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ON THE COVER:

The show is over and the crowds are gone. There's still plenty to talk about from NAB2002 from the show floor to the sessions. Cover design by Michael J. Knust.



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Currents Online

Wheatstone announces support for Stardraw ▶

Manufacturer's complete product line becomes part of the Stardraw product database.

Sirius up to 18 states

The satellite broadcaster adds seven more states to its service area.

Omnia enters agreement with Crown

Deal will implement digital audio processing directly into Crown FM-series transmitters.

Nausau taps Stratosaudio for interactivity

First live installations of technology will be installed in July.

XM drops PAC for CT-aacPlus ▶

A new algorithm is chosen for the XM's transmission.

NPR expands western coverage

Culver City will be new home to NPR's West Coast production facility.

FCC seeks AM IBOC comments

The FCC seeks information following the NRSC report.

CUE to license Ibiqity technology for traffic

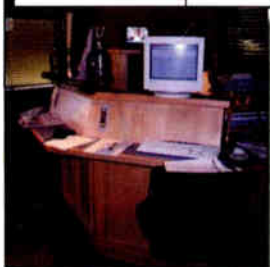
Datacasting capability will enhance CUE's network.

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Site Features



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A True Type font set of electronic symbols

Studio Spotlight, Indianapolis

More photos from Radio One Indianapolis

Studio Spotlight, Las Vegas

A new home for Lotus Broadcasting

Studio Spotlight, San Clemente

KWVE-FM builds a showcase facility.



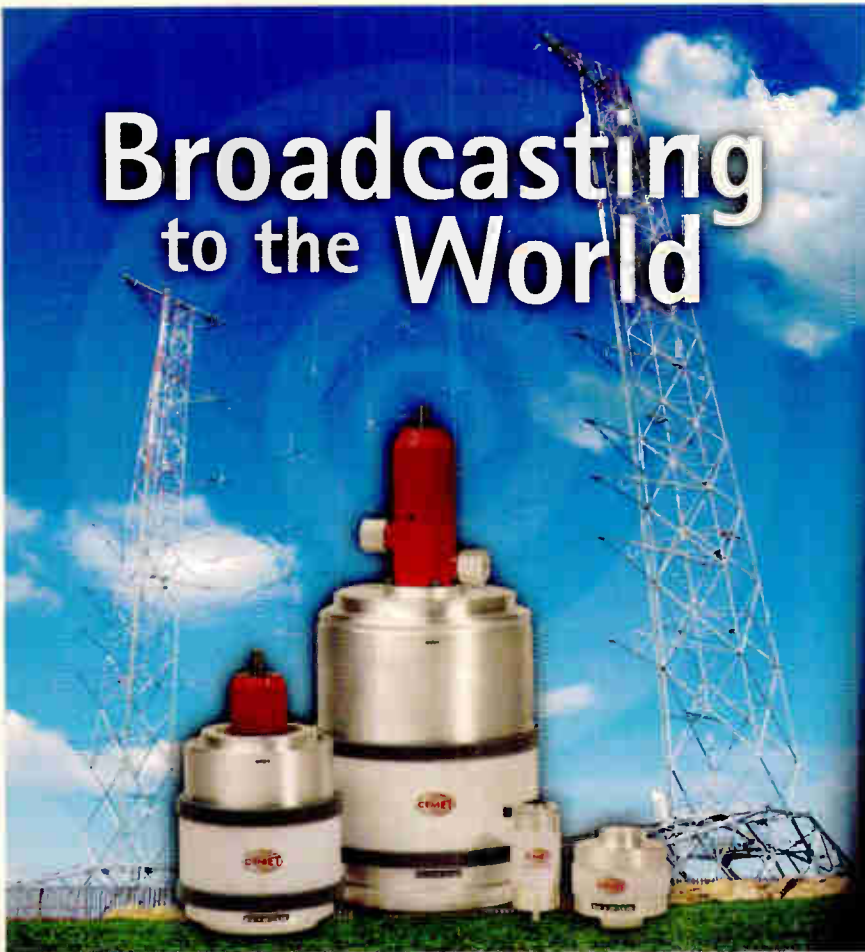
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Stunted growth

Already 10 years in the making, in-band on-channel digital audio broadcasting has promised to be the next evolution of terrestrial radio; an evolution that would carry the radio industry through the next 100 years.

The concept, plans and tests have all promised improved audio service with additional capabilities. From the beginning there have been reports and articles about various DAB technologies. Do you remember the early comparisons at the NASA Lewis (now Glenn) Research Center in Cleveland? I attended a demonstration of that setup. At that time it was determined that more work was needed on the versions of IBOC being evaluated. Looking back, I wonder why anyone even bothered with the tests and evaluations. It seems that little of what was done then is being used today.

From an original batch of developers, the field narrowed to one, then two, then three and then back down to two and then one. You cannot call it a roller coaster. Roller coasters move fast. This has been more of a tilt-a-whirl; it just goes around and around.

So after 10 years of IBOC development, what does the industry have

to show?

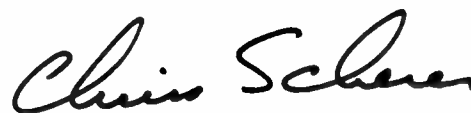
Last year, Ibiquity announced that it was ready to move full steam ahead. Agreements were struck with several transmitter manufacturers to produce hardware. Plans were made to announce the technology launch at the Consumer Electronics Show last January, followed by the launch at the NAB convention in April. Meanwhile, the actions of the NRSC and FCC have not exactly propelled the entire process forward. IBOC is still moving ahead, but not at the pace that was expected. The announcement of the licensing fees has turned most broadcasters away. The passed-through costs from the equipment manufacturers was one that likely have been grudgingly accepted. A cost that is 15 times the FCC's regulatory fee is more than most

stations are willing to pay, let alone actually afford.

DAB isn't dead in the water. Satellite radio began its service while IBOC was still on the drawing board. The satellite providers aren't immune to problems either. Both XM and Sirius are battling the wireless industry over possible interference issues in the 2.3GHz/2.4GHz bands. The skyward broadcasters are also under continuing scrutiny about their terrestrial repeaters. While their short-term plans do not include any repeater-based program origination, the owners will look at new services and methods once the services are established and showing a profit. One of these services likely will be local content.

Back to IBOC. NAB was its big chance. The FM tests looked good. The NRSC endorsed this half of the system. Then the AM tests were evaluated and looked fair on one part and failed on another. After years of demonstrating AAC encoding, the PAC algorithm was loaded before it could be optimized and then demonstrated for the convention. Between the NRSC endorsing only half the AM system and the PAC demos sounding terrible, we were shown that IBOC is not yet ready. In addition, on the convention floor the sour taste of IBOC licensing fees and passed-through hardware costs were still strong in the minds of attendees.

I want a digital radio service. I've waited 10 years for one. It's still not here.



Chris Scherer, editor
cscherer@primediabusiness.com



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Look for the list of nominees and details on how to cast your vote in the July issue.

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Transmitter site essentials

By Mark Krieger, CBT

Transmitter facilities hold a special fascination for radio engineers. Ranging from spotless high-rise suites to dirt road shacks, the "site" as it's known in the professional vernacular, represents a station's final, vital link to the listener. Consequently, it sometimes also serves as a repository for an engineer's blood, sweat and tears—so let's take a closer look at what it takes to maintain a safe and efficient operation at these mission-critical installations.

Documentation

Thorough and up-to-date documentation are fundamental to maintaining a robust transmission facility. Because the location serves as a control point during maintenance, copies of all current FCC licenses and authorizations, including chief operator designations and tower registrations, are required. But the legal obligations don't end there. OSHA regulations generally require a written, up-to-date lock-out/tag-out policy for all hard-wired, electrically powered equipment, along with approved

to develop one.

Equipment data such as manuals and schematics should be maintained on site for all essential systems. In addition, keep a list of essential phone numbers, including hot lines and key personnel along with local FAA, utility and safety service contacts. Attach a list of all telco circuit designators and the associated trouble reporting numbers.

If you had to call for police, paramedic or fire help, would they know how to find your facility? Contact representatives from all local safety services to make them aware of exactly who, what and where the facility is located. The difference in response time might save a life.

Keep detailed records. Although, the FCC lifted requirements for an official maintenance log years ago, keeping an organized, detailed, running account of all operating parameters, equipment installation, maintenance, outages and discrepancies is absolutely vital to the operation. Keep your FCC-mandated quarterly tower inspection among these documents and maintain them for a minimum of two years—they represent an irreplaceable information resource.

In addition to written records, a comprehensive flow chart/block diagram of the entire air chain, complete with all remote control switching functions, is an invaluable troubleshooting aid, on-site and off, particularly when you are maintaining multiple transmitter sites.

Tools and technology

The question of how many and what type of tools to maintain at a transmitter site is an interesting one. Most contract engineers I know rarely set foot out of the house without their tools, so the need for an on-site inventory is partially diminished. Still, it's a good idea to have a minimum complement of screwdrivers, pliers, wire cutters, adjustable wrenches, socket wrenches, hex keys and soldering aids on site. Also, any large or specialized tools such as vises, fuse pullers, pulley removers or pry bars should be available, along with a reliable trouble lamp and spare bulbs. This need not be an expensive proposition. Keep a shopping list for each site and pick up tools on sale (or used tools) until the desired inventory is built. Done this way, a minimal investment of \$100 can yield a useful selection.

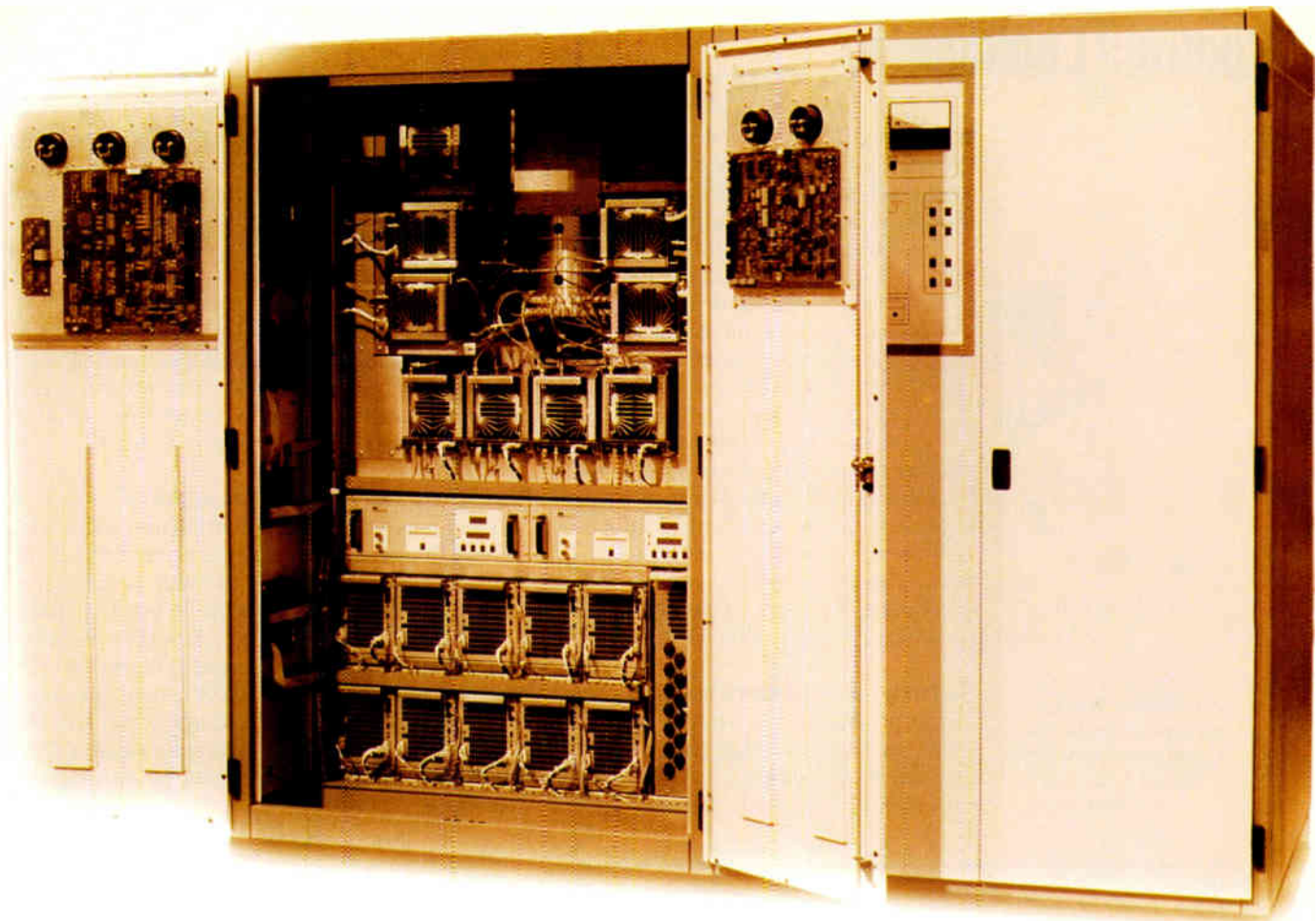
Likewise, a minimal stash of fasteners, particularly #4 through ¼" machine screws, washers and nuts are a cost-effective investment, particularly when one disappears down a crack at 3 a.m. Premium electrical and duct tape are equally indispensable.

The characteristics of any maintained electronic parts inventory depends largely on your equipment, its history and the available budget. Full sets of spare tubes and fuses are a must, but your own experience with each piece of equipment will tell you a great deal about which other specialized and non-specialized electronic components



While most contract engineers carry their own tools, the transmitter site should be stocked with some basic items.

locking devices and tags. Document in detail any areas (including areas on towers) that constitute a non-ionizing (RF) radiation occupational exposure hazard, as well as a policy regarding access and exposure limitations. Being a lessee at a site does not relieve you of any of these obligations—check with the owners to see if a master site plan exists. If not, work together



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A reliable DMM with appropriate test leads and spare batteries should be kept at a transmitter site.

to maintain. Equipment redundancy will also impact your parts inventory needs.

As for test equipment, this is again a case of what the budget will bear. At minimum, a reliable DMM, with multiple test leads and spare batteries should be present. An oscilloscope is a nice option, but should be kept in a protective case and tested periodically. Telephone butt sets and volt pens are also useful.

Finally, don't overlook cleaning supplies and chemicals. Straight isopropyl alcohol is a good cleaning agent for inside transmitters when teamed with lint-free shop towels. Spray contact cleaners are a key item, as are cleaning swabs and toothbrushes. Of particular merit is a shop-vac; a bulky item, but it will be used regularly.

Safety considerations

Safety is paramount at every transmitter facility. Items that should be readily accessible when you walk through the door are a flashlight with spare batteries and a

recently inspected fire extinguisher. Once inside, there should be an obvious place for a hard hat, safety gloves, goggles and kneepads. If you have a generator, hearing protectors are also a must. Additional site keys for gates and buildings should be clearly tagged and hung together in an easy-to-see location. Safety signs and notices should be posted wherever they are required.

As a final cautionary note, try to appreciate the critical need for having a buddy—anyone capable of watching you and able to call for help whenever you have to open energized or disconnected high-voltage equipment. Your life, and the people that depend on you, hang in the balance.

Backing up the back-ups

There is one last item worth considering for your site. An ISDN circuit carries a low monthly maintenance fee, can be used for POTS communications (with an ISDN phone) and also provides a potential air-quality link to any location in the outside world, should an STL path be disrupted or a studio facility be rendered unusable due to fire or other disaster. If you don't own an ISDN codec, find someone locally who does and forge a loan agreement in the event of an emergency. Better yet, work out a reciprocal agreement for sharing studio or transmitter facilities should the worst occur.

Krieger, BE Radio's consultant on contract engineering, is based in Cleveland and can be reached at mkrieger@drfast.net.

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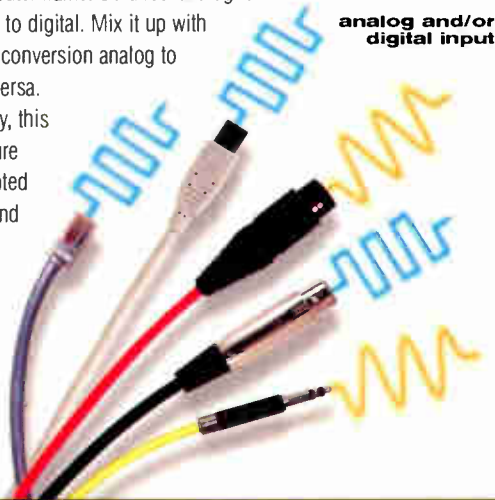
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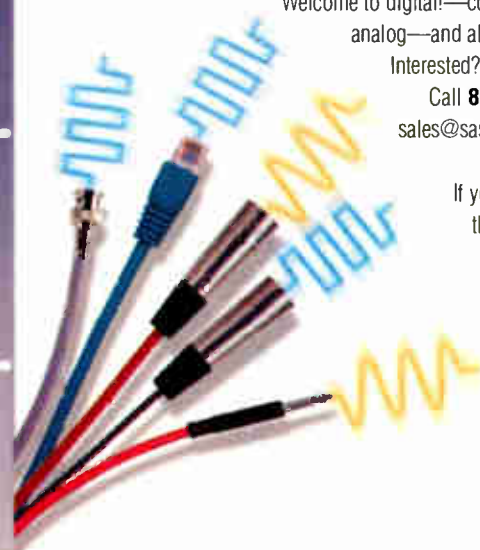
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IBOC and combiners

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

The engineering fraternity now knows the NRSC's opinion concerning the use of AM IBOC at night. This was a decision that surprised a number of engineers. However, nighttime AM IBOC is not dead, it is merely delayed for further investigation.

The NRSC's optimistic report on FM IBOC has been out for several months. Some transmitter manufacturers have already announced the availability of FM IBOC transmitting equipment, and offered actual equipment at the NAB show. FM IBOC requires considerably more equipment than the AM version, and it is more expensive.

In general, vacuum-tube operated AM transmitters do not appear to have sufficient linearity to pass the

IBOC waveform satisfactorily, while AM transmitters using PDM and solid-state AM transmitters using digital modulation appear to require only minor modifications to pass the IBOC waveform. This means that many smaller and older stations using tube transmitters may have to purchase new transmitters if they are going to radiate an acceptable signal. The exclusion of AM IBOC from nighttime operation at present may cause a delay in getting a number of these smaller stations on the air. The area in which many of these AM stations need signal improvement is at night and the added cost of introducing IBOC, which would produce no improvement in night service, will probably not be attractive to licensees.

AM problems and FM considerations

The average small market AM station may fail to meet the IBOC requirements of wide bandwidth and minimum phase distortion. Many AM stations, especially directional stations, have bandwidth and phase

distortion that are less than perfect. If the frequency response falls off at higher frequencies, a transmitter will have difficulty handling the IBOC waveform.

IBOC hybrid FM signals can be produced by three different methods: high-level combining, low-level combining and the use of separate antennas.

Low-level combining is probably the simplest and least expensive of the three FM IBOC methods. To accomplish this, an existing FM analog exciter has its output combined with the output from a separate IBOC exciter. These signals are then fed into a low-level combiner followed by a broadband power amplifier. This method reduces the equipment required, as well as saving on power consumption, but it requires a highly linear RF amplifier.

Existing high-powered FM stations may prefer to use the high-level system, which takes advantage of an operating high-powered FM transmitter and also requires a high-power combiner, filter and IBOC amplifier.

With high-level combining, there is a loss of about 10 percent of analog power and about 90 percent of the digital power to the reject load. The combiner with its reject load leg appears to be an unfortunate feature of IBOC operation. It is the required 10dB coupling figure that necessitates what seems to be an unfortunate inefficiency in IBOC.

The third method of obtaining FM IBOC operation uses two transmitting antennas. This method of operation is still being examined, but early tests appear to show that at least 40dB of isolation between the two antennas is required. If this method can be used commercially it could make IBOC attractive to stations that have room for another antenna on their towers and additional equipment in the transmitter building. Separate antenna operation would not require the cost of a combiner, or the generation of power that is ultimately lost in the reject load.

Combiners

Several manufacturers have paid a great deal of attention to the development of the hybrid combiners specifically for high-power broadband FM IBOC operation. At this stage in the development of FM IBOC, it appears that a 7dB or 10dB coupling level will be used for commercial operation. However, most manufacturers of combiners offer various coupling levels covering suitable ranges and power levels. The physical size of combiners depends on the individual manufacturer's design, but they seem to be smaller than combiners used with regular FM and transmitters.

Electronics Research Inc. (ERI) offers several versions of its IBOX hybrid combiner. The high-power version handles an analog input of 55kW with 40dB of isolation between the analog and digital inputs and only -0.46dB nominal coupling between the analog input and the antenna output. Its size is surprisingly small—only about 42 inches by 15



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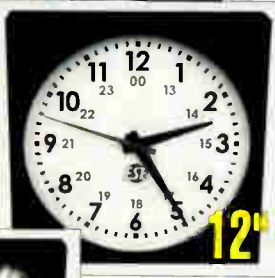
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inches overall.

For medium-power installations, the IBOX medium-power hybrid combiner handles 30kW of analog power with -10dB of coupling between the digital input and antenna output. Other operating parameters are similar to those for the high-power model, and customized versions with various coupling conditions and power levels are available.

Shively Labs has developed an Injector Filter IBOC combiner. This device combines the low-level digital signal with the high-level analog signal and dumps the excess signal in the reject load. A one-eighth wavelength ($\lambda/8$) coupling loop is used in this device, and the overall size is only about 20 inches by six inches.

The Shively injector filter comes with a standard 3/8-inch coaxial connector and 7/8-inch coaxial input for the digital signal. The standard 3-inch unit will handle 35kW analog input and 5kW digital input. The reject load is not supplied by Shively, but a good rule of thumb is to use a reject dummy load capable of handling about 1/3 of the input analog power. Thus, a 30kW analog transmitter would require about a 10kW reject load.

Dielectric Communications has also spent a lot of time working on IBOC. Dielectric offers a 10dB hybrid injector/combiner that allows high-level combining of the analog and digital transmissions. Dielectric also offers a low-level combiner for use in IBOC systems that uses a common linear amplifier and that does not need to separate high-operating powers.

Dielectric's experience in the development of HDTV transmission has led to the development of another type of shaping device in the form, off-elliptic function filters. These filters, a combination of combiner and mask filter, form supplemental masking filters that may help to provide isolation at band edges where there is insufficient bandwidth limiting.

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Fibre Channel overview

By Kevin McNamara, CNE

In the past 10 years, Ethernet-based local area networks (LANs) have progressed a great deal, particularly in their data throughput capabilities. Most data communications functions take place on either a network or channel connection.

Network connections, such as Ethernet, provide a means to transport data from point A to point B using a path that is shared with other traffic. In fact, most network-based data transport doesn't care what type of connection is required to make the data readable at its destination; that is left

the network hub but allow dedicated paths or channels to be established between network devices, thus reducing the potential for collisions to occur. However, Ethernet is still a network-based delivery method, and while it's efficient at carrying large amounts of data, it is not efficient for use in transporting more real-time data such as establishing direct I/O connections with disk drives.

In 1994, the American National Standards Institute (ANSI) established Fibre Channel as a standard. It combines the best of network and channel-based data transport.

How does it work?

Fibre Channel is based on an interconnection scheme called the *fabric*. The fabric essentially acts as an active switching system that can manage and route connections. The fabric consists of one or more Fibre Channel switches interconnected through one or more ports. Ports on the fabric are called *F_ports*.

Fibre Channel requires at least one link between two nodes. Fibre Channel devices are connected by hardware devices called *N_ports*, which are usually the physical termination between the device and the media used to attach to the Fibre Channel fabric. This is similar to how network interface cards (NIC) connect to the unshielded twisted pair cabling or fiber connections on an Ethernet network. The *N_Port* also contains all of the software and hardware to manage the Fibre Channel protocol. Each node connected to the fabric typically contains two ports, but must contain at least one port. The ports can act as transmitters and receivers. Fibre Channel nodes only need to manage their connection with the corresponding *F_Port* on the fabric.

Fibre Channels can support not only traditional network protocols such as TCP/IP, but also protocols such as the *Small Computer System Interface* (SCSI). For example, Fibre Channel permits network servers, located in one part of a building, direct access to arrays of disk drives and other high-performance storage media, separated by a room or a continent. This is the fundamental basis of Storage Area Networks.

Fibre Channel topologies

Fibre Channel can be deployed in one of three different topologies: point-to-point, arbitrated-loop and cross-point (also called fabric-switched).

The point-to-point topology is simply a connection between two *N_ports*, where one of those *N_ports* is a server (also called the initiator). This method is limited to only two nodes and therefore not able to grow with the network. The point-to-point topology may be used where

Detail	Fibre Channel	Gigabit Ethernet	ATM
Technology application	Storage, network, video, clusters	Network	Network, video
Topologies	point-to-point loop hub, switched	Point-to-point hub, switched	Switched
Baud rate	1.06Gb/s	1.25Gb/s	622Mb/s
Scalability to higher data rates	2.12Gb/s, 4.24Gb/s	Not defined	1.24Gb/s
Guaranteed delivery	Yes	No	No
Congestion data loss	None	Yes	Yes
Frame size	Variable, 0-2KB	Variable, 0-1.5KB	Fixed, 53B
Flow control	Credit based	Rate based	Rate based
Physical media	Copper and fiber	Copper and fiber	Copper and fiber
Protocols supported	Network, SCSI, video	Network	Network, video

The capabilities of different communications channels.

up to another process defined within the data-link stack of the Open Standards Interconnection (OSI) specification. In contrast, channel-based connections provide direct or switched point-to-point connections between the source and destination.

From an operational perspective, network-based communication is slower than that over a channel because it is typically software intensive.

Current versions of Ethernet support devices, called *network switches*, replace

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DSC-32/64 Satellite Channel Controller

The DSC-32/64 allows complete remote control of two StarGuide II/III, Wegener Unity 4000 or ComStream receivers. An encoder control with a 16 x 2 LCD display provides local control and program descriptions, while external control may be in the form of serial or 32 contact closures. Custom programming is accomplished with a non-dedicated computer.

SDD-8 Serial Data Director

The SDD-8 is a Serial Data Director, with one master RS232 port, and 8 - RS232 target ports that can be selected under software control, from a host computer, or other serial device. The function of the unit is very similar to a mechanical port selection switch (A, B, C, etc.)

DSC-20 Dual Satellite Controller

The DSC-20 adds remote control capability to two StarGuide II/III, Wegener Unity 4000 or ComStream receivers, allowing provider-service - audio changing by automation systems or contact closures. Customized programming is accomplished with a non-dedicated computer.

COA-37 Connect O' Adapter 37

The Connect O' Adapter 37 provides an effective way to convert the DB-37 connector to removable screw terminals. The COA-37 is designed to plug into the male 37-pin D-Sub connector on any StarGuide II or III Relay Module.

COA-15 Connect O' Adapter 15

The Connect O' Adapter 15 provides an effective way to convert the DB-15 connector to removable screw terminals. The COA-15 is designed to plug into the male 15-pin D-Sub connector on any StarGuide II or III Audio Module.

COP Connect O' Pad

The Connect O' Pad, (COP), provides an effective way to connect and adjust the audio outputs on your StarGuide II and III receiver. The COP is equipped with an eight-position removable screw terminal for connection to the balanced left, right, monaural outputs, audio and chassis ground.

USC-16/SG Upgrade

The USC-16/SG is a firmware upgrade for the USC-16, Universal Satellite Channel Controller. The USC-16/SG is field programmable to switch all functions on StarGuide II/III or other satellite receivers.



PSC-II



DSC-32/64



SDD-8



DSC-20



COA 37



COA 15



COP

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it is desirable to connect a single server to a single remote disk array.

The *Arbitrated Loop* (AL) topology has gained wider acceptance due to its lower per-port cost and ability to share media. AL breaks the Fibre Channel into loops, each loop supporting as many as 126 nodes and one fabric port. Note that devices supporting AL_ports on a node are called NL_ports

and ports on the fabric are called FL_ports. The AL topology works like that of Ethernet: only one device may send data at a given time. Where Ethernet uses a concept called *contention* to transmit data, AL uses *arbitration*. A node must win an arbitration to send data. The winner of that arbitration is called the *loop-master* and has the ability to send data for that instant. Adding too many devices to a loop may significantly degrade its performance.

The AL topology can be interconnected by using a hub or by daisy-chaining the devices. As with any network topology, daisy-chaining devices on a network could be dangerous because if one of the connections break, the entire segment is compromised.

Cross-point topology provides the highest performance for Fibre Channel. Cross-point topology is simply a fabric based on a number of interconnected switches. Each switch typically contains from eight to 64 ports, with the largest called *director switches*. The real benefit with this configuration is increased performance and its ability to scale as large as needed. While adding more devices to an AL topology may decrease performance, adding more switches in a cross-point topology actually increases its performance.

While Fibre Channel doesn't subscribe to the OSI standard used with traditional networking, it does subscribe to a similar five-layered architecture. Those five layers are:

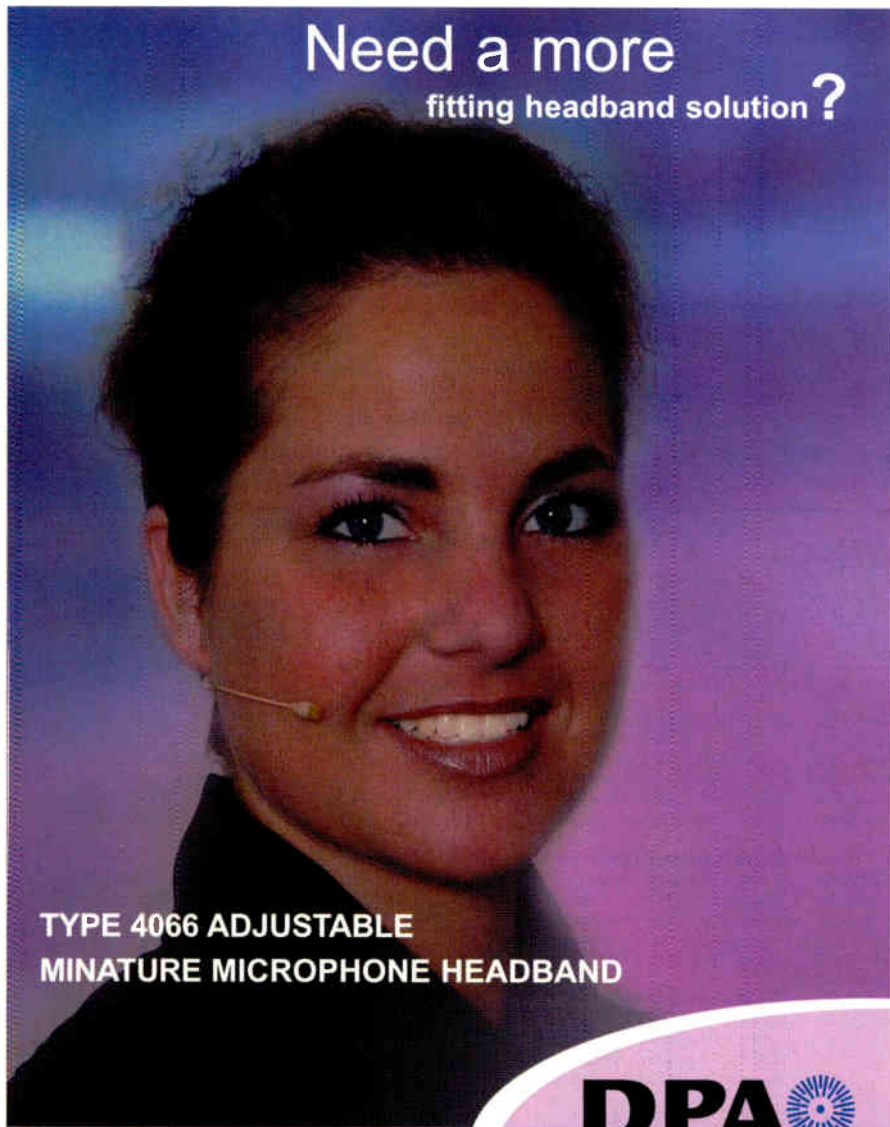
- 1.) FC-4 defines the interface between Fibre Channel and upper level protocols.
- 2.) FC-3 defines functions such as file encryption and compression.
- 3.) FC-2 defines Fibre Channel flow control, data encapsulation, classes of service information and the physical models for components.
- 4.) FC-1 describes the ordering of data into sets and defines the encoding and decoding schemes of data into bytes.
- 5.) FC-0 describes the physical media including the ports and cabling.

The next generation of Fibre Channel promises to be even faster and more efficient. Its natural ability to interface external disk arrays with network servers make it useful for users that require access to large amounts of storage, quickly and reliably.

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

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DAB update

By Harry Martin

The Commission is on the verge of approving the Iboquity standard for DAB (digital audio broadcasting) for a terrestrial in-band on-channel (IBOC) AM and FM system. But serious questions still exist as to the value of the system to broadcasters and whether a full-time AM system will ever work.

During NAB2002, a number of broadcasters asked what would they gain in light of the cost involved. The proponents of DAB, particularly those supporting the IBOC system, acknowledged that the short-term gains would not be dramatic, but that broadcasters could not allow themselves to be left out of the digital age. Proponents expect DAB to provide an enhanced audio fidelity using digital sound while at the same time being compatible with the existing analog service. A data-transmission component is also a possibility.

IBOC Iboquity system. Comments are due on June 18 with replies due July 18. The NRSC and Iboquity filings are available electronically at www.fcc.gov/e-file/ecfs.html under MM Docket Number 99-325.

Recent enforcement actions

Pirate nabbed. U.S. marshalls arrested a man in Brooklyn, NY, for operating a pirate FM radio station on 87.9MHz. On prior occasions, the pirate had been warned by the government that his operations were unlicensed and government agents had previously confiscated his transmitting equipment. The pirate now faces as much as a year in the brig and a penalty of as much as \$100,000.

Public File violations. In separate orders, the FCC fined two broadcasters for not allowing members of the public to see their public files. The radio station owner was fined \$10,000. As part of his defense, the broadcaster claimed that the members of the public requesting materials did not identify specific documents that they wanted to see. The FCC reminded the broadcaster that a simple request to see the

public file should be sufficient to elicit the complete file. Broadcasters are cautioned that requests from the public to view public file information should be met reasonably, and the broadcaster cannot withhold materials because the requester does not identify them with sufficient specificity. Stations may refer to Section 73.3526 of the Commission's rules (Section 73.3527 for non-commercial stations)

to verify that their files are complete.

Silent station's license forfeited. In a case where a station attempted to stay on the air, but claimed that a lack of FCC staff action on an application left the station believing that it could temporarily suspend operations, the FCC nevertheless cancelled the license after 12 months of silence. The Commission ruled that it could not ignore the statutory requirement that Congress imposed when it mandated that a license *automatically* expires if a station is silent for 12 consecutive months. Failure to operate at all for 12 months is fatal, and the FCC has no discretion to forgive compliance or waive the rule. Silent stations must watch their calendars carefully.

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

Dateline:

See the chart for the FCC-proposed schedule of regulatory fees for radio stations. Payments of FY2002 fees will be due in September 2002

Population Served (people)	AM Class A (\$)	AM Class B (\$)	AM Class C (\$)	AM Class D (\$)	FM Classes A, B1 & C3 (\$)	FM Classes B, C, C1 & C2 (\$)
< 20,001	500	375	275	325	375	500
20,001-50,000	925	725	375	525	725	925
50,001-125,000	1,500	975	525	775	975	1,500
125,001-400,000	2,250	1,575	800	950	1,575	2,250
400,001-1,000,000	3,125	2,525	1,425	1,700	2,525	3,125
> 1,000,000	4,975	4,100	2,075	2,625	4,100	4,975

2002 regulatory fees—See dateline below.

Approval of the Iboquity FM system is looking good. The same cannot be said for AM. In fact, the bugs for the nighttime operation of a DAB AM system have clearly not been worked out. As a result, recent reports of the National Radio Systems Committee (NRSC), which is sponsored by the NAB and the Consumer Electronics Association, raise serious questions about the workability of a nighttime AM operation. The URSC recommends that AM DAB be launched with a daytime-only facility. Many see this as the death knell of AM DAB and perhaps AM analog (if FM DAB ultimately supplants analog radio).

The Commission has asked for comments on the NRSC report, which also discusses the FM situation. The report evaluates laboratory and field testing of the

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the market. Nevertheless, the affiliates needed a live feed via satellite for their broadcasts.

Studio equipment installed

In September of 2000 the ESPN Radio 1000 studios decided to relocate. The relocation was to be completed by October of 2001.

WMVP is a sports talk operation that routinely performs as many as four simultaneous and/or back-to-back remotes using ISDN. Offering play-by-play for the Chicago White Sox and for the Chicago Bulls. WMVP frequently has pre-game and post-game shows from multiple locations, sometimes bringing in talent from yet another location, such as Wrigley Field. It is critical to have quality mix-minus operations for each of these remotes, as well as mix-minus for two phone systems in each studio. Therefore, a minimum of six mix-minus busses was required from the console.

Another demand was the need to control the mix for an uplink feed to Sox/Bulls play-by-play affiliates. In this case the ability to dynamically establish the mix, using program and audition selectors, was important.

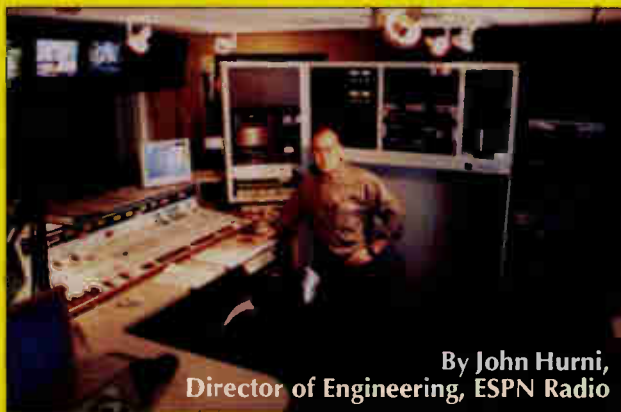
The last complication was that sometimes there are two games running through the studios simultaneously. This means there are duplicates of everything. Normally, the second game would be tape delayed or forwarded to another station in

The equipment installed in Sports-Center included a sports reporters production center with two edit positions and reporters desks, each with BE NewsBoss workstations. A sports update booth was added for production, phone interviews and the continuous 20-minute live sports reports. A main air studio/control room complex was added to accommodate Live Sports Talk shows with five microphones, phone screener, producer and board operator. A backup air studio/control room, identical to the main air studio/control room, was created for emergencies or overlapping game broadcasts, and set up for doing production the rest of the time. A production studio/control room was installed for creative production and a dubbing control room for overflow production workloads.

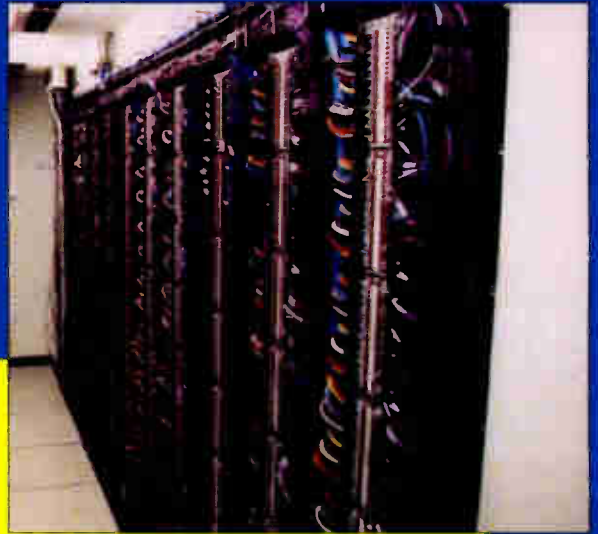
During the relocation the station looked at several console manufacturers trying to find the best fit for its needs, and finally elected to install Wheatstone A-6000 consoles. These are analog consoles, but they provide all the needed features for mix-minus and console configurations required, packaged in a solid hardware configuration. The consoles were delivered with pre-assembled harnesses that were then punched down to AVP punch blocks mounted on the wall.

For a routing system WMVP selected the SAS 64000 system, configured for 128x96, pre-wired with harnesses punched to AVP punch blocks. For an Intercom/IFB system we installed the SAS 32000 IFB system to connect all studios, on-air talent and all ISDN remotes. Finally, in each studio we installed a SAS 16000 router. Virtually all interconnects in each studio are done through this box, eliminating any need for patch bays, DA's and other ancillary switching interfaces that would have totaled to nearly the same cost as the SAS 16000.

The only other way to achieve this flexibility would have been to route all recorder machine ins and outs to the main SAS 64000, but this would have more than doubled the trunk cables needed to connect to the master control racks, as well as doubled the size of the SAS 64000, adding unnecessary costs. The SAS 16000 provides in-studio distribution and routing for the variety of DAT, CD, MD, cassette, Audicy, instant replay, Audio Vault and NewsBoss



By John Hurni,
Director of Engineering, ESPN Radio



recording machines.

Equipment, system integration and studio furniture were supplied by Ram Broadcast Systems. Ron Mitchell, president of RAM Broadcast, and his crew of experienced technicians set up shop on the floor and installed all the studio furniture and electronics for WMVP. This was good because the station crew was busy maintaining the current operation and

supervising the rest of the contractors involved in the studio/office build-out.

"I don't think I hardly picked up a screwdriver until the date of the move-in when we all worked around the clock to move in the Audio Vault, NewsBoss and Audicy hardware brought from our old studios," said John Hurni, chief engineer at WMVP. "The facilities were well prepared

and the move-in went without a hitch. We are particularly pleased with the quality custom studio furniture RAM was able to provide and have enjoyed our first six months in a facility that is a custom fit for our programming needs."

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NAB 2002

Pick Hits

Opening to rave reviews

Compiled By Kari Taylor, associate editor

At NAB2002 10 Pick Hit winners were selected by a panel of radio industry professionals. These companies' products were chosen as "hits" because they offer significant technological improvements and serve everyday applications. Every year since 1985, our panel of industry experts roam the show floor searching the exhibits to find those special products worthy of the *BE Radio* Pick Hits trophy. In case you missed them at the show, here are the products the panel chose this year.

For complete rules governing the Pick Hits selection process, see page 74.

The list of judges can be found on page 32.



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POTS to ISDN codec Telos Systems



Zephyr Xport: This codec uses a standard analog phone line to connect with any Zephyr Xstream ISDN codec. Spectral Band Replication coding delivers reproduction of voice and music. A broadcaster can use a standard analog phone line in the field to connect with the Zephyr Xstream ISDN codec in the studio. A custom DSP-based modem extracts bit-rate from real-world lines and prevents audio loss from retraining. With its built-in mixer, this product is useful for grab-and-go remotes. The DSP mixer section has mic and line inputs with selectable dynamics processing by Omnia, plus independent receive audio, headphone and monitor mix outputs. A built-in Web server and Ethernet port lets the user interact with this codec using a Web browser on a laptop.

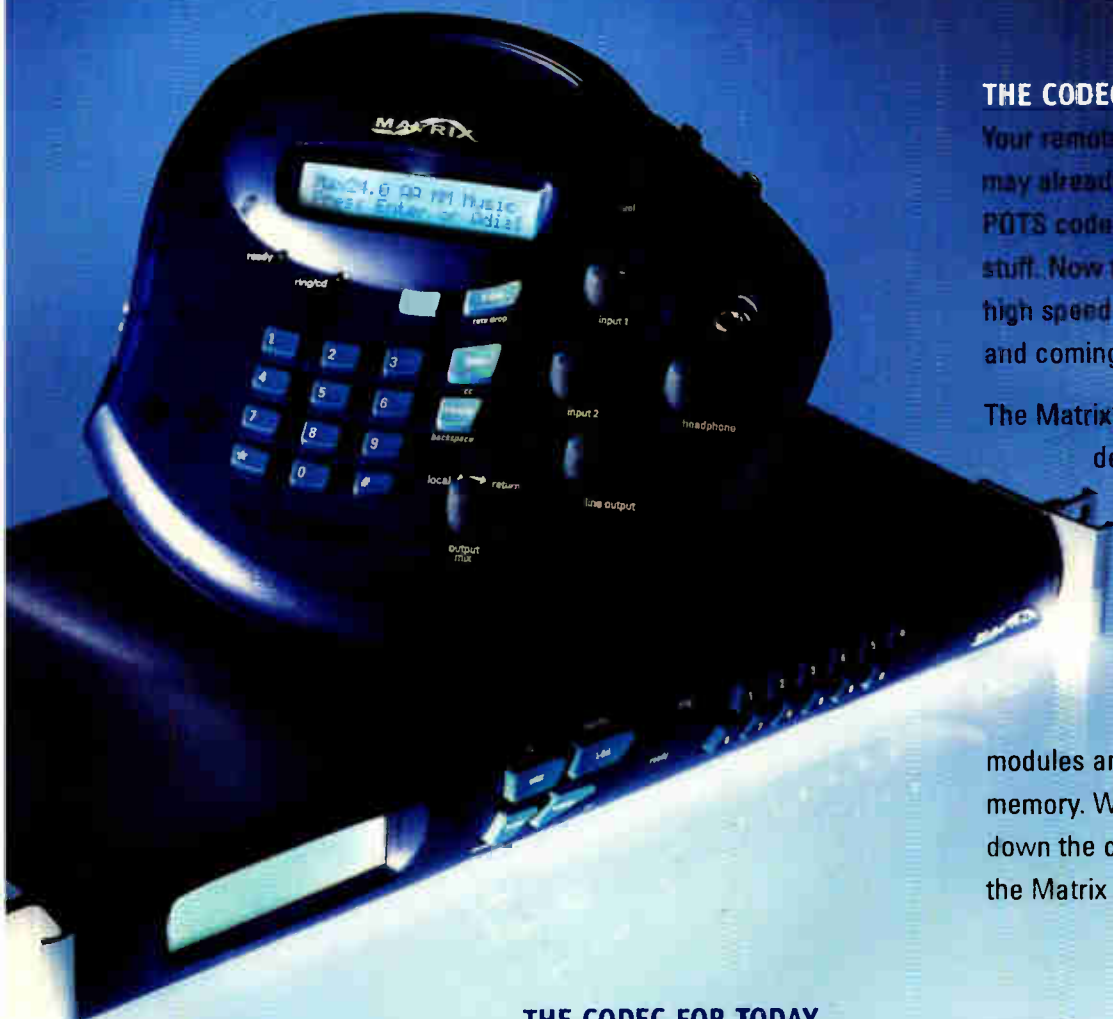
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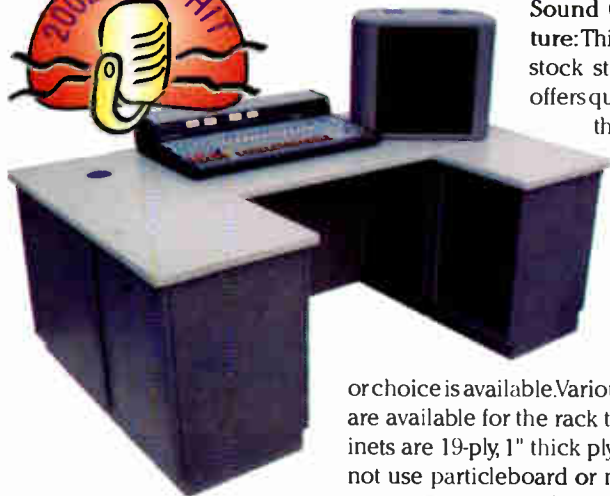
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NAB2002 Pick Hits



Studio furniture Mager Systems



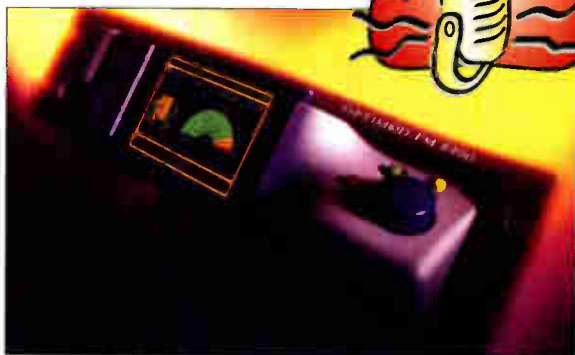
Sound Choice Furniture: This new series of stock studio furniture offers quality materials throughout. Vented cabinets have curved corners and countertop edges are rounded. A standard color choice is available. Various riser heights are available for the rack turret. The cabinets are 19-ply, 1" thick plywood and do not use particleboard or melamine. The countertops are solid-surface Avonite. No cabinet assembly is required. All surfaces are fully sealed with no laminate to crack, chip or peel.

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Digital processor Orban



Optimod 8400 version 2.0 w/ IBOC: Version 2.0 implements new low-delay processing on all presets, plus improved DSP algorithms that increase punch and presence. The 8400 was first introduced in 2000, and periodic software upgrades have maintained the 8400 as Orban's flagship FM processor. With version 2.0, talent can listen off the air through headphones without hearing any echo in their voices. This software retains and improves on Orban's technology and increases audio quality. The IBOC path provides multiple outputs to drive analog and digital transmission chains while using a single processor and control surface. Existing 8400s can be upgraded to version 2.0 software and the IBOC capability.

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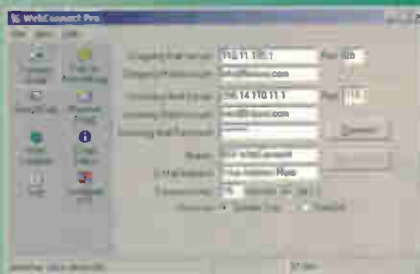
Any and all of our programs are available on our website for download. So install our software and play with it for as long as you want. Once you've decided that it's the software for your station, give us a call or order online.

WaveCart
digital cart machine

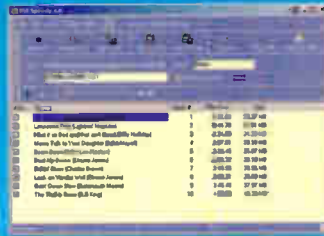


\$299

WebConnect Pro
email remote control



\$299



Speedy **\$199**
CD-to-PC recorder

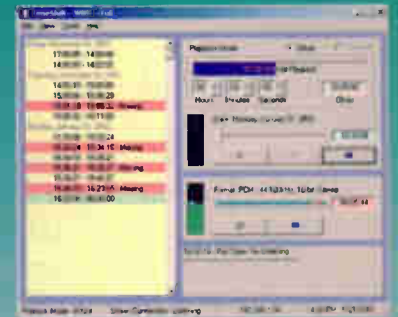


Simian **\$1499**
digital automation



Skimmer
easy audio logging
\$299

Stinger **\$199**
instant audio player



TimeShift **\$999**
continuous record of audio
and tones with time-delay
or random-access playback

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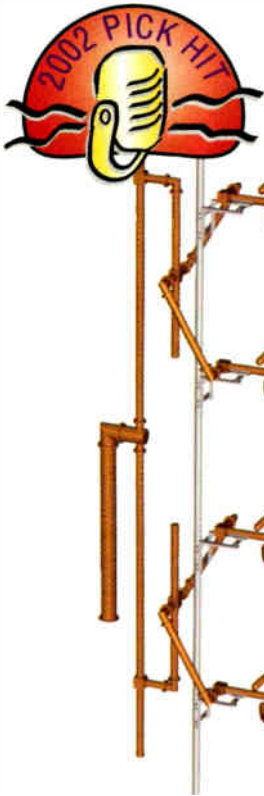
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NAB2002 Pick Hits



Broadband FM antenna ERI-Electronics Research

Axiom antenna: This antenna is a multi-station, side-mounted antenna platform that accommodates 10 or more stations. Its design incorporates three-stage transformation, shape-factored elements and feed-point reactance compensation. The antenna features a continuous solid-contact, interbay connection system designed to eliminate typical wear-and-tear bullet failures. The antenna is available for existing structures or a new site-specific design. This product features encapsulated, pressurized feed points that improve antenna reliability in inclement weather. A long support stem reduces tower distortion effects, and it's built of materials that provide resistance to environmental-related corrosion. Its mean gain is computer optimized and is a function of design frequencies. Axiom models are typically center fed and incorporate rigid coax harnessing.

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LED tower beacon Dialight



L864: The first LED-based flashing red beacon for marking towers and other FAA obstacles, the new lamp meets all FAA, Transport Canada and ICAO requirements. Designed primarily as a

replacement unit for 300mm incandescent red flashing beacons in existing installations, the L864 flashing red beacon mounts to standard bolt patterns and requires no additional wiring, controllers or monitors. It uses high-flux LEDs and uses 90 percent less energy than standard incandescent beacons that consume a minimum of 1,240W. Its design optimizes LED performance, resists shock and vibration and provides 360-degree visibility, while minimizing unwanted ground-lighting effect. The L864 flashing red beacon carries a limited five-year performance warranty.

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NAB2002 Pick Hits

Digital AM monitor Belar



AMMA-2. This addition to Belar's line of Wizard broadcast monitors offers full PC-based remote indication and control. Special metering algorithms set at the front panel allow the AMMA-2 to monitor conventional AM or controlled-carrier transmissions with accuracy. The DSP-based monitor operates over medium and short-wave bands with harmonic and IM distortion residual effects below 0.1 percent at all carrier frequencies and modulation levels as much as 99 percent.

610-687-5550; fax 610-687-2686; www.belar.com; sales@belar.com

IBOC exciter Harris



Dexstar. This exciter provides linear performance for mask-compliant IBOC coverage. At every stage (up-conversion, RF and audio inputs/outputs, user ergonomics and remote control interface) this product offers features designed for added functionality and simplicity. The exciter and transmitters are useful when a transmitter needs to be replaced but the broadcaster isn't ready to initiate IBOC service. When operating a Harris common amplification analog/IBOC transmitter with an analog exciter, simply add an IBOC exciter and audio processing in the future.

800-622-0022; fax 513-459-3890; www.harris.com; broadcast@harris.com

Pick Hits Panelists

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Executive
Vice President
First Broadcasting
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Mark Humphrey
Chief Engineer
Radio One
Philadelphia
Media, PA

Al Kenyon
Sr. VP projects
and technology
Clear Channel
Fairfield, OH

Gary Kline
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Flex-Studio

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World Radio History



NAB2002 Pick Hits

Portable mixer Behringer

MXB1002: This 10-channel mixing console operates on ac or battery power for studio or on-the-road applications. The input complement includes two mono, three stereo and a separate stereo tape return channel. All stereo channels feature separate gain controls for mic and line inputs. It also has three-band EQ on each channel, two aux sends and inserts on all mono channels. The mixer features gold-plated XLR mic connectors on all mono and stereo channels, as well as discrete mic preamplifiers on all microphone inputs. It offers balance 1/4" stereo jacks and balance controls on all stereo channels. At its largest dimensions, the unit measures 8.5" x 11.75" x 2.875".

877-672-0816; fax 425-673-7647

www.behringer.com; support@behringer.de



IBOC/analog antenna Shively Labs

IAD-FM 6813: This antenna is a cost-effective solution for low-power IBOC conversion aimed at Class A and similar power stations. It produces a digital IBOC signal using a separate antenna, but without requiring additional aperture. It does not require a 10dB coupler to inject signal onto the analog as is done with high-level combining. This means the 90 percent loss to the digital signal and the 10 percent loss to the analog signal is avoided. The antenna requires no additional tower space because the unit allows the digital antenna to be mounted directly to the feedline of the existing full wave spaced antenna. It will not affect the tuning of the existing analog antenna.

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NAB 2002

The show in review

As seen by the
BE Radio reporters

While the NAB2002 convention evidenced a decrease in attendees, the exhibitors were no less busy in unveiling new products. There were some new ideas and approaches represented in the products shown, but many were refinements or enhancements to existing products or technologies.

The BE Radio NAB2002 review is extensively covered in this issue. Our pool of reporters (listed on page 51) supplemented the BE Radio editorial staff to cover the entire show floor and bring you this all-inclusive coverage.

Also, be sure to review the recipients of radio's most prestigious, longest-lived and original technology award. The BE Radio Pick Hits can found on page 26.

— *Chriss Scherer, editor*

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The best selection

F1M Educational Circular Polarization antennas.

Model	No. Bays	Max. Input Power	Price
MP-1	1	500 W	\$250
MP-2	2	800 W	\$650
MP-3	3	800 W	\$950
MP-4	4	800 W	\$1,250
MP-4R	4	2000 W	\$1,750
MP-5	5	3000 W	\$2,250
MP-6	6	3000 W	\$2,700

F1M Low Power Circular Polarization antennas.

Model	No. Bays	Max. Input Power	Price
GP-1	1	1500 W	\$350
GP-2	2	3000 W	\$1,350
GP-3	3	4500 W	\$1,800
GP-4	4	6000 W	\$2,500
GP-5	5	6000 W	\$2,900
GP-6	6	8000 W	\$3,500

F1M Medium Power Circular Polarization antennas.

Model	No. Bays	Max. Input Power	Price
SGP-1	1	3000 W	\$650
SGP-2	2	6000 W	\$2,450
SGP-3	3	8000 W	\$3,500
SGP-4	4	8000 W	\$4,300
SGP-5	5	8000 W	\$5,100
SGP-6	6	8000 W	\$5,900
SGP-6R	6	15000 W	\$6,500

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TU & Radio antenna systems

NAB2002

Reviewing the show

Audio mixers

Arrakis Systems introduced the Nova-10C, a 10-channel digital mixing console.

Professional Sound unveiled the M3, a three-input, portable audio mixer for ENG and field production.

Logitek showed the Remora control surface. Also introduced was the redesigned Numix digital console as well as updates to the Logitek Audio Engine digital audio router.

Wheatstone's D-4000 is the latest addition to the company's Digital Series console line. It is based on the architecture of the D-5000. Also unveiled was the

D-8000, which includes Bus-Minus, four mix buses and 24-bit A/D inputs. The D-700 has also expanded to store as many as 99 presets for recalling settings.

Tamura showed the Qolle AMX Series portable mixer product line, which includes four analog models ranging from four to 20 channels.

Sound Devices displayed its 442 portable mixer, which offers features for field mixing applications.

Harris Pacific is now shipping the Legacy console.

AEQ showed the BC 2000 Digital, which consists of a rack unit with inputs, outputs and processing, and a control surface.

Denon introduced a DJ mixer, the DN-X400, which includes two digital outputs.

Dan Dugan showed the D-2 automatic

When the judges at the NAB show, slapped a Cool Stuff Award on our new RF Sentinel auto-backup transmitter system, we said: "Wow."

Then, we slapped some of our 'No Dead Air' buttons on them. (And they said: "Ow!")

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mixing controller, which adds digital signal processing, a separate control panel and three processing groups for multi-channel mixing.

Audio processing

Omnia Audio had several product introductions and demonstrations. The Omnia A/X is a software-only processor useful for Webcasting. It runs on Windows. The Omnia 6 CD is a studio mastering processor designed for audio mastering applications. The Omnia 4.5 AM and Omnia 4.5 FM are new and offer 96kHz processing with 24-bit dynamic range and a five-band limiter.

Orban added several products to its audio processing line. Version 2.0 software for the Optimod-FM 8400 (a *BE Radio* Pick Hit) reduces the system audio delay and offers improved DSP algorithms. The Optimod-FM 8400PD is an 8400 repackaged with no front-panel user interface. It is programmed via a PC software interface. Also announced was the Optimod-FM 8400IBOC processor.

AEV S.p.A. of Italy showed the Xtreme, a five-band digital audio processor with a built-in sample rate converter, daypart automation, remote control via an RS-232

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Settling for flabby, undefined bass? Buried, clouded, mids? Shrill, annoying high end that you just can't tune out of your current processor? Is your only comfort that some of your neighbors on the dial sound as bad or worse than you do? Then it's time to step up to the new Apex 2020MkIII.

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NAB2002

Reviewing the show

port and the optional RBDS module for the Xtreme FM, providing RBDS generation within the audio processor.

CRL Systems introduced the Amigo Grande processor set that reduces the unit count of devices from four to three.

Aphex released its latest on-air processor, the 2020 MKIII. This is a digitally-controlled analog processor with computer GUI control.

Waves displayed its bundled DSP software plug-in packages that provide editing tools, sweetening and

mastering processors, and sound design effects.

CTE International introduced the Condor 50AES digital audio processor. It features five-band processing in a 1RU package, with 10 programmable settings.

IDT has enhanced its Digital Virtual Processor with the Evolution II, which offers 10 times the processing power of the original DVP.

Audio recording, storage, playback and editing

Audion Labs again showed the Voxpro PC, which can now be configured to link multiple machines together across a network to share audio files.

Mackie's SDR24/96 is a 24-channel hard-disk recorder. Also shown was the redesigned Soundscape software.

The Mayah Flashman (a *BE Radio* Pick Hit) is a portable flash card audio recorder with variable sampling rates.

Telos showed the Profiler logging software that allows a station to automatically log its program audio.

Microboards Technology showed its line of CD replicators including the Copy Writer Live, a dual-drive CD recorder that spans multiple CDs to produce a never-ending recording. Also shown was the Orbit Pro, a two-drive, stand-alone 24x CD duplicator.

The Sonifex Net-Log network audio logger can provide as much as 42 days of two-channel audio. Audio can be played back through any PC on the network.

Denon introduced the DN-C550R dual-disc CD/CD-R/CD-RW recorder/player.

The Arrakis Digilink+ Plus is an upgrade to the Digilink Free that



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supports multiple sound cards and has advanced scheduling features.

Dalet demonstrated the Dalet Plus, a digital broadcast platform that includes a true client/server architecture, TCP/IP operation, new user interfaces and asset management that allows association of data and audio for Web publishing and a new mix editor with voice tracking.

CartWorks/dbm Systems announced enhancements to the CartWorks digital audio system including one-button operation, instant access for frequently played carts, live assist cart replacement, voice tracking and Web updating.

OMT/Media Touch demonstrated the lmediaexpress Encoder, which facilitates the use of a 100 CD jukebox player to convert all audio tracks to sound files in a variety of formats.

360 Systems had three introductions. The Ethernet Audio family of products uses central audio servers networking directly with as many as 24 dedicated Digicart/E units over CAT5 Ethernet networks. The Short/cut has received some enhancements for faster processing, expanded storage capacity and optional Zip drives. The Instant Replay has also been enhanced with trim, fade and level editing capabilities.

Computer Concepts announced enhancements to the Maestro system, which includes equalization.

The HHB 8-Track Portadrive combines 24-bit/96kHz multichannel recording with flexible on-board mixing facilities in a compact, portable package. HHB also announced an expansion and performance upgrade for HHB professional recording media and a new Burnit CD recorder.

Scott Studios displayed the Distant-City Voice Tracker, which automatically collects and compresses the beginning and end of the songs and spots adjacent to the voice tracks in the log. Also shown was new SS Flex software, which is based on the Scott Studios SS32 system. The

Lazer Blade phone recorder/editor also made its debut.

Prophet Systems Innovations (PSI) promoted the Nexgen Digital NS, an entry-level computer automation system that is fully scalable and offers most of the features found in the company's larger system. Prophet also introduced the Phone Trac, which allows remote recording and scheduling of audio feeds through a telephone line.

Tascam showed the SX1 DAW/mixer, whose features include motorized faders, configurable

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NAB2002

Reviewing the show

mixing layers and a built-in CD-RW drive.

Syntrillium Software demonstrated the latest release of Cool Edit Pro, version 2.

Mackie showed the SDR 24/96, a moderately priced, 24-track hard disk recorder/editor.

Digram released version 4.3 of the Xtrack editing software. The new version supports FTP file import and export.

Pristine has updated Rapidfire to include Quick-picks for instant audio-to-air playback, Timewarp for audio time shifting and a production application for voice tracking.



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When you've got audio to cut and no time to spare...

Trust Short/cut 2000™ to get a move on. How fast is it? You'll be editing tracks as fast as you can push the buttons. And when you're working on-air, Short/cut's ten Hot Keys keep your best clips cued-up and ready to go.

We've also tripled audio storage to a whopping 12 hours – and with a hard drive so quiet you can work right next to an open mike.

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Sonic Foundry released Sound Forge 6.0, which now features non-destructive audio editing, large file size support and enhanced time zoom.

Sadie released revision 4.2.0 of its DAW software. The new software is available for download for all existing users of Sadie Radia, 24-96 and Artemis workstations.

Audio routing, distribution and conversion

Logitek has enhanced its Audio Engine and added additional I/O capability, a network card for 1Gb connection between Engines, a multi-DSP card for EQ and dynamics processing and supervisory software.

Fast Channel introduced Freedom 4.0, a software update to the company's audio distribution software and services.

Radio Systems exhibited the D-A+A-D, a 1RU D/A-A/D converter with a 24-bit variable sampling rate up to 96kHz and auto sample rate sensing.

Liquid Audio demonstrated the Distra, a system for distributing and moving audio via the Web.

Arrakis has added a 4x6 routing switcher that talks to the Digilink+ Plus software.

Sierra Audio Systems added the RIO Link to its 32KD Digital Audio Network. The 2RU RIO Link allows a remote terminal to be linked to the 32KD mainframe by fiber or CAT5 cable, and provides as many as 32 channels of audio in and out, plus additional data channels, including 16 RS-485 remote control ports.

Aphex demonstrated the Model 212 A/D-D/A converter. It has a drift-stabilized circuit to reduce dc drift.

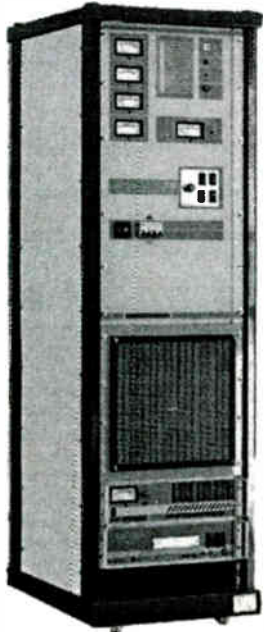
Computer Concepts demonstrated enhancements to the Epicenter, which can interface to the Telos Smart Surface and Logitek controllers.

Audioarts Engineering showed a new 32x32 audio router that combines audio

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250 watt Transmitter	3,000.00
350 watt Stereo Transmitter	3,500.00
500 watt Transmitter	4,000.00
1,000 watt Transmitter	7,000.00

Many other models to choose from

Transmissions Line

Superior Broadcast Products offers a wide range of transmission line and accessories

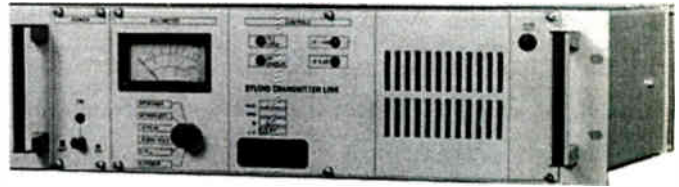
1/2 inch Foam Coax as low as	\$1.40 per foot
7/8 inch Foam Coax as low as	\$3.50 per foot
1 5/8 inch Foam Coax as low as	\$8.50 per foot
2 1/4 inch Foam Coax as low as	\$12.00 per foot

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Impressions of NAB

By John Battison

It would not be correct to say that IBOC was on everybody's lips at NAB, but there was considerable interest in it. I think that many people are awaiting the first real trial—the first commercial station to try it. Transmitter manufacturers were on the ball at the NAB convention and most of them had floor models to show or planned to produce IBOC transmitters shortly.

Broadcast Electronics showed the FSI 10 IBOC signal generator. It provides correct delay to match the analog and IBOC paths and encoding of the IBOC digital signal. It can be used with the XI 60/250 series digital FM exciter and the IBOC plug-in card. Depending on the user's requirements, it will produce an FM plus IBOC output for low-level combining systems, or IBOC output only, for use in high-level combined operations.

Despite the undoubted disappointment caused by the temporary decision to recommend daytime-only operation for AM IBOC, Broadcast Electronics has introduced the ASI 10 AM IBOC signal generator, which generates the required IBOC and AM signals simultaneously. It's interesting to note that tube-type

transmitters are generally not sufficiently linear for IBOC use. An audio input is split into digital and analog paths, processed separately, synchronized and encoded.

Harris displayed the Dexstar IBOC exciter. This is an interesting device that is available for AM IBOC or FM IBOC. The Dexstar exciter uses two 1 GHz microprocessors. A digital up-converter creates on-channel DAB and analog signals for AM, and 10.7 MHz IF DAB for FM. An RF up-converter uses the 10.7 MHz signal and generates the necessary FM DAB signal. A GPS receiver provides an accurate time reference for locking synchronous systems, which yields a faster acquisition time when tuning a receiver from station to station. The Dexstar exciter is designed to produce a low-level signal output of about 1 mW, which is then combined with the FM signal in what amounts to a small coupler. From there the signal goes to a linearity enhancer, then to the LPA stage and the final amplifier. Thus, expensive combiners are not required.

Nautel concentrated on AM IBOC and exhibited an eye-catching AM IBOC transmitter. An FM version is under development. Nautel demonstrated the ND 5d 5kW AM IBOC-compatible transmitter. This transmitter uses the new Nautel IBOC digital exciter, which is tunable in the AM and FM band. Also shown was the Nautel XI 60d 60kW solid-state AM IBOC DAB transmitter. Nautel has been working closely with Ibisquity in the development of IBOC, and Nautel's consistent solid-state development work seems to be paying dividends in IBOC.



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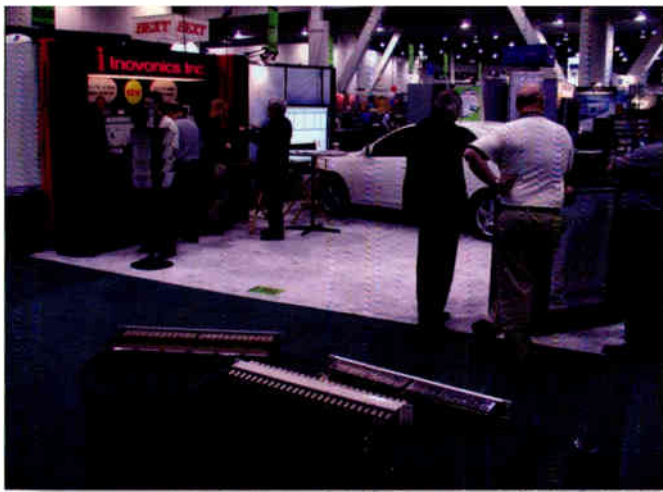
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Monitors, microphones and headphones

The Shure ULX wire mic systems now have additional frequencies available.

MB Quart displayed the MBK 948 ACS headphone/mic, which features four-mic elements and a closed-cup design.

Mackie unveiled the HR624, a two-way active nearfield monitor with a six-inch woofer.

Lightwave Audio Systems displayed the Minimount all-purpose isolation shockmount for short- and

quality and flexibility.

The Wheatstone Bridge 2001 router has added a logic I/O card to route data and a machine's status info, and an event scheduler to automatically change crosspoints or salvos.

Gepco had several new product introductions for AES-3 audio applications including the 552624GFC 24-pair cable.

Auditronics is now shipping the ALM-12d console that was introduced last year.

Gibson Labs introduced Magic (media-accelerated global information carrier) a replacement to long, heavy and bulky microphone snake cables by using A/D converters to multiplex as much as 200 inputs onto one cable.

Broadcast Tools unveiled the new SS16.4 16x4 switcher and the ACS8.28x2 switcher. Both can mix and overlap audio sources and can be controlled via contact closures, RS-232 or RS-485 serial connections. The NSS-3 can be used to send serial strings from an Ethernet connection.

The AEQ Impact/Caddy is an audio converter/router system that uses various rack-mount modules to provide as much as a 60x60 matrix. Optional control software is available.

Computers and peripherals

Ergo 2000 showed the CSD1-17, CSD-1 and S2-17 rack-mount LCD monitors with integrated keyboard and trackball, which fold into a 1RU drawer for storage while not in use.

Dbm Systems has added to the Audio Surge line of transient-voltage protectors for most major-brand digital audio cards.

AudioScience unveiled the ASI6114 digital audio with four stereo streams. The company is also adding MRX technology, the ability to mix multiple sampling rates and formats within a sound card, and SoundGuard, transient-voltage protection, to the ASI6122, ASI6114, ASI6118 and ASI6244 sound cards.

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medium-length mics.

Schoeps has repackaged its mics into sets with various amplifier and capsule combinations with accessories.

Genelec displayed the Sub LSE, a series of laminar, spiral enclosure sub-woofers providing high SPL with low turbulence noise.

A-audio (Audio) displayed the Envoy series of UHF wireless mic products.

Sabine showed a 2.4GHz spread-spectrum wireless mic system that is frequency agile and contains Sabine's FBX Feedback Exterminator, a compressor/limiter and an intelligent de-esser.

LPB has added the Tri-Mount silent boom mic to its offerings. It sits in the standard mounting flange.

PMI Audio Group exhibited the line of inexpensive studio condenser mics from Studio Projects.

The Mackie SP 400C monitor is designed to be concealed in a ceiling for tight studio configurations.

ATI showed the HDA400 and HDA600 headphone distribution systems with four and six outputs. Both can drive as much as 100mW into a 32-ohm to 600-ohm load.

Audio-Technica unveiled the studio condenser AT4040 mic, the Artist Elite series of handheld mics, the 30 series of mics and headphones and the UHF Yagi Antenna System for wireless mic applications.

AKG Acoustics debuted the K 240 Studio and K 141 Studio headphones. These feature Varimotion XXL drivers.

DPA Microphones introduced the Type 4071 omnidirectional miniature condenser mic.

Microwave, RPU, fiber optic and telco

Moseley debuted the Digital Composite Link. The Starlink Composite STL uses 16-bit sampling with a SNR of more than 85dB with more than 70dB of stereo separation. Options include an IBOC transport channel as well as MPEG LIII auxiliary audio channels.

Marti showed the SRPT40A transmitter. The Digital Cellcas, which also make an appearance, is designed to use the various

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Reviewing the show

digital cellphone networks found worldwide and the STL-20C composite STL transmitter and the STL-20M mono STL transmitter.

Mayah showed the Centauri 3000, a T-1 bi-directional STL with 15kHz uncompressed audio and an IP addressable Ethernet data link. Also shown was the Centauri 3001 ISDN Codec, which is compatible with all the major-brand ISDN codecs. The Centauri Web-server is a plug-and-play audio server for use on the Internet or on an intranet.

Broadcast Richardson showed the Swedish portable

IP Satellite Terminal, a suitcase-sized portable audio uplink that uses MPG2 for live two-way communications or MPG4 for higher-quality non-real time feeds.

Audio Processing Technology demonstrated the Program Channel Access Unit (PCAU), an encoder/decoder card using Apt-X encoding for 20Hz to 20kHz audio over a 128kb/s ISDN link.

DB Elettronica introduced the TD/16 and RD/16, a set of codecs that are compatible with any analog FM Aural STL, that provide a digital upgrade to existing equipment.

The Telos Zephyr Xport (a *BE Radio* Pick Hit) is a portable, POTS codec that connects to an ISDN codec.

Ireland-based ILD Networks showed the Surroundnet, a multichannel MPEG-2 codec for transmitting 5.1 channel audio, SMPTE time code, IFB and RS-232 data over bonded ISDN lines.

BandNet-64 is a low-delay audio codec for transmitting two-channel audio over ISDN for audio conferencing and remote music collaboration.

Tieline Technology unveiled the Patriot, a new POTS codec that has the company's latest proprietary algorithms to produce 15kHz mono audio at bit rates as low as 24kb/s with minimal delay.

Energy-Onix introduced a remote pickup transmitter/receiver system called the Roadcaster, available in UHF and VHF versions. Also shown was the Tele-Link Internet STL package that provides 22kHz stereo audio through a broadband Internet connection or Ethernet network.

Musicam USA showed the Liberty POTS codec, which delivers 15kHz bi-directional audio at connection rates as low as 24kb/s.

AEV S.p.A introduced the Millennium 2 audio codec, which automatically recognizes the codec at the other end of the line and is software remote controllable via Windows. It is available in two models, one with an LCD display and hardware user interface, and one designed strictly for remote PC control.

Orban's Opticodec 7200 has been added

to the Opticodec line with a 1RU unit without a display, which is designed for remote control use.

Bext unveiled the LKT/LKR aural studio-transmitter link, a 2RU 940 to 970MHz transmitter/receiver set that accepts a stereo composite input.

OMT/Media Touch showed the Imediamultistream, a streaming audio package allowing simultaneous streaming with as many as four audio inputs and as many as 16 streaming outputs from a single PC.

Comrex introduced the Blue Box, which works with POTS lines or GSM wireless services.

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JK Audio demonstrated the Celltap, Daptor Two and Compact. All three offer interface methods for POTS or cellphones.

AETA demonstrated the Scoop EZ for POTS, ISDN, wireless and Inmarsat use. It includes a built-in two-channel mixer and a selectable compressor/limiter.

AEQ introduced the Course ISDN codec rack-mount system. As many as 10 codecs can be mounted in a 4RU space.

Wil-burt showed the D-Tec ac field detection and object proximity detection for pneumatic masts.

Sigalarm displayed the High Voltage Power Line Proximity Warning System.

Power products

Superior Electric now offers a line of UPS products that are rack-mounted and available in various capacities.

Catalyst Power displayed the Pinnacle Plus system that combines a natural gas-powered generator, UPS and Smartgate, which is Catalyst Power's proprietary Internet-based remote power management technology.

Videoquip Research Limited showed the UVM-6 universal ac line voltage monitor, which can monitor and log voltage spikes and anomalies on as many as six circuits simultaneously.


Studio and facility support

Stardraw introduced Stardraw Radio, an easy-to-use CAD package for designing radiostudios that includes a library of more than 10,000 pieces of equipment from most major suppliers.

Dataworld brought several new services including License Tracker, which provides e-mail notification of upcoming license expiration dates and renewal application deadlines; Apptacker, which provides e-mail notification of activity on a specific application submitted to the FCC; and an improvement to the Flag service, a Web-based management page allowing users to set activity flag points using a control panel interface to monitor the status of pending FCC applications.

Masterclock showed its expanding line of master clock systems,





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displays and time generators.

Radio Systems has upgraded its timers so each one can act as a clock, timer or slave display. An infrared remote control is also available on some models.

Symetrix is developing its Airtools line with the 6100 Broadcast Audio Delay, which offers as long as a 20-second delay and 20kHz stereo bandwidth.

EDX demonstrated the Microcell/Indoor design tool to help determine interference and coverage problems of a wireless network. It maps all transmit and receive links.

Sonifex has added more devices to its Red Box line including the RB-HD1 stereo headphone amplifier and RB-DMA2 dual digital mic amplifier that converts mic level signals to AES3 or S/PDIF.

Gorgy Timing showed its complete line of clocks, timing systems, displays and time-sync generators and readers.

Henry Engineering showed the Moniswitch, which eliminates the headphone echo caused by digital processor delays. Also shown was the Patchbox, a passive DA that creates 11 stereo outputs from a single, balanced stereo input.

Radio Design Labs (RDL) showed the Accessory Mounting System for jacks, indicators, switches and controls that allows users to create custom projects with a completely finished look when used in conjunction with RDL modules and enclosures. Also exhibited were a series of audio isolation transformers called the Audio Format Converters. The Stick-on line has a new addition: The STM-LDA3 is a mic preamplifier with distributed line-level outputs.

Burli introduced its Virtual Newsroom software that manages all newsroom text and audio needs from a desktop computer.

Eventide displayed the BD960, a profanity delay featuring an eight-second maximum delay with built-in substitute audio, which is stored digitally, uncompressed in non-volatile memory.

Penny & Giles presented its Flexipatch Patchbay, a dipswitch-configurable patchbay with a compact design suited

for portable applications.

RCS demonstrated Selector XV, which has a new Windows interface.

Industrial Acoustics introduced a veneer finish to its steel doors to give the look of wood to the door. The company also introduced Track Walls, a method of moving wall partitions.

ATI added to the Nanoamp series with the AMM200, an audio monitor and metering device. Also added was the DM200, which can check the integrity of a digital line. It supports multiple sampling rates and

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NAB2002

Reviewing the show

has a headphone output.

Athens Technology Center introduced the News Asset system, an integrated approach to handling text, audio and other media files for news storage and delivery.

Acoustics First unveiled the Transfusor 2'x2' acoustic ceiling light cover.

Wireready showed the Sales System for managing contacts and client calls.

Gangverk, an Icelandic company, displayed its Majones radio system that allows listeners to view a

station's playlist and select songs from it through a mobile telephone interface.

System integrators and services

Mager Systems introduced the Sound Choice Furniture (a *BE Radio* Pick Hit), a line of studio furniture featuring solid-composition countertops.

Harris displayed the Quickline studio furniture and the new Smoothline series. One interesting addition was the Studioflex hydraulic lift furniture, which can change from stand-up to sit-down operation as needed.

Forecast Consoles exhibited the Imagemaster Edit Consoles, which are pre-engineered, modular edit stations that feature the Master Rail Dynamic Device Management System for quick reconfiguration of workstations.

Test and measurement

The Audemat AM Fieldstar automatically takes AM field strength measurements while driving. It includes an antenna that automatically nulls to the transmitter site, speeding measurement and data collection.

RDL (Radio Design Labs) showed the PT-ASG1 audio oscillator and the PT-AMG2 portable test instrument. The PT-AMG2 contains an oscillator and audio monitoring section with metering and a speaker.

Belar featured a new addition to the Wizard monitors, the AMMA-2 AM Digital Modulation Monitor/Analyzer (a *BE Radio* Pick Hit). It includes filters for IBOC compatibility and DSP processing allows IM distortion of less than 0.1 percent with as much as 99



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New York

percent modulation.

Potomac featured its line of AM antenna monitors and field-strength measuring equipment. Its antenna monitors are compatible with IBOC tests.

The Audio Precision ATS-2 is a PC-based audio test and measurement system. Capabilities include harmonic distortion, FFT and multi-tone analyzers.

Inovonics debuted the Model 531 FM modulation analyzer, which includes digitally synthesized tuning, subcarrier measurement, AM noise measurement and an extended meter range.

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Reviewing the show

Terrasonde demonstrated the Digital Audio Toolbox multifunction audio test set.

Aztec Radiomedia introduced the FMTEL5, an FM monitoring and supervision system built on a DSP architecture that provides an FM tuner and RDS decoder for remote monitoring of multiple stations.

Transmission and tower equipment

In addition to demonstrating the Digital Radio

Mondiale system, Continental Electronics announced that its 35kW FM transmitter will begin using a 4CX30000E.

Electronics Research Inc. (ERI) showed the IBOX, a hybrid digital/analog combiner with a nominal 10dB coupling level at medium- and high-power levels. Also shown was the S.A.M. hardware/software monitoring system for master antenna systems that monitors power, pressure, temperature, moisture and antenna icing at multiple points in the system.

Armstrong introduced the LCD series of FM transmitters with power ranges from 500W to 10kW.

Kintronic Labs released a new microwave isocoupler for PCS digital cellphones, wireless Internet or other spread-spectrum applications on AM broadcast towers.

Unimar displayed its ALTR tower lighting control that alternates between each lamp in a double obstruction-light assembly. Each time the unit is energized by the photo control, it switches lamps, ensuring equal usage of both lamps in the double assembly.

Bext displayed the HS series of solid-state FM transmitters, a line of low- to medium-power units featuring hot-swappable amplifier modules. The XPT FM transmitter series has AES3 digital inputs and onboard digital processing and are available in 50W, 100W, 250W and 500W power levels.

Dielectric introduced the 1400 series FM Filter: a compact, 10kW FM filter designed for bandpass, notch and constant impedance filter configurations.

Burk Technology displayed the Arcplus remote control. Auto-pilot version 2 is the new release of the remote control software, which has been completely rewritten. The ARC-16 has a new



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5RU with RS-232/RS-485 remote control.

Seratel Technology unveiled the ST 501 FM exciter, a 50W 2RU exciter with a front-panel LCD for control of all functions.

Bird Electronic introduced the BPM series of RF wattmeters. These systems combine accuracy of a calorimeter with the ease and price of a directional coupler.

Econco, known for its power tube rebuilding service, has added original manufacturing capabilities to its product offerings.

firmware upgrade to version 5.4 that allows adjustable alarm delays and command durations. An auto-load feature allows editing of all user-defined labels on a PC.

Broadcast Electronics showed its IBOC development progress with the FMI solid-state IBOC compatible transmitter line. This technology uses linearization techniques that allow the transmitters to be used in a high-level combined system or a common amplifier system. The Fxi60 and Fxi250 digital exciters can be configured with an optional IBOC input card and work with the Fsi-10 and Asi-10 FM and AM IBOC signal generators.

Shively Labs debuted the Interleaved Analog-Digital (IAD) antenna (a *BE Radio Pick Hit*) for IBOC conversion for low and medium-power stations, as well as the IBOC filter-injector.

Nautel showed its digital AM products. The ND, XL and NA line of transmitters are fully compatible with IBOC and DRM. Power levels are available from 1kW to 1MW. Also shown was the NE 50 IBOC exciter.

Presented by Flash Technologies, the Remote Telemetry System can monitor lights, door entry, generator fuel level and room temperature.

Harris exhibited several IBOC offerings. The Dexstar exciter (a *BE Radio Pick Hit*) is an exciter for AM or FM. The Z series transmitters are also being offered as the Z-IBIC series for IBOC applications.

Kintronics labs showed remotely controlled ATUs that are used over water, at significant heights or in hard-to-reach areas.

Crown Broadcast displayed the FMX series of 30W, 100W and 300W transmitters, which offer the DMS-enhanced front panel control and RMS remote interface system. Also shown was the RF Sentinel, a packaged system with a built-in, automatic backup system.

CTE International offered the VL 1000 1kW FM MOSFT amplifier, which occupies

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FACILITY SHOWCASE

This radio group rolls the dice in downtown Indianapolis with a hefty investment and a state-of-the-art facility that borrows from radio, television telecommunications technology.

Radio One

Gambling on Media Row

By Nate Pass

Monument Circle, the historic downtown landmark in Indianapolis, looks north toward a row of radio and TV stations that have chosen Meridian Street as the location to build anew or renovate their existing broadcasting studios and operations. Lanham, MD-based Radio One, which is the largest radio network targeting African Americans in the country, selected Indianapolis to invest more than \$40 million to purchase four radio stations and one TV station from Emmis Communications and Hoosier Broadcasting. The stations are WTLC-FM, WTLC-AM, WHHH-FM, WYJZ-FM and WDNI-TV65.

To facilitate the acquisition, Radio One moved two stations to its existing west side facility. The search for a permanent residence began immediately. About three months later, Radio One found a three-story building with 25,000 square feet of space that offered some unique benefits. Located on Meridian Street downtown, this facility sits in the midst of the existing line of radio, TV and production/post facilities that cover nearly 10 miles of Meridian Street

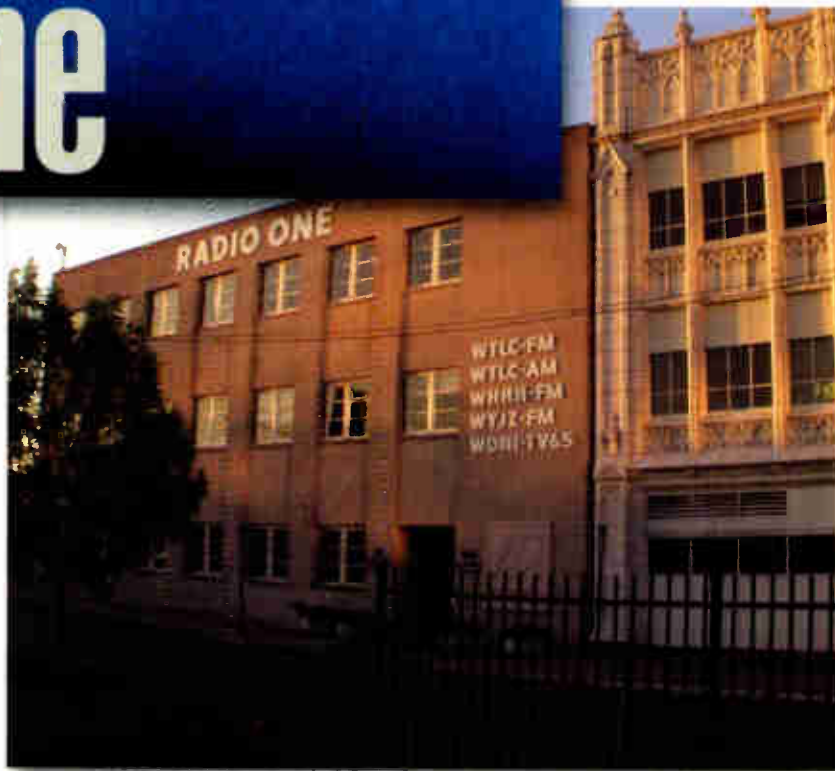
through the middle of the city.

The challenges associated with integrating new technology into an existing building can be difficult. Finding a jewel in a haystack was critical to Radio One's success. Leading a team of contractors, electricians and carpenters, plus seeking the perfect broadcasting location, can be the most daunting task assigned to any chief engineer.

Location, location, location

It may seem strange to leave a facility that offered low operational overhead expenses and facility maintenance, but the reasons

The new building first floor exterior windows have a privacy treatment that allows people inside to see out, but people on the outside cannot see in.



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included presence, visibility, connectivity, community and downtown convenience. Most importantly, the new location positioned Radio One in the prestigious broadcast row.

While the new location offered an established broadcast neighborhood, we had to plan for the increased RF congestion. A local frequency coordinator helped Radio One with this consideration.

Conducting multiple site evaluations of the location answered many questions that could have been easily overlooked. The evaluation checked to see if there was sufficient electric power, a need for emergency backup power, adequate HVAC and any potential compliance issues with OSHA, ADA or NEC codes or rules or local ordinances.

The new building's condition and location turned out to be a diamond. The functional requirements of the location, such as architecture, mechanical and electrical systems and fire protection satisfied the requirements for Radio One.

The project timeline called for moving the business operations, sales and promotions departments as part of the first phase in the relocation plans. It was decided to keep the current facility on the city's west side operational and use both locations until the final build-out was completed.

Opportunity calls

The previous tenant left all the CAT5 data network cabling and telephone lines in place on the second and third floors. Radio One was able to use this existing infrastructure, which saved substantial costs in labor and materials because they did not have to install it themselves.

The telephone company's demarcation point (or demarc), which was also the demarc for our ISP, is located on the fourth

floor. We designated a lockable room on the third floor as the security/networking room. This secure demarc served as the operational center for the LAN, voice mail, telephone switch, CCTV security camera and network servers.

The crew installed a 100Mb/s switch, router and firewall, using the existing horizontal cross-connections located on the tenants' side of the building. They installed a rack with a fiber breakout box and 100Mb/s

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Radio One



switch with wire management accessories on the second and third floors. Each of the telecommunications closets demarcation points were aligned vertically within the building's infrastructure. This made installation of the voice, data, audio, video, RF and control-lines cable-runs less labor intensive.

Two months after the lease was signed the administrative offices were complete. It was time to start the



Acoustical foam wedges were hand cut into the shape and design of each station's logo, creating a background for in-studio pictures with on-air personalities.



The 22'x13' on-air studios permitted Radio One to use Wheatstone's top of the line Preference Series furniture with rear countertops for interviewing guests.

relocation process. One of the most important lessons learned was to coordinate the move with the telephone company well in advance. This is critical to having all the lines in place and operational before the move. All special service lines such as broadcast loops, ISDN and POTS lines were tested completely. We also contacted our various programming providers to be sure that the satellite, Internet and other transmission services were included on the



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schedule for the facility change.

While construction is underway, take time to review its progress. A well-designed floor plan is crucial to a facility's functionality. Look at the big picture for all operations, components and equipment requirements. Individually consider the pros and cons of each system's placement, specifications and accessibility. It helps to do a conceptual walk through of the facility when each wall's framework is complete. It is less expensive to make a change at this point than after the wall is finished. Visually place each key piece of technical equipment within each rack and room location, considering proper ventilation, lighting and power requirements.

The building's first floor underwent major demolition and construction. The ceilings were 20-feet high and covered with asbestos. The outer perimeter consisted of old offices with large picture windows connected to the ceiling structure. After careful evaluation, Radio One removed all the walls and saved the window frames

to use in the new studios for a showcase view of the studios' operations.

The supporting systems

In our system design we separated the second- and third-floor HVAC and heating from the first floor. This enabled us to design and construct a completely new system for the first-floor studios and production rooms. The first-floor rooms are fed with cool air—the electronic equipment generates the necessary heat. This helps maintain the optimal room temperature (68 degrees to 72 degrees). In any installation it is important to not underestimate the cooling resources and the amount of HVAC needed to operate. Each station's geographical location will determine if this method can be

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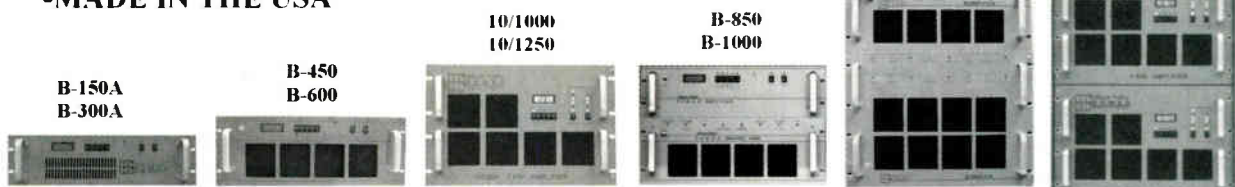


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Radio One

applied. For Radio One it has worked well.

A power outage, the villain of any broadcast operation, was something that Radio One wanted to avoid. The company decided to install a generator capable of handling the total load of all the on-air operating equipment. In addition to the backup generator we wired the building for dedicated isolation ground circuits for all technical areas.

Into the plans

The studios and control rooms are all designed in similar three-quarter, square-shaped floor plans. All these rooms have soundproof interiors and exteriors and are built around a center, insulated wall with air isolation on each side. A finishing wall was then added to each side. Two-inch wedged foam, an acoustical treatment material, was used to finish the sound proofing in each room. The doors are also soundproof, being made of heavy steel construction with filled centers. The drop ceiling is sound rated with a four-inch thick layer of baffling material installed above it. The hallway corridors, studios and production room lights are on 12V system. The lower voltage saves on electrical costs and reduces the amount of heat generated by the lamps. General-purpose 2x4 lighting was installed, providing ample light when needed.



Gospel station WTLC-AM captures the spirit of The Light, broadcasting live with Sunday morning worship services. This room has a direct view into a sit down live talk show room with processing and talk-back capabilities.

Developing system's diagrams, documentation, wiring schedules and standards are just part of the integration process of a new broadcast facility build. The technical equipment was placed in a centralized location near the studios and production rooms. This reduced the length of cable runs, saving expenses on materials and installation. Cable trays were mounted above the drop-ceiling panels enabling access with a step ladder. Cable trays entered and exited each room at both ends of a string of six Middle Atlantic racks, and four-inch conduit was installed to give direct overhead access to the racks. By using a combination of conduits and cable trays we avoided the need for expensive computer flooring.

Cabling for the future

One of the many challenges of building a new facility is to specify and select vendors that will fulfill your cabling needs. Because of the construction of the first floor, Radio One was limited to using mostly plenum-rated cable. We used a 12-pair AES3 plenum-rated cable. We also installed two 50-pair CAT5E cables to each studio and production room for future use. The cabling infrastructure terminated in a

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Radio One recently installed Scott Studios' SS32 in our Indianapolis market. Everything went smoothly, thanks to the easy-to-use, jock-friendly, touch screen interface. SS32 was put online during a recent studio relocation of our four stations and we didn't miss a beat. Our jocks have embraced and adapted quickly to the SS32 and we have had no loss of air time since the system went in. From installation to operation, we're very happy with Scott Studios' SS32. We recommend Scott Studios to others.

John Soller, Corporate Engineer, Radio One, Inc.

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WHHH-FM studio hosts various live programs supplemented by satellite feeds, remote pickups and other sources. An assortment of equipment is located within arm's reach of the operator.

centralized equipment room on a 24' x 20' backboard with 68 Krone punch blocks.

The Krone blocks connectivity made the design flexible. We terminated the blocks in a straight-through concept. The left side of the block carries the output of any device, studio or production room, while the right side of the block carries the input to any device, studio or production room. A jumper was then installed from the outputs to the inputs. This established a method for signal tracing and made troubleshooting the overall system simpler.



Sixty-eight Krone punch blocks were mounted on a backboard and served as cross-connects to the Wheatstone router, the studios and production rooms.

The fourth floor telecommunications room was the perfect location for equipment racks and had enough room to install two of them. We designated one rack for outgoing transmissions. The other rack is strictly used for incoming feeds from satellites, RPU, off-air tuners and other wireless equipment.

The location of the building was about a ¼ mile from the transmitter site. The STL signals were strong. We decided to use one Yagi STL receive antenna for three of the radio stations (WTLC-FM, WHHH-FM, WTLC-AM). A four-way 50-ohm divider was installed to feed each station's STL receiver and provide a test port for engineering.

Up on the roof

The location of the building solved many potential problems that can occur when relocating towers and antennas for STL and RPU radio signal paths. This building has three flat rooftops. A wall ladder

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Equipment List

Centralized Equipment Room

Wheatstone Bridge 2001 router
 Scott Studios SS32 music server
 Telos Zephyr codec
 APC 3KVA UPS
 TFT EAS 940A 4 Ch. Transmitter/Program Interrupt
 TFT EAS 930A Multi-Module Receiver
 TFT EAS 911R4 Encoder/Decoder w/RS232 ports
 Aphex 320A Compellor
 Metro Traffic news server
 Krone punch blocks
 Middle Atlantic equipment racks
 Leitch digital/analog tone generator
 QEI 691 modulation monitor
 Logitech dual VU meters
 Comrex Hotline POTS codec
 Cybex Longview/Companion KVM
 Pico Channel 5 and 10 eliminator
 Pico Agile signal processor
 Aska CATV distribution Amplifier

On-Air Studios

Wheatstone Furniture
 Scott Studios SS32
 Electro-Voice RE27ND mics
 Crown D75 power amplifier
 JBL 4410A monitors
 360 Systems Short/Cut
 Broadcast Tools Satellite Controller
 Audiometrics distribution amplifier
 Symetrix 528E voice processors
 Symetrix 506E headphone amplifier
 Tascam DA40 DAT
 PR&E LS-5 line switcher
 CBT Systems on-air lights
 Henry Super Relay
 Telos 4x6
 Telos One
 Studio Tech CD rack
 Technics SL-122MKII turntable
 ATI P100 stereo phono preamp
 Sony CDRW33 CD/CDRW Recorder
 360 Systems DigiCartII/Plus
 Yamaha SPX990 processor

Transmission

Orban Optimod 8400 processor
 Harris CD Link STL
 Moseley SL3003Q STL

gave easy access to each layer of the rooftop. Five non-penetrating mounts with custom 10x10 galvanized design brackets were installed on the lower and upper sections of the rooftop. Two of the mounts are used for 3.0m satellite dish antennas. The other mounts are used for Yagi, Para-flector and Mini-flector STL antennas. A 1.2m dish was installed to receive Metro Traffic news information. We also installed a broadband 25MHz to 1,300MHz antenna for receiving off-air signals and to serve as a backup RPU antenna. Radio One did not have to construct any towers at the new studio location.

The designated transmission room, located on the fourth floor, had a direct path and access to the roof for cabling. All the cabling



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Radio One



The centralized equipment room houses the Wheatstone Bridge 2001. The studios are wired with a Wiremax Studio Interface System.

is run through a three-inch conduit into a junction box that splits to feed two additional conduit runs for the upper and lower non-penetrating mounts for all dishes and antennas.

The rear of the building faces the transmitter sites for WTLC-FM and WHHH-FM. Our RPU receivers were also installed into these transmitter sites. We faced a challenge in establishing a link to WYJZ-FM, whose transmitter was now farther north from the new building's location.

We decided to install a digital, four-channel STL system for the STL to WYJZ. The signal was sent to the transmitter site for WTLC-FM and then relayed to the WYJZ transmitter to cover the 27-mile path. The WTLC-AM STL path did not change. The new building's location to the transmitter was almost in direct line-of-sight from the old studio location.



Showcase picture windows are installed in all on-air studios to allow visitors to look into the studios.

Air-studio configurations

The Scott Studios SS32 was put onto a discrete network, allowing all on-air control rooms to access the main server in the centralized equipment room with touch-screen operations. Because the equipment room to studio cable runs exceeded 150', we installed Cybrex Longview transceivers. Wheatstone A5000 audio consoles are supported by Wheatstone Preference control room furniture. The console layout was established after numerous meetings with the air personalities. The extra time and planning that were put into exact equipment placement in the turret and racks will reduce the complaints of inconvenient equipment operation. It also helps to minimize acrobatic contortion by the operators to reach equipment.

The Wheatstone A5000 audio consoles are tied to the Wheatstone

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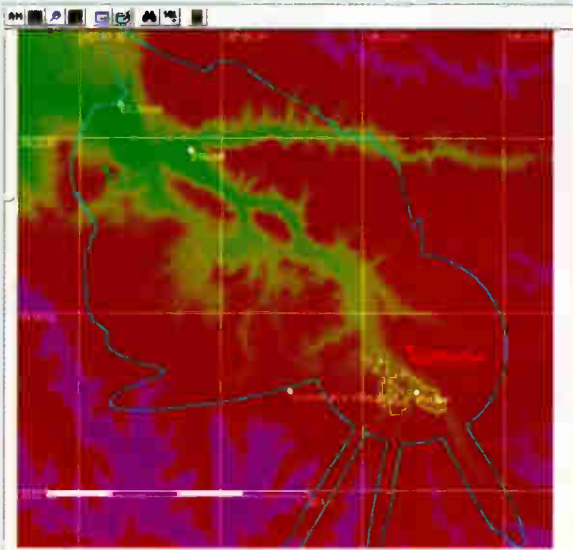
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Radio One

Bridge 2001 digital audio network router. The main studio program outputs feed the STL equipment directly. Radio One bypassed the router to ensure that an unlikely equipment failure would not take a station off the air. The digital audio router's ability to route any signal anywhere gave us the flexibility to change studios at the push of a button, a feature that saved us time wiring and provides greater flexibility in facility operations. The console's multiple output buses (PGM, AUD, AUX, UTIL, MXM)



For audio distribution, Radio One chose the Wheatstone Bridge 2001 Digital Network router with redundant power supplies.


were assigned based on each station's programming requirements. In addition to the 96x12 routing system, each studio was equipped with a 5x4 line selector that essentially created a mini-router for input selection to several recording and playback devices.

Cut-over or cut-off

There are many factors that loom over the head of an engineer about to move a station. The uncertainties encountered—interference, hits, pops, distortion, intermodulation—can make a person shake in his shoes. Thorough planning for the final cut over is critical when it involves multiple radio stations. Radio One's goal to complete the cut over with a minimum amount of off-air time was important. We coordinated our move using existing ISDN lines at the old studios in conjunction with newly installed ISDN lines at the transmitter sites. Radio One was set to make the cut over starting at midnight on a Friday. We moved each station at eight- to 16-hour intervals to allow time to troubleshoot any unexpected failures or problems and check audio and RF signal levels.

A lesson learned is to have enough key engineering personnel assigned at each critical point of the station's cut over locations: studios, STL and transmitter sites. The crew used cellphones to stay in constant communication throughout the process.

After a station's cut over is done, success can only be judged after a six-month period. The system has to stabilize and the station engineer's responsibilities are just beginning.

Radio One made the right move by finding the right location first. 

Pass is a broadcast consulting engineer based in Indianapolis.

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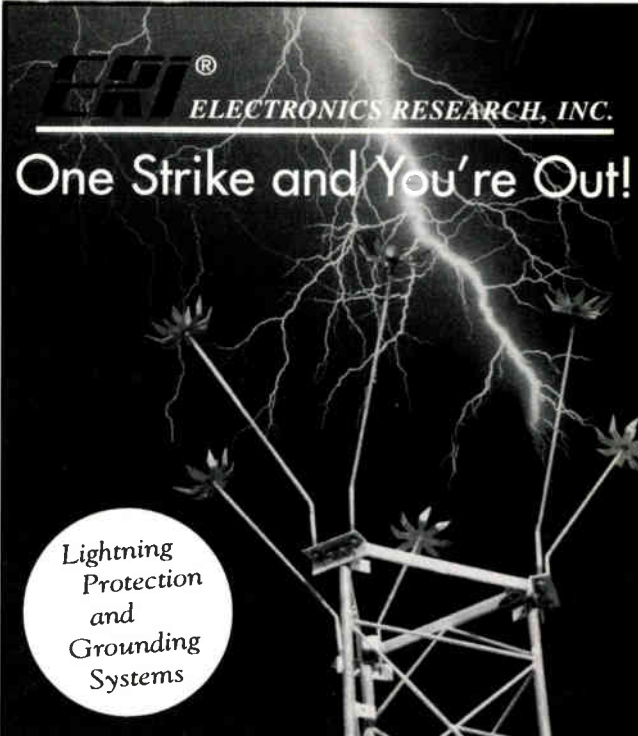
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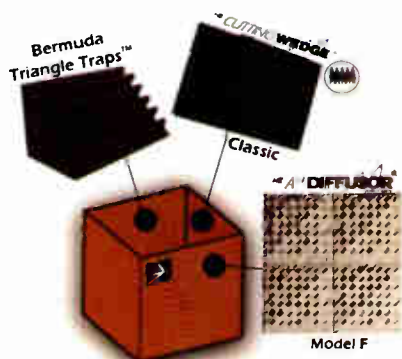


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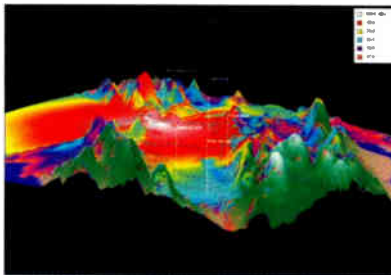


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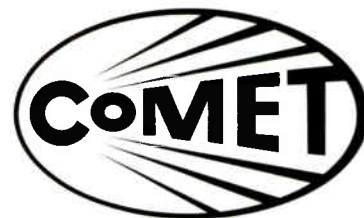
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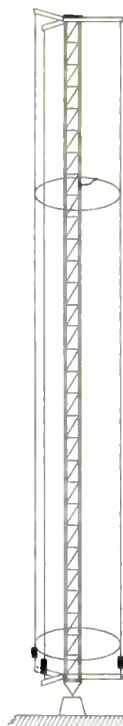
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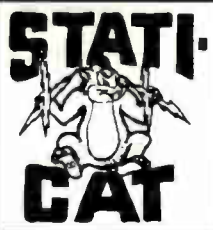
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3. Products must offer substantial improvements over previous technologies. Unique circuit architecture need not be included, but some new approach or application must be involved in the product's design.
4. The price of the products must be within reach of their intended users. The judges seek products appropriate to a range of facilities.
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By Kari Taylor, associate editor

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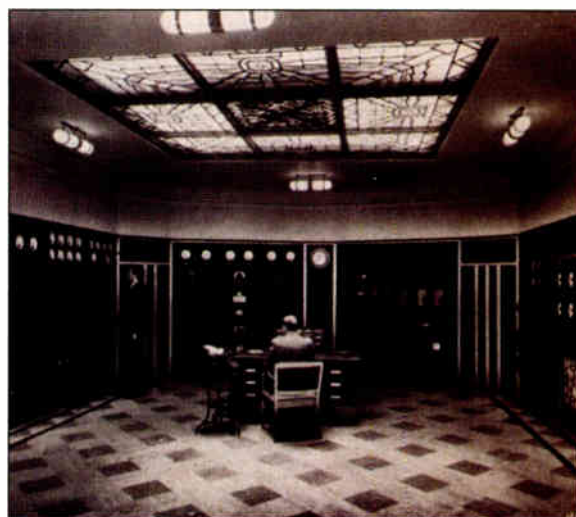


International Tapetronics Corporation's 850 debuted at the 1977 NAB convention, held in Washington, DC. The 850 featured differential braking, a push-button tape marker and a playback/record synchronizer. Differential braking stopped reels smoothly without slack or risk of tape damage. The playback/record synchronizer allowed users to record on one channel and listen to another in complete synchronization.

A high-friction polyurethane roller pulled the tape with less pressure, resulting in less wow and flutter. The keyboard configuration allowed eyes-off, hands-on "touch system" control, and

the record key was doublespaced, preventing the operator from pressing it by mistake. The hinged lid would lift back for access to the entire head assembly. The unit also featured a half-inch thick hardened aluminum deck and was warp-proof.

That was then



When several class 1A clear-channel AM stations signed on in the '30s, RCA-50B transmitters were a popular choice. This photo, taken around 1935, shows the installation of a 50B at KOA, Denver. This installation was typical of many stations at that time. KOA was owned by NBC, which also owned 50kW stations in Chicago, New York and San Francisco. Many of these transmitters remained in operation until the '60s. The 50B transmitters were manufactured for RCA by the General Electric Company and the Westinghouse Electric and Manufacturing Company.

The 50B transmitter consisted of a 50kW linear amplifier using two water-cooled UV-862 tubes in a push-pull circuit, which was driven by an RCA-5B 5kW transmitter. The transmitter had four main units: (left to right) the 5kW driver transmitter, the 50kW linear amplifier, rectifier cabinet and control panel.

While the transmitter room layout is typical of most 50B installations, the patterned glass ceiling is not.

Transmitter information and photo courtesy of John Byrnes from his website at www.enteract.com/~jbyrns.

Sample and Hold

A look at the radio industry

NAB Convention Attendance

A slow decline after a peak in 2000

Source: NAB
* - Anticipated figure. Official number has not yet been announced.

Year	Attendance
1996	92,333
1997	100,245
1998	104,805
1999	106,372
2000	115,293
2001	113,363
2002	95,000*

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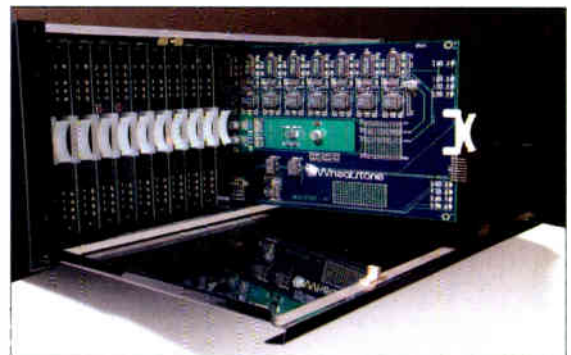
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