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## FCC Proposing Major Changes In AM Broadcast Service

The FCC in mid-April took several final actions and adopted a Notice of Proposed Rule-making looking toward the goal of improving AM broadcasting in general and reducing interference on the band.

"Final actions" taken by the Commission, although not scheduled for implementation until after the AM rule-making is complete in late 1990, targeted interference.

Some of the "final actions" are:

No "grandfathering" of stations that go off the air. Stations going "silent" generally will not be allowed to return to the air, which will reduce interference on the band.

New Sky wave and groundwave propagation curves adopted, which will allow the Commission to predict more accurately where interference may occur.

Acceptance of "contingent applications" where stations could agree to reduce overall interference by one or more stations choosing to reduce power to go dark in exchange for another station increasing facilities and service area. Reduction of overall interference would be a mandatory condition of the FCC approving such an arrangement, with the Commission not allowing any such arrangement to result in a "white" or "gray" area with minimal or no local service.

The elements of the new AM Improvement rulemaking (in MM Docket -87-267), now subject to public comment, include:

AM expanded band to be used only for relocation of existing AM stations, no new operators contemplated for expanded band, at least initially.

Consistent with earlier actions on expanded band, such stations would be omni-directional, fulltime, widely-spaced 10 kw day and no less than 1 kw night. (Power limits subject to analysis of public comment.) At these parameters, expanded band (1605-1705 kHz) would yield about 250-300 stations.

Stations whose migration would maximize interference reduction on the existing band would be given a performance for such a move. The Commission proposes to establish a mathematical formula to determine which stations would best qualify for relocation to the expanded band. It also will accept comment on whether other factors should be used to select among existing stations vying for an expanded band opportunity.

AM licensees could operate existing and expanded band stations during a "transition period" where receivers capable of band expansion reception would penetrate the marketplace.

Proposal that the FCC issue tax certificates to stations agreeing to reduce interference, or go off the air, in exchange for a payment from a benefiting licensee.

Proposal to allow commonly owned AM stations with overlapping principal

## FCC Fines Three Stations For Various Violations

The FCC staff has proposed a record fine of \$10,000 be levied against an Indianapolis TV station for apparent violations of the Communications Act's "lowest unit charge" (LUC) requirements. The fine is believed to be double that previously assessed any station for a political broadcasting violation.

The FCC staff action on the political front follows a series of substantial fines for EEO rules violations which topped out at a record \$20,000 imposed at the close of 1989. The Commission announced another EEO-based "Notice of Apparent Liability," this time for \$10,000. A target was a Florida radio station which was renewed subject to EEO reporting conditions.

The Commission said in a news release that the station had "failed to take meaningful and regular steps to recruit qualified minorities and to analyze the stations' efforts to recruit and hire qualified minorities."

In the LUC case, the Commission staff found that the station had apparently overcharged candidates for Indiana governor on 14 occasions during the 1988 elections, and had failed "to make available to candidates all discount privileges for all classes of spots otherwise offered to commercial advertisers."

The station itself had identified eight overcharges prior to the FCC's decision, and had voluntarily made refunds to the candidates. The FCC staff found six ad-

(Cont. to pg. 3)

(Cont. to pg. 2)

# CCIR Okays HDTV Parameter Values

The International Radio Consultative Committee (CCIR) of the International Telecommunications Union (ITU) recently approved the results of a four-year effort pertaining to HDTV standards for studio production and an international exchange of programs. The CCIR announcement was made in late May in Dusseldorf, West Germany, after the CCIR's working party met in Atlanta in March to give tentative approval to 23 of 25 "parameter values" that comprise the TV picture. The CCIR's approval of the working party's recommendations virtually clears the way for a manufacturers' start-up of HDTV picture tube production. Chairman of the CCIR's HDTV Study Group is Mark Krivocheev of the Soviet Union, who appeared at the 1990 NAB Engineering Conference in Atlanta immediately following CCIR's working party meeting.

The remaining two technical disagreements relate to the number of lines used to display a screen picture — 1,125 (Japan) or 1,250 (European Community) — and the number of times per second a TV picture is taken (scan rate). The 1,250 line system calls for 50 pictures per second, or Hz; the 1,125 system relies on 60 Hz. Those values will continue to be studied during the next four-year cycle, although a decision likely will be made whenever worldwide consensus is achieved.

Among the values now unanimously decided upon by all nations is the wide screen aspect ratio of 16 x 9 (compared to the current 4 x 3). Also, all nations have agreed to precise basic electronic definitions of color (red, blue and green) for the first time ever.  
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## NAB, Denon America Reach Agreement on Production of State-of-the-Art Am Stereo/FM Stereo Tuner

The National Association of Broadcasters and Denon America Inc., a consumer electronics manufacturer, announced they have signed a contract for Denon to manufacture and sell a high quality AM-FM radio tuner designed to broadcast industry specifications.

"This radio will unlock for consumers the new sound of improved AM and FM radio being broadcast in the 1990s" said NAB President & CEO Edward O. Fritts. "It will show consumers that the state of the art, particularly on AM, is much better than they hear on virtually all existing receivers."

The tuner will be manufactured by Denon's parent company, Nippon Columbia. It will carry the Denon and NAB names and should be in stores by early 1991 at a retail price of \$475.

Features of the high-quality Denon/NAB tuner will include:

- \*National Radio Systems Committee (NRSC) audio circuits for greater fidelity and reduced interference;

- \*FMX (TM) to enhance FM stereo fringe-area reception;

- \*AM stereo;
- \*AM noise blanking to cut static and noise;
- \*Expanded AM band capability (the new 1605-1705 kHz range);
- \*Provision for any external AM antenna; and
- \*A 30-station preset memory that can intermix AM and FM stations at the listener's choice.

"This tuner will be suitable as an in-home monitor for broadcast station personnel and consumers who want to feed their hi-fi systems with the best quality audio signals from AM and FM broadcasts," said NAB Senior Vice President, Science & Technology, Michael Rau.

The tuner combines previous design concepts developed under contract for NAB, design modifications by NAB engineers and manufacturing and production concepts developed by Denon. Development work began in 1987 and a prototype receiver, using an early version of the tuner circuit, was demonstrated at NAB's Radio '88 convention in Washington, DC.  
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ditional apparent overcharges after reviewing the station's records.

In a "Notice of Apparent Liability" signed by Mass Media Bureau Chief Roy J. Stewart, the FCC said the station's decision to make restitution of the eight overcharges it had identified "were only made after a Commission inquiry had begun" and did not "remedy the harm done to the candidates" during the campaign period.

The station has until late May to determine whether to pay the fine, file a reply to the "Notice," or take other action as provided by law.

Crusade Broadcasting Corporation of Norfolk, Virginia has been fined \$10,000 for operating its Trenton, New Jersey WIMG(AM) without a current station license. Although officially notified twice in 1989 that its license had expired, the station continued operating until February 1990. The FCC noted that WIMG had previously received fines and a long list of violations dating back to 1983.  
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(Cont'd from pg. 1)

community contours if one or more of the commonly owned would reduce co-channel or adjacent-channel interference to other broadcasters.

Proposal to reinstate the AM-FM program non-duplication rule.

New proposed classification of AM stations, to be lettered like FM classes (e.g. A, B, etc).

Up to 50 kw for Class III stations (now subject to a 5 kw domestic power limit) if such increases can meet more stringent interference protection standards.

More stringent first adjacent channel protection ratio of 16 dB.

Stereo incentives: FCC proposes to give band expansion preference to an applicant proposing to operate in AM stereo; similar incentives (or perhaps even a mandatory requirement) for existing band stereo operation also proposed. FCC has said it will not reopen the issue of which AM stereo standard should be employed by stations and receiver manufacturers.

Most existing band stations would be "encouraged" to cover at least 2,500 square miles daytime and at least 15 percent of daytime coverage at night.

Proposed establishment of FCC "reference receiver performance standards" (likely possessing 7-8 kHz bandwidth), with the FCC also proposing to publish, periodically, a listing of receivers that meet or exceed such a reference standard.

Stations on existing band filing for facility changes (after freeze is lifted at end of rulemaking) would have to meet higher technical standards. While exact dates will not be known until full texts of the FCC actions are published, comments on the proposed rulemaking will likely be due by mid to late summer with the rule-making final in late 1990. At that point, the "final actions" noted above will also be implemented.

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## New Broadcast Consulting Firm Formed

Three broadcast engineers have teamed up to form a consulting and strategic advice to station owners and operators.

The firm, called Lahm, Suffa & Cavell, Inc., was created by Karl Lahm, William Suffa and Garrison Cavell. "All three of us have extensive experience on a wide range of issues such as facility design, frequency and channel use, regulatory affairs, acquisitions and station operations," Lahm said.

"Karl has several years experience as an engineer a station chief engineer and broadcast equipment designer. Gary is a former station owner, was in upper level technical management for a major market television station and has eight years background in engineering consulting in Washington," Suffa said. Suffa spent five years as a field engineer for the FCC and four years with a broadcast consulting engineering firm.

The new firm is located at 9653 Lee Highway, Suite 25, in Fairfax, VA. Telephone is (703) 591-0110 and fax is (703) 591-0115.

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## Attendance Down At NAB '90

Final attendance figures for NAB Convention in Atlanta are in, confirming drop in overall paid attendance. Official total, including spouses, exhibitors and guests, is set at 50,413, down from 1989 figure of 53,100. Radio registration was down 16 percent from 1989, with 2,920 registrants against 3,504 last year. Television was down 7 percent, from 15,266 in '89 to 14,132 this year. Registrants representing both radio and

TV increased slightly, drawing 6,606 in 1990 vs. 6,423 in 1989. Only significant increase came from foreign broadcasters, who totaled 6,027 this year (reportedly way up from 1989 figures, which were unavailable). Foreign increase bodes well for NAB exploration of international convention arena.

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## NRSC Activities Update

The NRSC has approved the circulation for comment of a third voluntary standards proposal. The document, titled "Performance Recommendations for AM Receivers," addresses minimum operational performance for NRSC AM radios. To comply with the standard, receivers must be capable of audio response to 7.5 KHz, without harmonic distortion exceeding two percent. The NRSC prepared this document to augment the NRSC-1 audio standard, providing radio receiver manufacturers with more detailed design guideline information.

On FM radio issues, the NRSC Multipath Working Group is currently investigating a laboratory test plan that could isolate the effects of transmission system components on multipath distortion. The Composite Studies Working Group is studying the effects of subcarriers and system overshoot on total RF occupied bandwidth, as well as whether different types of FM receiver decoders are less susceptible to adjacent channel interference.

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## Telex Introduces Wireless System

Telex Communications introduced a new wireless intercom system called Telex RADIOCOM. The fourchannel, full duplex system operates in the high band, 150216 MHz, and Telex offers several frequencies from stock.

"This was a natural product extension for us," said Dan Dantzler, VP/sales, "because of our longstanding reputation as leaders in the headset, intercom and wireless microphone markets."

The BTR-200 base station has four receive channels and one (common) transmit channel. The TR-200 belt-pack transceiver has one transmit and one receive channel. As many as four belt-pack transceivers can operate in a fully duplex network with one BTR-200 base station.

The RADIOCOM wireless system can be integrated into most existing wired intercom systems.

Telex Communications is introducing the PC-25 carrying case, which allows a user to power the FMR-25 or FMR-25TD with AA batteries to create a portable unit. This wireless receiver fits snugly into the compact PC-25 carrying case, which is constructed of

durable, weather-resistant cloth and includes a pouch for an integral AA battery holder. The pouch accepts 10 AA batteries for approximately 1015 hours of operation.

Telex Communications, 9600 Aldrich Ave. South, Minneapolis, MN 55420; (612) 884-4051.

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## Atlas/Soundolier Bows New Products

Atlas/Soundolier has introduced compact 15-, 30- and 50-watt mini-loudspeaker systems with extended frequency response for indoor/outdoor use, and application in commercial sound or as an extension of residential audio systems. The systems were shown at this year's NSCA Convention.

The weather-resistant, surface-mounting W Series units are designed for monaural and stereo foreground and background music systems and sound reinforcement applications.

For more information, contact Atlas/Soundolier at (314) 349-3110.

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## Tascam Bows DA-30 DAT Unit

At this year's NAB Convention in Atlanta, Tascam introduced its latest addition to its lineup of sophisticated digital audio production tools, the DA-30.

An affordable, full-function stereo deck, the rack-mountable DA30's analog to digital converters use Delta-Sigma modulation and 64-times oversampling while the digital to analog converters feature 18-bit technology with eight times oversampling. Combined, this results in the achievement of a S/N ratio in excess of 94 dB.

"With the availability of a great deck like the DA-30, more end-users in a variety of production facilities and recording studios can have the best-sounding DAT at the best price," said Bill Mohrhoff, Tascam's marketing manager.

For more information, contact Tascam at (213) 726-0303.

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There's also our two-speed search dial with audible pause. Which makes finding your in point extremely easy.

Our professional CD player has other features professionals enjoy working with. Like one-touch memorization by time code, A-B repeat, and our exclusive rocker control search buttons. It's the digital equivalent of dragging your finger on the edge of a record.

A great deal of thinking also went into things like our balanced outputs (-10 dBm nominal into 600 ohms). There's even a port for a wired remote. And separate power sup-

plies for digital and analog circuits. Given this, it's not surprising that its S/N ratio is 112 dB.

If you're a professional CD player, chances are you're ready to hear what our professional CD player can do.

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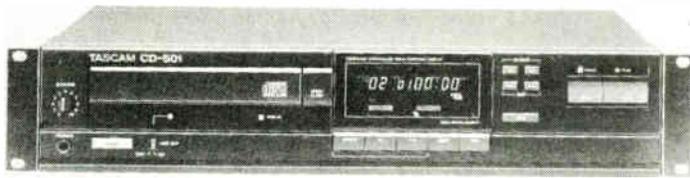
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The TASCAM CD-501 effectively integrates CD into the professional environment.

—869-007-001761 (\$18); Parts 40-69 (Common Carrier Services), —869-007-00177-0 (\$9.50); Parts 70-79, —869-007-00178-8 (\$18); Parts 80-End (Safety and Special Services), —869-007-00179-6 (\$20).

FCC Rules and Regulations are also available from commercial sources, including the Rules Service Co., Rockville, MD (301) 424-9402 and Pike & Fischer, Bethesda, MD (301) 654-6262.

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## Portable Radio Links

TFT, Inc., of Santa Clara, California, USA now has available its 8888 series of portable program quality radio links. These operate in the 370 MHz to 470 MHz range with up to 25 watts power output.

The 888 series is frequency agile, with variable FM deviation and selectable receiver bandwidth. Included is DTMF signaling for system security and cueing commands. There are three mike/line inputs, and audio processing loop-through facilities.

For information, circle Reader Service 59.

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## Panasonic has introduced a new portable digital audio tape recorder.

The SV-255 takes up where the SV-250 unit left off. It has newly designed mic preamps that offer 128 dB signal-to-noise ratio. Rather than a fader-style attenuator, the sv-255 features true gain control, Panasonic says. Also among the unit's new features is a dual-channel mono recording mode.

Panasonic - 6550 Katella Ave., Cypress, CA 90630, (714) 895-7277

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## Studio Metering

ATI's new Micro-Meter Studio Monitoring System allows visual monitoring of many audio lines simultaneously with expandable ATI micro-meters that display one, two, three or four stereo signal pairs (up to eight channels) on high resolution, three color, 16 segment LED bar graphs with simultaneous VU and PPM peak display. Balanced, bridging inputs prevent line loading and are individually switchable for OVU indication at -10, +4 or +8 dBu.

For information circle Reader Service 76

## Technology

### Satellite Users Beware 1990 Solar Flares

Solar activity is predicted to reach a 22-year peak in early 1990 and could threaten the quality of audio, video and data satellite transmissions. In the first part of 1990, an atmospheric effect called the Faraday rotation is expected to be energized to an uncommonly high level by an unusually intense amount of solar flare radiation striking the upper atmosphere. The most noticeable impact will be on C-band frequency satellite services which can expect a 10-fold increase over normal solar radiation conditions according to Reed Burkhart, Hughes Communications, which operates the Galaxy fleet of domestic satellites. Higher frequency Ku-band satellites are not as likely to be affected.

The Faraday rotation effect is caused by electrically charged atmospheric conditions in the ionosphere (50250 miles above surface, produced by solar radiation. The higher the level of radiation from sun flares the more intense the electrical field. Solar conditions this year will cause satellite signals transmitted through the layer to twist or rotate more than normal. The rotation effect does not radically alter the signal but it

can cause noticeable interference in the form of audio static, video “ghosts,” snow or data errors. Satellite receiving equipment at stations will need to be carefully monitored and adjusted throughout the early part of 1990 to minimize the effects of this solar phenomenon.

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## Finding FCC Rules & Regulations

Q. How do I order the FCC Rules and Regulations?

A. The most recent edition of the FCC Rules and Regulations is the Oct. 1989 edition of Title 47 (Telecommunication) of the Code of Federal Regulations, printed in five volumes and available for purchase from the Government Printing Office.

Send mail orders to Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9371. VISA and MasterCard orders may be placed by phone at (202) 783-3238.

Most broadcasters will need Parts 0-19 (FCC Organization and Procedures) and Parts 70-79 (Broadcast Services). Use the stock numbers when ordering:

Parts 0-19, —869-007-00175-3 (\$18); Parts 20-39 (Common Carrier Services),

## Ohm's Law for Lightning

The following article is re-printed from a recent SBE Chapter #56 newsletter.

Back in the eighteenth century, Benjamin Franklin wrote a paper on the "sameness of lightning and electricity." At that time, the study of electricity was in its infancy, but lightning had been around for longer than mankind; so when it was presented to the Royal Society in London, the paper was greeted with laughter. A few years later Franklin was vindicated when the scientific community acknowledged that lightning is indeed a form of electricity.

Over the two centuries since, all manner of formulas have been developed to describe and evaluate electricity as it is used by mankind. But since lightning is a form of electricity, don't the same formulas and laws apply? When allowances are made for the sudden massive quantities associated with lightning, most of them apply, but care must be made in the application.

Because the rise time of a lightning pulse is so rapid, it must be viewed as being equivalent to radio frequencies up to many hundreds of MHz. This means that a length of wire, a tower or any conductive object of significant length has a substantial inductive reactance to it, across which large instantaneous voltages can develop. Adjacent objects may have energy coupled into them by capacitance. The instantaneous energy

values are so large that large voltages and currents may be developed in such objects to the extent that the circumstances become mysterious. "How the heck did this thing get zapped when the lightning hit over there?" is a question sometimes heard after a damaging strike. Ohms law for AC has done its thing, but with special effects.

AC, you say? Doesn't lightning result from an extremely high DC voltage buildup between a cloud and the earth? Yes. But when the breakdown of the intervening air occurs, the situation changes from a relatively static state to a highly dynamic nature. A lightning discharge is not just a flow of DC current, but a chain of pulses from below 500 Hz to perhaps 2 KHz or more. That's pretty low frequency, down in audio so to speak, so how does it cause the problem? It does so because it's not sine wave in shape, but rather a series of very ragged pulses with usually very fast rise times which, like square waves, are composed of their fundamental frequencies plus all their odd harmonics.

Because of the fast rise times, frequencies from audio to many hundred of MHz are generated, allowing you to hear hissing sounds on most commonly used receivers. Yes, the higher frequencies receive less interference from lightning than the lower ones. The energy tapers off as the frequency increases. Recall that you don't hear just a sudden pop, but a hissing sound that

lasts for some time, electronically speaking. The chain of audio frequency pulses continues until the energy in that part of the cloud is depleted. It's kind of like a high distortion relaxation oscillator. The lightning bolts you've seen that just seem to hang there actually consist of this chain of pulses, but the persistence of your eye makes it appear to be a continuous discharge.

To sum up, we must deal with Ohm's law for both AC and DC to analyze lightning. And then there's the possibility of electron inertia. Some years ago, this effect was studied in the design of vacuum tubes. If there is inertia within a relatively small number of electrons moving through the evacuated space within a tube, is there not inertia in a massive pulse or electrons of 100 kiloamps or more?

Whether it's due to inertia or inductance, a lightning pulse does not like to turn sharp corners. When Faraday screens were built to protect munitions buildings, it was found that if lightning strikes a horizontal cable of the screen, when the pulse reaches the down lead connected to the ground system, if the turn is a right angle downward, a part of the pulse may take off from the corner becoming a bolt which can strike anything else in the vicinity.

To solve the problem, the down leads are dressed away at an angle of perhaps less than 45 degrees to allow the pulse

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(Cont'd from pg. 6)

to turn without causing a secondary strike. A secondary strike can occur when the high current pulse is transformed into a high voltage pulse by a high impedance. Anything in the path of the pulse that appears to it as a high impedance, whether resistance, reactance, a sharp turn or combination or these can cause a secondary strike to occur. A huge spark can travel through the air from one object to another with enough energy to cause death, serious injury or damage. A low resistance DC ground path may not suffice to prevent it. The entire complex impedance must be considered.

Now look at typical AM ground system in regard to a strike. Lightning hits the tower top and is guided straight down by the tower. The first thing the pulse sees is the ball gap, right? But the ball gap is at the end of rods that often stick out at nearly right angles, and the current pulse doesn't like sharp angles. A part of the pulse may discharge across the gap, but a great deal of energy still must be dissipated. Below the ball gap, all the radial wires take off at right angles. Again recall it as a high impedance. Straight down is soil which is not nearly as conductive as copper wire or even tower steel. So what does the pulse see? A high impedance. When you try to run a large current through a high impedance, what is the result? A very high voltage impulse.

Because they are broken up by insulators, AM guy wires present a high impedance to such a strike, and in fact may contribute to it in that the individual insulated segments can charge to substantial voltage which could possibly contribute to the total energy pulse that must be dissipated when a strike occurs.

Most AM radio engineers have heard the sudden "popcorn" sound that occurs during and prior to thunderstorms. The electrostatic field that builds up charges the guy segments to very high voltages, and when a strike occurs within a few miles, the sudden change in electrical potential of the field causes the segments to discharge. They do so by flashing across the insulators, and when the first one goes it leads to a chain reaction as each one dumps its charge into the next one below or above it, causing the accumulated charges to be transferred from one to the next. The segments are functioning as capacitors as they accumulate a DC charge from the energy of the surroundings field.

The best solution would be to eliminate the lightning strikes entirely. Point discharge systems attempt to do this and had been very successful. The dissipation current from such a system is of a relatively small value, and since this current flows more or less steadily during atmospheric disturbances, it can

be considered as DC in nature. However, if the worst case scenario comes about and a strike occurs, or if you don't want to install point discharge and just take the strikes as they occur, a few design pointers are in order.

1) Take advantage of the fact that a strike pulse does not like sharp corners. Lead the charge away from the tower with sweeping transitions or wide angles into the ground system. It's likely that a single large diameter rod or pipe very near the tower and very deep in the ground would perform better than several smaller rods driven at a distance from the tower and connected at right angles with wire. Connection perhaps should be with copper strap, which presents lower impedance to radio frequencies than wire. A deep, straight chemical grounding rod may present the lowest impedance to the pulse, and of course low impedance is what is wanted. Some stations have drilled wells and connected them in this manner which has been very effective. Because of electrolysis, the materials must be carefully selected. The chemical grounding rod fabricated of copper improves the conductivity of the soil around it and probably the best for the purpose.

2) Another example of taking advantage of the tendency of lightning pulses to avoid sharp turns is to utilize sharp turns in paths where you don't want lightning. An example is in the installation of a preamplifier in a coax run coming down a tall tower. Set the preamp off to one side of the coax pigtailed. At Cortana Corporation we are looking into the use of slipping ferrite toroid cores over the coax with flexible coax run and the pulse traveling down the coax shield. If they don't explode from the pulse, they should work. We'll let you know. In the meantime, just coil up two or three turns in each of the pigtailed. The inductance should provide a substantial impedance to the pulse, causing the bulk of the current pulse to continue in its downward path toward ground.

3) For RPU, STL, TSL and communications antennas, put two or three turns in the coax as it leaves the tower coming into the building. You could call this a lightning pulse choke. Do anything you can to prevent lightning from coming in and zapping a radio.

Finally, one big difference between electricity as we're used to it and the voltages associated with lightning is in the matter of connections with the result of heat. The charges that are found with lightning are less concerned with the electrical connections than with the directions in which they are traveling. With pops and snaps, they'll simply jump small gaps and keep going.

Tower sections are often welded together at the joints, but that makes no difference if lightning hits. The

charge will jump gaps, punching through paint and rust with no more than a small burnt spot. When tested with high voltage, wire is found to be completely ineffective. Five KV meter leads might as well be bare wire, as the current simply goes through the insulation.

Next time you're at your transmitter site, or any tower or structure that could possibly be struck by lightning, just back off, look up and ask yourself, "If I were a lightning pulse, where would I go?" Yes, it sounds a bit silly, but remember that as a pulse, you don't like sharp corners or any high impedances, so when you divide up all your currents according to Ohm's Law for both AC and DC, where are you going to send them? You might suddenly become aware of problems that were just not obvious before. Resistance, inductance, capacitance and electron inertia should all be considered as methods of transporting or diverting the massive energy contained in a powerful lightning strike. A low resistance DC ground path may not suffice to prevent it. The entire complex impedance must be considered.

\*\*\*\*\*

By: Ron Nott  
President, Cortana Corporation  
From Chapter #38 El Paso



## ATSC Names Kodak, Bellcore To Group

The United States Advanced Television Systems Committee (ATSC) has appointed Bell Communications Research, Inc. and Eastman Kodak Company to its executive committee.

Sony Advanced Systems Company and Thomson Consumer Electronics, Inc. were reappointed for the same three-year term.

Speaking of the 17 companies that are members of the committee, James C. McKinney, chairman of the ATSC, said: "All of these companies have been extremely active in the technical work of the ATSC during the past four years, and their expertise will be very helpful as we enter the home stretch in recommending production and transmission standards for the arrival of high definition television in the United States.

"We believe our Executive Committee is truly representative of the entire television industry and its diversity will inure to our benefit as difficult decisions have to be made."

## Seven ATV Systems Proponents Pay Testing Fees By June 1 Deadline

Six proposed ATV transmission systems proponents received preliminary certification from the FCC Advisory Committee on Advanced TV Service and paid the required fees for testing by the Advanced Television Test Center (ATTC) by the June 1 deadline. A seventh system, an unexpected last-minute entry, has paid the \$175,000 test fee and is seeking committee certification: General Instrument's DigiCipher system. However, two systems proposed earlier did not throw their hats in the ring by the deadline — Production Service's Genesys and NHK's MUSE-6.

Therefore, the seven proposed systems are now expected to be tested starting late this year. The seven (the first two systems representing "enhanced NTSC"; the remainder being "high definition" TV) include the following:

- 1) SuperNTSC/Faroudja;
- 2) Advanced Compatible TV/Advanced TV Research Consortium (Sarnoff);
- 3) Narrow MUSE/NHK
- 4) SC-HDTV/Zenith;
- 5) Analog Simulcast HDTV/Advanced TV Research Consortium (Philips);
- 6) Channel Compatible HDTV/Massachusetts Institute of Technology;
- 7) DigiCipher/General Instrument (pending certification).

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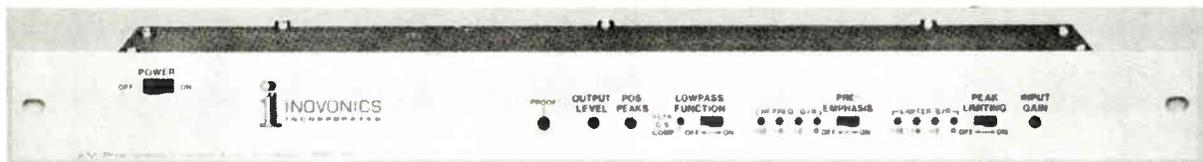


Are You NRSC Compliant Yet? If not, order Today!!



**\$590**

plus shipping & handling



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

## Inovonics FM Stereo Generator (with FMX™ as a plug-in option)



**\$1800.00**

Inovonics' 705 is a full-featured, stand-alone Stereo Generator incorporating all necessary lowpass filtering and transmission pre-emphasis functions. The subcarrier and pilot signals are generated by digital circuitry to assure optimum performance and drift-free operation.

FMX™, the coverage-extension system developed jointly by CBS and the NAB, is available as a plug-in option which, itself, makes extensive use of digital techniques. Whether or not the FMX™ option is used, the 705 Generator remains fully compatible with existing FM broadcasting standards and practices, whether reception is in the FMX™ conventional stereo or monaural mode.

### FEATURES:

**Digital synthesis** of pilot(s) and subcarrier(s) gives maximum stereo separation and stable operation with no trimming adjustments or other routine maintenance.

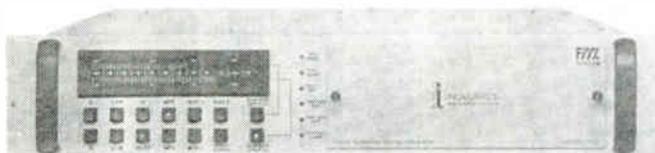
**Internal phase-compensated** lowpass input filtering provides complete pilot and SCA protection. A 25 Hz highpass function reduces exciter PLL perturbations.

**Built-in peak overmodulation protection** and proprietary filter overshoot control circuits assure full modulation without need for additional composite processing.

**Adjustable composite equalization** can correct for STL or other system non-linearities.

**The 705 can interface** with a variety of inovonics or other audio processing systems.

**Easy setup and maintenance.** All components are readily available; no encapsulated or single-source parts are used.



**\$3670.00**

With its new Model 706, Inovonics introduces a "second generation" FM Stereo Generator incorporating the FMX™ Transmission System as an easily-installed plug-in option.

The patented FMX™ System has been proven fully compatible with worldwide FM-Stereo broadcasting standards and practices. In conjunction with the FMX™ Stereo receivers now in production, FMX™ Stereo transmissions will give the broadcaster a substantial increase in his noise-free stereo coverage area.

The new Model 706 is not intended to replace the 705. Rather, it is an alternative for those situations which require additional operating and convenience features.

### 706 FEATURES:

**Digital synthesis** of composite signal (pilot and subcarriers) for optimum performance without need for routine adjustment.

**Internal low-pass filters** incorporate patented overshoot compensation for full modulation.

**Front-panel metering** of important internal signal levels for easy set-up and performance verification.

**Built-in combining circuitry** for up to three SCA or RDS channels; metering relates insertion levels to total modulation.

**Remote control** of input selection for emergency MOND switching and FMX™ System ON/OFF function.

**Interfaces** with a variety of Inovonics or other audio processing systems.

### ABOUT FMX™

"FMX" is the tradename for a patented, improved system of FM stereo broadcasting, fully compatible with the customary standards and practices used throughout the world. This means that not only can FMX™ employ a second, "quadrature" subcarrier at the same 38kHz as the regular L-R signal, but with a 90-degree phase offset. The additional subcarrier is modulated by "compressed" L-R information, and "expanded" in the FMX™ receiver for a much improved signal-to-noise figure.

Because the new transmission format squeezes yet another subcarrier into the already-"interleaved" composite stereo signal, Stereo Generator design becomes more critical to avoid potential overmodulation and other undesirable effects.

Inovonics chose first to develop a very high-performance conventional FM Stereo Generator, but with the necessary circuitry to support a user-installed plug-in option card. The obvious advantage of this approach over that of a dedicated-FMX™ generator is that the choice to use FMX™ generator is that the choice to use FMX™ is left open, with no penalty for a "yes/no" or "maybe later" decision. In addition, should the inventors make changes or improvements in the system, the plug-in card can be exchanged with an updated version in a matter of minutes.

FMX™ was developed jointly by Emil Torick, V.P. of Audio Technology for CS, Inc. and senior staff member of the former CBS Technology Center Technology Center (CBS Labs), and by Thomas Keller, senior V.P. of the Science and Technology Dept. of the Nat'l. Assn. of Broadcasters. The system is described in detail in U.S. Patent No. 4,485,483.

# MEMO FROM METZ



by  
David L. Metz

## BUILDING YOUR OWN LINEMANS HANDSET

My next door neighbor had a great idea. He's an electrician, and as such he had to start installing phone systems. It didn't take to long for him to figure out a linemans handset would come in damned handy. Problem was the price (isn't it always?). So one night he came over to my place with a cheap "princess" style phone and asked me if I could put a pair of test leads on it with alligator clips.

A linemans handset comes in useful for a variety of things. You can use it as a portable phone, where there is dial tone, there is life. You can check remote loops with it if you remembered to put a tone on the line from the station. By listening for clicks, you can determine if there's central battery on one side or both of a line to ground. This will tell if one side of the loop is grounded or open.

Don't forget the telco ring voltage is around 90 VAC and the central battery voltage is 40 to 50 VDC. So be careful when probing around!

After a little thought, I came up with something better than a simple phone with alligator clips. Find yourself a cheap "clonephone." You can buy one for \$17.00 at most distributors. Try to pick one out that has a fat case so you can mount a toggle switch inside.

You don't need any fancy features like memory dialing. Make sure it's the old fashioned design that uses a hybrid talk coil (telco folks call an audio transformer a coil). Some new designs are all electronic and require the central office battery voltage to operate. You don't want that.

The modification of the phone is simple. All you need to add is a single pole double throw switch with center off and a quarter inch bushing. It will replace the annoying hook switch this style of phone uses and provide the monitor function. On one side of the switch you connect a 1 to 2 mF 200 volt NP capacitor in series with the line cord.

The new toggle switch gives you a talk/off/monitor function. Closed (talk position) you have a normal phone that will draw line current to pull in the central office dial tone relay. In the center off position the phone is "on the hook." In the monitor position the capacitor blocks the DC so the phone won't pull a dial tone. It will pass audio and let you listen to what's going on the line without upsetting anything.

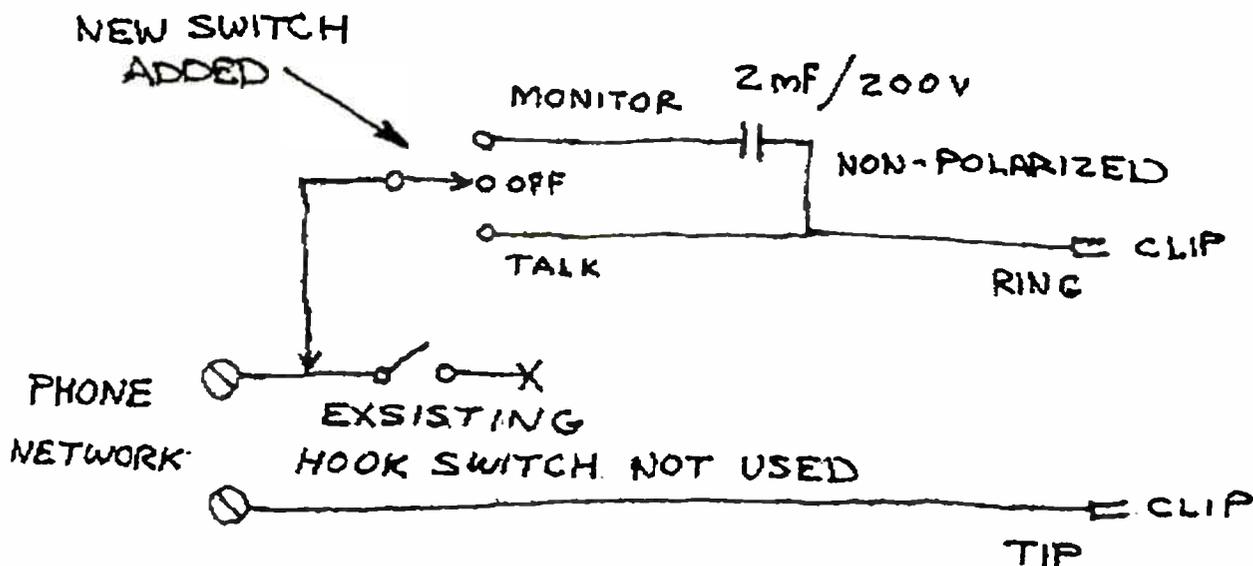
Connections: Buy some good flexible test lead wire for the leads. For the alligator clips the kind with the sharp insulation piercing spike inside the jaws work great. You can clip on right

through the insulation without doing any cutting on the pair your testing. Be sure to put insulated boots over the clips so you don't become a living voltmeter.

The only other thing you really need is a punch down tool. This gadget is a spring loaded device like an automatic center punch. You use it to shove the wires down into the jaws of telco punch down block connectors. when you pick yours out, be sure to get the more expensive automatic one. The cheap version isn't worth a damn. Note that one side of the tool has a sharp blade on it. Position the tool the right way, and it will cut off the excess wire as it pushes the lead down into the block.

There you have it, another handy cheap piece of test equipment. I've built several of these things for friends. It's amazing how handy they come in. I've used mine to get me into all kinds of interesting places. No one ever questions a man who wears a tool belt, a white hard hat and carries a linemans handset!

\*\*\*\*\*



## High-Speed PNP Device To Benefit Future Computing

Researchers at IBM have fabricated experimental PNP transistors which run twice as fast as previously reported devices of this kind. They believe the breakthrough is an important step toward significantly increasing the processing speed of future generations of large mainframes and supercomputers.

During operation, digital circuits built with the PNP transistors switched on and off 25 billion times per second, more than three times as fast as previous generations of PNP circuits, according to IBM.

The PNP devices run at speeds comparable to the historically higher operating speeds of the more commonly used NPN bipolar transistors. The latter are essential for highspeed logic and memory applications in today's highend computer systems. Both PNP and NPN are bipolar devices, which derive their names from the use of both positive and negative charges at the same time within the transistor.

PNP devices are composed of a region of n-type silicon sandwiched between p-type regions, where the "n" and "p" refer to the type of impurity added to provide current carrying charges. N-type impurities or dopants produce an excess of negatively charged carriers (electrons), while p-type dopants provide positively charged carriers (holes).

PNP devices are complementary to NPN devices (with n, p and n layers) in that the p and n dopant types are reversed, thereby reversing the voltage required for switching the device on and off and also reversing the direction of current flow through the device.

Many researchers believe that complementary bipolar circuits employing both NPN and PNP devices will be able to outperform circuits based on NPN devices alone by allowing higher speed operation at lower levels of power consumption.

To date, a major obstacle to achieving high performance complementary bipolar technology has been the lower speed of the PNP devices compared to the highspeed npn devices and the difficulty of combining both devices on one chip. IBM used existing silicon device fabrication methods to make the highperformance PNP devices. This may facilitate the production of both devices on one chip in a complete complementary bipolar process, according to IBM.

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## Study Suggests Best Ways For Broadcasters To Prepare For Disaster

A study released during the annual convention of the National Association of Broadcasters contains recommendations for broadcasters in dealing with disaster situations.

The study, funded by NAB and Marjorie and Robert Chandler, was released in conjunction with the session, "Disaster! Is Your Station Prepared?"

Results of a survey of Bay Area computers polled four weeks after the San Francisco earthquake generated five suggested courses of action for broadcasters:

- \* Be prepared. Many respondents said they weren't frightened until they turned on their TV and found that the station was not broadcasting;

- \* Show video of nondestroyed areas to balance visuals of dramatic damage;

- \* Air disaster preparedness programs on a semiregular basis as local conditions dictate. Interviewees who had seen a recent program on earthquakes said they felt better prepared to initiate safety measures after the disaster;

- \* For networks, use local coverage instead of national journalists whenever possible. Respondents resented the use of national journalists and felt they provided unbalanced information;

- \* Use care in conveying death and damage estimates, always cautioning the audience that the information is unconfirmed.

In addition, the study found that after the San Francisco earthquake, which took place at 5:04 p.m. on a Tuesday, 95 percent of interviewees had watched TV and 85 percent had listened to radio by bedtime Wednesday. This was notable because 62 percent of those surveyed had experienced power outages, some lasting for as long as 82 hours. Even by bedtime on Tuesday, 69 percent had seen two hours of television, and 85 percent had heard three hours of radio. These figures include those with and without power.

A majority of respondents (70 percent) gave both radio and TV high rankings for believability.

\*\*\*\*\*

## Bell Labs Builds First Digital Optical Processor

Scientists at AT&T Bell Laboratories (Holmdel, NJ) have built an experimental machine that uses light, or photons, rather than electrons to process information. The wireless processor uses lasers to transmit information internally and optical devices to process the information.

Since optics can handle many light

beams at once without interference, future optical processors might be able to process more than 1,000 times as much information as their electronic counterparts. Although the digital optical processor's capabilities are "very modest," the experimental machine demonstrates that the technology is possible. AT&T's optical processor operates at one million cycles per second (slower than most personal computers), but its developers believe that operating speeds of several hundred million cycles per second (which is faster than most supercomputers) can be achieved in the near future.

"This processor is a major step toward such a computer," said Alan Huang, head of the Optical Computing Research Department, where the processor was built. However, he added that "significant research must be done before the new technology can be turned into commercial products." Huang predicts that the first uses of the digital optical processor will involve problems requiring parallel processing, with applications in speech and vision recognition, switching and general computing to follow as the price becomes competitive.

\*\*\*\*\*

## The SBE and the Department of Defense Discuss the Expansion of the SBE Certification Program

The SBE and Dantes (Defense Activity for NonTraditional Education Support) are discussing the feasibility of using the SBE Certification Program in the U.S. Military Services. Andrew Byes, the Manager of Program Development for DANTES, views part of the SBE program as being used to certify members prior to their discharge. The Services want their members to be certified and thus more readily employable.

DANTES has testing centers throughout the world so the certification program would become available to service members at overseas locations as well as within the continental United States.

The SBE administers a certification program recognizing four levels of engineering achievement. They are:

- SBE Broadcast Technologist
- SBE Broadcast Engineer
- SBE Senior Broadcast Engineer
- SBE Professional Broadcast Engineer

The SBE has certified approximately 5,000 persons since 1975.

\*\*\*\*\*

## FCC News Briefs

New processing fees took effect at the FCC on May 21. Also beginning on that date, broadcasters will no longer send their fees and applications to Washington. Instead, applications and fees must be mailed to the Mellon Bank in Pittsburgh (see RW 5/7).

The new fees for commercial radio stations include: New/Major Change CP, AM station \$2,255; FM station \$2,030; Minor Change AM or FM \$565; Hearing \$6,760; License (Form 302) AM \$370; AM Directional \$425; FM \$115; Assignment/Transfer Form 314/315 \$565; Form 316 \$80; License Renewal \$100; New Calls \$55, Ownership Report \$35.

The FCC fee from (155) must accompany a specific application and a check payable to the FCC.

\*\*\*\*\*

Michael J. Marcus, assistant chief for technology with the FCC's Field Operations Bureau, has been named as the FCC Engineer of the Year by the Society of Professional Engineers.

Marcus, who is currently working with the FCC's Office of Plans and Policy, has been with the Commission since 1979.

According to the FCC, Marcus has been instrumental in removing regulatory barriers to technical innovation in many areas.

\*\*\*\*\*

Kathleen Levitz has been appointed deputy chief of the FCC's Policy and Rules Division, which is within the Mass Media Bureau. Levitz, who has been with the Commission since 1980, has served as former commissioner Dennis Patrick's legal assistant for common carrier matters.

She became legal assistant to the bureau chief of the Mass Media Bureau in February 1989.

\*\*\*\*\*

"Endlessly shoe-horning' in more and more AM stations is a sure prescription for substandard operations and 'lowest common denominator' service to the public," FCC Chairman Al Sikes said in underlining the Commission's stance on AM improvement.

In an address before the American Women in Radio and Television (AWRT) May 18 in Washington, Sikes "thirty years of shoe-horning has in fact degraded the quality of (AM) choice."

Sikes said the FCC's direction is clear: "We will, I predict, in 10 years fully achieve the model AM services outlined in our (recent) series of initiatives. AM broadcasters will have significant coverage contours that will be largely interference-free. Our fundamental goal of reducing interference will entail some reduction in the number of AM radio outlets. But thousands will remain, and they will be technically and economically stronger," Sikes noted.

As for regulation, Sikes told the group that when he arrived at the FCC, "It seemed almost everyone wanted to label me a 'de-regulator' or a 're-regulator.' I label myself an 'adaptive regulator.'"

\*\*\*\*\*

## Study Says More Prefer 1125 HDTV

Early returns of a survey of broadcasters and professional video users conducted by Sheer and Chaskelson Research, Inc. indicate that 41 percent of TV station and cable facilities chief engineers thought 1125 should be made a global standard for high definition television.

The next most mentioned standard was 1050, with 20 percent of respondents desiring it, and 1250, mentioned by 15 percent.

Among professional video users 1125 was again the most popular, with 32 percent indicating a preference for it. Next was 1250 (22 percent), followed by 1050 (13 percent).

The responses were based on 173 TV and cable station returns. This was the first year that the study, the Broadcast Equipment Marketplace, included cable stations. The Professional Video Marketplace study had previously tracked cable stations.

\*\*\*\*\*



## RADIO DESIGN LABS

SPECIALISTS IN PRACTICAL PRECISION ENGINEERING

### Comply with the NRSC standards... ...without compromising yours!!

WITH RADIO DESIGN LABS' "NRSC PACKAGES"  
...the only thing less is the cost!

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- NRSC-1 Pre-emphasis AND Filtering
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- Tight filtering without that annoying audible "ringing"
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- Asymmetrical modulation
- Fully RF protected inputs and outputs

The Radio Design Labs "NRSC Stick-Ons" are designed to give the AM broadcaster the economical tools to comply with the NRSC-1 emission standards. Designed to integrate with the station's existing monaural processor/limiter equipment, 3 RDL modules (and an ADDED BONUS) are available for your NRSC conversion.

NRSC-PR Connects between your compressor and limiter to provide NRSC pre-emphasis to your transmission system.

NRSC-FL Connects between your limiter output and transmitter audio input to provide POSITIVE control of required "Stopband" emissions.

NRSC-DM Connects between your modulation monitor (or monitor receiver) and your console/studio monitor to give "flat", de-emphasized audio into your monitors, plus with our deemphasis module, you get a tuneable 10 KHz notch filter to remove the "whine" from your monitors (frequently a very annoying problem during nighttime hours.)

The Bonus - "A Guide to NRSC Requirements." A complete bound booklet that takes the mystery out of the requirements. This guide provides a step-by-step explanation of the NRSC guidelines, and the FCC requirements. This is an invaluable manual that no AM station should be without (Available only in NRSC packages "A" and "B" - Not available separately.)

For convenience, these products are available in two packages:  
NRSC "A" Compliance Kit - Includes NRSC-PR, NRSC-FL, and the "Guide to NRSC Requirements." This is the ultimate "compliance kit" to fulfill the requirements. Price \$399<sup>00</sup>

NRSC "B" Compliance Kit - Includes NRSC-PR, NRSC-FL, NRSC-DM and the Guide to NRSC Requirements". This gives you both the equipment for NRSC-1 compliance, plus the demodulator you need for your studio monitors. Price \$449<sup>00</sup>

For stations already using our NRSC "A" Compliance Kit, or using another manufacturer's NRSC Transmission System, we are making available separately our NRSC-DM, which you need for your studio monitoring... and it is available in mono or stereo!

All this is available in the unbelievable convenient packaging of R.D.L.'s "Stick-On" line! Easy and quick to install. No Rack Space Required. R.D.L.'s NRSC products are the clear low-cost choice for NRSC-1 compliance that sounds good!



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## SBE Convention Update

The SBE has announced that the convention to be held in St. Louis, October 47 will have 3 1/2 days of intensive technical seminars covering both Television and Radio. This is a brief description of the papers scheduled.

**STATE OF THE BROADCAST INDUSTRY:** Several papers from national presenters set the stage for the conference.

**THE REGULATORY FRONT:** Officials from the FCC and the FAA will be on hand to answer attendee questions.

**RADIO TECHNOLOGY:** Important sessions on how to apply new techniques and technologies that will help the facilities become more efficient. Another half day session showing how computers and new antennas can improve station coverage.

**ADVANCED TELEVISION SYSTEMS:** Learn how to plan for the modernization and renovation the stations must undergo. In this half day session on HDTV & ADTV you will learn the techniques necessary to put the attendee and the facilities in control of their future.

**NEW TELEVISION TECHNOLOGY:** Here is where the attendee will learn how to apply the new technologies, graphics, transmitters, terminal equipment, and fiber optics.

**PREPARING FOR DISASTER:** Don't wait for disaster to strike to prepare your station. Experts surviving the San Francisco earthquake, and Hurricane Hugo will share their experiences in protecting their stations.

**NIGHT OWL SESSIONS:** Thursday and Friday Night Owl sessions provide a casual atmosphere for continued discussions. The ever-popular Audio processing session will take place Thursday evening. Learn how NRSC and digital processing apply to making your station sound better. The Friday Night Owl session will look at management techniques. This is where the attendee will learn how to manage themselves and others to become more productive.

### "THE ENNES WORKSHOPS"

The special one day long Ennes workshops will be conducted by factory-trained instructors who will be utilizing the identical equipment that our members use. Here is a brief outline of the SBE Ennes Workshop schedules.

**C-QUAM AM STEREO SYSTEMS** presented by Delta Electronics; **MEDIUM AND HIGH POWER FM TRANSMITTERS** presented by Varian-Continental Electronics; **RF TECHNOLOGY SESSION** presented by Harris/Allied Electronics; **S-VHS ENG AND PRODUCTION** presented by JVC Electronics; **EARTH STATION TECHNOLOGY** presented by the Andrew Corporation; **SATELLITE**

**COMMUNICATION** presented by Mitchell Vo-Technical School; **MANAGEMENT FOR ENGINEERS** presented by the Cupka Corporation; **DON MARKLEY RF WORKSHOPS** presented by Don Markley and associates.

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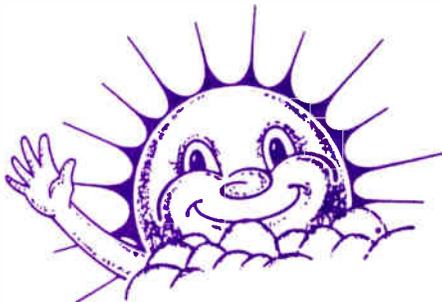
## IBM and Motorola Intro Radio-Computer Net

In a joint venture, IBM and Motorola have introduced a radio network that will let portable-computers users link to central computers from almost anywhere in the U.S. without using telephone lines. The 5050 partnership, which is based in Lincolnshire, IL under the name of Ardis, combines similar services previously offered by Motorola to clients in New York, Chicago and Los Angeles with a nationwide inhouse system designed by Motorola for IBM service technicians. A Motorola radio modem allows any brand of portable computer to be linked to the Ardis network.

The new system, scheduled to begin in April, is said to have several advantages over its major data-communications competitor in the portable market-cellular phones used with modems. The Ardis network is on line all the time, so there is no need to dial up a computer. Messages that are sent to the terminal when the user isn't monitoring it can be stored and recalled later. And, since radio waves of the proposed frequency can travel where higher-frequency cellular-phone waves cannot, the service can be used to link various locations inside a building.

Potential users include police officers, field-service personnel, delivery workers and real estate brokers. Billing is to be based on the amount of use, with the projected cost per terminal per month estimated to range between \$100 and \$150. The cost per modem is not yet available.

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**Circuit Works**  
conductive pen

\$10<sup>95</sup>

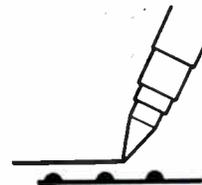


## Conductive Silver Traces, Jumpers and Shielding in a Pen

- Makes instant conductive silver traces
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- Valved pen tip for easy application
- Can be soldered at low temperature
- Use where conductive electronic traces are needed.



The spring loaded tip allows the silver conductor to flow smoothly and prevents clogging.



Draw silver traces in seconds. Save time and money in printed circuit board fabrication and repair.

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## Superb sound quality radio is coming to homes and cars:

### Digital Audio Broadcasting

DAB is a European development for terrestrial and satellite broadcasting to fixed, portable and especially mobile radios.

Radical changes in sound radio seldom occur. DAB is one, which brings together two new concepts in sound broadcasting:

High-quality bit-rate reduced digital sound (and data)

Echo-resistant digital transmission.

Combined, they enable the reception of an unimpaired studio-quality digital audio in listeners' home and cars.

The efficient source coding maintains the subjective quality of the compact disc while dramatically reducing the transmitted bit-rate. One stereophonic sound only needs about 200 kbit/s (compared to 1.4 Mbit/s of a CD). Real-time spectral analysis of the input signal is followed by adaptive coding techniques which are tailored to match the psychoacoustic characteristics of the human ear. In simple terms, the transmitted signal contains only those parts of the original sound which can really be heard by the listener. Furthermore, this form of audio reduction scheme has a much better performance in the presence of bit errors than conventional PCM-systems. Several prototype systems have been developed, all offering a similarly high subjective quality. One company has even developed a magneto

optical disc recording system using these coding techniques to squeeze four hours of music into a CD-sized carrier instead of just one.

The echo resistant modulation scheme allows for reliable digital radio transmission, either in a terrestrial network or by satellite (or perhaps both together, in a hybrid network), offering high spectrum efficiency and unimpaired reception in moving vehicle. 12 to 16 stereo programmes can be accommodated in a bandwidth of about 4 MHz. The system is typically 3 to 4 times more spectrally efficient than FM. The technique used is called Coded Orthogonal Frequency Division Multiplexing (COFDM). With COFDM the digital data is transmitted on a large number of carriers each having by itself a relatively low bit-rate. Combined with Viterbi decoding a very rugged digital transmission channel results even for moving vehicles as multi-path propagation does not completely degrade all the carriers at the same time. Both transmitter and receiver rely on full digital signal processing. This can be implemented in VLSI to achieve a low-cost, user-

friendly radios.

Alongside its principal sound broadcasting function, this advanced digital technique permits the transmission of additional data channel. This could be used, for example, to transmit information about the sound programme (title of a symphony, name of the conductor, etc.) for a text display on the receiver, or even to transmit still television pictures.

Experimental hardware has been in operation for nearly two years serving as a test-bed for optimization and refinement of the complex all-digital coding and modulation techniques involved. European broadcasters represented in the EBU have made a case for the introduction of up to 15 new stereophonic radio programme channels in each country, to national, regional or local services. The system has been demonstrated with extreme success in Geneva, Switzerland, at both WARC-ORB(88) and ITU-COM 89.

A spokesman of DAB stated that "all telecommunications administrations should look into the possible allocation

of suitable frequency bands both for terrestrial and satellite broadcasting, to give a strong administrative basis for the further development and the implementation of such a fully-digital radio broadcast service. The technology is ready but the appropriate frequency bands need to be allocated. (Ideally in the 100 MHz range for terrestrial and in the 1 GHz range for satellite services. Terrestrial local services could also be envisaged at higher UHF frequencies)."

In summary DAB provides the "missing link" to deliver CD-quality sound unimpaired from the studio direct to the listener's home and motor car. It is being developed now, in readiness for the 1990s. It is a major new landmark in the history of sound broadcasting, a landmark indicating the way ahead into the 21st Century.

\*\*\*\*\*

Introducing the AUDIOMAX4000 Broadcast Audio Tape Cartridge, another improvement in cartridge technology from Fidelipac Corporation.



## SPECIAL INTRODUCTORY OFFER

### AUDIOMAX MODEL 4000

10 sec - 100 sec - \$2.95 ea.  
140 sec - 4.5 min \$3.45 ea.  
5.0 min - 10.5 min - \$3.95 ea.  
plus shipping & handling

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

AUDIOMAX 4000 has been developed specifically for premium quality stereo use at elevated levels, and compatibility with existing Type AA-4 Cartridges. Its proprietary tape formulation, DYN-600X, features excellent high frequency response and headroom, and exhibits minimal oxide shedding and extended wear characteristics. Abrasion of expensive cartridge machine heads, tape guides, and capstan shafts has been minimized. The shell design is refined, utilizing first generation molds and the latest in rugged high grade engineering plastics. These features combine to provide a superior quality cartridge that sounds better, tracks phase tighter, and lasts longer under even the most abusive handling conditions.

# 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: 3-bay Phelps-Dodge FM antenna w/de-icers, tuned to 103.9 MHz; 250 ft. LDF5-50 heliax; 250 ft. HJ&-15A, 1-5/8" heliax. Contact John Carroll Jr., WKJC-FM, 523 Meadow, Tawas, MI 48763.

FOR SALE: 115 10" reels of Scotch automation tape, bulk erased, plastic reels. \$4.00 each. Tom Moore, WBCO, Bucyrus, Ohio, 419-468-2326.

CART MACHINES FOR SALE: ITC RP stereo, 3 Q tones, excellent condition, \$1250. ITC RP mono, 3 Q tones, excellent condition, \$1150. ITC RA, 1khz tones, \$450. (2) ITC RA's, 3 Q tones, \$500 each. M. Brown, 502-245-4889.

FOR SALE: 4 OTARI ars-1000 25hz decoder, \$1000; 1 IGM go-cart 24, \$2500; 1 SMC RP-1000 brain w/DS-20 switcher and clock and TAC-1 time announce, \$2700; 2 SMC 250 carousel. 1 w/elect. random select, 1 w/Schaffer random access, \$350; 1 SMC 721 dual cart PB in drawer, \$500; 1 SMC 710 single cart PB in drawer, \$250; 1 ITC R/P 3 tone, \$700; 1 REVOX A77, \$350; 250 10.5" reels easy listening music no dupes, all in VG condition with play sheets, \$10 each. Jim Wenstrom, CE, WYNNE Broadcasting, 503-882-4656.

FOR SALE: 1 Mosley RPU 161.67 plus 166.25 transmitter and receiver; 1 CBS FM stereo level control \*Slim Line\*; 1 Ampex 400 Mono; 2 Senheiser 421's in boxes; 1 Marti microphone w/on-off switch; 1 Microtrak 6444B Mixer Board-New; Misc. all new, Andrew 1-5/8" 87R's grounding and splice kits; 7/8" L44N, 75AN, 75ECT; 7/8" hanger kits and round member adaptors; 1 bird watt meter 100w Load, 25; 2 Optimod 8000; 1 ESE 301AE timer; 1 AM pro stereo doard 8CH; 1 BE 150A 8CH mono console, new; 1 Ramsa portable mixer WR-130; 1 Spotmaster 505 play cart machine; 1 MCI digital remote control; 1 MCI 450 MHZ, 10 watt, TSL; 1 Heathkit microphone mixer; 1 Sparta delay cart machine; 1 SMC random access; 6 repeat coils; 1 3-line speaker phone w/coupler; 1 ERI 2 Bay (current style) 92.1; 1 McKay Am base and head; 1 CRL AC 400 almost new; 1 Gates criterion (as is); 2 BE 2000 RP cart machine; 1 CBS Audimax and Volumax and recording Volumax; Misc RF relay, 1 ITC stereo RP premium; 1 ITC mono RP premium needs work; 1 ITC SP high speed cue; 1 CBS NTSC color corrector 5500A; 1 CBS Chroma keyer 7000; 1 CBS image enhancer 8000 MK III; 1 CBS sensor 5500. All removed from service. Jim Phillips, WZOM Radio, 408-1/2 Clinton St., Defiance, Ohio 43512.

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FOR SALE: 1--Ampex 350 Stereo Deck \$100.00, 1--Schaefer Stereo Playback Amp for Above \$50.00, 2--Lang Record/Play Amps for Above \$75.00 each, 1--Micro Controls PTS-10C/PRS-10C Composite STL System. Eight years old. Excellent 949.0 MHz \$2,500.00, 1--QEI 7775 AT System. Excellent \$500.00, 1--Sound Technology AN-1 Stereo Simulator \$400.00. Contact: Mark Persons (218) 829-1326 phone, (218) 829-2026 Fax.

FOR SALE: 1--Spotmaster/BE 500C Mono Cart Recorder, Good \$400.00, 1--CBS Audimax. Needs work \$50.00, 1--Marti CLA-40 Limiter. Excellent \$300.00, 2--UREI BL-40 Modulimiter, Excellent \$300.00, 1--Harris MSP 90 Limiter. Excellent \$250.00, 1--CBS DPE 450. Excellent \$250.00, 1--Heath IM-48 Audio Analyzer. Very Good \$75.00, 1--Crown IMA Analyzer. Excellent \$75.00, 1--McMartin AMR-1 Receiver, Good \$50.00, 1--Ramco DA-6BR/E Distribution Amp. Good \$75.00, 1--CCA FM 40E FM Exciter. Very Good \$1,500.00. Contact: Mark Persons (218) 829-1326 Phone, (218) 829-2026 Fax.

TV MAINTENANCE ENGINEER opening in TUCSON, AZ. Responsible for the maintenance and repair of all equipment at this CBS affiliate station. FCC license or SBE certification required. Contact: Robert Gaff (Technical Support Mgr.) KOLD TV (Ch 13), 115 W. Drachman St., Tucson, Arizona 85705, (602) 624-2511.

ITEMS FOR SALE: all prices are negotiable. CCA FM 10DS stereo generator, working when removed from service March, 1989. \$300.00. Contact J. Stack, WMPO Radio. (614) 992-6485.

FOR SALE: Gates Criterion 80 mono cart machine. Rec/Play. Very good condition. 2 cue tones. New P/roller and lamps. Total mechanical & electrical alignment completed. Desktop cabinet. \$650.00. Gates Criterion 80 mono cart machine. Playback only. Very good condition. Ready to go. In desktop cabinet. \$450.00. J. Stack (614) 797-2787.

WANTED TO BUY: Vintage microphones for display, part, etc. Contact Doug Koehn, KNEN Radio, Box 937, Norfolk, NE 68701, Phone: (402) 379-3300.

## Talk Back

WICHITA, KS--Thanks for keeping us updated on FCC proposals. Also, very good article from David Metz on metal finishing.

MISHAWAKA, IN--Thanks for all your hard work! As for the FCC inspection rumor, the South Bend, IN market just got theirs. Our first in about 12 years.

ST. CHARLES, MO--Appreciated the PCB up-date piece in May issue.

ROSWELL, NM--RB: Translators. If a translator does not meet the new rules, eliminate it. Too many translators on the air now abuse the rules.

CLYDE, OH--Thanks for a job well done & all the help you render. Another informative issue, especially on FM Class A's.

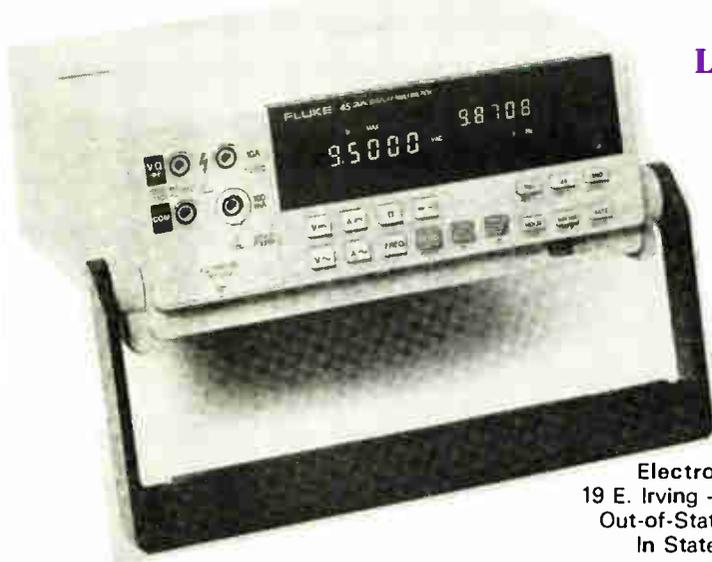
HARTFORD, KY--My ad in Feb. '90 Common Point brought good response. It's well read. Thanks.

## IEEE Appoints Standards Committee

FCC RF radiation hazard standards are largely based upon work of a committee of the American National Standards Institute (ANSI). This committee has disbanded, but the institute of Electrical and Electronics Engineers (IEEE) has appointed a Standards Committee to take up its work and broaden its scope. The committee consists of thirty distinguished representatives from a variety of relevant disciplines. RF hazards are increasingly becoming an area of controversy for broadcasters. With the Environmental Protection Agency having bowed out of the standards setting business, the IEEE entry will be particularly important to the resolution of RF hazards standards problems in the future.

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**LIST PRICE**  
**\$595.00**

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

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

- Multi-function vacuum fluorescent dual display
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- RS-232 interface standard, IEEE-488.2 option
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- 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<sup>®</sup>, 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<sup>®</sup>, 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)

#### Order

Fluke 45 Dual Display Multimeter	\$595
Fluke 45-01 with factory-installed battery	\$715
Fluke 45-05 with factory-installed IEEE-488.2	\$745
Fluke 45-15 with factory-installed battery and IEEE-488.2	\$865
Fluke 45-01K rechargeable battery kit	\$120
Fluke 45-05K IEEE-488.2 interface kit	\$150
C40 Soft Carrying Case	\$ 50
M00-200-634 Rack Mount Kit	\$ 95
RS40 6' RS-232 terminal cable	\$ 30
RS41 6' RS-232 modem cable	\$ 30
S45 "QuickStart 45" Software	\$ 95