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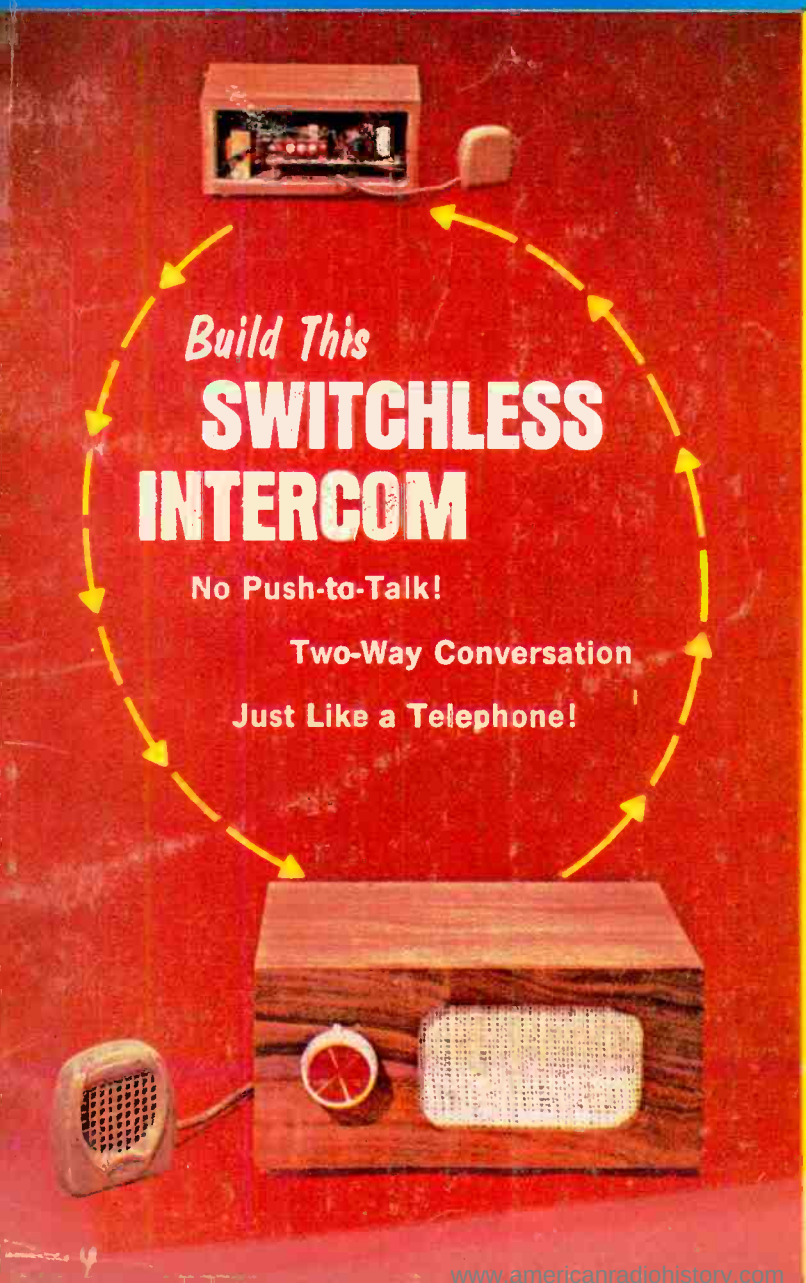

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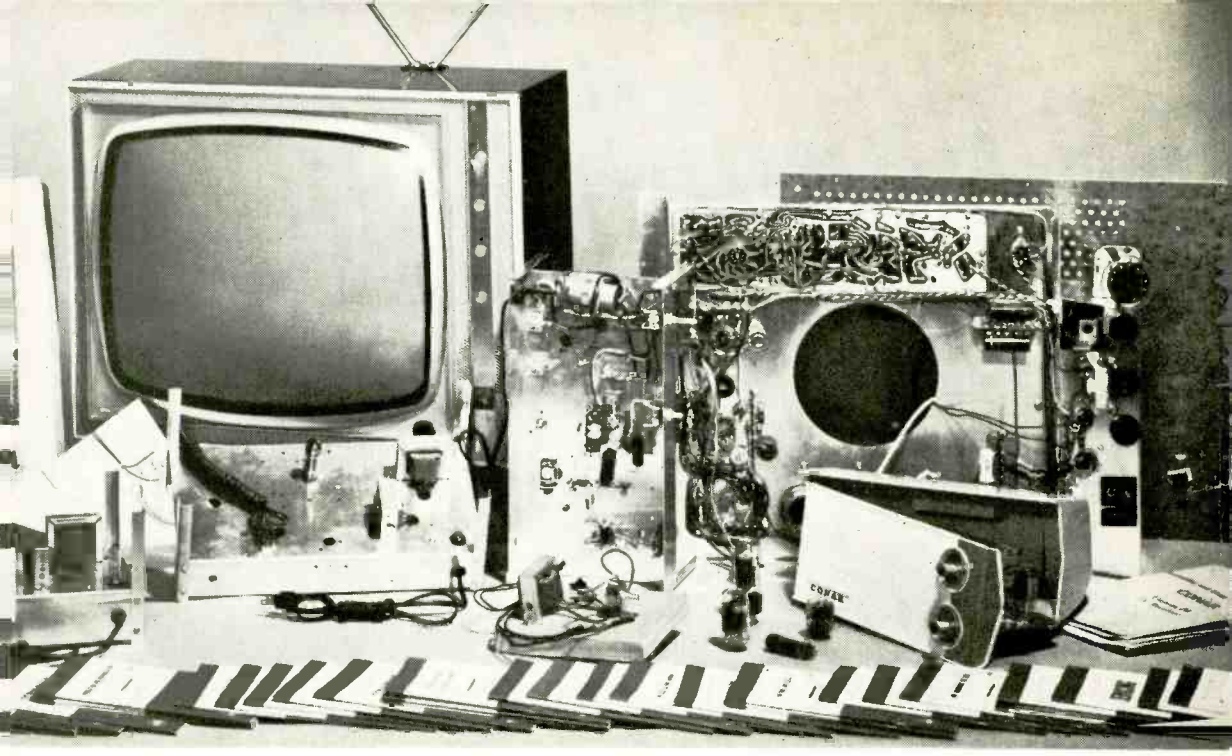

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"Many thanks to NRI for the Electronics training I received. I hold a first class FCC License and am employed as a studio and master control engineer/technician with KXJB-TV."

RONALD L. WOOD, Fargo, N.D.

"I am a Senior Engineering Aide at Litton Systems, in charge of checkout of magnetic recording devices for our computers. Without the help of NRI I would probably still be working in a factory at a lower standard of living."

DAVID F. CONRAD, Reseda, Calif.

"NRI training enabled me to land a very good job as Electronic Technician with the Post Office Dept. I also have a very profitable spare-time business fixing Radios and TV."

NORMAN RALSTON, Cincinnati, Ohio



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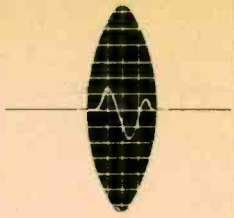
JANUARY, 1965 A Fawcett Publication Vol. 8, No. 1

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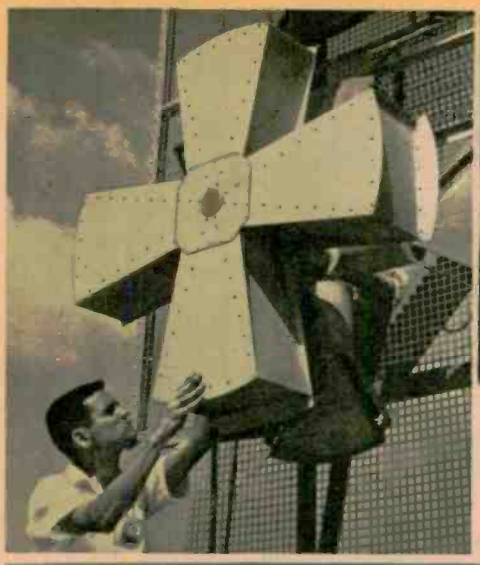

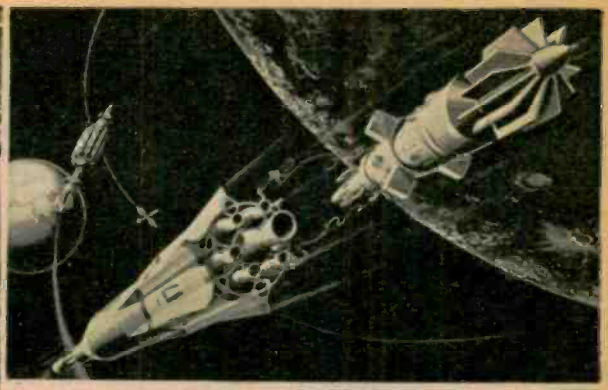

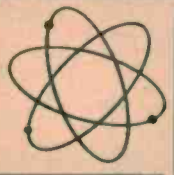


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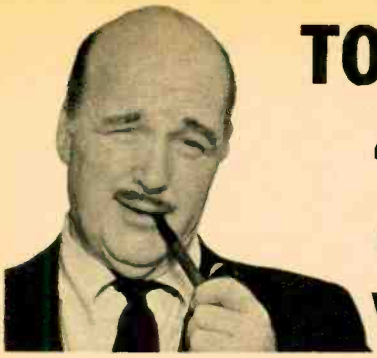

# TOM McCAHILL SAYS:

## "A lot of people could make themselves valuable FAST"

Everyone talks about high school dropouts and automation changing jobs and what to do after retirement. I know some full grown high school students who can't find summer jobs. I have known family men who thought the end of the world had come when the plant moved out of town.

I hope this doesn't sound like a two-bit sermon, but there are solutions to remedy almost any situation. A lot of people could make themselves valuable fast in a job field that nobody seems to know much about—yet, and that's fixing electrical appliances.

As you know, the day is long past when the average home had only one or two electrical appliances. Most homes today are loaded with electrical gadgets that are used for everything from drying milady's hair to cooking dinner and cooling or heating the house.

These appliances break down and that's where you come in.

Appliances have become a major part in our living habits, and in most areas, good appliance repairmen are as scarce as old maids in Corvettes.

What makes sense about this field is that it offers opportunities to men of any age. You'd be surprised at the extra income you can pick up doing good appliance servicing for your neighbors—or the possibilities of starting your own business with little or no investment. There are also good jobs to be had working for some one else who's already in the business.

How easy is it to break into this field?

A lot easier than you think, if you take a look at the home-study course offered by the Appliance Division of the National Radio Institute. You've probably seen the NRI ads. They've been one of the biggest and best schools around since 1914.

The course is good. It's easy. It costs less than many people shell out for one month's payment on that Detroit monster parked in the driveway. They train you fast, in an interesting way, to do some real *professional* appliance servicing on just about every type of appliance from small to large, including most farm and commercial appliances. It even covers small gasoline engines. And they have a separate arrangement to teach you air conditioning and refrigeration.

The point I want to make is this: About the worst thing anyone can do is to sit down and worry about where the extra bucks are coming from. It's not good for your digestive system. It isn't good for those who have to live with you. About the best thing any man can do is help himself.

Do a favor for the guy you see in the mirror every day. Get the details about this course. They send you some books that are worth reading—FREE. Send the coupon below or drop them a note.

No need to tell them I recommended the course. Get the details and see for yourself. Might be a whale of a smart move to do this today.

Tom McCahill

TOM McCAHILL

APPLIANCE DIV., NATIONAL RADIO INSTITUTE
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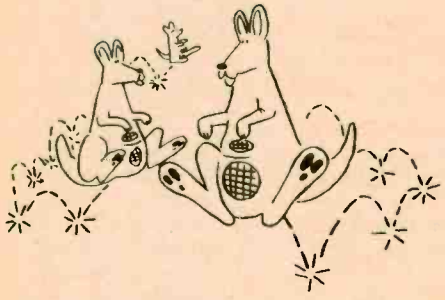
# FEEDBACK
## from our readers

Write to: Letters Editor, Electronics Illustrated, 67 West 44th Street, New York, N.Y. 10036

### ● OVER THERE



I couldn't agree more that that's a way-out name for a speaker system (THE NOVO TWO KANGAROO, November '64 EI). And as soon as I save up enough for the fare I'm going to retrieve mine from Australia—that's the direction I last saw them heading. Wish you had been more explicit in your instructions and said something about closing the windows. As it happens, my speaker system went way, way out.

Ray Stevenson
Montreal, Que.

### ● THE REMEMBERER

You have a cartoon in your November issue where a kit builder tells a friend that his new amplifier is heavier than most 20-watters because of six pounds of solder. I don't remember the issue, but I'm sure you published that same cartoon a couple of years ago. What happened? Are you: 1) too chintzy to buy new cartoons, or 2) still laughing at old ideas?

James Bartlett
Miami, Fla.

*3) Forgetful.*

### ● THE VOICE-MAKER

I have heard from several people that they think it would be possible to build a device that could bring back voices from the past. I don't know if it would be possible, but I would like to know what you think of it.

Robert Harris
Carthage, Mo.

*Depends on whose voices.*

### ● CENTENNIAL

Thank you for the treatment you gave to Mahlon Loomis as the inventor of radio (WHO REALLY INVENTED RADIO?, September '64 EI). I am continuing the drive for Loomis recognition in the centennial year of 1966.

Otis B. Young
Carbondale, Ill.

### ● DXer


Love in its many flowerings has always fascinated me. I, of course, possess a rather extensive library on the subject and I view myself, somewhat unshamedly, as an expert on the aforementioned matter. In speaking of the heart (NEW WAY TO KEEP TABS ON TICKERS, November '64 EI) you discuss several new devices; however, most would appear to require some physical attachment to the person concerned, thus making known their presence. I would hope to assess the cardiacal functions of a person in love remotely.

P. J. Stewart
Chicago, Ill.

*What?*

[*Continued on page* 8]



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# FEEDBACK

*Continued from page 6*

### ● THE DREAMER

I wonder if you could find a schematic for a short-wave set which would include the list of parts I have enclosed. I would like directions for a set which would include these parts. I would like to use these parts because of the technical challenge involved and to get experience.

M. R. Strathkoetler
Binghamton, N.Y.

*Afraid the challenge and experience would be all ours, M.R.S. And anyway, you don't have the makings of a short-wave receiver in your list.*

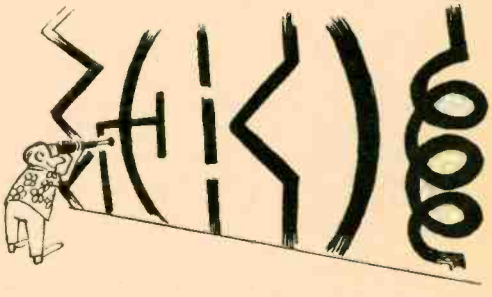
### ● DEMODULATED

I read a story once about rocks, hairpins, fillings in teeth and a cigarette lighter that could receive radio broadcasts. Is there anything to this?

Mel Van Pelt
Salisbury, Mo.

*Could be.*

### ● BEAT ART



You sure missed the boat in that story about man-size schematics beating ordinary squigglies any day of the week (SUPER-SIZE SCHEMATICS, November '64 EI). Who cares about putting projects together, anyway? Enlarge a squiggly to mural size, slap it on the wall and you've got the best pop art since the Brillo box came round.

Stanley Seigel
Chicago, Ill.



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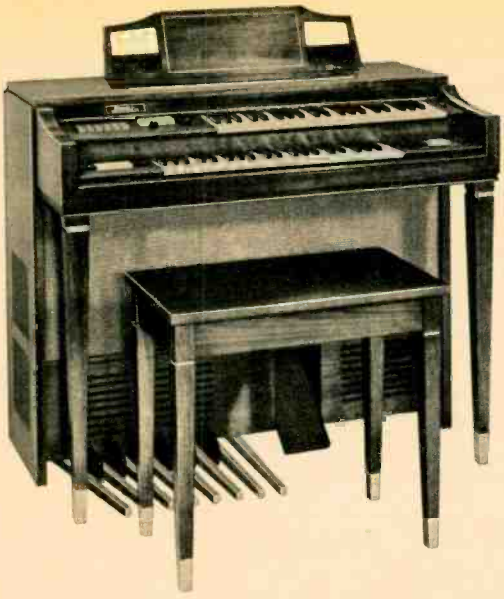

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**A Professional Organist's Dream With A Beginner's Simplicity!** Has every deluxe organ feature you've ever dreamed of for complete playing versatility . . . 17 beautiful true organ voices, plus chimes, reverb, sustain, vibrato, attack & repeat percussion and treble accent to create an infinite number of thrilling musical effects! And it's all wrapped up in a luxurious piece of walnut furniture that enriches any surroundings. It's all yours to enjoy at a savings of $449.

**Simple To Build, Simple To Play!** You don't have to be an electronics wizard to build it, nor a professional organist to play it! Famous Heath "Engi-nuity" has reduced assembly to simple-to- perform steps that require *no* special talents, background or tools. And the famous Thomas "Musical Fun Book" starts you easily playing many favorites. Get the full story free—tear out & mail the coupon now!

*Kit GD-983, 290 lbs., organ & bench . . . . . $849.00*

**COMPARE THESE FEATURES!**

• 17 rich organ voices • Two full-size 44-note keyboards • Built-in 2-speed Leslie plus 2-unit main speaker systems • 28 notes of chimes • 13-note heel & toe pedal board, range C thru C • New stereo chorus for exciting "stereo" effects • Color-tone Attack & Repeat Percussion • Sustain • Treble Accent • Reverb • Manual Balance • Pedal Volume • Expression pedal • Headset outlet for private play • 5-year warranty on transistor tone generators, the heart of the organ • 75-watt peak power amplifier • Hand-crafted, full-bodied, walnut-finished cabinet, completely assembled • Matching bench included

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CL-192

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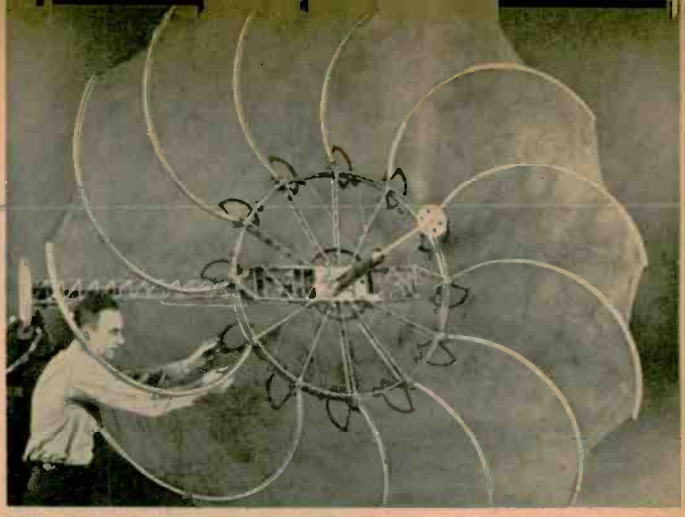

**SPACE-ACE** . . . Unfurling like a sunflower on a summer morn is this unusual 9-foot parabolic antenna. Goodyear designed the oddster for the California Institute of Technology's Jet Propulsion Lab, which will use it for communications between spacecraft and ground stations. Labeled a swirlabola by design engineers, the antenna consists mainly of curved ribs that fold around a circular hub. Thread-thin Invar metal woven in a raschel pattern provides the reflective surface.

# ...electronics in the news

**Mock Rock** . . . Diamonds used to be a girl's best friend—until man got into the act, that is. Now they're almost everyone's friend, at least where phonographs are concerned. The man-made diamond needles in our photo are the outcome of four years of research. And General Electric, the manufacturer, thinks so much of its new diamonds that they come with a full lifetime warranty.

**Ssssss Sniffer** . . . What might pass for an electronic tree pruner is nothing more than Delcon's new ultrasonic leak detector. Designated the Quik-Search Wand, it detects ultrasonic energy in the 35- to 45-kc range and translates this energy into audible sounds. Basic uses are for detecting leaks in telephone cable, industrial manifolds of compressed gasses or pressure and vacuum systems. The battery-powered instrument is completely transistorized and has a range of up to 60 ft.



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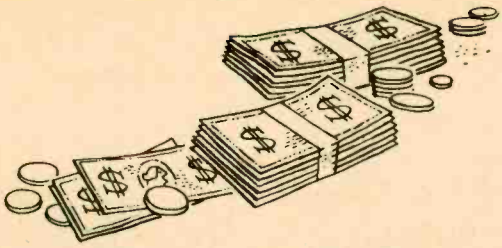
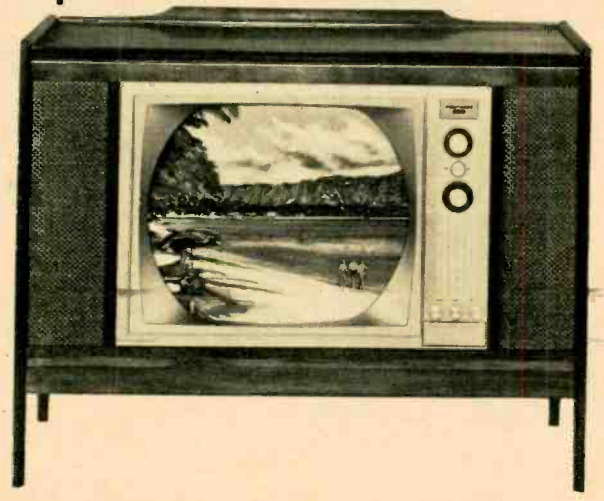
# Regardless of what you pay for other Color TV



## it can't perform as well as this one...



## and yet a Heathkit® set costs as little as $399!

**Exclusive Heath Features For Unequalled Performance!** That's right. No matter how many of your hard-earned dollars you pay for another brand of color TV, *none* can equal the performance of the Heathkit All-Channel, High Fidelity 21" Color TV! Why? *All* color sets require minor periodic adjustments to maintain peak picture performance. The Heathkit GR-53A is the *only* set with a "built-in service center" that provides facilities for perfect picture adjustments. Heath's simple-to-follow instructions and detailed color photos show you exactly what to look for and how to achieve it . . . quickly, easily! You become the expert! Results? Beautiful, true-to-life color pictures day in and day out . . . and *no* costly color TV service calls for simple picture alignment.

But don't take our word for it. See the special articles on the Heathkit GR-53A in the May issue of **Popular Electronics,** June issue of **Radio-TV Experimenter,** February issue of **Popular Mechanics,** April issue of **Science & Mechanics,** and the August issue of **Radio-Electronics.**

Then tear out the coupon and order yours now!

*Kit GR-53A, chassis, tubes, mask, VHF & UHF tuners, mounting kit, speaker, 127 lbs. . . . . $399.00*

### THE ONLY COLOR TV YOU CAN INSTALL 3 WAYS!

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2. **In Heathkit Deluxe Walnut Cabinet (Illust. above), Model GRA-53-7, 85 lbs. . . . . $115.00**
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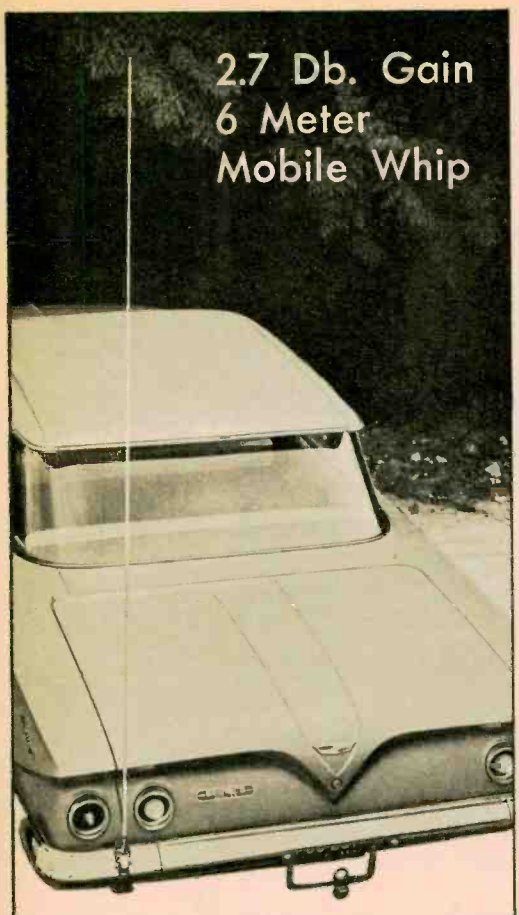


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## ...electronics in the news

**Mighty Magnetism** . . . From little acorns oaks shall grow, or so goes the saying. But the process seems to be reversed at RCA's System Center where mounds of paper are being reduced to handfuls of magnetic tape

almost daily. The workhorses of Wall Street paperwork are the RCA 501 and 301 computers. Presently, the Center is capable of handling some 40,000 stock transactions each business day.

---

**Organ Grinder?** . . . Not exactly, but it's one up on the old music-maker—this one listens at the same time it's making with the sounds. In reality, the gadget is an emergency radio transmitter/receiver for use in lifeboats. Developed by ITT's British Subsidiary, the

transistorized Solas II transmits on three different frequencies. Its receiver tunes continuously over the 8-mc marine band, and its transmitter can broadcast manual or automatic code, a two-tone alarm signal or speech. Power can be supplied by a built-in hand generator or optional 16½-volt battery.



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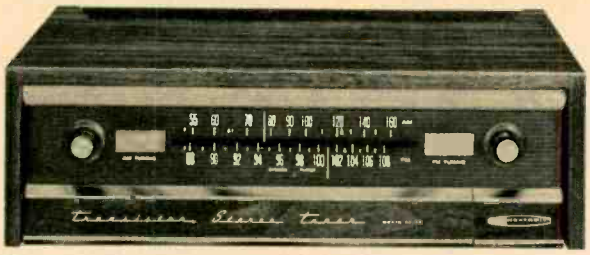
# For The Stereophile With An Eye...



# As Appreciative As His Ear...

# New Heathkit® Deluxe Transistor Stereo!

**Luxurious New Walnut Cabinet Styling!**

Do you consider appearance as carefully as performance when choosing stereo components? If you do, then you'll delight in this new look of Heathkit Deluxe Transistor Stereo. Sleek, richly warm walnut cabinets. Clean, uncluttered charcoal gray upper front panels. Soft refracted panel lighting. Hinged lower front panels (to neatly conceal all secondary controls and avoid accidental system setting changes). Beautiful enough to capture the spotlight in any room!

**And The Sound?**

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**Inside These Beautiful Cabinets . . .**

In the magnificient Heathkit AJ-43 Stereo Tuner, you'll find advanced solid-state circuitry . . . 25 transistors & 9 diodes in all! You'll find wide-band AM, FM, FM Stereo . . . automatic switching to stereo . . . filtered left & right channel outputs for direct, beat-free stereo recording . . . automatic stereo indicator . . . separate AM & FM tuning meters . . . automatic frequency control . . . automatic gain control . . . adjustable FM squelch . . . and stereo phase control for maximum separation, minimum distortion.

The matching Heathkit AA-21 Stereo Amplifier features 26 transistor, 10-diode circuitry to produce 70 watts continuous, 100 watts IHF music power at ± 1 db from 13 to 25,000 cps . . . complete freedom from microphonics, effortless transient response, cool, quick operation. In addition, there are complete controls, plus all inputs & outputs to handle any program source and most speaker impedances. With its encapsulated, epoxy-covered circuit modules and five stable circuit boards, assembly is fast, simple and fun . . . requires *no* special skills or knowledge!

**Please Your Ear, Your Eye & Your Sense Of Value!**

Choose this matched Heathkit Transistor Stereo pair now for better appearance and better performance at lower cost!

*Kit AJ-43C, tuner, 19 lbs.* . . . . . *$129.95*

*Kit AA-21C, amplifier, 29 lbs.* . . . . . *$149.95*

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## ...electronics in the news

**Narrow Novel?** . . . Judging a book by its cover is pretty much like selecting canned goods without labels. And this is especially true when there's a six-transistor radio lurking behind the book's covers. By mounting the transistors folded down rather than in their usual vertical position, Toshiba has come up with a novelette sort of radio that measures a mere 11/16-inch deep. A plastic book-jacket case rounds off the book motif.

---

**Time Checker Upper** . . . Back in the days of sundials, our ancestors were satisfied with knowing little more than the hour. Seconds hardly existed. But in the age of space, quantum physics and such, nothing less than microseconds can satiate our want of accuracy. Fact is, scientists at Hewlett-Packard have developed a couple of atomic clocks that'll vary nary a second in hundreds of years. Our photo shows the clocks being flown to Switzerland where official U.S. time will be compared with that on the Continent. One use for the clocks will be to measure radio propagation time between countries.



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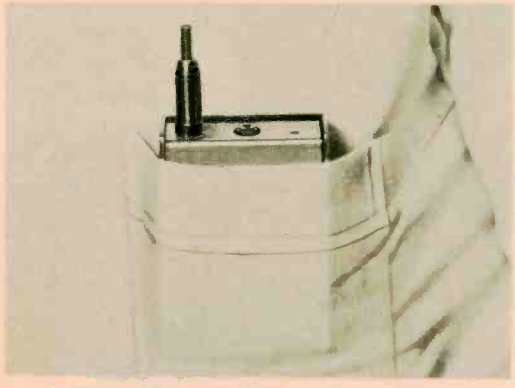

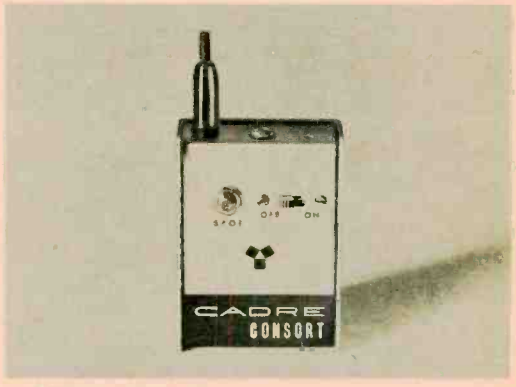


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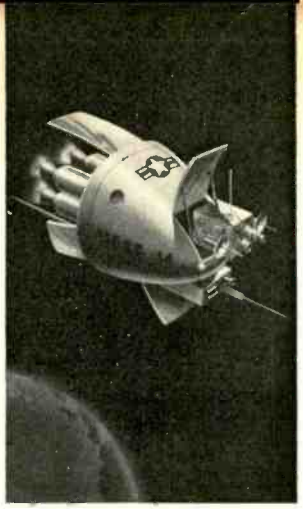

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# MARKETPLACE

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bars, a pattern of 54 dots, a crosshatch pattern, a vertical bar pattern and a horizontal bar pattern. Clip-on leads couple the generator to the TV set. Seco Electronics Inc., 1210 S. Clover Dr., Minneapolis, Minn. 55420

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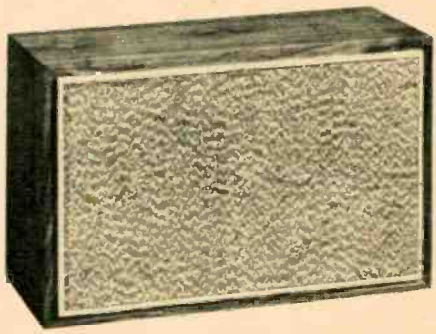
**Two for the Money** . . . Though designed for use at the N.Y. World's Fair, the S-5 two-way speaker system sounds good most



anywhere. And while it measures only 10 x 16 x 6¾ in. and weighs a mere 12 lbs., the S-5 is no little leaguer. Housed in its attractive cabinet is a low-resonance woofer, a high-frequency tweeter, a crossover network and a level control. Response is within 5db all the way from 60 to 15,000 cps. About $60. H. H. Scott Inc., 111 Powermill Rd., Maynard, Mass. 01754



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Robert L. Shuff, 1534 Monroe Ave., Huntington, W. Va.: "Thought I would drop you a few lines to say that I received my Edu-Kit, and was really amazed that such a bargain can be had at such a low price. I have already started repairing radios and phonographs. My friends were really surprised to see me get into the swing of it so quickly. The Trouble-shooting Tester that comes with the Kit is really swell, and finds the trouble, if there is any to be found."

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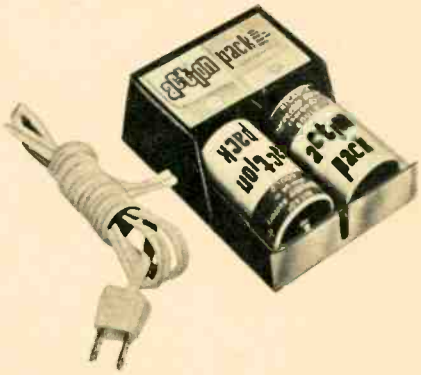
**Power Pack** . . . Put a couple nickel-cadmium batteries in Gould-National's Action Pack. Plug the little charger into the nearest 117-



VAC outlet, and what've you got? Well, give or take a few hours, and you have batteries good as new. Developed primarily for toys, bicycle lamps, flashlights and the like, the nickel-cadmium batteries can be used anywhere flashlight cells presently are employed. $5.95. Gould-National, E-1201 First National Bank Bldg., St. Paul, Minn. 55101



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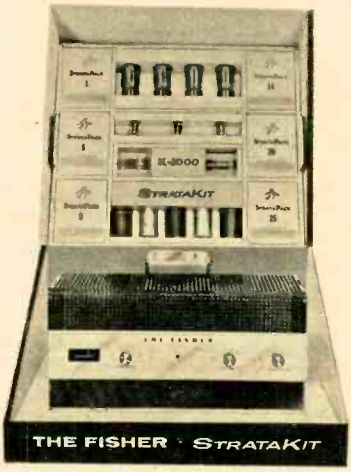


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The circuitry of the K-1000 is completely original in concept and features a host of engineering subtleties that will delight the technically sophisticated. Yet the unique Fisher StrataKit method of kit construction makes it so easy to build that your young son can complete it just as successfully as a skilled electronic technician.

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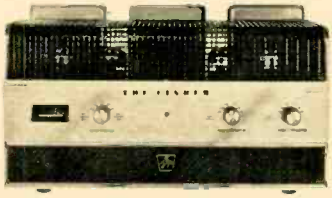

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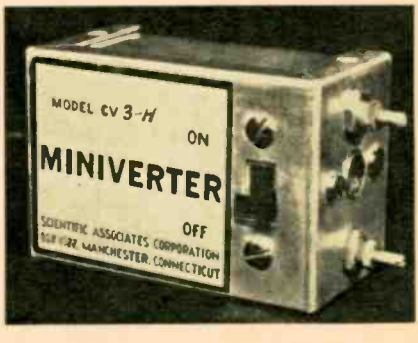


short-wave reception. Since each model is designed to cover a separate 1-mc-wide band, the model you pick will depend on the frequencies you want to tune. The unit measures only 3 x 2½ x 1⅝ in. $14.95 and up. Scientific Associates Corp., Dept. 42, P.O. Box 1027, Manchester, Conn. 06040.



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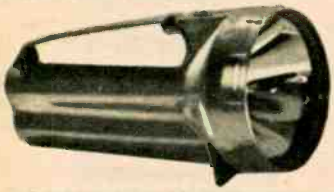

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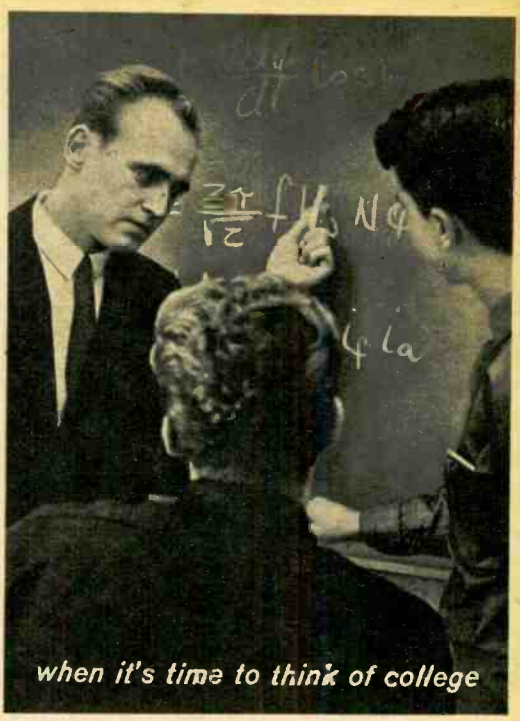


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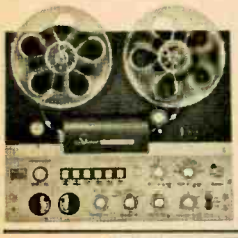

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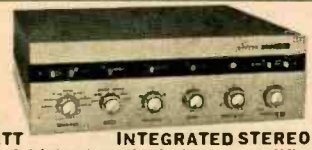

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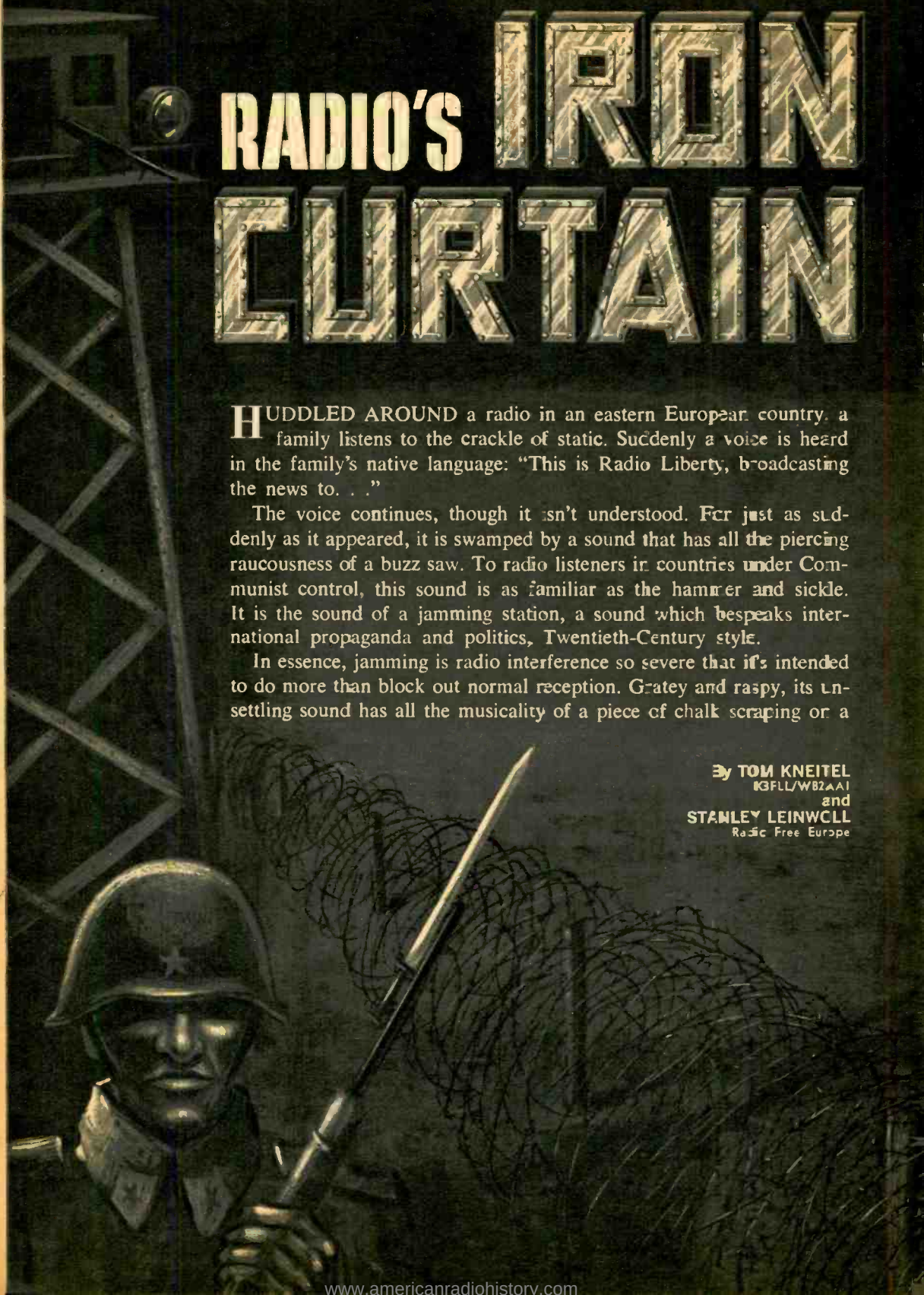
# RADIO'S IRON CURTAIN

HUDDLED AROUND a radio in an eastern European country, a family listens to the crackle of static. Suddenly a voice is heard in the family's native language: "This is Radio Liberty, broadcasting the news to. . ."

The voice continues, though it isn't understood. For just as suddenly as it appeared, it is swamped by a sound that has all the piercing raucousness of a buzz saw. To radio listeners in countries under Communist control, this sound is as familiar as the hammer and sickle. It is the sound of a jamming station, a sound which bespeaks international propaganda and politics, Twentieth-Century style.

In essence, jamming is radio interference so severe that it's intended to do more than block out normal reception. Grating and raspy, its unsettling sound has all the musicality of a piece of chalk scraping on a

By TOM KNEITEL
KGFLL/WB2AAI
and
STANLEY LEINWOLL
Radio Free Europe



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blackboard. The would-be listener's only out is to turn off his radio.

In jamming, the interference is broadcast on the same frequency as the program which is the target for obliteration. Occasionally such jamming is accidental—two radio stations inadvertently broadcasting on or near the same frequency. But most jamming is well-thought-out and purposeful.

The sounds of jamming are numerous and both listeners and engineers have created their own names for each type. Gulls, bagpipes, grunts, single tones, multi-tones, pulses, babbles and buzz-saws are in the picture. But all jamming boils down to one thing —noise, unlistenable and insufferable.

**How It Started.** Though this assortment of noises is very much part of the Twentieth Century, it isn't simply a development of the Iron Curtain. Radio jamming actually goes back some 30 years, when the Austrian government jammed Nazi programs beamed to the Austrian people.

Large-scale jamming began in 1938, when Russia attempted to jam anti-Communist broadcasts from Nazi Germany. Hitler's government retaliated by jamming all Russian broadcasts directed to the German people. In addition, the Italians jammed Russian programs in the Italian language as well as Ethiopian radio appeals for aid during the Abyssinian war.

When World War II erupted, propaganda broadcasts were stepped up immeasurably. So, too, were efforts to stop them from reaching their intended destinations.

Jamming was used by Germany, Italy and, to a lesser extent, Japan. Each country was feeding its populace a particular brand of propaganda. None wanted Allied broadcasts carrying our version of defeats and victories to be heard. Especially hard-hit were BBC broadcasts, which were jammed by the Nazis through most of the war years.

When the war ended it was thought that the days of jamming were over. This, as we now know, was a premature decision.

**Post-War Jamming.** Since 1945 jamming has had an overwhelmingly Red tinge. For with few exceptions, the Soviet Union and its satellites have been the biggest exporters of radio noise. The Russians and the Spaniards seem to have rekindled the sparks in 1946 by jamming each other's external services. Russia added BBC broadcasts to its jamming schedule in April, 1949. American broadcasts were jammed by the Russians starting about a year later.

From the dozen or so Soviet jamming transmitters in operation in 1946, there were at least 150 on the air four years later. And jamming grew more and more intense as the number of transmitters increased. Worse yet, as the satellite countries set up their own jamming stations, a jamming system or complex was established.

The buildup continued. By 1951, all free-world broadcasts beamed to the Soviet Union

**Radio listening in the Soviet bloc is fraught with frustration. Though jammers vary in effectiveness, they often totally obliterate programs of news and information transmitted from points outside the Iron Curtain.**



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and its satellites were subject to intense jamming.

And even this wasn't the end. As the free world increased the number of broadcasts to the Communists, more and more jammers were brought into operation. The number of jamming transmitters increased from something like 1,500 in 1952 to some 2,000 in 1956.

In the spring of 1956, coincident with the visits of Khrushchev and Bulganin to Great Britain, interference with BBC broadcasts to Russia ceased. But jamming of BBC programs in the languages of the satellites continued.

Jamming of broadcasts to the Soviet Union suddenly was resumed during the October 1956 Hungarian Revolution. And early in 1957 came first reports of determined efforts by the Chinese Communists to jam.

**Who Else Jams?** The United States never has used jamming as an instrument of peacetime national policy. All broadcasts from overseas are permitted to enter this country without interference. Similarly, none of the western-alliance countries has used jamming on a permanent basis.

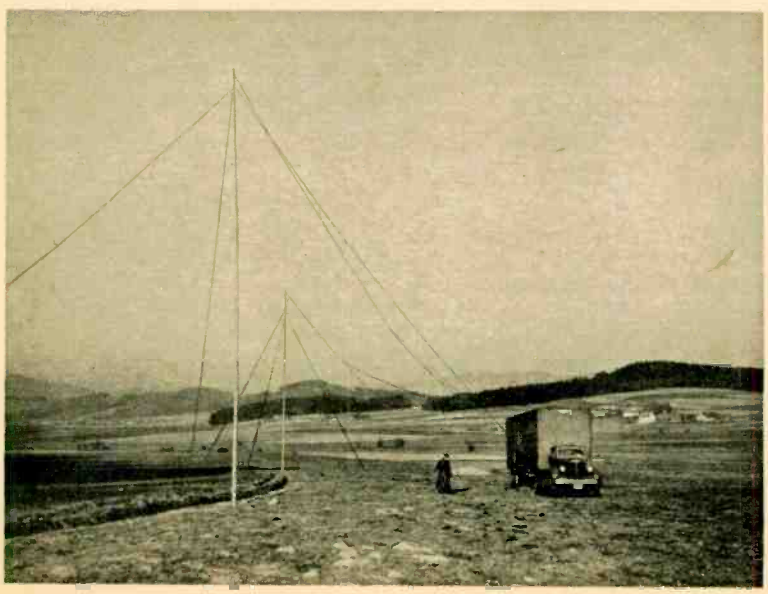
True, there were reports that the British jammed Egyptian and Greek programs during the Suez and Crete crises. In addition, the French were accused of jamming Algerian programs during some phases of the fighting in Algeria. To our knowledge, no free-world jamming presently is taking place.

**How Effective Is Jamming?** The effectiveness of deliberate radio interference varies with geographical location within a country, as well as from country to country. For the most part, reception in large urban population centers (such as Prague and Sofia, where jamming networks are located) is poor. Jamming in such cities is almost 100% effective. In smaller urban centers, as well as in rural and suburban areas, reasonable reception is possible at least 50% of the time. And this condition exists despite all-out efforts to jam.

By locating monitoring stations on the periphery of the Soviet orbit, it's possible to determine reception patterns over wide areas of adjacent Communist territory. This is because the behavior of high-frequency radio signals can be charted in much the same manner as the weather. If it's sunny in New York, for example, it also is likely that the sun will be shining within several hundred miles of the city.

Similarly, conditions affecting a given radio signal will differ only slightly over wide areas. If a signal, say, is getting through the jamming in southern Finland, then it probably is getting through to a good part of northern Russia—provided there are no local (ground-wave) jammers in the vicinity.

In addition to technical monitoring reports, information about reception is obtained from escapees who listened to free-world broadcasts before their flight. Then, too, letters from listeners behind the Cur-



Both fixed and mobile jammers are employed throughout the Soviet Union and in many of the satellite countries. Truck in this photo houses mobile jammer, which feeds fixed antennas at left. Guard with rifle can be seen in center of photograph.



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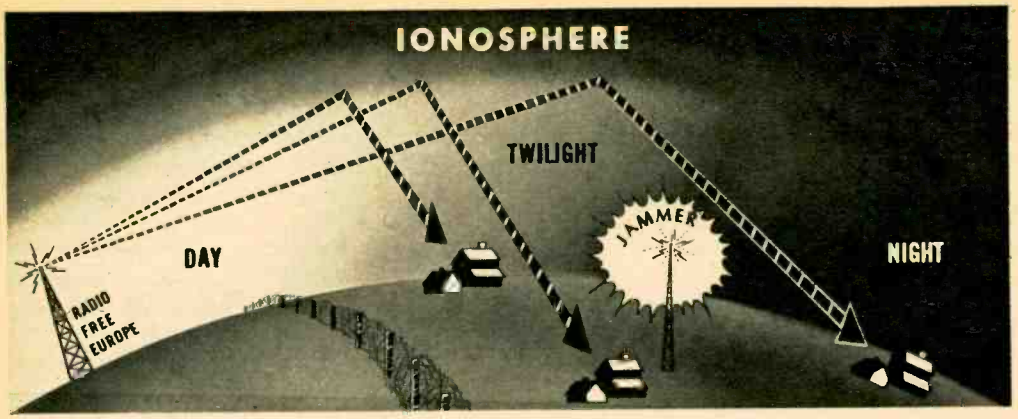


**Because of sun's effect on ionosphere, jammers located to the east of main transmitting site lose their effectiveness at twilight. This condition is known as twilight immunity and is explained further in text.**

tain sometimes come to light. Furthermore, attacks by various Communist regimes on free-world broadcasters often appear in the Soviet and satellite press. Sometimes there even is mention of such broadcasts over the Red radio, proof indeed that free-world transmissions are getting through.

**Anti-Jamming Techniques.** There is no single magic solution to jamming and no black box a would-be listener can attach to a receiver to eliminate the unwanted signal. Even so, several techniques have proven useful against jammers. Most successful of these is brute-force, in which transmitter power and antenna gain are increased until the signal is so strong it simply overrides the jammer.

On the other side of the ledger, the trend toward increased power among all of the world's broadcasters has overshadowed this technique to some extent. Further, though high power and increased antenna gain can deliver signals that are strong enough to override jamming in many areas, there is nothing to prevent the opponent from increasing his jamming power.

Fortunately, economics enters the picture in a helpful way. For each free-world transmitter whose power is increased, many jammers must hike their power to counter the effect. Reason is that propagation from a single jamming location simply isn't capable of delivering comparably stronger signals to all target areas.

A second anti-jamming technique might be called saturation programming. Essentially, it consists of having a great many transmitters simultaneously carry the same program in the same language. This puts an added strain on any jamming system. In many instances, it forces jammers to spread their facilities extremely thin. As a result, effectiveness of the saturation-type programs generally is quite high. R. Free Europe uses up to 12 transmitters simultaneously during its severely jammed Czech programs. Effectiveness of these programs consistently is over 90%.

In an effort to counter the effects of jamming, free-world broadcasters sometimes have scheduled transmissions adjacent to or co-channel with Russian and satellite transmissions. This hasn't mattered in the least to the Soviet bloc. They have shown no hesitancy in putting jammers on frequencies carrying their own broadcasts. If a free-world broadcast is being transmitted on that frequency, then the interference gets top priority, whether or not a Russian broadcast also will be jammed.

Another device tried during the early days of jamming is called jumping. A broadcast would start on one frequency, then jump to another when the jammers opened on the first. When the jammers moved to the second frequency, a third and then a fourth would be tried.

Trouble with this approach was the Red monitoring system. Highly efficient, it usually was able to find the new frequency within minutes. Worse yet, this cat-and-mouse game

[*Continued on page* 102]



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# RADIO CONTROL FOR MODEL TRAINS

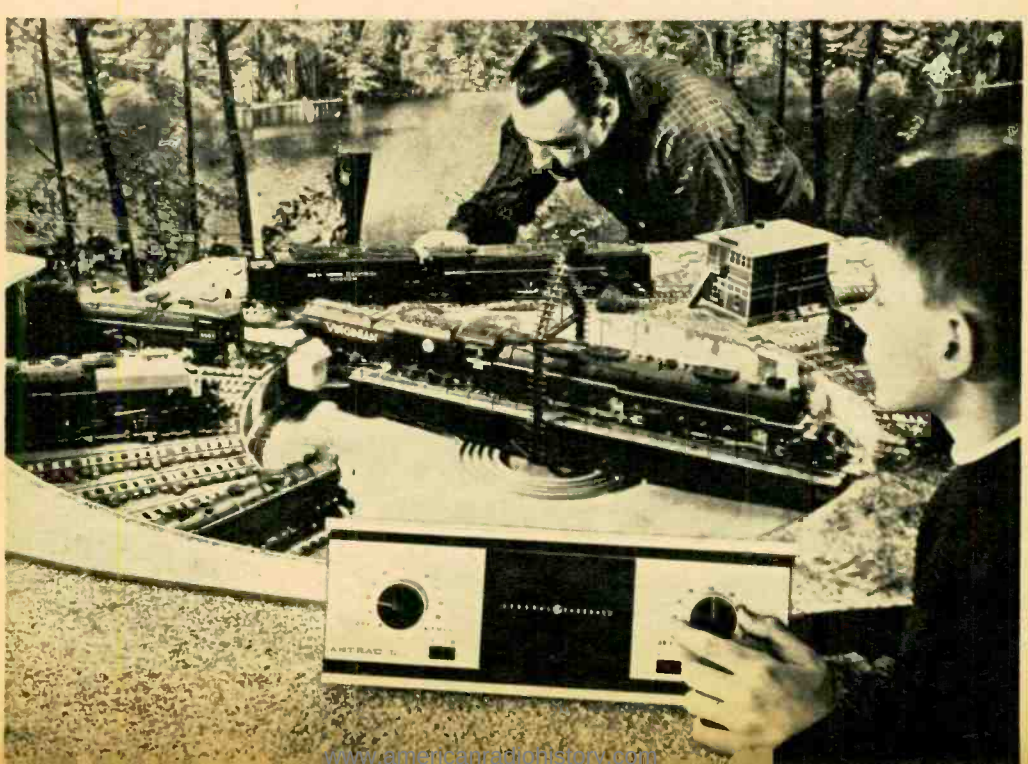
By HOWARD G. McENTEE

THERE'S SOMETHING new on the market for the dedicated model-train hobbyist, and it's a safe bet he'll go for it with every whistle blowing. Add this factory-wired radio-control transmitter and some receivers to your railroad-in-miniature, and you can have a freight yard or rail network that's as realistic as the B&O's. Reason: the R/C setup enables you to control as many as five trains simultaneously and individually—all on a single track. Trains can be made to rest dead on the track or move at any speed, forward or reverse. What's more, all train and accessory lights stay at full brilliance at all times.

**AC for DC.** A GE development, this all-electronic system is called ASTRAC (for *A*utomatic *S*imultaneous *TRA*in *C*ontrols). It's adaptable to any model-train system whose engines have permanent-magnet (DC) motors. And here's an offbeat angle: though the motors must operate on DC, the ASTRAC system puts AC on the track. This eliminates the relatively inefficient rectifier and rheostat in the power supply and it provides more realistic slow-speed operation. In fact, with ASTRAC, trains can be made to creep along with plenty of power and absolute smoothness.

The ASTRAC system requires one or more transmitters plus several receivers, one of which is placed in each engine. Big change you make in your setup to switch over to ASTRAC is to put AC on the track—even though you know PM motors won't run on it. Fortunately, most power packs have AC terminals. If yours doesn't, you simply bypass the rheostat and rectifier and feed the transformer output directly to the track. The receivers will operate on 6 to 30 VAC, but from 16 to 20 VAC will give you about the same speed and power you obtain with conventional DC systems.

**Five Channels.** The basic ASTRAC transmitter is a dual-control unit (Model K2 or K4), which has a panel knob and a switch for regulating the speed and direction of two locomotives. Hook a K2 and a K4 together, and you're all set to handle four trains at

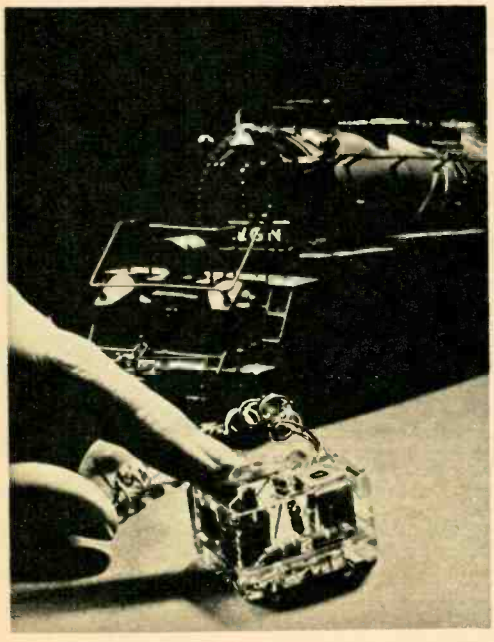


# RADIO CONTROL FOR MODEL TRAINS

once. What about five trains? A third unit, the Model K5 transmitter, is a single-channel device with a similar speed knob and forward/reverse switch—plus a channel selector that allows you to control any of five trains, one at a time. Add the K5 to the K2/K4 combo and you have the full-house, five-train system.

As you may have gathered, five radio frequencies—one for each channel—turn the trick. The transistorized transmitters put out one or more of these frequencies, depending on which model you select. Model K2 operates on 100 and 255 kc, while Model K4 radiates on 140 and 220 kc. The Model K5 puts out 180 kc, but its selector switch will pick any one of the five frequencies.

No engine ever should be operated on an ASTRAC-equipped track without a receiver, of course, since it is the receiver that prevents AC from reaching the engine motor. Five receivers are available, one for each frequency, and they're small enough to fit into most engines. As supplied, they measure ⅞ x 1½ x 1-3/16 inches, but a little whittling here and there can shrink even these miniscule dimensions.



Receiver for ASTRAC system picks up one of five channels, can be mounted inside locomotive.

Transmitters in the ASTRAC system are pretty straightforward, though there is a basic requirement that the AC on the track and the AC input to the transmitter be synchronized. However, since both come from the same socket, they have to be. In addition, a line-sync unit takes care of the all-important phasing and ensures that each RF burst from the transmitter starts at the desired point on the track AC cycle.

**Two SCRs.** The ASTRAC receivers, in contrast, are not nearly as simple as their size would suggest. Each is housed in clear silicone rubber, both to protect it from shock and to act as a heat-sink for the two silicon controlled rectifiers (SCR's) inside. An L-C circuit is tuned carefully to the desired frequency and the signal is fed to the gates of both SCR's. However, only one SCR conducts at a time.

Here's why. The first SCR is set up so it conducts every time it receives a positive pulse. Since the SCR rectifies the AC on the tracks, the motor can utilize its output. And, since the SCR gets these pulses only for about the last quarter of each cycle, it sends rather short positive pulses to the engine-drive motor. Due to its own inertia, however, the motor doesn't rotate in a series of jerks but turns smoothly at a fairly slow speed. Longer pulses from the transmitter hold the SCR on longer and the motor goes faster.

The second SCR works much the same, but it's set up to respond to negative pulses. Reversal of the 60-cycle input to the line-sync unit causes this SCR to feed negative pulses to the motor so the train will back up.

Though it's largely foolproof, there are a few things to watch out for with ASTRAC. Since the track voltage is higher than that from an ordinary DC supply, resistors should be placed in series with all lamps or the lamps should be wired in series. Further, if too many lamps are connected across the track the transmitter signals can be attenuated seriously. Remedy here is to insert 1- or 2-mh RF chokes in series with each lamp in the circuit.



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By LEN BUCKWALTER, KBA4480

# A NEW LOOK

CITIZENS BAND radio just mightn't be what it once was. Those rules changes the FCC has been hatching so long just may mean a new look and then some for CB. The band is still in the same place, of course, but that's about all.

To get some perspective on what's happening, you have to boil down 28 pages of legal and technical jargon, which is just what we've done here. Our version is meant to show you what's on the horizon for CB. The complete edition soon will be appearing in the FCC's official Rules and Regulations under the section numbers we indicate.

● **Use of Channels (Sec. 95.41).** Biggest change occurs here. Units of the same station (your base and mobile rigs, for example) still can communicate on any of the 23 channels. But units of different stations (i.e., those operated by other licensees) can communicate only on these seven channels: 9, 10, 11, 12, 13, 14 and 23.

● **Talking Time (Sec. 95.91).** As a general restriction, all transmissions must be kept as short as possible. And as a specific restriction, communications between different stations must not be more than 5 consecutive minutes in length. Furthermore, such stations must remain silent for a period of at least 5 minutes after each transmission and monitor the frequencies involved. One exception: a station observing its silent period can transmit to acknowledge a call from another station, though the message can consist of nothing more than a request to stand by until the silent period is over (silent periods apply even if you change channels).

● **Range (Sec. 95.83).** No station can communicate with any other over a distance of more than 150 miles.

● **10 Codes (Sec. 95.83).** Use them as before. However, you now are required to keep a list of 10 Codes and their meanings on hand in your station.

● **Station Identification (Sec. 95.95).** Call signs must be given in English even if you speak only Latvian. However, you don't have to say "this is" or "from" when identifying. Units of the same station (which can talk for more than 5 minutes at a time) now can exchange transmissions for as long as 15 minutes before identifying. No abbreviated calls are allowed; the full call-sign of all stations involved must be transmitted and each unit must identify itself separately. You can make up your own special calls for tactical reasons but these can be used only in addition to your regular, assigned call.

● **Equipment Connection (Sec. 95.83).** A transceiver can't be hooked directly into a public-address system but, of course, you still can inform a public-address announcer of information picked up via the receiver. Phone patches aren't specifically ix-nayed by the new rules; however, the Commission points out that many telephone companies prohibit such attachments. Turkey Calls and Q-Birds are out. But selective-call systems are all right so long as the tone signal is kept to less than 15 seconds in duration and actually is used to unlock the squelch of another unit similarly equipped.

● **Equipment (Sec. 95.43).** Power now is defined by more than just the old 5-watt input limitation. The rules add that output can't exceed 4 watts (a daydream, since even the Commission doubts that any rig can produce 4 watts output—80% efficiency—and still be legal). Sideband comes into its own in the new regulations, rated by average power (and not its higher-than-5-watt peak power). Also spelled out is the amount of time you can transmit a test signal. It's pegged at 1 minute during any 5-minute period.

● **Permissible Communications (Sec. 95.83).** Hold on to your db's—there's a new provision which forbids discussion over the air of the technical performance of radio equipment. An exception: you can inform another station when his signal isn't clear or understandable. Another part of this same section makes it illegal to talk to Canadian staions. (Canada, however, does approve certain business communications between U.S.



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# FOR CB?


and Canadian operators when a U.S. citizen is in Canada.)

● **Other Changes.** Many organizations—Civil-Defense teams, volunteer fire departments and the like—now can operate units under one call. If you change your address you still can operate while waiting for the new license, provided you notify the local FCC office. A club or association won't be granted a license unless it's incorporated. However, there is a chance of an unincorporated club receiving a license if the Commission recognizes a special need. Lending out call-signs is specifically prohibited. Even CB dealers can't permit a customer to operate under the dealer's license, though the dealer himself can demonstrate equipment over the air.

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**The Why of It.** Now that prophets of doom and the alarmists have had their day, the proposed CB rules can be reviewed in the pure light of fact. The rules provoke one inescapable conclusion. If you were operating in accordance with the old rules, the new ones should produce barely a ripple in your activities. The reasons aren't hard to find.

Purpose of the new rules seems twofold: 1) to cut down on hobby-type, hamming activities, and 2) to clarify vague features of the old law.

As any ragchewing kilocycle-killer knows, CB radio as an end in itself never was condoned. Consider the most sweeping change on the books—confining traffic among stations of different call-signs to seven channels. Just about all abuse occurred between different stations (as opposed to units of the same call), so the Commission packed them into a narrower orbit.

A peculiar logic can be applied. Some speculate that the new rule really puts the free-wheeling operator into a side pocket, isolating him in a sort of electronic Pandora's Box. Confined to seven channels, he can swallow himself in meaningless babble. The upright citizen, meanwhile, is free to conduct orderly communications on the other 16 channels. A cynical interpretation? Yes, but this new arrangement could provide a delicate balance which just might keep the service viable.

The rest of the new regulations are reminiscent of a mother-daughter conversation about dating. Daughter already knows, but mother further develops the points. For example, the old rules said an antenna couldn't be more than 20 feet higher than a natural or man-made structure. But the way around that one was obvious, as everyone soon recognized. As one man we know put it, "Anyone can raise a 40-foot tower (a man-made structure), then mount a CB antenna on it."

The rewritten regs nip such tricks by stating that a man-made structure is any construction other than a tower, mast or pole. Similarly, while the old version forbade transmitting music, the new one also tosses in whistling and sound effects. In much the same vein, the false-signal clause now includes a warning about saying MAYDAY. And salty language or blue-tinted gags won't go, either. The new rules not only forbid obscene or profane words but their meanings as well.

In short, the new rules have made for some major changes and picked up some loose ends. And what about the future? Some sage once said that a study of history can help prevent future mistakes. Sounds reasonable, and this same thought applies to CB. Just consider what happened when the rules traveled from mere proposals toward the force of law. Back in November 1962 the Commission first suggested the changes and invited comments. Reports said FCC offices were flooded with mail.

Not so when you look at the real figures. Approximately 2,500 comments were received over a period of more than a year. No flood, this—it was more like a leaky faucet,

[*Continued on page* 116]



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# HI-FI TODAY

By John Milder

- *Big-time sound in small-time packages*
- *What to watch out for with elliptical tips*
- *Second thoughts on solid-state tuners*

**IT'S A BIT EARLY** to make predictions, but it looks as though packaged hi-fi systems just might be the real show-stealer in 1965. By *packaged* I don't mean those preselected component systems some of the mail-order houses put together. Nor am I thinking of those old-style consoles that sound like banshees screaming in the night.

The new-style packages I'm talking about are compact, three-piece sound systems. They're built around a transistor amplifier and two speaker systems of bookshelf-or-smaller size. Such sound packages already are offered by Fisher, KLH, Scott and Shure. And other manufacturers expect to get into the act shortly.

What's behind this new idea in hi-fi design? Well, the transistor, mostly, and here's why. The transistor makes for small-scale (if not subminiature) equipment. This being the case, a system with one control section (containing a record changer and stereo amp/preamp) and two flanking speaker cabinets is right down the transistor's alley.

**Interesting angle here** is what can be done with transistors once you've given up the idea of matching a transistor amplifier to any and all speakers. Since transistor output stages tend to favor only one speaker impedance, having a specific speaker in the setup means you do away with the problem of accommodating speakers of differing impedances.

Then, too, toss out the need for matching more than one kind of pickup at the other end of the hi-fi chain and you can come up with a lot of performance in a neat, reasonably priced little package. Furthermore, design the amplifier for one particular speaker and you can match amplifier and speaker more precisely than in most any standard component stereo system. The speaker, by the way, also becomes a known quantity in the amplifier's distortion-reducing feedback circuitry.

Over the past year, we've seen these ideas reflected in J. B. Lansing's amplifier/speaker combos (which Lansing calls Energizer/Transducers). But now we're getting the "compleat package"—supplied both as portable phonographs and as ultra-compact non-portable systems. Each offers surprisingly good sound.

Most expensive so far is Shure's M100, which is built around the Dual 1009 automatic turntable and Shure's premium-quality V-15 cartridge. In its portable version, the M100 goes for $389.50; the non-portable Library system costs $450. Fisher's portable and stationary packages (the Models 50 and 75) are priced at $209.50 and $269.50, respectively. Scott's Stereo Compact (non-portable) is $299.50, while KLH's new package, the Model Twenty, includes a miniaturized stereo-FM tuner and sells for $399.50.

**As the prices** indicate, none of the new packages is exactly a bargain-basement item. But all the companies involved claim these new systems can stand their ground against component systems of much higher price. And they also argue that the small speakers sound big enough to satisfy all but the most gilded of golden ears.

Could this mean that components themselves are on the way out? Huh-uh. Matter

[*Continued on page* 116]

**One example of non-portable package stereo is Shure's M100. All-transistor, it sells for $450.**



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# Now! Hands-free conversation with our SWITCHLESS INTERCOM

By DAVID WALKER

HOW many times have you watched a conversation between two people that never mastered the art? Before long they're both talking at once. And what happens if these same people try to talk to each other over an ordinary intercom? You guessed it—they'll be tied in knots after two minutes of fiddling around with the push-to-talk switches.

The answer is not a course in the fine art of conversation but a switchless intercom like ours. Such an intercom lets each party break into the conversation at any time. It's like the telephone, but with loudspeaker volume. While one person is yacking, the other can start talking and will be heard instantly. You can even interrupt while your friend is interrupting you!

There are no voice-operated relays or other switches to delay the back-and-forth action. Everything is done electronically. But before you set about ordering parts, consider carefully the end use of such an intercom. Though fun to operate, its special design requires plenty of construction and parts.

Unlike push-to-talk intercoms, the switchless intercom requires two complete amplifiers instead of the usual one. Total cost of parts is about $30 to $35 if everything is purchased new. But for certain applications, you can't beat it.

Say the boss is dictating a letter to his secretary in another room. She can stop him and ask how to spell *phthisis* without a lot of distracting button pressing.

**Construction.** Since both units are identical, we show the diagrams of only one and the power supply. Most of the parts are mounted on a 3½x5½-inch piece of perforated board. Mount all parts on the board before fastening it in the U-section of an 8x6x3½ inch Minibox. Flea clips or other small push-in terminals serve as tie points. Transformer T1 and transistor Q4 are installed



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on the board as shown in the pictorial.

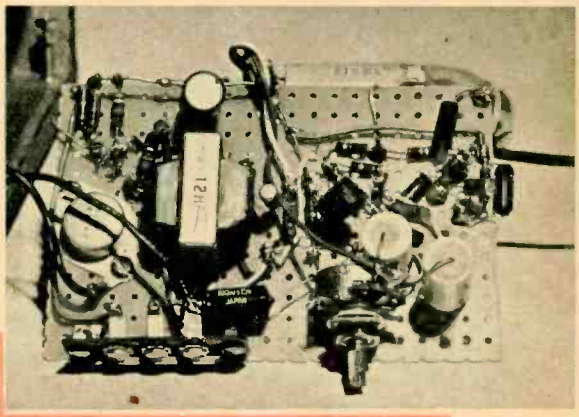
Grounds are important. Notice that a piece of heavy bare wire runs along two edges of the board. One point on this wire must connect to the solder lug which is attached to a long machine screw near C2. This screw also supports the front edge of the board about ¾ inch above the bottom of the cabinet. A third nut on the top of the board locks it in place. The rear of the board is held to the case with two small L-brackets.

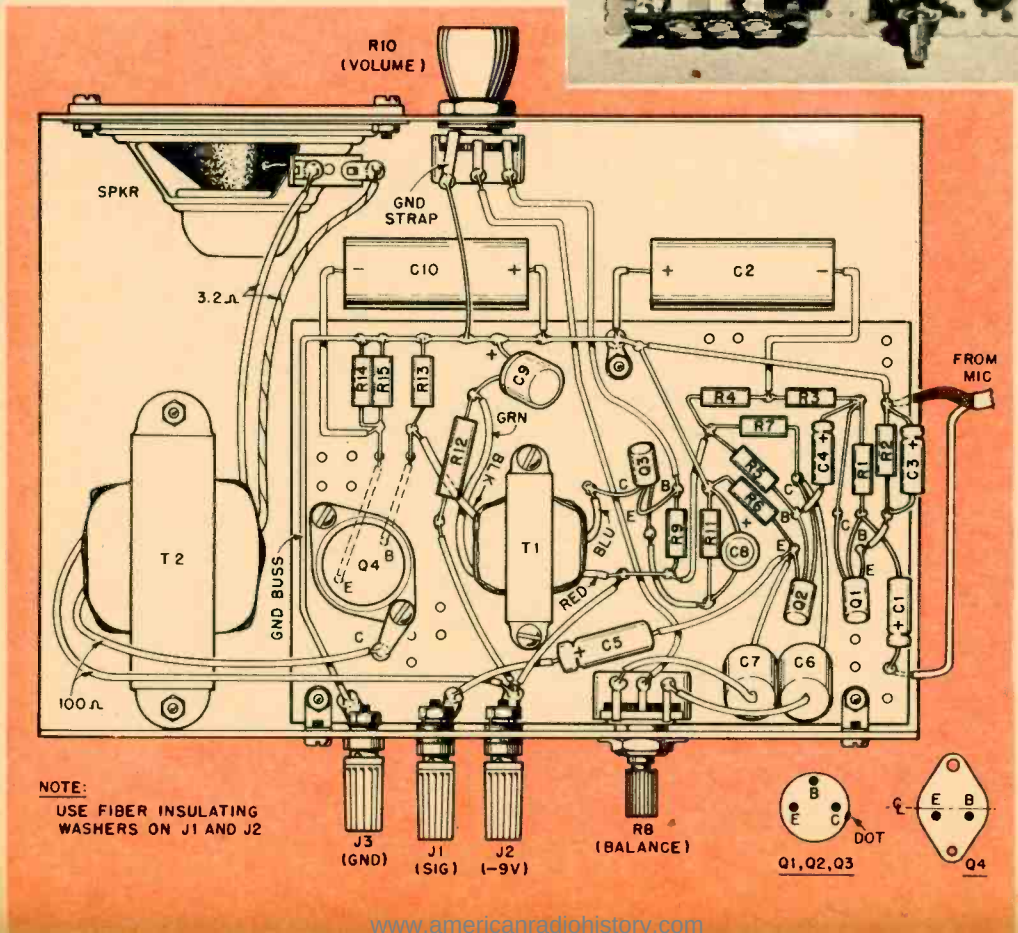
Another ground point is binding post J3. It is not necessary to use a fiber insulating washer for this post since it must make contact with the case. Binding posts J1 and J2 must be insulated from the case. The solder lug at one side of transistor Q4 is not for grounding. It is for T2's connection to Q4's collector (the case).

**Set-Up and Operation.** After both units and power supply are complete, connect all similarly marked terminals *(gnd, sig, —9V)* with a length of 3-conductor wire (No. 20 plastic-insulated hookup wire). The *aud* terminal that appears in the photo of the power supply has no internal connection to the

# SWITCHLESS INTERCOM

**First model was built in metal cabinet, hence J1, J2, J3, R8, R10 and the speaker are mounted as shown below. Circuit board is held in place with angle brackets at rear and machine screw at front. Later model (photo at right) was built for installation in wood cabinet shown on first and last pages of story. For this construction, mount R8 and screw-type terminal strip with angle brackets.**



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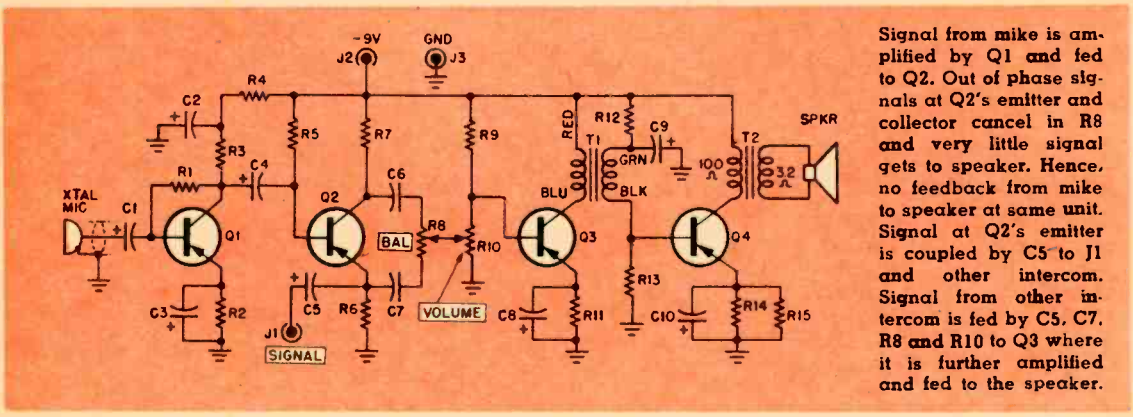
**PARTS LIST**

**Capacitors:** all electrolytic unless otherwise indicated
C1, C3—10 mf, 15 V
C2, C10—500 mf, 12 V
C4—10 mf, 6 V
C5, C9—100 mf, 15 V
C6, C7—.1 mf, 200 V tubular
C8—30 mf, 12 V
*C11—1,000 mf, 25 V
*C12—1,000 mf, 15 V
J1-J5—Five-way binding posts
**Transistors:** all RCA
Q1—2N2613 Q2—2N217
Q3—2N408 Q4—2N2147
**Resistors:** ½ watt, 10% unless otherwise indicated
R1—1 megohm
R2, R4—1,000 ohms
R3—10,000 ohms
R5—150,000 ohms
R6, R7—820 ohms
R8—10,000 ohm linear-taper pot
R9—47,000 ohms
R10—5,000 ohm audio-taper pot
R11—82 ohms
R12—270 ohms, 1 watt
R13—39 ohms
R14, R15—2 ohms, 5%
*R16—32 ohms
*S1—SPST toggle switch
*SR1, SR2—Silicon rectifier: 500 ma, 100 PIV
SPKR—3x5-inch speaker
T1—Driver transformer: primary, 8,000 ohms; secondary, 3.2 ohms (Allied 62 G 093)
T2—Output transformer: primary, 100 ohms; secondary, 3.2, 8, 16 ohms (Allied 64 G 149)
*T3—Power transformer: primary, 117 V; secondary, 26.5 V @ .6 A (Allied 61 G 476)
Misc.—8x6x3½ and *5x2¼x2¼-inch Miniboxes, perforated board, flea clips, crystal microphone
*Note: Order twice the quantity of all parts except those marked with an asterisk (*)




**Signal from mike is amplified by Q1 and fed to Q2. Out of phase signals at Q2's emitter and collector cancel in R8 and very little signal gets to speaker. Hence, no feedback from mike to speaker at same unit. Signal at Q2's emitter is coupled by C5 to J1 and other intercom. Signal from other intercom is fed by C5, C7, R8 and R10 to Q3 where it is further amplified and fed to the speaker.**

supply. It is just a tie point for the *sig* wires of the two intercoms. The location of the power supply may be anywhere along the line.

First thing to do is place the intercoms in separate rooms and close the door. (Feedback will occur if the two stations "hear" each other.) The mike should be located about two feet to the side of each intercom's cabinet. With power turned on, turn the volume control on one unit all the way up. Chances are you'll hear howling feedback. Reduce this by slowly turning balance control R8.

At some point near the middle of R8's rotation, the feedback should stop or become very weak. Now repeat this procedure at the other unit. (Note: this adjustment must be always made with both units connected.) If there is no feedback hold the mike a few inches from the speaker.

It is possible that feedback cannot be killed with the R8 because of mechanical feedback between mike and speaker through the table surface. You can determine this by holding the mike in your hand. If this stops it, place some soft material under the mike. Feedback may also occur if the mike is placed atop the intercom case or if it is too close to the speaker.

Some experimentation will be required to determine the best speaking level and setting of the volume control. Talking too close to the mike will produce distortion at the other unit. With our model, speaking at a distance of about one foot from the mike produced good intelligibility at the other unit.

**How it Works.** It's easy enough to use two wires with a telephone communications system, since there's no problem in having signals travel two ways simultaneously on one pair of wires. And there's no feedback at either end because the microphone and earphone are separated by the handset and because the gain is low.

With most conventional intercoms, the speaker is not used as a microphone and a speaker at the same time because there'd be feedback. Okay, you say, why not build an



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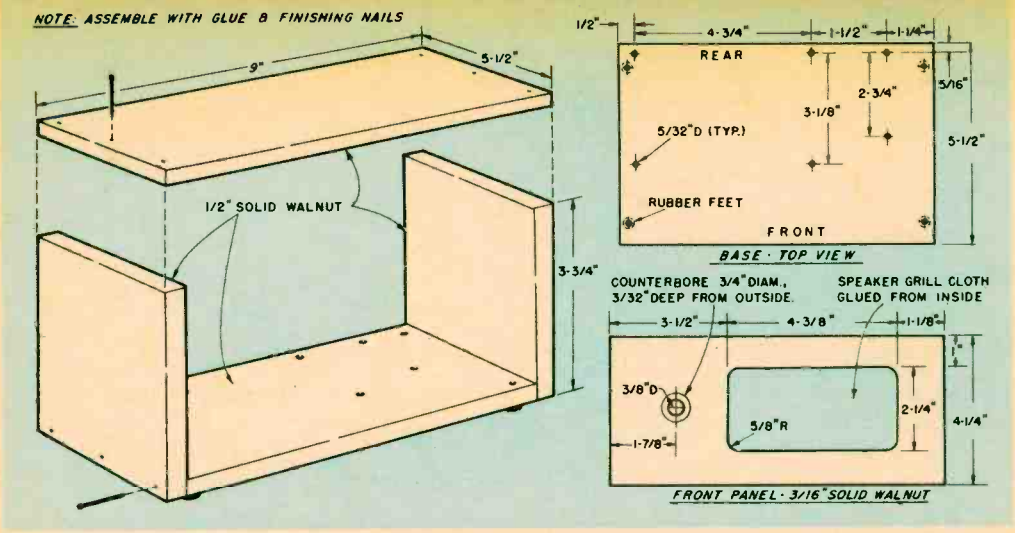
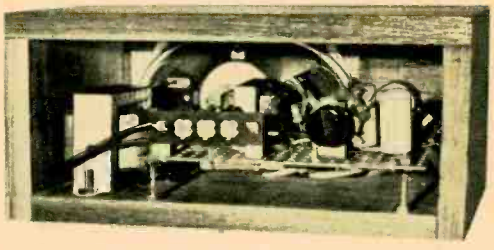


**If you install intercom in wood cabinet, mount speaker first, then output transformer. Attach volume control to front panel with long leads then mount circuit board atop machine screws. Connect one lead of output transformer's primary to collector of Q4, and other lead to the terminal strip.**

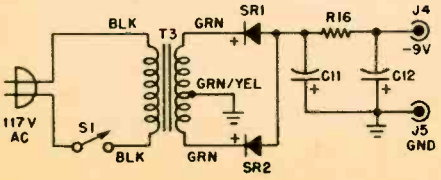
# SWITCHLESS INTERCOM

intercom with a speaker and mike at each end? Fine, except that you'd get feedback between them because of the high gain required to produce room volume.

The switchless intercom solves this problem. Here's how. Take a look at the schematic. When you talk into the mike, you want *your* signal to go to the other unit but not to *your* speaker. Watch what happens. The signal from your mike is amplified by Q1 and fed to Q2. This signal now appears at both Q2's emitter and collector. These two signals, which are 180 degrees out of phase, are fed to balance potentiometer R8, and at some point on R8 they cancel each other out. That point is where R8 must be set for minimum feedback, as we explained earlier. Since there's hardly any of the signal from your mike at this point none of it gets through to Q3, Q4 and to your speaker. Hence, there won't be any feedback at your unit.

Remember that we said your signal also appears at Q2's emitter. At this point the signal is not cancelled out. It is coupled through C5 to J1 and fed to the other intercom. Let's see what happens at the other intercom which is identical to yours.

The incoming signal at J1 goes through C5 to the emitter of Q2. Since this signal never goes through Q2 from its base, it is not cancelled out. Therefore it continues through C7 to R8 and goes on to Q3, Q4 and the speaker. In a nutshell, then, your signal to your own speaker is cancelled out at R8. But it is fed to the other intercom through C5. The signal passes through C7 to R8 and goes on to Q3, Q4 and to the speaker.




**Power supply right, and schematic, left. Lug marked "aud" on chassis is not shown in schematic as it is merely a tie point. Be sure you hook up SR1 and SR2 correctly.**



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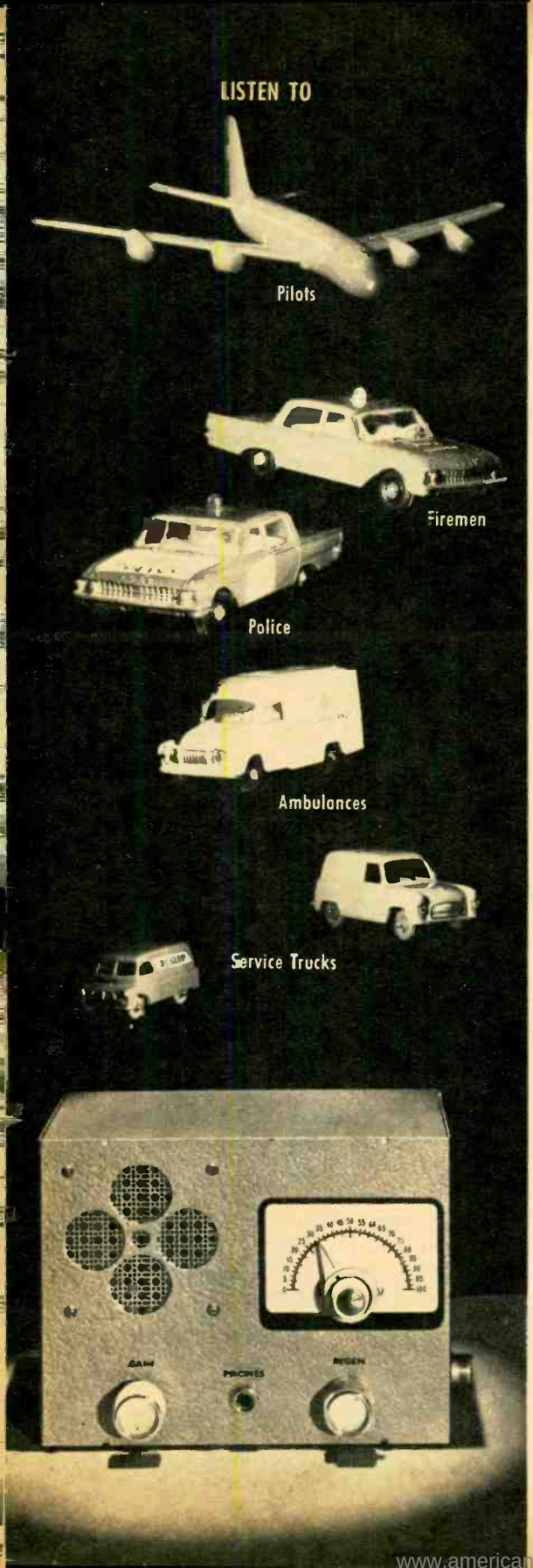


# VHF Broadspanner

*Two tubes and a really hot reflex hookup give you exciting listening all the way from 26 up to 173 mc!*

By CHARLES GREEN, W3IKH

THERE'S real excitement and adventure in the VHF radio spectrum, which begins at 30 mc and runs up to 300 mc. Sure, it may be lots of fun to tune in the *world* on a short-wave receiver. But on VHF there's so much activity in your own back yard and in the sky above that you'll be glued to your seat for days listening to it all.

Take a quick look at some of the things you'll be able to hear with EI's VHF Broadspanner, a really hot, two-tube VHF receiver. Starting at about 26 mc, you find the Citizens Band and then the 10-meter amateurs. Between 30 and 50 mc you hear police cars, fire departments, telephone paging, intra-airport communications and other conversations between public-safety vehicles.

From 50-54 mc, you can eavesdrop on the 6-meter hams. The Broadspanner also tunes the 88-108 mc FM broadcast band. Plug in another coil and listen to commercial and private aircraft and airport control towers. Put in the highest-frequency coil and you are able to tune from 140 to 173 mc for more public-safety listening and the 2-meter ham band at 144-148 mc. For more detailed information about what you can hear and where, take a look at the chart at the end of this article.

VHF is a big world. And the easiest and most economical way to listen is with the VHF Broadspanner.

The Broadspanner uses only two tubes in a reflex circuit that has a grounded-grid RF stage followed by a superregenerative detector. And there's plenty of audio power to drive its 3½-inch speaker to room volume.



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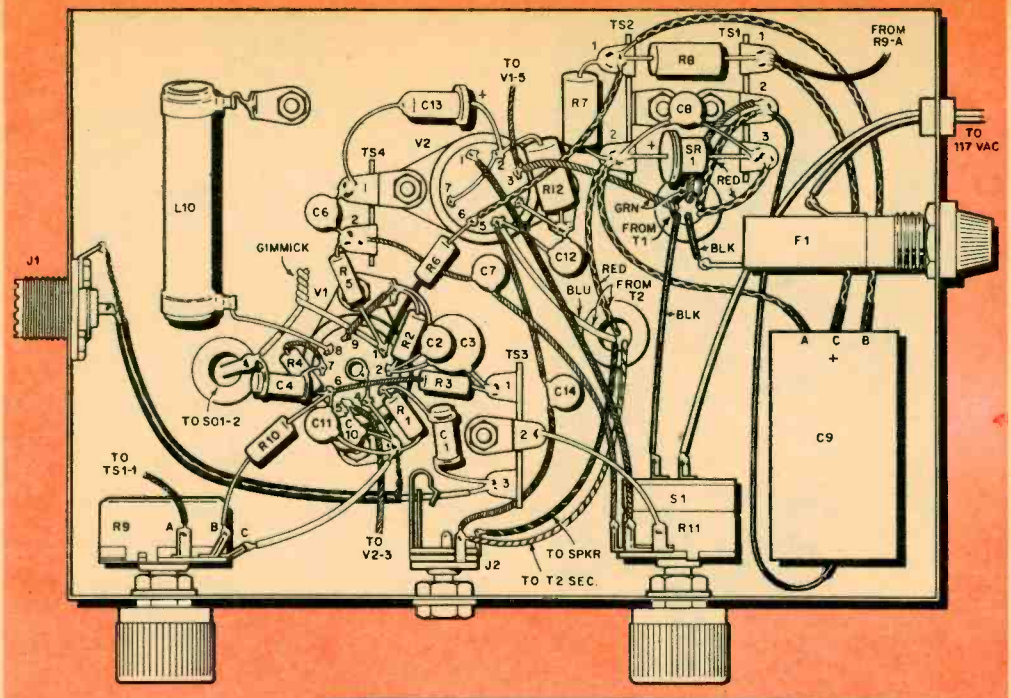


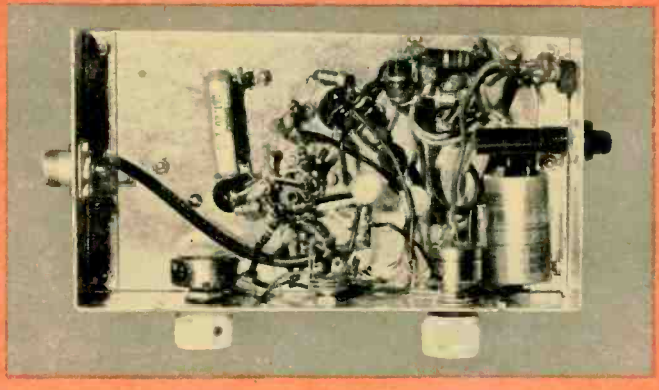

**Author's receiver is built in an 8x6x4½-inch LMB utility box (see Parts List). If you have difficulty getting this size, use a 8x6x3½ or a 12x7x4-inch box. Smaller size will mean crowding, so be careful. But whether you use larger or smaller box, keep all parts in same relative location. Chassis in photo at right is 4⅜x8 inches. Mount it with angle brackets or cut it 9 inches long and then bend edges ½ inch.**

# VHF Broadspanner

The receiver and its power supply fit in a compact metal cabinet. Using all new parts, the Broadspanner can be built for about $25. The nine coils that cover 26 to 50 mc and 88 to 173 mc aren't at all difficult to wind.

The coils are plugged in through an opening in the rear of the receiver so they can be changed easily. Assembly and wiring are straight-forward and you shouldn't have much trouble with construction.

### Construction

The author's receiver is built in the main section of an LMB 8x6x4½-inch aluminum utility box. The name of a distributor where you can buy this box is listed in the Parts List. But if you prefer, use a 12x7x4-inch cabinet, which should be easier to get. Just because this box is wider, do not spread out the parts. Because of the high frequencies at which the receiver operates, parts placement and wiring are critical. Therefore, follow exactly the layout shown in the pictorial.

Before installing the chassis, which can be cut from a piece of aluminum, drill and punch all holes for the components and tube sockets. You can mount the chassis either with four angle brackets at the corners or by bending the edges on the ends to form ½-inch lips. Either way, install the chassis 2



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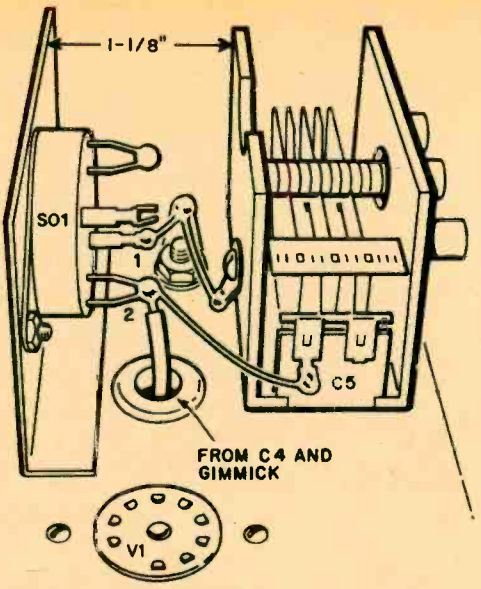



Coil socket mounting details. The lead that goes from pin No. 2 on SO1 to the junction of C4 and the gimmick capacitor must be No. 12 buss wire.

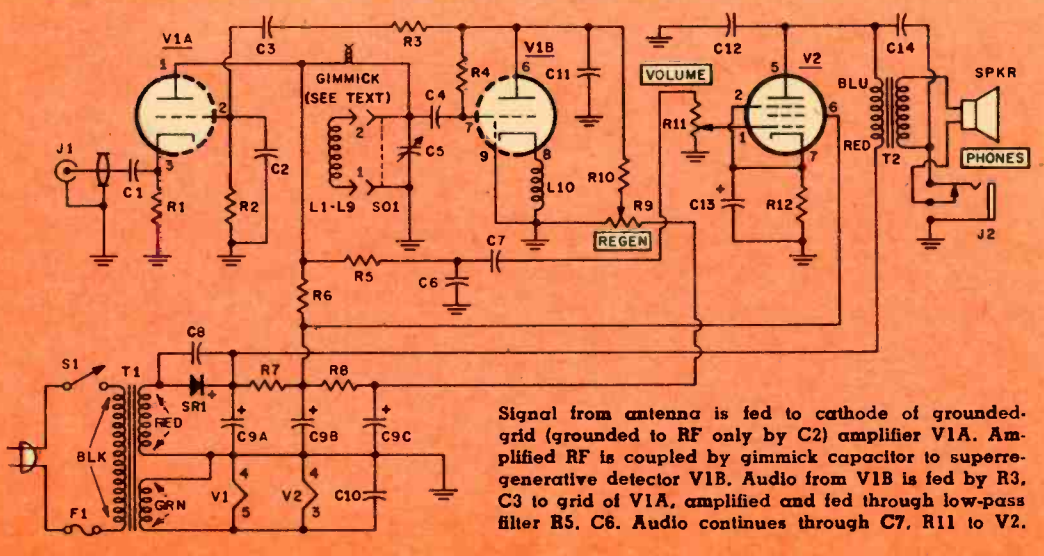
inches above the bottom of the box to allow plenty or room for input jack J1, the fuse holder and other parts.

The bracket for the coil socket can be made from a piece of aluminum left over from the stock from which you cut the chassis. The author's bracket is 2 inches wide and 1¾ inches high. Since the mounting lip is ½-inch wide, start off with a 2x2-inch piece of aluminum. Before installing the bracket, use a 1⅛-inch punch to put a hole in it for coil socket SO1.

Because tuning capacitor C5 has concen-

**PARTS LIST**

**Capacitors:**
C1, C4—47 mmf, 600 V tubular ceramic
C2, C6, C8, C10, C11—.001 mf, 600 V ceramic disc
C3, C7, C14—.005 mf, 600 V ceramic disc
C5—13 mmf variable capacitor (Lafayette HP-72. Concentric knobs Nos. 18-77 and 18-79; 36¢ and 25¢ respectively)
C9A, B, C—20/20/20 mf, 150 V electrolytic
C12—.01 mf, 600 V ceramic disc
C13—6 mf, 15 V electrolytic
F1—½ A fuse and holder
Gimmick—4 turns plastic hookup wire (see text)
J1—SO-239 chassis-type coax connector (Amphenol 83-1R)
J2—Closed-circuit phone jack
L1-L9—Coils (see chart and text)
L10—21 μhy RF choke (Ohmite Z-28 or equiv.)
**Resistors:** ½ watt, 10% unless otherwise indicated
R1—560 ohms
R2—1 megohm
R3, R5—47,000 ohms
R4—8.2 megohms
R6, R10—100,000 ohms
R7, R8—1,800 ohms, 2 watts
R9—150,000 ohm linear-taper pot
R11—500,000 ohm audio-taper pot
R12—380 ohms, 1 watt
S1—SPST switch on R11
SO1—4-pin tube socket (Amphenol 77MIP4)
SPKR—3½ inch, 3.2-ohm speaker
SR1—Silicon diode: 500 ma, 400 PIV
T1—Power transformer: 125 V @ 15 ma, 6.3 V @ 0.6 A (Stancor PS-8415 or equiv.)
T2—Output transformer: 10,000-ohm primary, 4-ohm secondary (Stancor A3879 or equiv.)
V1—6BZ7 tube
V2—6AK6 tube
Misc.—7- and 9-pin tube sockets, RG58/U coax, 8x6x4½-inch aluminum cabinet (LMB-146; Newark Electronics Corp. stock No. 91F1014). Or 12-7-4-inch aluminum cabinet (Bud CU-2111A) or 8x6x3½-inch aluminum cabinet (Bud CU-2109A).
Terminal strips, knobs, AC line cord, piece of sheet aluminum for chassis.




**Signal from antenna is fed to cathode of grounded-grid (grounded to RF only by C2) amplifier V1A. Amplified RF is coupled by gimmick capacitor to superregenerative detector V1B. Audio from V1B is fed by R3, C3 to grid of V1A, amplified and fed through low-pass filter R5, C6. Audio continues through C7, R11 to V2.**

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tric shafts for vernier operation, the shafts cannot be cut. Therefore, mount C5 behind the front panel with ⅜-inch-long spacers. This will keep the tuning knobs close to the dial.

Then install a solder lug on the rear of C5 with a 6-32x⅛-inch machine screw. Also mount a solder lug on the chassis as shown in the diagram on top of the third page of this article. Mount C5 so the bottom of its frame is ⅜ inch above the chassis.

Install the coil-socket bracket directly behind C5. This will make for short leads from pin 2 on SO1 to C5 and to the gimmick capacitor and C4 (under the chassis). Solder short pieces of wire from the ground lug on the rear of C5 and pin 1 on SO1 to the nearby chassis ground lug.

The author used a piece of perforated aluminum to protect the speaker's cone. And it's a good idea to use a 1-inch bracket between the speaker's lower left mounting hole and the chassis for extra rigidity.

To make the gimmick capacitor, solder a short length of No. 20 plastic-covered solid hookup wire to pin 1 of V1. Solder another short piece of the same wire to the junction of the No. 12 buss wire from pin 2 of SO1 and C4. Twist the wires tightly for 4 turns and cut off the excess. Position the gimmick as shown in the pictorial.

Connect input jack J1 to lug 3 on terminal strip TS3 with a short length of RG58/U coaxial cable. Make sure the shield is grounded at both ends as shown in the pictorial.

After the last part has been installed, cut a 3- or 4-inch hole in the back (the U-section) of the cabinet. Locate the hole directly behind the coil socket so the coils can be inserted and removed easily.

Rubber feet on the bottom of the cabinet finish the job and will prevent the receiver from scratching table surfaces.

Because of the many bands covered by the Broadspanner, you'll find it easier to use a logging scale calibrated from 0 to 100 for the dial, rather than a scale calibrated in frequencies.

Make and cement a long pointer to the back of the larger tuning knob and ink a line down the center of the pointer to make tuning easier. The longer the pointer and the larger the dial, the less trouble there will be in returning the receiver to a station previously logged. Attach the dial to the front of the cabinet with glue or tape.

### Winding the Coils

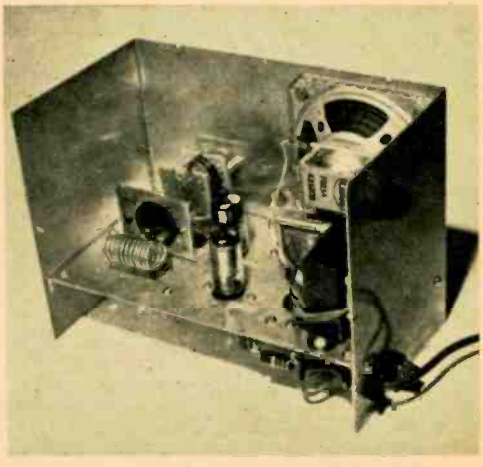
The frequencies covered by each coil (indicated in our diagram) are only approximate and depend on how carefully you do the winding. Coils L1 to L4 are made with No. 14 nyclad wire tightly scramblewound on a ¾-inch-diameter form (such as a dowel). After the coil is wound, remove it and wrap it tightly with plastic tape to hold the turns together. Then cut the leads to the lengths specified. Coils L5-L9 are made with No. 12 tinned copper wire and are wound on ½-inch forms. The pins for all coils can be obtained from the base of a discarded 4, 5 or 6 pin tube.

Two dimensions on the coil diagram are worth talking more about. On the sketches for coils L5 and L9, the *spacing* dimension (1¼ inches for L5, ½ inch for L6, 3/16 inch for L8) is the distance between the first and last turns. All lead lengths are measured from the body of the coil to the end of the *contact pin*.

Remember: be careful when winding the coils and be accurate with your measurements. Sloppy construction could mean that a coil will tune only part of the band for which it is designed.

### Testing and Operation

After all coils have been wound, install the



Use ⅜-inch spacers between tuning capacitor and panel and mount coil socket exactly as shown.



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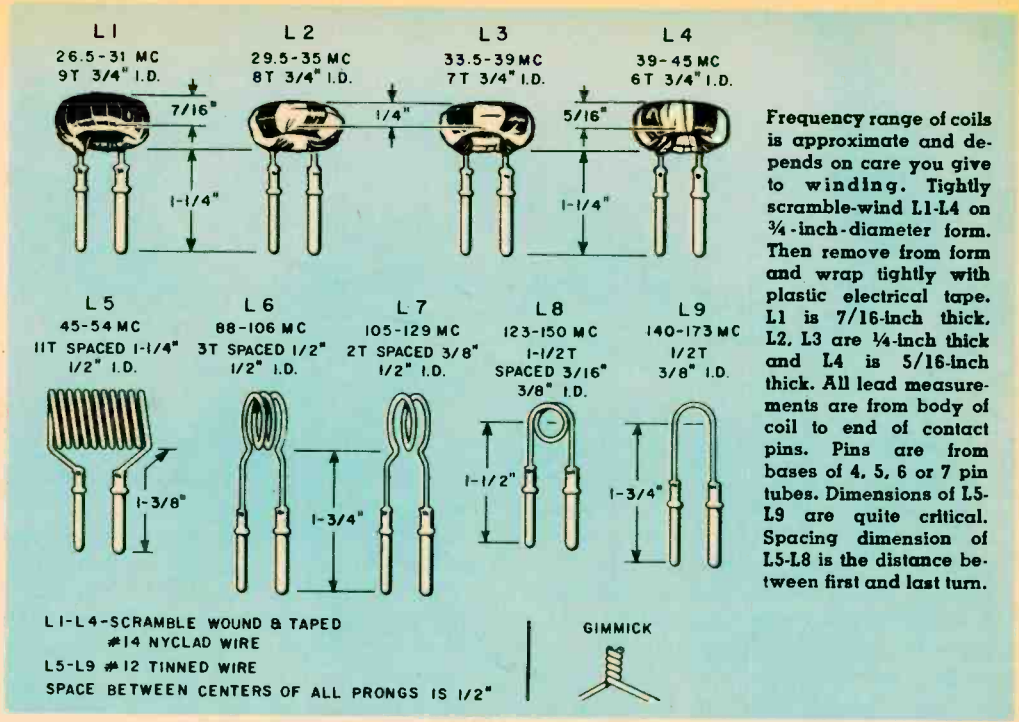
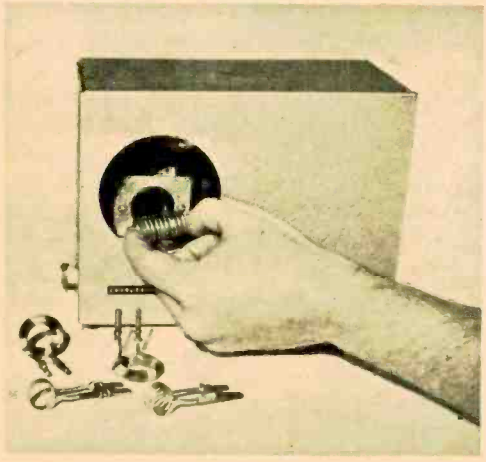



**Frequency range of coils is approximate and depends on care you give to winding. Tightly scramble-wind L1-L4 on ¾-inch-diameter form. Then remove from form and wrap tightly with plastic electrical tape. L1 is 7/16-inch thick, L2, L3 are ¼-inch thick and L4 is 5/16-inch thick. All lead measurements are from body of coil to end of contact pins. Pins are from bases of 4, 5, 6 or 7 pin tubes. Dimensions of L5-L9 are quite critical. Spacing dimension of L5-L8 is the distance between first and last turn.**

tubes and turn on the receiver. Set the volume control to maximum, plug in a coil for a fairly active band, such as CB, and allow a few minutes for warm-up. Check the receiver's operation by rotating the *regen* control until you hear a hissing sound.



**A 3- or 4-inch hole in back of cabinet behind the coil socket makes coil changing an easy job.**

The Broadspanner does not require alignment but coils L5-L9 may have to be compressed or spread apart slightly to get them to cover the band for which they're designed. The frequency covered by a particular coil also depends on the wiring and layout of the receiver. If you want great dial accuracy, calibrate the receiver and trim the coils with the aid of a grid-dip meter or a signal generator.

To tune a station, turn the *regen* control until you hear a loud hiss, then tune the band. Back off on the control for the best sound, once you've found a station. It's a bit more difficult to tune an FM signal than an AM signal. The best way to go about it is to tune the Broadspanner slightly to one side of the station's center frequency (this detection method for FM is called slope detection). The setting of the *regen* control is tricky and critical for FM, but a little practice and you'll get the feel of it.

Local high-power VHF stations can be pulled in easily with a short hank of antenna wire or a whip antenna. But for best reception, a good VHF antenna is required. Matter of fact, a 2-meter commercial job will do

[*Continued on page* 117]



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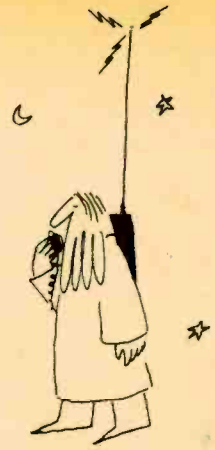
# AMATEUR RADIO CONFIDENTIAL



*The untold story about some fun & frolic that you might be surprised to find on the ham bands—but it happened!*

**Anonymous**

A FEW issues back we were treated to a report on the wild goings-on that could be observed on the Citizens Band. It was billed as a confidential history of CB and the guffaws echoed all the way to Washington.

"Those crazy CBers," the hams could be heard saying, "they're all going to get booted off the air the way they're going."

"Boy, I'm glad the hams never did anything like that. Policing ourselves has really saved us."

People are funny that way, especially hams. At times we have memories so short we have to look at our QSL cards to find out what our calls are. And while we were getting charley horses in the shoulder blade from patting ourselves on the back we just couldn't remember a one of those wild times back in the late Forties when Hiram Percy Maxim's ghost tried to turn in his ticket every night at the Pearly Gates FCC office.

The truth is, friend, in their own way the hams made latter-day CBers look like children playing with smoke signals.

Back in the middle Forties when I got my ticket I just couldn't wait to get on the air. So the day my license arrived I fired up the rig, hit the key and called CQ—for four straight hours. All I heard was a few cricket chirps from south Jersey and a couple of guys on phone trying to ignore this nut with the Morse.

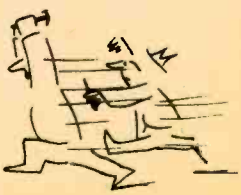
I'd been in such a rush to make my first QSO that I hadn't checked anything out and my signal sounded like a V-12 Lincoln hitting on two. Then I remembered what the old-timers said. So I cut my power way down and called again. I happened to be (we'll say) W1XGO but only a looney would have signed that way. XU1A, I signed, slanting my eyes slightly and turning a pale yellow. Suddenly I was in China.

I signed just once. That was enough. Twenty meters got as quiet as a quiz show when somebody says "payola." Then 40 bolts of lightning struck and guys that had never worked 20 before piled up like a regiment of lemming on a death march, all calling XU1A.

So I knew the transmitter worked.

A strange thing about that Chinese station. I never could understand the 599X reports I kept getting on the air. I was running a whole watt plate input, with enough key clicks to cover all of 20 and most of 10 meters. And my hum would have put the Wabash Cannonball to shame. 599X, they kept saying. Crazy hams.

The fun of making like a Chinaman with a spark gap eventually paled so I decided to reform. I cleaned up the signal, developed a better fist—and worked as bootleg DX for six months. But I was not just any DX call. I was the rare one. It took less work that way because I never had to sign more than once. EP1 in Iran. VR5 on Tonga Island. XZ4 in Burma. Pretty soon the lists in QST of phony DX calls were all mine. It was a game. Think up new ones faster than they could print them.





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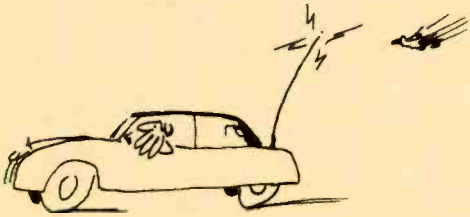
# AMATEUR RADIO CONFIDENTIAL

In case you get the idea that I was the only wild hair on the band, ponder some more. I just happened to specialize in rare DX of the seven-dollar-bill type. The bands were loaded in my big-city area with antics that gave me a halo by comparison.

When I finally realized that all my dubious ingenuity wasn't bringing me in any QSL's I had to find another challenge. It turned out to be that mysterious enigma known as Public Service. I joined our 10-meter Civil Defense net. Let me tell you what big-city CD was like back then. Think of a group of grown men and no-talent adolescents playing at disaster and you have it. The only disaster that happened was when the outfit met.

The typical CD crew got together once a week, fired up a three-rack kilowatt and made believe they were mobile, rescuing victims of bombings and giving safe harbor to maidens fleeing from overly amorous males. All this was accomplished, of course, while the gang lounged around the shack amid enough

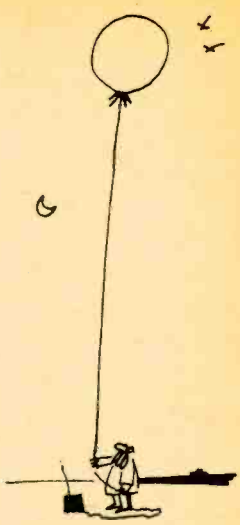


equipment to send the chief engineer at a broadcast station off his rocker. Obviously, I figured, something had to be done to improve CD's public image.

So one evening I cranked my power down to a flea's whisper. "Help! Help!" I panted. "My car ran off the road and turned over." The hard-hitting, efficient net swung into action. Net control took only 15 mintues to decide who would go out in mobiles in that terrible weather (it was about 60 degrees at the time) to rescue the poor slob.

Meanwhile, the big boys with their gallons and four-element rotaries were triangulating to get a fix on my signal and, in typical disaster style, looked at the map and gave my position in latitude and longitude. The mobiles, now careening around town like ants with hot tailpipes, had no maps but that didn't stop them from getting into a squabble about where so many degrees of latitude and longitude would be.

I naturally was helping things along. "There's a fire starting in the engine," I reported breathlessly. "Hurry!"



They finally got the triangulation deciphered. One fix had me ten miles out in the Atlantic. One put me 300 miles away at the Canadian border. The brain of the outfit topped them all, though. He figured my signal was coming in the long way around from Okinawa.

"Help," I said. "The whole car's going up. I'm being burned alive!"

"Actually," said the brain, "it's a skip signal. A soldier on Okinawa. Probably in a Jeep accident. It's out of our territory."

"It's getting hotter and ho. . . ." My signal cut off with dread finality.

"Well, it's too late now, anyway," somebody said. "Too bad he wasn't around here so we could help him."

It took three days for the trusty gang to realize that maybe everything hadn't been on the up and up. But the episode did have one good result. We tried to form a *real* CD organization, one that had mobility as well as all that equipment. Everyone who checked in (except control) was required to be in a car. Besides getting fresh air, we were ready to go into action immediately. It finally dawned on the big wheels that all the cars were parked in their own driveways—but fresh air was fresh air.

The true ham, it is said, is forever an experimenter. Which reminds me of the affair of the balloon. One morning W1XKK wandered by the house, looking like a refugee from the Signal Corps.

"What did you do?" I ask, blandly. "Get a Marshall Plan



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package from Ft. Monmouth or something?"

"We have here," says XKK, "a little roll of wire, or maybe a roll of little wire—like 5,000 feet of No. 93. And over here in this pretty metal canister is a balloon. This other stuff is radio junk. Come with me."

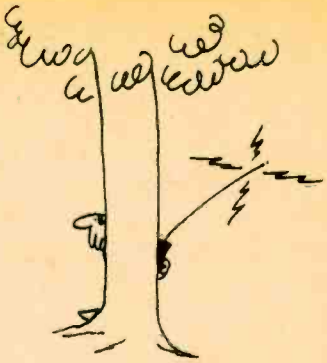
We walk down to the beach and hook his radio junk (an apt term) to one end of the wire and rig the reel of wire to the canister. The canister happened to be a surplus type that you plunged into the water. The balloon then inflated automatically with a light gas and took off.

XKK is ready. "Today," he says, "you and I will have the world's highest antenna. Ever hear of a 5,000-foot tower?" With that he plunges the canister into the salt water and funny things start happening. Suddenly XKK is no longer on the ground. He can fly. I grab for him and then we're both making like Peter Pan. Before we quite know what is going on we are in 30 feet of water, and we swim like half-looped mud turtles. The difficult part came later, though. How do you explain to a police captain that a big red balloon pushed you into the water?

Being true-blue ham experimenter types, we had another go at it a week later with a slightly smaller balloon. That day modest miracles happened. We did get the wire up and we worked out like crazy. It's the middle of summer and we're working 500-mile ground wave on 10 meters (which nobody *ever* has believed).

We're having so much fun that we fail to notice that our position is being surrounded by police like in the siege of Ft. Apache by the Indians. The leader of the gang remembers us from the week before. Why in hell, he wants to know, if we are going to fly balloons do we have to get them right in the airport's flight pattern?

Frequency control in those days, as you may remember, was a little like holding your finger on Old Faithful and trying to squirt a passing spider in the eye. After the Iowa outfit came out with its rig you could believe it if someone said you were off frequency. Until then, you only guessed.



One of the big trouble spots was the bottom of the 10-meter band. Everybody wanted to work 5 kc inside, with the sidebands going right up to the edge, because that was where all the foreign DX was. The overseas boys were permitted to work lower than we were and so they invariably came sliding up the band from the bottom. The DX chasers wrestled like a flock of cats with a dead fish, each one trying to get lower than the others so he could be the first one heard by the foreigners.

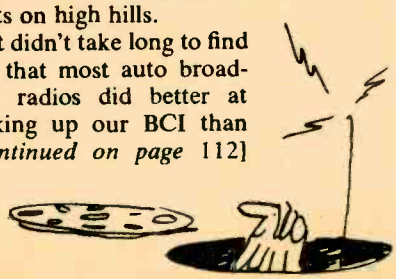
There was no rule-breaking in those nightly heave-hos, for a while. But then one wise guy stampeded the herd by moving deliberately below the band edge. The result could have been predicted. Seven other guys moved below XGO (as if you didn't know who it was) and then a whole herd of lids moved below *them*. There were all kinds of stories about QSO's with passing airplanes and dog sleds in Alaska.

The arguments about who was or wasn't outside the band was acrimonious. "He was, too, outside the band," you'd hear. "I know he was because I was 10 kc out and he was below *me!*"

In those early post-war years mobile operation probably was the biggest challenge to the amateur. It usually involved a trunkful of surplus gear and mobile modulation sounded as if someone had pushed the RCA pooch into the horn. Then suddenly one manufacturer hit gold with a 30-watt handful that mounted under the dash and it was unusual to hear a W station that wasn't mobile. All the lover's lanes around the suburbs were split between romance and DX, since both did best in deserted spots on high hills.

It didn't take long to find out that most auto broadcast radios did better at picking up our BCI than

[*Continued on page* 112]





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DX CLUB

# AWARDS for HAMS, SWLs, BCBers!

## Fourth Award Period declared officially open

## New BCB Award is based on states or provinces QSLed

WITH THE OPENING of its Fourth Award Period, EI's DX Club also celebrates a birthday, and a happy one at that. In the few short years of its existence, the Club has seen its membership grow by leaps and bounds. The Third Award Period, which ended April 30 of 1964, saw more applications for Awards roll into Club offices than during any previous award period. Further, because this was the first time the Club offered an Award specifically for radio amateurs, the Third Award Period saw Club membership more than double.

Since some newcomers may not be familiar with the place and purpose of EI's DX Club, a few words about the Club itself seem in order. To begin, EI's DX Club is a club with a difference. It holds no meetings, collects no dues, elects no officers. Matter of fact, it conducts only one sort of business. And that consists of awarding attractive-looking certificates to radio listeners and amateur radio operators for proven proficiency in the radio art.

Proof, in this instance, takes the form of official QSL cards or letters from stations which have been heard or contacted. In other words, EI's DX Club exists solely to issue certificates—certificates which serve as Awards to dedicated radio listeners and amateur radio operators who can prove that they have heard or communicated with a given number of distant stations.

**Types of Awards.** As you perhaps already have gathered, EI's DX Club offers two major types of Awards. One, though it has come to be known as the SWL Type, actually is subject to no frequency limitations whatsoever (save for the two BCB classes, which we'll discuss shortly). But it is a *listener's* certificate nonetheless, awarded to individuals who have documented proof that they have received transmissions from a given number of stations.

The second type of Award, known as the Ham type, is issued only to radio amateurs. As is the case with the so-called SWL type of Award, hams must have documented proof of transmissions involving a given number of stations. But in the case of the Ham award, such stations must be ham stations, and the applicant must have conducted *two-way* communications with the stations concerned.

**Classes of Awards.** When you come right down to it, both types of Awards really comprise a series. The HAM Award is issued in three different classes, while the SWL Award is issued in five classes. And, except for one class of SWL Award, the governing factor which determines the particular class of Award to which an SWL or a ham is entitled is the number of countries which the applicant has proof of having received transmissions from or conducted communications with.

Easiest type of Award for an SWL or a ham to qualify for is the 10-country Award, also called the SPECIAL. SWLs need have proof only of having received transmissions from stations in ten different countries. Hams, likewise, must have proof of having communicated with other ham stations in ten different countries.

Next class of Award for which both SWLs and hams may apply is the 50-Country Award, also called the GENERAL 50. And for those who want to try for the most coveted DX Club Award of all, there is that champion of awards — the 100-Country Award, also known as the DX CENTURY. As is the case with the SPECIAL Award, SWLs must prove reception of, while hams



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# AWARDS
## for HAMS, SWLs, BCBers!

must prove two-way communications with, stations in each country concerned.

As stated earlier, there are no frequency limitations for the 10-, 50- and 100-Country SWL Awards, though the frequency of the station always must be indicated clearly on the official application form. Hams naturally are limited to the various international ham bands for their transmissions, so they necessarily do have some obvious restrictions as to frequency. However, hams need not state a specific frequency on the application form. Simply mentioning the ham band on which the two-way communications took place is sufficient.

A fourth class of Awards—available only to SWLs—is known as the BROADCAST BAND Award. One of the two classes of SWL Award which are subject to frequency limitations, the BROADCAST BAND Award requires reception of stations in at least 15 different countries on the standard broadcast band (535-1605 kc).

Also available to SWLs is the Club's fifth and newest class of Award—the BROADCAST BAND STATESIDE SPECIAL. Unlike every other Award the Club offers, the BCB STATESIDE SPECIAL is *not* based on the number of countries an applicant has been able to enter in his log book. Instead, it is governed by the number of U.S. states or Canadian provinces for which the applicant has logged stations. Like the older BROADCAST BAND Award, the BCB STATESIDE SPECIAL is available only to SWLs. Similarly, being a BCB Award, only stations on the standard broadcast band (535-1605 kc) may be counted.

To be eligible for a STATESIDE SPECIAL Award, an applicant must have received transmissions from BCB stations in at least 25 U.S. states or Canadian provinces. In other words, since there are only two countries involved, countries are not the deciding factor. It is the number of states or provinces in those two countries that determines whether a BCB STATESIDE SPECIAL Award will be granted.

**How To Apply.** Our Fourth Award Period now is in progress, and all applications must be received during the time it is in effect. Official closing date for the Period is April 30, 1965, and all applications must be postmarked on or before that date to be eligible.

Official entry blank for an Award from EI's DX Club is the EI DX CLUB LOG which appears on the following pages. Full instructions are given at the top of this LOG, so it is not necessary to repeat them here. However, there are three things to keep in mind when filling in your DX CLUB LOG. Completeness, neatness and accuracy all are of utmost importance if your application is to win you an Award.

By completeness, we mean that every line and every blank must be filled in, and filled in in its entirety. By neatness, we mean that your application must be tidy and clearly legible if it is to be of value to the Club secretary or to you. And by accuracy, we mean that each and every entry—whether it be your own Zip Code, a station's call letters or the time at which a station was heard—must be correct in every respect. Failure to prepare a complete, neat and accurate application only can delay or perhaps negate your chances of receiving an Award.

To remove the LOG from the magazine, clip neatly along the dotted line with a pair of scissors. And for filling in the form itself, a ball-point pen is recommended.

A word of advice about the blank called CLASS OF AWARD: be certain to apply for the highest class of Award to which you are entitled. For example, a ham who has proof of two-way communications with stations in over 50 different countries naturally would apply for the GENERAL 50 Award rather than the SPECIAL.

Do *not* send your QSLs with your application. However, keep them on hand, since you may be asked to furnish any or all of them to prove the entries on your DX CLUB LOG actually are valid.

When you have checked and double-checked your DX CLUB LOG and satisfied yourself that it is complete, neat and accurate in every respect, place it in an envelope and mail it to

EI's DX CLUB
67 West 44th Street
New York, N.Y. 10036

If all is in order, your attractive EI DX Club Award will reach you after processing, ready for framing and hanging on the wall of your shack.



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# EI DX CLUB LOG

NAME ..... HAM CALL .....
(last name) (first name and initial)

ADDRESS .....

CITY ..... STATE AND ZIP .....
(or country)

TYPE OF AWARD ☐ SWL ☐ HAM

CLASS OF AWARD .....

INSTRUCTIONS. Clip along broken line at left. Under *Type of Award*, check *SWL* or *HAM*, depending on the type of award you are applying for. Under *Class of Award*, write class of award you are applying for (see text). Fill in *all* items on each entry line below. Under *Date*, use figures (such as 10-1-63); all log entries must be dated January 1, 1950, or later. Under *Time*, use local standard time and 24-hour clock (0000 to 2359 hours). To list second 50 countries, make up additional log pages in similar style. Fourth Award Period ends April 30, 1965.

| | DATE (local) | TIME (local) | FREQUENCY (kc) | STATION | LOCATION (city) | COUNTRY | TYPE OF QSL (check one) |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | card ☐ letter ☐ |
| 2 | | | | | | | card ☐ letter ☐ |
| 3 | | | | | | | card ☐ letter ☐ |
| 4 | | | | | | | card ☐ letter ☐ |
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| 21 | | | | | | | card ☐ letter ☐ |

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| | DATE (local) | TIME (local) | FREQUENCY (kc) | STATION | LOCATION (city) | COUNTRY | TYPE OF QSL (check one) |
|---|---|---|---|---|---|---|---|
| 22 | | | | | | | card ☐ letter ☐ |
| 23 | | | | | | | card ☐ letter ☐ |
| 24 | | | | | | | card ☐ letter ☐ |
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# The S-NINER

*Hook our tuned preamp on the front of an all-band rig and watch the S-meter jump!*

By HERB FRIEDMAN
W2ZLF

WHEN it comes to receivers, it's what's up front that counts. And those budget all-band rigs have precious little up front. A receiver must have a tuned RF stage if you want to join the big-league DXers. Sure, some low-cost receivers with a tuned RF stage give pretty good performance for the price. But they always can use a little extra sensitivity and selectivity to dig out those rare flea-power stations.

Put a preselector in front of a receiver and you will say goodbye to the times you tried to get another ten-degree twist out of the sensitivity or volume control.

The easiest and best way to pep up a budget receiver's performance is with EI's S-Niner. The S-Niner is a tunable, high-gain RF preamplifier that covers the ham bands, short-wave bands and the Citizens Band. You just connect it between the antenna and the receiver's input. Depending on the receiver's input circuit (an antenna trimmer capacitor) you'll get another 3 to 5 S-units (18 to 30db gain). And that's a lot of added sensitivity in anyone's book.

But before you go out to buy the parts, a word about the dial assembly. The National dial we specify in the Parts List has a vernier. Don't use an inexpensive imported vernier. The slightest misalignment between tuning capacitor C1 and an inexpensive vernier will cause the vernier to bind. The S-Niner tunes sharply and a binding vernier will cause problems.

**Construction.** The S-Niner should be built on a 5x7x2-inch aluminum chassis. The 5¼ x7-inch front panel, which is held to the chassis by S1, S3 and NL1, can be cut from an aluminum chassis bottom plate.

First, hold the front panel against the front of the chassis and temporarily mount C1 on the center of the top of the chassis. Put the dial vernier on C1's



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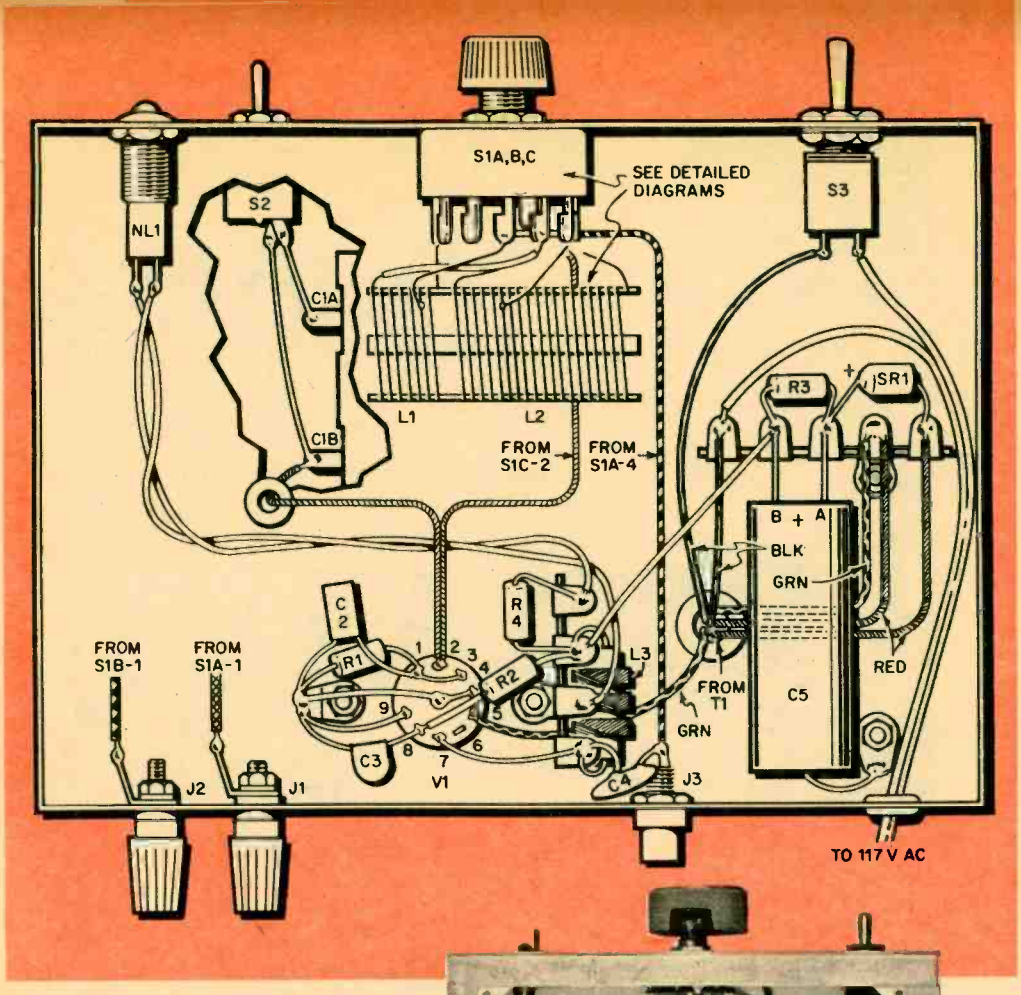


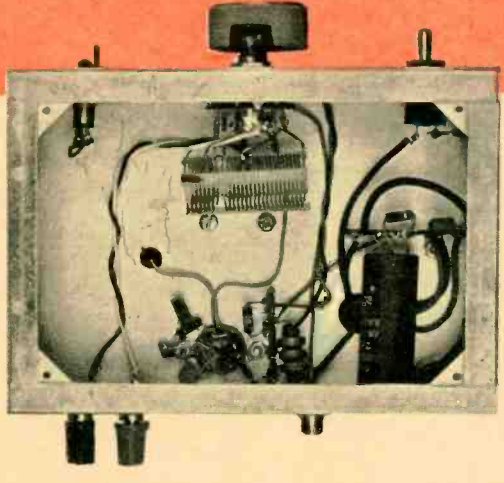

**Because there's RF all over the place, you must follow exactly the layout shown here. The placement of the lead from S1 to J3 is quite critical. It should be near the chassis and to the right of L2. Keep all component leads as short as possible. Chassis is shown cut away at upper left for a better look at connections to C1 and to S2.**

## The S-NINER

shaft (cut to ½-inch length) to determine where to cut a hole in the front panel for the vernier. Remove C1 from the chassis and then cut all the holes in the front panel for S1, S2, S3 and NL1. File away the bottom of the vernier so it clears the top of the chassis.

Coils L1 and L2 are made from a section of Barker and Williamson No. 3011 Miniductor coil stock. Before you start cutting and unwinding turns, carefully study the pictorial of the coils on the last page of this article.

Best place to start is with L2. Unwind one turn at the right of the stock by *rolling*, not pulling, the wire out of the plastic supports with needle-nose pliers. Count off 19 turns and cut the wire at the left side of the 20th turn's support. Unwind the 20th turn and you have a 19-turn coil. Cut only the 20th turn



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of wire, not the plastic supports.

Unwind the 21st turn, which is the start of L1. Count 7 turns to the left, cut the wire and roll it out of the plastic support. Discard the remainder of the Miniductor by cutting through the plastic supports.

Connect taps to the 14th turn from the right end of L2 and the 5th turn from the left end of L1. Press in the turns on each side of the tapped turn. Then solder No. 20 or No. 22 solid wire to the tapped turn. Take care when soldering that a solder blob doesn't short two turns—the wires are close.

All leads from S1 that connect to other points in the circuit should be installed before connecting L1 and L2 to S1. Make certain all connections to S1 are correct since it will be almost impossible to change them after the coil is installed on the back of S1. Note that each section of S1 has an unused lug.

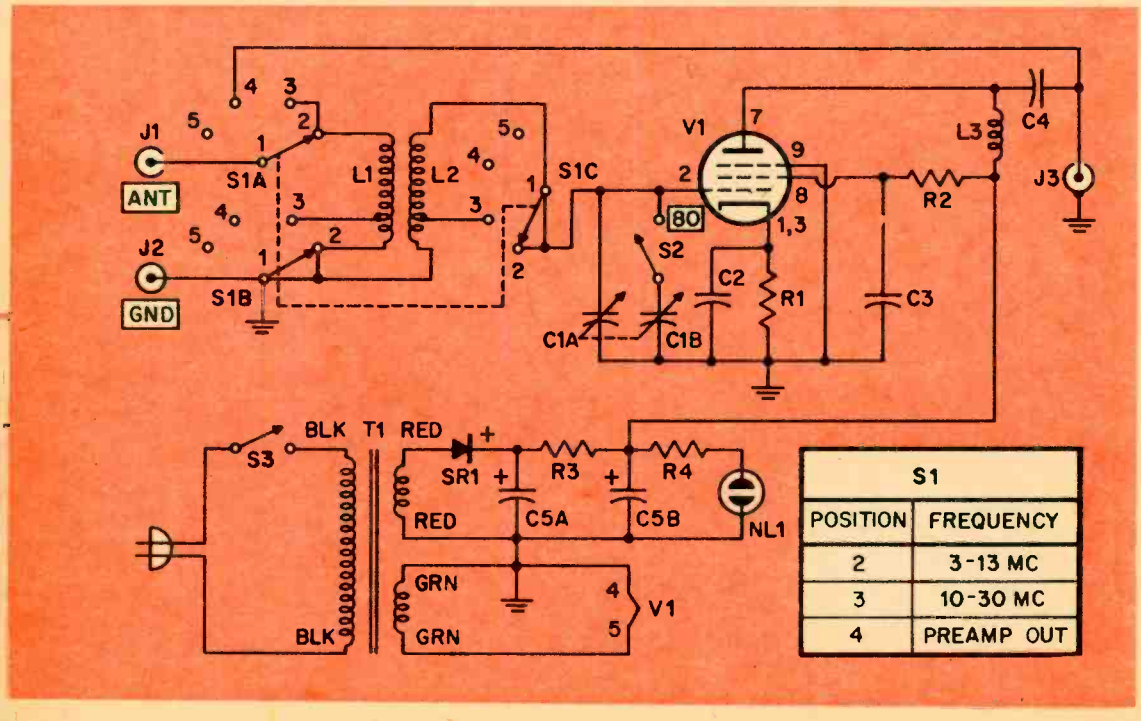
After the coil/switch assembly is mounted in the chassis, route the lead from S1 to J3 far away from other wires and V1's socket. Note that the lead from C1B to S2 is above the chassis.

**PARTS LIST**

C1A, C1B—2 gang, TRF variable capacitor 10-365 mmf per section (Lafayette MS-142 or equiv.)
C2—.01 mf, 75 V or higher capacitor
C3—.001 mf, 600 V ceramic disc capacitor
C4—.01 mf, 600 V ceramic disc capacitor
C5A, C5B—20/20 mf, 150 V electrolytic capacitor
J1, J2—5-way binding posts
J3—Phono jack
L1, L2—Barker & Williamson No. 3011 Miniductor (Newark Electronics Catalog No. 40F940)
L3—1 mh. RF choke (National R-50 or equiv.)
NL1—NE-2 neon lamp and holder

Resistors: ½ watt, 10%
R1—150 ohms
R2—5,600 ohms
R3—1,000 ohms
R4—220,000 ohms
S1A, B, C—3-pole, 4-position rotary switch (Mallory 3234J)
S2, S3—SPST toggle switches
SR1—Silicon diode; minimum ratings: 100 ma, 500 PIV
T1—Power transformer; secondaries: 125 V @ 15 ma, 6.3 V @ .6 A (Lafayette TR-121)
V1—6EJ7 tube
Misc.—National type MCN vernier dial, 5x7x2-inch aluminum chassis, tube socket with shield

**V1 is a high-gain (gm = 15,000) frame-grid pentode whose input is tuned by C1A, B. S1 selects appropriate taps on L1, L2 for 3-13 or 10-30 mc ranges. In position 4, S1 feeds signal directly from antenna to receiver. When tuning the 80-meter band, close S2. Leave S2 open when tuning all other frequencies.**




| S1 | |
|---|---|
| POSITION | FREQUENCY |
| 2 | 3-13 MC |
| 3 | 10-30 MC |
| 4 | PREAMP OUT |



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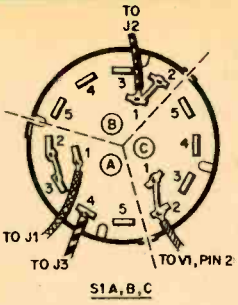
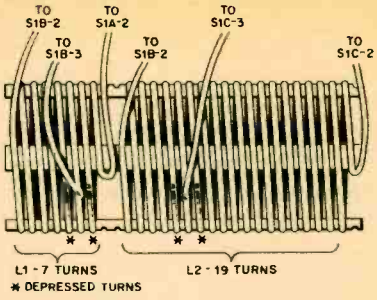
Position switch S2 as shown, draw section-dividing lines and connect jumpers as well as leads that go to J1, J2, J3 and V1. Cut 4 turns off coil stock, then push in turns on each side of 6th turn of L1 and 5th turn of L2. Solder leads to 6th and 5th turns, being careful not to apply too much heat. Side of coil shown should be mounted so it faces the rear of S1. Keep L1's and L2's leads short so that L1 is close to S1




# The S-NINER

The last assembly step is the mounting of the front panel and C1B's connection to pin 2 on V1. Don't force the vernier on C1's shaft since it may bind and prevent precise tuning. First tighten the vernier setscrew on C1's shaft, then attach the panel to the chassis by tightening S1, S3 and NL1's mounting nuts.

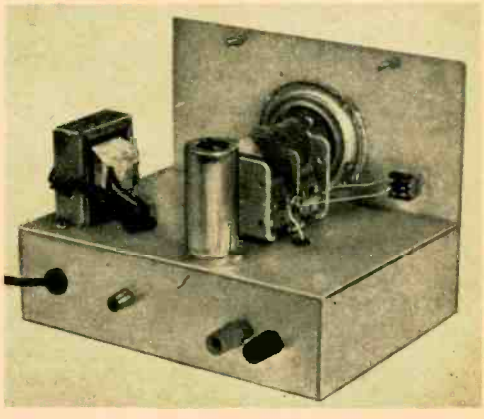
**Aligning and Using the S-Niner.** Connect your antenna feedline to binding posts J1 and J2 and connect the receiver to J3 with RG58/U coaxial cable. If the receiver is an AC/DC job, do not connect the coax shield directly to the receiver's ground terminal. Connect a .01 mf, 500 V capacitor between the *shield* and the ground lug on the *receiver*.

S1's extreme counterclockwise position (position No. 2 on the schematic) is the low band—4 to 13 mc. When tuning 3 to 5 mc (80 meters) with S1 in this position, close S2. This connects both sections of C1 in parallel. Rotate S1 one position clockwise (position No. 3 on the schematic) to tune 10 to 30 mc (make certain S2 is open when using this band). S1's third position (4 on the schematic) connects the antenna directly to the receiver.

Set switch S3 to *on* and set S1 to position 4 to connect the antenna to the receiver directly. Tune in a signal near 4 mc, then set S1 to the low band and adjust C1 for maximum S-meter indication or highest volume (if you have a VTVM, connect it to the receiver's AVC buss and tune C1 for highest negative voltage). Mark 4 mc on the dial (or whatever frequency you're receiving). Similarly tune frequencies up to 13 mc and mark the dial scale accordingly. Calibrate the high band the same way. The 80-meter calibration should be made with S1 set to the low band and with S2 closed. Use a separate dial scale for the 80-meter band.

Always keep the S-Niner on when the receiver is on and set S1 to position 4. When tuning a station that needs extra gain, set the S-Niner's dial and S1 for the same frequency to which the receiver is set. Then adjust C1 for maximum signal. If your receiver has an antenna trimmer, adjust it for maximum gain.

Some higher-priced receivers have sharply tuned input circuits which might cause the S-Niner to break into oscillation. This will be evidenced by a pinned S-meter. A slight detuning of the receiver's antenna trimmer will solve this problem. If it doesn't, tune the S-Niner to the *exact* signal frequency to stop oscillation.



Note short, direct connections between switch S2 (right) and each section of tuning capacitor. And be sure that you use a shield-base socket for V1.



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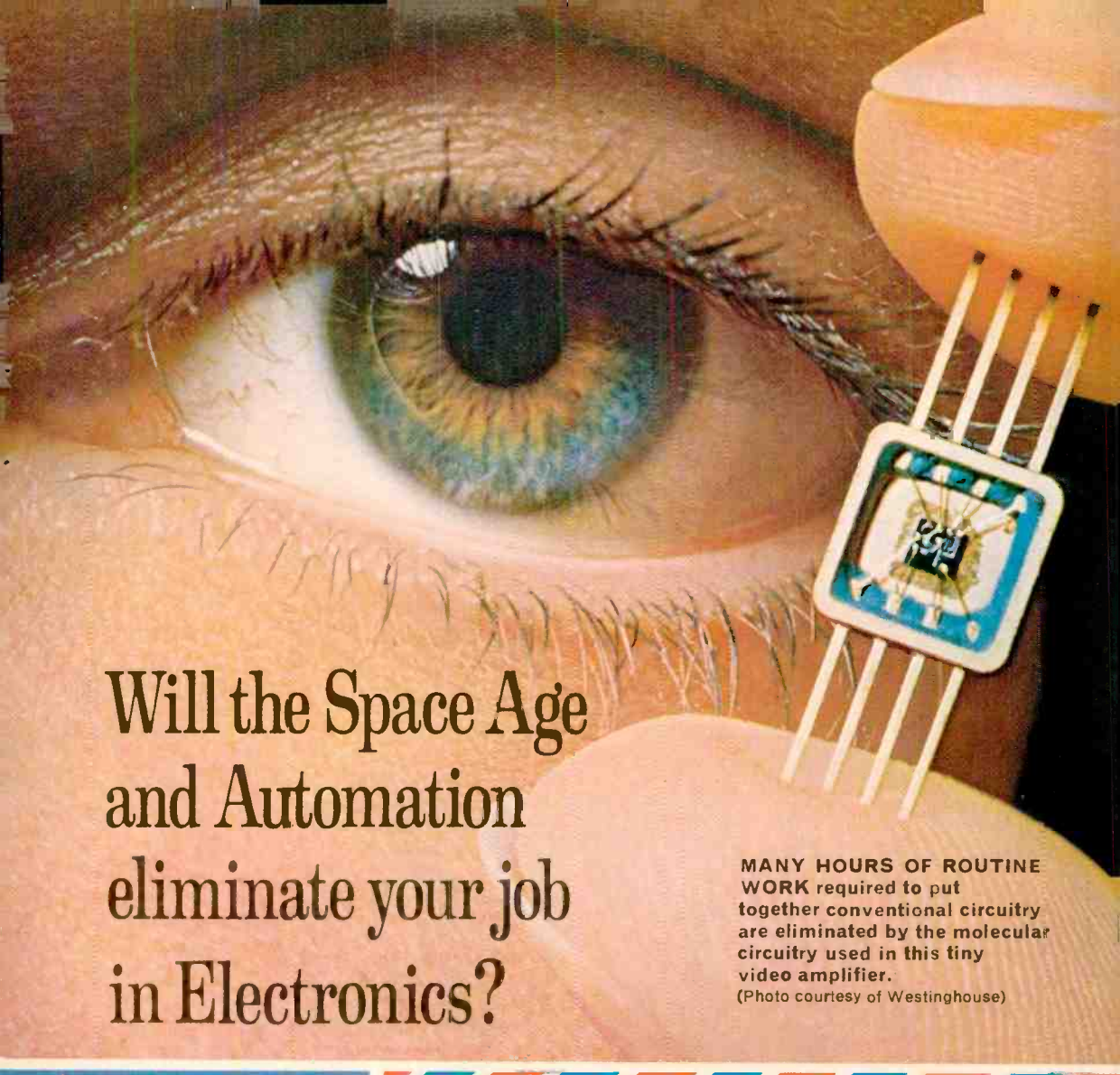

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**MANY HOURS OF ROUTINE WORK** required to put together conventional circuitry are eliminated by the molecular circuitry used in this tiny video amplifier.
(Photo courtesy of Westinghouse)

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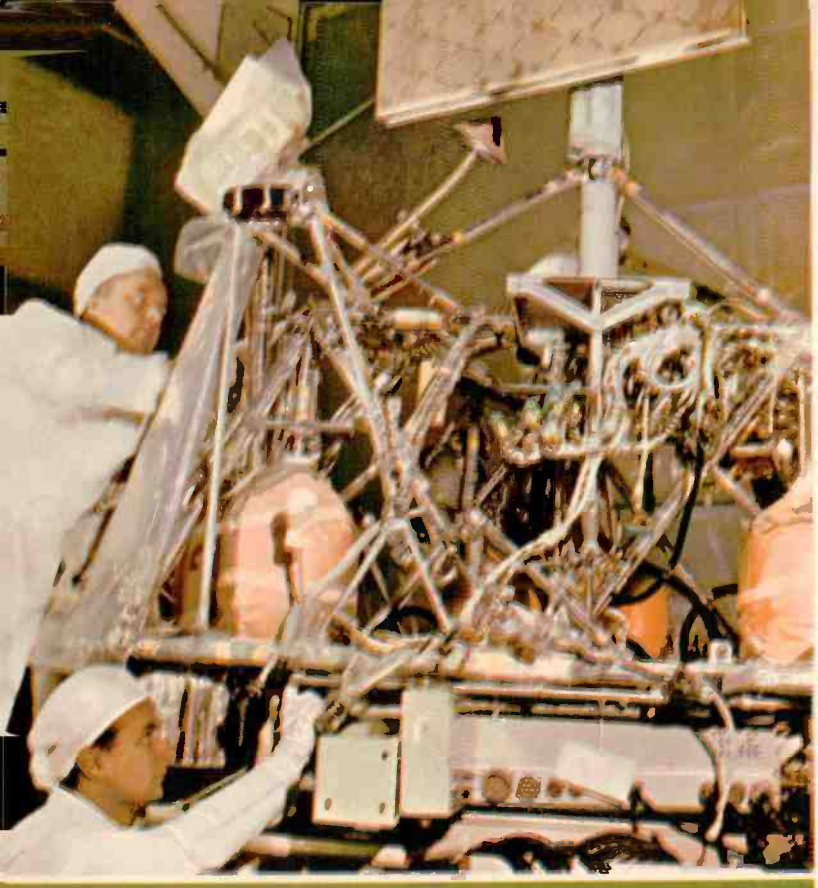

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# The LISTENER

C. M. STANBURY II

**SPACEBOUND...** All set for Transit DX? It's here, and you even have an option or two on how to get in on the fun.

When fully operational, the U.S. Navy's satellite navigation system will provide accurate, all-weather position-finding data anywhere on earth. And for DXers, these four satellites will produce a sure-fire space logging at least once every three hours —and with even the crudest of receivers.

Since one Transit frequency is on the lower edge of TV channel 2 (54 mc), you'll have no trouble setting up appropriate equipment. All you need is a 6-meter converter for use along with your regular SW set. Or a TV set with an IF around 27 mc (some old Philcos had them), an SW receiver which will tune that IF and a 100-kc frequency standard also will do the trick.

To use this latter combination, first wrap the SW receiver's antenna around the TV set's last video IF tube to determine exactly where the TV IF falls on your SW dial. This can be done best by tuning in a local TV station (preferably channel 6 or lower), then locating the video carrier (strongest buzz) on your receiver. Next, switch on the marker, put the TV on channel 2, tune the radio down approximately 1.25 mc and locate the marker.

Except for occasional minor frequency adjustments to compensate for drifting, all you have to do now is wait. While waiting, it's a good idea to reduce brightness so the picture tube won't distract you or unnecessarily strain your eyes. But be sure the contrast stays on full.

Though the Transit system is supposed to be operational in the near future, there's only one satellite on 54 mc as of this writing. And while obviously part of the Transit program, it's designated simply as 1963 satellite launch 49C. Matter of fact, all the U.S. Navy told EI was that, "The signals you mention are from an experimental vehicle. . . . The mission of the vehicle was the gathering of environmental data."

Further, while the basic Transit signal will be a continuous time marker, 1963 49C seems to have a more complex transmission pattern. Could be that the Navy and NASA are killing several birds with one satellite.

So long as there's just one satellite on 54 mc you might have to wait 12 hours before bagging it. And if you have a channel 2 station in your area you'll have to try after midnight or at whatever hour this station leaves the air.

[*Continued on page* 121]

**A television set is one way into Transit DX, assuming you don't have a 6-meter converter and don't mind doing things the kooky way. As explained in text, the set must sport a 27-mc video IF, and the only time you can do your Transit DXing is after local channel 2 packs up for the night.**



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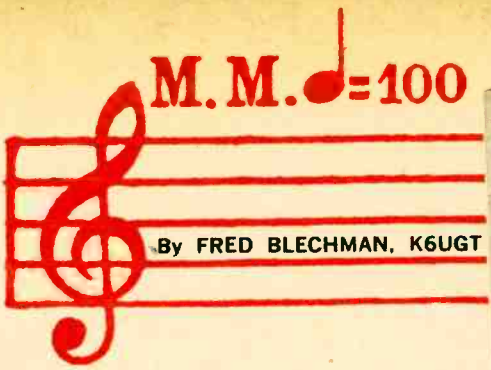
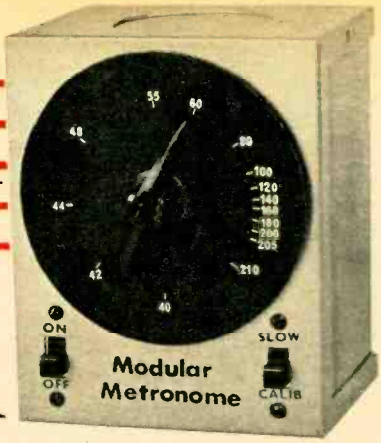



By FRED BLECHMAN, K6UGT




# MODULAR METRONOME

*Potted parts, an hour's time and you've got the beat.*

"TIME is the stuff life is made of," someone once said. And if you've studied a musical instrument you know how true this is since timing and rhythm are as important as hitting the right note. To get the music really swinging you've just gotta have the beat. Best way to develop it is with a metronome.

Most standard spring-wound metronomes cost around $12. Commercially-made electronic metronomes could run a lot more. However our Modular Metronome (MM) can be built for about $6. Its construction is so simple that all you have to know is the difference between black and white piano keys to get it together.

Secret of its simplicity is a module designed specifically for the application. It's a potted black cube that contains transistors, capacitors and resistors; five leads extend from it.

Add batteries, a potentiometer, switches, a resistor and a speaker and you've got a two-speed metronome that counts from 20 to 200 beats per minute. And besides being useful to musicians, it can also be used as an audible timer in a darkroom. For this application you'd just set the MM to 60 beats per minute and count off the seconds. This will allow you to pay full attention to other operations instead of watching a sweep-second hand on a clock. You could even use the MM to help you count sheep when you're trying to fall off to sleep.

**Construction.** A 3x4x5-inch Minibox will house the MM perfectly. The speaker is mounted in the top of the box. Use a piece of grille cloth or perforated metal to protect the speaker's cone from dirt or damage.

Potentiometer R1 should be mounted in the upper center of the front panel as shown in the photo on the next page. *On-off* switch S2 should be mounted on the lower left side of the front panel, and *slow-calibrate* switch S1 should be mounted at the lower right.

Switch S1 and resistor R2 aren't really necessary, but their added expense is worth it for two reasons: 1) They produce an extra slow speed of about 20 beats per minute, and 2) they spread out the calibration markings. Even if you don't want the two-speed feature, it's a good idea to use R2 for the second reason. If you don't use S1, place S2 in the center of the front panel.

All wiring is straightforward and not critical. Terminal strips are not required



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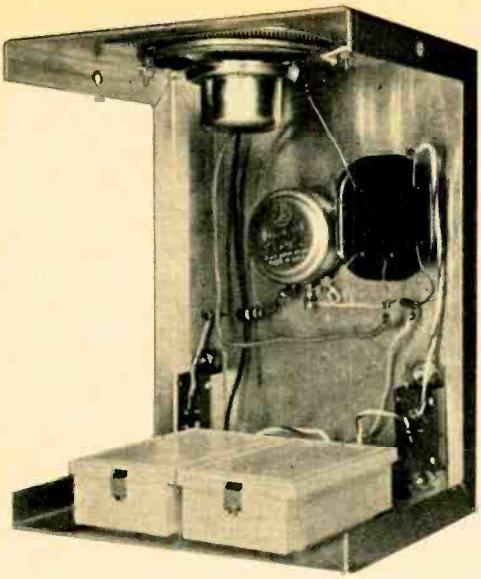
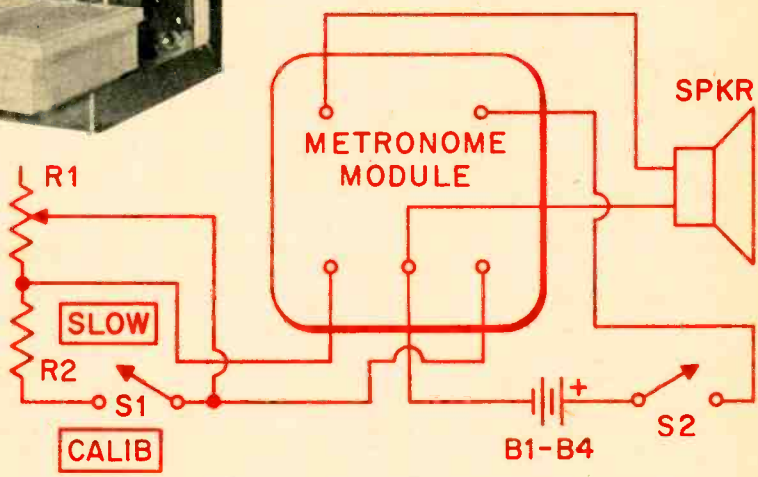


**PARTS LIST**

B1-B4—1.5-volt penlite battery
R1—500,000-ohm linear-taper potentiometer
R2—330,000-ohm, ½-watt resistor
S1, S2—SPST slide switch
SPKR—2-inch PM speaker
Metronome module (Lafayette SP-298)
Misc.—3x4x5-inch Minibox, pointer knob, battery holder

**Mount the speaker on top of the cabinet and glue the module in place. Author used plastic boxes for batteries, but a Keystone type 182 battery holder (Allied 55 J 904) will do the job just as well. Cover the module leads with spaghetti.**




**Instructions supplied with metronome module specify a 2-megohm potentiometer for R1. However we used a ½-megohm potentiometer to get the unit to operate at about one beat every three seconds when S1 is open. Close S1 and slowest speed is about 40 beats per minute. Speed increases as R1's wiper approaches R2.**

since the module leads can be used for tie points.

It's a good idea to mark calibrations on a separate circular disc rather than on the front panel since calibration is affected by battery voltage and, to some extent, by temperature. Cut the disc from a thin sheet of soft aluminum and paint it dull black or dark gray. It should be about 3½-inches in diameter to allow the use of a large pointer knob and so there will be plenty of room for all markings. By sandwiching the disc between an extra set of nuts and washers on R1's shaft, the disc can be turned to correct calibration.

**Calibration** requires a sweep-second hand watch and patience. With the disc mounted in position, turn on the MM and close S1. Rotate R1's shaft full counterclockwise, aim the pointer knob straight down and tighten it on the shaft. Now, simply count the number of beats in one minute. There should be around 40, but this may vary with individual modules.

Great accuracy is not required or attainable with the MM, so count to the nearest round number. Rotate the knob about 45 degrees and count for one minute. Put a light pencil mark on the disc opposite the pointer and keep track of the number of beats for each mark on a separate sheet of paper. You'll find after about 180 degrees of rotation that the speed increases more rapidly with only a small change in knob position, therefore pick out numbers about 20 beats apart.

When calibration is completed remove the disc and mark it with transfer-type numbers. The easiest way to check the calibration is at 60 beats per minute. Always move this marking on the disc under the pointer knob when it is set for this speed. The rest of the scale will now be pretty close.



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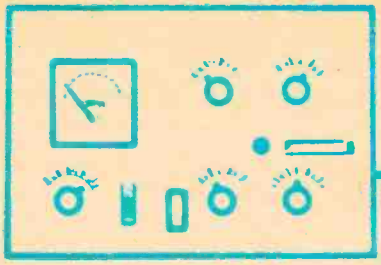

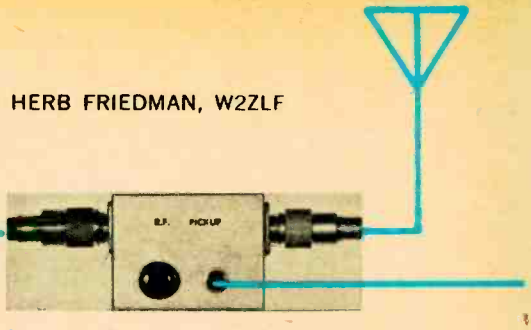

By HERB FRIEDMAN, W2ZLF

# PARASITE CW MONITOR

YOU really can't tell what your fist sounds like if you don't hear it. Ask any Old Timer at CW or a Navy man who has spent several years pounding brass and he'll agree to that mighty quickly. And the best way to keep close tabs on your fist is with a keying monitor. This simple but valuable shack accessory reproduces your CW signal just as it would sound at the receiving end.

Oh sure, there are hams who claim they can judge their fist by the clickety-click of the key. But their code probably sounds like a fifty-caliber machine gun. There's irregular spacing between characters, halting and choppy dots and dashes. To have a fist that invites replies to your CQ's, a keying monitor is a must.

EI's Parasite CW Monitor fills this bill and has several features not found in many other keying monitors. To avoid being caught with a dead battery, the monitor has been designed to be powered by your transmitted RF. A pitch control allows you to select a pleasant tone in the range of about 400 to 1,000 cycles.

And a volume control has been included to spare the household of the noise when you're sending. The volume control also affects the output level at the phone jack for either high- or low-efficiency phones. And it doesn't make any difference whether the phones are high or low impedance—even hi-fi phones can be used. To prevent the volume control from changing the tone's pitch, an L-pad is used instead of a rheostat or potentiometer.

Another big feature is the remote RF pickup box. Instead of running an extra transmission line over the operating table to the Monitor, as is usually done with many other RF-powered units, our separate RF pickup box is connected in your antenna feedline. And best of all, the Monitor can be used with any transmitter all the way from a 1 watter up to a 1 kilowatt rig.

### Construction

While the parts layout in a 4x5x6-inch Minibox is not critical, try to follow our arrangement as shown in the pictorial and photo. T1 must be the exact type specified. The Monitor most likely won't work if you substitute another transformer. To avoid a complicated L-pad connection we suggest you use the three-terminal pad specified. It looks and is wired just like a standard potentiometer.

Take particular note of the connections to phone jack J5, which is a shorting-type jack. When the phone plug is removed, the speaker is connected through the jack to T1. Make certain you do not use a grounding-type jack which will short T1 to ground when the plug is removed. To avoid damage to the speaker cone, install a piece of screen or perforated board between the speaker and the cabinet.

The RF pickup unit (built in a 2¾x2⅛x1⅝-inch Minibox) is designed for coaxial transmission line, therefore J1 and J2 should match your existing connectors. If you use twinlead, eliminate J1 and J2 and use a two-lug, screw-type terminal strip. Connect one lug to the cabinet (ground) and connect resistor R1 to the other lug.

The value of resistor R1 is determined by your transmitter's input power. To keep cal-



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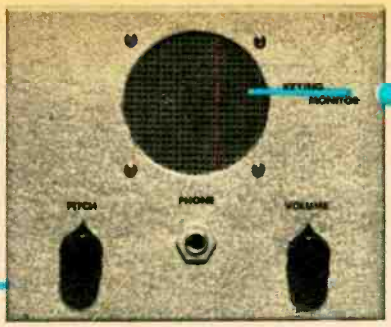
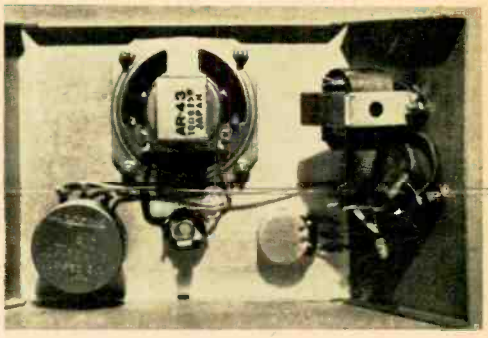



culations simple, use this formula:

$$R1 = \sqrt{W \times 10} / 0.007$$

W equals your transmitter's input power in watts. For example, if your transmitter has an input power of 10 watts, $R = \sqrt{10 \times 10} / 0.007$ which is 1,429 ohms. Since 1,429 ohms isn't a standard value, use the closest *lower* standard value—1,300 ohms.



**Monitor layout is uncrowded. Mount the terminal strip on the right panel, install the parts on it, then mount the other parts on front panel.**

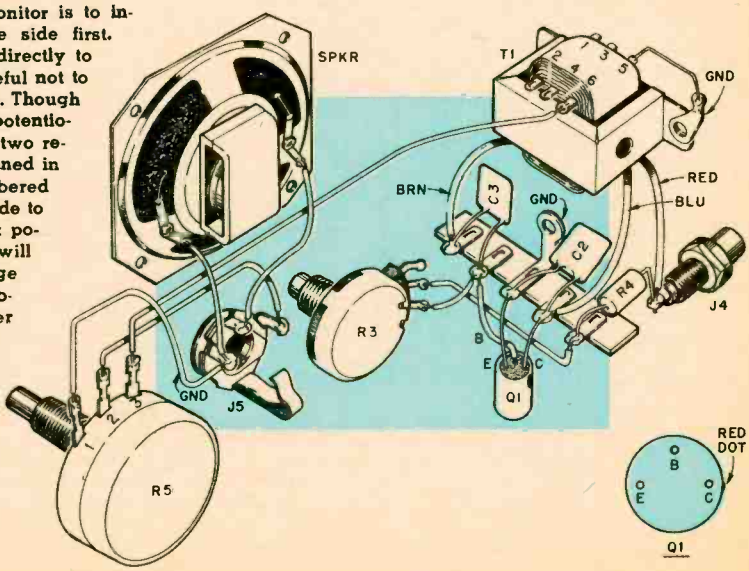
### Checkout and Use

Be absolutely certain the wiring of the Monitor and RF pickup is correct. A single improper connection could result in Q1 going up in smoke.

Connect the RF pickup in series with your coax transmission line and connect J3 to J4 with a piece of shielded cable. Set R2 full counterclockwise *(off)* and set R5 to its mid-position. Temporarily connect a VOM or VTVM from J4 to ground (negative probe on J4). Tune up your transmitter to normal power output and then slowly advance R2. As R2 is advanced, the meter should deflect up-scale. If the needle deflects to the left, D1 is installed in reverse.

At about —2 V you should hear a tone in the speaker. Since cleanest tone will be obtained between —4 and —7 volts, keep turning R2 until the meter indicates —6 volts. Rotate pitch control R3 from one end to the other; you should hear clean tone through the entire range. If the transistor's leakage is high the tone may cut out at *one* end, which

**Easiest way to wire the monitor is to install all small parts on the side first. Solder the transistor leads directly to the terminal strip being careful not to apply too much heat to them. Though R5 looks like an ordinary potentiometer, it is an L-pad whose two resistance elements are contained in one case. The lugs are numbered and connections must be made to them as shown. Don't use a potentiometer for R5 or the tone will be affected when you change volume level. And do not substitute some other transformer for the type specified for T1 in the Parts List or the unit will not work properly. Watch the wiring to phone jack J5.**



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# PARASITE CW MONITOR

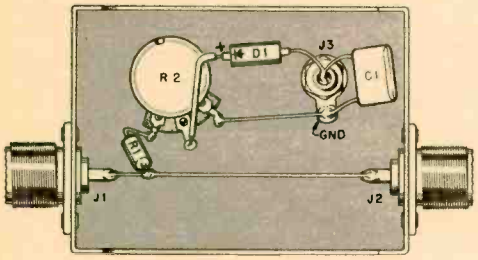
would be normal. If the tone drops out long before you reach *both* ends, adjust R2 for a slightly higher voltage until pitch control is constant. Under no circumstances should the voltage at J4 be more than —9 V.

If the transmission line SWR exceeds 3:1 it is possible that insufficient voltage will be developed in the pickup to power the Monitor. If this is the case try reducing R1's value in small increments of about 20 per cent. For example, if the calculated value for R1 is 1,000 ohms try 800 ohms.

As a bonus the Monitor can indicate antenna intermittents. Since the tone depends on both the supply voltage and SWR, any change in the antenna system, such as loose elements, will be indicated by a change in pitch during keying (this applies only to coax transmission lines).

If you use twinlead transmission line the RF pickup connection is slightly different. Set R2 full counterclockwise. Then connect a length of wire to one lug on the terminal strip. Wrap the wire around the transmission line a few times and connect the other end to the other terminal-strip lug. Key the transmitter and slowly advance R2 while watching the meter connected to J4. If you cannot obtain the proper voltage with R2 full-open try increasing the number of turns wrapped around the line. Sometimes a high SWR will prevent sufficient RF pickup. If this happens place the pickup coil near the transmitter's output tank coil. If you have a high-power transmitter and prefer to not fool around near the output coil, place the pickup loop near the driver stage. And make sure it is firmly held in position.

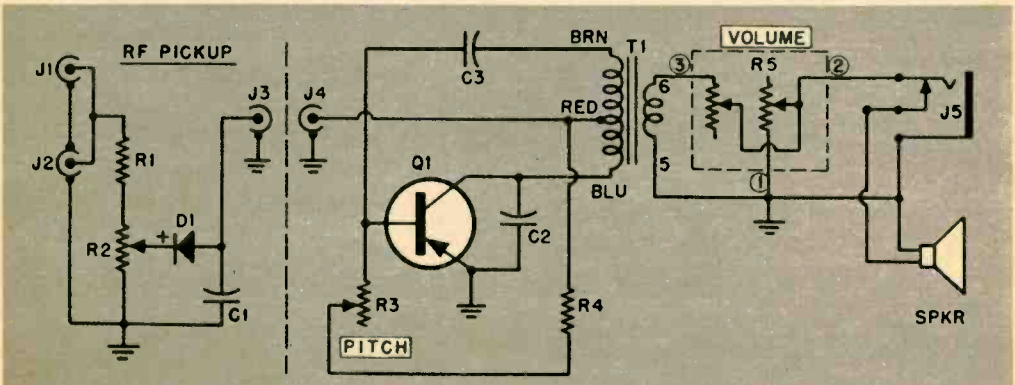
Whether you use coax or twinlead transmission line, once you've adjusted R2 the setting is good for life.




RF pickup box. If you use twinlead transmission line, eliminate J1 and J2 and install a two-lug screw-type terminal strip near R2. Connect one lug to ground and connect R1 to the other lug.

**PARTS LIST**

C1,C2—.25 mf, 15 V or higher capacitor
C3—.05 mf, 15 V or higher capacitor
D1—1N34A diode
J1,J2—SO-239 connector (see text)
J3,J4—Phono jack
J5—Shorting-type phone jack
Q1—2N217 transistor
R1—½ watt, 10% resistor (see text for value)
R2—1,000 ohm, linear-taper potentiometer
R3—100,000 ohm, linear-taper potentiometer
R4—22,000 ohm, ½ watt resistor
R5—8-ohm L-pad (Lafayette VC-49)
SPKR—2½-inch, 8- or 10-ohm speaker
T1—4-watt universal output transformer (Lafayette TR-12)




Portion of RF in transmission line is rectified by D1 and applied to transformer T1. Oscillator, comprising C2, C3, R3, R4 and Q1, starts and its output is coupled by T1 to L-pad R5 and speaker.



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*Buy now, think later. Bad business? Sure. And what better reason for a CBer to plan ahead?*

By ALEX F. BURR, 16W2941


# SLIDE RULE CB

THINK QUICKLY. How many CBers do you know who ran right out, plunked down several hundred smackeroos for a couple of installations and later became unhappy with the selection they had made? You probably could chalk up as many names as you have fingers in ten seconds flat. And even this wouldn't complete your listing of CBers who grabbed the wrong gear.

No, selecting the right CB equipment is more than thumbing through a dog-eared catalog. In one sense, the 200 or 300 bucks you shell out is on a par with the several-hundred-million the government spends for each item of rocket hardware. But does the government pick at random? Not when they're spending your money.

To get every last buck's worth, the government develops rocket systems where each component is selected specifically for optimum performance from the next component. It's sort of like a pyramid. Each part, or block, offers support for the next block.

While you probably aren't going to launch any rockets to the moon in the near future, the same principles of *system engineering* can be used to make sure you get the most CB performance for the least money. And systems engineering starts off with you deciding exactly what your reason is for going CB. Sure, it'll be for either personal or business communications. But right there lies a whale of a difference.

**Let's start with** business use. In any business the entire effort is directed toward one end—making money. Therefore, business-oriented CB gear *has* to make money. It can do this by stimulating enough new business to pay for the cost of the equipment, and then some. Or it can reduce your present operating expenses and thus justify the initial outlay.

First thing the business user has to do is figure out CB vs non-CB expenses. As an example, let's consider one radio-equipped pickup with a driver and helper. Suppose that CB radio saves the truck one five-mile trip to the base station every day. This is a total of ten miles on a round trip and, what with city traffic, probably half an hour of the driver's time. In cold cash, this stacks up as

| | |
|---|---|
| 10 miles at 10 cents per mile | $1.00 |
| 30 minutes at $3 per hour for the driver | 1.50 |
| 30 minutes at 1.20 per hour for the helper | .60 |
| Total savings for one radio call | $3.10 |

At the rate of one trip a day for twenty days, this gives a savings of about $60 per month or more than $700 per year. Result is that you now have $700 to play with. And so long as your equipment sets you back less than $700, you're ahead of the game.

Savings of this type are easy to spot and estimate, but there are still other, less-tangible benefits. A radio may mean better,




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quicker service for your customers. And better service means more business. You'll find that you can keep better track of vehicles, permitting closer scheduling of work. And if you know your own business you'll be able to see still other advantages of this sort.

A different set of conditions exists for the personal CB user. The primary reason for personal CB has nothing to do with making money. Instead, CB becomes a convenience. Whether it's talking to your buddy on another fishing boat or calling your wife to tell her you're stuck in traffic, CB simply makes life a lot less difficult.

Here, selecting the right CB gear gets a bit sticky. In a big metropolis like New York City, it would take an investment of at least $400 (for two units) just to tell your wife the car has boiled over. Reason is that everybody and his brother is likely to be using CB during the rush hour and super-selective equipment, which the situation demands, comes high. On the other hand, if you live in a small town in Idaho you could do the same job—and do it well—with $150 worth of gear.

But whether you want CB for business or pleasure, you'll get the most CB value per dollar by selecting a system which meets your needs. And a system isn't individual components tied together by connectors. Rather, it should be a complementary grouping of components which will do exactly what you need done.

**Next step in** the systems approach is finding out where you want to talk to. A good map, perhaps from a gas station, will be useful. Most base-to-mobile networks call for circular coverage around the base station. But if your store or home is on a lake or on the edge of the city, perhaps a directional beam which concentrates your signal over the city will suit your system better.

Write down your requirements so they always are in front of you. This done, you are ready to look into the equipment you'll need. A good place to start is with the antenna, since the type you will want depends on the decisions which have just been made. If your system is to include any mobiles you'll need a vertical antenna layout. On the other hand, if you desire only point-to-point work, a horizontal system may fit your needs better.

Reason that this basic decision must be made now is that there is a large signal loss (about 24db) when a vertical antenna is used to receive a signal from a horizontal antenna or vice versa. Since mobile stations always use vertical antennas, any system which has mobile units should have a vertically polarized antenna system.

But for point-to-point work horizontal antennas often are preferred, primarily because a horizontal beam is easier to install. In terms of working range there is essentially no difference between vertical and horizontal polarization.

The best all-round CB antenna is the ground-plane or its cousin in terms of performance, the coaxial antenna. These antennas are easiest to mount and cost in the vicinity of $15. They have a non-directional pattern, meaning the signal can be received equally well in all directions.

On the vehicles to be radio-equipped you almost certainly will use vertical whips. The standard 108-inch bumper-mounted type will fill most needs. For trucks with high bodies or cars which for some reason cannot use a long whip, the shortened, loaded jobs are available. Though some are only about 3 feet in length, these antennas approach the efficiency of full-size whips because they can be mounted on the vehicle for optimum radiation.

Perhaps the most difficult decision will be what to put at the bottom of the antenna. So far as the transmitter section of CB transceivers is concerned, there is no problem. The easiest thing to design is a 5-watt AM transmitter. And a CB transmitter is like a dragon; if you've seen one, you've seen them all. So whether you spend $60 or $200, you'll likely



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get a transmitter that's blood brother to every other 5-watter known.

Of course, some (a few) transceivers offer speech compression or clipping—a technique which simulates a transmitter running in excess of 5 watts by boosting the modulation. And when you must squeeze out every drop of operating range, a clipper or compressor certainly is worth looking into.

**The receiver section,** however, varies considerably with price. In fact, eliminating the few transceivers which throw in features just to boost the cost (like a chrome-plated panel), the transceiver's price largely is determined by the receiver.

The most important receiver characteristic is selectivity—the ability to reject interference caused by stations on channels other than the one you are using. For example, if you're communicating on channel 7, it's a bit annoying also to hear the yakking on channels 5, 6, 8 and 9.

Your requirements for selectivity depend on where you live and why you are using CB. Certainly, in a little backwoods California town with only five active CBers around there won't be much interference. And there's no sense in paying hundreds of dollars for selectivity you're never going to need. But in a big city, where there may be five simultaneous conversations on each channel, selectivity is the one big consideration.

One of the best ways of finding what demands your system will make on a receiver is to borrow a rig and tune across the band. There are several things to look for. What is the occupancy in your area? If the band is crowded you will need a selective model. But do you really need more than one channel? Would two or three channels suffice? Should you pay for 23 channels unless you really are going to use them?

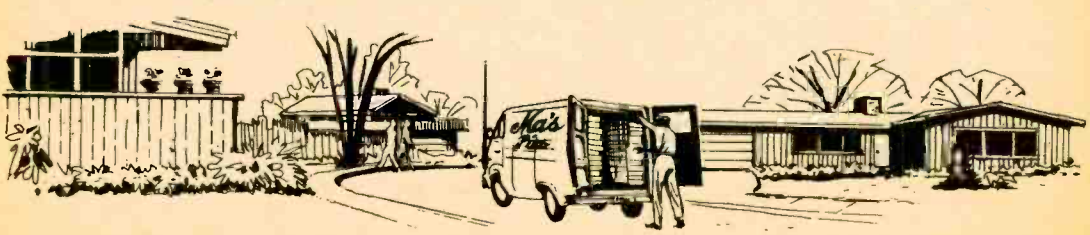
There are a few other items such as power supplies and accessory or specialized equipment that should be considered briefly. Some sets have universal power supplies for 6 VDC, 12 VDC and 117 VAC operation. Others have supplies good for only one voltage and are to be preferred if it is unlikely that the supply voltage will be changed or the set moved from one vehicle to another.

If your requirement is for portable sets, you can consider the walkie-talkies, which are hand-held. They come in three sizes: 25 milliwatts, 100 milliwatts and 1 watt or more. The smallest ones are cheap and, of course, have a limited range—a few blocks at the best. In fact, they are little more than toys. But they can be useful in some activities such as antenna erection where you can't shout quite loud enough. The larger rigs are perhaps more practical for communications when more reliability and a range of a mile or more is desired.

In most large cities there are more active stations on each channel than most CBers want to listen to. But if you're interested in hearing calls from your station only you can buy selective-calling devices which allow a transceiver to hear only those transmitters in the same system. These devices work by turning on your receiver only when it receives a special audio tone sent from one of your own transmitters. Result is that you hear nothing on your channel except when one of your own transmitters is active.

**Final choice** of your CB setup will hinge on operating convenience, price and overall quality. And for help in evaluating these characteristics, you can turn to equipment reviews, personal inspections of samples and the experience of other users. If you talk to a user, be sure that his requirements are similar to yours or his judgment likely won't be applicable to your system.

Next comes the really interesting part—evaluation of the system, which is the real heart of the systems approach. This evaluation consists merely of adding up the cost of the system and comparing it to the benefits to be derived. Will the system save you money? Will it help you make money? Will it make your job easier—or make life better? Will it contribute to better utilization of your leisure time? Only by a systems analysis can you know.





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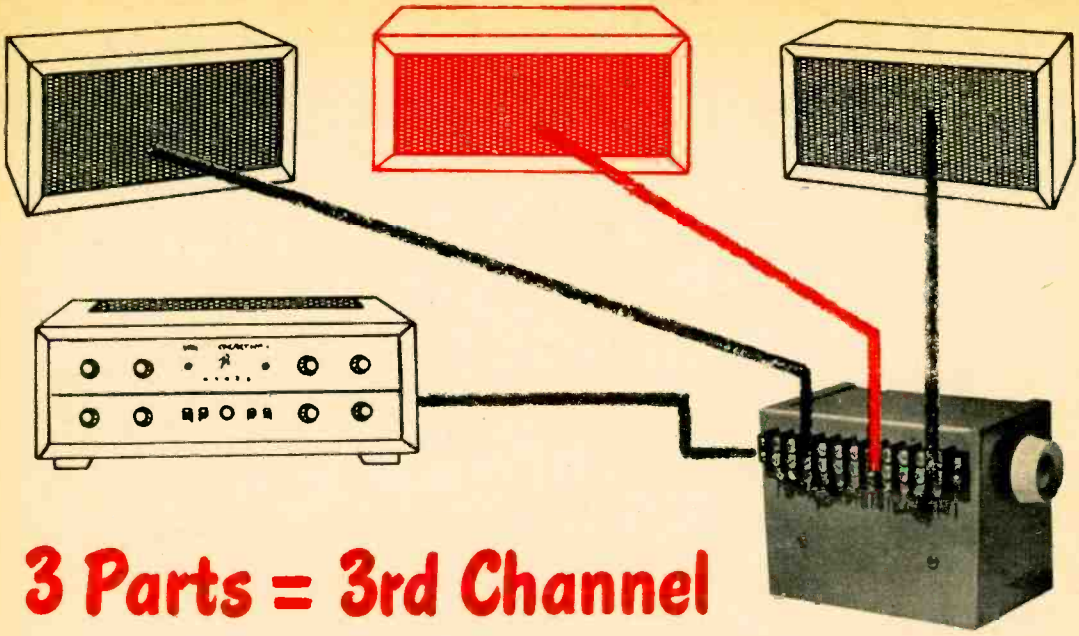


# 3 Parts = 3rd Channel

A GREAT deal of stereo sound suffers from excessive separation because the speakers are located too far apart. This means that instead of hearing a wall of sound you end up with the undersirable ping-pong effect.

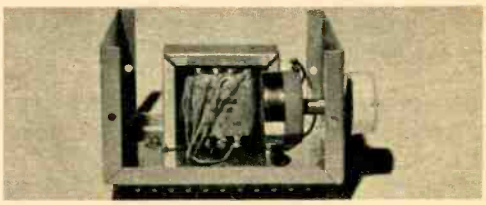
Easiest way to fill the hole in the middle is with a center speaker. But you just can't connect each lead from the center speaker to the amplifier's left- and right-channel output terminals. A special transformer is required to do the job.

The transformer takes equal amounts of left- and right-channel signals and adds them to provide a balanced L + R signal. The transformer also matches impedances.

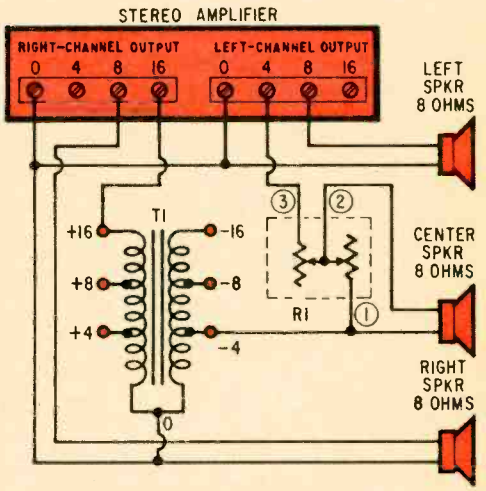
An L-pad should be installed in the center-channel speaker line to control the speaker's volume, should it be louder than the left and right speakers. If the left and right speakers are louder than the center speaker, install a dual L-pad in their lines.

The transformer, a Microtran Model HM-90, is available from Lafayette Radio (stock No. 32-4301Y) for $6.33 plus postage. It is not listed in the catalog. Single and dual 8-ohm L-pads are available from Lafayette with stock Nos. VC-49 and VC-55 respectively.

The transformer and L-pad can be housed in a Minibox on the outside of which should be mounted a barrier-type terminal strip for connections. *—Walter G. Salm*



All parts fit easily in a 3x4x5-inch Minibox.




Connections are for 8-ohm speakers. The transformer instruction sheet shows connections for other speaker impedances. The center speaker can also be used as a mono extension elsewhere.



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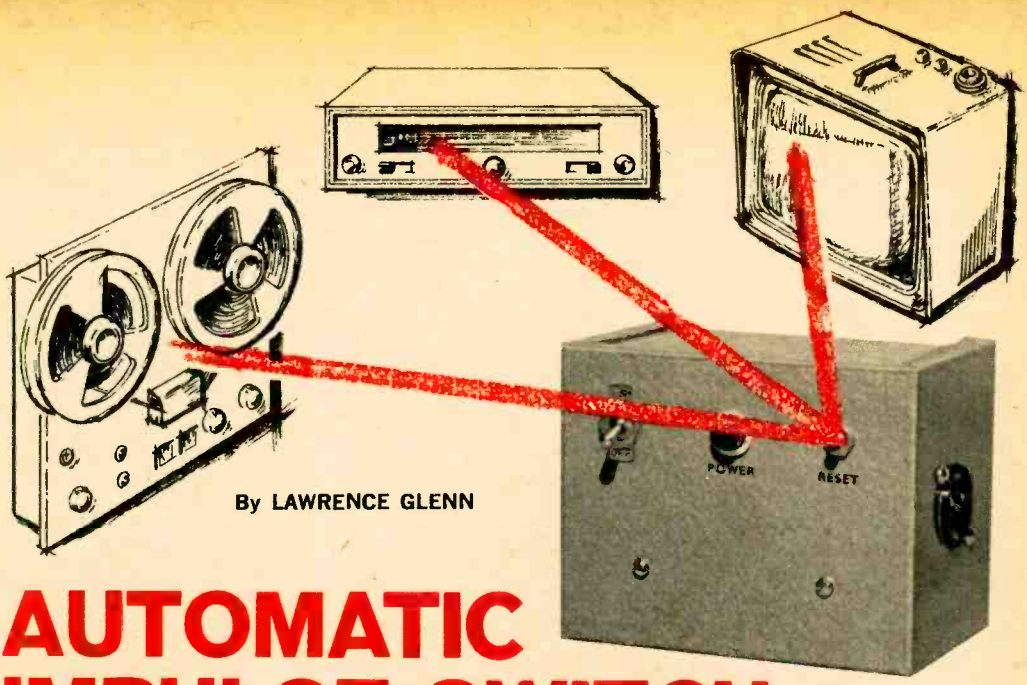


By LAWRENCE GLENN

# AUTOMATIC IMPULSE SWITCH

PUSH, it's on. Push again, it's off. Sounds almost like what you'd do with *any* switch to control power. But the Automatic Impulse Switch (AIS) is different. Its 6.3-volt AC control power is *not* applied to its control circuit continuously—it's present only in the instant the push button is pressed. And low voltage means that if you want to remote-control equipment such as a TV set, hi-fi or practically any electrical device, you can run ordinary zip cord through the walls without violating building codes. You could almost call it powerless control.

If you want to use a tape recorder to lull you to sleep, the AIS can put the tape recorder to bed, too, at the end of the tape. All you have to do is mount a set of contacts on the tape recorder so they touch the back of the tape as shown in the photo. Leads from the contacts plug into the J1. Then place a small piece of Scotch type 51 sensing tape (metallic foil with an adhesive back) at the end of the reel. When the foil touches the contacts, relay RY1 flips off and the tape recorder goes to sleep.

To see how all this is done, take a look at the schematic. Heart of the AIS is RY1—a special relay called an impulse relay. The instant current is applied to RY1 by push button PB1 (or a remotely located push button plugged into J1) RY1's contacts transfer and *stay* transferred even after current is removed. The next impulse of current switches RY1 the other way (such as *off* to *on*) where it also remains after current is removed. All it takes is that quick spurt of current to turn something on or off. At other times the AIS just sits there.

The AIS also can be used to add push-to-talk (PTT) to ham or CB equipment. Often when PTT wires carrying AC are run in the mike cable some hum gets into the mike leads. Since the AIS requires power *only* at the instant the control switch is pressed, there will be no hum when you talk.

**Construction.** There are no special construction problems. Therefore, you can follow our layout or one of your own design. Our model was built in a 3x4x5-inch Minibox. Be sure the wires to SO1 can carry the current required by the load.

Push button PB1 is required only if you use the AIS for remote control (it allows you to reset the AIS at the equipment location) or in conjunction with a tape recorder. That is, after the tape recorder turns itself off, you must press PB1 to turn the machine on.

S1 controls power to T1 only—not to the equipment connected to SO1. It allows you to turn off the AIS when not in use. For example, you can apply power to SO1 with PB1 and then set S1 to off. Power still will be



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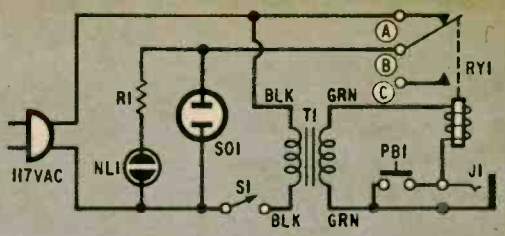
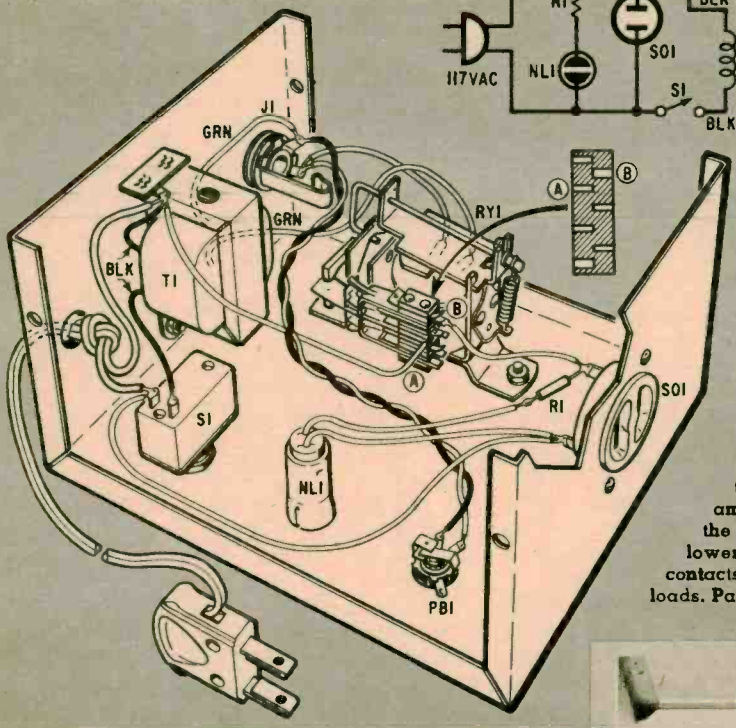
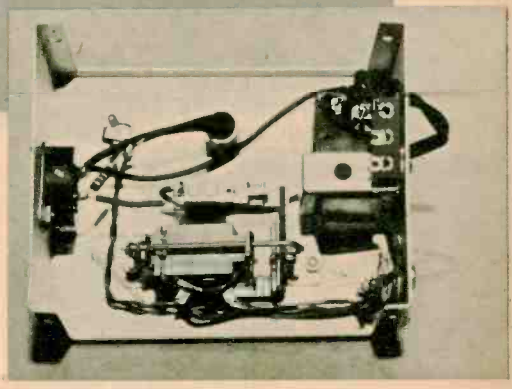
# AUTOMATIC IMPULSE SWITCH




Press PB1 or a push button plugged into J1 and contacts B and C (see above) close and stay closed after PB1 is released. Push again and A and B close. Watch RY1 in operation to see how it works. RY1's contacts are rated at 7.5 amps; therefore, connect the two contacts at the lower left in parallel with contacts A and B for heavier loads. Parts layout isn't critical.



**PARTS LIST**

J1—Phone or phono jack
NL1—NE-51 or NE-2 neon lamp and holder
PB1—Normally-open push button switch (see text)
R1—180,000 ohm, ½-watt resistor
RY1—Impulse relay: 6.3 VAC, DPDT. Potter & Brumfield type PC11A latching
S1—SPST switch
SO1—AC chassis receptacle (Amphenol 61-F1)
T1—Filament transformer: 6.3 V @ 1 A.

applied to SO1.

Neon pilot lamp NL1 indicates that power is applied to SO1 only. It remains on even when S1 is off. Any lamp assembly using an NE-51 or NE-2 can be used. If the assembly contains a current-limiting resistor, omit R1.

When using the AIS with a tape recorder remember that contact need be made only for a brief instant. Therefore, the sensing tape must be short so it coasts on across the contacts after the recorder is shut off. If the foil is too long it will stop on the contacts and apply power to RY1 continuously, causing it to overheat.

To get a tape recorder to turn itself off, make contacts as shown and mount against back of tape. Metallic tape at end energizes relay RY1.



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# CONFESSIONS OF AN FCC EXAMINER

*JUST TO SET the record straight, the letters FCC in that title above don't mean what you think they do. Fact is, there wasn't any Federal Communications Commission until 1934, and the experiences we're about to delve into took place a decade earlier.*

*In those days, it was the U.S. Dept. of Commerce that looked after the airwaves. But I like to think of myself as an FCC examiner nonetheless—one of those Friendly Compatriots of Communication whose job it was to check up on the hams of yesteryear. Care to reminisce?*

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By HOWARD S. PYLE, W7OE

For several weeks we had been receiving rather consistent complaints of amateur interference with reception in the Buffalo, N.Y., area. Even some bona-fide hams up that way had filed protests with us. They stated that a rather powerful sounding spark was not only breaking up broadcast reception but legitimate amateur operations as well.

Since I drew the assignment to investigate this one, I proceeded to Buffalo in the dead of winter (January) and contacted complainants. Listening for a couple of evenings at both broadcast listeners' homes and at amateur stations, I too heard the mysterious transmissions. There were no call letters or identifying conversation . . . just general ragchew communications.

One of the broadcast listeners possessed a so-called loop receiver—a Murad I think it was—so we decided to see if it could give us any kind of a bearing on the culprit. To some extent, it did. Loop broadcast receivers weren't much for direction finding, but we pretty well established the general direction the signals were coming from.

Loading the receiver, complete with batteries and loudspeaker, into the car of one of the local hams, we proceeded about a mile in the direction indicated. This done, we set up the equipment on the sidewalk under a corner street light and did some tuning. We apparently were on the right track. The signals were considerably louder, though the direction had shifted some 15 degress. We were glad to pack the gear in the car again; Buffalo isn't exactly balmy in January at 2 below zero!

We proceeded another mile on the new course and again set up our DF station on a street corner. The signals were much louder and the direction hadn't altered. Evidently the offender was a college student, since much of his conversation had to do with home work involving higher mathematics. But no names were transmitted and there still were no calls. We never did hear the station he was talking to.

The signals were of sufficient strength to lead us to believe that we were pretty close to the source. We decided to load the gear and cruise the streets in the neighborhood while I sat in back listening to the receiver. But this didn't prove too successful; shielding from the car body apparently obstructed most of our direction finding. So we proceeded up one street and down another, peering through the semi-darkness of a moonlit night for signs of ham antenna installations.

Though there were obviously plenty of broadcast-type antennas, there was noth-

A ham since 1908, Howard S. Pyle has spent his entire career in the field of professional radio operating and engineering. World War I saw him as chief radioman in the U.S. Navy. And following that war, he served as assistant U.S. radio inspector in the 8th Radio District. It is his experiences in this post that he brings to life again in this article.



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# CONFESSIONS OF AN FCC EXAMINER

ing which appeared to be conventionally ham. We gave up for the night when one of the hams volunteered to take me around for a more intent visual search the following day. This, too, proved unproductive, so we decided to try again that evening. The signals never were on in the daytime.

Returning to the sidewalk site we previously had tried, we set up the gear. Tune as I did, swinging the loop from side-to-side, I heard nary a signal from the suspected station! Working in shifts to try to keep warm, we gave up in favor of hot coffee and warm beds for that night.

The following night also turned out to be a dud. And since I had been away from the office a goodly time, I decided to return to Detroit the next day. Local Buffalo hams and the owner of the loop receiver promised to report the results of other observations which they might make.

In about a week we received a letter from one of the prominent Buffalo hams who had assisted us, advising that the station hadn't been heard for an entire week! Two weeks later we again received a similar letter. Since we had had no indication that the station would be going off the air, we district officers only could shrug and await developments.

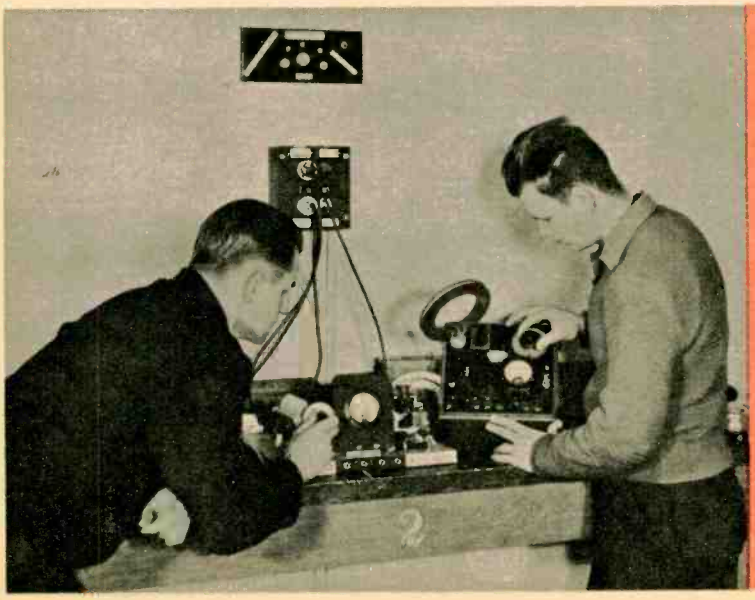
But we never again received a complaint on that particular station. Had he been tipped off that he was under surveillance by someone who had seen our street-corner installations? A number of curious passers-by had stopped, of course. And though we brushed them off with vague explanations, one of them *could* have been friendly ham. . .

---

One of my routine duties comprised the regular inspection of vessels docking at Detroit. These usually were conducted at intervals of about a week. This way, we caught the Great Lakes cruise ships, those on the Detroit-Cleveland overnight runs, grain carriers and the ore ships of Henry Ford (Detroit to Duluth).

Shortly after I had entered up such inspections, I drove onto the dock of the Detroit-Cleveland Navigation Co. I was in my own little Maxwell roadster, since we had no official Government cars in those days. And I was feeling rather conspicuous, what with my Maxwell painted bright fire-engine red! Since the weather was mild, I had the top folded down.

Suddenly a barrage of small round tin cans fell on me and on the seat! Looking up, I saw several girls in canvas bib aprons, framed in a second-story window, over the covered dock. Lettering on the glass indicated that those loft quarters were occupied by a rub-



Spark gaps and CW ruled the roost decades ago, and radio inspectors relied on an instrument called a decremeter to check up on those sparks. Reason was that a signal which decayed too rapidly when the key was open likely would cause severe interference. Our photo shows students testing out a Kolster decremeter in the laboratory of a Seattle, Wash. radio school back in the early 1920's.



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ber products manufacturing company. I assumed that these giggling young women were in its employ.

Ignoring rubber products and the women for the moment, I picked up the little tin containers and boarded the vessel. There the quartermaster met me with a grin and said, "Quite a shower the hussies gave you, eh?" I laughed it off, gave him a couple of the cans and proceeded with my inspection.

The incident was repeated the following week. I was a bit discomfited to receive the horse laugh from several longshoremen and ships' crewmen who apparently had been tipped off by the quartermaster. Several asked me for cans and I told them, "Help yourself; they're all over the car seat!"

My dignity was beginning to suffer. Nevertheless, I was determined to make one more trip before protesting to the rubber company, if it occurred again. Sure enough, the third week brought another hail of cans. Rather than cause a fuss, though, my subsequent trips to the pier found me parked on the opposite side of the building—out of sight and range of the rubber company's windows. I never was so saluted again!

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On one major inspection, which included the famous Westinghouse station, KDKA in Pittsburgh, the Inspector-in-Charge of the Detroit district office accompanied me. As KDKA wound up the broadcast stations we were scheduled to visit, we proceeded to a small western Pennsylvania town, whose name I don't recall.

Reason for our visit was a considerable number of complaints involving violation of quiet hours—a period of the day when all hams were supposed to be off the air. The alleged offenders were a group of amateurs who jointly owned a rather powerful ham station located on a high hill just outside of town.

We checked in with one of the more persistent of the complainants and listened to his broadcast receiver. Sure enough, at about 9:30 p.m., loud signals from an amateur station broke through, though the official silent period would continue in effect for another hour. There was no attempt on the part of the station to withhold call letters. And checking our records, we fond that they were bona-fide and listed with correct address. The broadcast listener, who was our host, said that he could take us directly to the station. Seems most of the town was familiar with its isolated location on the hilltop.

Perhaps five minutes' drive brought us to the foot of the hill. My cohort suggested that we leave the car there and proceed by foot to the station which could be seen, brightly lighted, a few hundred yards up the hill. The broadcast listener elected to remain in the car.

As we climbed the slope we could make

[*Continued on page* 109]

**Automation has been around longer than most people realize, at least when it comes to code tests for ham radio applicants. Mounted in a hardwood cabinet in front of each applicant was the famous Omnigraph, a device intended to insure uniform transmission of code characters. Applicants soon dubbed it the infernal machine, since even its presence was unsettling enough, let alone its iron fist.**



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# GOOD READING

By Tim Cartwright

*SPACE COMMUNICATIONS. By Stanley Leinwoll. John F. Rider, New York. 166 pages. $3.95*

It'll be a while yet before the first space-cab driver gets his calls over the Citizens Band. It's also going to take a few moons before hams on different planets make contact with one another. These facts notwithstanding, it's certainly not too early for radio hobbyists to make sure they have the ABC's of space communications down pat.

Space listening already is quite a hobby, of course. Both the U.S. and the U.S.S.R. have been sending out a stream of QSL's to verify reception of satellite transmissions. And there's good reason for anyone with reasonable curiosity to keep abreast of what's on the airwaves in the wild blue (or is it transparent?) yonder.

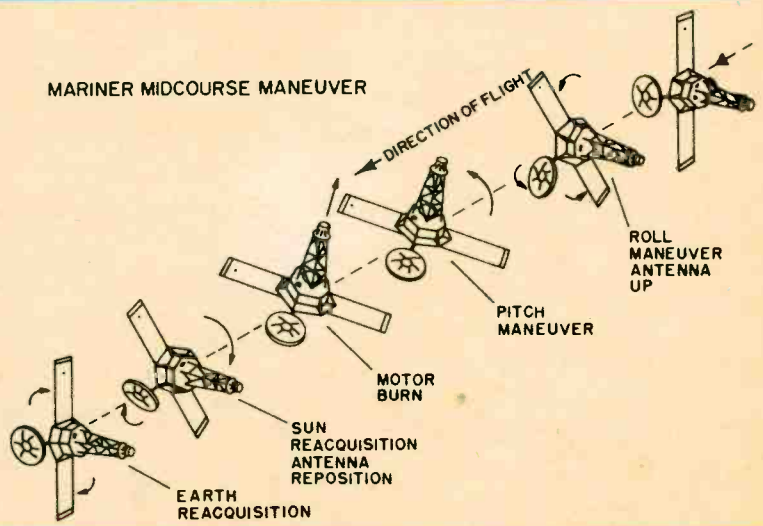
Stanley Leinwoll's book is about as thorough an introduction to the subject as anyone could ask for. Beginning with a short summary of present world communications systems, the author goes on to outline the basics of space communications. This done, he even delves into the whys and wherefores of the various special-purpose communications satellites amateurs have been keeping tabs on. In short, this stacks up as an interesting and well-written book, with plenty of excellent illustrations.

*ELECTRONIC GADGETS FOR THE CONSTRUCTOR. By E.N. Bradley. Norman Price, London, England. Distributed by Sim-Tech Book Co., Box 69, Agincourt, Ont. 64 pages. 90 cents.*

In case you've been out of touch since that Revolution of a few years ago, it may be interesting to discover a few things about our British cousins. And guess what. They also fool around with breadboards, chassis punches and all that jazz.

The inexpensive little volume we're concerned with here shows precisely what transatlantic tinkerers are up to. And if some of the projects (the theremin, say) are familiar, others—including some mystery display gadgets—will be brand-new and highly interesting. Just substitute tube for valve and ground for earth, and you'll be ready to tackle some worthwhile projects.

Incidentally, if it's not available in your book or parts store, try ordering the book direct from the Canadian distributor. It'll be worth the trouble, and who knows? You even might pick up a few Canadian stamps for your collection.




**Though the Mariner II spacecraft was lost in space some 54 million miles from earth, it earlier had passed within 22,000 miles of our sister planet, Venus. And in doing so, it told scientists facts about Venus they could have learned in no other way. Our illustration, taken from the book, Space Communications, discussed above, shows how the Mariner was stabilized by radio command from earth at a distance of more than a million miles.**



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By BERT MANN

*Jam-packed channels are wide open when a rig has razor-sharp tuning.*

WITH the new FCC rules crowding all communications between stations of different licenses (or calls) into only seven channels, CBers are likely to find the going rougher than ever. Getting a clear spot on the band will be like looking for a seat on the subway at rush hour.

One of the few good antidotes to the crowding malady will be a receiver with extremely sharp selectivity. Luckily, you don't have to throw out that budget transceiver and then spring for a high-price double-conversion job. Instead, keep the low-cost rig and merely add EI's CB Channel Slicer as an accessory. The Slicer makes adjacent-channel interference a thing of the past, giving you selectivity so sharp that you can separate two stations on the same channel if they are slightly off frequency.

In fact, if you're working a roundtable and everyone isn't in the center of the channel you'll have to trim the tuning each time a different station comes on.

The Slicer is a double-conversion adaptor which adds a 100-kc IF amplifier to transceivers whose IF is around 1,600 kc. The Slicer is not designed for transceivers with a 455-kc IF because the selectivity of these rigs is quite sharp, anyway.

The Slicer has an option. You can either cut a channel in two with 100-kc IF transformers or you can use 262-kc transformers. While not as sharp as 100 kc, selectivity still will be excellent. If an audio-frequency signal generator with a 100-kc output is not available do not use 100-kc transformers; alignment will be almost impossible without a generator. The 262-kc transformers are factory aligned and a reasonably good alignment job can be done by ear. Just adjust T1 as described later on, tune in a station and adjust T2 and T3 for maximum meter indication. Whichever you choose, construction is the same.

Since the 100-kc IF transformers are not stocked by many distributors, you will have to order them directly from Miller. To satisfy Miller's minimum-order requirement it will be necessary to order a complete set of transformers, consisting of oscillator transformer T1 and the two IF transformers, T2 and T3. Further ordering information appears at the end of the Parts List.

Because the power supplies of many trans-



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# CB CHANNEL SLICER

ceivers already may be overloaded with accessories, the Slicer has its own power supply—which means its operation is confined to base stations. It can't go mobile.

**Construction.** The Slicer fits easily on a 7x7x2-inch aluminum chassis. Component placement and values are critical so changes and substitutions should not be made.

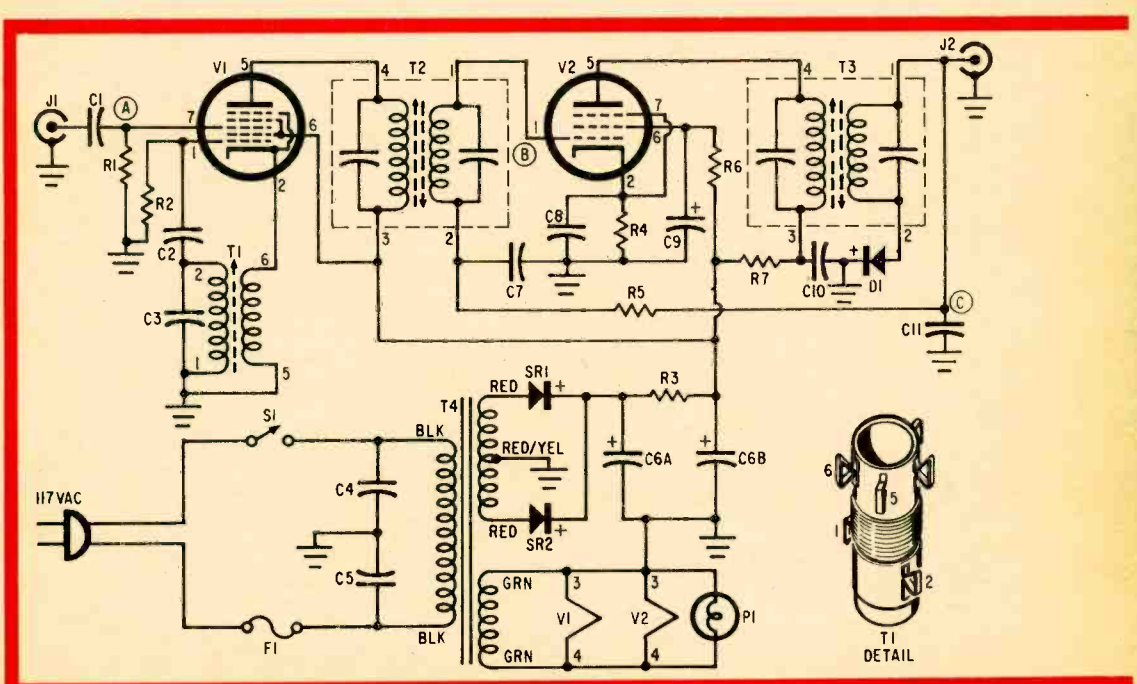
IF transformers T2 and T3—whether 100 kc or 262 kc—are mounted with the adaptor plate supplied with them. The adaptor hole should be cut with a 1⅛-inch chassis punch. Take care that you position them exactly as shown: pin 1 is color-coded green.

T2 and T3 are held in place by a U-clip (supplied with them) which fits through the adaptor plate and into the transformer cans Using your thumb, first press one side of the clip into position and then the other. *Do not* try to force both sides of the clip in place at once. Note that T2 and T3 are *not* connected

**PARTS LIST**

Capacitors: 600 V ceramic disc unless otherwise indicated
C1—240 mmf C2—47 mmf
C3—33 mmf (see text)
C4, C5, C11—.005 mmf
C6A, C6B—40/40 mf, 150 V electrolytic
C7—.05 mf, 75 V or higher
C8—.1 mf, 75 V or higher
C9—20 mf, 150 V electrolytic
C10—.1 mf
D1—1N34A diode
F1—½ A fuse and holder
J1, J2—phono jack
P1—6-V pilot lamp and holder
Resistors: ½-watt, 10%
R1—1 megohm
R2, R6—22,000 ohms
R3—470 ohms R4—100 ohms
R5—2.2 megohms
R7—1,000 ohms
S1—SPST toggle switch
SR1, SR2—Silicon diode: 50 ma, 500 PIV minimum ratings
*T1—540-1,600 kc miniature adjustable oscillator coil (Miller 70-OSC.)
*T2—IF transformer: 100 kc, Miller No. 1710; 262 kc, Miller No. 12H-1
*T3—IF transformer: 100 kc, Miller No. 1710; 262 kc, Miller No. 12H-2
T4—Power transformer: 250 V center tapped @ 25 ma; 6.3 V @ 1 A (Stancor PS-8416 or equiv.)
V1—6BE6 tube V2—6BJ6 tube
*Available as a group only from J. W. Miller Co., 5917 S. Main St., Los Angeles, Calif. 90003. 1—No. 70-OSC and 2—No. 1710, $5.34 plus postage. 1—No. 70-OSC, 1—No. 12H-1 and 1—No. 12H-2, $4.62 plus postage.

**Output (1,600 kc) of CB rig's IF strip is fed to pentagrid converter V1. Output of V1 (100 kc or 262 kc, depending on the value of C3) then goes to IF stage (100 kc or 262 kc) consisting of T2, V2 and T3. Circled letters are test and alignment points and are referred to in text. Watch the lug numbers on T1.**



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as specified in the instruction sheet supplied with them; use our connections.

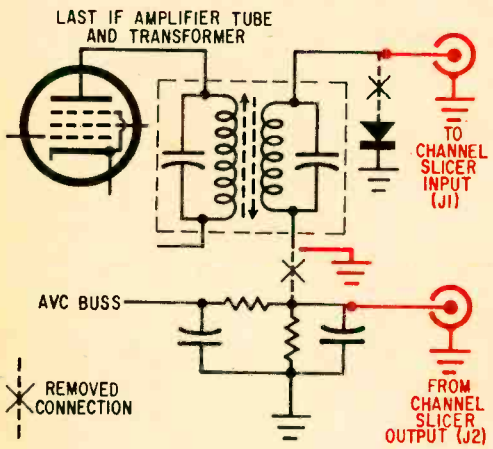
Take extreme care when connecting oscillator transformer T1 since the Slicer will not work if just one set of leads to T1 is reversed. If you employ 262-kc IF transformers, use a 24 mmf capacitor for C3. [C3 in any case should be an NPO disc or tubular ceramic.]

**Connecting the Channel Slicer.** The Slicer is connected between the transceiver's last IF transformer and the detector circuit. The modification to the CB rig is shown in the schematic directly below. To facilitate future transceiver servicing, connections for the Slicer should be brought to phono jacks on the transceiver's rear apron.

The IF transformer lug to which a diode (semiconductor or tube element) is now connected, is connected to the Slicer's input (J1). Next, unsolder the components from the IF transformer lug that feeds the AVC/audio line. Twist the leads together and connect them to the Slicer's output (J2). Then ground the IF transformer terminal which fed the AVC/audio line.

The connecting cables between the transceiver and Slicer should be made with short lengths of RG58/U coaxial cable.

**Alignment.** In order to align the IF transformers you must use the proper alignment tool. Attempts to use a screwdriver will damage the transformers. The 100-kc transformers require a hexagonal alignment tool whose parallel sides are ⅛-inch apart. The 262-kc transformers require a K-Tran alignment tool.




Modification of CB rig. Disconnect top lead of secondary of last IF transformer and connect to phono jack on the rear of chassis. Disconnect bottom secondary lead and ground it; run all AVC line leads to secondary to another jack installed on rear of transceiver chassis.

Temporarily disconnect the cable to the Slicer's input (J1). Connect a VTVM set to about —15 VDC to point C (C11) and connect an audio-frequency generator set to 100 kc to point B (pin 1 of V2). If you are using 262-kc transformers use an RF signal generator set to 262 kc.

Adjust the generator's output for the lowest readable meter indication; if necessary, switch to a lower meter range. Turn T3's bottom slug full counterclockwise. Then slowly turn the slug clockwise until the meter peaks. There will be two peaks but the correct one is with the slug nearest full counterclockwise. Align T3's top slug the same way. Then repeat the procedure. As you adjust the slugs the meter may go off scale. Rather than change the meter's setting, reduce the generator's output. Connect the signal generator output to point A (pin 7 of V1) and repeat the procedure on T2.

Now connect an RF signal generator set to the *transceiver's* IF frequency to J1. Adjust T1's slug—starting from full counterclockwise—for maximum meter indication. Disconnect the generator and connect the transceiver's output cable to J1.

Tune in a station on, let's say, channel 10 to check dial calibration. If the calibration is off, turn the tuning knob so the channel 10 dial marking is directly under the pointer. Now adjust T1 so you receive channel 10 right on the nose. This will be the point of highest meter indication.

Finally, tune in a strong station and adjust the transceiver's last IF transformer for a maximum meter indication. Disconnect the VTVM and the Channel Slicer is ready to go.

Just so you don't think that something's wrong we'd better warn you of what reception will sound like with the Slicer. The volume will be about that of an unmodified transceiver but everything will sound unusually quiet. This is normal. The less IF bandwidth, the less noise. With 100-kc transformers tuning will be razor sharp. In fact, if you're tuned to the center of the channel and someone comes in 3 kc off frequency, it's quite likely you won't hear him. With 100-kc



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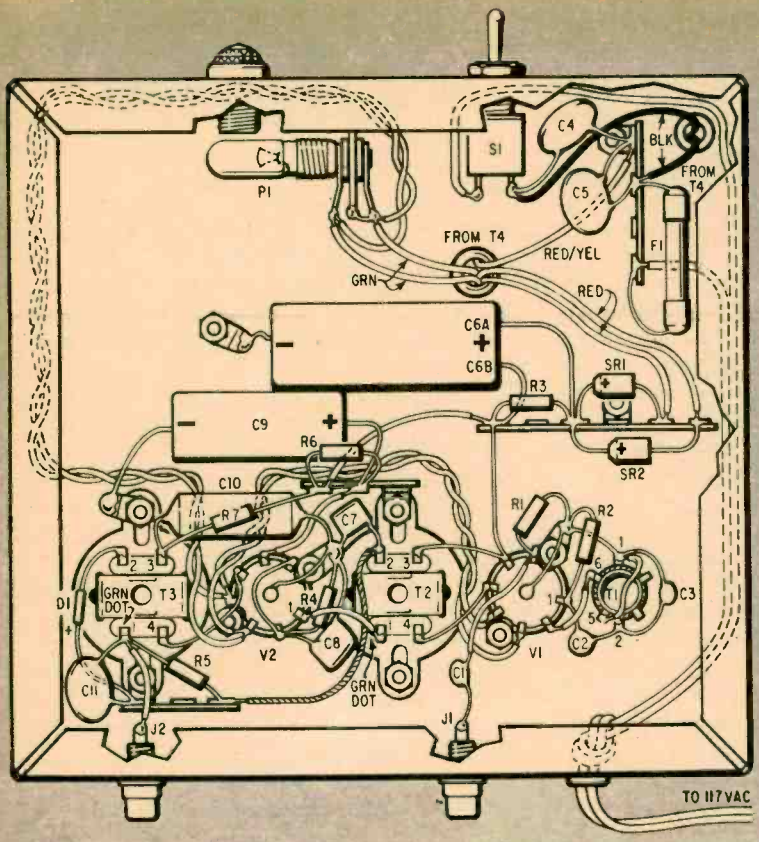


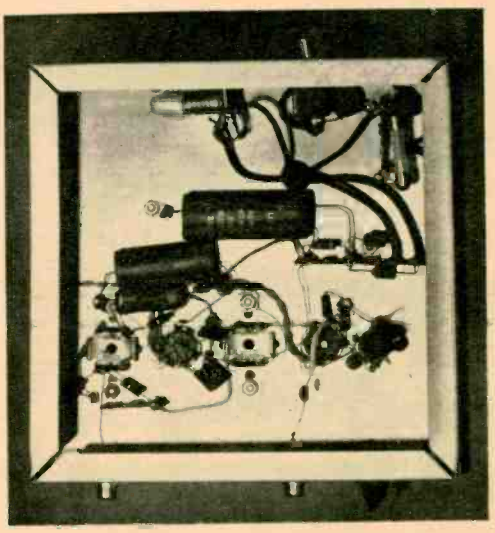

Because of the frequency at which the Channel Slicer operates, layout is important. Duplicate the arrangement shown here and you won't run into trouble later on. Install capacitor C3 on oscillator transformer T1 before you mount the transformer. Center lug on P1's socket is frame and is grounded. If your socket doesn't have such a lug, ground one of the filament leads to the socket's frame. Use heat sinks on D1's leads when soldering in place.

# CB CHANNEL SLICER

transformers, and to a lesser degree with 262-kc transformers, speech will sound somewhat muffled. This also is normal.

**Service Hints.** If T2 and T3 can be aligned but the IF signal cannot be pushed through the Slicer, the oscillator may be inoperative. Check this with the VTVM connected to pin 1 of V1. If the oscillator is working you will get an indication in excess of —10 VDC. If you fail to get the correct indication, check to see if a pair of T1's leads is reversed.

If the Slicer is working—as evidenced by your ability to align it and feed a signal through—but won't work when connected to the transceiver, either T1 is adjusted incorrectly or the connections to the transceiver's last IF transformer are incorrect.



Chassis is wide open; therefore, you shouldn't have difficulty getting everything in place. Long leads will cause trouble, so keep them short.



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# THAT HAM RADIO BRAWL

*Three fight camps develop in the ham world and barbs & brickbats fill the air as they battle over personalities, publications . . . even an issue or two.*

By NICHOLAS ROSA, WB6JTJ/W1BPQ

ROT . . . crud . . . vulgar . . . dope . . . slur . . .

With words like that flying about, where would you expect to be? In a pier brawl? At a beer bust for ex-cons? You certainly wouldn't be likely to hear the likes in the staid and sometimes stuffy world of amateur radio. After all, Golden Rule No. 1 in The Amateur's Code says, *The Amateur Is Gentlemanly.*

But those exact words and others of the same breed are, indeed, peppering the ham landscape these days. They're the ammunition in a donnybrook that has shaken amateur ranks from antenna to ground. Conservative brass-pounders and mike-grippers are by turns awed, surprised, shocked . . . and entertained. Clearly, the free-for-all is one of the more remarkable events for hams since they all got kicked off the air in World War I.

Involved in the brawl are personalities, publications and even an issue or two. There are three fight camps, though, in the manner of pugilistic heavyweights, each has friends, diehard supporters, hangers-on and camp followers. In the corners of this fire-and-brimstone triangle can be found:

The Connecticut-based American Radio Relay League; its publication, QST, and John Huntoon, W1LVQ, ARRL general manager and editor of the publication.

The Cowan Publishing Corp. of New York and its ham magazine, CQ.

Wayne Green, W2NSD/1, who edits and publishes an all-ham journal called 73 out of Peterborough, N. H.

All principals have bearded each other to a greater or lesser degree in the past several months, though Green has been by far the most active whisker-puller. W2NSD put together the slogan, Never Say Die, to fit his call letters, and he's gone to great lengths to follow the motto.

The New Hampshirite possess the fastest typewriter in the East and has become the maverick of ham radio, kicking sacred cows in the stomach and stomping on toes all over the place. His penchant for controversy and far-out ideas has made him easily the most colorful editor in the field, and also the most-talked-about spokesman for the hobby.

Green was not always at outs with one of the principal targets for his barbs—CQ Magazine. In fact, he was once its editor, and during a span of a few years he fairly set its pages ablaze. Then he disappeared from the Cowan fold in a row that—contrary to usual practice in the business world—got a full public airing from both parties. If there was


Ironical cover for CQ of January 1953 pictures Wayne Green (arrow) with celebrities; he and the magazine are now two principals in big brawl.
© 1953 by Cowan Publishing Corp.



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a single starting point for the brawl now raging, that unquiet break-up probably was it.

After he resigned or was fired (depending on which version you preferred) Green was not without a voice for long. A few months later he began publication of a new ham magazine called 73 (Best Regards, in ham parlance). The publication first saw life in Brooklyn, was later moved to the New Hampshire hills. "We are not mad at anybody," Green announced, and then let fly. Some of his barbs were good natured but, nevertheless, few in his audience could mistake his targets. Green's way with controversy and his method of combining humor with acid made his followers laugh while they gaped at the holes he burned in his victims.

Green next proved himself to be a veritable dynamo, stumping up and down the countryside and attending almost all conventions and hamfests. His magazine would revolutionize the ham world, he said. He won many followers. Meanwhile, he was busy with his broadsides at the other two ham camps, Cowan Publishing and the ARRL. Paper that went into his typewriter came out smelling


John Huntoon, W1LVQ, as general manager of the ARRL and editor of its publication, has caught many barbs resulting from controversial proposal.

de W2NSD/1

never say die

© 1964 by 73, Inc.

Most of Green's attacks on adversaries appear in his personal column, which carries the heading shown here: column is a mixture of humor and acid.

of fire.

Green had other ways of giving chuckles to his readers. His original cover price was 37¢, reversing the numerals in the title, and later he was not content with merely listing his new price. "A Steal at 40¢," he put on the cover, and, "a miniscule 40¢." Inside there were other yuks. In tiny type at the bottom of the indicia was this advice: "Readers should stop reading the fine print and stick to the articles and editorial." Through several issues Green's name got turned into Wayne Grein, Wayne Grn and Wain Green, who was listed simply as "Editor, etcetera."

Noses were tweaked all around when 73 vented irritation at the multiplicity and lack of originality in ham awards by announcing its own series of certificates. The big one was the Certificate Haters Club certificate (which sounded strangely like CQ's Certificate *Hunters* Club). Other awards included the WAAS (Worked *Almost* All States) and the Real Rag Chewers certificate, which could be won only if you conducted communications with another ham for six solid hours with no breaks.

During all this, and much more, both the ARRL and Cowan Publishing maintained a stony silence, even when 73 talked blithely about how much it offered in comparison to Brand X and Brand Y and when Green referred to one of his competitors as that "near-bankrupt" ham magazine. A little later, 73 came out with a cover that bore a striking resemblance to QST's long-standing format, though the famed QST line, "devoted entirely to amateur radio," now read, "devoted wholeheartedly to amateur radio."

The sniping went on several months before there was return fire from the other two garrisons. It was not until somewhat over a year ago that pot shots became a real battle. The



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# ZERO BIAS

ALAS—our noble vice-presidential candidate from New Hampshire has done it again—stuck his big foot in his very big mouth, that is. Although his April editorial quietly backed off on his March innuendos, in May he was back at it insisting that *73* contains: "a lot more flagrant information than flagrant misinformation."

We were almost in hysterics, when directly under this memorable quote we noted that *Auto-Call* (a very fine Washington, D.C. club paper, edited by W3NL): "devoted considerable space to my editorial. [illegible] it." Dear readers, *Auto-*[illegible] they tore him up in [illegible] and we vaguely remember Mr. Huntoon's salary as being considerably less than $25,000. We hope *73*'s comments won't cause Mr. Huntoon any undue hardship with the Bureau of Internal Revenue. By the way—couldn't *73* and the "Institute" operate more effectively as a two-man team?

*73*'s editor has, in past issues spoken of the abundance of his rejected manuscripts showing up in *CQ*. It is rather ironic that an article prepared for *CQ* has now shown up in *73*. *CQ* required that this article, written by one of his "Institute" Directors, be held over a while to correct some of the in-[illegible] therein. Impatient for

Cowan Publishing's main blast in ham war appeared in Zero Bias editorial column in CQ magazine.

immediate cause for the turn in events was supplied by the ARRL itself which, early in 1963, announced that it was submitting a rules-changing proposal to the Federal Communications Commission. The document dealt with incentive licensing and became known as RM-499 after its FCC file number.

The proposal posed a threat to 200,000 of the country's 280,000 licensed amateurs, suggesting that all General and Conditional class operators be barred after certain dates from transmitting phone (voice) signals on the four most popular bands—80, 40, 20 and 15 meters. Phone privileges would be restricted to Advanced and Extra class licensees—now a minority. Others would be per-

[*Continued on next page*]


Wayne Green's spoof (right) of long-standing QST format (left) got a lot of chuckles from the amateurs.

© 1958 by The American Radio Relay League, Inc. (left)
© 1963 by 73, Inc. (right)



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mitted CW (code) only.

The idea was to improve the quality of hams and hamming, giving them an incentive to improve themselves by trying for higher licenses. RM-499 itself became highly controversial amongst hams, many of whom were enraged at the idea of anyone's taking away operating privileges which they had enjoyed for years.

The ARRL, unfortunately for itself, filed the proposal before revealing the details to its 80,000 members. As a democratic, nonprofit association, it immediately came in for attack for not representing the views of its members. Green's typewriter roared into action, turning out sizzling lines that called upon amateurs to revolt, to protest not only to the ARRL but to the FCC. He raged about the proposal and the manner in which the action had been taken, arguing that ARRL members had not been consulted and, worse yet, that the board of directors of the League had not been queried in any meaningful way. The individual who bore the brunt of the attack was the League's top professional hand, John Huntoon. Salvo after salvo crashed around him; he ignored them all.

Cowan Publishing also remained aloof—for a while. Then it surprisingly condemned the ARRL's handling of RM-499 as "deceptive" and "secretive" and "cowardly." For a moment it appeared that bad blood might be purifying itself, what with the two rivals now on the same side of the fence. But not for long. Cowan soon ran alarmed editorials about Green and threw its support to the ARRL.

The League was in an embarrassing spot. Inherently too dignified and high-thinking to engage in Indian-style warfare, it obviously looked for a safe path. QST kept all references to W2NSD, even indirect, out of its editorial material (though its letters column carried mention of him).

The Green drumfire at length became too much, though a camp-to-camp battle between QST and 73 never came about. Instead, letters from Huntoon were sent out to all ARRL-affiliated local ham clubs to set matters straight according to the League's point of view.

Green's reaction could have been predicted. Far from ignoring the letters, he pounced on them with seeming glee, dubbed them Huntoon's Dirty Letters and invited his audience to go ahead and read them.

In the midst of the battle, verbal broadsides streaked across the sky like sparks in a blacksmith shop.

Charges of impropriety were hurled at certain officials of the FCC, which could be extremely serious to a government worker. The accusations never were proved.

Other shots ricocheted off such surprising targets as the Coca-Cola Corp. and the New York World's Fair, which got involved after visiting hams had trouble finding K2US, the ARRL's official station at the fair. The station was tucked away on the second floor of the Coke building and, after getting there, quite a few amateurs were disgruntled when they were not permitted to operate the equipment because they hadn't brought licenses along (as the law requires).

With the glare of rockets on the horizon, Green confounded everybody by organizing his own version of an amateur association, calling it the Institute of Amateur Radio (IoAR). The whole thing, said CQ, was meant merely to keep the 73 camp "in New Hampshire clover."

Though the IoAR to date has been noted mostly in its role of thorn in the side of the ARRL, the organization has a chance to contribute something new to the ham world. The ARRL, being a tax-free fraternal group, cannot indulge in anything that smacks of political activity, such as lobbying in Washington. The IoAR, on the other hand, works under no such restriction and is able to lobby for the benefit of the amateur hobby.

Through the whole fight, Green has shown himself to have the most lasting supply of ammunition. At one moment he lightheartedly discussed Huntoon's travel expenses, at the next he called the election of Herbert Hoover, Jr., W6ZH, as ARRL president a mistake. And whenever a Cowan Publishing head popped up, he had a brick handy.

Green, years before, had done a piece called ARRL Exposed, a tongue-in-cheek article which delighted many readers but enraged as many, and posed all the while as a friend of the League. The pattern was repeated this time. While damning the ARRL, the New Hampshire editor talked about how much the League had done for hamming and about its many valuable contributions. With friends like that, the League might have

[*Continued on page* 112]



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# CHRISTMAS GIFT


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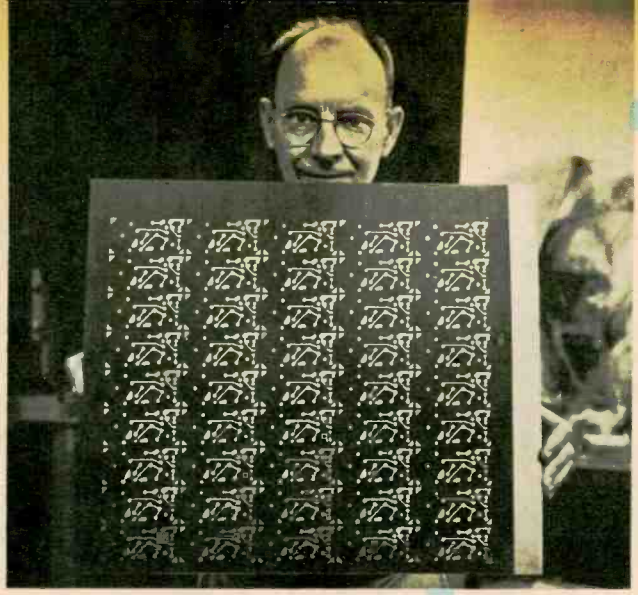

Printed circuits form heart of rig. This board will be cut to furnish 45 of them.

# BEHIND THE SCENES IN CB

HEROES, as the cartoon strip once put it, are made—not born. Same thing goes for CB sets, though we suspect a good many CBers never give much thought to the matter. For a look behind the CB scenes, EI takes you on a tour through the International Crystal Mfg. Co.'s plant in Oklahoma City, Okla. The unit in production is International Crystal's Executive transceiver.

Individual boards cut from phenolic sheet at left must be drilled to accept leads from components. Executive's three boards require about 450 holes.

With components mounted in place, board is coated with flux, dipped in molten solder.

After dip soldering, boards lack only tubes to make them complete. Worker inserts tubes, then sends boards to another worker who individually inspects and tests each one.

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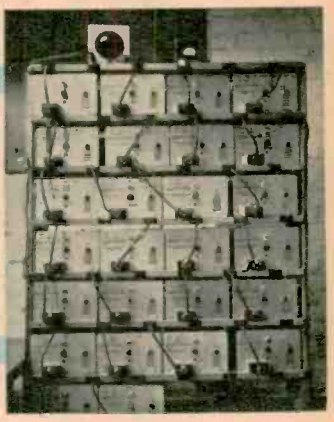
Aging completed, units are aligned with crystal-controlled frequency standard specifically designed for CB rigs.

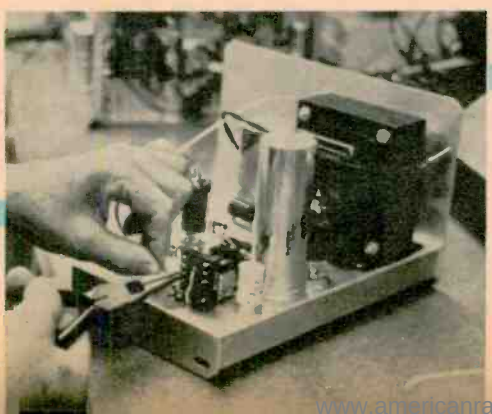
Finished Executive transceiver now can be put into operation on any of CB's 23 channels.

Following assembly, completed transceivers are placed in aging rack. Each unit remains in rack for 24 hours before undergoing final adjustments and operating tests.



Rig takes shape as printed circuits, power supply, etc., are combined.

Transmitter and power-supply sections are wired in conventional manner as separate assembly.



Preliminary test of transmitter and power supply insures this section of rig works properly.



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# Look what's happened to HOME-STUDY

By J. K. LOCKE

*Different? Sure. Better? Could be. Want to know more? Then read on.*

LESS THAN TWO decades ago, many schools offering courses in home-study electronics were set up primarily to turn out radio repairmen. But that was yesteryear. Today, electronics is claiming an ever more important role in business, industry, defense, space and entertainment. And, not surprisingly, schools and institutes are reflecting this growth in more ways than one.

If you doubt it, send for a few catalogs and take a long look. They're literally sprouting with spanking new courses in advanced new subjects. What's more, new teaching methods are being introduced, and advanced training aids are helping students learn more easily and quickly.

Most striking innovation at most schools are the new courses. As an example, take the latest additions to the curriculum at Cleveland Institute of Electronics. The Industrial Electronics and Automation course offered by this school includes instruction in such advanced areas as magnetic amplifiers, digital and analog computers, servomechanisms, ultrasonics, radiation inspection and detection, solar cells and counter tubes.

Go back a few years and you'd find these gadgets and many other such sophisticated devices were still laboratory toys. Today, they're in operation in factories, in offices, even in space. And, this being the case, technicians who install and maintain them need training in these and other far-out fields.

One of the most encouraging trends in home-study electronics is the way courses are keeping pace with changes in the field itself. The nation's study-at-home institutes constantly are adding new courses of instruction as the need arises. International Correspondence Schools of Scranton, Pa., for example, recently introduced eleven new courses in electronics. Among them were courses in telemetry, computers, high-fidelity sound systems, communications technology and industrial electronics engineering.

Similarly, DeVry Technical Institute of Chicago now provides a course in space and missile electronics; Central Technical Institute of Kansas City, Mo., will teach you about nuclear power; and Capitol Radio Engineering Institute of Washington, D.C., lists a special course in electronics for graduate engineers whose basic college work was in other fields. Needless to say, these are but random samples of the kinds of courses now yours for the taking.

**While a wide** variety of new home-study subjects is being taught, the bulk of courses offered by the schools still concern the fundamentals of electronics theory and practice. Dramatic new developments haven't repealed Ohm's law, and even space-age electronics experts still have to know how to use it. But the old courses are taking on a new look in some schools. Principal new twist given to fundamentals these days comes in the area of improved teaching methods.

Education experts in recent years have been revising some of their theories about how people learn. The most dramatic result of this work to date is the concept of programmed learning.

Basic principle behind this relatively new idea is that people learn better when they



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participate actively in the learning process. In other words, good learning is a two-way street. One simple step in this direction consists of nothing more magical than having students constantly answer questions and find out immediately whether their answers are right or wrong. Thing is, if the answers are wrong, students must stop then and there to find out what it is they don't understand.

One major proponent of the programmed learning concept is RCA Institutes. For the past year, this organization has offered its basic electronics course in programmed form.

RCA got into the programmed learning business a few years ago when the company was looking for a way to train technicians for its own computer-maintenance division. Company training experts worked out a programmed course. The programmed sequence —which RCA calls the Autotext—worked well.

Matter of fact, it worked so well that Harold Metz, vice-president in charge of RCA educational services, got the psychologists and educators who had developed the program together with officials of RCA Institutes. The combined team soon worked out a programmed course in elementary electronics to be offered to home-study students of the school.

Results to date have been impressive. For over a year now, students have been offered the introductory electronics course in either Autotext or conventional form. At the end of the course, they are given the same examination. Grades of Autotext students have averaged 10 to 15 per cent higher than those who learned the same material the conventional way. Fact is, school officials are considering eventual withdrawal of the standard course. And RCA soon may offer other courses in Autotext form.

Some other institutions also are starting to use the programmed learning technique. International Correspondence Schools, for example, offers some programmed courses. And other schools are either instituting or considering similar moves.

**Third major area** of innovation in today's home-study schools stems from what might be called better teaching aids. On the one hand, those who study at home never can have the opportunity to work on the great variety of complex and expensive equipment available to students who attend residence schools. Even so, lab experiments are an important part of most home-study programs. Schools provide kits of parts so students can perform experiments and get used to handling electronic equipment.

Main trouble with many experimental circuits designed for home use is that they take a long time to set up and tear down. The student spends much too much time getting ready for the experiment. Relatively few minutes actually go into finding out what makes resistors work—let alone capacitors, inductors, tubes, transistors and the circuits they make possible.

Several companies have developed clever devices to cut down on building time and allow students to concentrate on the learning part of the experiment. The modular panels and connectors now used by DeVry Technical Institute, for example, allow rapid construction. Students can jam the connectors



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# Look what's happened to HOME-STUDY ELECTRONICS!

into the holes anywhere on the board as dictated by the layout of the circuit. This done, they can wire the circuit simply by shoving component leads into the holes in the connectors. No soldering is necessary, and parts can be used again and again.

An even easier and faster circuit-building device is incorporated in the RCA Transistor Trainer. Designed for use along with RCA Institutes' basic course in transistors, the trainer is an optional aid which rents for $15 a month. Though a student can master the material in the course without it, he'll probably have a better grasp of transistor operation if he performs the experiments and observes first-hand what happens under varying conditions.

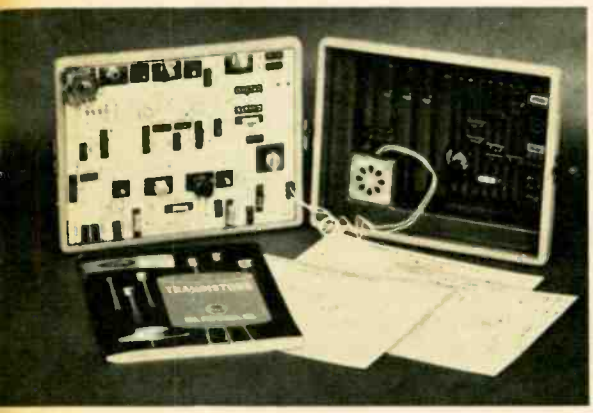
**Looking over** home-study electronics in general, you might say things never have stood better than they do today. New courses, new teaching methods and new equipment all number among the many innovations introduced by today's electronics home-study schools in their effort to stay abreast of the industry. As a result, students trained by today's institutes are well prepared for a rewarding career in the fast-moving field of electronics.

Also very much in the picture today are all the traditional benefits of home study. You undertake a home-study course on your own, and it is on your own that you complete it. For these reasons, anyone who studies at home must possess plenty of initiative and perserverance if he is to profit at all. And these same qualities also can spell success in most any field of endeavor.

A student simply must exercise initiative if he is to complete successfully a home-study course. This being the case, you might say the very nature of home study tends to develop your ability to analyze and depend on yourself. It can and should turn you into a self-starter. And the sort of intense personal application home study demands means that no one who satisfactorily completes a home-study course need have much worry about his own sense of initiative.

For a good sampling of schools offering courses in home-study electronics, scan through our list at right. This done, you might write the National Home Study Council, 1601 Eighteenth St., N.W., Washington, D.C. 20009, and ask for the Directory of Accredited Private Home Study Schools. It not only lists more than 60 of the nation's top home-study institutions, but also has a keyed alphabetical listing of courses. This way, you can find all schools that offer any selected course.

And before you make up your mind as to which school you'll call on to help you learn electronics, look up the course you're interested in. Then write all schools offering that course, and ask for more detailed information. From there on in, the road to electronics learning is yours.



Transistor Trainer by RCA Institutes contains twelve separate templates, sets up in minutes.

Circuit board from ICS is ideal for experiments. Parts are clipped rather than soldered in place.



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## MAJOR SCHOOLS OFFERING COURSES IN HOME-STUDY ELECTRONICS

AMERICAN INSTITUTE OF ENGINEERING AND TECHNOLOGY
1135 W. Fullerton Ave.
Chicago, Ill. 60614

AMERICAN SCHOOL
Drexel Ave. at 58th St.
Chicago, Ill. 60636

AMERICAN SCHOOL OF HOME STUDIES
127 Columbus St.
New York, N.Y. 10023

AMERICAN TECHNICAL SOCIETY
850 E. 58th St.
Chicago, Ill. 60637

BUSINESS ELECTRONICS
209 W. Jackson Blvd.
Chicago, Ill. 60606

CALIFORNIA ELECTRONICS & TV INSTITUTE
945 Venice Blvd.
Los Angeles, Calif. 90015

CANADIAN INSTITUTE OF SCIENCE AND TECHNOLOGY
617 Garden City Bldg.
263 Adelaide St., W.
Toronto 1, Ont.

CAPITOL RADIO ENGINEERING INSTITUTE
3224 Sixteenth St., N.W.
Washington, D.C. 20010

CENTRAL TECHNICAL INSTITUTE
1644 Wyandotte St.
Kansas City, Mo. 64108

CHRISTY TRADES SCHOOL
3214 W. Lawrence Ave.
Chicago, Ill. 60625

CLEVELAND INSTITUTE OF ELECTRONICS
1776 E. 17th St.
Cleveland, Ohio 44114

COMMERCIAL TRADES INSTITUTE
1400 W. Greenleaf Ave.
Chicago, Ill. 60626

COYNE ELECTRICAL SCHOOL
1501 W. Congress Pkwy.
Chicago, Ill. 60607

DEVRY TECHNICAL INSTITUTE
4141 Belmont Ave.
Chicago, Ill. 60641

DEVRY TECHNICAL INSTITUTE OF CANADA
970 Lawrence Ave., W.
Toronto 19, Ont.

GRANTHAM SCHOOL OF ELECTRONICS
1505 N. Western Ave.
Hollywood, Calif. 90027

INDIANA HOME STUDY INSTITUTE
Eastern Division
Box 282
Saxonville, Mass. 01256

INDUSTRIAL TRAINING INSTITUTE
2150 Lawrence Ave.
Chicago, Ill. 60625

INTERNATIONAL CORRESPONDENCE SCHOOLS
Scranton, Pa. 18515

MASSEY TECHNICAL INSTITUTE
148 E. 7th St.
Jacksonville, Fla. 32206

NATIONAL ELECTRONIC & TELEVISION SCHOOL
1298 Niagara St.
Buffalo, N. Y. 14213

NATIONAL RADIO INSTITUTE
3939 Wisconsin Ave., N.W.
Washington, D.C. 20016

NATIONAL TECHNICAL SCHOOLS
400 S. Figueroa St.
Los Angeles, Calif. 90037

NORTHWEST SCHOOLS
1221 N.W. 21st Ave.
Portland, Ore. 97209

PHILCO TECHNOLOGICAL CENTER
C & Ontario Sts.
Philadelphia, Pa. 19134

RADIO TELEVISION TRAINING OF AMERICA
52 E. 19th St.
New York, N.Y. 10003

RCA INSTITUTES
350 W. 4th St.
New York, N.Y. 10014



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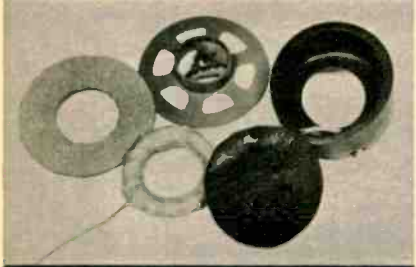
# Souped-Up Phone Tap

Remove flange from 8mm film reel, slip on cardboard disc 3/16 inch from other flange, then wind 1,000 turns.

After removing cardboard disc from reel hub, pull off coil, compress turns and wrap tightly with tape.



Movie-film reel with flange removed; cardboard-disc spacer and coil are at left. Finished tap is at right.

EASIEST way to tap your phone (*that's* legal) to record a message or for group listening through an amplifier is with an induction pickup coil. One commercially available type is a thin rectangle and fits under the telephone base. But it's hard to find the best coupling position. Cylindrical coils with a suction cup have somewhat better pickup than the flat-coil bit they're clumsy and often fall off the handset. Both types are high impedance (1,000 ohms) and are designed to work with tube or transistor amplifiers.

Our souped-up phone tap can be made for half the cost of other coils and, because it has a larger coupling area, it is about twice as sensitive. And its lower impedance (100 ohms) is a better match for transistor-amplifier inputs.

The rubber cap in which our coil is installed (see top photo) is called a Tele-Muff and is available for about 25¢ in stationery and office-supply stores. It holds the coil in perfect position over the handset earpiece and affords ear comfort.

The best form on which to wind the coil is the hub of a 50-foot 8mm movie film reel or a 3-inch tape recorder reel (modified, see second photo). If neither of these is available, wind the 1,000-turn coil (No. 34 enameled wire) on a 1¼-inch-diameter form between cardboard flanges spaced 3/16 inch apart. A quarter-pound spool of No. 34 wire has about 2,000 feet—enough for four pickup coils.

After the coil is wound, remove it from the form and wrap it tightly with masking tape. Neatness isn't terribly important but don't scrape any enamel insulation off the wires or you will short out some of the turns. Connect the coil leads to a length of shielded microphone wire.

Cut two 2¼-inch discs from cardboard and punch about six holes near the center of each (see top and bottom photos). Sandwich and glue the taped coil between the two discs. Then punch a small hole near the front of the Tele-Muff for the cable. Pull the cable through and push the coil/cardboard sandwich all the way into the Tele-Muff. Install a plug on the other end of the wire and you're ready to go.—*Gregg Bruce, Jr.*



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# Notes from EI's DX CLUB

WORLD'S FIRST two-headed radio rebel might be one way of looking at that station once called Teje Iran. These days it IDs simply as Peke Iran. And, once its Persian tirade is finished (around 1300 EST), it turns its 11695-kc transmitter over to an Iraqi Communist organization. This group goes at it in Arabic for the next half hour in first-class rat-tat fashion. All this hardly makes for interesting listening, of course, but it *is* programming with a twist.

Speaking of twists, a DXer in New York City sports a curved QSL from R. Tahiti. Why curved? Well, our guess is this gent has never heard R. Tahiti, let alone sent a report in its direction. Reason: though the card, which we had a look at, bears Tahitian stamps, it's postmarked in Massachusetts. Needless to say, it isn't counting.

Long-time EI DXer Hank Holbrook of Bethesda, Md., is the proud possessor of one of the year's longest-shot QSL's. It's from IDIWB, an Alitalia flight, no less, 200 miles NNW of La Coruna, Spain, at 33,000 feet with 100 watts. Frequency was 2945 kc which, technically at least, is medium-wave territory. In case you'd like to try your luck at such a feat, now's the time to log most any kind of utility DX below 3 mc.

For the record, those SWL swapping cards with the non-FCC calls do *not* count as QSL's. It shouldn't have to be said. But one sharpie tried to palm off two of them during our last Awards Period.

According to information distributed by Yemen at the World's Fair, R. Sanah still operates on 15710kc at 2200-0100, 0600-1000 and 1100-1700. This transmitter was heard widely in the fall of '63, though with considerable drifting. Reports out of neighboring Aden at that time put the station in Egypt, where it still might be. Since 15710 hasn't been reported in NA recently, you might try for the second SW channel (5950 kc) or even the BCB outlet on 881 kc.

Seems the only time ZK5, R. Rarotonga (Cook Islands), can be logged in North America is on those rare occasions when that potent radioteletype station on 5045 kc leaves the air. Best bet is between 0100-0200.

According to R. Sweden, R. Monte Carlo will put a long-wave transmitter into operation sometime during 1965. Meanwhile, R. Monte Carlo's transmissions this winter will be relayed by R. des Vallees-Andorre on 818 kc (BCB).

R. Togo at the capital city of Lome now has a new 100-kw transmitter on 5047 kc. With news in English at 1600. R. Togo is an excellent DX prospect.

Members who pride themselves on patience should try to log Australia via VL2UV. Station operates Tuesdays, Wednesdays and Thursdays only under auspices of the University of New South Wales at Sydney. Power is a puny 300 watts, frequency 1750 kc. Sign-on comes at 0300 (midnight PST), so be prepared to call on that patience during the wee hours.

Member H. L. Chadbourne of California reports a new frequency for the Far Eastern Broadcasting Company's Manila outlet. Station is heard in English on 9505 kc as early as 0700 (0400 PST) until past 1030.

Pretty soon EIDXC members will be able to stick to stations beamed to North America and still come up with pretty fair totals. Latest to join the long list is Radio Beirut (Lebanon) on 9625 kc at 2130.

Sign of the sunspot times is the fact that the Solomon Islands Broadcasting Commission has shelved all other SW frequencies in

[*Continued on page* 119]



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## ACOUSTECH IV

# ALL-TRANSISTOR PREAMPLIFIER

THE KIT: ACOUSTECH IV Stereo Control Center
THE MANUFACTURER: Acoustech Inc., 139 Main St., Cambridge, Mass. 02142
THE PRICE: $149
THE CONSTRUCTION TIME: about 20 hours

COMPONENT HI-FI came into its own about the time that Britisher named D.T.N. Williamson devised his famous amplifier. For though it never received a tenth the acclaim, Williamson also designed a preamp to go with that power amp of his. Flexibility was the thing Williamson seemed to have had in mind, since this duo sort of arrangement obviously makes the actual physical layout a good bit easier. Further, keeping preamp and power amplifier in separate packages helps eliminate the hum problems that can plague integrated amplifiers.

Tubes were kings in those days, of course, and the years have seen dozens of tube preamps in a baker's dozen different configurations. But now that semiconductors seem to have found their place in the hi-fi world, it's not surprising to see more and more appearing in preamps.

**What It Is.** Though the Acoustech people don't call their Acoustech IV a preamp, most people would. Acoustech refers to the device as a stereo control center, which, come to think of it, perhaps is a closer approximation to what the device actually is. But preamp or control center, the Acoustech IV weighs in as a solid-stater that's way out front in every respect. Appearance, design and, as our table indicates, performance make this a preamp that's no backseat billy from any point of view.

Though designed to work with the company's transistor power amplifier, the Acoustech can be used with practically any power amp. And it has sufficient inputs to accommodate most any program source a typical stereophile would have in mind. Its two low-level inputs serve for magnetic cartridges or, with modifications, tape heads. And its two high-level inputs can take a signal from a

*The ACOUSTECH IV at a Glance*

| |
|---|
| **Frequency response:** 20-20,000 cps, ±0.1db Flat from 5 cps (limit of test equipment) to −3db at 240 kc |
| **RIAA equalization:** ±0.5db |
| **Total harmonic distortion:** Below 0.1 per cent (limit of test equipment) at 20 cps, 1 kc, 20 kc |
| **Intermodulation distortion:** High-level inputs 0.082 per cent (60 and 6,000 cps mixed 4:1 for 2 V equivalent sine-wave output) |
| * **Hum and noise:** High-level inputs: −75.5db Low-level inputs: −56db |
| * **Sensitivity:** High-level inputs: 500 mv Low-level inputs: 2.8 mv |
| * 1 kc signal, 2 V rms out. |



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tuner or a high-output crystal or ceramic cartridge.

One thing you can't connect to the Acoustech is a tape deck—not in quite the right way, anyway. Equalization within the Acoustech is for RIAA phono, not NARTB tape, and there *is* a difference. But all isn't lost. For one thing, a tape deck with its own built-in preamp could be fed into the Acoustech's high-level inputs with no problem. Further, the Acoustech people will supply a modification kit, for $1, which will adapt one of the low-level inputs for tape use.

**The Controls.** Getting around to the front panel, the Acoustech's controls include an input selector switch for selecting the program source; a mode switch (stereo or mono); left and right frequency-compensation controls; a balance control; and a level control. In addition, there are four push buttons. One turns AC power on and off; a second—a muting button—drops the output of both channels 16 db; a third—called a comp switch—inserts or removes the frequency-compensating networks from the circuit; a fourth—called tape—enables you to play tapes no matter what position the input selector happens to be in.

Also on the front panel is a jack for high-impedance headphones and a switch that selects either left or right speaker, or both.

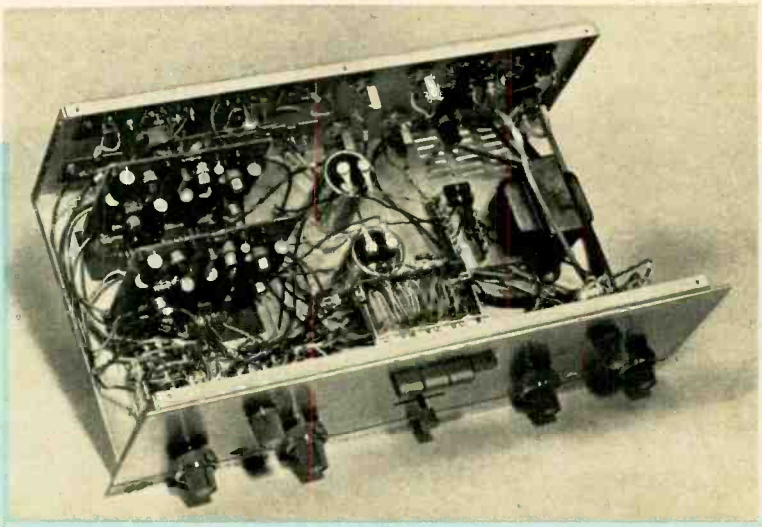
Of the push-button controls, one—marked comp—deserves special comment. When the control is in its normal position, response of the preamplifier is flat, a condition which the manufacturer states desirable for reasons of transient response and just plain listening. Depress the button, and the frequency compensation circuits (tone controls) become operative. But conventional controls they are not. They simply don't have the same effect that most bass and treble controls do. Matter of fact, maximum cut and boost is on the order of 10db, and even this occurs at the extreme limits of the audio spectrum.

The Acoustech people explain this by stating that "The action of the frequency compensating circuit has been designed . . . to satisfy audibly rather than to meet any preconceived ideas." And while this kind of English is a little hard to decipher, the meaning seems clear. In short, this is a preamp the listener drives—not vice versa.

**Putting It Together.** As you no doubt have gathered by now, the Acoustech IV isn't for the rank beginner. It's a preamp that's very definitely in the pro class from most every angle. And it's not for the beginner to construct, either, due chiefly to one big shortcoming in its construction manual.

To be sure, the text in the manual generally is excellent. The manufacturer has taken trouble to explain most operations carefully and thoroughly in a manner that is distinctly heart-to-heart. Before wiring up the push-button assembly, for example, you are told that "Possibility for error is greatest at this point" and that "if you are tired (or) if it is late at night, take a break or a nap." Simi-

[*Continued on page* 114]



There isn't much hardware in the Acoustech IV. The left- and right-channel preamp circuitry proper are supplied fully wired and tested on the two circuit boards at the left. Both boards plug into sockets after connections are made to them. Wiring on the four push button switches is tight, therefore you must exercise great care to avoid causing shorts in this area.



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CB CORNER

BY LEN BUCKWALTER KBA4480

# Is NA really for CB Radio?

**PROFESSOR MORSE** probably knew about it. Marconi surely suspected it. Now we've got a line for it. What is it? "An insatiable passion for communication." That's what.

Founder and sole spokesman for CB radio's newest would-be national organization says this passion explains CB's phenomenal growth over the years. And he also believes he knows the program that would enable his NACBR (National Association for Citizen Band Radio) to feed that passion. Yep, you read it right. The name is National Association for Citizen Band Radio, which makes for some unusual spelling, if nothing else.

NACBR's main plank seems to be that CBers should be allowed to talk about anything; be permitted long-distance contacts; have the right to erect antennas up to 100 feet high.

Another sweeping proposal centers on the 10-meter ham band. Located just above the Citizens Band in the 28- to 29-mc region, 10 meters is a tasty slice of spectrum NACBR would grab for CB. NACBR would convert 10 meters into a combined CB/amateur band. Ham privileges there would be, though no code or technical tests.

NACBR's roots provide an interesting contrast to previous groups with a let's-have-a-national-organization-for-CBers pitch. Man behind NACBR is Gordon P. Brown of Rochester, N.Y. He obviously belongs to a breed apart from other, earlier organizers who also wished to get CBers on the national-club bandwagon. Brown is an experienced businessman with resources at his command. He owns two AM radio stations and a hunk of a TV station.

**But let's look** further. Above all, Brown is forthright. He believes FCC gagging of CB chit-chat violates the right of free speech. Mr. Brown says he believes the Commission's move in this instance smacks of fascist dictatorship and does violence to the Constitution.

He goes on to label the recent rules-tightening as radio's Volstead Act (the 1920 law enforcing Prohibition). The assumption here is that the parallel lies in the fact that the Volstead was an example of an unpopular law.

There isn't much doubt about another point Brown makes again and again. He estimates there's some $350 million already invested in CB equipment. And, to his way of thinking, this investment "is a direct result of the public's insatiable passion for communication." Equally enticing are Brown's predictions of what CBers soon may be up to. They'll be using their channels "to spread the word of tolerance, knowledge and peace," he says.

**As for the NACBR,** we had a question for Mr. Brown and he had an answer for us. "Will NACBR members have the right to vote on issues or to elect officials?" we asked. Mr. Brown's answer: "No."

Which brings us to one piece of information omitted from NACBR literature. NACBR is a private, closed corporation. All decisions rest in the hands of its owner, Mr. Brown. A member's franchise is solely financial—exercised by paying yearly dues of $6, plus an optional $5 for an NACBR pin.

There is nothing which appears improper in Mr. Brown's organization. What deserves second thought, however, is an unfortunate choice of name.

If Mr. Brown succeeds in enlisting the support of most CBers, it would enrich NACBR's coffers by more than $3 million a year. The money would remain under Brown's exclusive control.

We are not at all sure that the National Association *really is* for Citizen Band Radio. Time alone will tell.



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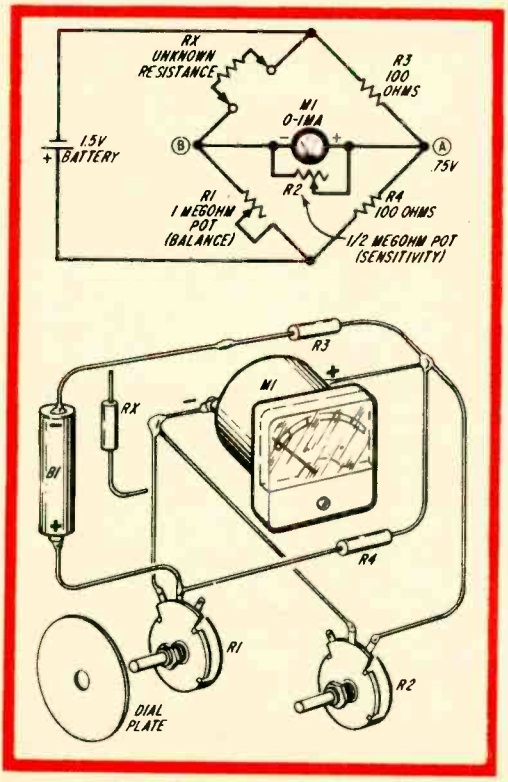
# The Wheatstone Bridge

BEST way to cross a river is via a bridge. And the best way to make accurate resistance measurements also is via a bridge—though a slightly different kind of one, to be sure. The latter is called a Wheatstone bridge and it does its job by comparing an unknown-value resistance with a known-value resistance. A meter, which is connected between two arms of the bridge, indicates a voltage difference which is proportional to the difference between the known and unknown resistances.

The Wheatstone bridge's accuracy is limited only by the precision of its components and its calibration. Unlike the VOM or VTVM, the Wheatstone bridge's accuracy is not affected by supply-voltage changes.

Let's take a look at the schematic to see what happens when a voltage is applied to the top and bottom of the bridge, or across R3 and R4—the comparison resistors. Since R3 and R4 are exactly the same resistance and they are in series, the 1½-volt battery voltage divides in half across them. That is, the voltage at A, with respect to the other side of R3 or R4, is exactly ¾ volt.

Look at the left side of the bridge. Resistor R1 is a potentiometer. The other resistance, Rx, is the resistor whose value you want to determine. Meter M1, connected from A to B, indicates the voltage difference between these points.




Let's set R1 so M1 indicates exactly zero. The bridge is now balanced and we know two important things. First, the voltage at B is also ¾ volt. If it weren't, M1 would deflect because there would be a voltage difference between A and B. Second, R1 equals Rx. Why? Because when R1 equals Rx the battery voltage divides equally (¾ volt) across them for the same reason it did across R3 and R4.

The thing to remember is that the resistance of R1 and Rx doesn't have to be the same as R3 and R4 for the voltage at A and B to be equal. If R1 and Rx were each, say, 1,000 ohms, the voltage drop across them would still be ¾ volt simply because their resistances are equal. Sensitivity pot R2 protects M1 against excessive current. Therefore, before connecting Rx, *always* turn R2 full counterclockwise. Then turn R2 slightly clockwise for a small indication on M1 (which could be to the left or right of zero). Then adjust R1 to zero M1 again. Repeat this procedure until R2 is full clockwise and M1 again indicates zero. Calibrate a scale for R1 with known-value precision resistors.

Using the parts values shown, our bridge will measure resistance up to 500,000 ohms. To measure higher resistance, use a 100-microampere meter for M1 or increase the battery voltage.

—*H. B. Morris*



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## Radio's Iron Curtain

*Continued from page 32*

ended when jammers came up on all the frequencies not being used as well as those on which program material was being transmitted. In the interests of good frequency management, this system soon was abandoned.

Perhaps the most effective anti-jamming device is known as *twilight immunity*. This method takes advantage of certain characteristics of the ionosphere.

The range of frequencies the ionosphere will reflect differs from day to night. During daylight hours the ionosphere will reflect higher frequencies than can be reflected at night. This phenomenon immediately suggests an anti-jamming device.

A transmitter located well to the west of a target area can get through to the desired territory no matter what a jamming station in the middle may do. Look at it this way: as darkness advances from the east there comes a time when the transmitting station is in daylight, the jammer in twilight and the receiving point in darkness. Both the broadcaster and the jammer can get a signal into the target area—but not on the same frequency.

A signal from the broadcaster hits a portion of the ionosphere that is in daylight and is reflected down to the target. But the spot of reflecting ionosphere between jammer and target is in darkness. A jamming signal on the broadcaster's frequency would not be reflected at all from the nighttime ionosphere and the jammer is out of business. This phenomenon occurs at dusk in Western Europe.

Our illustration shows that for several hours relatively high daytime frequencies can be propagated into Communist target areas while jammers between the transmitter and target are restricted to the lower frequencies that can be reflected from the nighttime ionosphere. For the jammer, it's a little like an outfielder watching a home run sail over his head and into the stands.

**Jamming's Future.** On August 1, 1964, just two days after the Chinese Communists publicly reaffirmed their refusal to attend any international conference on the ideological rift in the Communist camp, a major change in Soviet policy took place. The U.S.S.R. began deliberate jamming of R. Peking's Russian-language broadcasts directed to the Soviet Union. For the first time in nearly three decades of jamming, the Russians employed the technique against another Communist country. Thus, the wheel which had begun to turn in the summer of 1963, when jamming of V. America and BBC broadcasts in Russian was discontinued, had come full circle.

Interestingly enough, the U.S.S.R. did not use the familiar noise jammers against Peking. Instead, it employed broadcast jamming, which consisted of program material transmitted on Peking's frequencies. The Chinese almost immediately began jumping frequency, moving from 3 to as many as 40 kc away at regular time intervals. But the Russians followed them, thus eliminating all possibility that the interference was accidental.

And here's the really odd angle. The program material which the Russians were using to jam Peking was part of the R. Mayak transmission, also inaugurated August 1. R. Mayak, for the record, is a 24-hour-a-day program in Russian for listeners in the Soviet Union and abroad. It carries news on the hour and half-hour, as well as music and other special-interest features.

It appeared that the Russians were killing two birds with one stone. For one thing, they were inaugurating a new and revolutionary service. But they also were using many of the transmitters in this service to jam programs not to their liking.

In addition to R. Peking, the Russians were using R. Mayak to jam R. Free Europe's Polish programs. What's more, some R. Liberty programs also are being jammed by conventional noise jammers.

It now is evident that many of the transmitters formerly used for jamming BBC and V. America transmissions have been converted to conventional broadcast transmitters. These can be used either for international broadcasting or jamming—or both.

Though the Russians have cut back on their overall jamming effort over the past year and a half, there is every reason to believe that they would return to it should the occasion warrant. Further, they have assisted Castro by delivering several jamming transmitters to Cuba. And Castro has used them.

In the Far East, the Chinese Communist jamming effort is growing by the day.

There is no doubt that jamming will be with us for years to come.



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# THE HAM SHACK

BY ROBERT HERTZBERG W2DJJ

**MOBILE MIKE** . . . It's quite a switch from a beam on a roof tower to a modest little halo on a bumper mount. But we did it—as part of our shift from fixed-station SSB on 10, 15 and 20 meters to mobile AM on 2 meters. Just this past summer we installed a Heath Pawnee in our Chevy convertible (see photo). And first time we turned on the rig we found ourselves in a mighty different ham world.

As a for instance, we discovered that most Novices talk too much. It's possible, of course, that being new to the game has caused them to fall in love with their mikes. But whatever the reason, many seemingly can't bear to terminate a QSO. We must have covered 20 miles on an Ohio road while two lads in Cleveland made ready to sign off. We plain lost count of the final-finals they exchanged in the process.

Novices, of course, must use crystal control, so cross-band operation is common. Accustomed to transceivers, we found it a bit frustrating to hear one side of a conversation and not the other. The break-break technique that works so well on the other bands got us nowhere, so we called CQ and spun the receiver tuning knob for replies. Fortunately, there were plenty. After all, why shouldn't the sound of a W2 in W8 and W9 land make the boys pick up their ears?

On the lower-frequency bands most beams are only broadly directional, but on 2 they really are sharp. Some of the multi-element Yagis we heard were just like searchlights. Aimed directly at us when we were parked at a roadside eating place, they would pour in roaring signals. But turned away only a few degrees, they went absolutely dead.

The Pawnee now is the home shack, with us members in good standing of the Queens Insulting Net on 147.5 mc. We gas all through the evening hours with never a worry about TVI. It's fun!

---

**Fonetic Follow-Up** . . . Recent remarks in this column about Unfunny Fonetics have caused several readers to ask why we don't promote the new international alphabet used by the airlines. Though this Alpha-Bravo-Yankee-Zulu combination has been published widely, it's really no better than any of the more popular lists. These generally use easily recognizable names of people. The Alpha-Bravo assortment doesn't, and it also has one other notable weakness.

The catch we have in mind is the letter Q, for which the phonetic is Kay-beck. What, you well may demand, is the connection between Q and Kay-beck? Well, the latter happens to be the *French* pronunciation of Quebec, though it sounds more like the phonetic for K to most ears. And the choice of Quebec becomes even more puzzling when you think of all the other French words in which Q has the familiar kew sound.

There's still another curious aspect of the phonetic mix-up. Some radio services which do use the new international very meticulously also retain something that's extremely ancient. It happens to be the old military word Roger for R, which they use as the voice word of acknowledgement. To our way of thinking, this is an inconsistency if there ever was one!

---

**Sensible Signal** . . . Long before the military adopted *over* as a your-turn-to-talk signal in phone work, most everyone used the simple expression *go ahead*. This now is returning to favor in ham operation, but in somewhat abbreviated form. Today, it's *go*, sweet and simple. But it's also short, snappy and unmistakable. Like it?

Two-meter mobile can be fun and then some, as W2DJJ, learned on a trip through W8/W9 land.



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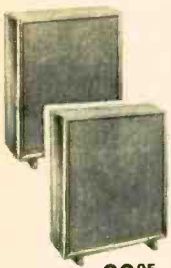

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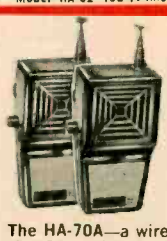

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## Confessions Of An FCC Examiner

*Continued from page 77*

out the rather tall masts which supported an elaborate antenna system. Continuing to a few yards from the building we had no trouble in observing an impressive installation of ham-radio equipment through an uncurtained window. A young man was manning the telegraph key industriously and the blue flashes from mercury-vapor rectifier tubes added an eerie glow to the well-lighted room. A second young chap was engaged with a coffee percolator and cups.

In a few moments, we proceeded to the door and knocked. The coffee chef immediately opened it and my cohort said, "We've been curious about this place for some time. It's an amateur radio station, isn't it?" The reply was affirmative, and we were invited in to look around and have a cup of coffee. After a brief explanation of amateur radio by the young man who had admitted us (the other remained at the key), my cohort said, "You fellows operate under some pretty stiff Federal laws, don't you?"

I think that right there the young lad smelled a rat, but he acknowledged that they did. My cohort went on, "Aren't these some hours during which you boys aren't allowed to operate?". Guess the reply. "Oh, yes, but we've been granted special privileges by the Radio Inspector as we have non-interfering equipment and lots of experience!"

The time had come. Slowly drawing back his coat to expose the glittering gold badge of the Department of Commerce, my cohort said nothing; it would have been superfluous. The young man at the key immediately stopped and pulled a switch. Both tried to talk at once but their stammering was interrupted when my cohort said, "All right boys; you've said enough. Pull the main switch, turn out the lights and lock the doors and windows. We will put a padlock and Government seal on your shack and you are warned not to again use your equipment until we authorize it from the district office."

This statement brought forth much pleading. "Can't we just operate a few more days if we observe the silent hours? We both go back to college in a couple of weeks and won't be home again until summer vacation (this was their Easter vacation)." But it was of no avail; my cohort remained firm and we closed them down. A few days later they received a citation from our office suspending both their operator and station licenses for a period of three months. This probably made them sadder and wiser; at any rate, we received no further complaints against them from then on.

---

As occasionally happens in connection with Government activities, attempts at bribery weren't unheard of. An occasional amateur sometimes would make a poorly disguised offer by saying, "Can't I just pay you a fine to cover this offense and close the matter?" A firm explanation by one of us that such tactics smacked of bribes usually was sufficient to set the offender straight.

Not only was such close approach to bribery tactics experienced, but a number of border-line cases also were known. Surprisingly enough, most of these emanated from some of the largest and most prominent firms in the industry, rather than individuals. Most were in the nature of attempts to gain favor and ingratiate themselves with the Radio Inspection Service. The hope was that more or less minor infractions therefore would be overlooked.

On more than one occasion, I came back from a field inspection trip which generally involved the checking of several prominent broadcast stations. And I would find an impressive express package addressed to me at the office, all prepaid and in order. The return name and address of the sender of course necessarily would appear on such as required by express company rules.

When I would call the parcel to the attention of the Inspector-in-Charge, he invariably would inquire, "Have you ordered anything from these people?" Upon my replying in the negative, he would say, "All right, you know what to do," and walk smilingly away.

Sure, I knew what to do; it was another established office routine. One of the office clerks would type out a Collect express label, addressed to the sender of the package. And, unopened, the box with whatever its contents were, promptly would go back!

Some packages even had been labelled brazenly with their contents: fragile: vacuum tubes, radio receiver, or more generally, radio parts. No acknowledgment of receipt of such shipments ever was made by our office. Nor was their return ever discussed on subsequent visits to the sender!



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# EI's 1964 Index

EI's 1964 Index

C—Construction Project
F—Feature Article
TP—Theory & Practice Article
Name following title is author.
Page number follows the date.

## AMATEUR RADIO



## AUDIO, STEREO & HI-FI



## CITIZENS BAND



## KIT REPORTS



## SHORT-WAVE LISTENING





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# EI's 1964 Index

EI's 1964 Index



## THEORY AND PRACTICE



## SPECIAL FEATURE ARTICLES



## SPECIAL CONSTRUCTION PROJECTS





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## That Ham Radio Brawl

*Continued from page 86*

countered (but didn't), it needs no enemies.

Several articles at one point appeared in 73 under the by-line of "Wretched Coward, K2PMM." No such call letters exist, though the name bears a striking relationship to that of a CQ official.

Green's big push against RM-499 came when he printed a for-or-against ballot on 73's cover and asked his readers to vote. He then announced that 83.5 percent of his readers, based on 3,000 ballots, were against the proposal, while QST claimed most hams enthusiastically supported it. CQ had a voice in that flurry, too. 73 was accused of counting "votes before the ballots are distributed."

One of the most surprising events did not concern the ham fight at all. Green declared his candidacy for the Republican vice-presidential nomination in the New Hampshire primary—and won! The fact that he happened to be the only candidate helped but, even so, he did receive a substantial number of votes. Green said his candidacy was not a pure lark but was meant to show deficiencies in American politics.

When CQ let go with its biggest shot of the squabble it started out by referring to "our noble vice-presidential candidate from New Hampshire. . ." The magazine went on to say that a ham club newspaper had torn Green up "in little pieces and dragged the remains from one side of his country barn to the other." Later they came on with, "Vulgar is the only word we can find to explain 73's expose of the so-called 'ARRL booze party.' "

"It's too bad so few of you read CQ anymore," was Green's retort. "Their few articles may be dull, but you're missing hilarious editorials." CQ, it happened, had just moved its headquarters from Manhattan to a Long Island suburb and Green, perhaps remembering the country-barn bit, said Cowan Publishing had moved "to what looks very much like an abandoned Howard Johnson restaurant. . ."

RM-499 is a serious piece of business for hams. Nearly all licensees agree that something must be done to clean up the clutter on the bands and that some form of incentive licensing probably is required. The question is whether RM-499 is the best answer.

However, just as the argument over the ARRL's handling of the proposal once eclipsed the concept itself, RM-499 now seems to have faded from the center of the ham brawl. Instead, the fight has become self-perpetuating and its point is the fight itself.

Whether or not RM-499 ever gets made into law by the FCC, the big brawl of the early Sixties likely will be remembered for a long while by most hams. The benefits of the donnybrook are few in number, though they do exist. Many hams who had become bored with the hobby have suddenly renewed their interest, taking one side of the argument or the other. Nonhams have been attracted by fireworks in what normally is a pretty quiet and conservative field and may in the end bring new blood (unspilled) into the amateur fraternity.

73 was accused by CQ of getting into the controversy to promote subscriptions and advertising. Whatever the intent, the magazine seems to be enjoying healthy days. (73 returned the compliment by saying CQ had the same goal when it let go with its broadsides.)

The greatest danger undoubtedly was to the personalities involved. Some of the things that have been said might make an occupant of skid row send for a lawyer. However, no lawsuits have been filed at this writing and it appears that, fortunately, all those involved have relatively durable skins and cool heads. Evidently, no reputations have been damaged.

## Amateur Radio Confidential

*Continued from page 52*

pulling in Sinatra, Monroe and that bunch. In a flash the hams became phantom voices in the night. "The green Chevrolet, license 100-509," we'd say. "Watch it, feller." The gags went on for a month or so in my area, ending in what one newspaper called a "Pier 6 brawl for children."

There are lots of other stories I could tell. Such as parking mobiles around the DX hound's house, with its big beam, and giving a dozen exotic DX calls in ten seconds. Or the time we found two mobiles parked back to back and tied the whips together.

But I just don't have time. I have to rush over to give a speech to a bunch of Novices at a school. My talk is titled, A Ham License Is a Privilege—*You* Have Responsibilities!



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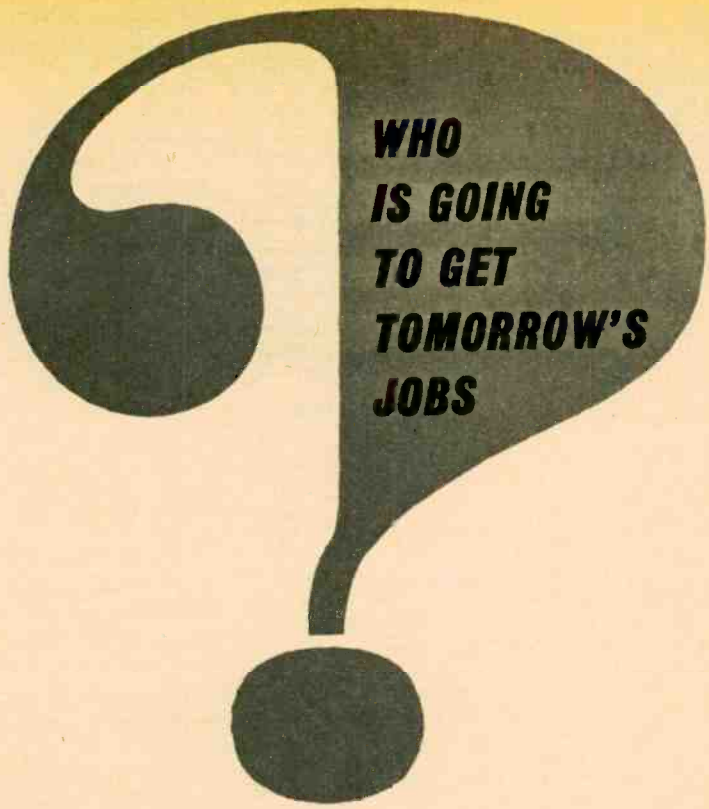


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# ELECTRONIC SWAP SHOP

EI's Swap Shop provides a way for readers to obtain equipment they want in exchange for items they no longer have use for. Notices must be from individuals, not commercial concerns. Entries must include your name and address, as well as a description of what you now have and what you would like in exchange. Address: EI's Swap Shop, ELECTRONICS ILLUSTRATED, 67 West 44th Street, New York, New York 10036.

EICO 762 factory-wired CB transceiver. Like new with two crystals, mike and manual. Will swap for 7-inch, 2-speed monophonic tape recorder. John F. Downing, 18411 Kingsbury St., Northridge, Calif. 91324.

HEATH IT-11 capacitor checker. Will trade for an audio wattmeter. H. Wolfe, Apt. 6C, 121-08 236th St., Rosedale, N.Y. 12472.

EI Stereo Beacon (built from May, '63 EI article). Works perfectly. Will swap for small FM tuner. R. L. Fuller, 3510 Carr Ave., Indianapolis, Ind. 46241.

GLOBE Mini-Matcher antenna tuner. Matches transmitter output to a long-wire antenna. Assembled from kit. New. Will swap for SWR meter. Charles H. Ensor, 6911 Garden Grove Ave., Reseda, Calif. 91335.

HEATH GW-11A 12-V CB transceiver. Will swap for test gear. Chuck Sklover, 121-12 236th St., Laureleton, N.Y. 11422.

WESTERN ELECTRIC Type 52 headset with adjustable headband and mike boom. Complete with plugs. Good condition. Will trade for Heath Sixer or make swap offer. Reed Layton, 4222 Lankershim Blvd., North Hollywood, Calif.

SPARTON photoelectric auto rear-view mirror. 12 volt. Double-surface mirror moves to non-glare position when headlights shine through rear window. Includes tube, photocell, relay and solenoid. Will swap for 35-mm camera. Chester Haynoski, 16453 Chatsworth St., Granada Hills, Calif.

HEATH GC-1A (Mohican) all-band transistor portable receiver with AC power supply. Make swap offer. M. Fisher, 4190 Bedford Ave., Brooklyn, N.Y. 71229.

GONSET Communicator III 2-meter transceiver with preamp and five-element beam with rotator. What have you to swap? Phil Bettan, 144-32 78th Ave., Flushing, N.Y.

HALLICRAFTERS HT-37 CW/AM/SSB transmitter with PTT. 80, 40, 20, 15 and 10 meters. Good condition; make me a swap offer. Allan Malamy, 102-35 67th Rd., Forest Hills, N.Y.

TRIPLETT 630 20,000 ohms/volt VOM with test leads. Good condition, recently calibrated. Will swap for pocket-size 20,000 ohms/volt VOM or VTVM. Fred Blechman, K6UGT, 23958 Archwood St., Canoga Park, Calif.

KNIGHT-KIT Span Master regenerative all-band receiver. Make swap offer. David Buckwalter, Wilridge Rd., Georgetown, Conn.

LAFAYETTE HE-15 CB transceiver. Needs crystals. Will swap for FM/AM tuner or hi-fi speaker and enclosure. Philip Weed, 17-19 Great Neck Rd., Copiague, Long Island, N.Y.

RCA 10-inch TV. 630 design, about 1948 vintage. In working order but needs touching up. Make swap offer. Christopher V. Waldorf, 2488 Grand Concourse, Bronx, N.Y.

## All-Transistor Preamplifier

*Continued from page 99*

larly, you are told precisely how to solder heat-sensitive components, exactly how to orient controls, and so on.

But if the text in the manual is superior, the drawings are just as poor. Even an experienced kit builder will find himself slowed in attempting to understand precisely what has been depicted. And certain inconsistencies between drawings tend toward confusion. The identical section on the input selector switch is shown quite differently in two succeeding drawings, for example, a failing that could lead to a wiring error in one of the sections the instructions spell out as "difficult." Further, had the drawings been clearer and easier to follow, construction time could be less than the 20 hours we specify.

Like some other kits now on the market, the Acoustech is supplied with all component parts neatly packaged in separate plastic envelopes. What's more, these various envelopes are stapled around the edge of a kit cloth, a large piece of felt-like material which Acoustech intends as covering for the work area. We found this made our task much easier, and Acoustech is to be congratulated for its care in this regard.

And should you want to use the Acoustech IV in places where the line voltage is 220/250 volts, the preamp can be easily modified for operation on this power. The modification is simple and requires only a minor wiring change in the connection of the primary of the power transformer.

Acoustech did not provide a center-channel output since it feels such an output degrades left- and right-channel separation. However, for those who want such an output to drive a third power amplifier, a special kit of parts is available for $1.

**How It Worked.** As our table indicates, the Acoustech IV is a preamp that's up with the pros. Its superb transient response makes for a sound many other preamps are just plain incapable of. Its frequency compensation network seems based, as the manufacturer states, on the human ear rather than the textbook. And, if we can ignore some of the manual's annoying though not insurmountable shortcomings, we could say that this is a preamp that is outstanding in every respect.



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# WORLD'S FUNNIEST ELECTRONIC FAKES!

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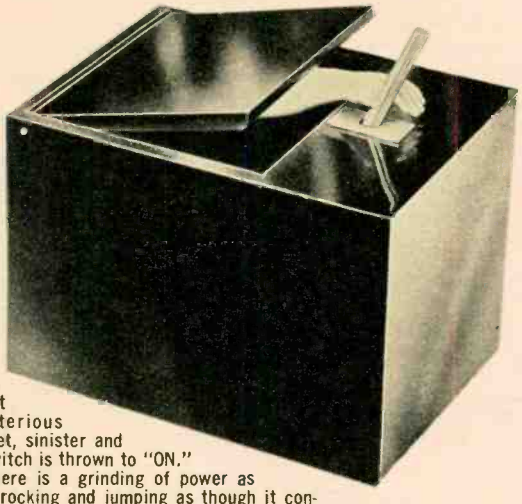

## LITTLE BLACK BOX

**LITTLE BLACK BOX.** There it sits, the mysterious Black Box, quiet, sinister and waiting. The switch is thrown to "ON." Immediately there is a grinding of power as the box starts rocking and jumping as though it contained a hidden genie. Then the lid slooowly rises, and from beneath it emerges a hand. The hand grabs the switch, pushes it to "OFF" and quickly disappears back into the box. The lid slams shut and all is as it was. IT DOES NOTHING—ABSOLUTELY NOTHING—EXCEPT SWITCH ITSELF OFF. It has a fantastic psychological impact. Once seen—never forgotten. A gift that's funny, different and completely impractical. Uses standard flashlight batteries, which are included in the price of **$4.98** ppd.

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## A New Look for CB

*Continued from page 39*

in view of the fact that less than one-half of one per cent of all licensed CBers responded. And many yielded no real comments at all, merely indignant blasts containing a few constructive steps and little reason.

"So what if I did write a letter," you say. "Would it mean anything?" Let's see how effective some comments were. For one, the Commission wanted to set aside five channels for stations of different call signs. Reviewing the comments, it expanded the number to seven. Also, the proposed rules once pegged maximum output power at 3.5 watts. (Assuming a 5-watt input, this would work out as 70% efficiency.) But several manufacturers plumped for a higher figure, claiming their 5-watt rigs could attain efficiencies of 80%. The Commission responded in two ways: saying on the one hand that such high efficiencies are doubtful but, on the other, granting the 80% figure (equal to 4 watts), anyway.

Several organizations requested permission to make up their own call-signs. The result is compromise; sure, you can devise special calls, but you can use them only in addition to your regular call. Some requests were denied as being contrary to the CB service; e.g. higher antennas, more power and assigning frequencies according to location.

New proposals for CB are in the making. There's one, for example, that could tighten technical specifications and possibly increase equipment cost. Too, there's a hint that antenna-height restrictions even might be relaxed somewhat. How do you feel about these issues? Well, we'll keep you posted . . . you go ahead and write the letters.

## Hi-Fi Today

*Continued from page 40*

of fact, the manufacturers mentioned simply are going after the quality-minded though non-technical market. There's still plenty of room for component hi-fi, and I haven't heard of any manufacturer who's thinking of cutting down on his component output.

What is going to be interesting here is the battle shaping up between the makers of the new high-quality packages and the big appliance manufacturers who turn out those raucous-sounding stereos. Whoever wins the battle (and I know where *my* sympathies lie), the consumer is bound to profit in the long run.

---

**I've had the chance** recently to check out some of the new cartridges with elliptical styli. And I can confirm the manufacturer claims that the elliptical tip (much closer to the shape of a recording stylus than the usual ball tip) cuts down tracking distortion and provides generally cleaner sound. But I have my reservations.

What really bothers me is that it's oh-so-easy to install any of the new elliptical pickups incorrectly. And if an elliptical tip is even slightly out of alignment with the groove, the pickup loses its one big advantage. Worse yet, it actually becomes a record-destroyer as the narrow radius of the tip makes frontal instead of perfectly lateral contact.

This, I think, is going to be a tough problem to deal with. The makers of elliptical pickups take tremendous pains to align the stylus tips properly, which is one reason why the ellipticals cost more than standard pickups. But let a user install the cartridge even slightly off-center in the tone-arm shell and all the manufacturer's troubles are for nothing. The same goes if the stylus is canted by being dropped accidentally on a record or turntable platter.

At this point, all I can say is that anyone interested in an elliptical pickup should be careful to install it properly. And I think any household where wives or children handle hi-fi equipment should be elliptically off limits.

---

**A good many people** have noted that some of the new "transistor" tuners actually are hybrid jobs, with standard tubes or perhaps Nuvistors in the front-end circuitry. Reason is that transistor front-ends tend to be plagued by overload and cross-modulation problems.

In two cases recently, I've checked transistor tuners that performed magnificently in my own location (130 air miles from New York City). But they promptly became next to useless when I took them into the Big Town. They plain just couldn't separate closely spaced stations and strong stations came blasting through at several points on the dial.

[*Continued on page* 119]



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## VHF Broadspanner

*Continued from page 49*

well in a strong-signal area. They cost only a few dollars. Take a look at the section of special antennas for VHF receivers in parts distributors' catalogs. There you'll find a selection of whip and ground-plane antennas that will cover practically all frequencies that can be tuned by the Broadspanner. The most common ranges of frequencies that are covered by the antennas are 30-50 mc, 108-136 mc and 144-174 mc.

Don't expect reception from 140 to 173 mc with coil L9 to be as hot as it was on the lower bands. The receiver's detector is a compromise design to cover 26-173 mc.

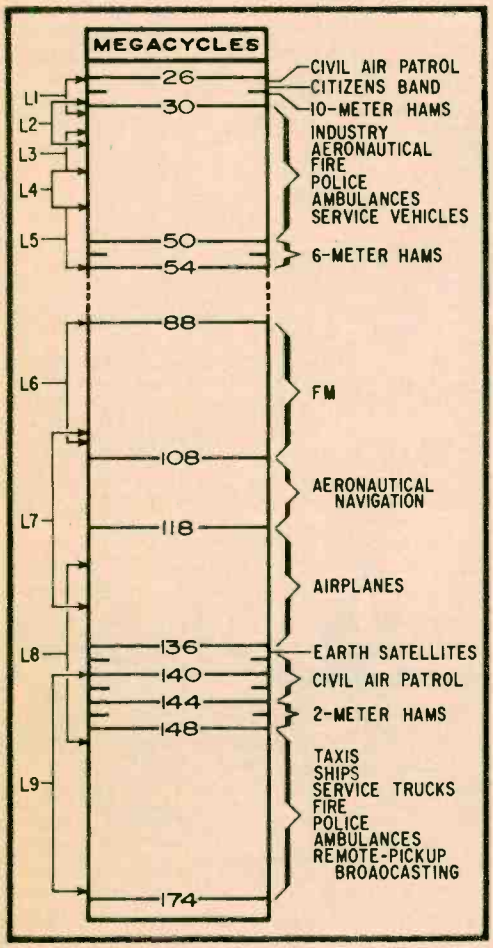
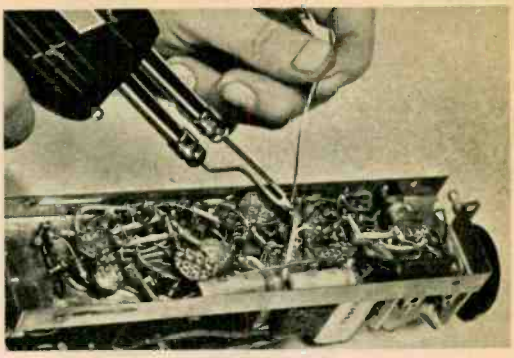



Chart shows frequencies covered by the Broadspanner's coils and what you can listen to.


# SOLDERING TIPS FOR HI-FI KIT BUILDERS



**AVOID USING TOO MUCH SOLDER**

Apply just enough solder to make a secure connection. Excess solder may fill up tube sockets, freeze switches or cause short circuits.


**USE A DUAL HEAT GUN**

Use the low heat trigger position to prevent damage when soldering near heat-sensitive components. Switch to high heat only when needed.

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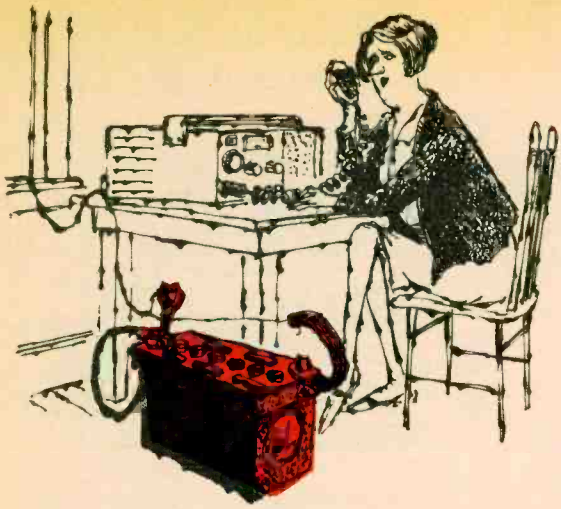
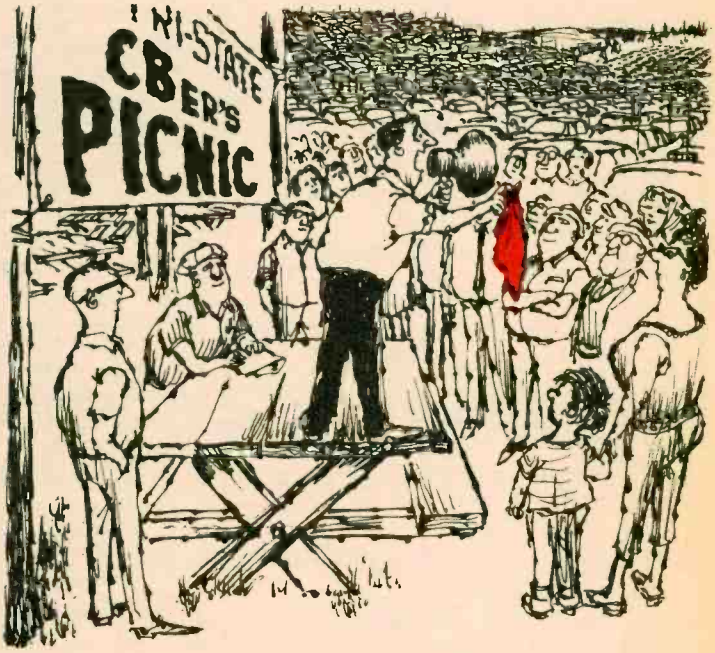


"Well, Eleanor, I AM going to have to tell George about the car, but at least nothing happened to the CB set."

"Oh, I beg your pardon! I thought you were a fellow CBer."

## OVER AND OUT

by Rodrigues


"All together, now—let's put our 3,600 rigs on channel 14 and when I drop my handkerchief we'll give a big 18,000-watt HAPPY BIRTHDAY to Joe Bentley, who's waiting down in the Canal Zone . . ."



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## Hi-Fi Today

*Continued from page 116*

I'm confident the problems with transistor front-ends can be straightened out (they already have been in several tuners). But I'd advise anyone interested in a solid-state tuner or receiver to check its selectivity carefully in a showroom and also to watch for cross-modulation, not to mention impulse noise.

Matter of fact, it's high time for anybody who doesn't live in a super-fringe area to concentrate on just those factors. There isn't much point in worrying about sensitivity anymore, since it's about as good in the current crop of tuners as it's likely to get. And while you're at it, make sure to save some of the moolah you *could* spend for extra sensitivity. It'll pay you to invest it in a good, directional outdoor antenna and rotor.

## El's DX Club

*Continued from page 97*

favor of its 75-meter channel (3995 kc). West Coast EIDXCers report it's often heard after 2330 PST. Hams also cite Pacific QSO's on 80 meters, so there's no denying DXers are feeling our sunspot low.

Deutsche Welle's arch nemesis, R. Berlin International, seems to have acquired some potent new transmitters. Matter of fact, RBI now is a cinch to log even with the simplest receiver. English is scheduled at 2245-2315 for the East Coast and one hour later for the Western states. Frequencies for these transmissions are 9645 and 6080 kc.

Keep in mind that a new series of manned U.S. space flights will start soon. Most likely channel is still 15016 kc, with SSB modulation only.

Propagation: Because of continued low sunspot activity, the highest useful bands for daytime DX, this winter will be 17 and 21 mc. DX on the higher frequencies—the 26-mc SWBC band, the 10-meter ham band and TV and FM channels—will be poor to nil.

During nighttime hours, the 4-, 6- and 7-mc SWBC bands will be best for DX. Even so, because of crowded band conditions, interference levels will continue high.


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*Continued from page 63*

Once you do pick up your target, you can check the ID in two ways. Best bet is to listen for Doppler frequency shift; i.e., use your marker as BFO and check whether the resultant audio note varies (see DR. DOPPLER'S STRANGE EFFECT, Nov. '64 EI). Or you can turn off the marker and replace it with the SW receiver's own BFO.

---

**Mystery Story.** Report circulated last spring via R. Sweden's DXcast said Deutsche Welle (the Voice of Germany) was planning a relay in Portugal. R. Sweden since has been besieged with queries regarding same, we suppose, but we decided to go straight to the source. We took pen in hand and asked DW whether a Portuguese relay was a possibility. With the note went a reception report.

About a month later we received a copy of DW's new program quarterly, Hello Friends, though no answer to our question. In another couple of weeks came a second program schedule—this one of the pocket variety intended especially for North American listeners. Again, there was no mention of that Portuguese relay. Latest mailing from DW is still another schedule, accompanied by a second one in German. And you've guessed it—our query was ignored again.

---

**Single Sideband.** SSB—which began with amateur and experimental stations, then spread to all international telephone circuits not equipped with scrambled speech—now threatens to swamp the entire utility field. Latest to go SSB are all USAF international channels, most important of which are 6730.5, 6738, 11228 and 15016 kc. Here you will find such rare catches as AFD14 (Ascension Island), AJM2 (Keflavik, Iceland) and Lajes (Azores).

This move to SSB certainly is not good news for many DXers. For one thing, single sideband requires two different tuning operations. You first must locate the channel, then tune the modulation with your BFO. Further, since many low-priced short-wave receivers don't have a BFO at all, you'll have to add one, or you're a gonner.


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| 1L4 | 6AH4GT | 6CD6G | 6S4 | 7A4/XXL | 7Y4 | 12Q7 |
| 1L6 | 6AH6 | 6CF6 | 6S8GT | 7A5 | 7Z4 | 12SA7 |
| 1N5GT | 6AK5 | 6CG7 | 6SA7 | 7A6 | 12A8 | 12SG7 |
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| 1Q5GT | 6AL7 | | | | | 12SK7 |
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| 1S5 | 6AN8 | | | | | 12SQ7 |
| 1T4 | 6AQ5 | | | | | 12V6GT |
| 1U4 | 6AQ6 | | | | | 12W6GT |
| 1U5 | 6AQ7GT | | | | | 12X4 |
| 1V2 | 6AR5 | | | | | 12Z3 |
| 1X2 | 6AS5 | | | | | 14A7/ |
| 2A3 | 6AT6 | | | | | 12B7 |
| 2AF4 | 6AT8 | | | | | 14B6 |
| 3BC5 | 6AU4GT | | | | | 14Q7 |
| 3BN6 | 6AU5GT | | | | | 19 |
| 3BZ6 | 6AU6 | | | | | 19AU4GT |
| 3CB6 | 6AU8 | | | | | 19BG6G |
| 3CF6 | 6AV5GT | | | | | 19J6 |
| 3CS6 | 6AV6 | | | | | 19T8 |
| 3LF4 | 6AW8 | | | | | 24A |
| 3Q4 | 6AX4GT | | | | | 25AV5 |
| 3S4 | 6AX5GT | | | | | 25BQ6 |
| 3V4 | 6B8 | | | | | 25DN6 |
| 4BQ7A | 6BA6 | | | | | 25L6GT |
| 4BZ7 | 6BC5 | | | | | 35W4GT |
| 5AS8 | 6BC8 | | | | | 25Z5 |
| 5AT8 | 6BD6 | | | | | 25Z6 |
| 5AV8 | 6BE6 | 6CL6 | 6SC7 | 7A7 | 12AQ5 | 26 |
| 5AW4 | 6BF5 | 6CM6 | 6SF5 | 7A8 | 12AT6 | 35A5 |
| 5BK7 | 6BF6 | 6CM7 | 6SF7 | 7B4 | 12AT7 | 35B5 |
| 5J6 | 6BG6G | 6CN7 | 6SJ7 | 7B5 | 12AU6 | 35C5 |
| 5T8 | 6BH6 | 6CS6 | 6SK7 | 7B6 | 12AU7 | 35L6GT |
| 5U4G | 6BJ6 | 6CU6 | 6SL7GT | 7B7 | 12AV6 | 35W4 |
| 5U8 | 6BK5 | 6DE6 | 6SN7GT | 7B8 | 12AV7 | 35Y4 |
| 5V4G | 6BK7 | 6DQ6 | 6SQ7 | 7C4 | 12AX4GT | 35Z5GT |
| 5V6GT | 6BL7GT | 6F6 | 6SS7 | 7C5 | 12AX7 | 37 |
| 5X8 | 6BN6 | 6H6 | 6T4 | 7C6 | 12AZ7 | 39/44 |
| 5Y3GT | 6BQ6GT | 6J4 | 6T8 | 7C7 | 12B4 | 42 |
| 5Y4G | 6BQ7 | 6J5 | 6U8 | 7E6 | 12BA6 | 43 |
| 6A7 | 5BY5G | 6J7 | 6V6 | 7E7 | 12BA7 | 45 |
| 6A8 | 6BZ6 | 6K6GT | 6W4GT | 7F7 | 12BE6 | 50A5 |
| | | | | | 12BF6 | 50B5 |
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• Resistance
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**Charles Morishita, Oregon,** worked as a farmer before taking DeVry's training. Now he builds and tests equipment at Lockheed's Space and Missile Division.
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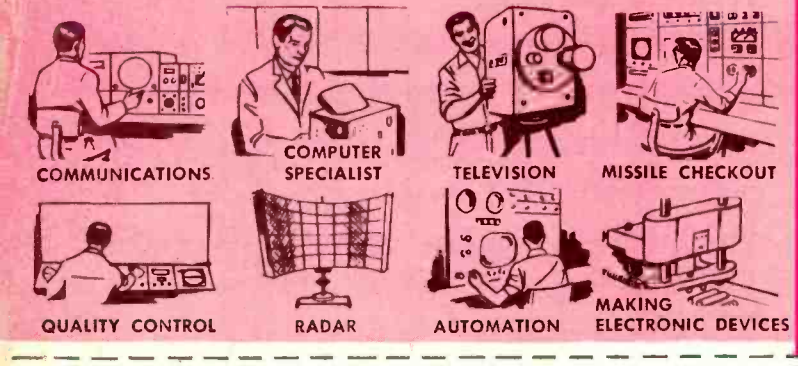


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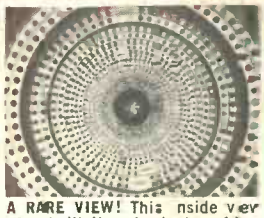
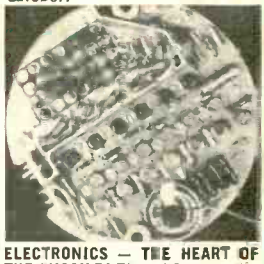
DeVry's president, Mr. [illegible] Lafeber, accorded a special invitation to inspect a famous missile facility, was deeply impressed with the role of Electronics in the national defense.



A RARE VIEW! This inside view of a ballistic missile is seldom seen by a civilian. It's a sight that greatly impressed Mr. Lafeber.



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