Radio Guide

Radio's Technology Forum August 1994

The FCC World BBS

The other night, while catching up on a two-foot pile of magazines that I hadn't read, I learned of a new electronic bulletin board service. As many of you probably know, there are thousands of them in use around the country and very few of them are of much use to radio engineers. Well, this one is!

How many times have you wished to have access to current FCC information and releases, as well as Report and Orders, filings, Broadcast Actions, etc.? More than likely, if you do have electronic access to this information, you're probably paying through the nose for it. This one is free!

The FCC WORLD bulletin board is a service of Smithwick and Belendiuk, P.C., a communications law firm out of Washington DC.

The number for the FCC WORLD BBS is 1-202-887-5718

Dial it up with your modem, and I guarantee that you'll be surprised ... and satisfied, at what you find.

Questionnaires Please ...

Last month I included a questionnaire with your issue of Radio Guide. So far, I've received a fair number back — but, by no means all. The information you provide to us on this form, is extremely valuable. We cannot know how you feel about your Radio Guide unless you tell us. These forms are one way we have of determining if we are doing the job and if we need to make changes. Please take the time to fill it out and fax it back. *Ray Topp - Publisher*

— TECH TIPS WANTED —

A reader has asked for help with a common problem: How to get a good base current sample.

Specifically, we need to know how to get a reliable and accurate base current sample circuit to provide around 3 VDC for 1.26 amps of base current.

If any of you have the answer, let us know right away.

Inside This Issue

Radio Guide

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Business, Production & Ad Copy

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How to Submit Tech Tips and Articles

Radio Guide welcomes your comments, letters, articles and Tech-Tips for publication.

By BBS: Call our BBS at 507-280-4045, and leave your tech tips, info and articles as a private message or file for the Sysop.

By Disk: Send your tech tips and informartion on a 3.5" or 5-1/4" double or high density floppy disk, in ASCII format, to: George Whitaker, at 3505 Daniel, Arlington, TX 76014.

By Letter: We also accept clean, typewritten or printed manuscripts mailed to the above address.

— Articles should be 1000 or 2000 words —

— Tech-Tips should be 200-250 words —

All "Tech Tipsters" receive a ***Radio Guide*** calculator.

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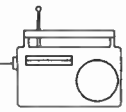
The Radio Forum

George Whitaker — Editor



Bully for You!

First off this month, I want to thank all of the Tech-Tipsters who contributed ideas for these pages. That's what it is all about. Sharing our experiences allows others to save time, trouble and energy.

One of the things I have enjoyed most about doing this job, is the communication with the other guys out in the field and getting to know them, even if just voices on the telephone. Over the years, I have managed to meet many of the voices, either at conventions or while traveling. It is always a real hoot to get to meet someone who has always been a signature or a voice.

As **Radio Guide** continues to grow, we will be gaining new sources for tips. As we grow, remember that we need your input also. Don't just depend on the other guys.

Jumping to something else — I hope you are making your plans now to attend the S.B.E. convention in Los Angeles. There are several engineers around the country I met at conventions in years past with whom I have continued a friendship throughout the years. I am going this year with a friend that I first met at S.B.E. national several years ago. We are meeting in northern California and then driving down to the convention together. This is the type of thing that comes out of these conventions, besides the knowledge you gain from the convention itself. I encourage you to make every effort to attend this year. *George*

Technical and Engineering Seminars

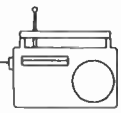
Engineering Management Seminar:
Tuesday, October 11, 1994

The Digital Radio Seminar:
Thursday, October 13, 1994

The AM Antenna Seminar:
Friday-Saturday, October 14-15, 1994

More on Measuring Audio Impedances

Gordon S. Carter — Owner, Professional Audio Services, LaGrange, IL & C.E. WFMT, Chicago



The article in the May, 1994, issue of Radio Guide on Measuring Audio Impedances, by George Whittaker, was very good. The information in that article is applicable to most older equipment. In the "good old days" most professional audio equipment was designed to be a 600 ohm source working into a 600 ohm load. Matching impedances provides maximum transfer of power between devices. 600 ohms was commonly used by the phone companies and became an early standard in broadcasting. With tubes and transformers this is usually the best way to go.

With the advent of solid-state equipment, much of the early equipment followed the same concepts, using transformers for input and output coupling. As the cost of good transformers began to rise, other circuit topologies were developed. The one that has become most common is the "voltage-source." With this topology, the output of each device is designed to provide a near-constant voltage (regardless of load). The input to each device bridges the output of the previous device. This allows easy fan-out from one source to many inputs, as well as other advantages.

The way to provide a constant-voltage source is with a very low source impedance. Theoretically, a zero-impedance source would not vary at all with any load except a short circuit. In practice, most solid state devices now operate with an output impedance of quite a bit less than 100 ohms. However, they are not designed to operate into a 100 ohm load, and in many cases such a load will destroy the output devices. The bridging inputs for such equipment will often be 10K ohms or greater.

In most modern equipment, the only place you find true 600 ohm outputs and inputs is in equipment designed to interface to the telephone company and their equipment. This is especially critical when working with equalized phone lines with passive equalizers. The source and load impedances to the equalizers and coils in this instance will drastically effect the equalization of the line. If the phone company does the equalization, they will use a true 600 ohm source and load for their measurements. The only way to duplicate their performance is with a true 600 ohm source and load.

In light of all of this, here are a few simple rules of thumb regarding audio impedances.

1.If the equipment is solid-state, be very careful when attempting to measure the output impedance. Use a very low signal level to make sure you are not attempting to force too much current into the load resistor. In many cases it may be very easy to damage the output if you try to follow the procedure given in the original article with a 1 volt signal. If the output impedance appears to be less than 200 - 300 ohms, the device is probably intended to work into a bridging load. Generally, the only time you will find critical impedances with solid-state equipment is if there is a transformer used for output coupling. Even solid-state power amplifiers are relatively non-critical in the loads they want to see, as long as it does not go too low.

2.Some solid-state equipment has a bridging (high-impedance) input with a 600 ohm resistor hanging across it to provide a 600 ohm load. In many cases this resistor can be removed to provide a true bridging load.

3.Solid-state equipment that drives the output directly from an integrated circuit often cannot work into a 600 ohm load. Only a few of the more modern IC's can do that alone. Some of the older designs used transistors to provide enough drive for a 600 ohm load.

4.If you are using a passive meter to measure the voltage, be sure to consider the impedance of the meter if you are working with higher impedances or lower signal levels. An older Simpson 260, for instance, has an input impedance of 20,000 ohms per volt. The impedance of the meter actually changes, depending on the voltage range being read. This is not a problem if you are working with 600 ohms and 1 volt, as mentioned in the article.

5.If you have to add resistors to increase the output impedance of a device, remember that this will reduce the signal provided to the next device. Depending on the circuit, this may not be necessary. Only use 600 ohm matching when absolutely necessary.

6.Do not attempt to measure the output impedance of a microphone! You will probably destroy it if you try using these techniques.

The key to knowing what to do, is to understand the circuits involved in the equipment being connected. You will frequently find newer equipment specifications that indicate a minimum load impedance along with the output impedance. Be sure to observe these warnings if you have that information available. Providing a load less than the recommended may cause premature clipping, excessive heating of the output devices, and possibly even damage the devices involved. If the manuals are missing, though, you will have to rely on your experience and common sense when connecting your equipment.

Radio Guide Quick-Tip:

When moving heavy transmitters or power supplies, use 1½" steel pipes underneath. You only have to lift one edge enough to insert one pipe, and then you roll it along by placing one pipe after another.

(If you have a Quick-Tip, call us at 507-280-9668)

"Full Logic" Remote Control for SL-1200 MK 2

Nick Kratz — Berkeley, CA

Editor: The SL-1200 is a popular turntable at stations today and, awhile back, I did a piece on remoting them. However, Nick Kratz, a volunteer staff engineer at KALX in Berkeley, CA has carried things a bit farther to allow for:

Full Logic Remote Control for SL-1200

Once in a while a dream comes true. Such was the case when KALX switched from an RCA BC-7A console to a PR&E, BMX III. As is often the case, there wasn't money left over for other new equipment, such as turntables. Given the changes in availability of broadcast quality turntables, even well-to-do stations using vinyl are finding the Technics SL-1200 MK 2 to be a viable option.

While the SL-1200 is a fine turntable, it lacks the remote start/stop capability expected of a true broadcast turntable. As pointed out by R.G.'s editor, George Whitaker, in the April 1992 issue, it is quite simple to parallel the internal start/stop switch for basic remote control. However, it would be nice to enable the full capabilities of the remote logic of today's sophisticated consoles by providing the missing run/stop "status" signal return from the turntable. As we shall see, obtaining/creating this signal is fairly simple.

The PR&E, TT-3 Turntable Interface for the BMX series of consoles is set up for members of the Technics SP series turntables, providing a single opto-isolated contact closure for start/stop, and requiring a "run" signal from the turntable capable of driving the LED in an MCT-2 opto-isolator (presumably, the requirements of other like consoles are similar). The question is, where is the run signal?

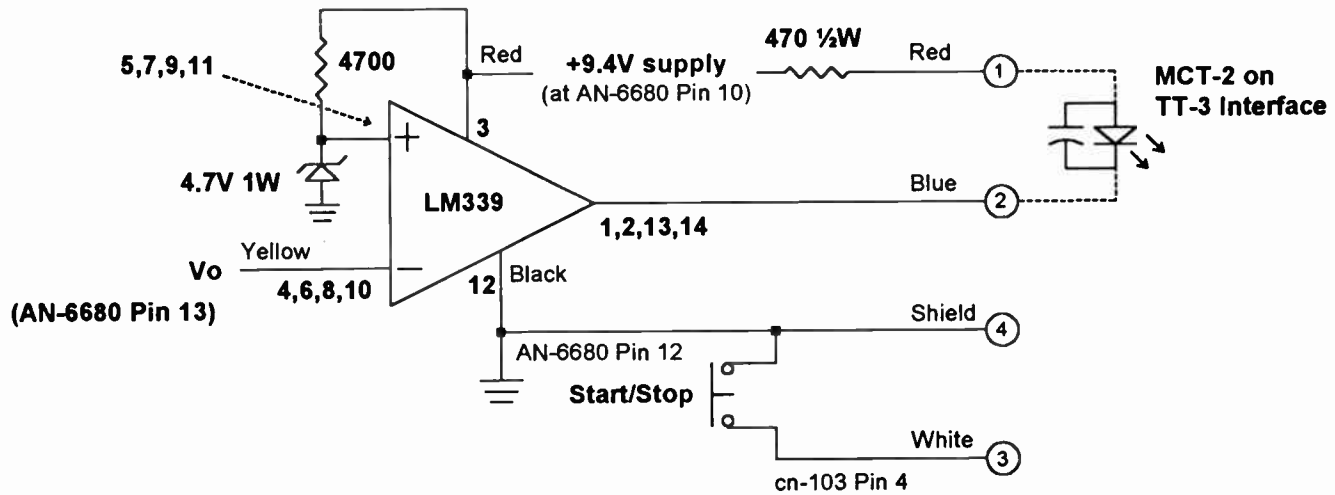
A comprehensive investigation of an SL-1200 with an oscilloscope and schematic revealed the disappointing news that there was no "pure" run or stop signal available to the outside world (it's inside IC-201, the AN 6680 Control IC). Undaunted, the investigation continued, and revealed that the Vo line (pin 13 of IC-201) was the closest viable option, going high (around +5V) as the platter commences rotating, and dropping low (+2V) when it reaches a standstill. As this line is very sensitive to loading, some buffering is necessary.

The first attempt used an MPS-A13 Darlington, but even this was too much of a load. The first version final circuit (Figure 1) uses an LM 339 comparator IC. All four comparators in the IC are paralleled to provide ample drive to the LED in the opto-isolator (and because they weren't going to be gainfully employed otherwise). The Vo line load is sufficiently low that the turntable displays no signs of unhappiness.

This circuit was in use between October 1989 and September 1992 on two SL-1200 MK 2's feeding a (virtually) stock PR&E, TT-3 interface, with no reported failures despite heavy 24-hour use (KALX uses a high percentage of vinyl). The only problems were loose connections upon initial installation, and the occasional heavy-handed programmer who stalls the platter while slip-cueing (they learn soon enough).

(continued on Page 5)

Figure-1 Technics SL-1200 MKII Turntable — Original Internal Modification



The 4 sections of the LM-339 are paralleled to insure sufficient current sinking for reliable LED operation. Vo loading with even four 339 sections is far less than discrete darlington transistors (a method that did not work).

"Full Logic" Remote Control for SL-1200 MK 2

(Continued From Page 4)

One minor, but possibly annoying, side-effect of using the Vo line is that the "Ready" (Off) lamp on the BMX flickers as the turntable platter draws to a stop (the comparator is toggled by the settling Vo line). While disconcerting, it is not a problem, and is actually a useful indicator to the programmer that he or she needs to lighten up on the slip-cue grip, or suffer a "wow" start.

The comparator circuit was assembled on a tiny scrap of perf board, and installed in the SL-1200 adjacent to IC-101, using one several unoccupied standoffs Technics so thoughtfully molded into the chassis. A length of 3-conductor with shield brought the control lines to the outside world, exiting the 1200 through the hole next to the AC cord.

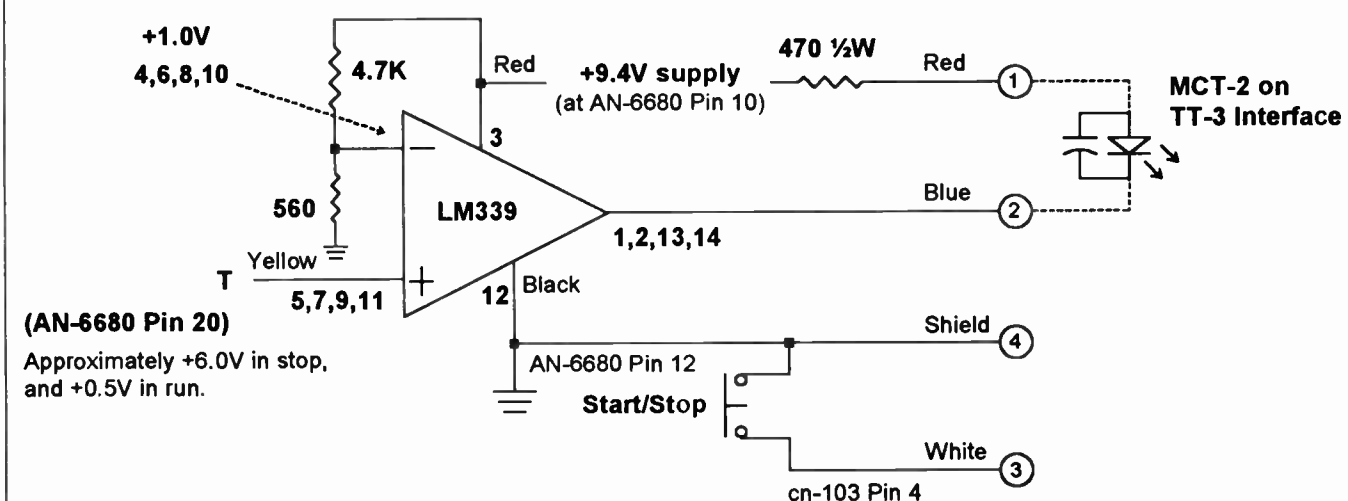
Revisiting the situation in 1992, in an attempt to cure the minor aberration, it was found that the T line on pin 20 of IC-201 (same as left end terminal of VR-201) provides a stable run/stop status indication, independent of platter stalling. The possible drawback here (and the reason this line was ignored during the initial inquiry) is the time constant ramping from run to stop, used for braking. Careful testing revealed this to be a non-problem, as this time constant is shorter than the typical toggling of the comparator by Vo during platter wind-down, and is thus harder to falsely trigger (during extremely rapid on-off-on sequences sometimes used for effect) than the original design. Changing the comparator threshold to 1.0V staved off any difficulty.

One might also be concerned about the degree to which the logic thresholds are affected by the Brake Adjustment (VR-201). The answer: Hardly at all. On a typical SL-1200, the T line ranged from +5.8 to 6.5 volts, in stop mode, and +3 to 1.5 volts, running over the full range of the Brake trimmer, with most deviation at the extremes. Typical values, with VR-201 correctly adjusted for fastest braking with no kick-back: +0.5 volt run, and +6.0 volts stop. The +4.7 volt threshold would provide plenty of margin for correct mode detection over the entire VR-201 range, but a long run to stop transition. For best results, pick the lowest threshold with which you're comfortable (I use 1.0 volt).

The T line seems relatively sensitive to external loading, but not quite to the degree of Vo. Experiments with resistive loading show T getting dicey around 50 K Ohms to common, so those planning alternatives to the LM-339 should think high beta, and at least 82 K Ohm build-out. The original comparator setup was retained (with a polarity flip corresponding to the T line's logic inversion) as it was already in place. (See Figure 2).

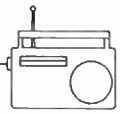
This latest incarnation has been in 24-hour service since September 1992, on two heavily-used 1200's without any reported failure or problems. With the simple addition of either of these circuits, cabling and connectors, and any standard logic interface require by your console, your facility can enjoy full-function remote control of these popular turntables.

Figure-2 Technics SL-1200 MKII Turntable — Internal Modification, Revision 1



The 4 sections of the LM-339 are paralleled to insure sufficient current sinking for reliable LED operation.

Emergency Sat Receiver



George Whitaker — Editor

Satellite receivers, in general, are very reliable and rarely give trouble. Usually the LNB, dish, or cable is the problem. However, in the event your receiver does bite the dust, there are a couple of make-do's that can get you a passable signal.

If you are picking up FM/FM (Also known by the trade name FM2) off of something like Spacenet III, and your receiver dies, there are a couple of things you can try.

First of all, remember that most commercial receivers are made up of several stages; the first being the receiver itself, used for tuning in the correct transponder. The output of this receiver is then fed to the cards that demodulate the correct carrier and/or control tones. In some systems the output of the first stage is the 70 mHz IF, and in some systems it is the baseband (all of the frequencies on that particular transponder). These signals are looped through the succeeding cards.

If you have lost the receiver section only, but the other cards have power, you can use a high quality "home type" receiver (something like a Drake) to tune the correct transponder. Then, jumper from the 70 mHz out on that receiver to the input of the demodulator cards. Or, if you are using something like a Zephyrus, you would need a jumper from the "un-clamped video" output of the receiver. This is sometimes labeled "baseband." This should get you back in operation until you can get the receiver card repaired.

Another option is to use an entirely different system while you send the other unit in. You can, again, use a good "home type" unit to tune the transponder. Then come out of the "baseband," or "un-clamped video" port and couple this to a high quality communications receiver (such as hams use). An example of this is the Kenwood R-2000. You will find the program audio in the 100 kHz to 5 mHz range.

If you are a ham, you may already have such a receiver, or you might borrow one for the duration. The receiver needs to have the following features: 1. Able to tune from 100 kHz to 5 mHz and remain stable. 2. Needs to have wide and narrow bandwidth FM. 3. The receiver needs to have very fine tuning steps.

I would suggest that, before an emergency arises, you might experiment with these suggestions and find out what you can do. Then, if you need it, you will be prepared.

Next month: A scanner as a substitute SCPC receiver.

Dirty Pots and Switches

Gerry Gibbs — Sioux City, IA

Editor: *Replacing pots and switches on a console can be a real headache. Lots of wires and close quarters can expand your vocabulary rather quickly. I have to admit, this is one job I would always put off until the attitude of the air staff would become absolutely hostile. Gerry Gibbs, of KMNS in Sioux City, IA, has a tip for delaying this nasty chore while keeping the air staff happy at the same time. He has a tip for dealing with:*

Dirty Pots and Switches

Sealed pots and switches can be a real headache when they get dirty. For awhile, I was changing out 1K fader pots in my 16-channel ADM console. Then I discovered a lot cheaper and easier way to get some new life out of the old pots.

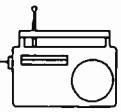
Using a very small, #60/.0400" diameter high speed drill bit in a variable speed drill (for better control), make a small hole in the *side* of the metal pot casing. Be very careful not to penetrate too far or you will damage the wiper or element inside. Then, simply squirt some normal contact cleaner in the hole and viola! ... a renewed pot that sometimes outlasts a new one.

Now, you might think the hole would allow more dust and dirt to accumulate inside, and over time it probably does, but I have found it to not be any sooner than the time it takes for a new one to start making noises; and we do have a relatively dusty environment here. I have re-sprayed some pots and gotten the same satisfactory results.

We also have a number of pushbutton switches on an 8 button channel pre-selector, soldered to the PC board. This thing is a real bear to replace because of all the solder connections to undo. But, no problem. Drill the same size hold in the END of the plastic case, give 'em a squirt, and the switches work like new again.

Sure saves a lot of trouble and expense.

Finding a Left-Handed Monkey Wrench



Gordon S. Carter — Owner, Professional Audio Services, LaGrange, IL & C.E. WFMT, Chicago

At one time or another you've probably heard the story about the novice mechanic who was sent on a wild-goose chase looking for a left-handed monkey wrench. Another variation on this is the apprentice cook who was sent looking for a salt extractor because the soup was too salty. Of course, there's always the radio engineer who needed a wire stretcher because he cut the wire an inch too short.

These exotic tools may sound plausible to the uninitiated, but we all know they don't really exist (at least I *hope* we all know that). However, there are other tools that may not have such exotic names, but really do exist. Sometimes while you are working, perhaps you may have wished you had a _____ (insert your special tool here) to do a specific job. Or worse, you may not know a tool exists for the job, you just know there *has* to be a better way.

A few examples: You're working on a tape recorder reel motor and are trying to get out the bearings. The bearings are held in by this very tough circular spring with a small hole in each end. You fight with your pliers, screwdrivers, or whatever else you may have to get this thing out, but all you manage to do is scratch things up, jab yourself with your tools a few times, and finally lose the spring as it goes flying across the room (at least you got it out). Well, there *is* a better way. It's known as a snap-ring tool or snap-ring pliers. There are two types, one for those that compress to open, and one for those that expand to open. The tools work differently so that you are squeezing to apply the proper force to open the spring. One version of this tool is reversible and can be used for both compression and expansion by simply moving a pivot on the tool.

Or, you're working with the brakes on a tape recorder or other device and try to remove or replace a spring. It looks simple enough, just unhook the spring from its anchor point and replace it. You pull out your trusty needle nose pliers (I said "trusty" not "rusty") and grab the end. Whoops! Now where did that thing go? Somewhere in that black hole of missing parts and odd socks. Again, there is a special tool to do the job. Actually, there are a number of them, each with its own special purpose. If you have the right one, you simply hook the tool over the end of the spring and do the job. The tool has a hook on the end so the spring doesn't go flying.

One final example. You're working on something, usually a cassette machine or computer accessory, and you notice that your screwdriver doesn't quite fit the screw. The screw is nice and tight, but because your screwdriver doesn't quite fit, all you manage to do is tear up the head of the screw instead of removing it. The problem is that you are using a screwdriver made to fractional inch dimensions to remove a metric screw. It's a little known fact, but the slots in metric screws are proportioned different from American screws. For straight slot screws, the slot is narrower for a given diameter head than it would be for the same size American screw. For Phillips style screws the holes in the metric ones are not quite the same as American. The answer, of course, is to get yourself some metric screwdrivers. Good luck! Most American companies don't even know there is a difference, let alone carry the right tools.

All of this is to encourage you to use the right tool for the job. Many times the problem is finding out what the right tool is or where to get it. I have found the best way to do this is to get some tool catalogs and just browse. I do this in hardware stores, too, and my wife hates it. (If you have a similar problem, just tell her you are getting even for her clothes shopping.) I can spend hours in a hardware store and not buy a thing. As you browse you will find lots of ideas. Of course, it is not practical to buy all the tools you see, but use your head. Only buy the ones you will use enough to pay for the investment. Buy good tools, they last longer and work better. I have included a partial list of companies that have interesting tool catalogs for you to look through. You will get lots of ideas.

Oh, by the way, if you are looking for metric screwdrivers, you probably won't find them as such. Most of the tool catalogs have converted the tools to American measurements for their American audience. Look for tools made in Europe, especially Germany or Switzerland. They are almost always made to metric standards and will do just fine on the metric screws. If you are in doubt, ask to speak to someone who knows, before you buy. Or be sure to get return privilege if they aren't what you expect.

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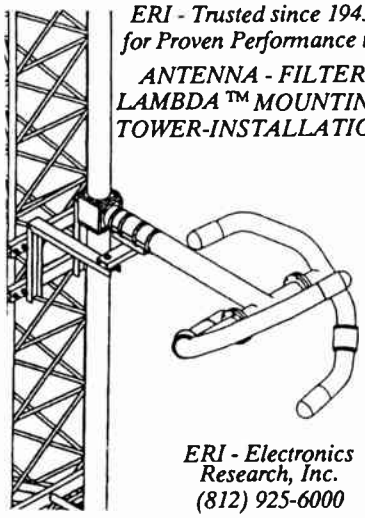

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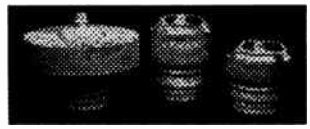

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FCC Rules on Kahn POWER-side

Motorola tried to deny broadcasters the right to increase coverage by using SSB — Kahn POWER-side™ equipment. But the FCC specifically ruled that the "Kahn POWER-side system... may continue to be operated ..." as a mono improvement system. So you can now use POWER-side with Kahn independent sideband exciters to immediately increase coverage to listeners using any and all type of AM receivers.

See FCC Order ⇨

Federal Communications Commission FCC 93-485

21. Kahn "POWER-side" Operation. Several parties express concern over the continued acceptability under our rules of operating using the Kahn POWER-side AM single-sideband system. POWER-side operation, as distinct from Kahn stereo operation, involves an AM transmitter with two independent sidebands, containing identical program material, but with intentional level and frequency response differences. This system is implemented with a Kahn independent sideband stereo exciter and is claimed to have certain advantages for reception with monophonic receivers, particularly in adjacent-channel interference situations. CTI and Furr argue that adoption of the proposed standard would prohibit such an implementation. Motorola maintains that the Kahn POWER-side mode of operation is not stereophonic and questions its legality under the present rules.

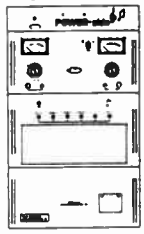
22. Our AM rules do not include a definition of the term "stereophonic." However, generally accepted definitions of stereo service infer two or more channels of audio information designed to produce and audio "image" when demodulated by an appropriate receiver. On this basis, we find that stations employing the Kahn POWER-side system are not subject to the provisions of the stereophonic transmitting standard adopted herein and may continue to be operated, provided that the program material fed to both channels of the exciter is identical in content.

POWER-side™

PROBLEMS

Adjacent Channel Interference
Antenna Null Distortion
Co-Channel Interference
Power-line Re-Radiation
Building Re-Radiation
Receiver Tuning
Low Fidelity Home Radios
Co-Channel Beat
Selective Fading

SOLUTION!



KAHN COMMUNICATIONS INCORPORATED

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