

Radio Guide

Radio's Technology Magazine

July 1992



Station Stories

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WTEM
Washington, DC

JG's Earwaves-Pg. 8

Waiting For The World To Change

Tips From the Field-Pg. 20

Optimod Set-Up & CD Skipping

Equipment Reports-Pg. 33

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World Radio History

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Radio Guide Page 4

Radio Revolution

By Ray Topp, publisher



How many of us thought that the "digital revolution" would affect the radio industry this fast? The change from tubes to transistors was gradual enough, as was the conversion from discrete devices to ICs. Now, almost overnight, we find whole stations able to be run from a single PC.

Remember all of those articles you read, about keeping yourself updated on the progress of digital electronics and ICs? Did you do it, or did you just figure that it wouldn't affect the radio industry any time soon?

We know what happened. Virtually every piece of new gear has become totally digital, or at the very least has a majority of its component parts made up of the multi-legged variety. This should actually be good news to chief engineers for a couple of reasons.

First, although ICs cannot be repaired, they can (usually) be easily replaced. In a certain sense you only have to troubleshoot equipment to the function level. And with so many functions now contained in a single IC, troubleshooting to the component level is not necessary as often.

Of course there will always be the inevitable loose connection, dirty switch or leaky capacitor. Nevertheless, finding a bad IC should be easier than tracing trouble to an intermittent component in discrete circuitry. When an IC goes bad, it usually affects a whole section or complete function of a piece of gear.

Second, this new sophistication has brought with it built-in diagnostic capabilities available in many pieces of new equipment. Adjustments and parameters are likely to be changed by key-pads and "virtual" knobs, eliminating many of the troublesome pots and switches found in earlier devices.

This technical sophistication sometimes requires a level of repair skill that we may not have. We shouldn't feel deficient; it's just a result of the rapid advances in technology. Where once basic electronics knowledge and a reasonable amount of OJT were all that was required to deal with most problems, now we're asked to deal with advanced digital equipment we may not have had a chance to read about, much less learn about. On top of that, specialized digital test gear is simply too expensive to justify, given the amount of actual work that is performed at any given facility.

This brings me to a point that I've made before, and bears repeating again. No matter how much you read, listen and learn about technology, you are still going to run across problems you can't solve right away. If it's not critical to the operation of the station, you may be able to take the time to learn more about its design and function ... and in the process be able to complete the repairs yourself.

But if time is short and your station's operation depends on that piece of gear, then you may need to put your ego (something most radio engineers lose after the first lightning strike at the TX site) in your back pocket and call the manufacturer for help. They built it, they know how it works and they can usually help you fix it. We all have legitimate stories of unresponsive companies and bonehead "technical assistance," but the bottom line is ... this is the exception rather than the rule. Most of the time they will be able to help you.

If you don't have the knowledge to be able to fix it, you should always know where to get it. That's the mark of a true professional. **R.T.**

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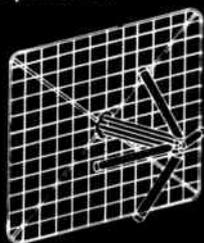


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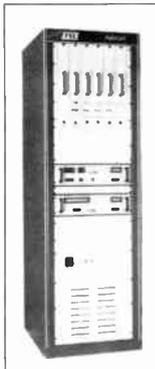
Reader Service #006

Product Page

New Products for Radio

TTC FMS-4000 Solid State

New from Television Technology Corp. at the NAB show was the FMS-4000 solid state FM transmitter. The FMS-4000 has TTC's Model X FM exciter and boasts specs like 90 dB SNR, -60 dB synchronous AM noise and distortion figures of less than 0.01%. Each 1200 W amplifier is vertically oriented with four Phillips FET devices. Each module is protected for over-voltage, over-current, VSWR and over-temperature. The FMS-4000 is available from 1 kW-16 kW. Call 303-665-8000 or circle reader service card number 063.



Continental's New FM Exciter

Continental Electronics introduced a new digital-quality FM exciter, the 802B, an upgrade of the 802A. The new exciter is completely broadband and can operate at any level from 5-50 W. The operating frequency may be selected from a digitally-programmed, dual speed, phase-locked



synthesizer in 10 kHz steps. The 802B is entirely modular and mounted on slides for easy access and installation. It will be ready in September and is covered by Continental's 2-year limited parts warranty and 24-hour technical support by phone. Call 214-381-7161 or circle number 064 on the readerservice card.

Computer Concepts Adds Editing

Computer Concepts DCS is about to include a new digital editing function as a standard feature on all of its DCS (Digital Commercial Systems) units. Existing DCS's receive the new feature as an upgrade. The new feature includes cut-and-splice real-time editing with accuracy to one-hundredth of a second. Edits can be done with keyboard or trackball. Editors get to assemble audio and save only the cuts desired. Call Computer Concepts at 800-255-6350 or circle number 065 on reader service card.



Processing Shoot-Out

What's the best way to tell if a particular processor will get the sound you want, especially in the Big Apple? Put it on the air. That's what WNEW-FM CE John Rosso did recently. "There were several we were interested in, so I decided to play with all of them," said Rosso. Cutting Edge's Frank Foti (rear of photo) helped Rosso set up the Unity 2000 digital processor. Rosso said he liked the flexibility and pointed out that with processing now in the digital age: "Hardware is no longer the primary concern. You can do a lot with software or a set-up change." In the end, Rosso decided to add the Unity 2000 to his processing chain "because it gave me the sound I wanted." And, yes, he said the New York market is "still brutal," processing wise. For info call Cutting Edge at 216-241-3343 or circle reader service card number 066.



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Reader Service #007



Waiting For the World To Change

by Judith Gross

Happens **every year** about this same time. The **humidity** makes everything stick to everything else ... mid-summer **lightning storms** threaten computer and **transmitter** all at once ... and the only thing resembling a **vacation** in your plans is that 5-foot square **empty space** at the beach or the lake with Cousin Tilly, the Brother-In-Law, and Sis' five **rap-listening pre-pubescent kids** who think you are so far out of it you're from another galaxy.

But enough about me. Summer **doldrums** hit you yet? Course, that may all change rather rapidly if those new **FCC ownership rules** go through. I'm picturing consolidation in a **BIG way**. Maybe not all at once ... but ...

Maybe markets with 15 stations down to **five or fewer** owners. Maybe some AMs with things like the **all-Romanian dance** music format, since you won't need to make so much money to keep the marginal ones in business.

And how about some **new-tech** ways of combining operations? How about codecs with **Switched 56, ISDN** and **V-Sat** remotes? Maybe put in a few **more digital satellite automation systems**, a workstation here, a second one there.

Just one thing, though. I hope the new breed of players doesn't take it all as **one more excuse** to cut back on engineering. Then again, it's kind of hard to **consolidate** what has already been cut to the **bare bones**, isn't it?

Speaking of such horrors ... Say it isn't so. Historic station **KDKA**, Pittsburgh, getting rid of its **engineering staff**? Deciding that a CE is a luxury in this day and age? Then wondering if it's still **necessary** to do such frivolous things as run **EBS tests**? (Gee, only if you really want to keep that **70-year-old license**, guys).

Somebody tell me I heard wrong, **pleeze**. This is one area where there's no glory in being a **pioneer**.

On a happier front, I understand those who showed for **Montreaux** were satisfied with attendance and the **overall results** of this first-time show. Now the **NAB** is thinking of making it an every year thing.

But what's this? Guess they decided to hold a **symposium** and not invite us. That's right. Just before the start of the **Montreaux convention** was the EBU's first **International DAB Symposium**. International, you say?

Then how come nearly **every single** session was devoted to some aspect of the **Eureka system**, with most of the papers given by **European speakers**, an occasional representative from **Japan**, one from **Canada** supporting Eureka and zero – count 'em – **zero** representatives of **U.S. DAB systems**?

OK, if you want to get picky, the U.S. was represented by the NAB's **John Abel**, but he's still calling in-band development "far from certain."

Was **Strother-Lincom** invited? No. How 'bout **Mercury Digital**? Unh-unh. **American Digital** radio? Not a chance. But not only was the **USA Digital** team NOT invited to make a presentation, their **specific request** to a U.S. member of the program committee to be included was **flatly turned down**. Shame, shame, shame!

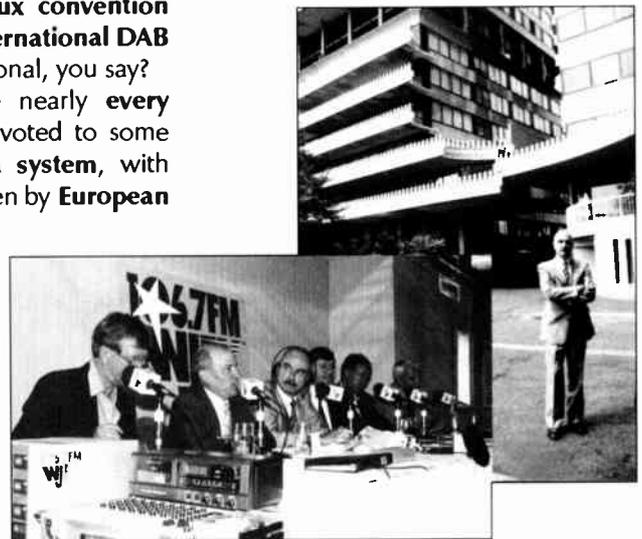
Oh, and on **DAB**. How come the **CPB** gets to spend **\$350,000** of our hard-earned tax dollars just "developing policy," whatever that means? Policy? You want policy? Heck, Give me about **2/3 of that amount** and I'll write it for you at a **discount**.

But just wait. If you think **DAB** is heating up again now, just wait until you see what gets going at the **Radio**

Show in N'Awlins. If even half of what I've heard whispered goes down ... Whew!

All right. Where were you **20 years ago**? Well, some of us, it seems, just couldn't let an **anniversary** pass in silence.

In a historic radio broadcast, Infinity's **WJFK-FM** brought **Watergate**



The Watergate master-mind returns to the scene of the crime in an historic radio broadcast

burglary mastermind G. Gordon Liddy back to the scene of the crime. Liddy's doing a **midday show** on the Fairfax, VA station, where the ex-FBI agent sometimes gets called "the G-man."

Oh, he talks mostly to conservatives about things like **surveillance**, the proper choice of **guns** and what it was like to spend **years in prison** for refusing to rat out the other Watergate culprits. Sort of a polite **Rush Limbaugh**, as it were.

But on June 16, **20 years** to the day after the bungled break-in that brought down the **Nixon presidency**, the man who refused to talk had plenty to say. Yes, the G-Man was back inside the famous Washington D.C. hotel, and this time, he even **used a key!**

All the major news networks and **C-Span** were there, and you never saw

JG's Earwaves

a single radio broadcast get so many cameras rolling. Problem was, darn few of them had the **courtesy** to mention the hosting radio station by name on air.

Now what is it with these guys? The TV news can talk endlessly about a piece of history and fail to mention **four tiny call letters**, even once in the whole segment. It's not a dirty four-letters, you know. Face it. Radio **upstaged** you all.

Good job on the broadcast, from WJFK CE **Dan Ryson**, known to the G-Man as "Engineer Dan." And good job too from the show's producer **John Papp**, working with some rather ancient equipment.

Just a few more interesting tidbits, then it's back to the tequila and lemonade for me.

First, there's an **updated copy** of "Making SCA Work In the Real World," that booklet from Modulation Sciences's **Eric Small** that's packed full of useful info.

SCAs are another area heating up again these days, what with technologies like **RDS** and the vehicle information service that has the highway folks and the car manufacturers salivating. Call **Eric at 800-826-2603** for your updated book.

Oh, and how are we supposed to **keep track** of all those folks changing places out there? First off, **Laura Tyson**, who has left **Denon** to open **Broadcast Supply West's** east coast office. Then **Cindy Edwards** heading up the North Carolina office for **Audio Broadcast Group**.

Let's see. **Marty Sacks** at D.C.'s WGAY took a job with **Northeast Broadcast** so Philly WXTU CE **Kevin MacNamara** (featured on the April cover of **RADIO GUIDE**) has moved into the slot vacated by Marty. Congrats to both.

SBE Executive Director **Steve Ingram** is leaving that post. His contract ended May 31 but Steve will stay on and help with the **October SBE convention** in San Jose.

I hear there's divided sentiment over whether a new **Exec Director** will

replace Steve or whether, in light of the recent budget controversy, the post will be **abolished**. We'll keep watching and find out.

And on a sad note, **Rick Sklar**, who was the force behind the radio I grew up with: **W-A-Beatle-C** in good ole NooYawk, died unexpectedly after surgery in June.

Hey, I remember the days when those guys got an unheard of **25% share**, one summer when we all had those little transistor AM radios all but glued to our ears; "Do You Want To Know A Secret" was Number One and **Big Dan Ingram** was the Kimosabe we couldn't do without.

Talk about a way to kill the summer blahs. OK, now, let me just get that album of oldies -- **remastered for digital**, of course -- on the CD player with the infrared remote and where did I put those lemons? I'll make yours a double.

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Radio Update

Broadcasting and New Technology News

EIA Deadline Sparks DAB Shuffle

By Judith Gross

The first deadline for DAB proponents to participate in the EIA's standard process came and went in mid-June and a total of eight proponents voiced interest in submitting systems.

The initial eight included USA Digital Radio (Project Acorn), Mercury Digital, American Digital Radio, Kintel, and Thomson Consumer Electronics backing Eureka 147.

But surprising letters confirming intent to submit DAB systems also came from AT&T/Bell Labs, Digital Planet and NHK. Notably absent was Strother-Lincom.

Then, several weeks after the first round of letters, NHK pulled out and Strother-Lincom confirmed its intentions to submit a system as well.

At press time, reports came in that the New Jersey offices of Digital Planet, which currently offers cable music services, had been padlocked by bank officials. How this will affect Digital Planet's participation in DAB remains uncertain.

The EIA committee will meet in mid-July to consider the written confirmation of DAB systems proponents' intent to submit hardware. The hardware is due for submission next April, with EIA planning to recommend a standard by October, 1993.

CPB Gets DAB Bids

The Corporation for Public Broadcasting's Office of Policy Development and Planning has received five propos-

als on plans to help to formulate a strategy on DAB.

The CPB solicited proposals from about 70 universities, broadcasters, equipment manufacturers and consultants, seeking someone to develop a policy for public broadcasters to benefit from DAB. The project is expected to take 15 months and will be funded with up to \$350,000.

Project manager Charles Wilk said even though DAB is still very much in its infancy as far as systems development, "It's time to start thinking about how to do things differently. We need to see the possibilities now."

Wilk noted that "We didn't pay enough attention to DAB at the begin-

(continued on page 13)

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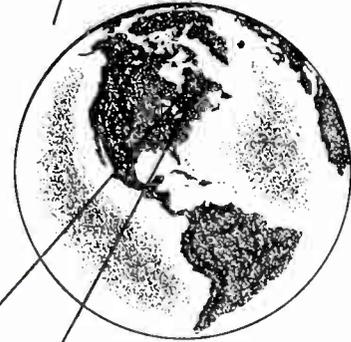
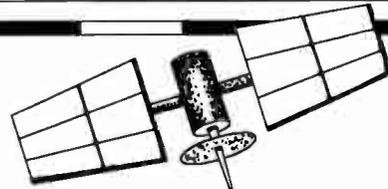
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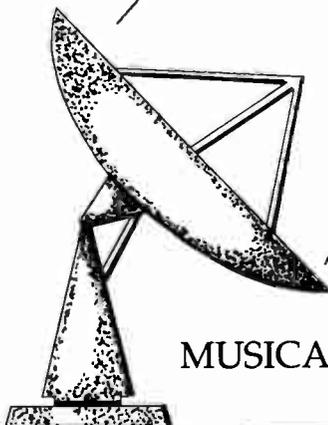
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Radio Update

continued from page 11

ning. We don't want to find ourselves stuck with just better sound."

Of those who received the request for proposals, specific DAB systems developers were in the minority. USA Digital, American Digital Radio and Satellite CD Radio received the request; Strother-Lincom did not.

Wilk said that the list of those who were sent proposals was culled from many sources, including the attendees of two meetings of the EIA's committee considering a DAB standard. He acknowledged a system proponent who did not attend the EIA meetings could have been unintentionally excluded from the request list.

But, while Wilk would not name the five who did submit proposals to help CPB develop DAB policy, he did say that none of the five were those on the EIA committee attendance list.

CCIR Compression Test Results

The CCIR has revealed preliminary results of its audio data compression system tests.

Eleven systems in all were tested for various applications including transmission directly to affiliates or end-users, and contribution and distribution, for instances where editing is done or the audio needs to go through more than one generation of compression.

In the case of audio compressed and then sent directly for airing (transmission), the systems tested were found to be virtually indistinguishable.

But for other applications, the ISO standard (MUSICAM incorporating ASPEC benefits) was considered superior. In these results, ISO won out over Dolby AC-2. But, in a form of *deja vu*, the results also said that Dolby AC-2 was easier to implement than ISO and suggested the two systems work together to combine these benefits. A similar result came from the original ISO tests between MUSICAM and ASPEC.

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Find It In the
Equipment Report
Pages 33-39**

IN BRIEF:

RDS Standard Looking Hopeful

It looks as if all the obstacles standing in the way of an NRSC standard on RDS have been removed. A draft recommended standard is expected to be released at the NAB's Radio Show, slated for New Orleans in mid-September. The NRSC working group has agreed on PTY (format) codes and also has plans to include ID Logic B, an RDS-like system for AM stations as part of the standard.

Rule Change Pending

The FCC's rule changes on ownership are set to take effect August 1 — or are they? There are several petitions for reconsideration pending and there's a chance Congress may get into the act. The Commission has set the cap on total stations owned at 30 AM and 30 FM with up to three of each per owner in a single market, depending on market size. But the NAB has asked the FCC to set the cap at 25 each with up to two of each in a single market. And minorities and public interest groups have attracted the attention of some Congressional members, who may consider attaching a rider to an appropriations bill which would prohibit the FCC from processing new applications. Stay tuned.



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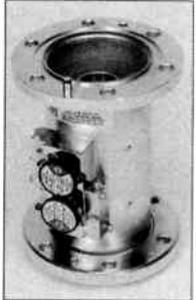
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Reader Svc. #013 Radio Guide Page 13

Number Crunching Freeware

by John Bredeson, P.E.

Sooner or later, every broadcast engineer is going to need help. Perhaps it's help obtaining a rectifier stack to get the rig back on the air. Maybe it's help in aligning a critical STL antenna path.

The purpose of this column is to present information and ideas which will help with your responsibilities at the Transmitter Site.

This month, I'll bet there are a few readers who could use help with some of the myriad math formulas needed to finish the FCC application(s) for that new transmitter site. Or determine quickly the value of resistors needed to make an audio "H" pad with a 150 ohm input and a 600 ohm output and 14 dB attenuation. Or how about ... ?

Broadcast Math

Hand held calculators have made some types of number crunching so easy that many eight year old kids can do things we wouldn't have wanted to contemplate with a slide rule. (You do remember that valued Post Versalog slide rule, much more how to use it, don't you? No batteries to change ever!)

The big problem with some types of broadcast related math challenges is remembering (and entering) the formula. For instance, how many of us can rattle off the formula for determining path loss for the STL link mentioned above?

Enter the computer, our increasingly valuable helpmate in so many

ways around the station. But have you ever had experience with writing software to make these wondrous machines be all they can be?

Share-Ware

I've used a few types of commercially produced software and most of them have been good. The one common trait they seem to share is cost.

I'm aware of two free software program disks which are great time savers and easy to use. Both have menus listing many sub-programs to solve problems such as the STL path loss computation and audio attenuator mentioned above. I'm most familiar with the program which came from RF Specialties, Inc. because I obtained it first, so I'll tell you about some of the features it has.

Continental Electronics in Dallas also has a program which overlaps in some features, but has some which are different. I'll tell you where to get these two programs at the end of the article.

When the RF Specs diskette menu is on the screen, you'll see listings for working with topics such as FM transmitting antenna calculations, geographic coordinates, design of an AM T-matching network, audio pad calculator, metric conversion, intermodulation products and others.

Intermod and ERP

The Intermodulation Products Calculator in the "RFS" program can greatly simplify the search for mathematical combinations of channels which might be producing an undesired spurious output.

It's also invaluable if you're moving your station to a site where existing radio facilities are in operation because, in many cases, the site manager will want an intermodulation study performed before determining whether you'll be an acceptable tenant or not.

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Transmitter Site

... continued

The FM Antenna program will calculate ERP after you enter the type and length of transmission line, transmitter output power, antenna type, and power split (50/50, 60/40, etc.). As is the case with many of the other programs from either source, the FM antenna program has internal look-up tables. When you enter the length of transmission line, for instance, it simply asks for the type of line by brand and stock number and calculates line efficiency and loss from tables within the program.

The sub-program for Geographical Coordinates allows you to enter coordinates for two different locations. It then calculates the distance between the two points and the azimuth.

Satellite Help

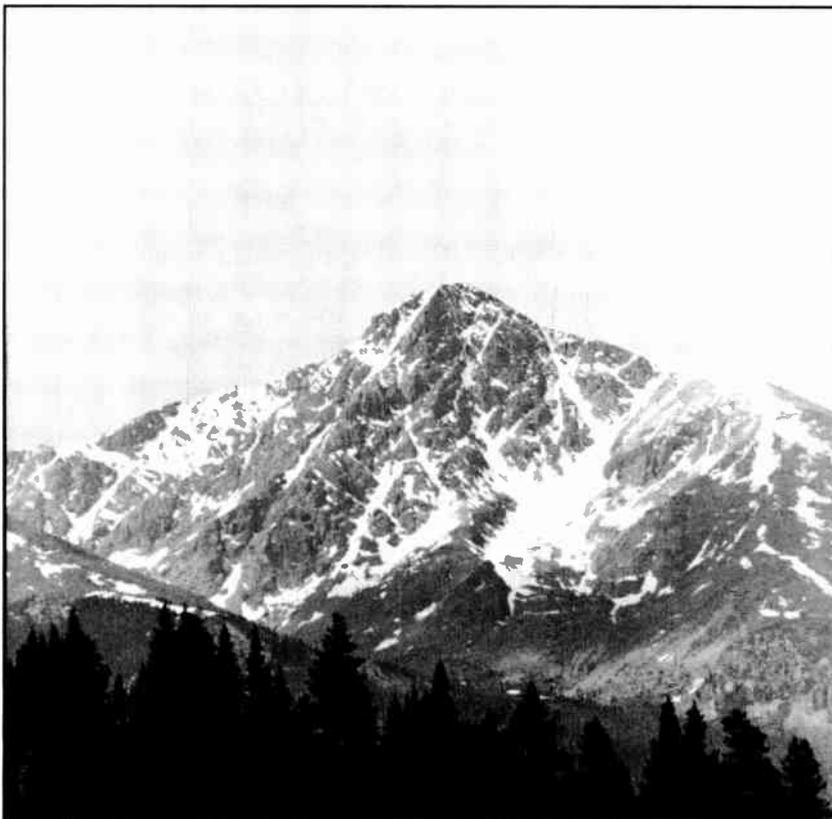
The Continental diskette has an interesting program if you need to aim an antenna towards a particular satellite. Enter the coordinates and magnetic deviation of your site and select from one of 32 listed birds. The program will give the elevation, azimuth and corrected magnetic compass heading of the selected satellite.

The RFS program is available by calling any RF Specialties, Inc. office, of which there are seven around the country. If you don't know how to contact the nearest one to you, call John Schneider at the Seattle office: (206) 546-6546 for information. Incidentally, John wrote most of the programs which appear on the disk.

The freeware program from Continental Electronics is available by calling the company in Dallas at 214-381-7161. This program disk was compiled and written by Steve Shott who is a salesperson for Continental Electronics.

John Bredesen has been involved in both radio and TV engineering for more than 30 years. He is a PE, and currently Chief Engineer of KLCC/KLCO in Eugene, OR. He can be reached at 503-747-4501, EXT. 2478.

Reader Service #015

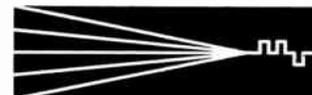


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Studio Site

Repair and Maintenance at the Studio

Planning Your Moving Budget

by Gordon Carter

While attempting to define your space needs for your move, you should also be defining a few budgets for the move.

"But the boss has told us we only have X amount of money to use for this move. What are you talking about when you refer to budgets?" you may ask.

Most people only think of money when they think of budgets. But when you're planning a project like a move of your studios, you have a lot more to think of than money. Not only do you have to make sure your needs and budget match each other, but you also have to budget your time and other resources so the move will go smoothly. In one respect, budgeting is nothing more than planning ahead.

Your moving team (real estate agent, architect, studio consultant and your in-house staff members) can be a vital resource in planning your budgets. They can provide you with information that will enable you to make intelligent choices for the use of your available resources.

Dollars and Sense

Naturally, one of the more important budgets you can put together is your financial budget. In most cases you will have a fixed amount of money to use for the move. This amount was probably set by your ownership or top management based on a number of factors including fixed assets, cash flow and desired indebtedness. Sometimes you can adjust this amount — especially if you can prove the need — but many times it will be non-negotiable.

If you are unfamiliar with the budgeting process, or have not put together a budget of this magnitude before, you will need some help. Chances are your company's financial officer will need to be involved, so be sure to take advantage of his or her expertise in preparing budgets.

He or she will also have some idea of how management wants the expenditures distributed and can be of help figuring out ways to get maximum use from the dollars available. However, you will need to make sure that nothing is neglected in this phase of the planning.

One line item that is omitted now could cause the entire project to run out of money later, making it difficult to finish everything and possibly even costing you your job.

Again, your moving team, especially your architect and studio consultant, can be a big help here. Their experience in similar projects will help you find all the hidden costs before you begin, so the budget can be as accurate as possible.

Filling in the Blanks

Regardless of the amount, you'll have to form your budget around it. You have to allocate the available funds for various parts of the move, including cost of property (purchase price if you are buying or front costs for a lease), termination of present arrangements, building improvements or construction, studio equipment, office furniture and equipment, moving expenses, fees (architect, consultant, building permits, etc.) and other miscellaneous costs.

Your moving team will be able to help fill in the blanks on a number of these items based on your projected needs. You will have to do some research to find out some of the other figures.

While you're planning this budget, you'll find that some costs are relatively fixed while others have a great deal of flexibility. Many times you'll have to fill in the fixed costs to determine what is left for the other items. This will help determine what trade-offs will have to be made from your ideal plan and projection.

For instance, when you determine the amount available for studio equipment, you and your studio consultant can then start to fill in some of the specific details for this equipment.

Financial Time Budget

Many times your accounting people will want to have some idea of when to expect many of the bills associated with a move to fall due. This information will help them plan expenditures and even decide when the best time will be to borrow money (if necessary). Remember that borrowing money costs money, so they will want to delay borrowing as long as possible. They may even want to pay some bills in advance to help balance the larger cash outlays with surplus income.

(continued on page 23)

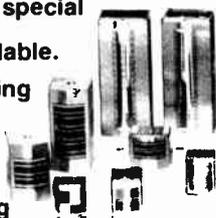
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Bits, Bytes & BBS

Broadcast Computing and Bulletin Boards

The New Station Computer Guru

By Steve Shrader

In the beginning, man created Morse Code. Then came AM, FM, TV, computers, cable, MDS, LPTV and DAB. In the past 25 years, the business of radio has been changed dramatically by the growth of FM and the use of computers in every aspect of station operation.

Twenty years ago most program logs and client billing were done manually. The sales folks had ratings books to convince prospective customers to buy; the programmers were rotating music and PSAs using cards and the engineers were spending countless hours on FM and AM applications using calculators and graphs. How things have changed.

Today, instead of having two or three people prepare program logs

and client billing, most stations have one "traffic" person. The sales staff can still browse through the ratings book but the real work is done by computer when it comes to preparing sales proposals comparing demos, reach, frequency and other quantitative and qualitative data about competing stations.

Even on Air

Gone are the music rotation and PSA cards – these have been replaced by music logs that have been churned out by another computer, after an analysis of tempo, subject, artist, length and frequency of play.

And finally, for the engineers, there is no need for hours and hours of tedious manual calculations and graph

preparation since this, too, can be done in minutes by a computer, with better accuracy than could be obtained manually.

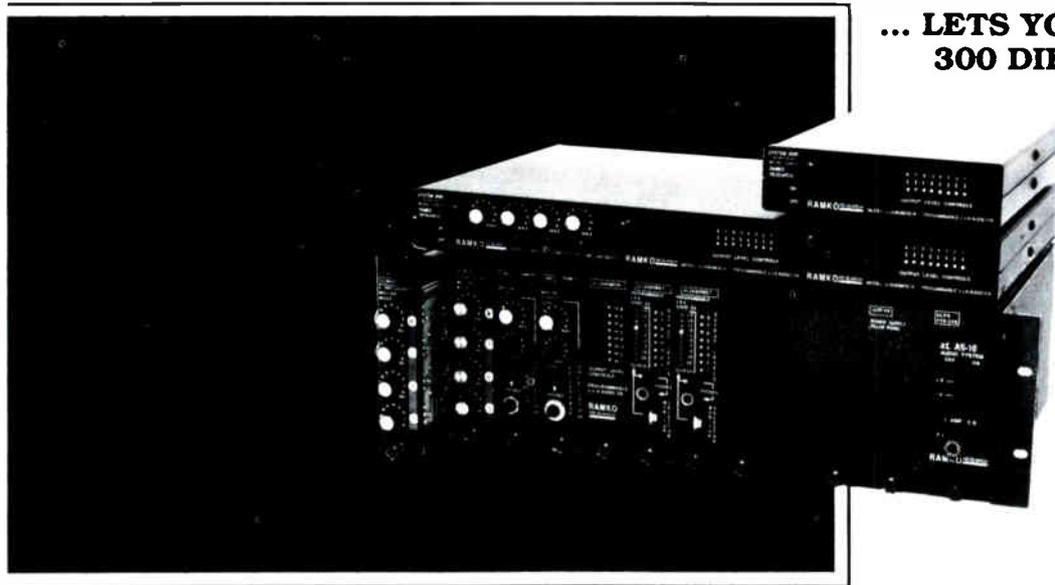
Perhaps you have never considered the impact that computers and microprocessors have on your everyday life as well as your career. Just take a look around at your stereo, microwave oven, VCR, clock radio, calculator, car, telephone, bank, transmitter remote control, cart machines and countless other items.

Just imagine if you could travel back in time and take a CD player, a VCR or a camcorder. You would either be crowned as a genius or burned at the stake as a witch!

(continued on page 18)

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Bits, Bytes and BBS

Continued from page 17

All Around Expert

Since computers are here to stay, it is imperative that you learn about them and how to use them to your advantage. Station personnel automatically expect you, the engineer, to know about these electronic machines.

Sales, ratings, cash flow and budgets now reign supreme. Most stations no longer have the luxury of "home office" experts to help deal with difficult technical problems. It is now up to the local staff to perform these functions and you are no exception.

Some Free Tools

To help you perform these new tasks you need to know how to use a computer and a few pieces of software. When you are asked to prepare a budget, or if the manager asks how much would it cost to move the studio, the use of a computer to get your answer quickly is invaluable.

If you are wondering what this has to do with the BBS, that's a simple question. To prepare your budgets, you could buy Lotus 123 for \$325 or download ASEASYAS from the BBS for free; or you could buy dBase for \$415 or download PC-File from the BBS for free. These two programs and hundreds of others are available on the Radio Guide/AVS Broadcast Services BBS.

To browse all of the files that are available, sign on to the BBS and issue the command: J3. This will get you into the Files Conference. When you are in the Files Conference, issue the command: F and you will be shown a listing of the file categories. Pick the category you want and the files available will be displayed.

For those of you who have used the FCC data programs in the AVS conference, I have rewritten some of the programs which I hope solves the display problems that were mentioned by some users. If you are using an IBM type system, be sure that you have included the command DEVICE =

ANSI.SYS in your CONFIG.SYS file. This will allow your system to display graphics properly.

The FCC FM data was updated and is current as of May 15, 1992. The AM program now provides you with the station coordinates, which it did not do previously. For the hams out there, the new HamCall disk is now On-Line to look up Amateur call signs through April of 1992.

As a final note, if there are any of you out there that would like to see additional on-line functions and would be willing to write some code, drop me a line at 910 S. Lynnhaven Rd, Virginia Beach, VA 23452.

With help from a few folks, the BBS could be an even more awesome FREE resource to its users. 'Til next month, keep those tower lights burning. The FCC upped its fine for improper operation, and I'm sure you don't need that headache!

Contact Steve Shrader through the RADIO GUIDE/AVS BBS at 804-468-4957. Steve can be reached by phone at 804-468-4344.

A Point-To-Point Audio Transmission Problem Solved

WGUC FM is the University of Cincinnati's prestigious classical music NPR station. It is located adjacent to Music Hall which hosts the Cincinnati Pops and Symphony Orchestras. Its audio quality is scrutinized by listeners who have come to expect a tradition of excellence. When WGUC chose two of T-TECH's Pro-Audio Fiberoptic STL's, one from studio to transmitter, and the other from transmitter to studio, its expectations of sonic transparency and freedom from code compression delays were fully met. WGUC's chief engineer, Brent Reider, describes his experience with the system:



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Contract Engineer

The Business of Radio Contract Engineering

Keeping The FCC At Bay

by Mike Patton

One of the most important factors in client relations for contract engineers is helping a station stay in compliance with FCC Rules. Although this may not be part of a contractor's job description initially, it is certainly something that's bound to come up in an ongoing relationship.

I have a few clients where I spend so much time that I appear to be full time and others that I only see once a month, or even less. At the few stations where I am semi-demi-quasi full time, I serve as chief operator and have time to chase down DJ permits, missed signatures and so on. These are not the stations where I have the biggest problem.

When you haven't been to a station in several weeks or months, there is always a long list of broken equipment, so taking care of FCC paperwork never seems to find its way to the top of the list.

Not The Last Laugh

For many years, FCC enforcement action in my part of the world, the deep south, was lax, to put it kindly (just in case someone at the New Orleans office reads this). Many's the time when I was literally laughed out of the manager's office at the mention of FCC Rule violations.

I suspect that this was widespread, as I received a standing O a few years ago at an SBE convention when I complained about this during an FCC roundtable session.

Things may not have changed much where you are, but lately the FCC enforcement people have been very conspicuous in Louisiana. This has been both gratifying and stressful: the increased activity has caused me to bone up on my understanding of the Rules and their current interpretations. It has even gotten my clients and most other stations around here to clean up their acts.

FCC Rule Checklist

For me as for a lot of contract engineers, the biggest problem is with the stations I don't see very much. I try to do a walkthrough at any station I visit and go through the following checklist:

EBS: Does the equipment work? Is it tuned to and receiving the right station? Do the DJs know how to send a test and what to do when one comes in? Are the log entries correct? Recently a local station was cited by the Commission for not following up on why they had not received a test during one week last month. Yes, there is a rule requiring once a week tests.

LICENSES: Is the station license current and present? Don't laugh, there's a station not far from here that changed hands, was dark for awhile and let their license lapse. Are all the STL/TSL/RPU licenses current and correct? For AM, does the antenna impedance match the license?

Also, do all the DJs have posted permits? I understand that permits in wallets are not OK; they must be posted. Another thing – I find a lot of two-year-old 60-day temporary licenses posted because the DJ forgot to post the real one or never sent it in because of the \$35 cost. Also check for the chief operator posting statement; does he/she do the chief operator's job?

FAA: Are the towers painted and lit? Can the lights be monitored by remote? Do the DJs know who and how to notify in case of light failure?

OPERATION: Is the transmitter operating with proper power and modulation? Is the remote control working and calibrated? How about the frequencies for everything (transmitters, STLs, RPUs, etc.)? Are the towers fenced and RF warning signs posted? What about PCBs? Any transmitter made before about 1980 may have PCBs in HV capacitors and oil-filled transformers.

Leave A Paper Trail

If any of these things are not right, I notify the station owner in person at the time, if possible, but always later in writing (cover your you-know-what).

In addition to being the ethical thing to do, and leaving a paper trail to protect yourself, I often find that I get at least some new business out of my observations. I believe that this is partly due to the fact that I have shown the station owner that I am willing to give a little something extra, what we in Louisiana call "Lagniappe."

A warning: Don't agree to be the chief operator of a station if you cannot take care of the responsibilities that entails. If the station does not pay you enough to come and review the logs every week, don't agree to be the chief operator. I know several contract engineers who won't be the chief operator at any station, because they don't think they can handle the requirements responsibly.

One Last Tip

Here's one easy and helpful thing I always do: I keep a stack of spiral-bound school notebooks, which I bought real cheap at Wal-Mart, and I leave one at each studio and transmitter site.

When I work at that site, I take five minutes to fill out this instant "maintenance log" and it becomes a record of my work there.

By following these few simple guidelines, you can help your clients stay legal and avoid fines, put some money in your pocket and give your clients the assurance that you are looking out for their best interests as well as your own.

Mike Patton owns and operates Mike Patton Associates and is known for his generous doses of Lagniappe. He can be reached at 504-292-4189.

Radio Guide Page 19

Tech-Tips From the Field

Practical Solutions to Practical Problems

1. Clock Close-Out

4. Cure Skipping CDs

My wife and I have completely different writing styles. I write the same way I speak; she has a very formal style. I honestly believe that, even on the word processor, her L's have a straighter upright and her O's are actually rounder than mine.

She recently wrote a piece that wound up on one of the network radio shows that originate here in the Metroplex. Grammatically correct, I am sure, but dripping with formality. I even had to reboot and reload the word processing program because it kept wanting me to say, "May I?" before it would let me start a new paragraph.

The point is, no matter what your writing style, the information is the important thing. Even if you feel that you have no writing talent, your Tech Tip is information you can share. If need be, (editor) Judith or I will reshape it grammatically while doing our very best to convey your idea.

2. Optimod Set-Up

5. Wire Size Matters

Send your Tech Tips to:

George Whitaker
3505 Daniel Dr.
Arlington, TX 76014

If you absolutely feel that you can't write it out, give me a call and tell me about it. Good ideas should never go to waste. My office number is 214-528-1600.

Before we introduce some new things, I need to back up to the April issue and the Cheap Count-Up Timer. I was talking to a gentleman who had built a couple of these for his station after the article appeared and he said that, although they work great, Radio Shack has thrown us a curve by discontinuing that model. Therefore, you may want to go out and pick up a couple of the clocks before they all disappear. Also, maybe someone will find another model that is adaptable and share the info through this column.

3. Log Your Mileage

by George Whitaker

Optimod 9100 Set-Up Shortcut

One of the steps in the Optimod 9100 set-up procedure directs that you apply a low frequency tone to the front panel test jack. The goal is to produce a square wave, monitor it on a scope attached to the transmitter and adjust the proper control for maximum flatness of the waveform. The fact that maximum flatness and minimum modulation coincide allows set-up without a scope, if need be.

Just adjust the proper control for a dip in the modulation with the square wave applied. When you have minimum modulation you are there.

This next item is not really a Tech Tip, but it is something that I thought might be worth sharing. Being a card-carrying tightwad, I look at everything that might save me money and that includes saving on what I pay Uncle Sam.

If you use your personal automobile to make a midnight run to the transmitter, or to go to the parts house, or for anything other than going to and

(continued on page 22)

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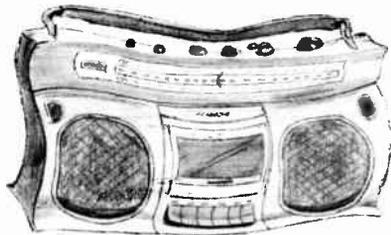
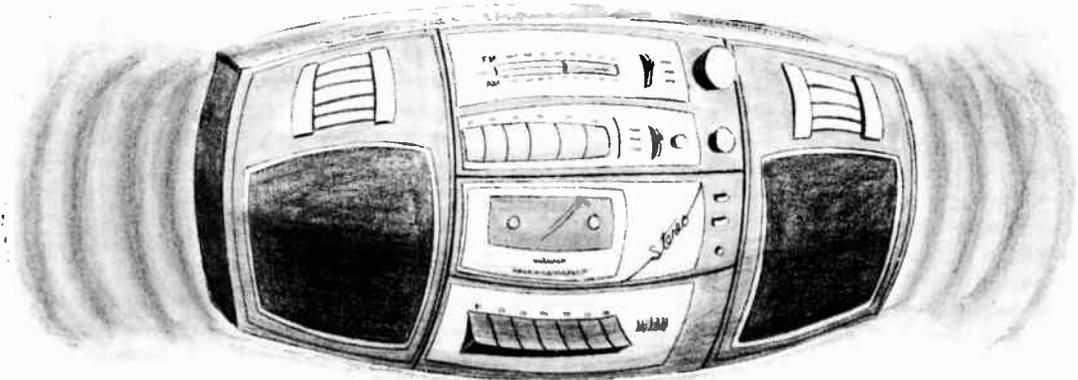


Sound's silly, doesn't it? But in reality, you may be doing just that. Equipment manufacturers, contract engineers and other services are at the mercy of their clients' ability or willingness to pay.

Broadcast Credit Reporting Service can help take much of the guess-work out of making credit-granting decisions. Member supported B.C.R.S. has front-line information on who's paying and who isn't. And since B.C.R.S. reports only on broadcast stations, we can devote our time to accuracy. Don't gamble - call now!

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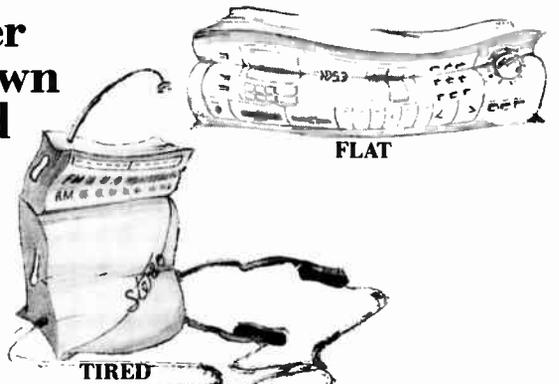
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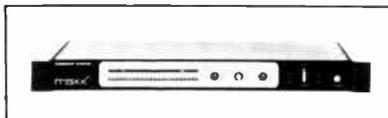
Hard to believe, but true. *StereoMaxx* adds **Power** to CHR and AOR formats, and adds **Foreground Punch** to AC stations. B/U sounds really **Jump Out Of The Set** with *StereoMaxx*. But you can also adjust *StereoMaxx* to make an Easy Listening/Beautiful Music station sound more lush and opulent.

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- **Get the Jump on the Competition, Call Now for Demo Cassette.**

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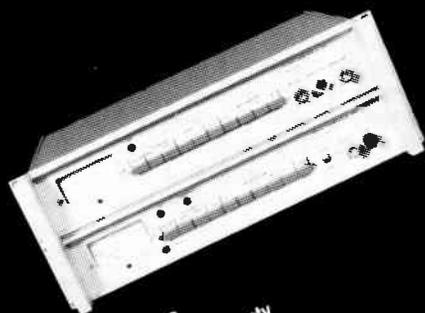
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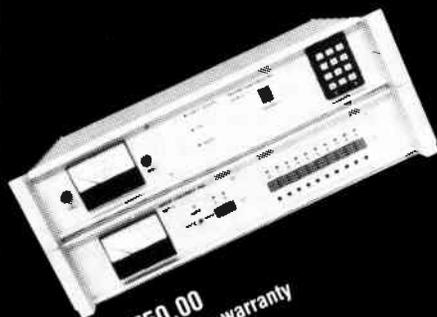
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Tips From the Field

continued from page 20

from work, you can deduct mileage ranging from 20 something cents to 40 something cents a mile. This depends on how much reimbursement you get from the station for car allowance and gasoline.

Although I very seldom have to use one of my personal cars for station business, I was amazed at how much it added up to when I got my taxes done for last year. I realized that it was certainly worth keeping up the necessary paperwork.

Now, I have not been specific about how this works because I am not a tax consultant. This information is being passed along with the idea that you will check with your own tax person and ask about your particular situation.

The Bible says in Proverbs 15:22, "Without consultation, plans are frustrated, but with many counselors they succeed." I take this passage to heart. You see, my boss thinks I really know what I'm doing.

In reality I just have a lot of friends that I call and say, "Explain this thing to me." Paul Strickland over at KKDA is one guy that I call on quite frequently and recently he helped me out with:

Another Cause Of Skipping CDs

I learned along the way, by destruction, that the laser optics in a CD player are mounted in a rubber gimbal similar to the way a microphone is mounted in a cage. The big difference being that the mount in a CD is a lot more solid. However, these mounts will get hard from age, smoke or other pollutants in the air.

We regularly clean our cart machine pinch-rollers with a product from Scotty Enterprises called Vita-Drive Rubber Drive Cleaner. This product deep-cleans the sur-

face of the rollers and preserves the soft texture.

I used the same approach to clean the surface of the rubber mount that holds the laser optics. The mount is too small to pass a Q-Tip through, but a toothpick soaked in the cleaner can be inserted gently into the passages to soak loose some of the stuff growing along the edges. You have to be careful not to damage the mechanical drives attached to the optics package in the process.

With some care you can reduce the number of skipping problems that are common among CD players found in a lot of studios. And all this time you thought that the manufacturers were putting out bad CDs.

The next item I am going to consider our beginner's item for this issue, as it seems I am one of the few people who took years to learn it. However, just in case you haven't heard, here is my tale of woe:

Ed Pryor, whom I consider to be a top-flight engineer, and I, had a discussion a few years ago in which I made the statement that, on a short run, the size of the speaker wire really didn't make that much difference. He told me that it *would* make a difference.

So, just to prove something to myself, I took my living room speakers and wired them up with four feet of 22 gauge wire on each. Then I wired them with four feet of #12 wire. The difference was astounding even at low volume. Ed was 100% right, and one more time I got to eat some crow pudding.

On many occasions I had wired control room speakers with small wire, rationalizing that the run was only a few feet and it wouldn't make any difference. Believe me, it does make a *big* difference.

Also, I acknowledge that last month I had a lapse in my synapse as I referred to Wyoming as "Big Sky" country. Everyone knows that Montana carries this moniker. Thanks for the kind words, as well as for being first to point out my error, go to Howard McDonald of Big M Broadcast Services of Veradale, WA.

Keep up the communications, we are all learning from it. ■

Studio Site

continued from page 16

Once again, your moving team will help with this budget. The real estate agent can tell you when to expect the various bills associated with finding another location. The architect can help with the timing of some of the fees and construction costs. The studio consultant can help with the timing of the equipment and installation costs.

Many times careful planning of ordering and delivery dates will help spread these costs out if desired. Again, the experience of your moving team will be a big help with this.

As you work on this phase of the budget, you should notice that a "time line" is developing for much of the project. Be sure to write this down in some form or another.

Some people work better with a calendar format while others can use a time line better. Whichever you prefer, be sure to use it. It will help everyone know when things will happen and help you with the next phase of your budget, your time allocations.

Time Allocation Budget

The time allocation budget is a tool for you to use as the project progresses. No one but you needs to see this budget, but that is no excuse for not doing it.

The time allocation budget shows how you'll use your own time and the

time of the people you are supervising to get the project done. You should be doing this on a smaller scale each day to plan your work day, but if you aren't, this is a good time to start.

In this budget you assign duties and responsibilities to each person involved with the project. You can start making up this budget using the time line developed in the previous phase of the budget process.

This will give you the framework from which to fill in the details. Initially you will only have a general view of what the various people will be doing at a certain time, but as you get closer to that date, you can get more specific.

This budget allows you to intelligently plan the project, and will probably show you more efficient ways of doing what needs to be done. For instance, if you find you have two different people in the same place doing different things at the same time, it may be possible to combine these duties.

The important thing to remember when planning any type of budget is to be flexible. Work from the things you can't change to the things you can to make maximum use of the resources available to you. Look for ways to eliminate duplication of efforts and unnecessary expenditures of time and money.

Gordon Carter is Studio Facilities Manager at WFMT-FM in Chicago. He can be reached at Professional Audio Services by calling 708-482-4142.

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Radio Basics

Practical Technology

From Ground Loops to Wire Wrap: A Guide To Building Systems

by Eric Small

Audio System Design and Installation

by Phillip Giddings

Howard W. Sams and Co., Publisher

Traditionally the secrets of audio system design and construction pass from generation to generation of engineers as though they were family recipes.

Sometimes hard won knowledge makes up this wisdom; more often though it's mostly superstition and old wives' tales. Grounding and impedance matching seem especially prone to the lore of the occult.

No one has written a book devoted to designing and building large professional audio systems in about 30 years. Audio has gone through two major revolutions in thirty years — vacuum tubes to solid state and analog to digital. Active balanced inputs and outputs were unknown a generation ago. Advances in materials have brought big changes in things as mundane as cable, connectors and switches.

Scattered Sources

A problem that plagues anyone designing or building a large audio system is the large number of different

places you need to search in order to get all the tidbits of required information.

One book has the color codes for cable, an old article (filed "somewhere") explains how to handle the grounding at a patch panel, and you need to look someplace else for attenuator pad design.

AC power distribution is the worst. Not only must you wade through the National Electrical Code, which seems written in its own dialect of technicalese, but then you must explain what it is you want to an electrician. Often the electrician has begun to figure out that this radio station studio job is a lot more complex than he considered when it was bid, and now wants to get out as quickly as possible.

And a really clever electrician will throw the electrical code back at you as a reason why he can't do anything but exactly what he always does ...

All In One Guide

All of these issues make "Audio System Design and Installation" a book that must be on the shelf of anyone who is involved in audio systems. Author Phillip Giddings approaches the nuts and bolts of audio system design

and installation from a thoroughly modern point of view and has produced an indispensable handbook.

The major section titles provide the best idea of the scope of the book: Power and Ground Systems, Interconnection, Cables Connectors and Wiring, and Housing Electronic Equipment.

The chapters listed under "Power and Ground Systems" are a good example of how comprehensive this book is: Grounded Power Systems, Power Distribution Systems, AC Power Disturbances and Safeguards, Technical Power Systems, Technical Ground Systems, and Earth Connection.

The chapter on Technical Ground Systems alone is worth the cost of the book. The discussion of ground loops is the most lucid I've seen. Ground loops are not only explained, but how to avoid them in light of the often conflicting demands of the electrical code is discussed in some detail. This attitude of recognizing the realities of making an audio facility work can be found throughout the book.

The section on wire connections compares, using Department of Defense data, the reliability of wire wrap, crimp, and hand solder terminations.



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Radio Basics

... continued

As I read it, I could hear the head of audio facilities for one of the networks telling me, "Wire wrap is nice, but it just isn't reliable enough for network use." He was staying with soldered terminal blocks. According to the quoted DOD report, wire wrap is one thousand times more reliable than hand-soldered connections!

Tin Or Gold?

Another section compares the reliability of tin-plated with gold-plated connectors. Giddings explains that for a small number of connections, where the connector does not undergo more than ten mating cycles in its lifetime, tin is pretty good for audio circuits and a lot less expensive.

On the other hand, for high density multicontact connectors, or for connectors that are used frequently, gold is a must.

The connector section points up an important strength of this book. It's

easy to find descriptions of connectors in many catalogs. But to find all the popular (and some not so popular) audio connectors described and compared in a uniform manner is unique — and very handy.

The section on how to set up, interconnect, power and cool equipment racks is the only common sense discussion that I've ever seen on the subject. Both portable and fixed racks are explained, as well as how to lay out the equipment that goes into the rack.

The section that compares various audio circuit bridging and terminating methods in relation to cable lengths and impedance is also one of a kind. This explains the conditions under which a system must stop using voltage/current (bridging) techniques and change to matched impedance drivers, loads and cable.

Little Left Unsaid

I searched this book hard looking for some mistakes to point out, so that this review could be considered "balanced." I could not find any mistakes, just some areas that I would have

hoped, from a broadcast point of view, more attention could have been paid.

Both VU and PPM level indicators were discussed, but PPM did not receive very fair treatment. The VU meter got five paragraphs, the PPM only one. The PPM's significant advantages in helping to prevent distortion were not even mentioned.

Although the protection of audio systems from RF interference received a lot of attention, there was scant mention of making audio systems work in really strong RF fields. In defense of the author, it may be that he felt that if an ambient RF field exceeded the allowable level for human exposure, he did not have to be concerned with making an audio system work in it.

I consider "Audio System Design and Installation" a valuable addition to the working engineer's library, and I could not imagine designing, building or maintaining an audio facility without it.

Eric Small is president of Modulation Sciences and can be reached at 800-826-2603.

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Radio Engineer

Improving Your Position

Earn Your Way To NAB '93

by Andy Butler

No one needs to tell RADIO GUIDE readers that the engineering world is changing dramatically. Facilities that were once tended by teams of qualified workers now receive occasional attention by an outside contractor, usually on a crisis intervention basis.

The pressure to downsize technical overhead continues to grow. Those remaining in the field are expected to deal effectively with an ever broadening array of responsibilities with fewer resources.

Today the average engineer must be able to handle everything from AM antenna systems to complex multi-user computer networks. Getting the training to handle this broad range of concerns is tough. Continuing budget

pressure has virtually eliminated formal training for most station engineers.

Benefits of Shows

National conventions and trade shows offer one of the most cost-effective routes to preserving your technical edge. Between the exhibit halls and the session rooms, engineers can get an intense technical update quickly and conveniently.

These events are also excellent venues for meeting other engineers and exchanging information one-on-one. Unfortunately, the unrelenting budget pressure has also made it harder to attend these events. You don't have to miss many before you start to lag behind. This affects both your performance and your attitude.

There is one novel way to attack the problem. The National Association of Broadcasters has decided to continue to offer complimentary conference registrations to those who make technical presentations. In its first year, this not-well-known policy allowed more than 200 people to attend the NAB Convention without paying a registration fee. In other words, for free.

This presents station engineers a golden opportunity. Every day you develop methods and procedures that help you do your job well. Your fellow broadcasters need to share those ideals. You can trade your knowledge for the opportunity to gain more.

Call For Papers

The NAB is currently accepting abstracts or proposals for three conferences: the 47th Annual Broadcasting Conference, the Third Annual NAB HDTV World Conference and the brand new NAB Multimedia World Conference. All three will be held in conjunction with the 1993 NAB Convention, April 19-22, 1993, in Las Vegas.

Papers for the Broadcast Engineering Conference should contain information on new ideas, technologies or methods to increase the technical knowledge or skills of attending engineers.

HDTV World provides an excellent opportunity for broadcasters, program producers, research laboratories and manufacturers to present advanced television tutorials, system and equipment descriptions and technical papers on state-of-the-art advanced television technologies.

The primary focus of the NAB Multimedia World Conference will be the emerging industry of developing interactive and multidimensional video programs using digital techniques, computers and other multimedia technologies.

If you are interested in participating in any of these conferences, you must send a one-page proposal (200 words minimum length) which outlines the contents of the paper along with a brief biography of the presenter to: the NAB Multimedia World Executive Committee; the NAB HDTV World Program Committee or the Engineering Conference committee at the following address:

NAB Science & Technology
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or fax it to: 202-775-4981.

Please include the author's name, address and telephone and fax numbers. Use your knowledge to improve yourself and your fellow engineers and pay your way to NAB '93.

Andy Butler has a long history of service in broadcast engineering and is currently a member of the NAB Science & Technology staff. For more information, call him at 202-429-5345 or fax him at 202-775-4981.

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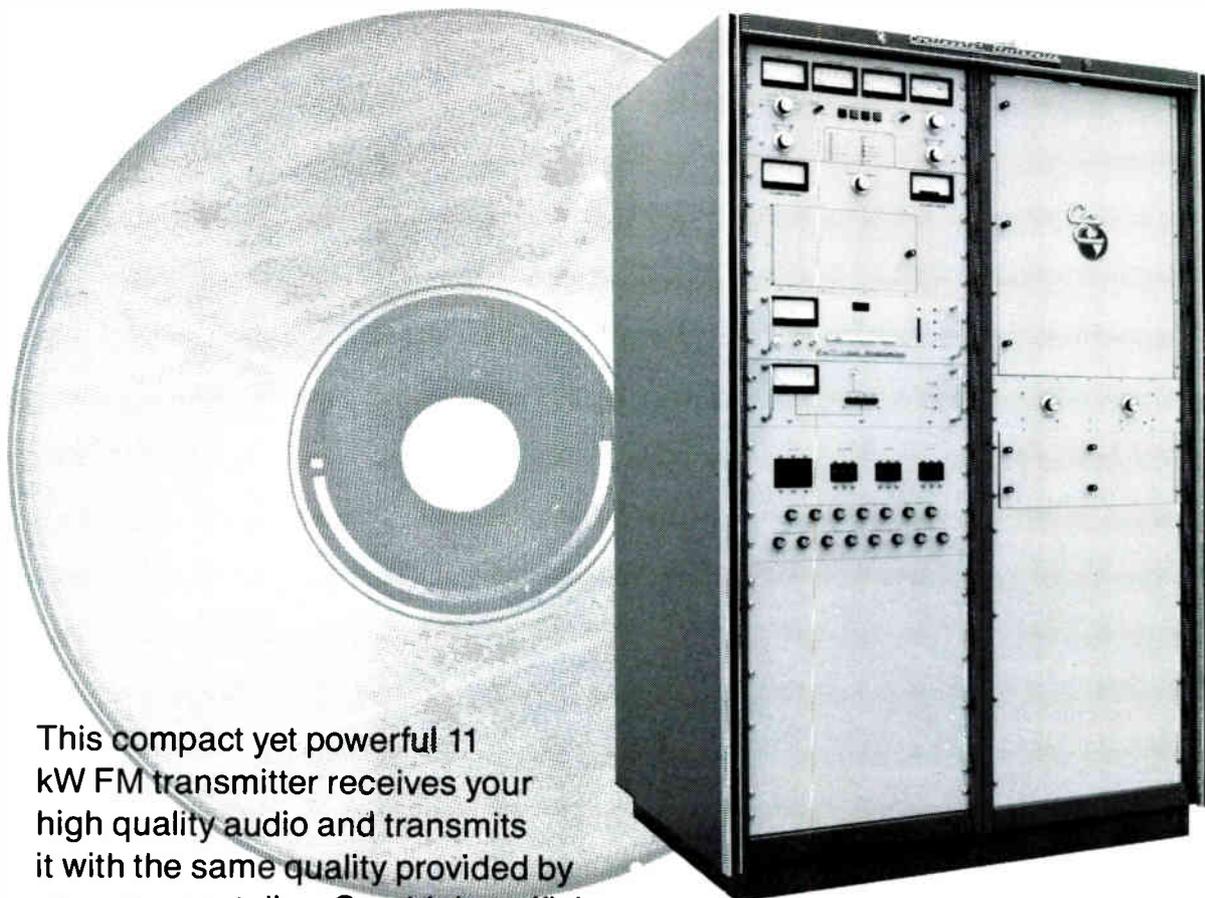
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Station Stories

Radio Station Installation Reports

Putting Together A Brand New Team

By Judith Gross

First they surprised the market by announcing a new format – yes, on AM! Then they hired well known radio and newspaper names for the line-up. Then they shocked the one-team city of Washington D.C. by grabbing the Redskins football team in an exclusive radio coup.

But before the new, all sports WTEM ("the Team") made headlines, Chief Engineer Jim Seaman had put together his own "team" to rush the new facility into operation.

The Team is the brain-child of owners Steven and Mitchell Rales, sports fans who have owned WGMS-AM/FM for years. The FM is D.C.'s only commercial classical outlet, and had always been simulcast on AM.

Raiding Talent

When the Rales brothers got the idea to turn WGMS AM into an all-sports station, they made two fast moves. The first was to set aside space in the same building for a brand new,

separate AM facility. The second was to hire Seamen away from New York's WFAN, the pioneer all-sports success.

It wasn't as if Seaman didn't have his work cut out for him. Once 12,000 square feet of space was leased from the same building in Rockville (but not

with the Indy 500 on Memorial Day weekend. I thought it would take eight weeks to finish, but we actually did it in six," Seaman said.

Working with a general contractor proved to be "unique," Seaman explained. They had a rapid construction schedule and a lot of decisions were made to meet the timetable. The result was double stud walls and a floating ceiling and floor. "Most of the cabling went under the floor," Seaman noted.

He had quite a bit of time at the front end of the schedule while the space was being readied, and these were hours he didn't waste. Seaman put together an extensive amount of documentation, including his own special code for each cable and connection.

A lot of work? Yes, but now future engineers can go in and locate the source of any problem anywhere in the facility. Next came the engineering team, which Seaman called "a God-send."



Operations Manager Michael Neff at the Harrison production board. Studio is analog now; digital to come.

the same floor) and once the walls, doors and floors were in place, there was only about two months before the target sign-on date.

"We started putting the studios together on April 15 and we signed on



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Station Stories

... continued

His Own Team

Seamen hired Harry Simons, formerly of WAEB in Allentown, PA, to help get things moving. His assistant chief is Con Sofologis; Ellis Terry from Howard University's WHUR came in to help, as did D.C.-area consultant John Bisset. He also recruited WCXR's Chris Wilk, Dave Abdor from Seaman's days in Schenectady and WGMS engineers Chic Leyh and Ed Channel. Just about enough for a baseball team.

"I needed as much help as I could recruit, and I got the best there was. It's hard to find engineers who have the know-how to build an entire studio," Seaman noted.

"We worked about 18 hours a day, with only one day off in the six weeks. We were crimping wires right up until the last moment," said Simons.

Given the current economic climate in radio, Seamen said his budget

for building a new facility practically from scratch was "reasonably generous."

"This was originally going to be a much more bare bones station. But it grew on itself as we went along and made changes in the plans," he said.

Push-Button Flexibility

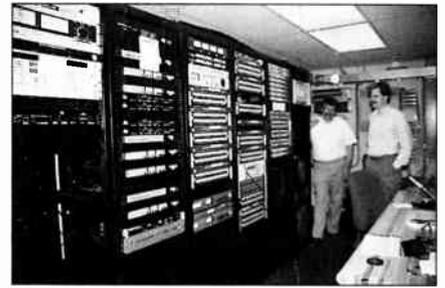
The empty space began taking shape as three control rooms and a talk studio. This gave Seaman the flexibility he felt was a necessity.

"I wanted enough redundancy to handle any situation. I wanted the advantage of two control rooms, so we could switch rooms with the push of a button," said Seaman.

Control Room 1 and an alternate Control/Production room are nearly identical. Each are equipped with a Radio Systems RS-24, the company's expanded console which was designed to accommodate WTEM's needs.

"I looked at the RS-18, but I wanted mix-minus in a console. Radio Systems said they could build me a

console with the four mix-minus buses and stretch the 18 out to a 24," said Seaman. The consoles also have two remote input selectors and mix-minus metering.



Harry Simons and CE Jim Seaman stand at the "nerve center"—equipment racks in engineering room.

Seamans also liked Radio Systems' cart machines, with their auto phase correction and splice finding features, so he installed them throughout the studios. "They're great," Seaman added. "I don't see why anybody would buy anything else."

(continued on page 30)

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Station Stories

Continued from page 29

Team Colors

But probably the most striking feature of all the rooms is the color scheme Seaman came up with. "I was tired of all that neutral studio furniture. I decided I wanted something beside the same old sand-and-saddle-leather color scheme. I wanted something for the '90s."

His solution? The very sporting combination of bright red and charcoal black. He discovered the combination when two color chips accidentally fell together. The next step was to contact Harris Allied and see if standard Arrakis furniture could be ordered in custom colors.

"The nice thing about the Arrakis line is that it's modular. It can be shipped in pieces and put together at the studio," said Seaman. "That was one way to get the rooms furnished on time."

The color combination has caught on and is evident in the talk studio, offices, reception area, and even the sales offices, affectionately known as "the bullpen." Unique light fixtures in the shape of microphones, and a wall

of baseballs at the front door set the tone right off the bat, so to speak.

"I think if you have more electric colors, people feel more energized. Sports is a high energy format," Seaman explained.

Rounding Out the Rooms

Seaman furnished a third room as a multitrack production studio with a Harrison Pro 790 console. To bring things into the digital age, all three studios also have Radio Systems RS-DAT machines. But Seaman says he hopes to convert multitrack production into a digital studio and that he's "looking at digital workstations."



Midday sports personality James Brown and guest take calls at the odd-shaped talk table.

The talk studio has four talent positions and boasts a unique "X" shaped table base with little clutter, except for that left by the sports-jocks.

With sports talk and call-ins the format, Eventide broadcast delays and Telos 100 hybrids play a big role in the studios. Seaman also created his own IFB system for inter-studio communications.

Audiometrics and ATIDAs, as well as ATI mic preamps complete the essentials of the four rooms. Seaman will be adding a new routing switcher soon to increase the capacity of simultaneous operations.

The nerve center of the entire operation is, of course, the engineering racks in the shop. The mic processing is in there, too, because Seaman "wanted to keep as many knobs as possible in the engineering shop."

There's a TFT EBS, a Moseley STL and Potomac Instruments remote control, as well. Next comes additional satellite equipment and control. Seaman also envisions a dedicated phone line for the Redskins play-by-play, "maybe Switched 56."

The shop's raised floor provides room for cable conduits and the back wall supports row upon row of terminal connections. The Seaman code system is clearly visible on the cables and the punch blocks, with everything labeled thoroughly and neatly.

The entire studio and talk room operation is air conditioned with its own, rather elaborate water cooled system. This was a necessity, Seaman noted, in a building where they shut off the central air conditioning at about 7 PM each day.

"The air ducts are oversized, so you get hardly any noise at all," said Seaman. The station also has a 30 KVA UPS and its own diesel generator.

No Time Out

You'd think with all the work that went into the six week rush, Seaman, Simons and the rest would now have a chance to rest, but the work continues. There's that production studio. And Seaman is gearing up for a transmitter site move, too.

What more could the station want? "Well, I'm cleaning up the processing right now. And we're not stereo yet, but we will be," said Seaman. Stereo for sports? Yes, as Seaman's experience with WFAN will attest.

"The spots, promos, sounders and theme music really get a boost from stereo sound," he said.



Harry Simons readies one of the RS-24 consoles for the alternate control studio.

Judging from the on-air excitement of the first few months, and the satisfaction from having the area's most popular sports franchise signed to an exclusive contract, the TEAM, with Seaman's own team's hard work as a foundation, is poised for success.

All this attention to detail will be welcome this fall, when every Redskins fan near a radio is tuned to the new kid on the dial, listening to their favorite team on the newest "Team."

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Radio Guide Page 31

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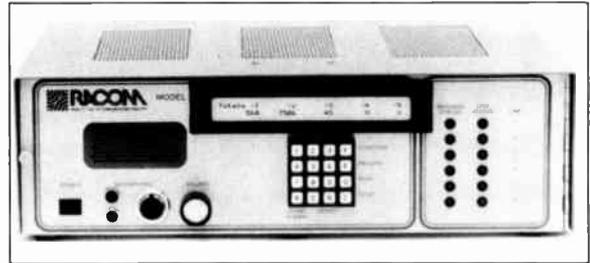
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Reader Service #039



Equipment Report:

T-TECH

Reader Service #040

Audio STL Designed For Fiber by Daniel B. Talbot, T-TECH Corp.

Very wideband analog signals can be sent and received over great distances using fiberoptic cable with lower loss than RF or copper.

Imagine, however, what could be accomplished if the audio signal were transmitted across its own dedicated fiber as a digital signal, extending applications to audio recording and radio. Then imagine a sampling rate of 200 kHz or more, which would support more general signals like composite stereo with SCA.

Such a product exists. It features four independent input channels each having DC-95 kHz bandwidth (DC-53 kHz linear-phase at 0.01 dB integral flatness or DC-67 kHz at -3 dB). These four channels are each encoded at 200 kHz sampling rates, serialized and error-coded and transmitted over fiber. The product is the T-Tech Pro-Audio fiberoptic link.

The transmitter and receiver use linear PCM coding, which achieves a total time delay of only 50 microseconds back-to-back (plus about seven microseconds per mile of fiber).

The 44.1 kHz sampling rate which has become widespread, mostly through the use of CDs, has always represented a compromise. In addition to the 20 kHz ringing problem caused by 44 kHz sampling, a theoretical 3.9 dB roll-off results near 20 kHz. This roll-off requires a compensating boost elsewhere in the system, usually in the form of a preemphasis curve.

If the sampling rate were increased to 200 kHz instead of 44 kHz, less than 0.5 dB roll-off will occur near 20 kHz, requiring insignificant preemphasis near that frequency. If the 200 kHz sampling rate is later converted to 44 kHz sampling (common form of "oversampling"), the roll-off problem resurfaces.

Therefore, by staying at 200 kHz from encoder input to decoder output throughout the system, brick-wall filtering at 22 kHz of any flavor (digital or analog filtering) and 20 kHz roll-off is avoided and ringing is moved to a much higher and completely inaudible frequency.

In addition, because the fiberoptic medium does not require the signal to be secondary-sampled in order to fit the bandwidth of the medium, error correction can be accomplished at the primary sampling rate of 200 kHz.

This results in incompletely corrected errors having a shorter life, because data is updated more rapidly. Of course, a side benefit of staying at the primary sampling frequency is the ability to handle wide bandwidth audio signals such as composite stereo with pilot and SCA. Or, normal 20 kHz audio can be processed relying on the ear to perform the lowpass filtering.

Because few high resolution A/D converters exist at sampling rates of 200 kHz, T-Tech uses its own proprietary design plus dithering, with a 20-bit word digital architecture to permit future expansion or enhancement.

The dithering can be switched on or off for any of the four channels and the particular dithering method helps to greatly in-

crease the effective resolution of the system, rendering low-level quantization distortion virtually absent.

Because the T-Tech system was designed exclusively to operate into fiberoptic cable, no compromises were necessary. For example, it was neither necessary nor desirable to observe the AES/EBU standard protocols which were written around low bit rates.

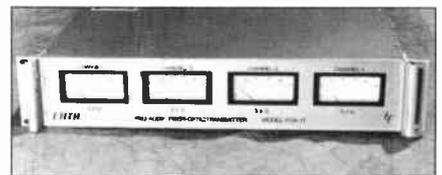
The negative side of this "no-holds-barred" design philosophy is the necessity to obtain a purely fiberoptic installation, which can be challenging if no previous experience exists on the part of the station's technical staff.

Error-correction is essential in a fiberoptic audio link. This is especially true if long transmission distances are required or when providing allowance for deterioration with aging.

If the benefits of fiberoptic transmission are fully exploited, without unnecessary trade-offs, the result is higher performance than is obtained by CD or DAT audio.

For the broadcaster, this means more transparency in the STL for normal audio or, alternatively, the ability to transmit composite stereo over the STL, permitting the stereo generator to be located at the studio.

For more information circle reader service card number 040 or call 508-562-5820.



Radio Guide Page 33

Digital STL Modem

by Joe McMurphy, TFT Inc.

The DMM-92 is a spectrally efficient digital STL modem. It represents the latest in technological advances in the digital arena by industry leader TFT, Inc. It is a software intensive design using numerous VLSI chips such as DSPs, FPGAs, PALs, GALs and PROMs.

The DMM-92 provides transparent delivery of audio and data signals from studio to transmitter in less than 200 kHz of occupied bandwidth, a very important consideration in congested metropolitan markets. This digital audio transmission is accomplished via conventional analog radio and requires only 75 kHz of composite baseband. It can be used on existing STL systems without modifications.

Left and Right channels are input on a 256 kbps V.35 interface port. Two SCA channels can be transmitted via two 64 kbps V.35 interface ports and a remote control signal can be passed on a low

speed asynchronous data channel via a 9600 bps RS-232C port.

All serial input signals are framed into a single, 15-level modulated Class IV partial response baseband signal. The digital encoding scheme permits robust encoding while occupying a minimum of RF bandwidth. This baseband signal, in turn, is used to drive the composite input of a conventional STL transmitter.

Adaptive Signal Equalization dynamically corrects for STL receiver baseband amplitude response and group delay characteristics on an active, dynamic basis. It actually learns characteristics of the channel on a real signal.

Bose Chaudhuri Hocquenghem (BCH) forward error correction insures integrity and accuracy of digital data from input to output and provides an additional margin of approximately 3 dB during signal fading conditions. This permits operation with signal levels as low as 20 μ V for error-free recovery.

A front panel display features a summary alarm that detects any multiplex or

input fault, individual channel input alarms, a hardware alarm to indicate disruption of interconnecting cables and a power indicator. Additionally, all these input and summary alarms are available remotely via a 9-pin "D" connector located on the rear panel.

System flexibility is a hallmark of the DMM-92. Its open architecture and use of internationally accepted standard digital I/Os allows for a choice of available digital hardware and source material. Digital audio compression algorithms made by MUSI-CAM, APT, Dolby, OKI, and others are all compatible with the DMM-92.

For more information about the DMM-92, please contact TFT, Inc. at (800) 347-3383 or circle number 041 on the reader service card.



Equipment Report:

Remote Control Helps Bottom Line

by Paul Anderson,

Gentner Broadcast Systems

One of the major concerns for broadcasters today is the bottom line -- keeping expenses under control. Many broadcasters are finding innovative ways to reduce manpower costs, but a key concern in doing so must be maintaining legal transmitter control.

The VRC-2000 provides full transmitter control through dial phone lines, radio link or any two-way voice grade communication circuit. It gives the operator the option of voice mode control or personal computer control. Using dial phone lines and the voice mode, you can access your transmitter site from any push-button phone, including cellular.

Using computer control, the operator can have the VRC-2000 provide transmitter readings at regular intervals and create either a printed report, disk file record or both. The VRC-2000 eliminates the need to have operators manually log transmitter readings to verify legal operation.

The VRC-2000 will also dial your studio or other phone numbers to alert you to alarm conditions or equipment failures. In

the event of power failure at the transmitter site, the VRC-2000 -- when equipped with battery back-up -- can continue to provide status reports back to the operator. Is your back-up generator running? The VRC-2000 can let you know.

The VRC-2000 can be instructed to automatically make an AM station's required daily power change. It uses preset time-of-day commands to switch a station's power or antenna pattern. With these commands, the operator can set any command channel to initiate action according to a preset schedule.

User-programming on the VRC-2000 can be done with any push-button telephone or with a personal computer. The setup VRC program is included with the VRC-2000 so the operator can use a PC to configure it. When changes to the configuration are needed, a push-button phone or PC can modify the initial settings. The setup program also functions as a terminal emulator to allow computer control of the VRC-2000.

The VRC-2000 has 16 metering channels, 16 command channels with raise and lower control and 16 transmitter status channels. Voice labels can be selected for various VRC-2000 functions so operators can get audible confirmation of actions performed.

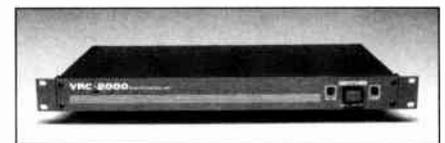
Alarm reporting is based on user-selectable parameters for either the metering or status channels. The VRC-2000 can take a corrective action if a parameter is out of tolerance. If transmitter power drops, the VRC-2000 will raise power until it is within legal limits. If the VRC-2000 cannot correct the low power, it will call the operator.

VRC-2000 alarm functions can be chained together so that one status channel can shut off alarm reporting on other channels. This function eliminates unneeded alarm calls when the station is signed off.

Of special interest to the contract engineer, the VRC-2000 provides information about a number of client stations through a dial phone line. If there is trouble, the engineer will have some idea about equipment status before driving to the transmitter site.

The flexibility of the VRC-2000 can make remote control invaluable to operators and station managers.

For more information on the VRC-2000, call 801-975-7200 or circle number 042 on the reader service card.



Codec Incorporates MUSICAM[®] by David Lin, Corporate Computer Systems

In 1989 CCS Audio Products introduced the Micro 56 7.5 kHz audio codec which enabled radio broadcasters to transmit high quality news and sports programs digitally by using the new switched 56 or ISDN digital telephone circuits.

This technology quickly replaced the multi-line analog frequency extenders and today there are more than a thousand 7.5 kHz codecs in use. However, since the majority of radio programming is done in stereo, broadcasters soon demanded more bandwidth and higher fidelity than 7.5 kHz G.722 codecs provided.

Two more years of intense R&D efforts led to the introduction of the CDQ-2000 multi-rate stereo MUSICAM codec in the last quarter of 1991.

At the heart of the CCS CDQ-2000 is the MUSICAM compression algorithm, which

was adopted by the ISO for digital audio compression (incorporating benefits of the ASPEC algorithm as well).

By using MUSICAM for audio encoding, the CDQ-2000 achieves a maximum compression rate of 13 to 1 and permits the transmission of near-CD-quality stereo audio with as little as 112 kbps of digital facility. Thus, for the first time, stereo music concerts can be sent from New York to California by using a pair of switched 56 digital phone lines at a cost of less than a dollar a minute.

The CCS CDQ-2000 encoder accepts analog audio inputs via XLR connectors; this information is digitized and compressed in 24 millisecond segments resulting in a binary bit stream of 112 kbps. With a built-in inverse multiplexer, this digital data is split into two 56 kbps streams and sent to a pair of switched 56 digital modems or an ISDN terminal adaptor for connection to the switched digital telephone network.

At the receiving end, the CDQ-2000 decoder recombines the split data stream, decodes it, and recovers the original audio.

If higher bandwidth digital facilities are available, the CDQ-2000 can also digitize stereo audio in 128, 192, 256 and 384 kbps by simply switching a rate selector switch. Higher data rates permit multiple generations of encoding and decoding without a loss of fidelity.

By using the CDQ-2000 codec and dial-up digital phone circuits, back-hauling stereo programs from New Zealand is no more difficult than from across town. Furthermore, the cost savings over satellite link-ups can often pay for the equipment after one or two events.

For more information on the CDQ-2000 call David Lin at 908-946-3800, fax 946-7167 or circle number 043 on the reader service card.



Equipment Report:

Digital Composite STL by Jeff Detweiler, QEI Corp.

The advantages and disadvantages of digital transmission for your program material have been discussed for years. The introduction of the CAT-Link system in 1989 has resulted in a telephone line or microwave based STL/TSL which combines previously unachievable signal quality with a "real time" transport system. The system was granted a U.S. patent in October, 1991.

The recent advances and greatly increased use of digital compression techniques for transport and storage have shown an increased need for system compatibility. Because the CAT-Link system does not use compression of any type, the compatibility requirements are reduced and the need for error correction routines is eliminated.

The result is a system with no audio delays and no compression algorithms which might interfere with your audio processing or other digital applications. The addition of various plug-in modules results in compatibility with composite stereo, discrete left and right channel audio, AES/EBU data transport or 56 kHz-based compression schemes.

In order to transmit a digital signal using the minimum bandwidth, the sampling rate must be held to a minimum. This requires the use of a sharp cutoff analog filter after the D/A converter. It is very difficult, if not impossible to manufacture a stable sharp cutoff analog filter without phase (time) nonlinearities. This means that all program frequency components do not take the same amount of time to get through the filter. The resulting signal contains artifacts which will alter the sound of the material.

If the sample rate could be multiplied after the digital signal was received, thereby using minimum transmission bandwidth, the output analog filter could be greatly simplified. Fortunately, DSP processors allow a technique using Finite Impulse Response (FIR) filters to increase the sampling rate before the bit stream is fed to the D/A converter.

An FIR filter function is performed by computation in the digital domain. It is possible for an FIR filter to have an extremely sharp frequency cutoff characteristic with zero group delay (linear phase).

The DSP processor compares two adjacent samples and computes the value of

the sample that would be between them, based on the frequency characteristic of the FIR filter function. Therefore, the bandwidth of the original analog channel is maintained but the number of samples (sample frequency) is doubled. This technique can be repeated up to the speed capability of the components involved.

This discussion explains the CAT-Link method of digitizing and recovering the complete composite stereo program (the processed output of the generator) together with additional audio or data information channels on a single DS-1 telephone circuit or microwave link with no delay or compression algorithms.

For more information, circle number 044 on the reader service card or call 800-334-9154.



Equipment Report:

Sine Systems

Reader Service #045

New Tech In Remote Control

by John Pate, Sine Systems

A little over three years ago, Sine Systems was contemplating making a new product: a dial-up remote control. Although several excellent dial-up remote control products existed at that time, we felt there was an unfulfilled need for a simpler, less expensive remote control.

At the same time, Motorola was in pilot production of a new microcomputer chip, the MC68HC811. When I saw the specs on this chip, I knew it was exactly what we needed to make our idea a reality.

Contained in the MC68HC811 was a CPU, a clock oscillator, ROM, RAM, a timer, parallel I/O ports, a serial port, an A-D converter and a section of user-writable nonvolatile memory.

The latter is just the thing for storing user data like set-ups, telephone numbers, and so forth, without the need for a memory back-up battery. All this in a square 52-pin chip a little smaller than a postage stamp.

Since simplicity was the goal, all we added was a telephone line interface with

surge protection and line fuses, a speech synthesizer, a DTMF detector, a DC amplifier to buffer the telemetry signal and a relay buss driver. All this was put on a 5.3 inch by 6.1 inch PC board, stuffed in a modem-sized metal case and dubbed the "RFC-1."

To interface with the outside world, we built the RP-8 relay panel. This 3.5-inch high rack-mounted panel interfaces eight channels of control and telemetry. It contains eight double-pole reed relays for telemetry selection and 16 control relays (8 ON/8 OFF) each rated at 5 amps.

Up to eight RP-8 panels can be connected to an RFC-1 in daisy-chain fashion by a 16 conductor flat cable. A jumper on each RP-8 determines the block of eight channels to which it responds. Using this architecture, the user has to buy only the number of channels needed. If eight channels are enough, only one RP-8 panel is required. The system can be expanded at anytime, all the way up to 64 channels.

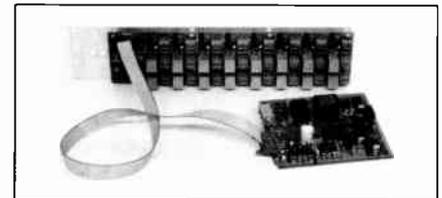
The original RFC-1 was introduced three years ago and there are now about 600 systems in service. The MC68HC811 has recently been upgraded to the MC68HC711;

the same chip with twice the RAM and six times the ROM. This chip runs our new System 4 software that vastly increases the power of the RFC-1.

New features include an internal clock/calendar with up to 80 user-programmable events, logarithmic telemetry conversion, automatic computation of indirect power and an RS-232 communications option for automatic logging or remote control by computer.

With these features the RFC-1 really can't be called a "no frills" remote control anymore. Yet it has remained true to its original design goal: a dial-up remote control that is inexpensive, reliable, easy to install and simple to operate.

For more information call (615) 228-3500 or circle number 045 on the reader service card.



Equipment Report:

Comrex

Reader Service #046

STL Problem Finds Codec Solution

by Tom Hartnett, Comrex Corp.

KFRM (AM 550), Hutchinson, Kansas, has an unusually long hop for its studio-to-transmitter link (STL): almost 120 miles. The corporation that owns KFRM and other stations consolidated operations in a single building in Hutchinson, so it was too difficult and expensive for this farm news and country music station to maintain its farm directors, DJs, news and weather people at the transmitter site studios.

Looking for the best way to get his signal to the transmitter without detracting from quality, Corporate Engineer Thomas Russell first investigated equalized telephone lines. But this involved crossing several area codes, thereby dealing with different phone companies, an expensive and complicated solution.

Next, KFRM investigated installing and maintaining its own terrestrial microwave link to span the distance. This looked attractive because the system could provide sufficient audio quality, plus "piggyback" remote control and talkback channels. Initial expenses would be about \$25,000. But when he plotted the microwave route required to implement the plan using existing

paths, the station was looking at \$9000 per year in tower rental charges.

As it turned out, the best solution for this long-haul STL was the Comrex Digital Audio Codec. Kansas Independent Networks, a very progressive and unusually cooperative cellular phone company (aka Kansas Cellular), uses a statewide fiberoptic network with a lot of extra room. And, most important to Russell, there's a 92-mile stretch of fiber from Hutchinson to another Kansas Cellular site just 12 miles from KFRM's transmitter.

Riding on Kansas Independent's "backbone" with 56 kbps channel costs just \$142 per month, plus a small charge for terminations. This data rate, the same used for an ordinary phone call, can be transformed into a wideband program channel using the codecs.

So Russell, who had been closely tracking Comrex's progress in digital codecs, arranged for an evaluation unit. Placing the unit in a loop-back mode, he was able to simulate what a completely encoded and decoded signal would do to his airchain.

After several days of testing the unit online, engineers, sales people and listeners noticed no difference in regular programming. Linked with a pair of microwave STLs, the system was completed at a cost well

below the alternatives.

KFRM used a pair of Comrex model DXR codecs to do the compression. These are a single rack unit high with a built-in power supply. The codecs have no external controls, since they automatically detect and adapt to either a rate of 64 or 56 kbps. They use the international compression standard G.722 to provide 7.5 kHz bandwidth in full duplex. This means they are compatible with other codecs of the same standard.

Since Comrex introduced the codec, the most common applications have been on Switched 56 or ISDN services. There are more dedicated applications emerging, however, as stations find new ways of providing excellent audio quality at minimal cost.

For more information, circle reader service card number 046 or call Comrex at 508-263-1800.



Equipment Report:

Dolby

Reader Service #047

A New STL Approach

by Tom Daily, Dolby Labs

Dolby Laboratories has brought some interesting new competition to the STL market by introducing the DP5500 DSTL, a completely digital STL.

We have combined Dolby AC-2, our digital audio coding algorithm with digital modulation and ultra-linear RF to achieve an extremely narrow occupied bandwidth of 250 kHz and receiver sensitivity down to -100 dBm. Dolby has engineered its system to optimize spectrum efficiency and RF robustness while maintaining very high audio quality.

The benefits of digital audio coding in digital transmission are well-known. To transmit 16-bit PCM using standard QPSK modulation requires almost 1 MHz of bandwidth. This is obviously impractical. Dolby AC-2 provides high quality digital audio at the relatively low data rate of 180 kbps.

When AC-2 is coupled with a suitable digital modulation scheme, two 15 kHz channels, one 7 kHz SCA and one 3 kHz voice/FSK channel occupy only half the bandwidth of a typical analog composite STL. More aggressive data rate reduction would reduce the occupied bandwidth further, but at a sacrifice in audio quality.

The selection of the proper digital modulation scheme for digital STL use is critical to achieving a robust RF design as well as a narrow occupied bandwidth. An overly complex digital modulation scheme could result in less occupied bandwidth. However, the accompanying carrier-to-noise ratio (CNR) necessary for error-free digital transmission reduces system robustness.

At the other extreme, a simpler digital modulation scheme allows for an extremely robust RF system with much higher tolerance to poor CNRs. But the resultant occupied bandwidth is excessive.

The Dolby solution has been to use 9-QPRS modulation to fit the four channels into 250 kHz. This 9-QPRS also allows for robust RF performance. The maintenance of spectrum efficiency and signal robustness offered by our systems approach yields distinct benefits over other STLs.

The RF section that is coupled with 9-QPRS modulation must be extremely linear. Our design incorporates conservative but innovative circuit design, highly linear in performance as well as stable, reliable and repeatable in its manufacture. You won't see coils in our RF board!

To match the combination of audio coding, digital modulation and RF amplifica-

tion, Dolby engineers designed a unique package that brings new levels of convenience and serviceability to the STL market.

Dolby has designed its system with modular construction, fault indicators, status closures and an all-digital stereo generator. And all Dolby DSTL dealers are set up to provide 24-hour service assistance and stock spare modules for reduced downtime.

For upgrades of existing installations, new STL paths, improvements in audio quality or solutions to interference or unusual path problems, Dolby's DSTL provides a new approach to meet a station's needs.

For more information, call 415-558-0200 or circle number 047 on the reader service card.



Equipment Report:

Cellcast

Reader Service #048

Cellcast RBS-400

by Jim Frey, Cellcast

The Cellcast RBS-400 is designed for broadcast remotes, providing the best audio quality available from analog-based cellular carriers. It operates on the 800 MHz AMPS system, making it useful in the western hemisphere and other parts of the world.

The Cellcast package consists of audio mixer, frequency extender and programming interfaces to a Nokia M11TXE transceiver with built-in charger/battery pack and external AC plug-in supply. It operates as a single line system with a choice of landline or cellular, wireline or non-wireline.

A small, flexible, elevated feed antenna is provided for cellular transmission, using a TNC connector. Other antenna options exist, including Yagis for fringe-area operation. An RJ-11 connector is provided for landline use.

The audio mixer portion of the Cellcast provides four electronically-balanced, 3-pin XLR, selectable Mic/Line inputs and five 1/4-inch mono, unbalanced, 8 ohm phone jack outputs. Four of the outputs are for headphones and one is a dedicated output to feed an external recorder, ENG truck or other multi-media.

The Cellcast extender function improves low-end frequency response, 50 Hz to 3 kHz bandwidth when activated. The Cellcast contains the encoder half of the process, which means a decoder is required at the receiving end of a Cellcast transmission. Several are available from different manufacturers in the \$500 to \$700 range.

Programming of the Cellcast is broken down into two routines. One is for entering cellular parameters needed to establish service; the other is for setting audio functions, operational choices and the timer/clock features. After programming is completed, the day-to-day use is fast and simple.

Except for the Mic/Line and Monitor/Headphone rotary gain controls, all other functions are accessed using membrane switches. These include the telephone keypad, PGM/Cue assignment, extender, audio settings lock, programming mode and power On/Off. Red LED indicators show the status of switched or programmed options and the presence of excessive audio.

The battery pack consists of 10 D-size NiCad cells. The charging function is enabled when the external AC power supply is plugged in. Providing the Cellcast is not powered up as well, typical charging time is

10 to 12 hours, which translates into 1-1/2 hours of cellular transmission.

A cigarette lighter adaptor is also provided to allow transmission from golf cart, car, truck, boat, motorcycle or wherever a good 12-volt source is available.

Cellcast dimensions are within 12x10x6 inches, and the weight is approximately 15 lbs. It comes with a carrying bag, set of batteries, AC plug-in power supply, antenna and operators manual.

For more information, circle reader service card number 048 or call 800-852-1333.



Radio Guide Page 37

LMA's and Digital STL's

by David Chancey
Moseley Associates, Inc.

Much has been written and said regarding the technical and economic benefits of the Moseley DSP 6000 digital STL system. One of the areas that has benefitted from the technology is the system's ability to solve many complex programming requirements involved in LMA's. Here are some creative ways engineers have made use of the benefits of the DSP 6000.

Many of the stations that we talk to already have an existing composite STL. With simple modifications to the radio and the addition of the DSP 6000, up to four 15 kHz audio channels, or two stereo pairs, can be conveyed over a single STL.

This allows the station the capacity to program two separate transmitters at a broadcast site from a single studio. What is truly noteworthy is that in an area of spectrum congestion, another STL channel does not have to be found by either the station or the SBE frequency coordination committee.

Another situation calls for a single studio to program separate transmitter sites. In this application, four audio channels are encoded into the DSP 6000 system and sent over the STL to the first site. At this point in the chain, audio channels one and two are

dropped and fed to the stereo generator. Audio channels three and four are fed into the DSP 6000 digital repeater and conveyed over an RF link to the second transmitter site.

Variations on this idea include having all four channels available at each site so that if separate spot or alternate programming is necessary, audio can be routed to the transmitters as needed. In most cases, the first hop of the STL system already exists.



The second hop, due to the nature of the application, is typically a long STL path. It is here that the -93 dBm radio sensitivity of the digital receiver proves its worth in making the shot practical. In one situation, and not without a lot of trepidation on everyone's part, we successfully put an STL on the air over a path that was 59.5 miles long.

In other cases, many engineers have been taking advantage of the 25 dB system gain that the DSP 6000 provides over a composite STL's gain change from simplex to full duplex STL operation. One station in the northeast used CelWave duplexers and transmitter combiners in tandem with existing STL antennas and PCL 505/C systems to backhaul their satellite audio.

This provided six 15 kHz audio channels; two 7.5 kHz audio channels backhauled two PCL 505/C systems. The audio was so clear that the station approved another DSP 6000 for the main 606/C STL.

For more information, call Moseley at 805-968-9621 or circle reader service card number 049.

Equipment Report:

RPT-30, A Station Staple

by Eddie Carrell, Marti Electronics

Since the first Marti appeared in the 1950s, imaginative broadcasters have found endless uses for the durable workhorse remote pickup transmitters from Marti Electronics. Right now, "Marti's" are at work in shopping malls and sporting events including the Barcelona Olympics as well as on the Greenland ice cap.

The Marti RPT-30 remote pickup transmitter features a frequency switch which selects one of two available frequencies and its corresponding deviation. This prevents operator error and possible interference. Four-channel units are available.

Audio is fed to the unit via four balanced microphone mixing inputs with one switchable to balanced line level. The audio is then processed by a built in FM compressor/limiter providing automatic modulation control. A switchable subaudible tone, developed by Marti and adopted by the industry, activates repeaters or other automated equipment.

This encode and decode function is a standard feature on all Marti RPU transmitters and receivers. An illuminated meter displays gain reduction, relative power output or power supply voltage. There are front panel flashing LEDs to indicate antenna VSWR problems and over temperature conditions.

The RPT-30 is available in both the UHF (450-455 MHz) and VHF (161 MHz) bands and is rated for continuous duty. The VHF units produce 45 W output power while the UHF frequencies do 30W. As with all current Marti equipment, the RPT-30 is FCC type-accepted.

Due to rigorous demands made on the equipment in the remote broadcast environment, the RPT-30 will operate from 10 to 45 degrees C. with frequency stability of .00025% for the base station and .0005% for mobile units.

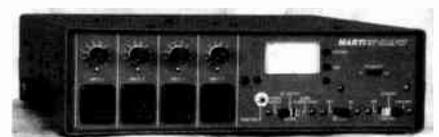
All Marti equipment operates on 110-125 V, 50/60 Hz AC (220 V available on request). DC operation is possible from 11-13.5 V using a nine-pin D connector accessory jack. In addition to DC power, this connector also provides remote control, encode and line level input.

The unit is compact at 3.5x11.5x13.3 inches and is housed in a rugged metal case complete with a handy carrying handle. There are a variety of mounting options for mobile or permanent installation.

When used with the CR-10 companion receiver, a communications link can be established that is capable of operation in today's real world RF environment. All Marti RPU systems offer subaudible encode/decode features at no additional cost as well as the exclusive Marti noise reduction feature for low signal and multipath dropouts and an optional high performance compander.

The RPT-30 transmitter continues the Marti tradition of offering the best, most practical mix of features requested by our customers at a remarkable affordable price.

For additional information, circle number 050 on the reader service card or call 817-645-9163.



Group Operations Via Satellite

by *Muffy Montemayor*,
National Supervisory Network

In many markets, the proliferation of new signals has resulted in media saturation.

The FCC has a theory that in a large group, some stations will make money and some won't; but all in all, the group will come out alright. Thus, the FCC is raising ownership limits to allow larger station groups.

By integrating station programming, production, operations and management within a group, any member station can take advantage of all the resources the group has available.

With VSAT technology, this can be accomplished economically for any size group, without increasing personnel requirements. The National Supervisory Network calls it VISION - VSAT Intelligent Satellite Integrated Operations Networks.

In the past, a 15 kHz full stereo broadcast-quality digital audio signal required a bit rate of 1,024 kbps for transmission. Today, using MUSICAM digital audio compression techniques, the bit rate can be reduced to 128 kbps for 20 kHz stereo audio.

Using MUSICAM-based ComStream VSAT digital audio products, the cost of sending high quality digital programming

across the U.S. is an affordable \$1200 to \$1500 per month. If you need to hit Alaska and Hawaii as well as the 48 contiguous states, add about \$500 per month.

Equipment at each transmit site consists of a VSAT antenna with a two watt SSPA outdoor unit, and an indoor unit which houses the RF interface and satellite modem. This terminal serves as a hub to send information to multiple receive locations.

ComStream's ABR200 audio receiver is a single rack unit integrated satellite receiver/MUSICAM decoder specifically designed for broadcast use. The unit provides eight relay closures available for program control from the uplink.

A 2400 baud async data port allows data transmissions for traffic and logs, playlists, or in fully integrated VSAT/automation systems, for automatic downloading of daily program logs, automation control packets and systems management.

National Supervisory Network Basic Service also provides broadcast stations with trained, experienced operators on duty via satellite. Offering an economical, FCC-legal, quality alternative to local control for broadcasters across the country, the NSN system is built upon the proven reliability of packet switching and interactive VSAT technology.

A computer at the remote site connects

directly to the station's transmitter remote control unit through the serial data port. An interface unit provides EBS control.

Alarms are sent to the operator immediately regardless of the regular reading transmission cycle. In the event of an EBS alarm, the duty operator is notified immediately through the satellite, while the remote site computer sends CPCS audio to the command center via telephone line.

In addition to monitoring and control, the bi-directional VSATs used for operations can be used to centralize and streamline group management functions.

X.25 PADs can be used to interconnect traffic and billing systems, exchange commercial copy and scheduling orders, exchange news copy and so on.

The fax and voiceover X.25 telephone ports give you satellite access to your station group members and their local dial tones without long distance charges.

VISION allows a station group to pool at any location the resources available at all locations. By integrating programming, production, operations, and management control with VSAT technology, each station can contribute to the group's overall success.

For more information, call NSN at 800-345-8728 or circle number 051 on the reader service card.

Equipment Report:

Intraplex

Reader Service #052

Affordable Higher Fidelity

by *Bob Band*, Intraplex, Inc.

With the cost of analog transmission lines increasing, digital STLs are becoming more attractive than ever. A T1 digital transmission line has come down in price to the point where it may cost less than a pair of 15 kHz analog lines.

What is less well known is the fact that a higher fidelity STL can be achieved using discrete as opposed to composite digital transmission techniques.

Discrete digital audio transmission, in which each channel of a stereo signal is separately encoded and decoded, provides a higher degree of stereo separation than either analog or composite digital transmission.

When combined with oversampling, 16-bit A/D conversion and careful input amplifier design, it enables the creation of an STL which delivers to the transmitter a broadcast signal with greater than 90 dB dynamic range, greater than 80 dB crosstalk separation, peak levels to +21 dBm and distortion under 0.01%.

Intraplex, Inc., an established manufacturer in the field of digital transmission and multiplexing, has designed a series of discrete digital audio transmitters (DDAT Links) especially suited to high fidelity STL application.

Versatile and requiring only 1-3/4 inches of rack space, the 4800 series DDAT Link comprises a discrete digital audio transmitter and matching receiver. These use a standard T1 format digital signal, suitable for transmission over leased telco lines, microwave radio or even satellite links.

The transmitter accepts inputs of stereo, monaural or dual monaural signals with a bandwidth up to 15 kHz and performs a non-compressed 16-bit linear A/D conversion with oversampling.

Special plug-in channel modules can be added for voice; SAP; voice frequency modem, telemetry and control; or SCA channels. The 4800 multiplexes these channels together with the program audio for transmission over a single T1 line.

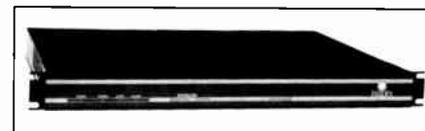
And since the T1 line is inherently a two-way connection, the same link can also provide backhaul channels for network satellite downlink and remote pick-ups.

The receiver demultiplexes the incoming T1 signal, using 16-bit linear decoding to recover the original stereo audio. Advanced error concealment circuitry prevents transmission bit errors from affecting the sound quality of the output signal.

A proprietary, robust T1 framing algorithm and automatic fallback timing help to maintain operation through difficult transmission conditions. Reliability may be further enhanced by an optional redundant power supply.

Built-in firmware provides the user with remote control and system status information, using an ordinary PC or dumb terminal via a dial-up modem. Power supply options include: 115 V AC, 230 V AC, -24 V DC and -48 VDC.

For more information, circle number 052 on the reader service card or call 508-486-3722.



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Reader Service #056

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CDS RF Engineering ToolsSM provide broadcast engineers with access to the most current government data files including FCC Broadcast, FAA, US Census and USGS databases. Our online/remote access programs are invaluable in the preparation of applications, exhibits, coverage predictions and other engineering needs. CDS RF Engineering ToolsSM include:

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Reader Service #055

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25kW	FM	1988	TTC 25,000
30kW	FM	1980	BE FM30

AM Transmitters

1kW	AM	1982	Continental 314R1
1kW	AM	1974	Harris BC1H
1kW	AM	1968	Harris BCIG
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
10kW	AM	1972	RCA BTA 10U
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Product Guide

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Transmitter Parts For:
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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.

Variable Transmitting Capacitors: E.F. Johnson Co., Cardwell Condenser Co., insulated shaft couplings as used in phasors, variable transmitting capacitors.

Weschler-Westinghouse: RF Ammeters, 0-0.5 Amps through 0-50 Amps, internal and external thermocouples, expanded and linear or square-law scales. Sizes are 3 & 4 inch, round and square. Special meters are available.

Radio Corporation of America - A division of Commercial Radio Company: RCA transmitter, phasor and antenna tuning unit parts.

Reader Service #057

New FM Transmitters

Manufactured by Henry Radio Inc.

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Reader Service #060

Radio Guide Page 41

Advertiser Listing

Advertiser	Page#	R/S#	Advertiser	Page#	R/S#
Adirondak	41	059	M-Street	29	031
Altronic	4	004	Marathon Products	41	060
Armstrong	32	036	Michael Patton	26	028
ATI	9	008	Micro Controls	22	022
AVS Broadcast Svc.	23	023	Modulation Science	21	021
Broadcast Credit	20	020	National Supervisory	15	015
Broadcast Auto.	25	026	Netwell	32	039
California Digital	12	011	Professional Audio	25	027
Coaxial Dynamics	13	013	QEI	13	012
Commercial Radio	41	057	QEI	20	019
Communication Data	40	055	QEI	30	033
Computer Concepts	43	061	Racom	32	037
Continental Elec.	27	029	Ramko	11	010
Cortana	40	056	Ramko	17	017
Eastboard Consoles	24	025	RCI Systems	41	058
Econco	29	032	SCMS	31	034
Electro-Impulse	23	024	Sine Systems	14	014
Energy Onix	32	038	T-Tech	18	018
Fidelipac	2	003	Telos	5	055
Henry Engineering	28	030	Telos	7	007
Intraplex	10	009	Transcom	40	054
Jampro Antennas	6	006	Wheatstone	44	062
JRF Magnetics	16	016	Wireready	31	035

STL and Remote Control

Equipment Reports Pages 33-39

For more information,
circle these numbers.

Report	Page#	R/S#
CCS	35	043
Cellcast	37	048
Comrex	36	046
Dolby	37	047
Gentner	34	042
Intraplex	39	052
Marti	38	050
Moseley	38	049
National Supervisory	39	051
QEI	35	044
Sine Systems	36	045
TFT	34	041
T-Tech	33	040

How to Submit Articles to Radio Guide

Radio Guide welcomes your comments, letters, articles and Tech-Tips. We prefer electronic submissions.

1. MCI Mail to Judith Gross, at MCI Mail #507-3038.

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.

4. Or post to the Radio Guide/AVS BBS by calling (804) 468-4957. Please send as a private message to Judith Gross or Ray Topp.

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.

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3. Combo AM/FM	13. Engineering	19. Approve
4. Educational	14. Programming/Production	
5. Network/Group	15. News	
6. Recording Studio	16. Other	
7. TV Station		
8. Consultant/Contract		
9. Mfg/Distributor		
10. Other		

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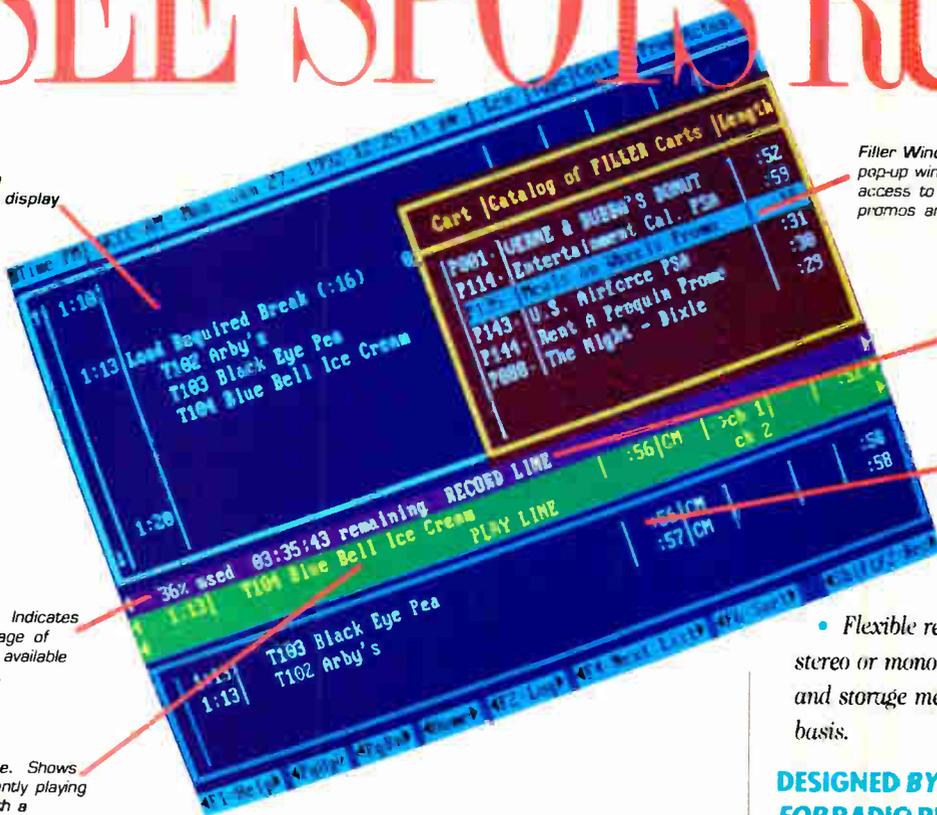
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003	028	053	078	103	128
004	029	054	079	104	129
005	030	055	080	105	130
006	031	056	081	106	131
007	032	057	082	107	132
008	033	058	083	108	133
009	034	059	084	109	134
010	035	060	085	110	135
011	036	061	086	111	136
012	037	062	087	112	137
013	038	063	088	113	138
014	039	064	089	114	139
015	040	065	090	115	140
016	041	066	091	116	141
017	042	067	092	117	142
018	043	068	093	118	143
019	044	069	094	119	144
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023	048	073	098	123	148
024	049	074	099	124	149
025	050	075	100	125	150

SEE SPOTS RUN.

On-screen traffic log display



Filler Window. This special pop-up window gives you quick access to PSAs, jingles, promos and other fillers.

Record Line. Shows what DCS is currently recording.

Queue Window. Just click on a listing, to place recordings in the queue for playing.

"Gas Gauge". Indicates what percentage of the system is available for recording.

The Play Line. Shows what's currently playing on-the-air, with a count-down timer.

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By combining a standard industrial-grade PC with an advanced stereo audio board, DCS lets you program a day, a weekend, even entire weeks!

AUTOMATE EVERYTHING, FROM PRODUCTION TO BILLING.

Production Studio. DCS simplifies board work and replaces the muddy sound of analog tape with crisp CD sound quality.

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And while Wheatstone is well known for superior technical performance, the A-6000 surpasses even our own previous consoles in virtually every measurement category.

The A-6000 has the appearance, features and power to excite the most demanding program and production staff; its engineering, performance and thoughtful design will help your technical staff achieve excellence. So contact Wheatstone, the people with knowledge, experience and a commitment to excellence.

