

# RADIO GUIDE

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A Forum for Radio Engineers  
Ray Topp Editor/Publisher (507) 280-9668

December 1989 Volume 2 - Issue 12 Copyright 1989 - Rochester Radio 511 18th Street SE Rochester, MN 55904

## Put Down This Paper

That's right -- but first look through the pages and find the number of an advertiser. Call them up, or fax them a message on the Radio Guide Fax-Gram on page 20. Yes, right now. Just tell them that you saw their ad in the Radio Guide and that you appreciate their support.

I'm not pushing products -- you know (by now) better than that! What I am pushing is the future of Radio Guide and broadcast engineering. The only other way to distribute the Radio Guide would be to charge for it. It's not a question of whether or not it would work that way, but rather it simply wouldn't get the information to all those who need it. Even for a few bucks, there are hundreds of stations that simply wouldn't authorize it -- no matter how helpful it would be to their engineers. Of course those stations don't feel the need to buy Q-tips or spare tubes either.

The point in sending Radio Guide out free of charge, is to disseminate technical information to **all** engineers. The only way we can do that is to be advertiser supported, and the only way they will continue to give their support, is to know that their messages are being seen. If they don't get that feedback, then I wouldn't blame them for jumping ship.

You, as an engineer and reader, will always be the first priority of Radio Guide. That will never change! As we head into the next decade, let's examine what we've done and where we would like Radio Guide to go. As always, it's up to you. Let me know what we've done right, what we've done wrong -- and most importantly, what you would like to see in 1990.



**Happy Holidays**

from

**Radio Guide**



## The Fax is Fine

Send Your Tips Via FAX to (507) 280-9143

Thanks to tips in via the chine. Looks to go out and rolls of fax invented that It's kind of you find in real smooth sorbant (not a either).



all who have sent articles and Radio Guide Fax ma- like I'm going to have get a few more paper. Who stuff anyway? like the paper porta-potties -- but not very ab- heck of a lot on the roll

Don't let up now! The Radio Guide Fax is a terrific way to submit your techni- cal tips and info to us. The Radio Guide appears each month and is a direct result of your technical submissions. There's not a large backlog of articles, and we don't have regular columnists. I depend on a few of you each month taking the time to stop and think where the Radio Guide would be without individual technical contributions -- such as the one you're about to write down and send in right now.

There's been an awful lot of grumbling, over the years, about how you can't find decent broadcast technical information in print. As I've said before, the information is out there. It's in your head! It just needs someplace to be written down. You write, I print -- fair enough?

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# 180 Degrees

## Occasional Editorial Comments

By Ray Topp - Editor/Publisher

By now, many of you have heard that non type-approved, older model STLs will no longer be authorized for use, after July, 1990. Certain people in the industry are criticizing the SBE for petitioning the FCC to extend the STL deadline. That's where I draw the line.

It's been said we've know about it for five years, and that we don't need an extension on that. Even though it's been in the FCC Rules for five years -- that doesn't mean we've all been aware of it! Up until a few months ago, most of us had never heard of this rule change. So much for the trade press keeping us up to date. Yes, I'm embarrassed to say that Radio Guide is among them -- I blew it too! I apologize for that.

Whatever the reasons, the fact is that this is fresh news to the majority of stations. We have to deal with it on that basis. Now that most stations are aware of the problem, I feel it's only fair that they be given the time to implement a solution.

It's a mistake to think that, just because there's an impending deadline, all stations are going to rush out and buy new STLs. The reality is that many stations may simply just keep right on operating with the same "old" STL system, until they feel they can afford a change -- no matter what the Rules say.

The sad fact is, the FCC just doesn't have the manpower to enforce what it is tasked to do. Stations will have to take it upon themselves to do what is right, and it will ultimately fall on the station engineer's shoulders to explain to the station owner why the change would be best for everyone concerned.

Since it will (as always) end up the engineer's responsibility, and since we all know how hard it is to justify the purchase or modification of equipment that may not add distinct audible merit to the station's performance, it is going to take more than the few months we have left to get it done.

The SBE is going to bat for stations and their engineers, to give them some breathing room. They are doing what a professional organization is supposed to do -- support their members! The SBE is doing that in the most tangible way possible, petitioning the FCC for an extension of time.

Nothing will be gained from forcing stations to comply with the July, 1990 deadline, except the operation of "illegal" STLs. Claims that extending the deadline only benefits frugal GMs, ignores that fact the the station budget is everyone's concern. There are stations out there that, through no fault of their own (with new stations and listener alternatives multiplying like rabbits), just don't have the money.

Those of use who have worked in the real-world of broadcasting, know that a few thousand, or even a few hundred, unplanned dollars spent on anything (at the wrong time) can be a big deal. If stations are forced into an unrealistic timetable, you know which section of the station's budget is going to suffer.

I think a realistic extension of time is in order. There are manufacturers preparing to market digital STL systems. Let's give stations the necessary time to buy what they really should have, instead of only what they must have.

Ray Topp - editor/publisher

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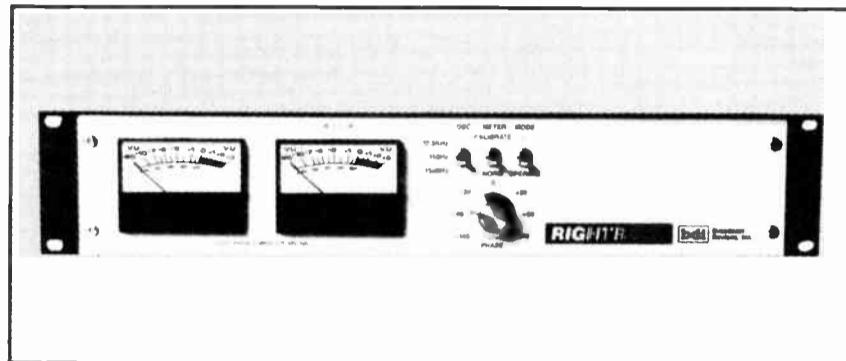
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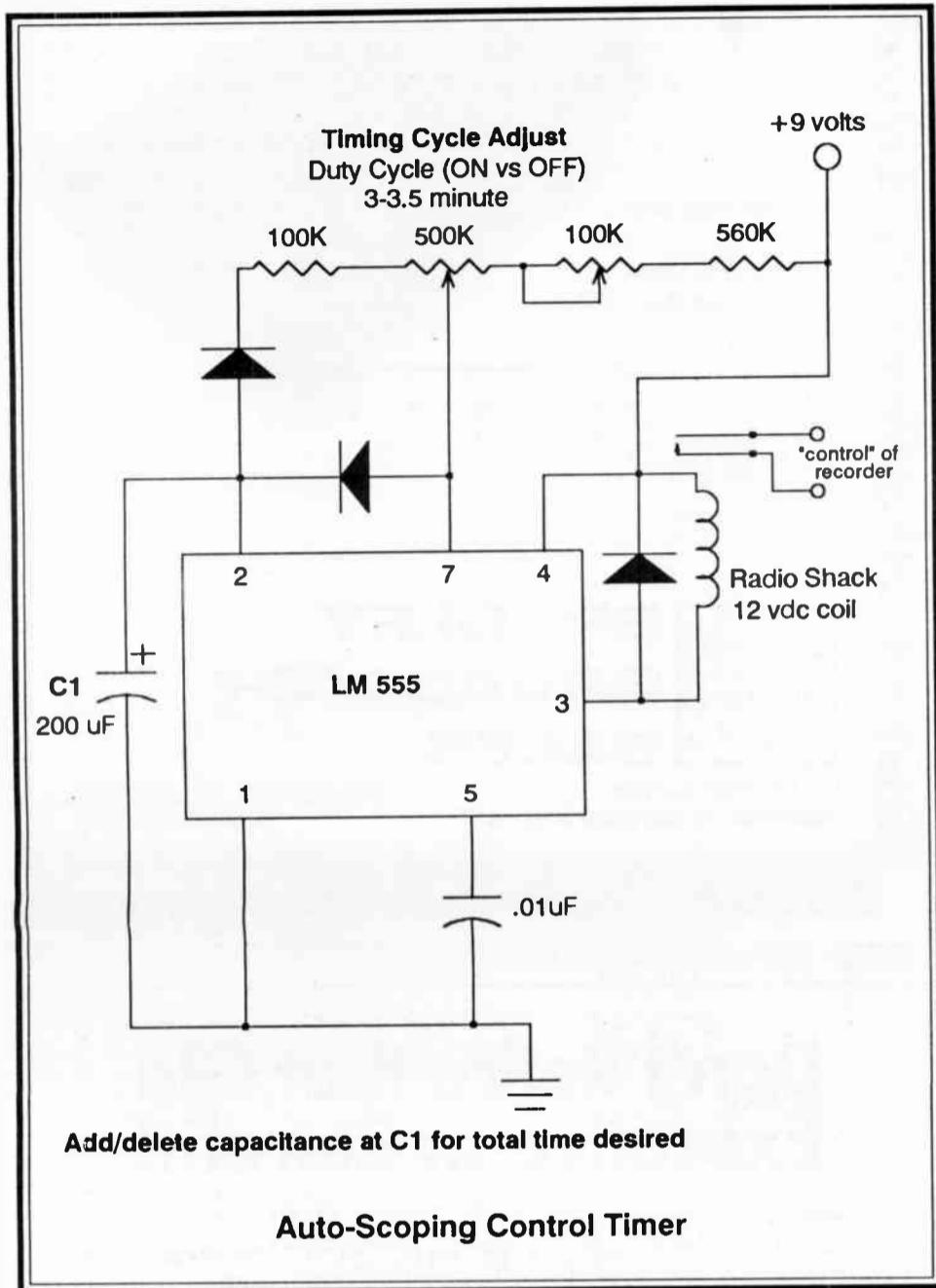


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# Auto-Scoping Control Timer

By Frank Hertel  
Newman-Kees Measurements  
Evansville, Indiana  
812-963-3294

Hook "control" output of the timer to the "remote" jack on your boom-box, or wire in series with motor voltage. Tune boom-box to desired station, and press "record" button on boom-box. Boom-box will record approximately 30 seconds out of every 3.5 minutes that the box is on.



## Save Those Data-Cells

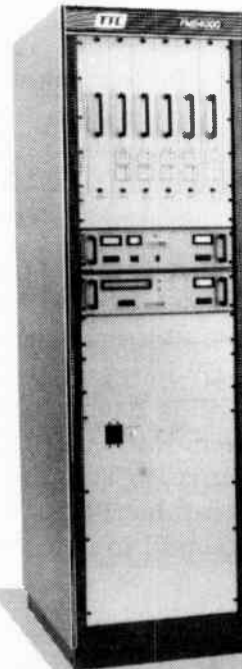
By Lane Lindstrom - WPOK/WJEZ  
Pontiac, Illinois

For those of you still blessed with a Sono-Mag AS-series audio switcher, here is a tip that you may or may not be aware of. The "heart" of the switcher is a plug-in opto-isolator -- the Sigma Data-cell. This little jewel, over the past years, has not only become super expensive, but also is hard to find. I was told that Sigma sold out to Magnacraft, and Magnacraft dropped production of the cells altogether.

The AS-series switchers used the Sigma Part 301-R2-24. I've been re-lamping our Datacells for the past five years with success. The lamp I felt worked the best was a 28-volt long life filament in a T-1&3/4 style package with wire leads (Newark Part # 44W1030).

First remove the aluminum cover by carefully bending back the four indentations on the base and then lifting off the cover. The ceramic light dependent resistor is very fragile, and is held in place on the cover with a clear silicone. Snip out the old bulb, solder in a new one, replace the cover, test it, and date it. You'll be glad you did the next time a power glitch, that brings all of the channels on at once, pops the filaments in about half of your Datacells. Don't pitch 'em -- repair them.

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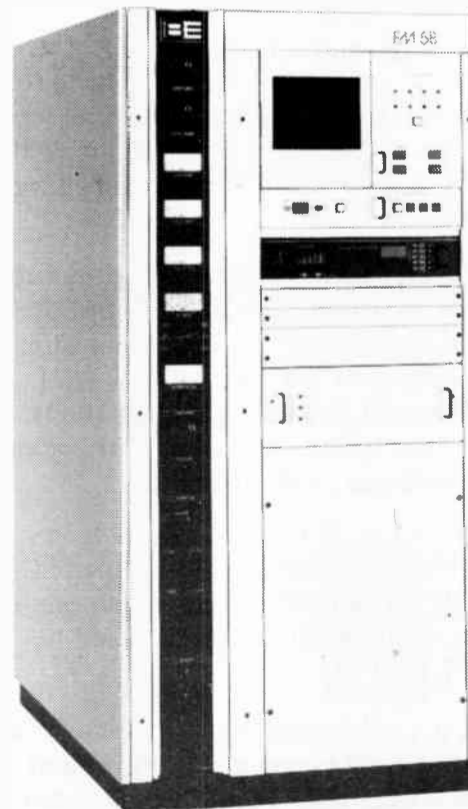
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## Surge Protection

By Chuck Condon, President  
Condon Broadcast Engineering  
Salt Lake City, Utah  
(801) 580-3025

I am a contract engineer for several stations in Salt Lake City, Utah. One station's transmitter (KMGR-FM) is located on Lake Mountain which is very rocky. We used to go off the air almost every week due to major power bump/lightning related problems. We greatly reduced our problems by upgrading our ground system.

In the beginning, we had two wimpy ground rods at the base of our FM tower and one wimpy ground rod at the service entrance. Both ground rods wiggled, as the ground is so rocky and doesn't hold the rod in the ground very well. We contacted Lightning Elimination Consultants (formerly Lightning Elimination Associates). They advised us to use "Chem-Rods." Each Chem-Rod is a 6'x 3" hollow copper tube in a "T" shape with a 3" diameter. The Chem-Rods are filled with a copper oxide type chemical that "leaks out" from various holes and chemically treats the ground to help its "groundness," as I put it.

We installed seven of them basically forming a circle around our building -- including one at the tower, one at the service entrance, and one at the power pole. Each rod is connected to the other rods with 3/4" copper tubing and are all common to the station ground straps and power company ground. The addition of all this copper and chemical treatment has greatly improved our "ground" and reduced our surge problems to about two a year as opposed to one a week!

We also have a 3-phase surge suppressor in parallel with our 3-phase AC line on the power pole side (made by Wilkinson). Our Moseley MRC-1600 has MOVs on the status and analog inputs as well.

At KOOL-FM in Phoenix, my partner Charles Jayson Brentlinger, of Brentlinger Broadcast Engineering, uses a Lightning Elimination Consultants "Surge Eliminator" SE-series surge suppressor. It uses a series-parallel system. After we installed it, KOOL-FM experienced a huge reduction in surge related problems.

## AM Stereo Improvement

By Chuck Condon  
Salt Lake City, Utah  
(801) 580-3025

I have a Harris MW-1A transmitter and a Harris ST-1B AM Stereo. A few months back, I noticed the station had very little to no stereo separation, a thin tinny sound, and a low right channel level. After playing around with the stereo exciter with no luck, I was stumped. What was wrong? The STL feed was OK, and everything up to the stereo generator was also OK.

The stereo exciter phase delay, EQ, and separation adjustments all had no effect on the problem. Well, quite honestly, I found the solution by accident. One night I was cleaning out the transmitter. I noticed a burned resistor on the oscillator card of the MW-1A. I replaced the resistor (a 47-ohm, 2-watt), finished cleaning the transmitter and put it back on the air. I got in my car, frustrated because I had not yet found the problem, and was ready to leave.

I turned on the radio and -- WALLA! There was a full clean sound with that magical thing called separation. What happened? Did the clean-up help the signal? It couldn't have been that resistor -- it was on the oscillator board, and the oscillator is not used because we are in stereo, right? Well, sort of . . .

I went back in and looked at the schematic only to discover a few facts! Sure the oscillator on that card is not used, but lo and behold that resistor was still used! It turns out that the oscillator feeds a buffer transistor and then sends the signal to the transmitter. That buffer transistor is precisely where the stereo exciter signal was inserted. The resistor was in parallel with the emitter!

The moral of the story? Don't underestimate your average 47 ohm resistor or assume you know everything about your AM Stereo system/transmitter.



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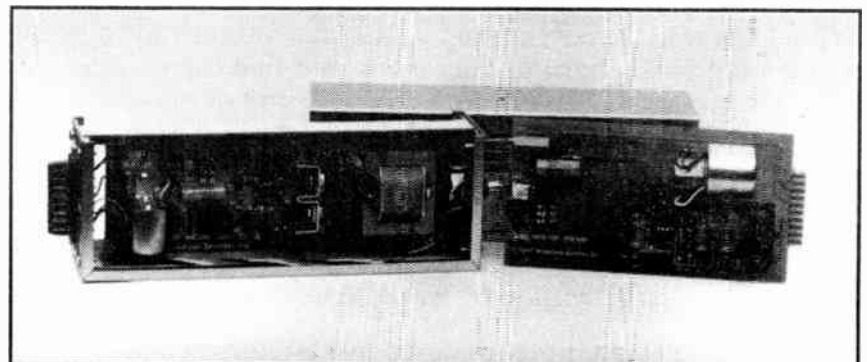
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xL82S shown

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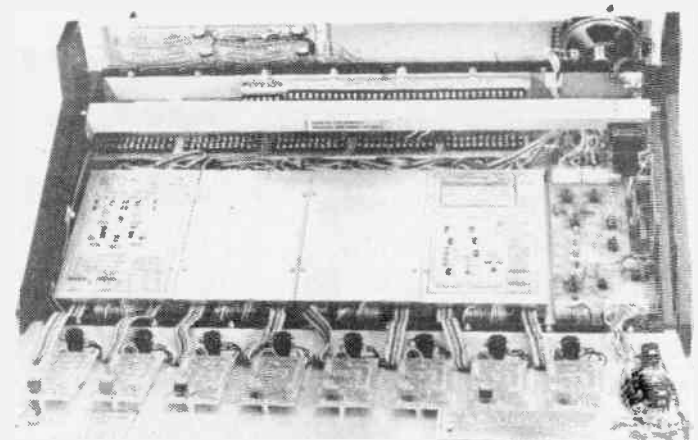
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# Answer to a 3-Phase Prayer

By Alan Roycroft - Hilo, Hawaii

The two first steps to take with your electrical installation are A: Become very familiar with every part and, B: Carry out real maintenance inspections. Sure, you can wipe off the dust, but do you really get into the guts of the system and actually understand it? May I help?

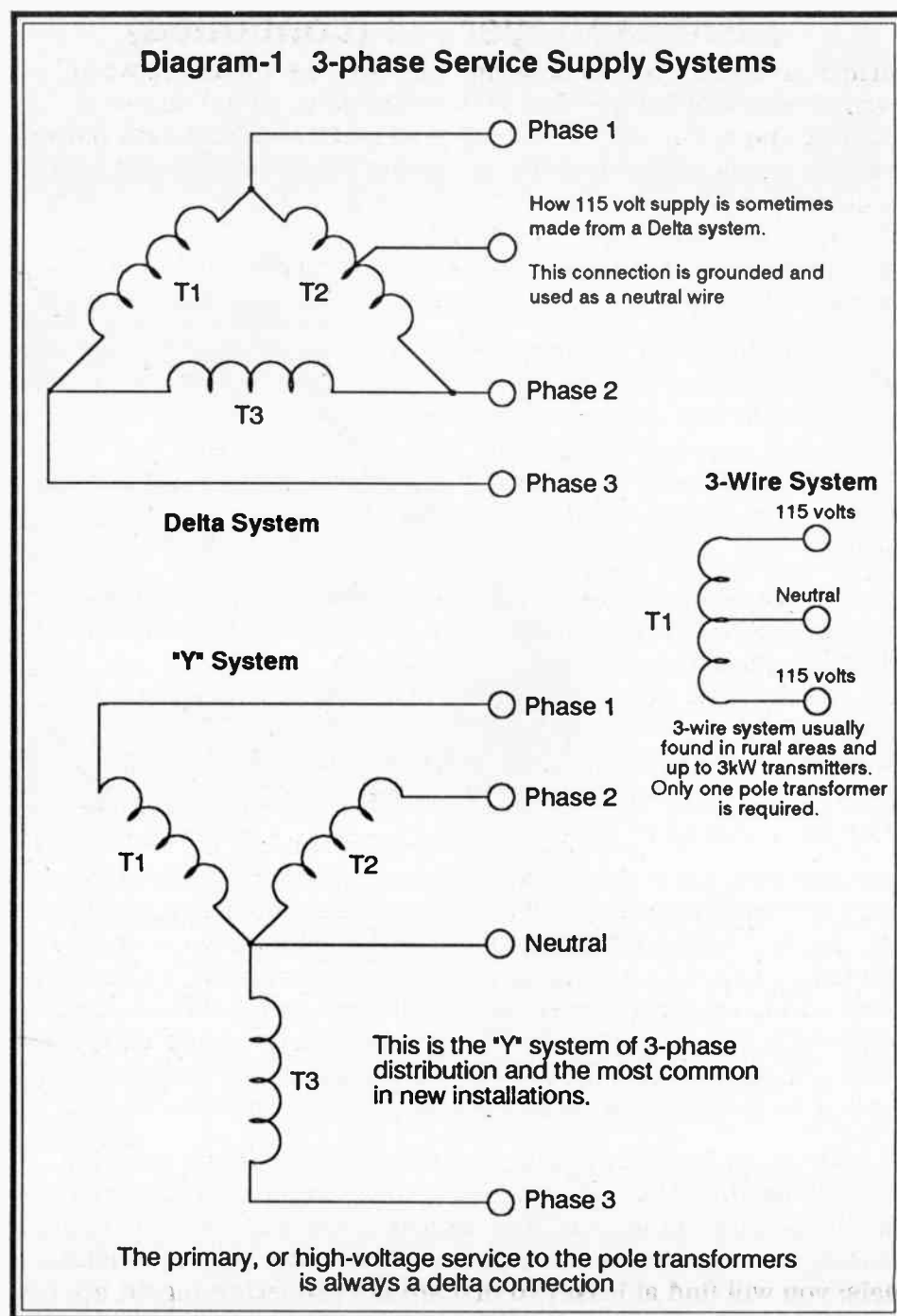
There are several types of electrical service: 3-phase delta, 3-phase "Y", and 3-wire. The first is found in installations with large loads or in old wiring. Diagram 1 shows that there are three pole or vault transformers that supply 230/240 volts each. In some rare instances, electrical supply authorities will center-tap one of the transformers and connect it to ground as neutral, but usually a delta system requires an additional transformer, frequently wall mounted, that is rated around 6 KVA, to provide the 115 volts for lights, limiters -- and coffee pots.

The most common service is the 3-phase "Y" configuration. The center common connection is the neutral terminal connected to ground at every transformer position and one point in every installation. All neutral wiring is white, and all phase wiring is black. Between each phase is the familiar 208 volts. Yes Clyde, we know there are two 115/120 volt transformer secondaries in series, but they do not produce 230/240 volts, as the phases are only 120 degrees apart, not 180.

The 3-wire system is used where only one phase of primary wiring is available or a single primary wire is used on the pole transformer with a ground wire for a return. The secondary of the single pole transformer is always center-tapped with a neutral connection with 115 volts each end. And yes, we do get 230 volts across the outer connections. This service is normally used for up to a 6 KVA load (meaning a 3 kW transmitter).

So if you are new on the job, or more likely have never given the electrical system much thought (that is until it produces low or no voltage), here is a splendid opportunity to spend a day checking all this out. First identify the service by looking at the pole trans-

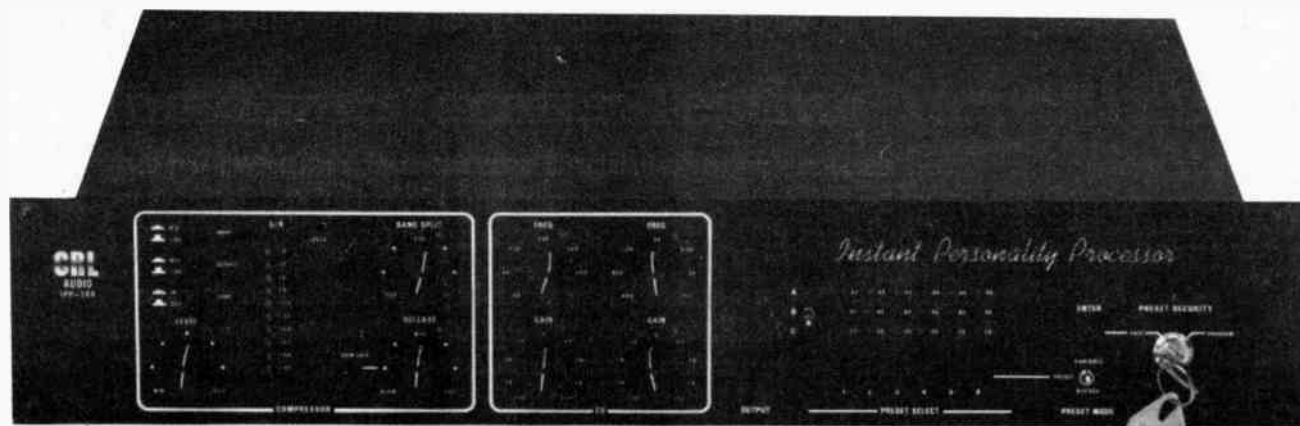
(continued on page 7)



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### 3-Phase Prayer . . . (continued)

former secondary connections and measure the voltage between each phase. Whether you find 208 or 230 volts, switch to the standby and get inside the main rig and make sure that each power transformer is set for the right voltage (or that a series resistor in a filament transformer primary, to make it operate from a 230 volts supply, is not in the circuit on a 208 volt supply). This will save hundreds of dollars in driver tubes, once corrected, as low voltage is as bad as high filament voltage.

Take along your vacuum cleaner and a bunch of cart labels so you can ID components that you really did not know what they were and gave you that sinking feeling when all meters read zilch. Next have a fuse day, listing every fuse in the system. When I say every fuse, include fuses inside transmitters, inside limiters and control units -- even the outside disconnect fuse box. Buy a little cabinet with drawers and fuse replacements, and mark each drawer.

So maybe you know how the power arrives to the equipment, you have all the breakers marked in each load center, and even a block diagram on the wall showing all items of equipment and where they are fused or breakered. But what do you know when the power does not arrive? Consider the average installation of three phases rated at 100-300 amps. If there is a total loss of power, where is that lantern kept? Where is the phone number of the electrical company's trouble service?

But wait -- you did check all the breakers in the building, but did you check the outdoor disconnect? If it is a breaker, pull it open and re-set it -- even if it looks OK; an old breaker may not show a full trip. If you have a fused switch box as a disconnect, and have been scared to death to even look inside, now is the time to check it out. Pick a time that will cause the least stress on programming and management, and pull the switch to see if has been properly wired so that in the "OFF" position, there is no power on the fuses.

Get acquainted by pulling them out and examining them for signs of heating. Have you got exact replacements? Place spares inside the box and in your little cabinet of drawers. Look for signs of heating at terminals. Get a large screwdriver and tighten all terminals; you will find at least two that are not properly snugged up. Be careful when you test the "LINE" terminals. Wrap electrical tape around the driver to avoid grounding it on the cabinet. If you feel better about it, get an electrician -- someone has to do it, especially if it is aluminum wire. But do change and hold the removed fuses so you lose that Nervous Nelly feeling.

Maybe your outage is not complete; you measure the voltage on each phase and find two phases read normal at 115 volts and the third has less than 80 volts. Maybe you can read between phase wires and find 208 volts on two but between one phase and either of the other two there is only about 160 volts. The problem is a blown primary pole fuse outside, that only the power company can replace. If this means a long wait, and your single-phase standby transmitter is also connected to the low phase, I would take the cover off the load center and transfer the black phase wire off the low phase and change it to the second good phase.

When the power company arrives, get them to check the fuse carriers for loose connections and corrosion, and replace all three pole fuses. Of course they may be the modern type and have an insulated telescoping rod with fuse grip on the end, and be in no mood to climb a pole to inspect anything. Whatever you do, know what you are doing and take precautions! Remember, electricity is like a horse. Respect it -- but if you are scared, it will kick you.

Sometimes, each month or so, a breaker will open under normal conditions. Beg, borrow or steal a clamp-on ammeter, and check out load currents on each phase or the only phase on the breaker. If there is a bad imbalance between phases, switch hot wires from various breakers so that the load on each phase is nearer to balanced. Large power consumers, such as exhaust fans and air conditioners, when plugged in, can unbalance a system badly, so the balancing trick will save the system. However, if a breaker opens and the load is normal, replace the breaker. They develop poor connections and can heat up, causing the breaker to trip.

It is fairly common for breakers, that have tripped more than a dozen times, to open at much less than their rated capacity. You can

(continued on page 8)



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### 3-Phase . . . (continued)

avoid unexpected breaker problems, especially with high current 3-phase types, by feeling the cases for hot spots. Get a replacement now, as there are many requirements for a breaker other than amperage rating, terminal types and mounting holes. Get that special model by ordering it now!

A word or two to 3-wire system users. You may be one of the lucky FMers with a power increase, but the nearest 3-phase service (necessary for higher power) is miles away -- and power companies usually charge around \$30,000 a mile to extend it. They may have a plan where a consumer can sign an agreement to use a minimum amount of power for a few years, and the increased revenue will pay for the extension. There are two transmitter manufacturers, to my knowledge, that make up to 10 kW single phase transmitters. You may be able to afford only a used transmitter with 3-phase input, but there are rotary converters that will produce the third phase. Get one safely rated for the transmitter, not the whole load of the transmitter site.

If you are an AMer, forget it; the regulation of these converters is not good enough for the pulsing modulator load and will produce carrier shift and lousy modulation. If you are clever, you can convert a 3-phase transmitter to single phase operation. It will require new additional filter reactors and capacitors, plate transformer, and silicons perhaps. There's nothing tough about it, but remember the FCC's type acceptance system for which you need to produce measurements proving that noise and power levels are not changed.

OK, you have the power, but surges and spikes are calling your bluff with shorted solid state equipment. There is only one way to cure this. Get a bucket of varistors; Radio Shack has a reasonably large model (#276-568B) for a couple of dollars. Connect them across every transformer primary in sight. Then, depending upon your 3-phase load, get a fast acting type of varistor with more than adequate rating, and connect it across your main breaker with the shortest, heaviest cable you can obtain.

There are companies, such as Midwest Components Inc., in Muskegon, Michigan, that can supply just the guts, while you provide a regular indoor electrical enclosure to house them in and have an electrician wire it in. Total cost of materials will be about \$1,000. A complete system with flashing lights and silver bells is around \$3,000.

OK for surges and spikes. Now there is a cute insurance law that protects the electrical company from claims for damages caused by loss of one phase, if the damaged equipment is not protected with a suitable detector system. There are some on the market, but it would be cheaper, and more satisfactory, to tailor your own to suit the load -- particularly if you have a generator with an automatic transfer switch. If you do not have a back-up generator, then get a 3-phase contactor with amperage rating to handle your load or match the main breaker rating.

Diagram 2, shows a "Brown-out and Downward Pulse Detector." The "RY2" relay's N/C contact will be wired in series with the solenoid coil of the contactor. The contactor contacts will be wired in series with each phase of the load to be protected. Action is as follows: When the phase drops down by about 10%, "RY1" will open quickly, latching "RY2", opening the contactor, and starting TD (time delay relay) which can be set for several minutes. At the end of the timed period, the low voltage sensing "RY1" will determine whether to restore "power on" or continue with another timing period.

However, if you do have a generator, this "Brown-out and Downward Pulse Protector" will work very well. It's fast acting response to low or zero volts will key off the "loss of phase" circuitry in the generator's transfer switch, start the generator, and hold it on to the load for the timed period. The most important action is the swiftness in pulling your transmitter off the quavery regular electrical supply until thing settle down. While on the job, you may discover that the highly touted "loss of phase protector," supplied with the transfer switch, guards only one phase.

You can extend this by installing three 120 volt AC relays with their coils connected between the common neutral and each phase of the supply. Their normally open contacts are wired in series with the original generator phase loss relay contacts. Remember, when

(continued on page 9)

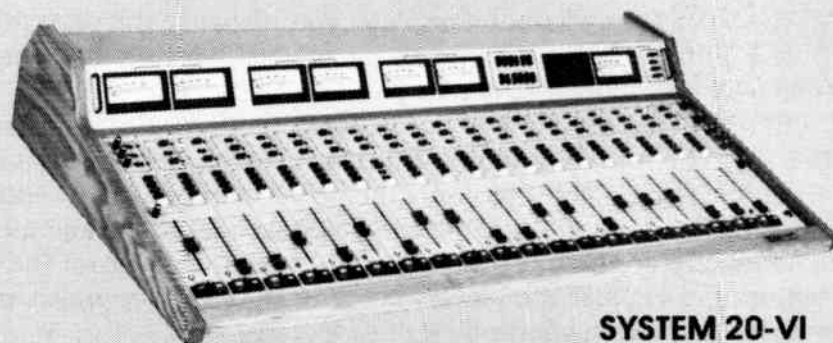
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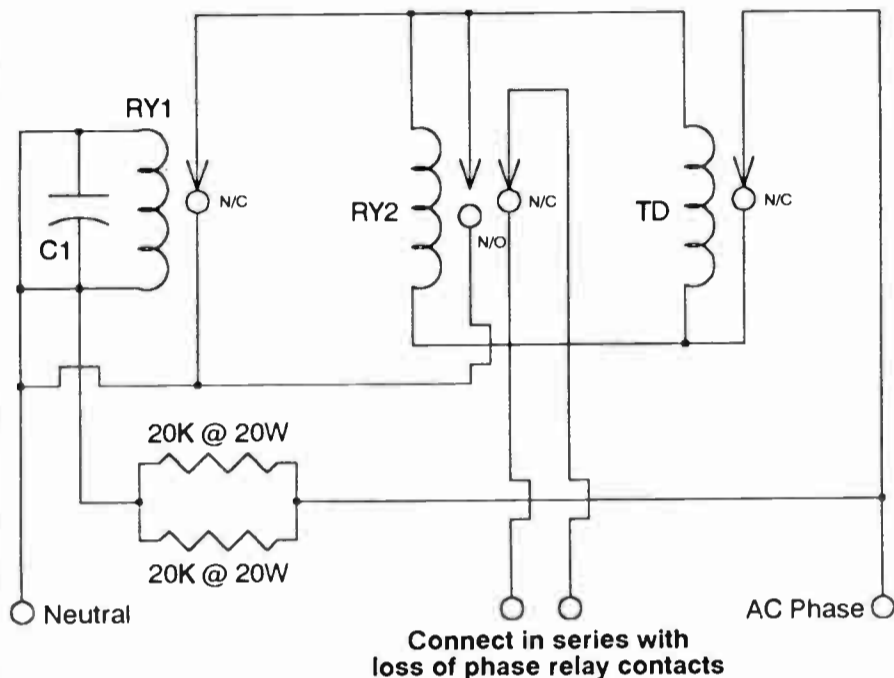


### 3-Phase Prayer . . . (continued)

connecting relay coils to 100 ampere or more busses, use an in-line fuse of 1 amp in case the worst happens to the relay coil. Octal plug-in relays are advisable so that, in case of problems, you can restore operation immediately by plugging in a spare.

Depending upon your style of generator system, it may get upset about starting with a load, particularly if it is a large blower motor. Sometimes they falter and open a breaker, which can be disastrous if it is thirty miles or more from the studio. Get one of the adjustable time delay relays, for a period of between 2 and 20 seconds, and wire its coil across the generator output (through that 1 amp fuse) with the normally open contacts wired in series with the generator load contactor solenoid. Usually a 5 second delay is sufficient to stabilize the generator and then make a clean switch.

**Diagram-2 Brown-Out and Downward Pulse Protector**



- RY1 - 115/120 volt AC relay with maximum spring tension
- RY2 - 115/120 volt relay as stock item
- TD - adjustable time-delay relay with 120 volt coil
- C1 - 1uF tubular or oil filled capacitor 400/600 volts (not an electrolytic)

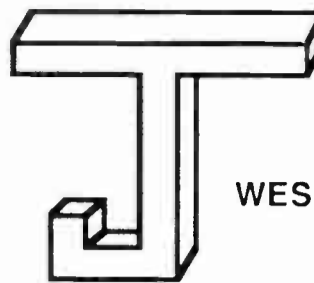
This system can be extended to monitor 3 phases, but in practice it has been found not to be necessary. It guards against a short downward voltage. The regular loss-of-phase protectors are not quick enough to respond to pulses, and return operation immediately to the service. This unit will transfer load to the safety of the generator until a selected time period has passed (about 10 minutes has been found to be the safest).

### Cart Secondary Tone Delay

By **Dave Higginbotham - WCAW/WVAF**  
 Charleston, West Virginia  
 (304) 925-4986

This problem had been encountered before, when we tried to make six ITC Omega cart decks start sequentially. What was happening was, when the cart started, the tail of the 1kHz cue tone (as the tape came up to speed) would pass through 150Hz, tripping the detectors. The cure is simple. The 1kHz tone has a 1-2 second disable. Tie this to the secondary tone detector -- and no more falsings.

No specifics can be given, as cue circuits differ, and each individual machine must be examined in all situations. Call the manufacturer, and they will help. I have done this with both ITCs and Carousels.



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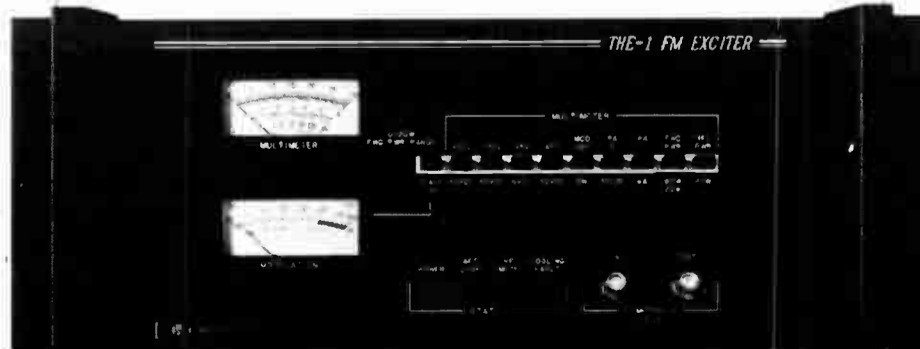
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# AEL Transmitter Notes

By Ray Jenkins - WAVL-FM  
Apollo, Pennsylvania  
(412) 478-4020

Those engineers who have AM-5KD or AM-10KD transmitters manufactured by American Electronic Laboratories (AEL) in the late 1970s, before they discontinued broadcast manufacturing, may find this information useful, particularly since AEL no longer provides any assistance to broadcasters.

## Control Panel Power Supply

The 25 VDC regulated supply which powers the control panel relays, lamps and PC cards is not metered. If the regulator fails, its output jumps to about 42 volts and can ruin the PC cards. Of course these cards are not available and, if the damage is major (in my case fire related), you will either have to build a replacement from scratch or forgo the overload and/or the warm-up/cool-down features.

I placed a 10 ohm/2 watt resistor in series with the ON push-button lamp, so that it is dim at 25 volts. If the regulator fails, the lamp will brighten considerably, warning the operator of the high-voltage condition. Since our studios are at the transmitter site, this is sufficient. If you are remotely operated, you may want to work up an auto-shutdown circuit.

## Unexplained High Voltage Shutdown

We experienced a few transmitter shutdowns last year which cleared out when troubleshooting was initiated. About this same time, our morning man reported that, occasionally on start-up, the INTERLOCK lamp lit as soon as the ON button was pressed. But -- the BIAS lamp, which normally lights a couple of seconds later, took much longer than usual.

Investigation showed that the air pressure switch, mounted in the "floor" of the PA enclosure (to protect against insufficient cooling air pressure), was not properly closing. Why this switch was not placed in a side wall, remains a question, but there is no question that its intake fitting acted like a "floor drain" and collected enough dirt, in over ten years, to interfere with proper switch operation! Disassembly and thorough cleaning did the trick.

## PA and Modulator Filament Voltages

These are measured with a panel meter which shows the filament voltage **at the sockets**, which aids in keeping track of the filament bus connection. Should the filament voltage read less than it had been reading (this is a good case for daily logging of the filament voltage), the culprit most likely is a dirty buss connection. After cleaning them be sure to get the connections **tight**.

## Exciter Problems (and a sure fix)

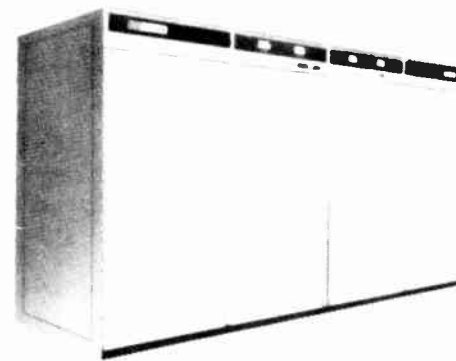
The AEL exciter can sometimes generate more ulcers than kilohertz! The solution to our myriad of intermittents, burned 2Q6 stage resistors and the like was to replace the solid state portion of the exciter with an outboard LPB model AM-5 transmitter.

The AM-5 feeds, via a piece of RG-58/U coax, the driver grid tank coil (which was also the 2Q6 collector coil). The 2Q6 collector is disconnected from the coil tap, and the center lead of the RG-59/U is attached. The coax braid, of course, is grounded at a lug nearby. Power is removed from the 2Q6 stage and the Oscillator PC card. In the LPB AM-5, the modulation is disabled by turning the MOD pot down and shorting the audio input terminals. OUTPUT is set to provide the proper Driver Grid Current. We made this change in May, 1989, and the rig has been humming along fine ever since, except for a shorted cap (see next item). (continued on page 11)

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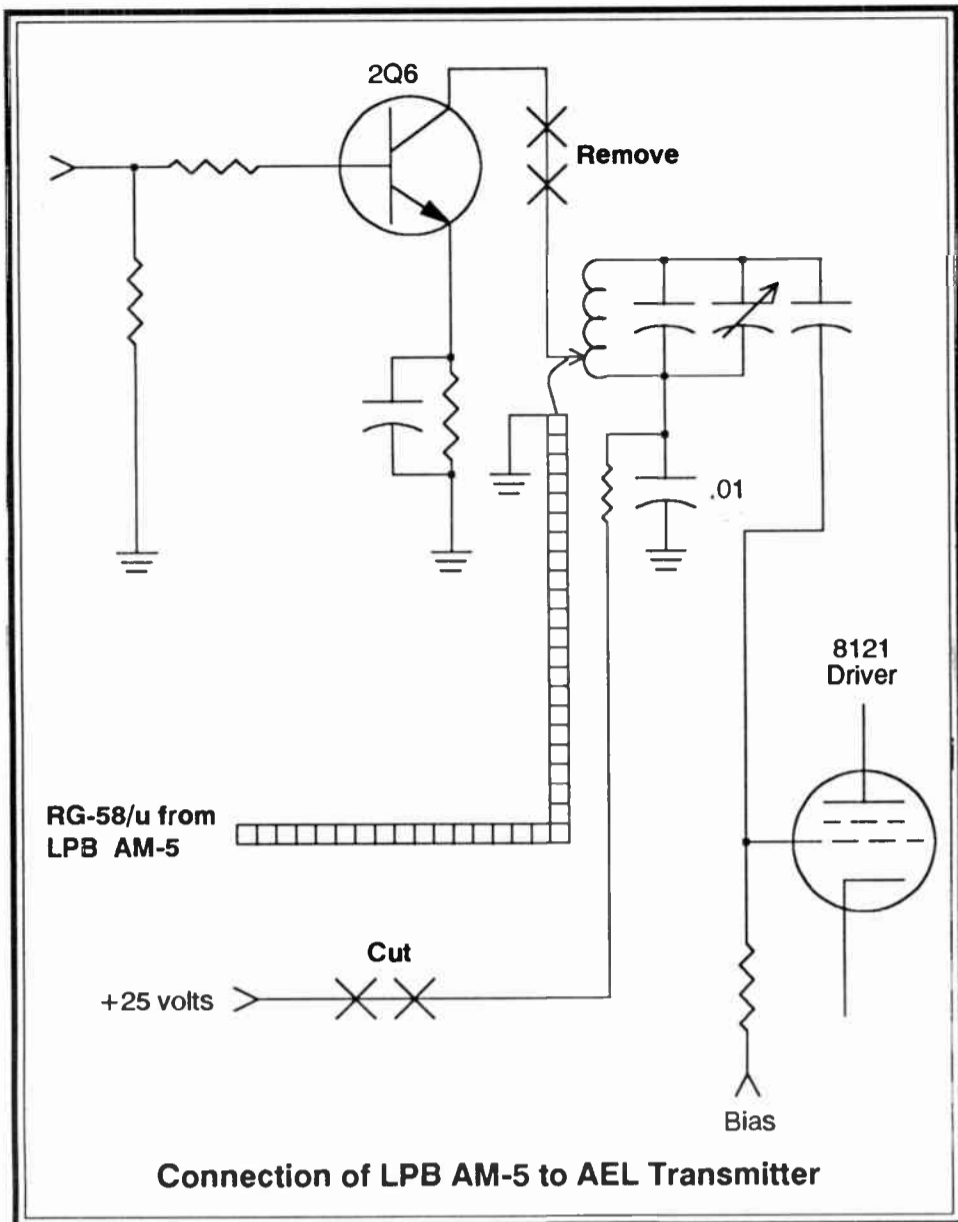
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## AEL Transmitter . . . (continued)



### 6kV Capacitors

The 6kV paper capacitors used in the HV and MOD are not standard of-the-shelf items. They can be made on special order, by the original manufacturer, in a 4-6 week time frame. It pays to have one of each on hand (the cost on special order is only half of what AEL wanted for them when they stocked them).

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### Air Filters

Lastly, the air filters can use a little help since the 1" filters supplied are subject to a lot of floor dust, due to their location (combined with a couple of aggressive fans). I suggest mounting a 16x20x1 filter on the intakes (louvered doors). Duct tape holds them in place very well.

Now can anybody tell me where I can obtain a couple of spare audio driver modules for the AEL?? They were made by Sanken, and I cannot find them anywhere. If either of the 25 VDC supplies (1A6 and 1A7) lose their regulation, kiss these audio modules good-bye!

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# A Sinking Motorboat

By Rod Rogers, CE - KINA/KQNS  
Salina, Kansas  
(913) 825-0266

After about a year of intermittent problems with our FM-3.5K, I decided it was time to get serious about the IPA regulator problems. On several occasions, the transmitter would go into erratic operation that sounded like "motorboating." Naturally, when I got to the site, it acted just fine most of the time -- but I finally managed to catch it in the act.

I found that the IPA supply voltage was low and, upon changing the IPA match control, I could reduce the current required from the regulator. The IPA voltage would then "snap" back to normal, and the motorboating would disappear.

What was happening was that the LM338 regulators (which are run in parallel) were shutting down. I had lost a few in the past, but none were bad this time. In fact, after removal of the regulator assembly, it seemed that there was nothing wrong! I then put the transmitter back on the air, and checked the voltage across the three 0.2 ohm/10W resistor, to see how these three chips were sharing the load. All were equal, reading about 0.6 volts, further telling me that there really wasn't anything wrong. Calculating this reading across 0.2 ohms indicates a current of about 3 amps, very acceptable since these are 5 amp devices, and the total current to IPA was running around 9 amps.

It was later that I happened to reach in and feel the TO-3 case of these regulators, with the transmitter in operation. I found that they were hot enough to burn the tip of my finger. (Please be careful if you try this; this area is pretty clear of any high-voltage, but I don't want anyone hurt following my advice.) I had been letting the tube cool a bit in the past, and since there is an air passage to this regulator assembly, it had been cooling too.

The problem was that, for some reason, these regulators were running extremely hot, with the current through them well within limits! At this point, I had two theories: An oscillation somewhere in the regulator (or IPA), or something was wrong with the mounting of the regulator chips, preventing good heat transfer.

Being a true blue broadcast engineer, I started with the cheapest option first (I have heard that the IPA amp replacement runs around \$1500). I added more heat sink compound to both sides of the mica insulator; they were better, but still too hot for my satisfaction.

Here's the ringer! I noticed a small, countersunk, phillips-head screw under the chip mounting that holds the socket in place. Upon dragging a razor blade across it, I found that it was not countersunk far enough and, due to this condition, was preventing the device from setting flat enough for full contact! After disassembly, and re-countersinking with a special drill bit, all three chips are running much cooler, and our "motorboating" problem is cured.

I am not sure which other Harris transmitters may use this same regulator assembly, but I assume that the problem could arise in them too. By the way, the best heat sink compound seems to be the white, sticky, messy stuff, shipped with solid state tower flashers. If you're in a pinch, the silicon grease shipped with Andrew Heliac connectors will do. There always seems to be a surplus of both at most operations.

I hope this not only helps someone else with intermittent IPA problems, but have included the whole troubleshooting story for the benefit of those just starting out, as many of the procedures used may be applied to other situations. Good luck!

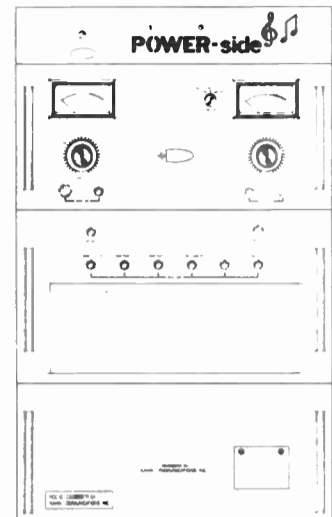
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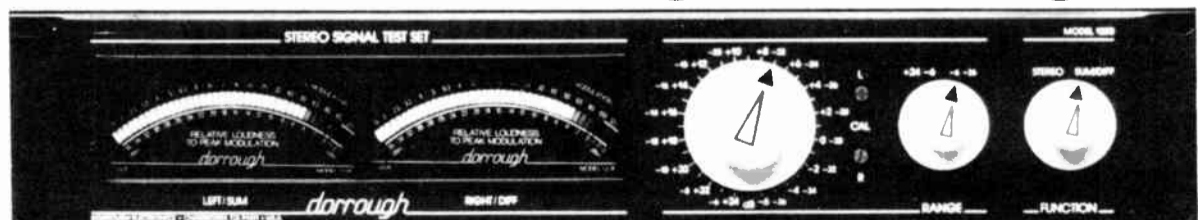
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## Moseley DRS-1A "Brick" Power Supply Replacement

By Jim Alexander - Broadcast Engineering Services  
Russellville, Arkansas (501) 968-7270

The Moseley DRS-1A Digital Remote Control unit uses a PC board mounted "brick" +/- 12 VDC power supply to operate the metering circuitry and the A/D converter. This power supply was originally a Semiconductor Circuits Type SQ-2.12.30. Semiconductor Circuits has been out of business for several years and, while Moseley still has a few on the shelf, they quote a \$170 price tag. With a bit of luck, I was able to track down a replacement for under \$40. It is a model MD12.03 power supply produced by the AAK Corp, 747 River Street, Haverhill, MA 08130. (617) 373-3769.

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When WDAC installed a new 500' tower and 5-bay Harris Sky Gain antenna in June of 1988, on one of the highest elevations in Lancaster, we knew it would be a target for lightning. To secure protection for our combination studio/transmitter location, as well as calm our neighbor's fears, we installed a lightning dissipation system (Lightning Prevention Systems Model ALS-6000), along with extensive (for an FM station) ground radials. The manufacturer supplied us with references from users which we checked out. All were very positive as to the effectiveness of the system in eliminating lightning strikes. I observed the tower though one storm, and there were no strikes. So far it appears that the system is doing what it was designed to do.

Being located in a rural area, power spikes are common. We have a 3-phase, 240 volt Surge Eliminator (LEA SE-240-100) which was installed in 1980. This was updated last year with several new modules, and installed in the new electrical room adjacent to the primary power CT box. When we still had some surge damage, I contacted the power company (Pennsylvania Power and Light), and their engineers examined our electrical system, making several suggestions. Power neutrals and common grounds must be kept separate at the equipment end. Incoming and outgoing wires to the Surge Eliminator must be isolated from each other so no incoming surge is induced into the protected AC circuits.

We have a new main 10kW FM transmitter (BE FM-10A) as well as an auxiliary 10kW transmitter (Harris FM-10H). The new BE transmitter has a number of ICs in the Automatic Power Control and Transmitter Controller modules. On one occasion, having completed maintenance on the BE transmitter, with the filaments on, the Harris transmitter plate was switched off and suddenly the BE transmitter went dead. This resulted from a spike caused by turning off the high voltage of the auxiliary transmitter. A 3-phase shunt type Surge Protector (MCG Industries Model 2023DCT) was installed on the load terminals of the circuit breaker protecting the BE transmitter. This solved the problem -- and no more damaged controller.

Additional surge protection is installed on the single phase 120 volt line supplying power to the Control Room audio and monitoring equipment. One of the most important factors in eliminating, or at least reducing, power line surges, is obtaining a good ground and following instructions carefully when installing the surge protectors. The new telephone systems are very susceptible to spikes and very expensive to repair if you own your own. System protection is well worth the cost of the individual line surge suppressors (Tripp-Lite Telespike Blok, Model TSB or equivalent).

We are also considering the advisability of installing a diesel, water cooled emergency generator since power blackouts seems to be occurring more frequently. If you would like any further details, I would be glad to answer any questions. I'm generally in the office from 7 a.m. till 2 p.m., Monday through Friday.

## ITC Cures

By **Neil Schwanitz, CE - WXYT-AM/WVAE-FM**  
**Southfield, Michigan**  
**(313) 569-8000**

I was paging through an issue of Radio Guide and saw an article by Vince Edwards of WBGW on ITC cures. Other capacitors, as well, will dry out in these decks. I have made it a standard practice to re-cap that machine the first time it is on the bench. This will save you the problem of the audio going South, on one channel, later. The best caps are those Japanese style. They have a higher voltage rating in a smaller package too. The best source for these little wonders is MCM Electronics in Dayton, Ohio. They have a toll-free number (800-543-4330), and carry a full line of Japanese ICs too.

Having problems with your ITC splice finder locking in the erase mode and running 'till the cows come home? Flip the deck over and locate R106 (6.8K/2W). The value probably has changed to about 3.2K and it may look healthy. Change this for a 6.8K, 5-watt.

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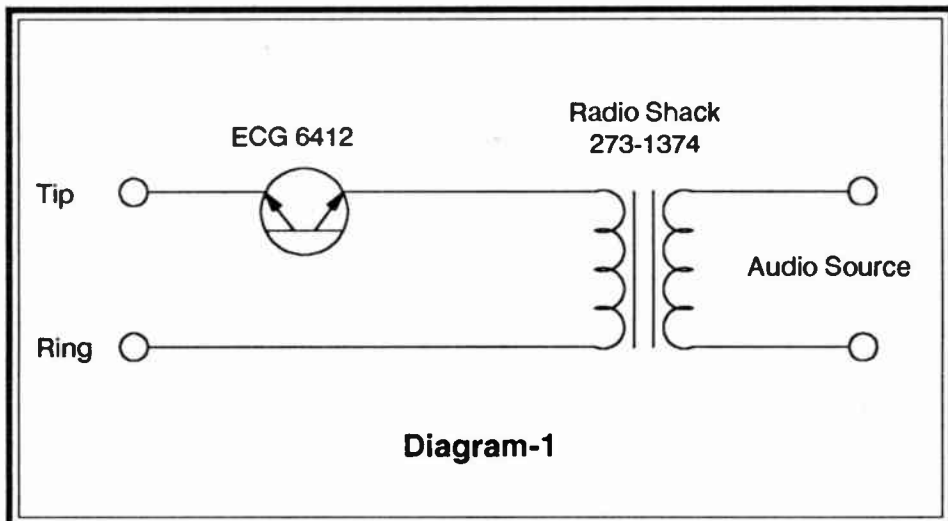
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# Auto Answer - Cheap

By Robert B. Hoy, CE (cheap engineer)  
 WWBD The Talk Station  
 Philadelphia, Pennsylvania  
 (215) 668-4431

This should be the last entry in the race to create the simplest auto-answer device. With just two (2) parts, we can couple an audio source into a phone line, and the cost will be less than a case of my favorite suds (\$4.98 on sale). Price seems to depend upon where you live and how good a discount you get on the Sylvania part.

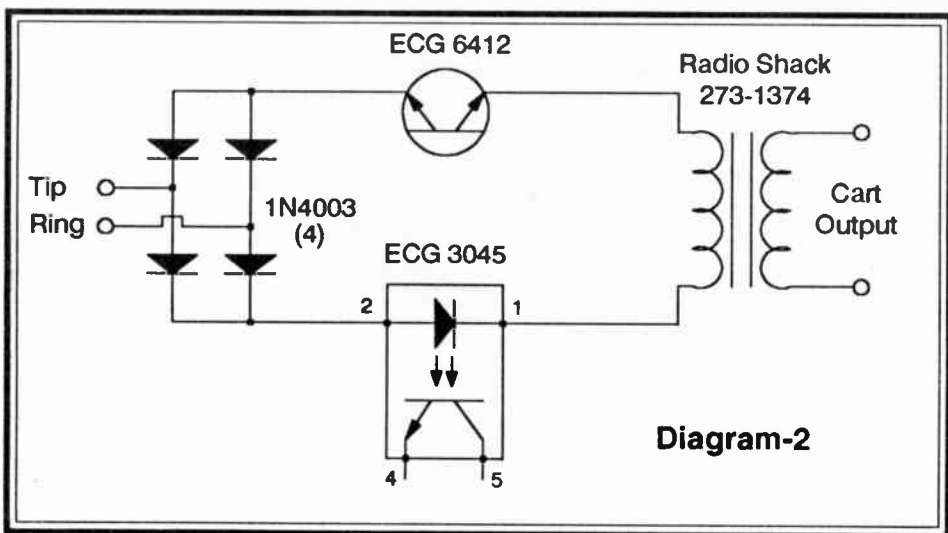


The "Diac" or "Bilateral Trigger Diode" looks like an open circuit until a voltage of either polarity is applied that is above its threshold of 63 (+/- 7) volts. When this voltage is exceeded, as when the line rings, the device acts as a switch and goes into conduction. This "answers" the phone and holds the line through the transformer, which couples the audio to the line.

When the caller hangs up, most telephone companies provide a momentary reversal of tip and ring which causes the diac to stop conducting and release the line.

This circuit will work on any "ESS," electronic switching and signaling, telco office. It may not work on other ones but, for a few bucks in parts, it would be worth trying it.

For those who have a larger budget, I would recommend Diagram-2. We have added a bridge rectifier and an optical coupler to the circuit. The bridge just makes sure that the LED in the coupler sees the proper polarity. If you are careful to observe polarity when connecting to Ma Bell, you can leave out those expensive diodes, and save anywhere from 20 to 50 cents!



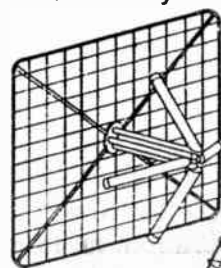
The optical coupler can be directly wired to the remote start of a cart machine so that we now have an auto-answer message machine. Be careful to only connect to machines that use 25 volts or less for the remote controls. Some of the older models used 110 AC, and they weren't even isolated from the line! If your machine won't work with the coupler, I guess you will have to bite the bullet, go to the "Shack," and get a cheap relay and plug-in supply.

Either circuit will accommodate an extra LED that could be used as a status indicator. Just be sure to keep the polarity proper and put it in series with the other components -- no ballast resistor is needed.



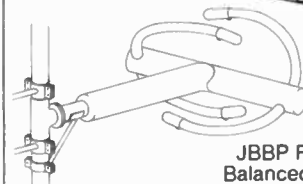
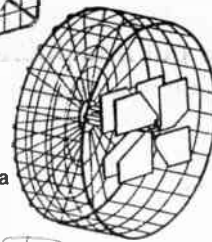
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# Coax Cable Problems

By Douglas White - White & Associates  
Saginaw, Michigan  
(517) 793-9994

It's interesting to note that two problems mentioned in Radio Guide were what I found at a client's station. Upon my first visit, usually the studios and transmitter facilities get inspected for unusual things that stand out, or obvious problems.

The first unusual thing discovered was the cable connecting the composite output of the audio processor/stereo generator to the STL transmitter. The manufacturer states that RG-58 should be used, and if a long run is required, RG-62 should be used. What I found was a white cable with molded F connectors at each end. It was a 75 ohm cable used for Cable TV! The actual connections to the equipment were made through F to BNC adaptors. The cable and adaptors were removed and the proper cable was installed. An audible difference was noticed! Stereo separation wasn't measured, but I'm sure it was affected.

Another unusual discovery was that the transmission lines going up to the main antenna and the backup antenna had no pressure in them. After a little investigating, it appears that this condition may have existed for 3 years. So, a trip to the nearby welding shop for a custom regulator and a couple of tanks of Nitrogen was in order. VSWR is 1.3:1 on the main line, and hopefully will be lower once the line is purged and pressurized again.

## STL Rumble

By Val Alwin - Alwin Engineering Services  
Watertown, South Dakota  
(605) 886-3025

An interesting noise problem was recently solved at an AM station in Eastern South Dakota. A station moved its studio and, in the process, installed an STL between the studio and the transmitter. Shortly after it was put into operation, an intermittent low frequency rumbling noise was noticed on the signal. Because it was coincidental with the move, it was assumed that there was some defective STL equipment or that something in the link was causing this very low frequency intermittent noise.

The station engineer was aware of the noise and, through the process of elimination, using tape recordings etc., he determined that it was coming from the transmitter and not the STL. Further investigation showed that the noise was caused by vibration of the equipment, and it was traced down to a loose screw on the plate cap of the tube in the transmitter. This, again, indicates that simple screw tightening is important to keep a station operating properly.

## Mod Transformer Testing

By Jim Alexander - Broadcast Engineering Services  
Russellville, Arkansas  
(501) 968-7270

In a recent issue of Radio Guide, some discussion was made concerning the testing of AM modulation transformers. My favorite method (which I make no claim as to being the originator) consists of removing all leads to the transformer and applying 120 VAC to the secondary winding. Then **carefully** (high voltages can be present depending on the windings ratio) measure the voltages on the primaries. These should be equal, or at least within 5 to 10 percent of one another, if the transformer is OK.

If you are nervous using a "suicide cord" (power cord to device with no fuses) for the test, insert a beacon lamp or electric heater of 600 watts or greater in series with the hot AC test lead. In the event of a short, the lamp or heater element will simply operate. This type of test circuit, with smaller lamp loads, is often quite handy in working on units which blow fuses before you can tell what is going on. Simply short out the fuse and use a series lamp load of about 2 to 3 times the wattage drawn by the device. The lamp will glow in relation to the degree of load (or overload), and the device will operate at a reduced power to enable you to get a few readings on the unit under test.



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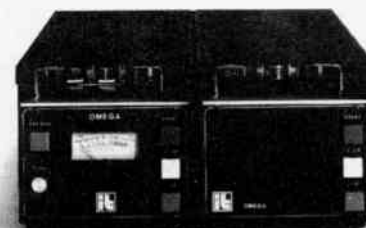
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## Audiofile Power Supply Fix

By Paul Moder - KATO/KXKQ  
Safford, Arizona

I do most of the engineering at a small market AM/FM combo. Since I am also the operations manager, program director, production director, etc., etc., I rely heavily on advice from factory engineers in order to save time when troubleshooting problems with equipment.

Recently, our ten year old Audiofile (Cetec 7000 Automation system) began playing the wrong carts. It would show on the CRT and printer that it was playing the right one, but any fool could hear that what was on the air was not what was on the screen. After numerous headaches, resets, and memory clears, I finally checked the power supplies with a scope. I found a strange looking square wave of 120 Hz hanging on the 12 volt DC power supply, with an amplitude of about 290 mV.

I called the factory, described all the symptoms, and told them about the strange waveforms. They said they had never heard of such a thing and that it wouldn't have any effect on the Audiofile because it was within specs. They said the problem was either in the logic board or in the interface card. I would have to send them a deposit, and they would send me replacement while they fixed mine for parts and labor.

Refusing to admit defeat and spend the boss's money, I decided the first thing to do was track down the source of the strange wave, just in case it **was** the problem (what did I have to lose?). I turned off the power and added a capacitor to the output of the power supply. Upon re-energizing the Audiofile, I found that the waveform was gone! Then slowly it reappeared. Aha -- a faulty regulator chip; when the chip warmed up, the waveform reappeared. By blowing air across the heatsink, I was able to clean up the DC line.

Still not believing that the experts could be wrong (and it being Friday), after a long week of frustration over the problem, I decided to go home and start with a fresh outlook on Monday. The system worked perfectly all weekend! When I closed up shop, I had left the cover off the power supply and the back door off the equipment rack. This provided just enough additional cooling for the chip to clear up the Audiofile's confusion.

Sometimes trial and error beats the best factory advice. That advice is free, so maybe it's worth what you pay for it.

## Gold and Grungy

By Gary A. Minker, CE - WIRK/WPBG  
Lake Worth, Florida  
(407) 965-9211

Are you one of the more fortunate fixits that gets to work on "older" equipment with those "new-fangled" edge connected PC boards, with tin or gold plated finger connectors? If you are, then you know that cleaning years of grunge off these fingers, especially where gold plating is involved, is troublesome.

Take this, for example -- the 3D in the production room gives up the ghost in one amp channel. You have re-seated the card a dozen times to try to cure the problem. Over the last millennium, the room has turned brown with nicotine, just to name a culprit. You have chemically cleaned this poor board until you have the cleanest fingernails in the building -- but the grunge is still there.

Sound familiar? Any engineer will tell you that crocus cloth is not the way, but it seems that this is the only answer short of nuclear reaction. Fortunately there is another method. For the amateur draftsman/technician, the cure for edge connector grunge is in the drafting table drawer. Yup, the motorized mechanical eraser. These plug-in marvels are available from any office supply or drafting house. They are available with a wide range of abrasive and non-abrasive inserts, depending on the level of grunge.

My favorite, for example, is a Bruning Model #87-201 motor unit with the Staedtler brand white compound eraser inserts. A few quick passes with this contraption and one swipe with your favorite cleaner to get any remaining oils off the card, and the machine is back in business.

The more abrasive inserts are very helpful in repairing PC boards where a de-soldering procedure has left an unsightly mess that won't come off with chemical cleaning -- or can't be chemically cleaned. Just run the eraser unit over the lands and solder away.

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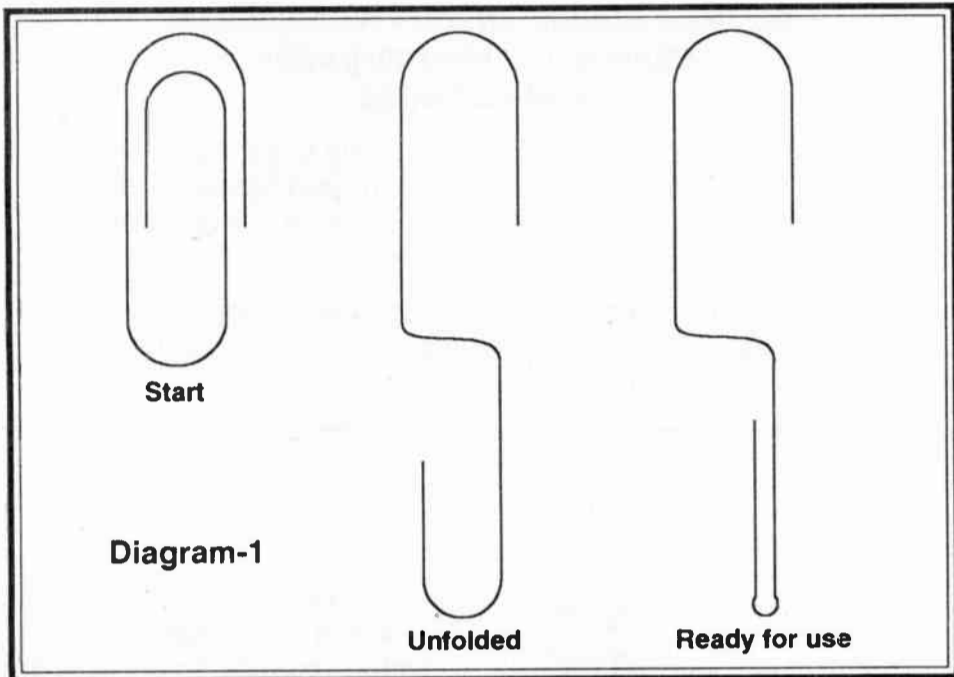
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# Cassette Speed Adjustment Tool

By Eric Chromick  
Waynesville, Ohio  
(513) 885-73660

I can never find my little screwdriver or a tuning tool that's long enough to adjust the speed pots in a cassette machine. One day a simple solution came to me; a small paper clip, when unfolded to look like the letter "S", can easily be bent to make a perfect tool. After unfolding it, use a pliers to flatten the smaller side, and your left with a rigid end that fits the trimmer and a wider end that gives you something to hold onto. (see Diagram-1)



I've made up one of these for every cassette machine I have to work with, and have taped them to the bottom of each machine (or inside the battery compartment on portables). The same tool also works on the recessed screws in XLR connectors without tearing up the threads. You might need to hold the tool with a pliers if the screw was tightened by "Conan the Intern."

## Tandy Tips

By Eric Chromick  
Waynesville, Ohio  
(513) 885-7360

### Datamite A/D Converter for Tandy Model 100

The Datamite (available from Jones Service & Design, 1842 S. Nugent Rd., Lummi Island, WA 98262, (206) 758-7258) is an analog to digital converter that plugs into the cassette port on the Tandy Model 100 computer and, along with its software, can function as a chart recorder, a voltmeter, or a frequency counter. The chart recorder function, alone, makes this a terrific piece of equipment. If you've ever looked at chart recorder prices or tried to rent one for a couple of days, you'll agree that the \$62.50 (+\$3 S&H) is a great deal.

### Tandy Model 100 Frequency Counter

I found a BASIC program called FRQCNT.BA on the Madison Tandy Users Group BBS (608-655-3806) that turns the Model 100 into a fairly accurate frequency counter. It uses the cassette port and cable with no mods to the computer.

Since the program is written in basic, it can easily be modified. The frequency value is an integer variable so you can print the frequency value to a RAM file, cassette file, printer, or even the RS-232 or modem for a remote readings. If you want to measure stability over a long time period, writing the frequency value and TIMES to RAM or an external device saves you from having to sit and watch the counter, while allowing an accurate time reference.

The program was written for cassette machine speed adjustment, which it does well, but the capabilities of the Model 100 allow you greater flexibility than a conventional counter.

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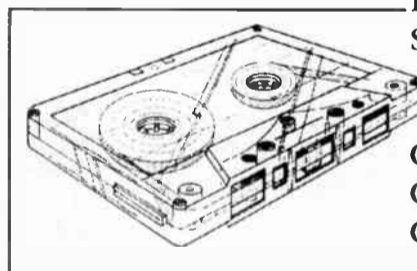
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## BMX Mike Compressor

By Frank L. Berry - WQYK  
St. Petersburg, Florida

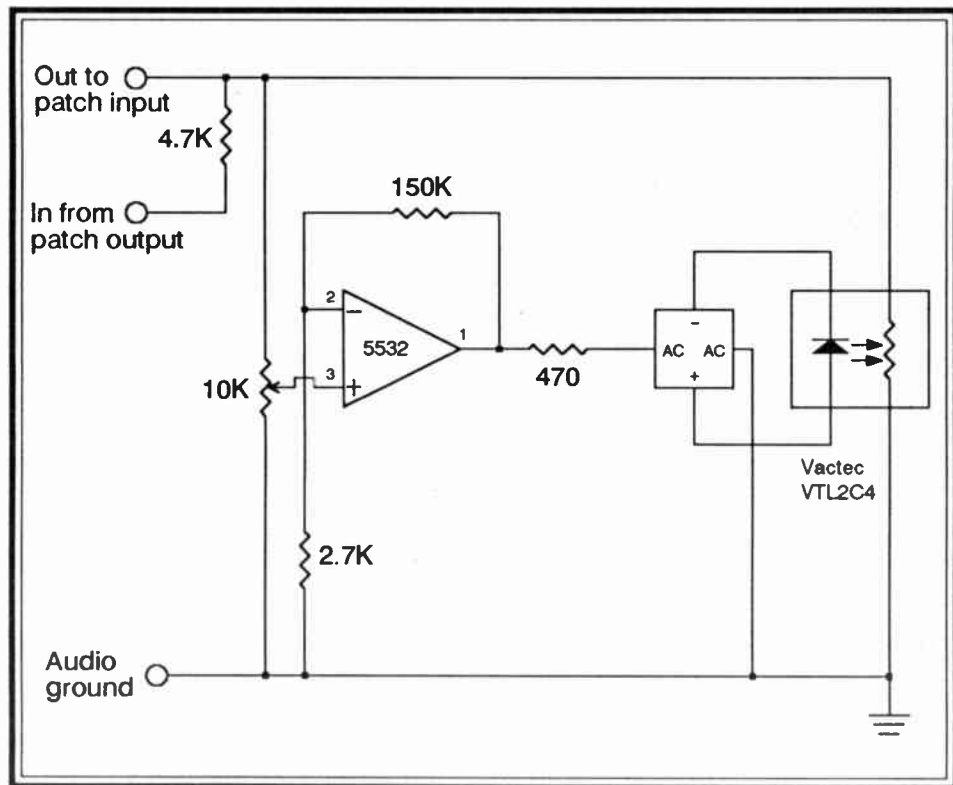
I designed this very simple and straightforward microphone compressor for use from the patch points of our BMX-series of consoles.

The secret behind the success of this circuit is the Vactec model VTL2C4 LDR package available from Newark Electronics. The VTL2C4 exhibits characteristics which make it ideal for use in the compression of audio signals. It has a fast attack and slow release time, when used as the shunt leg in an "L" or "T" pad.

Slope calibration controls are unnecessary as the driver op-amp gets its audio from the **output** of the controlled gain network and will automatically balance to the gain necessary to keep the compressor output level constant.

Any garden variety op-amp can be used to drive the LED within the LDR package. I chose the 5532 because I had plenty in stock.

In setting up the compressor, you will notice a reduction in microphone level as the 10K compression control is turned up. I have adjusted mine for 13dB compression, and instructed the jocks to run the microphone faders full open. the microphone levels peak at +2dB.

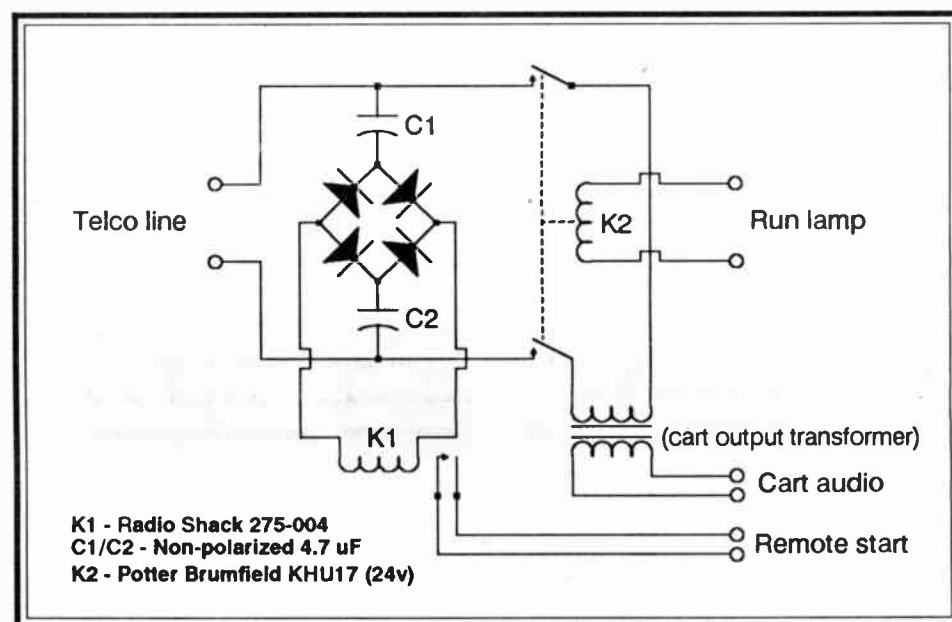


## Cart Telco Coupler

By Dave Higginbotham - WCAW/WVAF  
Charleston, West Virginia  
(304) 925-4986

A friend of mine passed this circuit along to me for an events call-in line. The ring voltage is rectified and used to start a cart machine. The run lamp voltage is used to operate K2 and seize the line via the output transformer of the cart machine.

For better quality audio, or cart machines that don't have output transformers, install a 600 ohm to 150 ohm transformer with the 150 ohm winding going to the phone line.



## Fidelipac False Start Fix

By Aaron Hackney - WBNH  
Pekin, Illinois  
(309) 347-8850

Aaron called with this tip on a Fidelipac Model CTR-10 stereo R/P cart deck. The symptoms are: false starts, muted audio, but the unit does detect cues.

On the play-logic board he found that there was an update shown on the schematic diagram but not installed on the board itself. It's called C-59 on the schematic, and it's a .01uF capacitor off the start switch. He added the capacitor to the circuit as shown in the manual's schematic diagram, and the unit works just great.

Thanks Aaron, for the tip . . . Editor

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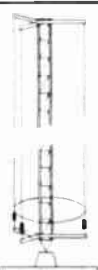
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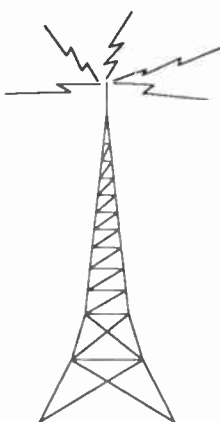
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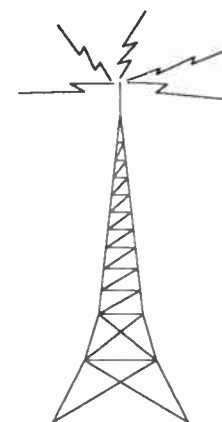
# The Radio Guide FAX-GRAM



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# Equipment Guide

Dec  
1989

Box 7001

Rochester, MN 55903

(507) 280-9668

Ray Topp - Editor

## Here's Why We Do It

The **Equipment Guide** is published as the primary source for all of your used equipment needs - - buying or selling. Here's why **Equipment Guide** works:

**Equipment Guide** does not have ads that are ancient history.

**Equipment Guide** does not limit you to a fixed number of words to describe your gear.

**Equipment Guide** reaches the right people.

The **Equipment Guide** can only help you, if you help it. Use the Guide to place your classified ads.

Call me at (507) 280-9668, and let me know what you like (what you don't like), and give me your suggestions. They will be used.

You'll like the results you get in the **Equipment Guide**.

*Ray Topp - - editor*

## Here's Where To Send It:

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**Rochester, MN 55903**

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## Here's What To Do:

**1** - Describe your used equipment, for sale or wanted, in as many words as you feel it takes to do the job.

**2** - Describe your help wanted or position wanted, again, in as many words as you feel you need.

**3** - Enclose a check for \$3.00, payable to Rochester Radio.

# Equipment For Sale

RF meters, used and tested  
Sangamo mica transmitting capacitors,  
assorted sizes, large variety

Dan's Discount Radio Parts  
Cavendish, VT  
802-226-7582

Thousands of Tape Carts  
Scotch I and Scotch II, Aristocarts,  
Fidelipacs, Capitol AA4 and A2, Master-  
carts  
50¢ to \$3.00 each, brand new to  
rebuildable condition  
Ampro Console, \$1250

Pat Martin  
PMA Marketing Company  
4359 S. Howell Ave. #106  
Milwaukee, WI 53207  
414-482-2638

Collins FM antenna made by Electronic  
Research Inc. 3-bay circular polarization,  
gain 1.5588, input 7.5 kW. Made in 1981  
and tuned to 97.7 mHz. \$2,000

Paulo S. Lotsof  
KAVV  
Box 42977  
Tucson, AZ 85733  
602-899-9797

Andrews 6-1/8" rigid line (50.5 ohms),  
1000 feet.  
600 feet 1.2" Hellax.  
6-rolls 1" copper.  
1-roll 3" copper.  
1-roll #10 or #12 copper wire.

Richard Myers  
KMBR  
4935 Belinder Rd.  
Shawnee Mission, KS 66205  
913-677-8944

Lampkin Model 205A modulation meter  
with quad scale. \$50 pre-paid.

Warren Arnett  
WBAT/WCJC  
Box 839  
Marion, IN 46952  
317-664-6239

Gatesway console. Excellent condition,  
used at college radio station. Asking \$900,  
negotiable.  
Gospel albums. 400 for \$500 or best offer.  
150 foot guyed tower, in place.

Les Williams  
WFIC  
P.O. Box 475  
Endless Road  
Collinsville, VA 24078  
703-647-1530

Gates 10G FM transmitter with Wilkinson  
FME-10 exciter on 102.7 mHz. Been used  
as a standby.

Mike Ripley  
KOZE  
Box 936  
Lewiston, ID 83501  
208-743-2502

Straight Wire Audio phono pre-amp.  
Model PH-2B-V. New, \$150.  
Fidelipac CTR12 stereo cart machine.  
New, \$1,000.  
Allied A/L-500N cart rack, still in box. \$374

Greg Thomas  
KELI Radio  
910 W 14th St.  
P.O. Box 3834  
San Angelo, TX 76902  
915-655-9879

Rohn 160-foot self support tower. On the  
ground, good condition, has not been  
painted. With new "J" bolts and all hard-  
ware. Asking \$3,500.

200-foot Cablewave 1-5/8" foam coax.  
Never installed, on the reel with new factory  
installed "N" connector on the feed end.  
Asking \$1,300.

100-foot Rohn SSV tower. Small, never  
painted, on the ground, all hardware.  
Asking \$1,000.

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

Shure M67 mixer. 4-channel mono,  
excellent shape. \$50

Write to: Tim Verthein  
Box 44  
Cohasset, MN 55721

Roller Coils:  
4-Gates 15VC1444, 15uH, 20A. \$40 each.  
3-Johnson 4134MS4, 15uH, 20A. \$50 each.

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Fine used AM & FM Transmitters  
and also New Equipment

For the best deals on Celwave products  
Andrew cable,  
Shively & Comark antennas.

|      |                |            |
|------|----------------|------------|
| 1980 | CCA FM-28,500  | 28.5 kW FM |
| 1980 | Harris FM-20K  | 20 kW FM   |
| 1976 | RCA BTF-20E1   | 20 kW FM   |
| 1978 | Collins 828E1  | 5 kW AM    |
| 1976 | Harris MW-5A   | 5 kW AM    |
| 1976 | CCA AM-50,000D | 50 kW AM   |
| 1978 | Harris MW50A   | 50 kW AM   |
| 1972 | Harris BC10-H  | 10Kw AM    |

201 Old York Rd.  
York Plaza Suite 207  
Jenkintown, PA 19046  
215-884-0888

Telex No. 910-240-3856 (TRANSCOM CORP. UQ)  
Fax No.. 215-884-0738

3-Gates 6VC0854, 6uH, 20A. \$40 each.

Fixed Coils:

4-Gates 6FB0854, 6uH, 15A. \$25 each.

2-Johnson 200-107, 10uH, 10A. \$15 each.

Heath-Schlaumberger frequency counter,  
SM-110C. \$75

Small Johnson Amateur Match-Box. \$75

All prices FOB Lufkin

Merl Saxon

622 Hoskins

Lufkin, TX 75901

409-634-9558

Potomac FIM-41 field strength meter.

Less than a year old, proof of calibration,  
perfect condition. Cost \$3,500 new -- will  
sacrifice for \$2,000.

Mike Cooney

Dakota Broadcasting

Box 97

227 22nd Ave. S.

Brookings, SD 57006

605-692-1430

Moseley MRC-1600 microprocessor  
remote control (studio & transmitter  
terminals). Approximately 2 years old, both  
work perfectly. New location makes this  
expendable to us. Hurry, this won't last.

Sells new for \$4595. Your cost is \$1,995  
firm.

Gary Hawke

KYRE-FM

316 Lawrence Ln.

Yureka, CA 96097

916-842-4158

RCA BTA-250L transmitter. 1230 kHz,  
with manual and some spare tubes.

RCA WF-48A frequency monitor.

RCA WM-43A Modulation monitor.

RCA wall-mount power supply. Possibly  
for old console.

Collins PB-190 cart playback. Rack  
mount, condition unknown.

Bogen CT-60 amplifier. Condition un-  
known.

RCA cart machine. Old-old. Might even  
work.

ITC-3D motor with capstan.

Schafer Model-800 automation system.  
With schematics, includes 4 Ampex play-  
only reels.

Might consider trading some of the above  
for needed equipment. Transmitter is for  
sale with no trade for it.

Best offer for all above equipment.

(continued on page 3)

**Don Niccum**  
KOZA Radio  
1301 South Crane  
Odessa, TX 79760  
915-333-3101

**RCA Audio Consoles:**  
BC-9A, four pots. \$50  
BC-8A, eight pots. \$125  
You pickup or pay shipping.

**John Getz CE**  
WPGH-TV  
750 Ivory Ave.  
Pittsburgh, PA 15214  
412-931-8141

6) New LEL 8-channel mono/4-channel stereo distribution amps. 1 year warranty. \$150

**Glynn Walden**  
KYW  
20 Derby St.  
Marlton, NJ 08053  
215-238-4893

3) Carousels model 20-A. All 3 in good working condition when removed from service July 1989. Make offer.

**Norm Mason**  
KXAR  
P.O. Box 320  
Highway 29N & I-30  
Hope, AR 71801  
501-777-3601

Gates M3625 audio box, working.  
B&W Model 400 distortion meter with manuals, working.  
Miratel AA-1 air alert, as-is.  
\$200 for all three.

**Alex Kolobielski**  
WAFL/WYVS  
P.O. Box 324  
Milford-Harrington Rd.  
Milford, DE 19963  
302-422-7575

**RCA BTF-20E1 Spare Parts**  
\$500 takes all.

**Dave Seavy**  
KROC-FM  
122 4th St. SW  
Rochester, MN 55902  
507-286-1010

**Phasemaster T12000A2, 110A, 240V,**  
phase converter. Only in service 2-1/2

years. Excellent condition. \$6000  
Shively 6810, 10-bay antenna. Only 2-1/2 years old, just taken out of service. Tuned to 101.1 mHz. \$10,000  
4) Otari ARS-1000 playback decks. Used very little, like new condition. \$1,200 each.

**Al Baxa**  
WAVV  
11800 Tamini Trail East  
Naples, FL 33962  
813-775-9288

**Harris satellite receiving equipment**  
shelf. Model 6550.  
**Commodore model 8032 computer**  
(monitor, keyboard, computer one piece).  
Dual floppy drive model 8050 and 10-meg Seagate external hard drive.  
Best offer for all.

**Ray Keller**  
KPRE-KBUS  
2775 NE Loop 286  
P.O. Box 1550  
Paris, TX 75460  
214-785-1068

**CRL SG-800A stereo generator** in working condition. \$1,050 or best offer.  
4) **Revox A-77 play/record** reel to reels. Two work and two for parts. \$1,000 for all four or best offer.

**Stereo Statesman 5-channel console.**  
Works fine. \$1,200 or best offer.

**Brad J.**  
KCIV 99.9 FM  
1031 15th St.  
Modesto, CA 95354  
209-527-6100 (afternoons)

**TFT Model 770 composite STL** in excellent condition on 948.5 mHz. \$3,500

**Dale W. Johnson**  
KBTA-KZLE  
1740 Chaney Dr.  
P.O. Box 2077  
Batesville, AR 72501  
501-793-3861

2) **Advance Model 155 heavy duty towers.**  
One at 370 feet, the other at 160 feet. Will hold 12-bay or more FM antenna. Can combine for 530 foot tower. Excellent condition.

2) **Marti RR-50/450 remote pick-up receivers.** UHF, late model, excellent condition. \$600 each.

2) **Marti MR-100 remote UHF pick-up receivers.** Excellent condition. Both for \$375 or \$200 each.

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## 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*

**Roger Wright**  
WLLX  
1208 N. Locust Ave.  
Lawrenceburg, TN 38464  
615-762-2916

**ADM ST-160 16-input stereo console**  
with furniture. Photos available. \$4,000 or best offer.

**Jeff Bretner**  
WDFX  
306 S. Washington  
Suite 500  
Royal Oak, MI 48067  
313-398-1100

Antenna tuned to 106.1 mHz. 8-bay plus over 3000 feet of coax.

**Joe Geoffroy**  
KNAN-FM  
2716 N. 7th St.  
West Monroe, LA 71291  
318-387-3922

**Shafer Automation System:**  
Model 901 control with following cards:  
1) System logger and cart encoding system

5) SMC Carousel control cards  
4) ITC control cards  
4) Revox interface cards  
1) Studio/net interface cards  
5) RAS carousel interface boards  
1) RAS extender card  
1) Monitor & battery back-up shelf  
1) 900 system power supply sources

4) Revox A-77 decks  
4) SMC 250 Carousels  
1) SMC 350 Carousels  
4) Shafer automation racks

**Jerry Gutensohn**  
KRNO  
475 E. Moana Lane  
Reno, NV 89510  
702-826-1355

**BE Spotmaster Model 400-A** cart machine. Mono record/play, used a lot.  
**Pioneer RT-707 2-track** stereo reel, record/play.  
**Tapemaster RP-7000** mono record/play cart machine. Used a lot.  
**Yamaha RM-602 & MT-44D** stereo cassette and mixing board. Real nice, used very little.  
**Various turntables for parts** (QRK, Russco, RCA, etc.).

(continued on page 4)

Quite a few electron tubes (small receiver types).

**Ron Price**  
**KWIK Radio**  
 259 East Center St.  
 Pocatello, ID 83201  
 208-233-1133

ITC RA (record amp for 3D). Missing case. \$375

3) ITC RAs with 3-tones. \$550 each.

ITC RA with 1 kHz tone. \$500

ITC R/P with network delay, in excellent condition. \$1,250

Otari ARS-1000 automation reel to reel playback deck, with 25-Hz sensor. Excellent condition. \$1,200 or best offer.

Belar AMM2 AM modulation monitor in excellent condition. \$580

Broadcast Electronics 4BEM50-A, 4-channel console. Perfect for newsroom use. \$450 or best offer.

2) Elmac 4-400As. New. \$88 each.

Many other tubes in stock, most new - call.

Moseley TRC-15 remote control, fixable. \$400 or best offer.

2) QRK 12-C turntables with Gray tone arms and cartridges. Very good condition. \$130 each or best offer.

**Michael Brown**  
 Radio Broadcast Consultant  
 3740 SW Comus St.  
 Portland, OR 97219  
 503-245-4889/503-667-1230

Hewlett Packard 8551B/851B RF spectrum analyzer. Covers 10 MHz to 40 GHz. Clean with manuals.

Tektronix Model 564 oscilloscope with model 3A72 dual trace vertical amplifier, model 2B67 time base, and model 3B1 dual time base.

Telequipment (Tektronix) Model D-67, 25 MHz solid state dual trace, dual time base oscilloscope. Clean with manuals.

Tektronix Model 1L20 RF spectrum analyzer. Covers 10 MHz to 4.2 GHz. Very clean with manuals.

Tektronix Model 132 plug-in unit power supply. Very clean with manuals.

General Radio 1021P2/1021P1 UHF RF signal generator and mainframe. Covers 250-920 MHz.

Singer MF-5 rack-mount mainframe, and UR-3 baseband spectrum analyzer plug-in. Measures baseband 0 to 480 MHz.

**Robert J. Lankton**  
 Precision Audio and Engineering  
 4027 Coshise Terrace  
 Sarasota, FL 34233  
 813-749-1420 Days  
 813-377-1488 Nights

**ITT Key Telephone System:**

6) ITT multi-line phones, 9-lines+hold, touch-tone, ivory color. 2 wall mount and 4 desk mount.

3) AT&T style speaker-phone, with control/mic units. 2 ivory color and 1 beige color, plus one speaker-phone for parts (unknown condition).

1) ITT 501 KSU. 5 lines with power supply, including ring generator and one extension cabinet (5 lines).

1) Melco 10-station intercom unit (KC-10X).

1) Melco S64-5RA loop detector.

System sold as-is. Fully operational when removed from service. some documentation supplied. \$700 or make offer.

**TIE Phone System:**

1) BK3 KSU. Includes CPU card, 1 tone supply card, 1 line card (4 lines), 4 station port cards (8 stations per card).

1) Power supply

15) Meritor HX phones.

System sold as-is. One or two phones don't work. KSU works fine. Requires 4-wire connection to each station. \$1,000 or make offer.

**Jerry Mathis**  
 WCSI/WKKG  
 3212 Washington St.  
 Columbus, IN 47203  
 812-372-4448

2) Tascam Model 112R, on-air cassette decks.

6) Tascam 122 MKII, cassette editing decks.

2) BE Model BM150A, broadcast consoles, with 8 channels.

3) Shure SM-57 mikes.

1) Luxo Model LM-1 boom support.

2) Mike boom clamps.

2) Atlas Model DS-7 desk-top mike stands.

1) PZM conference mike.

1) Shure M-267 on-air mixer.

1) Shure A268R mount for M-267.

1) CRL AGC-400 automatic gain control.

2) Fostex Model 6301 amplified speakers.

1) Belar Model AMM-3 modulation monitor with CRL MDF-400A NRSC de-emphasis filter.

1) Gentner silence sensor.

1) Belar Model RFA-1 RF amplifier.

1) McKay Dymek Model DA-9 base.

1) McKay Dymek Model DL-4 head.

Both used to feed RF amplifier and feed antenna system.

1) TFT Model 760-1A EBS monitor.

2) Soundolier Model 2070 equipment racks, with side panels and doors.

All equipment is less than two years old and used for less than one year.

**John Brennan Jr.**  
 Senior Vice Pres. Bank of Highwood  
 10 Highwood Ave.  
 Highwood, IL 60040  
 708-433-3000

# When we say we rebuild equipment We mean it!

**Special Extended to 1/15/90**



Model RP-0001  
 Recorder/Reproducer

Over 45 other ITC cart machines available

**ITC Premium Series  
 Mono RP Cart Machine**

Regular Price. \$995

**Special \$895**

(add \$95 for 3-tone option)

**Our price includes the following:**

-and-

**You are protected  
 with a full warranty  
 and right of return.**

- New motor bearings
- New capacitors on PC cards
- New sealed trim-pots
- New pinch roller
- New cartridge springs
- Re-lapped tape heads
- Documented spec. run
- All mating connectors
- Complete manual



1305-F Seminole Trail  
 Charlottesville, VA 22901

Phone (804) 974-6466  
 Fax (804) 974-6450

1) CBS Volumax 400 s/n 2439 AM limiter. \$100

1) CBS Audimax 111 s/n 335 AGC amplifier. \$100

3) Gates/ATC. Catalog ID: CPD, playback cart machines, s/n 6885, 6730, 6907. \$100 each.

1) Harris Model 994-7993-001 playback cart machine, mono. \$300

8) Andrew L44N female N connectors (new). \$28.80 each.

2) Andrew L44W male N connectors (new). \$28.80 each.

Approx 600) Fidelipac 300 (gray) audio carts. \$1.00 each.

Approx 250) Fidelipac Mastercarts (red). \$1.25 each.

1) Hewlett-Packard Model 206 audio sine wave generator (tube type). \$300

1) Hewlett-Packard Model 330B audio distortion analyzer (tube type). \$350

1) General Radio Model 1181-A AM frequency monitor (antique). \$25

1) RCA BCM-2A auxiliary mixer. 5 pots and 6 pre-amp cards. No power supply or upper front panel. May be able to locate power supply. Original RCA blue paint and very clean. \$500

1) RCA 243471 PA tuning screw for BTF-10E (black nylon-new). \$75

1) RCA MI-560719 module extender for BTE-15A exciter (new). \$75

1) RCA front door fingerstock for Model BTF-10E FM transmitter. 1 piece about 34" long, never used, silver plated, tarnished. \$50

1) California Microwave Model AD-2 downconverter for satellite system. \$200

1) Amplica Inc. Model CD-304302 LNA (120 deg.) s/n 558. \$75

1) California Microwave satellite receiver mainframe with: 1-PS01 power supply module, 1-SQ01 cue channel module, 3-SD153 program channel modules with frequencies of 64.0 MHz/64.4 MHz/ 76.7 MHz/ 77.9 MHz (77.9 MHz primary on all 3 SD153 modules). Used previously for reception of Mutual Broadcasting System Network. Worked when removed. \$1,500

1) Eimac 4CX10,000D/8171 transmitting tube, s/n 2DV825D. New in 1982 and never used. Still bright silverplate and not a mark on it. In original shipping boxes. New 1989 price is \$1,605. Make an offer.

2) Andrew 1703 AR connectors. \$50 each.

4-sets) Moseley manuals for PCL-606/606C (new). \$35 each.

1) CBS Audimax 4450, stereo. \$200

**The following is presently installed:**

350 feet of Andrew HJ8-50B 3" Heliac, air dielectric transmission line with 1) gas-pass connector and 1) gas barrier connector both installed. Line is presently attached up to the 150 foot level of a 190 foot shunt-fed AM tower. Balance of length is ground run. New price for cable is \$22 per foot (total \$7,700) without connectors attached. Connectors mentioned are about \$300 each when new. Line does have slight leak traceable to faulty connector O-rings which are field replaceable.

(continued on page 5)



Mr. Al Kaplan  
KWED Radio  
609 E. Court St.  
Seguin, TX 78155  
512-379-2234

All reasonable offers will be considered.

Rohn-80 640 foot tower with guys, lights, complete on ground. This is perfect for C-2 upgrades. Best offer over \$20,000

J. Boyd Ingram  
WBLE  
P.O. Box 73  
Batesville, MS 38606  
601-563-9002 Fax  
601-563-4664 Phone

- 2) 60foot Rohn towers (new). \$1,000 for both.
- 4) Gates CB1200 turntables. \$100 each.
- 1) McMartin B-502 stereo console. \$750
- 1) Teac reel deck. \$200
- 1) Spotmaster 500B stereo cart deck. \$100
- 1) NEL AM RF amp (AMPRFA-4). \$150
- 1) Powerline monitor. \$15
- 1) Harris AM-90 modulation monitor. \$450
- 1) Moseley TRC-15 remote control unit. \$600
- 1) Potomac Instruments FIM-21. \$750
- 1) Spotmaster 8-BEN100 (1/78) console. \$750
- 1) Complete Shafer 800 automation system in 3 racks. \$500  
Remote control unit for Shafer automation - included.
- 2) SMC 250 Carousels, working. \$800 for both.
- 1) Akai GX-77-7 reel deck. \$250
- 3) Scully stereo reel decks. \$500 each.
- 1) Moseley temperature sensor. \$25
- 1) Revox PR-99 playback deck. \$500
- 1) Moseley MRC-1600 remote control. \$2,250
- 1) Modulation Sciences SCA Sidekick. \$1,100
- 4) Newer Revox A-77 reel decks. \$400 each.
- 2) Yamaha CDX-5100 CD players. \$125 each.
- 1) ITC triple deck. \$600
- 2) Sennheiser MD-421 mikes. \$125 each.
- 1) Shure Audio-Master equalizer. \$50
- 1) Moseley TRC-15 remote control. \$600
- 1) Belar FMM-1 modulation monitor on 107.1 mHz.
- 1) Belar FMS-1 modulation monitor.
- 1) Belar RF amplifier on 101.7 mHz.
- All three units for \$800

Moseley SCG-R stereo generator. \$400  
CBS FM Volumax. \$100  
Teac A-7300 reel deck. \$250  
Fostex 450 mixer. \$450  
Fostex Model 20 2-track reel deck. \$500

Fostex Model 80 8-track reel deck. \$750  
Fostex RCH patch panel with cords. \$100  
ART Digital Reverb. \$200  
Kenwood KD-500 turntable. \$75  
Technics SLP-100 CD player. \$100  
Yamaha GC-2020 compressor. \$150  
ITC RP stereo deck. \$600  
Deltalab Effectron II. \$250

WZOK/WQEX/WCKT  
241 NE 10th Ave.  
Cape Coral, FL 33909  
813-574-5548

## Equipment Wanted

Wanted: Orban 8000A Optimods

PMA Marketing  
4359 S. Howell Ave.  
Suite 106  
Milwaukee, WI 53207  
414-482-2638

Wanted: Orban 8000As and 8100s.  
ITC Cart decks of all types.

Hall Electronics  
John Hall  
1712 Allied Street  
Charlottesville, VA 22901  
804-977-1100

Wanted: Dead or alive. Puotec EQs; Fairchild & Teletronix limiters; Neumann, Telefunken, AKG, RCA, and Scheps microphones. Tube Macintosh or Marantz amps and pre-amps. Sontec, ITI, and Lang EQs. Neve or API equipment. Boxes of old tubes. UREI, Orban, United audio, dBx, and other outboard gear. Ampex ATR-102 or 104. Parts for MCI JH-110/114 recorders. Altec 604s/crossovers/Tannoy speakers. JBL 2231; Altec 288-H driver; misc. equipment of all types.  
Please call Dan Alexander  
2944 San Pablo Ave.  
Berkley, CA 94702  
415-644-2363  
Fax 415-644-1848

Wanted: RP mono cart machine, 16" turntable(s) with or without tone arms (prefer Gates) RCA

Terry Knapp  
Dept of Psychology  
University of Nevada  
Las Vegas, NV 89154  
702-739-3305

# 96 - AM & FM Transmitters

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All In Stock  
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Alan Bishop  
WZSH  
P.O. Box 111  
East Rochester, NY 14445  
716-586-2263

Wanted: 5-tower, 1kW phasor cabinet with tuning components. Any frequency OK, good condition, no junk please.

Tom McGinley  
WPCG  
6301 Ivy Lane  
Suite 800  
Greenbelt, MD 20770  
301-441-3500

Wanted: Cash paid for all types of new and used tubes -- especially interested in transmitting and industrial types. Call anytime!

D&C Electronics  
3089 Deltona Blvd.  
Spring Hill, FL 34606  
904-688-2374

Wanted: Good used Optimod.

Used Otari 5050 (2-track) in good shape. Prefer late model.

Continental Z2 exciter on 107.1 mHz, in good shape.

Karen Wedge  
WPSK  
Box 351  
Pulaski, VA 24301  
703-980-2702

Wanted: New total Christian station needs any and all types of DONATION radio or production equipment. We are a non-profit church related station and can provide donors with tax receipt. Special areas of need are carts, cart players, RP machines, reel to reel RP machines, cart rewinding machine, and bulk tape for carts. Any and all help will be greatly appreciated. Help us get God's word to the multitudes.

Gary M. Duncan PD  
WURL AM760  
732 N. Pinehill Rd.  
Birmingham, AL 35217  
205-699-9875

(continued on page 6)

**Wanted: Two 20 kW Harris or Collins FM transmitters.**

**Also need two complete systems for automation for music satellite.**

**Used production equipment.**

**We are building two new FM stations at 100 and 50 kW — HELP!**

**Jack Bursack  
A1B Group Inc.  
Route 5 Box 515  
Lebanon, TN 37087  
615-444-0474 or 615-459-7777**

**Wanted: Gates/Harris RA-5B carousel automation programmer in good working condition.**

**Charles Frodsham  
KVSU  
P.O. Box 7  
Beloit, KS 67420  
913-738-2206**

**Wanted: Monitors, stereo studio equipment for new FM. Also looking for Systemation Automation.**

**Edward L. Roskelly  
KMRK-FM  
4000 Rasco Ave.  
Odessa, TX 79764  
915-363-9696**

**Wanted: 78RPM cutting lathe. Prefer later type ('50s) professional equipment with optional 33/45 speed, if possible. Also need advice on whereabouts to buy accessories, manuals, cutting needles, blank acetates, etc.**

**Old Jukeboxes wanted. Especially 40s and 50s Wurlitzers. Will pay good price including shipping costs.**

**Kim Gutzke  
7134 15th Ave. South  
Minneapolis, MN 55423  
612-866-6183**

**Wanted: Christian educational radio needs donation of two cart machines. Need one player and one record-player (may be mono). We'll pay all shipping charges.**

**Don Parsons  
KLUH-FM  
Poplar Bluff, MO 63901  
314-686-1663**

**Wanted: Christian ministry needs donation of the following equipment for donation supported Christian low power (250W) FM station.**

**FM mod monitor  
FM AGC processor, limiter  
Hi-gain antenna on educational band  
7/8" coax (400-900 feet)  
4) reel to reel mono recorders  
4) mono cart machines  
Marti RPU transmitter and antenna  
Marti receiver and antenna  
CD players (2 if possible)**

**Jullas Setzer  
Director of Christian Ministries Inc.  
P.O. Box 93  
Brookfield, MO 64628  
816-258-5310**

**Wanted: Otari ARS-1000 with 25 Hz decoder. Must be in very good condition. Can pay up to \$850.**

**Paul S. Lotsif  
KAVV  
Box 42977  
Tucson, AZ 85733  
602-889-9797**

**Wanted: Used EBS system**

**Les Williams  
WFIC  
P.O. Box 475  
Endless Road  
Collinsville, VA 24078  
703-647-1530**

## Equipment Guide

*The Yellow Pages of Broadcasting*

**For buying and selling used broadcast gear**

- and -

**Jobs and positions wanted**

**Equipment Guide**

**Box 7001**

**Rochester, MN 55903**

**(507) 280-9668**

## Broadcast and Media Related Computer Bulletin Boards

**Second opinion BBS**  
24-hours  
300/1200/2400/9600 baud - 8/N/1  
SBE Chapter 28 news and files  
414-771-3032

**The Communications Exchange**  
24-hours  
300/1200/2400/9600 baud  
SBE Chapter 24 news and files  
608-274-7776

**Allied/RW Broadcast BBS**  
300/1200/2400/ baud - 8/N/1  
Basic programs and ASCII files  
317-935-0531

**AV-Sync**  
24-hours  
1200/2400/9600 baud - 8/N/1  
Broadcast, recording, engineering files  
404-320-6202

**Broadcasting Computer Database**  
24-hours  
300/1200/2400/9600/19200 Baud Hayes/HST  
Broadcast, Engineering, Ham radio,  
MediaNET, On line database  
713-937-9097

**Network Communication System Bdcst BBS**  
300/1200 baud  
Technical tips and schematic graphics  
601-373-0160

**Flamethrower Broadcast Resource Center**  
24-hours  
300/1200/2400/ baud - 8/N/1  
Broadcast engineering and Ham radio  
804-730-1291

**ICEWEB**  
24-hours  
300/1200 baud  
CATV and engineering files and message base  
608-274-8601

**Broadcasters BBS**  
24-hours  
1200/2400 baud  
Broadcast and media files and message base  
804-973-8235

**Western Washington Frequency Coordination**  
24-hours  
300/1200/2400 baud  
WWFCC coordination program and data files  
206-443-6170

**Broadcasters Link**  
24-hours  
Announcer/programming orientation  
919-739-6150

**SBE Chapter 22 (Central New York)**  
24-hours  
300/1200/2400 baud  
315-457-5070

**Software Link BBS**  
24-hours  
804-397-9263

**Ambersoft**  
24-hours  
300/1200/2400 baud  
Engineering and programming  
219-256-2255

**KTOL Radio Point**  
24-hours  
300/1200/2400 baud  
206-459-4689

**The Rock Board**  
24-hours  
300/1200 baud  
Music orientation  
201-857-8880

**Olympia Broadcasting Networks**  
24-hours  
1200/2400 baud - 8/N/1  
Fro Olympia affiliates  
314-361-6688

**DFW Frequency Coordination**  
24-hours  
300/1200/2400/9600 HST  
SBE Chapter 67 frequency coordination  
and general broadcast engineering  
214-647-0670

**Colorado Broadcasters**  
24-hours  
Denver SBE Chapter materials and  
Colorado frequency coordination  
303-341-0129

**Northern California FCC**  
24-hours  
300/1200/2400 baud  
San Francisco area frequency coordination  
FidoNet 1:125/777  
415-391-2657

**Broadcasters BBS**  
24-hours  
300/1200/2400 baud  
Wide ranging broadcast topics  
602-934-4999

**Trillion**  
24-hours  
300/1200/2400 baud  
Broadcast engineering topics  
616-530-0821

**Videopro**  
24-hours  
300/1200/2400 baud  
Production concerns  
703-455-1873

**Chapter 75 SBE**  
24-hours  
300/1200/2400 baud  
Little Rock Chapter  
501-753-6536

**Visions Infoline**  
General media  
201-769-1779

**Gannett HelpScreen**  
USA Today  
201-525-3982

**Rock and Roll Party**  
Broadcasters  
404-982-0960

**Broadcasters Forum**  
Broadcast info  
602-395-9978

**So. California Media Line**  
Broadcast  
619-454-1629

**Programmers Retreat**  
209-526-9987

**Broadcasters BBS**  
602-872-9148

**Colorado Springs Broadcast BBS**  
New BBS on line  
719-471-9600

**Black Hole BBS**  
9600 Baud (HST)  
419-228-7236  
Fidonet 1:234/16  
Amateur radio, Radio & TV engineering.

**Call and place your board here**

# Contract Engineers Listing

This is provided as a listing service only.  
You must determine, for yourself, the technical  
qualifications of the contract engineers listed here.

Tom Becker  
Miami, Florida  
305-775-1351

Peter C.L. Boyce  
Midamerica Electronics Svc.  
New Albany, Indiana  
812-945-1209

James Boyd  
Boyd Broadcast Tech. Svc.  
Tualatin, Oregon  
503-692-6074

Mike Brown  
Portland, Oregon  
503-245-4889

Lee Freshwater  
Blue Ridge Consultants  
Flat Rock, North Carolina  
704-693-1642

Chuck Gennaro  
Wisconsin Rapids, Wisconsin  
715-423-6763

Kirk Harnack  
Memphis, Tennessee  
901-278-1306

Richard A. Hyatt  
Maine Engineering Assoc.  
Gardiner, Maine  
207-582-4192

John Morton  
Durango, Colorado  
303-247-8734

Don Musell  
Broadcast Engineering Svc.  
Mouth of Wilson, Virginia  
703-579-4461

Mark Pallock  
Marandee Broadcast Eng.  
Chatsworth, California  
818-882-9475

Ransom Y. Place III  
Westport, Massachusetts  
508-673-6831

John Ramsey  
West Hartford, Connecticut  
203-243-4703

Lee Soroca  
Soroca Electronics  
Syracuse, New York  
315-446-6106

Tom Toenjes  
Signal Specialists  
St. Marys, Kansas  
913-437-6549

Dave Wrenn  
Aiken, South Carolina  
803-649-1663

Brad Johnson  
Central California  
209-526-6277

Scott Dean  
Dean Engineering  
Fresno, California  
209-434-2358

Gary Smith  
Advanced Technical Svc.  
Abilene, Texas  
915-672-5149

James A. Chase  
Electro-Labs  
Angola, Indiana  
219-665-6427

Gary Reardon  
Ware, Massachusetts  
413-967-6156

James Droege  
Electronic Engineering Svc.  
Beatrice, Nebraska  
402-228-0780

Michelle Hunt  
Denver, Colorado  
303-469-1293

Tim Pozar  
Broadcast Engineering Cons.  
San Francisco, California  
415-695-7727

Mark Bohach  
Columbus, Ohio  
614-385-7583

Bob Ladd  
Bellevue, Ohio  
419-483-2511

Dave Hebert  
Pasco, Washington  
509-545-9672

Dave Biondi  
The Radio Service Company  
Houston, Texas  
800-444-2301

Bud Stuart  
STURADCO  
Susanville, California  
916-257-7820

Ronald J. Dot'o Sr.  
Salem, Oregon  
503-378-7024

John L. Nix  
Tower & ground systems  
Salem, Oregon  
800-321-4056

Steve Agnew  
Broadcast Technical Svc.  
Lincoln, Nebraska  
402-475-8920

Marsh Johnson Sr.  
Broadcast Operational Sys.  
Albany, Oregon  
503-928-8318

Carl Sampieri  
Sampieri Engineering  
Huntsville, Alabama  
205-830-8300

Don Roden  
Roden Engineering  
Huntsville, Alabama  
205-533-3676

Don Haworth  
Haworth Engineering  
Fargo, North Dakota  
701-237-5346

Jim Taylor  
Jim Taylor Engineering Svc.  
Augusta, Georgia  
404-738-2911

Mike Tosch  
Interstellar Broadcast Eng.  
San Diego, California  
619-576-8239

Jeff Twilley  
Ocean City, Maryland  
301-289-4545

Howard M. Ginsberg  
Communications Eng. Inc.  
Essex Junction, Vermont  
802-878-8796

Donald Frank White  
Roanoke Rapids, No. Carolina  
919-535-2599

Adam Perry  
S&B Communications Inc.  
Buffalo, New York  
716-832-7090

Thomas C. Taylor  
Total Communications Tech.  
Old Fort, North Carolina  
704-668-7977

Roger Cucci  
Techworks  
Milford, Connecticut  
203-878-3196

Harold Snure  
Calvmet Business Comm.  
Merrillville, Indiana  
219-769-4044

Dwayne Burlison & Assoc.  
Houston, Texas  
713-890-6565

Rick Cruz  
Mount Vernon, Ohio  
614-397-6440

Mark Persons  
M.W. Persons & Associates  
Brainerd, Minnesota  
218-829-1326

Hal Ross  
Air Com Communications  
Greenville, Pennsylvania  
412-588-8999

Russell Hines  
Cincinnati, Ohio  
513-721-7625

Jim Zastrow  
Zastrow Technical Service  
Mosinee, Wisconsin  
715-693-4299

Steve Holderby  
Bemsco Inc.  
Enid, Oklahoma  
405-242-7605

ACM Communications  
Napa, California  
707-257-6000

R. Michael King  
Circuit Doctors  
Frisco, Colorado  
303-668-3167

Joe Bellis  
RMF Associates  
Cape Girardeau, Missouri  
314-651-4272

Brian Walker  
Olympia, Washington  
206-438-2390

Jay Brentlinger  
Broadcast Engineering Inc.  
Phoenix, Arizona  
602-867-0181

Ken Bartz  
Bartz Engineering Services  
Fargo, North Dakota  
701-237-3006

Greg Blanchard  
Avila Engineering  
San Luis Obispo, California  
805-473-2396

J. Boyd Ingram  
J. Boyd Ingram & Associates  
Batesville, Mississippi  
601-563-4664

Troy D. Spencer  
Bassett, Virginia  
703-629-1161

Tom Oja  
ACM Communications  
Napa, California  
707-257-6000  
800-354-8600 (CA only)

Tom Lange  
TECS Electronics  
Kohler, Wisconsin  
414-458-1816

Lamar Ritchie  
Lamarco Inc.  
Hazard, Kentucky  
606-476-8438

Steve Weber Jr.  
Fresno, California  
209-276-1249

## More Contract Engineers

John Simmons  
Simmons Communications  
Columbus, Georgia  
404-596-0265

Jim Slawson  
Broadcast Engineering  
Swainsboro, Georgia  
912-237-2011

Bill Bowin  
Bowin Engineering Services  
Galion, Ohio  
419-468-1771

Steve Gordoni  
Wheeling, Illinois  
312-870-1463

Chris Scott & Associates  
Bowling Green, Kentucky  
502-781-1232

Michael G. McCarthy  
McCarthy Radio Engineering  
Mount Prospect, Illinois  
708-640-8965

J.R. Galbreath  
Broadcast Technical Services  
Colorado City, Texas  
915-728-8076

Jim Stanford  
New Orleans, Louisiana  
504-822-1945

Al Martin  
Segue Services Inc.  
Merrifield, Minnesota  
218-765-3333

Jim Stitt & Associates  
Cincinnati, Ohio  
513-621-9292

Troy Langham  
Tulsa, Oklahoma  
918-587-0941

H. Scott Blake  
Wilson's Peak Eng.  
Mount Wilson, California  
805-273-7717

Bill Spitzer  
WLS Communications  
Rapid City, South Dakota  
605-343-6986

Chris R. Holt  
San Jose, California  
408-985-9459

Bob Biermann  
Tacocca, Georgia  
404-886-4727  
404-886-1912

T. Michael Ezell  
Audiotronics Tech Service  
Dothan, Alabama  
205-793-6519

Dick Warren  
Warren Engineering  
San Diego, California  
619-279-0759

Joe DeRosa &  
Frank Bolognino  
Brooklyn, New York  
718-764-9698

Frank Baker  
Towers & Ground Systems  
503-775-3366

Paul Easter  
D&E Broadcast Services  
Corpus Christi, Texas  
512-994-0659

Bill Sutton  
Bill's RF Engineering  
Bamberg, South Carolina  
803-245-4902

Mark Sadacca  
San Bernadino, California  
714-882-2575

Gary Brown  
Broadcast Allocations  
Nashville, Tennessee  
615-662-1526

David Sanford  
St. George, Utah  
801-628-3075

Sam Garfield  
Raleigh, North Carolina  
919-870-1289

Joseph Papp  
Charleston, South Carolina  
803-884-8513

James Parkinson  
Siloam Springs, Arkansas  
501-248-1108

Joe Furjanic  
Furjanic Communications  
Monongahela, Pennsylvania  
412-379-8311

Ronald J. Meyer  
Meyer Communications  
Winterhaven, Florida  
813-293-9646

Ken Ruhland  
Central Bdcst. Eng. Group  
West Edmeston, New York  
607-847-8244

Griffen E. Dameron  
Charleston, South Carolina  
803-767-1669

Frank Hertel  
Newman-Keys Freq. Meas.  
Evansville, Indiana  
812-963-3294

Dr. Smokey King  
Amarillo, Texas  
806-335-1954

Bob Schneider  
Broadcast Technical Services  
Lubbock, Texas  
806-798-2601

Walt Gradski  
Marionics Inc.  
Toms River, New Jersey  
201-240-3119

Phillip Robillard  
Robillard Communications  
Haynesville, Louisiana  
318-624-0105

Larry Fiebig  
Cincinnati, Ohio  
513-742-3600

Peter Stohrer  
Concord, New Hampshire  
603-225-5153

Jim Trapani  
JT Communications  
Ocala, Florida  
904-236-0744

Jim Stoneback  
Mid-Atlantic states - AM only  
703-671-1037

Mark W. Crom  
Broadcast Technical Svc.  
Pequot Lakes, Minnesota  
218-568-5369

Bill Major  
Rio Rancho, New Mexico  
505-891-0719

Jeff Baker  
Technical/Design Service  
Fairport, New York  
716-258-3380

Mike Loos  
Quad City Broadcast Svc.  
Blue Grass, Iowa  
319-381-2590

Tommy Gray  
Broadcast Service Co.  
Jonesboro, Louisiana  
318-259-8835

Peter Martin  
Technical Services  
Rupert, Vermont  
802-394-7858

Don Cook  
Devon Broadcasting  
Odessa, Texas  
915-362-8300

Phil Wells  
Giant Step Enterprises  
Facility wiring/reworking  
Southern California  
619-565-8103

Tom Rusk  
T&M Enterprises  
Little Rock, Arkansas  
501-375-1440

Gorman Broadcast Cons.  
Pinellas Park, Florida  
813-546-6996

Jack Parker  
Independence, Kentucky  
606-371-2231

Clifford L. Bryson  
Zelienople, Pennsylvania  
412-776-5204

Chuck Condron  
Condron Broadcast Eng.  
Salt Lake City, Utah  
801-580-3025

Dennis Silver, PE  
West Valley, Utah  
801-973-7759

Douglas White  
White & Associates  
Saginaw, Michigan  
517-793-9994

Tim McCartney  
Bemidji, Minnesota  
218-751-1680

Burt Rickenbacker  
Holly Hill, S. Carolina  
803-496-5291

Richard A. Franklin  
Mid-Atlantic Radio Svc.  
Blue Bell, Pennsylvania  
215-277-7122

David W. Schmidt  
Mid-Atlantic Radio Svc.  
Wilmington, Delaware  
302-323-0338

JJ Largen  
The Largen Companies  
Radford, Virginia  
703-639-4900

Kurt Elsavage  
K&E Engineering  
Aberdeen, Maryland  
301-272-4667

Robert J. Lankton  
Precision Audio & Engineering  
Sarasota, Florida  
813-377-1488

Eric Chromick  
Waynesville, Ohio  
513-885-7360

Dennis Wilson  
Grand Rapids, Michigan  
218-326-9308

Tom Elmore  
Vermont Radio Engineering  
Proctorsville, Vermont  
802-226-7380

Rob Ramseyer  
RJ Communications  
Albuquerque, New Mexico  
505-266-1237

Mike Patton  
Patton Circuit Systems  
Baton Rouge, Louisiana  
504-292-4189

John Almon  
5-9 Communications  
Franklin, Tennessee  
615-664-6427

Kirk Wallace  
Fairfield, Illinois  
618-842-7785

Glen Dingley  
Ottawa, Illinois  
815-433-2580

Call Radio at  
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