Radio Guide

Radio Technology for Engineers and Managers January 2007

This Month's Gear Guide – Codec and Telco Products

Fire Safety for Broadcasters

Inside Radio Guide

Fires are not generally considered to be good things to have in your facility. Having the right portable fire extinguishers in place to handle emergencies is essential. Of course, that is of little help if the staff does not know how to use them – or where to find them.

Fire extinguishers are designed to extinguish or control small fires. It is quite possible that the use of the wrong kind of extinguisher might actually result in more damage to the equipment than the fire itself. Last month, we learned the proper type of extinguisher to be used on your delicate electronic equipment. This month we will learn what everyone in the building should know.

Radio Guide

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January 2007

Cover Photo

Joe Raisor and Tina Corcoran from the St. Johns County (FL) Fire Rescue instruct the WFOY staff on the proper use of a fire extinguisher.

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Radio Waves

by Barry Mishkind – Editor

MOVING AHEAD AT FULL SPEED

Hold it a minute! If you're like me, you need to put several "Post-Its" around as reminders that dates no longer have a "6" at the end. Otherwise, checks, logs, even memos will tend to occasion a grin from recipients, as if we really were living in the past.

But, no. It's time to start racing ahead into the new year. New budgets become available, new projects to get started, new products from the manufacturers to check out. And, for us here at ***Radio Guide***, a chance to review what we accomplished in 2006 and what we want to do in 2007.

Based on the feedback from our readers, we're justifiably proud of what we're doing – but we want to do better.

As you look through this issue – and subsequent numbers – you'll notice we've made some changes. Some are immediately obvious, others are more subtle. Each is an attempt to respond to requests from our readers to present articles in a better, more usable way. You'll see some new features this year, as well as some enhancements.

For example, many folks have asked how they can more easily access information from manufacturers and user reports. In response we've beefed up the material in our Gear Guide section and plan more user articles from real people who write about their experiences with the gear.

Additionally, the information will be posted on the Internet, at www.radiogearguide.com This new service will let you more easily find the latest information and user reports, clearly labeled so you know what is from the folks in the trenches and what is PR.

Our AM Transmission Seminar in Orlando is another response to requests for bringing education out into the field. Perhaps we'll see you there (Page 2).

What else can we do to make ***Radio Guide*** more valuable to you? Please feel free to direct your thoughts and suggestions to editor@Radio-Guide.com or to the address on this page. We're here for you. – *Radio Guide* –

Portable Fire Extinguishers in Broadcast Facilities

Part 2: Installation, Maintenance, and Training

by Patrick M. Griffith

Fires are not generally considered to be good things to have in your facility. As Patrick Griffith discussed last month, having the right portable fire extinguishers in place to handle such emergencies is essential. Of course, that is of little help if the staff does not know how to use them. In Part 2, Griffith explains what everyone in the building should know.

Fire extinguishers are designed to put out or control small fires. Meanwhile, it is quite possible that the use of the wrong kind of extinguisher might actually result in more damage to the equipment than the fire itself. Last month, we demonstrated the need to consider what type of extinguisher you would prefer to see used on your delicate electronic equipment.

The potential for damage can be reduced by placing a more *friendly* type of extinguisher in the area of concern. But what if the fire blocks safe access to that extinguisher? What if one extinguisher is not of sufficient size to control the fire? What if it malfunctions? You must also give consideration to the next closest fire extinguisher to the area being protected. You will want that extinguisher to be of the same type. And you will want its location to be known to the employees who work in that area.

Ideally, all employees should become familiar with the locations of several fire extinguishers closest to their work areas. And education of employees should include recognition of the various types of extinguishers and why they are located there.

INSTALLATION

Proper placement and installation of fire extinguishers can greatly affect the positive and negative results of their use. The National Fire Protection Association (NFPA) has developed a comprehensive guide known as *"NFPA Standard 10, the Standard for Portable Fire Extinguishers."*

Many jurisdictions rely on this standard and have adopted it as law. The NFPA standards can be searched and viewed on the Internet. These standards are updated frequently, so be sure you are viewing either the latest edition or the edition that is currently in use in your community.

Standard 10 specifies that fire extinguishers shall be located in plain view. In locations where it might be difficult to locate them in plain view, signage should be installed to help direct occupants to them.

A fire extinguisher must be off the floor, but not so high as to make it hard to reach.

The extinguishers should be located along normal paths of travel including exits from the area, mounted securely on hangars or brackets specifically designed for that purpose. They should be mounted so that the bottom of the extinguisher is at least four inches above the floor. Extinguishers with a gross weight under 40 pounds should be mounted so that the top of the extinguisher is five feet or less above the floor. Heavier extinguishers should be mounted so that the top is three and a half feet or less above the floor.

Fire extinguishers should be sized and located on the basis of anticipated hazards. Class "C" rated extinguishers are required where electrical equipment might be encountered.

The actual size and number of extinguishers required should be determined by the local Authority Having Jurisdiction (AHJ), as described in Part I. However, the rule of thumb for ordinary class "A" hazards is that the maximum travel distance from any location within the structure to the closest class "A" rated fire extinguisher should be no more than 75 feet.

INSPECTION AND MAINTENANCE

The NFPA requires that all fire extinguishers be inspected and maintained by a person who has been trained and certified to reliably perform that service. Inspection and servicing should be performed at least once every twelve months.

Anytime an extinguisher must be removed from service for maintenance it must be replaced by an extinguisher of equal or higher rating. Any extinguisher that has been discharged or found to be deficient or inoperable must be serviced or replaced immediately.

Each extinguisher should be equipped with a tamper seal and an inspection tag indicating when it was last serviced or inspected. A basic visual inspection to ensure that an extinguisher is ready for operation should be performed at least monthly. A designated employee can perform this basic inspection to quickly ensure the following:

- The extinguisher is in the proper location.
- The extinguisher is not obstructed from view or access.
- The extinguisher has not been damaged or discharged.
- The tamper seal is intact.
- Foreign material has not been placed in the discharge tube.
- The pressure gauge (if so equipped) displays the proper pressure.

TRAINING IS ESSENTIAL

All persons who are expected to use a fire extinguisher should, at a minimum, receive some basic education concerning the operation of these devices.

Unfortunately, most people have never used a fire extinguisher. Proper operation requires the operator to perform certain functions in a specific order. Where employees have not received training, the operation of fire extinguishers might be seriously delayed or the limited contents of the fire extinguisher might be wasted due to the poor application of the product.

In some areas the local Fire Department may offer to visit your facility to provide a basic training class for employees.

In other jurisdictions the local emergency management (EM) agency may be another resource for fire extinguisher training.

Benefit from instructional programs provided by the local Fire Department.

Under guidelines issued by the Department of Homeland Security, many EM agencies now provide fire extinguisher training as part of a Community Emergency Response Training (CERT) program for members of the community.

PASS

Basic operation of most fire extinguishers can be summed up with the acronym "PASS," which helps the non-professional user to remember the key points of proper fire extinguisher usage.

This simple reminder can be especially important during the high stress of encountering a fire. Many small fires have grown into large fires because persons in the area were unable to properly operate the fire extinguishers at hand while under stress. PASS stands for:

- Pull the pin.
- Aim the nozzle.
- Squeeze the handle.
- Sweep across the base of the fire.

Practice sessions like this help staff to know what to expect should they need to use a fire extinguisher.

FIGHT OR FLIGHT

Since all fires can be dangerous, safe fire extinguisher operation involves a "Fight or Flight" decision process. The safety of people is always the utmost concern. No individual should ever be forced to fight a fire – this is a personal decision that must be made by the individual facing the fire.

Upon discovery of a fire, the employee must make several quick decisions. They must first decide whether they are safe to remain in the premises long enough to take further actions or if they should leave immediately.

Then, if at all possible (if the premises are so equipped), the fire alarm system should be manually activated. In some facilities this will alert other occupants to the problem. Additionally, this action may also automatically notify the emergency responders.

GET HELP

The next step is to activate the 911 system either from inside the premises or from outside. This step should always be performed, even if the facility is equipped with a fire alarm.

Calling 911 establishes two-way communications between the scene and the emergency responders to ensure that the message has been received and to provide additional information to responding authorities.

(Continued on Page 6)

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Portable Fire Extinguishers in Broadcast Facilities

Part 2: Installation, Maintenance, and Training

– Continued from Page 4 –

Activation of 911 should always occur *before* making any attempt to fight a fire. If enough people are present, one may notify 911 simultaneously while others fight the fire.

Again, the safety of the occupants is the number one concern. If a person does attempt to fight the fire and is unsuccessful or becomes injured or disabled in the process, not activating the local emergency responders first could result in the inability to do so later.

Trip the fire alarm, but also call 911!

ENSURE THERE IS AN EXIT

After notification of the emergency responders, if you do choose to fight the fire, it is very important to make sure that you always have a means of egress. Remember that most fires continue to grow in size as long as the fire tetrahedron is present. Some say that a fire doubles in size every two minutes. Never allow the fire to get between you and your safe exit from the area.

If the choice is made to fight the fire, use the buddy system if at all possible. A buddy can assist you, monitor your well-being, look out for hazards, call for help, or even rescue you if something goes wrong.

An important fact to realize is that most fire victims die from exposure to toxic smoke and hot gases coming from the fire. Some fires – even involving ordinary products that you work around every day – can emit deadly and invisible gas products that can kill or render you unconscious in a single breath. Some dangerous gases commonly resulting from fires in homes and businesses include carbon monoxide, hydrogen cyanide, hydrogen chloride, and phosgene.

THE RIGHT PRODUCT, THE RIGHT APPLICATION

Make sure that you have selected the proper type of extinguisher for the fire at hand. For example, if the fire involves energized electrical equipment, make sure that the extinguisher is class "C" rated. Before approaching the fire, make sure that the extinguisher works and that you are familiar with its operation.

Use a sweeping motion to maximize the use of the product in the extinguisher. And remember to aim at the base of the fire. Many people tend to spray the extinguisher at the flames. But you want to extinguish the fire at the source which is at the base of the fire.

Do not forget that a fire extinguisher contains a very limited amount of fire fighting material. Using short bursts may help to maximize the material in the extinguisher.

MAKE SURE IT IS OUT

If you are successful in extinguishing the fire, be sure to watch for a while to make sure that it does not re-ignite.

On the other hand *NEVER FIGHT A FIRE IF...*

- ... the fire is spreading rapidly. You may become trapped.
- ... you do not know what kind of material is burning.
- ... you do not have the proper type of extinguisher for the fire.
- ... you are at risk of inhaling the smoke.

Most people work near a fire extinguisher every day. But many do not know how to use one if needed. A small amount of pre-planning and safety training can go a long way toward minimizing the damage and reducing the injuries caused by a small fire.

Patrick Griffith, CBT, CBNT, CRO, is an employee of NRC Broadcasting, Inc in Denver, CO. His previous career was that of fire fighter/ fire investigator. A graduate of the National Fire Academy, he is a Certified Fire and Explosion Investigator (CFEI) and Certified Fire Investigation Instructor (CFII). Contact Patrick at antennawizard@hotmail.com

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Processing Guide

by Goran Tomas

Different Processing is Needed for Analog and Digital Uses

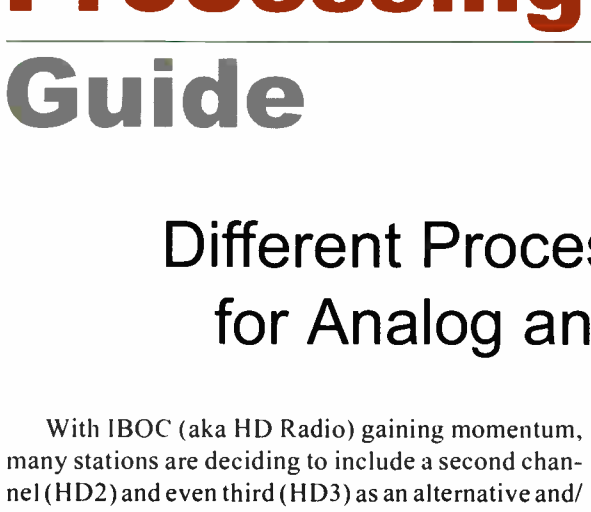
With IBOC (aka HD Radio) gaining momentum, many stations are deciding to include a second channel (HD2) and even third (HD3) as an alternative and/or additional programming to their main channel. Many broadcasters are also looking at streaming to the web as royalty fees are now clearly regulated and more people are using on-line multimedia services than ever before.

When it comes to processing for these new services – especially if they have different programming than the main channel – it is tempting to use your old FM processor that has been sitting as a backup. But that would be a mistake. In this article we will try to explain why and what are the requirements and the differences in processing for analog FM and digital channels.

PRE-EMPHASIS

If there is one crucial difference between a frequency-modulated channel and a digital one – it is that the latter does not require pre-emphasis!

Pre-emphasis has been a part of the FM transmission standard from the beginning. In a frequency-modulated system, noise has a triangular spectral distribution, which means it increases with frequency. The idea behind pre-emphasis and de-emphasis (a "mirror" reduction of higher frequencies in the receiver) was to increase the signal-to-noise ratio by boosting the high-frequencies in transmission and then reducing them by the same amount in the receiver, thus reducing the noise as well.



Pre-emphasis dramatically increases the amplitude of mid-range and higher frequencies.

Using pre-emphasis increases the total FM system signal-to-noise ratio by about 10 dB. However, pre-emphasis does introduce a particular problem: when processing for FM, the processor has to reduce the high-end by as much as 17 dB without introducing objectionable artifacts while doing so.

Over time, processing techniques have improved and modern processors cope with this problem rather well. However the consequence is that the high-end tends to be denser when compared to the original program material.

THE BANDWIDTH ISSUE

A digital system, on the other hand, requires no pre-emphasis and de-emphasis. From the processing point of view it is much easier and more natural sounding to process flat audio than having to deal with pre-emphasis. There is no unnatural high-end density build-up and the processing artifacts such as high-end squashing, smearing and hole-punching are greatly reduced.

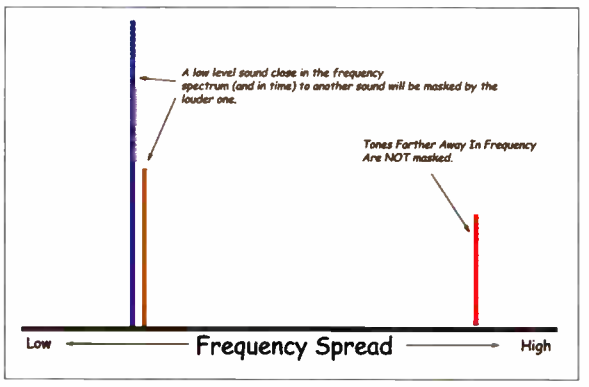
Thus the high-end can be much cleaner when processing flat audio. Therefore it can sound much more faithful to the original program material in regards to spectral density. However digital channels have limitations of their own.

The crucial one is bandwidth. Most of today's digital channels do not have enough bandwidth to pass full-frequency, full-fidelity audio. Nevertheless, we usually want to push even more audio – perhaps several audio streams – through each channel.

CODECS AND PRE-EMPHASIS

In order to utilize each digital channel more efficiently, we need to use data "compression" (or codecs – encoder/decoders) in order to reduce the amount of data, so that the information can be passed through the channel in real-time.

The data compression required – or more precisely, the data reduction – is usually achieved by removing audio information determined to be unnoticeable to the human hearing system due to psychoacoustic phenomena such as temporal and frequency masking effects.



Codecs can ignore the brown tone, as it is too close in frequency to the blue one to be differentiated.

If the requirements for such data reduction are moderate and modern coding techniques are used, the resulting audio can be indistinguishable from the original (the process is said to be transparent). However if high data reduction is required, the audio will suffer from more or less noticeable artifacts.

What does this have to do with pre-emphasis? Well, the problem lies in the fact that most codecs are particularly sensitive to higher frequencies – the part of the spectrum where most of the codec-induced artifacts are generated. More density in this area, caused by processing pre-emphasized audio, puts extra strain on the encoder and directly on its weakest link. The result is more unwanted artifacts.

BANDWIDTH AGAIN

Apart from pre-emphasis, there is another limitation fixed in the FM system: because the pilot (historically placed at the 19 kHz) must be sufficiently well protected for proper stereo decoding, the audio bandwidth must not exceed 15.5 kHz. In digital transmissions we do not have such a constraint and, in fact, can broadcast and reproduce full 20 kHz bandwidth if the bit rate and codec used allows that.

With very low bit rates or if the codec used inherently exhibits a distracting amount of high-end artifacts, experience shows that it is much better to slightly roll-off high frequencies before coding. With less audio spectrum with which to deal, the codecs exhibit fewer artifacts and so we increase the subjective audio quality.

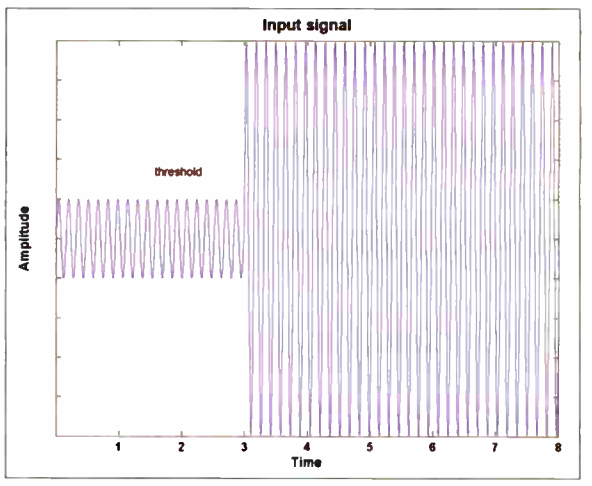
Newer and better quality codecs usually need only a subtle high frequency roll-off – if any. But with poorer performing codecs and when extremely low bitrates are used, a more drastic cut at 12 kHz or 10 kHz might be necessary.

In general, we want at least a full 20 kHz being processed for higher bandwidth, higher quality digital channels. But we also need to be able to reduce the audio spectrum when we have to deal with lower capacity digital transmission. What follows is that we want our FM processor to have an adjustable low-pass filter and not to be fixed to 15.5 kHz bandwidth.

PEAK HANDLING

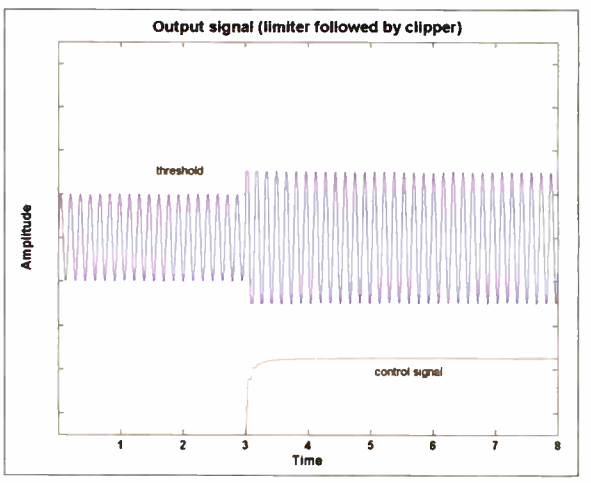
The third and final difference in processing between FM and digital delivery channels comes down to the way we perform final peak limiting. For analog FM broadcasting, a hard clipper (usually with some form of distortion reduction) is used.

Perhaps the hardest thing for a limiter to handle is a sudden spike in audio level. While the console or processor amplifiers can handle the audio cleanly, the limiter must prevent the spike from being passed to the transmitter and resulting in overmodulation.



An abrupt spike in audio level is a challenge for the limiter.

The main problem with the traditional limiter in this situation is the likelihood of some overshoot, as the limiter grasps and adjusts to the audio spike. One solution is to follow the limiter with a clipper that just "shears off" any peaks that get past the limiter.



Classic limiting produces overshoots that are then clipped off by the clipper.

Clipping is a very effective tool for performing peak limiting and achieving on-air loudness. However, the drawback of this technique is that it produces additional harmonic content.

Apart from degrading subjective audio quality, harmonic components generated by clipping add to

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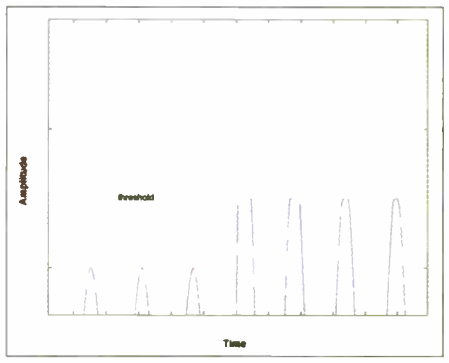
Processing Guide

by Goran Tomas

Continued from Page 8

the spectrum that is then subjected to the psychoacoustic coding, making it more difficult for the codec to distinguish between useful components and those which can be discarded.

As a result, the codec includes some of the harmonic content that is essentially distortion – and therefore unnecessary – at the expense of coding more of the original, and useful, audio information. The result is audio that gets further degraded.

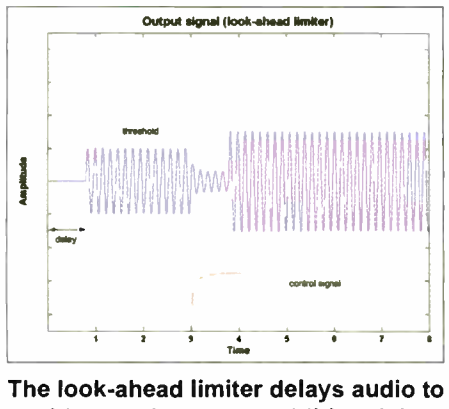


Clipping creates new harmonic components that the codec cannot differentiate from useful audio information.

THE LOOK AHEAD

To achieve better audio quality at the receiving end, we need to process audio to complement the transmission system (in this case the one that uses psychoacoustic coding) instead of working against it. In other words, what is needed is a peak limiting system that does not produce significant harmonic distortion. The BBC pioneered such a limiting system in 1967, called a "feedforward controlled delay-line limiter."

The idea behind it was to delay the audio path in relation to the control loop path in order to give the control loop time it needs to react to the incoming transient. The audio lags behind the control signal exactly the same amount of time the control loop needs to "attack" the envelope of the signal. Looking from an opposite point of view, the control part of the limiter looks ahead (before that part of audio is actually processed) hence the popular name "look-ahead limiter."



The look-ahead limiter delays audio to avoid overshoots or additional harmonic generation.

Using a look-ahead limiter, we now get no overshoots (the audio is precisely peak limited), while longer attack times that do not produce distortion of transients can be used. In addition, generation of harmonic components is minimized.

This is the primary reason for using look-ahead limiters (instead of clipping) in processing for coded audio. The audio is peak limited, but remains clean and produces better audio quality after psychoacoustic coding. As if to prove there never is a "free lunch" in processing, look-ahead limiting can produce gain pumping and inter-modulation, if used excessively.

Sophisticated designs and reasonable use of drive control, however, will produce a tightly peak-limited audio stream that is also free of noticeable artifacts.

THE RIGHT APPROACH

In the end it is clear that audio for a digital system should be processed flat without pre-emphasis. This will prevent high-end density induced artifacts, artifacts caused by inability to adjust filtering needed for particular codecs and bit rates used, reduced frequency response – where we really want full frequency response – and peak limiting that further degrades audio after coding.

If you just plug in your FM processor to process audio for HD radio or web streaming, not only do you loose all these benefits, but you actually employ techniques that are counterproductive for coded audio. Suffice to say that your digital will not sound as good as it could – and should!

FM processing is optimized for FM broadcasting and all its peculiarities. We need to treat digitally delivered audio with the same amount of thought and respect. Digital is here to stay, so why not make the best out of it?

Goran Tomas is a radio engineer and audio consultant based in Zagreb, Croatia. His passion is audio processing. You can contact Goran at: goran.tomas@post.htnet.hr

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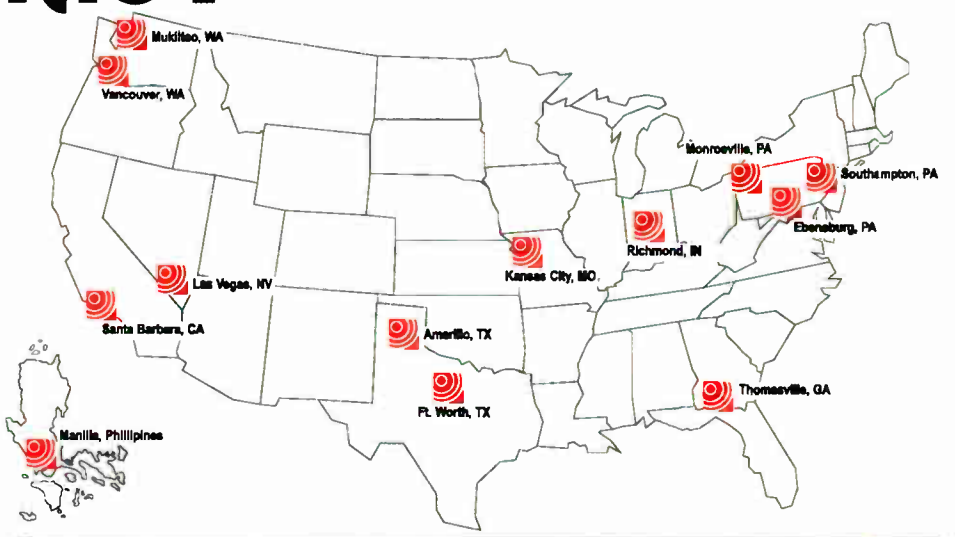

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Studio Guide

by Ted Alexander

Talk Show Tech

Getting it Ready to Go On the Air

In this third installment on planning and putting a talk show studio together, Ted Alexander reminds us that flexibility is the key to a successful project.

Once your pre-construction plans are complete and the equipment has been delivered, it is time to put it all together and get your new talk studio on the air.

STRAIGHT SIDEWAYS

While contemplating about the studio "final assembly" for this installment, I was thinking how nice it would be if your new talk show facility went together like a Heathkit. You do remember Heathkits, right? It was pretty straightforward: all the parts were supplied with a set of numbered step-by-step instructions. Just carefully follow the list and everything fits together and operates perfectly the first time.

In the real world, you often have to make it up as you go along. Changes happen. The furniture is on site and the room has had the carpeting installed. Plan on making last minute adjustments as final assembly takes place. Now the GM wants the talent to face an outside window and the PD wants the guests to have more room. So what can be done at this late hour?

One thing is certain in radio: nothing is "etched in stone." Some of those changing requirements will become apparent even before initial construction is completed. Other times you may need to try another direction to get the job accomplished. Therefore it is prudent to make your installation adaptable to changing requirements.

ANTICIPATING CHANGES

When installing the infrastructure, it is always wise to leave plenty of room for expansion in the months and even years ahead.

If yours is an analog installation, be sure to run plenty of extra wiring, leave some open rack space, and hope your analog board was ordered with space for a few more modules. Those runs of 12-pair cable may seem to have plenty of capacity today, but the system *will* fill up. Those fortunate to have a large enough installation may be able to afford a switching system for the control of studio inputs and outputs, which can enhance system capacity.

A system designed around audio via IP, such as Axia, really shines. It makes it a lot easier to add on additional inputs, outputs, and control, all interconnected via CAT 5.

THOSE UNEXPECTED NEEDS

Trust me, unexpected things will happen.

Think ahead to a morning where a guest comes in with his own keyboard and needs to connect to a line input on the board. What about an electric guitar? Will you have a place to plug in a drum microphone? Having one or two extra XLR's installed into microphone input channels are always nice to have when a band shows up and wants three or four vocal microphones.

Or, look at it from another direction. There may come an afternoon where a TV crew shows up and needs a "pre delay" program feed so they can cover your station's exclusive interview with the governor. Planning ahead allows you to be ready.

I have found that installing several "extra" XLR or other interconnects, wired to the appropriate studio input or DA output will allow someone to "plug in" an external device without having to run a long cable down the hall from master control – or clip-leading a bridging feed from the STL feed on the punch block. At one station, we even installed an outside XLR in a weatherproof box so we could broadcast occasionally from the parking lot.

Then there is the inevitable headphone crisis (aka lack of headphones). I have often found that when guests show up, you come up short on headphones. The production director does not want his classic PRO4AA's on someone else's toupe. My solution was to stock four or five $5 headphones in a "secret stash" in my office – just in case.

It is also worthwhile to plan for input isolation devices (transformer or distribution amplifier) to keep DC and hum under control. Along with those, add several line-level auxiliary outputs for the occasional external feed.

BUILD IN THE FLEXIBILITY

When installing the basic equipment, the computer, audio editor, microphones, and so on, it is so much easier and convenient to connect using the plug and jack method rather than hard wiring direct to a punch block – or even direct to a console input connector. Hard wiring everything to the punch block, or even the console, will cause you many hours of grief whenever anything needs to be changed.

For one thing, although we do not plan it that way, there are the inevitable times when some "emergency" makes it necessary to do some studio work while a show is live on the air. Pre-planning the infrastructure of the interconnects (for example, locating the punch blocks in a cabinet in the corner of the room rather than under the feet of the board operator or guests) allows changes to be made with minimal interruption.

Here is another nice addition to any studio where a lot of phone action is planned: a separate path and mixer for the recording/editing device for off-air calls. If you use separate microphone preamps, you can take an auxiliary feed from each preamp and connect them to a small mixer. Then you can install a switch on the input of the call recorder, allowing a connection from the program audio, the auxiliary audio bus, or only isolated microphone audio to the small mixer.

Of course, you can always use an auxiliary output from the on-air console for off-air phoners. However, being able to completely separate the main console from the off-air recording process was preferred by most of the talent with whom I worked – indeed, that was my own preference when I had to work in the studio I built.

TALK SHOW IN MOTION

One day, you may be asked to take the talk show on the road. Now, how do you provide for pre-delay audio monitoring, call selection, and off-air monitoring?

We are all getting used to "non real time" monitoring due to the eight-second or longer delay in HD radio, as well as the processing delays in both digital RPU equipment and on-air processors. But we need to provide the talent with as close to a "real time" communication path with the incoming caller as possible

With an ISDN connection, you can use a low latency algorithm, such as g.722 for return-audio monitoring. However, with multiple audio paths and several feeds, you can get into complications with each one having a processing delay. Many times the talent will complain about delay and echo, so care needs to be taken to minimize the combined latencies. You will need a mix-minus for the on-air feed and a separate mix-minus for the remote feed. You may also need a third mix-minus for the remote's monitor feed.

In the old days, we used a POTS dial-up for IFB, but the quality was, as expected, poor. However, it is about the only thing left that has almost no latency. If you still have a license and functional antennas, you might also fire up the old Marti RPU and send near zero latency audio back out to the field.

TRACKING THE AUDIO PATHS

Be sure to analyze ahead of time how many audio paths you will need, and in what directions.

Make yourself a block diagram to clarify all of those audio paths. One will be for the main program feed, one will be needed for monitoring, and a third may be needed for intercom communication – or the IFB may be shared with monitoring. (The problem with sharing an IFB type of feed from studio to remote location could be that, if you are using the IFB audio for a PA feed at the remote, your producer or board operator's instructions will be blasted out over the PA system.)

With a two-channel ISDN transceiver, you should have the necessary program paths available. But because Murphy hides just around the corner of most remotes, a POTS dial-up and/or a cell phone should be at the ready, just in case.

While we are thinking of backups, a well-stocked box of cable and connectors, allowing you to connect anything to anything can be a life (or remote) saver. Multiple connectors, wire cutters and strippers, electrical tape, transformers, capacitors, might just save the day. Include the flashlight, many extra batteries, duct tape, a butt set, extra extension cords and outlet strips you know your situation may need.

EXTENDING HOST CONTROL

If you are using an ISDN transceiver such as a Zephyr Xstream, you can take advantage of another data path. The Xstream allows an RS232 end-to-end connection for data transmission.

With that you can connect the studio call-controlling computer to a remote location's computer, enabling the remote host to control calls and see caller information on screen. If you also use end-to-end contact closures, you can remotely fire off whatever commands you need to take almost complete control of the show on the road.

ENJOY THE RIDE

So, the "fun" begins. With proper planning, involvement of all the station's departments, and not too many visits from Murphy, you soon will be serving your community with a fully capable and flexible talk show facility.

You will find the team approach will have paid off well. Ownership, management, programming, talent, and sales will be happy. And the engineering department will prove that it also can contribute positively to the income generation of the station.

A final word: Do keep up with all the advances in telephone talk show technology. New products are in development that will allow multiple hybrid interfaces, advanced signal processing to allow better quality audio recovery from poor caller lines, as well as more and more audio delivery via IP technology. The engineer who is current with the latest gear for all areas of his station(s) will always be in demand.

Ted Alexander is part of the technical support team at Telos-Omnia-Axia as well as a well-experienced engineer and voice talent in the Cleveland market. Contact Ted at talexander@telos-systems.com

Transmission Guide

by Alan Alsobrook

Maintaining a Worry-Free Unipole

The radiating element of any radio station is critical to maintaining solid coverage out to the station's service contour. For many facilities that have installed unipoles, it is important to regularly inspect and handle any problems before they impact transmissions. Alan Alsobrook explains the what's and why's.

When you first put up your unipole I am sure you were told that this device is so great it just performs and never needs any attention.

Well, unipoles are pretty good devices, but that part about them never needing any service is dead wrong. In the past few months I have had to troubleshoot and resolve several different unipole failures.

Unipoles have become a popular way to get multiple uses from towers.

WHEN UNIPOLES GO BAD

Many, if not most, unipoles that were installed back when they first became popular are now getting really old. The result is that the hardware most likely needs to be replaced soon – if not last year.

One recent and serious failure was when lightning hit and opened the short-back point at the upper end of the skirt. In an attempt to operate in an emergency mode, I tried driving the open skirt. However, the attempt was not successful; it just so happened that the electrical length of the skirt compared to the frequency of the station worked out to where the base impedance of the open skirts was very close to zero ohms. The transmitter would not load that low.

Since the problem was 250 feet up the tower, I had to wait for a tower crew to come in to repair it. Having gone through this experience, I would recommend that if you are installing a new system always bridge the skirt before you connect any of the shorting wires and keep a record of that value in the station records.

Having those measurements will come in very handy if you have a shorting wire open up, since you then can use a bridge to verify the trouble from the ground. It will also give you a starting point should you have to build a matching network to drive into the skirt alone.

OPEN LOAD

Another failure was caused when the lower ring connection opened. I was still driving one vertical wire of three, or at least I had connection to it, but the transmitter said, "Nope! Sorry, I do not like that" – and shut down.

Unfortunately, although I was looking directly at the location of the open connection, the cause of the trouble was not visible. It was not until I started shaking wires from below the insulator that I heard the transmitter try to come back on the air (the SX-1 just keeps trying and trying) and saw a slight wisp of smoke come out of the connection. Then I knew exactly where the open connection was located.

The problem was corrosion inside the split bolt had caused the connection to fail. The solution was as simple as taking the connection apart, cleaning it, and putting it back together.

AN OUNCE OF PREVENTION

Being able to prevent failure is always the best course of action. To accomplish that, the unipole should be carefully inspected on a regular basis, such as during your normal quarterly tower lighting system inspection.

As it is somewhat difficult to determine from the ground exactly what is going on up on top of the tower, you will also want to have the upper half checked out carefully by your tower crew any time you are having any work done on the tower.

During the inspection, you are looking for any loose or corroded connections. A loose connection may not be visually obvious, so put your hands on it (with the station turned off of course) and be sure all the connections are tight & clean.

CHECKING CONNECTIONS

Check the general hardware nuts, bolts and the like. Is anything rusting? I have seen many connections that were falling apart because they did not use stainless steel hardware.

This feed point on the ATU is rusting and corroding, resulting in poor electrical connection.

How are the insulators? Do you see any carbon tracks running down them? I thought those 40 kV insulators would stand up to this low power RF for years. That was until I looked at a tower shortly after a rain storm and saw steam pouring off all the insulators along with small flames shooting out of them indicating a serious insulation breakdown.

I would not even want to imagine what a spectrum analyzer would show with all those mini arc-gap transmitters firing off all the way up the tower.

SKIRT WIRE INSPECTION

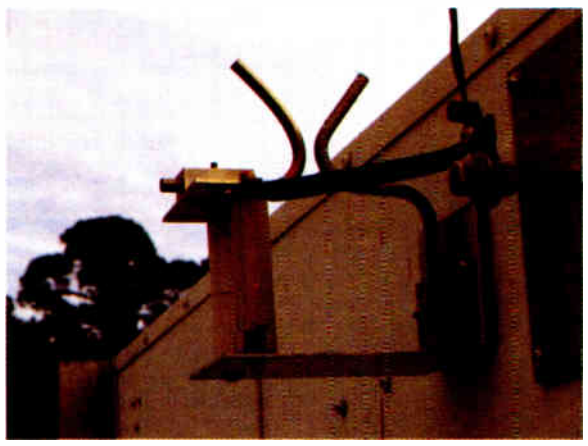
It is important to check the skirt wire tensioning, making sure the wires are not overly tensioned nor are they slack. Loose and sloppy wires can detune your system as the wind changes their distance from the tower. When inspecting the tensioning keep in mind the thermal effects on the wire; check for any slackness on your hottest days.

The surface of this fiberglass insulator was broken down allowing moisture and carbon tracks to form in the frayed surface.

Many of the enclosed (shock absorber type) tensioning devices I have seen on earlier unipoles have become pretty much "shot," either by rusting out or being frozen in one spot. If you have those type of tensioning devices, give them a tug and make sure that they still have the ability to retract and expand as needed.

THE ARC GAP

Another item to check is the arc gap at the ATU. Is it still in good shape? Do you even have one? I have seen many installations where it was assumed that since the unipole is DC grounded it did not need an arc gap.



Arc gaps are important. But broken insulators can also create arc-over points.

After taking care of many unipole installations here in lightning-prone Florida, I can assure you that could not be further from the truth. I have seen the results of non arc-gapped unipoles and, trust me, the amount of damage is just as bad, if not worse, than with a standard series radiator.

Think about it this way: if your tower takes a strike, there is a heavy strike current flowing down the tower and it will be inducing a very high voltage into the skirt wires surrounding it. Once induced, that voltage will find a way to get to ground. So your best bet is to give it a path that you have decided upon, rather than letting it choose its own path.

The lesson is that you should not think that your unipole will provide years and years of trouble free service without any maintenance. It requires the same love and care as any other device in the broadcast chain.

Alan Alsobrook is a regular contributor to ***Radio Guide****. He can be contacted at aalso@bellsouth.net*

Studio Guide

by George Zahn

Microphone Pickup Patterns

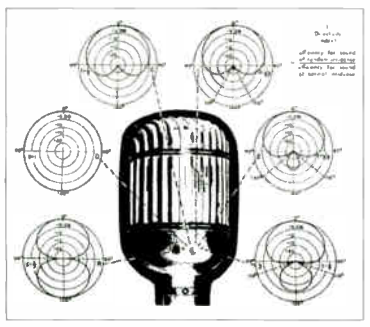
As we get to know more about the microphone families and their inherent qualities, George Zahn shifts his focus to some of the other criteria necessary for picking the right microphone for the task.

Whether you need a "hammer" or ribbon, there is a microphone made for every sound. However, understanding the microphone families is just the beginning of choosing the right microphone for the job.

Let us assume we have two similar microphones from the same family and at a similar price. Which one do you purchase? This time, we will focus on pickup patterns (contrary to what your sales guys might think, this does not refer to meeting singles at the local pub). It is the pickup pattern (or polar response) of the microphone(s) in question that may well determine which choice works best.

THE POLAR PLOT

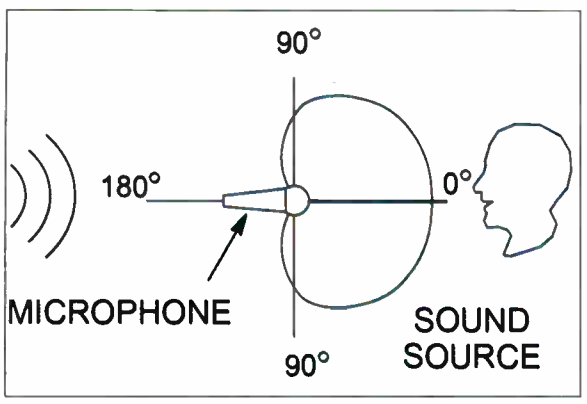
We will start by explaining a few simple, but key, points. First is response. In addition to its characteristic frequency response, every microphone has a specific directional sensitivity to picking up sound.



Typical microphone polar response graphs.

There are just a few major pattern classifications when it comes to that sensitivity: omnidirectional, unidirectional, and bidirectional. This sensitivity is shown in two dimensions as a polar response graph or polar plot.

On a polar response graph, the microphone is assumed to be in the center of the graph with the microphone facing 0°. Speaking into the front of the microphone is termed "on axis." Moving 90 degrees either way up to 180 degrees (around the back side) takes us progressively more "off-axis."



Proper microphone orientation.

X, Y AND Z AXES

A microphone receives sounds from all three axes at the same time. Although the omnidirectional pickup pattern usually is shown on a polar response graph as a circle, you really need to think of this in three dimensions. The omnidirectional microphone is not sensitive in a circular plane only. It is actually picking up sound from front, back, sides, above, and below – in effect a spherical pattern.

If you need a visual, imagine the microphone encased in the center of a large NERF ball. The spherical ball represents the area from which the microphone can "hear." A directional microphone possibly might be thought of as mounted more toward the edge of the sphere.

ANY "PORT" IN A SOUND STORM

You really cannot "aim" an omnidirectional microphone. So, when it became necessary to have a bit more control, modifications were made to some microphones which made them sensitive only to the front.

This pickup pattern is called unidirectional, meaning that the microphone now ignores sound from the rear. This was accomplished by adding small openings as holes or slots in the body of the microphone. These "ports" can be quite noticeable – as on an ElectroVoice RE20 – or very small, almost inconspicuous openings in the back of the body (Sennheiser MD421, for example) but their purpose is to allow sound waves to enter the rear of the microphone.

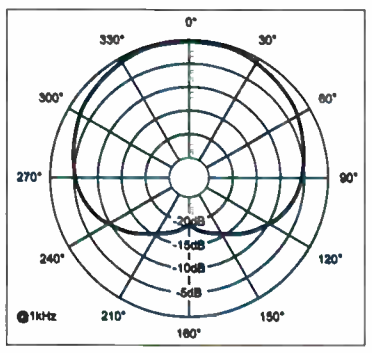
The ports on the side of an ElectroVoice RE20 affect polar response.

To directionalize a microphone, sound is passed through a phase shift network in the handle of most modified microphones. The sound from the rear hits the diaphragm of the microphone from the back at the same time as the sound waves hits the front of the diaphragm.

The equal sound pressure on both front and back of the diaphragm cancel out, meaning the sound entering the back of the microphone is negated. Imagine equal strength winds hitting both sides of a sail. Your boat simply will not move.

MICROPHONES WITH A HEART

You do not have to be Picasso to see that the unidirectional pickup pattern shown on the polar response graph resembles an upside down heart. This is why the unidirectional pickup pattern is often called "cardioid" or heart-like.



A plot showing a typical cardioid microphone's directional sensitivity.

Some microphone models have additional modifications to the port and phase shift design to make the pattern slightly more narrow, hence the term supercardioid. The supercardioid microphone might allow a roving host to get just a bit closer to a PA speaker without inducing feedback. It also gives even more control over the "aiming" of the microphone.

Again, please remember that the pickup patterns we are discussing here are indeed three dimensional, not just a simple plane as you see on the paper polar response graph.

LOADED SHOTGUNS

The neat thing about engineers is that they just cannot leave well enough alone. And for that we can thank them because, if not for that pioneering spirit, we might not be armed with shotgun microphones when we need a really, really narrow and long cardioid pattern.

Whether it is on a TV set on a fishpole or a boom or on your home video camera, you may well have encountered hypercardioid or ultracardioid pickup pattern microphones. These shotguns allow for incredibly narrow (ultra is more narrow than hyper) pickups for picking up sound sources from a distance – anytime you cannot mic closely. Examples would be people on a TV or theater set (where a microphone might aesthetically interfere) or when recording a wild bird 20 feet away in a tree.

During the Reagan administration, shotgun microphones were standard press corps equipment, as they were cordoned off from the President while he ran from the White House to a waiting helicopter.

EV ENG618 shotgun microphone.

Reporters could shout out questions and, thanks to the extended narrow range of the shotgun microphone, you might actually pick up a few words that might not effectively be captured by an omni or standard cardioid.

Of course, there is always a trade off when it comes to all things audio. In order to get the very narrow pickup pattern, we sacrifice a bit. The problem with shotgun microphones is that they have a small lobe of sensitivity directly behind the microphone; the tighter the pickup pattern, the more sensitive the rear pickup. This actually worked for the reporters in Reagan's time. You could hear them shouting the questions as well as the President's response.

A PERFECT "8"

Now that we have addressed most of the pickup patterns you will find on dynamic and most condenser microphones, we need to mention the standard, unmodified pickup pattern of the ribbon microphone. By basic design, the ribbon microphone is sensitive from the front and back, but not from the sides.

As we pointed out, sounds from the side will hit the front and the back of the ribbon at exactly the same time, which makes the microphone effectively "dead" from the side. This yields a bidirectional or "figure 8" pattern. Keep in mind that again, we are in three dimensions, so imagine a NERF ball in front of and a NERF ball behind the microphone to "see" its sensitivity.

There is one caveat on bidirectional patterns: we have pointed out that ribbons are basically a very predictable, nicely rounded figure 8 pattern. On the other hand, if you buy a really nice condenser microphone with switchable pickup patterns that features a bidirectional setting as one of the patterns, you cannot count on a smooth figure 8.

These condensers utilize two internal cardioid microphone elements which are then phase shifted to create the bidirectional pattern. Imagine one cardioid element facing forward and one facing backward. Throw them out of phase which eliminates any common sound entering the two elements. If you drop the overlapping sounds, you get a pickup pattern that more resembles an apple core than a smooth figure 8.

This does not make the switchable condenser bad, but keep in mind that you will not have a smooth loss of sound when you move around the side of the microphone. The sensitivity is slightly more erratic and harder to predict if you have talent used to working on a standard bidirectional mic.

THE PROXIMITY EFFECT

There is another trade off on cardioid microphones. I would call it a negative, but it actually works as a plus for some announcers.

When you deal with cardioid and supercardioid microphones which are often used in close up situations (as opposed to shotgun microphones which really are designed to be used from a distance), you need to be aware of proximity effect. Proximity effect is an exaggerated bass response which is peculiar to cardioid and supercardioid microphones.

Is that good or bad? It depends on the voice or instrument you are trying to capture. There are many announcers who count on working the microphone very closely to get that extra "umph" or resonance in their voice.

(Continued on Page 18)

Microphone Pickup Patterns

Continued from Page 16

If you are already endowed with bassy pipes, the proximity effect can vary from annoying to abject distortion – and it is *not* always evident.

PROXIMITY IS NOT ALWAYS GOOD

Here is a real life sample of a problem caused by proximity effect. It happened many, many moons ago when I was young and naïve to the ways of proximity effect.

A radio station where I was working had a chance to purchase some television time. We had a nicely produced spot from our national network that just needed some music and a voice tag at the end of the spot to identify our station. So, we brought in our deepest voiced announcer to add the extra polish to our TV spot.

He worked the microphone close – really close – almost literally dripping with his naturally warm bass and the extra punch of the proximity effect. We recorded him in the station studio and listened to the playback of the recording on our nice big JBL speakers. When we took the audio to the TV studio to assemble the spot, we were again listening on nice studio monitors. We all loved the spot; I even started clearing a spot on the mantle for the Emmy!

But when the spot started airing, we received nothing but complaints. On big stereo TVs, the voice on our tag was a bit too bass heavy, but on many tiny TV speakers the result of the original proximity effect yielded distortion and rattling speaker grills. We recut the spot almost immediately with a lower common audio denominator in mind.

The frequency settings at which the roll-off occurs is set at the factory. Many microphones have one roll-off setting. It is either on, meaning you are rolling off bass starting at a set frequency, or flat, meaning the microphone's output is not altered.

MORE FREQUENCY CONTROL

Some microphones have a multiple-position switch, allowing roll-off at different bass frequencies. For example, one microphone model has five different settings labeled M (Music), which is flat or unaltered, to S (Speech) which would make Darth Vader sound like a eunuch. There are three settings between the M and the S with varying frequencies rolled-off, moving up the frequency spectrum as you move from M to S.

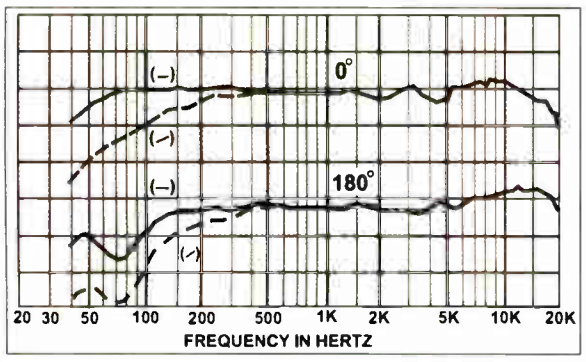
If the microphone does not have a bass roll-off switch, there is the psychological solution: you might be able to get a round mesh external pop filter and place it a distance from the microphone. The artist can then feel as if they are close to something by being on top of the mesh filter and not the microphone.

At other times, you may *want* the bass exaggeration of the proximity effect, but then may need a bit more sibilance to balance the overall frequency response of the microphone. A very limited number of microphones include a "brilliance boost" which slightly exaggerates the area around 4 kHz, increasing intelligibility. Keep in mind that you may be able to replicate these settings to some extent with a selective/variable equalizer, either one built into each channel of a multi-channel console or an external unit.

ROLLING OFF WITH THE PUNCHES

So how did we solve the problem? One way – perhaps the simplest – would have been to simply have our announcer back off the microphone a bit. That reduces the proximity effect.

Nevertheless, you and I have both worked with people who just *have* to swallow the microphone. If their voice is not very deep, that is actually a good thing because you might eek out some bass, but if you are recording a James Earl Jones-type voice who wants to be on top of the microphone, you need help.



Rolling off the low end with the microphone switch.

Most professional cardioid and supercardioid have a feature called a bass roll-off switch. It often shows a diagonal line representing a "lopping off" of the bass end of the frequency sensitivity of the microphone.

DIRECTION IS GOOD

As with choosing the right microphone family for your needs, selecting the proper pickup pattern can make for successful broadcasting or recording – or any number of problems.

If cost is a concern and you are just using one microphone for a purpose, the slightly less expensive omnidirectional microphone might work for you. But, if you want or need to control the sound pickup, you will want some degree of directionality. Keep in mind that most microphones are single pattern only. For example, it is not as if you can buy an ElectroVoice 635A in either an omni or unidirectional pattern. The 635A is strictly omnidirectional.

Switchable, multi-pattern microphones are in the condenser family and will generally cost quite a bit more than most any individual microphone that has one set pattern. On our next expedition as we boldly go where no microphone articles have gone before, we will set our "phasers" on stun and explain why you need unidirectional microphones when picking up panel discussions or multiple musicians for broadcast or recording.

Have an anecdote about someone who just could not seem to get the best from a microphone? We invite you to share your favorite microphone story, tales of survival, or creative solutions. Send them to George Zahn, WMKV-FM Station Director, at GZahn@lifesphere.org

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HENRY ENGINEERING

by Grant Bingeman

Whip That Pattern Into Shape!

A common sight at a remote broadcast site is the station van – usually with a whip antenna (or three) on top. The whip is a versatile and relatively omni-directional antenna, even when the van is in motion. But, can the radiation characteristics of the whip can be optimized for RPU uses? Grant Bingeman explains:

I had always wondered how a whip antenna's input impedance changed when it bent in the wind. Recently, I used EZNEC 4.0 (the National Electromagnetic Code modeling program) to model and analyze this and the resulting radiation patterns.

LOOKING AT WHIPS

Some whip antennas are very flexible in order to minimize damage from collision or to allow manual adjustment to different radiation patterns. Other vertical antennas are quite rigid and hardly bend at all.

I chose a frequency in the 10 meter amateur radio band to illustrate mobile whip antenna performance. However, this discussion applies equally well to CB and the lower RPU frequencies as well as the higher RPU channels.

We can start with a look at a flexible antenna and how it bends at 60 mph. The antenna in **Figure 1** is 8.43 feet long whether or not it is bent. In this case the vertical dimension of the bent whip is 8.00 feet or 95% of its unbent vertical height.

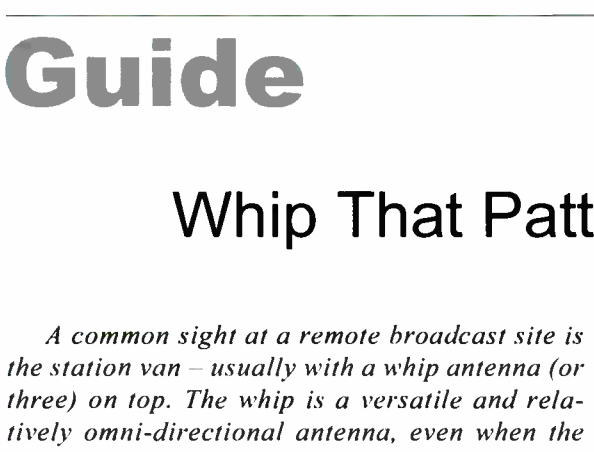

Figure 1: A whip mounted over 16 radials, each six feet long and elevated seven feet above the earth, or at 5 mS/m.

Calculating the impedance of the antenna in both straight and bent configurations, we find the following results at 29 MHz:

	Input Impedance	Resonated	SWR
Vertical	**22.1 - j10.3**	**22.1 + j0**	**1.00**
Bent	**21.4 - j11.9**	**21.4 - j1.6**	**1.08**

The bent version looks electrically shorter, hence the resistance is lower and the negative reactance is greater. However the overall effect is small judging by the change in SWR. In other words, it is nothing to worry about.

EFFECT ON RADIATION

When the whip is bent, there is an extra radiation lobe at higher elevation angles in the direction of the bend (see **Figure 2**), which slightly reduces the gain near the horizon. There is also a small horizontally-polarized component added to the pattern.

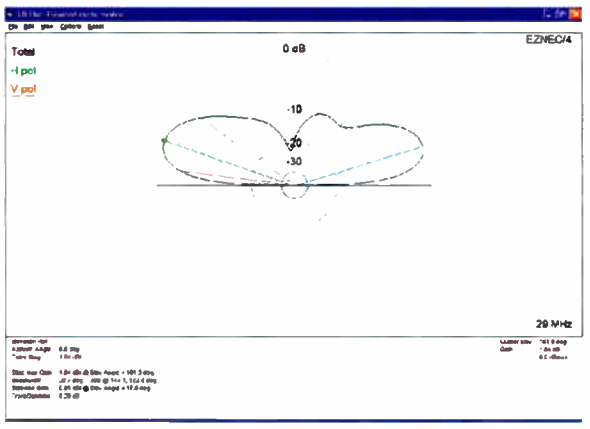

Figure 2: With the tip of the whip curving two feet to the right.

Essentially this means you will have slightly better coverage. The maximum gain is 1.04 dBi, which compares nicely to the unbent gain of 0.94 dBi. (By the way, if the antenna base was only one foot above ground the gain would drop to -0.19 dBi.)

MOUNTED ON A VAN

Now, let us put the whip on the top of a van (**Figure 3**). The input impedance is 48.4 + j4.3 ohms, almost ideal, since most transmitters are designed to work into a nominal load impedance of 50 ohms resonant.

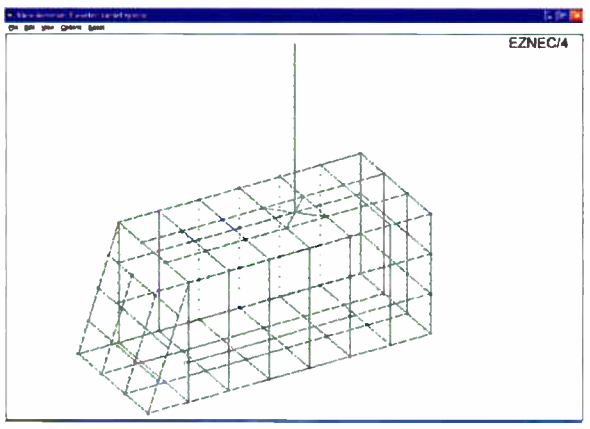

Figure 3: A van represented by a grid made of two-foot wires.

The van sits one foot off the ground. The antenna base is four feet from the rear of the van and seven feet off ground. Thus the tip is 15.43 feet off ground. However the gain drops to -0.41 dBi because the currents on the van are closer to lossy ground.

What happens if the van antenna bends back as in **Figure 1**? The resistance increases and the reactance heads closer to resonance: 52.9 + j4.0 ohms. I would have expected the resistance to decrease, but apparently the shape of the van has a greater effect. At any rate, the change is not critical to transmitter operation. The maximum gain drops to -0.85 dBi.

REALLY BENDING THE WHIP

If we look at an extreme case where the top 4.43 feet of the antenna bends at 90 degrees to the rear, four feet above the van roof, the 29 MHz impedance follows what we would expect of an electrically shorter antenna: 30.0 - j13.0 ohms.

In this case it would be desirable to adjust the impedance matching network a bit. This is well within the range of most automatic impedance matching networks. Max gain is 0.84 dBi, essentially no change from the previous example – and you gain about four feet of headroom.

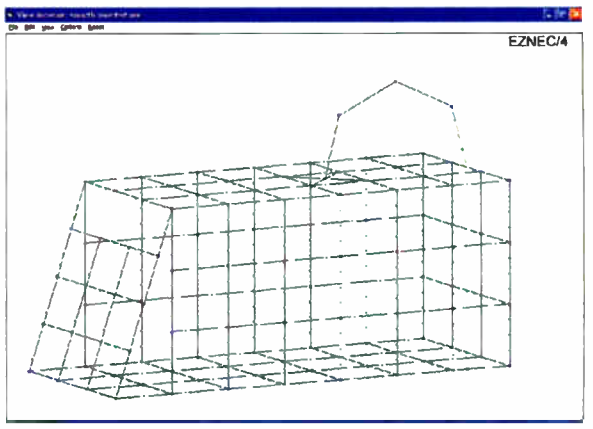

Figure 4: Modeling as a rear-drooping whip.

Suppose we tie off the tip of the whip with nylon string at the rear of the van, creating a smoothed, end-fed inverted-vee shape as in **Figure 4**. The impedance drops to 13.7 + j20.2 ohms and the radiation pattern is somewhat more directional. This is shown in **Figures 5 and 6**.

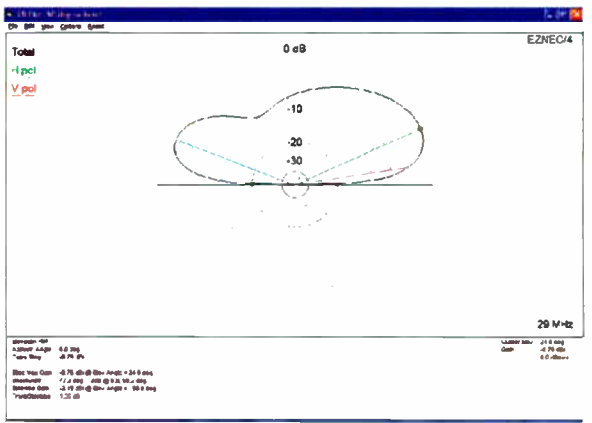

Figure 5: The vertical radiation pattern of a rear-drooping whip.

Again, the impedance change would require adjustment of the matching circuit. The main lobe is reversed but the rear gain of the antenna is not changed drastically (-0.79 dBi), so this is a valid mode of operation that will require much less headroom when traveling under trees and bridges. However, we have sacrificed a little forward gain.

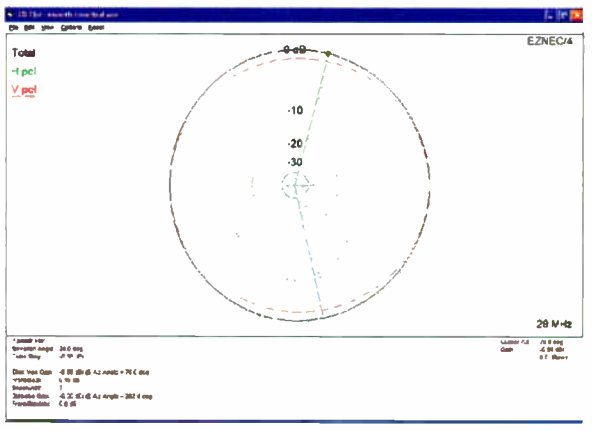

Figure 6: Significant H-pol radiation of a rear-drooping whip.

MOVING FORWARD

If we tie off the tip of the whip five feet towards the *forward* end of the van (left in the drawings), the impedance becomes 14.5 + j28.1 ohms.

In addition, the radiation pattern shifts a couple of dB towards the front end of the van and a strong signal is directed at high elevation angles, which is good for communication with nearby stations or repeater sites. The best news is that the maximum gain in that direction is now 1.13 dBi.

If we stretch the forward drooping whip from five feet to seven feet, it drops to 2.26 feet above the van roof at its maximum height. The input impedance is then 11.1 + j31.4 ohms, forward gain is 1.08 dBi and

(Continued on Page 22)

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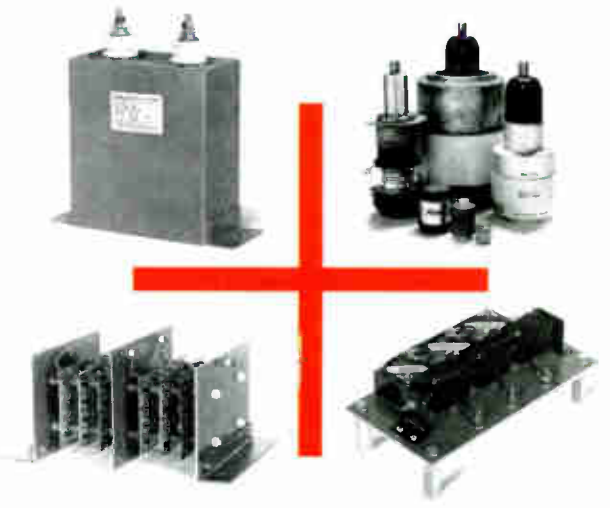

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RF Guide

by Grant Bingeman

Whip That Pattern into Shape!

– Continued from Page 20 –

rear gain drops to - 3.4 dBi. Thus, **Figure 7** shows the maximum gain ahead of the van's travel vector, with the minimum to the rear.

It appears that the closer we bring the whip down towards the van roof, the more energy is radiated at higher elevation angles. I personally would not want to feed a resistance lower than ten ohms, so this case is as low as I would pull down the whip.

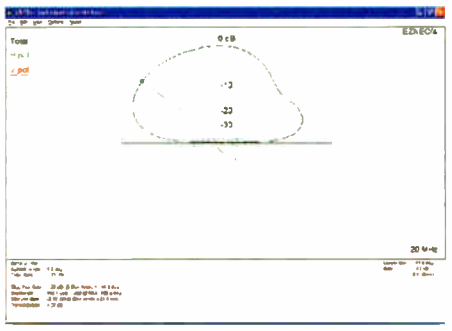

Figure 7: The vertical radiation pattern of a forward-drooping whip.

THE MORE RIGID ANTENNA

In the case of a rigid vertical antenna, if you want to slant it back to reduce your overhead clearance requirement, you can mount it on a small bracket.

What happens when we have an 8.43 foot-long antenna slanted back at a 45 degree angle? This reduces the overall height about 2.5 feet and the antenna tip extends one foot beyond the back of the van. The input impedance becomes 41.1 - j5.0 ohms and the pattern shows some forward gain – as showing in **Figure 8**, a maximum gain of 0.44 dBi.

Figure 8: The radiation plot for a rigid antenna slanted 45 degrees to the rear.

MORE HEADROOM, MORE RF

To do the analysis for this article, I used EZNEC 4.0 and a segment length of about six inches to model the antenna. Wire diameters varied from one-half to one inch. The ground was modeled as 5 mS/m, with a relative dielectric constant of 13.

In summary the classic vertical whip can be bent to advantage, yielding more headroom above the vehicle it is mounted upon. An antenna matching network is required unless the antenna is designed for a specific impedance at a specific frequency and operation is not required much beyond that frequency. (You are welcome to download a free impedance matching program from my web site: www.qsl.net/km5kg)

One last thing – a reminder: if your antenna is mounted on the roof of your vehicle, please do remember to remove it before driving into the garage. Your antenna will thank you.

If you would like to learn more about EZNEC and do some radiation monitoring yourself, you can view www.eznec.com where several versions of the program are displayed, including a free demo version of EZNEC 4.0 (for Windows 98 and higher). The free demo is located at http://www.eznec.com/demoinfo.htm

Additionally, you might be interesting in checking out Grant Bingeman's web page at www.qsl.net/km5kg/ On this page he has posted some of his software and articles on antenna design and transmitter operation. The URL is also at www.radio-guide.com/URL.htm

Grant Bingeman is a design engineer well-known in the broadcast industry for his work at Gates/Harris, Rockwell Collins, and Continental Electronics. His email is GrantBingeman@cs.com

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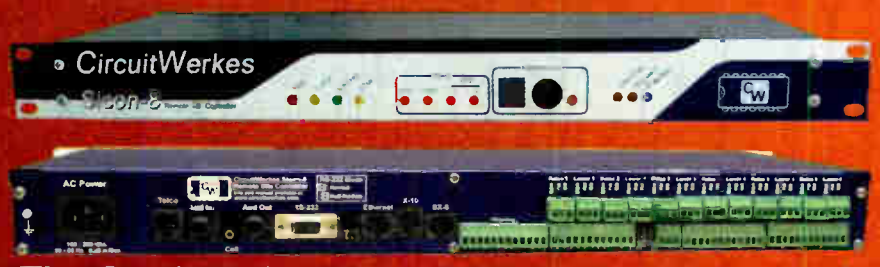

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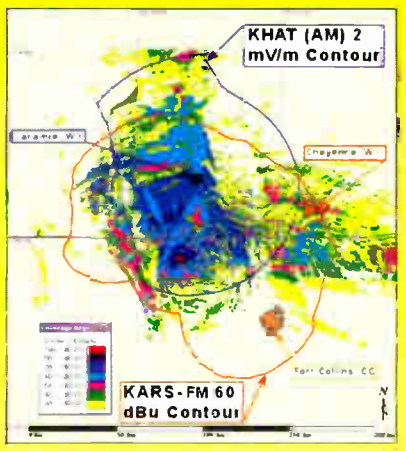

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Engineering Guide

by Bill Weeks

Turning Engineering Into a Radio Technology Department

By the nature of the work, many engineers seem like a "one-man band" – often working alone in isolated locations. However, more success can be had when the Engineering Department is seen as that – a Department – ready to serve the needs of the entire broadcast operation.

I have worked in "radio engineering" for a very long time – long enough to have observed that each of the particulars of the job has changed drastically. Most of them have changed several times.

I recently came across a magazine article about the Information Technology Infrastructure Library (ITIL). ITIL is a set of best practices for computing services and is contained in a set of books published by the United Kingdom's Office of Government Commerce (More information on ITIL can be found in the Wikipedia.)

The article started me thinking about the overall structure of our job. I have not stepped back to think about the big picture often enough. That is just one of my many mistakes.

In this product of my thinking about the subject, I have stolen some of the ITIL ideas. Most of the rest of the ideas herein come from my musings on some of the other mistakes that I have made over my years in the broadcast industry.

A STRUCTURED DEPARTMENT

I propose to discuss the structure and function of the Technology Department of a radio broadcast enterprise (both commercial and non-commercial). This department is more traditionally called the Engineering Department, but many of its functions can not properly be called "Engineering."

This structure and function, in general outline, scales to different levels of enterprise, from single stations, through local clusters, to large national groups. The department itself then scales from a single part-time individual to a large and geographically scattered number of individuals.

As we go along, I propose to refer to the department as the RT (Radio Technology) Department because I like the sound of that – and because it is easy to spell.

THE REASON WE ARE HERE

The purpose of a Radio Technology Department is to use its resources to serve its users for the benefit of the enterprise – according to the specifications of its customer.

The primary customer of the department is management – defined as "whomever approves the paychecks." This may be an individual, several individuals, or a chain reaching up to invisibility. However, the individual is the easiest to quantify and to deal with.

The users of RT department services include individual station personnel and departments (including the individuals who are also management). Some of the users may be virtual, rather than human, personnel; in the obvious case an automated station may have no human announcers or program director.

The listener ultimately is interested in the product of the broadcast enterprise as a whole and therefore is not a direct customer of the RT Department. For example, it is fairly certain that most listeners would have little or no interest even in the very cleanest of dead carriers.

MAKING THE CUSTOMER HAPPY

Remember that the customer of the RT Department is management. Remember also that "the customer is always right."

All of the stations under your care may be on the air, with all the users happy, and your department may be doing wonderfully at providing what you thought were all of its services. The customer, however, is the one who buys your services. If the customer does not believe that you have provided good value for his money, he will no longer buy your services. I do not know about your family, but my kids hate it when I cannot afford to buy food. Know what the customer thinks you should be doing.

Therefore, a successful RT Department must have a structure which is designed to effectively interface with both its customer and its users in such a way that excellent service is provided.

THE RIGHT PRIORITIES

In order to reach that goal of "excellent service," it is the first priority for the RT Department to identify exactly *what services* it is to provide on behalf of the customer. Then, the next key issue is to fully understand *the level of service* required in each area.

For example: if rain is leaking through into the control room, should the technician place a bucket under the leak, locate a roofing contractor, determine bid specifications, obtain quotes, or carry bundles of shingles up a ladder and replace the roof himself?

Once you know what services the customer wishes to buy, you should develop a plan to provide those services. Your plan will consider all of the obligations that you have accepted to all of your users, both human and virtual. You will allocate Radio Technology resources, including equipment, supplies, and labor to meet these obligations. If there are some obligations you do not wish to take on, make sure that is acceptable to your customer.

COMMUNICATE EFFECTIVELY

One clothing store chain uses the slogan: "an educated consumer is our best customer." This is an excellent concept – and one radio engineers should employ. But we cannot teach our customer, at least from a technical standpoint.

Unfortunately, very few broadcast enterprise managers come from a technical background. At the same time, the manager also has his customers, his users, and his resources – and they are not the same as yours.

It is a mistake to inadequately educate your customer. It is equally a mistake to attempt to teach him geekisms that are useless to his job. Your customer probably does not have to know which two pairs of Cat 5 cable are used for 10baseT; indeed, he most likely does not care. On the other hand, he may very well need to understand the expenses and benefits of digital broadcasting.

MONITORING SERVICES AND DELIVERY

Over time, you should monitor how available your services have been, so that any weaknesses in your plan or in your resources can be discovered before major issues arise.

It is much better for you to discover such deficiencies on your own and to present them and their solution to your customer than it is for him to find out from someone else what you did wrong. If you have, for example, underestimated the amount of labor involved in providing some service, you should present a more accurate time and cost estimate to your customer as soon as possible.

You may be frustrated when it takes three days to assemble the hutch that the sales manager traded out for her office. You may think that the silly thing took you away from your "real" job. That may in fact be true. Or not. The sales manager is a user, and the customer may wish to keep that user happy. Anyway, you would have been just as frustrated while trying to clean out the malware that came with the download of cute mouse pointers to the traffic computer.

KEEP THE CUSTOMER HAPPY

On the positive side, it is important to customer satisfaction to be able to report to him regularly that your services have been stable and available according to the plan.

He will probably already know that the stations are all on the air and that the roof does not leak. However, he may not know how much effort your department has exerted toward those ends and he will not properly appreciate you if you do not tell him of the effort. Your regular list of accomplishments should be in writing; think of it as a sales receipt for the customer.

You should also occasionally review with your customer the approximate costs, including both time and materials, of the various services that you are providing. The customer is the one who decides what he can afford.

MAKE ENGINEERING A PROFIT CENTER

The RT Department will be most intimately familiar with the technical operation of the enterprise. It is therefore uniquely placed to imagine potential improvements to the system that could contribute to overall efficiency.

These improvements can certainly include replacement of equipment that really is becoming too expensive to repair. They can include the use of more efficient software programs. They can also include more efficient work flow. Are there instances where information still is being moved by sneaker-net, when an electronic connection would be quicker and easier? Would removing the old turntables from the control room and putting in a flat countertop give the night jock a safer place to keep his cup of destructive coke?

The off-premises resources of the RT Department are dramatically more visible to you than they are to your customer. Be sure to be aware of improvements that can be made there. Is there a new tower somewhere that would be a better location for your second STL hop? Is there someone new that might want to rent space on your tower? Your customer may be highly appreciative of the additional income.

SERVICES PROVIDED

What all this means is that, in order to do a good job of managing its resources, the RT Department should know *both* what services it is providing and what services it should be providing. Most of these services in a modern cluster of stations can be placed under five headings: **the Program Chain, Information Technology, Regulatory Compliance, Facilities, and Personal Services.**

In the **Program Chain** I include the acquisition, storage, transport, and transmission of the broadcast product.

The Program Chain is not complete until the signal is launched, ready for the listeners.

Acquisition may include satellite reception, remotes whether promotional, sports, or news, or in-house input of anything from weather forecasts to live in-studio concerts. Note that most modern storage is on a computer hard drive rather than something like tape.

Transport can involve anything from a short piece of shielded wire to a complex microwave system. I include audio processing under the "transport" heading, for lack of a better shelf on which to store it. Transmission certainly involves transmitters, lines, and antennas, but now can also mean Internet broadcasting or podcasting.

(Continued on Page 26)

Engineering Guide

by Bill Weeks

Continued from Page 24

Information Technology includes various computing services, such as program log generation, accounting, and desktop applications, as well as program automation. Today, IT often includes the telephone system and its interconnections.

Regulatory Compliance. The FCC, often the FAA, and perhaps various other agencies are essentially users of services usually provided by the RT Department. Their services require the same sorts of resources as other users. Compliance with the EAS Rules, for example, requires hardware, software, and regular attention by the "Chief Operator" (how long has it been since the "Chief Operator" was likely to do much actual operating of a typical station?).

Facilities. The RT Department is usually responsible at some level for the stations' facilities – the buildings and grounds, towers, vehicles, and various other physical properties controlled by its customer. You probably do not have to paint the tower, but you probably do have to monitor the condition of the tower and its paint. The RT Department will normally have to at least *arrange* for keeping tower fields mowed.

The RT department is usually responsible for keeping the tower field mowed.

YES. THAT, TOO

Finally, the department, by default and because of perceived competence, usually provides various **Personal Services** which can range from fixing the manager's squeaky chair to changing the receptionist's flat tire. And I am fairly confident that I can correctly recall seeing a plunger in the hands of at least one Radio Technician.

My first full time radio job was at a radio station in Alaska that, because of the permanently frozen ground, did not have a septic system. The toilet was a device that, when activated, used a propane flame to incinerate its contents.

One day I went to take – and finally pass – my First Class Radiotelephone Operator's License exam. As I rode back to the station, I thought I was hot stuff: "six months ago I couldn't even spell 'injunear,' now I are a real one."

When I arrived back at the station, I came to understand that (1) the toilet had malfunctioned – it was merely heating the contents rather than fully incinerating them; (2) station personnel had continued to add to the contents anyway; (3) facility repairs were part of my job; and (4) hot "stuff" can be extremely unpleasant to work with.

IT IS ALL IMPORTANT

Of course, the various services may not all be equally critical or of equal priority. All of them are important if the customer thinks that they are so. And everything else is a waste of department resources if the customer does not think that it is important.

One subtle danger from this diversity of services is that of concentrating overmuch on one's areas of greatest expertise and ignoring the things one does not do well. On the other hand, perhaps the greatest joy in radio engineering is in the variety of jobs – Radio Technicians seldom have to face doing exactly the same work every day.

We will continue on next month with a discussion on how important it is for the Radio Technology Department to fully grasp what resources it has at hand and how to better utilize them in order to make the customer happy both in good times and during disasters.

Bill Weeks started out to be an "Experimental Psychology" major at college. He was drafted to reactivate a dormant carrier-current radio station and began the slippery slope down into radio engineering. Weeks' Hungry Wolf Electronics in Milton, NY is active in project engineering, which he defines as "any sort of paying work that does not require a pager." Email him at Bill@Wolftron.com

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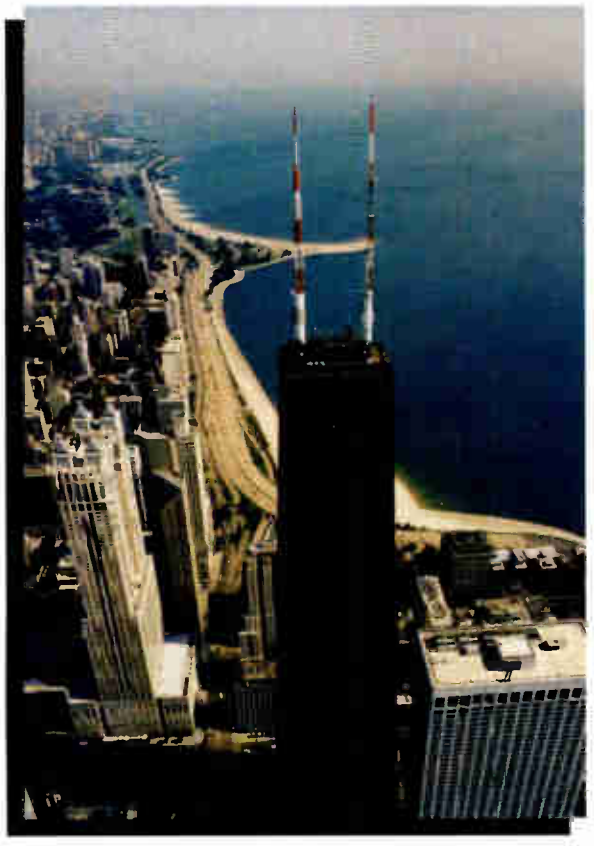

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Tech Tip

by Dale Manquen

Servicing Penny & Giles 8100 Series Faders

Quite a few consoles have Penny and Giles audio faders. They stand up well to abuse from jocks, slamming the pots up and down, food and liquid invasions, etc. Dale Manquen offers some help for those who are tasked to service the fader assemblies.

In 1993, Penny and Giles introduced the PGF8100 series audio faders as a lower-cost equivalent to the popular metal-shelled PGF3000 Series.

This newer model sports a two-piece molded shell featuring a special plastic containing embedded stainless steel particles to provide RF shielding. The conductive plastic resistance track is epoxied to the back half of the shell. The slider, supported by two polished steel rods, is a molded "engineered plastic" that serves as both the sliding bearings and the support structure for the multi-wire contact fingers.

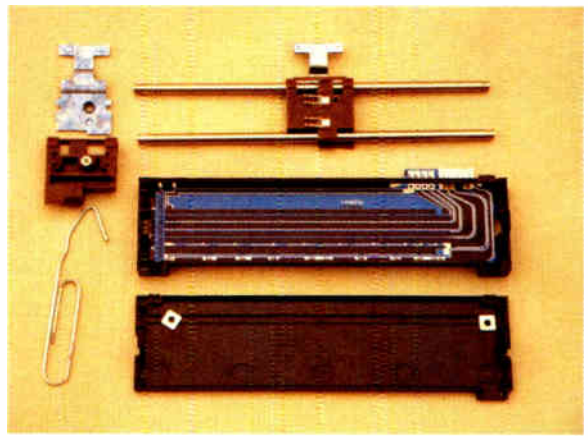
A KEEPER

Although the 8100 can be easily opened for cleaning and lubrication, P&G chose not to provide any replacement parts. In their minds, this was to be a disposable fader.

Many broadcast console manufacturers adopted the PGF8100 for their mixing consoles and we now find many thousands of these faders still in use. As a result, MANCO is getting many requests for parts to service these faders. We are pleased to report that P&G has agreed to provide replacement slider assemblies and knob brackets for these products.

INSIDE THE FADER

The slider assembly consists of a molded plastic block with one or two pair of contact brushes attached. (To simplify matters, all replacement sliders will have two sets of brushes.) The cast-metal knob bracket, which varies for different mounting panel thickness, is attached to the block with a single screw.



PGF 8000 components and bent paperclip for extracting rods.

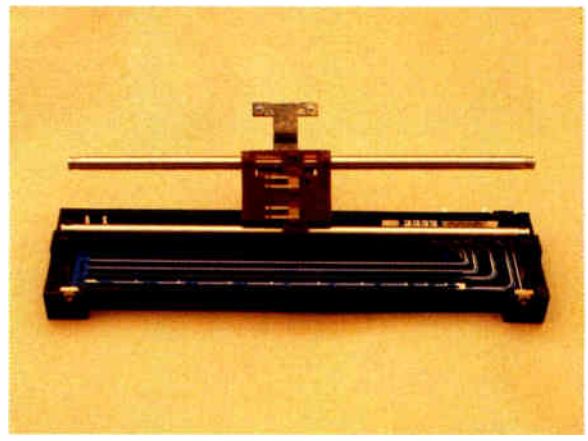
The contact point for the brushes can wear with time and use, flattening out and broadening the contact area. The result is that, as the area increases, the pressure at a given point decreases. Due to dirt or other contamination, the interface between the brush and the conductive plastic track can become more susceptible to liftoff, creating intermittencies.

If the wear pattern at the tip of the brush wires is a large oval, rather than a small circle, the brush is wearing out. In extreme cases, the end of the wire will break off and the remaining sharp end will gouge the resistive track.

INSPECTION

To inspect a slider assembly, the fader must first be dismounted from the console's metalwork. Next, on the label-bearing face gently push the two holding tabs toward the center to release the cover.

With the sidepiece removed, the rods can now be lifted from the snap cradles at the ends. Lift straight up (a large paper clip with a hook bent in the end can be used to lift the rod). To inspect the brush fingers, remove only the upper rod. The slider can then be rotated outward, providing access to the backside of the slider.



Slider opened for inspection.

If the inspection reveals that the slider is due for replacement, remove the remaining rod. The slider can now be slipped off the end of the rods. Remove the metal bracket by loosening the attachment screw.

CLEANING

It is recommended that rods should be washed – as well as the bushing holes in the slider if you are not replacing the slider – with 70% isopropyl alcohol to remove any dirt.

The conductive plastic track can be wiped with a wet tissue, using water if the track is fairly clean or alcohol if there are stubborn stains of deposits on the track. The tissue will normally pick up some loose carbon dust. A good gauge of cleanliness is the brightness of the silver pads and traces that connect the resistive tracks. A clean track will have bright silver showing.

REASSEMBLY AND LUBRICATION

The reassembly procedure consists of installing the slider on the rods, snapping the rods back into place and then mounting the metal knob bracket on the slider. Remember to face the contact brushes toward the conductive track!

Place two small drops of P&G silicone oil (P/N D23402) on each rod. Do not over-lubricate! Too much oil will cause oil to migrate onto the track, where it will pick up dirt and cause 'hydroplaning' of the contacts. After reinserting the mounting nuts, snap the cover into place.

If the metal knob bracket has been broken (by some of those DJs dancing on the console again), just follow the same procedure as above to access and replace the bracket.

MANCO offers a U-shaped metal spring clip that can be used to hold the two halves of the shell together if one of the plastic mounting ears breaks. We also have replacement snap covers, with and without microswitches installed.

CONTINUING SUPPORT

Penny and Giles (now a division of Curtiss Wright Corporation) is to be commended for their continued support to a market of aging but still useful products.

In an era of obsolete components and disappearing manufacturers, P&G is still providing support to faders that have been in service for over 25 years, dating back to the PGF1100/1500 Series with the heavy steel shells. As the exclusive P&G fader distributor for the U.S., MANCO is able to offer a complete line of P&G faders and parts, rotary faders and T-Bar controllers.

If you would like a pdf file copy of these "Servicing Instructions for P&G 8000 Series Faders," visit www.manquen.net or give us a call at 805-529-2496.

Dale Manquen has over 15 years of experience with Penny & Giles faders, and is happy to help find parts, oil, and information. You can reach him by email at dmanquen@email.msn.com

The Worst I've Ever Seen

A Visual Display of the Good, the Bad, and the Plain Hard-to-Believe

Fun With Cables

Do you ever have one of those nightmares about rewiring the station? You know, the one where you are half-way through pulling cables out of the rack (none of them labeled) and suddenly, as you stare at the growing pile, you realize *one of them has just put you off the air!*

It is real tricky to rewire a facility while it is operating – a nightmare even if you are wide awake – as this month's picture shows. Several engineers at the LDS Conference Center in Salt Lake City got the opportunity to work in a real "spaghetti bowl" of wiring when they set up to install two HD video switchers. Five thousand feet of Belden 1694A video cable were used in the conversion from SDI to HD.

It took a crew weeks just to put all the needed connectors on the cables. Perhaps the most startling aspect of this is what a small part of the plant it represents. When the TOC was moved from the tabernacle to the conference center four years ago, 300 miles – yes, *miles* – of cable was laid.

The LDS Church campus covers three city blocks and there are also 70 miles of fiber optics covering the entire campus. There are 1,500 different signals hitting the audio router, since they translate their conferences into 82 different languages. With the remodel of the tabernacle, they had a total of 100 fiber optic camera drops around the entire church campus. It is said the LDS system is larger than CBS Television City.

Pictured left to right: Gary Burgess, Engineer; David Gabbitas, TOC Engineer; Bob Wood, Engineer; and *a whole lot of cable.*

Our thanks to Sean McFarland, Conference Center CE, for the data and to Brent Hall for sharing Sean's picture and statistics with us. Pleasant dreams!

The Definitive FM Rebroadcast Receiver

The obvious choice for translator and other critical applications

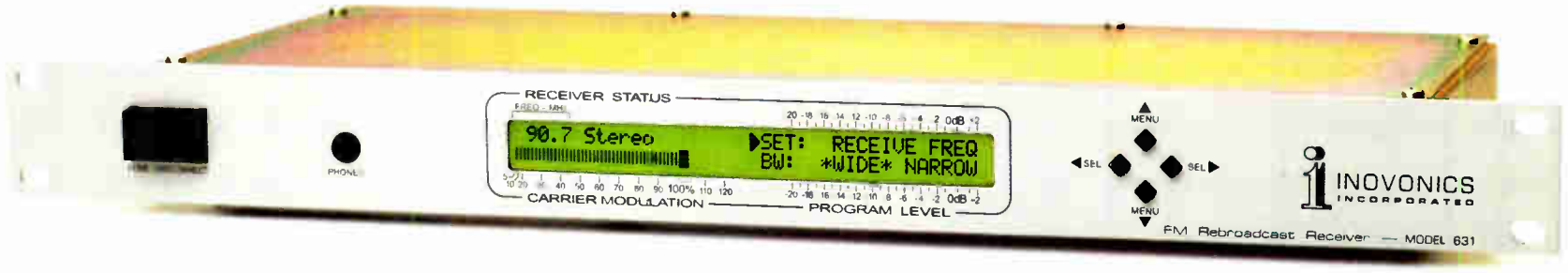
Inovonics' 631 is a truly professional, broadcast-quality FM receiver with unique features and excellent performance specs. The receiver is entirely menu-driven from the front panel, with nonvolatile memory for all settings and a rear-panel tamper lockout.

Front-panel metering shows both the composite/MPX level and stereo program audio. The display may also be scrolled to show the incoming RF signal strength and a readout of multipath distortion effects, both useful for proper antenna alignment.

A selectable IF bandwidth tames aggressive adjacent carriers, and carrier-loss muting and an overdeviation limiter protect the rebroadcast signal.

The 631 offers both a variable composite/MPX output and balanced left/right program audio. Alarm tallies enable remote indication of carrier loss and loss of program audio in either or both channels.

Model 631 – $1390



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Survival Guide

by Rich Wood

Your Job or Your Life

Anyone who has been in this business more than ten years is well aware of the changes consolidation has brought.

In the Good Old Days, the word "downsize" was rarely heard in the Broadcast industry; that was for employees at huge corporations. We were families. Companies were often run by people who actually lived within driving distance of their single AM/FM combo.

A CHANGED SITUATION

The first to go, surprisingly, were managers. A couple of years into consolidation someone estimated that 4,000 managerial jobs were gone. As it spread, consolidation took Program Directors and Operations Managers' positions and added additional station responsibilities. Where there was one station, there became eight.

Engineers know the story all too well. Once upon a time you might have a single station employee calling you in the middle of the night; one transmitter was in trouble. Today, you can multiply the possibility of being called 24/7 by a factor of between five and eight.

Think of it as being awakened by five or eight infants belonging to someone else. Not much sleep is in your future. Your job is very similar to many in the medical profession – the one difference is that a Doctor gets a breather. None are on call 24/7, except in life-threatening emergencies. A Doctor can save a life.

BETWEEN A LIFE AND A HARD PLACE

Many Broadcast Engineers in large clusters are less fortunate. Always on call, they have to trade a blissful family life for one of the few well-paying engineering positions left.

Consolidation also has brought about a nomadic lifestyle. As has always been the case with large multinational corporations, engineers now move from city to city relocating as the company dictates or seeking new jobs after downsizing. Such choices often prevent engineers without specialties in demand from pressing their employers to give them sufficient time to refresh themselves, enjoy recreation and be with those important to them.

Good managers and owners realize a genuinely overworked, tired and unhappy employee is no asset. Quite the opposite: such a person is a legal and organizational liability. "The beatings will continue until morale improves" rarely works. Bad morale is infectious. Legally, the company puts itself at risk when an engineer takes risks exacerbated by fatigue.

I know many companies wrongly assume there will always be someone to replace their engineer. However, they may eventually realize that assumption is wrong when it takes months to find someone far less qualified because working conditions are not conducive to the pursuit of happiness.

TROUBLE AT HOME

When your wife claims to be a widow and your children consider themselves orphans, you have a problem.

Single engineers trying to find a life partner often find themselves unable to participate in normal events that make relationships possible. A romantic dinner ends when a machine at one of the eight stations calls one of the many possible portable devices you carry to tell you it needs your affection more than the dinner companion you hope will want to spend the rest of his or her life with you.

Let it happen once and you may get a second chance. Let it happen again and that cherished third date vanishes. Dating a ghost has very little appeal. Disappointment and frustration replace both infatuation and genuine romantic interest.

THE RARE CATCH

Once in a while the object of your affection shares your love of Broadcast Engineering and is willing to accompany you on your quest to get that insensitive transmitter to make noise again. Very few find that kind of person with a heart still beating. If you do, it can be short-lived – but do not let them get away.

Being able to share your time with those significant to you is a major part of the quality of life. Those in committed relationships where children and community property are involved find the emotional and legal glue holding those relationships together is stronger. Medical research has shown a rewarding personal life prevents a catalog of ills.

I had a veteran jock working for me at WPIX-FM, New York, Though he was always employed (and had a business on the side), he warned me to always have some other talent I could rely upon once Broadcasting had chewed me up. He clearly understood the fragility of a radio job and the age ceiling I would find if I needed to look for another one after 40.

DO NOT FORGET THE FAMILY

The FCC is about to revisit ownership limits. My bet is that, regardless of the party in power, limits will be relaxed further. You may find yourself with a TV installation or a printing press to add to your duties.

Each of us has seen a family or relationship ruined by jobs that prevent nurturing those relationships. The time may come when you will be forced to make a choice between a burdensome job and a relatively normal life with those important to you.

As an industry we need to take a close look at what the future holds and decide where our priorities lie. The jobs are only going to get bigger.

Rich Wood is a regular contributor to ***Radio Guide****. Contact Rich at richwood@pobox.com*

End-to-End Solutions From SCMS

Orban 8500 FM Digital Audio Processor

Get your RACK Solutions from the Dealer That Knows Radio.

Introducing Optimod-FM 8500:
Orban's new flagship processor and the next step beyond the Optimod-FM 8400.
The 8500 builds on the proven, competitive sound of 8400 version 3 while adding features that make it the ideal choice for FM stations simultaneously transmitting iBiquity's HD Radio®, Eureka 147, or a netcast.
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The 8500 provides stereo enhancement, equalization, AGC, multiband compression, low-IM peak limiting, stereo encoding, and composite limiting—everything that even the most competitive major market station needs to stand out on the dial.
More than 20 excellent sounding, format specific factory presets get you started. You can customize them with an easy one-knob LESS-MORE control or with more than 60 advanced controls, whose versatility satisfies even the most finicky on-air sound designer.
Processing for digital radio/netcast (DR) is now supplied standard. We increased the base sample rate of all processing to 64 kHz. A built-in 8-second delay in the analog processing path vastly improves installation versatility in HD Radio plants.This allows you to use the 8500's built-in stereo encoder and composite limiter to drive the analog FM transmitter, ensuring no-compromise analog-channel loudness.

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IT Guide

by Chris Tarr

Putting a VPN to Use

Last month we discussed how to set up and configure a VPN. Now that we have gotten that accomplished, we can explore what can be done with our new connection.

One very powerful thing to do is to take control of your station's computers. The way to do that is to install and use VNC on top of the VPN connection.

VNC

Virtual Network Computing (VNC) was created at Olivetti and the Oracle Research Lab. It was originally designed to run on a "thin client" or terminal, in order to control a more powerful remote computer.

In 1999, AT&T acquired the lab, only to close down the research division in 2002. AT&T released the VNC code to the open source community under the GPL license. That makes the original version of VNC, as well as many of its variants, *completely free.*

The original VNC program is very basic. All it does is allow remote control of a computer. There is another release, Ultr@VNC, that has many more features like encryption, screen-scaling, and the ability to transfer files between the host and remote computers. I use Ultr@VNC on my network machines because of that flexibility.

INSTALLING VNC

All of the VNC programs come in two parts – the server, and the viewer. You need to install the server software on each computer that you want to control and install the viewer on each computer you use to access your remote systems.

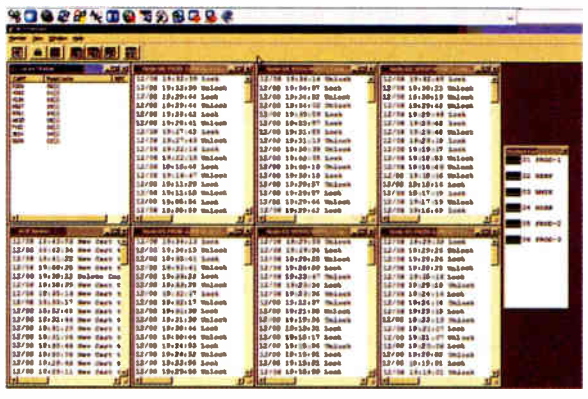
Installation is pretty straightforward, just follow the prompts and use the default settings. You will want to take note of the IP address of the computer on which you have installed the server, since you will need it to use the viewer.

Windows XP Service Pack 2 users please note: you will need to make an exception in the Windows firewall for VNC, the port number is 5900.

ENTER THE LAN

Now, let us actually connect to a remote computer. If you are outside of your network, establish a VPN connection. Then run the VNC viewer and enter in the IP address of the computer you want to access. Enter the password (if you set one up) and – in seconds – you are in control!

Here, as an example, is a screen shot of my automation server as I see it via VPN and VNC. It is just like being at the actual computer itself:



I have installed VNC on my automation server, the Burk Autopilot computer, even my security system. Thus I can remotely take control of the automation system, check transmitter readings, and actually lock and unlock the doors in my facility, as long as I have an Internet connection.

RUNNING FROM MOBILE DEVICES

It gets better. You do not even need to have a computer plugged into the wall to make this work.

If you have a Blackberry device and your company has your device running on BES, Idokorro's Mobile Desktop ($45.00) is a Windows Remote Desktop client available for the Blackberry. Palm smartphone (like the Treo) users using Mergic's VPN client ($29.95) can use Palm VNC (free) to access station servers from the mobile device.

Just imagine: opening a door or rebooting a problem computer at your facility without having to leave your family at the restaurant. I have to admit: VNC has saved my marriage more than once!

MORE OPTIONS

Now you are ready to control the universe from your mobile phone. What else can you do?

Since you are part of your network when connected through a VPN, you can stop emailing documents back and forth to yourself so that both your computers are up to date. Simply share a folder on your work computer and use that as a holding tank for files. Connect to your shared folder by clicking "Start" ... "Run" ... and then typing: \\<*ip_address*>\<*shared_folder_name*>

For example, if your desktop IP address is 192.168.1.1, and the name of your folder name is "shared," you would type \\192.168.1.1*shared* on the command line. In just a few moments, the folder will appear on your screen, ready to have files drag-and-dropped in and out. You can also connect to network printers and other machines. Remember: if it is on your network, you can access it through your VPN.

These tips should get you started. If you are as busy as I usually am, you will soon appreciate the time you will save – not to mention the free time you will gain by not having to run to the radio station or transmitter site every time there is a computer problem.

Here are URL links to the VNC programs I mentioned above:

- Real VNC (the original VNC program): http://www.realvnc.com
- Ultr@VNC: http://www.ultravnc.com
- Idokorro's Mobile Desktop: http://www.idokorro.com
- Mergic VPN Client for Palm: http://www.mergic.com
- Palm VNC: http://palmvnc2.free.fr

These URLs are also available, ready for you to "click" on, at www.radio-guide.com/URL.htm

Chris Tarr, CBRE, CBNT, is the Director of Engineering for Entercom in Milwaukee and Madison, WI. You can contact Chris at ctarr@entercom.com

We're all talk.

And all action, too.

All talk and no action? That certainly doesn't describe any radio station we've ever seen. With guest interviews, news and traffic feeds, live reports and listener calls to juggle, a talk studio is one of the most active places on the planet. Seconds count, and there's no room for mistakes.

That's why we created Status Symbols® for the Telos TWOx12 Talkshow System. Instead of flashing lights to decipher, there's easy-to-understand picture icons that give talk pros the information they need with just a glance. What caller's next? Who's screened, and who's just holding? With Status Symbols, you'll know instantly. And only Telos has them.

TWOx12 has lots more benefits. Like Digital Dynamic EQ, for uniform caller audio despite less-than-perfect lines. Twin DSP-powered hybrids for quick, no-hassle conferencing. A unique Dual Studio Mode that lets you use your 12-line phone system like dual six-line systems for extra flexibility. And TWOx12 is the world's only talk show system that can work with either POTS or ISDN lines to deliver exceptional caller clarity. Impressive? You'd expect no less from the company that *invented* the digital broadcast hybrid.

Is TWOx12 the perfect union of word and deed? Thousands of broadcasters worldwide think so. Why not see for yourself?

Telos
AUDIO | NETWORKS

12 lines, two digital hybrids, and superior audio performance. Desktop Director controller features handset, speakerphone and headset jack. Drop-in controls available for popular consoles.

New Call Controller has Status Symbols, DTMF pad and recorder controls (like Desktop Director), but lets talent use their favorite wireless phone or any standard handset for call screening.

Status Symbols show exactly what's what. Intuitive icons show calls locked on-the-air, which hybrid they're on, who's next in queue and more. So much better than a panel of blinking LEDs.

Assistant Producer enables talk show production via LAN or WAN. Status Symbols, Caller ID support, instant messaging and caller database are just a few benefits. Supports touchscreens, too.

Radio History

by Frank Gottlieb

KQV – A Pioneering Station in Pittsburgh

Life was much different a century ago. A hundred years ago, the entertainment options in Pittsburgh, Pennsylvania included vaudeville and the first Nickelodeon movie theater. Unless there was a piano in the parlor, entertainment was outside the home. But that was about to change.

SOUNDS IN THE AIR

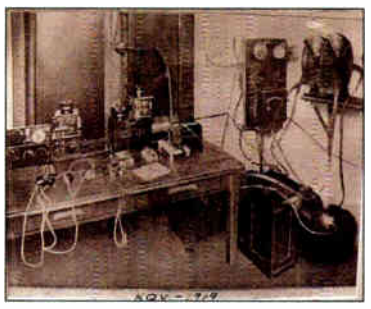
Frank Conrad, Nikola Tesla, Reginald Fessenden, Francis Potts, and Richard Johnstone were busy in their labs creating the technology that would bring voice and music to the masses. You may be familiar with Conrad, Tesla and Fessenden and their work with Westinghouse Electric. However, all but lost to history are Potts, a "ham" who worked for the Doubleday-Hill Electric Company in downtown Pittsburgh, and Johnstone, who was a draftsman with the American Bridge Company.

American society was going through a transformation. A growing tangle of wires powered streetcars, electrifying homes, and providing telephone and telegraph service. The electricity being wired into homes greatly improved quality of life. The wires would soon bring wireless information and entertainment to the masses.

Potts and Johnstone used a spark gap from a Ford automobile, a couple of nails, a spark cap, dry cell, and a sending key to construct a 20-watt transmitter. They began experimental broadcasts in 1919 using the 8ZAE amateur call sign of colleague Bert Williams. The aerial was strung across the street from the fledgling stations ninth floor studio and transmitter shack.

ALL-REQUEST RADIO 8ZAE

Doubleday-Hill began using the station on November 19, 1919 to sell a new technology called "radio." The station even set up one of broadcastings' first "request lines." When a dealer wanted to demonstrate a wireless radio set they would call – and 8ZAE would broadcast a recording.



A picture of the 8ZAE facility in 1919.

In January 1921 the experimental station 8ZAE became known as KQV, which stood for King of the Quaker Valley. (Before the FCC's creation, the Commerce Department's Bureau of Navigation assigned calls; American ships and experimental radio stations in the East usually received "K" series calls, as was KQV.)

The following year, on January 9, 1922, the DOC officially transferred KQV's license to the "Commercial" category granting license #452. The company vice-president responsible for the development of KQV was G. Brown Hill. Hill did not believe radio should be a commercial enterprise, so the station remained free of advertisements until 1925.

Radio was on its way to becoming a mass medium as stations in other cities including KQW in San Jose, California and WWJ in Detroit began broadcasting. Soon, Pittsburgh listeners had five local radio stations vying for their attention. In addition to KQV and KDKA, WCAE, WJAS, and WWSW began wireless transmissions. All remain on the air today.

EARLY STATION MOVES

KQV briefly had a sister station in Washington, DC, where Doubleday-Hill Electric also had a store. The company's WMU was also granted a license in 1922. However, in 1925 the station went silent and its license was deleted.

KQV remained on the air and progressively moved up the dial as the years went by. The first license was for 833 AM. KQV grew to 500 Watts and in 1925 switched frequency to 1090 AM. Two years later it moved to 1110 AM. 1928 brought a move to 1380, and the final change to the current dial position of 1410 was made in 1941.

KQV's current transmitter site was built at the same time as the move to 1410 was made. With the dial changes came progressive power increases, culminating in 1947 with KQV being authorized to run 5 kW, DA-2 from their site just north of the city center.

KQV covers Pittsburgh from a hill north of the city.

Doubleday-Hill sold KQV to H.J. Brennan in 1932; he also owned WJAS, Pittsburgh. The stations shared a transmitter site. Brennan moved KQV's studio to the Chamber of Commerce Building. It remained the stations' home for 60 years.

AN AGGRESSIVE AND CREATIVE STAFF

Paul Miller was one of the early station managers. Like other staffers, he held several jobs. Miller was the first Pittsburgh announcer to recreate a football game. His broadcast of a Notre Dame game was so realistic many listeners thought he was in South Bend.

Miller was also among the first to broadcast Pittsburgh Pirate baseball games, even though there was a ban on unauthorized broadcasting from Forbes Field. Cross-town rival WWSW had an exclusive contract to broadcast Pirate home games and KDKA broadcast the away games. So KQV pirated the Pirates!

(Continued on Page 36)

"We outgrew our old studios. With Axia, that won't happen again."

"Kaya FM is a trailblazer. We were the first independent radio station licensed in South Africa after apartheid. We invented our own unique format, a mix of music and talk. We grew into one of the most popular stations in Johannesburg. And we completely outgrew our original studios.

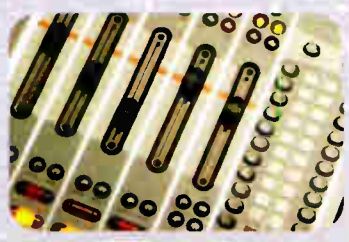
"Moving to Newtown, the city's cultural and entertainment center, required 'showcase' facilities; **dynamic, striking studios** that mirrored the buzz and excitement of our station and community.

"We also needed a routing system that would **seamlessly link all of our studios** and news facilities — cost-effectively, of course.

"Our equipment search began with the usual suspects, but nothing clicked until we saw Axia. Using Ethernet switches and CAT-6 cable to share audio between destinations makes a lot of sense, and costs a lot less than those expensive mainframe routers. Axia is **more flexible, too.**

"This is **a system we'll *never* outgrow,** because we can expand it by plugging in more audio nodes wherever we add new inputs.

"The on-air **staff loves the Axia consoles;** they're very flexible and easy to operate. Powerful, too: you can store custom show setups and call them up with one button. This really simplifies switching between talk and music shows — just load the show profile you want and the board is ready in seconds! And no more worries about setting up mix-minuses when doing remote broadcasts; the surface takes care of all that for you no matter how many callers or remote lines you have.



"I think **Axia was the perfect choice** for Kaya FM. We have all the functionality we wanted, and we got it for half the price of systems with less features. In fact, we've already ordered another new Element control surface! Axia is a technical dream... I can't imagine a better fit for our station."

— *Russell Pope, Operations Manager*
Kaya FM, Newtown, Johannesburg, South Africa

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www.AxiaAudio.com

Radio History

by Frank Gottlieb

Continued from Page 34

In 1938 KQV was sued in Federal Court for broadcasting play-by-play accounts of Pirate games without the expressed written consent of the Pittsburgh Athletic Company. KQV then rented space in a building with a view into Forbes Field. Spotters there relayed the action on the field back to the studio where Miller recreated the game.

But the broadcasts did not last. A canvas screen was raised to block the view from KQV's vantage point. In court, the judge ruled baseball games were subject to copyright law and rejected the stations' argument that the game was a bona fide news event worthy of live coverage. The ruling served as precedent for the 1998 ruling that blocked electronic paging companies from using spotters to offer real-time accounts of NBA basketball games.

FULL SERVICE PROGRAMING

Sports was just one of many offerings on KQV and other full service stations, as radio entered the Golden Age of the 1930s. There were local music programs, plays, and news and information programs. For network programming the station became an affiliate of the NBC Blue Network.

The mid-1940s brought changes in FCC ownership regulations. Brennan was required to sell one of his Pittsburgh stations. In January of 1945 he sold KQV to Allegheny Broadcasting for $575,000. The network affiliation changed to the Mutual Broadcasting System, and KQV became Pittsburgh's "Live and Lively" station.

Local personalities augmented by network programming were a major part of the stations success in the postwar years. Pirate's Hall of Famer Pie Traynor was KQV's sports director. Staff announcers were versatile. Dave Scott did virtually every type of program – including soap operas, talk shows, man-in-the street interviews, a trading post program, and – as Uncle Dave – a morning children's program.

FM AND TV COME, BUT AM STAYS

The new ownership saw the potential of the new FM band. Under the supervision of FM Supervisor Fred Zelner KQV-FM took to the airwaves at 98.1 MHz in 1948. The FM had substantially better coverage than the AM.

But the growth of a new form of wireless transmission called television kept FM listenership small. In the summer of 1953 newsman Bill Burns left KQV for the new DuMont television station WDTV-TV. KQV's owners saw the potential of the new medium and entered into a merger agreement with Hearst Broadcasting, the owner of WCAE, to apply for a television license. Because of the prohibition against owning two stations in the same market KQV was again up for sale and a willing buyer was found.

In August of 1957 American Broadcasting Co; Paramount Inc. bought the station from Allegheny Broadcasting for $700,000. KQV was about to become ABC's first Top 40 station. In January of 1958 the modified Top 40 format began.

1958 brings studios front and center on the street.

Most network programs were dropped. Exceptions included news, Don McNeill's Breakfast Club, and the Metropolitan Opera. In September of 1958 Lawrence Welk aired on KQV Wednesday evenings as one channel of an experimental stereo broadcast with Hearst television station WTAE-TV (the station KQV's former owners helped start).

BRINGING THE STUDIOS TO THE STREET

Meanwhile, an architect was designing what would become a downtown landmark. In October of 1958 KQV's studios and master control moved from the 14th floor of the Chamber of Commerce Building to the 1st floor site known as the corner of "Walk" and "Don't Walk."

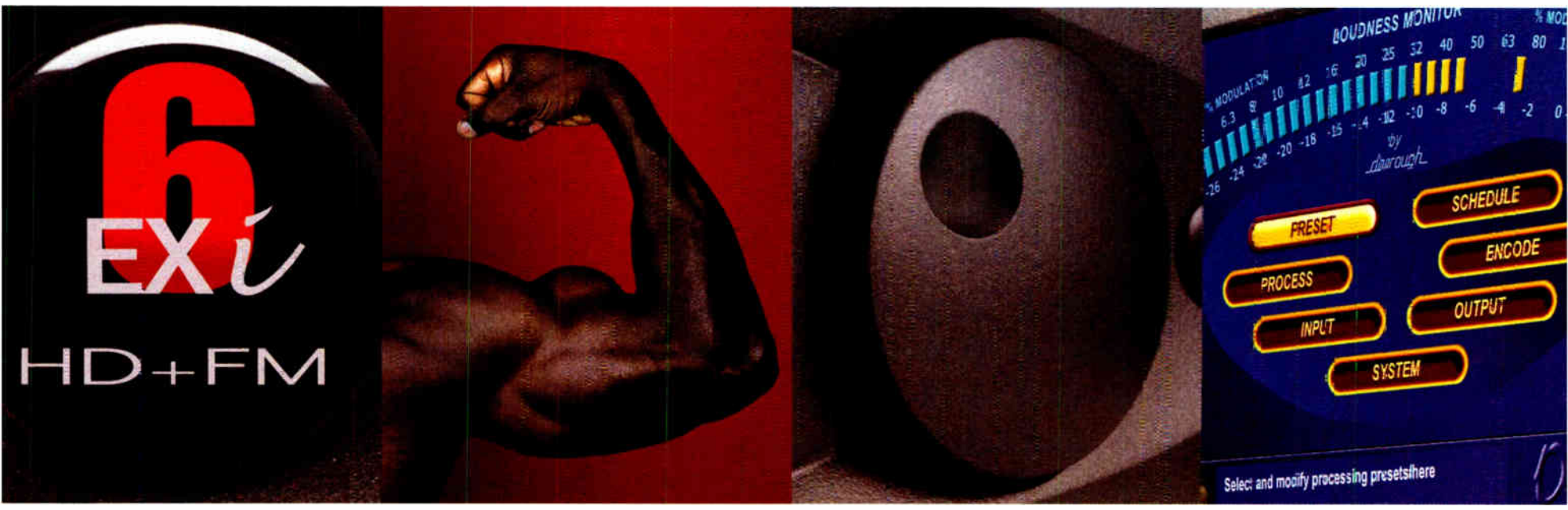
Passersby could watch Dave Scott and the other disc jockeys spin records in the showcase studios. In those years, most of the recorded program elements – music, jingles and commercials – were on records or transcription disks.

An ITA-5 transmitter was also installed in 1958 allowed higher peak modulation than the existing Western Electric rig.

To help KQV "rock," ABC installed an ITA 5 kW transmitter.

Other new technology began to radically change radio and bring us into the modern era. In the summer of 1959 KQV installed what was called an "automatic tape system" at a cost of $10,000. This early cart system gave what General Manager Ralph Beaudin called "a bright, clear, exciting sound." The plastic tape cartridges allowed the short program elements of the top 40 format.

(Continued on Page 38)



Omnia 6EX*i*

The Ultimate Upgrade.

Omnia-6 is the standard by which all other processors are measured. In the last few years, thousands of leading stations in the world's top markets have upgraded to Omnia. In fact, Omnia-6 has been so successful that some competitors have just given up; others are mere shadows of their former selves.

So why do broadcasters love Omnia-6? The *sound.* The clear, pure, crystal-clear sound (bone-shakingly loud, if you want) that's become the choice of #1-rated stations in New York, Los Angeles, Tokyo, Paris, London, Rome, Sydney and Beijing. The other guys tried to match its winning sound... and failed. So they've settled instead for trying to copy its innovative features.

Features that Omnia pioneered — like dual, simultaneous processing paths for HD Radio™ and conventional FM at no extra cost. The world's first non-aliasing digital clipping system, with composite clipping for the ultimate in competitive loudness. The high-precision Multi-Band Look-Ahead Limiter (invented by Omnia) for perfect HD Radio processing. The six-band limiter for conventional FM, with adjustable crossovers for surgically-precise control over your signature sound. An integrated Dorrough™ Loudness Meter. And of course, the groundbreaking 96 kHz, 24-bit platform that delivers full 20 kHz bandwidth for HD Radio broadcasts. Always innovating.

Which is why the **new Omnia-6-EX*i*** makes perfect sense. With **integral HD Radio Diversity Delay** that helps digital broadcasters eliminate analog connections to the HD exciter, ensuring independent analog and digital program streams. And the exclusive new **IoIMD Clipper** that actually **suppresses intermodulation distortion** to deliver audio that's cleaner, clearer and more detailed than ever — no matter how aggressive your processing. (If you already own an Omnia-6, don't worry – there's a low-cost upgrade to give your processor full-fledged Omnia-6EX*i* power.)

A lot of muscle? You bet. No wonder the competition is running scared.

Omnia
A Telos Company

OmniaAudio.com

Radio History

Continued from Page 36

ABC ROCKS IN THE 60's

The popularity of KQV's new Top 40 format prompted Bell of Pennsylvania to create a new telephone exchange. The volume of calls to the request line and Dial-a-Score was so great Bell created the "333" choke exchange to keep their central switch from crashing.

Unlike some other announcers of the era, Dave Scott successfully made the transition from block programming to ABC's Top 40 format. As one of the "Fun Loving Five plus One" he worked with talents such as Rod Roddy, Fred Winston, Chuck Brinkman, Gary Gears, Hal Murray, Jim Quinn, and Jeff Christie. By the way, Christie's real name is Rush Limbaugh; he is still in radio somewhere.

KQV began promoting rock concerts, including a Rolling Stones concert during their first American tour. The then unknown group attracted 300 people.

BEATLEMANIA!

The station also welcomed the Beatles to Pittsburgh on September 14, 1964. With the group at the height of its popularity, KQV and KDKA heavily promoted the upcoming concert, with each claiming to be "the Official Beatles Station." Station staff looked for ways to "score points" against the competition.

The Beatles held a pre-show news conference that their management said could not be covered live; there were no phone lines on site. So KQV applied for an emergency two-way license for coverage of a "beatle infestation." The result was the news conference aired with a seven-second delay.

As thousands of screaming fans arrived at the Civic Arena for the concert they saw "KQV Audio 14" banners above the stage and on the scoreboard. And when it was time for them to take the stage, Chuck Brinkman stepped to the mike and said "KQV presents the Beatles."

THIS TIME FM IS FOR REAL

The Beatles era was also the beginning of the FM era. KQV received a ratings boost from KQV-FM, which was now simulcasting the AM programming on 102.5 MHz.

However, the simulcast arrangement only lasted until the FCC requirement for separate programming prompted installation in 1968 of an automation system to broadcast the ABC "Love" format. Live local FM programming began a year later and in 1971 the FM call was changed to WDVE. Today, it is Pittsburgh's top-rated station.

Also in 1971, KQV AM installed a Bauer 5000J, which remains in operation as back-up transmitter.

THE NEWSCAST BEGINS

KQV and WDVE-FM were sold to Taft Broadcasting in 1974 for $3.5 million. With the rock audience increasingly switching to FM, and with other stations still doing Top40, Taft decided it was time for a format change. On October 14th of 1975 KQV switched to an All News format affiliated with NBC's NIS service. Robert W. Dickey became General Manager a year later.

KQV relies on Chief Engineer Steve Conti to keep the Harris "Gates Five" running smoothly.

When NBC dropped NIS, Dickey developed a local All News format. However, by 1982 Taft was ready to switch formats again, so Dickey began looking for an "angel" to invest in the station and save the format. With the financial assistance of publisher Richard Scaife, the newly formed Calvary Incorporated bought KQV for less than $2 million. CBS, Mutual, and the Wall Street Journal Radio Network augmented local news coverage.

In 1993 the station literally moved across the street to Centre City Tower. Internet streaming began in 1995. A Harris "Gates Five" was installed in 1999.

EVOLVING INTO THE FUTURE

As 2007 dawns, KQV celebrates 88+ years of service to the Pittsburgh market. KQV is still Pittsburgh's All News station. It continues to evolve and serve its listeners, even as other stations drop local news. 1410 KQV and www.kqv.com are live and local 15 hours per day thanks to a news staff larger than its competitors combined.

Mutual no longer exists. The CBS affiliation was dropped in favor of AP Network News. The charter affiliation with the Wall Street Journal Radio Network continues, as do affiliations with Bloomberg and Radio Pennsylvania. Tape cartridges were replaced in late 2006 with digital playback.

Night programming echoes KQV's heritage with the classic programming of "When Radio Was" interspersed with jingles from the Top 40 era. An automated version of the daytime format airs during the late night hours, however, the overnight editor can interrupt it at any time it is necessary to present breaking news.

ALL NEWS /ALL THE TIME
KQV AM 1410
HEAR...WHEN YOU NEED TO KNOW!

The News is still on, on KQV.

Like many of the staffers, Owner and General Manager Dickey has been with the station for over 30 years; he recently celebrated his 80th birthday. And like Potts, Johnstone, and the other visionaries of nearly a century ago he is looking ahead to what the future will bring.

Frank Gottlieb is a veteran broadcaster in the Pittsburgh market and has been News Director at KQV for the past 14 years. Contact Frank at FrankGott@aol.com

Radio War Stories

by George Whitaker

How to Steal a Radio Station

Part 2: Coax and Legal Games

Being forewarned is being forearmed. George Whitaker continues his discussion of some shady practices – and how you can protect your station from being victimized. Yes, the call letters have been changed for this story.

Last month we showed how to steal an antenna. However, the sharp crooks are out looking for the whole system. This time we will show you how they can save several thousand on the cost of building a new station simply by stealing the feedline.

LAYAWAY CONSTRUCTION

First they select a station that can only make improvements as the money is available – in other words, a station that will buy things and let them sit while they put the money together to finish the job.

The scam usually involves an unattended transmitter site. This gives the bad guys time to make off with stuff and have it installed somewhere else before the station even knows it has gone missing.

I witnessed a real example of this occurring between stations we will call KNIC (nice folks) and KRUK (crook). KNIC knew they needed to replace their old 3-1/2 inch coax line but did not have the money to do it all at once. So, they bought a roll of 3-1/2 inch coax and just left it sitting at the base of their tower. (This was before the price of copper made stealing cable for scrap profitable and the scavengers did not bother it.)

NOW YOU SEE IT, NOW YOU DON'T

Meanwhile, KRUK got a construction permit for a power increase and additional antenna height on their tower across town. They needed some 3-1/2 inch coax - and the owner of KRUK has spotted the perfect cable – sitting on the ground at KNIC.

The roll was longer than they needed for their new run, but the trouble of cutting the end off and reinstalling the connector was a small price to pay for free coax. So KRUK just went over one afternoon, picked up the roll of line, cut it to size, and installed it on their tower.

It was a month or so before the owner of KNIC went to his transmitter site and realized there was a vacant space where his cable used to sit. He asked some of the two-way guys who shared his tower and one of them said, "Well, I saw the guys from KRUK loading that cable up. I just assumed you had sold it to them and so I didn't call you. They didn't seem to care who saw them so I figured everything was on the up and up."

SLIGHT OF TONGUE

Needless to say, the owner of KNIC was somewhat miffed and he did what any of us would do: he called the Law and reported the theft.

The Law went out to see KRUK's owner and he said something like, "Well, yeah, I did use that roll of cable but I'll work something out with the owner of KNIC." At this point the lawmen are simply gathering information and no felony theft charges would have been filed.

KRUK was not upset at all by the visit from the lawmen. They had planned everything well in advance and just needed to wait until the theft was reported to work the next part of their scheme. Unfortunately, there are many lawyers who are crooked as a dog's hind leg; KRUK had one advising them as to just how to play this to get the cable and not be charged with theft.

HOW THE SCAM WORKS

KRUK called the owner of KNIC and the conversation (planned carefully by KRUK's lawyer) goes like this:

KRUK: "KNIC, this is KRUK".

KNIC: "You stole my cable!"

KRUK: "Yeah, we did put your cable up on our tower. But, we can't take it down now because we had to cut it and it would be too short for you now. I don't mind paying you for it. What is it worth?"

KNIC: "I paid $3,000 for that roll!"

Now, at this point KRUK is off "scot free." He can neither be jailed nor can he be made to pay for the cable unless KNIC could come up with the money to go through a big legal battle. Remember, it is the stations who can least afford it that become victims.

KRUK was instructed by his lawyer on exactly what to say to KNIC. If he could get KNIC to put a price on the cable it then becomes – the way the Law sees it – an offer to sell. Furthermore, if the cable is for sale, KRUK cannot be charged with theft because what we have now is just a dispute over price and collecting the money. It becomes a civil matter – and KNIC can only sue KRUK for their money.

Remember: crooks do not go after people who can defend themselves in court. If one calls and wants to work a deal, hang up without saying anything. The minute you talk money you have not only lost yours, but you have handed him a "Get Out of Jail Free" card.

George Whitaker is a long-time broadcaster, based in Arlington, Texas. Contact George at boss@mikeflags.com

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Remote Control

WVRC-8 8 Channel Web & Voice Remote Control System

The WVRC-8 provides a cost-effective, one rack-unit solution for web based and/or recordable voice response dial-up transmitter site control. The WVRC-8 was designed from a users point of view, so all of the basic functionality you need is included to control your site equipment, while including the accessories other manufacturers consider optional. Each analog, status, silence sensor and power failure input can be configured to email up to four individual email addresses, allowing different input alarms to be routed to different email recipients. The WVRC-8 is equipped with a browser based 100-event program scheduler for relay control and alarm muting, along with an 8192 event alarm logger. The user can also elect a sound effect to play when an out of tolerance alarm is generated. We have also provided SNMP capabilities to allow multiple units to be monitored with any SMNP manager software package. The WVRC-8 is equipped with eight high-resolution analog (telemetry) channels, while each of the eight optically isolated status channels may be configured for 5 to 24vdc wet or dry (contact closures) status monitoring. The eight control channels are equipped with independent SPST one-amp relays for each raise/on and lower/off function. These relays may be latched, unlatched or momentarily closed. The WVRC-8 is supplied with spoken words and phases in English, while the user is free to record words and phases in their language. In addition, the WVRC-8 may be programmed for dial-up operation via HyperTerminal, while the Java applet programming can be performed using your favorite web browser. System expansion may be accomplished by cascading multiple WVRC-8's on the same telephone line and/or Ethernet switch. Future external add-on products may be attached via the BT-Link expansion port.

WRC-4 Web Based Remote Control

The tiny TOOLS WRC-4 is a fresh approach to remote site monitoring and control or providing an inexpensive solution to Internet enabling your present remote control system. The WRC-4, combined with web access and your favorite web browser, brings you the following features, all available in this small, but powerful tiny TOOL: A powerful built-in web-server with non-volatile memory; 10/100baseT Ethernet port; four channels each of high resolution telemetry inputs with a large monitoring range; optically-isolated status (contact closures or external voltages) inputs; normally open dry one amp relays; open collector outputs; front panel status indicators, a single front panel temperature sensor and 4-email notification addresses. The WRC-4 is also SNMP enabled. The WRC-4 has been carefully RFI proofed, while including the accessories other manufacturers consider optional. The WRC-4 is supplied with plug-in euroblock screw terminals and loaded with a generic web page that may be edited by the end user. The WRC-4 works with either dynamic or static IP addresses (when used with a dynamic IP, an inexpensive cable or DSL router may be required). Multiple WRC-4s may be used with a user provided Ethernet hub. The WRC-4 may be set on a desktop, mounted on a wall or up to four units mounted on the RA-1, Rack-Able mounting shelf.

AVR-8 Voice Remote Control

The AVR-8 is a voice remote control system that automatically reports changes detected on any of its eight digital inputs to a remote telephone and/or pager. After speaking a greeting message that may identify the source of the call, the AVR-8 then speaks a unique message for each input change. Each message comes factory programmed, but may easily be re-recorded with your own customized messages. After reporting, the AVR-8 allows you to give it commands through your telephone keypad. Functions include telling the AVR-8 to report on the input state of any of the eight digital inputs, commanding the AVR-8 to pulse any one of its four relays for 750 ms and/or turning any one of the relays on or off. When a relay command is given, the AVR-8 speaks the relay 'name' followed by the 'on' or 'off' message. For instance, commanding relay 4 ON causes the AVR-8 to turn the relay on and then report "Relay 4 ... is on." As with the greeting and input messages, the relay 'name', 'on' and 'off' messages may be re-recorded if desired.

In addition to initiating a call out when inputs change, the AVR-8 monitors its telephone line to receive a call-in from a remote location. When a call is received, the AVR-8 speaks a greeting message, and is then ready to receive and execute commands to report on its inputs, change to its relay outputs or turn on an audio input to the telephone line.

VAD-2 Voice/Pager Auto Dialer with Silence Sensor

The tiny TOOLS VAD-2 is a user programmable two-input with integrated stereo silence sensor, multi-number voice/pager auto dialer, designed for dial out voice message notification. The VAD-2 has two dry contact inputs and stereo silence sensor, which, when tripped, will sequentially dial up to four different phone numbers and play back a user recorded message corresponding to the tripped input. The VAD-2 is also equipped with two SPST one amp relays for the control of external equipment. The VAD-2 can store up to four 32 digit phone numbers and one 32 digit pager phone number which may be associated with any of the two inputs and/or stereo silence sensor. The VAD-2 is capable of remote or local configuration and message recording with a total recording time of 16 seconds. The two SPST relays may be programmed for momentary, latching or tone duration operation. The VAD-2 may be set on a desktop, mounted on a wall or up to four units mounted on the RA-1, Rack-Able mounting shelf.

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INNOVATIVE PROBLEM SOLVING TOOLS FOR BROADCAST

Gear Guide

January-2007 Buyers Guide

Codecs and Telco • Wireless Audio

Portable and Remote Audio Gear

APT

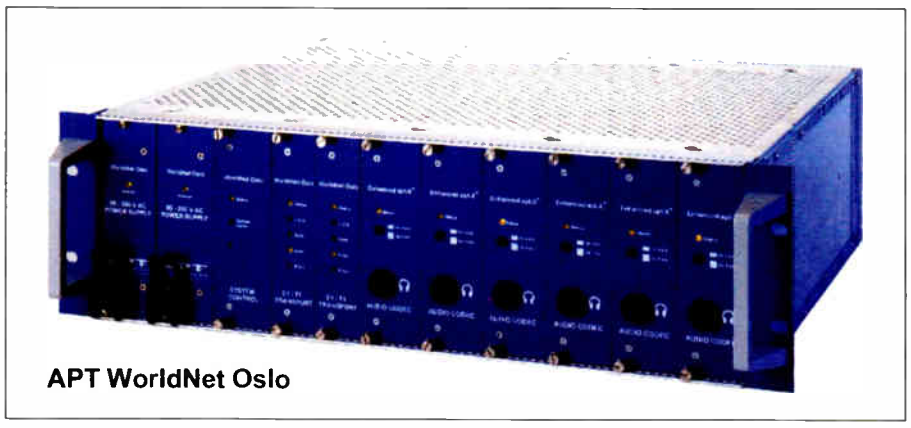
WorldNet Oslo Audio Codec

www.aptx.com • 800-955-APTX

The APT WorldNet Oslo Multiple Channel Audio Codec is a modular audio/data multiplexer. The WorldNet Oslo is described as ideal for radio stations wishing to upgrade their STL capabilities in order to accommodate the multiple audio streams of HD Radio. APT emphasizes built-in redundancy of the WorldNet Oslo, making it ideal for "mission critical" STL applications.

Via a single 1.53 Mb/s T1 link, the WorldNet Oslo is capable of simultaneously transporting HD1, HD2, and HD3 audio via Enhanced apt-X, plus IP LAN, RBDS data, contact closures, and engineering talk-back. E1 and IP links are also supported. The cost of multiple T1s is eliminated, as are the quality limitations of MPEG compressed audio, according to the company. Uni-directional or bi-directional links are supported.

APT points to the desirability of Enhanced apt-X in the modern broadcast environment of "dueling algorithms." Enhanced apt-X is a non-destructive coding technology based on ADPCM (Adaptive Differential (or Delta) Pulse-Code Modulation). Enhanced apt-X offers near-lossless audio encoding/decoding with under 2 ms delay. A word resolution (bit depth) of 16 or 24 bits is available resulting in a dynamic range of greater than 85 dB at 16 bits, and greater than 110 dB at 24 bits.



APT WorldNet Oslo

Svein Henning Skaga, Audio Engineer with P4, a Norway commercial broadcaster said, "We liked the bandwidth efficiency of the Enhanced apt-X audio cards which lie at the heart of the WorldNet Oslo system. We were able to get all the required audio channels onto a single E1, fully duplex and still have bandwidth left over for a 512 kBit video conferencing signal." Skaga continued, "Enhanced apt-X had the added benefit of being an ADPCM-based algorithm, avoiding any issues with cascading algorithms. This was particularly important as several lossy codecs were to be used further along in our audio chain."

"The modularity, flexibility and reliability of the WorldNet Oslo coupled with the low delay and high quality of the Enhanced apt-X algorithm made it perfect for our application" adds Rafael Martinez, Transmission Engineer with Canal Sur, a Spanish broadcasting conglomerate. "The units are located at the heart of a critical operational environment. Options such as redundant power supplies and hot-swappable cards provide the extra security we require." Martinez also appreciates the ratio of audio channels to rack space of the WorldNet Oslo. At only 3U high, it fits easily into our equipment racks."

Comrex

ACCESS System

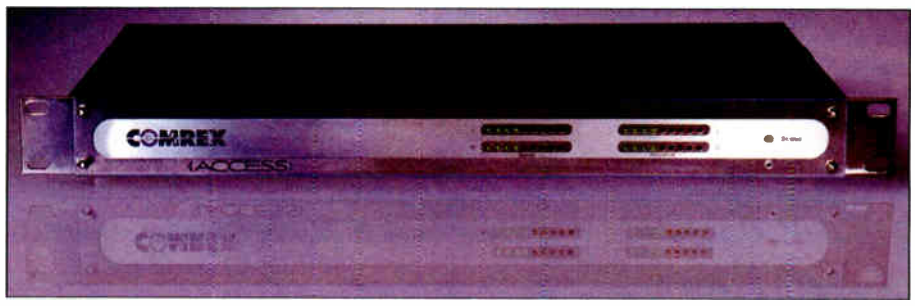
www.comrex.com • 800-237-1776

Trouble establishing a reliable connection for remote broadcast events has engineers, program directors, sales people and air talent all becoming more and more frustrated. With the advent of the inherent delay of the HD Radio™ air signal, off-air monitoring at a remote event is impossible.

RPU frequencies are congested and prone to interference from other broadcasters at just the wrong time. Compounding these problems is the lessening availability of ISDN and even adequate POTS lines. It is often easier to find an Ethernet port than a POTS line.

Comrex delivers an ideal solution for these issues with its ACCESS system. ACCESS delivers mono or stereo audio over POTS, DSL, Cable, Wi-Fi, 3G cellular data networks, the wired public Internet, and satellite. The low latency delay of the ACCESS system relative to the eight seconds of HD Radio audio allows air monitoring or IFB talkback for cueing in near-real time.

BRIC technology has been incorporated into the ACCESS system to ensure broadcast-grade reliability. Tom Hartnett, VP of Engineering for Comrex pointed to the diminishing availability of ISDN as a spur for Comrex to create – from a clean slate – a new broadcast remote connectivity technology. "Rather than sticking an Ethernet port onto an existing ISDN or POTS solution, we looked at the IP situation and built this from the ground up – new coding algorithms, extensive efforts into balancing stability with delay, packet loss protection and so on. We group this R&D effort into a technology we call BRIC," said Hartnett.



Comrex ACCESS Rack Unit

BRIC stands for Broadcast Reliable Internet Codec. Yes, that is Internet with a capital 'I' – the public Internet. BRIC is "constantly adapting to connectivity conditions in an effort to minimize delay," said Kris Bobo, VP Development for Comrex.

ISDN and POTS are circuit-switched technologies that are becoming obsolescent. With them, there is a dedicated connection between you and your destination. The public Internet is a packet switched technology in which you are sharing a connection with many others along the way. Delays and loss are inevitable. BRIC technology minimizes the effects of those problems to deliver a reliable broadcast-grade connection.

The Comrex ACCESS system includes the ACCESS Portable. "The ACCESS Portable is designed to be as easy to use and connect as your familiar laptop at a Wi-Fi hotspot," said Bobo. It incorporates a web browser to enable logins when necessary. The portable includes two cardbus slots and accepts the same cards as those used in a laptop.

JK Audio

Innkeeper 1x and 1rx Digital Hybrids

www.jkaudio.com • 800-552-8346

JK Audio has introduced the newly revised Innkeeper 1x and rack mounted 1rx digital hybrids. The 1x and 1rx have had new features added while being redesigned for the European RoHS initiative. The 1x and 1rx units now have a lower price.

"The new features include lower noise and better echo-cancelling performance and an RS-232 interface using a simple ASCII protocol. Also, the 1x and 1rx are now compatible with the optional RIU-IP Remote Control – an IP interface with a built-in web server for control from your web browser," said Joe Klinger of JK Audio.

"JK's digital hybrid utilizes a dual-convergence algorithm that uses only your transmit audio to build its filter. We do not send a noise burst down the phone line to prime the algorithm," continued Klinger. "Our method is so reliable that we only have one version of the product for all world markets. It doesn't matter if the phone line is in Manhattan, Sydney, Moscow, Paris, France, or Paris, Texas. Perhaps the real reason for this product's success is the quality of the echo canceller." The algorithm can achieve trans-hybrid loss typically exceeding 50 dB without any setup, according to JK Audio.

JK Audio Innkeeper 1x and 1rx

The user interface is intuitive and convenient. A component of the physical interface is a control access door behind which you will find four volume controls and five feature controls. For many applications these are set-and-forget controls conveniently hidden to discourage tampering. On the other hand, there are many situations where you will need to quickly adjust levels or change features. The last things you want to see are screwdriver trim pots and dip switches. Forgot your "greenie" or cannot find the dip switch label? No problem!

Common-sense features include a front-panel headphone jack and volume control from which you can monitor either the send signal, the caller's voice, or a mix of the two. Press the "Presence" button and you will get a richer sound from the caller's voice. This digital filter brings back some of the low-end lost in transmission, according to JK.

The optional remote RIU-IP interface incorporates a web server that allows the user to control the innkeeper hybrid via a web browser. The RIU-IP may be connected directly to the user's computer, to a local network, or to the Internet for control from anywhere in the world.

Gear Guide

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January-2007 Buyers Guide

www.RadioGearGuide.com

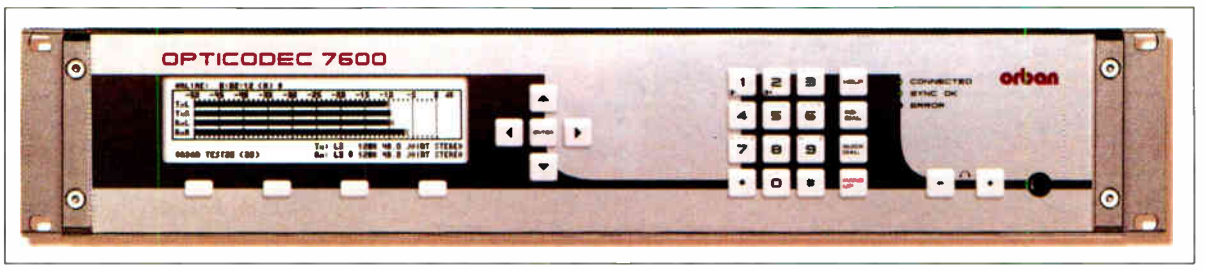
Orban

Opticodec 7600 Codec

www.orban.com • 480-403-8300

The newly introduced Orban OPTICODEC 7600, a rack-mounted unit, is described by Orban as the natural successor to their MusicTAXI. A fully duplex, nearly universal codec utilizing Orban's "automatic codec detect" function, the 7600 does not concern the user about what codec is on the other end of a connection.

That connection can be via ISDN, X.21, V.35, TCP/IP or POTS. Currently supported are the following algorithms: MPEG1 Layer 2 and Layer 3, MPEG2 Layer 2 and Layer 3, AAC, AAC+, AETA 4SB ADPCM, G.711 and G.722. Audio modes are mono, dual mono, stereo and joint stereo at sampling frequencies of 16, 22.05, 24, 32, 44.1, 48, 64, 88.2, and 96 kHz. The OPTICODEC 7600 utilizes the latest Motorola DSP – not a PC processor.



Orban OPTICODEC 7600

With a delay of less than 7 ms, AETA 4SB ADPCM is a good codec choice for transmitting sports events. You can even use your analog telephone system to establish a connection via POTS (Plain Old Telephone Service). The POTS interface uses the latest codec, aacPlus™, allowing high audio quality at low bit-rates.

Contributing to the Orban 7600's ease of use are the rationally designed front panel controls. The panel sports a multifunctional keypad with customizable direct-dial keys for all algorithms, a numeric keypad, and such shortcut keys as redial, quick dial, hang up and, best of all, help!

When using an OPTICODEC 7600 on a LAN/WAN/ATM/Internet connection, the user may choose NETControl remote software. Windows 2000/XP based NETControl allows you to monitor, configure and connect any Orban OPTICODEC attached to your network.

Ports and connectors include: up to 3x ISDN (64 - 384 kbps), 1x X.21/V.35, 10/100 BaseT, an alarm/control interface, remote port – ancillary data port over RS232 or USB full speed, external sync on BNC, AES/EBU I/O on XLR connectors, analog input and output range from -4 to 21 dBu on XLR-type connectors.

Telos

Zephyr Xstream Codec

www.telos-systems.com • 216-241-7225

The original Telos Zephyr is said to have set the standard for sending CD-quality audio over ISDN by marrying advanced audio coding and digital telephone technologies. Now, the new Zephyr Xstream at your studio carries these advancements further, becoming a "universal codec." The Xstream can connect with every popular ISDN codec for full-duplex, 20 kHz stereo audio, transmit and decode streaming MP3 audio over Ethernet, and even connect with the revolutionary Zephyr Xport portable codec via analog (POTS) telephone lines.

Many engineers are not aware that the Telos Xstream does IP streaming. IP is built-in even if you think you have just ISDN or V.35. The latest Zephyr Xstreams include 100-BaseT, so that you can connect them directly to your Livewire network. Bring audio from any codec anywhere in the world directly to your Axia network. "Xstreams built recently, with the newest hardware, plug directly into a Livewire network – with no traditional audio wiring," said Kirk Harnack of Telos/Omnia/Axia.

There is a choice of MP3 or AAC formats at bit rates from 8 kbps to 256 kbps and a range of buffer-time sizes. New MPEG AAC-LD coding lets you transmit Layer 3-quality audio with greatly reduced transmission delay.

"Xstreams in IP mode were used to keep at least a couple of New Orleans stations on the air for some weeks after Katrina," said Harnack. If you have an Xstream, the latest firmware is available at no cost. A portable Xstream incorporates a four channel stereo mixer and two local monitor mixes which can be used for a separate producer headphone mix and a separate PA mix.

New capabilities in the portable Zephyr Xport now give you increased flexibility for remote broadcasts. Breakthrough technology developed by Telos lets Zephyr Xport communicate with your studio's ISDN Zephyr Xstream from a standard POTS line – perfect for remote locations where ISDN is unavailable. With conventional POTS codec technology, the user is at the mercy of an unreliable POTS "last mile" connection at each end. The Zephyr Xport's technology reduces that lack of reliability by half making those high-billing remotes more certain of success.

By incorporating AAC+ coding technology, those remotes can sound fine on voice or music even at very low bit rates. In those instances where line quality degrades to an unusable point for digital connectivity, the Xport seamlessly reverts to a voice grade backup without interruption.

Telos Zephyr Xport and Xstream

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Multi-Mode Codecs

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Tieline America sees the future of remote connectivity as audio over IP. Tieline has made this versatile technology – both wired and wireless – its main focus. "Years ago we saw the writing on the wall that IP audio was the new future for broadcast remotes and we've proven that to be a fact as customers ask for IP audio by more than a 4:1 ratio over POTS or ISDN," said Kevin Webb, President of Tieline America.

Broadly versatile, the Tieline codecs are capable of delivering full bi-directional FM-quality stereo, mono, or dual-mono audio using wired or wireless IP, POTS or ISDN as well as GSM or X.21 all in one box.

Capable of making two connections simultaneously, one codec can operate as two, saving thousands of dollars. Further savings result from Tieline's scalability. A purchaser can select only what is needed at first and build on later at a significantly reduced cost. "Tieline has always engineered codecs that are "future-proof" – fully upgradeable in both hardware and software – so broadcasters can rest easily knowing they have the latest state-of-the-art remote broadcast equipment," said Webb.

Even though versatile, a Tieline is easy to setup. An operator only needs to plug in the power and wired connection if any, and the Tieline can completely take over. It will automatically make the bi-directional connection, maintain correct audio levels with intelligent gain control, automatically reconnect if the connection is ever lost, trigger relays back at the studio, lock out the keypad to prevent operator error, automatically adjust the connection parameters, and even notify the studio and/or operator if the connection is lost.

Tielines can execute manual or automatic failover functions. This makes for the most reliable remote connections possible. If a connection mode fails, such as wireless or ISDN, reconnection can automatically be made through POTS, for example.

Tielines are capable of full bi-directional FM-quality wireless IP audio using either the USB module and a data-capable phone or a wireless router and laptop air card.

Tielines can also be used as a true STL codec, capable of linear uncompressed raw audio at a 38k or 48k sample rate using only 3 MB of data throughput.

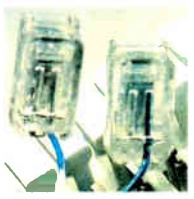
Each Tieline is completely remote-controllable on either end of the connection in three ways: by using the free Toolbox software from either end or even from a 3rd location, by control of audio levels from either end of the connection, and by means of sophisticated remote control relays and macro functions also from either end of the connection to fully control automation computers, etc.

"High quality bi-directional remote broadcasts are what broadcasters have been looking for ever since broadcasting began and Tieline can do it now," said Webb. "Imagine having 15-20 kHz bi-directional stereo audio wirelessly! All you need at the studio is a Tieline and a good wired IP connection. A POTS or ISDN line would be a good backup just in case.

"For the remote end you'll have a Commander or i-Mix G3 field unit and a USB module with a data-capable phone or a wireless router and laptop air card. All you have to do is go to your remote broadcast location, turn it on and broadcast. No more asking to borrow the customer's phone line, provisioning an ISDN line 2-4 weeks ahead of time at a large setup cost or using an unsafe microwave antenna mast."

Service Guide Radio Equipment Products and Services

Service Guide Radio Equipment Products and Services



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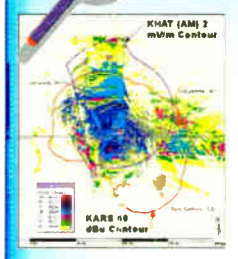

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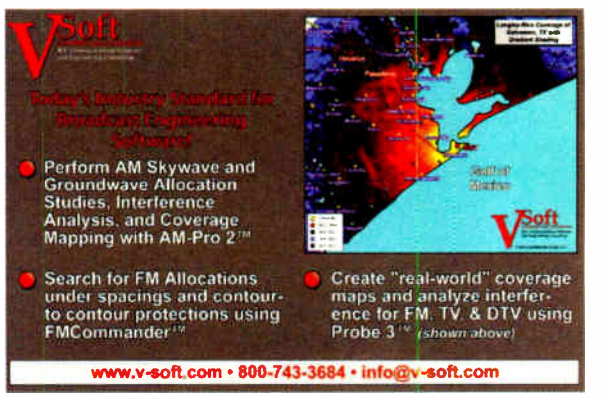

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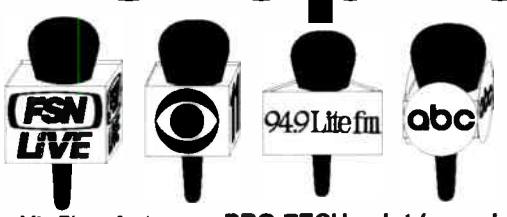

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The SanDisk e200 Series

A High Capacity Flash Memory MP3 Player – and Much More

In the old days, taking the station music, announcements, or other audio out on site for a remote broadcast usually required cases and cases of gear and records, carts or CDs. If you wanted to record audio for promos or newsgathering, even more gear was necessary. But a new product from Sandisk now makes it easy to carry virtually everything you need – in your shirt pocket.

The SanDisk Sansa e200 series.

The SanDisk Sansa e200 series of MP3 players (e250, e260, e270, and e280) will hold up to 8 GB of audio, all on flash memory (no moving parts). That is as many as 2,000 songs. An additional 2 GB of capacity can be achieved by using a microSD memory card.

VERSATILE

The sleek, thin design is only half an inch thick, two inches wide, weighs just over 2.6 ounces and includes a scratch resistant alloy metal back casing. At a remote site, the Sansa can be set in a docking station and audio played through a sound system using the remote control.

The Sansa docking station and remote control.

But the Sansa players are much more than MP3 players. The Sansa players include the most wanted features and, perhaps as importantly, they have eliminated many of the annoyances of existing similar products.

For example, unlike many similar units, the Sansa players have built-in a microphone and an FM radio. This makes the Sansa useful for electronic news gathering (ENG), quick recordings with listeners or clients, or artist interviews. The FM radio allows off-air reception as well as recording.

MUSIC AND VIDEO

MP3 files can be added simply by dragging and dropping them in Windows Explorer. These files can come from anywhere. (Windows Media Player can also be used to add and sync files – the Sansa supports Microsoft "PlayForSure" subscription services.)

Utilizing a graphical interface with advanced navigation features, the user can quickly and easily navigate to the desired function. The 1.8-inch color screen displays song information, elapsed time *and remaining time.*

While playing a song, the elapsed *and* remaining time is displayed on the display screen.

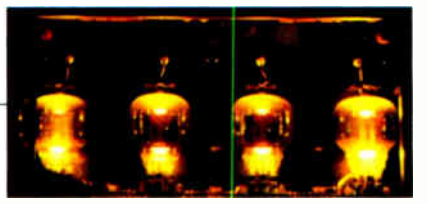
In addition to almost a dozen audio equalization pre-sets, a five-band user adjustable equalizer is included, as well as a "normal" and "high" output ranges, to allow setting the audio more easily to the user's personal preference. Photos and video can be added to the player, too. Using the Sansa Media Converter allows them to be optimized for best viewing.

REPLACEABLE BATTERY

The Sansa player plugs into any USB port for transfer and battery charging. SanDisk has also answered the problem of dealing with worn out rechargeable batteries. They are field replaceable by the user for under $20.

Because SanDisk is a major manufacturer of flash memory, the most costly part of MP3 players, the cost of the Sansa units is more modest than might be expected. For example, the e270, 2 GB model starts at under $140. Several stores are running specials, including rebates.

Final Stage



RADIO ROUNDUP

The Radio Guide Event Register

Email your dates and info to: ***radio@rconnect.com***

2007 Annual AM Transmission Seminar
February 14-16, 2007
Orlando, Florida
www.radio-guide.com/amseminar.htm

National Assoc. of Tower Erectors (NATE)
February 12-15, 2007
Nashville, Tennessee
www.natehome.com

National Religious Broadcasters NRB2007
February 16-20, 2007
Orlando, Florida
www.nrb.org

Great Lakes Broadcasting Conference & Expo
March 13-14, 2007
Lansing, Michigan
www.michmab.com

National Federation of Community Broadcasters
April 11-14, 2007
New Orleans, Louisiana
www.nfcb.org

NAB 2007
April 14-19, 2007
Las Vegas, Nevada
www.nabshow.com

OAB Annual Convention and Engineering Conf.
March 16-17, 2007
Tulsa, Oklahoma
www.oabok.org

SBE22 Broadcast & Technology Expo
October 16-17, 2007
Verona, New York
www.www.sbe22expo.org

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Armstrong Transmitters - 39	www.armstrongtx.com	Larcan - 27	www.larcan.com
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Axia - 35	www.axiaaudio.com	Lightner Electronics - 21	www.lightnerelectronics.com
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