazz, and country music applications such as drums, guitar cabinets, vocals, and other intense applications. [I've used the CM-700 on quiet acoustic guitar with no noise problems, but your results may differ — Ed.]

Frequency response indicates a relatively agressive mic. The response rolls off slightly below 50 Hz, and a couple of treble bumps [2.5 dB — Ed.] at 6 kHz and 10 kHz suggest a mic with a sharp top end and a relaxed bass performance. The mic features a humbucking transformer - probably the primary reason the mic is less sensitive and slightly more noisy than other competitors. However, I'm a big fan of good-sounding transformers. I think that mics with good transformers often have a sweeter top end and a rounder bass response than many of the transformerless designs available.

My CM-700MP shipped with the optional CM-SM shockmounts. These simple but elegant

CM-700MP matched pair

shockmounts will fit many different condenser mics. I found them to be a good fit for my SM-81s. These little shockmounts are very cool, and provide a wireclip to hold the wire and keep the mic suspended properly in the shockmount.

The mics are quite small, the smallest cardioid condensers I own — about the size of Neumann's KM184. This makes it easy to get the mic into tight spaces. Also I noticed that the condenser element is right up against the protective wire mesh - you can get that element within a couple of millimeters of the sound source! And with its high maximum SPL, you don't have to be afraid to just get the mic right up there against the drum or speaker. Of course, with an element so exposed I imagined this microphone would have a pretty powerful proximity effect, which was borne out in testing.

Crown also ships a windscreens with the mic. It's the usual "afro" looking egg-shaped screen found with many mics. [A hoop-type pop filter is recommended for vocal recording -- Ed.]

Studio Testing

Crown was generous enough to ship the CM-700s on the first day of a week-long set of sessions cutting rhythm tracks for an upcoming release by Four Mile Mule, a popular Dallas roots-rock/country band. I immediately popped the mics up over the drums as overheads and started dialing in sounds — probably the most typical application for this mic. Actually, I found this to be the best-sounding drum miking kit I've ever used: SM-57 and Marshall MXL-2001 on snare, AT-Pro25 on kick, SM-81 on hats, AT-4050s on toms, and the CM-700 MPs as overheads. We achieved some remarkably fat and tight drum sounds that day.

As I have gone forward into mixing the drums, I find myself usually starting with the drum overheads full-up, and dialing in the close-miked drums to add a little beef. This is in sharp contrast to other mic kits I have used on drums — I have previously used my matched AT-4050s as overheads, and their agressive sound tends to make cymbals too harsh to put forward in the mix. These CM-700s have an agression too — but the treble boost is shifted up an octave above the 4 kHz boost of the 4050s. Cymbals have a clear and bright sound — and as I suspected, the humbucking transformers provide a smoothness in the cymbals that my transformerless AT4050s cannot provide. These are sweet-sounding mics! So, these mics first application as drum overheads passed with flying colors.

Next came acoustic guitar. I reached for my SM-81 — usually the mic of first choice when recording an acoustic. We got a good sound, and I was tempted to just run with it. Then we threw up the CM-700s, and I was really surprised at what I heard. The CM-700s actually sounded better — and, dare I say, more accurate than the SM-81. I think that what I was hearing was the diminished treble response at 4 kHz and the accentuated response at 6-10 kHz, because the SM-81s are clearly flatter than the CM-700s. However, the CM-700 sounded less harsh and more "fluffy" than the SM-81. The guitar sounded smoother, rounder, less harsh. We recorded acoustic guitars for the project largely with the CM-700s, backed up with the SM-81 for quiet parts as well as my trademark "mystery mic" secret weapon for lo-fi sounds. For quiet acoustic guitar, you want a more sensitive microphone, but for strong rhythm parts, the CM-700 is outstanding.

We also used the CM-700 on electric amps with mixed results. I am just not a fan of using condenser mics on guitar amps. The key exception to that is the AT-4050, which is an OUTSTANDING mic on any guitar amp. The applications where the CM-700 worked well were room miking of the guitar amp, where you really want to hear the sound of the room. These are applications better suited to omni mics anyway. One nice thing about using the CM-700 in a room is that it seems to exhibit a gentler cardioid rolloff than my other cardioid mics — it's less "pinched" and more "open". I think this mic could also be excellent at recording that full-range Marshall distortion sound that's popular now in heavy guitar music, but we didn't have an opportunity to try this mic on an application like that. This could also be a great bass amp microphone. Unfortunately we didn't have the opportunity to try that either.

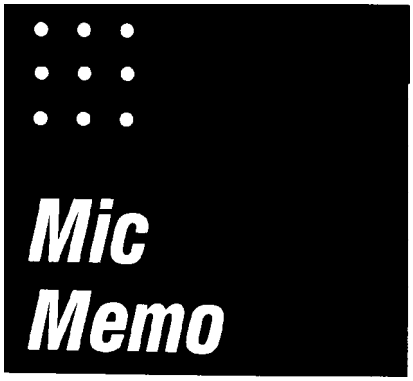
Finally, we tried the mic on vocals. Now, I'm a big believer in the use of large-diaphragm condenders on vocals, so I was a little skeptical of an inexpensive small-diaphragm condenser on vocals. But, I'd be a fool not to try it.

I was really surprised how good this mic sounds on vocals. I guess I shouldn't be: the mics nice, smooth treble boost at 10K is typical of the great vocal mics like the C-12 and U47. The CM-700 isn't as warm as those tube mics - it lacks the complexity and richness in the midbass and low midrange (300-500 Hz) of these large-diaphragm tube models - and it is fairly bassy. The effect is slightly "scooped out" with a nice, bright, smooth treble. I was right about the proximity effect. This mic's proximity effect can really add a lot of bass! And with that diaphragm way up front you must be VERY careful with plosive consonants. A poorly-delivered "P" can really wreck your day. For that reason I would recommend using a good pop filter at all times, and keeping the singer from singing "right down the tube". For an intimate vocal sound, the CM-700 can really put the singer right in your lap.

Conclusions

In the end I was very pleased and amazed at the sound of these mics. Specifications only tell part of the story. No numbers had prepared me to hear the truly beautiful sounds that this mic is capable of producing. From percussion to guitars to bass to vocals, this mic is a strong contender in virtually any application, particularly close miking of loud, powerful sounds. Before buying any other small-diaphragm condensers, you really need to listen to these mics. The CM-700s are a strong contender — and they have earned a permanent place in my studio.

Now Available: The Mic Memo CD-ROM



Now in stock at Crown is the *Mic Memo* CD-ROM. It features twenty years of *Mic Memo* issues — a tremendous database of applications and information on Crown microphones. The issues are arranged in chronological order. Whatever your application, you should be able to find useful tips here.

PZM pioneer Ken Wahrenbrock was the first editor of the *PZM Memo*, which later became the Crown *Mic Memo* as Crown developed a full line of microphones.

To search for a particular topic in this document, you can use Windows' FIND function. Type <CTRL> F and enter the word or words you are searching for.

Want to know more about stereo applications? Do a search for "stereo." Repeat until you find all the places that the word "stereo" was mentioned. Are you interested in applications for the GLM-100? Search for "GLM" or "GLM-100." All the app notes for this microphone will appear, one at a time.

This document, "20 Years of the Crown Mic Memo," is also on the Crown web site at http://www.crownaudio.com . Click on "Microphones," then click on "Info & How To." We hope you find the compilation an invaluble tool.

Mic Memo

crown

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor **Winter 2000**

SASS® Makes Demo Recording Easy

Sometimes, making a demo recording can be done in a matter of hours instead of weeks.

Mark Darnell, a Crown microphone technician, came up with a nifty way of recording his jazz combo. He arranged the band in a basement room, and miked them all with a SASS-P MKII stereo mic (Fig. 1). The mic was raised on a boom stand about 1 foot below the ceiling.

Since there was no mixing involved, Mark moved the instruments toward or away from the SASS to adjust their balance and stereo position. After a few trial recordings, he wound up with a realistic, honest demo tape of the band's performance.

This method may not work well with all types of bands. It would be hard to record a rock band like this and still get a good balance and a tight sound. But if you have a small acoustic jazz group you'd like to record, the SASS just might work for you.

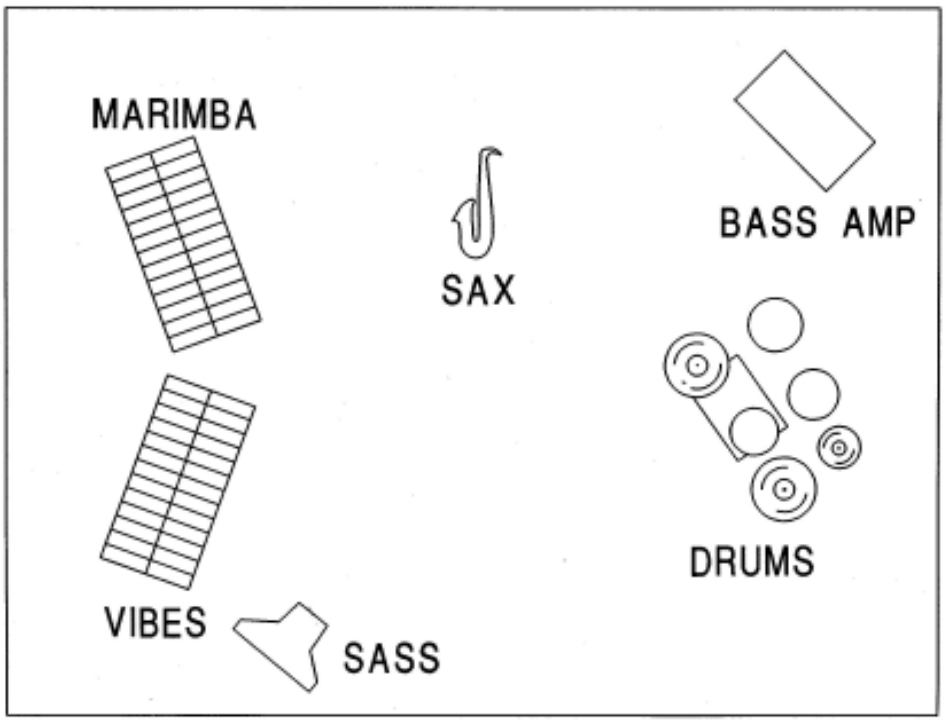


Fig. 1

Britney Spears Relies On Crown CM-311AE

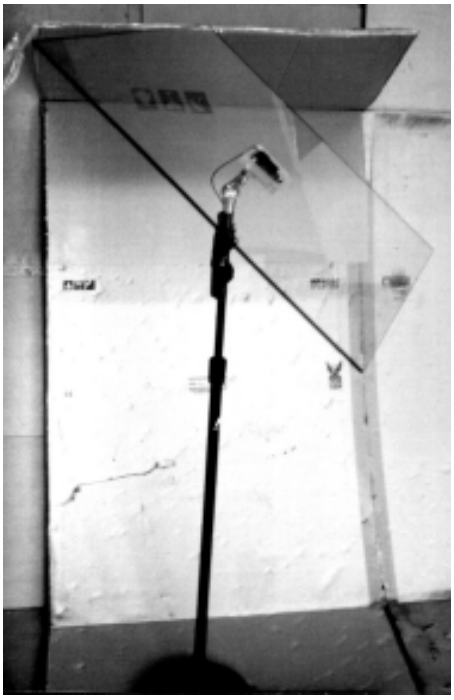
Photo from *Cute* magazine by Frank White

Garth is in good company. The October 1999 issue of (wow) *Cute* magazine features several photos of pop superstar Britney Spears wearing a Crown CM-311AE headworn microphone. The popular teenage performer recorded the albums "(You Drive Me) Crazy" and "Baby One More Time" (now 6X platinum). Also shown sporting the mic is teen singer Tatyana Ali.

Featured Inside

PZM® Panel Helps Pick Up Choir

Recording engineer David Sherman shared with us how he solved a choir-miking problem:



"The engineer and technicians had to design and install a sound system to accommodate a cathedral ceiling in St. Margaret's Catholic Church in Reading, PA.

"It was impossible to install microphones from the ceiling that would adequately amplify the choir's sound. To solve the problem, our technicians removed a PZM-6D from its plate and fastened the mic to a piece of plexiglass on a mic stand. The mic picked up the choir's sound as it hit the plexiglass and bounced back within the hemispherical polar pattern of the microphone.

"This setup was a success with the church and choir. Because of the mic's mobility and versatility, the church can use it for other activites such as their children's program. This item will work well for other churches with this same problem, and possibly for other difficult miking situations."

Theater Sound-Master Describes PCC®-160 Usage

Brian Ronan has been the production sound engineer on several Broadway shows such as *Rent, Guys and Dolls, The Secret Garden,* and *Damn Yankees*. His Broadway sound designs are *You're a Good Man Charlie Brown, Little Me, Cabaret, Triumph of Love,* and *1776.*

Brian has this to say about his use of Crown PCC-160 stage-floor mics:

"Due to advances in reliability, radio mics are pretty much the standard tool for vocal enhancement. Foot mics [such as the PCC-160] are still used as a backup and to feed a constant room send to the backstage program monitors and the in-house infrared listening system.

"Currently I have one PCC-160 on the floor at Cabaret. There is no hope of picking up the singers on foots as there is a band playing upstage of them in that particular show.

"In *Charlie Brown*, I'm using three PCC-160s across the floor. We had to use the foot mics this afternoon because an actor's radio mic went out briefly."

Wireless SASS Allows Easy Stereo Recordings

Some wireless mic companies make small transmitters that can be plugged into regular microphones. You take a standard hard-wired microphone, unplug its cable, and plug in a wireless transmitter. Then you pick up the mic's signal with a receiver.

This concept can be applied to the Crown SASS-P MKII stereo mic with great results. For example, mount two wireless transmitters on the SASS and put it on a 15-ft. high mic stand to record an orchestra. No hassle with running cables. You also could carry the SASS on a roller coaster and record the ride, with the receiver and recorder back on the ground.

One caution: Make sure that the sound source will not overload the transmitter. Inside most transmitters is a trim pot that is used to set input level. You should adjust this pot to prevent distortion.

Here's how to set the pot: Place the mic to pick up the sound source, or to pick up a loudspeaker playing a recording of a similar source (at a realistic volume). Record the receiver's signal. Starting with the trim pot turned up full clockwise, make a recording and play it back. It it's clean, you're done. If it's distorted, turn down the trim pot a little and record again. You want to adjust the trim pot as high as possible without audible distortion on loud peaks.

Mic Techniques For Acoustic Instruments

Acoustic Bass

The acoustic bass (string bass, bass viol) can be recorded many ways. This instrument puts out frequencies as low as 41 Hz, so use a mic with an extended low-frequency response. Three examples are the CM-700 cardioid, CM-150 omni, and GLM-100 omni.

For a well-defined sound, place a CM-700 a few inches in front of the bridge, on the side toward the G string (top string). For more fullness, move the mic toward the f-hole. Another spot is a few inches from the top of the treble f-hole. Watch out for proximity effect (up-close bass boost), and use the bass rolloff switch in the mic if necessary.

If you need more isolation, place a CM-200A cardioid mic near the treble f-hole and roll off the excess bass on your mixer.

Here are some methods which isolate the bass and let the player move around. They work well for P.A.:

- Wrap a GLM-100 mini omni mic in foam rubber (or in a foam windscreen) and mount it in an f-hole.
- Tape the cable of a GLM-100 to the bridge.
- Wrap a CM-700 in foam padding (except the front grille) and squeeze it behind the bridge or between the tailpiece and the body.
- Try a direct feed from a pickup. This method adds clarity and edge, but might sound electric. Also wrap a GLM-100 mini omni in foam and stuff it in an f-hole. Mix this mic with the pickup to round out the tone. You may need to roll off the bass of the f-hole mic. Flip the polarity of the mic and use whatever setting sounds best.

Saxophone

A sax miked very near the bell sounds bright, breathy, and rather hard. Mike it there for best isolation. Caution: some notes are missing near the bell because their sound comes out of the tone holes. To get a warm, natural sound, mike the sax with a CM-700 about 1-1/2 feet away, halfway down the wind column. Don't position the microphone too close, or the level varies whenthe player moves. A compromise position for a close-up omni mic is just above the player's-side edge of the bell, aiming at the holes.

Banjo

Try a CM-700 or CM-200A about 1 foot away. If you need more isolation, mike closer and roll off some bass. The sound is thinner toward the edge of the head. Some banjos have resonator holes around the head, and a mic placed near those holes will pick up a mellower sound with more tone. A cloth stuffed inside the banjo will reduce feedback in P.A. situations.

For the most isolation, tape a GLM-100 mini omni mic to the head about one inch in from the bottom edge, or on the tailpiece, or on the bridge. You can wedge a pickup between the strings below the bridge and the banjo head. Put the pickup flat against the head surface.

Mandolin, Dobro, Bouzouki, Lap Dulcimer

Mike these about a foot away with a CM-700. If you need more lows and more isolation, mike close to an f-hole. You can tape a GLM-100 mini omni near an f-hole and tweak EQ for the best sound.

Hammer Dulcimer

Place a CM-700 cardioid (a flat-response condenser mic) about 2 feet over the center of the soundboard (Fig. 2-A). On stage, place a CM-700 6 to 12 inches over the middle of the top end (Fig. 2-B). For the best gain-before-feedback in a P.A. system, mix in a GLM-100 very near the sound hole (Fig. 2-C).

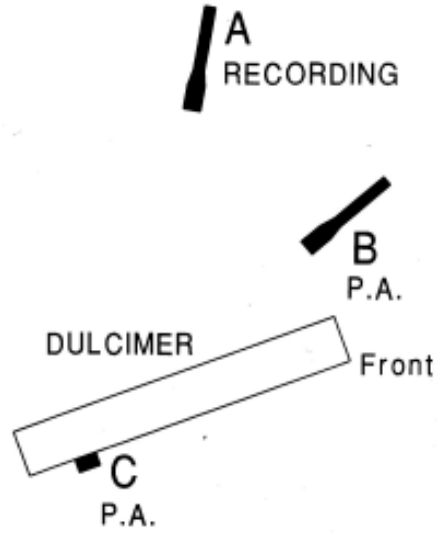


Fig. 2.

Fiddle (violin)

Listen to the fiddle itself to make sure it sounds good. Correct any instrument problems before miking.

First try a CM-700 or CM-150 mic about 2 to 3 feet over the bridge. This distant miking gives an airy, silky sound; close miking sounds nasal and scratchy. If the ceiling is low, reflections might color the sound. In that case, cover the ceiling over the fiddle with a sleeping bag or foam. Or have the fiddle player sit down.

If you have to mike close — say, for a singing fiddler — aim the mic horizontally at the mouth.

Other methods: Get a GLM-100 mini mic, and clip its holder to the violin's tailpiece. Mount the mic a few inches from an f-hole or over the bridge. Or clip the GLM-100 to the strings between the bridge and tailpiece; aim the mic at the fiddle body. If necessary, cut a little at 3 kHz to reduce harshness and boost around 200 Hz for warmth.

SASS Provides Surround Audio For Video Shoots

photo of camera and SASS mic

In Issue 6 of *Surround Professional*, veteran soundmixer Gary Pillon describes a field recording setup that provides excellent surround audio:

"You learn 'purist' recording techniques at an early stage of your career out of self-defense; a stereo boom and a couple of wireless spot mics are about all you can handle.

"As luck would have it, that's just about all you really need for news or documentary productions. The Crown SASS-P MKII, one of my personal favorites, gives you an enveloping sense of ambience, while providing a bed for seamlessly adding hidden body lavaliers.

"[I developed a production technique] called 'Perspective Imaging.' Mount a contemporary film or digital camcorder, from the modestly priced Canon XL-1 to High-Definition Sony, Panasonic, or JVC models, to a properly matched Steadicam, Glidecam, or Paddock PRO articulated arm and vest. You've created a 'Virtual Person' who 'remembers' whatever the operator 'experiences.' Take any surround mic (e.g. SASS-P), mount it to the hot shoe of the camera underneath the quick-release plate, or anchor it to the sled, and you've given this 'person' electronic ears. You can match visual images with real-time sonic textures that otherwise could take weeks to build.

"Mike Sokol, owner of JMS Productions, has convinced a major cable network to use this approach in making a ten-part music documentary series... He'll have a SASS-P MKII mounted to a Steadicam sled running into a High-Definition Sony camcorder. The whole design runs on batteries and straps to your back."

CM-311A Praise On The Net

On the Internet newsgroup rec.audio.pro were these comments on the Crown CM-311A headworn mic:

"The ONLY lead-vocal quality mic out there is the Crown CM-311A. Street price somewhere around $300... You can't go wrong."

— Charlie Tappa, Pro Sound Service

"Take a look at the Crown CM-311A and 312A, IMHO it blows all the others away. Stock out of the box, it comes with a power supply. It's also available without the power supply for wireless use only.

— Edie, KitchinsynkStudio

Miking A Flute With A Headworn Mic

Mike Sokol, a contributing editor for *EQ* magazine, suggested that a reader use a Crown CM-311AE for miking his flute (*EQ* June 1999):

"One of the best flute sounds I've gotten recently used a Crown vocal mic that mounts on a headband (for example, Garth Brooks or Janet Jackson-type mic) positioned up next to the player's cheek. This kept the mic out of the breath blast, and the talent was able to use different flutes without changing mics.

"And best of all, he had a UHF transmitter (wireless) on it so he could walk around stage while playing — certainly more dramatic than being tied to a single mic position."

CM-150 Users, Please Note!

To provide the best possible performance, Crown utilizes a high-performance and highly delicate titanium diaphragm on the CM-150 microphone. Both the titanium diaphragm and steel grille can be easily damaged by impact. Additionally, the diaphragm is susceptible to damage due to excess pressure.

When placing the protective plastic cap on the mic, DO NOT cover the air-release hole, as you may cause permanent damage to the diaphragm.

DAMAGE TO THE CM-150 MIC CAPSULE OR GRILLE DUE TO IMPACT OR EXCESSIVE PRESSURE IS NOT COVERED UNDER WARRANTY.

Need A Connector Added To Your Wireless Mic?

Crown can solder a connector of your choice onto a GLM-100E, CM-312AE, CM-311AE, or CM10E. The costs are below:

Lemo or Hirose $60.

Switchcraft $25.

To have this service done, have your Crown mic dealer special-order the mic with the connector. Please be sure to specify the pinout of the connector.

Mic Memo Spring 2000 Bruce Bartlett, Editor

SASS Stereo Mic Survives Guatemalan Jungle, Archives Dying Civilization

The mission: To record the music of an ancient civilization in one of the most humid parts of the world. Recordist David Horner tells the amazing story:

“The mission was a great success. It was a series of adventures, challenges and constant improvisations and we got some great recordings thanks in large part to the SASS-P MKII.

“It was the first mic I thought of when I learned of the project and it did us all proud. Many respected colleagues told me I was crazy to take condenser microphones into this humid environment and indeed I was a little concerned when I arrived into what is essentially a cloud forest at 8000 feet in the western highlands of Guatemala. Everyday it was the same; clear and cool in the morning, heating up to near summer conditions at noon and then by mid afternoon the entire area was shrouded in the thickest “pea-soup” fog I have ever experienced.

“The first day I set up in the church which is an open air building. The domed sanctuary is all that is left of the original Spanish colonial structure (1490AD) with the nave being demolished by Hurricane Mitch. The church is still surrounded by a large amount of rubble. The nave has been rebuilt out of concrete and a vaulted tin roof by local labor and has not had any glass installed in the windows. The adjoining bell tower at the other end has sunken in the unstable earth and has tilted several degrees.

“Surprisingly, the acoustics were wonderful and, with the added ambiance of birds reverberating through the open structure, made for some unique recordings. One of my favorites was of a solo vocalist named Elena who sang some beautiful songs from their daily mass in Qui-Che (their native Mayan language). Her voice echoes through the nave along with the birds and roosters who joined in at 6 a.m.

“Back to the microphones. That first day I pulled out everything to make sure it was all working after the bone-crushing 4x4 journey into town. The Neumann KM-84s I had brought from work started arcing after about five minutes in the open air. I quickly packed them back in a zip-lock bag with silica gel and began hearing my colleagues’ voices echoing in my head. With fingers crossed I pulled out the SASS-P MKII and plugged it in...All systems go!

“What a relief. Day after day I worried but the SASS never faltered. I had brought along some ribbon mics as a precaution but was not crazy about their sound. It was looking like I was down to the SASS and luckily it was my favorite sound of the three mic systems. The greatest test however was yet to come...

“A week into our stay we learned that we had been given the great honor of recording Senor Baltasar. He is one of the last Mayan priests who lives atop the mountain on the other side of the valley. We were invited to hike up to his home that evening and it would turn out to be one of the great experiences of my life. We took along an 80-year-old Mayan musician from our village in a 4x4 to the trail head. With a full moon overhead we hiked up a treacherous foot path while our flashlights kept us from plummeting into the gorge below. The 80-year-old man seemed undaunted but I felt like Indiana Jones. We kept climbing up an endless switch back through a cloud and ended up in a cornfield on a steep slope at about 9000 feet. It wasn’t that cold but my breath looked like steam in the moonlight. This is about as humid as it gets. I had the SASS in my backpack and had not brought anything else.

“Baltasar took us into a small hut with a dirt floor and a small shrine. The two men proceeded to give us a performance of an ancient reed flute and drum. The SASS captured the experience perfectly. Never a sputter, and the incredibly realistic stereo image best conveyed the feeling of being there.

“After this, Baltasar guided us to his outdoor altar. This is a semi-circular stone wall in the midst of the cornfield where he proceeded to perform a ancient ceremony that is a mixture of Catholicism and Mayan “black magic”. I set up the SASS in the back corner of the stone wall and sat myself between some 10-foot high cornstalks with headphones and a DAT machine. The ceremony lasted over two hours and included a lot of candles, symbols drawn in salt and acorns, holy water, and moonshine (which I was obliged to accept.

“With all that moisture, the smoke from the fire, and the wind, the SASS-P MKII was a true champion. I came out looking like a total hero.

“This really was the last days of Santa Catarina. The future of the town is uncertain and the youngest generation has for the first time rejected the culture that has sustained these beautiful people for so many centuries. Many of the songs and ceremonies we recorded will never be heard again. Father Baronti, who has lived among these people for a quarter century tells me we got there just in time.”

Crown Headworn Mic Customized for Melissa Etheridge

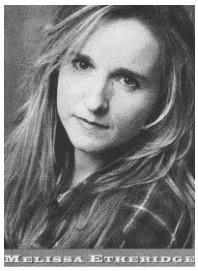


Photo source: http://members.aol.com/slntlgcy/me_rs1a.jpg

Melissa Etheridge, called by some “The Queen of Rock,” just wrapped up a national tour to promote her new album, *Breakdown*. Her headset mic was a modified Crown CM-311AE.

FOH mix engineer Steve Folsom tells how he changed the mic’s configuration:

“After we got through with [the CM-311AE], it became a ‘neckset’ mic,” Folson says with a grin. “Being a dynamic singer, what Melissa hated about headset mics was that she couldn’t ever get away from them. She couldn’t ‘play’ them properly, in other words. We took the Crown unit apart one day and sort of turned it inside out, adding a hair tie to hold everything together. Then we mounted it around her neck just like you’d do with a harmonica.” The result is that Etheridge can turn away from the mic as necessary, adding the dynamic control she can otherwise achieve only with a handheld mic.

Source: Feb. 2000 issue of *Mix*, “Tour Profile” by Greg Detogne.

How to Prevent DC on Phantom Power Supply Output

With the Crown PH-4B phantom power supply, some DC appears at its output if the supply is unloaded. Normally this is not a problem. But on very rare occasions, some users feed the PH-4B outputs to a mic-level matrix switcher, and they hear clicks or pops when the outputs are switched. Let's explain how this problem can be solved.

The PH-4B handles up to four condenser microphones. Each of the four channels has an input connector and an output connector. Feeding each output connector are two large coupling capacitors. They block the DC voltage from the phantom power.

However, since those capacitors are charged by phantom voltage, some DC can be measured at the output of the supply. This DC goes away when the supply is plugged into a mixer mic input, because the mixer input impedance drains off the charge.

When users feed the PH-4B outputs to a mic-level matrix switcher, however, switching pops can occur as the capacitors discharge. (Mic-level switching is not recommended in any case).

Here's how to prevent those pops. In the switcher, connect a 47K, 1/8 watt resistor between PH-4B output pins 1 and 2, and another 47K resistor between output pins 1 and 3. Do this for each PH-4B output connector. The resistors drain off the capacitors' charge, preventing pops.

A Mic Technique for Distance Learning

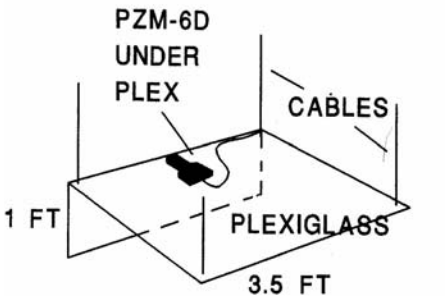


Figure 1. PZM corner boundary used in classroom.

This January I walked into a college classroom to check a Crown mic installation. Tandberg, a telecommunications company, had equipped the room for distance learning. Mics on the ceiling pick up the students, while a mic at the teacher's desk picks up the teacher.

Two PZM-6D's in plastic corner boundaries are enough to "hear"all the students in the 15' x 25' classroom. Each boundary is 3.5 feet wide and 1 foot tall, as shown in Figure 1. The boundaries are hung from the ceiling by steel cables. Two boundaries are used: one near the front of the room and one near the rear. In high-ceiling rooms, the boundaries are hung low—far from the ceiling—in order to be close to the students.

An MB-4 Mini Boundary Mic is attached by double-sided tape to the top of the teacher's computer touchscreen.

According to Tandberg, everyone in the classroom can be heard clearly.

Reba McEntire's Soundman Loves the Crown CM-311AE Headworn Mic

Photo source: http://www.geocities.com/Nashville/Opry/5827/reba21.jpg

We're proud that the Crown CM-311AE is becoming the headworn mic of choice for many musical stars, such as country artist Reba McEntire. Her monitor engineer, Robert Kosloskie, describes her use of the CM-311AE:

"When she comes to the concert section of the show, I've got the Crown CM-311AE headset mic. I keep trying new headset mics, but I havent't found one yet that beats that one as far as the audio and the rejection. It's just killer."

Source: Feb. 2000 issue of *Mix*, "Mixing Monitors" by Chris Michie.

Sampling With the SASS

Recording engineer Dave O'Neal describes how he uses a SASS mic to add real room reverb to his recorded tracks:

"Some of the best-sounding reverbs and delays come from the real world rather than a little box in your rack. I have this nasty habit of burning a CD of a drum, guitar, vocal, or other track, popping it into my car's CD player, and driving off to a great-sounding parking garage. Then I open the car doors, blast the track, and re-record it from several yards away (one floor up is nice) with a portable DAT recorder and some mics. I've found that Crown SASS mics are very good for this mission..."

"When I get back to the studio, I mix these recordings with the original dry tracks in my audio sequencer."

Source: *Electronic Musician's Desktop Music Production Guide 2000*.

Backstreet Boy's Soundman Loves the CM-311A

In the Nov. '99 issue of Mix, writer Chris Michie quotes Tim LaMoy, who mixes FOH for the Backstreet Boys.

"The Boys use wireless Crown 311 headset mics, a nice snappy-sounding mic. It's got great low end -- I can tune the P.A. with that mic, and everything else sounds good."

Letters from Crown Mic Users

Recording a Leslie with a PZM

I use a PZM-6LPB [now the PZM-6D] to mike the Leslie speaker for our church organ. The speaker stands next to the Hammond organ about 1 foot away. I "fun-tacked" (puttied) the mic to the side of the organ cabinet. My sound engineer had me move the mic up and down to get the proper balance of horn and woofer. The organ sounds great—very natural and full. This would also work if the speaker was located near a wall.

Lance Batchelder
The Tabernacle Church
Laurel, MD 21043

Jazzed by SASS

[When recording jazz with the SASS stereo mic,] I use a Sony TCD-8 DAT with a Super Bit Mapping unit. When I dub to cassette, I run the signal through a Very Nice Compressor.

I really am happy with what I get! Played back over my Magnepan speakers, it's just like being there!

Thanks for creating such a great stereo mic. It makes on-location recording very easy.

Gordon Wilson
Del Mar, CA

GLM Questions

I purchased two GLM-100E mics yesterday. What is the maximum voltage that these mics will handle (will 18 volts work)?

A GLM will handle up to 20 volts.

Do you need an output resistor after the cap shunted to the ground ?

No... whatever the load of mic preamp input is, that's the load on the mic. Ideally it would be at least 7 to 10 times the mic impedance.

What is the source resistance of the GLM-100E?

It's 3K ohms with unipolar power (using the circuit in Fig. 2), or 1.1 K ohms with bipolar power (Fig. 3) . Bipolar power gives 148 dB max SPL; unipolar power gives 120 dB max SPL. So I recommend bipolar power. It uses two 9V batteries, a 22K resistor, and a 4.7 microfarad capacitor.

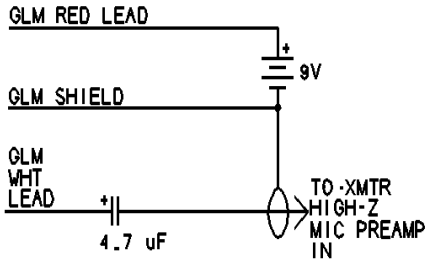


Fig. 2. Unipolar powering circuit for the GLM-100.

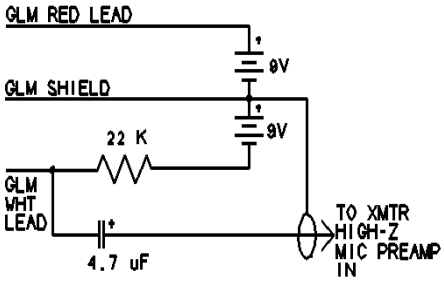


Fig.3. Bipolar powering circuit for the GLM-100

.I want to put the GLM in a corner of plexigass boundaries. How tight should the boundaries plates be? Can two or three plates be pressed together or must they be sealed? A hinge on two plates will result in a small air gap—how do you deal with it?

Suppose you have two boundaries at right angles to each other, and the GLM is in the corner. If there's a 1/8" gap between the boundaries where the mic is, the acoustic gain is about 6 dB at 1 kHz (Fig. 4). If there is no gap, the gain is 12 dB. However, the response is flatter with the gap. With the gap closed, the response tends to roll off in the highs (unless the capsule itself rises at high frequencies). If you put the hinge on the inside of the corner—the 90 degree angle—there should be little or no gap.

If the plates are touching tightly, but with no glue, the mic acts as if there's no gap.

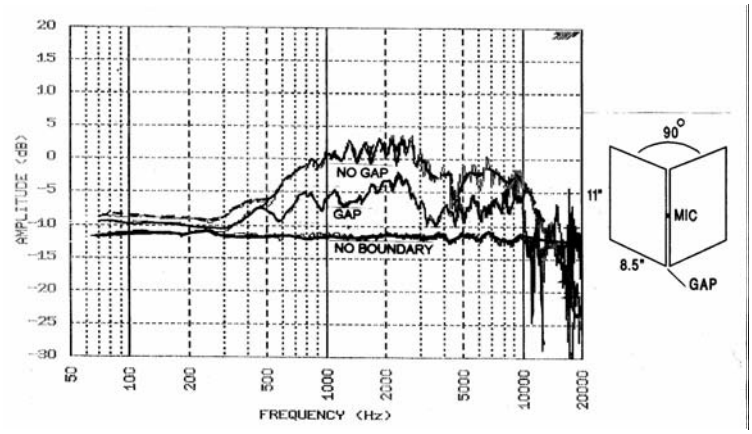


Fig. 4. Effect of panels and gap on frequency response.

# # #

Mic Memo

crown
A Harman International Company

How a Mid-Side Mic Array Creates Left and Right Polar Patterns

Suppose you assemble a mid-side mic with a forward-aiming (mid) cardioid pattern and a side-aiming bidirectional pattern. You feed the mid and side signals to a sum-and-difference matrix. The output of the matrix is a left-aiming polar pattern and a right-aiming polar pattern.

When you vary the mid/side ratio, the left and right patterns change shape and direction. As you increase the mid/side ratio from 0 to 10, the resulting left and right polar patterns change like this:

bidirectional —> hypercardioid —> supercardioid —> cardioid

Simultaneously, the axes of the polar patterns rotate from left and right to straight ahead. That is, the axes rotate from +/- 90 degrees to 0 degrees, where 0 degrees is straight ahead.

As you increase the mid/side ratio from 0 to 10, the perceived stereo spread varies from wide to narrow.

When the mid/side ratio is 1:1 (that is, the mid mic and side mic are at equal levels), the left and right polar patterns are halfway between hyper- and super-cardioid, with their axes pointing 65 degrees toward the left and right.

Now suppose you assemble a mid-side mic with an omnidirectional mid mic and a bidirectional side mic, and matrix them together. As you increase the mid/side ratio from 0 to 10, the resulting left and right polar patterns change like this:

bidirectional —> hypercardioid —> supercardioid —> cardioid —> subcardioid —> omnidirectional

The axes of those polar patterns always aim +/- 90 degrees left and right.

As you increase the mid/side ratio from 0 to 10, the stereo spread varies from wide to narrow.

When the mid/side ratio is 1:1 (that is, the mid mic and side mic are at equal levels), the left and right polar patterns are both cardioid, aiming +/- 90 degrees toward the left and right.

Crown Mics Used by TLC, Will Smith

[source: http://images.mp3.com/mp3s/images/tlc/lopes04.jpg]

TLC, a hot group of three women, bridges the gap between rap, hip hop, pop and soul. According to the "Live Sound" article in the April 2000 issue of *Mix*, they use the Crown CM-311A for vocals on stage.

[source: http://www.geocities.com/hollywood/set/2995/private16.jpg]

Will Smith sang into a CM-311 headworn mic in the 1999 MTV awards, and while hosting the Millennium Celebration in Washington D.C. on December 31, 1999.

Featured Inside

A PZM Mid-Side Microphone

Using two PZMs, you can create an MS mic array with an omni mid signal and a bidirectional side signal. Mount two PZM mics on either side of a large boundary, such as a 2 ft x 2 ft panel. Aim the edge of the panel at the sound source. Now you have a left-aiming PZM and a right-aiming PZM which are virtually coincident (Fig. 1).

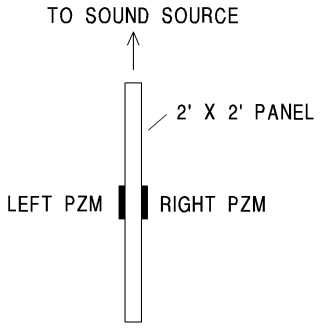


Fig. 1

Figure 2 shows how to create a mid and side signal from these two PZMs by using Y-cables, polarity reversers, and a 4-input mixer.

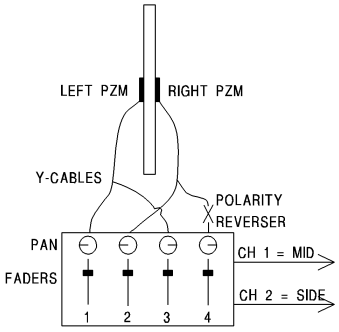


Fig. 2

Figure 3 shows how to sum-and-difference the mid and side signals to get left and right signals. By varying the mid/side fader ratio in Mixer 1, you can vary the stereo spread.

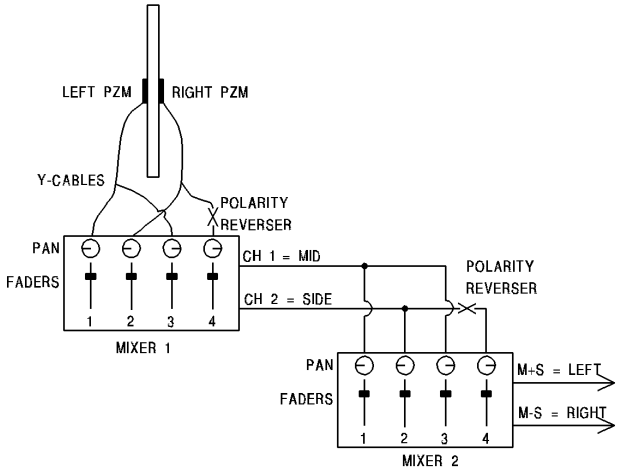


Fig. 3

Here's an easier way to vary the stereo spread: Simply connect the left PZM to fader 1. Connect the right PZM to fader 2. To get a wide stereo spread, pan the left PZM hard left, and pan the right PZM hard right. To get a narrow stereo spread, twist both pan pots partway toward the center.

Here's how the PZM mid-side microphone works:

Mid = L+R

Side = L-R

In Mixer 1, we are summing the left and right signals to channel 1 (using pan pots 1 and 2). This creates the mid signal. We are differencing the left and right signals and sending them to channel 2 (using pan pots 3 and 4). This creates the side signal.

Mid + Side = (L+R) + (L-R) = 2L

In Mixer 2, we are summing the mid and side signals to the left channel (using pan pots 1 and 2). So we get a left signal from Mixer 2's left channel.

Mid - Side = (L+R) - (L-R) = 2R

In Mixer 2, we are differencing the mid and side signals and sending them to the right channel (using pan pots 3 and 4). So we get a right signal from Mixer 2's right channel.

The Crown SASS Does Surround!

GTN soundmixer Gary Pillon told us that the Crown SASS-P MKII stereo mic works great with the Lexicon AVR-7000 receiver to create a surround effect from SASS recordings.

The receiver has Logic 7, which extracts 5.1 surround information. You just add some satellites and a subwoofer.

As Gary says, "The receiver pulls the sound that is behind the SASS into the rear and holds it there stably. To prove it, play the Earth Mover recording on the SASS Demo CD. The earth mover starts in front, goes over your head, and drives out behind you."

In the January 2000 issue of *EQ*, contributing editor Mike Sokol has this to say in the *Questions and Answers* column:

"I've been experimenting with the Crown SASS-P, which is a binaural-style mic, along with the AMS Soundfield quad-capsule mic. Both of these can be decoded via external processors to derive true 'surround' using two outputs from the Crown or four outputs from the AMS in B-Format mode. The Crown SASS-P can have rear surround 'extracted' from the binaural signal."

PZM Piano Miking

Source: Sweetwater Sound's Technical Tip of the Day

George Hanson

I have been the Stage Manager at the local Civic Center here for many years and have seen [piano miking] done a number of ways. The most common is, of course, the old mic on a boom stand. However, as head of the television production at a church I once attended, we tried several ways to get the best sound for television without picking up extraneous noises from the audience.

If you consider that the sound from a grand piano comes from the sound board underneath, the best place might be from the bottom. We tried that with a standard mic and a PZM mounted on a plexiglass backing. Both were somewhat effective — the PZM [was] probably the best — but both were still subject to extraneous audience noises.

The very best we were able to obtain came from mounting a PZM on the bottom side of the lid, using the lid for the necessary hard surface backing. With the lid closed, it is virtually unnoticed and blocks out all noises except somebody beating on the piano body.

Two things to watch out for: (1) be absolutely certain the mic is mounted so it will not fall off during performance, and (2) the microphone cable does not droop onto the strings killing some strings.

Why does this work well? A PZM is designed to pick up in all directions more so than other "instrumental" mics. A Shure SM58, let's say, will tend to pick up the sound the mic is closest to, i.e. bass strings or high end. One or the other will typically be weak. The PZM, on the other hand, mounted to the lid, picks up more nearly all of the frequencies of the instrument. You may need to pad the input, again depending on the particular mic you use. All of this is moot if your artist wants the lid off, but we have found it really is the best way to pick up the overall sound of the instrument.

Greg Baum Sweetwater

I have had outstanding results miking upright pianos by shoving a solitary Crown PZM mic up underneath the piano. If the piano is sitting on a naked wood floor, then the floor helps to act as a sounding board. I found the lows to be thick, the highs very clear and present and the mids to shimmer. The labels and A&R people loved it. I have tried other ways of miking, but I keep falling back on this. Using two mics doesn't work as well as using one. Once you get it positioned the sound will blow your mind!

Don Herman, Jr.

Most uprights allow one to open the top, which provides a place to put a pair of mics to pick up the high and low strings. Putting the mic in the cabinet has never worked well for me, however — too much boom and tizz. I'll usually put (or prop) up the lid a bit (maybe 8" to 10") and mic from the front, pointing the mics generally into the piano but at an angle. Some nice resonant effects can be had (also some bad resonance effects, of course) which add ambiance. This can be a challenge on some uprights, like some Steinways, which have the whole front section open rather than the top. For these, miking from the side may be better. In either case (no pun intended!) a PZM or two on the lid (or front) (facing the strings) may work really well.

It's almost always necessary to fiddle with mic placement (so what else is new?). I (or the player) pound out some chords and arpeggios, recording the same sequence using several initial placements to rough in the placement. Then I repeat the procedure with finer adjustments to choose the final positioning. You can get several sonic signatures ("bright" vs. "dark", "grand-like" vs. "honky-tonk", etc.) by doing this.

I generally also mic from the back (if it's not flat against the wall or I can move it) to help pick up the soundboard, in addition to the top (or front) mics. Mixed in at a lower level, or perhaps EQ'd so it's mostly bottom, the back mic can help fill out the sound.

Letters from Crown Mic Users

Just thought I would brag on Crown.

I have used the Shure/Countryman headset in the past. When I went looking for two systems for my church, I went with the Shure UC system... Along with the HH's, lavs, and bodypacks, I purchased a pair of your headsets.

WOW! Now I know why the big names use them.

Scores big on sound, gain / feedback, fit, comfort, durability, sound, cool flip down feature and best of all sound :-)) Keep up the great products !!

Mark B. Jenkins
mbj@aeneas.net
Union City, Tennessee
USA

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Fall 2000

SASS Stereo Mic for Assistive Listening Systems

In an email to churchsoundcheck.com digest, sound engineer Rick Chinn describes his use of the SASS for assistive listening:

"At the concert hall that I ply my trade in, we do provide headsets for the hearing impaired...We have a Crown SASS-P stereo microphone flown about 50 feet out in the audience area, and that is the usual source for the ALS system.

"When we drive it from the board, we add the board signal to the stereo mic's signal to retain the sense of being part of the audience. We delay the board signal to make it match the arrival time of sounds at the microphone...

" We also smack the signal fairly hard with a compressor to restrict the dynamic range. A hearing loss specialist told me that we should also bandlimit the frequency response to concentrate the energy into the speech range."

CM-311A Testimonials

Mic helps drummer sing

My name is Paul Stivitts, and I am the drummer for the Cary Pierce band. I wanted to thank you and tell you how much the headset microphone you sent [CM-311A] has raised the level of music for myself and the band.

I have the blessing (or curse) of having a high singing voice, and ever since Cary discovered I could sing, he's been trying to get it in to the show. I had never had much experience singing and playing, so it took a while before I was brave enough to try it. Then comes the "boom mic" stories. I did everything from bashing my teeth, hitting it with sticks, and getting my shirt caught. Needless to say, it made singing very difficult for me. That all changed the day your mic came in to Atlanta.

Now I am singing on at least half of the tunes, and it feels great! Thank you again, for your support, and your product. I am passing the word to everyone I know about Crown microphones! I hope we can meet in the future so I can thank you in person.

Sincerely,
Paul Stivitts

Happy customer

From a performer's standpoint, this CM-311A mic has been the most useful and valuable piece of gear I have ever owned. Since purchasing it many years ago, it has traveled the globe many times, covered the country back and forth on the road and in the air. It has changed the way I perform as a Christian musician/songwriter...

I love the rejection it has and the incredible sound of it...

You guys make terrific products and I've told many people that fact. Keep making things like you do! I'm one happy customer!

Sincerely,
Joel Weldon,
President- Little Peach Music, Inc.

Ambient Noise Pickup

To pick up ambient noise with PZMs, mount or tape one or two PZM-6D mics on the walls or ceiling, covering the area(s) that you want to pick up. If possible, keep the mics away from any PA speakers. Otherwise, the PZMs will sense the PA announcements as ambient noise.

Choosing the Right Gaf Tape

Many folks like to tape PZMs to the underside of piano lids. This results in a natural-sounding pickup of the piano sound. However, some gaffer's tape leaves a gummy residue when you remove it. Be sure to use only good-quality Permacel-type gaffer's tape that won't damage the instrument's finish.

Featured Inside

CM-700 Mic is First Choice

In the September 2000 issue of *Electronic Musician*, the Crown CM-700 microphone was picked as the first choice for microphone collections at two different price levels.

For his budget collection, Myles Boisen chose the CM-700, saying "The affordable Crown CM-700 small-diaphragm condenser has earned a permanent place in my mic cabinet by virtue of its warm and pleasing sound. The CM-700 is not as bright as most of the competing models, but it does convey every bit of tone in a source and features a 2-position low-cut filter that helps get the mud out."

"Like the Shure SM-57 dynamic," he continues, "the CM-700 is a microphone that you may never 'outgrow.' I keep finding new uses for it, including resonator guitar and marimba."

For his "No Compromise" midline system, Boisen chose the CM-700 for hi-hat. Brian Knave also selected the CM-700 in his "No Compromise" midline collection. Knave said, "For hi-hat, I picked the Crown CM-700 — not only because of its low price and great sound, but also because it offers a 2-position low-cut switch; with most hi-hats, I typically engage them both."

A Comment on the CM-310A from Live-Audio.com

The following exchange of emails occurred at http://www.live-audio.com:

Hey guys,

Was curious if anyone could tell me the difference between the Crown CM-310A Differoid microphone and normal microphones.

Josh Evans

Reply:

I used the CM-310A on Nirvana's vocals in the early '90s. Nirvana put out huge SPLs on stage (in the 110 dBA range) and we had always had problems with guitar and cymbal leakage into the vocal mics. The CM-310A cut this down by about 10 dB over a standard cardioid or supercardioid mic. The difference in the FOH mix was amazing. What had sounded like a jet taking off now sounded like a hit song! At big festivals, system engineers and other band mixers would ask me, "How are you doing that?" ...It became the mic I HAD to have. If you keep it dry and don't drop it, you should be happy with the CM-310A.

Craig Montgomery

Sagging phantom

One customer told us, "I'm building an active DI that operates on 48V phantom power. When I connect phantom, it drops to 3V. Can you help?"

We replied:

Your circuit looks good. I think that its current drain may be too high for the phantom supply in your preamp.

Check your preamp's schematic. Is there a 6.8 K resistor from +48V to pin 2, and another to pin 3? If the value is higher, there will be too much voltage drop under a heavy load (high current drain).

To measure the current drain of your circuit, make a 45V DC supply using five 9V batteries in series. Connect B- to your circuit ground. Connect a milliammeter between B+ and point P in your DI schematic. Measure the current drain of your circuit.

If the current drain is more than a few milliamps, that may be causing your phantom voltage to sag. The current drain of typical condenser mics is 0.5 to 4 mA.

Try an opamp designed for low current drain. Or, use a big 1:1 mic transformer instead of an opamp to balance the output. Use a FET source follower as the input circuit feeding the transformer. The FET gate bias resistor should be 100 megohms or higher.

With the FET/transformer circuit, the current drain should be very low, and the input impedance will be very high. Good luck!

Miking the Harp

If you need to mike a harp for sound reinforcement, here are some suggestions:

1. Place a CM-700 cardioid condenser about 8 inches from the sound board. First try a position about 1/3 up from the bottom, then fine-tune the placement until you locate the sweet spot for that particular harp.

2. Place a GLM-100 mini omni mic inside one of the sound holes. This placement provides good isolation and gain-before-feedback. The tone will be bassy, so roll off the excess bass with your mixer's EQ. For starters, try the hole that is 1/3 down from the top.

Hanging Mics for Distance Learning

A contractor wrote to us asking how to mike an auditorium for Distance Learning and videoconferencing. "[The room] has 256 seats. The ceiling height is 3.5m, but the seating is gently raked, so the ceiling height at the rear of the room is 2.5m.

"The AV contractor wants to use a number of CM-30s (supercardioid hanging mics) to provide speech reinforcement via ceiling loudspeakers. I need advice on how many microphones would be recommended at where to position them."

Our reply:

I suggest that you use a total of 16 CM-30 microphones hanging straight down over the students (see Figs. 1 and 2). The pickup angle of the CM-30 is +/- 60 degrees, or 120 degrees total. The mic sensitivity is down 3 dB at +/- 60 degrees off axis. I used that angle to determine how many mics are needed.

Assuming that the mics are hung one foot from the ceiling, three mics are needed (in a plan view or side view – Fig. 1) to cover all the students equally in each section. I suggest putting the speakers between the mics as shown, so that the speakers will be toward the rear of the mics' polar patterns to reduce feedback. Figure 2 shows the top view of the mic placement over the audience. The black dots are the mics.

It will be essential to use a gated mixer, so that only once mic is on at a time. Otherwise the gain before feedback and clarity will be poor. Also consider turning off the speaker nearest the active mic. Some gated mixers have this function.

Even with a gated mixer, the results might be marginal because the mic-to-source distance is so high. As an experiment, you could hang one mic, send its signal through the loudspeakers, and see if you can hear someone talking within +/- 60 degrees of the mic. If not, adding the other mics won't help. Many distance-learning setups require one mic per person, or one mic for every 2 to 3 people, mounted on desks or seat backs. A popular choice is the Crown PCC-170SW, a desk-mounted mic. The user presses its switch to turn on the mic when they want to speak.

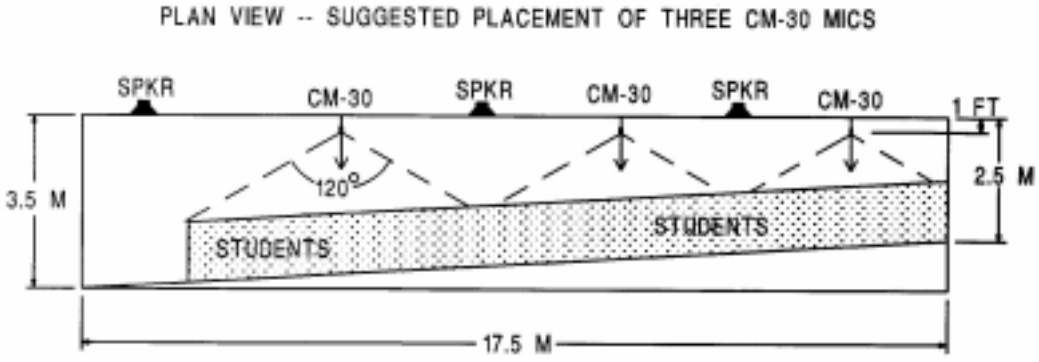


Fig. 1

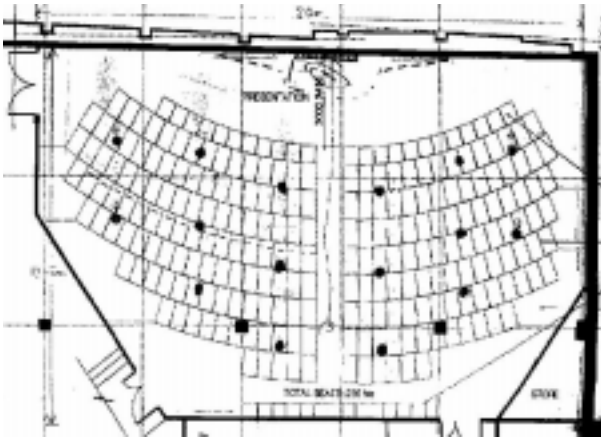


Fig. 2

For more information, Call 800-342-6939

Will phantom power damage dynamic or ribbon mics?

When you switch on phantom power in some mixers, phantom is applied to all the mic inputs at once. What will happen if you plug a dynamic or ribbon mic into one of those inputs? Will it be damaged by the phantom powering?

Not if the mic has a balanced output, and is wired correctly. Even if the mic is a dynamic or ribbon type, phantom will not hurt the mic. Please see Figure 3 and we'll explain.

Phantom powering applies a positive voltage to pins 2 and 3 in the mic, and the ground of the phantom supply is connected to pin 1. In a condenser mic, pins 2 and 3 are wired to the circuitry inside the mic. Phantom current entering pins 2 and 3 goes through the mic circuit, then exits out pin 1 and returns to the supply ground.

In a dynamic mic or ribbon mic, pins 2 and 3 are wired to the mic's voice coil or ribbon. Normally, the coil or ribbon is floating from the pin 1 ground. So the circuit loop to and from the phantom supply is incomplete. No current can flow through the mic's voice coil or ribbon if you apply phantom power. Result: no damage.

On the other hand, if one end of the voice coil or ribbon is accidentally shorted to ground inside the mic, several milliamps of current from the phantom supply will flow through the voice coil or ribbon back to the ground of the supply. This current can deform the ribbon or immobilize the mic diaphragm.

In short, if the mic has a balanced output in which the voice coil or ribbon is NOT connected to mic ground, phantom will not damage the mic. If the mic has an unbalanced output because the voice coil or ribbon IS shorted to mic ground, phantom could damage the mic. Miswired mic-level patchbays can damage mics as well.

When you plug a condenser mic into an input with phantom power on, the sudden application of phantom power creates a loud pop. Be sure to mute the mic channel that you are plugging into. If each channel has its own phantom switch, you could turn off phantom on that channel before plugging in, then turn phantom on. A dynamic mic creates little or no pop when plugged into phantom.

APPLYING PHANTOM POWER TO A DYNAMIC MIC

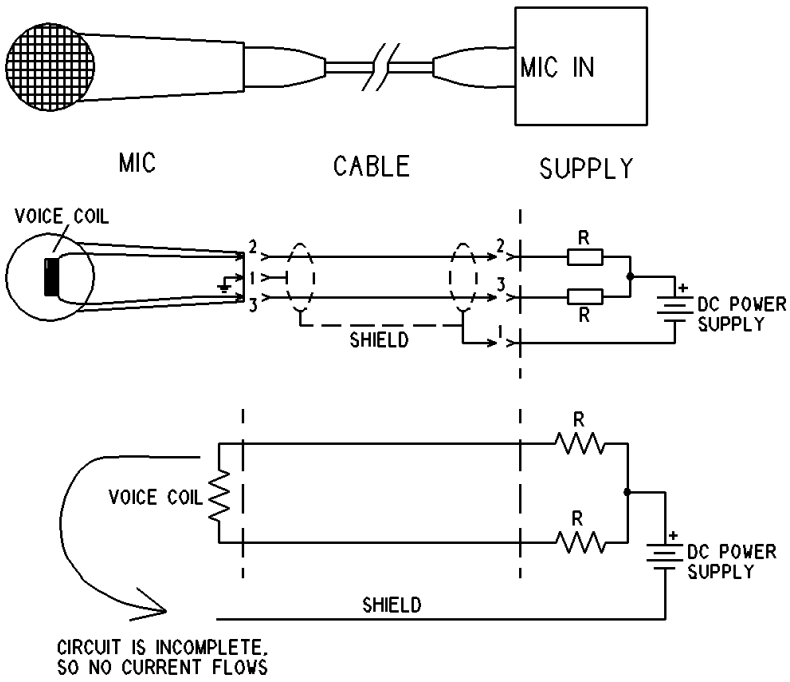


Fig. 3

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Winter 2001

'N Sync Uses Crown Mics on Tour

Two members of the five-man group, 'N Sync.
Photo source: http://onward.to/NSYNC

The top pop band, 'N Sync, wore Crown headworn microphones in their "No Strings Attached" tour last year, which was rated the Number 1 tour in Pollstar. In an article on the tour in the November 2000 issue of [italics]Mix[end italics], author Tom Kenny writes:

"The five members of 'N Sync—'the guys' as they're known on tour—sing through ... handhelds ..., switching to Crown CM-311s when they move over to headsets."

Make a Hoop-Type Pop Filter

Miking a singer for a studio recording? Be sure to watch out for breath pops. When a singer says the sounds "P", "B", or "T", a puff of air shoots out of the mouth and hits the mic diaphragm, causing a little explosion or thump sound called a "pop."

You can prevent this problem by buying or making a hoop-type pop filter. Basically it's a hoop with a stocking stretched over it. You place the filter a few inches from the mic, and it filters out the breath pops before they can reach the microphone.

In a craft store or fabric store, find an embroidery hoop and frame at least 4 inches in diameter. Then get some stockings from a women's clothing store. Put the inner hoop inside the stocking. Stretch the stocking over the inner hoop, and clamp it with the outer hoop. Tighten the nut on the outer hoop to keep everything secure. Cut off the excess stocking.

Next, get a coat hanger wire about one foot long. Using a pliers, bend the wire around the tightening-screw shaft in the outer hoop. Put the other end of the wire in a mic clamp and insert a microphone to trap the wire. Position the hoop about 2 to 3 inches from the mic, and enjoy pop-free recordings!

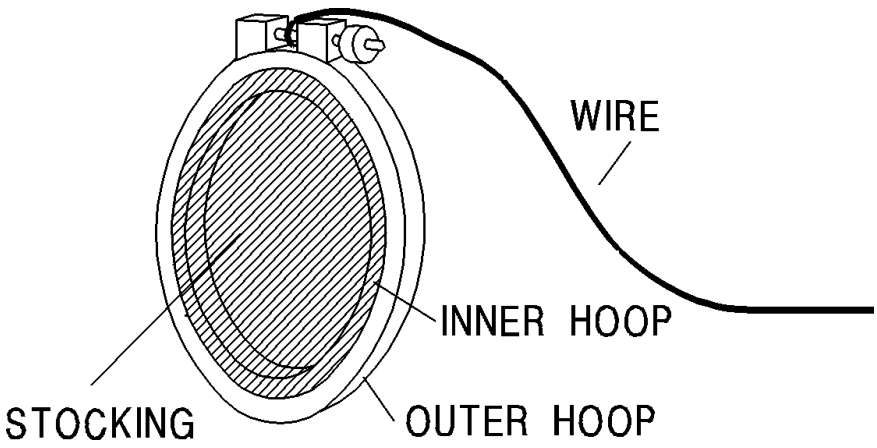


Fig.1. Hoop-type pop filter

Featured Inside

For more information, Call 800-342-6939

A Harman International Company

Ted Nugent Loves the Crown CM-311AE, CM-700

Photo source: http://www.tnugent.com/music/tour_photos2.shtml

Rock star and guitar phenomenonTed Nugent recently got to try the Crown CM-311AE Differoid headworn mic. He raved,"This mic has set me free!" Note the huge stack of Marshall amps behind him. The Differoid rejects the sound of those amps so that Ted's mic signal is only his voice.

Here's what Ted's soundman, Wayne Trevisani, said about the CM-700 cardioid condenser microphone:

"I got a chance to try out the CM-700. First [I tried it] on the bottom snare (replacing a Shure B87C), and found a much smoother response on the top end [high frequencies]. This mic sounded great on its own. The drummer, Tommy, has two high hats. I tried two CM-700s on the high hats (replacing one AT 4050), allowing me to get a tighter sound. With a matched set of CM-700's it helped clean up my entire rhythm sound!"

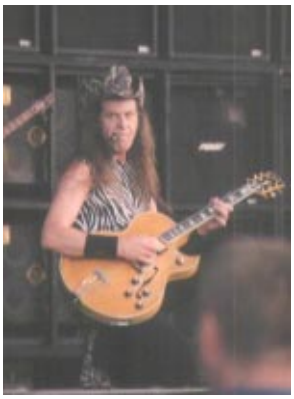


Photo source: http://www.tnugent.com

Thanks to Crown's David Grant and Mark Darnell for this information.

Customizing a SASS™ Stereo Mic

Lang Elliott, an outstanding nature recordist, sent us some CDs of birds and coyotes recorded with a Crown SASS stereo PZM microphone. It was custom fitted with low-noise omni microphones. The CDs sounded fantastic in their naturalness and stereo imaging.

Previously, I had given Lang the following advice about building his custom SASS:

"If you mount two omni mics in the SASS, they should be mounted with diaphragms flush with the boundaries. Remove the existing mic capsules and electronics, drill holes to fit the mics, and hold them in place with some foam or hardware. There should be an airtight seal between the mics and the SASS boundaries.

"When a mic is mounted in a boundary, the mic needs to have a rising high-frequency response (a pressure response) when measured in a free field. If you use mics with a flat free-field response, they will roll off in the highs when mounted in a boundary. So they will need some high-frequency boost EQ to sound natural."

Lang had this to say:

"The recordings on the CD's I sent you were made using the original SASS-B retrofitted with mics having an extremely low noise floor. They're mounted flush with the end of each mike held steady using a rubber gasket-sleeve glued to the inside of the SASS front surface. The gasket is actually a rubber 'pressure build-up ring' supplied with each mike to give a little boost to the highs.

"I have never done any high frequency EQ of my customized-SASS recordings yet they sound great. But the omni mics have totally flat response and I guess this means that there's some rolloff of the highs. But how much are we talking about? 3 dB or more from 8-20 kHz?"

I replied:

"If you're happy with the tonal balance you're getting with the SASS and omni mics, don't bother with EQ. Sounds like the rubber gasket is giving you some acoustic high-frequency boost anyway.

"In theory, a mic diaphragm experiences an 8-to-10 dB pressure buildup due to diffraction at the frequency whose wavelength equals the diaphragm diameter. So a 1 inch diameter diaphragm would have a pressure

Continued on page 3

For more information, Call 800-342-6939

crown®
A Harman International Company

Gran Torino Relies on Crown Mics

Gran Torino, a jazz/rock band with horns, plays a mixture of R&B and rock. Their infuences are Chicago, Earth Wind & Fire, Tower of Power, Blood Sweat and Tears, and Little Feat.

Trumpet player Scott Peterson filled us in on their usage of Crown microphones:

The band has two drummers, and the drummers use the PCC-160 (supercardioid boundary mic) in each kick drum. The mics sound "super hot, super clean, no mud, nice attack." Scott also uses the mics as triggers for a sound module playing subharmonics.

He uses the PZM-30D Pressure Zone Microphone on the low horn of the Leslie speaker, with zero EQ. The mic is mounted on the inside down by the bass rotor. There's a pair of CM-700s outside on the upper rotor. According to Scott, "They work really well and pick up a natural reverb about six inches from the cabinet. We overdrive the rig to saturation, and the mics pick up a lot of that nuance."

Guitar is picked up direct and miked with a CM-700. Horns, snare, and toms are all CM-700s as well.

The lead vocalist is using a CM-200A (cardioid condenser), while the guitarist sings through a CM-310A Differoid. His previous mic was picking up his amp, but not the CM-310A.

Check out Gran Torino's web site at http://www.grantorino.com.

Continued from page 2

rise around 13.6 kHz. The formula is f = c/d, where c is the speed of sound, 13560 inches per second, and d is the diaphragm diameter in inches.

"If a mic has a flat response in a free field, part of that flat response is due to the high-frequency pressure buildup. Without that buildup, the mic would roll off in the highs in the free field.

"That pressure rise due to diffraction does not occur if the mic is mounted in a boundary. Hence, there's a need to restore the rolled-off highs.

"When a mic is in a boundary, there's a pressure buildup (thus a rise in the response) at the frequency whose wavelength equals the boundary dimensions. So a 5-inch boundary would have a response peak around 13560/5 or 2712 Hz. This peak is strongest if the boundary is circular and the mic is in the center of the boundary. The SASS boundaries are not circular, and the capsules are not in the center of the boundaries, so the peak is minimal.

"The SASS response is optimized for use in a reverberant sound field, such as in a live concert hall. It tends to sound brighter when used in an anechoic sound field, like outdoors. To avoid that extra brightness with outdoor recordings, the mic may not need any high frequency emphasis. If your ears say it's okay, it is!"

Russian Government Uses Crown Conference Mics

RAD Co. in Seattle designed a highly effective Crown conference miking system for the Moscow House of Public and Political Organizations.

According to a press release, the automated conference system is easy to use. The sound person simply inserts the microphone plugs into the mounted holes in the boardroom or conference table, and the system switches to the configuration for the corresponding room.

The boardroom system includes 8 MB-1 Mini Boundary Mics, 1 PCC-130SW switched cardioid boundary mic, and 1 PCC-170SWGT mic. In the conference room are 11 MB-1's, 1 PCC-130SW, and 2 LM-301A lectern mics. All the mics are controlled by one Crown IQ-USM810 computer-controlled mixer. A Crown CP-660 power amp drives the speakers. The system works for teleconferencing as well.

A Crown D75 power amp is used for audio signal distribution to up to 40 journalists.

After the design, installation and setup by Sergei Eremine, more than 50 conferences have been held using the system. Several famous Russian leaders participated, such as Chief of Moscow City, Y. Luzhkov; Leader of the Public and Politial Organization "Otechestvo"; M. Gorbachev and others. According to the press release, "Every meeting worked well and was comfortable for the members."

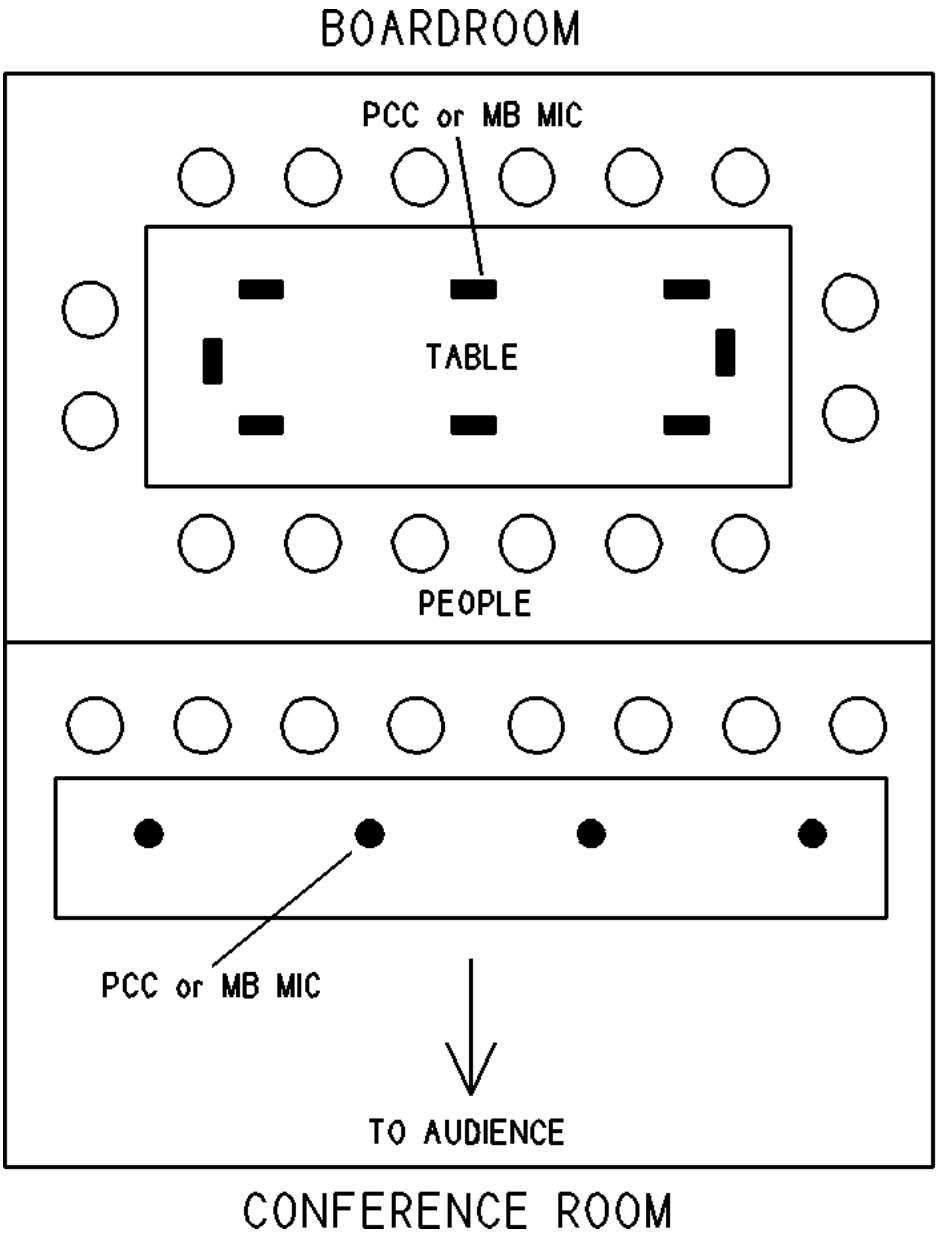


Fig. 2 - Microphone layout

Letters from Crown Microphone Users

A really-uptown opera singer loved the CM-700 that we used on her voice this week. We had four CM-700s downstage to mic a ten-piece vocal group during a symphony concert and we had run out of channels (80!!) and mics (78!!), so the CM-700s were doing double-duty as solo mics.

Originally, she was supposed to pick up a hand-held wireless to sing with, but ... she walked straight out and up to one of the 700s and I thought, this might be interesting. Well, it worked out great. She didn't want any monitors, so that wasn't an issue and she later commented that for once, she was free to use "expression" during her performance. Plus she went off-axis and several inches back and forth and the response of the mic stayed pretty much the same. Gee, who knew??

Geri O'Neil
Stagelite Sound

For more information, Call 800-342-6939

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor **Spring 2001**

Blues Band Boogies with Crown Mics

Photo source: http://www.southsidedenny.com

One of the top blues artists near Crown is singer/guitarist Southside Denny. Playing for decades, he has attracted a large following around the country. Check out his web site at http://www.southsidedenny.com.

Denny prefers to use the Crown CM-200A cardioid handheld mic on vocals and the CM-700 cardioid mic on his guitar amp because of their natural sound. The band's drum kit is miked with a single GLM-100 clipped to the rim of the snare drum on the drummer's right side. That's all it takes.

In the kick drum, lying on a blanket, is a PCC-160 supercardioid boundary mic. This mic is normally used on stage floors to pick up actors. But with some low boost and high cut, Denny says, the PCC-160 yields a great kick drum sound.

Getting a Bright Sound on an Upright Piano

Recording engineer Gary Wakenhut is a musician with the folk duo *Collecting Consort*. To pick up an upright piano, he placed a pair of GLM-100 mini omni mics under the keyboard, aiming at the open strings. This worked pretty well but he wanted a brighter sound.

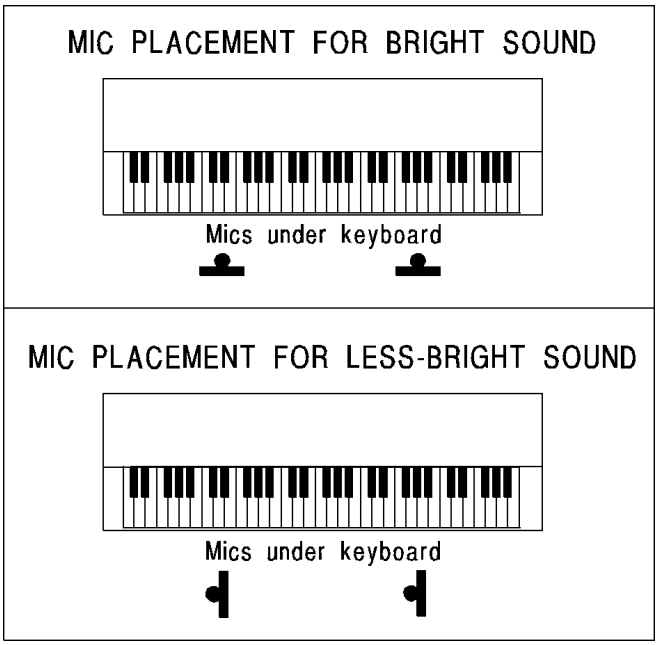


Fig. 1. Top: Sound Grabbers facing piano. Bottom: Sound Grabbers at right angles to piano.

We recommended that he try a pair of Sound Grabber II microphones in the same position. Because of their rising high-frequency response, they are bright-sounding mics. Also, the Sound Grabber has a built-in plate that acts like an acoustic equalizer. If you face the plate at the sound source, the upper mids are emphasized due to the plate's effect on the sound field (Fig. 1, top). If you turn the plate 90 degrees to the source, the tone quality is more natural (Fig. 1, bottom).

Featured Inside

Recording a Singer/Guitarist

Suppose you want to record a musician who plays guitar and sings at the same time. The vocalist is self-accompanied on acoustic guitar. Let's look at some ways to record them effectively.

At first glance, this seems like an easy miking situation. Just put a mic on the singer, another on the guitar, then mix the two mics. But how does it sound? No matter how good the mics you use, often the singer's voice sounds thin, hollow or filtered.

That strange sound can occur whenever you mix two mics that are picking up the same sound source. The vocal mic picks up the singer's voice, and so does the guitar mic. As Figure 2 shows, the vocal picked up by the guitar mic is delayed because the vocal sound travels a longer path to that mic.

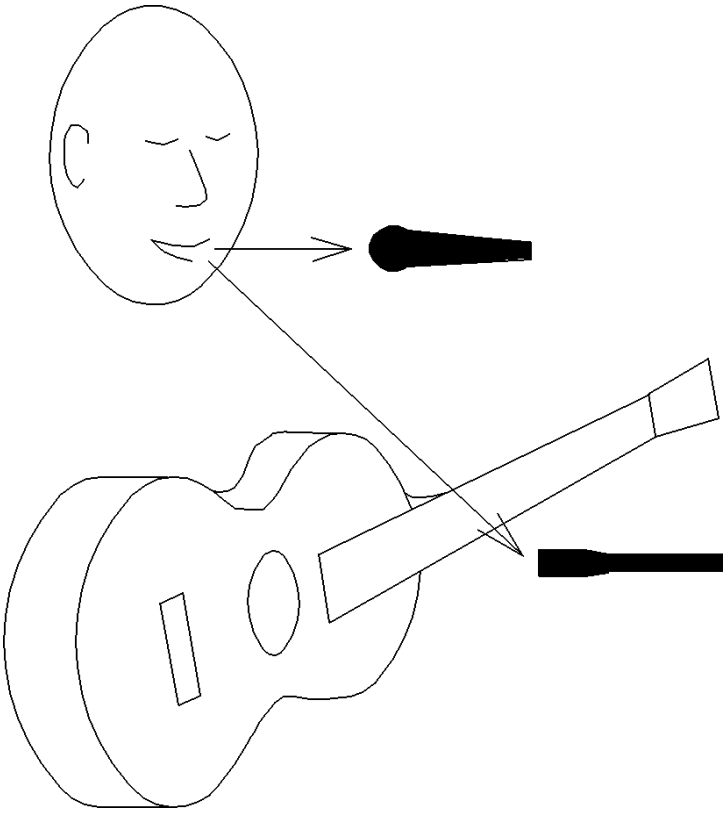


Fig. 2. Sound from the mouth travels different distances to the two mics.

The two vocal signals in the mix—direct and delayed—interfere with each other and make a hollow sound. How does that happen?

When you combine a signal with itself delayed, at equal levels, certain frequencies cancel out. In the frequency response of the mixed signals, a row of notches appear at the frequencies that cancel. This response is called a "comb filter" effect because it looks like the teeth of an inverted comb.

The frequencies that cancel depend on the difference in distance from the mouth to the two mics. For example, suppose the guitar mic is 1.13 feet farther from the mouth than the vocal mic is. A distance of 1.13 foot is ½ wavelength of a 500 Hz tone. So, 500 Hz would cancel out of the vocal signal, because 500 Hz is ½ wavelength out of phase at the guitar mic. When the peak of the 500 Hz wave is at the vocal mic, the trough of the 500 Hz wave is at the guitar mic. The peak and trough cancel when the signals are mixed.

Nulls occur at odd multiples: 500 Hz, 1500 Hz, 2500 Hz, 3500 Hz, and so on. The null spacing in Hz is C/D, where C is the speed of sound (1130 feet per second at 74 deg.), and D is the difference in miking distance in feet. In this case, C/D = 1130/1.13 = 1000 Hz constant spacing between nulls.

If we move the guitar mic to 6 inches further away to 1.63 feet difference, the nulls will be 1130/1.63 or 693.24 Hz apart.

In general, if two mics pick up the same sound source at different distances, and their signals are summed to the same mix channel, this will cause energy cancellation. These are dips in the frequency response caused by combining out-of-phase signals. The result is a colored, filtered tone quality that sounds like mild flanging.

In fact, that's how a flanger works. Using a digital delay that sweeps between 0 and 20 msec, a flanger creates a comb filter whose notches slide up and down the audio spectrum.

The hollow, filtered sound occurs when two mics pick up the same source at nearly equal levels, with a delay between the mics. There are at least three ways to solve the problem:

1. Make the mic levels unequal: increase the acoustic separation between mics, so that the guitar mic "hears" only the guitar, and the vocal mic hears only the vocal.
2. Remove the delay between mics.
3. Overdub the vocal.

Let's look at each technique.

Increasing the separation between mics

- Mike closer. Put the guitar mic close to the sound hole (Fig. 3-A). The tone there is very bassy, so turn down the low-frequency EQ on your mixer (or on the mic) until the sound is natural. Also cut a few dB around 3 kHz to reduce harshness. Put a foam pop filter on the vocal mic and angle it upwards. The singer should have lips lightly touching the pop filter. Again, the vocal tone will be bassy, so roll off the excess lows with your mixer's EQ.

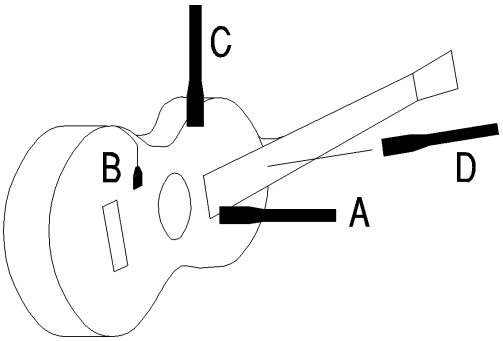


Fig. 3. Guitar miking (see text).

- Use a mini omni mic on the guitar to increase isolation. The Crown GLM-100 works very well taped about ½ inch from the low E string, about halfway between the sound hole and bridge (Fig. 3-B). Mounting the mic closer to the sound hole gives a bassier sound. You can roll off the excess bass with your mixer's EQ, and this will increase the separation.
- Use a pickup on the guitar instead of a mic. You get the most isolation with a contact pickup. It attaches to the guitar, usually under the bridge. The sound of a pickup is something like an electric guitar. You can mix a GLM-100 mic with a pickup to add air and string noise to the sound of the pickup. That way, you get good isolation and good tone quality.
- Use a supercardioid mic on the guitar. Aim the "dead" null of the guitar mic's pickup pattern at the mouth. Angle the vocal mic up toward the mouth, and angle the guitar mic down toward the guitar (Fig. 3-C). Then the guitar mic won't pick up so much vocal. This method helps even with a cardioid mic, such as the CM-700.

Removing the delay between mics

- Delay the vocal mic signal. Suppose you record the vocal and guitar on separate tracks of a multitrack recorder. Some digital multitracks, such as the TASCAM DA-38, have a track-delay feature. Just add a 1 msec delay to the vocal track. When you mix the vocal with the guitar, the delay will change the vocal tone from thin to natural.

  Ideally you would delay the vocal signal by the difference in sound-travel time between the vocal mic and guitar mic. For example, if the vocal mic is touching the lips, and the guitar mic is one foot from the mouth, the delay should be 0.88 msec. That's because sound travels 1 foot in 0.88 msec. Most delay units don't have that resolution, so try 1 msec as a compromise.
- Pick up both sources with one mic: Use just one CM-700 mic on the singer/guitarist midway between the two sources, about 1 foot out front. Raise or lower the mic to adjust the voice/guitar balance. You might also try a stereo mic (SASS-P MKII) or a stereo pair of CM-700 mics.

Overdubbing the vocal

- First record the guitar, then overdub the vocal. This method sounds the best because the isolation is perfect, and you can use any mic techniques you want.

Some guitarists, however, are not comfortable with this method. They need to sing and play at the same time. That's when you employ the techniques mentioned earlier. If you can record the guitar and vocal separately, here are some suggestions:

First prepare the guitar for recording. To reduce finger squeaks, try a commercial string lubricant, a household cleaner/waxer, talcum powder on fingers, or smooth-wound strings. Ask the guitarist to play louder so that the "music-to-squeak ratio" is high.

Replace old strings with new ones a few days before the recording. Experiment with different kinds of guitars, picks, and finger picking to get a sound that's right for the song.

For acoustic guitar, a popular mic is a condenser with a smooth, extended frequency response from 80 Hz up. This kind of mic has a clear, detailed sound. You can hear each string being plucked in a strummed chord. Usually the sound picked up is as crisp as the real thing.

Now let's look at mic positions. Try a CM-700 about 1 foot from where the fingerboard joins the guitar body—at about the 12th fret (Fig. 3-D). That's a good starting point for capturing the acoustic guitar accurately. Still, you need to experiment and use your ears. Close to the bridge, the sound is woody and mellow.

The guitar will sound more real if you record in stereo. Try one CM-700 near the 12th fret, and another near the bridge. Pan left and right.

Here's a typical way to mike a singer for an overdub in the studio. Place a CM-700 mic about 8 inches from the singer's mouth, and put a hoop-type pop filter midway between the mouth and mic grille.

Good luck capturing the singer/guitarist!

Shania, Britney Count on Crown Headworn Mics

The Feb. 2001 issue of *Mix* magazine is full of photos of pop star Britney Spears singing with the Crown CM-311A headworn microphone. She was wearing the mic on her European tour.

In the photo below, country star Shania Twain is shown with her band's guitarist sporting a CM-312A.

crown®
A Harman International Company

Miking Acoustic Guitar with a GLM-200

Miking an acoustic guitar is always a challenge. If you mike close to the sound hole in order to reject feedback, the tone quality is bassy. If you mike a foot away in order to get a natural sound, feedback is a problem. It's hard to get a natural sound and enough gain-before-feedback at the same time.

A Crown customer, Ken Laberteaux, told us about a guitar-miking method that worked well for him. He purchased a $6 clamp from Menards and affixed the clamp to a coat-hanger wire. This forms a GLM mic holder. Using this holder, Ken mounts a Crown GLM-200 mini hypercardioid mic about 3 inches from his guitar, pointing at the fretboard just above the sound hole. The mic is angled down slightly so that the mouth is in the null of the mic's polar pattern (110 degrees off-axis).

With the mic in this position, the gain is adequate in most cases. The sound is clear and natural if you apply a some bass and treble rolloff on your mixer's EQ.

A GLM-UM Universal Mount is packed with the GLM-200, and this mount could work when attached to the sound hole.

Popless Mic On/Off Switch

Many microphone users want to insert a mute button in-line with a mic cable. When you use a dynamic mic, all you have to do is short XLR pins 2 and 3 together to mute the mic. But with a condenser mic, shorting pins 2 and 3 can cause a click or pop.

The cause is phantom-power imbalance. If the phantom DC voltage on pin 2 is higher or lower than on pin 3, you get a pop when you flip the on/off switch.

Bob Stadtherr, of Bob Stadtherr Engineering, kindly supplied us with a circuit to prevent this problem. Stadtherr describes the circuit shown in Figure 4:

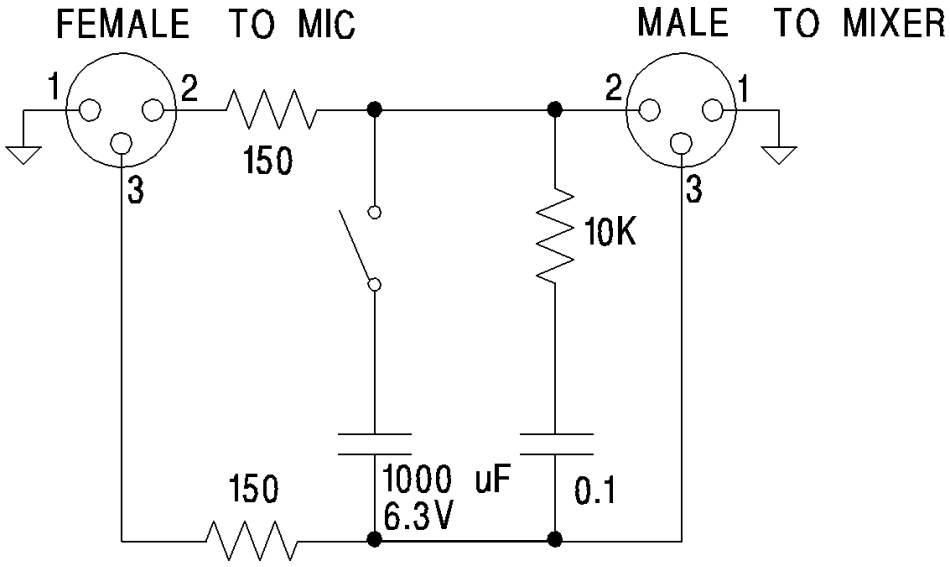


Fig. 4. Schematic of on/off switch.

"This is essentially a lowpass filter, with a cutoff frequency around 1 Hz (assuming a 150 ohm mic impedance). The 10K resistor allows the capacitor to charge to the DC voltage between the lines, so when the switch is closed, no change to the DC levels occurs."

Thanks for your suggestion, Bob! Figure 5 shows how to add an LED to this circuit. Use a DPDT switch and a 9V battery. It can be wired so that the LED comes on when the mic is on, or when the mic is off. In Fig. 5, the DPDT switch is shown pictorially rather than schematically. The components shown in Fig. 5 are the same as those shown in Fig. 4.

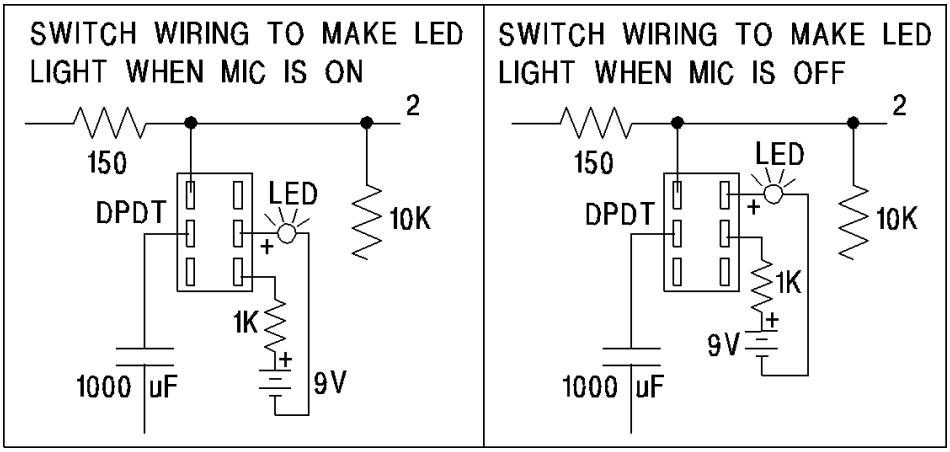


Fig. 5. DPDT switch wiring to an LED.

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Summer 2001

The Single Mic Technique for Music Reinforcement

What goes around, comes around. In the 1920's through the 1940's, PA systems for music used a single microphone. Band members gathered closely around this single mic and balanced themselves by moving toward or away from the microphone. Radio broadcasts and recordings used one mic as well.

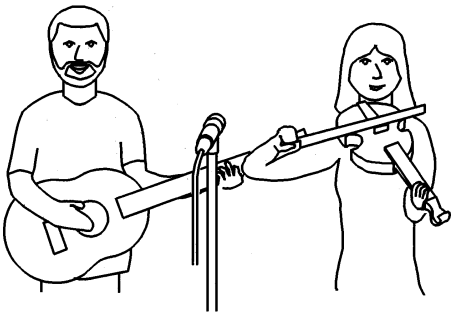


Figure 1. Single-mic PA method.

This old-fashioned technique is making a comeback. Many new bluegrass and folk bands are trying the one-mic method with surprisingly good results. They use a single modern microphone: typically a large diaphragm cardioid condenser. It picks up the sound with amazing clarity, and usually with very good gain-before-feedback.

How can a single mic work so well? As theory says, the fewer the number of open microphone, the better the gain-before-feedback. Also, a single mic picks up all the instruments and vocals with a coherent, focused sound. There are no phase cancellations between multiple mics to color the tone or smear the transients.

Placement

Want to try the single-mic method? Install a CM-700 cardioid condenser microphone on a stand, ideally in a CM-SM shock mount. Use a boom if you need more room for instruments. Place the mic at about chin height and 12 to 18 inches away from the performers.

The mic stand goes in the middle of two or three musicians. If the band is larger, every two people might use their own single microphone.

In a typical bluegrass or folk group, you'll see a fiddle, guitar, banjo, mandolin, singers and maybe a dulcimer or bass. It's possible to get a good balance of all these elements through careful mic placement. Raise the mic stand to make the vocals louder relative to the instruments, or vice versa. You might aim the mic slightly left or right of center to adjust the balance between performers.

Some bands prefer to run the mic through a high-quality mic preamp, then they give the preamp's line-level signal to the FOH engineer.

Feedback can be a problem with floor monitors, so this method generally omits them. Performers tend to hear each other just fine anyway because they are close together and don't use guitar amps.

It's a good idea to start with no EQ, then tweak a graphic equalizer to notch out feedback frequencies.

Advantages

One obvious advantage of the single-mic technique is that the stage looks cleaner. Gone is the forest of mic stands, booms and cables. Instead you have a low-tech, old-fashioned look that fits in well with the music.

Setup is much quicker, too. Just place the mic, plug it in and you're done. The band determines the mix, rather than the sound mixer, who might not be familiar with the music.

Frank Lee and Rayna Gellert are a prominent old-time duo who use the single-mic method. "I've often been disappointed with the PA sound that we've gotten on tour from sound mixers," says Frank. "Some of them don't know our style of music, so the mix is wrong or the instruments sound unnatural. But when we use one mic, the audience hears how we really sound."

"This technique is a natural for small bluegrass bands. As each musician takes a solo, he or she walks up close to the mic, just like in the old days."

Disadvantages

With the single-mic method, you do give up fine control of the mix balance, EQ and effects. The technique works best for small acoustic groups that have a good live balance.

Another disadvantage is that the method is unfamiliar to house engineers. As Frank Lee says, "About nine out of ten sound mixers are reluctant to use this technique. They don't like to give up control, or they don't think it can work. I have to convince them. But some sound mixers are open to the idea. They are surprised at how loud it is, and how balanced and natural it sounds. And during our set, they can relax and take a break!"

Summary

As they say, "Air is the best mixer." The single mic captures a balanced blend of of all the instruments and vocals at one point. Give it a try, and you might be delighted with the purity and simplicity of this technique.

Featured Inside

PZMs Recommended for Piano

In his article in the Mar/Apr 2001 issue of *Technologies for Worship*, author Curt Taipale suggested some ways to mike a piano with PZMs:

"Another possibility is to use one or two Crown PZM mics. The typical approach is to place them on the underside of the piano lid, since that provides a large boundary for the mic. Another choice is to place the PZM mic at the base of the stick, with the mic facing from right to left across the piano strings. Crown has an application note, which suggests some excellent techniques to try for getting the best sound from their mics. You can find them on the internet at www.crownaudio.com.

"There are two useful approaches for miking an upright piano. One is to place an omnidirectional mic, or even a PZM, inside the piano near the hammers. Another method is to mic the soundboard from the back with a cardioid mic."

Recording a Race Car

A recordist named Mar, from Steel Racing in Fairfax, VA, asked us how to record a race car effectively. He had attached some piezo disks to the tail pipe but picked up too much mechanical noise and pinging. And when he placed a mic near the tail pipe, the puffs of air popped the mic badly.

We recommended that he try a GLM-100 mini omni mic, which has a flat response down to nearly 30 Hz. A foam windscreen can be taped around the mic. A hoop-type pop filter between the mic and sound source can cut down on popping as well. It also helps to put the mic off-axis of the tail pipe, not directly behind it.

GLM-100

Being an omnidirectional mic, the GLM-100 is insensitive to mechanical vibration, so it can be used in a moving car.

We also recommended that Mar construct a pad (a resistive attenuator) to reduce the level from the mic so that it would not overload the recorder input. Try a 1000 ohm resistor in line with XLR pin 2, another 1000 ohm resistor in line with pin 3, and a 180 ohm resistor across the recorder end of the resistors.

SPL vs. Sound Pressure

Have you ever wondered how much pressure sound waves produce? Recall that normal atmospheric pressure is 14.7 lb/sq in. Sound waves are tiny deviations above and below that normal pressure. The equations below relate sound pressure level in dB to pressure in lb/sq inch:

First, note that normal atmospheric pressure = 14.7 lb/sq in = 1 bar = 1 million microbars.

1 microbar = 74 dB SPL = 0.0000147 lb/sq in.

10 microbars = 94 dB SPL = 0.000147 lb/sq in.

The equation relating SPL to pressure is

$SPL = 20 \log P/P_{ref}$

where

P = sound pressure in microbars, and P_{ref} = .0002 microbar.

Given the SPL, what is the sound pressure?

$P = P_{ref} \times 10^{(SPL/20)}$

150 dB SPL is 6324.6 microbars or .09 lb/sq in.

170 dB SPL is 63,246 microbars or .9 lb/sq in.

190 dB SPL is 632,455 microbars or 9 lb/sq in.

194 dB SPL is approx. 1 million microbars or 14.7 lb/sq in.

So, if a sound source is putting out 194 dB SPL, it is producing a vacuum (0 lbs/sq in) on negative peaks of the waveform. Higher SPLs than that would "clip" the air!

Letters from Crown Mic Users

I wanted to be able to give you a accurate and informed opinion on all of the [Crown] microphones. I've used them in every show I've mixed, and even a few recording projects. I'll try to be as objective as I can.

CM-311A: This is a truly "engineer friendly" mic. Dynamic range is all there, maintains a very consistent input gain as long as it stays in position. This headworn mic is so consistent, it almost acts as if it has a premium quality compressor on it. Feedback rejection is incredible; result: screaming loud and clear monitors as well as FOH. The hardest part of using this mic is putting it on.

CM-310A: Every bit as nice as the 311A in a handheld version. The only downside to this mic is training the vocalist to stay on it. However, like the 311A, this mic will produce great sounding monitors at impressive levels. Let's not forget the FOH guy, the advantage here is less stage noise bleeding into the vocal mics, thus producing a cleaner, more isolated and controllable mix.

CM-200A: The all-arounder. I haven't found an improper use for this mic. I have used this beauty on vocals, guitars, drums, Leslies, congas, timbales, bass cabinets, and even once as an overhead. The characteristics of the 200A are true representation of the instrument with a natural warmth compared to $2000.00 studio mics, with one exception: if you drop the 200, it will still work.

CM-200A

GLM-100: These little guys are quite impressive. Absolutely my new favorite high hat mic. The GLM sounds more natural on the hat than anything I've ever heard. I've tried this on a kick drum and was very suprised, once aimed it responded well almost sounding compressed. As a lavalier mic, it performs well also but sounding a bit hollow. With a little help from the parametric on the strip this was soon resolved. The downside to this mic seems to be the pattern, for tight applications there seems to be significant bleed [it is an omni mic]. However with proper or "creative" mic placement it shouldn't be too much trouble at all.

PCC-160: ... On a recording project I did find the right place for it. Inside a guitar cabinet it found its home; it was the perfect sound for a ghosty lead that the band seemed to be looking for. Sweet, full and haunting, the 160 did the trick in a signature manner. Recording studios should be looking into this one or they'll miss the boat.

CM-700: I've saved the best for last. I really can't say anything negative about this mic. There is no bad application for the 700. I have focused in on a ride cymbal from 5' away, bottom or top snare is incredible, toms, bass, guitar (acoustic or electric), latin percussion, Leslie high or low, and even once when another mic went down, I put it in a kick drum. The result was impressive, I expected the 700 to clip badly but it didn't. It was a bit more sensitive on input gain, however after a slight adjustment on trim, it floored me. What an impressive mic this is. Again, true and natural sounding posing minimal effort to get into the mix.

In conclusion, I am extremely impressed with the arsenal you provided me with. Crowns are my first choice on every show. The Crown Microphone Division has come through in a big way. In my opinion, you have found a spot in the frequency range that other companies have either not noticed or ignored. Although seeming a bit transparent at first on some models, these mics reproduce a more natural tone than any other. They seem to isolate instruments and vocals in a way that others don't. The majority of other microphones seem to compound certain undesirable frequencies causing the mix to suffer or at least keep the engineer cranking on more rotaries than should be necessary. I would recommend this line to anyone in our trade without reservation, any company, large or small, live sound or studio. It is obvious that Crown has done extensive research and listened to the opinions of the working engineer on these transducers in the same manner as they used to produce amplifiers. What more can I say; yet another home run.

Very sincerely,

Troy Shearman / The Sound Company

For more information, Call 800-342-6939

PZM-11 Picks Up Discussions for Psych Dept.

A customer who works at the Psychology Deparment of a large university called us, asking how best to mike a therapy room that was 16' x 20' by 8' high.

We recommended that he try two PZM-11 security mics in the ceiling, as shown in Figure 2. Those two mics should give even coverage of the entire room. Each mic covers half the room. The PZM-11 microphone has a high-frequency rise that compensates for the loss in highs when miking voices overhead, off-axis to the mouth. This compensation makes the sound crisp and clear.

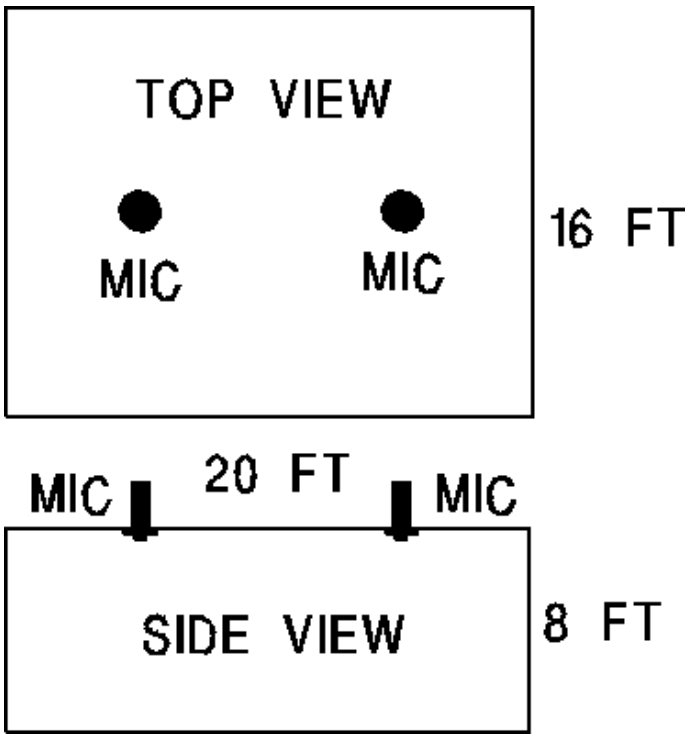


Figure 2. Placement of PZM-11 mics in a room 16' x 20' x 8'.

Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Fall 2001

SURROUND MICROPHONE TECHNIQUES USING THE SASS-P MKII

by Mike Sokol

For the last few months, I've been working with a number of broadcast sound designers that are trying to make 5.1 surround mixes out of regular stereo program material. Admittedly, some of the surround mixes they've come up with are quite remarkable, considering the tracks they started out with. By using a combination of joystick panning and multiple reverberation effects, these "surround" mixes have a lot of interesting movement and texture. However, the problem is that they really don't sound "live" to my ears. This is especially true of live multi-track concert recordings for DVD's or broadcast, where the audience in the surround speakers sounds canned, and there are lots of impossible sonic movements in the mix that don't match up with what the camera is seeing.

Now don't get me wrong, I personally like a music mix with lots of pans and moves. Back when dinosaurs ruled the earth (according to my kids), I played in various Rock bands where I jumped through fireballs on stage. I was weaned on Beatles in the 60's and Pink Floyd in the 70's. But when the audio is in a supporting role for the picture on the screen, the sound designer must be careful not to build a soundstage that overshadows the picture on the screen, Hi-Definition or otherwise. And this is even more true for 5.1 surround mixes, since there's the temptation to make the sound spin around the room, whether it's appropriate to the picture or not.

While at a recent panel discussion in Washington D.C. on 5.1 surround mixing for television, I posed a simple question to the panelists. Had any of them ever mixed an A/V program which had been planned for 5.1 surround from the start of the production? Interestingly, none of them had. The original microphone tracking wasn't designed with surround in mind, and no special surround microphone techniques were used. It seems that someone else always does the field recording, and then the tracks are passed on to the sound designers for processing and mixing. I noted that trying to make a realistic surround mix of a live performance without the tracking mics being in the right places was the hard way of doing it. With the proper placement of a few extra mics, they could have tracks that would practically mix themselves in surround, and they wouldn't have to resort to multiple reverbs to build an artificial space.

With these thoughts in mind, here is a basic microphone technique that will be useful for recording any type of live production with an audience that will be mixed to surround. Note that on the stage all the standard close miking techniques are in use. If there's a professional sound company working the gig, they will typically use Shure SM-58s and other mics of that level for the main sound system. You can then take a split from the stage box and go to your own multi-track recorders, typically Tascam DA-88 decks or one of the cool new 24-track hard drive recorders.

Whenever possible, use one microphone per recording track, as pre-mixing channels to fewer tracks will mean less options for a surround mix. Also, remember that for nearly every video production, recording at 48 kHz is the proper sample rate since all DVD's and HD-TV broadcasts are at that rate. Converting from 48 kHz down to 44.1 kHz is better than trying to go the other way.

To my ears, one of the things that makes surround sound of a live concert so wonderful is the ability of the engineer to put the audience reaction "behind" the listeners in their living room. This means that you can simply mix all the individual stage mics split from the PA system across the Left, Center, and Right speakers in front. Then if you had something proper to put in the rear "surround" speakers your mix would be complete.

Unfortunately, without properly placed audience response mics, you'll have no simple options beyond artificial reverb to recreate the room. It seems that most live sound engineers are confused about what to do for microphone placement. I've heard mixes where there were 6 or 8 audience response mics summed together in mono and pre-recorded on one track. Also, I've seen live shows where these audience mics were placed in the back of the room and pointed towards the stage. Both placements are wrong and will yield rear speaker mixes that do nothing but echo or phase cancel.

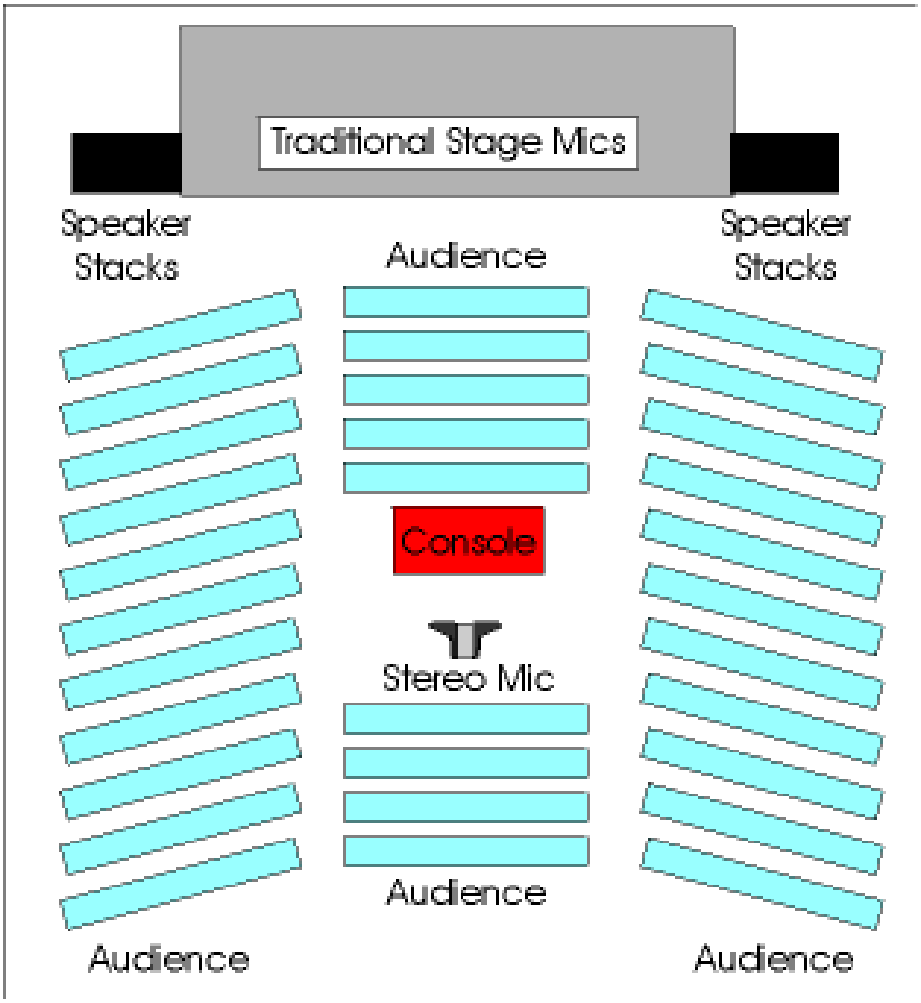
Here's a simple solution that works beautifully for these situations, and here's how I came up with it. In home theatre systems, the surround speakers are placed to the sides, almost like big headphones in relation to the listener's ears. So I hypothesized that a binaural-type microphone mixed to the surround speakers would provide the listener with enough phase and temporal clues that it would sound very realistic. This in fact does seem to be the case.

Now, I have done a fair amount of recording with a pure-binaural head of my own design similar to the Sennheiser "Fritz" which resembles a human head with microphones in its ears. And while it does work quite well, there are a

Featured Inside

few problems with it for general usage. One: it's a pretty expensive toy. Two: its profile tends to draw a lot of attention from the crowd and makes people want to shout at it and throw things which is a real problem when recording. And three: a pure binaural stereo signal doesn't work as well with speakers as with headphones, since the cross-mixing of the right speaker to the left ear (and vice versa) spoils the binaural effect to a large extent. Yes, you can make a binaural to stereo encoder, which makes pure binaural tracks work over loudspeakers.

Fig. 1



However, there's a simpler, cheaper, more elegant method. I've been using a Crown SASS-PMKII microphone, which is a semi-binaural microphone designed for standard stereo playback. It was originally designed as a way to record direct to stereo with live sound sources like symphonies and jazz acts. It utilizes a combination of two PZM (Pressure Zone Microphone[tm]) elements on a shoe-box sized enclosure. The SASS (which is a acronym for Stereo Ambient Sampling System) can make a beautiful stereo image with lots of binaural timing cues. The real trick is, instead of requiring headphones for playback, it works well over speakers.

As shown in the figure, a SASS-PMKII is simply placed in the center of the audience and oriented towards the rear of the room so that it "hears" the reflections of the back wall. I like to fly it about 12 to 15 feet above the crowd in whatever way works the best. Then record those two channels as the last tracks on your multi-track deck. Now when mixing to surround, simply use the SASS tracks for the rear surround channels, adding additional reverb on those tracks if the room tone was too dry to begin with, or some signal delay in the 30 to 40 millisecond range if the SASS was too close to the stage to sound BIG.

Be sure to monitor for downmixing compatibility. Sometimes longer delays are better than very short ones for the rear channels, since short delays tend to make really phasey sounding cancellations during a downmix to stereo.

Of course, you can substitute other stereo mics in place of a SASS for the audience response. I've also tried a Shure VP-88 Mid-Side stereo mic, or a pair of AKG-535 mics in a standard ORTF stereo array. Of course, these mics are always oriented to point towards the back wall. The key is to get a rear stereo image that sounds good on its own to begin with, and then do some sonic manipulations with reverbs and delays. Like they say, you can't make a silk purse out of a sow's ear, and trying to make convincing surround room tone out of the wrong type of mic tracks is just as frustrating.

Mike Sokol is teaching 5.1 surround production techniques at free seminars around the country. Visit www.modernrecording.com *for the latest tour, or email him at* mikes@modernrecording.com *with any questions or comments on audio in general.*

CM-700 ON THE WEB

The following quote is from www.live-audio.com/board.shtml

Re: Condenser mic selection

One condenser I would not leave out when deciding is the Crown CM-700. It is definitely the most all-round condenser I have ever used. Sounds great on piano, acoustic instruments and [drum] overhead. Works nice on choir too, and don't start me on wind instruments. You can basically put it in front of anything and what goes in comes out. Try it.

/Hasse :Neil

MIKING A SMALL CHOIR: WHAT TECHNIQUE WORKS BEST?

Suppose you want to mike a small choir of 12 people. Of course, you want the most gain-before-feedback possible. But you also want to keep the number of mics to a minimum, both to reduce cost and to simplify the mixer operation.

Should you use one close-up mic per person? One mic on every two people, or on every four people? How about one mic on the entire group?

There's a scientific way to answer these questions. It's possible to calculate the gain-before-feedback of a chosen mic setup, given these variables:

Number of open microphones

Miking distance

Mic polar pattern

Angle of sound incidence to the mic

Gain drops 3 dB every time you double the number of open mics.

Gain drops 6 dB every time you double the miking distance (not including proximity effect).

Directional mics have more gain than omni mics.

With directional mics, on-axis sound sources produce more gain than off-axis sources.

The results of these calculations might surprise you. Listed below are several mic techniques and their calculated gain-before-feedback. The gain-before-feedback of 12 closeup mics was normalized to 0 dB.

Fig. 2. 12 handheld mics, each 1.2 inches from the voice, cardioid, on-axis: 0 dB.

Fig. 3. 6 stand-mounted mics, each 7.2 inches from the voices, cardioid, 45 degrees: -14 dB.

Fig. 4. 1 overhead mic, 5.5 feet from the voices in three rows, supercardioid, on-axis: -23 dB.

Fig. 5. 1 floor mic, 8 feet from the voices in a semicircle, supercardioid, on-axis: -23 dB.

1 overhead mic and 1 floor mic: -26 dB.

Fig. 6. 3 supercardioid boundary mics on music stands, 2 feet from the voices, 90 deg.:

-25 dB.

Fig. 7. 3 omni boundary mics on music stands, 2 feet from the voices, 0 degrees: -22 dB.

Fig. 8. 3 cardioid mics on mic stands, 2 feet from the voices, 0 degrees: -20 dB.

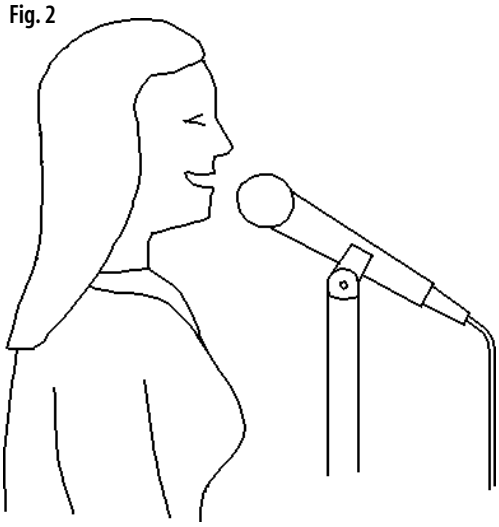
Three cardioid mics on stands, with each mic covering 4 people, might be a good compromise. They are 20 dB worse than 12 mics, but provide a simple setup. Three cardioid mics provide 2 to 5 dB more gain than three boundary mics on music stands at the same distance.

So, if you can afford 12 mics and can handle that many mics on your mixing board, you'll get the best gain-before-feedback by far. If six microphones make more sense, you save cost and complexity, but give up about 14 dB of gain-before-feedback. That's not necessarily a problem, depending on your venue, mics, and speaker placement.

If you want the simplicity of a single mic, try either one hanging supercardioid mic or one floor-mounted supercardioid mic. They'll give about 23 dB less gain-before-feedback than 12 handheld mics, but they might work fine anyway.

Of course, all this is theoretical and assumes that the mics have textbook polar patterns. Your real-world results may vary! But these findings might suggest some tendencies that are helpful to know.

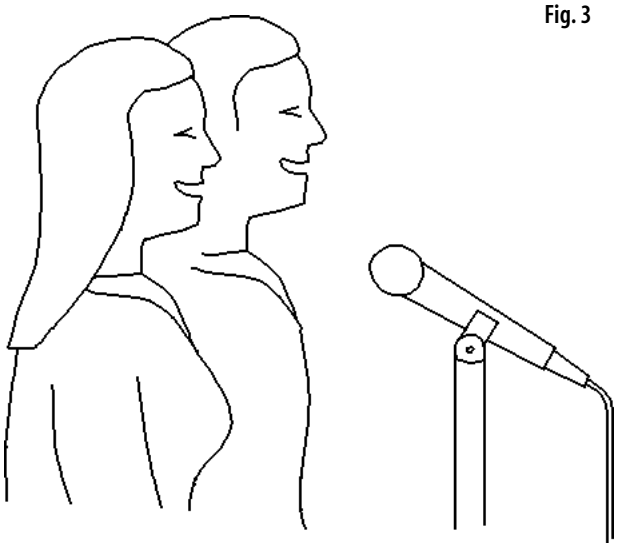
Fig. 2



The results above show that six mics are 14 dB worse than 12 mics, both because the six mics are farther away from the singers and because the singers must work the mics off-axis.

An overhead mic and a floor mic had the same results: 23 dB worse than 12 closeup mics.

Fig. 3



For more information, Call 800-342-6939

Fig. 4

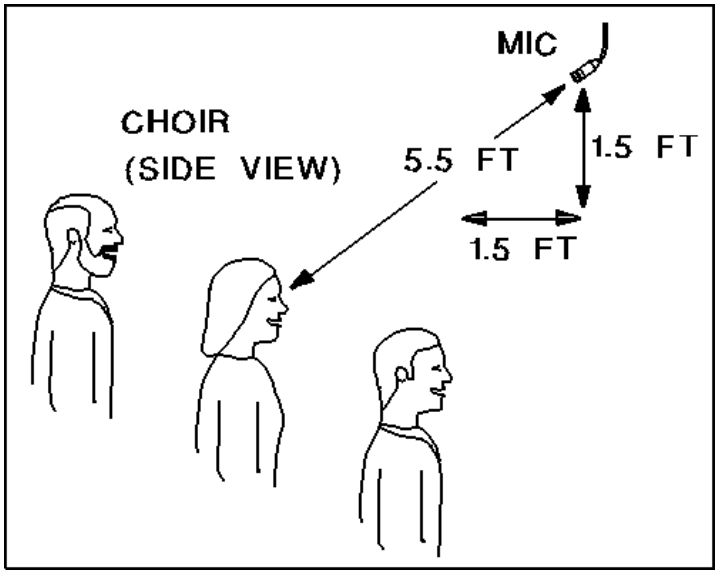


Fig. 5

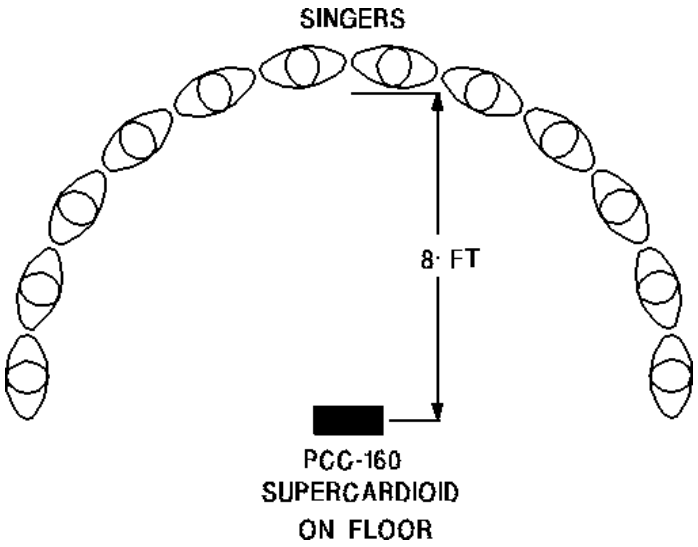


Fig. 6

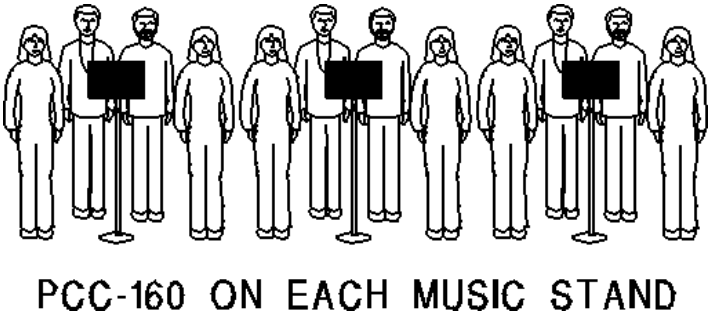


Fig. 7

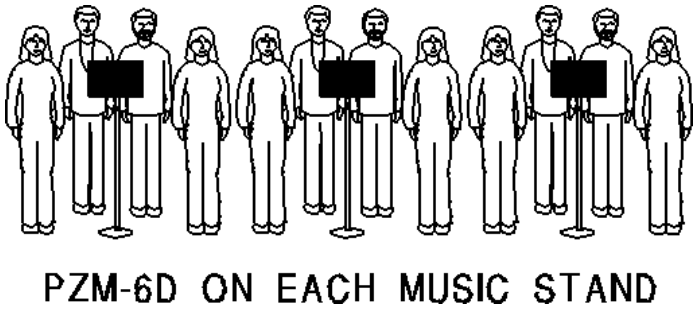
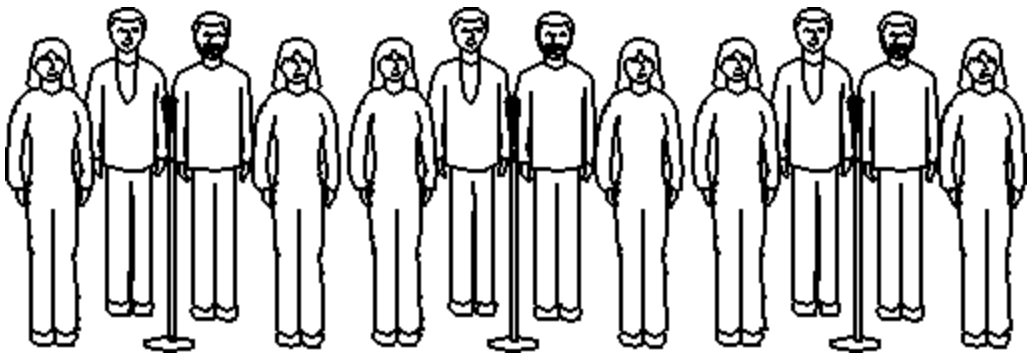


Fig. 8



Mic Memo

Crown's Quarterly Microphone Newsletter Bruce Bartlett, Editor Winter 2002

Who's Using Crown?

Every now and then we like to fill you in on some folks who are proudly using Crown mics.

• Singer-songwriter Cary Pierce is using CM-700s and PZMs in recording and a CM-311A with his touring band. (Cary did a great song about the events of September 11th. Check it out at http://www.carypierce.com.)

• One of the biggest tours of the fall and winter, Britney Spears and O-Town, is featuring CM-311As with both acts.

• Singer/songwriter Elliot Murphy is using both both CM-200As and CM-700s on his tour and in recording.

• On the heavier side of things, Zak Wylde's group Black Label Society has been using CM-310As on tour and CM-700s and PZMs in recording.

• DJ of the Year on the East Coast, Marcello, is a proud Crown amp and mic user.

• On the west coast, many time DJ of the Year Lisa Capitinelli is a proud Crown amp and mic user.

• On the cool, old-school side of things, the Spinners are out with CM-310As and CM-311As.

• On the super young boy band side of things, Dreamstreet are also using CM-311As.

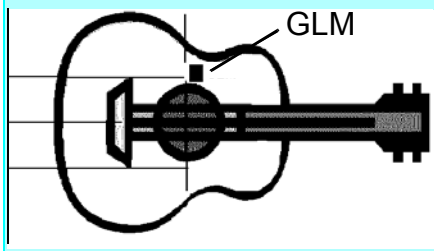
•The August, 2001 issue of *Systems Contractor News* features Crown LM-201A microphones in one photo.

• Your editor used Crown CM-700s as drum overheads, and for the lead vocal mic, on Southside Denny's new blues album *Movin' On*.

Mic Tips from Kathryn Williams' Sound Tech

European singer-songwriter Kathryn Williams is using Crown microphones on her tour. Jonathan Digby, her sound engineer, offers the following tips on Crown mic usage based on that tour.

"We love the mics! The band can't believe how clear and natural it all sounds. I'm very pleased with the results. Oh, and it's the best bass drum sound I've ever had.



Guitar

"I used a spectrum analyzer to find the best spot on the soundboard that best matched the response from the microphone placed a few feet from the front, studio-style. I've marked where I found it to be.

(continued on next page)

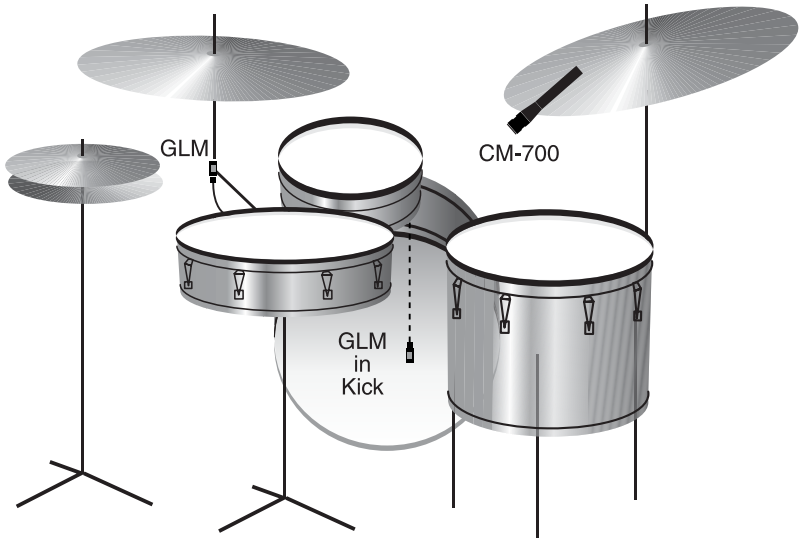
For more information, call 800-342-6939

A Harman International Company

Mic Tips (continued from page 1)

"I figured to have it about 1/2 inch or so away from the main nodes of the soundboard, to keep away from be the largest wavelength 'dead spots' (standing wave). So, it's about 1/2 inch up from the half-way point of the prime longitudinal node.

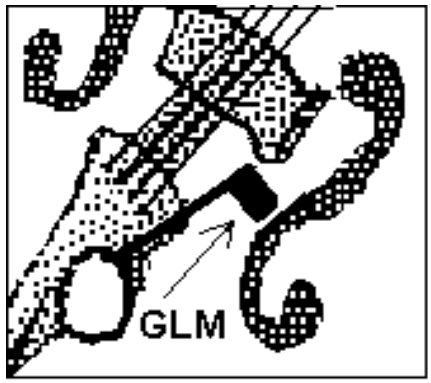
Drums



"With the drums, I drop one GLM-100 into the bass drum, thru the vent hole, use a clip to attach to the snare and position one GLM-100 halfway between the snare and hi-hat, with the element pointed toward the hat for good 10kHz response. The CM-700 is placed equidistant from the rack and floor tom and ride cymbal, by the drummer's right shoulder.

Bass

"I used the same technique as the guitars with the double bass and the violoncello with the spectrum analyzer and came up with a similar result. With the 'cello I use the clip to place the mic 1 inch above the soundboard but stick the mic directly onto the double bass as shown to the right.



Mixing

"Apart from a little lift around 2-3kHz on the nylon string guitar, I run all channels flat. I run the mics to FOH (the Front-of-House speakers) and send the instruments' direct-box signals to the monitors only.

"What I'm trying to do next is use a Yamaha O2R for FOH with only the eight mic channels running. I'm going to send monitor mixes back to the stage via tie lines or spare mic lines to in-ear monitors for everybody. This means: no more soundchecks, floor monitors or direct boxes. I'll be able to send the mics' signal to the P.A. It'll be self contained bliss. I also plan to use this setup in the studio.

Future Miking Plans

"I plan to use GLM-100's for floor tom, trumpet and violin, CM-200A's for the guitarist's backing vocal and for an extra backing vocalist.

"The PZM-6D is to be used with the PZM-30D as ambient mics for the in-ears. For live I plan to place the PZMs on either side of the stage, or on the ceiling, and to feed a little into the in-ear system for a more realistic mix.

"In the studio, I'd utilize the L^2 array. I also like the idea of recording the entire band with the PZM-6D in a corner.

(continued on next page)

Mic Tips (continued from page 2)

"The **CM-150** (above) is to be used in the studio as a vocal and instrument microphone, and as a stereo pair for kit/ensemble. I've worked out that I will be able to use it as a vocal mic live.

"Due to the very quiet nature of the main vocal, maximum gain needed in FOH is compromised by the monitors. This is workable with the CM-310A but suffers from a slight lack of sensitivity for my purpose, usually requiring approximately 50dB of gain at the desk.

"Davis and Davis state that the greatest gain before feedback is more easily achieved with a smoother response, inherent in an omni microphone and especially so in your reference mic CM-150. The extra sensitivity of the 150 will make for better signal-to-noise ratio.

"Also, the microphone is used right up to the mouth and so with an omni pattern will have no proximity boost problems.. With no monitors to discriminate against I feel it would be ideal for what we are doing.

"With the digital delay available on the output of the O2R as well, I'll be able to further cheat the FOH speakers. Nevertheless, in the studio or TV environment the CM-150 is definitely the choice.

"I've been asked by many musicians, particularly cellists and double-bass players, what type of mic we use and I've been very confident in recommending the GLM-100.

"I've also just spec'ed up seven of the GLM-100's for Dingwalls in London as part of a re-fit. I'm going to use them on drums and hang them on the guitar amps. I'm also getting them to buy one CM-310A and one CM-200A. Can I possibly be any more 'Crown happy' ?"

Jonathan Digby - Audio Engineering and Production

Crown CM-200A handheld condenser vocal mic

Letters from Crown Microphone Users

Mic for computer voice recognition

"I am a computer engineering senior at Marquette University. I am in a design group developing a [human] speaker authentication system.

"We are looking for a small mic that will fit in our front-end system. All we want is for it to be somewhat directional, pick up a variety of dB ranges and be really small.

"All your mics seem to be in a final package, so there is nothing we can really take apart and incorporate into our system. As a result, we have to design around available small mics.

"Your MB-2 removable/phone jack mic was the smallest mic. Moreover, it has one of the widest frequency ranges. If you have other mics that you think would be ideal, please inform us."

Kevin Riley
Milwaukee, WI

(Continued on next page)

Letters (continued from page 4)

Reply:
The MB-2 is a very good choice for your application. For a flat frequency response, use the MB-2 with the Crown MB-100 interface. Without the interface, the mic rolls off in the low frequencies and rises in the high frequencies.

Another option to consider is the Crown MB-4, which has an equalizer circuit built into its tubular electronics module. This mic fetures an XLR output connector. The mic requires phantom power from a phantom power supply (Crown PH-1A) or from a mixer (such as the Mackie 1202).

For the best rejection of background noises, consider using a headworn mic. Crown's CM-312AE headworn offers exceptional quality. It runs off 5 to 9 volts DC (red lead) and puts out an unbalanced audio signal(white lead and shield).

The MB-4 is cardioid, so it focuses pretty well on the speaker, but not as well as a headworn mic. You could mount one on top of the computer monitor.

Mic for videos

"I create videos using the Camtasia video screen capture software. My videos look great, but the sound is not as good as I would like. Camtasia told me that they use Crown microphones. Which Crown microphone would be compatible with a computer sound card?

"I am not recording music. I want a quality similar to a radio announcer."

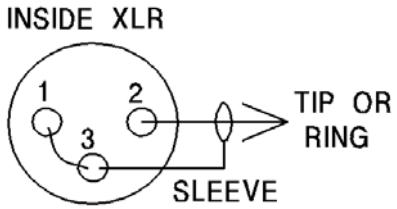
Robert Urfer
AbleSys Corporation

Reply:
For the best sound quality, we suggest using a high-end mic like the CM-700 with a hoop-type pop filter, or a CM-200A with a foam windscreen. Place the mic about 4 to 8 inches from your mouth.

Since the CM-700 and CM-200A are condenser mics, they need phantom power, either from a Crown **PH-1A** phantom supply or from an audio mixer that supplies phantom power.

Crown PH1A phantom supply

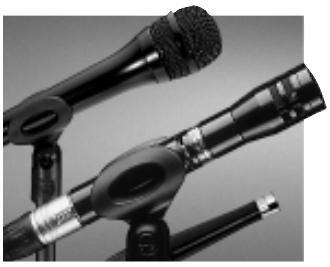
If you use a PH-1A phantom supply, the signal coming out of the PH-1A will be balanced mic level. You will need to make an adapter cable between the PH-1A balanced output and the sound card's unbalanced mic input.



The adapter cable will need a female XLR on one end and a stereo mini phone plug on the other. In the female XLR, solder a jumper wire between pin 1 and 3. Solder pin 1 to the cable shield. Solder pin 2 to the cable's hot conductor. In the mini stereo phone plug, solder the shield to the long lug, and solder the cable's hot conductor to either the tip or the ring terminal - whatever works.

If you use an audio mixer instead, you will need to come out of the mixer's unbalanced line output, through a cable, to a stereo mini plug. Connect the plug to the sound card's line input. Experiment to see whether the tip or ring connection to the cable hot conductresults in a signal into the computer.

Microphones Available From Crown



CM Series

CM-700 Cardioid condenser, 30 Hz - 20 kHz, for high-quality recording or P.A. **CM-700MP** is matched pair.

CM-200A Handheld cardioid condenser mic for stage vocals/instruments. Warm, smooth, and articulate sound. Very low handling noise and pop. Low-Z balanced.

CM-310A DIFFEROID® Handheld differential condenser mic for stage vocals. Cardioid. Warm, smooth sound. Extremely high gain-before-feedback. Low-Z balanced.

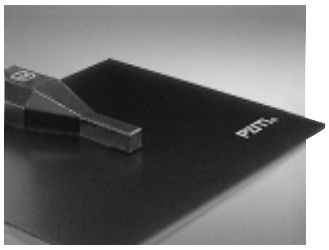
CM-311A DIFFEROID Headworn differential condenser mic for stage vocals and sportscasters. Extremely high gain-before-feedback. Battery belt pack. **CM-311AE** connects directly to 9V wireless microphone transmitter. **CM-311AHS** mounts on Sony MDR-7506 headphones.

CM-312A Headworn hypercardioid mic for stage vocals and sportscasters. Small and light. Good gain-before-feedback. Battery belt pack drives mixer or transmitter. **CM-312AE** connects directly to wireless microphone transmitter. **CM-312AHS** mounts on Sony MDR-7506 headphones.

CM-30 Miniature supercardioid condenser mic for inconspicuous overhead miking of choirs, orchestra sections, theater stages, conference tables, audience reaction. Electronics mount in electrical box.

CM-31 Same as CM-30 but with cylindrical electronics interface and XLR connector.

CM-150 1/2" omni condenser for free-field sound measurements, sound-level meter, and pro recording applications. **CM-150MP** is matched pair.



PZM Series

PZM®-30D Studio PZM with switchable dual frequency response (flat or rising). 5" x 6" boundary plate. XLR connector.

PZM-6D Low-profile PZM for conference or plexiglass panel. Switchable dual frequency response (flat or rising). 2" x 3" boundary plate. XLR connector on 15 foot cable.

PZM-20R Flush-mount PZM fits into a square cutout or 4" x 4" electrical-outlet box for permanent installations. Use one mic for up to eight people. Screw-terminal output.

PZM-185 Tabletop, handheld or adapter-mounted microphone. Built-in power-supply interface, phantom power or internal battery. Fiber-reinforced, high-impact plastic body and boundary. 7" long. XLR connector.

PZM-10 Security and surveillance mic. Inconspicuous. Mounts in drilled hole, XLR output. **PZM-10LL** is line level, 12-24V DC powered.

PZM-11 Security and surveillance microphone. Inconspicuous. Mounts in electrical box. Screw-terminal output. **PZM-11LL** is line level, powered by 24V AC, DC, or phantom.

PZM-11LLWR is water-resistant, line level, powered by 24V AC or 12-24V DC. Mounts in electrical box.

SASS Series

SASS®-P MKII PZM stereo microphone. Wide, smooth frequency response. Sharp and spacious imaging. Mono-compatible. No matrix box required. Battery/phantom powering. Low-cut switches. 20 Hz - 18 kHz. All accessories included.

SASS®-P MKII HC Same but without carrying case or accessories, lower cost.

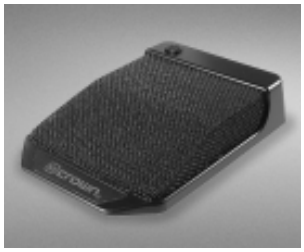
LM Series

LM-201 Supercardioid lectern microphone with swivel mount for noise-free adjustment. Pop filter and shock mount. Low-Z balanced. Powered by phantom or 12-24V DC adapter.

LM-300A Economical and elegant dual gooseneck mic that retains its shape. Supercardioid condenser element. XLR output, low-cut switch. Optional metal-screen grille and LM-300SM Shock Mount.

LM-300AL Same as LM-300A but 5" longer.

LM-301A Same as LM-300A but screws onto a flange. Allows cable to exit downward or out the side.



PCC Series

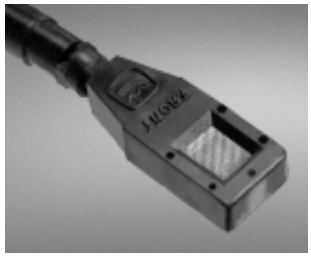
PCC®-160 Supercardioid surface-mounted microphone for stage floors, lecterns, and news desks. Increases gain-before-feedback and rejects sounds to the rear. XLR connector on 15-foot cable. Black or white.

PCC-170 Same as PCC-160 but attractively styled for conference-table use. Mini XLR connector on rear or stereo phone plug on bottom. **PCC-170SW** has on/off membrane switch.

PCC-130 Same as PCC-170 but with cardioid element and smaller. **PCC-130SW** has on/off membrane switch.

MB Series

Five styles of surface-mounted, supercardioid mini mics. Some use MB-100 or MB-200 interface with programmable switching and sensing. Inconspicuous, affordable multi-miking for conference tables, security, distance learning, boardrooms, and courtrooms.



GLM Series

GLM-100 Miniature omnidirectional condenser microphone. High SPL capability. Reduced pickup of handling noise and wind noise. XLR connector on 8' cable. 20Hz - 20kHz. Model **GM-100E** comes without connector for connection to wireless microphone transmitter.

GLM-200 Miniature hypercardioid condenser microphone. Increases gain-before-feedback, reduces pickup of leakage, background noise and room acoustics. XLR connector on 8' cable.

Microphone Warranty

Crown's professional microphones are guaranteed unconditionally against malfunction from any cause for a period of three years (one year for Sound Grabber) from date of original purchase. Should one of our microphones malfunction, it will be replaced or repaired at our expense, including all U.S. round-trip shipping. This warranty does not cover finish, appearance items, cable or cable connectors. This warranty does not cover normal wear and tear, malfunction due to abuse or operation at other than specified conditions. See your Crown dealer or representative for complete warranty details or contact Crown direct at 1-800-342-6939.

Information Exchange

Your ideas on how to use Crown microphones are important to us, and to the readers of Mic Memo. Could you let us know what you are doing with your microphones? Please use this link to send your ideas via email.

INFO EXCHANGE