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The Radio Technology Leader

October 2000
An INTERTEC®/PRIMEDIA Publication
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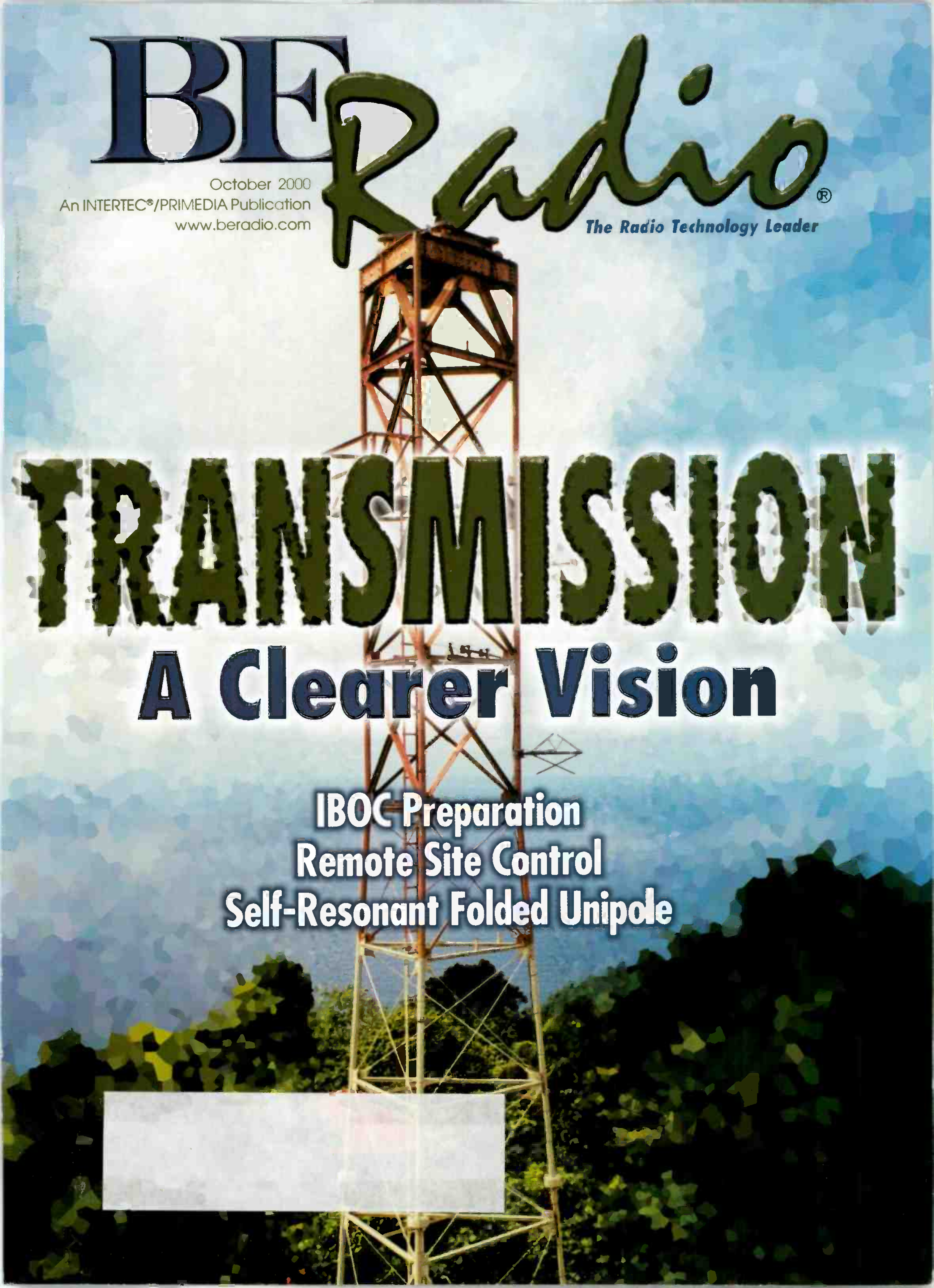

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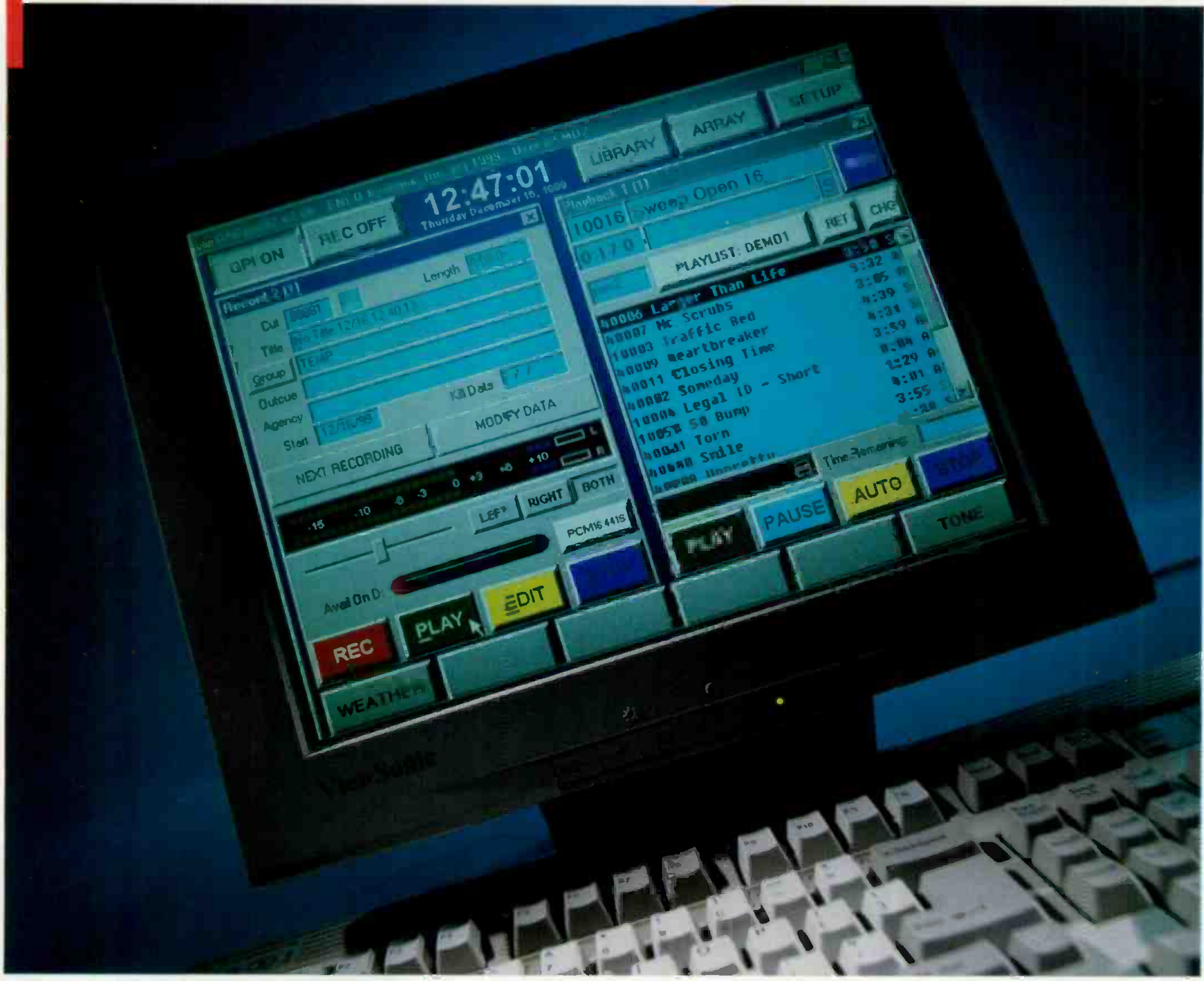

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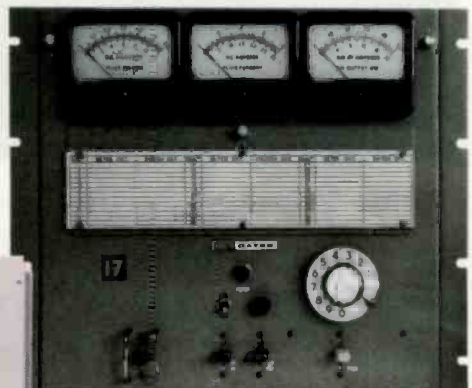

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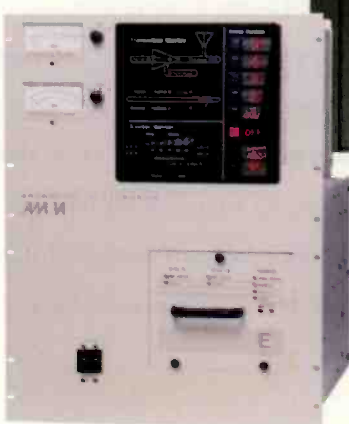

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ON THE COVER: Terrestrial transmission is the heart of radio. We provide you with a clearer view of the entire RF system. Photo by Kirk Harnack. Cover design by Michael J. Knust.

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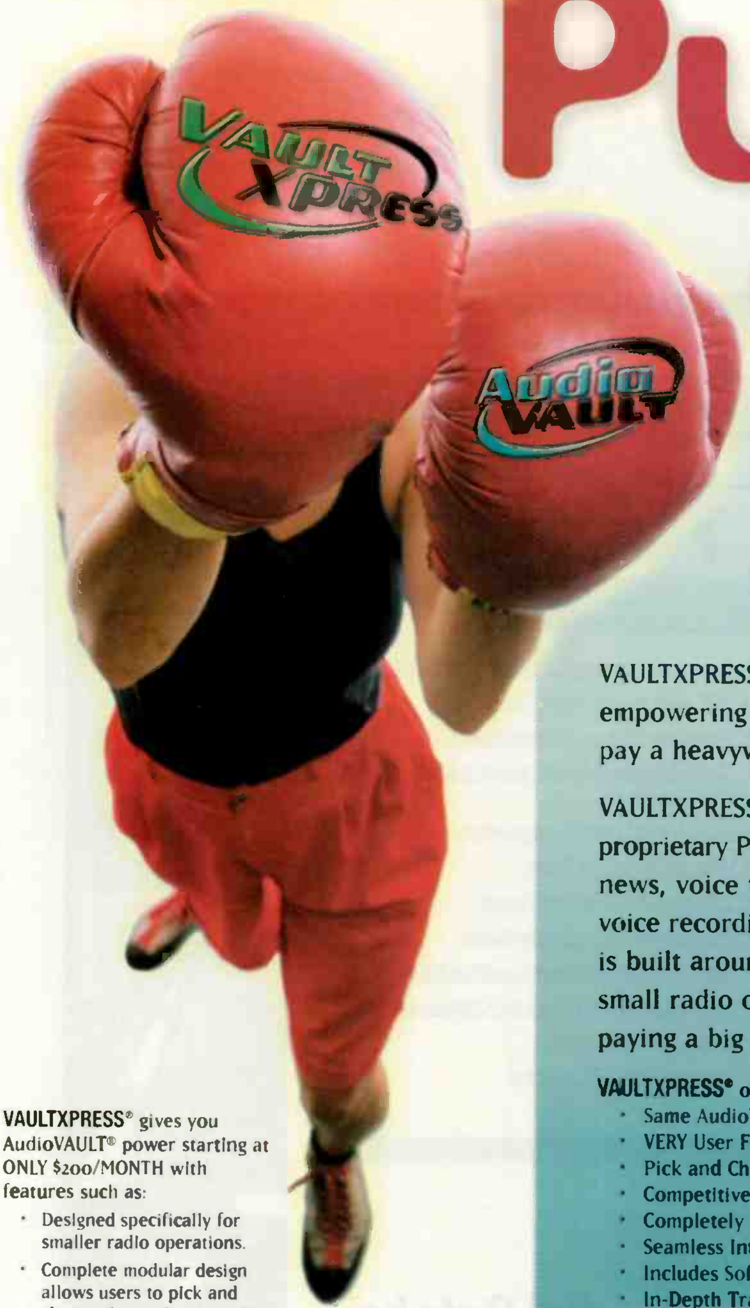

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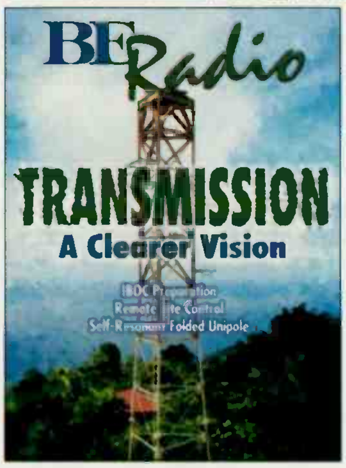

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Dot-coms and delivery

I recently returned from the West Coast after attending both the NAB Radio Show and the 109th AES Convention. Apart from the one-day show-floor overlap, both events were very good from my perspective. The NAB Radio Show has a history of catering to the interests of station managers, sales managers and program directors. This trend continues, but the focus on engineering interests is growing in session topics and exhibits. For example, I moderated a panel that covered the role of computers and networks in radio as part of the Digital Facilities Certification Workshop. Other technical sessions covered similar forward-looking topics including IBOC. There were also sessions that covered more traditional radio themes. The NAB has made a good effort at including radio technology in the sessions. The show floor also covers technology, but many other interests are represented as well.

This year's NAB Radio Show brought equipment manufacturers, service providers, syndicated-program originators and Internet-focused companies. This year, there seemed to be even more dot-com companies than last year, which is not really surprising. While the Internet is still a hot topic for every aspect of radio, it is interesting to compare the list of dot-com exhibitors from last year to this year. True to the Internet trend that we have seen so many times before, many of last year's dot-com exhibitors were nowhere to be found. Some have been bought by other companies. Many have simply run out of venture capital. Regardless of their fates or futures, the dot-coms were the stars of the show.

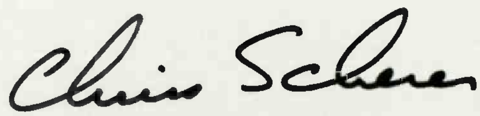
The influx of all the dot-com interests has necessitated new terminology for these radio delivery methods. The S-DARS companies are already known as satellite radio. At *BE Radio* we have adopted two terms to describe the conventional over-the-air delivery and the online delivery of radio broadcast: terrestrial radio and Internet radio.

Satellite radio had no real presence at the show. With both companies nearing service launch dates, most of their industry alliances have been formed. Their efforts are now being aimed at the consumer. Terrestrial radio continues to have strong roots at the radio show with IBOC still glimmering as a new hope. The recent creation of iBiquity Digital gave IBOC a new luster, but it was not the star of the show like it was last year or at NAB2000. Internet radio was making the biggest waves.

Previously, Internet radio interests only covered streaming audio. Simply putting an audio stream online is not enough anymore. Site-hosting and design services are only the beginning. Many dot-com exhibitors are offering methods of generating online revenue either by audio ad insertion, visual ad insertion, additional advertiser services and browser/player branding. Still, there were several dot-coms I visited that did not have a clear product or service. These companies are offering promises right now. These are the same companies that will likely become a statistic at next year's convention.

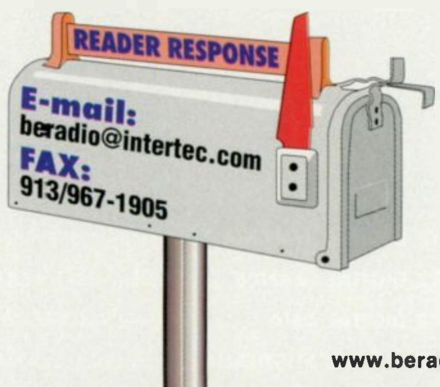
With all the focus on Internet radio – both delivery and revenue generation – it is obvious that radio broadcast is ready for an evolutionary change. Online listening presents new opportunities for both the broadcaster and the listener. These new opportunities create very different listening habits. Add to this the wireless application being developed with WAP-capable phones.

It is possible that radio's future will emphasize the creation of content and not the delivery mechanism. IBOC DAB provides a renewed opportunity for the content creator to control the delivery mechanism. Just as important will be the alternate delivery methods where the content creator passes the final product to an outside transmission provider such as an ISP or a wireless provider.



Chriss Scherer, editor
chriss_scherer@intertec.com

Look for a rundown of the new products at NAB Radio and AES in the November issue of BE Radio.

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Backup power

By Kirk Harnack

When was the last time the lights went out at your radio station? Last summer? Last winter? A year ago? Depending on your luck or your good planning, you may have never experienced an outage.

More and more station engineers, managers and owners are placing a priority on reliable power systems, and some of them are working quite well. Backup power systems are keeping stations on the air when utility companies are scrambling for work crews. Backup power systems keep the audience and the revenue streams firmly in place when commercial power providers drop the ball.

The decision process

In most cases, the decision to install backup power is a purely economic one. Top stations in large markets can purchase a complete backup power system with the gross revenue from one or two morning shows. For medium and smaller markets, the costs are much higher compared to the station's revenue. Generator sets (gensets) aren't getting any cheaper. However, *uninterruptible power supplies* (UPSs) have become very affordable. Consolidation of studio sites and transmission facilities is lowering the cost of power redundancy, too.

A larger, facility-wide UPS is an economical choice in new installations.

Not all broadcast engineers are experts in backup power systems. There is much to be learned from other engineers with considerable experience in the art of designing, implementing and maintaining such systems.

Entercom Communications installs UPS systems for two purposes: to provide clean power and short-term backup power to permit continued operations during the transition to an emergency generator or other power source. Many studio buildings suffer from significant AC line noise caused by elevator motor SCR controllers, high-capacity photocopiers, microwave ovens and other sources of electro-magnetic interference. For master-UPS installations, one of the most important features to include is a make-before-break or hot-bypass switch. This will permit servicing the UPS batteries without taking the system completely down. Usually the installing electricians hook this up.

Entercom also has found that many UPS units respond poorly to slightly off-frequency generator sets (a condition that is not unusual during engine warm-up), with the result being that although the generator is running, the UPS does not charge. This leads to a UPS failure. Although it is not always the case, the frequency-lock window for the UPS sensor often is adjustable and can compensate for the variation.

Entercom usually includes the on-air studios, news studios, audio delivery systems, traffic/billing systems, the LAN, STL and the telephone system on the master UPS. Also, many digital audio processors have a long recycle time. To avoid unnecessary program dropouts, these are kept on the UPS system. Smaller UPS units are used at the transmitter sites to support the microwave receivers, digital processors and remote-control units through the transition cycles of the emergency power generator.

Stormy weather

Like many Florida stations, Clear Channel of Panama City is frequented by fierce lightning and hurricanes. For this six-station installation, an 18kVA UPS feeds 120VAC to a separate power-distribution panel. This panel feeds all the on-air and production rooms, engineering rack room (with six racks full of STLs, RPUs, remote controls and processing), lighting in the control rooms and restrooms, and all the on-air computer systems. This UPS also feeds the file server and mail server connected to the Clear Channel WAN. When commercial power flickers, everything keeps running. In most cases, the on-air talent isn't aware of the failure.

The entire load listed above uses about 63 percent of the UPS's capacity. While the system can sustain the facility for 25 to 30 minutes, it never has run for more than one minute because the 200kW generator automatically transfers to power the entire building, including the air conditioning. The capacity to run everything, including the VHAC, is important because hurricanes and other

tropical storms are so common. A regular maintenance program is important for generators and UPSs. Most newer generators provide automatic testing.

Brownouts and blackouts

Critical on-air systems should have UPS support to maintain operation until a generator can pick up the load.

Generators provide an economical backup power solution for extended outages.

For multi-station or clustered groups, a large, central UPS is the best way to accomplish this. KDMX and KEGL in Dallas have such a system and are a good example of emergency power planning on a large scale.

The Clear Channel Dallas facility uses a 27-amp UPS to power the critical systems in the engineering shop such as automation servers, audio processors, T1 and RF STLs, and the office phone system. In the control rooms, smaller UPS systems handle the console, CD players, EAS and remote controls.

At the transmitters, Clear Channel Dallas has a UPS on the remote control system and a digital exciter, which requires a long time to reboot after a power loss. A generator provides extended backup-power support of the transmitters and HVAC. At one of the Clear Channel Dallas transmitter sites, two independent high-voltage feeds are provided from the local utility grid. These are switched automatically should one feeder go dead.

When planning to install or upgrade a backup power system, consider the amount of power that will be needed and the duration. Should one large UPS be used for powering on-air and computer equipment, or should several smaller units be distributed to necessary areas? How much load should a genset carry? Should HVAC be included? What fuel system is best for each generator installation? Local zoning laws, station economics and physical space will all affect the decision.

Three respected engineers contributed to this month's Contract Engineering column: Marty Hadfield of Entercom in Seattle; Charlie Wooten of Clear Channel in Panama City, FL; and Chris Boone of Clear Channel in Dallas.

Kirk Harnack, BE Radio's consultant on contract engineering, is president of Harnack Enginering, Cleveland, MS.

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Preparing the budget

By Ron Bartlebaugh

A budget consists of many individual line item expenditures. Some typical line items for an engineering department budget would include maintenance and repair, travel, training, utilities, freight, postage, dues, subscriptions, supplies, fees for outside services such as HVAC maintenance or consulting engineers, insurance, salaries, benefits, and capital equipment purchases. All line items combine together to create a chart of accounts for the department. The chart of accounts should be created with input from the department head and in cooperation with the station's business department. An individual budget for each station should be created in situations of multiple station ownership.

The expense of each budget line item needs to be predicted over a twelve-month period on a month-by-month basis. For line items that remain the same every month, an entry of equal value should be contained within the budget for each month. Other expenses incurred during a particular month should be entered by line item as a planned expense for that month. Some expenses may need to be posted in equal or variable values over several months, dependent upon the project size and the terms of payment of a particular contract.

Items such as transmitter tubes and other components have a finite life span and usually can be implemented into a regular budgeting process.

Within the lines

Line items such as salaries, benefits, insurance, and, to a certain degree, utilities, can be budgeted in equal monthly amounts over the twelve-month period. However, adjustments for short and long months in relation to payroll would need to be made as well as adjustments for utility usage during the months when utility costs are driven by climatic conditions unique to a specific geographic area. Travel expenses can be closely predicted by planning ahead regarding trade shows and/or seminars that one or more people from within the department may be attending. A good travel agent can be invaluable in helping to predict hotel and airline costs far in advance of an event. Training can often be combined with the travel line, or vice versa, when traveling to a seminar. Monthly amounts for dues and subscriptions should total the annual amount to be spent for dues paid to professional organizations and for subscriptions to publications, including FCC rules.

The maintenance and repair and supply line items, aside from salaries, benefits, and capital equipment, may be two of the larger line items within the engineering department budget. These line items typically cover parts and materials necessary for the day-to-day maintenance and repair of each individual station. Items ranging from electronic components to tower maintenance parts and labor are typically included within the maintenance and repair line. Other items for this line may include replacement tubes, modules, blowers, and other major repair items. By estimating the longevity of major parts such as tubes and blowers, one can more accurately plan for these rather costly expenditures.

Major purchases

Capital equipment purchases are those costing more than a certain dollar value and may be depreciated by the organization over a time period of a year or longer. The established dollar value may vary from operation to operation depending on accounting methods used. Typical items that may be considered capital equipment expenses may include consoles, computer equipment, transmitters, antennas, and some test equipment. Supplies and parts purchased for a major project may also be included in the capital expenditures instead of being budgeted under the operating budget.

It is good business practice to fund equipment depreciation. This funding may take many shapes and forms, again depending upon the accounting principles in use at a particular station. Equipment depreciation funding simply means that a pre-determined amount of money is to be set aside every year into an account to be used for equipment replacement. Equipment depreciation funding may be included as a line item within the engineering department budget or it could be managed as a totally separate line item located elsewhere within the overall station operating budget.

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FM4000G3	Grounded Grid Tube	4 kW	87.5-108.1 MHz	3CX800A7	3CX3000A7	$ 24,795.00
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FM4000GS3	Solid State / Tube	4 kW	87.5-108.1 MHz	FM700SS	3CX3000A7	$ 25,795.00
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FM5000G3	Grounded Grid Tube	5 kW	87.5-108.1 MHz	3CX800A7	3CX3000A7	$ 25,795.00
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FM8000GZ1	Grounded Grid Tube	8 kW	87.5-108.1 MHz	3CX800A7	3CX6000A7	$ 26,995.00
FM8000GZ3	Grounded Grid Tube	8 kW	87.5-108.1 MHz	3CX800A7	3CX6000A7	$ 26,795.00
FM8000GS1	Solid State / Tube	8 kW	87.5-108.1 MHz	FM700SS	3CX6000A7	$ 27,995.00
FM8000GS3	Solid State / Tube	8 kW	87.5-108.1 MHz	FM700SS	3CX6000A7	$ 27,795.00
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FM10000GS3	Solid State / Tube	10-12 kW	87.5-108.1 MHz	FM700SS	3CX10000A7	$ 28,795.00
FM15000G1	Grounded Grid Tube	12-15 kW	87.5-108.1 MHz	5CX1500B	3CX10000A7	$ 28,995.00
FM15000G3	Grounded Grid Tube	12-15 kW	87.5-108.1 MHz	5CX1500B	3CX10000A7	$ 28,795.00
FM20000G1	Grounded Grid Tube	20 kW	87.5-108.1 MHz	5CX1500B	3CX15000A7	$ 54,995.00
FM20000G3	Grounded Grid Tube	20 kW	87.5-108.1 MHz	5CX1500B	3CX15000A7	$ 43,995.00
FM25000G1	Grounded Grid Tube	25 kW	87.5-108.1 MHz	5CX1500B	3CX15000A7	$ 56,995.00
FM25000G3	Grounded Grid Tube	25 kW	87.5-108.1 MHz	5CX1500B	3CX15000A7	$ 44,995.00
FM30000G3	Grounded Grid Tube	30 kW	87.5-108.1 MHz	5CX1500B	3CX20000A7	$ 49,995.00
FM45000G3	Grounded Grid Tube	45kW	87.5-108.1 MHz	FM8000GZ3	YU1195	$ 64,995.00
FM50000G3	Grounded Grid Tube	50 kW	87.5-108.1 MHz	FM15000G3	YU1195	$ 69,995.00

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Model	Transmitter Type	Power Output	Frequency Range	IPA Type	PA Type	Modulator Type	List Price
AM10KWF	Plate Modulated AM	10 kW	500 KHz-2 MHz	4-400	4CX15000A	(2) 4CX5000A	$ 62,995.00
AM10KWFHF	Plate Modulated Short Wave	10 kW	2-22 MHz	4-400	4CX15000A	(2) 4CX5000A	Call
AM15KW	Plate Modulated AM	15 kW	500 KHz-2 MHz	4-400	4CX15000A	(2) 4CX5000A	$ 64,995.00
AM15KWFHF	Plate Modulated Short Wave	15 kW	2-22 MHz	4-400	4CX15000A	(2) 4CX5000A	Call
AM25KW	Plate Modulated AM	25 kW	500 KHz-2 MHz	4-400	4CX20000B	(2) 4CX15000A	$ 119,995.00
AM25KWFHF	Plate Modulated Short Wave	25 kW	2-22 MHz	4-400	4CX20000B	(2) 4CX15000A	Call
AM50KWF	Plate Modulated AM	50 kW	500 KHz-2 MHz	4-100	4CX35000C	(2) 4CX15000A	$ 209,995.00
AM50KWFHF	Plate Modulated Short Wave	50 kW	2-22 MHz	5CX1500B	4CX35000C	(2) 4CX15000A	Call

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Model	Transmitter Type	Power Output	Frequency Range	PA Type	Modulator Type	List Price
AM500SSi	Solid State AM	500 watts	535-1710 KHz	Solid State	Digital PDM	$ 7,000.00
AM1000SSi	Solid State AM	1 kW	535-1710 KHz	Solid State	Digital PDM	$ 8,800.00
AM1000SSA	Solid State AM	1 kW	535-1710 KHz	Solid State	Digital PDM	$ 16,495.00
AM2500SSA	Solid State AM	2.5 kW	535-1710 KHz	Solid State	Digital PDM	$ 23,495.00
AM5000SSA	Solid State AM	5 kW	535-1710 KHz	Solid State	Digital PDM	$ 41,495.00
AM10000SSA	Solid State AM	10 kW	535-1710 KHz	Solid State	Digital PDM	$ 62,995.00
AM25000SSA	Solid State AM	25 kW	535-1710 KHz	Solid State	Digital PDM	$ 131,995.00
AM50000SSA	Solid State AM	50 kW	535-1710 KHz	Solid State	Digital PDM	$ 194,995.00
AM100000SSA	Solid State AM	100 kW	535-1710 KHz	Solid State	Digital PDM	Call
SW1000SSi	Solid State Short Wave	1 kW	3-7 MHz	Solid State	Digital PDM	$ 11,495.00
SW1000SS	Solid State Short Wave	1 kW	3-7 MHz	Solid State	Digital PDM	$ 20,495.00
SW2500SS	Solid State Short Wave	2.5 kW	3-7 MHz	Solid State	Digital PDM	$ 27,995.00
SW5000SS	Solid State Short Wave	5 kW	3-7 MHz	Solid State	Digital PDM	$ 48,995.00
SW10000SS	Solid State Short Wave	10 kW	3-7 MHz	Solid State	Digital PDM	$ 72,995.00

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Managing Technology

Salaries and benefits are numbers that will almost always be entered into the budget by the station's management. The planned use of consulting or contract engineers needs to be posted into the budget on the month or months that the expenditure is to take place. As an example, if a contract engineer provided services in June, the invoice for those services would normally become due in July so the predicted expense would be posted under professional fees for July.

The technical budget may include expenses that affect other departments whose specific needs must be determined.

It is difficult to plan for the unexpected. It is always a good idea to include a contingency line item in every engineering budget for unforeseen emergencies. Five percent of the total engineering budget is a good rule of thumb for devising a contingency line number, however the final decision for the amount of this line item should be between the station management and the engineering department head.

Constructing and operating from a well-defined budget makes good business sense and is well worth the investment of time and energy. Always be sure to follow widely accepted accounting practices and maintain accurate records.

Ron Bartlebaugh is director of engineering for the WKSU Stations, Kent, OH, and president of Audio and Broadcast Specialists, Akron, OH.

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With AXS (pronounced ax'-cess) 3, the 3 tells you this is the *third generation* of one of the most popular digital studio systems in radio! AXS is in its *second decade* as radio's *premier* satellite automation and digital cart replacement deck.

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Air Studio Production Bonus: AXS 3 also has *another* stereo production output and record input. You can record and edit phone calls or spots and auto-delay news *and* audition them in a cue speaker while playing triple overlap on the air!

Premium SCSI LVD Hard Drives: The 3 also tells you that AXS 3 gives you a *3 year limited warranty* on hard drives. AXS 3 uses *exceptionally reliable and fast SCSI LVD 18GB hard drives* from quality manufacturers (like IBM, Seagate, and others you trust) to keep your precious commercials, jingles and other recordings *always* at your fingertips. Some other systems cut corners with slower and less reliable IDE hard drives that sometimes choke and sputter with triple overlap and music on hard drive. They also jeopardize your cash flow with less reliable drives more likely to crash.

Awesome Sound Quality: With AXS 3, your station will sound superb. AXS 3 uses only the best *non*-proprietary +4 balanced *4 output* digital audio cards by Audio Science. These are also sold by most of the major brands of digital systems, but only in their top-of-the-line models costing *lots more* than AXS 3.

Easy to Use: AXS 3 was *designed by jocks*, for jocks. It's 100% intuitive. AXS 3's big on-screen intro timer and separate countdown timers on every deck make pacing a snap.

If you know how to work cart decks, you know how to work AXS 3. It's so simple, everyone can run it! AXS 3 has *big* buttons. Other systems use complex multi-step mouse mazes. AXS 3 gets things done with one simple touch.

Flexibility: AXS 3 seamlessly mixes uncompressed (linear) audio and all popular MPEG II compression ratios. AXS 3 can also play MP3 songs and spots you get from other sources, but if you do this you must stay with one bit rate for all. (It's a limitation of MP3, not AXS 3.)

The Music's Easy: AXS 3 is delivered with *your* music library already pre-recorded for you either in MPEG II or uncompressed at no extra charge.

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Jocks love AXS 3! Scott Studios' AXS 3 works with three cart players on the right side of the AXS 3 screen. The program log (at left) automatically loads the decks, or you can insert anything from pick lists. The far left of AXS 3 has 12 Hot Keys that can play instantly at a touch.

AXS 3 comes with Scott's time-saving TLC (Trim, Label & Convert) CD Ripper software for your Program Director's computer. TLC uses a CD ROM drive to transfer 5 minute songs to hard drive digitally in 15-30 seconds.

The Best Air Studio Recording: AXS 3's built-in recorder has a *graphic waveform editor* for easy recording and editing of phone calls, spots, news or announcer lines. AXS 3's log editor lets you add new items to your schedule.

The Best Voice Tracking: AXS 3 works with Scott's optional *Voice Trax*, which you can add to your production room or air studio. Announcers will be able to hear surrounding music and spots in their headphones to match their voice to the moods and tempos of the music. During Scott Voice Trax, the level of your music is automatically lowered by AXS 3.

Quality Hardware: AXS 3 uses an industrial quality Pentium III rack mount Windows computer. Jocks can use a keyboard or mouse, or optional button box or touch screen for fast control.

The Best Tech Support: Toll-free emergency phone support is available 24 hours a day, 7 days a week (including holidays). Software updates with new features are available for AXS 3 customers several times per year to stations on our annual support plan.

Easiest to Install: AXS 3 comes with a pre-wired connections to CAT5 LAN cables for snap-in installation on the AXS3 end of the wiring. Satellite control logic is also a snap with a plug-in connector. Your first two satellite audio connections for music format and news network, as well as another for your production console, are all built into AXS 3. For most music formats, there are no satellite interface cards or external switchers required. Basic connections are built into AXS 3.

LAN and WAN: AXS 3 and other MPEG and uncompressed WAVE Scott Systems use the same recordings. You don't have to dub the same spot several times for several stations.

The Best Production Studios: AXS 3 is compatible with popular multi-track systems you may already have, like Sound Forge, Vegas Pro, Cool Edit Pro, Fast Edit and others. Simply add our time-saving $500 no-dub instant LAN spot upload option.

AXS 3 is Affordable: Satellite AXS 2 systems start at $7,995 with computer, double overlap audio card, satellite inputs, switcher and production recorder-player. Triple overlap AXS 3 adds 18GB of music on hard drive for only $9,995 delivered. For details, check scottstudios.com, axs3.com or call 800 SCOTT-77.

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Parasitic radiators

By John Battison, P.E., technical editor, RF

A radio engineer's definition of a parasite might be something that obtains its power from another's energy. In other areas of broadcast engineering it might be obnoxious RF signals that are developed in an otherwise stable RF amplifier, resulting in off-frequency operation. There are two general radiator cases for discussion: unintentional and undesired, and desired.

Harmful parasitics

Undesirable radiators are those that appear in the close fields of AM and FM transmitters. Almost any tower can cause havoc when located near an AM radiator. In the case of a non-DA station, such an unwanted device can at the very least distort the service area and, depending on circumstances, cause severe loss in a listening area.

In the case of a directional station, a *wild tower*, one that is not part of the array, can affect the pattern severely, put monitor points out of tolerance and, when close to an array, can cause changes in operating and common point impedance. These undesirable effects often happen without warning with the current trend of mushrooming wireless towers of 200 feet or less.

Structures built within an AM station's coverage may require detuning so they appear invisible to the AM station.

Another type of tower that often springs up with even less warning is the lower-voltage power line. These towers are usually made of wood and are probably not taller than 100 feet. During one project, on which I specified the location of a client's two tower array, the client noticed a new power line going into place just along the edge of the site just as the transmitter was being installed . When we arrived to proof the array, the line was almost complete. Needless to say it was impossible to meet the *maximum expected operating value* (MEOV). This was in the days before standard patterns. Each 80-foot pole had a solid ground wire running down its length. At 1600kHz, the poles reradiated horribly and completely ruined both the non-directional and directional patterns.

Power companies *never* permit a break in the wooden pole ground wire, and it is almost impossible to persuade these utility companies to change a power line's planned route. Fortunately, power line RF chokes can be inserted at the bottom of the ground wire. The DC circuit still meets the power company's requirements while providing the station with the necessary RF break in the line. In the installation I mentioned earlier, we used a number of these chokes and split the cost with the power company. Once installed, we obtained a nearly circular non-directional pattern.

Taller towers and structures can also be a source of reradiation. The process of detuning these structures is complicated and will be the subject of a later column.

For FM, troublesome reradiators are normally found very close to the antenna and are probably a part of the antenna supporting structure. Such problems are usually solved by the antenna and the tower manufacturers' cooperation. As a general rule, FM transmissions are usually not subject to the same unexpected intrusion of a closely spaced tower. When an FM antenna will be placed on an existing tower or located within short distances of other antennas, the antenna consultant will usually take care of such matters. Towers with candelabras are a typical example.

The FCC has never been very enthusiastic about undriven parasitic arrays for AM transmitters because of problems of stability. Where a radiator is driven by an established combination of current and phase there is little likelihood of sudden large drive changes taking place, which could drastically alter the pattern.

A parasitically driven element derives its power from the driving antenna. Therefore, even a small change in the power supplied to the driven tower could make a large change in the current and phase of the parasitic element. Naturally, the current developed in the parasitic radiator falls off rapidly as the distance between the two towers increases.

On the other hand, the phase in the driven tower increases with separation. A small degree of phase control, about 40 degrees, is possible by changing the length of the parasitic tower. However, this often reduces the current in the driven element and makes operation

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The dual configuration Quantum 20/20 with up to 44,000 watt capability now offers a practical solid state solution for high power FM stations. Overall efficiency of 68% keeps operating costs and cooling requirements at a minimum.

The Quantum transmitter's built-in redundancy and duplication features contribute to exceptionally high on-air confidence. Broadband RF Power Modules and IPA Modules each have their own Switching Power Supply Module. Both amplifiers and power supplies can be removed and serviced while the transmitter remains on air.

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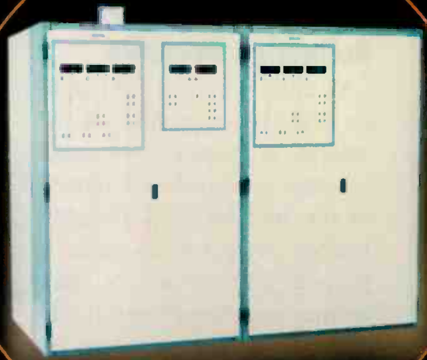

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more difficult. A small amount of control can be obtained by means of an L/C circuit at the base of the parasitic tower, but the system is still normally regarded as being less stable than a driven tower.

Reflecting elements

All radio engineers are familiar with *Yagi* antennas. In this system, a quarter-wave active antenna is connected directly to the receiver, and a slightly longer *reflector* element is placed approximately one-quarter wavelength behind the antenna. A slightly shorter *director* element is placed about one-quarter wavelength in front of the antenna. About 8dB or 9dB is the maximum gain obtained from this type of antenna. Because of the small element size, half-wave elements are commonly used in these antennas. A Yagi tends to exhibit narrow bandwidth as a result of its directivity.

Some interesting results can be obtained by using very tight spacing between the radiator and the reflector. When this is done the reflector no longer behaves as a reflector and becomes a driven element because of the high current induced in it due to of the close spacing. One example of a Yagi directional antenna is found in AM directional arrays today, but they are either all driven (not parasitic), or purely directors and reflectors. Typically referred to as in-line arrays and comprised of up to six towers, the system bandwidth can decrease and overall efficiency may be low.

Several station owners have wondered why they could not make a DA by dropping a wire from a guy wire. Usually there is not enough room, but the FCC has approved at least one. At one time, WKYC in Cleveland needed to reduce radiation towards Canada while using the TV tower as an AM radiator. The plan was to drive the drop wire on the Canadian side to reduce radiation.

It was found that driving the drop wire did not reduce the radiation in the Canadian direction sufficiently. Eventually, a resistor was placed on the ground end of the wire to reduce the radiation. I don't know if the FCC would accept this type of radiation control today. However, several consulting engineers have suggested that greater consideration be given to the use of drop wires from guy wires.

Parasitic elements can be used to add directionality to an antenna.

Nevertheless, the idea has merit, especially for AM stations located on small non-expandable antenna sites that need to directionalize to improve service or to provide protection. A simple two-tower DA could easily be designed for daytime use. Night vertical radiation requirements might be harder to meet.

The fact that as the parasitic radiator and driven tower move closer together they tend to act as a driven tower because of the very high induced current might make such a project feasible.

Photo on page 18 by Mark Heller, WTRW-AM, Two Rivers, WI. Photo on page 20 courtesy of Electronics Research Inc.

E-mail John at: batcom@bright.net.

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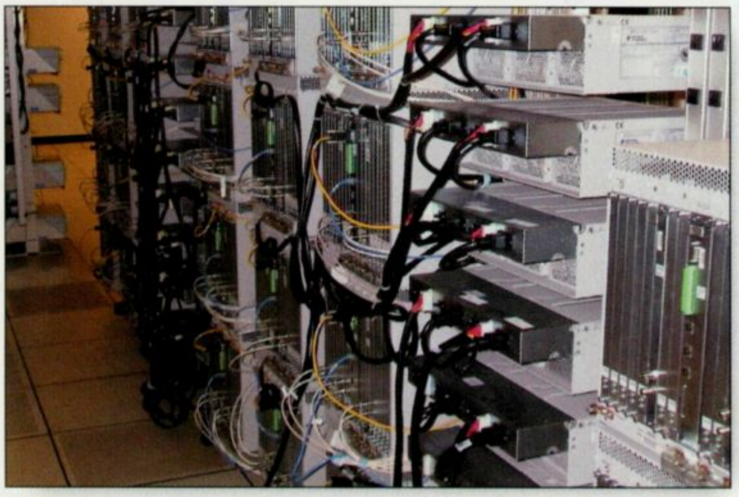
Serving the Net

By Kevin McNamara, CNE

As the Web continues to play an increasing roll in the marketing and positioning of radio stations, the subject will arise as to how Web hosting should be handled and what makes the most sense from an operational and financial point of view. You have many choices, most of which will be determined by understanding what results are expected. Creating a presence on the Web can be accomplished in one of two ways: contracting an external hosting service or installing a local server in your facility. Both have advantages, but it's important to understand what to expect from either approach.



A super POP like this one can handle a significant amount of Web traffic. By contracting Internet hosting services, all the equipment-purchase and maintenance costs are avoided. Photo by Van Holmes of Earthlink.

Questions to ponder

The Web has been adopted as an information medium faster than any other media and has become the primary source of news and information. Newspapers and TV have quickly jumped on board with sites that contain rich, up-to-date content. However, radio has been slow to use the Web as a viable adjunct to its programming. Here are some questions to ask each department manager before deciding how to host your site:

- What is expected from this site? The answers may surprise you, but generally programmers want to promote and sales people want to generate revenue.
- What will be placed on the site? Pictures, ads, news?
- How often will the content change? Every minute, hour, day, month?
- How will these changes be made?
- How will the site be promoted?
- How much value will this site bring to the station?

The answer to each of these questions will reveal key information that can be used to determine the best method for hosting your site.

External or internal hosting

Web hosting services are plentiful, however, the plans and services offered are varied. Most providers offer basic services that allow you to upload pages to the site via FTP. All services offer some type of e-mail support that allows a limited number of private mailboxes and the ability to route those mailboxes to other e-mail addresses. Generally, you are limited to a certain amount of space and, in some cases, simultaneous users. Higher-end hosting services also support streaming audio and video, extensive database integration and statistical information about your site. Since your site will most likely be sharing server space with other customers, you will have no control over the type of server operating system and Web server software.

Taking a slightly different approach to hosting, companies like rackspace.com provide you with dedicated servers, software, interconnection and backup power. This is the same as if you bought the equipment and installed it in your facility, except that the hosting company maintains the hardware and infrastructure for you. As the owner, you have full access and control over the hardware and software.

Hosting a Web site on your own server locally can be a relatively easy and inexpensive process. Essentially, you'll need a PC with Web server software to host the site, a dedicated connection to the Internet, and a means to maintain some level of security form hackers. We'll assume that you have already registered a domain name and possess an assigned TCP/IP address.

Equipment needs

Selecting the proper hardware will be based largely on the type of content that the station will provide. If the goal is merely to provide a few basic pages of information, then you could get away with a simple system.

Although you can find several inexpensive or free Web-hosting programs for any operating system, consider using Linux and Apache Web server software. This combination is used to operate the majority of Web servers around the world, and it is free. A wealth of information is to help you load and configure your server. Most of the Linux distributions that are found in stores include all of the software to get your server up and running quickly.

Connecting to the Internet

You'll need to establish a connection to the Internet backbone. This is typically accomplished using a dedicated connection to one of the many Internet backbone providers. These companies generally own a portion of the infrastructure that is the basis for the Internet.

Dedicated connection plans typically range from fractional T1 to OC3 and typically are packaged with different options. Some circuits permit full bandwidth but only charge for the actual bandwidth used. Dual leased lines provide a level of diversity should one fail.

Some local ISPs will sublease extra Internet backbone capacity at a better price than many direct backbone providers, however, you may still have to install an appropriate dedicated line to the ISPs network operations center. ISPs in some markets are offering dedicated high-speed service to wireless customers .

Another way to get connected is with DSL or cable modems. Most of the local telephone carriers, competitive local exchange carriers (CLEC) and cable companies offer packages that are suitable for a full time Web connection. Due to the nature of these systems, you may want to share your plans with the carrier. They may have an issue with 10,000 visitors trying to access your site at the same time.

Security

You must assess the security risk to your site. The two biggest site threats are hackers entering and changing the site content or redirecting visitors, and unauthorized access to other servers attached to a network that also connects to the Internet.

Firewalls provide a means to manage the security of any device attached to the Internet. There are three basic types of firewalls.

The simplest, called a *packet-filter*, simply accepts or rejects data based on a number of criteria such as specific IP addresses. Most routers posses the ability to filter packets. This type of filtering is vulnerable if a hacker is able to *spoof* or fake the firewall into thinking a blocked address is from an acceptable source.

Building on the packet-filtering scheme, a method called *Stateful-Inspection* uses a connection table to track the flow of data across a series of packets.

The most secure is called an *application proxy*. Network access requests from the outside will connect with the proxy server that first applies *policy rules* to the request. Only when the request is permitted will the user be routed to the appropriate server.

Kevin McNamara, BE Radio's *consultant on computer technology, is president of Applied Wireless Inc., New Market, MD.*

All of the Next Wave articles have been approved by the SBE Certification Committee as suitable study material that may assist your preparation for the SBE Certified Broadcast Networking Technologist exam. Contact the SBE at (317) 253-1640 or go to www.sbe.org for more information on SBE Certification.

Refined studio staffing requirement

By Harry Martin

The FCC recently made clear that a station being operated under a local marketing agreement (LMA) may meet its staffing requirements by employing individuals who are also full-time employees of another co-located station unrelated to the broker. This provides an efficient means to staff a station that leases main studio space from a station other than the broker. Several requirements must be met under an LMA.

Main Studio Rule. Every station, whether or not it operates under an LMA, must maintain a main studio. The studio must be equipped so that it is capable of originating programming for broadcast on the station at any time with the mere flip of a switch. This is true even if it is anticipated that all of the station's programming will actually originate elsewhere. Proper transmitter control and EAS facilities must be in place. The main studio must have a telephone number that is local or toll-free to all residents of the station's community of license. The station's public file must be kept at the main studio.

In addition, each main studio must be staffed with at least two full-time employees. One of the two employees must be managerial. The managerial employee must be based at the main studio and spend at least part of each day there. Alternatively, a station may employ two or more part-time managerial employees whose combined hours provide a full-time managerial presence at the main studio. The non-managerial, or staff, employee may be shared with another employer if the employee is present full-time at the main studio and has adequate time to handle his or her tasks for the station.

The LMA Context. The FCC previously ruled that the *managerial* employee of an LMA station could not also work for the broker. The FCC has now clarified that the managerial employee may simultaneously serve as full-time manager of other co-located stations not related to the broker. The FCC further stated that its rules require only that a station have employees *present* full-time at its main studio.

The New Case. In a recent case, an LMA station hired as its own full-time employees two individuals who also worked full-time for a station unrelated to the broker. The LMA station leased its own main studio space in the other station's studio building. The LMA station maintained a separate telephone line, but the employees performed their tasks for both stations from the same office space. One individual was a manager and the other was a non-managerial staff person. Both already worked full-time at the unrelated station. For the LMA station, they took on the minimal managerial and staff tasks typical for stations involved in LMAs, including the production of local programming and preparation of local PSAs. In connection with those tasks, the employees reported directly to the owner of the LMA station. They were paid an additional salary by the LMA station. In the face of arguments to the contrary made by a competitor and the FCC's Mass Media Bureau, the FCC ruled that this arrangement complied with its LMA staffing requirements. The key exculpating factor was the presence of the LMA station's employees at the main studio rather than how much time they actually spent doing the station's business.

More FCC Fines

Indecent Material. A Spanish language radio station recently aired a morning show segment involving material that the FCC found indecent. After translating a tape recording of the call-in segment from Spanish to English, the FCC concluded that the broadcast contained language that described sexual activities or organs in patently offensive terms and levied a $7,000 fine. Most of the allegedly offensive dialog was spoken by the call-in guest and not the radio personality. However, this had no bearing on the determination that indecent material was broadcast.

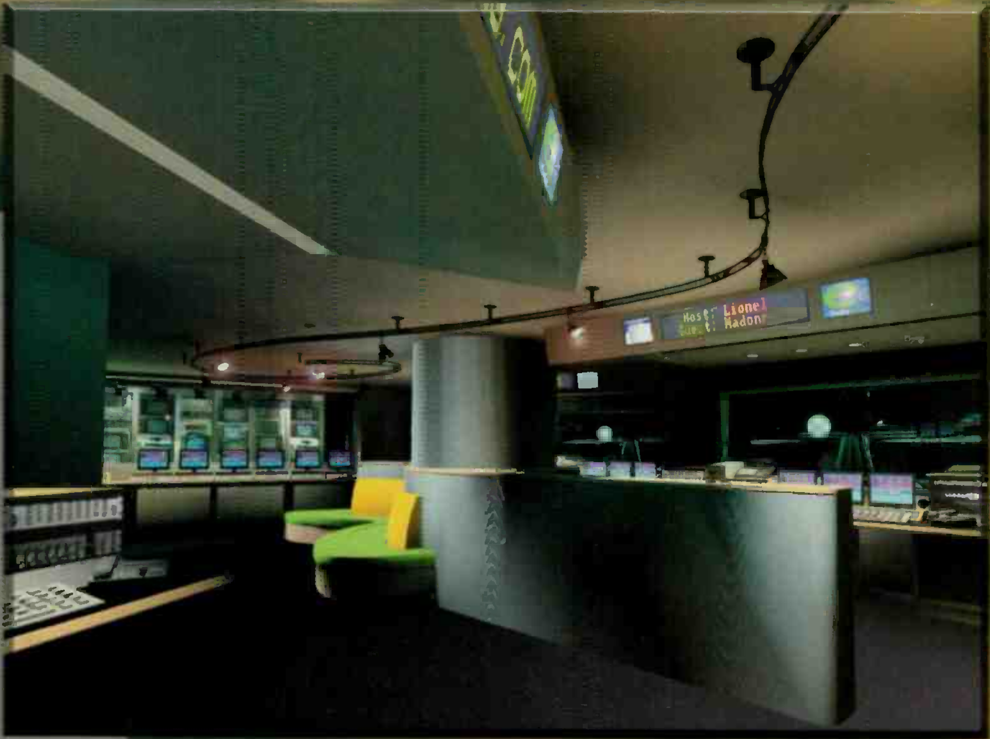
EAS, Emissions Testing, Public File. A Florida AM station was initially fined $20,000 for failing to install an EAS system, failing to perform annual emissions measurements and failing to keep an updated public inspection file. Based on a complaint, an FCC inspector determined that no EAS equipment had been installed, that no annual equipment performance measurements had been made (FCC rules require annual testing with a signed and dated record of test results) and that the public inspection file had not been updated. The fine was reduced to $5,000 based on the station's documented financial problems.

Harry Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Arlington, VA. E-mail martin@fhh-telcomlaw.com.

Dateline

Bienniel Ownership Reports will be due for both commercial and NCE radio stations in 2001, beginning on February 1. The first group of states required to file (on February 1) will be Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma.

Installation Profile



Facility Specs

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ADC digital audio patch panel
ADC I-24 punch blocks
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Aphex Compellor
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Belden CAT5 cable
Broadcast Devices UTA200
Comrex Vector
Crown D45
Crown D75
dbx 166XL
Denon DN500F CD Player
Dorrough Stereo Test Set 1200
Electro-Voice RE20
ESE 160A master clock
ESE 161 impulse driver
Fostex 6301BEAV monitors
Fostex Digital Patch Bay
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Harris logic interface for Mediamation Midi Decoder, Mediamation GFI Panel and on-air muting and machine start logic
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Shure SM 58 microphone
Sony DVP-S330 DVD player
Sony MDR-7502 headphones
Sony MDS-E11 Minidisk
Sony Play Station
Sony SLV-769HF VHS player
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broadcast@harris.com
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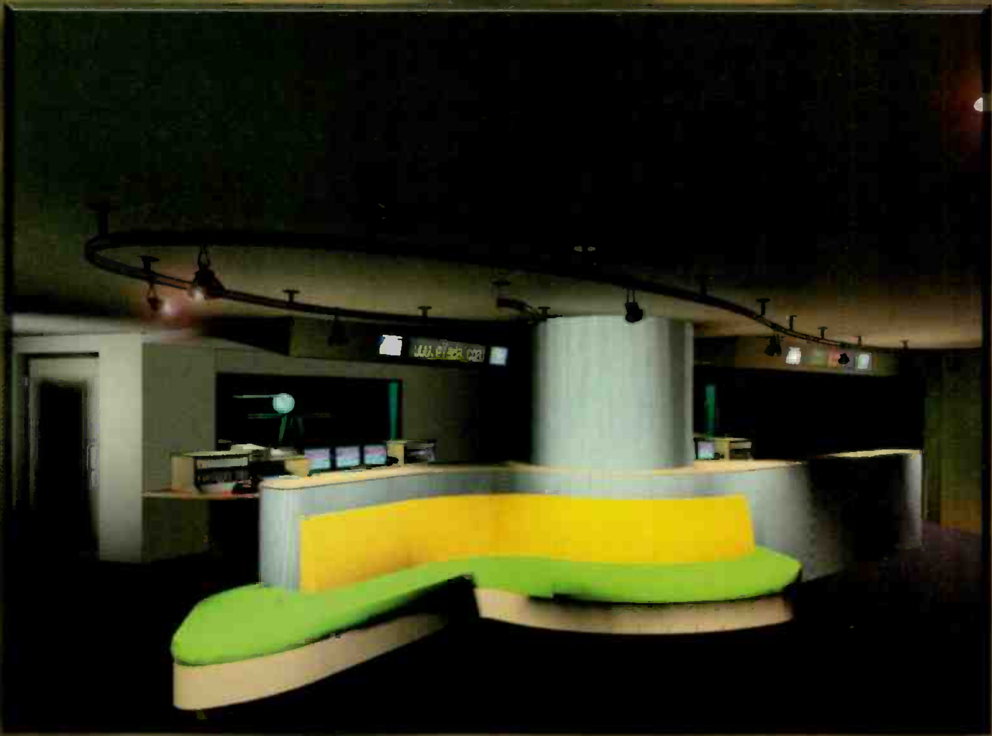
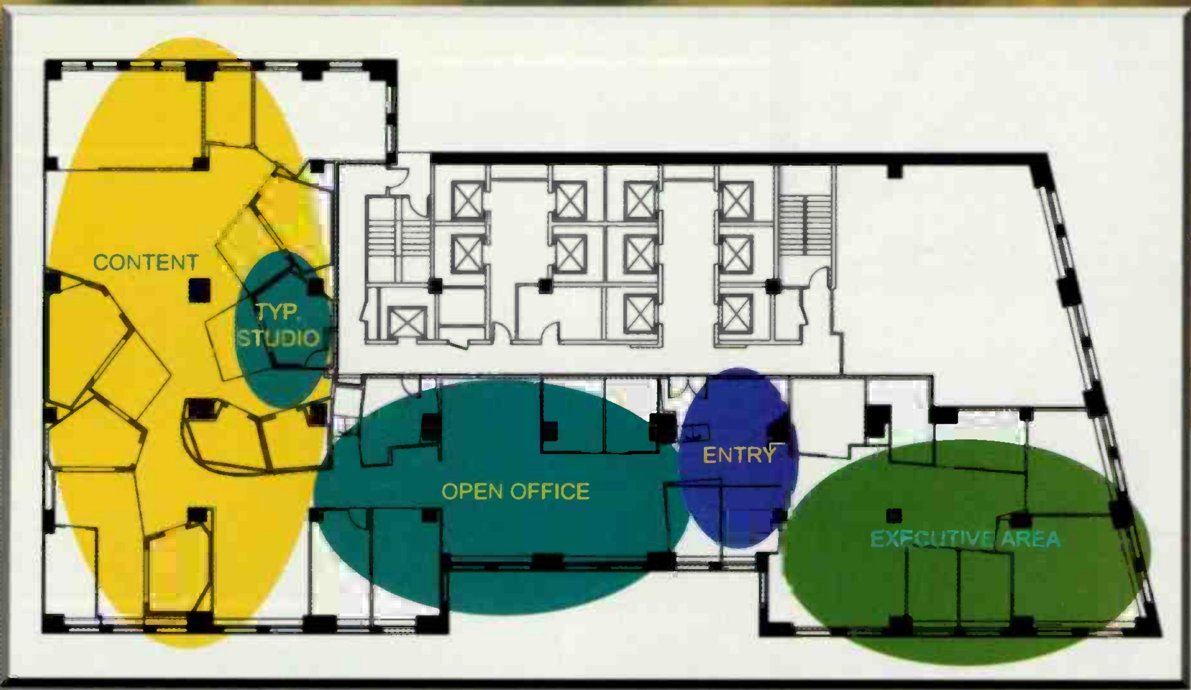
EYada.com Internet Radio

One of the leading Internet radio and entertainment companies, eYada.com, will be moving into new facilities in mid-November 2000. Harris Corporation was chosen to assist the growing Internet content provider in the studio design, facility construction and equipment selection for the facility. The new eYada.com headquarters will be on New York's Times Square.

EYada.com has emerged as one of the leading entertainment companies, reaching more than one million worldwide users each month. It currently features four channels: *Entertainment*, *Sports*, *Health, Fitness and Adventure*, and *Rave 2.0 for Teens*. In all, 46 shows and more than 200 hours of live, original programming are created each week from its studios in Manhattan, Los Angeles, and San Jose. EYada.com also offers streaming video of the jocks and guests in addition to the audio.

Currently, eYada.com occupies two locations in midtown Manhattan. The new facility will include five full-function studios, a single control room and various editing and production suites, from which its on-air personalities and celebrity guests will conduct interviews and debates, and offer breaking information, editorial insight and general talk throughout the day. Audio and video will either be streamed live from the studios to the Web or recorded off-site and then encoded and posted as on-





demand files on the eYada.com site.

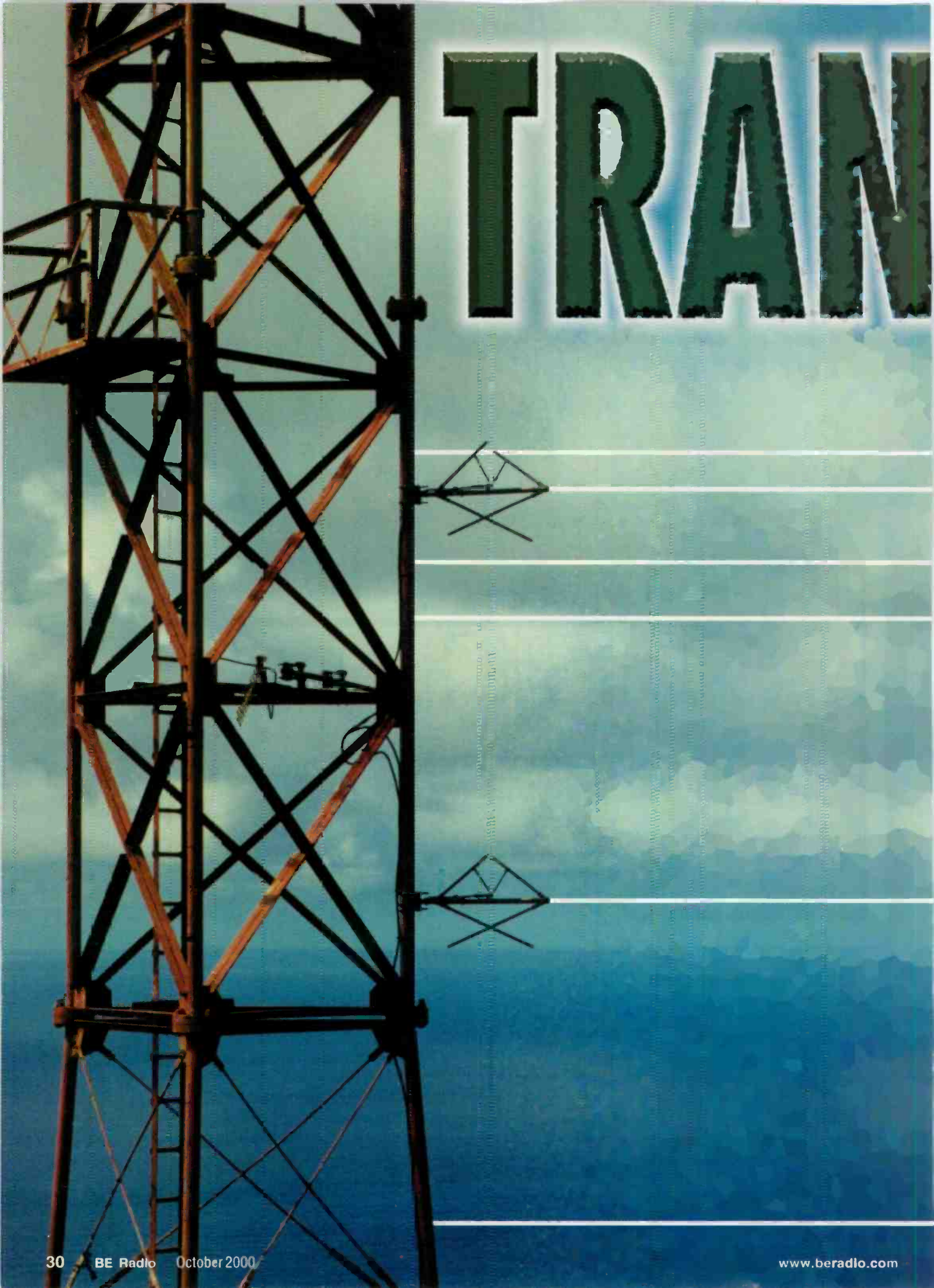
EYada.com chose Harris to provide all the studio products and systems including consoles, CD players, microphones and minidiscs. The project required a mix of ideas between traditional radio, digital delivery and information systems.

Each studio accommodates two hosts and two guests. A single master control room will be used for all the control rooms. This departure from a traditional radio design (dedicated control rooms) requires the use of near-field monitors for each control position to minimize aural interference.

Harris performed all the design engineering for the eYada.com facility at Harris' Mason, OH, facility near Cincinnati. The completed wiring, harnesses and patchbays were then shipped to the new Times Square location. The studio is scheduled to go online November 7.

Harris Corporation is an international communications equipment company focused on providing product, system and service solutions that take its customers to the next level. The company provides a wide range of products and services for wireless, broadcast, network support and government markets. The company has sales and service facilities in nearly 90 countries. ■

TRAN



SMISSION

Implementing IBOC

Digital radio: coming to a station near you

By Doug Irwin

Over the last several years, U.S. broadcasters have been deluged with press about the coming of digital audio broadcasting and specifically *in-band on-channel* (IBOC) DAB. The number of proponents whittled down to one since Lucent Digital Radio and USA Digital Radio recently merged to form iBiquity Digital. The proponent's test methodologies and results have been reported, and many people have had a chance to hear demonstrations at various conventions. Also, the sense of urgency is waxing since satellite digital radio is at hand.

So, let's jump ahead just a bit. Let's assume that the iBiquity system works and is subsequently approved by the commission. There are several questions that every station will ask: How will IBOC work on my station? Will stations need to replace every single piece of RF hardware, or will IBOC work with what is currently used? Will the current audio processing chain work with IBOC? Will the newly purchased digital audio delivery system and its audio compression sound good on an IBOC radio?

From the studio end

The iBiquity system most likely will use Lucent's *Perceptual Audio Coder* (PAC) at a data rate of either 96kb/s or 128kb/s for the FM band and 48kb/s for the AM band. PAC also will be used by the satellite radio providers. IBiquity wants to maximize the likelihood the receiver manufacturers will build receivers that will work not only with satellite-delivered digital radio, but with AM and FM IBOC as well.

I spoke with a well-known audio processor designer while researching this article. I was told that the audio being fed to the IBOC system should never be compressed to less than 384kb/s (referring to MPEG-1/Layer II). This designer went on to stress that audio fed in to the IBOC system should be uncompressed.

Now consider all the ways in which broadcasters use data compression. The most pervasive application of data compression is the storage of program material in the form of data files on a computer. How compressed are your audio files? Do you receive program material from a network or satellite feed that makes use of data compression? Do you receive remote broadcast feeds or talent feeds via an ISDN codec or perhaps via e-mailed MP3 files? And, perhaps most importantly, does your STL use a compressed data format? These are aspects of your operation that will need some attention. Right now, most broadcasters agree that *transcoding loss*, the audible effect from sequential use of different encoding and decoding algorithms, will render the final audio product unappealing at the consumer end, where it counts the most. This would obviously defeat the purpose of DAB, which is to provide a superior audio product.

Another operational consideration is that of the long delay inherent to the IBOC system. In the USADR system, when the listener turns on an IBOC receiver, the first audio heard will be an analog signal. The digital receiver takes some finite time to acquire the signal and begin decoding. Once the digital signal is acquired and reliably decoded, the digital signal will blend gently with and replace the analog signal in time. Another reason this is done is so that if the digital signal is lost, for example when a mobile receiver travels under an overpass or around a large building, the receiver will blend in the analog signal while it reacquires the digital signal. The audio delay allows the receiver to complete this blend *before* the listener notices a signal problem. Once the digital signal is reacquired, digital audio will once again replace the analog.

From a station-operation standpoint, the halcyon days of listening off-air are rapidly coming to an end. There already are some stations with an air monitor that switches to a separately processed feed when the jock turns the mic on. There are, of course, stations that use a profanity delay for on-air protection against errant lingual occurances. Now, however, there will be a long delay on the order of 8.5 seconds (4.5 for the DSP and 4 for time diversity) all the time. Stations with off-site traffic or news reporters will need to plan an alternative method of monitoring the station because off-air monitoring will be impossible. Remote broadcasts via ISDN codecs have faced this challenge for some time already. A pre-delay air monitor system will be required.

Processing and STLs

The designers at iBiquity anticipate that broadcasters will want to process analog audio separately from digital audio. For this reason the IBOC system has two audio inputs. This means that two audio processors will be needed. For complete audio chain redundancy, four audio processors will be necessary. (Perhaps you should reconsider donating your old processor to the local college station.)

Stations that enjoy the convenience of having all of the audio processing located at the studio most likely will have to buy a new STL or two. There now will be two separate air chains to be delivered to the transmitter site. Undoubtedly, STL manufacturers will devise a clever and straightforward way to accomplish this. AM-band stations will need an STL to carry the processed analog program (bandwidth limited to 5kHz mono) in addition to the

Transmitter In A Box

An alternative to constructing a transmitter building

By Lamar Owen

While investigating a new transmitter building for WGCR, I found that the reinforced, welded rebar sort of construction I wanted for RF shielding was terribly expensive — on the order of $20,000 for just the building. An alternative had to be found to fit our budget.

We found an unlikely solution; sea containers. A sea container is like a semi-trailer without the wheels. In our case, we purchased two refrigerated sea containers from a local container supplier for about $1,000 each. These containers have a fascinating construction. The outside has a heavy corrugated steel shell lined with four to six inches of a high-efficiency insulation. The inside is protected with 16-gauge stainless-steel walls and a ribbed-aluminum floor.

Detail of the corner showing the container stilts.

For a foundation, a 12-inch-thick concrete slab was poured, and then six 6-inch angle iron stilts were placed. Then, a plate was welded to the top of each stilt to form a socket for each corner of the containers to sit side by side. The containers were bolted through the sockets to the foundation and then welded. The containers sit 4 feet above the ground.

After the containers were set on the stilts, work began on the electrical and ventilation systems. One container is used for the transmitter and audio container with the electrical panels and entry, and the other houses the generator and storage for tools and other equipment.

Inside the generator container.

While the stainless-steel liner proved tough to drill, it also proved to be an ideal mount for various electrical boxes, panels and the generator transfer switch. All electrical, telephone, cable and RF wiring were routed through a common hole in the transmitter container and then bonded to the liner at point of entry. Heavy copper ground straps were brazed to both containers' inner and outer shells as close as possible to the point of entry and then bonded to the radial system at the tower base. The solid metal enclosure has provided the ultimate RF shield.

We also found, much to our surprise, that a negative pressure ventilation system, properly ducted, has served very well and allows the doors to seal properly, providing the best insulation for these containers. Conventional wisdom for typical buildings dictates positive pressure, but in this particular unconventional instance, negative pressure seems to work better.

How well has this setup performed once we moved our transmitter in? To say I am pleased with the result would be a major understatement, as mysterious RF troubles I had before are now gone for good.

Lamar Owen is chief engineer of WGCR-AM, Pisgah, NC.

Circle (122) on Free Info Card or online at www.beradio.com

PAC-encoded digital audio stream, which will be around 100kb/s after forward error correction is added. FM-band stations' STLs will have to carry the analog signal (still 2 channels of 15kHz audio) along with the PAC-encoded digital data stream, which will require about 240kb/s after forward error correction is added. Are you thinking capital budget yet?

The most economical way to get around the STL issues mentioned above will be to place the processors at the transmitter and deliver a single audio feed to the transmitter.

At the transmitter

There are three ways to accomplish the transmission of IBOC on the FM band. What an individual station does to facilitate the process will depend completely on the particular circumstances at the transmitter site.

AM	
Wideband antenna system	$20K to $55K
Solid-state, IBOC-capable transmitter	$0 to $130K

Anticipated potential costs for AM IBOC.

The first approach uses a combiner fed by the station's analog transmitter and digital transmitter. Similarly, it has two outputs: one for the combined RF signal with the analog and digital signals, and one output for wasted power. The combiner system has substantial losses on both the analog and the digital path. For example, for a station with 10kW total power output (TPO), the transmitter power will need to be increased to about 11.1kW to make up for the combiner loss. In this example, the combined digital power component will be about 63W because the ratio of the digital input power to the digital output power on the combined port is 10dB. The digital TPO needs to be 630W. It is important to note here that this will be the *average* power. Unlike the FM carrier familiar to most broadcasters, the digital transmitter output will vary in amplitude. In fact the peak-to-average ratio can be up to 6 dB. Ibiquity currently is working on a method to greatly reduce this variation. What this means is that the digital transmitter must be designed to handle 10 times its average output (albeit on an extremely small duty cycle).

The implications here are fairly obvious. Many stations do not have an analog transmitter capable of an additional 10 percent of output power to make up for the combiner loss. Additionally, it is not hard to imagine that the digital transmitter I mentioned in the above example will take up a considerable amount of floor space or rack space, which is precious at many transmitter sites. An additional transmitter at any site has its own requirements for main power, backup power and HVAC.

The second way to implement the IBOC scheme is by using a transmitter that can pass both the analog and digital signals all the way through, so

Continued on page 44

RadioShow

AUDIO... VISUALIZED

SOUND SOLUTIONS *for* INTERNET

AD INSERTION: THE BASICS

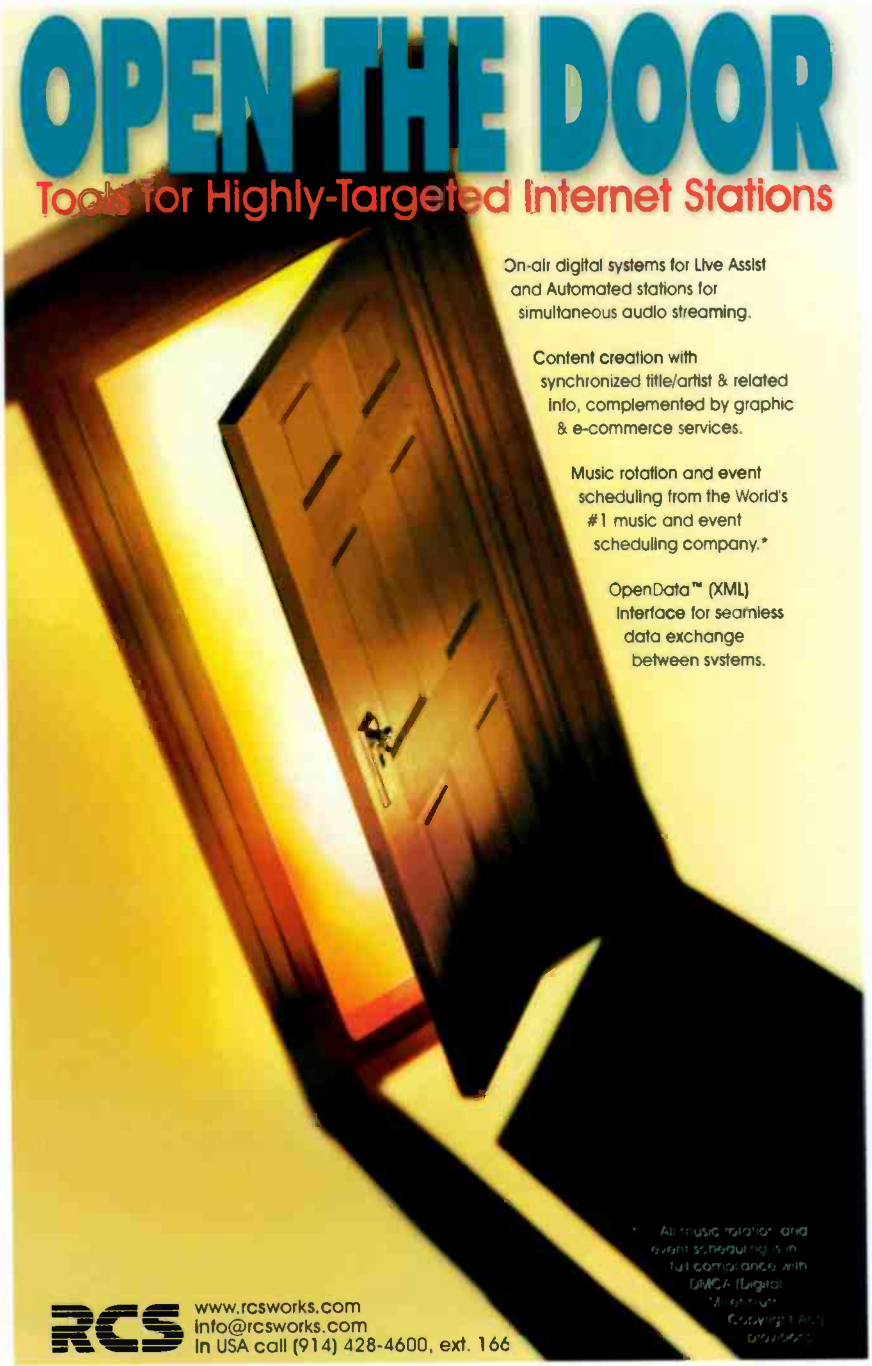
RCS

RCS: CONVERGING ON OPPORTUNITY

We're glad you're taking a moment to learn more about the methods of ad insertion technology, and hope what you read here helps clarify the questions you've had about this emerging industry and sparks your interest to learn more.

In this booklet, RCS provides basic info on the exciting world of ad insertion, and how it can affect the success of your station. Of course, ad insertion is just the latest step in a journey which began long ago for RCS, a company well-grounded in real-world experience and the ongoing input from thousands of existing customers.

Throughout the 80s most medium and small businesses rarely, if ever, relied on computers. Nobody even thought about personal computing then, because it didn't exist at that time. At that time, the term computer referred to huge computer banks with information meant for large groups of people to share.



Meanwhile, RCS was already taking an alternative stance by focusing on software for radio stations to handle the complex task of scheduling music, where each individual station had its own rules and guidelines quite often very different from other stations. In effect, RCS clients in the 80s were doing personal computing ten or more years before the worldwide PC revolution even began.

With the 90s came the rush to personal processing power: Microsoft Windows, the Internet, and people's ability to access large data banks from the home or the office was rapidly increasing. RCS found itself at an early intersection of technology and people's growing need for information.

Broadcasting and telecommunications were instrumental in not only creating, but expanding what technologies were available because of specific need application. RCS remained at the forefront, taking instrumental roles in driving radio and Internet communications to higher levels and more efficient programming.

Telecommunications with advanced bandwidth, coupled with the Internet, has changed marketing drastically at all levels of economic world markets. From a single user buying stocks on the web at home, to a large multinational corporation driving world market economies, broadcasting and telecommunications have been responsible for leading the revolution in the broadcast industry. Today, armed with state-of-the-art telecommunications capabilities, RCS can offer its audio and Internet convergence expertise, products and services to companies of any size, efficiently and cost effectively.

In addition to a leadership heritage in broadcasting, RCS develops technology solutions for communications marketing. RCS has the systems management applications and practical experience that translates easily into powerful marketing and sales tools.

Today, RCS is the world's leading provider of broadcast software. The company has also developed real-time audio recognition technology and creates strategic audio programming content for Internet and corporate sites. RCS

SOUND SOLUTIONS FOR INTERNET RADIO

A station's website is a direct, interactive link between the station and the listener. Terrestrial radio makes every effort to keep each listener as long as possible. Your website should do the same. Interesting content will keep a Web visitor's attention, and on the Web, active content is the key. Since radio is an aural medium, the Web offers a visual element that has never been available before. This visual element can display information about the current song or artist, information about the advertiser or any other information you want the visitor to see. The best way to provide this information for your Internet broadcast is with RCS RadioShow®. Bringing your station to the Internet with dynamic content, RadioShow displays a constantly changing series of images, song and artist notes, music news, weather, even concert dates and station events to your audience.

Generali

"Ever since RCS introduced Selector® in 1979, radio stations around the world have come to trust RCS as the pioneer in developing software for radio," says Philippe Generali, President of RCS. "Many of our products are developed in response to our clients needs, such as Linker Promo Scheduler and Master Control NT on-air digital system. Our newest 'by request' service is RadioShow, the all-purpose internet solution."

RadioShow can also expand your business by providing additional revenue opportunities. All spots, whether or not they paint a mental picture, now can add synchronized visual elements. Additional revenue can be produced by displaying net-only ads during music as well. Listeners don't need to search for information, RadioShow brings it all up to the front. Listeners are provided with a constantly changing stream of aural and visual items with no extra effort.

"RadioShow is the first step in creating a complete online package for Internet broadcasting," according to Brice Kirkendall, RCS Product Manager. "For terrestrial radio, the Internet provides a vehicle for an additional revenue source and adds a new inventory of visual content." Kirkendall continues, "online coupons, immediate, audio-related information, and the ability to make a purchase while you are listening to a song are all a part of the power of RadioShow."

Behind the scenes of RadioShow is the RCS Media Manager. Completely invisible to your Web audience, this powerful tool lets the station control the rotation and mix of the various graphic elements that appear during web streaming. An integral part of RadioShow, the RCS Media Manager makes your stream stand out.

Ad insertion allows you to have different ad materials inserted into the same program stream. This allows a single audio stream to have different commercials inserted for different listening audiences. This can be taken a step further with targeted ad insertion which is discussed on page 4. RCS

RCS OFFERS AD INSERTION OPTIONS

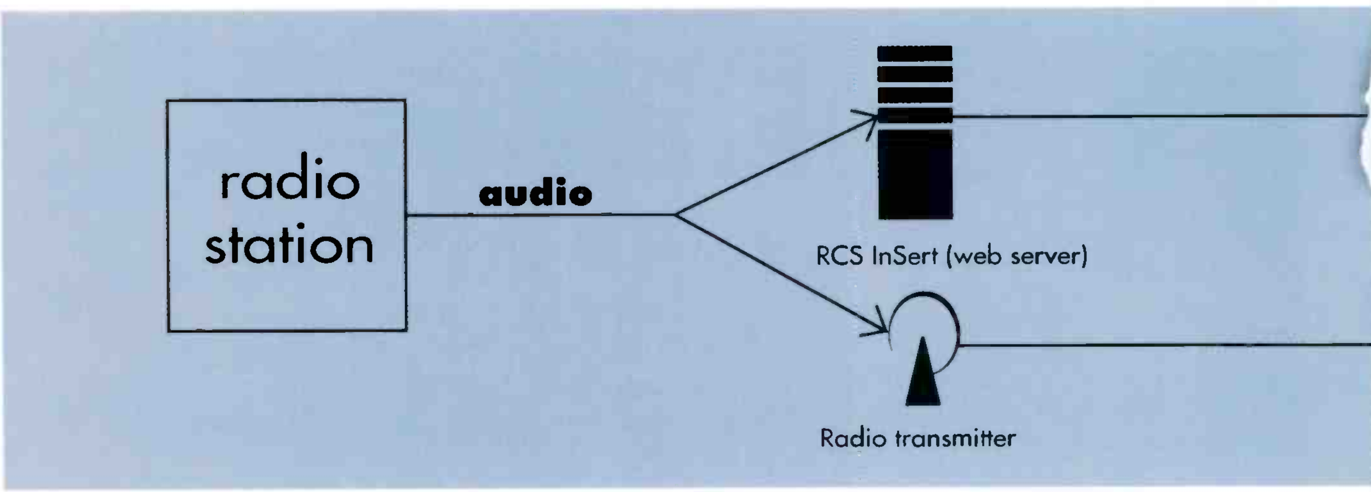
Ad insertion is a means of inserting new commercial material to replace existing commercial material. For terrestrial radio stations, this allows your on-air audio feed to be streamed online with new commercial content. Instead of giving away the commercial space online, create a new revenue stream by selling the same space on the new medium. Two products from RCS can do this, but each does it in a different way.

InSert: simple ad insertion

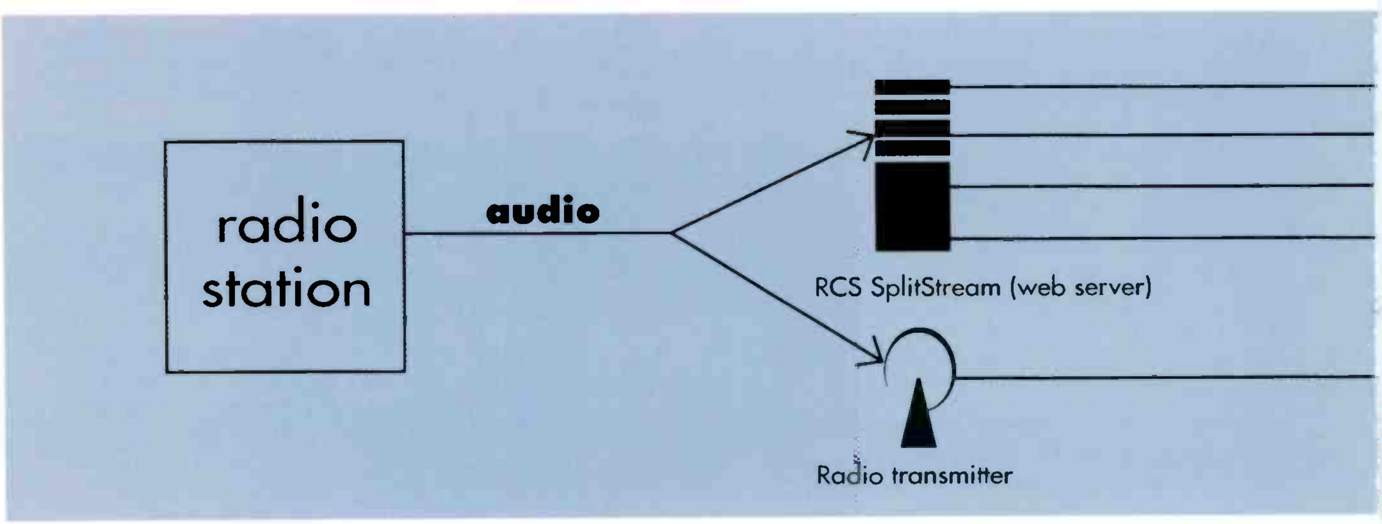
Your online listeners and over-the-air listeners may fall into the same basic demographic, but their listening habits can be very different. You can take advantage of this variation by inserting ads specific to the medium: the terrestrial radio listener will hear one commercial, the Internet radio listener will hear another. These online ads can also include graphics and dynamic links that the online listener

RCS WEB AD INSERTION

RCS METHOD 1: SAME AD TO ALL

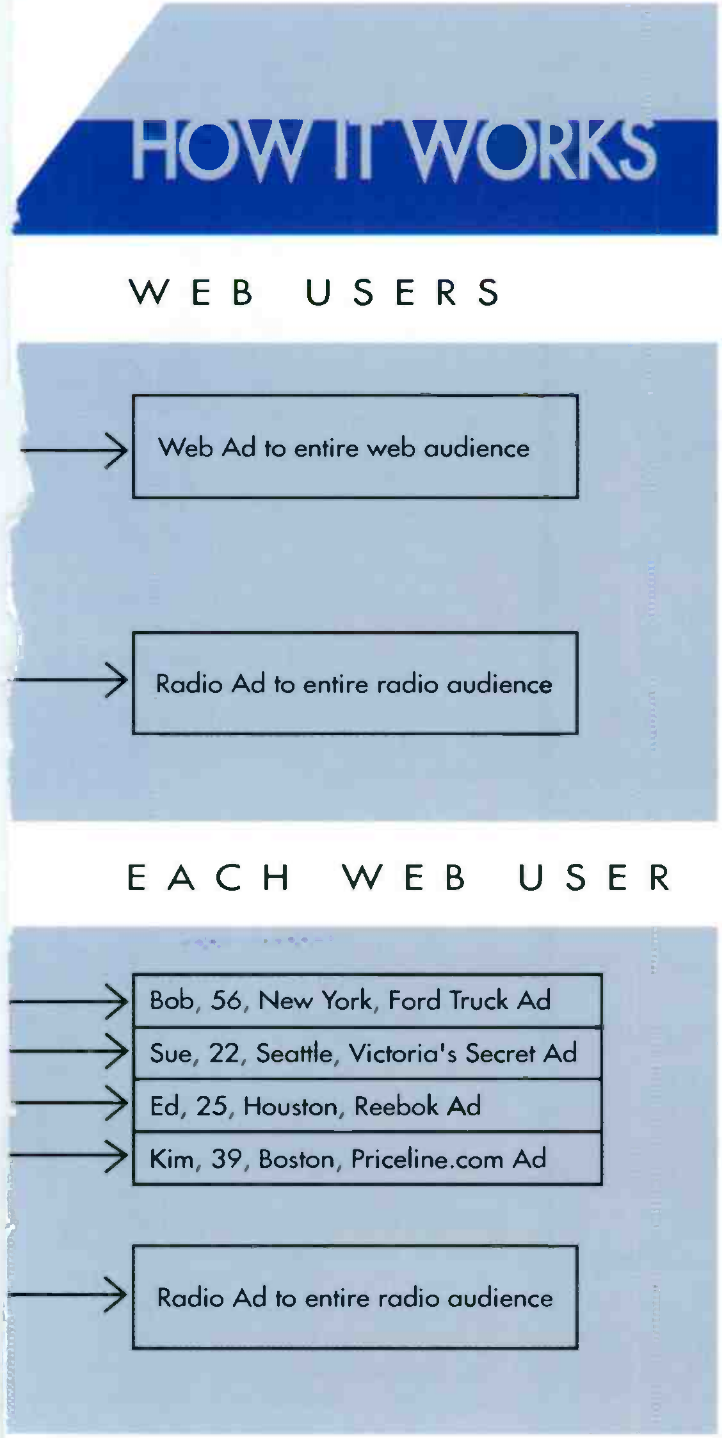


RCS METHOD 2: ADS TARGETED TO



can take advantage of. For more on this idea, see RadioShow on page 3.

InSert™ can play commercials from a schedule just like your on-air automation system. When a commercial break is scheduled, InSert will break away from the main feed, insert the appropriate online ads and then rejoin the main stream when it is finished. This allows the online stream to generate its own revenue instead of the inventory being given away with the on-air schedule. The program automation system provides the signal to make the switch.



InSert can be used with any streaming audio system such as Windows Media, Real Audio and QuickTime since the audio encoder is downstream of the audio switch. This is an example of *push* technology because the inserted commercial is pushed to the listener.

SplitStream: targeted ad insertion

SplitStream™, meanwhile, is an application for *targeted* ad insertion. Knowing specific information about the online listener allows you to send commercials that are uniquely interesting to that listener. The diagram on this page shows the general differences between InSert and SplitStream.

"InSert and SplitStream differ in their capabilities," says Chip Newton, Project Manager for RCS Ad Insertion Technologies. "InSert can replace any given spot in the stream with an alternate spot, while SplitStream is more sophisticated. Using specific database and profile information, SplitStream provides ads targeted to each listener. These advertisements can even include graphical components and click-throughs to encourage impulse buying."


Newton

InSert is designed to replace one broadcast signal or stream with another prior to the audio encoder, most typically when "covering" a terrestrial station's local commercials with a separate feed more suited for the Internet. SplitStream, conversely, can send different ads to individual listeners simultaneously, giving advertisers a much more focused and effective way of reaching consumers.

Instead of sending the inserted ads as part of the original stream, SplitStream sends the first few seconds of each ad to the listener's computer just prior to the commercial break. The remaining audio is streamed across the Internet directly from the ad server. The audio preroll eliminates the problem of lost audio from network congestion.

For effective targeted ad insertion, a listener's profile is obtained. This profile contains enough demographic and geographic information about the listener to make targeted ads effective. When a commercial break is scheduled, SplitStream signals the receiving computer to retrieve the appropriate commercials from an ad server such as Ad Force or Engage. The listener *pulls* the commercials from the ad server.

Because it's a targeted ad, each listener can have a different commercial and a graphic can be included with click-through links available. Each listener's profile is kept on that user's own computer by placing a *cookie*. Stations will ask listeners for some basic info the first time each one goes to listen. This could be supplemented by an incentive, such a drawing for a prize.

The Internet continues to offer new methods of information dissemination and revenue generation. Using InSert or SplitStream with RadioShow can do both for your station.

"Ad insertion technology at minimum pays for streaming," says Philippe Generali, President of RCS, "and has the potential to increase cash flow for Internet broadcasters." RCS

THOUSANDS OF STATIONS, ONE MANAGER

So far we have looked at enhancing your website presentation, handling the visual content and inserting ads in your online stream. There is still something missing: scheduling the ads and playing the audio on multiple stations. To do this, you need the multistation capacity of NetCom™ and MCnet™.

NetCom for multistation traffic

Every terrestrial radio station has some type of commercial traffic scheduling system. The need exists for Internet radio. NetCom from RCS functions in the same way that other commercial traffic scheduling systems do, but with some important differences. The key factor of NetCom is that it is designed to work with the needs of both terrestrial and Internet radio stations and does it all from one computer.

Most commercial traffic systems have a capacity of 125 stations. While this number may seem very high, the time to discover that you need to upgrade the capacity is *not* when you are adding the 126th station to the list. NetCom has the capacity to handle an incredible 9,999 stations on a single system. This allows you to add more stations to the system without exceeding its capacity. Unlike terrestrial radio where adding a station requires a license, Internet radio stations can be added as audiences demand by simply adding the appropriate hardware.

Richard Darr, VP Sales and Marketing notes, "NetCom allows you to create station groups by geography, format, demographics or any other sorting method and provide enterprise-wide sales based on these groups. Stations are not limited to any single group, they can be part of multiple groups to facilitate large-scale ad sales." By combining single stations into multiple groups, advertising schedules can be created that target multiple demographics across multiple formats.

Darr

NetCom uses an SQL server and WindowsNT workstations. It can interface with RCS's Master Control NT and most other manufacturer's automation systems.

MCnet for multistation playback

Master Control NT is an RCS product with a proven track record for reliable storage, scheduling and playback of audio elements. The multistation version is called Master Control Net, or MCnet. MCnet provides for a single, shared database on an SQL server, and allows multiple streams to be played from one consolidated database.

Each MCnet workstation can stream up to four audio channels. This provides a building block system of adding more channels as your Internet radio stations grow. As more streams are needed, additional workstations are added. MCnet interfaces with Selector Music Scheduling, Linker® Promo Scheduling, NetCom and RadioShow to create a comprehensive Internet radio package.

continued on bottom of page 7

MEDIA MANGER: THE "SECRET WEAPON"

Compelling online content is comprised of many elements: the digital automation system provides the audio while the inserted ads are another element. Your online presence requires more than audio and ads to be truly effective. The Web can provide a visual element and active links as well. These elements can be updated as often as you like. Scheduling and maintaining this additional content is a serious task and should be handled with the right tool. That tool is the RCS Media Manager™.

Your audio delivery system plays back an existing log, but it is not designed to handle the nuances of scheduling, such as dayparts, song rotation, tempo, artist separation and many others. This kind of scheduling is best accomplished with a powerful music scheduling system such as Selector®.

Based on Selector's proven principles, the Media Manager schedules the many elements displayed during Web stream. The Media Manager puts these pieces in the right place at the right time.

Using the same concepts that made Selector the number one scheduling software worldwide, the RCS Media Manager also uses clocks and policies to determine how liner notes, concert dates, online-purchase links and other information is selected and rotated. "Media Manager brings the power of Selector to a visual presentation on the Internet," according to Brice Kirkendall, Product Manager. "It allows you to provide rules and policies, create clocks and categorize your media into a dynamic and compelling visual presentation. This will prolong the time spent viewing on the station's website and drive traffic to your site and your advertisers' sites."

Kirkendall

Of course a schedule can be created manually if you like, but why? RadioShow's JIT (Just In Time) Scheduler is designed to *automatically schedule visual elements* based on rule settings and proportions you define in the Media Manager. Web link destinations can be updated at any time.

The Media Manager provides the ability to write station-specific content, and the option to support varying visitor connection rates.

The Media Manager is the most important tool within RCS RadioShow that brings a dynamic online presence to your Web visitors. RCS

continued from page 6

MCnet plays compressed and linear audio files on standard, nonproprietary computer audio cards. Any combination of MPEG Layer II, WAVE, and .BWF (Broadcast Wave) audio files can be loaded from the same log. Internet VoiceTracking™ is available so your on-air talent can run a show from any location over the Web. Internet radio is truly a global presentation so your air talent can be based anywhere in the world. RCS

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TELEWAVE

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ANTENNA SYSTEMS AND ARRAYS

MODEL	TYPE	FREQ.	GAIN	PWR.	LIST
ANT75D	SINGLE DIPOLE	66-88 MHz	1 to 2.5 dBd	500W	$608.00
ANT75D3	DIPOLE ARRAY	66-88 MHz	3 to 6 dBd	1000W	$1595.00
ANT90D	SINGLE DIPOLE	88-108 MHz	1 to 2.5 dBd	500W	$578.00
ANT90D3	DIPOLE ARRAY	88-108 MHz	3 to 6 dBd	1000W	$1495.00
ANT150D	SINGLE DIPOLE	138-174 MHz	1 to 2.5 dBd	500W	$250.00
ANT150D3	DIPOLE ARRAY	138-174 MHz	3 to 6 dBd	500W	$510.00
ANT150D6-9	DIPOLE ARRAY	138-174 MHz	6 to 9 dBd	500W	$872.00
ANT450D	SINGLE DIPOLE	406-512 MHz	1 to 2.5 dBd	500W	$198.00
ANT450D3	DIPOLE ARRAY	406-512 MHz	3 to 6 dBd	500W	$467.00
ANT450D6-9	DIPOLE ARRAY	406-512 MHz	6 to 9 dBd	500W	$782.00
ANT150Y7	3 ELEMENT YAGI	148-174 MHz	5 dBd	500W	$434.00
ANT195Y5	4 ELEMENT YAGI	174-216 MHz	5 dBd	500W	$495.00
ANT450Y7	4 ELEMENT YAGI	450-470 MHz	7 dBd	500W	$247.00
ANT850Y10	7 ELEMENT YAGI	824-896 MHz	10 dBd	500W	$214.00
ANT930Y12	12 ELEMENT YAGI	900-960 MHz	12 dBd	500W	$520.00
ANT150F2	COLLINEAR	138-174 MHz	2.5 dBd	500W	$404.00
ANT450F2	COLLINEAR	415-480 MHz	2.5 dBd	500W	$404.00
ANT850F6	COLLINEAR	806-896 MHz	6 dBd	500W	$712.00

CAVITIES

MODEL	TYPE	FREQ.	BANDPASS	ISOL.	PWR.	LIST
TWPC-1005-1	5" Single Pass	88-108 MHz	+/- 50 KHz	20 dB	350W	$248.00
TWPC-1005-2	5" Dual Pass	88-108 MHz	+/- 75 KHz	45 dB	350W	$531.00
TWPC-1005-3	5" Triple Pass	88-108 MHz	+/- 100 KHz	60 dB	350W	$817.00
TWNC-1005-1	5" Single Notch	88-108 MHz	+/- 50 KHz	25 dB	350W	$248.00
TWNC-1005-2	5" Dual Notch	88-108 MHz	+/- 75 KHz	55 dB	350[illegible]	[illegible]531.00

TRANSMITTER COMBINING SYSTEMS

MODEL	DESCRIPTION / FREQ.	LIST
TW930-2HRA1-SL	900 MHz Hybrid STL Combiner 2 Channel 25 Watt 70 dB isolation	$1,597.00
M101-900-2TRMH	900 MHz Hybrid STL combiner 2 channel 150 watt - Expandable	$3,918.00
M101-900-4TRMH	900 MHz Hybrid STL combiner 4 channel 150 watt - Expandable	[illegible]36.00

ISOLATORS

MODEL	TYPE	FREQ.	ISOL.	PWR.	LIST
T-1030	Single Isolator	66-108 MHz	35 dB	150W	$461.00
T-1060	Dual Isolator	66-108 MHz	70 dB	150W	[illegible]04.00
T-1530	[illegible]ingle Isolator	118-174 MHz	35 dB	150W	[illegible]
T-1560	Dual Isolator	118-174 MHz	70 dB	150W	$904.00
T-4530	Single Isolator	[illegible]06-512 MHz	35 dB	150W	$461.00
T-4560	[illegible]l Isolator	406-512 MHz	70 dB	150W	[illegible]
T-8630	Single Isolator	806-960 MHz	35 dB	150W	$461.00
T-8660	Dual Isolator	806-960 MHz	70 dB	150W	$904.00

FILTERS

MODEL	TYPE / DESCRIPTION	FREQ.	PWR.	LIST
TLF-90	TX Low Pass Filter	88-1[illegible]	400W	$ 159.00
TWX50	RX Crystal Filter - Specify Freq.	30-108 MHz	1 mW	$1,075.00
TWX150	RX Crystal Filter - Specify Freq.	108-216 MHz	1 mW	$1,075.00

WATTMETERS AND TEST LOADS

MODEL	DESCRIPTION / FREQ.	LIST
Model 44A	Broadband Wattmeter 25 MHz to 1000 MHz	$591.00
Model 44AP	Model 44A with -40 dB sampling port	$642.00
Model 44L1	HF/VHF Broadband Wattmeter 2 MHz to 200 MHz	$591.00
Model 44L1P	Model 44L1 with -40 dB sampling port	$642.00
TC44	Carrying case for all Telewave Wattmeters	$ 85.00
TWL-35	Test Load (35 Watt)	$ [illegible].00
TWL-60	Test Load (60 Watt)	$ 92.00
TWL-150	Bench Test Load (150 Watt)	[illegible]305.00
TWL-300	High Power Bench Load (300 Watt)	$5[illegible]6.00

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Implementing IBOC

Continued from page 34

that they can be combined at a lower power level. This sounds very good, but, not surprisingly, there are implications. Since the digital input signal varies in amplitude, the final amplifier that comprises this theoretical transmitter will need to reliably pass this signal. Instead of having one relatively small transmitter capable of passing the digital component operating in conjunction with an analog transmitter as in the example above, the entire transmitter must be capable of transmitting both the digital and analog hybrid signals. In the 10kW TPO case, the new transmitter would need to have the capability of delivering about 13.4kW, with a peak-to-average ratio of 6dB.

While this methodology eliminates the combiner, it complicates the transmitter requirements dramatically. In most cases, stations that want to transmit an IBOC signal in this fashion are going to need to replace their transmitter. If system redundancy is required, the cost will increase very quickly.

The third methodology is to use a separate digital transmitter feeding a separate antenna. Assuming that this digital antenna is physically close to the analog antenna portion (to forego any complicated licensing issues) the situation is simplified and made much less expensive by eliminating the high-power combiner requiring a lower-power digital transmitter. Station groups in a market can take advantage of the efficiencies of scale. Up to five digital transmitters can feed a low-power combiner connected to a single, broadband antenna. This saves floor and rack space, and it reduces power consumption and air conditioning load.

Fortunately, the bandwidth requirements for filters, combiners and antennas will remain the same. The overall bandwidth of the FM IBOC signal will be ±200kHz, and current filter/combiner and current VHF an-

FM Low-Level Combining

Linearized solid-state transmitter or new IBOC-ready transmitter	$25 to $70K
Bandpass filter, if required	$4 to $8K

FM High-Level Combining

Analog transmitter TPO	$0 to $65K
Solid-state IBOC transmitter	$25K to $70K
Combiner, hardware, transmission line, dummy load	$15K to $25K
Transmitter remote control	$0 to $3.5K
Building space, HVAC, AC power	$0 to $5K
Bandpass filter	$4 to $15K

Anticipated potential costs for the first two methods of FM IBOC implementation.

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tenna technology will handle this increased bandwidth.

Saving AM

Many broadcasters feel that AM IBOC will save the venerable band. Those that have heard AM IBOC demonstrations will agree. Will it be easier or less expensive to implement AM IBOC than its FM counterpart? Not surprisingly, the answer will depend upon the individual station's circumstances.

All IBOC Installations

Digital audio processing at the TX site with AES output	$4K to $10K
Digital STL or discrete analog STL	$0K to $20K
IBOC iDAB exciter	$12K to $15K
UPS for all rack equipment	$1K
Equipment rack space for the above equipment	$1K
Pre-delay monitoring	$1K to $10K

Anticipated potential IBOC costs for AM and FM in addition to the previous costs.

The transmission schemes for AM and FM IBOC are very similar, but one of the major differences is that *some* of the many carriers used to transmit the digital signal on the AM band will actually fall *within* the normal, analog passband (which, as was mentioned earlier, is ±5kHz). (All of the digital carriers in the FM system fall *outside* of the normal passband.) Like its FM counterpart, these carriers are modulated in pairs with the same data. Half of the pair will be above the center frequency, and the other half below. For this reason, symmetry in the frequency and phase response of the AM phasor and ATU system will be crucial beyond ±10kHz, just as it was for AM stereo. Poor system symmetry will lead to a higher bit error rate at the receiver. In fact, an AM transmission system optimized for AM stereo already is optimized for AM IBOC.

One lesser-known benefit of AM IBOC is the fact that the receiver does not use the main carrier in the detection process, instead relying completely on the low-level digital carriers that are transmitted along with the main carrier. The result should be good IBOC performance even in a directional station's nulls.

Like in the days of AM stereo, one of the most crucial performance aspects of a transmitter will be that of incidental phase modulation. This will result in an increase of the bit error rate at the receiver, thus limiting the system performance. Most older transmitters are not going to be able to meet this requirement.

Transition from hybrid stage

So far, this article has discussed only the AM and FM hybrid systems. Eventually, stations will abandon the hybrid schemes and transmit a completely digital signal. Ibiquity has also developed completely digital transmission schemes for the AM and the FM bands.

Implementing IBOC

With the current state of AM, I can see a day in the not-too-distant future in which a completely digital signal will be a reality. An AM owner may have little to lose to attempt a digital-only experiment. In a sense, the entire scheme is simplified because the need for backward compatibility is obviated. In practice, the digital signal in the digital-only IBOC carrier will be 13dB greater than the digital carrier in the hybrid system. The antenna requirements remain the same.

Final transition

The coding and data rate will remain the same as in the hybrid AM system at 48kb/s using Lucent's PAC algorithm. There will be an additional data stream available in the all-digital IBOC system, but it will be limited to 16kb/s, with a slight time delay.

Like its digital AM-band counterpart, the all-digital FM IBOC signal will contain a secondary data stream, also slightly delayed in time and limited to 24kb/s. The main signal will still be transmitted using the PAC algorithm, with a data rate of 128kb/s or 96kb/s. The level of the digital carrier will be increased by about 10dB compared to the FM hybrid system. The use of only one type of transmitter obviously eliminates the need for high-power combiners or separate antennas.

Expense Summary

FM high Level	$65K to $235K
FM low Level	$48K to $135K
AM	$20K to $185K

Potential expense summary for IBOC.

Changing times

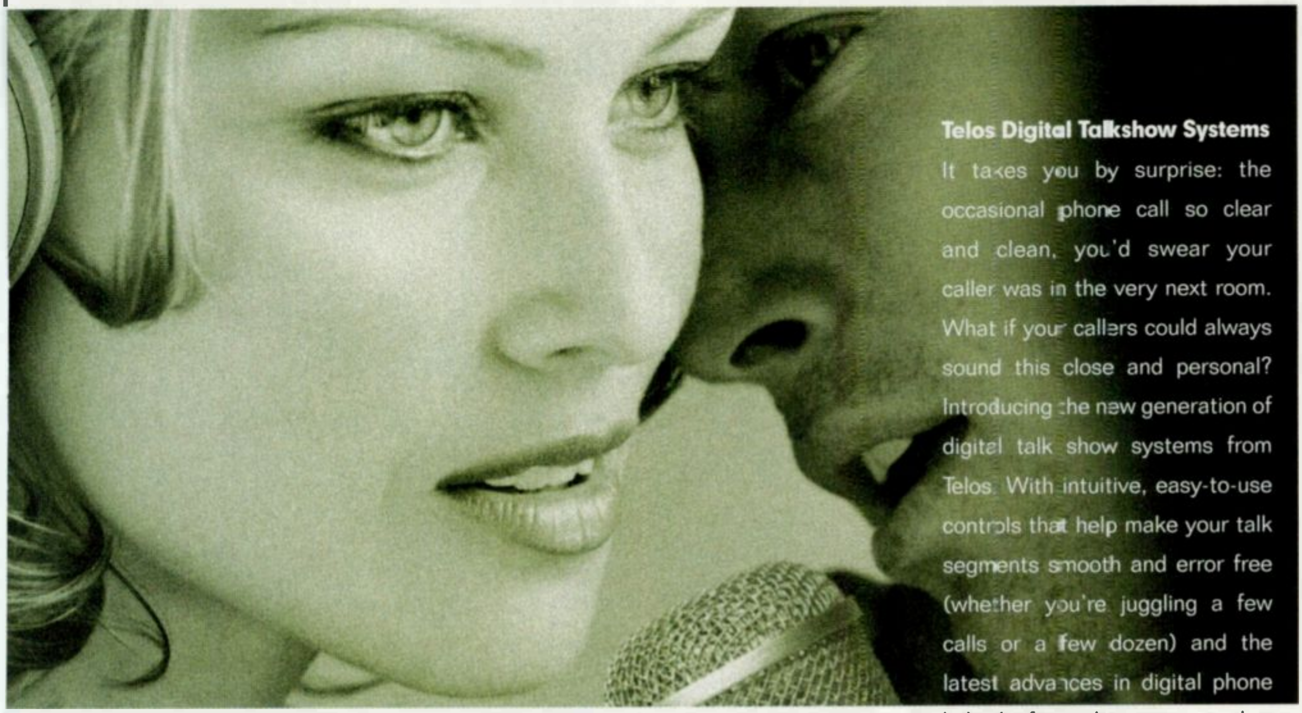
It is important to note that while this article was being written, the Lucent Digital Radio and USA Digital Radio teams are in a post-merger technical review, and aspects of the operation of the iBiquity system as described are subject to change. The best elements of each system will be used in the final product.

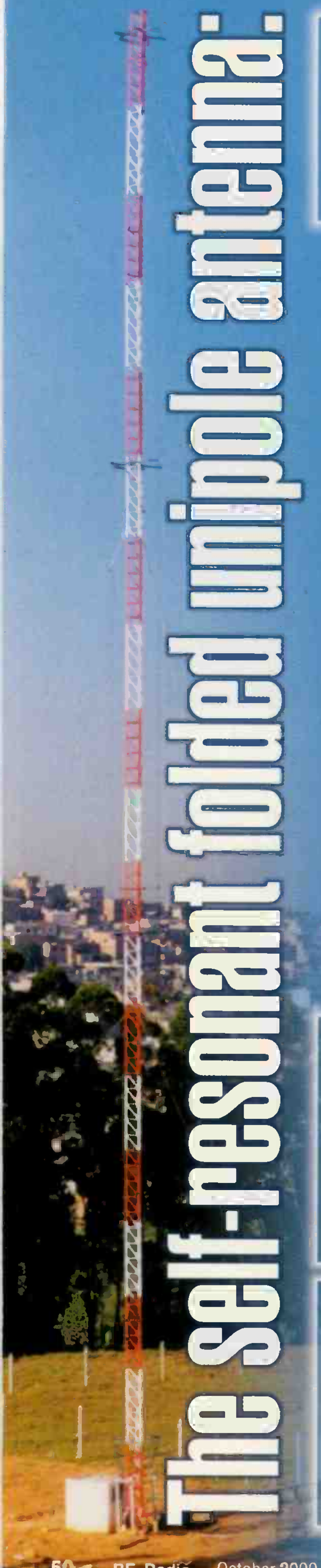
It is obvious that there are many issues to face at the average station prior to the implementation of IBOC. The expense is great enough, for either AM or FM, to prevent IBOC implementation from being a slam-dunk capital budget issue — even at the major market level.

The one crucial element being considered by every station is to what degree do consumers want digital radio. No company manager will approve a large capital expense without at least some reasonable assurance that the investment is going to pay off. Although satellite radio promises to be a competitive threat to some stations, at least it will afford stations a way to measure the level of interest of consumers in digital radio. I hope consumers snap it up.

Doug Irwin is director of engineering services for Clear Channel, San Francisco.

How are you preparing for IBOC? Let us know at beradio@intertec.com.





The self-resonant folded unipole antenna:

MEASURED RESULTS

By Sylvio M. Damiani, P.E.

An article in the October 1999 issue of *BE Radio* described the design of the self-resonant antenna for use with medium-wave or long-wave broadcasting. At that time, I disclosed only a theoretical method of obtaining a self-resonant antenna. This is a purely resistive antenna with no input reactance and an extremely wide bandwidth — features that are useful for AM broadcasting. The first measurements have confirmed the predicted characteristics and some extra features were discovered as well. These features have a natural application in IBOC DAB and should make the transmission system as transparent as the studio equipment.

Several small AM stations (1kW typically) in Brazil installed a self-resonant folded unipole like the one described in the October 1999 issue. ZYK-767, a 1kW station on 1490kHz, and ZYK-563, a 1kW station on 850kHz, are using a self-resonant folded unipole antenna right now. Over the past year, some low-power stations including ZYE-548 in Araras in the state of São Paulo, and some medium-powered stations like Radio Alvorada, a 5kW station in Londrina in the state of Parana, also have used a self-resonant unipole antenna. In addition, some high-power stations, including 50kW ZYK-588 on 1260kHz in São Paulo City, are now using a self-resonant unipole antenna with excellent results.

The basics of the self-resonant folded unipole

The conventional folded unipole has a closed ring around the bottom and top of a tower with vertical guys spaced evenly around the ring. In a self-resonant folded unipole, the rings at the top and bottom are not closed, but rather in a C-shape. A lumped reactance is placed in series between two of the vertical guys at the bottom. The exact location and value is determined mathematically.

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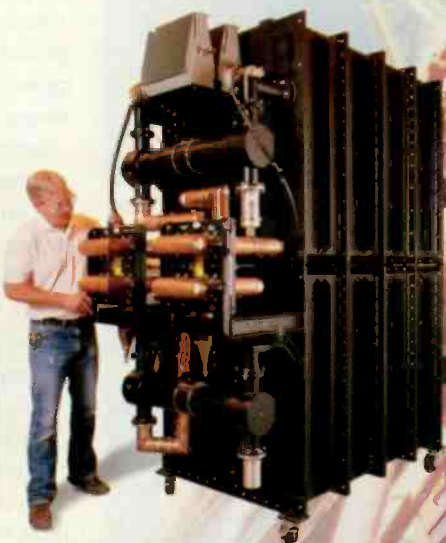

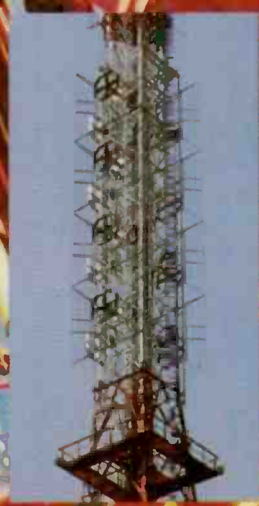

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MEASURED RESULTS

High-power ZYK-688 uses a two-tower array. The present version is a self-resonant folded unipole used as antenna one and a simple monopole as antenna two, which operates as a parasitic element on the array. The parasitic element is base-loaded with a variable vacuum capacitor to adjust phase. The base current ratio is less than 1:1, which produces a radiation pattern that has two medium nulls with the major lobe toward São Paulo.

The two-tower array of ZYK-688. The tower on the left is the self-resonant folded unipole.

Calculations and measurements

The antenna performance results for station ZYK-688, the 50kW on 1260 kHz in São Paulo, are shown in Table 1. Note that the measured values are sensibly better than the calculated values. The measured values were used to calculate an optimized TEE network to match the 50Ω coax cable to the system. Table 2 shows the ATU impedance curve data.

To my knowledge, this is the first time that a medium-wave directional antenna array (two-tower antenna in this case) was measured to show such a wide operating bandwidth. The results of ±20 kHz referenced to the carrier frequency are quite impressive. A phase-locked loop RF generator was used in place of the transmitter's oscillator for the frequency sweep impedance measurements.

Frequency (kHz)	Calculated Z_{in} (Ω)	Calculated VSWR	Measured Z_{in} (Ω)	Measured VSWR
1240	13.15 – j54.31	1:8.46	41.0 – j39.7	1:2 38
1245	25.44 – j40.38	1:3.64	45.0 – j29.6	1:1 90
1250	37.82 – j26.68	1:2.10	51.3 – j18.5	1:1 48
1255	50.57 – j13.20	1:1.39	56.0 – j9.41	1:1 23
1260	64.01 – j0	1:1.00	64 + j0	1:1 00
1265	78.48 + j12.71	1:1.31	70.0 + j8.0	1:1 16
1270	94.33 + j24.52	1:1.64	76.8 + j16.3	1:1 34
1275	111.81 + j34.76	1:1.98	83.5 + j25.2	1:1 54
1280	130.82 + j42.40	1:2.32	90 + j33.9	1:1.74

Table 1. The antenna input impedance. The calculated Z_{in} is the antenna input impedance operating in the array. The calculation was done with NEC Win Plus+ software. The measured Z_{in} is the antenna input impedance.

Frequency (kHz)	Input Impedance Z_{in} at ATU (Ω)	Module of Z_{in} (|Z_{in}|) (Ω)	VSWR (referenced to 50Ω)
1240	26.45 + j21.87	34 32	1:2.36
1245	33.49 + j21.45	40 19	1:1.89
1250	42.75 + j16.43	45 80	1:1.47
1255	48.52 + j10.01	49 54	1:1.23
1260	50.00 + j0	50 00	1:1.00
1265	49.00 – j7.31	49 54	1:1.16
1270	45.91 – j13.53	47 86	1:1.34
1275	42.04 – j18.38	45 88	1:1.54
1280	38.01 – j21.50	43 66	1:1.75

Table 2. The impedance at the ATU input.

Notice that the transmitter accepted the frequency variation across the entire frequency sweep. There were no overload problems noticed during the work, even when measured at ±20kHz from the center carrier. This means that the loads presented to the transmitter final stage were acceptable, even at ±20 kHz. This also demonstrates that frequencies ±20kHz from the carrier were passed without any attenuation in the final stage.

Figure 1 shows the symmetry of the SWR plot around the carrier frequency. The low values at these points denote the superior band-

width of the array using a self-resonant folded unipole antenna as the main radiator.

For IBOC, system linearity and symmetry will be critical (see Implementing IBOC, page 30). Plans are in

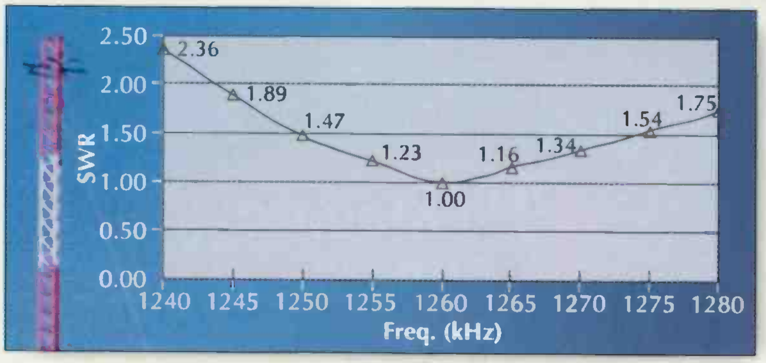
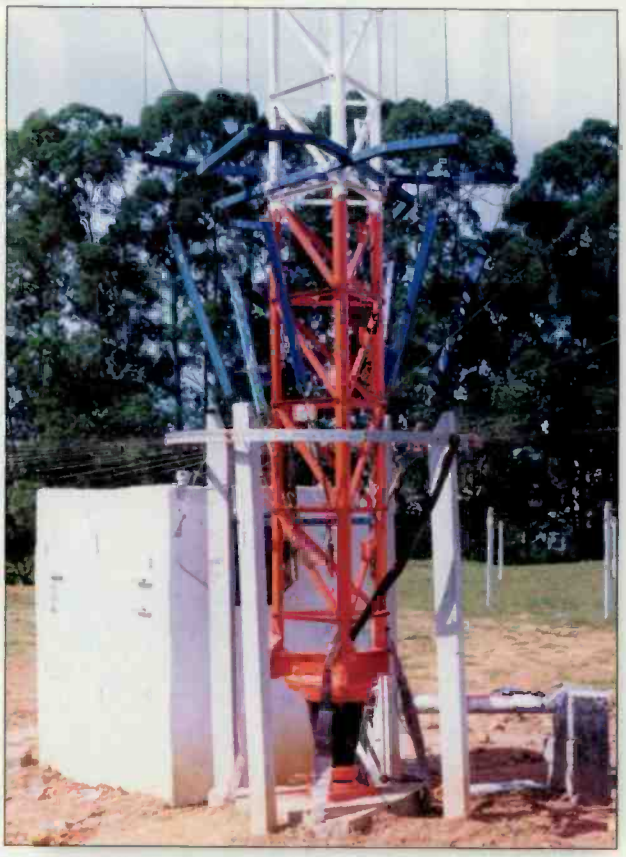


Figure 1. Plot of SWR vs. frequency for the ATU input at ZYR-688.

place to report the results of another medium-wave self-resonant folded unipole antenna installation as an omnidirectional radiator.

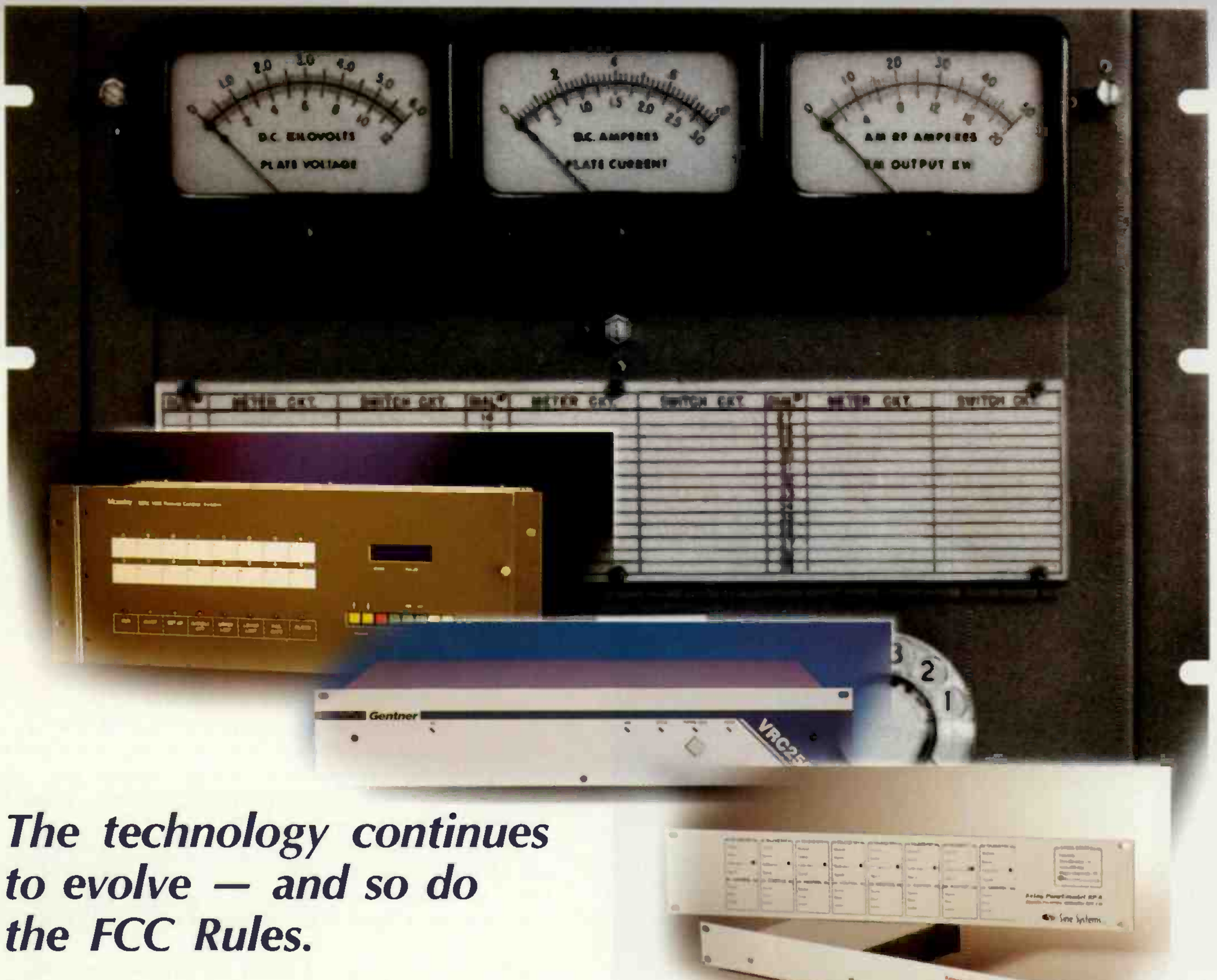


The base of the self-resonant folded unipole antenna. The blue bars are spacers for the vertical skirt wires and base insulators. The ring is part of the elevated ground system.

Sylvio M. Damiani, P.E., is a consulting engineer and coauthor of The Brazilian National Plan for MW Radio Stations. *He is based in São Paulo, Brazil.*

TRANSMITTER CONTROL Regulation and Implementation

By William D. Fawcett



The technology continues to evolve — and so do the FCC Rules.

I'd like to see a show of hands: How many of you have ever had the Commission call you and request an imme diate shutdown of your facilities? I thought so. In spite of its rarity (has it *ever* occurred?), the entire premise of the existing rules on transmitter control are based on this implausible scenario.

Not that anyone's complaining; but the current rules on transmitter control are by far the most lenient in the history of broadcasting. We have come a long way from 30-minute logging intervals and daily inspections. Technology has come a long way as well. About the only

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thing that hasn't come a long way is clarity in the FCC rules regarding transmitter control.

Not only is equipment much more stable than before, but the technological advances in computing have allowed many of the simple monitoring and control functions to be delegated to a microprocessor. Although still not too receptive to lightning hits, computer chips are seldom late for work, and rarely arrive with a hangover, so overall the switch to automated controls has been a net improvement.

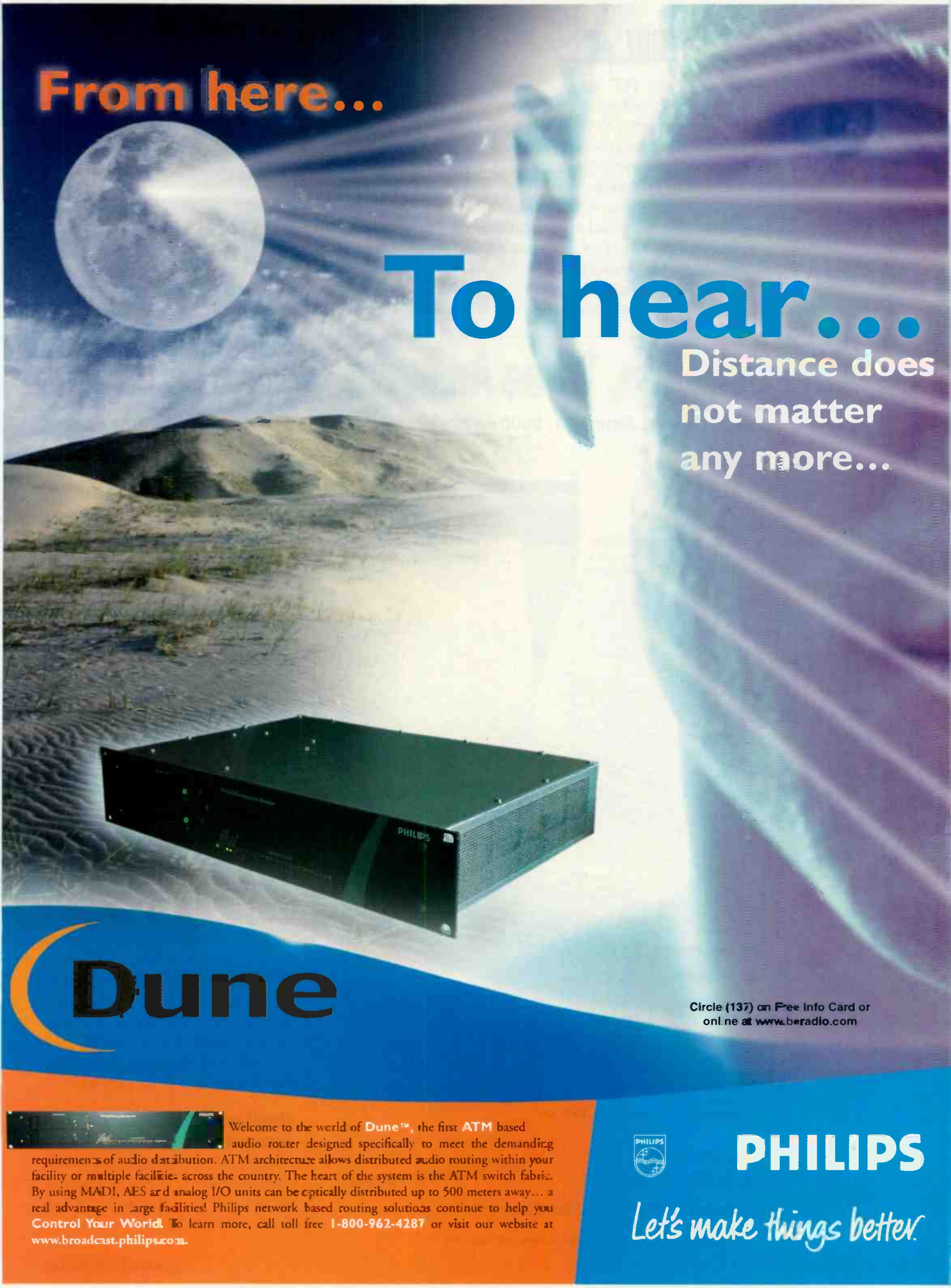
These technologies encouraged the FCC to first accept the concept of Automatic Transmission Systems (ATS) in 1977. Early units were amazing combinations of instrumentation amplifiers and motor driven rheostats. As microprocessors became common, these too were placed into service.

The array of equipment available today ranges from extension meters and simple stand-alone dial-up systems to web-cams and Ethernet-integrated systems capable of 256-site control. Regardless of the technology employed, there are several basic concepts that must be considered.

Attended vs. unattended operation

A station may operate attended, unattended, or a combination of the two. The FCC self inspection checklist states, "Attended operation consists of ongoing supervision of the transmission facilities by a station employee or other person designated by the licensee either at the transmitter site, a remote control point, or an ATS control point. Such supervision may be by direct observation and control of the transmitting system by a live person at the transmitter site or remote control point, or such supervision can be by automated equipment that is configured to contact a person designated by the licensee. In either case a live person must be on duty at a *fixed* location during all hours of broadcast operation where he or she can turn off the transmitter and can either monitor the station operating parameters or be contacted by the automated equipment that is monitoring the equipment. During attended operation, it is expected that the transmitter will be turned off by station personnel within three hours of an overpower or overmodulation condition that can cause interference that cannot be corrected within that period of time."[1]

Excerpts from the FCC's FAQ, *Unattended Operation of Radio and Television Broadcast Stations*, can be found online at www.beradio.com. Go to *This Month in Print* for the October issue and click on the link for the *Unattended Operation FAQ Excerpts*.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On the other hand, the FCC states, "Unattended operation consists of using self-monitoring or *automatic transmission system* (ATS) monitoring equipment to control the transmission system, or alternatively, operation in the absence of constant human supervision with equipment that can operate for prolonged periods of time within assigned tolerances. In the former case, equipment must be configured to automatically take the station off the air within the required three-hour or three-minute (certain AM DA requirements) time periods after an out-of-tolerance condition arises. In the latter case, the licensee is required to make certain that the station is monitored frequently enough to ensure that station operation is corrected or terminated within the designated 3-hour time limit, but constant human supervision is not required."[2]

Some remote controls have the same design basics as their early predecessors, but have increased significantly in capability, function, and method with the addition of multi-site monitoring, computer control and telephone access.

The Commission has been emphatic in stating that the rules permit unattended operation of the transmitter, but do not relieve the station of the staffing requirements of the main studio. Stated generally, for part 73 broadcasters, the main studio must be staffed by two full-time employees. (For more on this, see FCC Update on page 26.) Note that the FCC does not "require the main studio staff to monitor an unattended broadcast transmitter."[3]

Section 73.1350(b)(2) states that "transmitter control personnel must have the capability to turn the transmitter off at all times. If personnel are at a remote location, the control system must provide this capability continuously or must include an alternate method of acquiring control ...that operation [may] be terminated within 3 minutes."[4] The problem with this rule is that it does not seem to directly address the situation where the station is operating unattended, that is with no control personnel.

Monitoring and Control Systems

The broadcaster may choose among many differing schemes for transmitter control, which may be broken down into three major categories.

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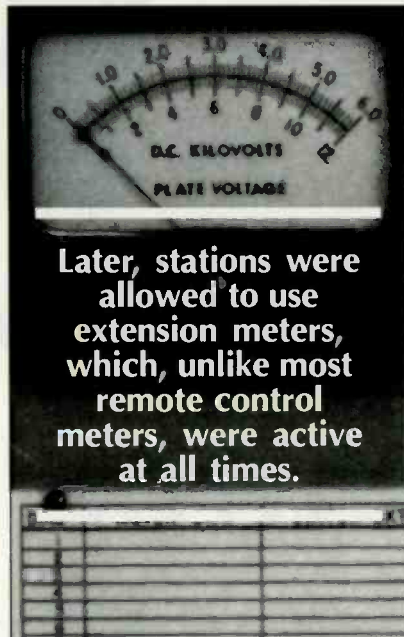
Local control, of course, is the simplest option. In the good old days, the transmitter meters had to be visible from the control point. This is why many studios had a transmitter in an adjacent room with a window. Some stations employed mirrors or TV cameras to meet this requirement. Later, stations were allowed to use extension meters, which, unlike most remote control meters, were active at all times. Under these rules the transmitter was required to be within 100 feet of the control point.

Remote control allows the location of the control point (typically the main studio) away from the transmitter site. The rules state that "The remote control system must provide sufficient transmission system monitoring and control capability so as to ensure compliance with Section 73.1350".[5]

ATS involves the use of monitoring systems that will contact an operator should an ongoing out-of-tolerance condition occur. If the condition is not corrected within a given time span, the equipment will shut down the transmitter. Many remote control systems may be configured for ATS operation. The FCC will allow a hybrid ATS/remote control-type system.

A fourth option is no monitoring whatsoever. The FCC allows the use of "equipment that can operate for prolonged periods of time within assigned tolerances." This option still requires periodic verification and the ability to shut down the equipment within the prescribed three-minute limit. Obviously, the broadcaster who chooses this option would not have a leg to stand on should the FCC detect an out-of-tolerance condition.

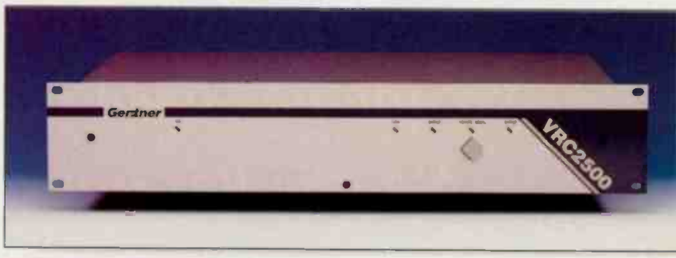


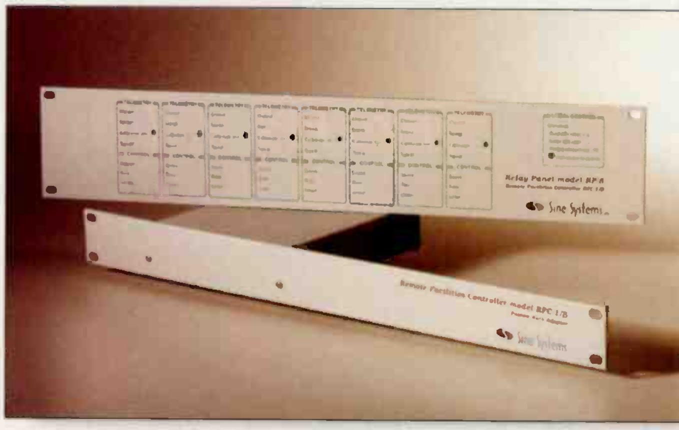
Telemetry and Control Links

A multitude of options are available here, too. For control from a fixed point, stations often employ part 74 frequencies, FM subcarriers or subaudible tones on AM. Recently, 2.4GHz unlicensed spread-spectrum devices have become popular. Stations that employ return links that piggyback on the broadcast signal are at a considerable disadvantage when the station goes off the air. Dial-up control systems are popular, especially since they allow the use of

floating control points and give the chief engineer direct access to the transmitter from any phone.

The use of dial-up control has been subject to controversy for many years. Finally, in the last revision to the remote control rules[6], the FCC allowed that the *public switched telephone network* (PSTN) was reliable enough to replace dedicated full-time leased lines. However, the rules require that the phone line at the transmitter site be dedicated to that purpose. The problem relates to the requirement that stations be able to shut down within three minutes of a request by the FCC. If the station engineer has dialed in to check meter readings, the station's control point operator cannot access the remote control because the phone is busy. Therefore, if the phone line is not dedicated, an alternate method of transmitter shutdown must be devised. This could involve a second phone line at the transmitter site, or an audio fail-safe (2.5-minute time out), or an alternate signaling method. A very common (and reliable) method is to loop the transmitter interlock line through your STL receiver's squelch relay. One FCC staffer implied that a "well aimed cannon"[7] would also meet this secondary fail-safe requirement, however this method is generally not acceptable to most zoning authorities.





Telephone access and control have become common in many systems. Some systems utilize different access and control methods than their traditional counterparts.

It seems that when the FCC relaxes the Rules on an issue, some want to push things even further. The FCC has allowed landline (PSTN) dial-up control without backup shutdown capability under certain conditions. Not all mountaintop transmitter sites have telephone lines available. Cellular is an option, but do not confuse cellular with PSTN circuits. It is possible to have a cellphone-controlled transmitter "leave the service area."

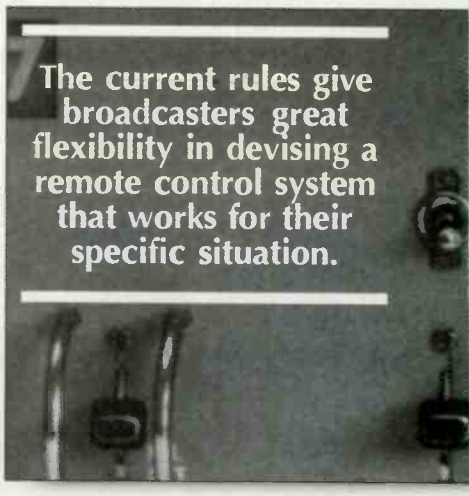
TRANSMITTER CONTROL

Because of the unreliability of cellular systems (especially during peak usage hours), I would suggest that any transmitter site that employs a cellular-linked control system use some form of ATS so that long-term (three hour) uncorrected conditions will trigger a shutdown. Furthermore, such a system should have a secondary means of shutdown, such as a silence-sense or STL squelch interlock. A station in Virginia has operated in accordance with the rules using a system like this during prolonged (five day) cellular outages.

If cellular is unreliable, how about the Internet? Think about how many times you have been unable to access the FCC Daily Digest website before pursuing this idea. While it might be an interesting experiment, a backup remote control or an ATS with a secondary shutdown capability would probably be necessary to ensure compliance.

Contact Person

The current rules give broadcasters great flexibility in devising a remote control system that works for their specific situation. The consolidation of broadcast facilities has brought forth a need for centralized control, and this is now a possibility. The Rules do not allow a broadcaster to simply lock the door to the station and go away — or do they? Some small-market operators have declared their home as a secondary



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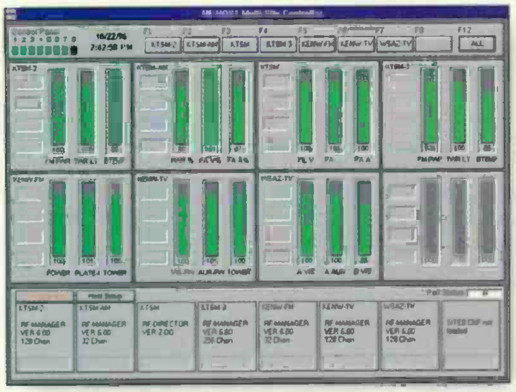

Access via computer allows for increased monitoring capability and greatly reduce system setup time.

control point, but are these operators really at that location at all times? What if a station declares its operation unattended? It is not required to have a control operator; therefore it is not required to have a control point. Nonetheless, stations must meet the three-minute shutdown rule, and it is implied that they must (through informal means[8]) have a record with the FCC of a contact person that can shut the station down.

Because of these ambiguities, the SBE petitioned the FCC for a declaratory ruling in 1998, but nothing has been forthcoming. For their own legal protection it would seem prudent for stations operating in the unattended mode to at least supply a pager or cell phone number to facilitate contact with the station during those times.

A remote transmitter site with dial-up control is not required to have a secondary shut-down means if a dedicated phone line is used. However, A special waiver to that single-use phone line is permitted — the phone may be used by the station engineer while he is at the site, with the site under local control

Of course, while the engineer is on the phone, the FCC has no way to reach the station to ask it to shutdown. In fact, there are sites that occasionally are operated under local control and do not have a phone at all. It seems clear that inconsistencies in the application of the three-minute rule leave all stations vulnerable to problems should a station inspection occur.

The future

The *NAB Guide to Unattended Station Operation* has a comprehensive section on the history of transmitter control regulation. This is a book that should be on the required reading list of any station considering unattended operation. It is interesting to see the progression of these rules through the years. ATS rules, which were very specific, have been generalized to the point where they have become hard to define. Certainly, anyone with an ATS or remote control system operating unattended would do well to simply declare it an unattended system based on stable operation using ATS or remote control features to enhance the operation of that system. This removes the higher obligations that are placed on those using an ATS or remote control system. Indeed, some fully staffed stations without ATS consider themselves operating unattended 24 hours a day.

This will practically set in place now what the FCC will inevitably do: eliminate any equipment specifications and simply require stations to operate within the prescribed limits. We saw this happen several years ago when the requirement for a modulation monitor was eliminated — now stations must simply stay within the FCC limits. Broadcasters need this change, or at least a response to the SBE request, to eliminate the confusion that these rules have spawned. There will always be stations that want to skirt the rules, but responsible broadcasters should not have to constantly wonder if they are meeting the letter of the law.

References

[1] *FCC Bulletin EB-18FM,* FM Broadcast Station Self-Inspection Checklist, *January 2000 edition.*

[2] *ibid.*

[3] *ibid.*

[4] *47 CFR 73.1350 (b)(2)*

[5] *47 CFR 73.1400(a)(3)*

[6] *Report and Order FCC 95-412, released October 23, 1995.*

[7] *Harold Hallikainen quoting John Reiser, Insight on Rules #96, www.hallikainen.com/rw/insite/insite96.html.*

[8] *Report and Order FCC 95-412, Paragraph 33, released October 23, 1995.*

William Fawcett is director of engineering at the Center for Public Broadcasting at James Madison University and president of Mountain Valley Broadcast Service in Harrisonburg, VA. Photo of the Gates remote control is from the collection of Chuck Leavens.

Looking for remote control equipment?

Go to www.beradio.com and see the Product Profile on remote site control equipment.

Further Reading:

Report and Order FCC 95-412 (MM Docket No. 94-130)
www.fcc.gov/Bureaus/Mass_Media/Orders/1995_Orders/fcc95412.txt

Unattended Operation of Radio and Television Broadcast Stations (FCC FAQ)
www.fcc.gov/mmb/asd/bickel/noonehome.html

FCC self-inspection checklists
www.fcc.gov/eb/bc-chklsts

SBE Request for Declaratory Ruling
www.jmu.edu/wmra/engineering/sberequest.pdf

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Next Month:
Audio Codecs • Digital Consoles

Broadcast Electronics AM-1A

By Mark Croom

When Northwestern College Radio acquired WMAD, Sun Prairie, WI, in January 1997, one of the first priorities was to replace the transmitter, a 1981-vintage unit from a defunct manufacturer. The previous owner spent $2,000 a year on tubes alone to maintain this unit. We selected the Broadcast Electronics AM-1 but did not purchase the new transmitter right away as we were also investigating the possibility of a power increase. We decided to delay the transmitter replacement until we knew exactly what power level would be needed.

Decision Time

In the meantime, the old transmitter started showing its age in the summer of 2000 and began to fail on a regular basis. One failure required several days to fix while the problem was diagnosed and parts were ordered. It was realized quickly that the economies of replacement-part costs, lost air time and even regular maintenance expenses made a new solid-state transmitter a smart purchase, even if the station did receive a power-increase authorization in the future. To help justify the expense of the new transmitter, station management used operating cost figures obtained from the salesperson at Broadcast Electronics. Without any additional expensive breakdowns from the old transmitter, the new transmitter cost would be recovered in just three years. Based on the old transmitter's performance over the last six months, the actual time period was going to be less.

Performance at a glance

- Compact size
- Energy efficient
- Good remote control and status circuitry
- Five power levels standard
- Cost effective

The Northwestern College FM station already owns a Broadcast Electronics FM transmitter, which has provided outstanding service. Previous satisfaction made the AM-1A an easy decision, especially with its reasonable cost. (The AM-1 had been replaced by the AM-1A by the time we were ready to buy.) The basic transmitter has several standard features, including a modulation monitor and an AM stereo exciter. It also provides an array of control inputs and status outputs to interface with a remote-control system.

One unusual feature of the AM-1A is that it is does not include a rack enclosure. This feature allows the transmitter to be shipped in sections by package carriers like FedEx or UPS. The main output amplifier is rather heavy (packed weight was more than 80 pounds), but when the need is dire, receiving the transmitter by next-day shipping is helpful. Installed, the transmitter occupies 42" (24RU) of space. The station bought a standard, 6-foot, 19-inch rack through a local audio supplier and had it wired with a welder-type outlet to provide the 220-volt, single-phase power source for the transmitter.

The transmitter is designed to operate into a 50Ω load with minimal reactance. Stations that must feed a load that is not 50Ω can install an optional output tuning unit for matching the transmitter to impedances outside the design range.

The transmitter doesn't have much metering; instead it relies on LED status indicators (which we call idiot lights) on the front panel for most status and alert indications. There is a meter for reflected power and a multi-meter that measures two RF power ranges and AC input voltage. I would prefer additional metering for PA supply voltage and current.

Ordering and Installation

It only took two weeks from the initial order for the transmitter to arrive at WNWC. To follow good engineering practice for solid state transmitters, we also installed AC surge-protection equipment. An assortment of amenities such as wire ties, and necessities such as ferrite cores, were provided with the transmitter.

The transmitter arrived before the equipment rack, which gave us some time to unpack the unit and study the documentation before beginning the installation. The transmitter manual is thorough and readable. By the time preparations were complete at the transmitter site, we were confident that the rest of the installation would be relatively simple.

Once the rack was delivered, the transmitter sections were installed easily. The final amplifier section can be installed by two people, but I recommend having three people available. It is a challenge for two people to handle the 80-pound section and get the rack screws installed.

On The Air

The remote-control cabling, feedlines and AC power went in without a hitch, and we were ready to start the transmitter. However, once AC was applied, the transmitter didn't work. This definitely was not what we expected, but it was the only problem encountered so far. The front panel indicated that lightning was present, and we didn't have any clue as to why — it was a bright, sunny day. As it turned out, the bright sunlight from the open door of the building was activating the lightning sensor's phototransistor and providing the false reading. The spark gap and phototransistor are clearly visible through vent holes at the side of the transmitter. After covering just enough holes to shadow the lightning sensor, we were once again ready to test the unit.

First, I ran the transmitter into a dummy load at its lowest power level, and everything looked fine. Next, I plumbed the transmitter through an antenna switch into the phasor, and began bringing it up through the power levels. Again, everything looked fine, though there was slightly more reflected power than I wanted for the permanent installation. I didn't have access to a common point bridge, so I used the transmitter's forward and reflected power metering to adjust the common point for minimum VSWR at the transmitter's antenna terminals. This plan worked well, and the station ended up with base currents within two percent of the licensed values at the licensed common point current. The resulting reflected power was less than eight watts with 1,100 watts forward power.

The transmitter has performed well since its installation in July 2000. We've had no unplanned downtime since it was put into service. It also sounds great on the air. Without adjusting the station's on-air processing, the audio sounds crisper and cleaner on typical radios. The station has never sounded better on a wideband radio than it does now.

We are very pleased with the transmitter so far, and we have not needed manufacturer product support yet. Based on my short experience with the transmitter, I recommend it to anyone requiring a straightforward, 1kW solid-state AM transmitter that's easy to install and inexpensive. I think it's a great buy.

Mark Croom is chief engineer and operations director at WNWC-AM/FM, Madison, WI.

Editor's note: *Field Reports are an exclusive* BE Radio *feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.*
These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.
It is the responsibility of BE Radio *to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by* BE Radio.

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New Products

Stereo audio editor
Audion Laboratories

◀ **VoxPro 2.0:** New version operates on iMac, iBook, PowerBook, G3 and G4 computers. Up to nine hours of stereo recording are possible with an iMac standard 6GB hard drive. Designed for fast editing of mono and stereo material for newsrooms, phone calls and on-air studios. Version 2 includes a new screen interface and system includes a dedicated hardware controller. The security dongle required for earlier versions is no longer required.

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Extended range test meter
Ward-Beck

XTM4: test meter for the measurement of analog, AES-3 and SDI embedded audio signals over a wide range; the 2RU unit is equipped with a high-quality stereo VU and PPM moving needle meter pair; all meters are LED illuminated; front panel controls and a bright dot matrix allow the user to select between the various signal sources, select the mode of operation and set the sensitivity of the meter; connection is via a rear panel XLR for the analog and 110Ω AES-3 signals and via BNCs for the AES-3ID and SDI signals.

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the AudioSonix system is the available bandwidth of the sending and receiving parties. The system can deliver commercial traffic and traffic instructions in one package. AudioSonix also can create custom applications to interface with its proprietary servers to make distribution from a web-based interface reliable, automated and verifiable. Latest version allows users to resume interrupted file downloads without the need of starting from the beginning.

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fax 520-752-4184
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Digital signal converter
ATI

▶ **DMM100:** A digital format converter that accepts an AES-3 (110Ω), AES3-ID (75Ω), S/PDIF or TOSLINK input and distributes it to all four outputs. The output complement is the same as the input section. All connections are transformer coupled and floating for maximum isolation and ground loop elimination. All outputs are digitally reshaped. The front panel has a power switch, power indicator and signal presence indicator. As part of the Nanoamp series, the unit can be rackmounted with other units or used as a stand-alone. The DMM100-BAT offers the same features but can be powered by four AA batteries.

800-959-0307; fax 215-443-0394; www.atiguys.com; sam@atiguys.com
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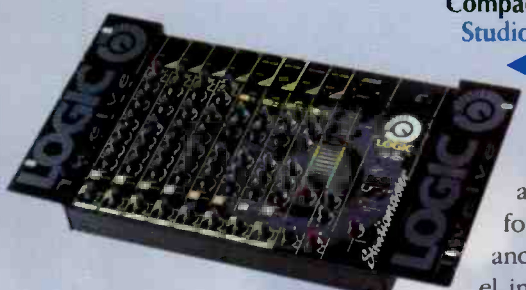
Compact mixer
Studiomaster



◀ **Logic 12:** This eight-channel, 12-input console has an easy-to-understand panel layout and high-quality audio specifications. Includes four mono channels with balanced microphone and line level inputs, a three-band EQ, two aux sends and PFL. The four stereo channels have two-band EQ. Also includes tape and stereo aux return inputs. Rack mount kit is included. XLR mic inputs have low noise pre amps and 48V phantom power. Three-color, 12-segment peak-reading LED bargraph meters. Occupies 6RU.

714-998-2102; fax 714-998-2086; www.studiomaster.com; us-info@studiomaster.com
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FM Antennas Medium power circular polarization

SGP-1	$690	4Kw
SGP-2	$2,690	8Kw
SGP-3	$3,595	10Kw
SGP-4	$4,500	10Kw
SGP-5	$5,300	10Kw
SGP-6	$6,100	10Kw

FM Antennas Low power circular polarization

GP-1	$350	1.5Kw
GP-2	$1,350	3Kw
GP-3	$1,900	5Kw
GP-4	$2,600	6Kw
GP-5	$3,150	6Kw
GP-6	$3,700	6kw

Other power configurations contact OMB America

FM Antennas Educational circular polarization

MP-1	$250	0.6Kw
MP-2	$680	0.8Kw
MP-3	$980	0.8Kw
MP-4	$1,280	0.8Kw
MP2-4	$1,820	2Kw
MP3-5	$2,270	3Kw
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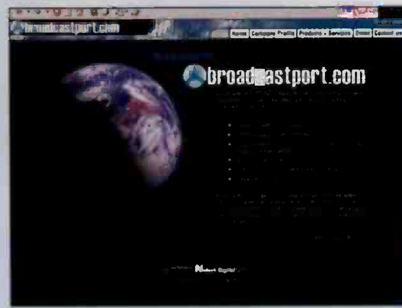

▲ **Broadcastport.com:** This virtual portal offers turnkey webcasting services to broadcasters. Designed to be an instant Internet solution for radio stations, the product offers high-bandwidth audio-stream hosting, e-shopping malls with transaction processing, order fulfillment services including warehousing and shipping of merchandise, studio-cam hosting, chatroom hosting, customized music formats for web-only streams and virtual office solutions. BroadcastPort.com offers several avenues for broadcasters to earn non-traditional revenue (NTR) on their websites such as Internet stream ad insertion, self-managing ad-banner placement, e-commerce and creation of live and custom audio streams. OMT has partnered with Globix, eScotia, Voyager.net, and Seattle Software to provide this service.

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Stream In: Automatically handles video data from acquisition, conversion, storage and transfer to a website or broadcast server. Uses an external GPI to digitize the data, encode it into Real video and/or MPEG4 and then send the files to the target Internet server. The process can be automatic or manual, live or pre-recorded. The Web URL, encoding format and type of compression are all configured by the user. Also includes a day-by-day events log which can be automatically e-mailed.

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Windows to the Web

www.logitekaudio.com

Logitek Electronic Systems: Manufacturer of digital audio consoles plus a full line of audio meters. Visit our website for information on the NUMIX, ROC-5 and ROC-10 digital audio consoles. You'll also find information on our DSP-based audio meters, offering a range of displays while conforming to IEC standard ballistics. Logitek — digital with a better difference!

www.omt.net

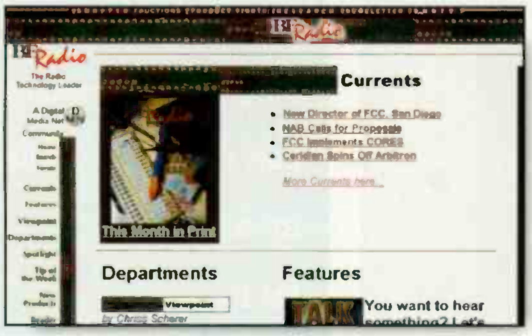
OMT Technologies: MediaTouch by OMT Technologies provides radio stations with state of the art digital audio systems for live assist or full automation use. With over 14 years of broadcast experience, MediaTouch has innovative software solutions starting as low as $995. Surf to MediaTouch, see our exciting new products and find out how our clients sound better and save money with our unsurpassed quality, reliability and support.

www.managementdata.de

Management Data Media Systems AG: One of the market leaders in the development and implementation of partial or full systems for digital broadcasting operations. In 1999, Management Data Media Systems introduced the new D'ACCORD III product range, a streamlined, updated system with improved features for recording, editing, storing, archiving and playing of digital audio files.

www.arrakis-systems.com

Arrakis: Manufacturers of studio systems including the popular DigiLink computer-based audio storage and playback systems, Arrakis analog consoles, Colorado Revolution digital and analog audio consoles, and broadcast studio furniture. The website features an online interactive catalog, station equipment calculator, an equipment list price generator and a section to download the latest software versions and patches.



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***BE Radio* magazine:** *BE Radio* gives radio station managers and engineers the information they need to make critical equipment purchase decisions. The magazine is published 12 times a year and distributed to over 14,000 qualified subscribers in North America. The website features Currents (all the news updated daily), The Studio Spotlight and the Tip of the Week in addition to the quality information available in each issue.

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Antex Electronics: If you're looking for the most versatile, best-sounding sound cards for broadcast applications, it's time to look at Antex. Browse through Antex's complete line of analog and digital-ready products, read independent product reviews, get in-depth technical information, check out high-end applications of Antex products in the Sound Advice newsletter and buy products securely online. Already a customer? Download drivers, software, owners manuals and more.

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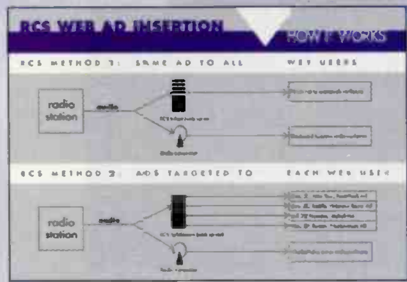

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DNS1000: Designed for audio post, live broadcast, and forensic audio. With virtually zero latency, its 40-bit multi-band processing removes unwanted noise from location sound, sound effects and dialogue. Removes rumble, hiss, whistles and broadband noise that often makes audio unusable. Has a simple-but-elegant user interface, powerful capabilities, and helps avoid overdubs.

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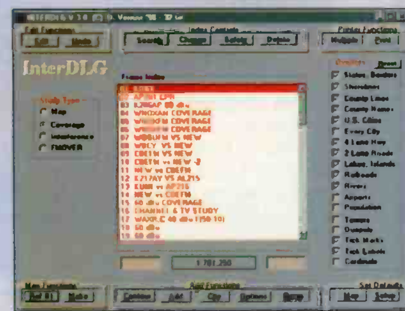
Coverage and interference mapping
V-Soft



▶ **InterDLG for Windows:** Creates FCC standard-coverage and protected-interference contour maps. Integrates automatic population calculations, tower and airport overlays with USGS digital line graphs. Prepares allocation maps quickly and efficiently. 32-bit version operates on Windows9x. Program produces precise coverage maps with user-selectable operating parameters for power, antenna height and frequency using the actual FCC TVFMINT FORTRAN code and V-Soft's 03 or 30 arc second NGDC digital terrain elevation database in a transparent interface to produce superbly accurate coverage maps in color or black and white. InterDLG produces up to 200 frames with a different map. Frames are indexed and stored on your hard drive for future use. At any time, an existing frame can be recalled for printing, editing or adding new information.

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MediaStation: Designed for small- to mid-sized market stations. Has integrated Mediatron plug-in technology. Until this release, the plug-in technology was only in use in the AirControl NT system developed by the company for bigger radio stations. Runs on Windows NT or Windows 2000 Professional on a Pentium II or faster with standard Windows-capable sound cards. Features intuitive handling so special training is not required. An optional user interface is available to make operation even simpler. Can also be used in connection with the Internet, digital radio stations and the multimedia services connected with them, such as PAD program associated data simply by installing the corresponding Mediatron WebShow or DAB plug-in module.

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IBOC-ready AM transmitter
Armstrong Transmitter

X-1AM: Solid-state AM transmitter features two 600W modules and has 90 percent PA efficiency. The optimized multiphase modulator provides flat group delay and a low source impedance. Capable of 150 percent positive modulation, the unit occupies 7RU and weighs 132 lbs. Modules can be hot swapped. Three preset power levels and full remote control connections are provided. Also features full redundancy for RF amplifiers, modulator, cooling system and power supplies.

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Audio processor
Broadcast Technology

▲ **TXL-210:** Designed to meet the new demands placed upon today's audio chain. Useful in applications such as limiting the audio into a digital production workstation, STL preprocessing, satellite uplink processing or SCA processing. Switch-selectable pre-emphasis and de-emphasis allow the unit to be used directly as an AM-NRSC or FM on-air processor. Designed to control any kind of energy. When installed in your air chain or production facility, it will produce the control of audio level you desire and be virtually undetectable. Has independent left and right input and output controls. Other features include a mono output and phase rotation in the control circuits for optimum voice level control. Comes in a single-channel version, which includes a mic input and output.

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Shure Inc

▲ **P4M:** developed for use with personal in-ear monitor systems; features four XLR mic/line inputs with individual level and pan controls; other features include four XLR split outputs and two 1/4-inch auxiliary inputs for adding channels from other sources; allows users to adjust their levels without interrupting the signal to the house console when microphone or line signals are run through the unit's split outputs before being connected to a main stage box; in "mix plus" mode, a mix passes through the P4M on one or two of its primary channels, with additional sources being added through the remaining primary channels and auxiliary inputs

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Active and passive nearfield monitor
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◀ **O 104/P 104:** A studio monitor available in active (O) and passive (P) versions. The two-way system has a compact cabinet with a 7.5 liter volume and exhibits excellent free field response of 85Hz to 20kHz at ±2 dB and THD below 0.5 percent at 95dB SPL. The cabinet and baffle are made of low-resonance integral molding material to form an elliptical wave guide for a larger sweet spot and to avoid edge diffraction and standing waves inside the cabinet. The passive version also features a four-position room equalization switch to adapt to various positioning options. The O 104 includes a bi-amplified power amplifier.

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New Products

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888-349-3222; fax 425-742-0564
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Reader Feedback

Clarity on cable

I only now got to the July issue with your excellent article on audio routing and distribution. I assume you saw the errors in Figure 1 where the *volts* should be *ohms*.

The one thing you didn't mention about Radio Systems' StudioHub is that it requires *shielded* CAT 5 cable. I am in an extended discussions with several manufacturers about the suitability of unshielded twisted pairs for analog audio. My paper at the 109th AES convention was the first salvo. The final shot will be a paper I am preparing for NAB2001 which will be an analysis of shielding and its effectiveness at analog audio frequencies. I predict that the results will throw everyone for a loop…but not a ground loop.

Also, there are baluns available to convert AES-3 to 1 volt, so that traditional analog video distribution amps can be used. Since all that old analog video gear is being tossed to make way for digital and HD stuff. This is a clever bit of recycling with TV equipment.

Thanks for also recognizing wire and cable as an essential part of an installation.

Steve Lampen, CBRE
Technology Specialist
Belden Electronics Division
San Francisco

Thanks for the kind words on the article. The error with the volts vs. ohms labeling is due to the font substitution for the omega symbol. The character was changed but the font was not. AES-3 indeed has a characteristic impedance of 110ohms and AES-3ID has a characteristic impedance of 75ohms.

Chriss Scherer, editor

Slinging records

Dear Mr. Scherer:

I agree with most of what you say about Napster, et al (Viewpoint, September 2000). The only problem I have is with your audio quality argument. The sad fact is that few of today's listeners have ever heard really good audio. The typical FM station is highly processed, and the typical FM receiver...well, the less said the better. On top of that, the typical young adult has had his or her ears so fried at overamplified rock concerts that their hearing is marginal at best. So a Napster rip-off probably sounds pretty good.

But your argument concerning the record companies' pricing of their product makes perfect sense. Having been in the record business, I can assure you that the manufacturers are thrilled with the idea of getting rid of their archaic ways of pressing and distribution. The future of music distribution is via the Internet and the manufacturers can hardly wait.

Robert E. Richer
President, Crossed Field Antennas Ltd
Farmington, CT

Kudos on testing

In the June issue, Kirk Harnack reported on test equipment (Contract Engineering). It's obvious Kirk has "been there, done that". He could not be any more on-track when he says that you don't need a multi-thousand dollar test lab to fix lots of problem around the facility. This probably comes as shock to many of the new engineers who want a $65,000 network analyzer to find water in a coaxial connector.

Some years ago I had to troubleshoot a Gates transmitter that was missing the schematic. The station also had no test equipment whatsoever. Using only my knowledge of the transmitter and a handful of fuses from the local grocery store, I found the problem by methodically going through the transmitter until I found blown RF choke in the PA. Total cost of test equipment: maybe $10 worth of fuses. As Kirk says, sometimes you can do it with little or nothing. Now, a busted LAN or some spurious emission from an FM transmitter may take more than a box of fuses from Piggly Wiggly.

By the way, I enjoy receiving *BE Radio*, both in print and on the Net. Your news about people is probably the most up-to-date of any of the sources we see here.

Richard Haskey, CPBE
Operations Manager
Western Wireless Works
Mesa, AZ

Accolades

Dear Mr. Battison:

This is just a brief note to tell you how much I enjoy your RF Engineering column in *BE Radio*. There aren't many of us left who do RF engineering, it seems. I recall reading in *BE Radio* some time back that you had a long association with the late Carl Smith. I had the pleasure of visiting Carl in his home not long before he died.

Lewis D. Collins, CBT
Wayland, MA

Dear Mr. Scherer:

Love the magazine! Your work ethic in the quality of the writing and the number of issues you yourself cover demonstrate your dedication to the publication and the industry. The magazine has a great staff of contributors, with special praise to John Battison, whom I met at NAB some time ago, whose expertise could supply the industry for an eternity.

I myself had been in radio for 20 years, but station consolidation as well as financial reasons forced me to move on to the cellular industry. Still, I don't miss an issue of *BE Radio*.

Thanks for your great efforts.

E. Michael Salbador
Nortel Networks
Richardson, TX

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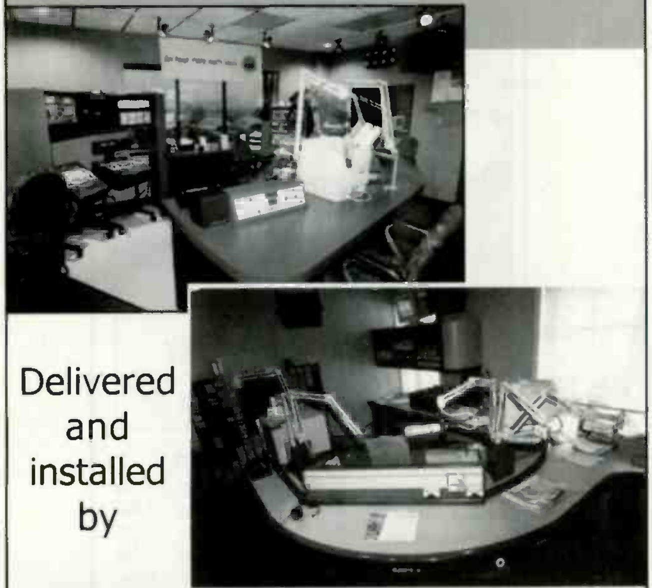

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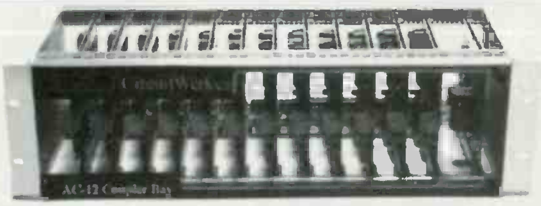

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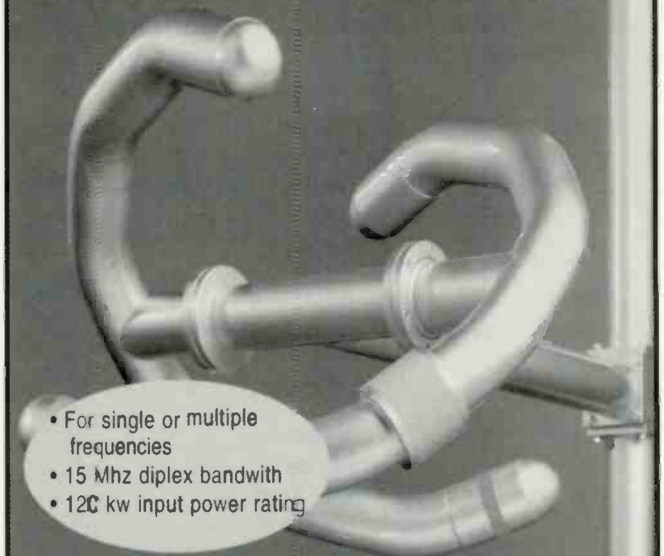

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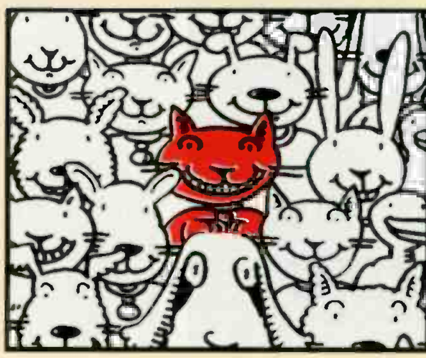

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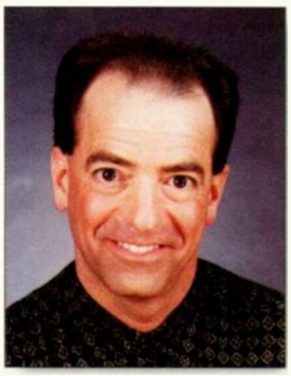
Learning to love the Deathstar, part 1

By Skip Pizzi, executive editor

As the S-DARS satellites rise into their orbital positions, it's a good time to start thinking realistically about how things might change when satellite radio hits the air. How will listeners react, and how will the new services alter audiences' use of local radio? The answers to these questions will help terrestrial broadcasters prepare their counter moves.

An apt model for future audience behavior in this case is the arrival of cable TV and its effect on local television stations. Just as with S-DARS, cable TV subscribers suddenly gained access to dozens of new channels, yet the majority of their viewing time remained tuned to their local broadcast stations via the cable service. The same now can be said for satellite TV viewers in the top 30 or so markets where "local into local" channels now are being carried in DBS TV services.



Certainly, these new channels have reduced the audience shares of local TV stations from what they were previously, but this drop is far from proportional to the number of new channels that have emerged. In other words, all the new channels are competing at the margins, and they are not splitting the whole audience in anything close to an equitable fashion with local stations. The mainstream services carried by local TV broadcasters have retained large majority shares, and this trend is likely to continue.

Interestingly, this has resulted in a beneficial arrangement for all players. Even with slightly reduced shares, the local stations are reeling in record revenues. Meanwhile, despite their marginal shares, most cable channels also are going strong, given their national audience aggregation. Will the same apply to radio after the arrival of S-DARS?

Similarities and differences

This well-understood and pertinent model offers a good context for evaluating the radio environment of next year and beyond. First consider some finer-grained similarities. Just as with cable TV, the S-DARS user will be asked to pay for a service that previously has been available for free, and which will still include commercials. In addition, new channels will be national in scope, while the continuing legacy services will remain locally originated.

Importantly, even though S-DARS *service* will not include local radio channels like cable or DBS TV does, all proposed S-DARS *receivers* will include AM and FM bands. This is tantamount to the must-carry situation in cable or local-into-local DBS, such that the user will receive local terrestrial and imported satellite signals on a single device. Yes, the radio user will have to switch bands to alternate between these services, but in return for this minor inconvenience, local radio stations will continue to control their own delivery destiny to the receiver. So while there are significant technical and regulatory differences between DBS radio and TV here, the end result is roughly equivalent to the user (i.e., one new box receives both local and imported services).

Local radio is likely to suffer audience erosion far greater than what local TV experienced with the introduction of cable.

Now consider the key differences between cable/DBS and S-DARS. First, current plans do not include tiering of services in S-DARS, meaning that both commercially supported and commercial-free premium music services will come in a single bundle for a flat subscription fee. This could make S-DARS service more appealing than cable/DBS. Also unlike cable, however, the subscription fee will not include the potentially improved reception of local channels in S-DARS, perhaps making it less attractive than cable/DBS TV in this respect.

Perhaps most significant, however, are the content distinctions between TV and radio services. Most cable TV channels serve niche audiences with fairly narrow and uniform national programming, while local TV stations present a more assorted bag of mainstream offerings, much of it exclusive (due to network affiliations and other protections), and some of it containing material of local interest. On the other hand, current plans call for S-DARS service to compete head-to-head with local radio formats. The S-DARS channel lineup looks very similar to the format list found across the dial in most US radio markets today, from public radio to heavy metal. Making matters worse, local radio's lack of much exclusivity and its current propensity toward de-localizing content (particularly in mid-sized and smaller markets) will make the distinction between S-DARS and local radio channels even smaller. By that analysis, one could conclude that local radio is likely to suffer audience erosion far greater than what local TV experienced with the introduction of cable.

None of these individual factors will operate in isolation, of course. The real outcome will depend on a complex interaction of multiple variables. Next month, this column will explore these projections of the future U.S. radio environment in greater depth and present some strategies for coping with the new competition.

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