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## SBE To Develop Three Technical Sessions at NAB '92

The Society of Broadcast Engineers (SBE) has agreed to develop three technical sessions at the annual convention of the National Association of Broadcasters, scheduled April 12-16 in Las Vegas.

The SBE sessions are being included for the first time at an NAB Broadcast Engineering Conference, which also runs April 12-16. The three sessions will be packaged as "SBE Day at NAB '92" and are scheduled Tuesday, April 14. The one-day event is designed to help engineers meet the technical challenges of radio and TV today.

There will be a radio and television engineering session in the morning, followed by a regulatory session on technical issues in the afternoon. An outline of the SBE sessions follows:

### SCHEDULE OF ENGINEERING SESSIONS LAS VEGAS, NV

*Tuesday, April 14, 1992 Morning Radio Session:*

Radio: Coping with New Technology

Session Coordinator: John Battison, Consultant

Session Assistant Coordinator: Paul Montoya, Brdcst. Services

- 8:45 a.m. Opening Presentation
- 8:55 a.m. Session Chair's Remarks and Welcome
- 9:00 a.m. Radio in the 1990's  
Challenges and Opportunities  
\* Brad Dick, Broadcast Engineering Magazine  
An overview of the technical and regulatory issues currently before the radio industry.
- 9:30 a.m. Digital Cable Audio: When and Where  
\* Don Lockett, National Public Radio  
A technical overview of acable radio, and its place in your market.
- 10:00 a.m. The Expanding Role of DSP in Audio Technology  
\* Michael Collins, Motorola  
An overview of digital signal processing technology, and how it is reshaping the professional audio industry.
- 10:30 a.m. Improving Transmitter Performance Through Class E Operation  
\* David Cripe, Broadcast Electronics  
Theory of operation of Class E power amplifiers, and how they compare with conventional Class D systems.
- 11:00 a.m. The Dependence of AM Stereo Separation on Transmitter Load Phase  
\* Jerry Westberg, Consultant  
Detailed analysis of load phase adjustment for optimum AM stereo performance.

(cont. to page 3)

## NAB and American Television Alliance Plan Live HDTV Broadcast Demonstration at NAB '92

General Instrument Corporation and the Massachusetts Institute of Technology (MIT), partners in the American Television Alliance, will exhibit the first live over-the-air demonstration of its DigiCipher HDTV system during the NAB HDTV World Exhibition, April 13-16.

The DigiCipher system is the world's first all digital HDTV system, and has just completed testing at the Advanced Television Test Center (ATTC). "We're comfortable with the way our system responded to test. Our information is that we did very well. But you can do all the lab test imaginable, and people won't be convinced until they see it," said Robert Rast, Vice President of HDTV Business Development for General Instrument.

The DigiCipher system demonstration will use low power transmission on UHF channel 15 from the south end of the Las Vegas Convention Center to the Las Vegas Hilton Center, approximately 1/4 mile. HDTV signals will be originated at the General Instrument/MIT booth in the HDTV World Exhibit Hall, encoded into a data compressed digital format and sent by microwave link to the transmitter site at the Convention Center.

The received HDTV images will be shown in a special viewing area adjacent to the General Instrument/MIT booth at the HDTV World Exhibit Hall, located in the Las Vegas Hilton Center. Additional technical support will be provided by Microwave Radio Corp., TTC

(cont. to page 2)

# Editor's Notebook



**GORDY DAILEY**

One of the more interesting TV programs that I have seen in quite a long time was broadcast by Public Television back in January. The program was entitled "Empire of the Air — The Men Who Made Radio", and it dealt with the lives of the three men who laid the groundwork for the American broadcast industry as we know it today, Lee de Forest, Edwin Armstrong and David Sarnoff.

Since many of us haven't read much about these men beyond the pages of a textbook it was rather enlightening to find out that they were human beings just like the rest of us, and in many instances not very nice human beings at that.

For instance, de Forest was variously described as a cad and a thief and many of his ideas were supposedly not his own. He took the Fleming valve added a grid to it and called it the "Audion". He considered it his greatest invention. He held more than 300 patents but for all his intelligence he was a poor business man. He began about twenty different companies and most of them went bankrupt. He died June 30, 1961.

Edwin H. Armstrong was probably the only true genius of the three men profiled. His invention of the regenerative detector, which was patented in 1913, made possible the oscillator for transmission purposes. He invented the superheterodyne receiver while in the Army Signal Corps, he is considered the "father of FM broadcasting". He and de Forest fought court battles for about twenty years. He committed suicide on January 31, 1954.

David Sarnoff came to New York from Russia in 1900 and went to work

for Marconi Wireless, and eventually became the "head man" at RCA/NBC. While de Forest and Armstrong were more technically minded, Sarnoff was more into marketing. He believed that radio should be a household item and it was he who marketed the superhet receiver after Armstrong invented it. He was supposed to have suppressed FM broadcasting so as not to detract from the new medium of television. Sarnoff was a hard taskmaster and once said that "I don't get ulcers, I give them". Sarnoff died in 1971.

If you didn't have a chance to watch this two-hour special of PBS it would be well worth your while to try to get a tape of the program. It is very informative and gives some insight into some of the pioneers of the broadcast industry.

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(cont'd from page 1)

Corporation, Andrew Corporation and Hammett and Edison, Consulting Engineers, Inc.

NAB has invited all proponents of HDTV terrestrial transmission systems being considered by the FCC to demonstrate HDTV broadcasting at the Convention. However, activities associated with the testing schedule at the Advanced Television Test Center (ATTC) will prevent Zenith/AT&T and the Advanced Television Research Consortium (ATRC) from being able to participate.

In addition, NHK elected not to demonstrate their Narrow MUSE system and ATRC chose not to demonstrate their NTSC-compatible ACTV system. DigiCipher is the first of four digital HDTV proponent systems being tested at ATTC.

The DigiCipher system was developed in San Diego, California by

a small, highly talented team of scientists headed by General Instrument's Dr. Woo Paik. It has 1050 scan lines and 2:1 interlaced scanning with 29.97 frames per second and 59.94 fields per second. A second Alliance system is scheduled for testing in summer 1992. That system employs 787.5 scan lines, and progressive scanning at 59.94 frames per second.

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## Amateur Radio

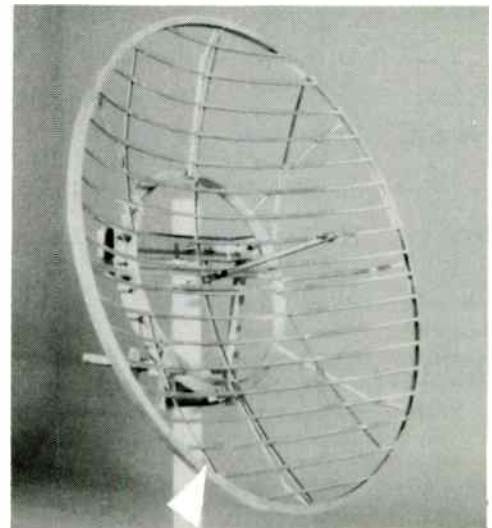
A new educational program created by Kenwood U.S.A. Corporation (Long Beach, CA) is designed to encourage young people to learn more about amateur radio. More than 2000 amateur radio clubs in the United States are being invited, in a special mailing, to join Kenwood in sponsoring a local junior or senior high school class, scout troop, or youth club in the Kenwood KIDS program. Each club that responds to the mailing will receive a package of educational materials. The package includes ten copies of the ARRL publication Now You're Talking and the companion instructor's guide, as well as a certificate for the Kenwood HamWindows computer program. According Tom Wineland, Vice President Communications and Test Equipment Division, The heart of the program is education, but we have built-in incentives for both the kids and the co-sponsoring clubs. Every youngster who succeeds in obtaining a license will receive a \$25 Kenwood gift certificate, while the sponsoring club will receive ten \$25 certificates for each successful class. The participating schools and clubs can also win complete HF stations.

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(cont'd from page 1)

11:30 a.m. Close of session

*Tuesday, April 14, 1992 Morning Television Session*

Television: Coping with New Technology  
Session Coordinator: Richard Farquhar, SBE President  
Session Assistant Coordinator: Robert Goza, KMOV-TV

8:45 a.m. Opening Presentation

8:55 a.m. Session Chair's Remarks and Welcome

9:00 a.m. Television: Where has all the Money Gone?  
\* Jerry Whitaker, Technical Writer  
An examination of key trends in the television market today, and what we can do about them.

9:30 a.m. Enterprise-Wide Automation  
\* Bob Paulson, AVP Communications  
Report on a new way of viewing television station automation, and how it can apply to your station.

10:00 a.m. A Case History: Master Control Automation  
\* Marvin Born, WBNS-TV, Columbus  
The paybacks and problems of television station automation.

10:30 a.m. Basic of Digital Video Compression  
\* Carl Ostrom, Systems Resources  
A summary of the major video compression schemes under development today, and what they hold for the future.

11:00 a.m. NASA: Applying New Technology Today  
\* Tom Bentson, NASA  
How NASA is using new technology to solve old problems.

11:30 a.m. Close of Session

**LUNCH BREAK**

*Tuesday, April 14, 1992 Afternoon Regulatory Session*

Broadcaster's Rules of the Road Session Coordinator: Dane Erickson P.E.,  
Hammett & Edison, Inc. Session Assistant Coordinator: William Hineman, WTHR-TV

12:45 p.m. Opening Presentation

12:55 p.m. Session Chair's Remarks and Welcome

1:00 p.m. FCC Enforcement Efforts:  
Not Business as Usual Anymore  
\* Richard Smith, FCC FOB  
Report on the enforcement activities of the Commission, and the effects that increased fines are having on stations.

1:30 p.m. Beta Testing a Self-Inspection Program  
\* Jim Zoulek, FCC Los Angeles office  
Report on the track record of a unique self-inspection program organized by one of the FCC Field Offices.

2:00 p.m. Changes in Structural Standards for  
Communications Towers  
\* John Windle, Stainless, Inc.  
An outline of the significant changes contained in new ANSI/TIA/EIA standards, and how they will effect a typical broadcast station.

2:30 p.m. New Issues Facing Frequency Coordination  
Richard Rudman, Chair, SBE Frequency  
Coordination Task Force  
The upcoming political conventions, proposed spectrum reassignments, and the looming issue of HDTV augmentation channels have made frequency coordination more critical than ever.

(cont. to page 4)

## Cutting Power Line Interference

Power line-generated interference always has been a problem for AM broadcasters. In many cases, when the source of interference can be located easily, power companies can help eliminate it. In other cases, broadcasters are unable to get any remedial action on the part of local power utilities and therefore suffer with listener complaints on a continuing basis.

AM broadcasters can follow these simple procedures to handle power line interference problems.

First, try to track down the exact location of the interference and determine if it is being produced by equipment owned by the power company. If interference is received along a certain stretch of roadway, try to isolate the source. Power line insulators are often the source of an annoying buzz heard on the radio. Usually, the source of this type of interference can be located easily by noting where the buzz becomes the loudest. Driving slowly in a car and stopping occasionally to walk around with a portable radio is usually a good method to isolate the source of interference.

If you have success in pinpointing the interference, contact the local power company and explain your situation to the customer service department. Be sure to tell the power company that you represent a radio station and that you have been receiving complaints from your listeners. Ask to speak with one of their engineers and explain the problem to him/her. To help make solving your problem a priority of the power company, emphasize that many people are complaining about this interference.

Colleen McNeely, public affairs officer of the FCC Norfolk, VA, field office suggests that if broadcasters do not receive cooperation from local power companies in resolving power line-related interference problems, they should complain to the state utilities commission. McNeely says these commissions essentially play the role of "boss" over local utility companies and can exercise considerable clout when necessary. "It would seem that the strength of state broadcast associations also could be of help to individual stations in their dealings with power utilities," says McNeely.

John Marino,  
NAB Science & Technology  
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(Reprinted from Feb. 10, 1992  
issue of NAB Radio Week)

(cont'd from page 3)

- 3:00 p.m. The SAGE I System for EBS  
\* Jerry LeBow, SAGE Alerting Systems  
An inside look at one alternative to the current EBS system.
- 3:30 p.m. The Future for EBS  
\* Bill Ruck, KFOG/KNBR Radio  
With the perspective to two recent San Francisco Bay area disasters (Oakland first and SF quake), where should EBS go from here?
- 4:00 p.m. WARC-92: What is it and Why Should I Care?  
\* John Reiser, FCC  
Report on the upcoming WARC meeting and other international activities, and what effects they could have on broadcasters.
- 4:30 p.m. Roundtable Discussion:  
Dealing with a Changing World  
\* Richard Smith \* Bill Ruck \* Jim Zoulek  
\* Jerry LeBow \* Don Windle \* John Reiser  
\* Richard Rudman \* Dane Ericksen
- 5:00 p.m. SBE Membership Meeting
- 5:30 p.m. Close of Session

*Tuesday April 14, 1992 Afternoon concurrent Event*

- 2-5 p.m. Certification Exams  
Rm. N111
- 3:00 p.m. SBE Chapter Chairmen's Meeting  
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## SMPTE Launches New Task Forces

The Society of Motion Picture and Television Engineers (SMPTE) has given two task forces the go-ahead to create protocols for high-resolution image exchange. The work will be a cooperative venture with the Advanced Television Systems Committee (ATSC) and the Institute of Electrical and Electronic Engineers Committee on communications and Information Policy (IEEE-CCIP).

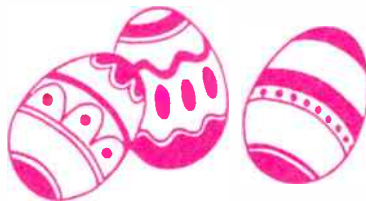
One of the task forces will work on developing a common header/descriptor protocol for identifying high-resolution imaging and high-definition TV formats, and the other will create a structure of hierarchy for these formats. According to SMPTE, a standardized header/descriptor and a reference structure for interformat exchange would allow, for example, a host display to recognize the header on an incoming signal and to be pre-programmed to self-adjust to display the format correctly. It is believed by SMPTE that a standard could have as much impact on the digital imaging world as SMPTE's 1973 time code standard had on the synchronization of audio, film and TV, if adopted.

Stanley N. Baron, SMPTE engineering vice president and managing director of technical development at NBC,

said the task force on header/descriptor is expected to be completed soon. "The task force will make recommendations to enable the exchange of images, image files and image sequences in digital form between differing high-resolution systems," said Baron. "A common protocol will facilitate the exchange of images created under different standards."

The task force on digital image architecture is also expected to complete its project soon, developing the structural requirements for a hierarchy of digital standards to facilitate interpolation of high-resolution display systems. The system of standards will provide for interoperability, be scalable to various performance levels and extensible to new technologies, according to SMPTE. Further discussion of the developments will be made at the 26th Annual Advanced Television and Electronic Imaging Conference, Feb. 7-8, 1992, in the St. Francis Hotel, San Francisco.

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## Many Papers to be Presented at NAB Engineering Conferences and HDTV World

More than 81 technical papers will be released for attendees at NAB's Broadcast Engineering Conference, and more than 65 papers will be presented at the 1992 NAB HDTV WORLD Conference, one of several features at NAB's annual broadcast convention in Las Vegas, April 12-16.

The technical papers will be presented at the conference, covering the most recent developments in radio and TV engineering. Topics range from TV automation, digital audio broadcasting, and digital compression techniques, to AM & FM improvement, reducing station power costs, and fiber optics.

The HDTV papers will be presented at 16 separate sessions, focusing on the technical, political and artistic issues raised by HDTV development. Topics at the April 13-16 conference range from HDTV production techniques, audio & ancillary services and programming, to HDTV proponent systems for terrestrial broadcasting, advanced television equipment and a digital HDTV tutorial.

All the papers will be compiled and presented in book form and will be sold at the convention.

## Zenith Comments on HDTV Timetable

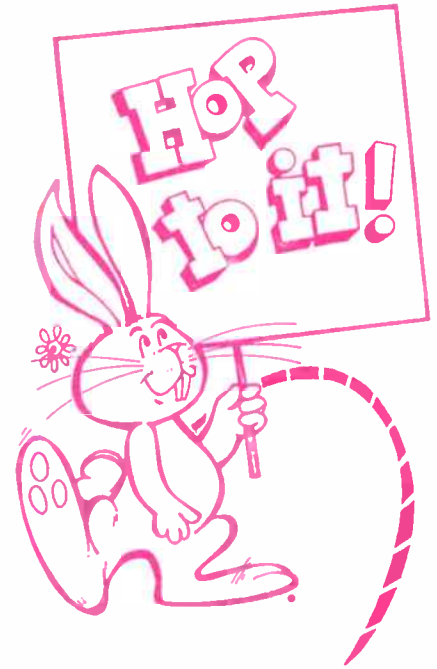
Responding to an FCC request for comments on a proposed implementation scenario for high definition TV, Zenith Electronics Corp. has proposed for FCC set a firm date for completed conversion to HDTV and termination of NTSC. In a 17-page reply, Jerry K. Pearlman, Zenith chairman and CEO, said this date should be nationwide, not market-by-market, giving broadcasters, hardware manufacturers and consumers a clearly-defined planning horizon.

Pearlman suggested that such a firm date not be set until there is "some history on which to judge and revise current forecasts for station conversion, receiver penetration and the availability of down-converter adaptor boxes." For example, the commission could take stock give years after the Report and Order establishing the HDTV service, then propose and seek comments on a date to cease NTSC broadcasting.

The FCC is aiming toward eventual recovery of the second 6 MHz channel needed for simulcasting in each market after full conversion is made, and Pearlman, recognizing this need, pointed out, though, that set manufacturers like Zenith will continue serving the NTSC receiver market until signifi-

cant HDTV broadcasting and programming is available. He stated, "Consumers will expect to use their newly purchased NTSC receivers for seven to ten years, so the commission should allow at least seven years between setting a date and actual cessation of NTSC broadcasting."

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## NAB Releases Report On Field Testing Of TV Ghost Canceling Systems

The NAB has completed field testing of five different TV ghost canceling systems. While NAB's test results show each system was effective in reducing or eliminating the fuzzy, multiple images that can sometimes degrade TV reception, NAB said that one system, developed by Philips Laboratories, appears to be the superior performer.

The other four systems measured were developed by AT&T/Zenith, the Broadcast Technology Association of Japan, the David Sarnoff Research Center/Thomson Consumer Electronics, and Samsung Electronics. The field test procedures were developed by a technical sub-group of NAB's Advanced Television Task Force and was supported by a ghost-canceling specialist group of the Advanced Television Systems Committee.

As the next step, NAB will share the results with its TV membership and ask its TV Board of Directors for a recommendation on further action. At the same time, the field tests are being submitted to the ATSC as a contribution toward development of an ATSC voluntary technical standard.

The NAB conducted the field tests in the fall of 1991, using UHF and VHF TV stations in Washington, DC. The goal is to develop a voluntary transmission standard that, in turn, would enable manufacturers to produce ghost canceling equipment, allowing TV stations to provide ghost-free pictures to their local communities.

Among the key findings, NAB said the field test performances varied significantly from system to system and depended to some extent on the transmitting frequency (VHF or UHF), the type and complexity of the ghosting condition, and the received signal level.

The field test program originated in July 1990, when NAB asked interested parties to submit proposals for ghost canceling systems to be considered for adoption as a voluntary U.S. broadcasting standard.

To implement ghost canceling in over-the-air TV reception, changes are required in both transmission and reception equipment. Ghost canceling systems work using a specialized training signal that is imbedded in broadcast transmissions; this signal is later analyzed and processed at the receiving end to reduce the effects of "ghosting."

The NAB activity is targeted at the standardization of only the ghost canceling training signal that is transmitted; receiver manufacturers then could choose to process the signal in any desired way, resulting in products that balance manufacturing cost with

customer requirements.

The field tests took place in the Washington D.C. area between September 27 and November 8, 1991. Three local stations participated in the field tests; one VHF station (WRC-TV, channel 4) one low UHF station (WDCA-TV, channel 20) and one high UHF station (WFTY, channel 50). System performance was compared at over 100 locations in the Washington area.

Additional sponsors of the field test program included the Cable Television Laboratories (CableLabs), The Electronic Industries Association (EIA), the Association for Maximum Service Television (MSTV) and the Public Broadcasting Service (PBS).

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## Butler Joins NAB Science & Technology

The National Association of Broadcasters has announced that Andy Butler has joined its Science & Technology department as staff engineer, conference programming.

Butler, who began work February 4, comes to NAB from WBAL/WIYY radio in Baltimore, where he was director of engineering. Prior to his experience in Baltimore, Butler worked as director of engineering for WFAN/WQHT and as vice president-engineering for Doubleday Broadcasting in New York.

Butler holds a B.S. and an M.S. in Engineering Management from the University of Missouri at Rolla. He is active in various industry groups, including the Society of Broadcast Engineers, for which he served as Executive Director for three years. Butler's primary responsibility will be the development of technical programs for NAB's conventions.

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## WARC Says OK To Worldwide L-Band DAB

The World Administration Radio Conference (WARC) has allocated space in the 1500 MHz band (L Band) for satellite and terrestrial DAB service worldwide.

WARC also allocated — for the U.S. only — space in the 2300 MHz band (S Band) for satellite and terrestrial DAB. WARC is a U.N. chartered group charged with mediating spectrum frequency questions worldwide. It said a world conference should be held by 1998 to set technical parameters for the regulation of DAB in the 1500 MHz band.

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## Star Trek To Be Beamed Into Broadcasting Hall of Fame

The television series Star Trek has been named the 1992 television inductee into the Broadcasting Hall of Fame, the National Association of Broadcasters announced this week.

Star Trek will be saluted at the annual convention of NAB, scheduled April 12-16 in Las Vegas. Paramount Pictures Chairman Brandon Tartikoff will be on hand to accept the award, and series cast members also are expected to attend the presentation Tuesday, April 14 at a special luncheon ceremony.

The NAB award recognizes individuals or programs that have made significant contributions to broadcasting and to the American public. "Star Trek

has been a progressive force, both as a television series and in its positive portrayal of human relations," said NAB TV Board Chairman Ron Townsend, president of Gannett Television. "The show has had an unprecedented impact on popular culture for nearly 25 years and it's recognition this week is well deserved."

The original TV series Star Trek ran three years from 1966-69. However, its considerable domestic and world-wide following was forged in syndication in the 1970s, later spawning six successful feature movies. It also produced two spin-off series, Star Trek: The Next Generation, which has enjoyed a five-year syndication run since 1987, and Star Trek: Deep Space Nine, a first-run syndication series slated for late 1992 release.

Past television inductees include the

cast of the 1950's TV series, The Honeymooners; Sid Caesar, Milton Berle, Lucille Ball and Jerry Lewis.

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## New Monaural STL Available

TFT's new Model 9200/9205 Monaural STL Transmitter and Receiver will soon be available for shipment.

The 9200/9205 Mono STL is an economical STL system that is designed for either single, redundant dual channel or stereo program transmission for studio-to-transmitter links or inter-city relays. Both the transmitter and receiver utilize state-of-the-art Very Large Scale Integrated (VLSI) circuits to achieve low component count for high reliability and reduced manufacturing costs.

TFT's new product is field programmable and frequency synthesized. "A common reason for field frequency change is due to unexpected RF interference in a congested area," says Darryl Parker, TFT's Director of Marketing. "With the model 9200/9205, broadcasters can change frequencies with internal dip switch settings. This feature makes servicing the equipment easier and results in improved delivery by TFT."

The TFT patented frequency synthesizer provides very-low-phase-noise and low spurious output so that the STL system can achieve greater than 70dB SNR with only 22kHz of FM deviation. This makes very efficient use of the RF spectrum. Other performance specifications include 0.2% T.H.D., 80 dB channel separation, and 7.5 watts RF power in the 800-960 MHz range (20 watts in other frequencies).

In addition, the new product offers an optional built-in 39 kHz FM subcarrier generator and demodulator that may be utilized for either data transmission or a supervisory channel. Also, when two STL transmitters and receivers are used for stereo, provision is made for properly matching phase and gain characteristics, providing for excellent separation and stability.

The transmitter/receiver pair lists for \$3,300.00. TFT also offers a 9200/9205 dual mono STL package for stereo applications for \$7,975.00. The 9200/9205 will be available in RF bands 800-960 MHz, 400-480 MHz, 300-340 MHz, 200-240 MHz and 140-180 MHz, as well as 1.4-1.7 GHz. An optional SCA subcarrier channel can be ordered.

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A Broadcast Industry

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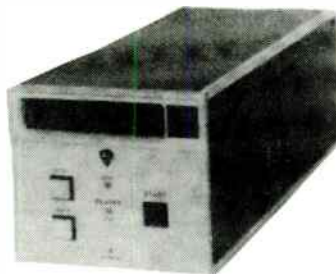
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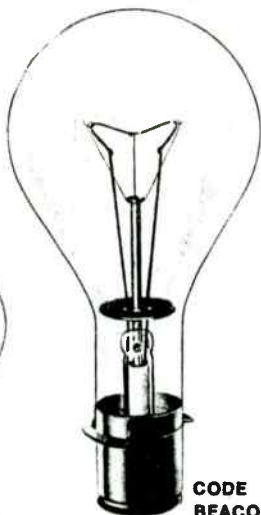
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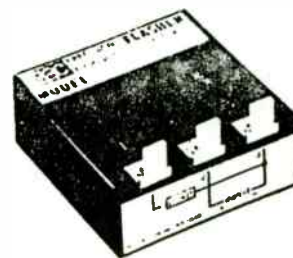
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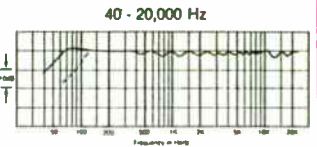
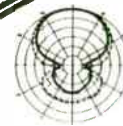
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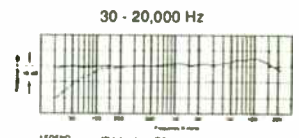
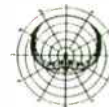
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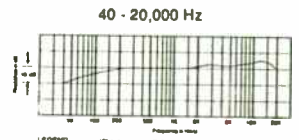
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# MEMO FROM METZ



## MAKING PRINTED CIRCUIT BOARDS

There always comes a time when you want to make your own P.C. board. There are alternatives, you can use perf board, or for R.F. projects build "dead bug" style on unetched raw P.C. board. In truth the dead bug method works pretty well, but not when you want something that is easy to reproduce.

The first boards I made, many years ago, I did with a so called etch resist pen by drawing the circuit right on the board. The results were so dismal that I'm embarrassed to even think about it. From the pen I progressed to nail polish for resist. That worked well as resist, but the narrowest land I could make was about a 1/8" wide. The resulting board still looked like a mess too.

Then I progressed to using in those dark pre-computer days professional methods, tape and pads. I used Bishop Graphics supplies. Just getting them was a terrific problem. You laid out your board on 1/10 inch grid engineer paper to get the component spacing correct. Then you placed the solder pads (called donuts from their shape) with an Exacto knife.

Interconnection runs were made with narrow black tape and the same Exacto knife. I got real good with that knife! You spent a lot of time peeling that tape back up to rerun the conductors. Figuring out the best layout that didn't have any jumpers (or at least not too many jumpers) was a real art. Or at least a real head scratcher!

I did my layouts twice finished size. Then took them to a local print shop to have a 50% reduction negative made. Then I did the smartest thing of all, I sent the negative to a commercial P.C. board plant where they etched and drilled the damned thing for me!

In truth I never laid out one board correctly the first time. So I always had to correct my art work, have the negative reshot and order another sample board. After awhile this process got

old and I sort of gave up on P.C. boards for a few years.

Last year the bug bit me again. I had some projects in mind that could benefit from being able to build multiple units quickly. Plus I had computer! After considerable researching, the ordering of many demo's, a friend and I ordered a real printed circuit CAD program.

We ended up with a package of related programs called "PC Boards" marketed by Mental Automation. PC Boards is a long way from perfect. It is also the best of low cost circuit board CAD programs we evaluated. Professional CAD software can cost a great deal. The best packages were simply out of our budget.

The low end programs are marketed as modules with each module costing about \$100.00. PC Boards is typical of this type of package in having three modules, a CAD program to draw the schematic, a printed circuit layout program to produce the board, and an autorouter to automate the process of laying out the traces on the board. It works and works well within some limitations.

With the complexity of the micro controllers we were interested in building, the autorouter became an important part of the entire package. This, it was hoped, would eliminate the hardest part of producing a working board, that is figuring out the best arrangement of the traces between the components.

The actual process of using the PC Boards package is simple in concept. You start by "drawing" the schematic with the SUPERCAD program. The screen gives you a grid to draw on. With your mouse, you choose components (such as resistor, I.C.s, etc.) and place them on the screen in the position you choose.

You do a lot of pointing and clicking! If you have experience with a mouse and have used any graphics or CAD software, this part comes easy. After the components are labeled and numbered (done automatically) you run the net list program.

The net list is simply a written description of the circuit. Each device in the circuit is given a name and the appropriate number of "ports," that is, gointas and go outas. The net list simply tells what each device ports are connected to. You can read it with your text editor and edit out errors and make modifications.

Yes, the programs do make errors! Or at least you made some errors on the CAD drawing you were not aware of. A careful examination of the net listing can eliminate problems later on down the line.

Next the SUPER CAD program is used to produce a "stuffing diagram." This drawing tells the autorouter the physical location of each component on the board and its physical dimension. I learned quickly that it is well to carefully consider the location of every component on the board! The autorouter can not work magic. Components have to be placed in rational relationships to one another to facilitate their interconnection.

Then comes the big moment when you have it all together! You have your net list and your stuffer and you get to run the autorouter. The screen shows you the location of all the pads (in color!). You hit RUN and away it goes, frantically trying to find a way of connecting everything together.

The result can be interesting to say the least. Different colored lines tell you if the trace is on the bottom or top of the board or a jumper. My first attempt consisted of a board 4 X 4 inches with four I.C.s on it and some discrete components. Single sided, it had a total of 160 holes. First try, it had 17 jumpers and just looked like a mess!

After six or seven passes with the stuffing program, I had the layout of parts rearranged to the point where the number of jumpers dropped to ten. Then I reverted to the human brain and tried solving some of the routing problems myself. This resulted in a board that looked a hell of a lot neater and had only six jumpers. It took ten passes (and about three hours) to do that!

At this point, I had some very nice looking art work for a board that would work on the first try. I could have done it faster if I had known what I was doing. Oh well, it's life on the learning curve I did feel real good when the laser printer spit out that final revision of the board.

Next month, I'll discuss some of the specific problems of using this software package and some of the nice things it can do to.

\*\*\*\*\*

## Illegal Electronic Equipment

United States Marshals, with assistance of FCC's Dallas office and Amarillo Policy Swat Team and under direction of assistant United States Attorney Mark Nichols, seized estimated \$20,000 of illegal electronic equipment from four businesses in Amarillo, TX, area: S & S CB Shop, Radio Depot CB Sales, Ben's CB Sales and Repair and Tri State Radio.

\*\*\*\*\*



## New Records Access at FCC

The FCC has implemented the Records Image Processing System (RIPS), which was designed to provide quick and timely access to documents associated with Commission docket and rulemaking proceedings.

The new system was activated Feb. 3, and enables the user to tap into FCC scanned documents proceedings via optical imaging technology. Previously, most Commission documents viewing required users to request the hard copies from FCC clerks.

The new system also utilizes "index terms" to facilitate retrieval of stored images in computer terminals located in the FCC's docket reference room. Users who still want paper copies of FCC-related documents can still get them via the copy contractor.

For additional information, call 202-632-6410.

## AM RF Study Available

The FCC has released a study assessing human exposure to RF radiation from AM towers.

The purpose of the study, conducted by Richard Tell & Associates, was to investigate RF field exposures of tower climbers who perform maintenance such as light replacement or painting.

"Data on such exposure should help the FCC advise broadcasters of transmitting power levels that would allow maintenance tasks to be performed while still preventing exposure of tower climbers in excess of recommended RF protection guidelines," the FCC said.

Prior research has indicated that the body can absorb significant RF radiation—especially at AM frequencies. The FCC study measurements were made using calculation of induced currents from a 1kW antenna.

To get a copy of the study, contact the National Technical Information Service (NTIS) at 800-553-NTIS (order number. 92125186), or the FCC's contractor at 202-452-1422 (order no. FCC/OET RTA 91-01).

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## REFORM POLICIES FOR NEW FM LICENSES, BROADCASTERS TELL FCC

The National Association of Broadcasters has urged the Federal Communications Commission (FCC) to reassess its rules for awarding FM station licenses. NAB said existing FM policies have overcrowded the airwaves with new FM stations, diminished FM technical quality for radio listeners and worsened the economic lot of existing

FM stations. As part of its request, the NAB also is asking for an FM license freeze.

In addition, NAB is asking the FCC to expand its FM ownership opportunities for minorities, including policies that would make it easier for minorities to purchase existing FM stations. NAB said this could be accomplished, in part, by expanding distressed sale and tax certificate policies. Also, the policy review is particularly appropriate today, due to the troublesome economic climate for radio. More than half of all AM and FM radio stations lost money in 1990.

In supporting an FCC freeze and regulatory review, NAB also wants the FCC to continue to allow broadcasters to upgrade their existing FM facilities. "We believe the Commission should not cease allotment and licensing activity associated with the improvement of existing service."

However, FCC Commissioner Andrew Barrett told a group of attorneys in Chicago that a freeze on new FM stations could "close the door" to newcomers to broadcasting.

"I agree that more is not always better, but am concerned that no new license grants coupled with greater concentration of existing media may close the doors for new entrants to broadcasting," Barrett said in a Jan. 24 speech to the Midwest chapter of the Federal Communication Bar Association.

\*\*\*\*\*

## FCC Moves To Make Space For New Services

The commission has proposed to allocate 220 mhz of spectrum between 1.85 and 2.20 ghz for emerging telecommunication technologies, frequencies now used primarily by state and local governments.

The reallocation means that existing fixed microwave users of those bands will have to relocate, which the FCC said would likely be done by new service providers buying out incumbents. Commissioner Andrew Barrett suggested that tax certificates could be used as an incentive for incumbent operators to shift from their current bands.

To reduce the impact relocation will have on current users, the FCC proposed permitting existing users to relocate to higher frequency fixed microwave bands or to alternative media with minimal disruption to their operations.

The FCC also proposed allowing existing band users to remain "co-primary," with new services for 10 to 15 years, or adopting a phased approach making specific blocks of spectrum available over a period of time. Existing facilities may also be allowed to operate during transition on a secondary basis

or permit state and local government fixed microwave facilities to operate on a primary basis indefinitely.

\*\*\*\*\*

## Radio in Financial Trouble According to FCC

Small (radio) station—the bulk of the industry—are in profound financial distress.

That's the first line and bottom line of an internal FCC report on the state of the radio business distributed to Chairman Alfred Sikes and other commissioners last week.

"Radio today is a world of large haves and little have-nots," the report says. "Industry revenue and profits are overwhelmingly concentrated in the small number of large radio stations, while most small stations struggle to remain solvent."

One indicator of the "distress": by the FCC's count, 287 radio stations have gone dark, 53% in just the last 12 months.

Not surprisingly, the findings undergird pending proposals to relax the radio ownership rules, which prohibit a company from owning more than one AM or FM in a market and from own-

(cont. to page 15)

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## Antenna to Resemble Flowers?

Radar, telecommunication and satellite dishes of the future may look a lot more like creations of Mother Nature, thanks to the work of electrical engineers at the Georgia Institute of Technology. The researchers have found that adding serrations shaped like flower petals to the outer edges of the dishes can significantly improve their performance.

The serrations gradually reduce the electrical fields reflected at the edges of the dishes, explained Dr. Edward B. Joy, professor of electrical engineering at Georgia Tech. Tapering the fields reduces unwanted "sidelobe" radiation and improves control over the resulting signals.

Reducing the sidelobe radiation—energy unintentionally scattered by the dishes—minimizes the chance that antennas will interfere with each other or send signals in undesired directions. Sidelobe interference, Joy noted, could be a problem for future telecommunication satellites, which will be placed much closer together in geosynchronous orbit.

The flower petal design was incorporated in an outdoor compact range recently built for the U.S. Army's Electronic Proving Grounds at Fort Huachuca, Arizona. At least one

manufacturer of compact antenna ranges has already adopted the technology, developed with support from the U.S. Joint Services Electronics Program (JSEP).

"Any high-gain antenna would be suitable for this kind of edge treatment," said Joy. "The basic idea would be useful for reflectors of any kind, though the primary use would be parabolic reflector antennas."

In modern high-gain antennas, designers attempt to maximize gain performance by creating a uniform electrical field across the surface of the antenna. Careful design of antenna feed devices and even the use of sub-reflectors—smaller dishes which bounce energy toward the main dish—help create uniform fields and desirable beam patterns.

But at the edges of the dish, the amount of electrical energy reflected by the dish suddenly drops to zero. That abrupt transition creates the unwanted sidelobe radiation.

Reducing the energy directed at the edges of the antennas would be one solution, but that would lower the efficiency—or gain—which designers usually wish to maximize.

Designers have attempted to deal with the problem by rolling the antenna edges, placing absorbing materials at the outer edges of the dishes or including triangular serrations. But by

gradually reducing the amount of metal at the antenna edges—and therefore the amount of energy reflected—the computer—designed flower petal serrations can make smooth transition, Joy believes.

\*\*\*\*\*

## EIA SETS DAB TIMETABLE

The Electronic Industries Association (EIA) digital audio radio subcommittee plans to set a timetable to selecting a single technical digital audio radio (DAR) system for the U.S. during its March 17 meeting here.

Subcommittee Chairman Randall Brunts of Delco said system proponents have been asked to declare their intent to propose DAR (or DAB) systems for testing by summer, and to submit detailed descriptions of their systems by the end of 1992. Testing is likely to take place in 1993.

The subcommittee, formed last year, also will discuss testing procedures and facilities for performance evaluation of proposed systems, and the voting procedures for the adoption process.

The EIA DAR performance parameters include CD sound quality, multipath immunity, and minimization of transmission costs and reception complexity.

\*\*\*\*\*

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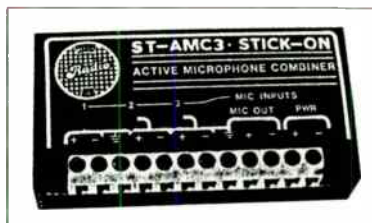
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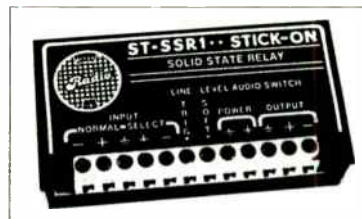
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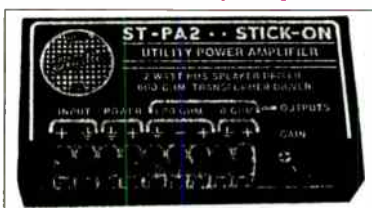
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## WCFL (FM)—“Off Again, On Again”

WCFL (FM), Morris, Illinois, which was ordered “off the air” by the FCC in late January was given permission to go back “on” February 7.

The FCC ordered the station to shut down for operating with excessive power, using a nondirectional antenna when it should have been using a directional antenna and for failing to have personnel at the transmitter because of an inoperable remote control system.

The station was operating on its fourth STA when it was ordered off the air.

Because it is licensed to serve the public interest, WCFL (FM) was given permission to go back on the air Feb. 7, but the FCC has indicated that the station still is subject to fines which could total as much as \$12,500 per day for each day it operated above licensed power.

The station’s problems began in early June, 1990, several months after Columbus-based MM Group bought WUEZ FM/WCSJ-AM in Morris, Ill. from Midwest Broadcasting Corp. for \$3.2 million.

Midwest previously had filed for permission to up WUEZ’s power from 40,000 to 50,000 watts. The proposal to the FCC specified switching from a non-directional to a directional antenna to help power down to 11,000 watts in the direction of Elkhart, Ind.—where WFRN-FM occupies the same frequency—and Chicago, to avoid interference with FAA air traffic control.

According to complaints filed by at-

torneys for WFRN and WXRFXM in Rockford, Ill., when FCC approval of the Midwest Broadcasting application came through, MM Group built a 500-foot tower for the station, now renamed WCFL. The station began broadcasting from the tower on June 6, 1990 without program test authority, using a non-directional antenna and creating considerable interference in surrounding service areas, according to the complaints.

Independent field strength measurements at the WCFL tower commissioned by a group of local broadcasters and later confirmed by the FCC’s Chicago Field Operations Bureau, revealed that the station was operating with an effective radiated power (ERP) of 40,000 watts non-directional.

“It trimmed our western coverage area anywhere from 10 to 20 miles,” WFRN Station Manager Ed Moore said. “Our signal was either rendered inconsistent or ruined completely.”

The FCC fined the station \$3,800 in late June 1990 and issued a cease operation order. Attorneys for WCFL countered the order to cease operations from the new tower by arguing that it was necessary to operate from the station’s temporary facilities in order to maintain service.

FCC FM Branch Chief Dennis Williams granted WCFL a temporary “dispensation” but ordered it to cut its power to 11,000 watts in all directions.

In mid-September 1991, local station engineers said they took another series of field strength measurements at the WCFL tower and found that its signal

was in excess of 11,000 watts—in one instance reaching 25,000.

### Here we go again

Vigorous complaints to the Chicago bureau of the FCC and key departments in Washington resulted in another official FCC field inspection on Jan. 16. The inspection confirmed that WCFL was operating with an ERP of 2.3 kilowatts, more than twice its legal limit. That inspection resulted in the January 24 order to stop broadcasting.

\*\*\*\*\*

## GENTNER TO ACQUIRE MACROMEDIA

Gentner Communication Corporation (NASDAQ: GTNR/GTNRU), has announced the signing of a letter of intent for the purchase of all products and technology of MacroMedia Inc., of Northfield, Minnesota. The acquisition will be accounted for as an asset purchase, involving a nominal sum of stock and cash. As part of the agreement, Gentner will not assume any MacroMedia liabilities.

MacroMedia is currently a Radio Broadcast leader in digital audio storage technology. With this technology, radio stations can virtually eliminate carts and cart machine equipment which have traditionally been used to record and play commercials, jingles, station ID’s, etc. With annual revenues of approximately \$1.5 million in just its second year of operation, MacroMedia’s “Audisk” product has surfaced as the standard for the small to lower-middle segment of the Radio Broadcast Market.

According to Russell D. Gentner, Chief Executive Officer, “The purchase of MacroMedia will not only provide additional revenues and earning for our Company, but will firmly place Gentner as the leader in the new digital audio storage evolution in Radio Broadcast. The excellent momentum and reputation of the MacroMedia products coupled with Gentner’s higher-end DAWN product, will enable us to provide solutions to the entire Radio Broadcast market, regardless of size or format.”

Mr. Gentner also noted that with the acquisition, the Company would be gaining nearly twenty years of technological and radio industry expertise with the addition of Mr. Tim Valley, the President of MacroMedia. As a Gentner employee, Mr. Valley will enter into no-competition and employment agreements, the terms of which will be determined prior to closing.

Both parties expect to close the acquisition within the next 30 days, subject to the satisfactory completion of their respective examinations.

\*\*\*\*\*



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1. one 2'-8" x 3'-10" x 2'-5" high steel desk

2. 5 beige formica and wood reel-to-reel stands (for Revox PR99)

3. 1 exquisite air rug: emerald green inlay bordering celery green, 12' x 8'-10"

4. 1 white air rug, 9'-8" x 7'-7"

5. 1 carrier 16k Btu Refrigerated A/C, 240 VAC

### HELIAIX, CABLE RUNS, ETC.:

1. 74 feet 5/8 inch Heliaix
2. 141 feet 5/8 inch Heliaix
3. various runs of 27 pair multi-cable shielded, all runs under 30 feet
4. punch blocks and jack panels

### MISCELLANEOUS:

1. 1 Marantz turntable
2. 1 transmitter breaker box, 240 VAC, 200 amp, 3 phase
3. 6 formica and wood turntable cut-outs for Technics SP-15 turntables, outside perimeter is square (4 beige and 2 dark brown)

### PRINTERS:

1. 1 Xtel Model 1 AF 11 R printer with stand and book
2. 1 Model 101 (Smith Corona) Universal Tractor Feed

### SATELLITE:

1. 1 LAUX Satellite System which includes 2 model 8705 Audio terminals, 1 LAUX LNA LC0106, 1 70 Mhz LAUX downconverter, 2 runs of 25-30 feet each of RG/59 U Coax, 1 nine foot parabolic dish for 4 Ghz, books included

### STUDIO EQUIPMENT:

1. 1 QRK 12 C turntable, no tone arm
2. 1 Russco Cue-Master turntable, no tone arm
3. 3 Technics SLP-1200 compact disc players

## MULTIPLE OWNERSHIP RULE APPEAL RECOMMENDED

Reflecting the aggressive deregulatory posture of FCC Chair man Alfred Sikes, the Mass Media Bureau floated a memo to commissioners proposing, as "primary recommendation," repeal of the national multiple ownership rule, which limits companies to 12 AM's and 12 FM's, and a drastic cut-back of the local duopoly rule, which limits companies to no more than one AM or FM in a market. In place of the duopoly rule, the bureau proposes let-

ting broadcasters own as many stations as they want in large markets (more than eight stations), subject to a listenership cap of 25. Under the plan, broadcasters would not have to divest stations if they exceed caps solely by building audience with programming. In small markets (eight or fewer), a single licensee could own no more than half the stations. The memo offers some alternatives. One multiple ownership fallback is a new cap on total station ownership at between 100 and 200 stations. A duopoly alternative would allow ownership of up to four stations (any combination of AM's and FM's) in a market, but in no case more than half the stations. With respect to local marketing agreements, the bureau's preference is to impose only reporting requirements.

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(cont'd from pg. 11)

ing more than 12 AM's and 12 FM's. (A minority-controlled company may own up to 14 stations of each type.) The FCC may vote on the ownership proposal in March or April.

"The potential economies from consolidation would materially improve industry profitability," the report says. "If a conservative 10% of general and administrative costs could be eliminated, for example, the report continues. "Alternatively, these savings could immediately boost flat per-station programming outlays by 5% and still raise industry profits by 15%," the report says.

The top-50 large-market stations, just one-half 1% of the some 10,000 stations now on the air, account for 11% of industry revenue and 50% of industry profit in 1990, the report says. Yet stations with less than \$1 million in annual revenues—75% of all stations—on average, lost money in 1990, it says.

\*\*\*\*\*

## SBE Certification Exam Dates Set For 1992

Exam dates for SBE Certification in 1992 are as follows:

April 14 at the NAB Convention in Las Vegas.

June 5-15, local chapters.

October 16, SBE Convention in San Jose.

November 6-16, local chapters

Increased fees, which went into effect in 1991, are listed below.

	SBE Member	Non-Member
Broadcast Technologist	\$35.00	\$90.00
Broadcast Engineer	\$50.00	\$105.00
Senior Broadcast Engineer	\$75.00	\$130.00
Professional Broadcast Engineer	\$100.00	\$155.00

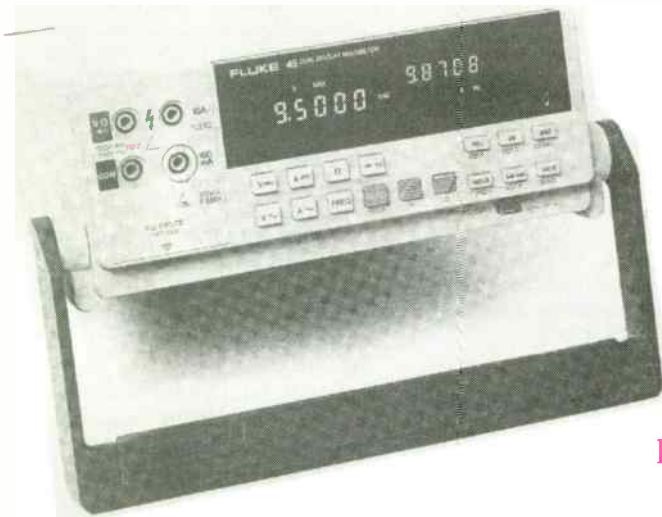
Non-members who certify are eligible to receive (1) free year membership in the SBE.

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# FLUKE

## 45 Dual Display Multimeter



**LIST PRICE**  
**\$655.00**

### 16 measurement functions and two 5-digit displays for maximum versatility in a single instrument

- Multi-function vacuum fluorescent dual display
- True RMS voltage and current, including ac + dc
- RS-232 interface standard, IEEE-488.2 option
- Frequency measurement to 1 MHz
- dB measurements with selectable reference impedances of 2Ω to 8,000Ω and audio power from 2Ω to 16Ω
- Compare (Hi/Lo/Pass) function for quick in-tolerance tests
- 0.05% dc current accuracy for 4-20 mA current loop service
- Touch Hold®, Relative and Min Max
- Audible continuity and diode test
- Optional rechargeable battery, carrying case, rack mount kit, and PC Software Package
- Closed-case calibration

The Fluke 45 is a feature-rich 5 digit, 100,000 count DMM with a unique multi-function dual display, allowing measurement of two signal parameters from a single test connection. The 45 offers high performance and versatility for manufacturing test, depot and field service, and research and development. A standard RS-232 interface makes it ideal for PC instrument applications.

#### Dual Display

The Fluke 45 is the first DMM with a multifunction "dual display," allowing the user to select a wide variety of measurement combinations. It is particularly useful in applications requiring two different measurements of the same signal; i.e. power supply testing, where Vdc output can be viewed on the primary display while the Vac ripple is shown on the secondary display.

#### Standard RS-232 Interface

The RS-232 interface, standard in each instrument, allows measurement data to be filed, manipulated, printed or transmitted by modem. The print mode automatically formats measurement data for printing on an RS-232 printer. Rates

for automated printing over RS-232 are adjustable from 1 reading every 50 ms to 1 reading every 5.6 hours. The optional "QuickStart 45" Software Package allows automated communications and filing of measurements with the Fluke 45 and an IBM-PC or compatible via RS-232.

#### dB Measurement

The Fluke 45 provides digital read-out of decibels with front panel selection of any of twenty-one reference impedances from 2Ω to 8,000Ω. For 2Ω, 4Ω, 8Ω and 16Ω impedances, the meter automatically calculates and displays audio power in watts.

#### Compare Function

The Fluke 45 has a compare function for fast in-tolerance limits testing. Upper- and lower-limits are entered through the front panel. Readouts show both a Hi/Lo/Pass evaluation and measured value.

#### Touch Hold®, Relative and Min Max

Touch Hold captures the measurement, beeps and locks it on the digital display until you are ready to

view it. It automatically updates with each new stable measurement. The Relative mode remembers a reading and shows the change (difference) between it and any readings that follow. Min Max records the highest and lowest values measured. Either can be recalled and displayed at any time.

#### Optional Battery and Case

An optional rechargeable battery and soft carrying case are available for precision field service applications. These options, coupled with a 30 mA dc current range and 0.05% accuracy, allow calibration of 4-20 mA loops in process control applications. The battery is available as a factory installed option or can be user-installed at a later date.

#### Optional IEEE-488.2 and Rack Mount

The Fluke 45 may be used with IEEE-488.2 systems, including existing IEEE-488 implementations. The IEEE-488.2 option is available as a factory installed option, or can be user installed and does not require removal of the RS-232 interface. A rack mount kit is also available.

#### Closed-Case Calibration

Calibration can be performed via the RS-232 (or optional IEEE-488.2) interface or manually from the front panel. No internal adjustments are required.

#### Standard Equipment

Each Fluke 45 Dual Display Multimeter includes an operator's manual, quick reference guide, line cord, and test leads.

#### Basic Accuracy (1 year except where noted)

(% of reading + number of digits)\*

DC Voltage (6 months)	0.02% + 2
AC Voltage (50 Hz - 10 kHz)	0.2% + 10
Specified from 20 Hz to 100 kHz	
Ohms	0.05% + 2
DC Current	0.05% + 2
AC Current	0.5% + 10
Frequency	0.05% + 1

\*30,000 count mode

#### One Year Warranty

One year calibration interval

#### Size

3.67 in high, 8.5 in wide, 11.27 in deep (9.3 cm high, 21.6 cm wide, 28.6 cm deep)

#### Weight

Net 5.2 lb. (2.4 kg), with battery: 7 lb. (3.2 kg)

**Electronic Industries**  
19 E. Irving - Oshkosh, WI 54901  
Out-of-State: 800-558-0222 or  
In State: 800-445-0222