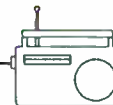


Radio Guide



Radio's Technology Forum

March 1994

Don't Miss an Issue

Welcome to the second issue of the new **Radio Guide**. The new subscriptions have been coming in, and you have my thanks for that. A publication such as the **Radio Guide**, certainly cannot exist without your support.

Our goal here is to make sure that you get real technical value every month in the **Radio Guide**. We would also like to see the **Radio Guide** grow, so that we can add more pages of technical information and Tech Tips. The equation is simple — the more subscribers we have, the more pages of information we can publish. And the only way for that to happen is for you to make the decision to support and subscribe to the **Radio Guide** right now.

Every month you wait, you'll be missing more of the unique Tech Tips that can only be found here. We both know that even one Tech Tip can save you more than the cost of a year's subscription to **Radio Guide**. Enough said!

WE NEED YOUR TECH TIPS

Many of you probably remember my chronic editorials, asking, even demanding, your Tech Tips for publication. During our absence, I'm sure that you must have accumulated a vast amount of technical information from all of the equipment problems you've solved. Now that we're back, you've got a place for all those tips and articles to be published. And so, here I am, hounding you again.

Radio Guide is now the only radio publication specifically devoted to the Radio Engineer's needs. Our goal is to supply you with technical information that can help you to be more productive. However, we cannot continue to supply that information if you do not send it to us.

Call me at (507) 230-9668 or George at (214) 817-468-5981, and either one of us will be glad to work with you to make your Tech Tips a part of this technical forum. Thanks.

Ray Topp



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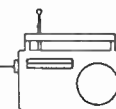
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— **Articles should be 750-1000 words** —

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

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Thanks Again

Here we are with the second issue of the new **Radio Guide**. I want to thank all of the people from whom we have received encouragement and support. It has been very gratifying to see the reception the reincarnation has stirred.

During the time I served as Tech-Tip editor for the old **Radio Guide**, I really enjoyed the communication with the Tech-Tipsters who contributed material. Many times I would call to discuss their tip with them and developed some phone friendships that mean a lot to me. **Radio Guide** is sort of like a convention where nobody has to travel. We can swap stories and information and build friendships through our love of engineering.

Until I am fully retired from KRVA, which will be in October, I won't have as much time as I would like to devote to visiting. However, I am in the Dallas (Arlington) office of **Radio Guide** every Wednesday. I can be reached at (817) 468-2586.

Remember to send your Tech-Tips so that we can share them with others. The entire purpose of **Radio Guide** is to help disseminate information helpful to the engineer. What you have learned, someone else can use. Take a few minutes to write up your idea or revelation and send it to **Radio Guide**, 3505 Daniel Dr., Arlington, TX 76014.

George

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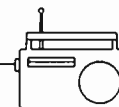
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Each of your Tech-Tips, that we publish, earns credit toward a free one year subscription to Radio Guide.

Effect of Balance on Stereo Separation

George Whitaker — Editor



First off, this month, I would like to share some experiences with:

The Effect of Balance on Stereo Separation

Several times in recent months, I have been called to stations where they had a problem with poor stereo separation, only to find that the solution was simply one of balance.

There are a number of things that can degrade your separation, however, the easiest to determine and correct is balance between channels. To see why this is true, let's do a quick review of what stereo is, and how we adjust for best separation.

Good separation means that there is maximum difference between the left and the right channel. If you are playing a piece with the guitar on the left and the drums on the right, you will hear nothing but the guitar in the left speaker and nothing but the drums on the right.

Now, if you subtract the right channel from the left, you have considerable L-R information because they are not alike to any degree.

But, let's say that some of the drums are appearing on the wrong channel. Now, when you subtract right from left, you have less information because the only real difference is the guitar. You have drums and guitar on the left, but, when you subtract the drums, what you have left is guitar because the drums on the left will cancel out with the drums on the right for zero drum information. Therefore, a stereo signal should have maximum information difference.

Now, to set this up, we have to think of it in the reverse. If good separation is maximum difference in stereo, then a monaural signal should give you minimum difference. If both channels are carrying the same information, then subtracting

right from left will yield zero information. And, in order for a monaural signal to subtract to zero, the two channels must be the same volume level as well as the same material.

This ideal is what we actually are trying to do when we start to set-up L-R and achieve maximum separation. In the real world you will not be able to get perfect cancellation.

Start with a tone generator at 1,000 Hz, or a pink noise generator, on an input to the console. Actually, connecting to the left and right program bus is better because the inputs may have balance controls. Set your console masters for exactly the same reading on both channels. Then, using test CD's or test cartridges, set the balance controls on each pot for exactly the same level on each channel. Now a mono signal from any input will have exactly the same information on each channel.

Then proceed through the audio chain setting each input and output to exactly the same level. When you get to your stereo generator you want to use your modulation monitor for the final balance.

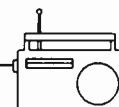
Set your modulation monitor to read L-R and very slowly rock the input control to the right or left channel to get the left minus right reading to fall as low as possible. You should have to change scales on the meter as you fine adjust this. The less L-R information you can have, the better your separation. Now when you play a good stereo CD you should have lots of L-R information.

As I mentioned at the start, I have found this problem several times recently. If you haven't done so already, follow the above procedure and you will probably hear a big difference in your stereo.

If you don't have your L-R set correctly, it doesn't matter how good the rest of the system is, you will not have good stereo separation.

Ampex ATR-700 Start Problems

Bill Jones — Charleston, SC



There are often times when the good ideas of the manufacturer do not necessarily work well in broadcast applications. Such was the case to follow when Bill Jones of Charleston, SC ran into:

AMPEX ATR-700 START PROBLEMS

Several of the stations for which I have done work have used the Ampex ATR-700 tape recorder in their production studios. It did have one fault, however, which made it difficult to use in a number of applications. If you attempted to tightly cue up the tape, when the play button was pressed, it would sound as if the tape were running away. In order to use a take-up motor with less torque, Ampex (TEAC) would switch the

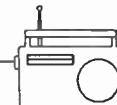
take-up motor into fast forward for approximately 0.1 sec. before switching into play mode.

Capacitor C-124 on the power supply board serves to keep relay K-103 energized for approximately 0.1 sec., putting 100 volts on the take-up motor. At the end of this time K-103 drops out putting about 57 volts on the take-up motor. I found that changing C-124 from 22 uFd. to 4.7 uFd. would still allow the motor to develop sufficient torque to start even a 10 inch reel of tape while eliminating the runaway tape sound.

I have made this modification to several machines with good results. This modification is also appropriate for many other of the machines marketed by TEAC or TASCAM.

Arrakis 12,000 Series Meter Lighting

Frank Kowinski — WSOY, Decatur, IL



Using florescent lights around audio can be problematic. However, Frank Konwinski of WSOY in Decatur, IL solved one of his problems by using some thought about how you might do this and not create a monster. He tells us about:

Lighting Meters on an Arrakis 12,000 Series

A couple of years ago, I installed an Arrakis 12,000 series console in the AM master control room. At the time I noted that all the VU meters could be backlighted, as they are in some of the other series. I didn't feel like installing the

wiring and all for the 14 pilot lamps it would take to light the seven meters.

Then, the other day, I realized that the total length of the space take by the meters in the bridge was 36 inches. So, I installed a 36 inch, 30 watt, cool white, florescent lamp. To avoid some of the hazards of using florescent around audio, I took the fixture apart and remoted the ballast to a cabinet where the board power supply is placed. I then ran shielded 20 ga. cable back to the sockets. The fixture is just placed behind the meters in an inverted position, it sits on the end sockets, and the lighting is evenly distributed. Plus, with the remote ballast, it runs cool.

Radio Guide Quick-Tip

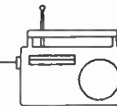
Reusable transmitter metal air filters can be "re-lubed" with PAM cooking spray. Don't soak the filter — a light spray will do.

Radio Guide Quick-Tip

Do mothballs keep the mice out of the TX building and doghouse? Spread some around the perimeter of each, and find out.

Consumer CD Player Skipping Fix

Arthur Reis — New Lenox, IL



It seems that, because of the attractiveness of "trade outs" from the local video/audio store, many stations are saddled with consumer-type CD players in the studios. When you find you've got a problem with one of these light duty units:

Don't Throw That CD Player Away!

If your station operations are like many, then you have a manager who thinks that CD players should only cost \$100 at K-Mart or Radio Shack, and must last about 8 years. And the boss probably doesn't understand when they go belly up after about 10 months.

Well, if one of your "do-list" assignments today is to resuscitate the CD player which is starting to "skip" badly, and you've already cleaned the lens a dozen times, then there may be something else you can do to revive the beast before consigning it to the junk heap.

Anyway, there are other means to fixing the things, especially if they are Magnavox units, although I'll bet they work on Japanese units too.

Here's the procedure:

1. Remove the lid and set it and the mounting hardware aside.

2. Remove the upper clamp which holds down the CD, gently detaching the spring which holds it down in the process. You will be working on both spring and lid.

3. Remove two or three turns of the spring to stretch it. The clamp needs more "oomph" from that spring, and this is how you get it.

4. Get a tube of silicone sealant and an old credit card. The latter should be easy, since we engineers save everything — right? Take the clamp assembly and turn it upside down. You will notice that the construction is of a reinforced platform with "joists," forming a honeycomb underneath. Fill the honeycomb with the silicone sealant, then smooth out the surface with the old credit card.

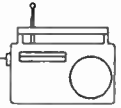
NOTE: Be careful not to get sealant on or near any moving parts of the clamp!

5. Remove the front panel (gently) from the unit and then take out the CD tray. Repeat the procedure (step #4), but this time with the underside of the CD tray. You will need a lot less silicone in this area, but you will need to be more careful in applying it.

6. Let the sealant dry for several hours, then re-assemble the unit. In the majority of cases, this procedure will cure the skipping in your consumer-grade CD unit.

Otari 5050 Series Remote Control Connections

Sid Schweiger — WFGL, Fitchburg, MA



The one thing that most engineers have to deal with, is remote control interface connections to existing studio equipment. Most of these connections are, by necessity, custom designed to serve a station's unique needs. The following article from Sid Schweiger tell us how to establish:

Otari 5050 Series Remote Controls

If you're got any of the Otari 5050 series reel decks, adding remote control doe not have to entail spending big bucks for the CB-102 remote control box or (gasp!) the Autolocator.

A remote control schematic is included in every Otari manual, on the same page as the control diagrams. The remote controls interface with the transport by means of a 12-pin plug. This plug can be obtained from Otari (part #2-CN212150). However, if there is a source of Cinch-Jones (TRW) plugs, using the appropriate Jones plug (P312CCT) might be easier and cheaper.

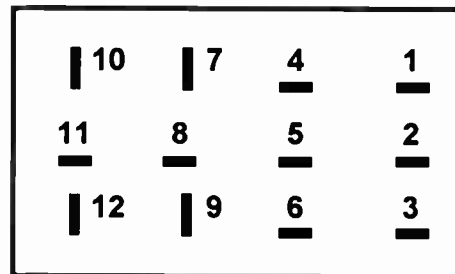
There is one caveat: The pin-outs on the two plugs are not the same! I had built a remote control box using the Jones plug, matching pin numbers on the plug with those in the diagram, and could only get the rewind function to work. I then learned that the pin numbers on the Jones plug are backward from those on the Otari plug.

Below is the layout of the socket on the rear of the Otari machines. You will need to match up the pins on your plug.

- Pin-1 Rewind
 - Pin-2 Fast Forward
 - Pin-3 Play
 - Pin-4 Stop
 - Pin-6 Record
 - Pin-7 Edit Break (common for Rec, Rwd, and FFwd)
 - Pin-10 Rec LED Anode + dropping resistor)
 - Pin-11 -21 VDC (common lead for Stop, Play, and Rec LED)
- (all switches are normally open, momentary)

Radio Guide Quick-Tip

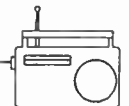
Make a list or chart of all the breakers, connections and circuits that need to be disconnected to allow you to safely work on each piece of gear.



Otari Socket
(viewed from rear of deck)

Simple Telephone Ring Detector

Rod Rogers — Salina, Kansas



We frequently can find ourselves involved in creating a complex solution to a simple problem. Rod shows us that there are times, when dealing with the telco, we only need a:

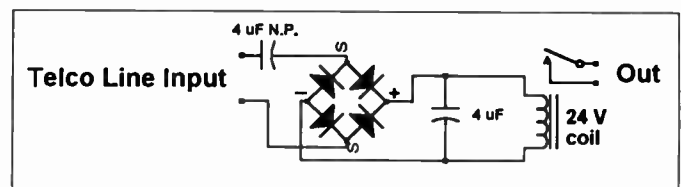
Simple Telephone Ring Detector

After seeing several ring detectors circuits in past issues of Radio Guide, I decided to send one in that I developed several years ago.

The difference is — it's passive! You need no power supply to run it, other than the power to operate the final sounder, light or cart deck through the relay contacts. The relay I used is a "KH" series 4PDT, but others will also work. Just make sure not to get a coil that draws a lot of current, or it may want to "answer" the line.

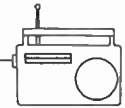
One of the handiest uses is for a control room ring light. I simply enclosed the circuit in a standard wiring box, with a light fixture mounted in the normal fashion. With the extra contacts of this type relay, you can easily latch it for cart machine operation, if needed.

The component values listed have worked on our phone exchange, but in different areas of the country, you may have to vary them slightly. Just make sure that all of them on the phone line side are rated at a minimum of 100 volts. Most ring signals leave the telco at around 90.



Power Outage Reset Timer

John Rohwer Jr. — Sterling, IL



Power outages can cause all kinds of problems. Usually, it's not when the AC power goes away, but when it comes back, that our equipment experiences maximum glitches and intermittent operation. John has a simple circuit that can serve as a:

Power Outage Reset Timer

Our operation is set up as “live assist.” We call it this because our live people are often called upon to assist the automation in the performance of its duties. During the time between these incidents, one is free to step away from the system, provided you wear a portable radio (no building speakers) to monitor the sequence.

We refer to these periods as “Walkman-Away Time.” As a general rule, this available time is inversely proportional to the importance of getting something else done, besides watching voice-tracks and song sequences. In all fairness, the system has proven quite reliable, and most of its actual “errors” have as their origin the human species.

But, power lines problems are quite another matter. In the good-old-days, when Edison produced electricity by burning Kingsford Charcoal and hundred dollar bills, power line disturbances/outages were rare, apparently due to the stability of the American Dollar and the use of premium briquettes. Nowadays, despite the fact that we have two nuclear power plants within sixty miles of us, outages are much more frequent, and they somehow seem related to our vocational school's bandsaw operation.

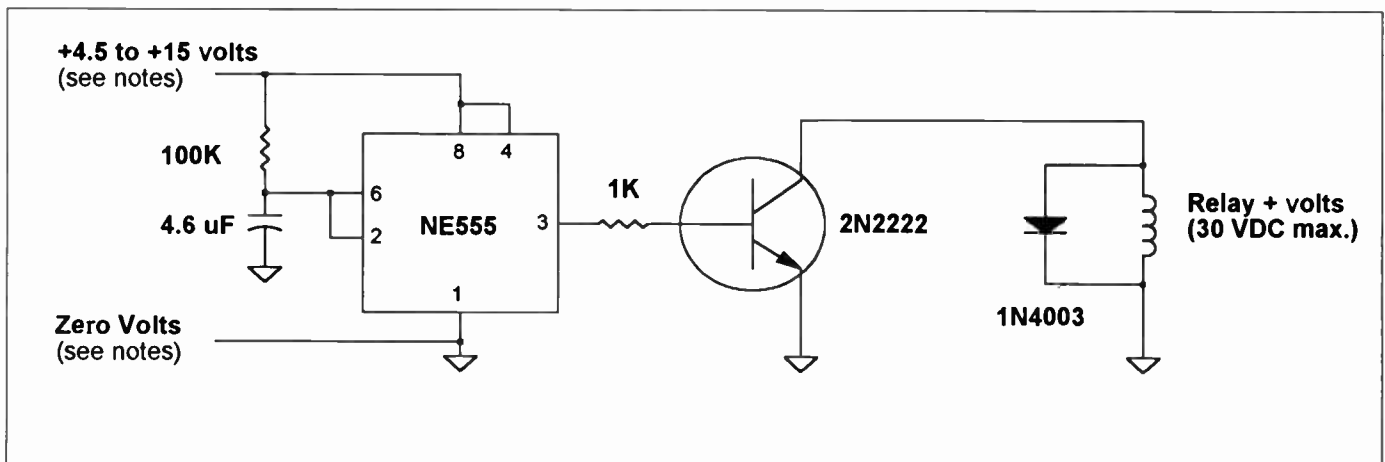
There is, in almost every radio station, a device that enters “START” mode, every time the power comes back up. At our installation, we had racks full of them. Carts and reels, every time the power came back up, would (most of the time) advance by one cut or track. This would throw the music sequence into disarray, requiring additional “live assist.”

We needed a circuit that would sense the return of the Edison line, and “hit the stop button” on all those decks — instantly — and hold it for a second. While sitting at the workbench the other day, I came up with the following circuit.

It is a single convenient 555 timer IC, and is configured as a non-retriggerable one-shot. Note that pin-7 (discharge) is unconnected. Upon return of power, the circuit emits a single pulse of about a second (with the values shown), and along with that 24-volt/49-contact “relay from hell” you've been wondering what to do with, will provide a stop or reset pulse to all offending decks until the system has time to settle itself.

Assembly and Installation

Etch a circuit board? Of course! A circuit this simple deserves only the finest spun epoxy-glass, mil-spec product available. Or you can do as I did — simply mount the parts in a cheap aluminum Bud box in the back of the rack. You can power the circuit from the automation power supply, and attach the stop/resets where needed. When properly installed, this device will take the worry out of power outages.

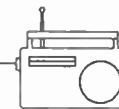


Circuit Notes:

In most cases, zero volts is power supply ground. Sometimes, we are surprised, though. This terminal is not audio ground. 15 VDC is measured from the supply ground (zero volts) and is the maximum voltage the IC will accept. All resistors are 1/2-watt, 20% carbon. Increased values in the R/C network will increase pulse duration.

Studio Wiring Hints

Michael Douthat — Northwest Missouri State University



Although many stations have much equipment in common, the big differences arise when you take a look at the wiring design. Many stations have chosen to use tried-and-true telco wiring hardware for their studio wiring construction. Here we take the time to see what Michael has learned, when he tells us about his:

Studio Wiring Hints

Having done contract engineering for several radio stations, in addition to my full time position, I have been involved in wiring and re-wiring a good number of studios. I thought I might pass along some things I have learned in “doing it right the first time.”

PAD BLOCKS

I bring all connections in and out of a console directly to barrier strips so that pads can be easily added or changed if necessary. Always use spade connectors on the ends of wires to make any future changes or troubleshooting easier.

CONTROL LINES

Bring all control lines out of the consoles to barrier strips also. Again, this allows you to make easy changes without sitting in the jock’s lap.

WIRE RUNS

I have learned not to tie-wrap wire runs, but to run them loosely through some sort of loop, like the telephone company does. This allows you to add or pull wires out, in the future, without having to cut tie-wraps.

AUXILIARY MUTING & ON-AIR LIGHT CONTROL

build or buy an auxiliary relay box that has several combinations of normally-open and normally-closed contacts, to mute, turn on air lights, start tape decks, etc. when the microphone is on.

RCA JACKS

I like to use the original color-coded RCA patch cords that come with CD players, cassette recorders, etc. I make a nice splice to the normal audio wire using heat-shrink tubing over the splice.

SHORT RACKS

To eliminate the mess of equipment on top of the console, I recommend buying or building short racks that go to the sides of the console, for CD players, cart decks, remote control, etc. By building your own, you can make the rack fit your particular equipment needs.

STUDIO CLUTTER

Keep as much equipment out of the control room as possible. Some equipment can be remote controlled and the actual equipment can be in another room. Equipment such as weather radios, EBS units, modulation monitors, audio routers, distribution amps, etc. are example of this type of equipment.

INTER-STUDIO WIRING

I highly recommend that you bring all studio wiring to a central location for studio interconnecting. Here, we have brought 100 pairs from each studio (50 pairs audio and 50 pairs control) to a central wiring area.

We brought all of wiring together on one 4' x 8' board. We used a 50-pair split block, so that you have three connections for each pair. Smaller facilities may get by with 50 pairs from each studio.

Take the time to clearly label all blocks and make a wiring book that shows where each pair goes to, and comes from. Our wiring book uses wide-lined notebook paper with one sheet for each side of the split block, so that when you open the notebook, the sheet on the left is the left half of the block and the sheet on the right is the right side. Come up with a logical system for numbering your blocks, such as A1 for studio “A,” block #1.

SHIELDED vs. NON-SHIELDED

I may have some disagreement here from some of you out there, but I don’t use shielded wire between studios. If you think about it, your program line goes for miles without being shielded, if you’re using the telco as your program link.

As long as you follow a couple of rules, you can use 25-pair telephone cable between studios: First, use levels of at least 0dB between studios (+4dB is better, and is more of a standard now). Second, don’t put an unbalanced signal on these unbalanced lines! This means you will have to use amplified interfaces for consumer type equipment such as CD’s, cassettes, etc., but the trade-off is worth it. If you elect to use unshielded wire between studios, then you can use telephone “cross-connect” wire between your blocks on the panel. This make wiring a snap.

Radio Guide Quick-Tip

When wiring studios, make use of plastic conduit clamps, or supports. They come in many sizes, and you can secure them to your wiring board with one screw, leaving one side open to slip in wires as needed

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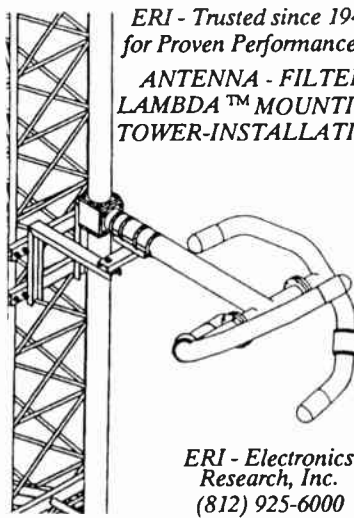
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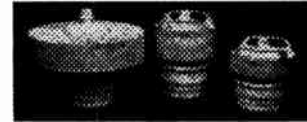
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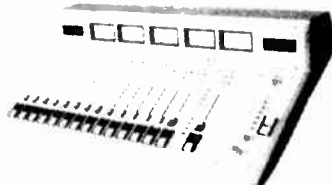
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Condenser Co., insulated shaft couplings as used in phasors,
variable transmitting capacitors.

Weachler-Weatinghouse: RF ammeters, 0-0.5 amps through 0-50
amps, internal and external thermocouples, expanded and linear or
square-law scales. Sizes are 3 & 4 inch, round and square. Special
meters are available.

RCA: Transmitter, phasor and antenna tuning unit parts.

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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 excitors 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.

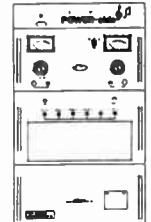
22. Our AM rules do not include a definition of the term "stereophonic." However, generally accepted definitions of stereo service infer two or more channels of audio information designed to produce and audio "image" when demodulated by an appropriate receiver. On this basis, we find that stations employing 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 Haul Distortion
- Co-Channel Interference
- Power-line Re-Radiation
- Building Re-Radiation
- Receiver Tuning
- Low Fidelity Home Radios
- Co-Channel Beat
- Selective Fading

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