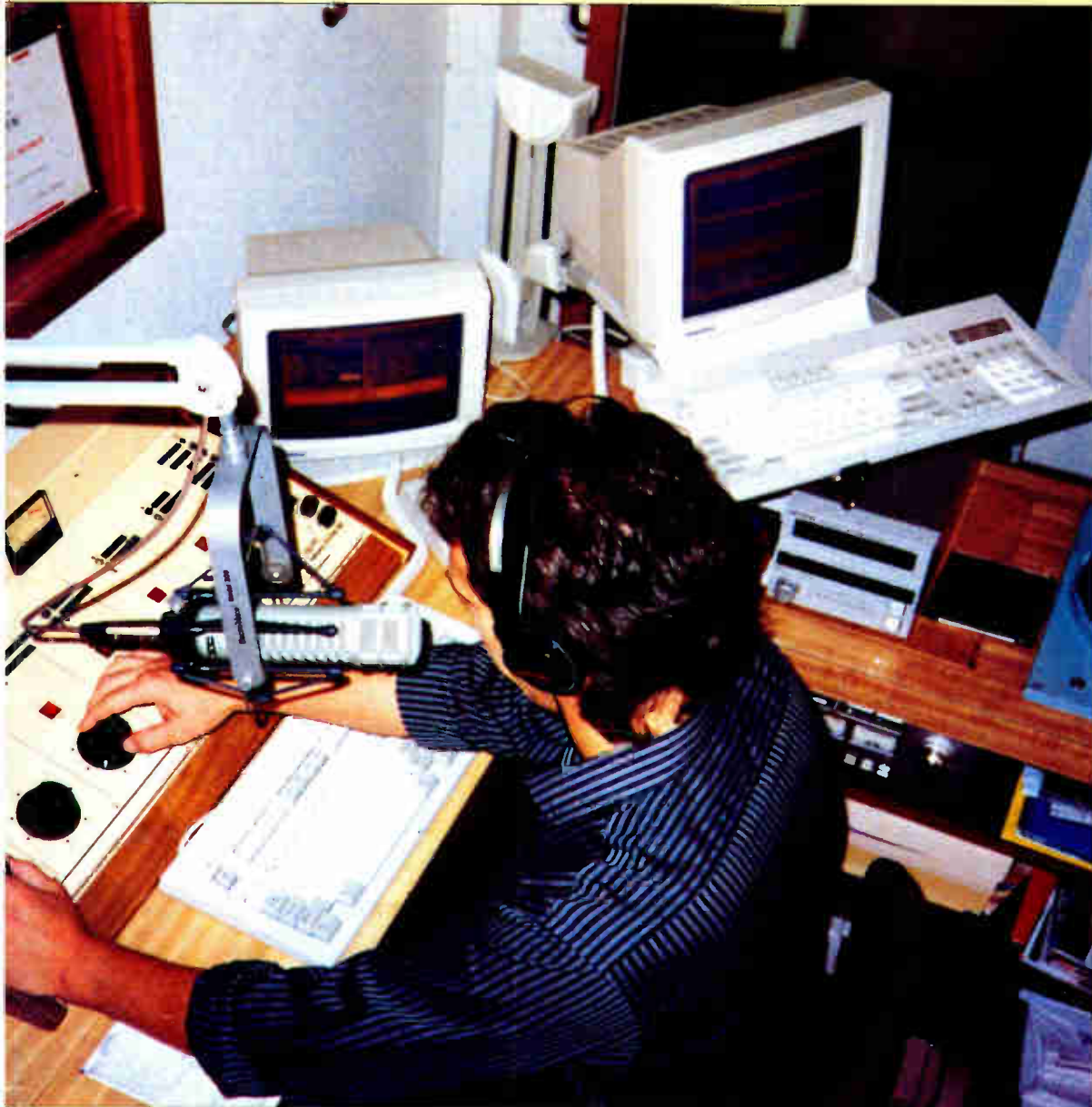


Radio Guide

Radio's Technology Magazine

September 1992



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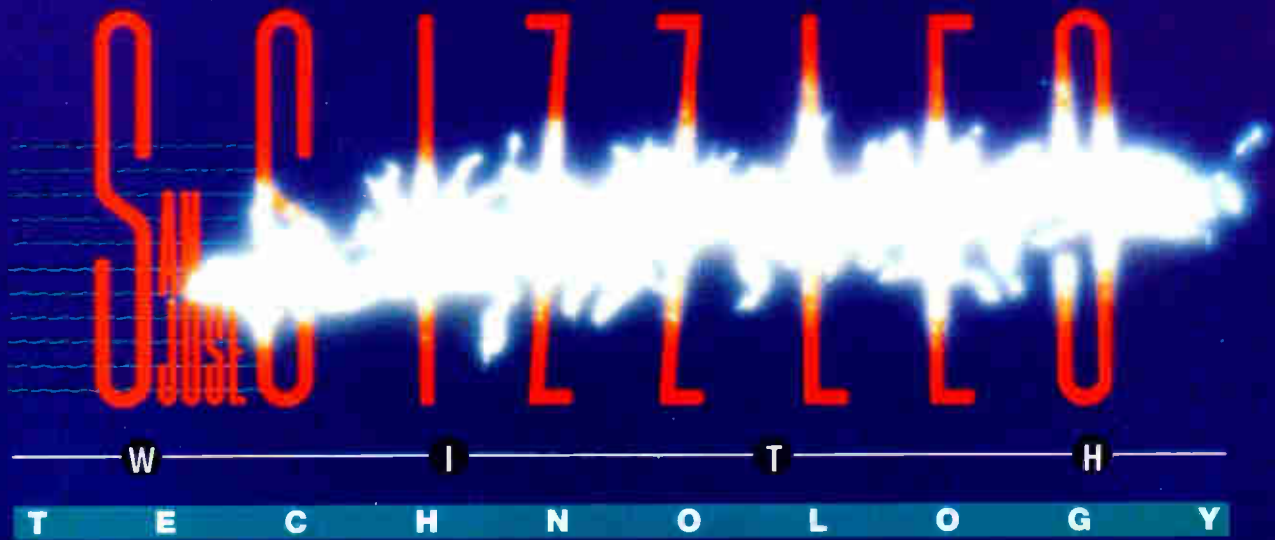
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New Era in Operations Demands New Solutions

LMAs, computers, and high-tech phobia all must be dealt with in today's radio station operation.

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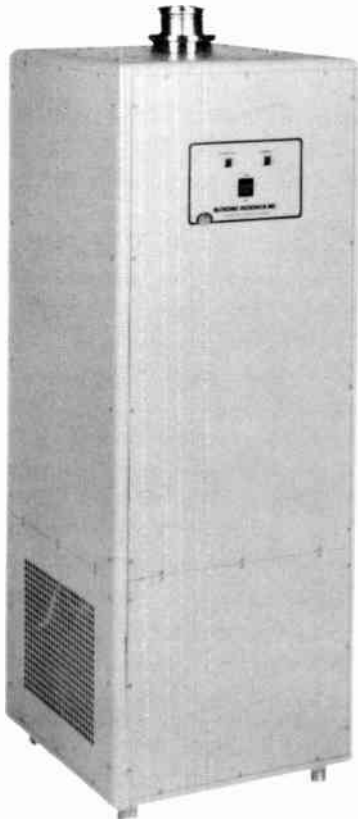
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Reader Service #001

Radio Guide Page 4

Publisher's Page

By Ray Topp

Equipment Guide Update

Facing the Future

Equipment Guide Update

A while back, we were asked by many of you to develop a new method of disseminating used equipment "classified ad" information on a timely basis. At that point, we developed the **Equipment Guide**, fax retrieval system to allow you to access our continually changing database of used equipment listings.

Your response to this system has been overwhelming, to say the least. Since we put the system on line early this year, we have received thousands of calls. But even a good system can be made better. Using your suggestions, we've done just that.

Over the past few months, quite a few of you have requested modifications to the system to allow access to more information in less time. By eliminating excess and redundant information on the system, and by deleting much of the "empty" space found on

the pages you receive, we have been able to condense the listings to allow you to obtain the complete list of all categories of used Equipment For Sale, without having to enter multiple categories.

You simply make one phone call -- punch in one number on your fax phone -- and you will receive all listings at one time, right on your fax!

There's more too. Equipment Wanted listings and Employment Classifieds will be available as well -- all on the same phone call.

On page 33 of this issue, you will find an **Equipment Guide** information sheet. On it you will find a brief description of how to use the updated system, and a form for you to use to send your equipment listings to us. Just fill out the form and fax it to us at **(507) 280-9143**. We'll place your equipment listings on the **Equipment Guide** system right away.

Less is More

I keep hearing that there are no station engineers out there. Yet at almost every station that I have had contact with, there is either a person on staff or on contract that serves in that capacity.

The industry is fond of quoting anecdotal evidence of stations that have gone "bare." And I suppose in certain instances there is some truth to that. But think about it ... there is usually someone (somewhere) that is tasked with handling the technical repair, installation and maintenance at almost every station.

Of course there aren't nearly as many station engineers (contract or otherwise) as in the past. Should that surprise us? Is it just low pay, lousy working conditions, and simple attrition? No, it's more than that. Modern technology has, at long last, discovered the radio industry and is provid-

ing stations with reliable, low-maintenance equipment. The FCC has helped things along by more-or-less removing any semblance of technical regulation.

The routine maintenance, adjustment, and FCC regulations that once required two or three staff engineers, is now easily handled by one contract person. We have an industry situation where fewer technical personnel are handling more stations. The "good old days" are gone. It can never be the way it was because the economics and technology of radio have changed. We may as well get used to it.

If engineers wish to remain in their capacities, they need to instruct themselves to be able to handle a larger variety of equipment and problems than ever before.

It's a matter of education. Next month we'll explore the possibilities.

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Reader Service #002

Overcoming Digital Sampling Roll-Off

By Dan Talbot

In Part I of this series we defined discrete-time sampling as the result of intermittent inspection (by a sampler) of an analog or "continuous-time" signal. Now we'll look at the result of the Hold action of the sample-and-hold process.

The holding or "time-stretching" of analog data creates a frequency response roll-off that is proportional to the duration of holding. The holding duration is usually equal to the interval between samples or "snapshots" of the original analog signal, but this does not always have to be the case.

For example, the analog output of a D/A converter is normally held for the entire interval between samples, but by placing a shorting switch at the D/A converter's output, we could force its output to 0 V well before the next

sampling pulse occurs. In that case, the hold time is less than the sampling interval. That condition has both good and bad outcomes.

The good is that frequency response rolloff is reduced. The bad is that extra circuitry is required, and the overall gain is reduced because the duty factor is now less than unity. Also, the system noise is no longer rolled off. In most cases a sample-and-hold is easier to implement than a sample-and-dump.

In a D/A converter, the holding occurs for free, and the rolloff that results is easily corrected. However, to correct the rolloff requires a compensating boost which may reduce the system headroom, especially if it is in the form of pre-emphasis rather than post-emphasis.

Regardless of this oversampling frequency, the end result is that voltages (or binary numbers representing same) are eventually "spit out" at the basic sampling rate. It is therefore this basic lowest rate that must be used as the sampling rate for entering the computer program to calculate rolloff.

The "oversampling rate" in a multi-rate system is useful for achieving part of the brick-wall filtering required at the final lowest rate. If oversampling were not used, 100% of the brick-wall filtering would have to be performed using analog components having extremely tight tolerances.

Therefore, oversampling only provides a convenient way to implement a brick-wall filter, and does not alleviate things like "Gibbs phenomenon" or ringing due to the necessary existence of brick-wall filtering. We will discuss this ringing in Part III.

The SINC Formula

The consequence of time-stretching each sample, or holding, is a rolloff (after reconstruction to analog format) which follows a mathematical formula called "SINC" or "sine-X-over-X."

Table 1 lists the results of computer calculations for two different sampling rates: 44 kHz and 200 kHz (the rate used in our digital audio fiberoptic STL). Notice that in all cases there is exactly 3.9 dB of rolloff at an analog signal frequency equal to one-half the digital sampling frequency.

It should also be noted that in some digital audio systems two sampling frequencies are employed: a basic sampling rate low enough to permit the signal to pass through a band-limited medium (eg. CD) and a higher sampling rate, usually harmonically related, called the "oversampling" sampling rate.

Another Approach

In single-rate sampling, sometimes a higher than necessary sampling frequency is used, and in that case the term "oversampling" can still be used. However, the motive is usually different than for oversampling in multi-rate systems. For example, we use 200 kHz sampling. This is higher than the 44 kHz required for sampling 20 kHz audio and it has its benefits.

First, the brick-wall filter corner frequency is moved to 100 kHz rather than 22 kHz. The ear can be relied on to provide whatever additional filtering is desirable, and since the ear ignores frequencies above 20 kHz, the system noise between 20 kHz and 100 kHz will be ignored.

This means that only 20% of the total noise from DC to 100 kHz will be heard, resulting in a five-fold reduction in noise power, slightly more than

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Digital Directions

... continued

a two-fold reduction in noise voltage, or about 7 dB improvement in dynamic range. Ringing will also be eliminated in the audio passband, since any brick-wall filters will ring at an ultrasonic frequency. Finally, data is updated faster, making error correction simpler and more effective.

Because the CD has a total playing time that shrinks as sampling rate increases, the basic rate is established at 44.1 kHz. This precludes single-rate oversampling; that is, the transmission of the X4 or X8 sample rate directly into or out of the medium. Fortunately, a fiberoptic link has no such playing-time restriction, since fiberoptics offers real time bandwidths into the GHz.

Dan Talbot is President of T-Tech and can be reached at 508-562-5820.

TABLE I

Sine-X-Over-X Roll-Off In Digital Audio Systems, Without Boost Compensation

dB Roll-off	Sample Frequency	
	44 kHz	200 kHz
7.5 kHz	-0.4 dB	-0.02 dB
10 kHz	-0.75 dB	-0.036 dB
12 kHz	-1.1 dB	-0.051 dB
13 kHz	-1.29 dB	-0.06 dB
15 kHz	-1.73 dB	-0.08 dB
17 kHz	-2.25 dB	-0.10 dB
19 kHz	-2.85 dB	-0.13 dB
20 kHz	-3.18 dB	-0.14 dB
22 kHz	-3.9 dB	-0.17 dB
30 kHz	N/A	-0.32 dB
35 kHz	N/A	-0.44 dB
40 kHz	N/A	-0.58 dB
45 kHz	N/A	-0.74 dB
50 kHz	N/A	-0.91 dB
55 kHz	N/A	-1.1 dB
70 kHz	N/A	-1.83 dB
85 kHz	N/A	-2.75 dB
100 kHz	N/A	-3.9 dB
110 kHz	N/A	N/A
120 kHz	N/A	N/A

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LMA, SBE & DAB

By Judith Gross

Ever wake up in the middle of the night and think you're a spotted owl or a bald eagle? Didn't think so. And yet...

Whyz'it I get the uneasy feeling that as the new ownership rules beget wheelings and dealings and LMAs out the wazoo, your friendly neighborhood CE and DE need Greenpeace or its radio equivalent to keep from getting pushed down lower and lower on the survival priority list?

I mean, not that the know-how isn't appreciated at 3 AM when the transmitter decides to give the old silent treatment. But when you start to hear about these contract guys handling upwards of several dozen stations (when do youse guys sleep, anyway?)...

And just when you thought you're an invisible member of perhaps the most unappreciated profession since they invented the tax collector, along comes the SBE's annual convention to try to change your mind and boost self-esteem.

But then again ...

Without being too critical (the kid gloves are on) I've been getting some mixed messages about the annual confab. On the plus side, it's a chance for engineers to get together and network, in both a social and professional way. Sure. Share ideas. Have a brewsky or a ginger ale. Exchange a few nuts and bolts. (What, no white lab coats with brownies in the pocket?!)

But this year's gathering comes on the heels of a pretty nasty rift over dues and budget priorities. Not to

mention the threshold of some very big changes going on in radio. Changes that, even in all optimism, might have some very immediate impact on engineers.

So here we are, in an industry where the engineering personnel is oft accused of self-isolation and a lack of communication with the rest of the station, and how many of the sessions are devoted to addressing the impact of those changes? Well, one. That's it.

Oh, not the engineer's concern that duopoly rules have gone bye-bye and LMAs are proliferating, you say? Uh-huh. Try telling that to the engi-

line of: "Adapting to A New Industry Order;" "How To Make Yourself Essential to Station Bean-Counters;" and "Recruiting The Next Wave of Station Engineers." Something like that.

Oh, and while the kid gloves are still on, I'm still hearing from a number of potential equipment exhibitors who opted out this year because of those three all important factors: location, location and location.

San Jose is probably a very nice city. But, some companies are in the general vicinity just a week or so prior for the AES convention, which is just early enough so that you have to choose

between AES and SBE (you couldn't coordinate it a little closer together, so one trip for both woulda done it?).

Last year, the regional Seattle SBE gathering out-pulled the national convention in attendance. That's a tough act to follow. I hope you don't think I'm being too harsh, SBE. I mean, I know we're all one big happy family and all (just ask Sandra Woodruff).



KIIS engineer Jerry Burnham gives "the bell" to USA Digital's candor

neering staff of KDKA (non-existent) and the corporate DE's who have been booted out the door in dollar-savings crusades.

When the buzzword "consolidation" (translation: layoffs) is trotted out in the new leaner and meaner operations, which department do you think is at greatest risk, when history is looked at?

Call me picky, but I guess I'm a wee bit troubled by the lack of programs that address where the engineers of tomorrow are coming from--or going to, for that matter. I guess I hoped to see more sessions along the

All right. It was August in Los Angeles. A very dramatic night for the local SBE chapter. They, and they alone, were getting a sneak preview of USA Digital's DAB system for AM. I hear tell some managers were even persuaded to attend. No kidding.

The demo was high fidelity audio crunched down to 96 kbs via MUSICAM, same as it will be in the Acorn AM DAB. And some snippets of details on the system--but I mean snippets.

KIIS' Mike Callaghan gave the details, but his cohort, Jerry Burnham, was at the ready with: "The Bell." The

JG's Earwaves

... continued

Bell was in case Mike got a little carried away with details of USA Digital's system. The system was set for its industry-wide debut a few weeks later in New Orleans at the Radio Show, and not too much could be revealed just then.

So it was sort of like a Gong Show for engineers. I understand the bell-ringing was kept to a minimum, and that more than a few attendees came away impressed. Tune in next time and I'll tell you about the on-air demos in N'Awlins. AM and FM.

And you might be wondering, why don't I ever say anything bad about USA Digital's DAB? Well here's a project that so far, in the face of some harsh skepticism, has managed to deliver what's been promised and in record speed, to boot. However, I solemnly promise I will say something bad about them

the minute there is something bad to report. Don't hold your breath, however.

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BE's CEO Nevin, flanked by congratulatory Grundy and Honnaker. The military smiles!

livery time was mentioned by Colonels William Grundy and Errol Honaker, who even smiled as they congratulated BE's CEO John Nevin in a cer-

emony at Quincy HDQ. Some of the 50 sites BE provided transmitters for are still broadcasting today.

Well, I'm finally back in my hometown, the Big Apple, Gotham, Noo Yawk, where a brand new FM antenna is about to alter forever the silhouette of King Kong's favorite perch.

Yesiree, back again in the city that never sleeps, where the people are surly, the streets are grungy, the garbage trucks wake you up at the crack of dawn and the Mets couldn't win a game if they were lined up before a firing squad. And the car behind me at the red light believes I live for the sound of his horn. And the taxi drivers have taught me a few gestures even I never saw before.

Ah yes, Toto. There's no place like home.

Something wacky going on in your neck of the woods? Let's gossip together. Call 516-599-4564; fax 703-212-0838 or MCI mail me at #507-3038.

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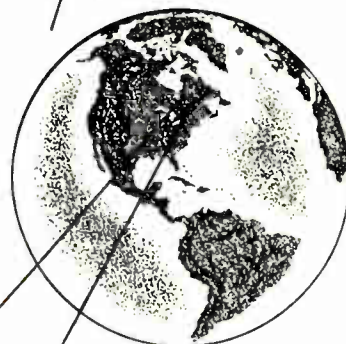
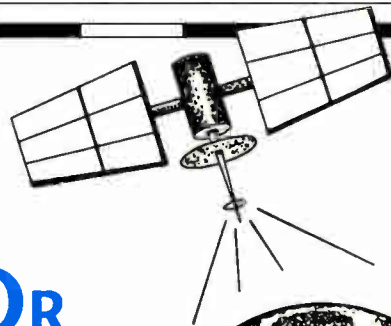
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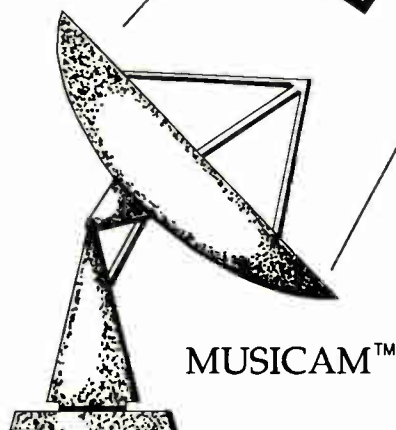
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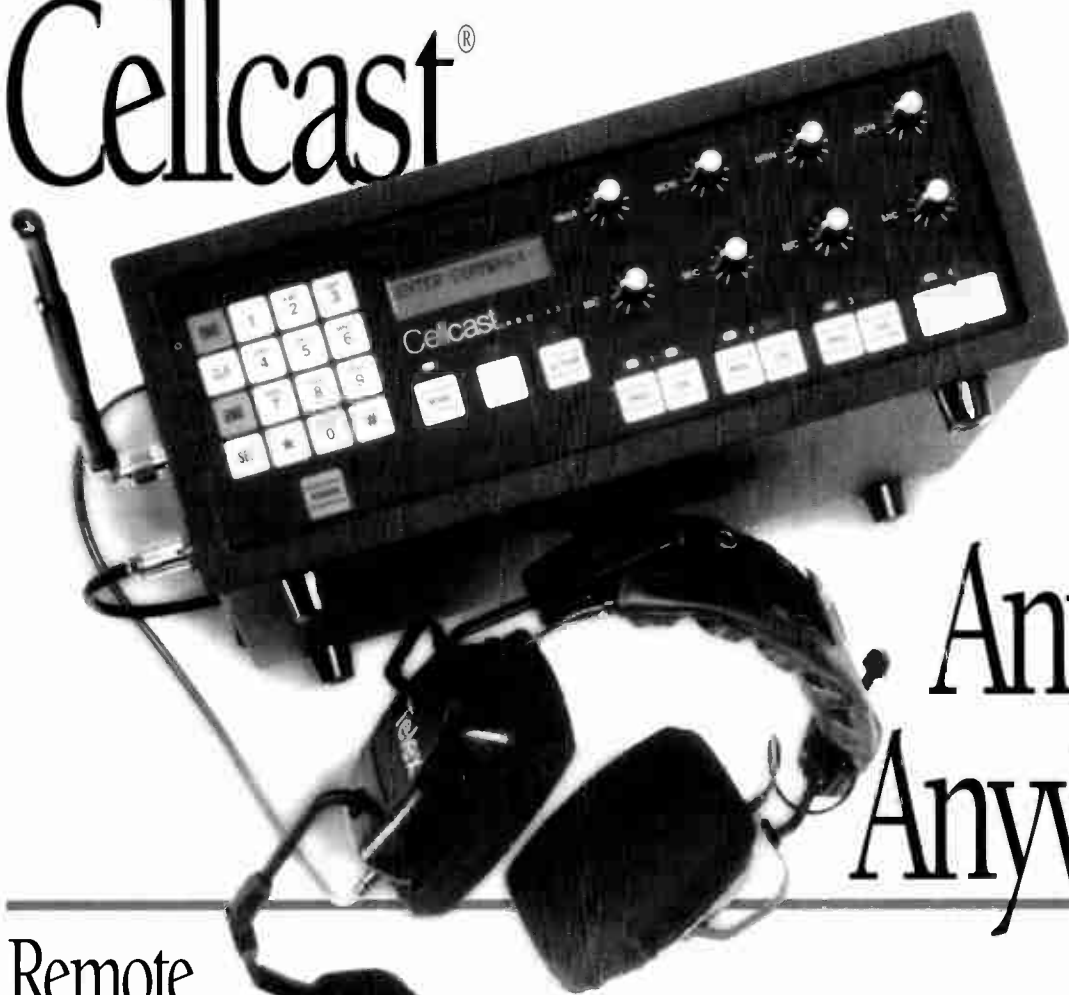


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Transmitter Site

Repair & Maintenance at the Transmitter Site

Generator Maintenance

By John Bredesen, P.E.

It was a dark and stormy night... Outside, the wind was howling like it hadn't in recent memory and rain filled the streets and highways. Harry, the CE of the top rated station in town, is relaxing with a hot cup of coffee. Trees struggle to remain upright against the forces. Suddenly, the station goes off the air as the power line to the transmitter snaps under the strength of the storm.

Not to worry, thinks Harry, because a few years ago he convinced the owner of the station of the value of a standby generator set for just such occasions. After years of good luck and good weather, this is his first chance to show the wisdom of his arguments. He recalls that it's supposed to be up to speed and on line in about ten seconds. Harry starts counting slowly.

Suddenly, when the count is up to 30, he realizes that the transmitter's still not on the air. Something's wrong. As he pulls on his rain slicker and boots, he wonders what. Arriving a while later at the site, all is dark and quiet except the storm. The generator is silent; the only sign of life is a small light which indicates the generator is

locked out on "overcrank" trip. It had failed to start within a predetermined time and automatically stopped cranking in order to protect the starter. With winter just around the corner, now's the time to take steps to prevent a failure like Harry experienced.

Maintenance Is Critical

Unless the engineering budget is flush, perhaps the best course is to perform some of the routine maintenance yourself, and contract with the dealer for some other specialized aspects, such as chemical analysis of the oil and coolant.

Operating hours quite often don't accumulate rapidly enough to warrant changing these on a routine basis. This is especially true on some large generator sets where lube oil quantity is measured in gallons instead of quarts. An analysis by the dealer, or a reputable lab which specializes in this type of work, can often save you money. This analysis can also detect material which may signal the failure of some component.

Most dealers are also capable of supplying some custom items for your

specific application. For instance, an electric engine block heater is necessary for proper, quick starting of a diesel engine. A local dealer installed a thermostat for me which operated if the heater failed and the block temperature fell below a safe level. The contacts, wired to the status indicators of the transmitter remote control, alerted personnel at the studio that a problem had developed before the generator was needed.

Always remember: safety first. Before performing any maintenance on an automatic generator set:

1. Disable the starting circuit
2. Make sure that there is no possibility of the transfer switch presenting a shock hazard through a backfeed.

(continued on page 14)

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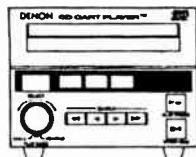


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Transmitter Site

Continued from page 13

3. Keep a pair of ear protectors handy, and use them.

Let's take a look at a schedule which can help avoid the "Harry" problem. It's my schedule, and may not be exactly that recommended by the manufacturer of your generator. Obviously, if you can obtain information specific to yours, follow that instead.

Monthly Checklist

Check coolant and oil levels. Be sure to check the oil level in the governor if appropriate. Check that cooling air and makeup air ducts, shutters and louvers are clear and operate freely. Check fan belts for proper tension and wear (turn them over so the bottom or narrow side of the belt is visible and check for cracks). Check battery terminals and the trickle charge rate.

Check electrolyte level if your battery design permits. If so equipped,

check for proper operation of the block heater (is the engine block warm after not running for days?). Make a general visual inspection for anything which looks amiss. Is the fuel tank full, or at least where you expect it to be?

Start the engine and check oil and fuel (if appropriate) pressure. Check the voltage and frequency (rpm) of the generator. Allow the engine to run until the oil comes up to normal operating temperature.

Usually a generator which isn't under load will have frequency and voltage readings which will be higher than those observed under load. Both depend upon the design of the generator set. Because of this, it's important to know that the settings are correct under load. When you perform the annual check, make sure the frequency and voltage are correct under load and then remove the load and make a note of the "unloaded" readings for future reference.

On the subject of fuel, don't assume the tank is full "because I remember filling it five months ago." I had a case where the power failed at the transmitter site, the changeover was flawless and the operator didn't assume anything was wrong except that there must have been a momen-

(continued on page 16)

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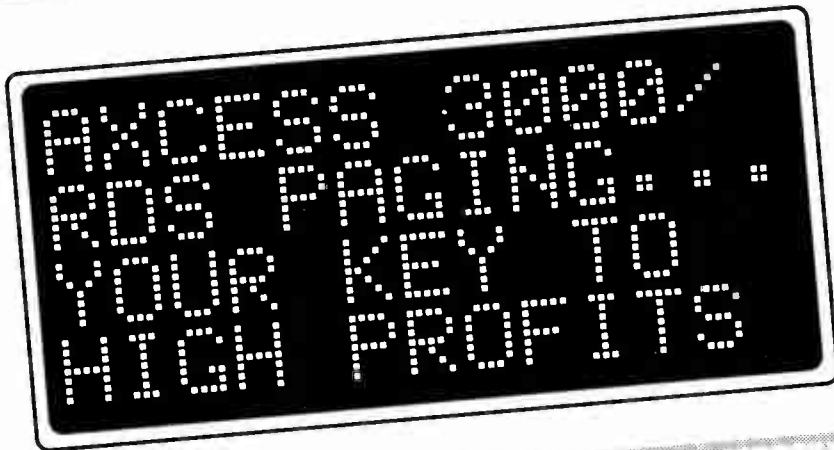
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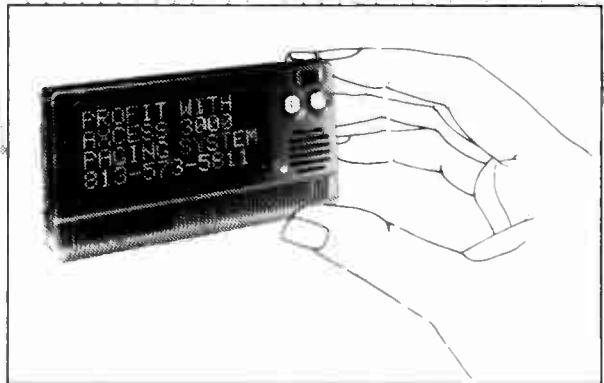
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Reader Service #014

Transmitter Site

Continued from page 14

tary power bump because the transmitter came right back up after a few seconds.

That new operator didn't notice the status panel was indicating back-up power. Commercial power was restored after sign-off so the transfer back also wasn't noted. It wasn't until several weeks later that an inspection revealed a fuel tank which wasn't full.

Annual Checklist

Perform all checks which are done monthly. In addition, change fuel filter(s) and drain water and sediment from fuel tank. Inspect air filter and clean or replace as needed. Clean crankcase breather. Check, and, if necessary, adjust engine valve lash. Refer to instructions for your specific engine. Check and lubricate mechanical linkages. The bearings on some generators may also need to be lubricated. Wipe down the engine. Doing so can

help you discover oil leaks the next time the engine is run.

It's important that the generator be tested under load at least annually. After the engine has run under load for at least an hour, take as complete a set of readings as is possible and save them for future reference. Be sure to refill the fuel tank if appropriate.

Once a year is also the time to take samples of the engine oil and coolant to have them analyzed. The lab can advise you what, if any, additives are necessary. Cut open the old oil filter and examine it for metal shavings and other foreign material which could signal the failure of some engine part. It's a little messy, but it could tip you off to a serious engine problem and possibly head off very expensive repairs.

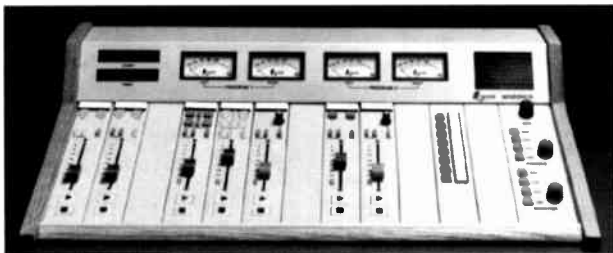
Diesel fuel has a finite storage life. Some types of bacteria can grow in diesel fuel and raise havoc with the engine. Caterpillar, Inc., a manufacturer of large generator sets, recommends that diesel fuel be filtered every six months and changed annually.

Natural gas is the fuel of choice when it's available. It's dependable, and for all practical effects, has an infinite life. Combustion products are cleaner, resulting in both better exhaust emissions and longer lubricating oil life. Propane has many of the same advantages as natural gas, but is usually stored in a pressure tank on site which must be refilled as with a liquid fuel. Gasoline is not recommended for use with a permanently installed stand-by generator because of its long term chemical instability.

I wish to express my thanks to Ken Kokkeler of Papé Brothers, Inc., the local dealer in Eugene for Caterpillar generator sets, for help in preparing this article. Next month we'll look at some aspects of commercial power and what you can do to keep your power bill down.

John Bredesen, PE, is currently CE of KLCC/KLCO in Eugene. He can be reached at 503-747-4501, Ext. 2478.

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Studio Site

Repair & Maintenance at the Studio

Finding The Right Space

By Gordon S. Carter

Once you have determined the general parameters for your new space and your financial budget, you are ready to begin looking at space possibilities. A good real estate agent will be able to help you find a space that will fit your needs. Also, the real estate agent can help rule out some spaces that you cannot use for various reasons such as zoning regulations and building codes.

As you look at the possible spaces, keep in mind some of the ideas discussed in your earlier planning. If you are looking at existing spaces, try to envision what will go where. Your architect and studio consultant will have some ideas as well, but these can all be discussed in the detailed planning stages.

Remember that you will never be

able to squeeze 15,000 square feet of facility into 10,000 square feet, but you may be able to make some smaller reductions if the layout is just right. Imagination is vital here.

Whether you are looking for a pre-existing building in which to build your new facility or are looking for a site where you can erect your own building, there are a number of things to be aware of. Ignoring or overlooking some of these could cost you a lot of time and money as you begin to build your facility.

Ambient Noise

Depending on your specific needs, you may want your station to be readily accessible for visitors or in the public eye. However, building a radio station on a busy street or near an expressway

may present some problems in controlling the noise in your studios. Similar problems can occur if you find a location near train tracks or under a flight path for an airport. If you suspect there may be a problem of this sort, visit the site at various times of day and various days of the week to get an overview of the traffic patterns.

Remember that low frequency vibration may be more of a problem than noise, so try to check for that as well. Checking with the railroad or airlines for schedules can help pinpoint times when you may have the most problems. You may find it worthwhile to make some noise measurements at the peak times.

A radio station needs an ample supply of electrical power, but be-

(continued on page 18)

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Studio Site

Continued from page 17

ware of too much of a good thing. Power sub-stations and high-tension lines can create enormous hum fields that will get into everything in your plant with a coil of wire in it. Most susceptible to this are dynamic microphones and audio transformers.

If you have any concerns in this area, a good test is to rig up a dynamic microphone with a pre-amp and headphones operating from a battery power supply. Listen carefully as you move the microphone around, trying various locations and orientations.

Remember that turning the microphone 90 degrees in any direction may make the difference between hum and no hum. If you hook up an audio voltmeter to your test set-up you can make relative measurements at various sites and locations.

Nearby RF

Another problem radio stations may encounter is too much RF energy. Most modern broadcast equipment is

fairly immune to RF interference from the standard AM and FM broadcast band, so your own transmitter will probably not pose any great problems if good engineering practices are observed in the installation of your equipment. However, you may have some problems if you are near a high-powered short-wave facility or a TV transmitter.

Some broadcast audio equipment filters at AM and FM frequencies, but other frequencies may cause some problems. If you are near a TV station, the sync pulses from the video may be demodulated in your audio equipment and buzz like crazy.

Some simple field intensity measurements before you commit to the site can save a lot of trouble trying to get rid of these problems later. It may be much easier and cheaper to find another location a little further from the offending signals.

Satellite Suitability

Many radio stations rely on satellite delivered signals for some or all of their programming. If you are one of these stations, or plan to use satellites

in the future, check your site for suitability for installing the satellite equipment. Make sure you have enough space for the dish in a location close to where your electronics will be.

If the site really looks like you will want to move there, spend the money for a frequency search before signing. If you cannot put your satellite dish near your facility, the cost of extra electronics and lines for a remote site may encourage you to continue your search for a main site.

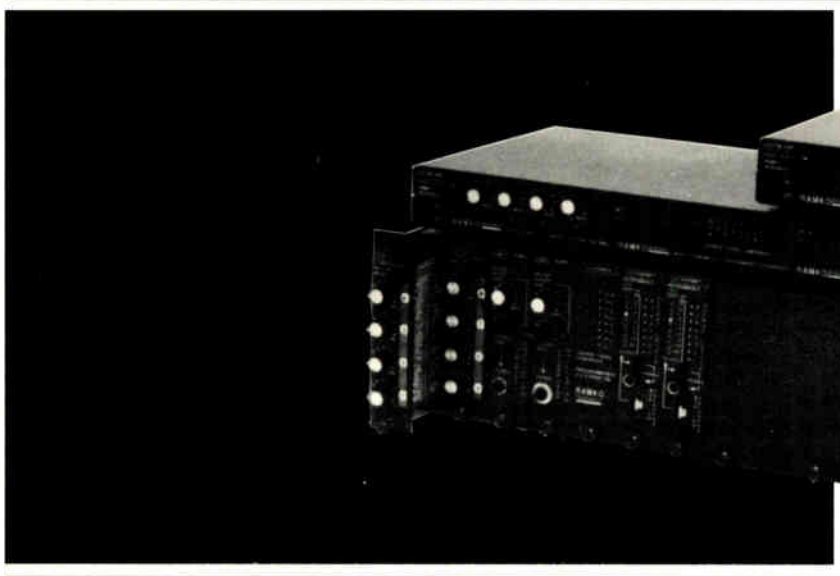
Unless you are very fortunate, or have an unlimited amount of time or money, you will need to make some compromises. This is all perfectly normal. Just make sure that you weigh all the pros and cons of each site so you don't end up with a lot of surprises.

Once you have picked a site, you are then ready for the real fun to begin--designing your dream facility. More on this next time.

Gordon Carter is studio facilities manager at WFMT-FM in Chicago. He can be reached at his company, Professional Audio Services, by calling 708-482-4142.

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Tech Tips From the Field

Practical Solutions to Practical Problems

Moseley TRC-15 Fix & an Idiot-Proof RPU

By George Whitaker

"It was the best of times. It was the worst of times." Dickens, of course, was not writing about a radio engineer. However, that line probably describes what makes this job the kind of thing we love. When something crashes at 2 in the morning we grumble and mumble about having to get up and go. But the adrenaline begins to flow and the challenge of it all makes it downright *fun*.

The more confident we are, the more fun it is. And that is where Tech Tips can really benefit an engineer. I have been reading and collecting information like this for as long as I have

been in the business. Just having a storehouse of other people's knowledge has always given me confidence.

About three weeks ago I got a call from a friend of mine here in town asking if I had any ideas for constructing a particular piece of gear. I told him that I had at least one article dealing with that subject. In the first anniversary issue of *Radio Guide* was a Tech Tip that provided the missing ingredient for the project. Now, if the author of that article had not been willing to share his information we would have been hard pressed to come up with a simple, workable circuit.

When you learn something new, or think of something you learned long ago that beginners might not know, send it in. You will be helping to build someone's confidence level and you also get a *Radio Guide* Tech Tipster pocket calculator as a token of our appreciation. Send your Tech-Tips to:

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(continued on page 20)

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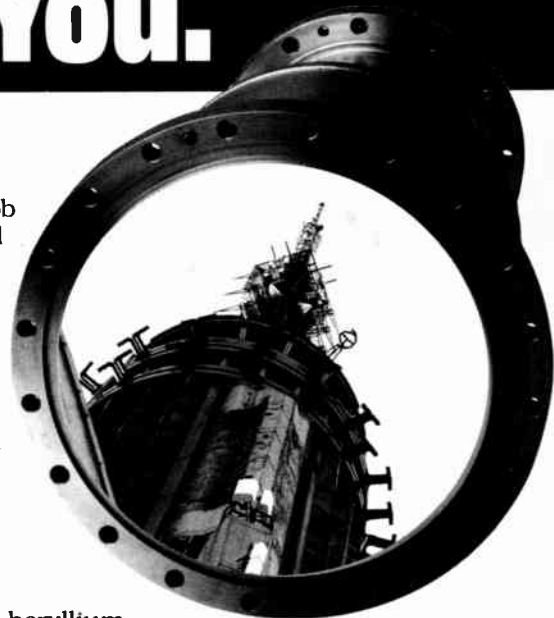
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Tech Tips

Continued from page 19

Another famous opening line is Snoopy's "It was a dark and stormy night..." which also begins John Bredesen's column this month. Apparently that's the kind of climate Charleroi, PA had when Richard Filchcock got a chance to learn something. His account may save you a lot of time with a:

Moseley TRC-15 Repair

An electrical storm had rendered our Moseley Remote Control inoperable. The problem manifested itself by not having control from the studio unit. At the transmitter end, when using the Advance button with the Local button depressed there was erratic behavior of channel selection as indicated by the channel LEDs.

Sometimes the channel indicator LEDs would advance and then, at

random channels, fall back to the CAL position. What was even worse, the Advance button would behave the same way even when the REMOTE button was depressed--there was local control when in Remote! Since the Moseley remote system is very reliable and seldom has need of any maintenance, I dreaded troubleshooting all those digital ICs.

Looking at the schematic led me to believe that surely the erratic behavior of the Advance button was due to the 74154 1-of-16 decoder. A quick check with a logic probe proved that was *not* the problem since there was an active LO at each channel position on the appropriate pin of the 74154 as the Advance button was coaxed through the channels. Further checking with the logic probe showed that the 7475 latch and 7493 counter were also tracking. Why then the erratic behavior?

Well, since the ICs are socketed, I replaced them anyway, but still no luck! To make a longer story short, the

TTL logic chips were all fine. However, the LM741 or uA741 op-amps were all destroyed. Replacement of the 741s restored the Moseley to working order.

Did you ever have trouble with the jock at the studio when you set up for a remote? I never have. They always gave me intelligent answers and never once told me a remote sounded great, only to take it and discover a signal-to-noise of -10, and..., if you believe *that*, I've got some land in Florida, etc. Anyway, Craig Jerome, who *is* in Florida, at WAVV-FM, WAXE-AM in Ft. Pierce, found some ways of

Idiot-Proofing RPU

In my many years in broadcasting I have set up hundreds of remote broadcasts. For the most part, set-up is easy; one thing I would always have trouble with, though, was the jock at the studio listening to the incoming remote signal. It never failed. The jock



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Tech Tips

... continued

would tell me the signal sounded fine until the first remote break.

We also had trouble with what receiver the remote was coming in on. I had four possible channels available at a given time. I use Marti remote gear, so one day I sat down with the receiver manuals and found that the remote connector has numerous functions that would help my staff. The CR-10 has a signal strength DC output. I connected each of my receivers to an unused channel on my Burk ARC-16 remote control system.

I then had a reading that helped in checking signal strength. I also noted there was a relay closure for squelch. When we would fire up a transmitter, the squelch on that particular receiver would open and close the relay contact.

I connected the closure to a free status input on the remote control. This alerted the jocks back at the studio which receiver was in use. For those of you who have receivers back at the studio, you have an extra function available that may make remotes even simpler. If you do not use the encode function on the Marti system, you can replace the slide switch for the encode function on the transmitter with a momentary pushbutton.

Each time you push the encode switch at the remote site, the encode relay will close in the CR-10. Using a light, this will attract attention back at the studio. You could also connect a cart deck to the relay output so the jock at the remote site can start a song or spot set. I found this works well for sporting events. Check your manuals for pin-outs on your particular equipment. If you have any questions I can be reached at (407) 567-1055.

Oh, yes -- in the June issue section dealing with phone wiring codes there appears the phrase, "...in a two wire system utilizing standard 'I' wire, (I for indoor), there are four conductors." It should read, "...in a two LINE system..., etc."

Radio Guide Page 21



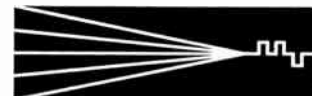
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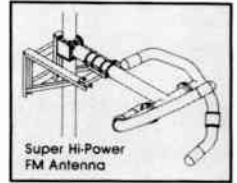
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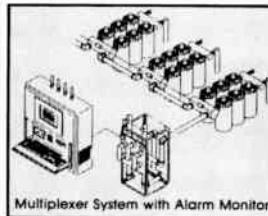
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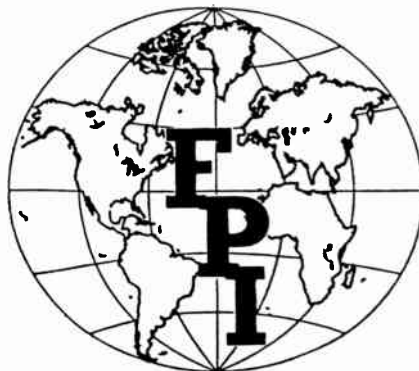
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A Wise Enterprise

Reader Service #031

Radio Guide Page 25

Stations Stories

Radio Station Installation Reports

New Era in Operations Demands New Solutions

By Judith Gross

The relaxation of duopoly, the proliferation of LMAs, the creation of regional networks...everywhere is evidence of creative radio owners meeting economic challenges with new ways of operating.

What has made the job easier for many of them are advances in technology and new product offerings designed not only to add black boxes to the list of studio gear but recreate technology to serve the changing marketplace.

Take Switched 56 and ISDN. Two years ago, few engineers and station managers had even heard of it. Now, in places such as Orlando and Dallas

the new technology is being used to simulcast a "big market" program into commonly-owned but, in many cases, ailing medium-market marginal stations.

Or satellite remotes. Before now, the gear and the price tag was burdensome. Now broadcasters get digital quality at a fraction of what they used to pay for unpredictable analog coverage.

The Rise Of Computers

The third area where technology is helping a new breed of owners reshape the fortunes of radio is in computerized audio. PC-based store and play and satellite-automation has made it possible for LMA to become an industry-wide word.

One early player in the game was Computer Concepts, who a few short years ago was the first to market a computer "cart replacement" by advising stations to come up with creative and slightly comical new uses for their old tape carts.

But to a station owner struggling to meet weekly payroll, such a high-tech advance has meant more than just an amusing convenience.

Mike Tracy of Scotts Bluff, NE, bought a failing AM to add to his successful FM in 1986. Then, almost clairvoyantly predicting the new wave of LMAs he preceded, he began adding stations. Tracy now operates KOAQ-AM, KMOR-FM and KOLT-AM out of a single building.

"We've been operating under a waiver since March 17," says Tracy, but under the new FCC rules we qualify for permanent license.

Economies of scale are crucial to keeping the stations on the air. "When I bought KOLT-AM, it had gone bankrupt and been silent for two years."

Now KOLT broadcasts a steady diet of country from the Jones satellite network. And KMOR-FM runs CHR from a tape automation system.

To LMA owners, consolidating operations--both sales and studio--is as important as finding formats that coexist well. Tracy notes that the advances introduced by a new breed of companies are instrumental in making the operation run smoothly and stay within a budget.

"We're using the Computer Concepts script program and we do traffic and billing for all three stations plus a paging and mobile phone company on the one system. The system keeps a whole room full of printers busy sending out monthly statements for all our operations," noted Tracy. He adds that there are 15 workstations on a Novell network with a second location connected by modem.

When it came time to shop around for an automated program source for KOLT, Tracy took his time and evaluated the systems on the market. In the end, he went with the Computer Concepts DCS hard disk audio system, choosing it over another system built a little closer to home because "It would run on our network and interface with everything else we had."

Learning Curve

Some station managers get an attack of high-tech phobia when faced with the prospect of a computerized operation that takes in everything from spot production and scheduling to billing clients. And that there is going to be a learning curve has got to be understood before the first system is ordered.

(continued on page 27)

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Stations Stories

... continued

But Tracy said station personnel found the system he selected to be "friendly and something that would actually save additional time and work."

His engineer augmented the Computer Concepts system by building a custom satellite switching matrix. On a typical day, it goes something like this:

Morning drive, the system handles KOLT's Jones country format, then at 10 AM sends a digital pulse to the satellite matrix to switch to AP news. The DCS inserts the appropriate commercials into such segments.

Five minutes later, it switches to another satellite to pick up Rush Limbaugh and at 1 PM it goes through the whole process in reverse. All spots and much of the local news comes off the hard disk.

Without a doubt, there are new ways of doing things to be learned when new owners begin to take full

advantage of new technology. Sometimes they have to learn to think in terms of dayparts. The words "sampling rate" and "digital pulse" become commonplace.

And most important is the need for back up systems. Many stations that are opting for the new computerized systems buy twice as much storage capacity and back everything up. Some stations still back up in analog. But with storage space coming down in cost, creating a system which anticipates problems and still maintains a healthy bottom line is becoming easier.

More Creativity

There are side benefits in using the new breed of station equipment as well. In addition to consolidating and streamlining operations, there is digital quality and minimal maintenance.

The ability to cater a smorgasbord of available programming, a la carte style, from a variety of networks, also helps make the new tech solutions attractive.

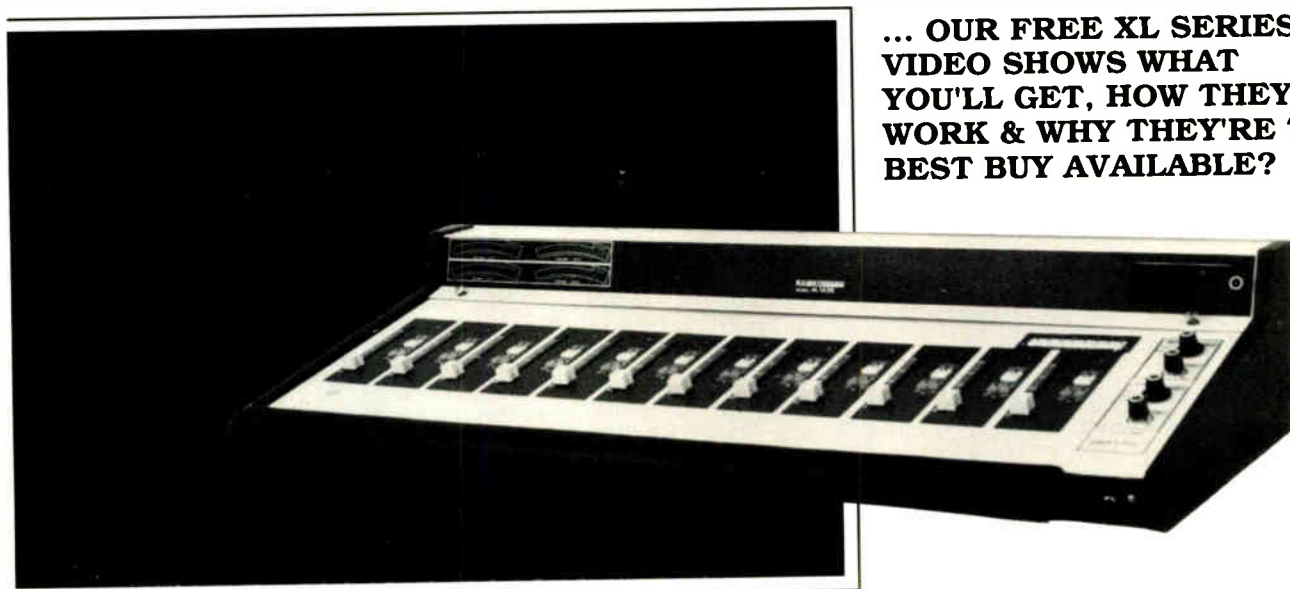
Production and even on-air programming can become more creative, especially with features such as the simultaneous crossfades recently patented by Computer Concepts for its systems. And stations find the systems flexible enough to customize for a variety of applications and formats.

It's probably still too early to assess the complete round of changes a combination of new rules, new ways of doing business and new technology will have on an industry forced to change to remain vibrant.

Some have predicted that the radio station of the year 2000 won't resemble anything we see today. And that may be true. But if Scotts Bluff, NE is any indication, at least some of the technical equipment will bear the same names we've been seeing emerge in the past few years. The ones who saw the winds of change on the horizon and rose up to meet it.

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Equipment Report:

FM Transmitters,
Exciters, RDS

QUIET PLEASE



Equipment Report:

Continental Electronics 814C

Reader Service #034

Solid State Offers Redundancy by John Hutson, Continental Electronics

High performance and low maintenance are the two criteria most considered in the selection of any transmitter. When planning to upgrade a Class "A" FM facility, the low maintenance factor becomes increasingly important due to the economics of smaller markets, which often dictate that engineering help will be hired on an "as needed" basis and is often far away from the site.

The Continental 814C all-solid-state 3.8 kW FM transmitter meets both criteria. Its "building-block" design, using wide-band 700 watt modules, provides the performance and redundancy necessary for today's competitive radio marketplace.

The 814C is built around eight identical modules. One is used as an IPA and the other seven are combined to produce the 3.8 kW output power. Each module contains its own protection circuits, which sense VSWR, input over-drive, power supply over-voltage, and heat sink over-temperature.

In the event one or more of these conditions exist in an individual module, it is shut down and a fault signal is sent to the transmitter's control circuits and to the LED block diagram on the front of the transmitter. While shut down in the fault mode, the transmitter's timing circuit continuously monitors the parameter causing the shutdown and restores module operation when the fault is corrected.

The modules connect to a 7-port combiner. The combiner is built with internal reject resistors and is cooled by 2 muffin-

type fans. The output of the combiner is connected to a wide-band, low-pass filter internal to the transmitter cabinet, then to a Bird line section, which provides forward and reflected DC samples for the transmitter's metering and automatic power control circuits.

The front panel has buttons for on-off, power raise and lower, auto-manual power control and local-remote operation. A power output meter is provided as well as a multimeter, which can read individual parameters on each of the solid state modules. Remote control connections are of the conventional type and are well documented.

The internal circuits are primarily TTL logic and have proven to be extremely reliable. No microprocessors are used. The 48-volt power supply is controlled by SCRs to allow smooth start-up and power control, and to limit current inrush and subsequent component stress on turn-on.

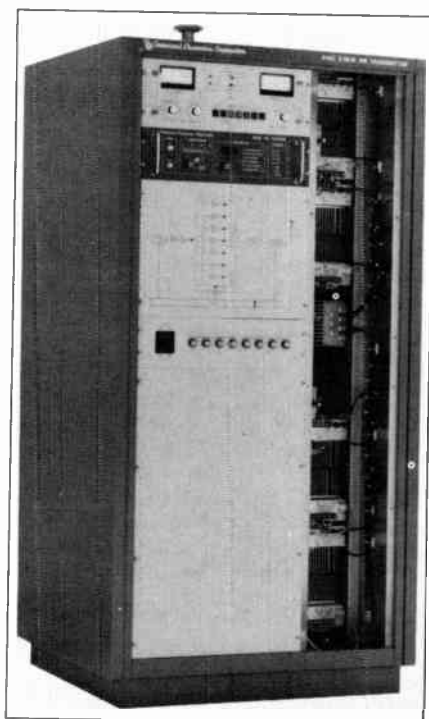
The 814C features the new 802B FM exciter, which is capable of FM noise readings in the 90 dB range and distortion figures around .005%. It also features greatly enhanced control and metering capabilities over its predecessor, the industry-standard 802A.

Such factors as tube aging, temperature, and accidental mistuning can cause problems. In addition, minimum synchronous AM and best harmonic distortion rarely coincide. The engineer must strike a compromise between them. The 814C eliminates this problem by totally eliminating tuning across the FM band.

Due to its inherent redundancy, the 814C is an excellent choice for remote mountaintop transmitter sites, where ac-

cess may be restricted by snow or other conditions. The lack of high voltages within the cabinet eliminates the attraction of dust particles which cause arcing and component failures. And, finally, its audio performance can show off the capabilities of the best studio and audio processing equipment available.

For more information, contact Continental Electronics Corp. at 214-388-5800 or circle number 034 on the reader service card.



Equipment Report:

Broadcast Electronics FM1C

Reader Service #035

Value Priced CD Quality

By Rick Carpenter, BE

The Broadcast Electronics FM1C transmitter offers maximum reliability and compact disc audio quality at a value-packed price. The components of the FM1C are the FX50 exciter, two 500 watt power modules and the system controller.

The FX50 exciter is the industry standard, offering unmatched audio performance (93 dB S/N, .003 THD) and bullet-proof reliability. Combined with a transparent, redundant RF amplifier, it allows stations to transmit the full audio capability of their digital source equipment.

The FM1C PA consists of two combined 500 watt power modules. Each module contains two matched pairs of Motorola MosFETs running very conservatively at 250 watts. Dual fans and efficient heat sinks reduce junction temperatures to less than 120 degrees C. Since each 10 degree C drop doubles the life of the device, the MTBF for the FM1C is greater than 10 years. The integral controller protects the modules from damage due to over-temperature, VSWR, over-current and over-voltage.

All indicators and metering are long life solid state LEDs and LCDs. Each module has a front panel indicator that shows module status. The simple status sequence:

green = OK, yellow = foldback, and red = no output makes fault identification simple for even non-technical personnel. Metering of operating parameters is easy with the FX50 and the PA amplifier LCD meters.

The system controller is an easy-to-troubleshoot, simple CMOS logic design. The transmitter will continuously fold RF power output to a minimum under excessive VSWR or temperature conditions, allowing maximum signal coverage under conditions that would result in dead air with other transmitters. Buffered front panel metering and control signals are provided on a 25 pin "D" connector or barrier strip.

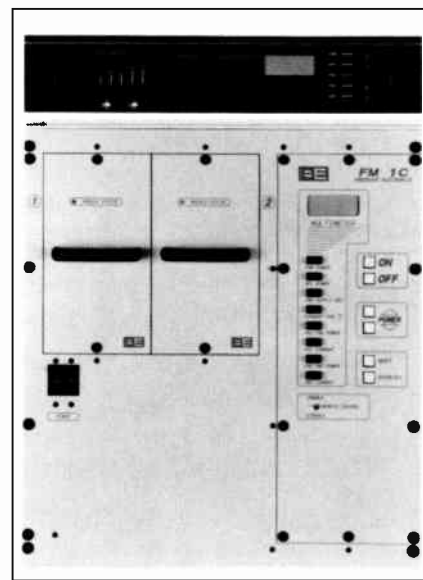
For servicing, the RF modules are easily removable from the cabinet front. A removable front panel provides access to controller circuitry, low pass filter and power supply. The transmitter will automatically operate at one-quarter power with the complete failure of one RF module.

Flexible patching of the RF amplifier outputs allows operation at half power. The FX50 can be patched to the antenna through the internal low pass filter. The only maintenance is periodic replacement of a pleated air filter, which is done while on the air.

The FM1C amplifier weighs 103 pounds -- only 67 pounds with the modules removed. The transmitter can be mounted in any "universal" rack or on a table top. Its

compact design and low 140 pound weight (with exciter) make this unit easily transportable. The unit is offered with power factor correction for areas where it is required. The FM1C transmitter is transparent to your studio sound and easy on the pocketbook.

For more information, circle number 035 on the reader service card or call Broadcast Electronics at 217-224-9600.



Equipment Report:

Harris Platinum Series

Reader Service #036

Harris Platinum Series

by Ronald Frillman, Harris Allied

Harris' modular Platinum Series FM transmitters, available in 2, 4, 5, 8 and 10 kW models, were introduced in 1990. They replace the single point-of-failure vacuum tube traditionally used as the power amplifier with multiple 1350 watt solid state FET RF power amplifier modules.

Each module operates over the frequency range of 87.5 to 108 MHz, has its own internal driver, is self-protected against VSWR voltage, current temperature and combining faults and has its own built-in diagnostics. Modules have a hot-pluggable design for safe removal and insertion while the rest of the transmitter continues to operate.

RF power amplifier modules operate in parallel and their output is combined to produce the required transmitter power. Depending upon transmitter power level, failure of a power amplifier module -- or even multiple power modules -- will take the transmitter off the air.

Platinum FM transmitters use the Harris THE-1 FM exciter. The unit's voltage-controlled oscillator's superb linearity ensures virtually transparent passage of stereo and multiple subcarriers. The THE-1's audio performance approaches the best digital program source material and exceeds that of most STLs and telco program links. Platinum FM transmitters are available with single or dual exciters.

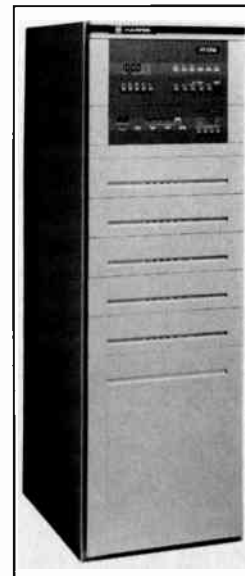
Harris' unique and compact "N"-way RF splitter/combiner divides and distributes exciter power to each RF amplifier, then combines amplifier output while maintaining high isolation. The splitter/combiner features a wideband multi-layer stripline design with integrated balanced loads and heat sinks.

This design allows for full power operation into VSWR loads of at least 1.3:1. A Platinum FM transmitter will automatically protect itself by reducing power (foldback) into higher VSWR loads while maintaining conservative operation to stay on the air.

Designed for simple and safe operation by even non-technical users, Platinum

FM transmitters eliminate the need for tuning, loading or matching. Platinum transmitters require less than ten percent of the routine maintenance of a typical tube transmitter. When maintenance is required, the low-voltage design allows a great deal of it to be performed while the transmitter is operating.

For more information contact Harris Allied at 217-222-8200 or circle number 036 on the reader service card.



Radio Guide Page 29

Equipment Report:

Access 3000 RDS Paging System

Reader Service #037

Profit From Access Paging
by **Matt Straeb**, *Access USA*

Access USA, Corp. markets and sells RDS (Radio Data System) communications systems worldwide. The flagship product, the Access 3000 paging system, utilizes the widely accepted RDS technology.

The Access 3000 RDS paging system will be sold throughout the world and operate as a country-wide, alphanumeric paging system integrated into a worldwide paging system using a satellite backbone.

The Access 3000 paging system consists of a modular paging switch for ease of subscriber expansion, multi-port RDS encoders for increased input of external data, satellite data delivery system, universal telephone connections, Access paging system software for optional network interconnection and the Access 3000 RDS pager. All of the data transmission equipment is off-the-shelf and uses proven technologies.

The heart of the system is the Access 3000 hand-held personal communication receiver capable of decoding RDS data transmitted via the 57 kHz FM subcarrier. It is the only hand-held digital device with 100% compliance of the CENELEC EN50067 specification (as developed by the EBU) in the world.

This means the Access 3000 Pager can accommodate all of the features inherent in the internationally accepted RDS technology, including any additional fea-

tures required in the future. Furthermore, the Access 3000 RDS pager is capable of supplying paging messages and information in other languages.

The Access 3000 Pager tunes automatically to exact frequencies with its digitally-tuned/frequency synthesized, phase-locked loop RF front end. This, coupled with the low-noise GaAs FET preamplifier, allows for high frequency accuracy and low phase noise which translates into superior signal integrity.

The patented adaptive-antenna tuner allows the Access 3000 Pager to operate in a range in excess of 50 miles at 80% threshold. Since the antenna was developed without using any ferrite material, the pager antenna will not fail if dropped or mishandled.

The unit is powered by rechargeable high-grade Nicad batteries capable of 1000 charges during their lifetime. Recharging is possible using a wall transformer or vehicle cigarette lighter.

The Access 3000 Pager memory capacity is 256K bytes (expandable to 1 Mb) used for storing special messages and/or names, telephone numbers, addresses or memos. The memory is allocated to support a free-form mail drop for sending a long message, such as a fax message. An on-line memory counter indicates available memory.

Pager alerts are available through three methods: visual with audio or discreet vibrator and silent alert for noise-sensitive

situations. During pager turn-on, the user is alerted by an internal alarm to any unread message stored in memory.

A built-in DTMF dialing feature provides the user with an easy way to dial phone numbers from incoming page messages or from the pager memory at the touch of a button.

The Access 3000 Pager has a bi-directional infra-red coupled serial port (1200 bps) for data input or output to terminal devices, personal computer, or printers using standard RS-232 protocol. The pager can function as a converter for a continuous stream of data for transfer to a printer or standard computer communications port.

RDS (Radio Data System) offers an alternative to all RCC (Radio Common Carrier) paging systems by using the FM 57 kHz subcarrier to transmit signals from existing FM radio stations worldwide.

For more information, contact Michael LaFrance at 504-889-9800, fax 504-887-0950, or circle 037 on the reader service card.



Equipment Report:

Modulation Sciences RDS Coder

Reader Service #038

Modulation Sciences RDS Products
by **Eric Small**, *President*

Modulation Sciences has created a unique approach to generating RDS. Instead of producing a standalone piece of hardware which might be either too simple or too complex to meet a station's long term needs, we have designed an RDS coder on a PC plug-in card. Our coder card will plug into any IBM-compatible computer. This approach allows broadcasters to configure an RDS system with hardware tailored to their unique requirements using all off-the-shelf equipment. All the brains of the coder reside in software. This approach allows quick response to changes or additions in the RDS standard, with a minimum of disruption to broadcasters and listeners. MSI supports both the American and European RDS standards.

Broadcasters wishing to implement only the bare minimum set of RDS features can quickly assemble a low-entry-cost coder. As RDS receivers become more prevalent, additional features can be used as the broadcaster desires. Typically, little or no additional hardware is required to add these features. Potential add-ons include precision real-time clocks, a contact closure card, or a multi-port serial card.

The primary goal in the design of the coder software was to simplify operation and to shield users from as many low-level details as possible. Any RDS parameter or data type may be set to change automatically at any time of the day, allowing a station to continually reconfigure their RDS transmission. The current value of all RDS parameters are continually shown on the PC's monitor. Manual changes in the system may be made using either the key-

board of the host PC, or with another PC and the included RDS-Remote software. Extensive documentation and MSI customer support make setup and everyday operation even easier.

The MSI RDS coder is available either in card form, or packaged in a self-contained unit with a single-board computer.

Modulation Sciences has also developed a small RDS-only receiver. This receiver provides an RDS data output. The entire RDS data stream or any subset of it are available through this output. It would be ideal for OEM applications, or for in-house use by a station.

For more information, contact Modulation Sciences at 800-826-2603 (in New Jersey, 908-302-3090), fax 908-302-0206, or circle 038 on the reader service card.

Equipment Report:

QEI Corp.

Reader Service #039

Designed For Performance
by Jeff Detweiler, QEI Corp.

The Frequency Modulated Oscillator (FMO) is the single most important part of the modern FM transmitter. One indication of the quality of the FMO is its ability to modulate the signal with very low distortion without the use of predistortion networks or other distortion compensation circuitry. The FMO used in QEI exciters is capable of distortion better than 0.025% at modulation levels far in excess of those required in today's FM broadcasting.

In fact, the FMO used in QEI exciters can modulate in excess of 200 kHz deviation without any problems. This is due, in part, to the extremely flat modulation sensitivity of the QEI FMO.

The fact that the QEI FMO is very flat over the entire FM band dictates that it must be extremely flat over any 75 kHz, or even 200 to 300 kHz range. This encompasses the range of significant harmonics for an audio signal.

After the modulated signal has been created, it only remains to be amplified to the required power level (TPO). We chose the grounded grid triode design for the final amplifiers as the best method.

The basic tube amplifier design was modified in order to eliminate trouble-prone components while maintaining the

overall reliability and simplicity. To this end, the sliding contact tuning lines were replaced with a trouble-free, lumped-constant tuning system which eliminates corrosion and binding problems encountered in the old design.

Similarly, the plate blocker capacitor which surrounds the tube and is prone to destructive arcing and damage when changing the tube has been replaced with a much more rugged capacitor that no longer hampers the tube change and has been field-proven to be trouble-free.

In addition, the filament inductors which were once prone to changes as the result of contact during normal maintenance have been replaced by simple but effective aluminum sections.

Add to this an interlocking section air chimney that allows easy inspection of the tube socket parts and the end result is a final amplifier enclosure that combines the operational advantages of improved stability, eliminates neutralization and provides a rugged design.

The modular solid state drivers with their own over-current, over-voltage and VSWR protection provide the correct amount of RF drive for efficient operation. These modules are driven from the exciter through the automatic power control unit which precisely controls the amount of RF into the IPA.

The automatic power control receives its reference from the final plate voltage and plate current samples and therefore maintains the output power at a precise level. One advantage of this method of power control, along with the grounded grid triode design, is a high voltage power supply that is always providing enough current for proper regulation at a relatively constant voltage. This allows the transmitter line to be equipped with a single phase high voltage power supply at a cost saving.

The automatic power control system with its protection features provides the same advantages in all QEI FM transmitters. An output VSWR fault causes a momentary drop to zero power, followed by a soft start to protect the power level. This feature insures that any arcs have been extinguished before operation is resumed and will limit damage to the transmission line and antenna system.

For more information, contact QEI at 800-334-9154 or circle number 039 on the reader service card.



Equipment Report:

Rohde & Schwarz DMC.10

Reader Service #040

The Future of Sound Broadcasting
by Günther Sponzel, Rohde & Schwarz

A significant innovation is forthcoming in FM sound broadcasting: the transmission of radio data within the stereo multiplex signal. This additional service is to provide support and information to the listeners of both home and in particular mobile radios.

Since 1987 Rohde & Schwarz has been playing a major role in the worldwide introduction of RDS. During this time the Radio Data Coders DMC from Rohde & Schwarz have been tested and used by more than 1500 broadcasting stations in numerous countries. This has resulted in extensive experience and a commitment to electrical and mechanical precision.

The hardware of the DMC.10 is a modular design with microprocessor controlled operation. A digital signal modulator is used to generate the accurate curve shapes according to RDS specifications, avoiding tolerance and drift.

The data rate of the signal used to modulate the 57 kHz subcarrier is 1187.5 bits per second. The data is transmitted as 16-bit words, each of which is associated with a special 10-bit checkword for error control. Four such 26-bit blocks form a "group" and various types of groups are specified to cover the various applications of RDS.

All the currently defined RDS information is stored in data sets. Eight separate data sets are available, enabling eight sets of RDS information to be prepared. The desired data set is selected and transmitted via manual or remote command.

The DMC.10 can operate in four different ways: manual control via front panel with status display; all RDS data may be entered in interactive dialogue via the terminal interface at the front; data transfer via RS-232-C to the rear data interface; and remote control via TTL control lines with acknowledgments.

The implemented features can be classified into different application groups like automated tuning features, switching ap-

plications, communication and information features and data services. These include display of station, call letters and program type, alternative frequency switching, traffic management, radio text, computer interface and location/navigation. Furthermore, the DMC.10 is ready for hardware and software extensions to handle the various applications in different countries.

For more information, please contact Rohde & Schwarz in Lanham, MD at 301-459-8800 or Günther Sponzel at Rohde & Schwarz Headquarters in Munich, Germany, telephone 011-49-89-4129-2913; fax: 011-49-89-4129-2224 or circle number 040 on the reader service card.



Radio Guide Page 31

Equipment Report:

RE America RE533 RDS Encoder

Reader Service #041

Convenient RDS Transmission
by *Bill Daniels, RE America, Inc.*

RE America, located in Westlake, OH, has designed and developed the RE533 "Slim Profile" RDS encoder, which will adhere to the United States RBDS standard now in the final stages of development by the NAB and EIA.

The RE533 is comprised of a single PCB housed in a 1U, 19" rack-mountable chassis. The rear panel of the RE533 contains a nine-pin RS232 serial communication port, a 25-pin remote control port, a single BNC connector for input signal, a single BNC connector for output signal and a three-pronged AC power input plug. The front panel consists of eight LED status indicators and three recessed screw-adjustable potentiometers for output signal and phase adjustments.

The RE533 encoder can be configured, via a toggle switch, to operate in two different output modes. In one mode, the unit can be configured to internally add the generated 57 kHz RDS signal to a composite input signal and provide this "composite + RDS" signal at the output. This mode is best suited for applications where the encoder is to be placed between the stereo

generator and the FM exciter or STL transmitter.

For protection of the composite input signal in this mode of operation, a relay signal pass-through circuit has been incorporated. The function of this circuit is to directly connect the composite input signal to the output BNC connector whenever the RE533 loses power or detects a malfunction. It essentially prevents the composite signal from ever being cut off from the exciter or transmitter.

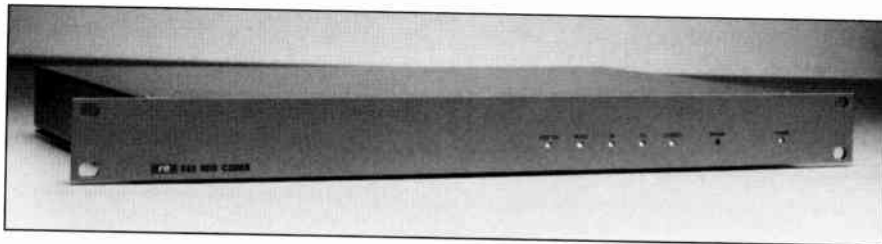
In the other mode, the RE533 can be configured to provide only the 57 kHz RDS signal as an output. This mode is best suited for applications where the encoder's output is to be connected directly to the stereo generator. However, it is also useful when the output is to be fed into an SCA channel input of an FM exciter. The unit is fed a composite sample into its input signal BNC

connector, so that it may strip out the 19 kHz pilot signal for the purpose of phase-locking the 57 kHz RDS output signal to the composite signal.

The unit is capable of transmitting the RDS defined groups of 0A, 0B, 2A, 2B, 4A, 10A, 15A and 15B. These basic RDS features allow the broadcaster to transmit: station call letters; program type (format and program type name); traffic programs and announcements; clock time information; radio text messages and alternate frequency switching.

The RE533 can be dynamically controlled via a personal computer running the PC control software program supplied with each unit.

For more information contact RE America at 216-871-7617 or circle number 041 on the reader service card.



Equipment Report:

TTC Corp. FMS Solid-State Series

Reader Service #042

Field-Proven Solid State FM
by *Russ Erickson, TTC Corp.*

TTC introduced the FMS series of solid state FM transmitters in 1989. Since then, we have shipped over 80 units to customers all over the world.

The RF chain is very straightforward. The IPA, PA and combiner modules are mounted in the RF system enclosure in the top of the rack. The Model X exciter and the "smart" transmitter controller are mounted in slide-out drawers in the center of the rack.

The RF chain begins at the Model X exciter. The Model X is adjusted for 10 watts output, driving a 300 watt FET IPA. The IPA runs at about 200 watts, the output being split appropriately to drive each PA module with 50 watts. Once the 50 watts enters the PA module, the power is split again by a 4:1 transformer, creating two equal signals 180 degrees out of phase.

Final amplification is Class C. TTC uses a dual FET package available from Philips or Motorola which exhibits excellent gain, with a maximum junction temperature of

200 degrees C. (392 F.), while the typical heat rise for an FMS-4000 is only 15 degrees C. The outputs of the individual 1 kW modules are then combined to provide the final RF power.

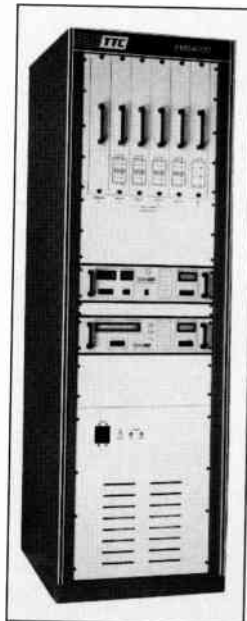
TTC uses a plenum which is pressurized by two fans to 800 CFM. If a fan should fail, shutters in front of the defective fan close, allowing the plenum to be pressurized by the remaining fan.

The combined RF output feeds an internal low pass filter/directional coupler which has a DC short for lightning protection. RF outputs from the directional coupler are fed to the "smart" transmitter controller where the signals are rectified to DC and used to drive the automatic power control and proportional VSWR foldback.

The automatic power control is accurate to +/-1%, and the proportional VSWR foldback allows continued operation even into a bad load caused by icing, heavy rain or other conditions. The controller also provides monitoring and control of all voltages, currents and module temperatures, and self-corrects for any anomaly. The controller also provides a digital wattmeter for forward and reflected power.

The power supply is a unique ferroresonant supply which can withstand voltage spikes and drops of +/-15% and still provide a clean +50 VDC to the transmitter. Additional lightning protection is provided by MOVs on the AC input for high amplitude spikes. In high lightning areas, the addition of an S1A series surge protector for the AC line is available.

For more information, circle number 042 on the reader service card or call TTC at 303-665-8000.



Equipment Guide



Call: (507) 280-4045
From Your Fax-Phone

Radio's Most Effective Classified Ad Listings

Classified Ads: On-Line — On Your Fax

Here's How to Get the Latest Equipment Listings:

1. Call the Equipment Guide at (507) 280-4045, from your Fax Phone.
2. Follow the operator's voice instructions, and you will be asked to press one or more of the following buttons on the phone:

- #1 — Used Equipment for Sale
- #2 — Equipment Wanted
- #3 — Employment Classifieds



3. Remember, just follow the voice instructions, and you'll get a complete fax printout of all the information you want — right on your fax machine.

Send Your Equipment Listing to Us — We'll Place it on the Equipment-Guide

1. Copy this ad form.
2. Use one form for each category.
3. Fill it out & fax or mail it to us at:

Equipment Guide

Box 7001, Rochester, MN 55903
Fax # (507) 280-9143

Name: _____ Station: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Fax: _____

Ad Copy Below: (Use a New Form for Each Category)

Equipment Categories:

- For Sale Wanted
- AM Transmitters
 - Antennas, Towers, Coax
 - Automation Equipment
 - Computer Equipment
 - Consoles and Mixers
 - Exciters: AM, FM, SCA & Stereo
 - FM Transmitters
 - Misc. Audio & Telephone Equipment
 - Misc. Equipment & Parts
 - Misc. RF Equipment
 - Processing & Equalization
 - Satellite Equipment
 - Schematics, Tech-manuals & Books
 - Speakers, Headphones & PA Equip.
 - Source Equip: TTs, CDs, Mikes
 - STL, RPU, TSL & Remote Control
 - Tape Equip: Reel, Cart, DAT, Cassette
 - Test, Monitor & EBS Equipment
 - Tubes, Sockets & Misc. Parts
 - TV & Video

Special Report:

SBE Convention Exhibitors

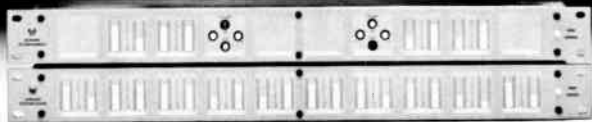
Following are radio equipment manufacturers scheduled to exhibit at the SBE Convention. Exhibit hours are from 10:00 AM to 4:00 PM on Friday and Saturday, October 16 and 17. Booth numbers listed are supplied by the SBE and are subject to change.

3M - 705
 Ampex Recording Media - 333
 Audio Precision - 113
 Bext - 627
 Bird Electronic Corp. - 227
 Broadcast Electronics - 618
 Broadcasters General Store - 125
 CCA Transmitters - 322
 Comark Communications - 521
 Computer Concepts - 718
 Comrex - 327
 Control Concepts - 502
 Current Technology - 323
 Cutting Edge - 125 & 308
 Delta Electronics - 418
 Dielectric Communications - 532

Dolby Laboratories - 616
 Econco - 414
 EEV - 523
 ERI - Electronics Research - 401
 Enco - 133
 Fidelipac - 315
 Harris Allied - 308
 Henry Engineering - 308
 Holaday Industries - 220
 Inovonics - 529
 Intraplex - 504
 Jampro Antennas - 701
 LDL Communications - 226
 Moseley Associates - 621
 Neutrik A.G - 105
 NPR Satellite Services - 222

NWL Capacitors - 332
 Pacific Radio Electronics - 328
 Panasonic Comm. & Systems - 503
 Philips Components - 126
 Pioneer Communications - 108
 Polyphaser Corp. - 427
 Radiation Systems - 326
 RCS - Radio Computing Svcs. - 601
 Radio Systems - 229
 Rohde & Schwarz - 517
 Rohn - 714
 Scala - 119
 Sennheiser - 515
 Shively Labs - 214
 Sony - 208
 Tektronix - 319
 TTC - 416
 Telex Communications - 111
 Telos - 125
 TFT - 121
 Wheatstone - 109
 Wohler Technologies - 600

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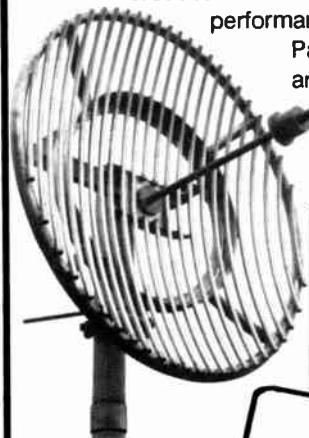
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MF-960	16.15	23	B*
GLF4-940	18.5	24	B
GLF6-940	21.9	26	A
GLF8-940	24.5	28	A
GLF10-940	26.5	30	A
GLF12-940	28.1	30	A

*when vertically polarized.

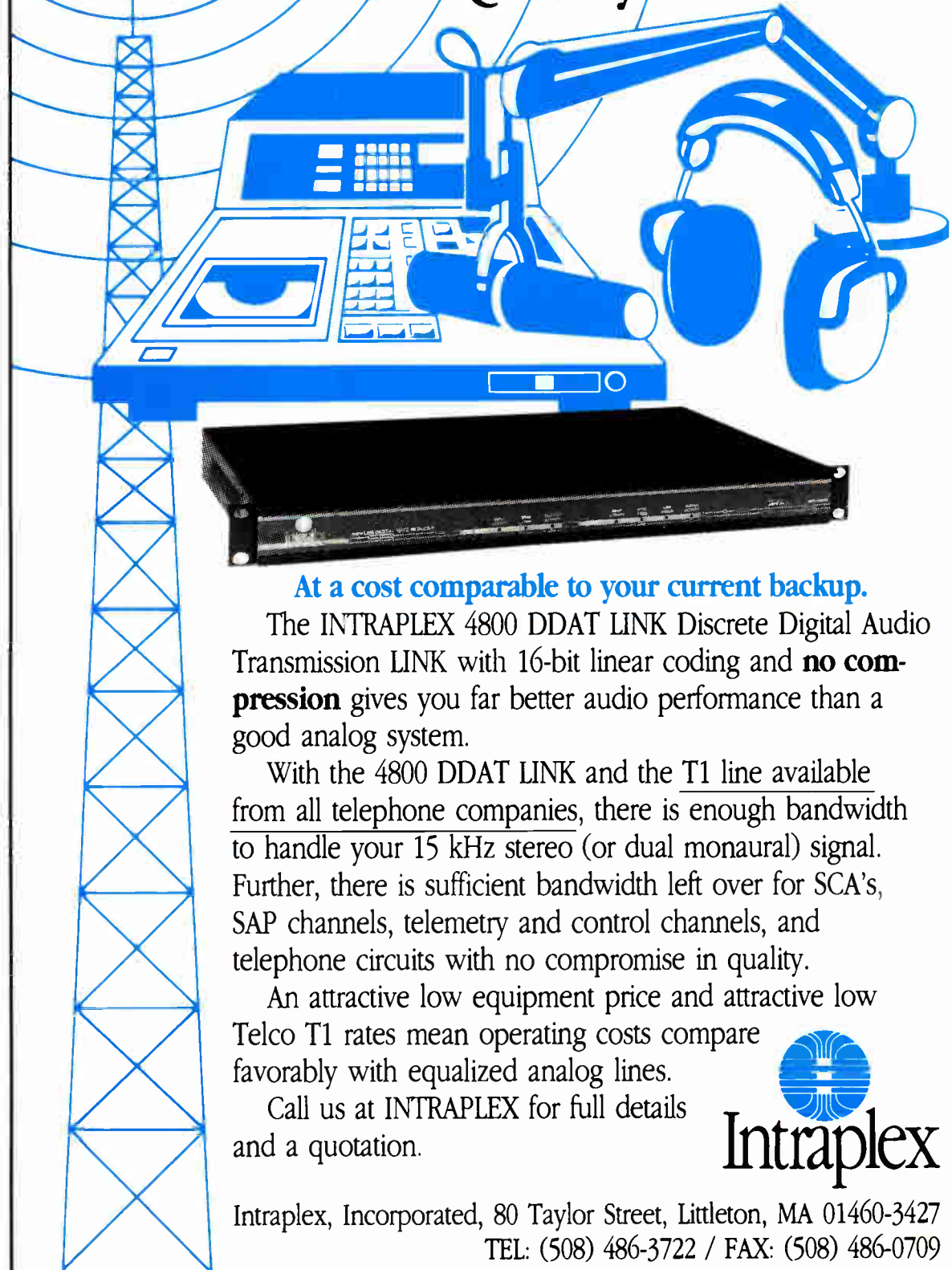
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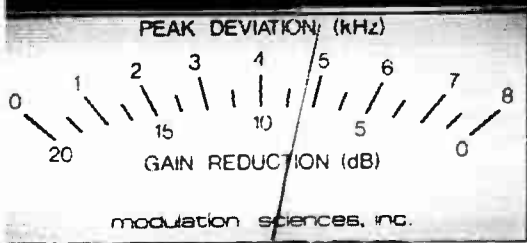
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E.J. PRYOR, JR. Broadcast Technologies, Inc.

"I have been operating one SCA on 67kHz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

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30-Market Survey Results:
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From SCA: Radio Subcarrier Report
 Waters Information Services, Inc.

Here's how Sidekick® makes SCA work:

Sidekick installation is quick, easy, and problem-free:

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Sidekick's "One Box Solution" builds in everything you need:

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Proven Performance:
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Call our Toll-Free SCA Info Hotline—(800)826-2603

Reader Service #046

Contract Engineer

The Business of Radio Contract Engineering

Trying to Reason With Hurricane Season

By Mike Patton

Hurricane Andrew just blew through here last Wednesday morning, with results devastating to many in south Louisiana and south Florida. My family and town were fairly lucky: we had a lot of downed trees and power lines but very little major damage and no deaths. Power was out for almost the entire city for the first day or two and, as of this writing (the Monday following) some people still are without it.

Many radio stations were off the air or on low power because of the limited capabilities (or lack) of generators. Some stations in nearby Lafayette are off the air because their tower has assumed ground elevation (AGL = HAAT = 0).

You may not live near the coast, but severe weather of some sort visits everybody. Here are some observations based on the sudden jump in my (limited) store of wisdom:

Backup Power

Backup power comes in many flavors, but some type is essential if your station is to be on the air in critical periods during and after severe weather. Stations here ran the gamut, from large (500 kW), auto-start, block-heated power plants capable of running the entire station--air conditioning and all--to portable, 2 kW, pull-start (pull and pull and pull) generators wedged in the back door. One lesson was painfully clear: backup power should be in place long before bad weather threatens. We tried to rent a generator for a transmitter site on Monday morning and found that all available units were gone by 9 AM.

If you are lucky enough to work for a station that has a permanently-installed generator, make sure it's ready to go when the going gets rough. Treat

it like your car engine, check the belts, hoses, oil, water (and antifreeze) and fuel. Better yet, get a routine service contract with a generator pro.

When you go to the transmitter site, test run the generator every time. Make yourself a checklist to verify that all is right before you leave. One station here has a huge underground fuel tank, which is pumped into a day tank to feed the generator. The day before the storm hit, their engineer had the big tank filled, and forgot to reopen the feed valves afterwards.

Sure enough, the power failed, the big plant fired up, ran the day tank dry in two hours and sucked air. Our hero had to go to his site at the height of the storm (at 4 AM) with a portable generator to run the fuel pumps just to get the big boy back on line. To add insult to injury, when the fuel-starved generator dropped off-line it damaged a transmitter.

If you're pitching a manager on the benefits of a generator, remind him or her that the cost of the emergency power plant is considerably less than the cost to the bottom line, ratings and public image if the station is off the air when competitors are up and running.

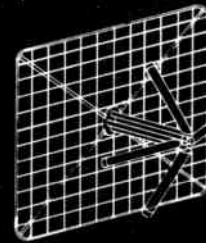
Portable Generators

If your station cannot afford a permanent generator installation, you should still install some type of mains disconnect switch and cord (with the correct plug) for a portable generator at each site. One of my client stations bought a generator, but no matching plug, and I found out shortly thereafter that there is nothing worse than standing in the pouring rain trying to splice wiring into a generator.

(continued on page 40)

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Reader Service #047

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Radio Guide Page 37

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Mica Transmitting Capacitors: Sangamo, CD, Sprague, Aerovox, Acushnet types: CM-15, CM-20, CM-25, CM-30, HT, HK, AT, AK, F1, F2, F3, 30B, E, 1996, 291, 292, 293, 294 & G5.

Fixed and Variable Vacuum Capacitors: Jennings, Dolinko & Wilkins. Mounting brackets and flanges. Vacuum relays.

Oil Filled Filter Capacitors: Plastic Capacitor Corp., 600 to 40 kV, 1 mFd to 30 mFd with special mounting brackets. Non-PCB oil capacitor replacements are available for most transmitters.

Ceramic RF Capacitors: Centralab, Jennings, Sprague, High Energy, 5 kV to 40 kV.

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Reader Service #052

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3kW	FM	1975	CCA 3000D
3kW	FM	1974	Harris FM3H
15kW	FM	1975	AEL 15KG
25kW	FM	1988	TTC 25,000
30kW	FM	1980	BE FM30

AM Transmitters

1kW	AM	1982	Continental 314R1
2.5kW	AM	1982	CCA 2500D
2.5kW	AM	1976	McMartin BA2.5K
5kW	AM	1968	Harris BC5H
5kW	AM	1972	CCA AM5000D
5kW	AM	1977	RCA BTA 5L
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Reader Service #053

Radio Guide Page 39

Contract Engineer

Continued from page 37

Never put a generator in a building while it is still running. Even the smallest generator creates an astounding amount of hot and noxious gases very quickly. In addition, the law requires you to store gasoline in specially sealed containers if you store it in an inhabited building.

One cheap solution that works well for several stations here is to use a UPS large enough to run the equipment in the control room with as much as six hours of battery time. They also have generators in a storage room or a nearby store-and-lock. When power fails, the UPS picks up the load and runs until the generator is set up and running.

This solution also protects sensitive equipment like computers from the often lousy power quality of a generator, gives a precise frequency for tape machines and clocks and allows the generator to be shut off for refueling without going off-air. Because our UPSs can charge their batteries very quickly, we were able to shuttle one generator between two stations and keep them both on the air.

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Personal Safety

Before the storm I promised myself (and my wife) that I would not go out in the hurricane. This resolution lasted until a 5 AM phone call from a client telling me that his transmitter power had failed and he needed (and expected) me to go to the transmitter with his newly-purchased generator and wire it up.

I guess that I could have said no, but I didn't want to find out what his reaction would have been (after all, he had driven to his studio site a few minutes before). So, I got into my trusty Jeep and drove, thanking the Cosmic Muffin that his site was not too far away. I'm still alive and employed, and was somewhat of a hero, if only for a short time, so I reckon I could have made a worse decision.

Besides, I got to spend the morning in my air-conditioned car instead of my hot, without-power house. That was really weird, how hot it was, even in the pouring rain. The problem with a hurricane is that it's hard to tell when it is over. The winds go on for hours, and die down very slowly. When it is "safe" to go out is very subjective.

Here in Baton Rouge, there was apparently no time when one's car would have actually been blown over. Closer to the coast, I'm sure that there were times and places that were patently unsafe. I'm not advocating that you risk your life for your job and I don't think that your customers want you to. But it's your butt on the line, and only you can make the final call. You've got to use your best judgement.

There is an ancient Chinese curse, so I'm told, that says "May you live in interesting times." Andrew was certainly one of the more interesting things to happen to radio in these parts in quite some time. I think I'll try living a pretty boring life for the next few months.

Next month we'll talk about the more mundane aspects of contract engineering, provided that we don't have another hurricane.

Mike Patton, who is no doubt still wringing out his wet socks, owns and operates Mike Patton Associates. He can be reached at 504-292-4189.

World Radio History

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Reader Service #060

The Equipment Guide is on line with easy, single-step access to all classified listings

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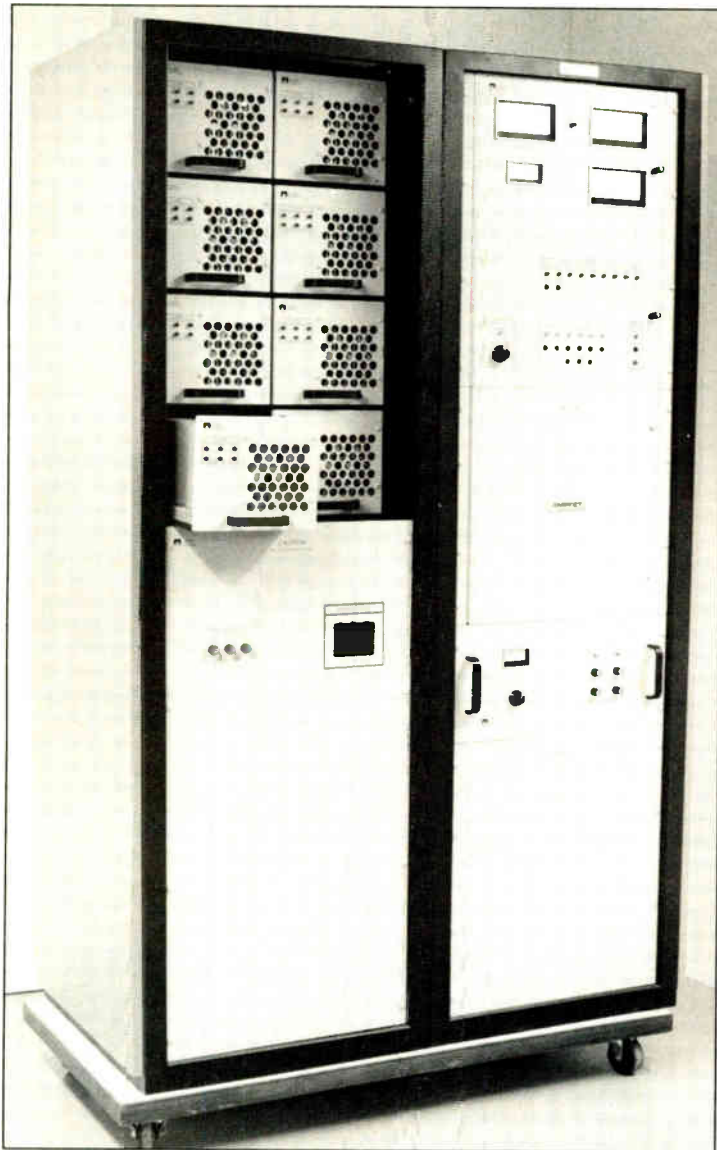
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Reader Service #055

Advertiser Listing

Advertiser	Page#	R/S#	Advertiser	Page#	R/S#
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ATI	9	006	Micro Technology	7	004
AT&T	22	023	Modulation Sciences	36	046
AVS Services	13	010	Myat	19	019
Access	15	014	National Supervisory	21	022
Broadcast Devices	38	048	Nautel	41	055
California Digital	10	007	Professional Audio	42	057
Cellcast	12	009	QEI	6	003
Coaxial Dynamics	7	005	QEI	14	013
Commercial Radio	39	052	QEI	40	054
Computer Concepts	43	058	QEI	40	060
Corporate Computer	17	017	QEI	40	061
Cortana	25	028	Ramko	18	018
Econco	16	016	Ramko	27	033
Enco	14	012	Scala	34	044
Energy Onix	25	031	SCMS	24	024
ERI	24	025	Sierra	20	021
Freeland Products	25	029	Studio Technology	24	027
Hall Electronics	24	026	Telos	5	002
Henry Engineering	20	020	Transcom	39	051
Intraplex	35	045	TTC	11	008
Jampro	37	047	Vacuum Tube	39	053
JRF Magnetic	13	011	Wheatstone	44	059
Logitek	16	015	Wireready	38	049
M-Street	42	056	Wohler	34	043

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2. Modem: Call 703-370-7943 and request an XMODEM transfer.
3. Mail a 3.5" or 5-1/4" double or high density floppy disk (Wordperfect 5.0 or ASCII) to: Judith Gross at 101 S. Reynolds St., Suite H-405, Alexandria, VA 22304.

We also accept clean, typewritten or printed manuscripts mailed to Judith Gross at the above address. Photos and clean, camera-ready art with articles and Tech-Tips appreciated. Articles should be 750-1000 words in length and Tech-Tips should be 200-500 words. Radio Guide pays for all articles accepted for publication and Tech Tipsters will receive a Radio Guide pocket calculator.

Equipment Reports:

FM Transmitters, Exciters & SCA's — Pages 28-32

For more information, circle the R/S numbers.

Report

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Broadcast Electronics
Harris
Access
Modulation Sciences

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Report

QEI Corp.
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039
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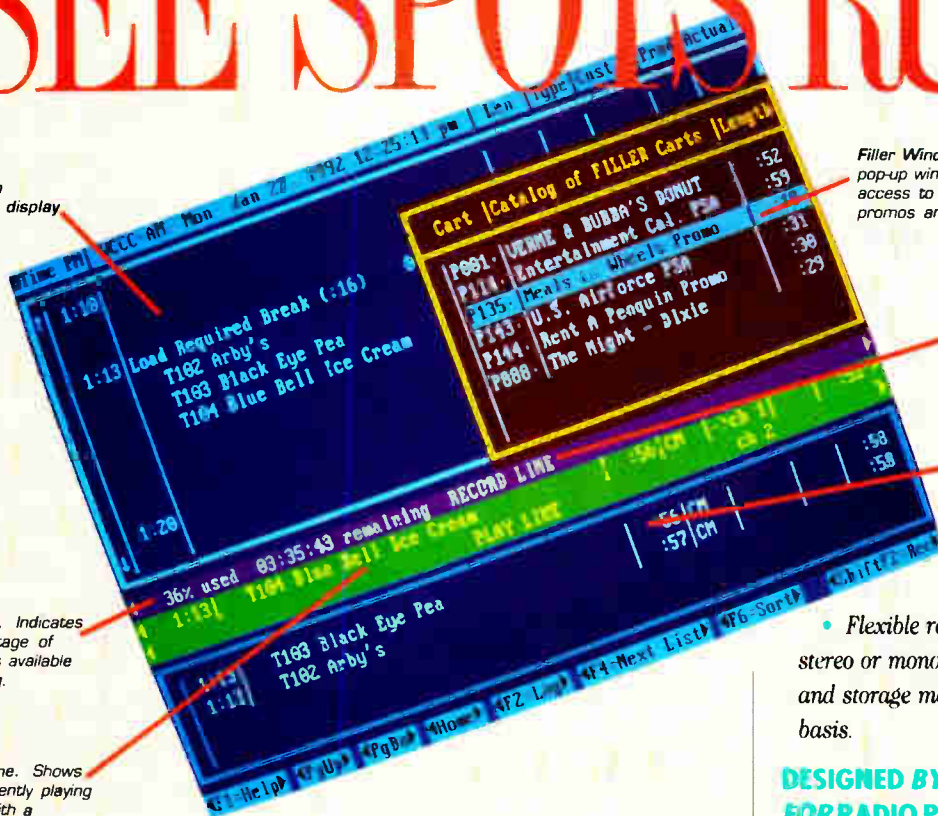
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On-screen traffic log display



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