

CBS FMs To Convert To FMX

by Alan Carter

New York NY ... CBS Radio has become the first group to formally endorse the FMX stereo extension system for FM radio.

In what it called an effort to encourage Japanese receiver manufacturers to produce FMX radios, CBS Radio announced that it will convert its 11-owned FM stations to FMX transmission by August.

CBS Radio President Robert Hosking said in making the announcement in early April that testing by CBS at WODS in Boston showed FMX transmission did not degrade reception on traditional

receivers, yet improved the signal for FMX-modified radios.

The radio group president also emphasized that Japanese receiver manufacturers should interpret CBS's conversion as support for this mode of transmission for the future. It will not take "too many major groups" for Japanese manufacturers to realize the US commitment and put FMX radios on the market, he said.

In addition to the enhanced signal, Hosking said CBS initiated the conversion because of a "demonstrated willingness" from Detroit to install FMX receivers in automobiles by 1991. "It

(FMX transmission) really makes a big difference in car radios," he added.

The conversion also is not an expensive proposition, Hosking noted. He estimated CBS will spend \$3,000 for the FMX equipment plus costs of monitors and test equipment for each of the 11 stations.

The first reaction Hosking said he had from the stations was, "Is it in any way going to degrade my signal?" And the answer to that is "it won't."

In addition to WODS, the CBS stations which will convert are: WBBM, Chicago; KTXQ, Dallas/Ft. Worth; KLTR, Houston; KNX, Los Angeles; WCBS, New

York; WCAU, Philadelphia; KRQR, San Francisco; KHTR, St. Louis; WYNF, Tampa/St. Petersburg, and WLTT, Washington, DC.

Testing

CBS tested FMX transmission at WODS with components of the system developed by Broadcast Technology Partners (BTP), the Greenwich, CT-based organization that holds the license to the system.

Testing began the first of March with the replacement of an existing stereo generator with an FMX adapted model, according to CBS Technical Operations Director Larry Conti. FMX was not switched on for two weeks, he said, so station personnel could evaluate the new generator.

Once FMX was switched on, Conti explained that engineers listened to hear the effect on the FM main channel and subcarriers. "As it turned out, FMX is transparent," he said. "It's just like it isn't there."

The second phase of testing involved evaluating the FMX signal with an FMX stationary receiver and an FMX auto receiver, both supplied by BTP. He said both receivers worked well.

In the automobile, Conti noted that the multipath, especially with adjacent channel WNBC in Boston, was reduced. The stationary receiver works, but he noted that with it "you're really not going through multipath."

Conti said CBS had decided to convert to FMX transmission "some time ago" but had to determine that it "did not affect the product we had."

With positive test results, Conti said, "anything from here is a plus."

WODS operates FMX with a CRL generator modified by BTP, Conti said. He said CBS will replace it with an Inovonics FMX generator and use that manufacturer's product at the other stations.

Good news

At BTP, FMX co-developer and BTP President Emil Torick said the CBS decision gave a "special impetus" to the FMX program.

"This is the type of news that receiver manufacturers will be delighted to receive," he continued.

According to Torick, nine stations including WODS are on air with FMX transmission: WDET, Detroit; WDHA, Dover, NJ; WDRC, Hartford, CT; WEZN, Bridgeport, CT; WJAZ, Stamford, CT; WPKT, Middlefield, CT; KNPR, Las Vegas and KRLV, Las Vegas.

The next "major milestone" for FMX will be the availability of the decoder chips.

Torick said he expects Sanyo to have a chip in production by "mid-summer" *(continued on page 13)*

Variety the Key in Radio Gear

by Judith Gross

Las Vegas NV ... Further advances in digital audio and making existing technology more affordable are two trends that emerged for radio at the 1988 NAB convention.

At one end it's apparent that the buzzword "digital" has pervaded every equipment category, from tape cassette, to processing, to transmitters and telephone gear.

At the other end, stations, particularly those in smaller and medium markets, are looking for ways to make studio additions more cost effective or add that production or back-up item without destroying the bottom line.

Digital audio tape

While the consumer market for DAT players remains uncertain in the wake of the copycode controversy, manufacturers



are wasting no time introducing products for the pro market.

The newness of the technology and such concerns as the time it takes to cue seem to be directing DAT more to production than on-air applications.

Sony has already shown its DAT field recorder and studio unit at past shows. This year several more companies caught DAT fever.

Harris introduced the model XD-001UH recorder/playback unit which was developed under an OEM agreement with Aiwa. It includes features such as scan and preview and can be hard-wired to a remote unit for console interfacing.

Tascam's model DA 50 pro DAT unit also features search and cue capabilities plus balanced and unbalanced analog *(continued on page 3)*



More than 46,000 convention-goers flocked to Las Vegas for the NAB convention 9-12 April.

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REGULATORY NEWS

Comments Favor New FM Class

by Alex Zavistovich

Washington DC ... Petitions filed with the FCC on the creation of a new class of FM facility generally supported the expanded service, although some questioned whether its protection standard would provide sufficient interference relief.

“ (Class A FMs) have seen their communities outgrow their service area. ”

Chief among these were the comments of the NAB, which supported the creation of the so-called "C3" facilities.

"We believe that the institution of a rule making proceeding to incorporate such Class C3 facilities in the Commission's FM radio allocations system would serve the public interest," the NAB wrote.

However, the association endorsed a stronger protection standard than suggested in the petition—60 dBu, as opposed to 57 dBu.

"... We believe that a 60 dBu factor would afford a more reasonable balance between concerns over increased interference and the prospects for introducing new and/or expanded service," said the NAB.

Proposal from Petaz

The original idea for the creation of C3 FM stations came from Petaz Communications, in a petition filed 16 June 1987.

The petition for rule making asked the Commission to amend its rules, to allow for "intermediate coverage area Class C3 facilities in Zone II," which would have

the same separations, protections and limitations on power and height as Class B1 stations.

The suggestion was made in part to aid Class A FMs, which Petaz said "have seen their communities outgrow their service area." Class C3s would provide an intermediate category for stations unable to otherwise upgrade to a different class.

Specifications for Class C3 facilities would be "more stringent" than those for Class A, C2 or C stations already in Zone II. The benefits in "spectral efficiency" through expanded service would be greater than that of the limited coverage Class A's, Petaz wrote.

Further, Petaz pointed out "the ancillary benefit of allowing many limited coverage Class A stations, which could not otherwise upgrade their facility to serve the expanding community, to upgrade to the Class C3 classification."

The proposed change—which would include a 57 dBu protection ratio—would impose a "minimum burden" on the FCC while retaining the table of allotments, the group contended.

Interference protection concerns

Although a number of applicants applauded the idea of a new expanded service category, the 57 dBu interference protection criterion was a cause for concern.

Filings from engineering groups and broadcasters seemed to concur that the new facility would have to have greater protection against interference than that proposed by Petaz.

The NAB, which expressed its belief that the protection should be increased, had based its recommendation on a filing made by JAB Broadcasting in response to the Petaz proposal.

JAB, which is the licensee of WDLT-FM, a Class A station in Chickasaw AL, submitted on 11 December 1987 a peti-

tion for rule making that supported the Petaz position, provided that protection of 60 dBu was specified for the Class C3 facilities.

In the petition, JAB maintained that the Petaz proposal would "provide opportunities for many existing Class A stations to expand their facilities with a concomitant benefit for the public interest."

Present spacing requirements for full C to C2 on first adjacent channels is 188 km, JAB wrote. Under 57 dBu protection for C3 channels, that spacing would be increased to 193 km, while a 60 dBu protection would give a spacing of 175 km.

The sacrifice in spacing when using 60 dBu would be offset by the benefits to be gained in interference protection, JAB commented.

The FCC proceeding is RM-6236. For more information contact the FCC Mass Media Bureau at 202-634-6530.

FCC Clips

FCC dismisses indecency charges

The FCC in early April dismissed indecency complaints against five broadcasters.

Stations cleared, based on insufficient proof, were WTRG-FM, Rocky Mount NC, for lyrics in a song; WTAM-FM, Charleston SC, for a political ad; and WBAI-FM, New York NY, for a reading of James Joyce's "Ulysses." Two television stations involved were WCET, Cincinnati, and KING, Seattle.

The FCC, in a letter from Mass Media Bureau Chief Alex Felker to the individuals who filed complaints, noted the charges were not supported by enough documentation.

Anti-lottery charge upheld

The FCC upheld an action by the Mass Media Bureau ordering Rex K. Jensen, former licensee of KRTZ-FM, Cortez CO, to forfeit \$6,000 for repeated violation of the Commission's anti-lottery rule, according to the agency.

The FCC stated that Jensen had conceded that KRTZ-FM had broadcast advertisements promoting bingo games sponsored by the Ute Mountain Ute (Indian) Tribe three to 33 times a day for 84 days and that the bingo games did constitute lotteries.

But the Commission stated that Jensen maintained that the forfeiture amount should be reduced or rescinded.

Patrick addresses NAB

FCC Chairman Dennis Patrick in a speech before the 1988 NAB annual convention in Las Vegas supported reform in the license renewal process.

In particular, he suggested an examination of spurious petitions to deny and falsified applications that would make a comparative applicant seem more fit than an incumbent.

Patrick also addressed proceedings at the FCC that reexamine the role of FM translators.

For further details, see the next issue of RW with complete convention coverage.

License revoked

The Commission has revoked the license of WGRI Radio Inc. for AM station WGRI, Griffin, GA, after the station failed to notify the FCC that it did not resume broadcasting after a fire in 1985.

In January 1985, the general manager notified the FCC that a fire forced the station to cease operations temporarily. The licensee, according to the FCC, said it expected to be back on the air in a month.

But as a result of Field Operations Bureau monitoring, the FCC said it learned that the station was still off the air. The FCC stated the station neither requested permission to discontinue operation temporarily or permanently nor turned in its license.

WGRI failed to respond to a show cause on why its license should not be revoked, according to the FCC.

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New Products Dazzle at NAB

(continued from page 1)

inputs and outputs and digital inputs and outputs.

Panasonic also had DAT recorder/players. The model SV-250 portable DAT machine is a field unit and the model SV-3500 is for the studio. The portable device weighs under 3.2 pounds and a variety of broadcast features are incorporated into each.

In addition, Radio Systems was offering a broadcast controller for the Sony DAT recorder/player. It adds such features as auto cueing and a complete remote interface and is manufactured by Peak Audio.

Compact discs have by now become a staple at many stations. Studer, one of the first companies to offer a pro CD player, has the next generation model in the A730. It features more accurate cueing and incorporates improvements suggested to the company's previous pro models.

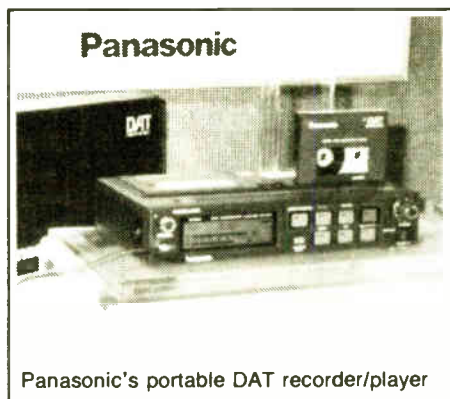
Transmitter innovations

Last year Harris introduced the first digitally-modulated transmitter, the DX-10. This year the company showed the DX-25, a 25 kW version.

Harris also introduced a new high power FM exciter, THE-1, and 10, 20 and 30 kW FM transmitters.

Nautel showed a new solid state 10 kW AM transmitter, the AMPFET ND-10.

Continental showed two new solid state transmitters, one for AM and one for FM. The XL-301 1 kW for AM is the first solid state transmitter from Continental. The 814C is a 3.8 kW solid state



Panasonic's portable DAT recorder/player

transmitter for FM.

QEI introduced its new line of FM transmitters, the FMQ series, at 30, 10 and 3.5 kW.

The NAB debut of Vector Technology's line of FM transmitters is one example of making existing technology more affordable for radio broadcasters. The FMT line offers transmitters from 3.5 to 25 kW.

Broadcast Electronics also showed a new line of cost effective transmitters for FM, including the 20 kW FM-20A and the 1 kW FM-1A.

And to make sure AM stations aren't causing splatter, and to help them comply with the NRSC standard, Delta Electronics showed the model SM-1 AM splatter monitor developed in cooperation with the NRSC.

Digital processing

Valley International unveiled the first truly digital multiband processor, the DDP. It operates on a 16-bit linear format and can be configured for three, five or eight bands.

Eventide introduced the Ultra Harmonizer H3000 with software designed for broadcast use.

Orban showed the 222A stereo spatial image enhancer and introduced the 787A programmable mic processor.

Modulation Sciences showed its StereoMaxx stereo spatial image enhancer as well.

On the FMX front, Inovonics is offering an FMX generator. Good news for FMX supporters is a total of nine stations on the air with it and the announced conversion of the CBS FM stations.

New telephone gear included the EFT line of frequency extenders from Gentner and new firmware for the company's VRS-1000 remote dial-up transmitter control.

Bradley Broadcast showed the next generation digital hybrid from Telos Systems, the Telos 100.

Moseley introduced PC control and new software for its remote control systems and new STL gear.

TFT unveiled a new generation of STL gear, the TSL (transmitter-studio link) 8700 series designed to operate in the 450 MHz group "P" channel frequencies.

And Potomac Instruments introduced the 1500 PC programmable controller for remote transmitter control.

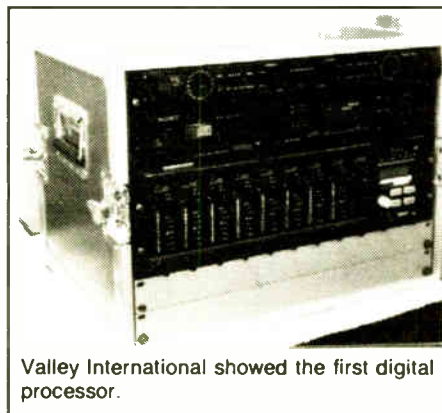
Consoles is one area where manufacturers are vying for medium and small market dollars.

Radio Systems led the way in cost effectiveness with a new line of audio consoles. The \$5000 model RS-12 features 12 inputs, but consoles with as few as six inputs or as many as 18 are also available.

Broadcast Electronics has decided to continue the "Trak" designation for its new equipment. The console the company introduced at the show is the Mix Trak 90 featuring modular design.

And Arrakis showed its new 10,000 series of on air and production consoles designed for major market applications.

For complete NAB convention product coverage see the 15 May issue of Radio World.



Valley International showed the first digital processor.

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Pretzels—and Food For Thought

by Judith Gross

Falls Church VA ... If it's one thing weary convention-goers appreciate almost as much as new products at the NAB each year, it's those considerate exhibitors that feed, refresh and/or otherwise offer a little fun and freebies in the midst of all the wheeling and dealing.

My vote for best goodie this year goes to Radio Systems for their big, hot Philadelphia pretzels, mmmmm ... (no wonder I spent so much time at that corner of the Radio & Audio hall).

Spending five days in glittery Vegas leaves you with so many impressions it will take more than one column to get all of it down, but here goes ...

To everyone who asked "What's the hottest new product?" I'd have to say DAT.

Dat's right. I was told in no uncertain terms that if you're still saying "R-DAT" you are out of it, not cool and just generally gauche. We're now calling digital audio tape machines with rotary heads simply "DAT."



Glad that's straightened out.

Anyway it was everywhere you looked. Harris surprised everyone with a DAT player developed in an agreement with Aiwa. Tascam had a pro model. Then there was Panasonic's offering, a very compact, nifty looking field model.

The music library folks, FirstCom, were offering formats on DAT. And the company's mascot, "Digital Head" had turned into "DAT Head" for this show.

Companies offering DAT are touting it as reel-to-reel replacements—a logical ap-



Radio Systems' Philadelphia pretzels warmed the convention tummy.

plication. But I'm betting it isn't long before stations start using them on-air, perhaps for music and spots or IDs.

Don't be surprised if it's a repeat of the situation with CDs when they first made their way into control rooms.

☆☆☆

It must have been the sickness of success ... but they were dropping like flies on the exhibit floor. Unofficial estimates have it that some one-third of those working at the booths, and some NAB staff, were hit with a mysterious bug that incapacitated the afflicted for 12 hours, with full recovery in about a day and a half.

Was it the food? The water? The ventilation system? Was a rival convention city trying to sabotage the competition? No one knows. But it would be interesting to take a convention floor plan and plot the booths that were hit with the bug to see if a pattern emerges (maybe it would spell out "NAB" or "DAT" or something).

The show was generally upbeat, with lots of happy exhibitor faces, and many, many kudos to Rick Dobson and his staff for bringing professional convention

management to the NAB.

The split between Radio & Audio (notice that's an ampersand) and the video exhibits worked well.

But it didn't all go entirely without a hitch. For one thing the two electronics unions who handle the convention center were at war, and members of one wouldn't go into a booth if there were members of the other one present. So one turned on the juice, the other hung up the sign, and so on.

There were a few complaints about housing—even the NAB staff had some rooms bumped. And Hagler and Hearn weren't even fighting this year!

That, and some problems with exhibitors getting express courier packages are two tidbits the exhibitor's advisory committee will be working on next year.

Thanks to Tom Keller for pointing out to me that this annual event is not a "show" but a "convention." It all depends on where you're looking, Tom.

☆☆☆

Two enthusiastic Brazilian broadcasters at the Delta Electronics booth, Jose and Evandro, paused to tell me that they

would like more support regarding AM stereo from their neighbors up north.

Brazil has adopted the C-QUAM system and would like to see US broadcasters rally likewise, to help get a more abundant supply of C-QUAM radios.

I understand the Lincoln-Mercury that was given away at the show (oops, sorry, I mean convention) had an AM stereo radio in it ...

Target Tuning was out in force (if you could wade through the crowds at their booth) and as promised, the Moonachie (love that name!), NJ company now has AM stereo samples, yes, both C-QUAM and Kahn/Hazeltine ISB.

For the C-QUAM radio the company uses the new Motorola chip. By the way, come on, Motorola, stop making it difficult for these people to get AM stereo radios out to the listening public ... get those chips to them.

And how do you think they accomplished the Kahn system decoding? I'll tell you if you first guess.

Ran into the GM of Kahn station KSL at the Target Tuning booth, by the way. You mean, sir, that you didn't know that there was no way your listeners could hear your station in stereo? Don't you talk to your engineer?



"DAT Head" announced the arrival of new technology.

If anybody out there wants to know if I saw that sign in Mr. Kahn's booth, the answer is "Yes."

☆☆☆

Some of the other nifty product highlights I saw were lots of telephone gear from Gentner, including frequency extenders and couplers. The company probably topped the list of most new products at the show with 23 in all ...

There's a console war going on. Radio Systems is leading the way with its \$5000 model, which many stations plunked down right at the booth (heck, some folks lost more than that at the roulette wheel, I'll bet) ...

There were new transmitters from a number of companies, both AM and FM ... and Harris looked pretty healthy despite a barrage of ugly rumors last year which seem to have abated ...

There's just too much to talk about, so see the product story in this issue and tune in our special and timely coverage (and this column) next issue for all the details.

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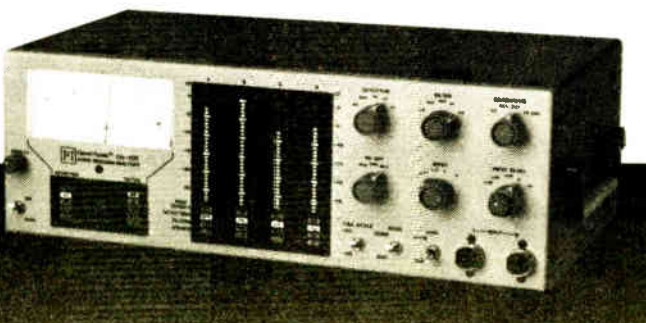
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World Radio History

OPINION

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

NRSC humbug

Dear RW:

Having witnessed in person the Michael Rau NRSC taped demonstration, let me say "Humbug!"

The demonstration switched between a non-NRSC, presumably Volumaxed program material and an NRSC-ed Optimod-AM. Yes, the NRSC-ed Optimod sounded better. Let me state that a Volumax with half its chips removed sounds better than a circa-1960 Volumax.

Next the demonstration showed the difference in splatter between a *preemphasized* signal and an NRSC-ed signal. I have to ask how much splatter would a non-preemphasized signal generate in comparison?

Rau is in charge of the NAB's Science & Technology department. I challenge him and any other NRSC proponent to start acting like scientists. The concept of a "control" element is known to the average fifth-grader. Yet this demonstration had no "control."

If we are going to A-B the effect of the NRSC pre-emphasis, let's keep the same audio processor in the chain. If we are going to discuss splatter, let's compare it to a standard "flat" signal.

Broadcasters, we are being sold a bill of goods by a group of people who think sizzle is hi-fidelity. What happened to the idea of a flat response? Why don't those who like sizzle turn their treble

control up on their receiver?

If we simply stayed with the response characteristics originally specified by the Commission we wouldn't have all this splatter. Maybe there was a reason for those specs!

Lastly, if we are going to use preemphasis, let's not pretend that the NRSC brick wall has no audible effect. Maybe it doesn't "ring" but the program material with a sharp cut off sounds like a phone line with sizzle.

Engineers who are concerned about this effect should call Mike Durrough and ask him why there is no NRSC brick wall retro-fit for the DAP-310.

I am tired of the NAB-NRSC promotional material telling me NRSC is right because Acme Processing Co. and Ajax Audio-Squash Inc. are making retrofits available.

All this proves is that they stand to make a buck if the NRSC is mandatory. I propose this: don't even make it optional.

William D. Fawcett, President
Mountain Valley Broadcast Service
Harrisonburg VA

AM's noise problems

Dear RW:

When are the AM broadcasters of this country going to stand up and demand that the real problem of AM broadcasting be addressed? The problem is *noise*! Noise from man-made sources and from a band packed with radio stations.

The plain fact is that when radio was first invented, modulation by amplitude was fine.

Anyone who knows radio history knows that many of the first AM stations had power levels of 10 to 50 watts, and a station with as much as 100 watts was thought to be powerful.

Now we read where daytime only stations granted power levels of 100 watts nighttime are not going to use this because they feel that such power levels are "pitiful" (*Radio World*, 15 February, page 7).

This should tell anyone that there is a difference between the good old days and today. The difference is the level of man-made noise that is interfering with today's AM signals.

The stations on the AM band need good programming and stereo is a plus, but to have a transmission system and receiver that can give the AM signal the "captured effect" that is enjoyed by current FM stations would really be the answer to the AM problem.

Sometime back in *Radio World* George W. Yazell of Lakeland, Florida told of his idea to broadcast with narrowband FM on the present AM band.

I really think this is an idea that is worth looking into. Mr. Yazell said that existing transmitters can be modified at a modest cost, and that the narrowband FM would be receivable by current AM receivers. The only problem he had was what to call the new service. How about low band FM?

The FCC's decision to freeze FM translator applications while it looks into possible abuses is a prudent move.

Since the technology was first authorized the FM band has grown and translator use has changed dramatically from the days when it was a simple repeater service.

The Commission's move to allow noncommercial educational translators to use microwave or satellite feeds also makes technological sense and will allow service to areas which have been underserved due to terrain limitations.

But the fears by some, notably the NAB, that the loosened restrictions may be extended to commercial translators and the outcry over a so-called

Misplaced Concerns

"low power FM" service are again evidence of an exclusivity many existing license holders prefer to competitive marketplace conditions.

The argument that a distant service can't broadcast in a local community's interest is a weak one. Many primary stations fall into formats

which tend to imitate each other and most play music from national playlists.

Even news and talk formats often syndicate the same network offerings. The introduction of a format which the community lacks may be more in a local area's interest than repetitive formats.

Most translators can't compete with the coverage of a primary station, either in signal strength or in local advertising revenue.

If a translator service finds enough listener and/or advertiser support to compete with primary stations, it should make little difference where the signal originates.

The FCC should rightly take action in cases where translators are found to interfere with existing stations. But in cases where there is no interference, the Commission should continue its free marketplace policy of allowing the largest number of stations a community can support.

And that should prevail regardless of where a service may originate.

—RW

Also in the area of AM improvements is Larry Tighe's plan for FM2, that is, radio allocation to a portion of the UHF-TV band. (*Radio World*, 15 February, page 2). This, too, is a plan that is worth looking into.

Let's face facts, there will always be new radio stations coming on the air, even though many of us radio owners feel that there are already too many stations. If this is a free country and anyone who is able has a right to put a station on the air there will be need for more space.

If the current AM band dies, and the plan for FM2 is written off, then all of the new stations will be packed into the current FM band.

Class C and B FM owners need to think about this for awhile, when the band is packed, the Commission is just going to reduce the separation.

If this happens there will come a day where you'll get class A coverage with 100 or 50 kW. Think it can't happen? Think again!

All of radio has a reason to work to bring the AM band back to good health. The way to do this is to finally start to work on the real problem: noise, not just AM stereo!

Jerry E. White, GM
WCLB Camilla GA

Carts vs. DAT

Dear RW:

Here's a few comments on the carts versus DAT column in the 15 December issue of *Radio World*, specifically in reference to R-DAT.

First, Sony and other R-DAT machine makers are to be expected to downplay R-DAT as a professional medium since many of them have more expensive fixed head DAT machines in the works for that market.

The durability of a consumer product

used at a radio or TV station may be a problem, though that depends on how well a particular unit is made.

There may not be a heavy-duty R-DAT machine available in the near future, but it won't be long in coming if the format catches on with broadcasters.

Remember, the first CD players were made for home use; however, that didn't keep them out of radio stations for very long. Nor was it all that long before "professional" models became available.

Secondly, there's no reason why one couldn't load a short piece of tape into a DAT case providing just enough tape for the intended use.

Set up the player to cue up on the first and only program and you have much of the "plug it in and play it" flexibility of NAB carts.

So it takes a few seconds for the R-DAT player to load the tape and cue up. If you've got two or three players in the CR, one or two can be loading while the ready one is on air.

It should work fine with all but the tightest formats. It's no problem at all if the station is automated.

Empty cases and bulk tape for DATs aren't available right now? They will be if enough people ask for them, especially considering how little needs to be changed in the manufacturing process.

If I were in the business of making analog cart machines, I may not be sweating it out right now. But maybe I'd be thinking more about a digital future or no future at all, rather than trying to fool myself into a false sense of security.

If I were looking at replacing a cart machine, it most likely wouldn't be with a new cart machine, not when I can expect to sell it for peanuts to a souvenir collector in a very few years.

Hey, lets face it, the days of analog recording are numbered.

Cart machines do have the advantage
(continued on page 13)

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Capacity Crowd For President's Address

by Alex Zavistovich

Las Vegas NV ... President Ronald Reagan, making his first appearance before an NAB Convention during his administration, used the show's theme of "Broadcasting and Democracy" as a backdrop for a major foreign policy speech.

The President, speaking to a packed house at the Las Vegas Hilton Pavilion on 10 April, used the opportunity to urge Soviet Premier Mikhail Gorbachev to "tear down the wall" against "the free flow of information and ideas."

Reagan also upheld his support of deregulation in broadcasting and stood

NAB Show Highlights

behind his veto of Fairness Doctrine legislation, while chiding the Senate for not confirming his nominees to vacant positions in the FCC.

President Reagan questioned why confirmation hearings for attorneys Bradley Holmes and Susan Wing have been delayed in Congress. Reagan named the two to fill slots on the FCC made vacant by the departures of former Chairman Mark Fowler and Commissioner Mimi Weyforth Dawson.

"I nominated Bradley Holmes to the FCC last fall, Susan Wing this past De-

cember," the President said. "Until these nominations are confirmed by the Senate, the FCC cannot operate effectively—yet for all these months, the Senate has failed to hold confirmation hearings, much less bring the nominations to a vote."

In his speech, Reagan linked the slowdown with his veto of the Fairness Doctrine. However, he supported his action, saying, "there is no reason to substitute the judgment of Washington bureaucrats for that of professional broadcasters."

But the President's address lingered less on broadcasting issues than on a foreign policy message aimed at the Soviet Union. Reagan is preparing for a May summit with that country's premier on the reduction in strategic arms and a zero-option proposal for intermediate-range nuclear forces in Europe.

Maintaining that the US is "dealing from a position of strength," Reagan contended that "strength works" in promoting freedom and peace. This strength is shown, Reagan said, in the support of strategic defenses.

He told the audience that, although defense is costly, "it is not so expensive when you consider what would happen if our defenses were permitted to fall."

The message of peace and democracy was further tied by the President to the "Broadcasting and Democracy" theme of the NAB convention. Reagan expressed belief in the need for a "free flow of information" between the US and USSR, facilitated by advances in technology.



President Reagan receives award from NAB's Wallace Jorgenson (l) and Eddie Fritts (r).

Equating the absence of such information flow with a "grim, invisible wall of oppression," the President echoed a message made to Gorbachev prior to the last arms reduction summit in which he urged the Soviet premier to tear down the Berlin Wall.

"I challenge Mr. Gorbachev to open the Soviet Union more fully to Western media," he said. He added that the Soviet public should have greater access to western electronic and print media.

"We have been too long divided, East from West," Reagan concluded. "Tear down this wall, Mr. Gorbachev, that our peoples might come to know one another—and together, build the world anew."

Following Reagan's address, NAB CEO Eddie Fritts presented the President with the first "Ronald Reagan Broadcasting

Award," in recognition of Reagan's contributions to broadcasting.

The President began his career as a radio station announcer, and has been called the "Great Communicator."

A capacity crowd, between 3,500 and 4,000, attended the President's speech in the convention center Pavilion. Several hundred convention-goers also watched the speech in the HDTV theater, where the event was carried live and also taped on high definition television. It was the first time a President was telecast and taped using the new technology.

Other attendees were able to view the speech from conference rooms during sessions, where the event was carried via fiber. Outside the convention center attendees were able to see, but not hear, the President's speech on a large video screen.

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STUDER REVOX

RF Mask Gets NRSC Approval



The NRSC met prior to the NAB convention to vote on an RF mask standard.

by Alan Carter

Las Vegas NV ... The National Radio Systems Committee (NRSC) has approved the transmission complement to the NRSC voluntary audio standard which went into effect last year.

The group, meeting here prior to the opening of the 1988 NAB convention approved publication of the NRSC-2, or so-called "RF Mask" as an interim voluntary standard effective 1 June.

Whereas the NRSC standard of 75 μ sec preemphasis and a 10 kHz stopband defined a station's signal from the studio to the transmitter, the RF mask is con-

cerned with the signal from the transmitter out.

The new standard calls for a station to comply with emissions standards that are more stringent than those currently allowed under FCC rules.

The RF mask was designed to address emissions, especially those of older transmitters, that may cause a station to exceed the NRSC standard at the point of transmission.

The committee made various revisions to the standard based on comments from members, transmitter manufacturers and others. Much of the discussion at the meeting centered on the testing procedure to be used to measure compliance with the mask.

New standard specs

Under the transmission standard, a station's signal should parallel the NRSC audio standard to 10 kHz.

As a result of discussion at the meeting the slope of occupied bandwidth in the transition region between 10 and 11 kHz is also expected to parallel the NRSC audio standard.

NAB Show Highlights

It should then be -25 dB to 20 kHz, -35 dB from 20 to 30 kHz, -35 dB plus 1 dB/kHz from 30 to 60 kHz, -65 dB from 60 to 75 kHz and -80 dB above 75 kHz.

In the previous proposal, the transmission standard was 35 dB plus 1 dB/kHz down from 30 to 75 kHz and 80 dB down above 75 kHz.

The changes at the most attenuated portion of the mask were made based on comments from transmitter manufacturers who noted transmitters of the future may be "cleaner" and may not produce as many spurious emissions.

Spectrum analyzer

The mask standard calls for measurements with a spectrum analyzer, but NRSC group members did not want stations to think purchase of the \$25,000 measuring device was a prerequisite for compliance.

The NRSC has been monitoring development of a splatter monitor by Delta Electronics to help measure compliance, but the device is still new to the market.

Several group members felt that field tests of the splatter monitor would be necessary before incorporating its use into the description of the mask.

The slope of the test limits was also changed at higher frequencies. Instead of dropping off at a continuous slope from -65 dB to -80 dB amplitude, the test limit will level off at -65 dB. The group felt there was no reason to have the test limit be more stringent than the standard itself.

On the issue of stereophonic conditions, the NRSC rewrote the section to address the problem of determining a standard signal that is stereo. The standard called for USASI noise which represents program material but is mono.

The section now states that two independent but equivalently designed USASI weighted noise sources are employed.

There was also some discussion as to
(continued on page 10)



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World Radio History

EPA Inaction Draws Workshop Criticism

by Alex Zavistovich

Las Vegas NV ... "The Environmental Protection Agency has been doing more foot-dragging than Quasimodo" over setting a standard for radiofrequency radiation (RFR) exposure limits, according to NAB Deputy General Counsel Barry Umansky.

Umansky, during a workshop on RFR regulation compliance at the NAB 1988 annual convention here, took the EPA to task over its inaction on RFR regulation compliance. The workshop featured Umansky, RF consultant Rick Tell and Bill Hassinger, the deputy chief for engineering of the FCC's Mass Media Bureau.

Moderated by consulting engineer Jules Cohen, the workshop panelists spoke to a capacity audience on a range of RFR compliance issues including preemptive federal RF standards and the FCC's position regarding control of RF emissions from broadcast antennas.

Regulatory concerns

The NAB is "concerned about regulatory trends" regarding RF emissions, Umansky said, and is anxious to have a "national, rational, scientifically-based" standard set for RF exposure.

Such a standard is needed, he said, to preempt state and municipal RF exposure criteria that are often confusing in that they show no agreement from one locale to another.

Uniformity would help broadcasters comply with emission limitations and reduce legal actions taken against stations that may exceed a local standard, Umansky commented.

Problems with conforming to local standards can slow a station's facility construction or upgrade plans, if a suit is filed against the broadcaster, he added.

However, the EPA probably will not issue a regulation this year or even next,

Umansky said. Without EPA action, no federal preemption can be legislated and the likelihood of FCC policy action in the area is "small," he claimed.

To help broadcasters comply with RF regulations, the NAB has set up a toll-free information number, 800-368-5644.

The FCC side

According to the FCC's Hassinger, the Commission has adopted RF exposure standards set forth by the American National Standards Institute (ANSI).

However, the ANSI standard, Hassinger said, is only a guideline the FCC uses to evaluate whether high RF fields at a site might pose a threat to humans.



If a high field is recorded at a site, the Commission requires that the owner "either keep radiation low or keep people out," Hassinger said. Means for keeping people out include barriers, warning signs, or even moving the antenna to a more remote location.

Fences around public access areas are considered adequate barriers, he noted, as long as the fences "mean business"—for example, one of 6' or more in height.

Stations can use their own data to support their claims of having a safe site, said Hassinger. However, he stressed that documentation of some type is required when filing a related application with the Commission.

In cases of shared towers or common sites, broadcasters have a "joint responsibility" to guarantee RF compliance, he said. The FCC general counsel has said the Commission can lower the power of stations failing to comply or take them off the air.

Hassinger also cautioned that new



Moderator Jules Cohen, the FCC's Bill Hassinger, consultant Rick Tell and the NAB's Barry Umansky discuss RF radiation rules.

legislation on the books has made tower relocation more complicated. Broadcasters must now take care that their towers do not pose a threat to endangered species, or intrude on sites of archaeological or historical significance or sacred ground of Native Americans.

Tower climbing

Rick Tell, former chief of the electromagnetics branch of the EPA, directed his presentation to the hazards of current induced in tower climbers, particularly those who work on AM towers.

RF fields are high on "hot" AM towers, he said, with strong radial and parallel field components. A parallel field can drive current through a climber's hands, and the loop formed by the climber's

body and the tower can exceed ANSI absorption standards.

To measure the specific absorption rate of RF in tower climbers, Tell climbed some of the structures himself. He found that the greatest emissions were at the tops of towers.

Occupational risk for tower climbers due to RF exposure can be reduced by having stations voluntarily lower power while climbers work on the structures, Tell said.

Tell also warned against the possibility of inaccurate measurements due to natural and meteorological conditions.

For more information, contact Barry Umansky at 202-429-5430, Rick Tell at 702-645-3338 or William Hassinger at 202-632-6460.

Mask Standard Approved

(continued from page 8)

whether or not the standard should actually be called a "standard."

The group decided to maintain the "interim" designation of the RF mask until test methods could be verified through field tests.

Unlike the procedure followed with the audio portion of the NRSC standard there will be no comment period on the RF mask which was approved. The mask will be published as a voluntary standard.

Also unlike the audio standard, the NAB has no plans to ask the FCC to

make the standard mandatory. Michael Rau, VP of Science and Technology said however, that the NAB was strongly urging the FCC to take action on its petition concerning the audio portion of the standard.

More than 700 stations have converted to the NRSC audio standard voluntarily. Comments received by the Commission on its NOI into AM technical standards generally favored a mandatory NRSC standard.

For more information on the NRSC, contact Stan Salek at the NAB, 202-429-5346.

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FCC Changes Translator Rules

by David Hughes

Washington DC ... In a two step decision, the FCC has approved allowing some noncommercial FM translators to be fed by satellite and microwave links, while proposing it for others.

In a 24 March decision, the Commissioners voted to allow noncommercial translators which are "owned and operated" by their primary station to use "alternative technologies" for signal delivery.

Previously the translators were required to be fed by an over-the-air link.

Stations affected by the rule change must also be located in the noncommercial FM band from 88.1 to 91.9 MHz, the FCC said.

"The new rules will allow improved service, but will not change the fundamental nature of translator service," the Commission said, "since noncommercial educational translators are already allowed outside the 1 mV/m contour of the primary station."

Noncommercial educational FM translators will still be secondary, restricted to the rebroadcast of a primary station, the FCC added.

While it approved the rule change for owned and operated noncommercial translators, the FCC, also on 24 March, released a proposal that would allow satellite and microwave feeds for all noncommercial FM translators.

According to Marcia Glauber, of the FCC's Policy and Rules Division, the proposal would affect translators that are owned by a third party, not just owned and operated translator facilities.

"The proposed rule change would increase the diversity of radio programming available to many segments of the population," the Commission said in its March announcement.

It added that by allowing all noncommercial stations located in the reserved FM band 88.1 to 91.9 MHz, to feed their translators by satellite or microwave links would provide "noncommercial radio service to unserved and underserved areas and improve the service by existing noncommercial translators."

"The new rules ... will not change the fundamental nature of translator service."

The Commission also said that with the rule change, "local organizations in remote communities may be more willing to pursue the construction and operation of a translator than would be the licensee of a full-service station located in a distant community and owned and operated by parties other than the primary station."

In addition to satellite and microwave links, the noncommercial translators could also be fed by broadcast auxiliary facilities, otherwise known as intercity relays, the FCC's plan indicated.

The Chicago-based Moody Bible Institute (MBI) had asked the FCC several times to allow it to feed its translators by

methods other than over-the-air feeds.

In 1984 the FCC turned down a MBI request and asked the institute to file again later, after the Commission could study the issue further. Moody again filed in 1985.

Jim Goodrich, MBI's assistant to the VP, said he was "quite pleased" by the FCC's recent actions.

While he acknowledged that there had been "a lot of misunderstanding about (MBI's) intentions," Goodrich stressed that the organization is interested only in improving its existing services and providing new services to unserved areas.

Goodrich added that the Commission has maintained that there are more than 3000 communities that do not receive any noncommercial FM services. "We want to fill some of those gaps," he said.

However, opposition to the FCC's actions came from the NAB.

In late March, the NAB Executive Committee said it would file a petition of reconsideration with the FCC asking it to prohibit FM translator signal delivery by satellite or microwave.

NAB President Eddie Fritts indicated that the plan could lead to the establishment of a new "low power FM service" in which a large number of translators across the nation could be fed by a single satellite feed.

He indicated that this service could harm the existing concept of locally owned and oriented radio stations.

Robert Fox, a member of the NAB Executive Board and CEO of KVEN/KHAY, Ventura, CA, said the NAB's radio members at the April NAB show in Las Vegas, were concerned that if the FCC further relaxed its restrictions on noncommercial translators, it could open the door for similar relaxations on commercial translators. (See the related article in this issue.)

He added that the increased use of satellite or microwave-fed translators would create a non-local form of radio, contrary to the locally based system of full-power radio that is currently in existence.

Also, in comments filed on the 1985 MBI petition, many individual broadcasters joined the NAB's stance in opposing satellite and microwave feeds for non-commercial translators.

At that time, many commercial broadcasters asked the FCC to limit the MBI request to prohibit the establishment of, as the management of KPSI, Palm Springs, CA, put it, "a single noncommercial, educational FM station ... with FM translators anywhere in the US without regard to need or relationship" to the primary station's area.

The item is contained in FCC docket MM 86-112. For more information contact Tatsu Kondo at the FCC: 202-632-6302. Contact Jim Goodrich at Moody: 312-329-4302. Contact the NAB at 202-429-5346.

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Freeze on New FM Translators

by David Hughes

Washington DC ... Many broadcasters oppose the FCC's recent action on translators and plan to fight to deny an expansion or liberalization of the translator rules.

"We want broadcasters to file comments on the plan with the FCC," said Robert Fox, CEO of KVEN/KHAY, Ventura, CA, and an NAB Executive Board member.

Broadcasters who attended the April NAB show in Las Vegas "were very concerned about the issue," he said. "They want to preserve the integrity of the FM band. This (FCC) proposal puts that in question."

"We could end up with a national network of unregulated, low power radio," Fox said, "while full power radio stations are regulated and licensed to serve the public."

On solving what many broadcasters see as an existing problem with translators being placed in distant markets, Fox said it would be doubtful to get rid of translators already on the air. "We would have to settle for just stopping the new ones," he said.

Commission action

The FCC imposed a freeze on new FM translators in conjunction with a new inquiry to "reevaluate the proper role of FM translators in the radio broadcast service."

In an action which took effect 24 March, the Commission imposed a "general freeze on the acceptance of ap-

plications for new FM translator stations pending (its) final action in this proceeding."

The freeze and new study come in response to a series of requests from the NAB, which has argued that many translator operators are "abusing" the FCC's rules by extending signals from a station's home market into markets already

“ ————— ”

We could end up with a national network of unregulated, low power radio.

” ————— ”

served by numerous local signals.

Last November, NAB officials met with FCC Chairman Dennis Patrick about the issue. At that time, Patrick promised that the FCC would examine the issue in early 1988. Those promised FCC actions came in March.

However, broadcasters, particularly the NAB, are fearful that the FCC may be leaning more toward liberalizing the rules—creating satellite fed translator networks—instead of tightening the rules to reduce the number of existing translators which compete with full-power stations.

In its 2-0 vote, the Commissioners voted to implement a freeze on new

translator operations and open a study of the issue. Chairman Dennis Patrick and Commissioner Patricia Dennis voted for the action, while Commissioner James Quello abstained.

Translator applications received by the FCC prior to 24 March will still be processed, the Commission said. The freeze also applies to applications for major changes to existing translators.

However, the FCC said it will still process applications for noncommercial translators for the noncommercial band 88.1 to 91.9 MHz.

Along with the freeze the FCC said it was seeking comments on a possible rulemaking procedure or Notice of Inquiry.

The Commission maintained it wants to "develop information" to assist it in "evaluating the role of FM translators in the provision of FM radio service."

It said it wants to study "the effects of such stations on the service provided by full-power FM stations and the impact of any possible changes to the current translator authorizations on the Commission's resources and enforcement activities."

Reassessment

The FCC also plans to reassess the impact of translators on competition, spectrum efficiency and on the FCC's processing and enforcement resources.

It added the Commission is seeking comment on "whether it would be appropriate to retain, strengthen, relax or eliminate the current restrictions on the operation of FM translators."

Current rules allow a translator to rebroadcast only the signals of a full-service FM station or another FM translator. The signals must be received directly over-the-air.

The rules, according to the Commission, also prohibit translators from originating their own programming, except for 30 seconds per hour in order to "solicit and/or acknowledge contributions to defray installation and oper-

ating costs."

While the Commission's action comes in response to petitions filed by the NAB, the association is clearly worried that instead of tightening the rules, the FCC may relax them.

The NAB has asked the FCC to prohibit the use of translators to expand the service areas of the primary FM stations. It also asked the Commission to reduce the possibility for interference from translators.

"The NAB petition," the FCC said, "argued that the current rules do not clearly reflect the Commission's original intent that such stations provide only supplementary service and that, as a result, many abuses are occurring that are posing problems for full-service stations."

The NAB and other broadcasters, such as Lindy Williams, VP/director of engineering for Lotus Communications, point to markets such as Tucson, AZ, as examples of translator abuse.

Even though Tucson has a full complement of local stations, the signals of two Phoenix stations are beamed into the market via translators, according to Williams. His firm, Lotus, owns a full power station in Tucson.

He maintained that a 10 W translator perched atop an 8000' mountain put in a stronger signal than a Class A operation would.

"Worst of all worlds"

In a statement following the FCC action, the NAB stressed that the Commission's inquiry could result in the creation of a new "low-power FM radio service," such as a system of translators fed by a satellite feed. The NAB said this would be "the worst of all worlds" to both broadcasters and the public.

NAB President Eddie Fritts indicated that even though there will be more signals in a community, those additional signals will not provide any local content.

The lone abstaining FCC vote, Quello's, *(continued on next page)*



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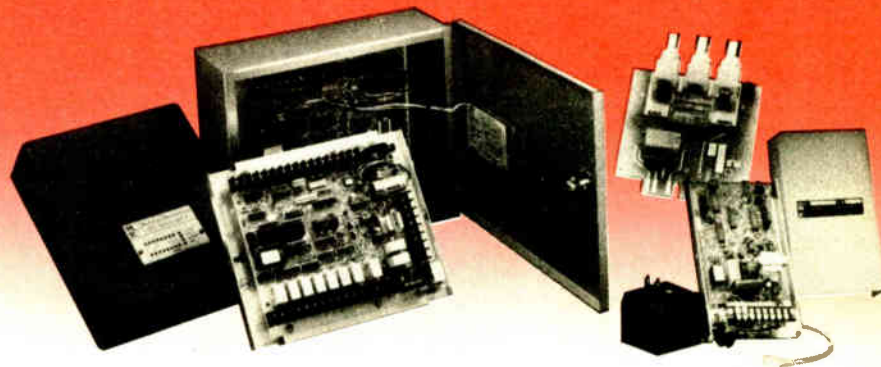
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FCC Begins Translator Inquiry

(continued from previous page) was reported as favoring tightening of translator rules to the favor of local broadcasters.

Following the FCC's actions on the translator issue, the NAB Executive Committee said the association will ask the FCC to "enforce existing translator rules to end translator abuses."

The other side

On the other side of the issue, translator operators have argued that they often provide formats that are not offered in the local market.

John LaTour, of Power-duPree Broad-

casting, which owns about 40 translators throughout the south, said that despite the negative comments from the NAB, he sees the FCC's move to study the issue and institute the freeze as a positive step.

His firm submitted a petition to liberalize the translator regulations in 1986. When it was first submitted, the FCC did not do anything, he said. "Now, it will ask for comments on it."

"I am encouraged that something is happening. Something is better than nothing," LaTour added.

He stresses that if the Commission is to make the translator regulations more liberal, it will have to be sold on the "program diversity" issue.

Many of his firm's translators relay formats into markets that do not already have similarly formatted stations, LaTour said.

"Existing radio stations cannot handle the narrow interest," he maintained. "In many markets, my (translators) provide the only religious or the only urban contemporary format."

"(FCC Chairman Dennis) Patrick is going to have to look at the programming issue, in which the more format choices an area has, the better," LaTour said.

If there's a market ...

"If there is a market for low power FM translators, then why not have them," LaTour said. "If there was not a need,

then we'd go broke."

He added that broadcasters should not even be afraid of a satellite delivered programming service for translators across the nation.

If a particular format flourished on a translator, a local broadcaster, with a much stronger signal, could easily capitalize on the format, La Tour said.

"What we want to do is to serve narrow fields, and in order to do that we need the cost savings that translators could provide," he said.

La Tour added that with modern technology, he could provide automated local response cut-ins at satellite fed translators.

The FCC docket is MM 88-140. For more information contact Marcia Glauberman at the Commission: 202-632-6302. Contact John LaTour at 501-443-7878. Contact Robert Fox at 805-642-8595.

Readers' Forum

(continued from page 5)

of being mechanically rugged. It is fairly difficult for an operator to really mess one up, though it has been done.

They will work after a fashion even with abuse and poor maintenance—not at their best, but they'll work. Keeping one working at its best though is almost a mystical art. Well, maybe not, but it does require a lot of fuss and bother.

R-DAT machines most likely won't offer the same kind of durability provided by cart machines. So what? An R-DAT machine will provide R/P capability for less than \$400 initially, and that will drop to less than \$200 in a few years (about 1/10 the price of a good R/P cart deck).

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So, anyway, until S-DAT machines make it to market, or a commercial grade R-DAT recorder comes along, you can get some experience with digital recording.

The only folks who really have something to lose are the ones who make analog tape recorders and don't have a digital deck at least in the works.

Andy Melnyk
Northboro MA

FMX Chosen

(continued from page 1)

with Sprague about three months behind.

At the 1988 NAB convention, Torick said six brands of FMX home receivers and seven automobile receivers were on display in the prototype stage.

Torick said his most common question from Japanese manufacturers is how many stations are FMX and where they are located. The CBS conversion, he noted, gives him a significant response.

"I'm hoping that in the Christmas market, you'll see some receivers coming in," Torick added.

Torick said BTP is gearing up for a public relations campaign directed at consumers, but not excluding broadcasters. The company has already obtained a new logo for the FMX system.

For more information on FMX, contact Emil Torick at 203-622-2643. The contact on CBS information is Helene Blieberg, 212-975-3771.

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We take our service commitment seriously. Because we know that if you're off the air, everything stops. Except the expenses.

Q. Which manufacturer offers formal technical training?

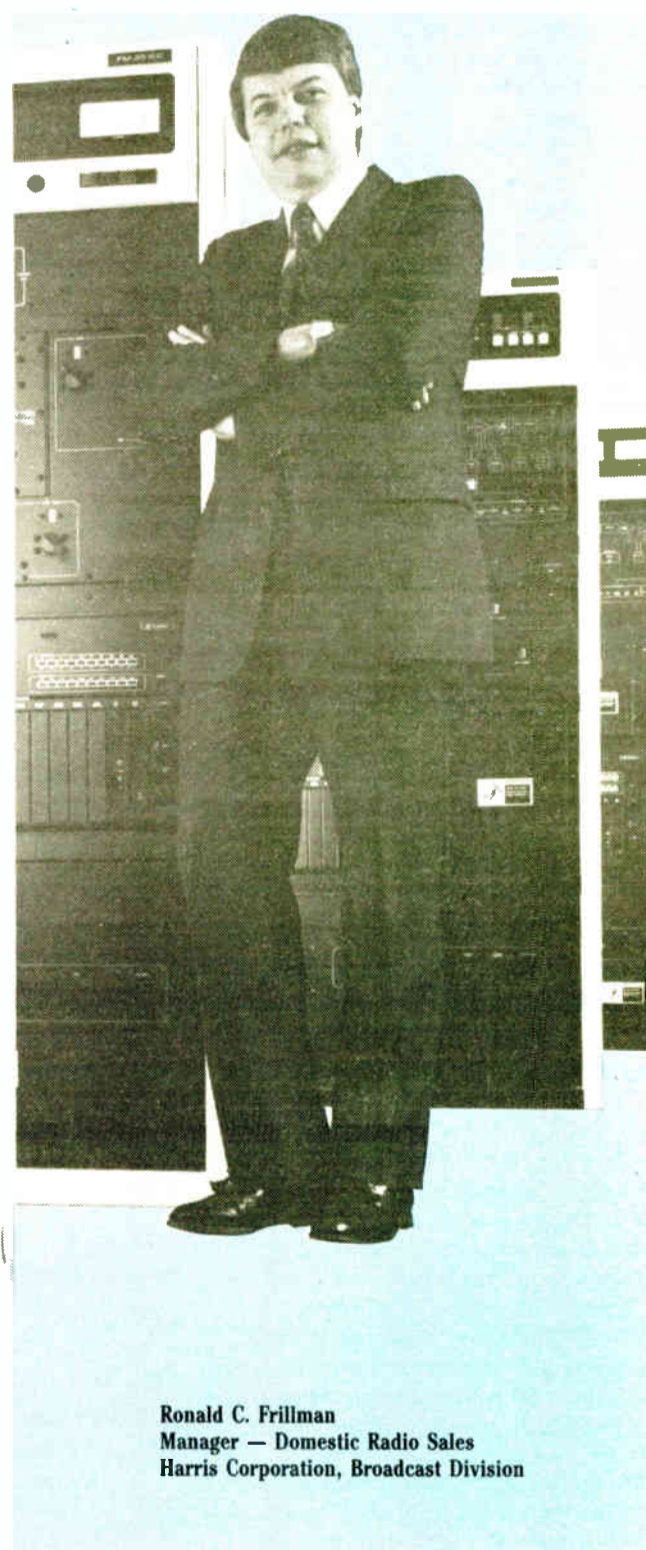
A. ONLY HARRIS. We know station engineers retire . . . that new engineers come on board . . . that engineers move from studio to RF systems maintenance. And we know that those who keep your equipment on the air need to be in the know.

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Turn-Key Firms Attract Stations

Editor's note: This is part two in a multi-part series on the recent and predicted growth of systems design in the radio broadcast industry. In this segment, we examine radio stations' needs for systems design from outside firms.

by David Hughes

Washington DC ... The need to get equipment installed quickly while preserving the bottom line, and the decline in the number of qualified engineers are fueling the growth of outside systems design firms, according to some radio station managers.

An increasing number of radio station owners are going outside, away from their own engineers, to firms offering entire turn-key systems. Instead of relying on their in-house engineer or engineering staff to design a new studio or transmitter site and then pick the gear, station owners are more often going to one firm to get the whole job done.

Special Report

Linda Rando Baines, GM and co-owner of WFAL, Fallmouth, MA, has very positive things to say about outside systems design work.

The station relies on a contract engineer, and designing and installing a new studio from the ground up may not have been within the engineer's schedule or scope of services performed for the station.

She contacted Radio Systems Inc. (RSI) to provide a turn-key package deal for her station's entire physical plant, apart from the tower and the transmitter building.

The station, WFAL, went on the air in February 1987, but Baines had contacted RSI in August 1986, even before the station had received all its final permits.

From the ground up

Baines said that having to deal with a variety of different equipment suppliers herself would have been "time consuming."

Yet, there were still some hurdles of having to deal with a systems firm, she said. To start, there were the initial sessions of having to sit down with the system provider and decide on a variety of equipment manufacturers—all the way down to who would supply the splicing tape.

"That was somewhat eye opening," Baines said. Still, she maintains that the procedure was valuable for her and she was glad she chose a systems firm to do the work.

"It was a good decision. But there was just so much to contend with. However, we got blanket discounts on equipment, and all the wiring was diagrammed," she said.

"And, if there were any problems, which there weren't, we would have had to deal with only one person," Baines added. WFAL relies on a contract engineer.

Even though WFAL needed the services of an outside firm for its entire operation, the need at established stations varies widely.

Gary Liebisch, CE/radio with WPTF/

WQDR, Raleigh, NC, said his stations have four engineers on staff and do not have the need to go to an outside firm for station upgrade projects.

While the stations did order nine rooms of furniture from an outside firm when they recently moved studio facilities, the stations have the engineering capacity to handle the rest of the work in-house.

Liebisch said he does, however, see a growing trend toward the use of outside systems firms at small and medium market stations. "They don't have a fulltime CE and when they make a facility move, the only way to go is with a systems firm."

He also advises stations seeking out-

side systems firms to do their homework and to pick a firm that has handled a number of similar projects. He advises selecting a company that is not too far away to insure easy access between the firm and the station.

Larger markets

But the trend toward systems work is also evident from station personnel in larger markets.

Dennis Ciapura, VP technical operations with Noble Broadcasting, said he notices a trend toward systems work, but says that his station group still relies heavily on local contract engineer firms.

However, two projects at his firm's XETRA-AM-FM operation in Tijuana,

Mexico, which serves the San Diego market, required the use of Allied's new systems division.

One project, a new on-air studio, needed to be completed in only six weeks and because of the speed of the project, Allied was called in, Ciapura said.

"We had a (broadcast) crew ready to go for a new morning show on our AM and we needed to get the studio materials quickly," he indicated.

Ciapura also said that some projects, because of their complex technical nature, also call for the expertise of an outside systems firm.

Recently XETRA needed to install a satellite downlink for its coverage of NFL Football games, in which it also used Allied.

Ciapura said he has witnessed a decline in the number of what he terms *(continued on page 21)*



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When Your FM Interferes With TV

by Conrad Trautmann

Westport CT ... Relocating an FM radio transmitting facility from a remote hill-top to a downtown area in the most populated city in the state forced WEBE's engineering staff to quickly become acquainted with FM interference to TV reception.

Expanded signal coverage for WEBE prompted our move to Bridgeport.

Interference problems were something that had not been given priority due to the many other demands of building the new facility. But we soon learned we had to deal with them quickly and efficiently.

Not only was the result of our work positive but we believe it helped our station gain listeners.

Distant reception

The new WEBE transmitter site is approximately 40 miles outside New York City where TV reception from the New York stations becomes marginal.

Put a 50 kW FM radio station on top of those residents trying to view NY TV and interesting things begin to occur. The most notable is WEBE audio overriding the audio for NY's public station Channel 13.

WEBE broadcasts on 107.9 MHz and Channel 13 broadcasts on 210 through

Conrad Trautmann has worked at several stations and was studio engineer for the American Comedy Network. He is currently consulting engineer for WCFS-AM and CE of WEBE-FM both in Westport. He can be reached at 203-853-9108.

216 MHz with its audio on 215.75 MHz. WEBE's second harmonic is a discomfitingly close 215.8 MHz.

FCC rules state that second harmonic transmissions should be 80 dB below the unmodulated carrier [73.317(d)]. Measuring our second harmonic proved it was well within limits.

The interference was being caused by the overloading of televisions or signal amplifiers (FM blanketing).

Since television reception is marginal in the vicinity of the new WEBE site, most antenna installations use a signal booster.

These boosters see the strong FM signal, become overloaded and cause internal generation of the second harmonic.

TVs without proper filtering will demonstrate the same effects. In addition, homes with more than one TV usually will have a signal amplifier/splitter in line which can experience the same overload problems.

The responsibility of the radio station in this instance is outlined in the FCC rule on FM Blanketing Interference.

A station determines the area of responsibility by the formula $R^5 = 0.245 \cdot \sqrt{P}$, where R is the radius (in miles) and P is the ERP in kW. WEBE's area is a radius of 1.73 miles from the base of the antenna tower.

This is the area in which a station is responsible for investigating all complaints.

The rule also states that the radio station is not responsible for TV receiving antenna installations using high gain antennas, improperly installed

antennas, signal amplifiers or mistuned receivers.

In WEBE's case this would have relieved the station of any responsibility for most of the area residents. But since we were interested in this town for listeners, it would not have been in our best interest to only follow the rule to the letter.

WEBE investigates every complaint called in and if possible will cure it, no matter where or what type of equipment is used.

Another important point in the rule is that a station making a major facility change is responsible for all complaints within its blanketing contour for a period of one year from the change.

Checking the antenna

Curing the TVI problem may sound easy in theory—install an FM notch filter in the system to prevent the overload. But, in reality, many antenna systems are complex.

The first thing to do when arriving at an interference complaint is to look at the antenna, if it's mounted outdoors.

Many signal boosters are the mast-mount kind and glancing up will tell you if this is the case. An FM trap must be installed on the input to any signal amps or boosters in the system.

If the booster is being overloaded, putting the trap on the output will have no effect. The second harmonic will have already been generated and will pass through the FM trap.

Many signal boosters have FM traps built in and it can be as easy as throw-

ing a switch to drop it in line. Others must be tuned to the FM fundamental frequency. Since many roofs can be dangerous to climb, WEBE hired an outside contractor to handle those.

FM trap

The next thing to look for is where the down lead comes into the house. Most will come into the attic or the basement.

This is helpful since many residents have more than one set and the splitter can usually be found in either of those locations.

Installing one FM trap on the input to the splitter can cure the TVI on all of the sets in the house.

The FM trap WEBE usually used in these installations is a 75 ohm broadband type (Macom Model 'FMT-88'). It will cover the entire FM band from 88 through 108 MHz (for areas with Channel 6, Macom Model 'FMT' covers 95 - 108 MHz).

These are the least expensive type but can cause problems when the complainant is also using the antenna system for FM reception.

In this case a tuneable FM trap must be used (General Instrument 300 ohm Model 'RFT-300').

This will allow tuning to just the frequency of your station and will notch enough signal to clear up the TV and still enable the complainant to listen to all FM stations, including your own.

These tuneable filters also work well when FM receivers are overloaded. Both types of filters provide an attenuation
(continued on next page)

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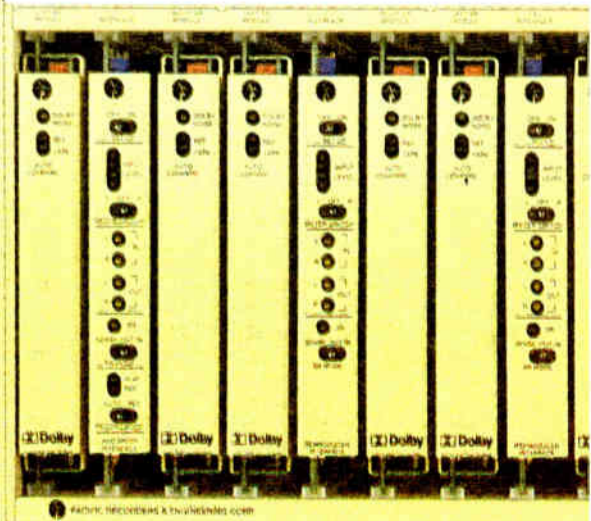


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Look Beyond Rules For Answers

(continued from previous page)
of approximately 20 dB.

In cases where the location is very near the tower, these filters may not work.

Putting two broadband FM traps in series will sometimes work, but in the most severe cases Blonder Tongue makes a 75 ohm tuneable filter that will provide a 60dB notch (Model 'MWT-2B'). This has never failed, even in the most severe case.

Most new consumer TV products are being sold equipped with a 75 ohm input which makes the installation of the broadband (75 ohm) trap very simple.

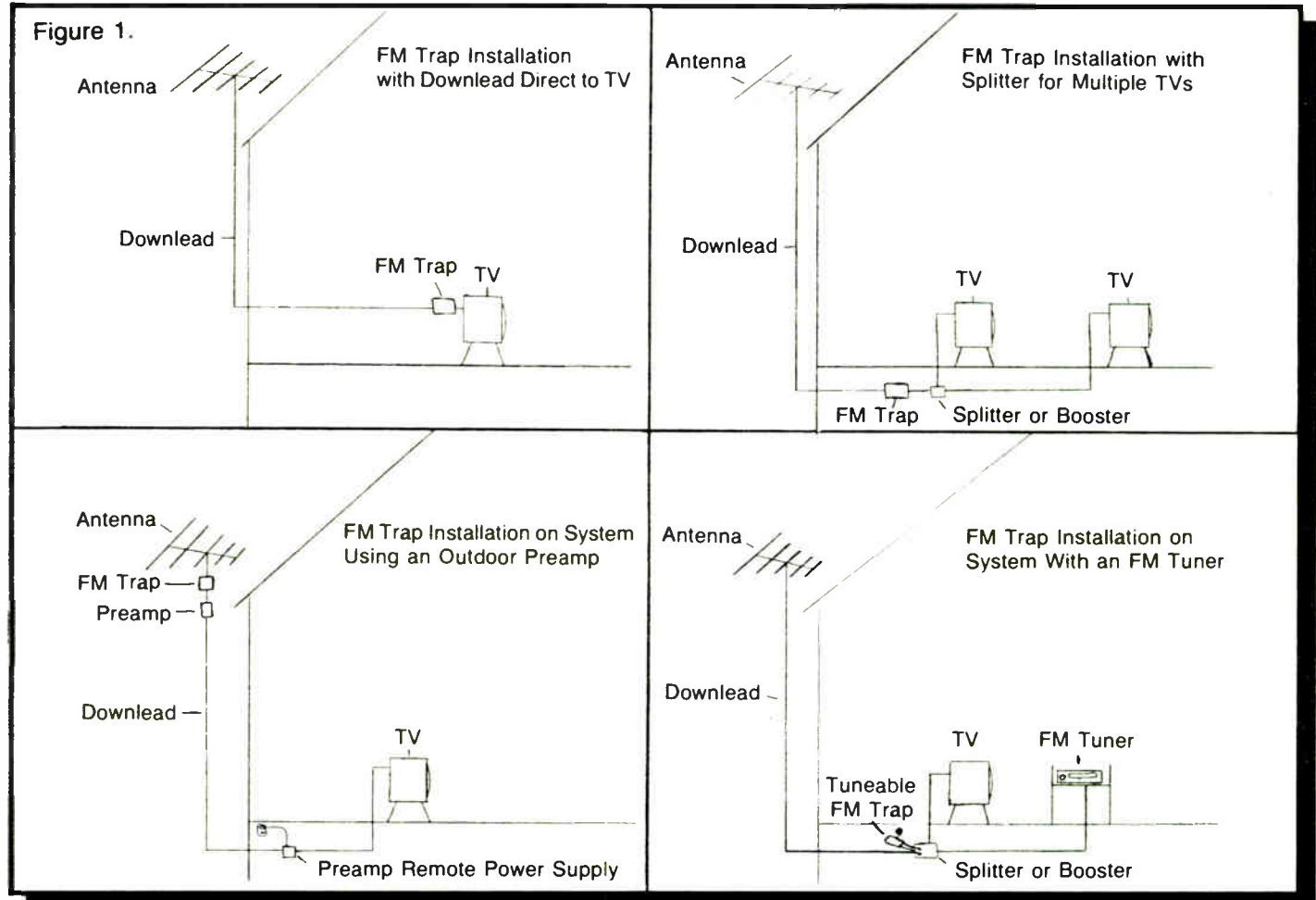
When the system is 300 ohms, switching to 75 ohms to accommodate the trap is not difficult.

A matching transformer (Macom model 'CM-3P' or 'TR-2') can be used to convert from 300 ohms to 75 ohms and if need be, to switch back to 300 ohms again. The same is true for a system where a tuneable (300 ohm) filter is necessary in a 75 ohm system.

In order to protect the radio station when clearing up interference complaints, it is advisable to devise a release form which the complainant signs before any work is done.

It should state that the installer and the radio station are not liable for any problems occurring due to the installation of the filter. This will prevent someone from claiming he/she wants a TV or new antenna replaced.

Once the problem of interference was recognized, WEBE mailed out an explanation of why the interference was oc-



curing and how to cure it, to all of the local area television and antenna repair companies.

This explained to those who were not familiar with FM blanketing interference and the amplifier overload phenomenon

how to cure the problems they encountered or to forward calls to the radio station.

Some literature currently available on this subject includes *The Interference Handbook* issued by the FCC, available

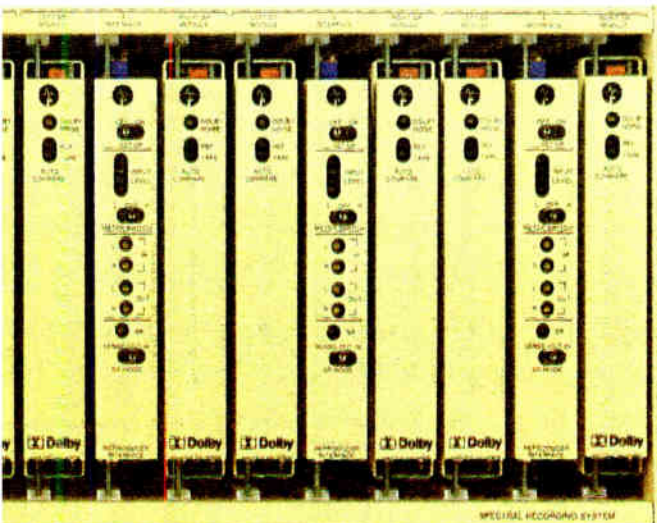
from the U.S. Government Printing Office.

Also useful is *Radio Frequency Interference, How to Identify and Cure It* published by the American Radio Relay League in Newington, Connecticut.

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Maintaining A Mountain Site

by Tim McCartney

Boise ID ... Why do broadcast engineers in western states climb mountains? Because they are there? No, the reason is that's where the transmitters, towers and antennas are found.

Every mountain with its broadcast equipment at the top poses a unique challenge for maintenance.

A 9,000' solar-powered site 80 miles east of Boise makes a great translator location.

Despite the fact that the topographical maps show little chance of a direct off-air pickup from Boise, the signal is heard strong and clear. Mountains care little for theory classes; they are more the

"hands-on" type.

This mountain is accessible by four-wheel drive about six months a year. The rest of the time it's a "snow-cat" or snowmobile. Similar situations exist in any mountain over about 5,000'.

The 7,000' elevation of Deer Point Mountain 10 miles from Boise is the only realistic choice for FM and TV stations which must cover the valley desert, and some of the mountain communities.

Naturally that's where all the FM and TV transmit sites are located. Of course, there's a price to pay for such great line-of-sight.

Winter is obviously the most challenging time of the year in terms of access.

First, a scenic drive up the sometimes

icy switchbacks is in order. If fortunate one can avoid the long line of impatient skiers driving the same road. Then it's on to one of a few routes to the top.

Ski lift

The budget crowd, or those with just a small amount of work, heads for Bogus Basin Ski Lift Chair #1. The lift takes seven to 15 minutes to reach Deer Point. From there, it's another five minutes by foot, usually with the aid of snowshoes.

The ski lift route to the top is fine until the lonely return trip down. Most people have no idea what it's like to defy ski logic by riding a chair lift down.

So, every would be Robin Williams on the way up feels compelled to offer bril-

liant observations such as, "Are those skis you're wearing?" Or, the standard (and my favorite), "Hey, you're going the wrong way!"

The perpetual repetition of these same two lines certainly subtracts from the otherwise beautiful ride down. And, it makes one wonder where the truly witty people ski.

Caution is still mandatory on the return leg amid such fantastic humor. My first ride down was memorable. As the ski lift operators forgot about my isolated existence I ended up with a skier in my lap.

If economy of travel is less critical, or something heavy needs to be transported up, a snowmobile usually suffices. But not every station has one.

If it's a very heavy load a snow cat is needed, capable of seating four people inside and hauling a cargo sled weighing some 1500 pounds.

Even fewer stations have one of these monsters. And, the ride is much rougher than one might guess—the one I rode up in was built by Morton Thiokol.

The time, difficulty, and uncertainty involved in reaching this summit long ago led to the development of an alternative to travel itself: year-around, live-in engineers.

Two of the TV stations maintain residences for engineers who rotate responsibilities each week, via a local co-op of participating stations.

It's kind of like those National Geographic TV programs in which scientists study arctic life isolated at the North Pole for months on end.

Mountain maintenance

These mountain engineers perform regular maintenance on their own stations' equipment, but also work for others in the co-op.

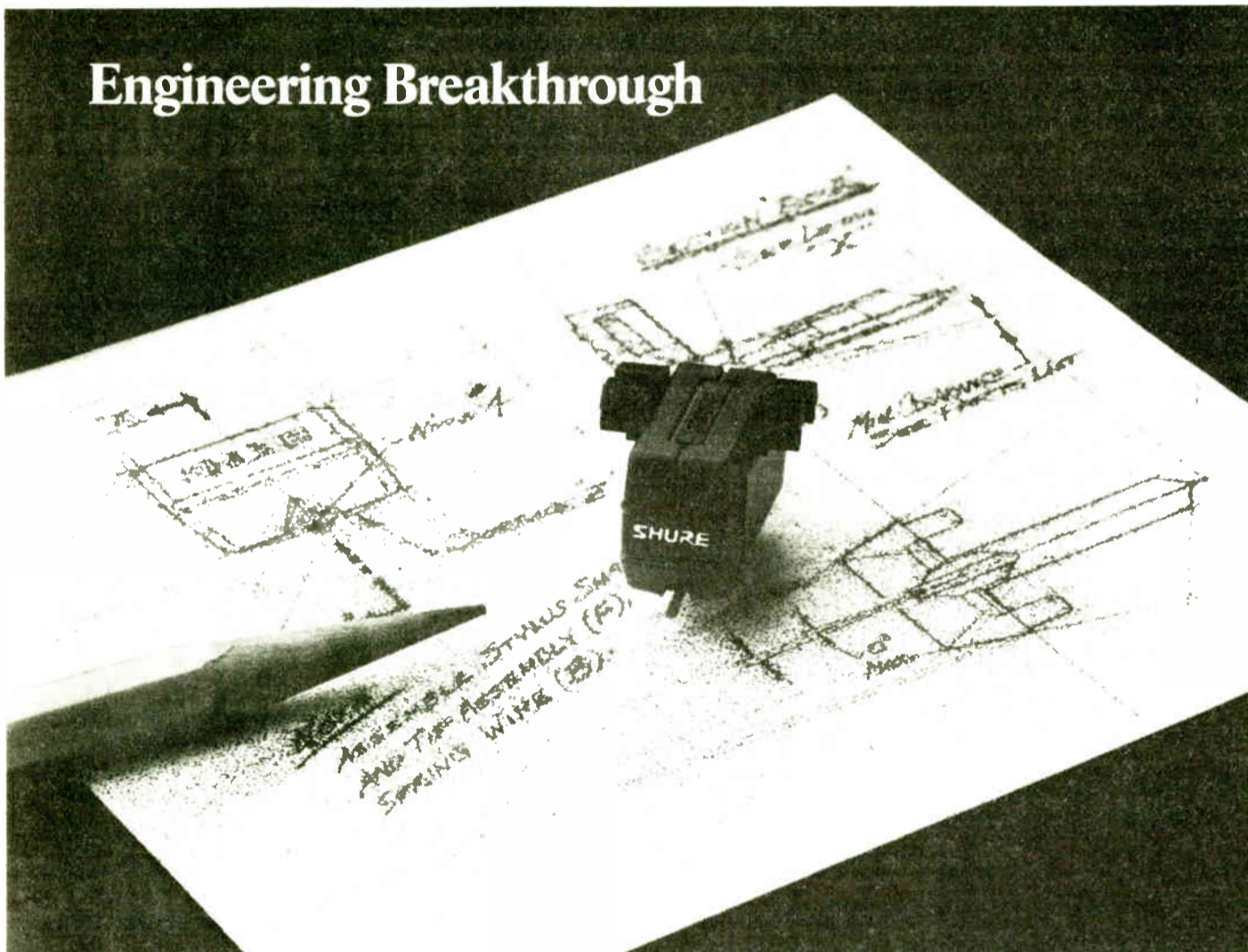
For example, after one of the six or seven annual lightning storms, they will be working around the clock for a couple of days trying to keep everyone on the air.

After resetting breakers and patching together microprocessor-based equipment, they may get some rest.

If the damage has been on the RF component side it can get very difficult. The lack of a good earth ground on the mountain leaves all stations vulnerable to each lightning storm.

These live-in engineers snowmobile in and out each week hauling a sled full of

(continued on page 21)



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Circle Reader Service 11 on Page 10

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Circle Reader Service 16 on Page 10

Pulling Circuits Out of a Hat

by John "Q" Shepler

Rockford IL ... "Geez, I wish I had a circuit that would ..."

How many times have you leaned back in your chair trying to figure out how to invent an electronic solution to a knotty problem. You play with it in your head. What if ... no, that's too expensive.

How about ... no, they don't make that. It would be too complicated anyway. So, you tell the PD it's just not possible. He'll have to do without.

But, wait! Suddenly a circuit flashes into your mind. It's a circuit you saw in an article five years ago.

Luckily, you cut it out and slipped it into the accordion file with the other studio interface circuits that you've been collecting over the years.

There's the file in your desk now. Just a quick afternoon of soldering parts on a perf-board and by-golly you're a hero again.

How to get started

Let those creative juices flow. Design whatever it is you have in mind.

Don't have a clue as to how to build a cue detector or automatic fader? Just draw an empty box, label it with the needed function, and continue inventing the rest of the system.

The empty boxes will get filled in later. Just assume that you'll come up with those circuits when you need them.

Okay, the automatic self-aligning expando-compresso phase-locked densiometric bass processor is all scoped out on paper. It's time to fill in those empty

boxes with real circuits. What now?

First, know that any creative problem has many solutions, several of which may be equally as good. Don't worry about finding the perfect solution unless you want to make a game out of becoming a super specialist in say, audio level control.

For the rest of us an electronic fader, for instance, can be made of many things. You can buy an attenuator chip, such as LM1035, MC3340 or TCG802, or use an analog multiplier with the audio as one input and a DC control signal as the other.

Q-Tips

You can make a circuit using FET's or forget the electronic approach and drive a carbon pot with a small DC motor. Hey, it works for transmitter remote power control.

Or you can "kluge" up something else. A while back I needed a way to fade automation audio to join a network. The system came with such a function built into the line amplifier.

However, the amps had 3% IM distortion designed in and the electronic attenuator was a major contributor.

Finally, in total frustration I gutted the amplifier chassis, bought two DAP 310 line amp cards from Mike Dorough (which had the needed quality and sensitivity) and created the fader from an LDR.

The LDR was a light bulb and dual resistive photocells which were transpar-

ent to the audio. When power is removed from the light bulb the cells go dark and their resistance climbs rapidly, attenuating the audio very cleanly but fast. Put a large capacitor across the bulb filament and the fade is slower.

This isn't quite the end of the story. If you've used LDRs you know they are notorious for burning out and leaving you with dead air.

The solution was a normally closed relay across the LDR which pulled in when the Fade button was pushed. If the bulb blew during normal operation, the relay maintained the audio circuit.

The moral is: it doesn't have to be pretty to sound good.

Circuits are everywhere

Still having trouble coming up with circuits after that story? Let's see what else we can find.

Check those scrapbooks. You've got to have a spiral bound notebook or at least some manila files set aside for great circuit finds. They never show up when they're needed, so you have to clip and save the best ones over a lifetime.

Many of these will be your own creations, possibly to solve some mundane problem at another station. Keep notes as you go, you'll need them again in a couple of years.

How about magazines? If you can't

bear to chop up your RW's, at least photocopy your favorite circuits so they can join the scrapbook.

You can also get a wealth of circuit ideas from electronics hobbyist magazines. You can visit the newstands, or save money by finding back copies at hamfests or auctions. You'd be surprised how many neat ideas those magazines contain.

Don't ignore books. There are two really hot sources for readable electronic books, Howard Sams & Company and Tab Books Inc. Most bookstores have some of each, although not much of a selection.

Last week I stumbled into a gold mine of Sams books at a TV parts distributor. Parts distributors always seem to have the best selections in town.

If you're out in the boonies, the best idea is to write to the book companies and get a new catalog. Howard W. Sams & Company is located at: 4300 West 62nd Street, Indianapolis IN 46268.

Tab Books Inc. is at: PO Box 40, Blue Ridge Summit PA 17214.

You can also get good book deals from a book club, but be careful about picking the right one. Some clubs cater strictly to hobbyists, others to computer buffs and others to industrial design engineers.

Maybe you don't need to buy a lot of books. Check the selection at your college or public library. If yours is typical, the shelves are just oozing with circuit

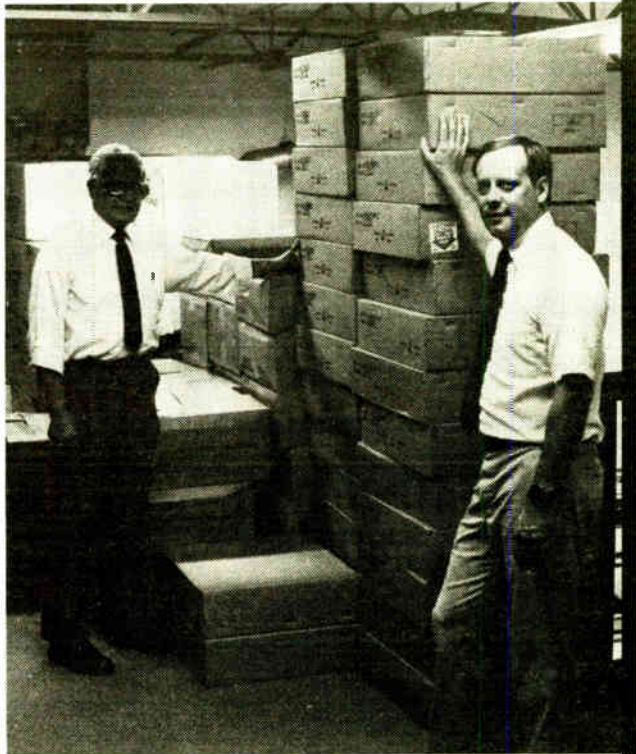
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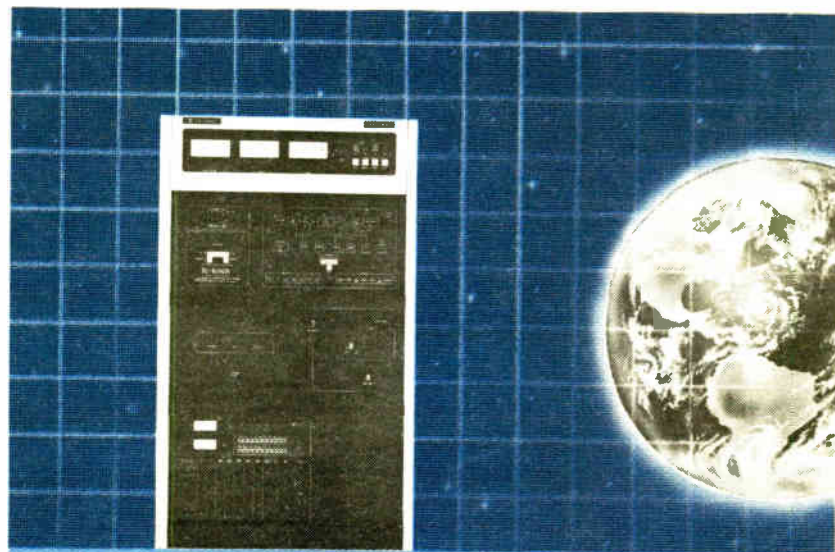
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Processing For Compact Discs

by Stephen Waldee

Part I of II

San Jose CA ... The digital audio revolution has brought the necessity for stations to treat the compact disc as a higher fidelity program source than the older analog LP.

The 90 dB dynamic range of the CD has enabled record producers to abandon their commonplace practice of protective peak limiting in LP disk-cutting.

I had long suspected that the CD versions of favorite LPs had a wider dynamic range than vinyl discs.

I felt this to be true from the vital im-

part of their sound in home listening, and the tendency of classical CDs to fade away to inaudibility or to seem generally softer in overall volume than comparable vinyl disks when heard over my favorite radio stations.

The brighter mixes of pop and rock CDs may even occasionally overload the cart equipment used to tape them for air-play, with a resultant mush or sibilance distortion.

Flat vs. boosted

This characteristic brightness of CDs in large part results from the flat audio power bandwidth—all the way up to 20 kHz at full level. Whereas the preemphasis on the RIAA curve for LPs res-

tricts the headroom over 17 dB at the high end.

In the classical category, a typical symphonic work may be loudest at the very end near the LP record label. This is where the combination of inner-groove distortion and reduced velocity restricts the response and clarity of transients.

On a CD, however, the most linear response is to be found just below the 0 dB recording point, where the highest levels of quantization are possible.

Of course, there is no inner-groove distortion, and the loudest climax should ideally be uncompressed and free from sonic congestion.

In this era of transition from the LP to the CD, a typical radio station programming department is confronted with the need to "seamlessly" integrate the compact disc into the predominantly LP/45 playlist (generally recorded onto cart).

My measurements show some basic differences between the digital and vinyl media, and I'll suggest ways to treat the individual sources for consistency.

Early dynamics

Recordings mixed in the 1950s on standard VU meters have most of their energy in the -20 to +3 VU range.

The average-to-peak values can be easily accommodated on most broadcasting audio processors, providing a clearly audible program for either car or home listening.

Even the classical recordings of the 1960s rarely achieved the true dynamics of the symphony orchestra.

The mainstream record companies

Figure 1. Beatles LP

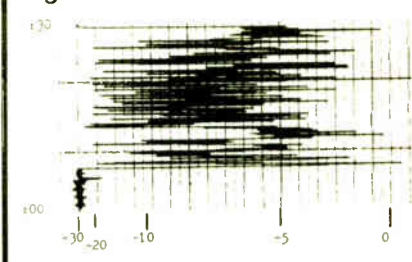
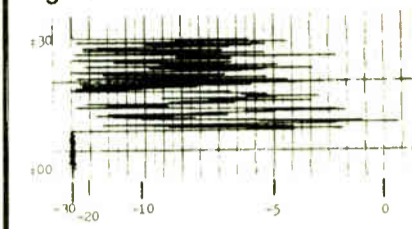


Figure 2. Beatles CD



Note: On these two, and charts below, the transfer characteristic of chart-recorder rectifier was non-linear, and amplitude references were plotted first with tones before making musical tests.

mixed their albums with the stereo consoles of the era in mind, even using special compression techniques like RCA's "Dynagroove" to control levels and reduce tracing distortion.

The late '70s ushered in the "direct to disc" era of the analog LP, in which purist classical and pop producers attempted to engrave their albums with the actual, unadulterated sounds of the session microphones, minus any equalization or compression.

The results were albums which for many record collectors of today were the most realistic recordings ever made in history.

All other records before (and many *(continued on page 23)*)

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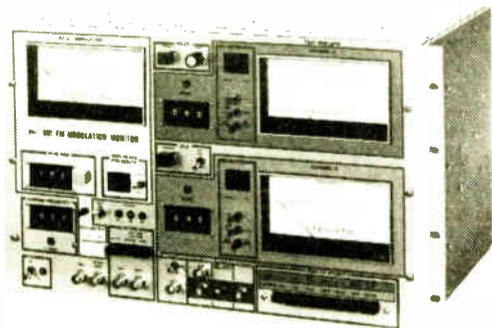
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Up On the Mountain

(continued from page 18)

clothes and provisions. They get involved in hobbies such as ham radio, artwork or watching the mountains and its wildlife with binoculars.

As the Idaho drought entered its second year, the mountain water well dried up this past winter. Not to fear—the engineers melted and boiled snow for their water.

In the spring, stations usually get together to bulldoze open the mountain road. But it's always a risk. Even though ski season ends in mid-April, Mother Nature may not notice.

One year six feet of snow fell the day after the ski slopes were closed. Another

time after a bone-dry May, Memorial Day saw 30 inches of snow. And in yet another season a mid-July storm added to the summer action.

On the opposite extreme, the drought winter of 1986-87 left the mountain road open and passable all but a few weeks.

Is mountain transmission worth the fuss? Station resources over the years have gone to site development: roads, buildings, towers, etc.

Tower costs are lower than the monster structures out on the prairies, but look at the other higher expenses and risks.

One of the problems is the federal

government, which owns all of these mountain-top lands. The National Forest Service or the Bureau of Land Management is charged with management of electronic sites, complete with permits and fees.

Lately the move has been to radically increase user fees for these sites, which threatens to close down translators for many small communities. In Boise we are fortunate to have competent and cooperative NFS officials.

Despite the costs and risks, the only realistic way for many broadcasters to survive is to locate their transmission plants on the tops of the tallest mountains.

With that as a given, we can look at the advantages: a great RF signal and beau-

tiful surroundings.

The 7,000' Deer Point location is such a terrific RF site that there is no such thing as a 100 kW FM station! All are "derated" by the FCC to the equivalents of 100 kW, due to the high elevation. They run 50 kW ERP but are still classified as Cs.

So, the rules aren't the same here. That which has been learned out on the prairie must be relearned for the high mountains.

Tim McCartney is director of engineering and operations at KBSU, Boise State University. He is an SBE broadcast engineer, a former GM and has a masters degree in human resources development. He can be reached at 208-385-3760.

Turn-Key Is New Trend

(continued from page 15)

"real engineers," those who can handle virtually any problem thrown at them.

With the removal of the FCC's licensing of the "first phone," many qualified broadcast engineers have moved to other industries, he said.

"There is a lower pool of really qualified engineers," Ciapura added. "That results in a larger market for Allied and the other systems firms."

"Fascinating changes"

Erik Disen, director of technical operations for CBS radio in the western US, said that the growth of the systems business is directly related to the decline in the number of broadcast engineers.

"The cutback is fascinating," says Disen.

When he started working at KNX-AM in 1973, CBS's Los Angeles radio operation, which also included an FM and network operations, they utilized 32 technicians.

"Then all the audio consoles were homemade," he remembers. "It was not until 1980, when we had only 17 technicians, that we installed a factory made console."

Today the network's LA radio operations include only five technicians. "With that kind of staffing, there is very little time to do design work," Disen says.

CBS's west coast radio division, long a hold-out on contracting outside for systems work, has finally taken the plunge. Recently, the network contracted out a control room project at its San Francisco FM, KRQR, to Pacific Recorders & Engineering, Disen indicated.

He did say that CBS's east coast radio division has already contracted for outside work at WCBS-FM, New York.

"This is a trend borne of necessity. If it works at KRQR, this is the way we will go in the future," Disen maintained.

Disen also predicted that most of the systems work will be concentrated at stations in the top 50 markets. It still is not as affordable for small stations, he said, despite the announced plans of some systems firms to target smaller market stations.

With the growth of systems work, Disen offers a sobering look into the future: "I'm 37, and I don't see a new wave of engineers following me."

In our next installment we will take a look at systems from an engineer's perspective.

"We wanted the best sound in town—I think we were successful."
Martin Brandl, Chief Engineer
CJMF-FM, Quebec City, Canada
(Soft Rock)

"The automatic equalization and gently gain riding were just what we were looking for. And thank you for making your updates retrofittable."
Don Hobson, Engineering Manager
KJQY, San Diego, CA
(Light and Easy Music)

"I would highly recommend it to anyone—except my competitors!"
Ray Fisher, Program Director
WZIX, Columbus, MS
(Contemporary Hit Radio)

"Increased our punch and gave us a fuller sound. It's ultimately clean. In a competitive market, regardless of format, the cleaner sound gets (and keeps) the long-term listener. The added controls give us the advantage of tailoring our sound to the listener."
John Bortowski, Chief Engineer
WBMX, Chicago, IL
(Urban Contemporary)

"It's scary! Loud and dense, but not fatiguing. And it's consistent whether we're playing old LPs or a new Huey Lewis CD."
Duffy Egan, Chief Engineer
WPRO-FM, Providence, RI
(Contemporary Hit Radio)

"Clean and loud."
Barry Mishkind, Chief Engineer
KFXX, Tucson, AZ
(Contemporary Hit Radio)

"Clean and natural without being strident. It gives you lots of adjustment capabilities, and will fit almost any format. The manuals are very good as usual."
David Ficker, Chief Engineer
KHOO, Waco, TX
(Adult Contemporary)

"Voices sound clean and open, and the music sounds great."
John Buckham, Chief Engineer
KITS, San Francisco, CA
(Modern Rock)

"Super! The most cost-effective change we've ever made."
Randy Wells, Chief Engineer
KREO, Santa Rosa, CA
(Adult Contemporary)

"It's the biggest bang for the buck—lets us customize our sound for our listeners."
Matt Conner, Chief Engineer
WASH, Washington, D.C.
(Adult Contemporary)

"Lethal."
Terry Carpenter, Chief Engineer
KJYY, Houston, TX
(Vocal Soft Rock)

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WPOC, Baltimore, MD
(Modern Country)

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* (suggested list)



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Translator Rules Raise Issues

by Harold Hallikainen

San Luis Obispo CA . . . Recent FCC actions raise some very interesting questions regarding localism in broadcasting and questions regarding transmitter operator requirements.

With the controversy surrounding FM translators, I thought we'd discuss those this month.

The Communications Act of 1934 requires the FCC to distribute broadcasting frequencies among communities on an equitable basis.

Had this not been the case, we may have ended up with several very powerful stations in the middle of the country, serving the whole country, and no local broadcast stations.

What's the harm in this? There is, of course, much programming (including news and public affairs) that is of national interest. There is also programming that is only of local interest.

Centralization

Originally, all broadcast programming was local and live (broadcasting of phonograph recordings violated copyright licenses).

Eventually, the copyright problems were worked out (they're still being worked out!) and national programming made it to broadcast stations through

phonograph recordings.

Other national programming (generally news and sports) arrived at stations by telegraph. Finally, audio networks brought live national programming to the stations.

The audio quality of the network lines generally limited the programming to talk.

Much of the "locally originated" programming still consisted of nationally distributed recordings, so in one sense, the amount of actual "local" programming in radio has generally been quite low (at least for music formats).

Insight on Rules

Even though much of the programming was national, there were still "local inserts" to satisfy the local requirements of the audience.

In the larger markets, some stations generate much more local programming. These are typically the "all news" or "news/talk" stations.

On these stations, some of the programming comes from networks or wire services, making some of the programming non-local.

How much local programming should a station run? We might compare radio

to other media, such as the local newspaper.

How much of the local newspaper is locally written, and how much comes in on wire services? It is the editor's job to determine the proper mix of local and non-local space in the newspaper.

It is the PD's job to determine the proper mix of local and non-local programming on a radio station. Both base their decisions on audience. Both are interested in maximum circulation or ratings to make their advertising sales more valuable.

FM translators

FM translators serve two purposes. The first purpose is to fill in an area that a station is predicted to cover but doesn't cover, due to terrain. These translators may be owned by the originating station licensee, and are not very controversial.

The controversial translators are those that bring in the signals of distant stations. These stations were initially like the original CATV systems.

In remote areas, the airwaves were so clean that there were no FM signals. Community groups got together to bring in FM service.

If the area already had an FM station, a commercial primary station could not provide any support of the translator prior to it going on the air [74.1232(d)(2)].

This limitation does not apply to non-commercial primary stations. It prevents distant commercial stations from competing for local audiences (and perhaps advertisers).

The lack of enforcement of this limitation is the current "translator abuse" problem, which caused the FCC to issue its NOI and to place a freeze on FM translator applications.

Why is the 74.1232(d)(2) limitation there? Why can translators be a form of "unfair competition?"

I believe the arguments in support of limitations on translators (other than perhaps allocation limitations to prevent "AM-ization") exist to protect local radio from low cost competition.

A local station is required to have an operator on duty at all times (although there are methods of "sharing operators" among stations).

The local station generally has to support a programming staff to generate local programming. Both of these are major expenses which a translator station does not have.

Of course, the cost of building and running a full power FM broadcast station is much higher than that of running a low power translator.

But apparently this is worth the extra expense, since stations are generally trying to figure a way of getting more power to get more coverage, instead of getting lower power to cut costs.

Operator costs

Full power stations are required to have operators while translators and boosters are not [74.1234].

The lack of operators on translators and boosters may appear to be due to their low power (with so little power, how can they cause substantial interference?).

However, the Communications Act of 1934 (on which our current rules are based) requires an operator at each broadcast transmitter *unless* that transmitter is merely rebroadcasting another

broadcast station (which presumably has its own operator).

The Act places no limits on power of the unattended broadcast transmitter, which make it appear that Congress may have been more concerned that a licensed operator be in control of the programming than in control of the transmitter (interference protection).

This argument may be further supported by the recent FCC action increasing the power of FM booster stations to 20% of the primary station power *without* modifying the authorization for unattended operation contained in 74.1234.

Are operators there for interference protection or for program control? It's still open to discussion.

Local programming costs

Local stations have substantial costs involved in the production of local programming, designed in part to meet the needs of the local community.

The determination as to how much locally generated news and public affairs programming is broadcast is based upon audience response (as measured by ratings).

In an effort to reduce overall programming costs, many stations have started using satellite distributed programming networks.

In response to cues from the network,

“ “ *Are operators there for interference protection or for program control?* ” ”

local inserts (both programming and advertising) are inserted into the local transmitter. This is quite similar to the techniques for handling local inserts on translators [74.1231(f)].

FM broadcast stations are authorized to use almost any method to get the programming to the transmitter.

FM translators were limited to directly picking up the primary FM station (or another FM translator) over the air.

But now, since the Commission's action on a petition by the Moody Bible Institute, use of microwave (whether terrestrial or satellite) to link programming to FM "translators" is also permitted for NCE stations.

The Commission's authorization of microwave linking of FM translators has the NAB concerned that this is the first step towards "low power FM."

The Commission's Chairman Dennis Patrick has responded that the FCC is not looking at establishing an LPFM service.

While the debate about whether or not the increased use of translators constitutes a "low power FM" service rages between the NAB and the FCC there are some points to consider.

It would appear, for example, that a low power FM station could originate local issue-responsive community programming, and would do so, if it were economically justified (ie: got the ratings).

The LPFM station could handle local programming the same way current full power stations utilizing program networks do. On a cue from network, local programming would be inserted.

The amount of power a station runs
(continued on next page)



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 **HARRIS**

Circle Reader Service 27 on Page 10

CDs Change Processing Rules

(continued from page 20) digital ones since) had a sonic veil that detached the listeners from the live musical event.

The best of contemporary digital productions have nearly equalled the legendary perfection of the Sheffield, Crystal Clear and Umbrella albums of the late '70s.

Attention to perfect microphone balance and natural acoustics, elimination of phase-shift, noise and coloration in circuitry, and clean equalization and signal processing have made today's finest digital classical and pop albums much closer to the original musical events than the typical commercial products of a decade ago.

Now the old-fashioned stereo console is being replaced by the rack system of at least 40 W per channel, and the 2 W mono car radio is giving way to the multi-speaker car stereo with a powerful bridge-amp.

Therefore, it is no longer necessary for the final mix of an album to be run through 10 to 20 dB of peak limiting. The "punch" of bass guitar and cymbals can be left intact, since the consumer's audio system can achieve more than a 30 dB dynamic range before clipping!

No wonder a 1962 Motown song sounds different on CD and LP as broadcast with the same amount and kind of audio processing. And no wonder the Mahler Third on Deutsche Grammophon CD will fade away to utter inaudibility when heard in car reception.

Measuring the difference

I offer as proof of CD's greater dynamic range two analog recordings now also on CD.

Using the equipment I employ to document radio station loudness in my consulting work, I reproduced the output of LP and CD versions on my Texas Instruments/Waters Associates chart recorder, fed from a mono sum signal of either phono preamp or CD player.

Before each chart recording was made, the source was auditioned on my Inovonics "Gordon Headroom" meter, a quasi-peak indicator with some hysteresis.

The peak level in each cut was adjusted to go no higher than 0 dB on the meter, and then the selection was

repeated for the chart recorder, driven by a full-wave rectifier with a 10 millisecond attack time and a 150 millisecond decay time.

Figure 1 shows the measurement of the Beatles' *Sergeant Pepper's Lonely Hearts Club Band* LP from the Capitol vinyl recording (SMAS-2653, Cut 1, opening to 30 seconds in).

Figure 2 is the same selection, but from the CD (EMI/Parlophone CDP 7 46442 2).

Figure 3 is the Epic vinyl recording of Beethoven's *Symphony No. 5, Cleveland Orchestra/Szell* (BSC 163, first 30 seconds).

Figure 4 is the same classical selection, but from CD (CBS/Sony 32DC 202).

Compression and other additions

In the classic Beatles album, the opening recording of crowd noises was peaked some 6 to 10 dB lower on the CD than on the LP, indicating that a rather significant amount of limiting was employed on the Capitol LP.

As an audio conscious Beatle enthusiast will know, the individual tracks

on the album were already heavily compressed (note the flattening of cymbals and the sudden level modulations caused by a crude peak limiter on Cut 1 in both LP and CD versions).

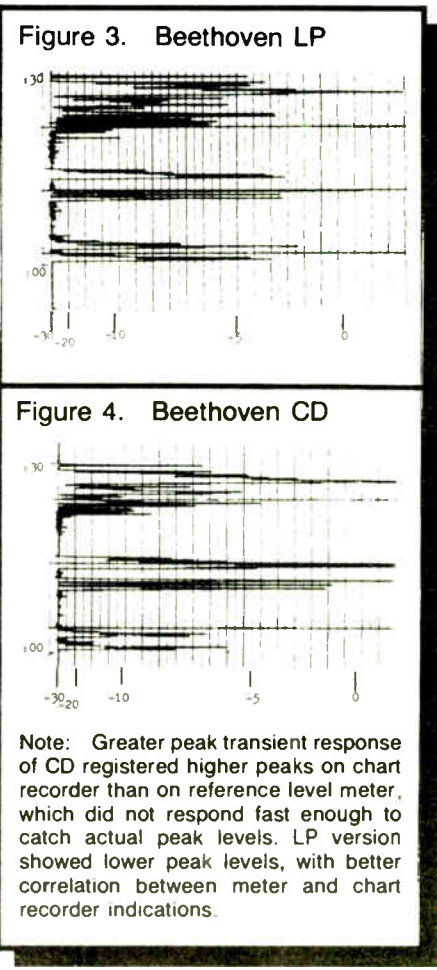
In the superb George Szell *Beethoven Fifth Symphony*, the CD issue shows greater pianissimi than the LP in measures 6 to 17 and from 25 to 32, again by a factor of over 6 dB. Peak limiting has caused these soft passages to have 50% less power on the CD version.

An audio processing scheme that will work well with typical LPs will thus be confronted with levels in these CDs that will drop far below expected values.

With contemporary all-digital recordings, the dynamic range contrasts will be even greater.

In the next part of this series, I'll suggest practical ways to compensate for the greater dynamic range of CDs in either live or catted formats.

Stephen Waldee is CE and PD of KBOQ-FM and CE of KOFY-AM, San Jose, and is also a consultant. He can be reached at 408-384-5755.



Questions of Localism and Low Power

(continued from previous page) appears to have little to do with how well it could respond to local programming needs.

There are only a few differences between an FM translator and a standard FM broadcast station.

The FM broadcast station is required to have an operator (although if it's rebroadcasting another station the Communications Act does not appear to require an operator for each transmitter).

The FM broadcast station is authorized to use the best means available to get the programming to the transmitter while translators must use "off air pickup" which results in lower quality audio.

FM broadcast stations are permitted (even encouraged) to generate local programming while translators are only allowed to locally acknowledge or solicit support. Maintenance of these differences may or may not benefit the public.

The printed arguments against expansion of the FM translator service into an LPFM service tend to concentrate on

public service (will the LPFM provide local issue responsive programming?).

But another argument against establishing such a service might be that it would increase the number of stations over what the market can support, and that the LPFM stations would have an unfair competitive advantage.

However, as the electronic media strive toward the "print model" of first amend-

ment freedom, the government is less inclined to protect existing media from competition.

It will be interesting to see how this situation develops.

Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.

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Circuits Everywhere

(continued from page 19)

books, including the ones just mentioned. The price is right.

There is one standard book you should be on the lookout for. It's called *Modern Electronic Circuits Reference Manual* by J. Markus.

That clever Markus created what amounts to a hardbound circuit scrapbook by collecting thousands of circuits from other books and magazines. It's huge.

I never could face up to paying the \$82.50 for a copy, but there is always one to borrow at the library. It's also just circuits. No details, but plenty of ideas to

breadboard.

Some of the best books are free. That is, if you have the right connections.

National Semiconductor is legendary for its applications notes, which not only provide a working schematic, but tell you what went into designing the chip and how to make the circuits work. The other chip houses such as RCA, Motorola and Analog Devices do likewise.

If you try to procure one of these tasty data books from your usual parts house, be prepared to faint when you hear the price. Don't pay it.

Instead, talk nice to an industrial chip distributor or find a friend who is a de-

sign engineer. These distributors literally shove their line cards and boxes of data books at circuit designers in hopes of getting big production orders.

As another circuit source, how about replacement cards? Who said you could only buy PC boards for repairs? If you like that mic amp card, make your own mixer, preamp or whatever out of a few cards plus a modular power supply.

Note however, that this is not the cheap way to go. Unless you can find a used or damaged piece of gear to cannibalize, these assemblies command top dollar. However, you're paying for and getting quality, convenience and proven designs.

You can find some strange and wonderful things in surplus catalogs. Most are pretty strange but have a way of lur-

ing you into buying them since "using only one or two parts pays for the whole board."

Ignore that temptation and buy something that works as a whole card or module. FM receivers and power supplies are good examples.

You might also be able to think of uses for a sound activated switch, stereo amp, 26 MHz remote control receiver, or even a sound effects board.

Don't overlook the possibility of trading circuits. If you're in a chain of stations or just have buddies around the country tell your associates what you need and see what they come up with.

Roll your own

This is the most exciting, cost effective, satisfying, terrifying and hair ripping-out approach to building equipment.

There are two basic approaches to circuit design. The decade box approach and the analytical approach.

For those of you who haven't built a decade box yet, that's a box of resistors and switches. The output resistance is a function of which resistors you have selected in series or parallel. Sort of like a pot with labeled click stops.

The decade box approach says to put together the closest circuit you can find and start switching in parts values until it works.

It's a fast method and doesn't require much research. But, is it a fluke that the circuit works at all? Can you build another one and have it work? What happens when voltage and temperature vary?

More professional circuit designers than you might think use this approach, at least when they hit a tough problem and no one is watching. In that case the preferred designation is "selected components."

Theory first

The other method says make it work on paper first and it will go together a lot faster on the bench. This approach almost guarantees eventual success and stable, predictable circuits.

However, you have to know what you are doing. At microwave frequencies that might require some specialized handbooks and a few years knowing what formula is good for what.

It may also require getting cozy with some pretty ugly mathematics, although most design problems have been reduced to canned equations by some kind soul. You just have to know where to look and that requires experience.

I say go ahead and take a crack at design. You'll find the limits of your patience. Start with the simple stuff and work up. You'll get an education as well as some equipment. You can also get training and advice from your local college. The key word is perseverance.

In the last few years, another attractive option has appeared for the electronics designer. Computer programs that run on a PC will lead you through a design, help draw a very professional schematic, lay out PC boards and analyze the circuit over a range of conditions.

Keep your eyes open for new circuits. Once you start a collection, you'll find them jumping out of publications and books. Maybe a few will even jump onto your workbench and find a home in the station racks.

John Shepler is an engineering manager, broadcast consultant, writer and regular RW columnist. He can be reached at 815-654-0145.



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RCA BA48A (3) audio amp, BO, RCA BA44C audio amp, BO, M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

BGW 250D power amp 250 W stereo, \$325. B Mortonsen, KALL, 312 E S Temple, Salt Lake City UT 84111. 801-364-3561.

UREI 1122 phono preamp, works & looks brand new, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Carver M1.0 +, 200 W/ch, 1 mon old, 4 yr warranty \$525. C Bradley, WRIK, 517 W 9th, Metropolis IL 62960. 618-524-3698.

Gates Solid Statesman II preamp, operating cond, w/manual, \$50 plus shpg. G Heiderfeldt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

Want to Buy

Audio amps, mono or stereo 300+ W, working or not. T Scott, Daley & Assoc, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Crown, BGW for sound reinforcement, 300 W or above. S Wallace, WWSN, 1400 Cincinnati St, Dayton OH 45408. 513-224-1137.

ANTENNAS & TOWERS

Want to Sell

RCA 20' rigid section, 3-1/8 line w/RF load & wattmeter, 50 ohm rated at 10 kW for UHF TV, \$750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

C.P. Cavity type broadband panel antenna. Multi-system application. Omni or directional pattern. 88 to 108 MHz. High power. Excellent axial ratios. Radomes. Al Warmus. 1-216-659-4440.

Jampro JA3B FM antenna, horiz pol, 3 bay gain of 3 dB, w/manual, 90.7 MHz, \$300 plus shpg. D Matthews, KASK, 802 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

Gates FMC-10, 10 bay FM w/de-icers, tuned to 95.4 MHz, w/pole mounting brackets, avail 5/15/88, \$5000 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-423.

Utility, Type 480, 100', guyed tubular tower, 30" face, non-insulated, w/Utility 95' pole, approx 10" diameter for mounting on tower, avail soon, \$2500 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Stainless 180' AM bdcnt tower, on ground, \$2000; Potomac AM19 analog antenna monitor, inline direct current sampling xmrs w/cable & remote metering panel, \$900; Harris 1 kW antenna tuning box, \$200. G Davis, WXIC, POB 227, Waverly OH 45690. 614-947-2166.

Cablewave 738350 EIA type connector for HCC300-50 cable (2), new, BO. C Springer, KLMR, Box 890, Lamar CO 81052. 719-336-2206.

Phelps-Dodge 2 element FM antenna, medium power, tuned to 88.1 w/matching transformer, \$1000. W Kennedy, KPAA, 13028 US Hwy 190, Port Allen LA 70767. 504-627-4578.

Phelps/Dodge 6 bay, CP w/de-icers, set to 104.3, 1-5/8" connectors, BO. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

Harmonic filter, 101.1. T.J. Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Shively 6810 8 bay, 106.1 MHz, excel cond, 4 yrs old, \$9000 plus shpg/hndlg. C Steely, KOAI, 8235 Douglas, Dallas TX 75225. 214-891-3400.

Celwave CFM-HP antenna elements, \$175 ea; Celwave radomes for CFM-HP antenna. D Dybas, WTTW, 2400 E Devon, Des Plaines IL 60018. 312-297-8430.

Utility Tower 304', w/18" face, solid legs, w/A3 lighting & guy cables, on ground, BO. F Shields, KERV, POB 2187, Kernville TX 78028. 512-895-1230.

Phelps-Dodge HP 12 12-bay antenna, 101.1 MHz; 300' 3" jacketed line. T.J. Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

RCA TFU-24DM UHF TV antenna on chnl 41, \$1500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

ERI SML-14C, 91.1 MHz, 3-1/8" center fed, low wind load, \$5000/BO plus ship. J Skinner, KANZ, 1 Bdcnt Plaza, Pierceville KS 67868. 316-335-5120.

Proline 3-1/8" transmission line, 760' plus, on-air now, \$4000/BO. J Skinner, KANZ, 1 Bdcnt Plaza, Pierceville KS 67868. 316-335-5120.

CO-EL CO-5FM, 8 bay horizontal, gain 4.7, mounted on 200' tower, \$3000; ERI 425 isocoupler, \$1500; Andrew HJ7-50A air line, approx 600', \$1500; Andrew LDF5-50, approx 400', \$425; Andrew 1930-B auto compressor-dehydrator, \$400. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

FM isocoupler, 3-1/8 milled flange, out of service, gd cond, \$2000. R Dufault, WEBB, 3000 Druid Park Dr, Baltimore MD 21215. 301-367-9322.

Andrew GP8F-890 950 MHz STL antenna, \$1700; Mark 2 GHz microwave dish w/radomes, BO; Cablewave HCC300-155 80' coax w/EIA flange or will sell separate, BO. K Schipper, KQKS, 919 Shemdon Blvd Ste 205, Westminster CO 80030. 303-427-7700.

Galvanized steel towers, (5) 196' 18" face, guys & insulators, BO; (5) ceramic base insulators; (4) antenna tuning units; (2) 500' sections of 7/8" hardline coax; (2) 300' sections of 1-5/8" hardline coax; phasor; Gorman Redlich antenna phase monitor, all less than 2 yrs old, BO. M Pulley, KYOO, 304 E Jackson, Bolivar MO 65613. 417-326-5257.

Harris/ERI FMD-3B directional FM, 3 bays, 50 kW, tuned to 100.7 MHz, used 10 mos, sep H/V elements arranged in 3 stick candelabra, pole mountable. J Seaman, WSWA, POB 752, Harrisonburg VA 22801. 703-434-0331.

Engle Hill PSA/PSS adapter, now in service, avail immed, BO. M Murray, WAMJ, 1129 N Hickory Rd, South Bend IN 46615. 219-234-1580.

Jampro JLCP-7 FM antenna, Jampro 7 bay for 12" face of leg mt, 106.3 MHz, \$5000; Prodelin 195' of 1 1/8" coax, air dielectric w/EIA conn each end, \$1400. B Dickerson, WPXE, POB 520, Starke FL 32091. 904-964-5001.

Fisher AM towers, (3) 330', 24" face, insulated, guyed, w/lighting & all hardware, vgc, BO & take them down. B Glasser, WHBC, POB 9917, Canton OH 44702. 216-456-7166.

Want to Buy

Bogner 8 & 16 bay low-power TV antenna; Scala antennas also. C Kidd, Kidd Comm, 4096 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

FM, 4-6 bay antenna w/de-icers, 98.5 MHz. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

Guyed tower, 500' & 4 bay FM antenna for 95.3 MHz. J Stitt, WIOK, 7075 Industrial Rd, Florence KY 41042. 606-727-0800.

Austin transformer, used/operational. M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

Jampro 4 bay for class A 3 kW 100.9 MHz or nearby; also need isocoupler and 370' 1-5/8" transmission line. S Rooth, KARY, POB 1310, Prosser WA 99350. 509-882-3500.

CP 2-bay low power FM antenna tuned to 104.9 MHz. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Mounting hardware, (brackets) for RCA BFA-8B FM antenna. B Howard, KOTR, POB 902777, Cambria CA 90809. 805-929-5021.

Tower beacons, used 300mm, price depends on cond of glass & casting. J Muehlert, Bdcnt Comm, POB 131, Verona WI 53393. 608-845-6755.

AUDIO PRODUCTION OTHER

Want to Sell

Eventide BD955 digital delay w/15 kHz bandwidth excel cond, \$2000. J Zack, WCZY, 15401 W 10 Mile, Oak Park MI 48237. 313-967-3750.

Teac AN-80 Dolby encoding system, excel cond, w/tech manuals. R Yaw, North Montana Bdcnt, Box 7000, Havre MT 59501. 406-265-7841.

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Orban 622B parametric EQ, excel cond, \$350; UREI 535 full octave stereo EQ, \$200; Harris FM 25K driver modules, tested, gd cond, also other xmt parts avail, \$300 ea. R Dietterich, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Audio & Design Scamp mini rack, w/F300S gate, S01 compressors, S04 parametric, S23 auto panner, TT patchbay, power supply, power supply module, Anvil mini case, \$1600/BO. R McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Eventide H910 Harmonizer, 2 outputs, works perfectly, \$999 firm. R McMillen, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Fairchild 644B EQ module (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

CBS processors; McMartin TBM 3500 modulation monitor; Harris FM limiter; Gates FM limiter; RCA 35 W 2-way units, (4), VHF. E Kazmark, KAZZ, POB 1369, Deer Park WA 99006. 509-276-8816.

Orban 245E stereo synth, gd cond, \$225; Lauderdale Lab EQ10 graphic EQ, \$50; Edcor HA400 headphone amp, gd cond, \$89; ORK Ultima II TT preamps, working order (2), stereo, \$25 ea. C Butler, Butler Bdcnt, 1775 Bartlett Ave, Orange Pk FL 32073. 904-264-8169.

Fairchild 658 reverb unit, w/remote amp/controller, excel cond, \$60/BO. A Tucker, Foothill Prod. 70 W 83 St, NY NY 10024. 212-877-0973.

Lauderdale Labs Splicemaster III, like new, \$150. B Dickerson, WPXE, POB 520, Starke FL 32091. 904-964-5001.

Fairchild 644B EQ modules (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

Want to Buy

Tone gen, 25 Hz. B Orderek, KTER, POB 190, Terrell TX 75160. 214-563-2646.

AUTOMATION EQUIP.

Want to Sell

ABC Network cue decoder, clean, excel cond, manual, \$250. D Matthews, KASK, 602 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

Conex CG-25, 25 Hz tone gen for automation tapes, almost new, \$200. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

Harris System 90, fair coond, (2) Automat-ed Bdcnt Control Carousels, \$3000. G Fallus, WLVH, Weathersfield CT 06114. 203-549-1175.

Systemation X3MT16-D cassette based automation systems, w/9 Nakamichi MR2's, remote terminal & printer logger option, live assist module up to 7 day walk away time, \$27,000/BO. C Jones, WXDJ, 3191 Coral Way, Ste 1000, Miami FL 33145. 305-447-9595.

Instacarts, (2) late model, black panel, mono, 48 tray, excel cond, currently on-air, you pick up, \$5500 ea. D Doelitzsch, WDDD, 1 Bdcnt Ctr, Marion IL 62959. 618-997-8123.

Schafer 902-1/2, (2) complete, working, (2) Schafer Audiofile I, Schafer Audiofile IIA, numerous Revox A77 & ITC I/O cards, remote control, lots of spare parts, complete tech manuals. R Yaw, North Montana Bdcnt, Box 7000, Havre MT 59501. 406-265-7841.

Gates FA-S 25Hz tone filter, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

BE TG-2A dual tone gen/detector, w/manual, mint cond, \$675. G Jones, KLXQ, Box 231, Uvalde TX 78802. 512-278-1102.

Schafer 902 automation system, RAS/MOS keyboard, 4 EVOXS, 2-48 tray Audiophiles, \$14,000. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

Instacart, SMC interface converts BCD to 1 of 48, w/150 Hz sensors, 2 yrs old, \$600. D Doelitzsch, WDDD, 1 Bdcnt Ctr, Marion IL 62959. 618-997-8123.

Gates SP-10-2 audiometry brain, cannabalized, gd for parts, \$200 for all; Tonmeister, TRE-3N tone decoder for NBC Network, excel, \$195. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Sono-Mag ESP-1 & DS-20A switcher, all working, \$4000/BO. P Wolf, 241 NE 10th, Cape Coral FL 33909. 813-574-5548.

IGM 364 automatic logger, mechanical printer, for parts. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

ITC 750 stereo R-R PB only, \$400/BO. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

IGM PAL encoder. E Kazmark, KAZZ, POB 1369, Deer Park WA 99006. 509-276-8816.

Schafer 800S, w/(4) Ampex 440 R-R decks, (2) McCarta cart machines, now in use, \$5000/BO. C Steinbacher, WWPFA, 230 Market St, Williamsport PA 17701. 717-323-7119.

Custom automation system suitable for cable orig, photos & info on request. R Tanner, Van Wert Cable, POB 126, Van Wert OH 45891. 419-238-4793.

Harris 900 automation system, w/Go-Carts & racks. M Crump, WCMS, 900 Commonwealth Pl, Virginia Beach VA 23464. 804-424-1050.

BE tone gen/detector, \$400. B Elliot, Bdcnt Systems, 200 West Road Ste 13, Elington CT 06029. 203-871-2976.

Automation startup system, just out of service, Control Design programmer, power pack, prog clock, tone sensor, five SMC Carousels, reasonable. D Anderson, WCSV, 510 Williams, South Haven MI 49090. 616-637-1138.

Schafer 800T 3 random access Carousels, (6) Ampex 440 R-R, stereo, recently rebuilt, many spare parts, \$6000. B Elliott, WKRL, 2 Corporate Dr, Clearwater FL 34622. 813-579-9790.

Harris system 90 brain (2) IGM Instacart 48 bay mono; (4) Ampex AG355-2 stereo PB only decks; Ampex AG350-2 stereo R/P, mounted in (4) Harris 6-1/2" racks, make offer on system or individual items, buyer pays shipping. J Saaco, WDAV, POB 1540, Davidson NC 28036. 704-892-8900.

Colorado Magnetics Transtar NS-200 network switcher, 2.5 yrs old, \$425. Bob or Jeff, KJ108, POB 1203, Grand Forks ND 58206. 701-746-1417.

Century video cue command decoder for ABC Talkradio; Epson MX-70 dot matrix printer; voice cue card for S-A digital audio earth terminal, gd cond, sold as package for \$500, or sold separately. M Martin, KWNO, Box 466, Winona MN 55987. 507-452-4722.

Schafer 903, 20 sources, 1064 events w/(3) Otari ARS-1000 reels, (2) IGM 48-PBM mono Instacarts, Extel logger, Schafer video terminal & cart encoding center, \$15,000. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

Want to Buy

Roland Compu-Editor CPE 800 w/CA800 module, M Anderson, Jeree Records, 1469 3rd Ave, New Brighton PA 15066. 412-847-0111.

CAMERAS (VIDEO)

Want to Sell

Sony 1640 single tube, CCU & 50' cable, mint cond. R Weller, Radio Station Bdcnt Svcs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

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JVC KY1900 10:1 zoom lens, DC adapter, case, \$1395; JVC KY210 10:1 Fujinon lens, DC adapter, case, \$2995. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Sony 3210 camera. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

RCA TK44 bdcst studio cameras (4), Cook zooms, all cables & manuals, \$2500. G Urban, 314 W 52nd St, NY NY 10019. 212-677-2200.

Sharp XC 700, 3 tube Saticon camera w/CCU, Fujinon 9-108, 2x lens, battery and charger, hard case, studio & ENG configurations; Panasonic AK 760, 3 tube Plumbicon camera w/Canon 9-118, 2x green line lens, ENG VF, studio tripod controls battery and charger, hard case, \$2000. R Krugen, Box 397, Roosevelt NJ 08555. 609-448-4739.

GX-S700U color video cameras, KM 1200U SFX gen. power supplies, batteries & cables, \$3500/BO. V Storer, Storer Studio Photo, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

Panasonic WV6000 420 line Saticon, 2 yrs old w/PS & carry case, \$1600; Panasonic WV3700, old two tube color camera, needs work, \$100. R Tanner, 419-238-4793.

Panasonic 3990B, \$1500; Norelco PCP-90 plumbicon color, \$500; Houston Fearless studio pedestals, \$350; RCA PK-701 color std camera, \$995; Norelco PC-70 color, as is (4), \$500. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

Norelco PC70 (11), some need Plumbicons, BO. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

RCA TK-44 (2) w/Canon lens & mounts, 100' camera cable, BO; (2) RCA film projectors, pre TP-66, BO. Jim or Fred, WLIO-TV, 419-228-8835.

JVC KY210 camera, 10:2 Fujinon lens, case, AC adapter, \$2995; JVC KY1900 camera, 10:1 lens, case, battery, AC adapter, \$1995; Harris 690 TVC frame sync, corrects 3/4", 1/2" & 1", 9 bit proc, latest factory upgrades, excel, \$4895. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Want to Buy

RCA metal tripod TD-11-A; RCA tripod dolly TD-15-A; RCA Lo Hat MI-26190-1; RCA studio camera dolly TD-5-A; RCA studio camera pedestal TD-1-A; RCA lens turret for TK-11-A camera. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

Panasonic WV3806B remote control for 3990 camera and (2) 19A50 camera cables. J Major, Marquette Public Schools, 1203 W Fair, Marquette MI 49855. 906-225-4273.

View finder for Sony DXC 1210; AC power supply and charger for Sony DXC 1800. C Lund, Cycle Snd & Video, 167 Madison St, Waterbury CT 06706. 203-756-7761.

Sony DXC 3000 video camera, must be in perfect shape. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

CART MACHINES**Want to Sell**

BE 2100P mono play only w/telephone interface to use as answering machine, seldom used, \$500/BO. A Martin, Seque Svcs, HCR1 Box 2860, Merrifield MN 56465. 218-765-3333.

Audi-Cord, Models S-26 R/P stereo, \$1,250; Twin stereo play TDS-6 (2), \$1095 ea. All unit factory rebuilt, mint cond., 1984 vintage. Kidd Communications, 4096 Bridge St., Ste 4, Fair Oaks CA 95628. 916-961-5433.

Tapecaster, Spotmaster machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7222.

Harris mono PB in gd cond (3), \$500 ea. G Falus, WLVI, Weathersfield CT 06114. 203-549-1175.

Audi-Cord 521 mono, gd cond. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

Spotmaster 505C mono decks w/record amp & new spare heads for both (2), \$400 ea. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

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ITC Premium & PD2 mono, R/P all tones mint (8). J Phillips, All American Bdcst, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

ITC RP 5933 tape delay R/P w/2 combo head, will consider trade for stereo unit. T Black, KBAS, 2332 Hwy 95, Bullhead City AZ 86442. 602-763-5227.

Tapecaster X600P transport deck, new w/X700P motor, \$40. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

Gates Criterion III mono R/P, \$500/BO. B Henry, KLLK, 12 W Valley St, Willis CA 95490. 707-459-1250.

Audiocord S Series (2) stereo R/P & (2) S Series dual PB. G Blau, WXTV, 5210 Auth Rd, Marlow Hgts MD 20746. 301-899-3014.

ITC SP mono cart PBs (2), w/rack adapt; ITC RP mono/delay cart record, w/rack mount adapt, both in gd shape. B Schloss, WMT, 600 Old Marion Rd NE, Cedar Rapids IA 52402. 319-395-0530.

Spotmaster TIA winder w/timer, gd cond, \$325. R Miller, WIMS, 685 E 1675 No, Michigan City IN 46360. 219-874-9467.

Ramko elect cart winder w/timer, vgc, \$250. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-0005.

ITC Delta stereo PB (3), \$1000 ea. T Gaiser, KUZZ, 3223 Silect, Bakerfield CA 93308. 805-326-1011 X644.

Gates RA5A random Carousel selector, gd for parts, \$100. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

ITC RP, beautiful cond, mono, \$850; ITC RP, not so beautiful, gd cond, \$750. F Lauerman, WMAM, POB 609, Roosevelt Rd, Marinette WI 54143. 715-735-6631.

Cuemaster stereo cart players, (2) pb cards prone to failures, but spare cards included; (2) BE 8 cart sequencers w/spare parts, unknown cond, many spares, send sealed bids by 4/15/88. M Staring, KPBS, SDSU, San Diego CA 92182.

Harris Criterion 90 R/P mono, cue tones, like new cond, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

ITC WRA record amp. P James, Allstar Bdcst, POB 7007, Defiance OH 43512. 419-782-8591.

RCA RT-125 mono PB, \$350/BO; RCA RT-126 mono recorder, \$500/BO. J Sweett, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

Ampro CT-4500B stereo R/P, gd cond, 4400; (2) Gates Criterion 80 mono R/P, gd cond, \$200 ea; ITC 3-deck mono, gd cond, \$500. D Kiker, WCOA, Box 12487, Pensacola FL 32573. 904-456-5751.

ITC Delta I & IV, \$1500 & \$2000. P Hawkins, New Life Prod, POB 19073, Louisville KY 40219. 502-968-9316.

RCA RT-27 mono (6), all tones, +4 dB audio, (5) completely refurbished, + one needs work, (2) BA-27 record amps for 2 of the decks, \$750/all or cash/trade for RCA 77DX/44BX mics. F Vobbe, 706 MacKenzie, Lima OH 45805.

ITC Delta, 3 deck stereo, play only, perfect cond, BO. R Sweattee, KZZU, South 5505 Regal St, Spokane WA 99223. 509-448-5555.

Tapecaster 700-RP, excel cond, w/extra motor, \$325/BO. J Klauk, WSAM, 200 Bloomfield, W Hartford CT 06117. 203-726-9083.

BE 5500B stereo audio cart machine, 2.5 yrs old, new motor 7 shaft recently installed, \$2200. Bob or Jeff, KJ108, POB 1203, Grand Forks ND 58206. 701-746-1417.

Audiocord E-21, gd cond, \$550. CE. WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Sparta MC-104 4 deck mono play only, \$400. J Phillips, All Star Bdcst, 414 Washington, Defiance OH 43512. 419-782-8591.

Tapecaster 700RP stereo R/P, gd cond, \$600. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Want to Buy

BE/Spotmaster 1000 or 2000, any version, any model, any cond. C Keith, Audiolab, Box 313, Keene NH 03431.

BE 3000 & 2100 cart machines wanted. Exporter needs 90 used machines, working cond, not more than 6 yrs old, reasonable price avail. Send particulars to: RW, POB 1214, Falls Church VA 22041. Attn: Box 1-1.

ITC WRA or RA record amp for cart machine (2). D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

ITC R/P mono machine in gd cond. J Bean, KSV, 1750 S Brentwood, St Louis MO 63144. 314-961-1320.

Mic preamp for BE 1070 RP mono cart machine. R Armstrong, WVMR, Rte 28, Dunmore WV 24934. 304-799-6004.

SMC, any cond, prefer rack mount, buy or trade. B Van Prooyen, 2111 Shangria Dr SE, Grand Rapids MI 49508. 616-532-1168.

Gates Criterion, 150 Hz record & playback boards & cans, also Microset head mounting assemblies. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

ITC mono PB, fair price for excel machine. B Anthony, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Telex 300 high-speed duplicator w/2 R-R & 3 cassette transports & rack, \$700; Nakamichi 1000H prof rack mount cassette deck, 3 head, full metering, EQ, remote control, etc, \$300; Ampex ATR700 1/4" 2 trk, gd cond, \$500. J Zack, WCZY, 15401 W 10 Mile, Oak Park MI 48237. 313-967-3750.

Ampex 440C (2) in cabinets, \$2800 ea. United Research, 681 Fifth Ave. N. N. Y. NY 10022. 212-751-4661.

Otari MX5050BII, 1/2 trk R-R, 100 hrs, BO; Pioneer 2024 1/2 trk & 4 trk, 2 head stacks, remote, factory road case, mint cond, \$850. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

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Ampex AG440B 2 trk. R/P vgc. \$1500. B Henry, KLLK, 12 W Valley St. Willis CA 95490. 707-459-1250.

Pioneer RT-909 several in box. w/warranty, \$450 ea. R Weller, Radio Station Bdcst Svcs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

Teac A-3440 4 chnl R-R less than 30 hrs w/remote controller & dbx NR, \$1000. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

Telex 6120 R-R duplicating system, master unit w/2 slaves, gd cond. T Cummings, AM Comedy Net, 10 Middle St, Bridgeport CT 06604. 203-384-9443.

Ampex 601-2 w/2 matching 620 amp/speakers, excel cond, \$500/BO; Magnecord M21, excel cond, \$300/BO. C Steinbacher, WPPA, POB 262, Williamsport PA 17103. 717-323-7118.

ITC 750 Series (4) stereo PB units w/25 Hz detectors, gd cond, \$3500 plus shpg. S Smith, WKSJ, 1559 W 4th St, Williamsport PA 17701. 717-327-1400.

Pioneer RT909, 1/2 trk stereo (2), like new cond, \$500 ea/BO. A Martin, Seque Svcs, HCR1 Box 2860, Merrifield MN 56465. 218-765-3333.

Magnecord 1021 in fair cond (2), \$200 ea. G Falus, WLVI, Weathersfield CT 06114. 203-549-1175.

Ampex 351 mono w/Inovonics 380 elec, \$300 plus shpg. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

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Inovonics 375 stereo w/Ampex 440 transport in Rusling console, excel cond, \$1795. Ampex 440 transports & 351 transports. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

MCI JH-110 stereo in Rusling console w/locator, excel cond, \$3500. Ampex AG-440 stereo, excel cond, in console, \$1095. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

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Scully 280, (2) mono, excel cond, in Rusling console, \$995 or w/o console, \$795. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Ampex AG 600B (2), one w/case, \$300; one w/o, \$250, both mono, w/manuals. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Alpha 21, 16:1 hi-sp, mono cass dupl. one copy per pass, both sides, auto rewind, vgc, \$700/BO; VSC Soundpacer mdl C-4 vanspeed, varpitch, speech compression cass rec. AC/DC w/thruput, new cond, \$125/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Ampex AG-350, 2 trk, 3 spd reversible Beau motor, Inovonics electr, gd cond, \$1000; Ampex 375 vari-speed amp for 300, 350, 440 decks, \$75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Scully 280, 2 trk, 7.5 & 3.75 ips, \$600/BO, Ampex AG-440, 2 trk w/extra 1/4 trk play hd, 7.5 & 15 ips, w/Inovonics electr, gd cond, \$1000. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Uher 4000 Report L, record, new belts, caps, full alignment w/power supply & service manual, vgc, 30 day delivery, \$600 plus shpg; Uher 4000 Report S, record, new belts, caps, full alignment w/service manual, gd cond, \$450 plus shpg. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

3M M64 4 trk 1/2", gd cond. 7.5 & 15 ips, in roll around console, \$850. J McDaniel, Sound Project, 1000 S Young, Kennewick WA 99337. 509-783-3534.

Scully 280-280B, 8 trks (2), console 16 in 16 out & Crown amp, mics, TTs, etc, sell or trade for car or truck, \$6500. WC Burchett, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

Wollensak T-1500 1/2 trk mono R-R (2), BO; Wollensak stereo T-1515-4 R-R, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

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Ampex 600 FT, excel cond, \$200/BO; Ampex AG500-2 in remote case w/mic preamps, 7.5-3.75 ips, \$500/BO. M Saady, First City Recording, 141-60 84th Rd, Briarwood NY 11435. 718-846-2062.

Scully 280, (2) 4 chnl in Rusling cabinets, 1/2" tape, \$1100 ea. M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

MCI recorder parts, for JH-110 A & B: heads, motors, PC boards, pinch rollers, etc. at 1/2 price. Call 818-355-3656 for inventory list.

Ampex 440, scrape flutter idlers, perfectly reconditioned, \$25 plus your old idler. C Close, 1502 Chappel Ct, Northbrook IL 60062.

MCI JH16 2" 16 trk, gd cond, \$9500; Tascam 80-8 w/DS8 dbx, new record head, \$1700. B McPeck, Mirror Image, 619 S Main St, Gainesville FL 32601. 904-376-8742.

Ampex MM1000 16 trk. w/full remote, auto locator, test tape, cables, VSO, like new, \$6500. D Vost, 1913 Oaklawn, Cleveland OH 44134. 216-741-1400.

Otari MX5050B 2 trk master recorder, 1-1/2 yrs old, very little use, \$1800. T Carroll, Linear Acoustic, LPO Box 932 CN 5064, New Brunswick NJ 08903. 201-932-1248.

Ampex 350 3 trk console, \$800; Ampex 4 trk wsel-sync, \$950; Ampex 2 trk, \$750, take all 3 for \$2350. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Tandberg TCD-320 cassette deck, excel cond, 3 motors, dual capstans, \$350. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Ampex extender card for ATR-100 series recorder circuit boards, \$150; MCI JH24 series multitracks, used spare cards, bias \$118, repro \$115, output \$85, record/cue \$320. R McMillan, 3809 SW Marigold St, Portland OR 97219. 503-293-1170.

Scully 270 stereo (3), excel cond, \$600 ea or all for \$1650; Scully 270 mono (2), \$600 ea or both for \$1000; Crown tube FT, fair cond, \$150. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

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Scully 280 stereo 2-trk rec/reproducer, new heads, gd cond, w/manual, \$400/BO. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

Ampex 440B, 7.5-15 ips from home studio, clean, \$1295; also roll around cabinet, \$295. D Elliot, Creative Services, 10909 Riverside Dr, N Hollywood CA 91602. 818-762-3554.

Revov A77 2 trk, 7.5-15, low time on recent heads, wire remote, \$595. B Borrelli, Media Group, 462 Merrimack St, Methuen MA 01844. 617-688-5573.

Ampex AG440B 2 trk in console (2), \$1000 ea. T Gaiser, KUZZ, 3223 Silect, Bakersfield CA 93308. 805-326-1011 X644.

Otari ARS1000DC (2) \$1000; & ITC 750 wensor, \$700. C Harrison, KGOT, 5601 Cashia, Boise ID 83705. 208-344-3511.

ITC 750 record elec, \$400. D Talmage, Future Snd Studios, POB 8042, Marion OH 43302. 614-383-2566.

ITC 750 R-R recorders (3). D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Ampex ATR-700 FT w/stereo capabilities in excel cond; Ampex AG-440C FT w/2-trk head cable box & remote control in vgc. BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 5

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Want to Buy

Ampex 351 or AG440. P Hons, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883.

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Ampex AG440, 351 or other 3 motor deck, R/P P Hons, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883.

Low cost 8 trk. for use in studio. W Dougherty Jr, WLD Recording, Rt: 1 Box 70, Mill Spring MO 83152. 314-998-2377.

CONSOLES

Want to Sell

Arrakis 500SL, 8 chnl stereo, excel cond, \$1900/BO; Arrakis 150SL, 6 chnl stereo, excel cond, \$1300/BO. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-384-2374.

Gates Stereo-5, rotary pot board, working when removed, \$650 plus shpg. J Littlejohn, WLTU, 2150 Goshen Rd, Ft Wayne IN 46808. 219-482-9288.

Spec 16 x 16 x 4 mixing board, w/lots of extras, excel cond, \$3750; Audio Technica ATC820 8 x 4 mixing board in flight case, like new, \$1250. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Audionics 110A 4 trk w/full EQ & custom caddy, cart equip rack; (2) Scully 280B 2 trk R-R; 280 4 trk R-R; Ampex ATR100 R-R, all transports have remote & vari-speed, excel cond, \$2000 all/part. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

Arrakis 500SC-8S, 8 pot stereo, new. G Blau, WXTR, 5210 Auth Rd, Marlow Hgts MD 20746. 301-499-3014.

Optimax Automation System, uses SMPTE & floppy disc. storage, 40 chnl capacity, no mds to faders required, \$10K. R Robinson, 203-269-4465.

Russco Studio Master 505 5 chnl mono console in gd cond, \$600. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

Shure M257 no scratches, like new, \$225/BO. P Wolf, WRCC, 2600 Pine Island Rd, Cape Crral FL 33904. 813-574-5548.

CCA dual 10 chan, gd cond, \$700; BE 4-150M (2), light service, \$500 ea. T Shinn, WKSF, POB 6447, Asheville NC 28806. 704-257-2700.

Gates Gateway & Gates 31 consoles. D Tabor, WLCK, POB 158, Scottsville KY 42164. 502-237-3149.

BE 105350, 10 chnl, dual stereo console, w/slide faders, less than 1 yr old, gd cond, \$3750. L Blakeney, WBBN, Rt 2 Box 273B, Taylorsville MS 39168. 601-729-8100.

Bdct Audio System IV, 8 chnl stereo. R Lane, KTYD, 5360 Hollister, Santa Barbara CA 93111. 805-967-4511.

Cetec 2000 Series, 5 chan, everything works, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Bi Amp 16 chnl stereo mixing console mdl 1682, \$500. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

Neve 5402 12 x 2 stereo mixer; Attec 250A, very clean, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Cetec 2000, 5 in 2 out; Quantum 8P 8 in 4 out; Quantum QM 22/8 8 in 4 out. R Kragen, Box 397, Roosevelt NJ 08555. 609-448-4739.

RCA BC-4A 4 chan mono tube, gd cond, \$200; Bogen LOM mixer, fair cond, \$50; Bogen MXM mixer, 4 chan, mono, fair cond, \$50. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Gates Yard power supply & monitor amp, excel cond, w/tubes, \$75; Gates Yard input matching transformer bank in rack panel, \$75; GE BC-1A power supply, gd cond, needs minor work, \$30; Gates Yard misc parts, some new, some used. G Heidenfelt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

McMartin 802 8 chan mono, working when removed from service, \$800. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

Wheatstone SP5 prod console, lots of modules, 2 yrs old, \$12,000. S McCloskey, WBHH, 916 Bay St, Beaufort SC 29902. 803-524-9210.

CCA 10-chn stereo console; Micro-Trak 4-chn console. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Gatesway audio console. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Gemini MX4440 disco mixer, 5 chan, stereo, excel cond, \$100. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Tascam Mdl 3, 8 in 4 out, approx 8 yrs old, gd cond, \$600; Shmtron 340 4 chan audio mixer similar to Shure Vumeter. line out, \$150. R Tanner, 419-238-4793.

Ampex MX35's (3), \$250 ea/all \$725; Sigma mixers (3), \$100 ea/all \$270; Attec portable mixers (2) 1567A, \$250 ea/both \$475; Harmon Kardon mixers (2) mdl DPR7, \$85 ea; (2) Echo bleeds passive off mic input lines to Fisher echo or any, \$25 ea/all \$65. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

QRK 8S solid state w/manual, spare modules & parts, \$900/BO; Wilkinson PAC-S3 solid state, \$500/BO. L Spivey, WLLS, Hwy 231 S, Hartford KY 42347. 502-298-3268.

Audionics 110, 14 input by 4 or 2 out for prod or on-air, recently refurbished, \$7000. J Georgiads, WRR0, 124 N Park Ave, Warren OH 44481. 216-373-1440.

Want to Buy

Gateway II, for parts, modules & power transformers. B Zellmer, KROZ, POB 2224, Greeley CO 80632. 303-351-8354.

Manual for Sparta AS40D console. M Numerick, WJCO, 1293 Floyd, Jackson MI 49203. 517-784-1510.

DISCO & SOUND EQUIP.

Want to Sell

Pro gear inc: JBL 4312 speakers, \$325; Howe phase chasers, \$800/pr; Crown 700 recorder, \$350; Yamaha NS-10M; Crown PL-1 & D-150 power amps, \$325 & \$250; Nakamichi BX-125 cassette decks; EV-644 shotgun mike, \$160. C Keith, Audioblab, Box 313, Keene NH 03431.

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\$1.3K; RCA 77DX—\$800; Dolby A Cat 22—\$350.
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ADC SA-3X Octave RTA, Radio Shack TV audio tuner. R Robinson, 203-269-4465

Martin Audio Varispeed III, AC capstan motor, low freq osc amp, solid state, excel cond, \$350. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

Fairchild 644B EQ modules, (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

Electro Harmonix vocoder, \$250. R Robinson, TNA, 203-269-4465.

Klipsch-Hersey speaker, \$375; dbx 10/20 computer EQ analyzer, rack mount, \$495. S Hofmann, Theater Arts Dept, Cameron Univ, 2800 W Gore, Lawton OK 73505. 405-581-2428.

JBL 4406 studio monitors, like new, \$200. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

Attec-Lansing 9844A monitor speaker, BO; Attec-Lansing Valencia 1792, BO; Attec-Lansing 604D, BO. J Phillips, All Am Bdctg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Attec Lansing Voice of the Theater studio monitors (2), BO. J Howell, Howells Audio, POB 6184, Kingman AZ 86401. 602-753-2054.

dbx RM155, gd cond, \$750. D Huettner, Dynamic, 358 Bell, Neenah WI 54956. 414-722-7228.

JBL & EV raw speakers (8), 12" & 15", new. P James, Allstar Bdctg, POB 7007, Defiance OH 43512. 419-782-8591.

Want to Buy

JBL 4443, 4415, 4413 monitors. D Glenn, WBZE, Box 3B Montgomery Ln, Waldorf MD 20601. 813-634-1940.

LIMITERS

Want to Sell

CRL FM4G & SPP800's proc system complete & (2) SPP800's. G Blau, WXTR, 5210 Auth Rd, Marlow Hgts MD 20746. 301-899-3014.

Modulation Sciences CP803, non rack mount composite processor, \$500. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

CBS Volumax 400, auto peak controller mono, gd cond. R Roisaland, KEWI, POB 4407, Topeka KS 66604. 913-272-2122.

Moseley TFL-280, (2) gd cond, \$750/BO both. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-386-2374.

Texar Prisms, two digital audio pre-cond for Optimod 8100, gd shape, \$600; dbx 140 stereo NR, gd cond, \$200. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

Modulation Sciences CP803, w/manual, like new, \$750. R Blankenship, WARR, 880 Commonwealth Ave, Hagerstown MD 21740. 301-733-4500.

Audimax 4440A, 4450A automatic limiter, Volumax 4000A & 4110 auto peak limiters, all in good working/physical condition, with technical manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

EXR exciter, one chnl is intermittent, \$175; UREI 31 band model 531 graphic EQ, \$475. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.



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Orban 8000A factory recond, \$2000/BO. C Steinbaker, WWPA, POB 262, Williamsport PA 17103. 717-323-7118.

UREI 1176LN limiter & compressor, excel cond, \$375. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

UREI LA5, similar to LA4, w/rack mt, \$250/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

Aphex Compellor, like new, \$800. J Breiten, WRQN, 136 W South Boundary, Perrysburg OH 43051. 419-874-1548

Fairchild Conax 600 mono, \$200; Gates slavelet M5167 limiter, \$175. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Stereo Volumax model 411; Ampex 601-2 portable stereo, 1/4" recorder, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Orban 424A stereo limiter, perfect cond, \$700/BO; UREI LA-4 (2) stereo sets, gd cond, \$600/BO pr. R Dietterich, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

UREI LA3A (2), \$300 pr. S Fox, KKIQ, 1603 Barcelona St, Livermore CA 94450. 415-838-3063.

CRL APP-400, \$350/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909. 813-574-5548.

CBS 411-Volumax, tested, fully oper, excel cond w/man. \$300 + shpg G Heidenfelt, 2880 W Lake, Wilson NY 14172. 716-751-6187.

CRL SEP400A, (2), \$900 for both. P Parks, KHY5, 7700 Gulfway Dr, Pt Arthur TX 77642. 409-963-1276.

Symetrix 501 compressor w/limiter, mint cond, \$200; Fostex 3070 stereo gated compressor, \$225. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

Pacific Recorders Multimax tri-band AGC (2); CBS Audiomax AGC; CBS Volumax limiter; Harris MSP-90 w/AM limiter module; Gates Solid Statesman FM limiter; (2) Gates Sta-level AGC; Intersound PRV-1 reverb/EQ. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Volumax, factory rebuilt. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180

BE FM601 stereo AGC/limiter, gd cond, \$400. J Gaboury, KECC, 699 Ave B, Yuma AZ 85364. 602-782-4321.

Moseley TPL 280 solid state mono audio limiter, clean & complete, \$100. H Ruh, WOVV, 540 Oakton, Des Plaines IL 60018. 312-803-8443.

Want to Buy

Allison Research Gainbrain 700. K Smith, Smith Eng Svcs, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

Optimod 8000. P Martin, WZUU, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

MICROPHONES

Want to Sell

AKG (3) C60/CK22/N62E, \$300 ea/all for \$800. G Hoffman, Akron PA 17501. 717-859-1633.

AKG The Tube, mint cond, \$975. J Arcotta, Sound Innovations, 3161 Westwood Ct, Boulder CO 80302. 303-444-5035.

AKG 414, (2) excel cond, \$675 ea; AKG 460CK1, excel cond, \$325. J Frankel, 8039 H Casminito De Piza, San Diego CA 92108. 619-291-9118.

Shure 545L, BO; AKG 919E, BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

Shure SM5B, (2) in gd cond, \$500; Shure SM-81, AC power supply, metal boxes, EC, \$500; EV-667A, Etable, boomable, studio dynamic, mint, \$225. J Newman, Box 7703, Atlanta GA 30357. 404-876-8623.

Audio-Technica AT1813 studio cardioid condenser mic, phantom powered, new in box, \$140. G Jones, KLXQ, Box 231, Jvalde TX 78802. 512-278-1102.

Neumann tube mics, pristine collection of M49's, SM2, & KM 54's, 90 matched pairs. K Heyne, 415-664-0163.

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Broadcast Equipment Exchange

MICROPHONES . . . WTS

AKG D19E, BO; Shure 545L, BO. P Sibley, Sibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

EV RE-20 w/EV 309 shock mount & both in excel cond, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

CBS (Radio) Network ID plate for RCA 44B/BX mic; RCA 44BC ribbon mic for trade for pre-1940 condenser mic or RCA BK-10A (uni-axial). J Steele, Philocom, 160 W 77th St, NY NY 10024. 212-206-5240.

AKG D330BT, excel vocal mike, LF & HF filter switches, gd shape, \$100; EV CS15 condenser w/cardiod capsule, gd for boom mike or snake, acoustic guitar etc, \$125. R McMullen, 3809 SW Mangold St, Portland OR 97219. 503-293-1170.

AKG V19E; Shure 545L, BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

EV RE-15 excel cond, \$100. L Bergman, Universal SnDs, POB 18716, Spokane WA 99308 509-328-0766.

Want to Buy

RCA 88A, junker for parts, cheap B Robinson, WTOK, 9th & 23rd, Meridian MS 39301. 601-693-1441.

RCA BK-6A lavalier; RCA BK-10 uni-axial, any cond; RCA 91-A announce (desk) stand for RCA 44 mic; Yoke (fork) shock mount assembly for RCA 44 mic. J Steele, Philocom, 160 W 77th St, NY NY 10024. 212-206-5240.

RCA studio boom, length approx 10', mfg by Mole-Richardson, 1940 era; RCA floor & desk mic stands. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

MISCELLANEOUS

Want to Sell

Electro Impulse CPTN-3000 (2) 3 kW dummy load, DC to 1 GHz oil filled, air cooled w/type LC connector, new, \$995 ea. C Waltman, 66 Jack London Sq, Oakland CA 94607. 415-836-0910.

Gates antenna shunts w/5 amp meters (2). E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

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Rust AL-100 autolog xmtr chart recorder w/AP-12 alarm panel, \$100 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Ford Code-A-Phone 111 & 180, \$40 ea or both for \$75. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

IBM System 34 computer, no peripherals, but comes w/full compliment of spares, storage since 1986, appears excel, \$1000 plus shpg. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

Superscope RBC-2, 5 V, NiCad battery pack, \$12; takahata Kogyo tape timer, \$75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

Jack strip, 52 RTS, dbi closed circuit jacks, gnds normalised, gd cond, \$100/BO; (2) UTC A-33 20 dB magnetic shields, \$10/both; line xfms (2) EV 502, EV 502B, Shure AB6A, \$12.50 ea/all for \$40; Pioneer JA-R102 rk mnt adaptor kit, \$7. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

Harris Cope 1035 printer; Digital VT-8E terminal; NCR 796-401 terminal; (2) Wang 700B advanced programming calculators; IBM 6.5 cart sys recorder type 281. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

RCA AVQ10, needs work, BO. T Clucke, WQKS, 905 S Main, Hopkinsville KY 42240. 502-886-1480.

Extel AF11R printer, used as auto logger, gd working/physical cond, w/tech manuals. R Yaw, North Montana Bdt, Box 7000, Havre MT 59501. 406-265-7841.

TI Silent 700 terminal w/acoustic modem, BO; Beckman 96 PH meter #9600, S/N 166679, BO; (2) Sony transcribers, gd cond. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

RCA 43 printer for teletype w/1571 weather writer board, 3 yrs old, like new, \$750. L Stone, KLID, POB 458, Poplar Bluff MO 63901. 314-785-9637.

Isolator, 5 kW, solid copper, BO. F Shields, KERV, POB 2187, Kerrville TX 78028 512-895-1230.

Sonex 4' x 4' x 3', new in box, \$200/carton. L Mueller, WSTF, 2500 Maitland Cir Pkwy, Maitland FL 32751. 305-660-0664.

Giant 30' inflatable cowboy, 8 yrs old, \$2000 w/compressor. C Hodgson, KKLZ, 925 E Desert Inn Rd, Las Vegas NV 89109. 702-737-9600.

Bird 3127 FM power mon & alarm, gd cond, \$500/BO; Sola 63-13-150, gd cond, \$150/BO; Elgin ERC, send/receive & answer to/from phone line, \$75/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909 813-574-5548.

Tandberg TCD 330 cassette deck; Waveform 452A tone osc; (2) Shure M63 audio masters; (2) Shure M62V audio level controllers; Shure M675 audio prod master; (2) Ampex A692 amps/speakers, send sealed bids by 4/15/88. M Starling, KPBS, SDSU, San Diego CA 92182.

NW-1 remote meter panel; Delta remote base meter; (4) Luxo mic booms; (4) EVJ mic shock mounts. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Patch bays, (2) row of 12 ea 19" rack mount, very new w/cords, \$100 ea; Daven panel (8) pots for volume controls, excel, no noise, \$100. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Aquarius 16K memory w/expander w/printer data recorder, games & manuals, like new in original box, \$125 plus frt. M Kantor, WPOB, 50 Knickerbocker Rd, Plainview NY 11803. 516-822-8915.

Jennings N-16-C-65863-2275 10,000 V caps, vgc, \$75 ea; Mylar caps, various values 200-600 V, large quantities avail, 3-30" ea. N Carlson, Mobile Snd Group, Box 148794, Chicago IL 60614. 312-871-7459.

Custom made 19" equip rack, table model, black in vgc, \$75. L Bergman, Universal SnDs, POB 18716, Spokane WA 99208. 509-328-0766.

Want to Buy

16mm TV shows, old TV movies, radio, magazines; 35mm film trailers & cartoons. S Albert, TVC Enter, POB 188, Needham MA 02192. 617-238-1179.

RCA BTF20E1 manual; any early 1960's radio transmitting equipment catalogs. W Irwin, WHIS, 900 Bluefield Ave, Bluefield WV 24701. 304-327-7114.

Rack cabinet, 19" w/doors. J Sherwood, KC Amateur Radio Club, POB 6551, Shawnee Mission KS 66206. 913-676-3020.

MONITORS

Want to Sell

TFT 763 mod mon w/724 stereo mon, 764 pre-selectors & remote metering, gd cond, \$2000. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

Potomac AM19 ant monitor, two tower day & night, \$1500. S Karwan, KCMJ, 490 S Farrel C202, Palm Springs CA 92262. 619-320-6818.

TFT 785, 763, 724A mod monitor, consists of preselector, mod mon & stereo mon, full spare part kits & manuals, 42000. S Karwan, KCMJ, 490 S Farrel C202, Palm Springs CA 92262. 619-320-6818.

McMartin TBM-3500B mod monitor with TBM-2200A stereo monitor, TBM2000A SCA monitor, all in good condition, \$1200/all. S Cilurzo, KGMG, 5735 Kearny Villa Rd, Suite G, San Diego CA 92123. 619-560-5464.

McMartin TBM-300A FM freq/pilot monitor, \$80. R Roisaland, KEWI, POB 4407, Topeka KS 66604. 913-272-2122.

Belar SCM1 SCA monitor, BO; McMartin TR55D, SCA tuners, BO. R Kinsley, Box 271, RD 3, Vergennes VT 05491. 802-759-2575.

JBL 4311 studio monitors, excel cond, no grills, \$500/pair. B Fenberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

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Arriflex BL camera, battery and all accessories, magazines, etc. F Singuschkin, Seraphin Comm, 1568 Eustis Street, St Paul MN 55108. 612-645-9173.

Singer autoload 16mm and B&H 1400 Series sound projectors; Fairchild, rear screen, 8mm salesman's projector, \$60 each; Teletype 33, ASR, with punch and reader, \$125 each. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

RECEIVERS & TRANSCEIVERS

Want to Sell

Wilson WE-800, 144-148 MHz, synthesized transceiver, 1 or 12 W, 12 VDC or internal NiCad batt, w/spkr/mic & hand-tooled leather case, mobile mt, \$200/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Sansul-G7700 stereo receiver 120 W/chan, excel cond, digital tuner w/all kinds of inputs, \$300. B Fenberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

SCPC receiver. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

McMartin TRE6B SCA receivers (10), \$55 ea plus shpg. P Lierman, Chriscomm Services, 701 Spur Round SE, Rio Rancho NM 87124. 505-891-0764.

Want to Buy

Fischer FM100 FM tuner. K Smith, Smith Eng Svcs, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Anixter-Mark P-972 GR-M1, 6' STL antenna, vgc, \$1000; Moseley SCM1 (2), one on 110 kHz, the other on 185 kHz plus power supply, new, \$1000 for all three. S Karwan, KCMJ, 490 S Farrel C202, Palm Springs CA 92262. 619-320-6818.

Equatorial Sat Receiver & down converter, 5100 controller, like new Model 5102-00, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

TFT 7601, 10 chan digital single wire or audio chan link, \$1200. D Doelitzsch, WDDD, 1 Bct Ctr, Marion IL 62959. 618-997-8123.

Moseley MRC-1600 remote control w/CRT option, excel cond, \$3500. D Malin, WPHN, POB 1212, Gaylord MI 49735. 517-732-6274.

S-A 7300 wide band rcvr, 7325 processing unit & 2.8 meter dish, currently in use, excel cond, \$5500/BO. A Wynn, KODL, POB 74, The Dalles OR 97058. 503-296-2101.

Gabriel 10' microwave dish, used as a sign, buyer must pick up, \$95. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Moseley 505 STL receiver, 951.5 MHz, BO. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

Moseley SCS-2 status control system, xmtr & rcvr, gd working & physical cond, w/tech manuals. R Yaw, North Montana Bdt, Box 7000, Havre MT 59501. 406-265-7841.

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Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: ____

POSITIONS WANTED

CE seeking FT position in a quality conscience AM & FM or combo as chief or assistant, 17 yrs exper, 1st class gen lic, SBE member, certified eng, 1st class NARTE. Maint & repair background. E Garrett, 3111 Doner Circle NW, Huntsville AL 35810. 205-852-0322/4024 or 205-895-9574.

Just sold station owned 20 years. Want work as manager, sales or related field. Will travel. Now in Texas. Send inquiries to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-1-88.

Radio eng seeks FT employment, exper w/AM DA's, multitrack prod, automation & xmtr exper, construction & design exper also, preferably Midwest area. D Walker, Walker Assoc, 883 Ross Ave, Hamilton OH 45013. 513-868-7064.

Cart Bdrct Eng, AM/FM, 14 yrs exper. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 5-1-88.

CE, NBN, HBO MDS, 2 college radio stations, excel personality looking for FT, PT or contract work. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

CE, radio, now! Former radio CE, top 5 market, FCC general, ham, non-drinker. M Gottesman, 3377 Solano Ave #312, Napa CA 94555. 415-221-2000.

CE w/over 2 yrs exper looking for FT position. Exp in AM/FM, FCC genrl, AS degree. J Grimes, Box 336 RD2, New Cumberland WV 26047. 304-387-4424.

CHR/UC announcer seeking FT employment in AM/FM markets, will relocate, FCC permit, \$4/hr paying internship considered, resumes available. J Torres, Columbia Sch of Bctg, 4326 Ivy St, E Chicago IN 46312. 219-397-4156.

Station/Ops Mgr, major market exper in programming, sales, budgeting, client relations,

etc. looking for similar position in station or group, results oriented, turnarounds considered. Box 81, Westhampton NY 11977.

On the ball 8 yr vet, currently working as PD, strong in formatives, looking for PD or jock job in East. D Silverstein, 703-955-4688.

Interim GM position sought (1-6 mos.) by Alan Swan, 18 W Spring Garden St, Palmyra NJ 08065. 609-829-1770.

Engineer, 11 yrs exper. large markets, high power, AM directionals, AM stereo, superior sound, presently DE of small group. Looking NYC, Boston, Philly, Baltimore, Jim, 1449-I Devon Ln, Harrisonburg VA 22801. 703-434-5926.

Short-term, 2-12 mons. interim GM seeks position. A Swan, Box 3, Palmyra NJ 08065. 609-829-1770.

HELP WANTED

The Daytona Group, a rapidly expanding, dynamic, radio chain is looking for several overachievers to head up new engineering departments. Successful candidates must have at least three years engineering exper, communicate well & love radio. Send resume to Kyle E Magrill, 770 W Granada Blvd, Ste 206, Ormond Beach FL 32074.

Top LA prod. studio wants adv. prod. eng., experienced, creative, fast, equip knowledge & ad people. Sweetening exp helpful. Send tape & resume. Salary negotiable. All inquiries confidential. Send to Radio World, POB 1214, Falls Church VA 22041. Attn: Box 4-3-88.

CE wanted in Northern California's top FM, on the leading edge of technology. Building new plant this year. Send detailed resume & salary requirements to Gordon Zlot, KZST, Box SS, Santa Rosa CA 95402. EO E M/F.



Broadcast Equipment Exchange

REMOTE . . . WTS
Comtek (Fairchild) RCV 360 Transtar AC format receiver & downconverter, \$1500; Moseley TRC15 remote control, set up for two wires, gd cond, \$1000. S Kanwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

Moseley PCL 303/C composite STL, gd cond, \$2500; Moseley PBR-30/AR remote control, gd cond, \$750. B Henry, KLLK, 12 W Valley St, Willis CA 95490. 707-459-1250.

S-A DAT 32, complete receiving system, \$9995. E Stenage, WCAO, 8001 Park Hgts Ave, Baltimore MD 20218. 301-653-2200.

S-A DAT 32 digital audio terminal, complete receiving system. C Steinbacker, WWPB, POB 2168, Williamsport PA 19703. 717-323-7118.

Gentner SPH3 telephone interface system, new, \$350. Catec Bdct remote 4 chnl console w/dual TTs, stand, etc, excel cond, \$500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

Symetrix 104 telephone interface (2), \$950 ea. John, WTDY, POB 2058, Madison WI 53701. 608-271-1484.

S-A 6602 satellite video rcvr, excel cond, freq agile 3.7-4.2 GHz, front panel C/N meter & IF monitor, local or remote control, \$1600. P Smith, 1147 Palore, St Paul NM 55105. 612-898-6369.

Transtar ssat receiver for oldies format. N Al-lebaugh, WFCE, 100 John St, Cumberland RI 02864. 401-725-9000.

TFT 8300 STL xmtr only, 947.5 MHz, new cond, \$3700. L Mueller, WSTF, 2500 Maitland Ctr Pkwy, Maitland FL 32751. 305-660-0664.

TFT 7601 10 chan RC for telco, STL or SCA, gd cond, \$1000. R Simmons, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Moseley TRC15 AM RC system for use w/STL, studio & xmtr units & insertion units, manuals, gc cond, \$2500. B Gordon, KIPA, 688 Kinross St, Hilo HI 96720. 808-935-6858.

Moseley PCL 505/C composite STL system, presently on 951.500 MHz, \$3000. G Savore, WFRD, Dartmouth College, Hanover NH 03755. 603-646-3313.

Potomac RC16 + 16 chan remote control, \$3500. H Reinders, WOGO, 5558 Hallie Rd, Chippewa Falls WI 54729. 715-723-1037.

Marti STL-8 dual-chan system on 950.0 MHz; RCA PBR-30 RC system w/SCD-2 subcarrier detector; RCA PBR-15A RC system, send sealed bids by 4/15/88. M Stirling, KPBS, SDSU, San Diego CA 92182.

Moseley SCG8 SCA gen, BO. R Kinsley, Box 271, RD3, Vergennes VT 05491. 802-759-2575.

Want to Buy

Rust R1-108 24 position remote control xmtr end, but will take entire system if avail, must have gd stepper relays in xmtr end. R Schott, WARD, POB 1550, Pittston PA 18640. 717-655-5521.

M/A Video STL's, 23 GHz, 18, 12 & 16 GHz; also used Moseley 505/C & 606/C units always wanted. C Kidd, Kidd Comm, 4096 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

Moseley MRC 1600 xmtr unit only; Moseley PCL 505C STL receiver. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

Marti RTC15 RCU for parts, need all 3 pieces. M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

Telephone interface, Gentner, Symetrix or similar in working cond. M Schaaphok, Protestant Radio & TV Ctr, 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

RCA early portable microwave units. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

STATIONS

Want to Sell

Atlanta area, 1 kW DT AM station, approx 4 acre tower site, recently renovated 1500 sq ft office bldg on approx 1/4 acre in business district, new bdct & prod equip, more. J Brown, POB 958, Douglasville GA 30133. 404-920-2281.

LPTV's (2) N. Minnesota/N. Dakota, equipment on site, ready to build! Low dial positions, Ch 17 & 28. Established UHF market in Fargo ADI. Kidd Communications, 4096 Bridge St., Ste 4, Fair Oaks CA 95628. 916-961-5433.

FM CP'S Wanted

Clients seek CP's any size market. Small, medium, large. Will consider FM upgrades, too!

Send inquiries to: Radio World POB 1214, Falls Church, VA 22041 Attn: Box 4-2

Pueblo CO, KAYK-AM for sale, off air, take over payments, inspected April 14. G Erway, Erway Bdctg, 1505 Crestview, Ordell OK. 405-832-5432.

LPTV-CP South CA coastal city, large market, \$50,000. G Erway, 805-688-0249.

Want to Buy

Bdct investor group forming to purchase profitable combo in medium market in South, reply to: Bdct Group, POB 976, Rayville LA 71269. 318-728-4574 (PM).

Looking for AM, FM or CP in east for right price/terms. H Kozlowski, 703-631-0197.

Looking for small, good recrdng studio for sale/lease in Chicago area. C Fuller, 312-579-9578.

STEREO GENERATORS

Want to Sell

Moseley SCG-9, excellent condition, \$400. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-386-2374.

Moseley SCG-3T, composit output, gd working/physical cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7641.

CCA SG1D stereo gen, BO. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

Harris 994-6533-001, gd cond for TE-3 exciter, \$300/BO. P Wolf, WRCC, 2600 Pine Island, Cape Coral FL 33909. 813-574-5548.

BE FS30, excel cond, \$1000/BO. J George, WMFX, POB 210271, Columbia SC 29221. 803-772-4980.

CCA SG-1D stereo gen. T J Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Sparta 682, needs work, w/Audiobol Elec lowpass filters, \$125. S Fox, KKIQ, 1603 Barcelona St, Livermore CA 94550. 415-838-3063.

Want to Buy

Standby gen, 15 kW single phase 220V LP gas w/automatic switching. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

SWITCHERS (VIDEO)

Want to Sell

Dynair 5100 Series routing switcher w/controller for 12 x 12 matrix, stuffed for 10 x 12, spares, extenders & docs. R Weller, Radio Station Bdct Svcs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

ISI 904, 10 input, (2) ME's, DSK, \$5000. E Denke, Amer Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Sharp XEG3000 by Crosspoint Latch 5 input, \$800. D Michel, 1743 Huffman, Dayton OH 45403. 513-254-2605.

TAPES, CARTS & REELS

Want to Sell

Beautiful Music record collection, BO. C Bryson, Conserv, 93 Robinhood Dr, Zelienople PA 16063. 412-776-5204.

3M used 1/2" tape, 206 (12) full, (2) partial hubs, 208 (1) full hub; Ampex 406 (1) full hub, \$5 per hub, (2) 1/2" metal 10" reels, \$3 ea, entire lot, \$75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

NAB reels, 10.5" metal 1/4", all in gd cond, 1-10, \$1.50 ea, 11-100, \$1.25 ea, 100 + , \$1 ea. Falk Recd Svcs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

We have largest quantity of reprocessed audio tape in the world. We also have the lowest prices! Sizes from 5" to 14" & 1/4" to 2", all brands, all types. We carry a full line of cassettes, broadcast carts, reels, boxes & related accessories at unbeatable prices. Call for our new catalog & more info 1-800-331-3191/516-678-4414 in NY. Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572.

A&D Cartridge Rebuilding Service

We clean, load & pack. Serviced within 10 work days! Work guaranteed!
3380 Oakley Ave., Eau Claire, WI 54701
(715) 835-7347

Cassette C-Box, has push eject system w/removable label holder, one hand operation, stackable, compatible w/old Scotch C-Boxes, 200 for \$120. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

3M used 1" tape, 206 (6) full on reels, 208 (2) full, one on reel, other on hub; Ampex 406, partial on hub, \$10/roll or entire lot for \$75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

Recortec tape evaluators, 1", 2" & 3/4", several of each. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Used 3/4" tape suitable for reloading. R Weller, Radio Station Bdct Svcs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

Fidelipac AA2's, 3's & 4's, various lengths, \$3 ea; Lauderdale Elect various lengths, \$1.50 ea; Ampex 7.5" reel tape, 1800' w/plastic reels, hundreds to choose from, \$2 ea; Magnetic Media 30, 60 & 90 min blank cassettes, white & black shells, case of 100 tapes, \$30 ea any length. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

Fidelipac Mastercart, varied lengths (150), BO. D Talmage, Future Snd Studios, POB 8042, Marion OH 43302. 614-383-2566.

Scotch 2500" 1", new (13) 201, all \$115; 2500" 1/4" 206 (12) new, all \$95; 5", 7", 12" empties, cheap. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

Scotchcart II, never used, 80 5/2 min. 30 3/2 min, \$385 takes all. G Elliot, WKEE, Box 2288, Huntington WV 25701. 304-525-7788.

Capital HOLN Q-17, 60-3500' hubs, \$15/hub. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-0005.

Recortec tape evaluators, 1", 2" & 3/4", several of each. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Want to Buy

Old time rock-n-roll or country hits from '50s & '60s in gd cond, reasonable prices for top cond library, prefer records, no tapes please. B Coleman Jr, WIST, POB 460, Lobelville TN 37097. 615-593-2294.

Fidelipac carts in rebuildable cond. JV Salazar, MRC, POB 3246, Laredo TX 78044. 512-722-6832.

Airchecks, transcriptions, 78's, 1920-50. G Tognacci, Starstream Comm Group, 9800 Richmond St 300, Houston TX 77042. 713-781-0781.

Pre-recorded automation tapes of big band or adult oldies. B Van Prooyen, 2111 Shangrila Dr SE, Grand Rapids MI 49508. 616-532-1168.

TAX DEDUCT. EQUIP.

School needs FM xmtr for educ purposes, 10 W & up. Rev M Mullen, Intl Mission Radio Assn, St Johns Univ, Jamaica NY 11439.

Eng student desiring donation of old bdct equip (anything in repairable cond, will pay all shipping charges. EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

TEST EQUIPMENT

Want to Sell

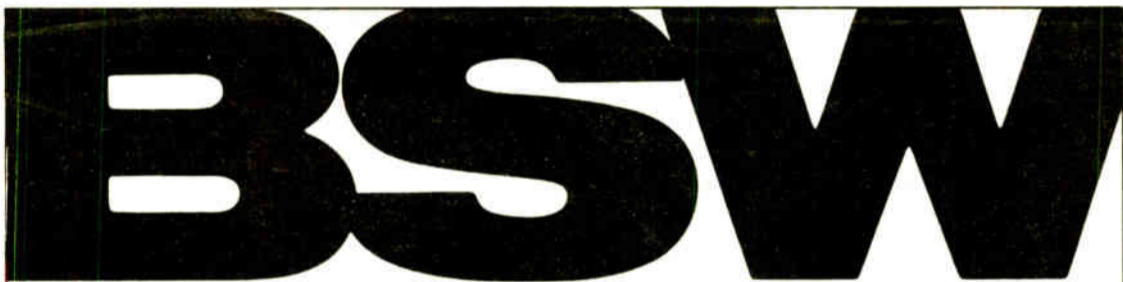
Sound Technology 1710A, generator analyzer, excel cond, \$2500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

HP 5212 electronic converter in use & gd working order, \$100. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

GR 1932A dist meter (2), one in gd cond & one operating as is; GR 1301 low distortion osc, gd cond. D Walker, Walker Assoc, 883 Ross Ave, Hamilton OH 45013. 513-868-7064.

Potomac FIM-41 field strength meter, 540 kHz to 5 MHz, 6 yrs old, excel cond, some scratches on case. BO. J Seaman, WSWA, Box 752 Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

Halcyon 701A digi xmsn test set, ex cond, \$695; Ithaco 4302 dual 24 dB/octave filter, ex cond, \$695. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.



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Free listings in Broadcast equipment exchange are offered to all United States Broadcasters AM/FM/TV and all Pro-Sound end users. BSW will accept up to three listings by telephone. For more than three listings BSW will send you an ad order sheet for your convenience. BSW will list each ad for a period of three full months.

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EMPLOYMENT SECTION:

Help Wanted
Any company or station can run "Help Wanted" ads at the flat rate of \$18 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

Positions Wanted
Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (there will be NO invoicing). Responses will be forwarded to the listee, unopened.

Check as appropriate: Help Wanted With Box Number
 Positions Wanted Without Box Number

Text (25 words maximum): _____

Name _____ Title _____
Company/Station _____
Address _____
City _____ State _____ Zip _____
Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041



Broadcast Equipment Exchange

TEST . . . WTS

Heathkit 10-4550 10 MHz dual trace scope w/man & Heathkit dist anal IM-5258 w/man—both \$350/BO. C Steinbacher, WWSA, POB 262, Williamsport PA 17103. 717-323-7118.

NLS mini scope MS-215, \$275. J Frankel, 8039 H Casminito De Pizza, San Diego CA 92108. 619-291-9118.

Tek 529 waveform monitors, \$400; Tek 1420 & 1520 vector scopes, \$400. G Urban, 314 W 52nd St. NY NY 10019. 212-677-2200.

Potomac FIM 71, \$3000 & FIM 41, \$1950; Tek 2215 scope, \$1050; HP dist anal mdl 331A/332, \$500; Sencor LC53 Z meter, \$500; GR-916AL comm bridge, \$450. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

Sencore FC-51 1 GHz freq counter, \$450; HP 427A voltmeter, \$250; HP 200CD wide range osc, \$200; HP high freq probe 11096B, \$80. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

Tek 6120 probe, BO; Bird 43 thru line wattmeter, BO; Bird dummy load, BO. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

B&W test osc; B&W distortion/noise meter. D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

Tek 527 waveform monitors, tube type, as is, \$150. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

GR 1606-A RF bridge, thru AM band, \$400/BO. L Albert, MSU-TV, Box 2266 Univ Sta, Murray KY 42071. 502-762-4664.

GR 916 RF bridge, BO. E Slimak, WWAK, POB 1195 Redwater Lake, Hawthorn FL 32640. 904-481-2310.

Potomac AT51, Sencor SG61. J Phillips, All Am Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

Sencore VA62, NT64, VC63, all mint cond, \$2500. L Clinton, KKYK, POB 4189, Little Rock AR 72214. 501-661-7590.

Heath SG-18A, \$100/BO. P Wolf, 241 NE 10th, Cape Coral FL 33909. 813-574-5548.

Want to Buy

Bird or equiv, 20 kW or higher dummy load, water cooled. J Schloss, KICD, 2600 Hwy Blvd Spencer IA 51301. 712-262-1240.

OVER 110 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FM's: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

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Dallas, TX 75248

214-630-3600
214-276-9725

TRANSMITTERS

Want to Sell

Gates BC1F, working cond, BO. T Clucke, WOKS, 905 S Main, Hopkinsville KY 42240. 502-886-1480.

RCA BTA-5F mod xfrmer, new, in crate, \$600; RCA BTA 5F, 5 kW AM, excel cond, operational & phys w/floor layouts & manuals, recent removed from serv, \$10,000; RCA BTA 50F 50 kW AM, recently out of serv, ex cond, cosmetically & operational, compl w/manual & floor layout, \$18,000. G Heidenfelt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

CSI 25 kW transmitter, 2 years old, one phasor, (4) ATU's. M Pulley, KYOO, 304 E Jackson, Bolivar MO 65613. 417-326-5257.

Collins 20V3 1 kW, presently on air, clean, \$6000. J Scott, WENT, Harrison St Ext, Gloversville NY 12078. 518-725-7175.

Harris MS15 exciter w/Harris 3CX150 rack mounted IPA stage, excel cond, \$2500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

Cetec 680 exciter, 10 W, \$850/BO. C Steinbacher, WWSA, POB 262, Williamsport PA 17103. 717-323-7118.

RCA BTE115 exciter. BO. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

Nautel AMPFET 400 AM xmtr, 2 yrs old, 810 kHz, factory stereo mod, easily retuned, \$5000. D Doelitzsch, WDDD, 1 Bdct Cir, Marion IL 62959. 618-998-8123.

RCA BTE-15A FM exciter, 107.7 MHz, w/SCA module, wb input mod, manual, gd operating cond, \$800. R Roisland, KEWI, POB 4407, Topeka KS 66604. 913-272-2122.



High performance at affordable prices.

15, 20, 30, 80 W exciters and translators /boosters. 100, 250, 400, 500, 1000 and 2000 W amplifiers.

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Telex 229882LJMUR

WE 1 kW, 1930 vintage, 4 units, D87740 osc unit, D88485 amp, HV rectifier & motor generator set, museum piece SN 102, somewhat busted up inside, no PCB's, free, you pick-up. B Frahm, KBOI, POB 1280, Boise ID 83701. 208-336-3670.

CCA FM 10000DS w/spare tubes & fan. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

SUPER-GEN

This high-performance FM Stereo Generator has selectable pre-emphasis, overshoot-controlled lowpass filters, digital pilot/subcarrier synthesis and built-in overmod protection. CBS/NAB's "FMX" system is available as a plug-in option.

Inovonics
SANTA CRUZ, CA (408) 458-0552

Powerpak, 40 W solid state digital prog exciter. J Phillips, All Am Bdcg, 414 Washington, Defiance OH 43512. 419-782-8591.

Solatron 39-59-325 3 phase 25 kVA, 208-230V, working when removed, you ship. \$500/BO. L Albert, MSU-TV, Box 2266 Univ Sta., Murray KY 42071. 502-762-4664.

RCA TTU-12 UHF TV xmtr (2), \$5000; AEL 10 W solid state FM exciters (2) mdl 2202A, \$300/both. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

CCA FM 10-DS exciter. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

Collins 20-V 500/1000 W AM, works gd for standby or night power, \$1100. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

CSI 25 kW AM, 1 yr old. M Pulley, 304 E Jackson, Bolivar MO 65613. 417-326-5257.

Want to Buy

Raytheon RF250, in any cond. B Van Prooyen, WYGR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

LPTV 1 kW, in gd cond, J Hold, WZBAI, Iuka IL 62849. 618-822-6197.

FM xmtr, 10 kW w/xciter, must be in gd cond. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

LPTV 1 kW, 100 W, 10 & 20 W xmtrs. all brands considered. C Kidd, Kidd Comm, 5094 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

RCA 5 kW (1960's). C Bryson, Comserv, 93 Robinhood Dr, Zelenople PA 16063. 412-776-5204.

RCA 5H or 10H for tubes & parts; also a 500-1500 W FM in gd cond. B Zeilmer, KROZ, POB 2224, Greeley CO 80632. 303-351-8354.

Gates BC1T xmtr or parts, need T-2 low voltage xfrmer. E Slimak, WWAK, POB 1195 Redwater Lake, Hawthorn FL 32640. 904-481-2310.

FM 5 kW. H Parshall, WDPR, 1514 W Dorothy Ln, Dayton OH 45409. 513-299-3297.

Manual for RCA BTA5F. M Numerick, WJCO, 1293 Floyd, Jackson MI 49203. 517-784-1510.

Service manual for ITA FM 10 kW or 15 kW xmtr. A Wiener, 178 Lawrence Park Terr, Bronxville NY 10708. 914-337-4554.

TUBES

Want to Sell

EIMAC 4-400A (2), new, BO. C Springer, KLMR, Box 890, Lamar CO 81052. 719-336-2206.

Eimac 4CX15000A (2), \$850 ea/BO. K Harnack, WCRV, 4554 Fleming Rd, Collierville TN 38107. 901-529-0098.

T-12 crystal, 1250 kHz (2), \$150 ea or will trade for 1370 or 1010; CCA AGC-1D AGC amp tube, fair cond, \$100. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

T-12A VAC crystal for 1010 kHz or will swap for T-12 1250 kHz crystal. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

Eimac 4-500B xmtr tubes, new or good. K Larke, POB 151, Caro MI 48723. 517-673-2136 after 6PM.

SK800 sockets in any cord (2). B Morris, POB 854, Mulino OR 97042. 503-829-2738.

TURNTABLES

Want to Sell

Russco Studio Pro B, w/Micro-Trak 303 tonearm, Stanton 500 cartridge (2), \$350/all. D Stewart, 615 Oak St, Prescott AR 71857. 501-887-5930.

Technics SL1100 w/all access, excel cond, \$295. J Price, Price Recgd, 2651 Globe Ave, Dallas TX 75228. 214-321-8576.

Technics SP10MKII (2), new in boxes, \$500 ea. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

Russco Studio Pro, low usage, \$385; Collins corner-shift 12" TT, recond & refinished, \$125; (2) Audio-Technica ATP12T tonearms, new, \$150 ea; Audio-Technica AT81E stereo phono cartridges (30), \$8.50 ea. G Jones, KLCQ, Box 231, Uvalde TX 78802. 512-278-1102.

Studer A725 CD player w/rack mount digital speed control, \$750. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

Audio Technica ATP12T tone arms (2), excel cond, \$100 ea. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

Technics SL1500 MKII, gd cond, w/Shure BC-70 bdc cart w/2 extra styli, digital speed & pitch controls, \$200. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

QRK 12" studio TTs, 3 speed, vgc, w/Rek-O-Kut arms, \$110 ea. P Combs, Only Son Prod, 2316 Forrest Home, Dayton OH 45404. 513-236-2340.

Russco Studio B TTs w/Micro-Trak tone arms, \$75. T Gorton, KQEV, POB 48, Olympia WA 98507.

Gates CB77 (2). D Tabor, WLCK, POB 158, Scottsville KY 42164. 502-237-3149.

Russco Studio Pro TTs (2), less headshells & cartridge, \$150 ea. D White, WYBR, POB 7180, Rockford IL 61126. 815-874-7861.

Russco Cue-master (2) w/Micro-Trak tone arms, both in vgc, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

Russco Studio Pro (2), gd working cond, will ship UPS COD or prepaid, w/tonearm, cartridges, preamp & PS, \$20 ea. M Schaaphok, Protestant Radio & TV Ctr, 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

TV FILM EQUIP

Want to Sell

Singer/Graphlex 16mm projector w/film chain shutter, like new, \$300. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

Want to Buy

Philco Cinescanner TV broadcast projector DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

VIDEO PROD. EQUIP

Want to Sell

RCA TTS-1A delay EQ system, \$750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TP76, trade or sell. JV Salazar, MRC, POB 3246, Laredo TX 78044. 512-722-6832.

GVG 711C video proc amp, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Videotek monitor & vectorscope; Sony 5800 & 5850; Tapco audio mixer; Hitachi camera & CCU; Sony editor & much more inc mixers, speakers, VTR, equip rack, switcher, etc, package or unit prices. W Libby, CFC-TV, 10237 Leesburg Pike, Vienna VA 22180. 703-759-4210.

Panasonic WVLK10 lens & filter. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

Harris 690 frame sync TBC, correct 1", 3/4", etc, excel cond, \$4295. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

JVC 8200 & 5500 editing system, w/Convergence ECS90, 44500; JVC BY 110 camera, 10:1 zoom lens, \$2200; Sony 4800 3/4" recorder, \$1400. D Weber, Sound Images, 57 E 11th St, NY NY 10003. 212-995-8822.

Sony VCR 2850 (3), \$750; Sony VP2002, \$500; Panasonic VCR color 3/4" R-R NV3132 & 3161; Magnecord TT58 (3) voice only; Xerox 3400; Compugraphic 4 typesetter; 11x17 press; 007 Intimus shredder. A Curtis, POB 2387, Arlington VA 22202. 703-521-1089.

Convergence ECS 103B w/cards for Sony 5000 Series, \$3500; Convergence SW1 110, \$1200; Convergence TC 100, \$900; Lenco sync generator, proc amp, DA's, \$2200. E Denke, Amer Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Knox K-50 character gen, 4 pages, \$400. R Tanner, 419-238-4793.

Telemation TSE-200 \$500; Panasonic BT51300N, \$325; Panasonic CT-110M 10", \$175; American Data 553A, \$500; Pelso MS512DT switcher, \$125; Telemation TSG-2000 bdc sync gen, \$950; Panasonic WJ-225-R, \$150; Panasonic dual 9" B&W monitors, \$195. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

Want to Buy

Tech manual for video projectors GE PJ7100 & PJ700, reasonable. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

Video projector & screen. M Schaaphok, Protestant Radio & TV Ctr, 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

VIDEO TAPE RECORDERS

Want to Sell

Sony SL2000 portable, no tuner, slip in AC adapter, NiCad pack case, \$375. S Hofmann, Theater Arts Dept, Cameron Univ, 2800 W Gore, Lawton OK 73505. 405-581-2428.

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Sony AV3600 VTR. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

Sony VP-1000 player; (2) Sony VO-1800 R/P; Sony AV-3650 R/P, Sony 3600 R/P; JVC CR-8300U; (3) Concord 800 R/P; (3) Panasonic NU 3020 R/P; (2) Sony portable AV-3400 R/P w/carrying cases; Ampex VR-600 studio VTR, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

Panasonic NV8500 edit VCR, 2 yrs old, \$1800. R Tanner, 419-238-4793.

IVC 1" VTR, \$500; NEC 3/4" video cassette player, \$500; JVC 3/4" video cassette player, \$650. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

RCA TR22, (2), one working & one for parts. Brad or Ron, KMZ, 501 Business Loop 70 E, Columbia MO 65201. 314-449-0917.

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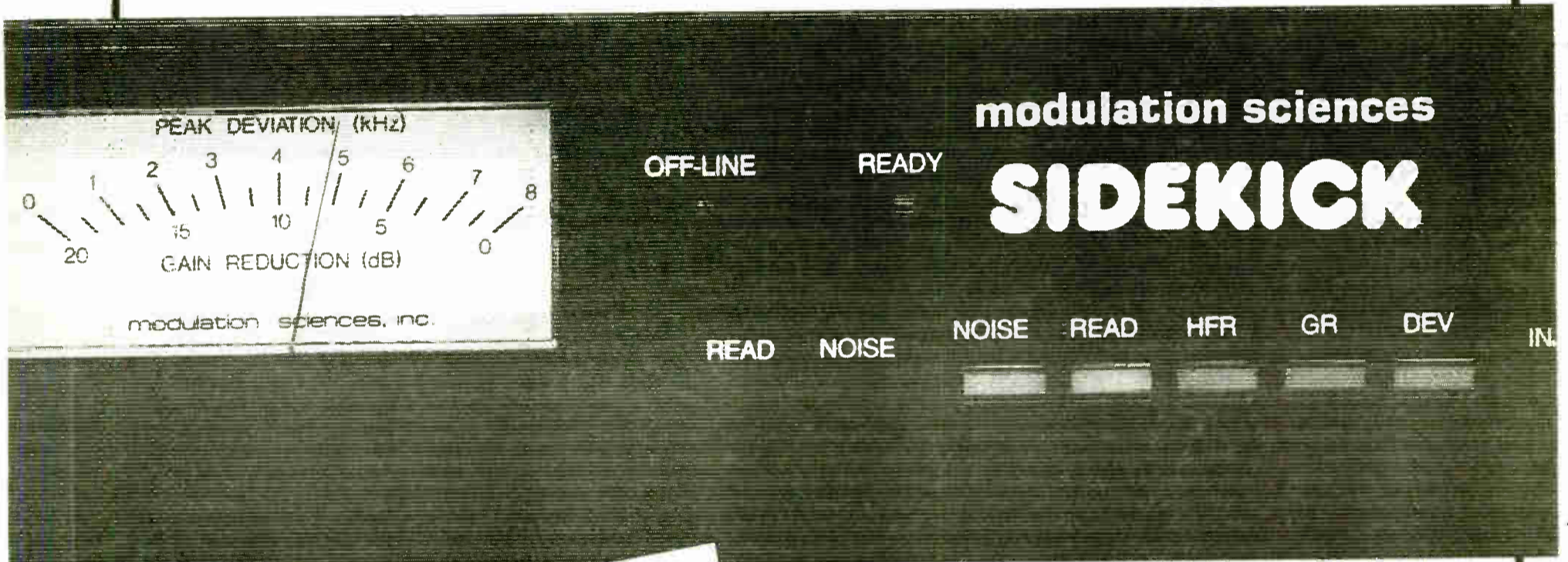
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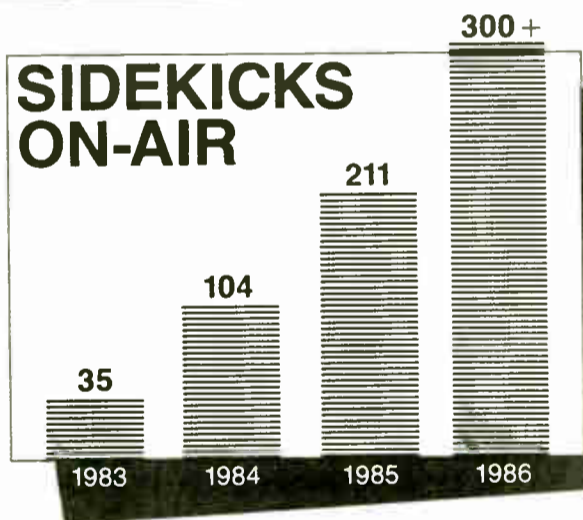
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