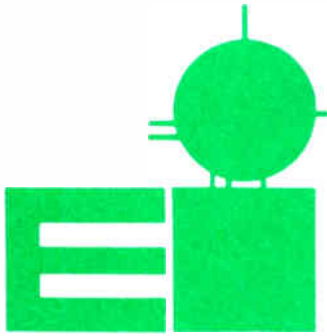


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## Hilmer I. Swanson to Receive NAB Engineering Achievement Award

The National Association of Broadcasters' Engineering Conference Committee has selected Hilmer I. Swanson, a senior staff scientist at Harris Corporation's Broadcast Division, Quincy, IL, to receive NAB's Engineering Achievement Award.

Swanson is responsible for much of the technology used in AM transmitters today. In announcing the award Monday, NAB recognized Swanson for giving AM broadcasts the potential to compete with other high fidelity media. Other work by Swanson has dramatically lowered the power requirements for transmitters, saving AM radio stations an estimated \$50 million in extra power costs over the years.

Swanson will accept his award at NAB's engineering luncheon Tuesday, April 3, during NAB's annual convention in Atlanta, GA, March 31-April 3, 1990.

Swanson joined Harris (formerly Gates Radio) in 1965, following a five-year stint with Collins Radio and several years at Bendix Aviation. At Bendix, Swanson began his career as an engineering student and continued his work designing ultrasonic equipment after graduation from Valparaiso Technical Institute with a B.S. in electrical engineering.

But Swanson soon turned his attention to broadcast technology. At Collins Radio, he developed 250,000-watt

transmitters for the federal government's Voice of America.

At Harris, Swanson made significant contributions in the development of pulse modulation techniques and, more recently, digital modulation for AM radio. In fact, many of Swanson's patents represent the same standards and benchmarks used by transmitter designers worldwide.

But Swanson's body of work has meant more than the tangible benefits of improving the audio quality and power efficiency of AM. To NAB and

other broadcasters, Swanson's work has helped preserve a segment of the radio industry by strengthening the economic viability of AM music stations today.

Swanson is an honors graduate of the Army Signal Corps and also holds a masters of electrical engineering (M.S.E.E.) from the University of Iowa. Swanson and his wife, Carolyn, live in Quincy, and have four children.

NAB serves and represents America's radio and television stations and all major networks.

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## Bill Smullin Named Recipient of Broadcasting's Distinguished Service Award

Bill Smullin, chairman and founder of California Oregon Broadcasting, Inc., Medford, OR, and Eureka, CA, has been named recipient of the National Association of Broadcasters' 1990 Distinguished Service Award -- the industry's highest honor.

NAB Joint Board Chairman Lowry Mays said, "Bill is a great standard-bearer for all broadcasters today. A true innovator and broadcast pioneer, Smullin has dedicated his life towards making small market broadcast outlets all they can possibly be." Mays is chairman & CEO of Clear Channel Communications, San Antonio, TX.

The Smullin presentation will be

made at the opening luncheon of NAB's annual convention, held March 31-April 3, 1990 at Atlanta's Georgia World Congress Center. At the same center, NAB's Engineering Conference is scheduled March 30-April 3, 1990.

The award, established in 1953, is presented each year to a single individual who has "made a significant and lasting contribution to the American system of broadcasting." The award honors individuals "by virtue of a singular achievement, or continuing service for or on behalf of the (broadcast) industry."

Smullin's selection was made by NAB's Executive Committee during the

cont. to pg. 3

# Editor's Notebook



It seems to me that NAB conventions are a lot like birthdays. The older you get the faster they seem to come around. Just about a year ago we were making plans to go to Las Vegas. This year it will be a trip to Atlanta, March 31-April 3. Again this year digital will be one of the hot items. Another will be audio processing, especially for AM broadcaster's concerned with meeting the June 30 deadline for compliance with the FCC rules.

In the digital area, there are a considerable number of radio stations around the country who are using some type of CD players either for "direct-to-air" play, or else in the production studio for dubbing to tape carts. The reports I've read in various trade publications during the past year say that CDs are outselling records and that vinyl records may very well become extinct in the not too distant future. As with any piece of equipment though, CD players have not been without their own problems. Dust, dirt, fingerprints and tobacco smoke can cause problems to both the CDs and the CD players.

Another up and coming digital medium is DAT (Digital Audio Tape). While it hasn't made the inroads into broadcasting that the CD has it is slowly gaining in popularity.

Digital technology is also being used extensively in audio processing equipment and consoles and also in telephone and microwave transmission equipment, however, most of the equipment in these areas is a combination of digital and analog.

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In the transmitter area, there are some fully digital AM transmitters being manufactured and a means for full digital FM modulation was recently introduced to broadcast manufacturers. At this year's convention I expect one of the big drawing cards will be demonstration of a fully digital system which was developed in Europe by the European Broadcasting Union (see article elsewhere in this publication).

If all this talk about digital depresses you when you look around and see all the two or three-speed turntables and reel-to-reel tape decks in your facility, take heart. Analog is not dead!

For one thing, and probably the biggest reason, there are an awful lot of small and medium market stations who are not well enough off economically to be able to suddenly throw out all of their old analog equipment and replace it with digital. Furthermore, none of the manufacturers that I'm acquainted with have quit making analog equipment and in fact are continuing to develop new equipment in this area. (Witness Genter's new SPH-5A analog hybrid.) At some point in time we will probably see fully digital broadcasting but it is still a ways down the road. A lot of owners are going to be leery of shelling out the kind of money it will take to convert to digital until the cost comes down and proven reliability goes up.

One other area which will get a good share of AM broadcaster's attention will be NRSC. With the FCC's June 30 deadline for compliance with NRSC-2 (which will be delayed until 1994 for stations who have installed NRSC-1 equipment), audio processing manufacturers expect a lot of attention to be paid to their products. Attention which, hopefully, will turn into sales.

One thing for sure, NAB conventions are usually interesting and always tiring. Sometimes you feel as though you are in the monkey house at the zoo but in the end you always come away having learned something new.

See you in Atlanta.

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## NAB Board Briefed On DAB

The next major audio innovation in the American marketplace will be digital audio tape (DAT), and perhaps, digital audio broadcasting (DAB). DAT, by its very nature, will have a major impact on the quality-minded American consumer, and no doubt on the radio industry itself. The more direct potential impact on the radio industry of ter-

restrial DAB — which will be demonstrated at NAB '90 in Atlanta this spring (not over air) — was highlighted in a special presentation before the NAB Board earlier this month by NAB Exec VP/Operations John Abel. Dr. Abel recently witnessed a sophisticated DAB demonstration in Geneva, Switzerland, on which part of his firsthand report is based. Here are the main points from Dr. Abel's report:

- The American consumer is virtually always attracted to (and will pay more for) audio systems of the most superior technical quality at any given time.

- DAB likely is a bigger technological development than FM.

- DAB will provide noticeably higher quality than FM stereo (about 22 kHz audio response compared to 15 kHz).

- DAB has no multipath interference.

- DAB requires incredibly low power to broadcast; at 100 mHz, the highest power required would be about 100 watts.

- Because of a remarkable technical achievement, the old stumbling block of unrealistic spectrum demands for digital transmission has been overcome (DAB is about four times as "spectrum-efficient" as current FM broadcasting). Yet DAB still would require new U.S. spectrum because it is incompatible with current analog broadcasting.

- All stereo DAB stations in a market would use one parent tower and all transmit at the same power; the number of such stations would be determined prior to construction and licensing.

- Research on DAB in the U.S. has been extremely limited, and then on a very different approach than European DAB. An ongoing experiment using WGBH-FM (non-commercial) and WGBX-TV in Boston has been extended by the FCC through mid-1990.

- At least three companies are beginning to offer digital radio services that can provide cable subscribers with high quality commercial-free music piped into their home stereo systems. The companies expect to reach 10% cablehome penetration within three years.

- In one company's survey of cable digital audio services, the venue was rated as "meeting or exceeding the expectations of 88% of initial customers."

- The current threat to conventional broadcast radio stations come from at least four main venues: CDs, DATs, cable audio, and direct broadcast satellite. Satellites — unlike digital cable audio — can offer digital audio services wherever the customer is located.

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association's semi-annual Board of Directors meeting.

This spring will mark Smullin's 57th year in broadcasting. His influence in shaping the success of his company is rooted in his pioneering work for all broadcasters. On the West coast, Smullin was one of the earliest newspapermen into radio; radio owner into television; television owner into cable, and cable television owner into microwave television.

In 1933, Smullin started his company with a radio station in Eureka, CA, and built an empire of small market broadcast outlets throughout Southern Oregon and Northern California. Smullin's company is the longest, continuous, independent broadcast group in the West.

After almost six decades in broadcasting, Smullin remains active, shepherding the day-to-day operation of his broadcast holdings. They include KAGI-AM in Grants Pass, OR; KOB-TV, Medford, OR; KOTI-TV, Klamath Falls, OR; KEKA-FM and KFLI-AM in Eureka, CA; KRCR-TV, Redding, CA; KAEF-TV, Arcata, CA, and KFWU-TV, Ft. Bragg, CA.

Considered a champion of small market broadcasting, Smullin helped form Television Station Inc. to buy and distribute films to show on rural TV, a move that helped make smaller markets competitive in the 1960s. Smullin also was instrumental in the development of public broadcasting in Southern Oregon and Northern California.

In the early 1960's, he formed Pacific Teletronics, a microwave company that allowed rural residents to receive local television programming from San Francisco, and Oakland, CA, as well as from Portland, Salem and Corvallis, OR.

Smullin is a founding member and organizer of both the California and Oregon associations of broadcasters and has received the top broadcasting awards from both organizations. Smullin also brought the first VHF television station to the state of Oregon, when he put KOB-TV in Medford, OR, on the air in 1953.

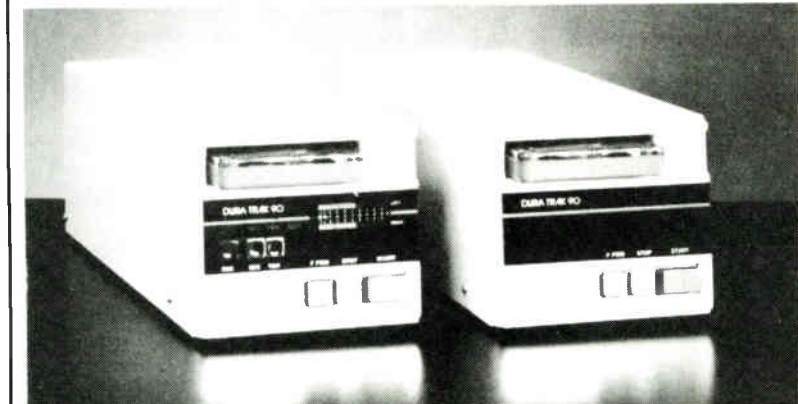
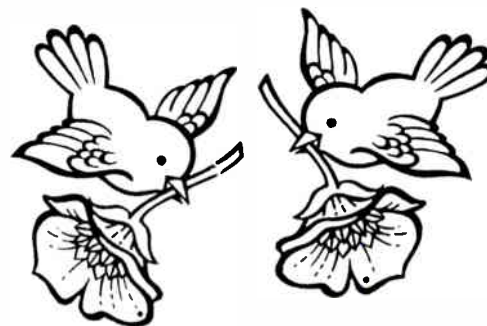
A native Oregonian, Smullin was raised near the base of Mt. Hood, where his parents were granted a homestead in 1909. He is a 1929 graduate of Willamette University. After working as a newspaper editor in Coos Bay, and

later as an advertising manager for the Oregon Grange Bulletin in Portland, a state-wide farm publication, Smullin launched his broadcast career.

Throughout Oregon and California, Smullin is well known for his contributions to the community. He has established student scholarship funds at Willamette U., the Oregon Institute of Technology, Humboldt State University, and Southern Oregon State College. He also is a major benefactor to community hospitals.

Smullin is married to Patricia D. Smullin. They have three daughters and two sons, three of whom are in broadcasting.

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## SBE HAPPENINGS

### SBE Files Comments to Protect STL Frequencies

The Society of Broadcast Engineers (SBE) filed comments opposing a petition by Cellular 21 of New Jersey to reallocate 940-944MHz to a new roaming cordless telephone service. Citing the existence of large numbers of "grandfathered" Studio-to-Transmitter Links (STLs) and Intercity Relays in the band, and the extensive use of 942-944 MHz for aural STLs in Puerto Rico, the Society voiced its opposition to the measure.

In its petition, Cellular 21 not only requested the use of 940-944MHz, but suggested that broadcasters and other auxiliary users vacate the current aural STL band. Cellular 21's petition suggested that broadcasters be relocated to bands above 24GHz to accommodate further expansion of their proposed service. Their petition presented no specifics on how this might be accomplished, or how other fixed users in 941-944 MHz would be affected by their plan.

Taking note of the lack of a specific interference contour in the Cellular 21 plan, SBE indicated that there is no

technical basis for compatible channel sharing. The transmitters and locations (to be used by Cellular 21) are not identified. There is no provision in the petition for the prediction of interference criteria or plans for their resolution.

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### SBE Brings Together Regulatory and Industry Leaders

The Society of Broadcast Engineers (SBE) recently brought together industry leaders to discuss critical issues affecting all broadcasters. The Washington, D.C. luncheon was attended by representatives from the FCC, Corporation of Public Broadcasting, public and commercial television, training foundations, consulting engineers and the media.

At the meeting, SBE President Brad Dick, encouraged the leaders to use the society as an information resource when technical issues arise. "Our broadbased membership includes all classes and sizes of radio and TV stations. When you want to know what the stations and engineers need, we can tell you. Whenever you want to better understand the technical needs of our industry, our members stand ready to help," said Dick.

At the luncheon, a Special Service Award was given to the society's second President, Charlie Hallinan. The award was presented to him by the society's founder, John Battison. Hallinan was responsible for successfully moving the society from the embryonic stage into an industry-recognized organization.

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### FCC Grants SBE Request for Rule Delay

The SBE's petition for a three-year delay in the implementation of the July 1st date for STL type-acceptance compliance has been granted by the FCC.

The SBE petitioned the Commission on Nov. 13, 1989 to grant stations a 3-year delay in meeting the recent rule changes. According to a study by the SBE, many stations would suffer severe financial penalty if required to meet the new rules.

National Public Radio provided additional documentation and support to the SBE's petition.

SBE Counsel, Chris Imlay said, "This delay was important not only to our member's station, but the industry as a whole. We're glad we could help convince the Commission of the negative

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impact that would occur if the rule was not delayed."

Stations will now be able to use their current STL equipment for an additional three years. By that time, many believe that new technology will be developed, providing superior transmission characteristics to today's analog systems.

\*\*\*\*\*

### SBE Files Aural STL Rulemaking

The SBE has filed a rulemaking petition to amend the Aural STL rules. The changes would require some installations to meet minimum antenna standards similar to those TV Auxiliary stations have been required to meet since 1981.

The petition would also require new Aural STL stations to provide specific desired-to-undesired (D/U) ratios to existing co-channel and first adjacent channel stations. Furthermore, STL sites would be classified as either congested or not-congested. Congested sites would require Category A receive antennas.

Frequency tolerance would be

tightened to 0.0005%.

Transmitter output power would be limited to no more than 10 Watts. The Aural STL stations would also be required to limit EIRP for paths of less than 22km.

A three-year grandfather period would be permitted.

The SBE believes this combination of changes would help greatly reduce the interference now experienced in the Aural STL band.

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### Independent Surveys Rate SBE Convention as Success.

The 1989 SBE convention underwent close examination from several sources. One of the recently implemented management tools was the use of independent surveys to evaluate the performance of the SBE convention. Three survey instruments were used to produce the final report.

In order to maintain the best of services to the exhibitor, the SBE maintains an exhibitor's Committee. The 1989 committee was chaired by Jack Williams, President of Pacific Recorders. The committee is charged with providing feedback to the conven-

tion planners on exhibitor needs.

Convention exhibitors were surveyed in early December. The results show widespread support the convention's scheduling, site selection and show management. Most important, the survey shows that the convention continues to be a highly successful show for exhibitors.

Convention attendees were also surveyed to determine how they felt about the show. In the attendee survey, more than 92% of the respondents gave the show a positive (Excellent or Good) rating. Other results are shown below:

Ennes Workshop positive rating: 90%

Seminar Usefulness positive rating: 86%

Visited exhibits: 93%

Attended before: 65%

Planning to attend in 1990: 84%

SBE members: 66%

An independent convention consultant was also hired to evaluate many aspects of the 1988, 1989 and future shows. The results of that survey echo the above results. Said consultant Dawn Pratt, "I'm amazed at how many people really like your show. I've never encountered a trade show where (the show planners) received so many positive comments from the attendees." One of the most-often mentioned benefits of the SBE convention was the more relaxed atmosphere.

The surveys confirm that SBE management has resolved the concerns expressed in 1988. Attendees and exhibitors alike say they like the SBE convention and plan to continue supporting it.

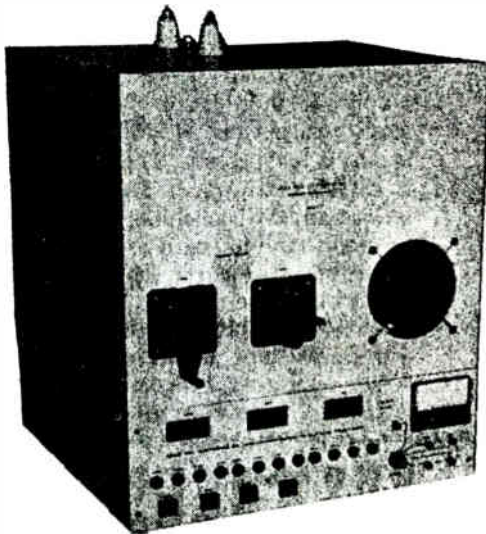
The 1990 SBE convention will be held in St. Louis, MO, October 4-7. For more information on the convention contact the national convention office: 317-842-0394. Exhibitor information is available from Eddie Barker Associates, 800-225-8183.

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### From SBE Chapter 56 Tulsa, OK

An AM radio station in Claremore went dark December 18th. KWPR-Am was shut down by sheriff deputies who hauled away the station's transmitter, satellite dish, and other studio equipment. The gear was taken as a \$25,000 judgement against the station's owner, and was awarded to Satellite Music Network of Dallas, Texas. The station, which was located at 1270 AM, is not expected to return. What makes this such a tragic story, is the fact that many other small town AM stations may meet a similar fate in the next decade.

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# Let's Clear The Air On The FCC FM Class A Rules

by Ben Evans, Evans Associates, Consulting Communications Engineers  
Reprinted from Jan. issue of Wisconsin Broadcaster's  
Association Newsletter.

Last summer, the FCC adopted sweeping changes in its technical rules which regulate FM Class A stations. Foremost in the revised rules is the increase in the maximum effective radiated power for Class A stations from 3,000 watts to 6,000 watts. These new rules, which became effective on October 2, have provided a great number of Class A stations a chance to better compete with their higher-power neighbor stations.

You may have heard of the FCC's list of about 680 "fully-spaced" Class A stations around the country which meet all of the newly-adopted minimum distance separation requirements and are therefore eligible to increase power to 6,000 watts at their authorized sites. At the same time, the FCC issued a separate list of stations which have become short-spaced under the new rules and which have antenna heights below 100 meters HAAT. These "newly-grandfathered" stations, about 480 in number, are eligible to increase power at their existing sites to some intermediate level between 3,000 and 5,800 watts.

For the stations on these two lists, the FCC has created a fast track for licensing at the new power level. The stations may effect their power increases starting December 1, 1989, without submitting a construction permit application (FCC Form 301) provided that the power increase can be accomplished by relatively simple means, such as replacing a non-directional antenna with another non-directional antenna of higher gain at the same

height, or increasing the input power to the existing antenna. Once the station is on the air at the new power level, the station must submit an application for license (FCC Form 302) within 10 days, along with a supplemental environmental statement certifying that the increase in power would not be an RF radiation hazard.

This is all that most broadcasters know about the new Class A rules. Beyond the obvious, confusion reigns supreme over what the specific provisions of the new rules and administrative policies say about Class A stations that wish to take advantage of the new power limit but don't know where to start. You can ask ten different technical consultants a specific question about the new rules and, chances are, you will get at least five different answers.

This is an effort to put together a short Class A question-and-answer guide. After countless hours of studying the new rules and their implications and pestering FCC engineers with point-blank questions, I have come up with some questions and answers with which a general manager or chief engineer at a typical Class A station might be concerned:

My station is on the "newly-grandfathered" Class A list. What determines the power level that we're allowed?

Your station has an antenna height above average terrain less than 100 meters. You are eligible to increase your effective radiated power above 3,000 watts provided that your interference contour

does not exceed that of a 3,000-watt station at 100 meters HAAT, up to a maximum of 5,800 watts.

Any Class A station which does or can meet the minimum distance spacings that were in effect prior to the revision of the rules may seek a power increase in accordance with the above if they are using an antenna below 100 meters HAAT.

My station is on the list for a power increase. However, our present transmitting equipment is not capable of giving us the entire power increase that we're allowed. Are we required to go to the full notified power level, or can we operate at the power level that our transmitter can handle until we purchase new equipment?

You may begin operation on or after December 1 at the power level that you can go to, provided that you submit within ten days an FCC 302 application for license and the supplemental environmental effect statement. When you have installed the new equipment necessary for operation at the maximum allowed power level, you may begin operating at that power level if your antenna height did not change more than two meters and if you submit another FCC 302 and supplemental environmental statement within ten days.

My station is not on either list. Does this mean that I am forever shut out of a future power increase?

Not necessarily. The lists contain only existing stations and facilities authorized by construction permit that were eligible for a power increase as of the late October date the lists were compiled. A Class A that is not now eligible for an increase may someday become eligible due to changes in authorization of a station or stations that the Class A is short-spaced with. As an illustration, suppose Class A Station X is not on the list for 6,000 watts because it is short-spaced with Station Y, and Station Y is the only station Station X is short-spaced with. Now, Station Y moves to a new transmitter site that is fully-spaced to Station X. Station X then becomes eligible for 6,000 watts. Or Station Y changes frequency pursuant to an FCC order. Station X may become fully-spaced that way qualifying for 6,000 watts.

Class A stations which are not now eligible for six kilowatts need not fear that they will be hemmed in by other FM assignments. Stations which presently are not short-spaced to your Class A station must protect you as if you were operating at six kilowatts non-directionally. Also, future FM assignments must be fully spaced to you as a six-kilowatt station. The FCC has taken the position that Class A stations that do not qualify for power increases have a right to the expect someday operating at six kilowatts by any means possible under the rules.

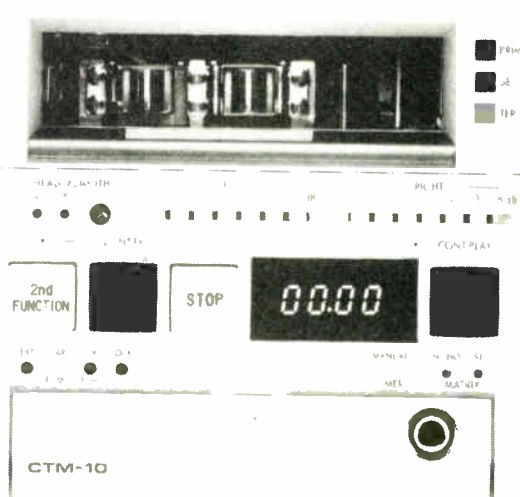
On the other hand, if you believe that your station should have been on the list, you could be in the following situation:

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My consulting engineer told me that my station was fully-spaced for six kilowatts, but we didn't get on the list. Why?

The first, but least likely, possibility is that you were excluded by an FCC computer error. In fact, about two weeks after the Class A list was published, the FCC issued a correction to the list which contained twelve additions to the "fully-spaced" Class A stations.

Or it could be that your station is not on the list because it is within 320 kilometers (199 miles) of either the Canadian or Mexican border. The governments of Canada and Mexico have not yet formally approved our new rules, and until they do, requests by border-area Class A stations for power increases will be dealt with on a case-by-case basis. If your station is indeed fully-spaced domestically and if your planned power increase is consistent with current international agreements, you can get FCC approval for the increase. This also applies to newly-grandfathered Class A stations within the border areas with antenna heights less than 100 meters.

Another possibility is that a proposed rule making or application was filed prior to October 2nd which was not short-spaced to you under the old rules but became short-spaced after October 2nd. If your last allocation study was done before the list was published, your consulting engineer should run it through again.

How will I know when my station becomes eligible for a power increase?

As more stations become eligible for power increases, through corrections in the FCC's computer program, authorization changes or Canadian or Mexican concurrence, the FCC supposedly will issue notices which list these stations.

If you don't want to wait for the FCC's notices, have your consulting engineer do a study on your station. He or she may be able to determine in advance whether your station will qualify for a power increase.

I've heard that if my station is short-spaced with one or more Class A stations, we could all apply for mutual power increases. How does this work?

First of all, your station and the other Class A stations have to be newly-grandfathered (short-spaced as a result of the new rules). Second, you must obtain the consent of all co-channel, first, second or third adjacent channel stations that are short-spaced. Third, your transmitter site must meet the IF-related channel spacings. Fourth, you must show that your power increase is in the public interest. For guidance in this public interest showing, consult FCC Public Notice 75-1347. Lastly, if you are short-spaced to stations of other classes, you must show in your application that there are no alternative fully-spaced or less short-spaced sites available. If you meet all of these requirements, you can apply for the power increase with an application for construction permit - FCC Form 301.

The best situation is when you are

short-spaced only to other Class A stations that are also seeking increases. In this case, you need not show that a fully-spaced site or less short-spaced site is available. If you are short-spaced with a station or stations of other classes, applying for a power increase can be tricky. Class B and C stations will not be quick to give their consent to a power increase to a station that is short-spaced to them. Also, the enormous burden of proving that your transmitter site is the only site available requires the best engineering and legal counsel money can buy.

Could I get a power increase by moving my transmitter?

Under the new rules you can, provided there is a geographical area in which you can move your antenna and fully protect other stations, and, at the same time, continue to serve your city of license with the required 3.16 mv/m contour. You must file a construction permit application (FCC Form 301) to do this.

If your new transmitter site meets new minimum spacings, you can apply for 6,000 watts and 100 meters antenna HAAT.

Suppose my station is short-spaced, and I cannot move my transmitter due to budgetary or land restrictions. Is there another way I can get a power increase?

You may be able to apply under the new short-spacing rules (Section 73.215), which allow you to specify a short-spaced

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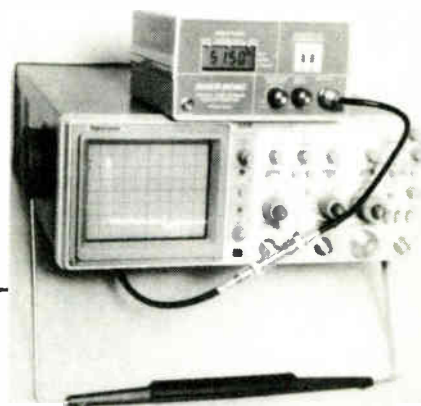
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cont'd from 7

site while providing equivalent protection to the short-spaced station or stations. In order to provide this equivalent protection, one of three situations should occur: 1) terrain elevation between your station and the station it short-spaces is high enough so there is no predicted interference at 6,000 watts, 2) a directional antenna is specified, or 3) an effective radiated power below 6,000 watts is specified so no interference occurs.

However, if you apply for a short-spaced site using a directional antenna or less-than-maximum power, your proposed facilities will not be protected from future FM authorizations as if you were a 6,000-watt non-directional station. You will be protected only to the level of your actual calculated 1 mv/m contour.

Class A stations that could not upgrade to Class B1 or the new Class C3 may have another opportunity to improve their facilities. The FCC does not mete out such

technical relief to broadcasting stations very often, so Class A station owners should seriously investigate their options in obtaining a power increase.

## More Than 700 Exhibitors Set for NAB 90 Convention

The National Association of Broadcasters has announced that more than 700 exhibitors will participate at its annual convention in Atlanta, GA, March 31-April 3, 1990.

Exhibitors will have more space than ever before. More than 430,000 square feet of space has been reserved for exhibitors at the Georgia World Congress Center. Though the main exhibit hall is sold-out, other space is still available for NAB 90.

At the same center, NAB's Engineering Conference is scheduled March

30-April 3, 1990. Off-site, NAB is sponsoring a combined Advanced Television/HDTV exhibit at the Atlanta Inforum, March 30 - April 2, 1990. Located a few short blocks from the Georgia World Congress Center, this single exhibit will use more 100,000 square feet of space and draw participants from more than 50 companies.

\*\*\*\*\*





# Symetrix

## 528 Voice Processor



Five high performance signal processors in a single rack space.

Complete microphone input signal processor: mic preamp, compressor/limiter, downward expander, parametric equalizer/notch filter, de-esser, all in single rack space package. Phantom powering for condenser mics, balanced line input for high level

signals. LED metering indicates output level, gain reduction, de-esser activity. Used for broadcast announce mics, public address, and specialized processing in recording and high level sound reinforcement.

LIST PRICE  
**\$679**

**Mic Preamp:** Gain 0-50dB EIN: -127dBm Phantom power +48Vdc THD: 0.35% **Parametric/Notch Filter:** Boost/Cut +15dB -30dB Bandwidth 0.5-3 octave **De-esser:** Range 20dB  $f_c$  1kHz 8kHz **Comp/Limit/Expander:** THD 0.35% Max gain reduction/attenuation 40dB **Output:** Gain 0-25dB Metering de-esser, comp/limit/exp, output **Controls:** Preamp Gain, De-esser Frequency, De-esser Range, Compress Threshold, Compress Ratio, Gate Threshold, Cut/Boost (x3), Bandwidth (x3), Frequency (x3), Output Level **Switches:** Bypass (x3), Meter Select

## A-220 Stereo Amplifier



Stringent noise and distortion specs in a compact, professional power amp.

High performance, low price. Specifically designed for video production, near-field monitoring, headphones, and small reference speakers. Stereo two channel or mono-bridged operation. Balanced XLR, balanced/unbalanced 1/4" input

connectors, barrier strip output terminals, independent or dual tracking input level controls for two channel or true stereo use. Used in video suites, television studios, radio stations, recording studios and paging/music systems.

LIST PRICE  
**\$349**

**Stereo Power Output:** 20w/channel into 8 ohms, 20w/channel into 4 ohms **Mono-bridged Power Output:** 40w/channel into 8 ohms **THD:** 0.5% 20Hz to 20kHz **S/N Ratio:** 93dB (20kHz NBW) **Controls:** Level 1, Level 2 **Switches:** Independent/Dual Tracking, Power, Dual Channel/Mono Bridged (rear panel)

LIST PRICE  
**\$339**



### SX205 PRECISION DIGITAL METER

- Calibration oscillator
- Reads VU and watts
- Digital accuracy
- Average with peak hold

The Model SX205 Precision Digital meter is a microprocessor controlled, two-channel level display that measures both voltage (VU) and power (watts across 2, 4 or 8 ohms). Included is a 1000Hz sine wave calibration oscillator. Each channel may be individually set to display average level (with adjustable peak-hold), or peak level (with adjustable peak hold). The SX205's intelligent display driver allows bargraph or dot format to be selected. Peak-hold time may be set

from zero to infinity. The voltage scale, in volume units, is -39VU to +6VU. The power display may be set for a full scale reading of 100W or 1000W, referenced to 2, 4 or 8 ohms.

To extract full 16-bit performance from digital systems, precision metering is essential. With 1/2dB accuracy, and its ability to indicate crest factor (peak-to-average ratio), the SX205 is an ideal reference standard for digital recording, digital signal processing, radio, television and teleconferencing studios, MIDI/sampling suites, and high performance concert sound systems. For convenience, Symetrix recommends terminating all of the SX205's inputs, and its oscillator output, in a patch bay.

#### Specifications

<b>OVERALL ACCURACY</b>	VU: 50µV RMS to 75V RMS W: 50mW RMS to 1000W RMS ref 2Ω, 4Ω or 8Ω	±1/2dB (-33dB to +6dB) 20Hz to 20kHz
<b>RELATIVE ACCURACY</b>	Between any two LEDs	±1/2dB (-15 to +6)
<b>DISPLAY RANGE</b>	VU Watts 100W scale 1000W scale	45dB, -39 to +6 0.13W to 400W 13W to 4kW
<b>INTEGRATION TIME</b>	VU	per IEC 61681 (ASA) C16.5-1961
	PPM	per DIN 45406
<b>PEAK HOLD TIME</b>	off to infinity	
<b>VOLTAGE INPUTS</b>	Impedance	electronically balanced >40kΩ unbalanced
	Sensitivity	>20kΩ unbalanced OVU = -20dBv to +120dBv
<b>POWER INPUTS</b>	Actual impedance	floating
	Reference impedance	>100kΩ switchable for 2Ω, 4Ω, or 8Ω
<b>CALIBRATION OSCILLATOR</b>	Frequency	1kHz
	Output Level	OVU, +4dBm into 2kΩ
<b>THD</b>	Output impedance	<2%, OVU, 600Ω <100Ω unbalanced

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# MEMO FROM METZ



by  
David L. Metz

## SURFACE FINISHING OF METALS - PART 2

I was up on a roof, inspecting the remains of what had once been an expensive UHF remote antenna with a fellow engineer. The copper balun on the feed point had badly corroded ruining the antenna. I remarked that if we choose to make a new balun, I could electroplate it with silver or gold and prevent further problems.

"Gold plate? How?" That would cost a fortune!" He replied looking at me like I was nuts (I'm used to that).

"Simple." I replied, suddenly getting an idea for another common point article. Metal plating is one of those arts that can come in quite handy for the practical radio engineer. I learned it so I could plate my own VHF and UHF radio components such as cavities. After I got good at plating it didn't take long to see the wisdom in gold plating certain antenna components and other parts to protect them from corrosion.

The methods I use I learned from jewelry making texts. The supplies are also available from jewelry supply houses. Look in the yellow pages for jewelry making equipment and supplies. I get mine from a local lapidary (rock) shop that supplies all the local jewelry stores with tools and supplies. Plating supplies are hard to buy mail order because of shipping restrictions.

Electroplating uses an electric current to remove ions of metal from a "anode" to a work piece. Both the anode and the work piece are immersed in a "bath." The bath is a solution of metal salts and caustic chemicals to promote the plating. Note the solution lasts almost forever since the anode supplies the metal to be plated on the work piece.

The solutions used for electroplating are ABSOLUTELY DEADLY! So are the fumes generated! All contain POTASSIUM CYANIDE, one of the deadliest poisons known. The gas that is generated while plating is hydrogen CYANIDE, again one of the deadliest gases known.

- Always wear eye protection and gloves.
- Always work in a well ventilated area.
- Neutralize all spills with household bleach.
- Dispose of spent solutions only after neutralization with bleach.
- Keep your solutions locked up under your personal control.

All of the solutions used are extremely corrosive. They will burn your skin and eat holes in your clothing. OK, you have been warned! This stuff is nothing to fool around with. I have done electroplating for years with no problems. That's because I am very careful! If you can handle ordinary battery acid safely, you will have no problems with plating solutions. Just use some common sense!

You will need three things to plate successfully:

1. A small variable current power supply. About six volts at up to two amps. You will need a large rheostat in series to control the current and a meter to monitor it.
2. Metal anodes. One of stainless steel for the cleaning bath. And anodes of copper, silver and gold for the finish plating bath.
3. Electro-cleaning and electroplating solutions.

My power supply is some old junk box thing I made up out of a old six volt filament transformer and a full wave bridge. I filter it with a huge junk box electrolytic. Current control is a 100 watt 1,000 ohm Hamfest rheostat from some long forgotten W.W. II God knows what. Not very high tech, but perfect for the job.

For small objects (the size of your hand is surface area) you will need up to two to four amps for cleaning. For plating no more than 250 mA. or less is fine. You could use a fixed resistor in series with a variable voltage supply. I've used the method and it works fine.

My Stainless anode is a large bolt and found among my tower stuff. For a copper anode I use a chunk of copper water pipe. The silver anode is a one ounce silver coin. Newly minted these "coins" cost you about \$8.00 at a coin shop.

Gold is a problem due to its cost. You don't need much, my gold anode is a chunk of 18 karat gold from a broken bracelet about one inch long. I got it at a local jewelry store and had them roll it out to a flat ribbon. Try to get as pure as gold as possible, pure gold is rather soft so most jewelry contains copper. 24

karat is pure gold, 12 karat is 50% copper. The copper in the gold alloy leaves a green "dross" in your plating bath.

I silver soldered stainless steel leads onto all of my anodes. I made the leads out of thin stainless steel welding rod (about #18 wire gauge). Bend the leads into a hook so you can hang the anodes in the plating bath.

The solution I use are the "Hoover & Strong" and "Vigor" brands. They come in one quart plastic jars. The electrocleaner is used as a final cleaning solution with the steel electrode for the work piece to be plated. The cleaner and the copper plating solution are sold concentrated and must be diluted with three parts of distilled water before using. Expect to pay \$5 to \$7 a quart for them.

Silver and gold solutions are sold ready to use. Silver costs about \$10 a quart and gold at least \$60! I advise if you just want to experiment, start with copper and don't try gold till you get the hang of things!

That's it for this month, I'll let you round up your supplies and rig up a power supply. The next issue I'll describe how to use all this stuff correctly and SAFELY!

\*\*\*\*\*

## MOTOROLA SCHEDULES 1990 C-QUAM AM STEREO TECHNICAL SEMINAR

Stations currently on air in C-QUAM or planning conversion in the near future should consider attending Motorola's 1990 technical seminar on the C-QUAM AM Stereo system. The two day seminar, scheduled for May 9 and 10, 1990, will cover C-QUAM theory, design, circuit analysis and troubleshooting. A fee will be charged for materials, luncheon and refreshments. Attendees will be responsible for transportation, other meals, and lodging. The seminar is a perfect place to meet with fellow C-QUAM engineers. For further information, contact:

Don Wilson  
C-QUAM Technical Seminar  
1216 Remington Road  
Schaumburg, IL 60173  
Phone: (708) 576-3592  
FAX: (708) 576-5479

\*\*\*\*\*

## Osgood, Jackson To Be Inducted Into Broadcasting Hall of Fame

CBS News Correspondent Charles Osgood and Inner City Broadcasting Corporation's Hal Jackson have been named radio recipients of the National Association of Broadcasters' "Broadcasting Hall of Fame Award."

"Charles Osgood is regarded by his peers as a broadcaster's broadcaster, a great writer and story teller, and Hal Jackson's pioneering work as both broadcaster and station owner helped pave the way for minorities in broadcasting today," said NAB Radio Board Chairman William R. Sanders, president and owner of KICD/KICD-FM, Spencer, IA.

The recipients will be inducted at the Sunday radio brunch during NAB's annual convention, March 31-April 3, 1990, at Atlanta's Georgia World Congress Center. At the same center, NAB's Engineering Conference is scheduled March 30-April 3, 1990.

After more than 25 years in broadcasting, Osgood remains one of the busiest newsmen in radio and TV. On

the CBS Radio Network, Osgood anchors and writes "The Osgood File," four daily commentaries on headlined or little-known news stories of his choice. Osgood also produces a television version of the "Osgood File" for "CBS News This Morning," in addition to his frequent contributions for the "CBS Evening News" with Dan Rather and "Sunday Morning" with Charles Kuralt.

Osgood joined CBS News as a New York-based correspondent in 1971 and built a huge following, in part, for his news commentaries delivered in verse and for such collectible quips as "See you on the radio." A native New Yorker, Osgood was at onetime a correspondent for ABC News and honed his skills working for several local radio stations.

Jackson's contributions to radio broadcasting span no less than a half-century. He began his broadcast career as a play-by-play announcer during the 1940's, covering collegiate athletics for Washington, DC's Howard University and other schools, in addition to broadcasting games for the American Negro Baseball League.

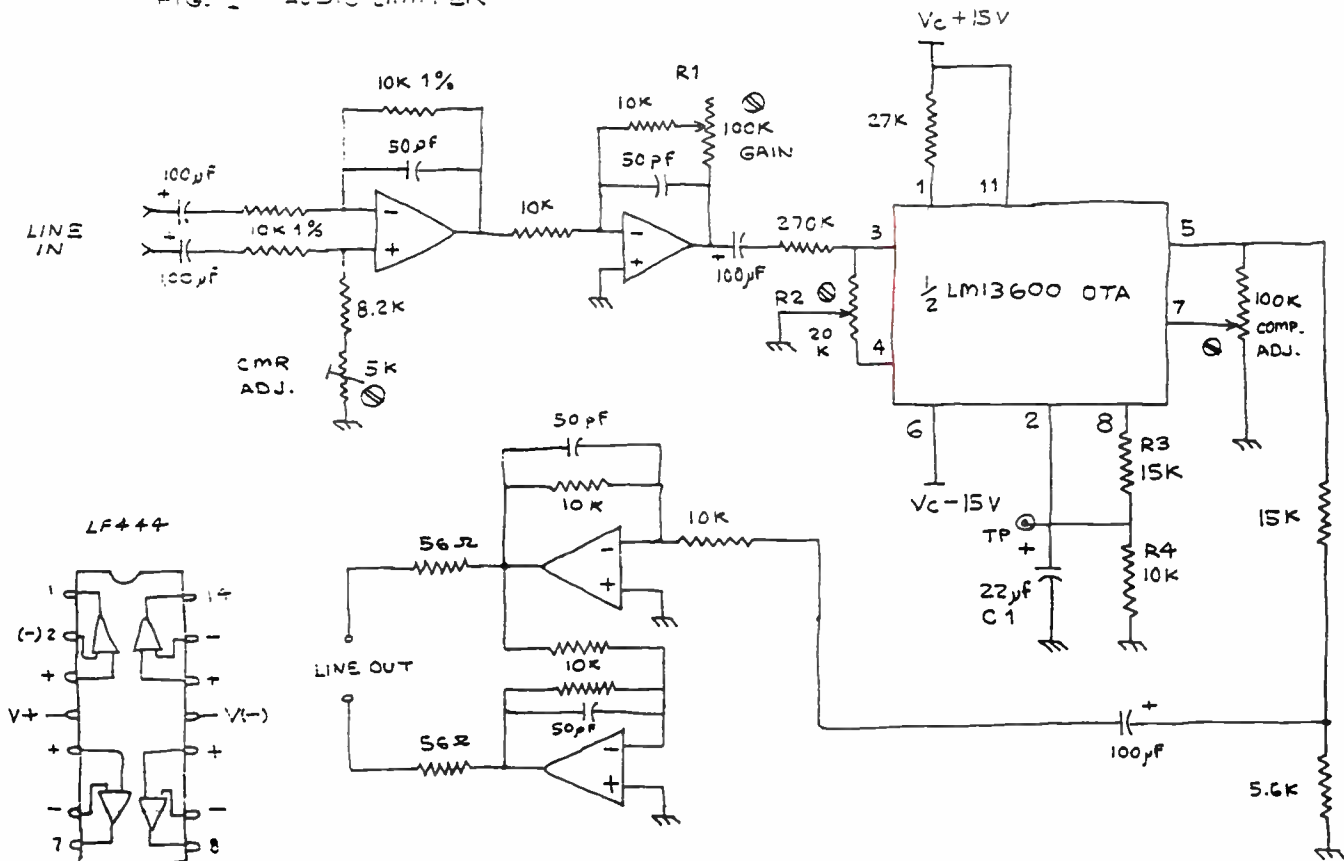
As group chairman of the Inner City Broadcasting Corp., New York, NY, Jackson repeatedly distinguished himself as a respected professional and for his good works with America's minority communities. He has raised over \$5 million for at least 30 New York charities and has participated as contributing master of ceremonies for Cerebral Palsy telethons for 30 years. Recently, Jackson was the recipient of the first Man of Radio Award presented by the National Association of Black Owned Broadcasters in 1989.

\*\*\*\*\*



## Diagram from January Issue of Metz

FIG. 1 AUDIO LIMITER



## NEW PRODUCT

### TELEX—CARRYING CASE

An addition to the FMR-25 Wireless System family line, the PC-25 carrying case allows users to power the FMR-25 or FMR-25TD with AA batteries, creating a portable unit.

The wireless receiver fits into the compact case, which is constructed of weather-resistant cloth, and includes a pouch for an integral battery holder that accepts 10 AA batteries for approximately 10-15 hours of operation. A short "rubber duck" antenna is available.

The PC-25 can be worn over the shoulder or mounted on the camera itself with extra-strength velcro strips. **Telex Communications, 9600 Aldrich Ave., So., Minneapolis, MN 55420 (612) 884-4015. Fax (612) 884-0043.**

### SENNHEISER

Sennheiser introduced the HD 450 Studio stereo headphone. The HD 450 Studio is a supra-aural open-air model designed for the professional user who needs a durable acoustically accurate high impedance headphone. The HD 450 Studio accuracy is derived from the use of neodymium ferrous magnets. This material provides a stronger magnetic field than conventional

magnet structures. A driver operating under these conditions reacts more immediately to an electrical signal change, due to the coil/diaphragm being more tightly coupled to the magnetic field. **Sennheiser Electronic Corp., 6 Vista Dr., P.O. Box 987, Old Lyme, CT 06371; (203) 434-9190.**

### STUDER - Audio recorder

The PR99 MKIII is a new version of the PR99, intended for commercial-industrial and broadcast on-air applications.

The unit features autolocator, built-in varispeed and fader start, VU meters with peak LEDs, balanced and floating line-in and line-out, a digital counter and a zero-locator.

The recorder comes in a die-cast aluminum transport chassis and headblock, with a servo capstan motor and modular electronics. **Studer Revox America, Inc., 1425 Elm Hill Pike, Nashville, TN 37210 (615) 254-5651.**

### PANASONIC - Portable DAT recorder

The SV-250 Digital Audio Tape recorder is intended for high quality professional or on-the-job recording applications indoors or out.

The unit includes 11 new LSIs, a rechargeable battery that delivers 2.2

hours of continuous recording or playback, and a MASH ADC plus digital filtering.

The unit measures 9 by 1 (3/4) by 5 (3/8) inches and weighs 3.2 pounds. **Panasonic Industrial Company, One Panasonic Way, Secaucus, NJ 07094 (201) 348-7000.**

### DOLBY - Audio System

The Dolby digital audio system, used for the first NTSC broadcasts ever with high quality digital stereo sound, is a compatible digital system designed to bring stereo TV sound comparable to CD into the home over regular broadcast and cable TV channels.

In contrast to digital systems based on pulsecode modulation (PCM), Dolby's ADM system can be operated with a lower bit rate, of particular significance when bandwidth is predetermined by an existing broadcast or transmission medium. **Dolby Labs, 100 Potrero Ave., San Francisco, CA 94103 (415) 558-0200. Fax (415) 863-1373.**

\*\*\*\*\*



Using the same simple design and ease of operation which has made its predecessor so popular, the DN-950FA is an industrial strength CD player built to withstand the wear and tear resulting from daily use. It features quick cartridge loading, and functions and dimensions almost identical to other professional broadcast equipment. Moreover, the DENON CD Cart Player™ offers the outstanding sound quality of the compact disc.



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## FCC NEWS

### New Phone Numbers

Two FCC field offices have new phone numbers. The San Francisco Regional Office, located at 211 Main Street, Room 537, San Francisco, can now be reached at (415) 744-2722. The office provides administrative coordination and guidance to the FCC's local offices in Livermore, Los Angeles and San Diego, as well as an Arizona office in Douglas.

The phone number of the FCC's Chicago area office has also been changed. It is now (312) 353-0195. The recording number is (708) 298-5171. The office's location is in the Park Ridge Office Center, Room 306, 1550 Northwest Highway, Park Ridge, IL.

### Felker Joins Law Firm

Former FCC Mass Media Bureau chief Alex Felker, who resigned last fall, has joined the Washington law firm of Wiley, Rein and Fielding. The firm is headed by Richard Wiley, a former

chairman of the FCC and the current head of the FCC's Advisory Committee on Advanced Television Service.

Felker, who doesn't have a law degree, will serve the firm as an engineering and technology consultant.

### FCC List of Revised Forms

The FCC has issued a revised listing of acceptable broadcast forms because the forms are frequently revised. The Commission warns that the use of obsolete forms can result in unnecessary delays in processing applications, in requests for more information, or in the preparation and submission of data no longer required. For a copy of the listing, which was issued on Nov. 22, contact the FCC's news media information office at (202) 632-5050.

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**The New FCC Fee Schedule** — Soon to be implemented as a result of an across-the-board filing fee increase recently passed by Congress. Call (202) 632-3906.

**Lottery Information** — If you would like to know if the commercial your station has been asked to air falls within the legal limits of the lottery laws, call (202) 632-7048.

**FCC Forms** For the latest forms, call (202) 632-FORM.

**Engineering Standards** — (202) 653-6288.

**EBS** — For a checklist or to have your questions answered, call (202) 632-3906.

**License Renewal** — AM stations call (202) 254-9572; FM stations call (202) 632-3954.

**EEO Guidelines** — To find out if you are in compliance, call (202) 632-7069.

**Class A FM Upgrades** — If you want to know if your station is eligible, call (202) 632-2049 or 9660.

**RF Radiation Exposure Standards** — To determine what your station has to do to comply, call (202) 653-8169.

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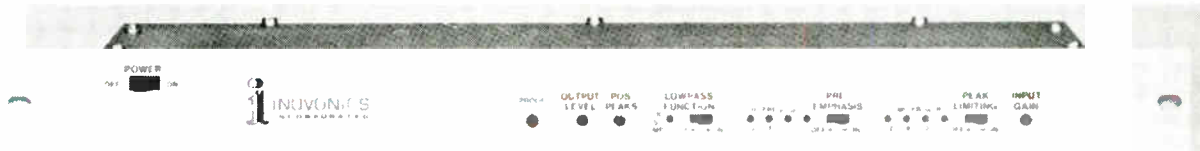
## Beat The June 30th Deadline For NRSC With Inovonics



\$590

222

"NRSC" Audio Processor



Inovonics' 222 is an audio processor specifically intended for AM broadcasting. It incorporates an "adaptive" preemphasis characteristic to enhance signal intelligibility and "presence," and a sharp-cutoff lowpass function to eliminate interference with adjacent channels.

The US-standard version conforms to the preemphasis/cutoff recommendations of the National Radio Systems Committee (NRSC). Optional variations can accommodate European Medium Wave or international Shortwave broadcasting practices.

The 222 includes a sophisticated Peak Limiter for "stand-alone" service between the program source and the transmitter. This function may be defeated when the unit is preceded by an existing audio processing system which already incorporates comprehensive peak control.

The frequency and phase response of the 222 is rigidly maintained from unit-to-unit to ensure optimum stereo performance from paired Processors, whether installed at the same time or years apart.

**Electronic Industries**  
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**WANT TO DELAY NRSC-2  
COMPLIANCE UNTIL 1994  
THEN BECOME NRSC-1  
COMPLIANT NOW!**

**CONTACT US FOR THE RIGHT EQUIPMENT**

**CRL SPOTLIGHT**



**Converting to the  
NRSC Standard?  
Want to Improve Coverage  
of Your Station?**

Electronic Industries  
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Out-of-State: 800-558-0222 or  
In State: 800-445-0222

**ONLY \$18.50**  
plus shipping & handling

CRL's new PMC 450 AM Limiter is a cost effective way to convert your station to the NRSC standard, and in many cases improve your coverage as well. The PMC 450 consists of a gated input compressor followed by an NRSC compliant tri-band limiter section. An adjustable presence band boost augments vocal clarity and punch. A patented overshoot corrected low-pass filter ensures maximum modulation control. Low frequency tilt correction circuits plus adjustable asymmetry levels assure compatibility with all transmitter types.

cont'd from pg. 13

**Construction Permits** — To apply for a construction permit, or to determine the status of an application, call (202) 632-6908 for FM stations and (202) 254-9570 for AM stations. If your application is contested, you should consult your attorney before making the call.

**Rule Interpretations** — To find out the specifics of a certain FCC rule, call (202) 632-7792.

If your question falls into a category other than those listed above, call the Commission's general information number, (202) 632-7000.

\*\*\*\*\*

FCC Commissioner James Quello wants to bring back the FCC's annual financial reporting requirement not only for cable as proposed in last week's "effective competition" rulemaking (see story), but also for broadcasting "so we can see what the actual figures are — what people are earning or not earning."

With the full support of the broadcasting and cable industries, the FCC dropped its financial reporting requirements in 1983 as part of then-Chairman Mark Fowler's campaign to rid the agency's book of as many burdensome regulations as possible.

Individual reports, which included operating revenues and expenses, were kept confidential, but the figures from all the reports were tabulated each year to come up with industry totals.

In comments during last week's open hearing, Quello said the annual reports are needed in cable to "separate some of the facts from rhetoric" and in broadcasting to settle disputes. "So many people charge people with earning too much or too little," he said.

The return of financial reporting would be an "administrative burden" for the Mass Media Bureau, he said, "but I think it would be well worth it."

Whether Quello's proposal becomes reality is up to FCC Chairman Alfred Sikes, who controls the FCC agenda. Mass Media Bureau Chief Roy Stewart, who implements Sikes's mass media agenda, told reporters following the open meeting that there are no current plans to consider extending the financial reporting requiring to broadcasting.

\*\*\*\*\*

**C-QUAM PORTABLES  
HIT THE STREET**

Receiver manufacturers now have the capability of producing portable and personal portable C-QUAM AM Stereo receivers for public use. In fact, one company, Sangean Electronics of

Taiwan has already begun marketing its "SR-66", an inexpensive C-QUAM AM Stereo/FM Stereo variable tune headphone receiver. The Sangean radio uses Motorola's MC 13024 decoder/receiver IC. Other manufacturers who have been shipped IC samples have also scheduled portable and personal portable receivers. 1990 will be a landmark year for C-QUAM AM Stereo, and for those who have been waiting for portable C-QUAM AM Stereo products.

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**Stations Adopt NRSC  
Standard**

The latest stations to adopt the NRSC-1 standard for AM facilities include: WABF/Fairhope, AL; CJOC/Lethbridge, Alberta; KCKY, Coolidge, AZ; KORT/Grangeville, ID; KLER, Orofino, ID; WXEZ/Chicago; WFIW/Fairfield, IL; KMA/Shenandoah, IA; WHB/Shawnee Mission, KS.

Also: KAOL/Carrollton, MO; WMBH/Joplin, MO; KALM/Taylor, MO; WDIX/Yadkinville, NC; KMFR/Medford, OR; WXKW/Allentown, PA; WXKU/York, PA; WATS/Sayre, PA; WCOS/Columbia, SC; WJXY/Conway, SC; KOLY/Mobridge, SD; WKTY/La Crosse, WI.

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# COMMON POINT CLASSIFIEDS

## EI Classifieds

EI Classifieds are free to the readers of Common Point magazine. To place an ad type it on the acknowledgement card that comes with each issue and mail to us. We assume no responsibility for the condition of any of the equipment or services in these ads.

FOR SALE: Utility 347 foot tower (C1983 Standing) \$10,000.00, Barcus Berry Processor (used 6 mo.) \$300., MCI RCR-9 Remote Control \$1500., Orban 111 Dual Reverb \$300., DBX 163 Comp. Limiter \$200., 3" to 1" reducer for solid line with gas hookup (EIA flanges & bullets) \$200., Gates Stereo Yard tube type 8 chan removed from service this year. \$500., Gatesway tube type console condition unknown in storage \$200., two background music play decks \$150. each, three Revox 99-B stereo playback only \$700 each., 1000 Grey Fidelipac Carts 50 cents each in lot or 75 cents each split, 300 Scotchcarts with country hits last 2 years various lengths \$3.50 each or \$3 each for lot. Best offer on any item! KJLO Radio, Roger K. Bennett, Chief Engineer, Box 4808, Monroe, LA 71211, 318-388-2323.

FOR SALE: Hewlett Packard test set, AN/USM-37A microwave with accessories, \$300, Kay Markasweep 154C, \$75, Narda directional coupler, 1.7-4.2 GHz, \$35, Jennings RB7A vacuum relay, \$50, 50 watt AM transmitter (home brew type), \$500. James Cunningham, KEOR, Stonewall, OK. (405) 265-4496.

FOR SALE OR TRADE: Kay Marka-Sweep 154C, HP Microwave test set, MicaCap 300pf/35KV, W.E. video Attenuator, Sony V01600 VCR and Home Brew 10-50W. A.M. Transmitter (phone 405-265-4496).

## NAB '90 To Host First U.S. Demonstration of True Digital Audio Broadcasting

The National Association of Broadcasters will host the first U.S. demonstration of the EBU/Eureka 147 system of digital audio broadcasting at its annual convention in Atlanta, Georgia, March 31-April 3, 1990.

The demonstration, which will be available throughout the convention, will be given near the Engineering Conference area at the Georgia World Congress Center, headquarters for NAB's

annual convention. NAB's Engineering Conference is scheduled at the Center March 30-April 3, 1990.

EBU, the European Broadcasting Union, comprises 38 broadcasting organizations in the European Broadcasting Area, which includes the Mediterranean countries. The EBU project began in 1987, and has been operational in testing for about 15 months. The NAB Radio Board was briefed on the issue at its January meeting in Rancho Mirage, CA.

Digital audio broadcasting (DAB) is a new terrestrial means of transmitting radio signals directly to new receivers in cars and homes and to portable radios. The new technology is available only as a substitute for AM or FM broadcasting, since DAB is not technically compatible. DAB can be received in mobil environments without most of the interference found in traditional AM and FM radio broadcasts. In addition, DAB can accommodate broadcast channels more efficiently than the existing FM band. Much less power is needed to broadcast DAB with stations in each market being able to share one transmitter.

At the heart of the DAB design is a digital coding technique for compressing, digitizing, transmitting and reconverting signals back to analog, which is superior to existing analog-to-digital conversion methods. The end result is a radio system that can deliver true CD-quality sound directly to listeners.

\*\*\*\*\*

## Fiber Optic Testing Underway

The first field trials of fiber-optic networks for broadcast television have begun with ABC's transmission of live television from New York to seven cities across the country.

Coordinated by Bellcore, the five consecutive trials will use coast-to-coast fiber optic links to test how efficiently network television studios can broadcast programming to affiliate stations using a land-based alternative to satellite.

Each of the five major broadcasters (ABC, CBS, NBC, Fox, PBS) will have

exclusive use of the trial networks established in Atlanta, Boston, Indianapolis, Los Angeles, Minneapolis, New York, St. Louis and Washington for up to three months.

Conventional signals are being transmitted at 45 megabits per second (DS3 rate). The signals travel over a new two-way, tree branch-like network that permits broadcasters to distribute programming simultaneously to a number of affiliate stations. Eight Bell operating companies and five interexchange carriers are providing the fiber-optic networks for the trials, and several suppliers are providing equipment ranging from video and audio codecs to a new multi-cast switch.

Various factors have combined to make the tests possible, including the declining cost of a DS3 channel and the availability of fiber optics (about 300 cities are connected by fiber optics and are capable of transmitting video at the DS3 rate). Space is limited on satellites, which are also subject to the problems of aging. Further, fiber networks offer near-instantaneous customizing of a program's destinations, lack of signal interference, security from unauthorized receivers, multiple simultaneous audio-channel capability, and the flexibility to make every network affiliate a program source.

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# FLUKE

## 80 Series Analog/Digital Multimeters

### NEW!



83



85



87

### High Performance Meters With 11 Functions And 40 Ranges For A Wide Variety Of Electronic And Industrial Applications

- Min Max Average recording mode with Min Max Alert™
- Frequency, duty cycle and capacitance measurements
- 1000V rms input protection; Input Alert™ detects wrong input jack connections
- 3¾ digit, 4000 count display updates 4 times per second, analog display updates 40 times per second
- 4½ digit mode, 1ms peak hold, back lit display and true-rms measurements (87 only)
- Touch Hold\* and Relative modes
- Splash proof and dust proof case; EMI shielded
- Protective holster with Flex-Stand™
- Protected from 6 kV transients on 660V major ac feeders
- UL 1244 listed
- Made in U.S.A.
- Three year warranty



The new Fluke 80 Series (83, 85, and 87) is a family of versatile analog/digital multimeters with an impressive range of capabilities, including frequency, duty cycle and capacitance measurement.

Designed for electronic as well as industrial applications, the 80 Series features durable construction and several unique safety features.

#### Min Max Average Recording Mode With Min Max Alert

Stores the highest, lowest, and average of all readings, allowing you to monitor a signal for seconds or days. Selectable response times allow you to specify the time required to sense changes. Min Max Alert gives an audible tone for readings above or below previous minimums or maximums.

#### Frequency, Duty Cycle and Capacitance Measurements

Fluke 80 Series meters have a counter for frequency measurements from 0.5 Hz to 200 kHz, and duty cycle measurements from 0.1% to

99.9% of cycle. All three meters measure capacitance from 10 pF to 5 µF. Larger value capacitors may be measured using the analog display in the resistance mode.

#### Input Alert and Overload Protection

Input Alert provides an audible warning if the test leads are in current but function switch is not, this reduces the risk of damage to the equipment being tested and to the meter. Fluke 80 Series meters also provide 1,000 volt rms input protection in both ohms and diode test.

#### Fast 3¾-digit, 4000 Count Digital Display, High Resolution Analog Display

Digital display updates 4 times/second. For changing or unstable signals, the 87 features a high-resolution analog pointer; the 83 and 85 use an analog bargraph. The 83 and 85 also feature Zoom Mode for higher resolution analog readings. Analog displays update 40 times per second.

#### 4½ Digit Mode, 1ms Peak Hold, True-rms, Back-Lit Display (87 Only)

The Fluke 87 is a true-rms ac meter, and offers 4½ digit, 19,999 count high resolution mode, plus 1ms Peak Min Max hold. The back lit display assures readability in poorly lit settings. Light shuts off automatically after 68 seconds, prolonging battery life.

#### Touch Hold & Relative Modes

Touch Hold captures the measurement, beeps and locks it on the digital display until you're ready to view it. It automatically updates with each new measurement. The Relative Mode remembers a reading and shows the change (difference) between it and any readings that follow.

#### Rugged, Sealed Construction

Splash proof and dust proof case and a specially designed protective holster protect the meter even under harsh operating conditions. All units are sealed and EMI shielded.

#### Standard Equipment

Every meter comes packaged with a yellow protective holster complete with Flex-Stand safety-designed test leads, 9V battery (installed), manual and operator guide.

#### Options/Accessories

A dark grey holster with Flex-Stand is available. The full line of Fluke measurement accessories is compatible with the 80 Series.

#### Basic Accuracy

	(% of reading+number of counts)		
	83	85	87
DC Voltage	0.3%+1	0.1%+1	0.1%+1
AC Voltage	1%+3	0.5%+2	0.7%+2
True RMS	No	No	Yes
Specified to	5 kHz	20 kHz	20 kHz
Ohms	0.4%+1	0.2%+1	0.2%+1
DC Current	0.4%+2	0.2%+2	0.2%+2
AC Current	1.2%+2	0.6%+2	1%+2
Frequency	0.005%+1	0.005%+1	0.005%+1
Capacitance	1%+2	1%+2	1%+2

#### Battery Life

500 hours typical (alkaline)(83, 85)  
400 hours typical (alkaline)(87)

#### Three Year Warranty

One year calibration interval

#### Size

1.25" H x 3.41" W x 7.35" L  
(32mm H x 87mm W x 187mm L)

#### Weight

12.5 oz. (0.36 kg)

#### Order

Fluke 83 Multimeter with holster	\$165.37
Fluke 85 Multimeter with holster	\$200.37
Fluke 87 Multimeter with holster	\$252.87

### Electronic Industries

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