Radio Guide

Radio Technology for Engineers and Managers

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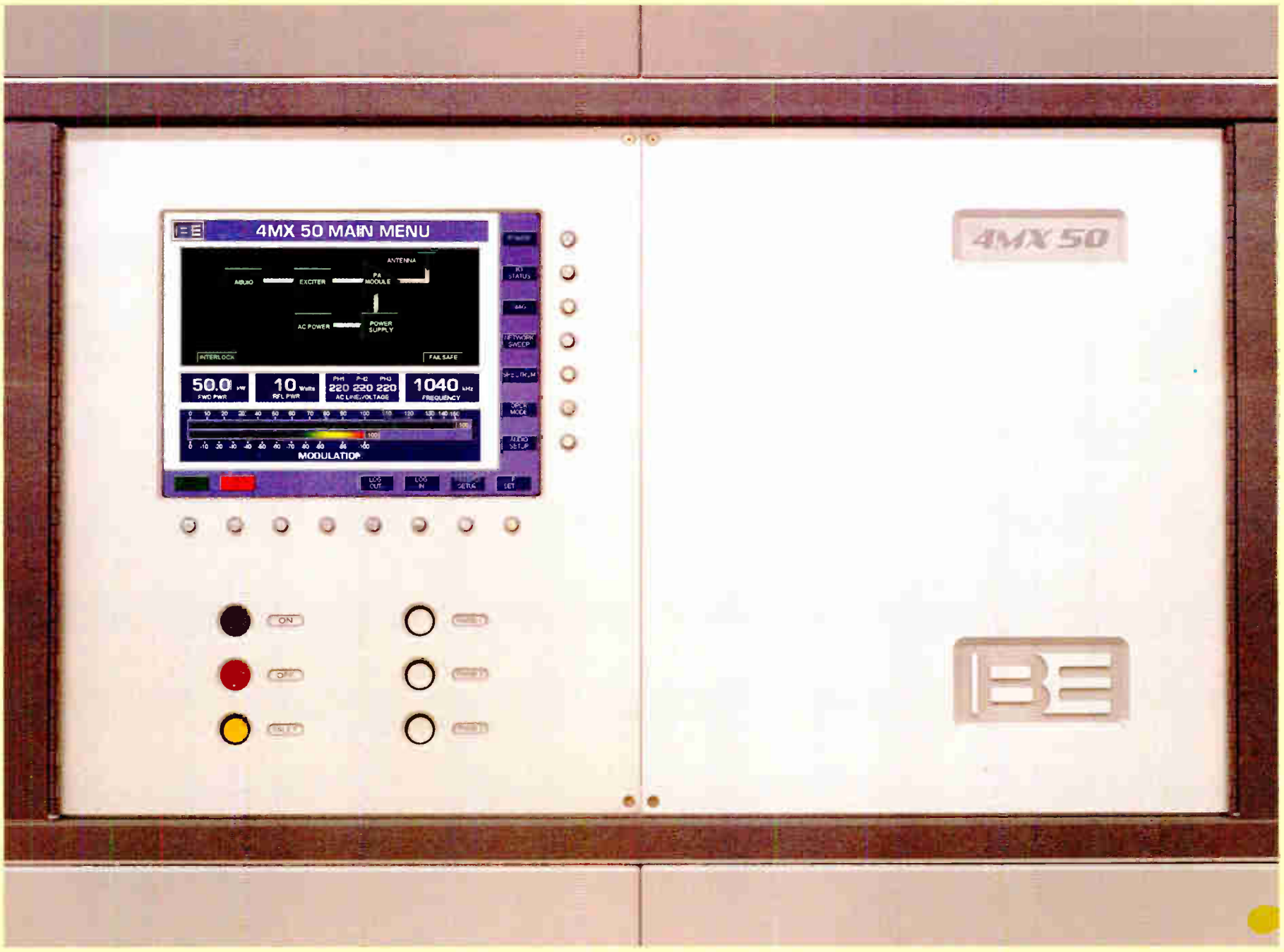
October 2004

Volume 12 Issue 10

New Gear for Building the Digital Station



Pressing Ahead with Digital Radio

Page 4 – Many manufacturers of broadcast gear are smiling. Although sales have been somewhat thin over the past several years, as many corporations have been focused on purchases of licenses and consolidation of studios, the purses have started to open, fueled in large part by an increasing commitment to digital radio.

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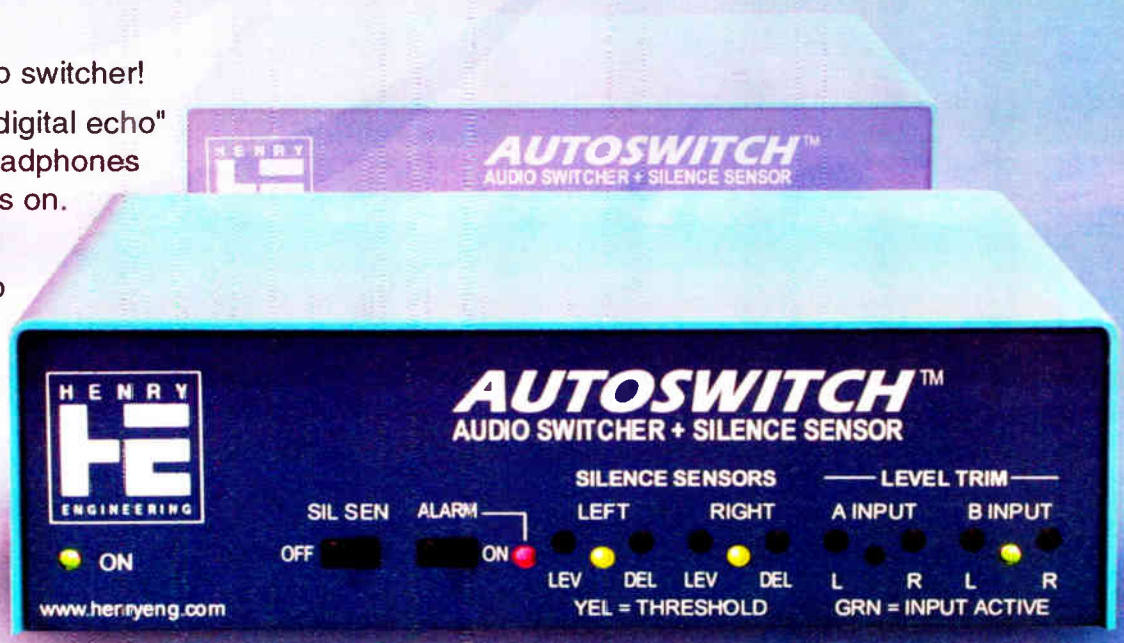

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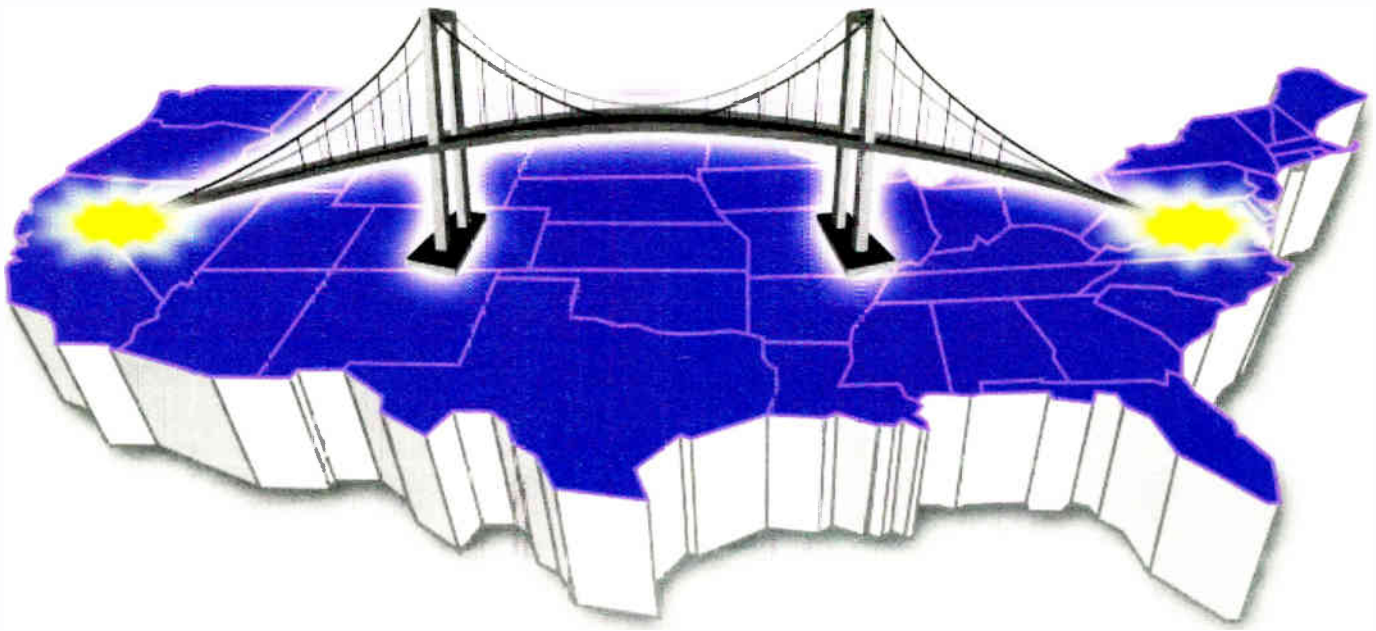

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Cover Photo:
The new Broadcast Electronics model 4MX 50, 50 kW AM transmitter.

Radio Guide

Volume 12 Issue 10
October 2004

Can You Feel the Urgency in the Air?

Although the exact number of attendees and exhibitors at the fall NAB show in San Diego will be debated as always – "Was it high enough?" "Is the Fall Show dead?" – the overall "feel" this time should be clear: there is a new "urgency" in the air, growing from the commitment to digital transmission announced by several of the chains over the past months.

Manufacturers say they are ready to supply all the gear needed for the conversions, and look forward to the cash flow. This is positive for the industry. There already have been so many companies that no longer are active in the radio field, it would not be good for everyone if we lost more.

There is also strong interest in 5.1 audio and the dramatic way the audio "involves" the listener. Ultimately, though, it is not the technical advances that will make or break terrestrial broadcasting. It is the content. This is recognized by virtually all in the engineering community.

Can we "educate" management about the advantages and disadvantages of going digital? Of course we can. But the ultimate factors will be if management and programming can deliver content people want to listen without killing the goose that laid the golden egg by running those ten-spots-in-a-row breaks (more like compound fractures).

Regardless, our mission is to implement the decisions of management to use or not use digital transmission. By carefully inspecting, analyzing and planning our facilities, we will not only give the station the best possible transmitted product, we will do it in the most cost effective way, proving our value as professional engineers.

Pressing Ahead with Digital Radio

by Barry Mishkind

[SAN DIEGO, California - October 2004] Many manufacturers of broadcast gear are smiling. Although sales have been somewhat thin over the past several years, as many corporations have been focused on purchases of licenses and consolidation of studios, the purses have started to open, fueled in large part by an increasing commitment to digital radio.

Certainly the announcement by Clear Channel Radio that they would convert 1,000 stations to transmit digital audio over three years indicates a coming series of orders for new generation equipment from the studio to the antenna. Other chains that either have already started the build-outs or announced their intentions include Entercom, Cox, and others.

PRODUCT INNOVATION

Of course, the IBOC exciters are in a process of improvement and constant upgrading. And much has been said and written about the high-level and low-level FM combining and antenna transmission systems. But, there are also a lot of innovations and new product introductions all through the station.

At the studio end, many companies are designing and selling more digital consoles than analog models. In fact, some manufacturers have converted completely and no longer sell analog consoles. This has brought about some interesting products and changed the way many studios are planned and wired. Instead of huge wire conduits and troughs being filled with 2 pair, 6 pair, 26 pair, etc. cables, they are now hosting a couple of fiber optic cables and/or CAT5 cables.

After converting the microphone audio to the digital domain, the audio can now stay digital, avoiding the different A/D and D/A conversions that often worked against early digital audio chains. Even getting the audio to the transmitter can now be accomplished with digital STLs and digital wire links. And at the transmitter site, everything from new transmitter designs to antenna configurations seek to provide a clean, wideband path for launching the digital signals.

STUDIO END

Elaine Jones at Logitek reports that since their conversion to manufacturing only digital engines, "...more than 600 have been shipped to stations in markets large and small." The Logitek Numix and Remora models are quite popular with stations of all sizes, and can be combined for up to three of studios at modest cost. Further expansion can be handled with multiple networked Audio Engines.

Harris Corporation in its new alignment has revitalized the Radio Division to give strong attention to the needs of AM and FM stations. At the studio end, for example, the Harris acquisition of PR&E (Pacific Research) digital consoles has led to a series of digital models, now installed in many stations.

True, the first units were pricey – $40,000 or so. But Martha Rapp, Marketing Coordinator for Harris says, "A new line of affordable technology is being developed, so even small stations can invest modestly in digital systems now, and upgrade as they are able to do so." The VistaMax and RMX Digital are examples of consoles developed to meet the middle and smaller market needs.

At the other end of the scale, Harris also produces a router that is claimed to handle the largest clusters, switching audio and intercom streams from producers to studios to remote sites.

AUDIO HANDLING

Given that many stations are unhappy either with MP3 encoding or the digital output from their automation systems, the NeuStar Codec Conditioner is a popular choice to solve problems brought on by low bandwidth HD Radio broadcasts. According to Mark Seigle, "The Harris/Neural Audio NeuStar system can clean up audio artifacts and deliver sound at 32-64-96 kbps that sounds like it was encoded at a much higher rate."

Seigle also noted that Neural Audio supports 5.1 encoding, "... with the NeuStar 5225, by transcoding 5.1 content down to stereo that one can edit and then broadcast."

Audio processor manufacturers have also been quick to ramp up models for digital operation. CRL/Orban's Optimod 8400 can handle all the digital and audio preparation (including delay for IBOC, and non-delayed audio for control rooms). The Telos/Omnia 6 now is also capable of producing the 5.1 audio for which many HiFi enthusiasts have asked (See Frank Foti's article in the September 2004 **Radio Guide**).

Meanwhile other manufacturers like Broadcast Warehouse are building digital processors with impressive capabilities for as little as 1/3 the price of some competitors. Scott Inez has recently released Version 2 of the FM product, and has plans for an AM version of the DSP-X in the near future.

Commenting on the impending conversion of station audio chains, Jim Wood of Inovonics said, "Having talked with a number of broadcasters, the commitment by the groups is real." Wood also noted that many broadcasters also have expressed interest in new monitoring gear for the analog/digital broadcasts. Belar, too, is committed to a digital modulation monitor, having signed up with iBiquity right after the Spring 2004 NAB Show.

BRIDGING THE STUDIO AND TRANSMITTER

A major concern for engineers has been getting all this new programming bandwidth out to the transmitters; in most cities of any size, the STL channels are beyond overloaded. Some stations have tried different frequency bands, returned to telephone company loops, moved on to digital transmission over the Internet, or a combination of these techniques.

Moseley Associates Starlink digital STLs have been quite popular, handling up to six audio and two data channels over either RF or wired paths. This turns out to be a plus for Moseley, with Dave Chancey remarking that to avoid "phone company oversell or backhoe fades" on T-1s, "most big time users now will have both a T-1 and 950 MHz [links]. Going off the air is not an option any more."

BE wants you to think of their Big Pipe as "an STL plus." Operating in the 5 GHz range, the Big Pipe boasts bi-directional capabilities of up to 45 Mbps. Speaking for BE, Dee McVicker says, "That's 40 times the bandwidth of standard studio-to-transmitter links," so broadcasters can allocate space as needed for analog or digital audio, AES/EBU uncompressed audio, RDS or HD Radio data, and Ethernet and RS232 communications.

The Big Pipe can be used not only for studio-to-transmitter links, but also as a studio-to-studio link for clustered groups.

TRANSMISSION ISSUES

Of course, the most critical (and expensive) part of the conversion to digital broadcasting is at the transmitter site. Both the transmitters and the antennas have to be much "cleaner" than ever before to transmit the signal properly.

And then there is the issue of "wasted" power; the losses in the analog/digital combiners used by many stations, since low-level combining often can exceed the transmitter capacity. Other stations suffer from simply not having any available floor space for adding digital gear.

Some of these issues were addressed earlier this year as ERI introduced a dual input antenna, aimed at removing the need for additional tower aperture and without requiring the use of high loss hybrid combiners or having to compensate for the loss of a circulator.

ERI Antenna

The other antenna folks, including Shively and Jampro, are providing products and information for customers to assess their needs as they plan for digital implementation.

However, the big issue for many stations continues to be the transmitter. Most of the older tube units are not suitable for passing digital signals, hence the floor space dilemma. Among the solutions, manufacturers have used newer solid state designs to pack more power capability into the same size cabinets, allowing low-level combining to be used in some situations.

For stations with higher power levels, Harris came up with an innovative Split-Level combining design (See Dave Agnew's article on page 6). Using a combination of low and high-level combining, a significant power savings is achieved. However, this design still does require two transmitters.

It is on AM where digital radio meets the oldest, and sometimes most narrowbanded systems. More than a few stations are going to have to replace their entire transmission system from transmitter to phasor to ATU, and sometimes even the tower itself.

Given the dominance of Harris and Nautel in the high power AM range, it is very interesting to see BE introduce its new 50 kW model, the 4MX 50. Although the technology is also useful internationally, clearly BE sees a market among US stations that need to upgrade for digital operation. A prime feature is being able to run from 250 watts to 55 kW at a high efficiency.

Speaking about the new modulation technique – the patent pending Fourier Modulation (4M) – Richard Hinkle, Broadcast Electronics' Director of RF Engineering said, "This is a huge departure from the usual modulation techniques, and it all started with a 'what-if' question: What if we modulated RF devices directly and independently, so we didn't need a modulator stage or to turn PA modules on and off?"

As we watch the rollout of these products and the digital technology, watch for future articles in **Radio Guide** designed to help you evaluate and install digital gear in your facility.

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Digital Guide

Split Level Combining

by Dave Agnew, FM Applications Engineer, Harris Corporation

As stations continue to evaluate and move toward implementing digital transmission, efforts continue to reduce the "coupling penalty," where a good bit of RF is turned into heat. Dave Agnew describes the theory underlying the Harris Split-Level approach, which appears to provide improved efficiency.

[MASON, Ohio - October 2004] High level combining has proved to be a practical way to add HD Radio™ to FM stations. The approach is now well understood and fairly simple to implement with readily available 10 dB couplers. If separate antennas are not desired and other low loss injection methods are not practical, it is the only method with which to upgrade to HD at higher FM TPO levels.

Unfortunately, high level combining only offers an efficiency of 83% – as 90% of the HD transmitter power is wasted into a dummy load, along with 10% of the generated analog FM power. The power lost in the reject load and the power headroom demanded of the main transmitter rate as the two main complaints against high level combining using a 10 dB coupler. In fact, the required power headroom from the FM transmitter is proving to be an unsurpassable requirement for some existing sites ready to upgrade to HD.

SPLIT LEVEL OPTION

Harris Split-Level™ combining presented in Figure 1 is a new innovative combining technique that minimizes the FM and HD power losses in high level combining schemes. Split-Level combining is essentially a combination of low level combining and high level combining.

With Split-Level combining, the output of the station's existing FM transmitter is combined with the output of a ZHD transmitter that is amplifying both FM and HD. The technique of using a common amp transmitter and a combiner with the appropriate coupling ratio is what makes Split-Level combining work.

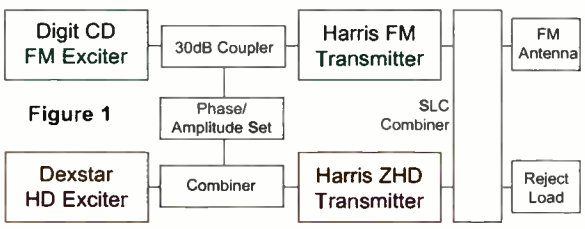

Figure 1

Four primary benefits come from the use of the Split-Level technique; higher overall system efficiency, elimination of the need to increase the TPO of the FM transmitter (FM TPO is actually reduced), significant reduction in dissipated reject load power, and built-In low power FM back-up capability through the use of the ZHD common amp transmitter.

Split-Level combining is a solution for adding HD Radio to FM stations without impacting the output requirement from the main FM transmitter. It also reduces by at least 50% the power lost in the reject load. These features, along with the increase in the overall system efficiency will be studied using figures from an operating system at Harris' training facility in Quincy.

DEMONSTRATING THE CONCEPT

The Split-Level system running in Quincy and displayed at the NAB Radio Show is comprised of a Z10CD FM transmitter, a Z8HD transmitter, using a 6 dB combiner and Bird BPM series thru-line watt meters for measuring the reject and combined output power. The 6 dB coupling factor tends to be the optimum value to minimize the size required for the digital transmitter and to reduce the dissipation in the reject load. The system was monitored live from the show using Harris eCDI and ReCon remote control equipment.

The following calculations demonstrate how the performance of Split-Level combining excels above standard high level combining using a 10 dB coupler and allow a quick comparison of high level combining using a 10 dB coupler to Split-Level combining.

It should be noted that Split-Level combining may be used at FM output power levels from less than 5 kW to as high as 70 kW with the most beneficial powers being in the range of 10 kW to 25 kW. In this example the FM TPO is 10 kW.

The results show the FM transmitter power requirement was reduced from 11.1 kW to 8.4 kW, a 25% reduction of FM power output. The reject load dissipation power was reduced from 2 kW to 400 watts, an 80% reduction, and the overall efficiency increased from 45.7% to nearly 51%, a 5% savings in total power consumption.

The overall dissipation in heat is reduced by 18% and the power savings in HVAC is not included in the 5% overall efficiency improvement. The digital power losses in this case are reduced from 90% to 66% with the 6 dB combiner used here.

SINGLE TRANSMITTER LOSS

A question that comes up frequently is what happens if one or the other transmitter is removed from operation (assuming no RF bypass switching is in place)? The result depends on what combining ratio has been selected for the high power combiner. The three common ratios offered are 3 dB, (50/50 ratio), 4.77 dB (66/33 ratio) and 6 dB (75/25 ratio).

In this case a 6 dB coupler has been selected to combine the output of the Z10 and Z8HD transmitters. If the Z8 goes off, 6.29 kW or 75% of the 8.4 kW FM TPO will be fed the FM antenna and 2.1 kW or 25% of the FM TPO will end up as wasted power in the reject load. If the Z10 FM transmitter is turned off, then 25% or 425 watts of FM power will feed the antenna and 75% or 1.28 kW will end up in the reject load.

OVERALL BENEFITS

It is evident that Split-Level combining is an improvement over high-level combining with a 10 dB coupler and is a viable method for adding HD Radio to FM stations. This method uses a tighter coupling coefficient at the output combiner, which decreases the HD losses.

Simultaneously, by injecting a small fraction of the FM signal, properly phased, at the coupled port, the total combining efficiency is increased, as both the main and the additional FM injection are partially summed at the output. Under these conditions, the total reject power is expected to be reduced by 50% or more, resulting in a boost to the overall system efficiency of 3 to 5 %.

All these benefits are added to the fact that with Split-Level Combining, the main FM transmitter does not have to increase its output level to overcome the coupler losses, an inconvenient and unsurpassable problem for many installations now in the field.

Additionally, this technique provides a built-in low power back-up transmitter and can save space as the existing back-up transmitter may need to be removed to make way for the new digital transmitter.

Finally, the system performance is dependant on the size of the digital transmitter in the following manner: the bigger the digital transmitter to be used, the stronger the FM injection through it and the tighter the optimum coupling coefficient can be. The effect is a lower output power requirement from the main FM transmitter, a lower reject power and a higher overall system efficiency.

You may access a Split-Level calculator tool using the following link to the Harris website: http://www.broadcast.harris.com/extremedigital/hdradcalc.asp This calculator tool allows you to enter your FM TPO and select different transmitter and combiner combinations to optimize the system performance.

Dave Agnew is an FM Applications Engineer at the Broadcast Division of Harris Corporation in Mason, OH. You can contact Dave at dagnew@harris.com

High Level Combining	Enter TPO (Watt) Here: 10,000	Split-Level Combining
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-10	Coupling Factor	-6.02
Z6HD ▽	ZHD TRANSMITTER	Z8HD ▽
4,125	PSat (W)	5,500
1,000	HD Power (W)	400
NA	FM Power (W)	1,710
NA	HD/FM Ratio, dB	-6.3
NA	Total RF Power (W)	2,110
2,597	Dissipation (W)	3,885
3,597	AC Power Consumption (W)	5,965
27.8	Overall Efficiency (%)	35.4
	MAIN FM TRANSMITTER	
111.1%	FM Power (% of TPO)	83.9%
11,111	FM Power (W)	8,390
7,407	Dissipation (W)	5,593
18,519	AC Power Consumption (W)	13,983
60	Overall Efficiency (%)	60
	REJECT LOAD	
2,011	Rejected Power (W)	400
	SYSTEM PERFORMANCE	
12,015	Total Dissipation (W)	9,848
22,115	Total AC Power Consumption (W)	19,948
83.4%	Combining Efficiency (%)	96.2%
45.7%	Overall Efficiency (%)	50.6%
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The Transmitter Shack

Preventing Fire at the Tower

by John White, CBRE, Crawford Broadcasting

Unfortunately, the effects of nature are not the only concerns for tower site operators. Site security is an increasing concern, as shown by recent incidents at various sites around Portland, OR. In this article, John White provides food for thought regarding tower and coax vulnerabilities.

[PORTLAND, Oregon - October 2004] Portland Oregon area Broadcaster and Communication Engineers have learned just how vulnerable our facilities can be to vandalism. A recent series of 16 or more communications facilities and tower arson fires shows the need to upgrade protection. Three of the fires resulted in major losses, with estimates ranging from $100,000 to total loss.

OUTSIDE VULNERABILITY

The fires ignited outside buildings, near the towers or cable entryways to the buildings. The arson resulted in the ignition of the protective jacket of coaxial and wave guide cables. The fire then worked its way up the cables to the full height of the tower, dropping flaming globs of material as it went. The cables and entranceway also can provide a path to the interior of the building.

Smaller, flexible cables usually carry a CL2, CL2P or similar rating. CL2 rated cables may combust in the presence of flame but do not support combustion on their own. Some larger, semi-rigid, cables are available in fire retardant rated jacketed cables for indoor installations. Andrew CATVX, CATVR and CATVP Blue and Gray cables are examples. These products have UV stabilizers for "outdoor storage."

Outdoor weatherproof and durable semi-rigid cables use a standard black, typically polyethylene, jacketing. The polyethylene jacketing material is used because of its excellent weather-resistance and suitability for use in extreme climates. The trade off is that polyethylene is flammable and the vertical flame spread rate of the jackets is very high.

REDUCING THE DANGER

After the rash of arson fires, some form of improved fire protection at our facilities is clearly necessary. At a minimum, the challenge is to stop the propagation of fire up the vertical run of the tower or into the building via the entranceway. Any solutions that can limit damage or delay the spread of the fire are beneficial.

Fire-stop materials have been available for some time for wall penetrations of plastic pipe and electrical cables. These materials are typically intumescent and – when exposed to flame – char and expand to seal and choke off combustion. So far as I know, fire-stop materials have not been tested with semi-rigid cable or non-penetrating fire-stop situations.

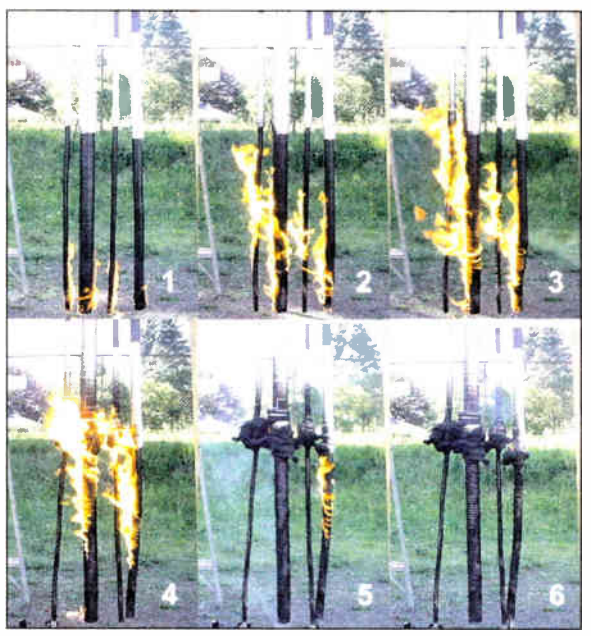
Removing a portion of the cable jacket does not provide a total solution when an accelerant is thrown against the entranceway, since the flame can still enter the building. The jacket is also required to prevent galvanic corrosion and contact rectification problems.

In the presence of heat, a polyethylene jacket begins to liquefy and once in a liquid state the material combusts easily. The copper shield of semi-rigid cable provides a heat conduction path, which efficiently liquefies adjacent unburned jacket material, a challenging fire-stop situation requiring some form of suitability testing. The results of the testing I did are shown in the series of pictures in this article.

TESTING THE CABLES

For this suitability test I chose to simulate cables hung in an orderly manner on a tower cable ladder. The cables I tested included one each 3-1/8 inch air line, one each 1-5/8 inch semi rigid-foam, and two 7/8 inch semi-rigid foam cables. The smaller cables were grouped around and between the larger cables.

At the beginning of the test all of the cables were ignited at the bottom and photographs taken periodically through out the test.



As the test progressed it was observed that flames would easily propagate between adjacent cables. It is clear that fire in a group of cables is much more energetic that a single cable. A random close-spaced bundle would be much worse. I also observed a large puddle of burning material collect on the ground below the test. I visualized the results as that flaming material fell on a building roof.

In all tests the fire was extinguished at the fire-stops. Pictures of the cable after the fire self-extinguished are shown below.

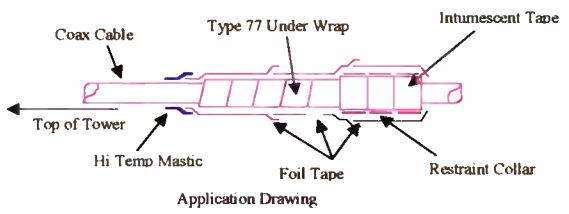
Burned Cable and Activated Fire-Stop

These tests were not certified and suitability testing for your application is suggested. The penetration portion of the test is discussed below.

TEST METHODS

In order to speed up assembling the test, I used locally available materials. The materials used included intumescent tape, rubber high temperature tape, foil fire tape and mastic sealant. The recommended restraining wrap strip for the intumescent tape was not in stock so I had to use an alternate solution. I happened to have some wrap lock cable strapping, which is no longer used so that became my alternate restraint collar. (Manufacturer, part numbers and vendor information is shown at the end of this article.)

For my test the vertical run fire-stop was installed as shown in Figure 7. *All* cables must be fire-stopped at the *same level*, otherwise the fire will follow the unprotected cable then jump back to the protected cables. The fire-stop is made up of several components to form a system. Below is a guide drawing to the application.



Step 1: Intumescent Tape

The intumescent tape is placed at the lowest level, held in place by a restraining collar. The collar holds the material in place when it expands to seal and choke off combustion. Small cables (1-5/8 inches or less) should have a total of 4.5 inches applied, 6 inches for 3-1/8 inch cable. I did not test cables larger than 3-1/8 inches.

Step 2: Under-Wrap Tape

Directly above the intumescent tape a half lap layer of insulating rubber tape is placed to provide heat protection to the cable. I used 3M Scotch type 77. Extend this wrap to provide *at least 24 inches* of protection; 36 inches is preferred. Type 77 tape is non-adhesive and requires a binder wrap such as 3M Scotch type 69. The figure below shows the Type 77 ready for the binder wrap.

Fire Stop and Under Wrap

Step 3: Foil Over-Wrap

The fire retardant foil is applied as a double layer. The tape should be applied as series of wraps, with each wrap burnished down and sealed prior to applying the next higher wrap. I used a plastic tool with a rounded edge to burnish the foil tape. Start at the lowest working to the top. Each higher tape lap should overlap the lower wrap to exclude moisture. See the figures below. Note, less expensive foil "duct" tape should not be used. The adhesive used on these tapes is highly flammable and fails under fire conditions.

Closeup of Burnished Double Layer Protective Foil

Upper Layers Overlap Lower Layers to Shed Moisture

Step 4: Mastic Seal

As a last step a high-temperature mastic is used to seal the top layer of foil tape. In my research on mastic material I found that temperature or flammability specifications are seldom available.

I tested using a propane torch, the material may combust under the flame of the torch but should not support combustion on its own.

(Continued on Page 10)

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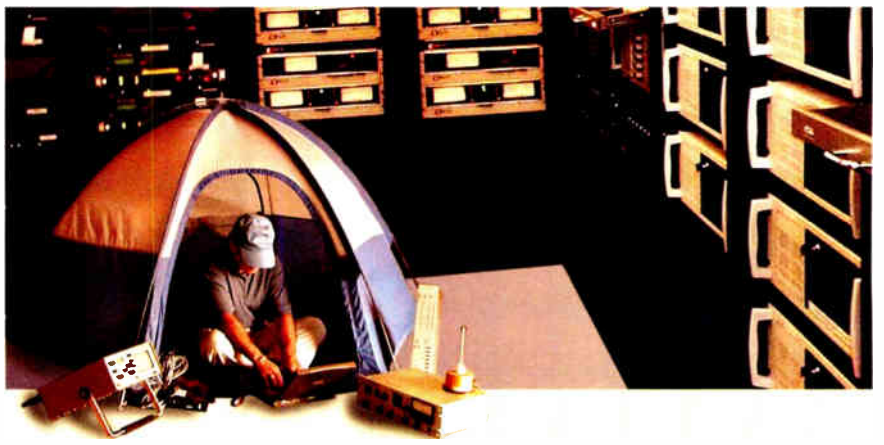

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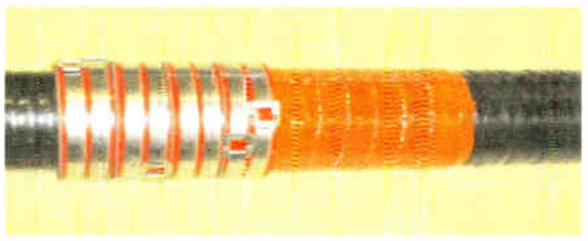
The Transmitter Shack

Preventing Fire at the Tower

Continued From Page 8

Heat Resistant Mastic Overlaps Foil

Under Wrap Note: As part of my research I received a sample of a high temperature fiberglass tape. I applied this tape to one cable during the test. The tape is shown below.



BUILDING PENETRATION

The vulnerability of the cable penetrations are also important to check. At my facility I found two wall penetrations that had been weather sealed with canned foam insulation sealant. These foam sealants are combustible and will readily propagate fire into the building.

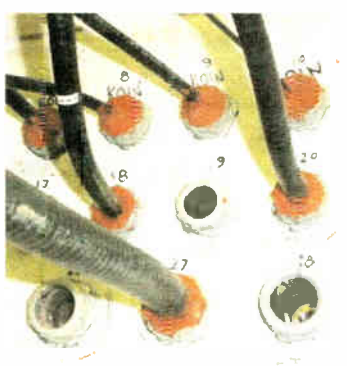
I used fire-stop materials at the cable entranceway. My entranceway fittings allowed filling the one-inch deep space with a fire chalk material. I used 3M fire barrier CP 25WB+, which is a latex based caulk that cures in place. The figures below show a test of this material.

Left: Cable Penetration Flame Side, with extensive damage.

Right: Cable Penetration Interior Side, showing no penetration or damage.

The figure below shows a typical caulking application.

If your installation does not allow a caulking solution, an application of intumescent tape and a preformed restraining collar can be used. SSI and other manufacturers have preformed collars with mounting tabs in standard pipe sizes. (See Figure 8). Restraining collar strips that can be cut to the required size are also available. Fire-stop pillows, small "bean bags" of material, may also be used with larger openings.



Entrance Way Caulking

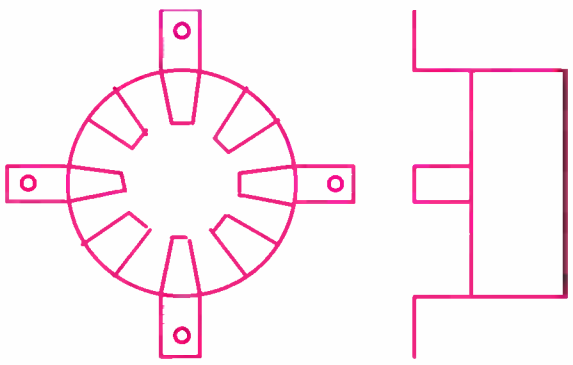


Figure 8 – Penetration Collar

OTHER VULNERABILITIES

Fortunately my primary facility building is block concrete construction with a steel plate at the cable entrance way. The roof and overhang however is wood frame construction which is vulnerable to arson fires at the entranceway. Here I used a metal fire shield to divert flame out and away from the building. Similar solutions should be considered for your facilities.

Roof Fire Shield

OTHER PRODUCTS

While I was researching available fire-stop and control materials, I found quite a broad range of products are available. One example is intumescent paint which can protect wood surfaces. These products, such as Flame Seal FX-100 Coating can expand as much as 100 times the coating thickness to protect from fire.

CONCLUSION

My investigation and tests show that it is possible to fire-stop vertical cable runs and that mitigation to control damage is practical on a field retrofit basis. A broad range of inexpensive fire control products are available, and ultimately facility protection has huge pay-backs. Fire caulking at cable entrances and fire-stopping cables are effective and inexpensive insurance.

Additional product information may be found at these web pages.

ADL Insulflex:
http://www.adlinsulflex.com

Specified Technologies Inc:
http://www.stifirestop.com

Flame Seal Products, Inc:
http://www.flameseal.com/index.html

International Fire Resistant Systems, Inc:
http://www.firefree.com

Materials List:

3M Scotch is available from several local distributors.

Type 77 fire-retardant tape.

Type 69 glass cloth binder tape.

CP 25WB+ 3M fire barrier caulk.

Specified Technologies Inc. Granger is a local distributor.

SSWRED RED Wrap Strip (Intumescent Tape)

SSC Firestop Collars

WSC-8RED Preformed Restraining Collar

SSWFT Foil Tape

SSWRC2 Metal Restraining Collar

SSB Firestop Pillows

ADL Insulflex

PYROTAPE , High Temperature Fiberglass Tape

PYROSIL TAPE High Temperature Insulation Tape

John White is Chief Engineer for the Crawford stations in Portland, and manages their hilltop site, which includes 3 self-supporting AM towers for KKPZ and KDZR. You can contact him at jdwhite@teleport.com

Tech Tips

Using a Broadcast Microphone with Cell Phones

By Jeff Kachmarski

[SWIFT CURRENT, Saskatchewan - October 2004] Getting good live audio back to the station can be tricky when a quick interview or news story needs to be transmitted immediately. Simply trying to hand a cell phone back and forth is less than optimal. Here is a simple microphone solution, compatible with most cell phones.

SOLVING THE PROBLEM

The challenge began when we upgraded from our old 3-watt bag phones. The previous set-up just was too large and bulky to use with newer cell phones, so we started looking for something better. It had to look good, be simple to use, and work with a variety of different cell phones. After some experimentation, we found a very good solution.

Even better, it actually turned out to be a relatively easy project to assemble, once we identified the parts we needed and how to make them "fit."

What we did was to take a regular hands-free headset, extend the ear bud and put the microphone in the shell of a SM63 microphone.

FIELD PROVEN

This setup allows two-way communication between the user and the station even while interviewing a guest. Audio quality is surprising considering the simplicity of this set-up.

We have used this for summer events reports, in the newsroom, and for remote broadcasts when a landline is not accessible.

Once again, as it usually turns out, the simplest solution wins again!

Jeff Kachmarski is CE for CKSW, Golden West Broadcasting, in Swift Current, SK. Email: jkachmarski@goldenwestradio.com

Reducing AM Band Clutter

A New Policy at Clear Channel

by Jeff Littlejohn

With Digital Radio rapidly becoming reality, many stations are taking stock of their transmission systems and operations. All around the country many hundreds of stations with old narrow bandwidth systems, not to mention the numerous diplexed, triplexed, etc. stations, are looking into some pretty nasty "loads." This evaluation is leading many engineers to consider reducing transmitted bandwidth as a way to "clean up" splatter on the dial..

[CINCINNATI, Ohio - October 2004] Over the past couple of years, I have spent some time doing IBOC testing to determine its impact on the AM Band.

One such test was conducted in Cincinnati at WLW, and in New York City at WOR. During those tests, we limited both stations to an audio bandwidth of 5 kHz, and then turned the IBOC carriers on and off at one minute intervals. I happened to be flying home the night of the tests, so I was not able to go to the transmitter site. But I did tune in on the drive home from the airport. The result was pretty interesting!

LESS INTERFERENCE

When I tuned to 710 AM, I heard WOR-AM's skywave crystal clear! Never in the dozen years of living in Cincinnati had I heard WOR's skywave signal; it had always been obliterated by the sidebands of WLW. Next, I tuned to WLW 700, I could not perceive any audible degradation by limiting the audio to 5 kHz.

Suddenly, it struck me that Radio had lost the battle that was fought in 1987 through 1991.

That was the time period when we argued with the CEA, NAB and NRSC about several new AM audio standards: NRSC-1, NRSC-2 and NRSC-3. I remember complaining about how much limiting our audio sidebands to 10 kHz was going to degrade the performance of AM. The NAB wanted to retain 15 kHz audio, CEA wanted us to reduce our audio bandwidth to 5 kHz. In the end, we settled on 10 kHz audio and later the FCC adopted the standard as the new bandwidth requirement.

The goal of NRSC was laudable and was intended to result in wider bandwidth receivers. Remember the AMAX standard? The fact is no one ever made more than a handful of wide-bandwidth receivers. Instead – in response to customer complaints about AM interference – the receiver manufacturers continued to reduce the audio bandwidth of AM receivers to eliminate the chatter caused by the sidebands of adjacent channels.

The result is that an above average receiver today has an audio response of less than 4.5 kHz; most have audio response down 10-12 dB at 5 kHz, and a roll-off that can start as low as around 2 kHz. As far as I am aware, only one commonly manufactured radio has more than 4.5 kHz audio bandwidth: the GE SuperRadio (in "Wide Band" mode). That one is good to about 6 kHz before it is significantly rolled off. These results were confirmed by tests conducted under a study by ATTC.

THE BIG QUESTION

Ask yourself: Why do we broadcast 10 kHz audio on the AM Band if nobody can pick it up? The only reason I can find to maintain 10 kHz audio bandwidth is "It's the way we've done it for the last 12 years."

Reducing AM bandwidth to match the bandwidth of the available receivers will:

1. Increase Modulation Efficiency. By eliminating the broadcast of the high frequency energy, we can increase the amount of energy that is in the 20 Hz-5 kHz region. Let us not forget that due to pre-emphasis, higher frequencies are boosted and will have a more profound affect on total modulation than lower frequencies will.

2. Reduce interference to first-adjacent frequencies.

3. Reduce the noise floor within the audible bandwidth by eliminating modulation that falls outside of a receivers usable bandwidth.

THE SOLUTION

Since I can find no good reason to maintain 10 kHz audio bandwidth, and there are substantive benefits to reducing of audio bandwidth to match the pass band of AM receivers, I have introduced a Standard Operating Practice for all Clear Channel AM stations.

Our engineers will immediately put into operation the following S.O.P.:

All Clear Channel AM stations operating with modern audio processors will reduce their audio bandwidth to 5.0 kHz except "music intensive" AM stations, which will utilize 6.0 kHz audio bandwidth.

Stations without modern audio processors capable of this reduction in audio bandwidth will get favorable review to any request for a replacement audio processor.

THE RIGHT THING TO DO

One thing a few people have misunderstood – and I want to make this clear – this change in our transmitted bandwidth does not have anything to do with HD Radio. This change reduces interference in the AM Band; whether that interference is caused to Analog or Digital, it is still interference. Reducing interference will help all reception.

It is true a reduced audio bandwidth of 5 kHz is required in order to properly implement AM HD Radio, and we are making serious efforts to implement AM HD Radio at Clear Channel stations over the next couple of years. However, this is the right thing to do for AM Analog radio service. HD radio just happened to point out the benefits.

The end result will be more competitive AM Analog modulation (with less audio processing) and reduced interference to our neighboring stations.

As the Co-Chairman of the AM Subcommittee of the NRSC, I am proposing this standard practice be adopted by all AM licensees. But for today, Clear Channel will be the leader in this effort to clean up the AM Analog Service.

Jeff Littlejohn is the Senior Vice-President for Engineering at Clear Channel Radio. He can be contacted at jefflittlejohn@clearchannel.com

Full Duplex

Customer Service in the Radio Station

by George Nicholas

[CEDAR RAPIDS, Iowa - October 2004] "I've got so much work," Murph the Engineer moaned to his manager, "I can't even begin to deal with your needs today." Oops! Murph just flunked the customer service test.

FRONT LINE TROUBLES

Perhaps our most common experience with customer service is in a restaurant. We have observed good service and bad. Bad situations usually occur when lazy managers hire inexperienced, young people, and just push them into front-line positions.

For a brief moment, it sounded like I was describing radio! Actually, I always have believed there is an interesting similarity between restaurants and radio. (Have you ever met an engineer who did not like a good meal?) The point is: like it or not, we are in the engineering "service" business. If so, what can we learn from restaurants?

MAKE THE CUSTOMER HAPPY

In his outstanding book *"Give 'em the Pickle and They'll be Back!"* author Robert Farrell relates philosophies on management principles that spill over into everyday life. It should be required reading for anyone in the service industry, whether you work in a restaurant or are just in charge of making customers feel good. (Although out of print, a few copies of the book remain at Amazon.com.)

Farrell developed a restaurant chain in the Northwest called Farrell's Ice Cream Parlours. These stores evolved to include family-type meals, including hamburgers and other prepared foods. As the chain began to grow, it became clear to Mr. Farrell that not only was the food supposed to be good, *the service had to be excellent*, and no customer should leave the store unhappy – ever.

That kind of in-your-face customer service, along with good food, made his stores very successful. It is based on the following two credos: One, the customer is always the boss. Second, the most important thing a customer can say is "I'll be back."

UNDERSTANDING THE GOAL

The book is peppered with one-liners that are real "keepers." Example: *"A person rarely succeeds at anything, unless they have fun doing it."* Think about the radio people you know who have moved quickly up the career ladder. I bet most of them have outgoing personalities and are fun to be around.

Another similarity between radio and restaurants: *"You never get a second chance to make a first impression."* Have you ever had an experience at a restaurant that was so bad you vowed never to return? I am afraid it happens in radio too – more than we think! *"Nothing is more expensive than ignorance in action."* How true!

HAND OVER THE PICKLE

The pickle in the book's title is a classic story: a regular customer was used to always getting an extra pickle with his meal. One day as usual, he ordered his meal and asked for his second pickle. The server – obviously new on the job – responded, "We can do that, but it'll cost you $1.25." "But I always get an extra pickle free," replied the customer, adding, "Please ask your manager."

The server did so, and then said, "I can sell you a pickle for a nickel." The customer, now very agitated, responded basically by telling the server where to put that pickle, as well as the rest of the meal, and stormed out. Incensed, he wrote a nasty letter to the president of the company (Farrell), telling him "if that is the way you run your company, I will not be coming back."

Farrell received the letter and immediately responded with an apology and certificates for free food, inviting the customer back, so he could make things right for him.

THE BIG PICTURE

Farrell saw the big picture in what had happened: every contact with a customer is a moment of truth. Either they will leave happy or unhappy, depending on how well we manage the situation. Consider this: A typical business hears from only 4% of its dissatisfied customers. The other 96% just quietly go away. And 91% *never return.*

One survey discovered that of those 91%, over two-thirds quit because of an attitude of indifference toward the customer by the owner, manager or employee. Worse yet, a typical dissatisfied customer will tell eight to ten people about his experience; one in five of those people will tell twenty. It takes twelve positive service incidents to make up for one negative incident. For Farrell's business, *one unhappy person* could cost the business $24,000 in gross sales if left untreated!

Smart managers know to solve complaints, and solve them quickly. The good news, seven out of ten complaining customers will do business with you again if you resolve the complaint in their favor. If you resolve it on the spot, 95% will return. On average, a satisfied customer will tell five friends.

CUSTOMER SERVICE IN THE STATION

Assume for a moment our "customer" is the Program Director. Hopefully, the customer is satisfied. But there may be times he or she may not be happy with the service you provide as an Engineer. According to our model above, it will not fix itself. It will require both parties to communicate and commit to resolving the problem, or, worst case, find a compromise, hopefully with minimum management intervention.

If you are a PD, let the Engineer know when you are troubled. Do not expect him or her to read your mind. Equally important: if your Engineer is doing a good job, let him know – and share that news with other people, above and below.

In either case, if it is a positive experience, all of us will be back.

George Nicholas specializes in technical and communications consulting throughout the US. If you have an experience to share, or an idea you would like to explore, email him at: georgenicholas@csi.com

Tower Topics

We Deal in Steel – The Truth About Towers

Part 1 – Tower Basics

by Leonard Weenou, P.E.

[SEDONA, Arizona - October 2004] Some months back, during a big series of snow, cold and ice events that took place nationwide, I participated in several conference calls organized to develop contingency planning in case of a structure or antenna failure at some of my client broadcast stations.

In most of these calls, sort of like Jacque Cousteau, "suddenly I came upon a murky archipelago of misconceptions and misunderstandings" – which in this case concerned towers, their design and construction.

The first time this subject came up it took me about an hour to cover the facts and bring everyone to fully understand the realities of the situation, basically using a Question and Answer format. I took some notes as points were reached or passed, so that we could return and explore them more fully before closing.

Each time the issue came up with a different group, I added more notes, etc. By the last of these conversations with different groups, going from the notes pretty much allowed me to cover the topics right along in a straight line fashion. In fact, this series of articles is a direct result of those conversations.

A good place to begin might be with something like the **Eight Basic Facts About Towers** that, as you will see, relate to all towers.

TOWERS 101

Fact #1: The design of a tower is always worked backwards from its *projected loads* and from its *fixed location*. Keep that in mind: loads and location.

The loads include antennas, lines, lighting, elevator, signage – whatever you want to put up there, and the elevation, weight and size of each. The location factors include some important – and site unique – items such as soil type (the ability to bear the weight of the loads) and base elevation (which in conjunction with its susceptibility to high wind as well as the location's latitude generally identify the weather environment).

Fact #2: There is no best or strongest tower between the choice of a guyed or self-supporting tower. Each has their strong suit of capabilities and assets *but none is intrinsically stronger than another*. Tower structures are strong by design.

Plan for Ice-Loading

Fact #3: The forces that act upon a structure trying to stand up in the air are the same on any tower, guyed or self-supporting. The greatest force is usually the wind resistance presented by that structure followed closely by its own weight (tower, antennas, ice, etc.) and the related overturn moment (its desire to fall down when it is not perfectly balanced straight up in the air) created by its own weight and dynamic factors.

No matter what type of tower you have, you have to resolve those forces. For that reason, at least initially, the calculations to identify those forces are the same for any tower.

Fact #4: Towers fail because of overstress, not because of who made it. This overstress can be plain and simply because the people using that tower have exceeded its design criteria *or* when the capability of the tower has been drastically lowered due to poor or no maintenance *or* that an exceptional weather event has just exceeded its design parameters even on an instantaneous basis.

Our fact four definition also includes the most unfortunate overstressing event which is a rigging accident, where during maintenance or installation a critical stress point on the tower is exceeded by the effort of the riggers and a tower failure is precipitated.

Another stress failure is when the tower is not fabricated to the design criterion or when defective or lesser strength materials are substituted without the knowledge of the user and the capability of the tower is notably less than the design. In this case, overstress comes at a much lower point than anticipated.

A COMPLETE INSPECTION

Fact #5: When a failure occurs, *everything* involved in that failure is suspect until determined otherwise and this includes the anchors, footings, base, guylines, what-have-you. A careful inspection and survey is needed before you can reuse surviving assets.

Among other items, anchors have to be inspected, stress tested and surveyed. Insulators have to be carefully inspected. Threads on turnbuckles have to be carefully examined to make sure that high stress did not flatten them, etc., etc. Even if there is the smallest scintilla of doubt – replace it.

Fact #6: Tower fabricators do not "stock" towers. If your station tower is greater than 24 inches in face width and more than 200 feet high, it is highly unlikely that even the best vendors will have sufficient material on hand to quickly supply you with a new tower. If they do have an immediate solution for you, it is undoubtedly because they shipped you someone else's tower that was ready for delivery or have a refurbished used tower available. Most often, they will have to acquire the material and fabricate it like any other tower order. Be prepared to wait if you want a specific new tower of any consequence.

PATIENCE

Fact #7: Concrete takes, on average, a week to set up to 50% bearing strength and four weeks to come to full strength. You can improve these numbers a little by using special admixtures and drying techniques but you *cannot* just pour and go.

Fact #8: There are firms that do emergency restorations, *but* these normally are for shorter microwave towers. Ordinarily you need to make advance arrangements which amounts to an insurance policy of sorts and this is very expensive. If weather took you out, it probably took others out in the same region which questions the availability of these temporary towers. Further they have to get to you and your site! A better temporary arrangement is on an alternative high point like a building or other nearby tower or a portable crane (for FM) or a long wire for AM. The more you want to control the situation, the more advance planning you should do and as a result, the less expensive it will be if disaster ever strikes.

With the above as preamble, next time we will begin to design a tower for a typical broadcast installation so that you can see how the design flows from loads and location.

(Photo courtesy of Dielectric Communications)

A consulting engineer, Leonard Weenou has overseen many tower projects. So far as we can tell, all have stayed erect! Contact him at editor@radio-guide.com

What to do if you have a weather-related tower failure?

by Leonard Weenou, P.E.

[SEDONA, Arizona - October 2004] It is the call any engineer dreads. "The tower is d... We're off the air! What do we do now?"

DOCUMENTATION

First of all, determine exactly at what time the failure occurred. Tuesday evening is not exact. Tuesday evening at 2331 Eastern Standard Time is exact. Unless you have been through one of these, you do not know how much having an exact time simplifies the matter.

Contrary to your first impulse, your first big goal should be to document the loss – not to get the station back on the air. If your tower is down, you will be off for a long time and so your first priority is to establish the extent and cause of the loss to make sure your insurance carrier pays their fair share. This includes not only the physical loss but also the "disruption insurance" if you have it. Additionally, this documentation makes sure that you only have to bear your fair share of the blame if there is any for you to bear.

VISUAL RECORDS

Take pictures immediately, using some sort of numbering scheme to keep a written track of what they are as well as the angle and time the picture was taken.* Also roll video if at all possible shooting lots of long, slow pans (for spatial orientation) and then push-ins to particular items of consequence.

If ice brought down the tower, get a picture of the biggest piece that you can find and put a ruler next to it. Once that ice has melted, it is your word against everyone else's that there was 2 inches (or whatever you had) of ice on your tower! Try to be logical and methodical in your pictorial effort so the proof can easily be seen right there in front of the viewer.

Obtain validated copies of the nearest reporting station's weather ASAP and try to obtain any first hand reports from "sky watch" people and pilots who might have been in the area and have a recollection of "gusts or funnel clouds, or ice forming, etc." Download animated weather radar displays as additional proof. Memories dim, exact times are forgotten, detailed data gets blown away and then it is very hard to prove even basic premises of your claim. Get it ASAP.

SECURE THE SITE

Secure the site immediately, even if you have to hire private police until it can be inspected by your carrier, and OSHA (if needed) – and to make sure that "gawkers" or souvenir hunters do not walk off with critical items of evidence. On top of everything else, these catastrophe sites are downright dangerous. For example, energy stored in still connected but highly overtensioned guy lines at ground level can cause them to snap unpredictably. There is enough energy released when this happens to cut a person in half like a razor whip.

Another hazard is sharp steel torn edges of sections driven in the ground that may be under snow or mud. These can do horrendous damage to people's feet when they slice or penetrate through shoes or boots. It is just good sense to keep everyone out of the site until a full assessment can be made by people who know how to do it safely and accurately..

Once this CYA exercise is done, you can begin to get your station back on.

** Each of us should keep one of those disposable, flash cameras in our vehicle glove compartment at all times. It is a great stimulator to keep everyone honest at any accident event as well as a super backup for when pictures are needed on an immediate basis.*

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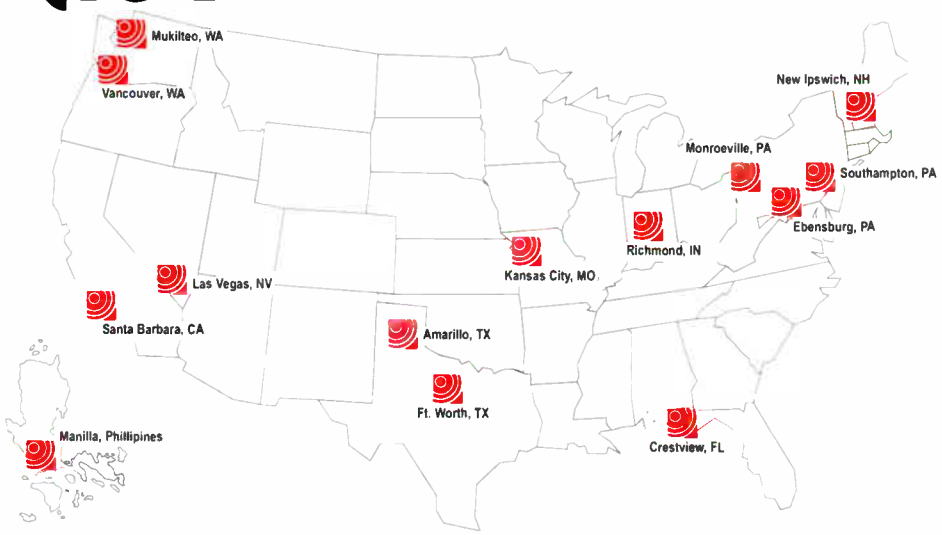

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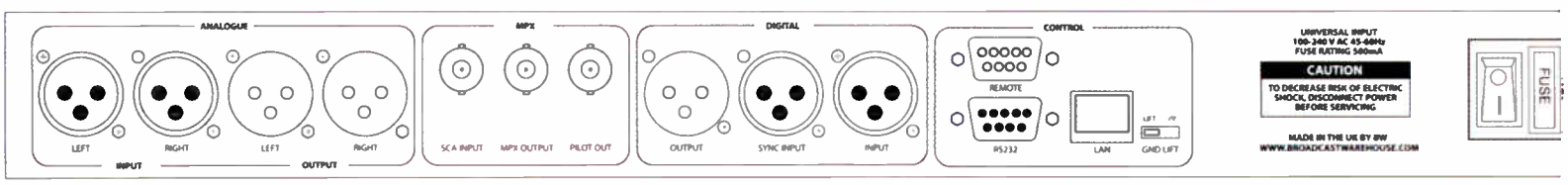

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Practical Engineering

Preparing Yourself for Winter

by Dave Dunsmoor

While it is important to get the transmitter site ready for winter, the question arises, "Are you ready for the cold weather?" Dave Dunsmoor offers some advice that might keep you from getting too "cool!"

[MINOT, North Dakota - October 2004] I generally like winter. It was not always this way. Winter can be so very unforgiving. But the years have taught me that planning ahead solves – or even prevents – all sorts of hassles. As we head toward the cold months, perhaps a short discussion on winter methods and safety might be a good thing, bringing personal safety to the fore.

True, most of you already have your own methods of handling things all worked out. Nevertheless, I am certain there are a few young and/or new guys out there who have just joined a new operation, or have been thrust into a work situation that usually (during warmer weather) would not offer any problems, or may now be required to do some extensive out of town driving.

In any case, years of experience have made me smarter. Like the old saying goes: "Good judgment comes from exercising poor judgment ... and living through it." So for the few of you out there who have not yet had to consider winter travel out away from civilization, here are a few observations and ideas.

STAYING WARM

Have you ever heard of someone (after all, it is always *someone else* who does this kind if thing!) jumping in the car to make a quick transmitter check or repair 20 miles out of town? Perhaps they left without even a warm jacket in the car? Even though it was below zero out, the wind was calm, the sun was shining, and the car was in good condition.

All was well with the world – until something happened to make the trip take three hours instead of 30 minutes and the sun went down, or the car quit, or you slid into the snow bank to avoid hitting an errant deer. Uh-oh, *now* things have changed a bit for the worse!

33° below: not the best temperature in which to have trouble!

Of course, I have never done this kind of thing – I only have heard of it happening somewhere, sometime. *[Editor's note: Yeah, right Dave!]* Still, you know where I am going with this: keep some cold weather gear in a bag, and carry it wherever you go.

SAFETY PACKAGES

Here is what I recommend: snowmobile suit and boots, extra gloves (lightweight cotton gloves inside the leather ones work well), socks, and even extra lightweight shoes for trundling around in the transmitter shack (those snow boots can get heavy). Add to that a "Snoopy" hat (those fur balls with the flaps. A real fashion statement, but they *are* warm), stocking cap, candle, coffee can, paper, matches, snack bars – whatever you can think of that will keep you alive if you are stuck somewhere.

Remember also to stock some emergency supplies (snacks and water) at each site, stashed where the mice cannot get into them. I have never had to stay at a site for an extended time, but it could happen. This would make it at least survivable, maybe even tolerable.

SAFETY FIRST

Second, and here is the tough one to remember, when "the call" comes in, *take your time to get ready*, to pack or transfer all the above into the vehicle you are taking. I do not care what the market or who the PD/GM is, *radio is not worth life and limb.*

If you already have everything in the back of the car, good. If not, get it. Then go do your work. For communication, remember cell phones are much more useful if you can make contact. Three things will help here: an outside antenna, a car charger (or an inverter for the regular charger), and a spare battery. Keep them charged.

Here is a key point: *let someone know where* you are going, when you expect to return, perhaps even the route you intend to take, and how to contact you. It is not out of line to ask that they call you occasionally to confirm your location and condition.

INTO THE WEATHER

Often when you get to the bottom of the hill, the car will not (or should not) go any further and you are going to need to walk in. When was the last time you got enough exercise that you can plow through snow one to two feet deep for 300 yards without turning red in the face? That is a lot of work if you are pheasant hunting. It is even more so if you are carrying parts and tools up a hill.

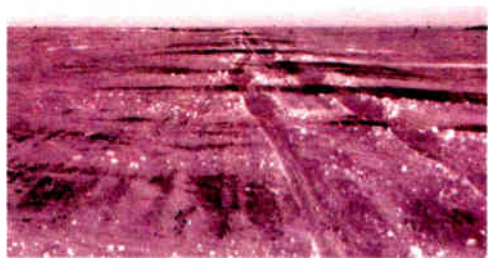
Take it easy, rest every few feet, enjoy the view or it may be your last time to admire the scenery.

If it is still snowing, most likely you can walk a little faster as the snow is still loose, but if the storm is past, and the wind has been blowing for a day or so, the snow will have packed enough to crust over, but not completely support your full weight. This is the toughest walking condition: where you sink in every step.

Take it slow and easy. The combination of cold weather and exertion can exacerbate a marginal situation rapidly. If the wind has been blowing for several days the drifts will probably support your weight, but if you sink once, you will sink again, and that is tiring. Again, take it easy. Dead air is not going to kill the station staff; there is no reason for it to kill you.

And speaking of crusted over snow, unless it is only six inches deep and on the level, or you are driving a good 4X4 with some very good tires, leave the car back where you can get it back onto the road in one try. Shoveling enough snow so that it is no longer high-centered and the tires can actually find something to grip is a lot more work than walking. You *did* bring the shovel, right? You are not trying to do this with the metal dustpan are you? Good, you are smarter than me

This is representative of the conditions I encounter from time to time. After snow reaches a depth of about one foot, the wind does its work. When drifts reach about three to four feet, walking is quite difficult and the hilltop can seem quite far away.



It is useful to keep on hand the phone number of someone who will be willing to either keep the road clear anytime it snows, or is willing to get up with a 2 AM call to plow so you can get in to put it back on the air.

AVOIDING GETTING STUCK

Do you know how to drive into snow so you can get back out without any assistance from Ole's towing service? The first tip is that *bumper high snow is too much.* Stay put. Otherwise, if you have decided you are going in anyway, you have two options.

You can take it easy – and at the first sign of slippage, stop and backup. Or you can put the long skinny pedal to the floor and see what happens. I have done both. Plan one usually works best when there is a long distance to go, or you do not know how deep the snow is. Plan two works when there is only a single drift to cross, or if the snow is not deep.

I have found it works – especially with 4X4s – to drive until you are not making any headway, but before you start to dig in, pop it into neutral and let the drivetrain come to a complete stop.

Sit there for a while to let the tires cool (this is important). Then – with the brakes on – put it in reverse, let the driveline take up all the slack, then back up. If you start to slip, put it into neutral again and let things come to a complete halt. Let the tires cool – they grip much better when they are not melting snow. This method has gotten me out of more stuck situations without shoveling than by trying to burn my way through. Give it a try at home before you get out in the backcountry to get the feel for what works.

REMEMBER TO LOOK UPWARD

Another item to seriously remember (I admit I have not always done so) is ice on the tower and guys carries a tremendous amount of energy while falling to the ground. This was illustrated to me this past spring when we had a late ice/snow storm.

It was warm out. Stopping to visit a friend's transmitter site I noticed he had parked quite far from the tower, and that there were lots of ice chunks on the ground. I parked next to his truck, and carefully walked in, listening for falling ice. When he finished with his work, we headed out, mentioning even inside the concrete building, we could feel as well as hear, the ice falling outside.

Standing by our vehicles, another chunk let loose; it made a substantial thump when it hit the ground. I felt it, I heard it; and we were perhaps a 100 yards from the tower. That made the point very clear. Distance is safety; a flattened vehicle will not get you away from a site.

As I said, I generally like winter. The point here: do the preparation well before the cold hits. Get the car serviced, check your cold weather pack, close the vents in the transmitter building, cover the A/C, check the building heaters and the weather stripping (to keep the mice as well as the cold out).

Attention to these items now will make it so much more pleasant (and relaxing) to go into winter.

Dave Dunsmoor has not yet been cryogenically frozen, although he has come close a time or two. You might find him with infrared. Or email him at mr.fixit@min.midco.net

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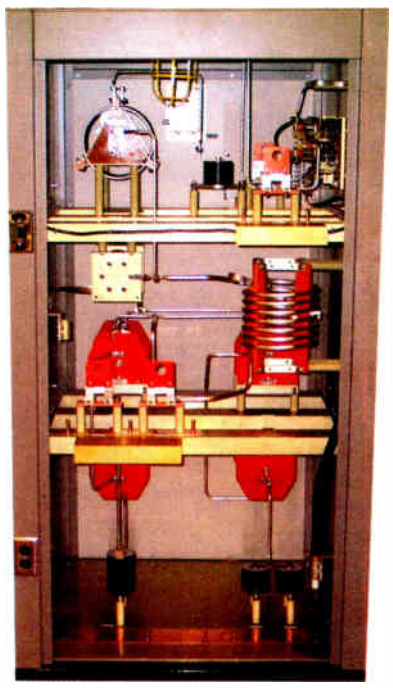

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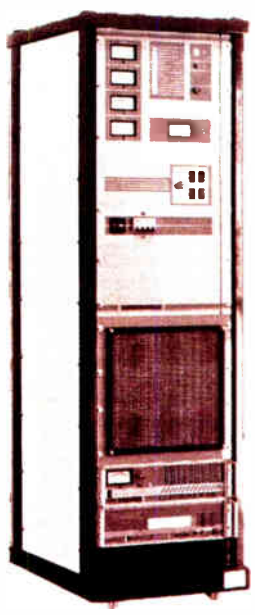

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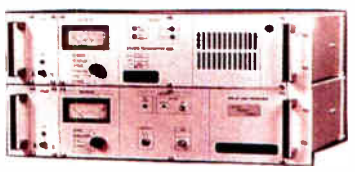

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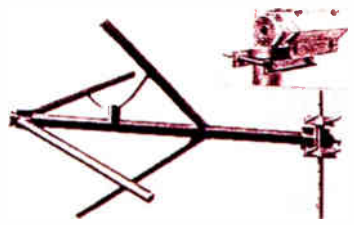

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The Canadian View

The Smell of Failure: A Troubleshooting Aid

by Dan Roach

Finding a failed component can be a challenge. Dan Roach encourages using multiple senses – sight, memory, and smell – to speed up the repair process.

[VANCOUVER, BC, Canada - October 2004] One of the most powerful electronic troubleshooting tools is a mental catalog of remembered fragrances of damaged components. Who can forget the delicate aroma of a burnt carbon resistor, the pungent fragrance of an overheated inductor, or the telltale stench of a cooked selenium rectifier?

Successful troubleshooting can be a sensory experience as well as being a theoretical exercise. Burnt resistors often – but not always – have a certain look to them, and a burst electrolytic capacitor is a dead giveaway that there is trouble afoot. But the most valuable trick is to remember the ways that individual components fail. After all, there are patterns to how stuff breaks.

FAMILIAR PATTERNS

First: the fuse. Most of us know transistors fuse faster than the fuses that are there to protect them. But fuses can get tired, too – particularly the slow-blow variety. Supposedly, metal fatigue in the expansion occurring during each power-on surge finally takes them out.

Thermal problems also can cause intermittent faults in power supply rectifier bridges, and they will sometimes cycle on and off every few seconds in a most entertaining fashion.

Anything at high voltage potential attracts dust particles, which eventually adhere, develop a path to ground, carbonize, and either provide a high voltage shorting path – or an explosion. This natural law is partially counteracted by the tendency of all physical connections to busily expand and contract as power is cycled, trying to work themselves loose. However, they usually will get hot and burn before they open up completely.

Electrolytic capacitors are always either trying to leak or to dry out. If they dry out, they will intermittently go open. If they leak, Murphy's Law states "corrosive electrolyte will drip onto and destroy the traces on any printed circuit board in the vicinity." Even if that does not happen, PCB material left to its own devices (!) will gradually blacken, carbonize and start conducting under the influence of heat from nearby power resistors.

YES, RESISTORS CHANGE VALUE

The heat generated by power carbon composition resistors actually causes the carbon particles inside the resistor to regranulate over the years, causing the resistance to drop. Of course, in most circuits this means the resistor will pass more current, causing more heat, more regranulation, etc., etc.

After this they usually present a very high and unstable resistance, and often will fall apart if touched. Look for a telltale discoloration. But often there is no visible clue this is occurring, and you will have to measure the resistor to be sure it is "cooked."

Over time, mica capacitors (the cylindrical kind with metal flanges), develop an increasing internal series resistance, often varying with ambient temperature. The resistive component begins heating up – until the inevitable fire. The old white ceramic type will sometimes contain itself and just go short; the newer black plastic ones generally will spray flaming black rubbery goo all over the place until the transmitter overloads and gives up. These can present a real fire hazard. Both types can smell very bad when this happens.

Metal oxide varistors always fail by suddenly providing a dead short. Of course, they often explode when this happens, so you might end up with an open circuit and two leads where the varistor used to be. Bear in mind that either way, the "ex-varistor" is not providing protection to the circuit in question any more.

PINHOLE SCOUTING

Hollow doorknob capacitors will heat up inside until the solder connections to their terminals melt. The solid red doorknob kind will get tiny pinholes or carbon traces, sometimes internal, but almost always very hard to see. Typically these are very intermittent faults, too.

Mylar capacitors, or plate blockers, also are prone to tiny pinholes hidden under the plate bypass element. These can be almost invisible to the unaided eye. Still, if they were easy to see, there would not be a challenge!

MORE PATTERNS

Oil-filled capacitors generally leak, or short out and explode with a tremendous noise! Tantalum capacitors prefer to go out with a dead short. Disc ceramics go "leaky," developing a varying shunt resistance, or they will just absorb water vapor and start drifting in value.

Old selenium rectifiers also go "leaky," but when this happens they produce a stench that makes skunks stare in disbelief. You will know exactly where to look as soon as you enter the transmitter building.

Heat and ozone can break down high-voltage wire, eventually causing carbonizing, typically near one end or the other. However, the carbon traces can travel several inches back from the end. Neoprene rubber insulation also rots from heat and ozone, and flakes off, exposing the (usually blackened) copper underneath.

IF YOU SEE A PHONE BOOK...

An old trick of high-power plate supply inductors is to maintain their inductance, but short a point in the windings to the case. You can sometimes solve this by slipping last year's telephone book under the unit, insulating the whole works from ground. If the transformer does short out some windings, the smell of cooking shellac will tell you where to look.

Outside, ceramic tower guy line insulators ("eggs") will develop carbon traces, then start arcing over, creating RF interference. The fiberglass rod type will break down in the sun, absorb water, and arc until they are fully carbonized. Then they explode.

Finally, old circuit breakers – like old engineers – just get "tired" and start tripping over themselves for no good reason!

Dan Roach works at S.W.Davis Broadcast Technical Services Ltd., a contract engineering firm in Vancouver, Canada. He can be reached at dan@broadcasttechnical.com

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Audio Processing	None	Simple AGC	**Digital multi-band AGC with look-ahead limiter by Omnia**
Remote Control	No	RS-232 and dedicated computer	**Ethernet via Web browser**
Auto Dial Storage	19 Numbers	50 Numbers	**100 Numbers**
Frequently-Used Settings Storage	none	none	**30**
Standards-based POTS Codec	No - Proprietary	No - Proprietary	**Yes - aacPlus (MPEG HEAAC)**
Transmit-Receive Quality Display	No	Yes	**Yes**
Contact Closures	2	2	**3**
Display Resolution	120x32 LCD	120x32 LCD	**128x64 LCD**
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Automatic Voice-Grade Backup	No	No	**Yes**
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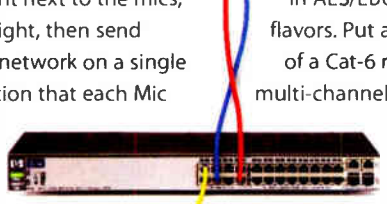

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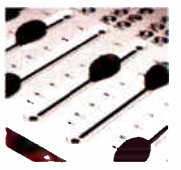

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User Reports From Radio Guide Readers

Field Guide

Radio Systems Millennium Consoles

One Installer's Favorite

by Bob Burnham

[SOUTHFIELD, Michigan - October 2004] I became a fan of consoles manufactured by New Jersey-based Radio Systems at a time when consoles from Pacific Recorders & Engineering could be found at many of the most respected stations.

A GOOD CHOICE

The year was 1988, and I had convinced the GM of a small independent AM station in Jackson, Michigan that the Radio Systems console would be more cost effective than re-building their old rotary RCA console, yet give them the performance and reliability of consoles demanding twice the price. And I was right.

A decade later, I would be in that position again at a Detroit area station. This time I specified RS consoles be ordered for both On-Air and Production use, since they are flexible enough to be at home in either application.

All the consoles at these facilities outlasted the stations for which they were purchased. They never went down or had problems outside of normal wear and tear on the (then) mechanical switches. But the real selling point to me, aside from the cost effectiveness, was the ease with which these consoles are installed, even using traditional time-intensive wiring techniques.

STILL THE CHOICE

In 2002, the Specs Howard School of Broadcast Arts in Southfield, Michigan began an extensive renovation, which included new consoles and my re-evaluation of several brands. The "cool" factor was very important as well as long-term reliability and their ability to tolerate daily abuse without failure.

The school is the home to four on-campus radio stations and 15 practice studios. Three of the four stations were slated to have their consoles replaced. I mentioned the "cool" factor – that was especially important in this case, as two of these stations can be viewed in a glass-enclosed area adjacent to the school's front lobby.

Our supplier (Broadcasters General Store) had suggested a variety of options, including some offering more features than we needed or being outside our budgetary plans. (A fully configured digital console at that time was cost prohibitive, so the choices were limited to high-end analog consoles.) In the end, the Millennium fit our needs the best.

There are times when analog equipment can be relied upon to serve an intended purpose with little or no sacrifice in quality. The analog specs of the RS console offer a signal-to-noise approaching -90 decibels and a distortion level of .005%. And since these consoles will be fully upgradeable to digital, the concern about investment in equipment for long-term use is lessened (however, as of this writing the upgrade kits were not yet available for shipping. The company, however, expects have to them ready for shipment by 4th quarter 2004).

Functionally, these boards cover all the basics, are extremely flexible and more easily configurable than some of the competition. With the change of a few supplied gain headers (plug-in resister blocks), any (or all) channels can be configured as microphone level, standard balanced broadcast level, or unbalanced level, stereo or mono, etc.

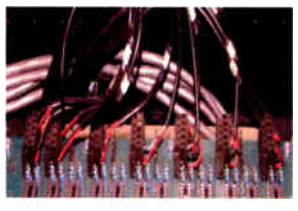
The lamps in the control buttons in the Millennium boards are long-life LEDs (earlier RS models utilized incandescent lamps). The buttons themselves are feather-touch with sort of a rubbery yet positive feel with no audible "click" when pressing the start button.

A prize for the installer comes with this board – a free T-shirt the company sends when you return the warranty card. The T-shirt boasts either "When You're Good Broadcast It!" or "Ready for the new Millennium" with the company logo.

The T-shirts are cool, but actually the real prize is the connectors!

EASY INSTALLATION

Many of the most popular consoles utilize nylon connectors made by the Molex Corporation; cable termination requires extensive use of a crimping tool. Other consoles utilize variations of this, including connectors invented by the computer industry or proprietary connectors. RS consoles use a miniature plug-in terminal block connector known as the Phoenix connector, from manufacturer Phoenix Contact.



To wire a Radio Systems console, the only tools required are your favorite wire strippers and a "greenie" (the famous Xcelite R3323 miniature flat blade screw driver). That is it. If you make a mistake, use the screwdriver. Forget about any of those awkward pin extractor tools!

You can change channels simply by plugging/unplugging these connectors. They are secure long life connectors and a lot easier to move around than a Molex connector. Use your favorite punchblock tool and soldering iron for the terminations on the opposite ends of the wires and your entire studio is completely wired before you know it.

QUICK WORK

I found installing each console was only a one day project working entirely alone, using traditional techniques and central bunch blocks for each studio (it would take even less time with the Radio Systems pre-wire kits – especially if you used the Studio Hub product).

The installation manual is a well-organized binder that is concise and easy to follow with a specification check-out sheet in the front. The input boards on the RS console are situated in groups of six channels each, and other options and fine adjustments are logically arranged (no pun intended).

Each IC is socketed, although I have never had to replace any. The logic functions including the various mute applications are programmable with jumpers on the logic boards for each channel. They are mounted on the underside of the "hood" for lack of a better name (the underside of the control surface).

A few other studio and installation details: I use Belden 9451 for all analog wiring. The shield strips with the outer covering making it very easy and fast to neatly wire inside the console without having to use heat shrink to cover any stray foil.

One of our radio stations features an Enco Pro32 Digital Audio Delivery System. At this workstation, the school uses only the simple virtual cart players in the "DAD" system, which are configured to be remote-fired from the Radio Systems console. This is handled easily by the console's logic without using any external circuitry to either the console or the control card in the computer workstation.

Additionally, in each studio, a Sony MDS-E12 MiniDisc machine is set up to skim students' radio shows. Because of the design of the Sony equipment combining Play and Pause into a single closure, a Henry Engineering LogicConvertor was used to both isolate and combine these functions into both the On and Off buttons of the microphone channels on the console. Alternately, it could also have been tied in with studio muting circuitry.

Two of the radio stations feature Marantz PMD-325 CD players and MD machines for playback. The remote control ports on the Marantz players are easily interfaced directly with the console's logic circuitry.

INNOVATIVE APPROACHES

Radio Systems was one of the first manufacturers to design a console with no audio on the actual faders or switches. As mechanical components wear, you do not hear it because they just control VCA amplifiers and logic switches situated in the input and output motherboards.

Radio Systems also developed the unique series of products called Studio Hub+. Its main feature is the use of Cat 5 cable as a studio replacement for Belden and other types of more expensive audio cable. I have not yet used Studio Hub products personally, but have seen their presentation at one of the conventions. I have also seen the specs and they look impressive, indeed. This company has a background in doing installations, and it is very apparent in their products.

Regarding maintenance on the RS products: there is none! At one point, it was considered important for a console to have a modular design, rather than Radio Systems' approach. If an input channel failed, you could pull it out and swap it for another while the bad one was being repaired. With the increased reliability of today's broadcast equipment, however, that need has been largely eliminated. In fact, on some of the older modular consoles, those edge connectors can actually become a maintenance issue as their contacts oxidize.

I have already pointed out there was never a major failure in any of the RS consoles I had installed over several decades. The Millennium consoles at Specs Howard School have been in service for two years and none have exhibited a single problem, small or large.

There are many good console products being offered to broadcasters today. Depending on the facility needs, sometimes a good part of the budget needs to go for associated equipment; there just might not be an extra thousand or two available to go toward the full-blown digital model just yet. If that happens to be the case, the Radio Systems Millenium analog model would make an excellent choice. Looking ahead, when the studio is using digital equipment, you can always upgrade the console to digital.

Bob Burnham has been working in the metro-Detroit area for over 25 years, the last five at Specs Howard School of Broadcast Arts, Southfield, MI. He also provides consulting and technical services for broadcast syndication and area stations and studios. He can be reached at (248) 358-9000, or email at: bburnham@specshoward.edu

FCC Focus

When the FCC Comes Calling

By Frank Hadley, Ops Manager KCBX-FM

[SAN LUIS OBISPO, California - October 2004] I am the operations manager at KCBX-FM, a small NPR affiliate in San Luis Obispo, California. I have been working in radio for about 20 years, and have always had a vague notion that the FCC theoretically could pay a visit, but in reality I never spent much time worrying about it.

When I got the job here and was designated the Chief Operator, I spent some time familiarizing myself with some of the FCC Rules. But again, I was not really that concerned. I had always heard that the FCC was far too busy to concern itself with a small station like ours.

"THEY'RE HERE!"

Arriving at work on Tuesday, August 17th, I was met at the back door by our Program Manager and Music Director. "Hank, the FCC's here, and they're asking *lots* of questions!" whispered Neal, the MD. I blinked a couple of times, and made my way into the studio where two men wearing brown slacks and Hawaiian shirts (were they undercover, or just comfortable?) were poring over the little thermal strips of calculator paper that our Sage EAS unit spits out.

I introduced myself to them; in return they flipped open their badge wallets and gave me their official looking government business cards. They continued studying the strips of paper, taking notes. One of them handed Neal two months worth of printout strips, and asked him to neatly affix them to 8 x 11 sheets of paper, and make copies for them.

Then they asked me to show them the EAS handbook, which was hanging on a hook above the Sage unit – then the Sage manual and our EAS Local Area Plan. I had vague memories of the Sage book being somewhere in my office. I made a hasty search of my desk files and thankfully located the manual. As for the Local Area Plan, I had no clue!

"WE HAVE IT RIGHT HERE"

Pessimistically, I went through my somewhat disorganized file cabinet and came across a sealed envelope labeled "LECC Plan." I opened it in front of one of the inspectors, who gave me a tight lipped smile, "It does not look like that gets read a lot!" They looked it over and proclaimed it was in order, but recommended that we keep it in the control room.

One of them asked me to show him our transmitter remote control. He gave it a perfunctory glance without comment. He then asked about our Designation of Chief Operator letter. We keep a small binder next to the transmitter remote control with our translator licenses, as well as the designation letter he was seeking. He took a quick look at it, making sure there was both an operator named (me) as well as a back-up operator. He said that keeping it in a binder was not proper, it should be posted on the wall. I made a quick photocopy of it and stapled it to the wall, while he watched.

PUBLIC FILE JITTERS

Next, he had me lead him to the Public File. He said there were a few items missing, namely a donor-list and the ownership report. Since I have nothing to do with the Public File, I made a quick phone call to our GM who was at home sick with a bad back:

" Frank, the FCC is here!"

"Is this a joke?"

"I'm afraid not, they have some questions about the Public File."

"I'll be right there!"

As luck would have it, our FCC attorney from D.C. was in town to meet with Frank about (among other things) our Public File! In fact, Frank was in the midst of reassembling and updating the file when he threw his back out. Thus, most of the needed items were available, just spread out on his desk.

Frank gobbled down a couple of Vicodins and pleaded his case with the inspectors. They were very understanding and accommodating, saying they had several other stations to visit, and they could come back late the next day.

The FCC folks did return the next day, verified the Public File was in order and were on their way! They even mentioned that compared to some of the other stations in our area, we were in very good shape.

It took us all the rest of the day to calm down, but (knock on wood) it appears – aside from the emotional stress – we escaped relatively unharmed. Indeed, if we are inspected again, we expect to be ready ... and a whole lot calmer!

Hank Hadley is now off the Valium and no longer is shaking. He continues to function as Operations Manager for KBCX-FM. You can share your FCC contact experiences with him at hhadley@kcbx.org

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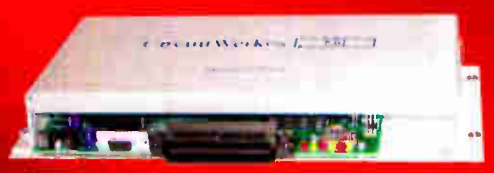

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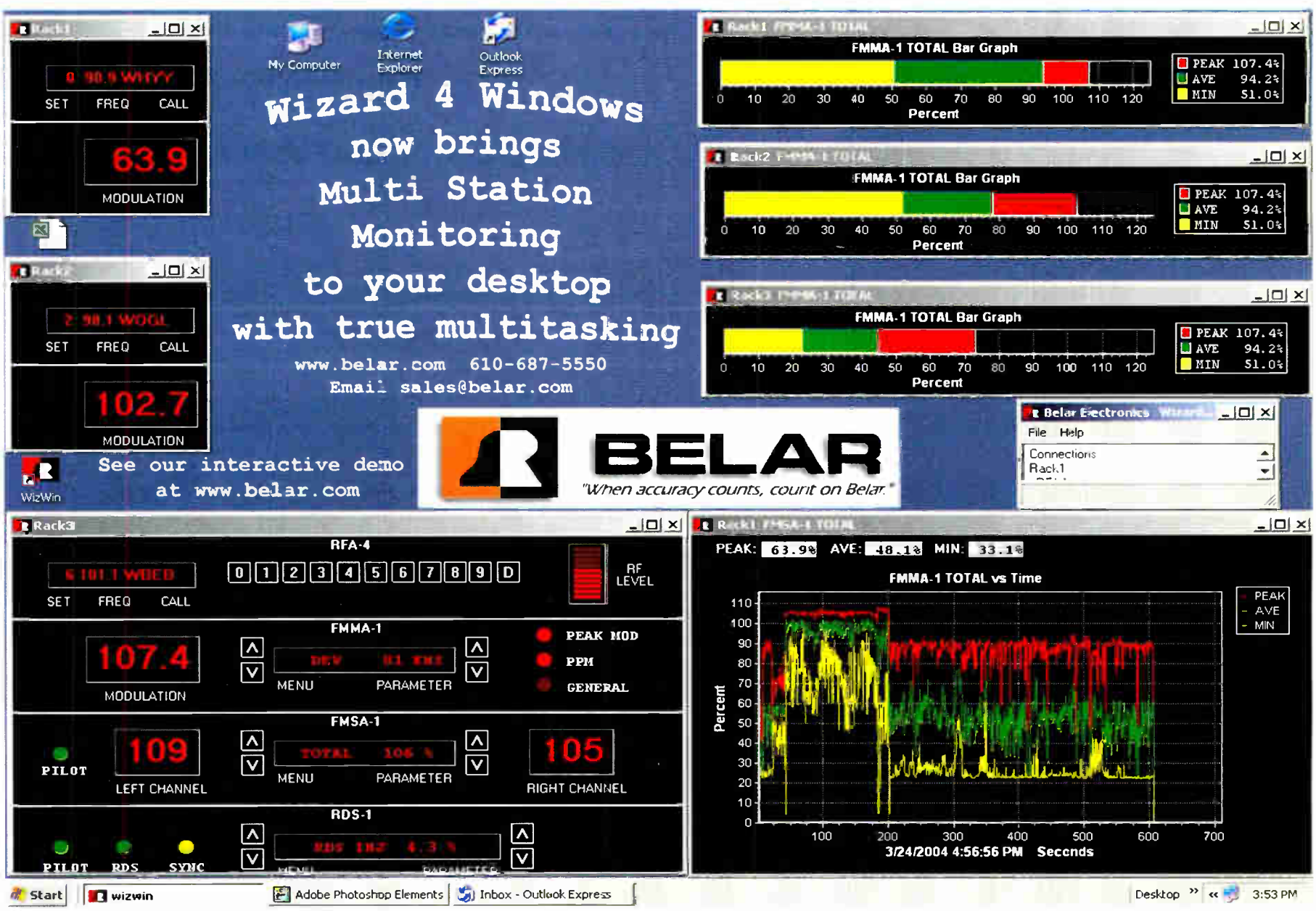

EAS Q&A

Answers to Your EAS Questions

by Clay Freinwald with Barry Mishkind

[SEATTLE, Washington - October 2004] Once again, we invite you to grab a cup of your favorite beverage, relax, and join us as Clay and Barry discuss some of the topics and questions that come up in EAS operations.

UPGRADE TIME?

Barry - Clay, earlier this summer, The National Weather Service announced they were going to start using the new Event Codes that were part of the most recent EAS upgrade. Some stations are asking if they have to upgrade their decoder for this?

Clay - No, not necessarily. Weather messages from the NWS are in the voluntary category of EAS – it is not an FCC requirement that they be relayed, etc. However, I would hope all companies would, in good conscience, be eager to upgrade your EAS equipment. All too many times folks forget the major reason why we have an EAS system. It is all about *saving lives* – and broadcasters should support this mission. I applaud the NWS for taking the lead in this.

Barry - By the way, these changes also include new FIPS (location) codes that describe coastlines or water areas off the coast. How are the EAS equipment makers dealing with these codes?

Clay - This is a good question. The new Location Codes for offshore areas are certainly more complicated than the present FIPS, which basically are county names. It will be interesting to see how the EAS equipment makers deal with a location whose description contains a line of text.

Barry - Speaking of county names, a reader asks: "You made an interesting case for using "county-segments." How do we get this started in my area?"

Clay - This is a chore for your LECC (Local Emergency Coordinating Committee) and/or SECC (State Emergency Coordinating Committee). These committees, working with state and local governments, will need to develop criteria for dividing a county into segments based on established location names.

This really is a situation where no plan fits all. For example: sometimes a county only has a couple of descriptive terms, ie, North and South, or East and West; others have more. This is why the names for county segments were changed in the last go-round of EAS Rule changes - to make it easier for this scheme to work. As is the case in most areas, these EAS Committees could probably use your help. Bring this matter up at their next meeting and offer to get involved.

SAGE ENDEC PROBLEMS

Barry - A persistent problem in many facilities is the failure of the power supplies for the Sage units, causing random resets and lost alerts and relays.

Clay - That is true. With many of these units having been in use for about seven years, the "wall wart" type power supplies are often the source and cause of such failures. One fairly quick test is to set the unit to print out a report while the speaker is turned on. Marginal power supplies will not be able to provide the needed current, and the unit will reset or simply shut down.

Obviously, this is not a good situation. All too often, the way this is diagnosed is after an emergency does happen, and the unit fails in the middle of the alert. Unfortunately, even some LP-1 stations have been "bitten" by this problem.

Of course, replacement power supplies are available from the manufacturer. On the other hand, some stations have tried to reduce future failures by building or buying heavier duty power supplies. Either way, this highlights the need to continually test your EAS machines on a regular basis.

Barry - A reader in Nebraska reports his Sage is displaying "Time is Bad," with a date that does not change. Is this also a power supply problem?

Clay - Although not the power supply itself, it is somewhat related. The backup battery is likely in need of replacement. (Thanks, Gary Timm)

HOW MANY TESTS?

Barry - Another reader notes that shortly after they ran a "real" EAS alert (AMBER) forwarded to them by the State, the scheduled Required Monthly Test (RMT) came through. He asks: "Should have we forwarded that as well, or does doing the 'real thing' count?"

Clay - To answer this, we need to carefully check the FCC Rules. (I do not want anyone blaming me for this!) As a rule I would prefer that *all* RMTs be relayed. Here is why: The Monitoring Assignments come into play. In many cases, one station will relay to another and to another in the dreaded "Daisy-Chain."

RMTs are required to be forwarded to test this part of the system. With AMBER, things are much different. First, AMBER is part of the "voluntary" part of EAS – relaying these messages is not required. Secondly, many stations will air the AMBER messages but will not forward them, complete with all the data bursts etc. Either way, some "down-stream" stations would receive nothing and their logs would be devoid of an RMT reception for the month.

Barry - OK, that makes sense. I suppose you would say the same thing regarding the Weekly Test (RWT)?

Clay - It depends on how you handle it. Like the RMT, the RWT is a test of your facility's EAS Encoder. Again, if you receive an EAS AMBER message and simply air it, without running the data bursts (fully encoding it as an EAS message), those monitoring your station will not be able to log receipt of an RWT from you.

One needs to be thinking in terms of those down-stream stations. The FCC wants to see the receipt of one RMT per month, and at least two RWTs per week – one from each of their two monitoring assignments. If they do not get it from you, then they could have a problem. At minimum they would need to explain in their log what happened – meaning they would need to make contact with you to find out what happened.

Barry - So, then the issue is whether or not you re-transmit the header codes?

Clay - Yes, that is it! Check out Part 11.51 (a)(2)(I) of the Rules.

TESTS, TESTS, AND MORE TESTS

Barry - In some parts of the country, AMBER Alert (CAE) messages are received, but in the end turn out to be only a test. What can we do to get them to stop this?

Clay - Tests should *never* be issued using any "real"' Event Code. While it is important that testing take place, it is vital there be no mistake as to whether or not it is a real message or a test. I recommend such tests be coded DMO. This code is used for demonstrations or the transmission of messages that are *not* to be put on the air.

Barry - This highlights one of the major problems with EAS: the inability of TV stations to get textual information about EAS events.

Clay - You are correct about that. EAS works well for Radio but not as well for TV. The only way for a TV station to display the information in the voice portion of the EAS message on their crawls is to manually transcribe them – something very few stations are set up to do.

In the case of an un-attended TV station, it is impossible for the facility to do anything beyond showing what is in the header code (which may be vague or misleading). For example, sending an AMBER Alert (or CEM - Civil Emergency Message) as a test could end up alarming TV viewers, especially those who are hearing impaired. That is why all non-RMT or RWT tests should use the DMO code.

Barry - Some areas report they get *a lot* of testing. In those places, it seems the folks there have discovered the DMO, and as a result some stations complain they go through a lot of printer paper for nothing.

Clay - I encourage the sources of EAS messages to test their systems. At the receiving end, stations are encouraged to program their equipment in such a way they are not going through printer paper nor annoying personnel needlessly.

Barry - You mean they do not have to log every message – test or not – that is received?

Clay - Correct. Check the latest FCC revisions to the EAS rules for details.

Barry - What if an EAS receiver will not permit a station to "not log" certain events, like DMOs, etc.

Clay - This is going to come as a big shock; Perhaps they should consider purchasing a different brand of equipment.

RECORD RETENTION

Barry - A common question that is asked – usually by someone who is newly tasked with EAS – "How long do we have to keep our EAS logs or print outs?"

Clay - The simple answer: If you are a Broadcast Station: 2 years; if you are a cable company: 3 years.

Barry - What about the State and Local Area Plans? Each station should have a copy of them, correct?

Clay - My recommendation is that all stations should have – *at the operating position* – where the person in charge of the station can find it, the following:

1. FCC Rules for Part 11.
2. The FCC EAS Booklet.
3. State EAS Plan.
4. Local EAS Plan.
5. Copy of the applicable monitoring assignments (usually part of the EAS Plans).
6. Specific Instructions as to how to operate the EAS equipment, logging requirements etc.

You will find there are some things found in the FCC's EAS Checklist that are not in the Rules. Personally, I would take the conservative approach. FCC inspectors certainly are going to be more pleased with a facility that clearly demonstrates it is *trying to be in full compliance* than one doing just enough to "get by."

WHICH MARKET TO MONITOR?

Barry - Here is an interesting question from a reader: "I have a question about hyphenated markets. We are in a market that covers two states. To make matters worse, my transmitter is in one state and the studio is in another. What do I do about monitoring?"

Clay - This is a very common situation and one the SECCs of the two states should have resolved long ago. The first step would be to contact both of them and ask for direction.

For example: in setting up EAS in Washington State, the Washington SECC "gave" Clark County, Washington to Oregon. Clark County – and its largest city, Vancouver – is just across the river from Portland and clearly in the Portland area. Therefore, those facilities licensed in that county work with the Oregon SECC or the Portland LECC.

Kansas City is a good example of metropolitan areas that straddle a state line with no clear geographical boundary. In these instances, it is up to the EAS Committees that handle these regions to come up with clear and easy to understand instructions for those stations that are caught in the middle.

Another part of the solution: get more information into the hands of the stations, so they can determine whether the event affects their coverage area.

Even before the advent of EAS, some SECC and LECC folks in California created a system using Packet-Radio technology to distribute detailed information from governmental agencies to broadcasters. They call it EDIS.

Frankly, I feel that many areas should have an EDIS system; it is just that they do not know the solution has already been invented. Check out http://www.edis.ca.gov for more information.

According to NOAA, Clay Freinwald is a official Hero. The Senior Facilities Engineer for Entercom in Seattle, was named "National Environmental Hero" this past spring. Hero Clay welcomes your EAS questions at k7cr@wolfenet.com

Subcarrier Radio: FM's Hidden Gem

Part 2: Making it Happen on SCA

by Robert Sims

SCA transmissions can serve many needs, from IFB to remote control to a secondary program channel, separate from the main channel. In Part 1, Robert Simms discussed how SCAs work. In Part 2, he shares some of what made a Texas project into a success.

[PHARR, Texas - October 2004] Recently KVMV-FM, the Christian Broadcaster in Pharr, Texas, modified its programming by shifting a number of its preaching and teaching programs to one of the SCA channels. By doing this, the station was able to maintain service to a large number of our more dedicated listeners.

IMPLEMENTATION

Once we had the equipment up and functioning, we still had to go through the licensing procedures with our programmers. Just because the FCC does not charge us anything to use the subcarriers does not mean we do not have obligations; program material is copyrighted after all, and real people put real time and real resources into producing it. What goes around comes around: do not stiff the programmers.

SCA program generation and monitoring.

Religious programming by nature is designed to reach out to people and we found many programmers excited about getting additional coverage and reaching more people. Non-profit differs from commercial broadcasting in how fees and programming costs are handled, but with some creative thinking mutually satisfactory agreements can be reached.

Were we to do music broadcasting, licensing fees to ASCAP, SESAC, and BMI would apply, though at a lesser rate (assessed on a per-case basis).

PROMOTION

Promotion is for the creative. If you are not much at creative marketing, find someone who is creative. Niche products and services *must* be well promoted if they are to catch on!

At KVMV, we rolled out our subcarrier with a mass mailing and simultaneous promotion on our website. We also gave it frequent mentions on the air. Although we had no clue what to expect – good, bad, or otherwise – the combination yielded a great response. Inquiries and orders for the fix-tuned subcarrier receiver we offered started coming in immediately.

CHOOSING THE RECEIVER

There are some considerations to bear in mind. When determining which subcarrier tuner to use, keep in mind that among the low-cost consumer models of tuners available, *performance and aesthetics vary widely*. Performance should be your main concern, but do not discount looks as it is a big factor in the decision to buy. Consumers generally assume the product you are selling is quality (otherwise you would not get the sales) and then make their decision based on looks.

Taking the responsibility for providing a quality receiver on your shoulders, pick carefully. Once you have choices narrowed down to a handful of receivers with roughly equivalent performance, select the one that looks the best. Throughout this process, test the radios yourself. Loan a few out to your staff members and have them test the units. Get their feedback. They are the next best thing to your listener, so do not overlook them.

After our tests, we settled on the MS-922 S model from MetroSonix in Bayonne, New Jersey (www.metrosonix.com). It offers solid tuning (the SCA frequency is locked, with normal reception available across the rest of the FM band plus AM) at a reasonable cost per unit. It scores about average in the looks department, but it was what best met our specific needs.

Since decent reception of your subcarrier service will vary with terrain, common sense indicates you should not sell a product to someone who will not be able to benefit from it. Therefore, use your earlier testing to define the areas from which you will accept orders. Note that returns will cost you more than the money you hand back. And, the old marketing adage truly applies: a satisfied customer will tell a friend, a dissatisfied customer will tell ten!

SCA generally should not be expected to reach much beyond the inner 50% or so of your coverage – and that is being generous. So, the more testing you do ahead of time, the better equipped you will be when you begin promoting and distributing the tuners.

MAINTAIN CONTACT WITH LISTENERS

Once your tuner sales are underway, do not let the follow-up escape your attention. Your own experience will tell you how much your listeners can bear. The occasional letter sent to those who have purchased receivers to remind them of the value and potential of the broadcasts they hear will serve as an encouragement to support your ministry or cause. If you overlook this key part of the equation, you have effectively doomed your efforts.

Of course, I am approaching this from a religious broadcasting perspective, but the same could easily apply to a public radio station or a community station with a limited budget. Commercial broadcasters would probably be best suited with a subscription-based business model where you retain ownership of the receivers. In that case, you could afford to spend more on the receivers to get the professional "look."

POSSIBILITIES

Consider the opportunities afforded by subcarrier broadcasting: Does your community have a large ethnic population? Perhaps a dominant denomination or religious persuasion exists in your coverage area. Is a local station meeting their needs? Probably not. Most broadcasters do not aim at niches with their primary signal. Here then is your chance to provide a valuable targeted service for your community, promote goodwill for the station, and last but not least, maybe even bring in extra income on the side.

If you do not have the manpower necessary to make it a realty, consider renting out a subcarrier channel to an outside group. You retain ultimate control (and responsibility) for the subcarrier, but you do not have to do the work to generate and arrange the programming. If no one is interested it renting out a subcarrier channel 24/7, you can always block it out by dayparts. The only limitation is your own creativity and motivation.

AND THE TECHNICAL AND LEGAL STUFF... (VERY IMPORTANT)

Most audio subcarrier broadcasting takes place on the 67 kHz and 92 kHz portions of your FM carrier wave. While FCC regulations no longer specify the location of subcarrier channels within your FM carrier, it is generally accepted practice to position them as discussed earlier. Standardization is a good thing (and it cuts back on the specialty manufacturing costs).

Once you have these two additional subcarriers in place, your space is pretty well used up. It is conceivable that another could be squeezed in with some adjustments made to everything but the FM and pilot portions (which must remain where they are), but then you get into situations where crosstalk and bleed become more likely to be picked up by anything other than high-end receivers.

Subcarrier tuners are subject to some regulation by the FCC that date back to the original SCA authorization and which were not voided by the deregulation of 1983. Specifically, is illegal to use a subcarrier tuner to receive broadcasts which you are not authorized to receive. Ambiguous, yes, but that is how it is written. It was designed to prevent businesses from tapping into background music transmission for which they had not paid a fee, or others from getting confidential broadcasts, not intended for the general public.

The best way to enforce the regulation was to limit the sale of tuneable subcarrier receivers. Fix-tuned subcarrier receivers offer much less functionality to the unauthorized user, but also offer the stability of locked-in tuning which can otherwise be quite fickle. After all, the less work your listener has to do, the happier he is!

That said, there are kits available (from companies such as Ramsey) that will allow you to tune the subcarriers across the entire FM band. These "gray-area" tuners are intended for use strictly by hobbyists and engineers. The sale of such tuners is not specifically limited, because the required skill to assemble them is prohibitive to the casual listener.

The Ramsey SCA-1C

However, should a purchaser tell the seller that he intends to use the tuner for illegal purposes, the seller would be prohibited from completing the transaction (the same policy that applies to the retail sale of scanning equipment). If you are interested in finding out what's available on subcarrier but do not want to assemble a kit, several companies sell custom-modified tuners (using the GE Super Radio II or III chassis) ready for use. But, the law mentioned above still applies.

CONCLUSION

As an FM operator, you have a choice. Will you go on as normal and overlook an opportunity? Or, will you consider the possibilities of having one or two more stations "within" your station, using mostly equipment you already have, to provide services which can benefit you and the community you serve? Any good thing takes effort, but the payoff can be of great value.

When this article was written, Robert Sims was a producer and the Webmaster at HCJB/World Radio Network affiliate KVMV-FM in Pharr, Texas. Robert is happy to respond to your questions on SCA matters. Contact him at: bobosims@juno.com

Solutions Cookbook

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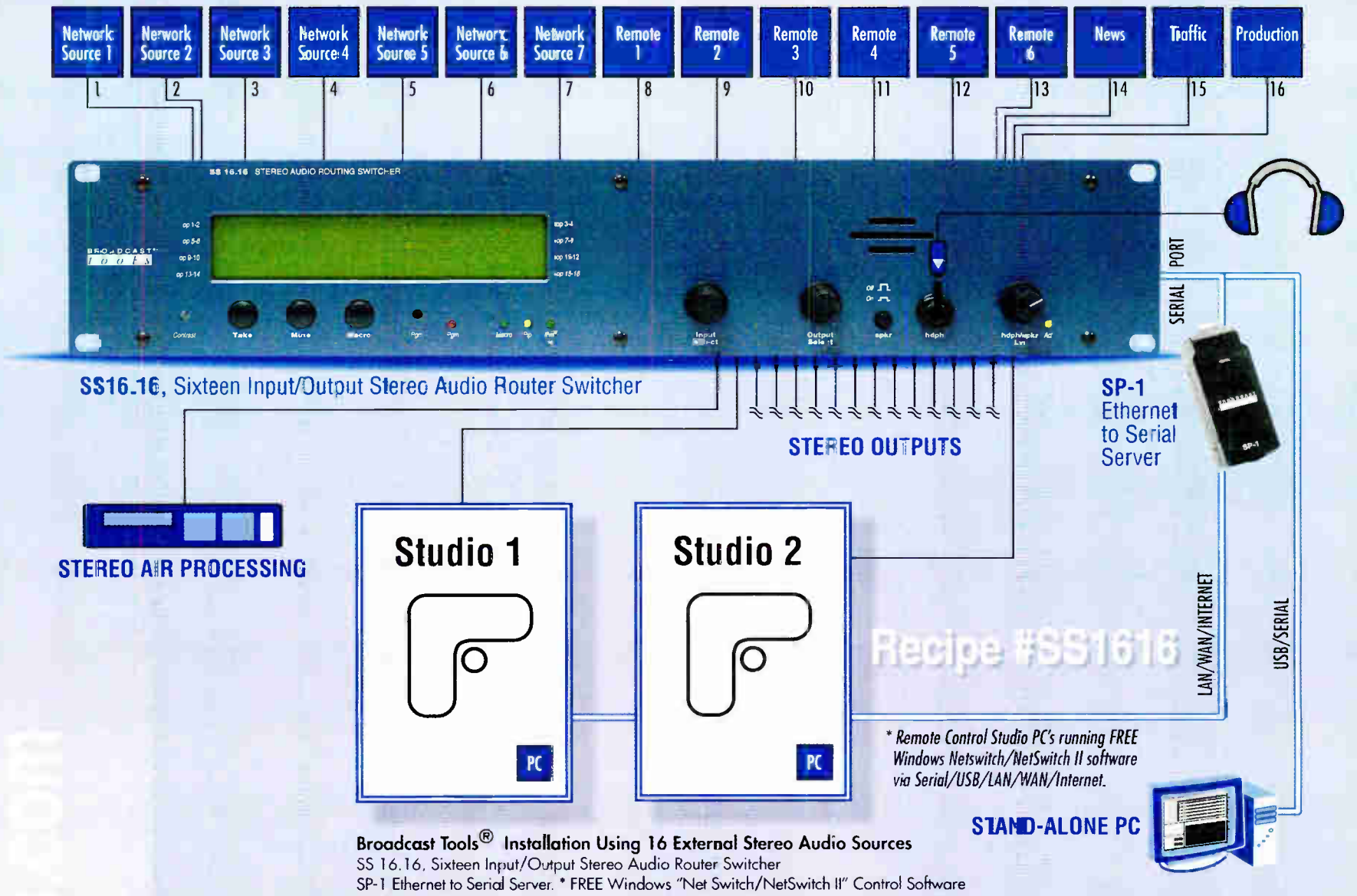

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BROADCAST tools

Restoring Old Radios

Part 2: Refurbishing the Electronics

by Allen Singer

Rebuilding an old radio can be a rewarding experience. In part two of Allen Singer's discussion, he turns his attention to rebuilding the radio electronics.

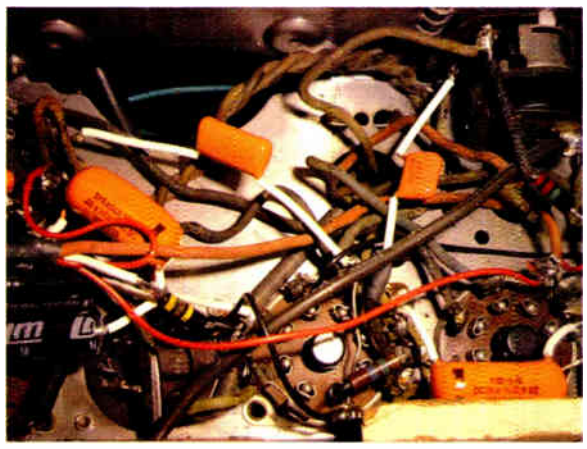
[CINCINNATI, Ohio - October 2004] As with most projects, one of the secrets for successfully rebuilding an old radio is to take the time to do it carefully. Among the hassles it prevents is repeated disassembly to repair or replace "just one more part."

CHECK EACH PART

Not just the electrolytics, but each part should be inspected and tested. Even if they look OK, they may have deteriorated over time. For example, checking each resistor with an ohmmeter will turn up very old resistors changed in value due to overheating or moisture absorption. Such bad resistors can cause the radio to play with crackling and popping bursts of static.

Other parts in the chassis may need replacing as well. Check the transformers; a shorted transformer will pass no audio. The line cord will almost always need to be replaced. You can go retro and replace it with a rayon-covered cord, either from your spare parts box or purchased new. The cheapest alternative is to buy an extension cord from the dollar store and cut off the end.

Most (if not all) internal wiring will need to be replaced as well. Any appropriate same-gauge wire will work, although some restoration purists insist on using the same style of wire used when the radio was built. This option is left up to the individual restorer since this is an aesthetics issue rather than functionality. If you are restoring the radio for someone who is paying you to do so, you may want to ask what the client prefers. Chances are, wire type will not be an issue.



New capacitors can be "hidden" under the chassis.

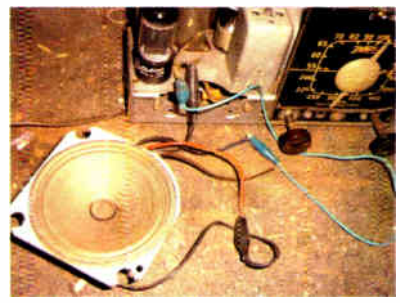
Speaking of aesthetics, oftentimes "can" capacitors are mounted on the chassis next to the tubes. These cans typically contain two or three capacitors inside sharing a common ground. Obviously these need replacement as well, but it may be difficult to find a new one exactly like the old one. For appearance sake, it may be best to leave the original capacitor in its place, simply disconnecting it and installing new capacitors underneath (inside) the chassis.

MORE PARTS

The on-off/volume switch will need to be thoroughly cleaned with contact cleaner; moving parts should receive drops of 3-in-1 oil. Replace a broken tuning string with a genuine tuning string – ordinary kite string will not work. If the pilot light bulb is burned out, a common replacement can be found at Radio Shack. If you leave the burned-out bulb in place when you prepare to turn the unit on for the first time, you may be surprised when none of the tubes light. Often, the bulb was an integral part of the circuit, and the radio will not work without it.

The radio's speaker can be a hassle to replace. If you are very lucky, the speaker might be in good enough shape to keep. If not, you will have to look for a new one. This can be tricky since not all speakers fit all radios. This can be an occasion when a spare-parts radio can come in handy.

With some effort, an old used speaker can be modified to fit the different chassis. The original speaker might have contained two wires, and the replacement might have four or more.



When this is the case, you must use your schematic and electronics skills to get the unit to sound just right.

IF AT FIRST YOU DON'T SUCCEED

Chances are very good, though, that the radio will not play. Perhaps one of the tubes does not light. Maybe you only hear faint static as you turn the tuning dial. Or the radio plays, but you hear monstrous static bursts as you tune. This is the most frustrating part of the restoration. In times like these, you must take a break. Walk away from your bench for a few hours, or even a day or two to let your mind rest so you will be refreshed when you begin the aggravating troubleshooting process.

When you are ready, get the schematic and examine the components in the chassis. Check all solder connections, resolder leads to the tube sockets – even if you did not touch them before. Look for any misplaced leads or components. The problem is never obvious and can take a while to locate. Your oscilloscope will be useful here, and if worse comes to worst, you can always find a radio restoration website and email for advice.

It is impossible to list here all the different scenarios that could be wrong with the radio. But with diligence and patience, you should be able to locate the problem. Even if not, the radio can always sit on the shelf to serve as a source for future repairs.

Allen Singer is a freelance writer in Cincinnati. He writes on broadcast topic, and has a new book on the Cincinnati subway system coming soon.. You can email Allen at allensedge@yahoo.com

Tech Tips

An Inexpensive Temporary Dehydrator

By Jeremy Storm

Many times dehydrators are installed at transmitter sites, and never checked again until there is some major problem. If you find yourself with problems at an odd time, here is a solution that works in a pinch.

[HILO, Hawaii - October 2004] If one of your transmission systems uses a dehydrator, you might find this useful.

Hilo, Hawaii has two distinctions. We have the highest rate of interracial marriages, and the most annual rainfall of any U.S. city. I am not sure if the two are related, but here "where the rain reigns" would be a good place to test my idea.

TROUBLE CALL

One day the low pressure alarm status indicator at one of our FM sites lit up at the studio. I arrived at the site and found the dehydrator compressor making a terrible grinding noise. It seems it threw its needle bearings along with other metal bits, and by the time I arrived, it was well on its way to a meltdown.

The transmission line at this site is a bit leaky so setting up nitrogen gas would be impractical. Until parts arrive (or the bean counters let you replace the compressor – at a cost of something like $1400), what can an engineer do to keep things operating?

A LOW VOLUME COMPRESSOR

All we really need is a low volume moderate pressure compressor, something like an aquarium pump. These are capable of making a peak pressure of 4 psi, and will pump up to one liter per minute at no pressure. It would be perfect for our needs.

I know dampness in a home closet can be controlled with DAMP-RID. This is an inexpensive chemical (calcium chloride) dryer. This, along with the aquarium air pump, seemed like a natural.

To construct my emergency dehydrator, the following items were bought locally *for a total of $23.*

(1) Aquarium air pump.

(1) Aquarium tee with valves.

(1) Plastic box with snap on lid, size: one cubic foot.

(1) Container of DAMP-RID (and an extra box of chemical).

(1) Length of plastic hose for aquarium pump, enough to run to the RF feed line gas barb.

PUTTING IT TOGETHER

Set it up like this:

Cut a three (3) inch section from the hose to connect air pump out to the input on the tee.

Connect the remaining hose to one output on the tee and open its valve. (This will connect to the feed line later.)

Close the other valve.

Cut a 1/2 inch hole in the lip of the box lid just large enough for the output hose and compressor power cord.

Activate the DAMP-RID container by pouring in the pellets.

Put the DAMP-RID container, air pump and tee valves into the box and close the lid.

Connect the output hose to your feed line gas barb.

Wait a few minutes for the air to dry then plug in the air pump.

After a few more minutes the pressure will reach 4 psi.

Finally, lift the lid and open the closed bypass valve slightly so the pressure drops off to 1 or 2 psi.

This will make sure air is flowing through the pump and the small draft will help circulate the air in the box. Replace the lid and sit back to enjoy your handiwork.

MINOR TASK

This dehydrator is not automatic so be sure to check the DAMP-RID container monthly and add or change the chemical before it turns into a liquid.

The aquarium pumps are very reliable and should not be a source of trouble during the time it takes to repair your very expensive automatic dehydrator.

Jeremy Storm is a contract engineer for a gaggle of AM and FM transmitters located in Hilo and Kona on the Big Island of Hawaii. Contact him at jstorm@pacificradiogroup.com

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The Radio Guide Tech Initiative

As announced at the NAB 2004 Radio Show, **Radio Guide** magazine has embarked on a **Tech Initiative** to encourage the sharing of technical knowledge and experience among the engineering community.

As part of this outreach to encourage information sharing, a number of manufacturers have already contributed over $15,000 of gear, to be awarded to the best submissions. Some of the items include:

Audion Labs VoxPro Digital Audio Editor

Broadcast Warehouse DSP-X Digital Processor

Comrex DH-20 Digital Phone Hybrid

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rfSoftware rfInvestigator (full package)

Orban Optimod 1100 Processor Card

What we are asking is for you to share your Tech Tips, User Reports and War Stories as well as longer articles on topics that interest you, from studio construction or renovation, to transmitter site maintenance, or the way in which you research new equipment purchases.

Do not worry about being a perfect writer; we will help you get it done. And besides the personal satisfaction of "giving something back," you will earn recertification credits from the SBE, a check from **Radio Guide**, and the chance to receive one of the special awards.

More details will appear here. In the meantime, please address any questions or submissions to Editor@radio-guide.com.

Keeping an Old Studio Alive

The WFLR "RCA Kit"

by James Schreck

The Antique Wireless Association (AWA) has, since its founding in 1952, encouraged the preservation of electronic communications history. At their Annual Conference, held this past August in Rochester, NY, quite a few enthusiasts shared displays of old equipment. This year's theme was "Broadcasting" and Jim Schreck shares some pictures of his winning display in the "Studio" category.

[GENEVA, New York - October 2004] A cache of RCA items was recently unearthed from the basement of WFLR Radio, Dundee, NY. Dating back a half century, I was thrilled to be able to acquire some of them for my personal collection.

READY TO COLLECT

Knowing of my love of old radios (or anything found in the tech closet!), both our general manager and operations director have supported my acquisition of any old gear being tossed out. Anytime the back room has gotten cleaned out, they have either offered me the first pick, or (literally) I went dumpster diving for what was tossed.

After the announcement we would be purchasing WFLR, they told me there was plenty of "old stuff" at the Dundee location. When I finally got down there, many items in the attic already were marked "save." But, as it turned out, the stuff I found most interesting was on a dark forgotten shelf in the basement.

According to a former station employee, these represent what remains of an "RCA Kit," purchased when 1570 WFLR began broadcasting in 1956. According to him, such "kits" typically included all the necessary equipment to put a radio station on the air. The station engineer notes that this board was on-line and in use from 1956 through the mid-1980s.

OLD STUDIO CONTEST

Shortly thereafter, I learned the theme of this year's 43rd annual Antique Wireless Associations equipment contest would be Broadcasting, so I decided to enter the RCA collection in the contest.

With only a light cleaning, the mixing console, modulation monitor and microphone are presented just as they were discovered in the WFLR basement. (Due to surface corrosion, the top portion of the BN5A remote amplifier had to be stripped and repainted.) Much to my surprise, the display took the blue ribbon in the Studio Equipment category!

James Schreck with his RCA gear display.

In the collection you can see an RCA BC5B mixing console, M1-11470A speaker cabinet, a BK-1 microphone, a BW66E modulation monitor, and a BN5A remote amplifier, used to broadcast local football games.

An RCA Model BW66E Modulation Monitor

Of all the items, the speaker cabinet fared the worst. In addition to missing one side panel and both original drivers, the front was modified in the past with a bass port and an enlarged hole for the replacement horn. One of the cabinet ends also suffered water damage and was re-glued, sanded, and painted in an attempt to maintain as much of the original wood as possible.

AWA HELPS PRESERVE HISTORY

The AWA maintains a museum of radios, transmitters, and other items related to electronic communication. Curator Ed Gable (K2MP) presides over more than 25,000 artifacts going back to 1901. The AWA Museum is located at 187 Lighthouse Rd., Hilton, NY 14468, just outside Rochester, NY. Information on the museum or the Association can be found at www.antiquewireless.org

Jim Schreck is Production Director for the Fingerlakes Group of stations, as well as afternoon drive host on WNYR-FM. Contact him at gtrtoys@lynnet.com

Consultant Guide: Radio Consulting Engineers

Tips From the Field

A Minidisk Toggle Switch

by David Forsman

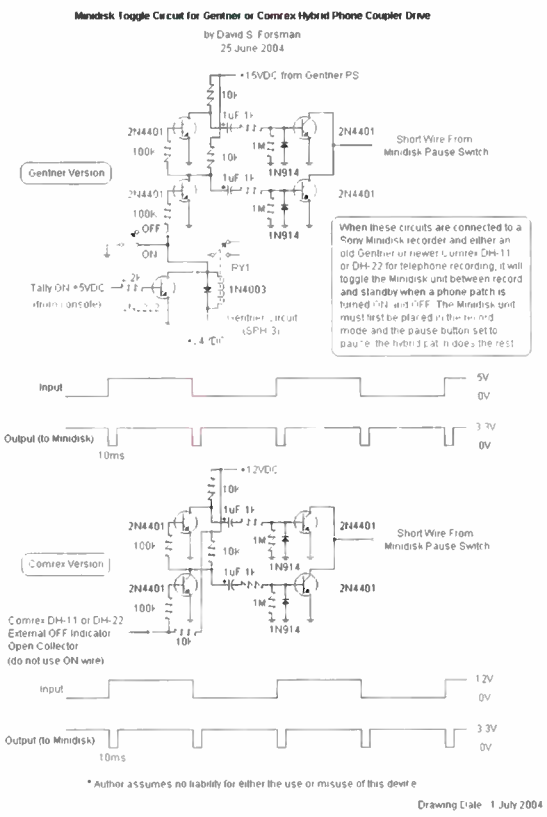
[LEWISTON, Idaho - October 2004] Do you have a need for a quick way to record telephone calls from listeners? The following details a small, inexpensive "toggle switcher" that I constructed to drive the Sony Minidisk recorders in our stations.

This switcher is actually the latest version of an older relay-capacitor-resistor circuit I designed and used for many years at KOZE-FM here in Lewiston, Idaho. The circuit replaced the older mechanical-electrical circuit recently when we installed a Wheatstone D-16 in their FM control room. Thus far, it seems to have worked out well.

PUTTING IT TOGETHER

I connected the Minidisk to this circuit with a short two-foot piece of audio connection cable using an RCA plug on one end (the Hi-Z kind that you use for connecting consumer Hi-Fi and video equipment). I soldered the center wire to the high side of the pause button and the shield to its ground on the front panel circuit board. There is usually a hole in the bottom of the Minidisk units that can be used to route the cable through, or you can drill your own.

The mixed output (caller plus send audio) of the Gentner or Comrex hybrid box is fed through a 6 dB attenuator (10 k resistor divider) and into the Minidisk. The Minidisk is first put into the record mode and then placed into pause. As the hybrid is turned ON and OFF, the Minidisk toggles between record and pause. Each caller generates a separate audio file.



In the case of the Comrex DH-11 and DH-22, the OFF indicator open collector output should be used to drive this circuit. This is because when a caller is ringing the line, the ON indicator open collector output conducts to indicate each ring and would give a false toggle to the Minidisk.

AUDIO SKIMMING ADAPTATION

This circuit could also be used as an "audio skimmer" if it were to be activated with the tally light of the microphone circuit of an audio console instead of the phone channel tally.

The Minidisk does not care which function (ON or OFF) triggers the circuit, since there is always an ON for every OFF. The ON/OFF switches of the Gentner or Comrex are used to answer the phone line, and the MIC source is fed into the send audio input for off-air recordings. Naturally, the program mix-minus is used for send during on-air.

The goal was to build a small, cheap circuit with the flexibility to handle these functions. Thus far this seems to be the best one I have built. I hope that you find some use for it, too.

David Forsman is Chief Engineer for KOZE and KATW in Lewiston, Idaho. He has designed all manner of circuits to solve problems at the transmitter and in the studio. You can contact David at shampoo@syringa.net

Gear Guide: Towers – Antennas – RF Parts & Components

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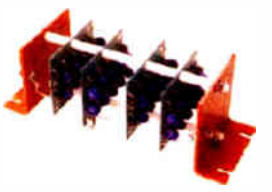

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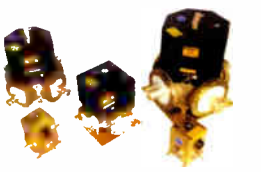

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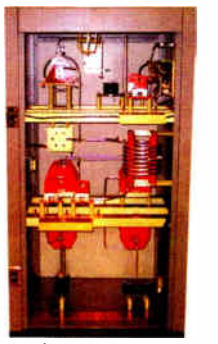

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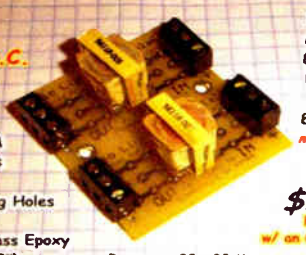

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October 22-23 – Grapevine, TX – www.sbe67.org

Bos-Con Boston SBE Regional Convention
October 26-27 – Boston, MA – www.sbe11.org

Audio Engineering Society
October 28-31 – San Francisco – www.aes.org

IBS - Intercollegiate Broadcasting Chicago
October 30 – Chicago – www.collegeradio.tv

PA Assoc. of Broadcasters Engineering Conf.
November 4 – Hershey, PA – www.pab.org

National College Media Convention
November 4-7 – Nashville, TN
www.collegebroadcasters.org/convention.shtml

IBS - Intercollegiate Broadcasting Boston
November 6 – Boston – www.ibsradio.org

IBS - Intercollegiate Broadcasting Los Angeles
November 13 – Los Angeles
www.collegebroadcasters.net

Canadian Association of Broadcasters
November 27-29 – Ottowa – www.cab-acr.ca

Sencore DAG5161 Digital Audio Generator

Sencore Electronics introduces the new, portable DAG5161 Digital Audio Generator that tests digital audio equipment and makes room acoustic analyzing faster and easier.

Sencore Electronics, Inc. announces a new handheld, multi-channel digital and analog audio generator that provides stereo, Dolby 5.1 and DTS 6.1 surround, PCM digital audio from industry standard AES/EBU and S/PDIF coaxial and toslink outputs for testing professional and consumer audio systems and performing acoustic tests.

The Sencore Inc. DAG5161 boasts 8 automated tests, all digital and analog formats, performance capture, and reports among some of its features.

The battery operated DAG5161 teams with the Sencore SoundPro Audio Analyzer for eight automated tests of A/V receiver and room acoustic calibration. The DAG allows installers to switch between speaker channels seamlessly to simplify calibration.

The DAG5161 provides all the test signals needed for audio testing and room acoustic analyzing such as variable frequency test tones, pink noise at various bandwidths, and impulse waves.

All common digital and analog formats that are contained on audio consumer products are available, along with all the output options you will need. Analog outputs include dual phono and stereo minijack, while digital output options include AES/EBU and S/PDIF outputs.

An audio installation technician using the DAG5161 will be able to run automated tests, capture the performance of the system, and make the necessary manual calibrations based on the test results. This system will be much more accurate and efficient than other manual calibration methods.

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New Heavy Duty CAT-5 Cable for Remotes

This one of the coolest things we have seen in a long time! A CAT-5E cable with a rubber jacket for heavy duty remote use! Gepco calls it their "Tactical" CT504HD Category 5E cable.

An ideal solution for portable or remote patching of Ethernet networks or digital audio/video formats utilizing CAT5e type cable, the CT504HD was created to meet the increased demand of audio/video professionals who need a rugged, reliable, portable and flexible cable solution. The CT504HD is intended for use with Neutrik EtherCon connectors, and is also available as pre-terminated cable assemblies.

Traditionally, electrical performance and bandwidth of conventional CAT5 cable is degraded through physical damage. However, Gepco has addressed this issue with the introduction of its CT504HD by utilizing a unique double jacket construction. The inner jacket of the CT504HD allows the pair to have proper physical spacing in order to achieve EIA/TIA CAT5 specifications, while the durable TPE outer jacket protects the cable from physical damage or abuse. In addition, the CT504HD utilizes stranded 24-gage conductors that enhance the cable's flexibility and flex-life durability.

"The concern among CAT5 cable users in the professional audio/video industry has always been that it isn't durable enough to handle the traditional wear and tear associated with the workload," stated Scott Fehl, Gepco's Products Development Manager. "Ideally, typical CAT5 cables should only be used in permanent installation environments because the electrical performance often suffers under constant wear. Our CT504HD was designed specifically to meet the needs of portable applications."

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Heading the office will be Dean Tiernan. Dean was Product Manager of Audicy, Orban's Digital Audio Workstation, and worked for Orban in a product management and technical support role for 7 years.

Dean will be based in San Luis Obispo, CA and will be joining ENCO Systems' support team working with the radio, television and fixed sound markets.

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