Radio Guide

Radio's Technology Magazine

February - 1991

HEAD TURNING

STUDIO FURNITURE

SIX COMPLETE LINES, FROM ECONOMICAL TO ELEGANT. SHIPPED IN AS LITTLE AS TWO WEEKS.

THE EXPRESS GROUP.

CALL US AT (619) 298-2834

FAX (619) 298-4143.

THE EXPRESS GROUP

Radio Guide
- Contents -

February - 1991
Volume 4 Issue 2

Cover Photo
Courtesy of
CRL Systems

More After This!

Editorial Comments

Ray Topp - Editor/publisher

Is Radio Guide "Free?"

What have you done to support **Radio Guide**? Have you sent in an article? Have you called us to express your suggestions and ideas for a better magazine? Have you taken the time to let our advertisers know that their support is appreciated?

It's Fallen and it Can't Get Up

Where is that technical article you were planning on sending the other day? It must have fallen behind the workbench. A number of you have made a commitment to write for **Radio Guide** on a regular basis. I know that there are many more of you out there who would like to do the same thing. Don't worry if you're not an "expert" - few of us are. If we spend too much time protecting our egos, the important technical information we have to offer won't be disseminated to those who need it. Remember, you're not writing for those who already know the answers.

We Bought a Case of Paper

Our fax machine is on-line 24 hours a day! Call it at (507) 280-9143. If you need a part, a schematic, a new boss ... if you have a question, a suggestion, a bitch ... anything and everything is fair game for our fax machine. You tell us - we'll get it in the Guide. But please ... no more pictures of Bart Simpson!

Reach Out and Thank Someone

If you are not buying from a particular **Radio Guide** advertiser, does that mean that you shouldn't give them a call and thank them for their support of **Radio Guide**? Of course not! Can you imagine what would happen if all of you stopped right now and called a **Radio Guide** advertiser? What is the price of your "free" **Radio Guide**? Just a thought ...

Are You in Business?

Would you like to expand your kitchen-table or basement manufacturing business? If you need a place to advertise your widgets, call us at (507) 280-9668 and ask about our special "emerging technology" rates. We'll help you to promote your products during the start-up phase. This is a special cooperative effort, and requires no money up front. Give us a call!

Ray Topp ... editor

Radio Guide Forum

Letters, Questions, Help & Parts Wanted From Radio Guide Readers

Letters to the Editor

Response to the "Desert Chief"

It continues to amaze me how some supposedly technical people can be so narrow minded when it comes to progress. The letter you published (RG Dec-90) from an unidentified writer underscores my amazement.

Yes, NRSC compliance required an expense somewhat less than $1,000 for a rule decreed by the "Royal FCC," but encouraged by our brethren. With that relatively small investment, AM radio received the opportunity to convince the manufacturers to make wider band AM receivers, perhaps 7 or 8 kHz rather than 2 or 3. Not really hi-fi, but a heck of a lot better than it was.

I'll bet this desert tech never heard a Japanese radio with a wide band switch and AM Stereo! (They made a few about 4 or 5 years ago.) When in the presence of an NRSC AM Stereo station, and no one splattering into the 10 kHz sideband, it sounds real good. A quantum improvement over the so-called "premium sound" Detroit radio under the same circumstances.

Give the manufacturers a chance. Prove to them we need a signal worthy of wider band receivers. AM needs to pull together to survive. Naysayers should be banished to the telephone company where 3 kHz is an accomplishment.

Gary L. Kneisley - V.P & GM
WNWV - Cleveland, Ohio

"Babe in the Trenches"

Almost every engineer will agree that the hardest things to obtain in this business are experience, respect and friends.

Experience that tells us to plug it in after checking the fuse and troubleshooting a dead power supply. Friends come even harder, for we must first prove our worth by solving their problems first. And respect? Lord knows, we must earn that.

Look at engineering from the outside. Low pay, work hours that breed ulcers, and that make-you-feel-good-all-over look you get from the air staff after pulling an all nighter at the transmitter. Did I miss anything? Hey, I'm not crying into my coffee, but it is a two-way street. We should reflect a professional attitude at all times, and management should include us as part of management.

Approach everything as positive as possible, explain your position, stand your ground, and even admit that very rare mistake. (Engineering Rule #1: The engineer never makes mistakes - only adjustments.) Open the door to a good working relationship; at least try. Invite them on a trip to the transmitter site, talk with them, and relax. Don't tech-talk them to death.

By the way, one point I have not seen in the trade magazines is how to deal with age. No, I'm not talking old, I mean how to deal with being the young brat that can fix stuff. I may be one of a small percentage of engineers under 25, but I am here fighting in the trenches like an "old-timer." 75% of the equipment is older than I am, my FM transmitter is a 29 year old ITA (want to swap war stories).

The next time you "old-timers" feel left out in the cold, imagine how lucky you are that you are respected for your experience. By the way, I'm 22 and love what I do (no explanations - I just love it). Radio should be fun and exciting with different challenges daily. Stress? What is stress? Where's my hammer ... the transmitter just quit again.

Randall McKenzie - CE, WBRF-FM
Galax, Virginia

Gone Fishing

As of late, there has been an influx of articles in the trade magazines dealing with the lack of respect afforded engineers. It is true. At most stations, engineers have gone from being "God" to being necessary evils. Let's face it, we generally don't waltz into the GM's office and announce that we've closed a deal that will net the company a bunch of money. Quite often we do, however, crawl in front of his/her desk with our tail tucked between our legs and tell 'em if they don't spend some money, some major disaster will happen. More often than not we're right. But being right isn't always popular with management and ownership.

I'm not suggesting that you, as an engineer, should take a "so be it" position. What I have found is that I take a load of my shoulders just knowing I'm doing the best job I can. It's not easy to maintain a positive attitude.

(continued on page-6)

Radio Guide

Vol. 4 - No. 2
February 1991

Sales Offices

Dale Tucker - sales manager
865 Hawthorne Dr.
Walnut Creek, CA 94596
(415) 935-1470

Cal Vandegrift - sales
33729 32nd Ave. SW
Federal Way, WA 98023
(206) 874-4976

Editorial/Publishing Office

Ray Topp - publisher
511 18th St. SE
Rochester, MN 55904
(507) 280-9668
Fax (507) 280-9143

Radio Guide is published monthly by Radio Press Group Inc.

Free subscriptions are available to all people involved in radio broadcasting and allied fields. Send name and address or any changes to Radio Guide editorial/publishing offices in Rochester, MN.

All letters and copy submitted to Radio Guide are assumed to be for publication, unless notified otherwise.

Radio Guide Forum

Letters, Questions, Help & Parts Wanted From Radio Guide Readers

There are many external negatives screaming at us. Ownership is forever cutting our budgets. Professional groups blast us with the hidden message that - if we're not certified by them, we're not really qualified to carry out our duties (even though many of us have been discharging our duties long before the group's inception). The Commission changes the Rules as often as we change underwear. DJ's can always do our jobs better and faster. We're the only ones in the station who have to get out of bed at all hours of the nights, etc. So why do we stay in the business?

Hopefully, for the same reasons that we got into it. To utilize our specialized talents and have fun doing it. Certainly we'd like to earn more money and gain more respect, but times have changed. Even with the changes, I don't know of many positions that give us the freedom we've got. Most of us don't have a bunch of co-workers who can do our job. You could think of that as a liability, but it's truly an asset. The inter-company competition is virtually eliminated. Is the Sales Manager as lucky?

Generally, if we work during the night, we are not looked down upon for not being to work by 8:00 a.m. the next morning. If the morning drive announcer does a station promotion until midnight, he/she must still be on the air at 5:30. I could go on, but the point is this: In the big picture, glamour and respect often carry a large price tag. Given the choice of having tons of respect or being able to do my job pretty much as I see fit, I'll opt for the latter. Because in the end, if it's a nice summer afternoon, and I decide to stop by my favorite stream on the way back from the transmitter to drown a couple of worms, I'll be enjoying myself while everybody is back at the station falling all over each other trying to make a few brownie-points with the boss!

Dave Seavy - CE, KROC-FM
Rochester, Minnesota

Tech Manuals Needed

Wanted: Old Broadcasting Yearbooks, White's Radio Logs, Radio-TV Experimenter magazines, etc.

Contact: Peter Hunn - WZZZ
Lakeshore Rd.,
Fulton, NY, 13069
(315) 593-1313

Wanted: Spotmaster manual for a 3100P (1976 model). Also want to buy Spotmaster 3100 play/record units (1976 models).

Contact: Lloyd Spivey - WLLS Radio
Sprinks Shopping Center,
Hartford, KY, 42347
(502) 298-3268

Wanted: Howe Audio tech manual for a series 2000 Phase Chaser. Please help!

Contact: Dave Fortenberry - KXOA
280 Commerce Circle,
Sacramento, CA, 95815
(916) 923-6800

Parts Needed

Wanted: Gates Automation detector control DCU-3R.

Contact: Paul Miller
522 E. Curlew Pl.,
Tarpon Springs, FL, 34689
(813) 934-3466

Wanted: Technics direct-drive motor for an M85-MKII cassette recorder. Model number RS-M85MKII.

Contact: Tony Welborne - WNAA
Suite 200 Price Hall,
NC A&T University
Greensboro, NC 27411
(919) 334-7936

Wanted: Used Harris MW-1A PA module. Does not have to work, but it must have a good PC board.

Contact: Bill Brown - WBCO/WQEL
403 E. Rensselaer St.,
Bucyrus, OH 44820
(419) 562-2222

Wanted: 7.5 kHz audio decoder module for a Scientific Atlanta digital audio terminal (DAT-32).

Contact: Al Meeves - WFDX-FM
832 W. Washington St.,
Marquette, MI, 49855
(906) 228-5295

Wanted: Collins plug-in 53 kHz low-pass filter for Collins type 310Z-2 stereo generator/exciter.

Contact: Jeff Pearce - KSSS/KVUU
2864 S. Circle Dr. Ste. 150, Colorado Springs, CO, 80906
(719) 579-0880

Wanted: A 7.5 kHz dual audio module for a Fairchild DART-384 digital receiver.

Contact: John Cole - WBTM
710 Grove St.,
Danville, VA, 24541
(804) 793-4411

Radio Guide Forum

Letters, Questions, Help & Parts Wanted From Radio Guide Readers

Wanted: Ampex 2-track tape head for an AG-500.

Contact: Steve Tunwall - KMA
209 N. Elm, Shenandoah, IA, 51601
(712) 246-5270

Equipment Wanted:

Wanted: Need an Instacart.

Contact: Ken Thompson - WWIC
815 W. Willow St.,
Scottsboro, AL, 35768
(205) 574-2198

Wanted: Station Equipment. We are constructing a new FM radio station at 88.5 mHz, with on-air target date of June, 1991. We need the following for our new 50kW FM: Any and all studio, transmitting and microwave equipment.

WBHY is owned and operated by Goforth Media Inc., a 501-C-3 tax exempt corporation. Anyone wishing to donate equipment should contact:

Wilbur Goforth - WBHY
P.O. Box 1328,
Mobile, AL, 36633
(205) 432-8484

Wanted: A Spectrum Analyzer. Looking to purchase a used portable spectrum analyzer. Must be capable of measuring to 5 gHz.

Contact: Tim Hunt - KILA
2201 S. 6th St.,
Las Vegas, NV, 89104
(702) 731-5452

Wanted: A Marti STL-10. Must be stereo units with 2 receivers and 2 transmitters, plus combiners.

Contact: Joseph Bahr - WVIS-FM
P.O. Box 487 Frederifested,
Saint Croix, US VI, 00841
(809) 778-5199
Fax (809) 756-5914

Wanted: CD Players. Looking for several working or serviceable Technics SL-P520, SL-P720 or similar CD players with cueing wheel. If you've got one or more on the air, or in production, I'll even buy you a NEW machine of comparable price to replace it!

Contact: Ed Sackly - WRKR-FM
9835 Portage Rd.,
Kalamazoo, MI, 49002
(616) 327-2000

Wanted: A working CBS Laboratories model 4450 stereo Audimax.

Contact: Jeff Pearce - KSSS/KVUU
2864 S. Circle Dr., Ste. 150,
Colorado Springs, CO, 80905
(719) 579-0880

Wanted: A Harris 9160 and relay panel.

Contact: Marvin - KAJO
600 Roguelea Ln.,
Grants Pass, OR, 97526
(503) 476-6608

Wanted: A 5M150 or 5M250 Broadcast Electronics (or similar) audio console in workable condition at a reasonable price.

Contact: Herb Gardner - WHHV
P.O. Box 648,
Hillsville, VA, 24343
(703) 728-9114

Wanted: A Moseley MRC-1600 in good condition. Should be telco version. Will trade Micro-Controls STL, ITC stereo Deltas, board, hybrids, mikes.

Contact: Dave Solinske - WSUN
877 Executive Center Dr. W.,
St. Petersburg, FL, 33702
(813) 576-1073

Need a Part?
Get it in the Guide!

Wanted: Disc Cutting Equipment. Especially Fairchild, Rek-O-Kut and Presto. Need heads, amps, limiters, blanks, needles, manuals, etc. Any advice on where to look for these items would be appreciated.

Contact: Kim Gutske
7134 15th Ave. S.,
Minneapolis, MN, 55423
(612) 866-6183

Wanted: QEI 7775Q FM ATS

Contact: Elvis Moody - KJEM
216 N. Main,
Pentonville, AR, 72712
(501) 273-9039

Wanted: An RCA BTS-1B stereo generator for BTE-15A FM exciter. Need complete or incomplete General Electric Consolette audio mixers (the old ones). Looking for parts to restore the 3 I have.

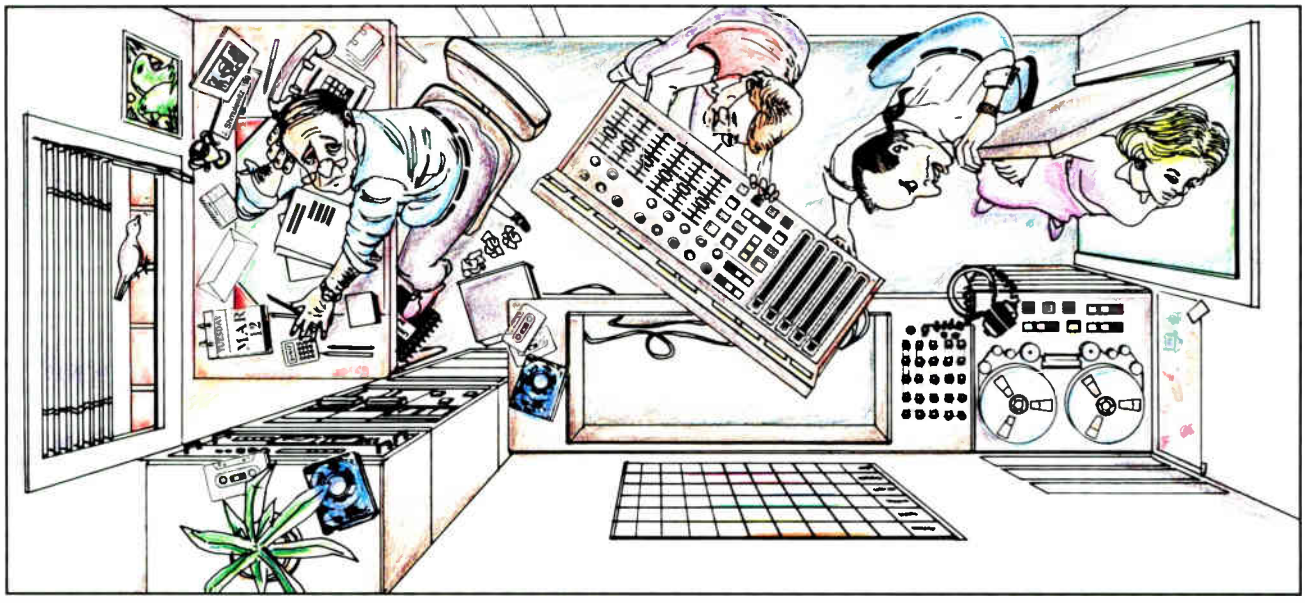
Contact: Johnny Almond
P.O. Box 898,
Mt. Gilead, NC, 27306
(919) 439-6855

Wanted: FM Antenna. Christian station needs a 12-16 bay FM CP antenna for power increase. Everything else in place. Frequency is 92.3 mHz.

Contact: Ken Diebel - KTJC-FM
1207 Louise St.,
Rayville, LA, 71268
(318) 728-5852

Wanted: Blank and recorded acetate discs. Also old spots, programs, and home-made recordings. Need all types and speeds. Also interested in non-pro disc recording equipment.

Contact: Tim Verthein - KOZY
P.O. Box 597,
Grand Rapids, MN, 55744
(218) 326-3446



How do you turn a multitrack production room into a *real* profit center? With fast, efficient operation and superb audio quality—a combination you won't get from "beefed up" recording studio boards or on-air boards with a few tacked-on features. Unfortunately, if your budget didn't have room for PR&E's ABX, you had to accept one of these compromises.

Well, not any more. Introducing Productionmixer™, a genuine broadcast production console that costs no more than the board you thought you had to settle for. We think everyone—including management—will agree it's a better choice.

Production Directors are going to fall in love with Productionmixer's full multitrack capabilities, versatile EQ with 3 sweepable bands, built-in dual telephone mix system, auto timer, two stereo effects sends and flexible monitoring/mixdown system. Chief Engineers will appreciate its high RF immunity, powerful CMOS logic control, top-quality components and complete, full-support documentation.

There's no room in your operation for an ordinary production console.

General Managers may well get the biggest thrill out of Productionmixer—when they realize that it delivers PR&E reliability, performance and functionality for no more than a "compromise" production console. As with our highly popular Radiomixer, we've made Productionmixer affordable without lowering our standards.

If you're trying to build an extraordinary production room on an ordinary budget, Productionmixer delivers the creative power you need in an efficient, easy to use format. For more information and your copy of the color Productionmixer brochure, call us direct at 619-438-3911.

Productionmixer

Pacific Recorders & Engineering Corporation
2070 Las Palmas Drive • Carlsbad, CA 92009
Tel 619-438-3911 • Fax 619-438-9277

State of the Art

By Chip Morgan - CMBE
Folsom, California - (916) 983-9834

A Computer on Every Desk

Computer makers have promised to unite in a standard so that software developers can start writing multimedial programming packages. Multimedia is the combination of TV and computers. It's a combination of sound, graphics text and video in one package. The new standards are based on a personal computer with an 80286 or 80386 microprocessor, two megs of memory, enhanced graphics, special audio computer chips and a CD-ROM drive, I hope somebody is making sure that radio is integrated into this!

Looking for a Antenna Site?

MCI is selling about 250 microwave tower sites during its conversion to digital. They have constructed a lot of fiber facilities in the last 5 years. They expect to sell all the sites within the next year, although major market areas are going fast. For more information, call Mr. Lynn Dawson at 800-627-9207.

Switched 56 is the Radio Remote Line of the Future

The telcos are rapidly introducing "Switched 56" which will allow radio remotes through the phone system on a dial-up basis. Instead of waiting a week to get a special phone line for a remote, we'll be able to plug in our equipment, make a phone call, and have 15 KHz audio quality over a dial-up line. No waiting!

Nexrad Installations May be an Income Source

The U.S. Government is installing a new radar system designed to increase lead-times before weather emergencies. The system is called NEXRAD (which stands for Next Generation Weather Radar) and has the ability to analyze movement inside a storm. It will be used by NOAA, the National Weather Service, the FAA and the U.S. Air Force. In some locations NEXRAD will need to relay data through facilities that can be installed on broadcast towers.

Space Age Studio Design

New designs for radio studios and offices are best for the information age. We are now using sleek, modern high-tech desks for control rooms and newsrooms instead of the bulky wooden boxes used by most studio designers. The concept is a "Landing Site" system, where people roll in their personal file/equipment pods and the work area is configured for their needs.

The Paperless Studio is Here

There are several software packages available to allow your programming staff to set up an on-line system in the control room which displays music rotations, logs, news, weather, sports, technical information, help files, liners and PSAs.

No More Lightbulbs?

General Electric has announced development of a "Light Engine" for autos that generates light and can be used with fiber optics to power tail lights, dome lights, instrument panels and "forward lighting systems." With fiber, there are no lightbulbs to purchase or replace. The system is said to reduce the electrical power required for lighting systems and allows power to be diverted to computer systems and other power-using systems of the future. A system like this could work in homes, offices and broadcast stations!

Turn Your Computer On and Off by Modem

A new device allows you to call up a PC, turn it on, run programs and turn if back off. This means that PC's at transmitter sites or in remote locations don't have to run continuously. The controller has surge-protected power outlets for the computer, monitor, printer and modem. The system can operate at 9600 bits per second and can be installed on any PC. Price is only $219.95 from Power-On at 800-835-1515.

Compuserve Forum

If you haven't checked out BPFORUM on Compuserve, you should! You'll find sections for Radio, TV, CATV/MMDS, Contract Engineering, Radio/TV talent, Audio, FCC Q&A and Cellular/LMR.

A Cable TV System Could be Used as Phone System

A low cost digital device is being sold that allows telephone communication on a cable or computer network system. It uses a small box installed in the home or office which interfaces the phone into the network. Another piece of equipment links the network to the public phone network. Calls can be made between phones in the network and from the network to the outside world.

More on Sprint Conference Calls

A new service fro Sprint called the "Sprint Conference Line" allows up to 100 people to be in a telephone conference call. It costs 24 cents per minute plus $3 per location called, but might make an interesting morning show network.

New Services From the Phone Company

Express Call Completion allows callers to directory assistance to have their call completed automatically. Message Center is voice mail for residences. Computer Billing allows customers to have their monthly billing on a computer disk. Repeat Dialing is an autodialer.

Let Advertisers Know That You Appreciate Their Support of Radio Guide!

By Russ Erickson - BE
Quincy, Illinois - (217) 224-9600

Proofs ... They're Still Important

I had the opportunity in October to travel from St. Louis to San Antonio in a vehicle that sported an "AM only" radio. What an adventure! I never listened to so many variations of news/talk in my life. Other noteworthy formats were black religious talkshows, radio bingo, and the cost savings simulcasts of country and CHR music. I came across a station that took me back 20 years. Oklahoma City's KOMA. WOW! what a great station!

I grew up listening to CKLW (Windsor-Detroit), the "BIG 8." I will never forget the fast pace, high intensity, and great music of the "BIG 8." KOMA has succeeded in bringing that whole radio "feeling" back. Their intensity is awesome, they read commercials live, the pace is hot, and the music "fits" on AM. I think that is the true indicator of what we need to do with AM.

KOMA sounds so good because the music they play is recorded when we had a bandwidth-limited ability to record. I mean the Beatles were the first group to even use multi-track. Why don't more AM stations use this to their advantage? Instead of trying to force feed a spectrum rich format through a transmitter and antenna combination that is bandwidth-limited to 10 kHz (or less), use material on AM that "fits" on AM. Simulcasting may save you a few bucks in payroll, but you can't expect material that sounds great on FM to sound great on AM.

Hats off to Dennis Phaff and all the staff at KOMA for a truly great AM station!

I just heard from Gene Nelson at KSYM-FM in San Antonio. He called to tell me my neutralization technique described in the September issue of Radio Guide didn't work on his Gates FM-1C. I think it's because it's the old push-pull Class C final amplifier. I have to admit that I have only used that technique on single tube, grid-driven transmitters. Sorry, Gene.

Also, if there is anybody out there that is still using a Gates FM-1C, Gene would like to swap stories with you. The only FM-1C I can remember is in Cambridge, Ohio, and I don't know if they are even using it anymore. It's a classic design that uses 4-400C's in the final.

So when was the last time you ran a Proof-of-Performance on your station? Are you a contract engineer who barely has the time to keep your fire extinguisher filled, or do you have the luxury of actual preventive maintenance? If you are just getting started in broadcast engineering, remember there is no quicker way to spot check your station's capability then to run a quick "Proof" at the extremes. Here's how.

What you want to do is run the worst case measurements on noise, distortion, frequency response, and stereo separation to see if the system can handle it. Obviously this approach can also be used for spot checking individual pieces of equipment too. Here's what to look for:

-Check the system noise relative to 100% modulation in the stereo mode. This should be greater than -60dB.

-Check the distortion figures at 50Hz, 1000Hz, and 15,000Hz. The distortion will be higher at the lower frequencies, but should not exceed 1% at any frequency.

-Check the frequency response at 50Hz, 1000Hz, and at 15,000Hz. In a modern facility, the response shouldn't change more than +/- 1dB.

-Check stereo separation at 1000Hz, and at 15,000Hz. It should be greater than 30dB as a minimum.

You will notice by performing multiple tests at a given frequency, you can run these tests very efficiently. It shouldn't take you long to determine if your station is up to a Proof because if it can't pass the extremes, there's work to be done. So now get down into the individual pieces of gear, and find the culprit.

Noise - Power supplies, Check the DC output of the individual power supplies for ripple, starting with the console. If the console passes, step next to the audio processing, then to the STL, etc. Note your readings, because noise can be cumulative, and you may need to repair more than one supply. Also note that in push-pull amplifiers, the common mode rejection (balance) is determined by the bias balance adjustments. Make sure these are accurately set.

Another good idea is to isolate the transmitter to make sure it is not the noise source itself. You can do this by injecting your signal into the balanced 600 ohm mono input of the exciter.

Distortion - Distortion and nonlinearity problems are hard to find, and can be best approached on an individual equipment basis. Before you spend a great deal of time on checking frequency response, make sure the noise figure for the equipment is at least at factory spec. The problem is, noise can show up as distortion and can have you running in circles trying to track down the problem.

Frequency Response - Frequency response errors are also cumulative, so we are in luck as they can also be subtracted. Look first to matching problems. With the use of consumer grade equipment in a broadcast environment, the possibilities are greater for a mismatch. Also beware of inserting a new piece of gear in the RF chain without doing a Proof on the chain when you're done. You may forget about it, and it won't crop up again until it's time to run some numbers. Also keep in mind that a response problem can manifest itself from a distortion problem. Again we're looking for the proper balance in push-pull stages of audio gear. An unbalance in audio stage can show up as poor low frequency response, as well as distortio. Running a Proof at the extremes, on a regular basis, can help you in your efforts to always be on the air.

EXPERIENCE COUNTS . . .

Continental Electronics Installations At Master Antenna Facilities.

OLDSMAR TOWER PROJECT
Tampa, Florida
2 OF 2 STATIONS

WKRL 40 kW
WUSA 40 kW

TELETOWER PROJECT
Houston, Texas
2 OF 2 STATIONS

KLTR 27.5 kW / 21.5 kW (Aux)
KMJQ 50 kW

BRODIE LANE TOWER SITE
Austin, Texas
2 OF 2 STATIONS

KHFI 35 kW
KPEZ 21.5 kW

MILLER TOWER SITE
Dallas, Texas
6 OF 6 STATIONS

KKDA 40 kW
KLTY 40 kW
KLUV 40 kW
KOAI 45 kW
KZPS 40 kW
WRR 40 kW

LOXLEY TOWER SITE
Mobile, Alabama
3 OF 3 STATIONS

WBLX 27.5 kW
WGCX 27.5 kW
WJLQ 27.5 kW

LOADSTAR TOWER PROJECT
Ft. Lauderdale, Florida
2 OF 2 STATIONS

WJQY 40 kW
WKQS 50 kW

GANNETT TOWER PROJECT
Miami, Florida
8 OF 10 STATIONS

WEDR 50 kW
WHQT 25 kW
WLVE 25 kW (2)
WPOW 25 kW
WQBA 21.5 kW
WSHE 25 kW
WTMI 25 kW (2)
WZTA 25 kW (2)

BITLOW TOWER PROJECT
Orlando, Florida
3 OF 3 STATIONS

WHTQ 50 kW
WSSP 50 kW
WSTF 50 kW

LOADSTAR TOWER PROJECT
Orlando, Florida
3 OF 3 STATIONS

WJHM 25 kW
WJYO 55 kW
WOCL 55 kW

LOADSTAR TOWER PROJECT
Jacksonville, Florida
3 OF 4 STATIONS

WAIV 40 kW
WFYV 27.5 kW
WQIK 35 kW

SENIOR ROADS TOWER GR
Houston, Texas
7 OF 12 TRANSMITTERS

KFMK 27.5 kW (2)
KIKK 27.5 kW (2)
KKBQ 27.5 kW (2)
KLOL 27.5 kW

SUMMIT TOWER PROJECT
Atlanta, Georgia
2 OF 3 STATIONS /
4 OF 5 TRANSMITTERS

WSTR 35 kW (2)
WVEE 40 kW

LOADSTAR TOWER PROJECT
New Orleans, Louisiana
4 OF 4 STATIONS

WEZB 35 kW
WLNG 35 kW
WMXZ 35 kW
WQUE 35 kW

SHOREVIEW TOWER PROJECT
Minneapolis, Minnesota
6 OF 8 STATIONS

KDWB 25 kW
KEEY 25 kW
KLXK 25 kW
KQRS 25 kW
WLOL 25 kW
WLTE 25 kW (2)

MONTGOMERY TOWER PARTNERS
Montgomery, Alabama
4 OF 4 STATIONS

WBAM 35 kW
WHHY 35 kW
WLWI 35 kW
WQ[illegible] [illegible] kW

WEST TIGER MOUNTAIN TOWER SITE
Seattle, Washington
6 OF 9 TRANSMITTERS

KBSG 50 kW
KMPS 50 kW
KRPM 50 kW

When experience counts you can count on Continental transmitters. This track record reflects the quality of Continental transmitters and our commitment to the broadcaster. May we assist you in planning your new facility around a new Continental transmitter?

Continental Electronics Corporation

P.O. BOX 270879 DALLAS, TEXAS 75227-0879 214-381-7161 TELEX: 73-398 FAX: 214-381-4949

Station Automation

By Steve Walker - Broadcast Automation
Dallas, Texas - (214) 380-6800

Carousels ... Go-Carts ... Instacarts

This month we're going to talk about the most popular multi-cart audio sources used in automation: Carousels, Go-Carts, and Instacarts.

The Carousel, a device designed by Sono-Mag Corporation (SMC) in Normal, Illinois, is perhaps the most common multi-cart source in use today, It's been through at least four generations: Model 248, model 250 (252 for stereo), model 350 and the current model, the 450.

The Carousel can hold up to 24 carts. It has only one transport, so the cart is rotated in carousel style until it is in the front of the transport when "trayed in." Now it's in position to play the proper cart when called for by the automation system.

The Carousel uses a twenty-four position rotary switch to determine when the correct cart is in position. From model to model, various means are used to provide position decoding information. Some models (with the suffix RSB) include this circuitry within the Carousel, and in other cases, the circuitry is part of the automation system or interface.

The Go-Cart has been called by some, "IGM's version of the Carousel." However, IGM took a different approach when designing the Go-Cart 24. The only real similarity is the fact that both use the carousel approach (like Kodak's slide projector) and the Carousel and GO-Cart 24 both have 24 trays. While the Carousel has been around longer and has many more refinements, the Go-Cart was originally designed on a simpler scale. We can assume that IGM learned from SMC's mistakes and thus required fewer refinements along the way; this is the American way, after all.

The Go-Cart uses plastic trays as cart carriers; these usually are well fixed and require no adjustment. the tray sensing mechanism for determining position is electronic and is built to a higher degree of precision than the Carousel. However, the Carousel mechanisms do allow ample room for adjustment and the Carousel is more affordable for many applications. And any machine is going to require periodic maintenance and repair no matter how well built it is. Anyone who has ever rebuilt a piece of "jock-proof" gear knows that.

The third device we'll talk about today is another IGM product: the Instacart. the Instacart bears absolutely no physical resemblance to the Carousel or the Go-Cart. The original version contained 48 trays (removable), 48 heads, and 48 solenoids. The removable trays each have their own pinch rollers.

The Instacart is laid out in in four columns of 12 trays each. Each column has its own capstan motor and its own audio/cue detector card. At first glance, it looks like a maintenance nightmare, but IGM has special tools available for head alignment and, like the Go-Cart, the Instacart is a high-precision machine designed to required only routine preventative maintenance.

If one motor goes down, you've only lost 12 of the 48 trays, and the biggest advantage of the Instacart is that you can play several spots in a row - unlike the other two devices we've discussed. The Instacart's biggest disadvantage is price: several times that of the Carousels or the Go-Cart. However, IGM's new version of the Instacart is available modularly; that is, you don't have to buy all 48 trays at once. You buy stacks of 12.

All these multi-cart sources are available used/rebuilt/re-manufactured. But take care when buying from another station or through dealers of unknown character. Machines that were "working when removed from service" seldom work when received in your shop or station. These are all fragile machines and many problems can develop in these areas: removal from service, shipping, and re-installations. If you've never done all three of these functions before, I don't recommend attempting any of them without lots of advice from someone who has.

Every week I get a phone call from a station engineer who's afraid for his job. He's bought a truckload of automation equipment from a good buddy he used to know and can't make *any* of it work. It turns out he's been shorted some little "insignificant" piece or part such as a complete power supply or interface cable, has shipping damage because the gear was shipped in Styrofoam "goobers" instead of the required special wooden crate, or he just bought junk. Be careful, sometimes the guy on the other end is trying to rip you off, but usually he just doesn't know what he's selling. Check him out. Then get a second opinion.

Starting next month, we'll begin to get a little deeper into the inner working of automation. We'll also get into some of the problems that people run into when they ask machines to do their more mundane tasks for them.

ELSEWARE

A Remote Control Program For Use With PC Based Automation Systems

Is your station fully automated? With everything left to a PC or clone? Welcome to the world of broadcast automation. It's 3 a.m. and the board operator calls with a message ... "Something seems to be wrong with the program."

We know you live two minutes away from the studio and don't mind driving down in your pajamas to sort it out on the computer and set things right ... No??

Then you need ELSEWARE ... and a modem. If you can't convince the GM to buy a modem for the automation PC then get it yourself. It's worth the extra sleep.

ELSEWARE is a *free* program. It is similar to commercial programs such as CO-SESSION that allow you to control a host PC from a remote location. You must have a PC and modem and an intimate knowledge of the automation program that you are going to try and fix at 3 a.m., while you are still half asleep.

ELSEWARE requires that you set certain parameters in your AUTOEXEC.BAT and CONFIG.SYS files. When you call the line that the automation PC is connected to, the PC will answer that line after a predetermined number of rings. You enter a command at your end to "capture" the host terminal. This will allow you to see what is on the screen at the host terminal and to enter keyboard commands as if you were there.

Generally, a remote control program such as this will allow you to control the host but at the cost of speed. The delay inherent in the ELSEWARE program is tolerable at 2400 baud and very good at 9600 baud.

I have found some minor glitches in the ELSEWARE program that can be easily compensated for. The glitches vary from machine to machine and they really are *minor* compared to having to drive 20-30 miles to fix the automation with two or three keyboard entries.

ELSEWARE is really free, having been released as freeware by the author. Comparable programs cost around $200 if you go the commercial route. I have enough trouble convincing the GM to pay me much less spend $200 on a "useless computer program." (He forgot the automation is also run by a computer program)

ELSEWARE is written by Kevin Kiley of Interlink Technologies. It is available for download from computer BBS's around the country. You can contact the programmer directly at the following address: **Kevin Kiley - Interlink Technologies, P.O. Box 49646, Sarasota, FL 34230-6646**

If you have trouble contacting the programmer and would like to try this program, send me a card with your name and voice contact number and I'll arrange a modem transfer with you or a floppy disk mailing. **S A Walker, P.O. Box 162, Hilo, HI 96721-0162**

By W.C. Alexander - Crawford Broadcasting
Garland, Texas - (214) 445-1713

Using DA's for FM Short Spacing

Many FM stations across the country, especially in the midwest and northeast, are restricted to ERPs below the maximum for their class because of short-spacings. If yours is one of these, then a directional antenna could provide a way to upgrade your facility.

If the short-spacing is to a single station or a number of stations all in the same general direction from your transmitter location, then a directional antenna can be used to upgrade your facility to the maximum ERP for your class in all azimuths except those where the short-spacing exists, provided that all the requirements of 73.215 of the FCC Rules are met.

First Step

To determine if a directional antenna will help your situation, a channel search must first be run. This will tell exactly what the spacings, including short-spacings, are to all stations within a given radius on the pertinent channels. It will show where the short-spacings are, the bearing and distance to the short-spaced station(s), and the height and ERP of all the stations within the radius. The search can be conducted by your consulting engineer, or you can use any reliable broadcast data service that is known to have reliable and current information.

Using this data, the next step is to draw a permissible radiation graph.

Developing the Graph

Before we can find the maximum permissible radiation toward the short-spaced stations, we must know where their normally protected contours lie. In the case of a Class B station, the normally protected contour is the 0.5 mV/m contour.

To find and plot this contour, you will need to obtain the digitized terrain average between 3 and 16 km from that station's transmitter site on a number of radials. Start with the direct bearing from the short-spaced station toward your station or proposed site, then continue at 10 degree intervals either side of that azimuth to tangent.

Next, using the graph in 73.333, Figure 1 (or better yet, use the FCC's computer program, "CURVES" - you can get this in IBM PC format on the Compuserve Broadcasters Professionals Forum), find the distance from the short-spaced station's transmitter site to its 0.5 mV/m (54 dBu) contour on each of these radials. If this station is operating with less than maximum facilities (HAAT and ERP) for its class, assume maximum facilities for the purpose of plotting the normally protected contour.

Find the exact geographic coordinates of the point on each of these radials where the 0.5 mV/m contour falls and note them. Do this with your handy-dandy programmable pocket wizard or PC (or you can do it with topo maps - perish the thought). There are numerous programs out in public domain that will give coordinates from a fixed location, distance, and bearing.

Now, find the distance and bearing from your station or proposed site to each of these points and note them. Now, obtain the digitized 3-16 km terrain average on each of these radials from your station or site.

In this discussion, we will assume that the distance to the short-spaced station's normally protected contour from our proposed site is 159.6 km on a direct bearing of 225 degrees.

Before we continue, it will be necessary to determine what the value of the F(50,10) interfering contour is. This interfering contour is defined in 73.215(a)(2) as -20 dB (10:1 voltage ratio) for co-channel stations, -6 dB (2:1) for first adjacent channel stations, +20 dB (1:10) for second adjacent channel stations, and +40 dB (1:20) for third adjacent channel stations. For the purpose of this discussion, let's assume that our short-spaced station is a co-channel station; this makes the interfering contour 20 dB below the normally protected contour of 54 dBu, or 34 dBu (.05 mV/m).

The next step is to find the ERP on each of these radials that will produce the F(50,10) interfering contour at the short-spaced station's normally protected contour on each of these radials. You can do this using 73.333 Figure 2, or you can use a computer program as discussed above.

If you are using the F(50,10) chart (heaven forbid), do this by placing the sliding scale mark representing the interfering contour on the intersection of the appropriate distance and HAAT on the F(50,10) scale. Read the ERP on the power scale at the 40 dBu mark on the graph ordinate.

Using the CURVES program, you will have to iterate until the distance to the contour comes out right. You should be able to get close quickly and then zero in with a few cycles.

Working the problem as you read along, assuming that we wish to operate our co-channel station with a HAAT of 150 meters, you should have found the maximum ERP for our direct bearing distance of 159.6 km to be 30 kW. In the case of a real world allocation problem, you would now repeat this operation on all of the radials you found above from tangent to tangent.

For each of these bearings, you will have found the maximum ERP in kW. To put these on a relative field polar graph, we will need to convert the ERP values to a ratio. First, consider that the maximum ERP for our class of station is our maximum ERP and thus equal to a ratio of 1.000. For this example, we are using a Class B station, so our maximum is 50 kW. Now, for all azimuths on which we calculated a maximum ERP of less than the maximum for the class, we will find the relative field ratio. Use the following formula:

(continued on page-15)

DA Systems

Continued . . .

$$F_{REL} = 1/\left(\frac{\sqrt{P_{MAX}}}{\sqrt{P_{MIN}}}\right)$$

FREL = Relative field

PMAX = Maximum power for class of station

PMIN = Calculated permissible ERP for radial

In the example of our direct bearing ERP of 30 kW, take the reciprocal of the square-root of 50 divided by the square-root of 30. The relative field for our direct bearing of 225 degrees is thus calculated as 0.774.

Plot this value on a piece of polar graph paper on the appropriate azimuth. Calculate the permissible relative field for all the remaining radials toward the short-spaced station. Determine from these figures whether there is more than a 2 dB change per 10 degrees of azimuth. If there is, then 2 db/10 degrees will be used on the graph; if the change is less than 2 dB per 10 degrees, then the actual calculated relative field will be plotted. The reason for this check is that the FCC requires in 73.316(b) that there be no more than a 2 dB change in relative field every 10 degrees.

Now, plot either the actual calculated relative field or a 2 dB increase for the radials 10 degrees either side of the direct bearing. Repeat for all the remaining bearings toward the short spaced station until the 1.000 line is reached on the polar graph. Join these points smoothly using a french curve. Assuming that there was only one short spaced station to worry about, you can now complete the relative field graph by drawing a semicircle along the 1.000 line to join the two ends already plotted. If there is more than one station to consider, repeat all the above steps for each additional short-spacing.

Carefully and clearly label the graph, noting major scale divisions, azimuths, and note the bearing and permissible relative field value toward all the short spaced stations.

Ideal Pattern

What you now have is a graphic representation of the radiation pattern of the ideal directional antenna for your station. Ideally, this antenna will radiate the maximum ERP for your class of station in all directions except toward the short-spacing(s), and on radials close to that bearing, the radiation will taper off at a rate of 2 dB per 10 degrees or less, until the short-spaced station's azimuth is reached. In that direction, the radiation will be restricted to the direct bearing value calculated above.

(continued on page-16)

Continued . . .

So now, we pick up the phone, call up the local antenna man, and order one, right? Well, almost.

Real World Antennas

In the real world of antennas, such a perfect pattern is impossible to achieve. It is possible, however, to achieve a directional pattern that approximately resembles the ideal, and that restricts radiation where needed and otherwise meets FCC specifications for FM directional antennas.

The first thing we do is to talk to the manufacturers. They can give you an idea of cost, gain (thereby allowing you to select the number of sections needed to make the desired maximum ERP), and mounting requirements (allowing you to arrange for either a new tower of the appropriate type or the required modifications to your existing tower, if possible).

Most antenna manufacturers will, at no cost, take your maximum permissible relative field graph and design from it a "real world" antenna and pattern that will work. A complete description of the proposed antenna, along with a tabulation of the relative field, ERP, and field strength at one kilometer will be provided to you with the proposal. Polar graphs of the H and V patterns will also be provided.

The Trap!

All this material, provided it meets the specifications set forth in 73.316(c), can be filed directly with the FCC with your Form 301 (all the material provided by the major antenna manufacturers is certain to). Normally, the FCC will, at some point, then grant you a construction permit. However, herein lies a trap! Listen up!

If you submit the manufacturer's theoretical pattern and submit it with the Form 301, the construction permit you will receive will specify that the actual, measured pattern not exceed the theoretical pattern in any azimuth, and further, that the RMS of the measured pattern exceed 85% of the RMS of the theoretical pattern. Let me tell you, that is a tall order! When the manufacturer actually builds the proposed antenna, he will perform a full set of range measurements and will "tweak" the design until it resembles the theoretical pattern as closely as possible. However, there is a good chance that they won't quite hit this acceptable performance envelope. If he misses, even a little bit, you will be stuck filing for modification of C.P. and awaiting program test authority for many months, all after the new antenna has been bought and paid for.

The best way to be sure this doesn't happen is to arrange with the antenna manufacturer for a set of range measurements before the Form 301 is filed. He will probably charge you a few kilobucks for this, but it should apply toward the purchase price of the antenna later. If you file a measured pattern as the theoretical, there is no way you can miss.

Preparing the 301

With the data provided you by the antenna manufacturer, you are ready to begin preparation of the FCC Form 301.

The Form 301 for FM directional systems is cumbersome with requirements related to the directional antenna, but it is certainly nothing to be afraid of. The important things to watch for are:

- Letter perfect forms and exhibits. Cross check everything, including coordinates, heights, descriptions and addresses with your current station license with any sources at your disposal. If not changing sites, use the existing station license and/or the last Form 301 filed as a guide. There should be no discrepancies.

- Be sure to include everything required by 73.316(c). This includes all the data on the proposed directional antenna, which should have been provided by the manufacturer as discussed above.

- Maps as required by the FCC. The Commission has tightened its map requirements considerably in recent years. It will no longer accept anything but the best quality topographical map reproductions. There are some specific guidelines published in a Public Notice dated 5 April, 1985. Copies are available from the Commission.

Consult the Consultant

It is an excellent idea, if you did not employ a consulting engineer to aid in the preparation of the application, to have one check over your completed application before filing. Most consultants are very conscious of the FCC's stringent application requirements, and are therefore very sensitive to what the FCC staff will look for.

Once the application is filed, you wait. Eventually, provided that you have done your homework and everything in the application is correct and letter perfect, you will receive a construction permit in the mail.

Once you have the construction permit, you are ready to order the antenna. If you did not have range measurements done before you filed, you must submit a copy of the C.P. to the antenna manufacturer, who will work toward meeting the limits set forth therein as he adjusts the pattern. Sometime before shipment, the manufacturer will provide you with a full proof-of-performance on your antenna. It is up to you to compare the actual field-measured values with the C.P. limits and give the manufacturer the final approval. Of course, if you filed a measured pattern with the 301, you already have the proof in hand.

Installing the DA

There is no great secret to installing a directional FM antenna. However, these antennas are complicated, with many more parts than an ordinary FM antenna; careful, on-site supervision of the tower crew performing the assembly and installation is a must. Drawings and instructions provided by the manufacturer must be followed to the letter. If something doesn't fit, stop and ask the manufacturer for help. If the assembly is not performed correctly, the pattern won't be right and interference will result.

DA Systems

Continued . . .

When the antenna is installed on the pole atop the tower (directionals always require a pole mount), it must be aligned by a civil engineer. Once the engineer has verified the mounting direction, he must provide you with a sealed certification that the antenna was aligned on the proper bearing, as per the manufacturer's instructions.

Once the antenna is installed and connected to the transmission line and transmitter, you can start program tests immediately, right? Wrong! This is the exception to the automatic program test authority rule. You must first file a FCC Form 302 and request program test authority.

Along with the 302, you must submit the complete antenna proof-of-performance as provided by the manufacturer. If everything in the 302 is in order and agreement with the terms of the construction permit, you will receive program test authority within ten days. With this in hand, you are ready to begin operating at maximum-facility power!

How Well Do FM DAs Work?

You should expect to see an increase in coverage area proportional to the square root of the power increase in all azimuths where ERP is not limited by the antenna.

As with any facility change, perceived coverage can be misleading. Changes in fresnel zone clearances, Brewster angle and other factors can lead to increased or decreased multipath in some areas.

Take a scientific approach to evaluating the antenna's performance. If it is done correctly, you will see a proportional increase in the size of the coverage area.

Antenna maintenance is no more of a problem than with any antenna; care must be exercised by workers when they are working around the antenna. Parasitic radiators mustn't be moved and elements must stay precisely aligned. If the antenna is ever removed from the tower for maintenance or repair, get a civil engineer to verify the re-installation.

The use of directional antennas can solve a number of problems for stations facing a mandated site change in an allocation-congested area or operating with reduced ERP/HAAT under 73.213 because of an existing short spacing. A competent engineer can make it happen.

What Would You Like to Read About?

Call Radio Guide and Let Us Know!

Radio Engineer

By Tim McCartney - McCartney Radio Eng.
Bemidji, MN - (218) 751-1680

Sorry? But I'm Not Sorry

It's clear that most engineers want to remain engineers. After a tough decade starting with deregulation and degrading to excessive radio station debt, survival has not been all that easy. So, a proper mentality is essential. It's like WKRP guru Dr. Johnny Fever's defense of his paranoid behavior as "a good way of thinking when everybody's out to get you."

This column seeks to develop and improve a healthy attitude toward engineering by exploring both positive and negative themes. Along these lines, a few suggestions from an RG reader are aired. Then, a few bursts of steam.

Cloning IBM

We might try copying standard IBM company policy. As I understand it, technical personnel are not available to customers by telephone on the first attempt. Rather, calls are returned later.

Thus, the customer perceives that IBM's technical professionals are busy! Perhaps the resulting psychology earns them some of that elusive respect.

$$ Stats

Another suggestion is to tailor some of the current computer bulletin board services to exchange information normally delivered only via word-of-mouth.

One possibility is an engineering credit bureau to access the payment history of radio stations to their engineers. I had assumed that development of such a data base would be hampered by legal problems; but, as we know, credit bureaus routinely operate in a similar manner. In fairness to a station so tainted, a rebuttal could be included.

Also suggested is a resource file of engineer finances: billing rates, structure of emergency service rates, mileage charges, and state sales and social security tax matters.

If you have any information relevant to these suggestions, let me know so that I may pass them along in this column. Now, about that steam in need of release.

Not Sorry About That, Chief

In addition to management's short-sighted, excessive debt policies, I condemn the general arrogance emerging in the forms of callousness and ignorance toward engineers.

But, on occasion I may have erred when chastising owners and managers in this column. Really, I shouldn't be suggesting that all GMs are unethical. Recalling my own GM years, it would be more fair to further reduce such a blanket charge. Instead, the remark should be refined to suggest that lots of GMs can comfortably wear those shoes. And, I don't apologize for saying so.

Take 2

Which remarks would I edit if the tape could be rewound? Well....

- It was a risk to suggest that a few GMs might be tempted to buy that Texas radio station just because a free S&L sweetened the deal. In the real world, the green stamps wouldn't have helped.

- There was that one unfortunate recommendation that the IRS examine a few managers' "Vegas" connections. Really, any kind of audit would have sufficed.

- I goofed by divulging that story about the GM who was upset when the Statue of Liberty refused to wave at him.

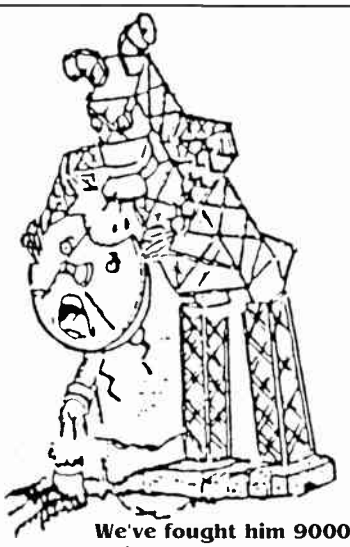
- I broke one of my own rules by talking hi-tech with one GM. Just mentioning R2D2 brought on the familiar yawns.

- It was presumptuous of me to suggest to a tower climbing crew that management accepts full responsibility for ANSI compliance.

- I was wrong to tell that story about the GM who said my career was on the line over that "transformer thing." I should have just suggested he take the A-train.

(continued on page-30)

MICROWAVE MONSTER EATING *YOUR* DISH?



We've fought him 9000 times and never lost!

You Probably Need Our **EXCLUSIVE** Block Band TI Filters!

Used by over 3000 commercial TVRO installers and operators:
- SMATV builders such as Spectradyne.
- CATV MSO's such as Warner, TCI, ATC, Viacom and others.
- Program providers such as HBO, TBC and others.
- TV/FM Broadcasters such as NBC.
- Motels/Universities/Government/Industry.

Most TVRO systems are now block downconverted, with LNB and no 70 MHz loop-out on the receiver. Neither microwave (4GHz) notches or 70 MHz filters are applicable. Block band filters can ALWAYS be installed in the coax cable, to suppress the TI before it hits the receiver. Their batting average is over 90% - we know, because we sell them MONEY BACK!

But, in the rare case they don't tame the monster, our FREE in-house consultants know ALL the Monster's tricks - and have a solution for each one of them - most of them available OVERNIGHT if necessary:

- **Telephone Microwave**
- **Aircraft Altimeter Signals**
- **Airport Radar**
- **Coastal Navigation Radar**
- **Railroad Microwave**
- **Common Carrier**
- **VHF Ingress**
- **False TI (Low Signal)**

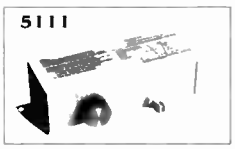
Having A Problem NOW? Up Against A DEADLINE?
Call Your FREE TI Consultant TODAY - And Sleep Tonight!

Before

After

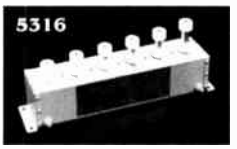
Before

After

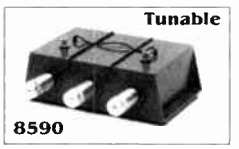


Single Receiver

Block band TI notchers: tunable single receiver or multiple carrier models for CATV/SMATV. Models for all blocks.



Multiple Receiver



Tunable or single channel block bandpass filter clears up pictures due to weak transponder signal. (Single channel 8730)

Ask for your TI First Aid Handbook and Filter Catalog MTV/87.

- TI Sources/Symptoms
- Cures For 500 Receivers
- Exclusive Block Filters
- Exclusive 4 GHz Filters
- Notches For 70 MHz or Any IF
- Side Lobe Reducers
- TI Site Test Equipment

"Stick-on Absorber Kit, reduces side lobes - the gateway to all microwave TI"

MICROWAVE FILTER COMPANY, INC.•6743 KINNE STREET•EAST SYRACUSE, NY 13057
Toll Free(US/Can): 1-800-448-1666•Collect(NY/AK/HI): 315-437-3953•FAX: 315-463-1467•Telex: 249-613

Soldering Tips

By Richard Majestic - Engineering Consultant
Annapolis, Maryland - (202) 619-1228

Precision Sum And Difference (Audio Matrix) Circuit

If you have to build an accurate sum and difference signal from stereo left and right audio sources (or the reverse), stay tuned. A trivial 1.0dB amplitude difference, or 6 degree system phase error will lower overall stereo separation to 25dB. 25dB is unacceptable today, except for boom-box stereo radios. The sum and difference amplitude and phase (time delay) errors can cause substantial errors in the reconstructed left and right audio channels; this design minimizes those matrix errors.

The design offered has essentially no differential phase error or system group delay, in the sum or difference output channels, as measured over the audio spectrum, 20Hz. to 20,000Hz., with signal amplitudes of -40dBu to +20dBu. The design utilizes low cost matched resistor networks, combined with high open-loop gain bipolar IC amplifiers with unique differential input topology.

The Circuit Description:

Referring to figure 1 diagram, the input amplifiers U3 and U4 are NE5534AN IC(s) and function as input signal buffers; they provide a low source impedance (essentially 0 ohms) to the matched 10,000 ohm virtual ground current summing network nodes of U1 and U2. The input buffer circuit has unity gain (0dB). The buffer amplifiers are low noise, high performance bipolar IC devices with nearly flat group delay characteristics when used unbalanced and inverting. The buffer amplifiers are configured as inverting amplifiers for lowest phase and group delay effects [an artifact of IC amplifier technology]. U3 and U4 have been compensated for a frequency response that extends to 100,000 Hz., at +24dBu peak signal level.

U1 and U2 are PMI SSM-2015 IC(s), and are true differential input, high performance bipolar amplifiers. The IC inputs are employed in the current summing mode, in both sum and difference functions. Bipolar and BiFET operational amplifiers exhibit substantial propagation time difference between the inverting and non-inverting inputs, these delay errors make the devices unsuitable for matrix encoding. The extra stage or stages, that cause the time delay difference, also introduces frequency gain and amplitude dependent phase errors that results in unpredictable differential group delay and sometimes circuit instability. By design, the PMI SSM-2015 device has essentially equal propagation time for the inverting and non-inverting inputs. Differential delay is typically less than 10nSec. This important characteristic contributes to the high accuracy of the derived L-R channel signal. To maintain time accuracy between L-R and L+R channels, both U1 and U2 should be identical IC types. U1 and U2 are ultra low noise audio preamplifier IC(s), so they contribute very little noise and signal distortion to the output signals. Please note the performance specifications.

The DC servo formed by U5 (A&B), is a dual BiFET IC amplifier L072AP. It serves as a long time constant integrator to stabilize the low level DC offset voltage of U1 and U2. The non-inverting input is referenced to ground (0VDC), so the circuit will attempt to hold the output of U1 and U2 at 0VDC. Direct coupling of the matrix is recommended to prevent in-band envelope distortion. The DC servo time constant is long enough to prevent formation of signal envelope modulation distortion and low frequency group delay errors.

Construction Criteria:

As mentioned before, all 10k ohm resistors are part of a resistor network package, and need to be matched to within 0.1% (or better) of each other, but can have a 5% value tolerance; matching to each other is key. The 0.1uF capacitor in the integrator circuit should be a metalized polyester film capacitor. All signal wiring should be kept short, and a PC board is recommend. Signal lead pairs should be close to the same length and have the equal spacing from all grounded shielding. The power supply rails should be regulated at +/- 18VDC.

Circuit Performance Specs.

Freq. Response = 20Hz to 20kHz (+/- 0.02dB)

S/N Ratio = 104dB

THD+Noise = 0.007% (20Hz to 20kHz)

IMD = 0.015% (SMPTE 60Hz & 4kHz, 4:1)

Slew Rate = 10V/uS

Nominal Input Level = -10dBu

Max. Output Voltage = +23.3dBu (2k ohm load) 11.3V_{RMS}

Amplitude Accuracy = 0.05%

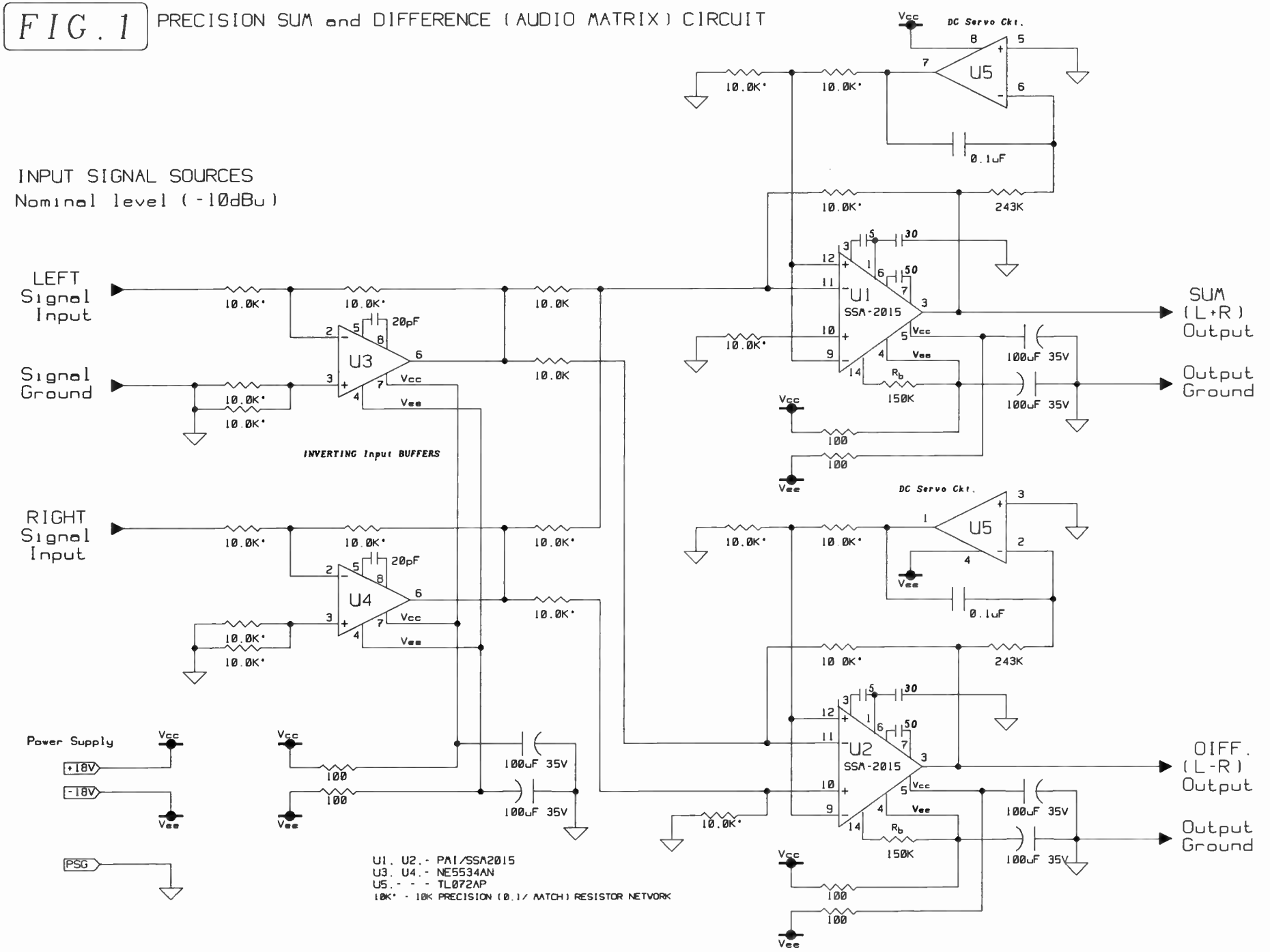
Differential Time Error = >10nS

System Stereo Sep.* = 85dB (encoded & decoded)

***Typical left to right separation, assuming no (L-R) and (L+R) path amplitude, gain linearity or differential time errors.**

Richard Majestic is an engineering division chief at the U.S. Information Agency's Voice of America in Washington, DC, and is an active audio consultant engineer. Considered and expert in audio systems design and analog audio circuit design, he holds numerous patents for instrumentation and analog circuit designs.

FIG. 1 PRECISION SUM and DIFFERENCE (AUDIO MATRIX) CIRCUIT



Studio Site

By Gordon Carter - Studio Facilities Manager, WFMT
Chicago, Illinois - (708) 482-4142

Studio Maintenance -- Getting Started

One day as you walk into work, one of the jocks (you know who, the one that's always complaining) corners you about how one of the cart machines doesn't sound right.

"Hey, Bob, that cart number 1 sounds funny. Can you do anything about it?"

"Well, maybe. What's it doing?"

"Whenever I play a cart in it, there's no bottom end. It sounds shrill, but kinda muffled."

"Does it stop at the right time?"

"Yes."

"I'll look at it later. I've got to get to the transmitter site to clean the tube socket in the aux."

You both go your separate ways, but you think to yourself that the jock should clean the wax out of his ears. On the other hand, the jock thinks that you've brushed him off and nothing will be done to the cart machine until the second Tuesday of next week.

This is a fictional story, but based on reality. Many engineers pay much more attention to the transmitter than they do to the studio equipment. The transmitter is kept clean and purring like a kitten, but the studio gear is only worked on when it completely fails. Some engineers would be hard pressed to tell if some of the audio gear is working right, since they do not have the right test equipment or know what normal operation is for the equipment.

Yes, the transmitter is important, and the heat is really on when it's down, but is the studio equipment any less important? The cart machines, consoles, turntables, CD players, and other studio gear all contribute to the sound of your station. If your station is hard to listen to, people will tune out quicker, and that will be reflected in the ratings. No, you won't increase your ratings with better studio maintenance, but at least you won't decrease them, either.

"But I'm already overloaded with transmitter work, remotes, and other things," you say. Maybe you are, but then again, maybe it is just an excuse. Perhaps you don't feel comfortable working on audio gear, or even around other people. Many times you have to work on studio equipment when other people are trying to use it, so you get in each other's way. Could better scheduling on your part, or perhaps even a cooperative approach help solve the problem? You will have to answer that.

So, where do we start? We start with you, the engineer. You have to come up with an intelligent plan for studio maintenance. Just fixing things when they break is not adequate. You need to keep them from breaking. The solution to this is two-fold:

1. Know your equipment and what normal operation is for it.

2. Anticipate problems before they develop and deal with them.

In order to keep a good working relationship with others in the station, and to allow yourself to get some quality work done, schedule a time for studio maintenance. If you only have one control room and nothing else, this may be difficult, but it is absolutely necessary. If you don't work on the equipment before it breaks, it will break, and probably when least convenient for all concerned. If you have more than one room that can be put on the air, it becomes easier to schedule. You may only need an hour or two at a time, or you may need more time, but be sure to schedule it. If you don't schedule it, you will sooner or later end up getting in someone's way and eventually getting them mad at you. Work with your on-air staff and your production staff to come up with a mutually agreeable time. If they don't want to cooperate, convince them that you are doing this for their own good.

Getting to know your equipment takes time. Ideally, you should make a complete performance check on every new piece of equipment that enters your station. Keep this on file for future reference. Look in-

(continued on page-23)

Continued . . .

side the equipment and find out how to open it for service quickly if you have to. If you don't have a complete service manual, get one. If you have more than one item of the same type, number them for easy reference.

Every piece of audio equipment is a little different. Two supposedly identical tape recorders will behave in slightly different ways. Manufacturer's specifications are usually not a good indication of normal performance, but are really a minimum performance standard. I have seen many examples of equipment working within the manufacturer's specifications, but it was not working properly. This is usually an early warning of more serious trouble to come.

Good record-keeping is important to knowing your equipment. You may not work on a certain piece of equipment for over a year, and by then you have probably forgotten most of what you knew about it. Keeping good records will help solve this problem.

The way you keep your records will depend on what you have available. A good computer data-base system helps with quick retrieval and cross referencing of information, but is frequently not where you need it. A manual file can contain some things (such as frequency response charts) that are difficult to store in a computer data-base system. However, a manual file can become bulky and more difficult to use.

Keep a file for each piece of equipment. This should include complete check-out data when new, a record of all service performed on the equipment, and data from periodic performance checks. Of course, manufacturer's data such as model and serial number, date purchased, and your own reference number should be included. The type of check-out data required is different for different types of equipment. The information included by the manufacturer in the specification sheet should serve as a guide to what is useful information.

Keep another file for quick analysis and trouble-shooting. This record should be keyed to trouble symptoms you have encountered on certain types of equipment, such as cart machines. Knowing the problem that was encountered, the brand and model number of the piece of equipment that had the problem, and the eventual cause and cure may help you find the cause of a similar problem in the future on another machine. As you use these files you can fine-tune the system to be the most useful to you. Remember that these files are only as good as they are complete. Failure to enter information in the file, using the excuse "Oh, I'll remember it next time" is the best way to make the file useless.

Audio maintenance requires audio test equipment. You may already have some of it on hand, but there are a few items that are frequently missing from an engineer's arsenal. Each piece of test equipment has its own use, and you can frequently get by without certain items. Let's look at this equipment and the function of each item.

1. Audio (sine wave) generator. You need to be able to produce fairly low-distortion sine waves (less than .01% THD) to test most audio equipment. Better audio equipment will require lower distortion levels to show the true performance. The generator should be able to provide a number of frequencies across the audio band, and should do so with virtually no variation in output level. Other considerations should be evaluated in choosing a generator, such as balanced or unbalanced outputs, output impedance, range of output levels available, and multiple outputs.

Sometimes you can get IMD (intermodulation distortion) test signals from the same generator for little additional cost, and this is helpful for some testing. So-called function generators can be helpful, but generally do not have low enough distortion figures for audio testing. Some people have advocated using a special test CD (compact disk) to generate test signals, and they can be useful in a pinch, but do not give you the best versatility.

2. Audio meter. You need to be able to measure your audio levels accurately, and this is the device to do it.

(continued on page-24)

Continued . . .

Many multi-purpose meters claim to do audio, but be sure to check the frequency response of the AC range. This should be flat up to at least 50 kHz, if not higher, to allow for accurate measurements in the audio band. Input sensitivity is an important specification as well, since the audio levels are frequently in the millivolt range. Many newer digital meters provide a very useful option of reading AC (audio) in db. This is made even more useful with a relative mode, which allows you to set a reference and make all readings with that as your zero.

3. Distortion analyzer. A distortion analyzer allows you to determine the amount of distortion on the sine wave being fed to it. This is an important indication of how well a piece of equipment is working, especially analog tape recorders. You need to be able to resolve distortion at least as low as your generator, if not lower. Most distortion analyzers are primarily for THD (total harmonic distortion) but some are made for IMD (intermodulation distortion). If you can only have one, THD is the one to get, but IMD has its own set of uses. Most distortion analyzers have some filtering capability to help weed out hum and high-frequency noises which can give misleading readings. All THD analyzers need to provide some nulling of the fundamental frequency (they notch out the fundamental frequency and read what is left) and this can be either manual or automatic. Automatic is usually more expensive, but it can save a lot of time. Frequently your distortion analyzer can double as an audio volt-meter.

4. Oscilloscope. A scope that is good up to 500 kHz or more is a great time saver when trouble-shooting audio equipment. It can help pin-point a problem quickly. However, a scope has very little use in simple performance testing.

5. Wow & flutter meter. This is the simplest and cheapest way to check the mechanical performance of analog tape systems. Any increase in wow or flutter is indicative of a bad bearing, pinch roller, motor, guide, or anything else in the tape path. A few simple tricks with one of these can help you locate the offender in a matter of minutes. Flutter is a frequently over-looked parameter in broadcast studios, but it can really make you sound bad on the air.

6. Test cables. I cannot over-emphasize the importance of good test cables. I have seen good engineers waste hours of valuable time looking for the right audio adapters and trying to get a hum out of a piece of equipment that was due entirely to incorrect hook-up. You should have a set of cables to go from your test equipment to any type of audio connectors you may encounter, such as XLR, RCA, and phone plugs. Using adapters is just asking for trouble, since they provide more chance of a bad contact. Ma'.e sure they are properly wired to eliminate hums and allow them to work as intended.

If you need to add to your test equipment, and are working on a tight budget, don't give up hope. Keep your eyes open in used equipment directories and at local ham fests. Some great bargains can be obtained if you are patient and informed.

A number of manufacturers are now making some very sophisticated audio test equipment, much of it computer controlled. While this equipment is rarely found on the used market, it has certain advantages that make it worth considering. Depending on the specific equipment, many common audio tests can be automated, saving quite a bit of time. Also, some of these allow for easy data collection and presentation in graph form, which can be a useful part of your service records. You will have to decide if the time savings are worth the extra cost.

We have discussed scheduling regular maintenance with the on-air and production staff. When your scheduled time comes, be there and be ready to work. Have a list of the equipment you are going to work on and what you are going to do with it. Keep track of what you get done, and what you don't. Remember that while a control room is made up of a number of pieces of equipment, they have to all work together. Make sure you test the entire system, as well as the individual pieces.

(continued on page-25)

Studio Site

Continued . . .

No matter how good your regular maintenance is, something will break eventually. When it does, you may not be there, or you may have more pressing things to do. Many times a malfunctioning piece of equipment can be worked around for a while, thus not having to call you in. Sometimes it is vital that the item be fixed immediately.

When someone finds something that is not working correctly, or that they think is not working correctly, have them fill out a trouble report form. Keep these forms in a handy place, so there is no excuse for not using them. Have a place for them to be put to get your attention quickly, such as on your shop door. The form should contain information as to the piece of equipment and its identification number (if used), time and date the problem is noticed, nature of the problem, and who is making the report. Include a response section that has the date and time you receive the report, your findings, and the date and time the report is cleared. We use a three-part carbonless form. The first copy (white) is for engineering files. The second copy (yellow) is a response to the person initiating the report. The third copy (pink) is put on the machine when the report is filed and should only be removed when the problem is solved. This alerts others to the possibility of the problem.

Getting everyone to work with a system like this takes time, and you will have to be consistent and prompt with your responses. After using this system for a while your people will learn that it gets results. Just think how much easier this would have been than our opening fiasco.

Probably the single most important part of studio maintenance has nothing to do with engineering. It is communication. Learn to communicate with your co-workers and management. Let them know that the work you are doing is to help them do their jobs easier and more efficiently. When they have a complaint or comment, be sure to give them a response, not just a put-down or a brush-off. They will then be better able to understand just what it is you are doing and why you are doing it. That will lead to more confidence in you, and maybe (no promises) that long-awaited raise (or at least a good "Atta boy").

A well-planned and well-executed studio maintenance program is much more visible, and just as important, as good transmitter maintenance. Knowing your equipment and how to test it properly will help keep the plan moving, and good communication to others will keep them informed as to what you are doing.

Transmitter Site

By Ronn Nott - Nott. Ltd.
Farmington, New Mexico - (505) 327-5646

Vortex Shedding and Radio Towers

This month we'll cover a couple of topics , each of which by itself is not enough for a full column. They are somewhat related, because they both pertain to potential mechanical problems in radio towers and antennas.

First is the problem of mechanical oscillation of any tall, un-guyed structure caused by wind vortexing, When the Sears Tower in Chicago was completed in the late '60's, two large cylindrical columns were mounted on top to support all kinds of broadcasting antennas. There was concern that if either of these columns began to oscillate in a high wind, it could eventually break loose and fall with catastrophic results. The solution was to spiral wrap steel cable around the cylinders with a space between each wrap from top to bottom of the columns. Why?

When the wind blows across any smooth, cylindrical object projecting up into the sky, a vortex forms on the downwind side of the object. The smooth, rounded surface causes whirlpools or eddy effects behind it. If the wind velocity is high enough, the object will move and the vortex generates positive feedback, putting it into mechanical oscillation. A good example is a tall whip antenna on the bumper of a car. If the dimensions are right and the car speed is right, it will flutter or oscillate in the wind. All manner of things are done to break this oscillation including the following.

If the surface of the cylinder is rough rather than smooth, the vortex will be weakened and break up, so the source of the positive feedback is eliminated. That's what wrapping the cable around the columns on the Sears Tower did. It roughened the surface to break up the vortex. The antennas mounted on the columns no doubt help to some degree, but apparently the designers didn't think it was quite enough so they wrapped the cable around them. Vibration dampeners seen on some power lines and guy wires are other methods of breaking mechanical oscillation.

When you hear humming in wires or towers in the winter, it's the sound of the vortices on the downwind side of them. You can feel the vibration with your hand when you touch them. The wind is powerful, especially when it's driving a mechanical oscillator. Sometimes the vibration causes failure, due to long term fatigue.

It's just something to keep in mind if you have damage from wind and weather. If you're wondering why the elements have come off of a Yagi or other VHF of UHF antenna, maybe this will explain why. The engineers call elimination of this problem vortex shedding.

Weld your tower joints

About three decades ago, I signed on the transmitter of the AM station I was working for early on a Saturday morning. Everything was OK for about an hour, but then we began to get phone calls saying that there was another station interfering with us. Sure enough, it was there on the station receiver. In order to get away from field effects, I jumped in the car and drove about a mile away and listened. It was still there. Scanning the dial revealed the spurious signal on several different frequencies. It was identified as another station just across the Mississippi River from our station.

After quickly checking our transmitter and phasor, I called the engineer who had the maintenance contract on the other station. After courteously listening to my panicky phone call, he calmly said, "Don't worry about a thing. I'll call you in a few minutes." Sure enough, in about 20 minutes he called and asked if the problem was still there. I checked and found that all the spurs were gone and our signal was clean. When I asked what he did to fix it so quickly he said, "I just massaged the tower with a ten pound sledge hammer."

When this station was built, the joints in the tower were not welded and several years on the banks of the Mississippi had corroded the joints to the point where one or more of them would sometimes function as a diode. Then the signal from our station and their station would mix (intermodulate) and generate other products. At least that was the engineer's theory, and I have no cause to doubt him. Until someone else comes up with a better idea, that one will have to do. Banging on the tower a few times with a sledge apparently restored conductivity to the offending joint. Temporarily, that is. Welding would have been the permanent fix, but they said they couldn't afford it.

Since the entire tower functions as antenna for an AM station, it needs good, solid conductivity throughout its length. Even if they don't cause intermod as described above, poor or intermittent connections at the tower joints can cause loss, and variations and inconsistencies in the antenna impedance. Sometimes the impedance will change with a change in the weather or season. This could be caused by poor connections in the ground system, the ATU or the tower joints. All of them are electrical connections that must be tight or bonded somehow.

The only sure way to bond the tower joints is by welding. It only takes a weld bead of an inch or two on each leg, but make sure to weld each leg. Arc

(continued on page-27)

Transmitter Site

Continued . . .

welding is by far the easiest way. The ground lead of the welding machine is connected to the bottom of the tower, The tower lead and stinger are hoisted to the top of the tower and the rigger works his way down from the top, welding each joint of each leg as he comes down. After welding, the weld beads should be cleaned thoroughly and then sprayed with cold galvanizing to prevent rust.

FM towers should be welded because they can experience the same diode intermod problems as AM stations. Also, look at the tower's resistance path for lightning and static electricity. If the steel tower has a bit of resistance at each joint, that nice fat coax cable with its pure copper jacket becomes the lowest resistance path to ground. Since most of the current follows the path of least resistance, guess where the lightning current is going to go. If your tower has a low resistance to ground and your coax has several big ferrite toroids surrounding it, then maybe, just maybe, the lightning strike will go into the ground system instead of your beautiful FM transmitter.

Curiously, flange type tower joints seem to be worse about developing resistance than slip in type joints. Maybe it's just our personal experience, but it seems to be the case. All of them should be welded, though.

Do the joints need to be welded if you install a folded unipole antenna? You Bet! Par of the RF current still flows in the tower, so to have a stable consistent antenna, the joints must be welded. We have experienced some very curious effects that have been solved by welding the tower joints. Every type of AM antenna should have all the tower joints welded for best performance.

Whether AM or FM, your tower is part of the antenna system and to preserve its electrical integrity every joint should be welded to its adjacent joints. For RF, static electricity and lightning you need good continuity and conductivity throughout.

AM Signal

By George Whitaker - KSSA-AM/FM
Dallas, Texas - (214) 528-7343

Synchronous AM ... Part Two

There are several factors to consider when setting up a synchronous transmitter operation. There are technical considerations, of course. However, the first question to answer is, "What do I want to accomplish and what am I willing to give up to get what I want?"

By this, I am referring to the fact that you will want to gain audience, but you have to consider that the zone of interference will exist somewhere. The object is to get the zone to fall in an area that has the least value to you. The effect you get when a beat moves through is just like when you drive under some highlines. Except, you don't have to be moving. Thus, the worst area of the zone is, for the most part, a write-off.

In our case, we were just downright lucky in that the Trinity River floodplain and Lake Arlington were in the right place. By placing the transmitter in downtown Ft. Worth we were able, with our 210 watts, to place most of the zone in an area that is sparsely populated. The first time I set up one of these I was very proud of my planning job, in that the zone was across an airport, an industrial area, and an area of very expensive, exclusive homes that I figured would not be prime targets for the format. However, I overlooked the fact that the owner of the station lived in one of those houses. You don't want to do that!

The rules allow you to move the zone around by adjusting the power of the synchronous transmitter. It may be run at less than full authorized power, but, not more. In some cases it may be desirable to run less power than authorized in order to get the zone to fall in the area you want. By adjusting the power slightly you can move the zone a fair distance and the detectable decrease in coverage area is very slight. This was what I had to do to get the owner's house out of the zone.

The maximum allowable power will, of course, be determined by the applicable interference rules. You may choose to go directional in order to get more power. The first one of these we built ran a nightime power of 1,000 watts with a four tower array and we spent several hundred thousand dollars setting it up. However, the current site in Ft. Worth was constructed using equipment that was already on hand except a used transmitter that we picked up. The total cost on the current site was less than $20,000. The 210 watt non-directional covers the area very well and is considered by management to be one of the best investments they ever made.

Once the site is selected it is time to consider equipment needs. Obviously, the first question is, "What do we use to lock the transmitters together?" We are using a system that is not true sync. In our case, we are using a pair of precision oscillators, supplied by Harris, that will maintain the frequency to +/- 1×10^{-9} (at a constant temperature). This system works well enough to make the project worthwhile.

However, Elliot Klein of Klein Broadcasting (602-991-0575) has a system that seems to be the better way to go. He takes the primary transmitter and divides it to an audible signal which is then fed by phone line to the sync site and multiplied to drive the sync transmitter. We are currently looking toward changing to this method, at least temporarily, to evaluate the system for ourselves.

Because of the different distances from the studio to the two transmitters it is necessary to have an audio delay unit at the nearer site. We are using an Eventide PD-860. This is set such that the listener will get the audio from both transmitters at the same time. The sync system and the audio delay are the only two pieces of extra equipment necessary. We spent about $6,500 acquiring the extras.

This pretty well covers the basic planning stage. Now, lets take a look at the more technical aspects of the operation.

(continued on page-29)

AM Signal

Continued . . .

The modifications to the transmitter are actually the same as if you were installing stereo. A method for using an external exciter must be provided. In the case of our Harris SX-5 this was already built into the transmitter as it is stereo-ready. On our Collins 828 E-1 auxiliary it was necessary to add a switch to the exciter card and also use a couple of diodes to change the sine wave output of the external oscillator to a square wave.

On the used 500-H it was also necessary to modify the transmitter. Originally, I tried to go directly to the 807 RF drivers in the transmitter. However, the output from the oscillator was not sufficient to drive the 807's in the transmitter. So, I capacitively coupled into the transmitter's oscillator section just ahead of the last stage and gained the amplification necessary.

I have not detailed the modifications to the two transmitters here because they are pretty standard now for stereo. If someone would like more details on these mods, I would be happy to supply them.

In order to set up the system, it is necessary to have some location that will allow testing and adjusting while monitoring in a zone of interference. With our first site I learned that this location, in addition to being in an area of near equal signal strength, should also allow for the transmitters being at a right angle to each other in reference to your location.

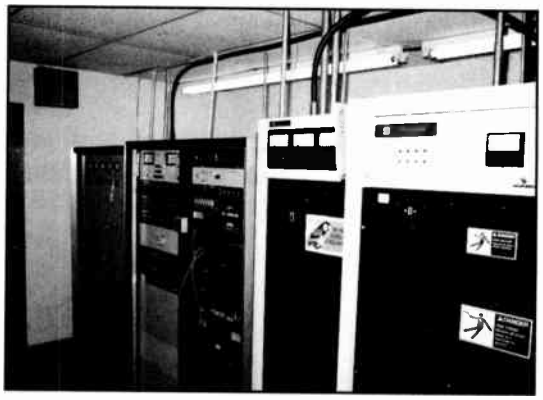
In other words, if a field strength meter is aligned on transmitter #1 and another meter is aligned on transmitter #2, they will be at right angles to each other. This allows for maximum separation of the signals when reading each transmitter individually. This arrangement is desirable for keeping up with the field strength ratio and is a must for setting your time delay. (At least using the method we devised for doing this.) There may be another way, but we didn't think of it if there was.

The method we used was to align a field strength meter with each transmitter to get as discrete audio as possible from each one. Then, the audio was fed to a dual trace scope in the X-Y mode. The time delay unit was then increased in delay time until the signals were in phase during a peak in the received signal. When the audio received from the two transmitters was in phase, we knew that the delay was as nearly correct as we could achieve.

The closer the time delay is to perfection, the less objectionable the beats are. This has the effect of making the zone of interference more confined. During this stage of our experiments, we dropped our zone from being eight to twelve miles wide to a more livable 2 to 3 miles.

Next month - experimental results.

'Scope Watching (l-r)
Bob Weirather, Harris Corp.;
Paul Strickland - KKDA, Dallas;
George Whitaker - KSSA, Dallas



KSSA, Dallas
Transmitter Site

Radio Engineer

Continued . . .

Continued from page-18 ...

- I shouldn't have lambasted the GM who bragged that his engineer could do the work of two. That 70-hours-a-week crack broke my usual cool.

- It was stupid of me to suggest that engineers report law-breaking GMs to all proper authorities. The FCC and EPA are enough.

- I still feel bad about that GM who was mistaken as a local sex offender, beat up and locked in jail. A front-page article with his 13-year old friend would have sufficed.

- I should have bitten my tongue when a GM claimed to have seen Elvis. I prefer Jim Morrison sightings.

- I wish corporate hadn't fired that one GM over my report on the PCB spill. A public decontamination would have done just fine.

- I was just kidding about those attack dogs. A little nip would have done the job fine.

- It's too bad that I ever said that the manager had only two problems: himself and himself. I was only half right.

- I shouldn't have described that contract engineering deal as a pocket full of dreams. Under the GM's leadership, it was more like a closet full of nightmares.

- I was only kidding when I said that a few GMs still quip about routinely granting staff pay increases every Feb. 29. The truth is that all managers weave that old yarn!

- I pushed my luck by telling one GM that Carnack confiscated his checkbook. The "Great One" only had commandeered his balance sheet.

- I slipped when talking about the radio station staff which labels its latest GM the "Stud Duck." I should have smoothed things over by clarifying for its current title holder the oh-so-temporary nature of the title.

- I was wrong to support that boycott of political advertising by the "Association of Ethics in Radio Station Management." After all, our politicians must remain the best money can buy.

- I was only kidding when I told a GM that the cops in his new town all had wooden legs. He was really hoping for IRS vision troubles.

- I've had sleepless nights about that untimely loud laugh at a local Kiwanis meeting. A GM actually told 50 other men that his radio station was, first and foremost, "a community service."

- The Mark Twain incident was truly unfortunate. The author described someone not unlike a typical GM as "a good man in the worst sense of the word." I should be more careful since I like Mr. Twain.

- I should have excused myself during an unwise Golden Rule debate. As I argued the canon wording was "do unto others as you would have them do unto you," management's cynical version was abruptly countered.

- I presented the wrong digital alternative to one GM. He wrote "zero" on my check.

With inspiration from musician Christine Lavin, I'm sorry that I'm not sorry about saying all of this. But, I am grateful that I'm not like them.

Author's Note:

This article was written on Jan. 20, 1991 in Washington, DC. Since July of 1990 I have often lived and worked near the White House. I want to pull from the fairly recent archives that hasty remark about "peace breaking out all over the world." That's something I really am sorry about.

Business Guide

Products and Services for the Broadcast Industry

Business Guide

Products and Services for the Broadcast Industry

FCC's Engineering
AM, FM and TV Data Bases
On floppy (or) 9-track tape

Call today to request a free sample

Communication Data Inc.
6105 E. Arlington Blvd.
Falls Church, VA 22044
703-534-0034

STANLEY BROADCAST ENGINEERING

FCC Applications - Measurements
Field Services

P.O. Box 24601
Tempe, AZ 85282

(602) 264-8752

East
BOB STEWART
404-992-2230

West
TOM BUTLER
501-253-8127

Fax 501-253-6151

ROSCOM GENERAL
BROADCAST EQUIPMENT SPECIALISTS
RF AND STUDIO EQUIPMENT

GET IT ALL WITH ONE CALL
FROM TOWERS TO TONEARMS

Consulting Communications Engineers

- FCC Data Bases
- FCC Applications and Field Engineering
- Frequency Searches and Coordination
- AM-FM-CATV-ITFS-LPTV

OWL ENGINEERING, INC.

1306 W. County Road. F,
St. Paul, MN 55112
(612)631-1338 "Member AFCCE"

Complete Service for Lightning Protection, Grounding and Power Conditioning

We Guarantee NO Strikes

Call Lightning Eliminators & Consultants, Inc.

LEC Inc.

6687 Arapahoe Road
Boulder, Colorado 80303
(303) 447-2828
FAX (303) 447-8122

GOODRICH enterprises, Inc.

Parts and technical service for all
McMartin - Transmitters, Consoles, Exciters
Modulation Monitors Calibrated
Transmitter Tubes - New and Re-Built

11435 Manderson St.
Omaha, NE 68164
Phone (402) 493-1886
Fax (402) 331-0638
Telex 940103 WU PUB TLX BSN

NORTHERN MAGNETICS
CERTIFIED TAPE HEAD SERVICES

Northern Magnetics is an industry leader in the supply and service of tape heads and tape head products.

P.O. Box 16409
Minneapolis, MN 55416

Phone: (612) 333-3071
Telex: 1561238 MPS UT
FAA Repair Station # C14-57

Contract Guide

Contract Engineering Services
For The Broadcast Industry

To Be Listed Here Call (507) 280-9668

Harnack Engineering
Kirk Harnack & Robert Benjamin
1385 Lamar Suite 5
Memphis, TN 38104
(901) 278-1306 or (800) 366-7618
Studio Design & Construction, Maintenance
STL Engineering, RF Plant Design & Const.

Electro-Labs
James Chase
RFD #3 Box 124
Angola, IN 46703
(219) 665-6427
Contract Engineering Service, Field intensity measurements for AM, FM, TV (UHF & VHF).

Boyd Broadcast Technical Services
21818 SW Columbia Circle
Tualatin, OR 97062
(503) 692-6074

Phoenix Broadcast Engineering
David Dickson
851-A East Coshise Dr.
Phoenix, AZ 85020
(602) 371-0991
12 yrs. experience in recording studio and broadcast engineering

Central Broadcast Engineering Group
Ken Ruhland
607-847-8244
Construction/Monthly contracts, Emergencies

Magrill & Associates
Kyle Magrill
P.O. Box 456
Orange Lake, FL 32681
(904) 371-4288
FCC Applications, Computerized Frequency Searches, Complete Design and Construction. Fast Service & Reasonable Rates

Send Your Tech-Tips To Radio Guide We Pay $15.00 Each For Every One Used Fax (507) 280-9143

Broadcast BBS

By Mark Shander - KNXV/Fox-15
Phoenix Arizona - (602) 243-4151

Telecommunications News:

9600 Baud modems and speed-modem combo update ...

One of the hottest debates on the subject of high-speed modems concerns 9600 baud modems, and proprietary standards for communication. The SpeedModem Combo reviewed here a couple of months ago uses a proprietary standard for 9600 baud communications. It connects at 4200 bps with or without MNP4 or MNP5 when communicating with modems from other manufacturers.

Though the SpeedModem Combo did not receive rave reviews in a previous "Broadcast BBS column, we have offered to again review a current production model, in the interest of providing CompuCom Corporation another chance for a positive review in Radio Guide

So far there has been no response to take us up on this offer. Should CompuCom decide to respond, look for another review of their 9600 baud FAX card/modem combo in the near future.

If you're interested in increasing your file transfer efficiency with the purchase of a 9600 bps modem, you might want to wait until later on this year, when the v.32 standard for 9600 baud communications becomes more widely available. We're speculating that v.32 will become the standard of choice for many broadcast-oriented computer bulletin board systems that offer high-speed connect rates. Also, speeds greater than 9600 bps will be available, and will make BBS'ing more efficient than ever!

BBS News

The Idiot Box BBS and the Spin-Off BBS, both of which were toll-free BBS's with broadcast themes, and both of which were operated by Michael White, are unfortunately no longer available. Do to a delay time between the time this column is written and the time it is published, not many of our readers were able to sample either of the systems before they became unavailable. Michael White could not be contacted for information concerning possible future access to the systems.

On the topic of toll-free BBS's, Radio Guide has learned of a BBS that is reportedly available via an 800 number, but charges for access to the system. The Minos BBS is reportedly located in Los Gatos, California, offers multi-line chat (live, typed conversation with other BBS callers), many message areas covering a variety of topics, 4 nodes (incoming lines), and access to RIME and RELAY-NET message bases. It is also reportedly using Wildcat! BBS software. The number is reported to be 1-800-477-6466. Registration is reported to be $15-$35, with the $35 rate offering unlimited, unrestricted access to the system. Efforts to verify this system resulted in a constant ringing with no answer condition.

Radio Daze recently received bank funding to go multi-node and to add more megabytes of disk storage to the system. Radio Daze SysOp Michael Shannon reports Radio Daze will be operating using an IBM-compatible 80386/16 with 1.5 gigabytes of hard disk storage and 4 nodes (incoming lines). Shannon also indicates the system will soon have over 15,000 files available for downloading, and currently offers users access to more than 70 doors (external games and features available to use whole you're on line). Radio Daze is available by calling (219) 256-2255.

The IEEE Conference, available from Burt Juda's IEEE-GATEWAY BBS in Piscataway, New Jersey, offers IEEE members and engineers the opportunity to exchange information on a wide variety of technical topics, including future standards. FIDOnet SysOps interested in carrying the IEEE echo (and the two associated IEEE SysOp-only echoes) should sent NETmail to Burt at FIDOnet Address 1:107/309 or 1:107/310.

Spectronet Professional BBS Network Grows

The second incarnation of SpectroNet, the media professionals-only BBS network, looks very promising. SpectroNet has been restructured, and is now available to all FIDOnet SysOps that would like to offer it to their users.

SpectroNet originates from the Electronic Arts BBS (1:363/61), operated by SysOp David Musick. Musick coordinates SpectroNet with his partner, Jeff Alwin.

Musick describes himself as "A 36 year old studio/video engineer (with emphasis on audio). I am working on a new business, 'Media Engineering Corporation', a company that will be providing engineering and data communication services to media facilities and independent contractors. I started in audio in 1972 touring with bands, and eventually designed and helped build studios, I got into video in 1980, and from then until now have been mainly doing audio for video, and design consultation for video, audio and film facilities. I became interested in data communications and its usefulness in both the general and media environments in 1983."

Musick describes SpectroNet's other coordinator as someone who is also very interested in sharing knowledge with media professionals, and is certainly qualified to do so. Music continues, "Jeff Alwin is a very talented video and film transfer engineer who's been practicing his trade for some 15 years now at state of the are facilities. Currently employed with Century III Teleproductions at Universal Studios, Jeff sees just about every video and audio gadget from EdiFlex off-line editing systems and D2, to New England Digital's range of synthesizer-turned-audio-work stations. Not only does he know and work in the NTSC environment, but PAL as well. If you want to know more from Jeff, you can write to him via SpectroNet, or at Fido 1:363/61. Jeff's also the guy who fields all the really tough engineering questions."

Broadcast BBS

Continued . . .

"Our knowledge and skills are what we'd like to share via Spectronet, and locally through our BBS, as well as making it possible for other media professionals to communicate with each other. It is to all of our benefits is all involved sysops include similar goals for both their systems and the network," Musick states. "The real purpose of the network is to provide communications to media folk. The network does not support areas about the media, (from a consumer standpoint) but rather areas FOR the media. Needless to say, a casual user looking for movie reviews, or consumer product reports would be disappointed in SpectroNet. In the near future we will be experimenting with placing front-end mailers in medial facilities. A training program is being developed so that non-computer types can use and benefit from the system."

Musick acknowledges that SpectroNet message bases are more likely to be added by SysOps who are already members of the FIDOnet BBS network. He adds, "SpectroNet, however, is not restricted to FIDO members. In the event of a non-FIDO system joining the network, they will be provided with a SpectroNet node list and address. Netmail to that system from systems without a SpectroNet list will have to be forwarded through a head-end system. A SpectroNet node list will be distributed to all for optional use when the number of affiliate systems reaches 20. The node list will come out each Sunday night, or as needed.

The list of message bases available to users who reach a SpectroNet-affiliated BBS include:

ACTORNET
Acting related topics

ADDNET
The subject of advertising

AGENTNET
Professional representation

ARTNET
Artist's forum

AUDIONET
Audio production and post

CABLENET
Cable Television

CHATNET
Consumer link (chat with viewer/ listener)

CHITNET
General chit-chat

DEMOGRANET
Demographics

DIRECTORNET
Topics concerning directors

DTPNET
Desktop publishing in the media

ENGINET
General engineering

FILMNET
Film (motion Picture)

FREELANET
Freelancer's forum (TV, video, film)

GRAPHNET
Computer graphics forum

GRIPNET
Grip topics

JOBMARKETNET
Employment

LPTVNET
Low power broadcast television

MANAGENET
Facilities management

MIDINET
MIDI topics

MODELNET
Models and modeling topics

MUSICIANET
Musicians forum

PHOTOGRANET
Still photography forum

PRINTNET
Writers forum (for print medium)

PUBLISHNET
The topic of publishing

RADIONET
Radio broadcasting

SCREENET
Writer's forum (for the screen)

SPECSYS
SpectroNet SysOp forum

STAGENET
Live performance topics

TVNET
Television broadcasting

TWOWAYNET
Link technology topics

UNIONET
Media union topics

VIDEONET
Video production and post

VOICEOVERNET
Voiceover and ADR topics

Encourage your local FIDOnet SysOP to contact Musick at FIDOnet address 1:363/61, concerning making SpectroNet available to you. Please feel free to send comments, questions, BBS list updates, and other information to Mark Shander Morosoff at the Broadcaster's BBS, (602) 872-9148), FIDOnet Address 1:114/91, or by writing him

Mark Shander Moroscoff
Master Ctrl. Director, KNXV FOX-15
4625 South 33rd Place
Phoenix, Arizona 85040

BBS Listing

Broadcast Oriented BBS Listings

Special thanks to Mark Leff of CNN/Atlanta for the original list.

201 769-1779
Visions Infoline II
Sysop(s): Jeff Morgan
Plainfield, NJ
BBS Type: Wildcat - Speed: 3/12/24
PC-Pursuit Code: NJNEW

201 857-8880
Rockboard
Sysop(s): Adam Curry
Verona, NJ
BBS Type: Hermes (Mac) - Speed: 3/12/2400
PC-Pursuit Code: NJNEW

203-438-9908
Orion's Nebula
SysOp: Ward Carpenter
Ridgefield, CT
BBS Type: OPUS - Speed: 1200/2400

205 859-3030
Traveler
Sysop(s): Mike Bennett
Huntsville, AL - Company: WAHR-FM
BBS Type: Phoenix - Speed: 3-2400

206 443-6170
W. Wash. Freq Coord
Sysop(s): Walt Jamison
Seattle, WA
BBS Type: OPUS - Speed: 3/12/24
PC-Pursuit Code: WASEA

206 566-1155
AmoCat
Sysop(s): Rich Langsford
Tacoma, WA
BBS Type: Wildcat - Speed: 3-9600 HST

212 415-3500
HyperCube Systems
Sysop(s): Mike Oswald
New York, NY
BBS Type: PCBoard - Speed: 3/12/24
PC-Pursuit Code: NYNYO

212 645-8673
Communication Specialties
Sysop(s): Rich Brooks
New York, NY
BBS Type: Searchlight - Speed: 12-9600HST
PC-Pursuit Code: NYNYO

214 647-0670
DFW Freq Coord Counc
Sysop(s): Darryl Doss
Allen, TX - Company: SBE Chapter 67
BBS Type: OPUS - Speed: 3-96 HST
PC-Pursuit Code: TXDAL

215 364-3324
Satalink
Sysop(s): Ron Brandt
Huntingdon Vly, PA
BBS Type: PCBoard - Speed: 12/24/9600

216 529-0121
Signal BBS
Sysop(s): Lynn Laymon
Rocky River, OH
BBS Type: PCBoard - Speed: 3/12/2400
PC-Pursuit Code: OHCLE

219 256-2255
Radio Daze
Sysop(s): Mike Shannon
Mishawaka, IN
BBS Type: GAP - Speed: 3/12/2400

301 725-1072
FCC Public Access
Sysop(s): Bob Weber
Suburban DC, MD - Company: FCC
BBS Type: custom - Speed: 300/1200
PC-Pursuit Code: DCWAS

303-341-0129
Colorado Broadcast Frequency Coordinating Committee (CBFCC)
SysOp: Jeff Brothers
Aurora, CO
BBS Type: OPUS - Speed: 2400 Baud

303-949-3253
Master Control
SysOp(s): Lynn Osburn
Avon, CO
BBS Type: OPUS - Speed: 300-9600v.42

305-828-7909
Telcom Central
SysOp: Ray Vaughn
Miami Lakes, FL
BBS Type: OPUS - Speed: 300/1200/2400/9600HST

315 474-5070
SBE Chapter 22
Sysop(s): Steve Hines
Syracuse, NY - Company: SBE
BBS Type: RBBS - Speed: 3/12/2400

317 935-0531
Allied-Radio World
Sysop(s): Bob Groome
Richmond, IN - Company: Allied
BBS Type: Michtron - Speed: 3/12/2400

402 289-2515
KFMQ 102 Connection
Sysop(s): Dan ?
Lincoln, NE - Company: KFMQ Radio
BBS Type: WWIV - Speed: 1200/2400

404 320-6202
AV-Sync Atlanta (tm)
Sysop(s): Bill Tullis
Atlanta, GA
BBS Type: PCBoard - Speed: 12-9600HST
PC-Pursuit Code: GAATL

404 982-0960
Rock & Roll Atlanta
Sysop(s): Bob Helbush
Atlanta, GA
BBS Type: PCBoard - Speed: 1200-2400
PC-Pursuit Code: GAATL

407 239-2607
Producer's Circle
Sysop(s): Skeeter Durham
Orlando, FL
BBS Type: GT Power - Speed: 3/12/2400

407 649-9834
Electronic Arts Info
Sysop(s): Jeff Alwin
Orlando, FL
BBS Type: QuickBBS - Speed: 3/12/24

408 985-8675
KOME Silent Side
Sysop(s): Greg Argendeli
San Jose, CA - Company: KOME-FM
BBS Type: Michtron(Atari) - Speed: 300/1200
PC-Pursuit Code: CASJO

412 981-3151
Mabel's Mansion
Sysop(s): Charles Ring
Sharon, PA
BBS Type: OPUS - Speed: 12-9600HST

414 873-7807
Second Opinion
Sysop(s): Mark Timpany
Milwaukee, WI
BBS Type: Wildcat - Speed: 12-96HST
PC-Pursuit Code: WIMIL

415 391-2657
NCFCC
Sysop(s): Tim Pozar
San Francisco, CA - Company: Northern Calif. Freq. Coord. Cmte.
BBS Type: RBBS - Speed: 3-2400
PC-Pursuit Code: CASFA

415 571-6160
Production World
Sysop(s): Wes Dorman
San Mateo, CA - Company: Film/Tape World Magazine
BBS Type: Red Ryder Host - Speed: 3/12/24
PC-Pursuit Code: CAPAL

415 641-4373
Information Radio
Sysop(s): Dave Evans
San Francisco, CA
BBS Type: Wildcat - Speed: 3-2400 v42
PC-Pursuit Code: CASFA

419 228-7236
Black Hole BBS
Sysop(s): Fred Vobbe
Lima, OH
BBS Type: TBBS 2.1 Multiline (8 Lines) - Speed: 3-14.4

501 753-6536
N.L.R.-80
Sysop(s): James Padgett
Little Rock, AR
BBS Type: Spitfire - Speed: 12-2400

518 283-4067
Northeast Networks
Sysop(s): John Nelsen
Albany, NY
BBS Type: PCBoard - Speed: 12/24

601 373-0160
Net-Works
Sysop(s): Herb Jolly
Jackson, MS - Company: Myers Bdcst Svcs/J&J Software
BBS Type: Galacticomm - Speed: 1/24

602 438-0459
CRL
Sysop(s): Hank Langlinais
Phoenix, AZ - Company: CRL
BBS Type: RBBS - Speed: 12-2400
PC-Pursuit Code: AZPHO

BBS Listing

Broadcast Oriented BBS Listings

602 482-1001
Catalyst
Sysop(s): David Kidder
Phoenix, AZ - Company: Take 3 Inc.
BBS Type: TBBS - Speed: 3/12/24
PC-Pursuit Code: AZPHO

602 872-9148
Broadcasters BBS
Sysop(s): Mark Shander
Phoenix, AZ
BBS Type: RemoteAccess - Speed: 3/12/2400
PC-Pursuit Code: AZPHO

608 274-7776
Communications Exch
Sysop(s): David Willow
Madison, WI
BBS Type: GT Power - Speed: 12-9600HST

616 530-0821
Trillion
Sysop(s): Dick Castanie
Grand Rapids, MI
BBS Type: Wildcat - Speed: 3/12/24

617 439-5699
Boston CitiNet
Sysop(s): JAE/Koch
Boston, MA - Company: Applied Videotex Systems
BBS Type: Yellow - Speed: 300/1200
PC-Pursuit Code: MABOS

619 298-4027
So. Calif. MediaLine
Sysop(s): Steve Tom
La Jolla, CA
BBS Type: PCBoard - Speed: 12/24/96H
PC-Pursuit Code: CASDI

703 455-1873
VideoPro
Sysop(s): Tom Hackett
Burke, VA
BBS Type: PCBoard - Speed: 3/12/24
PC-Pursuit Code: DCWAS

703 538-6540
East Coast Pub Net
Sysop(s): Charlen Kyle
Suburban DC, VA
BBS Type: PCBoard - Speed: 3-2400
PC-Pursuit Code: DCWAS

707 553-8452
KDA Message System
Sysop(s): Keith Davidson
Vallejo, CA
BBS Type: PICS - Speed: 3-2400

713 997-7575
Ed Hopper's
Sysop(s): Ed Hopper
Houston, TX
BBS Type: PCBoard - Speed: 3/12/24
PC-Pursuit Code: TXHOU

713 855-4382
Cloud Nine
Sysop(s): David Armstrong
Houston, TX
BBS Type: PCBoard - Speed: 3-96HST
PC-Pursuit Code: TXHOU
Second node at 859-8195.

713 284-1090
SBE Chapter 105
Sysop(s): Frank Rainey
Houston, TX - Company: SBE
BBS Type: PCBoard - Speed: 3-12-2400
PC-Pursuit Code: TXHOU

717 731-8966
Cat's Castle
Sysop(s): Dale Fedorchik
Harrisburg, PA
BBS Type: Wildcat - Speed: 3/12/2400

719 634-5661
ColoSprgs Broadcast
Sysop(s): John Anderson
ColoradoSprings, CO
BBS Type: TBBS - Speed: 3/12/2400

800-766-1720
Idiot Box BBS
SysOp: Michael White
Hemet, California
BBS Type: RBBS - Speed: 1200/2400

800-283-5313
The Spin-Off BBS
SysOp: Michael White
Hemet, California
BBS Type: RBBS - Speed: 1200/2400

801 967-9716
Planet Vulcan
Sysop(s): Chuck Condron
Salt Lake City, UT
BBS Type: Wildcat - Speed: 3-14.2KHST
PC-Pursuit Code: UTSLC

804 393-6390
Tidewater Media Link
Sysop(s): George Randell
Portsmouth, VA
BBS Type: PCBoard - Speed: 12/2400

804 550-3338
Flamethrower
Sysop(s): Jeff Loughridge
Richmond, VA
BBS Type: Binkley/OPUS - Speed: 3/12/24

804 973-8235
Broadcasters BBS
Sysop(s): Pat Wilson
Charlottesville, VA
BBS Type: PCBoard 12 - Speed: 3/12/24

806 352-2482
Radio Online
Sysop(s): Ron Chase
Amarillo, TX
BBS Type: PCBoard - Speed: 12-96HST
Second node at (806) 352-9365.

813 527-5666
St Pete Pgm Exchange
Sysop(s): Bill Blomgren
St Petersburg, FL
BBS Type: PCBoard - Speed: 12-96HST

818 248-3088
Hot Tips
Sysop(s): Mike Callaghan
Glendale, CA
BBS Type: Wildcat - Speed: 1200/2400
PC-Pursuit Code: CAGLE

818 363-3192
Call Sheet
Sysop(s): Wayne Parsons
Los Angeles, CA
BBS Type: TBBS - Speed: 300/1200
PC-Pursuit Code: CAGLE

818 567-6564
Hotline
Sysop(s): Jon Badeaux
Glendale, CA
BBS Type: PCBoard - Speed: 12-19.2HST
PC-Pursuit Code: CAGLE

916 338-5227
KBBS
Sysop(s): Mark Stennett
Sacramento, CA
BBS Type: QBBS - Speed: 3/12/24
PC-Pursuit Code: CASAC

916 646-3600
FM102
Sysop(s): Les Tracy
Sacramento, CA - Company: KFSM Radio
BBS Type: QuickBBS - Speed: 300/1200
PC-Pursuit Code: CASAC

916 646-9358
Scratching Post
Sysop(s): Stacy Rothwell
Sacramento, CA
BBS Type: QuickBBS - Speed: 3/12/24
PC-Pursuit Code: CASAC

916 728-5700
Entertain-Net
Sysop(s): Les Tracy
Citrus Heights, CA
BBS Type: TBBS multiline - Speed: 3/12/24
PC-Pursuit Code: CASAC

918 437-9004
The Radio BBS
Sysop(s): Clark Dixon
Tulsa, OK
BBS Type: QuickBBS - Speed: 2400

919 481-2947
Recording Studio
Sysop(s): Greg Nowak
Cary, NC
BBS Type: WWIV - Speed: 3/12/24
PC-Pursuit Code: NCRTP

Don't Be Invisible

If you have a BBS, and it's not listed here, call Radio Guide at (507) 280-9668 and we'll get it on the list.

If you discover any errors or problems with any of the boards listed here, let us know that too.

Computer Connection

By Kelly Klaas - KEZJ
Twin Falls Idaho - (208) 733-7512

As I am writing this for preparation for the February issue of Radio Guide, it is the first part of January. There are several inches of snow on the ground. It is cold and miserable. Although with the temperatures in the mid 20's, we are counting our blessings after enduring minus 25 degree temperatures during the holidays. It's interesting that in the summer when temperatures are in the 90's and it cools off to the 60's, we freeze our buns. In the winter, when we are acclimated to below zero temperatures and it warms up to the 20's, we feel like dragging out the Bermuda's and sipping the lemonade under our favorite tree. It's all in what we get used to.

Actually, I have a motive for saying all this. It's what we get used to on our computers. My first computer was a Radio Shack Color Computer that I purchased back in about 1982. One of my first BASIC programs I wrote was one to calculate the length of an antenna based on the frequency. It consisted of only a few lines of code but the results were astounding. When the correct answer appeared on the screen, I felt like I had conquered all the diseases known to man.

As time went on, my programs became more sophisticated and complicated. I was certainly learning the basics of BASIC. Soon I was no longer satisfied with the results of that simple program. I began to desire longer, more sophisticated programs that would not only tell me how long my antennas should be, but how to build the radio to drive the antenna.

Today, I can go back to my original ten line BASIC program and look at its simplicity. I can also go to another directory in my IBM compatible computer and draw a schematic of a radio to drive that antenna. To return to the simplicity of that original ten line program almost seems like a sacrilege to modern technology.

Get it in the Guide

I guess a good comparison would be to buy a Rolls Royce Silver Cloud and use it only to drive up to the transmitter site on the mountain once a week. Yet, it is the simplicity that drew me to computers in the first place.

Computers can make our jobs as engineers so much simpler, and yet so much more complicated. It's the simplicity I like to dwell on, and leave the complicated-ness (is that a word?) to the psychiatrists. Read on, and I will show you some simplicity.

I broke one of my resolutions by the first week of the new year. I cleaned up my den at home. I found disks and programs that I forgot I had. I came across one disk that had several BASIC programs for broadcasting. I thought "what a great subject for my next column in RG." I loaded up GWBASIC and started exploring my new-found treasure.

I tried one program that figured VSWR on a transmission line. It would calculate VSWR from the forward and reflected power. It would also calculate reflected power from the forward and the VSWR. It would even calculate the percentage of reflected power for a specified VSWR.

Let's face it. If the situation should arise that we needed these figures, we could drag out the manuals and look up the formulas. Then we could figure the results. But isn't it so much easier (and fun) to let the computer do it?

The same program also calculates the length of an antenna based on the operating frequency. Naturally I had to see if our AM tower was the correct height for 1450 kHz. The program was so simple to use I almost felt guilty.

Another program would calculate the STL signal path in miles, given the transmitter and receiver coordinates. This program would be handy if you design and build microwave sites. Many of us inherited the sites we have and have no particular use for such a program. However, it is fun to enter the figures and compare the results with the actual figures.

One program on the disk was a real eye opener. It would calculate third order harmonic products at a communication site. Our FM station is on a butte with many other radio and television services. I entered 4 known frequencies, and the results were 12 different harmonic frequencies for just the 4 entered. I can't begin to imagine how many frequencies it would calculate if I fed in all several hundred frequencies radiated from that hill. Is it any wonder we have strange noises coming from our radios at some time or another?

Granted, it is not often you need to calculate these figures. But when you do, it's good to know you have a tool to do the work. It is from these humble beginnings that large and sophisticated programs are born. It is these simple programs that lured many of us into the world of computers. How many of us, who have had a computer for any great length of time, have not written a simple basic program to do simple calculations? It is almost as easy to calculate the length of an antenna in my head, but I still retreat to the computer for the exact calculations...if for no other reason than to help justify my investment.

When I have started writing a program, whether it be in BASIC or a database application, I have always revised it many times into a bigger and better program. Sometimes I abandon the project because I find another program that does the job even better. Sometimes I tuck it away only to bring it out on the few occasions I need to know what it can tell me.

Our computers are tools of the trade. They are like a hammer that can be used to pull a single nail from a board, or to build a huge house. Because we use them for a simple or sophisticated application really has no basis on which to justify their existence. The satisfaction I get from completing large and sophisticated programs today in no way compares to the feel of accomplishment I got when I wrote my first BASIC program on that Color Computer back in 1982.

Take the RS 2000 $50.00 user test drive!

"What do I get if I buy an RS-2000?"

You get a better cart machine, with phase correction, front panel azimuth adjust, three cue tones, fast forward, splice finder, timer, the industry's first flutter correction, DC motor, massive deck plate, excellent audio specifications. . . and you'll save hundreds of dollars over competing brands!

"And if I still prefer an older brand?"

We'll refund your money, PLUS a check for $50.00. . . just for trying ours first.

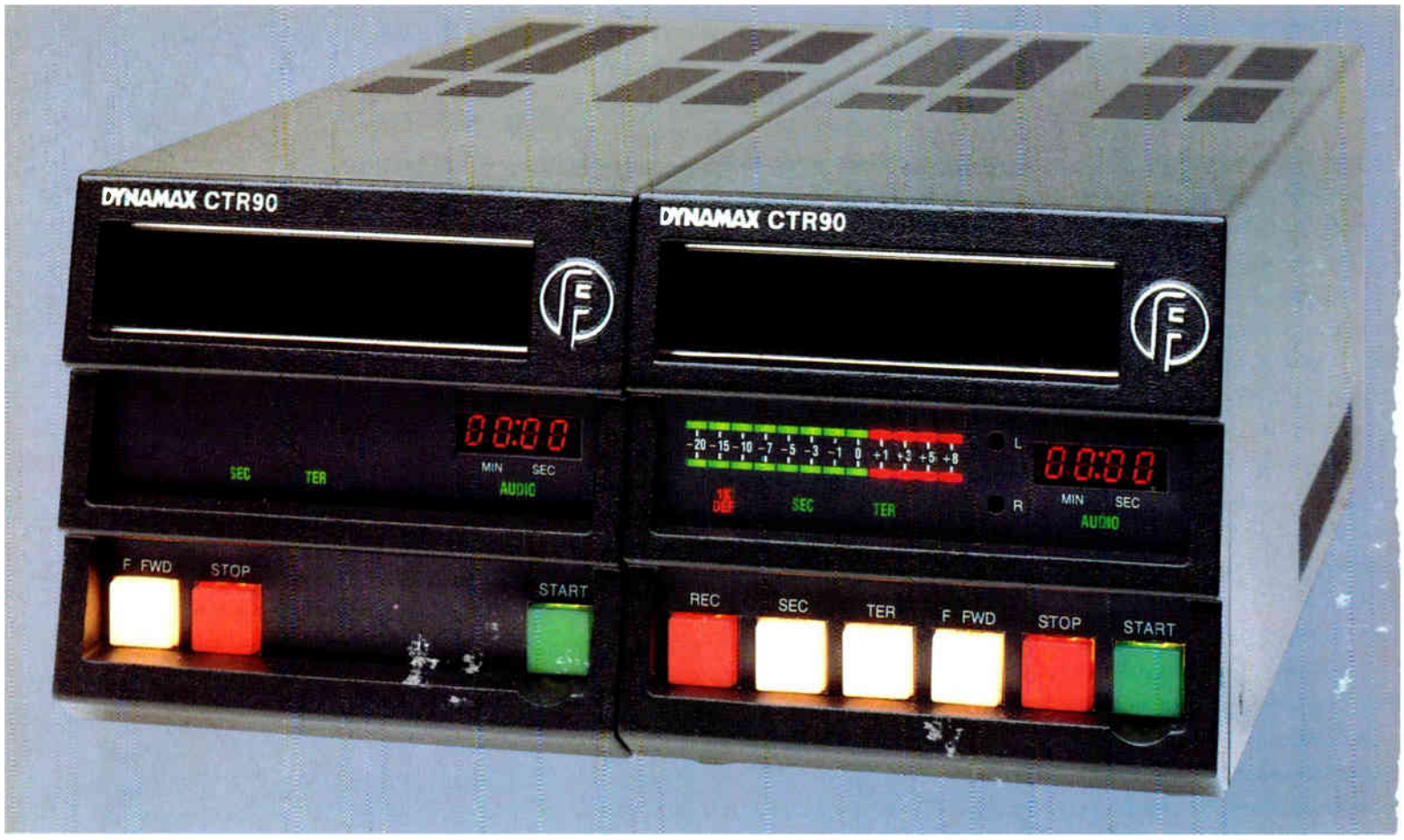
"Why is Radio Systems doing this?"

Because, just like the auto makers say, we think that once you try the RS-2000, you won't want any other cart machine. It's that good a machine! But even if you do return the RS-2000, you'll receive $50.00 as our way of saying thanks.

The small print: *Test drive a RS-2004 Stereo Record/Play cart machine for up to 30 days. And if you still prefer another brand, return the RS-2000 in mint condition and include a proof-of-purchase for a qualifying new stereo record/play cart machine purchased and delivered within 30 days of RS-2000 return. We'll refund your money plus $50.00. Qualifying machines include all new stereo record/play models from ITC, Fidelipac, Pacific Recorders, Otari, and the Phase-Trak and Dura-Trak lines from Broadcast Electronics. Complete rebate rules are available from Radio Systems; offer subject to change without notice.*

Model RS-2004 Stereo Record/Play

RADIO SYSTEMS INC. 110 High Hill Road □ P.O. Box 458 □ Bridgeport, NJ 08014-0458 □ 609/467-8000 □ 800/523-2133 □ FAX 609/467-3044



The New Dynamax® CTR90 Series Sounds as good as CD on the air

With a -81 dB signal to noise ratio, the new Dynamax CTR90 Series is the best piece of equipment that we have ever built. And, we're convinced, the best cartridge machine ever built. What's more, the CTR90 Series outperforms other elements of the broadcast chain, including typical STLs, exciters, transmitters, and even the best audiophile quality receivers.

In addition to Dolby HX Pro™ Headroom Extension and DNR® Dynamic Noise Reduction, the CTR90 Series provides many useful features including Extended Scale VU/PPM Metering, a Real Time Minutes & Seconds Timer, Active Balanced Inputs & Outputs, and both XLR and "D" type Input/Output Connectors. All models are ruggedly constructed to Dynamax standards, with toroidal transformer based powering, constant current solenoid drive, DC/PLL motor control, and an improved high stability Head Bridge with non-interactive adjustments.

And, believe it or not, the new and fully loaded Dynamax CTR90 Series is about the same price as our CTR10 Series, the most widely accepted cartridge machine worldwide for the past 4 years. So, if you want top value, and cartridge performance comparable to CD, try the Dynamax CTR90.

Call your Dynamax Dealer or Fidelipac for a complete CTR90 Series brochure.

DYNAMAX®
BROADCAST PRODUCTS BY FIDELIPAC

Fidelipac Corporation ☐ P.O. Box 808 ☐ Moorestown, NJ 08057 U.S.A. ☐ TEL 609-235-3900 ☐ FAX 609-235-7779 ☐ TELEX 710-897-0245

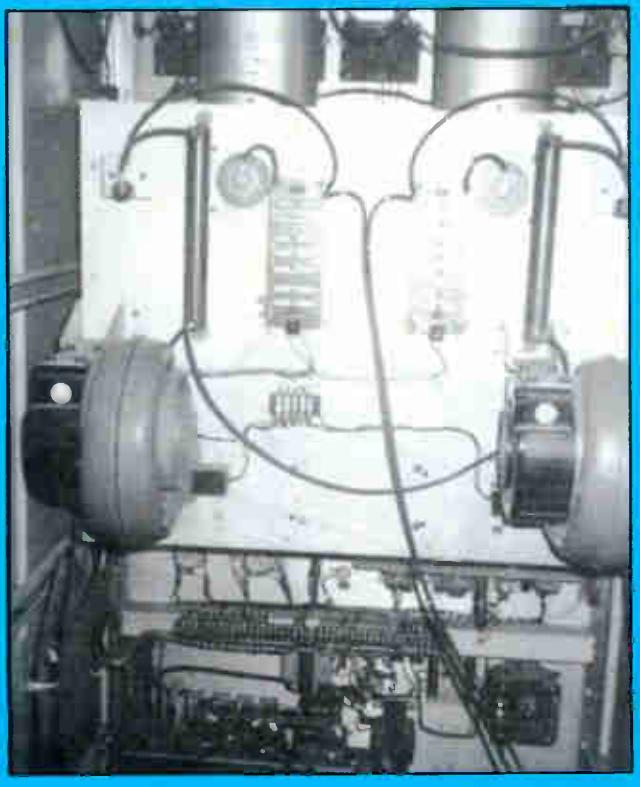
CTR90 Series Signal to Noise Ratio
-81 dB, "A" Weighted, referenced to 250 nWb/m, with DNR active. -70 dB, "A" Weighted, referenced to 250 nWb/m, with DNR inactive.

Dolby HX Pro Headroom Extension originated by Bang & Olufsen and manufactured under license from Dolby Laboratories Licensing Corporation.

DNR is a registered trademark of National Semiconductor Corporation under U.S. Patents 3,678,416 and 3,753,159.

Equipment Guide

February - 1991



Equipment Guide

Radio's Most Effective Classified Ads

1. **Copy the classified ad form on the next page.**
2. **Send as many forms as you like -- no limit. Please use a separate form for each category of equipment.**
3. **Check the proper categories on each form.**
4. **Fill in your name, etc., on each form.**
5. **Mail your forms to P.O. Box 7001, or Fax them to (507) 280-9143**
6. **Send no money -- your ads are free!**

Fax It Today!

(507) 280-9143

Equipment Guide

P.O. Box 7001
Rochester, MN 55903
Fax (507) 280-9143

Name: _____ **Station:** _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone: _____ **Fax:** _____

Equipment Categories: (check one) ○ Buy ○ Sell

- ○ Antennas, Towers, Coax
- ○ Automation Equipment
- ○ Audio Tape: Reel, Cart, DAT, Cassette
- ○ Audio Source: HD's, CD's, TT's, Mikes
- ○ Audio Control: Consoles, Mixers
- ○ Audio Processing & Equalization
- ○ STL, RPU, TSL, Remote Control
- ○ AM Transmitters
- ○ FM Transmitters
- ○ AM/FM Exciters, SCA & Stereo Gen.
- ○ Test and Monitor Equipment
- ○ Sound and PA Equipment
- ○ Tubes and Components
- ○ Satellite Equipment
- ○ TV and Video Equipment
- ○ Misc. RF Equipment
- ○ Misc. Audio & Telco Equipment
- ○ Misc. & Computer Equipment

Ad Copy Below: (Use Extra Form for Each Category)

_____

_____

_____

_____

_____

_____

_____

_____

_____

February- 1991

Antennas, Towers, Coax, Connectors, Etc.

200-feet Rohn 45G tower. One year old, new condition, on ground, in dry storage. Has not been painted, no lighting available. You Ship. $1,800

190-foot Rohn self-supported tower. Section 12NH, 11N, 10NH, 8N, 6N, 5N, 4N, and 1/2 of 3WN. Has not been painted, excellent condition, on ground. All hardware and cross sections. You ship. $7,000

Adam Wantuck - WAZY-FM
1975 E. Sunrise Blvd.
Ft. Lauderdale, FL 33304
305-463-9299

2-bay ERI "Roto-tiller." Tuned to 93.7 mHz. Rated at 25kW. $1,700

Gene Faltus - WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

Two 20-foot sections of Rohn 65 tower. $300 each.

Ten 20-foot sections of Rohn 80 tower. $400 each.

Two sections of 6-inch coax. (1) 130-foot, and (1) 120-foot.

Elvis Moody - KJEM
216 North Main
Bentonville, AR 72712
501-273-9039
Fax 501-273-9030

JSCP-6R FM antenna on 89.5 mHz. Factory tuned and tested with warranty. $16,000

JSLP-2R FM antenna on 95.9 mHz. Factory tuned and tested with warranty. $4,100

1100-10D antenna on 89.9 mHz. You pick up at Amarillo. $1,000

6812-4 antenna on 88.5 mHz. You pick up at Amarillo. $400

Bird 25kW, 31-27-055 watt meter system. $845

Dielectric 5900, 5kW dummy load. $2,000

Tim Hawks
P.O. Box 7630
Amarillo, TX 79114
806-372-4518

Shively 6810, 6-bay FM antenna on 103.3 mHz. $600 or best offer.

Doug Hainer
WCRF
9756 Barr Rd.
Cleveland, OH 44141
216-526-1111
Fax 216-526-1319

ERI 2-bay FM antenna tuned to 106.3 mHz.

P.D. 2-bay antenna tuned to 92.1 mHz.

Olen Booth
J.E.S.
200 Meadow Lark Dr.
Starkville, MS 39759
601-324-6934
Fax 601-324-1170

Trusconn 254-foot self-supporting tower. this is an older heavy tower with base insulators, suitable for AM broadcasting. Needs lighting. Make and offer F.O.B. Des Moines, Iowa.

Jeff Hansen
KDMG-FM
100 Court Ave. Ste. 103
Des Moines, IA 50309
515-282-1033
Fax 515-282-1062

SWR SFW-12 12-bay FM antenna tuned to 91.7 mHz. 3 years old, used 9 months, pressurized on the ground for 8 months. Asking $15,000 or best offer.

Ron Brown
KVTT
3737 Red Bluff Rd.
Pasadena, TX 77503
713-473-5585
Fax 713-477-5657

Andrew HJ12-50J coax. 780-feet of 2-1/4" air dielectric. Never used, on original reel. Includes 3-1/8" EIA flanges. Priced to sell!

Bob Dean - KXKT
1108 Douglas St.
Omaha, NE 68102
800-736-3835

Phelps Dodge CFM-2P 2-bay FM antenna on 107.1 mHz. $475.

Phil Wells - KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

TRANSCOM CORP.

Fine used AM & FM Transmitters and also New Equipment

The best deals on: **Celwave Products**
Andrew Cable
Shively/Comark Antennas

1978	CCA 2500R, 2.5 kW FM
1983	Wilkenson 10000E, 10 kW FM
1971	Harris FM20H3, 20 kW FM
1976	RCA BTF-20E1, 20 kW FM
1975	Collins 831G2, 20 kW FM
1986	Continental 314R1, 1 kW AM
1974	Harris BC1H, 1 kW AM
1981	McMartin BA-2.5K, 2.5 kW AM
1977	RCA BTA 5L, 5 kW AM
1966	Continental 315B, 5 kW AM
1980	Harris FM10K, 10 kW FM
1980	McMartin BA-5K, 5 kW AM
1972	CCA AM5000D, 5 kW AM
1980	Continental 316F, 10 kW AM
1972	Harris FM20H3, 20 kW FM
1976	CCA AM 50,000, 50 kW AM
1972	RCA BTA-10U, 10 kW AM

201 Old York Rd.
York Plaza Suite 207
Jenkintown, PA 19046

215-884-0888 or 800-441-8454

Fax No. 215-884-0738

125-feet 9913 coax. Brand new, will ship anywhere in U.S. for $65.

Chris Daniel
HCR #9 Box 28C
Mena, AR 71953
501-394-6654 or
501-394-1450

---

4) Andrew 3-1/8" flange connectors. Type 78ARF, new, still in boxes. $300 each or $1,100 for all plus shipping.

Randy Kerbawy - WTNJ
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Automation Equipment

IGM Automation system:

2) IGM GO-Carts, 48-tray with mono heads and stereo electronics. $900 each.

"Basic-A" automation control system includes: 3000 event memory; video monitor; log printer; remote control; 13 source cards including 2 live/net and one relay control cards; 2 FSK logging systems; an IGM EN system with Televideo terminals and IGM PAL system with Teletype terminal. This system is 12 years old and was operating when taken out of service. Make an offer for part or all.

Darrel Gander - KDUZ
P.o. Box 10
Huntchinson, MN 55350
612-587-2140
Fax 612-587-5158

Complete SMC Automation System:

ESP-2 automation Controller with memory expanded to 8000 steps.

USI-1 universal satellite interface.

5) Carousel model 452's (stereo cart player).

2) CH4-ESPR control heads.

DT1-1 interface.

DT-5 data terminal.

PSB-3A power supply with battery.

3) Autotronics video monitors.

3) Equipment racks.

All associated cables.

Full system used less than 2 years, Carousels less than 6 months.

Cost $37,000 new, asking $20,000.

Glenn Simmonms
WWNK/WSAI
2601 W. 8th
Cincinnati, OH 45204
513-471-9465
Fax 513-251-9550

Harris 9000 series automation with CRT and keyboard includes: (5) ITC 770 reel-to-reels in excellent condition; (3) IGM 48-tray Instacarts (mono) in excellent condition. Includes (4) mounting racks.

Greg Harper
WSTV/WRKY
320 Market St.
Steubenville, OH 43952
614-283-4747
Fax 614-283-3655

---

2) SMC RS Carousels. $400 each.

2) Schafer Audiofile A2's. $2,500 each.

Source cards for Cetec 7000.

Old Schafer automation controller. $300

Elvis Moody
KJEM
216 North Main
Bentonville, AR 72712
501-273-9039
Fax 501-273-9030

BE "Sat-16" automation unit. Complete automation includes: Triple-deck; (3) SMC Carousels; (6) reconditioned reel-to-reel units; processor; remote input and more. $6,900 or best offer.

Phil Noble
KLEN
1416 Bradley Ave.
Cheyenne, WY 82001
307-637-5555
Fax 307-634-8031

Micro-probe MP-100 48-position, 8-source, automation controller. 3 years old, excellent condition, replaced by satellite format. Includes (4) Ampex 445B machines in beautiful wall custom cabinet, with pre-amps and 25 Hz tone detectors. $4,500 complete, you ship.

Hal Kneller - WKII
3151 Cooper St. #56
Punta Gorda, FL 33950
813-639-1112
Fax 813-637-6187

---

5) 350 RS Carousels. $600 each.

1) 350 RSC Carousel for parts. $400

3) 250 RSC Carousels. $450 each.

6) Equipment racks. $225 each.

1) Revox A77. $300

Plus many other items including a complete DP-1 Programmer, AS-20 Switcher, tone sensor, etc.

Ed Dulaney - KYKK-AM
619 N. Turner
Hobbs, NM 88240
505-397-4969
Fax 505-393-4310

M.W. Persons Programmer. Like new. $700

5) Otari ARS-1000 reel decks in good condition. $750 each or $3,500 for all.

Paul Wolf - WZCR
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

Total SMC Automation:

SMC DAS-6/12 digital audio switcher

2) SMC CH4 programmer

2) Magnavox computer monitor 80

SMC MSP-12

3) SMC mono Carousels

Racks, cables, etc. Looking for negotiable offers.

Patrick Berger - WNAM
1413 S. Commercial St.
Neenah, WI 54956
414-727-2040
Fax 414-722-0211

---

3) Shafer Audiofile 2A automatic cart playback systems. Some modules working, some for parts. Each system 48-tray. Best offer or trade for (4) Schafer 901/903 ITC premium line cart I/O cards.

Terry Jordan
WFNC
P.O. Box 35297
1009 Drayton Rd.
Fayetteville, NC 28303
919-864-5222
Fax 919-864-3065

Spartamation 1052 program controller.

Lou Maeirhofer - WTGC
101 Armory Blvd.
Lewisburg, PA 17837
717-523-3271

---

2) SMC 250RD mono Carousels in very good condition. $600 each.

Mark Persons
218-829-1326
Fax 218-829-2026

Xtel AF-11R printer in good condition. $100

Xtel AF-11R printer for parts. $50

Rackmount for Harris 90 cart recorder. $25

Rackmount for Harris 90 cart playback. $25

Mark Persons
402 Buffalo Hills Ln.
Brainerd, MN 56401
218-829-1326
Fax 218-829-2026

MEI Satmaster satellite programmer.

2) SMC 425 stereo bi-directional Carousels.

Cables manuals included good condition, just removed from service. 5 years old but has had very little use. $8,000 for all plus shipping. Don't want to sell separately.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Audio Tape: Reels, Carts, DAT Cassette

Crown reel to reel model BX-801. Make offer.

Ampex reel to reel model 300. Make offer.

Dwight Morgan
KJEY/KNZZ
1360 E. Sherwood Dr.
Grand Junction, CO 81501
303-241-9230

Tascam #34B, 4-track reel with 4-track board. Less than 250 hours of use. $1,300 or will trade for 5-pot LPB board or equal.

Olen Booth
I.E.S.
200 Meadowlark Dr.
Starkville, MS 39759
601-324-6934
Fax 601-324-1170

Armstrong Transmitter

Finest Rebuilt Transmitters

The leading re-manufacturer of transmitters worldwide

Tuned and tested on your frequency - Guaranteed and installed
Completely re-manufactured - Expedited service available

AM Transmitters

Power	Make	Model
250W	GE	250
1kW	Gates	BC1E
1kW	Gates	BC1F
1kW	Gates	BC1T
1kW	Gates	BC1J
1kW	CCA	1000D
1kW	Collins	820D1
1kW	McMartin	BF-1K
1kW	Sintronics	S-1-A
1kW	Harris	MW-1A
1kW	Gates	BC-1G
5kW	Gates	BC-5B
5kW	Gates	BC-5E
5kW	RCA	BTA-5T
5kW	RCA	BTA-5H
5kW	Collins	21E
5kW	RCA	BTA-5L
5kW	Harris	BC-5H
5kW	Wilkinson	5000E
5kW	Collins	820E/F
5kW	Gates	BC-5P2
10kW	RCA	BTA-10K
10kW	RCA	BTA-10H
15kW	Sintronics	S-1-15A
50kW	RCA	50G
50kW	RCA/Canada	50kW
50kW	Continental	317B

- Trade-ins Accepted -

FM Transmitters

Power	Make	Model
250W	Collins	731A
1kW	Gates	FM-1B
1kW	ITA	1000B
1kW	TA	1000C
1kW	RCA	BTF-1D
1kW	Collins	830D1
1kW	RCA	BTF-1E
2.5kW	Continental	814R2
3kW	Sintronics	S-3-E
3kW	CCA	3000D
3kW	RCA	BTF-3B
5kW	Harris	FM-5H3
5kW	CCA	5000D
10kW	RCA	BTF-10D
10kW	Collins	830F
10kW	RCA	BTF-10E1
10kW	Gates	FM-10B
10kW	Harris	FM-10H
20kW	CCA	20,000E
20kW	Collins	831G
20kW	Harris	FM-20H
20kW	RCA	BTF-20E1
25kW	CCA	25,000E
25kW	Collins	831G1B
25kW	CCA	25,000W
25kW	Wilkinson	25000
25kW	McMartin	BF25K
30kW	McMartin	BF30K
40kW	RCA	BTF-40E

Armstrong Transmitter Corp.

5046 Smoral Rd. Syracuse, NY 13031
Phone 315-488-1269 Fax 315-488-1365

12) Audio Lab tape degaussers, model HP-13064A. new, in package, excellent condition. $45 each.

Michael Murphy
Surplus Materials Inc.
11621 Valle Vista Rd.
Lakeside, CA 92040
619-561-2726

450-500 Aristocarts. Some orange, some black. Very few usable, all are rebuildable.

Bill Bowlin
WMNI/WMGG
1458 Dublin Rd.
Columbus, OH 43215
614-481-7800
Fax 614-481-8070

Magnecord 1021 mono 7" reel deck. Rack mount, needs minor work.

Richard Hardy
Richardy Productions
3239 S. 90th E. Ave.
Tulsa, OK 74145
918-627-2937

Spotmaster 10-spot. Fair condition, needs work and parts. $200

ABC "Carousel." New, but incomplete. Missing heads and trays. $250

Infonics open-reel duplicator. Full-track, 30-IPS, 3 copies per pass. $250

Infonics open-reel duplicator. 2-track, 30-IPS, 3 copies per pass. $250

Auditronics AV123-4TS open-reel duplicator. 1/4-track, 3 copies per pass. $250

Soundscriber logger in fair condition. $50

6) RCA RT-7 cart players in good to poor condition. All or part, best offer.

3) RCA BA-7 cart record amps for RT-7. Good to poor condition. All or part, best offer.

3) Magnacord PT-6. Full-track; (2) stereo. Need work, all or part, best offer.

R. Meyers
Benchmark Comm.
4700 SW 75th Ave.
Miami, FL 33155
305-995-1717

Scotch Carts. (21) 201/2 min.; (100) 3-1/2 min.; (11) 4 min.; (339) 4-1/2 min.; (224) 5-1/2 min.

Ronald Steenway
WKLQ
60 Monroe Center
Grand Rapids, Mi 49503
616-774-8461
Fax 616-774-0351

---

140) Cases of 8206 slow logger tape.

12) 10-1/2" reels in boxes. One pass used per reel, stored in AC environment. Tapes are 3, 4, and some 5 years old. $2.50 per reel or $25 per case. You ship.

Adam Wantuck
WAXY-FM
1975 E. Sunrise Blvd.
Fort Lauderdale, FL 33304
305-463-9299

Ampex 440A 1/2-track deck. $400

Ampex 440B 1/2-track deck. $1,000

Both in excellent condition with low hours.

Doug Walter - WSMC-FM
P.O. Box 870
Collegedale, TN 37315
615-238-2905
Fax 615-238-3001

ITC model SP, mono playback deck. $300

Harris/Gates model 994-6701002 mono playback deck. $300

Harris/Gates play/record deck missing record head. $300

All in working order when removed from service. You pay shipping.

Griffin Broadcasting
KERV/KRVL
301 Junction Hwy. Ste. 333
Kerrville, TX 78028
512-896-1230
Fax 512-792-5555

---

2) Gates Criterion-80 mono cart decks. Playback only, no reasonable offer refused.

Sam Bonacci - WDIG
P.O. Box 970
Steubenville, OH 43952
614-264-4731

Spotmaster 2000 record/play cart deck. Best offer.

Spotmaster 2000 playback deck. Best offer.

Larry Filkins - KNGX-FM
Rogers State College
Claremore, OK 74017
918-341-7510 (ext. 201)

FM BROADCASTERS!!

We can meet all your FM transmitter needs!!

SOLID STATE - LOW POWER

Amplifiers and transmitters are available at the popular levels of 30W, 100W, 300W, 500W, and 1KW. All units are solid state, broadband, and designed for both local and remote operation.

ONE AND TWO TUBE HIGH POWER

Medium transmitters with broadband solid state drivers and one zero bias grounded grid triode in their PA are available at 1.5KW, 3.5KW, 5.5KW, 7.5KW, and 12KW. Higher power transmitter utilizing two grounded grid triodes (one as a driver) are available at standard outputs of 15KW, 22KW, 25KW, 30KW, 40KW, and 50KW.

Energy-Onix

752 Warren Street Hudson, New York 12534

(518) 828-1690 FAX (518) 828-8476

A Wise Enterprise

New Audiopak carts. Various lengths, over 4,000 in stock. $2.50 per cart. Order all or some.

Richie Allen
TM Century Inc.
14444 Beltwood Parkway
Dallas, TX 75244
800-879-2100
Fax 214-934-8511

---

2) Scully 270 2-track playback decks. $300 each.

2) Scully 280 2-track playback decks. $350 each.

2) ITC 750 2-track playback decks. $375 each.

2) ITC 760 2-track playback decks. $375 each.

2) Telex Magnecord 1021 R/P units. $100 each.

200) Gray Fidelipac carts. $1.00 each.

2) Spotmaster 500B R/P decks. $350 each.

Elvis Moody
KJEM
216 North Main
Bentonville, AR 72712
501-273-9039
Fax 501-273-9030

---

2) BE 1070 stereo play cart machines. One record.

Numerous "can" modules for Criterion I cart machines: power supplies, cue, pgm amps. $25 each.

Hal Kneller
WKII
3151 Cooper St. #56
Punta Gorda, FL 33950
813-639-1112
Fax 813-637-6187

---

3) ITC SP playback decks. Mono with tones. In service now.

Bob Evans - WQXB
P.O. Box 946
Grenada, MS 38901
601-226-1400
Fax 601-226-4679

BE 5300 mono cart. 3-play with manual. $800

Steve Karwan - KCMJ-AM
490 South Farrell #C202
Palm Springs, CA 92262
619-320-6818
Fax 619-320-1493

SMC mono R/P cart deck in good condition. $500

5) ARS-1000 Otari reel decks. Good condition, new heads. $7650 each or 3,500 for all.

3) ITC Omega mono cart decks. Fast cue, like new. $750 each.

ITC Omega mono R/P cart deck. Fast cue, like new. $950

5) ATC mono (rack mount) mono cart decks. Like Criterion-80. $125 each.

Paul Wolf - WZCR
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

Tascam 32 tape deck. New in factory sealed box. 10-1/2" reel capacity. $1,000

C. Onan
51 Crandall St.
Glens Falls, NY 12801
518-798-4739 after 5 p.m.

Telex RP-85 slow speed logger reel deck. $800 or best offer.

ITC ESL-IV bulk eraser splice finder. $500 or B.O

Gary Fullhart - WVKS-FM
4665 W. Bancroft
Toledo, OH 43615
419-531-1681
Fax 419-536-9271

Gates 55 cart handler. $55 F.O.B. my garage, plus shipping.

200) Carts. Entire lot for $100.

Dick Palmquist - KDNO
1305 Glenwood
Delano, CA 93215
805-725-2345
Fax 805-725-2609

ITC stereo RP with 3 tones. Program amp card needs repair, otherwise in good condition. Asking $800 or best offer.

Jeff Hansen - KDMG-FM
100 Court Ave. Ste. 103
Des Moines, IA 50309
515-282-1033
Fax 515-282-1062

---

2) BE 10-spots. One in box, one used heavily in automation. Best offer for one or both.

Ampex 601 and 602. (3) of each in case. May be rack mounted.

Lou Malerhofer - WTGC
101 Amory Blvd.
Lewisburg, PA 17837
717-523-3271

ITC 99B mono cart recorder. $1,650

ITC RP mono cart recorder (3 tones). $775

UMC 11-113 mono reproducer (3 tones). $375

3) ABCO wire cart racks on floor stands, holding 500 carts each. $225 each or all for $600.

500) Scotchcart II's with soft-A/C library well recorded in stereo. $2.00 each or $950 for lot.

Set of LEL alignment gauges for Ampro cart decks. $15

Ampex 350 stereo recorder. $375

Pair of Inovonics 370 R/P electronics. $375

MCI JH-110B FT stereo for 14" reels. In metal rollaround cabinet. $2,375

Phil Wells - KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

Scully 280B mono R/P reel deck in good condition. $350 plus shipping.

2) ITC 750 stereo R/P reel decks. $300 each or $500 for both.

3) ITC SP stereo cart decks. $500 each, plus shipping.

ITC mono cart R/P. $600 plus shipping.

Lazy-susan cart rack. 500 cart capacity. $350, you pick up.

Spotmaster R/P. $100 plus shipping.

Bob Statham - WHGL
1000 Alice Ave.
Stuart, FL 34994
407-692-1000

Reel Decks:

Tapsonic TRS70 2-track. $300

Teac A7030 2-track. $350

Teac A3300SXZT 2-track. $350

Tascam 34, 4-channel. $800

Tascam DX4D N.R. unit. $300

Teac A3340SX channel. $800

Teac A505 tube type. $300

Akai 4000D. $100

Sony TC650D. $130

Teac A4010 (used). $100

Cassette Decks:

Sharp APSS. $100

JVC CD1636 (new). $200

John Parsons Sr.
10375 Cannas St.
N. Huntongdon, PA 15642
412-863-9590

2000) Fidelipac 300 (gray) carts. Various lengths, various conditions, from new to good for parts. $0.50 each plus shipping.

Randy Kerbawy - WTNJ
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Audio Source: CD, TT, Mikes, Hard Disks

2) Metron turntables with tone arms. $50 each or pair for $80, plus shipping.

2) Russco Cue-Master turntables with tone arms. Mounted on table with folding legs. $150 plus shipping.

Chuck Larsen
KAMI-AM/FM
835 Meridian St.
Cozad, NE 69130
308-784-1580

Technics SP-15 turntable. Best offer

Technics SL-D1 turntable. Best offer.

Alex Bowab
WDLT-FM
2402 Wolf Ridge Rd.
Mobile, AL 36618
205-344-3698

---

3) Harris 3-speed rim-drive turntables with Micro-Trak 303 tone arms. $115 each.

2) Sparta 2-speed rim drive turntables with tone-arms. $100 each.

6) Harris mono TT pre-amps. Late model, solid state. Use 2 for stereo.

Bill Brown
WSWR
47 E. Main St.
Shelby, OH 44875
419-347-9797

Harris CB1200 turntable with Micro-Trak arm.

Russco turntable with Shure arm.

Russco Cue-Master turntable with Audio-metrics arm.

Richard Hardy
Richardy Productions
3239 S. 90th E. Ave.
Tulsa, OK 74145
918-627-2937

---

2) Numark model II1400, direct drive turntables with pitch control. Like new. $200 each, plus shipping..

1) Numark model II1400, direct drive turntable with pitch control. $175, plus shipping.

KERV/KRVL
301 Junction Hwy Ste. 333
Kerrville, TX 78028
512-896-1230
Fax 512-792-5555

---

4) Gates CB1200 turntables for parts or rebuild to your specs. Make an offer.

Sam Bonacci - WDIG
P.O. Box 970
Steubenville, OH 43952
614-264-4731

---

2) Technics SL-1200 turntables. New, $300 each.

Paul Way - WZCR
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

---

4) Rek-O-Kut turntables and tone arms. $50 each or best offer.

2) Technics SP-25 turntables with S-220 tone arms. $300 each, or best offer.

Radio Systems PA-1 stereo phono preamp. $125 or best offer.

Gary Fullhart - WVKS-FM
4665 W. Bancroft
Toledo, OH 43615
419-531-1681
Fax 419-536-9271

---

2) Gates 12" turntables. 3-speed, fair condition.

2) LPB turntables in good condition with medium use.

1) CCA label turntable. Heavy use in fair condition.

Lou Meirhofer
WTGC
101 Armory Blvd.
Lewisburg, PA 17837
717-523-3271

QRK turntable in excellent condition. Needs headshell for tone arm. $125 plus shipping.

Bob Statham
WHLG/WSTU
1000 Alice Ave.
Stuart, FL 34994
407-692-1000

---

2) Electro-Voice EV635 mikes. Will ship anywhere in U.S. for $95.

Chris Daniel
Daniel Electronics
HCR #9 Box 28C
Mena, AR 71953
501-394-6654 or
501-394-1450

Ramko stereo turntable preamp model SP-8E in good condition. $50 plus shipping.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Consoles and Mixers

Collins mono 10-pot console. $300 plus shipping.

Chuck Larsen
KAMI-AM/FM
835 Meridian St.
Cozad, NE 69130
308-784-1580

McCurdy SS-7500 custom 10-mixer console. $1,200

Dan Gunderson
KCCM
P.O. Box 72 Concordia College
Moorhead, MN 56562
218-299-3666

Harris Medalist 12 stereo console. Good condition, available in late April.

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

Gates Dualux model M5236 console. Includes manual.

Gates Studioette M-5381 4-pot console.

Dwight Morgan
KJYE/KNZZ
1360 E. Sherwood Dr.
Grand Junction, CO 81501
303-241-9230

Harris Meadalist 10-channel stereo console. In service now.

Bob Evons - WQXB
1348 Sunset Dr.
Grenoda, MS 38901
601-226-1400
Fax 601-226-4679

Wheatstone A-500 console. Has 6 channels, expandable to 20 by adding modules. New in crate, was $14,000 new, asking $7,000. Never used.

Tascam 388 Studio 8 console. Like new,was $3,200, asking $2,300.

Paul Wolf - WZCR
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

CCA Futura-6 mono console, in good condition.

Ramko 5-pot DC-5RA console. Mono, Clean, good condition, little use.

Gates Yard console. Stereo, tube, sharp, light use.

Lou Meirhofer - WTCG
101 Armory Blvd.
Lewisburg, PA 17837
717-523-3271

LPB 5-mixer stereo console in good condition. $1,750 plus shipping.

Bob Statham
WHLG/WSTU
1000 Alice Ave.
Stuart, FL 34994
407-692-1000

---

3) Altec 1567A tube mixers. $100 each.

4) Altec 1607A mixer amps. $100 each, or all 4 for $300.

John Parsons Sr.
10375 Cannas St.
N. Hintingdon, PA 15642
412-863-9590

Allen & Heath modular series 2000 mixing console. 8 channels in/out with EQ, pan pots, patch bay, including mixdown facility. $750

Bill Sitzman
Music for all Seasons
110 Country Rd. 146
Trumansburg, NY 14886
607-273-2970
Fax 607-387-3193

RCA BC-15/18 audio console. 8 channels, 32 inputs, good condition, good specs, plus manuals. $500 plus shipping.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Audio Processors, and EQ

Orban 536A de-esser. $275 plus $10 shipping.

2) Burwen Research model 7000A transient noise eliminators. Like new condition. $175 each plus $10 shipping.

Melvon Gollub
WMJS
P.O. Box 547
Prince Frederick, MO 20678
301-535-2201

Marti CL40 compressor/ limiter with manual. No reasonable offer refused.

Sam Bonacci
WDIG
P.O. Box 970
Steubenville, OH 43952
614-264-4731

Audio Digital TC-4 digital delay (6.8 sec.). 15kHz, mono, excellent condition. $600

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

Harris AM limiter. $500

Harris ME-1 modulation enhancer. $150

Harris tri-band AGC(AM) model MSP90. $1,000

Inovonics model 230AM, multi-band audio processor. $900

Elvis Moody
KJEM
216 North Main
Bentonville, AR 72712
501-273-9039
Fax 501-273-9030

Harris MSP-90 dual AM peak limiter. $500

CBS Volumax 411 modified for flat audio. $200

CBS Volumax 410 FM mono. $100

Hal Kneller
WKII
3151 Cooper St. #56
Punta Gorda, FL 33950
813-639-1112
Fax 813-637-6187

Orban model 222A stereo spatial enhancer. 7 months old, with manual. $800

Steve W. Karwan
KCMJ-AM/FM
490 South Farrell #C202
Palm Springs, CA 92262
619-320-6818
Fax 619-320-1493

CBS 400 Volumax limiter. Clean and works fine. $100

BE Spotmaster CLE-500 compressor/limiter/ expander. Does nice job. $450

Paul Way - WCKM
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

CBS Volumax 4000. Works fine.

Tom Ringer
WAFL
P.O. Box 808
Milford, DE 19963
302-422-7575
Fax 302-422-3069

Orban 8100A FM Optimod. Like new with manual. $3,899 or best offer. Call on Fridays only.

Brad Johnson
KO93
2121 Lancey Dr. #1
Modesto, CA 95355
209-551-1306
Fax 209-551-1359

Howe Audio 2100 Phasechaser. $1,200 or best offer.

Gary Fullhart
WVKS-FM
4665 W. Bancroft
Toledo, OH 43615
419-531-1681
Fax 419-536-9271

CRL Dynafex DX-2 stereo single ended noise reduction unit. Like new, never rack mounted. Asking $500 or best offer.

Radio Shack video sound processor, noise reduction, and stereo simulator. Almost new, best offer.

Ted Alexander
WDOK
1250 Superior Ave.
Cleveland, OH 44114
216-696-0123
Fax 216-579-9365

Gates Solidstatesman limiter. $175

Phil Wells - KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

Kahn Laboratories #SP-58-1A Symetra-Peak. $50

Bill Sitzman
Music for all Seasons
110 County Rd. 146
Trumansburg, NY 14886
607-273-2970
Fax 607-387-3193

CRL PMC-300A AM limiter with CRL SPF-300 NRSC adapter. Excellent condition.

CRL IPP-100 mike processor. $1,200

Mark Persons
218-829-1326
Fax 218-829-2026

STL, RPU, Remote Controls

Marti RMC-20T/RMC-20S complete 20-unit remote control with manuals. Factory reconditioned and calibrated. No reasonable offer refused.

Sam Bonacci
WDIG
P.O. Box 970
Steubenville, OH 43952
614-264-4731

Micro-Controls DLC-9/DLT-9 remote control. Make offer.

Larry Filkins
KNGX-FM
Rogers State College
Claremore, OK 74017
918-341-7510 (ext. 201)

Rust RC-1000 remote control. Working when removed from service, switch on studio unit replaced. With full documentation. $300

Hal Kneller
WKII
3151 Cooper St. #56
Punta Gorda, FL 33950
813-639-1112
Fax 813-637-6187

---

2) 6-foot Mark Antenna Paraflectors. $500

Steve W. Karwan
KCMJ-AM/FM
490 South Farrell #C202
Palm Springs, CA 92262
619-320-6818
Fax 619-320-1493

Moseley MRC-1600 remote control for STL, with SCA return. $1,500

Paul Wolf - WZCR
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

---

2) Anixter Mark 6-foot grid STL dishes. One dish lacks the feedhorn assembly, otherwise both are in perfect condition. Will mount on up to 3-1/2" O.D. pipe or tower leg. $1,300 for both, you pick up.

Jeff Hansen
KDMG-FM
100 Court Ave. Ste. 103
Des Moines, IA 50309
515-282-1033
Fax 515-282-1062

Moseley TRC-15 remote control with 110kHz TSL link. Also has Hallikainen digital display and Hallikainen ITO-177 computer interface. $450

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

Marti RMC-2AXS remote control system. $300

Mark Persons
402 Buffalo Hills Ln.
Brainerd, MN 56401
218-829-1326
Fax 218-829-2026

Marti RPT-2 2.5 watt dual frequency transmitter in good condition. $800 plus shipping.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckly, WV 25802
304-877-5592

AM Transmitters

RCA BTA 10-H. Many new components, available now, new transformers and reactors, no PCB's. $5,000

J. Ward
WARD
P.O. Box 1550
Pittston, PA 18640
717-655-5521
Fax 717-883-0959

FM Transmitters

Continental 816R-2B 10kW FM transmitter, less exciter. Never turned on, available immediately, priced to sell!

Bob Dean
KXKT
1108 Douglas St.
Omaha, NE 68102
800-736-3835

RCA BTF 5E transmitter with BTE FM exciter and BTE-10CT FM exciter with new spares.

4CX5000A and 4CX250B Eimac tubes.

Coax and RCA BFA-2 antenna.

James Natoli
WBTC-AM
2305 North Water St.
Uhrichsville, OH 44683
614-922-2700
Fax 614-922-2702

Bauer model 607A, 1kW FM transmitter with exciter. Includes manual, (1) 4CX250B driver, (2) 8163 finals, and harmonic filter. Transmitter is clean and in good condition.

Gus DeSoto
KLVR-FM
2290 Airport Rd.
Santa Rosa, CA 95403
707-528-9236
Fax 707-528-5426

Collins FM-250B, 250 watt transmitter.

Sam or B.B.
WLSU
1728 State St.
La Cross, WI 54601
608-785-8380

Harris FM5K (1983 vintage) with MX-15 exciter on 99.3 mHz. Good condition. $14,500

Paul Way - WZLR
241 NE 10th Ave.
Concord, FL 33909
813-574-5548

AM/FM Exciters, Stereo & SCA Generators

Motorola AM Stereo exciter model 1300 and Motorola AM Stereo monitor model 1310. Excellent condition.

Gregg Clapper - KKGR
P.O. Box 9032
Gresham, OR 97030
503-667-1230
Fax 503-667-4335

Motorola C-Quam AM Stereo exciter and mod monitor. 6 years old, needs a visit to Motorola for tune-up. $4,000

Steve Karwan
KCMJ-AM/FM
490 S. Farrell #C202
Palm Springs, CA 92262
619-320-6818
Fax 619-320-1493

C-Quam AM Stereo system. 1300 C-Quam AM Stereo Exciter and 1310 C-Quam AM Stereo monitor. Make offer.

Pete Peterson
KSFT
57 West South Temple
Salt Lake City, UT 84101
801-524-2600
Fax 801-521-9234

---

2) Orban ACC-025 composite isolation transformer kits. Brand new, never used.

Bill Brown
WMNI/WMGG
1458 Dublin Rd.
Columbus, OH 43215
614-481-7800
Fax 614-481-8070

---

2) Moseley SCG4-T 67kHz SCA generators. $250

Phil Wells
KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

AFC and oscillator boards for Harris MS-15 exciter. $30 each.

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

CCA 40 watt exciter.

Olen Booth
I.E.S.
200 Meadowlark Dr.
Starkville, MS 39759
601-324-6934
Fax 601-324-1170

Collins 310Z-2 FM exciter. $2,000

Collins A830-2 FM exciter. $900

Mark Persons
218-829-1326
Fax 218-829-2026

Test and Monitor Equipment

Gulf & Western 1000 Sensaphone. Telephone monitoring of power, temperature, and 3 status alarm inputs. $75 plus shipping.

Richard Hardy
Richardy Productions
3239 S. 90th E. Ave.
Tulsa, OK 74145
918-627-2937

Tektronix model 455, dual-trace 'scope with 2 10:1 probes. $650

S.C. Ellis
WQPT
6600 34th Ave.
Moline, IL 61265
309-769-2424

Belar AMM-1 modulation monitor. Clean and works fine. $450

Paul Wolf
WCRM
241 NE 10th Ave.
Cape Coral, FL 33909
813-574-5548

Tektronix model 7L12 spectrum analyzer in Tektronix model 7623 storage mainframe. Clean and in very good condition. All manuals, etc. $4,500 or near.

E.H. Munn & Associates
P.O. Box 220
Coldwater, MI 49036
517-278-7339
Fax 517-278-6973

Fluke model 8840, 5-1/2 digit, true RMS, SPI interface. Calibrated, Jan-1991.

Olen Booth
J.E.S.
200 Meadowlark Dr.
Starkville, MS 39759
601-324-6934
Fax 601-324-1170

Radio Design model ACM-1 unit. For use in monitoring AM noise in FM transmitters. New, in factory box. Paid $1,495, will sell for $1,250.

Dan Peluso
KJUL-FM
2880 E. Flamingo Rd.
Las Vegas, NV 89121
702-732-2200
Fax 702-731-1211

TFT EBS AM synthesizer receiver/tone decoder.

Lou Meirhofer - WTGC
101 Armory Blvd.
Lewisburg, PA 17837
717-523-3271

B&W oscillator meter and B&W distortion meter. $200 for the pair, plus shipping.

Bob Statham
WHGL/WSTU
1000 Alice Ave.
Stuart, FL 34994
407-692-1000

Tubes and Components

4CX3500A. Used, has less than 25 hours on it. Make offer.

Tim Hunt - KLIA
2201 S. 6th St.
Las Vegas, NV 89104
702-731-5452
Fax 702-731-1992

Satellite Equipment

Adcom satellite receiver with block down-converter. Has tuneable transponder selector and tuneable demod card. Make offer.

Tom Ringer - WAFL
P.O. Box 808
Milford, DE 19963
302-422-7575
Fax 302-422-3069

Fairchild DART 384 digital receiver with 4-frequency down-converter (3 frequencies active). With chassis, BPSK demod, decoder and de-multiplexer, and (1) Fairchild 15kHz dual program module. Used less than 1 year, used for Unistar format. Asking $5,250, plus shipping.

John Hendry
KXYL/KISJ
Box 100 #1 Texas Ave.
Brownwood, TX 76804
915-646-3535
Fax 915-646-5347

California Microwave AD2 downconverter. $50

Mark Persons
402 Buffalo Hills Ln.
Brainerd, MN 56401
218-829-1326
Fax 218-829-2026

TV, Video

Sony VP-5000 U-Matic videocassette player.

Andrew 6-foot solid reflector dish for 2 gHz band, with feed-horn and mount. Make offer.

Alex Bowab
WDLT
2402 Wold Ridge Rd.
Mobile, AL 36618
205-344-3698

Ampex AVR-3 broadcast videotape recorders. Complete with continuous duty Merlyn air system. 2 operational machines, one recently serviced. Asking $5,000.

William Burnsed
B&B Systems
28111 Avenue Stanford
Valencia, CA 91355
805-257-4853
Fax 805-257-8065

Shibaden SV-700UC videotape recorder. Mint condition, make offer.

Kurt Weinschenker
2901 Cathedral of Learning
Pittsburgh, PA 15260
412-624-6197
Fax 412-687-8929

Sony VP-5000 U-Matic VCR. $500 or best offer.

Phil Wells - KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

Misc. RF Equipment

3) 8-foot sample loops and isolation coils. Good condition, best offer.

W. Rossini - WLQR
125 S. Superior
Toldeo, OH 43602
419-244-8321
Fax 419-244-7631

---

2) Gates motors for older transmitters. Used to turn a control with limit switches. Part # 994-4703-003 and 994-5066-001. $50 each plus shipping. As-is.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Misc. Audio and Telco

Russco 4428 distribution amp. Like new, never in service. Can be 4x4, 2x8, or 1x16. $250 plus shipping, firm.

Microtrak HE-1 portable headphone amp. New, operates on battery or power supply.

Richard Hardy
Richardy Productions
3239 S. 90th E. Ave.
Tulsa, OK 74145
918-627-2937

---

5) RCA BA-33 program amplifiers. Mostly suitable for parts, some working, as-is.

Hal Kneller
WKII
3151 Cooper St. #56
Punta Gorda, FL 33950
813-639-1112
Fax 813-637-6187

Executone Gateway K2100 electronics business telephone system. 5 lines, 20 extensions. Working system or use for parts. $800 or best offer.

Gary Fullhart
WVKS-FM
4665 W. Bancroft
Toledo, OH 43615
419-531-1681
Fax 419-536-9271

RCA BA-44, BA-48 power amp/line amp. Brand new. $100 each.

R. Humphrey
WLTJ
7 Parkway Center
Pittsburgh, PA 15220
412-922-9290
Fax 412-928-9290

---

2) ADM DA-16 distribution amps. Comes with 9 1x6 cards. Available in April.

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06441
203-296-1175
Fax 203-296-1996

Marti PGM-20 line amp. $50

Spotmaster 1x5 mono DA. $50

Phil Wells
KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

Symmetrix T1-101 telephone hybrid. $300

Mark Persons
218-829-1326
Fax 218-829-2026

---

12) Western Electric patch panels (TRS). Six rows of 24 jacks, normaled, wire wrap or solder connections. Your choice, $35 each plus shipping. Patch cords are available for these panels from ADC.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Misc. Equipment

Trippilte PR-35, 13.8 volt @35 amp regulated power supply. Excellent condition. $100 plus shipping.

Richard Hardy
Richardy Productions
3239 S. 90th E. Ave.
Tulsa, OK 74145
918-627-2937

---

2) Full size equipment racks with doors. Black color. Make offer.

Bud Nornes - KJJK
2450 College Way Box 724
Fergus Falls, MN 56537
218-736-5408
Fax 218-736-5400

New plate transformer for RCA BTF-5E transmitter. $600, you pay to ship.

Jim Ward - WARD
P.O. Box 1550
Pittston, PA 18640
717-655-5521
Fax 717-883-0959

Alden C2000R weather radar. Uses telephone line to connect to radar site. Good for radio or TV news.

W. Rossini
WLQR
125 S. Superior
Toledo, OH 43602
419-244-8321
Fax 419-244-7631

Heathkit weather station. Display only. $25
Gentner silence sensor. $95

Phil Wells
KJQY
San Diego, CA
619-238-1037
Fax 619-238-6157

ESE model ES-510 timer. $60
Assorted 19" equipment racks.

Gene Faltus
WZMX
905 Wethersfield Ave.
Hartford, CT 06114
203-296-1175
Fax 203-296-1996

ABC Network pulse decoder (32 pulse). Good condition. $175 plus shipping.

Randy Kerbawy
WTJN-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Belden Cable:
1000-feet 8449. $275
880-feet 8449. $238
97-feet 8447. $35
192-feet 879-. $60
850-feet 8422. $275
247-feet 9750. $75
360-feet 8448. $150
250-feet tinned bonding cable. $90
500-feet 8627. $300
Will sell all for $1,050 or separately. You pay shipping.

Square-D 200 amp 3-phase 3PdT safety switch with center off. Good condition. $100 plus shipping.

Randy Kerbawy
WTNJ-FM
P.O. Box 1127
Beckley, WV 25802
304-877-5592

Rebuilt Transmitting Power Tubes

- Fraction of new tube prices
- New tube warranty
- Guaranteed satisfaction
- Duds purchased or rebuilt

Send types used for quote

Partial list: 356, 880, 892, 5606, 5667, 5668, 5671, 5681, 5682, 5771, 5918, 5936, 6424, 6425F, 6426, 6427, 6623, 6696, 6800, 7560, 7804, 8461, 8795, 22789, 23431, 23791, 4CX35000

Vacuum Tube Industries Inc.

506 N. Warren Ave. P.O. Box 2009
Brockton, MA 02405

508-584-4500 **800-528-5014** **Fax 508-584-0096**